

Customer Name	Date of Issue	November. **.2013
	Issued No.	Rev.00

<b>PRODUCT INFORMATION</b>	
Product Name	8.9"WQXGA LCD (LCD Module)
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【FUNCTION】8.9inch Transmissive WQXGA Color LCD Module

P/N : TFTMD089030  
 Manufacturer : JDI(China)  
 SPC : 8.9 " HD LCD Moudule  
 A- grade  
 Q'ty :215K(Panox Display HK warehouse)



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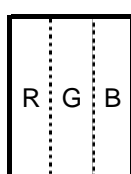
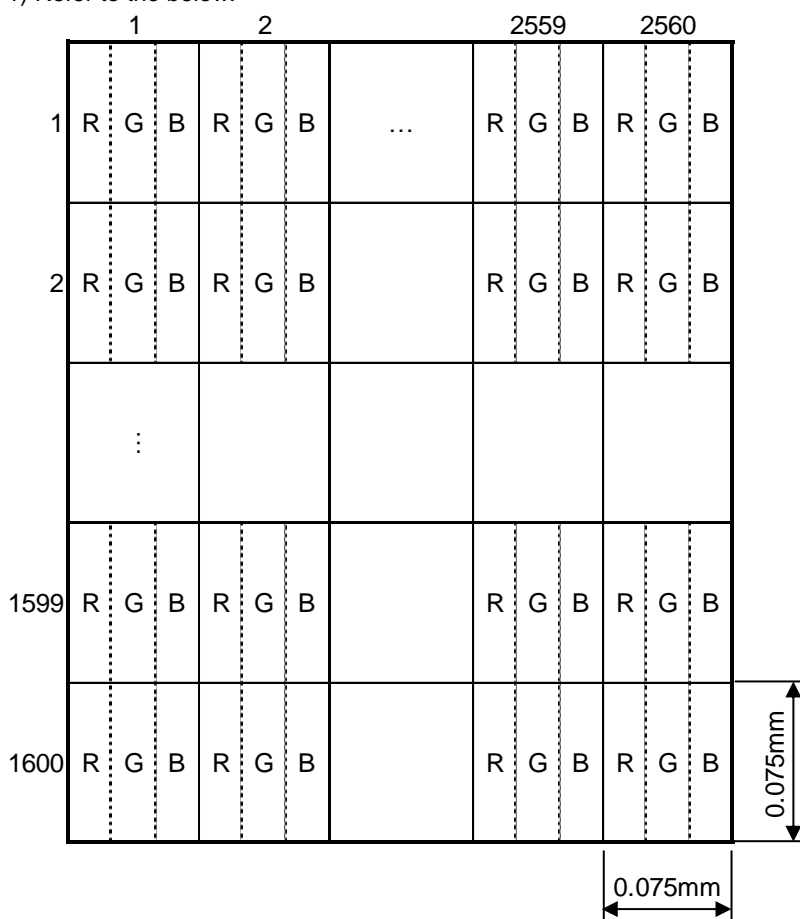
### 1. Scope of Application

This specification shall be applicable to TFT-LCD Cell TFTMD089030, designed for Tablet Devices

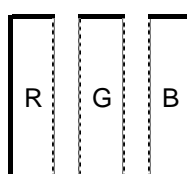
### 2. General Data

Item	Specifications	Remark
Display Mode	Transmissive Type, Normally Black Mode, In-Plane Switching Mode 16,777,216 Colors	
Driving Method	TFT active matrix, Low-temperature poly-silicon	
Input Signals	MIPI-DSI, Command/Video mode (4Lane x 2Port)	
Outside Dimensions	197.60(W) x 129.60(H) (typ.)	
Active area	192.0(W) x 120.0(H) (mm)	
Number of Pixels	2560(W) x 1600(H)	1)
Pixel Pitch	0.075 (W) x 0.075 (H) (mm)	1)
Pixel arrangement	RGB Vertical stripe	
Required LCD Driver IC	2 chip IC : Renesas R69429	

Note 1) Refer to the below.



: Pixel



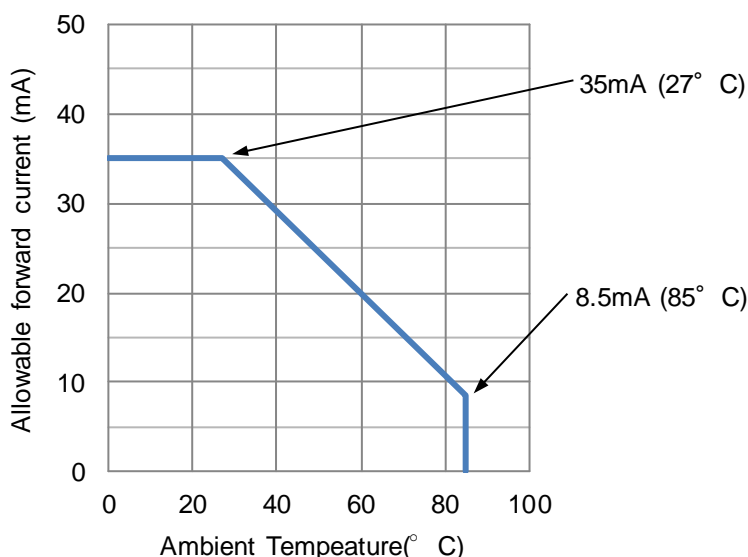
: Dot (Sub-pixel)

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### 3. Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Note
Power Supply for I/O Interface	IOVCC	-0.3	4.6	V	(1)
Power Supply for MIPI DSI DPHY	DPHYVCC	-0.3	4.6	V	(1)
Power Supply for Analog	VSP	-0.3	6.5	V	(1)
Power Supply for Analog	VSN	-6.5	+0.3	V	(1)
Input Voltage	Vi	-0.3	IOVCC+0.3	V	(2)
LED Reverse Voltage	V <sub>R</sub>	-	5	V	
LED Forward Current	I <sub>LED</sub>	-	Note (3)	mA	per LED
Static Electricity	-	-	±2	kV	(4)

- Notes (1) Keep all Voltages no lower than GND.  
 (2) Applies to the RESET pin.  
 (3) Ambient Temperatures vs. Allow able Forward



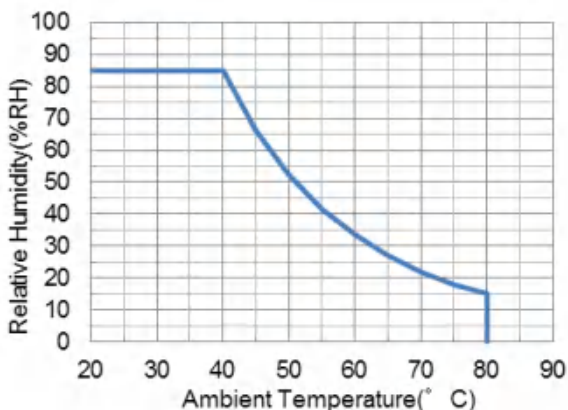
- (4) 100 pF - 1.5 kohm, 25°C-70%RH  
 Static electricity discharge is to be aimed at the center of the active area.

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**4. Environmental Absolute Maximum Ratings**

Item	Operating		Non-Operating Note(3)		Remarks
	Min	Max	Min	Max	
Ambient Temperature	-20°C	60°C	-20°C	65°C	Note (2)
Humidity	Note (1)		Note (1)		No condensation
Corrosive Gas	Not Acceptable		Not Acceptable		

Notes (1) Ta < 40°C 85%RH max.  
 Ta > 40°C Absolute humidity must be lower than the humidity of 85%RH at 40°C.  
 No dew condensation is allowed.



- (2) Background color slightly changes depending on ambient temperature and viewing angle.  
 The temperature for operating in the table above apply to operation only.  
 Visual qualities, such as contrast ratio and response time, to be evaluated at Ta = 25°C Operating.
- (3) This is not for storing condition.  
 The following precautions are necessary in long-term storage for the LCD modules.
  - (1) Store the LCD modules in a dark place; do not expose them to Keep the temperature between 10 and 30°C, and the humidity between 55% and 75%RH.

## 5. Electrical Characteristics

GND=0V, Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Power Supply Voltage for Logic and Analog	VBAT		3.0	3.3	4.5	V	-
Power Supply for I/O Interface	VDDIO		1.7	1.8	1.9	V	-
Input Voltage for Logic Circuits	Vi	"H" level	0.70×VDDIO	-	VDDIO	V	(1),(2)
		"L" level	0	-	0.30×VDDIO		
Input Voltage for EN	Vi	"H" level	0.90×VDDIO	-	VDDIO	V	(1)
		"L" level	0	-	0.10×VDDIO		
Output Voltage for Logic Circuits	Vo	"H" level	0.80×VDDIO	-	-	V	(1),(2)
		"L" level	-	-	0.20×VDDIO		
Input/Output Leak Current	ILi	-	-10	-	10	μA	(3)
Power Consumption	POWER	All White	-	230	300	mW	(4),(5)

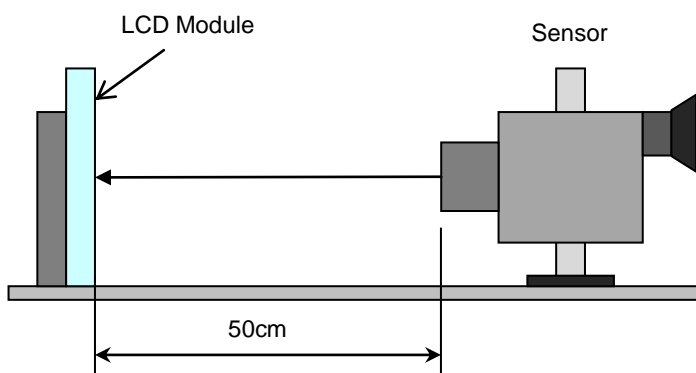
- Notes
- (1) VDDIO = 1.7V to 1.9V
  - (2) Input : RESET, DBIST, Output : PWM, TE
  - (3) Except the current of out driving MOS.
  - (4) IOVCC= 1.7V~1.9V, VBAT=3V~4.5V, Column inversion mode.  
Display image : ALL White.
  - (5) Operation Mode : MIPI-DSI Command mode, LCM Display frame rate = 60.37~66.72fps  
MIPI-DSI Data and Clock lane = LP11

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### 6. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Notes
Brightness	B	$\varphi=0^\circ, \theta=0^\circ$	380	(500)	-	Cd/m <sup>2</sup>	(1),(2)
Viewing Angle on axis	$\varphi=0$	$\theta$	CR>10	-	(80)	-	degree
	$\varphi=90$						
	$\varphi=180$						
	$\varphi=270$						
Contrast Ratio	CR	$\varphi=0^\circ, \theta=0^\circ$	-	(1200)	-	-	(5)
Color Gamut CIE 1931 (Primary Color)	Red	x	$\varphi=0^\circ, \theta=0^\circ$	-	(0.646)	-	-
		y		-	(0.330)	-	
	Green	x		-	(0.302)	-	
		y		-	(0.610)	-	
	Blue	x		-	(0.155)	-	
		y		-	(0.062)	-	
	White	x		-	(0.31)	-	
		y		-	(0.33)	-	
NTSC Ratio (CIE1931)	-	$\varphi=0^\circ, \theta=0^\circ$	-	(72)	-	%	-
Gamma Curve	-	$\varphi=0^\circ, \theta=0^\circ$	-	(2.2)	-	-	-
Cross Talk	CT	-	-	-	(4)	%	(6)

Notes (1) Definition of Brightness "B". At the Center of Active Area.

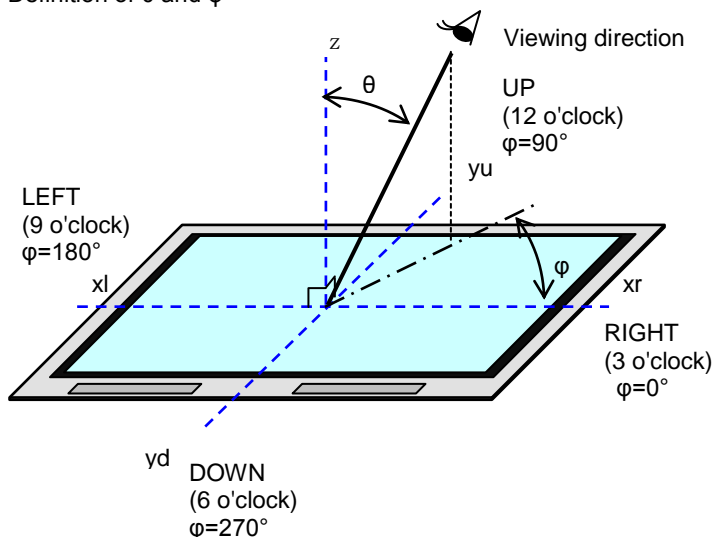


Sensor : KONICA MINOLTA CS-1000 or equivalent

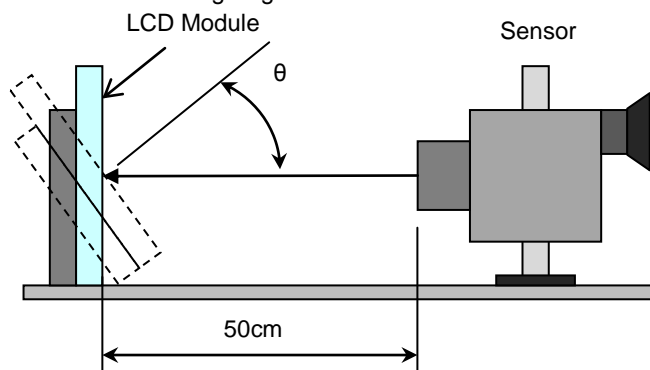
(2) Display image for measurement : All White

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(3) Definition of  $\theta$  and  $\varphi$



(4) Definition of Viewing Angle  $\theta$



Sensor : TOPCON's BM-5A or equivalent

(5) Definition of Contrast "CR"

CR = (Brightness when displaying White raster) / (Brightness when displaying Black raster)

(6) Definition of Cross Talk "CT"

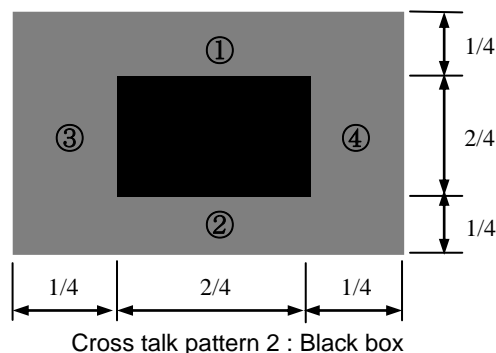
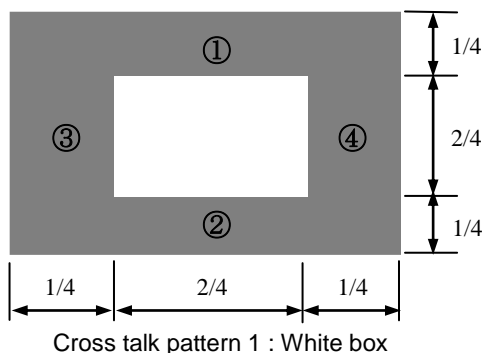
CT = {(Brightness [Cross-talk pattern]) - (Brightness [127Gray])} / (Brightness [127Gray]) x 100(%)

Measurement pattern :

- Cross talk pattern 1 : White box
- Cross talk pattern 2 : Black box

Measurement Point :

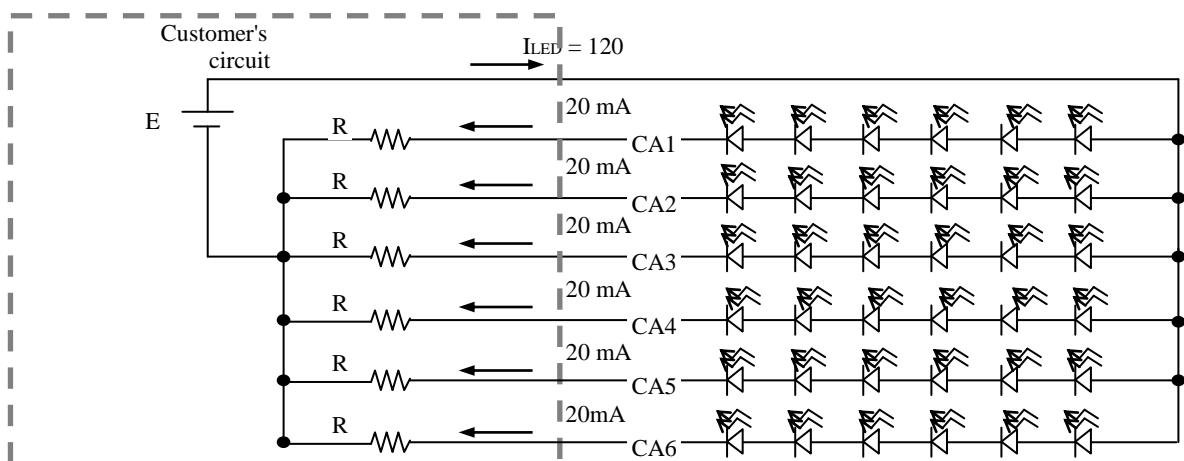
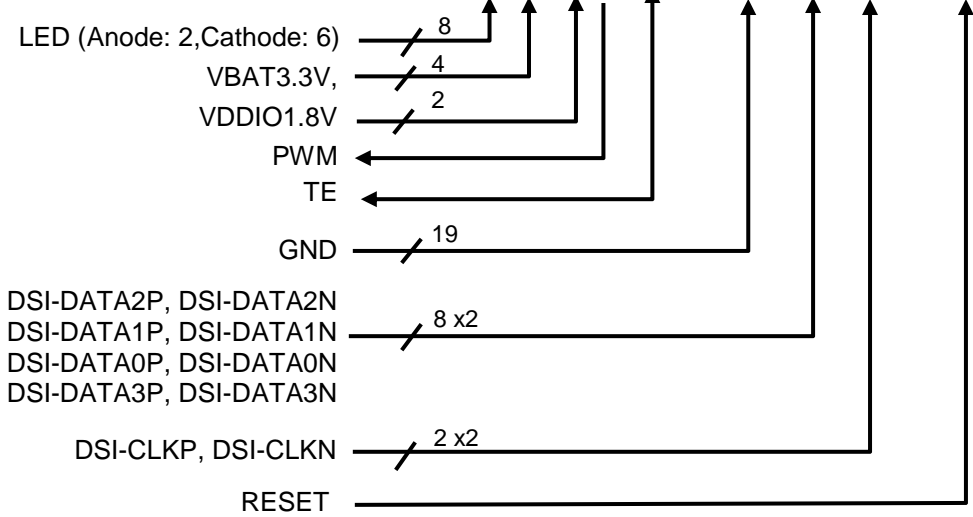
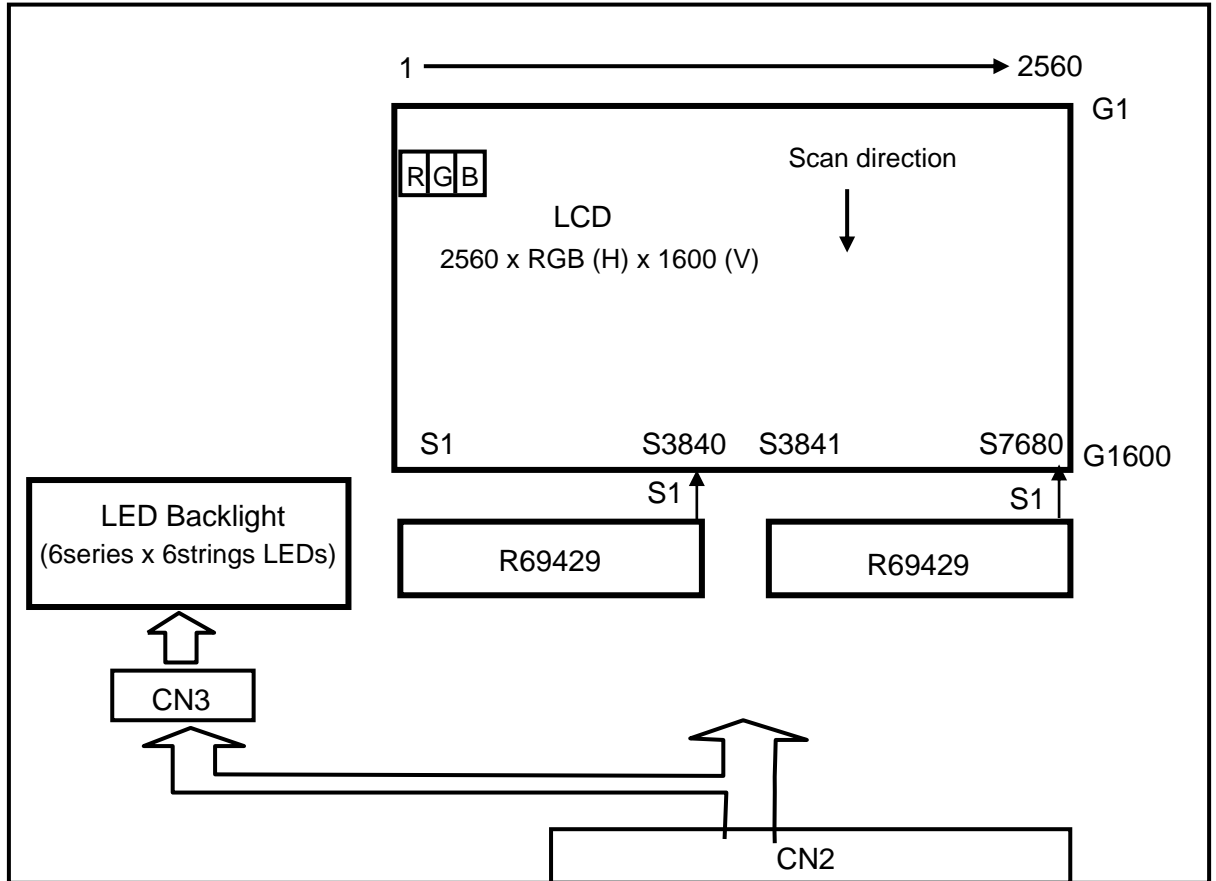
- Vertical Crosstalk : ① and ②
- Horizontal Crosstalk : ③ and ④





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7. Block Diagram / Interface Pins



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PIN	SYMBOL	FUNCTION	I/O	REMARKS
1	GND	GND	-	-
2	GND	GND	-	-
3	GND	GND	-	-
4	V_LED_C6	GND for LED	-	-
5	V_LED_C5	GND for LED	-	-
6	V_LED_C4	GND for LED	-	-
7	V_LED_C3	GND for LED	-	-
8	V_LED_C2	GND for LED	-	-
9	V_LED_C1	GND for LED	-	-
10	V_LED_A	Power Supply for LED	-	-
11	V_LED_A	Power Supply for LED	-	-
12	N.C	Non connect	-	-
13	GND	GND	-	-
14	PWM	Control Signal for LED Brightness	O	LEDPWM
15	TE	Tearing Effect Output	O	TE
16	GND	GND	-	-
17	DSI_R-DATA-2P	Positive MIPI Data2 Input	I	DATA2P
18	DSI_R-DATA-2N	Negative MIPI Data2 Input	I	DATA2N
19	GND	GND	-	-
20	DSI_R-DATA-1P	Positive MIPI Data1 Input	I	DATA1P
21	DSI_R-DATA-1N	Negative MIPI Data1 Input	I	DATA1N
22	GND	GND	-	-
23	DSI-CLKP	Positive MIPI Clock Input	I	CLKP
24	DSI-CLKN	Negative MIPI Clock Input	I	CLKN
25	GND	GND	-	-
26	DSI_R-DATA-0P	Positive MIPI Data0 Input/Output	I/O	DATA0P
27	DSI_R-DATA-0N	Negative MIPI Data0 Input/Output	I/O	DATA0N
28	GND	GND	-	-
29	DSI_R-DATA-3P	Positive MIPI Data3 Input	I	DATA3P
30	DSI_R-DATA-3N	Negative MIPI Data3 Input	I	DATA3N
31	GND	GND	-	-
32	EN	Enable Pin to Operate DC/DC	I	-
33	N.C	Non connect	-	-
34	VBAT	Power Supply for DC/DC converter	-	-
35	VBAT	Power Supply for DC/DC converter	-	-
36	VBAT	Power Supply for DC/DC converter	-	-
37	VBAT	Power Supply for DC/DC converter	-	-
38	N.C	Non connect	-	-
39	VDDIO	Power Supply for I/O Interface and	-	-
40	VDDIO	Power Supply for I/O Interface and	-	-

Note) I : Input O : Output I/O : Input/Output

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PIN	SYMBOL	FUNCTION	I/O	REMARKS
41	GND	GND	-	-
42	DBIST(GND)	GND	I	DBIST
43	TE_S	Non connect	O	-
44	GND	GND	-	-
45	RESET	Reset Signal	I	RESX
46	GND	GND	-	-
47	DSI_L-DATA-2P	Positive MIPI Data2 Input	I	DATA2P
48	DSI_L-DATA-2N	Negative MIPI Data2 Input	I	DATA2N
49	GND	GND	-	-
50	DSI_L-DATA-1P	Positive MIPI Data1 Input	I	DATA1P
51	DSI_L-DATA-1N	Negative MIPI Data1 Input	I	DATA1N
52	GND	GND	-	-
53	DSI-CLKP	Positive MIPI Clock Input	I	CLKP
54	DSI-CLKN	Negative MIPI Clock Input	I	CLKN
55	GND	GND	-	-
56	DSI_L-DATA-0P	Positive MIPI Data0 Input/Output	I/O	DATA0P
57	DSI_L-DATA-0N	Negative MIPI Data0 Input/Output	I/O	DATA0N
58	GND	GND	-	-
59	DSI_L-DATA-3P	Positive MIPI Data3 Input	I	DATA3P
60	DSI_L-DATA-3N	Negative MIPI Data3 Input	I	DATA3N
61	GND	GND	-	-

Note) P : Power supply U : User define

CN002 : FH36W-61S-0.3SHW(50) (HIROSE)

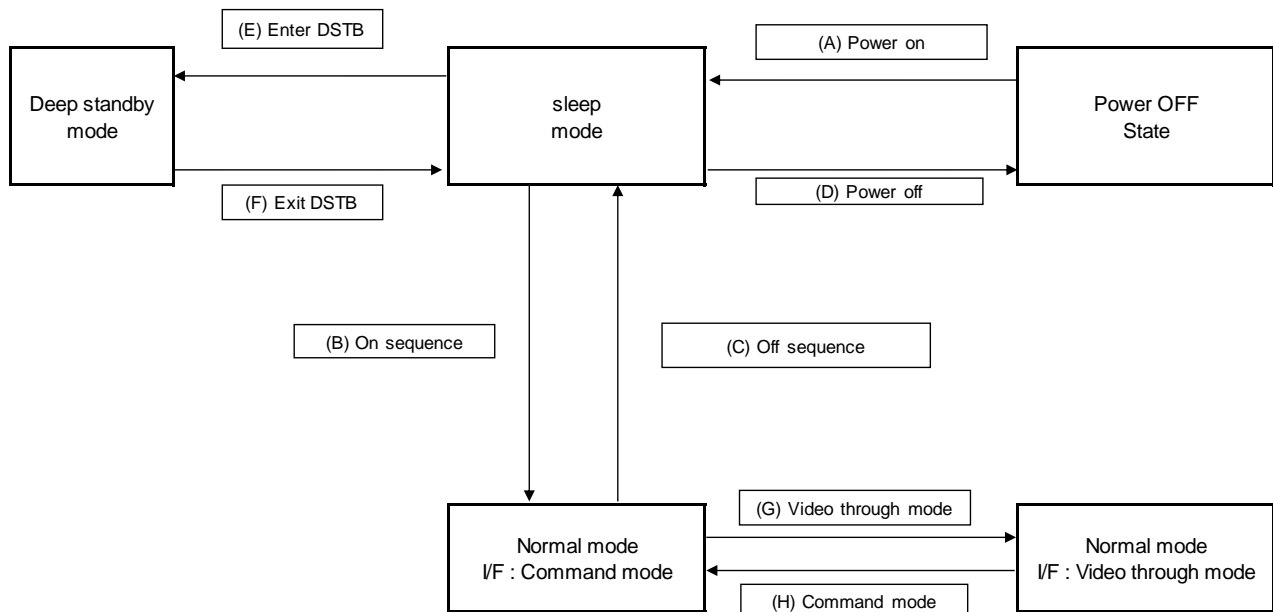
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## 8. FUNCTION

The use of 8.9"WQXGA LCD basically conforms to specifications of LCD driver IC: R69429(Renesas SP drivers INC.). It explains typical function in this manual.

### 8.1 OVERVIEW

The basic operation mode of 8.9"WQXGA LCD Module is illustrated below. When changing from one mode to another, make sure to follow the sequence indicated in the figure.



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## 8.2 INTERFACE

- MIPI DSI Command mode and Video mode 4 Data Lanes x 2port
- HS(High Speed) Transmission (Unidirectional)
- LP(Low Power) Transmission (Bidirectional)
- Diagnostic function – checksum and ECC error monitoring
- Functionality supported by Escape mode
- Clock Lane supports ULPS
- Packet-Based Protocol
- Maximum MIPI transfer rate : 1000Mbps

The DSI incorporated in the LCD driver complies with the following standards.

- MIPI DSI: Version 1.01.00r11
- MIPI D-PHY: Version 1.00.00
- MIPI DCS: Version 1.01.00

### 8.2.1 MIPI-DSI

The module DSI interface employs 2port of clock and 4 data lanes.

- DSI-D0+D0-is bi-directional with Low-Power Reverse Escape Mode supporting Low Power Data Transmission.
- DSI-D1+D1-D2+D2-D3+D3- is unidirectional without Turnaround or any kind of Reverse communication functionality.

The DSI interface can communicate in 2 modes, Low Power Data Transmission Mode (LP-Mode) and High Speed Mode (HS-Mode).

In LP-Mode, the differential pair lines are operating in Single End Mode, the differential receiver is disabled and the termination resistor is disconnected from the differential pair lines.

In HS-Mode, the termination resistor is connected and the differential pairs are no longer working in Single End mode.

The lane states are determined by the active Transmitter (Tx). In Normal operation, the lanes are being driven by either a High Speed Transmitter (HS-Tx) or a Low Speed Transmitter (LP-Tx). In HS mode, there are 2 possible lane states and in Low Speed mode, there are 4 possible lanes states defined by the table below:-

State Code	Line Voltage Levels		High Speed (HS)	Low-Power (LP)	
	Dx+ line	Dx- line	Burst Mode	Control Mode	Escape Mode
HS-0	HS-Low	HS-High	Differential – 0	Note 1	Note 1
HS-1	HS-High	HS-Low	Differential – 1	Note 1	Note 1
LP-00	LP-Low	LP-Low	N/A	Bridge	Space
LP-01	LP-Low	LP-High	N/A	HS-Request	Mark-0
LP-10	LP-High	LP-Low	N/A	LP-Request	Mark-1
LP-11	LP-High	LP-High	N/A	Stop	Note 2

Notes:-

1. During High Speed Transmission, the Low-Power Receivers constantly check for LP-00 state code.
2. If LP-11 occurs during Escape mode, the Lane will return to Stop State (Control Mode LP-11)

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**8.2.2 MIPI-DSI Clock Lanes**

The DSI Clock Lanes can operate in different power modes, controlled by the Transmitter (Tx):-

- High Speed Clock Mode (HSCM)

It is only possible to enter High Speed Clock Mode (HSCM) from Low Power Mode (LPM) by the sequence LPM → LP-01 → LP-00 → HS-0 → HS-0/1 (HSCM).

- Low Power Mode (LPM)

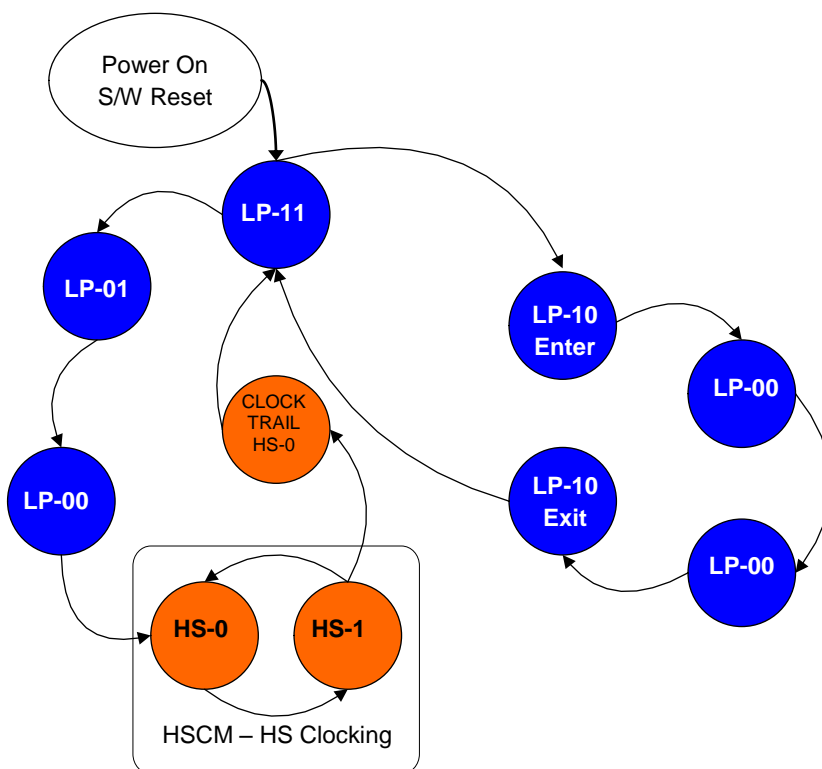
There are 3 possible methods to enter Low Power mode (LPM).

1. Power On, Software Reset or Hardware Reset → LPM.
2. From Ultra Low Power Mode (ULPM) by the sequence ULPM → LP-10 → LP-11 (LPM).
3. From High Speed Clock Mode (HSCM) by the sequence HSCM → HS-0 → LP-11 (LPM)

- Ultra Low Power Mode. (ULPM)

It is only possible to enter Ultra Low Power Mode (ULPM) from Low Power Mode (LPM) by the sequence LPM → LP-10 → LP-00 (ULPM).

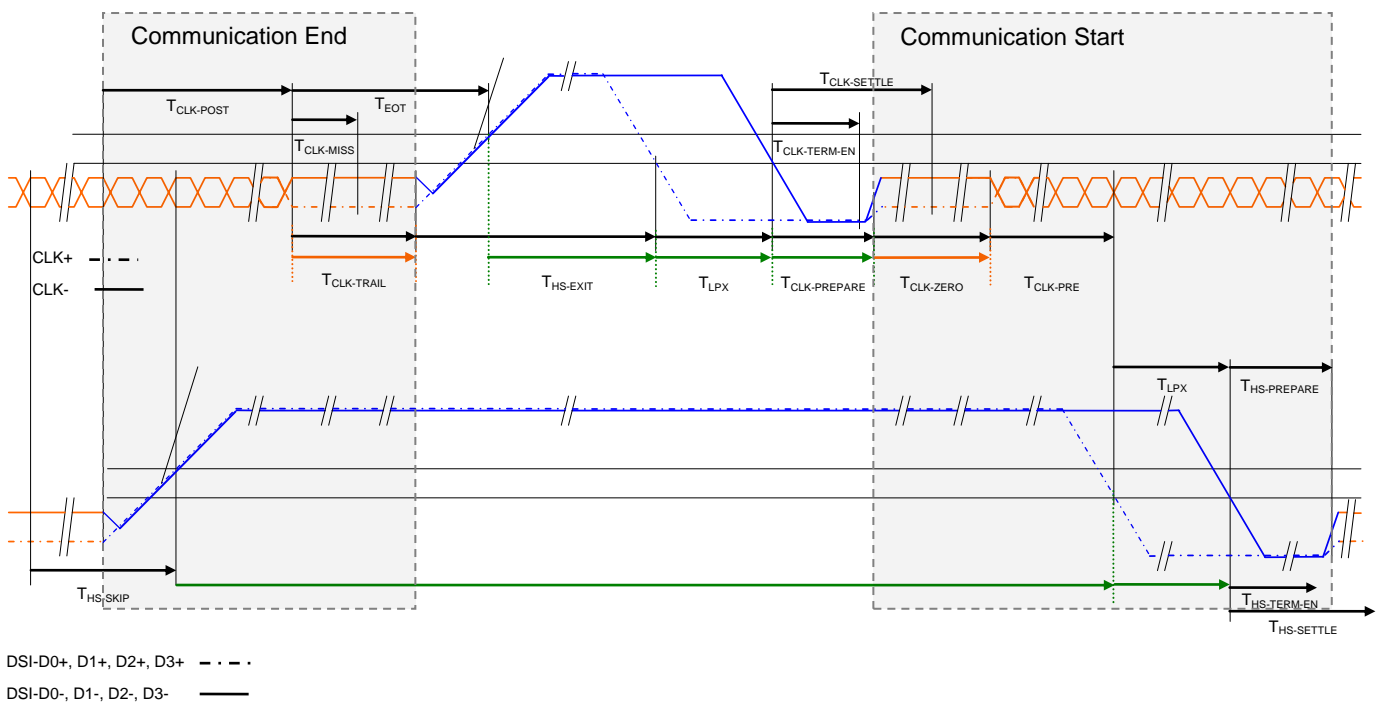
The protocols for entering/leaving the different power modes can be summarized by the following diagram:



**Figure 1 Clock Lane Power Modes.**

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For a high speed communication, the DSI CLK+/- lines are always started before high speed data is sent on DSI-D0+/- or DSI D1+/- or DSI D2+/- or DSI D3+/- . The clock lines also continue clocking for a defined period after the data transmission has ended as shown in the diagram below.



**Figure 2 Clock Lane Power Transitions**

The High Speed Clock burst always starts and ends with state HS-0 so the burst always contains an even number of clock transitions.

### 8.2.3 MIPI-DSI Data Lanes

The DSI Data Lanes DSI D0+/-, D1+/-, D2+/- and D3+/- can operate in different modes, controlled by the Transmitter (Tx):-

- High Speed Data Transmission (HSDT) where the display is receiving data from the host.

It is only possible to enter High Speed Data Transmission (HSDT) from Control Mode by the sequence LP-11 → LP-01 → LP-00 → HS-0 → HS-0/1 (HSDT).

- Escape Mode – Applies only to D0+/-.
- Bus Turnaround Mode – Applies only to D0+/-.

It is only possible to enter Bus Turnaround Mode from Control Mode by the sequence LP-11 → LP-10 → LP-00 → LP-10 → LP-00.

Control Mode is defined as the Data Lane Stop State LP-11.