CUSTOMER :

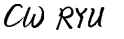
M O D E L : MOG-128GB59T-S-KE0260

DESCRIPTION : LCD MODULE

◆ CUSTOMER APPROVAL

APPROVAL	CHECKED	CHECKED	APPROVAL
REMARK			

◆ SUPPLIER APPROVAL

PREPARED	CHECKED		APPROVAL
			

MYTECH CORPORATION

180 Old Tappan Rd., Bldg. 6, Old Tappan, NJ 07675
Tel: (201) 784-8867 Fax: (201) 784-8932
Email: *mysales@mytechcorp.com*

1. FEATURES

- Number of dots ---------- 128 dots X 64 dots
- Display mode ---------- Black & White
- Display type ---------- Positive, Transflective
- Viewing direction ---------- 6 o'clock
- Operating temperature ---------- Outdoor
- Driving method ---------- 1/65 duty, 1/9 bias
- Microprocess Interface ---------- 8-bit parallel bi-directional with 6800-series or 8080-series
  Serial interface(only write operation) available
- Built-in Analog Circuit ---------- On-chip oscillator circuit
  Voltage converter(x2, x3, x4, x5)
  Voltage regulator(temperature coefficient:-0.05%/℃,-0.2%/℃)
  Voltage follower
  Electronic contrast control function(64steps)
- Applicated IC
  - Controller ---------- KS0713TB-06-L4TF
- Backlighter ---------- LED panel (Emitting color : yellow)
  4 chips

2. MECHANICAL DATA

ITEM		WIDTH	HEIGHT	THICKNESS	UNIT	REMARK
Module size(With TAB)		41.5	33.7(52.8)	7.5	mm	Refer. To Page 10
Viewing area		31.5	23.26	-	mm	
Dot	Construction	128 x 64			-	
	Size	0.20	0.30	-	mm	
	Pitch	0.22	0.32	-	mm	
Weight		Approx. 20			g	

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	RATING	UNIT	REMARK
Power supply for logic	V_{DD}	-0.3 ~ 7.0	V	
Power supply for LCD	V_{LCD}	-0.3 ~ 17.0	V	
Input voltage	V_I	-0.3 ~ V_{DD}+0.3	V	
Operating Temperature	Top	-20 ~ 70	℃	
Storage Temperature	Tstg	-30 ~ 80	℃	

4. ELECTRICAL CHARACTERISTICS [V_{DD}=2.2~4.0V]

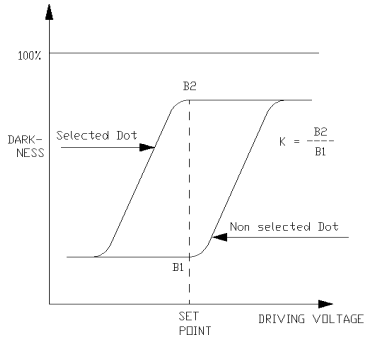
ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Power supply for logic	V_{DD}	Ta = 25℃	2.4	2.9	5.5	V
Input high voltage	V_{IH}	-	0.8V_{DD}	-	V_{DD}	V
Input low voltage	V_{IL}	-	V_{SS}	-	0.2V_{DD}	V
Power supply for LCD	V_{LCD}	I_{DD}=150㎂	-	8.5	-	V
Power consumption for LED	I_F	V_F=2.1V		15	20	mA
Brightness of backlighter	L	V_F=2.1V		2.8		Nit
Voltage regulator	-	-	-	5		-
Voltage electronic volume	-	V_{LCD}=7.8V		45		Step
Current consumption	I_{DD}	V_{DD} = 2.9V		150		㎂

* Test condition : Display pattern is all " 2 " and Icon ON.

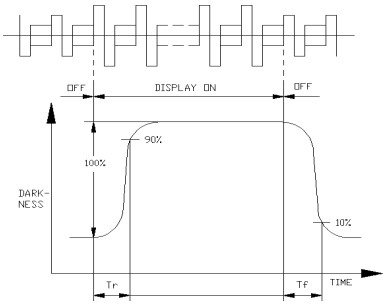
5. ELECTRO-OPTICAL CHARACTERISTICS (FSTN) (Ta = 25 ℃)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast ratio	K	2	4	-	-	1
Response time (rise)	T_r	-	200	-	ms	2
Response time (fall)	Tf	-	200	-	ms	2
Viewing angle	ϕ	-10 ~ +40			deg.	3,4
	θ	-40 ~ +40				

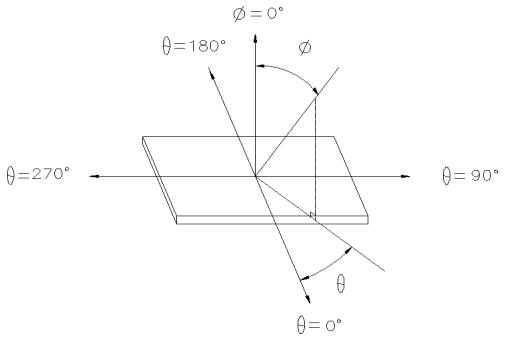
NOTE1. Definition of contrast K



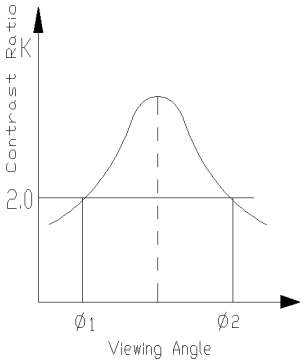
NOTE2. Definition of optical response



NOTE3. Definition of angle θ and ϕ



NOTE4. Definition viewing angle ϕ1 and ϕ2



6. QUALITY SPECIFICATION

6.1 Acceptable Quality Level

INSPECTION ITEM	SAMPLING PROCEDURES	A.Q.L
MAJOR	MIL-STD-105E Inspection Level II Normal Inspection Single sample inspection	1.0
MINOR	MIL-STD-105E Inspection Level II Normal Inspection Single sample inspection	2.5

Major defect :

A major defect is a defect that could result in failure or maternally reduce that the usability of the unit of product for its intended purpose.

Minor defect :

A minor defect is one that does not materially reduce the usability of the product for its intended purpose or is a departure from established standards giving no significant bearing on the effective use or operation of the unit.

6.2 Inspection Conditions

6.2.1 The environmental conditions for inspection shall be as follows

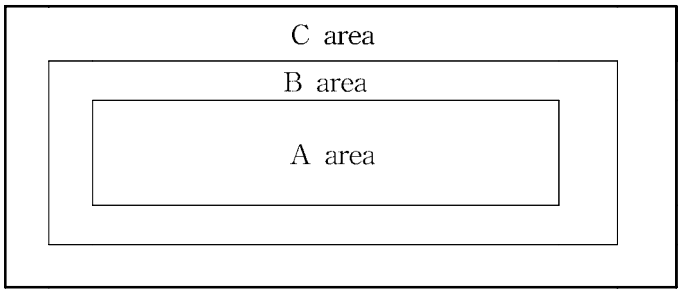
-Room Temperature : 25±3℃

-Humidity Temperature : 65±20%RH

6.2.2 The external visual inspection

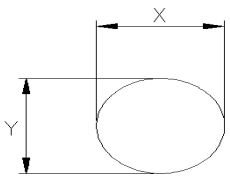
-The inspection shall be performed by using 40Watts fluorescent lamp for illumination and the distance between LCD and eyes of the inspector shall be 30cm or more.

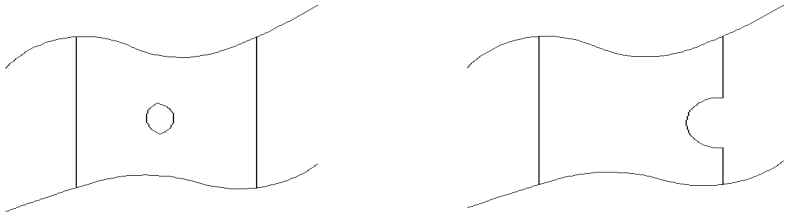
6.3 Definition of the Area



A area: Active Area
B area: Viewing Area
C area: Out of Viewing Area

6.4 Inspection Standards

<table>
<tr><th>Class of defects</th><th>Inspection Item</th><th colspan="4">Criteria of defects</th><th>Remarks</th></tr>
<tr><td rowspan="2">MAJOR</td><td>Display on inspection</td><td colspan="4">1) No Display
2) Abnormal Operation
3) Short Circuit
4) Pattern Open
5) Off Viewing angle</td><td></td></tr>
<tr><td>Missing</td><td colspan="4">Component missing</td><td></td></tr>
<tr><td rowspan="4">MINOR</td><td rowspan="2">Spot/Dent</td><td>Size</td><td colspan="2">Defect size</td><td>Acceptable Number</td><td rowspan="2"></td></tr>
<tr><td colspan="4">Cell Size (Viewing Area Criteria)
※ A size < 2500mm^2 Spot size= (X+Y)/2
B size ≥ 2500mm^2
 
</td></tr>
<tr><td rowspan="3">A Size</td><td colspan="2">$\phi \leq 0.1$ mm</td><td>Ignore</td><td rowspan="6"></td></tr>
<tr><td colspan="2">$0.1 < \phi \leq 0.2$ mm</td><td>1</td></tr>
<tr><td colspan="2">$\phi > 0.2$ mm</td><td>0</td></tr>
<tr><td rowspan="3">B Size</td><td colspan="2">$\phi \leq 0.1$ mm</td><td>Ignore</td></tr>
<tr><td colspan="2">$0.1 < \phi \leq 0.2$ mm</td><td>2</td></tr>
<tr><td colspan="2">$\phi > 0.2$ mm</td><td>0</td></tr>
<tr><td rowspan="5">Scratch</td><td colspan="2">POSITIVE</td><td colspan="2">NEGATIVE</td><td rowspan="5"></td></tr>
<tr><td>Width X Length</td><td>Acceptable Number</td><td>Width X Length</td><td>Acceptable Number</td></tr>
<tr><td>0.1 X 1.5 mm</td><td>3</td><td>0.1 X 1.5 mm</td><td>3</td></tr>
<tr><td>0.08 X 3.0 mm</td><td>2</td><td>0.08 X 3.0 mm</td><td>2</td></tr>
<tr><td>0.05 X 5.0 mm</td><td>1</td><td>0.05 X 5.0 mm</td><td>1</td></tr>
<tr><td colspan="5">※ Scratches should be separated more than 10mm each other</td></tr>
<tr><td>Bubble</td><td colspan="4">1) Round bubble should be treated as spot(positive)
2) Line bubble should be treated as scratch(positive)</td><td></td></tr>
</table>

Class of defects	Inspection Item	Criteria of defects	Remarks
MINOR	Pattern Misalignment	Voids in segment 	
	Stain	Stains which cannot be removed even when wiped slightly with a soft cloth.	
	Rainbow	More than 2 colors are noticeable in the viewing direction.	
MINOR	PCB damage	Damage on gold or copper foil	
	Parts alignment	1) IC lead width is more than 50% beyond land pattern 2) Chip component is off center and more than 50% of the leads is off the pad out line.	
	Conductive foreignmatter (solderball, soldersplash)	Conductive foreign matter is not allowed	
	Bezel claw	Bezel claw missing or not bent	

7. RELIABILITY

- Operating life time : Longer than 50,000 hours
  (at room temperature without direct irradiation of sunlight)
- Reliability characteristics shall meet following requirements.

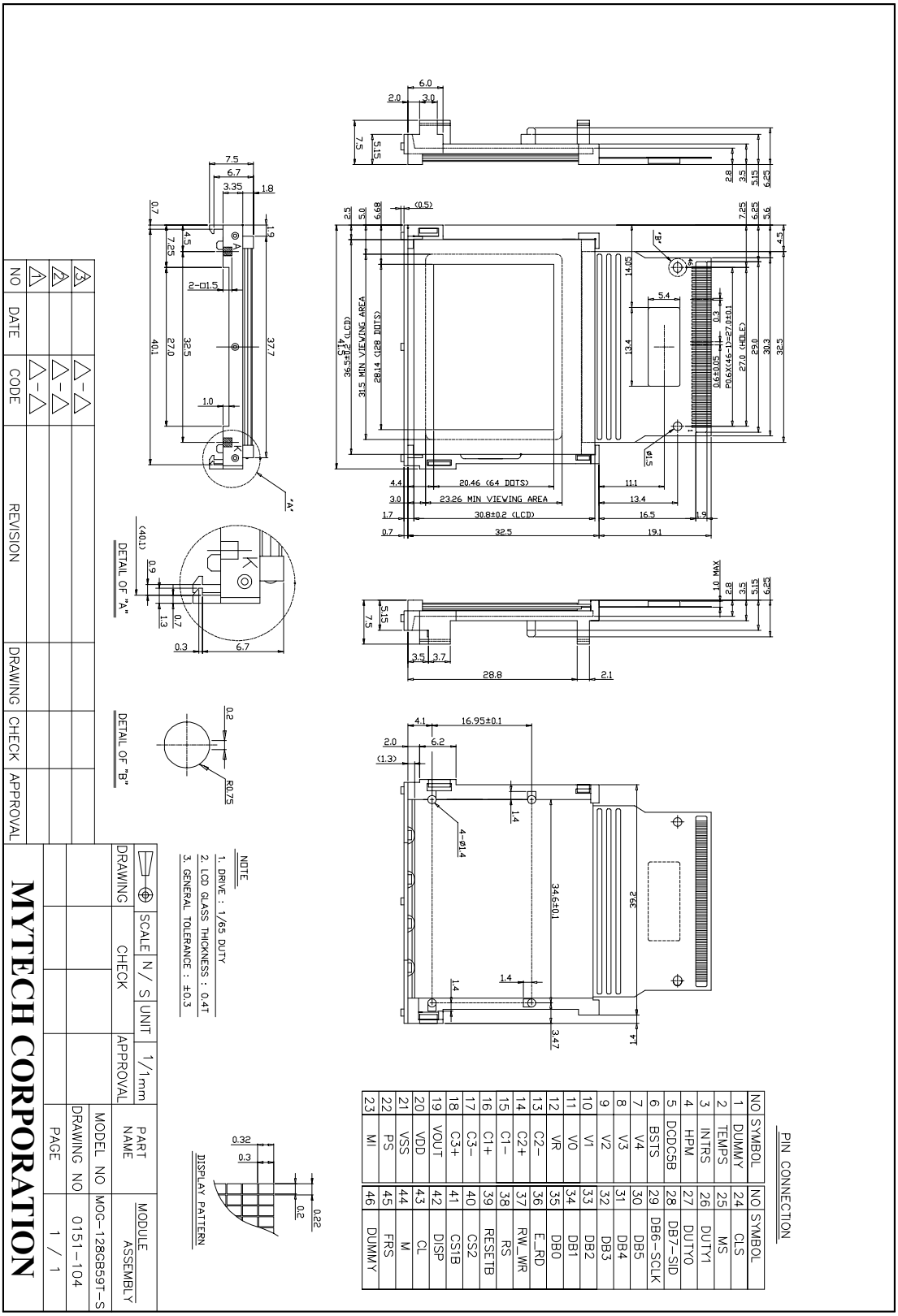
ITEM	TEST	CRITERION
High temp.	80℃ / 240 Hrs	* Total current consumption should be below double of initial value * Contrast ratio should be within initial value ±50% * No defect in cosmetic and operational function is allowable
Low temp.	-30℃ / 240 Hrs	
High humidity	40℃ X 90%RH / 240 Hrs	
Thermal shock	-20℃ → 25℃ → 70℃ → 25℃ / 5 Cycles (30min) (5min) (30min) (5min)	
Vibration	1. Operating time : Thirty minutes exposure in each direction(x,y,z) 2. Sweep frequency (1min) : 10Hz →55Hz →10Hz 3. Amplitude : 0.75mm double amplitude	

* Remarks : Samples subjected to the tests shall be " Not operating " condition .

8. PIN CONNECTIONS

NO.	SYMBOL	FUNCTION
1	DUMMY	
2	TEMPS	
3	INTRS	
4	HMP	
5	DCDC5B	
6	BSTS	
7	V4	LCD power supply
8	V3	LCD power supply
9	V2	LCD power supply
10	V1	LCD power supply
11	V0	LCD power supply
12	VR	
13	C2-	Connect for internal voltage converter
14	C2+	Connect for internal voltage converter
15	C1-	Connect for internal voltage converter
16	C1+	Connect for internal voltage converter
17	C3-	Connect for internal voltage converter
18	C3+	Connect for internal voltage converter
19	VOUT	Voltage converter output
20	VDD	Power supply for IC
21	VSS	GND
22	PS	
23	MI	Microprocessor interface select input in parallel mode
24	CLS	
25	MS	
26	DUTY1	
27	DUTY0	
28	DB7	8-bit bidirectional data bus
29	DB6	
30	DB5	
31	DB4	
32	DB3	
33	DB2	
34	DB1	
35	DB0	
36	E_RD	Active high in 6800 series, Active low in 8080 series
37	RW_WR	Enable signal (H:read/L:write in 6800 series, enabled at low in 8080 series)
38	RS	Register slect input (L:control data, H:display data)
39	RESETB	Hardware reset pin
40	CS2	
41	CS1B	Chip select input
42	DISP	
43	CL	
44	M	
45	FRS	
46	DUMMY	

9. EXTERNAL DIMENSION



10. PRECAUTION FOR USING

- HANDLING
  * Refrain from storing mechanical shock and from applying any force to LCD MODULE. It may cause mis_operation or damage of LCD.
  * Do not touch, press or rub the display panel with a hard, stiff tool or object as the polarizers in the panel are easily scratched.
  * If LCD is broken and liquid crystal material flow out, ingestion, inhalation, or contact with skin should be avoided. If liquid crystal material contact with skin, wash immediately with alcohol and rinse thoroughly with water.
  * Never use organic solvents to clear the display panel as these solvent may adversely affect the polarizer. To clean the display panel dampen a bit of absorbent cotton with petroleum benzene and gently wipe the panel, or contaminations by using a scotch tape.
  * Refrain from discharge of high electro-static voltage, it will damage C-MOS LSI in the MODULE.
  * Do not leave the MODULE in high temperature, especially in high humidity for a long time. It is recommended to store the MODULE where the temperature is in the range of 0℃ to 35℃ and the humidity is lower than 70%.
  * Store the MODULE without exposure to direct sunlight or fluorescent lamp.
  * Ultra violet cut filter is necessary for outdoor operation.
  * Avoid condensation of water, it may cause misoperation or disconnection of electrode.

- OPERATION
  * Never connect or disconnect the LCD MODULE from the main system while power is being supplied.
  * When supplying the M signal from the external unit to a GRAPHIC MODULE, set the duty to 50%±1%.
    If the duty deviates too greatly from the value, a DC voltage will be applied to the liquid crystal, which could induce an electrochemical reaction and reduce the life of the MODULE.
  * Do not exceed the maximum rating values under the worst conditions taking account of the supply voltage variation, input voltage variation, and environmental temperature, etc. Otherwise LCD module may be damaged.