DATASHEET

9/7/2017

Fema Part Number

GM800480E-50-TTX3-HTGG	
	5” Full Color TFT
	800X480 Resolution
	High bright 850 nits
	Integrated Projected Capacitive touch (enlarged coverglass)
	Focaltech FT5426 Controller on flex

Fema Electronics Corporation:

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

1. GENERAL DESCRIPTION

1.1 Description

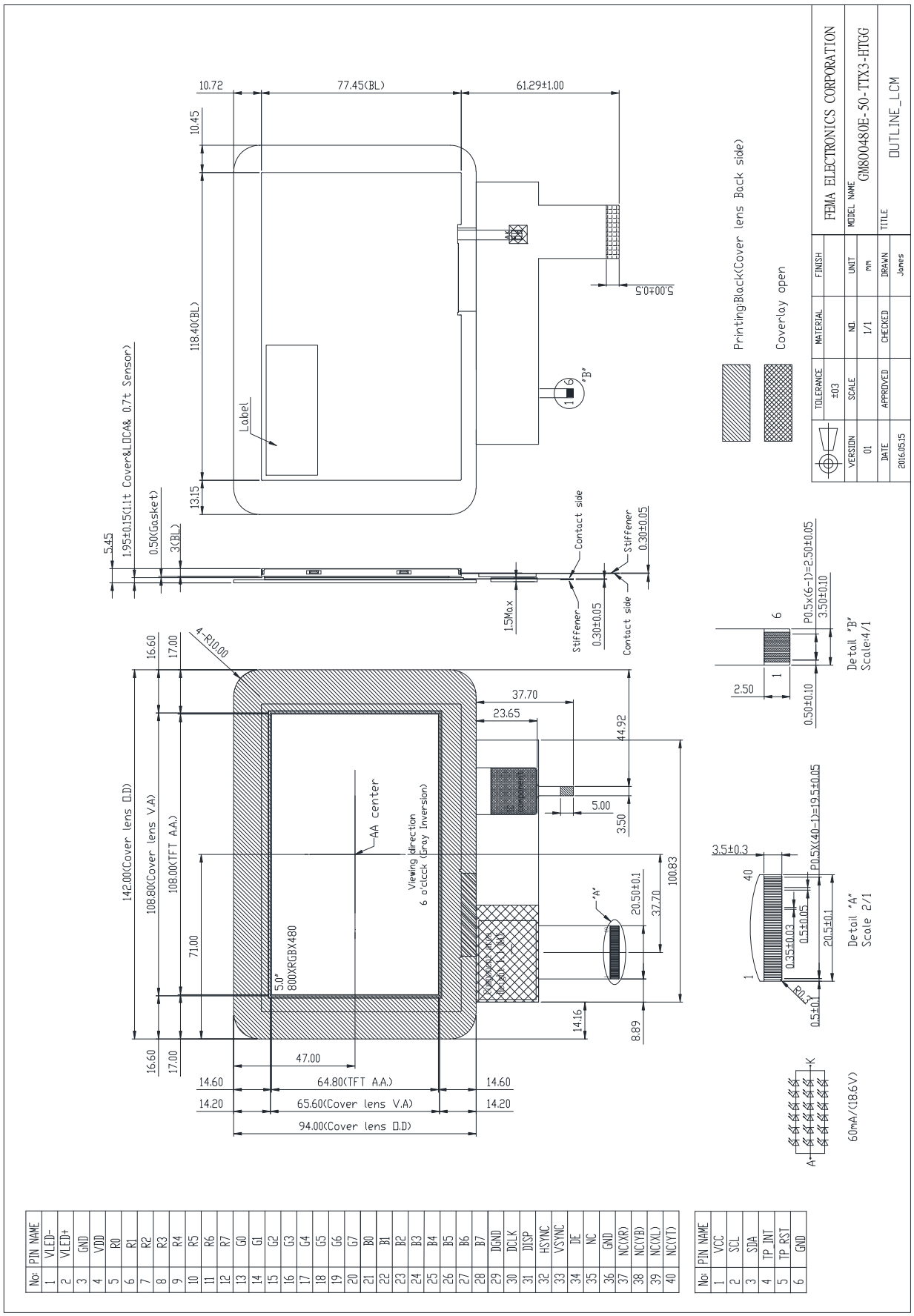
The specification is model GM800480E-50-TTX3-HTGG is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, a backlight system and projected capacitive touch panel. This TFT LCD has a 5.0

(16:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixels) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	5.0”	Inch
2	Number of Pixels	800 (W) x RGB x 480 (H)	Pixels
3	Active Area	108 (W) × 64.8 (H)	mm
4	Pixel Pitch	0.135 (W) x 0.135 (H)	mm
5	Outline Dimension	142 (W) × 94 (H) × 5.45 (T)	mm
6	Number of Colors	16.7M	- -
7	Display Mode	TN / Normally White / Transmissive	- -
8	View Direction	6 o’clock (Gray Inversion)	
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Clear (7H)	- -
11	Contrast Ratio	600 (Typ.)	- -
12	Luminance (cd/m^2)	850 (Typ.)	cd/m2
13	Interface	RGB 24bit Interface	- -
14	Backlight	White LED	- -
15	Operation Temperature	-30 ~ 70	°C
16	Storage Temperature	-30 ~ 80	°C
17	Weight	TBD	g

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

Pin No.	Symbol	I/O	Function	Remark
1	VLED-	P	Power for LED backlight cathode	
2	VLED+	P	Power for LED backlight anode	
3	GND	P	Power Ground	
4	VDD	P	Power Supply	
5	R0	I	Red data signal (LSB)	
6	R1	I	Red data signal	
7	R2	I	Red data signal	
8	R3	I	Red data signal	
9	R4	I	Red data signal	
10	R5	I	Red data signal	
11	R6	I	Red data signal	
12	R7	I	Red data signal (MSB)	
13	G0	I	Green data signal (LSB)	
14	G1	I	Green data signal	
15	G2	I	Green data signal	
16	G3	I	Green data signal	
17	G4	I	Green data signal	
18	G5	I	Green data signal	
19	G6	I	Green data signal	
20	G7	I	Green data signal (MSB)	
21	B0	I	Blue data signal (LSB)	
22	B1	I	Blue data signal	
23	B2	I	Blue data signal	
24	B3	I	Blue data signal	
25	B4	I	Blue data signal	
26	B5	I	Blue data signal	
27	B6	I	Blue data signal	
28	B7	I	Blue data signal (MSB)	
29	DGND	P	Digital ground	
30	DCLK	I	Pixel clock	
31	DISP	I	Display on: high / off: low	
32	HSYNC	I	Horizontal sync signal	
33	VSYNC	I	Vertical sync signal	
34	DE	I	Data Enable signal	

35	NC	-	No Connect	
36	GND	P	Power Ground	
37	NC	-	No Connect	
38	NC	-	No Connect	
39	NC	-	No Connect	
40	NC	-	No Connect	

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

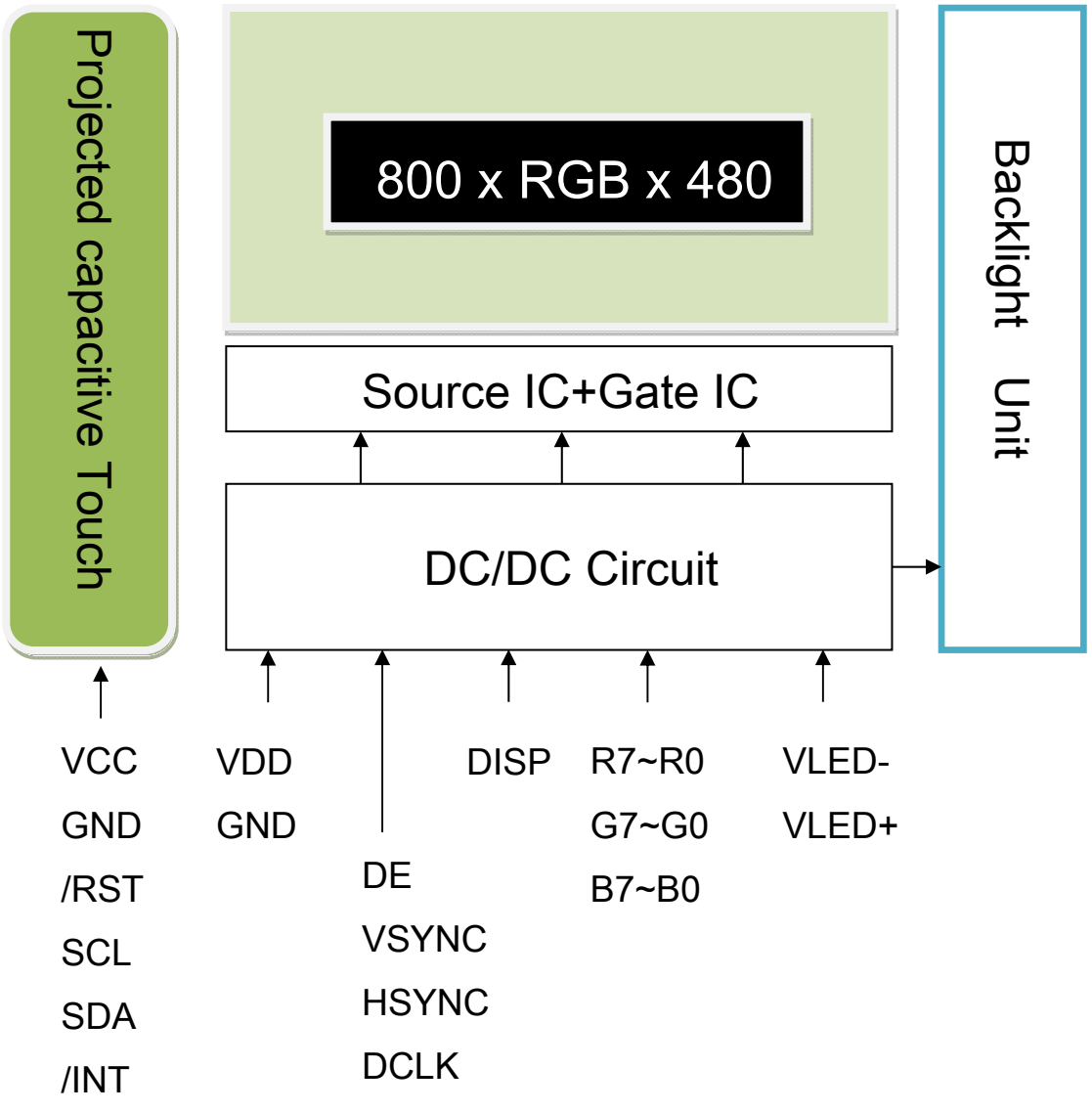
Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VDD	-0.3	5.0	V	

4.1.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-30		70	°C	Ambient temperature
Storage Temperature	Tstg	-30		80	°C	

5. BLOCK DIAGRAM

5.1 TFT LCD Module



6. Relationship Between Displayed Color and Input

6.1 8 bit

	Color & Gray Scale	Data Signal																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(127)	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(127)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

7. ELECTRICAL CHARACTERISTICS

7.1 TFT LCD Module

Item		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power supply voltage		VDD	3.0	3.3	3.6	V	
Input Voltage for logic	H Level	VIH	0.7xVDD	-	VDD	V	
	L Level	VIL	0	-	0.3xVDD	V	
Digital Current		IDD	-	150	220	mA	Note1

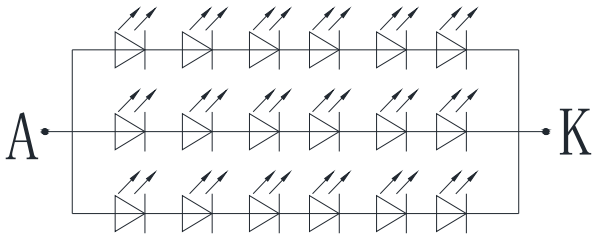
Note 1: frame =60Hz, Ta=25°C, Display pattern: Black pattern



7.2 Backlight Unit

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	(17.4)	(19.2)	(20.4)	V	
LED Current	If	-	(60)	-	mA	6S3P
Power Consumption	PBL	-	1152		mW	
LED Life Time (25℃)	-	(50000)	-	-	hr	(1)

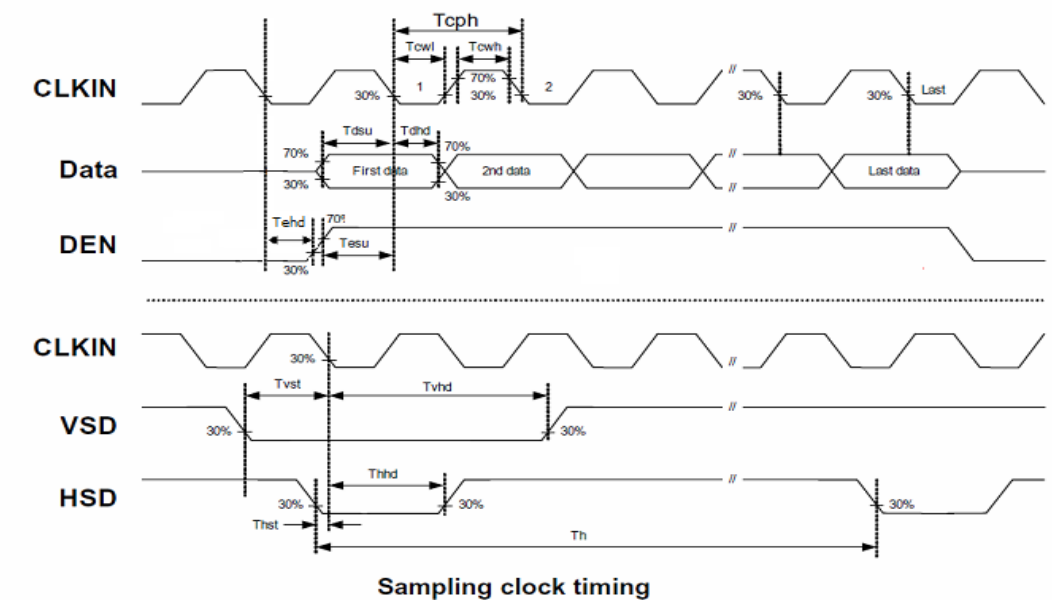
Note (1): The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ 60% RH.



7.3 INTERFACE SPECIFICATIONS

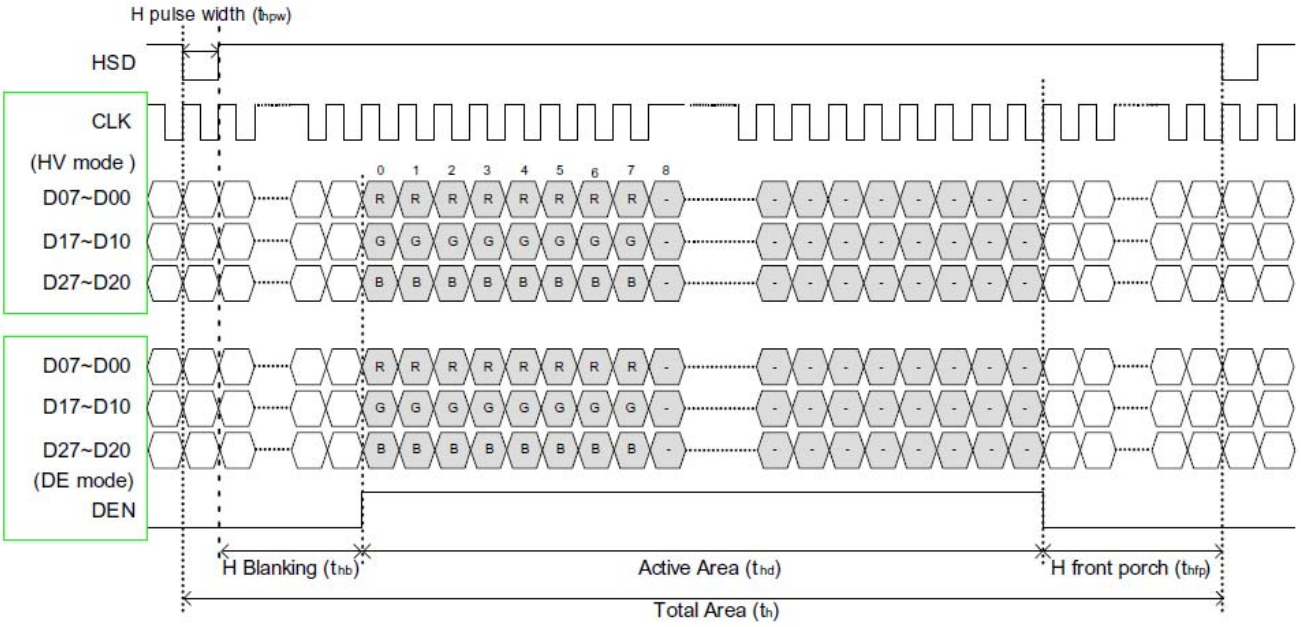
7.3.1 Timing characteristics

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	DCLK cycle time	Tcph	25	-	-	ns	
	DCLK Frequency	fclk	-	30	40	MHz	
	DCLK High plus width	Tcwh	40	50	60	%	
Horizontal	HSD setup time	Thst	8	-	-	ns	
	HSD hold time	Thhd	8	-	-	ns	
	Horizontal display area	thd	-	800	-	Tcph	
	HSD period time	th	-	928	-	Tcph	
	HSD pulse width	thpw	1	48	-	Tcph	
	HSD back porch	thb	-	40	-	Tcph	
	HSD front porch	thfp	-	40	-	Tcph	
Vertical	VSD setup time	Tvst	8	-	-	ns	
	VSD hold time	Tvhd	8	-	-	ns	
	Vertical display area	tvd	-	480	-	th	
	VSD period time	tv	-	525	-	th	
	VSD pulse width	tvpw	-	3	-	th	
	VSD back porch	tvb	-	29	-	th	
	VSD front porch	tvfp	-	13	-	th	
DE	DE setup time	Tesu	8	-	-	ns	
	DE hold time	Tehd	8	-	-	ns	
DATA	Data setup time	Tdsu	8	-	-	ns	
	Data hold time	Tdhd	8	-	-	ns	

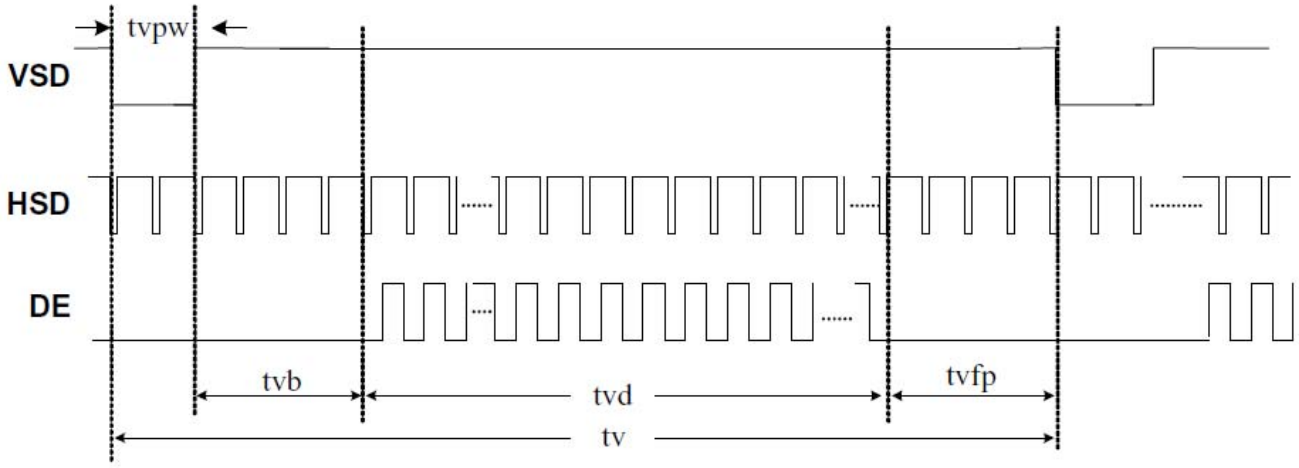


Sampling clock timing

7.3.2 DE Mode Input Timing Table

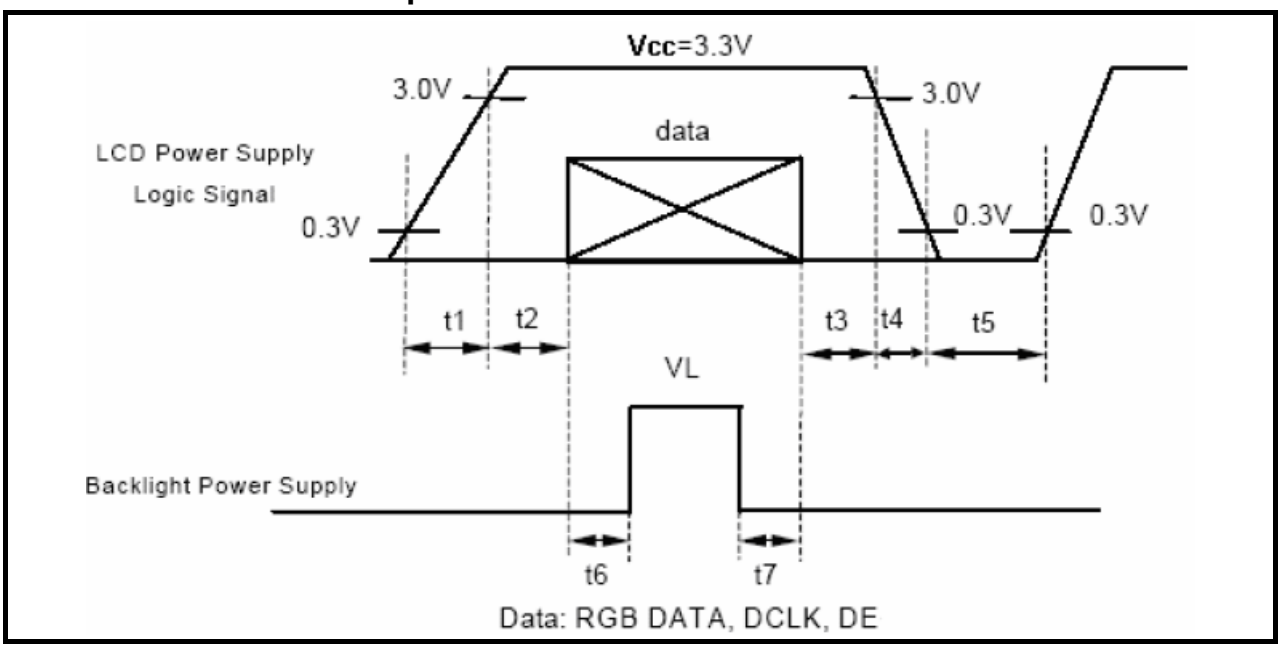


Horizontal display timing range



Vertical timing

7.4 Power On / Off Sequence



t1 ≤10ms : 1 sec≤ t5

50ms≤ t2 : 200ms ≤t6

0<t3 ≤50ms: 200ms≤ t7

0<t4 ≤10ms

8. PROJECTED CAPACITIVE TOUCH PANEL

8.1 Main Feature

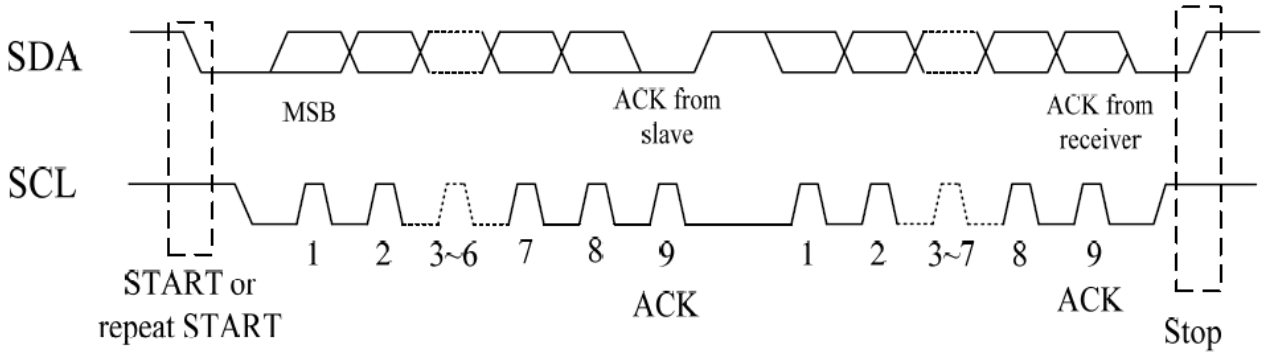
Item	Specification	Unit
Screen Size	5.0 inch	Diagonal
Type	Transparent Type Projected Capacitive	--
Input Mode	Human's Finger	--
Finger	5	--
Interface	I2C	--
Cover glass pencil-hardness	7H	--
Response time	25	ms
Driver IC	FT5426	

8.2 Pin Assignments and Definitions

Item	Name	I/O	Unit
1	VCC	P	Power; VDD =3.3V(typ.)
2	SCL	I	I2C clock
3	SDA	I/O	I2C data
4	/INT	O	Interrupt signal to inform the host processor that touch data is ready for read
5	/RST	I	External low signal reset the chip.
6	GND	P	Ground

8.3 ELECTRICAL CHARACTERISTICS

Communication protocol: I2C

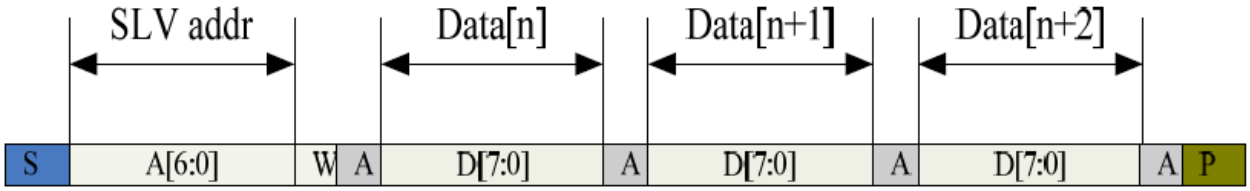


8.4 I2C Interface Protocol

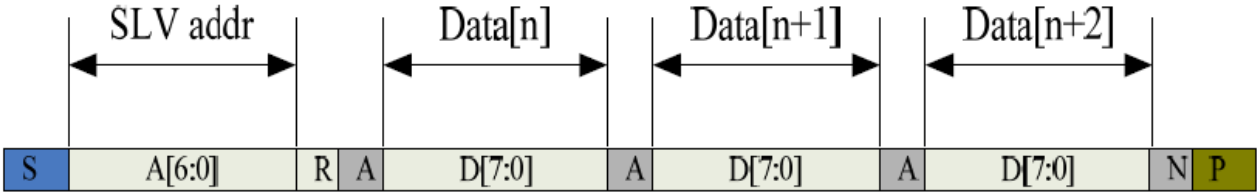
8.4.1 Default I2C Address

The default I2C Address of FT5426 is 0x70 (8-bit address)

8.4.2 I2C master write, slave read



8.4.3 I2C master read, slave write



Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:4]: 3'b011 A[3:0]: data bits are identical to those of I2CCON[7:4] register.
W	1'b0: Write
R	1'b1: Read
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

8.5 Register Definitions

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Host Access
00h	DEVIDE_MODE		Device Mode[2:0]							RW
01h	GEST_ID	Gesture ID[7:0]								R
02h	TD_STATUS					Number of touch points[3:0]				R
03h	TOUCH1_XH	1st Event Flag				1st Touch X Position[11:8]				R
04h	TOUCH1_XL	1st Touch X Position[7:0]								R
05h	TOUCH1_YH	1st Touch ID[3:0]				1st Touch Y Position[11:8]				R
06h	TOUCH1_YL	1st Touch Y Position[7:0]								R
07h										
08h										
09h	TOUCH2_XH	2nd Event Flag				2nd Touch X Position[11:8]				R
0Ah	TOUCH2_XL	2nd touch X Position[7:0]								R
0Bh	TOUCH2_YH	2nd Touch ID[3:0]				2nd Touch Y Position[11:8]				R
0Ch	TOUCH2_YL	2nd Touch Y Position[7:0]								R
0Dh										R
0Eh										R
0Fh	TOUCH3_XH	3rd Event Flag				3rd Touch X Position[11:8]				R
10h	TOUCH3_XL	3rd Touch X Position[7:0]								R
11h	TOUCH3_YH	3rd Touch ID[3:0]				3rd Touch Y Position[11:8]				R
12h	TOUCH3_YL	3rd Touch Y Position[7:0]								R
13h										R
14h										R

15h	TOUCH4_XH	4th Event Flag		4th Touch X Position[11:8]	R
16h	TOUCH4_XL	4th Touch X Position[7:0]			R
17h	TOUCH4_YH	4th Touch ID[3:0]		4th Touch Y Position[11:8]	R
18h	TOUCH4_YL	4th Touch Y Position[7:0]			R
19h					R
1Ah					R
1Bh	TOUCH5_XH	5th Event Flag		5th Touch X Position[11:8]	R
1Ch	TOUCH5_XL	5th Touch X Position[7:0]			R
1Dh	TOUCH5_YH	5th Touch ID[3:0]		5th Touch Y Position[11:8]	R
1Eh	TOUCH5_YL	5th Touch Y Position[7:0]			R
1Fh					R
20h					R
21h	TOUCH6_XH	6th Event Flag		6th Touch X Position[11:8]	
22h	TOUCH6_XL	6th Touch X Position[7:0]			
23h	TOUCH6_YH	6th Touch ID[3:0]		6th Touch Y Position[11:8]	
24h	TOUCH6_YL	6th Touch Y Position[7:0]			
25h					
26h					
27h	TOUCH7_XH	7th Event Flag		7th Touch X Position[11:8]	
28h	TOUCH7_XL	7th Touch X Position[7:0]			
29h	TOUCH7_YH	7th Touch ID[3:0]		7th Touch Y Position[11:8]	
2Ah	TOUCH7_YL	7th Touch Y Position[7:0]			
2Bh					
2Ch					
2Dh	TOUCH8_XH	8th Event Flag		8th Touch X Position[11:8]	
2Eh	TOUCH8_XL	8th Touch X Position[7:0]			
2Fh	TOUCH8_YH	8th Touch ID[3:0]		8th Touch Y Position[11:8]	
30h	TOUCH8_YL	8th Touch Y Position[7:0]			
31h					
32h					

33h	TOUCH9_XH	9th Event Flag		9th Touch X Position[11:8]	
34h	TOUCH9_XL	9th Touch X Position[7:0]			
35h	TOUCH9_YH	9th Touch ID[3:0]		9th Touch Y Position[11:8]	
36h	TOUCH9_YL	9th Touch Y Position[7:0]			
37h					
38h					
39h	TOUCH10_XH	10th Event Flag		10th Touch X Position[11:8]	
3Ah	TOUCH10_XL	10th Touch X Position[7:0]			
3Bh	TOUCH10_YH	10th Touch ID[3:0]		10th Touch Y Position[11:8]	
3Ch	TOUCH10_YL	10th Touch Y Position[7:0]			
3Dh					
3Eh					
3Fh	Reserved				
...	...				
7Fh	Reserved				
80h	ID_G_THGROUP	valid touching detect threshold.			R/W
81h	ID_G_THPEAK	valid touching peak detect threshold.			R/W
82h	ID_G_THCAL	the threshold when calculating the focus of touching.			R/W
83h	ID_G_THWATER	the threshold when there is surface water.			R/W
84h	ID_G_THTEMP	the threshold of temperature compensation.			R/W
85h					R/W
86h	ID_G_CTRL			Power control mode[1:0]	R/W
87h	ID_G_TIME_ENTER _MONITOR	The timer of entering monitor status			R/W
88h	ID_G_PERIODACTIVE			Period Active[3:0]	R/W
89h	ID_G_PERIOD MONITOR	The timer of entering idle while in monitor status			R/W
8Ah					R/W
8Bh					R/W
8Ch					R/W
8Dh					R/W
8Eh					R/W
8Fh					R/W
90h					R/W

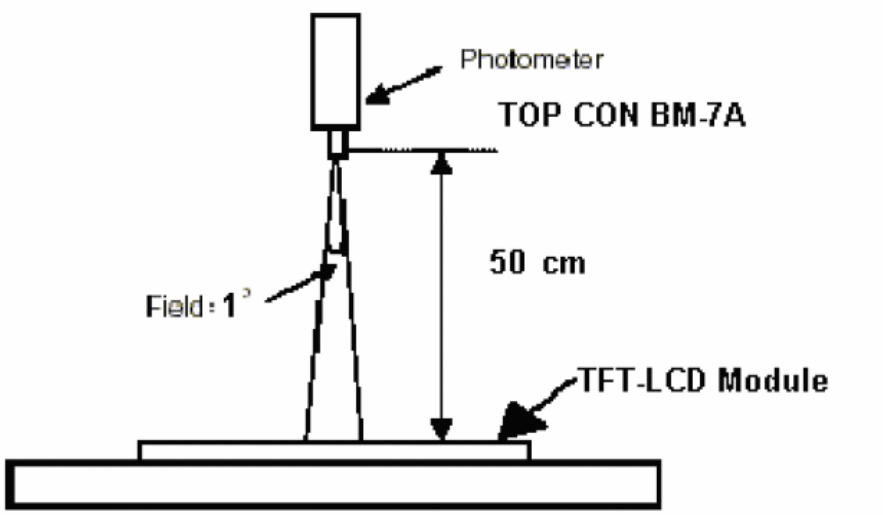
91h			R/W
92h			R/W
93h			R/W
94h			R/W
95h			R/W
96h			R/W
97h			R/W
98h			R/W
99h			R/W
9Ah			R/W
9Bh			R/W
9Ch			R/W
9Dh			R/W
9Eh			R/W
9Fh			R/W
A0h	ID_G_AUTO_CLB _MODE	auto calibration mode	R/W
A1h	ID_G_LIB_ VERSION_H	Firmware Library Version H byte	R
A2h	ID_G_LIB _VERSION_L	Firmware Library Version L byte	R
A3h	ID_G_CIPHER	Chip vendor ID	R
A4h	ID_G_MODE	the interrupt status to host	R
A5h	ID_G_PMODE	Power Consume Mode	
A6h	ID_G_FIRMID	Firmware ID	R
A7h	ID_G_STATE	Running State	
A8h	ID_G_FT5201ID	CTPM Vendor ID	R
A9h	ID_G_ERR	Error Code	R
AAh	ID_G_CLB	Configure TP module during calibration in Test Mode	R/W
ABh			R/W
ACh			R/W
ADh			R/W
AEh	ID_G_B_AREA_TH	The threshold of big area	R/W
AFh			R/W
…	…		
FDh	Reserved		
FEh	LOG_MSG_CNT	The log MSG count	R
FFh	LOG_CUR_CHA	Current character of log message, will point to the next character when one character is read.	R

9. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--	Note1, Note 3, ($\theta = 0^\circ$, Normal Viewing Angle)	680	850	--	cd/m2
Uniformity		B-uni		70	75	-	%
Contrast Ratio		CR		480	600	--	--
Response Time		Tr		--	3	6	ms
		Tf		--	7	14	ms
Color Chromaticity	White	Wx		0.260	0.310	0.360	--
		Wy		0.280	0.330	0.380	--
View angle	Horizontal	θ x+	Center CR≥10	65	75	--	
		θ x-		65	75	--	
	Vertical	θ Y+		50	60	--	
		θ Y-		60	70	--	

Note：The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C. The measurement method is shown in Note1.

Note1: The method of optical measurement:

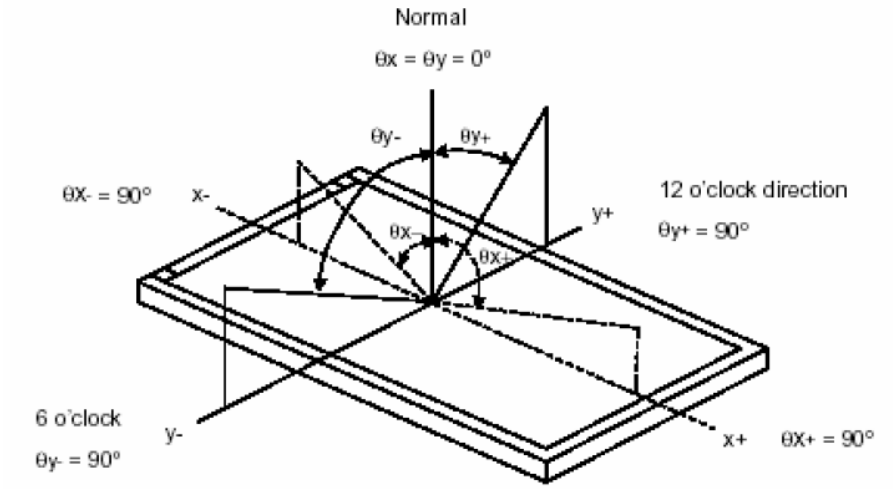


Note2: Measured at the center area of the panel and at the viewing angle of the θ x= θ y =0°

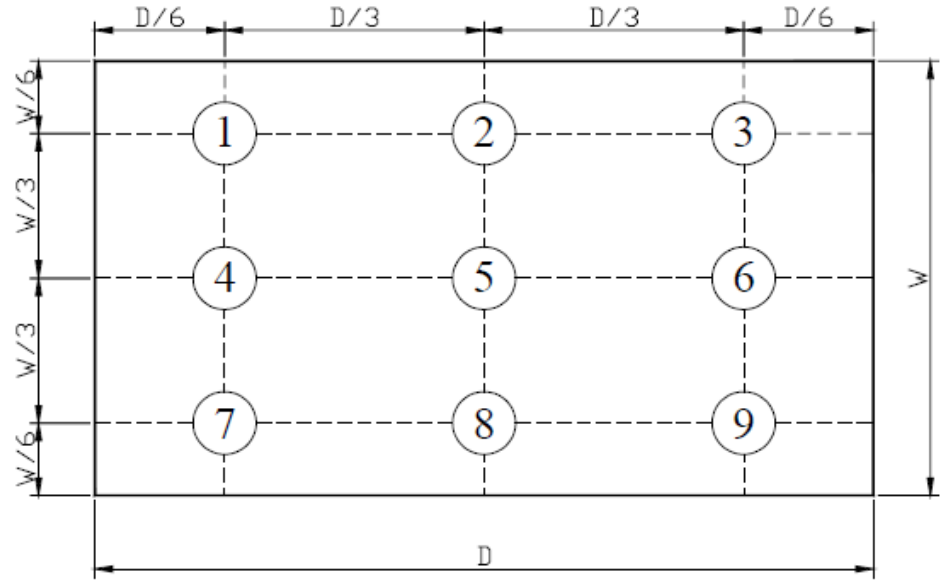
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state ÷ Luminance with all pixels in Black state

Note 4: Definition of Viewing Angle:

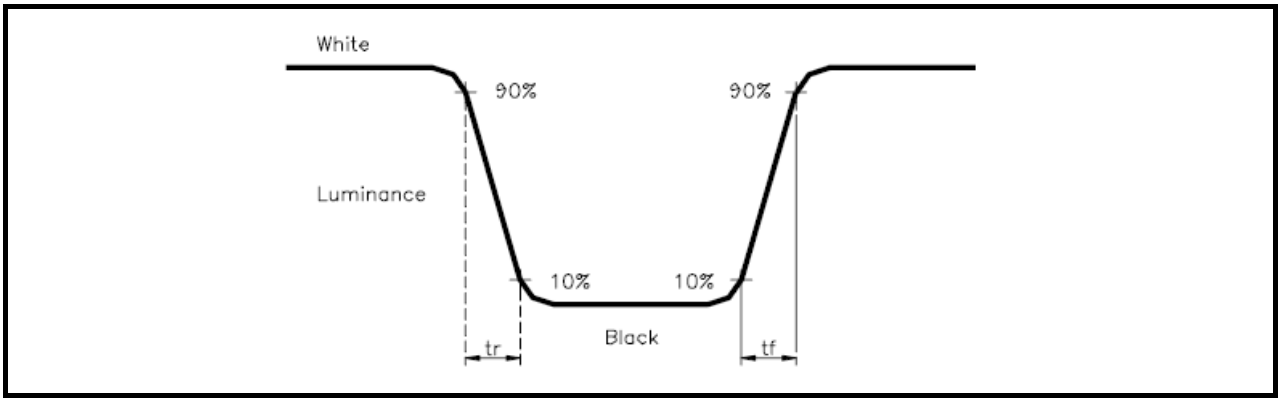


Note 5: Definition of Brightness Uniformity (B-uni):



B-uni ＝(Minimum luminance of 9 points÷Maximum luminance of 9points)X100%

Note 6: Definition of Response Time:
The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure



Note 7: Definition of Chromaticity:
The color coordinates (Wx,Wy),(Rx,Ry),(Gx,Gy),and (Bx,By) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

10. RELIABILITY

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

10.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

10.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	80°C, 120 hrs
2	Low Temperature Storage	-30°C, 120 hrs
3	High Temperature Operating	70°C, 120 hrs
4	Low Temperature Operating	-30°C, 120 hrs
5	High Temperature/Humidity Non-Operating	60°C, 90%RH, 120 hrs
6	Temperature Shock Non-Operating	-30°C ←→ 80°C (0.5hr each), 25 cycles
7	Vibration Test Non-Operating	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
8	Electro-static Discharge Non-Operating	150pF,330Ω Air:± 12KV;Contact: ±6KV 10 times/point;4 points/panel face

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

10.3 JUDGMENT STANDARD

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

10.4 INCOMING INSPECTION STANDARDS

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Operating</td><td>Display function: No Display malfunction (Major)
Contrast ratio (Black, White):
Does not meet specified range in the spec. (Major) (Note:3)
Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)
Point Defect (Red, green, blue, dark): Active area ≤ 5 dots (Minor) (Note:1)
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Acceptable number</th><th rowspan="2">Total</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>Bright</td><td>0</td><td>2</td><td rowspan="3">5</td></tr>
<tr><td>Dark</td><td>2</td><td>4</td></tr>
<tr><td>Total</td><td>2</td><td>4</td></tr>
</table>
Non-uniformity: Visible through 6%ND filter. (Minor)
Foreign material in Black or White spots shape (W>1/4L)
<table>
<tr><th>Zone / Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D> 0.5</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.1 ≤ D ≤ 0.5</td><td>4</td></tr>
<tr><td>D ≤ 0.1</td><td>*</td></tr>
</table>
D = (Long + Short) / 2 ＊: Disregard
Foreign Material in Line or spiral shape (W≤1/4L) (Note: 4)
<table>
<tr><th>L (mm) / Zone W(mm)</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>L >2</td><td>W>0.1</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.5 < L ≤ 2</td><td>0.03 < W≤0.1</td><td>1</td></tr>
<tr><td>L ≤0.5</td><td>W≤0.03</td><td>*</td></tr>
</table>
L : Length W : Width ＊: Disregard</td></tr>
<tr><td>2</td><td>External Inspection (non-operating)</td><td>Dimension: Outline (Major)
Bezel appearance: uneven (Minor)
Scratch on the polarize: (Note:2)
<table>
<tr><th>L (mm) / Zone W(mm)</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>--</td><td>W>0.1</td><td>0</td><td rowspan="2">Minor</td><td rowspan="2">1.5</td></tr>
<tr><td>L ≤ 2</td><td>W≤0.1</td><td>3</td></tr>
</table>
L : Length W : Width ＊: Disregard
Dent or bubble on the polarize (Note:2)
<table>
<tr><th>Zone / Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D≤0.05</td><td>*</td><td rowspan="2">Minor</td><td rowspan="2">1.5</td></tr>
<tr><td>D≤0.3</td><td>3</td></tr>
</table>
D = (Long + Short) / 2 ＊: Disregard</td></tr>
</table>

Class of defects	**Major**	AQL 0.65%	**Definition** It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5%	It is a defect that will not result in functioning problem with deviation classified.

Note1:

(a)Bright point defect is defined as point defect of R,G,B with area >1/2 pixel respectively

(b)Dark point defect is defined as visible in full white pattern.

(c)Definition of distribution of point defect is as follows:

-minimum separation between dark point defects should be larger than 5mm.

-minimum separation between bright point defects should be larger than 5mm.

(d)Definition of joined bright point defect and joined dark point defect are as follows:

-Two or more joined bright point defects must be nil.

-Three joined dark point defects must be nil.

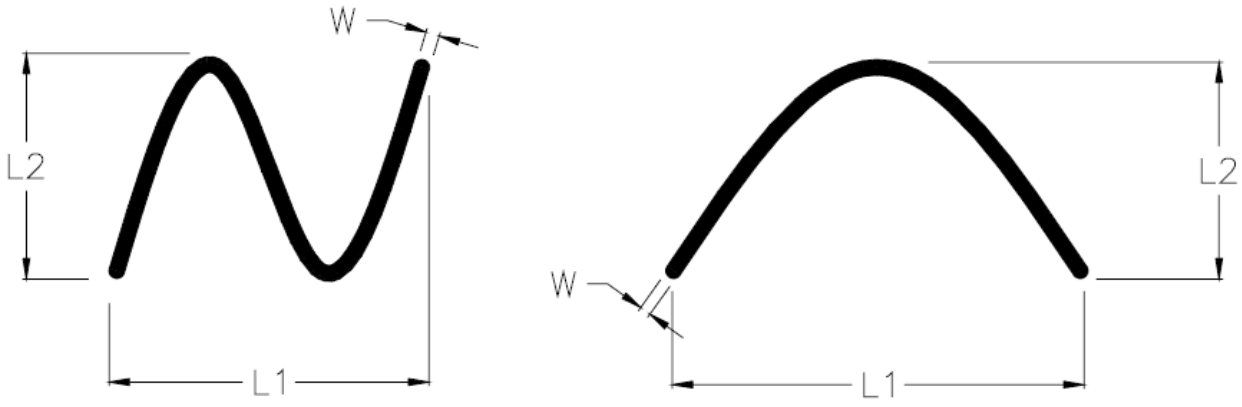
-Coupling of one dark and one bright point in junction is counted as one dark and bright spot with 1 pair maximum.

-Two Joined dark point is counted as two dark points with 2 pair maximum.

Note2: The external inspection should be conducted at the distance 30± 5cm between the eyes of inspector and the panel.

Note3: Luminance measurement for contrast ratio is at the distance 50± 5cm between the detective head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note4: W-Width in mm , L-length of Max.(L1,L2) in mm.



10.5 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

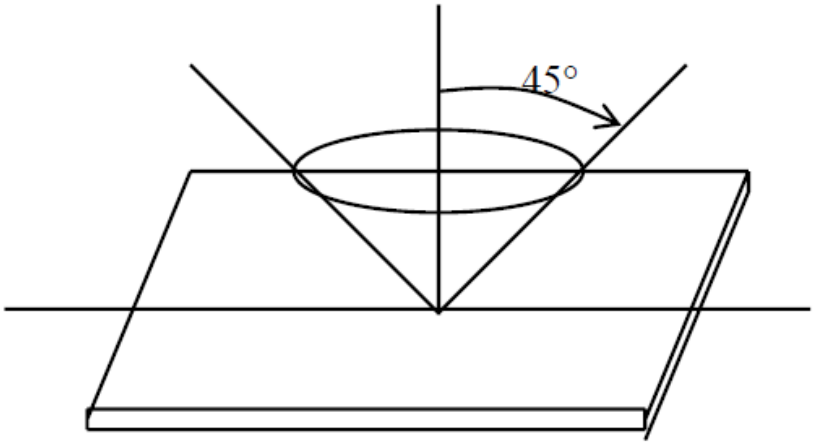
Inspection level: Level II

10.6 Inspection conditions

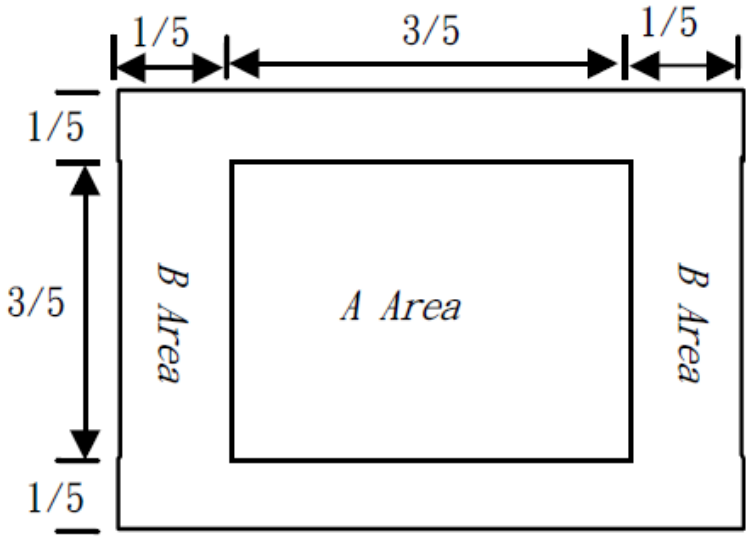
The LCD shall be inspected under 40W white fluorescent light.

$\theta \leq 45^{\circ}$ inspection under non-operating condition.

$\theta \leq 5^{\circ}$ inspection under operating condition



Definition of applicable Zones



11. PRECAUTION RELATING PRODUCT HANDLING

11.1 SAFETY

11.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

11.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

11.2 HANDLING

11.2.1 Avoid any strong mechanical shock which can break the glass.

11.2.2 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.

11.2.3 Do not remove the panel or frame from the module.

11.2.4 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.)

11.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

11.2.6 Do not touch the display area with bare hands , this will stain the display area.

11.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

11.2.8 To control temperature and time of soldering is 280 ± 10°C and 3-5 sec.

11.2.9 To avoid liquid (include organic solvent) stained on LCM.

11.3 STORAGE

11.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

11.3.2 Do not place the module near organics solvents or corrosive gases.

11.3.3 Do not crush, shake, or jolt the module.