LCD TFT Module Specification

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RVT50AQFFWC00

LCD TFT Datasheet

Rev.1.0

2015-10-06

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally white	/
Size	5.0	Inch
Viewing Direction	12:00 (without image inversion)	O' Clock
Gray Scale Inversion Direction	6:00	O' Clock
LCM (W × H × D)	121.50 ×76.60 ×9.70	mm^3
Active Area (W × H)	108.00 × 64.80	mm^2
Dot Pitch (W × H)	0.045×0.135	mm^2
Number Of Dots	800 x (RGB) × 480	/
Driver IC	FT813	/
Backlight Type	12 LEDs	/
Surface Luminance	510	cd/m^2
Interface Type	SPI/QSPI	/
Color Depth	16.7M	/
Pixel Arrangement	RGB Vertical Stripe	/
Surface Treatment	Clear	
Input Voltage	3.3	V
With/Without TSP	Projected Capacitive Touch Panel	/
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.0	2015-10-06	Initial Release	

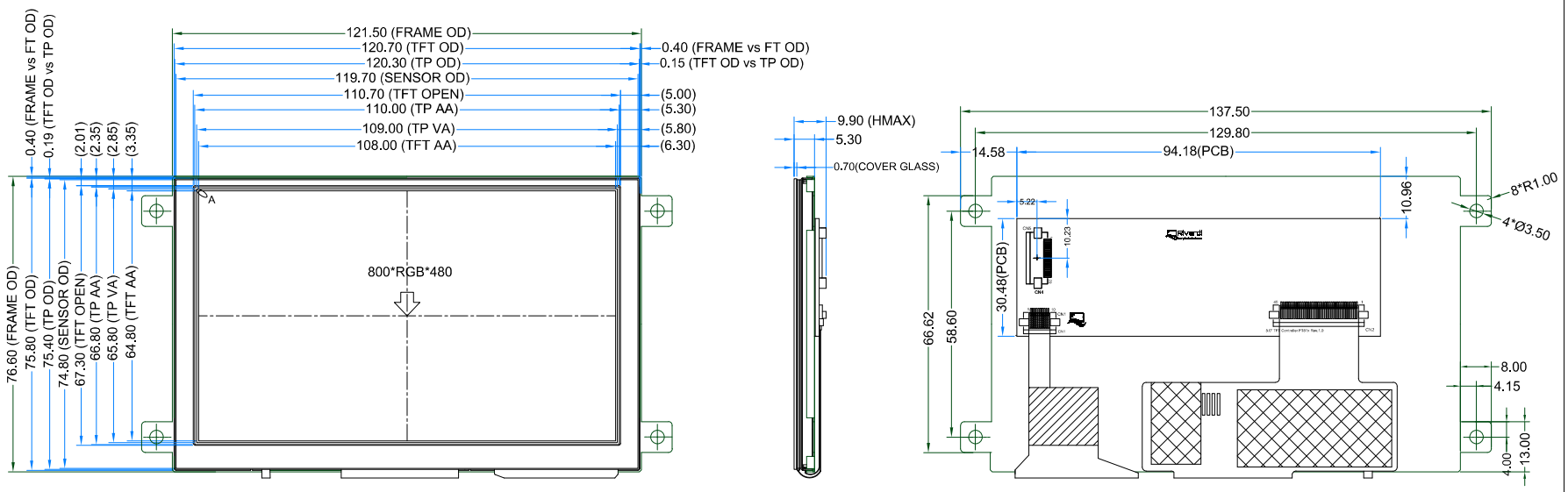
CONTENTS

1 MODULE CLASSIFICATION INFORMATION

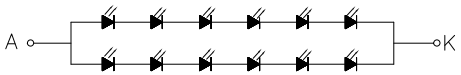
RV	T	50	A	Q	F	F	W	C	00
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

1.	**BRAND**	**RV** – Riverdi
2.	**PRODUCT TYPE**	**T – TFT Standard** **F** – TFT Custom
3.	**DISPLAY SIZE**	**35** – 3.5” **43 –** 4.3” **50 – 5.0”** **70** – 7.0”
4.	**MODEL SERIAL NO.**	**A (A-Z)**
5.	**RESOLUTION**	**Q– 800x480 px**
6.	**INTERFACE**	**T –** TFT LCD, RGB **L**– TFT LCD, LVDS **S** – TFT + Controller SSD1963 **F – TFT + Controller FT813**
7.	**FRAME**	**N –** No Frame **F – Mounting Frame**
8.	**BACKLIGHT TYPE**	**W – LED White**
9.	**TOUCH PANEL**	**N –** No Touch Panel **R** – Resistive Touch Panel **C – Capacitive Touch Panel**
10.	**VERSION**	**00** (00-99)

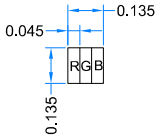
TFT PINOUT	
PIN	DESC
1	VDD
2	GND
3	SPI_SCLK
4	MISO/IOO
5	MOSI/I01
6	CS
7	INT
8	PD
9	NC
10	AUDIO_OUT
11	GPIO0/IO2
12	GPIO1/IO3
13	GPIO2
14	GPIO3
15	NC
16	NC
17	BLVDD
18	BLVDD
19	BLGND
20	BLGND



INTERNAL BACKLIGHT CIRCUIT DIAGRAM



DETAIL A
SCALE 60:1



CTP PINOUT	
PIN	DESC
1	VSS
2	VDD
3	SCL
4	NC
5	SDA
6	NC
7	RST
8	WAKE
9	INT
10	VSS

NOTES:
1. DISPLAY TYPE: TFT,TRANSMISSIVE, NORMALLY WHITE
2. OPERATING VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK
4. IC DRIVER: FT813
5. IC DRIVER CTP : FT5306 (SMT).
6. OPERATING TEMP: -20°C ~ 70°C
7. STORAGE TEMP: -30°C ~ 80°C
8. LED BACKLIGHT: 12 WHITE LED
9. LCM SURFACE LUMINANCE: 510cd/m^2
10. GENERAL TOLERANCE: ±0.3
11. RoHS COMPLIANT

CUSTOMER		2015.10.06
DRAWN	SCALE 1:1	TITLE RVT50AQFFWC00
DFTG CHK	UNIT mm	
ENGR CHK		MODEL
APPROVAL		

Ver.	DESCRIPTION	DATE
1.0	Initial case	2015.10.06

DWG NO	PAGE
Rev. 1.0	1/1

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2 ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage For Logic	VDD	-0.3	4.0	V
Input Voltage For Logic	VIN	VSS-0.5	VDD+0.3	V
LED forward current (each LED)	IF	-	60	mA
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

3 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage For Module	VDD	3.0	3.3	3.6	V	
Input Leakage Current	I_{LKG}	-	-	-	µA	
Input Voltage ' H ' level	V_{IH}	0.8VDD	-	VDD	V	
Input Voltage ' L ' level	V_{IL}	-0.3	-	0.2VDD	V	

4 BACKLIGHT CHARACTERISTICS

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_I	17.4	18.3	19.6	V
Current for LED backlight	I_I	30	40	50	mA
Power consumption	W_{BL}	522	732	980	mW
LED Life Time	-	30000	50000	-	Hrs

Note:

The LED Supply Voltage is defined by the numbers of LED at Ta= 25±2°C and 60%RH±5%.
The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C.
The LED time life will be reduced if LED is driven by high current, high humidity and temperature ambient conditions.

5 ELECTRO-OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time		Tr+Tf	θ=0° Ø=0° Ta=25	-	20	-	ms	Figure 1	4
Contrast Ratio		Cr		-	500	-	---	Figure 2	1
Luminance Uniformity		δ WHITE		75	80	-	%	Figure 2	3
Surface Luminance		Lv		467	510	-	cd/m²	Figure 2	2
Viewing Angle Range		θ	Ø = 90°	40	50	-	deg	Figure 3	6
			Ø = 270°	60	70	-	deg	Figure 3	
			Ø = 0°	60	70	-	deg	Figure 3	
			Ø = 180°	60	70	-	deg	Figure 3	
CIE (x, y) Chromaticity	Red	x	θ=0° Ø=0° Ta=25	0.540	0.590	0.640	Figure 2		5
		y		0.300	0.350	0.400			
	Green	x		0.298	0.348	0.398			
		y		0.520	0.570	0.620			
	Blue	x		0.095	0.145	0.195			
		y		0.060	0.110	0.160			
	White	x		0.270	0.320	0.370			
		y		0.310	0.360	0.410			

Note 1. Contrast Ratio(CR) is defined mathematically as below, for more information see Figure 1.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see Figure 2.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3. The uniformity in surface luminance δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope series.

Note 5. CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Figure 3.

Note 7. For viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCON's BM-5 photo detector.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

Figure 1. The definition of response time

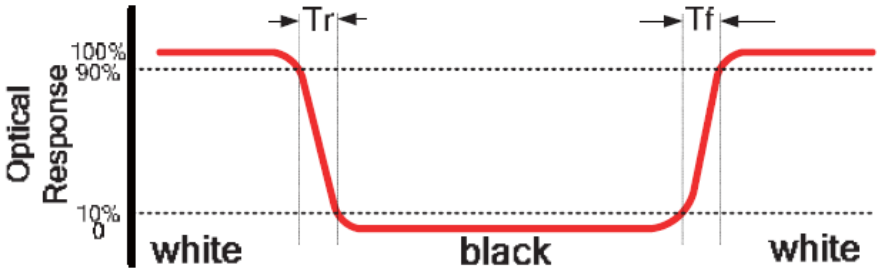


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

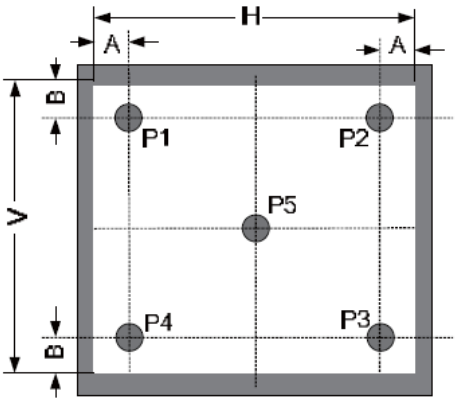
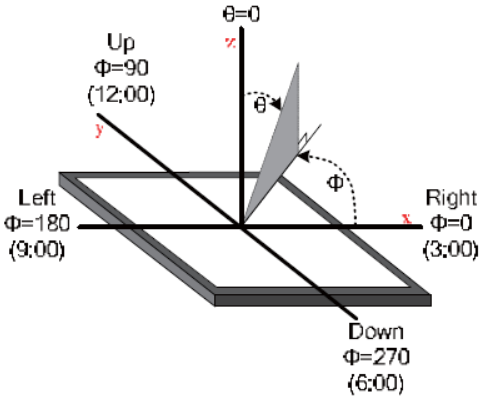


Figure 3.The definition of viewing angle



6 INTERFACE DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION
1	VDD	Power Supply
2	GND	Ground
3	SPI_SCLK	SPI SCK Signal, Internally 47k Pull UP
4	MISO/ IO0	SPI MISO Signal / IO0 Signal, Internally 47k Pull UP
5	MOSI/ IO1	SPI MOSI Signal / IO1 Slave Address Bit 0, Internally 47k Pull UP
6	CS	SPI Chip Select Signal , Internally 47k Pull UP
7	INT	Interrupt Signal, Active Low, Internally 47k Pull UP
8	PD	Power Down Signal, Active Low, Internally 47k Pull UP
9	NC	Not Connected
10	AUDIO_OUT	Audio Out Signal
11	GPIO0/IO2	SPI Single mode: General purpose IO0/ SPI Quad mode: SPI data line 2
12	GPIO1/IO3	SPI Single mode: General purpose IO1/ SPI Quad mode: SPI data line 3
13	GPIO2	General purpose IO2
14	GPIO3	General purpose IO3 or analog input for ADC
15	NC	Not Connected
16	NC	Not Connected
17	BLVDD	Backlight Power Supply, Can Be Connected to VDD
18	BLVDD	Backlight Power Supply, Can Be Connected to VDD
19	BLGND	Backlight Ground, Internally connected to GND
20	BLGND	Backlight Ground, Internally connected to GND

7 FT813 CONTROLLER SPECIFICATIONS

FT813 or EVE (Embedded Video Engine) simplifies the system architecture for advanced human machine interfaces (HMIs) by providing functionality for display, audio, and touch as well as an object oriented architecture approach that extends from display creation to the rendering of the graphics.

7.1 Serial host interface

Figure 4.SPI interface connection

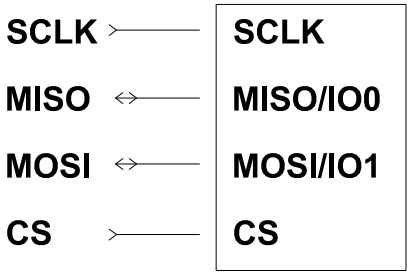
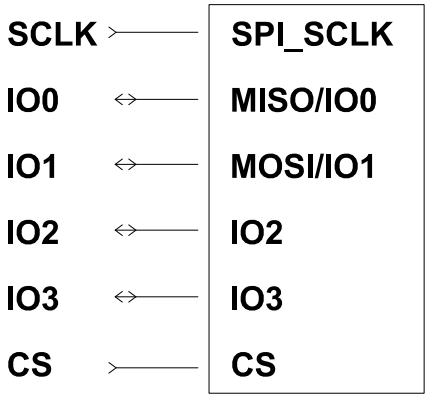


Figure 5. QSPI interface connection



SPI Interface – the SPI slave interface operates up to 30MHz.

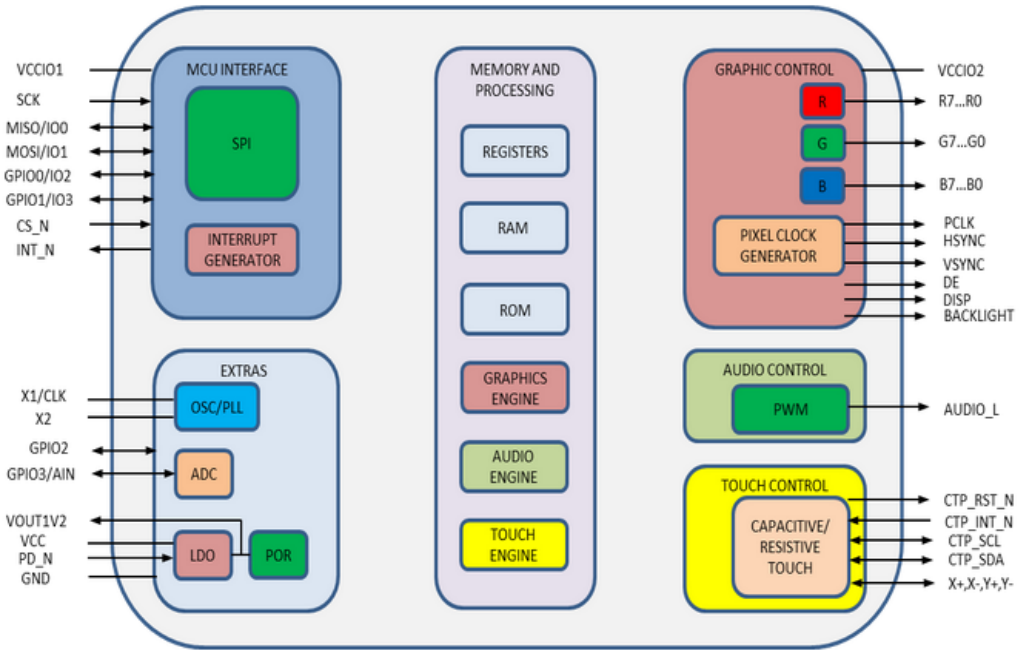
Only SPI mode 0 is supported. The SPI interface is selected by default (MODE pin is internally pulled low by 47k resistor).

QSPI Interface – the QSPI slave interface operates up to 30MHz. Only SPI mode 0 is supported. The QSPI can be configured as a SPI slave in SINGLE, DUAL or QUAD data bus modes.

By default the SPI slave operates in the SINGLE channel mode with MOSI as input from the master and MISO as output to the master. DUAL and QUAD channel modes can be configured through the SPI slave itself. To change the channel modes, write to register REG_SPI_WIDTH.

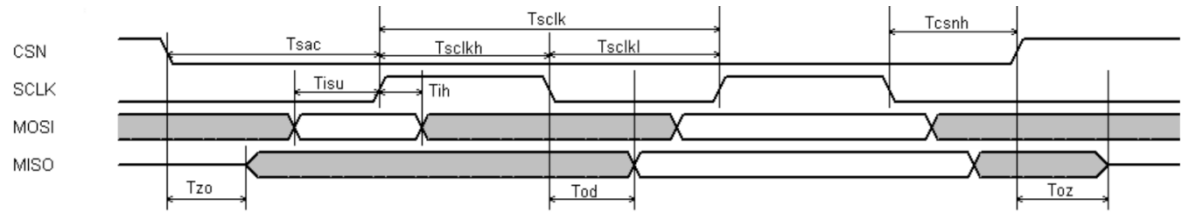
7.2 Block Diagram

Figure 6. FT813 Block diagram



7.3 Host interface SPI mode 0

Figure 7. SPI timing diagram

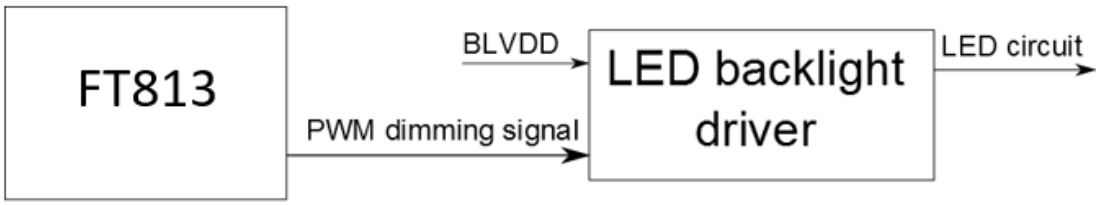


For more information about FT813 controller please go to official FT81x website
http://www.ftdichip.com/Products/ICs/FT81X.html

7.4 Backlight driver block diagram

Backlight enable signal is internally connected to FT813 Backlight control pin. This pin is controlled by two FT813's registers. One of them specifies the PWM output frequency, second one specifies the duty cycle. Refer to FT813 datasheet for more information.

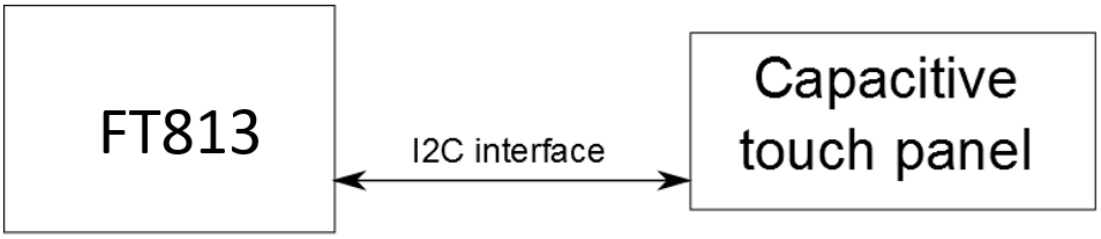
Figure 8. Backlight driver block diagram



8 CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

The Capacitive Touch Panel is directly connected to FT813 module. Therefore communication with Capacitive Touch Panel is simplified to read registers of FT813.

Figure 9.Capacitive Touch Panel Connection



8.1 Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	5.0 inch	
Outline Dimension (OD)	120.3mm x 75.4mm	Cover Lens Outline
Product Thickness	1.9mm	
Glass Thickness	0.7mm	
Ink View Area	109.00mm x 65.80mm	
Sensor Active Area	110.0mm x 66.8mm	
Input Method	5 Finger	
Activation Force	Touch	
Surface Hardness	≥7H	

8.2 Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.3V
Power Consumption (IDD)	Active Mode	TBD mA
	Sleep Mode	TBD µA
Interface		I^2C
Controller		FT5306
I2C address		0x38 (7 bit address)
Resolution		800*480

9 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage	80±2°C/240hours
2	Low Temperature Storage	-30±2°C/240hours
3	High Temperature Operating	70±2°C/240hours
4	Low Temperature Operating	-20±2°C/240hours
5	Temperature Cycle	-30±2°C~25~80±2°C × 20 cycles (30min.) (5min.) (30min.)
6	Damp Proof Test	60°C ±5°C × 90%RH/240hours
7	Vibration Test	Frequency 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep: 10Hz~55Hz~10Hz X, Y, Z 2 hours for each direction.
8	Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces
9	ESD Test	Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 time

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