

POWERTIP TECH. CORP.

DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer : _____

Model Type : LCD MODULE

Sample Code : PS640480FRC-ANN-C01

Mass Production Code : _____

Revision : 0

Customer Sign	Sales Sign	Checked By (QA)	Approved By	Prepared By

Revision Record

[illegible]

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1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	640 * 3 (R.G.B)(W) * 480 (H)Dots
LCD Type	Color STN , Transmissive , Negative
Driver Type	1/484 Duty
Viewing Direction	6 O'clock
Backlight	CCFL B/L
Weight	240 g
Other	-

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	197.0 (L) * 145.0 (w) * 8.0 (H)(Max)	mm
Viewing Area	158.0 (L) * 118.0 (w)	mm
Active Area	79.665 (L) * 59.745 (w)	mm
Dot Size	0.064 (L) * 0.222 (w)	mm
Dot Pitch	0.079 (L) * 0.237 (w)	mm

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	$V_{LCD} - V_{SS}$	-	0	42.0	V
Input Voltage	V_{IN}	-	$V_{SS} - 0.3$	$V_{DD} + 0.3$	V
Operating Temperature	T_{OP}	-	0	50	°C
Storage Temperature.	T_{ST}	-	-20	70	°C
Humidity	H_D	-	-	85	%RH



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1.4 DC Electrical Characteristics

 $V_{DD} = 5.0\text{ V}$, $V_{SS} = 0\text{ V}$, $T_a = 25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	-	4.5	5.0	5.5	V
“H” Input Voltage	V_{IH}	-	$0.8 V_{DD}$	-	V_{DD}	V
“L” Input Voltage	V_{IL}	-	0	-	$0.2 V_{DD}$	V
Supply Current	I_{DD}	$V_{DD} = 5.0\text{ V}$	-	10	30	mA
	I_{LCD}	$V_{DD} = 5.0\text{ V}$	-	12	50	
LCD Driver Voltage	V_{OP}	$V_{LCD} - V_{SS} (0^\circ\text{C})$	-	-	40	V
		$V_{LCD} - V_{SS} (25^\circ\text{C})$	35.1	36.6	38.1	
		$V_{LCD} - V_{SS} (40^\circ\text{C})$	32	-	-	

1.5 Optical Characteristics

 $1/484\text{ Duty}$, $V_{OPR} = 36.6\text{ V}$, $T_a = 25^\circ\text{C}$

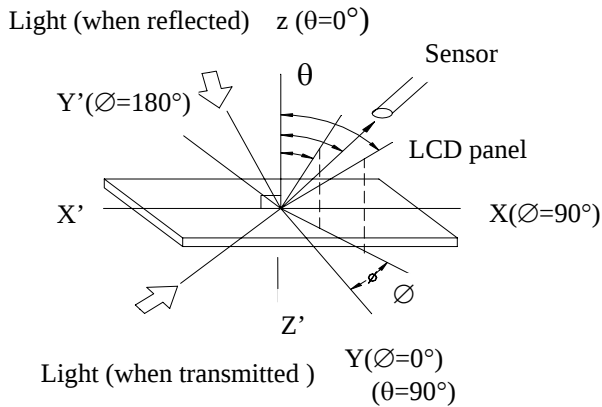
Item		Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle		θ	$C \geq 2.0, \varnothing = 0^\circ$	-60°	-	60°	Notes 1 & 2
Contrast Ratio		C	$\theta = 0^\circ, \varnothing = 0^\circ$	-	30	-	Note 3
Response Time(rise)		tr	$\theta = 0^\circ, \varnothing = 0^\circ$	-	340 ms	-	Note 4
Response Time(fall)		tf	$\theta = 0^\circ, \varnothing = 0^\circ$	-	100 ms	-	Note 4
Color Tone (CIE Coordinate)	R	X	$\theta = 0^\circ, \varnothing = 0^\circ$	0.44	0.49	0.54	-
		Y	$\theta = 0^\circ, \varnothing = 0^\circ$	0.30	0.35	0.40	-
	G	X	$\theta = 0^\circ, \varnothing = 0^\circ$	0.28	0.33	0.38	-
		Y	$\theta = 0^\circ, \varnothing = 0^\circ$	0.44	0.49	0.54	-
	B	X	$\theta = 0^\circ, \varnothing = 0^\circ$	0.15	0.20	0.25	-
		Y	$\theta = 0^\circ, \varnothing = 0^\circ$	0.16	0.21	0.26	-
	W	X	$\theta = 0^\circ, \varnothing = 0^\circ$	0.27	0.32	0.37	-
		Y	$\theta = 0^\circ, \varnothing = 0^\circ$	0.30	0.35	0.40	-



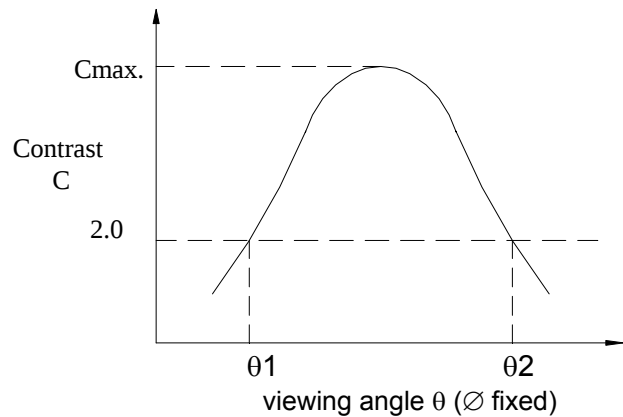
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Note 1: Definition of angles θ and ϕ



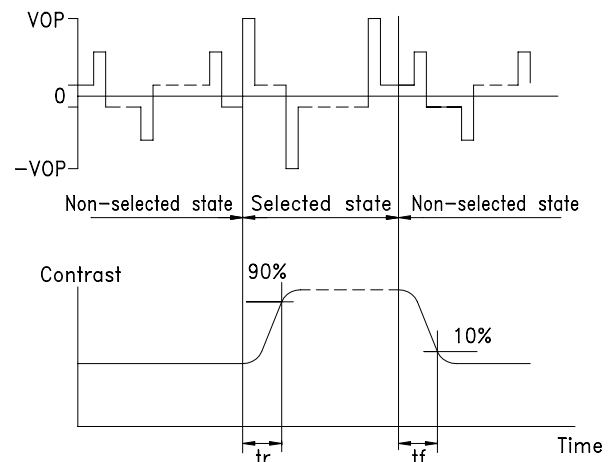
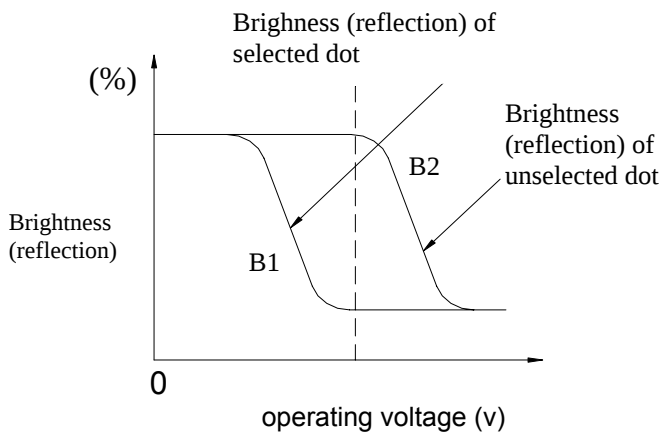
Note 2: Definition of viewing angles θ_1 and θ_2



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

LCD Module with CCFL Backlight

Electrical Characteristics

Item	Spec	Unit	Condition
Start Voltage	900	Vrms	25
Tube Voltage	440	Vrms	
Tube Current	4.0	mA	
Life Time	10000	Hr	
Driver Frequency	60	KHz	

Optical Characteristics

Item		Min.	Typ.	Max.	Unit	Condition
Average Brightness (With LCD , Dots all On)		-	100	-	cd/m ²	Inverter : CXA-K10L-FS2 , 5.0V Ta =25 ± 2 30~85% RH
Chromaticity	X	-	0.32	-	-	
	Y	-	0.35	-	-	



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2. MODULE STRUCTURE

2.1 Counter Drawing

* See Appendix

2.2 Interface Pin Description

CN1

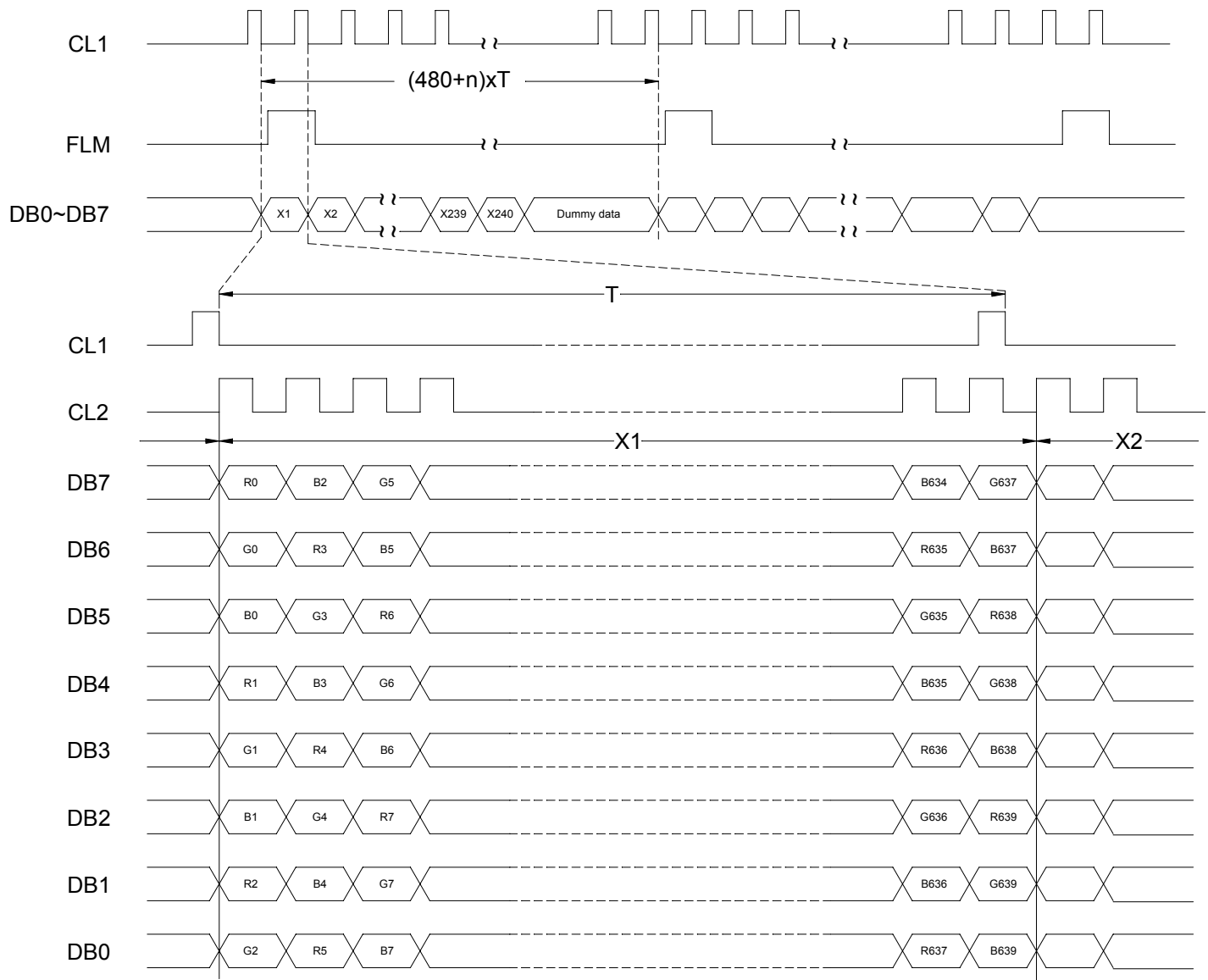
Pin No.	Symbol	Function
1	FLM	Scan start-up signal
2	V _{SS}	GND
3	CL1	Input data latch signal
4	V _{SS}	GND
5	CL2	Data shift clock
6	V _{SS}	GND
7 ~ 14	D0 ~ D7	Display data
15	DISP	Display control signal H : ON , L : OFF
16	V _{DD}	Logic supply voltage
17	V _{DD}	Logic supply voltage
18	V _{SS}	GND
19	V _{LCD}	Power supply for LCD
20	V _{SS}	GND

CN2 : M63-M83-04 (MITSUMI)

Pin No.	Symbol	Function
1	GND	CCFL GND
2	NC	No Connection
3	NC	No Connection
4	H.V	Power supply for CCFL



2.3 Timing Characteristics



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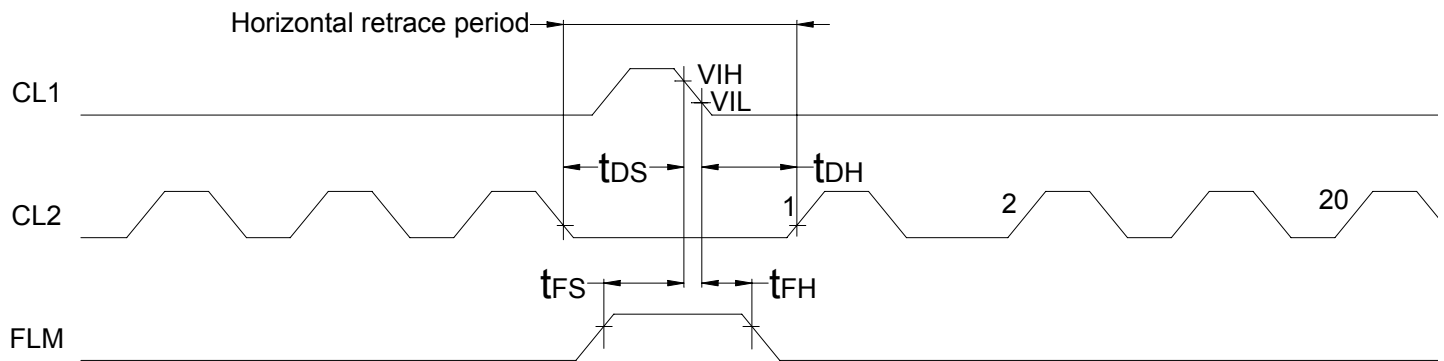
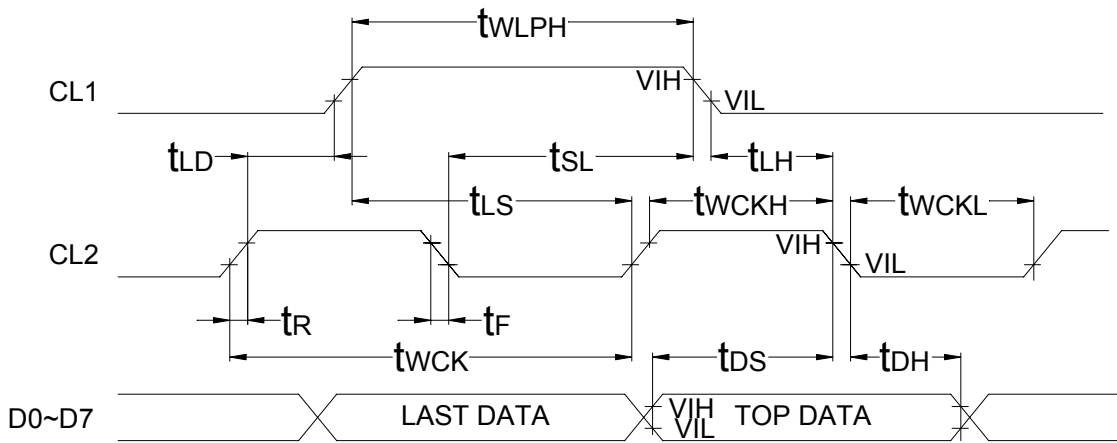
$$V_{DD} = 3.0 \sim 4.5 \text{ V}, V_{LCD} = 10 \sim 42 \text{ V}, T_a = 0 \sim 40$$

Item	Symbol	Min.	Typ.	Max.	Unit
Shift clock period	t_{wck}	66	-	-	ns
Shift clock "H" pulse wide	t_{wckH}	23	-	-	
Shift clock "L" pulse wide	t_{wckL}	23	-	-	
Data setup time	t_{DS}	10	-	-	
Data hold time	t_{DH}	25	-	-	
Latch pulse "H" pulse wide	t_{WLPH}	30	-	-	
Shift clock rise to latch pulse rise time	t_{LD}	10	-	-	
Shift clock fall to latch pulse fall time	t_{SL}	30	-	-	
Latch pulse rise to shift clock rise time	t_{LS}	30	-	-	
Latch pulse fall to shift clock fall time	t_{LH}	30	-	-	
Enable setup time	t_{TS}	12	-	-	
Input signal rise time	t_R	-	-	50	
Input signal fall time	t_F	-	-	50	
Out delay time (1)	t_D	-	-	44	
FLM setup time	t_{FS}	30	-	-	
FLM hold time	t_{FH}	50	-	-	



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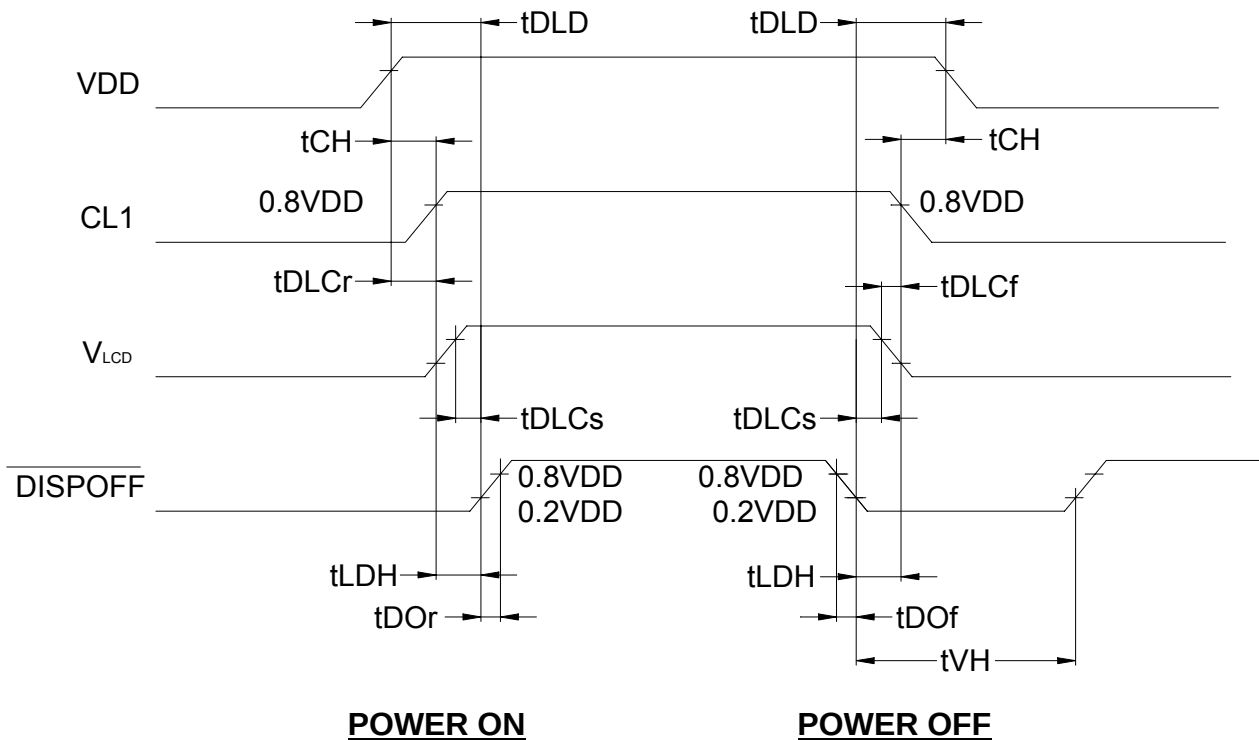


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2.4 Power Supply and Signal Sequence

Do not apply DC voltage to the LCD panel because it will induce the electrochemical reaction and reduce its life time. Please follow the power supply ON/OFF sequence To prevent DC driving of LCD or latch-up of COMS LSI, as shown below.



Symbol	Min.	Max.	unit	Comment
tDLD	200	-	ms	-
tCH	0	-	ms	
tLDH	20	-	ms	
tDOr	-	100	ns	-
tDOF	-	100	ns	
tDLCr	0	-	ms	
tDLCf	0	-	ms	
tDLCs	20	-	ms	
tVH	200	-	ms	

Note1 : Please keep the specified sequence because wrong sequence may cause permanent damage to the LCD panel.

Note2 : We recommends you to use /DISPOFF function.

Display quality may deteriorate if you don't use /DISPOFF function.



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2.5 Input Data Allocation Table

Data Signal	D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4		D4	D3	D2	D1	D0
X \ Y	1	2	3	4	5	6	7	8	9	10	11	12	...	1916	1917	1918	1919	1920
1	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
2	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
3	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
4	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
5	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
6	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
7	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
8	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
9	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
10	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
:	:	:	:	:	:	:	:	:	:	:	:	:		:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:	:	:		:	:	:	:	:
478	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
479	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
480	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B

R : RED

G : GREEN

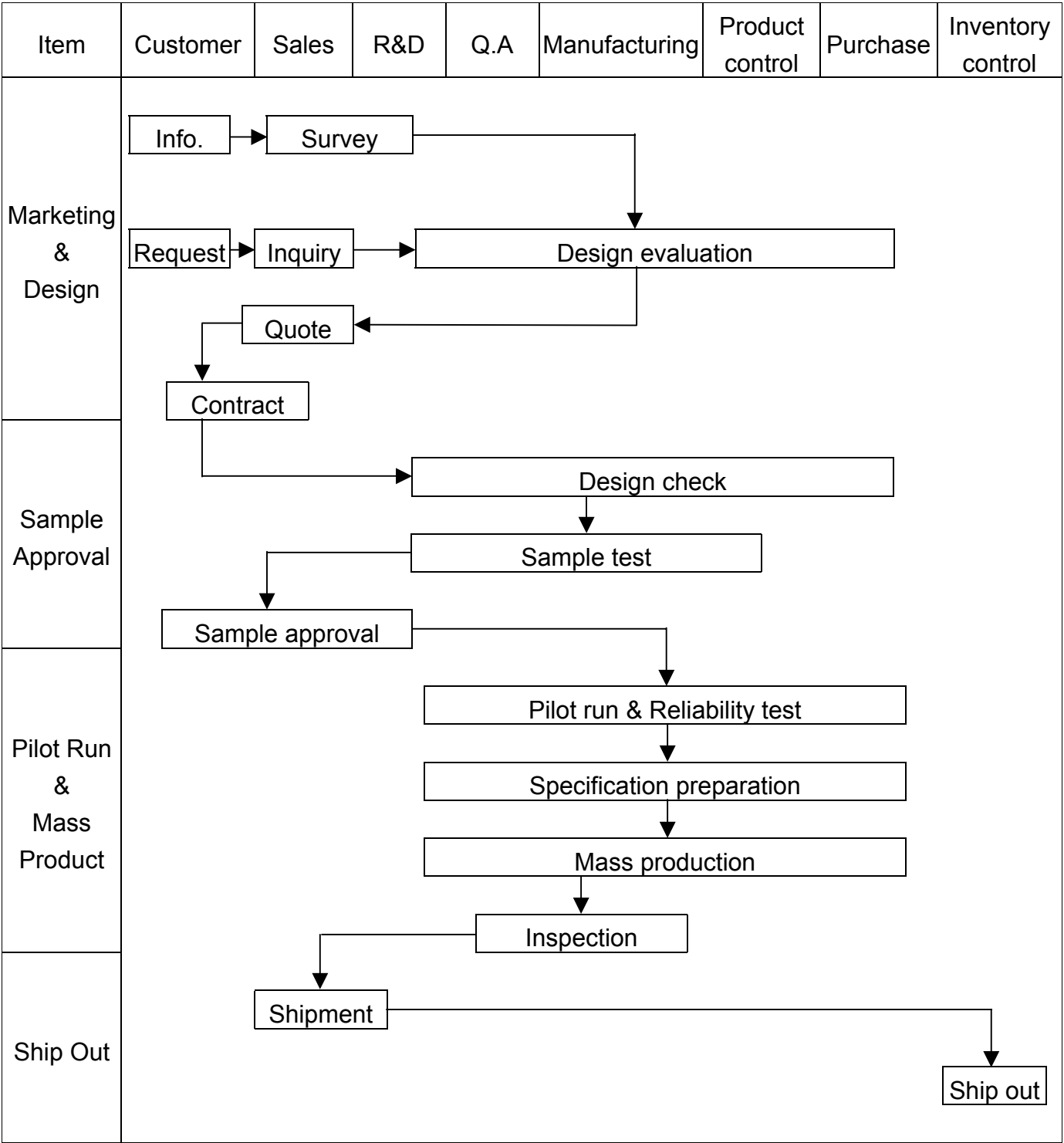
B : BLUE


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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 --> Analysis[Analysis report] Failure --> Corrective[Corrective action] Corrective --> 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 .

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.

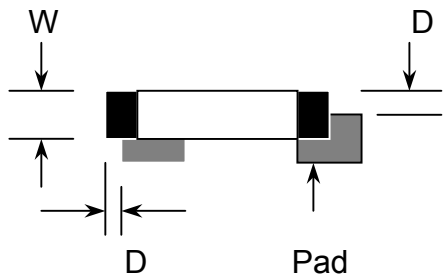
Specification :

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	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 > 3.0mm 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



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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 > 20mm Or High > 2.5mm	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 > 1.5mm	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	N.G.	Minor
		Flux area $A > 1/4$ solder area	N.G.	Minor
		Component broken	N.G.	Minor
			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	$\begin{array}{ccccccc} -20 & \rightarrow & 25 & \rightarrow & 70 & \rightarrow & 25 \\ \leftarrow & & & & & & \rightarrow \\ (30\text{Mins}) & (5\text{Mins}) & (30\text{Mins}) & (5\text{Mins}) & & & \end{array}$ 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 $\pm$ 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.

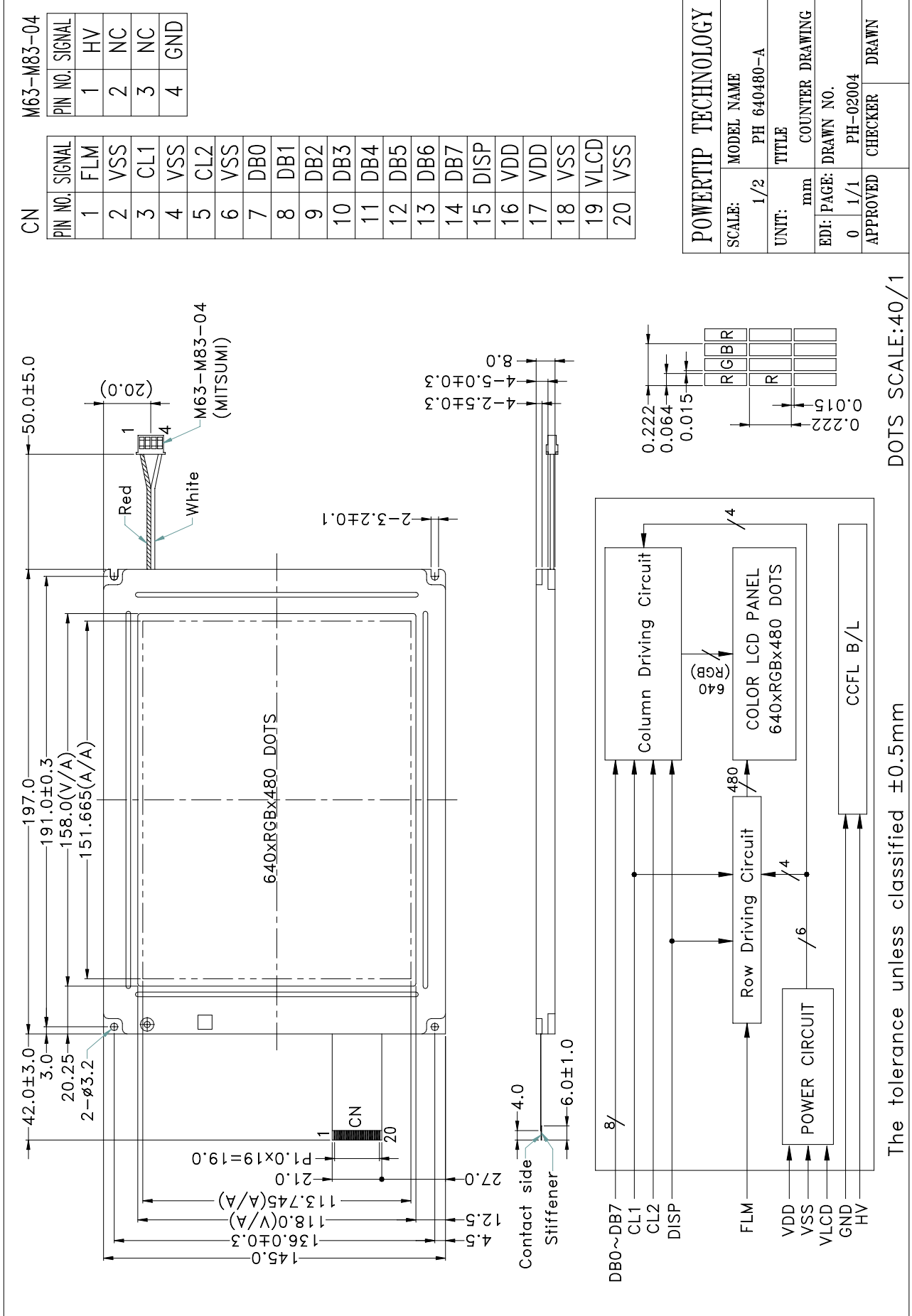
5.4.2 Unaccepted responsibility

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.



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