DEVETECH ELECTRONICS CO. LTD

TFT 10,1” LVDS 18/24 BITS
CUSTOMER: DACHS ELECTRONICA
P/N: DVR10140285CP18-1

DESIGNED BY	
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Document revision history				
Change Nº	Date	Subject and reason	Version Nº	Responser
1	2012.01.20	New	01	

1.0 General description

1.1 Introduction

HSD Display model FRD10140285CP18A is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel and a driving circuit. This TFT LCD has a 10.1 (16:9) inch diagonally measured active display area with 1024 horizontal by 600 vertical pixel resolution.

1.2 Features

10.1 (16:9 diagonal) inch configuration
Compatible with NTSC & PAL system
Image revision: UP/DOWN and LEFT/RIGHT
ROHS design

1.3 General information

Item	**Specification**	**Unit**
Outline dimension	234.9 (H) x 142.8 (V) x 5.0 (D)	mm
Display area	222.72 (H) x 125.28 (V)	mm
Number of pixel	1024 RGB (H) X 600 (V)	Pixels
Pixel pitch	0.2178 (H) x 0.2088 (V)	mm
Pixel arrangement	RGB vertical stripe	
Display mode	Normally white	
Color filter array	RGB vertical stripe	
Backlight	White LED	
Weight	TBD	g

2.0 Absolute maximum ratings

2.1 Electrical absolute rating

2.1.1 TFT LCD module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	DV_{DD}	-0.3	5.0	V	GND=0
	AV_{DD}	6.5	13.5	V	AGND=0
	V_{COM}	3.44	3.62	V	
Analog signal input level	V_R, V_G, V_B	-0.2	AV_{DD}+0.2	V	
Logic signal input level	V_I	-0.3	5.0	V	

Note(1): Stresses above those listed under "Absolute maximum rating" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at indicated in the operational sections (6.1) of this specification.

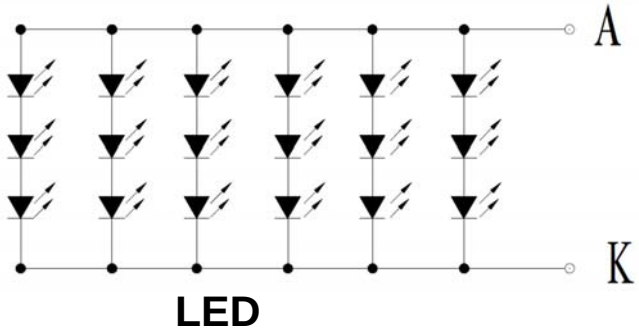
2.2 Environment absolute rating

Item	Symbol	Min.	Max.	Unit	Note
Operating temperature	Topa	-10	60	ºC	
Storage temperature	Tstg	-20	70	ºC	

2.3 Back-light unit

Parameter	Sym.	Min.	Typ.	Max.	Unit	Test condition	Note
LED Current	IF	-	120	-	mA	-	-
LED Voltage	VF	9	9.9	10.5	V	-	-
Life time		-	25000	-	Hr	I≤120mA	-
Color	White						

Note(1)Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.
Note(2)Ta=25±2ºC
Note(3)Test condition: LED current 120mA



LED

3.0 Optical characteristics

3.1 Optical specification

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥10)	θ_L	Φ=180º(9 o'clock)	40	45	-	degree	Note 1
	θ_R	Φ=0º(3 o'clock)	40	45	-		
	θ_T	Φ=90º(12 o'clock)	10	15	-		
	θ_B	Φ=270º(6 o'clock)	30	35	-		
Response time	T_{ON}	Normal θ=Φ=0º	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	C_R		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		210	250	-	cd/m^2	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test conditions :

1. V_{CC}=3.3V, I_L=220mA (Backlight current), the ambient temperature is 25ºC.
2. The test systems refer to Note 2.

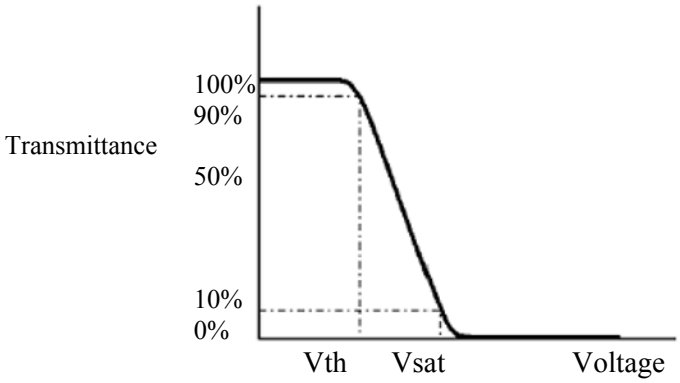
3.2 Measuring condition

- Measuring surrounding: dark room
- Ambient temperature: 25±2ºC
- 30min. warm-up time.

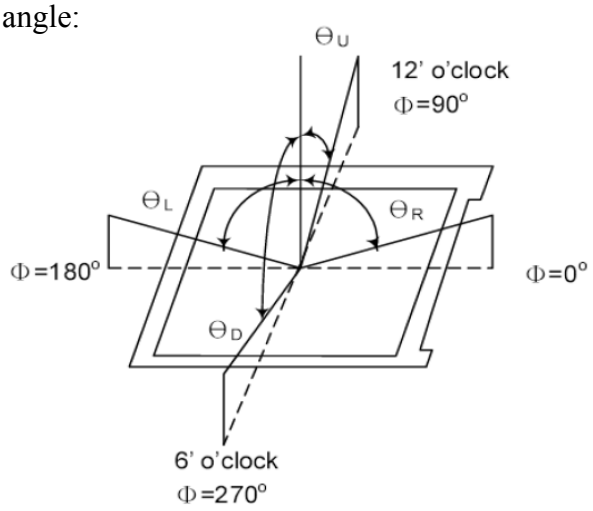
3.3 Measuring equipment

- TOPCON BM-7
- Measuring spot size: field 2º

Note 1: Definition of Vsat and Vth (at 20ºC)



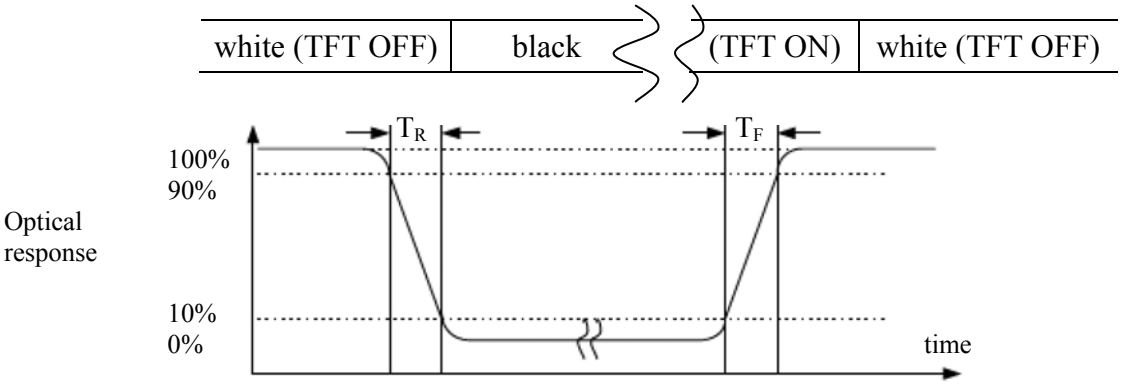
Note 2: Definition of viewing angle:



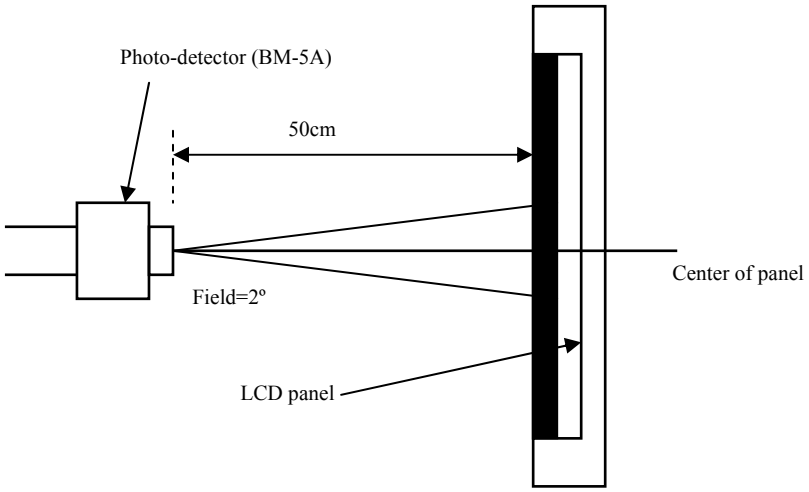
Note 3: Definition of Contrast Ratio (CR):
Measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

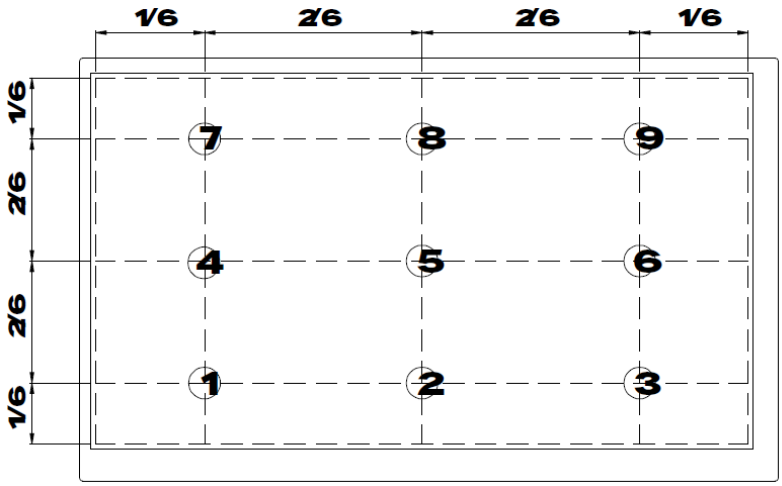
Note 4: Definition of Response Time: Sum of T_R and T_F



Note 5: Definition of optical measurement setup



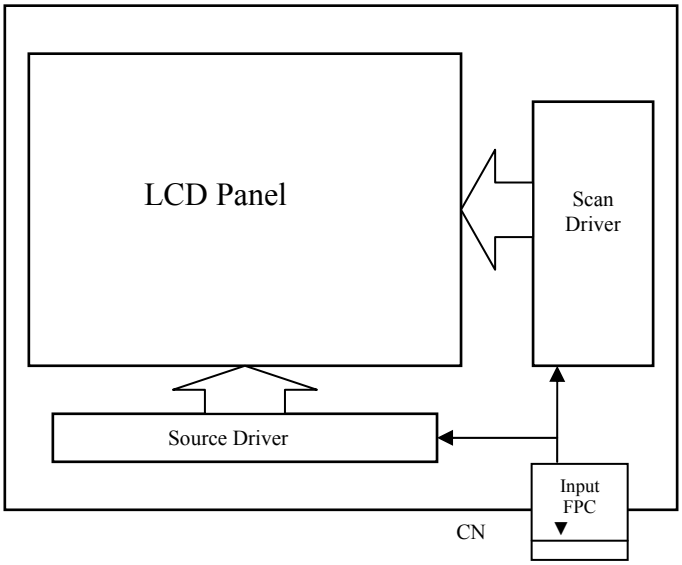
Note 6: Definition of brightness uniformity



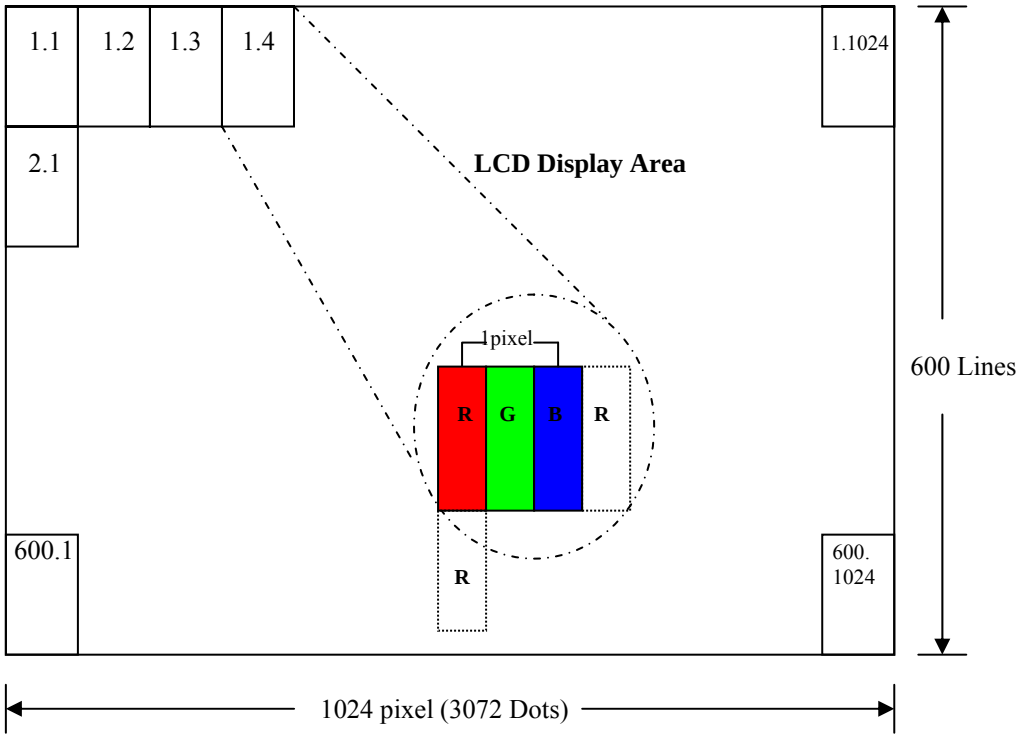
Note 7: Rubbing direction. The different rubbing direction will cause the different optima view direction.

4.0 Block diagram

4.1 TFT LCD Module



4.2 Pixel format



4.3 Relationship between displayed color and input

4.3.1 6bit

	Display	MSB LSB R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	Gray scale level
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	-
	Light blue	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↕ Light	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:						:						:						L3...L60
		H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L62
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↕ Light	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L2
		:						:						:						L3…L60
		L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61
		L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L62
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	GreenL63
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↕ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:						:						:						L3…L60
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L61
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L62
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	BlueL63
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↕ Light	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L1
		L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L	L2
		:						:						:						L3…L60
		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L61
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L62
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	WhiteL63

4.3.2 8bit

	Display	MSB LSB R7 R6 R5 R4 R3 R2 R1 R0	MSB LSB G7 G6 G5 G4 G3 G2 G1 G0	MSB LSB B7 B6 B5 B4 B3 B2 B1 B0	Gray scale level
Basic color	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	-
	Blue	L L L L L L L L	L L L L L L L L	H H H H H H H H	-
	Green	L L L L L L L L	H H H H H H H H	L L L L L L L L	-
	Light blue	L L L L L L L L	H H H H H H H H	H H H H H H H H	-
	Red	H H H H H H H H	L L L L L L L L	L L L L L L L L	-
	Purple	H H H H H H H H	L L L L L L L L	H H H H H H H H	-
	Yellow	H H H H H H H H	H H H H H H H H	L L L L L L L L	-
	White	H H H H H H H H	H H H H H H H H	H H H H H H H H	-
Gray scale of Red	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark ↕ Light	L L L L L L L H	L L L L L L L L	L L L L L L L L	L1
		L L L L L L H L	L L L L L L L L	L L L L L L L L	L2
		:	:	:	L3...L251
		H H H H H H L L	L L L L L L L L	L L L L L L L L	L252
		H H H H H H L H	L L L L L L L L	L L L L L L L L	L253
		H H H H H H H L	L L L L L L L L	L L L L L L L L	L254
	Red	H H H H H H H H	L L L L L L L L	L L L L L L L L	Red L255
Gray scale of Green	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark ↕ Light	L L L L L L L L	L L L L L L L H	L L L L L L L L	L1
		L L L L L L L L	L L L L L L H L	L L L L L L L L	L2
		:	:	:	L3…L251
		L L L L L L L L	H H H H H H L L	L L L L L L L L	L252
		L L L L L L L L	H H H H H H L H	L L L L L L L L	L253
		L L L L L L L L	H H H H H H H L	L L L L L L L L	L254
	Green	L L L L L L L L	H H H H H H H H	L L L L L L L L	GreenL255
Gray scale of Blue	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark ↕ Light	L L L L L L L L	L L L L L L L L	L L L L L L L H	L1
		L L L L L L L L	L L L L L L L L	L L L L L L H L	L2
		:	:	:	L3…L251
		L L L L L L L L	L L L L L L L L	H H H H H H L L	L252
		L L L L L L L L	L L L L L L L L	H H H H H H L H	L253
		L L L L L L L L	L L L L L L L L	H H H H H H H L	L254
	Blue	L L L L L L L L	L L L L L L L L	H H H H H H H H	BlueL255
Gray scale of White & Black	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark ↕ Light	L L L L L L L H	L L L L L L L H	L L L L L L L H	L1
		L L L L L L H L	L L L L L L H L	L L L L L L H L	L2
		:	:	:	L3…L251
		H H H H H H L L	H H H H H H L L	H H H H H H L L	L252
		H H H H H H L H	H H H H H H L H	H H H H H H L H	L253
		H H H H H H H L	H H H H H H H L	H H H H H H H L	L254
	White	H H H H H H H H	H H H H H H H H	H H H H H H H H	WhiteL255

5.0 Interface Pin Connection

5.1 FPC pin assignment for notebook application. (This is for customers who will use LED pad to the light bar of backlight).

FPC connector is used for electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin Nº	Signal	Description
1	VCOM	Common Voltage
2	VDD	Power Voltage for digital circuit
3	VDD	Power Voltage for digital circuit
4	NC	No connection
5	Reset	Global reset pin
6	STBYB	Standby mode. Normally pulled high STBYB="1", normal operation STBYB="0", timing controller, source driver will turn off, all output are High-Z
7	GND	Ground
8	RXIN0-	-LVDS differential data input
9	RXIN0+	+LVDS differential data input
10	GND	Ground
11	RXIN1-	-LVDS differential data input
12	RXIN1+	+LVDS differential data input
13	GND	Ground
14	RXIN2-	-LVDS differential data input
15	RXIN2+	+LVDS differential data input
16	GND	Ground
17	RXCLKIN-	-LVDS differential clock input
18	RXCLKIN+	+LDVS differential clock input
19	GND	Ground
20	RXIN3-	-LVDS differential data input
21	RXIN3+	+LVDS differential data input
22	GND	Ground
23	NC	No connection
24	NC	No connection
25	GNC	Ground
26	NC	No connection
27	NC	No connection
28	SELB	6bit/8bit mode selection
29	AVDD	Power for Analog Circuit
30	GND	Ground
31	LED-	LED Cathode

Pin Nº	Signal	Description
32	LED-	LED Cathode
33	L/R	Horizontal inversion
34	U/D	Vertical inversion
35	VGL	Gate OFF Voltage
36	NC	No connection
37	NC	No connection
38	VGH	Gate ON Voltage
39	LED+	LED Anode
40	LED+	LED Anode

I: input O: output P: Power

Note (1): If LVDS input data is 6 bits, SELB must be set to High;
If LVDS input data is 8 bits, SELB must be set to Low.
Note (2): When L/R="0", set right to left scan direction.
When L/R="1", set left to right scan direction.
When U/D="0", set top to bottom scan direction.
When U/D="1", set bottom to top scan direction.

5.2 FPC pin assignment for portable DVD application. (This is for customers who not use LED pad to connect to the light bar of backlight).

FPC connector is used for electronics interface. The recommend model is FH12A-40S-0.5SH manufactured by Hirose.

Pin Nº	Signal	Description
1	VCOM	Common Voltage
2	VDD	Power Voltage for digital circuit
3	VDD	Power Voltage for digital circuit
4	NC	No Connection
5	Reset	Global reset pin
6	STBYB	Standby mode, normally pulled high STBYB="1", normal operation STBYB="0", timing controller, source driver will turn off, all output are High-Z
7	GND	Ground
8	RXIN0-	-LVDS differential data input
9	RXIN0+	+LVDS differential data input
10	GND	Ground
11	RXIN1-	-LVDS differential data input
12	RXIN1+	+LVDS differential data input
13	GND	Ground

Pin Nº	Signal	Description
14	RXIN2-	-LVDS differential data input
15	RXIN2+	+LVDS differential data input
16	GND	Ground
17	RXCLKIN-	-LVDS differential clock input
18	RXCLDIN+	+LVDS differential clock input
19	GND	Ground
20	RXIN3-	-LVDS differential data input
21	RXIN3+	+LVDS differential data input
22	GND	Ground
23	NC	No Connection
24	NC	No Connection
25	GNC	Ground
26	NC	No Connection
27	NC	No Connection
28	SELB	6bit/8bit mode selection
29	AVDD	Power for Analog Circuit
30	GND	Ground
31	NC	NC
32	NC	NC
33	L/R	Horizontal inversion
34	U/D	Vertical inversion
35	VGL	Gate OFF Voltage
36	NC	No Connection
37	NC	No Connection
38	VGH	Gate ON Voltage
39	NC	NC
40	NC	NC

I: input O: output P: Power

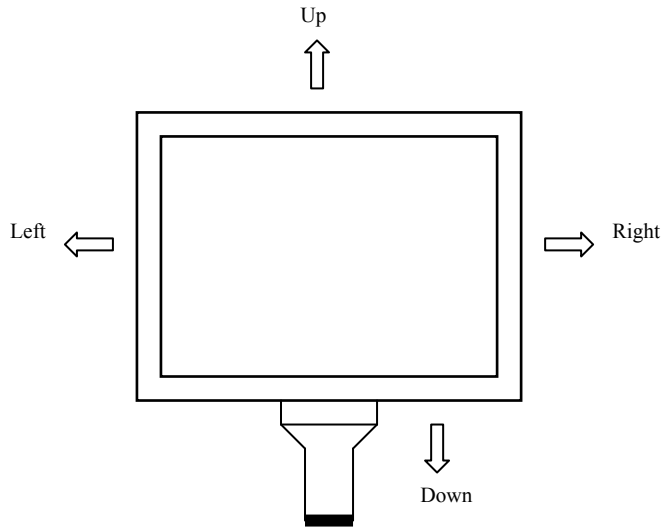
Note (1): If LVDS input data is 6 bits, SELB must be set to High;
If LVDS input data is 8 bits, SELB must be set to Low.

Note (2): When L/R=”0”, set right to left scan direction.
When L/R=”1”, set left to right scan direction.
When U/D=”0”, set top to bottom scan direction.
When U/D=”1”, set bottom to top scan direction.

Note (4): Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV_{DD}	Up to down, left to right
DV_{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV_{DD}	DV_{DD}	Down to up, left to right

Note (5): Definition of scanning direction.
Refer to the figure as bellow.



Note (6): Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note (7): Dithering function enable control, normally pull high.
When DITHB=”1”, Disable internal dithering function.
When DITHB=”0”, Enable internal dithering function.

Note(1) Selection of scanning mode (please refer to the following table)

Setting of scan control input		**IN/OUT state for start pulse**				**Scanning direction**
U/D	L/R	STVD	STVU	STHR	STHL	
GND	DV_{DD}	output	input	output	input	up to down, and from left to right
DV_{DD}	GND	input	output	input	output	down to up, and from right to left
GND	GND	output	input	input	output	up to down, and from right to left
DV_{DD}	DV_{DD}	input	output	output	input	down to up, and from left to right

Note(2) MOD=H: Simultaneous sampling. (Please check CPH2 and CPH3 to GND when MOD=H).
MOD=L: Sequential sampling.

6. Electrical characteristics

6.1 TFT LCD Module

Item	**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Supply Voltage	DV_{DD}	3.0	3.3	3.6	V	
	V_{GH}	14.55	15	15.45	V	
	V_{GL}	-7.25	-6.9	-6.25	V	
	AV_{DD}	8.722	8.9	9.08	V	
Video signal amplitude (VR, VG, VB)	V_{IA}	-	-	AV_{DD}-0.4	V	
	V_{IAC}	-	-	-	V	AC component
	V_{IDC}	-	AV_{DD}/2	-	V	DC component
VCOM	V_{CAC}		-	-	VP-P	AC component
	V_{CDC}	-	-	-	V	DC component,(1)
Input signal voltage	V_{IH}	0.7DV_{DD}	-	DV_{DD}	V	(2)
	V_{IL}	0	-	0.3DV_{DD}	V	(2)
Current of power supply	I_{DD}	-	-		mA	DV DD=3.3V
	I_{ADD}	-	-		mA	AV_{DD}=5V
	I_{GH}	-	-		uA	V_{GH}=15V
	I_{GL}	-	-		mA	V_{GL}=-10V

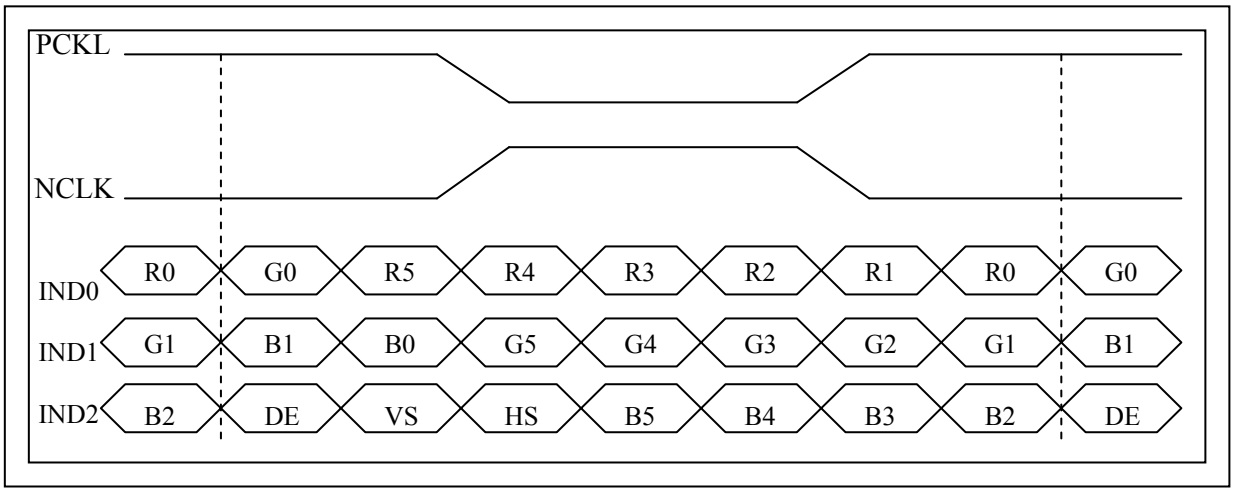
Note(1): The brightness of LCD panel could be changed by adjusting the AC component of VCOM.
Note(2): STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D

6.2 Switching characteristics for LVDS Receiver

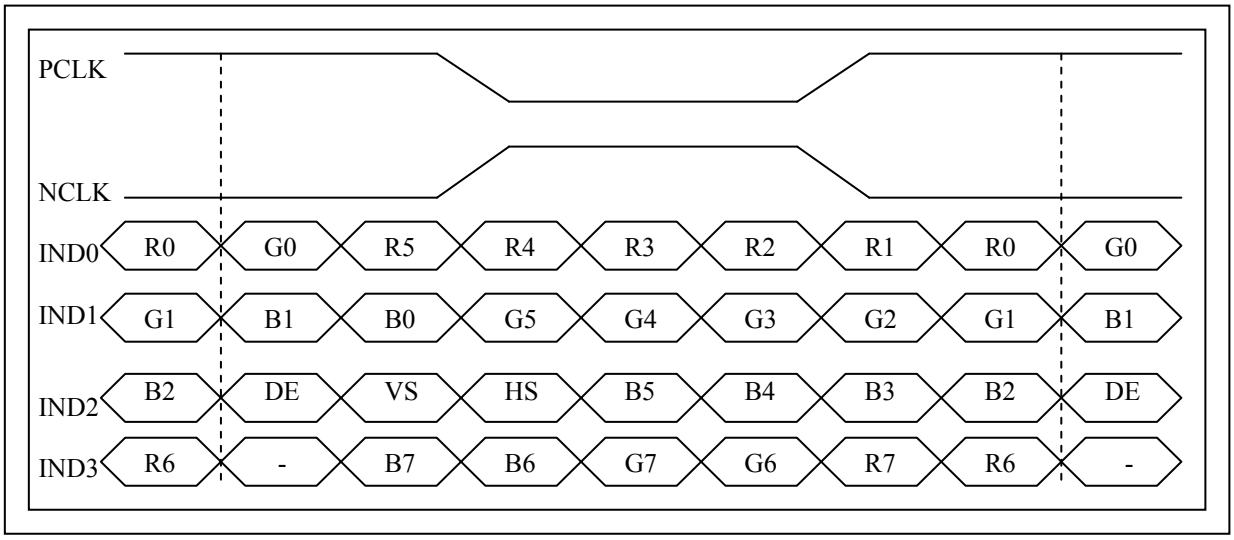
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	-	-	100	mV	V_{CM}=1.2V
Differential Input Low Threshold	Vtl	-100	-	-	mV	
Input Current	I_{IN}	-10	-	+10	uA	
Differential input Voltage	$\|V_{ID}\|$	0.1	-	0.6	V	
Common Mode Voltage Offset	V_{CM}	0.7	1.2	1.6	V	

6.3 Bit LVDS input

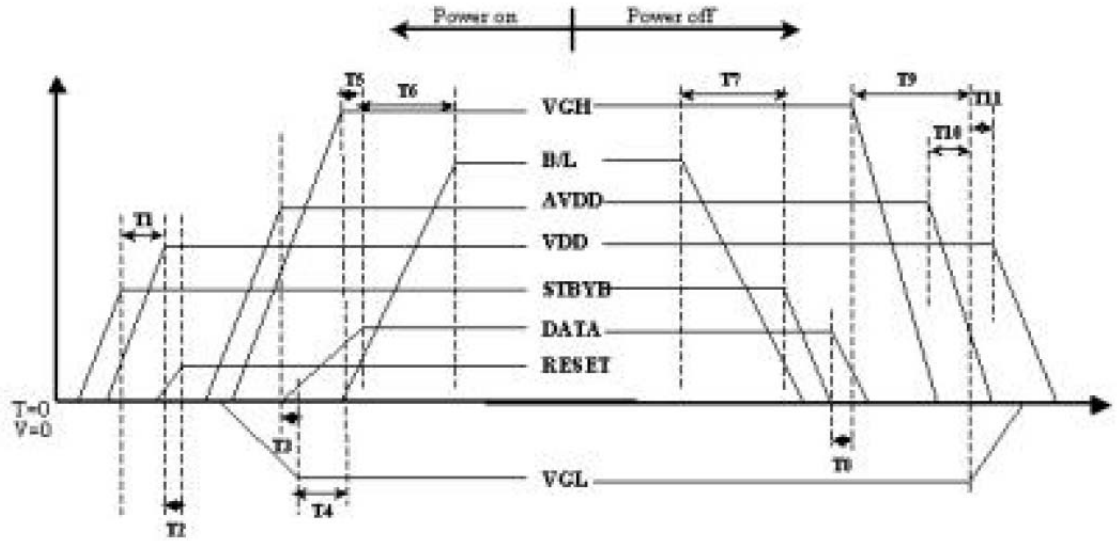
6.3.1 6bit LVDS input



6.3.2 8bit LVDS input



6.4 Power On/Off Sequence



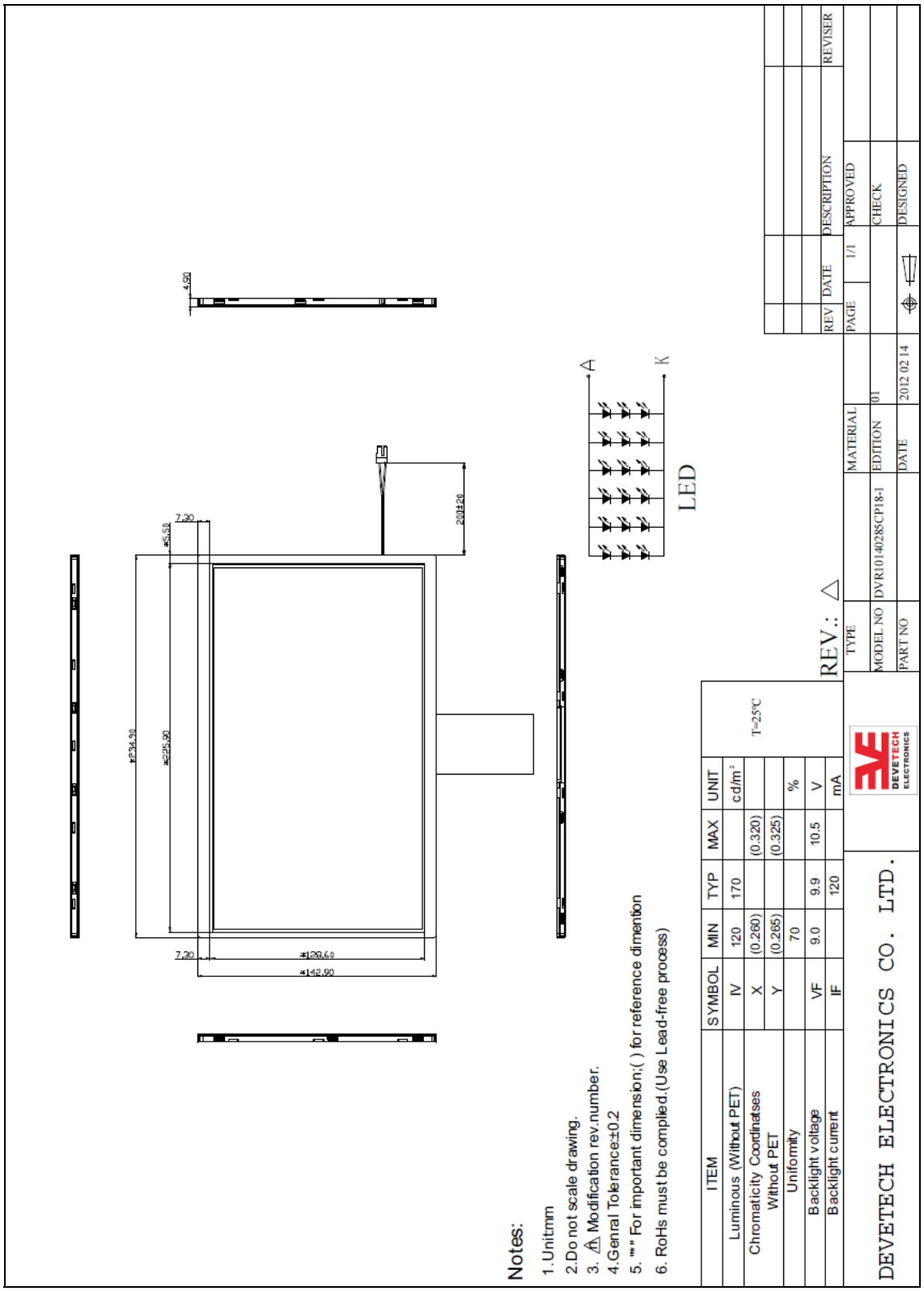
Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3ºC, typical IL value indicated in the above table until the brightness becomes less than 50%.

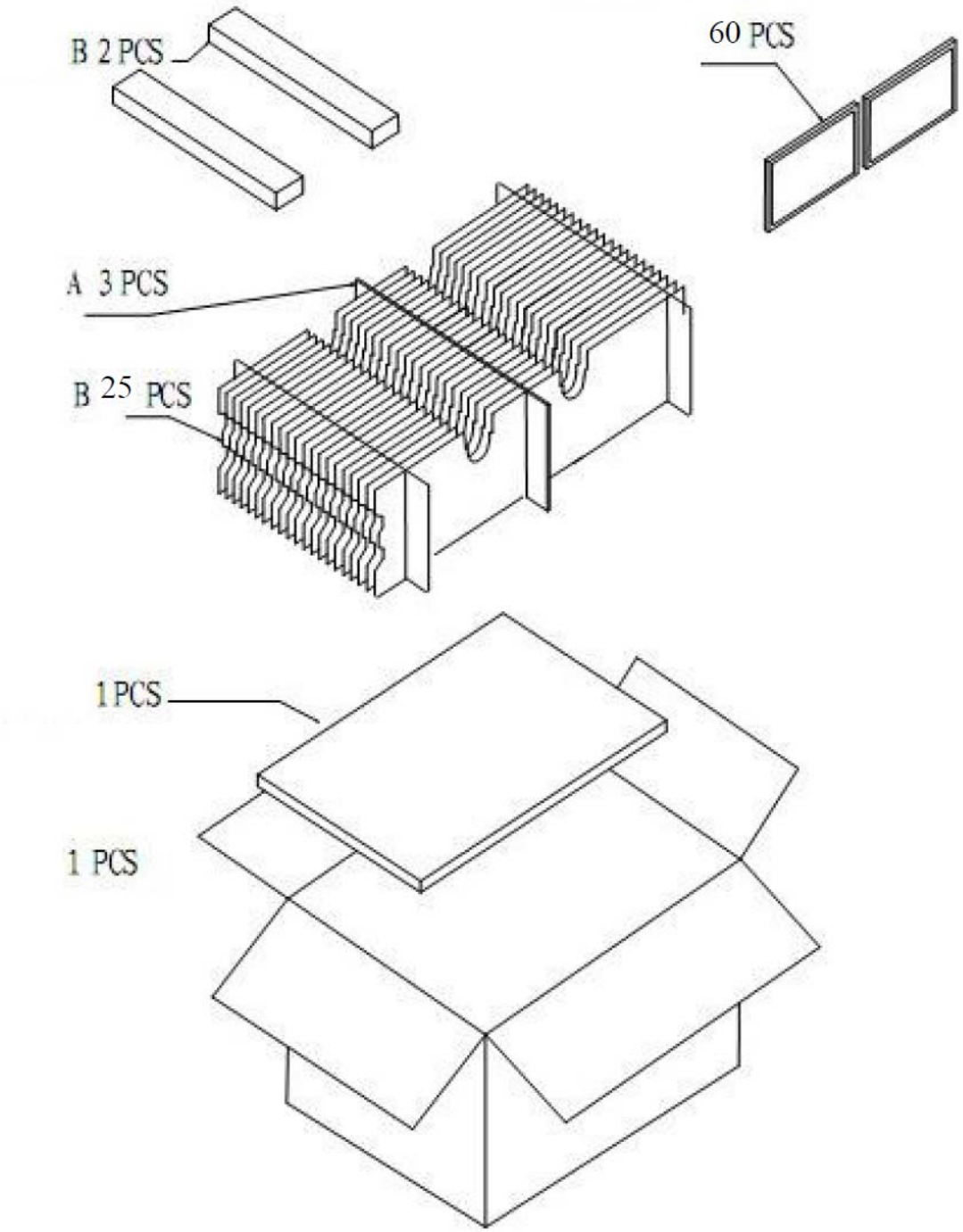
7.0 Reliability test items

NO	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70ºC, 240hrs	
2	Low Temperature Storage	Ta=-20ºC, 240hrs	
3	High Temperature Operation	Ta=+60ºC, 240hrs	
4	Low Temperature Operation	Ta=-10ºC, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60ºC, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-20ºC(0.5hr)→+70ºC(0.5hr),200cycles	
7	Vibration	1.Random:1.04G,10-500Hz,X,Y,Zdirection 30min/each direction 2.Sweep sine:1.5G, 5~500Hz,X/Y/Z,30min/each direction	
8	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10(condition A)
9	Vibration (with carton)	1.Random:1.04Grms, 10-500Hz, X/Y/Z 45min/each direction Fixed:5Hz, 1.5Grms, X/Y/Z 45min/each direction	
10	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202
11	Electrostatic Discharge	±200V, 200PF, 0Ω1 time/each terminal	

Note: All tests above are practiced at module type.
There is no display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.


4.50
7.20
5.50
234.30
226.90
7.20
129.60
142.90
200±20
A
K
LED
Notes:
1. Unitmm
2.Do not scale drawing.
3. ⚠ Modification rev.number.
4.Genral Tolerance±0.2
5. "*" For important dimension;( ) for reference dimention
6. RoHs must be complied.(Use Lead-free process)
REV.: △
ITEM
SYMBOL
MIN
TYP
MAX
UNIT
Luminous (Without PET)
IV
120
170
cd/m²
Chromaticity Coordinatses Without PET
X
(0.260)
(0.320)
Y
(0.265)
(0.325)
Uniformity
70
%
Backlight voltage
VF
9.0
9.9
10.5
V
Backlight current
IF
120
mA
T=25°C
DEVETECH ELECTRONICS CO. LTD.
TYPE
MODEL NO
DVR10140285CP18-1
PART NO
MATERIAL
EDITION
01
DATE
2012.02.14
PAGE
1/1
REV
DATE
DESCRIPTION
APPROVED
CHECK
DESIGNED
REVISER

9.0 Packing form



10.0 General precaution

10.1 Use restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Assembly Precaution

10.2.1 Please use the mounting hole on the module side in installing and do not bending or wrenching LCK in assembling. And please do not drop, bend or twist LCD module in handling.
10.2.2 Please design display housing in accordance with the following guide lines.
10.2.2.1 Housing case must be destined carefully so as no to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.
10.2.2.2 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
10.2.3 Please do not push or scratch LCD panel surface with anything hard. And do no soli LCD panel surface by touching with bare hands. (Polarized film, surface of LCD panel is easy to be flawed).
10.2.4 Please do not press any parts of the rear side such as source IC, gate IC and FPC during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
10.2.5 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
10.2.6 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
10.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

10.3 Disassembling or modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module and may cause scratches or dust on the display. Devetech does not warrant the module if customers disassemble or modify the module.

10.4 Breakage of LCD Panel

10.4.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
10.4.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
10.4.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
10.4.4 Handle carefully with chips of glass that may cause injury when the glass is broken.

10.5 Absolute maximum ratings and power protection circuit

10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts, parameters, environmental temperature, etc., otherwise LCD module may be damaged.
10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
10.5.3 It's recommended employing protection circuit for power supply.

10.6 Operation

10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
10.6.3. Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

10.7 Static electricity

10.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
10.7.2 Because LCD module uses CMOS-IC on TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.
10.7.3 Persons who handle the module should be grounded through adequate methods.

10.8 Disposal

When disposing LCD module, obey the local environmental regulations.

10.9 Others

10.9.1 A strong incident light into LCD panel might cause display characteristics, changing inferior because of polarizer film, color filter and other materials becoming inferior.
Please do not expose LCD module direct sunlight land strong UV rays.
10.9.2 Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
10.9.3 For the packaging box, please pay attention to the followings:
10.9.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
10.9.3.2 Please do not pile them up more than 6 boxes. (They are not designed so). And please do not turn over.
10.9.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
10.9.3.4 Packing box and inner case for LCDs are made of cardboard, so please, pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet).