

Fema Part Number

GM800600T-104-TTX2NLW-TPCGFF	
Description	10.4" Full Color TFT LCD
	800x600 Resolution
	Brightness = 320 nits (Typical)
	Integrated Projected Capacitive Touch Panel with Black Border Coverglass*

** See Projected Capacitive Touch Panel addendum at end of TFT Spec Sheet*

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Please visit our website www.femaelectronics.com or email us at tft@femacorp.com

1 General Specifications

Feature		Spec
Display Spec.	Size	10.4 inch
	Resolution	800(RGB) x 600
	Interface	LVDS 6 bits
	Color Depth	262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.264x0.264
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti-Glare(3H)
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	236.00x176.90x5.60
	Active Area(mm)	211.20x158.40
	With /Without TSP	Without TSP
	Weight (g)	288

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : Requirements on Environmental Protection: RoHS

Note 3 : LCM weight tolerance : +/- 5%

2 Input/Output Terminals

2.1 TFT LCD Panel

Matching connector of Hirose DF19K-20P-1H (56)

No	Symbol	I/O	Description	Comment
1	VDD	P	Power Supply	
2	VDD	P	Power Supply	
3	GND	P	Ground	
4	GND	P	Ground	
5	IN0-	I	LVDS receiver negative signal channel 0	
6	IN0+	I	LVDS receiver positive signal channel 0	
7	GND	P	Ground	
8	IN1-	I	LVDS receiver negative signal channel 1	
9	IN1+	I	LVDS receiver positive signal channel 1	
10	GND	P	Ground	
11	IN2-	I	LVDS receiver negative signal channel 2	
12	IN2+	I	LVDS receiver positive signal channel 2	
13	GND	P	Ground	
14	CLK-	I	LVDS receiver negative signal clock	
15	CLK+	I	LVDS receiver positive signal clock	
16	GND	P	Ground	
17	NC	-	No connection	
18	NC	-	No connection	
19	GND	P	Ground	
20	GND	P	Ground	

Note: I/O definition:

I----Input O---Output P----Power/Ground

2.2 CN2 (LED connector)

No	Symbol	I/O	Description	Wire Color
1	VL1	P	LED power supply(high voltage)	Red
2	VL2	P	LED power supply(GND)	White

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	5.0	V	
Input voltage	V _{IN}	-0.3	5.0	V	Note1
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	

Note1: V_{IN} represent IN0±, IN1±, IN2±, CLK±

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
LVDS Differential input high threshold	V _{TH}	-	-	+100	mV	V _{CMLVDS} =1.2V
LVDS Differential input low threshold	V _{TL}	-100	-	-	mV	V _{CMLVDS} =1.2V
Differential input voltage	V _{ID}	0.1	-	0.6	V	
LVDS input common mode voltage	V _{CMLVDS}	V _{ID} /2	-	1.4-(V _{ID} /2)	V	
Input current	I _{IN}	-10	-	10	μA	
Supply Voltage	VDD	3.0	3.3	3.6	V	
Common Electrode Driving Signal	VCOM	-	4.36	-	V	Note1
Sync Frequency	FVD	-	60	70	Hz	
VDD Power Consumption	I _{DD}	-	260	380	mA	Note2

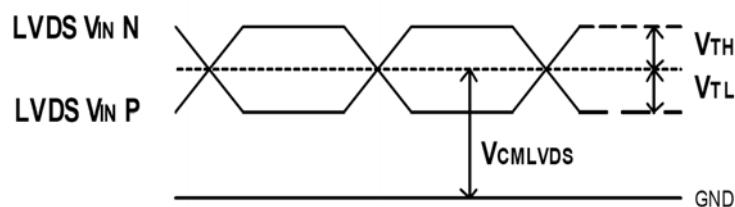


Figure 4.1.1 LVDS DC timing diagram

Note1: The value may be different for different LCM.

Note2: To test the current dissipation, using the “color bar” testing pattern shown as below:

1. White
2. Yellow
3. Cyan
4. Green
5. Magenta
6. Red
7. Blue
8. Black

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

Figure 4.1.2 Current dissipation testing pattern

4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	120.0	-	mA	Note 1
Forward Current Voltage	V_F	17.7		20.7	V	Note 1
Backlight Power Consumption	WBL	-	2304	2484	mW	Note 1
Operating Life Time	--	10000	(20000)	--	hrs	Note 2

Note 1: The figure below shows the connection of backlight LED.

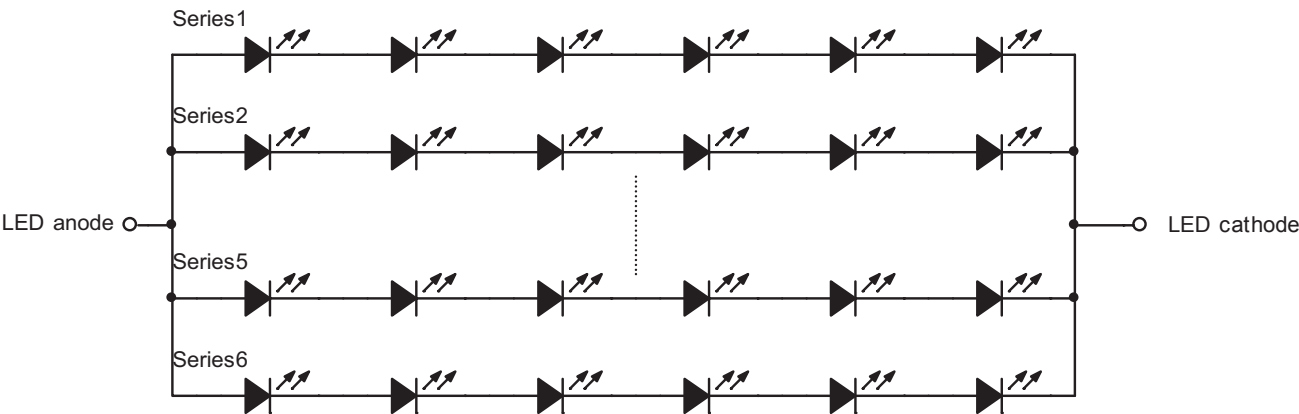


Figure 4.2 LED connection of backlight

Note 2: I_F is defined for one channel LED.

Optical performance should be evaluated at Ta=25℃ only.

If LED is driven by high current, high ambient temperature & humidity condition.

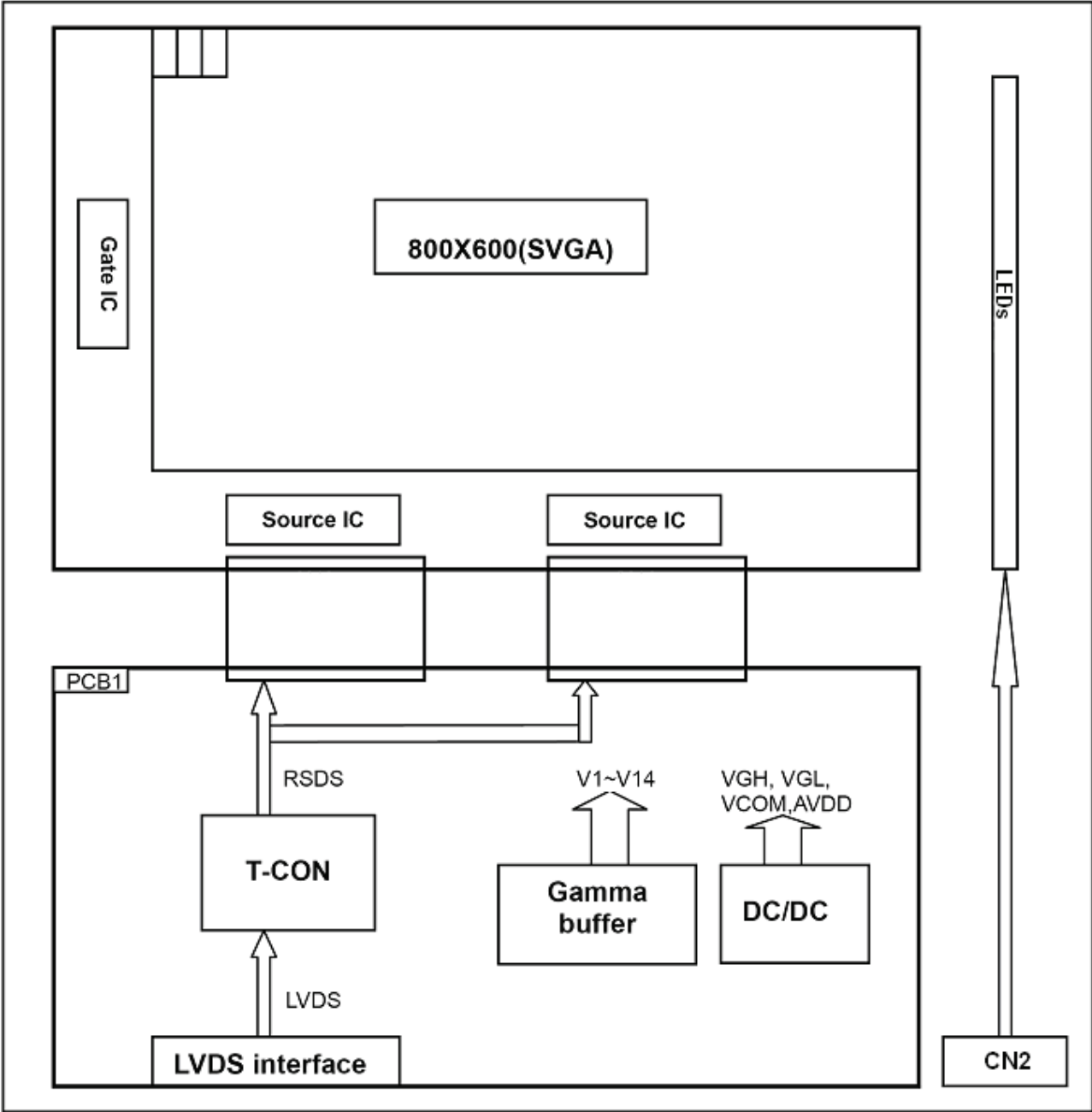
The life time of LED will be reduced.

Operating life means brightness goes down to 50% initial brightness.

Typical operating life time is estimated data.

Note 3: One LED: $I_F = 20\text{mA}$.

4.3 Block Diagram

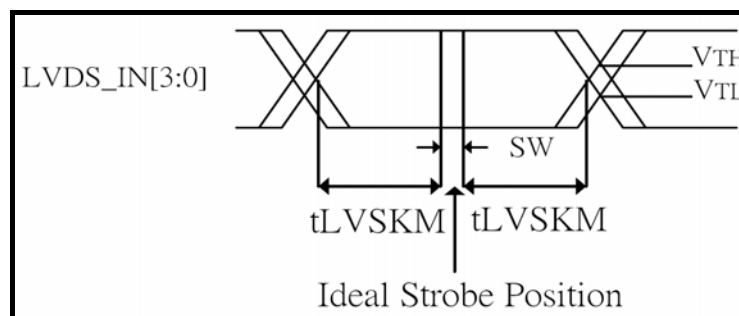
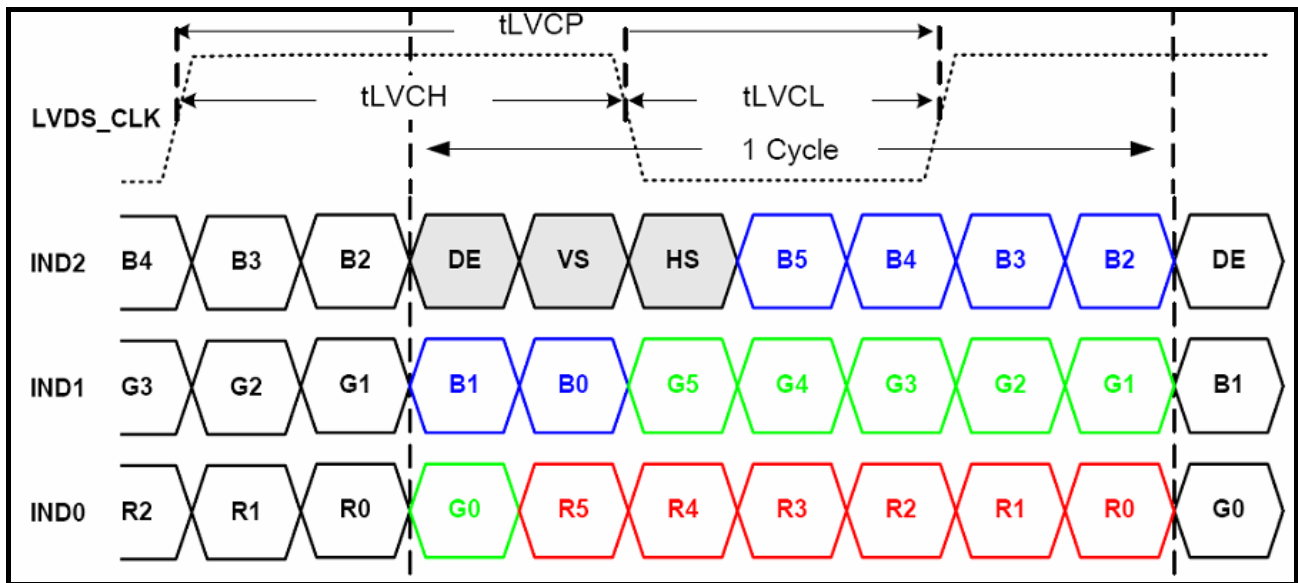
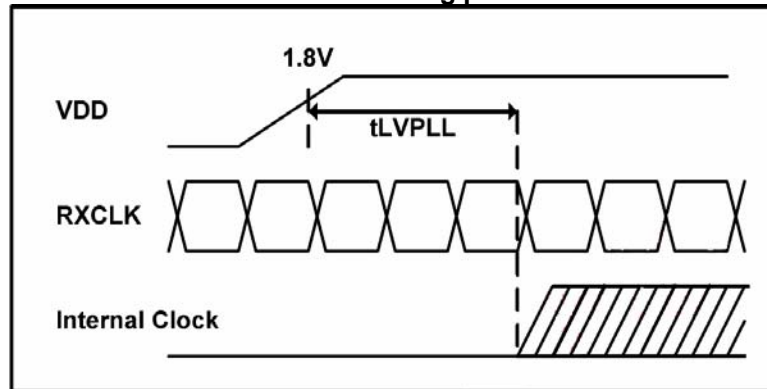


5 Timing Chart

5.1 Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Condition
Clock period	tLVCP	20.0	25	31.25	ns	
Clock high time	tLVCH	-	14.29	-	ns	
Clock low time	tLVCL	-	10.71	-	ns	
PLL wake-up time	tLVPLL	-	-	1	ms	
Input skew margin	tLVSKM	400	-	-	ps	f=85MHz

Table 5.1 timing parameter



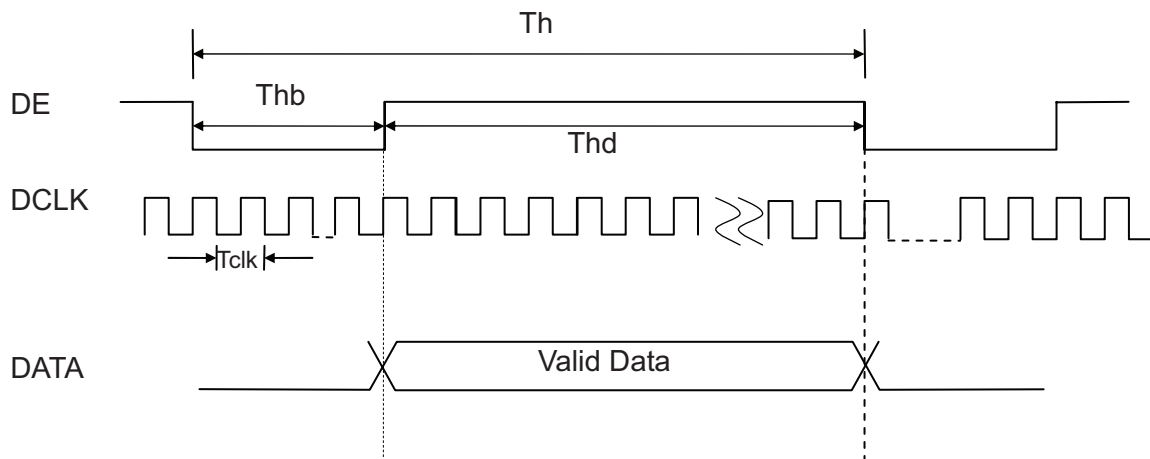
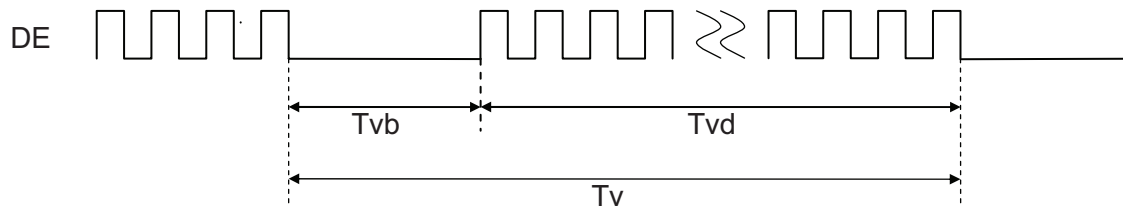
SW: Setup and Hold time
Figure 5.1 Input signal data timing

5.2 Recommended Input Timing of LVDS transmitter

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Dclk frequency		1/Tclk	32	40	50	MHz	
Horizontal section	Horizontal total	Th	866	1056	1064	Tclk	
	Horizontal blanking	Thb	66	256	264	Tclk	
	Valid Data Width	Thd	800	800	800	Tclk	
Vertical section	Frame rate	-	-	60	70	Hz	
	Vertical total	Tv	604	628	800	Th	
	Vertical blanking	Tvb	4	28	200	Th	
	Valid Data Width	Tvd	600	600	600	Th	

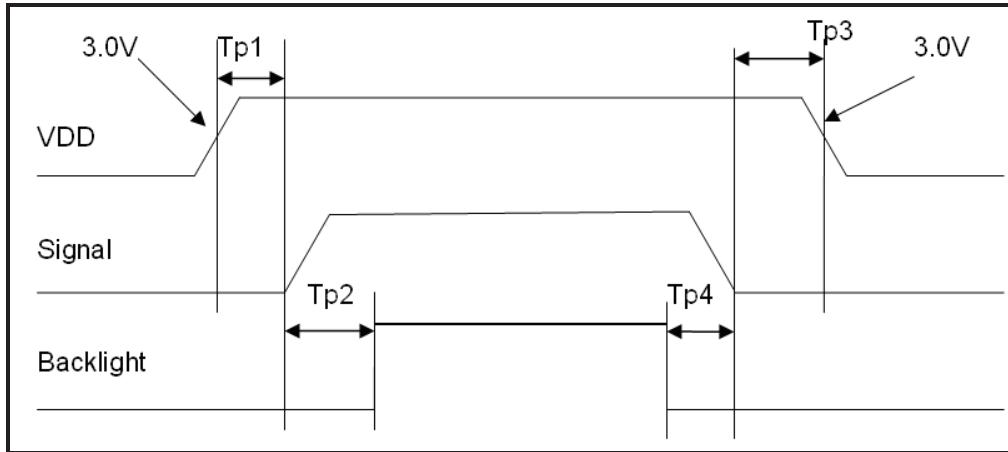
Note: DE signal is necessary.

Input Timing Control Conditions



5.3 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD 3.0V to signal starting	Tp1	0	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD 3.0V	Tp3	0	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	



6 Optical Characteristics

6.1 Optical Specification

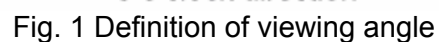
Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	-	Degree	Note 2
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	300	400	-	-	Note1 Note3
Response Time		T _{ON}	25℃	-	10	15	ms	Note1
		T _{OFF}		-	15	25		Note4
Chromaticity	White	x	Backlight is on	0.259	0.309	0.359	-	Note5 Note1
		y		0.284	0.334	0.384		
	Red	x		0.550	0.600	0.650		
		y		0.296	0.346	0.396		
	Green	x		0.283	0.333	0.383		
		y		0.516	0.566	0.616		
	Blue	x		0.092	0.142	0.192		
		y		0.065	0.115	0.165		
Uniformity		U	-	70	80	-	%	Note1 Note6
NTSC		-	-	-	50	-	%	Note 5
Luminance		L		350	400	-	cd/m ²	Note1 Note7

Test Conditions:

1. The ambient temperature is 25±2℃.humidity is 65±7%
2. The test systems refer to Note 1 and Note 2.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

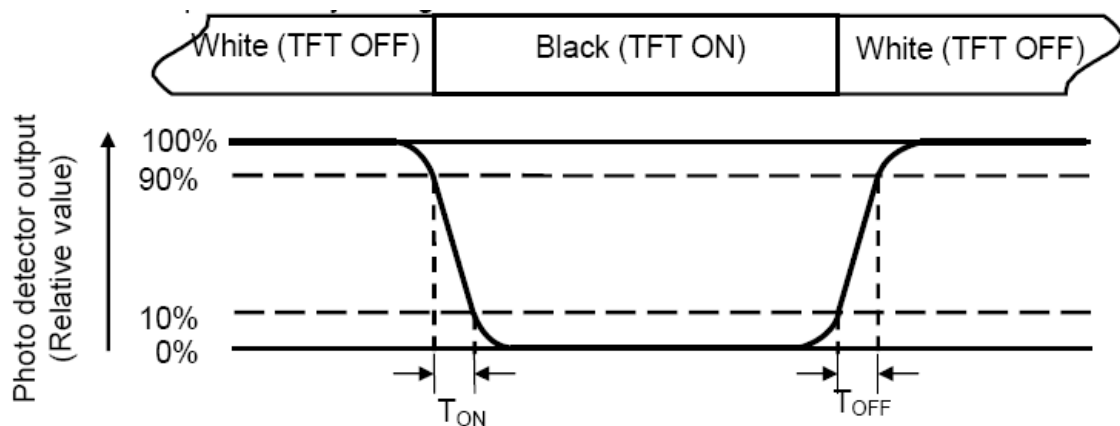
"White state": The state is that the LCD should be driven by V_{white} .

"Black state": The state is that the LCD should be driven by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = L_{min} / L_{max}

L -----Active area length W ----- Active area width

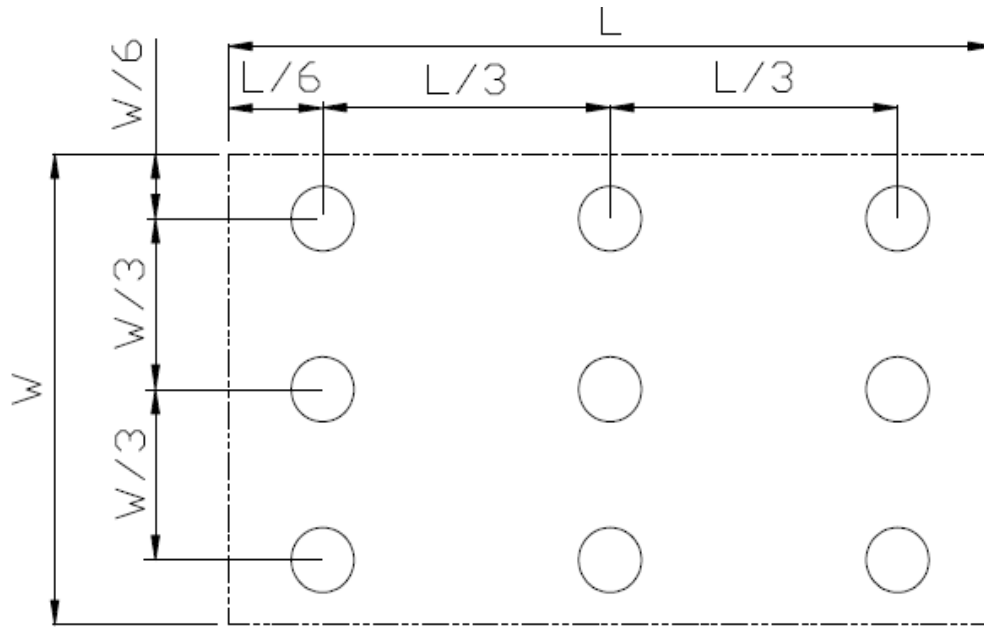


Fig. 2 Definition of uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

Measure the luminance of white state at center point.

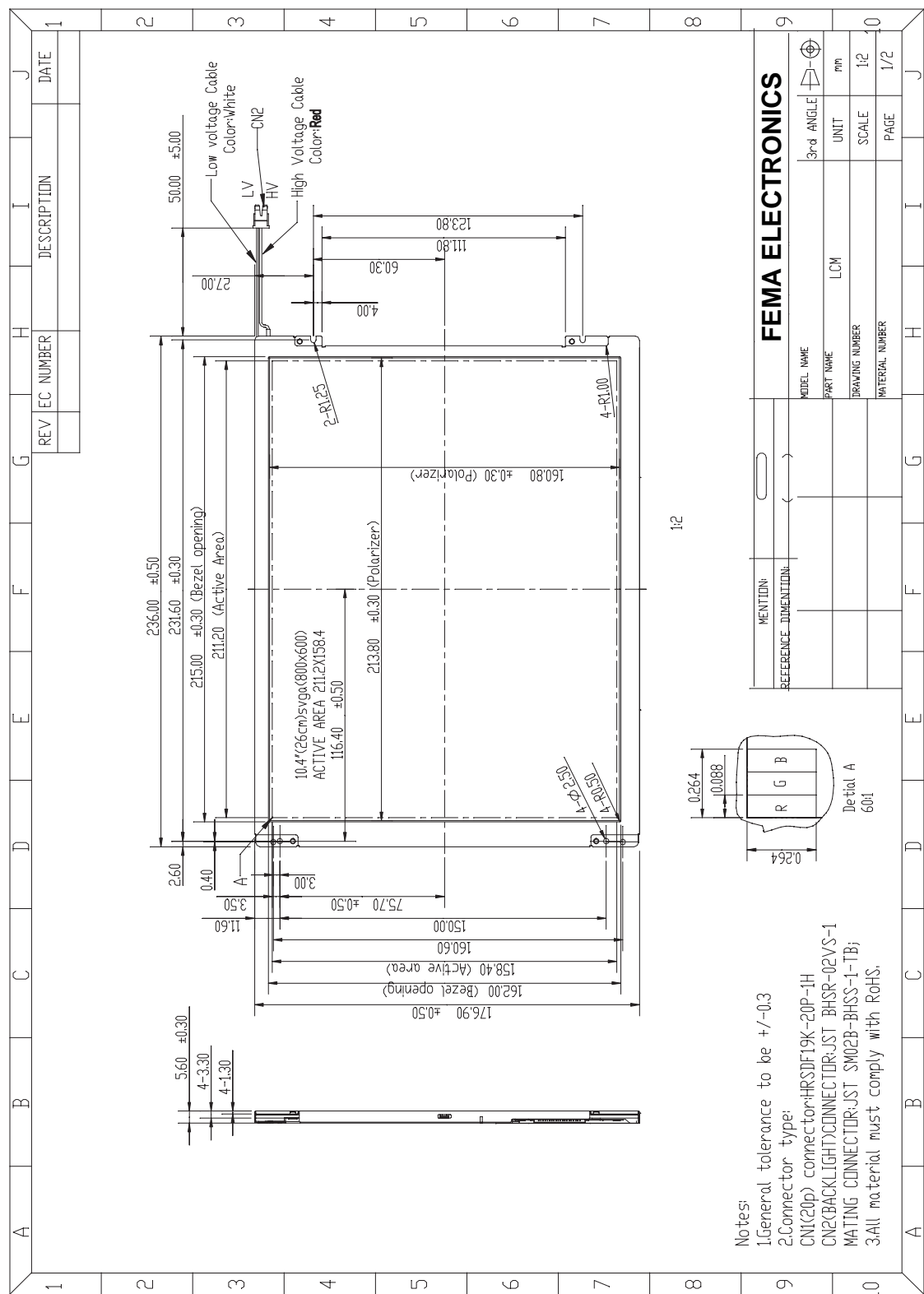
7 Environmental / Reliability Test

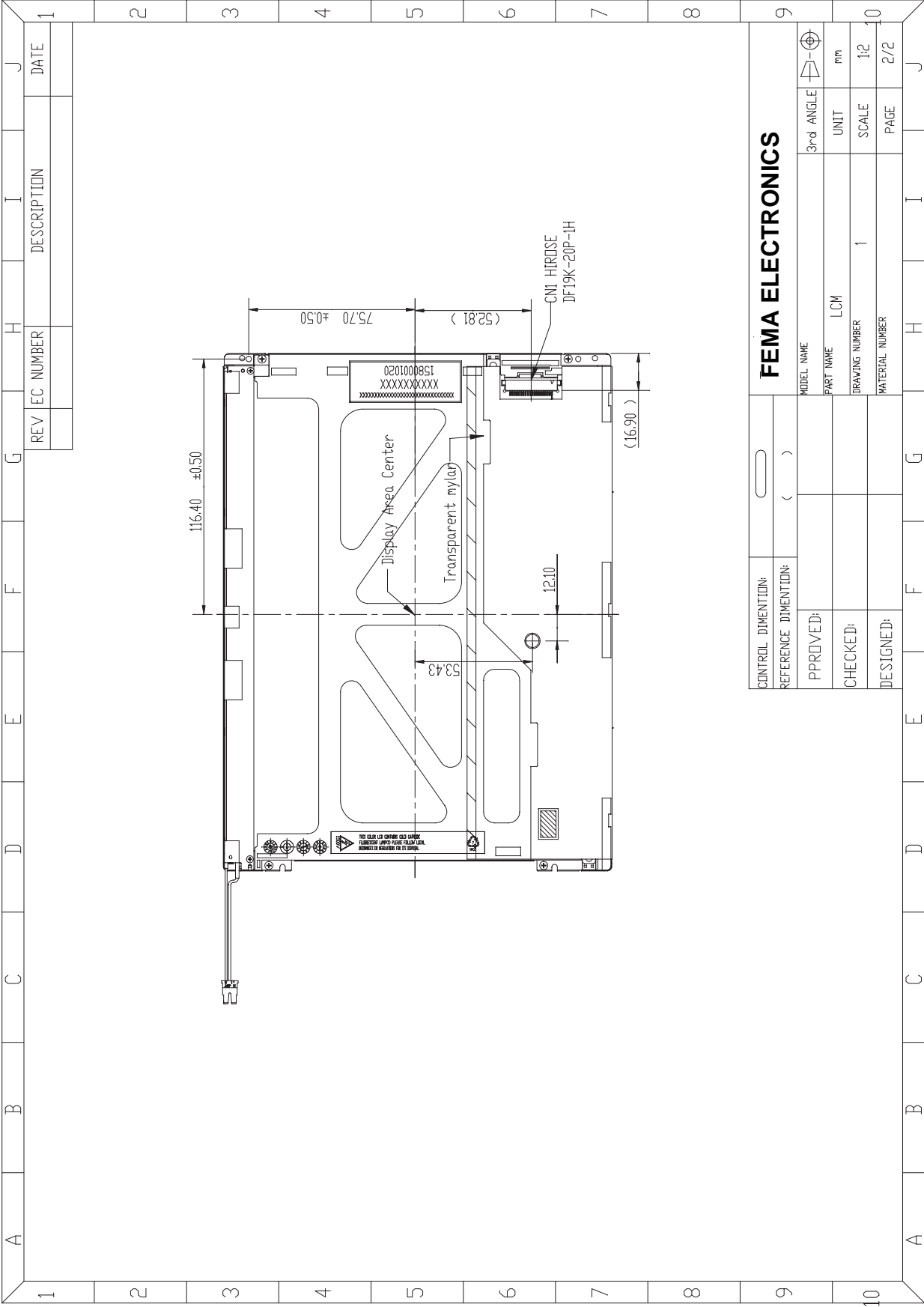
No	Test Item	Condition	Remark
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1 GB2423.1—89
3	High Temperature Storage (non-operation)	Ta=+80℃, 240hrs	IEC60068-2-2, GB2423.2—89
4	Low Temperature Storage (non-operation)	Ta=-30℃, 240hrs	IEC60068-2-1 GB2423.1—89
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ 30 min~+70℃ 30 min, Change time:5min, 100 Cycles	Start with cold temperature, end with high temperature IEC60068-2-14,GB2423.22—87
7	Electro Static Discharge (operation)	C=150pF,R=330Ω, Air:±15Kv, Contact:±8Kv, 10times/terminal	IEC61000-4-2 GB/T17626.2—1998
8	Vibration (non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X.y.z (6 hours for total)	IEC60068-2-6 GB/T2423.10—1995
9	Shock (non-operation)	80G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/2423.8—1995
11	Package Vibration Test	Random Vibration: 0.015GxG/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total)	IEC60068-2-34

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

8 Mechanical Drawing







DATASHEET

11/23/2012

Fema Part Number

TPCAP-104-HGFF	
Description	10.4" Projected Capacitive Touch Panel
	Integrated Coverglass with Black Border

Fema Electronics Corporation:

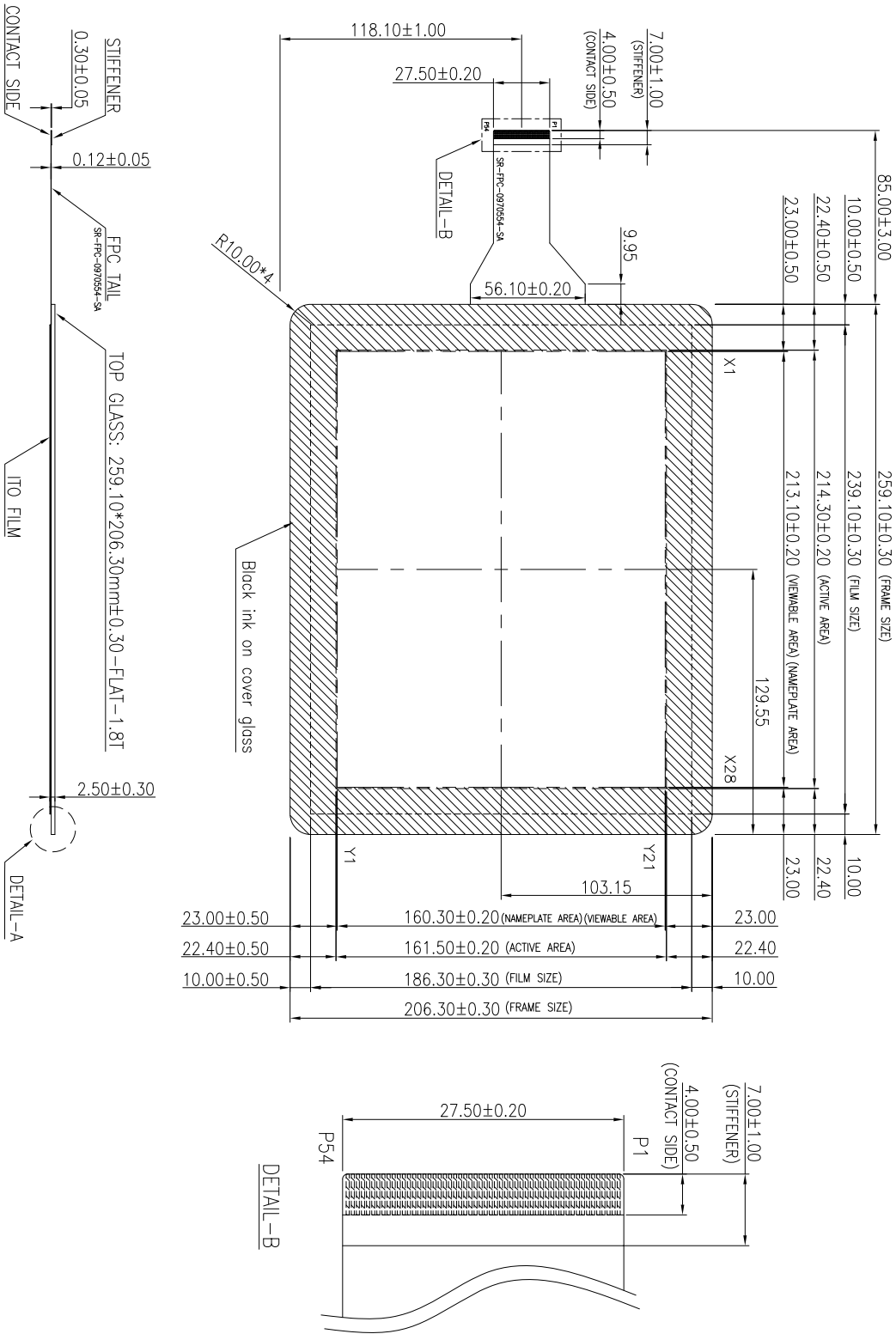
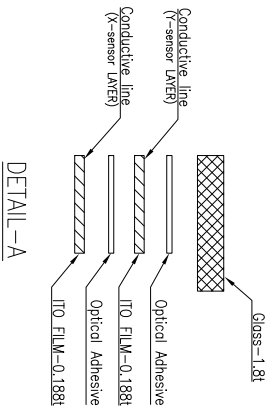
17815 Newhope Street, Suite G, Fountain Valley, CA 92708 Tel: 714-825-0140

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TOUCHSCREEN TABULATION		
PART NUMBER	TYPE	PART NO.
XDN051G	CLEAR	
XDN051N	ANTI GLARE	

REV.	ECN NO.	DESCRIPTION	DATE

CONNECTOR PINOUT			
PIN NO.	DESIGNATION	PIN NO.	DESIGNATION
1	N/C	31	SHIELDINGTX
2	SHIELDINGTX	32	SHIELDINGTX
3	X 28	33	Y 21
4	X 27	34	Y 20
5	X 26	35	Y 19
6	X 25	36	Y 18
7	X 24	37	Y 17
8	X 23	38	Y 16
9	X 22	39	Y 15
10	X 21	40	Y 14
11	X 20	41	Y 13
12	X 19	42	Y 12
13	X 18	43	Y 11
14	X 17	44	Y 10
15	X 16	45	Y 9
16	X 15	46	Y 8
17	X 14	47	Y 7
18	X 13	48	Y 6
19	X 12	49	Y 5
20	X 11	50	Y 4
21	X 10	51	Y 3
22	X 9	52	Y 2
23	X 8	53	Y 1
24	X 7	54	SHIELDINGTX
25	X 6		
26	X 5		
27	X 4		
28	X 3		
29	X 2		
30	X 1		



DESCRIPTION	10.4" Projected Capacitive Touch Panel	DATE	MAR.28 ,2012	APPROVED	Rev.	A
MODEL	TPCAP-104-HGFF	SCALE	-/-	DESIGN	Page	of
UNIT	mm.	DRAWING			B-Page	of

01. **Circumscription** The specification is for Projected Capacitive Touch Panel modules.

02. **Features**

Item		Specifications
(1)	Type	Projective Capacitive
(2)	Input Mode	Finger
(3)	Connector	FPC

03. **General Specification**

Item		Specifications
(1)	Frame Size	259.10±0.30 X 206.30±0.30 mm
(2)	View Area	213.10±0.20 X 160.30±0.20 mm
(3)	Active/Precision Area	214.30±0.20 X 161.50±0.20 mm
(4)	Total Thickness	2.50±0.30 mm
(5)	Tail Length	85.00±3.00 mm
(6)	I/O Channel	54pin

04. **Environmental Characteristics**

Item [項目]		Specifications [規格]	
		Temperature [溫度]	Humidity [濕度] (Non Condensing) [不可結露]
(1)	Operation	-20°C ~ +70°C	20%RH~85%RH
(2)	Storage	-40°C ~ +80°C	10%RH~90%RH

Note: Testing environment is under normal atmosphere pressure.

※When the ambient temperature is above 65°C, the humidity is allowed to be below 50%RH .

05 Optical Characteristics

Item		Specifications [規格]
(1)	Transparency	90% ± 3%
(2)	Haze	<2%

※measured by BYK-Gardner

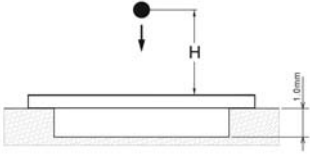
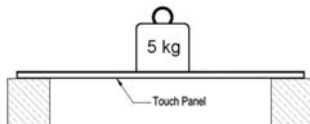
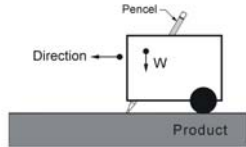
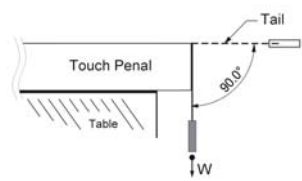
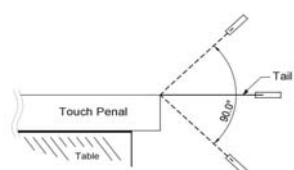
06 Electrical Characteristics

Item [項目]		Specifications [規格]
(1)	Response	According to Integration time of controller
(2)	Insulation	$\geq 100\text{M}\Omega/25\text{V(DC)}$
(3)	Linearity	$X \leq 1.0\%$, $Y \leq 1.0\%$ (See Figure 10-1)

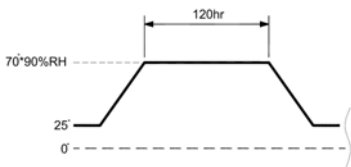
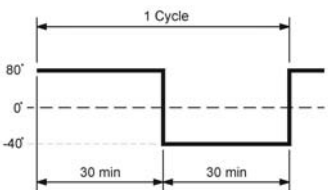
07 Durability

Item [項目]		Specification [規格]
(1)	Knock Test	100,000,000 times

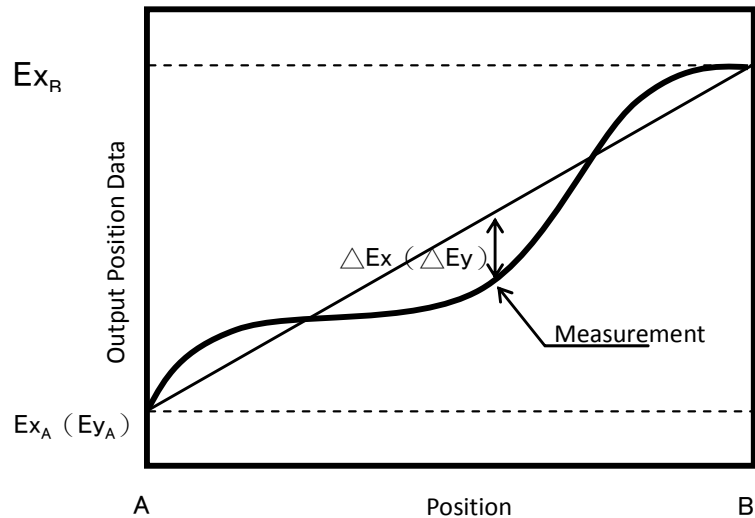
08. Mechanical Characteristics

Item		Condition	Specification [規格]
(1)	Operating Force	Finger $\leq 10g$	Satisfy- 1. Optical Characteristics. 2. Electrical Characteristics. Appearance- 1. Ignore test area 2. No mechanical damage.
(2)	Impact	25.0 ϕ DIA. Steel Ball/67g Height=30cm / 1 time, Impact at center area 	
(3)	Static Load	5000g within 10cm ϕ area for 30sec 	
(4)	Hardness	7H pencil, pressure 750g/45° 	
(5)	Tail Peeling	800g/cm by vertical 90° for 30sec 	
(6)	Tail Bending	90° 10 times left & right 	

09. Reliability

Item		Condition	Specification
(1)	Constant Temperature /Humidity	70°C x 90%RH, 120 hrs and normalized for 4 hrs	Satisfy- 1.Electrical Characteristics.
			
(2)	Heat Cycle	70°C /120 hrs and normalized for 4 hrs	
(3)	Cold Cycle	-40°C /120 hrs and normalized for 4 hrs	
(4)	Thermal Cycle	-40°C ~80°C [60 min./cycle] *10 cycles and normalized for 4 hrs	
			

10. Linearity :

(1)	Linearity Condition
	<p>Measure the product output data when a brass finger connected with GND is traced a straight line AB. ΔE is the maximum output difference when a brass finger traces A to B. AB is the end and the end in an active area. Linearity is expressed by the following equation. (Fig 10-1)</p> <div data-bbox="574 627 1332 1142"><p>The graph shows 'Output Position Data' on the y-axis and 'Position' on the x-axis. A solid curve represents the 'Measurement'. A straight line segment connects point A on the x-axis to point B on the x-axis. The y-coordinates of A and B are labeled $E_{x_A} (E_{y_A})$ and E_{x_B} respectively. A vertical double-headed arrow between the curve and the line AB is labeled $\Delta E_x (\Delta E_y)$ and 'Measurement'.</p></div> <p>(Fig 10-1)</p> <p>※ X directional linearity = $(\Delta E_x / \Delta E_{x_{a-b}}) \times 100[\%]$ Y directional linearity = $(\Delta E_y / \Delta E_{y_{a-b}}) \times 100[\%]$</p> <p>※ Test Tool: Brass Finger</p> <p>Cylindrical brass bar simulating a fingertip used in measurement and testing.</p>
(2)	Specification [規格]
	linearity must be meet the electrical specification outlined in Item 6