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		APPLICABLE DIVISION DEVELOPMENT DEPARTMENT 1 DISPLAY DEVICE UNIT 1

SPECIFICATION

DEVICE SPECIFICATION for

CGS Color LCD Module

(720 × RGB × 1280 dots)

Model No.

LS063K3SX01(G)

☐ CUSTOMER'S APPROVALDATE

DATE _____

BY _____

PRESENTED BY _____

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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) Certain materials such as epoxy resin (amine's hardener) or silicone adhesive agent (de-alcohol or de-oxym) emits gas to which polarizer reacts (color change). Check carefully that gas from materials used in system housing or packaging do not hart polarizer.

(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.

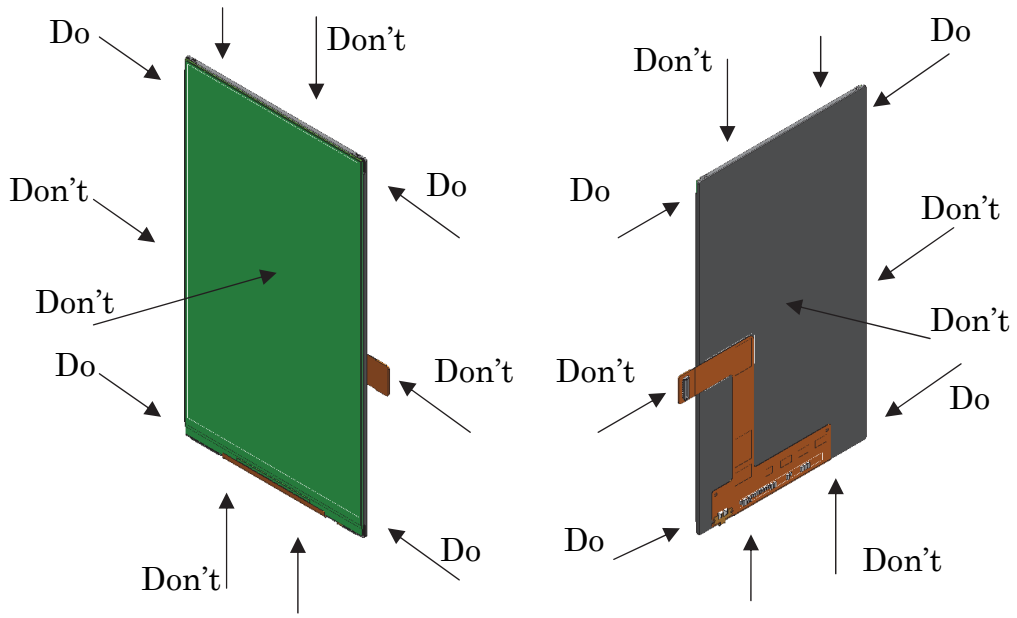
⑥Others
Protective film is attached on the surface of LCD panel to prevent scratches or other damages. When removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.

(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. 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) in all materials used, in all production processes.

[For operating LCD module]

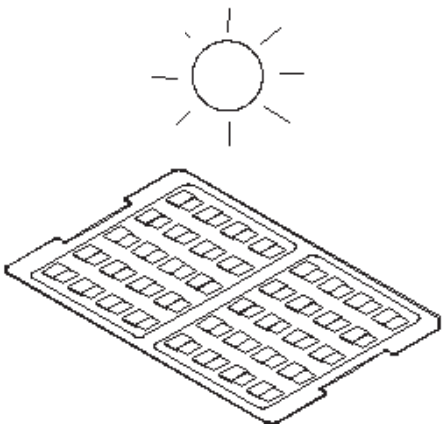
(1) Do not operate or store the LCD module under outside of specified environmental conditions.
(2) At the shipment, adjust the contrast of each LCD module with electric volume. LCD contrast may vary from panel to panel depending on variation of LCD power voltage from system.
(3) As opt-electrical characteristics 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

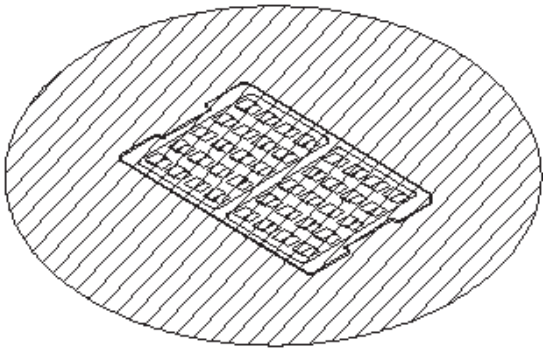
a. Don't keeping under the direct sunlight.

DON'T



b. Keeping in the tray under the dark place.

DO



(1) Do not operate or store the LCD module under outside of specified environmental conditions.
(2) 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 (VDD-GND) are low when LCD module is working, place the de-coupling capacitor nearby 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.

(8) The connector used in this LCD module is the one Sharp have not ever used.
Therefore, please note that the quality of this connector concerned is out of Sharp's guarantee.

[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 LS063K3SX01 active matrix 16,777,216 color LCD module.
Main color LCD module is controlled by Driver IC (NT35596J).
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

Construction: LCD panel, Driver (COG), FPC with electric components,
14 White LED lump, prism sheet, diffuser, light guide and reflector,
plastic frame and metal frame to fix them mechanically.
Outline: See page 24
Connection: B to B connector (HIROSE ELECTRIC, BM10NB(0.8)-40DS-0.4V 40 pins, 0.4mm pitch)
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 (T.B.D)

In order to realize thin module structure, double-sided adhesive tapes are used to fix LCD panels.
As these tapes do not guarantee to permanently fix the panels,
LCD panel may rise from the module when shipped from factory.
So please make sure to design the system to hold the edges of LCD panel by the soft material such as sponge when LCD module is assembled into the cabinet.

3. Mechanical Specification

Table 1

Parameter		Specifications	Unit
Outline dimensions (typ)		81.7 (W)×146.95(H)×1.612 (D)(mm)	mm
Main LCD Panel	Active area	78.3(W)×139.2(H)	mm
	Display format	720(W)×RGB×1280(H)	-
	Dot pitch	0.03625 (W) ×0.10875 (H)	mm
	Base color *1	Normally Black	-
Mass		Typ42.6 g	g

*1 Due to the characteristics of the LC material, the colors vary with environmental temperature.

4. Absolute Maximum Ratings

(4-1) Electrical absolute maximum ratings

Table 2 Ta=25 ℃

Parameter	Symbol	Min	Max	Unit	Remark
Supply voltage	IOVDD	0	+5.5	V	GND=0V
	AVDD+	0	+6.5	V	GND=0V
	AVDD-	0	-6.5	V	GND=0V

Note1) If the module exceeds the absolute maximum ratings, it may be damaged permanently.
Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.
It is not allowed for any of these ratings to be exceeded.
Make sure all the design characteristics are adequate before the panel is initialed.

(4-2) Environment Conditions

Table 3

Item	Top		Tstg		Remark
	MIN.	MAX.	MIN.	MAX.	
Ambient temperature	-20 ℃	+60℃	-30 ℃	+70℃	

Note1) 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℃ and it becomes stable.
Be sure not to exceed the rated voltage, otherwise a malfunction may occur.

Note2) Ta < 40℃ 85%RH max.
Ta > 40℃ Absolute humidity must be lower than the humidity of 85%RH at 40℃.

5. Electrical Specifications

(5-1) Electrical characteristics

Table 4

Ta=25 ℃, GND=0V

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable Pin
Supply voltage		IOVDD	(note 1)	1.7	1.8	1.9	V	
		AVDD+	(note 1)	4.9	5.0	5.1	V	
		AVDD-	(note 1)	-5.1	-5.0	-4.9	V	
Power consumption (All white pattern)		I_{IOVDD}		-	29	36	mA	
		I_{AVDD+}		-	7	9	mA	
		I_{AVDD-}		-	-8	-10	mA	
Frame frequency		F	(note 2)	-	60	-	Hz	
Input Signal Voltage	H Level	V_{IH}		0.8xIOVDD	-	IOVDD	V	
	L Level	V_{IL}		0	-	0.2xIOVDD	V	
Output Signal Voltage	H Level	V_{CH}		0.8xIOVDD	-	IOVDD	V	
	L Level	V_{CL}		0	-	0.2xIOVDD	V	

(Note 1) Ta=-20～65℃.
The operation is guaranteed under the recommended operating conditions only.
The operation is not guaranteed if a quick voltage change occurs during operation.
To prevent noise, a bypass capacitor must be inserted into the line close to power pin.
Please make sure all the design settings are used within this range before the panel is initialed.

(Note 2) Please make sure that DC is not supplied to LCD for long period.

(5-2) LED back light

(1) At main panel the back light uses 14pcs edge light type white LED.

Table 5

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward current	Ta=25 °C	I_{LED}	-	20*1	-	mA	LEDA-LEDC

LED lamp: NSSW206C (NICHIA)

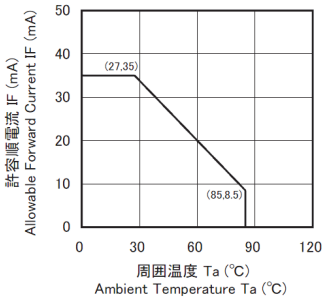
([Luminous Intensity rank]: NW775~NW825 [Color rank]: Sa62)

*1 per one piece of LED

*Please consider Allowable Forward Current on used temperature

(refer to Ambient Temperature vs. Allowable Forward Current curve)

■ 周囲温度－許容順電流特性
Ambient Temperature vs.
Allowable Forward Current



	Rank Sa62			
x	0.288	0.282	0.291	0.296
y	0.262	0.272	0.287	0.276

∗ Forward Voltage Measurement allowance is ± 0.05V.
∗ Luminous flux value is traceable to the CIE 127:2007-compliant national standards.
The measurement value of this product is different from the one of the products measured using the previous reference standards.
∗ Please refer to CIE 1931 chromaticity diagram.

Fig.1 LED Characteristic(De-rating Curve)

(1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	35	mA
Pulse Forward Current	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Power Dissipation	P_D	115	mW
Operating Temperature	T_{opr}	-30~85	°C
Storage Temperature	T_{stg}	-40~100	°C
Junction Temperature	T_J	105	°C

* Absolute Maximum Ratings at T_A=25°C.
* I_{FP} conditions with pulse width ≤10ms and duty cycle ≤10%.

(2) Initial Electrical/Optical Characteristics

Item		Symbol	Condition	Typ	Unit
Forward Voltage		V_F	I_F=20mA	3.0	V
Reverse Current		I_R	V_R=5V	-	μA
Luminous Flux		Φ_v	I_F=20mA	8.0	lm
Luminous Intensity		I_v	I_F=20mA	2.6	cd
Chromaticity Coordinate	x	-	I_F=20mA	0.300	-
	y	-	I_F=20mA	0.295	-

* Characteristics at T_A=25°C.
* Luminous Flux value as per CIE 127:2007 standard.
* Chromaticity Coordinates as per CIE 1931 Chromaticity Chart.

(3) Ranking (Ta=25℃)

Item		Symbol	Condition	Min.	Max.	Unit
Luminous Flux	Rank NW775	φv	If=20[mA]	7.75	8.00	lm
	Rank NW825			8.25	8.50	

* Luminous Flux Measurement allowance is ± 7%.

(5-3) Interface signals

Table 6

Pin No	Symbol	Description	I/O	Remarks
1	CN2-2	CN2-2	I	
2	CN2-7	CN2-7	I	
3	CN2-3	CN2-3	I	
4.	GND	GND level pin	-	
5	CN2-4	CN2-4	-	
6	LED PWM	Display brightness control	O	
7	CN2-5	CN2-5	-	
8	GND	GND level pin	-	
9	CN2-6	CN2-6	I	
10	D3_N	MIPI data signal line (-)	I/O	
11	GND	GND level pin	-	
12	D3_P	MIPI data signal line (+)	I/O	
13	AVDD-	Power supply for analog	-	
14	GND	GND level pin	-	
15	AVDD+	Power supply for analog	-	
16	D0_N	MIPI data signal line (-)	I/O	
17	IOVDD	Power supply for I/O	I	
18	D0_P	MIPI data signal line (+)	I/O	
19	VGH	Positive Gate Driver Output Voltage	O	
20	GND	GND level pin	-	
21	NC	NC	-	
22	CLK_N	MIPI clock signal line (-)	I	
23	GND	GND level pin	-	
24	CLK_P	MIPI clock signal line (+)	I	
25	RST	Reset enable pin	I	
26	GND	GND level pin	-	
27	GND	GND level pin	-	
28	D1_N	MIPI data signal line (-)	I/O	
29	LED-A	LED anode	-	
30	D1_P	MIPI data signal line (+)	I/O	
31	LED-A	LED anode	-	
32	GND	GND level pin	-	
33	LED-C1	LED cathode1	-	
34	D2_N	MIPI data signal line (-)	I/O	
35	LED-C1	LED cathode1	-	
36	D2_P	MIPI data signal line (+)	I/O	
37	LED-C2	LED cathode2	-	
38	GND	GND level pin	-	
39	LED-C2	LED cathode2	-	
40	GND	GND level pin	-	

Mounted connector : 40pins; 0.4mm pitch; B to B connector. (HIROSE - BM10NB(0.8)-40DS-0.4V)

Corresponded connector : 40pins; 0.4mm pitch; B to B connector. (HIROSE - BM10B(0.8)-40DP-0.4V)

Signals connect to LCD module. Symbols correspond able to Circuit diagram in Page 11.

(5-3) Interface signals

Pin No	Symbol	Description	I/O	Remarks
1	GND	GND level pin	-	
2	CN2-2	CN2-2	I	
3	CN2-3	CN2-3	I	
4.	CN2-4	CN2-4	-	
5	CN2-5	CN2-5	-	
6	CN2-6	CN2-6	I	
7	CN2-7	CN2-7	I	
8	HSYNC	Horizontal scan signal	O	

Mounted connector : 8pins; 0.25mm pitch; Zif connector. (FUJIKURA DDK- FF28-8A-R11A-3H-D3)

Signals connect to LCD module. Symbols correspond able to Circuit diagram in Page 11.

(5-4) Schematic of LCD module system

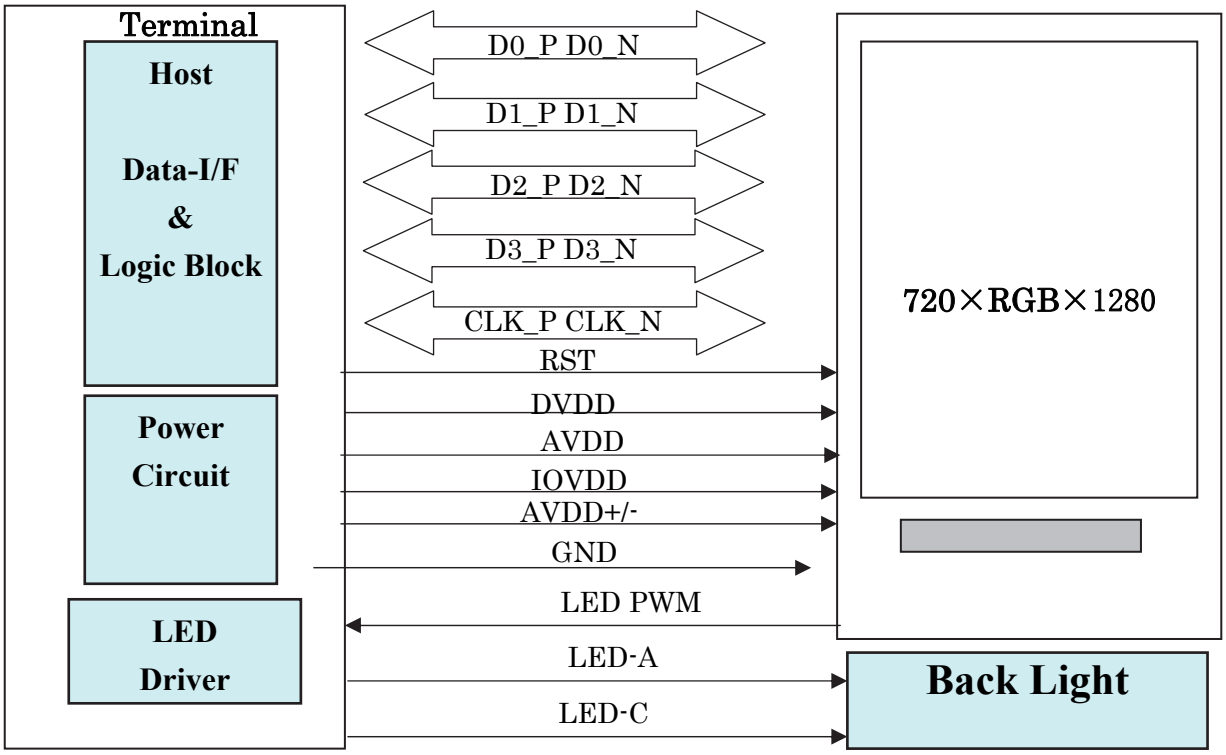


Fig.2 Schematic of LCD module system

(5-5) Circuit Diagrams

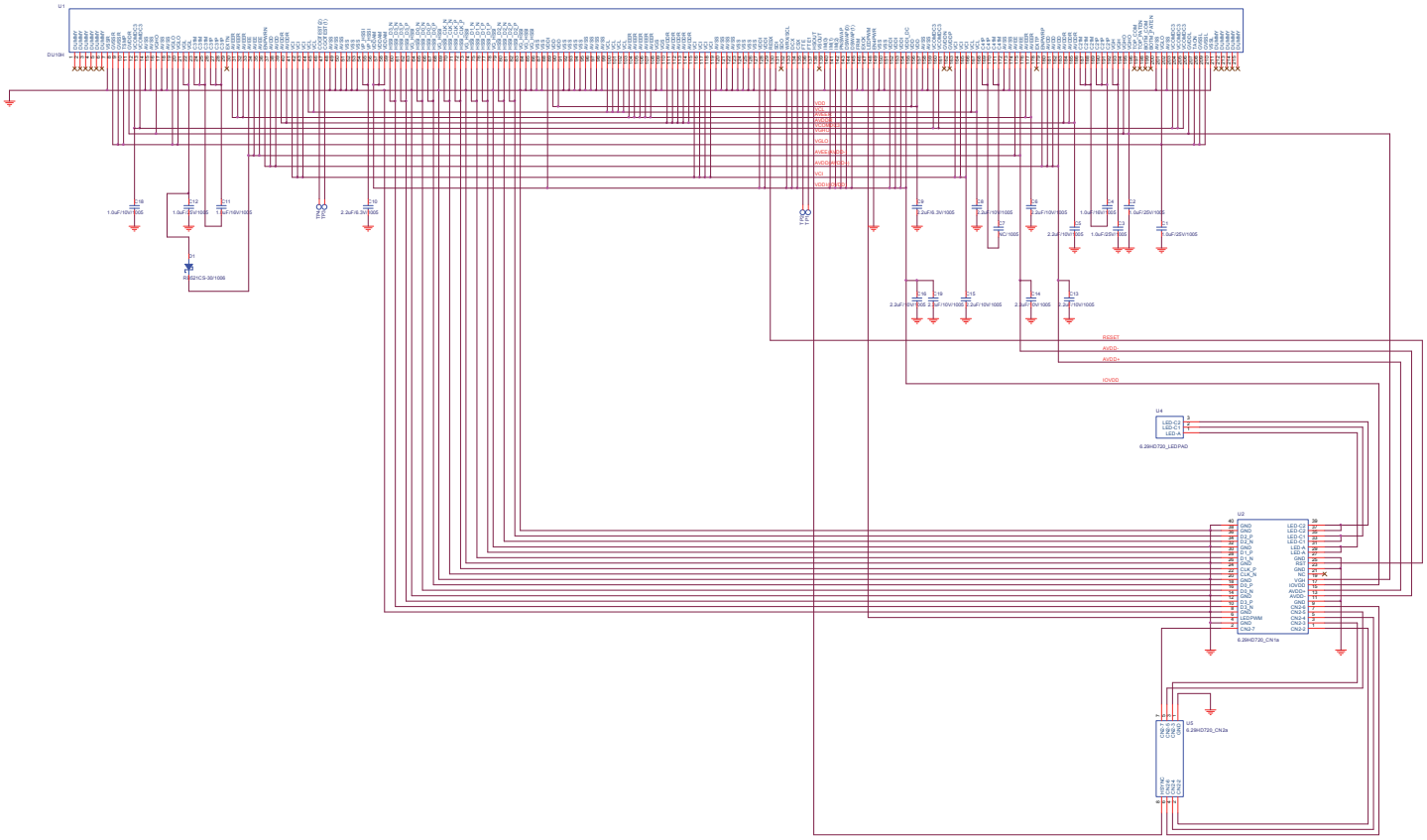


Fig.3 Circuit diagram

(5-6) Parts List

Table 7

Category	Ref. No.	Spec				Vendor
Capacitor	C1	1.0uF	25V	1005		Multi Vender
	C2	1.0uF	25V	1005		Multi Vender
	C3	1.0uF	25V	1005		Multi Vender
	C4	1.0uF	16V	1005		Multi Vender
	C5	2.2uF	10V	1005		Multi Vender
	C6	2.2uF	10V	1005		Multi Vender
	C7	NC				
	C8	2.2uF	10V	1005		Multi Vender
	C9	2.2uF	6.3V	1005		Multi Vender
	C10	2.2uF	6.3V	1005		Multi Vender
	C11	1.0uF	16V	1005		Multi Vender
	C12	1.0uF	25V	1005		Multi Vender
	C13	2.2uF	10V	1005		Multi Vender
	C14	2.2uF	10V	1005		Multi Vender
	C15	2.2uF	10V	1005		Multi Vender
	C16	2.2uF	10V	1005		Multi Vender
	C18	1.0uF	10V	1005		Multi Vender
	C19	2.2uF	10V	1005		Multi Vender
Diode	D1	VF<0.4V VR≧max.30V				ROHM
Connector	CN1	0.4mm pitch、40Pin				HIROSE ELECTRIC
Connector	CN2	0.25mm pitch、8Pin				FUJIKURA DDK

(5-7)FPC Artwork

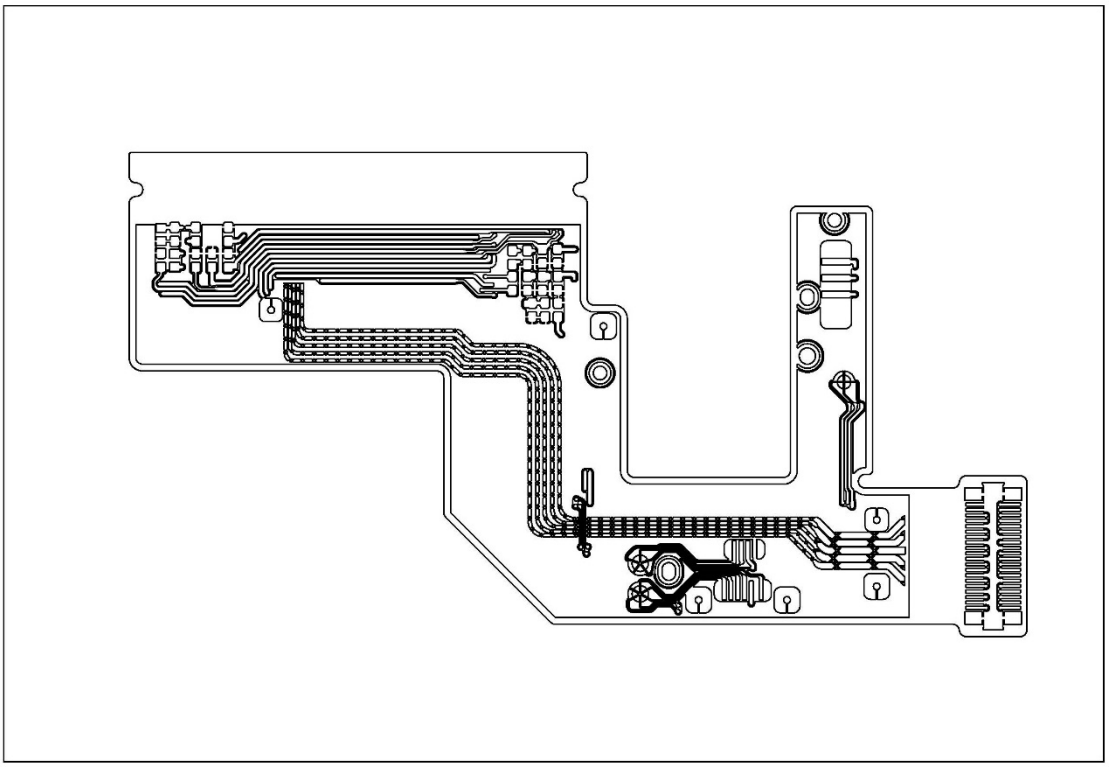


Fig. 4 Layer 1

(5-7)FPC Artwork

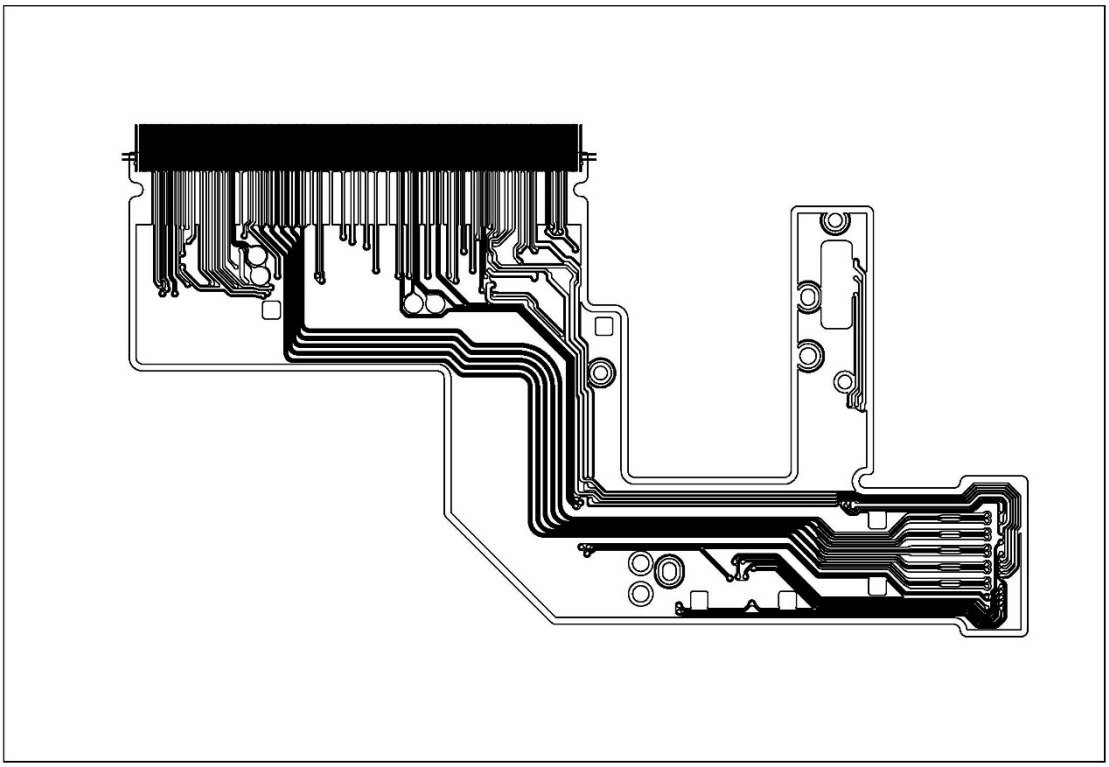


Fig. 5 Layer 2

6. Initial Sequence

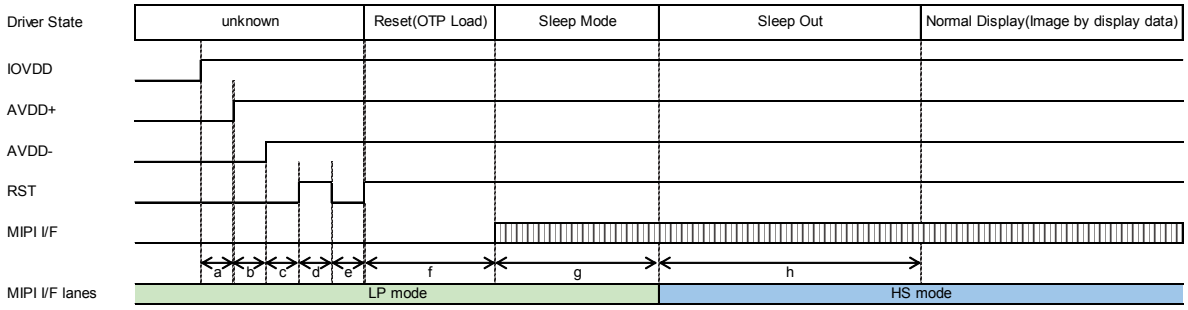
Power On Sequence

Table 8

Recommended Power On Sequence

Step	Address	Parameter	Data	DSI data type	Delay	Command	MIPI LP/HS	Term
1	Initial condition					XRES = L		
2	Power Supply IOVDD (Typ1.8V) On					IOVDD ON		
3	Wait				Min.>0ms	Wait until power stable		a.
4	Power Supply AVDD+ (Typ5.0V) On					AVDD+ ON		
5	Wait				Min.>0ms			b.
6	Power Supply AVDD- (Typ-5.0V) On					AVDD- ON		
7	Wait				Min.10ms			c.
8	RESET High					RST = H		
9	Wait				Min.10 us			d.
10	RESET Low					RST = L		
11	Wait				Min.10 us			e.
12	RESET High					RST = H		
13	Wait				Min.10ms	[Automatic] OTP Auto load		f.
14						[Automatic] Sleep Mode On		g.
15	If customer need, please add initial command in here.							
16	CMD1_11h	-	-	DCS 39h		Sleep Out	LP/HS	h.
17	Wait				Min.100ms			
18						[Automatic] Sleep Mode Off		
19	CMD1_29h	-	-	DCS 39h		Display On	LP/HS	i.
20	Host Display Data transfer					Image Write(Send Video Stream Packet)	HS	
21	Wait				Min.40ms			
22						[Automatic] Display On		
23	Backlight On							
24	Normal Display							

Table 9



6. Initial Sequence

Power Off Sequence

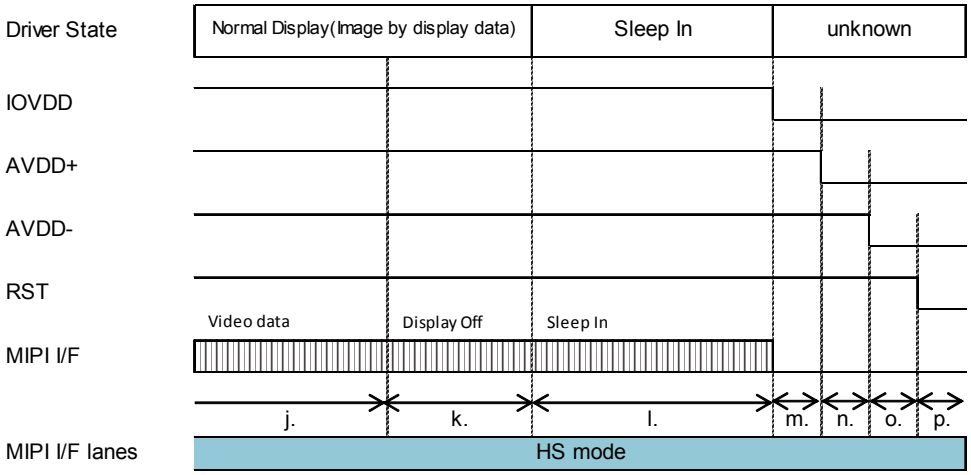
Table 10

Recommended Power Off Sequence

Step	Address	Parameter	Data	DSI data type		Delay	Command	MIPI LP/HS	Term
1	Normal Display								
2	Backlight Off								j.
1	CMD1_28h	-	-	DCS	39h		Display Off	LP/HS	k.
2	Wait					Min.4 frame			
3	CMD1_10h	-	-	DCS	39h		Sleep In(*Note)	LP/HS	l.
4	Wait					Min.60 ms or Wait Min 4frame			
7	Power Supply AVDD- (Typ-5.0V) OFF						AVDD- Off		m.
8	Wait					Min.0ms			
9	Power Supply AVDD+ (Typ5.0V) Off						AVDD+ Off		n.
10	Wait					Min.0ms			
11	Power Supply IOVDD (Typ1.8V) Off						IOVDD Off		o.
12	RESET Low						RST=L		p.

Note:DSI Video signals should be send for 2 frames after Sleep In command.

Table 11



7. Mipi 4lane / 24 Bit color Setting

Table 12

Contents	Symbol	Condition	Min	Typ	Max	Unit
Horizontal low pulse width	HS			7		CLK
Horizontal front porch	HFP			213		CLK
Horizontal back porch	HBP			133		CLK
Horizontal active area	HDISP			720		Line
Verticle low pulse width	VS			(2)		Line
Vertical front porch	VFP			8		Line
Vertical back porch	VBP			-		Line
Vertical data start point		VS+VBP		8		Line
Vertical active area	VDISP			1280		Line
Vertical Refresh rate	VRR		57	60	63	Hz
Mipi Lane				4		lane
Mipi Speed			475	500	525	Mbps

7. Mipi 4lane / 24 Bit color Setting

Table 13

MIPI DC Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
Power and Operation Voltage for MIPI Receiver					
VDDAM	Power supply voltage for MIPI RX	1.7	1.8	3.6	V
VP_HSSI	High speed / Low power mode operating voltage		1.2		V
MIPI Characteristics for High Speed Receiver					
VILHS	Single-ended input low voltage	-40			mV
VIHHS	Single-ended input high voltage			460	mV
VCMRXDC	Common-mode voltage	70		330	mV
ZID	Differential input impedance	80	100	125	ohm
|VOD|	HS transmit differential voltage (VOD=VDP-VDN)	140	200	250	mV
V_{IDTH}	Different input high threshold			70	mV
V_{IDTL}	Different input low threshold	-70			mV
$V_{TERM-EN}$	Single-ended threshold for HS termination enable			450	mV
MIPI Characteristics for Low Power Mode					
VI	Pad signal voltage range	-50		1350	mV
VGNDSH	Ground shift	-50		50	mV
VIL	Logic 0 input threshold	0.0		550	mV
VIH	Logic 1 input threshold	880		VDDAM	mV
VHYST	Input hysteresis	25			mV
VOL	Output low level	-50		50	mV
VOH	Output high level	1.1	1.2	1.3	V
ZOLP	Output impedance of Low Power Transmitter	80	100	125	ohm
VIHCD,MAX	Logic 0 contention threshold	0.0		200	mV
VILCD,MIN	Logic 1 contention threshold	450		VDDAM	mV

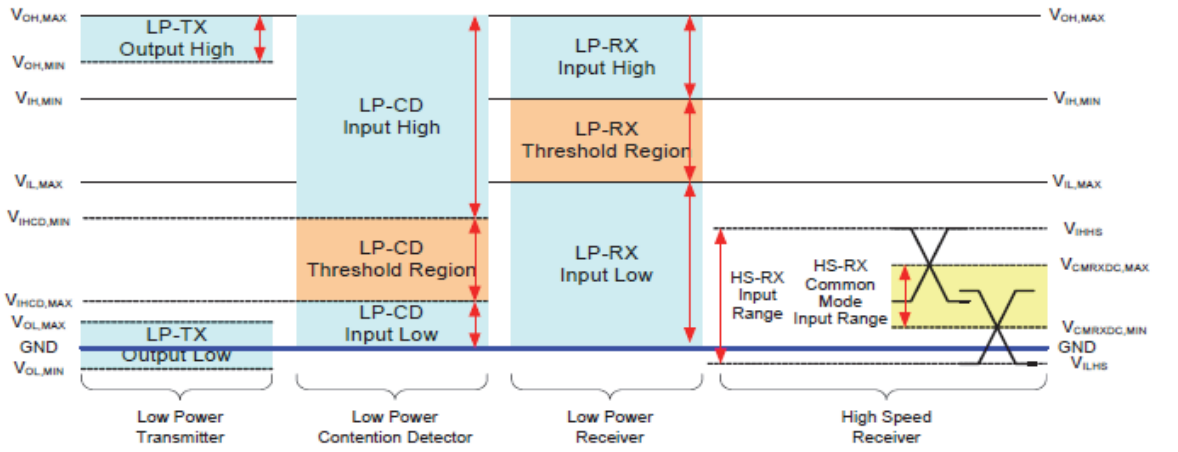


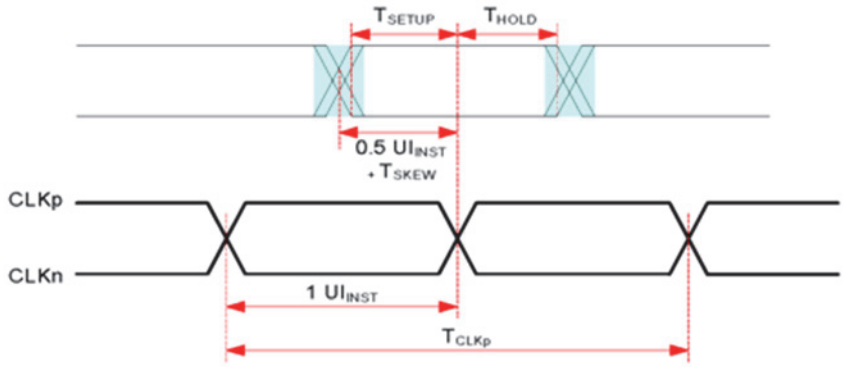
Fig. 6 Mipi 4lane / 24 Bit color Setting

7. Mipi 4lane / 24 Bit color Setting

AC CHARACTERISTICS

MIPI Interface Characteristics

High Speed Data Transmission: Data-Clock Timing



Parameter	Symbol	Min	Typ	Max	Units	Notes
UI instantaneous	UI_{INST}	1.8		12.5	ns	1,2,7
Data to Clock Skew [measured at tansmitter]	T_{SKEW}[TX]	-0.15		0.15	UI_{INST}	3
Data to Clock Setup Time [measured at receiver]	T_{SETUP}[RX]	-0.15		0.15	UI_{INST}	4
Data to Clock Hold Time [measured at reciever]	T_{HOLD}[RX]	-0.15		0.15	UI_{INST}	4
20% - 80% rise time and fall time	t_R / t_F	100			ps	6
				0.3	UI_{INST}	5

Note:

1. This value corresponds to a minimum 80 MHz data rate.

2. The minimum UI shall not be violated for any single bit period, i.e.,any DDR half cycle within a data burst.

3. Total silicon and package delay budget of 0.3 UIINST when D-PHY is supporting maximum data rate = 550Mbps.*

4. Total setup and hole window for receiver of 0.3 UIINST when D-PHY is supporting maximum data rate = 550Mbps.*

5. Applicable when operating at HS bit rates ≤ 550Mbps (UI ≥ 1 ns).

6. Applicable for all HS bit rates. However, to avoid excessive radiation, bit rates ≤ 1 550Mbps (UI ≥ 1 ns), should not use values below 100 ps.

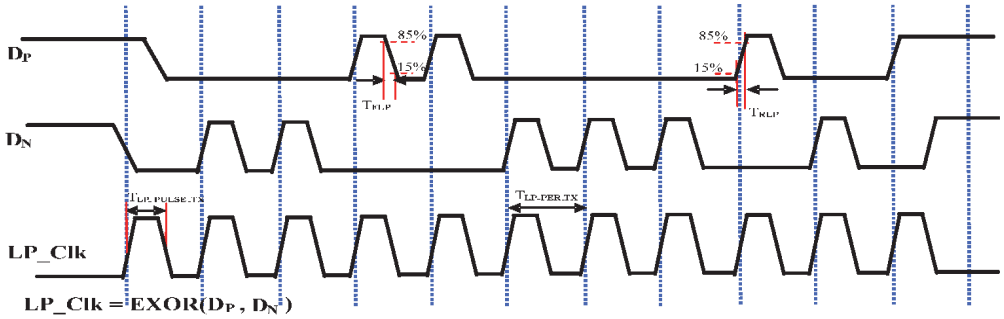
7. For MIPI speed limitation:

[1] Per lane bandwidth is 550Mbps,

[2] Total Bit Rate: 2.2Gbps for 8-8-8

7. Mipi 4lane / 24 Bit color Setting

LP Transmission AC Specification



Parameter		Symbol	Min	Typ	Max	Units	Notes
15%-85% rise time and fall time		T_{RLP} / T_{FLP}			25	ns	1
30%-85% rise time and fall time		T_{REOT}			35	ns	1,5,6
Pulse width of the LP exclusive-OR clock	First LP exclusive-OR clock pulse after STOP state or last pulse before stop state	$T_{LP-PULSE-TX}$	40			ns	4
	All other pulses		20			ns	4
Period of the LP exclusive-OR clock		$T_{LP-PER-TX}$	90			ns	
Slew Rate@ C_{LOAD} = 0pF		$\delta V/\delta t_{SR}$	30		500	mV/ns	1,2,3,7
Slew Rate@ C_{LOAD} = 5pF			30		200	mV/ns	1,2,3,7
Slew Rate@ C_{LOAD} = 20pF			30		150	mV/ns	1,2,3,7
Slew Rate@ C_{LOAD} = 70pF			30		100	mV/ns	1,2,3,7
Load Capacitance		C_{LOAD}			70	pF	1

Note:

1. CLOAD includes the low-frequency equivalent transmission line capacitance. The capacitance of TX and RX are assumed to always be <10pF. The distributed line capacitance can be up to 50pF for a transmission line with 2ns delay.

2. When the output voltage is between 15% and below 85% of the fully settled LP signal levels.

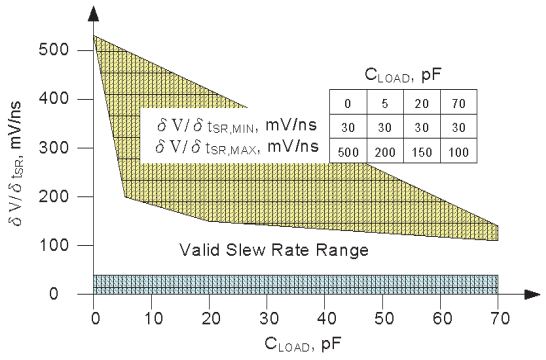
3. Measured as average across any 50 mV segment of the output signal transition.

4. This parameter value can be lower then TLPX due to differences in rise vs. fall signal slopes and trip levels and mismatches between Dp and Dn LP transmitters. Any LP exclusive-OR pulse observed during HS EoT (transition from HS level to LP-11) is glitch behavior.

5. The rise-time of TREOT starts from the HS common-level at the moment the differential amplitude drops below 70mV, due to stopping the differential drive.

6. With an additional load capacitance CCM between 0-60pF on the termination center tap at RX side of the Lane.

7. This value represents a corner point in a piecewise linear curve as bellowed.



9. Optical Characteristics

Table 14

ILED=20mA/pcs, Ta = 25℃

Optical Characteristics							
Parameter	symbol	condition	MIN	TYP	MAX	unit	Remark
Brightness	Br	θ=0°	360	450	-	cd/㎡	Note1,2
Contrast	Co	θ=0°	700	1000	-		Note1,3
Viewing Angle	θ11	Co > 5	80	85	-	deg	Note1
	θ12		80	85	-		
	θ21		80	85	-		
	θ22		80	85	-		
White chromaticity	x	θ=0°	0.25	0.30	0.35		Note.1,3
	y		0.27	0.32	0.37		
Red chromaticity	x	θ=0°	0.59	0.64	0.69		
	y		0.28	0.33	0.38		
Green chromaticity	x	θ=0°	0.255	0.305	0.355		
	y		0.574	0.624	0.674		
Blue chromaticity	x	θ=0°	0.10	0.15	0.20		
	y		0.01	0.06	0.11		
Uniformity	-	θ=0°	80	-	-	%	Note.5
NTSC ratio	-	θ=0°	69	74	-	%	Note.1,3
Flicker ratio	-	*1	-	-	15	%	Note.4

Note 1) Definition of range of visual angle

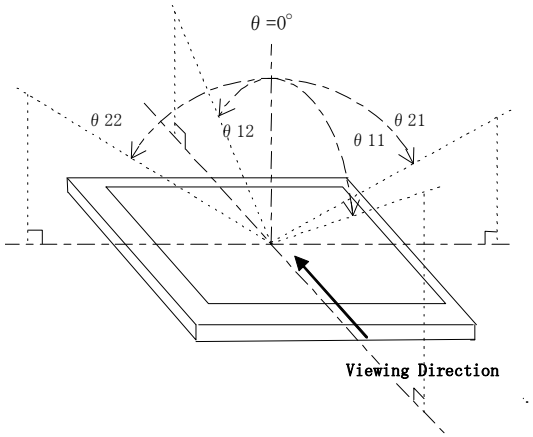


Fig .7 Definition of viewing angle

Note 2) Brightness is measured as shown in Fig.8, and is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

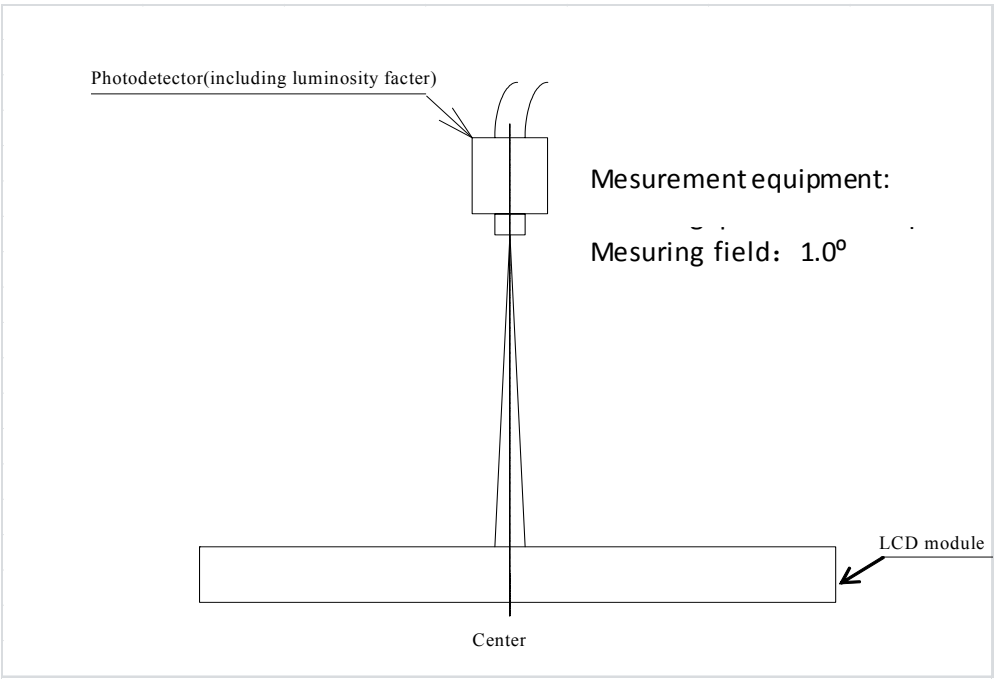


Fig. 8 Optical characteristics Test Method (Brightness)

Note 3) Contrast ratio is defined as follows:

$$Co = \frac{\text{Luminance(brightness) all pixcels "White"}}{\text{Luminance(brightness) all pixcels "Black"}}$$

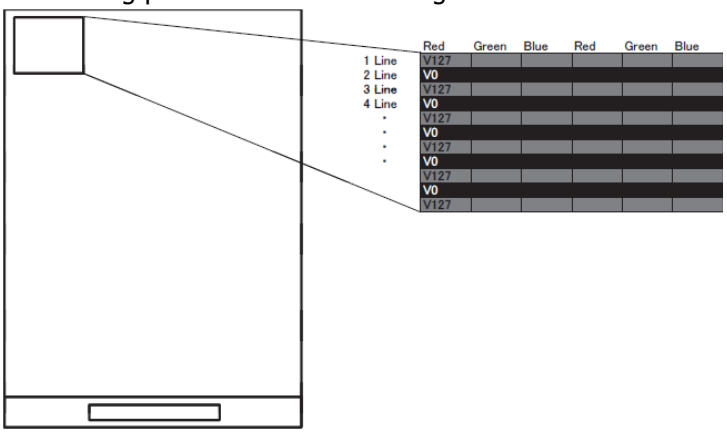
Note 4) Measuring systems: KONICA MINOLTA DISPLAY COLOR ANALYZER CA-210

・Temperature = 25℃(±3℃), Frame Frequency = 60Hz, LED back-light: ON
Environment brightness < 150 lx

・Measured sample : New sample before a long term aging.

・Flicker ratio is very sensitive to measuring condition.

・Measuring pattern Please refer to figure below.



1columm inversion (V0/V127)

Fig. 9 Flicker Measuring pattern

Note 5) Uniformity is defined as follows:

$$\text{Uniformity} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

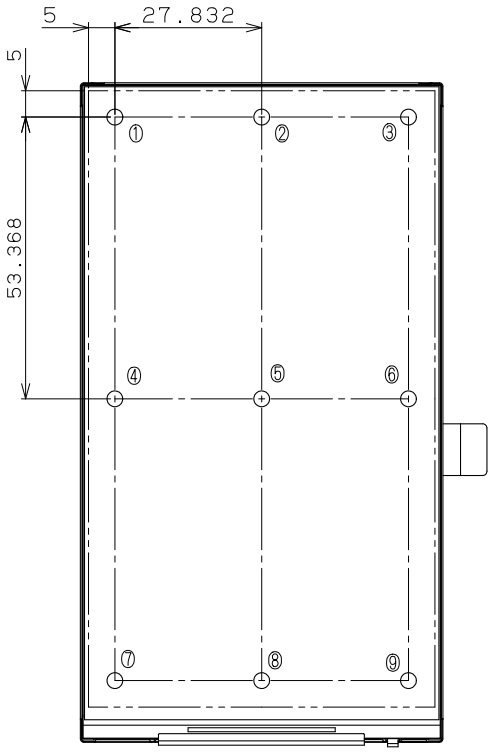


Fig. 10 Measuring Point

10. Reliability

Table.15

No.	Test	Condition	Judgment criteria
1	Temperature Cycling	-20℃ → 70℃ → -20℃ … 60min (3min) 60min (3min) 60min 5cycle	Per table in below
2	High Temp. Storage	Ta=70℃ 240h	Per table in below
3	Low Temp. Storage	Ta=-30℃ 240h	Per table in below
4	Humidity Operation	Ta=40℃ 95%RH 240h	Per table in below (polarizer discoloration is excluded)
5	High Temp. Operation	Ta=60℃ 240h	Per table in below
6	Low Temp. Operation	Ta=-20℃ 240h	Per table in below
7	ESD	Discharge resistance: 0 Ω Discharge capacitor: 200 pF Discharge voltage: ±200 V Max Discharge 1 time to each input line ※ "GND" of display module is connected GND of test system ground.	Per table in below

*Ta = Ambient temperature

* Check items for other Test

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

11. Packaging specifications

(11-1) Details of packaging

1) Packaging materials: Table.16
2) Packaging style : Fig. 11

(11-2) Packaging quantities

120 modules per master carton

(11-3) Packaging weight

About 10.7 kg

(11-4) Packaging outline dimensions

580mm×365 mm×235 mm (H)

(Packaging materials)

Table.16

	Parts name	Materials
1	Master carton	Corrugate card board
2	Inside sleeve	Corrugate card board
3	Outside sleeve	Corrugate card board
4	Tray for packaging	Polystyrene with anti-static treatment + anti-static polystyrene
5	Protective bag	Polyethylene with anti-static treatment
6	OPP tape	Polypropylene
7	Bar code label	Anti-static polyethylene

11. Packaging specifications

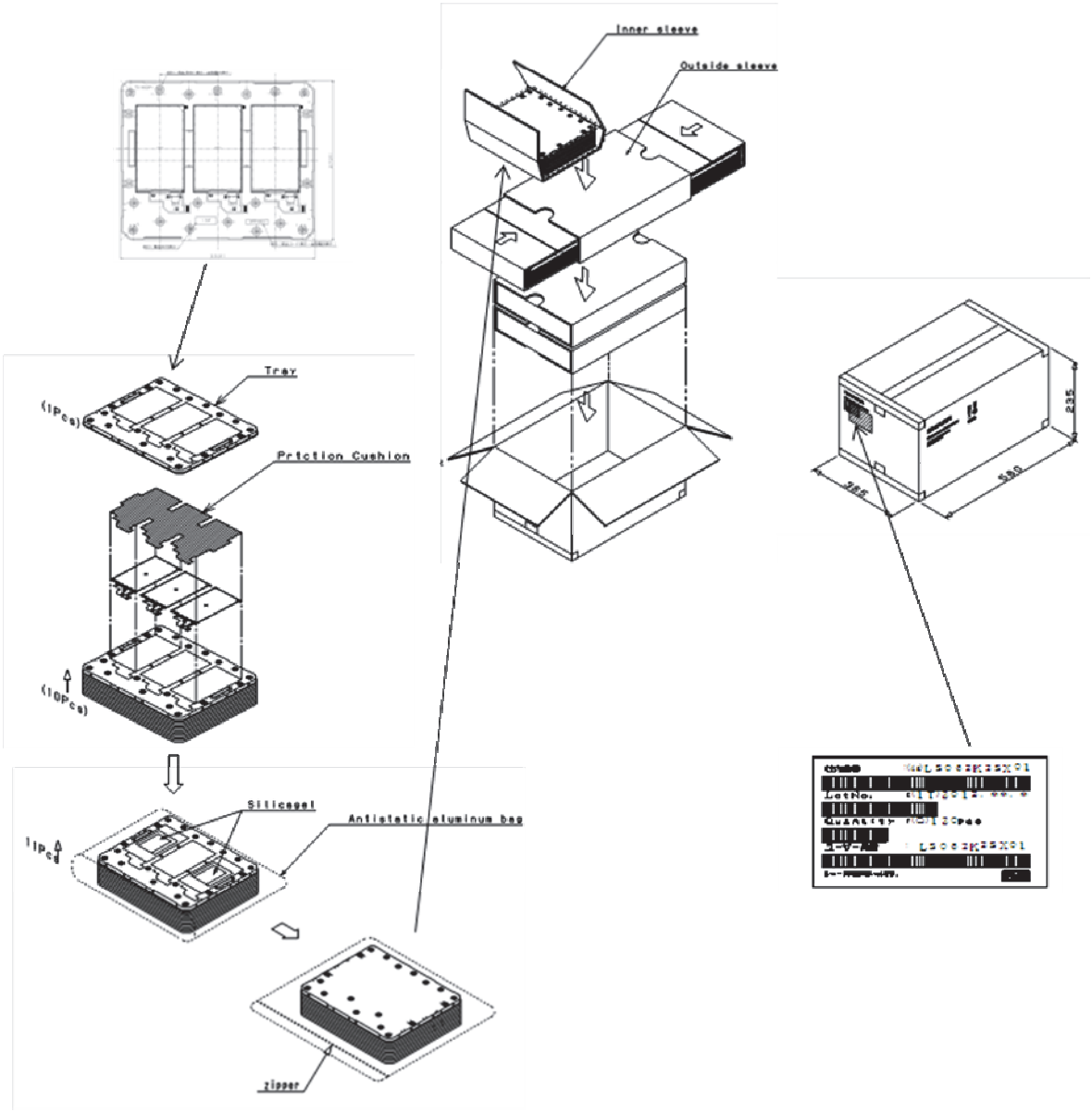


Fig.11 Packaging style

12. Serial Number identification

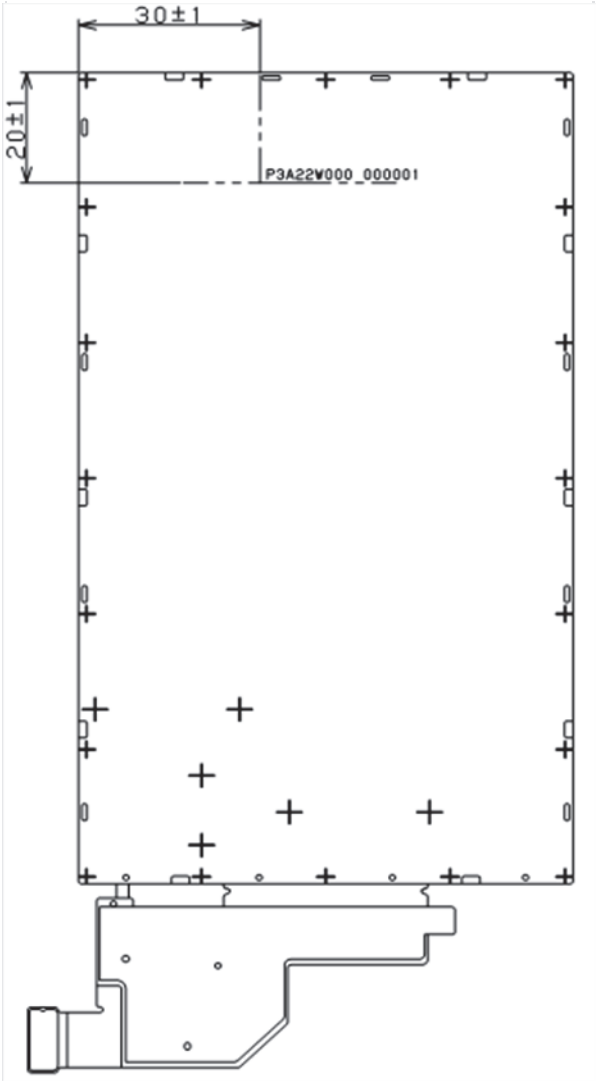
Numbering is specified as follows.

This serial number gives the following information for traceability;
- Lot numbers of parts
- Working shift (day or night)
- Workers of each process
- Machines number of each process

P3A22W0000 _000001

①Maker sign P (SHARP)
②figures of the year : 3(2013),4(2014)
②Month (1 digit) : 1,2, ・ ・ ・ ,9,A,B,C
③Date (2 digits) : 01,02, ・ ・ ・ ,30,31
④Production factory
⑤0 (4 digits)
⑥space
⑦Serial number(6 digits) : 00001

The modules(LS063K3SX01) are assembled by WSEC(Wuxi Sharp Electronic Components Co. LTD.)



13. LCD Module Code Rule

LS 063 K 3 S X 01

① ② ③ ④ ⑤ ⑥ ⑦

①Parts type	:	CGS LCD
②Active area size	:	6.29inch
③Dot format	:	720 format
④LCD type	:	Transmissive
⑤Interface type	:	MIPI DSI 4 Lane
⑥Polarizer / LCD viewing type	:	Clear type / Wide viewing angle
⑦Serial Code		

14. Outline dimensions

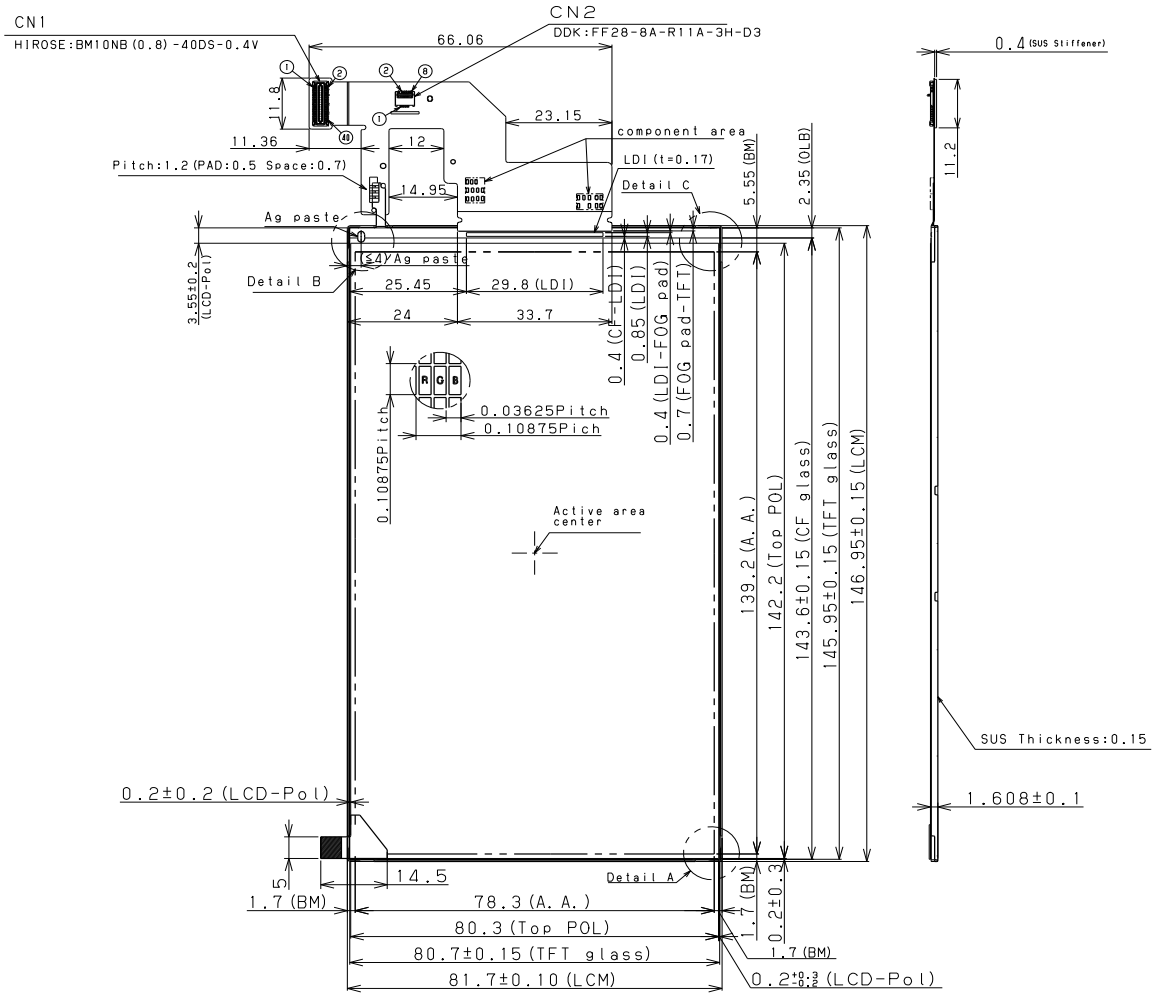


Fig. 12 Outline dimensions