SPECIFICATION

LCD Module

Customer Product number: _____

Product number:　L4S00242P00

Customer Approved	
DATE : By	

Presented by　　　Design DPT.	QA DPT.
Approved *S. Kobayashi* *K. Yamagishi* Certificate Drawn　KOJIMA *T. Inui*	Approved *Hiro Tanaka* Certificate *M. Hirai*

	D a t e	Rev
Issued Date	Aug.20,2007	00
Revised Date		

EPSON IMAGING DEVICES CORPORATION

Revision History

P / N	Rev	Revised Item	Date
L4S00242P00	00	Initial issue	Aug.20.2007

QA STD Number

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1. FEATURES

・ The TFTLCD Module is designed to be suitable for use in display.

・ The TFTLCD Module is a combined unit that consists of a TFTLCD panel ,a backlight unit , a metal frame and a T/P.

・ Power supply circuit for backlight is not included.

・ Display data can be inputted via a display interface by stream data.

　　・ Simultaneous 262,144 colors.

　　・ Data format:　 RGB each 6 bit

・ Driving and it's conditions are controlled by a serial command interface.

2. BASIC SPECIFICATIONS

FACTOR	SPECIFICATIONS
Outward	49.5(W) x 70.2(H) x 3.56(D) mm (excluding part of protruding)
Weight	Approx .23.4g
Screen size	42.48(W)× 56.64(H) mm
Number of dots	1440(480 x RGB)(W) x 640(H) dots
Dot pitch	0.0295(W) x 0.0885(H) mm
Dot layout	Stripe
Viewing direction	6h
Liquid crystal mode	Slightly reflective type transparent display (Normally Black)
Polarization plate	Hard Coat
Backlight	Side-light type with 5 LEDs
Touch Key	・analogical resistance type ・film and glass type ・clear type

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3. BLOCK DIAGRAM
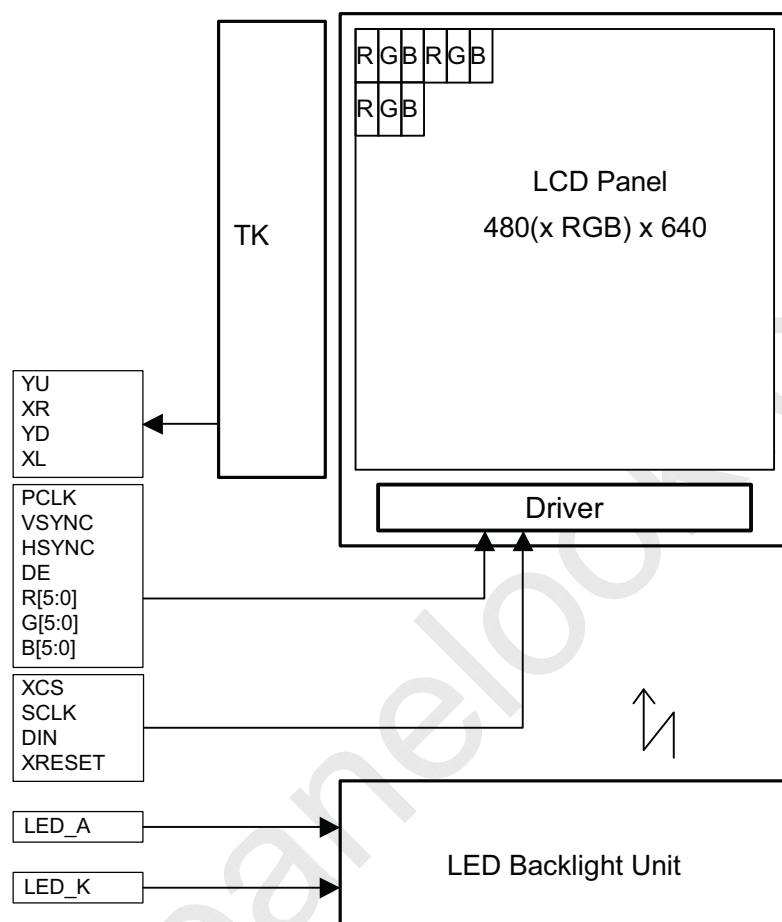
Circuit of Backlight Unit

< Parts list of Backlight Unit >

LED : NSSW020

varistor : EZJZ0V420WA

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4. INTERFACE PINS

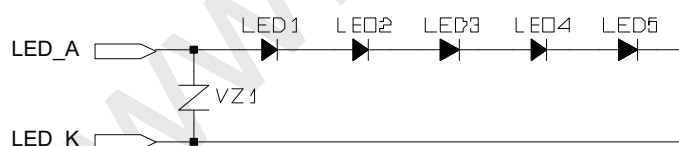| PIN No.	SYMBOL	FUNCTION	I/O	REMARKS
1	YU	Y_Top	R	Touch panel
2	XR	X_Right	R	Touch panel
3	YD	Y_Bottom	R	Touch panel
4	XL	X_Left	R	Touch panel
5	GND	Ground	P	
6	GND	Ground	P	
7	VSYNC	Vertical Synchronous Signal	I	Display interface
8	HSYNC	Horizontal Synchronous Signal	I	Display interface
9	DE	Data Enable Signal	I	Display interface
10	GND	Ground	P	
11	PCLK	Data clock	I	Display interface
12	GND	Ground	P	
13	B0	Display Data	I	Blue Data LSB
14	B1	Display Data	I	Blue Data
15	B2	Display Data	I	Blue Data
16	B3	Display Data	I	Blue Data
17	B4	Display Data	I	Blue Data
18	B5	Display Data	I	Blue Data MSB
19	GND	Ground	P	
20	G0	Display Data	I	Green Data LSB
21	G1	Display Data	I	Green Data
22	G2	Display Data	I	Green Data
23	G3	Display Data	I	Green Data
24	G4	Display Data	I	Green Data
25	G5	Display Data	I	Green Data MSB
26	GND	Ground	P	
27	R0	Display Data	I	Red Data LSB
28	R1	Display Data	I	Red Data
29	R2	Display Data	I	Red Data
30	R3	Display Data	I	Red Data
31	R4	Display Data	I	Red Data
32	R5	Display Data	I	Red Data MSB
33	GND	Ground	P	
34	XRESET	Reset	I	L: reset active
35	XCS	Chip select	I	L: Chip Select active
36	SCLK	Serial Clock	I	Command Interface
37	DIN	Serial Data	I	Command Interface
38	NC		N.C.	Not connected
39	GND	Ground	P	
40	VDDI	VDDI	P	1.8V
41	VDDI	VDDI	P	1.8V
42	VDD	VDD	P	2.8V
43	VDD	VDD	P	2.8V
44	LED_K	LED_Cathode	P	Cathode
45	LED_A	LED_Anode	P	Anode

[I/O column abbreviations]   I: Input pin   O: Output pin   R: reference pin   P: Power supply pin   NC: Not connected

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5. FUNCTIONS

5.1 DISPLAY INTERFACE

PIN	Cycle					
	1	2	3	4	…	480
R0	$R0^0$	$R1^0$	$R2^0$	$R3^0$	…	$R479^0$
R1	$R0^1$	$R1^1$	$R2^1$	$R3^1$	…	$R479^1$
R2	$R0^2$	$R1^2$	$R2^2$	$R3^2$	…	$R479^2$
R3	$R0^3$	$R1^3$	$R2^3$	$R3^3$	…	$R479^3$
R4	$R0^4$	$R1^4$	$R2^4$	$R3^4$	…	$R479^4$
R5	$R0^5$	$R1^5$	$R2^5$	$R3^5$	…	$R479^5$
G0	$G0^0$	$G1^0$	$G2^0$	$G3^0$	…	$G479^0$
G1	$G0^1$	$G1^1$	$G2^1$	$G3^1$	…	$G479^1$
G2	$G0^2$	$G1^2$	$G2^2$	$G3^2$	…	$G479^2$
G3	$G0^3$	$G1^3$	$G2^3$	$G3^3$	…	$G479^3$
G4	$G0^4$	$G1^4$	$G2^4$	$G3^4$	…	$G479^4$
G5	$G0^5$	$G1^5$	$G2^5$	$G3^5$	…	$G479^5$
B0	$B0^0$	$B1^0$	$B2^0$	$B3^0$	…	$B479^0$
B1	$B0^1$	$B1^1$	$B2^1$	$B3^1$	…	$B479^1$
B2	$B0^2$	$B1^2$	$B2^2$	$B3^2$	…	$B479^2$
B3	$B0^3$	$B1^3$	$B2^3$	$B3^3$	…	$B479^3$
B4	$B0^4$	$B1^4$	$B2^4$	$B3^4$	…	$B479^4$
B5	$B0^5$	$B1^5$	$B2^5$	$B3^5$	…	$B479^5$

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5.2 COMMAND INTERFACE

The TFTLCD Module has a command interface to control driving and to settling it's conditions. Command interface is operated as a serial interface using three input pins of DIN, SCLK, and XCS. Operational timings are independent from a display interface or it's PCLK.
When XCS is "L", the serial data on DIN is valid and it can be latched by a rising edge of SCLK.
One packet(9bit) consists of a start-bit(A0) and a command or a parameter.

< Packet formation >
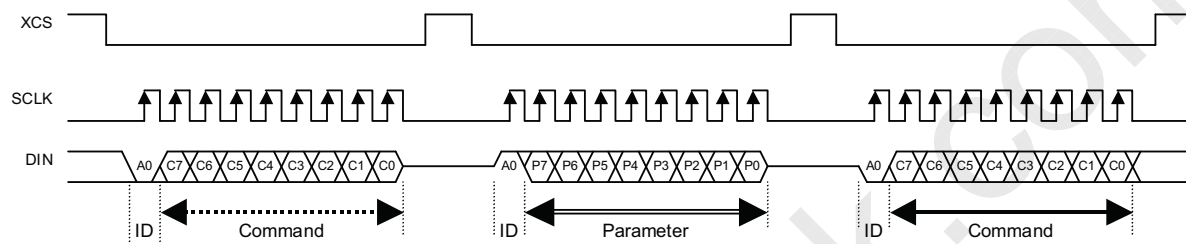
Start-bit(A0) is used as an ID of commands or parameters.

A0	IDENTIFICATION
0	Command
1	Parameter

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6. COMMAND

6.1　COMMAND LIST

Command	HEX	D7	D6	D5	D4	D3	D2	D1	D0	parameter
DISON	29(h)	0	0	1	0	1	0	0	1	No
DISOFF	28(h)	0	0	1	0	1	0	0	0	No
GAMSET	26(h)	0	0	1	0	0	1	1	0	Yes
SLPIN	10(h)	0	0	0	1	0	0	0	0	No
SLPOUT	11(h)	0	0	0	1	0	0	0	1	No
PASET	2B(h)	0	0	1	0	1	0	1	1	Yes
CASET	2A(h)	0	0	1	0	1	0	1	0	Yes
MADCTL	36(h)	0	0	1	1	0	1	1	0	Yes
COLMOD	3A(h)	0	0	1	1	1	0	1	0	Yes
RAMWR	2C(h)	0	0	1	0	1	1	0	0	Display-data
PTLON	12(h)	0	0	0	1	0	0	1	0	No
PTLAR	30(h)	0	0	1	1	0	0	0	0	Yes
NORON	13(h)	0	0	0	1	0	0	1	1	No

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6.2 COMMAND DETAILS

Recommended parameters to settle are recorded in the chapter "7. RECOMMENDED SEQUENCE".

Mark "-" means "invalid".

See "6.3 COMMAND INTERVALS " to design command sequence.

(1) DISON

DISON is used to set the display to the operative state. DISON should be used after entering SLPOUT.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
29h	0	0	1	0	1	0	0	1	

The default setting is DISON inactive (DISOFF active) state.

(2) DISOFF

DISOFF is used to forcibly set the display to the fully OFF state.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
28h	0	0	1	0	1	0	0	0	

The default setting is DISON inactive (DISOFF active) state.

(3) GAMSET

GAMSET and the subsequent parameter are used to select the setting of gray scales. GAMSET and its parameter should be entered under the DISOFF active state.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
26h	0	0	1	0	0	1	1	0	

	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
P1	01h	0	0	0	0	0	0	0	1	

Be sure to use the value specified on this table for P1.

(4) SLPIN

SLPIN is used to set the LCD module to sleep state. After using SLPIN, the power supply voltage (VDDI, VDD) must be maintained for more than 100ms to discharge.

While in sleep state, the oscillator circuit and the DC-DC converter circuit are stopped.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
10h	0	0	0	1	0	0	0	0	

The default setting is SLPIN active (SLPOUT inactive) state.

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(5) SLPOUT

SLPOUT is used to cancel the LCD module's sleep state. The oscillator circuit and the DC-DC converter circuit start when SLPOUT is entered.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
11h	0	0	0	1	0	0	0	1	

The default setting is SLPIN active (SLPOUT inactive) state.

(6) PASET

PASET and the subsequent parameters are used to set the page address limits of RAM. When column address is incremented to the end column, the column address returns to the start column and the page address is incremented. After page address is incremented to the end page, the page address returns to the start page. The start page must be less than the end page.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
2Bh	0	0	1	0	1	0	1	1	

<parameters>

	Hex	PR7	PR6	PR5	PR4	PR3	PR2	PR1	PR0	Remark
P1	-	0	0	0	0	0	0	P11	P10	Start page -upper
P2	-	P27	P26	P25	P24	P23	P22	P21	P20	Start page -lower
P3	-	0	0	0	0	0	0	P31	P30	End page -upper
P4	-	P47	P46	P45	P44	P43	P42	P41	P40	End page -lower

The default setting of Start page is 0d(0000h), End page is 159d(009Fh).

(7) CASET

CASET and the subsequent parameters are used to set the column address limits of RAM. When column address is incremented to the end column, the column address returns to the start column and the page address is incremented. After page address is incremented to the end page, the page address returns to the start page. The start column must be less than the end column.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
2Ah	0	0	1	0	1	0	1	0	

<parameters>

	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
P1	-	0	0	0	0	0	0	P11	P10	Start column -upper
P2	-	P27	P26	P25	P24	P23	P22	P21	P20	Start column -lower
P3	-	0	0	0	0	0	0	P31	P30	End column -upper
P4	-	P47	P46	P45	P44	P43	P42	P41	P40	End column -lower

The default setting of Start column is 0d(0000h), End column is 479d(01DFh).

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 (8) MADCTL

MADCTL and the subsequent parameter are used to set the accessing orders of RAM and the scanning orders of RGB interface.

<command>

hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
36h	0	0	1	1	0	1	1	0	

	hex	D7	D6	D5	D4	D3	D2	D1	D0	SETTINGS
P1	0h	P17	P16	P15	P14	0	0	0	0	

Be sure to use the value specified on this table for D3 of P1.

・ When you use internal RAM.

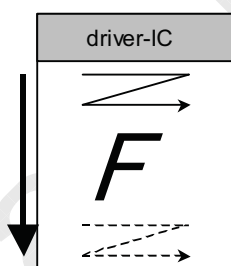- Display direction -

	P17	P16	P15	P14	CASET	PASET	REM.
Case 1	0	0	0	0	P1P2=0000h	P1P2=0000h	
Case 2	1	1	0	1	P3P4=01DFh	P3P4=009Fh	
Case 3	1	0	1	1	P1P2=0000h	P1P2=0000h	
Case 4	0	1	1	0	P3P4=009Fh	P3P4=01DFh	

Specified parameters of CASET and PASET are at the case of partial display mode.
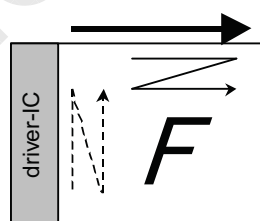
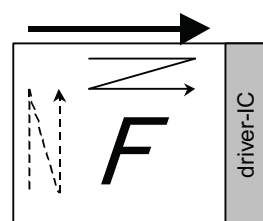common scan direction   RAM writing direction by Interface   RAM reading direction by LCD
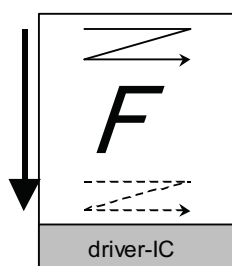
Case 1   Case 2   Case 3   Case 4

・ When you use RGB interface. (P15 and P14 are not used.)

- Display direction -

		P17 : 0 Top to Bottom	P17 : 1 Bottom to Top
P16 : 0	Left to Right	Driver IC	Driver IC
P16 : 1	Right to Left	Driver IC	Driver IC

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(9) COLMOD

COLMOD and the subsequent parameter are used to set color mode.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
3Ah	0	0	1	1	1	0	1	0	

	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
P1	-	0	P16	P15	P14	0	0	0	0	color mode setting

P16	P15	P14	Color Mode
1	0	1	565 mode (65K colors)
1	1	0	666 mode (262K colors)

Be sure to use the value combination specified on this table.

The default setting is 666 mode.

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(10) RAMWR

RAMWR is used to put the system in display data entry state. Additionally, the result of entering RAMWR is that the page address and the column address are always set to the start address. Writing data subsequent to RAMWR causes the content of RAM to be overwritten and at the same time the column address or the page address to be incremented. Inputting other commands automatically cancels data writing state.
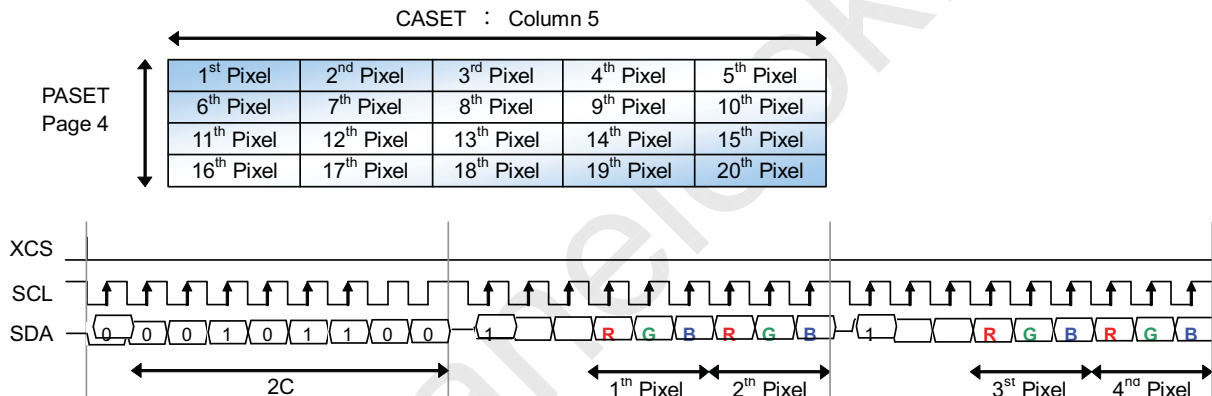
<command>
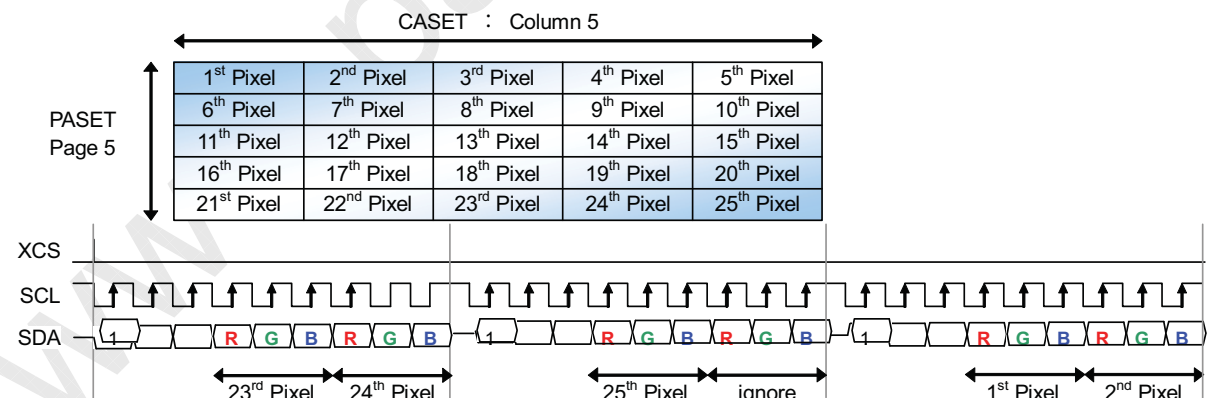
Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
2Ch	0	0	1	0	1	1	0	0	

<display data>

	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
DC	-	DC7	DC6	DC5	DC4	DC3	DC2	DC1	DC0	data of display data to write

Writing data for 2 pixels are transferred as 1 byte towards VRAM.

P7 and P6 are not related to display, so they shoule be set to "H" or "L".

CASET ： Column 5

1st Pixel	2nd Pixel	3rd Pixel	4th Pixel	5th Pixel
6th Pixel	7th Pixel	8th Pixel	9th Pixel	10th Pixel
11th Pixel	12th Pixel	13th Pixel	14th Pixel	15th Pixel
16th Pixel	17th Pixel	18th Pixel	19th Pixel	20th Pixel

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If the number of total pixels within a specified area (CASET,PASET) is odd, unused bit of the last byte is discarded.

CASET ： Column 5

1st Pixel	2nd Pixel	3rd Pixel	4th Pixel	5th Pixel
6th Pixel	7th Pixel	8th Pixel	9th Pixel	10th Pixel
11th Pixel	12th Pixel	13th Pixel	14th Pixel	15th Pixel
16th Pixel	17th Pixel	18th Pixel	19th Pixel	20th Pixel
21st Pixel	22nd Pixel	23rd Pixel	24th Pixel	25th Pixel

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(11) PTLON

PTLON is used to activate the partial display mode (driving some lines of display) in order to reduce power consumption.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
12h	0	0	0	1	0	0	1	0	

The default setting is PTLON inactive (NORON active) state.

(12) PTLAR

PTLAR and the subsequent parameters are used to set the partial display area by lines of display.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
30h	0	0	1	1	0	0	0	0	

<parameters>

	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
P1	-	0	0	0	0	0	0	P11	P10	Start page -upper
P2	-	P27	P26	P25	P24	P23	P22	P21	P20	Start page -lower
P3	-	0	0	0	0	0	0	P31	P30	End page -upper
P4	-	P47	P46	P45	P44	P43	P42	P41	P40	End page -lower

The default setting of start line is 1d = page 0d(0000h), and of end line is 160d = page 159d(009Fh).

<setting example>

	P11	P10	P27	P26	P25	P24	P23	P22	P21	P20	Remark
start page	0	0	0	0	0	0	0	0	0	0	page 0 = line 1

	P31	P30	P47	P46	P45	P44	P43	P42	P41	P40	Remark
end page	0	0	0	0	0	0	1	0	0	1	page 9 = line 10

(13) NORON

NORON is used to cancel the partial mode.

<command>

Hex	D7	D6	D5	D4	D3	D2	D1	D0	Remark
13h	0	0	0	1	0	0	1	1	

The default setting is NORON active state.

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6.3   COMMAND INTERVALS

The following commands should be used with minimum intervals specified.

SLPIN	>>	SLPOUT	>>	DISON	>>	SLPIN	>>	DISOFF
	60ms		60ms		60ms		60ms	

SLPOUT	>>	SLPIN
	60ms	

DISOFF	>>	SLPOUT
	60ms	

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6.4 MEMORY MAP

	MADCTL P15=0:Column P15=1:Page	0			1			2						477			478			479		
		R	G	B	R	G	B	R	G	B				R	G	B	R	G	B	R	G	B
		1st pixel			2nd pixel			3rd pixel						478th pixel			479th pixel			480th pixel		
MADCTL P15=0:Page P15=1:Column	**LCD line**																					
0	1																					
1	2																					
2	3																					
3	4																					
4	5																					
~	~																					
155	156																					
156	157																					
157	158																					
158	159																					
159	160																					

RAM area

Indicating addresses are changed by a setting of P15 in MADCTL.

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7. RECOMMENDED SEQUENCE

< TURNING ON >

○ Turn on system power(VDDI, VDD)

　　　　↓

○ Make a device reset　　　　　　　　　　　　　　　　*1)

　　　　= SLPIN active state

　　　　= DISOFF active state

　　　　= idling mode is OFF

　　　　= input data mode is 666 mode

　　　　　　↓

○ Release the device reset　　　　　　　　　　　　*1)

　　　　↓

○ Enter the following commands and parameters if necessary.

・MADCTL

・GAMSET

・COLMOD

・PASET

・CASET

　　　　↓

○ Enter the following command.

・SLPOUT　　　　　　　　　　　　　　　　　　*2)

　　　　↓

○ Start to input display contents.

　　　　↓

○ Enter the following command.

・DISON　　　　　　　　　　　　　　　　　　*2)

< TURNING OFF >

○ Enter the following commands and parameters if necessary.

・DISOFF　　　　　　　　　　　　　　　　　*2)

・SLPIN　　　　　　　　　　　　　　　　　　*2)

　　　　↓

○ Turn off system power (VDDI, VDD)　　　　　　　*1)

*1: Comply the following chart.

*2: See "6.3 COMMAND INTERVALS" to design intervals.

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VDDI

1ms≧t1≧0

1ms≧t4≧0

VDD

t2≧100μs

XRES

t3≧10ms t5≧60ms t6≧60ms t7≧60ms t8≧100ms

start to input
PCLK

| start to input commands ∗ | SLPOUT | DISON | DISOFF | SLPIN | end to input PCLK |

* MADCTL,GAMSET,COLMOD,PASET,CASET

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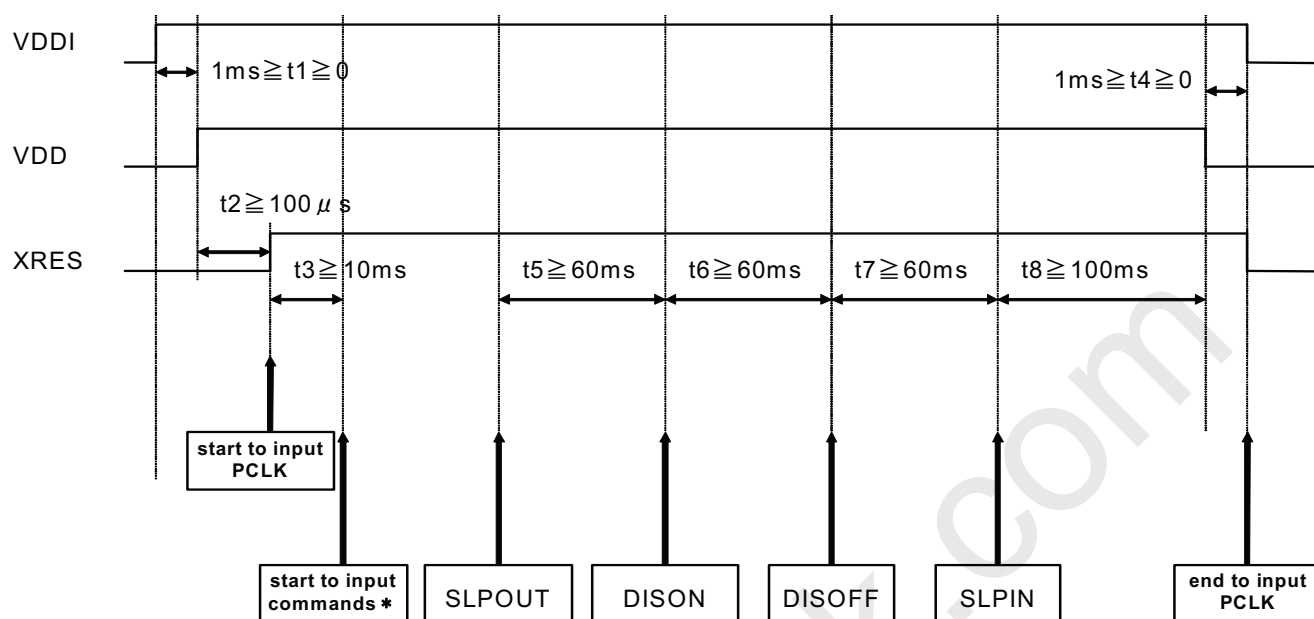
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8. ABSOLUTE MAXIMUM RATINGS

All data and ratings in this chapter are from the objective specification for product development.

Parameter	Symbol	Ratings	Unit	Remarks
power supply voltage	VDD	0 to 3.5	V	Pins:No.42,43
power supply voltage	VDDI	0 to 2.4	V	Pins:No.40,41
Input voltage	VIN	0 to VDDI+0.5	V	
LED forward current	IF	35	mA	Ta=25℃　*1)
operating temperature range (environmental)	TOP	-20 to 70	℃	no dew condition
storage temperature range (environmental)	TST	-30 to 80	℃	no dew condition

*1: The rating of maximum LED forward current is decreased along the ambient temperature as a figure following.
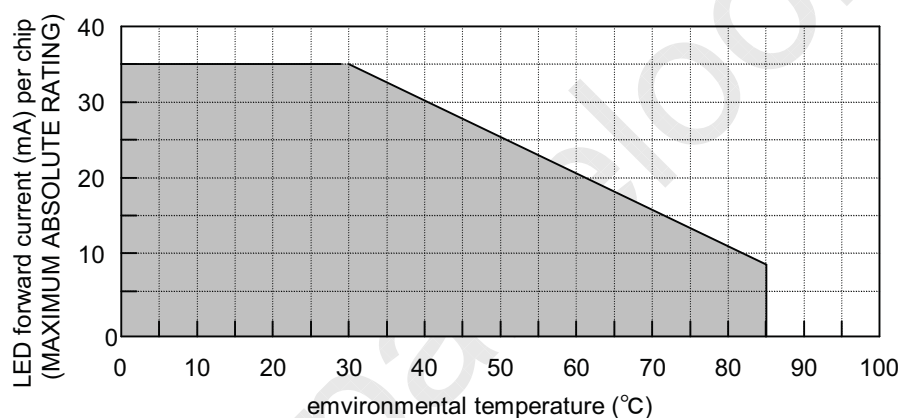
< Recommended Operating Temperature >

Recommended operating temperature is provided independently from the absolute maximum ratings. Functional operation of the device is realized within the recommended operating temperature.

Parameter	Symbol	Ratings	Unit	Remarks
operating temperature range (environmental)	TROP	0 to 60	℃	no dew condition

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9. ELECTRICAL SPECIFICATIONS

All data and ratings in this chapter are from the objective specification for product development.

9.1 DC SPECIFICATION

Parameter	Symbol	Ratings			Unit	Pins
		Min.	Typ.	Max.		
Power supply voltage *1)	VDD	2.7	2.8	2.9	V	No. 42,43
Power supply voltage *1)	VDDI	1.7	1.8	1.9	V	No. 40,41
Low-level input voltage	VIL	0	-	0.3 x VDDI	V	
High-level input voltage	VIH	0.7 x VDDI	-	VDDI	V	
Input leak current	ILI	-	-	1	µA	
Power supply current (RMS) *2)	IDD	-	21	30	mA	
	IDDI	-	2.1	4.0	mA	
LED forward current *3)	IF	-	20	25	mA	

*1: Rated values indicate operating range of electrical functions.

*2 : When it is the power supply voltage Typ. and the temperature of 25 °C, Display image is "color bar".

*3: Recommend constant current control.

<Color bar display>

Black | Blue | Red | Magenta | Green | Cyan | Yellow | White

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9.2 AC SPECIFICATIONS

9.2.1 comand interface
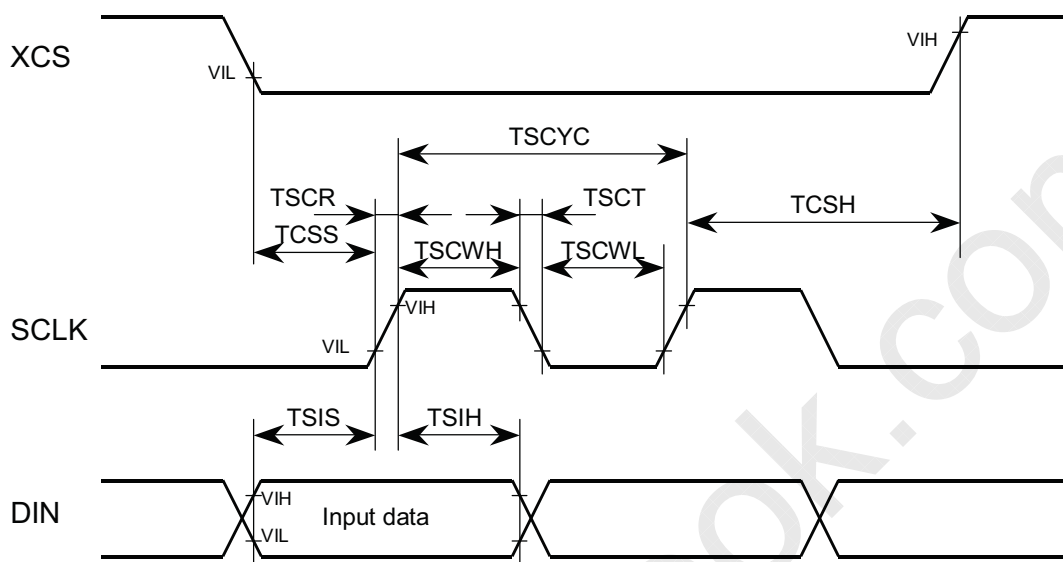
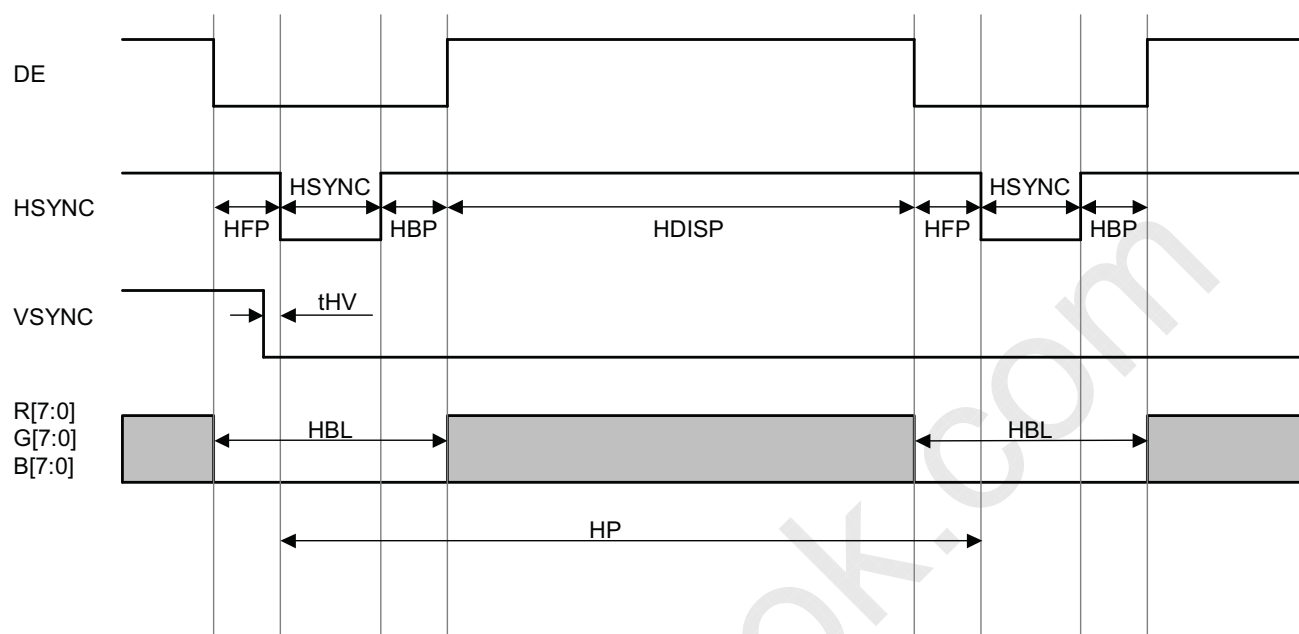| Parameter	Symbol	Ratings			Unit	Remarks
		Min.	Typ.	Max.		
SCLK cycle time	TSCYC	90	-	-	ns	
SCLK "H" width	TSCWH	25	-	-	ns	
SCLK "L" width	TSCWL	25	-	-	ns	
SCLK transition time	TSCR, TSCT	-	-	10	ns	
XCS setup time	TCSS	25	-	-	ns	
XCS hold time	TCSH	25	-	-	ns	
DIN setup time	TSIS	10	-	-	ns	
DIN hold time	TSIH	10	-	-	ns	

*: When both the rising time (tr) and the falling time (tf) of input signals are less than 10ns.

*: At the condition of power supply voltages are in a range of "DC specification", ambient temperature is in a range of operating temperature.

*: Ratings are specified as interval by at the voltage of 30% and 70% of VDDI-GND.

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9.2.2 display interface
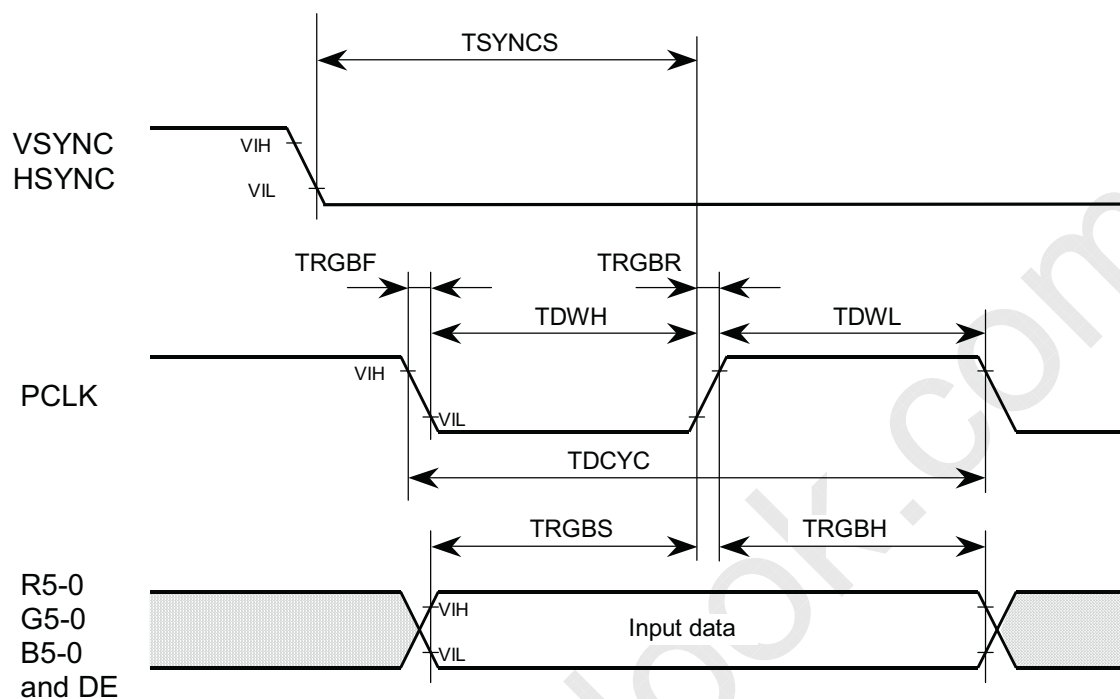
Parameter	Symbol	Ratings			Unit	Remarks
		Min.	Typ.	Max.		
VSYNC / HSYNC setup time	TSYNCS	10	-	-	ns	
PCLK "L" width	TDWL	10	-	-	ns	
PCLK "H" width	TDWH	10	-	-	ns	
PCLK cycle time	TDCYC	40	-	-	ns	
PCLK transition time	TRGBF, TRGBR	-	-	10	ns	
Input Data, DE setup time	TRGBS	10	-	-	ns	
Input Data, DE hold time	TRGBH	10	-	-	ns	

*: When both the rising time (tr) and the falling time (tf) of input signals are less than 10ns.

*: At the condition of power supply voltages are in a range of "DC specification", ambient temperature is in a range of operating temperature.

*: Ratings are specified as interval by at the voltage of 30% and 70% of VDDI-GND.

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9.2.3 display interface (Vertical)
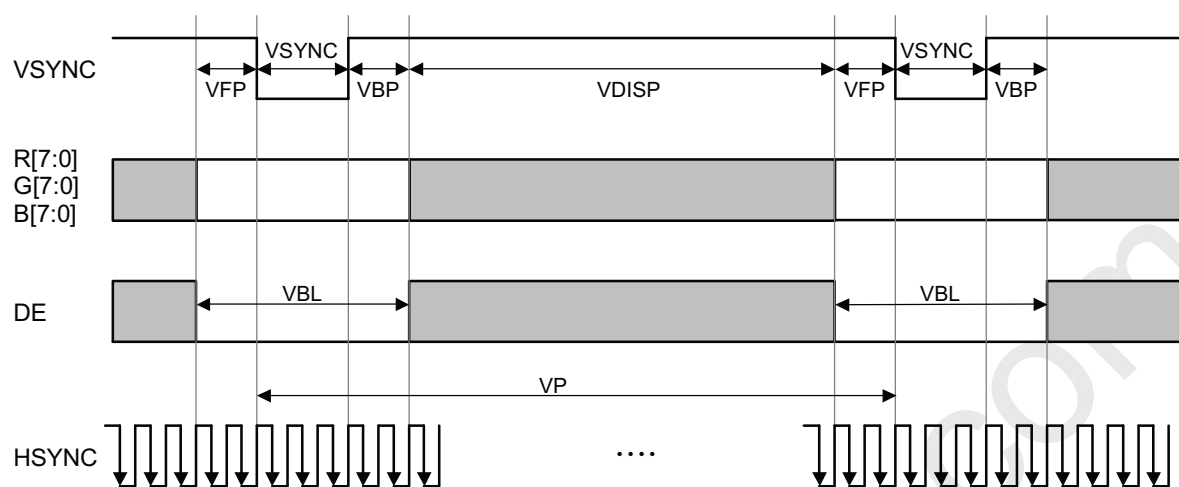
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP		=	665	=	Line
VSYNC L pulse width	VSYNC		5	10	15	Line
Vertical back porch	VBP		5	10	15	Line
Vertical front porch	VFP		5	5	5	Line
Vertical data start point		VSYNC + VBP	=	20	=	Line
Vertical blanking period	VBL	VFP + VSYNC + VBP	=	25	=	Line
Vertical active area	VDISP		-	640	-	Line
Vertical refresh rate			-	60	-	Hz

-: no rating in here   =: only Typ. value is allowed

*: When both the rising time (tr) and the falling time (tf) of input signals are less than 10ns.

*: At the condition of power supply voltages are in a range of "DC specification", ambient temperature is in a range of operating temperature.

*: Ratings are specified as interval by at the voltage of 30% and 70% of VDDI-GND.

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9.2.4 display interface (Horizontal)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Horizontal cycle	HP		=	601	=	PCLK
HSYNC L pulse width	HSYNC		5	20	75	PCLK
Horizontal back porch	HBP		5	60	75	PCLK
Horizontal front porch	HFP		5	41	111	PCLK
Horizontal data start point		HSYNC + HBP	=	80	=	PCLK
Horizontal blanking period	HBL	HFP + HSYNC + HBP	=	121	=	PCLK
HSYNC delay from VSYNC	tHV		0	4	30	PCLK
Horizontal active area	HDISP		-	480	-	PCLK
Pixel clock frequency	PCLK		-	24	-	MHz

-: no rating in here   =: only Typ. value is allowed

*: When both the rising time (tr) and the falling time (tf) of input signals are less than 10ns.

*: At the condition of power supply voltages are in a range of "DC specification", ambient temperature is in a range of operating temperature.

*: Ratings are specified as interval by at the voltage of 30% and 70% of VDDI-GND.

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9.2.5 reset
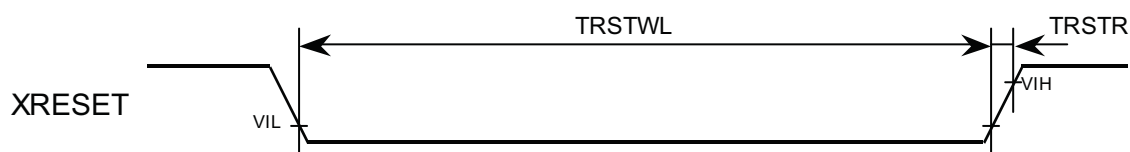
Parameter	Symbol	Ratings			Unit	Remarks
		Min.	Typ.	Max.		
XRESET "L" width	TRSTWL	15	-	-	μs	
XRESET rising time	TRSTR	-	-	10	ns	

*: When both the rising time (tr) and the falling time (tf) of input signals are less than 10 ns.

*: At the condition of power supply voltage is in a range of "DC specification", ambient temperature is in a range of operating temperature.

*: Ratings are specified as interval by at the voltage of 30% or 70% of VDDI-GND.

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10. OPTICAL CHARACTERISTICS

Values in "OPTICAL SPECIFICATIONS" are provided under the following conditions.

* The state that assembled the touch key.

* Frame Frequency　: 60Hz

* VDDI　　　　　　: 1.80V

* VDD　　　　　　: 2.80V

10.1　OPTICAL SPECIFICATIONS

10.1.1 transparence

Item		Symbol	Temp. (°C)	Rating			Unit	definition (Condition)	Remark
				Min.	Typ.	Max.			
Contrast		CR	25	180	280	-	-	-(1)	
Response	W→B	t_r	25	-	18	-	ms	1(2)	
	B→W	t_f	25	-	13	-			
Color coordinates	R-x	Rx	25	0.60	0.65	-	-	2(1)	
	R-y	Ry		-	0.34	0.39			
	G-x	Gx		-	0.32	0.37			
	G-y	Gy		0.56	0.61	-			
	B-x	Bx		-	0.14	0.19			
	B-y	By		-	0.07	0.12			
	W-x	Wx		0.24	0.29	0.34			
	W-y	Wy		0.26	0.31	0.36			
Brightness		B	25	150	220	-	Cd/m^2	-(1)	If = 20mA
Brightness uniformity			25	70	-	-	%	3(3)	If = 20mA

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10.2   DEFINITIONS AND CONDITIONS

10.2.1 definitions of optical characteristics

Definition 1

tf: This is a time that decreases to 10% of total change of the screen surface brightness from the point of 90%, after data signal is switched from white-raster to black-raster.

tr: This is a time that increases to 90% of total change of the screen surface brightness from the point of 10%, after data signal is switched from black-raster to white-raster.

Definition 2

This is the x-y coordinate of Red, Green, Blue and White colors specified on the CIE1931 chromaticity diagram.

Definition 3
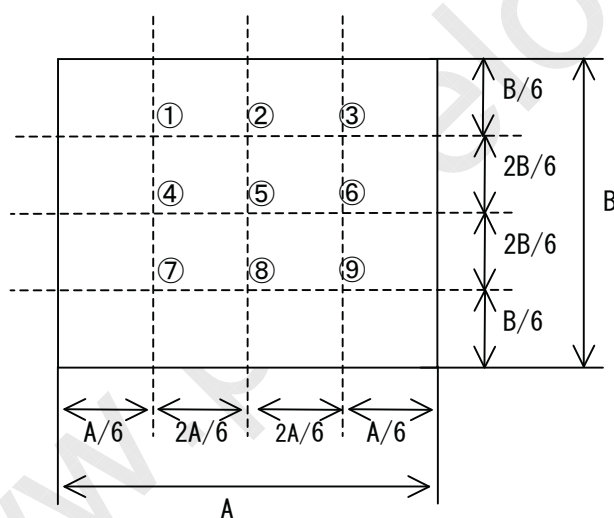
Figure A

The brightness uniformity "δB" is defined as:

$$\delta B = \frac{\text{Minimum brightness of the nine points}}{\text{Maximum brightness of the nine points}} \times 100(\%)$$

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10.2.2 measurement conditions of optical characteristics

[electrical inputs and adjustments]

　　Black raster display　　　　　　　　　　R[ ] = G[ ] = B[ ] = 0

　　White raster display　　　　　　　　　　R[ ] = G[ ] = B[ ] = 63

　　Saturate color raster display　　　　　R[ ], G[ ], B[ ] (one color only) = 63,　　otherwise = 0

　　Color bar display　　　　　　　　　　　Vertical color bars

　　　　　　　　　　　　　　　　　　　　　　　with pure colors and complementary colors

Condition 1

[optical system]
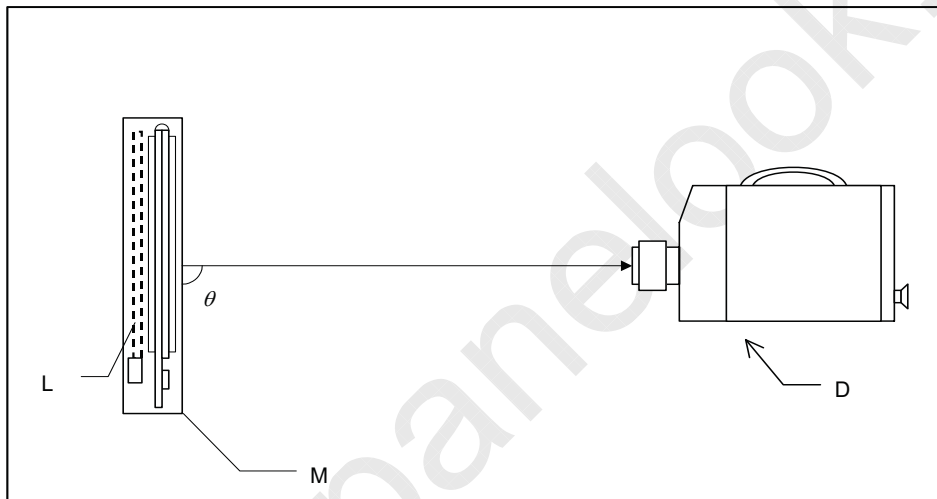
　　L　　：Light source mounted to the LCD module (LED Back Light)

　　M　　：LCD module

　　D　　：Measurement instruments

　　θ　　：Measurement angle (=90°)

　　Measurement point　　　　：the center of the active area

[instruments and it's measurement conditions]

　　Instrument　　　　　　　　：Color Luminance meter CS-1000A(MINOLTA)

　　Measurement distance　　：500mm

　　Measurement field angle　：2°

　　Measurement point　　　　：the center of the active area

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Condition 2

[optical system]
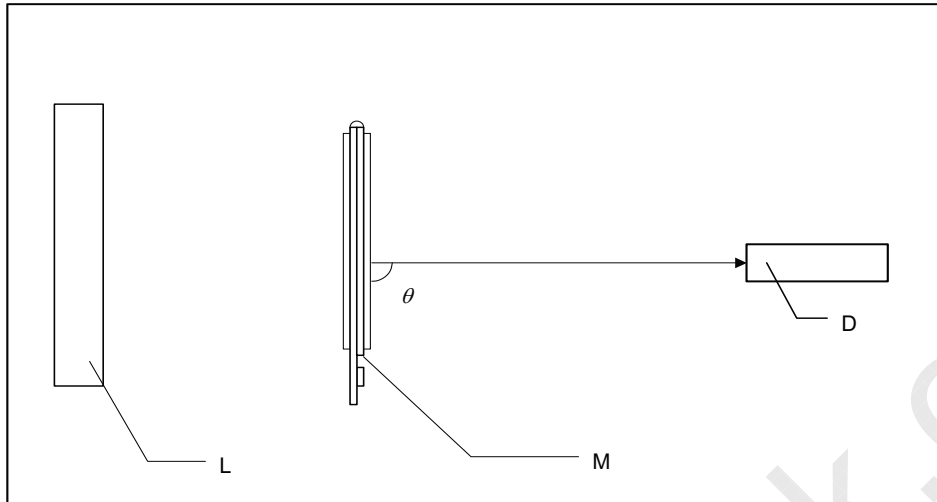
L　　：Light source

M　　：LCD module

D　　：Measurement instruments

θ　　：Measurement angle (=90°)

Measurement point　　：the center of the active area

[instruments and it's measurement conditions]

Instrument　　：LCD meter LCD-5000 (OTSUKA)

Measurement distance　　：133mm

Light Source　　：Halogen lamp

Measurement point　　：the center of the active area

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Condition 3

[optical system]
The same system to condition 1.

[instruments and it's measurement conditions]

Instrument   : Color Luminance meter CS-1000A(MINOLTA)

Measurement distance   : 500mm

Measurement field angle   : 2°

Measurement point   : each 9 points in Figure A

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11. TOUCH KEY

The following contents are applied only inside T/K active area.

11.1 SPECIFICATION

Mechanical specifications					
* Input Method: Finger or Stylus Pen (Polyacetal)					
Item	Ratings			Unit	Remark
	Min.	Typ.	Max.		
Activation Force	0.05	0.2	－	N	Polyacetal pen (R0.8mm)
Surface hardness	3	－	－	H	Pencil hardness test (JIS K5400)
Puffiness *1）	－	－	0.4	mm	
Electrical / Optical specifications					
Operating Voltage	－	5	7	V	
Linearity *2）	-1.5	－	+1.5	%	
Terminal Resistance	200	388	600	Ω	X (Glass side)
	200	367	600	Ω	Y (Film side)
Insulation resistance	20	－	－	MΩ	DC25V
Bouncing	－	－	10	ms	Tip R3.75mm,hardness 10°～ 20°,silicon rubber,500gf operation:40mm/sec

*1）Definition of Puffiness
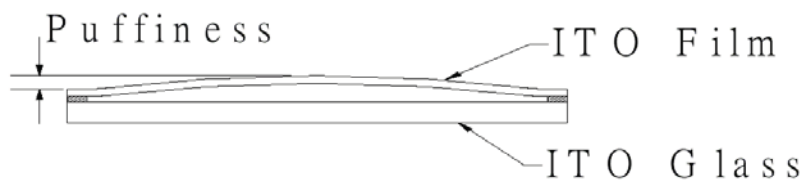
*2) Definition of Linearity

Linearity (%) = ΔV/(EV-SV) x 100
ΔV : The difference between the ideal voltage and measured voltage on the each measuring line.
SV : Voltage of starting points
EV : Voltage of ending points

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11.2 DURABILITY

Test area should be at the center part of T/K active area.

The surface shall be free from damage.

No.	Item	Specification
1	Hitting durability (test area should be the center part of T/P)	1,000,000 times min at the same point. The surface shall be free from damage. Test conditions Hitting pad : Tip R 8mm Silicone rubber & Tip R0.8mm stylus pen. Load : 250gf Hitting speed : 3times / sec. Electric load : None
2	Pen Sliding durability (X direction: Test area in T/P Active Area.) (Y direction : Test area should be at 1.1mm insaide of T/P Active Area.)	100,000 times min(slide only not in cycle). The surface shall be free from damage. Test conditions Sliding pen : Tip R0.8mm stylus pen. Load : 250gf Sliding speed : 180mm / sec Sliding length : 30mm Electric load : None
3	Low Pressure Test	The requirements in the mechanical, electrical and optical characteristics shall be satisfied after exposing at 60.8kpa(0.6atm) RT for 48 hours and at normal pressure for 24 hours.

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12. INSPECTION

12.1　QUALITY STANDARD

12.1.1 standards

The standards are the quality level used to judge whether or not product lots pass during acceptance inspections of products delivered to your company. The standards are shown below.

* Inspection method: Compliant with ANSI/ASQC Z1.4-1993, ordinary inspection level II, inspection by one time sampling.
* AQL

Defect type	AQL	Definition
Major defects	0.4%	accompanied with functional abnormalities
Minor defects	0.65%	out of the range of "12.3 EXTERNAL APPEARANCE STANDARDS", but no functional abnormalities

12.1.2 lot

Lot means the unit includes all products delivered to your company at one time.

12.1.3 inspection conditon

(1).environmental conditions
　　　　　Temperature : 20 to 25℃
　　　　　Humidity : 60±15%RH.
　　　　　Operative inspections are done under 800 to 2000 lx environment.
　　　　　Especially related to transparence are performed under at most 50 lx environment.
(2). inspection method
　　　　　Inspect the screen by naked eye from a distance of about 30 cm on a vertical direction front on.
(3). driving condition
　　　　　According to the specification.

12.1.4 treatment of defective products in the acceptance inspection

(1). When a product has failed to pass your company's acceptance inspection, please notify to　EPSON IMAGING DEVICES CORP. within 3 weeks from delivery. Otherwise,　EPSON IMAGING DEVICES CORP. will regard that it had been accepted.
(2) When a lot has failed to pass your company's acceptance inspection, please return the entire lot to　EPSON IMAGING DEVICES CORP.　EPSON IMAGING DEVICES CORP. will investigate the causes of defects and will report both the causes and the responses taken to them. Non-defective products shall be delivered to replace all defective products within nonconforming lots.
(3) Non-defective products shall be delivered to replace all defective products within conforming lots.

12.1.5 treatment of other problems

If any troubles should occur concerns our products that have been assembled at your company's manufacturing processes, both companies shall jointly investigate and resolve the causes.

12.1.6 warranty

　EPSON IMAGING DEVICES CORP. warrants this product for a period of 14 months from the date of delivery.

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12.2 DISPLAY APPEARANCE STANDARDS

<Application scope>
The application scope is limited to the viewing area.
The product should be judged non-defective if all defects are outside of the active area and do not interfere with product quality or the assembly process.

If any item is defined with a boundary sample, the boundary sample takes precedence.

No.	ITEM	CRITERION	CLASS
1	display problems	Must not include any nonfunctioning or failure to display the correct pattern corresponding to input signal.	major defect
2	missing lines	No missing lines permitted.	major defect
3	dot defects	Defined allowable ranges should be met for each white, black, R, G, B raster. The limits apply to the entire display area. *1) Bright spot in 60% or more of dot aperture is defined as a bright dot defect, less than 60% is permitted. Black spot in 60% or more of typical pixel aperture is defined as a black dot defect, less than 60% is permitted.	minor defect
4	Inconsistent display	Should not be prominent. If necessary, boundary samples should be provided.	minor defect
5	refuses and scratches on polarization plate (These specifications include polarization plate, touch key and the gap of the touch key and LCD panel.) *2)	<dot shape> allowable range 1. distinctly recognized | size d(mm)	numbers
---	---
d<=0.10	permitted
0.10<d<=0.20	6
0.20<d	0 | Criterion is applied also to pin-holes. Defects must not be crowded. <line shape> | Length L (mm)	Width W (mm)	numbers
---	---	---
any	W<=0.02	permitted
L<=2.0	0.02<W<=0.05	7
-	0.05<W	treat as a dot defect		minor defect
6	bubbles in polarizer (display area) *2)	allowable range | diameter d(mm)	numbers
---	---
d <=0.1	permitted
0.1<d<=0.2	3
0.2<d	0		minor defect

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7	Fish eye on the film of touch key *3)	allowable range		minor defect

allowable range

diameter d(mm)	numbers
d≦0.2	permitted
0.2<d≦0.4	6
0.4<d≦0.6	2
0.6<d	0

8	Newton's ring	No remarkable Newton's ring in practical use. Visual inspection shall be done at a distance of 300 mm min. between eyes and a product at an angles of 60 min. to the surface of the product under a ceiling fluorescent light (40W natural color).	minor defect

Each "dot" means the smallest display unit for R, G, or B.

A set of three adjacent R, G, and B dots comprise one pixel.
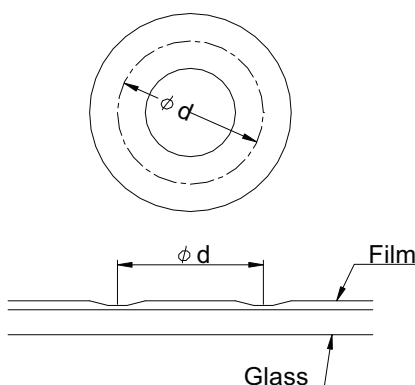
*1: dot defect's allowable range

No.	Item	Bright dot defect			Black dot defect	Total
		Red	Green	Blue		
1	Defects counts	1	1	3	7	12
2	Bright dot combined defects	0				

Defects must be at least 5mm apart from one another.

*2: outward of refuses, scratches, and bubbles

dot shape   line shape

$d=(a+b)/2$
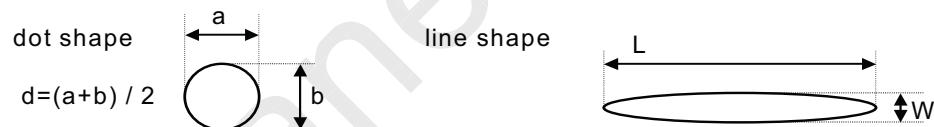
*3: Fish eye on the film of touch key
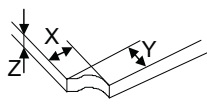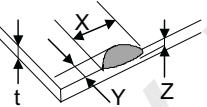
Any defect outside the viewing area can be ignored.

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12.3   EXTERNAL APPEARANCE STANDARDS

No.	ITEM	CRITERION	CLASS
1	different specifications	Not permitted.	major defect
2	missing parts	All parts must be complete.	major defect
3	damaged resist on FPC	Copper patterns on FPC must not be visible.	minor defect
4	circuit pattern	Must not be peeled or separated from FPC.	major defect
5	conductive refuses	No solder refuses or solder balls easily moving. Fixed conductive refuses over 0.2mm φ are not permitted. Should not be crowded. (crowded: means gathering more than 5 pcs within φ=5mm)	minor defect
6	dirt	Should not be prominent. Dirt on backside is permitted.	minor defect
7	dirt or scratch on interface pins	Should not be prominent.	minor defect
8	plating	Must not be peeled, no rust, no discoloration.	minor defect
9	soldering	Solder omissions are not permitted at any solder point. Solder bridges are not permitted. Cold soldering are not permitted.	major defect major defect minor defect
10	parts soldering	 There must be fillet	minor defect
11	chipping of the glass 11-1 Chip on Corner <T/K> 	<Touch key> -Following criterion(11-1) is applied to all corners of touch key's glass. X≦3.0,Y ≦3.0, Z ≦ t (unit: mm) *The crack runs inside touch key can not be allowed.	minor defect
	11-2 Chip on ridge <T/K> 	<Touch key> -Following criterion(11-2) is applied to all side edges of touch key's glass. X ≦3.0, Y ≦2.0, Z ≦ t (unit: mm) *The crack runs inside touch key can not be allowed.	

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13. DURABILITY

No.	PARAMETER		CONDITION		REMARK
1	High-temperature storage		80℃	240 h	
2	Low-temperature storage		-30℃	240 h	
3	Temperature cycling		-30℃ ⇔ 80℃ (30 min)　　(30 min)	10cycles	*1) *2)
4	High-temperature operation		70℃	240 h	
5	Low-temperature operation		-20℃	240 h	
6	High-temperature, High-humidity operation		40℃ 90%RH	240 h	*1)
7	static electricity characteristics	onto panel surface	100pF,1.5kΩ,20 to 25℃,60%RH	15kV	
		onto connector		200V	
8	Package drop		・ according to JIS-Z0202 ・ height for plane drop: 50 cm ・ height for corner and ridge drop:　30 cm		
9	Package vibration resistance		・ 1.5G, ・ 10 - 55 Hz variable / 1 cycle(1 minute) ・ 20 cycles for each in X, Y, Z direction		

*1): No guarantee for polarization plate in the case of dew condensation.
*2): Bubbles must not be within the active area.
　　However, it does not guarantee about bubbles when mechanical stress is given to the LCD panel at low temperature.

FAULT JUDGMENT CRITERIA

After completing the durability tests, leave the samples under the room temperature and　(25℃, 40%RH) for 2 hours and check for the following inspection items.

(1)　No clearly visible defects or deterioration of display quality allowed.
(2)　Contrast ratio should be at least 50% of initial value.
(3)　No function-related abnormalities.
(4)　Current consumption must not exceed 2 times of initial value.
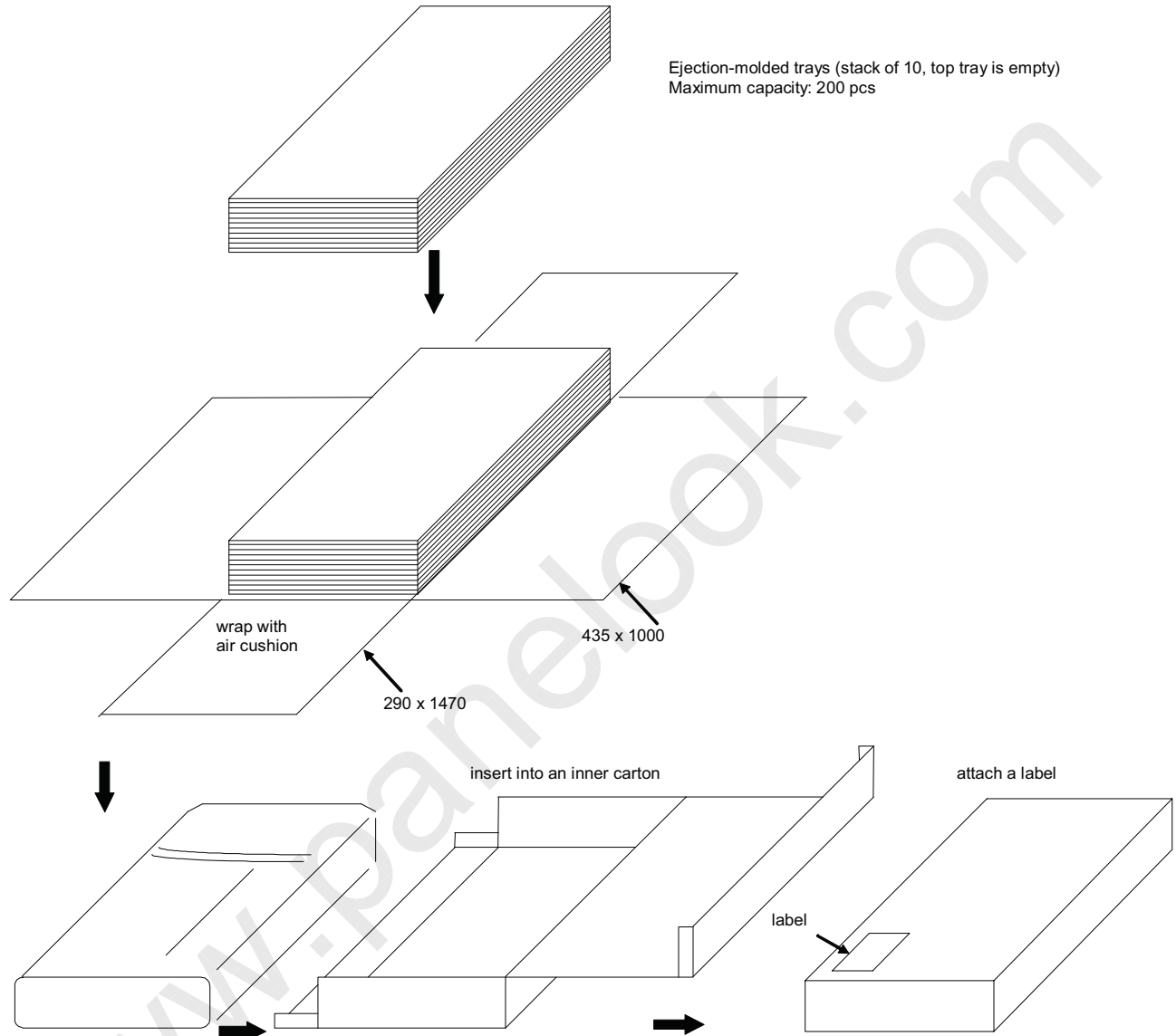(5)　R, G, and B color area must be at least 70% of initial value.

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14. PACKING SPECIFICATIONS

< INNER CARTON >

Ejection-molded trays (stack of 10, top tray is empty)
Maximum capacity: 200 pcs

wrap with
air cushion

435 x 1000

290 x 1470

insert into an inner carton

attach a label
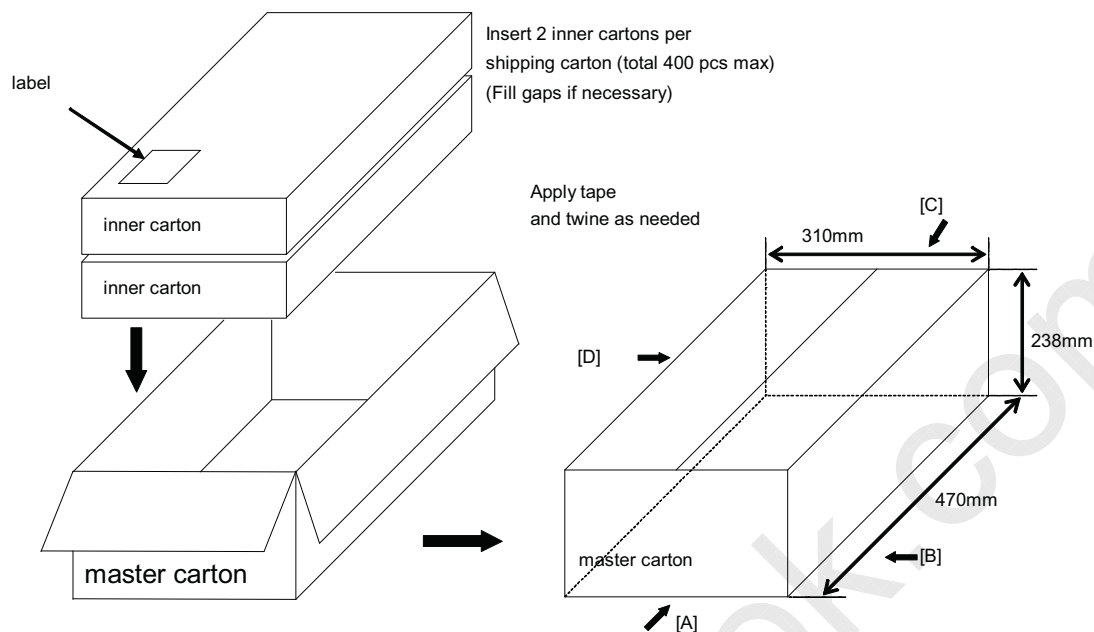
label

<contents of the label>

Lot number will be made according to the following format. The lot number has the same description with the printed number on each products. If plural lots are packed together into one package, plural lot numbers must be printed on the label.

Product No.

L4S00242P**

Q'ty	pcs	Lot
Customer Product No.		
EPSON IMAGING DEVICES CORP.		

<Lot No.description>
upper 1 digit   :year code
upper 2,3 digits   :week code
upper 4 digit   :day of the week
lower digit   :factory code
                                 "P":PIF   "S":SZE   "7":Chikuma
                                 "G":Ingus   "J":Toyoshina
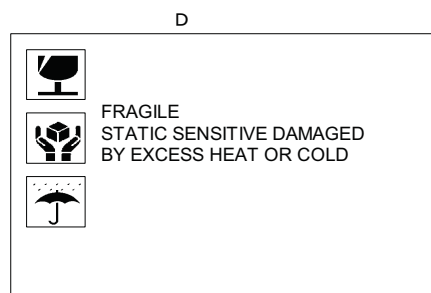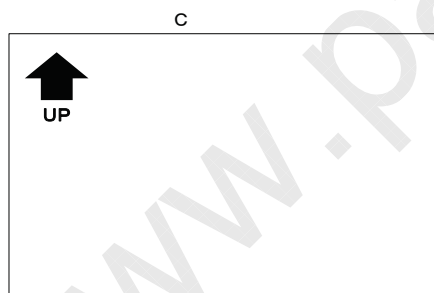...date indicates the shipping inspection's finished day

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< MASTER CARTON >

label

inner carton

inner carton

master carton

Insert 2 inner cartons per
shipping carton (total 400 pcs max)
(Fill gaps if necessary)

Apply tape
and twine as needed

[C]

310mm

238mm

[D]

470mm

[B]

master carton

[A]

Indication onto [A] [B] [C] [D] on master carton are shown below.

A

UP

LABEL

B

FRAGILE
STATIC SENSITIVE DAMAGED
BY EXCESS HEAT OR COLD

C

UP

D

FRAGILE
STATIC SENSITIVE DAMAGED
BY EXCESS HEAT OR COLD
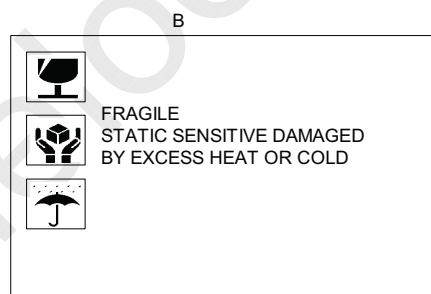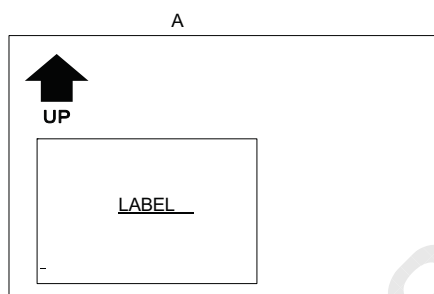
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15. LCD MODULE USAGE AND PRECAUTIONS

15.1 HANDLING

(1) The display panel is made of glass. Do not subject it to mechanical shock such as dropping it from a high position, etc.

(2) If the display panel is damaged and internal liquid crystal substance leaks out, be sure not to inhale or consume it. If the internal liquid crystal substance comes into contact with skin or clothing, promptly wash it off using soap and running water.

(3) Do not apply excessive force on the surface, perimeter or adjoining areas of LCD module since this may cause display panel color tone to vary.

(4) The polarizer covering the display panel surface of the LCD module is soft and can be easily scratched. Handle this polarizer carefully.

(5) If the surface polarizer becomes contaminated, use the following recommended or equivalent adhesive tape for contaminants removal.

• Scotch-brand mending tape (No. 810)

(6) Do not breathe on the display surface or use Ethyl Alcohol solvent for contaminant removal as polarizer discoloration may occur. Furthermore, solvent other than mentioned above may also damage the polarizer.   Especially, do not use the followings.

• Water

• Ketones

• Aromatic solvents

(7) When mounting the LCD Module, be sure that it is free from twisting, warping, or distortion. Any stress can have great influence to the display quality. Also, in cases where outer case or frame is included, be sure to secure sufficient stiffness on the outer case or frame for a robust design.

(8) Do not apply pressure at or around the LSI chip and the surrounding mold area.

(9) Do not attempt to disassemble or rework the LCD module.

(10) To prevent destruction of the elements by static electricity, be careful to maintain an optimum working environment. And notice that this LCD module tend to easily get electrostatic charge because of metal frame.

• Be sure to ground your body before handling the LCD module.

• Make sure that solder guns and all other tools required for assembly have been grounded.

• To reduce occurrence of static electricity, avoid using this product in dry environments.

• A protective film has been attached to the surface of the LCD panel. When peeling off the protective film, be careful to prevent electrostatic discharges.

(11) To minimize performance degradation of the LCD module caused by destructive forces such as static electricity, etc., avoid direct contact to the following sections when handling the LCD module.

• terminal electrodes of connector

• wiring pattern on FPC

(12) LCD Panel surface is protected by a protective film layer. This protective film must be removed before final product installation. After removal of protective film layer, some adhesive residues maybe left on the LCD panel, especially after long storage period, please refer to section 5) listed above for proper contaminant removal procedure.

(13) Take precaution to minimize corrosion of electrodes. Corrosion of electrodes is accelerated by moisture, condensation or a current flow in a high-humidity environment.

(14) Do not apply excessive pressure to the FPC part. Force type such as twist, warp, etc., may damage FPC patterning traces.

(15) Do not use sharp, pointy or rigid tools when handing LCD panels. These objects can scratch or nick the glass panel which can cause it to crack.

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(16) Avoid using LCD module under condensation or high humidity environment because polarizer etc. maybe damaged in these conditions.

(17) Trays are used to package LCD modules for shipment. If LCD modules scratch the tray during shipment, material of the scratched tray may be left on LCD modules. In such case, clean up LCD modules after removal from trays.

(18) When installing LCD module, don't apply excess stress of bending or stretching to the FPC.

(19) Keep NC terminal open electrically.

(20) After storage under high humidity or condensation environment, keep LCD module under room temperature more than 30 minutes before operation.

(21) Take precautions to handling LCD module because the glass plate has very keen edges.

15.2   DESIGN OF APPLICATION

(1) The absolute maximum ratings represent the rated values which LCD module can not exceed. When LCD modules are used beyond this rated value, the operating characteristics may be adversely affected.

(2) To prevent the occurrence of erroneous operation caused by noise, special attention on satisfying VIL, VIH specified values is required. This includes taking the precautionary measures of using short cables for signal transferring.

(3) An inherent characteristic of liquid crystal display is its temperature dependency. Be sure to use the LCD modules within the specified operating temperature range, as recognition of the display becomes difficult when the LCD module is used outside its range. Also, keep in mind that the voltage levels necessary for clear display images will vary according to temperature.

(4) It is recommended that power supply lines (VDDI,VDD) to include current surge protection.

(5) Note the peripheral devices can cause mutual noise interference with LCD modules. Especially, input devices such as Touch Panel, etc., may output operational level by radiation noise even when these devices are not in operation. Actual performance confirmation and verification under actual usage environment by actual final product is highly recommended.

(6) To avoid EMI, preventive measures should be implemented in the final product.

(7) Display abnormality may occur with sudden removal of power supply such as device battery. Sudden removal of power supply shall be avoided at all time. LCD module quality can not be guaranteed under such condition.

(8) The LCD module is affected by light exposure easily because the Driver IC is mounted as a bare chip on the LCD module. To avoid higher levels of current consumption and accompanied shut-down of power supply, give consideration to taking light-blocking methods in the final product.

(9) Ensure sufficient light shading measures during design phase and when assemble the LCD module.

(10) Ensure sufficient light shading measures in the inspection process.

(11) Similar to general electronic components, ESD may cause LCD IC to malfunction. ESD preventive measures should be considered around the LCD module, especially Driver IC and Power IC.

(12) When logic circuit power is off, do not apply any signals to the input terminals.

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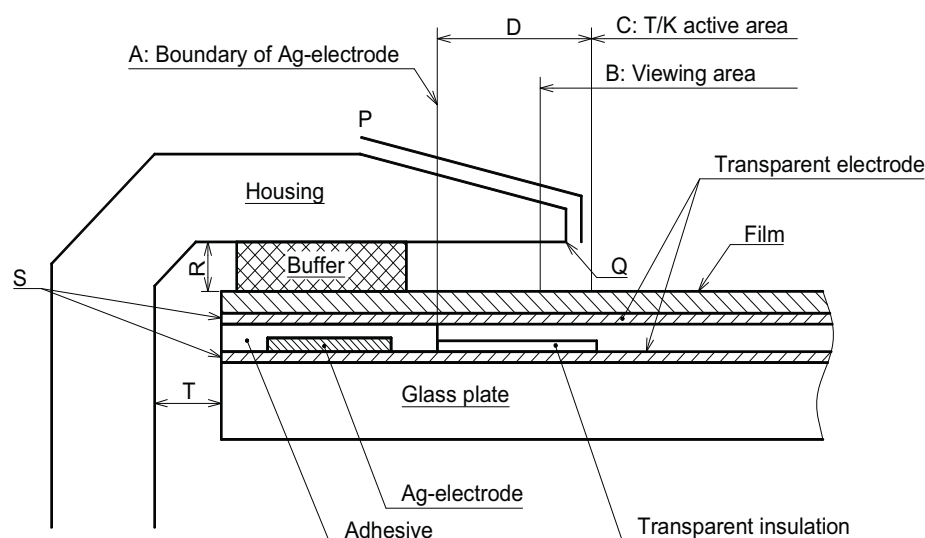| Product Number	L4S00242P00	Revision Number	00	Page	40/42

15.3　TOUCH KEY

Figure 1. Ideal design structure (for Film/Glass type)

15.3.1 Cautions for design

(1)　Cautions for each area

　　A: Boundary of Ag-electrode
　　　·　When holding the touch key by housing, it needs to be held at outside of this boundary.
　　　·　It is electrically detectable inside of this boundary.

　　B: Viewing area
　　　·　Appearance inspection area
　　　·　Cross point and cosmetic imperfection will be allowed outside this area.

　　C: T/K active area
　　　·　This area is where the performance and durability are guaranteed.

　　D: Operation inhibition area
　　　·　This area is inferior to the active area in sliding and hitting durability.
　　　·　Do not operate the touch key in this area. It would cause the crack of transparent electrode.
　　　·　Pressing the area around "P" may cause faulty operation. So, design its structure impossible to press the area "D" by the housing, etc. Particularly the part "Q" shall be free from burr, etc.

(2)　It is recommended to provide a buffer material at clearance "R".

(3)　To avoid giving strain to film, do not bond the upper film board to the housing. It may cause faulty operation.

(4)　Respective transparent electrodes for film and glass do not perform pattern etching. Therefore, design the construction not to touch conductive material on the end of part D. (Part "S")

(5)　Please have clearance between the glass and the housing (Part "T") and design for a shock not to get across to glass directly.

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15.3.2 Cautions for handling

(1) Upon carrying the product, be sure to hold the glass edge.
(2) Do not give a force to FPC. It may break.
　【 Inhibition 】
　　　Do not hold, pull, or bend FPC.
(3) The surface of the touch key is soft and easily scratched. Do not operate the touch key by a thing other than a stylus pen (tip R0.8mm or more) or the finger. Do not use hard or sharp things like a ballpoint pen, sharp pencil, etc.
(4) Do not give excessive strain or give strain for a long time to the touch key.
(5) Wipe off the stain on the film and the glass by using soft dry cloth.
　【 Inhibition 】
　　　Do not use any organic solvent or detergent.
　　　It may cause peeling of a film or defective operation.
(6)　Please note dew condensation by rapid change of temperature or humidity. It may cause deterioration of the performance.
(7) The input position may be fluctuated a little trough long-time use. It is desirable to provide a zero-adjustment function by using a circuit and software.
(8) The glass of touch key may break due to a set's drop or overload on the panels. Besides, the broken glass may cause injuries. Therefore, take care not to break the glass of touch key when handling the set. When handling the product, take care not to break the touch key.

15.4　DISPLAY CHARACTERISTICS

(1) One of the special characteristics of liquid crystal is that it freezes when stored at the temperature below the storage temperature range. Such freezing may cause orientation defects or bubbles (black or white) to appear in the LCD panel. Bubbles may also occur if the panel receives an impact in a low-temperature environment.
(2) If the LCD module is left operating for a long time with the same display showing, the displayed pattern may leave traces on the screen or the contrast may become inconsistent.

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15.5   STORAGE

(1) When storing LCD modules, avoid the following condition or environment.
• Exposure to direct sunlight or fluorescent lamps lightings.
• High-temperature/high-humidity or very low-temperature (below 0°C) environments.
• Exposure to water droplets, condensation, etc.
Furthermore, keep LCD modules in anti-static bags to prevent static electricity charge ups. Whenever possible, LCD modules should be stored in the same conditions in which they were shipped from   EPSON IMAGING DEVICES CORP.
(2) Take precaution to minimize corrosion of electrodes. Corrosion of electrodes is accelerated by moisture, condensation or a current flow in a high-humidity environment.
(3) Recommended storage conditions.
• Storage environment : +15°C～35°C, less than 65%RH
• Duration: up to 2 months after shipping date
(4) The shipping carton must not be stacked up over 2m in height.

15.6   DISPOSAL

(1) When disposing LCD modules, consult company specialized in industrial waste treatment which is permitted by the government or local authority.   When incineration is the method of LCD module disposal, law of environmental hygienic must be obeyed.

15.7 OTHERS

(1) This product is designed to be used in ordinary electronic devices. Do not use this product in other applications, especially in devices that may cause direct bodily damage to end users (such as aerospace equipment, traffic control equipment, medical equipment, life-support system equipment, or safety equipment).
(2)   EPSON IMAGING DEVICES CORP. shall not be responsible for defects that occur in this product or in equipment connected to this product if the product is used in an environment that exceeds the ranges specified in this document, or in an environment not described in this document.

16. CHANGES

Specification, cosmetic, specified components, circuits and design improvement maybe done periodically. Items that affect this specification document will be notified prior to implementation. Otherwise, items will be modified without notification.

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No	I/F Terminal
01	YU
02	XR
03	YD
04	XL
05	GND
06	GND
07	VSYNC
08	HSYNC
09	DE
10	GND
11	PCLK
12	GND
13	B0
14	B1
15	B2
16	B3
17	B4
18	B5
19	GND
20	G0
21	G1
22	G2
23	G3
24	G4
25	G5
26	GND
27	R0
28	R1
29	R2
30	R3
31	R4
32	R5
33	GND
34	XRESET
35	XCS
36	SCLK
37	DIN
38	NC
39	GND
40	VDDI(1.8V)
41	VDDI(1.8V)
42	VDD(2.8V)
43	VDD(2.8V)
44	LED_K
45	LED_A

Dimension	Tolerance
6m.≤5	±0.10
5≤dim.≤15	±0.15
15≤dim.≤30	±0.20
30<dim.	±0.30

NOTES:
1. Cosmetic imperfection will be allowed outside the V.A(Viewing Area).
2. FPC terminal connecter:FH26-45S-0.3SHW(05)(HRS)
3. As a preventive method of ESD, the metal frame shall be connected with Handset's GND plane.
4. Module thickness is measured in the pressed state. (No backlash)
5. Please suppress the outside of Double-Sided Tape Boundary when suppressing it with the frame and components.
6. Protection foil is on T/P before assembly peel off this film.
7. ( ):Reference dimension.
8. Kapton tape thickness : 0.055mm
9. Module thickness is measured in the pressed state.
· Measurement tool : Vernier (Code No.573-121-10)

Stamp area

Metal Frame–GND contact
(Stiffener)
Guide line(Cu)
(Rib)
(Dent)
(Kapton tape area)
MetalFrame Opening and Soldering area

480(x 3)x 640PIXELS
PIXELPITCH(0.0885x 0.0885)
VIEWING DIRECTION(6H)

(Projection)
(Double-Sided Tape Boundary)
(Metal Frame(=V.A))
(T/P A.A)
(A.A)

Contact Side

Detail view of A (S=5:1)

(plating lead)