Microtips TECHNOLOGY

Model No: UMO-P076MD-T

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Revision record

Document Revision	Model No. Version No.	Description	Revision by
0	UMO-P076MD-T Version No. 0		C.K.T. Chen Zi Xin Ou 24-Nov-2015
1	UMO-P076MD-T Version No. 0	Change the connector type from FP270H-031 to FH35C-31S-0.3SHW(50)	C.K.T. Chen Zi Xin Ou 19-Feb-2016
2	UMO-P076MD-T Version No. 0	Modify 8.4. Standard of visual inspection.	QA May-26-2016

CONTENTS:

1. BASIC SPECIFICATION

1.1 Mechanical specifications

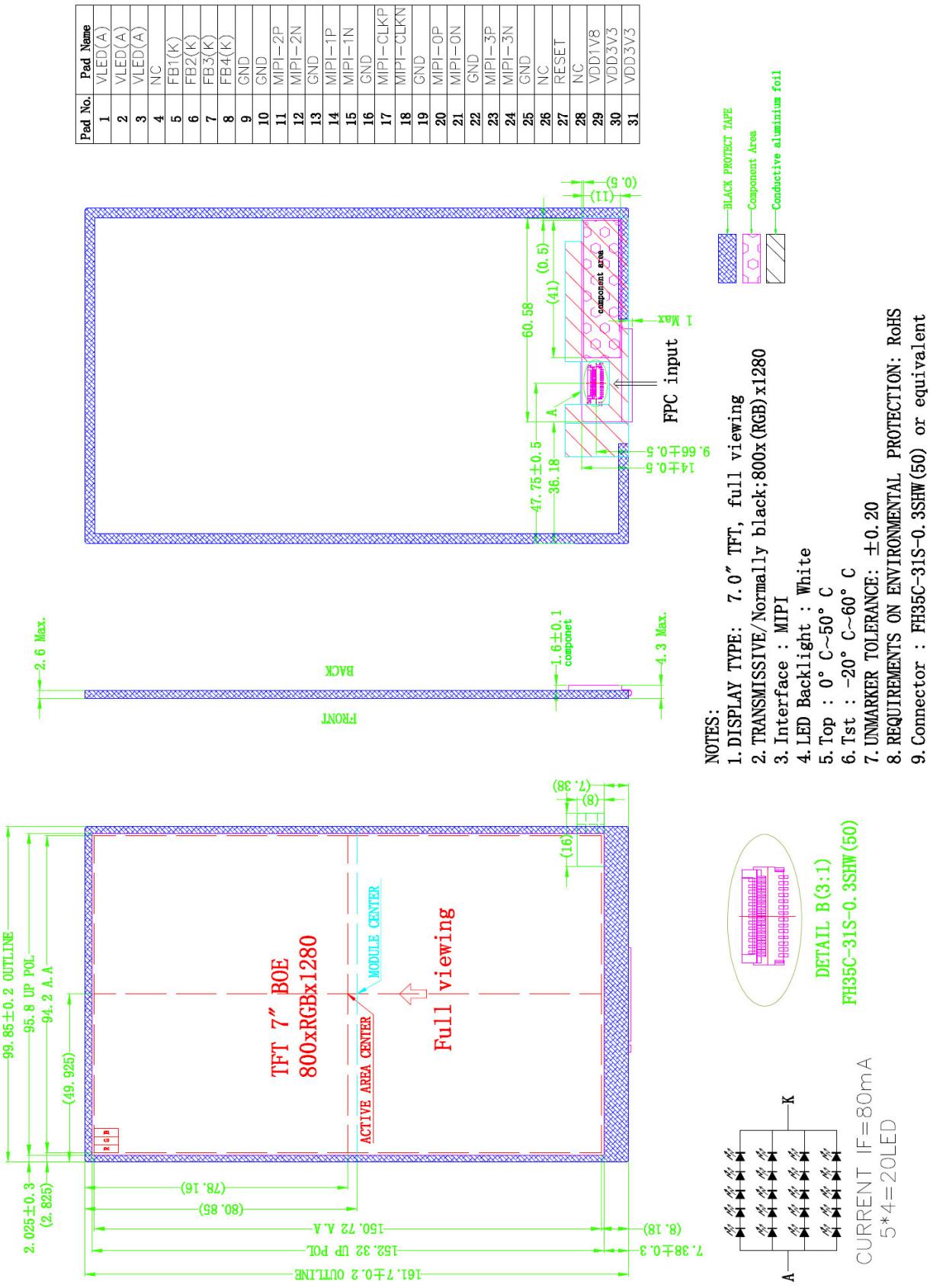
Items	Nominal Dimension	Unit
Active screen size	7.0''TFT	-
Dot Matrix	800 x R.G.B. x 1280	Pixel
Module Size (W×H×T)	99.85 x 161.7 x 2.6	mm.
Active Area (W×H)	94.2 x 150.72	mm.
Pixel Size (W×H)	0.11775 (H) x 0.11775 (V)	mm.
Color depth	16.7M	Color
Interface	MIPI interface	-
Driving IC Package	COG	-
Module weight	90±10%	g

1.2 Display specification

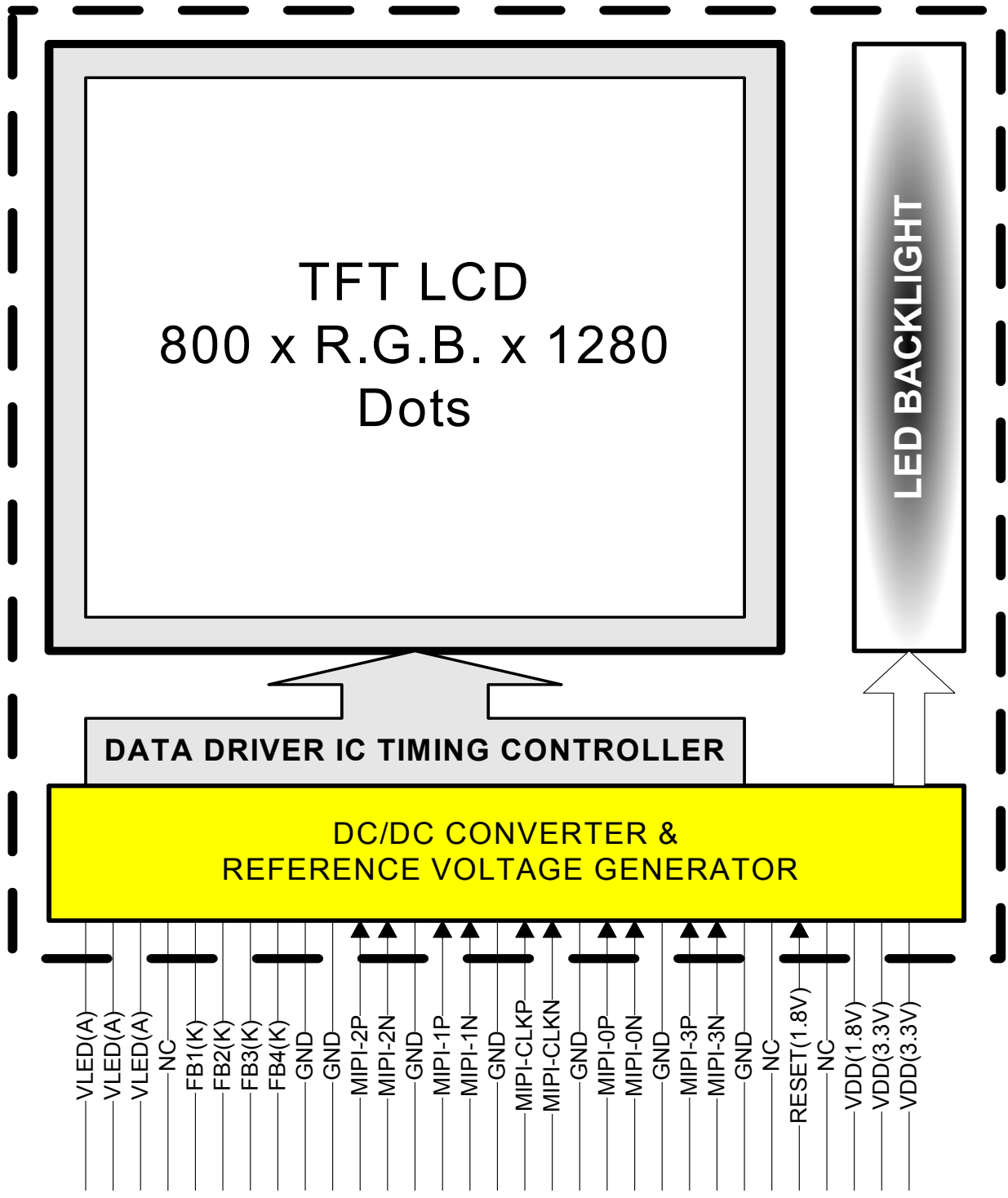
Display	Descriptions	Note
LCD Type	a-si TFT active matrix	-
LCD Mode	TN/ Normally Black	-
Polarizer Mode	Transmissive	-
Polarizer Surface	Normal	-
Pixel arrangement	RGB vertical stripe	-
Backlight Type	LED	-
Surface Treatment	Anti-Glare	-
Viewing Direction	Free	-

*Color tone is slightly changed by temperature and driving voltage.

1.3 Outline dimension



1.4 Block diagram:



1.5 Interface Pin Connection:

Pin No.	Pin Symbol	I/O	Description
1~3	VLED(A)	P	Power for LED backlight (Anode)
4	NC	-	No connection
5	FB1(K)	P	Power for LED backlight (Cathode)
6	FB2(K)	P	Power for LED backlight (Cathode)
7	FB3(K)	P	Power for LED backlight (Cathode)
8	FB4(K)	P	Power for LED backlight (Cathode)
9~10	GND	P	Ground
11	MIPI-2P	I	MIPI data positive signal
12	MIPI-2N	I	MIPI data negative signal
13	GND	P	Ground
14	MIPI-1P	I	MIPI data positive signal
15	MIPI-1N	I	MIPI data negative signal
16	GND	P	Ground
17	MIPI-CLKP	I	MIPI CLK positive signal
18	MIPI-CLKN	I	MIPI CLK negative signal
19	GND	P	Ground
20	MIPI-0P	I	MIPI data positive signal
21	MIPI-0N	I	MIPI data negative signal
22	GND	P	Ground
23	MIPI-3P	I	MIPI data positive signal
24	MIPI-3N	I	MIPI data negative signal
25	GND	P	Ground
26	NC	-	No connection
27	RESET(1.8V)	I	Chip reset pin
28	NC	-	No connection
29	VDD1	P	A power supply for the logic power and I/O circuit. VDD1=1.65 to 2.0V.
30~31	VDD3	P	A power supply for the analog power. VDD3=3.0V to 3.6V.

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power Supply Voltage	VDD1	-0.3	+3.6	V
	VDD3	-0.3	+5.0	
Input Voltage	VIH	0.7*VDD1	VDD1	V
	VIL	0	0.3*VDD1	
Operate temperature range	TOP	0	50	℃
Storage temperature range	TST	-20	60	℃

2.2 DC Characteristics:

Typical Operation Conditions

(Note 1) T_a= 25℃

Items	Symbol	Min.	Ty .	Max.	Unit
Power Supply Voltage	VDD1	1.65	1.8	2.0	V
	VDD3	3.0	3.3	3.6	V

Current Consumption

(Note 1) T_a= 25℃

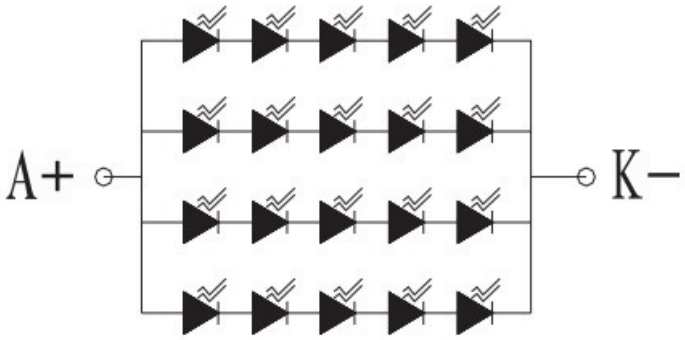
Items	Symbol	Mi .	Typ.	Max	Unit
Current for Driver	IVDD1	-	10	-	mA
	IVDD3	-	97	-	mA

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

2-3 Back-light only Specification :

PARAMETER	Symbol	MIN	TYP	MAX	Unit	Note
LED Light Bar Power Supply Voltage	VL	14.5	16.5	17.5	V	Total LED
LED Light Bar Power Supply Current	IL	-	80	-	mA	IF=80mA
Reverse current	IR	-	-	50	uA	VR=5V,1LED
Peak forward current	IFP		100		mA	Total LED
Power Consumption	PL	-	1.4		W	1LED
LED Life Time	LBL	-	15000	-	Hrs	1LED

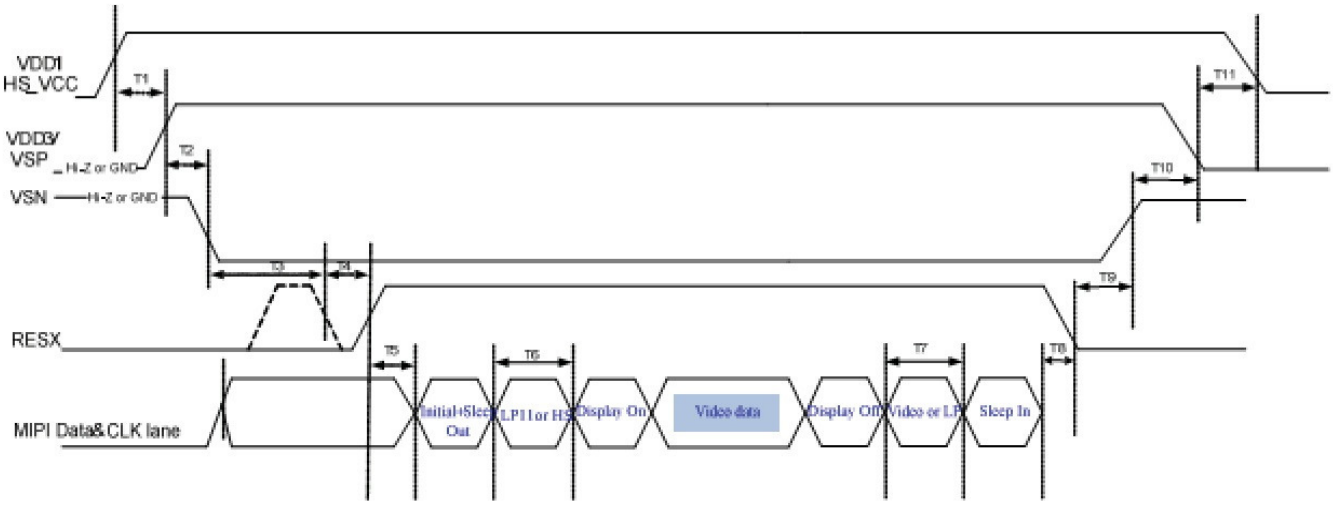
※1. Internal Circuit Diagram



CURRENT IF=80mA

5*4=20LED

2.4 POWER ON/OFF SEQUENCE



Power On			
	Min	Max	Unit
T1	1		ms
T2	1		ms
T3	1		ms
T4	10		ms
T5	180		ms
T6	180		ms

Power Off			
	Min	Max	Unit
T7	50		ms
T8	50		ms
T9	10		ms
T10	1		ms
T11	1		ms

2-5 INITIAL CODE

RB9 FF 83 94
RB1 64 10 30 44 34 11 F1 81 70 D9 34 80 C0 D2 1F
RB2 45 64 0F 09 40 1C 08 08 1C 4D 00 00
RB4 00 FF 18 60 60 60 00 00 01 30 04 68 18 60 60 60 00 00 01 30 04 68
RB6 40 40
RCC 01
RD3 00 08 00 01 07 00 08 32 10 0A 00 05 00 20 0A 05 09 00 32 10 08 00 11 11 0D 07 23 0D 07 47 0D 08
RD5 01 01 01 01 00 00 00 00 03 03 03 03 02 02 02 02 20 20 18 18 18 18 18 18 18 18 18 18 18 21 21 18 18 18 18 18 18 18 18 18 18 18 18
RE0 01 09 0B 26 2A 2E 14 34 05 09 0B 16 0E 12 14 12 14 07 13 15 17 01 09 0B 26 2A 2E 14 34 05 09 0B 16 0E 11 14 12 14 07 13 15 17
RD9 00 01 02 07 0C
R11
R29

2-6 DC ELECTRICAL CHARACTERISTIC

(VDD3=2.5 ~ 3.6V, VDD1=1.65~3.6V, T_A=-40 ~ 85 °C)

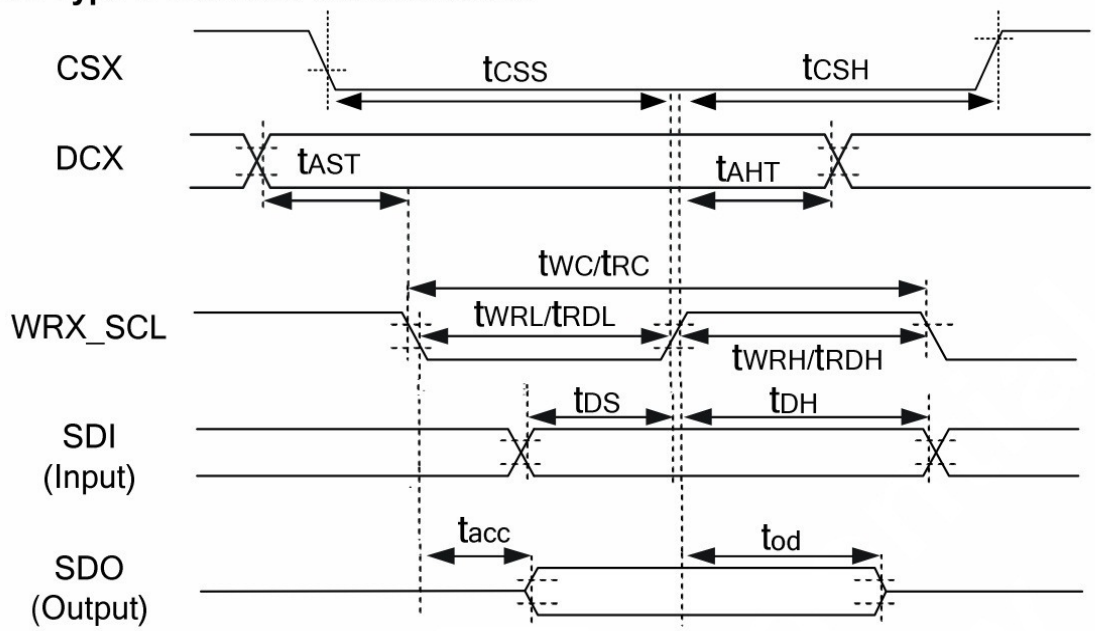
Item	Symbol	Unit	Test Condition	Min.	Typ.	Max.	Note
Input high voltage	V_{IH}	V	VDD1= 1.65 ~ 3.6V VDD3= 2.5 ~ 3.6V	0.7 V_{DD1}	-	VDD1	
Input low voltage	V_{IL}	V		0	-	0.3 V_{DD1}	
VPP	V_{IH}	V	VPP	7.25	7.5	7.75	Note1
	V_{IL}	V					
Output high voltage (SDO, CABC_PWM_OUT)	V_{OH1}	V	I_{OH} = -1.0 mA	0.8 V_{DD1}	-	VDD1	
Output low voltage (SDO, CABC_PWM_OUT)	V_{OL1}	V	VDD1= 1.65 ~ 3.6V I_{OL} = 1.0 mA	0	-	0.2 V_{DD1}	
Logic High level input current	I_{IH}	uA	VSYNC, HSYNC	-	-	1	
			RESX, DCX, CSX, SCL	-	-	1	
	I_{IHD}	uA	DB[23:0], SDI, DCX	-	-	1	
			DB[23:0]	-	-	1	
Logic Low level input current	I_{IL}	uA	VSYNC, HSYNC	-1	-		
			RESX, DCX, CSX, SCL	-1	-		
	I_{ILD}	uA	DB[23:0], SDI, DCX	-1	-		
			DB[23:0]	-1	-		
Current consumption standby mode (VDD3-VSSA)	$I_{ST(VDD)}$	µA	VDD3/HS_VCC=2.8V, VDD1=1.8V T_A =25°C (DSI Ultra Low Power mode)	-	10	30	
Current consumption standby mode (VDD1– VSSD)	$I_{ST(VDD1)}$	µA		-	10	30	
Current consumption standby mode which include HS_VCC (HS_VCC-HS_VSS)	$I_{ST(VDD1)}$	µA		-	10	30	
Oscillator tolerance	△OSC	%	T_A =25°C	-3	-	3	
			T_A =-40°C~85°C	-5	-	5	

Note1: The VPP pin is open on normal mode and in used while OTP programming condition.

DC characteristic

2-7 AC characteristics

DBI Type C interface characteristics



DBI Type C interface characteristics

(VSSA=0V, VDD1=1.8V, VDD2=2.8V, VDD3=2.8V, T_A = 25°C)

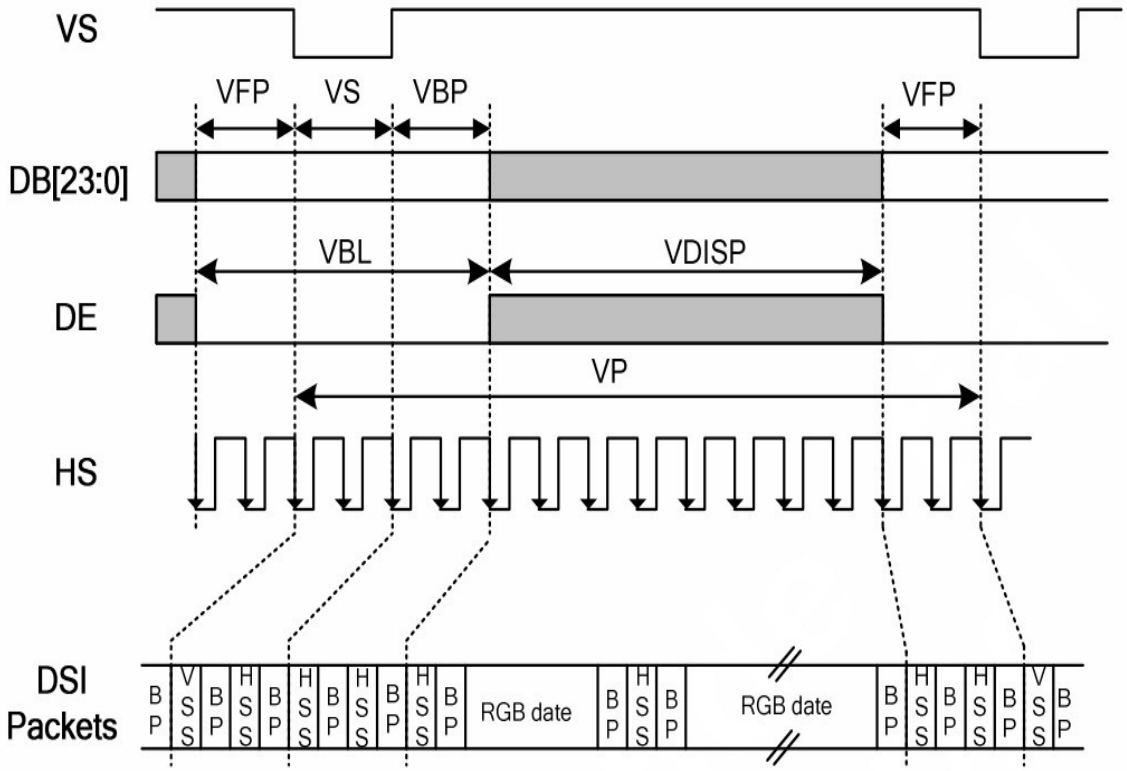
Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	t_{CSS} t_{CSH}	Chip select setup time (Write) Chip select setup time (Read)	40 40	- -	ns	-
DCX	t_{AST} t_{AHT}	Address setup time Address hold time (Write/Read)	10 10	- -	ns	-
WRX_SCL (Write)	t_{WC} t_{WRH} t_{WRL}	Write cycle Control pulse “H” duration Control pulse “L” duration	100 40 40	- - -	ns	-
WRX_SCL (Read)	t_{RC} t_{RDH} t_{RDL}	Read cycle Control pulse “H” duration Control pulse “L” duration	150 60 60	- - -	ns	-
SDI/SDO (Input)	t_{DS} t_{DT}	Data setup time Data hold time	30 30	- -	ns	For maximum C_L=30pF For minimum C_L=8pF
SDI/SDO (Output)	t_{RACC} t_{OD}	Read access time Output disable time	10 10	- 50	ns	

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.
Logic high and low levels are specified as 30% and 70% of VDD1 for Input signals.

DBI Type C interface characteristics

2-8 Timings for DSI Video mode

Vertical Timings



Vertical Timings for DPI I/F

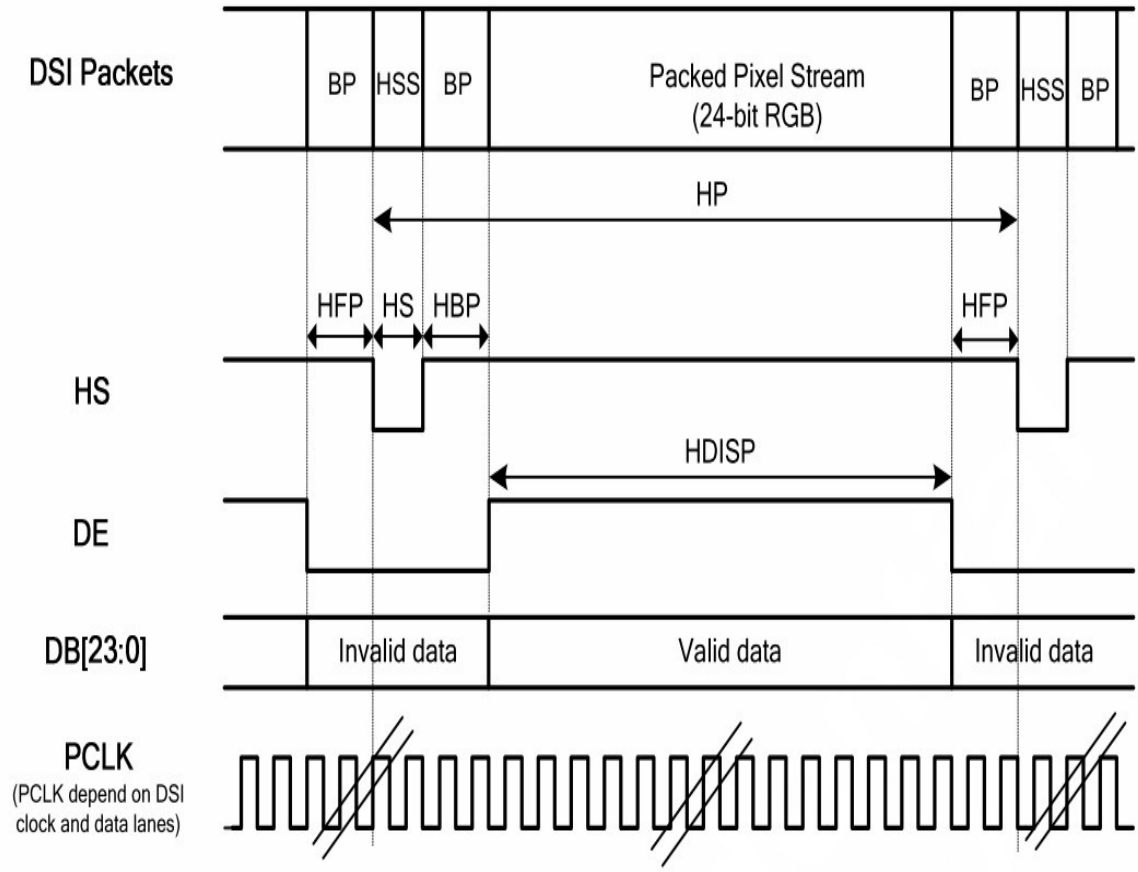
Resolution=800x1280(VSSA=0V, VDD1=1.8V, VDD2=2.8V, VDD3=2.8V, T_A=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	1286	-	-	Line
Vertical low pulse width	VS	-	2	-	Note(1)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(1)	Line
Vertical data start point	-	VS+VBP	4	-	Note(1)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	1280	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

Vertical Timings for DSI I/F

Horizontal Timings



Horizontal Timing for DSI Video mode I/F

Resolution=800x1280 (VSSA=0V, VDD1=1.8V, VDD2=VDD3=VCC=2.8V, T_A=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS low pulse width	HS	-	0.2	-	-	us
Horizontal back porch	HBP	-	1.0	-	-	us
Horizontal front porch	HFP	-	1.0	-	-	us
Horizontal data start point	-	HS+HBP	1.2	-	-	us
Horizontal blanking period	HBLK	HS+HBP+HFP	2.2	-	-	us
Horizontal active area	HDISP	-	-	800	-	DCK

Horizontal Timings for DSI Video mode I/F

3. OPTICAL CHARACTERISTICS

3.1 Characteristics

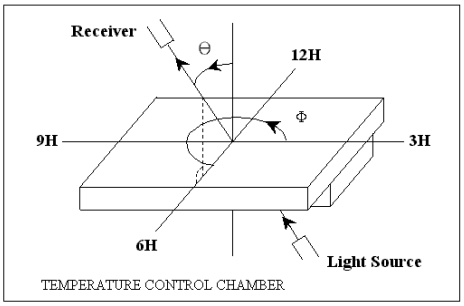
Electrical and Optical Characteristics

No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+Tf	25 ℃	-	20	-	ms	2
2	Viewing Angle	Hor.	Cr>10	Θ_{2+}	Φ = 0°	70	80	-	degree	3
				Θ_{2-}	Φ = 180°	70	80	-		
		Ver.		Θ_{1+}	Φ = 270°	70	80	-		
				Θ_{1-}	Φ = 90°	70	80	-		
3	Contrast Ratio			Cr	25 ℃	400	500	-	-	4
4	Red x-code			Rx	25 ℃	0.546	0.596	0.646		5
	Red y-code			Ry		0.303	0.353	0.403		
	Green x-code			Gx		0.258	0.308	0.358		
	Green y-code			Gy		0.552	0.602	0.652		
	Blue x-code			Bx		0.100	0.150	0.200		
	Blue y-code			By		0.074	0.124	0.174		
	White x-code			Wx		0.242	0.292	0.342		
	White y-code			Wy		0.287	0.337	0.387		
	Brightness			Y		300	-	-	cd/m^2	
5	Brightness Uniformity				25 ℃	70	75	-	%	6

3.2 Definition of optical characteristics

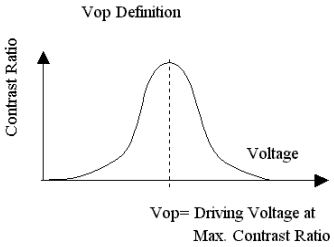
Measurement condition :

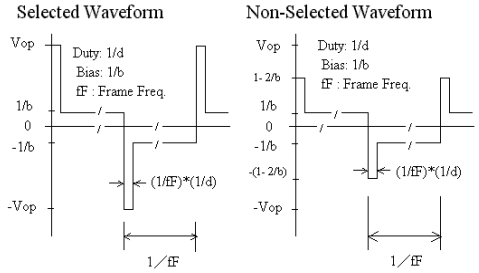
Transmissive and Transflective type



PHOTAL LCD-5000

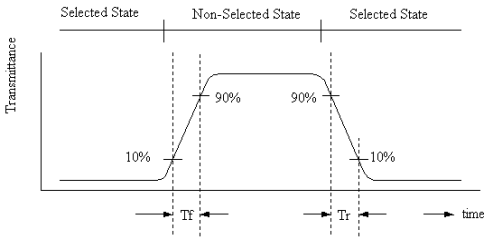
[Note 1] Definition of LCD Driving Vop and Waveform :



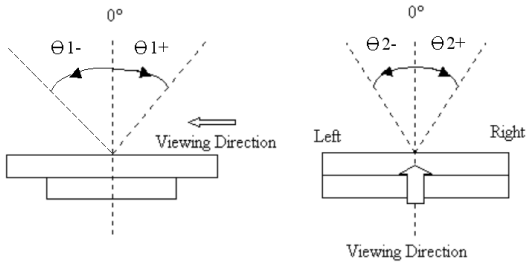


[Note 2] Definition of Response Time

for Positive type :

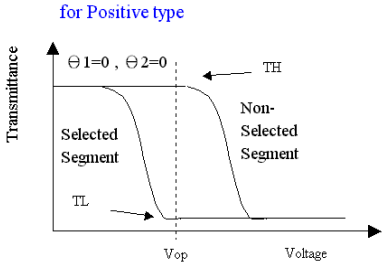


[Note 3] Definition of Viewing Angle :



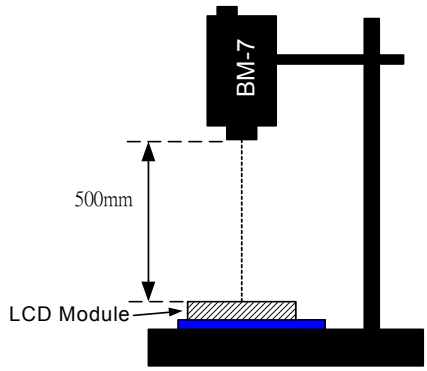
[Note 4] Definition of Contrast Ratio :

for Positive type

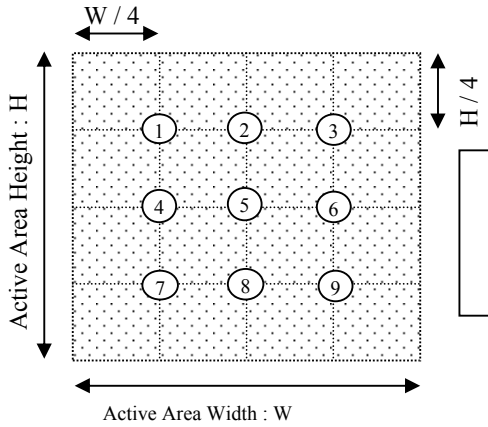


$$\text{Contrast Ratio} = \frac{TH}{TL}$$

[Note 5] Definition of measurement of Color Chromaticity and Brightness

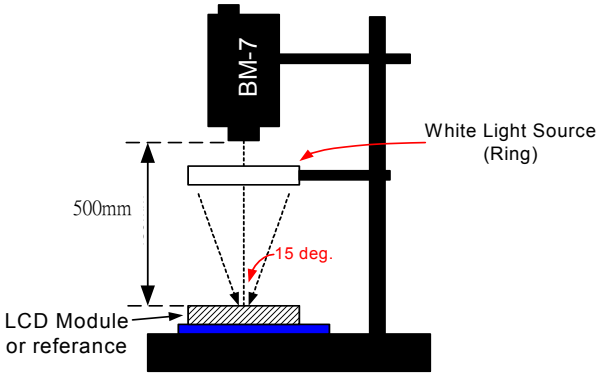


[Note 6] Definition of Brightness Uniformity



$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~9}}{\text{Maximum Brightness of Point 1~9}}$$

[Note 7] Definition of Measurement of Reflectance



4. RELIABILITY :

Item No	Items	Condition	Note
1	High temperature operating	50 ℃ , 120 hours	1
2	Low temperature operating	0 ℃ , 120 hours	1
3	High temperature storage	60 ℃ , 120 hours	1
4	Low temperature storage	-20 ℃ , 120 hours	1
5	High temperature & humidity	50℃, 80%RH, 96 hours	2
6	Thermal Shock storage	-20℃, 30min.<=> 60℃, 30min. 10 Cycles	1
7	Vibration test	Frequency range:10 HZ~50HZ Stroke:1.0mm,sweep:10 HZ ~50HZ x,y,z 2 hours for each direction	
8	ESD Test	150pF□330 □ Contact:±4KV,Air:±8KV	
		200pF□0 □±200V contact test	

Note 1：The product move into the room temperature for at least 2 hours with no condensation.

Note 2：The product move into the room temperature for at least 24 hours with no condensation.

Note 3 : Please change the display picture (autorun) during operating mode. Avoid displaying static images to avoid image sticking , and the image sticking is accelerated by temperature.

Note 4: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

* One single product test for only one item.

* Judgment after test : keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function : work normally

5. PRODUCT HANDLING AND APPLICATION

☐ PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection equipement to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Pay attention to the humidity of the work shop, 50~60%RH is satisfactory.
- Use a non-leak iron for soldering LCM.
- Do not touch the display surface or connection terminals area with bare hands.Smudges on the display surface reduce the insulation between terminals.
- Cautions for soldering to LCM:
  Condition for soldering I/O terminals:
  Temperature at iron tip :350℃±15℃.
  Soldering time : 3~4sec./ terminals.
  Type of solder : Eutectic solder(rosin flux filled).

☐ PRECAUTION IN USE OF LCM

- Do not contact or scratch the front surface and the contact pads of a LCM with hard materials such as metal or glass or with one's nail.
- To clean the surface , wipe it gently with soft cloth dampened by alcohol.
- Do not attempt to wiped off the contact pads.
- Keep LCM panels away from direct sunlight , also avoid them in high-temperature & high humidity environment for a long period.
- Do not drive LCM by DC voltage.
- Do not expose LCM to organic solvent.
- Liquid in LCM is hazardous substance. In case a contact with liquid crystal material is occured, be sure to immediately wash such material away by soap and water.
- The polarizer is easily damaged and should be handle with special care. Don't press or rub it with hard objects.

☐ PRECAUTION FOR STORING AND USE OF LCM

- To avoid degradation of the device , do not store the module under the conditions of direct sunlight , high temperature or high humidity . Keep the module in bags designed to prevent static electricity charging under low temperature / normal humidity conditions(avoid high temperature / high humidity and low temperature below 0℃)
- Never use the LCD , LCM under 45 Hz , the liquid crystal will decomposition and cause permently damage on display !!

☐ USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

- For the application in medical care, safety and hazardous prodcuts or systems, an authorization from MT is required. MT will not responsible for any damage or loss which caused by the products without any authorization given by MT.
- This product is not allowed to be designed and used for military application and/or purpose.
- The delivery of this product to the countries and/or regions where the embargoes are imposed by U.N. is prohibited.
- The application and delivery of this product must comply with Startegic High-Tech Commodities (SHTC) export control and the sales to the embargoed and/or sanctioned countries or regions are strictly prohibited.

6. DATE CODE OF PRODUCTS

- Date code will be shown on each product :

- **YY MM DD - XXXX**

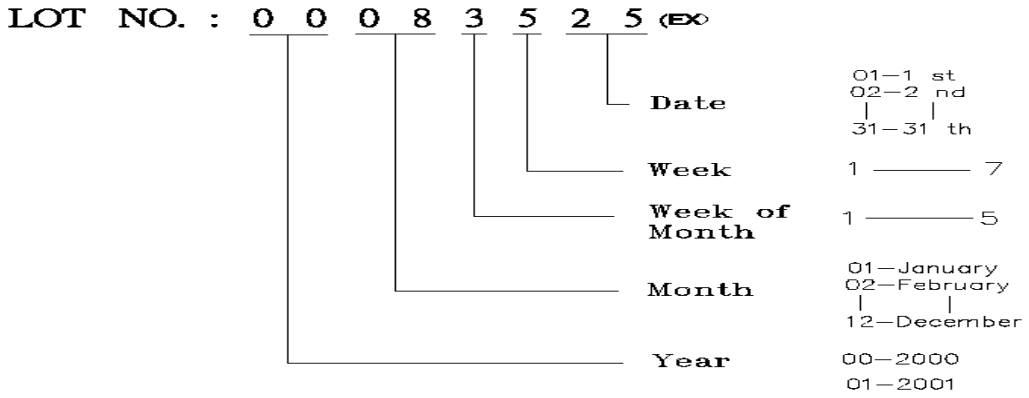
  Year Month Day - Production lots No.

- Example: 121108 - 0 0 0 3 ==> Year 2012, November,8th , Production lots No.0003

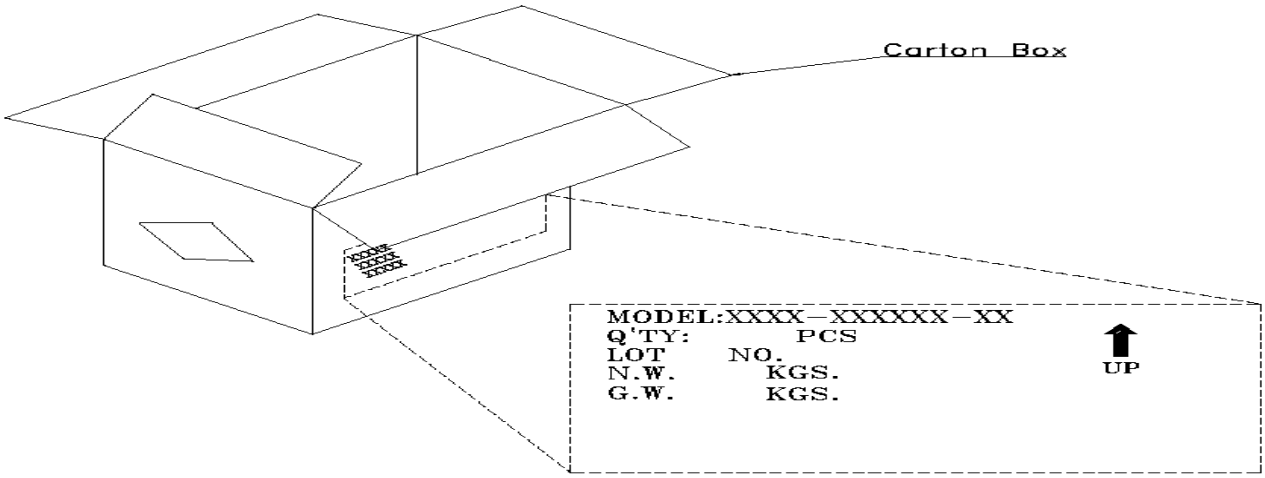
Note ： The lot no. attached on the packing box will be used for tracking once the part is too small to print the date code.

7. PACKING

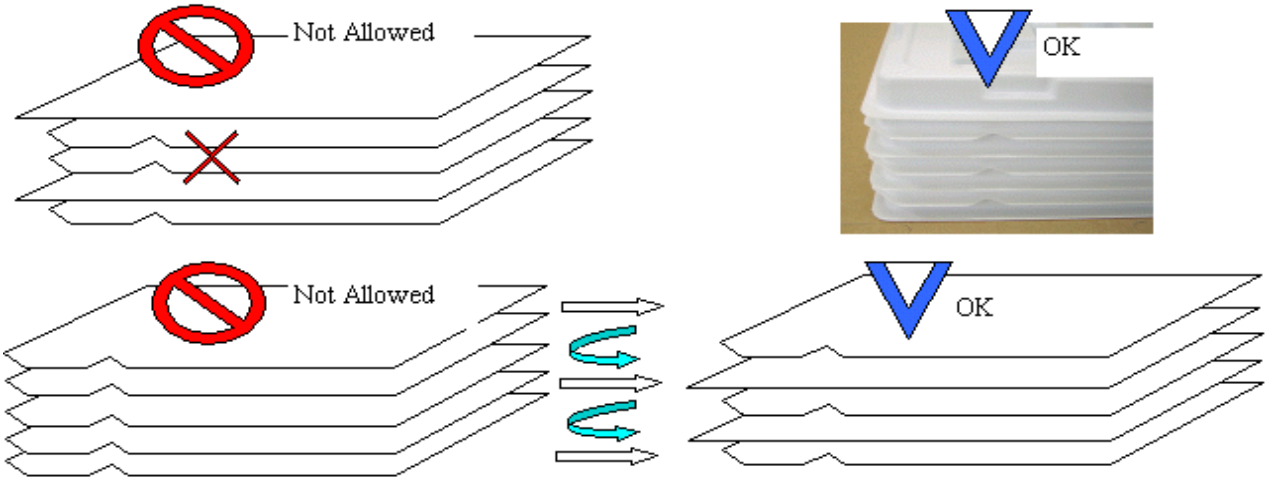
Instruction of lot number:



Lable of carton:



Packing tray must be stacked with alternated direction to each others.
To tacks packing trays in same direction will cause product damaged.



MODEL NO: UM*

T.B.D. pcs / Tray

T.B.D. Tray / Box

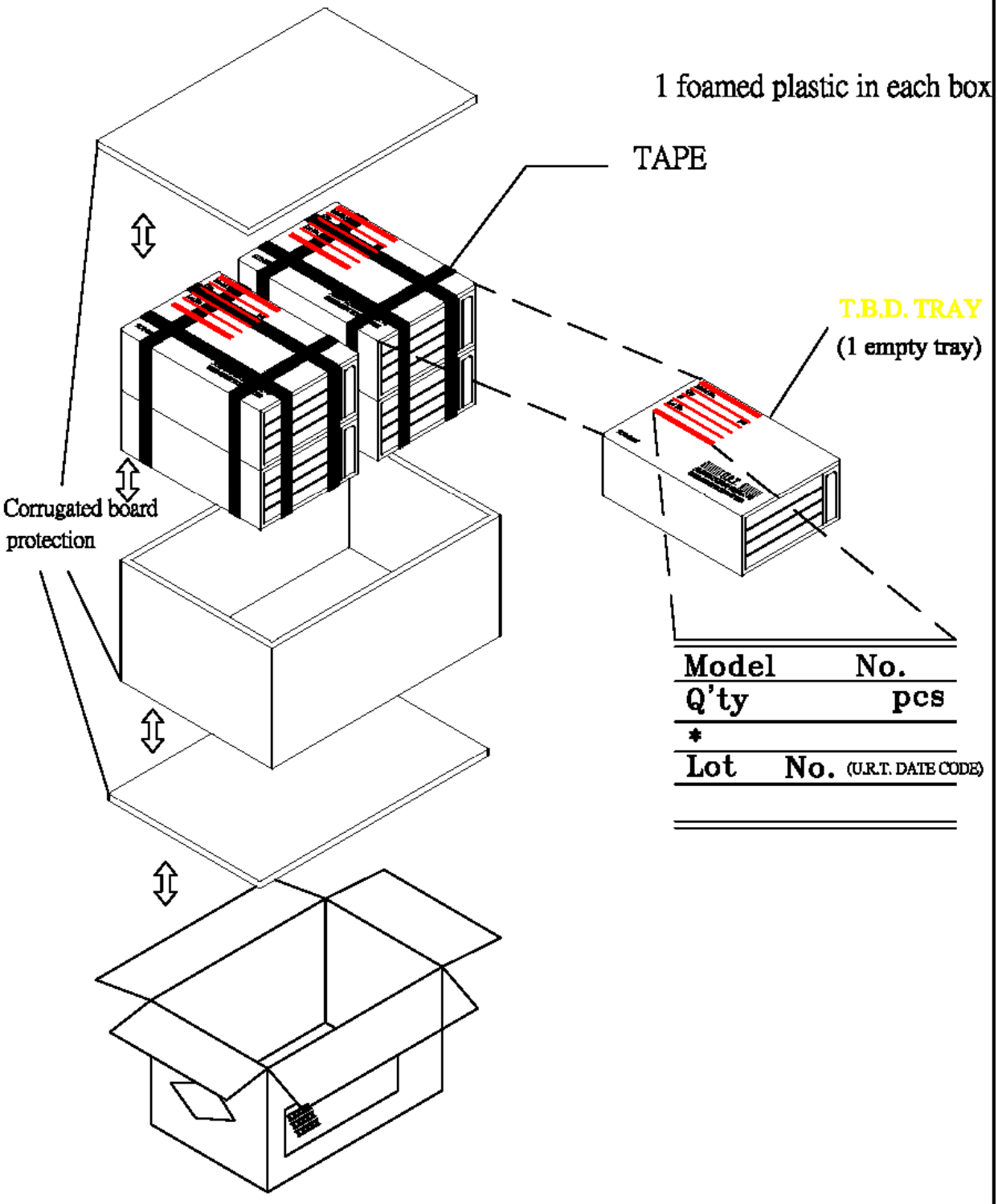
T.B.D. Box / Carton

T.B.D. pcs / Carton

NOTE:

(1)Be warned ,the direction of the tray has to turn it by 180 degree before stack it up.Otherwise, it will be packager's responsibility!!

(2)Safe Stack : 5 cartons only



8. INSPECTION STANDARD

8.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

8.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM MT TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10℃ □ 40℃ ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

8.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E) , LEVEL Ⅱ SINGLE PLAN.

CLASS	AQL(%)
MAJOR	0.65 %
MINOR	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

8.1.3. WARRANTY POLICY

MT WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. MT WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCT S WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF MT.

8.2. CHECKING CONDITION

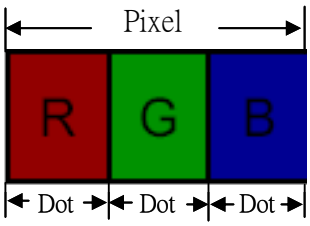
8.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA FROM VIEWING DIRECTION.

8.2.2. CHECKER SHALL SEE OVER 35~45cm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

8.3. INSPECTION PLAN :

CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA ……..REJECTED	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST、VOP、 CHROMATICITY … ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT、LINE、CHARACTER ....REJECTED	Critical
	12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY	NON DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. PIN HOLE、PATTERN DEFORMITY	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

8.4. STANDARD OF VISUAL INSPECTION

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td rowspan="4">8.4.1</td><td rowspan="4">MINOR</td><td>Spot</td><td>NOTE: Φ=(LENGTH+WIDTH)/2 unit : mm.
<table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>Φ ≦ 0.2</td><td>DISREGARD</td></tr><tr><td>0.2 < Φ ≦ 0.4</td><td>3 (Distance>5mm)</td></tr><tr><td>0.4 < Φ</td><td>0</td></tr></table></td></tr>
<tr><td>Fiber</td><td>unit : mm.
<table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>L ≦ 2.5</td><td>0.1 < W ≦0.2</td><td>4 (Distance>5mm)</td></tr><tr><td>L > 2.5</td><td>0.2 < W</td><td>0</td></tr></table></td></tr>
<tr><td>Dent</td><td>NOTE: Φ=(LENGTH+WIDTH)/2 unit : mm.
<table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>Φ ≦ 0.25</td><td>DISREGARD</td></tr><tr><td>0.25 < Φ ≦ 0.5</td><td>4 (Distance>5mm)</td></tr><tr><td>0.5 < Φ</td><td>0</td></tr></table></td></tr>
<tr><td>Scratch</td><td>unit : mm.
<table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>------</td><td>W ≦0.05</td><td>DISREGARD</td></tr><tr><td>L ≦ 10.0</td><td>0.05 < W ≦0.1</td><td>3 (Distance>5mm)</td></tr><tr><td>------</td><td>0.1 < W</td><td>FOLLOW ROUND TYPE</td></tr></table></td></tr>
<tr><td>8.4.2</td><td>MINOR</td><td>Bubble in Polarizer</td><td>NOTE: Φ=(LENGTH+WIDTH)/2 unit : mm.
<table><tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>Φ ≦0.30</td><td>DISREGARD</td></tr><tr><td>0.25 < Φ ≦ 0.5</td><td>2 (Distance>5mm)</td></tr><tr><td>0.5 < Φ</td><td>0</td></tr></table></td></tr>
<tr><td>8.4.3</td><td>MINOR</td><td>Dot Defect</td><td><table><tr><th>Items</th><th>ACC. Q'TY</th></tr><tr><td>Bright dot</td><td>N≦ 4 (Distance > 5mm)</td></tr><tr><td>Dark dot</td><td>N≦ 4 (Distance > 5mm)</td></tr></table>Pixel Define :
 

Note 1: The definition of dot: The size of a defective dot over
Note 2 1/2 of whole dot is regarded as one defective dot.
Note 3 in which LCD panel is displaying under black pattern.
which LCD panel is displaying under pure red, green
,blue pattern.</td></tr>
</table>