LCD/Plasma/Touch/LED дисплеи
Технические характеристики

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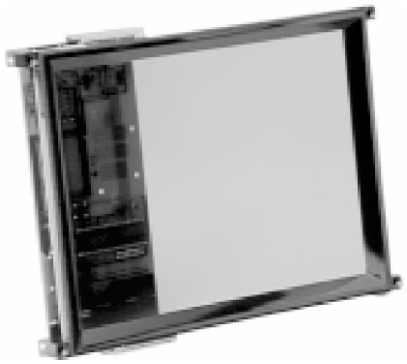
Infrared Touch Panel with Controller



TIP products are infrared touch panels designed to fit most flat panel display technologies. The touch panels are a matrix of infrared diodes and detectors, scanning electronics, micro-processor controller, bezel/optical filter assembly and hardware to mount the touch panel and controller to the flat panel display. These touch panels are ideal for many applications including medical instrumentation, machine or process controls, point of sale devices, public information displays, banking and military.

Vishay Dale® TIP touch panels have a unique patented scanning l9ogic system that makes them virtually immune to most lighting environments.

Optional PC based software (TBDriver, a DOS mouse emulator; and TWDriver, a Windows® mouse emulator) provide simple touch panel integration.

Windows® is a registered trademark of the Microsoft Corporation.

FEATURES

- Fast response time
- Flexible operating modes
- User transparent
- Rugged construction
- Sealed for environmental resistance
- Immune to high or changing ambient light
- RS-232C interface
- Pre-assembled - no assembly or disassembly required to mount display

ELECTRICAL SPECIFICATIONS

Voltage: + 12 V_{DC} ± 5 %

Current: 400 mA typical

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: 0 °C to + 55 °C

Storage Temperature: - 55 °C to + 85 °C

Relative Humidity: 10 % to 90 % non-conditioning

INTERFACE

Type: RS-232C

Data Rate: 300 baud, 1200 baud, 9600 baud and auto baud

Word Format: 8 data bits, no parity, 1 start bit, 1 stop bit

ORDERING INFORMATION

TIP	3216	FA	A	XXX
MODEL	MATRIX	DISPLAY DESIGNATOR	FILTER (1)	DASH NUMBER (if required)

TOUCH PANEL		DISPLAY				
MATRIX	TOUCH POINTS	PIXELS	TECHNOLOGY	MANUFACTURER	PART NUMBER	DESIGNATOR
3216	63 x 31	512 x 256	ELD	Finlux Planar	MD512.256 EL6648MSS	FA PA
3220	63 x 39	640 x 400	ELD	Finlux Planar Sharp	MD640.400 EL8358HR LJ640U27	FB PB SA
3224	63 x 47	640 x 480	ELD	Sharp	LJ64ZU49	SB
3526	69 x 51	640 x 480	ELD	Planar	EL7768MS	PC

A = Non-polarized, gray
B = Polarized, gray
C = Non-polarized, amber
D = Polarized, amber
S = Special, contact factory

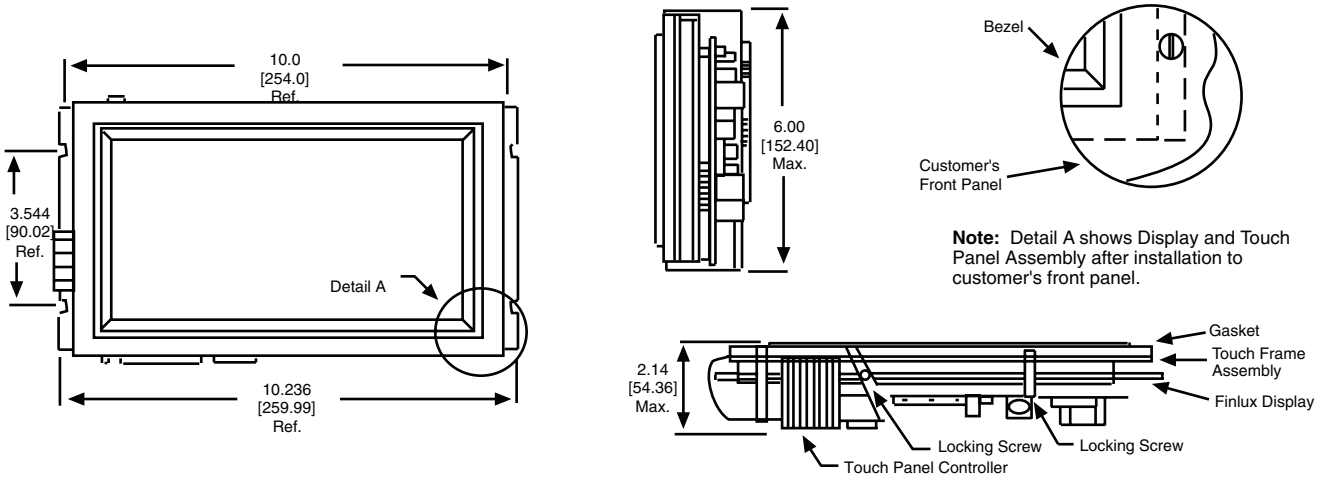
Notes

(1) Other user specified filters will be designated as “S”. Contact factory for availability. Any “S” filter designation will require a factory assigned dash number suffix. Filters A to D are plastic. Glass filters may be available on selected models.

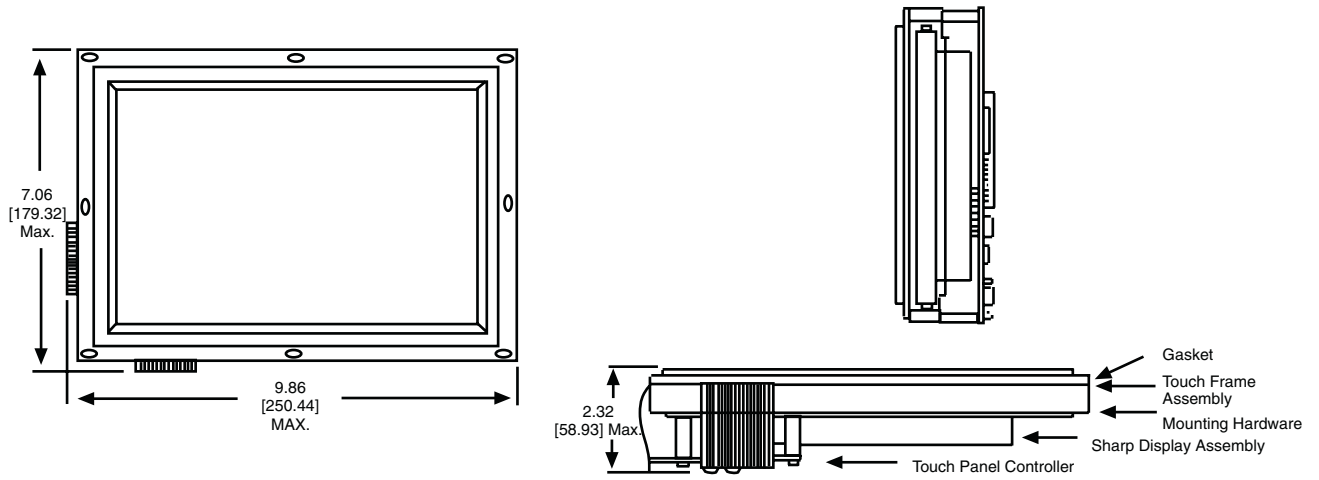
- Many additional touch panel options available to fit color LCD’s and other display technologies. Please contact factory for assistance.

DIMENSIONS in inches [millimeters]

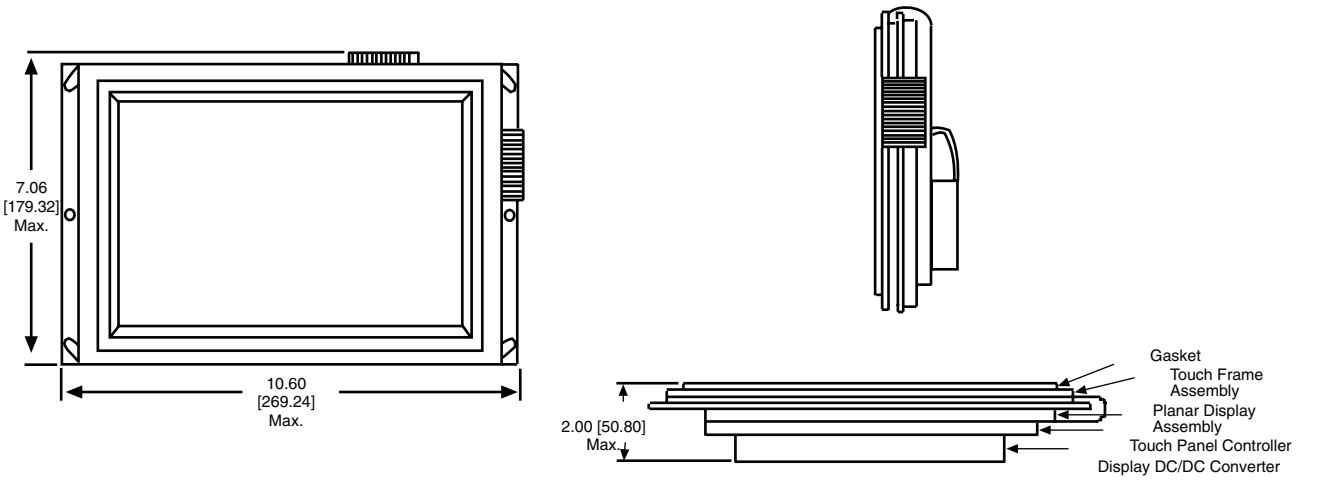
TIP-3216 WITH FINLUX 512 x 256 DISPLAY



TIP-3220 WITH SHARP 640 x 400 DISPLAY



TIP-3220 WITH PLANAR 640 x 400 DISPLAY



Note

- Contact factory for models not shown

GENERAL DESCRIPTION

Each Vishay Dale touch panel has infrared LED emitters and detectors along the X- and Y-axis, forming a grid of infrared light beams across the face of the display. The first two numbers of the TIP "matrix" number specify the number of vertical beams and the last two numbers specify the number of horizontal beams. The controller scans the emitter/detector pairs one at a time and determines whether both X and Y beams are blocked, indicating that a finger or stylus is present. (When beams are blocked on only one axis, they are ignored and not reported to the host.) The controller determines the coordinates of the touch point and reports them to the host computer. By interpolating a "virtual" beam between two physical beams, the number of touch points on each axis is effectively doubled. When an odd number of beams along either axis is blocked, the coordinate of the center physical beam is reported. When an even number of beams is blocked, the coordinate of the virtual beam in the center of the blocked beams is calculated and reported. The touch controller supports *enter*, *exit*, *continuous* and *tracking* report modes or combinations of these modes. The controller also has a beeper output. Hardware handshaking, software handshaking, baud rates and auto-baud features are jumper selected. The user initializes the desired report modes and requests reports when needed.

Several optical filters are standard to provide the most cost effective filter for each application. "Non-standard" filters may be specified as well. The filter increases the contrast ratio of the display and protects the display face and electronics.

Vishay Dale can assist in recommending the optimum filter based on years of experience as a display manufacturer. The perimeter of the filter is bonded to the bezel and a bezel to front panel gasket is includedto provide a splash proof seal.

MATING CONNECTORS

	VISHAY	OTHER
J1	280105-02	AMP 746285-1
J5, J6	280105-07	MOLEX 22-01-3037 housing, 08-50-0114 terminals
J4	280108-06	MOLEX 22-01-3037 housing, 08-50-0114 terminals

PIN CONNECTIONS

J1 DATA CONNECTOR

PIN	SIGNAL	PIN	SIGNAL
1	RD (to touch panel)	2	Ground
3	+ 12 (optional)	4	+ 12 (optional)
5	CTS	6	Reserved
7	RTS	8	Reserved
9	Ground	10	TD (from touch panle)

J5, J6 POWER CONNECTOR

PIN	SIGNAL
1	+ 12 V_{DC}
2	Beeper signal (active low)

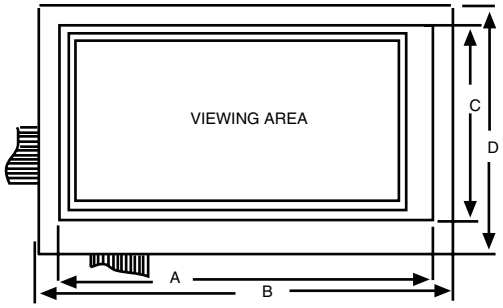
J4 AUDIO FEED BACK CONNECTOR

PIN	SIGNAL
1	Ground
2	Beeper signal (active low)
3	+ 5 V_{DC}

COMMAND SET (a bridged)

11H	DC1, Ctl Q, XON software handshaking
13H	DC3, Ctl S, XOFF, Software handshaking
20H	Enable *exit* point mode
21H	Disable *exit* point mode (default)
22H	Enable *enter* point mode
23H	Disable *enter* point mode (default)
24H	Enable *continuous* mode/disable *tracking*
25H	Disable *continuous* mode (default) and *tracking*
26H	Enable touch panel
27H	Disable touch panel (default)
28H	Request Failed beam report
29H	Enable automatic report transfer
2AH	Disable automatic report transfer (default)
2BH	Request one coordinate report
2CH	Reset touch panel
2EH	Disable beeper (default)
2FxxH	Sound beep, xx = duration (00H to FFH)
34H	Enable *tracking* mode/disable *continuous*

TOUCH FRAME DIMENSIONS in inches [millimeters]



MODEL	B	C	D	VIEWING AREA
3216	9.608 [244.04]	4.86 [123.44]	5.67 [144.02]	7.9 x 4.1 [200.66 x 104.14]
3220	9.748 [247.60]	6.238 [158.45]	6.950 [176.53]	8.0 x 5.2 [203.20 x 132.08]
3224	9.680 [246.0]	6.687 [169.85]	7.086 [179.98]	7.8 x 5.9 [198.12 x 149.86]
3526	10.404 [264.26]	7.311 [185.70]	7.532 [191.31]	8.6 x 6.4 [218.44 x 162.56]

Display Modules

Vishay Dale

APD-128G064C

APD-240M021

APD-240G120-A

APD-016A070

FEATURES

- **Viewing Angle:** Vishay Dale's patented "open" construction method provides superior viewing angles that are unsurpassed by any display technology.
- **Brightness:** Vishay Dale displays are designed to exploit the inherent high brightness capability of DC Plasma displays to make them excellent choices for practically any application, whether it is in sunlight, brightly lit factories, or total darkness. The nature of the plasma glow make the display characters or graphics appear much larger than they actually are. The bright ness is also extremely uniform since there are no inter nal filaments or grids that affect the light output.
- **Compact Size:** State-of-the-art design using the latest SMT components and DC/DC converters result in modules that provide minimum front panel space and depth.
- **Flexibility:** Vishay Dale excels in building display modules that allow the user to personalize their products at affordable prices. Our screened image display technology allows maximum freedom to design a display module that is application specific with interface circuitry that is synergistic to the end system.
- **High Speed Data Input:** Vishay Dale's creative inter faces allow high speed data input without display flicker ing or difficult handshaking schemes.
- **Rugged Design:** Shock and Vibration (non operating and operating) are no problem, as there are no fragile filaments or grids that may break.
- **Made in USA:** Vishay Dale Plasma display modules are completely manufactured in the USA by Vishay Dale which insures total control over all aspects of design and manufacturing to provide the utmost in customer service and support.

THE SELECTION PROCESS

- **Call Vishay Dale:** We have designed hundreds of application specific displays which enable us to give you an objective analysis of your needs and options.
- **Type and Amount of Information to be Displayed:** This will define whether a graphics or character format is required, and the minimum size of the format.
- **Viewing Distance Range:** This will determine the size of the characters from which the pixel pitch and size will be derived.
- **Ambient Lighting Conditions:** The lighting conditions will dictate the display luminance, whether or not dimming is required, and the type of contrast enhance ment filter.
- **Power and Voltage Available:** Through the use of efficient DC/DC converters, Vishay Dale can design modules compatible with practically any power and voltage source. Vishay Dale's Plasma display power requirements are competitive with any light emissive display technology.
- **Overall Size:** Vishay Dale is adept at designing pack ages to fit your space budget.
- **Interface:** Three basic interface levels are available: (1) ASCII - Parallel or serial (RS-232), (2) CRT controller (user supplies sync, pixel data, and clock signals) or (3) Display glass only (Vishay Dale will gladly provide application assistance).
- **Operating Environment:** The operating conditions may affect the component selection and whether special packaging is required for hostile environments.

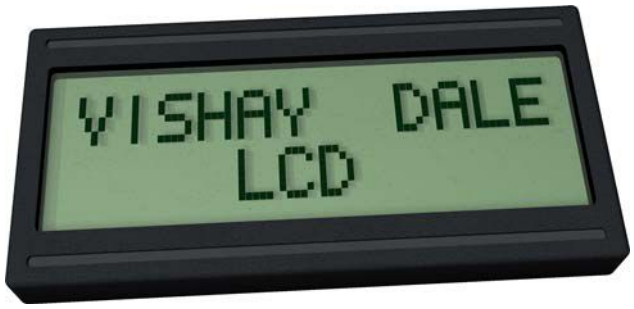
VISHAY DALE'S GOAL

- To help you select the best display for your application the first time.

LCD/PLASMA/TOUCH/LED DISPLAY - PLASMA DISPLAYS

Series	Description	Technology
APD-128G032	128 x 32 Graphics Display with Drive Electronics and TTL Level Data Interface, TTL level video interface, Highly visible for long distance viewing, >30:1 contrast ratio, Bright and pleasant neon orange color	Plasma
APD-128G032A	128 x 32 Graphics Display with Drive Electronics, TTL Level Data Interface and Integrated DC Converter	Plasma
APD-128G064	128 x 64 Graphics Display with Drive Electronics and TTL Level Data Interface, Slim Profile, Low DC Power Consumption, Very Affordable	Plasma
APD-128G064C	128 x 64 Graphics Display with ASCII Input Controller, DC Converter, Drive Circuitry, Bright and Vivid Graphics, Parallel Interface or RS-232 Serial Interface, Powerful Software Commands	Plasma
APD-128G064D	128 x 64 Graphics Display with Video Interface, DC Converter, Drive Circuitry, Bright, Vivid Graphics, Powerful Software Commands, Flicker Free Screen, Slim Profile	Plasma
APD-128G064E	Plasma Panel Display Modules 128 x 64 Graphics Dispaly with ASCII Input Controller, DC/DC Converter and Drive Circuitry	Plasma
APD-192G064-1	192 x 64 Graphics Display with Drive Electronics, TTL Level Data Interface, Integrated DC Converter, Slim Profile, Large, Bright Characters and Graphics, Highly Visible for Long-Distance Viewing	Plasma
APD-192G096	192 x 96 Graphics Display with Drive Electronics, Controller and Serial Interface, Text or Graphics Mode, Very Compact, Wide Viewing Angle, Flicker Free Refresh, Editing Functions, High Brightness	Plasma
APD-240G064	Plasma Panel Display Modules, 240 x 64 Graphics Display with ASCII Input Controller, DC/DC Converter and Drive Circuitry	Plasma
APD-240G120	240 x 120 Graphics Display with Drive Electronics & Controller, Text or Graphics Modes, Flicker Free Refresh, Parallel or RS-232/422 Serial Interface, Editing Functions, VT-100 Compatible	Plasma
APD-256G064-1	256 x 64 Graphics Display with Drive Electronics, TTL Level Data Interface, Integrated DC Converter, Slim Profile, Large Bright Characters and Graphics, Highly Visible for Long-Distance Viewing	Plasma
APD-256G064A	Plasma Panel Display Module, 256 x 64 Graphics Display with Drive Electronics, + 5V CMOS Level Video Interface and Integrated DC Converter	Plasma
APD-32A025A	Intelligent Plasma Display	Plasma
PD-020D025-7	Plasma Display 20 Characters, 7 Segments, Annunciators	Plasma
PD-04A200	4 Character, 16 Segment Alphanumeric Display with 2.00"" [50.80mm] High Characters, 200 Foot Lamberts Brightness, Designed for Multiplexed Operation, Edgeboard Connection, End Stackable	Plasma
PD-08D025-17	Plasma Display 8 Characters, 7 Segments, Annunciators	Plasma
PD-09D025-1	Plasma Display 9 Characters, 7 Segments, Annunciators	Plasma
PD-10D025-10	Plasma Display 10 Characters, 7 Segments, Annunciators	Plasma
PD-13D025-2	Plasma Display 13 Characters, 7 Segments, Annunciators	Plasma
PD-16A040	16 Character, 16 Segment Alphanumeric Display with .400"" [10.16mm] High Characters, 50 Foot Lamberts Brightness, Designed for Multiplexed Operation, Edgeboard Connection, Low Power Consumption	Plasma
PD-20D025-5	Plasma Display 20 Characters, 7 Segments	Plasma
PD-29D025-1	Plasma Display 29 Characters, 7 Segments, Annunciators	Plasma
PD-32A025	32 Character, 16 Segment Alphanumeric Display with .250"" [6.35mm] High Characters, 80 Foot Lamberts Brightness, Multiplexed Operation	Plasma
PDS-500/-1	Graphic Plasma, Display Controller	Plasma

12 x 2 Character LCD



FEATURES

- Type: Character
- Display format: 12 x 2 characters
- Built-in controller: HD44780 (or equivalent)
- Duty cycle: 1/16
- 5 x 8 dots includes cursor
- + 5 V power supply
- LED can be driven by pin 1, pin 2, or A and K
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT

MECHANICAL DATA

ITEM	STANDARD VALUE	UNIT
Module Dimension	55.7 x 32.0 x 9.7 (max.)	mm
Viewing Area	46.0 x 14.5	
Dot Size	0.45 x 0.60	
Dot Pitch	0.55 x 0.70	
Mounting Hole	31.2 x 30.0	
Character Size	2.65 x 5.50	

ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN.	TYP.	MAX.	
Power Supply	V_{DD} to V_{SS}	- 0.3	-	7.0	V
Power Supply	V_{DD} to V_0	- 0.3	-	13.0	
Input Voltage	V_I	V_{SS}	-	V_{DD}	

Note

- V_{SS} = 0 V, V_{DD} = 5.0 V

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Input Voltage	V_{DD}	V_{DD} = + 5 V	4.5	5.0	5.5	V
Supply Current	I_{DD}	V_{DD} = + 5 V	-	1.2	-	mA
Recommended LC Driving Voltage for Normal Temperature Version Module	V_{DD} to V_0	- 20 °C	-	-	5.7	V
		0 °C	-	-	-	
		25 °C	-	4.2	-	
		50 °C	-	-	-	
		70 °C	3.5	-	-	
LED Supply Voltage	V	n/a	-	-	-	V
LED Supply Current	I_{LED}	n/a	-	-	-	mA

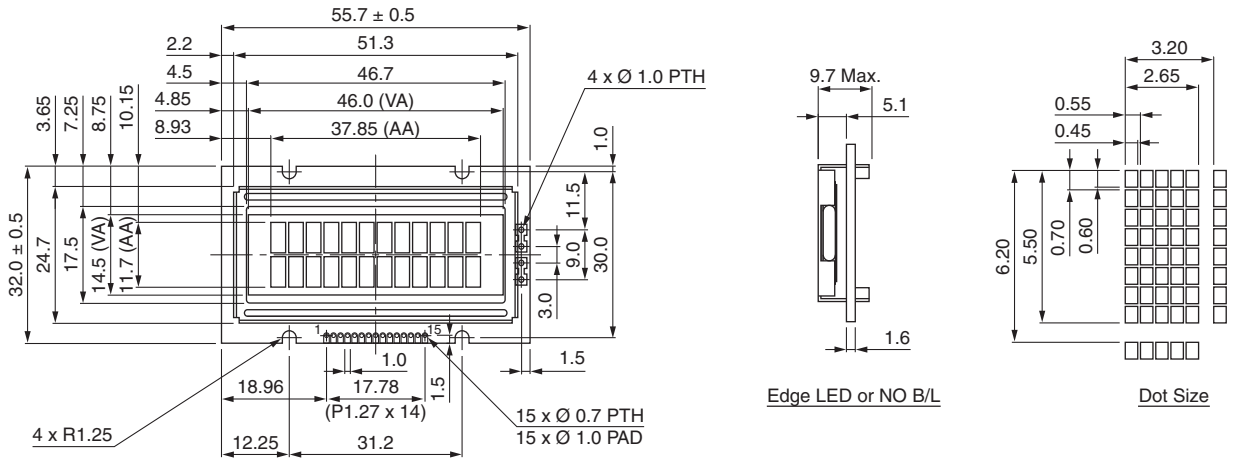
DISPLAY CHARACTER ADDRESS CODE

Display Position

	1	2	3	4	5	6	7	8	9	10	11	12
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B

INTERFACE PIN FUNCTION		
PIN NO.	**SYMBOL**	**FUNCTION**
1	V_{SS}	Ground
2	V_{DD}	+ 5 V supply voltage for logic
3	V_0	Operating voltage for LCD (variable)
4	RS	H/L; H: data/L: instruction code
5	R/$\overline{W}$	H/L; H: read (MPU → module)/L: Write (MPU → module)
6	E	H, H → L chip enable signal
7	DB0	H/L data bus line
8	DB1	H/L data bus line
9	DB2	H/L data bus line
10	DB3	H/L data bus line
11	DB4	H/L data bus line
12	DB5	H/L data bus line
13	DB6	H/L data bus line
14	DB7	H/L data bus line
15	A	NC

DIMENSIONS in millimeters



1.Module Classification Information

LCD- 012 N 002 A -N G G -ET

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

1. Brand：Vishay Intertechnology, Inc.
2. Horizontal Format: 12 characters
3. Display Type：N→Character Type, H→Graphic Type
4. Vertical Format: 2 lines
5. Model serials no.: A
6. Backlight Type：
   N→Without backlight, B→EL, Blue green, D→EL, Green, W→EL, White, F→CCFL, White, Y→LED, Yellow Green, T→LED, White, A→LED, Amber, R→LED, Red, O→LED, Orange, G→LED, Green
7. LCD Mode：
   B→TN Positive, Gray, N→TN Negative, G→STN Positive, Gray, Y→STN Positive, Yellow Green, M→STN Negative, Blue, F→FSTN Positive, T→FSTN Negative
8. LCD Polarize Type/ Temperature range/ View direction
   A→Reflective, N.T, 6:00, D→Reflective, N.T, 12:00, G→Reflective, W. T, 6:00, J→Reflective, W. T, 12:00, B→Transflective, N.T,6:00, E→Transflective, N.T.12:00, H→Transflective, W.T,6:00, K→Transflective, W.T,12:00, C→Transmissive, N.T,6:00, F→Transmissive, N.T,12:00, I→Transmissive, W. T, 6:00, L→Transmissive, W.T,12:00
9. Special Code
   ET : English and European standard font;
   Compliance with the ROHS Directions and regulations

2.Precautions in use of LCD Modules

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.
(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
(3)Don't disassemble the LCM.
(4)Don't operate it above the absolute maximum rating.
(5)Don't drop, bend or twist LCM.
(6)Soldering: only to the I/O terminals.
(7)Storage: please storage in anti-static electricity container and clean environment.

3.General Specification

Item	Dimension	Unit
Number of Characters	12 characters x 2 Lines	—
Module dimension	55.7 x 32.0 x 9.7(MAX)	mm
View area	46.0 x 14.5	mm
Active area	37.85 x 11.7	mm
Dot size	0.45 x 0.60	mm
Dot pitch	0.55 x 0.70	mm
Character size	2.65 x 5.50	mm
Character pitch	3.20 x 6.20	mm
LCD type	STN Positive, Gray Reflective,	
Duty	1/16	
View direction	6 o'clock	
Backlight Type	Without backlight	

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	V_{SS}	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}-V_{SS}	-0.3	—	7	V
Supply Voltage For LCD	V_{DD}-V_0	-0.3	—	13	V

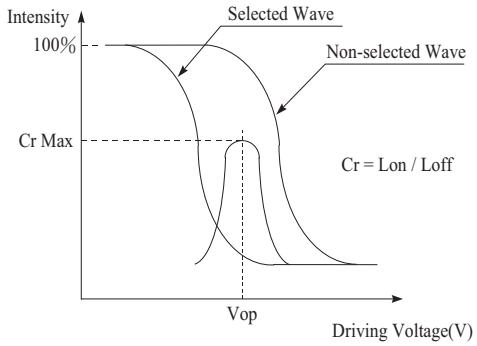
5.Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	4.5	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_0	Ta=-20℃	—	—	5.7	V
		Ta=25℃	—	4.2	—	V
		Ta=70℃	3.5	—	—	V
Input High Volt.	V_{IH}	—	0.7V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	V_{SS}	—	0.6	V
Output High Volt.	V_{OH}	—	3.9	—	—	V
Output Low Volt.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{DD}	V_{DD}=5V	—	1.2	—	mA

6.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ	CR≧2	20	—	40	deg
	(H) φ	CR≧2	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	150	200	ms
	T fall	—	—	150	200	ms

Definition of Operation Voltage (Vop)



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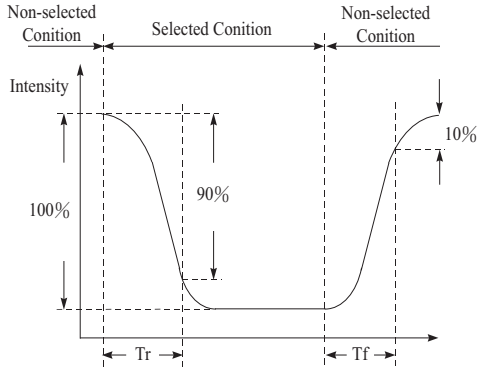
Definition of Response Time (Tr , Tf)



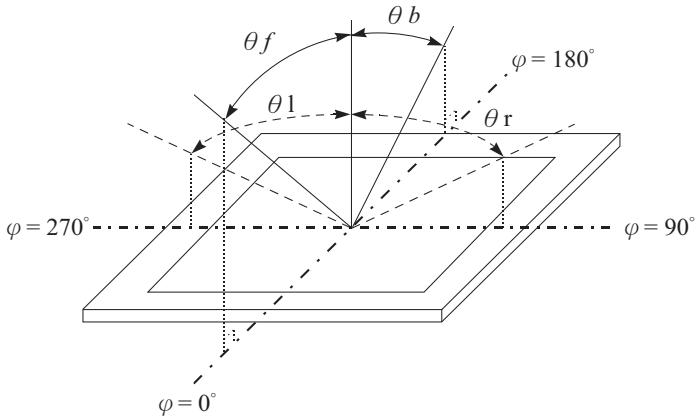
[positive type]

Conditions :

Operating Voltage : Vop Viewing Angle(θ ， φ) : 0˚， 0˚

Frame Frequency : 64 HZ Driving Waveform : 1/N duty , 1/a bias

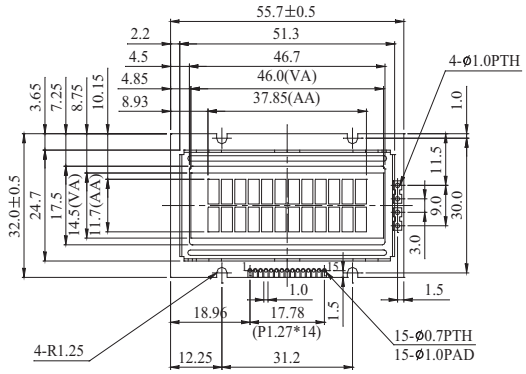
Definition of viewing angle(CR≧2)

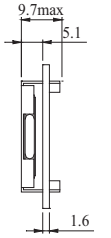


7.Interface Pin Function

Pin No.	Symbol	Level	Description
1	V_{SS}	0V	Ground
2	V_{DD}	5.0V	Supply Voltage for logic
3	VO	(Variable)	Operating voltage for LCD
4	RS	H/L	H: DATA, L: Instruction code
5	R/W	H/L	H: Read(MPU→Module) L: Write(MPU→Module)
6	E	H,H→L	Chip enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
15	A	—	NC

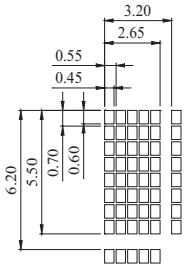
8.Contour Drawing &Block Diagram





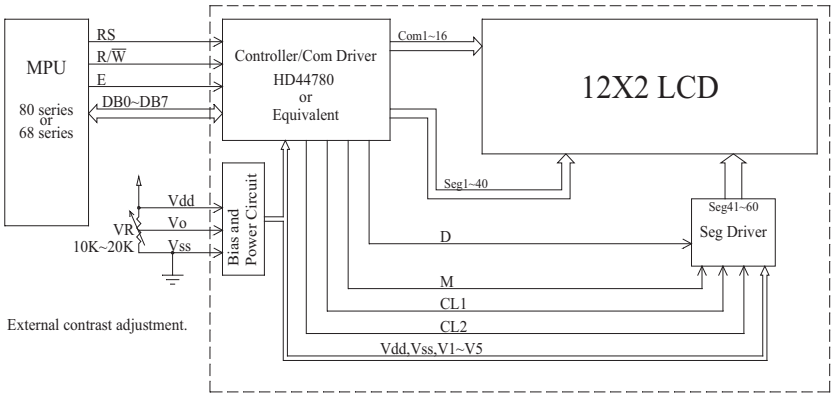
LED or NO B/L

1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A



DOT SIZE

The non-specified tolerance of dimension is ±0.3mm.



Character located	1	2	3	4	5	6	7	8	9	10	11	12
DDRAM address	00	01	02	03	04	05	06	07	08	09	0A	0B
DDRAM address	40	41	42	43	44	45	46	47	48	49	4A	4B

9.Function Description

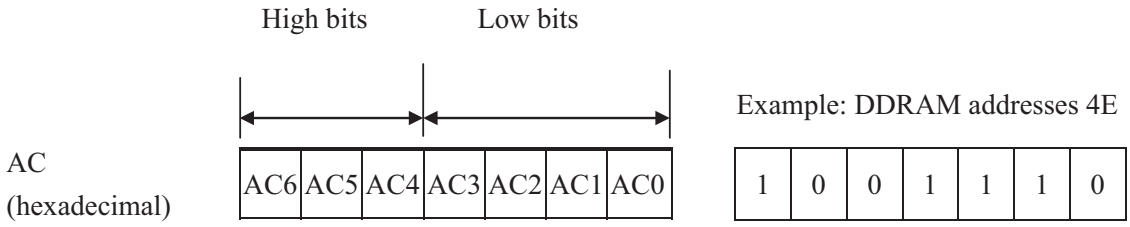
The LCD display Module is built in a LSI controller, the controller has two 8-bit registers, an instruction register (IR) and a data register (DR).
The IR stores instruction codes, such as display clear and cursor shift, and address information for display data RAM (DDRAM) and character generator (CGRAM). The IR can only be written from the MPU. The DR temporarily stores data to be written or read from DDRAM or CGRAM. When address information is written into the IR, then data is stored into the DR from DDRAM or CGRAM. By the register selector (RS) signal, these two registers can be selected.

RS	R/W	Operation
0	0	IR write as an internal operation (display clear, etc.)
0	1	Read busy flag (DB7) and address counter (DB0 to DB7)
1	0	Write data to DDRAM or CGRAM (DR to DDRAM or CGRAM)
1	1	Read data from DDRAM or CGRAM (DDRAM or CGRAM to DR)

Busy Flag (BF)
When the busy flag is 1, the controller LSI is in the internal operation mode, and the next instruction will not be accepted. When RS=0 and R/W=1, the busy flag is output to DB7. The next instruction must be written after ensuring that the busy flag is 0.

Address Counter (AC)
The address counter (AC) assigns addresses to both DDRAM and CGRAM

Display Data RAM (DDRAM)
This DDRAM is used to store the display data represented in 8-bit character codes. Its extended capacity is 80×8 bits or 80 characters. Below figure is the relationships between DDRAM addresses and positions on the liquid crystal display.



Display position DDRAM address

1	2	3	4	5	6	7	8	9	10	11	12				
00	01	02	03	04	05	06	07	08	09	0A	0B				
40	41	42	43	44	45	46	47	48	49	4A	4B				

2-Line by 12-Character Display

Character Generator ROM (CGROM)

The CGROM generate 5×8 dot or 5×10 dot character patterns from 8-bit character codes. See Table 2.

Character Generator RAM (CGRAM)

In CGRAM, the user can rewrite character by program. For 5×8 dots, eight character patterns can be written, and for 5×10 dots, four character patterns can be written.

Write into DDRAM the character code at the addresses shown as the left column of table 1. To show the character patterns stored in CGRAM.

Relationship between CGRAM Addresses, Character Codes (DDRAM) and Character patterns

Table 1.

For 5 * 8 dot character patterns

Character Codes (DDRAM data)		CGRAM Address		Character Patterns (CGRAM data)	
7 6 5 4 3 2 1 0		5 4 3 2 1 0		7 6 5 4 3 2 1 0	
High Low		High Low		High Low	
0 0 0 0 * 0 0 0		0 0 0	0 0 0	* * * ■ ■ ■ ■ 0	Character pattern(1)
			0 0 1	* * * ■ 0 0 0 ■	
			0 1 0	* * * ■ 0 0 0 ■	
			0 1 1	* * * ■ ■ ■ ■ 0	
			1 0 0	* * * ■ 0 ■ 0 0	
			1 0 1	* * * ■ 0 0 ■ 0	
			1 1 0	* * * ■ 0 0 0 ■	
			1 1 1	* * * 0 0 0 0 0	Cursor pattern
0 0 0 0 * 0 0 1		0 0 1	0 0 0	* * * ■ 0 0 0 ■	Character pattern(2)
			0 0 1	* * * 0 ■ 0 ■ 0	
			0 1 0	* * * ■ ■ ■ ■ ■	
			0 1 1	* * * 0 0 ■ 0 0	
			1 0 0	* * * ■ ■ ■ ■ ■	
			1 0 1	* * * 0 0 ■ 0 0	
			1 1 0	* * * 0 0 ■ 0 0	
			1 1 1	* * * 0 0 0 0 0	Cursor pattern
			0 0 0	* * *	
			0 0 1		
0 0 0 0 * 1 1 1		1 1 1	1 0 0		
			1 0 1		
			1 1 0		
			1 1 1	* * *	

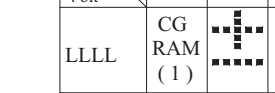
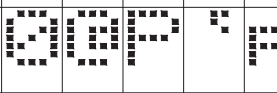
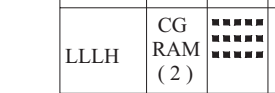
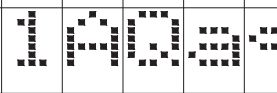
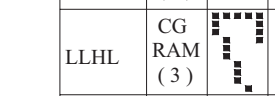
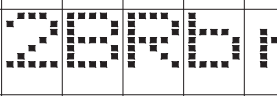
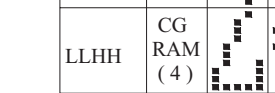
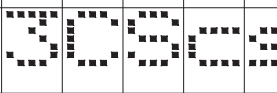
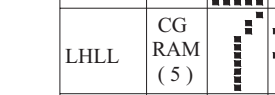
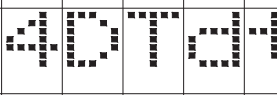
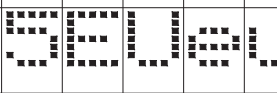
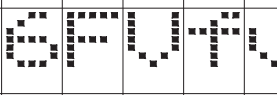
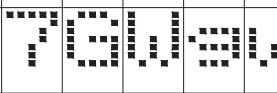
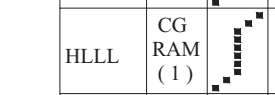
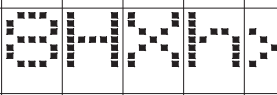
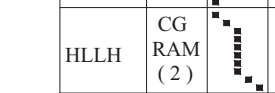
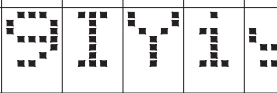
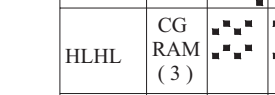
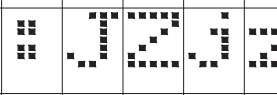
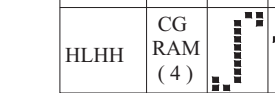
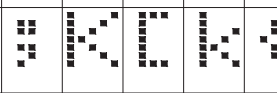
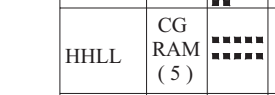
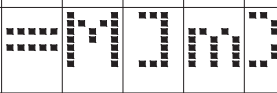
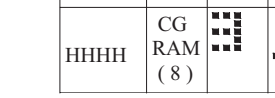
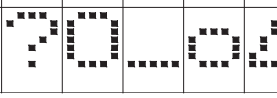
For 5 * 10 dot character patterns

Character Codes (DDRAM data)		CGRAM Address		Character Patterns (CGRAM data)	
7 6 5 4 3 2 1 0		5 4 3 2 1 0		7 6 5 4 3 2 1 0	
High Low		High Low		High Low	
0 0 0 0 * 0 0 0		0 0	0 0 0 0	* * * 0 0 0 0 0	Character pattern
			0 0 0 1	* * * 0 0 0 0 0	
			0 0 1 0	* * * ■ 0 ■ ■ 0	
			0 0 1 1	* * * ■ ■ 0 0 ■	
			0 1 0 0	* * * ■ 0 0 0 ■	
			0 1 0 1	* * * ■ 0 0 0 ■	
			0 1 1 0	* * * ■ ■ ■ ■ 0	
			0 1 1 1	* * * ■ 0 0 0 0	
			1 0 0 0	* * * ■ 0 0 0 0	
			1 0 0 1	* * * ■ 0 0 0 0	
			1 0 1 0	* * * 0 0 0 0 0	Cursor pattern
			1 1 1 1	* * * * * * * *	

■ : " High "

10.Character Generator ROM Pattern

Table.2

Upper 4 bit / Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)															
LLLH	CG RAM (2)															
LLHL	CG RAM (3)															
LLHH	CG RAM (4)															
LHLL	CG RAM (5)															
LHLH	CG RAM (6)															
LHHL	CG RAM (7)															
LHHH	CG RAM (8)															
HLLL	CG RAM (1)															
HLLH	CG RAM (2)															
HLHL	CG RAM (3)															
HLHH	CG RAM (4)															
HHLL	CG RAM (5)															
HHLH	CG RAM (6)															
HHHL	CG RAM (7)															
HHHH	CG RAM (8)															

11.Instruction Table

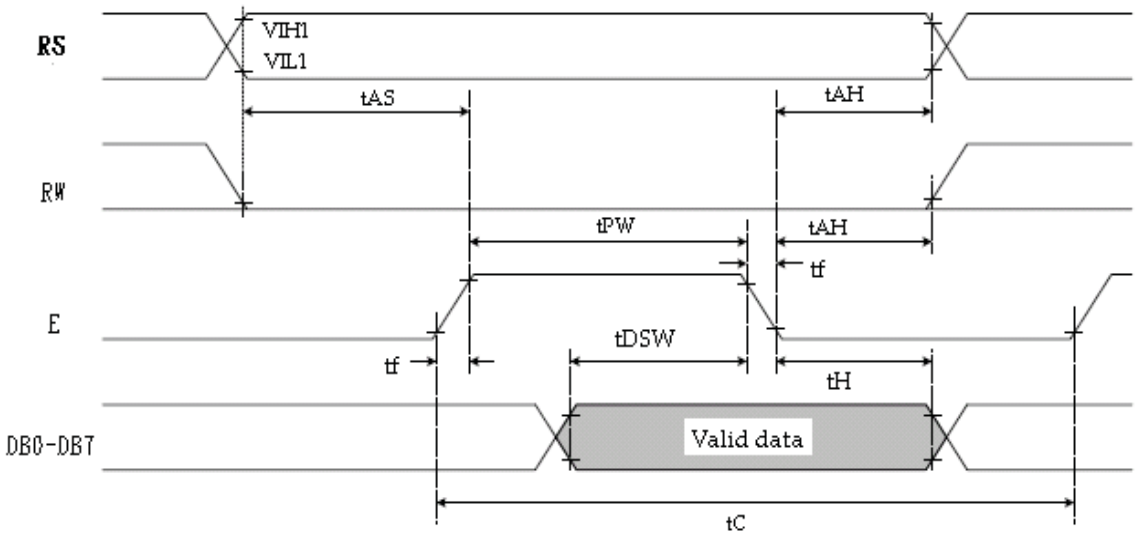
Instruction	Instruction Code										Description	Execution time (fosc=270Khz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write “00H” to DDRAM and set DDRAM address to “00H” from AC	1.53ms
Return Home	0	0	0	0	0	0	0	0	1	—	Set DDRAM address to “00H” from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.53ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39 μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor (C), and blinking of cursor (B) on/off control bit.	39 μs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	—	—	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	39 μs
Function Set	0	0	0	0	1	DL	N	F	—	—	Set interface data length (DL:8-bit/4-bit), numbers of display line (N:2-line/1-line)and, display font type (F:5×11 dots/5×8 dots)	39 μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39 μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39 μs
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 μs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43 μs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	43 μs

＊ ”—”：don’t care

12.Timing Characteristics

12.1 Write Operation

- Writing data from MPU

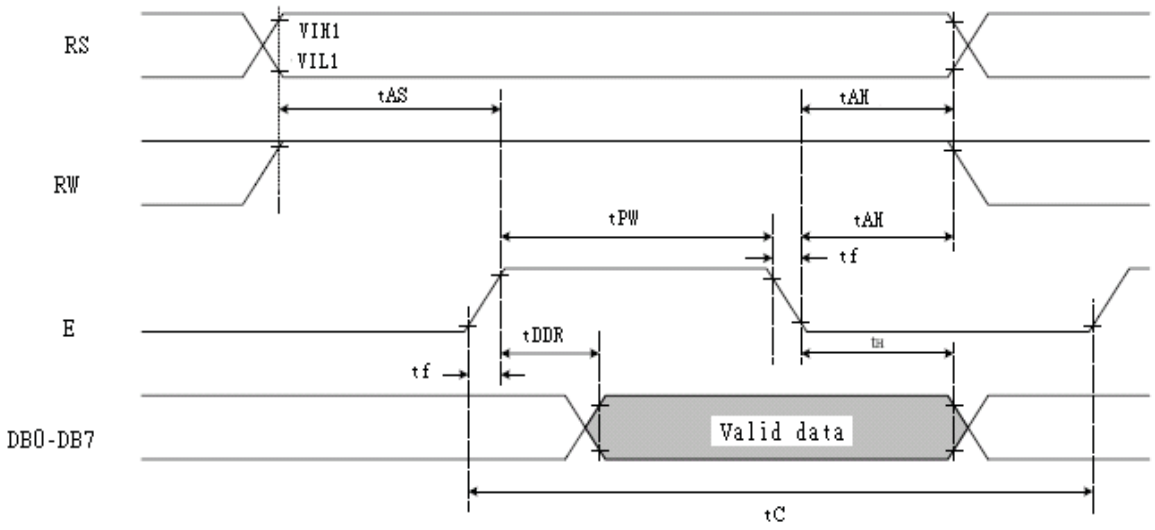


Ta=25℃, VDD=5.0V

Item	Symbol	Min	Typ	Max	Unit
Enable cycle time	T_C	1200	—	—	ns
Enable pulse width	T_{PW}	140	—	—	ns
Enable rise/fall time	T_R,T_F	—	—	25	ns
Address set-up time (RS, R/W to E)	t_{AS}	0	—	—	ns
Address hold time	t_{AH}	10	—	—	ns
Data set-up time	t_{DSW}	40	—	—	ns
Data hold time	t_H	10	—	—	ns

12.2 Read Operation

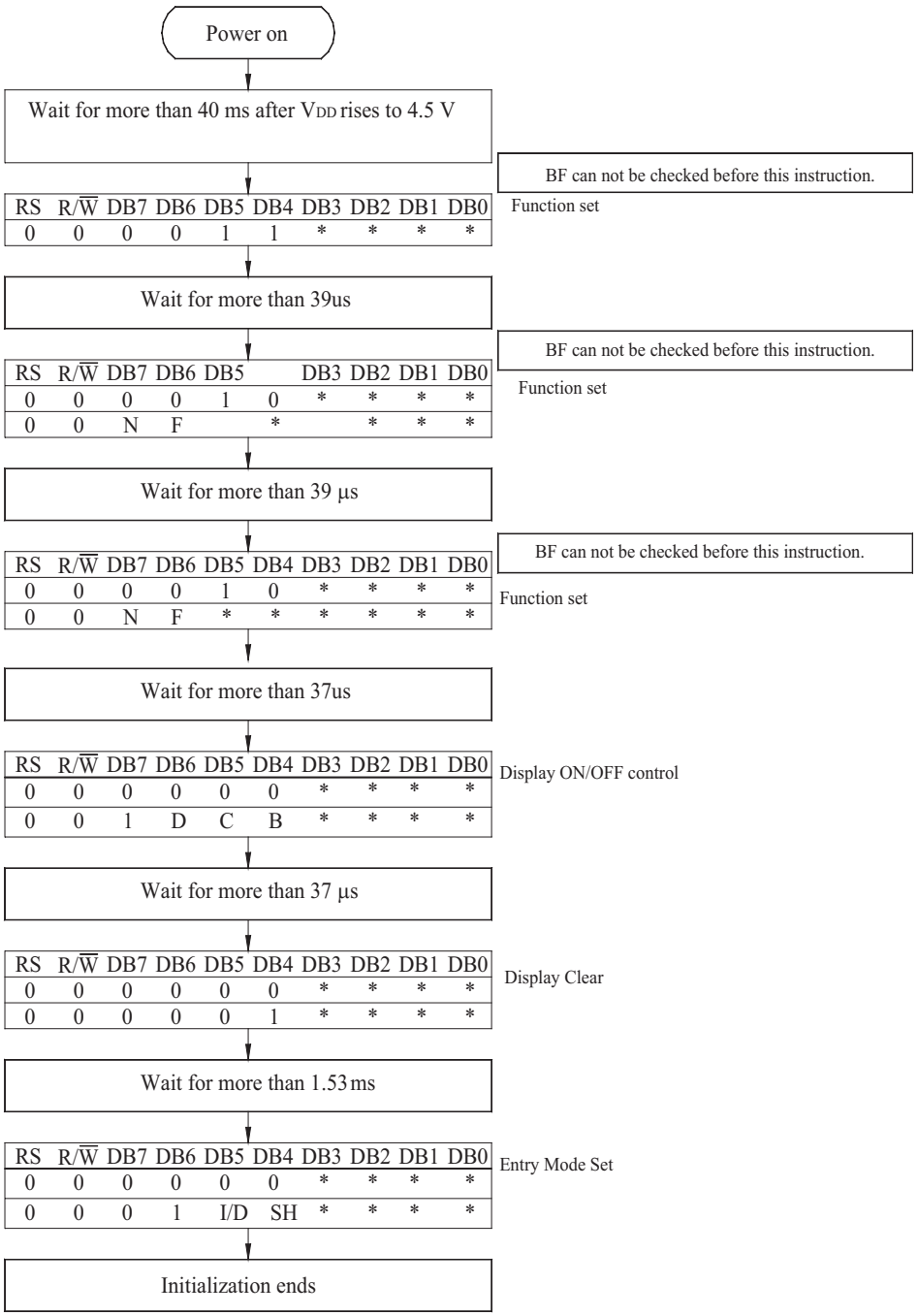
- Reading data from ST7066U



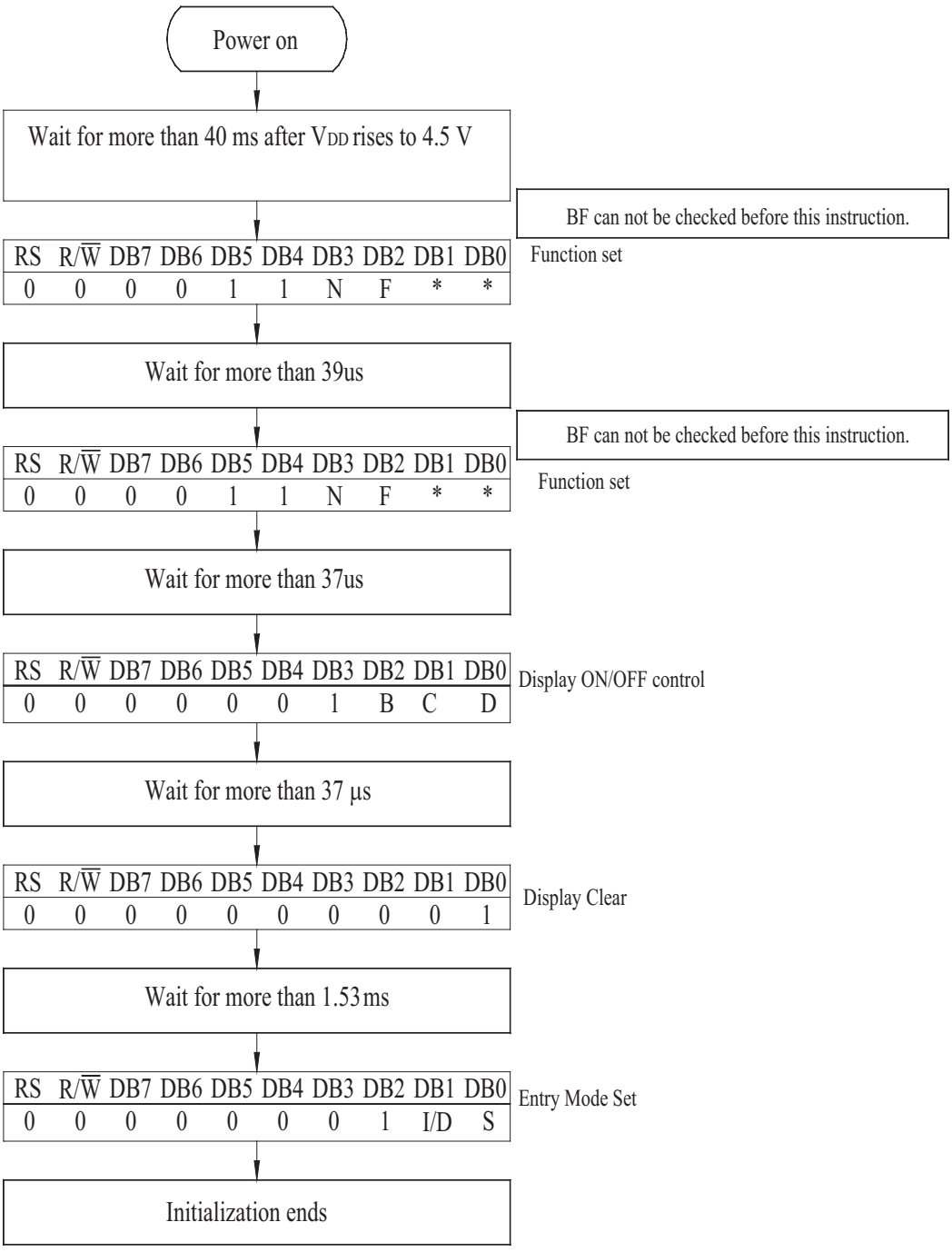
Ta=25℃, VDD=5V

Item	Symbol	Min	Typ	Max	Unit
Enable cycle time	T_C	1200	—	—	ns
Enable pulse width (high level)	T_{PW}	140	—	—	ns
Enable rise/fall time	T_R,T_F	—	—	25	ns
Address set-up time (RS, R/W to E)	t_{AS}	0	—	—	ns
Address hold time	t_{AH}	10	—	—	ns
Data delay time	t_{DDR}	—	—	100	ns
Data hold time	t_H	10	—	—	ns

13.Initializing of LCM



4-Bit Interface



8-Bit Interface

14.Reliability

Content of Reliability Test (wide temperature, -20℃~70℃)

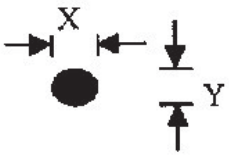
Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃ 30min min 1 cycle	-20℃/70℃ 10 cycles	——
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	——

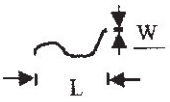
Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: Vibration test will be conducted to the product itself without putting it in a container.

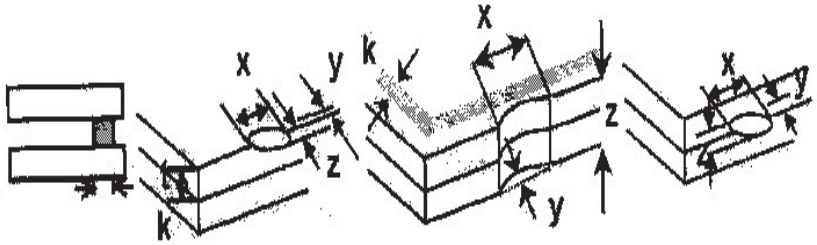
15. Inspection specification

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.
1.2 Missing character , dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Mixed product types.
1.8 Contrast defect.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or white spots on LCD (display only)</td><td>2.1 White and black spots on display ≦0.25mm, no more than three white or black spots present.
2.2 Densely spaced: No more than two spots or lines within 3mm</td><td>2.5</td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing
Φ=(x + y) / 2
 

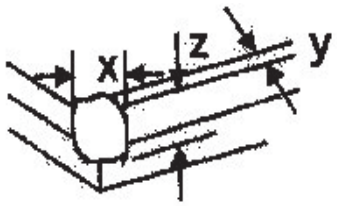
<table>
<tr><th>SIZE</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ ≦0.10</td><td>Accept no dense</td></tr>
<tr><td>0.10＜Φ ≦0.20</td><td>2</td></tr>
<tr><td>0.20＜Φ ≦0.25</td><td>1</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>3.2 Line type : (As following drawing)
 

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02＜W≦0.03</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03＜W≦0.05</td></tr>
<tr><td>---</td><td>0.05＜W</td><td>As round type</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size Φ</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20＜Φ ≦0.50</td><td>3</td></tr>
<tr><td>0.50＜Φ ≦1.00</td><td>2</td></tr>
<tr><td>1.00＜Φ</td><td>0</td></tr>
<tr><td>Total Q TY</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
</table>

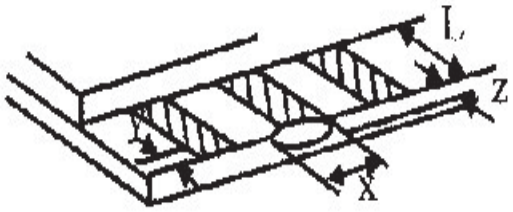
<table>
<tr><td>NO</td><td>Item</td><td>Criterion</td><td>AQL</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 LCD black spots, white spots, contamination</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>
Symbols Define:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length:

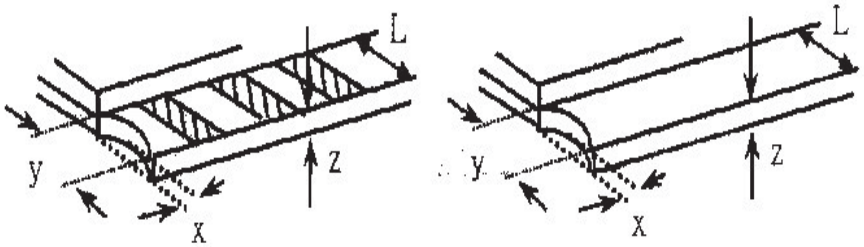
6.1 General glass chip :
6.1.1 Chip on panel surface and crack between panels:


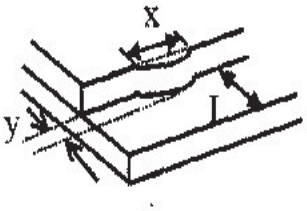
<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is total length of each chip.

6.1.2 Corner crack:


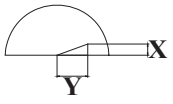
<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is the total length of each chip.
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Glass crack</td><td>
Symbols :
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length
6.2 Protrusion over terminal :
6.2.1 Chip on electrode pad :


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
6.2.2 Non-conductive portion:


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦ L</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
⊙If the product will be heat sealed by the customer, the alignment mark not be damaged.
6.2.3 Substrate protuberance and internal crack.


<table>
<tr><td>y: width</td><td>x: length</td></tr>
<tr><td>y≦1/3L</td><td>x ≦ a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn’ t light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down. 10.9 The Scraping testing standard for Copper Coating of PCB  **X * Y<=2mm^2**	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. 12.2 No cracks on interface pin (OLB) of TCP. 12.3 No contamination, solder residue or solder balls on product. 12.4 The IC on the TCP may not be damaged, circuits. 12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever. 12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 12.7 Sealant on top of the ITO circuit has not hardened. 12.8 Pin type must match type in specification sheet. 12.9 LCD pin loose or missing pins. 12.10 Product packaging must the same as specified on packaging specification sheet. 12.11 Product dimension and structure must conform to product specification sheet.	2.5 0.65 2.5 2.5 2.5 2.5 2.5 0.65 0.65 0.65 0.65

16. Material List of Components for RoHS

1. Declaration that all of or part of products (with the mark “N” in code), including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

Exhibit A：The Harmful Material List

.

Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm
Above limited value is set up according to RoHS.						

2.Process for RoHS requirement：

(1) Use the Sn/Ag/Cu soldering surface；the surface of Pb-free solder is rougher than we used before.

(2) Heat-resistance temp.：

Reflow：250C, 30 seconds Max.；

Connector soldering wave or hand soldering：320C, 10 seconds max.

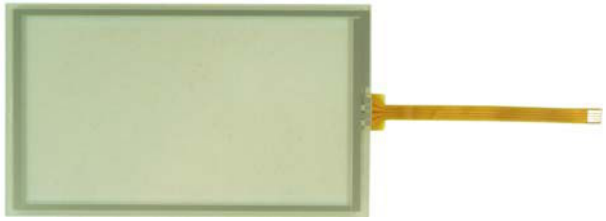
(3) Temp. curve of reflow, max. Temp.：235C±5 degrees；

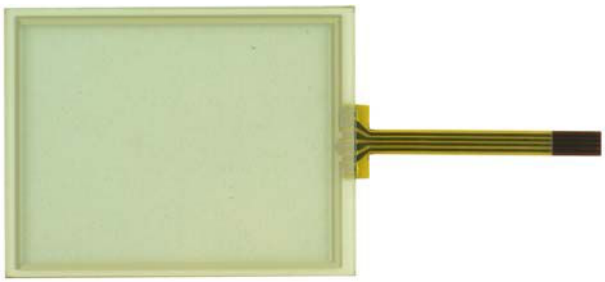
Recommended customer’s soldering temp. of connector：280C, 3 seconds.

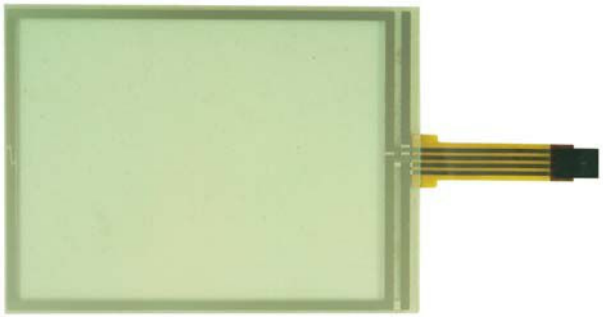
Available Touch Screen Options for Vishay LCD Modules

Vishay

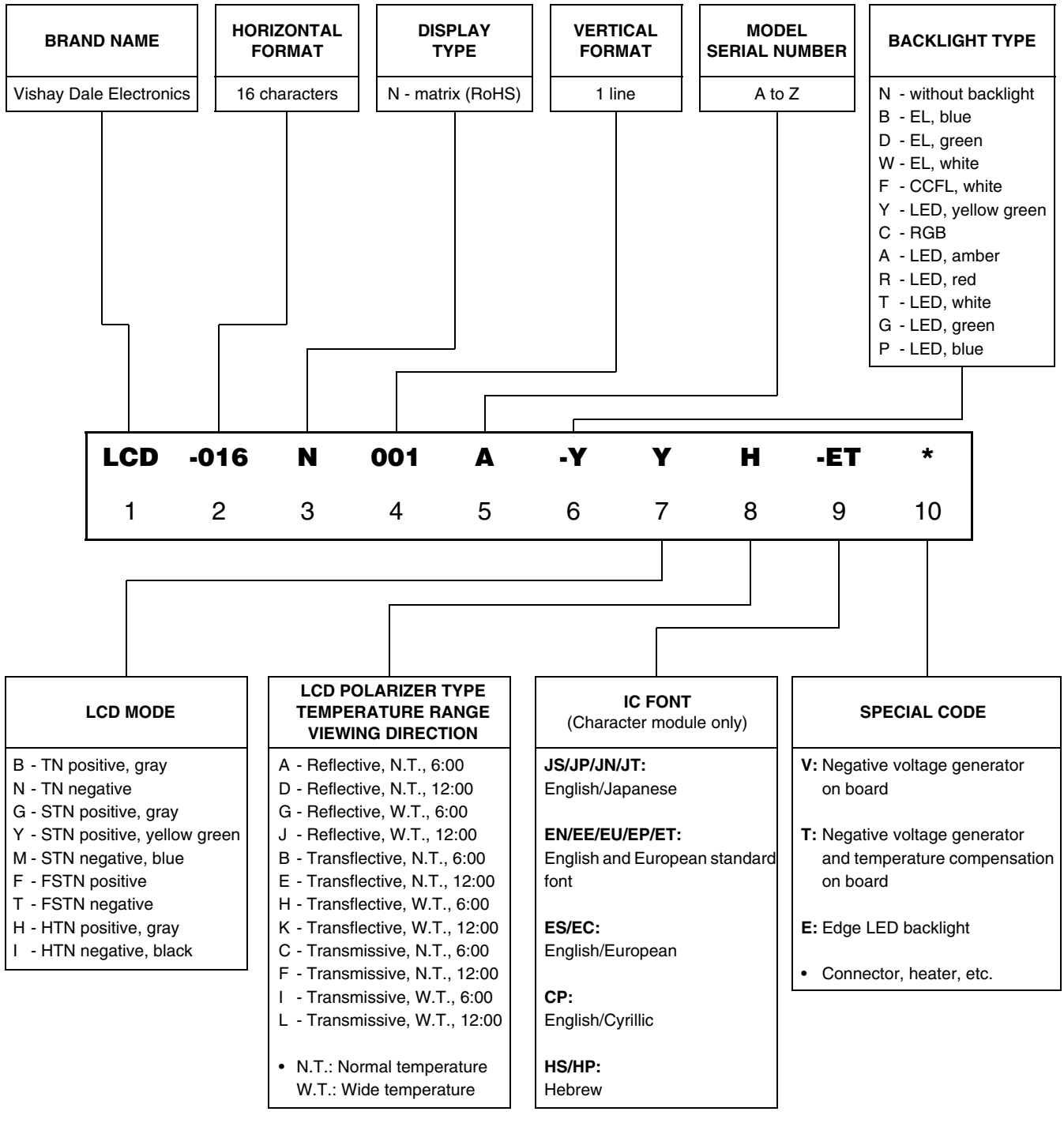
RESOLUTION	TOUCH PANEL OPTIONS FOR VISHAY SERIES
128 x 64	LCD-128H064A
	LCD-128H064C
	LCD-128H064D
	LCD-128H064F
	LCD-128H064G
	LCD-128H064I
	LCD-128H064J
	LCD-128H064K
	LCD-128H064M
240 x 128	LCD-240H128B
	LCD-240H128D
	LCD-240H128E
	LCD-240H128L
	LCD-240H128R
	LCD-240H128T
320 x 240	LCD-320H240A
	LCD-320H240BX/B0
	LCD-320H240CX/C0
	LCD-320H240D
	LCD-320H240H
	LCD-320H240K
	LCD-320H240L
	LCD-320H240R
	LCD-320Y240CX/C0
	LCD-320Y240F
	LCD-320Y240D/DX
	LCD-320Y240G







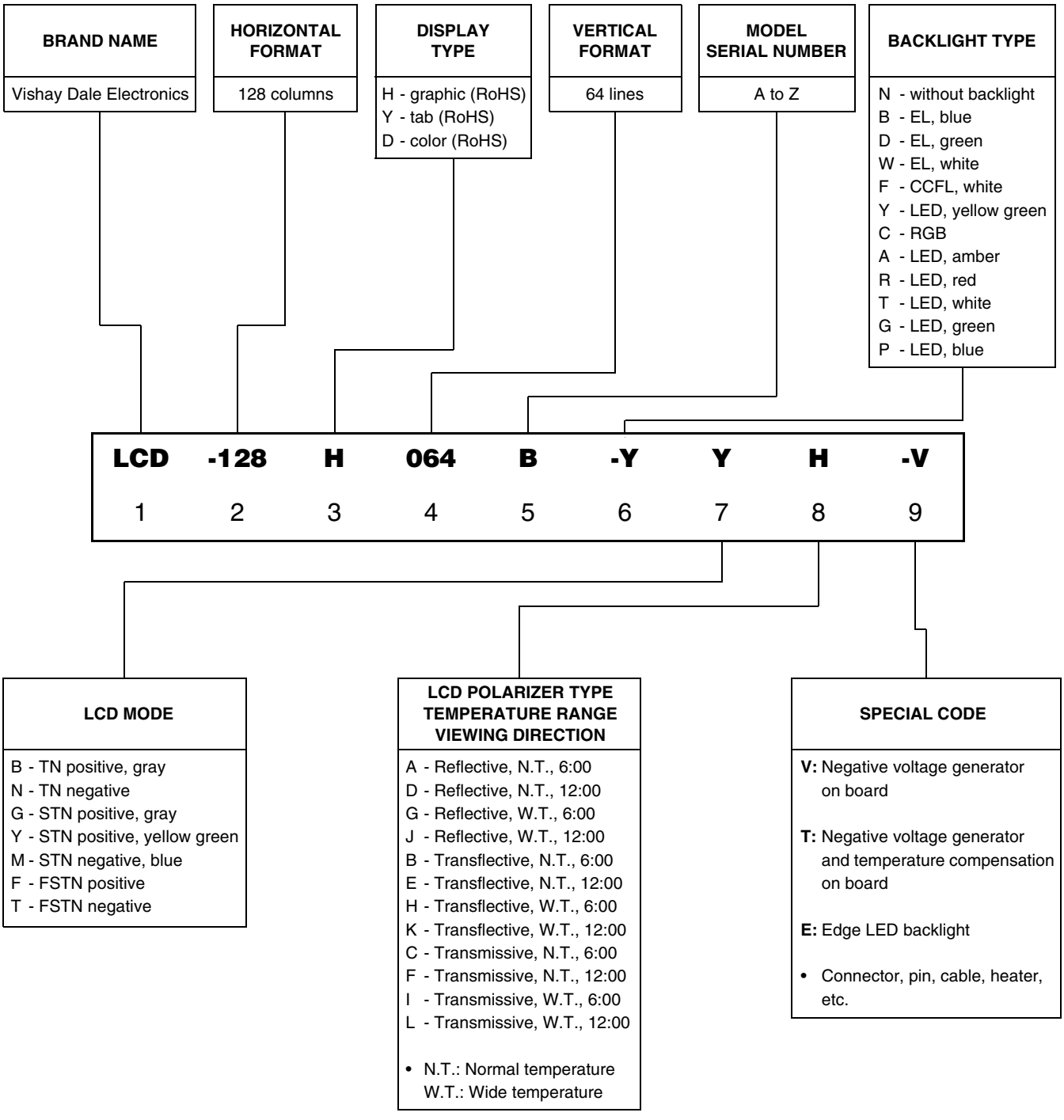
CHARACTER MODULE



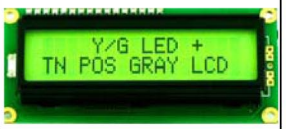
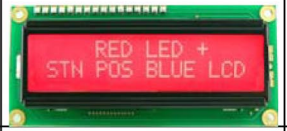
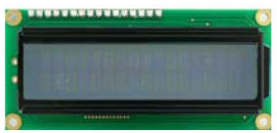
Product Numbering System

Vishay

GRAPHIC MODULE



LED BACKLIGHT & LCD COLOR MATCHING LIST

	STN POSITIVE YELLOW/GREEN	STN POSITIVE GRAY	STN NEGATIVE BLUE	FSTN POSTIVE	FSTN NEGATIVE	TN POSITIVE GRAY	TN NEGATIVE BLACK
Y/G LED							
	YYH	YGH	YMI	YFH	YTH	YBH	YNI
RED LED							
	RYH	RGH, **NOT RECOMMEND**	RMI	RFH	RTH	RBH	RNI
BLUE LED							
	PYH	PGH	PMI, **NOT RECOMMEND**	PFH	PTH	PBH	PNH
WHITE LED							
	TYH	TGH	TMI	TFH	TTH	TBH	TNI
GREEN LED							
	GYH	GGH	GMI	GFH	GTH	GBH	GNI
AMBER LED							
	AYH	AGH	AMI	AFH	ATH	ABH	ANI
WITHOUT BACKLIGHT							
	NYG	NGG	NMI, **NOT RECOMMEND**	NFG	NTH, **NOT RECOMMEND**	NBG	NNI, **NOT RECOMMEND**

LCD/PLASMA/TOUCH/LED DISPLAY - LCD CHARACTER

Series	Type	Display Format	Outline Dimensions (W x H mm)	Effective Viewing Area (W x H mm)	Character Size (W x H mm)	Dot Size (W x H mm)	Dot Pitch (W x H mm)	Driving Method (Duty)	Built-In Controller	Process Color				BL		
										TN	STN Gray	STN Yellow	STN Blue	None	LED	EL
LCD-008N002A1	Character	8 x 2 characters	58.0 x 32.0	38.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70	1/16	ST7066 or equivalent	x	x	x	x	x	x	x
LCD-008N002A1-NFG-ET	Character		58.0 x 32.0 x 8.9 max.						ST 7066 or equivalent						x	x
LCD-008N002A1-TFH-ET	Character		58.0 x 32.0 x 13.2 max.												x	x
LCD-008N002A1-TMI-ET	Character														x	x
LCD-008N002A1-YGH-JT	Character														x	x
LCD-008N002A1-YYH-ET	Character														x	x
LCD-012N002A	Character	12 x 2 characters	55.7 x 32.0	46.0 x 14.5	2.65 x 5.50	0.45 x 0.60	0.55 x 0.70	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x
LCD-016N001A	Character	16 x 1 characters	80.0 x 36.0	66.0 x 16.0	3.07 x 6.56	0.55 x 0.75	0.63 x 0.83	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x
LCD-016N001A-NFG-ET	Character		80.0 x 36.0 x 9.7						ST 7066 or equivalent							
LCD-016N001A-NGG-ET	Character															
LCD-016N001A-TFH-ET	Character		80.0 x 36.0 x 13.5													
LCD-016N001A-TMI-ET	Character		80.0 x 36.0 x 13.2													
LCD-016N001A-YYH-ET	Character															
LCD-016N001B	Character		85.0 x 28.0						ST 7066 (or equivalent)						x	x
LCD-016N001B-NGG-ET	Character		85.0 x 28.0 x 9.7						ST 7066 or equivalent						x	x
LCD-016N001B-TFH-ET	Character		85.0 x 28.0 x 13.5												x	x
LCD-016N001B-TMI-ET	Character														x	x
LCD-016N001B-YYH-ET	Character														x	x
LCD-016N001L	Character		122.0 x 33.0	99.0 x 13.0	4.84 x 8.06	0.92 x 1.10	0.98 x 1.16		ST 7066 (or equivalent)						x	x
LCD-016N001L-NFG-ET	Character		122.0 x 33.0 x 9.8 max.						ST 7066 or equivalent						x	x
LCD-016N001L-TFH-ET	Character		122.0 x 33.0 x 13.5 max												x	x
LCD-016N001L-TMI-ET	Character														x	x

Series	Type	Display Format	Outline Dimensions (W x H mm)	Effective Viewing Area (W x H mm)	Character Size (W x H mm)	Dot Size (W x H mm)	Dot Pitch (W x H mm)	Driving Method (Duty)	Built-In Controller	Process Color				BL		
										TN	STN Gray	STN Yellow	STN Blue	None	LED	EL
LCD-016N001L-YYH-ET	Character														x	x
LCD-016N002A	Character	16 x 2 characters	84.0 x 44.0	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	KS 0066 (or equivalent)	x	x	x	x	x	x	x
LCD-016N002B	Character		80.0 x 36.0		2.96 x 5.56										x	x
LCD-016N002C	Character		85.0 x 36.0												x	x
LCD-016N002D	Character		85.0 x 30.0												x	x
LCD-016N002J	Character		85.0 x 36.0		2.95 x 5.55										x	x
LCD-016N002L1	Character		122.0 x 44.0	99.0 x 24.0	4.84 x 9.66	0.92 x 1.10	0.98 x 1.16		ST 7066 (or equivalent)						x	x
LCD-016N002L1	Character														x	x
LCD-016N002M	Character		85.0 x 32.6	66.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70								x	x
LCD-016N002O	Character		85.0 x 25.2		2.95 x 5.55	0.55 x 0.65									x	x
LCD-016N002P	Character														x	x
LCD-016N002S	Character		59.0 x 29.3	52.0 x 15.0	2.45 x 4.67	0.45 x 0.54	0.50 x 0.59								x	x
LCD-016N002T	Character		65.4 x 28.2	54.8 x 19.0	2.67 x 5.57	0.51 x 0.67	0.54 x 0.70								x	x
LCD-016N002V2	Character		89.0 x 19.6	61.0 x 15.9	2.95 x 5.55	0.55 x 0.55	0.60 x 0.70								x	
LCD-016N002V2	Character		69.0 x 29.2		3.55 x 5.55	0.55 x 0.65									x	x
LCD-016N002W	Character		80.0 x 36.0	66.0 x 16.0	2.95 x 5.55				ST 7066						x	x
LCD-016N004A	Character	16 x 4 characters	87.0 x 60.0	62.0 x 26.0	2.95 x 4.75	0.55 x 0.55	0.60 x 0.60	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x
LCD-016N004B	Character		70.6 x 60.0	60.0 x 32.6											x	x
LCD-020N002A	Character	20 x 2 characters	116.0 x 37.0	85.0 x 18.6	3.2 x 5.55	0.60 x 0.65	0.65 x 0.70	1/16	ST 7066 (or equivalent)	x				x	x	x
LCD-020N002D	Character		89.0 x 21.5	75.0 x 15.0	2.95 x 5.15	0.55 x 0.60	0.60 x 0.65				x	x	x		x	
LCD-020N002L	Character		180.0 x 40.0	149.0 x 23.0	6.0 x 9.66	1.12 x 1.12	1.22 x 1.22			x				x	x	x
LCD-020N002M	Character		146.0 x 43.0	123.0 x 23.0	4.84 x 9.22	0.92 x 1.10	0.98 x 1.16								x	x
LCD-020N004A, LCD-020N004B	Character	20 x 4 characters	98.0 x 60.0	77.0 x 25.2	2.95 x 4.75	0.55 x 0.55	0.60 x 0.60	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x
LCD-020N004D	Character		77.0 x 47.0	60.0 x 22.0	2.3 x 4.03	0.42 x 0.46	0.47 x 0.51								x	x

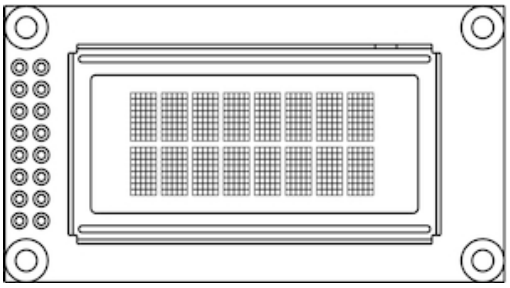
Series	Type	Display Format	Outline Dimensions (W x H mm)	Effective Viewing Area (W x H mm)	Character Size (W x H mm)	Dot Size (W x H mm)	Dot Pitch (W x H mm)	Driving Method (Duty)	Built-In Controller	Process Color				BL		
										TN	STN Gray	STN Yellow	STN Blue	None	LED	EL
LCD-020N004L	Character		146.0 x 62.5	123.5 x 43.0	4.84 x 9.22	0.92 x 1.10	0.98 x 1.16								x	x
LCD-024N002A	Character	24 x 2 characters	118.0 x 36.0	94.5 x 16.0	3.2 x 5.55	0.60 x 0.65	0.70 x 0.65	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x
LCD-040N002A	Character	40 x 2 characters	182.0 x 33.5	154.4 x 16.5	3.2 x 5.55	0.60 x 0.65	0.65 x 0.70	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x
LCD-040N004A	Character	40 x 4 characters	190.0 x 54.0	147.0 x 29.5	2.78 x 4.89	0.50 x 0.55	0.57 x 0.62	1/16	ST 7066 (or equivalent)	x	x	x	x	x	x	x

LCD/PLASMA/TOUCH/LED DISPLAY - LCD GRAPHIC

Series	Type	Display Format	Outline Dimensions (W x H mm)	Effective Viewing Area (W x H mm)	Character Size (W x H mm)	Dot Size (W x H mm)	Dot Pitch (W x H mm)	Driving Method (Duty)	Built-In Controller	Process Color				BL			
										STN Gray	STN Yellow	STN Blue	FSTN B & W	None	LED	EL	CCFL
LCD-122H032A, LCD-122H032C	Graphic	122 x 32 dots	84.0 x 44.0	60.0 x 18.0	N/a	0.40 x 0.45	0.44 x 0.49	1/32	Epson SED1520 (or equivalent)			x	x	x	x	x	
LCD-122H032B, LCD-122H032G	Graphic		65.4 x 28.2	54.8 x 19.0		0.36 x 0.41	0.40 x 0.45							x	x		
LCD-122H032BP1	Graphic		65.4 x 28.2 x 10.5												x		
LCD-122H032D	Graphic		59.0 x 29.3	52.0 x 15.0		0.345 x 0.345	0.375 x 0.375						x	x	x	x	
LCD-122H032E, LCD-122H032J	Graphic		80.0 x 36.0	60.0 x 18.0		0.40 x 0.45	0.44 x 0.49					x		x	x	x	
LCD-122H032I	Graphic		59.0 x 29.3 x 5.55	52.0 x 15.0		0.345 x 0.345	0.375 x 0.375			x	x			x			
LCD-122H032K	Graphic		59.0 x 32.1										x	x	x	x	
LCD-122H032L	Graphic		84.0 x 44.0	60.0 x 18.0		0.40 x 0.45	0.44 x 0.49		ST7920			x		x	x	x	
LCD-122H032M	Graphic		59.0 x 29.3 x 5.5	52.0 x 15.0		0.345 x 0.345	0.375 x 0.375							x			
LCD-122H032N	Graphic													x	x	x	
LCD-122H032O	Graphic		77.8 x 27.2	60.0 x 18.0		0.40 x 0.45	0.44 x 0.49		Epson SED1520 (or equivalent)					x	x	x	
LCD-128H064A	Graphic	128 x 64 dots	93.0 x 70.0	72.0 x 40.0	N/a	0.48 x 0.48	0.52 x 0.52	1/64	Samsung KS 0107/KS 0108 (or equivalent)	x	x	x	x	x	x	x	
LCD-128H064B	Graphic		75.0 x 52.7	60.0 x 32.6		0.39 x 0.39	0.43 x 0.43							x	x	x	x
LCD-128H064C	Graphic		78.0 x 70.0 x 14.3	62.0 x 44.0		0.42 x 0.58	0.44 x 0.60							x	x	x	
LCD-128H064D	Graphic								RA6963				x	x	x	x	
LCD-128H064E	Graphic	128 x 64 dots and 4 icons	54.0 x 50.0 x 7.5	43.5 x 29.0	N/a	0.28 x 0.35	0.32 x 0.39	1/64	Samsung KS 0108	x	x		x	x		x	
LCD-128H064I	Graphic	128 x 64 dots	80.0 x 70.0	72.0 x 40.0	N/a	0.48 x 0.48	0.52 x 0.52	1/64	NT7108 or equivalent	x	x	x	x	x	x	x	
LCD-128H064K	Graphic		113.0 x 53.0						Samsung KS 0107/KS 0108 (or equivalent)					x	x	x	
LCD-128H064M	Graphic		95.5 x 50.2											x	x	x	
LCD-128H128A	Graphic	128 x 128 dots	85.0 x 100.0	62.0 x 62.0	N/a	0.40 x 0.40	0.43 x 0.43	1/128	RA6963	x	x	x	x	x	x	x	
LCD-144H032A	Graphic	144 x 32 dots	85.0 x 36.0	66.0 x 16.0	N/a	0.38 x 0.38	0.42 x 0.42	1/32	ST7920	x	x	x	x	x	x	x	
LCD-144H032B	Graphic		80.0 x 36.0											x	x	x	

Series	Type	Display Format	Outline Dimensions (W x H mm)	Effective Viewing Area (W x H mm)	Character Size (W x H mm)	Dot Size (W x H mm)	Dot Pitch (W x H mm)	Driving Method (Duty)	Built-In Controller	Process Color				BL			
										STN Gray	STN Yellow	STN Blue	FSTN B & W	None	LED	EL	CCFL
LCD-144H032D	Graphic		85.0 x 30.0 x 13.2						(ST7920)					x	x	x	
LCD-160H032A	Graphic	160 x 32 dots	85.2 x 55.0	74.0 x 22.0	N/a	0.40 x 0.56	0.44 x 0.61	1/32	Epson SED1520 (or equivalent)	x	x	x		x	x	x	
LCD-160H128B	Graphic	160 x 128 dots	129.0 x 102.0	101.0 x 82.0	N/a	0.56 x 0.56	0.60 x 0.60	1/128	RA6963	x	x	x	x	x	x	x	x
LCD-160H128C	Graphic		115.0 x 112.0						Toshiba T6963C (or equivalent)						x	x	x
LCD-160H128E	Graphic		129.0 x 102.0			0.54 x 0.54	0.58 x 0.58		RA6963					x	x	x	x
LCD-160H160A	Graphic	160 x 160 dots	89.2 x 85.0	62.0 x 62.0	N/a	0.34 x 0.34	0.38 x 0.38	1/160	None	x	x	x	x	x	x	x	
LCD-202H032A	Graphic	202 x 32 dots	146.0 x 43.0	123.0 x 23.0	N/a	0.57 x 0.57	0.59 x 0.59	1/32	Avant (SBN1661G) or equivalent	x	x	x	x	x	x	x	
LCD-240H064A	Graphic	240 x 64 dots	180.0 x 65.0	133.0 x 39.0	N/a	0.49 x 0.49	0.53 x 0.53	1/64	RA6963	x	x	x	x	x	x	x	x
LCD-240H064C	Graphic								Toshiba T6963C (or equivalent)					x	x	x	x
LCD-240H064J	Graphic			132.6 x 39.0		0.48 x 0.48			RA6963					x	x	x	x
LCD-240H128A	Graphic	240 x 128 dots	170.0 x 103.5	132.0 x 76.0	N/a	0.47 x 0.47	0.50 x 0.50	1/128	Toshiba T6963C	x	x	x	x	x	x	x	x
LCD-240H128B	Graphic		144.0 x 104.0	114.0 x 64.0		0.40 x 0.40	0.45 x 0.45							x	x	x	x
LCD-240H128E	Graphic					0.43 x 0.43			Toshiba T6963C (or equivalent)					x	x	x	x
LCD-320H240A	Graphic	320 x 240 dots	166.8 x 109.0	122.0 x 92.0	N/a	0.34 x 0.34	0.36 x 0.36	1/240	None	x	x	x	x	x	x	x	x
LCD-320H240B	Graphic								RA8835 and SRAM					x	x	x	x
LCD-320H240BX, LCD-320H240BP2, LCD-320H240BP3	Graphic								Epson S1D13700					x	x	x	x
LCD-320H240C	Graphic		148.02 x 120.24	120.14 x 92.14					RA8835 and SRAM								
LCD-320H240CX	Graphic								Epson S1D13700	x	x	x	x	x	x	x	x

LCD/PLASMA/TOUCH/LED DISPLAY - OLED CHARACTER



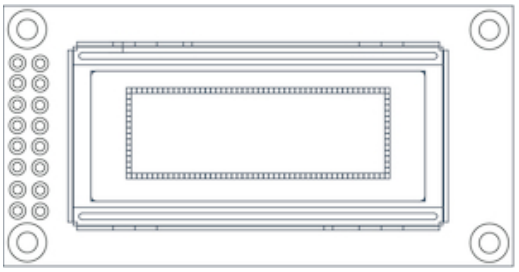
Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-008N002A	Character	8 x 2 characters	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-008N002A-BPP5N00000	character	8 x 2 characters	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-008N002A-GPP5N00000	character	8 x 2 characters	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-008N002A-RPP5N00000	character	8 x 2 characters	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	-	Yes	-	-
OLED-008N002A-WPP5N00000	character	8 x 2 characters	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	2.96 x 5.56	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-012N002A	Character	12 x 2 characters	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	2.65 x 5.5	0.45 x 0.60	0.55 x 0.70	1/16	OLED-0010	Y	-	-	-	-
OLED-012N002A-GPP5N00000	character	12 x 2 characters	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	2.65 x 5.5	0.45 x 0.60	0.55 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-012N002A-LPP5N00000	character	12 x 2 characters	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	2.65 x 5.5	0.45 x 0.60	0.55 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-012N002A-WPP5N00000	character	12 x 2 characters	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	2.65 x 5.5	0.45 x 0.60	0.55 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-016N001A-BPP5N00000	character	16 x 1 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 6.35	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	-	-	-	Yes	-
OLED-016N001A-GPP5N00000	character	16 x 1 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 6.35	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	-	Yes	-	-	-

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-016N001A-LPP5N00000	character	16 x 1 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 6.35	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	Yes	-	-	-	-
OLED-016N001A-WPP5N00000	character	16 x 1 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 6.35	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	-	-	-	-	Yes
OLED-016N002A	Character	16 x 2 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-016N002A-BPP5N00000	character	16 x 2 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-016N002A-GPP5N000A0	character	16 x 2 characters	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-016N002B-BPP5N00000	character	16 x 2 characters	122.0 x 44.0 x 10.0 (max.)	99.0 x 24.0	4.74 x 8.90	0.90 x 1.06	0.96 x 1.12	1/16	OLED-0010	-	-	-	Yes	-
OLED-016N002B-WPP5N00000	character	16 x 2 characters	122.0 x 44.0 x 10.0 (max.)	99.0 x 24.0	4.74 x 8.90	0.90 x 1.06	0.96 x 1.12	1/16	OLED-0010	-	-	-	-	Yes
OLED-016N002C	Character	16 x 2 characters	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-016N002C-BPP5N00000	character	16 x 2 characters	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-016N002C-GPP5N00000	character	16 x 2 characters	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-016N002C-LPP5N00000	character	16 x 2 characters	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-016N002C-WPP5N00000	character	16 x 2 characters	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-016N002E	Character	16 x 2 characters	84.0 x 44.0 x 10.0 (max.)	66.0 x 16.0	2.95 x 5.55	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-016N002H-BPP5N00000	character	16 x 2 characters	122.0 x 44.0 x 10.0 (max.)	98.0 x 21.0	4.74 x 8.9	0.90 x 1.06	0.96 x 1.12	1/16	OLED-0010	-	-	-	Yes	-
OLED-016N002H-GPP5N00000	character	16 x 2 characters	122.0 x 44.0 x 10.0	98.0 x 21.0	4.74 x 8.9	0.90 x 1.06	0.96 x 1.12	1/16	OLED-0010	-	Yes	-	-	-

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
			(max.)											
OLED-016N002H-LPP5N00000	character	16 x 2 characters	122.0 x 44.0 x 10.0 (max.)	98.0 x 21.0	4.74 x 8.90	0.90 x 1.06	0.96 x 1.12	1/16	OLED-0010	Yes	-	-	-	-
OLED-016N002H-WPP5N00000	character	16 x 2 characters	122.0 x 44.0 x 10.0 (max.)	98.0 x 21.0	4.74 x 8.9	0.90 x 1.06	0.96 x 1.12	1/16	OLED-0010	-	-	-	-	Yes
OLED-016O002B-BPP5N00000	character	16 x 2 characters	53.0 x 20.0 x 7.6 (max.)	36.0 x 10.0	1.67 x 2.84	0.30 x 0.32	0.34 x 0.36	1/16	OLED-0010	-	-	-	Yes	-
OLED-016O002B-LPP5N00000	character	16 x 2 characters	53.0 x 20.0 x 7.6 (max.)	36.0 x 10.0	1.67 x 2.84	0.30 x 0.32	0.34 x 0.36	1/16	OLED-0010	Yes	-	-	-	-
OLED-016O002C-LPP5N00000	character	16 x 2 characters	68.5 x 17.5 x 2.17	58.22 x 13.52	2.97 x 5.57	0.57 x 0.67	0.60 x 0.70	1/16	SSD1311	Yes	-	-	-	-
OLED-016O002C-SPP3N00000	character	16 x 2 characters	68.5 x 17.5 x 2.05	58.22 x 13.52	2.97 x 5.57	0.57 x 0.67	0.60 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-016O002C-WPP5N00000	character	16 x 2 characters	68.5 x 17.5 x 2.17	58.22 x 13.52	2.97 x 5.57	0.57 x 0.67	0.60 x 0.70	1/16	SSD1311	-	-	-	-	Yes
OLED-016O002G-LPP5N00000	character	16 x 2 characters	84.0 x 44.0 x 9.67	58.22 x 13.52	2.97 x 5.57	0.57 x 0.67	0.60 x 0.70	1/16	SSD1311	Yes	-	-	-	-
OLED-020N002A-BPP5N00000	character	20 x 2 characters	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	3.2 x 5.55	0.6 x 0.65	0.65 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-020N002A-GPP5N000A0	character	20 x 2 characters	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	3.2 x 5.55	0.6 x 0.65	0.65 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-020N002A-LPP5N000A0	character	20 x 2 characters	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	3.2 x 5.55	0.60 x 0.65	0.65 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-020N002A-WPP5N00000	character	20 x 2 characters	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	3.2 x 5.55	0.6 x 0.65	0.65 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-020N002B-GPP5N00000	character	20 x 2 characters	180.0 x 40.0 x 9.3 (max.)	149.0 x 23.0	6.0 x 9.66	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	-	Yes	-	-	-
OLED-020N002B-LPP5N00000	character	20 x 2 characters	180.0 x 40.0 x 10.0 (max.)	149.0 x 23.0	6.0 x 9.66	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	Yes	-	-	-	-
OLED-020N002B-SPP5N00000	character	20 x 2 characters	180.0 x 40.0 x 9.3 (max.)	149.0 x 23.0	6.0 x 9.66	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	-	-	-	Yes	-
OLED-020N002B-WPP5N00000	character	20 x 2 characters	180.0 x 40.0 x 9.3 (max.)	149.0 x 23.0	6.0 x 9.66	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	-	-	-	-	Yes
OLED-020N004A-BPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	70.0 x 25.2	2.90 x 4.75	0.54 x 0.55	0.60 x 0.59	1/16	OLED-0010	-	-	-	Yes	-

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-020N004A-GPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	Yes	-	-	-
OLED-020N004A-LPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	Yes	-	-	-	-
OLED-020N004A-WPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	-	-	-	Yes
OLED-020N004B	Character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	70.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	Y	Y	Y	-	-
OLED-020N004B-BPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.90 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	-	-	Yes	-
OLED-020N004B-GPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	Yes	-	-	-
OLED-020N004B-LPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	Yes	-	-	-	-
OLED-020N004B-WPP5N00000	character	20 x 4 characters	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	2.9 x 4.75	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	-	-	-	Yes
OLED-020O002A-LPP5N00000	character	20 x 2 characters	84.5 x 19.28 x 2.17	75.52 x 13.52	3.22 x 5.57	0.62 x 0.67	0.65 x 0.70	1/16	SSD1311	Yes	-	-	-	-
OLED-020O004C-LPP5N00000	character	20 x 2 characters	84.5 x 27.5 x 2.17	72.42 x 22.82	2.97 x 4.77	0.57 x 0.57	0.60 x 0.60	1/32	SSD1311	Yes	-	-	-	-
OLED-040N002A-GPP5N00000	character	40 x 2 characters	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.5	3.05 x 5.55	0.57 x 0.65	0.62 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-040N002A-LPP5N00000	character	40 x 2 characters	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.5	3.05 x 5.55	0.57 x 0.65	0.62 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-040N002A-SPP5N00000	character	40 x 2 characters	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.5	3.05 x 5.55	0.57 x 0.65	0.62 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-040N002A-WPP5N00000	character	40 x 2 characters	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.5	3.05 x 5.55	0.57 x 0.65	0.62 x 0.70	1/16	OLED-0010	-	-	-	-	Yes

LCD/PLASMA/TOUCH/LED DISPLAY - OLED GRAPHIC



Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-048O064A-LPP3N00000	graphic	48 x 64 dots	13.90 x 22.0 x 1.26	12.14 x 16.30	-	0.198 x 0.208	0.220 x 0.230	1/64	SSD1306BZ	Yes	-	-	-	-
OLED-050H016A	Graphic	50 x 16 dots	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	-	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-050H016A-BPP5N00000	graphic	50 x 16 dots	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	-	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-050H016A-GPP5N00000	graphic	50 x 16 dots	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	-	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-050H016A-LPP5N00000	graphic	50 x 16 dots	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	-	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-050H016A-WPP5N00000	graphic	50 x 16 dots	58.0 x 32.0 x 10.0 (max.)	38.0 x 16.0	-	0.56 x 0.66	0.60 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-064O032A-LPP3N00000	graphic	64 x 32 dots	14.5 x 11.6 x 1.26	12.58 x 6.58	-	0.153 x 0.153	0.175 x 0.175	1/32	SSD1306BZ	Yes	-	-	-	-
OLED-064O048A-LPP3N00000	graphic	64 x 48 dots	18.46 x 18.10 x 1.3	15.42 x 12.06	-	0.185 x 0.185	0.210 x 0.210	1/48	SSD1306BZ	Yes	-	-	-	-
OLED-076H016A-BPP5N00000	graphic	76 x 16 dots	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	-	0.45 x 0.60	0.55 x 0.70	1/16	OLE D-0010	-	-	-	Yes	-
OLED-076H016A-GPP5N00000	graphic	76 x 16 dots	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	-	0.45 x 0.60	0.55 x 0.70	1/16	OLE D-0010	-	Yes	-	-	-
OLED-076H016A-LPP5N00000	graphic	76 x 16 dots	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	-	0.45 x 0.60	0.55 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-076H016A-WPP5N00000	graphic	76 x 16 dots	55.7 x 32.0 x 11.0 (max.)	46.0 x 14.5	-	0.45 x 0.60	0.55 x 0.70	1/16	OLE D-0010	-	-	-	-	Yes

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-096O064A-BPP3N00000	graphic	96 x 64 dots	24.9 x 22.95 x 1.65	21.953 x 15.424	-	0.186 x 0.188	0.208 x 0.210	1/64	OLE D-0010	-	-	-	Yes	-
OLED-096O064A-GPP3N00000	graphic	96 x 64 dots	24.9 x 22.95 x 1.65	21.953 x 15.424	-	0.186 x 0.188	0.208 x 0.210	1/64	OLE D-0010	-	Yes	-	-	-
OLED-096O064A-LPP3N00000	graphic	96 x 64 dots	24.9 x 22.95 x 1.65	21.953 x 15.424	-	0.186 x 0.188	0.208 x 0.210	1/64	SSD1305Z	Yes	-	-	-	-
OLED-096Y064A-BPP3N00000	graphic	96 x 64 dots	33.59 x 23.62 x 1.65	25.49 x 17.65	-	0.215 x 0.215	0.245 x 0.245	1/64	OLE D-0010	-	-	-	Yes	-
OLED-096Y064A-LPP3N00000	graphic	96 x 64 dots	33.59 x 23.62 x 1.65	25.49 x 17.65	-	0.215 x 0.215	0.245 x 0.245	1/64	OLE D-0010	Yes	-	-	-	-
OLED-096Y064A-WPP3N00000	graphic	96 x 64 dots	33.59 x 23.62 x 1.65	25.49 x 17.65	-	0.215 x 0.215	0.245 x 0.245	1/64	OLE D-0010	-	-	-	-	Yes
OLED-096Y064B-BPP3N00000	graphic	96 x 64 dots	33.59 x 23.62 x 1.65	25.49 x 17.65	-	0.215 x 0.215	0.245 x 0.245	1/64	OLE D-0010	-	-	-	Yes	-
OLED-096Y064B-LPP3N00000	graphic	96 x 64 dots	33.59 x 23.62 x 1.65	25.49 x 17.65	-	0.215 x 0.215	0.245 x 0.245	1/64	OLE D-0010	Yes	-	-	-	-
OLED-100H008A	Graphic	100 x 8 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	Y	Y	Y	Y	Y
OLED-100H008A-BPP5N00000	graphic	100 x 8 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	n/a	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	-	-	-	Yes	-
OLED-100H008A-GPP5N00000	graphic	100 x 8 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	n/a	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	-	Yes	-	-	-
OLED-100H008A-LPP5N00000	graphic	100 x 8 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	n/a	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	Yes	-	-	-	-
OLED-100H008A-WPP5N00000	graphic	100 x 8 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	n/a	0.55 x 0.75	0.60 x 0.80	1/8	OLED-0010	-	-	-	-	Yes
OLED-100H016A-BPP5N00000	graphic	100 x 16 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	.	-	Yes	-
OLED-100H016A-GPP5N00000	graphic	100 x 16 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	Yes	-	-	-
OLED-100H016A-LPP3N00000	graphic	100 x 16 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Yes	-	-	-	-

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-100H016A-LPP5N00000	graphic	100 x 16 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	Yes	-	-	-	-
OLED-100H016A-RPP5N00000	graphic	100 x 16 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	-	Yes	-	-
OLED-100H016A-WPP5N00000	graphic	100 x 16 dots	80.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	-	-	-	Yes
OLED-100H016C-BPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	-	-	Yes	-
OLED-100H016C-GPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	Yes	-	-	-
OLED-100H016C-LPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	Yes	-	-	-	-
OLED-100H016C-WPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	-	-	-	Yes
OLED-100H016D	Graphic	100 x 16 dots	85.0 x 30.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-100H016D-BPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	-	-	Yes	-
OLED-100H016D-GPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	Yes	-	-	-
OLED-100H016D-LPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	Yes	-	-	-	-
OLED-100H016D-WPP5N00000	graphic	100 x 16 dots	85.0 x 36.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLE D-0010	-	-	-	-	Yes
OLED-100H016E-BPP5N00000	graphic	100 x 16 dots	84.0 x 44.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-100H016E-GPP5N00000	graphic	100 x 16 dots	84.0 x 44.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-100H016E-LPP5N00000	graphic	100 x 16 dots	84.0 x 44.0 x 10.0	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	Yes	-	-	-	-

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
			(max.)											
OLED-100H016E-WPP5N00000	graphic	100 x 16 dots	84.0 x 44.0 x 10.0 (max.)	66.0 x 16.0	-	0.55 x 0.65	0.60 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-100H016F	graphic	100 x 16 dots	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	-	0.60 x 0.65	0.65 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y
OLED-100H016F-BPP5N00000	graphic	100 x 16 dots	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	-	0.60 x 0.65	0.65 x 0.70	1/16	OLED-0010	-	-	-	Yes	-
OLED-100H016F-GPP5N00000	graphic	100 x 16 dots	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	-	0.60 x 0.65	0.65 x 0.70	1/16	OLED-0010	-	Yes	-	-	-
OLED-100H016F-LPP5N00000	graphic	100 x 16 dots	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	-	0.60 x 0.65	0.65 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-100H016F-RPP5N00000	graphic	100 x 16 dots	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	-	0.60 x 0.65	0.65 x 0.70	1/16	OLE D-0010	-	-	Yes	-	-
OLED-100H016F-WPP5N00000	graphic	100 x 16 dots	116.0 x 37.0 x 9.8 (max.)	85.0 x 18.6	-	0.60 x 0.65	0.65 x 0.70	1/16	OLED-0010	-	-	-	-	Yes
OLED-100H016H-GPP5N00000	graphic	100 x 16 dots	180.0 x 40.0 x 9.3 (max.)	149.0 x 23.0	-	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	-	Yes	-	-	-
OLED-100H016H-LPP5N00000	graphic	100 x 16 dots	180.0 x 40.0 x 9.3	149.0 x 23.0	-	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	Yes	-	-	-	-
OLED-100H016H-SPP5N00000	graphic	100 x 16 dots	180.0 x 40.0 x 9.3 (max.)	149.0 x 23.0	-	1.12 x 1.12	1.22 x 1.22	1/16	OLED-0010	-	-	-	Yes	-
OLED-100H032A	Graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	Y	Y	Y	-	-
OLED-100H032A-BPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	-	-	Yes	-
OLED-100H032A-GPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	Yes	-	-	-
OLED-100H032A-LPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	Yes	-	-	-	-
OLED-100H032A-WPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	-	-	-	Yes
OLED-100H032B-BPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	-	-	Yes	-

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-100H032B-GPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	-	Yes	-	-	-
OLED-100H032B-LPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.2	-	0.54 x 0.55	0.59 x 0.60	1/16	OLED-0010	Yes	-	-	-	-
OLED-100H032B-WPP5N00000	graphic	100 x 32 dots	98.0 x 60.0 x 10.0 (max.)	77.0 x 25.20	-	0.54 x 0.55	0.59 x 0.60	1/16	OLE D-0010	-	-	-	-	Yes
OLED-128F064Q-LPP3N00000	graphic	128 x 64 dots	89.7 x 47.2 x 3.4	63.41 x 32.69	-	0.45 x 0.45	0.48 x 0.48	1/64	SSD1309	Yes	-	-	-	-
OLED-128O032A-BPP3N00000	graphic	128 x 32 dots	62.0 x 24.0 x 2.35	57.02 x 15.10	-	0.408 x 0.388	0.43 x 0.41	1/32	SSD1305Z	-	-	-	Yes	-
OLED-128O032A-GPP3N00000	graphic	128 x 32 dots	62.0 x 24.0 x 2.35	57.02 x 15.10	-	0.408 x 0.388	0.43 x 0.41	1/32	SSD1305Z	-	Yes	-	-	-
OLED-128O032A-LPP3N00000	graphic	128 x 32 dots	62.0 x 24.0 x 2.35	57.02 x 15.10	-	0.408 x 0.388	0.43 x 0.41	1/32	SSD1305Z	Yes	-	-	-	-
OLED-128O032A-SPP3N00000	graphic	128 x 32 dots	62.0 x 24.0 x 2.35	57.02 x 15.10	-	0.408 x 0.388	0.43 x 0.41	1/32	SSD1305Z	-	-	-	Yes	-
OLED-128O032A-WPP3N00000	graphic	128 x 32 dots	62.0 x 24.0 x 2.35	57.02 x 15.10	-	0.408 x 0.388	0.43 x 0.41	1/32	SSD1305Z	-	-	-	-	Yes
OLED-128O032D-LPP3N00000	graphic	128 x 32 dots	30.0 x 11.5 x 1.45	24.384 x 7.584	-	0.152 x 0.152	0.175 x 0.175	1/32	SSD1306BZ	Yes	-	-	-	-
OLED-128O032D-SPP3N00000	graphic	128 x 32 dots	30.0 x 11.5 x 1.45	24.384 x 7.584	-	0.152 x 0.152	0.175 x 0.175	1/32	SSD1306	-	-	-	Yes	-
OLED-128O032D-WPP3N00000	graphic	128 x 32 dots	30.0 x 11.5 x 1.45	24.384 x 7.584	-	0.152 x 0.152	0.175 x 0.175	1/32	SSD1306	-	-	-	-	Yes
OLED-128O032E-LNP3N00000	graphic	128 x 32 dots	33.4 x 14.5 x 1.65	27.68 x 7.80	-	0.176 x 0.176	0.200 x 0.200	1/32	SSD1306BZ	Yes	-	-	-	-
OLED-128O032E-LPP3N00000	graphic	128 x 32 dots	33.4 x 14.5 x 1.65	27.68 x 7.80	-	0.176 x 0.176	0.200 x 0.200	1/32	SSD1306BZ	Yes	-	-	-	-
OLED-128O032F-LPP3N00000	graphic	128 x 32 dots	30.0 x 11.5 x 1.45	24.384 x 7.584	-	0.152 x 0.152	0.175 x 0.175	1/32	SSD1306BZ	Yes	-	-	-	-
OLED-128O032F-WPP3N00000	graphic	128 x 32 dots	30.0 x 11.5 x 1.45	24.384 x 7.584	-	0.152 x 0.152	0.175 x 0.175	1/32	SSD1306BZ	-	-	-	-	Yes
OLED-128O064A-LNP3N00000	graphic	128 x 64 dots	42.04 x 27.22 x 1.45	37.05 x 19.52	-	0.249 x 0.249	0.274 x 0.274	1/64	SSD1309ZC	Yes	-	-	-	-
OLED-128O064D-BPP3N00000	graphic	128 x 64 dots	26.7 x 19.26 x 1.65	23.938 x 12.058	-	0.148 x 0.148	0.17 x 0.17	1/64	SSD1306BZ	-	-	-	Yes	-

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										Yellow	Green	Red	Blue	White
OLED-128O064D-GPP3N00000	graphic	128 x 64 dots	26.7 x 19.26 x 1.65	23.938 x 12.058	-	0.148 x 0.148	0.17 x 0.17	1/64	SSD1306BZ	-	Yes	-	-	-
OLED-128O064D-LPP3N00000	graphic	128 x 64 dots	26.7 x 19.26 x 1.65	23.938 x 12.058	-	0.148 x 0.148	0.17 x 0.17	1/64	SSD1306	Yes	-	-	-	-
OLED-128O064D-WPP3N00000	graphic	128 x 64 dots	26.7 x 19.26 x 1.65	23.938 x 12.058	-	0.148 x 0.148	0.17 x 0.17	1/64	SSD1306BZ	-	-	-	-	Yes
OLED-128O064F-GPP3N00000	graphic	128 x 64 dots	41.8 x 27.9 x 1.8	38.45 x 20.21	-	0.255 x 0.255	0.285 x 0.285	1/64	SSD1325Z1	-	Yes	-	-	-
OLED-128O064F-LPP3N00000	graphic	128 x 64 dots	41.8 x 27.9 x 1.8	38.45 x 20.21	-	0.255 x 0.255	0.285 x 0.285	1/64	SSD1325	Yes	-	-	-	-
OLED-128O064F-WPP3N00000	graphic	128 x 64 dots	41.8 x 27.9 x 1.8	38.45 x 20.21	-	0.255 x 0.255	0.285 x 0.285	1/64	SSD1325	-	-	-	-	Yes
OLED-128O064G-GPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	-	Yes	-	-	-
OLED-128O064G-LPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	Yes	-	-	-	-
OLED-128O064G-SPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	-	-	-	Yes	-
OLED-128O064G-WPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	-	-	-	-	Yes
OLED-128O064H-GPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	-	Yes	-	-	-
OLED-128O064H-LPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	Yes	-	-	-	-
OLED-128O064H-SPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	-	-	-	Yes	-
OLED-128O064H-WPP3N00000	graphic	128 x 64 dots	60.50 x 37.00 x 2.15	57.01 x 28.91	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309ZC	-	-	-	-	Yes
OLED-128O064J-GPP3N00000	graphic	128 x 64 dots	75.0 x 52.7 x 8.5	57.01 x 29.49	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309Z	-	Yes	-	-	-
OLED-128O064J-LPP3N00000	graphic	128 x 64 dots	75.0 x 52.7 x 8.5	57.01 x 29.49	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309Z	Yes	-	-	-	-
OLED-128O064J-SPP3N00000	graphic	128 x 64 dots	75.0 x 52.7 x 8.5	57.01 x 29.49	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309Z	-	-	-	Yes	-
OLED-128O064J-WPP3N00000	graphic	128 x 64 dots	75.0 x 52.7 x 8.5	57.01 x 29.49	-	0.40 x 0.40	0.43 x 0.43	1/64	SSD1309Z	-	-	-	-	Yes
OLED-200H016A	Graphic	200 x 16 dots	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.50	-	0.57 x 0.65	0.62 x 0.70	1/16	OLED-0010	Y	Y	Y	Y	Y

Series	Type	Display Format	Outline Dimensions (W x H x D) (mm)	Viewing Area (W x H) (mm)	Character Size (W x H) (mm)	Dot Size (W x H) (mm)	Dot Pitch (W x H) (mm)	Driving Method (Duty)	Built-In-Controller	Emitting Color				
										Yellow	Green	Red	Blue	White
OLED-200H016A-GPP5N00000	graphic	200 x 16 dots	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.5	-	0.57 x 0.65	0.62 x 0.70	1/16	SSD1305	-	Yes	-	-	-
OLED-200H016A-LPP5N00000	graphic	200 x 16 dots	182.0 x 38.5 x 9.3 (max.)	154.4 x 16.5	-	0.57 x 0.65	0.62 x 0.70	1/16	OLED-0010	Yes	-	-	-	-
OLED-256Y064A-BPP3N00000	graphic	256 x 64 dots	84.0 x 25.8 x 2.05	71.104 x 19.264	-	0.248 x 0.248	0.27 x 0.27	1/64	SSD1322	-	-	-	Yes	-
OLED-256Y064A-GPP3N00000	graphic	256 x 64 dots	84.0 x 25.8 x 2.05	71.104 x 19.264	-	0.248 x 0.248	0.27 x 0.27	1/64	SSD1322	-	Yes	-	-	-
OLED-256Y064A-LPP3N00000	graphic	256 x 64 dots	84.0 x 25.8 x 2.05	71.104 x 19.264	-	0.248 x 0.248	0.270 x 0.270	1/64	SSD1322	Yes	-	-	-	-
OLED-256Y064A-RPP3N00000	graphic	256 x 64 dots	84.0 x 25.8 x 2.05	71.104 x 19.264	-	0.248 x 0.248	0.27 x 0.27	1/64	SSD1322	-	-	Yes	-	-
OLED-256Y064B-GPP3N00000	graphic	256 x 64 dots	88.0 x 27.8 x 2.05	78.78 x 21.18	-	0.278 x 0.278	0.3 x 0.3	1/64	SSD1322	-	Yes	-	-	-
OLED-256Y064B-LPP3N00000	graphic	256 x 64 dots	88.0 x 27.8 x 2.05	78.78 x 21.18	-	0.278 x 0.278	0.300 x 0.300	1/64	SSD1322	Yes	-	-	-	-
OLED-256Y064B-SPP3N00000	graphic	256 x 64 dots	88.0 x 27.8 x 2.05	78.78 x 21.18	-	0.278 x 0.278	0.3 x 0.3	1/64	SSD1322	-	-	-	Yes	-
OLED-256Y064B-WPP3N00000	graphic	256 x 64 dots	88.0 x 27.8 x 2.05	78.78 x 21.18	-	0.278 x 0.278	0.3 x 0.3	1/64	SSD1322	-	Yes	-	-	-
OLED-256Y064D-GPP3N00000	graphic	256 x 64 dots	146.0 x 45.0 x 2.05	137.65 x 35.89	-	0.5 x 0.5	0.53 x 0.53	1/64	SSD1322	-	Yes	-	-	-
OLED-256Y064D-LPP3N00000	graphic	256 x 64 dots	146.0 x 45.0 x 2.05	137.65 x 35.89	-	0.50 x 0.50	0.53 x 0.53	1/64	SSD1322	Yes	-	-	-	-

10.2" Color TFT Display

FEATURES

- Type: TFT
- Diagonal dimension: 10.2"
- Display format: 800 x 480 (RGB)
- Built-in controller: RA8875
- +3.3 V, +5 V power supply

Pb-free
RoHS COMPLIANT

MECHANICAL DATA

ITEM	DIMENSION	UNIT
Dot matrix	800 x 480, RGB (TFT)	dots
Module dimension	235.0 x 145.8 x 12.1	mm
Active area	222.0 x 132.48	mm
Dot pitch	0.0925 x 0.276	mm
LCD type	TFT, normally white, transmissive	
View direction	12 o'clock	
Gray scale inversion direction	6 o'clock	
Backlight type	LED, normally white	
Controller IC	RA8875	
Interface	Digital 8080 family MPU	

Note

- Color tone changed by temperature and driving voltage

ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN.	TYP.	MAX.	
Operating temperature	T_{OP}	-20	-	+70	°C
Storage temperature	T_{ST}	-30	-	+80	°C

Notes

- Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above
- Temperature ≤ 60 °C, 90 % RH max. temperature > 60 °C, absolute humidity shall be less than 90 % RH at 60 °C

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply voltage for LCM	V_{DD}	-	3.0	3.3	3.6	V
Supply current for LCM	I_{DD}	(1)	-	190	195	mA
Operation current for LED driver	I_{LED}	V_{LED} = +5 V (2)(3)	500	-	750	mA
Power consumption		V_{LED} = +5 V (2)(3)	2500	-	3750	mW
Supply voltage for LED driver	V_{DD}	V_{LED+}	-	5	-	V
LED life time	t	(3)(4)(5)	20 000	-	-	h

Notes

(1) This value us test for V_{DD} = 3.3 V, T_{amb} = 25 °C only
(2) Base on V_{LED} = 5 V for the backlight driver IC specification
(3) T_{amb} = 25 °C
(4) Brightness to be decreased to 50 % of the initial value
(5) The single LED lamp case

INTERFACE PIN FUNCTION		
PIN NO.	**SYMBOL**	**FUNCTION**
1	GND	System ground pin of the IC; connect to system ground
2	V_{DD}	Power supply: +3.3 V
3	NC	No connection
4	RS	Data / command select
5	WR	Write strobe signal
6	RD	Read strobe signal
7	DB0	Data bus
8	DB1	Data bus
9	DB2	Data bus
10	DB3	Data bus
11	DB4	Data bus
12	DB5	Data bus
13	DB6	Data bus
14	DB7	Data bus
15	DB8	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
16	DB9	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
17	DB10	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
18	DB11	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
19	DB12	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
20	DB13	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
21	DB14	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
22	DB15	Data bus (when select 8 bits mode, this pin is “no connection”) (1)
23	WAIT	Wait signal output (H: active)
24	NC	No connection
25	CS	Chip select
26	RST	Hardware reset
27	L / R	Left / right selection, default L / R = H (2)(3)
28	U / D	Up / down selection, default U / D = L (2)(3)
29	NC	No connection
30	NC	No connection
31	NC	No connection
32	NC	No connection
33	VLED-	Power for LED driver IC (ground)
34	VLED-	Power for LED driver IC (ground)
35	VLED+	Power for LED driver IC (+5 V)
36	VLED+	Power for LED driver IC (+5 V)

Notes

(1) When select 8 bit mode, DB0 to DB7 be used, DB8 to DB15 no connection. When select 16 bit mode, DB8 to DB15 be used

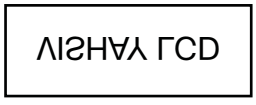
(2) Selection of scanning mode

SETTING OF SCAN CONTROL INPUT		SCANNING DIRECTION
U / D	**L / R**	
GND	V_{DD}	Up to down, left to right
V_{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
V_{DD}	V_{DD}	Down to up, left to right

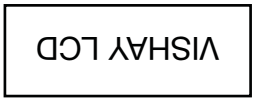
(3) Definition of scanning direction, refer to the figure as below:

1. U / D = L; L / R = H

2. U / D = L; L / R = L

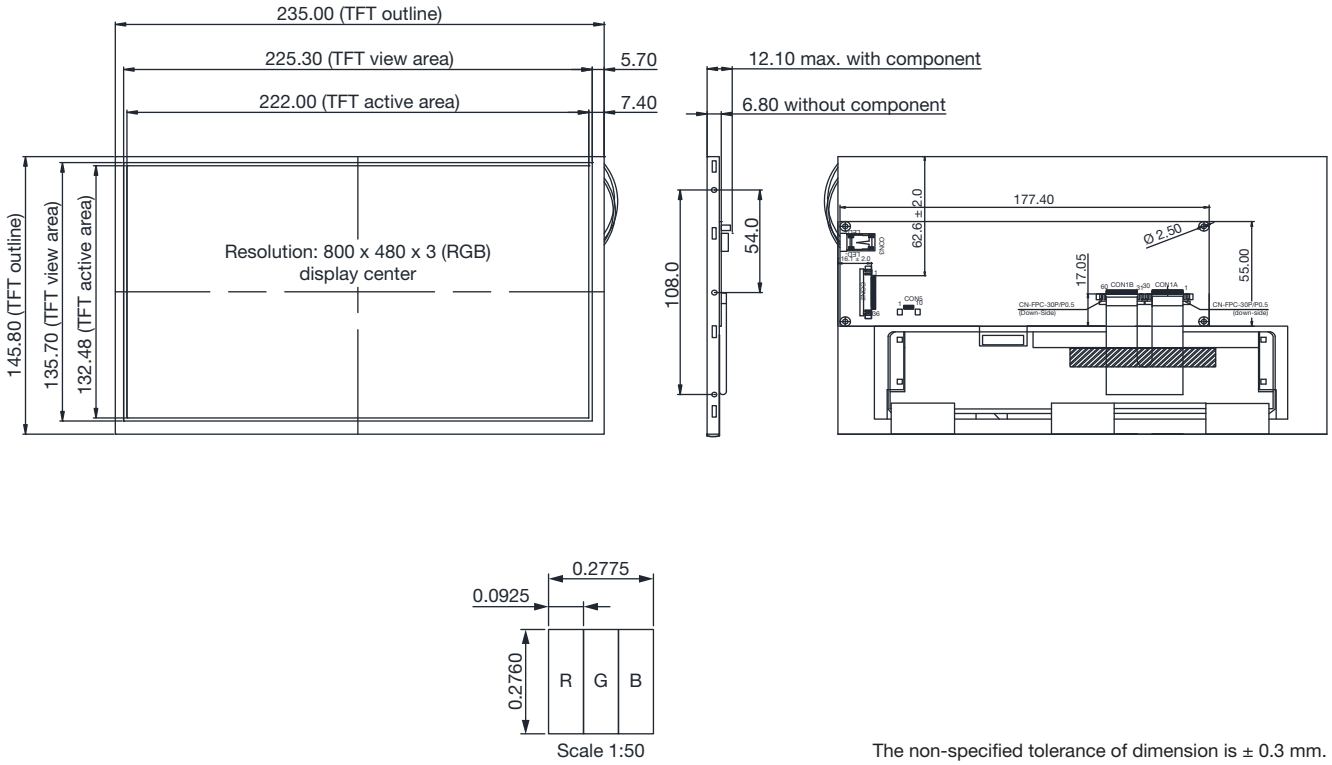


3. U / D = H; L / R = H



4. U / D = H; L / R = L

DIMENSIONS in millimeters



Scale 1:50

The non-specified tolerance of dimension is ± 0.3 mm.

MODULE CLASSIFICATION INFORMATION

LC	F	-	102	P	T	I	F	G	D	B	N	0	H
1	2		3	4	5	6	7	8	9	10	11	12	13

1	Brand	Vishay Intertechnology, Inc.				
2	Display type	F: TFT type J: custom TFT				
3	Display size	10.2" TFT				
4	Model serials number	P				
5	Backlight type	F: CCFL, white S: LED, high light white T: LED, white Z: Nichia LED, white				
6	LCD polarize type, temperature range, gray scale inversion direction	A: transmissive, N.T, IPS TFT C: transmissive, N.T, 6:00 F: transmissive, N.T, 12:00 I: transmissive, W.T, 6:00 K: transflective, W.T, 12:00 L: transmissive, W.T, 12:00 N: transmissive, super W.T, 6:00			Q: transmissive, super W.T, 12:00 R: transmissive, super W.T, O-TFT V: transmissive, super W.T, VA TFT X: transmissive, W.T, VA TFT Y: transmissive, W.T, IPS TFT Z: transmissive, W.T, O-TFT	
7	TFT type	A: TFT LCD B: TFT + FR + control board C: TFT + FR + A/D board D: TFT + FR + A/D board + control board E: TFT + FR + power board			F: TFT + control board G: TFT + FR H: TFT + D/V board I: TFT + FR + D/V board J: TFT + power board	
8	Resolution	A: 128160 B: 320234 C: 320240 D: 480234 E: 480272	F: 640480 G: 800480 H: 1024600 I: 320480 J: 240320	K: 800600 L: 240400 M: 1024768 N: 128128 P: 1280800	Q: 480800 R: 640320 S: 480128 T: 800320 U: 8001280	V: 176220 W: 1280398 X: 1024250 Y: 1920720 Z: 800200	2: 1024324 3: 7201280
9	-	D: digital L: LVDS M: MIPI				
10	Interface	A: 8 bit B: 16 bit H: HDMI I: I^2C interface			N: without control board R: RS232 S: SPI interface U: USB	
11	Touch panel	C: capacitive touch panel (G-F-F) G: capacitive touch panel (G-G)			N: without touch panel T: resistive touch panel	
12	Version	0				
13	Special code	H: RoHS-compliant with RoHS Directive regulations				

SUMMARY

TFT 10.2" is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module. It is usually designed for industrial application and this module follows RoHS compliance.

GENERAL SPECIFICATIONS		
ITEM	**DIMENSION**	**UNIT**
Size	10.2	inch
Dot matrix	800 x 480 (RGB)	dots
Module dimension	235.0 x 145.8 x 12.1	mm
Active area	222.0 x 132.48	mm
Dot pitch	0.0925 x 0.276	mm
LCD type	TFT, normally white, transmissive	
View direction	12 o'clock	
Gray scale inversion direction	6 o'clock	
Aspect ratio	16:9	
Backlight type	LED, normally white	
Controller IC	RA8875	
Interface	Digital 8080 family MPU 8 bit / 16 bit	
With or without touch panel	Without touch panel	
Surface	Anti-glare	

Note

- Color tone slight changed by temperature and driving voltage

DC CHARACTERISTICS						
ITEM	**SYMBOL**	**CONDITION**	**STANDARD VALUE**			**UNIT**
			MIN.	**TYP.**	**MAX.**	
Low level input voltage	V_{IL}	-	GND	-	0.2 V_{DD}	V
High level input voltage	V_{IH}	-	0.8 V_{DD}	-	V_{DD}	V

INTERFACE TIMING

8080 Mode

The following timing charts are used to describe the timing specification of the standard 8080 interfaces.

8080 MODE WRITE CYCLE					
SYMBOL	**PARAMETER**	**RATING**		**UNIT**	**SYMBOL**
		MIN.	**MAX.**		
t_{CYC8}	Cycle time	50	-	ns	t_C is one system clock period: t_C = 1/SYS_CLK
t_{CC8}	Strobe pulse width	20	-	ns	
t_{AS8}	Address setup time	0	-	ns	
t_{AH8}	Address hold time	10	-	ns	
t_{DS8}	Data setup time	20	-	ns	
t_{DH8}	Data hold time	10	-	ns	
t_{ACC8}	Data output access time	0	20	ns	
t_{OH8}	Data output hold time	0	20	ns	

8080 8-bit / 16-bit Interface

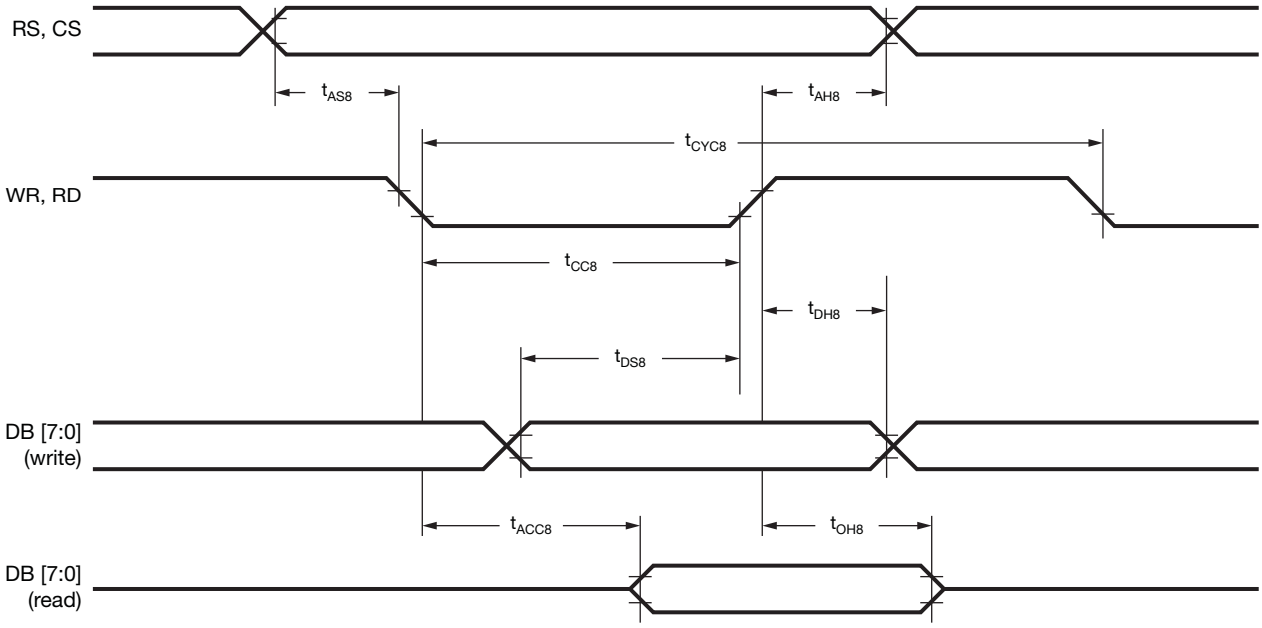


Fig. 1

The data bus width of RA8875 can be selected to 8-bit / 16-bit by setting the bit [1:0] of SYSR. When bit [1:0] of SYSR is cleared to “00”, then the data bus is 8-bit. If bit [1:0] of SYSR is set to “11”, then the data transition is set as 16-bit.

Pixel Data Format

16-bit mode color

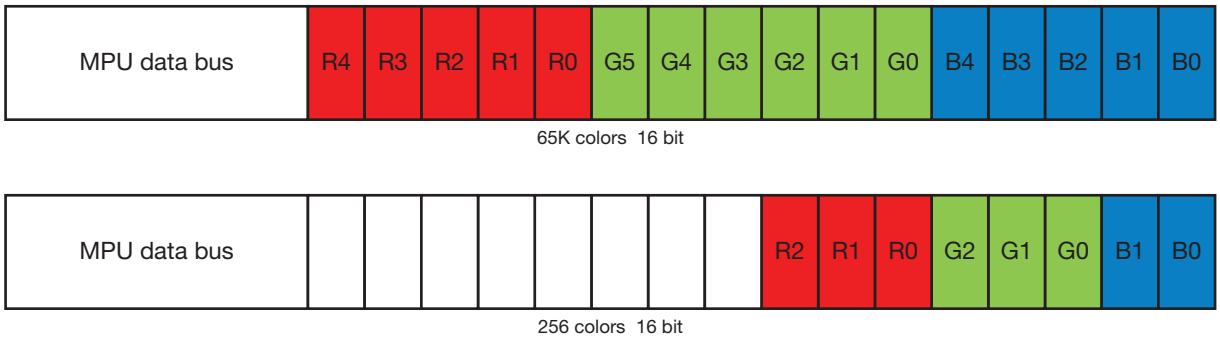


Fig. 2

8-bit mode color

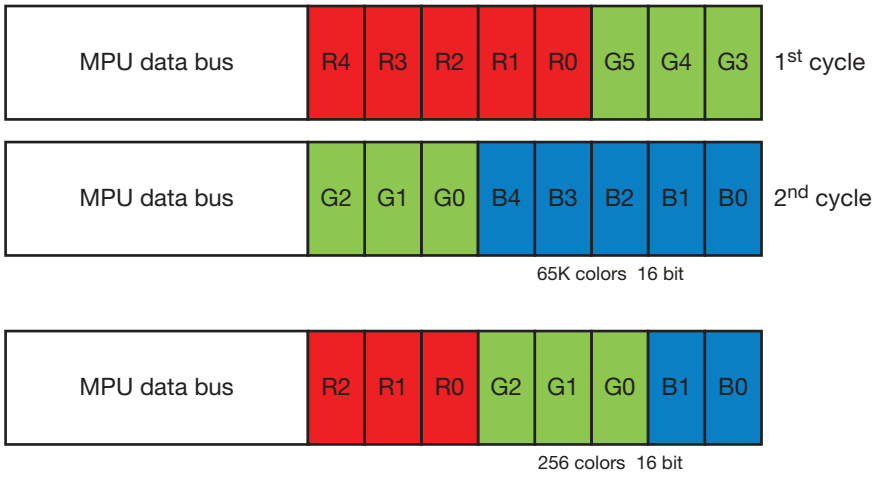


Fig. 3

OPTICAL CHARACTERISTICS

TFT LCD CHARACTERISTICS (T_A = 25 °C ± 2 °C)							
ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Response time [3][5]		t_r	Θ = 0°, Φ= 0°	-	15	30	ms
		t_f		-	20	40	ms
Contrast ratio [4][5]		CR	At optimized viewing angle	250	300	-	
Color chromaticity	White	W_x [2][6][7]	Θ = 0°, Φ= 0°	0.26	0.31	0.36	
		W_y		0.28	0.33	0.38	
Viewing angle (gray scale inversion direction) [1]	Horizontal	$Θ_R$	CR ≥ 10	55	65	-	deg
		$Θ_L$		55	65	-	
	Vertical	$Φ_T$		35	45	-	deg
		$Φ_B$		55	65	-	
Brightness		-	Center of display	250	350	-	cd/m^2

Notes

[1] Definition of viewing angle range

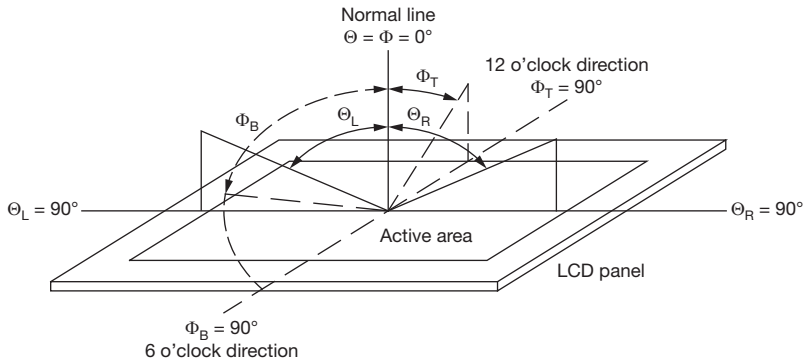


Fig. 4 - Definition of Viewing Angle

[2] Test equipment setup:
after stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50 cm and normal direction

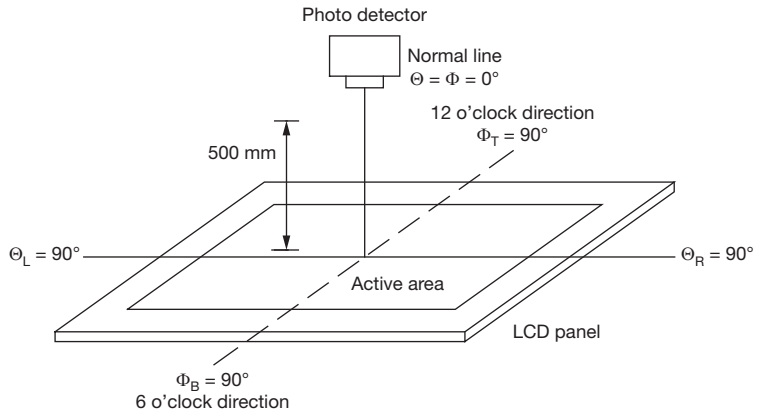


Fig. 5 - Optical Measurement System Setup

(3) Definition of response time:
the response time is defined as the LCD optical switching time interval between “white” state and “black” state. Rise time, t_r, is the time between photo detector output intensity changed from 90 % to 10 %. And fall time, t_f, is the time between photo detector output intensity changed from 10 % to 90 %

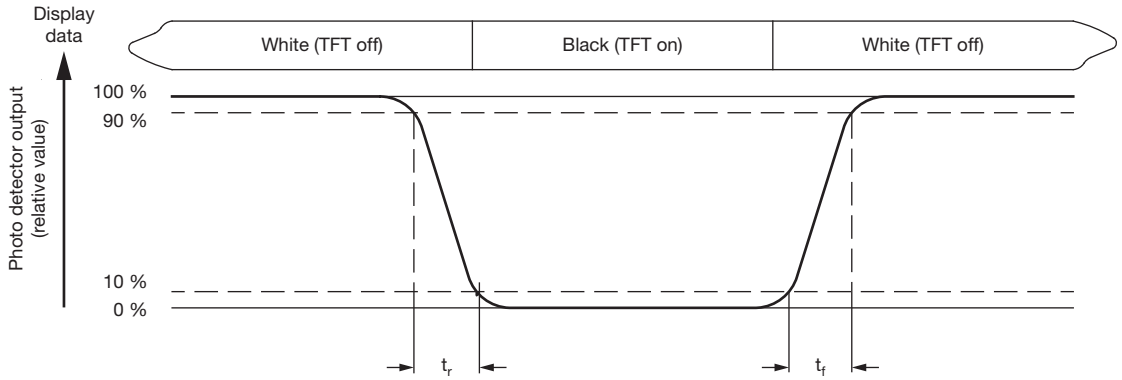


Fig. 6

(4) Definition of contrast ratio:
the contrast ratio is defined as the following expression

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the white state}}{\text{Luminance measured when LCD on the black state}}$$

(5) White $V_I = V_{I50} \pm 1.5$ V
Black $V_I = V_{I50} \pm 2.0$ V
“±” means that the analog input signal swings in phase with V_{COM} signal.
“±” means that the analog input signal swings out of phase with V_{COM} signal.
The 100 % transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened

(6) Definition of color chromaticity (CIE 1931): color coordinates measured at the center point of LCD

(7) Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened

BLOCK DIAGRAM

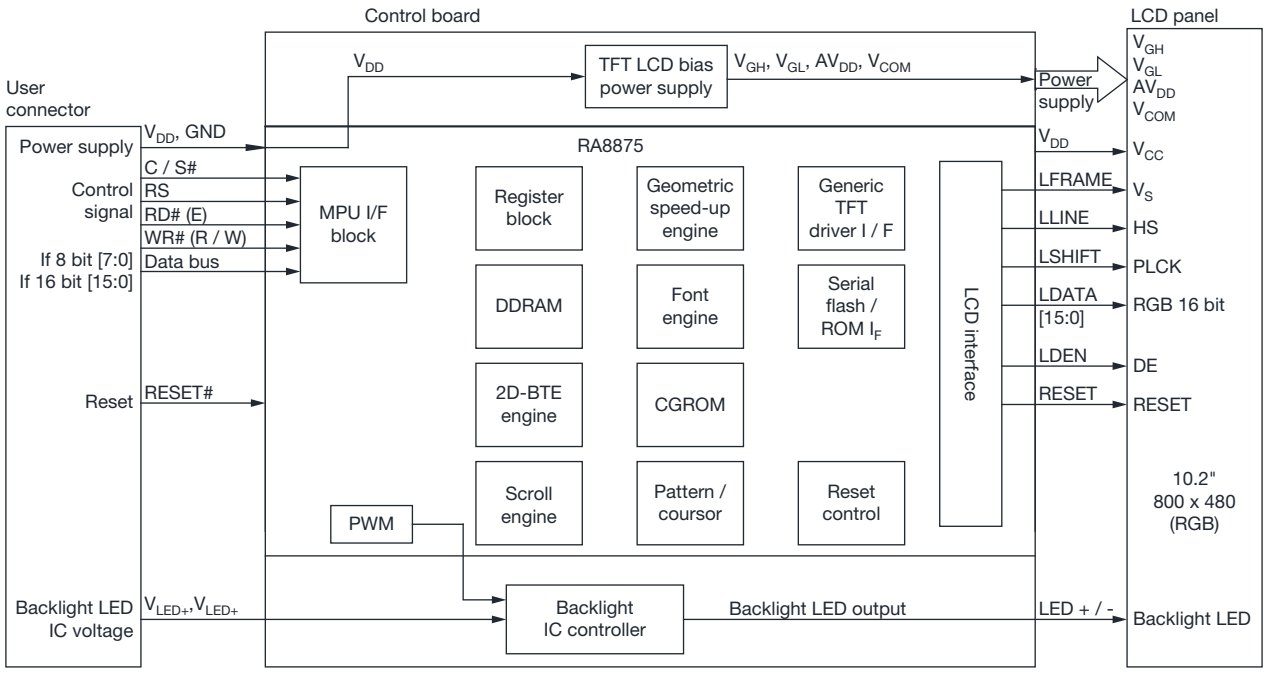
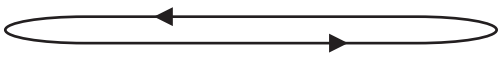


Fig. 7

RELIABILITY		
ENVIRONMENTAL TEST		
TEST ITEM	**CONTENT OF TEST**	**TEST CONDITION**
High temperature storage (1)	Endurance test applying the high storage temperature for a long time.	80 °C, 200 h
Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30 °C, 200 h
High temperature operation	Endurance test applying the electric stress (voltage and current) and the thermal stress to the element for a long time.	70 °C, 200 h
Low temperature operation (2)	Endurance test applying the electric stress under low temperature for a long time.	-20 °C, 200 h
High temperature / humidity operation (1)(2)	The module should be allowed to stand at 60 °C, 90 % RH max.	60 °C, 90 % RH, 96 h
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20 °C 25 °C 70 °C  30 min 5 min 30 min 1 cycle	-20 °C / 70 °C, 10 cycles
Vibration test (3)	Endurance test applying the vibration during transportation and using.	Total fixed amplitude: 1.5 mm, vibration frequency: 10 Hz to 55 Hz, one cycle 60 s to 3 directions of X, Y, Z for each 15 minutes
Static electricity test	Endurance test applying the electric stress to the terminal.	V_S = ± 600 V (contact), ± 800 V (air), R_S = 330 Ω, C_S = 150 pF, 10 times

Notes

(1) The function test shall be conducted after 4 hours storage at the normal temperature and humidity after remove from the test chamber

(2) No dew condensation to be observed

(3) The packing have to including into the vibration testing

INITIAL CODE FOR REFERENCE

```
void Initial_RA8875()
{
        RES = 1;
        Delay1ms (10);
        RES = 0;                    //Active low
        Delay1ms (50);
        RES = 1;
        Delay1ms (100);
        LCD_CmdWrite(0x88);
        LCD_DataWrite(0x0c);
        Delay1ms(1);
        LCD_CmdWrite(0x89);
        LCD_DataWrite(0x02);
        Delay1ms(1);
        LCD_CmdWrite(0x10);
        LCD_DataWrite(0x0c);
        LCD_CmdWrite(0x04);
        LCD_DataWrite(0x81);
        Delay1ms(1);

        //Horizontal set
        LCD_CmdWrite(0x14);
        LCD_DataWrite(0x63);
        LCD_CmdWrite(0x15);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x16);
        LCD_DataWrite(0x03);
        LCD_CmdWrite(0x17);
        LCD_DataWrite(0x03);
        LCD_CmdWrite(0x18);
        LCD_DataWrite(0x0B);
        LCD_CmdWrite(0x19);
        LCD_DataWrite(0xdf);
        LCD_CmdWrite(0x1a);
        LCD_DataWrite(0x01);
        LCD_CmdWrite(0x1b);
        LCD_DataWrite(0x20);
        LCD_CmdWrite(0x1c);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x1d);
        LCD_DataWrite(0x16);
        LCD_CmdWrite(0x1e);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x1f);
        LCD_DataWrite(0x01);

        //setting active window X
        LCD_CmdWrite(0x30);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x31);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x34);
        LCD_DataWrite(0x1F);
        LCD_CmdWrite(0x35);
        LCD_DataWrite(0x03);

        //setting active window Y
        LCD_CmdWrite(0x32);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x33);
        LCD_DataWrite(0x00);
        LCD_CmdWrite(0x36);
        LCD_DataWrite(0xdf);
        LCD_CmdWrite(0x37);
        LCD_DataWrite(0x01);
}
```

LCM SAMPLE ESTIMATE FEEDBACK SHEET

Module Number: _____

1. Panel Specification

1.	Panel type:	☐ Pass	☐ NG, _____
2.	View direction:	☐ Pass	☐ NG, _____
3.	Numbers of dots:	☐ Pass	☐ NG, _____
4.	View area:	☐ Pass	☐ NG, _____
5.	Active area:	☐ Pass	☐ NG, _____
6.	Operating temperature:	☐ Pass	☐ NG, _____
7.	Storage temperature:	☐ Pass	☐ NG, _____
8.	Others: _____		

2. Mechanical Specification

1.	PCB size:	☐ Pass	☐ NG, _____
2.	Frame size:	☐ Pass	☐ NG, _____
3.	Material of frame:	☐ Pass	☐ NG, _____
4.	Connector position:	☐ Pass	☐ NG, _____
5.	Fix hole position:	☐ Pass	☐ NG, _____
6.	Backlight position:	☐ Pass	☐ NG, _____
7.	Thickness of PCB:	☐ Pass	☐ NG, _____
8.	Height of frame to PCB:	☐ Pass	☐ NG, _____
9.	Height of module:	☐ Pass	☐ NG, _____
10.	Others:	☐ Pass	☐ NG, _____

3. Relative Hole Size

1.	Pitch of connector:	☐ Pass	☐ NG, _____
2.	Hole size of connector:	☐ Pass	☐ NG, _____
3.	Mounting hole size:	☐ Pass	☐ NG, _____
4.	Mounting hole type:	☐ Pass	☐ NG, _____
5.	Others:	☐ Pass	☐ NG, _____

4. Backlight Specification

1.	Backlight type:	☐ Pass	☐ NG, _____
2.	Backlight color:	☐ Pass	☐ NG, _____
3.	Backlight driving voltage (reference for LED type):	☐ Pass	☐ NG, _____
4.	Backlight driving current:	☐ Pass	☐ NG, _____
5.	Brightness of backlight:	☐ Pass	☐ NG, _____
6.	Backlight solder method:	☐ Pass	☐ NG, _____
7.	Others: _____		

5. Electronic Characteristics of Module

1. Input voltage:	☐ Pass	☐ NG, _____
2. Supply current:	☐ Pass	☐ NG, _____
3. Driving voltage for LCD:	☐ Pass	☐ NG, _____
4. Contrast for LCD:	☐ Pass	☐ NG, _____
5. Backlight driving method:	☐ Pass	☐ NG, _____
6. Negative voltage output:	☐ Pass	☐ NG, _____
7. Interface function:	☐ Pass	☐ NG, _____
8. LCD uniformity:	☐ Pass	☐ NG, _____
9. ESD test:	☐ Pass	☐ NG, _____
10. Others:	☐ Pass	☐ NG, _____

6. Summary

Sales signature: _____ **Date:** _____ /_____ / _____

Customer signature: _____

LED Display Modules

128 x 32 Graphics Display with Drive Electronics and + 5 V HC CMOS Level Video Interface Orange 0603 Chip LEDs, High Brightness, RoHS Compliant

Pb-free
RoHS COMPLIANT

FEATURES

- LED replacement for the popular APD-128G032 plasma display module
- + 5 V HC CMOS level video interface
- Large characters
- Highly visible for long distance viewing
- > 30:1 contrast ratio
- Brilliant neon orange color
- Slim profile
- Compliant to RoHS directive 2002/95/EC

The LEE-128G032 is an LED replacement for the popular APD-128G032 plasma display module. It is designed to offer high brightness and superior viewing characteristics in a slim package. This display is ideal for low to medium level information content and is ideal for applications such as arcade games, process control, POS terminals, medical equipment, message centers and ATM machines.

The LEE-128G032 LED display offers high contrast, wide viewing angle, and long distance readability. It emits a brilliant orange color which catches the attention of the viewer, but is yet comfortable to the eye.

The LEE-128G032 LED display has a video type interface and is driven in a standard row/column refresh method. Pixel data is clocked for a row, and rows are scanned sequentially. Signals are presented for *serial data*, *dot clock*, *column latch*, *row data*, *row clock* and *display enable*. The *serial data* is entered with the *dot clock* up to frequencies as high as 8 MHz. After a row of 128 pixels is clocked in, the *column latch* signal is toggled and the data is latched. At the time the data is latched, the display is briefly disabled using the *display enable* signal, then the row pointer is advanced with the *row clock* signal. Once each frame the *row data* must be asserted to synchronize the column serial data with the beginning row. The recommended scanning frequency is approximately 70 Hz, but may be as high as 200 Hz.

ELECTRICAL SPECIFICATIONS

Voltage(s) Required: + 5 V_{DC} (V_{CC})

Power Required (Fully Lit): Typical = 12.5 W
Maximum = 15 W

OPTICAL SPECIFICATIONS

Viewing Area: 12.75" [323.8 mm] W x 3.15" [80.01 mm] L

Character Size (5 x 7): 0.65" [16.51 mm] H x 0.45" [11.43 mm] W

Pixel Size: 0.063" [1.6 mm] H x 0.031" [0.8 mm] W

Pixel Pitch: 0.100" [2.54 mm]

Luminance: 100 ft-L minimum

Color: Neon orange

Viewing Angle: > 150°

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: - 40 °C to + 85 °C

Storage Temperature: - 40 °C to + 85 °C

Relative Operating Humidity: To 95 % non-condensing

Mechanical Shock: 30 G

Vibration: 3 G

Operating Altitude: 10 000 ft

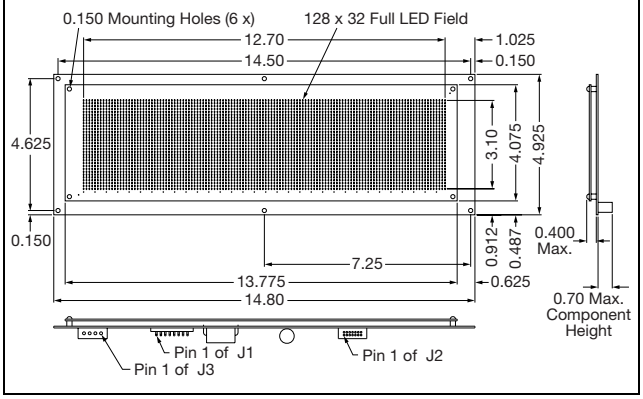
STANDARD ELECTRICAL SPECIFICATIONS [1]

DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic and LED Drive Voltage	V_{CC}	+ 4.5	+ 5.0	+ 5.5	V_{DC}
Logic and LED Drive Current (Fully Lit)	I_{CC}	-	2.5	3.0	A_{DC}
Logic 1 Input	V_{ih}	0.7 V_{CC}	-	-	V_{DC}
Logic 0 Input	V_{il}	-	-	0.2 V_{CC}	V_{DC}

Note

(1) Recommended operating voltages, all maximums are absolute maximum

DIMENSIONS in inches [millimeters]



PIN DESCRIPTION

J1 - POWER CONNECTOR

Molex 26-48-1082 or equivalent. Mates with Tyco AMP 3-640428-8, Molex 09-50-3081 housing with 08-50-0106 socket crimp terminals or equivalent

PIN	SIGNAL	DESCRIPTION
1	N/C	No connection
2	N/C	No connection
3	KEY	Used to key connector
4	GND	Ground
5	GND	Ground
6	V_{CC}	Logic and LED drive supply
7	RESERVED	No connection
8	N/C	No connection

J2 - DATA CONNECTOR

Tyco AMP 5103309-2 or equivalent.
Mates with Tyco AMP 1658621-2 or equivalent

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Display enable	2	Ground
3	Row data	4	Ground
5	Row clock	6	Ground
7	Column latch	8	Ground
9	Dot clock	10	Ground
11	Serial data	12	Ground
13	No connection	14	Ground

J3 - POWER CONNECTOR

Tyco AMP 641737-1 or equivalent. Mates with Tyco AMP 1-480424-0 housing, 60617-4 socket crimp terminals

PIN	SIGNAL	DESCRIPTION
1	RESERVED	No connection
2	GND	Ground
3	GND	Ground
4	V_{CC}	Logic and LED drive supply

INTERFACE SIGNAL DESCRIPTION

Dot clock - This signal enters the *serial data* on each low to high transition. A total of 128 *dot clock* transitions must be present for each line of column/anode data.

Serial data - This signal presents the pixel data in positive logic format. A logic one represents a lit pixel and a logic zero represents an extinguished pixel. Data is entered from right to left. The first pixel data entered will represent the left most pixel in the row.

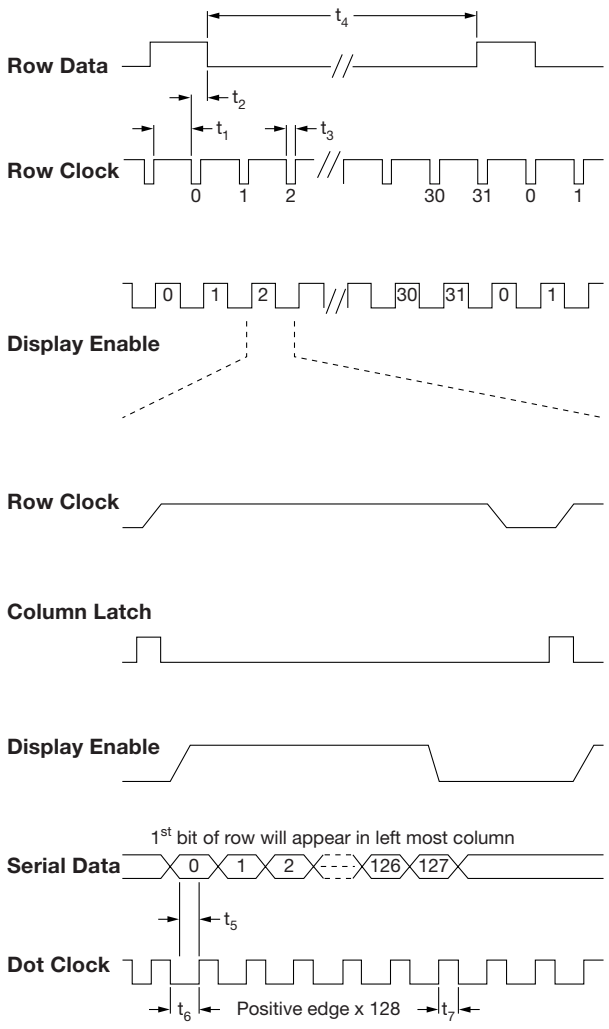
Column latch - This signal latches the pixel data into the driver outputs. When the *column latch* signal goes to logic one the data entered previously will fall through to the driver outputs. When the signal returns to a logic zero the data is latched and the shift register is now ready to accept the next row of data. Must be held low while entering new *serial data*.

Display enable - This signal enables the output drivers. Using a duty cycle control, this signal may also be used for intensity control. The *display enable* must be at logic zero before the *column latch* signal transitions. To avoid display blurring, the *row clock* signal should also transition while *display enable* is a logic zero.

Row data - This signal is the first line marker for the scan. This input should be held high to correspond to the first row of pixel data.

Row clock - This signal clocks *row data* on the falling edge. The *row clock* signal is repetitive and must be present for proper scanning of the display module.
The LEE-128G032 has an unique input protection circuit that assures the column drivers stay blanked on power up. The protection circuit unblanks the column drivers when the *row clock* signal begins (i.e the display begins scanning).

LOGIC AND DATA TIMING



PARAMETER	MIN.	TYP.	MAX.	UNITS
t_1	100	-	-	ns
t_2	5	-	-	µs
t_3	1	-	-	µs
t_4	-	70	200	Hz
t_5	25	-	-	ns
t_6	75	-	-	ns
t_7	75	-	-	ns

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Driver Electronics and + 5 V HC CMOS Interface	LEE-128G032
J2 Data Connector Kit (2 pcs. recommended)	280105-08
J1 Power Connector Kit	280108-14
J3 Power Connector Kit	280108-15

LED Display Modules

128 x 32 Graphics Display with Drive Electronics and + 5 V HC CMOS Level Video Interface Orange 0603 Chip LEDs, Normal Brightness, RoHS Compliant

The LEE-128G032-1 is an LED replacement for the popular APD-128G032 plasma display module. It is designed to offer high brightness and superior viewing characteristics in a slim package. This display is ideal for low to medium level information content and is ideal for applications such as arcade games, process control, POS terminals, medical equipment, message centers and ATM machines.

The LEE-128G032-1 LED display offers high contrast, wide viewing angle, and long distance readability. It emits a brilliant orange color which catches the attention of the viewer, but is yet comfortable to the eye.

The LEE-128G032-1 LED display has a video type interface and is driven in a standard row/column refresh method. Pixel data is clocked for a row, and rows are scanned sequentially. Signals are presented for *serial data*, *dot clock*, *column latch*, *row data*, *row clock* and *display enable*. The *serial data* is entered with the *dot clock* up to frequencies as high as 8 MHz. After a row of 128 pixels is clocked in, the *column latch* signal is toggled and the data is latched. At the time the data is latched, the display is briefly disabled using the *display enable* signal, then the row pointer is advanced with the *row clock* signal. Once each frame the *row data* must be asserted to synchronize the column serial data with the beginning row. The recommended scanning frequency is approximately 70 Hz, but may be as high as 200 Hz.

STANDARD ELECTRICAL SPECIFICATIONS (1)

DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic and LED Drive Voltage	V_{CC}	+ 4.5	+ 5.0	+ 5.5	V_{DC}
Logic and LED Drive Current (Fully Lit)	I_{CC}	-	1.1	1.3	A_{DC}
Logic 1 Input	V_{ih}	0.7 V_{CC}	-	-	V_{DC}
Logic 0 Input	V_{il}	-	-	0.3 V_{CC}	V_{DC}

Note

(1) Recommended operating voltages, all maximums are absolute maximum

FEATURES

- LED replacement for the popular APD-128G032 plasma display module
- + 5 V HC CMOS level video interface
- Large characters
- Highly visible for long distance viewing
- > 30:1 contrast ratio
- Brilliant neon orange color
- Slim profile
- Reduced power and brightness version
- Compliant to RoHS directive 2002/95/EC

Pb-free
RoHS COMPLIANT

ELECTRICAL SPECIFICATIONS

Voltage(s) Required: + 5 V_{DC} (V_{CC})

Power Required (Fully Lit): Typical = 5.5 W
Maximum = 6.5 W

OPTICAL SPECIFICATIONS

Viewing Area: 12.75" [323.8 mm] W x 3.15" [80.01 mm] L

Character Size (5 x 7): 0.65" [16.51 mm] H x 0.45" [11.43 mm] W

Pixel Size: 0.063" [1.6 mm] H x 0.031" [0.8 mm] W

Pixel Pitch: 0.100" [2.54 mm]

Luminance: 100 ft-L minimum

Color: Neon orange

Viewing Angle: > 150°

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: - 40 °C to + 85 °C

Storage Temperature: - 40 °C to + 85 °C

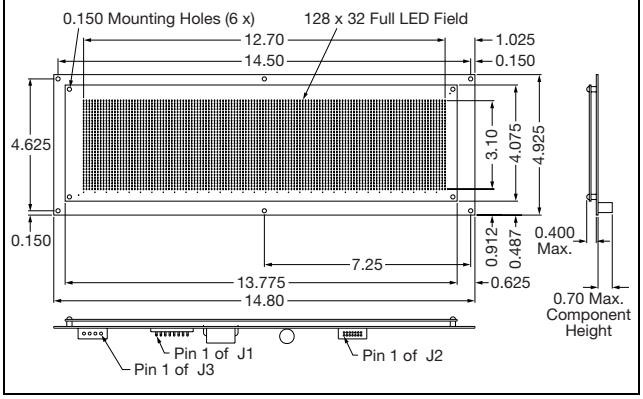
Relative Operating Humidity: To 95 % non-condensing

Mechanical Shock: 30 G

Vibration: 3 G

Operating Altitude: 10 000 ft

DIMENSIONS in inches [millimeters]



PIN DESCRIPTION

J1 - POWER CONNECTOR

Molex 26-48-1082 or equivalent. Mates with Tyco AMP 3-640428-8, Molex 09-50-3081 housing with 08-50-0106 socket crimp terminals or equivalent

PIN	SIGNAL	DESCRIPTION
1	N/C	No connection
2	N/C	No connection
3	KEY	Used to key connector
4	GND	Ground
5	GND	Ground
6	V_{CC}	Logic and LED drive supply
7	RESERVED	No connection
8	N/C	No connection

J2 - DATA CONNECTOR

Tyco AMP 5103309-2 or equivalent.
Mates with Tyco AMP 1658621-2 or equivalent

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Display enable	2	Ground
3	Row data	4	Ground
5	Row clock	6	Ground
7	Column latch	8	Ground
9	Dot clock	10	Ground
11	Serial data	12	Ground
13	No connection	14	Ground

J3 - POWER CONNECTOR

Tyco AMP 641737-1 or equivalent. Mates with Tyco AMP 1-480424-0 housing, 60617-4 socket crimp terminals

PIN	SIGNAL	DESCRIPTION
1	RESERVED	No connection
2	GND	Ground
3	GND	Ground
4	V_{CC}	Logic and LED drive supply

INTERFACE SIGNAL DESCRIPTION

Dot clock - This signal enters the *serial data* on each low to high transition. A total of 128 *dot clock* transitions must be present for each line of column/anode data.

Serial data - This signal presents the pixel data in positive logic format. A logic one represents a lit pixel and a logic zero represents an extinguished pixel. Data is entered from right to left. The first pixel data entered will represent the left most pixel in the row.

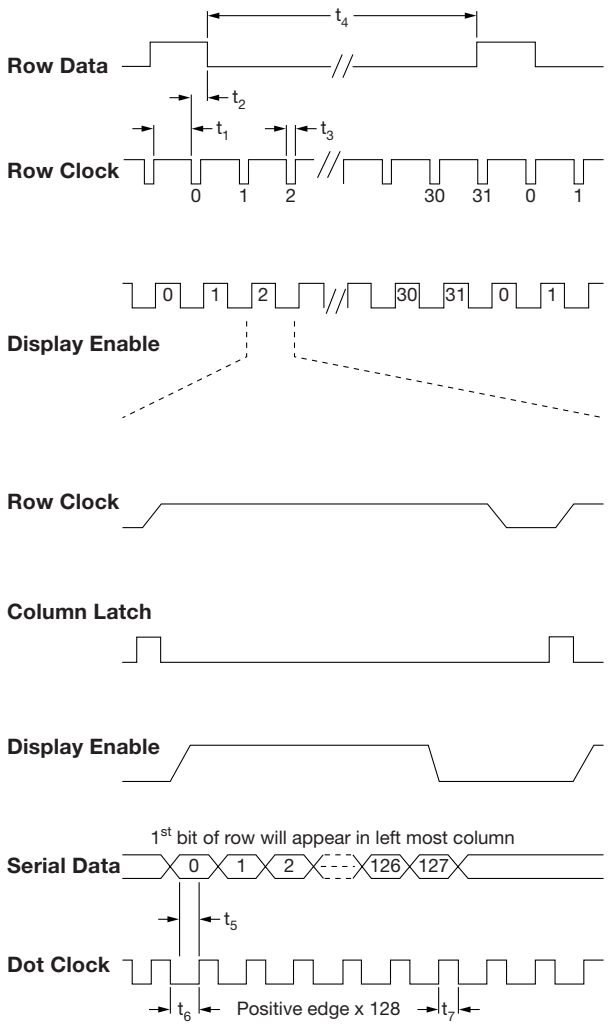
Column latch - This signal latches the pixel data into the driver outputs. When the *column latch* signal goes to logic one the data entered previously will fall through to the driver outputs. When the signal returns to a logic zero the data is latched and the shift register is now ready to accept the next row of data. Must be held low while entering new *serial data*.

Display enable - This signal enables the output drivers. Using a duty cycle control, this signal may also be used for intensity control. The *display enable* must be at logic zero before the *column latch* signal transitions. To avoid display blurring, the *row clock* signal should also transition while *display enable* is a logic zero.

Row data - This signal is the first line marker for the scan. This input should be held high to correspond to the first row of pixel data.

Row clock - This signal clocks *row data* on the falling edge. The *row clock* signal is repetitive and must be present for proper scanning of the display module.
The LEE-128G032-1 has an unique input protection circuit that assures the column drivers stay blanked on power up. The protection circuit unblanks the column drivers when the *row clock* signal begins (i.e the display begins scanning).

LOGIC AND DATA TIMING



PARAMETER	MIN.	TYP.	MAX.	UNITS
t_1	100	-	-	ns
t_2	5	-	-	µs
t_3	1	-	-	µs
t_4	-	70	200	Hz
t_5	25	-	-	ns
t_6	75	-	-	ns
t_7	75	-	-	ns

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Driver Electronics and + 5 V HC CMOS Interface	LEE-128G032-1
J2 Data Connector Kit (2 pcs. recommended)	280105-08
J1 Power Connector Kit	280108-14
J3 Power Connector Kit	280108-15

LED Display Modules

128 x 32 Graphics Display with Drive Electronics and + 5 V HC CMOS Level Video Interface
Red LED Modules, Normal Brightness, Single Board Construction, RoHS-Compliant

The LEE-128G032B is an LED replacement for the popular APD-128G032 plasma display module. It is designed to offer high brightness and superior viewing characteristics in a slim package. This display is ideal for low to medium level information content and is ideal for applications such as arcade games, process control, POS terminals, medical equipment, message centers and ATM machines.

The LEE-128G032B LED display offers high contrast, wide viewing angle, and long distance readability. It emits a bright red color which catches the attention of the viewer, but is yet comfortable to the eye.

The LEE-128G032B LED display has a video type interface and is driven in a standard row/column refresh method. Pixel data is clocked for a row, and rows are scanned sequentially. Signals are presented for *serial data*, *dot clock*, *column latch*, *row data*, *row clock* and *display enable*. The *serial data* is entered with the *dot clock* up to frequencies as high as 8 MHz. After a row of 128 pixels is clocked in, the *column latch* signal is toggled and the data is latched. At the time the data is latched, the display is briefly disabled using the *display enable* signal, then the row pointer is advanced with the *row clock* signal. Once each frame the *row data* must be asserted to synchronize the column serial data with the beginning row. The recommended scanning frequency is approximately 70 Hz, but may be as high as 200 Hz.

FEATURES

- LED replacement for the popular APD-128G032 plasma display module
- + 5 V HC CMOS level video interface
- Large characters
- Highly visible for long distance viewing
- > 30:1 contrast ratio
- Bright red color
- Slim profile
- Reduced power and brightness version

Pb-free
RoHS COMPLIANT

ELECTRICAL SPECIFICATIONS

Voltage(s) Required: + 5 V_{DC} (V_{CC})
Power Required (Fully Lit): Typ. = 5.5 W, max. = 6.5 W

OPTICAL SPECIFICATIONS

Viewing Area: 12.75" [323.8 mm] W x 3.15" [80.01 mm] L
Character Size (5 x 7): 0.65" [16.51 mm] H x 0.45" [11.43 mm] W
Pixel Size: 0.063" [1.6 mm] H x 0.031" [0.8 mm] W
Pixel Pitch: 0.100" [2.54 mm]
Luminance: 100 ft-L minimum
Color: Bright red
Viewing Angle: > 150°

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: - 40 °C to + 85 °C
Storage Temperature: - 40 °C to + 85 °C
Relative Operating Humidity: To 95 % non-condensing
Mechanical Shock: 30 G
Vibration: 3 G
Operating Altitude: 10 000 ft

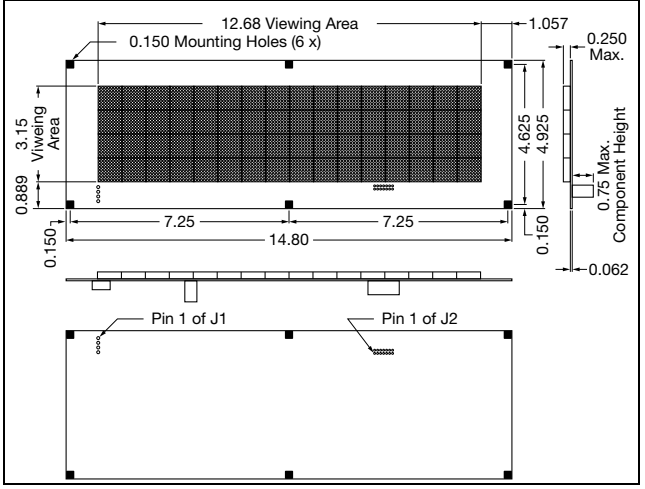
STANDARD ELECTRICAL SPECIFICATIONS

DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic and LED Drive Voltage	V_{CC}	+ 4.5	+ 5.0	+ 5.5	V_{DC}
Logic and LED Drive Current (Fully Lit)	I_{CC}	-	1.1	1.3	A_{DC}
Logic 1 Input	V_{ih}	0.7 V_{CC}	-	-	V_{DC}
Logic 0 Input	V_{il}	-	-	0.3 V_{CC}	V_{DC}

Note

- Recommended operating voltages, all maximums are absolute maximum

DIMENSIONS in inches [millimeters]



PIN DESCRIPTION

J2 - POWER CONNECTOR

Molex 26-48-1045 or equivalent.
Mates with Tyco AMP 3-640428-8, or Molex 09-50-3041 housing with 08-50-0106 socket crimp terminals or equivalent.

PIN	SIGNAL	DESCRIPTION
1	V_{CC}	Logic and LED drive supply
2	V_{CC}	Logic and LED drive supply
3	GND	Ground
4	GND	Ground

J1 - DATA CONNECTOR

FCI 75869-102LF or equivalent.
Mates with Tyco AMP 1658621-2 or equivalent

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Display enable	2	Ground
3	Row data	4	Ground
5	Row clock	6	Ground
7	Column latch	8	Ground
9	Dot clock	10	Ground
11	Serial data	12	Ground
13	No connection	14	Ground

INTERFACE SIGNAL DESCRIPTION

Dot clock - This signal enters the *serial data* on each low to high transition. A total of 128 *dot clock* transitions must be present for each line of column/anode data.

Serial data - This signal presents the pixel data in positive logic format. A logic one represents a lit pixel and a logic zero represents an extinguished pixel. Data is entered from right to left. The first pixel data entered will represent the left most pixel in the row.

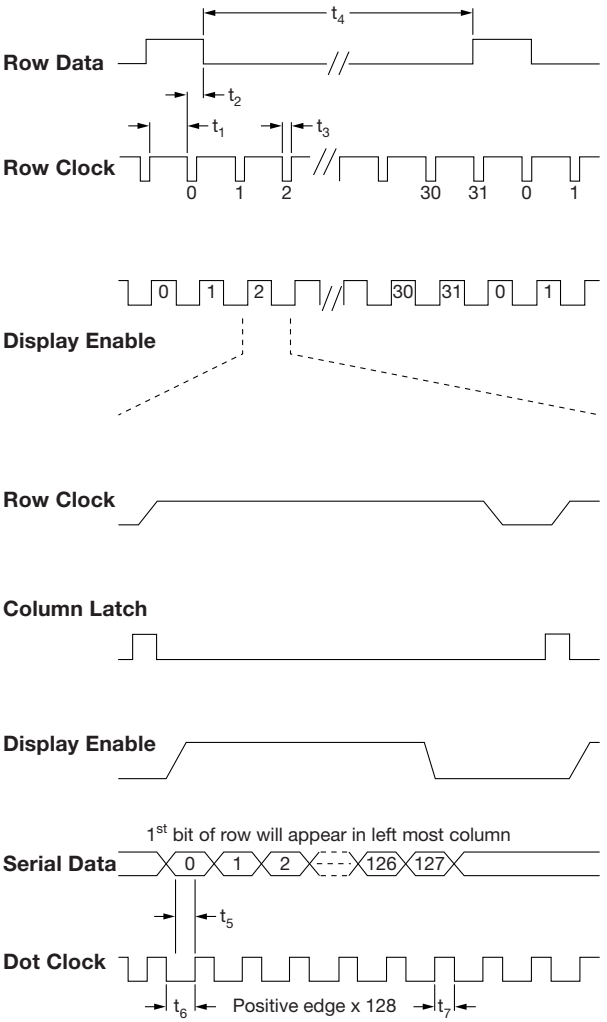
Column latch - This signal latches the pixel data into the driver outputs. When the *column latch* signal goes to logic one the data entered previously will fall through to the driver outputs. When the signal returns to a logic zero the data is latched and the shift register is now ready to accept the next row of data. Must be held low while entering new *serial data*.

Display enable - This signal enables the output drivers. Using a duty cycle control, this signal may also be used for intensity control. The *display enable* must be at logic zero before the *column latch* signal transitions. To avoid display blurring, the *row clock* signal should also transition while *display enable* is a logic zero.

Row data - This signal is the first line marker for the scan. This input should be held high to correspond to the first row of pixel data.

Row clock - This signal clocks *row data* on the falling edge. The *row clock* signal is repetitive and must be present for proper scanning of the display module.
The LEE-128G032B has an unique input protection circuit that assures the column drivers stay blanked on power up. The protection circuit unblanks the column drivers when the *row clock* signal begins (i.e the display begins scanning).

LOGIC AND DATA TIMING



PARAMETER	MIN.	TYP.	MAX.	UNITS
t_1	100	-	-	ns
t_2	5	-	-	µs
t_3	1	-	-	µs
t_4	-	70	200	Hz
t_5	25	-	-	ns
t_6	75	-	-	ns
t_7	75	-	-	ns

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Driver Electronics and + 5 V HC CMOS Interface	LED-128G032B
J1 Data Connector Kit (2 pcs. recommended)	280105-08
J2 Power Connector Kit	280108-16

LED Display Modules

128 x 32 Graphics Display with Drive Electronics and + 5 V HC CMOS Level Video Interface Orange LED Modules, Normal Brightness, Single Board Construction, RoHS-Compliant

The LEE-128G032B-1 is an LED replacement for the popular APD-128G032 plasma display module. It is designed to offer high brightness and superior viewing characteristics in a slim package. This display is ideal for low to medium level information content and is ideal for applications such as arcade games, process control, POS terminals, medical equipment, message centers and ATM machines.

The LEE-128G032B-1 LED display offers high contrast, wide viewing angle, and long distance readability. It emits a bright orange color which catches the attention of the viewer, but is yet comfortable to the eye.

The LEE-128G032B-1 LED display has a video type interface and is driven in a standard row/column refresh method. Pixel data is clocked for a row, and rows are scanned sequentially. Signals are presented for *serial data*, *dot clock*, *column latch*, *row data*, *row clock* and *display enable*. The *serial data* is entered with the *dot clock* up to frequencies as high as 8 MHz. After a row of 128 pixels is clocked in, the *column latch* signal is toggled and the data is latched. At the time the data is latched, the display is briefly disabled using the *display enable* signal, then the row pointer is advanced with the *row clock* signal. Once each frame the *row data* must be asserted to synchronize the column serial data with the beginning row. The recommended scanning frequency is approximately 70 Hz, but may be as high as 200 Hz.

STANDARD ELECTRICAL SPECIFICATIONS					
DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic and LED Drive Voltage	V_{CC}	+ 4.5	+ 5.0	+ 5.5	V_{DC}
Logic and LED Drive Current (Fully Lit)	I_{CC}	-	1.1	1.3	A_{DC}
Logic 1 Input	V_{ih}	0.7 V_{CC}	-	-	V_{DC}
Logic 0 Input	V_{il}	-	-	0.3 V_{CC}	V_{DC}

Note

- Recommended operating voltages, all maximums are absolute maximum

FEATURES

- LED replacement for the popular APD-128G032 plasma display module
- + 5 V HC CMOS level video interface
- Large characters
- Highly visible for long distance viewing
- > 30:1 contrast ratio
- Bright orange color
- Slim profile
- Reduced power and brightness version

Pb-free
RoHS COMPLIANT

ELECTRICAL SPECIFICATIONS

Voltage(s) Required: + 5 V_{DC} (V_{CC})
Power Required (Fully Lit): Typ. = 5.5 W, max. = 6.5 W

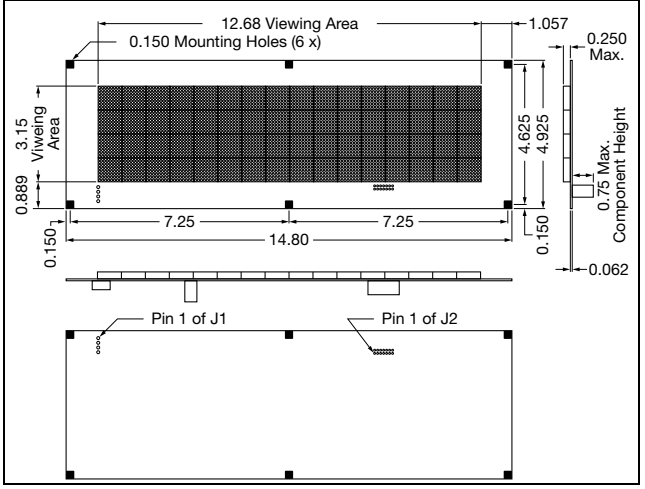
OPTICAL SPECIFICATIONS

Viewing Area: 12.75" [323.8 mm] W x 3.15" [80.01 mm] L
Character Size (5 x 7): 0.65" [16.51 mm] H x 0.45" [11.43 mm] W
Pixel Size: 0.063" [1.6 mm] H x 0.031" [0.8 mm] W
Pixel Pitch: 0.100" [2.54 mm]
Luminance: 100 ft-L minimum
Color: Bright orange
Viewing Angle: > 150°

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: - 40 °C to + 85 °C
Storage Temperature: - 40 °C to + 85 °C
Relative Operating Humidity: To 95 % non-condensing
Mechanical Shock: 30 G
Vibration: 3 G
Operating Altitude: 10 000 ft

DIMENSIONS in inches [millimeters]



PIN DESCRIPTION

J2 - POWER CONNECTOR

Molex 26-48-1045 or equivalent.
Mates with Tyco AMP 3-640428-8, or Molex 09-50-3041 housing with 08-50-0106 socket crimp terminals or equivalent.

PIN	SIGNAL	DESCRIPTION
1	V_{CC}	Logic and LED drive supply
2	V_{CC}	Logic and LED drive supply
3	GND	Ground
4	GND	Ground

J1 - DATA CONNECTOR

FCI 75869-102LF or equivalent.
Mates with Tyco AMP 1658621-2 or equivalent

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Display enable	2	Ground
3	Row data	4	Ground
5	Row clock	6	Ground
7	Column latch	8	Ground
9	Dot clock	10	Ground
11	Serial data	12	Ground
13	No connection	14	Ground

INTERFACE SIGNAL DESCRIPTION

Dot clock - This signal enters the *serial data* on each low to high transition. A total of 128 *dot clock* transitions must be present for each line of column/anode data.

Serial data - This signal presents the pixel data in positive logic format. A logic one represents a lit pixel and a logic zero represents an extinguished pixel. Data is entered from right to left. The first pixel data entered will represent the left most pixel in the row.

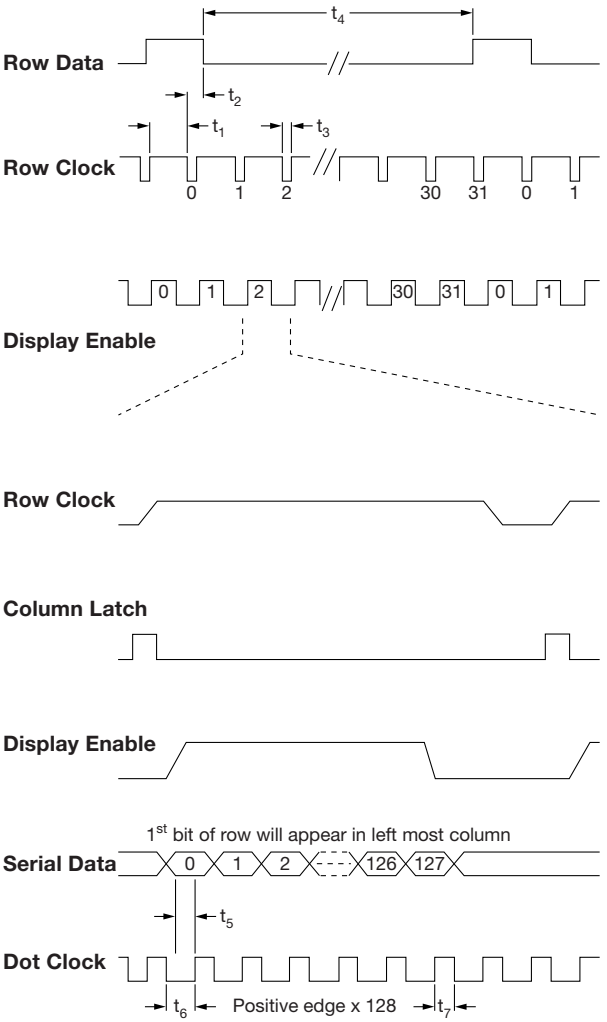
Column latch - This signal latches the pixel data into the driver outputs. When the *column latch* signal goes to logic one the data entered previously will fall through to the driver outputs. When the signal returns to a logic zero the data is latched and the shift register is now ready to accept the next row of data. Must be held low while entering new *serial data*.

Display enable - This signal enables the output drivers. Using a duty cycle control, this signal may also be used for intensity control. The *display enable* must be at logic zero before the *column latch* signal transitions. To avoid display blurring, the *row clock* signal should also transition while *display enable* is a logic zero.

Row data - This signal is the first line marker for the scan. This input should be held high to correspond to the first row of pixel data.

Row clock - This signal clocks *row data* on the falling edge. The *row clock* signal is repetitive and must be present for proper scanning of the display module.
The LEE-128G032B-1 has an unique input protection circuit that assures the column drivers stay blanked on power up. The protection circuit unblanks the column drivers when the *row clock* signal begins (i.e the display begins scanning).

LOGIC AND DATA TIMING



PARAMETER	MIN.	TYP.	MAX.	UNITS
t_1	100	-	-	ns
t_2	5	-	-	µs
t_3	1	-	-	µs
t_4	-	70	200	Hz
t_5	25	-	-	ns
t_6	75	-	-	ns
t_7	75	-	-	ns

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Driver Electronics and + 5 V HC CMOS Interface	LED-128G032B-1
J1 Data Connector Kit (2 pcs. recommended)	280105-08
J2 Power Connector Kit	280108-16

LED Display Modules

128 x 32 Graphics Display with Drive Electronics and + 5 V HC CMOS Level Video Interface Blue LED Modules, Normal Brightness, Single Board Construction, RoHS-Compliant

The LEE-128G032B-2 is an LED replacement for the popular APD-128G032 plasma display module. It is designed to offer high brightness and superior viewing characteristics in a slim package. This display is ideal for low to medium level information content and is ideal for applications such as arcade games, process control, POS terminals, medical equipment, message centers and ATM machines.

The LEE-128G032B-2 LED display offers high contrast, wide viewing angle, and long distance readability. It emits a bright blue color which catches the attention of the viewer, but is yet comfortable to the eye.

The LEE-128G032B-2 LED display has a video type interface and is driven in a standard row/column refresh method. Pixel data is clocked for a row, and rows are scanned sequentially. Signals are presented for *serial data*, *dot clock*, *column latch*, *row data*, *row clock* and *display enable*. The *serial data* is entered with the *dot clock* up to frequencies as high as 8 MHz. After a row of 128 pixels is clocked in, the *column latch* signal is toggled and the data is latched. At the time the data is latched, the display is briefly disabled using the *display enable* signal, then the row pointer is advanced with the *row clock* signal. Once each frame the *row data* must be asserted to synchronize the column serial data with the beginning row. The recommended scanning frequency is approximately 70 Hz, but may be as high as 200 Hz.

STANDARD ELECTRICAL SPECIFICATIONS					
DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic and LED Drive Voltage	V_{CC}	+ 4.5	+ 5.0	+ 5.5	V_{DC}
Logic and LED Drive Current (Fully Lit)	I_{CC}	-	1.1	1.3	A_{DC}
Logic 1 Input	V_{ih}	0.7 V_{CC}	-	-	V_{DC}
Logic 0 Input	V_{il}	-	-	0.3 V_{CC}	V_{DC}

Note

- Recommended operating voltages, all maximums are absolute maximum

FEATURES

- LED replacement for the popular APD-128G032 plasma display module
- + 5 V HC CMOS level video interface
- Large characters
- Highly visible for long distance viewing
- > 30:1 contrast ratio
- Bright blue color
- Slim profile
- Reduced power and brightness version

Pb-free
RoHS COMPLIANT

ELECTRICAL SPECIFICATIONS

Voltage(s) Required: + 5 V_{DC} (V_{CC})
Power Required (Fully Lit): Typ. = 5.5 W, max. = 6.5 W

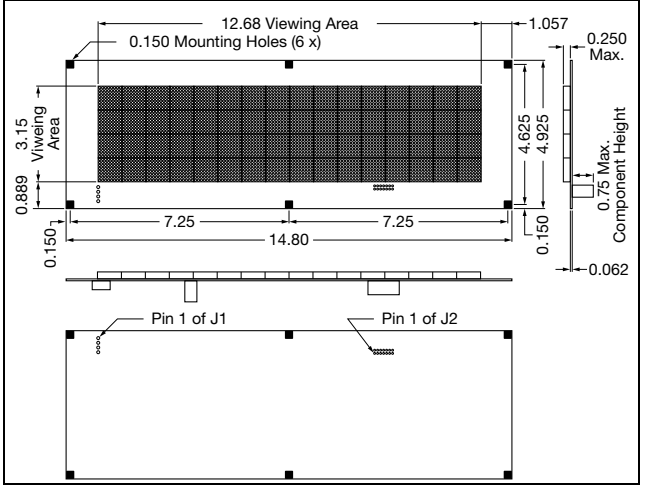
OPTICAL SPECIFICATIONS

Viewing Area: 12.75" [323.8 mm] W x 3.15" [80.01 mm] L
Character Size (5 x 7): 0.65" [16.51 mm] H x 0.45" [11.43 mm] W
Pixel Size: 0.063" [1.6 mm] H x 0.031" [0.8 mm] W
Pixel Pitch: 0.100" [2.54 mm]
Luminance: 100 ft-L minimum
Color: Bright blue
Viewing Angle: > 150°

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: - 40 °C to + 85 °C
Storage Temperature: - 40 °C to + 85 °C
Relative Operating Humidity: To 95 % non-condensing
Mechanical Shock: 30 G
Vibration: 3 G
Operating Altitude: 10 000 ft

DIMENSIONS in inches [millimeters]



PIN DESCRIPTION

J2 - POWER CONNECTOR

Molex 26-48-1045 or equivalent.
Mates with Tyco AMP 3-640428-8, or Molex 09-50-3041 housing with 08-50-0106 socket crimp terminals or equivalent.

PIN	SIGNAL	DESCRIPTION
1	V_{CC}	Logic and LED drive supply
2	V_{CC}	Logic and LED drive supply
3	GND	Ground
4	GND	Ground

J1 - DATA CONNECTOR

FCI 75869-102LF or equivalent.
Mates with Tyco AMP 1658621-2 or equivalent

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Display enable	2	Ground
3	Row data	4	Ground
5	Row clock	6	Ground
7	Column latch	8	Ground
9	Dot clock	10	Ground
11	Serial data	12	Ground
13	No connection	14	Ground

INTERFACE SIGNAL DESCRIPTION

Dot clock - This signal enters the *serial data* on each low to high transition. A total of 128 *dot clock* transitions must be present for each line of column/anode data.

Serial data - This signal presents the pixel data in positive logic format. A logic one represents a lit pixel and a logic zero represents an extinguished pixel. Data is entered from right to left. The first pixel data entered will represent the left most pixel in the row.

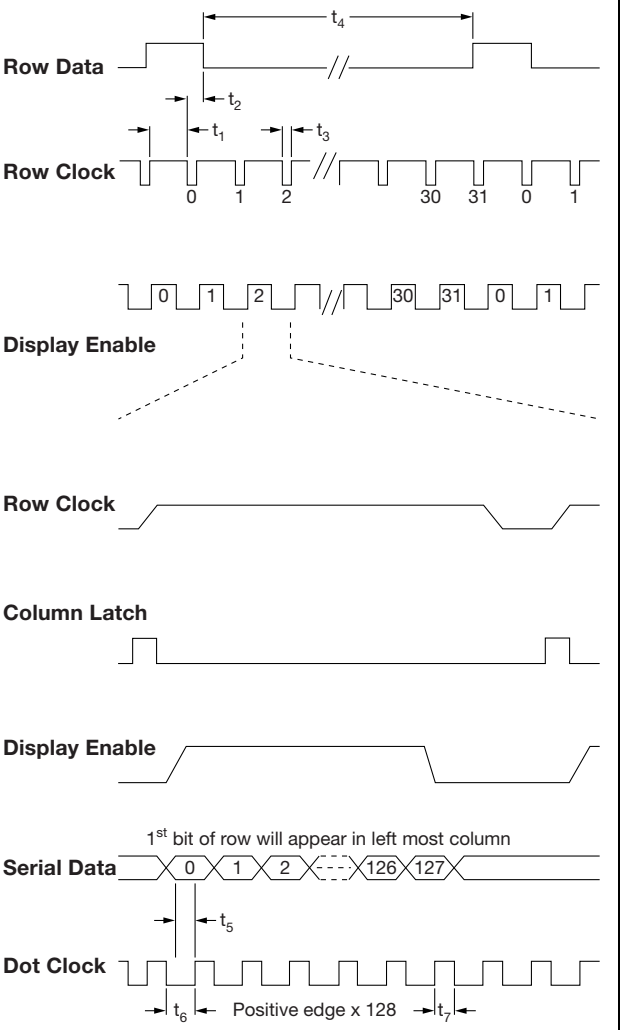
Column latch - This signal latches the pixel data into the driver outputs. When the *column latch* signal goes to logic one the data entered previously will fall through to the driver outputs. When the signal returns to a logic zero the data is latched and the shift register is now ready to accept the next row of data. Must be held low while entering new *serial data*.

Display enable - This signal enables the output drivers. Using a duty cycle control, this signal may also be used for intensity control. The *display enable* must be at logic zero before the *column latch* signal transitions. To avoid display blurring, the *row clock* signal should also transition while *display enable* is a logic zero.

Row data - This signal is the first line marker for the scan. This input should be held high to correspond to the first row of pixel data.

Row clock - This signal clocks *row data* on the falling edge. The *row clock* signal is repetitive and must be present for proper scanning of the display module.
The LEE-128G032B-2 has an unique input protection circuit that assures the column drivers stay blanked on power up. The protection circuit unblanks the column drivers when the *row clock* signal begins (i.e the display begins scanning).

LOGIC AND DATA TIMING



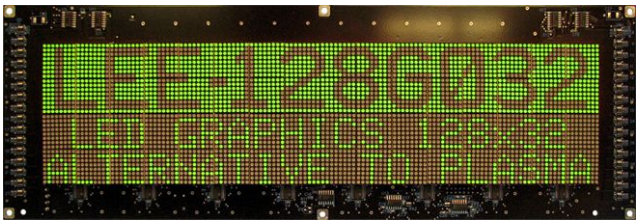
PARAMETER	MIN.	TYP.	MAX.	UNITS
t_1	100	-	-	ns
t_2	5	-	-	µs
t_3	1	-	-	µs
t_4	-	70	200	Hz
t_5	25	-	-	ns
t_6	75	-	-	ns
t_7	75	-	-	ns

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Driver Electronics and + 5 V HC CMOS Interface	LED-128G032B-2
J1 Data Connector Kit (2 pcs. recommended)	280105-08
J2 Power Connector Kit	280108-16

LED Display Modules

128 x 32 Graphics Display with Drive Electronics and + 5 V HC CMOS Level Video Interface Green LED Modules, Normal Brightness, Single Board Construction, RoHS-Compliant



The LEE-128G032B-3 is an LED replacement for the popular APD-128G032 plasma display module. It is designed to offer high brightness and superior viewing characteristics in a slim package. This display is ideal for low to medium level information content and is ideal for applications such as arcade games, process control, POS terminals, medical equipment, message centers and ATM machines.

The LEE-128G032B-3 LED display offers high contrast, wide viewing angle, and long distance readability. It emits a bright green color which catches the attention of the viewer, but is yet comfortable to the eye.

The LEE-128G032B-3 LED display has a video type interface and is driven in a standard row/column refresh method. Pixel data is clocked for a row, and rows are scanned sequentially. Signals are presented for *serial data*, *dot clock*, *column latch*, *row data*, *row clock* and *display enable*. The *serial data* is entered with the *dot clock* up to frequencies as high as 8 MHz. After a row of 128 pixels is clocked in, the *column latch* signal is toggled and the data is latched. At the time the data is latched, the display is briefly disabled using the *display enable* signal, then the row pointer is advanced with the *row clock* signal. Once each frame the *row data* must be asserted to synchronize the column serial data with the beginning row. The recommended scanning frequency is approximately 70 Hz, but may be as high as 200 Hz.

STANDARD ELECTRICAL SPECIFICATIONS					
DESCRIPTION	SYMBOL	MIN.	TYP.	MAX.	UNITS
Logic and LED Drive Voltage	V_{CC}	+ 4.5	+ 5.0	+ 5.5	V_{DC}
Logic and LED Drive Current (Fully Lit)	I_{CC}	-	1.1	1.3	A_{DC}
Logic 1 Input	V_{ih}	0.7 V_{CC}	-	-	V_{DC}
Logic 0 Input	V_{il}	-	-	0.3 V_{CC}	V_{DC}

Note

- Recommended operating voltages, all maximums are absolute maximum

FEATURES

- LED replacement for the popular APD-128G032 plasma display module
- + 5 V HC CMOS level video interface
- Large characters
- Highly visible for long distance viewing
- > 30:1 contrast ratio
- Bright green color
- Slim profile
- Reduced power and brightness version

Pb-free
RoHS COMPLIANT

ELECTRICAL SPECIFICATIONS

Voltage(s) Required: + 5 V_{DC} (V_{CC})
Power Required (Fully Lit): Typ. = 5.5 W, max. = 6.5 W

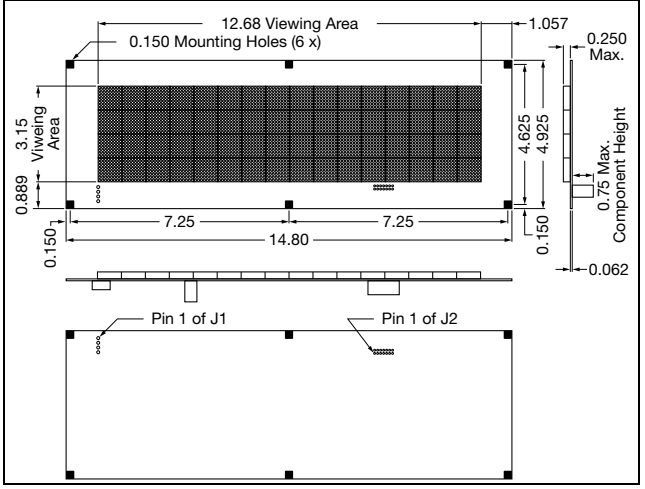
OPTICAL SPECIFICATIONS

Viewing Area: 12.75" [323.8 mm] W x 3.15" [80.01 mm] L
Character Size (5 x 7): 0.65" [16.51 mm] H x 0.45" [11.43 mm] W
Pixel Size: 0.063" [1.6 mm] H x 0.031" [0.8 mm] W
Pixel Pitch: 0.100" [2.54 mm]
Luminance: 100 ft-L minimum
Color: Bright green
Viewing Angle: > 150°

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: - 40 °C to + 85 °C
Storage Temperature: - 40 °C to + 85 °C
Relative Operating Humidity: To 95 % non-condensing
Mechanical Shock: 30 G
Vibration: 3 G
Operating Altitude: 10 000 ft

DIMENSIONS in inches [millimeters]



PIN DESCRIPTION

J2 - POWER CONNECTOR

Molex 26-48-1045 or equivalent.
Mates with Tyco AMP 3-640428-8, or Molex 09-50-3041 housing with 08-50-0106 socket crimp terminals or equivalent.

PIN	SIGNAL	DESCRIPTION
1	V_{CC}	Logic and LED drive supply
2	V_{CC}	Logic and LED drive supply
3	GND	Ground
4	GND	Ground

J1 - DATA CONNECTOR

FCI 75869-102LF or equivalent.
Mates with Tyco AMP 1658621-2 or equivalent

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Display enable	2	Ground
3	Row data	4	Ground
5	Row clock	6	Ground
7	Column latch	8	Ground
9	Dot clock	10	Ground
11	Serial data	12	Ground
13	No connection	14	Ground

INTERFACE SIGNAL DESCRIPTION

Dot clock - This signal enters the *serial data* on each low to high transition. A total of 128 *dot clock* transitions must be present for each line of column/anode data.

Serial data - This signal presents the pixel data in positive logic format. A logic one represents a lit pixel and a logic zero represents an extinguished pixel. Data is entered from right to left. The first pixel data entered will represent the left most pixel in the row.

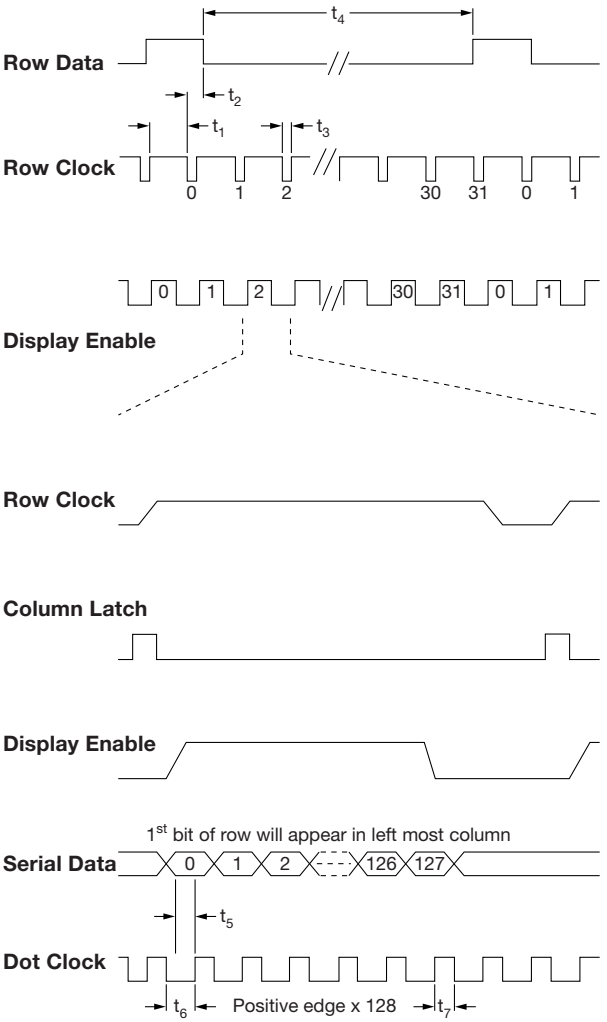
Column latch - This signal latches the pixel data into the driver outputs. When the *column latch* signal goes to logic one the data entered previously will fall through to the driver outputs. When the signal returns to a logic zero the data is latched and the shift register is now ready to accept the next row of data. Must be held low while entering new *serial data*.

Display enable - This signal enables the output drivers. Using a duty cycle control, this signal may also be used for intensity control. The *display enable* must be at logic zero before the *column latch* signal transitions. To avoid display blurring, the *row clock* signal should also transition while *display enable* is a logic zero.

Row data - This signal is the first line marker for the scan. This input should be held high to correspond to the first row of pixel data.

Row clock - This signal clocks *row data* on the falling edge. The *row clock* signal is repetitive and must be present for proper scanning of the display module.
The LEE-128G032B-3 has an unique input protection circuit that assures the column drivers stay blanked on power up. The protection circuit unblanks the column drivers when the *row clock* signal begins (i.e the display begins scanning).

LOGIC AND DATA TIMING



PARAMETER	MIN.	TYP.	MAX.	UNITS
t_1	100	-	-	ns
t_2	5	-	-	µs
t_3	1	-	-	µs
t_4	-	70	200	Hz
t_5	25	-	-	ns
t_6	75	-	-	ns
t_7	75	-	-	ns

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Driver Electronics and + 5 V HC CMOS Interface	LED-128G032B-3
J1 Data Connector Kit (2 pcs. recommended)	280105-08
J2 Power Connector Kit	280108-16

По вопросам продаж и поддержки обращайтесь:

Алматы (7273)495-231
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46

Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
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Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56

Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
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Ярославль (4852)69-52-93

Россия (495)268-04-70

Киргизия (996)312-96-26-47

Казахстан (7172)727-132

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