POWERTIP TECH. CORP.

DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer : _____

Model Type : LCD MODULE

Sample Code : PG640480FRT-ANN-I-S0

Mass Production Code : _____

Revision : 0

Customer Sign	Sales Sign	Checked By	Prepared By

Revision Record

Date(y/m/d)	Rev.	Description	Note	Page
2002/05/23	0	New sample		

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	640*480 Dots
LCD Type	FSTN, Transmissive, Negative, normal Temp.
Driver Type	1/240 Duty , 1/13 Bias
Viewing Direction	6 O'clock
Backlight	CCFL
Weight	-
Other	—

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	197 (L) * 145 (w) * 11.0 (H)(Max)	mm
Viewing Area	153 (L) * 115.745 (w)	mm
Active Area	151.555 (L) * 113.745 (w)	mm
Dot Size	0.217 (L) * 0.217 (w)	mm
Dot Pitch	0.237 (L) * 0.237 (w)	mm

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{DD}	—	0	6.0	V
LCD Driver Supply Voltage	V_{DD}-V_{EE}	—	0	45	V
Input Voltage	V_{IN}	—	-0.3	V_{DD} +0.3	V
Operating Temperature	T_{OP}	—	-20	70	°C
Storage Temperature.	T_{ST}	—	-30	80	°C
Humidity	H_D	—	-	90	%RH

1.4 DC Electrical Characteristics

V_{DD} = 5.0 V ± 10%, V_{SS} = 0V, Ta = 25°C

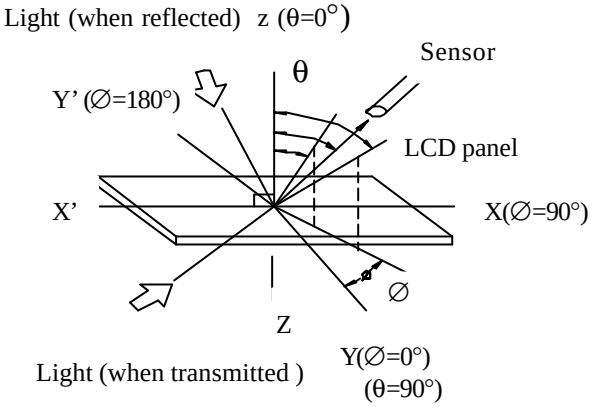
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	—	3.0	5	5.5	V
"H" Input Voltage	V_{IH}	—	0.8 V_{DD}	-	V_{DD}	V
"L" Input Voltage	V_{IL}	—	0	-	0.2 V_{DD}	V
"H" Output Voltage	V_{OH}	—	V_{DD}-0.3	-	V_{DD}	V
"L" Output Voltage	V_{OL}	—	0	-	0.3	V
Supply Current	I_{DD}	V_{DD} = 5.0 V	-	3	-	mA
Supply Current (B/L)	I(B/L)	450Vrms 30kHz	-	5	-	mA
LCD Driver Voltage	V_{OP}	V_{DD} – V_O	-	-	-	V
		V_{DD} - V_O (0°C)	-	23.5	-	
		V_{DD} - V_O (25°C)	-	22.3	-	
		V_{DD} - V_O (50°C)	-	20.5	-	

1.5 Optical Characteristics

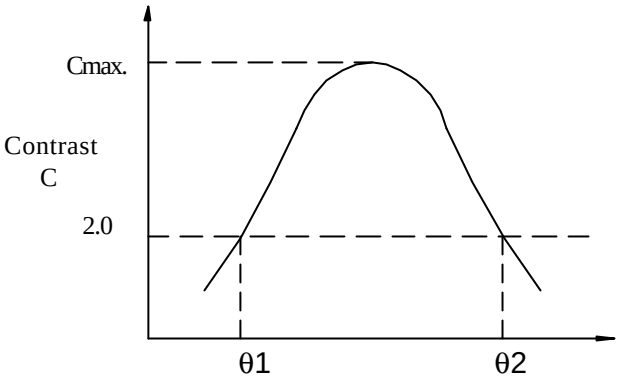
1/240 Duty, 1/13 Bias, VOP = 22.3 V, Ta = 25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	C≥2.0,∅= 0°	-22°	-	37°	Notes 1 & 2
Contrast Ratio	C	θ= 5°, ∅= 0°	-	4	-	Note 3
Response Time(rise)	tr	θ= 5°, ∅= 0°	-	150 ms	-	Note 4
Response Time(fall)	tf	θ= 5°, ∅= 0°	-	200 ms	-	Note 4
Luminance (LCM)	L	-	100	120	-	Cd/m^2

Note 1: Definition of angles θ and ∅



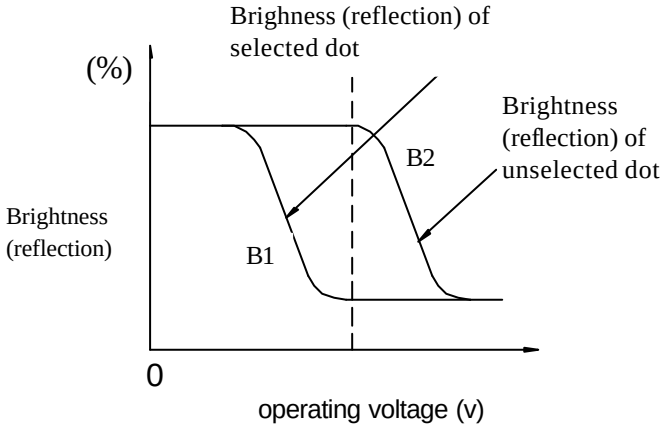
Note 2: Definition of viewing angles θ1 and θ2



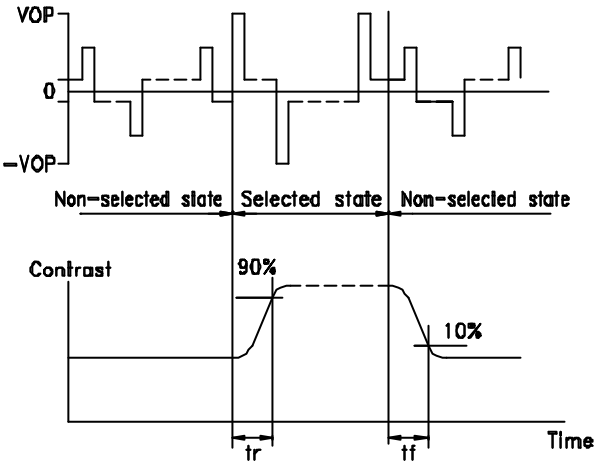
Note : Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same

Note 3: Definition of contrast C

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



Note 4: Definition of response time



Note: Measured with a transmissive LCD panel which is displayed 1 cm²

V_{OPR} : Operating voltage
f_{FRM} : Frame frequency
t_r : Response time (rise)
t_f : Response time (fall)

1.6 Backlight Characteristics

LCD Module with CCFL Backlight

Electrical Characteristics

Item	Spec	Unit	Condition
Start Voltage	590	Vrms	25°C
Tube Voltage	295	Vrms	
Tube Current	5±1.0	mA	
Power Consumption	1.5	W	
Driver Frequency	55	KHz	
Operating Temperature	0~60	°C	90% RH
Storage Temperature	-30~70	°C	
Half-brightness lift time	15000	Hours	50mA
Luminance	233	cd/m²	25°C

Optical Characteristics

Item	Min.	Typ.	Max.	Unit	Condition
Average Brightness (With LCD , Dots Off)	-	233	-	cd/m²	Ta =25°C 5mA Using TDK L10L Inverter
Brightness Uniformity	70%	85%	100%		

2. MODULE STRUCTURE

2.1 Counter Drawing

* See Appendix

2.2 Interface Pin Description

LCM Connector : MOLEX 53261-1590

Pin No.	Symbol	Symbol	Function
1	FP	H	The FLM signal indicating the beginning of each display cycle
2	LP	H L	Display data latch pulse
3	SCP	H L	Display data shift clock
4	/DISPOFF	-	“H” : Display ON ; “L” : Display OFF
5	VDD	-	Power supply for logic circuit
6	VSS	-	Ground
7	VEE	-	Contrast adjustment voltage, VEE-VSS=22.5V at 25°C
8~11	UD0~UD3	H/L	Upper Screen Display data
12~15	LD0~LD3	H/L	Lower Screen Display data

Mating connector:

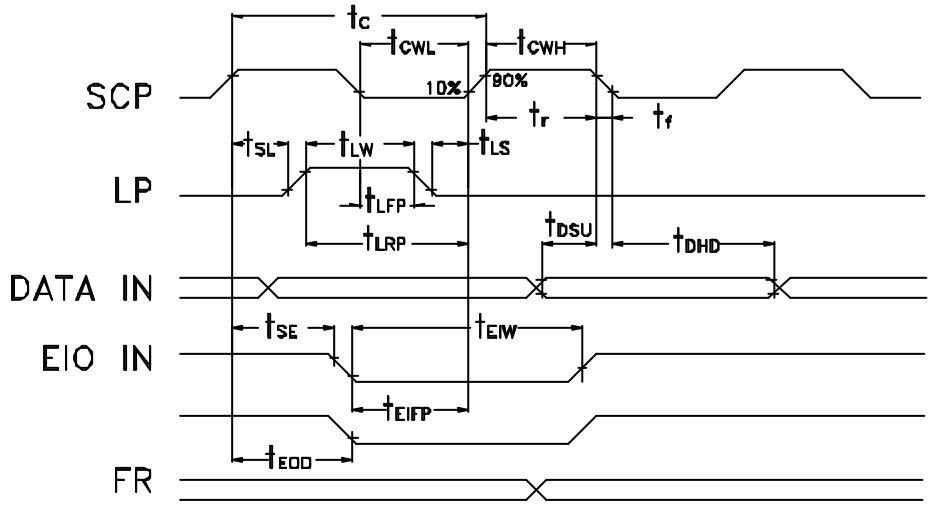
MOLEX 51021-1500(HOUSING)*1+MOLEX 50058-8000(TERMINAL)*15

CCFL Connector : MITSUMI : M63-M83-04

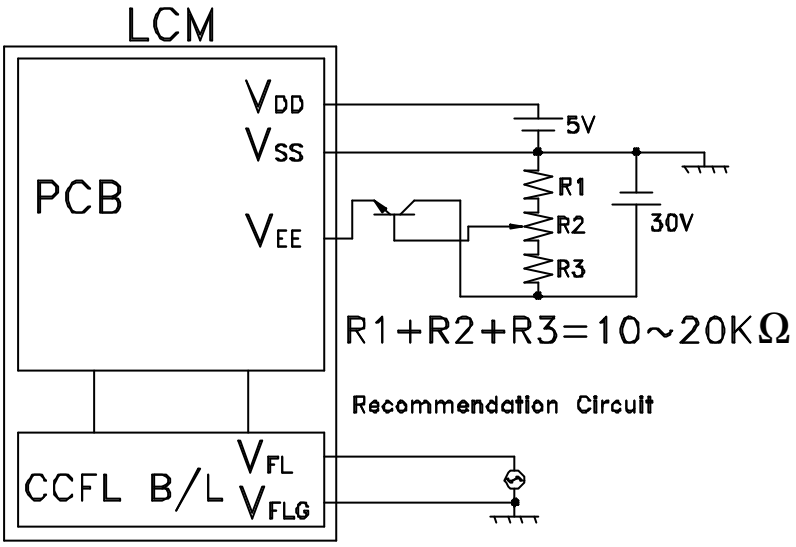
Interface	Pin	Signal	Function
CCFL Backlight	1	VFL	Power supply for CCFL backlight
	2-3	NC	No connection
	4	VFLG	Power supply for CCFL backlight

2.3 Timing Characteristics

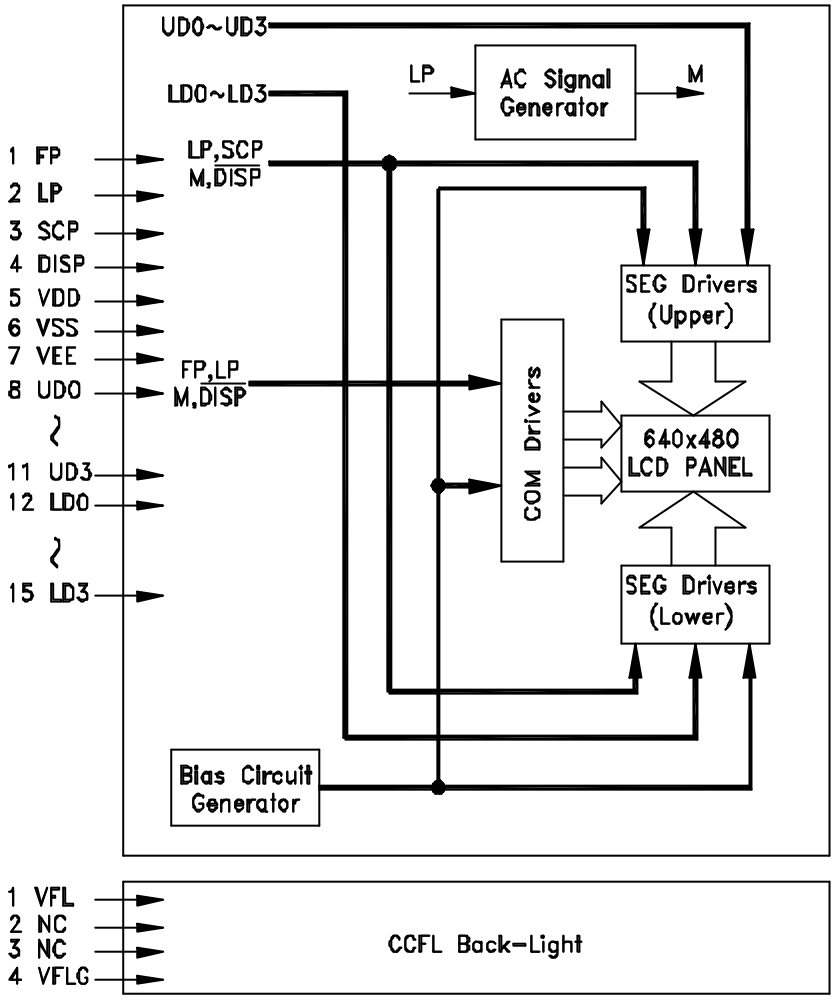
ITEM	Symbol	TEST CONDITIONS	Min	Max	Units
Clock Cycle	tc	-	125	-	ns
SCP Pulse Width	TcwH, tcwL	-	50	-	ns
DATA Set-up Time	tDSU	-	50	-	ns
DATA Hold Time	tDHD	-	50	-	ns
SCP Rise/Fall Time	tr,tf	-	-	(*5)	ns
LP Rise Time	tLRP	-	50	-	ns
LP Fall Time	tLFP	-	50	-	ns
LP Pulse Width	tLW	-	45	-	ns
SCP-to-LP Delay Time	tSL	-	40	-	ns
LP-to-SCP Delay Time	tLS	-	40	-	ns
EIO-in Fall Time	tEIFP	-	40	-	ns
EIO-in Pulse Width	tEIW	-	40	-	ns
SCP-to-EIP Delay Time	tSE	-	20	-	ns
EIO-out Delay Time	tEOD	(*6)	-	80	ns



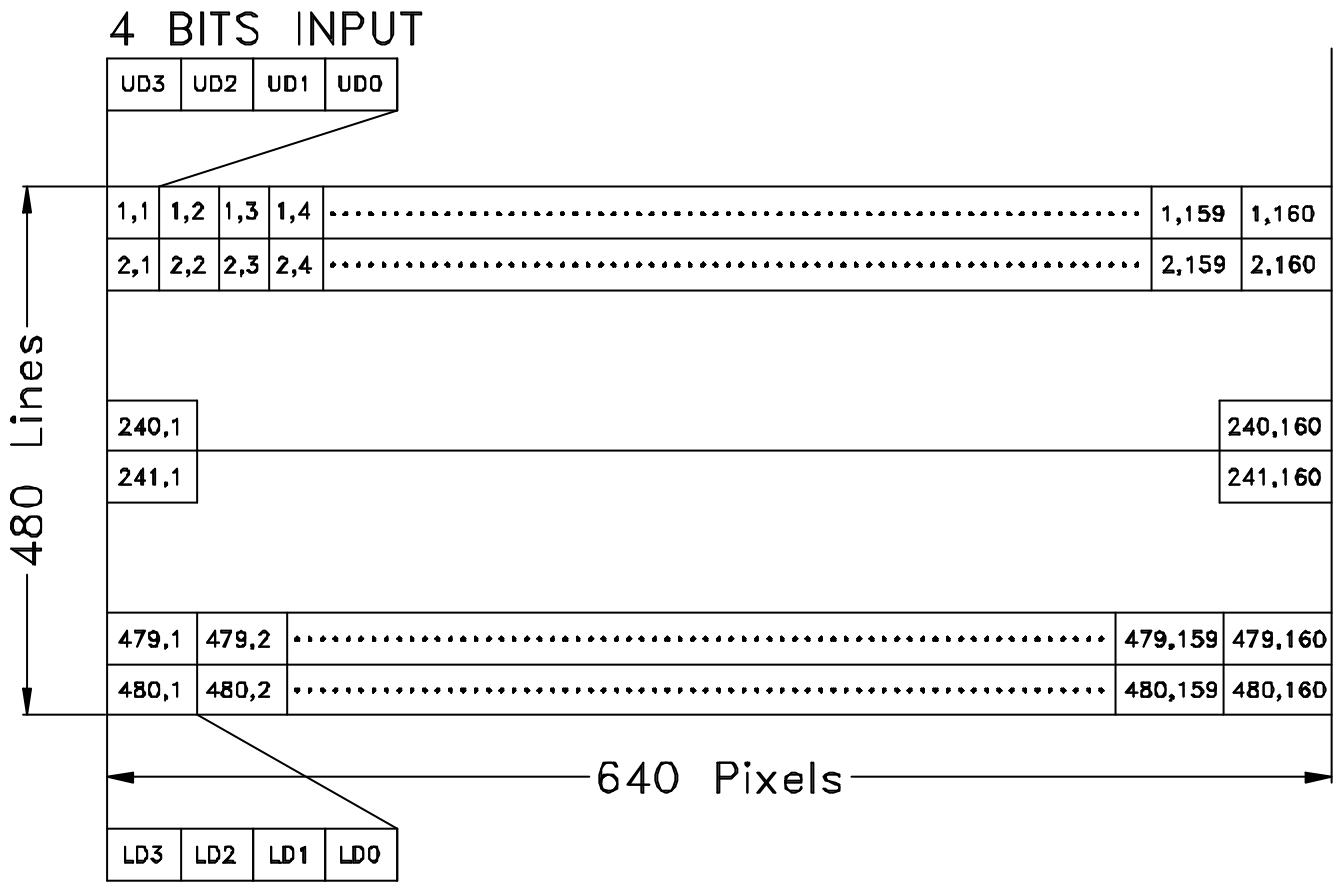
POWER SUPPLY



BLOCK DIAGRAM

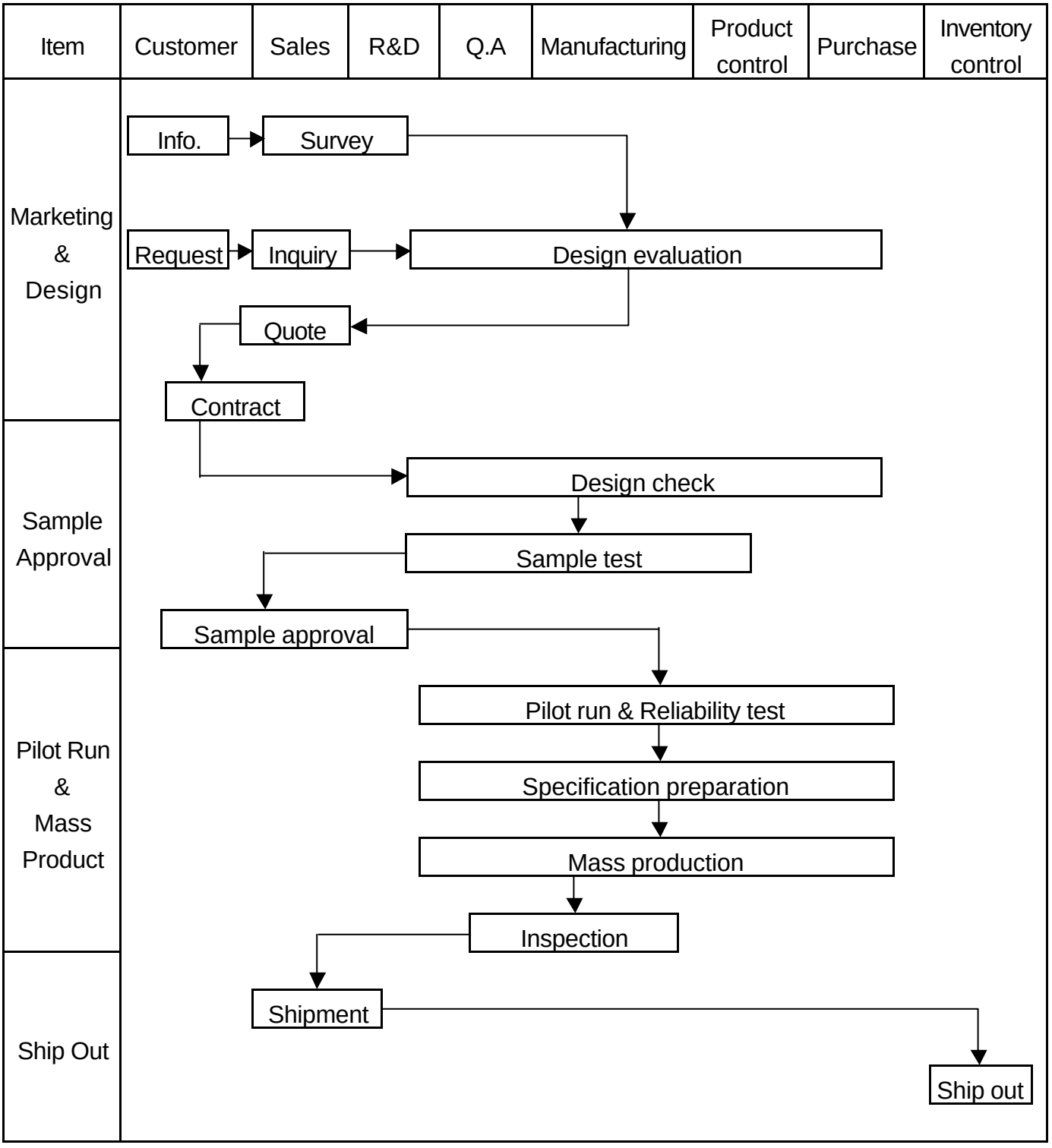


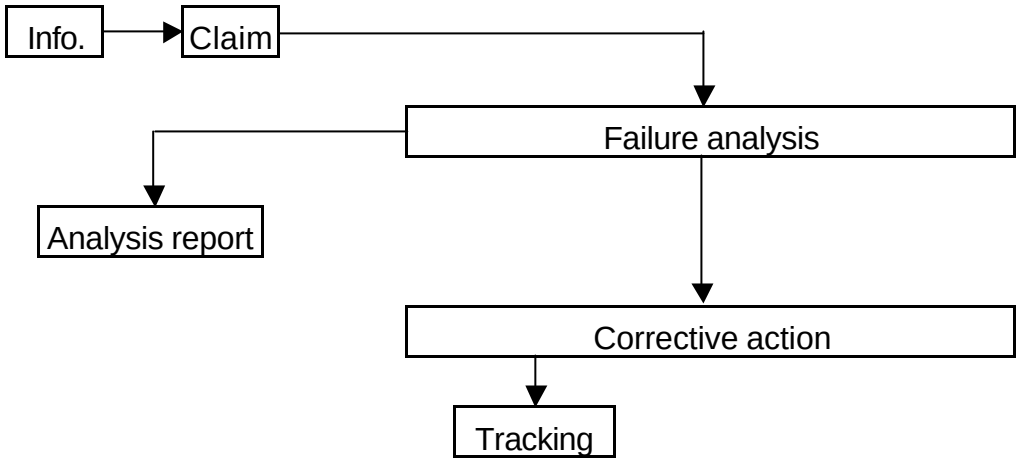
DISPLAY PATTERN



3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

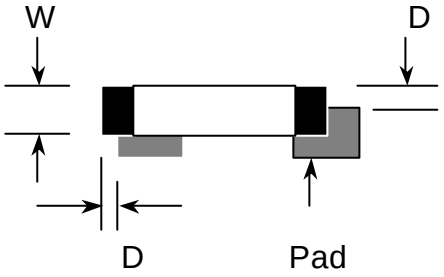


Sales Service	
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management

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)÷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)÷2 Dirty particle (Include scratch、bubble)	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 length ＞3.0mm And 0.01mm＜ Width ≦0.05mm (Width＞ 0.05mm 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)÷2	Burned PCB	N.G.	Major
		Green paint stripped & visible circuit A＞1.0mm (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
		0.2mm＜Tin ball area A≦0.4mm And Q'TY＞4 Pieces	N.G	Minor
		Tin ball area A＞0.4mm	N.G	Minor

N O	Item	Specification	Judge	Level
6	Molding appearance A=(L + W)÷2	Too soft：Shape by touch changed	N.G.	Major
		Insufficient epoxy：IC circuit or IC pad visible	N.G.	Minor
		Excessive epoxy：Diameter ＞20mm Or High＞2.5mm	N.G.	Minor
		Pin hole through to IC and A＞0.2mm	N.G.	Minor
7	Bezel appearance A=(L + W)÷2	Angle between frame and TAB＞45 +10	N.G.	Minor
		Electroplate strip A ＞1.0mm (Top view only)	N.G.	Minor
		Rust (Top view only)	N.G.	Minor
		Crack	N.G.	Minor
8	Backlight electric characteristics A=(L + W)÷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＞1.5mm	N.G.	Minor
9	LCD Appearance A=(L + W)÷2	Polarize rise over V/A	N.G.	Minor
10	Assembly parts A=(L + W)÷2	Components mark unclearly	N.G.	Minor
		Components' distance more than 0.7mm firm the PCB	N.G.	Minor
		Error position ,not in center D＞1/4W 	N.G.	Minor
		Non- solder area＞Twice solder area	N.G.	Minor
		Flux area A＞1/4 solder area	N.G.	Minor
		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 ±2℃ 96~100 hrs Surrounding Temperature, Then Storage At Normal Condition 4hrs.		MIL-202E
2	Low Temperature Storage	Storage At -30 ±2℃ 96~100 hrs Surrounding Temperature, Then Storage At Normal Condition 4hrs.		MIL-202E
3	High Temperature Humidity Storage	1.Storage 96~100 hrs 60 ±2℃, 90~95%RH Surrounding Temperature, Then Storage At Normal Condition 4hrs .(Polarizer may fail in this environment). or 2.Storage 96~100 hrs 40 ±2℃, 90~95%RH Surrounding Temperature, Then Storage At Normal Condition 4 hrs.		MIL-202E
4	Temperature Cycling	-20℃ → 25℃ → 70℃ → 25℃ (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℃ ±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.

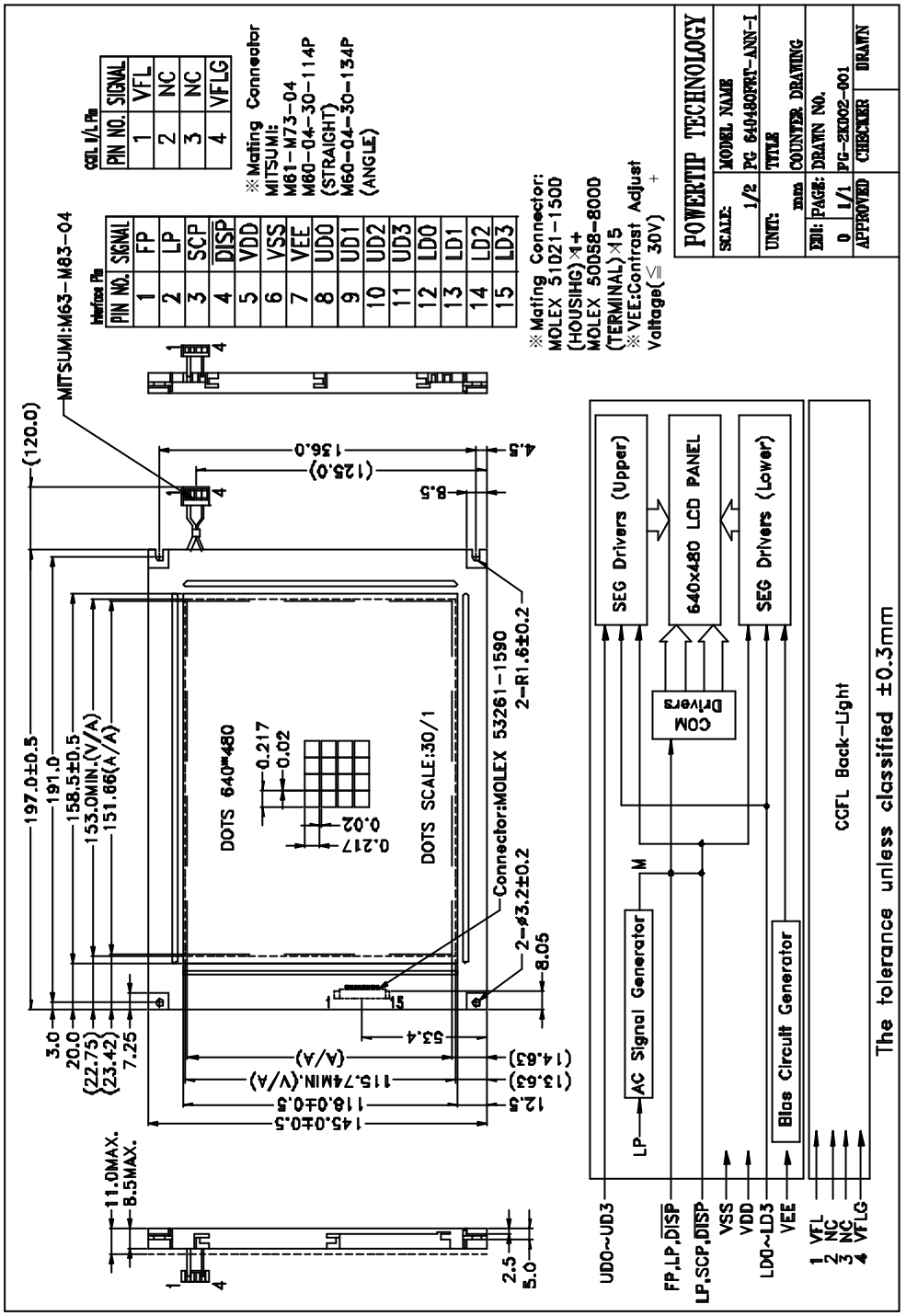
5.4 TERMS OF WARRANTY

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 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.


POWERTIP TECHNOLOGY
MODEL NAME
PG-640480FRT-ANN-I
TITLE
COUNTER DRAWING
DRAWN NO.
PG-2K002-001
CHECKER
DRAWN
SCALE: 1/2
UNIT: mm
PAGE: 1/1
APPROVED
CCFL I/L Pin
PIN NO. SIGNAL
1 VFL
2 NC
3 NC
4 VFLG
※Mating Connector
MITSUMI:
M61-M73-04
M60-04-30-114P
(STRAIGHT)
M60-04-30-134P
(ANGLE)
Interface Pin
PIN NO. SIGNAL
1 FP
2 LP
3 SCP
4 DISP
5 VDD
6 VSS
7 VEE
8 UD0
9 UD1
10 UD2
11 UD3
12 LD0
13 LD1
14 LD2
15 LD3
※Mating Connector:
MOLEX 51021-1500
(HOUSING)×1
MOLEX 50058-8000
(TERMINAL)×15
※VEE:Contrast Adjust
Voltage(≦ 30V)
MITSUMI:M63-M83-04
(120.0)
136.0
(125.0)
4.5
8.5
197.0±0.5
191.0
158.5±0.5
153.0MIN.(V/A)
151.66(A/A)
DOTS 640*480
0.217
0.02
0.02
0.217
DOTS SCALE:30/1
2-R1.6±0.2
Connector:MOLEX 53261-1590
2-ø3.2±0.2
8.05
53.4
3.0
20.0
(22.75)
(23.42)
7.25
(A/A)
115.74MIN.(V/A)
118.0±0.5
145.0±0.5
(14.63)
(13.63)
12.5
11.0MAX.
8.5MAX.
2.5
5.0
SEG Drivers (Upper)
640x480 LCD PANEL
SEG Drivers (Lower)
COM Drivers
AC Signal Generator
Bias Circuit Generator
CCFL Back-Light
LP
M
UD0~UD3
FP,LP,DISP
LP,SCP,DISP
VSS
VDD
LD0~LD3
VEE
1 VFL
2 NC
3 NC
4 VFLG
The tolerance unless classified ±0.3mm