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4. Application

This specification is applied to the 15.0 inch XGA supported TFT-LCD module, and can display true 16.7M colors(8 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 15.0" TFT-LCD panel, a driver circuit and backlight unit and used as the input devices for general electric appliances via both finger and Capacitive stylus pen.

5. Features

- XGA (1024×768 pixels) resolution.
- HDMI Interface.
- Projected Capacitive Touch
 - USB Interface
 - Multi Touch (Five points)
 - 4096 x 4096 resolution

6. General Specifications

Item	Specifications	Unit
Screen Size	15.0 (Diagonal)	inch
Display Format	1024RGB(H)×768(V)	dot
Active Area	304.1(H)×228.1(V)	mm
PIXEL Pitch	0.297(H)×0.297(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	VA Type / Transmissive Mode / Normally Black	-
Surface Treatment	Clear(7H)	-
Viewing Direction	Full view angle	-
Outline Dimension	326.5(W)×253.5(H)×17.41(D)	mm
Weight	(1435)	g
RoHS Compliance	RoHS Compliance	-

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7. Absolute Maximum Ratings

7.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-30	+80	°C	-
Operating Ambient Temperature	T _{OP}	-20	+70	°C	-

7.2 Electrical Absolute Ratings

7.2.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	V _{CC}	-0.3	6.0	V	-

7.2.2 BACKLIGHT UNIT

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V _i	-0.3	18	V	(1), (2)
Enable Voltage	EN	---	5.5	V	
Backlight Adjust	Dimming	---	5.5	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

7.2.3 Projected Capacitive Touch

(Ta=25±2°C, GND=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	VDD	-0.3	5.3	V	-

8. Electrical Characteristics

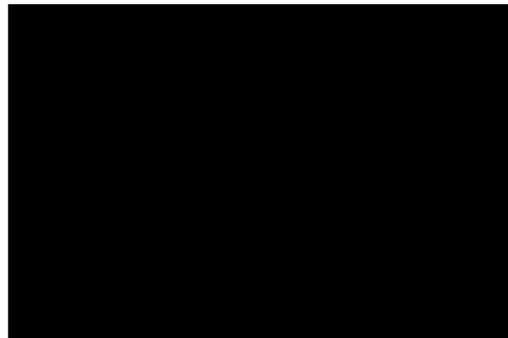
8.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	4.5	5.0	5.5	V	-
Power Supply Current	I _{CC}	-	600	840	mA	(1)
Input High Threshold Voltage	V _{IH}	2	-	3.3	V	-
Input Low Threshold Voltage	V _{IL}	0	-	0.8	V	-
Power Consumption	P _L	-	3000	4620	mW	(1)
VSYNC Frequency	F _V	-	60	-	Hz	-
DCLK Frequency	DCLK	-	51.2	-	MHz	-

Note (1) The specified power consumption is under the conditions at V_{CC}=5.0V, F_V=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray



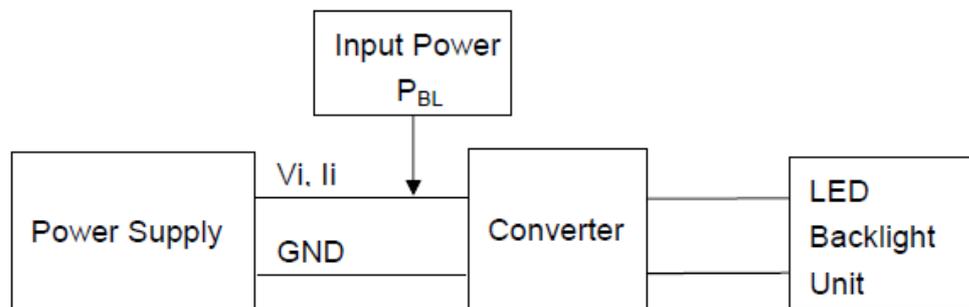
Active Area

8.2 Backlight Unit

($T_a=25\pm 2^\circ\text{C}$)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Converter Power Supply Voltage	V_i	10.8	12.0	13.2	V	
Converter Power Supply Current	I_i	0.5	0.65	0.8	A	@ $V_i = 12\text{V}$ (Duty 100%)
Backlight Power Consumption	P_{BL}	-	7.8	9.6	W	@ $V_i = 12\text{V}$ (Duty 100%)
EN Control Level	Backlight on	2.0	3.3	5.0	V	
	Backlight off	0	---	0.8	V	
PWM Dimming Control Level	PWM High Level	2.0	3.3	5.0	V	
	PWM Low Level	0	-	0.15	V	
PWM Dimming Control Duty Ratio	-	1	-	100	%	@200Hz
PWM Dimming Control Frequency	f_{PWM}	190	200	20k	Hz	(2)
LED Life Time	L_L	50,000	70,000	-	Hrs	(3)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:



Note (2) At 20k Hz PWM control frequency, duty ratio range is restricted from 20% to 100%.

Note (3) The lifetime of LED is estimated data and defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2^\circ\text{C}$ and Duty 100% until the brightness becomes $\leq 50\%$ of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.

8.3 Projected Capacitive Touch

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	VDD	4.8	5.0	5.2	V	-
Power Supply Current	IDD	-	34.5	48.3	mA	(1)
Output High Threshold Voltage	V _{OH}	2.8	-	-	V	-
Output Low Threshold Voltage	V _{OL}	-	-	0.8	V	-
Differential Input Sensitivity (D+)-(D-)	V _{DI}	0.2	-	-	V	-
Differential Input Common Mode Range	V _{CM}	0.8	-	2.5	V	
Power Consumption	P _L	-	172.5	241.5	mW	@5.0V
Report Rate	R _R	-	60	-	Hz	-
Interface		USB				-
Function		Multi Touch				-

Note (1) This test condition is touched with 5 points.

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10. Input / Output Terminals Pin Assignment

10.1 TFT-LCD Module

Connector: Mini-HDMI Connector

No.	Symbol	I/O	Description
1	TMDS Data2 Shield	I	Ground
2	TMDS Data2+	I	Channel-2 positive receiver input – Positive side of channel-2 TMDS low-voltage signal differential input pair. Channel-2 receives red-pixel data in active display and CTL2, CTL3 control signals in blank.
3	TMDS Data2–	I	Channel-2 negative receiver input – Negative side of channel-2 TMDS low-voltage signal differential input pair.
4	TMDS Data1 Shield	I	Ground
5	TMDS Data1+	I	Channel-1 positive receiver input – Positive side of channel-1 TMDS low-voltage signal differential input pair. Channel-1 receives green-pixel data in active display and CTL1 control signals in blank.
6	TMDS Data1–	I	Channel-1 negative receiver input – Negative side of channel-1 TMDS low-voltage signal differential input pair.
7	TMDS Data0 Shield	I	Ground
8	TMDS Data0+	I	Channel-0 positive receiver input – Positive side of channel-0. TMDS low-voltage signal differential input pair. Channel-0 receives blue pixel data in active display and HSYNC, VSYNC control signals in blank.
9	TMDS Data0–	I	Channel-0 negative receiver input – Negative side of channel-0. TMDS low-voltage signal differential input pair.
10	TMDS Clock Shield	I	Ground

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No.	Symbol	I/O	Description
11	TMDS Clock+	I	Clock positive receiver input – Positive side of reference clock. TMDS low-voltage signal differential input pair
12	TMDS Clock–	I	Clock negative receiver input – Negative side of reference clock. TMDS low-voltage signal differential input pair
13	DDC Ground	I	Ground
14	N.C.	I	Not Connection
15	DCC_SCL	I	Serial Clock for EEPROM
16	DCC_SDA	I	Serial Data for EEPROM
17	Reserved (N.C. on device)	I	Not Connection
18	+5V Power	I	5V for EEPROM
19	HPD	I	Hot Plug Detect High: Active link Low: Inactive link

10.2 Power Connector

Connector: CI4406M21HR0-LF

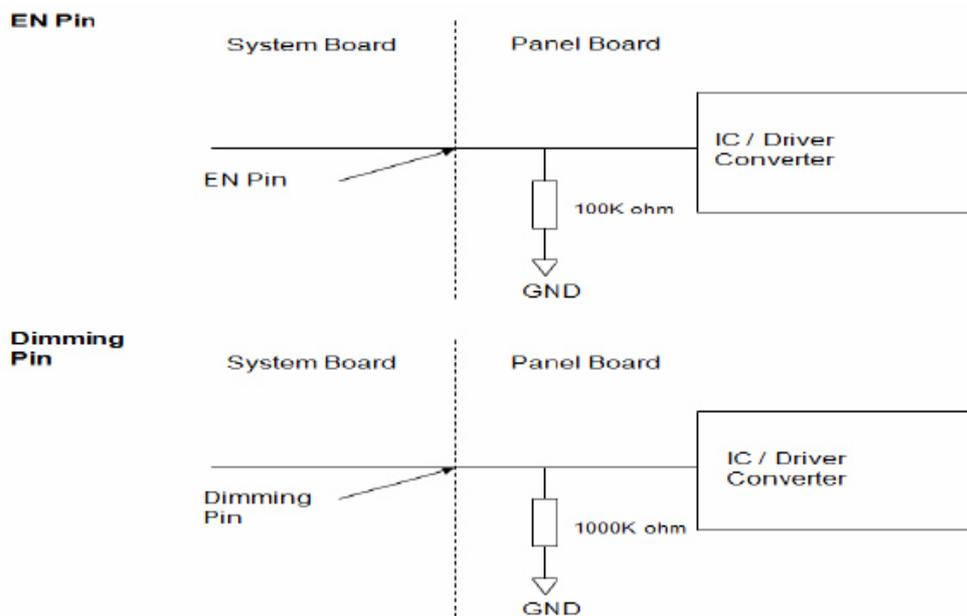
No.	Symbol	Functions
1	VCC	+5.0V power supply
2	VCC	+5.0V power supply
3	NC	Not Connection
4	NC	Not Connection
5	GND	Ground
6	GND	Ground

10.3 Backlight

Pin	Symbol	Description	Remark
1	V_i	Converter input voltage	12V
2	V_{GND}	Converter ground	Ground
3	EN	Enable pin	3.3V
4	Dimming	Backlight Adjust	PWM Dimming (Hi: 3.3V _{DC} , Lo: 0V _{DC})
5	NC	Not Connect	

Note (1) Connector Part No.: CI4205M2HRP-NH (Cvilux) or equivalent.

Note (2) User's connector Part No.: MOLEX 51146-0500 or equivalent.



10.4 Projected Capacitive Touch

Connector: CI0105M1HR0-NH

Pin No.	Symbol	I/O	Description
1	VDD	I	+5.0V power supply.
2	D-	I/O	USB D-
3	D+	I/O	USB D+
4	GND	I	System ground.
5	GND	I	System ground.

12. Optical Characteristics

The optical characteristics should be measured in a dark environment (≤ 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	1800	(2500)	-	-	(2)
Response Time		T_R+T_F		-	23	35	ms	(3)
Luminance (Center)		Y		350	(440)	-	cd/m ²	(4)
White Variation		δW		-	1.25	1.33	-	(5)
Color Chromaticity	Red	Rx		0.597	0.647	0.697	-	(1),(4)
		Ry	0.288	0.338	0.388	-		
	Green	Gx	0.271	0.321	0.371	-		
		Gy	0.556	0.606	0.656	-		
	Blue	Bx	0.107	0.157	0.207	-		
		By	0.001	0.051	0.101	-		
	White	Wx	0.263	0.313	0.363	-		
		Wy	0.279	0.329	0.379	-		
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$	80	(88)	-	deg.	
		θ_{x-}		80	(88)	-		
	Vertical	θ_{y+}		80	(88)	-		
		θ_{y-}		80	(88)	-		

