RECORDS OF REVISION

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instructions and the precautions specified in these specification sheets.

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[For handling and system design]

(1) Do not scratch the surface of the polarizer film as it is easily damaged.

(2) If the cleaning of the surface of the LCD panel is necessary, wipe it swiftly with cotton or other soft cloth. Do not use organic solvent as it damages polarizer.

(3) Water droplets on polarizer must be wiped off immediately as they may cause color changes, or other defects if remained for a long time.

(4) Since this LCD panel is made of glass, dropping the module or banging it against hard objects may cause cracks or fragmentation.

(5) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film.
Check carefully that gas from materials used in system housing or packaging do not hart polarizer. Be sure to confirm the component of them.

(6) Liquid crystal material will freeze below specified storage temperature range and it will not get back to normal quality even after temperature comes back within specified temperature range. Liquid crystal material will become isotropic above specified temperature range and may not get back to normal quality. Keep the LCD module always within specified temperature range.

(7) Do not expose LCD module to the direct sunlight or to strong ultraviolet light for long time.

(8) If the LCD driver IC (COG) is exposed to light, normal operation may be impeded. It is necessary to design so that the light is shut off when the LCD module is mounted.

(9) Do not disassemble the LCD module as it may cause permanent damage.

(10) As this LCD module contains components sensitive to electrostatic discharge, be sure to follow the instructions in below.

① Operators

Operators must wear anti-static wears to prevent electrostatic charge up to and discharge from human body.

② Equipment and containers

Process equipment such as conveyer, soldering iron, working bench and containers may possibly generate electrostatic charge up and discharge. Equipment must be grounded through 100Mohms resistance. Use ion blower.

③ Floor

Floor is an important part to leak static electricity which is generated from human body or equipment. There is a possibility that the static electricity is charged to them without leakage in case of insulating floor, so the

countermeasure(electrostatic earth:$1\times10^{8}\Omega$) should be made.

④Humidity

Proper humidity of working room may reduce the risk of electrostatic charge up and discharge. Humidity should be kept over 50% all the time.

⑤Transportation/storage

Storage materials must be anti-static to prevent causing electrostatic discharge.

⑥Others

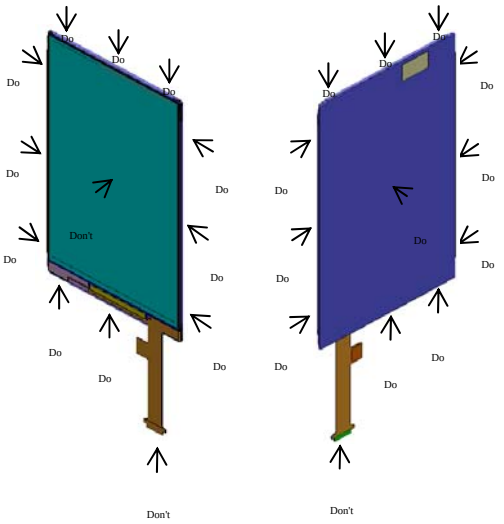
Protective film is attached on the surface of LCD panel to prevent scratches or other damages. When removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.

(11) Hold LCD very carefully when placing LCD module into the system housing. Do not apply excessive stress or pressure to LCD module. Do not to use chloroprene rubber as it may affect on the reliability of the electrical interconnection.

(12) Do not hold or touch LCD panel to flex interconnection area as it may be damaged.

(13) As the binding material between LCD panel and flex connector mentioned in 12) contains an organic material, any type of organic solvents are not allowed to be used. Direct contact by fingers is also prohibited.

(14) When carrying the LCD module, place it on the tray to protect from mechanical damage. It is recommended to use the conductive trays to protect the CMOS components from electrostatic discharge. When holding the module, hold the Plastic Frame of LCD module so that the panel, COG and other electric parts are not damaged.



(15) Do not touch the COG‘s patterning area. Otherwise the circuit may be damaged.

(16) Do not touch LSI chips as it may cause a trouble in the inner lead connection.

(17) Place a protective cover on the LCD module to protect the glass panel from mechanical damages.

(18) LCD panel is susceptible to mechanical stress and even the slightest stress will cause a color change in background and pooling. So make sure the LCD panel is placed on flat plane without any continuous twisting, bending or pushing stress.

(19) Protective film is placed onto the surface of LCD panel when it is shipped from factory. Make sure to peel it off before assembling the LCD module into the system. Be very careful not to damage LCD module by electrostatic discharge when peeling off this protective film. Ion blower and ground strap are recommended.

(20) Make sure the mechanical design of the system in which the LCD module will be assembled matches specified viewing angle of this LCD module.

(21) This LCD module does not contain nor use any ODS (1,1,1-Trichloroethane, CCL4), CFCS, Carbon tetrachloride, Halon in all materials used, in all production processes.

(22) Do not bend FPC in PC5500 area. In LCM manufacturing, crack might be caused in PC5500.

[For operating LCD module]

(1) Do not operate or store the LCD module under outside of specified environmental conditions.

(2) At the shipment, adjust the contrast of each LCD module with electric volume. LCD contrast may vary from panel to panel depending on variation of LCD power voltage from system.

(3) As opt-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

[Precautions for Storage]

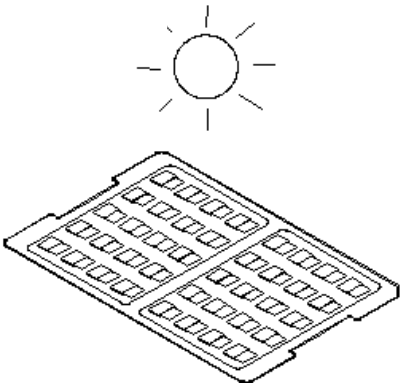
(1) Do not expose the LCD module to direct sunlight or strong ultraviolet light for long periods. Store in a dark place.

(2) The liquid crystal material will solidify if stored below the rated storage temperature and will become an isotropic liquid if stored above the rated storage temperature, and may not retain its original properties. Only store the module at normal temperature and humidity (25±5°C,60±10%RH) in order to avoid exposing the front polarizer to chronic humidity.

(3) Keeping Method

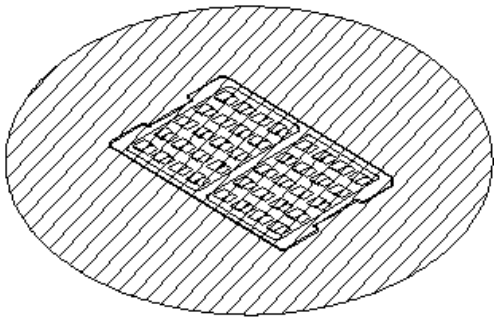
a. Don't keeping under the direct sunlight.

DON'T



b. Keeping in the tray under the dark place.

DO



(4) Do not operate or store the LCD module under outside of specified environmental conditions.

(5) Be sure to prevent light striking the chip surface.

[Other Notice]

(1) Do not operate or store the LCD module under outside of specified environmental conditions.

(2) As electrical impedance of power supply lines (AVDD/IOVDD-GND) are low when LCD module is working, place the de-coupling capacitor near by LCD module as close as possible.

(3) Reset signal must be sent after power on to initialize LSI. LSI does not function properly until initialize it by reset signal.

(4) Generally, at power on, in order not to apply DC charge directly to LCD panel, supply logic voltage first and initialize LSI logic function including polarity alternation. Then supply voltage for LCD bias. At power off, in order not to apply DC charge directly to LCD panel, execute Power OFF sequence and Discharge command.

(5) Don't touch to FPC surface, exposed IC chip, electric parts and other parts, to any electric, metallic materials.

(6) No bromide specific fire-retardant material is used in this module.

(7) Do not display still picture on the display over 2 hours as this will damage the liquid crystal.

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[Precautions for Discarding Liquid Crystal Modules]

COG: After removing the LSI from the liquid crystal panel, dispose of it in a similar way to circuit boards from electronic devices.

LCD panel: Dispose of as glass waste. This LCD module contains no harmful substances. The liquid crystal panel contains no dangerous or harmful substances. The liquid crystal panel only contains an extremely small amount of liquid crystal (approx.100mg) and therefore it will not leak even if the panel should break.

-Its median lethal dose (LD50) is greater than 2,000 mg/kg and a mutagenetic (Aims test: negative) material is employed.

FPC: Dispose of as similar way to circuit board from electric device.

1. Application

This data sheet is to introduce the specification of LS043T1LX01 active matrix 16,777,216colors LCD module.

LCD module is controlled by Driver IC (NT35565 with RAM).

If any problem occurs concerning the items not stated in this specification, it must be solved sincerely by both parties after deliberation.

As to basic specification of driver IC refer to the IC specification and handbook.

2. Construction and Outline

This module is a color transmissive, high contrast, wide viewing angle and active matrix LCD module incorporating CG-Silicon TFT (Continuous Grain-Silicon Thin Film Transistor), named ASV LCD (Advanced Super View LCD).

Construction: LCD panel, Driver (COG), FPC with electric components, 10 white LEDs prism sheet, diffuser, light guide and reflector, plastic frame and metal frame to fix them mechanically.

Outline: See page 24(Fig.1 Outline Dimensions)

Connection: ZIF connector (PANASONIC AYF332335)

There shall be no scratches, stains, chips, distortions and other external drawbacks that may affect the display function.

Rejection criteria shall be noted in Inspection Standard.

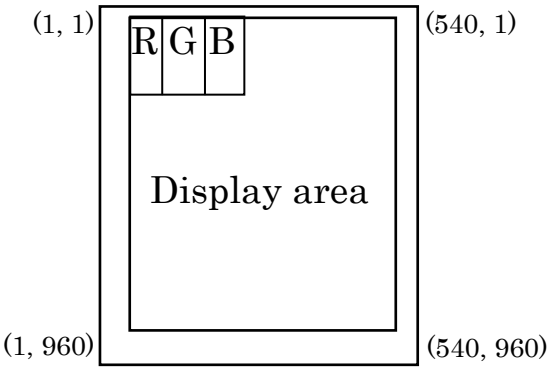
3. Mechanical (Physical) Specifications

Table1

Item	Specifications	Unit	Remarks
Screen size	10.9044 (4.29” type) Diagonal	cm	
Active area	53.46(H)×95.04(V)	mm	
Pixel format	540(H)×960(V)	pixel	
	1 Pixel =R+G+B dots	-	
Pixel pitch	0.033(H)×0.099(V)	mm	
Pixel configuration	R,G,B vertical stripes	-	
Display mode	Normally Black	-	
LDC Driving method	DC Driving / Dot Inversion	-	
Number of colors	16,777,216	colors	24bits
Outline dimensions	58.54(W)×105.7(H)×1.5(D)	mm	【Note3-1】
Mass	21	g	
Surface hardness	3H(Initial)	-	Pencil hardness

【Note3-1】The above-mentioned table indicates module sizes without some projections and FPC.
For detailed measurements and tolerances, please refer to Fig.1 Outline Dimensions.

4. Pixel Configuration



5. Input Terminal Names and Functions

Table2

Pin No.	Symbol	I/O	Description	Remarks
1	LED+	-	Power supply for LED(Anode)	
2	LED-	-	Power supply for LED(Cathode)	
3	GND	-	Ground	
4	TE	O	Tearing signal output from driver IC	
5	IOVDD	-	Power supply for I/O	
6	AVDD	-	Power supply for analog	
7	LEDPWM	O	Backlight LED driver PWM	
8	XRES	I	Device reset signal	“L” Active
9	GND	-	Ground	
10	VR	O	Test pin usage, must be left open.	Open
11	CTS1/ID1/IM1		Control signal 1/ID1(100kΩ Pull-down GND) and interface select signal of MDDI and MIPI	ID1=”0” L:MIPI H:MDDI
12	GND	-	Ground	
13	GND	-	Ground	
14	MDDI_STBM/DSI_CLKN	I	MDDI strobe negative signal	
15	MDDI_STBP/DSI_CLKP	I	MDDI strobe positive signal	
16	GND	-	Ground	
17	MDDI_DM1/DSI_D0N	I/O	MDDI data1 negative signal	
18	MDDI_DP1/DSI_D0P	I/O	MDDI data1 positive signal	
19	GND	-	Ground	
20	MDDI_DM2/DSI_D1N	I/O	MDDI data2 negative signal	
21	MDDI_DP2/DSI_D1P	I/O	MDDI data2 positive signal	
22	GND	-	Ground	
23	GND/MTP PWR	I	Voltage supply pin for MTP, Please connect to ground	GND

Fitting connector: ZIF connector (PANASONIC AYF332335)

6. Absolute Maximum Ratings

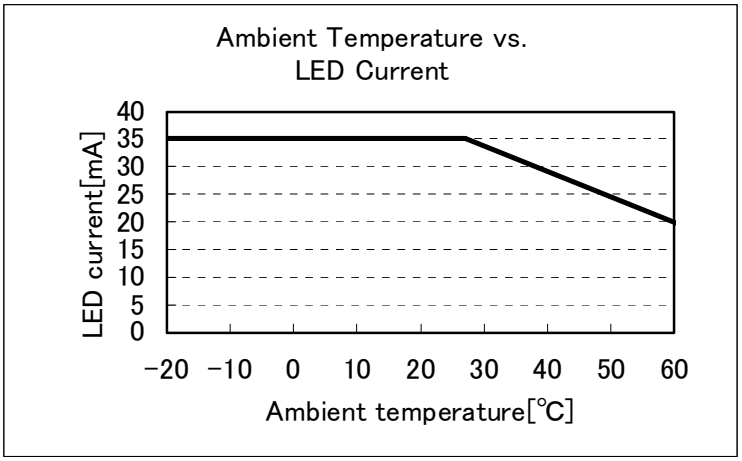
Table 3 GND=0V

Parameter	Symbol	Conditions	Rated value	Unit	Remarks
Driver IC (Analog) Power Supply Voltage	AVDD	Ta=+25℃	-0.3 ~ +5.5	V	【Note6-1】
Driver IC (Digital) Power Supply Voltage	IOVDD	Ta=+25℃	-0.3 ~ +5.5	V	【Note6-1】
Temperature for storage	T_{stg}	-	-30 ~ +70	°C	【Note6-2】
Temperature for operation	T_{opr}	-	-20 ~ +60	°C	【Note6-2】
LED Input electric current	I_{LED}	Ta=+25°C	35	mA	【Note6-3】

【Note6-1】Voltage applied to GND pins. GND pin conditions are based on all the same voltage (0V). Always connect all GND externally and use at the same voltage.

【Note6-2】Humidity : 95%RHMax.(at Ta≤40°C). Maximum wet-bulb temperature is less than 39°C(at Ta>40°C). Condensation of dew must be avoided.

【Note6-3】Ambient temperature and the maximum input are fulfilling the following operating conditions.



7. Electrical Characteristics

7-1. TFT-LCD Panel Driving Section

Table 4 Ta=+25°C, GND=0V

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Driver IC(Analog) Power Supply Voltage	AVDD	2.95	3.1	3.3	V	【Note7-1】
Driver IC(Digital) Power Supply Voltage	IOVDD	1.65	-	AVDD	V	【Note7-1】
Input voltage (Low)	V_{IL}	0	-	0.3IOVDD	V	【Note7-2】
Input voltage (High)	V_{IH}	0.7IOVDD	-	IOVDD	V	【Note7-2】
Input current (Low)	I_{IL}	-1	-	-	μA	
Input current (High)	I_{IH}	-	-	1	μA	
Output voltage (Low)	V_{oL}	0	-	0.2IOVDD	V	I_{oL}=+0.1mA
Output voltage (High)	V_{oH}	0.8IOVDD	-	IOVDD	V	I_{oH}=-0.1mA
Power consumption	Pw1	-	101	-	mW	【Note7-3】
	Pw2	-	104	130	mW	【Note7-4】
	Pw3	-	67	-	mW	【Note7-5】
	Pw4	-	88	-	mW	【Note7-6】

【Note7-1】Include Ripple Noise

【Note7-2】Applied overshoot

【Note7-3】Measurement Conditions : Full screen checker pattern, AVDD=3.1V, IOVDD=1.8V, Static Image

【Note7-4】Measurement Conditions : Full screen white pattern (Worst case), AVDD=3.1V, IOVDD=1.8V, Static Image

【Note7-5】Measurement Conditions : Full screen black pattern, AVDD=3.1V, IOVDD=1.8V, Static Image

【Note7-6】Measurement Conditions : Full screen color bar pattern (following pattern), AVDD=3.1V, IOVDD=1.8V, Static Image

7-2. Back Light Driving Section

Table 5 Ta=+25°C, GND=0V

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
LED Voltage	V_{LED}	-	+30	+33	V	【Note7-7】
LED Current	I_{LED}	-	20	-	mA	
Power Consumption	W_{LED}	-	600	-	mW	【Note7-8】
LED Quantity		10			pcs	
LED Rank		Brightness(W675～)			-	NSSW206A
		Chromaticity:(Sa62,Sbj2)			-	

【Note7-7】at I_{LED}=20mA

【Note7-8】$W_{LED}=V_L \times I_L$

7-3. Timing characteristics of LEDPWM signal

Table 6 Ta=+25°C, GND=0V

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
LEDPWM Frequency	fLEDPWM	0.07659	-	39.0625	KHz	
LEDPWM Frequency Tolerance	ftLEDPWM	-10	-	+10	%	

8. Timing characteristics of input signals

8-1.MDDI DC/AC Characteristics

Data/Strobe Rx DC characteristics

Table 7 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Parameter	Description	MIN	TYP	MAX	Unit	Note
V_{IT+}	Receiver differential input high threshold voltage. Above this differential voltage the input signal shall be interpreted as a logic-one level.	–	0	50	mV	
V_{IT-}	Receiver differential input low threshold voltage. Below this differential voltage the input signal shall be interpreted as logic-zero level.	-50	0	–	mV	
V_{IT+}	Receiver differential input high threshold voltage (offset for hibernation wake-up).Above this differential voltage the input signal shall be interpreted as a logic-one level.	–	100	125	mV	
V_{IT-}	Receiver differential input low threshold voltage (offset for hibernation wake-up).Below this differential voltage the input signal shall be interpreted as logic-zero level.	75	100	–	mV	
$V_{Input-Range}$	Allowable receiver input voltage range with respect to client ground.	0.5	–	1.2	V	
R_{term}	Parallel termination resistance value	80	100	120	Ω	

COG driver electrical DC characteristics

Table 8 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Parameter	Description	MIN	TYP	MAX	Unit	Note
$I_{diffabs}$	Absolute driver differential output current range (Current through the termination resistor)	1.5	–	2.5	mA	Rterm= 100 Ω
$V_{out-rng-int}$	Single-ended driver output voltage range with respect to ground, internal mode	0.6	–	1.1	V	Under all conditions, *including double-drive*

Note: Please refer to VESA specification Ver 1.2

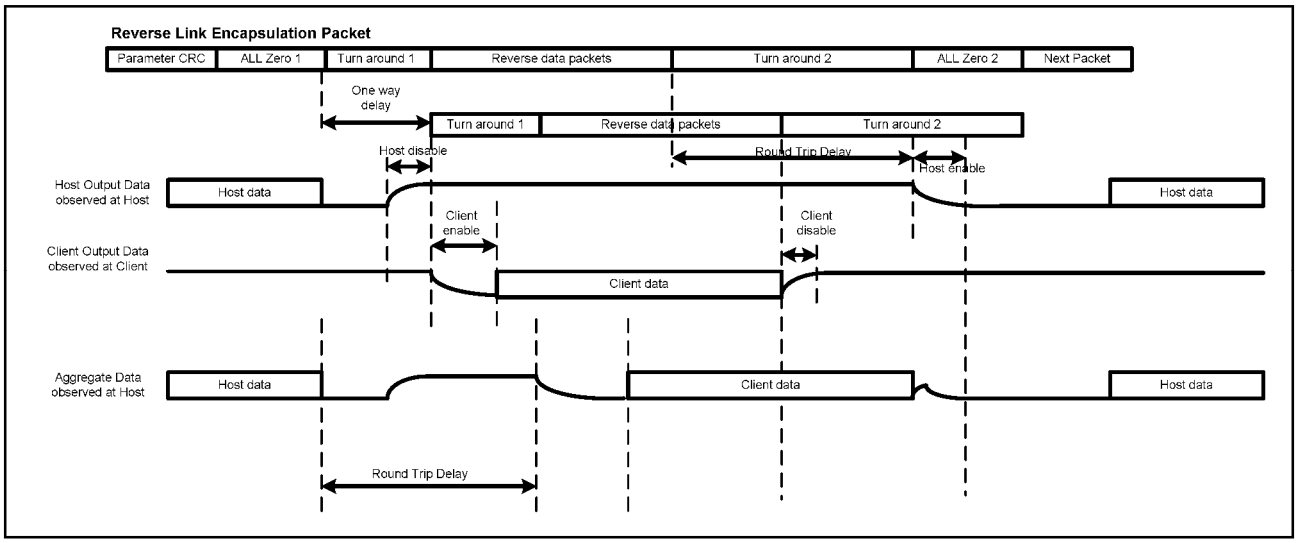


Fig. Host enable/disable time and client enable/disable time diagram

Receiver AC Characteristics

Table 9 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Parameter	Description	MIN	TYP	MAX	Unit
t_{BIT}	Forward link data bit rate.	3.0	-	-	ns
$T_{host-enable}$	Host output enable time	0	-	100	ns
$T_{host-disable}$	Host output disable time, entire length of the Turn-Around 1 field	0	-	20	ns
$T_{client-enable}$	Client output enable time, entire length of the Turn-Around 1 field	0	-	100	ns
$T_{client-disable}$	Client output disable time, measured from the end of the last bit of the Turn-Around 2 field	0	-	20	ns

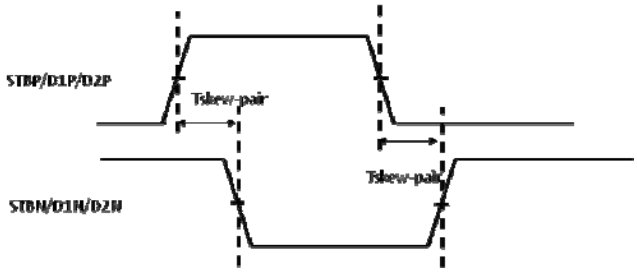
Note, tBIT= 1 / Link_Data_Rate, where Link_Data_Rate is the bit rate of a single data pair.

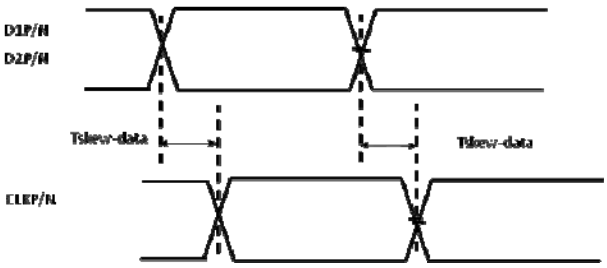
These specifications are from VESA specification Ver 1.2.

Data transfer rate

Table 10 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Symbol	Parameter	Min	Typ	Max	Unit
1/tBIT	Data transfer rate	10	384	400	Mbps (Par lane)
|Tskew-pair|	Differential transfer input skew	-	-	0.25	ns
|Tskew-data|	Data Stb input skew	-	-	0.30	ns





8-2.MIPI DC/AC Characteristics

DC characteristics

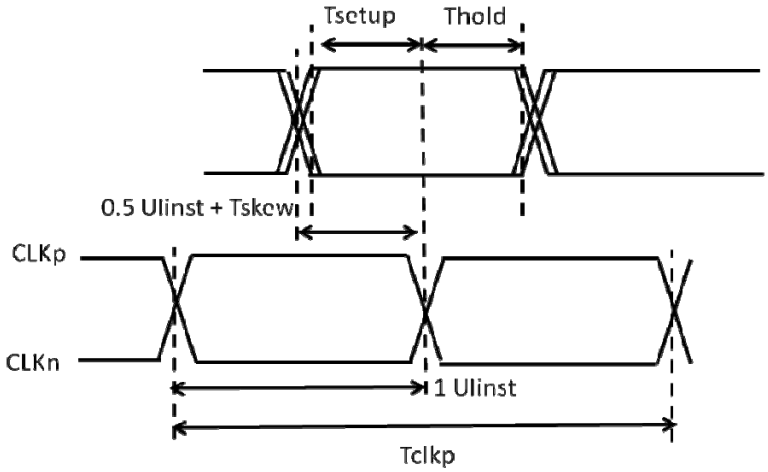
Table 11 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
High speed mode						
Single ended input low voltage	VILHS	-40	-	-	mV	
Single ended input high voltage	VIHHS	-	-	460	mV	
Common mode voltage	VCMRXDC	70		330	mV	
Differential impedance	ZID	80	100	120	ohm	
High speed transmit differential voltage	|VOD|	140	200	250	mV	
Low power mode						
Pad signal voltage range	VI	-50	-	1350	mV	
Ground Shift	VGNDSH	-50	-	50	mV	
Logic 0 input threshold	VIL	0	-	550	mV	
Logic 1 input threshold	VLH	880	-	1350	mV	
Input hysteresis	VHYST	25	-	-	mV	
Output low level	VOL	-50	-	50	mV	
Output high level	VOH	1.1	1.2	1.3	V	
Output impedance of Low Power transmitter	ZOLP	80	100	120	Ohm	
Logic 0 contention threshold	VIHCDMAX	0.0	-	200	mV	
Logic 1 contention threshold	VIHCDMIN	450	-	1350	mV	

AC Characteristics

Table 12 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Transmission rate	$1/UI_{INST}$	80	-	510	Mbps/lane	
UI instantaneous	UI_{INST}	1.96	-	12.5	ns	【Note8-1, 2】
Data to Clock Skew [measured at transmitter]	$T_{SKEW[TX]}$	-0.15	-	0.15	UI_{INST}	【Note8-3】
Data to Clock Setup Time [measured at receiver]	$T_{SETUP[RX]}$	0.15			UI_{INST}	【Note8-4】
Data to Clock Hold Time [measured at receiver]	$T_{HOLD[RX]}$	0.15			UI_{INST}	【Note8-4】
20% - 80% rise time and fall time	Tr/Tf	150	-	-	ps	
		-	-	0.3	UI_{INST}	



【Note8-1】 This value corresponds to minimum 80MHz rate.

【Note8-2】 The minimum UI shall not violated for any single bit period.

【Note8-3】 Total delay budget of 0.3 UI_{INST}.

【Note8-4】 Total setup and hold window for receiver of 0.3 UI_{INST}.

MIPI DSI Interface (D-PHY: V0.90.00 , DSI:1.01.00 R11, DCS:1.01.00)

8-3.Reset Timing Characteristics

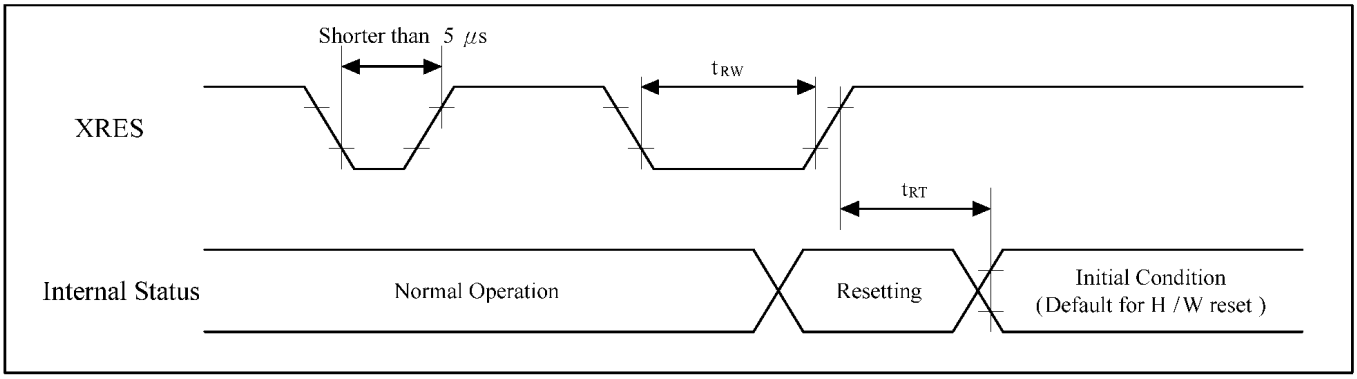


Table 13 Ta=+25°C, GND=0V, AVDD=2.85V to 3.3V, IOVDD=1.65V to 3.3V

Signal	Symbol	Parameter	Min.	Max.	Unit
XRES	t_{RW}	Reset pulse duration	10(Note)	-	us
	t_{RT}	Reset cancel	-	5(Note)	ms
			-	120(Note)	ms

Note：

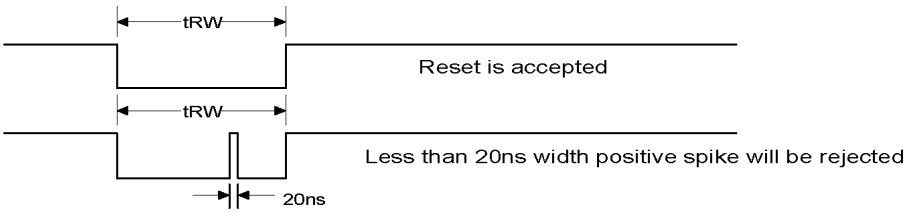
-The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from EEPROM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of XRES.

-Spike due to an electrostatic discharge on XRES line does not cause irregular system reset according to the table below ：

XRES	Pulse Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset Starts

-During the Resetting period, the display will be blanked(The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep-Out mode. The display remains the blank state in Sleep-In mode). Then return to Default condition for Hardware Reset.

-Spike Rejection also applies during a valid reset pulse as shown below ：



-When Reset applied during Sleep-In Mode.

-When Reset applied during Sleep-Out Mode.

-It is necessary to wait 5ms after releasing XRES before sending commands. Also Sleep Out command cannot be sent for 120 ms.

9. Power Sequence

9-1 MDDI Power On Sequence

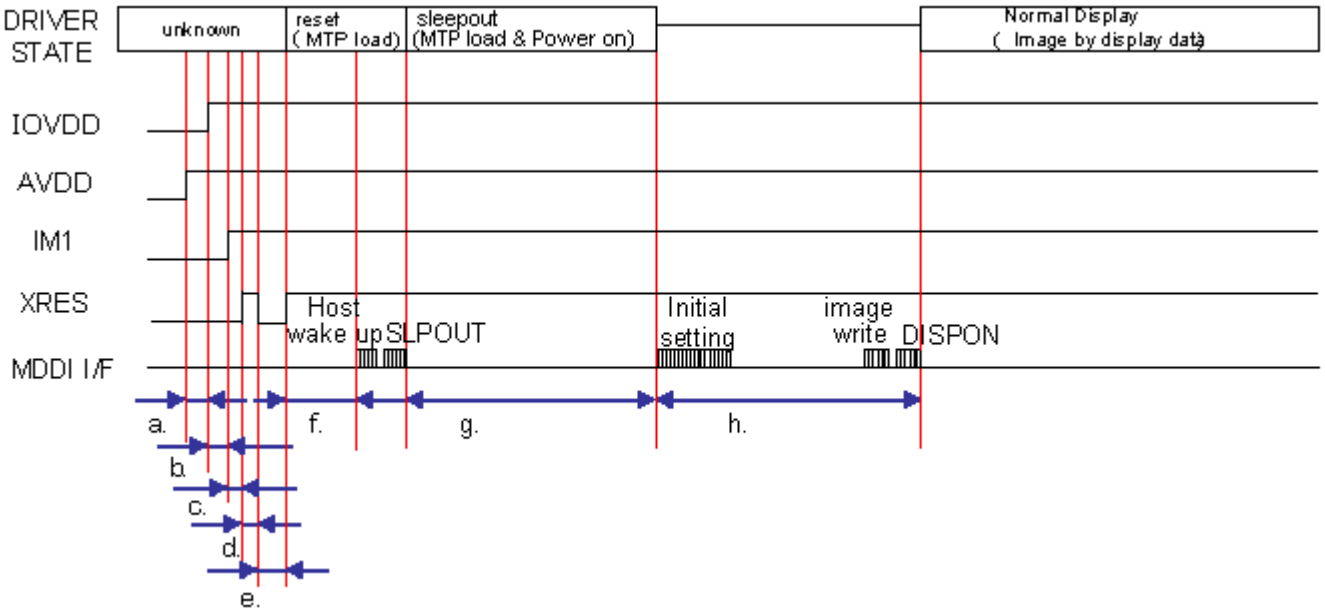


Table 14

Recommended Power On Sequence					term
Step	**Reg.**	**Data**	**Delay**	**Command**	
1	Initial condition			XRES = L , IM1 = L	
2	Power Supply AVDD			AVDD ON	
3			Min 0 ms - Max.10 ms	.	a.
4	Power Supply IOVDD			IOVDD ON	
5			Min. 10ms		b.
6				IM1 = H	
7			Min. 1µs		c.
8				XRES = H	
9			Min. 10 µs		d.
10				XRES = L	
11			Min. 20 µs		e.
12				XRES = H (release)	
13			Min. 20 ms		f.
14				Host Wake up	
15	0x1100	0x0000		SLEEP OUT	
16			Min. 150 ms		g.
17	0x____	0x____		Initial setting (If you need the other register setthing)	h.
18	0x____	0x____		Image Write(Send Video Stream Packet)	
19	0x2900	0x0000		Display ON	

9-2 MDDI Power Off Sequence

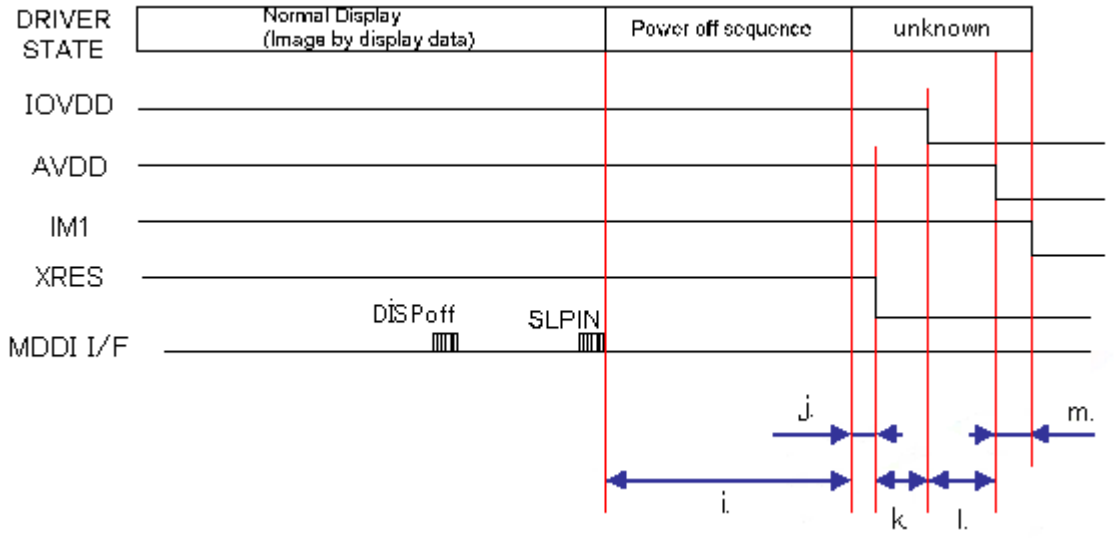


Table 15

Recommended Power Off Sequence					term
Step	Reg.	Data	Delay	Command	
1	0x2800	0x0000		Display off	
2	0x1000	0x0000		Sleep In	
3			Min. 100ms		i.
4			Min. 0ms		j.
5				XRES = L	
6			Min. 0ms		k.
7	Power OFF			IOVDD OFF	
			Min. 0ms - Max. 10ms		l.
				AVDD OFF	
			Min. 0ms		m.
				IM1 = L	

9-3 MIPI Power On Sequence

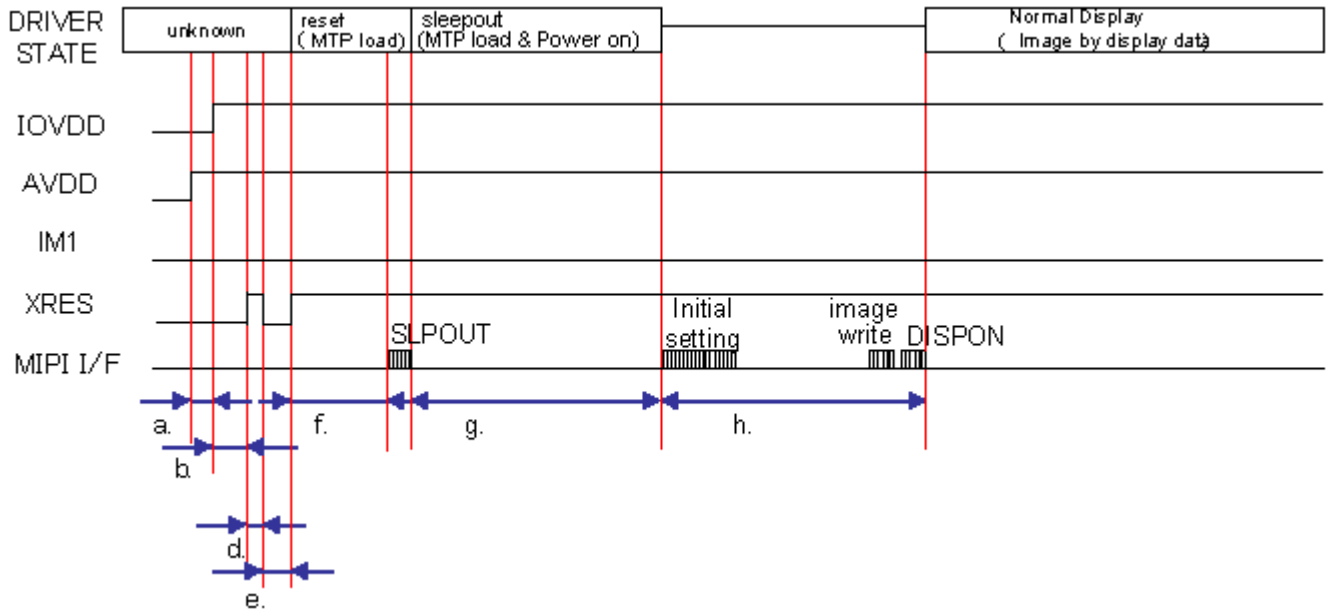


Table 16

Recommended Power On Sequence					term
Step	**Reg.**	**Data**	**Delay**	**Command**	
1	Initial condition			XRES = L , IM1 = L	
2	Power Supply AVDD			AVDD ON	
3			Min 0 ms - Max.10 ms	.	a.
4	Power Supply IOVDD			IOVDD ON	
5			Min. 10ms		b.
6				XRES = H	
7			Min. 10 µs		d.
8				XRES = L	
9			Min. 20 µs		e.
10				XRES = H (release)	
11			Min. 10 ms		f.
12	0x11	0x00		SLEEP OUT	
13			Min. 150 ms		g.
14	0x__	0x__		Initial setting (If you need the other register setthing)	
15	0x__	0x__		Image Write(Send Video Stream Packet)	h.
16	0x29	0x00		Display ON	

9-4 MIPI Power Off Sequence

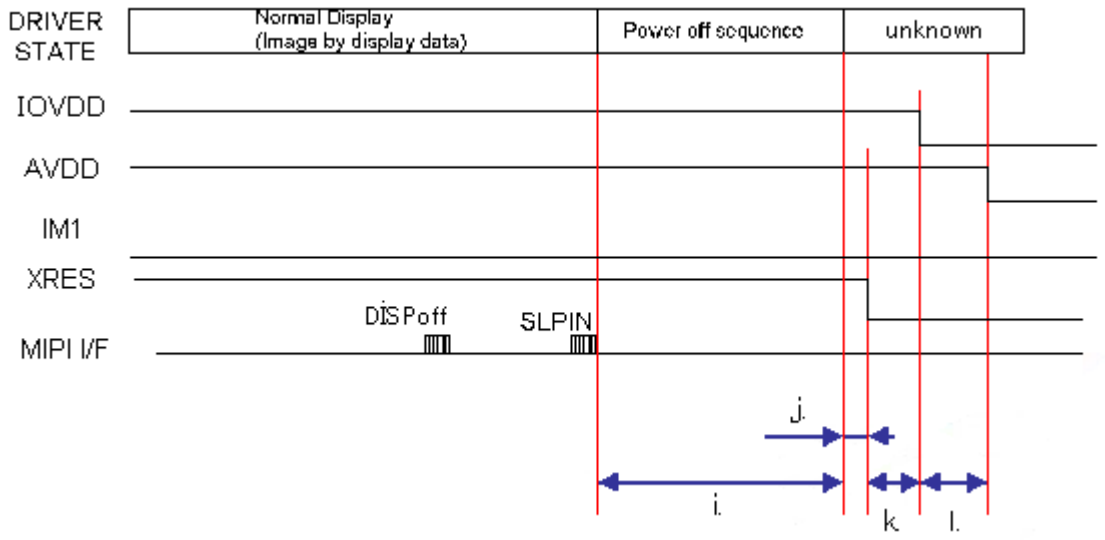


Table 17

Recommended Power Off Sequence					term
Step	Reg.	Data	Delay	Command	
1	0x28	0x00		Display off	
2	0x10	0x00		Sleep In	
3			Min. 100ms		i.
4			Min. 0ms		j.
5				XRES = L	
6			Min. 0ms		k.
7	Power OFF			IOVDD OFF	
			Min. 0ms - Max. 10ms		l.
				AVDD OFF	

10. Input Signals, Basic Display Colors and Gray Scale of Each Color

Table 18

	Colors & Gray Scale	Gray Scale	Data signals																							
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
			LSB							MSB	LSB							MSB	LSB							MSB
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
	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
	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
	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
	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
	Magent	–	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
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	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	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	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	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	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	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Low level voltage, 1: High level voltage

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

11. Optical Characteristics

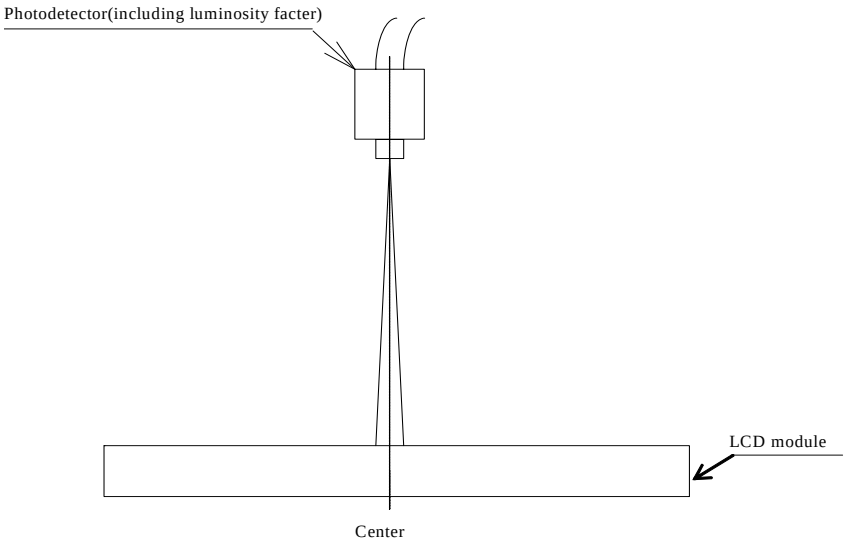
11-1 Driving the Back Light Condition

Table 19 Ta=+25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	θ21, θ22	CR>10	70	80	-	degree	【Note11-1, 2】
	θ11, θ12		70	80	-	degree	
Contrast Ratio	CR	θ=0°	700	1000	-	-	【Note11-2】
Response Time	Tr +Td	θ=0°	-	-	35	ms	【Note11-3】
White Chromaticity	x	θ=0°	0.28	0.31	0.34	-	
	y		0.29	0.32	0.35	-	
Red Chromaticity	x		0.605	0.64	0.675	-	
	y		0.315	0.35	0.385	-	
Green Chromaticity	x		0.285	0.32	0.355	-	
	y		0.585	0.62	0.655	-	
Blue Chromaticity	x		0.105	0.14	0.175	-	
	y		0.035	0.07	0.105	-	
Brightness	L	θ=0°	400	500	-	cd/m²	I_{LED}=20mA
Uniformity	U	θ=0°	75	85	-	%	【Note11-4】
NTSC Ratio	S		60	70	-	%	
Gamma	γ	θ=0°	-	2.2	-	-	

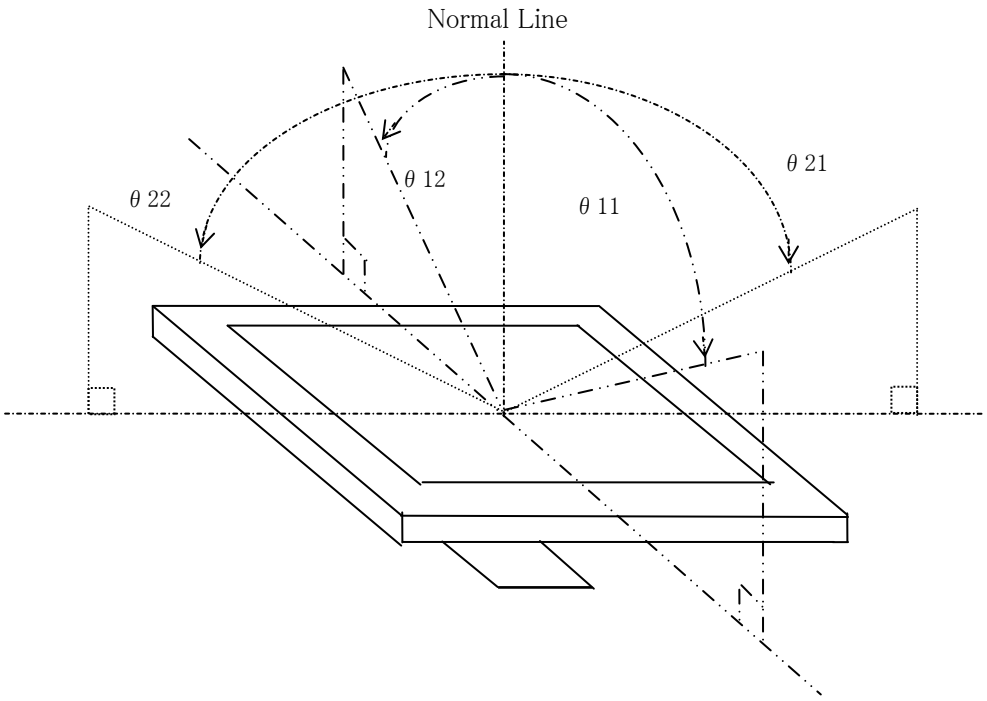
*The measuring method of the optical characteristics is shown by the following figure.

*A measurement device is TOPCON luminance meter SR-3.(Viewing cone 1°.)



Measuring method for optical characteristics

【Note 11-1】Viewing angle range is defined as follows.



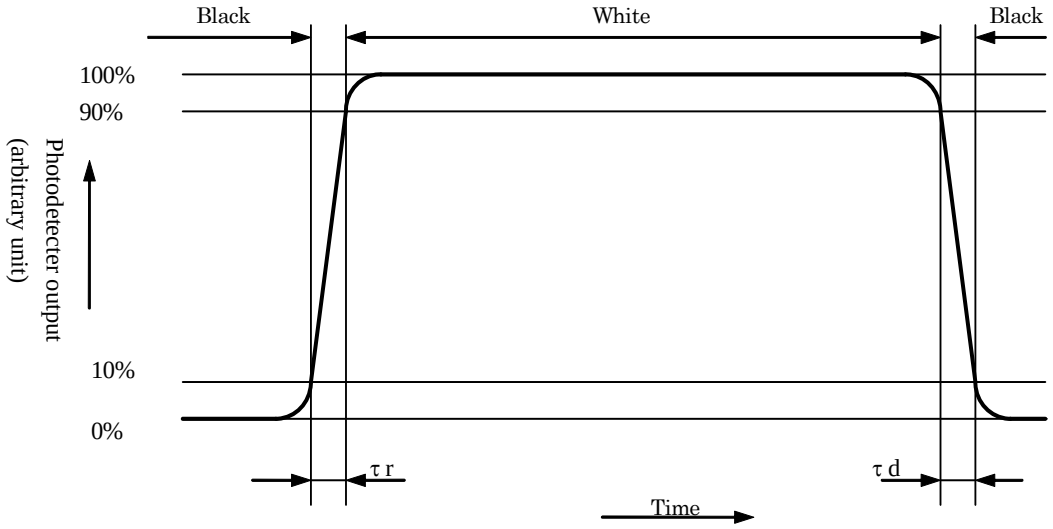
【Note 11-2】Definition of contrast ratio:

The contrast ratio is defined as the follows:

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

【Note 11-3】Definition of response time:

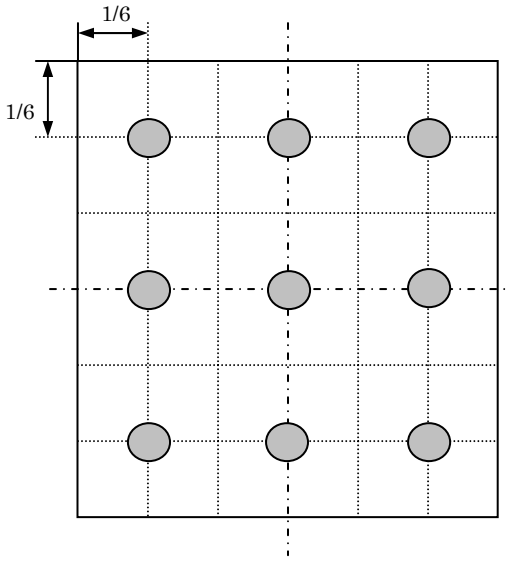
The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”



【Note 11-4】Definition of Uniformity.

$$\text{Uniformity} = \frac{\text{Minimum Brightness}}{\text{Maximum Brightness}} \times 100\,(\%)$$

The brightness should be measured on the 9-points as shown in the following figure.



12. Reliability Test Items

Table 20

No.	Test item	Conditions
1	High temperature storage test	Ta = +70°C, 240h
2	Low temperature storage test	Ta = -30°C, 240h
3	High temperature and high humidity storage test	Ta = +60°C90%RH, 240h (No condensation)
4	High temperature operation test	Ta = +60°C, 240h
5	Low temperature operation test	Ta = -20°C, 240h
6	High temperature and high humidity operation test	Ta = +40°C95%RH, 240h (No condensation)
7	Heat shock test	Ta = -30℃(30min)～70°C(30min), 50cycle
8	Shock test	980m/s^2, 6ms ±X, ±Y ±Z, 3times for each direction (JIS C0041, A-7 Condition C)
9	Vibration test	Frequency range: 10Hz~55Hz Stroke: 1.5mm, Sweep: 10Hz~55Hz X, Y Z, 2 hours for each direction(total 6 hours) (JIS C0041, A-7 Condition C)
10	Electro static discharge test	±200V, 200pF(0Ω) to Terminals(Contact) (1 time for each terminals) ±8kV, 150pF(330Ω) to Housing bezel(Contact) ±15kV, 150pF(330Ω) to Housing bezel(Air) IEC 61000−4−2

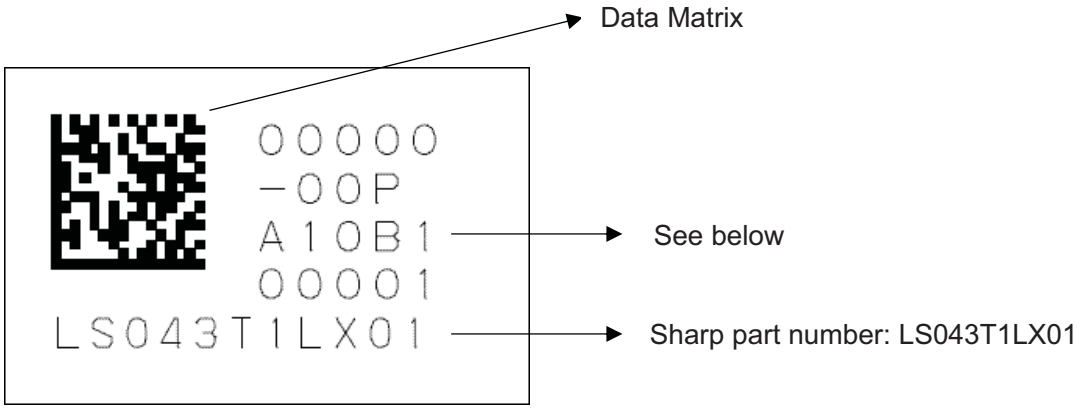
*Ta = Ambient temperature

*Check items

In the standard condition, there shall be no practical problems that may affect the display function.

13. Indication of lot number

The lot number is shown on a label. Attached location is shown in Fig.1 (Outline Dimensions).



S/N : RRYMD ZZZZZ

RR : Revision code

Y : Manufacture year

M :Manufacture month

D :Manufacture day

Z :Remaining 5 digits of serial number

14. Forwarding form

(a) Piling number of cartons : 7 deep

(b) Package quality in one cartons : 240 pcs

(c) Carton size : 580 mm × 365 mm × 235 mm

(d) Total mass of 1 carton filled with full modules : approximately 9.25kg

Condition for storage

Environment

(1) Temperature : 0～40°C

(2) Humidity : 60%RH or less(at 40°C)

(3) Atmosphere : Harmful gas, such as acid or alkali which erodes electronic components and/or wires, must not be detected.

(4) Period : about 3 months

(5) Opening of the package : In order to prevent the LCD module from breakdown by electrostatic charges, please control the room humidity over 50%RH and open the package taking sufficient countermeasures against electrostatic charges, such as earth, etc.

SHARP

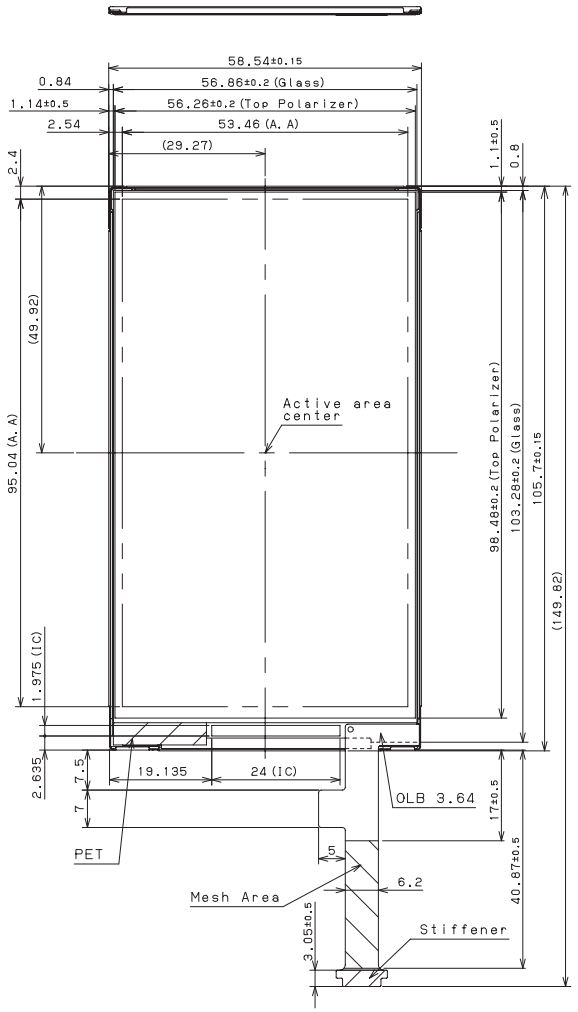
CONFIDENTIAL

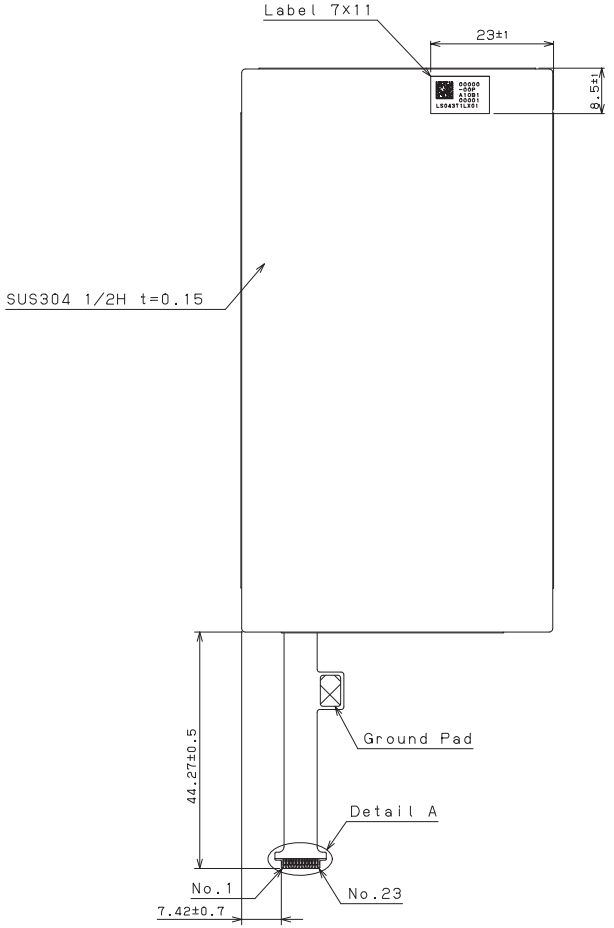
TENTATIVE

The drawings above are tentative as the some parts are currently being under review, which may be changed in future.

PIN DESCRIPTION (CN)

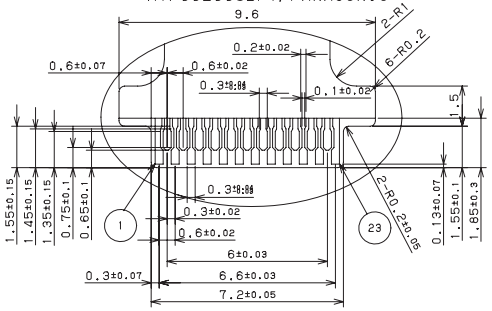
1	LED+
2	LED-
3	GND
4	TE
5	IOVDD
6	AVDD
7	LEDPWM
8	XRES
9	GND
10	VR
11	CTS1/ID1/IM1
12	GND
13	GND
14	MDDI_STBM/DSI_CLKN
15	MDDI_STBP/DSI_CLKP
16	GND
17	MDDI_DM1/DSI_D0N
18	MDDI_DP1/DSI_D0P
19	GND
20	MDDI_DM2/DSI_D1N
21	MDDI_DP2/DSI_D1P
22	GND
23	GND/MTP PWR





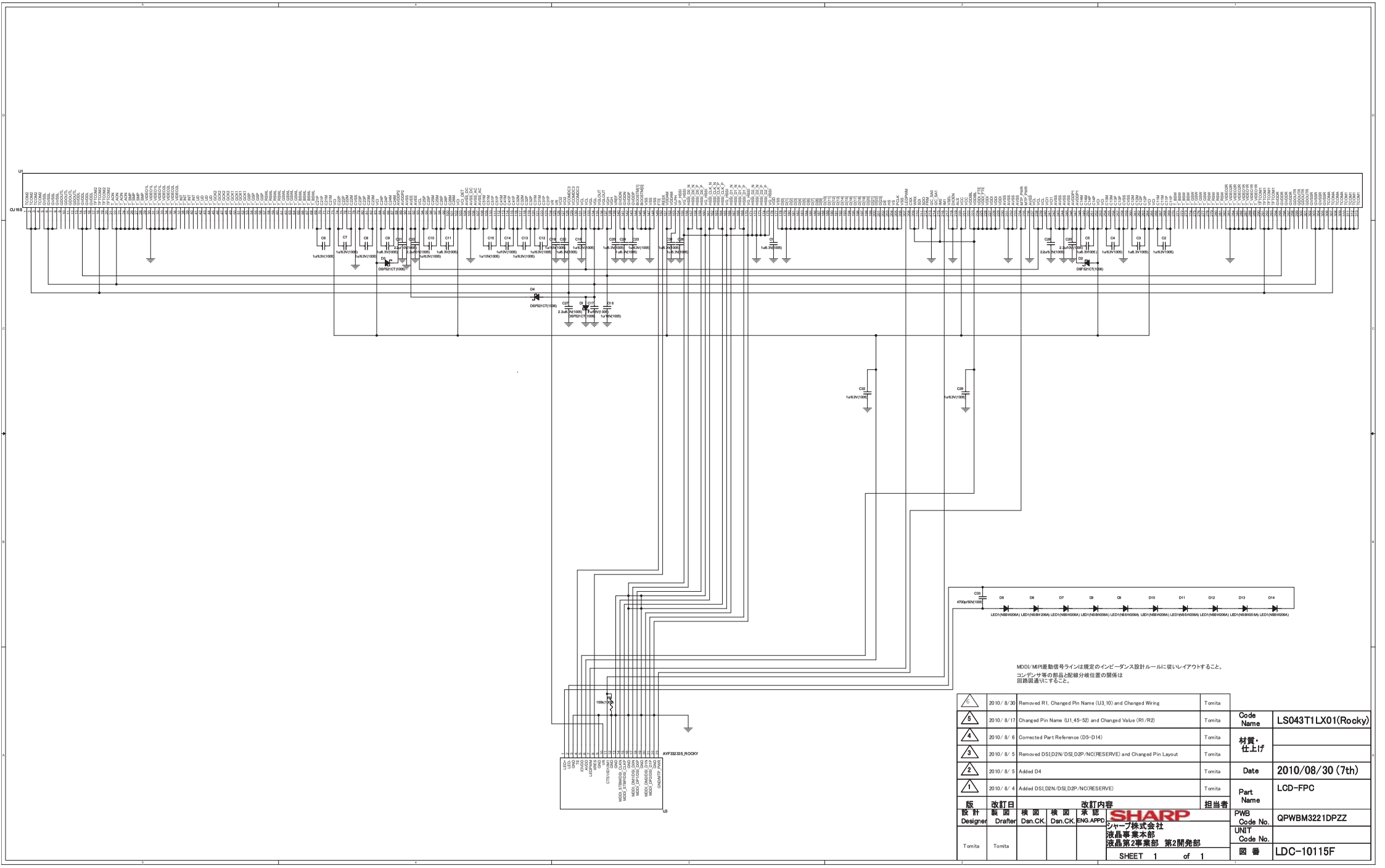
Please consider externals in which the module back surface is supported to prevent a positional LED and the panel float.
There is a driver crack anxiety by the impact, please consider the set design.
Any foreign materials and contamination outside the active area shall be treated as "NO-Count" at our inspections.
Guarantee of appearance=LCD Active Area.
General tolerance is ±0.3.
LCD warp is ≦ 0.3.
LCD-FPC bend larger than 0.6 in radius.
Please design carefully to hide the polarizer and other frame areas, which are outside of the guaranteed area.
When the set is not properly designed, it is possible that backlight light may leak from the gap at outside of black-mask area which is located at outside of active area, so, please pay attentions to try not to cause suchleakage when designing the set.
The tolerances of the module thickness do not include warp of the Metal-case.

Connector FPC,
23P, 0.3Pitch,
AYF332335BP1, PANASONIC



5							ORIGINAL MODEL	LS043T1LX01
4							画面サイズ ACTIVE AREA SIZE	(4.29")
3							尺度 SCALE 1/1	First edition DATE 2011.02.18
2								Revised edition DATE
1							単位 Unit mm	名称 NAME 4.29" qHD Outline dimensions
改訂日		改訂記事 REVISION			担当			ユーザー USER
設計 DESIGNER	製図 DRAFTER	検図 DSN CK	検図 DSN CK	承認 ENG APPD	シャープ株式会社		原紙サイズ A3	図番 DRAWING NO LDM-11003A
T.Ushida		M.Komoto			ENGINEERING DEPT. I LIQUID CRYSTAL DISPLAY DIVISION I LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION			

Fig. 1



版	改訂日	改訂内容	担当者
6	2010/ 8/30	Removed R1, Changed Pin Name (U3_10) and Changed Wiring	Tomita
5	2010/ 8/17	Changed Pin Name (U1_45-52) and Changed Value (R1/R2)	Tomita
4	2010/ 8/ 6	Corrected Part Reference (D5-D14)	Tomita
3	2010/ 8/ 5	Removed DSI_D2N/DSI_D2P/NC(RESERVE) and Changed Pin Layout	Tomita
2	2010/ 8/ 5	Added D4	Tomita
1	2010/ 8/ 4	Added DSI_D2N/DSI_D2P/NC(RESERVE)	Tomita

設計 Designer	製図 Drafter	検図 Dsn.CK.	検図 Dsn.CK.	承認 ENG.APPD
Tomita	Tomita			

SHARP
シャープ株式会社
液晶事業本部
液晶第2事業部 第2開発部
SHEET 1 of 1

Code Name	LS043T1LX01(Rocky)
材質・仕上げ	
Date	2010/08/30 (7th)
Part Name	LCD-FPC
PWB Code No.	QPWBM3221DPZZ
UNIT Code No.	
図番	LDC-10115F

Fig. 2

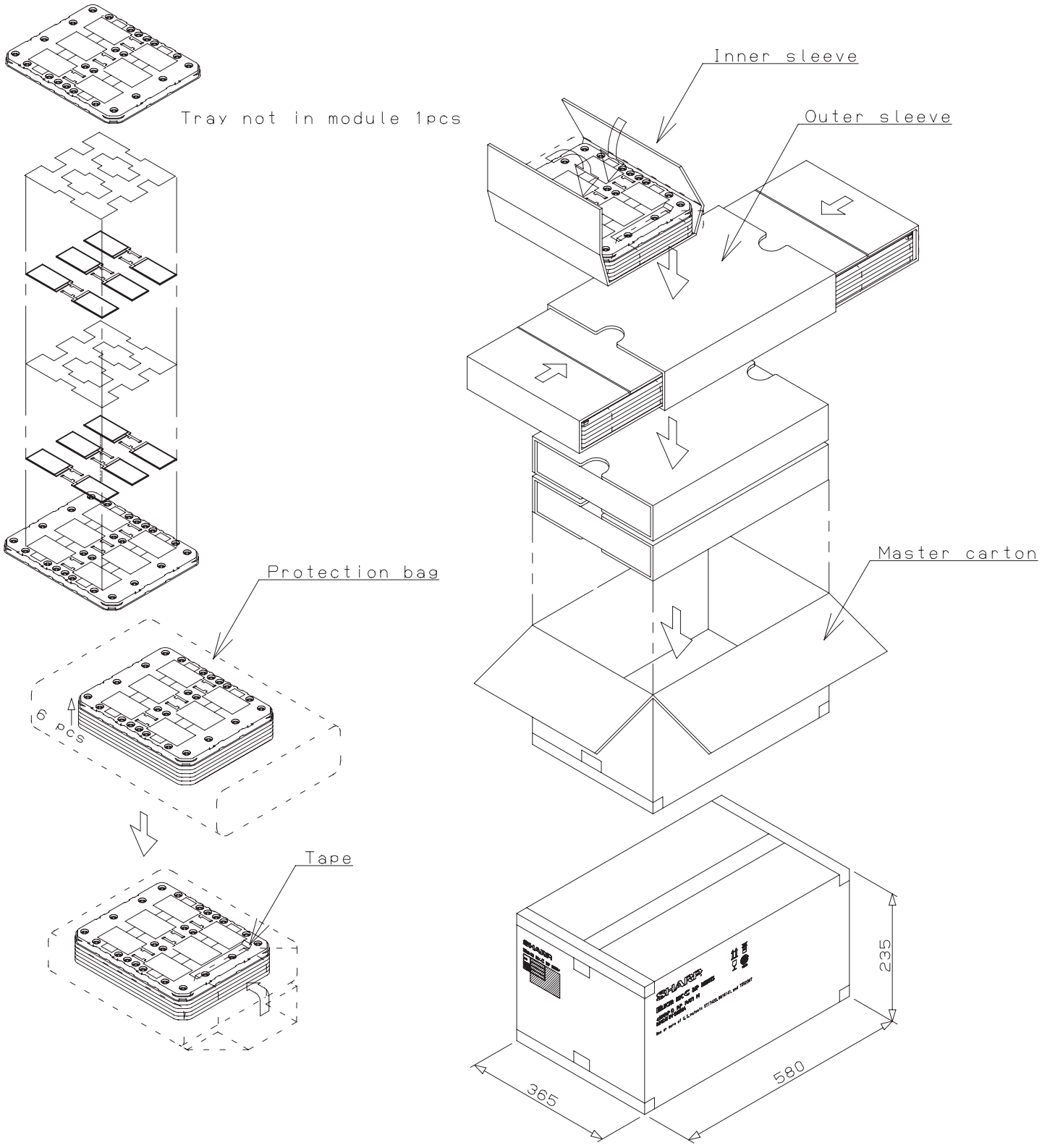

Tray not in module 1pcs
Inner sleeve
Outer sleeve
Protection bag
6 pcs
Master carton
Tape
235
365
580

Fig. 3