

LCD Module Technical Specification

Part No: **MG 780F-LY**

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Crystal

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1.0 General Description

The **MG 780F-LY** is a compact RoHS Compliance LCD module capable of displaying graphics and characters. It has been developed specially for reliable applications.

The module has the following features:

Display Format	120 x 32 Dots
Display Mode	FSTN, Negative, Transmissive
Driving Method	1/32 Duty Cycle, 1/6 Bias
Viewing Direction	6 O'clock
LED Backlight	Yellow-Green
LCD Controller LSI	S1D15300D10A000 (SED1530DAA) from EPSON

2.0 Product Specifications

2.1 Mechanical Data

Item	Specifications	Unit
Outline Dimensions	78.0 (L) x 33.2 (W) x 8.5 (H)	mm
Viewing Area	58.34 (L) x 22.5 (W)	mm
Number Of Dots	120 x 32	-
Dot Size	0.42 (L) x 0.6 (W)	mm
Dot Pitch	0.47 (L) x 0.65 (W)	mm

2.2 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	$V_{CC} - GND$	-0.30	6.00	V
LCD Driving Voltage	V_{OD}	$V_{CC}+0.3$	-	V
Input Voltage	V_{IN}	-0.30	$V_{CC} + 0.30$	V
Peak Forward Current (LED Backlight)	I_F	-	250	mA
Reverse Voltage (LED Backlight)	V_R	-	8	V
Operating Temperature	T_{OPR}	0	+70	°C
Storage Temperature	T_{STG}	0	+70	°C

2.3 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	$V_{CC} - GND$	4.75	5.00	5.25	V
LCD Driving Voltage	V_{OD}	5.65	5.95	6.25	V_{O-p}
Supply Current	I_{CC}	-	60	90	mA
V_{IN} High	V_{IH}	$V_{CC} - 1.00$	-	V_{CC}	V
V_{IN} Low	V_{IL}	0	-	0.80	V

2.4 Optical Specifications

2.4.1 LCD Driving Voltage

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Recommended LCD Driving Voltage	$V_{CC}-V_{EE}$	$\theta=10^\circ, \phi=0^\circ$, $T_a = 25^\circ\text{C}$	5.65	5.95	6.25	V

2.4.2 Optical Characteristics

$V_{LCD} = 5.95\text{V}$, 1/32 Duty, 1/6 Bias

Item		Symbol	Condition	°C	Min.	Typ.	Max.	Unit
Contrast Ratio (Note 1)		CR	$\theta = 10^{\circ}, \phi = 0^{\circ}$	25	-	10.0	-	-
Viewing Angle (CR \geq 2)		θ	$\phi = 0^{\circ}$	25	45	50	-	deg
			$\phi = 180^{\circ}$	25	35	40	-	
			$\phi = 90^{\circ}$	25	40	45	-	
			$\phi = 270^{\circ}$	25	45	50	-	
Response Time	Rise	T _{ON}	$\theta = 10^{\circ}, \phi = 0^{\circ}$	0	250	579	650	ms
				25	60	150	170	
				70	20	44	65	
	Decay	T _{OFF}	$\theta = 10^{\circ}, \phi = 0^{\circ}$	0	150	346	600	
				25	60	131	180	
				70	20	43	65	
Brightness (Note 2)		L	-	25	20	25	-	cd/m ²

Note 1 : Contrast ratio is defined as follows :

$$CR = L_{OFF} / L_{ON}$$

L_{ON} = Luminance of the ON segments

L_{OFF} = Luminance of the OFF segments

Note 2 : This is measured directly from the surface of the LCDP.

2.5 Interface Pin Assignments

Pin No.	Symbol	Function
1	GND	Logic Ground
2	GND	Logic Ground
3	VCC	Logic Power Supply
4	VEE	Turn off LCD display
5	RS	Read Signal
6	RW	Write Signal
7	/CS1	Chip enable
8	/CS2	Chip enable
9	Vcc	Logic Power Supply
10	DB0	Data Bus Input Bit 0
11	DB1	Data Bus Input Bit 1
12	DB2	Data Bus Input Bit 2
13	DB3	Data Bus Input Bit 3
14	DB4	Data Bus Input Bit 4
15	DB5	Data Bus Input Bit 5
16	DB6	Data Bus Input Bit 6
17	DB7	Data Bus Input Bit 7
18	Vcc	Logic Power Supply

3.0 LCD Interface Control

Please refer to the LCD driver **S1D15300D10A000 (SED 1530DAA) EPSON** data book for details of command and interface control for LCD display.

4.0 Reliability Specifications

4.1 Test Specimen

Unless otherwise specified, two specimens shall be taken from a normal production lot and subject to each of the tests specified herein.

4.2 Operational State

Unless otherwise specified, test specimens shall be in Operational State during all tests meaning power and signals shall be applied.

4.3 Acceptance Criteria

Test specimens shall not exhibit any sign of uneven contrast, flickering, missing, shorted pixels or unusual patterns for the entire duration of the auto cycle test pattern.

4.4 Reliability Test Description

4.4.1 Four-Corner Environmental Stress Test

Test specimens shall be subjected to a 4 state environmental stress test as follows:

- State 1 : 0°C, 10% RH
- State 2 : +70°C, 10% RH
- State 3 : 0°C, 85% RH
- State 4 : +70°C, 85% RH

Each state shall last 24 hours including ramp-up/down periods not less than 1 hour each.

4.4.2 Storage Test

High temperature storage : Function test shall be conducted after storage 96 hours in the non-operational state at $+70^{\circ}\text{C} \pm 2^{\circ}\text{C}$, and 4 hours storage at normal temperature and humidity ($65 \pm 5\%$ RH).

Low temperature storage : Function test shall be conducted after storage 96 hours in the non-operational state at $0^{\circ}\text{C} \pm 2^{\circ}\text{C}$, and 4 hours storage at normal temperature and humidity ($65 \pm 5\%$ RH).

4.4.3 Vibration Test

Test specimens shall be subjected to vibration as follows:

- Amplitude : 0.50 mm
- Frequency : Sweeping from 10 Hz to 60 Hz and then back to 10 Hz
- No. Of Cycles : 10 cycles of 1 minute in each of the 3 axes
- Mounting : Test specimens are to be secured to the vibrating table via the appropriate fasteners at the 4 corners of the test specimens.

4.4.4 Drop Test

The quantity of test specimens shall be the maximum prescribed per the designated packing carton. Each test specimen shall be packed in its respective prescribed packaging medium and in accordance to the prescribed Packaging Instructions X-780-XX.

The packed specimens shall be dropped once on each of the 4 corners and each of the 6 faces, height of drop 60 cm onto concrete floor.

After the completion of all 10 drops, all specimens shall be subjected to 100% mechanical inspection, followed by 5 cycles of the auto cycle test pattern routine.

4.4.5 ESD (Electro - Static Discharge) Immunity

Test specimens shall meet the standards of IEC801-2 at minimum Air Discharge Voltage level of 12 kV. Test specimens will not exhibit any hard (unrecoverable) error after test.

Note : For Vibration Test, ESD Immunity Test & Drop Test, the reports will only be provided upon requests by customer. The cost involved in generating the report will be fully responsible by the customer.

5.0 Inspection Specifications

5.1 Inspection Level

This section specifies failure criteria and failure rate for the LCD Assembly. All series production LCD assembly shall be tested 100% prior to shipment for further processing. The LCD assembly shall be considered a failing unit when it no longer meets any of the requirements stated in this specification.

The display assembly shall be considered a failing unit when any one of the following occur :

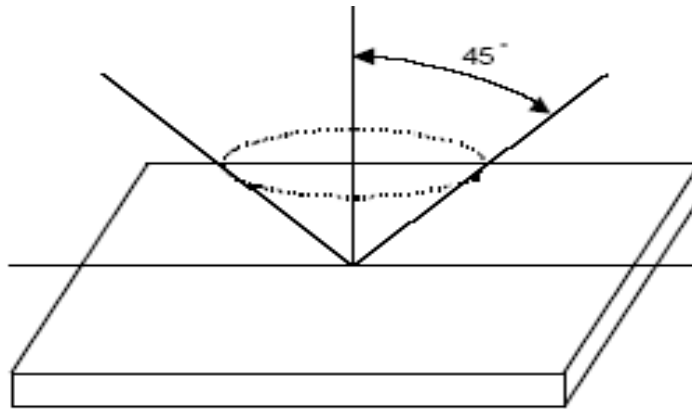
- The back light output drops down to 40% luminance (FOS) of the initial value.
- Any screen defects which belong to the failure of the LCD electrical circuitry.
- Any lead or wire breaking caused by corrosion and of mechanical/thermal shock.
- Wire / cables / connectors / glass plates failure in any manner affecting form, fit function or reliability.
- Bad viewing angle in wrong position.
- Segment shorts (automatic test).
- Unreliable contacts (flickering of entire display or of individual segments).

Class	Contents	AQL (%)
Critical Defects	No display turn on, inappropriate SEG turn on, functional defect	0.25
Major Defects	Electrical, optical, mechanical parameters out of spec. without affecting functions.	1.00
Minor Defects	Black spots, foreign substances, pin hole segment, deformation, scratches (polarizer), air bubbles between glass & polarizer, color variations, polarizer dirt, other visual defects.	2.50

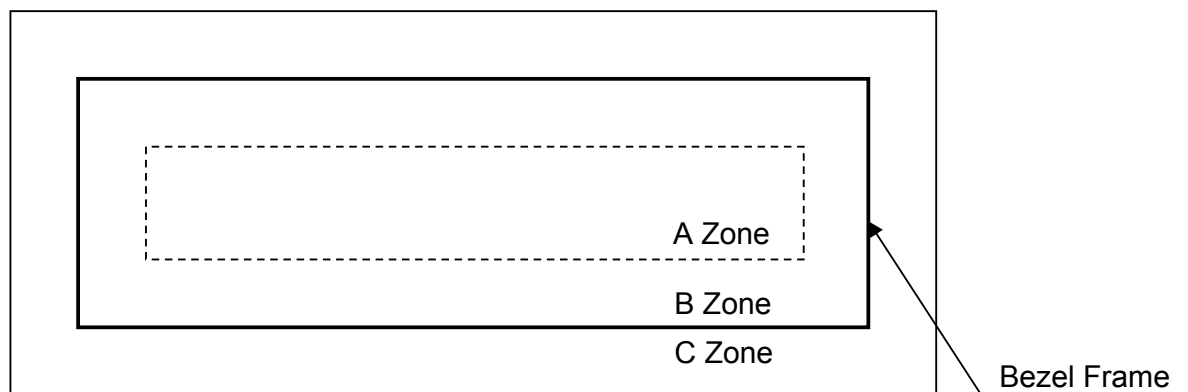
5.2 Appearance Standards

5.2.1 Inspection Conditions

The module shall be inspected under 40 W white fluorescent light. The distance between the eyes and the sample shall be 30 cm. All directions for inspecting the samples should be within 45° against the vertical of the LCD.



5.2.2 Appearance Specifications



- a) A Zone : Active display area
- b) B Zone : Area from outside of "A ZONE" to validity viewing area
- c) C Zone : Rest parts.

A Zone + B Zone = Validity viewing area

Inspection Criteria for LCDP

No.	Defect	Judgment Criteria			Category		
1	Spots / Dust / Bubble (round type)	Size, D (mm)			Acceptable qty. in active area	Minor	
		D ≤ 0.1 5			Disregard		
		0.15 < D ≤ 0.20			3		
		D > 0.20			0		
2	Dust / Scratches / Black Streak (line type)	Width, W (mm)			Length, L (mm)	Acceptable qty. in active area	Minor
		W ≤ 0.02			Disregard	Disregard	
		W ≤ 0.03			L ≤ 1.0	Disregard	
		W ≤ 0.05			L ≤ 2.0	3	
		W > 0.05			Disregard	0	
3	Allowable Density	Above defects should be separated more than 5mm each other.			Minor		
4	Rainbow	Obvious uneven color (rainbow) shall not be noticeable.			Minor		
5	Display Condition	Dim display on the patterns or extra pattern or short circuit is not acceptable.			Major		
6	No Display or Missing Display	The patterns of display shall light up as required. No display or missing display is not acceptable.			Major		

Note : $D = (\text{long length} + \text{short length}) / 2$

6.0 Precautions For Use Of LCD Module

6.1 Handling Precautions

The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place.

If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth. If the substance comes into contact with your skin or clothes, please immediately wash it off using soap and water.

Do not apply excessive force on the surface of display or the adjoining areas of LCD module since this may cause the color tone or vary. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Please be sure to ground human body and electric appliances during work.
- It is preferable to use conductive mat on table and wear cotton clothes or conduction processed fiber.
- Slowly peel off protective film since static electricity may be generated.

6.2 Storage Precautions

When storing the LCD module, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the LCD module in bags provided to prevent static electricity charging under low temperature (0°C to 25°C) / normal humidity conditions (avoid high temperature / high humidity and low temperature below 0 °C).

If storage condition is not satisfactory, display (especially polarizer) may be deteriorated or soldering I/O terminals may become difficult (some oxide is generated at I/O terminals plating).

6.3 Design Precautions

The absolute maximum ratings represent the rated value beyond which LCD module cannot exceed. When LCD module is used in excess conditions, their operating characteristics may be adversely affected.

The liquid crystal display exhibits temperature dependency characteristics, be sure to use the LCD module within the specified range. To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy the VIL, VIH specification values.

7.0 Warranty

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1. We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
2. We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
3. We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.
4. We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception of those issues relating directly to the structure or method of manufacturing of our product.
5. Optrex will not be held responsible for any quality guarantee issue for defect products judged as Optrex-origin longer than two years from Optrex production or one year from Optrex, Optrex America, Optrex Europe delivery whichever comes later.