MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI240128J-G

Revision	1.4
Engineering	
Date	
Our Reference	

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History of Version

Date (mm / dd / yyyy)	Ver.	Edi.	Description	Page	Design by
10/13/2008	1.0	001	New Sample	-	
12/09/2008	1.1	002	Modify the SPEC content,Add customer's circuit and software in appendix.	-	
06/21/2009	1.2	003	Mass production	-	
11/04/2009	1.3	004	Modify VOP:12.95V	-	
12/27/2010	1.4	005	Add Read EPROM Procedures	5,6	

Contents

Note : For detailed information please refer to IC data sheet : Sitronix --- ST7529-G

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	240*128 dots
LCD Type	FSTN,Positive,Transflective,Extend Temp.
Driver Condition	LCD Module :1/160Duty,1/10Bias
Viewing Direction	6 O'clock
Backlight	White LED B/L
Weight	-
Interface	Support 8 bit parallel interface with 8080 or 6800 series MPU
Other(controller / driver IC)	ST7529-G

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	99.2(L) * 64.2(W) * 5.4(H)	mm
Viewing Area	93.0(L) * 49.0(W)	mm
Active Area	82.775(L) * 44.135(W)	mm
Dot Size	0.32(L) * 0.32(W)	mm
Dot Pitch	0.345(L) * 0.345(W)	mm

Note：For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{dd}	—	-0.5	4.0	V
LCD Driver Supply Voltage	V_{LCD}	—	-0.5	20	V
Input Voltage	V_{IN}	—	-0.5	$V_{DD}+0.5$	V
Operating Temperature	T_{OP}	—	-20	70	℃
Storage Temperature	T_{ST}	—	-30	80	℃
Storage Humidity	H_{D}	Ta＜60 ℃	-	90	%RH

1.4   DC Electrical Characteristics

V_{DD} =3.0±0.3V，V_{SS} =0V，Ta = 25℃

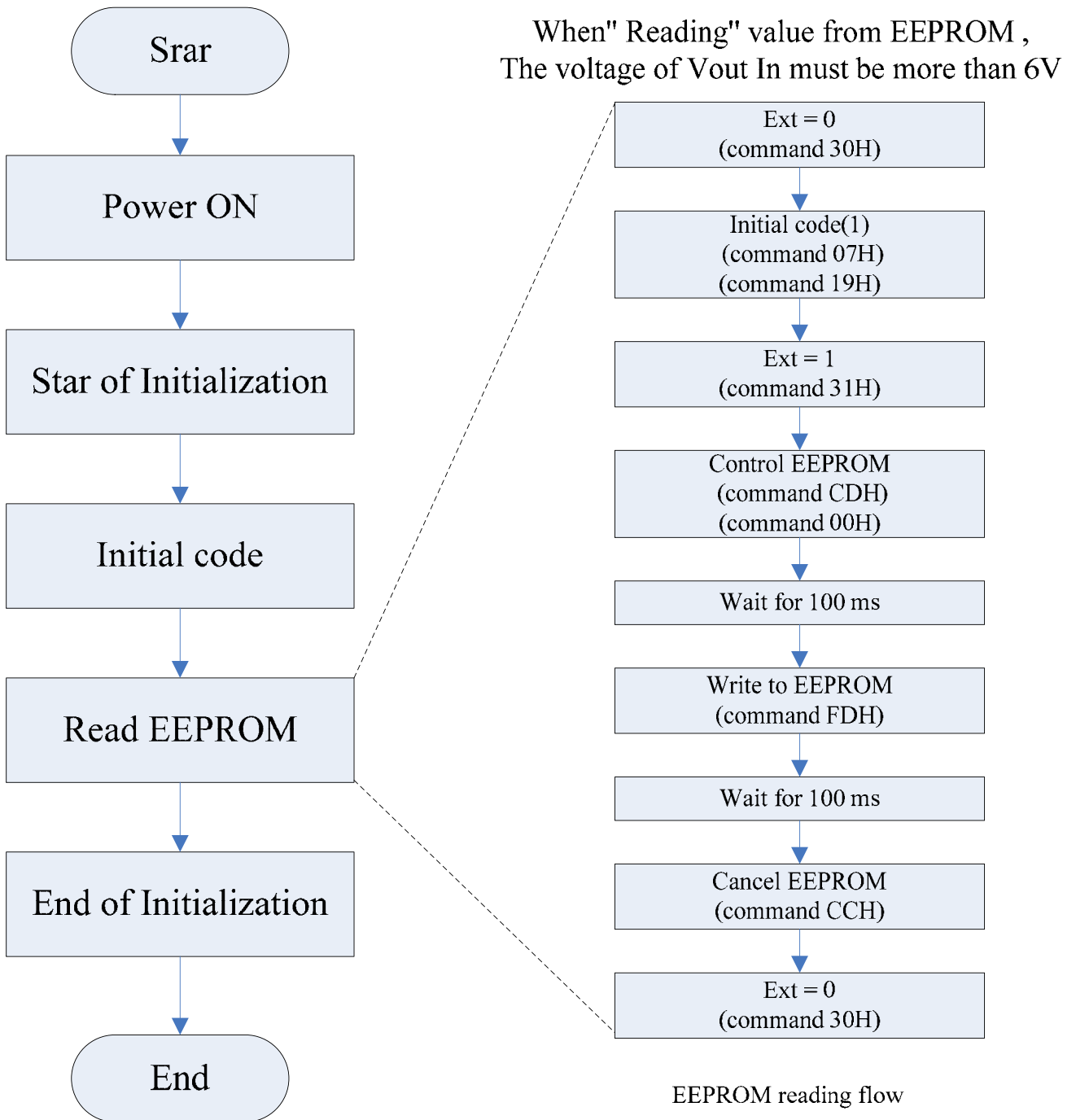| Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	-	2.7	3.0	3.3	V
"H" Input Voltage	V_{IH}	-	$0.7V_{DD}$	-	V_{DD}	V
"L" Input Voltage	V_{IL}	-	V_{SS}	-	$0.3V_{DD}$	V
"H" Output Voltage	V_{OH}	-	-	-	-	V
"L" Output Voltage	V_{OL}	-	-	-	-	V
Supply Current	I_{DD}	V_{DD}=3.0V, V_{OP}: 12.95 V Pattern= Full OFF	-	1.2	—	mA
		V_{DD}=3.0V, V_{OP}:12.95 V Pattern= Full display *1	-	4.7	6.2	
LCM Driver Voltage	V_{OP}*2, *3,*4	-20℃	13.50	13.65	13.80	V
		25℃	12.80	12.95	13.10	
		70℃	11.90	12.05	12.20	

NOTE: *1 The maximum current display

*2 The V_{OP} test point is V0-V_{SS}

*3 The command is used to program the optimum LCD supply voltage V0.

	D7	D6	D5	D4	D3	D2	D1	D0
Command	1	0	0	0	0	0	0	1
Parameter Byte 1 (PB1)	*	*	1	0	1	0	1	0
Parameter Byte 2 (PB2)	*	*	*	*	*	0	1	1

*4 The ST7529 offer read Electronic Control value function from the built-in EEPROM,
  Must set up and carry out in initial value in order to avoid that it is unusual to export
  Please see the following diagram.

```
      ┌──────────────┐
      │     Srar     │
      └──────────────┘
             │
             ▼
  ┌────────────────────┐
  │      Power ON      │
  └────────────────────┘
             │
             ▼
  ┌────────────────────┐
  │ Star of Initialization │
  └────────────────────┘
             │
             ▼
  ┌────────────────────┐
  │    Initial code    │
  └────────────────────┘
             │
             ▼
  ┌────────────────────┐
  │    Read EEPROM     │
  └────────────────────┘
             │
             ▼
  ┌────────────────────┐
  │ End of Initialization │
  └────────────────────┘
             │
             ▼
      ┌──────────────┐
      │     End      │
      └──────────────┘
```

When" Reading" value from EEPROM ,
The voltage of Vout In must be more than 6V

```
  ┌──────────────────────────┐
  │         Ext = 0          │
  │      (command 30H)       │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │     Initial code(1)      │
  │      (command 07H)       │
  │      (command 19H)       │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │         Ext = 1          │
  │      (command 31H)       │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │     Control EEPROM       │
  │      (command CDH)       │
  │      (command 00H)       │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │     Wait for 100 ms      │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │    Write to EEPROM       │
  │      (command FDH)       │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │     Wait for 100 ms      │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │     Cancel EEPROM        │
  │      (command CCH)       │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │         Ext = 0          │
  │      (command 30H)       │
  └──────────────────────────┘
```

EEPROM reading flow

1.5　Optical Characteristics

LCD Panel: 1/160 Duty, 1/13 Bias, V_{LCD} = 15.0 V, Ta = 25°C

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Reference
Response Time	Rise	tr		-	135	205	ms	Note2
	Fall	tf		-	300	450		
Viewing angle range	Top	⊖Y+	C≥2.0, ∅ =270	+45	-	-	Deg.	Notes 1
	Bottom	⊖Y-		-40	-	-		
	Left	⊖X-		R45	-	-		
	Right	⊖X+		L40	-	-		
Contrast Ratio		C	-	6	8	-	-	Note 3
Average Brightness (with LCD) *2		IV	If=80 mA	40	55	-	cd/m^2	-
CIE Color Coordinate (With LCD)		X		0.25	0.30	0.35	-	Note 4
		Y		0.29	0.34	0.39		
Uniformity *1		△B	-	70	-	-	%	-

Note 4　:

1：△B=B(min) / B(max) * 100%

2：Measurement Condition for Optical Characteristics:

　　a：Environment: 25℃±5℃ / 60±20%R.H，no wind，dark room below 10 Lux at typical lamp current and typical operating frequency.

　　b：Measurement Distance: 500 ± 50 ㎜ ，(θ= 0°)

　　c：Equipment: TOPCON BM-7 fast，(field 1°)，after 10 minutes operation.

　　d：The uncertainty of the C.I.E coordinate measurement ±0.01，Average Brightness ± 4%

Colorimeter=BM-7 fast
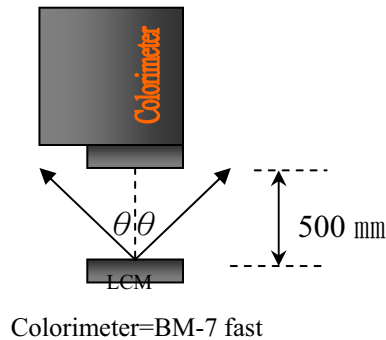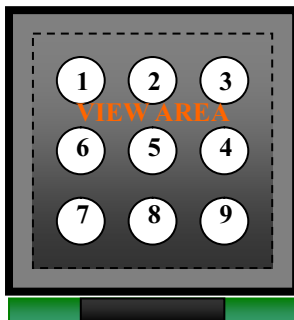
Note 1.

Optical characteristics-2

Viewing angle

Rear (12H)
$\varphi =90°$

Top ($\theta =0°$)

θ L θ R

$\theta +$

Left (9H)
$\varphi =180°$ $\theta -$ Right (3H)
$\varphi =0°$

Front (6H)
$\varphi =270°$
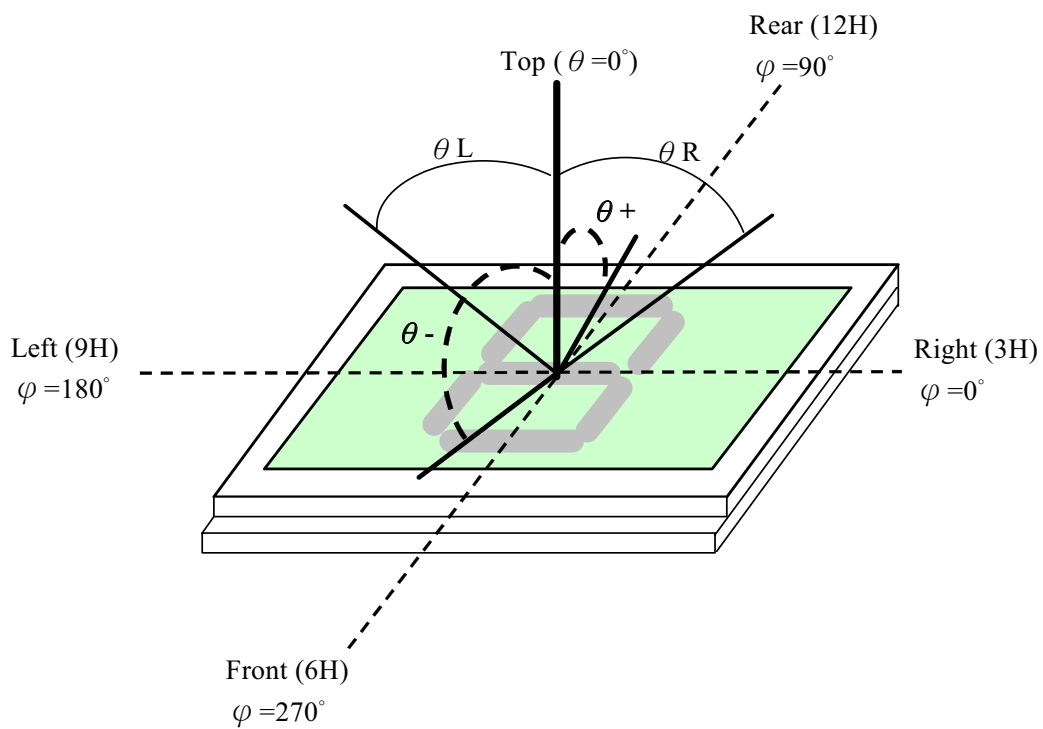
Viewing angle

Note 2.

Optical characteristics-3
    Fig.2 Definition of response time

Positive Type

No selected waveform → ←— Selected waveform —→ ← No selected waveform

Transmittance

100%   90%   10%

Tr   Tf

Negative Type

No selected waveform →←— Selected waveform →←— No selected

Transmittance

100%   90%   10%

Tr   Tf
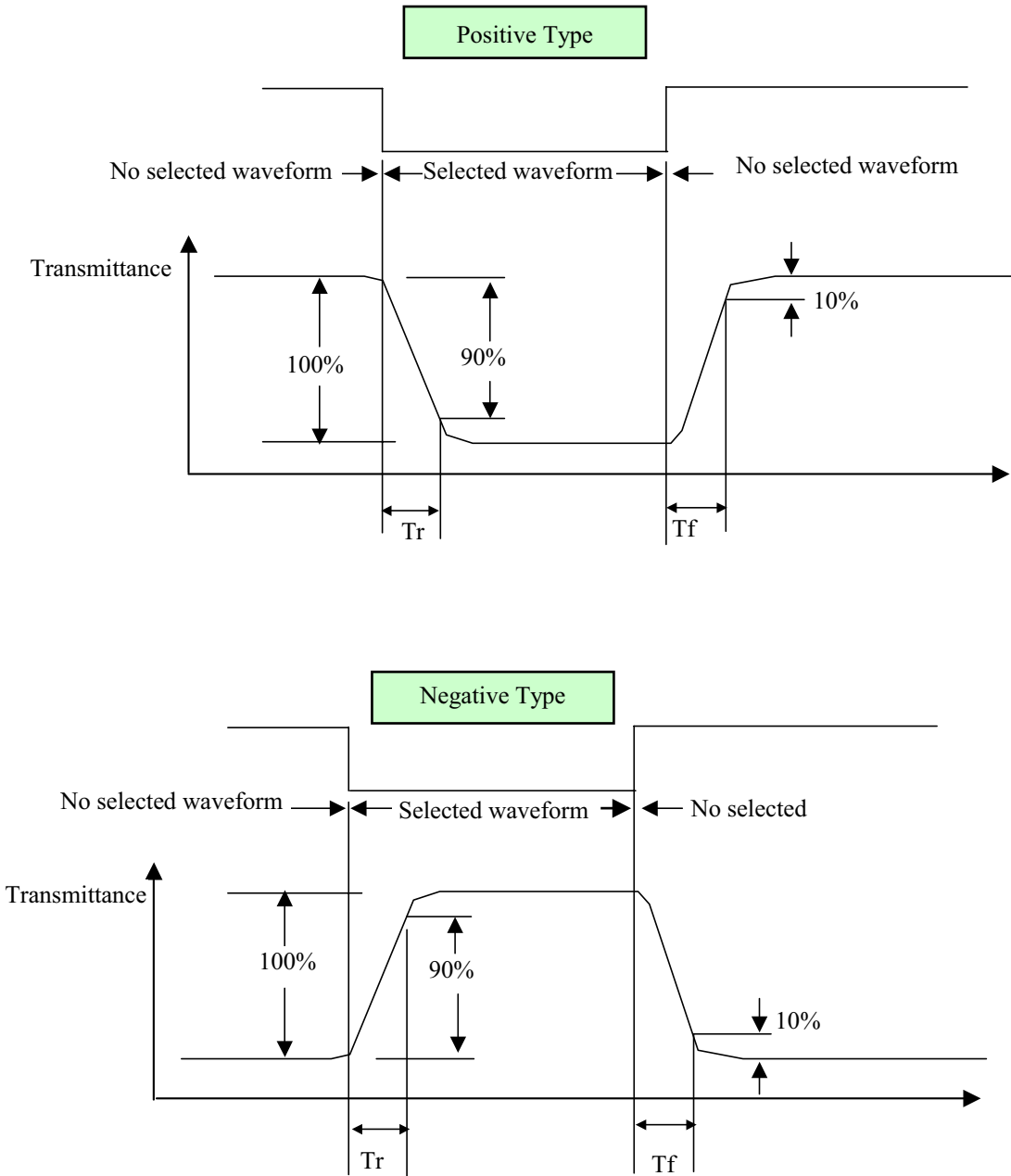
Electrical characteristics-2
　　※2 Drive waveform
　　Vop: Drive voltage   fF: Frame frequency
　　1/B: Bias   fD: Drive frequency
　　N: Duty

(1) Selected waveform
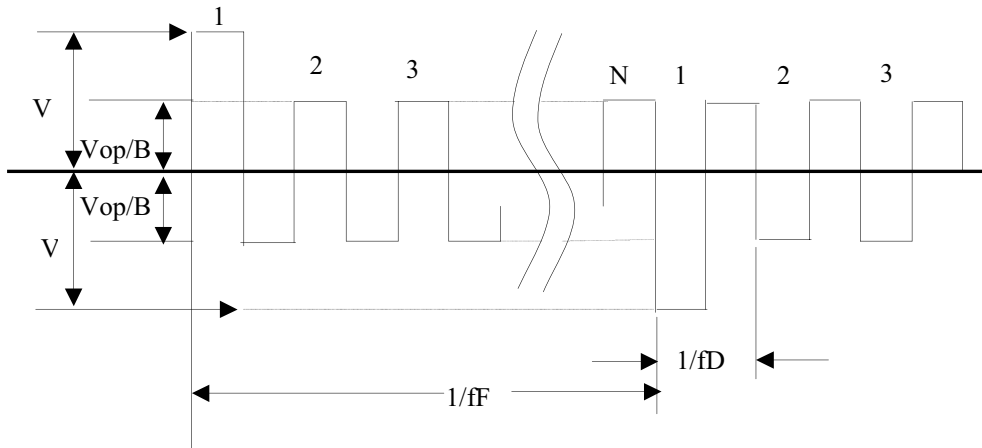
(2) Non- Selected wave form
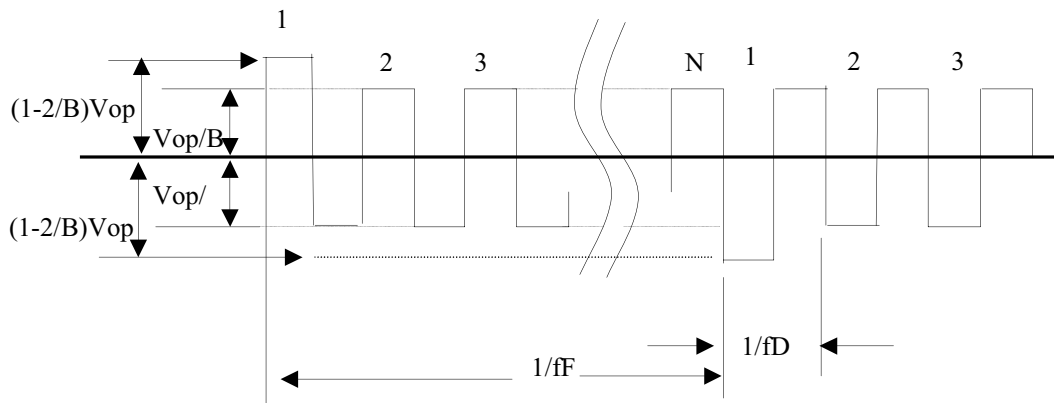
Note:
Frame frequency is defined as follows: Common side supply
voltage peak - to - peak /2 = 1 period

Note 3. : Definition of Vth

Transmittanc

100

73%

50%

Selected waveform

No selected waveform

Vth1   Vth2   Drive

Active voltage range
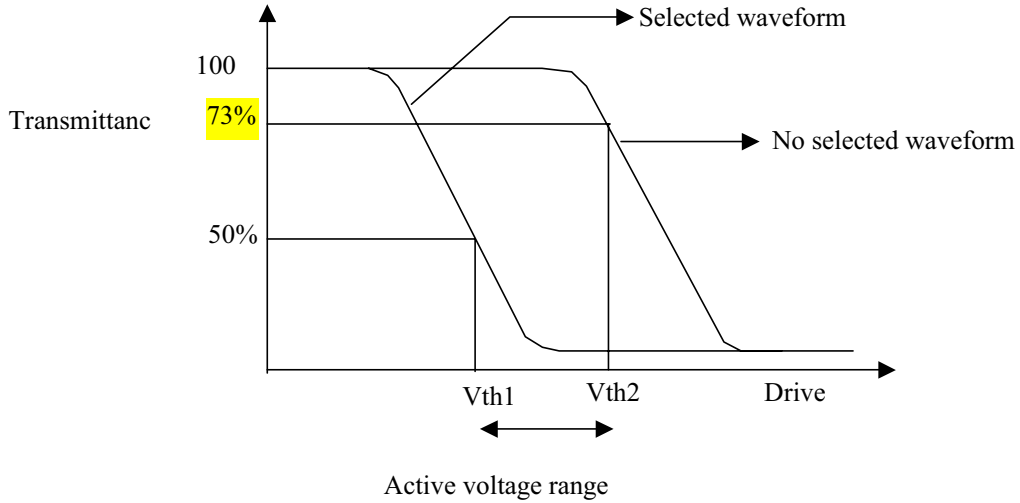
	Vth1	Vth2
View direction	10°	40°
Drive waveform	(Selected waveform)	(No selected waveform)
Transmittance	50%	73%

※1 Contrast ratio
= (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System

θ

Photo Detector

Human

Active

Temperature Control Chamber

ϕ

LCD Panel

Transmissive
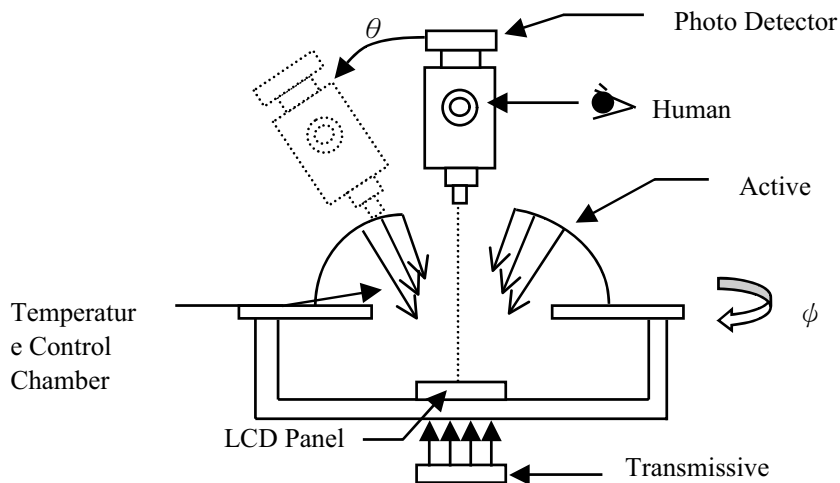
Measuring System: Autronic DMS-803

1.6　Backlight Characteristics

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If=80 mA	-	3.3	3.6	V
Average Brightness (Without LCD)	IV		176	220	--	cd/m^2
Color	White					

2. MODULE STRUCTURE

2.1   Counter Drawing

2.1.1   LCM Mechanical Diagram

* See Appendix

2.1.2   Block Diagram

LED   BACKLIGHT

COM0
COM63   240 * 128 DOTS
LCD PANEL   COM64
COM127
SEG0 -------------------------- SEG239

SEG239 -------------- SEG0 COM80
COM63
IC-ST7529
COM0   COM143

PIN40 --- PIN1
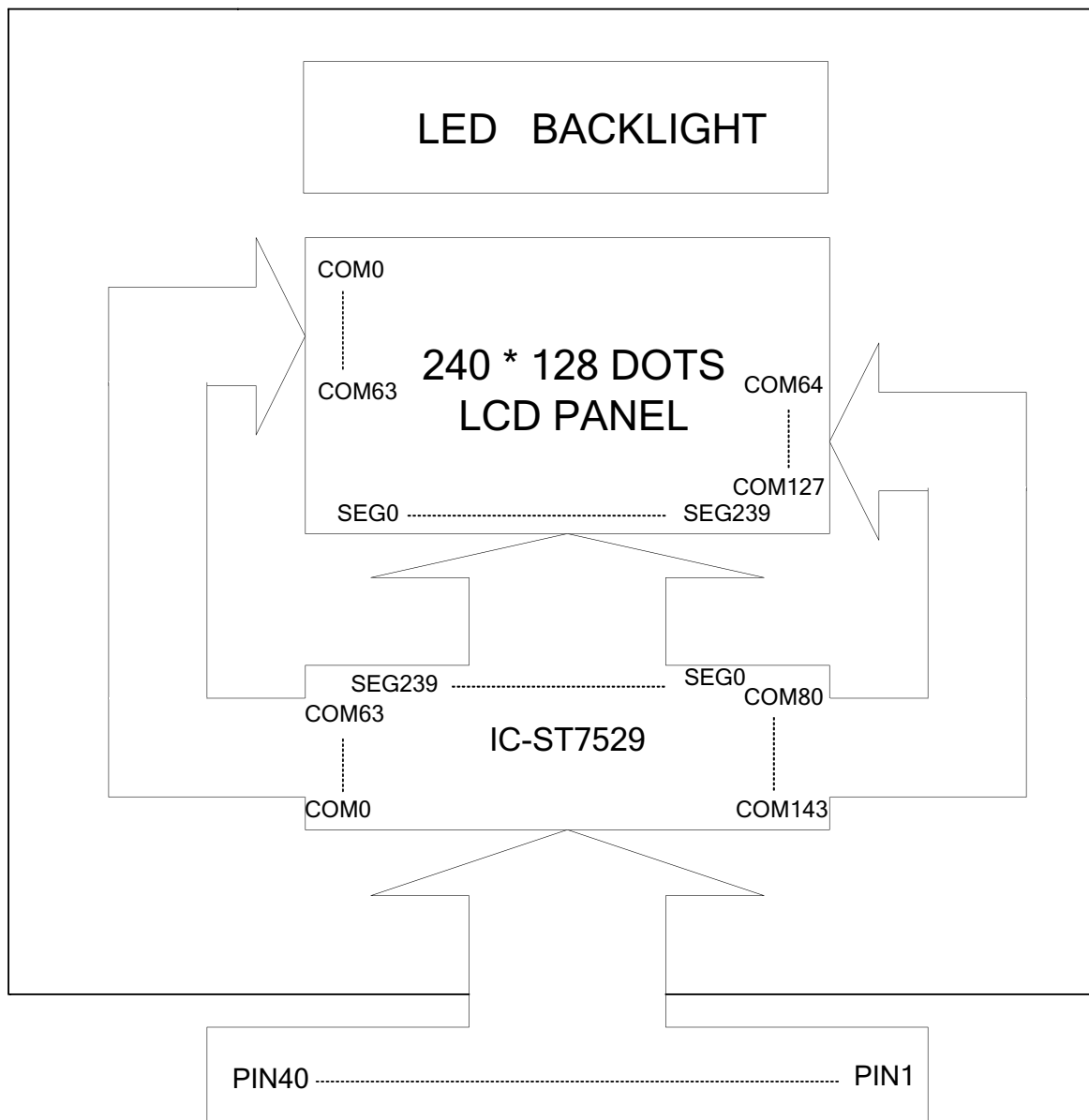
Please refer interface pin description for detail

2.2 Interface Pin Description

Pin No.	Symbol	Function
1	A0	Register select input pin – A0 = "H": DB0 to DB8 or SI are display data – A0 = "L": DB0 to DB8 or SI are control data
2	RW_WR	Read / Write execution control pin <table><tr><td>MPU Type</td><td>RW_WR</td><td>Description</td></tr><tr><td>6800</td><td>RW</td><td>Read / Write control input pin RW = "H" : read RW = "L" : write</td></tr><tr><td>8080</td><td>/WR</td><td>Write enable clock input pin The data on DB0 to DB8 are latched at the rising edge of the /WR signal.</td></tr></table>
3	DB0	They connect to the standard 8-bit MPU bus via the 8 bit bi-directional bus.When the following interface is selected and the XCS pin is high, the following pins become highimpedance, which should be fixed to VDD or VSS.
4	DB1	
5	DB2	
6	DB3	
7	DB4	
8	DB5	
9	DB6	
10	DB7	
11	E_RD	Read / Write execution control pin <table><tr><td>MPU Type</td><td>RW_WR</td><td>Description</td></tr><tr><td>6800</td><td>E</td><td>Read / Write control input pin -RW = "H": When E is "H", DB0 to DB8 are in an output status. -RW = "L": The data on DB0 to DB8 are latched at the falling edge of the E signal.</td></tr><tr><td>8080</td><td>/RD</td><td>Read enable clock input pin When /RD is "L", DB0 to DB8 are in an output status.</td></tr></table>
12	RST	Reset input pin. When RST is "L", initialization is executed.

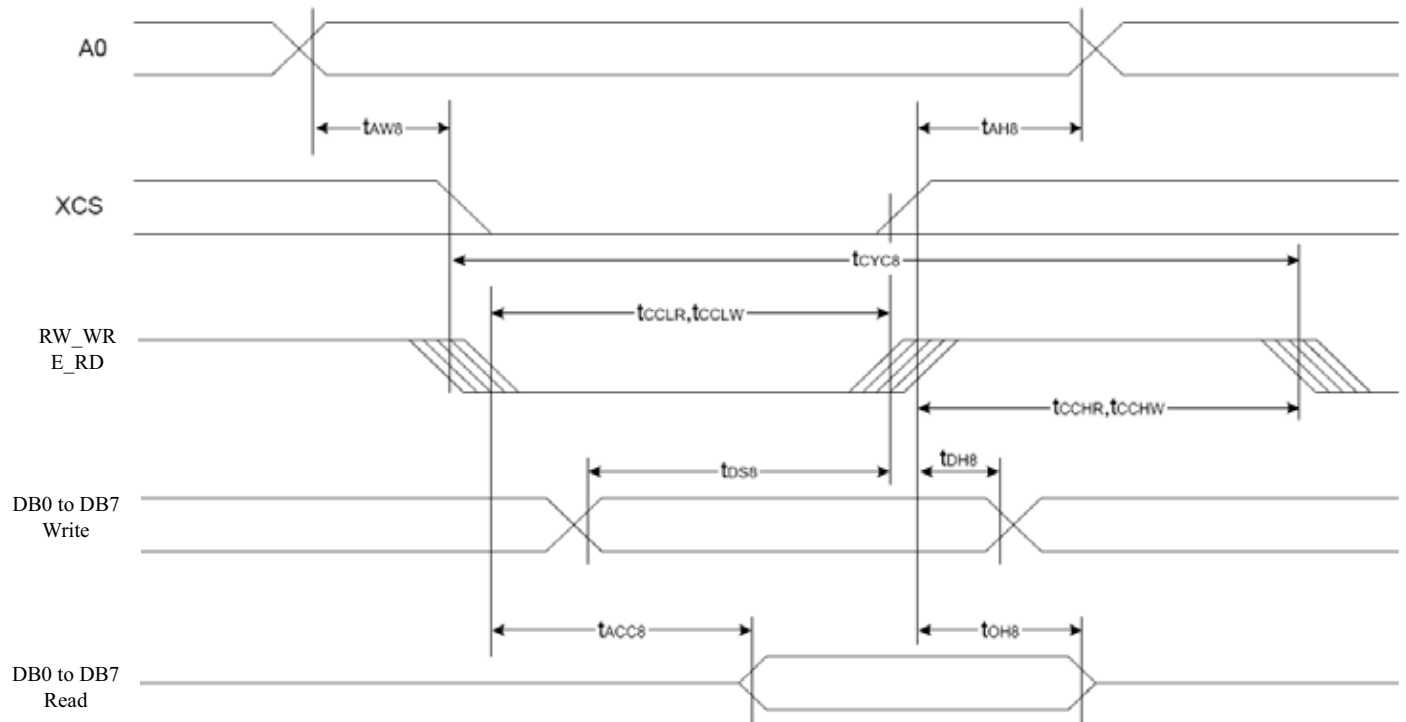| Pin No.	Symbol	Function		
13	IF1	IF1	IF3	MPU interface type
		H	L	80 series 8-bit parallel
14	IF3	L	H	68 series 8-bit parallel
15	XCS	Chip select input pins Data/instruction I/O is enabled only when XCS is "L". When chip select is non-active, DB0 to DB8 may be high impedance.		
16	VSS	Power supply (VSS=0)		
17	VDD	Power supply (VDD=3.3V)		
18	CAP7P	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦7X VLCD; 8X CAP1N terminal.		
19	CAP1N	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦5X OPEN;≧6X also CAP5P; ≧8X also CAP7P terminal.		
20	CAP5P	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦5X VLCD; ≧6X CAP1N terminal.		
21	CAP3P	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦3X VLCD; ≧4X CAP1N1 terminal.		
22	CAP1N1	DC / DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.		
23	CAP1P	DC / DC voltage converter. Connect a capacitor between this terminal and the CAP1N1 terminal.		
24	CAP2P	DC / DC voltage converter. Connect a capacitor between this terminal and the 2X VLCD; ≧3X CAP2N terminal.		
25	CAP2N	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦2X OPEN; ≧3X CAP2P terminal.		
26	CAP4P	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦4X VLCD; ≧5X CAP2N terminal.		
27	CAP2N1	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦6X OPEN; ≧7X CAP6P terminal.		
28	CAP6P	DC / DC voltage converter. Connect a capacitor between this terminal and the ≦6X VLCD; ≧7X CAP2N1 terminal.		
29	VLCD	If the internal voltage generator is used, connect to a stabilizing capacitor(1uF/25V) between VSS and VLCD. If an external supply is used, the external LCD supply voltage can be supplied using the VLCD pin. In this case, the internal voltage generator has to be programmed to zero(SET register VB=0). (Positive voltage:15±0.5V)		

Pin No.	Symbol	Function
30	V4	LCD driver supply voltages V0In & V0out should be connected together in FPC area.
31	V3	Voltages should have the following relationship: $V0 \geq V1 \geq V2 \geq V3 \geq V4 \geq VSS$
32	V2	When the internal power circuit is active, these voltages are generated as the following table according to the state of LCD bias.
33	V1	<table><tr><td>LCD Bias</td><td>V1</td><td>V2</td><td>V3</td><td>V4</td></tr><tr><td>1/N Bias</td><td>(N-1) / N x V0</td><td>(N-2) / N x V0</td><td>(2/N) x V0</td><td>(1/N) x V0</td></tr></table>
34	V0	NOTE: N = 5 to 14 Connnect capacitors(1uF/25V) between these terminals and GND.
35~37	A	Power supply for Backlight (anode)
38~40	K	Power supply for Backlight (cathode)

NOTE:IF an external voltage supply is used on VLCD terminal,PIN18~28:Not connect.

Reference circuit for using LCM module:

Pin	Signal	Name
A0	1	A0
RW_WR	2	RW_WR
DB0	3	DB0
DB1	4	DB1
DB2	5	DB2
DB3	6	DB3
DB4	7	DB4
DB5	8	DB5
DB6	9	DB6
DB7	10	DB7
E_RD	11	E_RD
RST	12	RST
IF1	13	VDD(80 series)/VSS(68 series)
IF3	14	VSS(80 series)/VDD(68 series)
XCS	15	XCS
VSS	16	VSS
VDD	17	VDD
CAP7P	18	
CAP1N	19	
CAP5P	20	
CAP3P	21	
CAP1N1	22	
CAP1P	23	
CAP2P	24	
CAP2N	25	
CAP4P	26	
CAP2N1	27	
CAP6P	28	
VLCD	29	
V4	30	
V3	31	
V2	32	
V1	33	
V0	34	
A	35	
A	36	A
A	37	
K	38	
K	39	K
K	40	

1. DC/DC voltage converter, refer interface pin description.
2. Use external voltage:NC

1. Use internal voltage:NC
2. Use external voltage:
   VEE(Positive voltage)

C6 1uF/25V
C1 1uF/25V
C2 1uF/25V
C3 1uF/25V
C4 1uF/25V
C5 1uF/25V

2.3 Timing Characteristics
For the 8080 Series MPU

$V_{DD} = 3.3V$

Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Address hold time	A0	t_{AH8}	-	20	-	ns
Address setup time		t_{AW8}	-	20	-	
System cycle time		t_{CYC8}	-	200	-	
Enable L pulse width (Write)	RW_WR	t_{CCLW}	-	100	-	
Enable H pulse width (Write)		t_{CCHW}	-	100	-	
Enable L pulse width (Read)	E_RD	t_{CCLR}	-	100	-	
Enable H pulse width (Read)		t_{CCHR}	-	100	-	
WRITE Data setup time	DB0 to DB7	t_{DS8}	-	150	-	
WRITE Address hold time		t_{DH8}	-	20	-	
READ access time		t_{ACC8}	$C_L=100pF$	-	40	
READ Output disable time		t_{OH8}	$C_L=100pF$	-	30	

VDD=2.7V

| Item | Signal | Symbol | Condition | Rating | | Units |
				Min	Max	
Address hold time	A0	t_{AH8}	-	20	-	ns
Address setup time		t_{AW8}	-	30	-	
System cycle time		t_{CYC8}	-	250	-	
Enable L pulse width (Write)	RW_WR	t_{CCLW}	-	150	-	
Enable H pulse width (Write)		t_{CCHW}	-	100	-	
Enable L pulse width (Read)	E_RD	t_{CCLR}	-	150	-	
Enable H pulse width (Read)		t_{CCHR}	-	100	-	
WRITE Data setup time	DB0 to DB7	t_{DS8}	-	200	-	
WRITE Address hold time		t_{DH8}	-	20	-	
READ access time		t_{ACC8}	C_L=100pF	-	40	
READ Output disable time		t_{OH8}	C_L=100pF	-	30	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC8} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC8} - t_{CCLR} - t_{CCHR})$ are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 t_{CCLW} and t_{CCLR} are specified as the overlap between XCS being "L" and WR and RD being at the "L" level.

For the 6800 Series MPU

$V_{DD}=3.3V$

Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Address hold time		t_{AH6}	-	20	-	
Address setup time	A0	t_{AW6}	-	20	-	
System cycle time		t_{CYC6}	-	200	-	
Enable L pulse width (Write)	RW_WR	t_{EWLW}	-	100	-	
Enable H pulse width (Write)		t_{EWHW}	-	100	-	
Enable L pulse width (Read)	E_RD	t_{EWLR}	-	100	-	ns
Enable H pulse width (Read)		t_{EWHR}	-	100	-	
WRITE Data setup time		t_{DS6}	-	150	-	
WRITE Address hold time	DB0 to DB7	t_{DH6}	-	20	-	
READ access time		t_{ACC6}	C_L=100pF	-	40	
READ Output disable time		t_{OH6}	C_L=100pF	-	30	

VDD=2.7V

Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Address hold time	A0	t_{AH6}	-	20	-	ns
Address setup time		t_{AW6}	-	30	-	
System cycle time		t_{CYC6}	-	250	-	
Enable L pulse width (Write)	RW_WR	t_{EWLW}	-	150	-	
Enable H pulse width (Write)		t_{EWHW}	-	100	-	
Enable L pulse width (Read)	E_RD	t_{EWLR}	-	150	-	
Enable H pulse width (Read)		t_{EWHR}	-	100	-	
WRITE Data setup time	DB0 to DB7	t_{DS6}	-	200	-	
WRITE Address hold time		t_{DH6}	-	20	-	
READ access time		t_{ACC6}	C_L=100pF	-	40	
READ Output disable time		t_{OH6}	C_L=100pF	-	30	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leqq (t_{CYC6} - t_{EWLW} - t_{EWHW})$ for $(t_r + t_f) \leqq (t_{CYC6} - t_{EWLR} - t_{EWHR})$ are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 t_{EWLW} and t_{EWLR} are specified as the overlap between XCS being "L" and E.

Reset Timing

<div align="right">V_{DD} =3.3V</div>

Item	Signal	Symbol	Condition	Rating			Units
				Min	Typ	Max	
Reset time	-	t_R		-	-	1	μs
Reset "L" pulse width	RST	t_{RW}	-	1	-	-	μs

<div align="right">V_{DD} =2.7V</div>

Item	Signal	Symbol	Condition	Rating			Units
				Min	Typ	Max	
Reset time	-	t_R		-	-	1.5	μs
Reset "L" pulse width	RST	t_{RW}	-	1.5	-	-	μs

2.4 Display Command

Ext=0 or Ext=1

Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	Ext In	0	1	0	0	0	1	1	0	0	0	0	Ext=0 Set	30	None
2	Ext Out	0	1	0	0	0	1	1	0	0	0	1	Ext=1 Set	31	None

Ext=0

Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	DISON	0	1	0	1	0	1	0	1	1	1	1	Display On	AF	None
2	DISOFF	0	1	0	1	0	1	0	1	1	1	0	Display Off	AE	None
3	DISNOR	0	1	0	1	0	1	0	0	1	1	0	Normal Display	A6	None
4	DISINV	0	1	0	1	0	1	0	0	1	1	1	Inverse Display	A7	None
5	COMSCN	0	1	0	1	0	1	1	1	0	1	1	COM Scan Direction	BB	1 byte
6	DISCTRL	0	1	0	1	1	0	0	1	0	1	0	Display Control	CA	3 bytes
7	SLPIN	0	1	0	1	0	0	1	0	1	0	1	Sleep In	95	None
8	SLPOUT	0	1	0	1	0	0	1	0	1	0	0	Sleep Out	94	None
9	LASET	0	1	0	0	1	1	1	0	1	0	1	Line Address Set	75	2 bytes
10	CASET	0	1	0	0	0	0	1	0	1	0	1	Column Address Set	15	2 bytes
11	DATSDR	0	1	0	1	0	1	1	1	1	0	0	Data Scan Direction	BC	3 bytes
12	RAMWR	0	1	0	0	1	0	1	1	1	0	0	Writing to Memory	5C	Data
13	RAMRD	0	1	0	0	1	0	1	1	1	0	1	Reading from Memory	5D	Data
14	PTLIN	0	1	0	1	0	1	0	1	0	0	0	Partial display in	A8	2 bytes
15	PTLOUT	0	1	0	1	0	1	0	1	0	0	1	Partial display out	A9	None
16	RMWIN	0	1	0	1	1	1	0	0	0	0	0	Read and Modify Write	E0	None
17	RMWOUT	0	1	0	1	1	1	0	1	1	1	0	RMW end	EE	None
18	ASCSET	0	1	0	1	0	1	0	1	0	1	0	Area Scroll Set	AA	4 bytes
19	SCSTART	0	1	0	1	0	1	0	1	0	1	1	Scroll Start Set	AB	1 byte
20	OSCON	0	1	0	1	1	0	1	0	0	0	1	Internal OSC on	D1	None
21	OSCOFF	0	1	0	1	1	0	1	0	0	1	0	Internal OSC off	D2	None
22	PWRCTRL	0	1	0	0	0	1	0	0	0	0	0	Power Control	20	1 byte
23	VOLCTRL	0	1	0	1	0	0	0	0	0	0	1	EC control	81	2 bytes
24	VOLUP	0	1	0	1	1	0	1	0	1	1	0	EC increase 1	D6	None
25	VOLDOWN	0	1	0	1	1	0	1	0	1	1	1	EC decrease 1	D7	None
26	RESERVED	0	1	0	1	0	0	0	0	0	1	0	Not Use	82	0
27	EPSRRD1	0	1	0	0	1	1	1	1	1	0	0	READ Register1	7C	None

28	EPSRRD2	0	1	0	0	1	1	1	1	1	0	1	READ Register2	7D	None
29	NOP	0	1	0	0	0	1	0	0	1	0	1	NOP Instruction	25	None
30	STREAD	0	0	1				Read Data					Status Read		
31	EPINT	0	1	0	0	0	0	0	0	1	1	1	Initial code(1)	07	1 byte

Ext=1
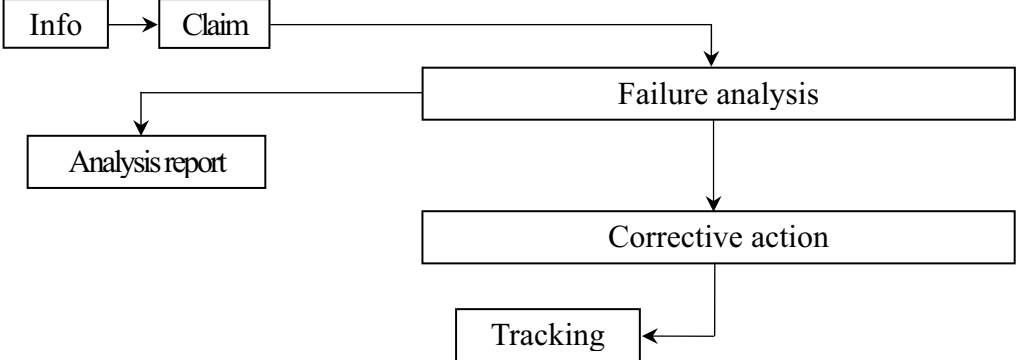
Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	Gray 1 Set	0	1	0	0	0	1	0	0	0	0	0	FRAME 1 Gray PWM Set	20	16 bytes
2	Gray 2 Set	0	1	0	0	0	1	0	0	0	0	1	FRAME 2 Gray PWM Set	21	16 bytes
3	Wt. Set	0	1	0	0	0	1	0	0	0	1	0	Weight Set	22	3 bytes
4	ANASET	0	1	0	0	0	1	1	0	0	1	0	Analog Circuit Set	32	3 bytes
5	DITHOFF	0	1	0	0	0	1	1	0	1	0	0	Dithering Circuit Off	34	None
6	DITHON	0	1	0	0	0	1	1	0	1	0	1	Dithering Circuit On	35	None
7	EPCTIN	0	1	0	1	1	0	0	1	1	0	1	Control EEPROM	CD	1 byte
8	EPCOUT	0	1	0	1	1	0	0	1	1	0	0	Cancel EEPROM	CC	None
9	EPMWR	0	1	0	1	1	1	1	1	1	0	0	Write to EEPROM	FC	None
10	EPMRD	0	1	0	1	1	1	1	1	1	0	1	Read from EEPROM	FD	None

3. QUALITY ASSURANCE SYSTEM

3.1   Quality Assurance Flow Chart

Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Marketing & Design								
Sample Approval								
Pilot Run & Mass Product								
Ship Out								

Item	Customer	Sales	R&D	Q.A	Manufact uring	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management			2. Process improvement proposal 4. Education And Training Activities				

Info → Claim → Failure analysis → Corrective action → Tracking

Analysis report

3.2 Inspection Specification
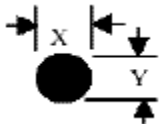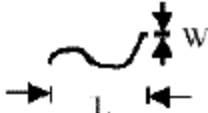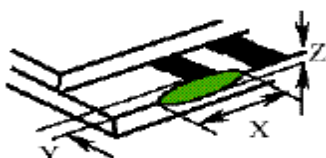
◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ .
◆Equipment : Gauge、MIL-STD、Multi-Inno、Sample
◆Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 .
◆OUT Going Defect Level : Sampling .
◆Manner of appearance test :
   (1). The test be under 40W×2 fluorescent light ' and distance of view must be at 30 cm.
   (2). The test direction is base on about around 45° of vertical line.   (Fig. 1)
   (3). Definition of area . (Fig. 2)

B area : Outside of viewing area

eyes   eyes

45° 45°

A area : viewing area
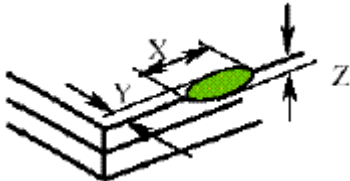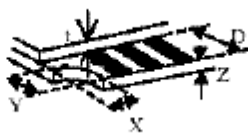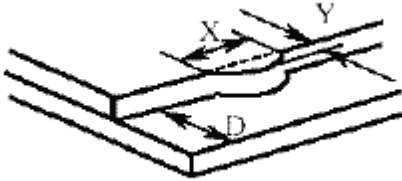
◆ Specification:

NO	Item	Criterion	level
01	Product condition	1.1 The part number is inconsistent with work order of Production.	Major
		1.2 Mixed production types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	3.1 Product dimension and structure must conform to Structure diagram.	Major
04	Electrical Testing	4.1 Missing line character、dot and icon.	Major
		4.2 No function or no display.	Major
		4.3 Output data is error.	Major
		4.4 LCD viewing angle defect.	Major
		4.5 Current consumption exceeds product specifications.	Major
05	Black or white dot、scratch、contamination Round type	5.1 Round type: 5.1.1 display only : ・White and black spots on display ≦ 0.30mm, no more than Four white or black spots present. ・Densely spaced : NO more than two spots or lines within 3mm	Minor

◆Specification :

NO	Item	Criterion	level
05	Black or white dot、scratch、contamination Round type $\Phi=(x+y)/2$	5.1.2 Nom-display : **Round type table** Dimension (diameter : Φ) — Acceptance(Q'ty) Φ≦0.10mm — Accept no dense 0.10mm＜Φ≦0.20mm — 3 0.20mm＜Φ≦0.30mm — 2 Total — 4 5.1.3 Line type:	Minor

5.1.2 Nom-display :

Dimension (diameter : Φ)	Acceptance(Q'ty)
Φ≦0.10mm	Accept no dense
0.10mm＜Φ≦0.20mm	3
0.20mm＜Φ≦0.30mm	2
Total	4

5.1.3 Line type:

Dimension (diameter : Φ)		Acceptance (Q'ty)	
Length	width	A area	B area
---	w≦0.03mm	Accept no dense	Don't count
L≦3.0mm	0.03mm＜Φ≦0.05mm	4	Don't count
L≦2.5mm	0.05mm＜Φ≦0.075mm		Don't count
---	w＞0.075mm	As round type	

NO	Item	Criterion	level
06	Polarizer Bubble	(see table below)	Minor

Dimension (diameter : Φ)	Acceptance(Q'ty)	
	A area	B area
Φ≦0.20mm	Accept no dense	Don't count
0.20mm＜Φ≦0.50mm	3	Don't count
0.50mm＜Φ≦1.00mm	2	Don't count
Φ＞1.00mm	0	Don't count
Total quantity	4	Don't count

NO	Item	Criterion	level
07	The crack of glass	● Glass Crack: 7.1 Crack on the circuit of electrode terminal : 	Minor

	X	Y	Z
Front	X≦1/5 a	Y≦ 1/2 D	Z≦ t
Back	Neglect		

◆Specification :

NO	Item	Criterion	Level
07	The crack of glass X: The length of Crack Y: The width of crack Z: The thickness of crack D: terminal length T: The thickness of glass A : The length of glass	● Glass Crack: 7.2 General glass crack and corner edge: 7.2.1 | X	Y	Z
---	---	---
Neglect	Out A area	Neglect | 7.2.2 | X	Y	Z
---	---	---
Neglect	Out A area	Neglect		Minor
		7.3 Glass remain: | X	Y
---	---
Neglect	≦ 1/3 d		Minor

◆Specification :

NO	Item	Criterion	Level
07	The crack of glass X: The length of Crack Y: The width of crack Z: The thickness of crack D: terminal length T: The thickness of glass A : The length of glass	7.4 Corner crack and medial crack: 【OK】 【NG】 | X	Y	Z
---	---	---
≦1/5a	Crack can't enter viewing area	≦1/2t
≦1/5a	Crack can't exceed the half of width of SP width of SP	1/2t<Z≦2t		Minor
08	Backlight elements	8.1 Backlight can't work normally.	Major
		8.2 Backlight doesn't light or color is wrong.	Major
		8.3 Illumination source flickers when lit.	Major
09	General appearance	9.1 pin type must match type in specification sheet	Major
		9.2 No short circuits in components on PCB or FPC	Major
		9.3Product packaging must the same as specified on packaging specification sheet.	Major
		9.4 The folding and peeled off in polarizer are not acceptable	Major
		9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is ≦1.5mm	Major

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO.	TEST ITEM	TEST CONDITION	
1	High Temperature Storage Test	Keep in 80 ±2℃ 96 hrs	
		Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage Test	Keep in -30 ±2℃ 96 hrs	
		Surrounding temperature, then storage at normal condition 4hrs	
3	High Humidity Storage	Keep in +60℃/90%RH duration for 96 hrs	
		Surrounding temperature, then storage at normal condition 4hrs	
		(Excluding the polarizer)	
4	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		1. Temperature Ambient:15℃～35℃ 2. Humidity relative:30%～60% 3. Energy Storage Capacitance(Cs+Cd):150pF±10% 4. Discharge Resistance(Rd):330Ω±10% 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 s) (Tolerance lf the output voltage indication: ±5%)	
5	Temperature Cycling Test	-20℃ → 25℃ → 70℃ → 25℃ (30mins) (5mins) (30mins) (5mins) ←————————————————→ 10 Cycle Surrounding temperature, then storage at normal condition 4hrs	
6	Vibration Test (Packaged)	1. Sine wave 10～55HZ frequency (1 min) 2. The amplitude of vibration :1.5 mm 3. Each direction (XYZ) duration for 2 Hrs	
7	Drop Test (Packaged)	<table><tr><td>Packing Weight (Kg)</td><td>Drop Height (cm)</td></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table> Drop direction :※3 comer /1 edges /6 sides etch 1times	

5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

5.1.1   If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

5.1.2   If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

5.2 HANDLING

5.2.1   Avoid any strong mechanical shock which can break the glass.

5.2.2   Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.

5.2.3   Do not remove the panel or frame from the module.

5.2.4   The polarizing plate of the display is very fragile. So , please handle it very carefully ,do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

5.2.5   Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.

5.2.6   Do not touch the display area with bare hands , this will stain the display area.

5.2.7   Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8   To control temperature and time of soldering is $320\pm10℃$ and 3-5 sec.

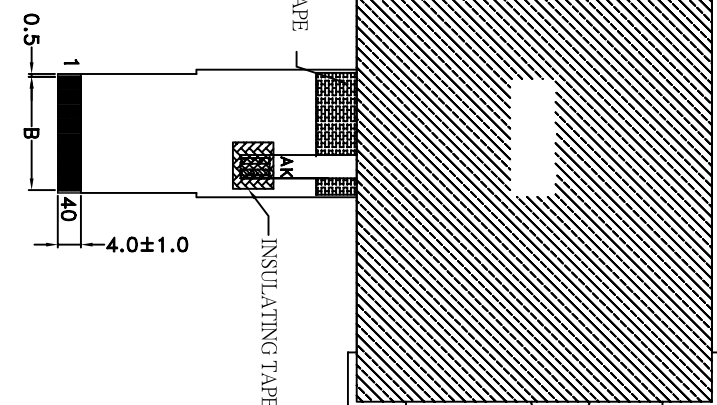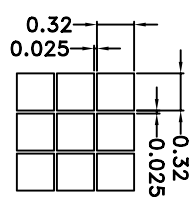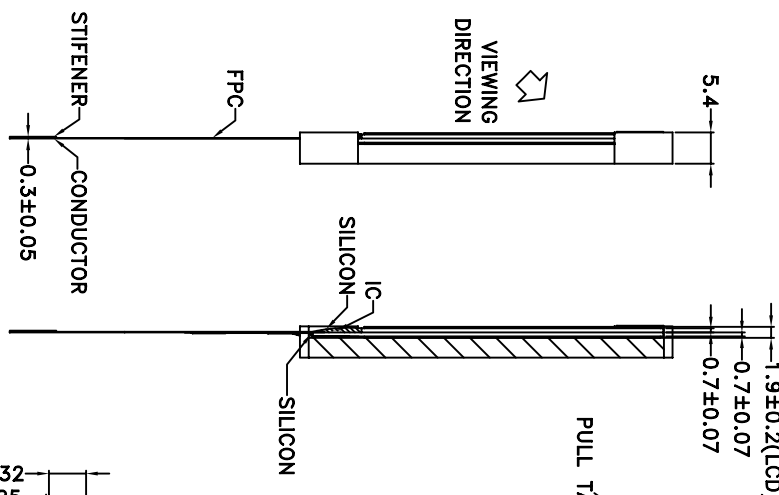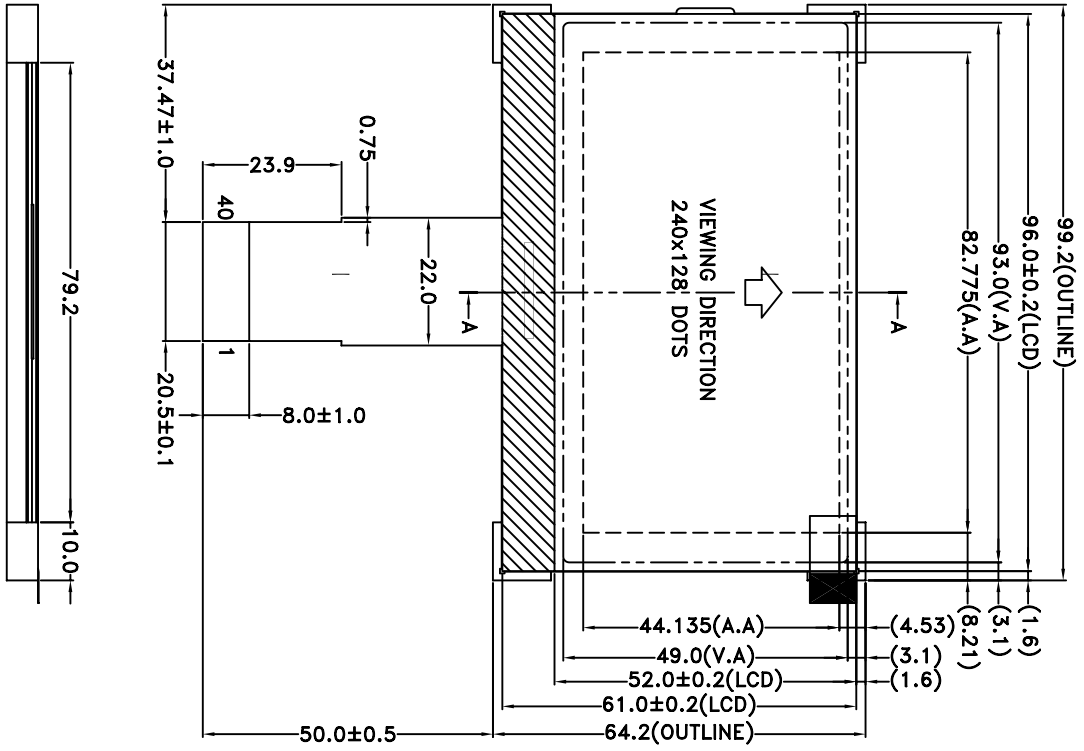5.2.9   To avoid liquid (include organic solvent) stained on LCM .

5.3 STORAGE

5.3.1   Store the panel or module in a dark place where the temperature is $25℃\pm5℃$ and the humidity is below 65% RH.

5.3.2   Do not place the module near organics solvents or corrosive gases.

5.3.3   Do not crush , shake , or jolt the module.

5.4 TERMS OF WARRANTY

5.4.1   Applicable warrant period

The period is within thirteen months since the date of shipping out under normal using and storage conditions.

5.4.2   Unaccepted responsibility

This product has been manufactured to your company's specification 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 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.

VIEWING DIRECTION
240x128 DOTS

99.2(OUTLINE)
96.0±0.2(LCD)
93.0(V.A)
82.775(A.A)

37.47±1.0
23.9
0.75
40
22.0
1
20.5±0.1
8.0±1.0
79.2
10.0

44.135(A.A)
49.0(V.A)
52.0±0.2(LCD)
61.0±0.2(LCD)
64.2(OUTLINE)
50.0±0.5

(4.53)
(3.1)
(1.6)
(8.21)
(3.1)
(1.6)

NOTES:
1.LCD TYPE: FSTN
2.LCD DISPLAY:POSITIVE / TRANSFLECTIVE
3.VIEW DIRECTION: 6 O'CLOCK
4.TOP: -20~70°C   TST:-30~80°C
5.B=P0.5x39=19.5±0.05,W=0.25±0.05
6.IC NO.:ST7529
7.THE COLERANCE UNLESS CLASSIFIED ±0.3MM
8.THIS PRODUCT CONFORMS ROHS

STIFENER
FPC
CONDUCTOR
VIEWING DIRECTION
5.4
0.3±0.05

SECTION A-A

SILICON
IC
SILICON
1.9±0.2(LCD)
0.7±0.07
0.7±0.07

PULL TAPE

0.32
0.025
0.32
0.025

DOTS DETAIL

SHIELDING TAPE
0.5
1
B
40
4.0±1.0
AK
INSULATING TAPE

CUSTOMER APVL
DRAWN
DFTG CHK
ENGR CHK
APPROVAL

CUSTOMER
SCALE
UNIT   mm
DATE
TITLE
MODEL   MI240128J-G
DWG NO
PAGE 1/1

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