POWERTIP TECH. CORP.

DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer _____

Model Type   LCD   MODULE

Sample Code   _____

Mass Production Code   PE160160BRF-001HP1

Revision   ___0___

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

Revision Record

Date(y/m/d)	Rev.	Description	Note	Page
2003/02/21	0	Mass Production		

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DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Contents

1. SPECIFICATIONS

1.1   Features

Item	Standard Value
Display Type	160 * 160 Dots
LCD Type	FSTN, Transflective, Positive
Driver Connation	1/160 Duty , 1/12 Bias
Viewing Direction	6 O' clock
Backlight	EL B/L
Weight	60g
Interface	4 bits parallel data input , without controller IC
Other	Extended Temp. External positive voltage

1.2   Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	70.2 (L) * 89.5 (W) * 10.2 (H)(Max)	mm
Viewing Area	60.98 (L) * 80.9 (W)	mm
Active Area	55.985 (L) * 55.985 (W)	mm
Dot Size	0.335 (L) * 0.335 (W)	mm
Dot Pitch	0.35 (L) * 0.35 (W)	mm

Note: Other spec please refer to module drawing.

1.3   Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	Vdd		-0.3	7.0	V
LCD Driver Supply Voltage	+Vee - Vss		-0.3	+25.0	V
Input Voltage	V_{IN}		-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	Touch panel and EL B/L excluded	-20	70	°C
Storage Temperature.	T_{ST}		-30	80	°C
Humidity	H_D		20	90	%RH

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1.4 DC Electrical Characteristics

Vdd = 5.0V±0.5V   Vss = 0V   Ta = 25°C

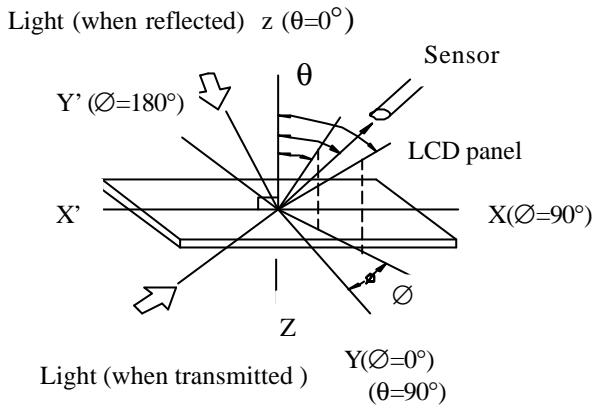| Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	Vdd		4.5	5.0	5.5	V
"H" Input Voltage	V_{IH}		0.8 Vdd	-	--	V
"L" Input Voltage	V_{IL}		--	-	0.2 Vdd	V
"H" Output Voltage	V_{OH}		Vdd-0.4	-	--	V
"L" Output Voltage	V_{OL}		--	-	+0.4	V
Supply Current	Idd	Vdd = 5.0 V	-	0.1	0.5	mA
	Iop	+Vee-Vss=19.1V	--	1.6	3.5	
LCM Driver Voltage	V_{OP}	+Vee-Vss (-20°C)	20.2	20.4	20.6	V
		+Vee-Vss (25°C)	18.9	19.1	19.3	
		+Vee-Vss (70°C)	16.9	17.1	17.3	

1.5 Optical Characteristics

1/160 Duty   1/12 Bias V_{OPR} = 19.1V   Ta = 25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	C≥2.0,∅= 0°	-40°	-	40°	Notes 1 & 2
Contrast Ratio	C	θ= 5°, ∅= 0°	2	5	-	Note 3
Response Time(rise)	tr	θ= 5°, ∅= 0°	-	200 ms	400 ms	Note 4
Response Time(fall)	tf	θ= 5°, ∅= 0°	-	200 ms	400 ms	Note 4

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Note 1: Definition of angles θ and ∅

Light (when reflected) z (θ=0°)

Sensor

Y' (∅=180°)

θ

LCD panel

X'

X(∅=90°)

∅

Z

Y(∅=0°)
(θ=90°)

Light (when transmitted)

Note 2: Definition of viewing angles θ1 and θ2

Cmax.

Contrast
C

2.0

θ1   θ2
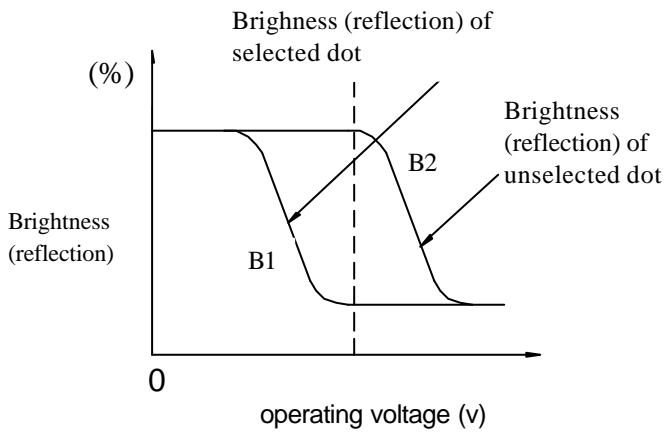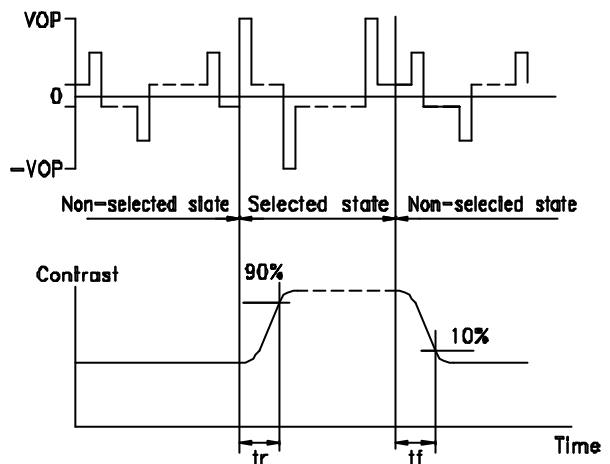
viewing angle θ (∅ fixed)
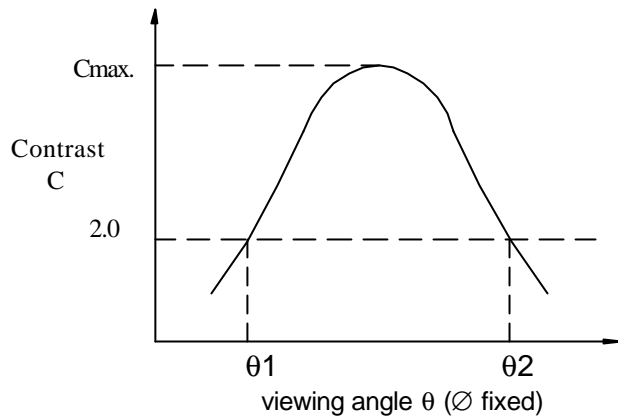
Note :   Optimum viewing angle with the
naked eye and viewing angle θ at
Cmax. Above are not always the same

Note 3: Definition of contrast C

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

(%)

Brighness (reflection) of
selected dot

B2

Brightness
(reflection) of
unselected dot

B1

Brightness
(reflection)

0

operating voltage (v)

Note 4: Definition of response time

VOP

0

−VOP

Non-selected state | Selected state | Non-selected state

Contrast

90%

10%

tr

tf

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)

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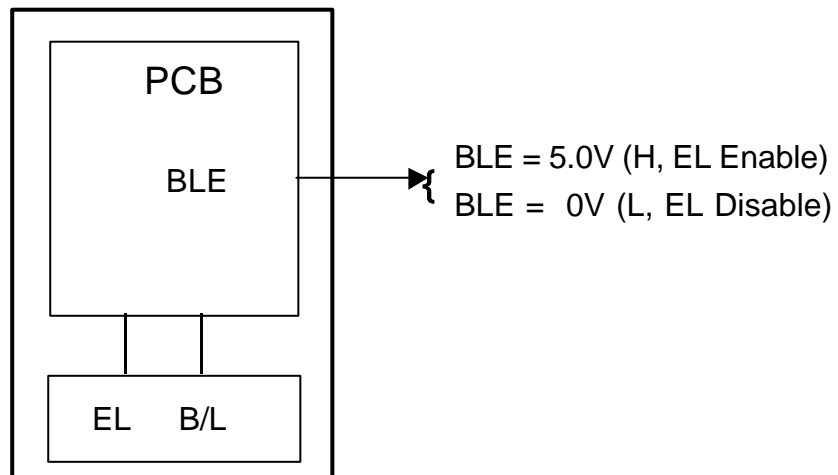DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

1.6 Backlight Characteristics

LCD Module with EL Backlight(Include Inverter)

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Inverter input Voltage	Vii	Vdd-Vss	4.5	5.0	5.5	V
Inverter output Voltage	Vio	Vii=5V	130	170	210	Vp-p
Inverter output Frequency	Fi	Vii=5V	160	210	260	Hz
Supply current	Iii	Vii=5V	28	33	38	mA
Luminous Intensity	IV	With LCD	1	2	--	cd/m
Operating Temperature	T_{OP}	--	-35	--	50	°C
Storage Temperature.	T_{ST}	--	-40	--	60	°C
Storage Humidity	H_{ST}	--	--	70	--	%RH
Color	Blue-Green					

EL B/L Circuit

```
 ┌─────────────────────┐
 │  ┌───────────────┐   │
 │  │     PCB       │   │
 │  │               │   │──────▶  BLE = 5.0V (H, EL Enable)
 │  │     BLE       │   │         BLE =  0V (L, EL Disable)
 │  │               │   │
 │  └──┐        ┌───┘   │
 │     │        │       │
 │  ┌──┴────────┴───┐   │
 │  │   EL    B/L   │   │
 │  └───────────────┘   │
 └─────────────────────┘
```

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1.7 Touch Screen Characteristic

1. Input Method and Activation Force
    Stylus 10~40 grams and Finger 20~40 grams

2. Typical Optical Characteristics
    Visible Light Transmission : >78%@550nm

3. Electrical Specifications

    1. Operating resistance <2K

    2. Circuit close resistance   X : 300~1000   Y : 150~800

    3. Circuit open resistance > 20M   at 25V DC

    4. Linear Test Specification : +/- 1.5% (maximum)

    5. Surface Hardness PET   3H

4. Linearity Tolerance : 1.5% (maximum)

5. Environment Specification
    Operating Temperature 0°C ~ +50°C (Humidity less than 85% RH)
     Storage   Temperature -20°C ~ +70°C (at ambient Humidity)

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2. MODULE STRUCTURE

2.1 Counter Drawing

  * See Appendix

2.2 Interface Pin Description

Pin No.	Symbol	Function
1	Vss	Signal ground
2	FLM	Frame signal
3	CL1	Display data latch
4	CL2	Display data shift
5	M	AC signal
6	Vdd	Power supply for logic
7	BLE	H: EL Enable L: EL Disable
8	+Vee	LCD drive Supply voltage +Vee-Vss = 25V max
9	D3	Display data
10	D2	Display data
11	D1	Display data
12	D0	Display data
13	TP_L	Connection to Left side of Touch Panel
14	TP_U	Connection to Up side of Touch Panel
15	TP_R	Connection to Right side of Touch Panel
16	TP_D	Connection to Down side of Touch Panel
17	Vss	Signal ground
18	Vss	Signal ground

2.3 Timing Characteristics

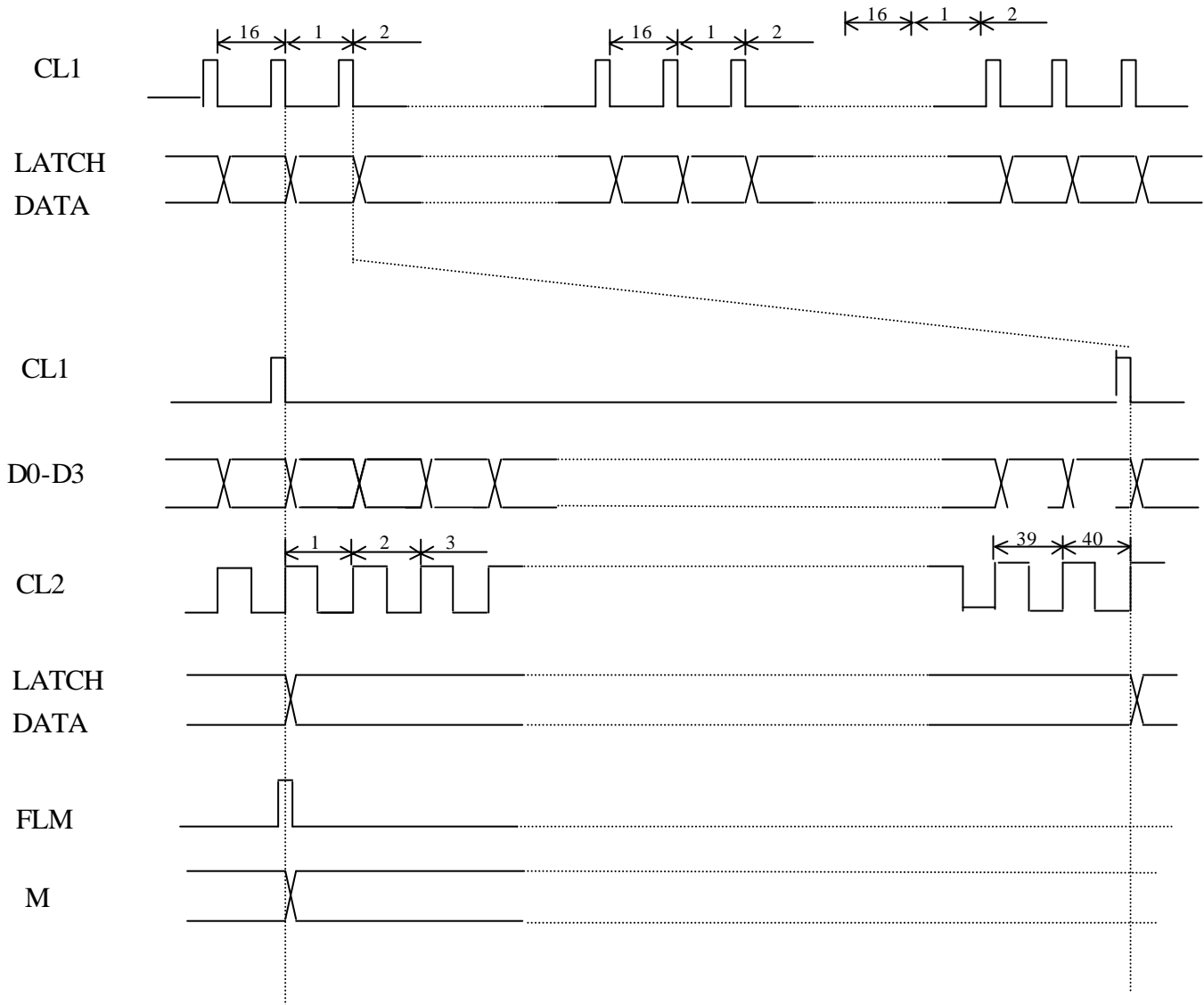| Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	tWCK	125	-		ns	tr, tf ≦ 11ns, Note 1
Shift clock "H" pulse width	tWCKH	51	-		ns	
Shift clock "L" pulse width	tWCKL	51	-		ns	
Data setup time	tDS	30	-		ns	
Data hole time	tDH	40	-		ns	
Latch pulse "H" pulse width	tWLPH	51	-		ns	
Shift clock rise to Latch pulse rise time	tLD	0	-		ns	
Shift clock fall to Latch pulse fall time	tSL	51	-		ns	
Latch pulse rise to Shift clock rise time	tLS	51	-		ns	
Latch pulse fall to Shift clock fall time	tLH	51	-		ns	
Input signal rise time	tr		-	50	ns	Note 2
Input signal fall time	tf		-	50	ns	Note 2
Enable setup time	ts	36	-		ns	
Output delay time (1)	tD		-	78	ns	CL = 15pF
Output delay time (2)	tpd1, tpd2		-	1.2	µs	CL = 15pF
Output delay time (3)	tpd3		-	1.2	µs	CL = 15pF

Note

1. Take the cascade connection into consideration.

2. (tCK - tWCKII - tWCKL)/2 is the maximum in the case of high speed operation.
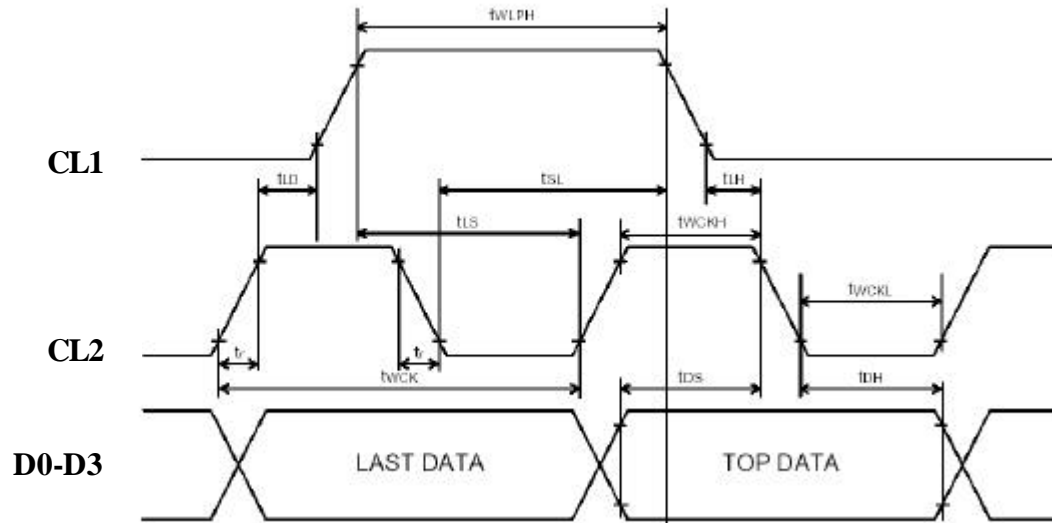
2.4 Interface Timing

CL1

LATCH
DATA

CL1

D0-D3

CL2

LATCH
DATA

FLM

M

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Marketing & Design	Info. → Survey				Design evaluation			
	Request → Inquiry							
		Quote						
	Contract							
Sample Approval				Design check				
				Sample test				
	Sample approval							
Pilot Run & Mass Product					Pilot run & Reliability test			
					Specification preparation			
					Mass production			
				Inspection				
Ship Out	Shipment							Ship out

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Sales Service	
	Info. → Claim → Failure analysis → Analysis report
	Failure analysis → Corrective action → Tracking

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

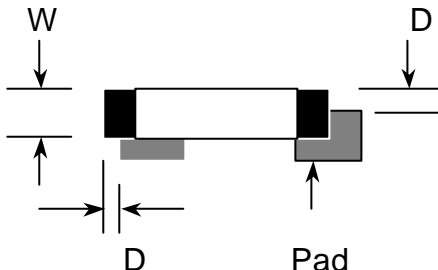FQC Defect Level   100% Inspection

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 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 W　　　　　　　D D　　　　　Pad	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

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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

NO	Item	Packing Weight (Kg)	Drop High (Cm)	Applicable Standard
6	Drop Test	0 ~ 45.4	122	MIL-810E
		45.4 ~ 90.8	76	
		90.8 ~ 454	61	
		Over 454	46	

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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 electicity 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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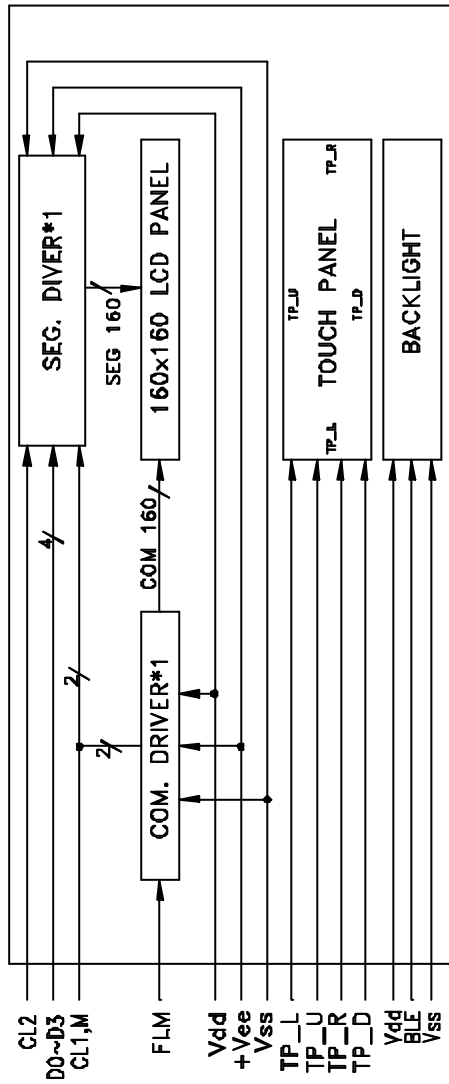DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN
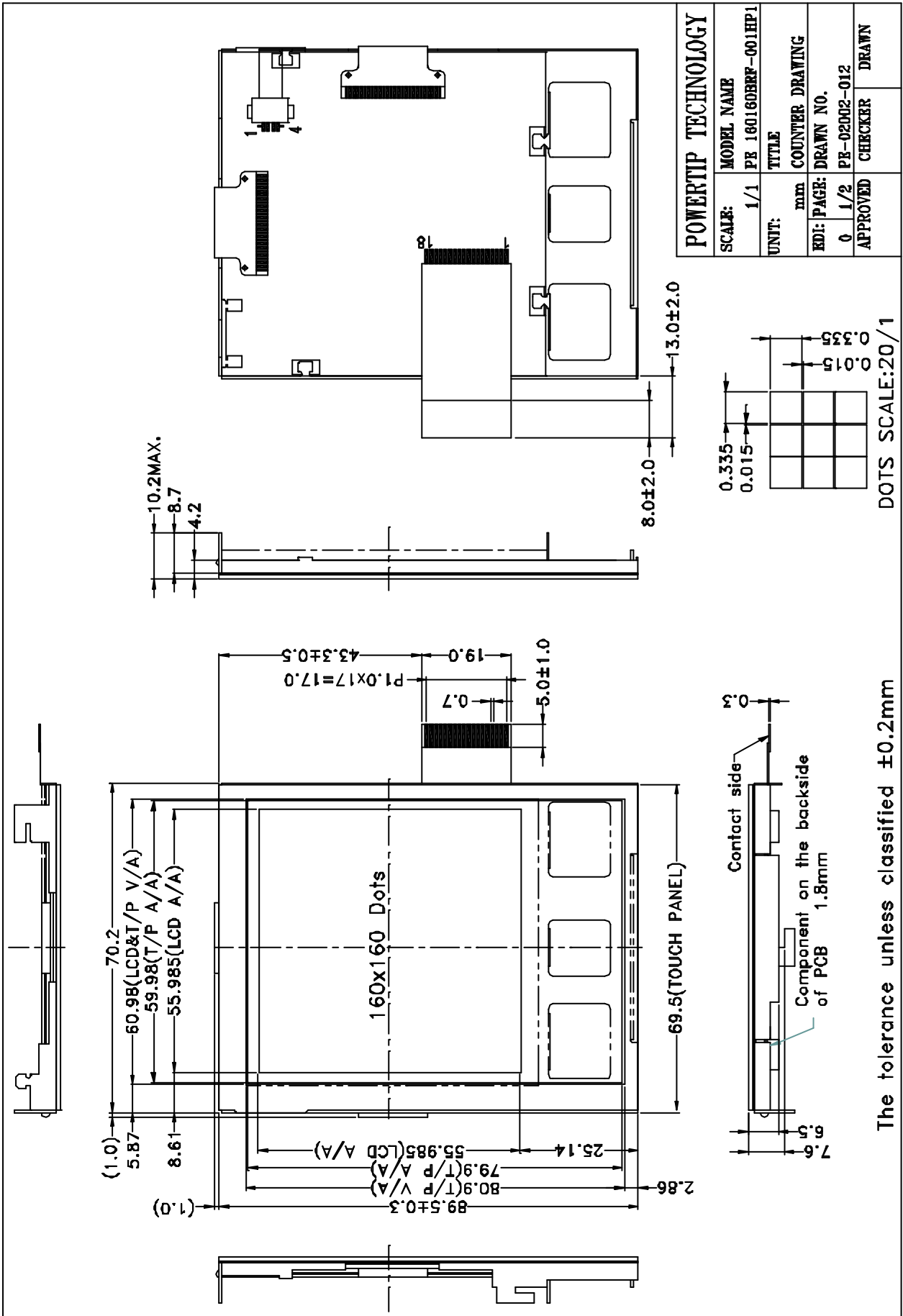
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PIN ASSIGNMENT

PIN NO.	SIGNAL
1	Vss
2	FLM
3	CL1
4	CL2
5	M
6	Vdd
7	BLE
8	+Vee
9	D3
10	D2
11	D1
12	D0
13	TP_L
14	TP_U
15	TP_R
16	TP_D
17	Vss
18	Vss

Touch Panel pinout

PIN NO.	SIGNAL	
1	X1	TP_R
2	Y1	TP_U
3	X2	TP_L
4	Y2	TP_D

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MODEL NAME	PE 160160BRF-001HP1
SCALE: N/A	
UNIT: mm	TITLE: COUNTER DRAWING
	DRAWN NO. PE-02002-012
EDI: 0	PAGE: 2/2
CHECKER	DRAWN
APPROVED	

Block diagram labels: SEG. DIVER*1, 160x160 LCD PANEL, SEG 160, COM 160, COM. DRIVER*1, TOUCH PANEL, BACKLIGHT, TP_R, TP_U, TP_L, TP_D

Signal labels: CL2, D0~D3, CL1,M, FLM, Vdd, +Vee, Vss, TP_L, TP_U, TP_R, TP_D, Vdd, BLE, Vss

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