POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER : 賚晟

SAMPLE CODE (Ver.) :

MASS PRODUCTION CODE (Ver.) : PG320240WRF-DE9HZ4 (Ver.0)

DRAWING NO. (Ver.) : PG-03100-211

Customer Approved

Date:

Approved	QC Confirmed	Designer
研發 94.10.13. 林忠聖	[signatures] 8/21-06	研發 94.10.17 張展源; 生技 94.10.14 王大維

☐ Approval For Specifications Only.

* This specification is subject to change without notice.

Please contact Powertip or it's representative before designing your product based on this specification.

■ Approval For Specifications and Sample.

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(#068075)

POWERTIP

RECORDS OF REVISION

Date	Ver.	Description	Page	Design by
2005/10/14	0	Mass Production Short : JP(3-2), JDS(3-1), JMS(3-1), JF, JE1, JE2	—	Vodka

Total : 22 Page

Contents

Note : For detailed information please refer to IC data sheet : EPSON---S1D13700

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	320 * 240 Dots
LCD Type	FSTN , Positive Transflective
Driver Condition	LCD Module: 1/240 Duty, 1/16 Bias
Viewing Direction	6 O'clock
Backlight	White LED
Weight	310 g
Interface	Support 8080 MPU Parallel 8 Bits data bus
Driver IC	Controller IC: S1D13700

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	153.54 (L) * 120.24 (w) * 22.4 (H)(Max)	mm
Viewing Area	120.14 (L) * 92.14 (w)	mm
Active Area	115.18 (L) * 86.38 (w)	mm
Dot Size	0.34 (L) * 0.34 (w)	mm
Dot Pitch	0.36 (L) * 0.36 (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}	–	-0.3	+7.0	V
LCD Driver Supply Voltage	V_{DD}-V_{EE}	–	-0.3	25	V
Input Voltage	V_{IN}	–	-0.3	V_{DD}+0.5	V
Operating Temperature	T_{OP}	Excluded T/P	-20	70	°C
Storage Temperature	T_{ST}	Excluded T/P	-30	80	°C
Storage Humidity	H_D	Ta＜40 ℃	20	90	%RH

1.4 DC Electrical Characteristics

V_{DD} = 5.0 V ± 0.5 , V_{SS} = 0 V , Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	–	4.5	5.0	5.5	V
"H" Input Voltage	V_{IH}	–	3.5	–	–	V
"L" Input Voltage	V_{IL}	–	–	–	1.0	V
"H" Output Voltage	V_{OH}	–	VDD -0.4	–	–	V
"L" Output Voltage	V_{OL}	–	–	–	0.4	V
Supply Current	I_{DD}	V_{DD} = 5.0 V	–	20	80	mA
LCM Driver Voltage	V_{OP}	(V_{OP}+) – (V_{OP}-) (-20°C)	22.3	22.5	22.7	V
		(V_{OP}+) – (V_{OP}-) (25°C)	21.9	22.2	22.5	
		(V_{OP}+) – (V_{OP}-) (70°C)	21.1	21.3	21.5	

1.5 Optical Characteristics

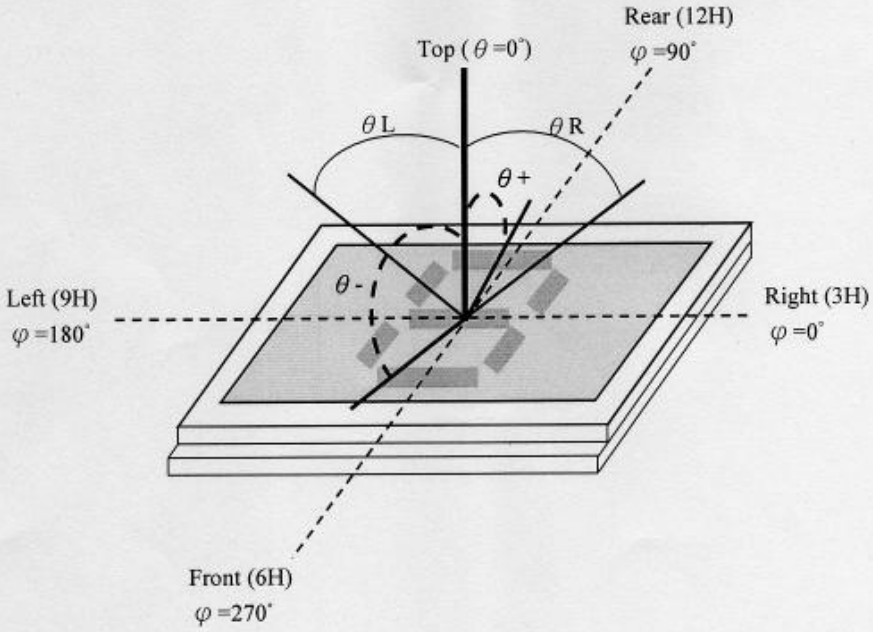
LCD Panel: 1/240 Duty, 1/15 Bias, V_{LCD} = 22.0 V, Ta = 25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	C≥2.0 , ∅ = 270°	-40°	–	40°	Note 1
Contrast Ratio	CR	θ = -5° , ∅ = 270°	2	4	–	Note 3
Response Time(rise)	Tr	θ = -5° , ∅ = 270°	–	120 ms	180 ms	Note 2
Response Time(fall)	Tf	θ = -5° , ∅ = 270°	–	290 ms	435 ms	

Note 1.

Optical characteristics-2

Viewing angle

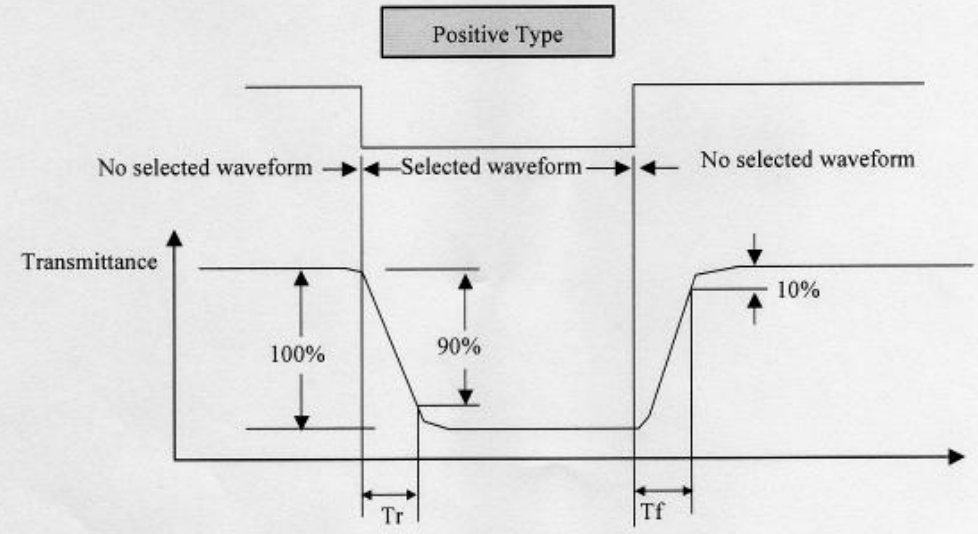


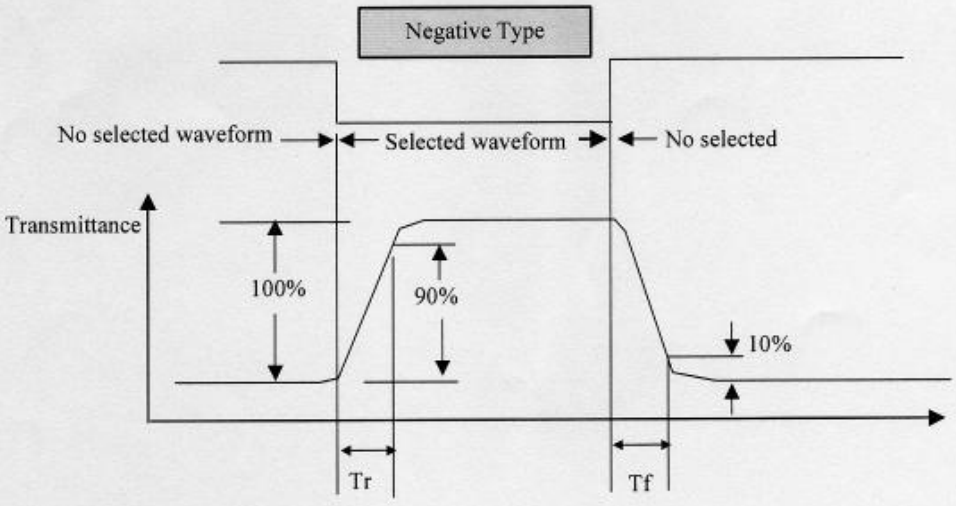
Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time





Electrical characteristics-2

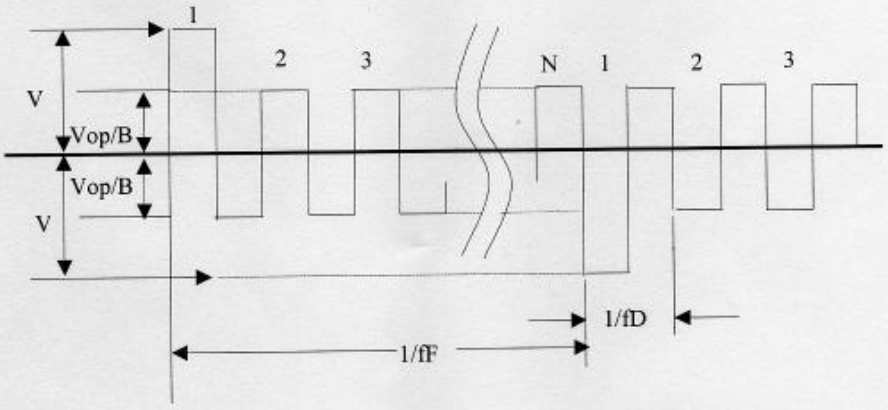
※2 Drive waveform

Vop: Drive voltage　　fF: Frame frequency

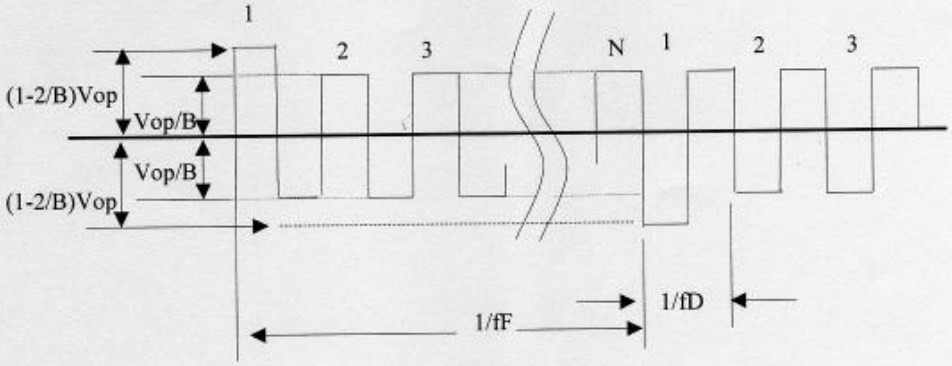
1/B: Bias　　fD: Drive frequency

N: Duty

(1) Selected waveform



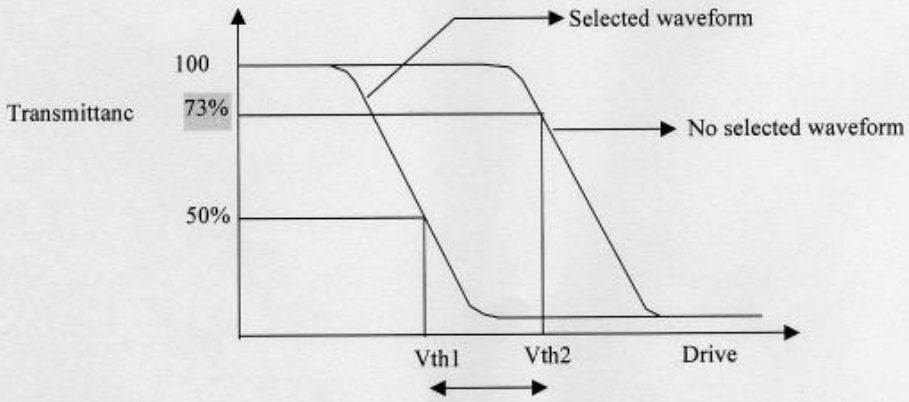
(2) Non- Selected waveform



Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak /2 = 1 period

Note 3. : Definition of Vth

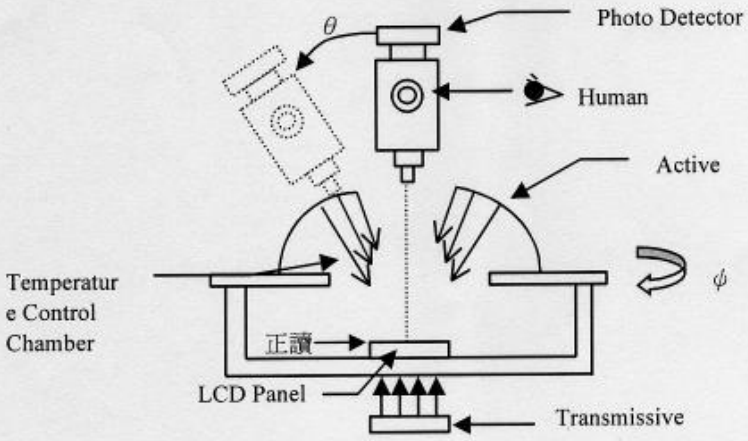


Active voltage range

	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



Measuring System: Autronic DMS-803

1.7 Touch Screen Characteristic

1. Input Method and Activation Force

   Stylus < 30 grams and Finger < 80 grams

2. Typical Optical Characteristics

   Visible Light Transmission : >80%@550nm

   Haze : 5%±2% through hard coated PET only

3. Electrical Specifications

   1. Operating Voltage 5.5V or less

   2. Contact current 20mA(maximum)

   3. Circuit close resistance X : 400~800Ω Y : 200~500Ω

   4. Circuit open resistance ≥ 20MΩ at 25V DC

   5. Contact bounce ≤ 15ms

4. Linearity

   Linear Test Specification : Direction X : ± 1.5% (maximum)

   Direction Y : ± 1.5% (maximum)

5. Environment Specification

   Operating Temperature -10°C ~ +50°C (Humidity less than 90% RH)

   Storage Temperature -20°C ~ +70°C (at ambient Humidity)

Touch Panel Interface Pin Description

Pin No.	Symbol	Function
1	YU	Touch panel Y coordinate up
2	XR	Touch panel X coordinate right
3	YD	Touch panel Y coordinate down
4	XL	Touch panel X coordinate left

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	–	160	mA
Reverse Voltage	VR	Ta =25℃	–	5	V
Power Dissipation	PO	Ta =25℃	–	0.67	W

.Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reverse Current	IR	VR= 5 V	–	–	10	uA
Forward Voltage	VF	IF= 160 mA	–	3.7	4.2	V
Average Brightness (With LCD and Touch Panel)*1	IV		15	25	–	cd/m^2
Uniformity (With LCD and Touch Panel)*2	△B		70	–	–	%
CIE Color Coordinate (With LCD and Touch Panel)	X		0.26	0.32	0.38	–
	Y		0.27	0.33	0.39	
Color	White					

*1:This value will be changed while mass production

*2: △B = B(min) / B(max) %

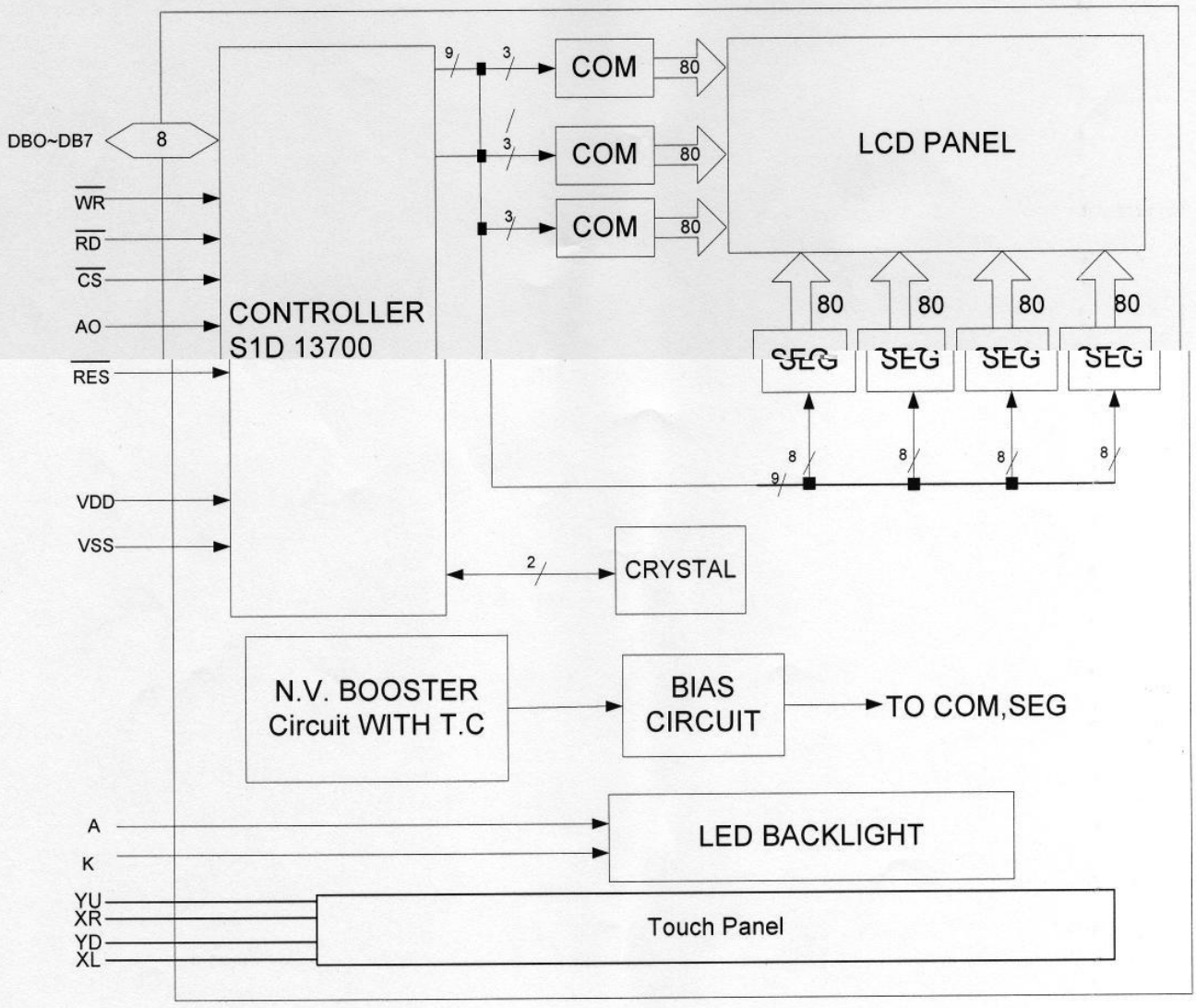
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



2.2 Interface Pin Description

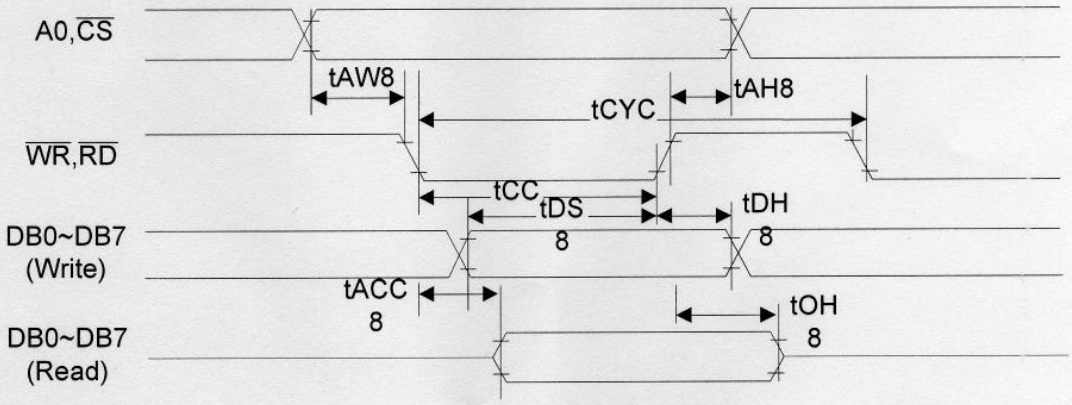
Pin No.	Symbol	Function
1	V_{SS}	Ground (V_{SS}=0 V)
2	V_{DD}	Power Supply (V_{DD} = 5.0 V)
3	V_{LCD}	Operating voltage for LCD. No connection , must be open
4	/RD	Data read (read data from the module at "L")
5	/WR	Data write (write data to the module at "L")
6	A0	Command / Data read or write select (H : command L : data)
7	DB0	Data bus bit 0
8	DB1	Data bus bit 1
9	DB2	Data bus bit 2
10	DB3	Data bus bit 3
11	DB4	Data bus bit 4
12	DB5	Data bus bit 5
13	DB6	Data bus bit 6
14	DB7	Data bus bit 7
15	/CS	Chip select , active “L”
16	/RES	Reset input , active “L”
17	V_{EE}	Negative voltage out. No connection , must be open
18	FG	Frame ground (connected to metal bezel)
19	NC	Not connection
20	NC	Not connection
21	NC	Not connection
22	NC	Not connection
—	A	Power supply for LED B/L. (Anode)
—	K	Power supply for LED B/L. (Cathode)

Built in negative voltage generator circuit and temperature compensation circuit.

Built in Timing mode for 8080 family.

2.3 Timing Characteristics

8080 family interface timing



Ta = -20 to 70°C , V_{DD} = 4.5 to 5.5 V

Signal	Symbol	Parameter	Min	Max	Unit
A0 , /CS	t_{AH8}	Address hold time	10	–	ns
	t_{AW8}	Address setup time	0	–	ns
/WR , /RD	t_{CYC8}	System cycle time	See note	–	ns
	t_{CC}	Strobe pulse width	120	–	ns
DB0 to DB7	t_{DS8}	Data setup time	120	–	ns
	t_{DH8}	Data hold time	5	–	ns
	t_{ACC8}	RD access time	–	50	ns
	t_{OH8}	Output disable time	10	50	ns

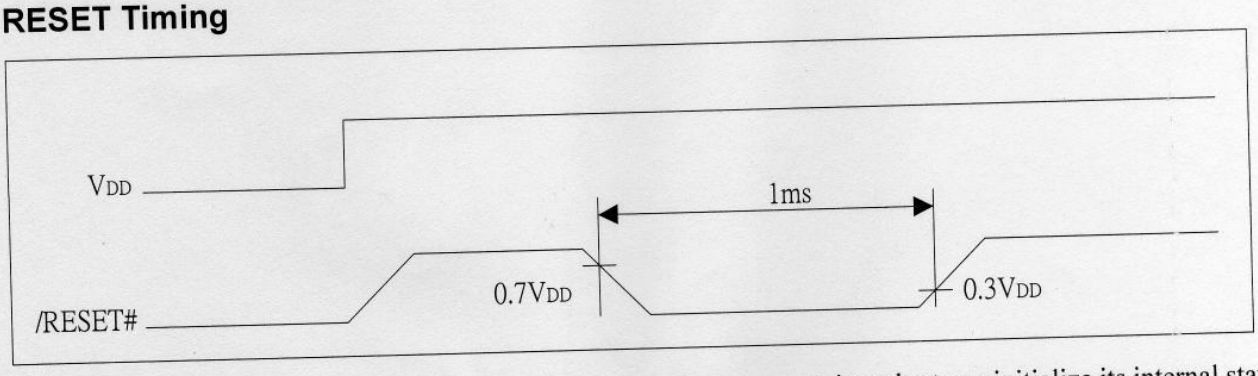
Note : For memory control and system control command:

$t_{CYC8}=2t_C+t_{CC}+t_{CEA}+75 > t_{ACV}+245$

For all other commands:

$t_{CYC8}=4t_C+t_{CC}+30$

RESET Timing



The S1D13700F01 requires a reset pulse of at least 1 ms after power-on in order to re-initialize its internal state. For maximum reliability,it is not recommended to apply a DC voltage to the LCD panel while the S1D13700F01 is reset .Turn off the LCD power supplies for at least one frame period after the start of the reset pulse.

During the reset period the S1D13700F01 cannot receive commands.Commands to initialize the initialize registers should be issued soon after a reset.During reset,theLCD drive signals FPDAT,FPLINE and FR are halted.

A delay of 3ms(maximum) is required following the rising edges of both /RESET# and VDD to allow for system stabilizayion. This delay allows the clock used by the internal oscillator circuit become stable before use.

2.4 Display Command

Class	Command	Code											Hex	Command description
		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0		
System control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialize device and display
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter standby mode
Display control	DISP ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58. 59	Enable and disable display and display flashing
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	Set display start address and display regions
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor type
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	5A	Set horizontal scroll position
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	Set display overlay format
	GRAY SCALE	1	0	1	0	1	1	0	0	0	0	0	40	Setup grayscale display mode
Drawing control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	Set cursor address
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	Read cursor address
Memory control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	Write to display memory
	MRAD	1	0	1	0	1	0	0	0	0	1	1	43	Read from display memory

Notes

1. In general, the internal registers of the SED 13700 series are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new input will have been changed but the remaining parameter registers are unchanged.

   2-byte parameters (where two bytes are treated as 1 data item) are handled as follows:

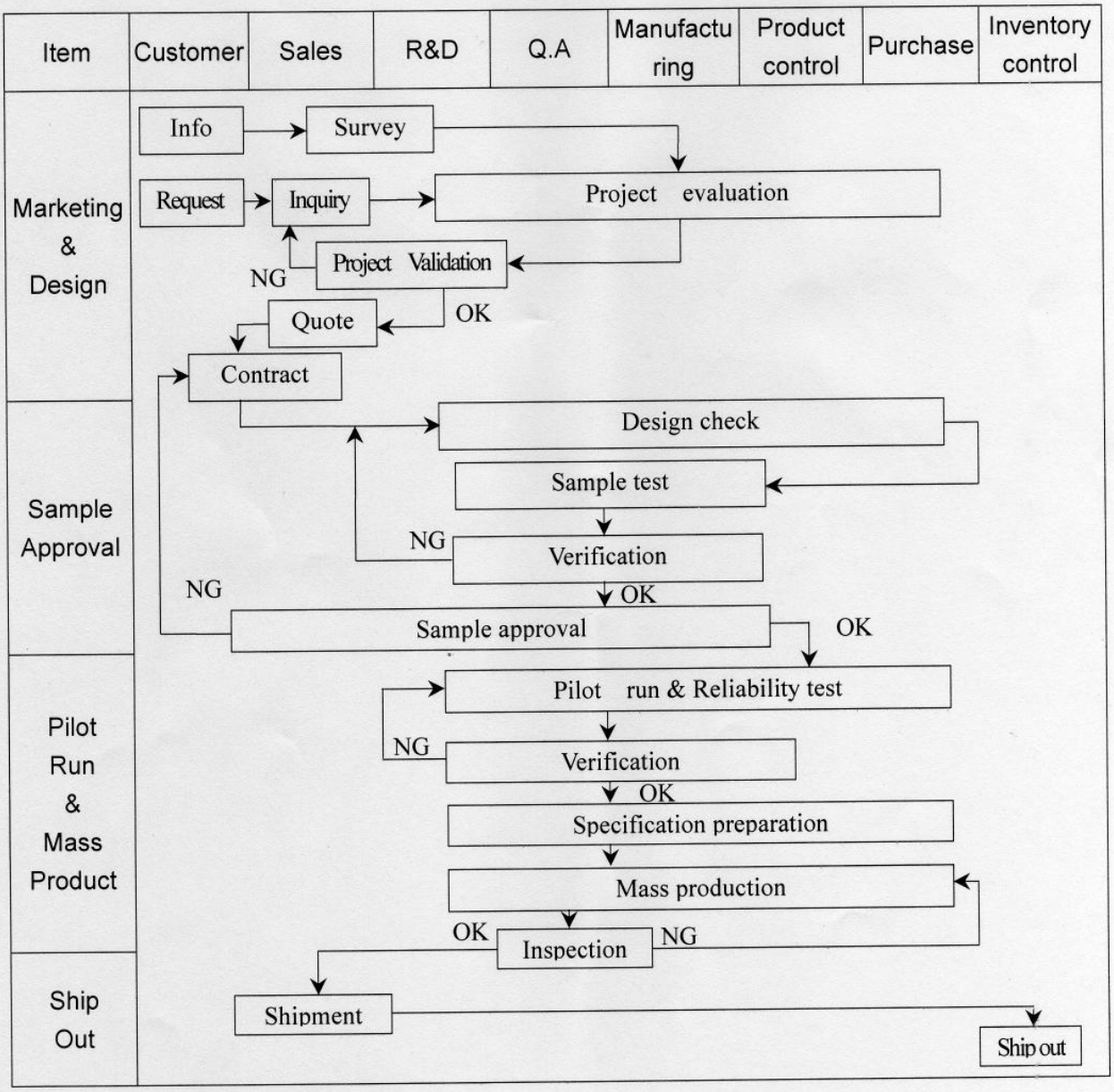
   a. CSRW, CSRR: Each byte is processed individually. The microprocessor may read or write just the low byte of the cursor address.

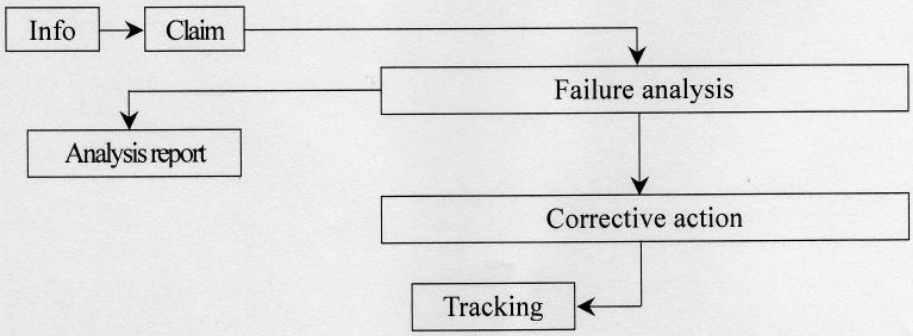
   b. SYSTEM SET, SCROLL, CGRAM ADR: Both parameter bytes are processed together. If the command is changed after half of the parameter has been input, the single byte is ignored.

2. APL and APH are 2-byte parameters, but are treated as two 1-byte parameters.

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

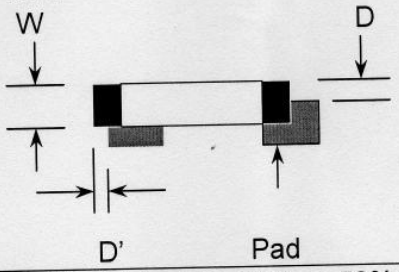


Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

3.2 Inspection Specification

Inspection Standard：MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ。
Equipment：Gauge、MIL-STD、Powertip Tester、Sample。
IQC Defect Level：Major Defect AQL 0.4; Minor Defect AQL 1.5。
FQC Defect Level：100% Inspection。
OUT Going Defect Level：Sampling。
Specification：

NO	Item	Specification	Judge	Level
1	Part Number	The part number is inconsistent with work order of production	N.G.	Major
2	Quantity	The quantity is inconsistent with work order of production	N.G.	Major
3	Electronic characteristics of LCM A=(L + W)÷2	The display lacks of some patterns.	N.G.	Major
		Missing line.	N.G.	Major
		The size of missing dot, A is＞1/2 Dot size	N.G.	Major
		There is no function.	N.G.	Major
		Output data is error	N.G.	Major
4	Appearance of LCD A=(L + W)÷2 Dirty particle (Including scratch、bubble)	Material is different with work order of production	N.G.	Major
		LCD is assembled in inverse direction	N.G.	Major
		Bezel is assembled in inverse direction	N.G.	Major
		Shadow is within LCD viewing area + 0.5 mm	N.G.	Major
		The diameter of dirty particle, A is＞0.4 mm	N.G.	Minor
		Dirty particle length is ＞3.0mm, and 0.01mm＜ width ≦0.05mm	N.G.	Minor
		Display is without protective film	N.G.	Minor
		Conductive rubber is over bezel 1mm	N.G.	Minor
		Polarizer exceeds over viewing area of LCD	N.G.	Minor
		Area of bubble in polarizer, A＞1.0mm, the number of bubble is ＞1 piece.	N.G.	Minor
		0.4mm＜Area of bubble in polarizer, A＜1.0mm, the number of bubble is ＞4 pieces.	N.G.	Minor
5	Appearance of PCB A=(L + W)÷2	Burned area or wrong part number is on PCB	N.G.	Major
		The symbol, character, and mark of PCB are unidentifiable.	N.G	Minor
		The stripped solder mask , A is＞1.0mm	N.G.	Minor
		0.3mm＜stripped solder mask or visible circuit, A ＜ 1.0mm, and the number is ≧4 pieces	N.G.	Minor
		There is particle between the circuits in solder mask	N.G	Minor
		The circuit is peeled off or cracked	N.G	Minor
		There is any circuits risen or exposed.	N.G	Minor
		0.2mm＜Area of solder ball, A is ≦0.4mm The number of solder ball is ≧3 pieces	N.G	Minor
		The magnitude of solder ball, A is ＞0.4mm.	N.G	Minor

NO	Item	Specification	Judge	Level
6	Appearance of molding A=(L + W)÷2	The shape of modeling is deformed by touching.	N.G.	Major
		Insufficient epoxy: Circuit or pad of IC is visible	N.G.	Minor
		Excessive epoxy: Diameter of modeling is >20mm or height is >2.5mm	N.G.	Minor
		The diameter of pinhole in modeling, A is >0.2mm.	N.G.	Minor
7	Appearance of frame A=(L + W)÷2	The folding angle of frame must be >45° +10°	N.G.	Minor
		The area of stripped electroplate in top-view of frame, A is >1.0mm.	N.G.	Minor
		Rust or crack is (Top view only)	N.G.	Minor
		The scratched width of frame is >0.06mm. (Top view only)	N.G.	Minor
8	Electrical characteristic of backlight A=(L + W)÷2	The color of backlight is nonconforming	N.G.	Major
		Backlight can't work normally.	N.G.	Major
		The LED lamp can't work normally	N.G.	Major
		The unsoldering area of pin for backlight, A is >1/2 solder joint area.	N.G.	Minor
		The height of solder pin for backlight is >2.0mm	N.G.	Minor
10	Assembly parts A=(L + W)÷2	The mark or polarity of component is unidentifiable.	N.G.	Minor
		The height between bottom of component and surface of the PCB is floating >0.7mm	N.G.	Minor
		D>1/4W 	N.G.	Minor
		End solder joint width, D' is >50% width of component termination or width of pad	N.G.	Minor
		Side overhang, D is >25% width of component termination.	N.G.	Minor
		Component is cracked, deformed, and burned, etc.	N.G.	Minor
		The polarity of component is placed in inverse direction.	N.G.	Minor
		Maximum fillet height of solder extends onto the component body or minimum fillet height is <0.5mm.	N.G.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition	
1	High Temperature Storage	Storage at 80 ±2℃ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage	Storage at -30 ±2℃ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Temperature /Humidity Storage	1.Storage 96~100 hrs 60±2℃, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer). or 2.Storage 96~100 hrs 40±2℃, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.	
4	Temperature Cycling	-20℃ → 25℃ → 70℃ → 25℃ (30mins) (5mins) (30mins) (5mins) 10 Cycle	
5	Vibration	10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs)	
6	ESD Test	Air Discharge: Apply 6 KV with 5 times discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		Testing location: Around the face of LCD	Testing location: 1.Apply to bezel. 2.Apply to Vdd, Vss.
7	Drop Test	Packing Weight (Kg)	Drop Height (cm)
		0 ~ 45.4	122
		45.4 ~ 90.8	76
		90.8 ~ 454	61
		Over 454	46

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.

5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is 25℃ ±5℃ 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.