PHOENIX DISPLAY INTERNATIONAL, INC.

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SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDI055HDHI-01C
DESCRIPTION	5.5" 720RGB x 1280
VERSION	V1
ISSUE DATE	01-Nov-17

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Table of Contents

目录

1. GENERAL DESCRIPTION..... 3
1.1 DESCRIPTION..... 3
1.2 GENERAL INFORMATION..... 3
2. ELECTRICAL CHARACTERISTICS..... 4
2.1 LCM DC CHARACTERISTICS..... 4
2.2 BACK-LIGHT UNIT CHARACTERISTICS..... 4
3. OPTICAL CHARACTERISTICS..... 5
4. MODULE OUTLINE DIMENSION..... 8
5. MODULE INTERFACE DESCRIPTION..... 9
6. REFERENCE APPLICATION CIRCUIT..... 10
7. TIMING DIAGRAM..... 10
7.1 RESET TIMING CHARACTERISTICS..... 10
7.2 MIPI-DSI CHARACTERISTICS..... 10
8. Capacitive Touch Panel specifications..... 12
8.1 Mechanical characteristics..... 12
8.2 Electrical characteristics..... 12
8.3 Interface timing characteristics..... 12
8.4 Power on/Reset/Wake Sequence Parameters..... 13
9. RELIABILITY TEST CONDITIONS..... 14
Remarks:..... 14
10. PACKING SPECIFICATION..... 14

1. GENERAL DESCRIPTION

1.1 DESCRIPTION

'055HDHI-01C is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module (TFT-LCD panel, driver IC and FPC), a back-light unit,and with a CTP. The resolution of 5.5" contains 720RGB x 1280 pixels and can display up to 16.7M colors.

1.2 GENERAL INFORMATION

Items	Specification	Unit	Note
Display mode	TFT Transmissive, Positive, NW，IPS	-	-
Drive element	a-Si TFT active matrix	-	-
LCM outline size	71.00(W) x 129.66(H) x 1.62(T)	mm	Note (1)(2)
LCM+CTP size	76.8(W) x 137.4(H) x 2.72(T)	mm	
Active area	68.04(W) x 120.96(H)	mm	-
Number of pixels	720RGB x 1280	pixels	-
Pixel arrangement	RGB stripe	-	-
Pixel size	0.09(W) x 0.09 (H)	mm	-
Display color	16.7M	color	-
Viewing direction	ALL VIEW	-	-
Controller / Driver	ILI9881C	-	-
LCD Data interface	MIPI-4	-	
Backlight	14 White LED,40mA,22.4V	-	
Weight	TBD	g	

Notes:

(1) Touch panel and back-light unit are included.

(2) FPC no included. (Refer to the module outline dimension for further information). Please see module specification drawing in Page8 for more details.

2. ELECTRICAL CHARACTERISTICS

2.1 LCM DC CHARACTERISTICS

(Ta=25±2°C)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage 2	IOVCC	1.65	1.8	3.3	V	
Power Supply Voltage 3	VCI	2.3	2.8	3.6	V	
Gate Driver High voltage	VGH	9.5	14.25	-	V	
Gate Driver Low voltage	VGL	-6.85	-9.5	-	V	
Current Consumption	I_{DD}	-	TBD	-	mA	Normal mode
	$I_{DD-SLEEP}$		TBD		uA	Sleep mode
Input voltage "L" Level	V_{IL}	GND	-	0.3IOVCC	V	VDD1=1.65~3.3
Input voltage "H" Level	V_{IH}	0.7IOVCC	-	IOVCC	V	
Output voltage "L" Level	V_{oL}	0	-	0.2IOVCC	V	I_{OL}=1mA
Output voltage "H" Level	V_{oH}	0.8IOVCC	-	IOVCC	V	I_{OH}=-1mA

2.2 BACK-LIGHT UNIT CHARACTERISTICS

The back-light system is an edge-lighting type with 7 chips white LEDs Serial and 2 Parallel connection. The characteristics of the back-light are shown in the following tables.

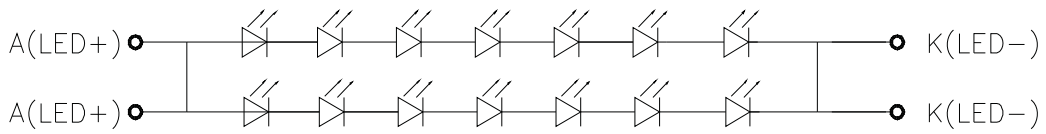
(Ta=25±2°C)

Characteristics	Symbol	Condition	Min.	Type	Max.	Unit	Notes
Forward Voltage	Vf	I_L=40mA	20.3	22.4	23.8	V	
Forward current	I_L		--	40	-	mA	-
Luminance	Lv	I_L=40mA	TBD	TBD	--	cd/m^2	-
LED life time	-	I_L=40mA	10,000	20,000	--	Hr	Note 1

Note:

(1) The "LED life time" is defined as the module brightness decrease to 50% of original brightness at I_L=40mA. The LED life time could be decreased if operating I_L is larger than 40mA.

Backlight circuit diagram shown in below:



3. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room.

Measuring equipment: BM-5AS, BM-7, EZ-Contrast.

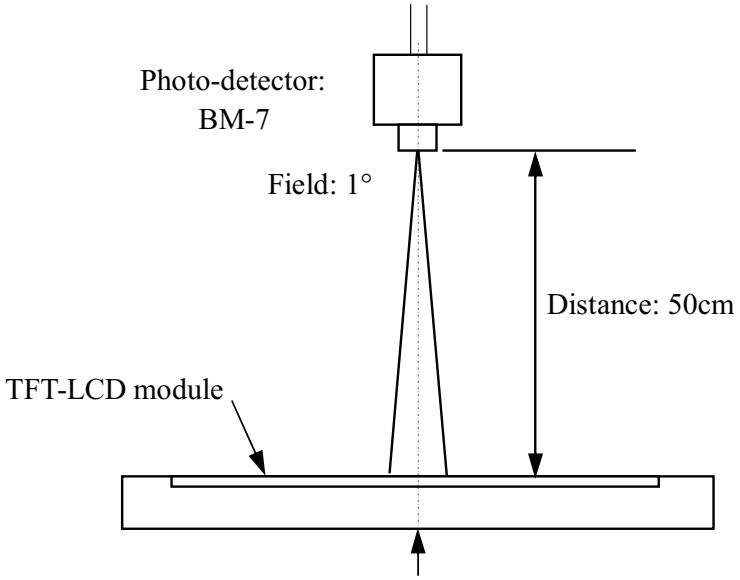
(Ta=25±2°C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center point)		C/R	-	500	800	-	-	BM-7 Note(2)
Luminance of white (Center point)		L_w	B/L on	300	350	-	cd/m^2	BM-7
Luminance uniformity		U_W	θ = 0. Normal viewing angle B/L On Note(1)	80	-	-	%	BM-7 Note(3)
Response Time		Tr + Tf		-	25	35	ms	BM-5AS Note(4)
Color Chromaticity (CIE 1931)	White	W_X		0.267	0.297	0.327	-	BM-7 Note(5)
		W_Y		0.301	0.331	0.361		
	Red	R_X		0.611	0.641	0.671		
		R_Y		0.290	0.320	0.350		
	Green	G_X		0.270	0.300	0.330		
		G_y		0.536	0.566	0.596		
	Blue	B_X		0.104	0.134	0.164		
		B_Y		0.098	0.128	0.158		
Viewing Angle	Hor.	θ_L	C/R≥10	80	85	-	Deg	EZ Contrast Note(6)
		θ_R		80	85	-		
	Ver.	θ_u		80	85	-		
		θ_D		80	85	-		
Optima View Direction			ALL VIEW					Note(7)

* This condition will be changed by the evaluation circumstance. If product is exposed to high temperatures for extended time, there is a possibility of the polarizer film damage which could degrade the optical characteristics.

Notes:

(1) Test Equipment Setup: After stabilizing and leaving the panel alone at a given temperature for 30min, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room 30min after lighting the back-light. This should be measured in the center of screen.

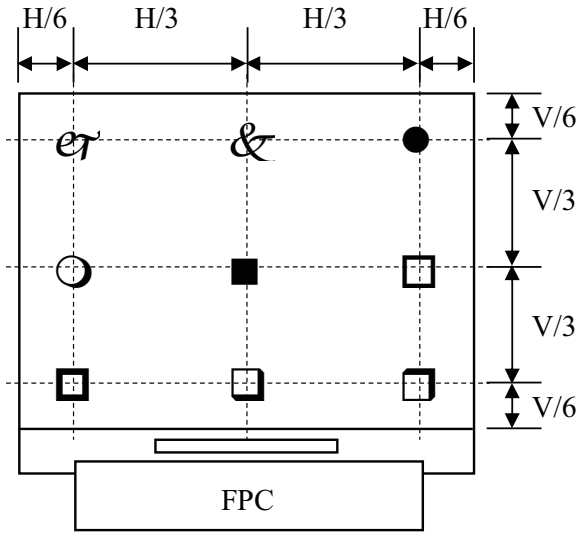


(2) Definition of Contrast Ratio (CR):

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance measured when LCD on the “white” state}}{\text{Luminance measured when LCD on the “black” state}}$$

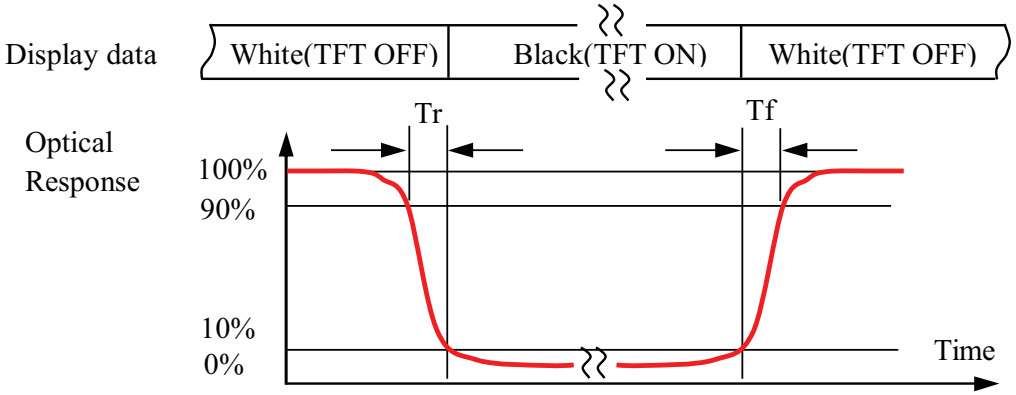
(3) Definition of Luminance Uniformity: Active area is divided into 9 measuring areas (Shown in below), every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity} = \frac{\text{Min Luminance of white among 9-points}}{\text{Max Luminance of white among 9-points}} \times 100\%$$

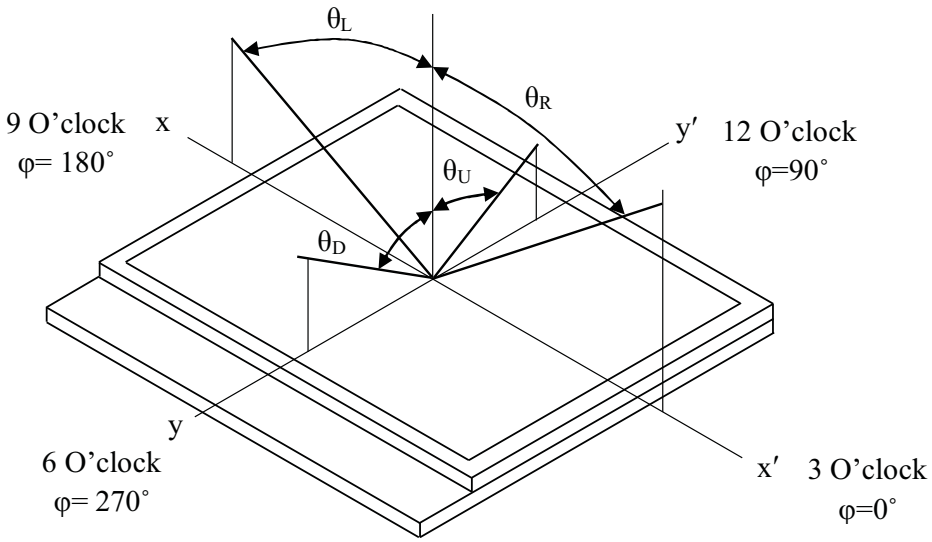


The spot locations for luminance measurement

(4) Definition of Response time: Sum of Tr and Tf.



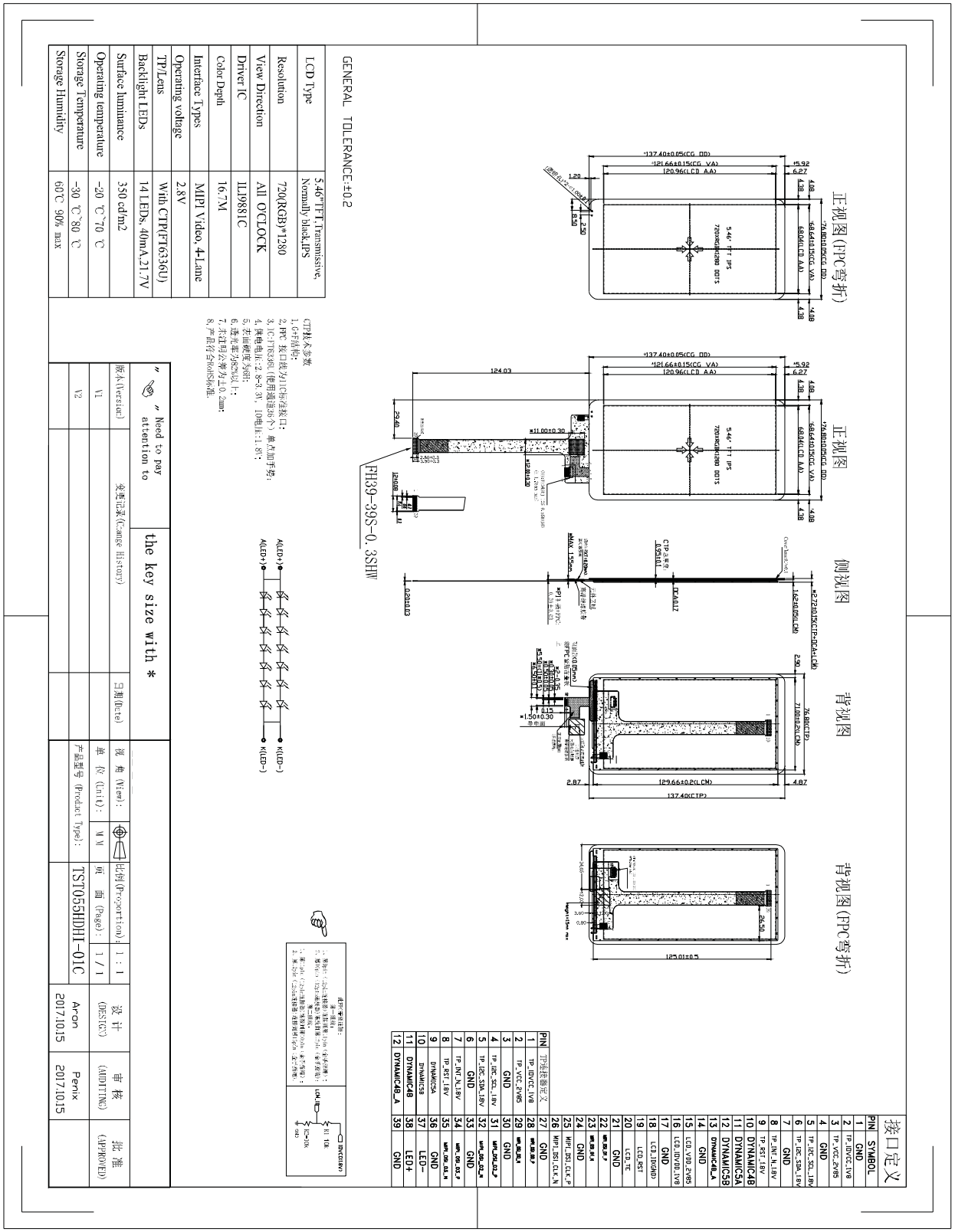
(5) Definition of Viewing Angle: The viewing angle range that the CR≥10.



(6) Definition of Color Chromaticity (CIE 1931)
Color coordinate of white & red, green, blue at center point.

(7) The different Rubbing Direction will cause the different optima view direction.

4. MODULE OUTLINE DIMENSION



LCD Type	5.46"TFT,Transmissive, Normally black,IPS
Resolution	720(RGB)*1280
View Direction	All O'CLOCK
Driver IC	ILI9881C
Color Depth	16.7M
Interface Types	MIPI Video, 4-Lane
Operating voltage	2.8V
TP/Lens	With CTP(FT6336U)
Backlight LEDs	14 LEDs, 40mA,21.7V
Surface luminance	350 cd/m2
Operating temperature	-20 ℃~70 ℃
Storage Temperature	-30 ℃~80 ℃
Storage Humidity	60℃ 90% max

PIN	SYMBOL
1	GND
2	TP_IOVCC_1V8
3	TP_VCC_2V85
4	GND
5	TP_I2C_SCL_1.8V
6	TP_I2C_SDA_1.8V
7	GND
8	TP_INT_N_1.8V
9	TP_RST_1.8V
10	DYNAMIC4B
11	DYNAMIC5A
12	DYNAMIC5B
13	DYNAMIC4B_A
14	GND
15	LCD_VDD_2V85
16	LCD_IOVDD_1V8
17	GND
18	LCD_IOGND
19	LCD_RST
20	LCD_TE
21	GND
22	MIPI_DSI_D3_P
23	MIPI_DSI_D3_N
24	GND
25	MIPI_DSI_CLK_P
26	MIPI_DSI_CLK_N
27	GND

PIN	TP连接器定义
1	TP_IOVCC_1V8
2	TP_VCC_2V85
3	GND
4	TP_I2C_SCL_1.8V
5	TP_I2C_SDA_1.8V
6	GND
7	TP_INT_N_1.8V
8	TP_RST_1.8V
9	DYNAMIC5A
10	DYNAMIC5B
11	DYNAMIC4B
12	DYNAMIC4B_A

PIN	SYMBOL
28	MIPI_DSI_D2_N
29	MIPI_DSI_D2_P
30	GND
31	MIPI_DSI_D1_N
32	MIPI_DSI_D1_P
33	GND
34	MIPI_DSI_D0_N
35	MIPI_DSI_D0_P
36	GND
37	LED-
38	LED+
39	GND

5. MODULE INTERFACE DESCRIPTION

Pin No.	Symbol	I/O	Description	Note
1	GND	P	Ground	
2	TP_1V8	P	Power supply 1.8V	
3	TP_2V85	P	Power supply 2.85V	
4	GND	P	Ground	
5	TP_SCL	I	CTP I^2C clock input	
6	TP_SDA	I/O	CTP I^2C data input/output	
7	GND	P	Ground	
8	TP_INT	O	CTP interrupt signal output pin	
9	TP_RST	I	CTP reset signal input pin	
10	C4B	-	TBD.	
11	C5A	-	TBD.	
12	C5B	-	TBD.	
13	C4B_A	-	TBD.	
14	GND	P	Ground	
15	2V85	P	Power supply 2.85V	2.8V
16	1V8	P	Power supply for I/O interface, 1.8V	1.8V/2.8V
17	GND	P	Ground	
18	ID	P	LCD Identification pin	
19	RST	P	Reset signal	
20	TE	O	Frame Sync signal	
21	GND	P	Ground	
22	D1P	I/O	Data differential signal input pins.(Data lane 1)	
23	D1N	I/O	Data differential signal input pins.(Data lane 1)	
24	GND	P	Ground	
25	CLKP	I/O	Clock differential signal input pins	
26	CLKN	I/O	Clock differential signal input pins	
27	GND	P	Ground	
28	D0P	I/O	Data differential signal input pins.(Data lane 0)	
29	D0N	I/O	Data differential signal input pins.(Data lane 0)	
30	GND	P	Ground	
31	D2P	I/O	Data differential signal input pins.(Data lane 2)	
32	D2N	I/O	Data differential signal input pins.(Data lane 2)	
33	GND	P	Ground	
34	D3P	I/O	Data differential signal input pins.(Data lane 3)	
35	D3N	I/O	Data differential signal input pins.(Data lane 3)	
36	GND	P	Ground	
37	LEDK	P	Back-light Cathode	

38	LEDA	P	Back-light Anode	
39	GND	P	Ground	

6. REFERENCE APPLICATION CIRCUIT

Please consult our technical department for detail information.

7. TIMING DIAGRAM

7.1 RESET TIMING CHARACTERISTICS

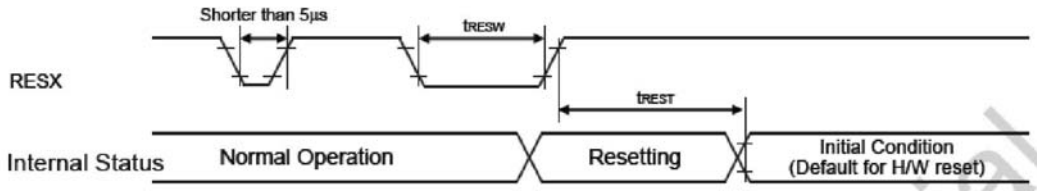


Table 7.3.2.1 Reset input timing

VSS=0V, VDDIO=1.6V to 3.6V, VCI=2.5V to 5.5V,Ta = -30 to 70°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	µs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-		-	120	When reset applied during Sleep out mode	ms

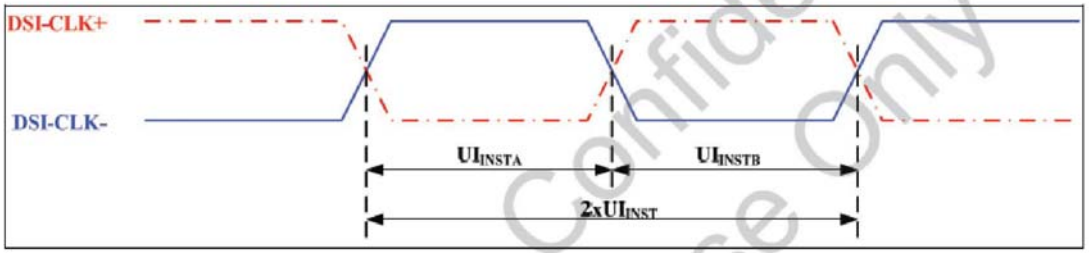
Note 1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 10µs	Reset
Between 5µs and 10µs	Reset starts (It depends on voltage and temperature condition.)

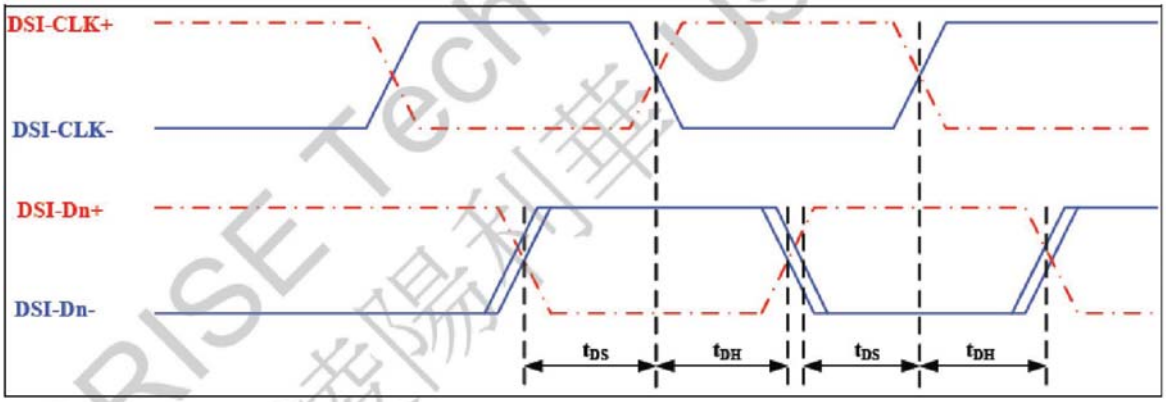
7.2 MIPI-DSI CHARACTERISTICS

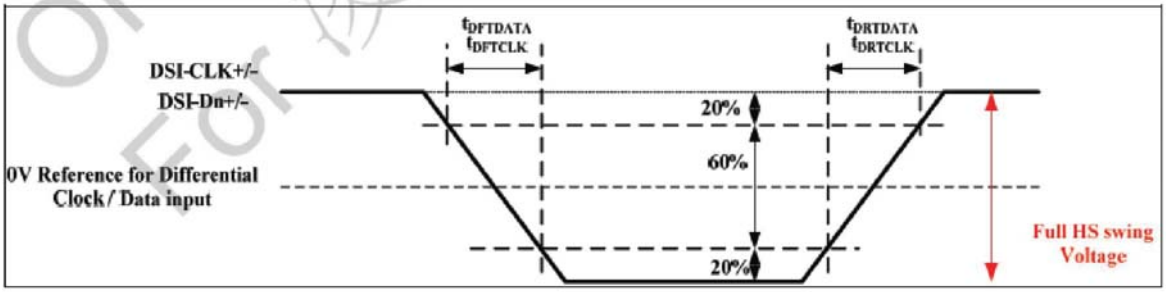
7.2.1 HIGH SPEED CYCLE SEQUENCE

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed mode						
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	4	-	25	ns
DSI-CLK+/-	UI_{INSTA} , UI_{INSTB}	UI instantaneous Halfs	2	-	12.5	ns
DSI-Dn+/-	t_{DS}	Data to clock setup time	0.15	-	-	UI
DSI-Dn+/-	t_{DH}	Data to clock hold time	0.15	-	-	UI
DSI-CLK+/-	t_{DRTCLK}	Differential rise time for clock	150	-	0.3UI	ps
DSI-Dn+/-	$t_{DRTDATA}$	Differential rise time for data	150	-	0.3UI	ps
DSI-CLK+/-	t_{DFTCLK}	Differential fall time for clock	150	-	0.3UI	ps
DSI-Dn+/-	$t_{DFTDATA}$	Differential fall time for data	150	-	0.3UI	ps



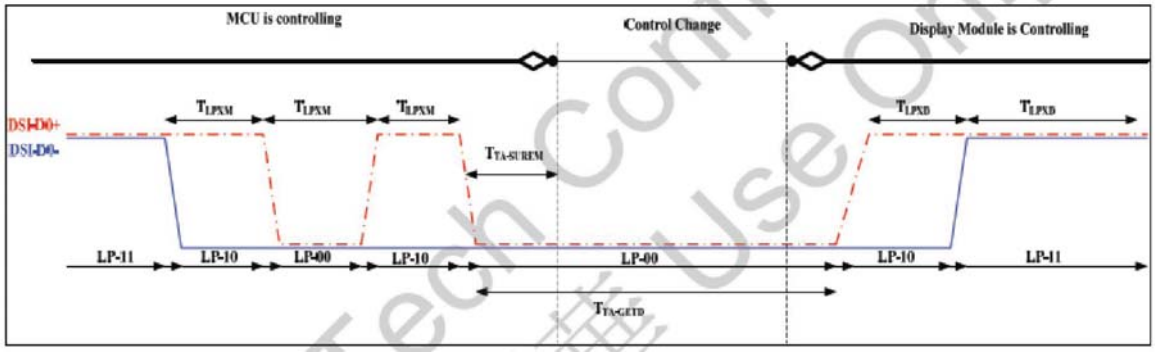
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7.2.2 LOW POWER CHARACTERISTICS

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Low Power mode						
DSI-D0+/-	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU → Display Module	50	-	-	ns
DSI-D0+/-	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module → MPU	58	-	-	ns
DSI-D0+/-	$T_{TA-SURED}$	Time-out before the MPU start driving	T_{LPXD}	-	$2XT_{LPXD}$	ns
DSI-D0+/-	$T_{TA-GETD}$	Time to drive LP-00 by display module	$5XT_{LPXD}$	-	-	ns
DSI-D0+/-	T_{TA-GOD}	Time to drive LP-00 after turnaround request - MPU	$4XT_{LPXD}$	-	-	ns
DSI-D0+/-	Ratio T_{LPX}	Ratio of T_{LPXM} / T_{LPXD} between MCU and display module	2/3	-	3/2	



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8. Capacitive Touch Panel specifications

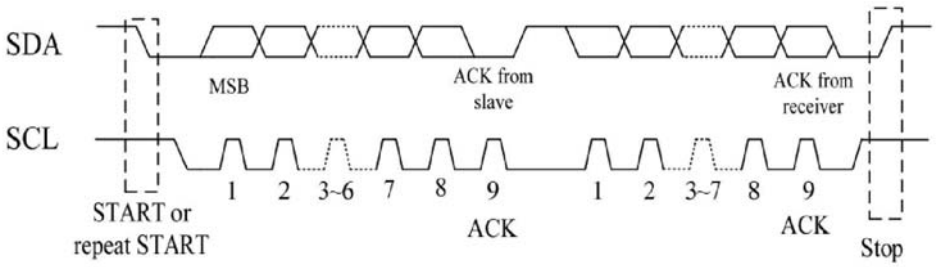
8.1 Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	5.5	
Outline Dimension (OD)	76.8(H) x 137.4(V)x mm	Cover Lens Outline
Product Thickness	1.67mm(max)	
Glass Thickness	0.7mm	
Ink View Area	68.64x121.66mm	
Input Method	1 Fingers + gesture(单点+手势)	
Activation Force	Touch	
Surface Hardness	≥6H	

8.2 Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.6V
Power Consumption (IDD)	Active Mode	12~4.5mA
	Sleep Mode	TBD
Interface		I²C
Controller IC		FT6336U
I²C address		0x70
Resolution		720*1280

8.3 Interface timing characteristics



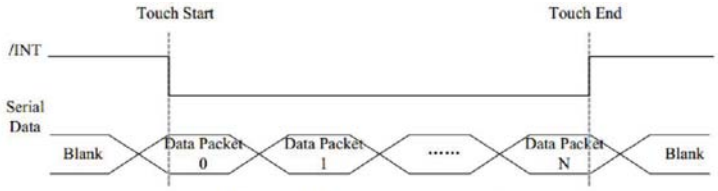


Figure 1-2 Interrupt query mode

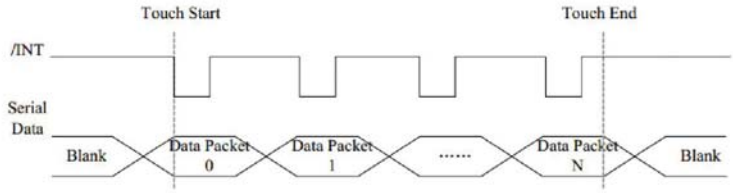


Figure 1-3 Interrupt trigger mode

PARAMETER	MIN	MAX	UNIT
SCL Frequency	10K	400K	Hz
Bus Free Time Between a STOP and START Condition	4.7	-	uS
Hold Time (repeated) START Condition	4.0	-	uS
Data Setup Time	250	-	nS
Setup Time for Repeated START Condition	4.7	-	uS
Setup Time for STOP Condition	4.0	-	uS

8.4 Power on/Reset/Wake Sequence Parameters

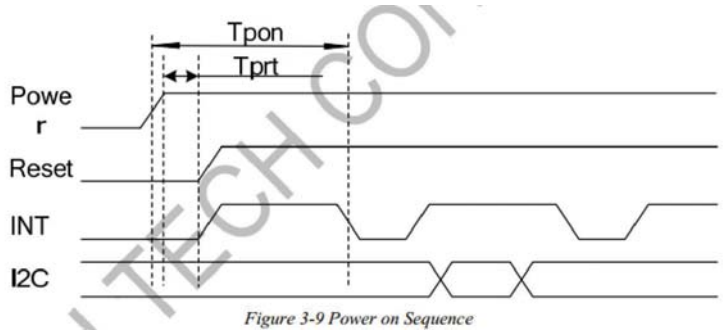


Figure 3-9 Power on Sequence

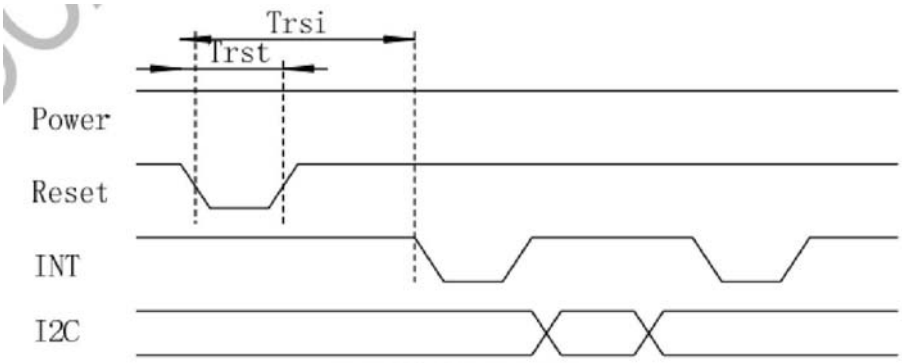


Figure 3-10 Reset Sequence

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	-	3	ms
Tpon	Time of starting to report point after powering on	300	-	ms
Tprt	Time of being low after powering on	1	-	ms
Trsi	Time of starting to report point after resetting	300	-	ms
Trst	Reset time	5	-	ms

9. RELIABILITY TEST CONDITIONS

No.	Test Item	Test Condition	Notes
1	High Temperature Storage	+80°C / 120H	Inspection after 2~4h storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Seal leak; 3. Non-display; 4. Missing segments; 5.Glass crack; 6. The surface shall be free from damage. 7. The electrical characteristics requirements shall be satisfied.
2	Low Temperature Storage	-30°C / 120H	
3	High Temperature Operating	+70°C / 120H	
4	Low Temperature Operating	-20°C / 120H	
5	Temperature Cycle	-20±2°C∆25°C∆+70±2°C x 10cycles (30min) (5min) (30min)	
6	High Temperature /Humidity storage	50+5°C x 90%RH / 120H	
7	Vibration Test	Frequency: 10Hz~55Hz~10Hz Amplitude:1.5mm, 2 hours for each direction of X, Y, Z	
8	Packing Drop Test	Drop to the ground from 1m height, 1 corner, 3 edges, 6 surfaces.	
9	ESD test	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	

Remarks:

(1) The test samples should be applied to only one test item.

(2) Sample size for each test item is 5~10pcs.

(3) For High Temperature/Humidity storage test, pure water (resistance>10MΩ) should be used.

(4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.

(5) Failure judgment criterion: basic specification, electrical characteristic, mechanical characteristic, optical characteristic.

10. PACKING SPECIFICATION

TBD.