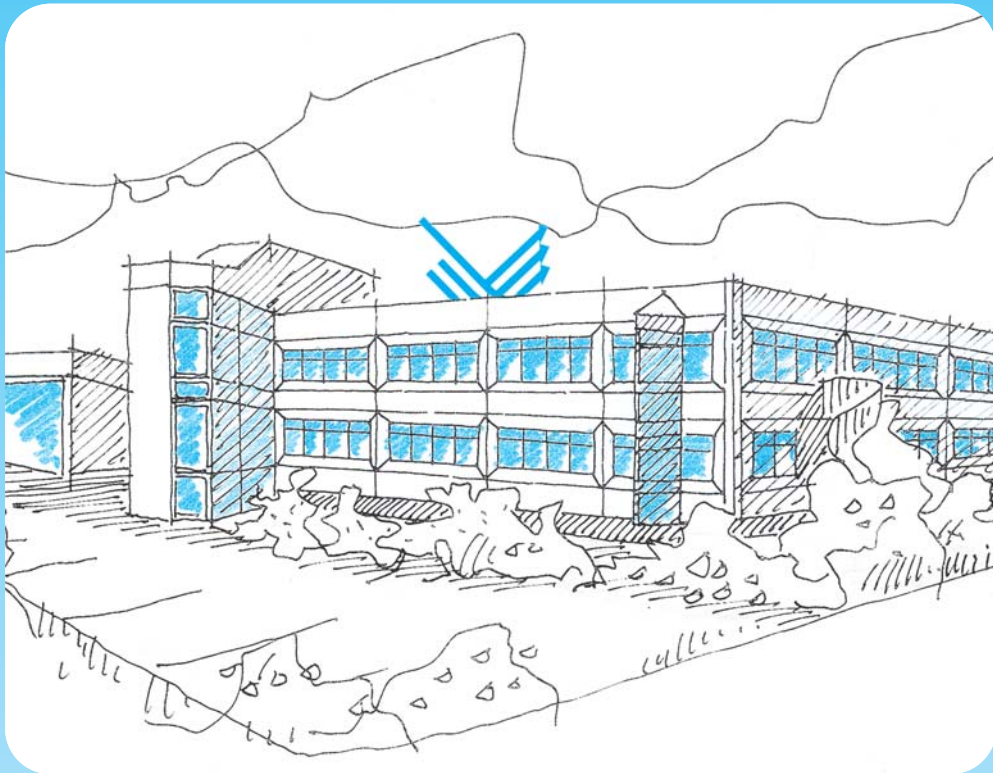


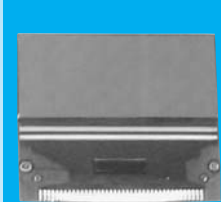
# digital electronic gmbh

## LIEFERÜBERSICHT

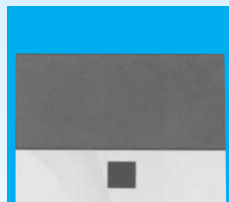
# LCD - DISPLAYS



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**LCD-  
Displays**



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## STANDARD CHARACTER MODULES

Module Type Series	Module Size, mm WxHxT (T1)	Character, mm WxH	Dot Size, mm WxH	Dot Pitch WxH	V.A., mm WxH	Duty	Backlight						FONT			Page
							TN			STN			Sta.	Euro	Russ.	
							None	LED	EL	None	LED	EL				
YMS0801-01	54x37x10	2.9x7.6	0.5x0.6	0.6x0.7	32x16	1/11	▼	▼	▼	▼	▼	▼	▼	▼	9	
YMS0802-01	58x32x9/13	2.96x5.56	0.56x0.66	0.6x0.7	38x16	1/16	▼	▼	▼	▼	▼	▼	▼	▼	10	
YMS122-01	55.7x32.0x9.8	2.65x5.5	0.45x0.6	0.55x0.7	46.7x17.5	1/16	▼	▼	▼	▼	▼	▼	▼	▼	12-13	
YMS161-01	80x36x10/13	3.07x6.56	0.55x0.75	0.63x0.83	64.5x14	1/16	▼	▼	▼	▼	▼	▼	▼	▼	11	
YMS161-04	151x40x15	6.0x14.54	1.152x1.765	1.212x1.825	120x23	1/8	▼	▼	▼	▼	▼	▼	▼	▼	14	
YMS162-01	80x36x9.5/13	2.95x4.35	0.55x0.5	0.6x0.55	64.5x13.5	1/16	▼	▼	▼	▼	▼	▼	▼	▼	15	
YMS162-02	122x44x9.5/14.3	4.84x9.66	0.92x1.1	0.98x1.16	99x24	1/16	▼	▼	▼	▼	▼	▼	▼	▼	16	
YMS162-03	67x36x10	2.44x3.94	0.44x0.44	0.49x0.49	52x14	1/16	▼	▼	▼	▼	▼	▼	▼	▼	17	
YMS162-04	84x44x10/14.5	2.95x5.55	0.55x0.65	0.6x0.7	61x17	1/16	▼	▼	▼	▼	▼	▼	▼	▼	18	
YMS162-10	80x36x9.5/13	2.95x4.35	0.55x0.5	0.6x0.55	64.5x13.5	1/16	▼	▼	▼	▼	▼	▼	▼	▼	19	
YMS162-21	53x20x8.5	1.85x3.15	0.33x0.35	0.38x0.4	36x10	1/16	▼	▼	▼	▼	▼	▼	▼	▼	20	
YMS162-22	85x36x14.5/9.5	2.96x5.56	0.56x0.66	0.6x0.7	66x16.2	1/16	▼	▼	▼	▼	▼	▼	▼	▼	21	
YMS164-01	87x60x9/14	2.95x4.75	0.55x0.55	0.6x0.6	61.8x25.2	1/16	▼	▼	▼	▼	▼	▼	▼	▼	22	
YMS202-01	116x37x10/14	3.2x5.55	0.6x0.65	0.65x0.7	83x18.6	1/16	▼	▼	▼	▼	▼	▼	▼	▼	23	
YMC202-16	146x43x14/10	4.84x9.22	0.92x1.1	0.98x1.16	123x23	1/16	▼	▼	▼	▼	▼	▼	▼	▼	24	
YMS204-01	98x60x9.2/14.2	2.95x4.75	0.55x0.55	0.6x0.6	76x25.2	1/16	▼	▼	▼	▼	▼	▼	▼	▼	25	
YMS204-02	146x62.5x13.6/10	4.84x9.22	0.92x1.1	0.98x1.16	123.5x43	1/16	▼	▼	▼	▼	▼	▼	▼	▼	26	
YMS242-01	118x36x9.5/14	3.2x5.55	0.6x0.65	0.65x0.7	93.5x15.8	1/16	▼	▼	▼	▼	▼	▼	▼	▼	27	
YMS402-01	182x33.5x9.6/13.6	3.2x5.55	0.6x0.65	0.65x0.7	154.4x15.8	1/16	▼	▼	▼	▼	▼	▼	▼	▼	28	
YMS404-01	190x54x9.2/14.5	2.8x4.91	0.52x0.57	0.57x0.62	147x29.5	1/16	▼	▼	▼	▼	▼	▼	▼	▼	29	

## STANDARD GRAPHIC MODULES

Module Type Series	Module Size, mm WxHxT (T1)	Number of dots or pixel WxH	Dot Size, mm WxH	Dot Pitch WxH	V.A., mm WxH	Duty	Backlight				Built-In Controller	Page
							STN					
							None	LED	EL	CCFL		
YMS12232-01	84x44x9/14.2	122x32	0.4x0.4	0.44x0.44	60x18.5	1/32	▼	▼	▼	▼	SBN1661G M18	30-31
YMC12232-03	65.4x30.25x6	122x32	0.4x0.45	0.44x0.49	60.6x20	1/32	▼	▼	▼	▼	SBN1661G M18	32-33
YMS12864-01	93x70x12.2	128x64	0.48x0.48	0.52x0.52	70.7x38.8	1/64	▼	▼	▼	▼	NT7107	34-35
YMS12864-04	75x52.7x9	128x64	0.4x0.4	0.43x0.43	60.5x33	1/64	▼	▼	▼	▼	NT7107	36-37
YMS128128-01	75x81.2x8.1	128x128	0.4x0.4	0.43x0.43	60x60.1	1/128	▼	▼	▼	▼	NT7107	38-39
YMC160128-01	100x73.4x14.8	160x128	0.425x0.425	0.455x0.455	77x62	1/128	▼	▼	▼	▼	T6963C	40-41
YMC16080-05	120.8x95.89	160x80	0.57x0.625	0.6x0.655	103x80	1/80	▼	▼	▼	▼	HD66421TBO	42-43
YMC192192-01	86x95x9	192x192	0.3x0.3	0.33x0.33	67.4x67.4	1/192	▼	▼	▼	▼	---	44-45
YMS24064-02	180x65x11/13.8	240x64	0.49x0.49	0.53x0.53	134x40.4	1/64	▼	▼	▼	▼	T6963C	46-47
YMS240128-01	144x104x13.8	240x128	0.4x0.4	0.45x0.45	114x64	1/128	▼	▼	▼	▼	T6963C	48-49
YMS240128-02	170x101.5x14	240x128	0.47x0.47	0.5x0.5	128x74	1/128	▼	▼	▼	▼	T6963C	50-51
YMS320240-02	134.5x117x14	320x240	0.27x0.27	0.3x0.3	103x79	1/240	▼	▼	▼	▼	---	52-53
YMS320240-03	144x96.8x12	320x240	0.27x0.27	0.3x0.3	104x79.3	1/240	▼	▼	▼	▼	---	54-55
YMS320240-05	167x109x11	320x240	0.36x0.36	0.33x0.33	122x92	1/240	▼	▼	▼	▼	---	56-58

## STANDARD TAB, COG, COF MODULES

Module Type Series	Module Size, mm WxHxT (T1)	Character, mm WxH	Number of Dots or Pixel WxH	Dot Size, mm WxH	Dot Pitch WxH	V.A., mm WxH	Duty	Backlight			Built-In Controller	Page
								STN				
								None	LED	EL		
YMS162-08	65x27.7x2.1	2.95x5.15	16x2	0.55x0.6	0.6x0.65	61x15.7	1/16	▼	▼	▼	NT7605H-BD	59
YMS202-04	78.8x27.7x7.8	2.95x5.15	20x2	0.55x0.6	0.6x0.65	74.8x15.7	1/16	▼	▼	▼	NT7605H-BD	60-61
YMS12864-06	70x43x9	128x64	0.39x0.39	0.43x0.43	59x30.5	1/64	▼	▼	▼	▼	ST7565R, NT7538	62-63
YMS12864-15	93.7x53x5.5	128x64	0.48x0.48	0.52x0.52	70.7x38.8	1/65	▼	▼	▼	▼	ST7565R, NT7538	64-65
YMS12864-18	72x90x7	128x64	0.45x0.53	0.465x0.545	66.4x39.4	1/64	▼	▼	▼	▼	SPLC501C	66-67
YMS12864-20	70.2x40.5x5.85	128x64	0.39x0.39	0.43x0.43	59x30.5	1/65	▼	▼	▼	▼	ST7567	68-69
YMS160160-01	54.48x57.9x3.5	160x160	0.245x0.245	0.265x0.265	45.68x45.68	1/160	▼	▼	▼	▼	---	70-71
YMS160160-02	75.5x70.5x10.4	160x160	0.3345x0.3345	0.3545x0.3545	61.5x61.5	1/160	▼	▼	▼	▼	---	72-73
YMC240128-13	98.7x67.7x9.5	240x128	0.325x0.325	0.35x0.35	92x53	1/128	▼	▼	▼	▼	ST7529-G	74-75
YMS320240-10	93.9x71.3x7.9	320x240	0.225x0.2244	0.24x0.2394	79.6x60.5	1/240	▼	▼	▼	▼	---	76-77
YMS320240-11	120.3x69.1x6.5	320x240	0.225x0.225	0.24x0.24	79.8x60.6	1/240	▼	▼	▼	▼	---	78-79
YMS320240-12	158.15x109x7.5	320x240	0.33x0.33	0.36x0.36	121x91.6	1/240	▼	▼	▼	▼	---	80-81
YMC320240-15	60.8x77.3x8.9	320x240	0.185x0.185	0.2x0.2	51.6x67.7	1/240	▼	▼	▼	▼	---	82-83
YMC320240-68	154.6x114.8x9	320x240	0.345x0.345	0.36x0.36	120x90	1/240	▼	▼	▼	▼	IST3225	84-85

## TFT TRANSMISSIVE LCD MODULES

Module Type Series	Module Size, mm WxHxT	Active Area (A/A), mm WxH	Color	Resolution	Size	Backlight LED	Built-In Controller	Page									
									YTS240DLAC-03-100N	42.72x59.46x3.1	36.72x48.96	262K	240(RGB)x320	2.4"	▼	HX8347-A	86-87
									YTS240DLAC-03-100T	42.72x59.46x4.2	36.72x48.96	262K	240(RGB)x320	2.4"	▼	HX8347-A	88-89
YTS240DLAC-01-102N	42.72x60.26x2.55	36.72x48.96	262K	240(RGB)x320	2.4"	▼	IL193250	90-91									
YTS280DLAC-03-200N	50x69.2x2.85	44.2x58.6	262K	240(RGB)x320	2.8"	▼	HX8347-A01	92-93									
YTS350ELAK-01-100T	77.80x64.5x4.1	70.08x52.56	16M	320(RGB)x240	3.5"	▼	HY8238-D	94-95									
YTS350ELAK-01-100N	77.8x64.5x3.04	70.08x52.56	16M	320(RGB)x240	3.5"	▼	HX8238-D	96-97									
YTS350ELAJ-01-100T	77.8x64.5x4.04	70.08x52.56	262K	320(RGB)x240	3.5"	▼	SSD2119	98-99									
YTC430LAC-01-100T	105.5x67.2x4.9	95.04x53.86	16M	480(RGB)x272	4.3"	▼ High Brightness	HX8257	100-101									
YTS700LAA-01-100T	126x101.55x6.9	115.2x86.4	16M	320(RGB)x240	5.7"	▼	HX8218&HX8615	102-103									
YTS700RLAB-01-100N	165x104.44x5.2	152.4x91.44	16M	800(RGB)x480	7"	▼	HX8262&HX8678	104-105									
YTS700RLAB-01-100T	165x104.44x6.6	152.4x91.44	16M	800(RGB)x480	7"	▼	HX8262&HX8678	106-107									
YTS700RLAB-02-103N	166.6x109.4x10.0	152.4x91.44	16M	800(RGB)x480	7"	▼ High Brightness	HX8262&HX8678	108-109									
YTS800SLAA-01-100T	183x141x7	162x121.5	16M	800(RGB)x600	8"	▼	---	110-111									

## BASIC SPECIFICATION

### LCD-PANEL

#### TYPE OF DISPLAY

##### Positive mode



It is necessary to use type under ambient light condition.

##### TN Type

##### Negative mode



Negative type is most applicable for backlighting system and is capable of multi-color displaying.

##### STN Type

**Yellow Mode:** Dark blue segment on yellow-green background.

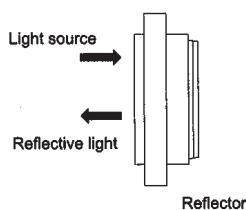
**Blue Mode:** White segment on blue background.

**Grey Mode:** Nearly black and white display with the combination of yellow mode STN and polarizer.

**B/W Mode:** Film compensated STN, black and white display

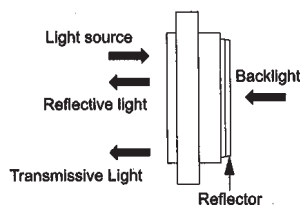
#### LIGHTING METHODS

##### Reflective Type



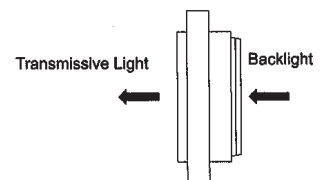
.It is necessary to use type under ambient light condition.

##### Transflective Type



.Ambient light is taken the outside during day and a back-light is used in the dark.

##### Transmissive Type



A back light is always used.

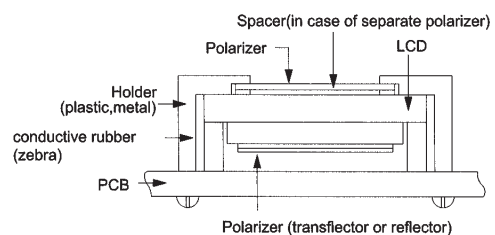
#### CONNECTOR AND LCD MOUNTING METHODS

The following connectors are available for connecting LCD to the drive circuit.

##### Rubber Connector



- Structure: Alternate lamination of conductive rubber and insulating rubber.
- Connecting method: Mechanical compression.
- Pitch: min. 0.3 mm



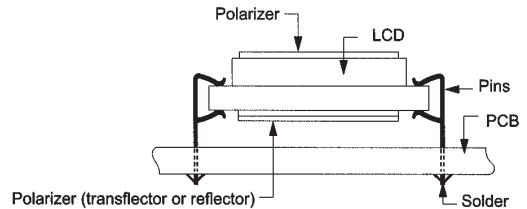
- Easy to assembly.
- Adopted for many years.
- Applicable even to narrow pads.
- Printed circuit boards need gold plating or graphite coating.

## BASIC SPECIFICATION

### Pin Connector

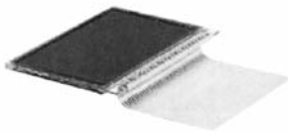


- Structure: Metal pins fit onto the panel terminal pad.
- Connecting method: Soldering.
- Pitch: 1.5, 1.8, 2.0, 2.54 mm

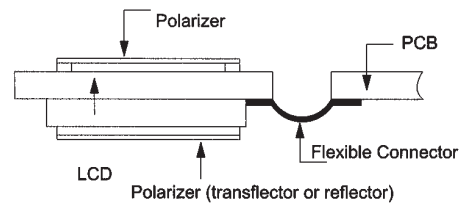


- Suitable for small production runs.

### Flexible Connector



- Structure: Film with electroconductive thin film or printed graphite.
- Connecting method: Heat and pressure fitting, soldering or mechanical compression.
- Pitch: Heat Seal: min. 0.4 mm; Soldering: min. 0.8 mm.



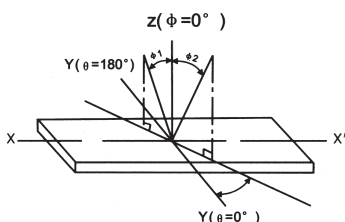
- Resin on connecting point.
- Thin structure can be achieved.
- Possible to bend.
- Free trimming possible.

## ELECTRO-OPTICAL CHARACTERISTICS

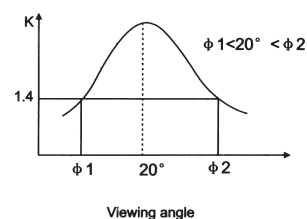
### STN TYPE

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Viewing angle	$\phi 2 - \phi 1$	$K=2.0$	60	-	-	deg.	1.2
Contrast ratio	K	$\phi = 20^\circ$ $\Theta = 0$	3	10	-	-	3
Response time (rise)	$t_r$	$\phi = 20^\circ$ $\Theta = 0$	-	200	250	ms	4
							4
Response time (fall)	$t_f$	$\phi = 20^\circ$ $\Theta = 0$	-	200	250	ms	4
							4

#### NOTE 1. Definition of Angle $\Theta$ and $\phi$

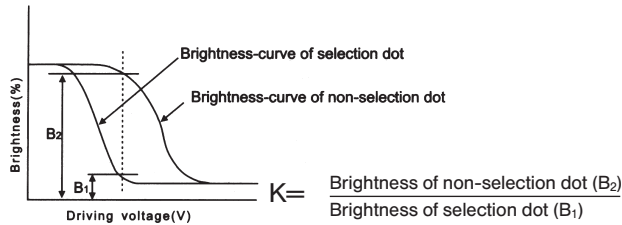


#### NOTE 2. Definition of Viewing Angle $\Theta 1$ and $\phi 2$

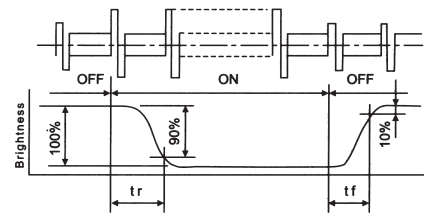


# BASIC SPECIFICATION

## NOTE 3. Definition of Contrast 'K'



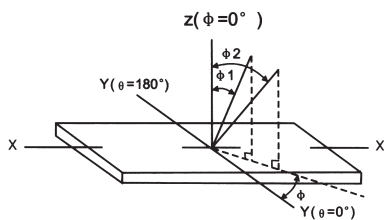
## NOTE 4. Definition of Optical Response



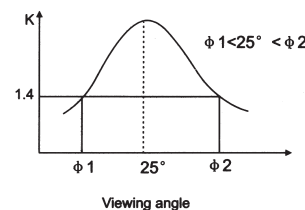
## TN TYPE

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Viewing angle	$\Phi 2 - \Phi 1$	$K = 1.4$	20	-	-	deg.	1.2
Contrast ratio	K	$\Phi = 25^\circ$ $\Theta = 0$	-	3	-	-	3
Response time (rise)	$t_r$	$\Phi = 25^\circ$ $\Theta = 0$	-	150	250	ms	4
Response time (fall)	$t_f$	$\Phi = 25^\circ$ $\Theta = 0$	-	150	250	ms	4

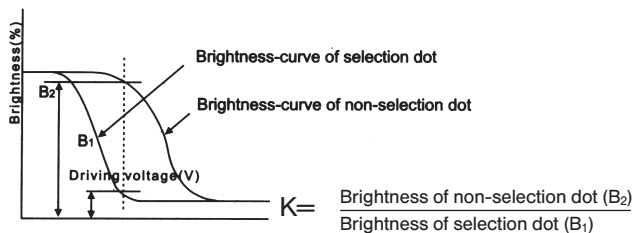
## NOTE 1. Definition of Angle $\Theta$ and $\Phi$



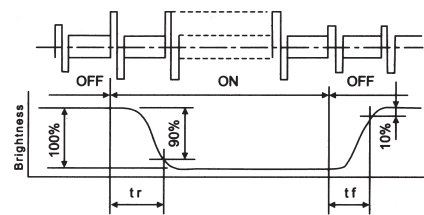
## NOTE 2. Definition of Viewing Angle $\Theta 1$ and $\Phi 2$



## NOTE 3. Definition of Contrast 'K'



## NOTE 4. Definition of Optical Response



## HANDLING LCD PANEL AND MODULE

### LCD PANELS are composed of glass and polarizer. Pay attention for:

- Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- Don't touch, push or rub the exposed polarizers with anything harder than an HB pencil lead.
- When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material soaked in alcohol. Don't scrub hard in order to avoid damaging the display surface.
- Wipe off saliva or water drops immediately. Contacting water over a long period of time may cause deformation or color fading.
- After products are tested at low temperatures they must be warmed up in container before they contact room temperature air.
- Don't put or attach anything on the display area in order to avoid leaving marks on.
- As glass is fragile, it tends to become chipped during handling especially on the edges. Please avoid dropping or jarring.

### Storage of LCDs for some years:

- Store them in a dark place, don't expose to sunlight or fluorescent light. Keep the temperature between 0°C and +35°C.

- The polarizer surface shouldn't contact any other objects. Please store LCDs in the container in which they were shipped.

### Environmental conditions:

- **Humidity** - observe the following conditions both in storage and operation:
  - $T_a < +40^\circ\text{C}$  85%RH or less ( $T_a$  - ambient temperature)
  - $T_a \geq +40^\circ\text{C}$  below max. absolute humidity of  $+40^\circ\text{C}$  85%RH
- **Exposure to high humidity and temperature:**
  - Don't leave them for more than 160 hrs. at  $+60^\circ\text{C}$
  - Shouldn't be left for more than 48 hrs. at  $-20^\circ\text{C}$ .

### LCD MODULES Handling:

- Don't alter or modify the shape of the tab on the metal frame.
- Don't make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Don't damage or modify the pattern wiring on the printed circuit board.
- Absolutely don't modify the zebra strip (conductive rubber) or touch it with another object.
- Expect for soldering the interface, don't make any alterations or modifications with a soldering iron.
- Don't drop, bend or twist LCD Module.

## BASIC SPECIFICATION

### BACKLIGHT CHARACTERISTICS

#### LED BACKLIGHT

	DIRECT TYPE	SIDE LIGHTGUIDE TYPE
<b>ADVANTAGE</b>	<ul style="list-style-type: none"> <li>■ DC Signal Operating</li> <li>■ Long Life Time</li> <li>■ Wide Useful Driving Temperature</li> <li>■ Various Color</li> <li>■ High Brightness</li> </ul>	<ul style="list-style-type: none"> <li>■ DC Signal Operating</li> <li>■ Long Life Time</li> <li>■ Wide Useful Driving Temperature</li> <li>■ Compactness (Thin &amp; Flat)</li> </ul>
<b>STRUCTURE</b>	Direct Type 	Side Lightguide Type 
<b>LUMINOUS COLOR</b>	Yellow/Green, Red, Amber	
<b>DRIVING VOLTAGE</b>	DC 4V ~ 8	
<b>THICKNESS OF HOUSING UNIT MIN.</b>	Direct Type: 5.0 mm	Side Type: 1.0 mm
<b>LIFE TIME</b>	50.000 hours	

#### EL BACKLIGHT

<b>ADVANTAGE</b>	<ul style="list-style-type: none"> <li>■ Compactness (Thin &amp; Flat)</li> <li>■ High Uniformity</li> </ul>	<ul style="list-style-type: none"> <li>■ High Uniformity</li> <li>■ Easy to Design</li> </ul>
<b>STRUCTURE</b>		
<b>LUMINOUS COLOR</b>	White, Blue/Green	
<b>DRIVING VOLTAGE</b>	AC 100V ~ 130V, 400 Hz ~ 1 KHz, (DC/AC Inverter is necessary)	
<b>THICKNESS OF HOUSING UNIT MIN.</b>	0.3 mm	
<b>LIFE TIME</b>	2.000 ~ 50.000 hours	

#### CCFL BACKLIGHT

<b>ADVANTAGE</b>	<ul style="list-style-type: none"> <li>■ High Brightness</li> <li>■ High Uniformity</li> </ul>	<ul style="list-style-type: none"> <li>■ Easy to Design Large Size</li> <li>■ Useful to Color LCD</li> </ul>
<b>STRUCTURE</b>	Direct Type 	Side Lightguide Type 
<b>LUMINOUS COLOR</b>	White	
<b>DRIVING VOLTAGE</b>	AC 200V ~ 400V, 30 Hz ~ 50 Hz, (DC/AC Inverter is necessary)	
<b>THICKNESS OF HOUSING UNIT MIN.</b>	Direct Type: 10.0 mm	Side Type: 3.5 mm
<b>LIFE TIME</b>	10.000 ~ 20.000 hours	



## BASIC SPECIFICATION

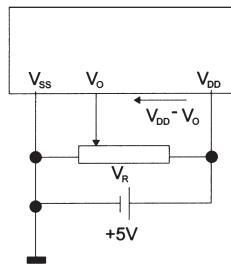
### TEMPERATURE CHARACTERISTICS

MODEL		OPERATING TEMP.	STORAGE TEMP.
TN	STANDARD	0 °C ~ + 50 °C	- 10 °C ~ + 60 °C
	HIGH RELIABILITY	- 10 °C ~ + 60 °C	- 30 °C ~ + 85 °C
STN	STANDARD	0 °C ~ + 50 °C	- 10 °C ~ + 60 °C
	HIGH RELIABILITY	- 10 °C ~ + 60 °C	- 30 °C ~ + 85 °C
FSTN (BLACK & WHITE)	STANDARD	0 °C ~ + 50 °C	- 10 °C ~ + 60 °C
	HIGH RELIABILITY	- 10 °C ~ + 60 °C	- 30 °C ~ + 85 °C

Except Backlight Unit.

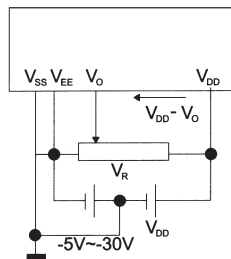
### POWER SUPPLY SCHEMATICS

#### SINGLE SOURCE



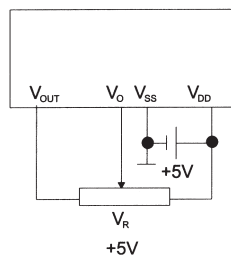
$V_{DD} - V_O$ : LCD Driving Voltage  
 $V_R$ : 10k - 20k

#### DOUBLE SOURCE



$V_{DD} - V_O$ : LCD Driving Voltage  
 $V_R$ : 10k - 20k

#### NEGATIVE POWER SUPPLIER INCLUDED



$V_{DD} - V_O$ : LCD Driving Voltage  
 $V_R$ : 10k - 20k

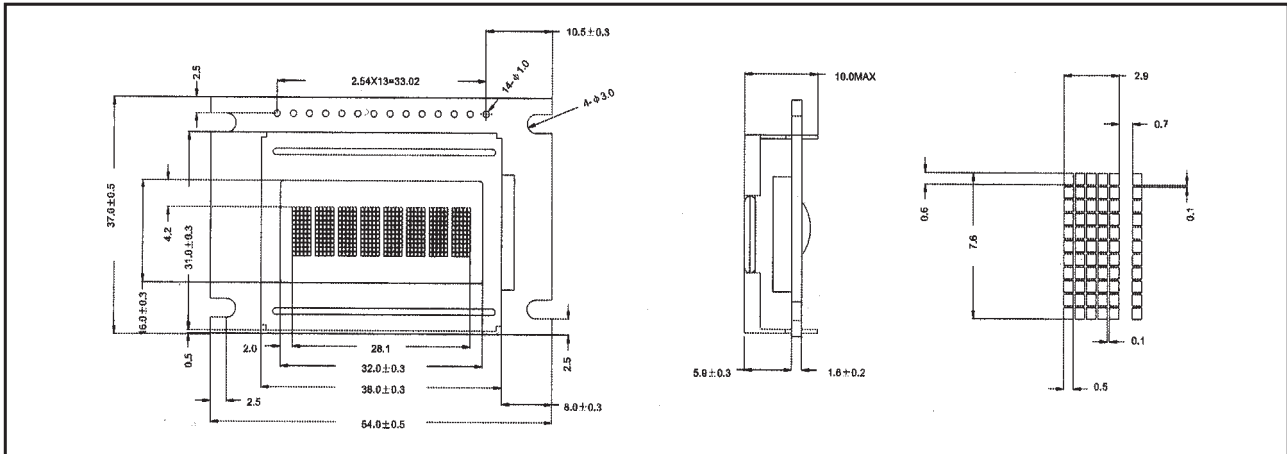


## STANDARD CHARACTER MODULES

### YMS 0801-01

8 CHAR x 1 LINE, 1/11 DUTY, 1/4 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	54.0 x 37.0 x 10.0	mm
Viewing Area (W x H)	32.0 x 16.0	mm
Character Font (W x H)	5.0 x 10.0 with cursor	dots
Character Size (W x H)	2.9 x 7.6	mm
Dot Size (W x H)	0.50 x 0.60	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Voltage Control for LCD
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read /Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode

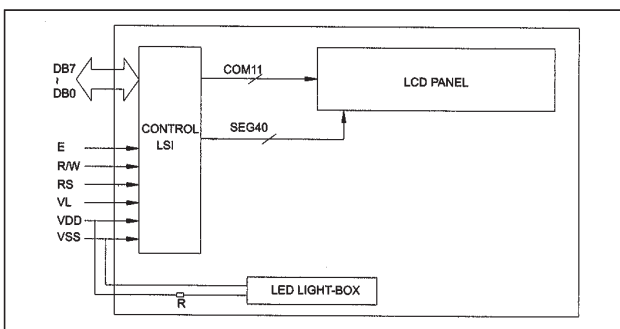
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2\text{mA}$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2\text{mA}$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$		4.2	4.7	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

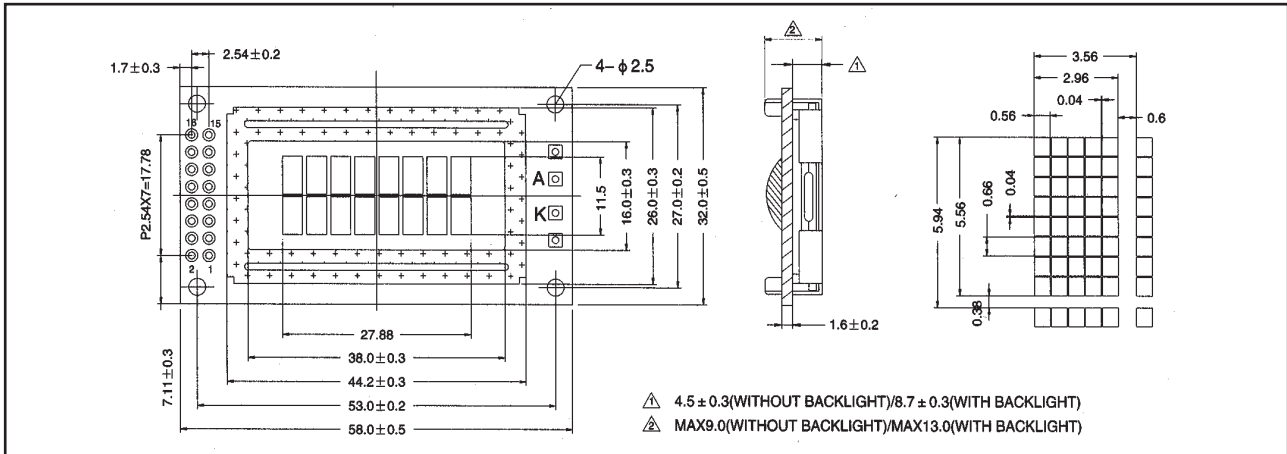
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.0	3.2	3.5	V
Power Consumption	$P_{LED}$				140	mW

## STANDARD CHARACTER MODULES

### YMS 0802-01

8 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	58.0 x 32.0 x 9.0/13.0	mm
Viewing Area (W x H)	38.0 x 16.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.96 x 5.56	mm
Character Pitch (W x H)	3.56 x 5.94	mm
Dot Size (W x H)	0.56 x 0.66	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

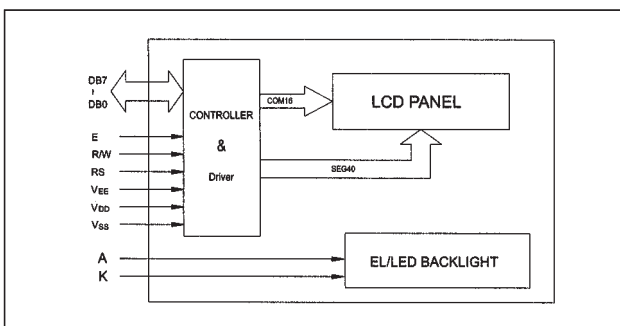
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

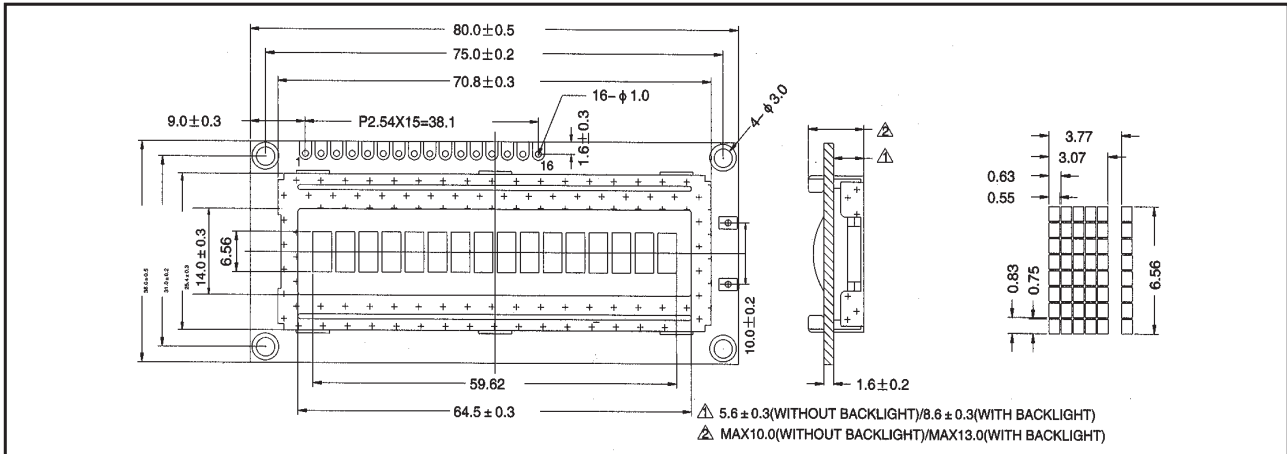
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.8	4.0	4.2	V
Power Consumption	$P_{LED}$	$I_F = 60mA$		240	600	mW
Luminous	$I_V$	$I_F = 60mA$	82	103		cd / m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 161-01

16 CHAR x 1 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	80.0 x 36.0 x 10.0/13.0	mm
Viewing Area (W x H)	64.5 x 14.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	3.07 x 6.56	mm
Character Pitch (W x H)	3.77	mm
Dot Size (W x H)	0.55 x 0.75	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

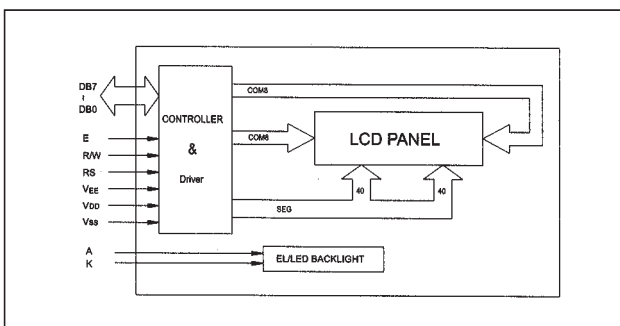
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): ( ) Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

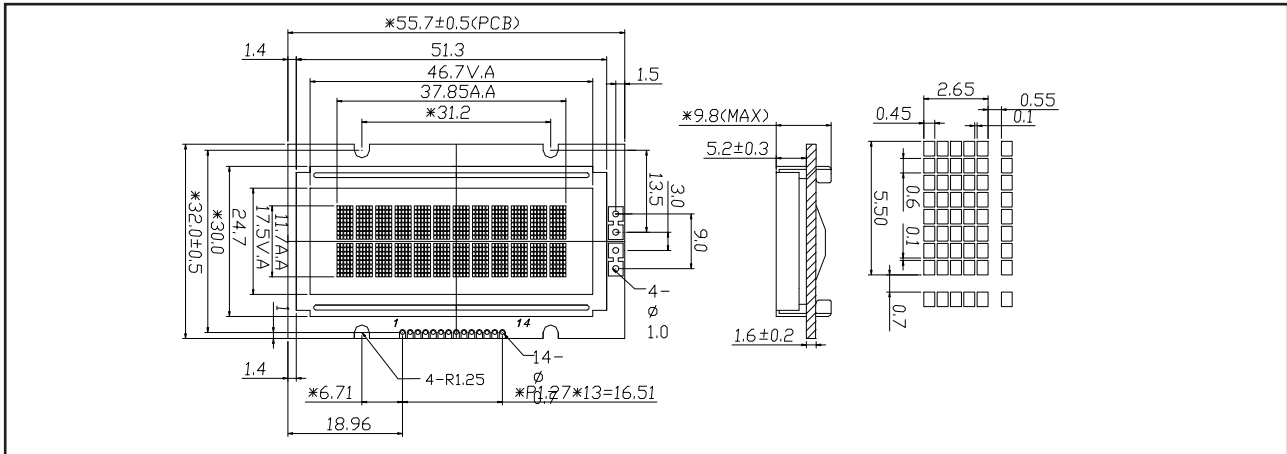
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$	$I_F = 90mA$		380		mW
Luminous	$I_v$	$I_F = 90mA$		200		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 122-01

12 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	55.7 x 32.0 x 9.8	mm
Viewing Area (W x H)	46.7 x 17.5	mm
Character Size (W x H)	2.65 x 5.55	mm
Character Pitch (W x H)	3.2 x 6.2	mm
Dot Size (W x H)	0.45 x 0.6	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	$V_{DD} - 10$	$V_{DD} + 0.3$	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Logic Supply Voltage (+5.0V)
3	$V_L$	LCD Driver Voltage Input
4	RS	DATA / Instruction Register Select
5	R/W	Read / Write Select
6	E	Enable Signal
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus Line

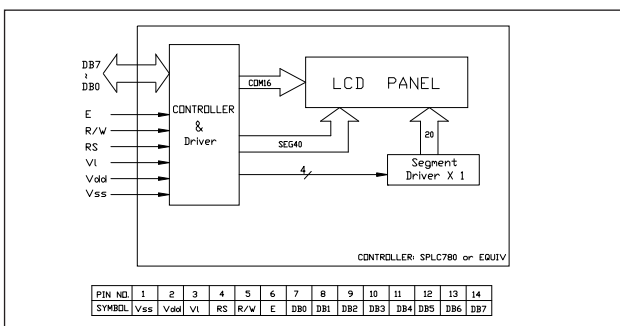
#### ELECTRICAL CHARACTERISTICS, $T_a = 23^\circ\text{C} \pm 3^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$			5.0		V
LCD Operating Voltage	$V_{DD} - V_0$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.3	4.5	4.7	V
Response Time	$T_{ON}$ $T_{OFF}$			94 230		ms
Contrast	CR		2.0			
Viewing Angle	12H	$\theta 1$	CR $\geq 2.0$			Deg.
	6H	$\theta 2$				
	3H	$\theta 3$				
	9H	$\theta 4$				

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



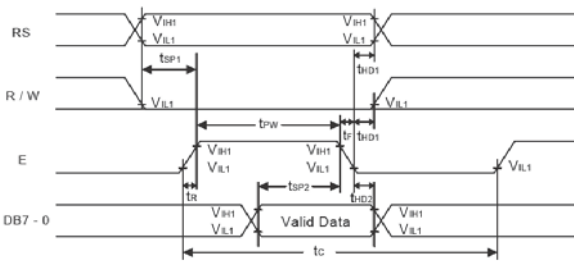
# STANDARD CHARACTER MODULES

## YMS 122-01

12 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

### INTERFACE TIMING CHARACTERISTICS

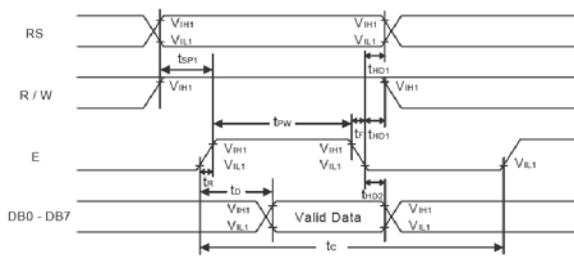
Write Mode Timing Diagram (Writing Data from MPU to SPLC780D1)



Write Operation (Writing Data from MPU to SPLC780D1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
E Cycle Time	$t_c$	Pin E	400		ns
E Pulse Width	$t_w$	Pin E	150		ns
E Rise / Fall Time	$t_r, t_f$	Pin E		25	ns
Address Setup Time	$t_{SP1}$	Pins: RS, R/W, E	30		ns
Address Hold Time	$t_{HD1}$	Pins: RS, R/W, E	10		ns
Data Output Delay Time	$t_D$	Pins: DB <sub>0</sub> -DB <sub>7</sub>	40		ns
Data Hold Time	$t_{HD2}$	Pins: DB <sub>0</sub> -DB <sub>7</sub>	10		ns

Read Mode Timing Diagram (Reading Data from SPLC780D1 to MPU)



Read Operation (Writing Data from SPLC780D1 to MPU)

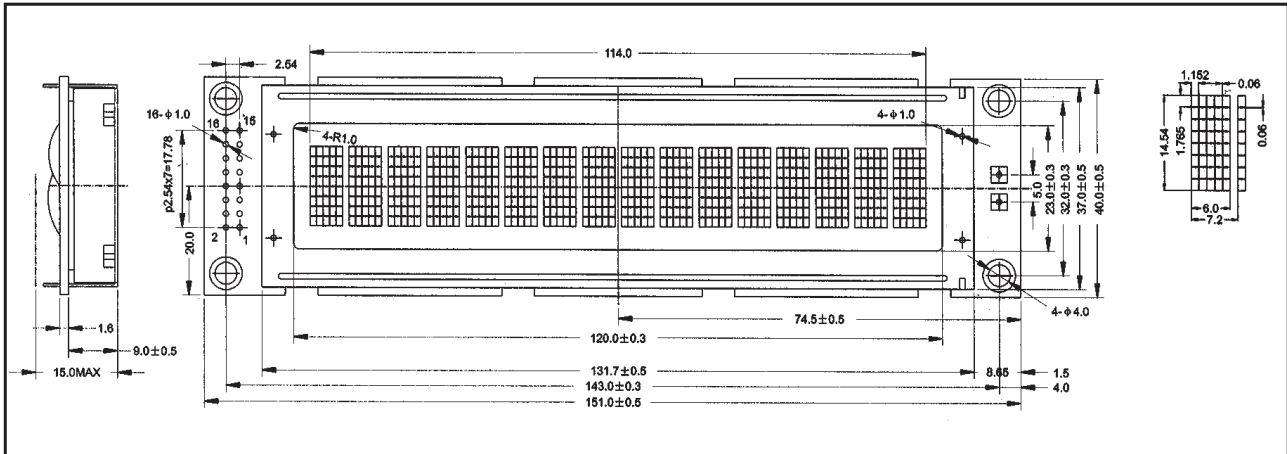
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
E Cycle Time	$t_c$	Pin E	400		ns
E Pulse Width	$t_w$	Pin E	150		ns
E Rise / Fall Time	$t_r, t_f$	Pin E		25	ns
Address Setup Time	$t_{SP1}$	Pins: RS, R/W, E	30		ns
Address Hold Time	$t_{HD1}$	Pins: RS, R/W, E	10		ns
Data Output Delay Time	$t_D$	Pins: DB <sub>0</sub> -DB <sub>7</sub>		100	ns
Data Hold Time	$t_{HD2}$	Pins: DB <sub>0</sub> -DB <sub>7</sub>	5		ns

## STANDARD CHARACTER MODULES

### YMS 161-04

16 CHAR x 1 LINE, 1/8 DUTY, 1/4 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	151.0 x 40.0 x 15.0	mm
Viewing Area (W x H)	120.0 x 23.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	6.0 x 14.54	mm
Dot Size (W x H)	1.152 x 1.765	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Logic Supply Voltage (+5.0V)
3	$V_{EE}$	LCD Driver Voltage Input
4	RS	DATA / Instruction Register Select
5	R/W	Read / Write Select
6	E	Enable Signal
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus Line
15	A, K	LED Backlight
16		

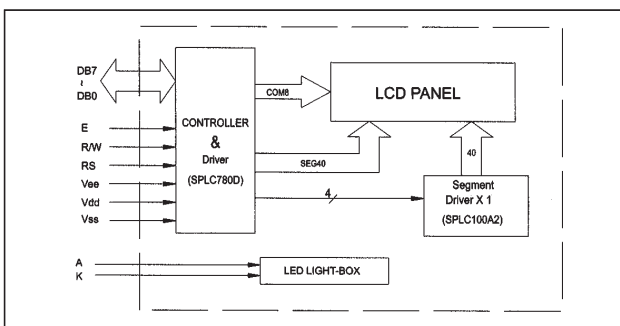
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		1.13		mA
Input Voltage	HIGH	$V_{IH}$	$0.7 V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.05	V
Output Voltage	HIGH	$V_{OH}$	$V_{OH} = 1.2mA$	$0.8 V_{DD}$		V
	LOW	$V_{OL}$	$V_{OL} = 1.2mA$		$0.2 V_{DD}$	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	3.0	5.6	9.0	V
Supply Current LCD Drive	$I_{EE}$			1.0		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$	$I_F = 300mA$	3.8	4.1	4.2	V
Power Consumption	$P_{LED}$			1230		mW
Luminous	$I_v$					cd/m <sup>2</sup>



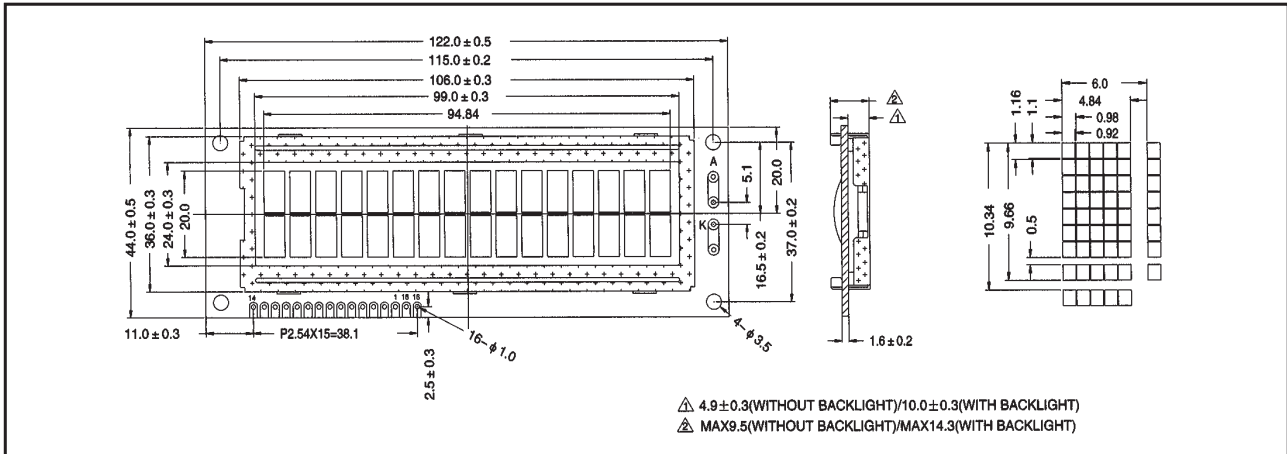


## STANDARD CHARACTER MODULES

### YMS 162-02

16 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	122.0 x 44.0 x 9.5/14.3	mm
Viewing Area (W x H)	99.0 x 24.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	4.84 x 9.66	mm
Character Pitch (W x H)	6.0 x 10.34	mm
Dot Size (W x H)	0.92 x 1.1	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read /Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

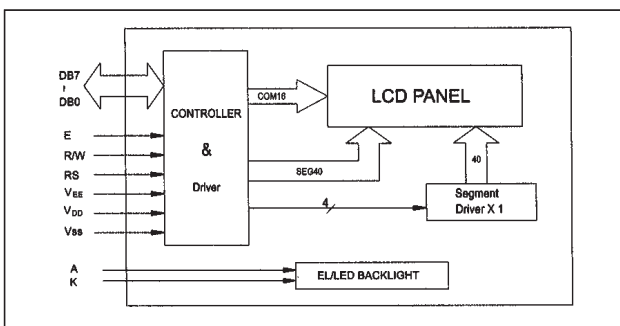
#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ C$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

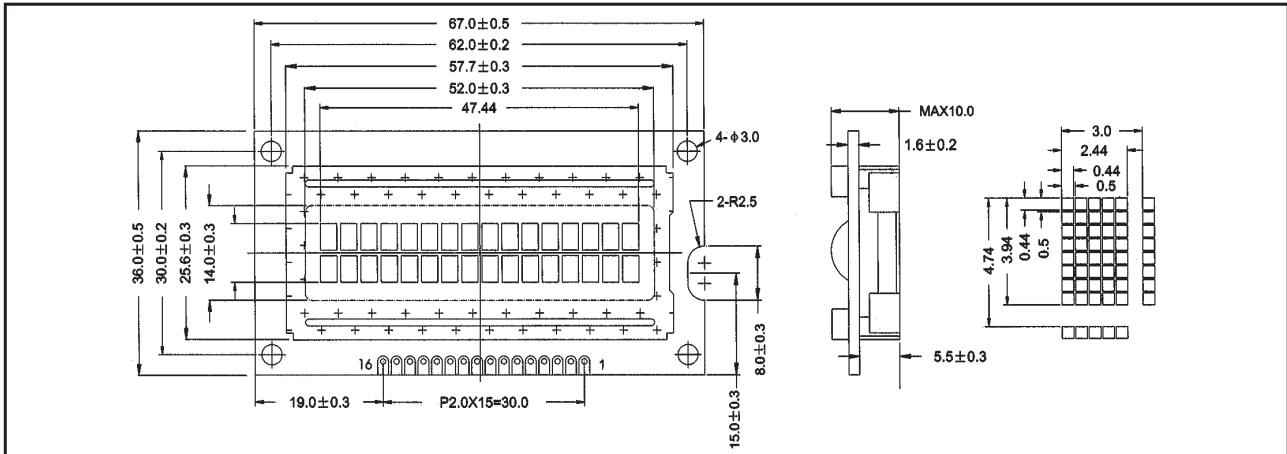
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$	$I_F = 270mA$		1140		mW
Luminous	$I_v$	$I_F = 270mA$		185		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 162-03

16 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	67.0 x 36.0 x 10.0	mm
Viewing Area (W x H)	52.0 x 14.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.44 x 3.94	mm
Character Pitch (W x H)	3.0 x 4.74	mm
Dot Size (W x H)	0.44 x 0.44	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

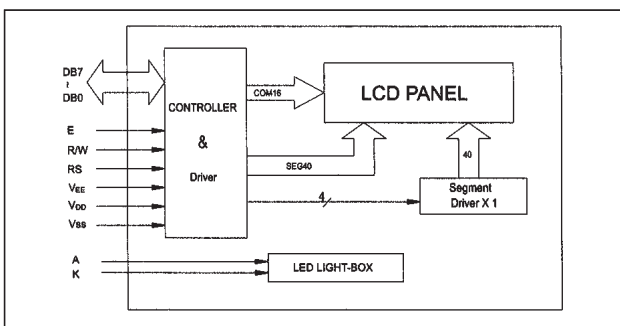
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

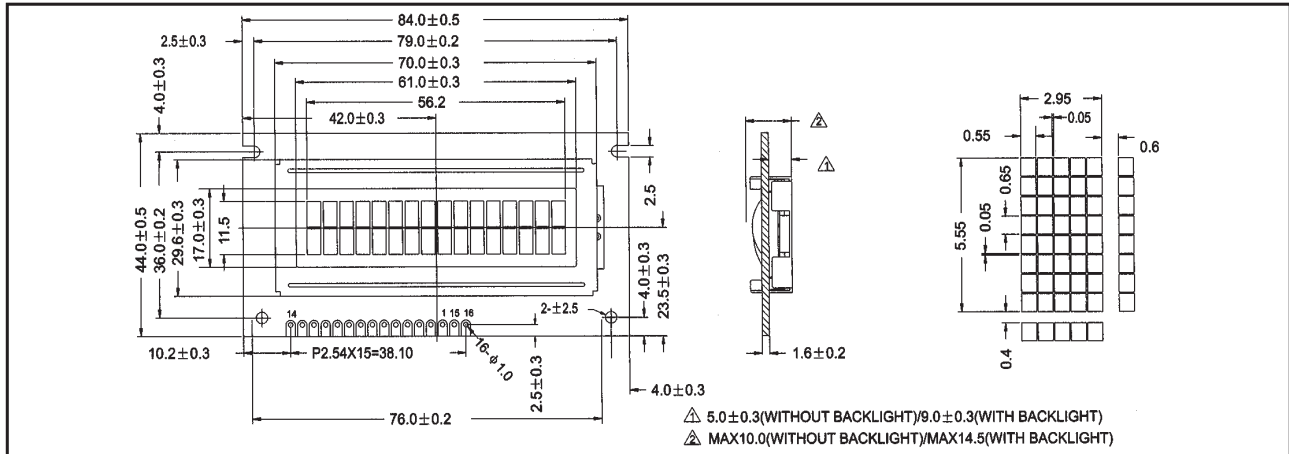
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		4.05	4.25	4.45	V
Power Consumption	$P_{LED}$	$I_F = 2 \times 20mA$		$2 \times 130$	600	mW
Luminous	$I_V$	$I_F = 2 \times 20mA$	45	564		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 162-04

16 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	84.0 x 44.0 x 10.0/14.5	mm
Viewing Area (W x H)	61.0 x 17.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.95 x 5.55	mm
Character Pitch (W x H)	3.55 x 5.95	mm
Dot Size (W x H)	0.55 x 0.65	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

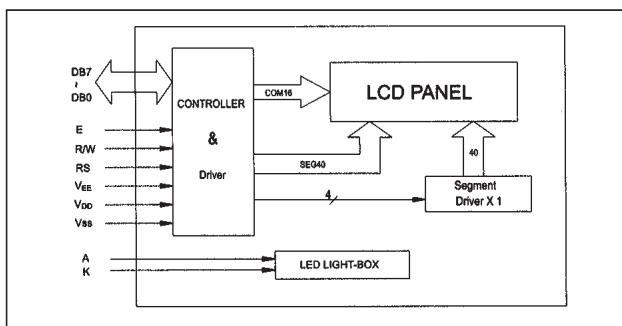
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

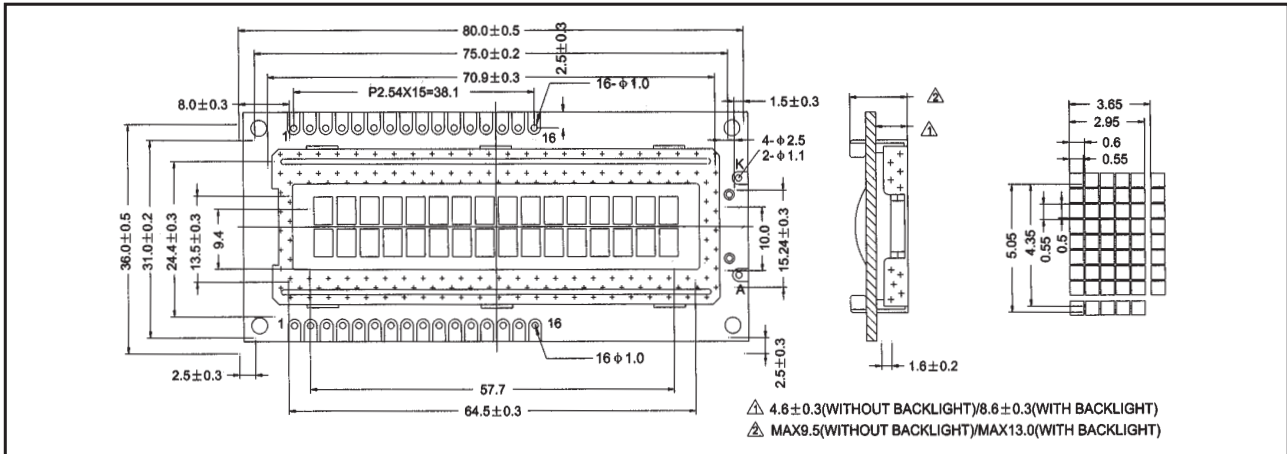
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.8	4.0	4.2	V
Power Consumption	$P_{LED}$	$I_F = 90mA$			900	mW
Luminous	$I_V$	$I_F = 90mA$	92.5	116		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 162-10

16 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	80.0 x 36.0 x 9.5/13.0	mm
Viewing Area (W x H)	64.5 x 13.5	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.95 x 4.35	mm
Character Pitch (W x H)	3.65 x 5.05	mm
Dot Size (W x H)	0.55 x 0.5	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature	See page 8			

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

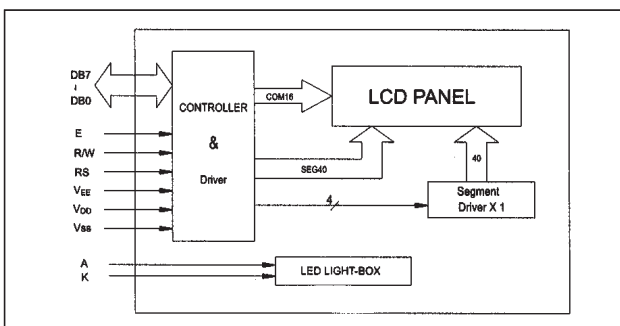
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

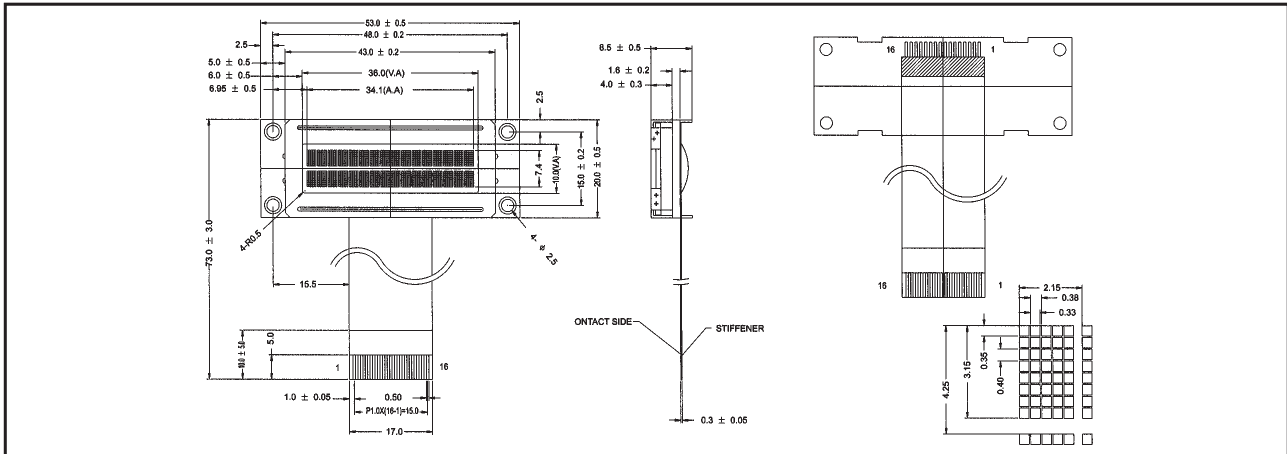
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$	$I_F = 90mA$		380		mW
Luminous	$I_V$	$I_F = 90mA$		200		cd/m <sup>2</sup>

# STANDARD CHARACTER MODULES

## YMS 162-21

16 CHAR x 2 LINE, 1/16 DUTY, 1/4 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	53.0 x 20.0 x 8.5	mm
Viewing Area (W x H)	36.0 x 10.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	1.85 x 3.15	mm
Character Pitch (W x H)	2.15 x 4.25	mm
Dot Size (W x H)	0.33 x 0.35	mm

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

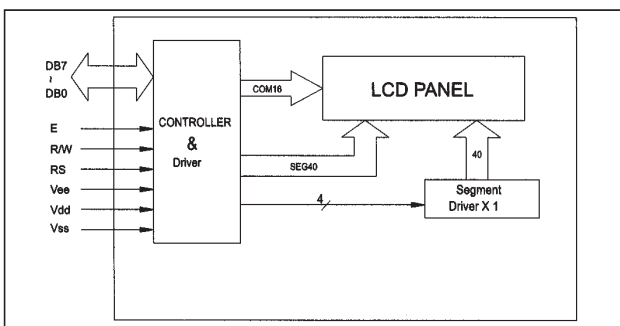
### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 1.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$		4.4		V
Supply Current LCD Drive	$I_{EE}$			1.0		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

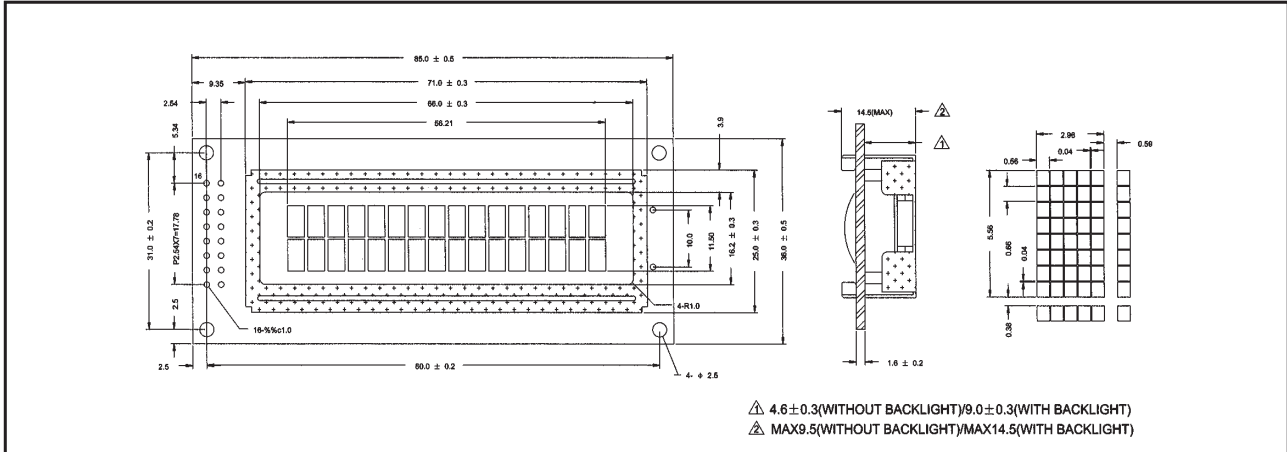
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.9	4.2	4.5	V
Luminous	$I_v$		80			cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 162-22

16 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	85.0 x 36.0 x 14.5/9.5	mm
Viewing Area (W x H)	66.0 x 16.2	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	85.0 x 36.0	mm
Character Pitch (W x H)	2.96 x 5.56	mm
Dot Size (W x H)	0.56 x 0.66	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

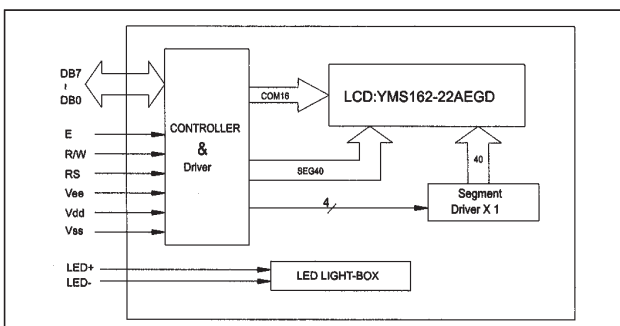
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 0.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$		7.8/4.7		V
Supply Current LCD Drive	$I_{EE}$			1.3		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

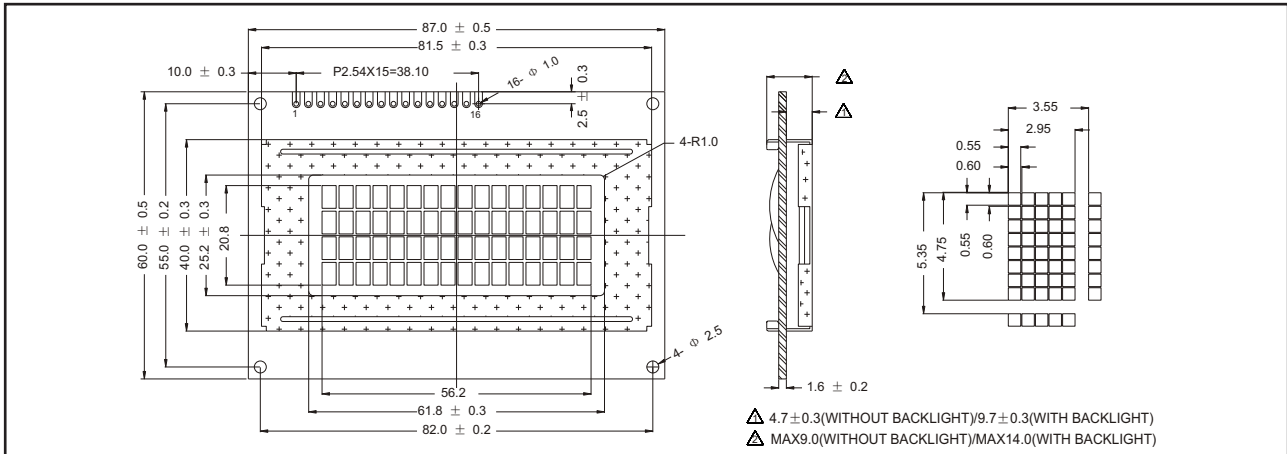
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$			0.38		mW
Luminous	$I_v$			40	200	cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 164-01

16 CHAR x 4 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	87.0 x 60.0 x 9.1/14.0	mm
Viewing Area (W x H)	61.8 x 25.2	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.95 x 4.75	mm
Character Pitch (W x H)	3.55 x 5.35	mm
Dot Size (W x H)	0.55 x 0.55	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

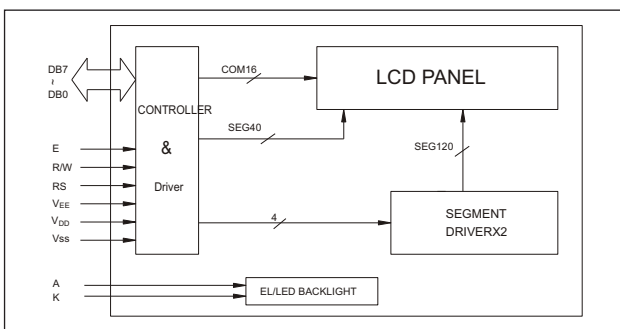
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2\text{mA}$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2\text{mA}$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$	$I_f = 200\text{mA}$		840		mW
Luminous	$I_v$	$I_f = 200\text{mA}$		80		cd/m <sup>2</sup>

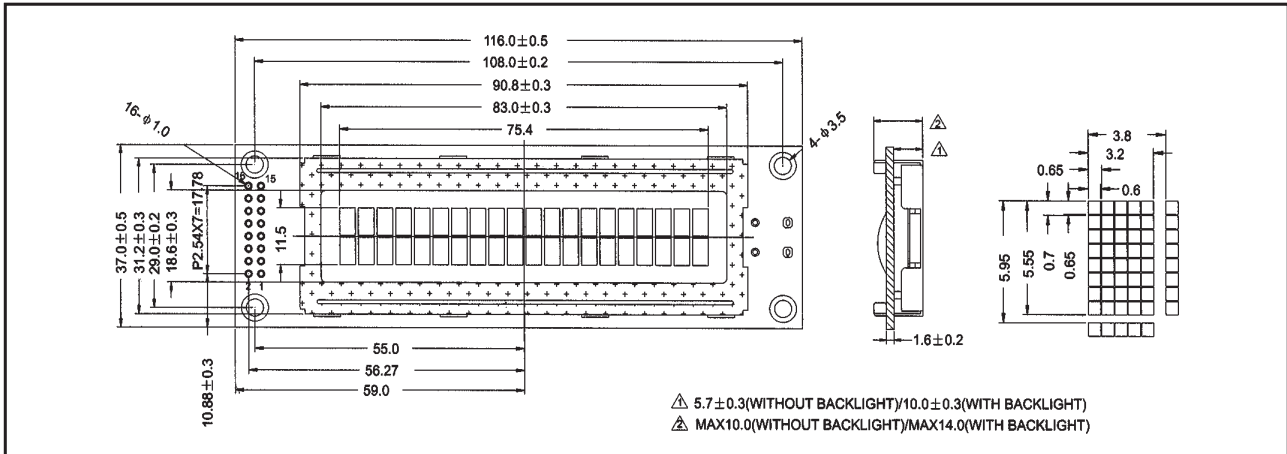


## STANDARD CHARACTER MODULES

### YMS 202-01

20 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	116.0 x 37.0 x 10.0/14.0	mm
Viewing Area (W x H)	83.0 x 18.6	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	3.2 x 5.55	mm
Character Pitch (W x H)	3.8 x 5.95	mm
Dot Size (W x H)	0.6 x 0.65	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	3.0	11.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

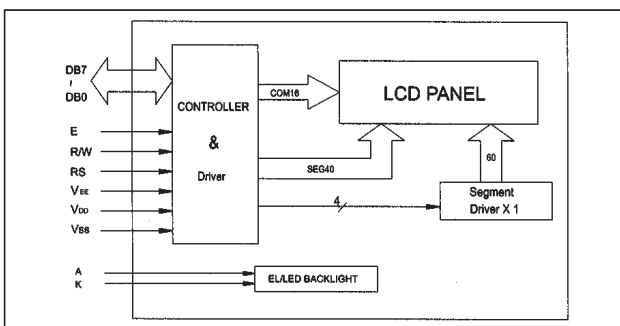
PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A/N/C	Anode of LED Unit / No Connection
16	K/N/C	Cathode of LED Unit / No Connection

#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type. Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

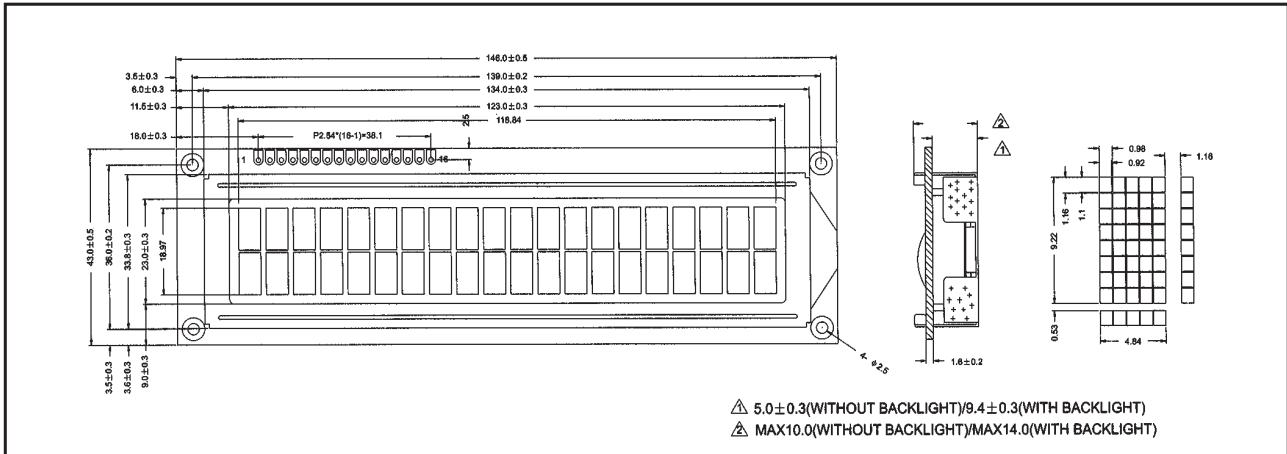
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$	$I_F = 140mA$		590		mW
Luminous	$I_v$	$I_F = 140mA$		200		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMC 202-16

20 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	146.0 x 43.0 x 14.0/10.0	mm
Viewing Area (W x H)	123.0 x 23.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	4.84 x 9.22	mm
Dot Size (W x H)	0.92 x 1.1	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	$V_{DD} + 0.3$	$V_{DD} - 13.5$	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

#### PIN CONFIGURATION

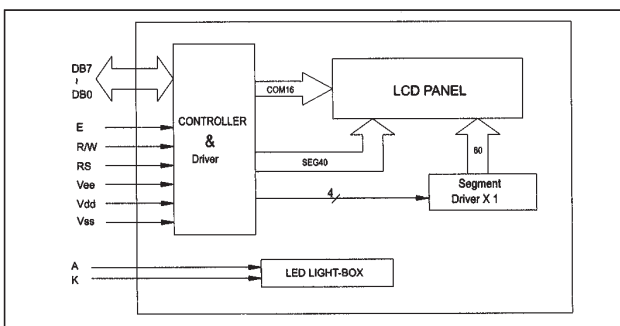
PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0		V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	4.5	mA
Input Voltage	HIGH	$V_{IH}$	2.2		0.3	V
	LOW	$V_{IL}$	-0.3		$0.3 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 1.2\text{mA}$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2\text{mA}$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$		4.2	4.7	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type. Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

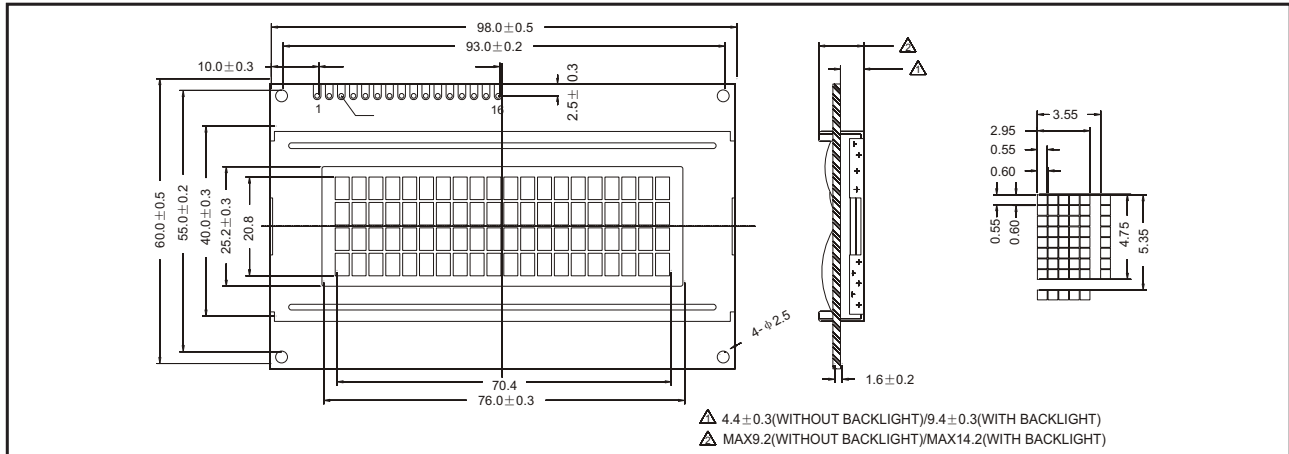
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.0	3.2	3.5	V
Power Consumption	$P_{LED}$				140	mW

## STANDARD CHARACTER MODULES

### YMS 204-01

20 CHAR x 4 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	98.0 x 60.0 x 9.2/14.2	mm
Viewing Area (W x H)	76.0 x 25.2	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.95 x 4.75	mm
Character Pitch (W x H)	3.55 x 5.35	mm
Dot Size (W x H)	0.55 x 0.55	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	$V_{DD}+0.3$	$V_{DD}-13.5$	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD}+0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

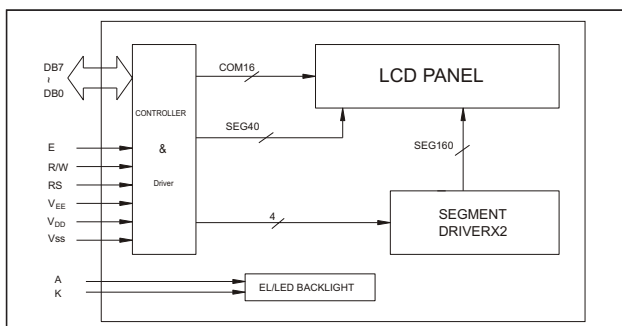
#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		2.2	3.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ C$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	2.2	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

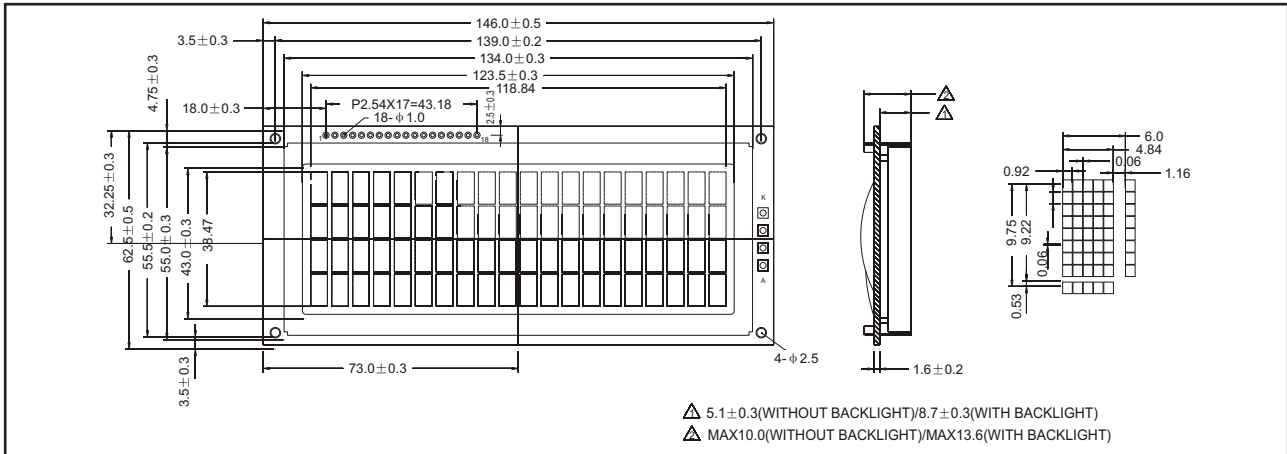
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.8	4.0	4.2	V
Power Consumption	$P_{LED}$	$I_F = 180mA$		720		mW
Luminous	$I_v$	$I_F = 180mA$				cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 204-02

20 CHAR x 4 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	146.0 x 62.5 x 13.6/10.0	mm
Viewing Area (W x H)	123.5 x 43.0	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	4.84 x 9.22	mm
Character Pitch (W x H)	6.0 x 9.75	mm
Dot Size (W x H)	0.92 x 1.1	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	$V_{DD} + 0.3$	$V_{DD} - 13.5$	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

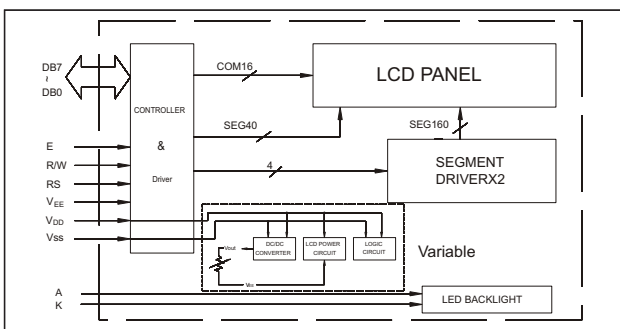
PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = High: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit
17	$V_{OUT}$	Power Supply Voltage LCD Driver
18	NC	No Connection

#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		2.0	3.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			2.99		mA

Note (1): Value is high reliability type. Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

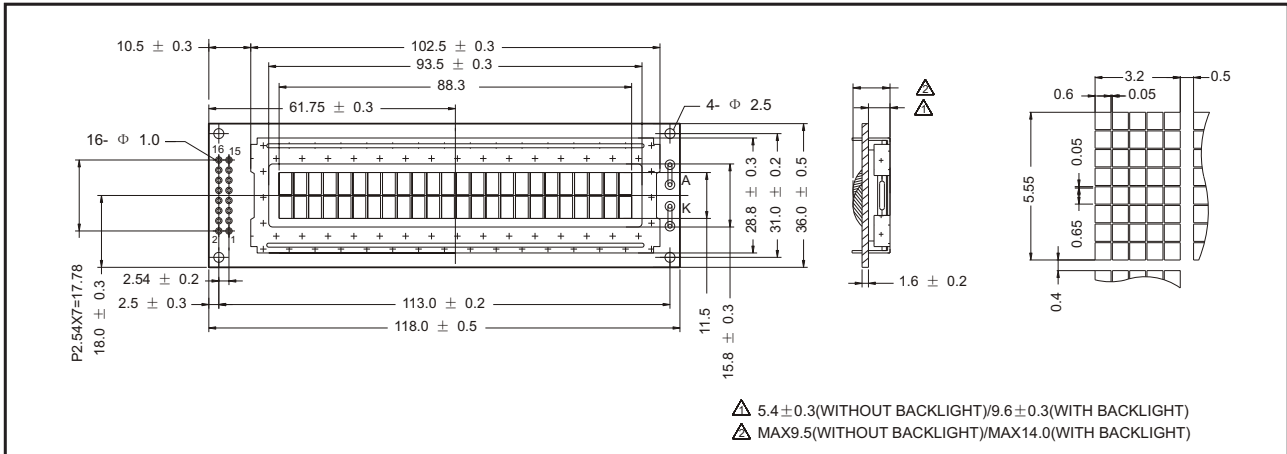
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.1	4.5	V
Power Consumption	$P_{LED}$	$I_F = 770mA$		3157		mW
Luminous	$I_v$	$I_F = 770mA$		150		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 242-01

24 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	118.0 x 36.0 x 9.5/14.0	mm
Viewing Area (W x H)	93.5 x 15.8	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	3.2 x 5.55	mm
Character Pitch (W x H)	3.7 x 5.95	mm
Dot Size (W x H)	0.6 x 0.65	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	3.0	11.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH=DATA
5	R/W	Read /Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

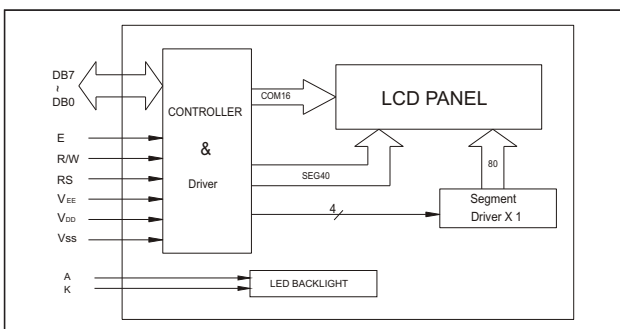
#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ C$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.38		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

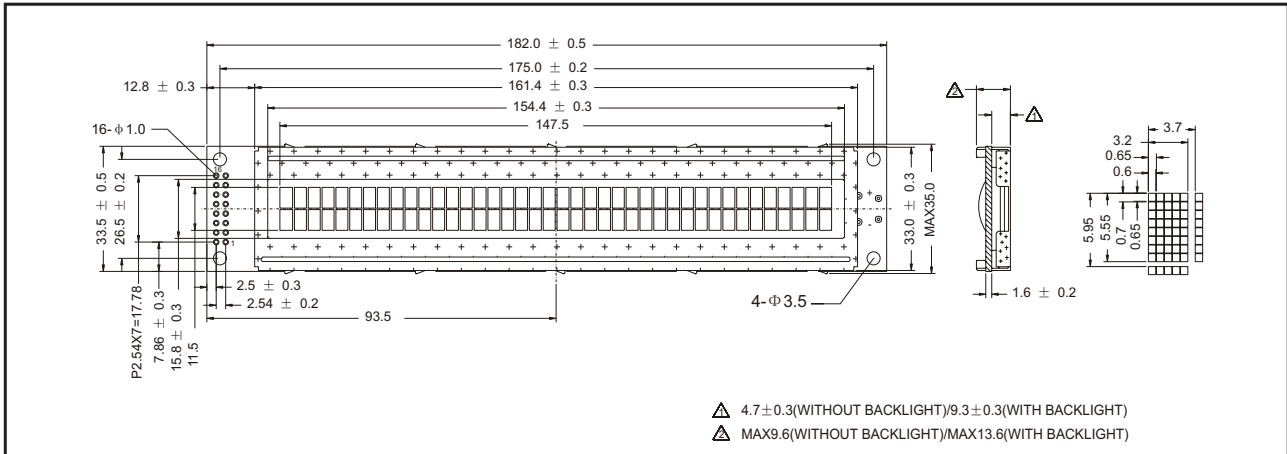
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.2	4.6	V
Power Consumption	$P_{LED}$	$I_F = 150mA$		630		mW
Luminous	$I_v$	$I_F = 150mA$		185		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 402-01

40 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	182.0 x 33.5 x 9.6/13.6	mm
Viewing Area (W x H)	154.4 x 15.8	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	3.2 x 5.55	mm
Character Pitch (W x H)	3.7 x 5.95	mm
Dot Size (W x H)	0.6 x 0.65	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	3.0	11.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_{DD}$	Power Supply (+5.0V)
3	$V_{EE}$	Supply Voltage LCD Driver
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
15	A	Anode of LED Unit
16	K	Cathode of LED Unit

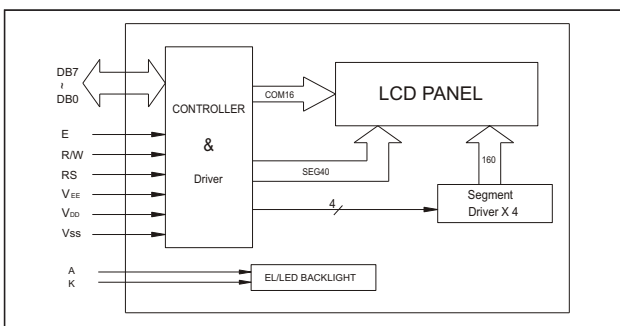
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	2.2	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

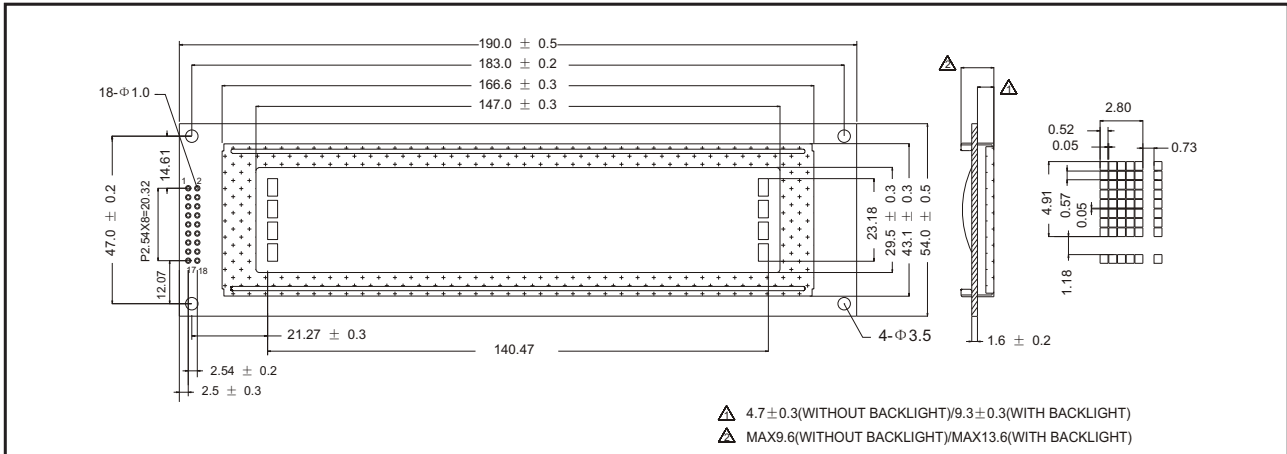
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.0	3.3	3.6	V
Power Consumption	$P_{LED}$	$I_F = 40mA$		132		mW
Luminous	$I_V$	$I_F = 40mA$	80	100		cd/m <sup>2</sup>

## STANDARD CHARACTER MODULES

### YMS 404-01

40 CHAR x 4 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	190.0 x 54.0 x 9.2/14.5	mm
Viewing Area (W x H)	147.0 x 29.5	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.8 x 4.91	mm
Character Pitch (W x H)	3.53 x 6.09	mm
Dot Size (W x H)	0.52 x 0.57	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	3.0	11.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

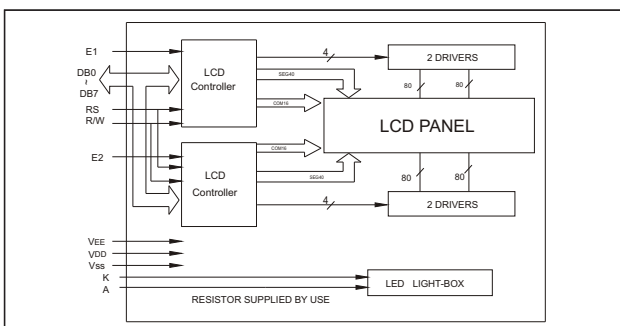
PIN	SYMBOL	SIGNAL DESCRIPTION
1 to 8	DB <sub>7</sub> to DB <sub>0</sub>	Data Bus - Software selectable 4 or 8 bit Mode Enable
9	E1	R/W = LOW: Data are talking over at falling edge R/W = High: Data can be read at E = 1
10	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
11	RS	Register Select - LOW = Instruction, HIGH = DATA
12	$V_{EE}$	Supply Voltage LCD Driver
13	$V_{SS}$	GND (0 V)
14	$V_{DD}$	Power Supply (+5.0V)
15	E2	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
16	N/C	N/C
17	A	Anode of LED Unit
18	K	Cathode of LED Unit

#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2\text{mA}$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2\text{mA}$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	4.5	4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.7	mA

Note (1): Value is high reliability type. Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$			4.1		V
Power Consumption	$P_{LED}$	$I_F = 500\text{mA}$		1000		mW
Luminous	$I_v$	$I_F = 500\text{mA}$	60	80		cd/m <sup>2</sup>

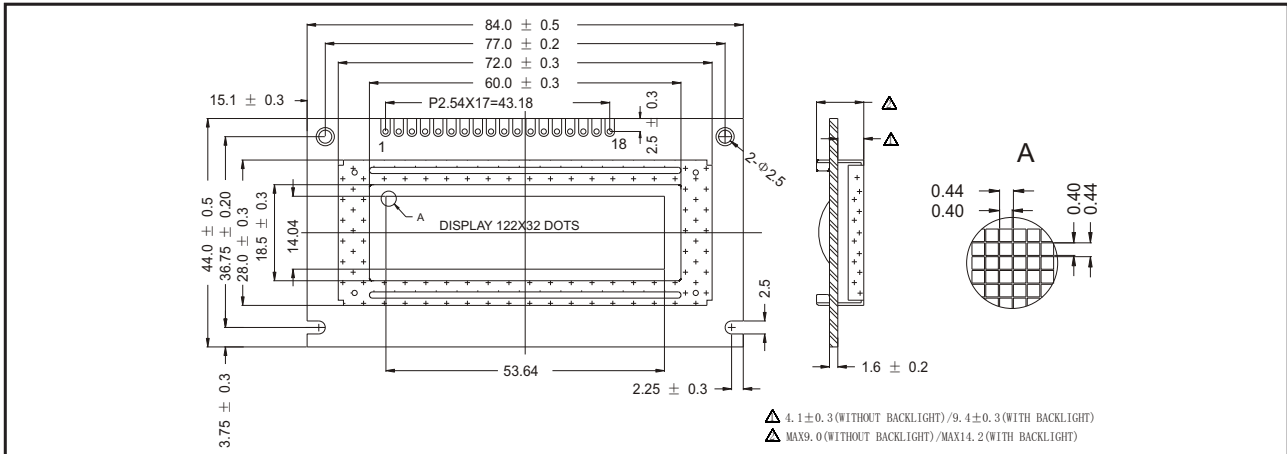


# STANDARD GRAPHIC MODULES

## YMS 12232-01

122 X 32 DOTS, 1/32 DUTY, 1/5 BIAS

### INTERFACE TIMING CHARACTERISTICS



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	84.0 x 44.0 x 9.0/14.2	mm
Viewing Area (W x H)	60.0 x 18.5	mm
Number of Dots	122 x 32	dots
Dot Pitch (W x H)	0.44 x 0.44	mm
Dot Size (W x H)	0.4 x 0.4	mm

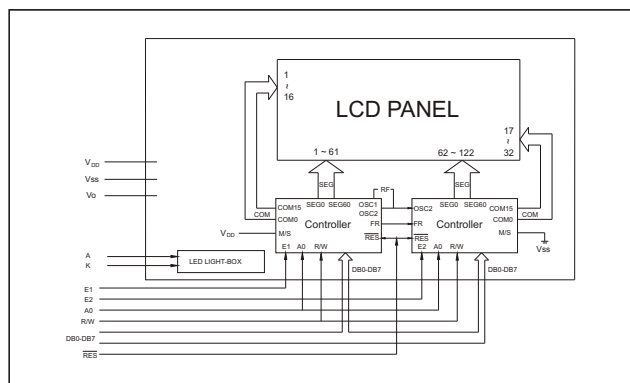
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	8.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	16.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	$V_{SS}$	0V	GND (0 V)
2	$V_{DD}$	+5V	Supply voltage for Logic and LCD
3	$V_0$		Operating Voltage for LCD (variable)
4	A0	H/L	Register Select - LOW = Instruction, HIGH=DATA
5	E1	H/L	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
6	E2		
7	R/W	H/L	Read / Write LOW = MPU to LCM, HIGH=Data
8	DB <sub>0</sub>	H/L	Data Bit 0
9	DB <sub>1</sub>	H/L	Data Bit 1
10	DB <sub>2</sub>	H/L	Data Bit 2
11	DB <sub>3</sub>	H/L	Data Bit 3
12	DB <sub>4</sub>	H/L	Data Bit 4
13	DB <sub>5</sub>	H/L	Data Bit 5
14	DB <sub>6</sub>	H/L	Data Bit 6
15	DB <sub>7</sub>	H/L	Data Bit 7
16	/RES	H/L	Reset Signal
17	A		Anode of LED Unit
18	K		Cathode of LED Unit

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

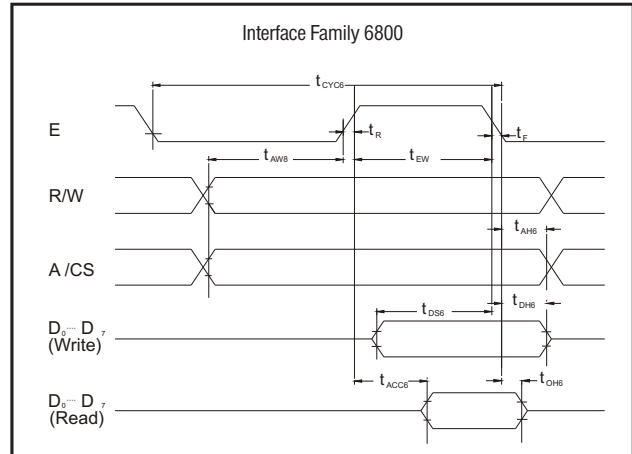
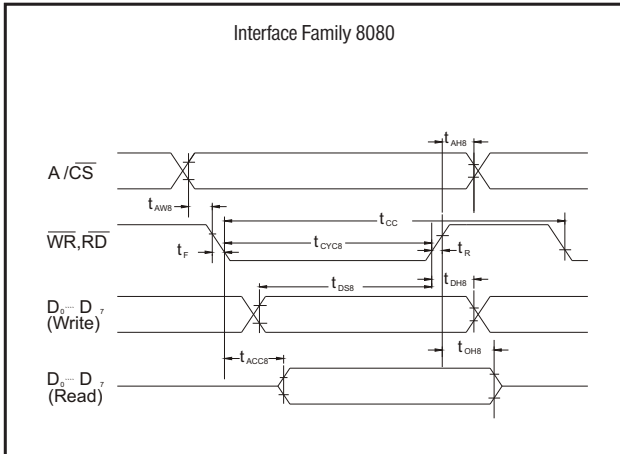
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.95	4.1	4.25	V
Power Consumption	$P_{LED}$	$I_F = 90\text{mA}$		369	900	mW
Luminous	$I_v$	$I_F = 90\text{mA}$				cd/m <sup>2</sup>

## STANDARD GRAPHIC MODULES

### YMS 12232-01

122 X 32 DOTS, 1/32 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.5	1.0	mA
Input Voltage	HIGH	$V_{IH}$	$0.8 V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$	$V_{SS}$		$0.3 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 3.0mA$	$V_{DD} + 2.4$		V
	LOW	$V_{OL}$	$I_{OL} = 3.0mA$		$V_{DD} + 0.4$	V
LCD Operating Voltage	$V_{DD} - V_0$	$V_{DD} = 5V$ $T_a = +25^\circ C$		5.0		V
Supply Current LCD Drive	$I_0$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### SWITCHING TIMING CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Address Hold Time	$t_{AH6}$	10		ns
Address Setup Time	$t_{AW6}$	20		ns
System Cycle Time	$t_{CSC6}$	1000		ns
Control Pulse Width	$t_{CC}$	200		ns
Data Setup Time	$t_{DS6}$	80		ns
Data Hold Time	$t_{DH6}$	10		ns
RD Access Time	$t_{ACC6}$		90	ns
Output Disable Time	$t_{OH6}$	10	60	ns
Rise and Fall Time	$t_R, t_F$		15	ns

Condition:  $V_{DD} = +5.0, V_{SS} = 0V, T_a = +25^\circ C$

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Address Hold Time	$t_{AH6}$	10		ns
Address Setup Time	$t_{AW6}$	20		ns
Data Setup Time	$t_{CSC6}$	1000		ns
Data Hold Time	$t_{DS6}$	80		ns
Data Setup Time	$t_{DH6}$	10		ns
Output Disable Time	$t_{OH6}$	10	60	ns
Access Time	$t_{ACC6}$		90	ns
Enable Low	READ	$t_{EW}$	100	ns
Pulse Width	WRITE		80	ns
Rise and Fall Time	$t_R, t_F$		15	ns

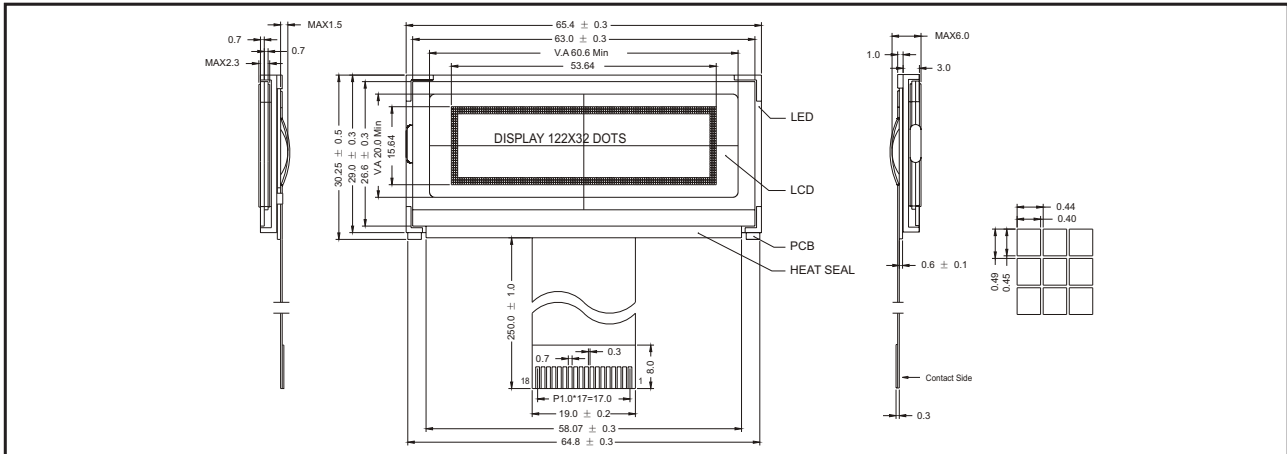
Condition:  $V_{DD} = +5.0, V_{SS} = 0V, T_a = +25^\circ C$

# STANDARD GRAPHIC MODULES

## YMC 12232-03

122 X 32 DOTS, 1/32 DUTY, 1/5 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	65.4 x 30.25 x 6.0	mm
Viewing Area (W x H)	60.6 x 20.0	mm
Number of Dots	122 x 32 with cursor	dots
Dot Pitch (W x H)	0.40 x 0.45	mm
Dot Size (W x H)	0.44 x 0.49	mm

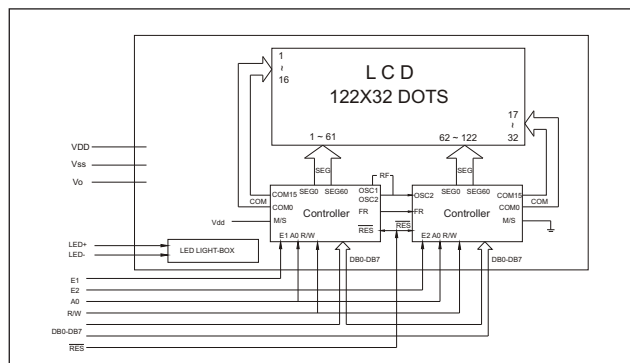
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	8.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	13.5	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{DD}$	Logic Supply Voltage (+5.0V)
2	$V_{SS}$	Ground (0V)
3	$V_0$	Power Supply for LCD Driving
4	RES	Reset Signal
5	E1	Enable Clock
6	E2	Enable Clock
7	R/W	Read / Write Select
8	$A_0$	Identify the Data or a Command
9-16	DB <sub>0</sub> - DB <sub>7</sub>	Data Bus Line
17-18	LED+, LED-	LED Backlight

### BLOCK DIAGRAM



### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.5	1.0	mA
Input Voltage	HIGH	$V_{IH}$		$0.8 V_{DD}$	$V_{DD}$	V
	LOW	$V_{IL}$		$V_{SS}$	$0.3 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 3.0mA$	$V_{DD} + 2.4$		V
	LOW	$V_{OL}$	$I_{OL} = 3.0mA$		$V_{DD} + 0.4$	V
LCD Operating Voltage	$V_{DD} - V_0$			5.0		V
Supply Current LCD Drive	$I_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ C$		1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

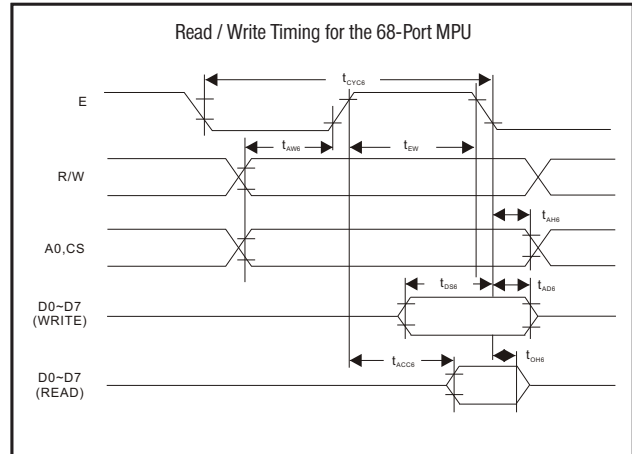
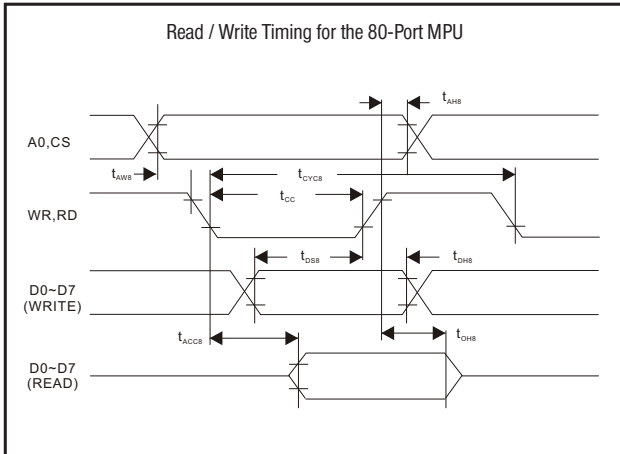
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$	$I_F = 140mA$		2.1	2.3	V
Power Consumption	$P_{LED}$	$I_F = 140mA$		0.29		W
Luminous	$I_v$	$I_F = 140mA$		25		cd/m <sup>2</sup>

# STANDARD GRAPHIC MODULES

## YMC 12232-03

122 X 32 DOTS, 1/32 DUTY, 1/5 BIAS

### INTERFACE TIMING CHARACTERISTICS



### SWITCHING TIMING CHARACTERISTICS: READ/WRITE TIMING FOR THE 80-PORT MPU, Ta = -25°C~75°C

PARAMETER	SIGNAL	SYMBOL	CONDITION	RATING			
				MIN.	TYP.	MAX.	UNIT
Address Hold Time	A <sub>0</sub> , CS	t <sub>AH8</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	10 20			ns
Address Setup Time		t <sub>AW8</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	20 40			ns
System Cycle Time	WR, RD	t <sub>CYC8</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	1000 2000			ns
Control Pulse Width		t <sub>CC</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	200 400			ns
Data Setup Time	D <sub>0</sub> - D <sub>7</sub>	t <sub>DS8</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	80 160			ns
Data Hold Time		t <sub>DH8</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	10 20			ns
RD Access Time		t <sub>ACC8</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V			90 180	ns
Output Disable Time		t <sub>OH8</sub>	CL= 100pF CL= 100pF, V <sub>SS</sub> = -3V	10 20		60 120	ns

### SWITCHING TIMING CHARACTERISTICS: READ/WRITE TIMING FOR THE 68-PORT MPU, Ta = -25°C~75°C

PARAMETER	SIGNAL	SYMBOL	CONDITION	RATING			
				MIN.	TYP.	MAX.	UNIT
Address Hold Time	A <sub>0</sub> , CS, R/W	t <sub>AH6</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	10 30			ns
Address Setup Time		t <sub>AW6</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	20 40			ns
System Cycle Time		t <sub>CYC6</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	1000 2000			ns
Control Pulse Width	D <sub>0</sub> - D <sub>7</sub>	t <sub>DS6</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	80 160			ns
Data Setup Time		t <sub>DH6</sub>	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	10 20			ns
Data Hold Time		t <sub>OH6</sub>	CL= 100pF, V <sub>SS</sub> = -5V	10 20		60 120	ns
RD Access Time		t <sub>ACC6</sub>	CL= 100pF, V <sub>SS</sub> = -5V			90 180	ns
Enable/Disable Time	READ WRITE	E	V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V V <sub>SS</sub> = -5V V <sub>SS</sub> = -3V	100 200 80 160			ns

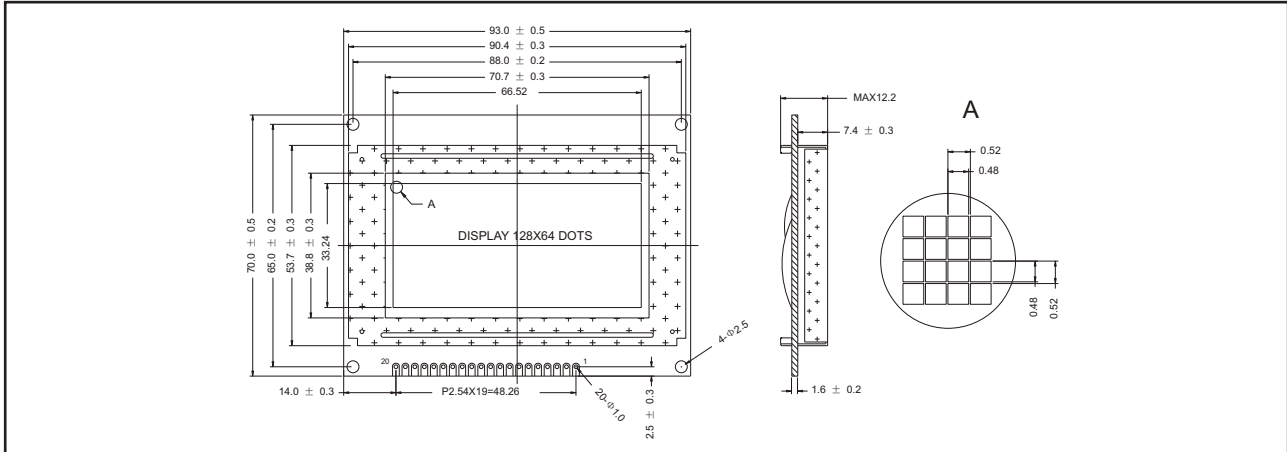
Condition: t<sub>CYC6</sub> indicates the cycle during which CS/E are high; it doesn't indicate are cycle of the E signal.

# STANDARD GRAPHIC MODULES

## YMS 12864-01

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	93.0 x 70.0 x 12.2	mm
Viewing Area (W x H)	70.7 x 38.8	mm
Number of Dots	128 x 64	dots
Dot Pitch (W x H)	0.52 x 0.52	mm
Dot Size (W x H)	0.48 x 0.48	mm

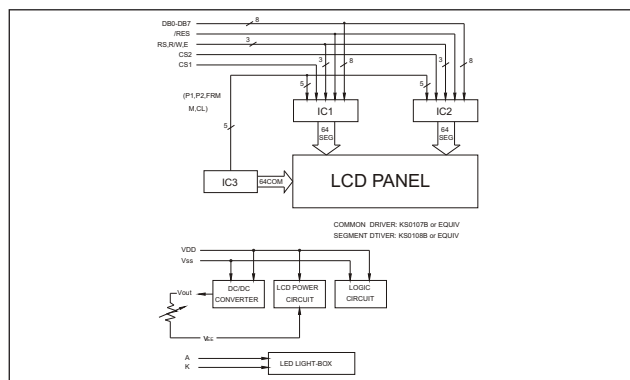
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	18.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	$V_{SS}$	0V	GND (0 V)
2	$V_{DD}$	+5V	Supply Voltage for Logic and LCD
3	$V_{EE}$		Operating Voltage for LCD (variable)
4	RS	H/L	H: DATA, L: Instruction Code
5	R/W	H/L	H: Read (Module-MPU), L: Write (MPU-Module)
6	E	H, H-L	Chip Enable Signal
7	DB <sub>0</sub>	H/L	Data Bit 0
8	DB <sub>1</sub>	H/L	Data Bit 1
9	DB <sub>2</sub>	H/L	Data Bit 2
10	DB <sub>3</sub>	H/L	Data Bit 3
11	DB <sub>4</sub>	H/L	Data Bit 4
12	DB <sub>5</sub>	H/L	Data Bit 5
13	DB <sub>6</sub>	H/L	Data Bit 6
14	DB <sub>7</sub>	H/L	Data Bit 7
15	CS <sub>1</sub>	H/L	Chip Select Signal for IC 1
16	CS <sub>2</sub>	H/L	Chip Select Signal for IC 2
17	/RES	H, H-L	Reset Signal
18	$V_{OUT}$		Power Supply Voltage for LCD
19	A		Anode of LED Unit
20	K		Cathode of LED Unit

### BLOCK DIAGRAM



## STANDARD GRAPHIC MODULES

### YMS 12864-01

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>		4.5	5.0	5.5	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> = 5V		3.0	4.5	mA
Input Voltage	HIGH	V <sub>IH</sub>	0.7 V <sub>DD</sub>		V <sub>DD</sub>	V
	LOW	V <sub>IL</sub>	0		0.3 V <sub>DD</sub>	V
Output Voltage	HIGH	V <sub>OH</sub>	I <sub>OH</sub> = 0.205mA	2.4		V
	LOW	V <sub>OL</sub>	I <sub>OL</sub> = 1.6mA		0.4	V
LCD Operating Voltage	V <sub>DD</sub> - V <sub>EE</sub>	V <sub>DD</sub> = 5V Ta = +25°C		13.5		V
Supply Current LCD Drive	I <sub>EE</sub>			3.0	4.5	mA

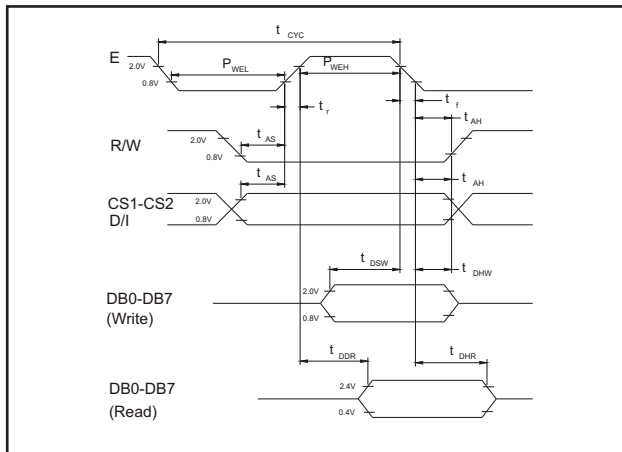
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	V <sub>LED</sub>		3.9	4.15	4.3	V
Power Consumption	P <sub>LED</sub>	I <sub>F</sub> = 180mA		738		mW
Luminous	I <sub>v</sub>	I <sub>F</sub> = 180mA	51	69		cd/m <sup>2</sup>

#### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Address Hold Time	t <sub>AH</sub>	10		ns
Address Setup Time	t <sub>AS</sub>	140		ns
E Cycle Time	t <sub>CYC</sub>	1000		ns
E High Level Width	t <sub>WEH</sub>	450		ns
E Low Level Width	t <sub>WEL</sub>	450		ns
E Rise Time	t <sub>r</sub>		25	ns
E Fall Time	t <sub>f</sub>		25	ns
Data Setup Time	t <sub>DSW</sub>	200		ns
Data Delay Time	t <sub>DDR</sub>		320	
Data Hold Time - Write	t <sub>DHW</sub>	10		ns
Data Hold Time - Read	t <sub>DHR</sub>	20		ns

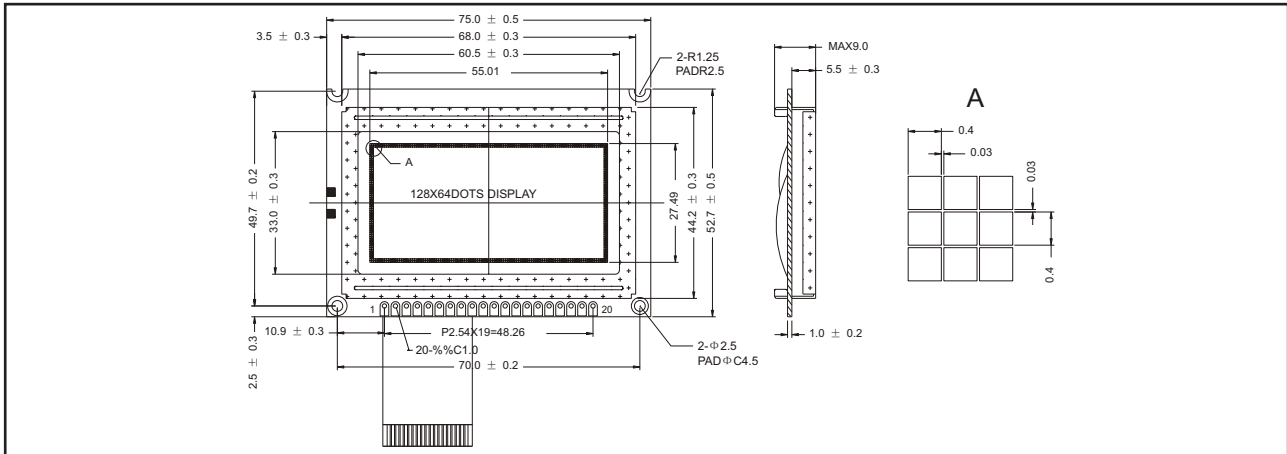
Condition: V<sub>DD</sub> = +5.0 ± 10%, V<sub>SS</sub> = 0V, Ta = +25°C

# STANDARD GRAPHIC MODULES

## YMS 12864-04

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	75.0 x 52.7 x 9.0	mm
Viewing Area (W x H)	60.5 x 33.0	mm
Number of Dots	128 x 64	dots
Dot Pitch (W x H)	0.43 x 0.43	mm
Dot Size (W x H)	0.40 x 0.40	mm

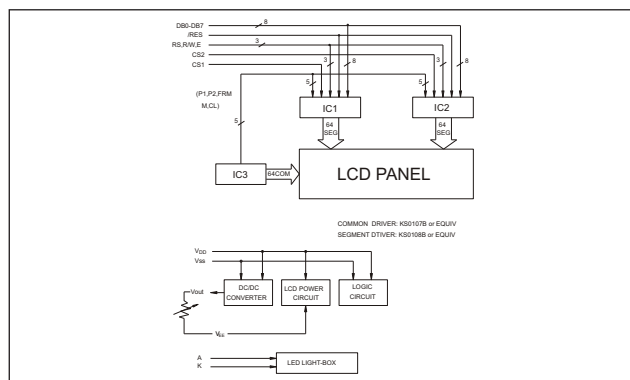
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	18.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	$V_{SS}$	0V	GND (0 V)
2	$V_{DD}$	+5V	Supply Voltage for Logic and LCD
3	$V_{EE}$		Operating Voltage for LCD (variable)
4	RS	H/L	H: DATA, L: Instruction Code
5	R/W	H/L	H: Read (Module-MPU), L: Write (MPU-Module)
6	E	H, H-L	Chip Enable Signal
7	DB <sub>0</sub>	H/L	Data Bit 0
8	DB <sub>1</sub>	H/L	Data Bit 1
9	DB <sub>2</sub>	H/L	Data Bit 2
10	DB <sub>3</sub>	H/L	Data Bit 3
11	DB <sub>4</sub>	H/L	Data Bit 4
12	DB <sub>5</sub>	H/L	Data Bit 5
13	DB <sub>6</sub>	H/L	Data Bit 6
14	DB <sub>7</sub>	H/L	Data Bit 7
15	CS <sub>1</sub>	H/L	Chip Select Signal for IC 1
16	CS <sub>2</sub>	H/L	Chip Select Signal for IC 2
17	/RES	H, H-L	Reset Signal
18	$V_{OUT}$		Power Supply Voltage for LCD
19	A		Anode of LED Unit
20	K		Cathode of LED Unit

### BLOCK DIAGRAM





## STANDARD GRAPHIC MODULES

### YMS 12864-04

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>		4.5	5.0	5.5	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> = 5V		3.0	4.5	mA
Input Voltage	HIGH	V <sub>IH</sub>	0.7 V <sub>DD</sub>		V <sub>DD</sub>	V
	LOW	V <sub>IL</sub>	0		0.3 V <sub>DD</sub>	V
Output Voltage	HIGH	V <sub>OH</sub>	I <sub>OH</sub> = 0.205mA	2.4		V
	LOW	V <sub>OL</sub>	I <sub>OL</sub> = 1.6mA		0.4	V
LCD Operating Voltage	V <sub>DD</sub> - V <sub>EE</sub>	V <sub>DD</sub> = 5V Ta = +25°C		9.7		V
Supply Current LCD Drive	I <sub>EE</sub>			3.0	4.5	mA

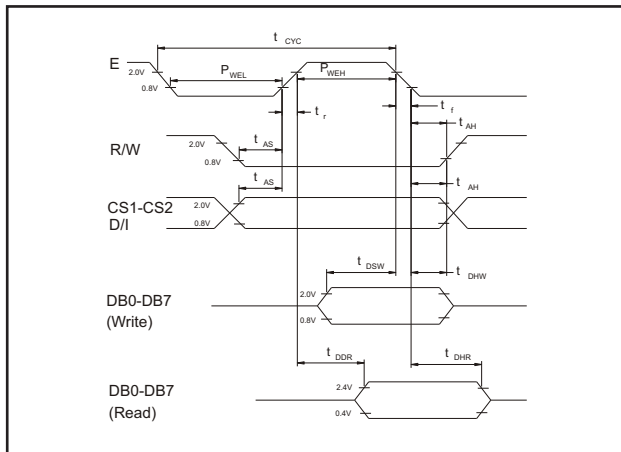
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	V <sub>LED</sub>			4.1		V
Power Consumption	P <sub>LED</sub>	I <sub>F</sub> = 100mA		410		mW
Luminous	I <sub>v</sub>	I <sub>F</sub> = 100mA		60		cd/m <sup>2</sup>

#### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Address Hold Time	t <sub>AH</sub>	10		ns
Address Setup Time	t <sub>AS</sub>	140		ns
E Cycle Time	t <sub>cyc</sub>	1000		ns
E High Level Width	t <sub>WEH</sub>	450		ns
E Low Level Width	t <sub>WEL</sub>	450		ns
E Rise Time	t <sub>R</sub>		25	ns
E Fall Time	t <sub>F</sub>		25	ns
Data Setup Time	t <sub>DSW</sub>	200		ns
Data Delay Time	t <sub>DDR</sub>		320	
Data Hold Time - Write	t <sub>DHW</sub>	10		ns
Data Hold Time - Read	t <sub>DHR</sub>	20		ns

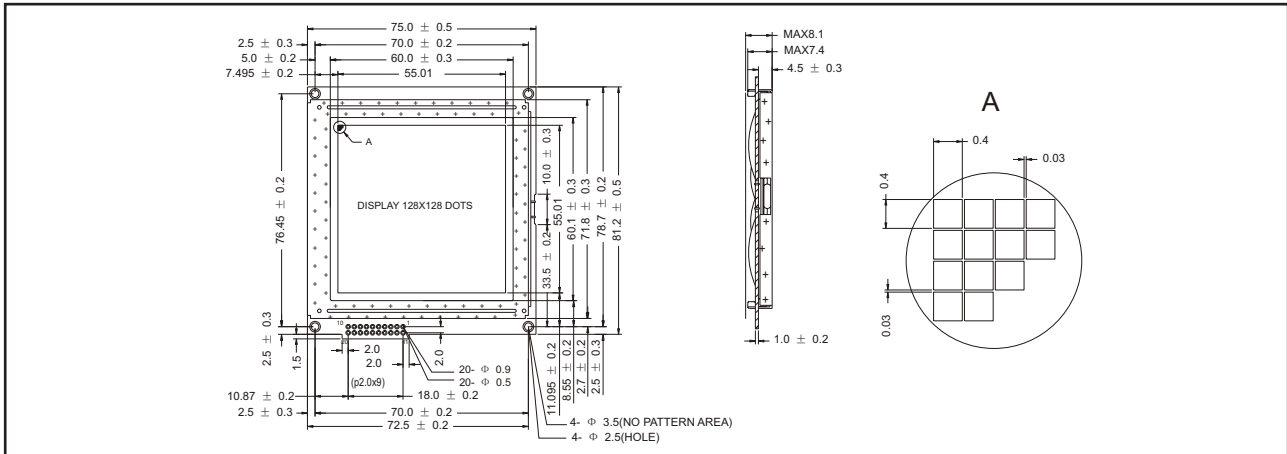
Condition: V<sub>DD</sub> = +5.0 ± 10%, V<sub>SS</sub> = 0V, Ta = +25°C

# STANDARD GRAPHIC MODULES

## YMS 128128-01

128 X 128 DOTS, 1/128 DUTY, 1/12 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	75.0 x 81.2 x 8.1	mm
Viewing Area (W x H)	60.0 x 60.1	mm
Number of Dots	128 x 128	dots
Dot Pitch (W x H)	0.43 x 0.43	mm
Dot Size (W x H)	0.40 x 0.40	mm

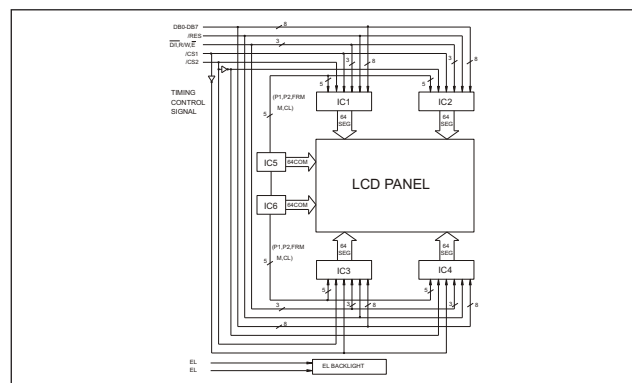
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	$V_{DD}$	+5V	Supply Voltage for Logic and LCD
2	$V_{SS}$	0V	GND (0 V)
3	$V_{EE}$		Operating Voltage for LCD (variable)
4	$DB_0$	H/L	Data Bit 0
5	$DB_1$	H/L	Data Bit 1
6	$DB_2$	H/L	Data Bit 2
7	$DB_3$	H/L	Data Bit 3
8	$DB_4$	H/L	Data Bit 4
9	$DB_5$	H/L	Data Bit 5
10	$DB_6$	H/L	Data Bit 6
11	$DB_7$	H/L	Data Bit 7
12	$CS_1$	H/L	Chip Select Signal for IC 1
13	$CS_2$	H/L	Chip Select Signal for IC 2
14	/RES	H, H-L	Reset Signal
15	R/W	H, H-L	H: Read (Module-MPU), L: Write (MPU-Module)
16	DL	H/L	H: DATA, L: Instruction Code
17	E	H, H-L	Chip Enable Signal
18	$V_{SS}$	0V	Power Supply Voltage for LCD
19	EL		EL Power
20	EL		

### BLOCK DIAGRAM



# STANDARD GRAPHIC MODULES

## YMS 128128-01

128 X 128 DOTS, 1/128 DUTY, 1/12 BIAS

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD}=5V$		3.0	4.5	mA
Input Voltage	HIGH	$V_{IH}$	$0.7 V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$	0		$0.3 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH}=0.205mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL}=1.6mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD}=5V$ $T_a=+25^\circ C$		17.8		V
Supply Current LCD Drive	$I_{EE}$			9.8		mA

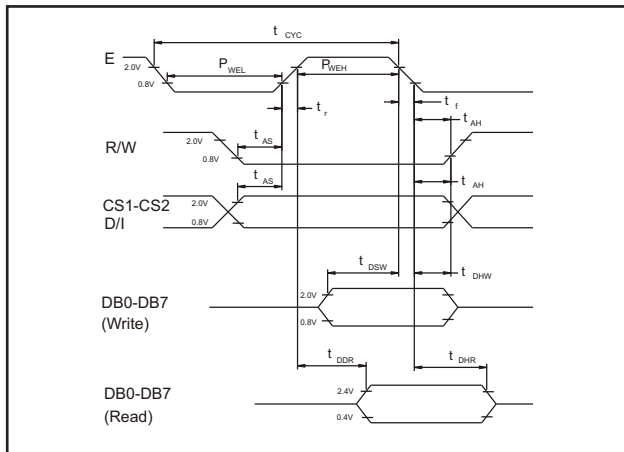
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Applied Voltage	$V_{EL}$			100	150	V
Applied Frequency	$F_{EL}$			400		Hz
Current	$I_{EL}$	$V_a=100V\ rms$		5.27	7.47	mA
Power Consumption	$P_{EL}$	$F_a=400\ Hz$		527	747	mW
Luminous	$I_v$		45	55		cd/m <sup>2</sup>

### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Address Hold Time	$t_{AH}$	10		ns
Address Setup Time	$t_{AS}$	140		ns
E Cycle Time	$t_{cyc}$	1000		ns
E High Level Width	$t_{WEH}$	450		ns
E Low Level Width	$t_{WEL}$	450		ns
E Rise Time	$t_r$		25	ns
E Fall Time	$t_f$		25	ns
Data Setup Time	$t_{DSW}$	200		ns
Data Delay Time	$t_{DDR}$		320	
Data Hold Time - Write	$t_{DHW}$	10		ns
Data Hold Time - Read	$t_{DHR}$	20		ns

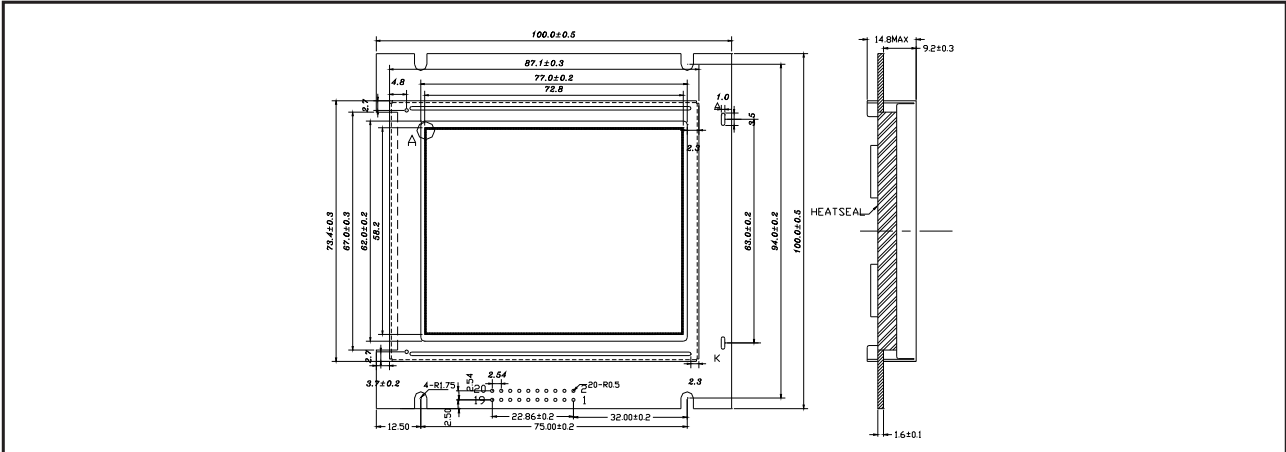
Condition:  $V_{DD}=+5.0 \pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=+25^\circ C$

## STANDARD GRAPHIC MODULES

### YMC 160128-01

160 CHAR x 128 DOTS, 1/128 DUTY, 1/12 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	100.0 x 73.4 x 14.8	mm
Viewing Area (W x H)	77.0 x 62.0	mm
Number of Dots	160 x 128	dots
Character Pitch (W x H)	0.455 x 0.455	mm
Dot Size (W x H)	0.425 x 0.425	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$			V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

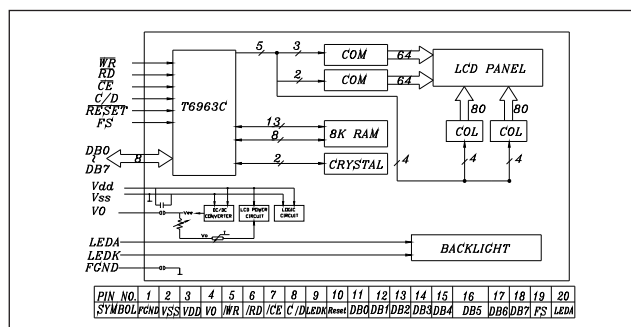
PIN	SYMBOL	SIGNAL DESCRIPTION
1	FGND	Frame Ground
2	$V_{SS}$	Ground
3	$V_{DD}$	Supply Voltage for Logic and LCD
4	$V_0$	Contrast Adjust for LCD Driving
5	WR	Write Signal
6	RD	Read Signal
7	CE	Chip Enable Signal
8	C/D	H: Instruction Code; L: Data
9	LEDK	LED Backlight
10	RESET	Reset Signal
11-18	DB <sub>0</sub> -DB <sub>7</sub>	Data Bus Line
19	FS	Pins for Selection of Font
20	LEDA	LED Backlight

#### ELECTRICAL CHARACTERISTICS, $V_{SS}=0V$ , $V_{DD}=5.0V \pm 10\%$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Input Voltage	HIGH	$V_{IH}$	$V_{DD} - 2.2V$		$V_{DD}$	V
	LOW	$V_{IL}$			0.8	V
Output Voltage	HIGH	$V_{OH}$	$V_{DD} - 0.3V$		$V_{DD}$	V
	LOW	$V_{OL}$			0.3	V
	HIGH	$R_{OH}$	$V_{OUT} = V_{DD} - 0.5V$		400	$\Omega$
	LOW	$R_{OL}$	$V_{OUT} = 0.5V$		400	$\Omega$
Input Pull-Up Resistance	$R_{PU}$		50	100	200	$K\Omega$
Operating Frequency	$F_{OSC}$		0.4		5.5	MHz

Note (1): Applied / T1 / T2 / RESET  
 MD<sub>5</sub>=L, MD<sub>6</sub>=L, MD<sub>7</sub>=H, MD<sub>8</sub>=H, FS<sub>7</sub>=L, FS<sub>8</sub>=L, /SDSEL=L, /DUL=H, D<sub>7</sub> to D<sub>0</sub> = LHLHLHLH

#### BLOCK DIAGRAM

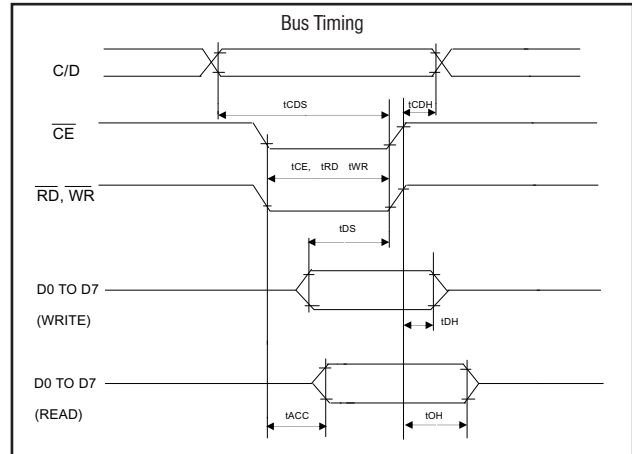
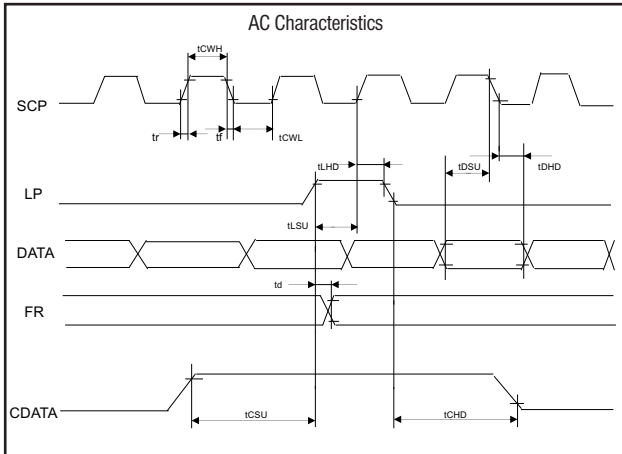


# STANDARD GRAPHIC MODULES

## YMC 160128-01

160 CHAR x 128 DOTS, 1/128 DUTY, 1/12 BIAS

### SWITCHING TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Frequency	$f_{SCP}$		2.75	MHz
SCP Pulse Width	$t_{CWH}, t_{CWL}$	150		ns
SCP Rise/Fall Time	$t_r, t_f$		30	ns
LP Setup Time	$t_{LSU}$	150	290	ns
LP Hold Time	$t_{LHD}$	5	40	ns
Data Setup Time	$t_{DSU}$	170		ns
Data Hold Time	$t_{DHD}$	80		ns
FR Delay Time	$t_d$	0	90	ns
CData Setup Time	$t_{CSU}$	450	850	ns
CData Hold Time	$t_{CHD}$	450	950	ns

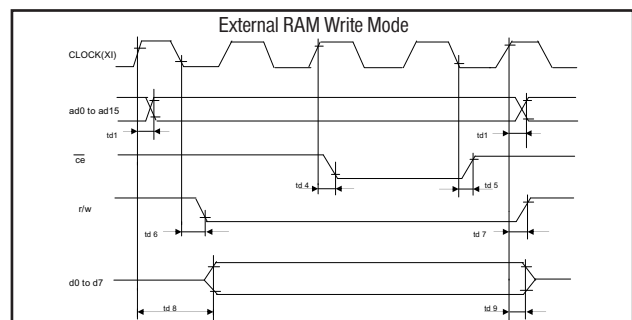
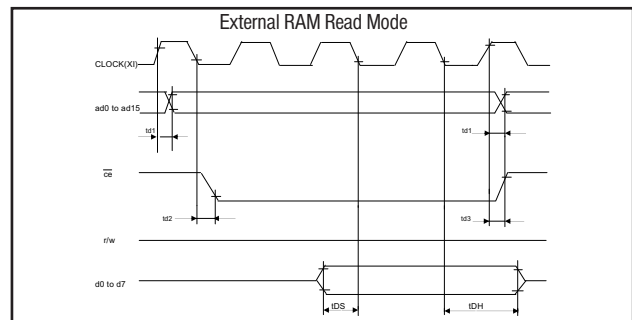
Condition:  $V_{DD}=+5.0, V_{SS}=0V, T_a=+25^\circ C$

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
C/D Setup Time	$t_{CDS}$	100		ns
C/D Hold Time	$t_{CDH}$	10		ns
/CE, /RD, /WR Pulse Width	$t_{CE}, t_{RD}, t_{WR}$	80		ns
Data Setup Time	$t_{DS}$	80		ns
Data Hold Time	$t_{DH}$	40		ns
Access Time	$t_{ACC}$		150	ns
Output Hold Time	$t_{OH}$	10	50	ns

Condition:  $V_{DD}=+5.0, V_{SS}=0V, T_a=+25^\circ C$

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Address Delay Time	$t_{d1}$		250	ns
CE Fall Delay Time (Read)	$t_{d2}$		180	ns
CE Rise Delay Time (Read)	$t_{d3}$		180	ns
Data Setup Time	$t_{dS}$	0		ns
Data Hold Time	$t_{dH}$	30		ns
CE Fall Delay Time (Write)	$t_{d4}$		200	ns
CE Rise Delay Time (Write)	$t_{d5}$		200	ns
R/W Fall Delay Time	$t_{d6}$		180	ns
R/W Rise Delay Time	$t_{d7}$		180	ns
Data Stable Time	$t_{d8}$		450	ns
Data Hold Time	$t_{d9}$		200	ns

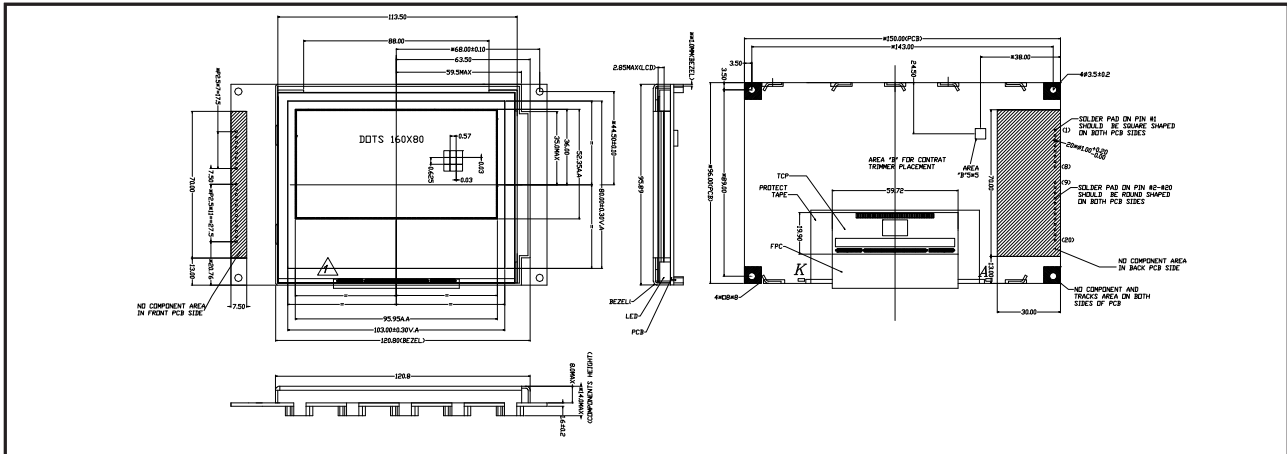
Condition:  $V_{DD}=+5.0, V_{SS}=0V, T_a=+25^\circ C$



## STANDARD GRAPHIC MODULES YMC 16080-05

160 CHAR x 80 DOTS, 1/80 DUTY, 1/10 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	120.8 x 95.89 x 14.0	mm
Viewing Area (W x H)	103.0 x 80.0	mm
Number of Dots	160 x 80	dots
Character Pitch (W x H)	0.6 x 0.655	mm
Dot Size (W x H)	0.57 x 0.625	mm

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{CC}$	-0.3	7.0	V <sup>1</sup>
Supply Voltage Drive	$V_{LD}$	-0.3	20.0	V
Input Voltage 1	$V_{T1}$	-0.3	$V_{CC} + 0.3$	V <sup>1,2</sup>
Input Voltage 2	$V_{T2}$	-0.3	$V_{LD} + 0.3$	V <sup>1,3</sup>
Operating Temperature		See page 8		
Storage Temperature				

Notes: 1. Measured Relative to GND; 2. Applies to Pins M/S, OSC, OSC<sub>1</sub>, OSC<sub>2</sub>, DB<sub>7</sub> to DB<sub>0</sub>, /RD, /WR, /CS, RS, /RES, CL<sub>1</sub>, M, FLM; 3. Applies to Pins V<sub>10</sub>, V<sub>20</sub>, V<sub>30</sub>, V<sub>40</sub> and V<sub>50</sub>; 4. If the LSI is used beyond its absolute max.rating, it may be permanently damaged. It should always be used within the limits of its electrical characteristics to prevent malfunction or unreliability.

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{LED+}$	LED Power
2	$V_{LED-}$	LED Power
3	NC	No Connection
4	RESET	Reset the LSI Internally When Drive Low
5	/RD	Inputs Read Strobe
6	/WR	Inputs Write Strobe
7	/CS	Select the LSI, Specifically Internal Registers (Index and Data Registers) when Drive Low
8	$A_0$	Select One of the Internal Registers
9-16	$D_0 - D_7$	Data Bus Line
17	$V_{DD}$	Power Supply Voltage
18	$V_{DC+}$	Power Supply for DC-DC
19	GND	Ground
20	NC	No Connection

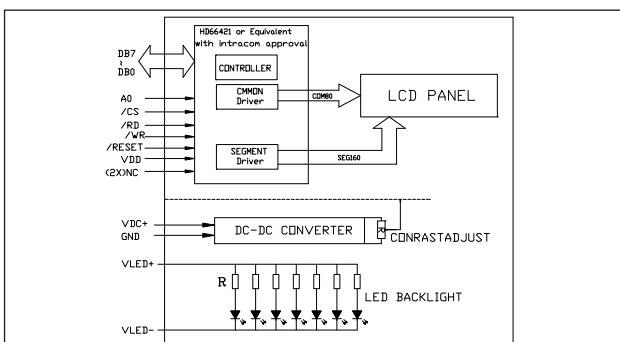
### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$			3.0±10%		V
LCD Operating Voltage	$V_0 - V_{SS}$	$T_a = +25^\circ\text{C}$	15.2	15.4	15.6	V
Response Time	$T_{ON}$ $T_{OFF}$			72 315		ms
Contrast	CR		2.0			
Viewing Angle	12H	$\theta_1$	CR ≥ 2.0	45		Deg.
	6H	$\theta_2$		65		
	3H	$\theta_3$		55		
	9H	$\theta_4$		55		

Note (2): Value is high reliability type.

Note (3): Electro-Optical Characteristics: See page 5.

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	$V_f$	$I_f = 70\text{mA}$	3.0	3.2	3.5	V
Forward Current	$I_f$	$V_f = 2.1\text{V}$	20	70	120	mA
Power Dissipation	$P_d$	$I_f = 70\text{mA}$		0.21		W
Reverse Voltage	$V_r$				5.0	V
Reverse Current	$I_r$	$V_r = 5.0\text{V}$ each chip			10	uA
Luminous Intensity	$L_v$	$I_f = 70\text{mA}$		TBD		cd/m <sup>2</sup>
Luminous Uniformity	$\Delta L_v$		65			%
Emission Wave Length	$\lambda_p$	$I_f = 20\text{mA}$ each chip	569		575	nm

Note (4): Operating Temperature Range  $T_{op}$  -20°C to +70°C; Storage Temperature Range  $T_{stg}$  -30°C to +80°C.

## STANDARD GRAPHIC MODULES YMC 16080-05

160 CHAR x 80 DOTS, 1/80 DUTY, 1/10 BIAS

### INTERFACE TIMING CHARACTERISTICS

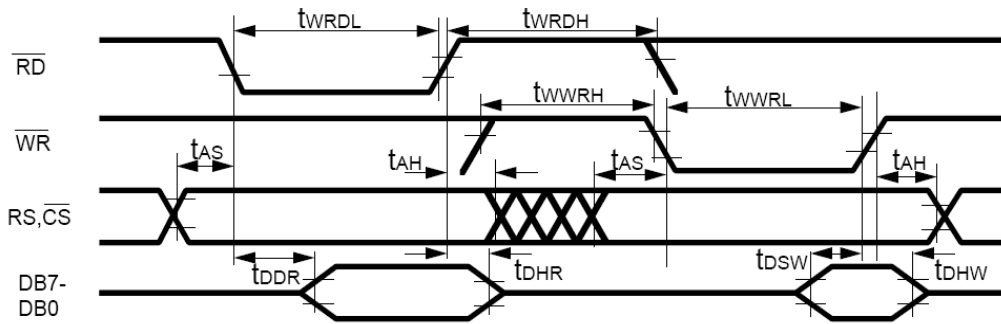
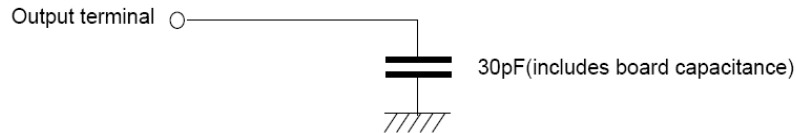


Figure 1 MPU Interface

Notes. The following load circuit is connected for specification.  
VOH and VOL of the timing specification is 1/2 VCC level.



HITACHI

### CLOCK CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTES
Oscillation Frequency	$f_{osc}$	160	220	280	kHz	$R_f=180k\Omega$ , $V_{CC}=3.0V$
External Clock Frequency	$f_{CP}$	50		400	kHz	
External Clock Duty Cycle	DUTY	45	50	55	%	
External Clock Fall Time	$t_f$			0.2	$\mu s$	
External Clock Rise Time	$t_r$			0.2	$\mu s$	

### MPU INTERFACE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTES
RD Low Level Width	$t_{WRDL}$	250 190		$4t_{osc}-450$	ns	$V_{CC}=2.2V$ to $3.0V$ , <sup>2</sup> $V_{CC}=3.0V$ to $5.5V$ , <sup>2</sup>
RD High Level Width	$t_{WRDH}$	450			ns	
WR Low Level Width	$t_{WWRL}$	250 190		$4t_{osc}-450$	ns	$V_{CC}=2.2V$ to $3.0V$ , <sup>2</sup> $V_{CC}=3.0V$ to $5.5V$ , <sup>2</sup>
WR High Level Width	$t_{WWRH}$	450			ns	
Address Setup Time	$t_{AS}$	20			ns	
Address Hold Time	$t_{AH}$	20			ns	
Data Delay Time	$t_{DDR}$			180 150	ns	$V_{CC}=2.2V$ to $3.0V$ $V_{CC}=3.0V$ to $5.5V$
Data Output Hold Time	$t_{DHR}$	20			ns	
Data Setup Time	$t_{DSW}$	150 100			ns	$V_{CC}=2.2V$ to $3.0V$ $V_{CC}=3.0V$ to $5.5V$
Data Hold Time	$t_{DHW}$	10			ns	
RES Low Level Width	$t_{RES}$	1			ms	

Note 1: All electrical characteristics are guaranteed at +85°C for die products.

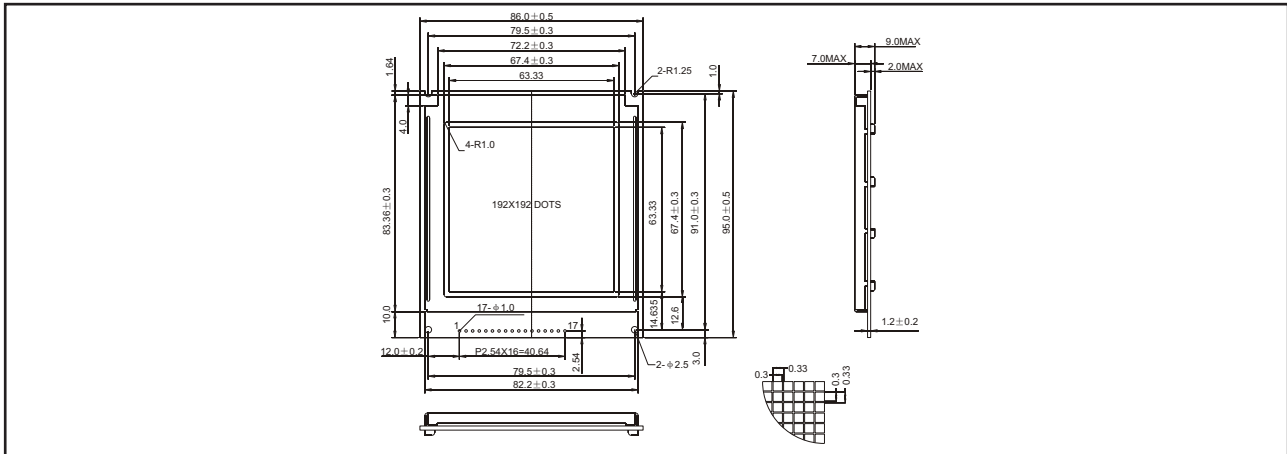
Note 2:  $t_{osc}=1/f_{osc}$

## STANDARD GRAPHIC MODULES

### YMC 192192-01

192 X 192 DOTS, 1/192 DUTY, 1/12 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	86.0 x 95.0 x 9.0	mm
Viewing Area (W x H)	67.4 x 67.4	mm
Number of Dots	192 x 192	dots
Dot Pitch (W x H)	0.33 x 0.33	mm
Dot Size (W x H)	0.3 x 0.3	mm

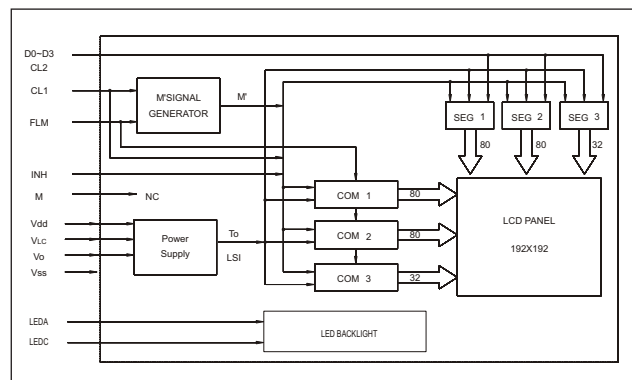
#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{DD}$	Logic Supply Voltage (+5.0V)
2	FG	Frame Ground
3	CL2	Data Shift Clock
4	INH	Display ON/OFF Control Terminal
5	FLM	Frame Signal
6	CL1	Data Latch Signal
7	$V_{SS}$	GND
8	M	LCD Drive Signal (AC Signal)
9-12	DB <sub>0</sub> -DB <sub>3</sub>	Data Bus Line
13	$V_{LC}$	Operating Voltage for LCD
14	$V_O$	LCD Drive Output Voltage Level
15	$V_{SS}$	GND
16	LEDA	Power Supply Terminal for Driving LED Backlight
17	LEDC	GND Terminal for Driving LED Backlight

#### BLOCK DIAGRAM



#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		2.7	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8		mA
Input Voltage	HIGH	$V_{IH}$	0.8 $V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$			0.2 $V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$V_{DD} - 0.4$			V
	LOW	$V_{OL}$			0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$	6.0	24.0	28.0	V
Supply Current LCD Drive	$I_{EE}$			0.5		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_F$	$I_F = 150\text{mA}$	3.9	4.1	4.3	V
Power Consumption	$P_{LED}$			615		mW

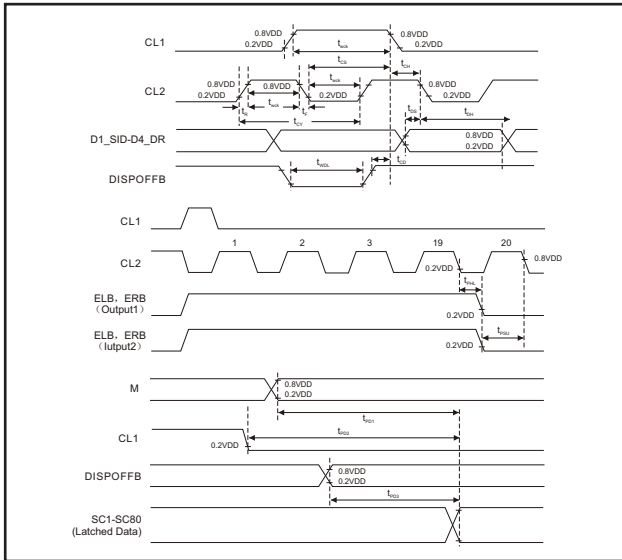


# STANDARD GRAPHIC MODULES

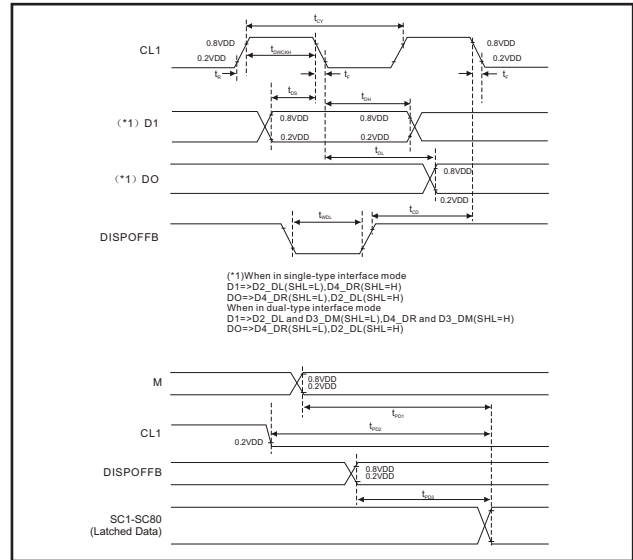
## YMC 192192-01

192 X 192 DOTS, 1/192 DUTY, 1/12 BIAS

### SEGMENT DRIVER APPLICATION TIMING



### COMMON DRIVER APPLICATION TIMING



### AC CHARACTERISTICS: SEGMENT DRIVER APPLICATION, $V_{SS}=0V$ , $T_a=-30^{\circ}C$ to $+85^{\circ}C$

CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{DD}=5V \pm 10\% (1)$			$V_{DD}=3V \pm 10\% (2)$			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Clock Cycle Time	$t_{CY}$	Duty=50%	125			250			ns
Clock Pulse Width	$t_{WCK}$		45			95			ns
Clock Rise / Fall Time	$t_R/t_F$							30	ns
Data Setup Time	$t_{DS}$		30			65			ns
Data Hold Time	$t_{DH}$		30			65			ns
Clock Setup Time	$t_{CS}$		80			120			ns
Clock Hold Time	$t_{CH}$		80			120			ns
Propagation Delay Time	$t_{PHL}$	ELB Output			60			125	ns
		ERB Output			60			125	ns
ELB ERB Setup Time	$t_{PSU}$	ELB Input	30			65			ns
		ERB Input	30			65			ns
DISPOFFB Low Pulse Width	$t_{WDL}$		1.2			1.2			$\mu s$
DISPOFFB Clear Time	$t_{CD}$		100			100			ns
M-OUT Propagation Delay Time	$t_{PD1}$	$C_L=15pF$			1.0			1.2	$\mu s$
CLI-OUT Propagation Delay Time	$t_{PD2}$				1.0			1.2	$\mu s$
DISPOFFB-OUT Propagation Delay Time	$t_{PD3}$				1.0			1.2	$\mu s$

### AC CHARACTERISTICS: COMMON DRIVER APPLICATION, $V_{SS}=0V$ , $T_a=-30^{\circ}C$ to $+85^{\circ}C$

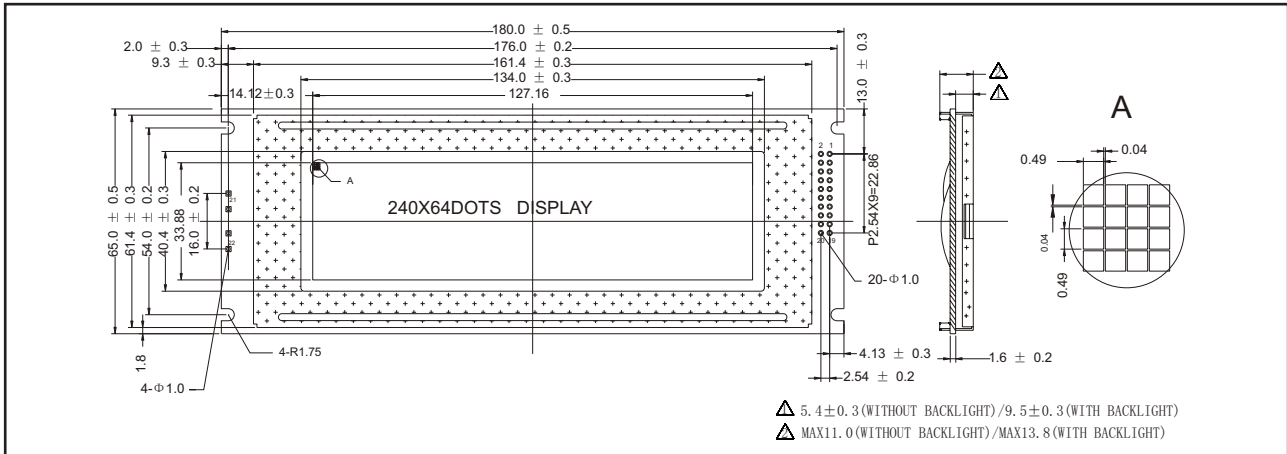
CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{DD}=5V \pm 10\% (1)$			$V_{DD}=3V \pm 10\% (2)$			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Clock Cycle Time	$t_{CY}$	Duty=50%	250			500			ns
Clock Pulse Width	$t_{WCK}$		45			95			ns
Clock Rise / Fall Time	$t_R/t_F$				50			50	ns
Data Setup Time	$t_{DS}$		30			65			ns
Data Hold Time	$t_{DH}$		30			65			ns
DISPOFFB Low Pulse Width	$t_{WDL}$		1.2			1.2			$\mu s$
DISPOFFB Clear Time	$t_{CD}$		100			100			ns
Output Delay Time	$t_{DL}$	$C_L=15pF$			200			250	ns
M-OUT Propagation Delay Time	$t_{PD1}$				1.0			1.2	$\mu s$
CLI-OUT Propagation Delay Time	$t_{PD2}$				1.0			1.2	$\mu s$
DISPOFFB-OUT Propagation Delay Time	$t_{PD3}$				1.0			1.2	$\mu s$

## STANDARD GRAPHIC MODULES

### YMS 24064-02

240 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	180.0 x 65.0 x 11.0/13.8	mm
Viewing Area (W x H)	134.0 x 40.4	mm
Number of Dots	240 x 64	dots
Dot Pitch (W x H)	0.53 x 0.53	mm
Dot Size (W x H)	0.49 x 0.49	mm

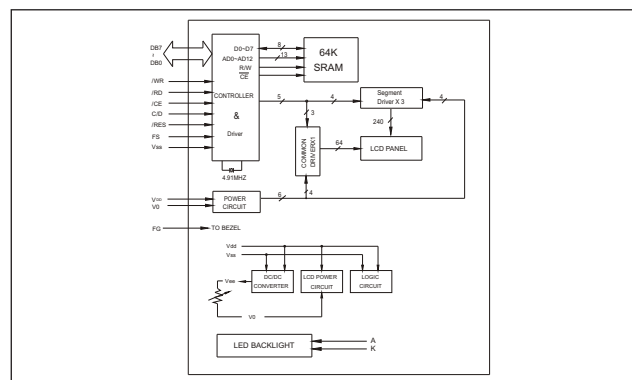
#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	FG	0V	Frame Ground
2	$V_{SS}$	0V	GND (0 V)
3	$V_{DD}$	+5V	Supply Voltage for Logic and LCD
4	$V_0$		Operating Voltage for LCD (variable)
5	/WR	L	Write Signal
6	/RD	L	Read Signal
7	/CE	L	Chip Enable Signal
8	C/D	H/L	H: Instruction Code, L: DATA Code
9	$V_{EE}$		Supply Voltage LCD Driver
10	/RES	H, H-L	Reset Signal
11	DB <sub>0</sub>	H/L	Data Bit 0
12	DB <sub>1</sub>	H/L	Data Bit 1
13	DB <sub>2</sub>	H/L	Data Bit 2
14	DB <sub>3</sub>	H/L	Data Bit 3
15	DB <sub>4</sub>	H/L	Data Bit 4
16	DB <sub>5</sub>	H/L	Data Bit 5
17	DB <sub>6</sub>	H/L	Data Bit 6
18	DB <sub>7</sub>	H/L	Data Bit 7
19	FS	H/L	Font Select Signal (H: 6x8 dots, L: 8x8 dots)
20	NC		No Connection
21	A		Anode of LED Unit
22	K		Cathode of LED Unit

#### BLOCK DIAGRAM



## STANDARD GRAPHIC MODULES

### YMS 24064-02

240 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		8.7	13.0	mA
Input Voltage	HIGH	$V_{IH}$	$V_{DD} - 2.2$		$V_{DD}$	V
	LOW	$V_{IL}$	0		0.8	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 3.0mA$	$V_{DD} - 0.3$	$V_{DD}$	V
	LOW	$V_{OL}$	$I_{OL} = 3.0mA$	0	0.3	V
LCD Operating Voltage	$V_{DD} - V_0$	$V_{DD} = 5V$ $T_a = +25^\circ C$		11.0		V
Supply Current LCD Drive	$I_0$			2.0	3.0	mA

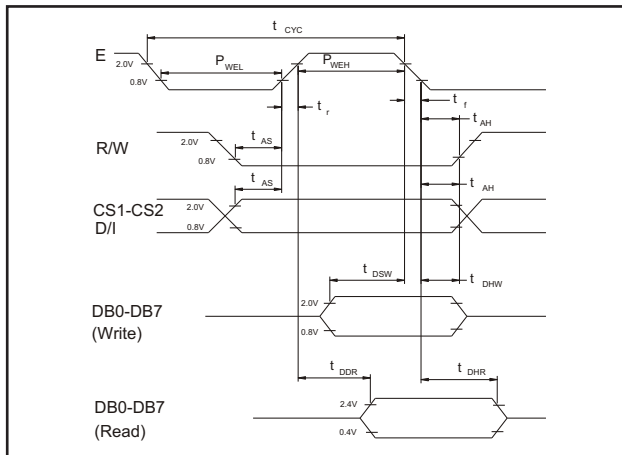
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		7.9	8.2	8.5	V
Power Consumption	$P_{LED}$	$I_F = 400mA$		3280		mW
Luminous	$I_V$	$I_F = 400mA$				cd/m <sup>2</sup>

#### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
C/D Setup Time	$t_{CDS}$	100		ns
C/D Hold Time	$t_{CDH}$	10		ns
/CE/RD/WR Pulse Width	$t_{CE} t_{RD} t_{WR}$	80		ns
Data Setup Time	$t_{DS}$	80		ns
Data Hold Time	$t_{DH}$	40		ns
Access Time	$t_{ACC}$		150	ns
Output Hold Time	$t_{OH}$	10	50	ns

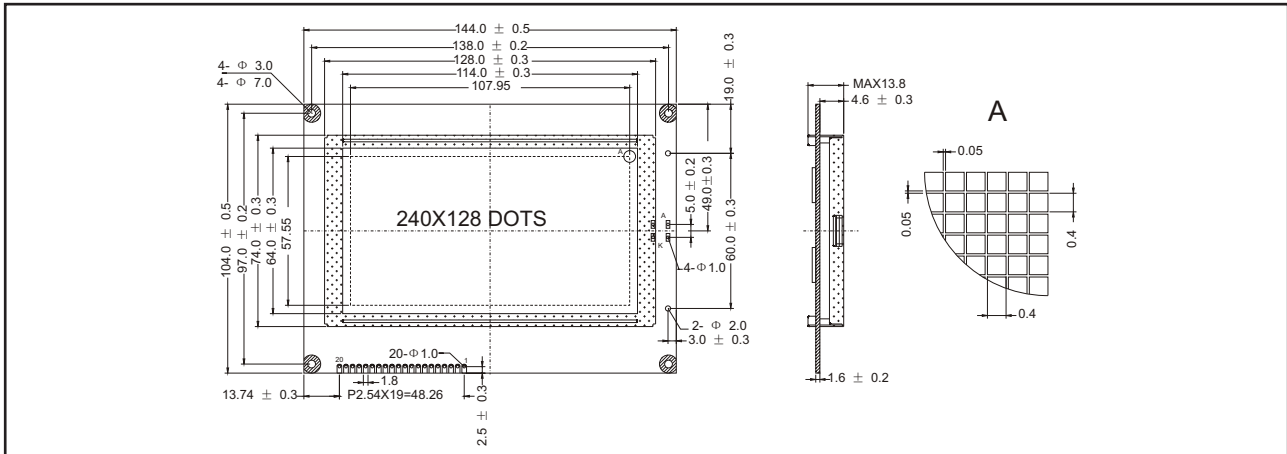
Condition:  $V_{DD} = +5.0V \pm 10\%$ ,  $V_{SS} = 0V$ ,  $T_a = +25^\circ C$

# STANDARD GRAPHIC MODULES

## YMS 240128-01

240 X 128 DOTS, 1/128 DUTY, 1/12 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	144.0 x 104.0 x 13.8	mm
Viewing Area (W x H)	114.0 x 64.0	mm
Number of Dots	240 x 128	dots
Dot Pitch (W x H)	0.45 x 0.45	mm
Dot Size (W x H)	0.40 x 0.40	mm

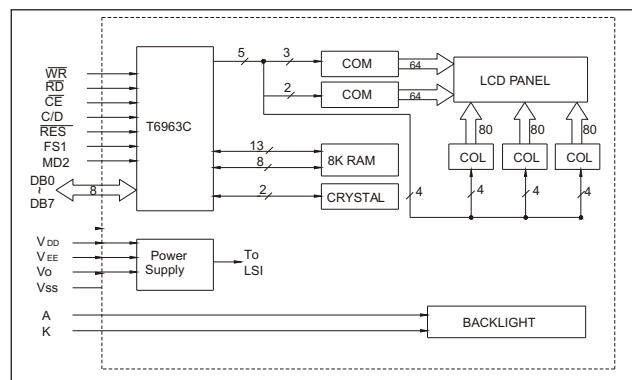
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	$V_{SS}$	0V	GND (0V)
2	$V_{DD}$	+5V	Supply Voltage for Logic and LCD
3	$V_0$		Operating Voltage for LCD (variable)
4	C/D	H/L	H: Instruction Code, L: DATA Code
5	/RD	L	Read Signal
6	/WR	L	Write Signal
7	DB <sub>0</sub>	H/L	Data Bit 0
8	DB <sub>1</sub>	H/L	Data Bit 1
9	DB <sub>2</sub>	H/L	Data Bit 2
10	DB <sub>3</sub>	H/L	Data Bit 3
11	DB <sub>4</sub>	H/L	Data Bit 4
12	DB <sub>5</sub>	H/L	Data Bit 5
13	DB <sub>6</sub>	H/L	Data Bit 6
14	DB <sub>7</sub>	H/L	Data Bit 7
15	/CE	L	Chip Enable Signal
16	/RES	H, H-L	Reset Signal
17	$V_{EE}$		Supply Voltage LCD Driver
18	MD2	H/L	Number of Columns Select Signal
19	FS1	H/L	Font Select Signal (H: 6x8 dots, L: 8x8 dots)
20	NC		No Connection
21	A		Anode of LED Unit
22	K		Cathode if LED Unit

### BLOCK DIAGRAM



# STANDARD GRAPHIC MODULES

## YMS 240128-01

240 X 128 DOTS, 1/128 DUTY, 1/12 BIAS

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD}=5V$		8.7	13.0	mA
Input Voltage	HIGH	$V_{IH}$	$V_{DD}-2.2$		$V_{DD}$	V
	LOW	$V_{IL}$	0		0.8	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH}=3.0mA$	$V_{DD}-0.3$	$V_{DD}$	V
	LOW	$V_{OL}$	$I_{OL}=3.0mA$	0	0.3	V
LCD Operating Voltage	$V_{DD} - V_0$	$V_{DD}=5V$ $T_a=+25^\circ C$		16.6		V
Supply Current LCD Drive	$I_o$			5.47		mA

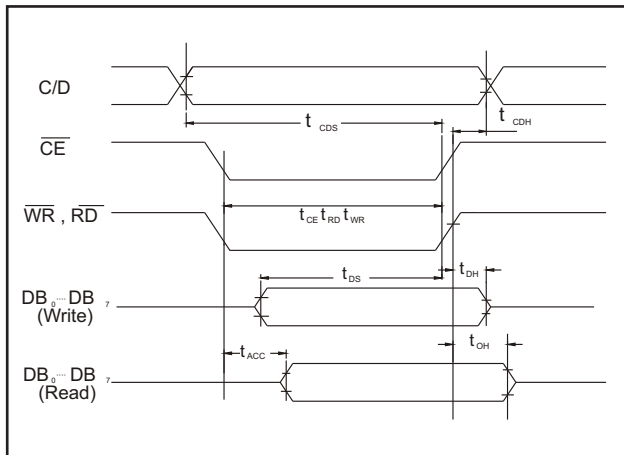
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$		3.6	4.1	4.5	V
Power Consumption	$P_{LED}$	$I_F=720mA$		2950		mW
Luminous	$I_v$	$I_F=720mA$	133	190		cd/m <sup>2</sup>

### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
C/D Setup Time	$t_{CDS}$	100		ns
C/D Hold Time	$t_{CDH}$	10		ns
/CE/RD/WR Pulse Width	$t_{CE} t_{RD} t_{WR}$	80		ns
Data Setup Time	$t_{DS}$	80		ns
Data Hold Time	$t_{DH}$	40		
Access Time	$t_{ACC}$		150	ns
Output Hold Time	$t_{OH}$	10	50	ns

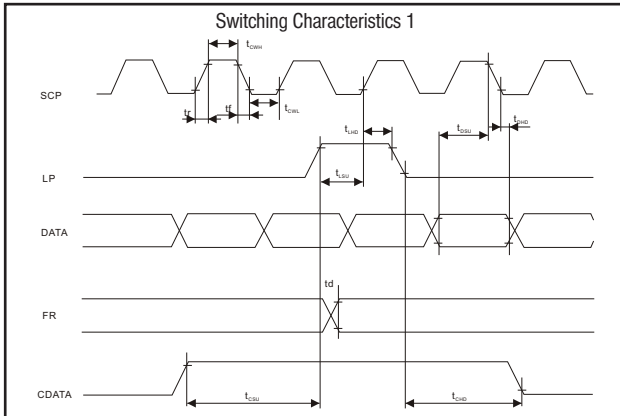
Condition:  $V_{DD}=+5.0V \pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=+25^\circ C$



## STANDARD GRAPHIC MODULES YMS 240128-02

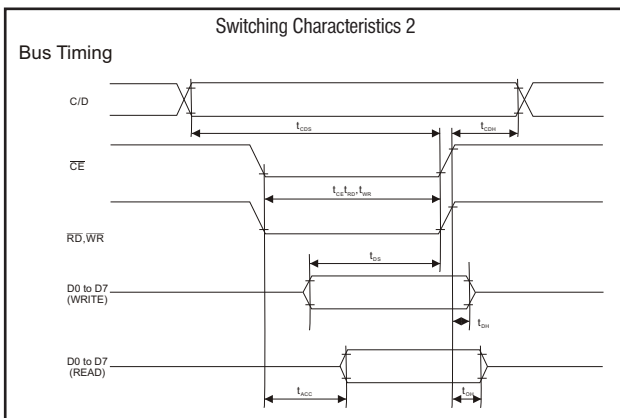
240 X 128 DOTS, 1/128 DUTY, 1/13 BIAS

### INTERFACE TIMING CHARACTERISTICS



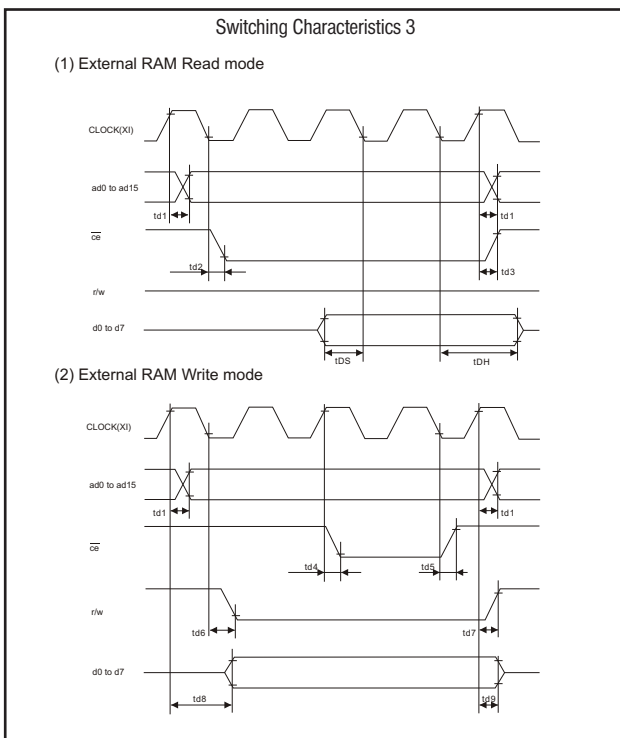
Test Conditions: Unless otherwise noted,  $V_{DD}=5.0V\pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=-20^{\circ}C$  to  $+70^{\circ}C$

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Operating Frequency	$f_{SCP}$	$T_a=-10^{\circ}C$ to $+70^{\circ}C$		2.75	ns
SCP Pulse Width	$t_{CWH}$ , $t_{CWL}$		150		ns
SCP Rise/Fall Time	$t_r$ , $t_f$			30	ns
LP Setup Time	$t_{LSU}$		150	290	ns
LP Hold Time	$t_{LHD}$		5	40	ns
Data Setup Time	$t_{DSU}$		170		ns
Data Hold Time	$t_{DHD}$		80		ns
FR Delay Time	$t_d$		0	90	ns
CDATA Setup Time	$t_{CSU}$		450	850	ns
CDATA Hold Time	$t_{CHD}$		450	950	ns



Test Conditions: Unless otherwise noted,  $V_{DD}=5.0V\pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=-20^{\circ}C$  to  $+75^{\circ}C$

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
C/D Setup Time	$t_{CDs}$		100		ns
C/D Hold Time	$t_{CDH}$		10		ns
/CE,/RD,/WR Pulse Width	$t_{CE}$ , $t_{RD}$ , $t_{WR}$		80		ns
Data Setup Time	$t_{DS}$		80		ns
Data Hold Time	$t_{DH}$		40		ns
Access Time	$t_{ACC}$			150	ns
Output Hold Time	$t_{OH}$		10	50	ns



Test Conditions: Unless otherwise noted,  $V_{DD}=5.0V\pm 10\%$ ,  $V_{SS}=0V$ ,  $T_a=-20^{\circ}C$  to  $+70^{\circ}C$

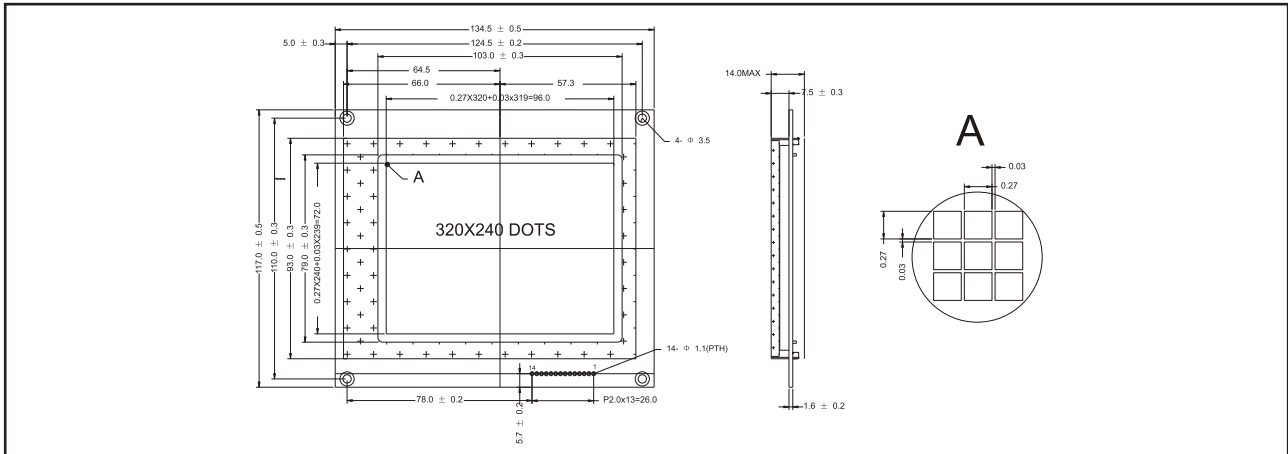
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Address Delay Time	$t_{d1}$			250	ns
CE Fall Delay Time (Read)	$t_{d2}$			180	ns
CE Rise Delay Time (Read)	$t_{d3}$			180	ns
Data Setup Time	$t_{DS}$		0		ns
Data Hold Time	$t_{DH}$		30		ns
CE Fall Delay Time (Write)	$t_{d4}$			200	ns
CE Rise Delay Time (Write)	$t_{d5}$			200	ns
R/W Fall Delay Time	$t_{d6}$			180	ns
R/W Rise Delay Time	$t_{d7}$			180	ns
Data Stable Time	$t_{d8}$			450	ns
Data Hold Time	$t_{d9}$			200	ns

# STANDARD GRAPHIC MODULES

## YMS 320240-02

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	134.5 x 117.0 x 14.0	mm
Viewing Area (W x H)	103.0 x 79.0	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.3 x 0.3	mm
Dot Size (W x H)	0.27 x 0.27	mm

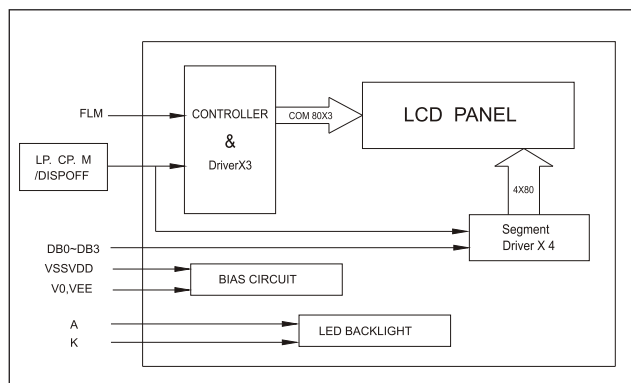
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	$V_L$		Operating Voltage for LCD (variable)
2	$V_{EE}$		Supply Voltage for Logic and LCD
3	DB <sub>3</sub>	H/L	Data Bit 3
4	DB <sub>2</sub>	H/L	Data Bit 2
5	DB <sub>1</sub>	H/L	Data Bit 1
6	DB <sub>0</sub>	H/L	Data Bit 0
7	$V_{SS}$	0V	Ground
8	$V_{DD}$	+5V	Power Supply
9	CL <sub>2</sub>	H, H-L	Display Data Shift Clock
10	CL <sub>1</sub>	H, H-L	Display Data Latch Clock
11	FLM	H	First Line Marker
12	K		Cathode of LED Unit
13	A		Anode of LED Unit
14	NC		No Connection

### BLOCK DIAGRAM





# STANDARD GRAPHIC MODULES

## YMS 320240-02

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

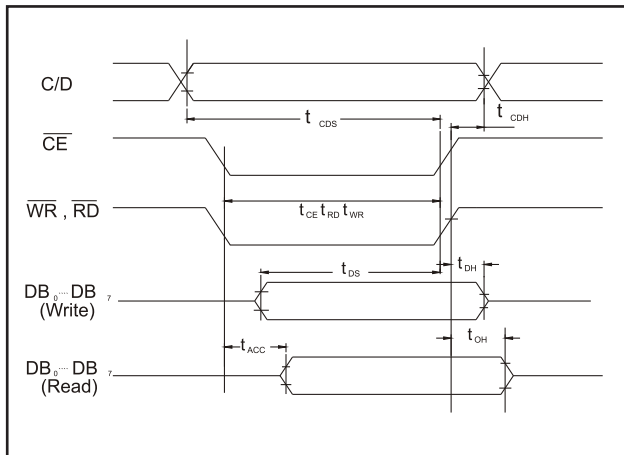
### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		8.7	13.0	mA
Input Voltage	HIGH	$V_{IH}$	$V_{DD} - 2.2$		$V_{DD}$	V
	LOW	$V_{IL}$	0		0.8	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 3.0mA$	$V_{DD} - 0.3$	$V_{DD}$	V
	LOW	$V_{OL}$	$I_{OL} = 3.0mA$	0	0.3	V
LCD Operating Voltage	$V_{DD} - V_0$	$V_{DD} = 5V$ $T_a = +25^\circ C$		22.9		V
Supply Current LCD Drive	$I_0$			4.5		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### SWITCHING TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
C/D Setup Time	$t_{CDS}$	100		ns
C/D Hold Time	$t_{CDH}$	10		ns
/CE, /RD, /WR Pulse Width	$t_{CE} t_{RD} t_{WR}$	80		ns
Data Setup Time	$t_{DS}$	80		ns
Data Hold Time	$t_{DH}$	40		ns
Access Time	$t_{ACC}$		150	ns
Output Hold Time	$t_{OH}$	10	50	ns

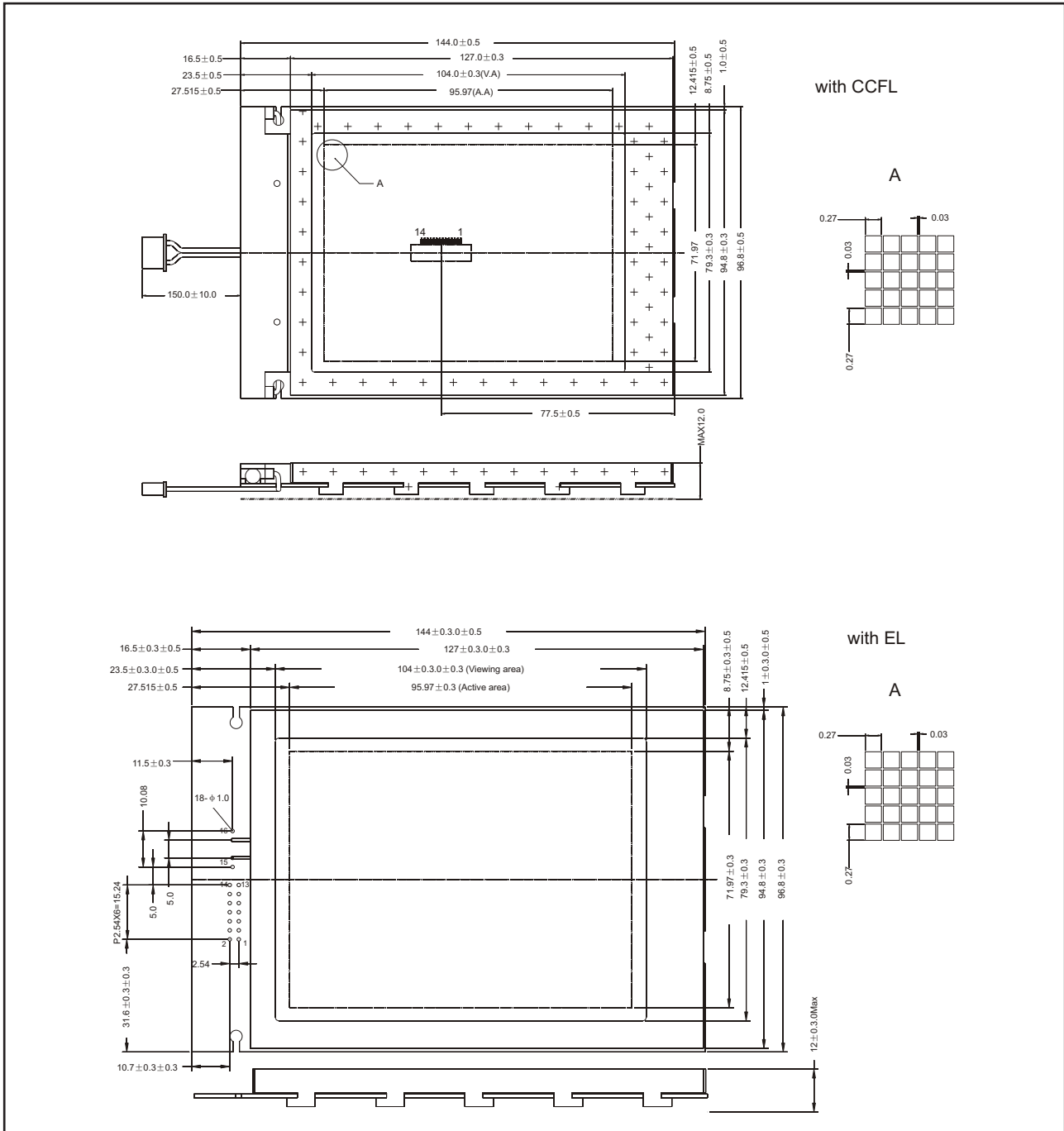
Condition:  $V_{DD} = +5.0V \pm 10\%$ ,  $V_{SS} = 0V$ ,  $T_a = +25^\circ C$

# STANDARD GRAPHIC MODULES

## YMS 320240-03

320 X 240 DOTS, 1/240 DUTY, 1/12 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	144.0 x 96.8 x 12.0	mm
Viewing Area (W x H)	104.0 x 79.3	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.3 x 0.3	mm
Dot Size (W x H)	0.27 x 0.27	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

# STANDARD GRAPHIC MODULES

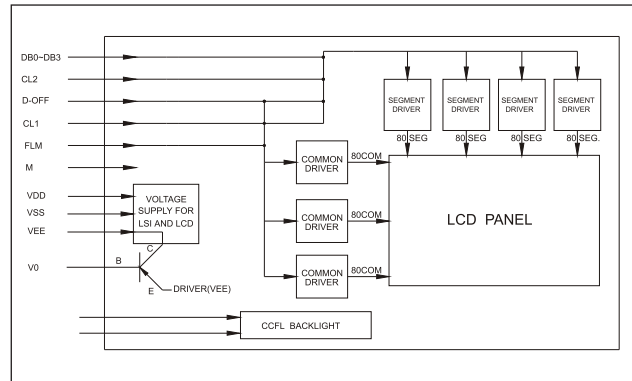
## YMS 320240-03

320 X 240 DOTS, 1/240 DUTY, 1/12 BIAS

### PIN CONFIGURATION

PIN	SYMBOL	LEVEL	SIGNAL DESCRIPTION
1	FLM	H	First Line Marker
2	M	H/L	AC Driving Control Signal
3	CL <sub>1</sub>	H, H-L	Display Dta Latch Clock
4	CL <sub>2</sub>	H, H-L	Display Data Shift Clock
5	/DISPOFF	L	Display Off
6	DB <sub>0</sub>	H/L	Data Bit 0
7	DB <sub>1</sub>	H/L	Data Bit 1
8	DB <sub>2</sub>	H/L	Data Bit 2
9	DB <sub>3</sub>	H/L	Data Bit 3
10	V <sub>DD</sub>	+5V	Power Supply
11	V <sub>SS</sub>	0V	Ground (0 V)
12	V <sub>EE</sub>		Supply Voltage for Logic and LCD
13	V <sub>0</sub>		Operating Voltage for LCD (variable)
14	FGND		Front Panel Ground

### BLOCK DIAGRAM



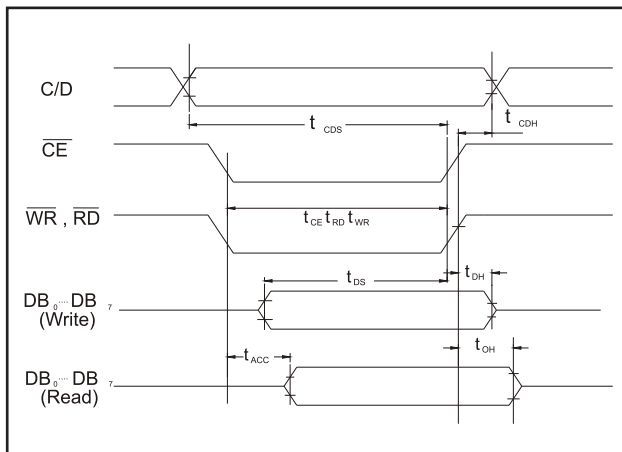
### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>		4.5	5.0	5.5	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> = 5V		8.7	13.0	mA
Input Voltage	HIGH	V <sub>IH</sub>	V <sub>DD</sub> - 2.2		V <sub>DD</sub>	V
	LOW	V <sub>IL</sub>	0		0.8	V
Output Voltage	HIGH	V <sub>OH</sub>	I <sub>OH</sub> = 3.0mA	V <sub>DD</sub> - 0.3	V <sub>DD</sub>	V
	LOW	V <sub>OL</sub>	I <sub>OL</sub> = 3.0mA	0	0.3	V
LCD Operating Voltage	V <sub>DD</sub> - V <sub>0</sub>	V <sub>DD</sub> = 5V Ta = +25°C		22.0		V
Supply Current LCD Drive	I <sub>0</sub>			4.5		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### SWITCHING TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
C/D Setup Time	t <sub>CDS</sub>	100		ns
C/D Hold Time	t <sub>CDH</sub>	10		ns
/CE, RD, WR Pulse Width	t <sub>CE</sub> t <sub>RD</sub> t <sub>WR</sub>	80		ns
Data Setup Time	t <sub>DS</sub>	80		ns
Data Hold Time	t <sub>DH</sub>	40		ns
Access Time	t <sub>ACC</sub>		150	ns
Output Hold Time	t <sub>OH</sub>	10	50	ns

Condition: V<sub>DD</sub> = +5.0V ± 10%, V<sub>SS</sub> = 0V, Ta = +25°C



## STANDARD GRAPHIC MODULES

### YMS 320240-05

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	167.1 x 109.0 x 11.0	mm
Viewing Area (W x H)	122.0 x 92.0	mm
Number of Dots	320 x 240 with cursor	dots
Dot Pitch (W x H)	0.33 x 0.33	mm
Dot Size (W x H)	0.36 x 0.36	mm

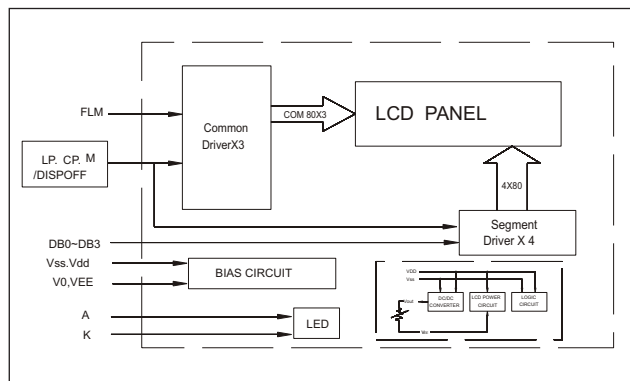
#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

#### PIN CONFIGURATION: CN<sub>1</sub> / CN<sub>2</sub> / CN<sub>4</sub>

PIN	SYMBOL	SIGNAL DESCRIPTION
1-4	DB <sub>0</sub> -DB <sub>3</sub>	Data Bit
5	/DISPOFF	H: Display ON, L: Display OFF
6	FRAME	Indicates the Beginning of each Display Cycle
7	NC	No Connection
8	LOAD	Data Latch Pulse
9	CP	Data Shift Clock Pulse
10	$V_{DD}$	Supply voltage for Logic and LCD (+)
11	$V_{SS}$	Ground
12	$V_{EE}$	Supply Voltage for LCD (-)
13	$V_0$	Operating Voltage for LCD (variable)
14	FGND	Frame Ground

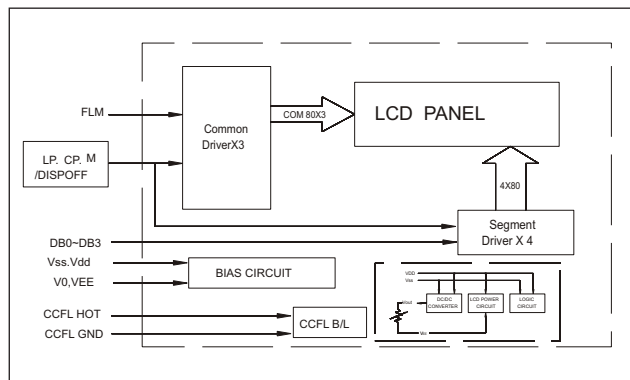
#### BLOCK DIAGRAM



#### PIN CONFIGURATION: CN<sub>3</sub>

PIN	SYMBOL	SIGNAL DESCRIPTION
1	FRAME	Indicates the Beginning of each Display Cycle
2	NC	No Connection
3	LOAD	Data Latch Pulse
4	CP	Data Shift Clock Pulse
5	/DISPOFF	H: Display ON, L: Display OFF
6-9	DB <sub>0</sub> -DB <sub>3</sub>	Data Bit
10	$V_{DD}$	Supply voltage for Logic and LCD (+)
11	$V_{SS}$	Ground
12	$V_{EE}$	Supply Voltage for LCD (-)
13	$V_0$	Operating Voltage for LCD (variable)
14	FGND	Frame Ground

#### BLOCK DIAGRAM



#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		8.7	13.0	mA
Input Voltage	HIGH	$V_{IH}$	$0.5 V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$	$V_{DD}$		0.8	V
Output Voltage	HIGH	$V_{OH}$	2.4		$0.2 V_{DD}$	V
	LOW	$V_{OL}$			0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ C$		22.0		V
Supply Current LCD Drive	$I_{EE}$		4.5	0.3		mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

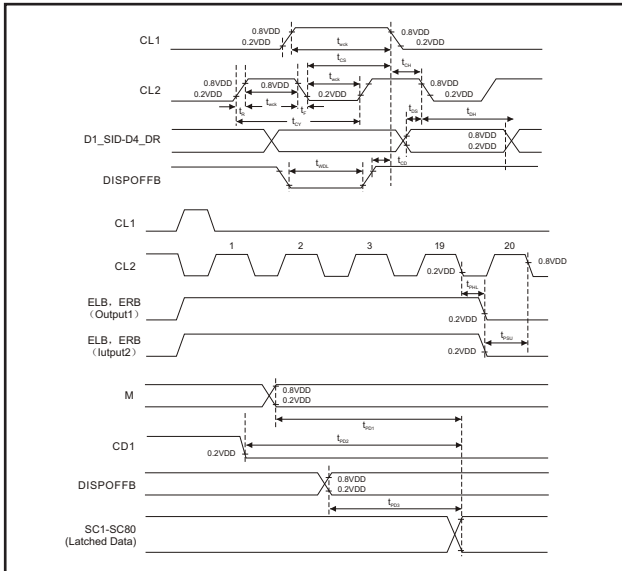
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_F$			500	600	V
Power Consumption	$F_{OSC}$			55		Hz
Luminous	$I_v$			500		cd/m <sup>2</sup>

# STANDARD GRAPHIC MODULES

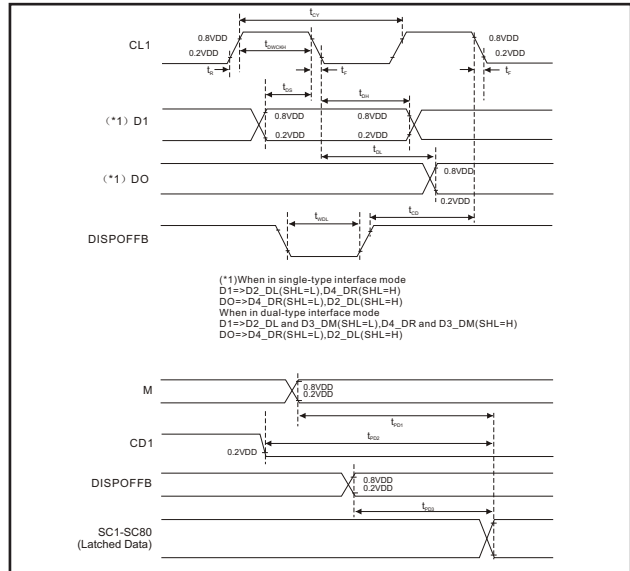
## YMS 320240-05

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

### SEGMENT DRIVER APPLICATION TIMING



### COMMON DRIVER APPLICATION TIMING



### AC CHARACTERISTICS: SEGMENT DRIVER APPLICATION, $V_{SS}=0V$ , $T_a=-30^{\circ}C$ to $+85^{\circ}C$

CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{DD}=5V \pm 10\% (1)$			$V_{DD}=3V \pm 10\% (2)$			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Clock Cycle Time	$t_{CY}$	Duty=50%	125			250			ns
Clock Pulse Width	$t_{WCK}$		45			95			ns
Clock Rise / Fall Time	$t_R/t_F$							30	ns
Data Setup Time	$t_{DS}$		30			65			ns
Data Hold Time	$t_{DH}$		30			65			ns
Clock Setup Time	$t_{CS}$		80			120			ns
Clock Hold Time	$t_{CH}$		80			120			ns
Propagation Delay Time	$t_{PHL}$	ELB Output			60			125	ns
		ERB Output			60			125	ns
ELB ERB Setup Time	$t_{PSU}$	ELB Input	30			65			ns
		ERB Input	30			65			ns
DISPOFFB Low Pulse Width	$t_{WDL}$		1.2			1.2			$\mu s$
DISPOFFB Clear Time	$t_{CD}$		100			100			ns
M-OUT Propagation Delay Time	$t_{PD1}$	$C_L=15pF$			1.0			1.2	$\mu s$
CLI-OUT Propagation Delay Time	$t_{PD2}$				1.0			1.2	$\mu s$
DISPOFFB-OUT Propagation Delay Time	$t_{PD3}$				1.0			1.2	$\mu s$

### AC CHARACTERISTICS: COMMON DRIVER APPLICATION, $V_{SS}=0V$ , $T_a=-30^{\circ}C$ to $+85^{\circ}C$

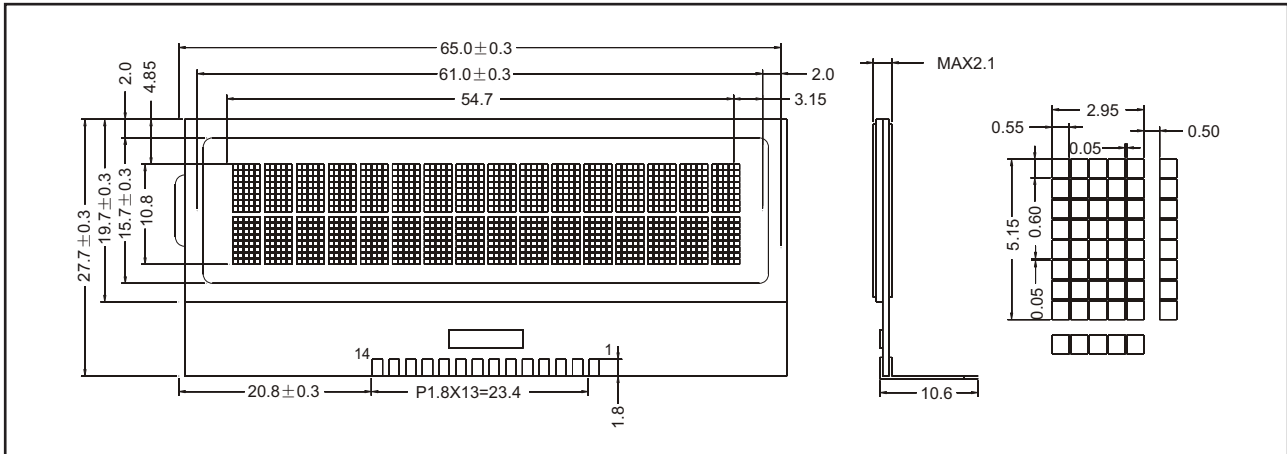
CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{DD}=5V \pm 10\% (1)$			$V_{DD}=3V \pm 10\% (2)$			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Clock Cycle Time	$t_{CY}$	Duty=50%	250			500			ns
Clock Pulse Width	$t_{WCK}$		45			95			ns
Clock Rise / Fall Time	$t_R/t_F$				50			50	ns
Data Setup Time	$t_{DS}$		30			65			ns
Data Hold Time	$t_{DH}$		30			65			ns
DISPOFFB Low Pulse Width	$t_{WDL}$		1.2			1.2			$\mu s$
DISPOFFB Clear Time	$t_{CD}$		100			100			ns
Output Delay Time	$t_{DL}$	$C_L=15pF$			200			250	ns
M-OUT Propagation Delay Time	$t_{PD1}$				1.0			1.2	$\mu s$
CLI-OUT Propagation Delay Time	$t_{PD2}$				1.0			1.2	$\mu s$
DISPOFFB-OUT Propagation Delay Time	$t_{PD3}$				1.0			1.2	$\mu s$

## STANDARD COG MODULES

### YMS 162-08

16 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	65.0 x 27.7 x 2.1	mm
Viewing Area (W x H)	61.0 x 15.7	mm
Character Font (W x H)	5.0 x 7.0 with cursor	dots
Character Size (W x H)	2.95 x 5.15	mm
Character Pitch (W x H)	3.45 x 5.65	mm
Dot Size (W x H)	0.55 x 0.60	mm

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	7.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{SS}$	GND (0 V)
2	$V_L$	Voltage Contrast Control for LCD
3	$V_{DD}$	Power Supply (+5.0V)
4	RS	Register Select - LOW = Instruction, HIGH = DATA
5	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
6	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
7 to 14	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode

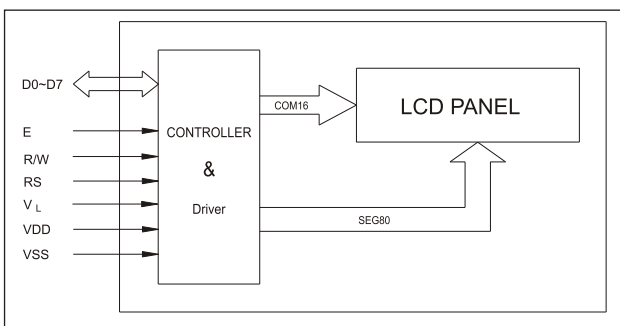
#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		0.8	2.0	mA
Input Voltage	HIGH	$V_{IH}$	2.2		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		0.6	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.2\text{mA}$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.2\text{mA}$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$		4.4	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BLOCK DIAGRAM

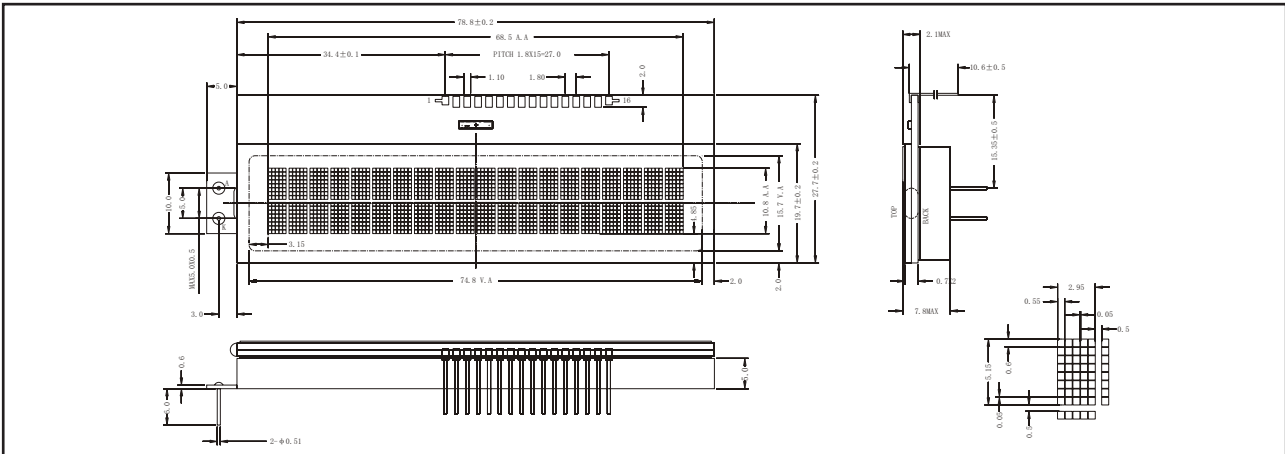


# STANDARD COG MODULES

## YMS 202-04

20 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	78.8 x 27.7 x 7.8	mm
Viewing Area (W x H)	74.8 x 15.7	mm
Number of Dots	20 x 2	dots
Character Size (W x H)	2.95 x 5.15	mm
Dot Size (W x H)	0.55 x 0.60	mm

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD}$	-0.3	7.0	V
Supply Voltage Drive	$V_1 - V_5$	GND	$V_{DD} + 0.3$	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	NC	No Connection
2	$V_{SS}$	GND (0V)
3	$V_L$	Voltage Control for LCD
4	$V_{DD}$	Power Supply (5V)
5	RS	Register Select - LOW = Instruction, HIGH = DATA
6	R/W	Read / Write LOW = MPU to LCM, HIGH = LCM to MPU
7	E	Enable R/W = LOW: Data are talking over at falling edge R/W = HIGH: Data can be read at E = 1
8 to 15	DB <sub>0</sub> to DB <sub>7</sub>	Data Bus - Software selectable 4 or 8 bit Mode
16	NC	No Connection

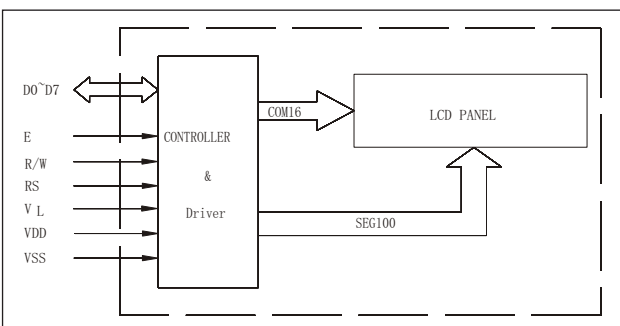
### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		4.5	5.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		1.0	2.0	mA
Input Voltage	HIGH	$V_{IH}$	$0.8 V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$	-0.3		$0.2 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 1.2\text{mA}$	$V_{DD} - 0.6$		V
	LOW	$V_{OL}$	$I_{OL} = 1.2\text{mA}$	GND + 0.6		V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ\text{C}$		4.7	5.0	V
Supply Current LCD Drive	$I_{EE}$			1.0	1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BLOCK DIAGRAM





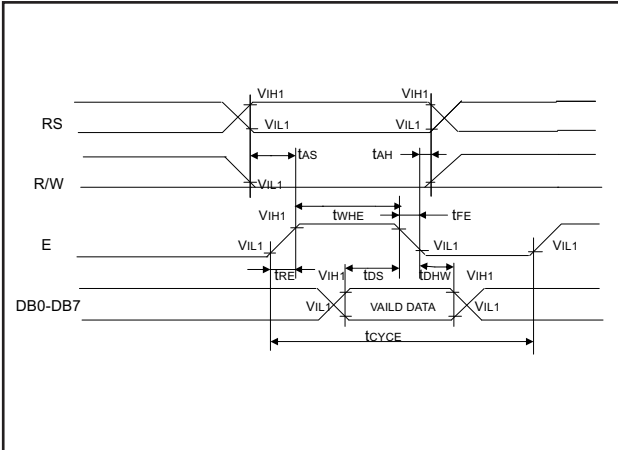
## STANDARD COG MODULES

### YMS 202-04

20 CHAR x 2 LINE, 1/16 DUTY, 1/5 BIAS

#### INTERFACE TIMING CHARACTERISTICS : WRITE CYCLE

$V_{DD}=+5.0V$



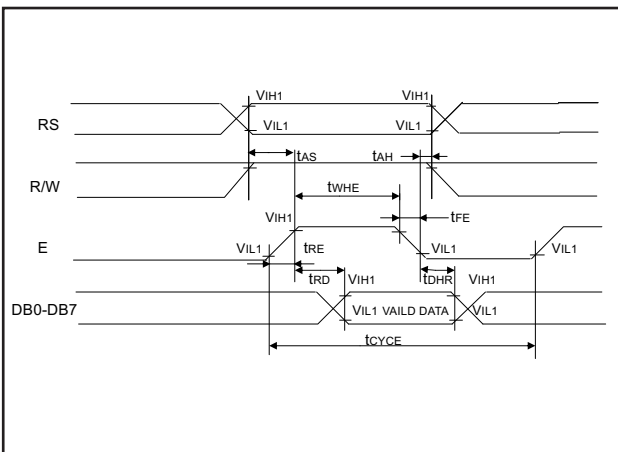
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
E Cycle Time	$t_{CYCE}$	500		ns
Enable High Level Pulse Width	$t_{WHE}$	300		ns
Enable Rise Time	$t_{RE}$		25	ns
Enable Fall Time	$t_{FE}$		25	ns
RS,R/W Address Setup Time	$t_{AS}$	$60^{(1)}$ $100^{(2)}$		ns
RS,R/W Address Hold Time	$t_{AH}$	10		ns
Data Output Delay	$t_{DS}$	100		ns
Data Hold Time	$t_{DHW}$	100		ns

Note (1): 8-bit operation mode.

Note (2): 4-bit operation mode

#### INTERFACE TIMING CHARACTERISTICS : READ CYCLE

$V_{DD}=+5.0V$



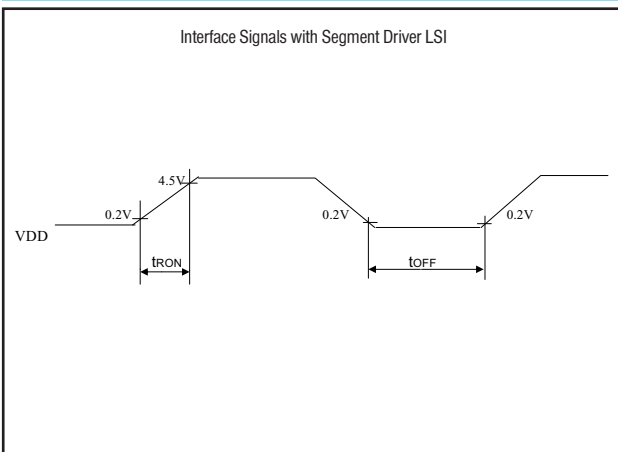
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
E Cycle Time	$t_{CYCE}$	500		ns
Enable High Level Pulse Width	$t_{WHE}$	300		ns
Enable Rise Time	$t_{RE}$		25	ns
Enable Fall Time	$t_{FE}$		25	ns
RS,R/W Address Setup Time	$t_{AS}$	$60^{(1)}$ $100^{(2)}$		ns
RS,R/W Address Hold Time	$t_{AH}$	10		ns
Data Output Delay	$t_{RD}$		190	ns
Data Hold Time	$t_{DHR}$	20		ns

Note (1): 8-bit operation mode.

Note (2): 4-bit operation mode

#### POWER SUPPLY CONDITIONS USING INTERNAL RESET CIRCUIT

$V_{DD}=+5.0V$



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Power Supply Rise Time	$t_{RON}$	0.1	10	ms
Power Supply OFF Time	$t_{OFF}$	1.0		ms

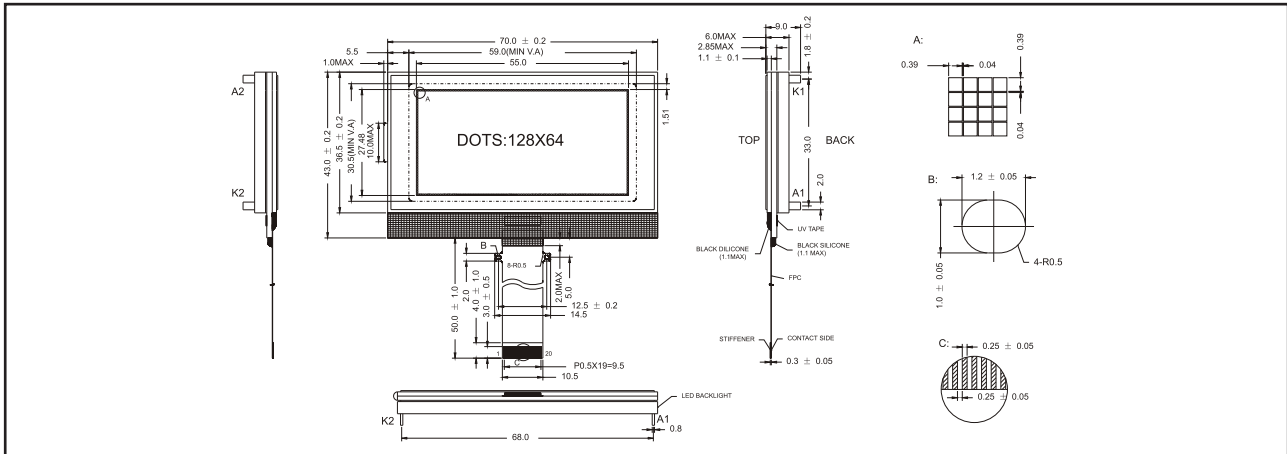
Note (3):  $t_{OFF}$  stipulates the time of power OFF for instantaneous power supply to or when power supply repeats ON and OFF.

# STANDARD COG MODULES

## YMS 12864-06

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	70.0 x 43.0 x 9.0	mm
Viewing Area (W x H)	59.0 x 30.5	mm
Number of Dots	128 x 64	dots
Dot Pitch (W x H)	0.43 x 0.43	mm
Dot Size (W x H)	0.39 x 0.39	mm

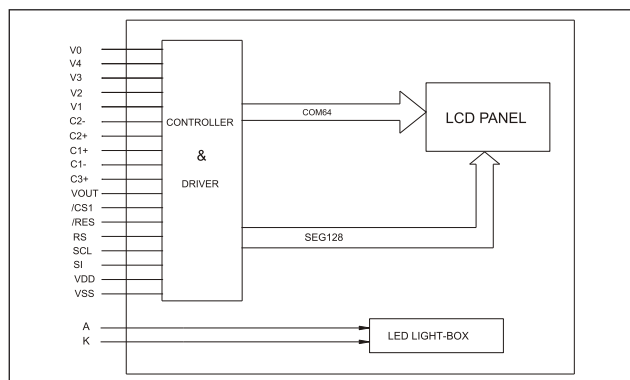
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	18.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	NC	No Connection
2	$V_0$	LCD Driver Supply Voltage
3	$V_4$	LCD Driver Supply Voltage
4	$V_3$	LCD Driver Supply Voltage
5	$V_2$	LCD Driver Supply Voltage
6	$V_1$	LCD Driver Supply Voltage
7	$C_{2-}$	Capacitor 2 Negative Connection Pin for Voltage Converter
8	$C_{2+}$	Capacitor 2 Positive Connection Pin for Voltage Converter
9	$C_{1+}$	Capacitor 1 Positive Connection Pin for Voltage Converter
10	$C_{1-}$	Capacitor 1 Negative Connection Pin for Voltage Converter
11	$C_{3+}$	Capacitor 3 Positive Connection Pin for Voltage Converter
12	$V_{OUT}$	Voltage Converter Input / Output Pin
13	$V_{SS}$	Ground
14	$V_{DD}$	Power Supply
15	SI	Serial Input Clock
16	SCL	Serial Input Data
17	RS	Register Select Input Pin
18	/RES	Reset Signal
19	/CS	Chip Select Signal
20	NC	No Connection

### BLOCK DIAGRAM



# STANDARD COG MODULES

## YMS 12864-06

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

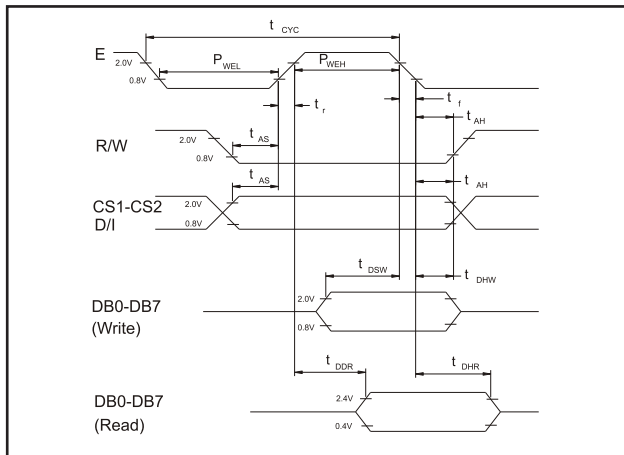
### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		2.7	3.0	3.3	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 3V$		1.0	1.2	mA
Input Voltage	HIGH	$V_{IH}$	$0.7 V_{DD}$		$V_{DD}$	V
	LOW	$V_{IL}$	0		$0.3 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.205mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.6mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 3V$ $T_a = +25^\circ C$		9.0		V
Supply Current LCD Drive	$I_{EE}$			0.8	1.0	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Enable Cycle Time	$t_{cyc}$	1000		ns
Enable High Level Width	$t_{WEH}$	450		ns
Enable Low Level Width	$t_{WEL}$	450		ns
Enable Rise Time	$t_r$		25	ns
Enable Fall Time	$t_f$		25	ns
Address Setup Time	$t_{AS}$	140		ns
Address Hold Time	$t_{AH}$	10		ns
Data Setup Time	$t_{DSW}$	200		ns
Data Delay Time	$t_{DDR}$		320	ns
Data Hold Time - Write	$t_{DHW}$	10		ns
Data Hold Time - Read	$t_{DHR}$	20		ns

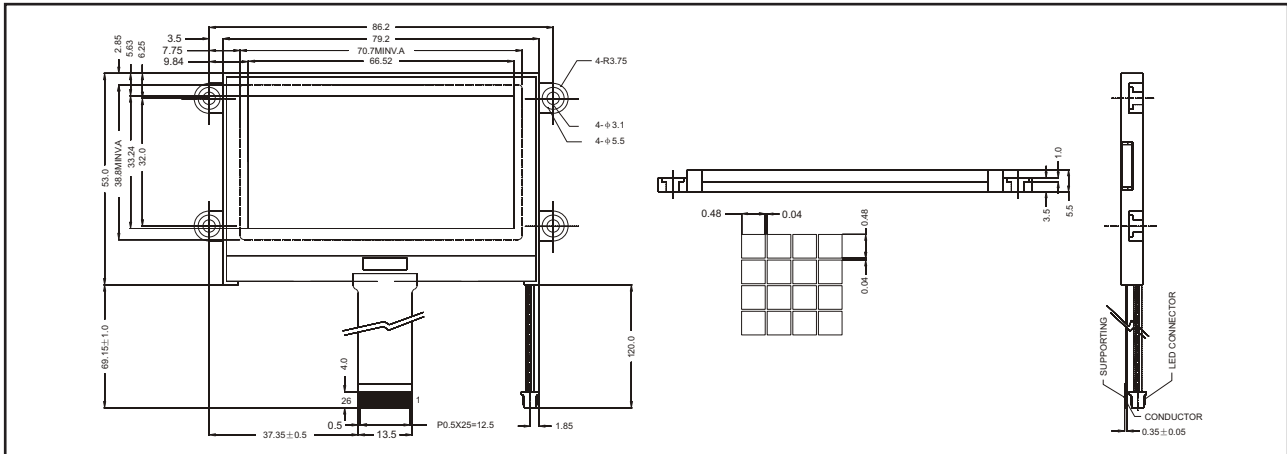
Condition:  $V_{DD} = +5.0V \pm 10\%$ ,  $V_{SS} = 0V$ ,  $T_a = +25^\circ C$

# STANDARD COG MODULES

## YMS 12864-15

128 X 64 DOTS, 1/65 DUTY, 1/9 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	93.7 x 53.0 x 5.5	mm
Viewing Area (W x H)	70.7 x 38.8	mm
Number of Dots	128 x 64	dots
Dot Pitch (W x H)	0.52 x 0.52	mm
Dot Size (W x H)	0.48 x 0.48	mm

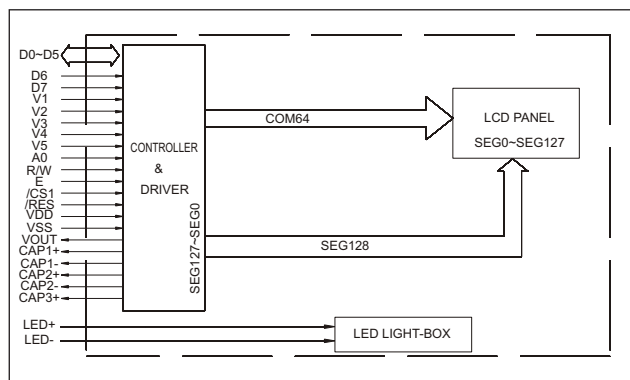
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	17.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	/CS <sub>1</sub>	Chip Select Signal
2	/RES	Reset Signal
3	A <sub>0</sub>	Register Select Signal
4	R/W	Read / Write Execution Control
5	E	Enable Signal
6-13	DB <sub>0</sub> -DB <sub>7</sub>	Data Bus Line
14	V <sub>DD</sub>	Power Signal
15	V <sub>SS</sub>	Ground
16	V <sub>OUT</sub>	Voltage Converter Input / Output
17	CAP <sub>3-</sub>	Capacitor 3 Negative Connection Pin for oltage Converter
18	CAP <sub>1+</sub>	Capacitor 1 Positive Connection Pin for oltage Converter
19	CAP <sub>1-</sub>	Capacitor 1 Negative Connection Pin for oltage Converter
20	CAP <sub>2-</sub>	Capacitor 2 Negative Connection Pin for oltage Converter
21	CAP <sub>2+</sub>	Capacitor 2 Positive Connection Pin for oltage Converter
22	V <sub>1</sub>	LCD Driver Supply Voltage
23	V <sub>2</sub>	LCD Driver Supply Voltage
24	V <sub>3</sub>	LCD Driver Supply Voltage
25	V <sub>4</sub>	LCD Driver Supply Voltage
26	V <sub>5</sub>	LCD Driver Supply Voltage

### BLOCK DIAGRAM



## STANDARD COG MODULES

### YMS 12864-15

128 X 64 DOTS, 1/65 DUTY, 1/9 BIAS

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>		2.4	3.0	5.5	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> = 3V	1.0		3.0	mA
Input Voltage	HIGH	V <sub>IH</sub>	0.8 V <sub>DD</sub>		V <sub>DD</sub>	V
	LOW	V <sub>IL</sub>	V <sub>SS</sub>		0.2 V <sub>DD</sub>	V
Output Voltage	HIGH	V <sub>OH</sub>	I <sub>OH</sub> = 0.5mA	0.8 V <sub>DD</sub>		V
	LOW	V <sub>OL</sub>	I <sub>OL</sub> = 0.5mA	V <sub>SS</sub>		V
LCD Operating Voltage	V <sub>DD</sub> - V <sub>EE</sub>	V <sub>DD</sub> = 3V Ta = +25°C		8.5		V
Supply Current LCD Drive	I <sub>EE</sub>		0.8		1.6	mA

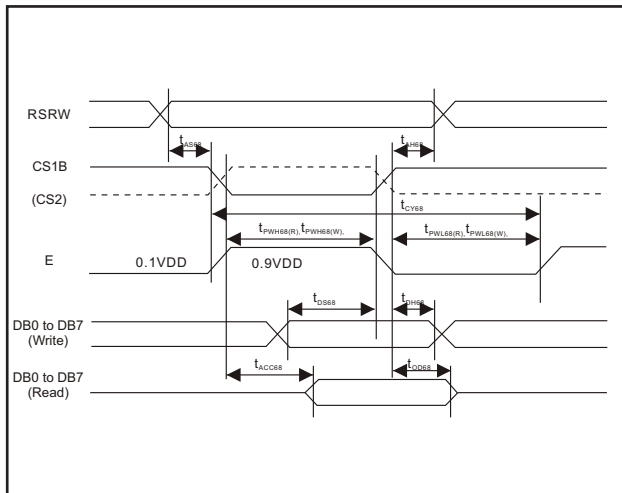
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	V <sub>EL</sub>	I <sub>f</sub> = 135mA	3.2	3.5	3.8	V
Power Consumption	P <sub>LED</sub>			472.5		mW
Luminous	I <sub>v</sub>					cd/m <sup>2</sup>

#### INTERFACE TIMING CHARACTERISTICS



Condition: t<sub>PWH68(W)</sub> and t<sub>PWH68(R)</sub> is specified in the overlapped period when CS<sub>1B</sub> is low (CS<sub>2</sub> is high) and E is high.

PARAMETER	SIGNAL	SYMBOL	MIN.	MAX.	UNIT
Address Hold Time	RS, RW	t <sub>AH68</sub>	0		ns
Address Setup Time	RS, RW	t <sub>AS68</sub>	0		ns
E Cycle Time	E	t <sub>CY68</sub>	166		ns
Enable Pulse High Width Read	E	t <sub>PWH68(R)</sub>	70		ns
Enable Pulse High Width Write	E	t <sub>PWH68(W)</sub>	30		
Enable Pulse Low Width Read	E	t <sub>PWL68(R)</sub>	30		ns
Enable Pulse Low Width Write	E	t <sub>PWL68(W)</sub>	30		
Data Setup Time	DB7-DB0	t <sub>DS68</sub>	30		ns
Data Hold Time		t <sub>DH68</sub>	10		
Access Time, C <sub>L</sub> = 100pF		t <sub>ACC68</sub>		70	
Output Disable Time, C <sub>L</sub> = 100pF		t <sub>OD68</sub>	10	50	ns

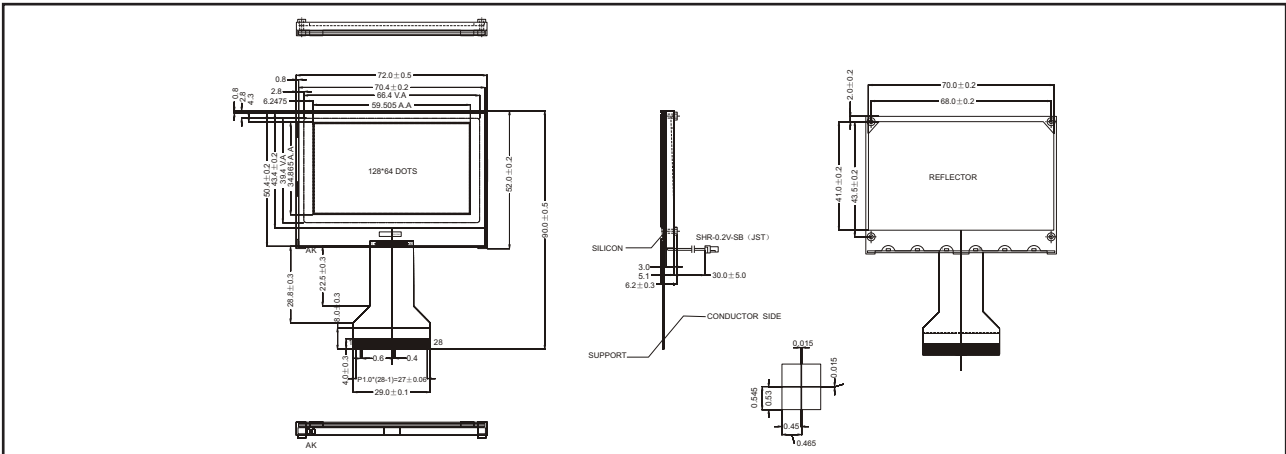
Condition: V<sub>DD</sub> = 4.5 to 5.5V ±10%, Ta = -40°C to +85°C

# STANDARD COG MODULES

## YMS 12864-18

128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	72.0 x 90.0 x 7.0	mm
Viewing Area (W x H)	66.4 x 39.4	mm
Number of Dots	128 x 64	dots
Dot Pitch (W x H)	0.465 x 0.545	mm
Dot Size (W x H)	0.45 x 0.53	mm

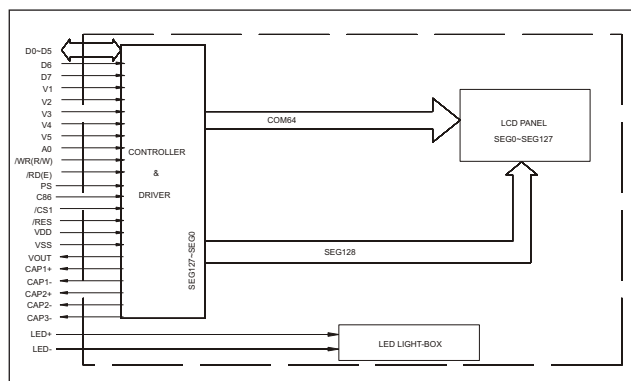
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	P/S	Parallel / Serial Data Input Select Input
2	$C_{86}$	Microprocessor Interface Select Input Signal in Parallel Mode
3-7	$V_5 - V_1$	LCD Driver Supply voltges
8-9	$CAP_{2+}, CAP_{2-}$	Capacitor 2 Positive/Negative Connection Pin for Voltage Converter
10-11	$CAP_{1+}, CAP_{1-}$	Capacitor 1 Positive/Negative Connection Pin for Voltage Converter
12	$CAP_{3-}$	Capacitor 3 Negative Connection Pin for Voltage Converter
13	$V_{OUT}$	Voltage Converter Input / Output Pin
14	$V_{SS}$	Ground
15	$V_{DD}$	Power Supply
16	$D_7$ (SI)	Data Bit 7 (Serial Input Data)
17	$D_6$ (SCL)	Data Bit 6 (Serial Input Clock)
18-23	$D_5 - D_0$	Data Bit 5 - Data Bit 0
24	/RD (E)	Read Execution Control (Enable)
25	/WR (R/W)	Write Execution Control (Read / Write)
26	$A_0$	H: Data, L: Instruction Code
27	/RES	Reset Signal
28	/CS <sub>1</sub>	Chip Select Signal

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	$V_{LED}$	$I_f = 90\text{mA}$	2.85	3.2	3.4	V
Power Consumption	$P_{LED}$	$I_f = 90\text{mA}$		288	306	mW
Luminous				60		cd/m <sup>2</sup>

### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		2.7		3.3	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 3.3\text{V}$	0.8		1.2	mA
Input Voltage	HIGH	$V_{IH}$	$V_{DD} - 2.2$		$V_{DD}$	V
	LOW	$V_{IL}$	0		0.8	V
Output Voltage	HIGH	$V_{OH}$	$V_{DD} - 0.3$		$V_{DD}$	V
	LOW	$V_{OL}$	0		0.3	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 3.3\text{V}$ $T_a = +25^\circ\text{C}$		9.7		V
Supply Current LCD Drive	$I_{EE}$		0.7		1.0	mA

Note (1): Value is high reliability type.

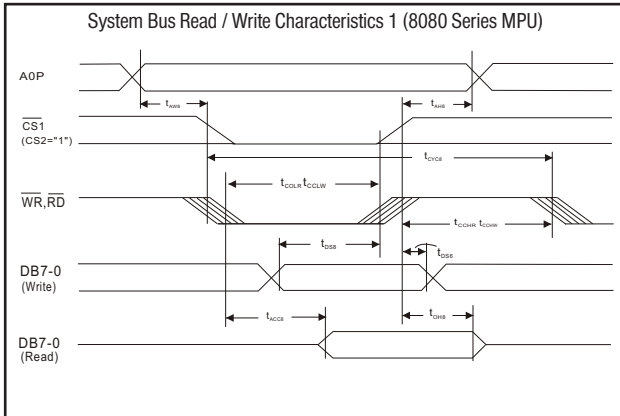
Note (2): Electro-Optical Characteristics: See page 5.

## STANDARD COG MODULES

### YMS 12864-18

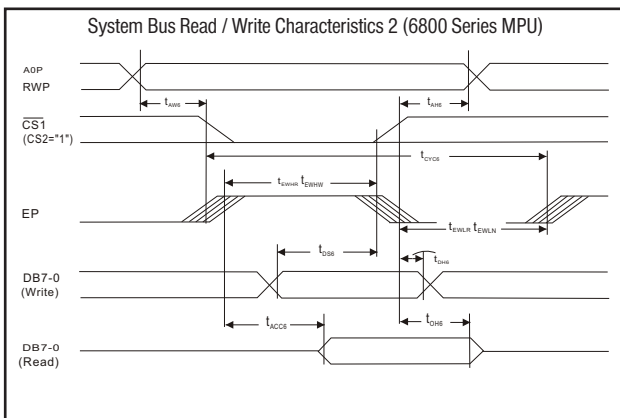
128 X 64 DOTS, 1/64 DUTY, 1/9 BIAS

#### INTERFACE TIMING CHARACTERISTICS



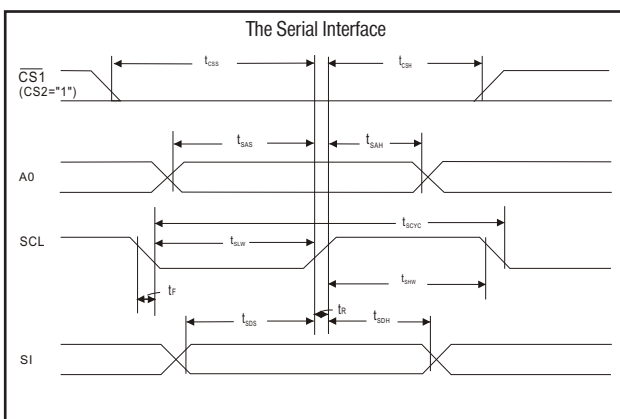
Test Conditions:  $V_{DD}=2.7V$  to  $4.5V$ ,  $T_a=-25^{\circ}C$

PARAMETER	SIGNAL	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT	
Address Hold Time	AOP	$t_{AH8}$		0		ns	
Address Setup Time	AOP	$t_{AW8}$		0		ns	
System Cycle Time	AOP	$t_{CYC8}$		300		ns	
Control L Pulse Width /WR	/WR	$t_{CCLW}$		60		ns	
Control L Pulse Width /RD	/RD	$t_{CCLR}$		120		ns	
Control H Pulse Width /WR	/WR	$t_{CCHW}$		60		ns	
Control H Pulse Width /RD	/RD	$t_{CCHR}$		60		ns	
Data Setup Time	DB <sub>7</sub> to DB <sub>0</sub>	$t_{DS8}$	$C_L=100pF$	40		ns	
Address Hold Time		$t_{DHB8}$		15		ns	
RD Access Time		$t_{ACC8}$			140		ns
Output Disable Time		$t_{CH8}$		10	100		ns



Test Conditions:  $V_{DD}=2.7V$  to  $4.5V$ ,  $T_a=-25^{\circ}C$

PARAMETER	SIGNAL	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT	
Address Hold Time	AOP	$t_{AH6}$		0		ns	
Address Setup Time	AOP	$t_{AW6}$		0		ns	
System Cycle Time	AOP	$t_{CYC6}$		300		ns	
Data Setup Time	DB <sub>7</sub> to DB <sub>0</sub>	$t_{DS6}$	$C_L=100pF$	40		ns	
Address Hold Time		$t_{DHB6}$		15		ns	
RD Access Time		$t_{ACC6}$			140		ns
Output Disable Time		$t_{CH6}$		10	100		ns
Enable H Pulse Time	Read	EP		$t_{EWHR}$	120	ns	
Enable H Pulse Time	Write			$t_{EWHW}$	60	ns	
Enable L Pulse Time	Read	EP		$t_{EWLR}$	60	ns	
Enable L Pulse Time	Write			$t_{EWLW}$	60	ns	



Test Conditions:  $V_{DD}=2.7V$  to  $4.5V$ ,  $T_a=-25^{\circ}C$

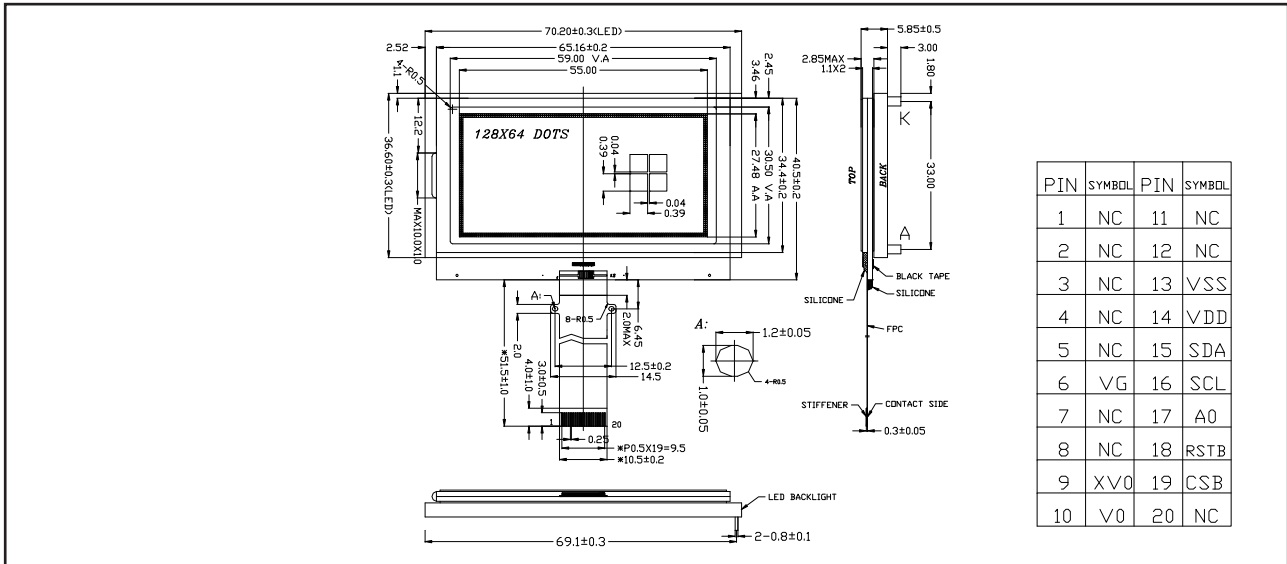
PARAMETER	SIGNAL	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Serial Clock Period	SCL	$t_{SCYC}$		250		ns
SCL „H“ Pulse Width		$t_{SHW}$		100		ns
SCL „L“ Pulse Width		$t_{SLW}$		100		ns
Address Setup Time	AOP	$t_{SAS}$		150		ns
Address Hold Time		$t_{SAH}$		150		ns
Data Setup Time	SI	$t_{SDS}$		100		ns
Data Hold Time		$t_{SDH}$		100		ns
CS-SCL Time	CS	$t_{CSS}$		150		ns
		$t_{CSH}$		150		ns

## STANDARD COG MODULES

### YMS 12864-20

128 X 64 DOTS, 1/65 DUTY, 1/9 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	70.2 x 40.5 x 5.85	mm
Viewing Area (W x H)	59.0 x 30.5	mm
Number of Dots	128 x 64	dots
Dot Pitch (W x H)	0.43 x 0.43	mm
Dot Size (W x H)	0.39 x 0.39	mm

#### ABSOLUTE MAXIMUM RATINGS

\*Note1

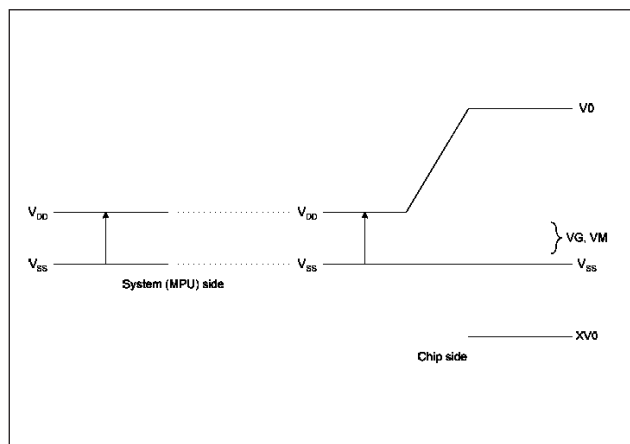
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Digital Power Supply Voltage	V <sub>DD1</sub>	-0.3	3.6	V
Analog Power Supply Voltage	V <sub>DD2-VDD3</sub>	-0.3	3.6	
LCD Power Supply Voltage	V <sub>0</sub> - XV <sub>0</sub>	-0.3	1.6	V
	V <sub>G</sub>	-0.3	3.6	
	V <sub>M</sub>	-0.3	V <sub>DD2</sub>	
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>DD1</sub> + 0.3	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

Note (1): Stresses above those listed under Limiting Values may cause permanent damage to the device. Parameters are valid over operating temperature range unless otherwise specified. All voltages are with respect to V<sub>SS</sub> unless otherwise noted. Insure the voltage levels of V<sub>0</sub>, V<sub>DD2</sub>, V<sub>G</sub>, V<sub>M</sub>, V<sub>SS</sub> and XV<sub>0</sub> always match the correct relation: V<sub>0</sub> ≥ V<sub>DD2</sub> > V<sub>G</sub> > V<sub>M</sub> > V<sub>SS</sub> ≥ XV<sub>0</sub>

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-5	NC	No Connection
6	V <sub>G</sub>	LCD Driving Voltage for Segment Circuit
7-8	NC	No Connection
9	XV <sub>0</sub>	LCD Driving Voltage for Common Circuit t at Positive Frame
10	V <sub>0</sub>	LCD Driving Voltage for Common Circuit t at Negative Frame
11-12	NC	No Connection
13	V <sub>SS</sub>	Ground
14	V <sub>DD</sub>	Power Supply
15	SDA	Serial Data Input
16	SCL	Serial Clock Input
17	A <sub>0</sub>	Data or Command
18	RSTB	Hardware Reset Input Pin
19	CSB	Chip Select Input Pin
20	NC	No Connection

#### BLOCK DIAGRAM





# STANDARD COG MODULES

## YMS 12864-20

128 X 64 DOTS, 1/65 DUTY, 1/9 BIAS

### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$			3.0		V
LCD Operating Voltage	$V_0 - V_{SS}$	$T_a = +25^\circ\text{C}$		8.3		V
Response Time	$T_{ON}$ $T_{OFF}$			89 305		ms
Contrast	CR		2.0			
Viewing Angle	12H $\theta_1$	CR $\geq 2.0$		60		Deg.
	6H $\theta_2$			70		
	3H $\theta_3$			65		
	9H $\theta_4$			65		

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

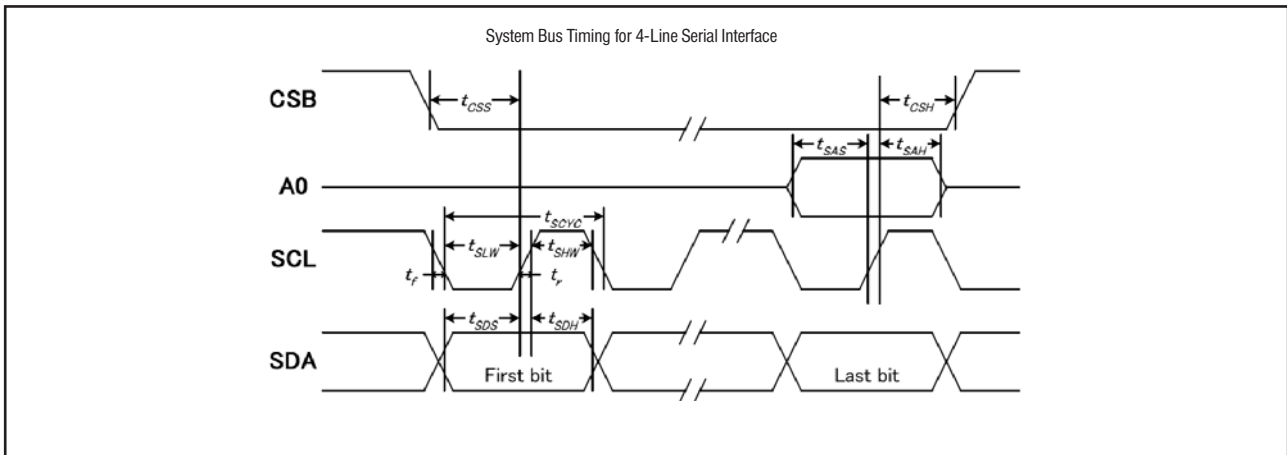
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	$V_f$	$I_f = 30\text{mA}$	4.3	4.5	4.7	V
Forward Current	$I_f$			30	40	mA
Power Dissipation	$P_d$	$I_f = 30\text{mA}$		0.135		W
Reverse Voltage	$V_r$			5.0		V
Reverse Current	$I_r$			0.2		mA
Luminous Intensity	$L_v$	$I_f = 30\text{mA}$	40	50		cd/m <sup>2</sup>
Luminous Uniformity	$\Delta L_v$	$I_f = 30\text{mA}$	70			%
Chromaticity Coordinate	X	$I_f = 15\text{mA}$ each chip	0.27		0.31	
	Y		0.27		0.31	

Note (3): Operating Temperature Range  $T_{op}$   $-20^\circ\text{C}$  to  $+65^\circ\text{C}$ ; Storage Temperature Range  $T_{stg}$   $-30^\circ\text{C}$  to  $+70^\circ\text{C}$ .

Color: White.

Backlight is a kind of current device, it must connect a resistance for limiting current or it will be damaged.

### INTERFACE TIMING CHARACTERISTICS



### AC CHARACTERISTICS, $V_{DD} = 3.3\text{V}$ , $T_a = 25^\circ\text{C}$

PARAMETER	SIGNAL	SYMBOL	MIN.	MAX.	UNIT
Serial Clock Period	SCLK	$t_{SCYC}$	50		ns
SCLK „H“ Pulse Width		$t_{SHW}$	25		ns
SCLK „L“ Pulse Width		$t_{SLW}$	25		ns
Address Setup Time	$A_0$	$t_{SAS}$	20		ns
Address Hold Time		$t_{SAH}$	10		ns
Data Setup Time	SDA	$t_{SDS}$	20		ns
Data Hold Time		$t_{SDH}$	10		ns
CSB-SCLK Time	CSB	$t_{CSS}$	20		ns
CSB-SCLK Time		$t_{CSH}$	40		ns

Note (4): The Input Signal Rise and Fall Time ( $t_r$ ,  $t_f$ ) are specified at 15 ns or less.

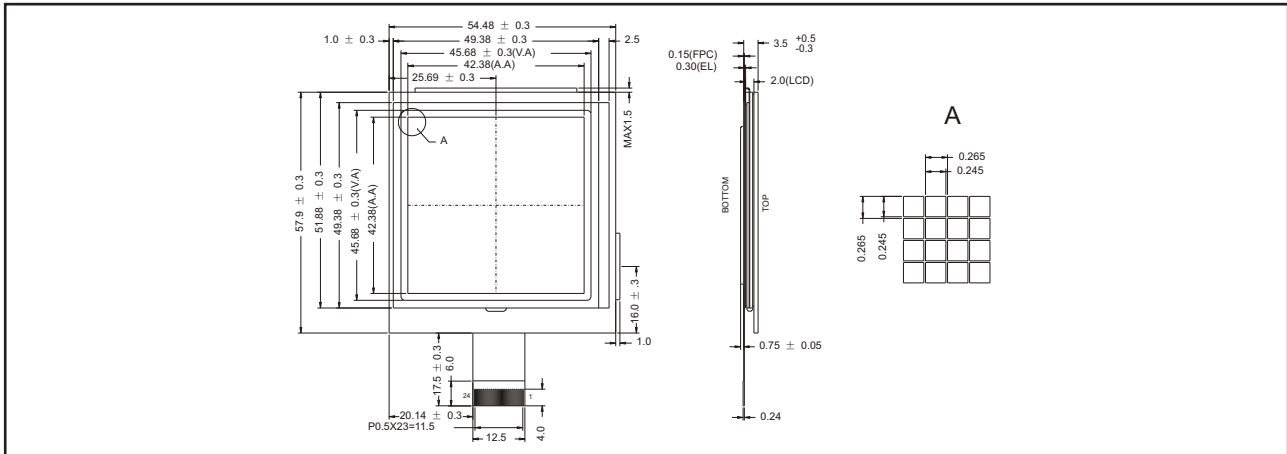
Note (5): All Timing is specified using 20% and 80% of  $V_{DD1}$  as the Standard.

# STANDARD COF MODULES

## YMS 160160-01

160 X 160 DOTS, 1/160 DUTY, 1/13 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	54.48 x 57.9 x 3.5	mm
Viewing Area (W x H)	45.68 x 45.68	mm
Number of Dots	160 x 160	dots
Dot Pitch (W x H)	0.265 x 0.265	mm
Dot Size (W x H)	0.245 x 0.245	mm

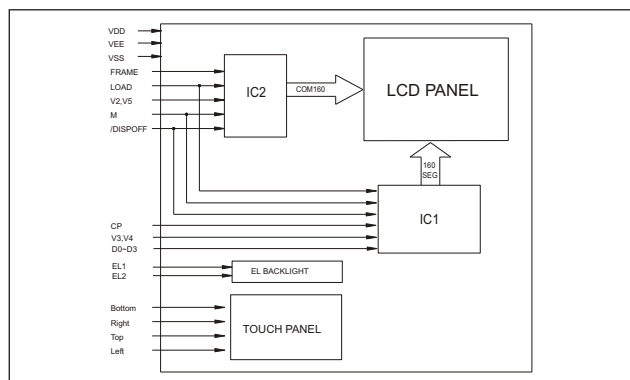
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_5$	Bias Voltage Non-Select (Common Driver)
2	$V_2$	Bias Voltage Non-Select (Common Driver)
3	$V_{EE}$	Power Supply Voltage for LCD (+V)
4	$V_{DD}$	Power Supply for Logic
5	FRAME	Frame Start Signal (First Line Mark of Common Signal)
6	GND	Ground
7	LOAD	Latch Pulse of Display Data
8	$V_{SS}$	Power Supply (0V)
9	M	Switch Signal to Convert LCD Drive Wave From Into AC
10	/DISPOFF	H: Display On, L: Display Off
11	CP	Clock Pules for Segment Shift Register
12	$V_4$	Bais Voltage Non-Select (Segment Driver)
13	$V_3$	Bais Voltage Non-Select (Segment Driver)
14	$DB_3$	Display Data
15	$DB_2$	Display Data
16	$DB_1$	Display Data
17	$DB_0$	Display Data
18	NC	No Connection
19	$EL_1$	Power Supply for the $EL_1$
20	$EL_2$	Power Supply for the $EL_2$
21	BOTTOM	Touch Panel Pin
22	RIGHT	Touch Panel Pin
23	TOP	Touch Panel Pin
24	LEFT	Touch Panel Pin

### BLOCK DIAGRAM



# STANDARD COF MODULES

## YMS 160160-01

160 X 160 DOTS, 1/160 DUTY, 1/13 BIAS

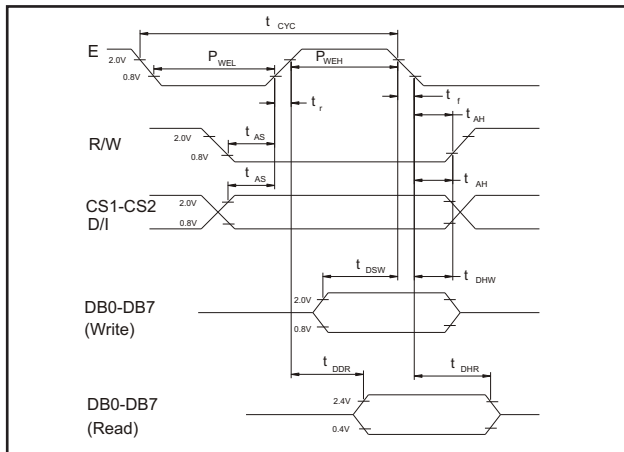
### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$			18.6		V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 5V$		3.0	4.5	mA
Input Voltage	HIGH	$V_{IH}$		$0.7 V_{DD}$	$V_{DD}$	V
	LOW	$V_{IL}$		0	$0.3 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$I_{OH} = 0.205mA$	2.4		V
	LOW	$V_{OL}$	$I_{OL} = 1.6mA$		0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 5V$ $T_a = +25^\circ C$		9.0		V
Supply Current LCD Drive	$I_{EE}$			0.8	1.0	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### INTERFACE TIMING CHARACTERISTICS



PARAMETER	SYMBOL	MIN.	MAX.	UNIT
E Cycle Time	$t_{cyc}$	1000		ns
E High Level Width	$t_{wEH}$	450		ns
E Low Level Width	$t_{wEL}$	450		ns
E Rise Time	$t_r$		25	ns
E Fall Time	$t_f$		25	ns
Address Setup Time	$t_{AS}$	140		ns
Address Hold Time	$t_{AH}$	10		ns
Data Setup Time	$t_{DSW}$	200		ns
Data Delay Time	$t_{DDR}$		320	
Data Delay Time - Write	$t_{DHW}$	10		ns
Data Hold Time - Read	$t_{DHR}$	20		ns

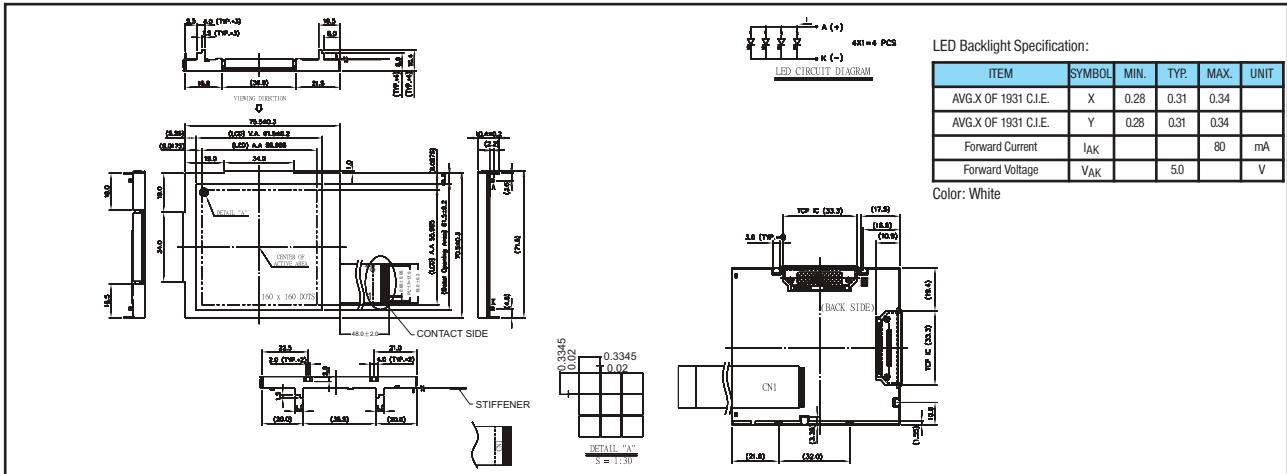
Condition:  $V_{DD} = +5.0V \pm 10\%$ ,  $V_{SS} = 0V$ ,  $T_a = +25^\circ C$

## STANDARD TAB MODULES

### YMS 160160-02

160 X 160 DOTS, 1/160 DUTY, 1/13 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	75.5 x 70.5 x 10.4	mm
Viewing Area (W x H)	61.5 x 61.5	mm
Number of Dots	160 x 160	dots
Dot Pitch (W x H)	0.3545 x 0.3545	mm
Dot Size (W x H)	0.3345 x 0.3345	mm

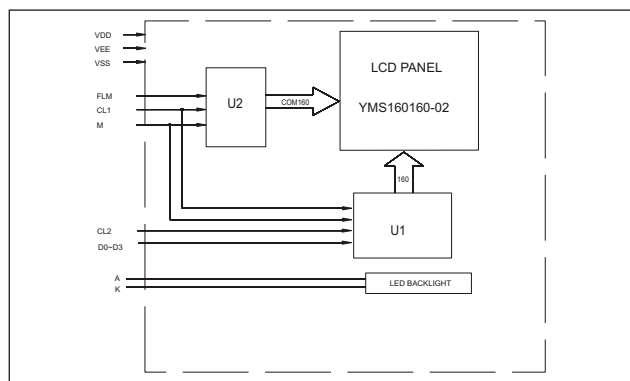
#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	V <sub>DD</sub> - V <sub>SS</sub>	-0.3	7.0	V
Supply Voltage Drive	V <sub>DD</sub> - V <sub>EE</sub>	-0.3	30.0	V
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>DD</sub> + 0.3	V
Operating Temperature		See page 8		
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	V <sub>SS</sub>	Power Supply (0V)
2	FLM (E102)	First Line Mark for Common Scan
3	CL <sub>1</sub> (LP) V <sub>0</sub>	H → L Data Latch Pulse
4	CL <sub>2</sub> (XCK)	Clock Pulse for Segment Shift Register
5	M (FR)	H/L Frame Reverse Signal
6	V <sub>DD</sub>	H/L Supply for Logic (+3.3V)
7	NC	No Connection
8	V <sub>EE</sub>	Power Supply for LCD
9-12	D <sub>3</sub> -D <sub>0</sub>	H/L Display Data
13-16	NC	No Connection
17	A	Power Supply for LED Backlight
18	K	Power Supply for LED Backlight

#### BLOCK DIAGRAM



#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	IF	VF=5.0V		80	120	V
Power Consumption	P <sub>LED</sub>			400	600	Hz
Luminous			390		405	cd/m <sup>2</sup>

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>		2.5		5.5	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> =3.3V		1.5	2.5	mA
Input Voltage	HIGH	V <sub>IH</sub>	0.8 V <sub>DD</sub>			V
	LOW	V <sub>IL</sub>				0.2 V <sub>DD</sub>
Output Voltage	HIGH	V <sub>OH</sub>	V <sub>DD</sub> - 0.4			V
	LOW	V <sub>OL</sub>				0.4
LCD Operating Voltage	V <sub>DD</sub> - V <sub>EE</sub>	V <sub>DD</sub> =3.3V Ta=+25°C		20.0		V
Supply Current LCD Drive	I <sub>EE</sub>			0.8	1.0	mA

Note (1): Value is high reliability type.

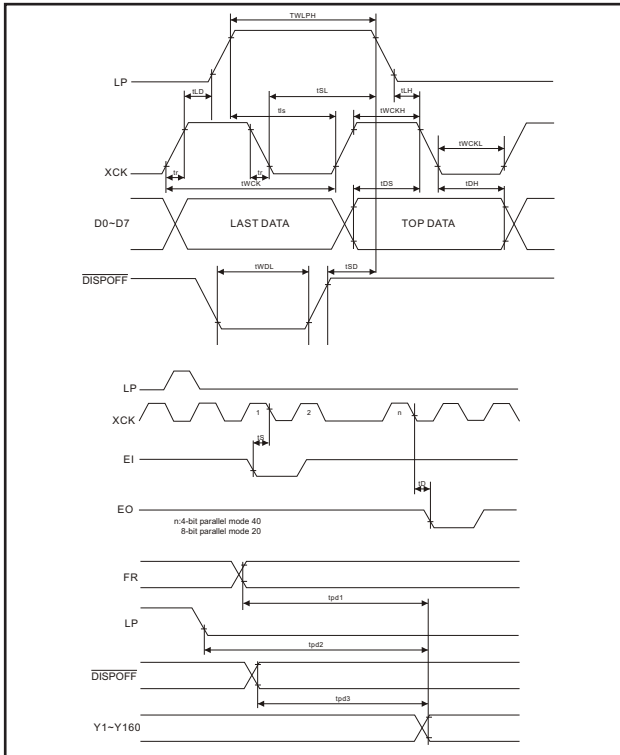
Note (2): Electro-Optical Characteristics: See page 5.

## STANDARD TAB MODULES

### YMS 160160-02

160 X 160 DOTS, 1/160 DUTY, 1/13 BIAS

#### TIMING WAVEFORM OF SEGMENT MODE

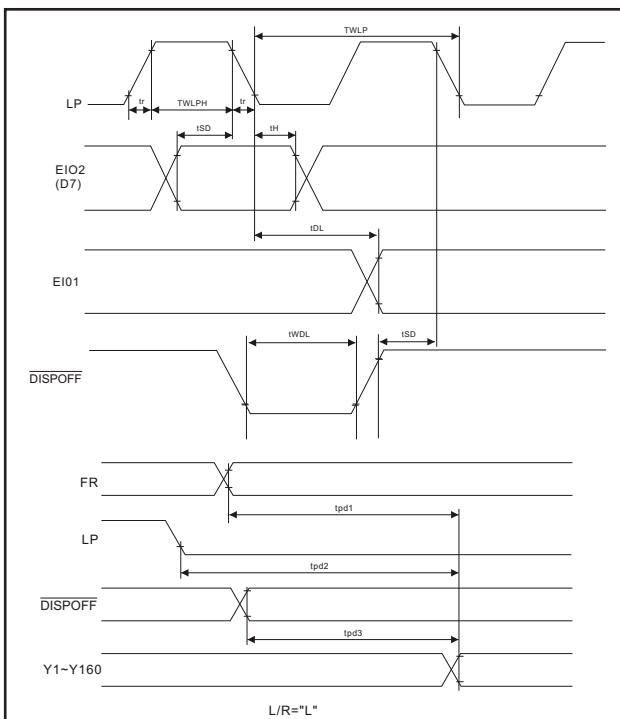


#### SEGMENT MODE

$V_{SS}=0V$ ,  $V_{DD}=2.5 \sim 4.5$ ,  $V_O=15$  to 30 and  $T_a=-20^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WCK}$	125			ns	$t_r, t_f \leq 11$ ns Note 1
Shift Clock „H“ Pulse Width	$t_{WCKH}$	51			ns	
Shift Clock „L“ Pulse Width	$t_{WCKL}$	51			ns	
Data Setup Time	$t_{DS}$	30			ns	
Data Hole Time	$t_{DH}$	40			ns	
Latch Pulse „H“ Pulse Width	$t_{WLPH}$	51			ns	
Shift Clock Rise to Latch Pulse Rise Time	$t_{LD}$	0			ns	
Shift Clock Fall to Latch Pulse Fall Time	$t_{SL}$	51			ns	
Latch Pulse Rise to Shift Clock Rise Time	$t_{LS}$	51			ns	
Latch Pulse Fall to Shift Clock Fall Time	$t_{LH}$	51			ns	
Input Signal Rise Time	$t_r$			50	ns	Note 2
Input Signal Fall Time	$t_f$			50	ns	Note 2
Enable Setup Time	$t_S$	36			ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			78	ns	$C_L=15$ pF
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu$ s	$C_L=15$ pF
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu$ s	$C_L=15$ pF

#### TIMING CHARACTERISTICS OF COMMON MODE



#### COMMON MODE

$V_{SS}=0V$ ,  $V_{DD}=2.5 \sim 5.5$ ,  $V_O=15$  to 30 and  $T_a=-20^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

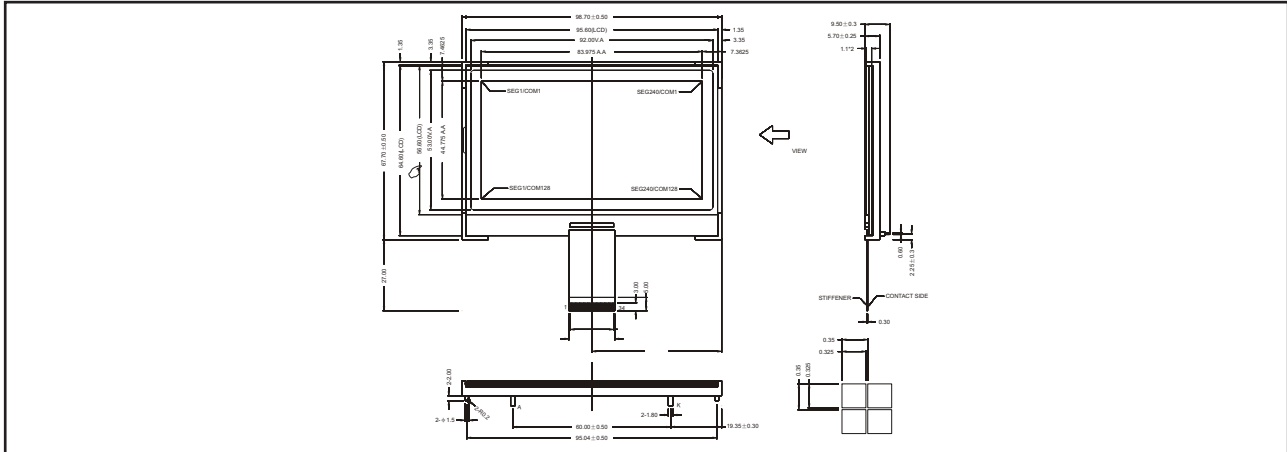
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WLP}$	250			ns	$t_r, t_f \leq 20$ ns Note 1
Shift Clock „H“ Pulse Width	$t_{WLPH}$	15			ns	$V_{DD}=+5.0V$ $\pm 10\%$
		30			ns	$V_{DD}=+2.5$ $\sim +4.5V$
Data Setup Time	$t_{SU}$	30			ns	
Data Hole Time	$t_{HI}$	50			ns	
Input Signal Rise Time	$t_r$			50	ns	
Input Signal Fall Time	$t_f$			50	ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			200	ns	$C_L=15$ pF
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu$ s	$C_L=15$ pF
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu$ s	$C_L=15$ pF

# STANDARD COG MODULES

## YMC 240128-13

240 X 128 DOTS, 1/128 DUTY, 1/12 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	98.7 x 67.7 x 9.5	mm
Viewing Area (W x H)	92.0 x 53.0	mm
Number of Dots	240 x 128	dots
Dot Pitch (W x H)	0.35 x 0.35	mm
Dot Size (W x H)	0.325 x 0.325	mm

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} (V_{DD} - V_{SS})$	-0.5	4.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.5	20.0	V
Input Voltage	$V_{IN}$	-0.5	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-6	$V_{OIN}, V_{OOUT}, V_1, V_2, V_3, V_4$	LCD Driving Supply Voltage
7	$V_{OUT}$	Chip's Power Supply Pin
8	$C_{6P}$	Connection Pin for Voltage Converter
9	$C_{2N}$	Connection Pin for Voltage Converter
10	$C_{4P}$	Connection Pin for Voltage Converter
11	$C_{2N}$	Connection Pin for Voltage Converter
12	$C_{2P}$	Connection Pin for Voltage Converter
13	$C_{1P}$	Connection Pin for Voltage Converter
14	$C_{1N}$	Connection Pin for Voltage Converter
15	$C_{3P}$	Connection Pin for Voltage Converter
16	$C_{5P}$	Connection Pin for Voltage Converter
17	$C_{1N}$	Connection Pin for Voltage Converter
18	$C_{7P}$	Connection Pin for Voltage Converter
19	$V_{DDA}$	Chip's Power Supply Pin
20	$V_{SS}$	Ground
21	$V_{DD}$	Chip's Power Supply Pin
22	XCS	Chip Select Input Pin
23	RES	Reset Input Pin
24	E	Read / Write Execution Control
25-32	$D_7-D_0$	The 8-bit Bi-Directional Data Bus to be connected to the MCU in Parallel Interface Mode
33	R/W	Read / Write Execution Control
34	$A_0$	Identify the Data or a Command

# STANDARD COG MODULES

## YMC 240128-13

240 X 128 DOTS, 1/128 DUTY, 1/12 BIAS

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>		2.4	3.3	3.3	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> = 3.3V			1.6	mA
Input Voltage	HIGH	V <sub>IH</sub>	0.7 V <sub>DD</sub>		V <sub>DD</sub>	V
	LOW	V <sub>IL</sub>	V <sub>SS</sub>		0.3 V <sub>DD</sub>	V
Output Voltage	HIGH	V <sub>OH</sub>	0.5			V
	LOW	V <sub>OL</sub>			-0.5	V
LCD Operating Voltage	V <sub>DD</sub> - V <sub>EE</sub>	V <sub>DD</sub> = 3.3V Ta = +25°C		13.5	18	V
Supply Current LCD Drive	I <sub>EE</sub>				1.3	mA

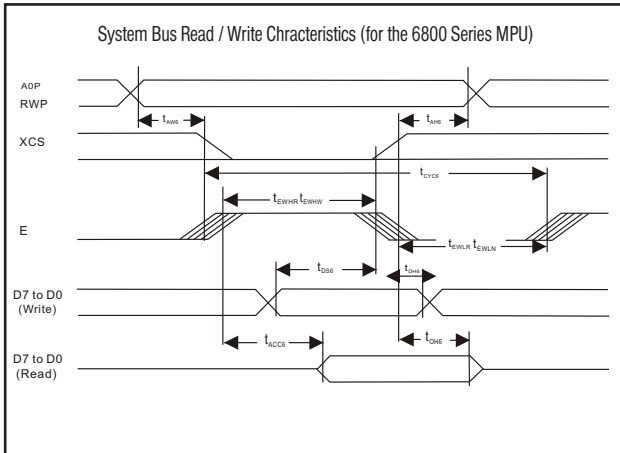
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Current	I <sub>F</sub>	V <sub>F</sub> = 3.8V		90	120	mA
Power Consumption	P <sub>LED</sub>			342		mW
Luminous	I <sub>v</sub>	V <sub>F</sub> = 3.8V	70			cd/m <sup>2</sup>

### AC CHARACTERISTICS



PARAMETER	SIGNAL	SYMBOL	CONDITION	MIN.	MAX.	UNIT
Address Hold Time	AO	t <sub>AH6</sub>		20		ns
Address Setup Time		t <sub>AW6</sub>		20		ns
System Cycle Time		t <sub>CYC6</sub>		200		ns
Enable LPulse Width Write	WR	t <sub>CCLW</sub>		100		ns
		t <sub>CCLR</sub>		100		ns
Enable H Pulse Width Read	RD	t <sub>CCHW</sub>		100		ns
		t <sub>CCHR</sub>		100		ns
Write Data Setup Time	D <sub>0</sub> to D <sub>7</sub>	t <sub>D0S6</sub>		150		ns
Write Data Hold Time		t <sub>D0H6</sub>		20		ns
Read Access Time		t <sub>ACC6</sub>	C <sub>L</sub> = 100pF		40	ns
Read Output Disable Time		t <sub>CH6</sub>	C <sub>L</sub> = 100pF		30	ns

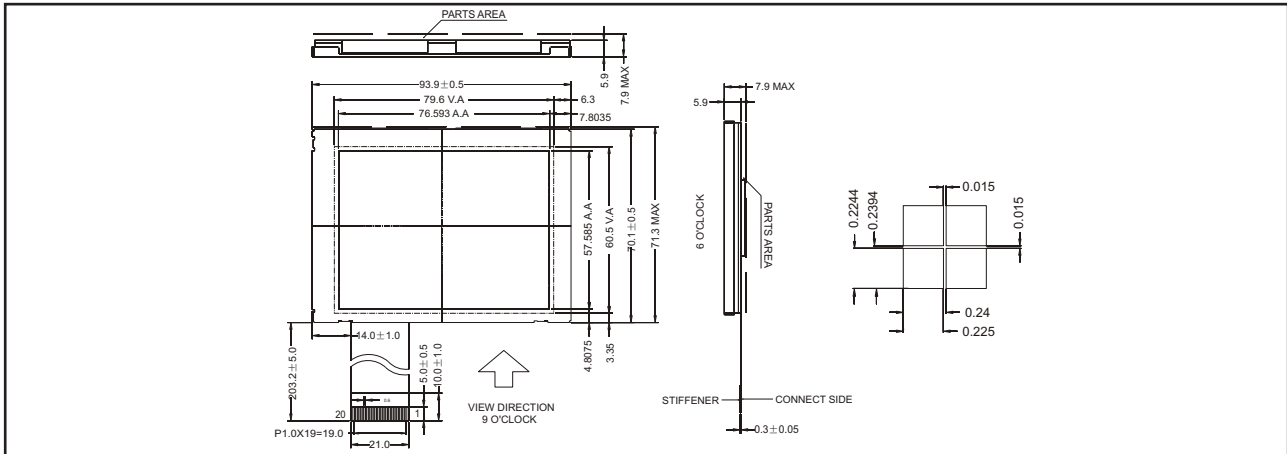
Condition: V<sub>DD</sub> = +3.3V, Ta = -30°C to +85°C, Die)

# STANDARD TAB MODULES

## YMS 320240-10

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	93.9 x 71.3 x 7.9	mm
Viewing Area (W x H)	79.6 x 60.5	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.24 x 0.2394	mm
Dot Size (W x H)	0.225 x 0.2244	mm

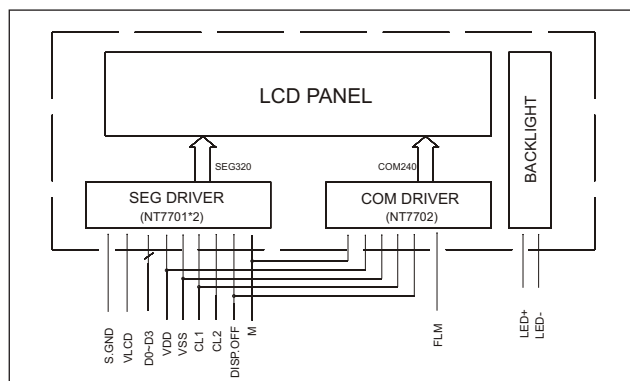
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	0	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	$V_{DD}$	Power Supply for Logic
2	S.GND	Ground
3	$V_{LCD}$	Power Supply Pin for LCD Driver Voltage
4	FLM	Frame Signal
5	DISP.OFF	Control Input Pin for Output Deselect Level
6	M	H/L Supply for Logic (+3.3V)
7	LP	No Connection
8	XCK	Power Supply for LCD
9	$V_{SS}$	Ground
10-13	$D_3-D_0$	Display Data Input
14	$V_{SS}$	Ground
15,16	LED+, LED-	Power Supply Terminal for Driving LED Backlight
17-20	NC	No Connection

### BLOCK DIAGRAM



### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Current	$I_F$	$I_F = 70 \text{ mA}$	3.0	3.2	3.3	V
Power Consumption	$P_{LED}$			224		mW
Luminous						cd/m <sup>2</sup>

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		2.5	3.3	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 3.3\text{V}$			2.0	mA
Input Voltage	HIGH	$V_{IH}$	0.8 $V_{DD}$			V
	LOW	$V_{IL}$				0.2 $V_{DD}$ V
Output Voltage	HIGH	$V_{OH}$	$V_{DD} - 0.4$			V
	LOW	$V_{OL}$				0.4 V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 3.3\text{V}$ $T_a = +25^\circ\text{C}$	22.7			V
Supply Current LCD Drive	$I_{EE}$		1.8			mA

Note (1): Value is high reliability type.

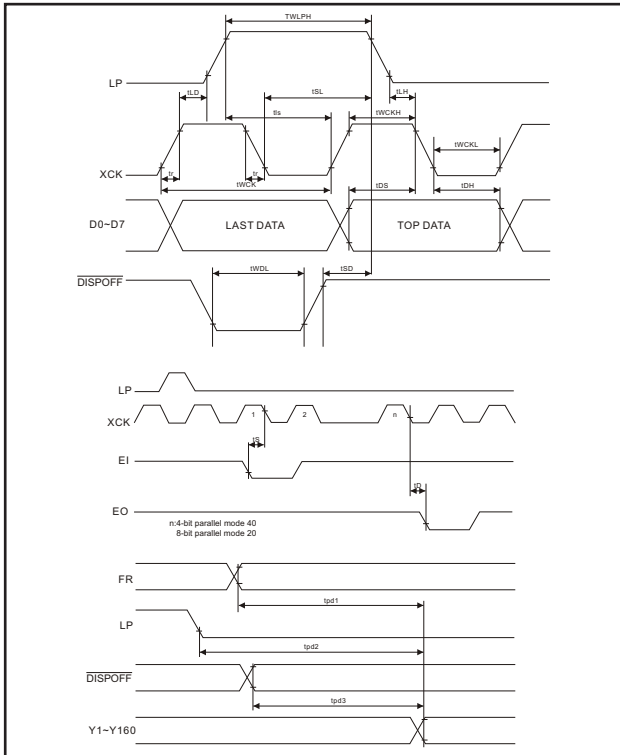
Note (2): Electro-Optical Characteristics: See page 5.



## STANDARD TAB MODULES YMS 320240-10

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

### TIMING WAVEFORM OF SEGMENT MODE

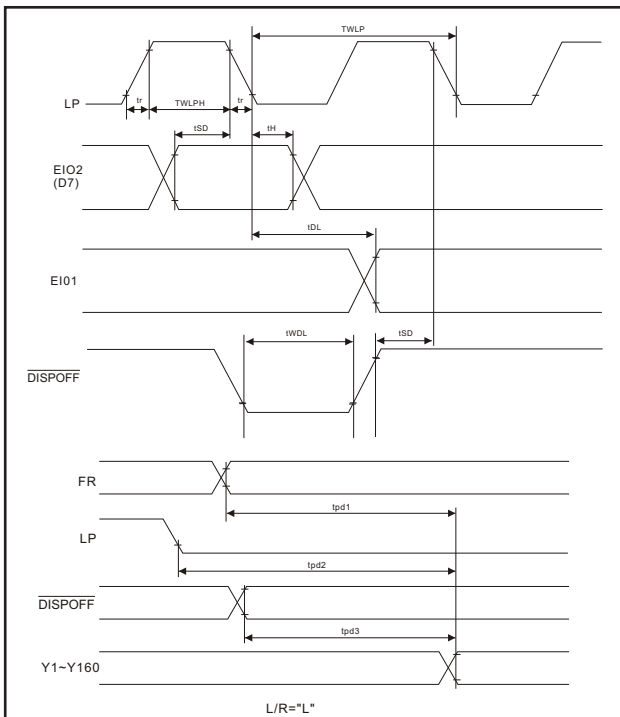


### SEGMENT MODE

$V_{SS}=0V$ ,  $V_{DD}=2.5\sim 4.5V$ ,  $V_O=15$  to 30V,  $T_a=-20^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WCK}$	125			ns	$t_r, t_f \leq 11$ ns Note 1
Shift Clock „H“ Pulse Width	$t_{WCKH}$	51			ns	
Shift Clock „L“ Pulse Width	$t_{WCKL}$	51			ns	
Data Setup Time	$t_{DS}$	30			ns	
Data Hole Time	$t_{DH}$	40			ns	
Latch Pulse „H“ Pulse Width	$t_{LWPH}$	51			ns	
Shift Clock Rise to Latch Pulse Rise Time	$t_{LD}$	0			ns	
Shift Clock Fall to Latch Pulse Fall Time	$t_{SL}$	51			ns	
Latch Pulse Rise to Shift Clock Rise Time	$t_{LS}$	51			ns	
Latch Pulse Fall to Shift Clock Fall Time	$t_{LH}$	51			ns	
Input Signal Rise Time	$t_r$			50	ns	Note 2
Input Signal Fall Time	$t_f$			50	ns	Note 2
Enable Setup Time	$t_S$	36			ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			78	ns	$C_L=15$ pF
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu$ . s	$C_L=15$ pF
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu$ . s	$C_L=15$ pF

### TIMING CHARACTERISTICS OF COMMON MODE



### COMMON MODE

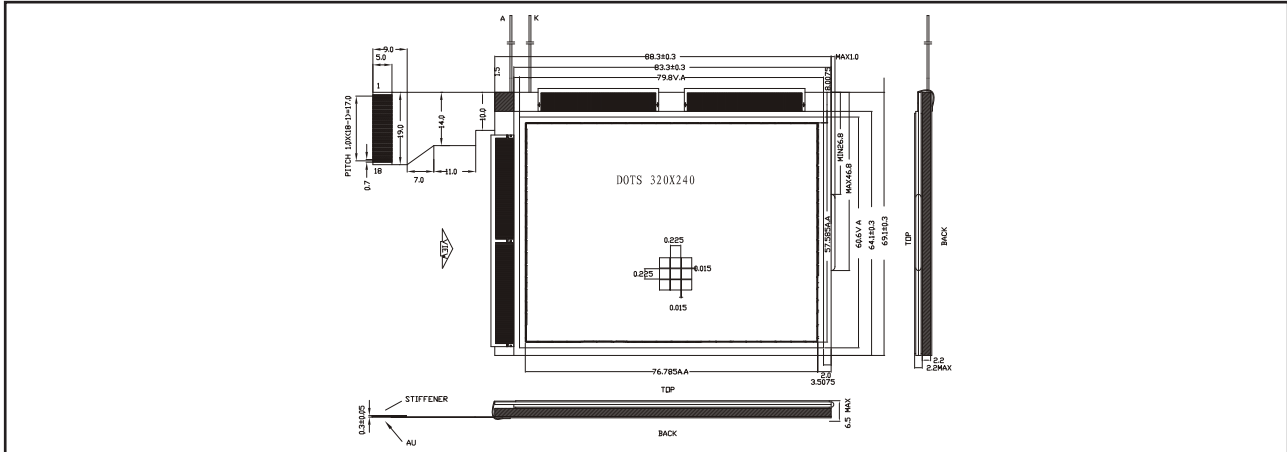
$V_{SS}=0V$ ,  $V_{DD}=2.5\sim 5.5$ ,  $V_O=15$  to 30 and  $T_a=-20^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WLP}$	250			ns	$t_r, t_f \leq 20$ ns Note 1
Shift Clock „H“ Pulse Width	$t_{WLPH}$	15			ns	$V_{DD}=+5.0V$ $\pm 10\%$
		30			ns	$V_{DD}=+2.5$ $\sim +4.5V$
Data Setup Time	$t_{SU}$	30			ns	
Data Hole Time	$t_H$	50			ns	
Input Signal Rise Time	$t_r$			50	ns	
Input Signal Fall Time	$t_f$			50	ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			200	ns	$C_L=15$ pF
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu$ . s	$C_L=15$ pF
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu$ . s	$C_L=15$ pF

## STANDARD TAB MODULES YMS 320240-11

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	120.3 x 69.1 x 6.5	mm
Viewing Area (W x H)	79.8 x 60.6	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.240 x 0.240	mm
Dot Size (W x H)	0.225 x 0.225	mm

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-6	$V_{LCD}(V_1, V_6, V_3, V_4, V_5, GND(V_2))$	Power Supply Pin for LCD Driver Voltage
7	GND	Ground
8	$V_{DD}$	Power Supply
9	FLM	Frame Signal
10	$CL_2$	Display Data Shift Clock Input for Segment Mode
11	M	AC Signal
12	$CL_1$	Latch Pulse Input / Shift Clock Input for the Shift Register
13	/DOFF	Control Input for Output Deselect Level
14	GND	Ground
15-18	$D_3-D_0$	Display Data

### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		2.5	3.0	5.5	V
Supply Current (Logic)	$I_{DD}$	$V_{DD} = 3.0\text{V}$			2.0	mA
Input Voltage	HIGH	$V_{IH}$	$0.8 V_{DD}$			V
	LOW	$V_{IL}$			$0.2 V_{DD}$	V
Output Voltage	HIGH	$V_{OH}$	$V_{DD} - 0.4$			V
	LOW	$V_{OL}$			0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	$V_{DD} = 3.0\text{V}$ $T_a = +25^\circ\text{C}$		22.0		V
Supply Current LCD Drive	$I_{EE}$	$V_{DD} = 3.0\text{V}$ $T_a = +25^\circ\text{C}$			1.5	mA

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

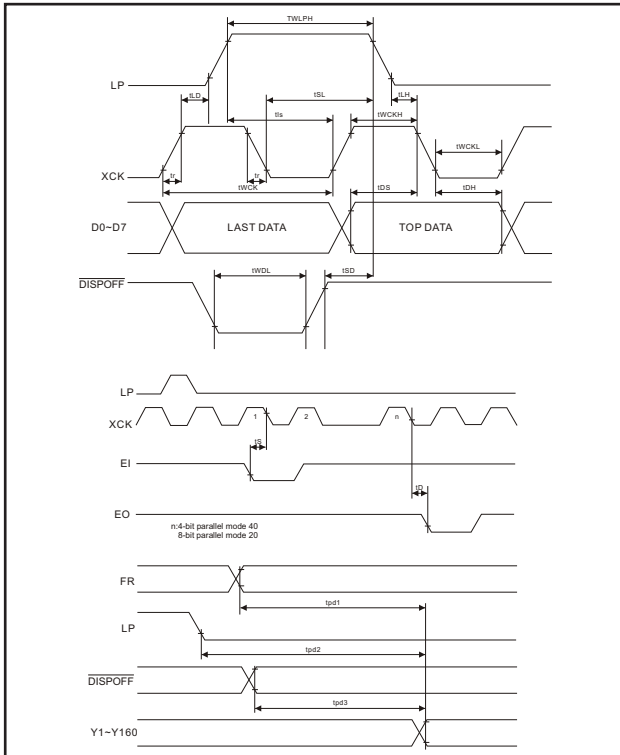
### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Current	$I_F$	$I_F = 60\text{ mA}$	2.9	3.0	3.1	V
Power Consumption	$P_{LED}$			180		mW
Luminous				TBD		cd/m <sup>2</sup>

## STANDARD TAB MODULES YMS 320240-11

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

### TIMING WAVEFORM OF SEGMENT MODE

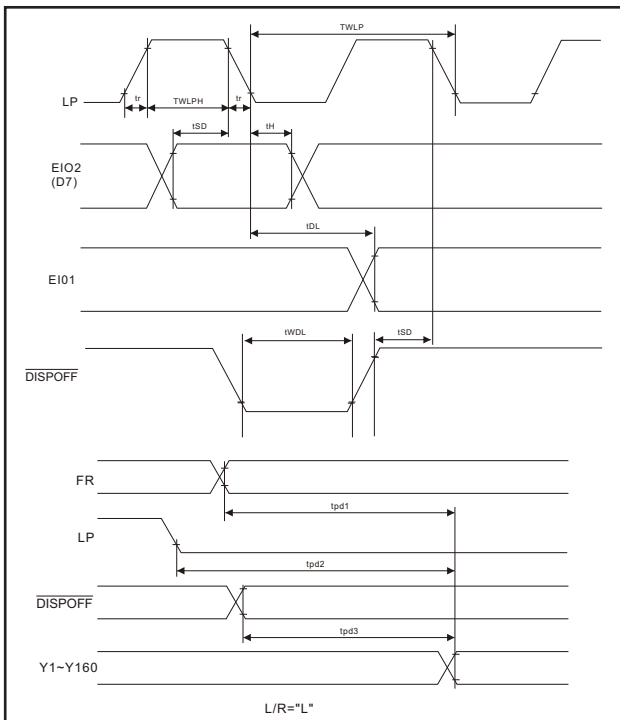


### SEGMENT MODE

$V_{SS}=0V, V_{DD}=2.5 \sim 4.5V, V_O=15 \text{ to } 30V, T_a=-20^\circ\text{C to } +85^\circ\text{C}$ , unless otherwise noted.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WCK}$	125			ns	$t_r, t_r \leq 11\text{ns}$ Note 1
Shift Clock „H“ Pulse Width	$t_{WCKH}$	51			ns	
Shift Clock „L“ Pulse Width	$t_{WCKL}$	51			ns	
Data Setup Time	$t_{DS}$	30			ns	
Data Hole Time	$t_{DH}$	40			ns	
Latch Pulse „H“ Pulse Width	$t_{WLP}$	51			ns	
Shift Clock Rise to Latch Pulse Rise Time	$t_{LD}$	0			ns	
Shift Clock Fall to Latch Pulse Fall Time	$t_{SL}$	51			ns	
Latch Pulse Rise to Shift Clock Rise Time	$t_{LS}$	51			ns	
Latch Pulse Fall to Shift Clock Fall Time	$t_{LH}$	51			ns	
Input Signal Rise Time	$t_r$			50	ns	Note 2
Input Signal Fall Time	$t_f$			50	ns	Note 2
Enable Setup Time	$t_S$	36			ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			78	ns	$C_L=15\text{pF}$
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu\text{s}$	$C_L=15\text{pF}$
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu\text{s}$	$C_L=15\text{pF}$

### TIMING CHARACTERISTICS OF COMMON MODE



### COMMON MODE

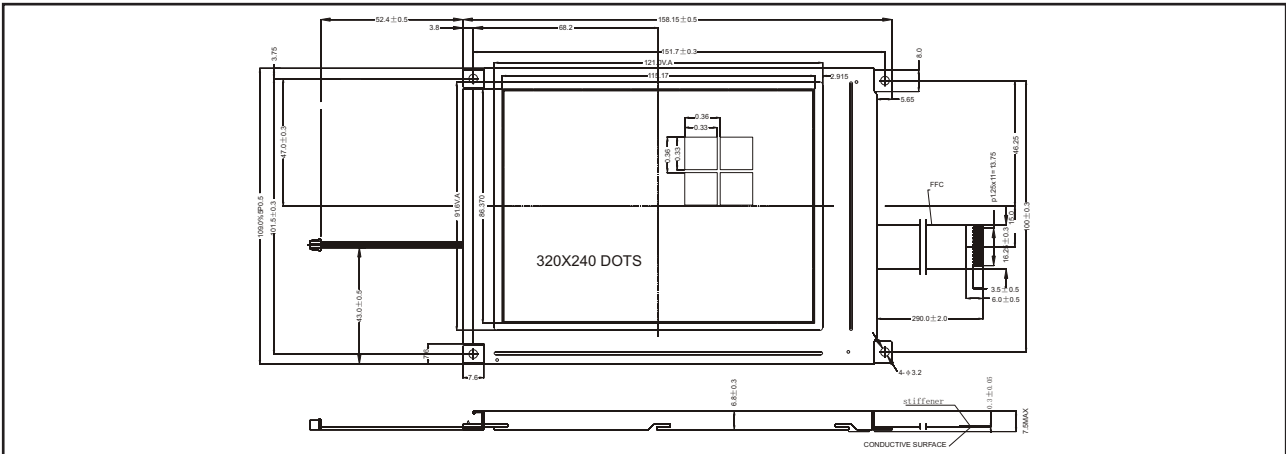
$V_{SS}=0V, V_{DD}=2.5 \sim 5.5, V_O=15 \text{ to } 30 \text{ and } T_a=-20^\circ\text{C to } +85^\circ\text{C}$ , unless otherwise noted.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WLP}$	250			ns	$t_r, t_r \leq 20\text{ns}$ Note 1
Shift Clock „H“ Pulse Width	$t_{WLP}$	15			ns	$V_{DD}=+5.0V$ $\pm 10\%$
		30			ns	$V_{DD}=+2.5$ $\sim +4.5V$
Data Setup Time	$t_{SU}$	30			ns	
Data Hole Time	$t_{H}$	50			ns	
Input Signal Rise Time	$t_r$			50	ns	
Input Signal Fall Time	$t_f$			50	ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			200	ns	$C_L=15\text{pF}$
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu\text{s}$	$C_L=15\text{pF}$
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu\text{s}$	$C_L=15\text{pF}$

## STANDARD TAB MODULES YMS 320240-12

320 X 240 DOTS, 1/240 DUTY, 1/12 BIAS

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	158.15 x 109.0 x 7.5	mm
Viewing Area (W x H)	121.0 x 91.6	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.33 x 0.36	mm
Dot Size (W x H)	0.33 x 0.33	mm

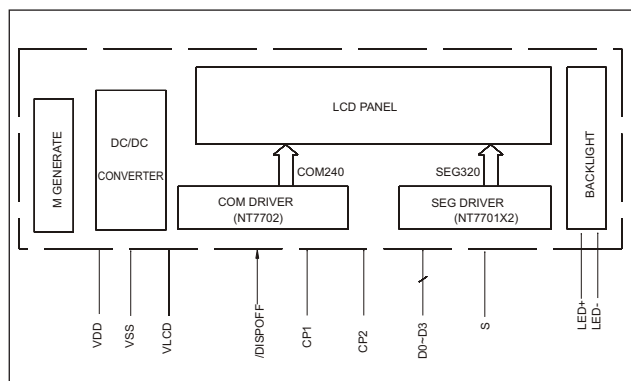
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply Voltage Drive	$V_{DD} - V_{EE}$	-0.3	30.0	V
Input Voltage	$V_{IN}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	S	Frame Signal
2	CP <sub>1</sub>	Latch Pulse Input Pin for Display Data
3	CP <sub>2</sub>	Clock Input Pin for Taking Display Data
4	NC	No Connection
5	DISP.OFF	Control Input Pin for Output Deselect Level
6-9	DB <sub>0</sub> -DB <sub>3</sub>	Data Bit 0 - Data Bit 3
10	V <sub>DD</sub>	Power Supply for Logic
11	GND	Ground
12	V <sub>LCD</sub>	Power Supply Pin for LCD Driver Voltage

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Current	IF	VF=3.2V		120		mA
Power Consumption	P <sub>LED</sub>			384		mW
Luminous				TBD		cd/m <sup>2</sup>

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$		2.5	5.0	5.5	V
Supply Current (Logic)	I <sub>DD</sub>	V <sub>DD</sub> =5.0V			2.0	mA
Input Voltage	HIGH	V <sub>IH</sub>		0.8 V <sub>DD</sub>		V
	LOW	V <sub>IL</sub>			0.2 V <sub>DD</sub>	V
Output Voltage	HIGH	V <sub>OH</sub>		V <sub>DD</sub> -0.4		V
	LOW	V <sub>OL</sub>			0.4	V
LCD Operating Voltage	$V_{DD} - V_{EE}$	V <sub>DD</sub> =5.0V Ta=+25°C		21.9		V
Supply Current LCD Drive	I <sub>EE</sub>				1.4	mA

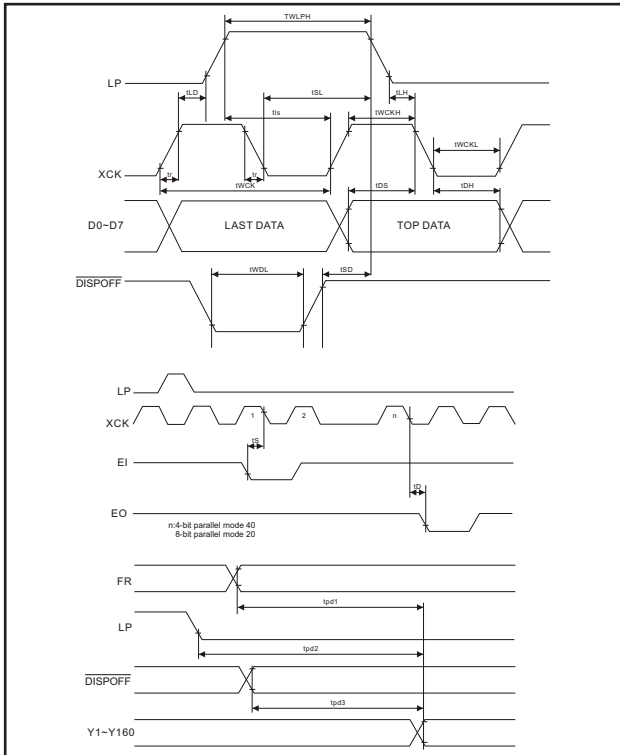
Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

## STANDARD TAB MODULES YMS 320240-12

320 X 240 DOTS, 1/240 DUTY, 1/12 BIAS

### TIMING WAVEFORM OF SEGMENT MODE

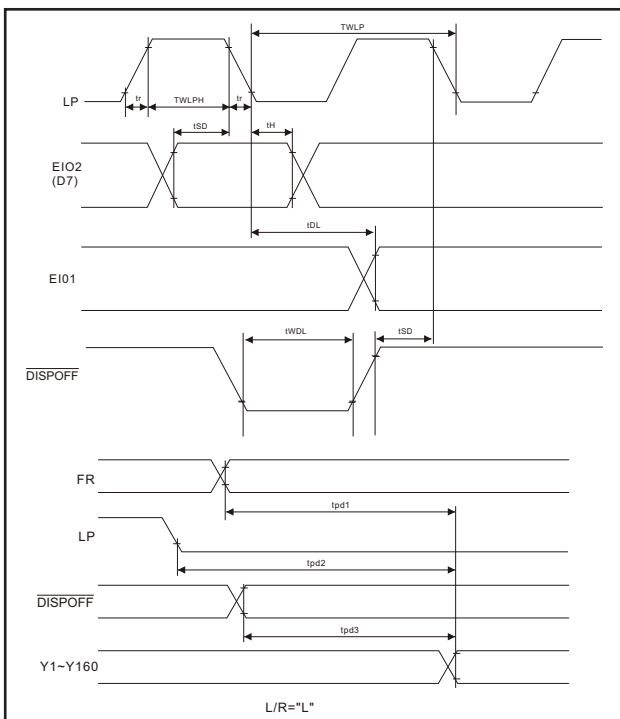


### SEGMENT MODE

$V_{SS}=0V$ ,  $V_{DD}=2.5 \sim 4.5V$ ,  $V_O=15$  to 30V,  $T_a=-20^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WCK}$	71			ns	$t_r, t_r \leq 11ns$ Note 1
Shift Clock „H“ Pulse Width	$t_{WCKH}$	23			ns	
Shift Clock „L“ Pulse Width	$t_{WCKL}$	23			ns	
Data Setup Time	$t_{DS}$	10			ns	
Data Hole Time	$t_{DH}$	20			ns	
Latch Pulse „H“ Pulse Width	$t_{WLP}$	23			ns	
Shift Clock Rise to Latch Pulse Rise Time	$t_{LD}$	0			ns	
Shift Clock Fall to Latch Pulse Fall Time	$t_{SL}$	25			ns	
Latch Pulse Rise to Shift Clock Rise Time	$t_{LS}$	25			ns	
Latch Pulse Fall to Shift Clock Fall Time	$t_{LH}$	25			ns	
Input Signal Rise Time	$t_r$			50	ns	Note 2
Input Signal Fall Time	$t_f$			50	ns	Note 2
Enable Setup Time	$t_S$	21			ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			40	ns	$C_L=15pF$
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu s$	$C_L=15pF$
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu s$	$C_L=15pF$

### TIMING CHARACTERISTICS OF COMMON MODE



### COMMON MODE

$V_{SS}=0V$ ,  $V_{DD}=2.5 \sim 5.5V$ ,  $V_O=15$  to 30V,  $T_a=-20^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

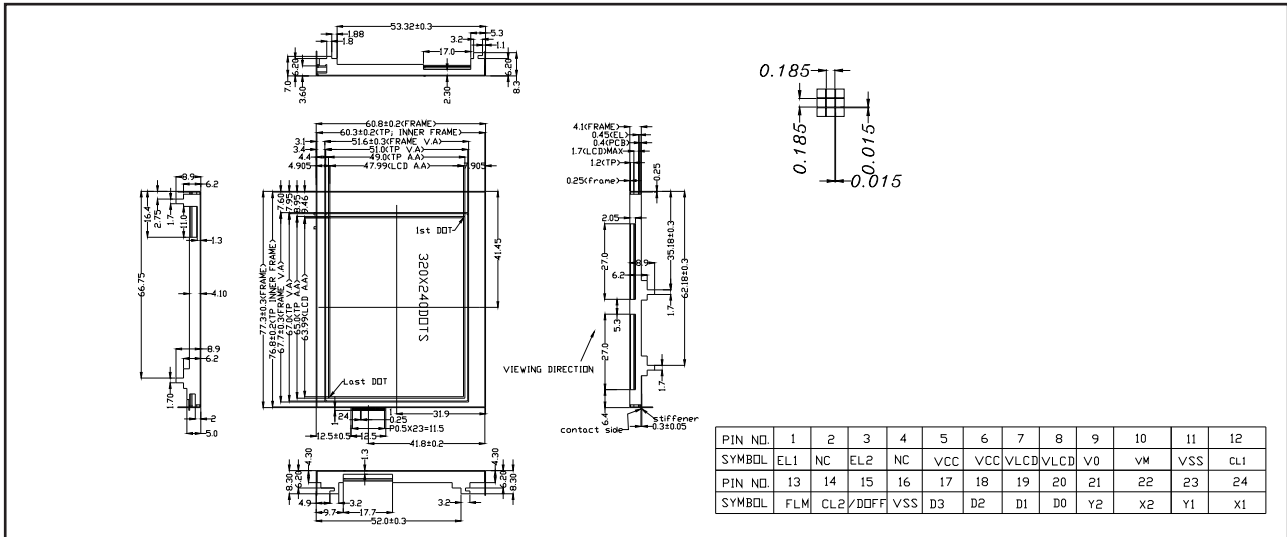
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WLP}$	250			ns	$t_r, t_r \leq 20ns$ Note 1
Shift Clock „H“ Pulse Width	$t_{WLP}$	15			ns	$V_{DD}=+5.0V$ $\pm 10\%$
		30			ns	$V_{DD}=+2.5$ $\sim +4.5V$
Data Setup Time	$t_{SU}$	30			ns	
Data Hole Time	$t_H$	50			ns	
Input Signal Rise Time	$t_r$			50	ns	
Input Signal Fall Time	$t_f$			50	ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			200	ns	$C_L=15pF$
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu s$	$C_L=15pF$
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu s$	$C_L=15pF$

## STANDARD TAB MODULES

### YMS 320240-15

320 X 240 DOTS, 1/240 DUTY, 1/17 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	60.8 x 77.3 x 8.9	mm
Viewing Area (W x H)	51.6 x 67.7	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.2 x 0.2	mm
Dot Size (W x H)	0.185 x 0.185	mm

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	EL1	EL Terminal (+)
2	NC	No Connection
3	EL2	EL Terminal (-)
4	NC	No Connection
5	VCC	Power Supply for Logic
6	VCC	Power Supply for Logic
7	VLCD	Power Supply for LCD
8	VLCD	Power Supply for LCD
9	V0	Bias Voltage for Non-Select (Segment Driver)
10	VM	Bias Voltage for Non-Select (Segment Driver and Common Driver)
11	VSS	Ground
12	CL1	Latch Pulse of Display Data Shift Clock fo Common Driver
13	FLM	Frame Start Signal (Data Signal of the Shift Register of the Common Driver)
14	CL2	Clock Pulse for Segment Shift Register
15	/DOFF	H: Display ON; L: Dispaly OFF
16	VSS	Ground
17	D3	Data Bus
18	D2	Data Bus
19	D1	Data Bus
20	D0	Data Bus
21	Y2	Terminal (Up Side of Vertical) for Touch Panel
22	X2	Terminal (Right Side of Horizontal) for Touch Panel
23	Y1	Terminal (Down Side of Vertical) for Touch Panel
24	X1	Terminal (Left Side of Horizontal) for Touch Panel

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	V <sub>DD</sub> - V <sub>SS</sub>			3.3		V
LCD Operating Voltage	V <sub>LCD</sub>	Ta = +25°C		21.6		V
Response Time	T <sub>ON</sub> T <sub>OFF</sub>			172 196		ms
Contrast	CR		2.0			
Viewing Angle	12H	θ1	CR ≥ 2.0	50		Deg.
	6H	θ2		65		
	3H	θ3		55		
	9H	θ4		55		

Note (1): Value is high reliability type.

Note (2): Electro-Optical Characteristics: See page 5.

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Voltage				110		V
Frequency				400		Hz

Color: Blue-Green

# STANDARD TAB MODULES

## YMS 320240-15

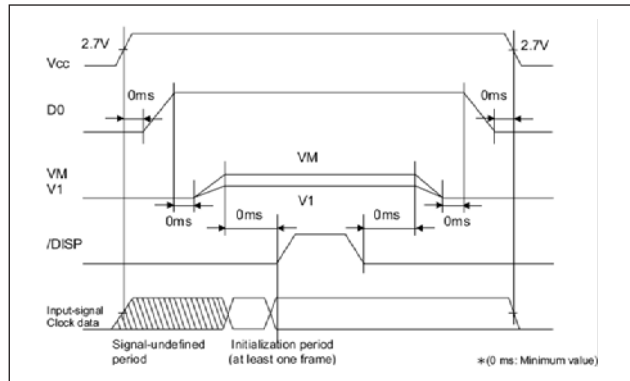
320 X 240 DOTS, 1/240 DUTY, 1/17 BIAS

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{CC}$	-0.3	7.0	V
Supply Voltage Drive	$V_0$	-0.3	7.0	V
Input Voltage 1 (Note 1,2)	$V_{T1}$	-0.3	$V_{DD} + 0.3$	V
Input Voltage 2 (Note 1,3,4)	$V_{T2}$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature	See page 8			
Storage Temperature				

Note (1): Potential from the GND.  
 Note (2): Applied to pins SHL, /EIO1, /EIO2, /DISP, D<sub>0</sub> to D<sub>7</sub>, CL<sub>1</sub>, CL<sub>2</sub>, M, BS and MODE.  
 Note (3): Applied to VML, VMR, V1L and VMR. Operating the LSI in excess of the absolute maximum rating will result in permanent damage. Use the LSI observing electrical characteristic conditions in normal operation. Exceeding the conditions will cause malfunctions or will affect LSI reliability.  
 Note (4): Conform to the following turn-on/off sequence of the power and signals. Otherwise, the LSI will malfunction or will be permanently damaged. In addition, LSI reliability will be affected.

### BLOCK DIAGRAM, IST3031

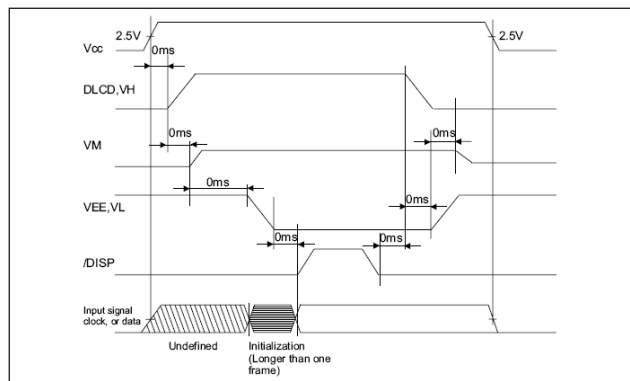


### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage Logic	$V_{CC}$	-0.3	7.0	V
Supply Voltage LCD Drive	$V_{LCD}$	-0.3	25.0	V
	$V_{EE}$	-20.0	0.3	V
Input Voltage 1 (Note 1,2)	$V_{T1}$	-0.3	$V_{DD} + 0.3$	V
Input Voltage 2 (Note 1,5,8)	$V_H$	-0.3	$V_{DD} + 0.3$	V
Input Voltage 3 (Note 1,6,8)	$V_L$	-0.3	$+V_{EE}$	V
Input Voltage 4 (Note 1,6,8)	$V_M$	-0.3	5.0	V
Operating Temperature	See page 8			
Storage Temperature				

Note: If the LSI is used beyond the above maximum ratings, it may be permanently damaged. It should always be used within its specified operating range for normal operation to prevent malfunction or degraded reliability.  
 Note (1): The reference point is GND (0V).  
 Note (2): Applies to DIO<sub>1</sub>, /DISP, SHL, M, NWS<sub>0</sub>, NWS<sub>1</sub>, NWS<sub>2</sub>, NWS<sub>3</sub>, NWS<sub>4</sub>, RESET, MODE<sub>0</sub>, MODE<sub>1</sub>, CL, /M/S, AMP, CCL, DIO<sub>2-3</sub>.  
 Note (3): Applies to V<sub>LCDL</sub>, R pin.  
 Note (4): Applies to V<sub>HIL</sub>, R pin.  
 Note (5): Applies to V<sub>EEL</sub>, R pin.  
 Note (6): Applies to V<sub>LL</sub>, R pin.  
 Note (7): Applicable to ML, R pins (Caution). Operating the LSI in excess of the absolute maximum rating will result in permanent damage. Use the LSI observing electrical characteristic conditions in normal operation. Exceeding the conditions will cause malfunctions or will affect LSI reliability.  
 Note (8): Follow the sequence of activation and inactivation for the following power supplies and signals. And this sequence should be applied when using built-in switching circuit. If the sequence is not followed, it may cause LSI malfunction, permanent damage, or adverse effects.

### BLOCK DIAGRAM, IST3032

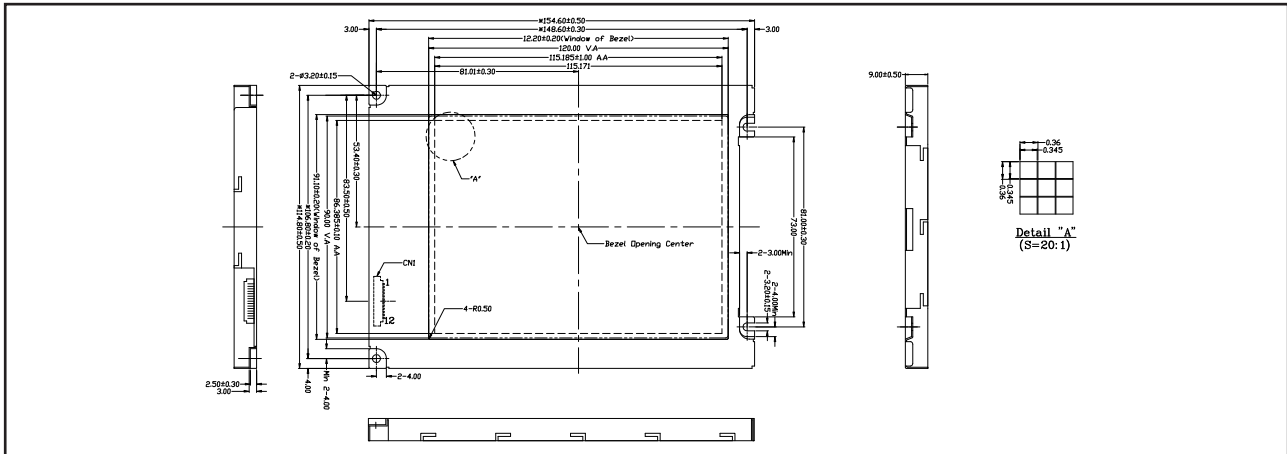


## STANDARD TAB MODULES

### YMS 320240-68

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x T)	154.6 x 114.8 x 9.0	mm
Viewing Area (W x H)	120.0 x 90.0	mm
Number of Dots	320 x 240	dots
Dot Pitch (W x H)	0.36 x 0.36	mm
Dot Size (W x H)	0.345 x 0.345	mm

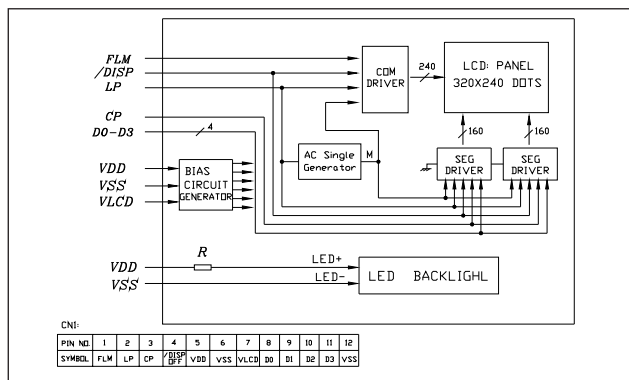
#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage 1	$V_{DD}$	-0.3	7.0	V
Supply Voltage 2: $V_{OL}$ , $V_{OR}$	$V_0$	-0.3	40.0	V
Supply Voltage 2: $V_{12L}$ , $V_{12R}$	$V_{12}$	-0.3	$V_0 + 0.3$	V
Supply Voltage 2: $V_{34L}$ , $V_{34R}$	$V_{34}$	-0.3	$V_0 + 0.3$	V
Supply Voltage 2: $V_{5L}$ , $V_{5R}$	$V_5$	-0.3	$V_0 + 0.3$	V
Input Voltage: $D_{i1}$ , $D_{i7}$ , XCL, LPFR, MD, S/C, $E_{i01}$ , $E_{i02}$ , /DISPOFF, TEST <sub>1</sub> , TEST <sub>2</sub>	$V_i$	-0.3	$V_{DD} + 0.3$	V
Operating Temperature		See page 8		
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	FLM	Scan Start-Up Signal
2	LP	Input Data Latch Signal
3	CP	Data Input Clock Signal
4	/DOSPOFF	Display Control Signal
5	$V_{DD}$	Power Supply for Logic
6	$V_{SS}$	Ground
7	$V_{LCD}$	Power Supply for LCD Drive
8	$D_0$	Display Data Signal
9	$D_1$	Display Data Signal
10	$D_2$	Display Data Signal
11	$D_3$	Display Data Signal
12	$V_{SS}$	Ground

#### BLOCK DIAGRAM



#### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	$V_f$	$I_f = 300\text{mA}$	2.9	3.2	3.5	V
Forward Current	$I_f$			300	375	mA
Power Dissipation	$P_d$	$I_f = 300\text{mA}$			1.3125	W
Reverse Voltage	$V_r$				5.0	V
Reverse Current	$I_r$	$V_r = 5.0\text{V}$			1.5	mA
Luminous Intensity	$L_v$	$I_f = 300\text{mA}$	1000			cd/m <sup>2</sup>
Luminous Uniformity	$\Delta L_v$	$I_f = 300\text{mA}$	70			%
Chromaticity Coordinate	X	$I_f = 15\text{mA}$ each chip	0.27		0.32	
	Y		0.27		0.32	

Note (1): Operating Temperature Range  $T_{opr}$   $-20^\circ\text{C}$  to  $+70^\circ\text{C}$ ; Storage Temperature Range  $T_{stg}$   $-30^\circ\text{C}$  to  $+80^\circ\text{C}$ . Color: White. A Backlight is a kind of current device, it must connect a resistance for limiting current or it will be damaged.

#### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage (Logic)	$V_{DD} - V_{SS}$			5.0		V
LCD Operating Voltage	$V_{LCD}$	$T_a = +25^\circ\text{C}$		20.0		V
Response Time	$T_{ON}$			220		ms
	$T_{OFF}$			164		
Contrast	CR		2.0			
Viewing Angle	12H	$\theta_1$	CR $\geq 2.0$	42	Deg.	
	6H	$\theta_2$		55		
	3H	$\theta_3$		50		
	9H	$\theta_4$		50		

Note (2): Value is high reliability type.

Note (3): Electro-Optical Characteristics: See page 5.

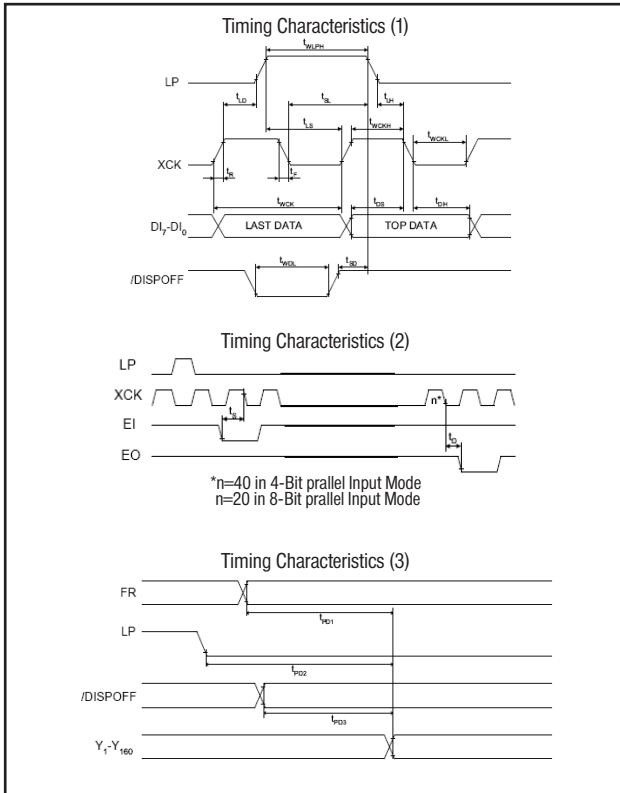


## STANDARD TAB MODULES

### YMS 320240-68

320 X 240 DOTS, 1/240 DUTY, 1/13 BIAS

#### AC CHARACTERISTICS, IST3225



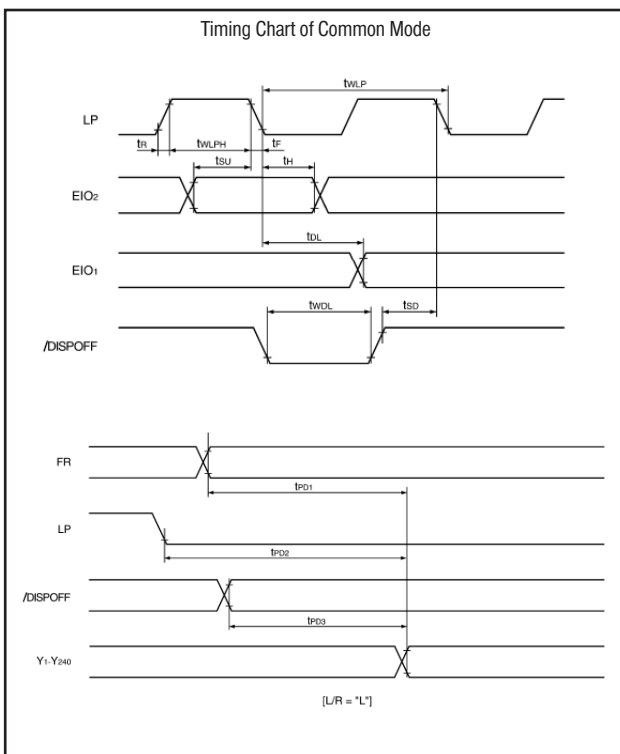
#### SEGMENT MODE

$V_{SS}=V_5=0V$ ,  $V_{DD}=2.5$  to  $5.5V$ ,  $V_0=10$  to  $40V$ ,  $T_{OPR}=-30^{\circ}C$  to  $+85^{\circ}C$ .

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WCK}$	125			ns	$t_r, t_f \leq 11ns$ Note 1
Shift Clock „H“ Pulse Width	$t_{WCKH}$	51			ns	
Shift Clock „L“ Pulse Width	$t_{WCKL}$	51			ns	
Data Setup Time	$t_{DS}$	30			ns	
Data Hole Time	$t_{DH}$	40			ns	
Latch Pulse „H“ Pulse Width	$t_{WLP}$	51			ns	
Shift Clock Rise to Latch Pulse Rise Time	$t_{LD}$	0			ns	
Shift Clock Fall to Latch Pulse Fall Time	$t_{SL}$	51			ns	
Latch Pulse Rise to Shift Clock Rise Time	$t_{LS}$	51			ns	
Latch Pulse Fall to Shift Clock Fall Time	$t_{LH}$	51			ns	
Input Signal Rise Time	$t_r$	36			ns	Note 2
Input Signal Fall Time	$t_f$			50	ns	Note 2
Enable Setup Time	$t_S$			50	ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			78	ns	$C_L=15pF$
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu.s$	$C_L=15pF$
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu.s$	$C_L=15pF$

Note (1): Takes the cascade connection into consideration. Note (2): ( $t_{WCK}-(t_{WCKH}-(t_{WCKL})/2$ ) is maximum in the case of high speed operation.

#### AC CHARACTERISTICS, IST3226



#### COMMON MODE

$V_{SS}=V_5=0V$ ,  $V_{DD}=2.5$  to  $5.5V$ ,  $V_0=10$  to  $40V$ ,  $T_{OPR}=-30^{\circ}C$  to  $+85^{\circ}C$ .

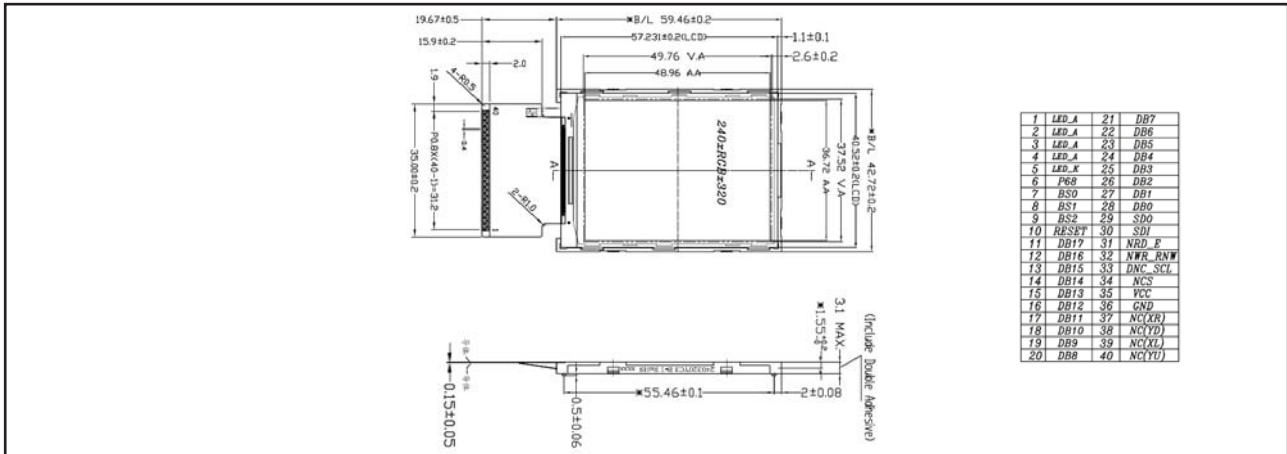
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Shift Clock Period	$t_{WLP}$	250			ns	$t_r, t_f \leq 20ns$ Note 1
Shift Clock „H“ Pulse Width	$t_{WLP}$	15			ns	$V_{DD}=+5.0V$ $\pm 10\%$
		30			ns	$V_{DD}=+2.5$ $\sim +4.5V$
Data Setup Time	$t_{SU}$	30			ns	
Data Hole Time	$t_H$	50			ns	
Input Signal Rise Time	$t_r$			50	ns	
Input Signal Fall Time	$t_f$			50	ns	
/DISPOFF Removal Time	$t_{SD}$	100			ns	
/DISPOFF Enable Pulse Width	$t_{WDL}$	1.2			ns	
Output Delay Time (1)	$t_D$			200	ns	$C_L=15pF$
Output Delay Time (2)	$t_{pd1}, t_{pd2}$			1.2	$\mu.s$	$C_L=15pF$
Output Delay Time (3)	$t_{pd3}$			1.2	$\mu.s$	$C_L=15pF$

# TFT TRANSMISSIVE LCD MODULES

## YTS 240DLAC-03-100N

2.4", 240 X 320 DOTS, 1/320 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	42.72 x 59.46 x 3.1	mm
Active Area (W x H)	36.72 x 48.96	mm
Viewing Direction	6:00	o'clock
Number of Dots	240 (RGB) x 320	dots
Colors	262K	

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage 1	IOV <sub>CC</sub>	-0.3	4.6	V
Supply Voltage 2	V <sub>Cl</sub>	-0.3	4.6	V
Supply Voltage 3	DDV <sub>DH</sub>	-0.3	9.0	V
Supply Voltage 4	V <sub>CL</sub>	-4.6	0.3	V
Supply Voltage 5	V <sub>GH</sub>	-0.3	18.5	V
Supply Voltage 6	V <sub>GL</sub>	-18.5	0.3	V
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>Cl</sub> +0.3	V
Operating Temperature		See page 8		
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-4	LED_A	Backlight LED Power
5	LED_K	Backlight LED Power
6	P <sub>68</sub>	Select the MPU Interface Mode
7	BS <sub>0</sub>	Select the MPU Interface Mode
8	BS <sub>1</sub>	Select the MPU Interface Mode
9	BS <sub>2</sub>	Select the MPU Interface Mode
10	RESET	Reset Pin
11-28	DB <sub>17</sub> -DB <sub>0</sub>	Data Bus
29	SD <sub>0</sub>	Serial Data Output
30	SD <sub>1</sub>	Serial Data Input Pin
31	NRD_E	I80 System: Serves as a Read Signal and Read Data at the Low Level. M68 System: 0 - Read/Write Disable; 1 - Read/Write Enable. Fix it to IOV <sub>CC</sub> or V <sub>SSD</sub> Level when Using Serial Buss Interface.
32	NWR_RNW	I80 System: Serves as a Write Signal and Write Data at the Rising Edge. M68 System: 0 - Write; 1 - Read. Fix it to IOV <sub>CC</sub> or V <sub>SSD</sub> Level when Using Serial Buss Interface.
33	DNC_SCL	The Signal for Command or Parameter Select under Parallel Mode (i.e. Not Serial Interface). When under Serial Interface, it serves as SCL.
34	NCS	Chip Select Signal
35	V <sub>CC</sub>	Power Supply
36	GND	Ground
37-40	NC	No Connection

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta = +25°C		-8.0		V
TFT Common Electrode Voltage	V <sub>comH</sub> V <sub>comL</sub>		2.5 -2.0		4.5 0	V

Note (1): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.  
 Note (2): V<sub>GH</sub> is TFT gate operating voltage.  
 Note (3): V<sub>GL</sub> is TFT gate operating voltage. The storage capacitance structure of this products is C<sub>st</sub> (Storage on Common).  
 The low voltage level of V<sub>GL</sub> signal must be fluctuated with same phase as V<sub>com</sub>, in case of Storage on Gate structure.  
 Note (4): Environmental condition: 25°C±5°C.  
 Note (5): Operating Voltage V<sub>CC</sub>=3.3V

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> =20mA		9.6		V
Reverse Current	I <sub>r</sub>	V <sub>r</sub> =5.0V		20		μA
Luminance	L <sub>v</sub>	I <sub>f</sub> =20mA	2900	3200		cd/m <sup>2</sup>
Average	Avg	- Aperture: 1°, 9 Point.	80			%
Colour Coordinate	X	- The Measurement Instrument is BM-7.	0.26		0.31	
	Y	- Average=min. / max. *100%	0.26		0.31	

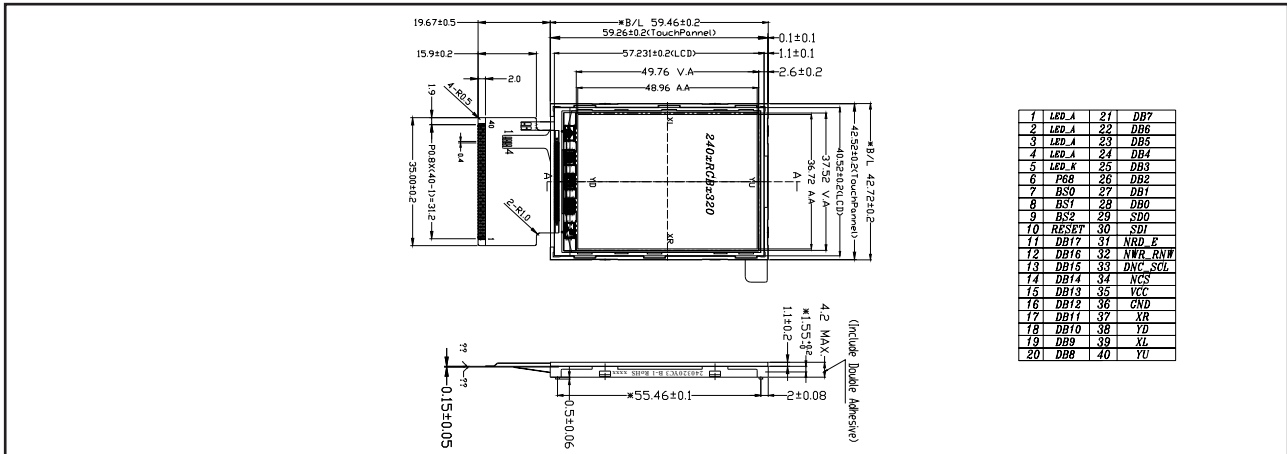


## TFT TRANSMISSIVE LCD MODULES

### YTS 240DLAC-03-100T

2.4", 240 X 320 DOTS, 1/320 DUTY

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	42.72 x 59.46 x 4.2	mm
Active Area (W x H)	36.72 x 48.96	mm
Viewing Direction	6:00	o'clock
Number of Dots	240 (RGB) x 320	dots
Colors	262K	

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage 1	IOV <sub>CC</sub>	-0.3	4.6	V
Supply Voltage 2	V <sub>Cl</sub>	-0.3	4.6	V
Supply Voltage 3	DDV <sub>DH</sub>	-0.3	9.0	V
Supply Voltage 4	V <sub>CL</sub>	-4.6	0.3	V
Supply Voltage 5	V <sub>GH</sub>	-0.3	18.5	V
Supply Voltage 6	V <sub>GL</sub>	-18.5	0.3	V
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>Cl</sub> +0.3	V
Operating Temperature		See page 8		
Storage Temperature				

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-4	LED_A	Backlight LED Power
5	LED_K	Backlight LED Power
6	P <sub>68</sub>	Select the MPU Interface Mode
7	BS <sub>0</sub>	Select the MPU Interface Mode
8	BS <sub>1</sub>	Select the MPU Interface Mode
9	BS <sub>2</sub>	Select the MPU Interface Mode
10	RESET	Reset Pin
11-28	DB <sub>17</sub> -DB <sub>0</sub>	Data Bus
29	SD <sub>0</sub>	Serial Data Output
30	SD <sub>1</sub>	Serial Data Input Pin
31	NRD_E	I80 System: Serves as a Read Signal and Read Data at the Low Level. M68 System: 0 - Read/Write Disable; 1 - Read/Write Enable. Fix it to IOV <sub>CC</sub> or V <sub>SS0</sub> Level when Using Serial Buss Interface.
32	NWR_RNW	I80 System: Serves as a Write Signal and Write Data at the Rising Edge. M68 System: 0 - Write; 1 - Read. Fix it to IOV <sub>CC</sub> or V <sub>SS0</sub> Level when Using Serial Buss Interface.
33	DNC_SCL	The Signal for Command or Parameter Select under Parallel Mode (i.e. Not Serial Interface). When under Serial Interface, it servers as SCL.
34	NCS	Chip Select Signal
35	V <sub>CC</sub>	Power Supply
36	GND	Ground
37	XR	The Pin of Touch Panel
38	YD	The Pin of Touch Panel
39	XL	The Pin of Touch Panel
40	YU	The Pin of Touch Panel

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta = +25°C		-8.0		V
TFT Common Electrode Voltage	V <sub>comH</sub> V <sub>comL</sub>		2.5 -2.0		4.5 0	V

Note (1): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.  
 Note (2): V<sub>GH</sub> is TFT gate operating voltage.  
 Note (3): V<sub>GL</sub> is TFT gate operating voltage. The storage capacitance structure of this products is C<sub>st</sub> (Storage on Common).  
 The low voltage level of V<sub>GL</sub> signal must be fluctuated with same phase as V<sub>com</sub>, in case of Storage on Gate structure.  
 Note (4): Environmental condition: 25°C±5°C.  
 Note (5): Operating Voltage V<sub>CC</sub>=3.3V

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

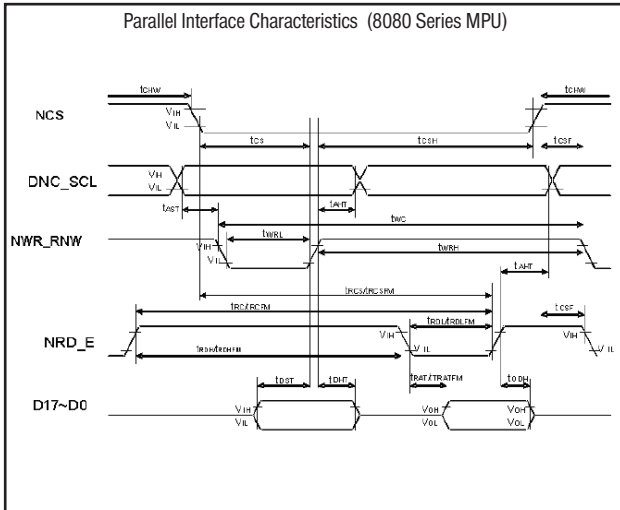
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> =20mA		9.6		V
Reverse Current	I <sub>r</sub>	V <sub>r</sub> =-5.0V		20		μA
Luminance	L <sub>v</sub>	I <sub>f</sub> =20mA	2900	3200		cd/m <sup>2</sup>
Average	Avg	- Aperture: 1°, 9 Point.	80			%
Colour Coordinate	X	- The Measurement Instrument is BM-7.	0.26		0.31	
	Y	- Average=min. / max. *100%	0.26		0.31	

## TFT TRANSMISSIVE LCD MODULES YTS 240DLAC-03-100T

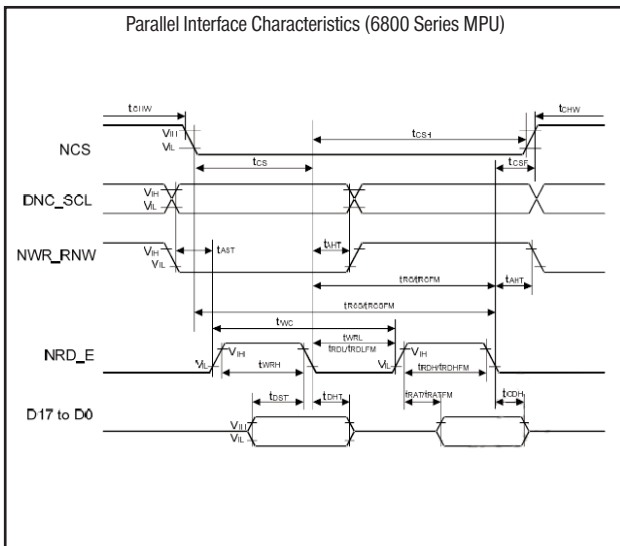
2.4", 240 X 320 DOTS, 1/320 DUTY

### INTERFACE TIMING CHARACTERISTICS

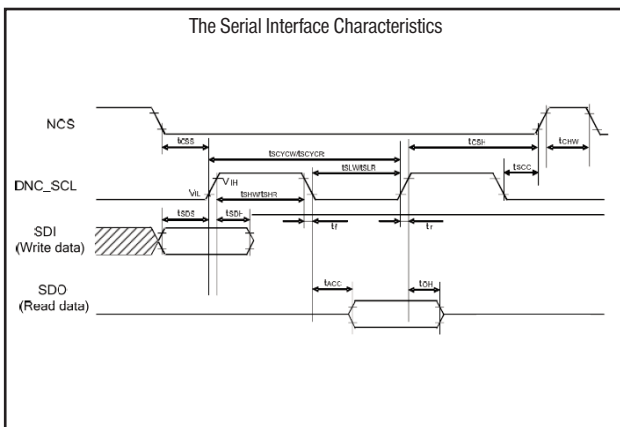
$V_{SSA}=0V, IOCC=1.65V \text{ to } 2.9V, VCI=2.3V \text{ to } 2.9V, T_a=-30^{\circ}C \text{ to } 70^{\circ}C$



Note (1): The input signal rise time and fall time ( $t_r, t_f$ ) is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of  $IOV_{CC}$  for input signals.



Note (2): The input signal rise time and fall time ( $t_r, t_f$ ) is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of  $IOV_{CC}$  for input signals.



Note (2): The input signal rise time and fall time ( $t_r, t_f$ ) is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of  $IOV_{CC}$  for input signals.

PARAMETER	SIGNAL	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Address Hold Time	DNC_SCL	$t_{AHT}$	Write/Read	10		ns
Address Setup Time		$t_{AST}$		10		ns
Chip Select „H“ Pulse Width	NCS	$t_{CHW}$		0		ns
Chip Select Setup Time (Write)		$t_{CS}$		35		ns
Chip Select Setup Time		$t_{RCFSM}$		355		ns
Chip Select Wait Time (Write/Read)		$t_{CSF}$		10		ns
Chip Select Hold Time	NWR_RNW	$t_{CSH}$		10		ns
Write Cycle		$t_{WC}$		100		ns
Control Pulse „H“ Duration	NRD_E	$t_{WRH}$		35		ns
Control Pulse „L“ Duration		$t_{WRL}$		35		ns
Read Cycle	NRD_E	$t_{RCFM}$	When read from GRAM	450		ns
Control Pulse „H“ Duration		$t_{RDHF}$		90		ns
Control Pulse „L“ Duration		$t_{RDLF}$		355		ns
Data Setup Time	D <sub>17</sub> to D <sub>0</sub>	$t_{DST}$	for max. $C_L=30$ pF for min. $C_L=8$ pF	15		ns
Data Hold Time		$t_{DHT}$		10		ns
Read Access Time		$t_{RATFM}$			340	ns
Output Disable Time		$t_{ODH}$		20	80	ns

PARAMETER	SIGNAL	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Address Hold Time	DNC_SCL	$t_{AHT}$	Write/Read	10		ns
Address Setup Time		$t_{AST}$		10		ns
Chip Select „H“ Pulse Width	NCS	$t_{CHW}$		0		ns
Chip Select Setup Time (Write)		$t_{CS}$		35		ns
Chip Select Setup Time		$t_{RCFSM}$		355		ns
Chip Select Wait Time (Write/Read)		$t_{CSF}$		10		ns
Chip Select Hold Time	NWR_RNW	$t_{CSH}$		10		ns
Write Cycle		$t_{WC}$		100		ns
Control Pulse „H“ Duration	NRD_E	$t_{WRH}$		35		ns
Control Pulse „L“ Duration		$t_{WRL}$		35		ns
Read Cycle	NRD_E	$t_{RCFM}$	When read from GRAM	450		ns
Control Pulse „H“ Duration		$t_{RDHF}$		90		ns
Control Pulse „L“ Duration		$t_{RDLF}$		355		ns
Data Setup Time	D <sub>17</sub> to D <sub>0</sub>	$t_{DST}$	for max. $C_L=30$ pF for min. $C_L=8$ pF	10		ns
Data Hold Time		$t_{DHT}$		10		ns
Read Access Time (ID)		$t_{RAT}$			100	ns
Read Access Time (FM)		$t_{RATFM}$			340	ns
Output Disable Time		$t_{ODH}$		20	80	ns

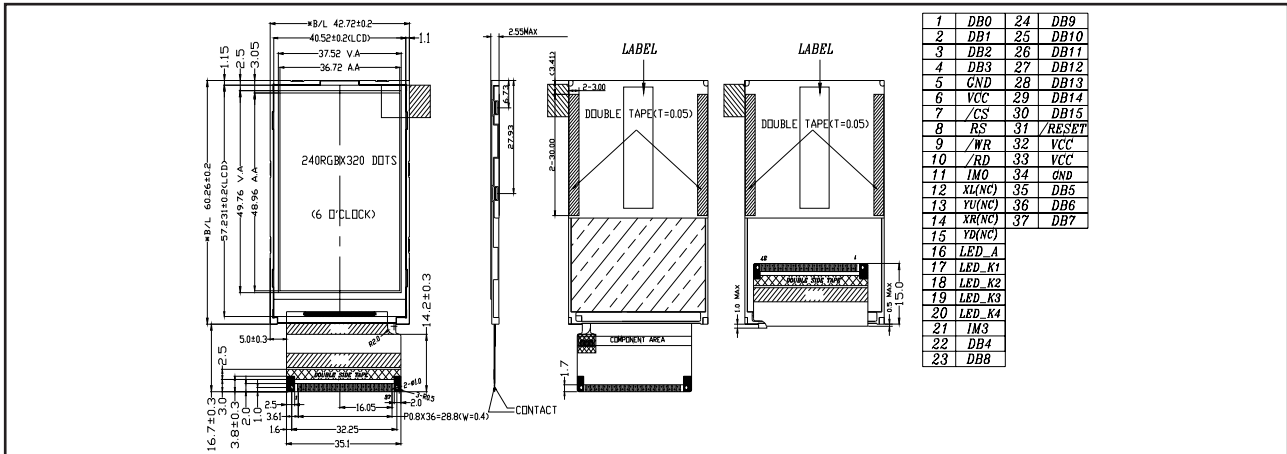
PARAMETER	SIGNAL	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Serial Clock Cycle (Write)	DNC_SCL	$t_{SCYW}$		100		ns
DNC_SCL „H“ Pulse Width (Write)		$t_{SHW}$		35		ns
DNC_SCL „L“ Pulse Width (Write)		$t_{SLW}$		35		ns
Data Setup Time (Write)	SDI	$t_{SDS}$		30		ns
Data Hold Time (Write)		$t_{SDH}$		30		ns
Serial Clock Cycle (Read)	DNC_SCL	$t_{SCYR}$		150		ns
DNC_SCL „H“ Pulse Width (Read)		$t_{SHR}$		60		ns
DNC_SCL „L“ Pulse Width (Read)		$t_{SLR}$		60		ns
Access Time		$t_{ACC}$	SD <sub>0</sub> for max. $C_L=30$ pF for min. $C_L=8$ pF	45	100	ns
Output Disable Time		$t_{OH}$		15	100	ns
DNC_SCL to Chip Select	DNC_SCL, NCS	$t_{SCC}$		15		ns
NCS „H“ Pulse Width	NCS	$t_{CHW}$		45		ns
Chip Select Setup Time		$t_{CSS}$		60		ns
Chip Select Hold Time		$t_{CSH}$		65		ns

# TFT TRANSMISSIVE LCD MODULES

## YTS 240DLAG-01-102N

2.4", 240 X 320 DOTS, 1/320 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	42.72 x 60.26 x 2.55	mm
Active Area (W x H)	36.72 x 48.96	mm
Viewing Direction	6:00	o'clock
Number of Dots	240 (RGB) x 320	dots
Colors	262K	

Note (1): GND must be maintained. High  $V_{CI} \geq$  GND (Low), (High)  $IOV_{CC} \geq$  GND (Low). Make sure (High):  $V_{CI} \geq$  GND (Low);  $DDV_{DH} \geq$  GND (Low);  $DDV_{DH} \geq V_{CL}$  (Low);  $V_{GH} \geq$  GND (Low);  $GND \geq V_{GL}$  (Low);

### ABSOLUTE MAXIMUM RATINGS

\*Note 1

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage (Digital)	$IOV_{CC-GND}$	-0.3	4.6	V
Supply Voltage (Analog)	$V_{CI-GND}$	-0.3	4.6	V
Driver Supply Voltage Range	$DDV_{DH-GND}$	-0.3	6.0	V
	$V_{COMH-V_{COML}}$	-0.3	6.0	V
	$GND-V_{CL}$	-0.3	4.6	V
	$DDV_{DH-V_{CL}}$	-0.3	9.0	V
	$V_{GH-V_{GL}}$	-0.3	30.0	V
Input Voltage	$V_I$	-0.3	$IOV_{CC}+0.3$	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-4	DB17-DB0	Data Bus
5	GND	Ground
6	$V_{CC}$	Power Supply
7	/CS	Chip Select Signal
8	RS	Register Select Signal
9	/WR	Write Strobe Signal and Enables an Operation to Write Data when the Signal is low.
10	/RD	
11	IMO	Select the MPU System Interface Mode.
12-15	XL, YU, XR, YD (NC)	No Connection
16	LED_A	LED Backlight
17	LED_K1	LED Backlight
18	LED_K2	LED Backlight
19	LED_K3	LED Backlight
20	LED_K4	LED Backlight
21	IM3	Select the MPU System Interface Mode
22	DB4	Data Bus
23-30	DB8-DB15	Data Bus
31	RESET	Reset Pin
32-33	$V_{CC}$	Power Supply
34	GND	Ground
35	DB5	Data Bus
36	DB6	Data Bus
37	DB7	Data Bus

### ELECTRICAL CHARACTERISTICS, $T_a = 25^\circ\text{C}$

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	$V_{GH}$			15.0		V
TFT Gate OFF Voltage	$V_{GL}$	$T_a = +25^\circ\text{C}$		-8.0		V
TFT Common Electrode Voltage	$V_{COMH}$ $V_{COML}$		2.5 -2.0		4.5 0	V

Note (2):  $V_{COM}$  must be adjusted to optimize display quality: cross talk, contrast ratio and etc.

Note (3):  $V_{GH}$  is TFT gate operating voltage.

Note (4):  $V_{GL}$  is TFT gate operating voltage. The storage capacitance structure of this products is  $C_{ST}$  (Storage on Common).

The low voltage level of  $V_{GL}$  signal must be fluctuated with same phase as  $V_{COM}$ , in case of Storage on Gate structure.

Note (5): Environmental condition:  $25^\circ\text{C} \pm 5^\circ\text{C}$ .

Note (6): Operating Voltage  $V_{CC} = 2.8\text{V}$

### BACKLIGHTING CHARACTERISTICS, $T_a = 25^\circ\text{C}$ , LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	$V_f$	$I_f = 60\text{mA}$	2.9	3.2	3.4	V
Reverse Current	$I_r$	$V_f = 5.0\text{V}$			50	$\mu\text{A}$
Luminance	$L_v$	$I_f = 60\text{mA}$	3500	3800		$\text{cd/m}^2$
Average	Avg		80			%
Colour Coordinate	X		0.24		0.30	
	Y		0.24		0.30	

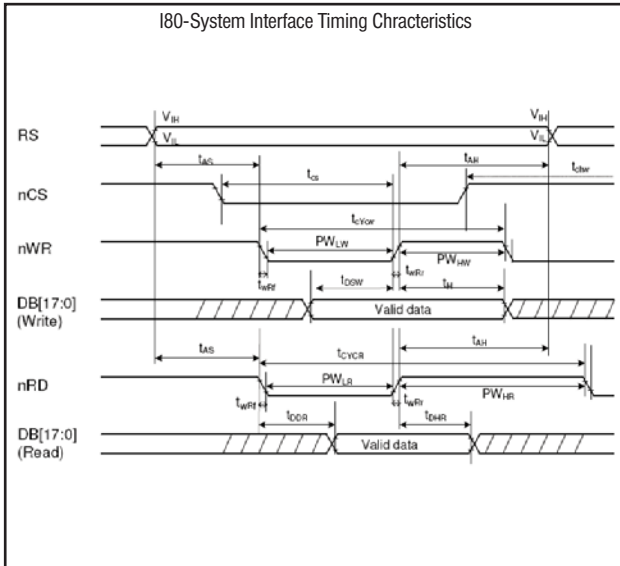
# TFT TRANSMISSIVE LCD MODULES

## YTS 240DLAG-01-102N

2.4", 240 X 320 DOTS, 1/320 DUTY

### INTERFACE TIMING CHARACTERISTICS

Normal Write Mode IOV<sub>CC</sub>=1.65V to 3.3V



PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Bus Cycle Time	Write	t <sub>CYCW</sub>	80		ns
	Read	t <sub>CYCR</sub>	300		ns
Write Low Level Pulse Width	PW <sub>LW</sub>		50		ns
Write High Level Pulse Width	PW <sub>HW</sub>		15		ns
Read Low Level Pulse Width	PW <sub>LR</sub>		150		ns
Read High Level Pulse Width	PW <sub>HR</sub>		150		ns
Write / Read Rise/Fall Time	t <sub>WR</sub> /t <sub>WRf</sub>			25	ns
Setup Time	Write	t <sub>AS</sub>	RS to nCS, E/nWR	10	ns
	Read	t <sub>AS</sub>	RS to nCS, RW/nRD	5	ns
Address Hold Time	t <sub>AH</sub>		5		ns
Write Data Setup Time	t <sub>DSW</sub>		10		ns
Write Data Hold Time	t <sub>H</sub>		15		ns
Read Data Delay Time	t <sub>DDR</sub>			100	ns
Read Data Hold Time	t <sub>DHR</sub>		20	100	ns

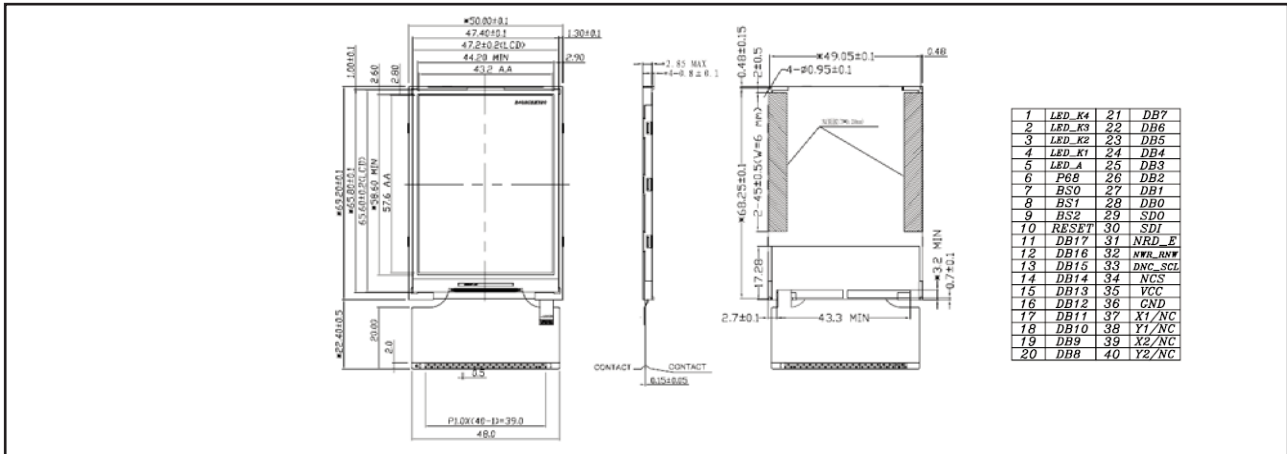


# TFT TRANSMISSIVE LCD MODULES

## YTS 280DLAC-03-200N

2.8", 240 X 320 DOTS, 1/320 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	50.0 x 69.20 x 2.85	mm
Active Area (W x H)	44.20 x 58.60	mm
Viewing Direction	6:00	o'clock
Number of Dots	240 (RGB) x 320	dots
Colors	262K	
Surface Brightness	160	cd/m <sup>2</sup>

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage 1	IOV <sub>CC</sub>	-0.3	4.6	V
Supply Voltage 2	V <sub>Cl</sub>	-0.3	4.6	V
Supply Voltage 3	DDV <sub>DH</sub>	-0.3	9.0	V
Supply Voltage 4	V <sub>CL</sub>	-4.6	0.3	V
Supply Voltage 5	V <sub>GH</sub>	-0.3	18.5	V
Supply Voltage 6	V <sub>GL</sub>	-18.5	0.3	V
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>Cl</sub> + 0.3	V
Operating Temperature		See page 8		
Storage Temperature				

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	LED_K4	Backlight LED Power
2	LED_K3	
3	LED_K2	
4	LED_K1	
5	LED_A	
6	P68	Select the MPU Interface Mode
7	BS0	Select the MPU Interface Mode
8	BS1	Select the MPU Interface Mode
9	BS2	Select the MPU Interface Mode
10	RESET	Reset Pin
11-28	DB17-DB0	Data Bus
29	SD0	Serial Data Output. If not use, let it to open.
30	SD1	Serial Data Input Pin
31	NRD_E	I80 System: Serves as a Read Signal and Read Data at the Low Level. M68 System: 0 - Read/Write Disable; 1 - Read/Write Enable. Fix it to IOV <sub>CC</sub> or V <sub>SSD</sub> Level when Using Serial Buss Interface.
32	NWR_RNW	I80 System: Serves as a Write Signal and Write Data at the Rising Edge. M68 System: 0 - Write; 1 - Read. Fix it to IOV <sub>CC</sub> or V <sub>SSD</sub> Level when Using Serial Buss Interface.
33	DNC_SCL	The Signal for Command or Parameter Select under Parallel Mode
34	NCS	Chip Select Signal
35	VCC	Power Supply
36	GND	Ground
37-40	X1/NC, Y1/NC, X2/NC, Y2/NC	No Connection

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta = +25°C		-8.0		V
TFT Common Electrode Voltage	V <sub>comH</sub> V <sub>comL</sub>		2.5 -2.0		4.5 0	V

Note (1): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.  
 Note (2): V<sub>GH</sub> is TFT gate operating voltage.  
 Note (3): V<sub>GL</sub> is TFT gate operating voltage. The storage capacitance structure of this products is C<sub>st</sub> (Storage on Common).  
 The low voltage level of V<sub>GL</sub> signal must be fluctuated with same phase as V<sub>com</sub>, in case of Storage on Gate structure.  
 Note (4): Environmental condition: 25°C ± 5°C.  
 Note (5): Operating Voltage V<sub>CC</sub> = 3.3V

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	V <sub>DD</sub> - V <sub>SS</sub>		3.0		3.4	V
Supply Current	I <sub>DD</sub>	fixed		60		μA
Luminance	L <sub>v</sub>		3000		5000	cd/m <sup>2</sup>
Average	Avg		80			%
Colour Coordinate	X		0.26		0.31	
	Y		0.26		0.31	

Note (6): Operating temperature -20°C to +70°C; Storage temperature -30°C to +80°C.  
 Note (7): LED - 4 pcs.



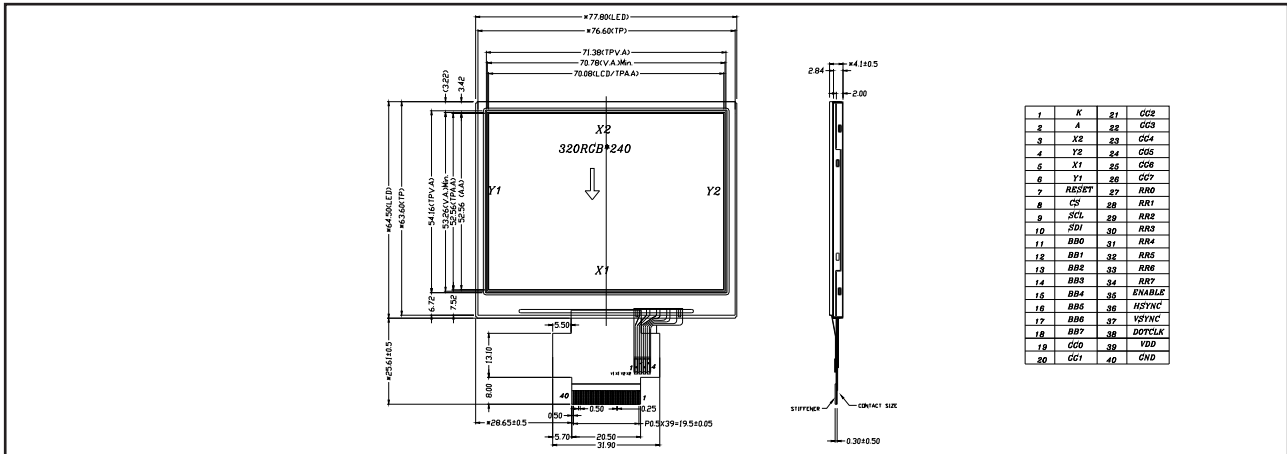


## TFT TRANSMISSIVE LCD MODULES

### YTS 350ELAK-01-100T

3.5", 320 X 240 DOTS, 1/240 DUTY

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	77.80 x 64.50 x 4.1	mm
Active Area (W x H)	70.08 x 52.56	mm
Viewing Direction	12:00	o'clock
Number of Dots	320 (RGB) x 240	dots
Colors	16M	

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V <sub>DD</sub>	-0.3	2.7	V
	V <sub>DDIO</sub>	-0.3	4.0	V
Input Voltage	V <sub>CI</sub>	V <sub>SS</sub> -0.3	5.0	V
Operating Temperature		See page 8		
Storage Temperature				

Note (1): Current Drain per Pin excluding VDD and VSS: 25mA typical.

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	LED_K	LED Backlight
2	LED_A	
3	X <sub>2</sub>	The Pin of Touch Panel
4	Y <sub>2</sub>	
5	X <sub>1</sub>	
6	Y <sub>1</sub>	
7	RESET	Reset Pin
8	CS	Chip Select Pin
9	SCL	Clock Pin of Serial Mode
10	SDI	Data Input Pin in Serial Mode
11-18	BB <sub>0</sub> -BB <sub>7</sub>	Blue Data
19-26	GG <sub>0</sub> -GG <sub>7</sub>	Green Data
27-34	RR <sub>0</sub> -RR <sub>7</sub>	Red Data
35	ENABLE	Display Enable Pin from Controller
36	HSYNC	Line Synchronization Signal
37	VSYNC	Frame Synchronization Signal
38	DOTCLK	Dot-Clock Signal and Oscillator Source
39	V <sub>DD</sub>	Power Supply
40	GND	Ground

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta=+25°C		-10.0		V
TFT Common Electrode Voltage	V <sub>comH</sub> V <sub>comL</sub>		2.5 -2.0	(3.6) (-2.4)	4.5 0	V

Note (2): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.

Note (3): V<sub>GH</sub> is TFT gate operating voltage.

Note (4): V<sub>GL</sub> is TFT gate operating voltage. The storage capacitance structure of this products is C<sub>st</sub> (Storage on Common).

The low voltage level of V<sub>GL</sub> signal must be fluctuated with same phase as V<sub>com</sub> in case of Storage on Gate structure.

Note (5): Environmental condition: 25°C±5°C.

Note (6): Operating Voltage V<sub>CC</sub>=3.3V

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

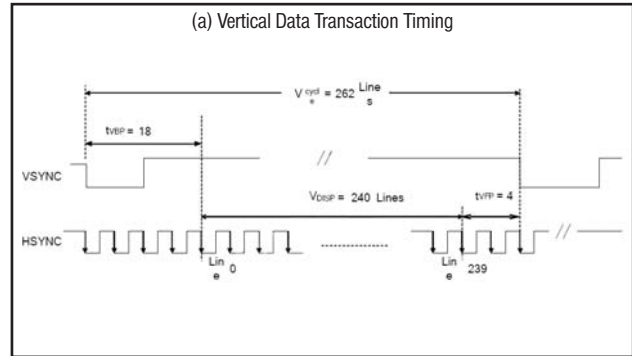
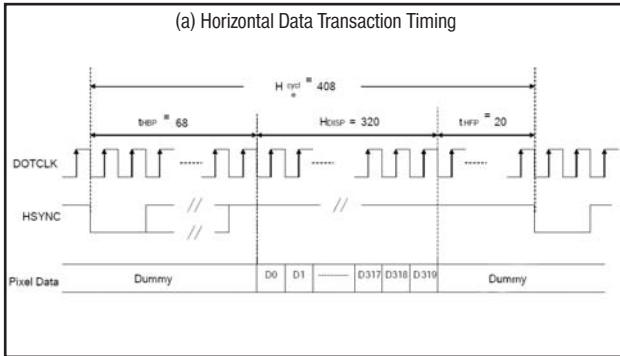
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> =20*2mA	9.0	10.2	10.8	V
Forward Current	I <sub>f</sub>			20*2		mA
Power Dissipation	P <sub>d</sub>	I <sub>f</sub> =20*2mA		0.384		W
Reverse Voltage	V <sub>r</sub>				3.0	V
Reverse Current	I <sub>r</sub>					mA
Luminous Intensity	L <sub>v</sub>	I <sub>f</sub> =20*2mA	6000			cd/m <sup>2</sup>
Luminous Uniformity	ΔL <sub>v</sub>		75	80		%
Chromaticity Coordinate	X	I <sub>f</sub> =15mA, Ta=25°C each chip	0.27		0.33	
	Y		0.27		0.33	

Note (7): Operating temperature range T<sub>opr</sub> -30°C to +70°C; Storage temperature range T<sub>sty</sub> -40°C to +85°C.

## TFT TRANSMISSIVE LCD MODULES YTS 350ELAK-01-100T

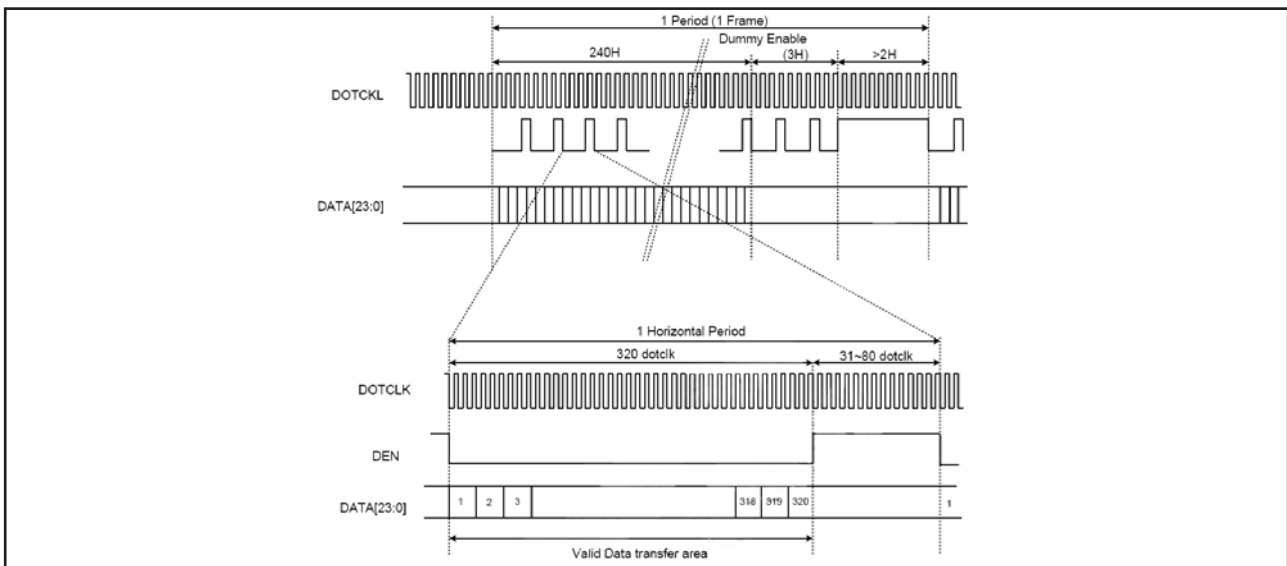
3.5", 320 X 240 DOTS, 1/240 DUTY

### TIMING OF POWER SUPPLY: DATA TRANSACTION TIMING IN PARALLEL RGB (24 BIT) INTERFACE (SYNC MODE)



PARAMETER	SYMBOL	MIN.		TYP.		MAX.		UNIT
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	$f_{\text{DOTCLK}}$			6.5	19.5	10	30	MHz
DOTCLK Period		100	33.3	154	51.3			ns
Horizontal Frequency (Line)	$f_H$			14.9		22.35		kHz
Vertical Frequency (Refresh)	$f_V$			60		90		Hz
Horizontal Back Porch	$t_{\text{HBP}}$			68	204			$t_{\text{DOTCLK}}$
Horizontal Front Porch	$t_{\text{HFP}}$			20	60			$t_{\text{DOTCLK}}$
Horizontal Data Start Point	$t_{\text{HBP}}$			68	204			$t_{\text{DOTCLK}}$
Horizontal Blanking Period	$t_{\text{HBP}} + t_{\text{HFP}}$			88	264			$t_{\text{DOTCLK}}$
Horizontal Display Area	$H_{\text{DISP}}$			320	960			$t_{\text{DOTCLK}}$
Horizontal Cycle	$H_{\text{CYCLE}}$			408	1224	450	1350	$t_{\text{DOTCLK}}$
Vertical Back Porch	$t_{\text{VBP}}$			18				Lines
Vertical Front Porch	$t_{\text{VFP}}$			4				Lines
Vertical Data Start Point	$t_{\text{VBP}}$			18				Lines
Vertical Blanking Period	$t_{\text{VBP}} + t_{\text{VFP}}$			22				Lines
Vertical Display Area	NTSC	$V_{\text{DISP}}$		240				Lines
	PAL		280 (PALM=0)				Lines	
	PAL		288 (PALM=1)				Lines	
Vertical Cycle	NTSC	$V_{\text{CYCLE}}$		262		350		Lines
	PAL		313				Lines	

### SIGNAL TIMING IN DE MODE

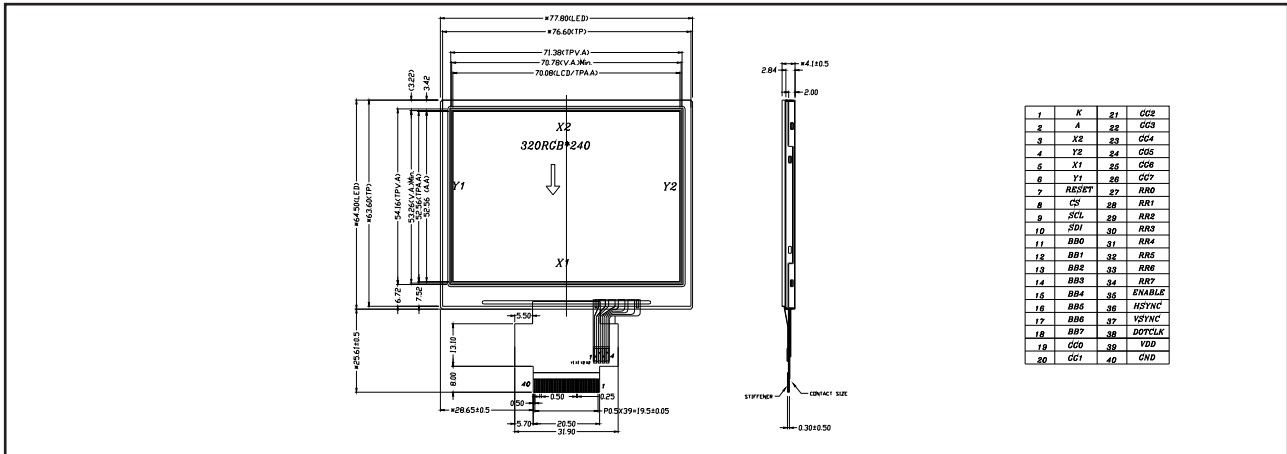


## TFT TRANSMISSIVE LCD MODULES

### YTS 350ELAK-01-100N

3.5", 320 X 240 DOTS, 1/240 DUTY

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	77.80 x 64.50 x 3.04	mm
Active Area (W x H)	70.08 x 52.56	mm
Viewing Direction	12:00	o'clock
Number of Dots	320 (RGB) x 240	dots
Colors	16M	

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V <sub>DD</sub>	-0.3	2.7	V
	V <sub>DDIO</sub>	-0.3	4.0	V
Input Voltage	V <sub>CI</sub>	V <sub>SS</sub> -0.3	5.0	V
Operating Temperature		See page 8		
Storage Temperature				

Note (1): Current Drain per Pin excluding VDD and VSS: 25mA typical.

#### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	LED_K	LED Backlight
2	LED_A	
3	X <sub>2</sub> /NC	No Connection
4	Y <sub>2</sub> /NC	
5	X <sub>1</sub> /NC	
6	Y <sub>1</sub> /NC	
7	RESET	Reset Pin
8	CS	Chip Select Pin
9	SCL	Clock Pin of Serial Mode
10	SDI	Data Input Pin in Serial Mode
11-18	BB <sub>0</sub> -BB <sub>7</sub>	Blue Data
19-26	GG <sub>0</sub> -GG <sub>7</sub>	Green Data
27-34	RR <sub>0</sub> -RR <sub>7</sub>	Red Data
35	ENABLE	Display Enable Pin from Controller
36	HSYNC	Line Synchronization Signal
37	VSYNC	Frame Synchronization Signal
38	DOTCLK	Dot-Clock Signal and Oscillator Source
39	V <sub>DD</sub>	Power Supply
40	GND	Ground

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta = +25°C		-10.0		V
TFT Common Electrode Voltage	V <sub>comH</sub>		2.5	(3.6)	4.5	V
	V <sub>comL</sub>		-2.0	(-2.4)	0	

Note (2): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.

Note (3): V<sub>GH</sub> is TFT gate operating voltage.

Note (4): V<sub>GL</sub> is TFT gate operating voltage. The storage capacitance structure of this products is C<sub>st</sub> (Storage on Common).

The low voltage level of V<sub>GL</sub> signal must be fluctuated with same phase as V<sub>com</sub>, in case of Storage on Gate structure.

Note (5): Environmental condition: 25°C ± 5°C.

Note (6): Operating Voltage V<sub>CC</sub> = 3.3V

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

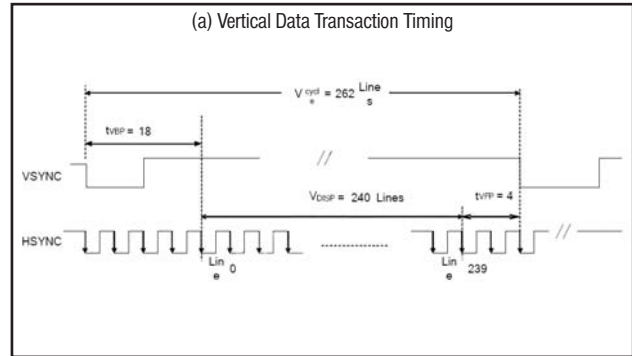
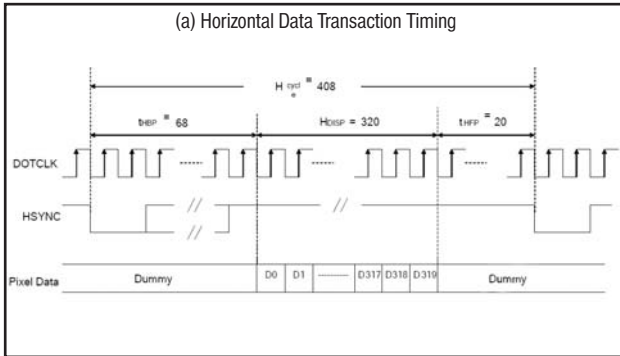
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>F</sub> = 20*2mA	9.0	10.2	10.8	V
Forward Current	I <sub>F</sub>		20*2			mA
Power Dissipation	P <sub>d</sub>	I <sub>F</sub> = 20*2mA	0.384			W
Reverse Voltage	V <sub>r</sub>				3.0	V
Reverse Current	I <sub>r</sub>					mA
Luminous Intensity	L <sub>v</sub>	I <sub>F</sub> = 20*2mA	6000			cd/m <sup>2</sup>
Luminous Uniformity	ΔL <sub>v</sub>		75	80		
Chromaticity Coordinate	X	I <sub>F</sub> = 20 mA, Ta = 25°C each chip	0.27		0.33	
	Y		0.27		0.33	

Note (7): Operating temperature range T<sub>opr</sub> -30°C to +70°C; Storage temperature range T<sub>sty</sub> -40°C to +85°C.

## TFT TRANSMISSIVE LCD MODULES YTS 350ELAK-01-100N

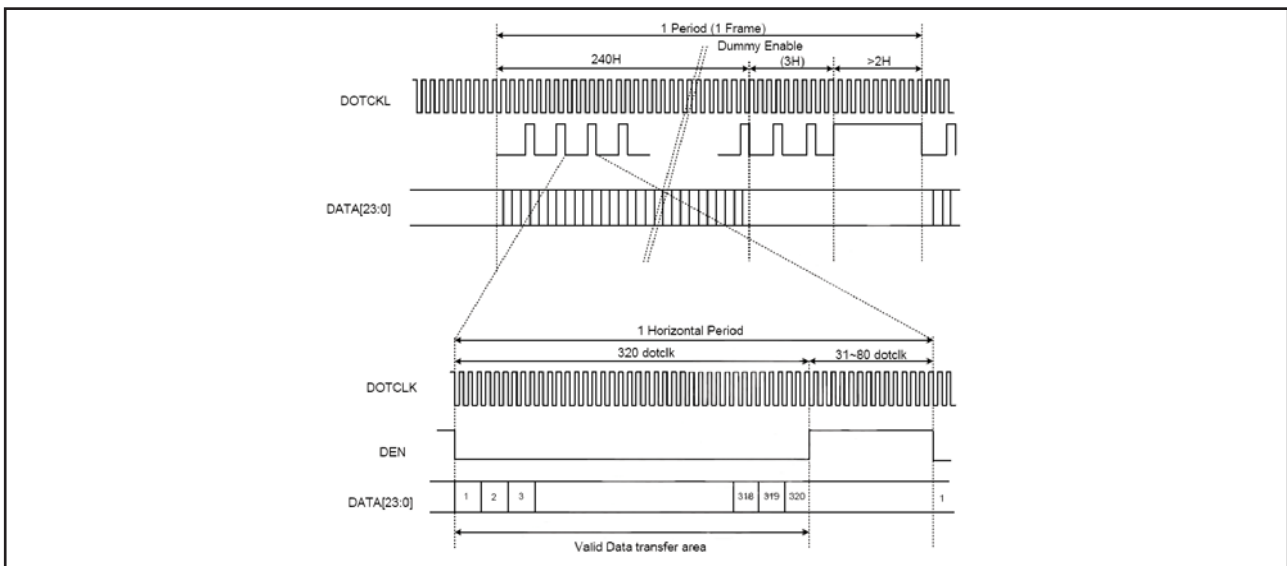
3.5", 320 X 240 DOTS, 1/240 DUTY

### TIMING OF POWER SUPPLY: DATA TRANSACTION TIMING IN PARALLEL RGB (24 BIT) INTERFACE (SYNC MODE)



PARAMETER	SYMBOL	MIN.		TYP.		MAX.		UNIT
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	$f_{\text{DOTCLK}}$			6.5	19.5	10	30	MHz
DOTCLK Period		100	33.3	154	51.3			ns
Horizontal Frequency (Line)	$f_H$			14.9		22.35		kHz
Vertical Frequency (Refresh)	$f_V$			60		90		Hz
Horizontal Back Porch	$t_{\text{HBP}}$			68	204			$t_{\text{DOTCLK}}$
Horizontal Front Porch	$t_{\text{HFP}}$			20	60			$t_{\text{DOTCLK}}$
Horizontal Data Start Point	$t_{\text{HBP}}$			68	204			$t_{\text{DOTCLK}}$
Horizontal Blanking Period	$t_{\text{HBP}} + t_{\text{HFP}}$			88	264			$t_{\text{DOTCLK}}$
Horizontal Display Area	$H_{\text{DISP}}$			320	960			$t_{\text{DOTCLK}}$
Horizontal Cycle	$H_{\text{CYCLE}}$			408	1224	450	1350	$t_{\text{DOTCLK}}$
Vertical Back Porch	$t_{\text{VBP}}$			18				Lines
Vertical Front Porch	$t_{\text{VFP}}$			4				Lines
Vertical Data Start Point	$t_{\text{VBP}}$			18				Lines
Vertical Blanking Period	$t_{\text{VBP}} + t_{\text{VFP}}$			22				Lines
Vertical Display Area	NTSC	$V_{\text{DISP}}$		240				Lines
	PAL			280 (PALM=0)				Lines
	PAL			288 (PALM=1)				Lines
Vertical Cycle	NTSC	$V_{\text{CYCLE}}$		262		350		Lines
	PAL			313				Lines

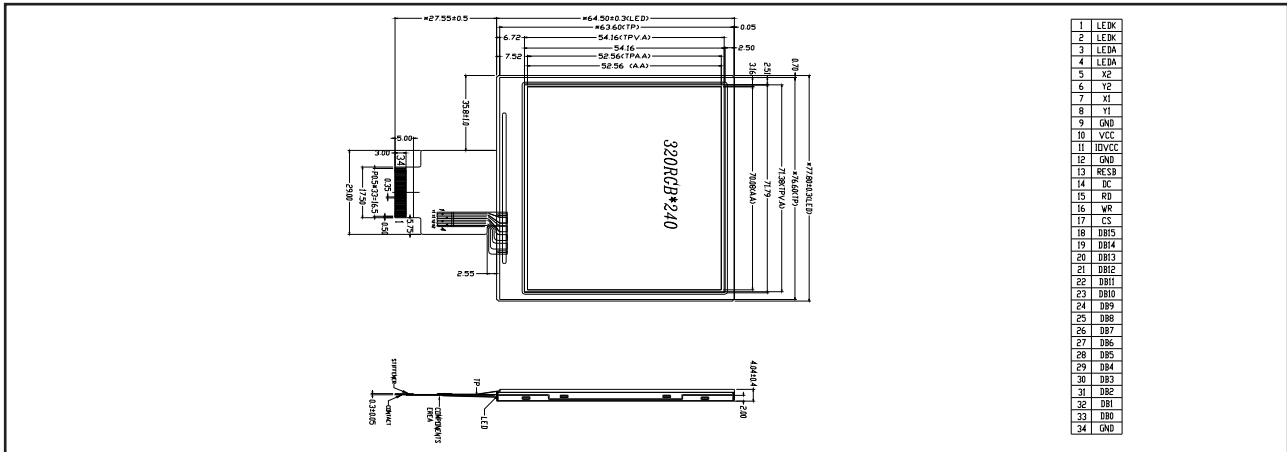
### SIGNAL TIMING IN DE MODE



## TFT TRANSMISSIVE LCD MODULES YTS 350ELAJ-01-100T

3.5", 320 X 240 DOTS, 1/240 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	77.80 x 64.50 x 4.04	mm
Active Area (W x H)	70.08 x 52.56	mm
Viewing Direction	12:00	o'clock
Number of Dots	320 (RGB) x 240	dots
Colors	262K	

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V <sub>DDIO</sub>	-0.3	4.0	V
Input Voltage	V <sub>CI</sub>	V <sub>SS</sub> -0.3	5.0	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

Note (1): Current Drain per Pin excluding VDD and VSS: 25mA typical.

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	LED_K	LED Backlight
2		
3		
4		
5	X <sub>2</sub>	Touch Panel
6		
7		
8		
9	GND	Ground
10	V <sub>CC</sub>	Interface I/O Power Supply
11	IOV <sub>CC</sub>	Power Supply for Analog Circuit
12	GND	Ground
13	RESB	System Reset
14	DC	Data or Command
15	RD	8080-System: RD (Read Strobe Signal)
16	WR	8080-System: WR (Write Strobe Signal)
17	CS	Chip Select
18-33	DB <sub>15</sub> -DB <sub>0</sub>	Data Bus
34	GND	Ground

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>		+10.0		+16.0	V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta=+25°C	-16.0		-9.0	V
TFT Common Electrode Voltage	V <sub>comH</sub> V <sub>comL</sub>		2.5 -2.0		+5.0 0	V

Note (2): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.

Note (3): V<sub>GH</sub> is TFT gate operating voltage.

Note (4): V<sub>GL</sub> is TFT gate operating voltage. The storage capacitance structure of this products is C<sub>cl</sub> (Storage on Common).

Note (5): Environmental condition: 25°C±5°C.

Note (6): TFT frame frequency advise 60 Hz.

Note (7): Operating Voltage V<sub>CC</sub>=2.5 to 3.3V; IOV<sub>CC</sub>=1.8 to 3.3V

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>F</sub> =20*2mA	9.0	10.2	10.8	V
Forward Current	I <sub>F</sub>		20*2			mA
Power Dissipation	P <sub>d</sub>	I <sub>F</sub> =20*2mA	0.384			W
Reverse Voltage	V <sub>r</sub>					3.0 V
Reverse Current	I <sub>r</sub>					mA
Luminous Intensity	L <sub>v</sub>	I <sub>F</sub> =20*2mA	6000			cd/m <sup>2</sup>
Luminous Uniformity	ΔL <sub>v</sub>		75	80		%
Chromaticity Coordinate	X	I <sub>F</sub> =20mA, Ta=25°C each chip	0.27			
	Y		0.27			0.33

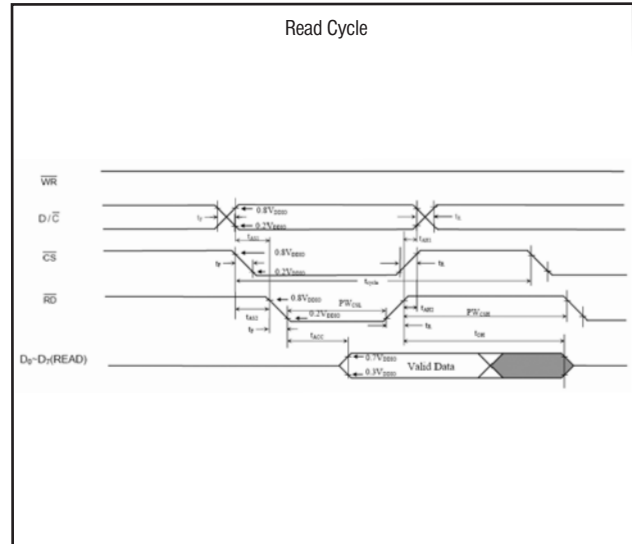
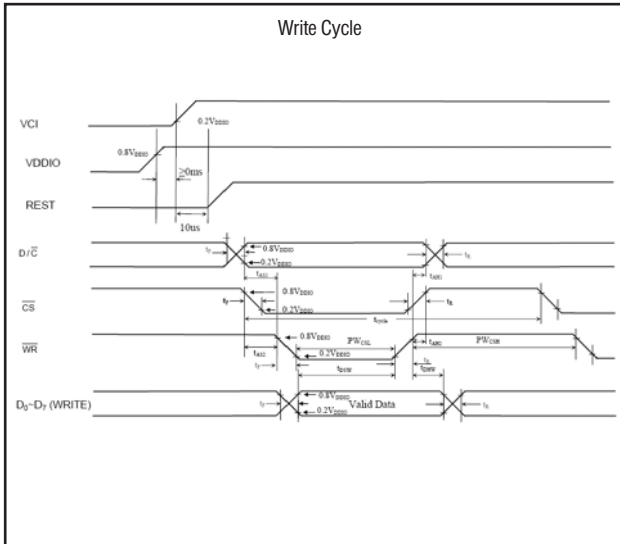
Note (8): Operating temperature range T<sub>opr</sub> -30°C to +70°C; Storage temperature range T<sub>sty</sub> -40°C to +85°C.

# TFT TRANSMISSIVE LCD MODULES

## YTS 350ELAJ-01-100T

3.5", 320 X 240 DOTS, 1/240 DUTY

### INTERFACE TIMING CHARACTERISTICS



Note (1): It's recommended that /RD remains high for the whole Write Cycle.

### TIMING OF POWER SUPPLY: PARALLEL 8080 TIMING CHARACTERISTICS $V_{DDIO}= 1.4V$ to $3.6V$ , $T_a=-40^{\circ}C$ to $85^{\circ}C$

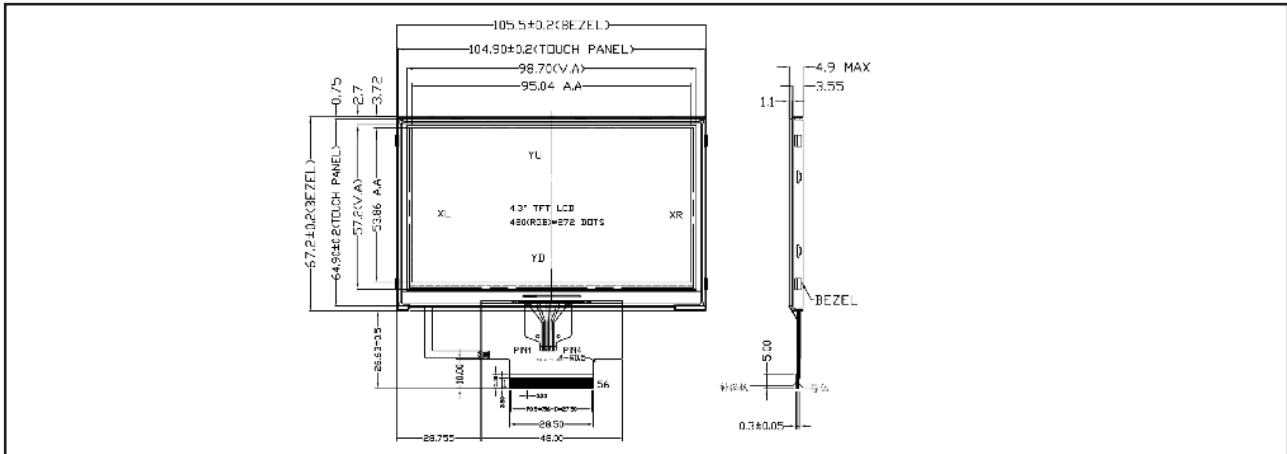
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Clock Cycle Time (Write Cycle)	$t_{CYCLE}$	75		ns
Clock Cycle Time (Read Cycle) (Based on $V_{OL} / V_{OH}=0.3 \cdot V_{DDIO}/0.7 \cdot V_{DDIO}$ )		450		ns
Address Setup Time between (R/W) and D/C	$t_{AS1}$	0		ns
Address Hold Time between (R/W) and D/C	$t_{AH1}$	0		ns
Address Setup Time between (R/W) and /CS	$t_{AS2}$	0		ns
Address Hold Time between (R/W) and /CS	$t_{AH2}$	0		ns
Data Setup Time ( $D_0$ to $D_7$ Write)	$t_{DSW}$	5		ns
Data Hold Time ( $D_0$ to $D_7$ Write)	$t_{DHW}$	5		ns
Data Access Time ( $D_0$ to $D_7$ Read)	$t_{ACC}$	250		ns
Output Hold Time ( $D_0$ to $D_7$ Read)	$t_{OH}$	100		ns
Pulse Width /CS Low (Write Cycle)	$PW_{CSL}$	40		ns
Pulse Width /CS High (Write Cycle)	$PW_{CSH}$	25		ns
Pulse Width /CS Low (Read Cycle)	$PW_{CSL}$	500		ns
Pulse Width /CS High (Read Cycle)	$PW_{CSH}$	500		ns
Rise Time	$t_R$		15	ns
Fall Time	$t_F$		15	ns

# TFT TRANSMISSIVE LCD MODULES

## YTS 430ILAC-01-100T

4.3", 480 X 272 DOTS, 1/272 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	105.5 x 67.2 x 4.9	mm
Active Area (W x H)	95.04 x 53.86	mm
Viewing Direction	12:00	o'clock
Number of Dots	480 (RGB) x 272	dots
Colors	16M	

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1	NC	No Connection
2	LED_K	LED Power
3	LED_A	LED Power
4-5	NC	No Connection
6	GND	Ground
7	V <sub>CC</sub>	Logic Regulator Power Supply
8	CPWM	Duty Cycle Control Signal of CABC Function
9	SDO	Data Output Pin in Serial Mode
10	SDI	Data Input in Serial Mode. Internal Pull High
11	SDL	Clock Pin of Serial Interface
12	CS	Chip Select Pin of Serial Interface
13	ENABLE	Input Data Enable Control
14	V <sub>SYNC</sub>	Verical SYNC Input with Negative Polarity
15	H <sub>SYNC</sub>	Horizontal SYNC Input with Negative Polarity
16	DISPLAY	Display ON/OFF Mode Control
17	DOTCLK	Clock Signal for Data Latching and Internal Counter of the Timing Controller.
18-33	GND	Ground
19-26	B <sub>7</sub> -B <sub>0</sub>	Blue Data Bit
27-34	G <sub>7</sub> -G <sub>0</sub>	Green Data Bit
35-42	R <sub>7</sub> -R <sub>0</sub>	Red Data Bit
43	GND	Ground
44	RESET	Active Low Global Reset Signal Input
45	IOV <sub>CC</sub>	Interface I/O Power Supply
46	V <sub>CI</sub>	Liquid Crystal Analog Circuit Power Supply
47	GND	Ground
48	DRV <sub>1</sub>	Power Transistor Gate Signal for the Boost Converter 1
49	VFB <sub>1</sub>	Main Boost Regulator Feedback Input 1
50	GND	Ground
51-54	YU, XL, YD, XR	The Pins of Touch Panel
55	GND	Ground
56	NC	No Connection

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Logic Power Supply	V <sub>DDIO</sub>	-0.3	4.0	V
Booster Power Supply	V <sub>CI</sub>	-0.3	5.0	V
Analog Circuit Power Supply	V <sub>CIP</sub>	-0.3	5.0	V
Power Supply of Analog Block and V <sub>LCD</sub> /V <sub>OC</sub> Regulation	V <sub>CIX2J</sub>	-0.3	6.0	V
Power Pin for Internal Logic Circuit	V <sub>DD</sub>	-0.3	2.7	V
Using External V <sub>GH</sub> - V <sub>GL</sub>	V <sub>GH</sub> - V <sub>GL</sub>	-0.3	45.0	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta = +25°C		-10.0		V
TFT Common Electrode Voltage	V <sub>comH</sub> V <sub>comL</sub>			4.2 -1.4		V

Note (1): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.  
 Note (2): V<sub>GH</sub> is TFT gate operating voltage.  
 Note (3): V<sub>GL</sub> is TFT gate operating voltage.  
 Note (4): Environmental condition: 25°C ± 5°C.  
 Note (5): Reference waveform for panel light on is as below: gate width is 1.5 ms. V<sub>GH</sub> / V<sub>DH</sub> / V<sub>GL</sub> / V<sub>COM</sub> are referred to driver IC specification.  
 Note (6): Operating Voltage V<sub>CC</sub> = 3.3V

### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> = 20mA;	18.6	19.8	21.0	V
Reverse Current	I <sub>r</sub>	- Aperture: 1°, 12 Point;			15.0	mA
Luminous Intensity	L <sub>v</sub>	- The Measurement Instrument is BM-7;	5200			cd/m <sup>2</sup>
Average		- Average = min/max * 100%	75			%
Chromaticity Coordinate	X		0.245		0.295	
	Y		0.245		0.295	



# TFT TRANSMISSIVE LCD MODULES

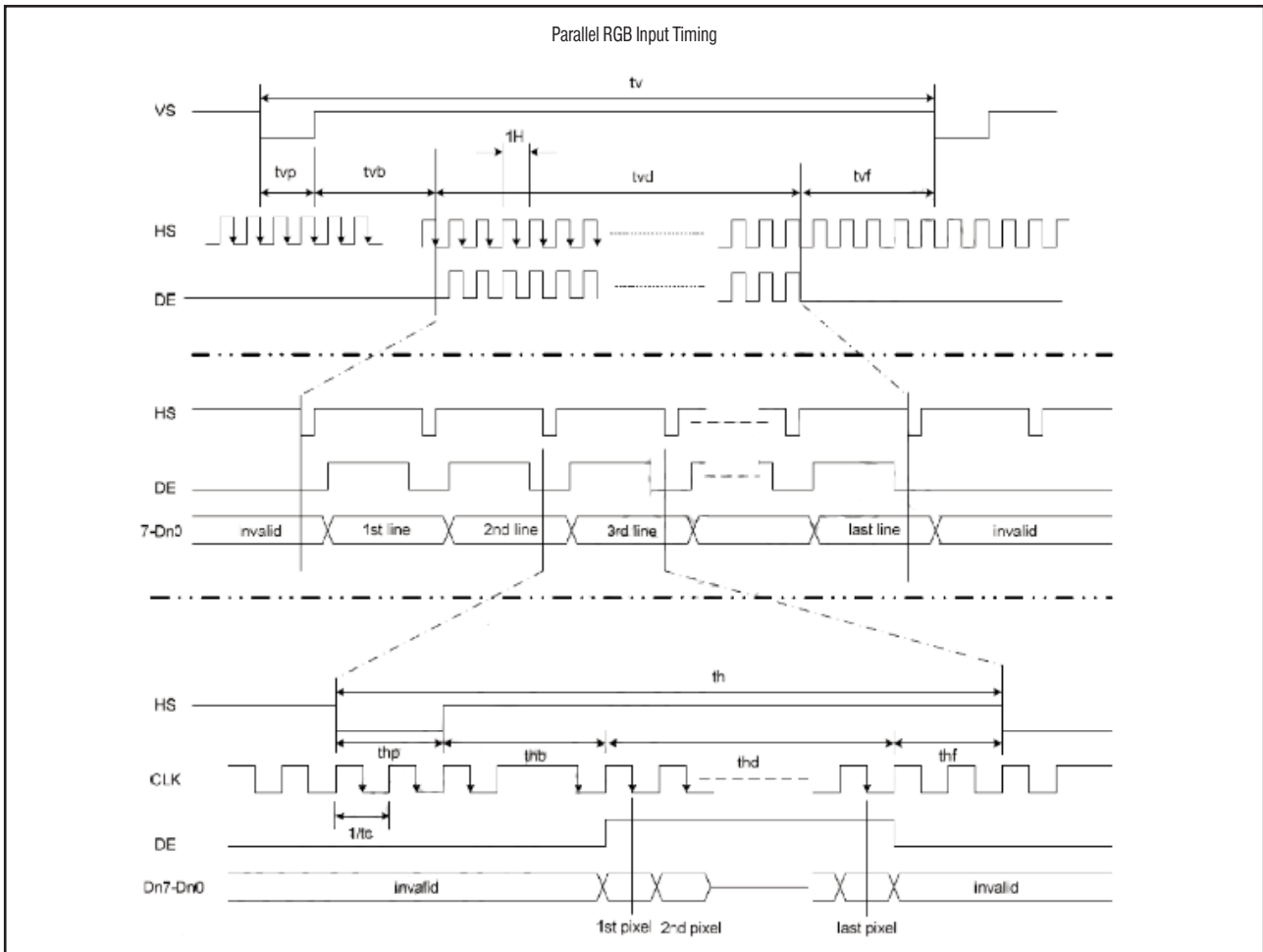
## YTS 430ILAC-01-100T

4.3", 480 X 272 DOTS, 1/272 DUTY

### AC CHARACTERISTICS

V <sub>DDIO</sub> =1.8 to 3.6V, DV <sub>SS</sub> =0V, T <sub>a</sub> =25°C, 480 RGB x 272					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Cycle	f <sub>CLK</sub> <sup>(1)</sup>		9		MHz
H <sub>SYNC</sub> Cycle	1/th		17.14		kHz
V <sub>SYNC</sub> Cycle	1/tv		59.94		Hz
Horizontal Signal					
Horizontal Cycle	th	525	525	605	CLK
Horizontal Display Period	tdh	480	480	480	CLK
Horizontal Front Porch	thf	2	2	82	CLK
Horizontal Pulse Width	thp <sup>(2)</sup>	2	41	41	CLK
Horizontal Back Porch	thb <sup>(2)</sup>	2	2	41	CLK
Vertical Signal					
Vertical Cycle	tv	285	286	399	H <sup>(1)</sup>
Vertical Display Period	tvd	272	272	272	H <sup>(1)</sup>
Vertical Front Porch	tvf	1	2	227	H <sup>(1)</sup>
Vertical Pulse Width	tvp <sup>(2)</sup>	1	10	11	H <sup>(1)</sup>
Vertical Back Porch	tvb <sup>(2)</sup>	1	2	11	H <sup>(1)</sup>

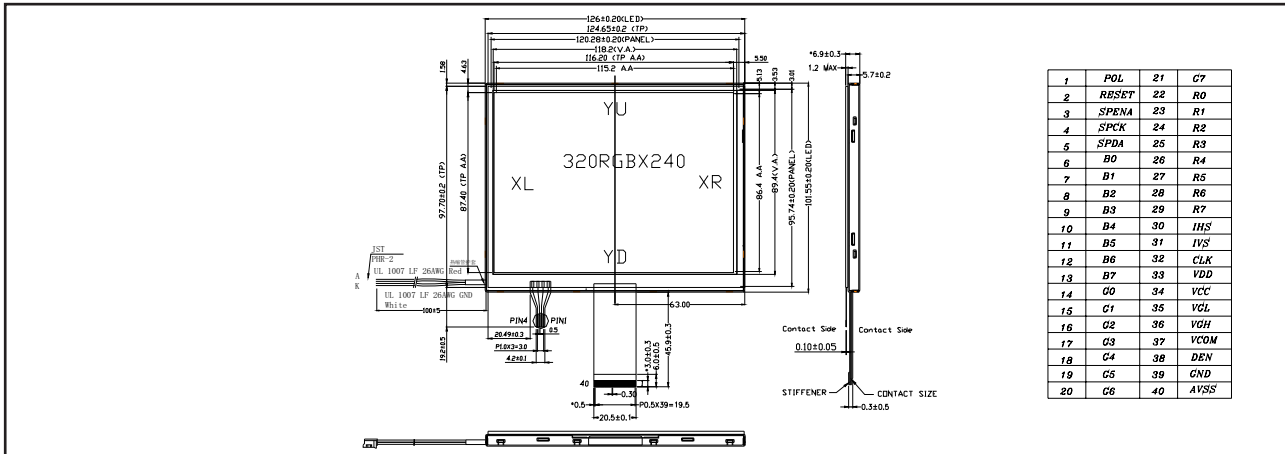
Note (1): Unit: CLK=1/f<sub>CLK</sub>, H=th  
 Note (2): It's necessary to keep tvp+tvb=12 and thp+thb=43 in Sync Mode. DE Mode is unnecessary to keep it.



## TFT TRANSMISSIVE LCD MODULES YTS 570ELAA-01-100T

5.7", 320 X 240 DOTS, 1/240 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	126.0 x 101.55 x 6.9	mm
Active Area (W x H)	118.26 x 89.40	mm
Viewing Direction	12:00	o'clock
Number of Dots	320 (RGB) x 240	dots
Colors	16M	

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage <sup>(1)</sup>	V <sub>CC</sub>	-0.3	7.0	V
Supply Voltage <sup>(2)</sup>	V <sub>DD</sub>	-0.3	7.0	V
Logic Output Voltage	V <sub>OUT</sub>	-0.3	7.0	
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>DD</sub> +0.3	V
Operating Temperature		See page 8		
Storage Temperature				

Note (1): All of the voltage listed above are with respect to GND=V<sub>SS</sub>=0V  
 Note (2): Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

### PIN CONFIGURATION

PIN	SYMBOL	I/O	SIGNAL DESCRIPTION
1	POL	O	Polarity Signal to Monitor V <sub>COM</sub> Signal
2	RESET	I	Hardware Reset
3	SPENA	I	The Pin of Touch Panel
4	SPCK	I	Serial Port Clock
5	SPDA	I/O	Serial Port Data Input/Output
6-13	B <sub>0</sub> -B <sub>7</sub>	I	Blue Data Bit 0 to Blue Data Bit 7
14-21	G <sub>0</sub> -G <sub>7</sub>	I	Green Data Bit 0 to Green Data Bit 7
22-29	R <sub>0</sub> -R <sub>7</sub>	I	Red Data Bit 0 to Red Data Bit 7
30	IHS	I	Horizontal SYNC Input in Digital RGB Mode
31	IVS	I	Vertical SYNC Input in Digital RGB Mode
32	CLK	I	Clock Signal
33	V <sub>DD</sub>	I	Analog Power
34	V <sub>CC</sub>	I	Digital Power
35	V <sub>GL</sub>	O	Negative Power Output Pin for Gate Driver
36	V <sub>GH</sub>	O	Positive Power Output Pin for Gate Driver
37	V <sub>COM</sub>	O	Power Supply for the TFT Display Common Electrode
38	DEN	I	Input Data Enable Control
39	GND	I	Digital Ground
40	AV <sub>SS</sub>	I	Analog Ground

### ELECTRICAL CHARACTERISTICS, Ta=25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>			15.0		V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta=+25°C		-10.0		V
TFT Common Electrode Voltage	V <sub>COMH</sub> V <sub>COML</sub>		2.5 -2.0		5.5 0	V

Note (3): V<sub>COM</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.  
 Note (4): V<sub>GH</sub> is TFT gate operating voltage.  
 Note (5): V<sub>GL</sub> is TFT gate operating voltage.  
 Note (6): Environmental condition: 25°C±5°C.  
 Note (7): Reference waveform for panel light on is s below: Gate width is 1.5 ms. V<sub>GH</sub> / V<sub>OH</sub> / V<sub>GL</sub> / V<sub>COM</sub> are referred to driver IC specification.  
 Note (8): Operating Voltage V<sub>CC</sub>=5.0V

### BACKLIGHTING CHARACTERISTICS, Ta=25°C, LED

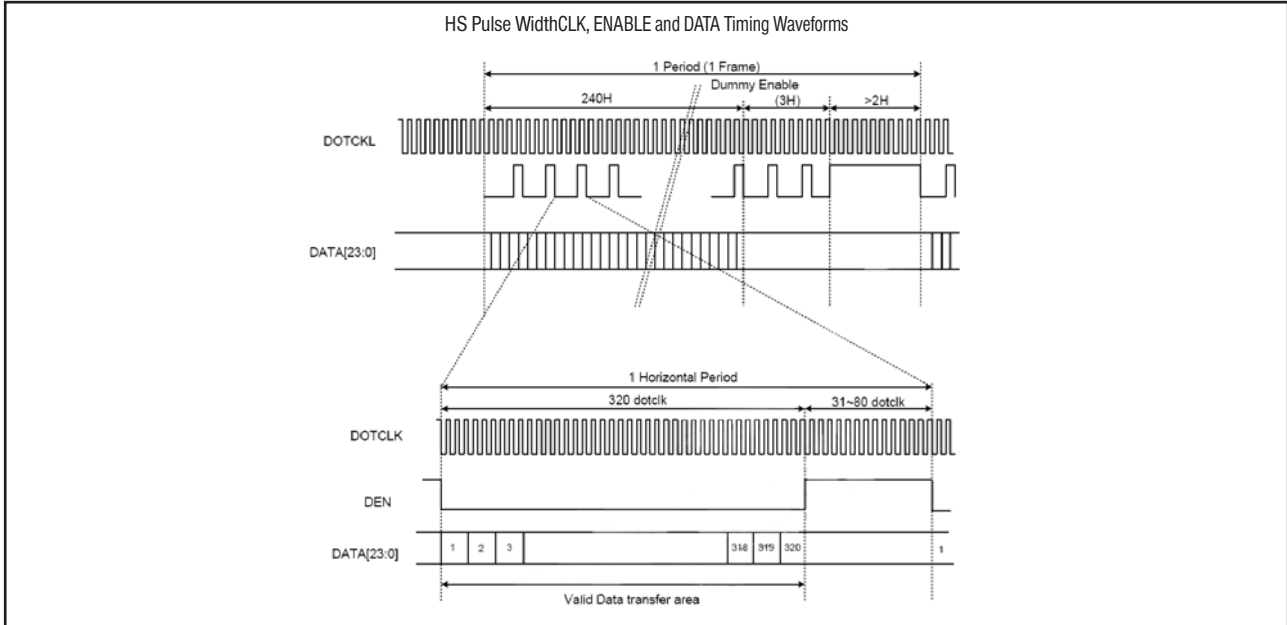
ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> =Typ.	9.0	9.6	10.2	V
Forward Current	I <sub>f</sub>			140		mA
Luminous Intensity	L <sub>v</sub>	I <sub>f</sub> =Typ./Chip	4500	5000	5500	cd/m <sup>2</sup>
Luminous Uniformity	ΔL <sub>v</sub>	Ta=25°C	75			%
Chromaticity Coordinate	X		0.27	0.292	0.287	
	Y		0.27	0.270	0.310	

Note (9): Operating temperature range T<sub>opr</sub> -30°C to +70°C; Storage temperature range T<sub>stg</sub> -40°C to +85°C.

## TFT TRANSMISSIVE LCD MODULES YTS 570ELAA-01-100T

5.7", 320 X 240 DOTS, 1/240 DUTY

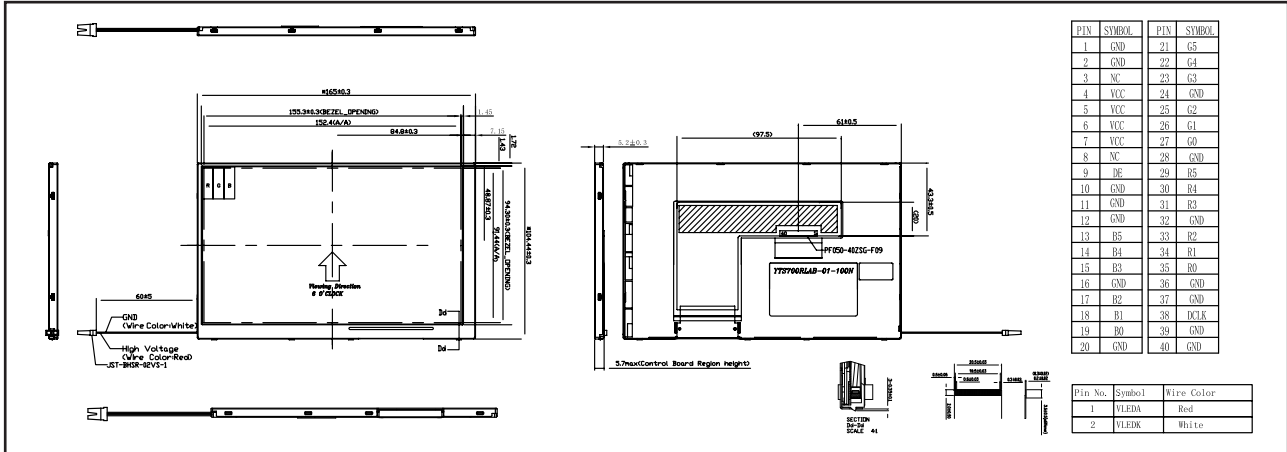
### TIMING OF POWER SUPPLY: SIGNAL TIMING IN DE MODE



## TFT TRANSMISSIVE LCD MODULES YTS 700RLAB-01-100N

7", 800 X 480 DOTS, 1/480 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x D)	165.0 x 104.44 x 5.2	mm
Active Area (W x H)	152.4 x 91.44	mm
Pixel Size	190.5 x 190.5	um
Viewing Direction	6:00	o'clock
Number of Dots	800 (RGB) x 480	dots
Color Sturation (NTSC)	45	%
Colors	16M	

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-2	GND	Power Ground
3	NC	No Connection
4-7	VCC	Power Supply for Digital Circuit
8	NC	No Connection
9	DE	Data Enable
10-12	GND	Power Ground
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	GND	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	GND	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	GND	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	GND	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	GND	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0 (LSB)
36-37	GND	Power Ground
38	DCLK	Clock Signals; Latch Data at the Falling Edge
39-40	GND	Power Ground

### ABSOLUTE MAXIMUM RATINGS GND=0

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Power Voltage	VCC	-0.3	6.0	V
Input Logic Voltage <sup>(1)</sup>	V <sub>I</sub>	-0.3	VCC+0.3	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

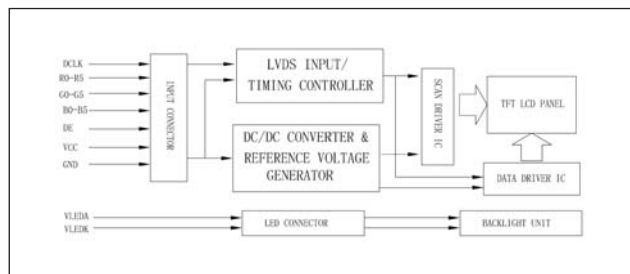
Note (1): DCLK, DE, R<sub>0</sub> to R<sub>5</sub>, G<sub>0</sub> to G<sub>5</sub>, B<sub>0</sub> to B<sub>5</sub>.

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Power Supply Voltage	VCC		3.0	3.3	3.6	V
Input Logic High Level <sup>(2)</sup>	V <sub>IH</sub>		0.7VCC		VCC	V
Input Logic Low Level <sup>(2)</sup>	V <sub>IL</sub>		0		0.3VCC	V

Note (2): DCLK, DE, R<sub>0</sub> to R<sub>5</sub>, G<sub>0</sub> to G<sub>5</sub>, B<sub>0</sub> to B<sub>5</sub>.

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
LED Current <sup>(3)</sup>	I <sub>LED</sub>			160.0		mA
LED Voltage	V <sub>LED</sub>			9.9		V
LED Life Time <sup>(4)</sup>	L <sub>v</sub>		10000	20000		hr

Note (3): There are 8 groups LED shown as below, V<sub>LED</sub>=9.9V; I<sub>LED</sub>=160mA.

Note (4): Brightness to be decreased to 50% of the initial value.

Note (5): Pin 1 = V<sub>LED,A</sub> = Red, LED\_Anode; Pin 2 = V<sub>LED,K</sub> = White, LED\_Cathode.

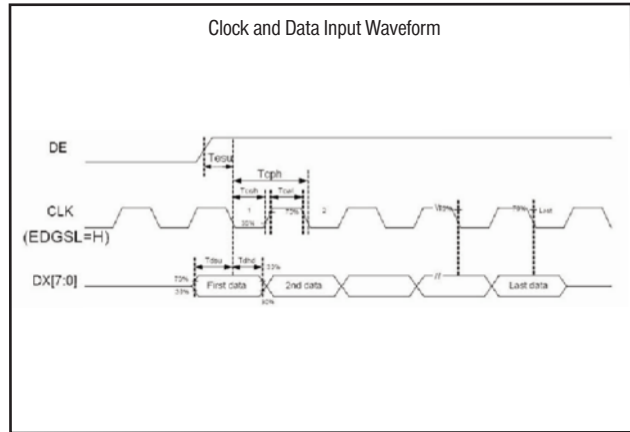
# TFT TRANSMISSIVE LCD MODULES

## YTS 700LAB-01-100N

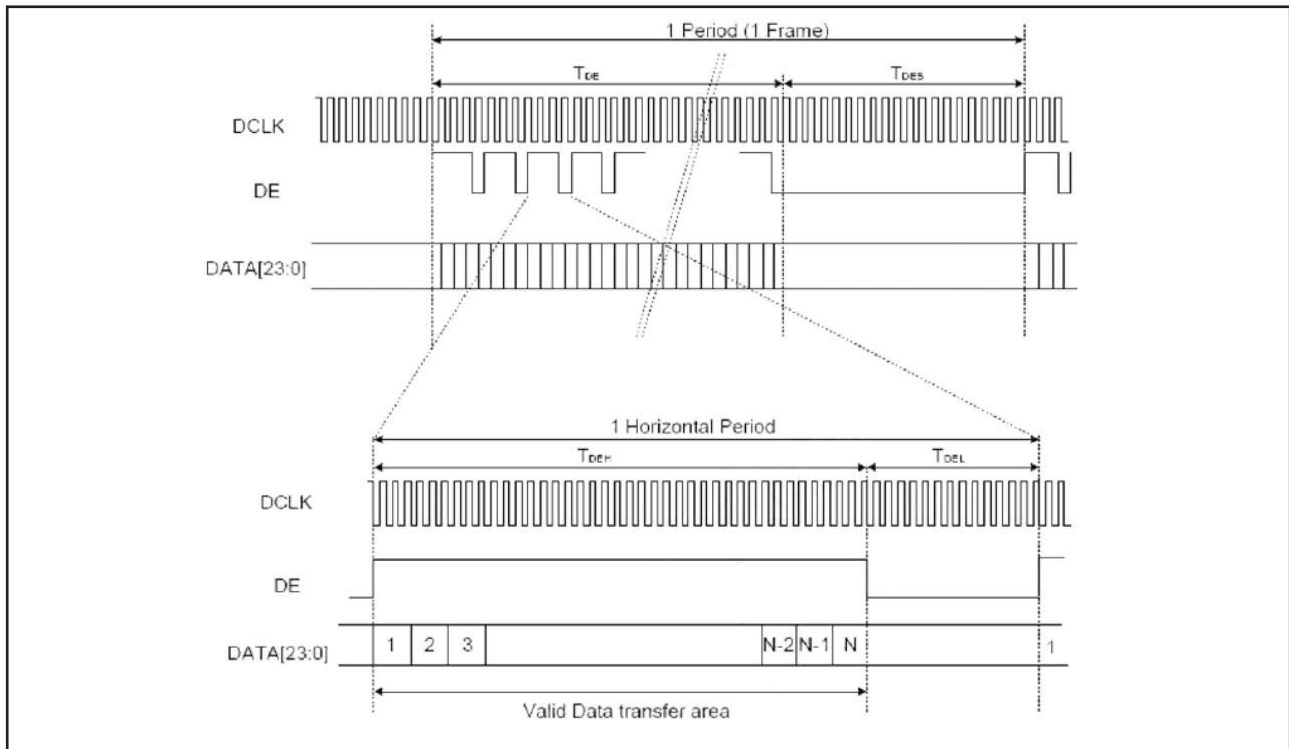
7", 800 X 480 DOTS, 1/480 DUTY

### AC CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Data Setup Time	$T_{DSU}$	6			ns
Data Hold Time	$T_{DHD}$	6			ns
DE Setup Time	$T_{ESU}$	6			ns
CLK Frequency	$F_{CPH}$	29.40	33.26	42.48	MHz
CLK Period	$T_{CPH}$	23.54	30.06	34.01	ns
CLK Pulse Duty	$T_{CWH}$	40	50	60	%
	$T_{CWL}$	40	50	60	%
DE Period	$T_{DEH}+T_{DEL}$	1000	1056	1200	$T_{CPH}$
DE Pulse Width	$T_{DEH}$		800		$T_{CPH}$
DE Frame Blanking	$T_{DEB}$	10	45	110	$T_{DEH}+T_{DEL}$
DE Frame Width	$T_{DE}$		480		$T_{DEH}+T_{DEL}$



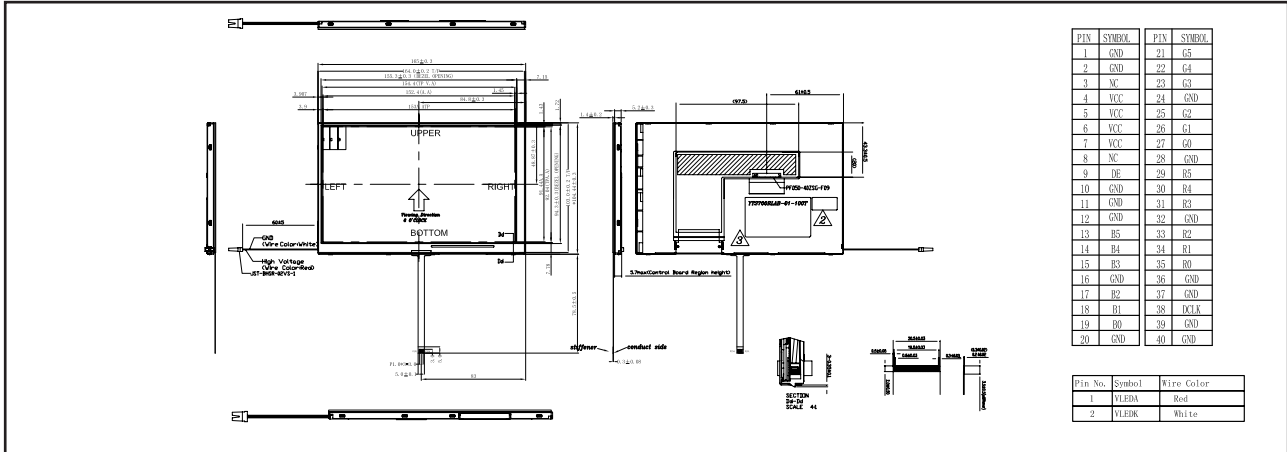
### DATA INPUT FORMAT



## TFT TRANSMISSIVE LCD MODULES YTS 700RLAB-01-100T

7", 800 X 480 DOTS, 1/480 DUTY

### EXTERNAL DIMENSION AND DISPLAY PATTERN



### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H x D)	165.0 x 104.44 x 6.6	mm
Active Area (W x H)	152.4 x 91.44	mm
Pixel Size	190.5 x 190.5	um
Viewing Direction	6:00	o'clock
Number of Dots	800 (RGB) x 480	dots
Color Sturation (NTSC)	45	%
Colors	16M	

### PIN CONFIGURATION

PIN	SYMBOL	SIGNAL DESCRIPTION
1-2	GND	Power Ground
3	NC	No Connection
4-7	VCC	Power Supply for Digital Circuit
8	NC	No Connection
9	DE	Data Enable
10-12	GND	Power Ground
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	GND	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	GND	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	GND	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	GND	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	GND	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0 (LSB)
36-37	GND	Power Ground
38	DCLK	Clock Signals; Latch Data at the Falling Edge
39-40	GND	Power Ground

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Power Voltage	V <sub>CC</sub>	-0.3	6.0	V
Input Logic Voltage <sup>(1)</sup>	V <sub>I</sub>	-0.3	V <sub>CC</sub> + 0.3	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

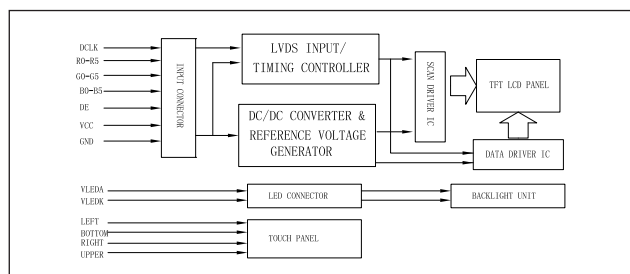
Note (1): DCLK, DE, R<sub>0</sub> to R<sub>5</sub>, G<sub>0</sub> to G<sub>5</sub>, B<sub>0</sub> to B<sub>5</sub>.

### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Power Supply Voltage	V <sub>CC</sub>		3.0	3.3	3.6	V
Input Logic High Level <sup>(2)</sup>	V <sub>IH</sub>		0.7V <sub>CC</sub>		V <sub>CC</sub>	V
Input Logic Low Level <sup>(2)</sup>	V <sub>IL</sub>		0		0.3V <sub>CC</sub>	V

Note (2): DCLK, DE, R<sub>0</sub> to R<sub>5</sub>, G<sub>0</sub> to G<sub>5</sub>, B<sub>0</sub> to B<sub>5</sub>.

### BLOCK DIAGRAM



### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
LED Current <sup>(3)</sup>	I <sub>LED</sub>			160.0		mA
LED Voltage	V <sub>LED</sub>			9.9		V
LED Life Time <sup>(4)</sup>	L <sub>v</sub>		10000	20000		hr

Note (3): There are 8 groups LED shown as below, V<sub>LED</sub>=9.9V; I<sub>LED</sub>=160mA.

Note (4): Brightness to be decreased to 50% of the initial value.

Note (5): Pin 1 = V<sub>LED,A</sub> = Red, LED\_Anode; Pin 2 = V<sub>LED,K</sub> = White, LED\_Cathode.

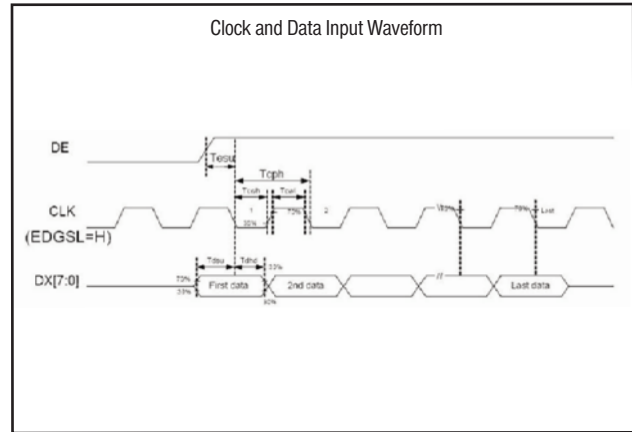
# TFT TRANSMISSIVE LCD MODULES

## YTS 700RLAB-01-100T

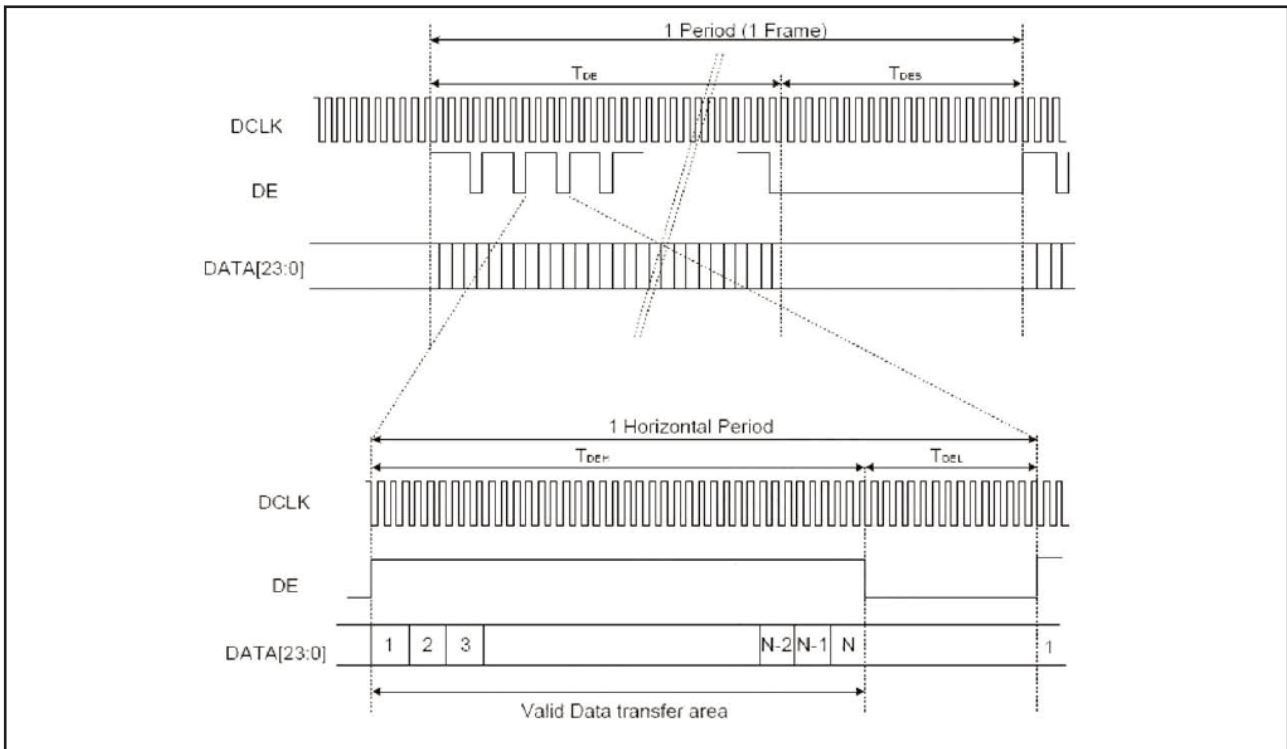
7", 800 X 480 DOTS, 1/480 DUTY

### AC CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Data Setup Time	$T_{DSU}$	6			ns
Data Hold Time	$T_{DHD}$	6			ns
DE Setup Time	$T_{ESU}$	6			ns
CLK Frequency	$F_{CPH}$	29.40	33.26	42.48	MHz
CLK Period	$T_{CPH}$	23.54	30.06	34.01	ns
CLK Pulse Duty	$T_{CWH}$	40	50	60	%
	$T_{CWL}$	40	50	60	%
DE Period	$T_{DEH}+T_{DEL}$	1000	1056	1200	$T_{CPH}$
DE Pulse Width	$T_{DEH}$		800		$T_{CPH}$
DE Frame Blanking	$T_{DEB}$	10	45	110	$T_{DEH}+T_{DEL}$
DE Frame Width	$T_{DE}$		480		$T_{DEH}+T_{DEL}$



### DATA INPUT FORMAT

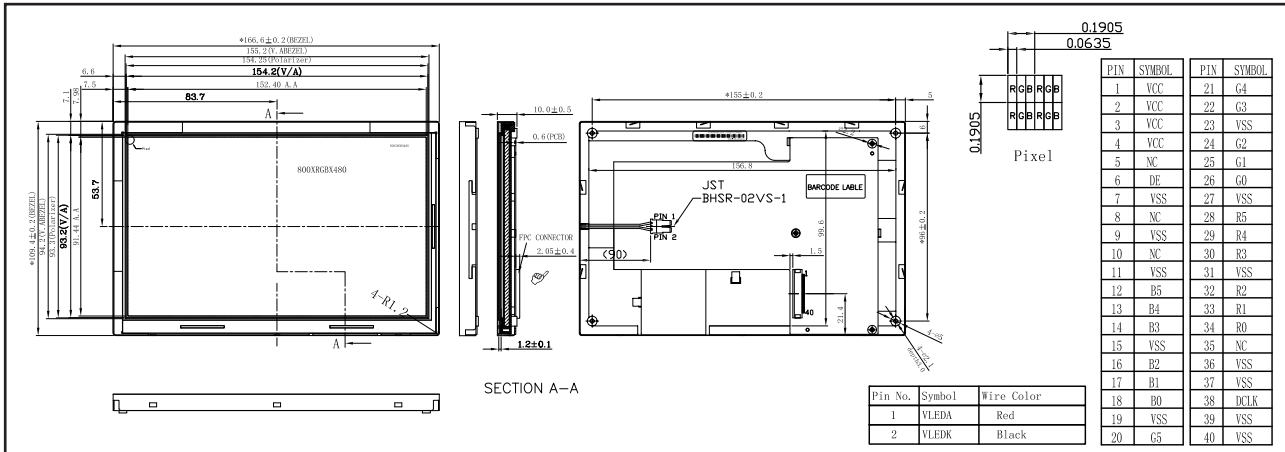


## TFT TRANSMISSIVE LCD MODULES

### YTS 700RLAB-02-103N

7", 800 X 480 DOTS, 1/480 DUTY

#### EXTERNAL DIMENSION AND DISPLAY PATTERN



#### MECHANICAL DATA

ITEM	SPECIFICATION	UNIT
Module Size (W x H)	166.6 x 109.4 x 10.0	mm
Active Area (W x H)	152.4 x 91.44	mm
Viewing Direction	6:00	o'clock
Number of Dots	800 (RGB) x 480	dots
Color Sturation (NTSC)	16M	%

#### PIN CONFIGURATION

PIN	SYMBOL	I/O	SIGNAL DESCRIPTION
1-4	V <sub>CC</sub>	I	+3.3V Power Supply
5	NC	I	No Connection
6	DE	I	Input Data Enable Control
7	V <sub>SS</sub>	I	Ground
8	NC	I	No Connection
9	V <sub>SS</sub>	I	Ground
10	NC	I	No Connection
11	V <sub>SS</sub>	I	Ground
12	B <sub>5</sub>	I	Blue Data 5 (MSB)
13	B <sub>4</sub>	I	Blue Data 4
14	B <sub>3</sub>	I	Blue Data 3
15	V <sub>SS</sub>	I	Ground
16	B <sub>2</sub>	I	Blue Data 2
17	B <sub>1</sub>	I	Blue Data 1
18	B <sub>0</sub>	I	Blue Data 0 (LSB)
19	V <sub>SS</sub>	I	Ground
20	G <sub>5</sub>	I	Green Data 5 (MSB)
21	G <sub>4</sub>	I	Green Data 4
22	G <sub>3</sub>	I	Green Data 3
23	V <sub>SS</sub>	I	Ground
24	G <sub>2</sub>	I	Green Data 2
25	G <sub>1</sub>	I	Green Data 1
26	G <sub>0</sub>	I	Green Data 0 (LSB)
27	V <sub>SS</sub>	I	Ground
28	R <sub>5</sub>	I	Red Data 5 (MSB)
29	R <sub>4</sub>	I	Red Data 4
30	R <sub>3</sub>	I	Red Data 3
31	GND	I	Ground
32	R <sub>2</sub>	I	Red Data 2
33	R <sub>1</sub>	I	Red Data 1
34	R <sub>0</sub>	I	Red Data 0 (LSB)
35	NC	I	No Connection
36-37	V <sub>SS</sub>	I	Ground
38	DCLK	I	Dot Clock
39-40	V <sub>SS</sub>	I	Ground

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Power Supply Voltage <sup>(1)</sup>	V <sub>CC</sub>	-0.3	7.0	V
Power Supply Voltage <sup>(2)</sup>	V <sub>DDA</sub>	-0.3	13.5	V
Logic Output Voltage	V <sub>OUT</sub>	-0.3	7.0	V
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>DDA</sub> +0.3	V
Operating Temperature		See page 8		
Storage Temperature		See page 8		

Note (1): All of the voltage listed above are with respect to GND=-V<sub>SSA</sub>=0V  
 Note (2): Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

#### ELECTRICAL CHARACTERISTICS, Ta = 25°C

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
TFT Gate ON Voltage	V <sub>GH</sub>		16.0	18.0	19.0	V
TFT Gate OFF Voltage	V <sub>GL</sub>	Ta=+25°C	-7.0	-6.0	-5.0	V
TFT Common Electrode Voltage	V <sub>comDC</sub>		4.5	4.6	5.1	V

Note (3): V<sub>com</sub> must be adjusted to optimize display quality: cross talk, contrast ratio and etc.  
 Note (4): V<sub>GH</sub> is TFT gate operating voltage.  
 Note (5): V<sub>GL</sub> is TFT gate operating voltage.  
 Note (6): Environmental condition: 25°C±5°C.  
 Note (7): Digital Power Input of Driver IC: V<sub>CC</sub> min. ≥ 3.2V  
 Note (8): Operating Voltage V<sub>CC</sub>=3.3V

#### BACKLIGHTING CHARACTERISTICS, Ta = 25°C, LED

ITEM	SYMBOL	CONDITION	SPEC. VALUE			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> =200mA	9.0	9.9	10.5	V
Forward Current	I <sub>f</sub>			200		mA
Power Dissipation	P <sub>d</sub>			1.98		W
Luminous Intensity	L <sub>v</sub>	I <sub>f</sub> =200mA	3800	4000		cd/m <sup>2</sup>
Permeation LCD	I <sub>v</sub>		450			cd/m <sup>2</sup>
Luminous Uniformity	ΔL <sub>v</sub>		75	80		%
Chromaticity Coordinate	X	I <sub>f</sub> =20mA, Ta=25°C each chip	0.28	0.31	0.34	
	Y		0.28	0.31	0.34	

Note (9): Operating temperature range Iopr: -20°C to +70°C; Storage temperature range Istry: -30°C to +80°C.  
 Note (10): Pin 1 = V<sub>LED\_A</sub> = Red, LED\_Anode; Pin 2 = V<sub>LED\_K</sub> = Black, LED\_Cathode.



# TFT TRANSMISSIVE LCD MODULES

## YTS 700RLAB-02-103N

7", 800 X 480 DOTS, 1/480 DUTY

### TIMING OF POWER SUPPLY: SYNC MODE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLK Frequency	$F_{CPH}$		33.26		MHz
CLK Period	$T_{CPH}$		30.06		ns
CLK Pulse Duty	$T_{CWH}$	40	50	60	%
HS Period	$T_H$		1056		$T_{CPH}$
HS Pulse Width	$T_{WH}$	1	128		$T_{CPH}$
HS-first Horizontal Data Time	$T_{HS}$	STHD [7;0] +88 <sup>(1)</sup>			$T_{CPH}$
HS Active Time	$T_{HA}$		800		$T_{CPH}$
VS Period	$T_V$		525		$T_H$
VS Pulse Width	$T_{WV}$	1	2		$T_H$
VS DE Time	$T_{VS}$	STVD [6;0] +8			$T_H$
VS Active Time	$T_{VA}$		480		$T_H$

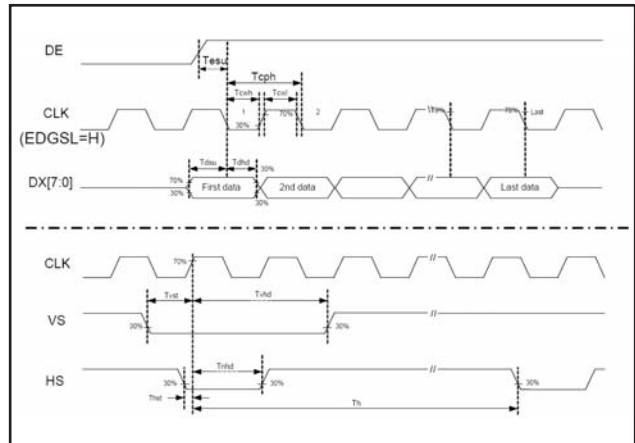
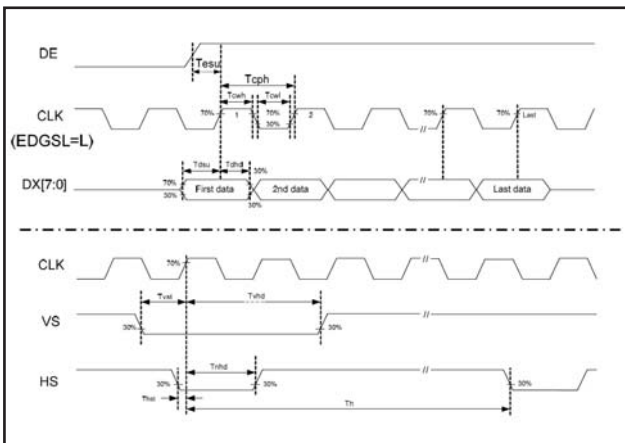
Note (1):  $T_{HS} + T_{HA} < T_H$

### TIMING OF POWER SUPPLY: DE MODE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLK Frequency	$F_{CPH}$		33.26		MHz
CLK Period	$T_{CPH}$		30.06		ns
CLK Pulse Duty	$T_{CWH}$	40	50	60	%
DE Period	$T_{DEH} + T_{DEL}$	1000	1056	1200	$T_{CPH}$
VS Pulse Width	$T_{DH}$		800		$T_{CPH}$
VS DE Time	$T_{HS}$	10	45	110	$T_{DEH} + T_{DEL}$
VS Active Time	$T_{EP}$		480		
OEV Pulse Width	$T_{OEV}$		150		
CKV Pulse Width	$T_{CKV}$		133		
DE Internal-STV Time	$T_1$		4		
DE Internal-CKV Time	$T_2$		40		
DE Internal-OEV Time	$T_3$		23		
DE Internal-POL Time	$T_4$		157		
STV Pulse Width			1		

Note (1):  $T_{HS} + T_{HA} < T_H$

### CLOCK AND DATA INPUT WAVEFORM

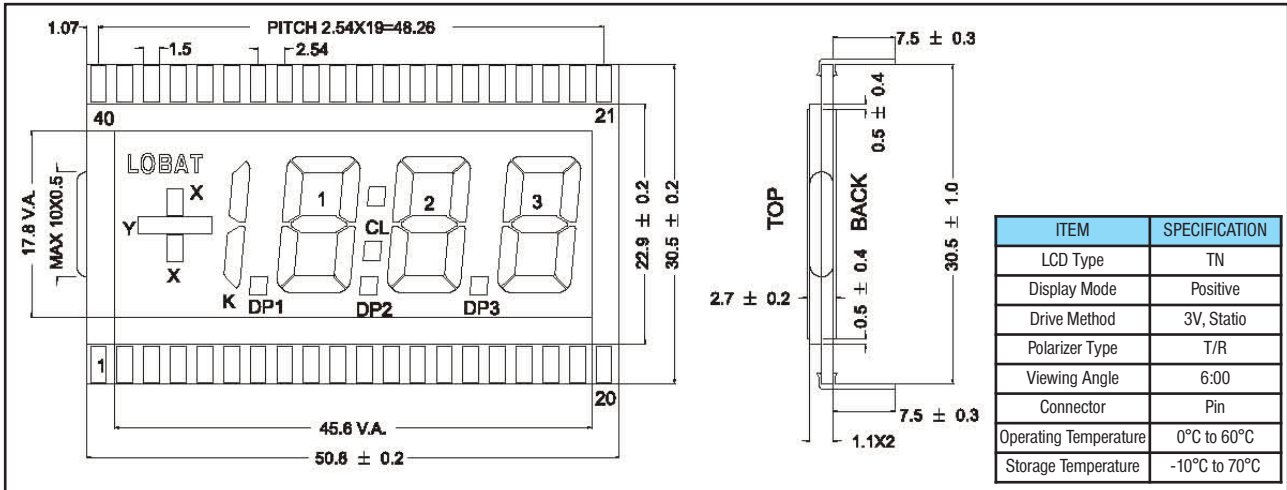




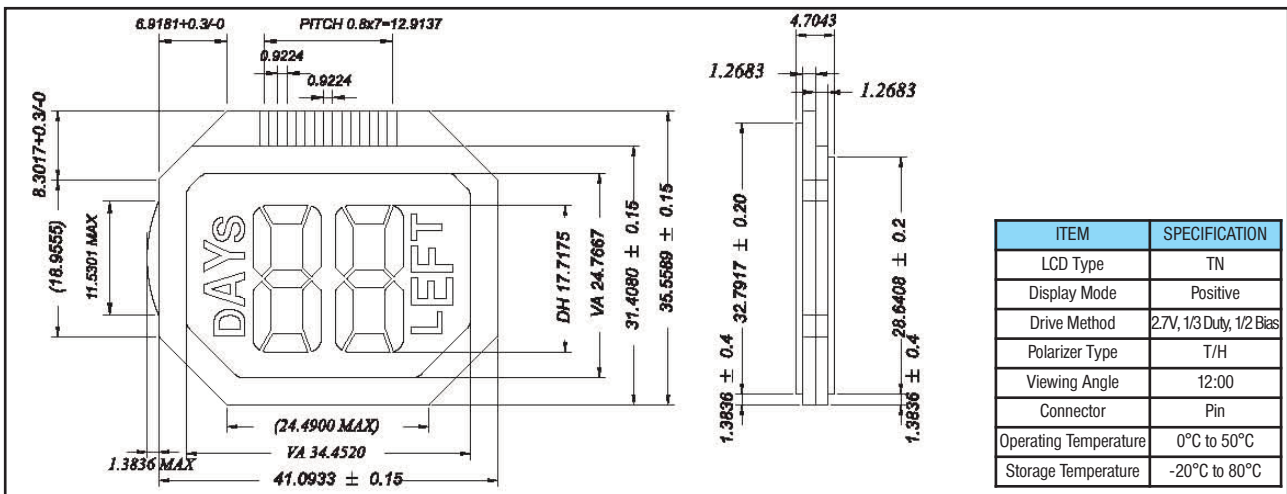


## CUSTOM-DESIGN LCD PANELS

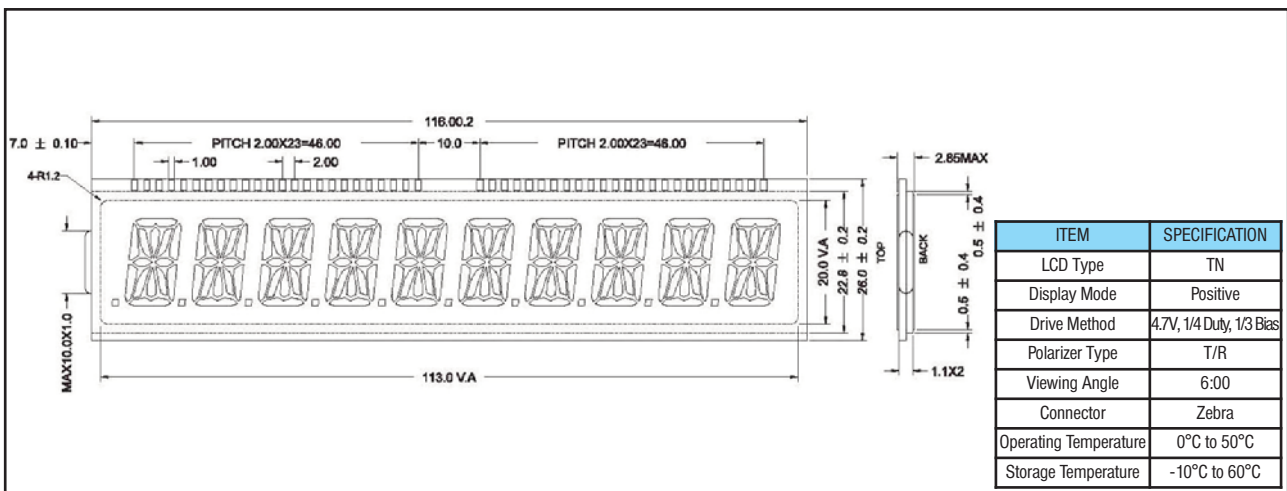
### YDDC1001ABTRP



### YDDC4588AAHYH

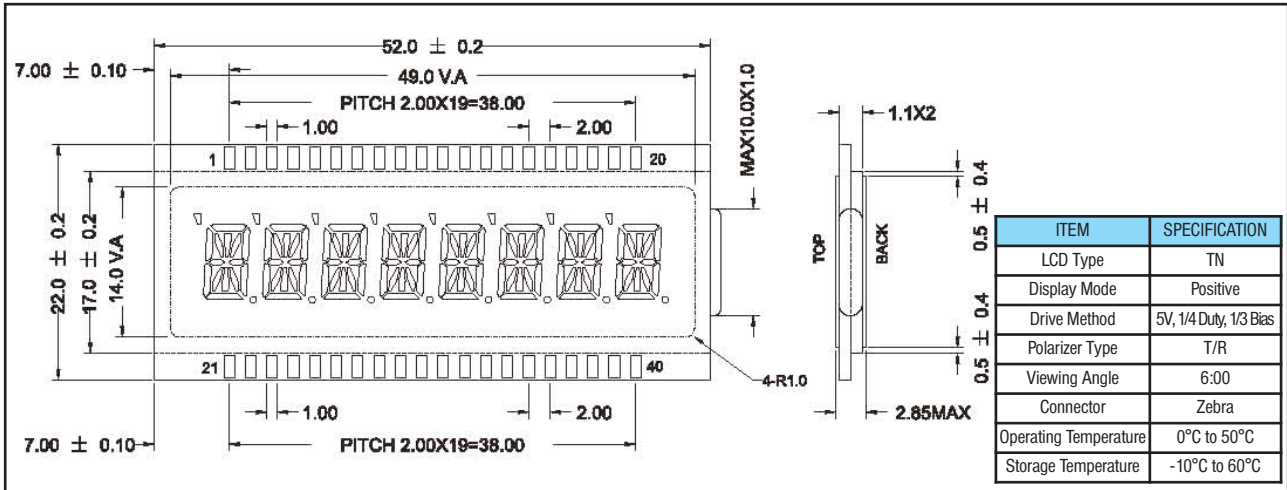


### YDDC4179AATRZ

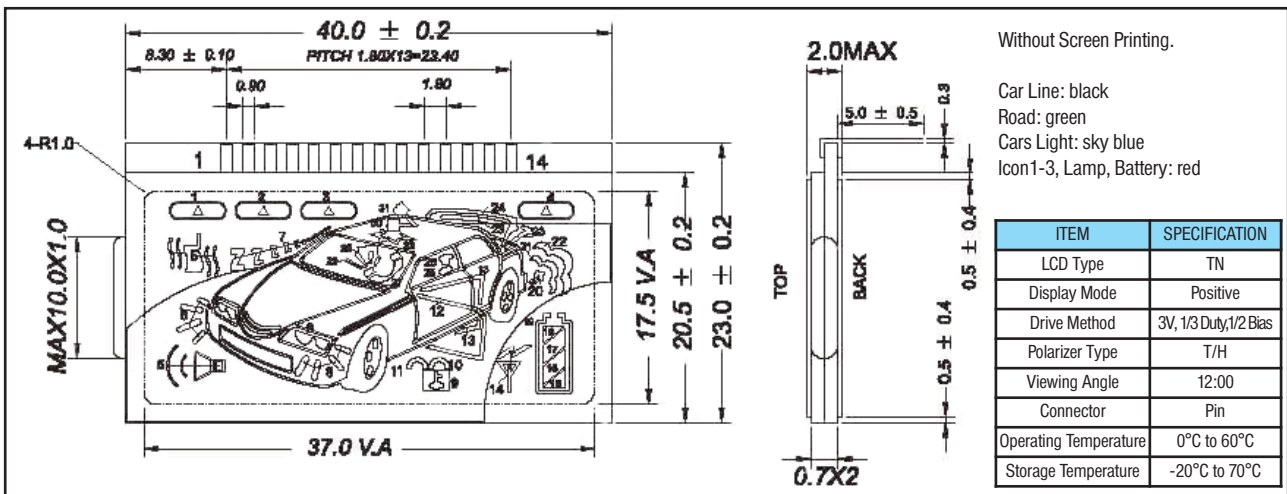


## CUSTOM-DESIGN LCD PANELS

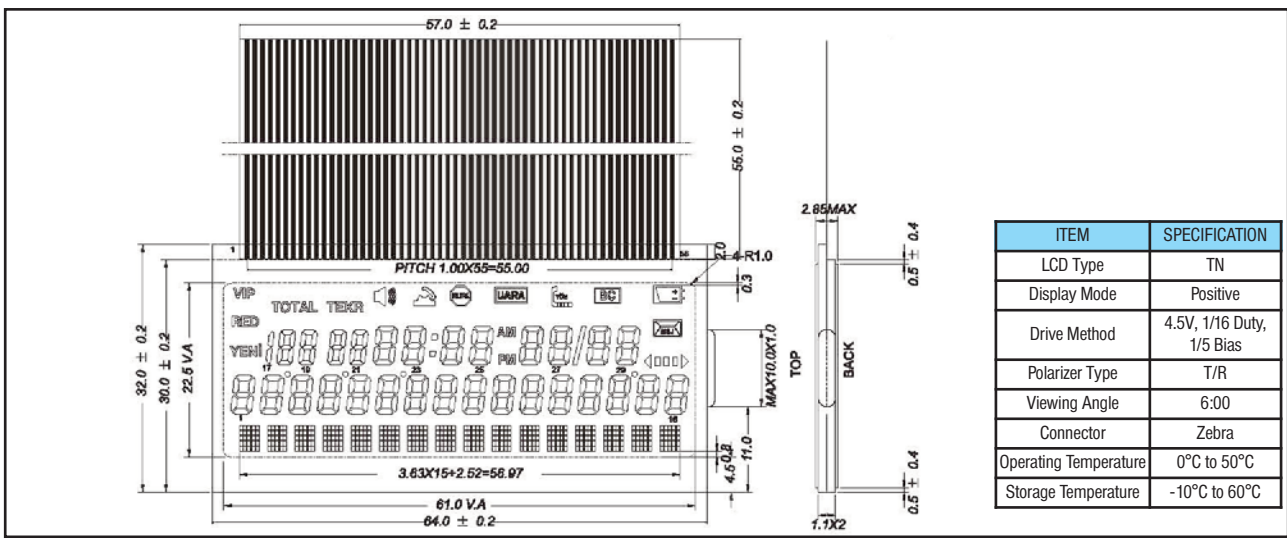
### YDDC4617AATRZ



### YDDH3015HPTHP



### YDDF0033BFTRH

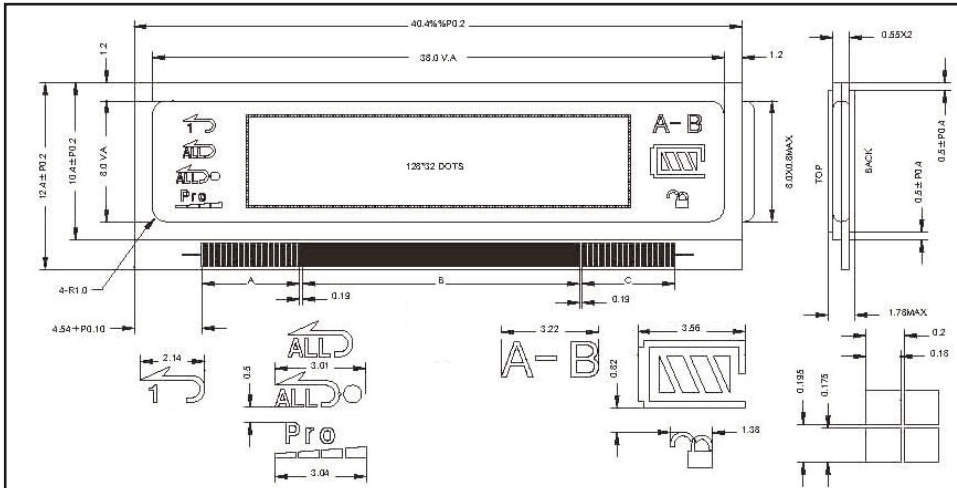






## CUSTOM-DESIGN LCD PANELS

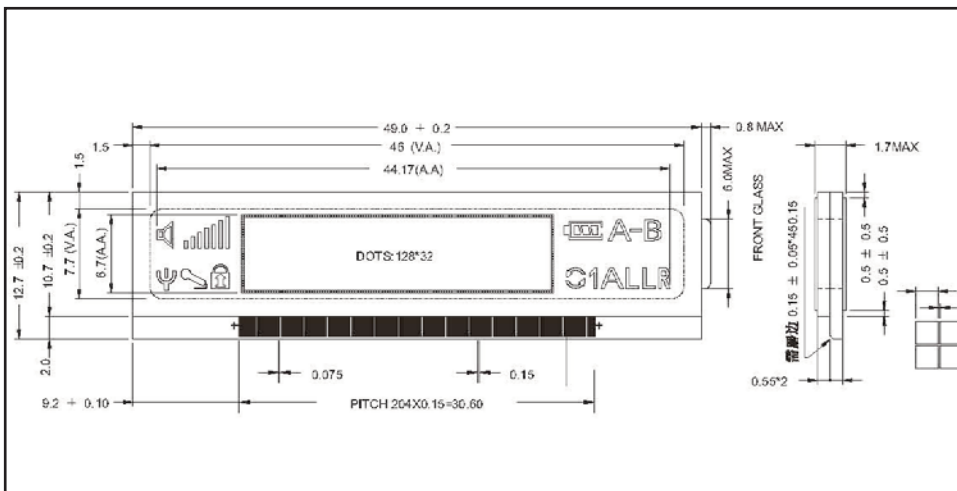
### YDDT0008AAFH



A: Pitch 0.18x36	6.48
B: Pitch 0.14x131	18.34
C: Pitch 0.18x34	6.12

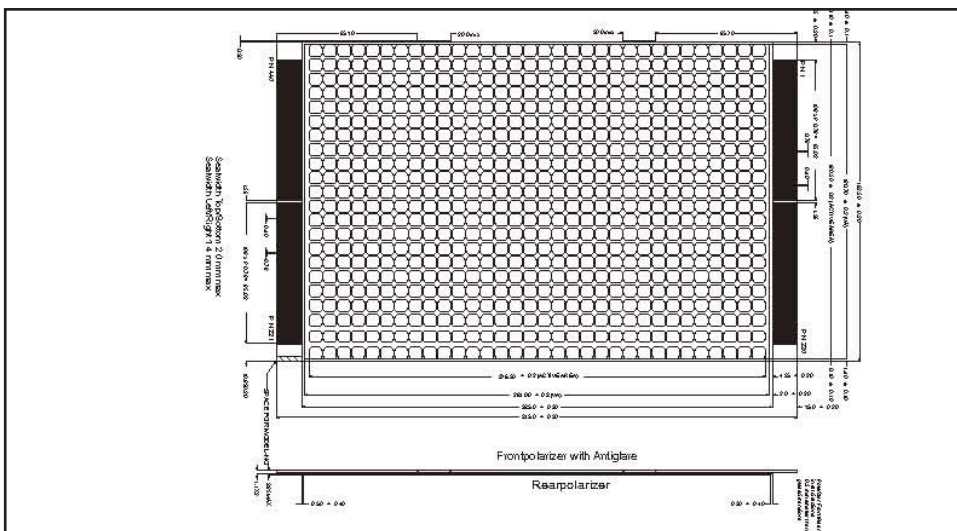
ITEM	SPECIFICATION
LCD Type	FSTN
Display Mode	Positive
Drive Method	9V
Polarizer Type	T/H
Viewing Angle	6:00
Connector	TAB
Operating Temperature	-10°C to 60°C
Storage Temperature	-20°C to 70°C

### YDDT0015AAFH



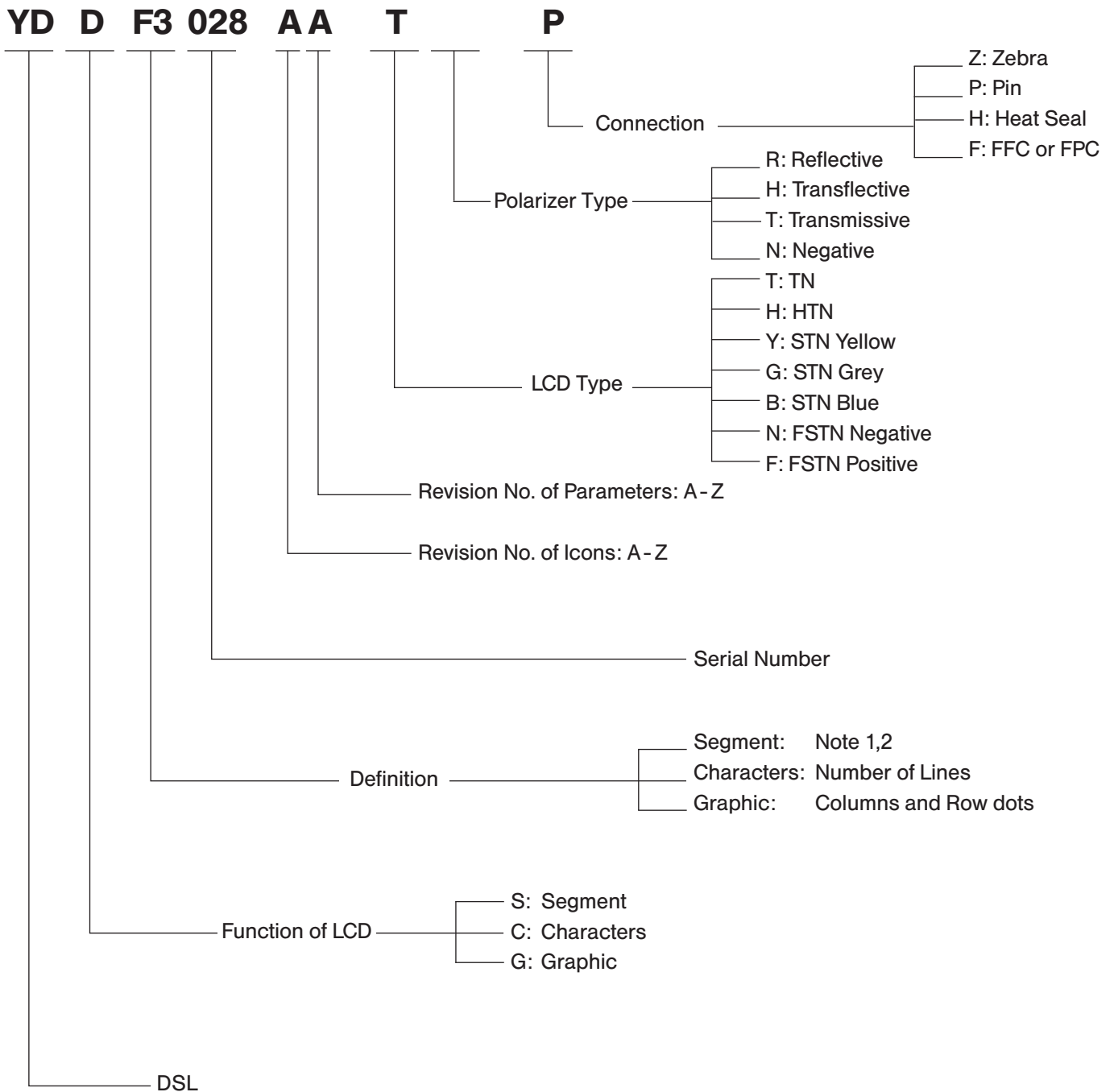
ITEM	SPECIFICATION
LCD Type	FSTN
Display Mode	Positive
Drive Method	9V
Polarizer Type	T/H
Viewing Angle	6:00
Connector	TAB
Operating Temperature	-20°C to 70°C
Storage Temperature	-30°C to 80°C

### YDDC2186AATNZ



ITEM	SPECIFICATION
LCD Type	TN
Display Mode	Negative
Drive Method	6.5V max.
Polarizer Type	T/T
Viewing Angle	6:00
Connector	Zebra
Operating Temperature	-20°C to 75°C
Storage Temperature	-25°C to 85°C

# CUSTOM-DESIGN LCD-PANEL NUMBERING SYSTEM



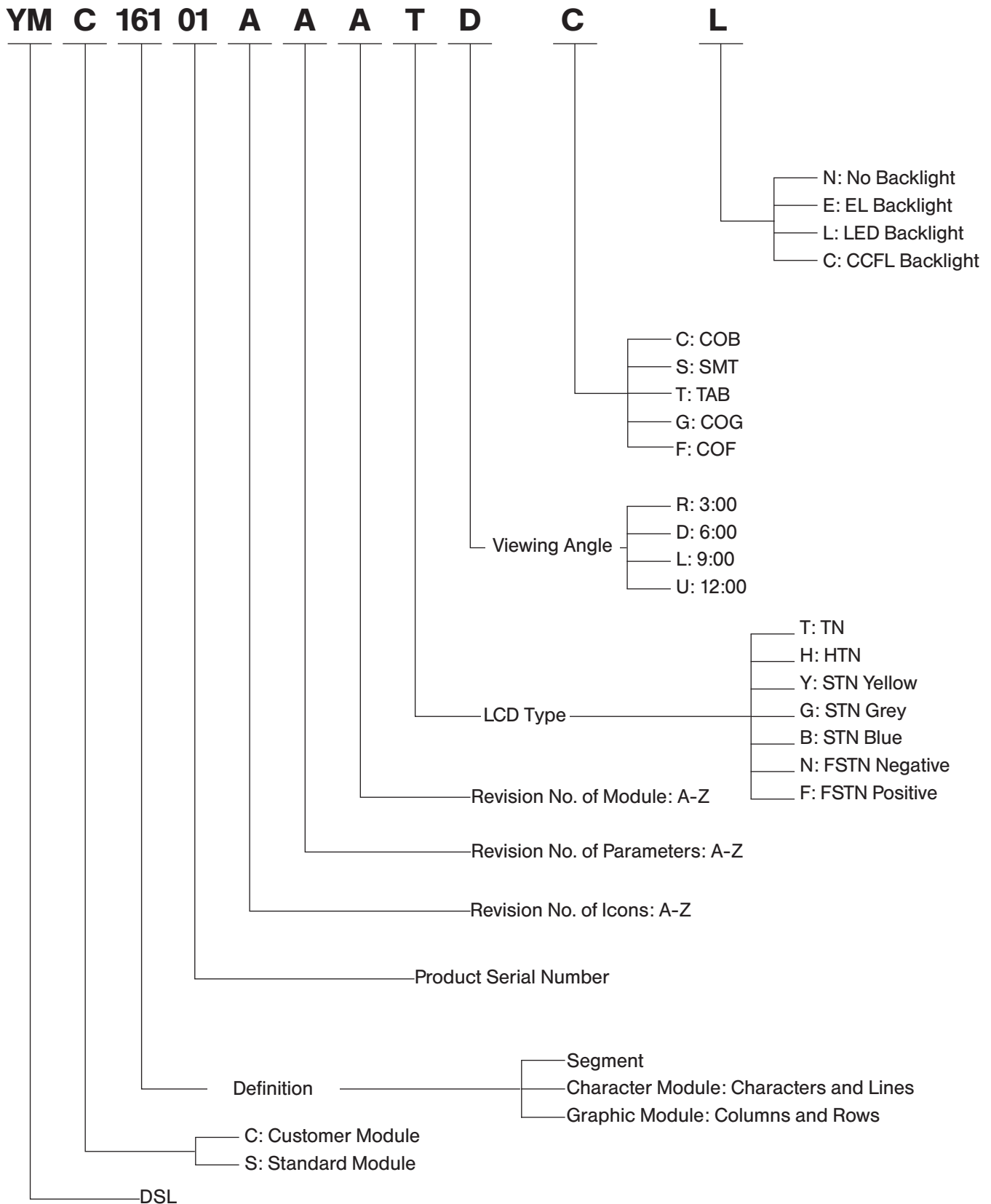
Note 1. For segment type, the serial Number is two digit number. For character, the maximum Number is three digit.

- Note 2. The letters indicates the application of the LCD panels:
- |                           |                      |        |
|---------------------------|----------------------|--------|
| A. Clock                  | F. Telephone         | O. COG |
| B. Calculator             | G. Remote controller |        |
| C. Instruments and meters | H. Audio and video   |        |
| D. Calender               | I. Other             |        |
| E. Game                   | T. TAB               |        |

The digit indicates the duty , when the duty is more than 1/9, it indicates 0.



## STANDARD MODULE NUMBERING SYSTEM



# LCD PANEL CHECK LIST

APPLICATION	<input type="checkbox"/> Clock (Watch) <input type="checkbox"/> Calculator <input type="checkbox"/> Instruments <input type="checkbox"/> Calendar <input type="checkbox"/> Game <input type="checkbox"/> Telephone <input type="checkbox"/> Remoter <input type="checkbox"/> Others _____			
DISPLAY MODE	1. <input type="checkbox"/> TN <input type="checkbox"/> HTN <input type="checkbox"/> STN <input type="checkbox"/> Other _____ 2. <input type="checkbox"/> Positive <input type="checkbox"/> Negative 3. <input type="checkbox"/> 3:00 <input type="checkbox"/> 6:00 <input type="checkbox"/> 9:00 <input type="checkbox"/> 12:00 <input type="checkbox"/> Other _____			
DRIVE METHOD	Driving Voltage: _____ V      Duty: _____      Bias: _____      Freq: _____ Hz			
POLARIZER	Front: <input type="checkbox"/> Reflective <input type="checkbox"/> Transmissive <input type="checkbox"/> Transflective <input type="checkbox"/> Pasted <input type="checkbox"/> Separated Rear: <input type="checkbox"/> Pasted <input type="checkbox"/> Separated			
TEMPERATURE	Operating Temperature: _____ °C ~ _____ °C Storage Temperature: _____ °C ~ _____ °C			
CONNECTOR	1. <input type="checkbox"/> Zebra <input type="checkbox"/> Pin <input type="checkbox"/> Heat Seal <input type="checkbox"/> Other _____			
LCD CONFIGURATION	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Other			
SCHEDULE	A. Counter drawing for approval by: B. Operating sample for approval by: C. Mass production starting from: Order volume: _____ pcs/month Total: _____ purchase			
REMARK				
COMPANY				ATTENTION
PHONE:			FAX:	DATE:

# LCD MODULE CHECK LIST

		<p>A. OUTLINE DIMENSION (A x B) _____ x _____ mm</p> <p>B. MOUNTING HOLE LOCATION (C x D) _____ x _____ mm</p> <p>C. HOLDER SIZE (E x F) _____ x _____ mm</p> <p>D. VIEW AREA (G x H) _____ x _____ mm</p> <p>E. DIAMETER OF MOUNTING HOLE (1) _____ x _____ mm</p> <p>F. UPPER THICKNESS (T1) _____ x _____ mm</p> <p>G. LOWER THICKNESS (T2) _____ x _____ mm</p> <p>H. EXTERNAL HEIGHT (T) _____ x _____ mm</p>
DISPLAY SPEC		<p>(1) CHARACTER TYPE:</p> <p>A. CHARACTER FONT: _____ x _____ DOTS, WITH / WITHOUT CURSOR.</p> <p>B. CHARACTER TYPE: _____ CHARACTERS x _____ LINES.</p> <p>C. DOT SIZE (A x B) _____ x _____ mm</p> <p>D. DOT PITCH (C x D) _____ x _____ mm</p> <p>E. CURSOR SPACE (E) _____ x _____ mm</p> <p>F. CHARACTER PITCH: (F x G) _____ x _____ mm</p> <p>G. OTHERS: _____ x _____ mm</p>
		<p>(2) CHARACTER TYPE:</p> <p>A. NUMBER OF DOTS _____ x _____ mm</p> <p>B. DOT SIZE (A x B) _____ x _____ mm</p> <p>C. DOT PITCH (C x D) _____ x _____ mm</p> <p>D. OTHERS: _____ x _____ mm</p>
EXTERNAL CONNECTION METHOD	<input type="checkbox"/> PATTERN TERMINAL <input type="checkbox"/> CONNECTOR: <input type="checkbox"/> OTHERS:	
LCD SPECIFICATION	<p>A. VIEWING ANGLE:    <input type="checkbox"/> 6:00      <input type="checkbox"/> 12:00      <input type="checkbox"/> OTHER</p> <p>B. LCD TYPE:        <input type="checkbox"/> TN          <input type="checkbox"/> STN YELLOW    <input type="checkbox"/> STN GRAY    <input type="checkbox"/> STN BLUE    <input type="checkbox"/> FSTN B/W    <input type="checkbox"/> OTHER</p> <p>                          <input type="checkbox"/> REFLECTIVE      <input type="checkbox"/> TRANSMISSIVE      <input type="checkbox"/> TRANSFLECTIVE</p> <p>                          <input type="checkbox"/> POSITIVE TYPE    <input type="checkbox"/> NEGATIVE</p> <p>C. VISUAL SPEC:    <input type="checkbox"/> NORMAL      <input type="checkbox"/> ANTI-GLARE      <input type="checkbox"/> _____</p>	
IC	<p>A. COMMON DRIVE: _____    B. SEGMENT DRIVE: _____</p> <p>C. CONTROLLER: _____    <input type="checkbox"/> BUILT-IN    <input type="checkbox"/> EXTERNAL    D. OTHERS _____</p>	
DRIVING METHOD	<p>A. SUPPLY VOLTAGE FOR LOGIC:    <input type="checkbox"/> 5 V      <input type="checkbox"/> 3 V      <input type="checkbox"/> OTHER _____ V</p> <p>B. SUPPLY VOLTAGE FOR LCD:      <input type="checkbox"/> _____ V</p> <p>C. <input type="checkbox"/> STATIC      <input type="checkbox"/> DUTY _____</p>	
BACKLIGHT	<p>A. <input type="checkbox"/> NO BACKLIGHT</p> <p>B. BACKLIGHT TYPE:    <input type="checkbox"/> LED    <input type="checkbox"/> EL    <input type="checkbox"/> CCFL    <input type="checkbox"/> OTHER</p> <p>C. BACKLIGHT COLOR:    <input type="checkbox"/> YELLOW <input type="checkbox"/> GREEN <input type="checkbox"/> AMBER <input type="checkbox"/> RED    <input type="checkbox"/> BLUE    <input type="checkbox"/> WHITE    <input type="checkbox"/> _____</p>	
TEMPERATURE	<p>OPERATING TEMPERATURE: _____ °C ~ _____ °C</p> <p>STORAGE TEMPERATURE: _____ °C ~ _____ °C</p>	
SCHEDULE	<p>A. ESTIMATE:                      B. SAMPLE:    DELIVERY: _____    QUANTITY: _____ PCS</p> <p>C. MASS PRODUCTION:                      DELIVERY: _____    QUANTITY PER LOT: _____ PCS</p>	
CUSTOMER		



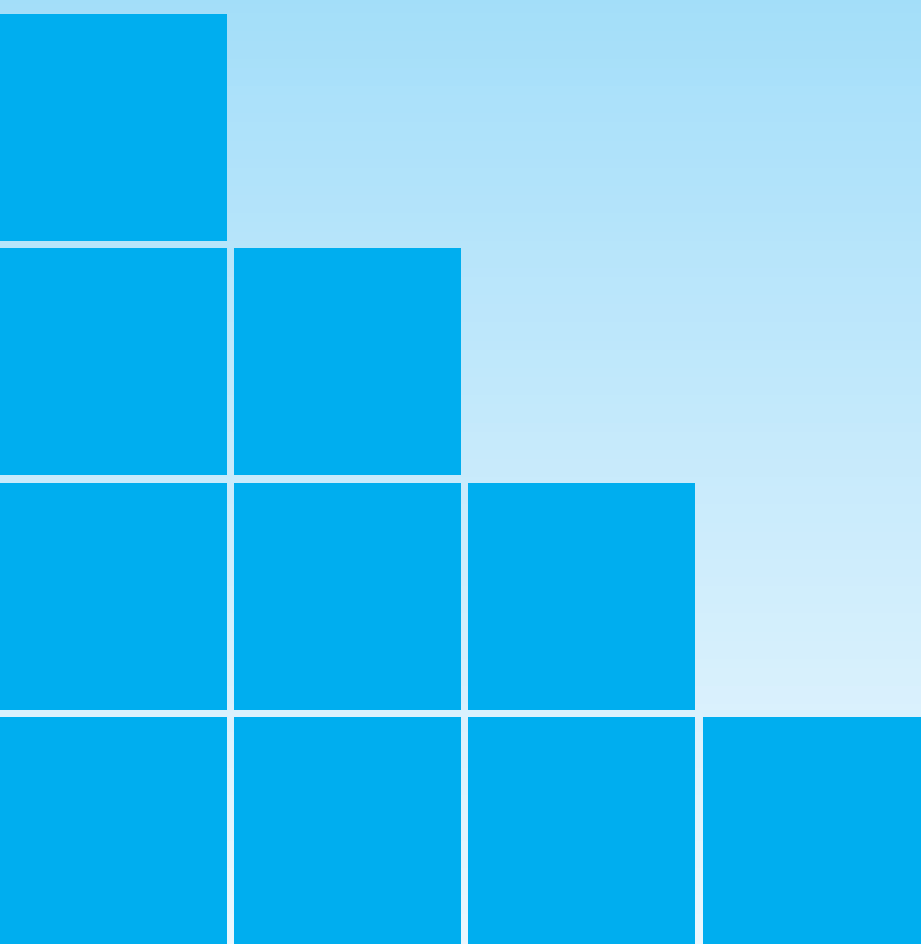
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