

POWERTIP TECH. CORP.
DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer : Eutronix

Model Type : LCD MODULE

Sample Code : PS320240FRC-BNN-C01

Mass Production Code : _____

Revision : 0

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

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1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	320 * 3 (R.G.B)(W) * 240 (H)Dots
LCD Type	Color STN , Transmissive , Negative
Driver Type	1/242 Duty
Viewing Direction	6 O'clock
Backlight	CCFL B/L
Weight	TBD
Other	-

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	74.6 (L) * 58.4 (w) * 4.8 (H)(Max)	mm
Viewing Area	59.6 (L) * 45.2 (w)	mm
Active Area	57.584 (L) * 43.184 (w)	mm
Dot Size	0.044 (L) * 0.164 (w)	mm
Dot Pitch	0.06 (L) * 0.18 (w)	mm

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{DD}	-	-0.3	5.0	V
LCD Driver Supply Voltage	$V_{LCD}-V_{SS}$	-	0	38.0	V
Input Voltage	V_{IN}	-	-0.3	$V_{DD}+0.3$	V
Operating Temperature	T_{OP}	-	0	40	°C
Storage Temperature.	T_{ST}	-	-20	60	°C
Humidity	H_D	-	-	85	%RH



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1.4 DC Electrical Characteristics

 $V_{DD} = 3.3 \text{ V} , V_{SS} = 0\text{V} , T_a = 25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	-	2.5	3.3	4.5	V
“H” Input Voltage	V_{IH}	-	$0.8 V_{DD}$	-	-	V
“L” Input Voltage	V_{IL}	-	-	-	$0.2 V_{DD}$	V
Supply Current	I_{DD}	$V_{DD} = 3.3 \text{ V}$	-	3.0	5.0	mA
	I_{LCD}	$V_{LCD} = 25.0 \text{ V}$	-	-	1.5	
	I_{IN}	$V_{IN} = V_{DD} \text{ or } V_{SS}$	-	-	10.0	μA
LCD Driver Voltage	V_{OP}	$V_{LCD} (0^\circ\text{C})$	-	-	-	V
		$V_{LCD} (25^\circ\text{C})$	-	25.0	-	
		$V_{LCD} (40^\circ\text{C})$	-	-	-	

1.5 Optical Characteristics

 $1/242 \text{ Duty} , V_{OPR} = 25.0 \text{ V} , T_a = 25^\circ\text{C}$

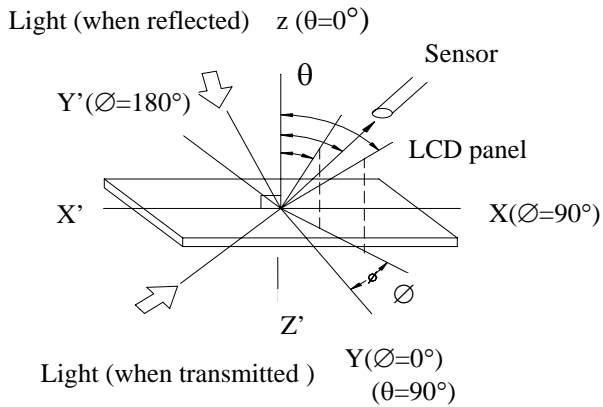
Item	Symbol	Conditions	Min.	Typ.	Max.	Reference	
View Angle	θ	$C \geq 2.0, \varnothing = 0^\circ$	-40°	-	40°	Notes 1 & 2	
Contrast Ratio	C	$\theta = 0^\circ, \varnothing = 0^\circ$	-	30	-	Note 3	
Response Time(rise)	t_r	$\theta = 0^\circ, \varnothing = 0^\circ$	-	190 ms	-	Note 4	
Response Time(fall)	t_f	$\theta = 0^\circ, \varnothing = 0^\circ$	-	110 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	-



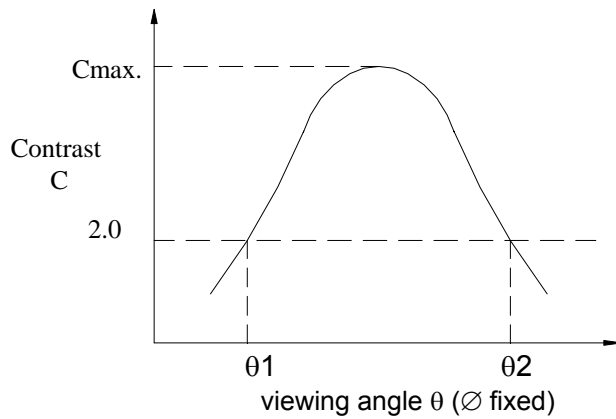
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Note 1: Definition of angles θ and ϕ



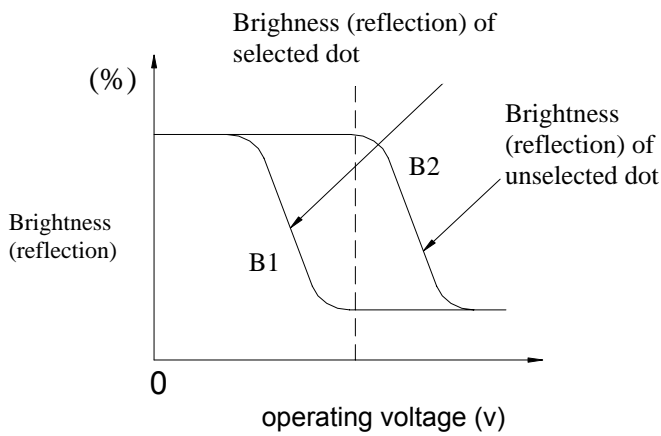
Note 2: Definition of viewing angles θ_1 and θ_2



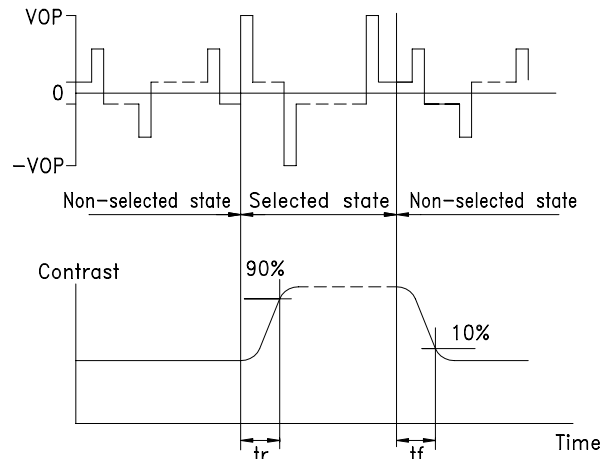
Note : Optimum viewing angle with the naked eye and viewing angle θ at C_{max} . Above are not always the same

Note 3: Definition of contrast C

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



Note 4: Definition of response time



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

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	900	Vrms	25
Tube Voltage	250	Vrms	
Tube Current	4.0	mA	
Life Time	10000	Hr	
Driver Frequency	60	KHz	



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2. MODULE STRUCTURE

2.1 Counter Drawing

* See Appendix

2.2 Interface Pin Description

CN1 : Suitable FPC

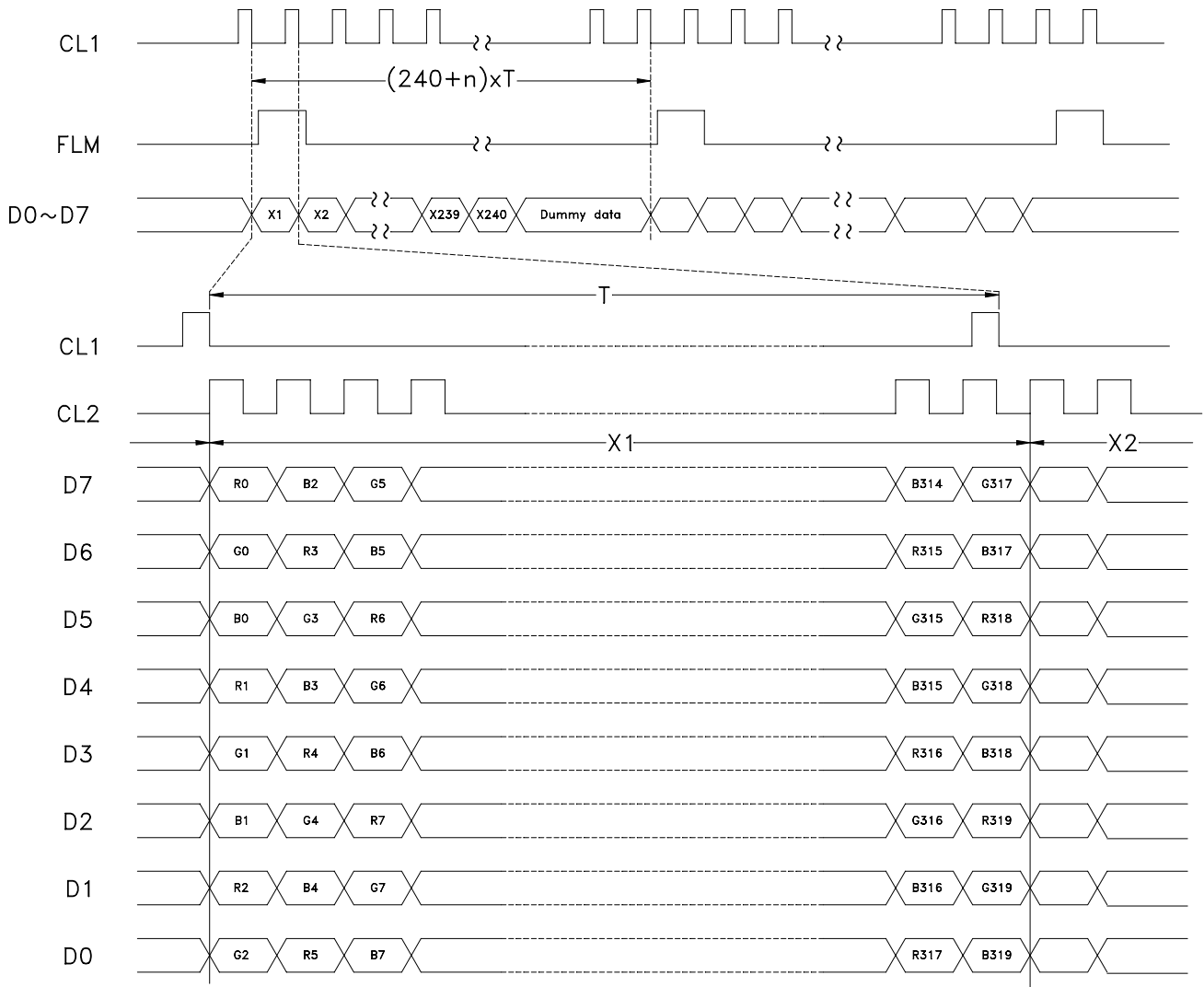
Pin No.	Symbol	Function
1	V _{LCD}	Power supply for LCD driver
2	V1	Power supply for LCD driver
3	V4	Power supply for LCD driver
4	V _{DD}	Logic supply voltage
5 ~ 8	D0 ~ D3	Display data
9	V _{SS}	GND
10 ~ 13	D4 ~ D7	Display data
14	CL2	Data shift clock
15	DISP	Display control signal H : ON , L : OFF
16	CL1	Input data latch signal
17	FLM	Scan start-up signal
18	M	Control signal for AC driving
19	V3	Power supply for LCD driver
20	V2	Power supply for LCD driver

CN2 : BHSR-02VS-1(JST)

Pin No.	Symbol	Function
1	H.V	Power supply for CCFL
2	GND	CCFL GND



2.3 Timing Characteristics



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$$V_{DD} = 3.0 \sim 4.5 \text{ V}, V_{SS} = 0\text{V}, T_a = -20 \sim 85$$

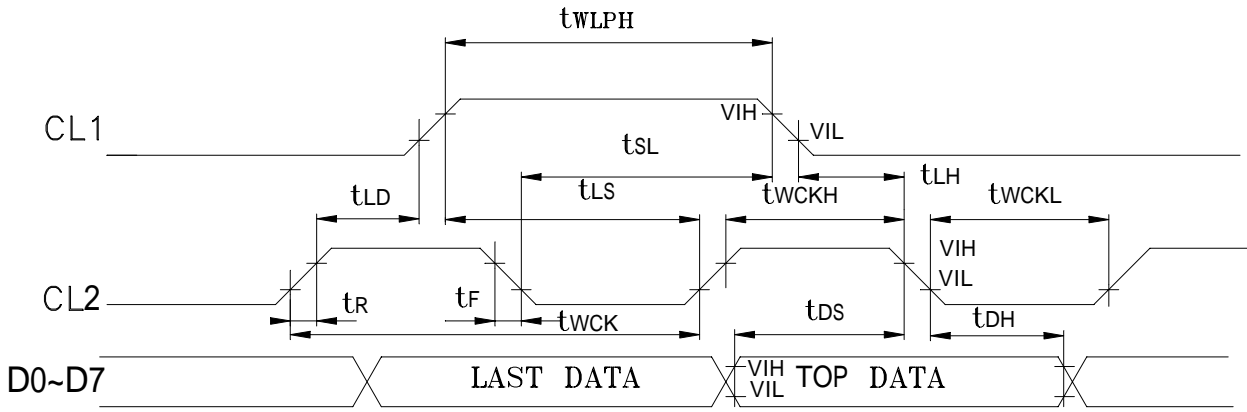
Item	Symbol	Min.	Typ.	Max.	Unit
Shift clock period	t_{wck}	66	-	-	ns
Shift clock "H" pulse wide	t_{wckH}	23	-	-	
Shift clock "L" pulse wide	t_{wckL}	23	-	-	
Data setup time	t_{DS}	15	-	-	
Data hold time	t_{DH}	23	-	-	
Latch pulse "H" pulse wide	t_{WLPH}	30	-	-	
Shift clock rise to latch pulse rise time	t_{LD}	0	-	-	
Shift clock fall to latch pulse fall time	t_{SL}	50	-	-	
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_S	15	-	-	
Input signal rise time	t_R	-	-	50	
Input signal fall time	t_F	-	-	50	
Out delay time (1)	t_D	-	-	41	
Out delay time (2)	t_{PD1}	-	-	1.2	
Out delay time (3)	t_{PD2}	-	-	1.2	
Out delay time (4)	t_{PD3}	-	-	1.2	
FLM setup time	t_{FS}	100	-	-	
FLM hold time	t_{FH}	50	-	-	



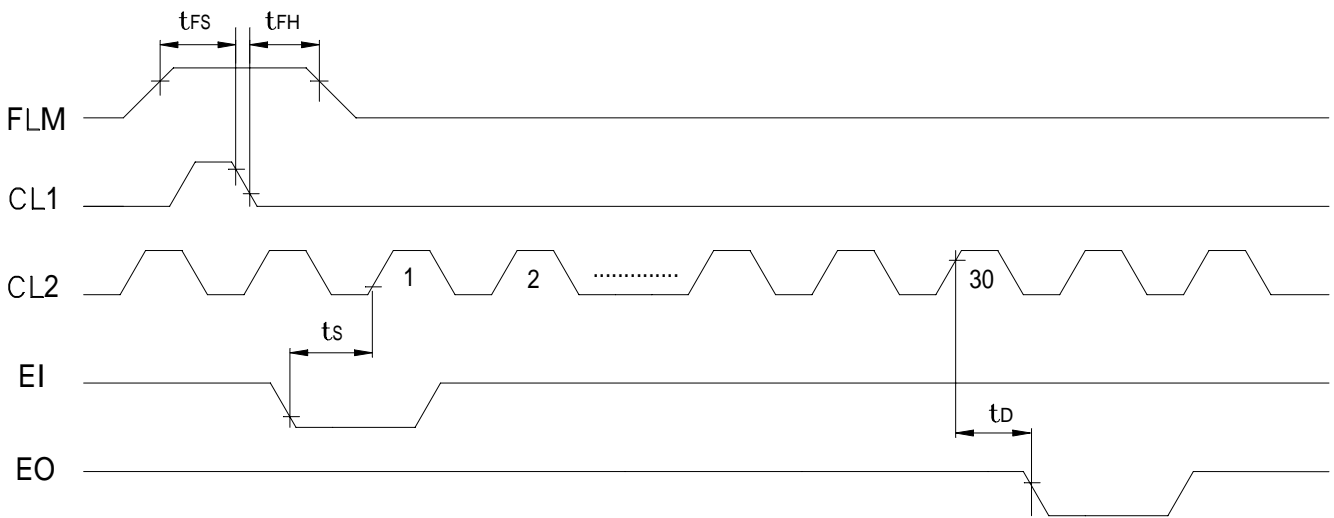
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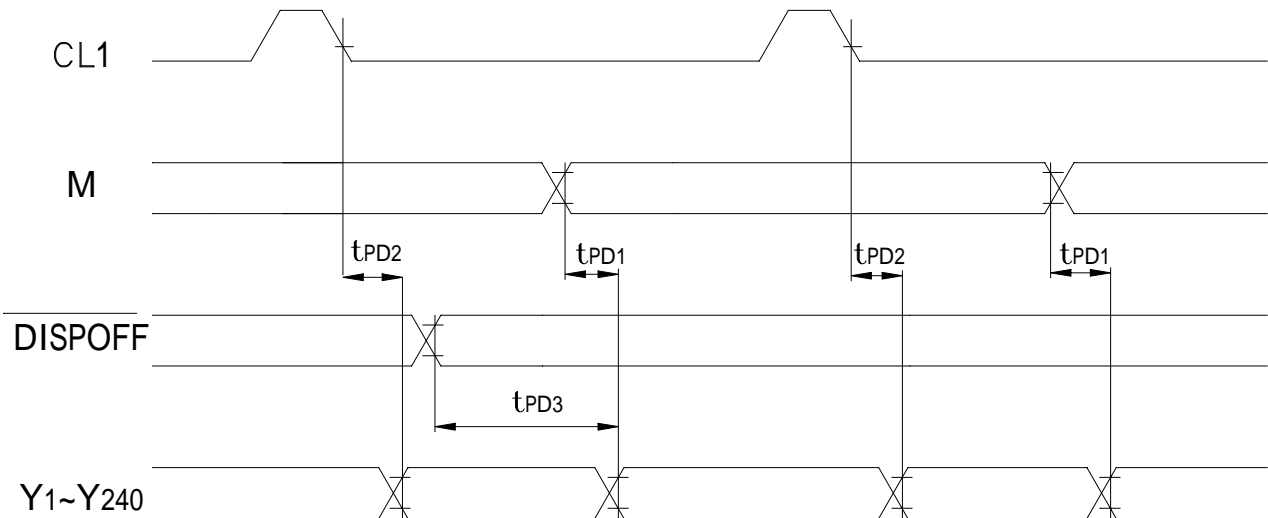
Input Timing Characteristics



Input/Output Timing Characteristics

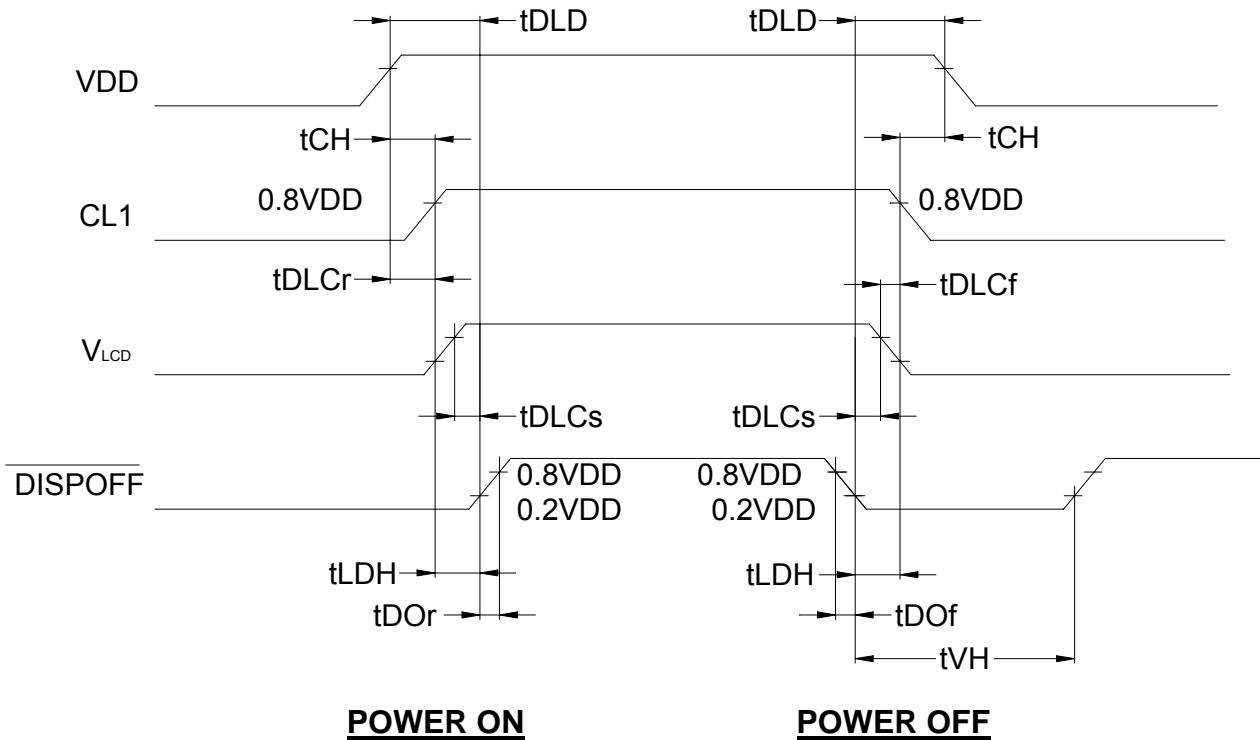


Input/Output Timing Characteristics



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 LCD driving, 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	956	957	958	959	960
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
:	:	:	:	:	:	:	:	:	:	:	:	:		:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:	:	:		:	:	:	:	:
238	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
239	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
240	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B

R : RED

G : GREEN

B : BLUE

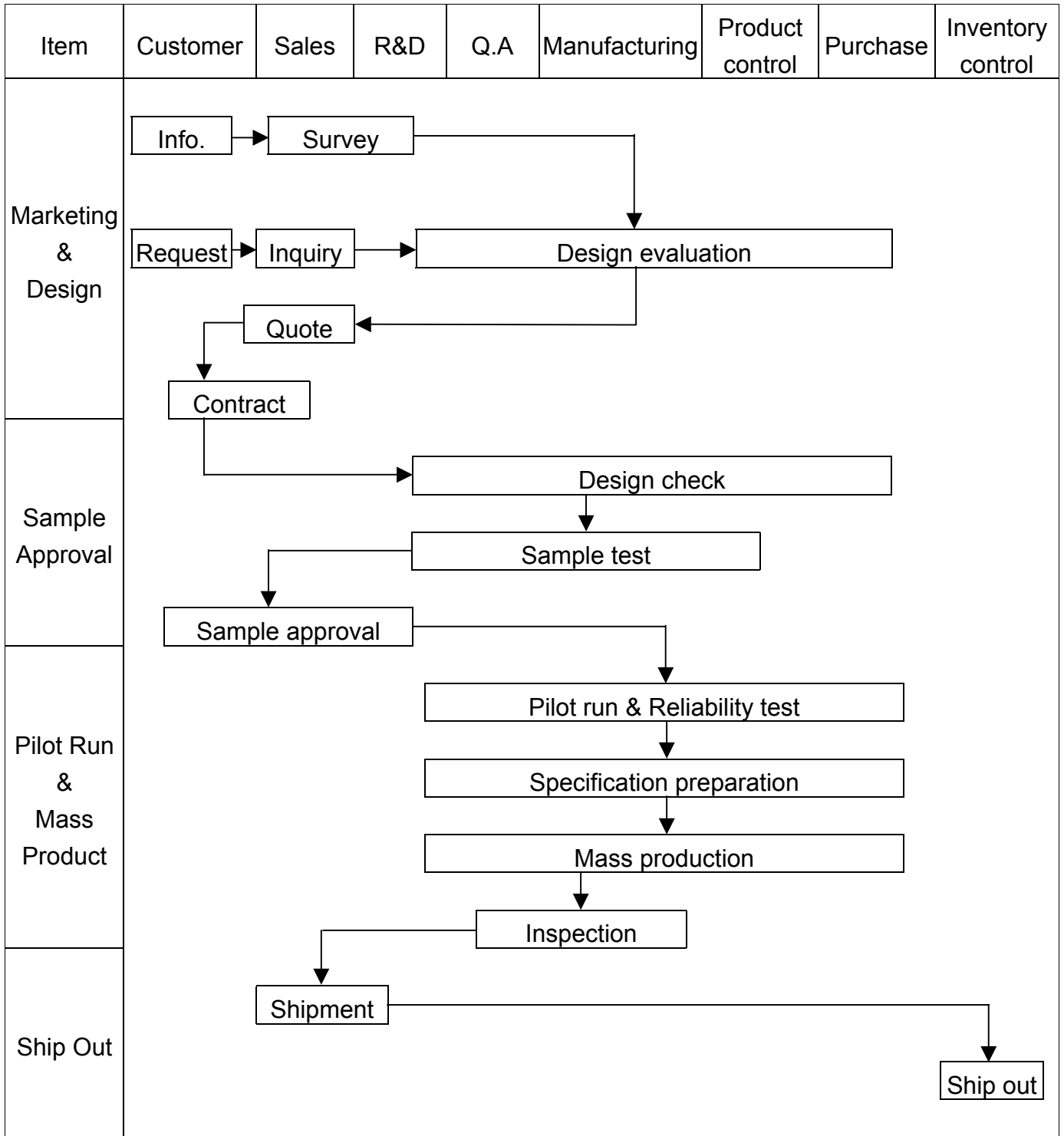


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3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



<p>Sales Service</p>	<pre> graph TD Info[Info.] --> Claim[Claim] Claim --> FA[Failure analysis] FA --> AR[Analysis report] FA --> CA[Corrective action] CA --> Tracking[Tracking] </pre>
<p>Q.A Activity</p>	<ol style="list-style-type: none"> 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 .

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.

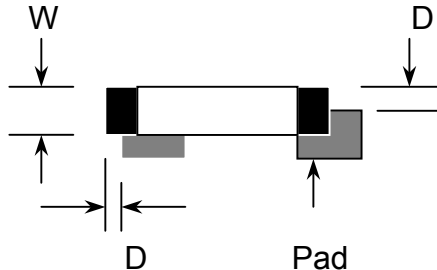
Specification :

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 (Include scratch、bubble)	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



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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 firm 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	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	$\begin{array}{ccccccc} & -20 & & 25 & & 70 & & 25 \\ & \longleftarrow & & \longrightarrow & & \longrightarrow & & \longrightarrow \\ & (30Mins) & & (5Mins) & & (30Mins) & & (5Mins) \end{array}$ 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 ±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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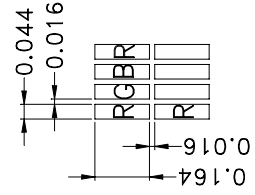
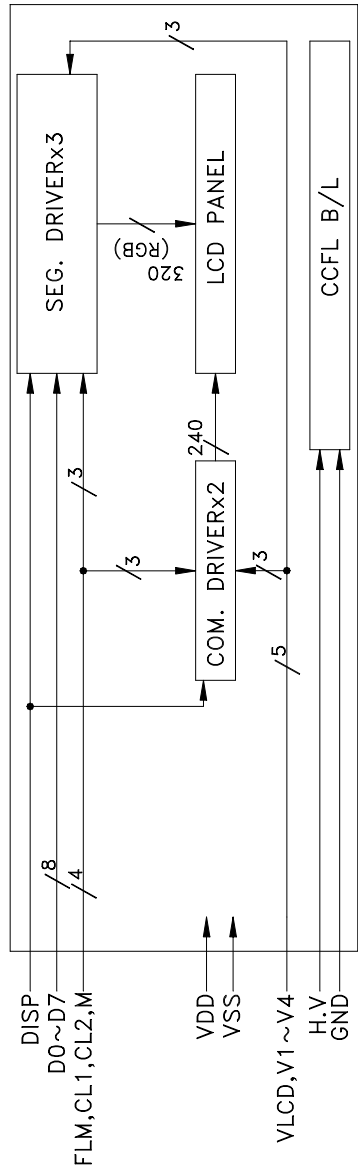
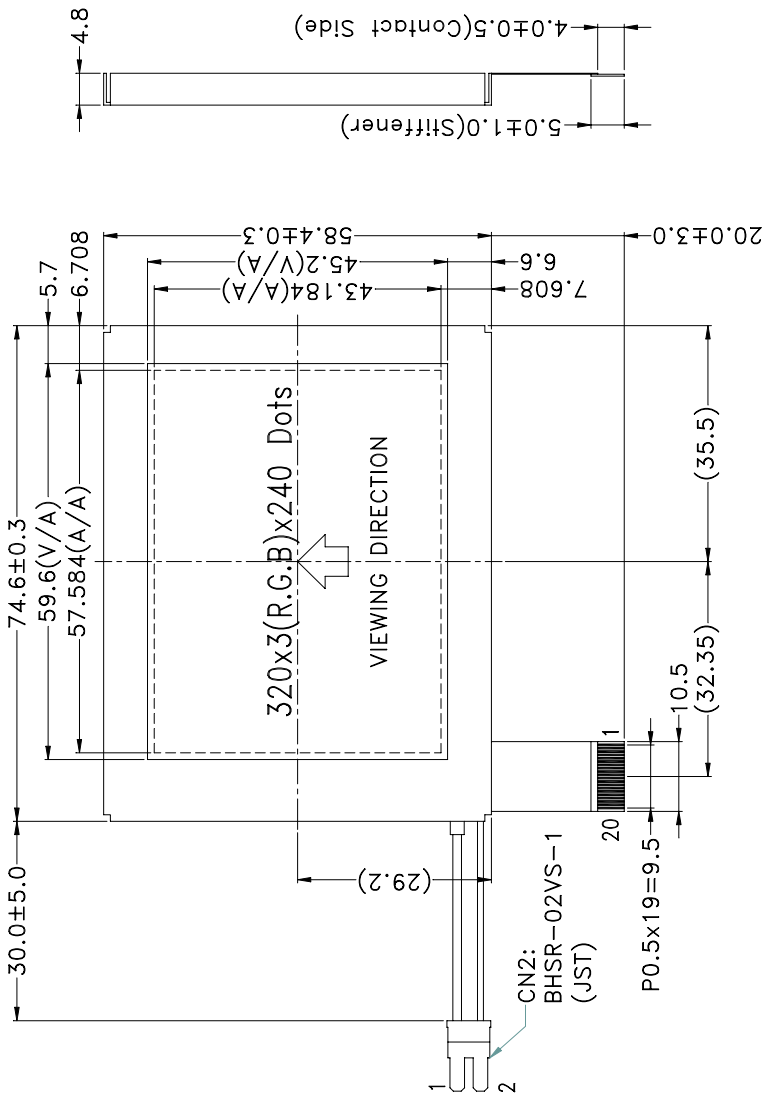
DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

CN2

PIN NO.	SIGNAL
1	H.V
2	GND

CN1

PIN NO.	SIGNAL
1	VLCD
2	V1
3	V4
4	VDD
5	D0
6	D1
7	D2
8	D3
9	VSS
10	D4
11	D5
12	D6
13	D7
14	CL2
15	DISP
16	CL1
17	FLM
18	M
19	V2
20	V3



POWERTIP TECHNOLOGY

SCALE:	1/1	MODEL NAME	PH 320240-B
UNIT:	mm	TITLE	COUNTER DRAWING
EDI:	PAGE: 1/1	DRAWN NO.	PH-02002
APPROVED	0	CHECKER	DRAWN

DOTS SCALE:50/1

The tolerance unless classified ±0.2mm