

POWERTIP TECH. CORP.

DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer : _____

Model Type : LCD MODULE

Sample Code : _____

Mass Production Code : PG320240LRF-HNN-B(S0)

Revision : 0

Customer Sign	Sales Sign	Checked By	Prepared By

Revision Record

Date(y/m/d)	Rev.	Description	Note	Page
2002/06/05	0	New sample		



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1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	320 * 240 Dots
LCD Type	FSTN, Black & White, Transflective, Positive, Normal Temp.
Driver Type	1/240 Duty , 1/15 Bias
Viewing Direction	6 O'clock
Backlight	LED Backlight
Weight	-
Other	4bits parallel data input

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	92.0 (L) * 71.7 (w) * 10.0 (H)(Max)	mm
Viewing Area	78.78 (L) * 59.58 (w)	mm
Active Area	76.78 (L) * 57.58 (w)	mm
Dot Size	0.22 (L) * 0.22 (w)	mm
Dot Pitch	0.24 (L) * 0.24 (w)	mm
Interface connector	16-pin flat ribbon connector with 1mm pitch	-

1.3 Absolute Maximum Ratings

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply Voltage	Vdd	Reference to Vss(0V)	-0.3	-	7	V
	V _(B/L)	I _(B/L) =175mA max	-	4.1	4.4	V
Input voltage	V _{in}	-	-0.3	-	VDD+0.3	V
Operating temperature	T _{opr}	-	0	-	50	°C
Storage temperature	T _{stg}	-	-20	-	70	°C
Humidity	-	27°C	5	-	95	%RH



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1.4 DC Electrical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply Voltage	V _{dd}	Reference to V _{ss} (0V)	-0.3	-	7	V
	V _(B/L)	I _(B/L) =175mA max	-	4.1	4.4	V
Input voltage	V _{in}	-	-0.3	-	V _{DD} +0.3	V
Operating temperature	T _{opr}	-	0	-	50	°C
Storage temperature	T _{stg}	-	-20	-	70	°C
Humidity		27°C	5	-	95	%RH

1.5 Optical Characteristics

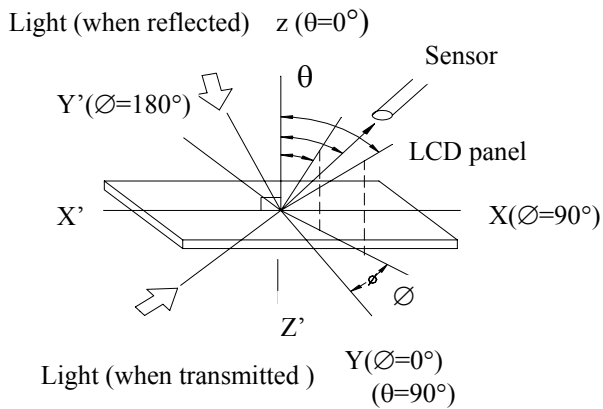
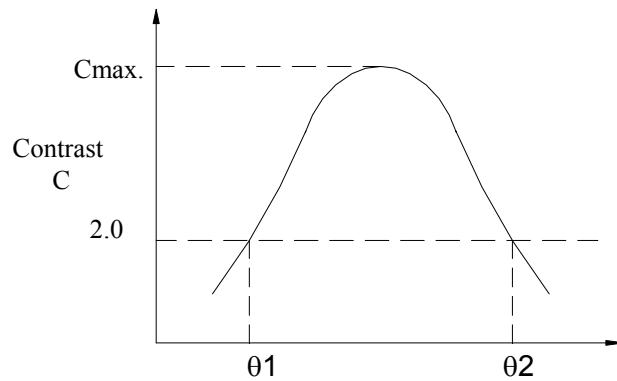
V_{OPR}=23V, 1/240 duty, 1/15 bias, Ta=25°C

Item	Symbol	Conditions	Min.	Typ.	Max	Reference
Viewing angle	θ2-θ1	C≥4.0, Ø=±25° θ1=-20° θ2=+30°	50°	-	-	Notes 1 & 2
Contrast	C	θ=25° Ø=±25° θ=15° θ=0°	4 5 6	-	-	Note 3
Response time(rise)	T _r	θ=25° Ø=±25° θ=-5° θ=-10°	-	-	300ms 1250ms 1900ms	Note 4
Response time(fall)	T _f	θ=25° Ø=±25° θ=-5° θ=-10°	-	-	400ms 2500ms 3750ms	Note 4



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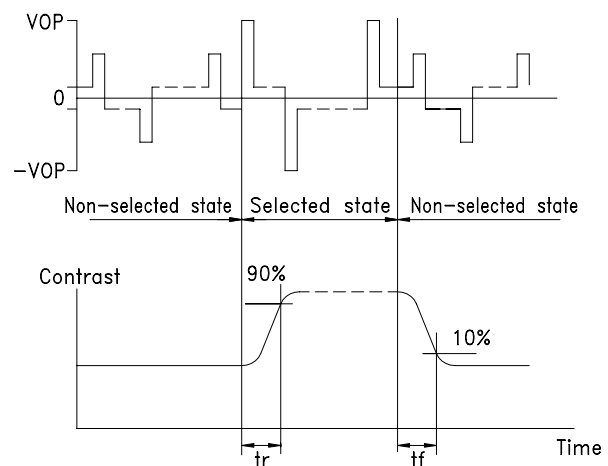
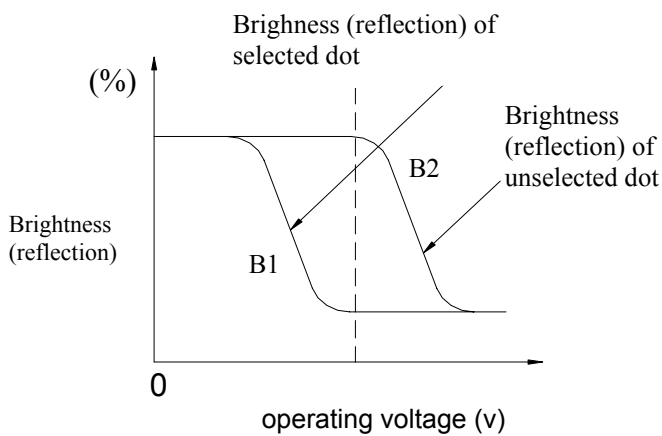
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Note 1: Definition of angles θ and $\varnothing$ Note 2: Definition of viewing angles θ_1 and θ_2 viewing angle θ ($\varnothing$ fixed)

Note : Optimum viewing angle with the naked eye and viewing angle θ at C_{max} . Above are not always the same

Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



Note: Measured with a transmissive LCD panel which is displayed 1 cm^2

V_{OPR} : Operating voltage
 t_r : Response time (rise)

f_{FRM} : Frame frequency
 t_f : Response time (fall)



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1.6 Backlight Characteristics

The LCD Module is built-in a LED backlight.

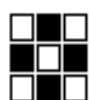
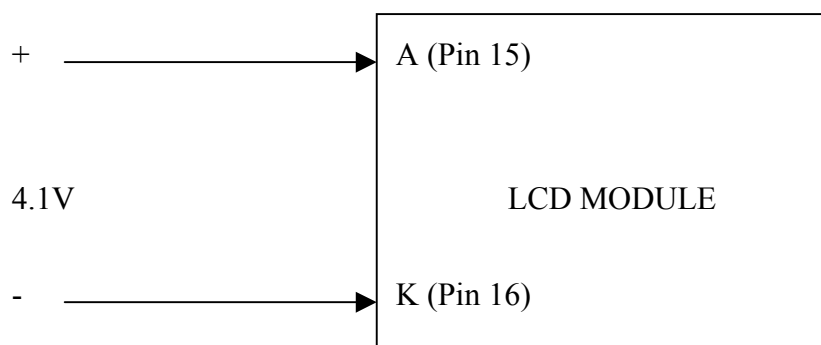
Absolute Maximum Ratings: (Ta=25°C)

Item	Symbol	Ratings	Unit
Peak forward current	IF	175	mA
Reverse voltage	VR	8	V
Power dissipation	Po	0.77	W
Operating temperature	Topr	-20 to +70	°C
Storage temperature	Tstg	-40 to +80	°C
Soldering temperature: 3 sec.		260	°C

Electrical/Optical specifications:

Item	Symbol	Condition	Min.	Typ	Max.	Unit
Forward Voltage	VF	IF=70 mA TA=25°C		4.1	4.4	V
Luminous intensity (Without LCD)	IV		7	9		cd/m ²
Luminous intensity (With LCD & Touch Panel)	IV		0.7	1.2		cd/m ²
Peak emission wavelength	Hue		569	-	576	nm
Spectral line half width	Δλ			30		nm
Reverse current	IR	VR=8 V			0.2	mA
Color	Yellow-green					

- Light the LED backlight



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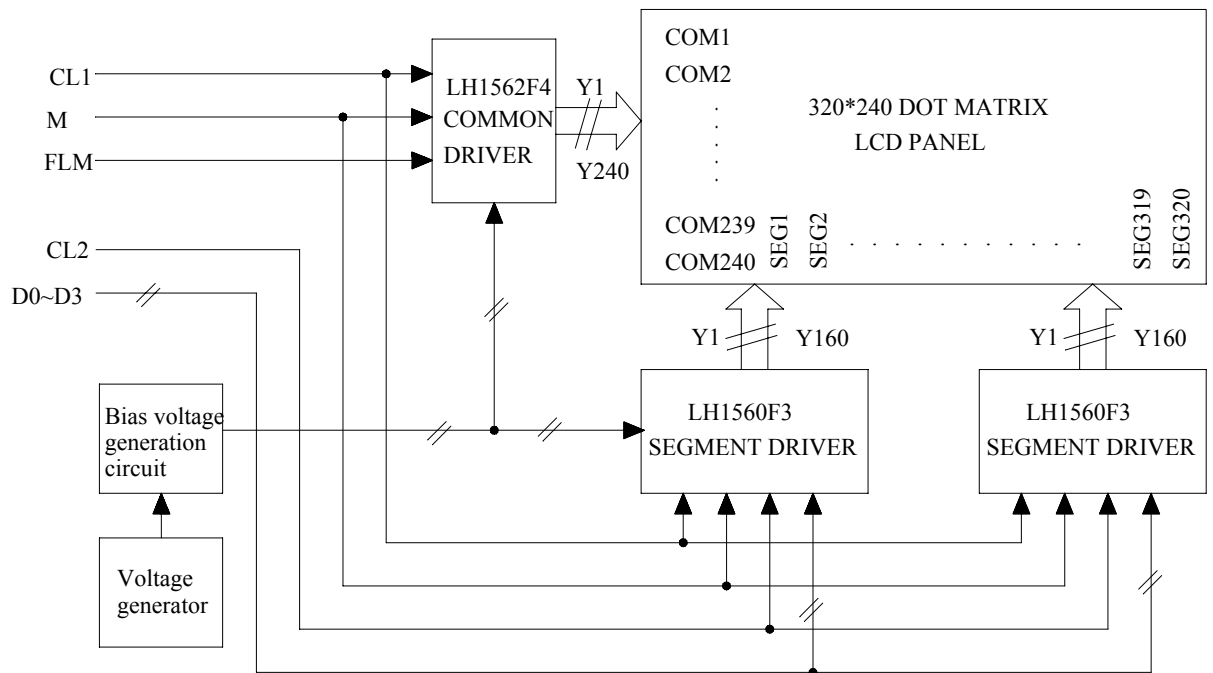
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2. MODULE STRUCTURE

The PG320240-H includes a common driver, two segment drivers, a bias voltage generation circuit, a LCD voltage generation circuit, and an edge type LED backlight.

2.1 Driver ICS

- Segment driver : LH1560F3*2 (SHARP)
- Common driver : LH1562F4*1 (SHARP)
- Block diagram



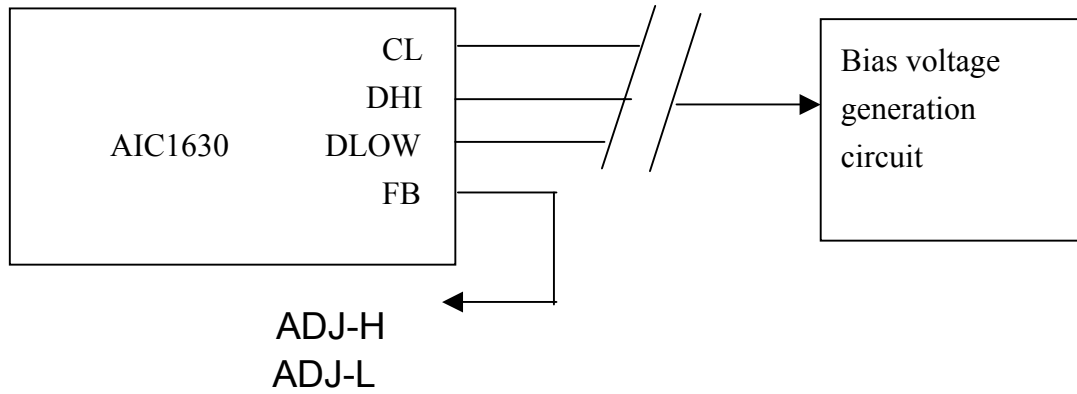
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2.2 LCD Voltage Generator

The bias voltage of the LCD display shall be generated on the LCD module. AN ADVANCE INFORMATION AIC1630 voltage regulator circuit generates the voltage needed to properly driver the LCD.

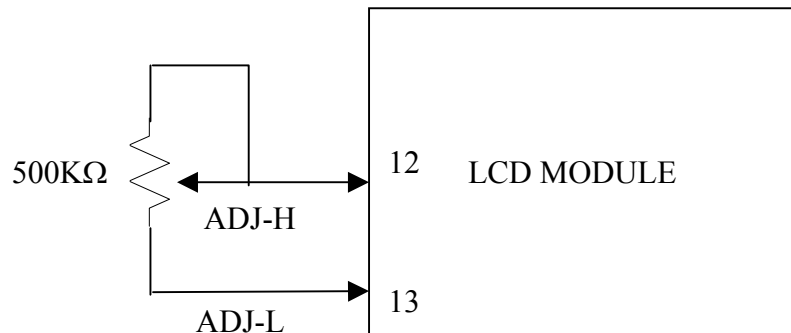
- Block diagram



2.3 Interface Pin Description

PIN	SIGNAL NAME	DESCRIPTION
1	FLM	Indicates the beginning of each display cycle.
2	M	AC signal input for LC driving waveform
3	CL1	Bi-directional shift register shift clock pulse input pin.
4	CL2	Clock input pin for taking display data
5	/D-OFF	Control input pin for output deselect level
6	D0	Display data input pin
7	D1	Display data input pin
8	D2	Display data input pin
9	D3	Display data input pin
10	VDD	Logic system power supply pin
11	VSS	Ground pin
12	ADJ-H	Contrast adjust(1)
13	ADJ-L	Contrast adjust(2)
14	NC	No connection
15	A	Power supply for Backlight (+)
16	K	Power supply for Backlight (-)

- Contrast Adjust



Vss=0V, Vdd=+4.5V to +5.5V, Ta=25°C

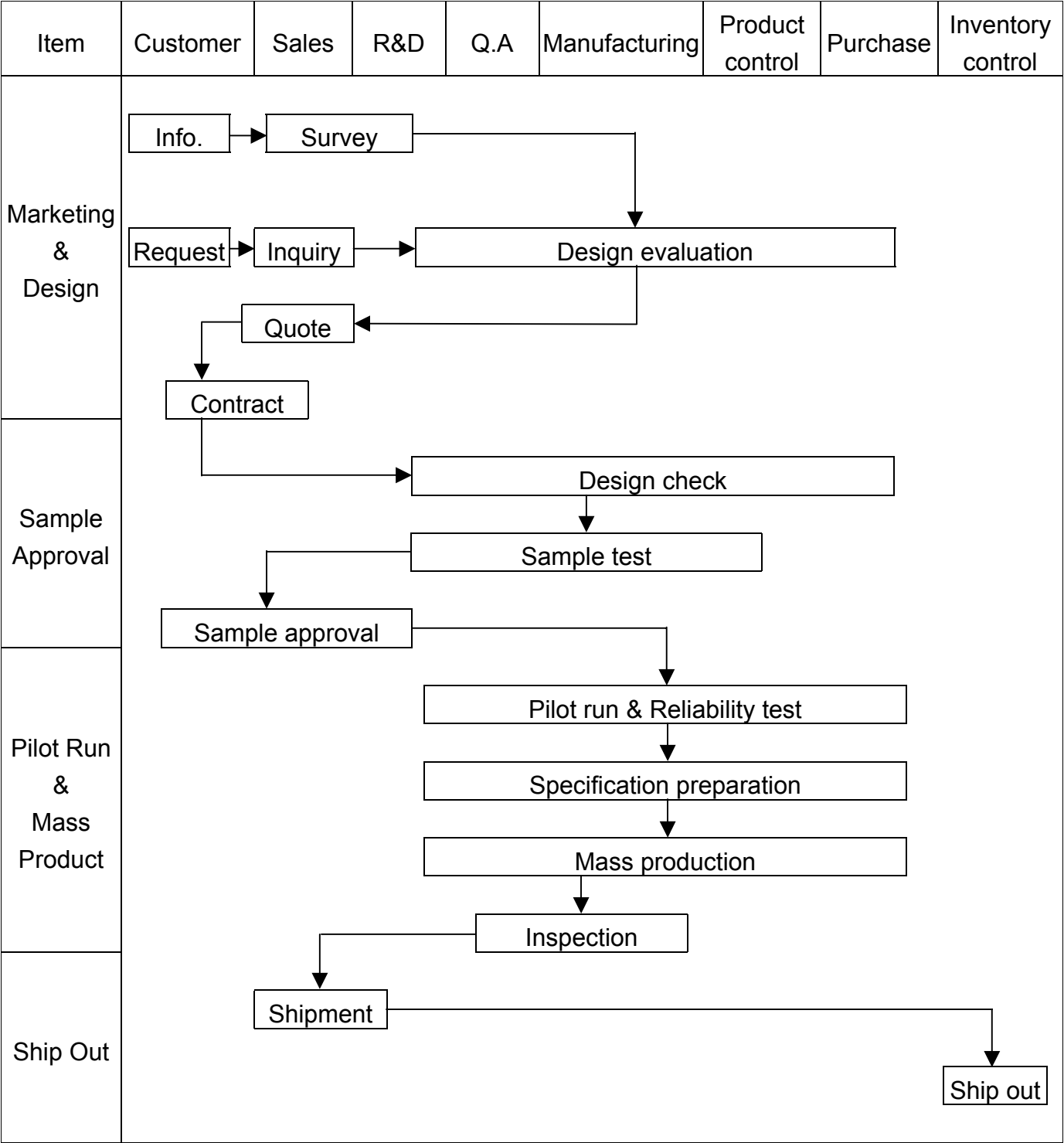
Parameter	Symol	Condition	Min.	Typ.	Max.	Unit
Shift clock period	t_{WCK}	$t_r, t_f \leq 10 \text{ ns}$	71			ns
Shift clock "H" pulse width	t_{WCKH}		23			ns
Shift clock "L" pulse width	t_{WCKL}		23			ns
Data setup time	t_{DS}		10			ns
Data hold time	t_{DH}		20			ns
Latch pulse "H" pulse width	t_{WLPH}		23			ns
Shift clock rise to Lath pulse rise time	t_{LD}		0			ns
Shift clock fall to Lath pulse fall time	t_{SL}		25			ns
Latch pulse rise to Shift clock rise time	t_{LS}		25			ns
Latch pulse fall to Shift clock fall time	t_{LH}		25			ns
Input signal rise time	t_r				50	ns
Input signal fall time	t_f				50	ns
/Dispoff removal time	t_{SD}		100			ns
/Dispoff "L" pulse width	t_{WDL}		1.2			us
Output delay time (1)	t_{pd1}, t_{pd2}	CL=15 pF			1.2	us
Output delay time (2)	t_{pd3}	CL=15 pF			1.2	us

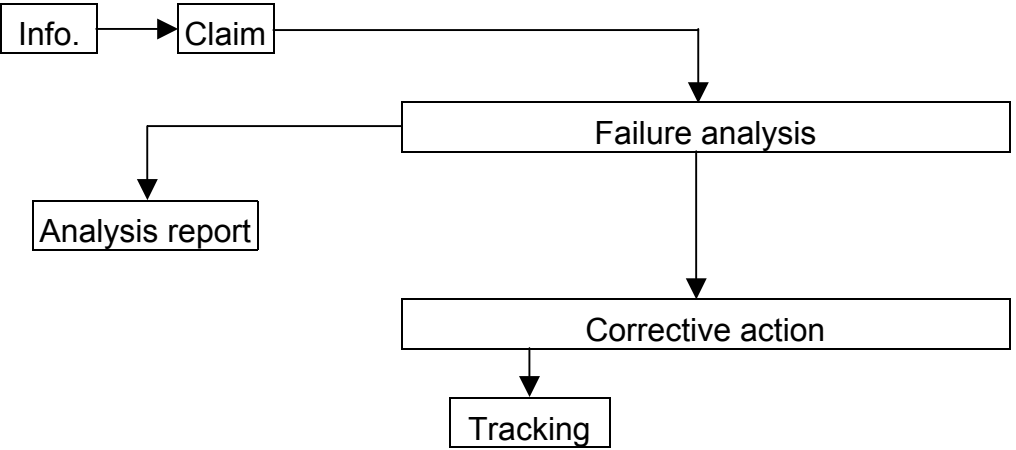
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3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



Sales Service	 <pre> graph TD Info[Info.] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> Report[Analysis report] Failure --> Action[Corrective action] Action --> Tracking[Tracking] </pre>
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management



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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 0.65; Minor Defect AQL 1.0 ◦

FQC Defect Level : 100% Inspection ◦

OUT Going Defect Level : Sampling ◦

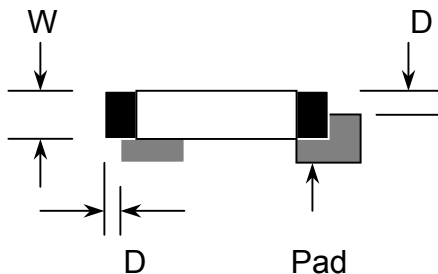
Specification :

N O	Item	Specification	Judge	Level
1	Part Number	Inconsistent with the P/N on the flow chart of production	N.G.	Major
2	Quantity	Inconsistent Q'TY with the flow chart of production	N.G.	Major
3	Electronic characteristics $A = (L + W) \div 2$	Display short	N.G.	Major
		Missing line	N.G.	Major
		Dot missing $A > 1/2$ Dot size	N.G.	Major
		No function	N.G.	Major
		Out put data error	N.G.	Major
4	Appearance $A = (L + W) \div 2$	Material difference with flow chart	N.G.	Major
		LCD Assembled in opposite direction	N.G.	Major
		Bezel assembled in opposite direction	N.G.	Major
		Shadow within LCD V./A + 1.0 mm	N.G.	Major
		Dirty particle $A > 0.4$ mm	N.G.	Minor
	Dirty particle (Include scratch 、 bubble)	Dirty particle length > 3.0 mm And $0.01\text{mm} < \text{Width} \leq 0.05\text{mm}$ (Width $> 0.05\text{mm}$ Measure by area)	N.G.	Minor
		Without protective film	N.G.	Minor
		Conductive rubber over bezel	N.G.	Minor
5	PCB Appearance $A = (L + W) \div 2$	Burned PCB	N.G.	Major
		Green paint stripped & visible circuit $A > 1.0$ mm (Finish coat not counted in)	N.G.	Minor
		A particle across the circuit	N.G.	Minor
		Circuit split $> 1/2$ Circuit width	N.G.	Minor
		Any circuit risen	N.G.	Minor
		$0.2\text{mm} < \text{Tin ball area } A \leq 0.4\text{mm}$ And Q'TY > 4 Pieces	N.G.	Minor
		Tin ball area $A > 0.4\text{mm}$	N.G.	Minor



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N O	Item	Specification	Judge	Level
6	Molding appearance $A = (L + W) \div 2$	Too soft : Shape by touch changed	N.G.	Major
		Insufficient epoxy : IC circuit or IC pad visible	N.G.	Minor
		Excessive epoxy : Diameter $> 20\text{mm}$ Or High $> 2.5\text{mm}$	N.G.	Minor
		Pin hole through to IC and $A > 0.2\text{mm}$	N.G.	Minor
7	Bezel appearance $A = (L + W) \div 2$	Angle between frame and TAB $> 45^\circ + 10^\circ$	N.G.	Minor
		Electroplate strip A $> 1.0\text{mm}$ (Top view only)	N.G.	Minor
		Rust (Top view only)	N.G.	Minor
		Crack	N.G.	Minor
8	Backlight electric characteristics $A = (L + W) \div 2$	Error backlight color	N.G.	Major
		No function	N.G.	Major
		Any LED dot no function	N.G.	Major
		PIN soldering without tin A $> 1/2$ solder pad	N.G.	Minor
		Solder PIN high $> 1.5\text{mm}$	N.G.	Minor
9	LCD Appearance $A = (L + W) \div 2$	Polarize rise over V/A	N.G.	Minor
10	Assembly parts $A = (L + W) \div 2$	Components mark unclearly	N.G.	Minor
		Components' distance more than 0.7mm from the PCB	N.G.	Minor
		Error position ,not in center $D > 1/4W$	N.G.	Minor
				
		Non- solder area $>$ Twice solder area		
		Flux area A $> 1/4$ solder area		
		Component broken	N.G.	Minor



4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition		Applicable Standard
1	High Temperature Storage	Storage At $80 \pm 2^{\circ}\text{C}$ 96~100 hrs Surrounding Temperature , Then Storage At Normal Condition 4hrs.		MIL-202E
2	Low Temperature Storage	Storage At $-30 \pm 2^{\circ}\text{C}$ 96~100 hrs Surrounding Temperature, Then Storage At Normal Condition 4hrs.		MIL-202E
3	High Temperature Humidity Storage	1.Storage 96~100 hrs $60 \pm 2^{\circ}\text{C}$, 90~95%RH Surrounding Temperature, Then Storage At Normal Condition 4hrs .(Polarizer may fail in this environment). or 2.Storage 96~100 hrs $40 \pm 2^{\circ}\text{C}$, 90~95%RH Surrounding Temperature, Then Storage At Normal Condition 4 hrs.		MIL-202E
4	Temperature Cycling	$-20^{\circ}\text{C} \rightarrow 25^{\circ}\text{C} \rightarrow 70^{\circ}\text{C} \rightarrow 25^{\circ}\text{C}$ (30Mins) (5Mins) (30Mins) (5Mins) 10 Cycle		MIL-202E
5	Vibration	10~55Hz (1 Minute) 1.5mm X,Y And Z Direction * (Each 2hrs)		MIL-202E
6	Drop Test	Packing Weight (Kg)	Drop High (Cm)	MIL-810E
		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 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 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.



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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.

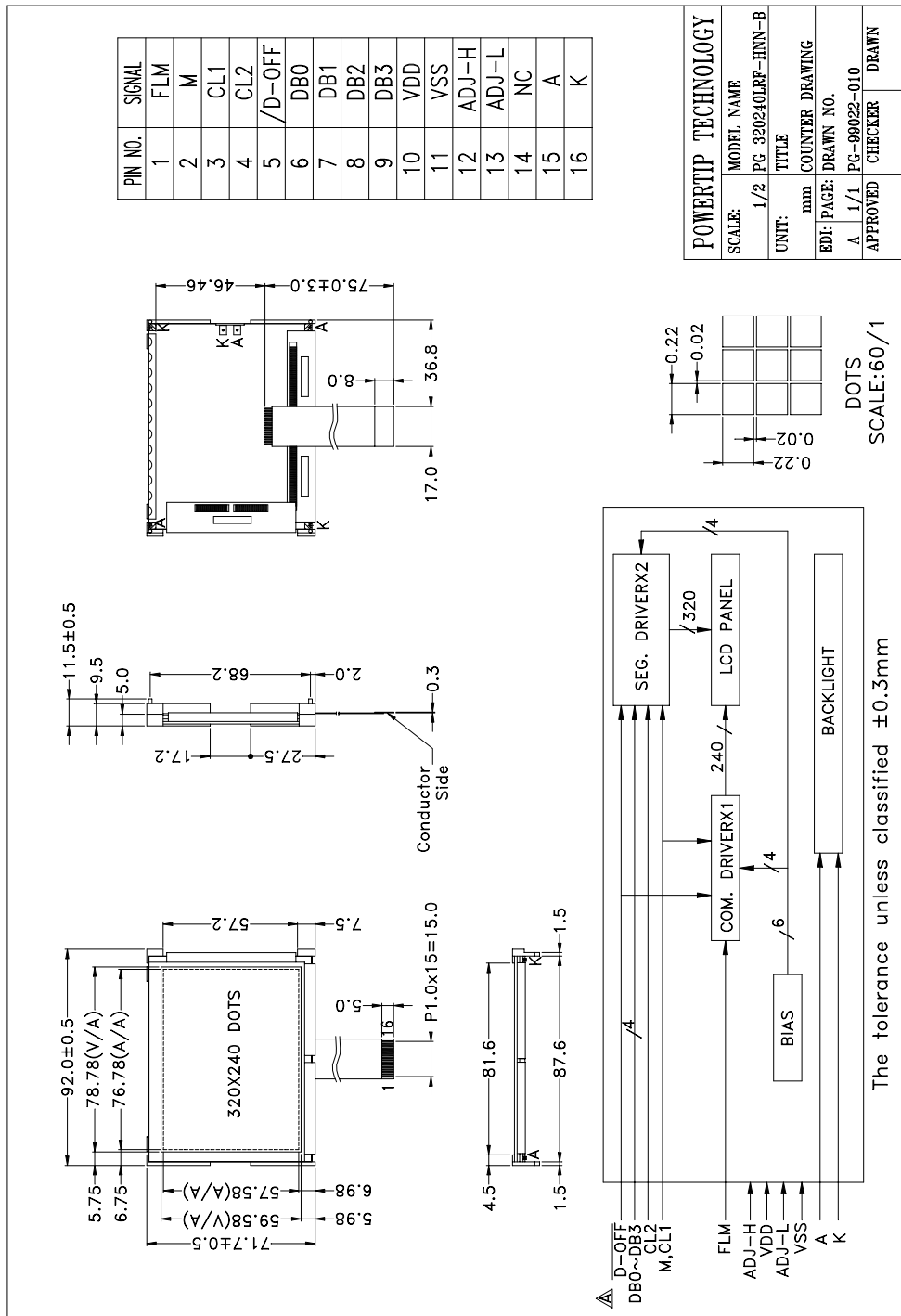
5.4.2 Unaccepted responsibility

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 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.



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