Microtips TECHNOLOGY

Model No: AWK-7201280T50PC02

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Revision Record

Rev No.	Rev Date	Contents	Note
A	2018/05/15	New issue.	
B	2019/07/26	6.DC Characteristics: Add analog & power Supply current Item.	-
C	2020/04/20	Add the proposed connector.	

Table of Contents

1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by Microtips Technology.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution

2. General Information

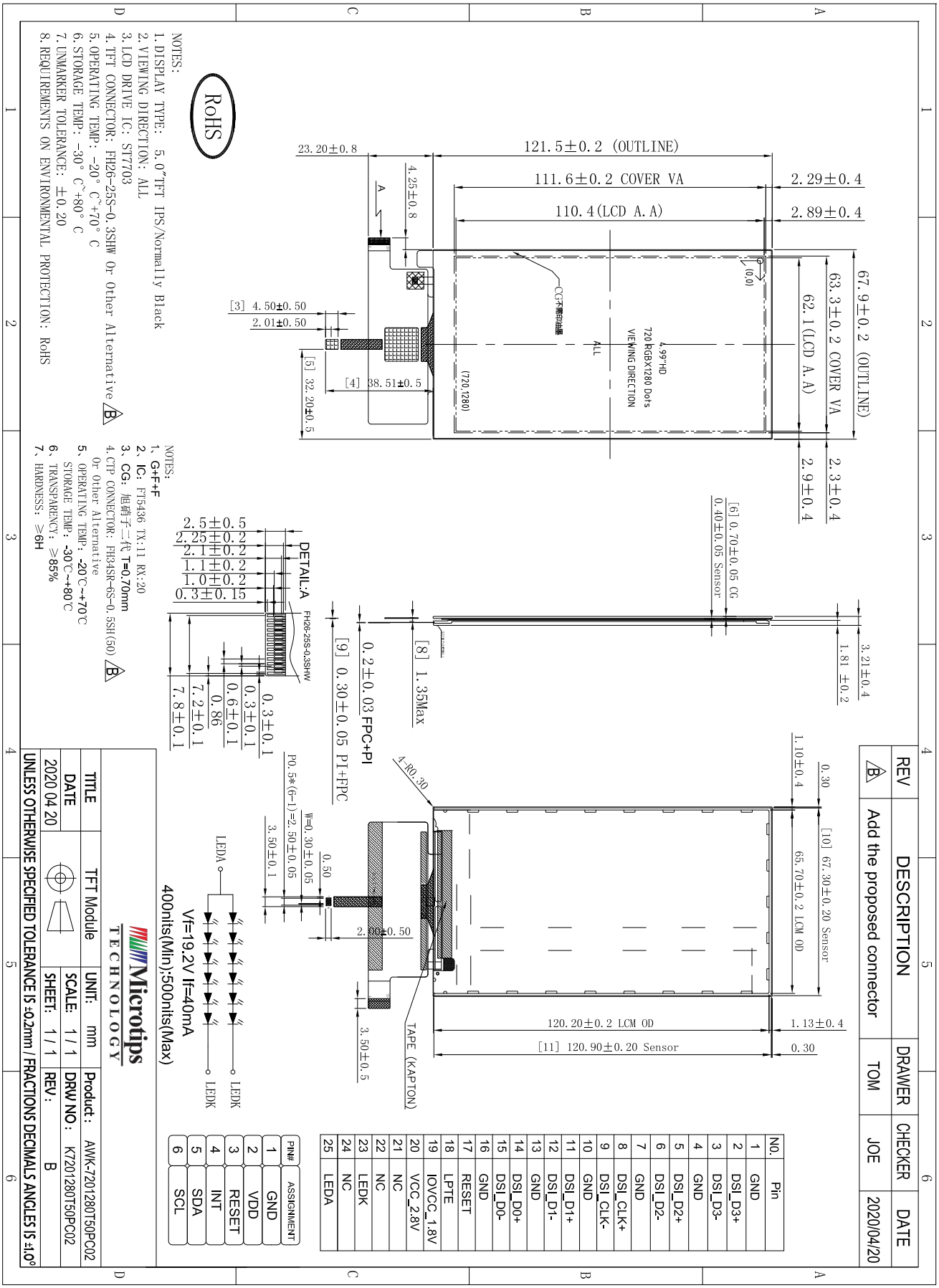
TFT

Item	Standard Values	Units
LCD type	4.99”TFT	--
Dot arrangement	720×1280	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally Black	-
Viewing Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Module size	67.90(W)×121.50(H)×3.21(T)	mm
Active area	62.10(W)×110.40(H)	mm
Dot pitch	0.08625(W)×0.08625(H)	mm
Interface	MIPI	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	12 White LEDS	--

CTP

Item	Standard Values	Units
CTP type	Glass + Film + Film + FPC	--
CTP Driver IC	FT5436	--
Surface hardness	≥6H	--
Transmittance	≥85%	--
CTP size	67.90(W)×121.50(H)×1.1(T)	mm(without adhesive)
Active area	63.30(W)×111.6(H)	mm
CTP Interface	I²C	-
Pointing Stick	5	-

3. External Dimensions



4. Interface Description

TFT

Pin No.	Pin Name	Description
1	GND	Power ground
2	DSI_D3+	MIPI DSI differential data pair
3	DSI_D3-	MIPI DSI differential data pair
4	GND	Power ground
5	DSI_D2+	MIPI DSI differential data pair
6	DSI_D2-	MIPI DSI differential data pair
7	GND	Power ground
8	DSI_CLK+	MIPI DSI differential clock pair
9	DSI_CLK-	MIPI DSI differential clock pair
10	GND	Power ground
11	DSI_D1+	MIPI DSI differential data pair
12	DSI_D1-	MIPI DSI differential data pair
13	GND	Power ground
14	DSI_D0+	MIPI DSI differential data pair
15	DSI_D0-	MIPI DSI differential data pair
16	GND	Power ground
17	RESET	Reset input pin
18	LPTE	TE Signal
19	IOVCC_1.8V	Logic Supply Voltage
20	VCC_2.8V	Analog Supply Voltage
21	LCD_ID	ID Voltage
22	NC	No connection
23	LEDK	LED backlight (Cathode).
24	NC	No connection
25	LEDA	LED backlight (Anode).

CTP

Pin No.	Pin Name	Description
1	GND	CTP power ground.
2	VDD	CTP supply voltage.
3	RESET	CTP external Reset, Low is active.
4	INT	CTP external interrupt to the host.
5	SDA	CTP I2C serial data input and output.
6	SCL	CTP I2C serial clock input.

5. Absolute Maximum Ratings

TFT

Item	Symbol	Min.	Max.	Unit
Analog Supply Voltage	IOVCC	-0.5	5.0	V
Power supply voltage	VCC	-0.5	5.0	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

CTP

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	1.8	3.6	V

6. DC Characteristics

TFT

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog Supply Voltage	IOVCC	1.65	1.8	2.0	V	-
Analog Supply current	IIOVCC	-	65	85	mA	-
Power supply voltage	VCC	2.5	3.3	4.8	V	-
Power supply current	IVCC	-	15	20	mA	-
Input High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	-
Input Low Voltage	V_{IL}	GND	-	0.3 IOVCC	V	-
Output High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	-
Output Low Voltage	V_{OL}	GND	-	0.2IOVCC	V	-
I/O Leak Current	ILI	-	-	1	uA	-

CTP

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	VDD	2.8	3.3	3.6	V	-
Interruption Signal	INT	1.5	1.8	2.1	V	
Reset Signal	RST	1.5	1.8	2.1	V	
I^2C Clock	SCL	1.5	1.8	2.1	V	
I^2C Data	SDA	1.5	1.8	2.1	V	

7. Timing Characteristics

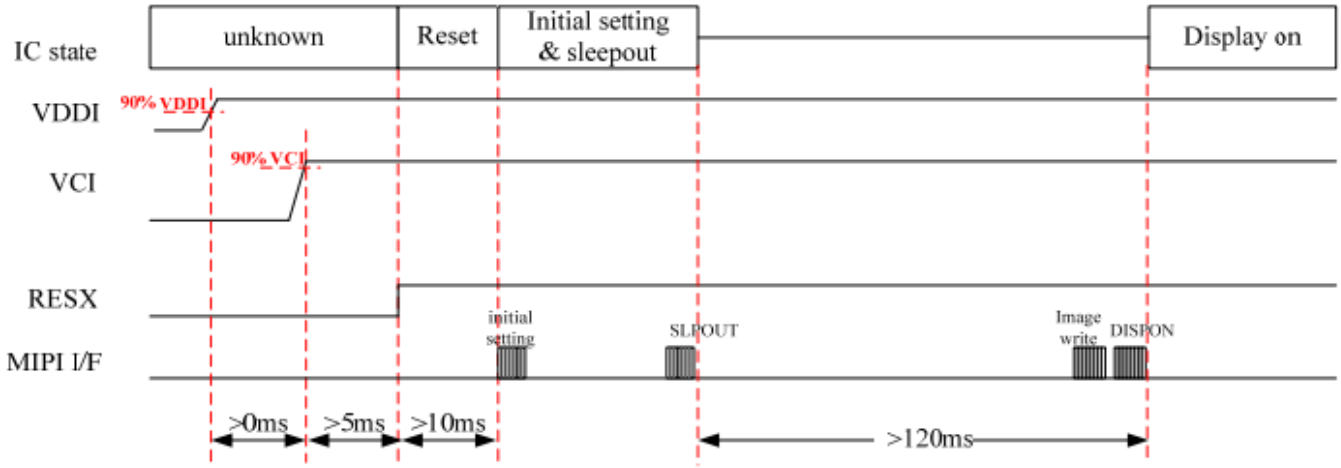
TFT

7.1. Power ON/OFF Sequence

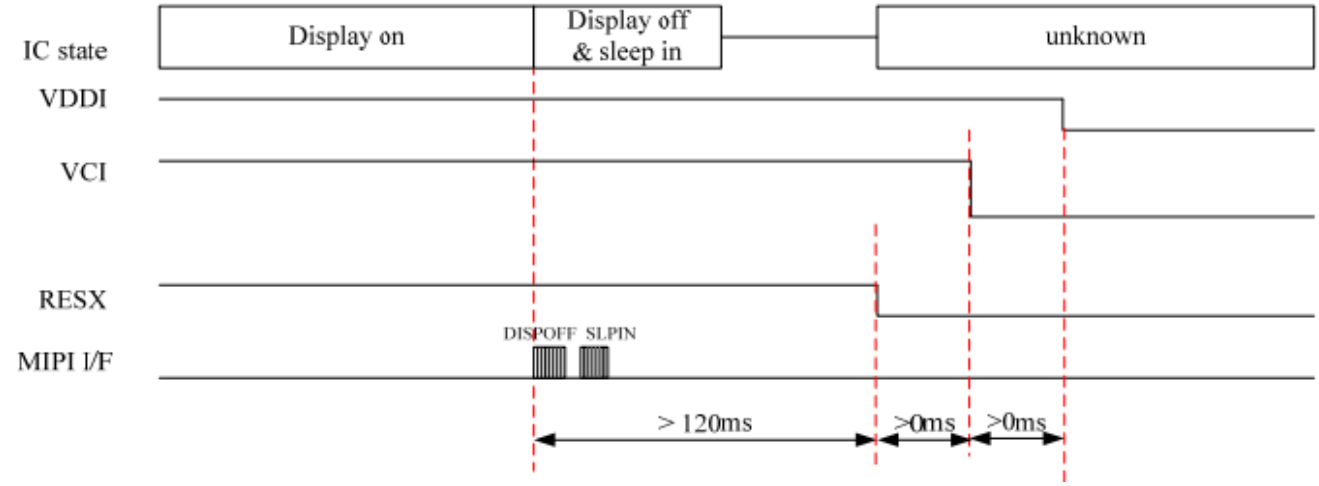
2-Power mode with Power IC or PFM mode

The power on/off sequence for 2-power mode, in which input powers are VCI and VDDI, is depicted in the following. Please follow the power input sequence to avoid triggering any abnormal state.

Power On sequence



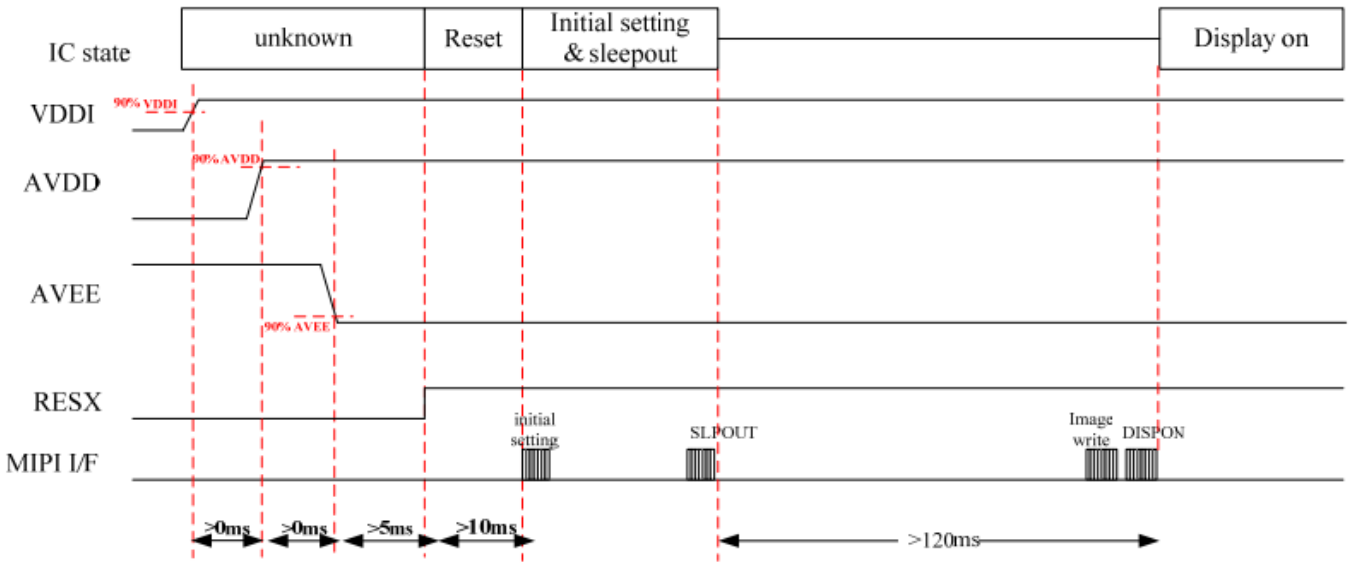
Power Off sequence



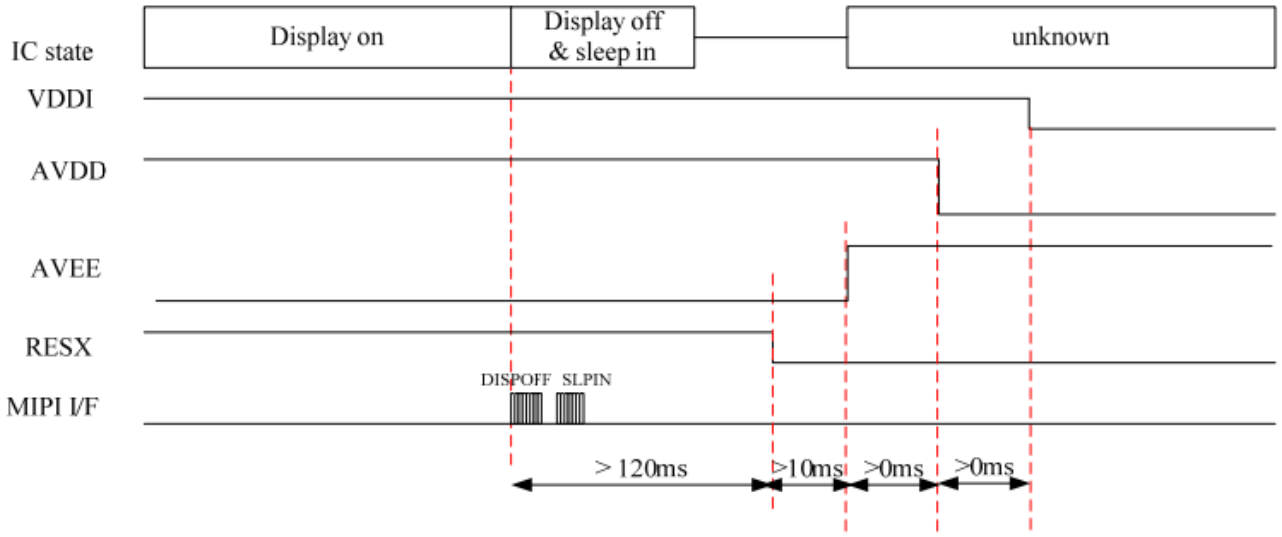
3-Power IC mode

The power on/off sequence for 3-power mode, in which input powers are VDDI, AVDD and AVEE, is depicted in the following. Please follow the power input sequence to avoid triggering any abnormal state.

Power On sequence

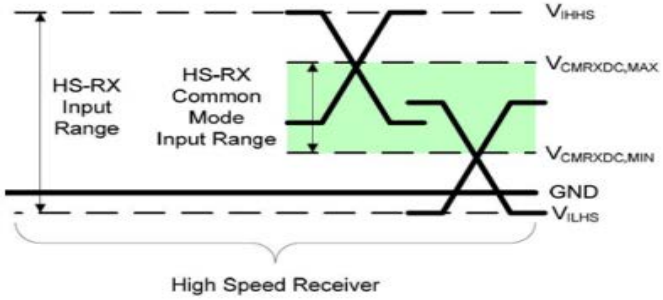


Power Off sequence



7.2 MIPI Characteristics

7.2.1 DC Specifications High-Speed Receiver Specification

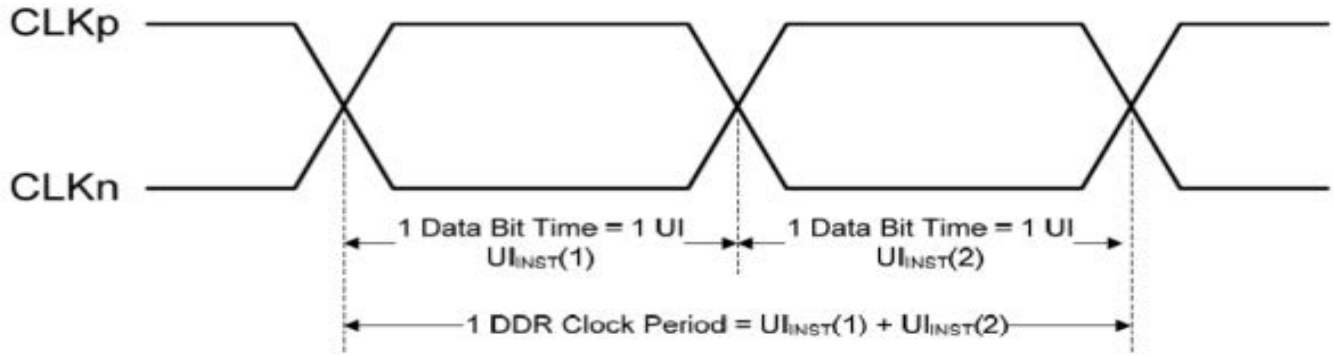


Parameter	Description	Min	Nom	Max	Units	Note
VCMRX(DC)	Common-mode voltage for HS receiver	70		330	mV	1,2
VIDTH	Differential input high threshold			70	mV	
VIDTL	Differential input low threshold	-70			mV	
VIHHS	Single-ended input high voltage			460	mV	1
VILHS	Single-ended input low voltage	-40			mV	1
ZID	Differential input impedance	80	100	125	Ω	

Notes:
1. Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
2. Values in this table include a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz

7.2.2 Forward high speed transmissions

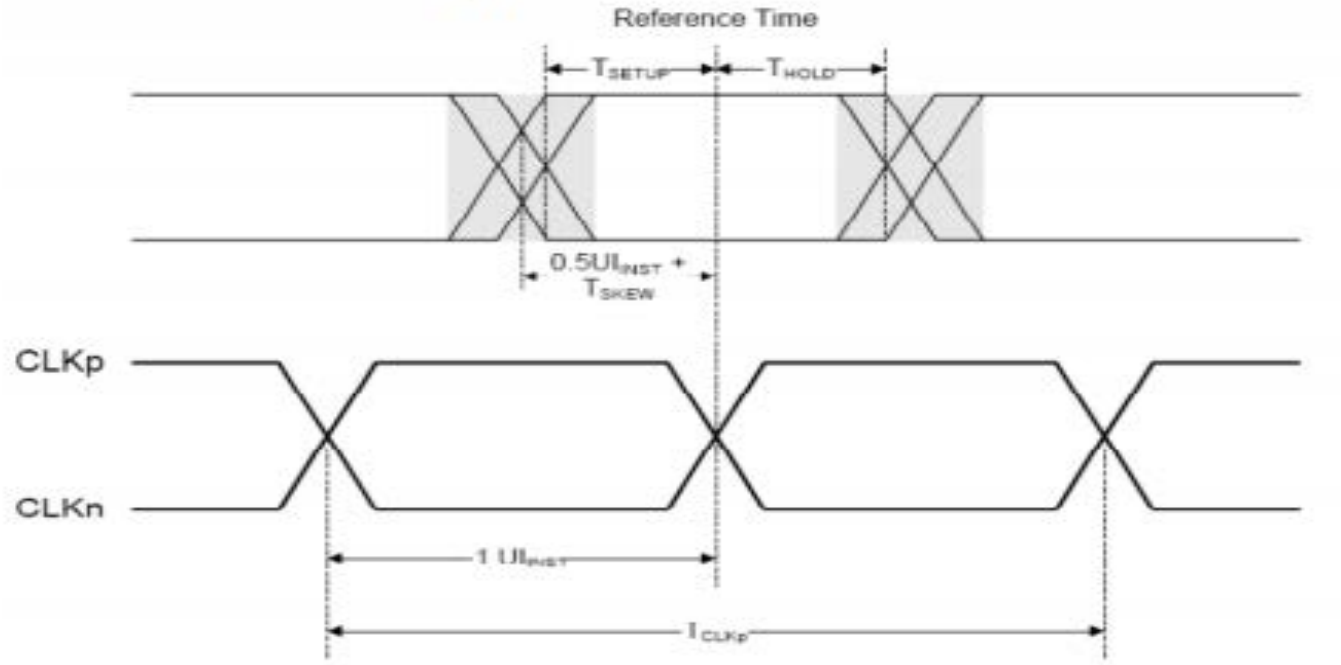
DDR Clock Definition



Clock Parameter	Symbol	Min	Typ	Max	Units	Notes
UI instantaneous	UI_{INST}			12.5	ns	1,2

Notes:
1. This value corresponds to a minimum 80 Mbps data rate.
2. The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a data burst.

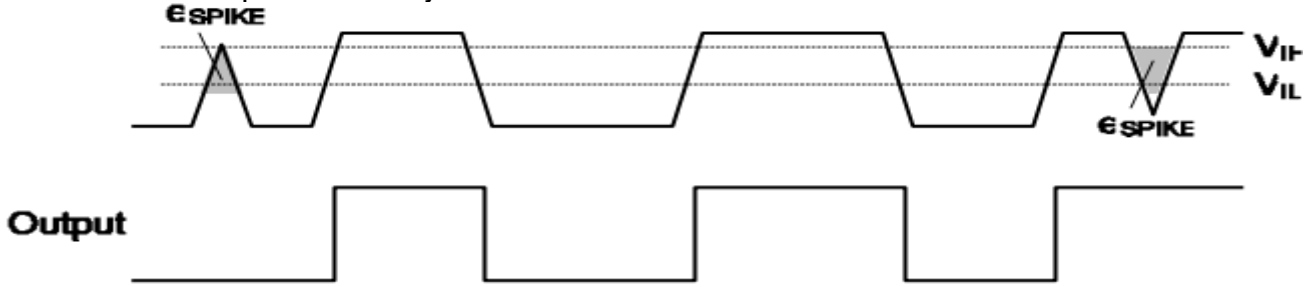
Data to Clock Timing Definitions



7.2.3 Low power transceiver specifications

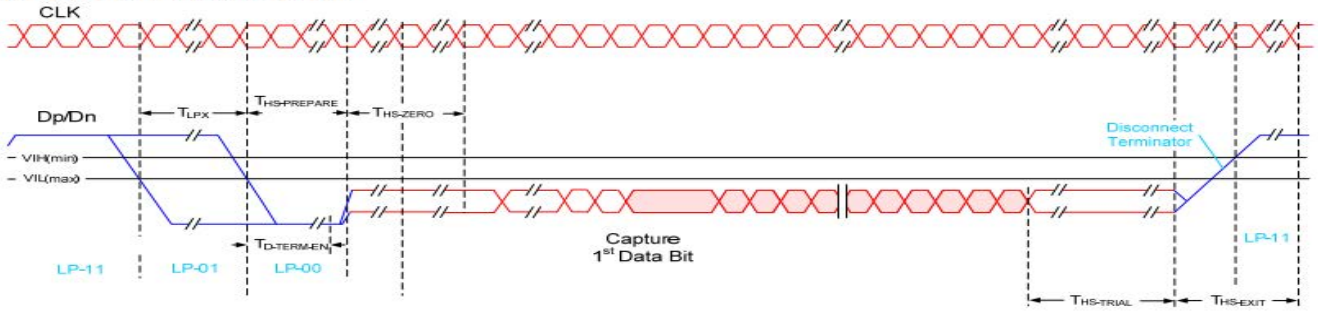
Parameters	Symbol	Condition	Min	Typ	Max	Unit
Logic high level input voltage	VIHCD	Contention Detection (Lane_D0)	450		1350	mV
Logic low level input voltage	VILCD	Contention Detection (Lane_D0)	0		200	mV
Logic high level input voltage	VIH-LPRX	LP-Rx (Lane_CK, Lane_D0, Lane_D1)	880	-	1350	mV
Logic low level input voltage	VIL-LPRX	LP-Rx (Lane_CK, Lane_D0, Lane_D1	0		550	mV
Logic low level input voltage	VIL-ULPS	LP-Rx ULPS (Lane_CK, Lane_D0, Lane_D1)	0		300	mV
Logic high level input voltage	VOH-LPTX	Contention Detection (Lane_D0)	1.1	1.2	1.3	V
Logic low level input voltage	VOL-LPTX	Contention Detection (Lane_D0)	-50	0	50	mV
eSPIKE[1,2,3]	Fig. 2	Input pulse rejection			300	V.ps

Notes:
(1) Time-voltage integration of a spike above VIL when being in LP-0 state or below VIH when being in LP-1 state an impulse less than this will not change the receiver state.
(2) In addition to the required glitch rejection, implementers shall ensure rejection of known RF-interferers. Input Glitch Rejection of Low Power Receivers as follow.

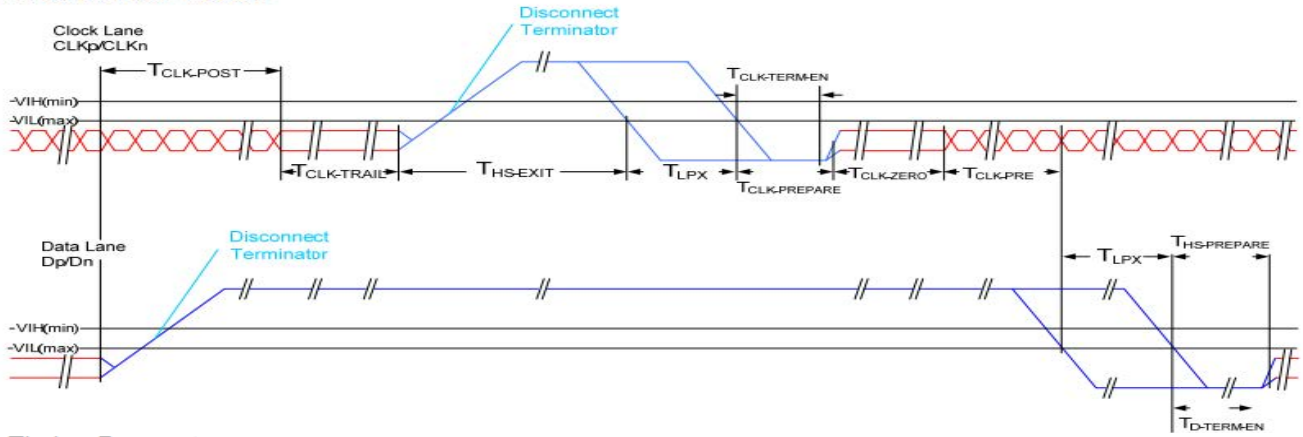


7.3 DSI Timing Characteristics

HS Data Transmission Burst



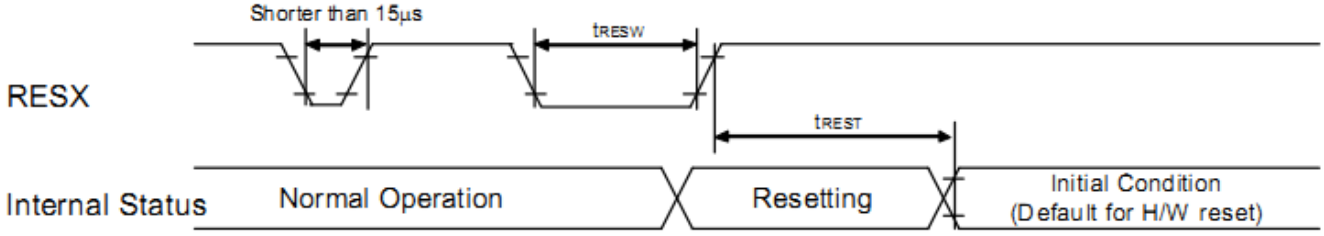
HS clock transmission



Timing Parameters:

Parameter	Description	Min	Typ	Max	Unit
$T_{CLK-POST}$	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$.	60ns + 52*UI			ns
$T_{CLK-TRAIL}$	Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.	60			ns
$T_{HS-EXIT}$	Time that the transmitter drives LP-11 following a HS burst.	**300**			ns
$T_{CLK-TERM-EN}$	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		38	ns
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.	38		95	ns
$T_{CLK-PRE}$	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8			UI
$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.	300			ns
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		35 ns +4*UI	
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission	40ns + 4*UI		85 ns + 6*UI	ns
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.	145ns + 10*UI			ns
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	60ns + 4*UI			ns

7.4 Reset Timing Characteristics



Reset timing:

IOVCC=1.65V to 3.6V, AGND=DGND=0V, Ta=-40 to 85℃

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	15	-	-		µs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during sleep-in mode	ms
		-		-	120	When reset applied during sleep-out mode	ms

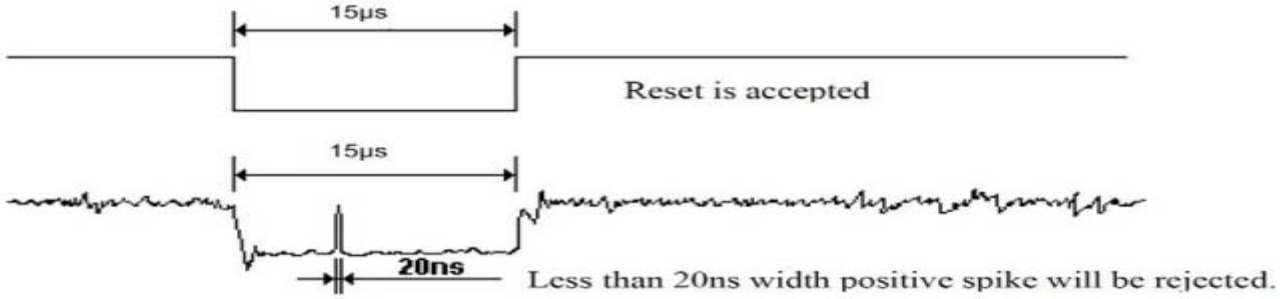
RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 15µs	IC Reset
Between 5µs and 15µs	Reset starts (It depends on voltage and temperature condition.)

Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.

Note 3. During Reset Complete Time, data in MTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RESX.

Note 4. Spike Rejection also applies during a valid reset pulse as shown below:

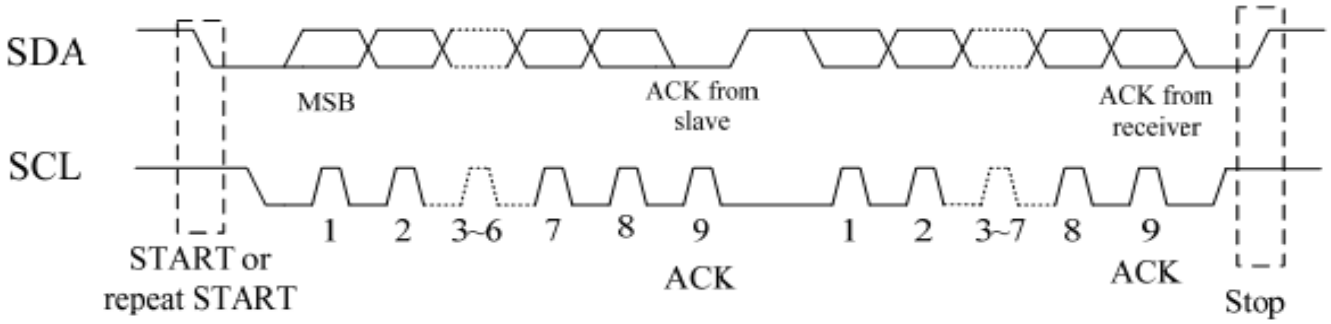


Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

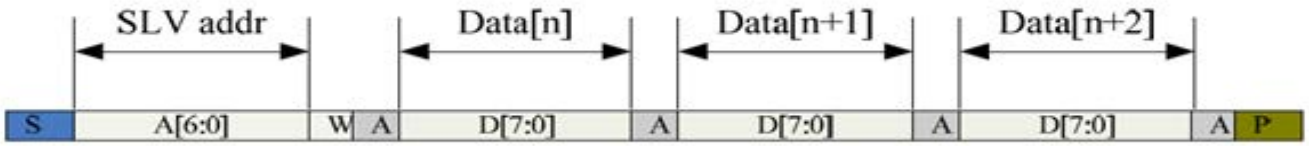
CTP

7.5 CTP Timing Characteristics

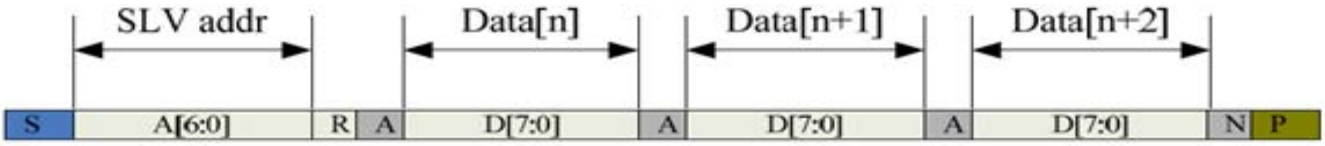
7.5.1 Serial Interface



I²C serial data transfer format



I²C master write, slave read



I²C master read, slave write

Mnemonics description

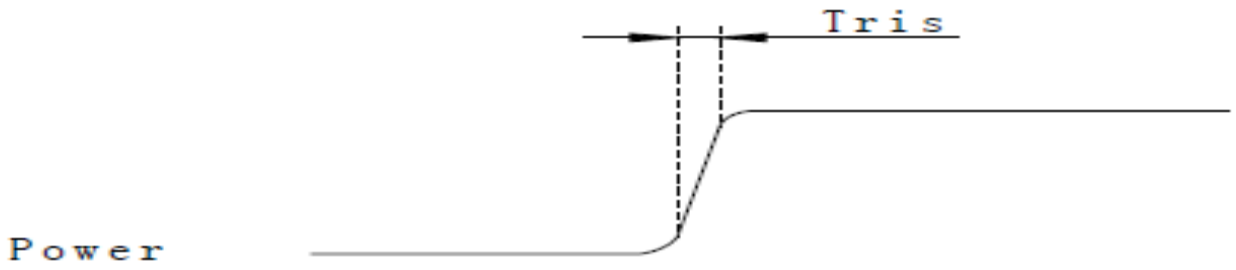
Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:0]: address bits are identical to those of I2CADDR [7:1] register.
R/ W	'1' for read, '0'for write
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

Timing characteristics

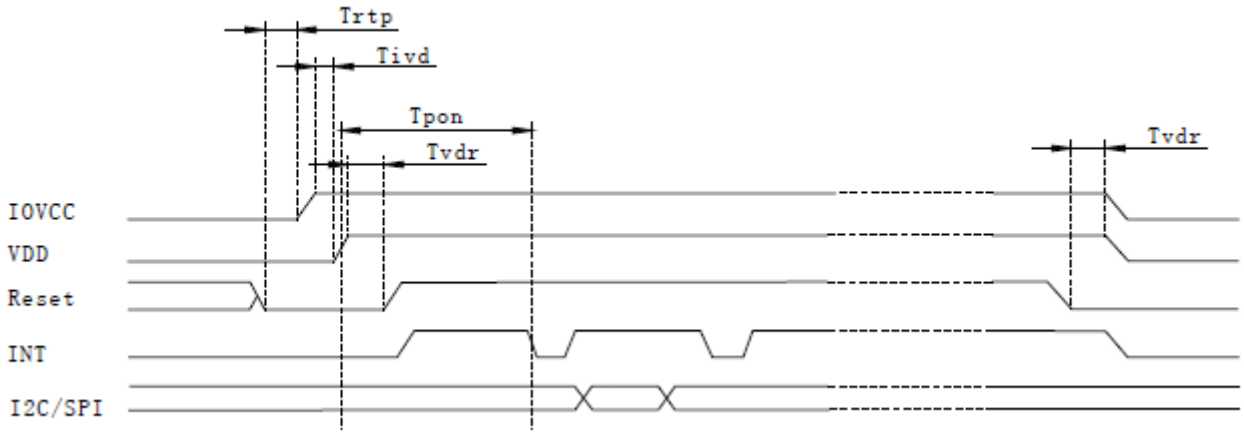
Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\

7.5.2 POWER NO /Reset/Wake Sequence

Reset should be pulled down to be low before powering on and powering down. INT signal will be sent to the host after initializing all parameters and then start to report points to the host.

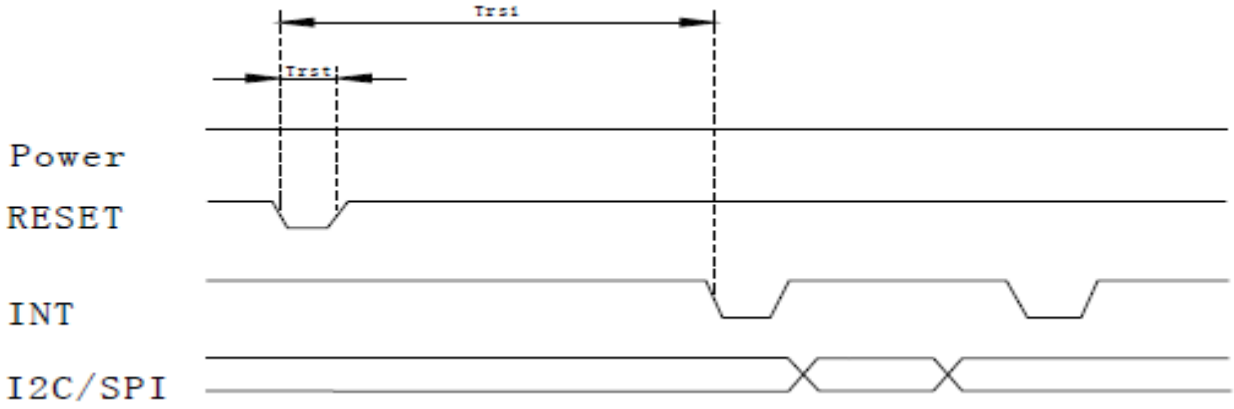


Power on time



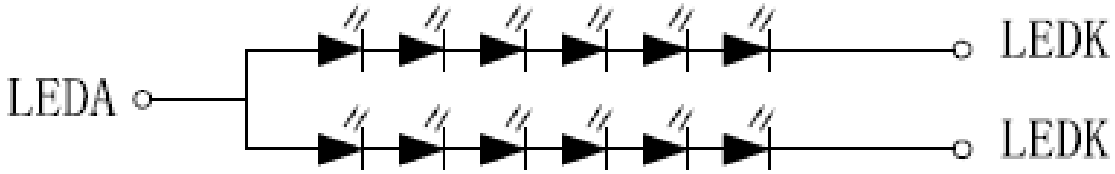
Power on sequence

Reset time must be enough to guarantee reliable reset, The time of starting to report point after resetting approach to the time of starting to report point after powering on.



Reset sequence

8. Backlight Characteristic



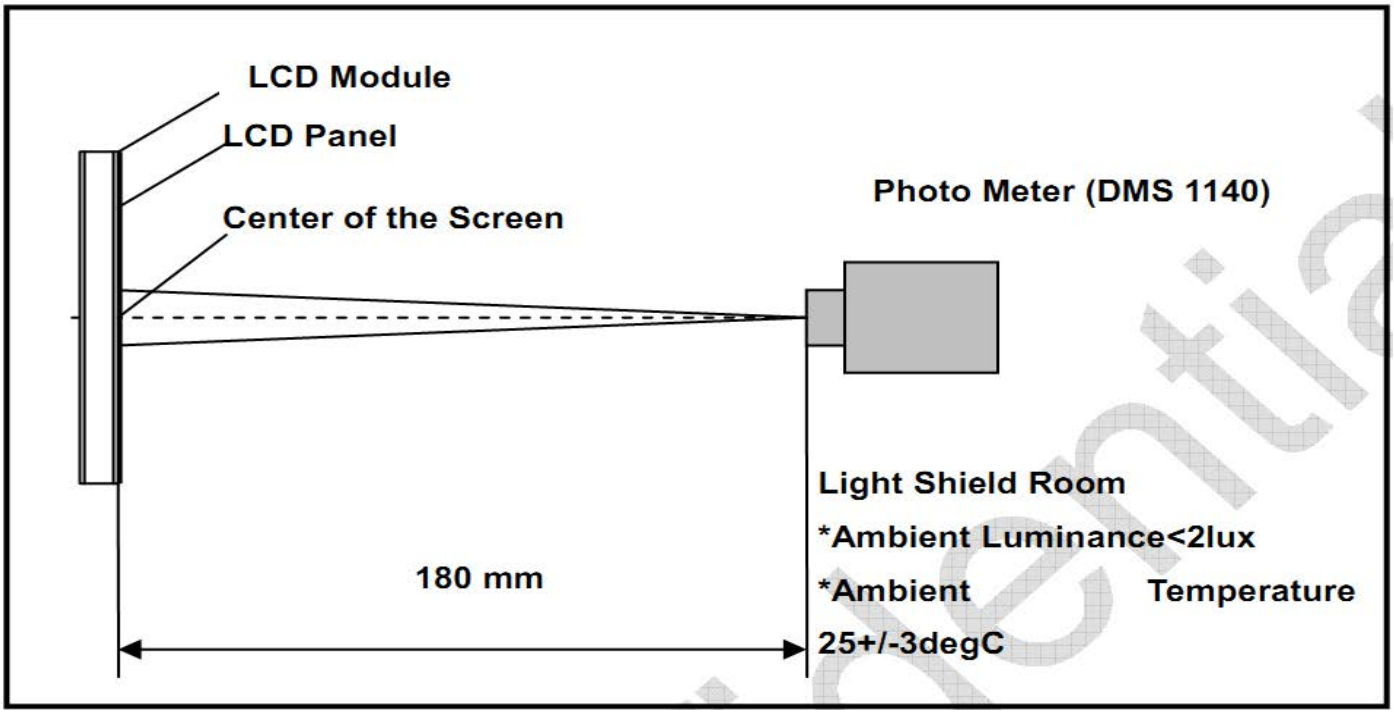
Item	Symbol	MIN	TYP	MAX	UNIT	Remark
Supply Voltage	Vf	16.8	19.2	21.6	V	Note 1
Supply Current	If	-	40	-	mA	
Luminous Intensity for LCM	-	300	-	420	cd/m^2	
Uniformity for LCM	-	75	80	-	%	
Life Time	-	20000	(30000)	-	Hr	Note 2
Backlight Color	White					

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and If =40mA.
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and If =40mA. The LED lifetime could be decreased if operating If is larger than 40mA.

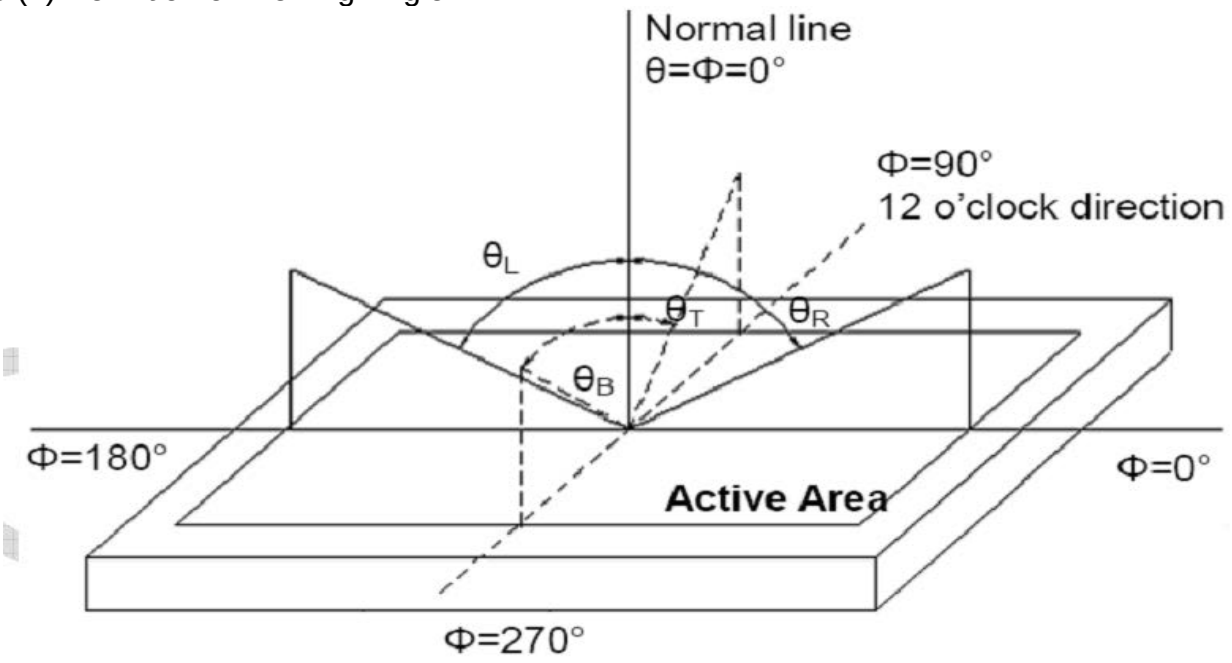
9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	-	80	-	degree	(1),(2),(6)
		θ_R	-	80	-		
	Vertical	θ_T	-	80	-		
		θ_B	-	80	-		
Contrast Ratio	Center		1000	1200	-	-	(1),(3),(6)
Response Time	Rising		-	25	-	ms	(1),(4),(6)
	Falling						
CF Color Chromaticity (CIE1931)	Red x		0.562	0.612	0.662	-	(1), (6)
	Red y		0.294	0.344	0.394	-	
	Green x		0.283	0.333	0.383	-	
	Green y		0.547	0.597	0.647	-	
	Blue x		0.086	0.136	0.186	-	
	Blue y		0.002	0.052	0.102	-	
	White x		0.267	0.317	0.367	-	
	White y		0.292	0.342	0.392	-	

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



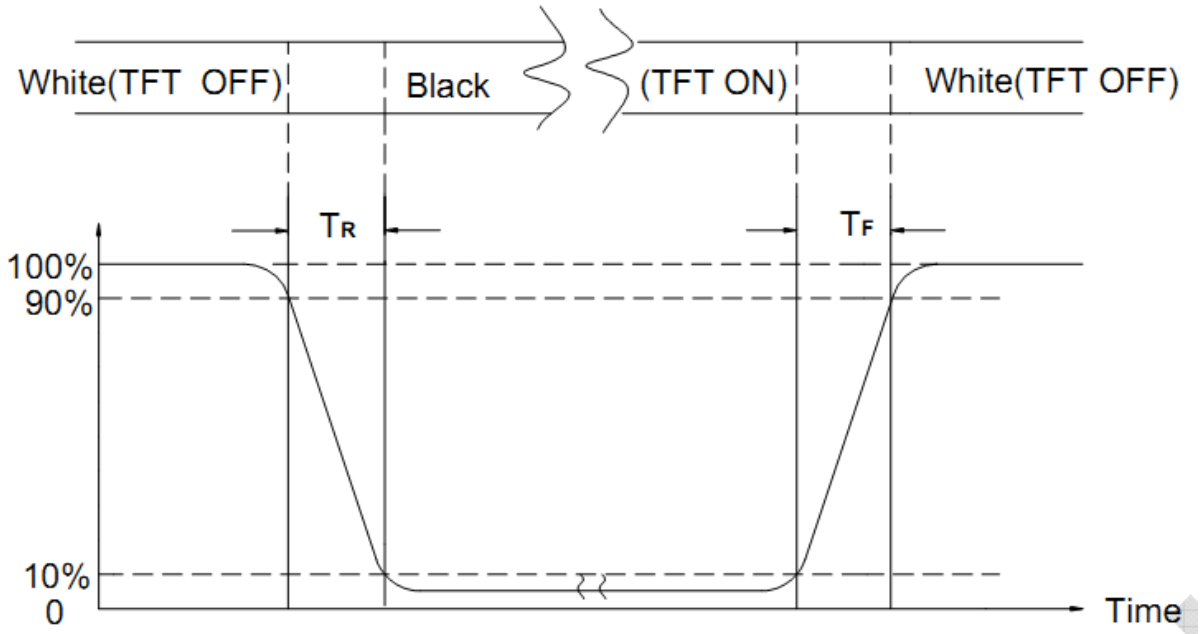
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time



Note (5) Definition of Transmittance (Module is without signal input)

Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods

No.	Test Items	Test Condition	Inspection After Test
①	High Temperature Storage	80°C±2°C×96Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
②	Low Temperature Storage	-30°C±2°C×96Hours	
③	High Temperature Operating	70°C±2°C×96Hours	
④	Low Temperature Operating	-20°C±2°C×96Hours	
⑤	Temperature Cycle(Storage)	-20°C ⟺ 25°C ⟺ 70°C (30min) (5min) (30min) 1cycle Total 10cycle	
⑥	Damp Proof Test (Storage)	50°C±5°C×90%RH×96Hours	
⑦	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
⑨	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

REMARK:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 5~10pcs.
3,For Damp Proof Test, Pure water(Resistance＞10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Inspection Standard

11.1. Scope

Specifications contain

11.1.1. Display Quality Evaluation

11.1.2. Mechanics Specification

11.2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E.

11.2.1. Lot size: Quantity per shipment as one lot (different model as different lot).

11.2.2. Sampling type: Normal inspection, single sampling.

11.2.3. Sampling level: Level II.

11.2.4. AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.5

11.3. Panel Inspection Condition

11.3.1. Environment:

Room Temperature: 25±5°C.

Humidity: 65±5% RH.

Illumination: 300 ~ 700 Lux.

11.3.2. Inspection Distance:

35±5 cm

11.3.3. Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

11.3.4. Inspection time：

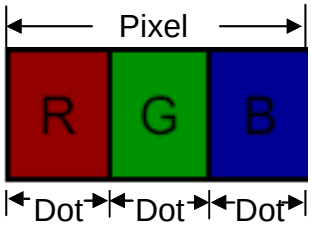
Perceptibility Test Time: 20 seconds max.

11.4. Inspection Plan

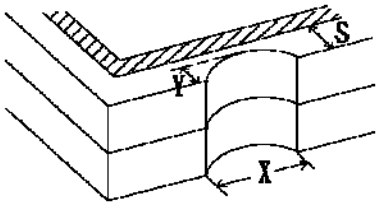
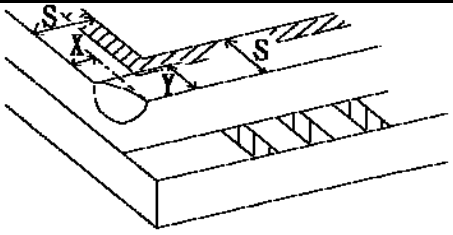
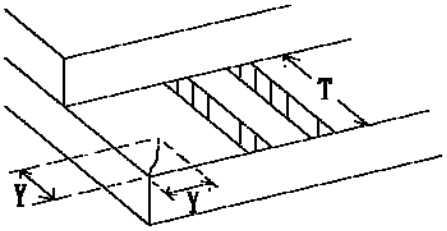
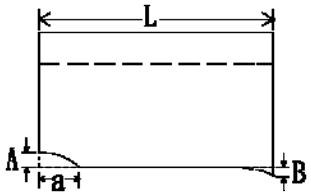
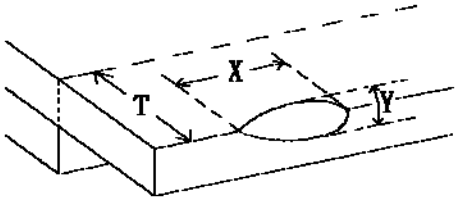
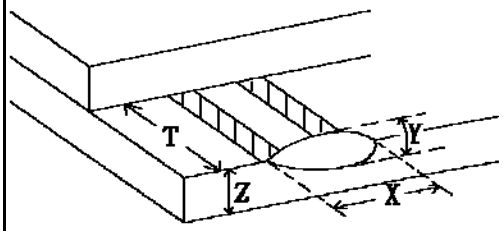
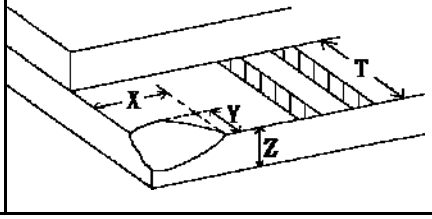
Class	Item	Judgment	Class
Packing & Indicate	1. Outside and inside package.	"MODEL NO.", "LOT NO." and "QUANTITY" should indicate on the package.	Minor
	2. Model mixed and quantity.	Other model mixed.....Rejected. Quantity short or over.....Rejected.	Critical
	3. Product indication.	"MODEL NO." should 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.	No display, wrong pattern display, current consumption. Out of specification.....Rejected.	Critical
	13. Dot defect.(for color and TFT)	According to standard of visual Inspection.	Minor

11.5. Standard Of Visual Inspection

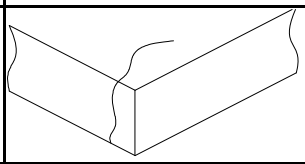
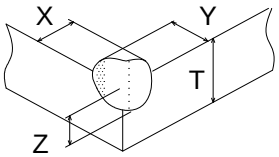
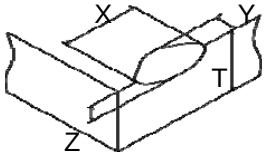
<table>
<tr><th>No.</th><th>Class</th><th>Item</th><th>Judgment</th></tr>
<tr><td>11.5.1</td><td>Minor</td><td>Black and white spot. Foreign materiel.
Dust.
Blemish.
Scratch.</td><td>(A)Round type: Unit: mm
<table>
<tr><th>Diameter (mm.)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.2</td><td>Disregard</td></tr>
<tr><td>0.2 < Φ≦0.3</td><td>2(Distance>5mm)</td></tr>
<tr><td>0.3 < Φ</td><td>0</td></tr>
</table>
Note: Φ = (length+width)/2

(B) Linear type: Unit: mm
<table>
<tr><th>Length</th><th>Width (mm.)</th><th>Acceptable Q'ty</th></tr>
<tr><td>--</td><td>W≦0.03</td><td>Disregard</td></tr>
<tr><td>L≦5.0</td><td>0.03 < W≦0.05</td><td>2(Distance>5mm)</td></tr>
<tr><td>L≦5.0</td><td>0.05 < W≦0.07</td><td>1</td></tr>
<tr><td>--</td><td>0.07 < W</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.5.2</td><td>Minor</td><td>Dent on polarizer.</td><td>Unit: mm.
<table>
<tr><th>Diameter</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.20</td><td>Disregard</td></tr>
<tr><td>0.20 < Φ≦0.50</td><td>2</td></tr>
<tr><td>0.50 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.5.3</td><td>Minor</td><td>Dot defect</td><td>
<table>
<tr><th>Items</th><th>Acceptable Q'ty</th></tr>
<tr><td>Bright dot</td><td>N ≦ 2</td></tr>
<tr><td>Dark dot</td><td>N ≦ 3</td></tr>
<tr><td>TOTAL</td><td>N ≦ 4</td></tr>
</table>
Pixel define :
 

Note1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Note 3: The bright dot defect must be visible through 2% ND filter
Note 4: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.</td></tr>
</table>

No.	Class	Item	Judgment		
11.5.4	MINOR	LCD GLASS CHIPPING.		Y>S	Reject
11.5.5	MINOR	LCD GLASS CHIPPING.		X or Y>S	Reject
11.5.6	MAJOR	LCD GLASS CRACK.		Y>(1/2) T	Reject
11.5.7	MAJOR	LCD GLASS SCRIBE DEFECT.		1. a>L/3, A>1.5mm Reject 2. B : According to dimension	
11.5.8	MINOR	LCD GLASS CHIPPING. (ON THE TERMINAL AREA)		Φ = (x+y)/2>2.5mm	Reject
11.5.9	MINOR	LCD GLASS CHIPPING. (ON THE TERMINAL SURFACE)		Y>(1/3)T	Reject
11.5.10	MINOR	LCD GLASS CHIPPING.		Y>T	Reject

11.6. Inspection standard of touch panel

NO.	CLASS	ITEMS		JUDGMENT	
11.6.1	Major	Touch panel crack.			Reject
11.6.2	Minor	Touch panel chipping.	Corner.		Not CNC products: X≦0.5mm, Y≦0.5mm, Z＜1/2T — Accept
			Edge.		Not CNC products: X≦0.5mm, Y≦0.5mm, Z＜1/2T — Accept
11.6.3	Minor	Scratch. Dust and foreign materiel. (linear type)		W≦0.03, L≦3mm	Accept
				0.03mm<W≦0.07mm, L≦3mm Distance ≧5mm	Accept 3 ea Max.
				W>0.07mm	Reject
11.6.4	Minor	Scratch. Dust and foreign materiel (round type: Φ = (length+width)/2)		Φ≦0.2mm	Accept
				0.2mm＜Φ≦0.3mm Distance ≧5mm	Accept 2 ea Max.
				Φ＞0.3mm	Reject
11.6.5	Minor	Touch panel dent / fish eyes.		Φ≦0.2mm	Accept
				0.2mm＜Φ≦0.3mm Distance ≧5mm	Accept 2 ea Max.
				Φ＞0.3mm	Reject
11.6.6	Minor	Touch panel air bubble.		Φ≦0.2mm	Accept
				0.2mm＜Φ≦0.3mm Distance ≧5mm	Accept 2 ea Max.
				Φ＞0.3mm	Reject
11.6.7	Minor	Touch panel printing area scratch.		W≦0.03mm, L≦3mm	Accept
				0.03mm<W≦0.05mm, L≦3mm Distance ≧5mm	Accept 2 ea Max.
				W＞0.05mm or L＞3mm (W>0.05 follow 11.6.4 round type)	Reject
11.6.8	Minor	Touch panel white haze mark / dust.		Can not be removed	Reject

12. Handling Precautions

12.1 Mounting method

The LCD panel of Microtips TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (CI), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

12.4 Packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

12.6 Storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

13. Precaution for Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to Microtips TFT, and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

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