GTK UK LTD.

PRODUCT SPECIFICATION

6.8" TFT LCD MODULE
MODEL: TFTL-0107   Ver:1.0

ROHS

< ◇ >   Preliminary Specification

< ◆ >   Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2016.09.13	ZFY	Initial Release	

Table of Contents

1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver Ics and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	6.8"	
LCD type	IPS TFT	
Display Mode	Transmissive /Normally black	
Resolution	480 RGB x 1280	Pixels
View Direction	FULL VIEW	Best Image
Module Outline	66.12(H) x 171.79 (V) x 2.5 (T) (Note1)	mm
Active Area	60.22 (H) x 160.59 (V)	mm
Pixel Size	125.46 (H) x 125.46 (V)	um
Pixel Arrangement	Stripe	
Display Colors	16.7M	
Interface	MIPI	
With or without touch panel	Without	
Driver IC	EK79030	-
Operating Temperature	**-20~60**	℃
Storage Temperature	**-20~65**	℃
Weight	TBD	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCI	2.5	6.0	V
	IOVCC	1.8	5.5	
Storage temperature	T_{STG}	-20	+65	℃
Operating temperature	T_{OP}	-20	+60	℃

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.
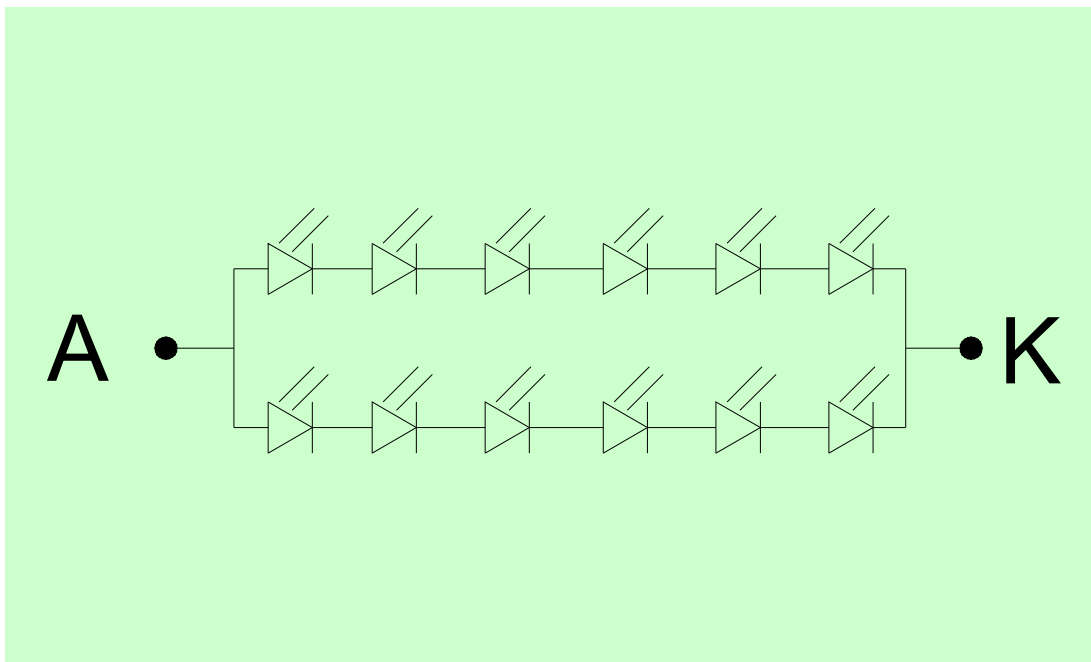
4. DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage		VCI	2.5	3.3	3.6	V
		IOVCC	1.8	3.3	3.6	
VDDIO Input low level voltage		V_{IL}	VSS	-	0.2*IOVCC	mV
VDDIO Input high level voltage		V_{IH}	0.8*IOVCC	-	IOVCC	mV
Current Consumption All Black	Logic	$I_{CC_+} I_{IN}$	-	TBD	-	mA
	Analog					

5. Backlight Characteristic

5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	Ta=25 ℃, I_F=20mA/LED	**16.8**	**19.2**	**20.4**	V
Forward Current	I_F	Ta=25 ℃, V_F=3.2V/LED	-	**20*2**	-	mA
Power dissipation	P_D		-	**768**	-	mW
Uniformity	Avg		70	-	-	%
Drive method	Constant current					
LED Configuration	12 White LEDs (6 LEDs in one string and 2 groups in parallel)					

### 5.2. Backlight Characteristic

6. Optical Characteristics

6.1. Optical Characteristics

Ta=25ºC, VCI=3.3V, TN LC+ Polarizer

Item		Symbol	Condition	Specification			Unit
				Min.	Typ.	Max.	
Backlight On (Transmissive Mode) Luminance on TFT(I_f =20mA/LED)		Lv	Normally viewing angle θX = φY =0º	320	400	-	cd/m²
Contrast ratio(See 6.3)		CR		700	900	-	
Response time (See 6.2)		T_R+T_F		-	25	35	ms
Chromaticity Transmissive (See 6.5)	Red	X_R			TBD		
		Y_R			TBD		
	Green	X_G			TBD		
		Y_G			TBD		
	Blue	X_B			TBD		
		Y_B			TBD		
	White	X_W			TBD		
		Y_W			TBD		
Viewing Angle (See 6.4)	Horizontal	θX+	Center CR≥10	70	80	-	Deg.
		θX-		70	80	-	
	Vertical	φY+		70	80	-	
		φY-		70	80	-	
NTSC Ratio(Gamut)				-	60	-	%

6.2. Definition of Response Time

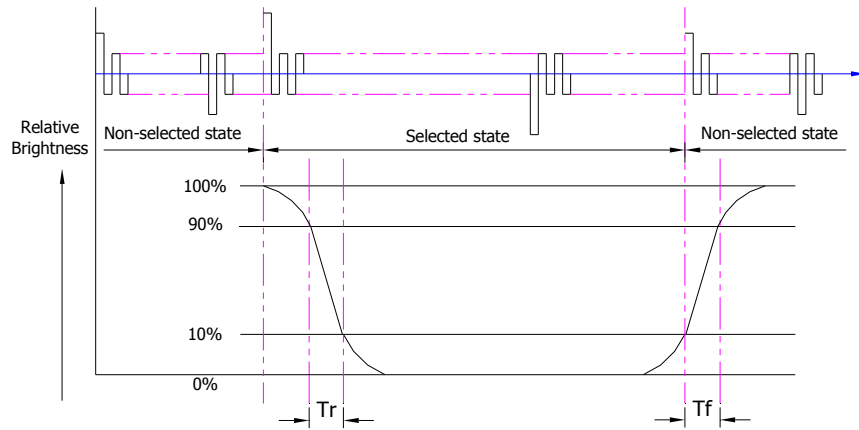### 6.2.1. Normally Black Type (Negative)
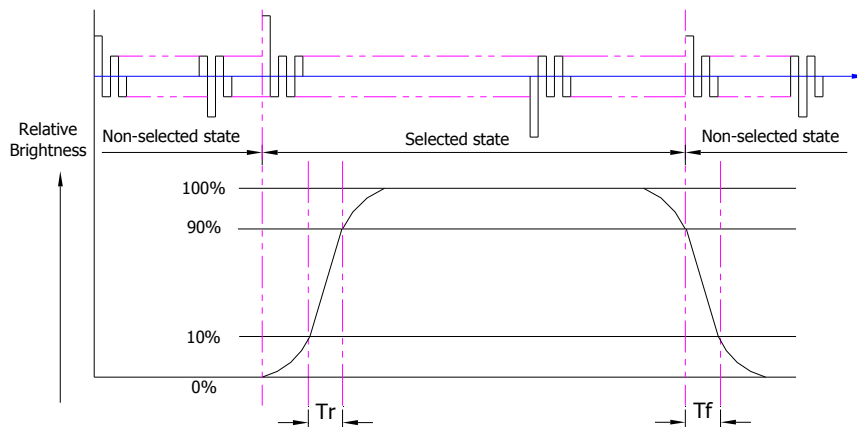
Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

6.2.2. Normally White Type (Positive)

Tr is the time it takes to change form non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

6.3. Definition of Contrast Ratio

Contrast is measured perpendicular to display surface in reflective and transmissive mode. The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

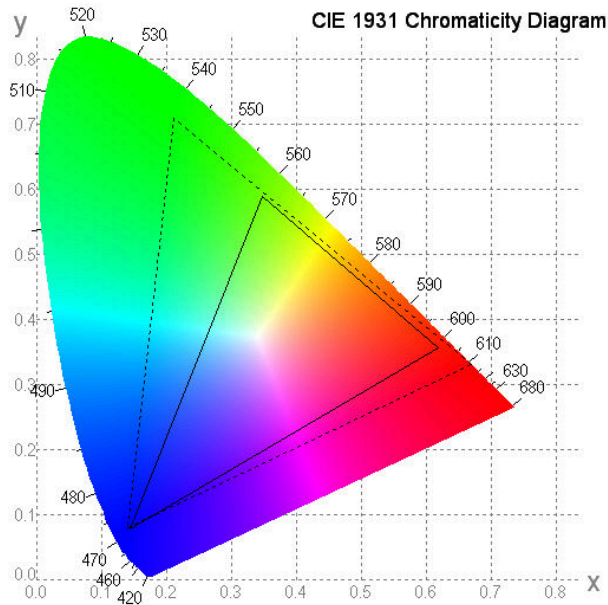## 6.4. Definition of Viewing Angles
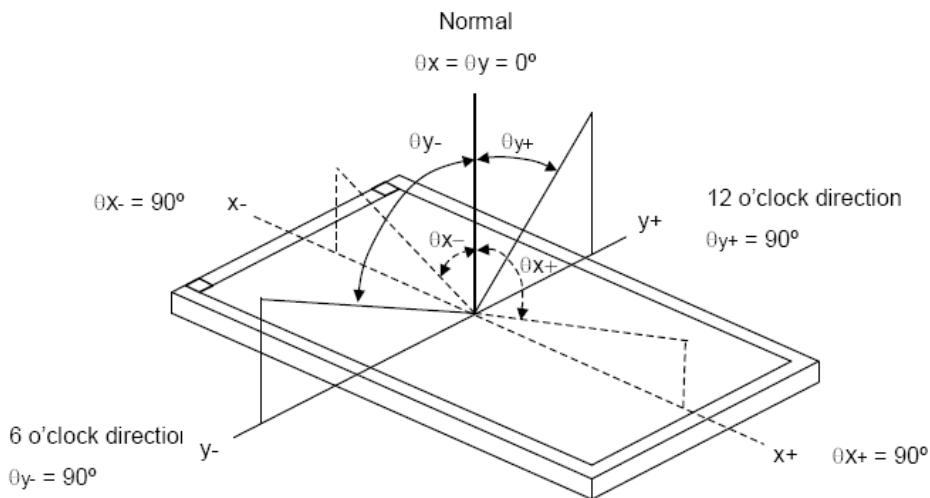
Measuring machine: LCD-5100 or EQUI

6.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)
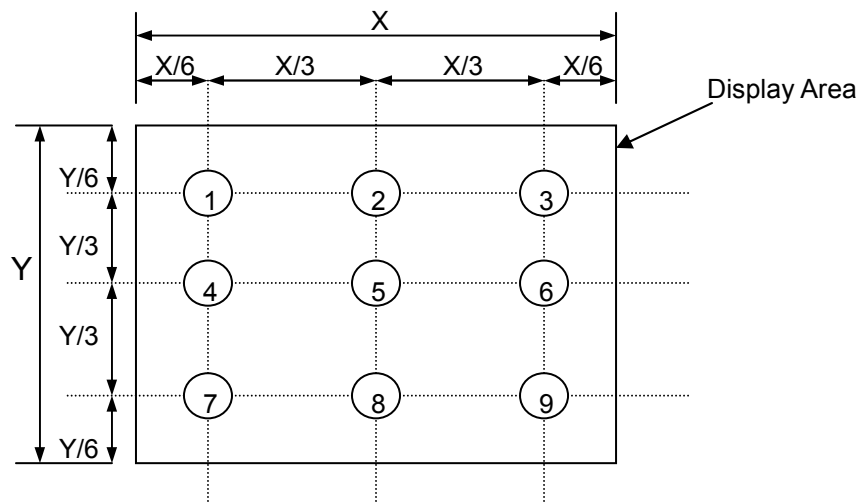

## 6.6. Definition of Surface Luminance, Uniformity and Transmittance

Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1.   Surface Luminance: L_V = average (L_{P1}:L_{P9})

6.6.2.   Uniformity = Minimal (L_{P1}:L_{P9}) / Maximal (L_{P1}:L_{P9}) * 100%

6.6.3.   Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7

7. Block Diagram and Power Supply
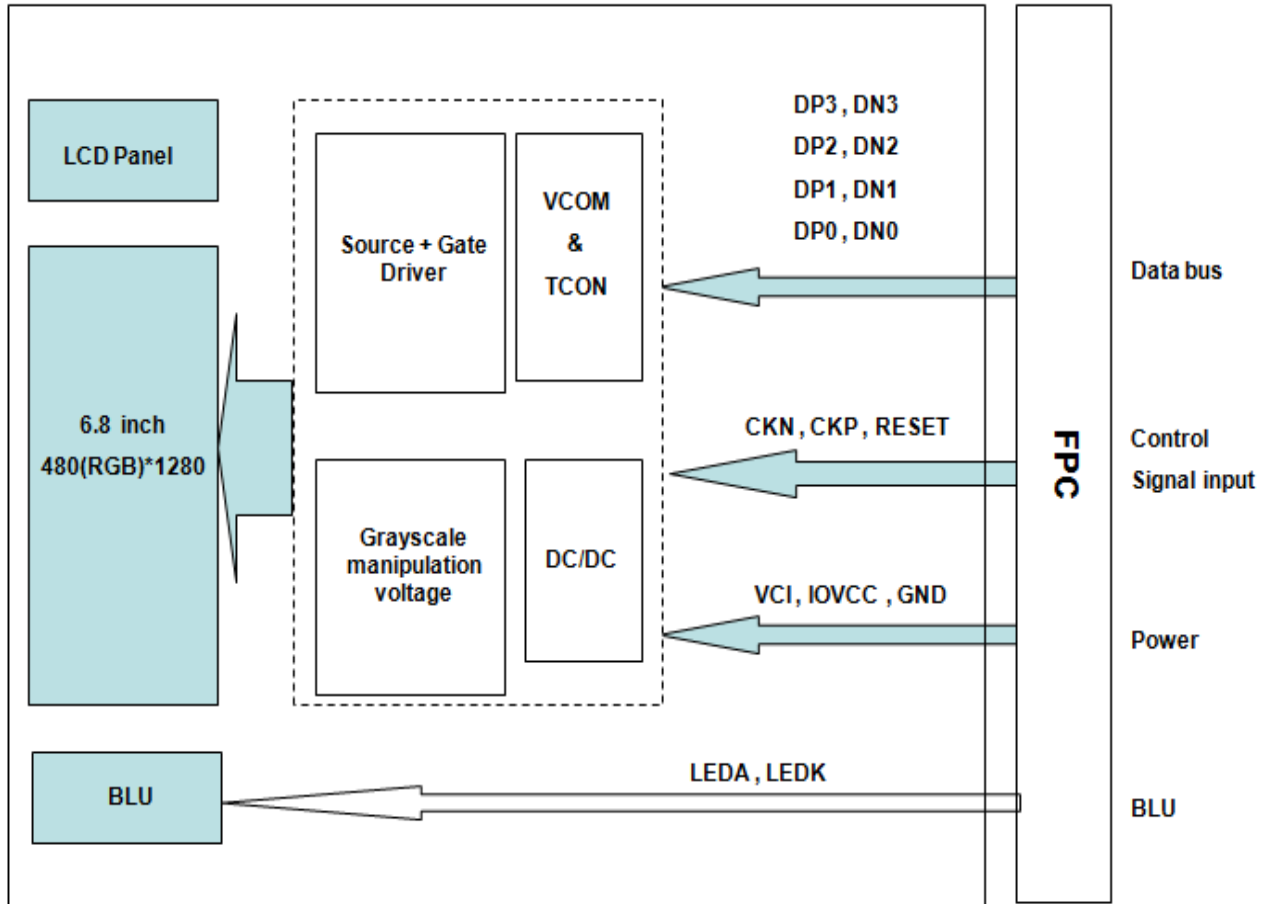
8.   Interface Pins Definition

No.	Symbol	Function	Remark
1	GND	Ground	
2	VCI	A power supply for DC/DC circuit	
3	VCI	A power supply for DC/DC circuit	
4	IOVCC	A power supply for the I/O circuit	
5	GND	Ground	
6	RESET	Reset pin	
7	TE	No connection	
8	GND	Ground	
9	GND	Ground	
10	DN3	MIPI data Input	
11	DP3	MIPI data Input	
12	GND	Ground	
13	DN2	MIPI data Input	
14	DP2	MIPI data Input	
15	GND	Ground	
16	CKN	MIPI clock Input	
17	CKP	MIPI clock Input	
18	GND	Ground	
19	DN1	MIPI data Input	
20	DP1	MIPI data Input	
21	GND	Ground	
22	DN0	MIPI data Input	
23	DP0	MIPI data Input	
24	GND	Ground	
25	GND	Ground	
26	LEDK	Led cathode	
27	LEDK	Led cathode	
28	LEDA	Led anode	
29	LEDA	Led anode	
30	NC	No connection	

9. AC Characteristics

9.1. MIPI Input timing

For 480RGBx1280

	Symbol	Value			Unit
		Min.	Typ.	Max.	
MIPI (4 Lane) @Frame rate=60Hz			386		Mbps
Lane) @Frame rate=60Hz			515		Mbps
DCLK frequency @Frame rate=60Hz	F_{DCLK}		64.4		MHz
HSYNC period time	T_H		824		DCLK
Horizontal display area	T_{HD}		480		DCLK
HSYNC pulse width	T_{HPW}		24	-	DCLK
HSYNC back porch	T_{HBP}		160	-	DCLK
HSYNC front porch	T_{FBP}		160	-	DCLK
VSYNC period time	T_V		1304		H
Vertical display area	T_{VD}		1280		H
VSYNC pulse width	T_{VPW}		2	-	H
VSYNC back porch	T_{VBP}		10	-	H
VSYNC front porch	T_{VFP}		12	-	H

9.2. MIPI AC characteristics
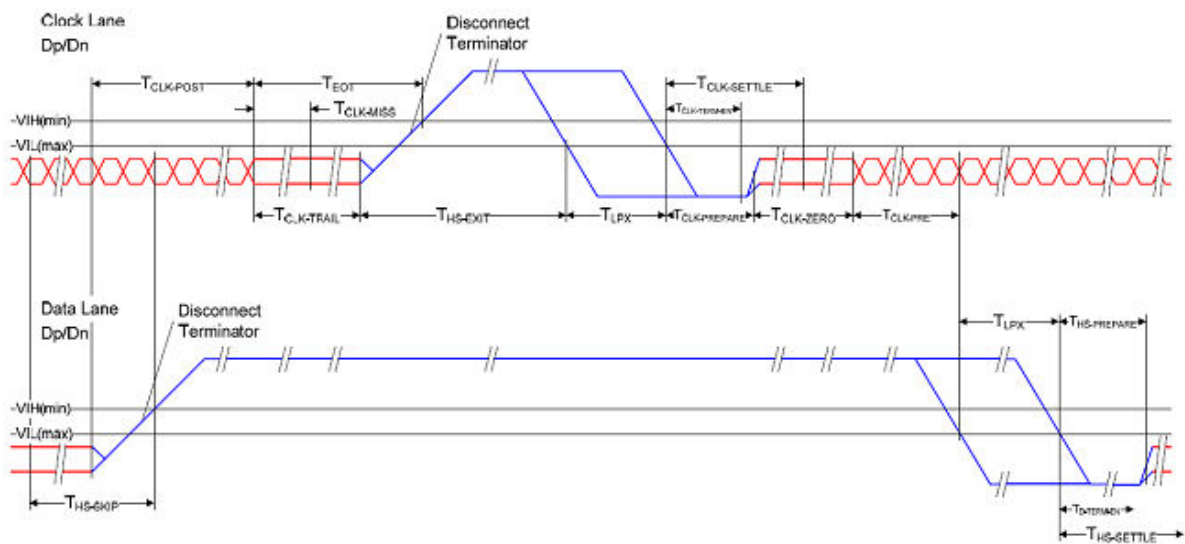
Switching the clock lane between clock transmission and low-power mode
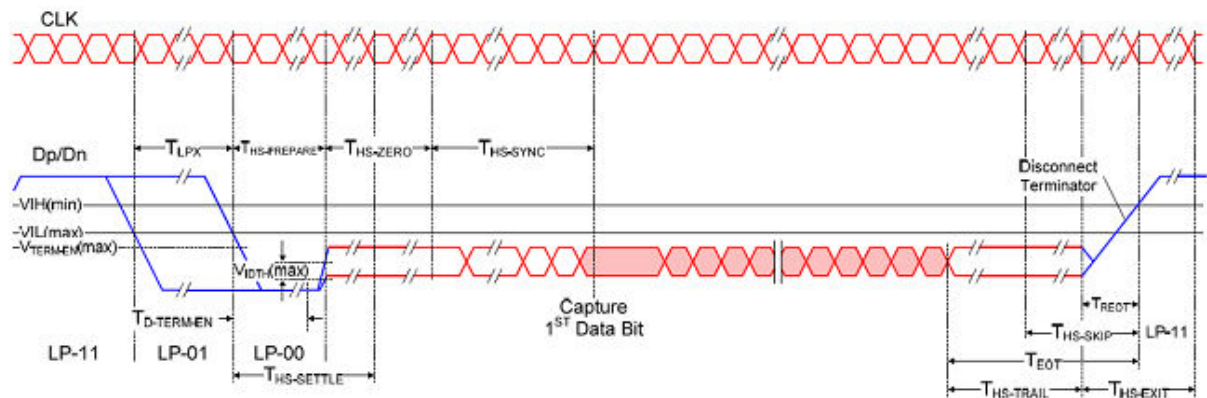
Timing of high-speed data transmission in bursts

Parameter	Descript	Spec.			Unit
		Min.	Typ.	Max.	
T_{REOT}	30%-85% rise time and fall time	-	-	35	ns
$T_{CLK-MISS}$	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.	-	-	60	ns
$T_{CLK-POST}$*1	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 $T_{CLK-TRAIL}$.	60 ns + 52*UI (For DCS)			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	-		ns
$T_{CLK-SETTLE}$	Time interval during which the HS receiver shall ignore any Clock Lane HS transitions, starting from the beginning of $T_{CLK-PRE}$.	95	-	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 VTERM-EN	-	38	ns
$T_{HS-SETTLE}$	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of $T_{HS,PREPARE}$.	85 ns + 6*UI	-	145 ns + 10*UI	ns
T_{EOT}	Time from start of $T_{HS-TRAIL}$ or $T_{CLK-TRAIL}$ period to start of LP-11 state	-	-	105ns+48*UI	-

$T_{HS-EXIT}$ [1]	time to drive LP-11 after HS burst	100	-	-	ns
$T_{HS-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	40ns + 4*UI	-	85ns+6*UI	ns
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + Time to drive HS-0 before the Sync sequence	145ns + 10*UI	-	-	ns
$T_{HS-SKIP}$	Time-out at RX to ignore transition period of EoT	40	-	55ns+4*UI	ns
$T_{HS-TRAIL}$	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60 + 4*UI	-	-	ns
T_{LPX}	Length of any Low-Power state period	50	-	-	ns
Ratio T_{LPX}	Ratio of $T_{LPX(MASTER)}$/$T_{LPS(SLAVE)}$ between Master and Slave side	2/3	-	3/2	-
T_{TA-GET}	Time to drive LP-00 by new TX	5*T_{LPX}			ns
T_{TA-GO}	Time to drive LP-00 after Turnaround Request	4*T_{LPX}			ns
$T_{TA-SURE}$	Time-out before new TX side starts driving	T_{LPX}	-	2*T_{LPX}	ns

Note: (1) For image transmission:
$T_{CLK-POST}$ min value =164 when MIPI max frequency per lane = 0.53Gbps.
$T_{CLK-POST}$ min value =112 when MIPI max frequency per lane = 1Gbps

10. Reset timing

When RESETB of the reset pin equals to Low, it will be in the condition of reset.
When it is in the condition of reset, it will make the device recover the initial set.

However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.

The closed interval of Low can be shown as the following.

(Test condition: VDDIO=1.65V~3.6V, VSS=0V, TA=-20 ~+85)

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max	
Reset low pulse width	Trst		20	-	-	μs
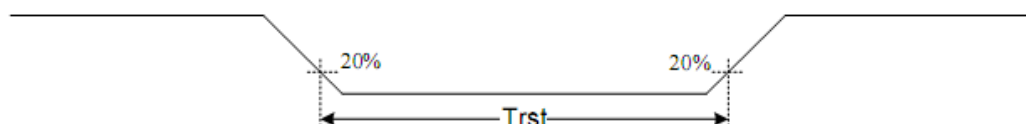
11. Quality Assurance

11.1.   Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

11.2.   Standard for Quality Test

11.2.1 Sampling Plan:
      GB2828.1-2012
      Single sampling, general inspection level II

11.2.2 Sampling Criteria:
      Visual inspection: AQL 1.5%
      Electrical functional: AQL 0.65%.

11.2.3 Reliability Test:
      Detailed requirement refer to Reliability Test Specification.

11.3.   Nonconforming Analysis & Disposition

11.3.1 Nonconforming analysis:
    11.3.1.1 Customer should provide overall information of non-conforming sample for their complaints.
    11.3.1.2 After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.
    11.3.1.3 If cannot finish the analysis on time, customer will be notified with the progress status.

11.3.2 Disposition of nonconforming:
    11.3.2.1 Non-conforming product over PPM level will be replaced.
    11.3.2.2 The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

11.4.   Agreement Items

Shall negotiate with customer if the following situation occurs:

11.4.1 There is any discrepancy in standard of quality assurance.

11.4.2 Additional requirement to be added in product specification.

11.4.3 Any other special problem.

11.5.   Standard of the Product Visual Inspection

11.5.1 Appearance inspection:
    11.5.1.1 The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.
    11.5.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.
    11.5.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area,
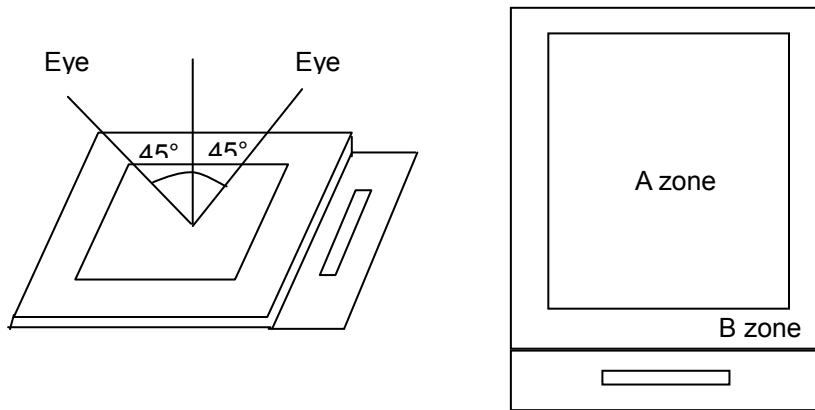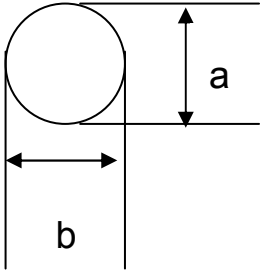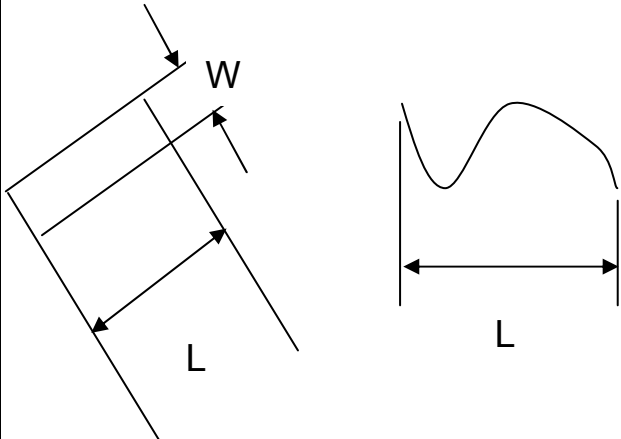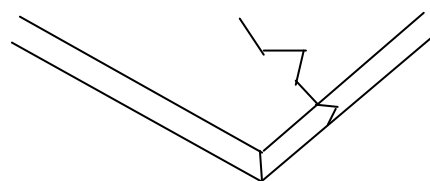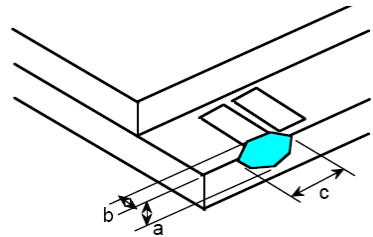
11.5.2 Basic principle:

      11.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.
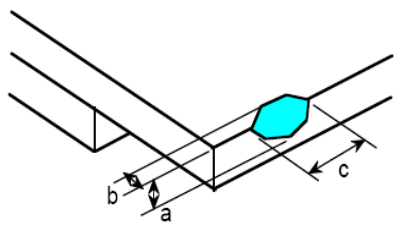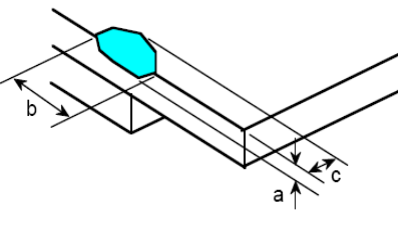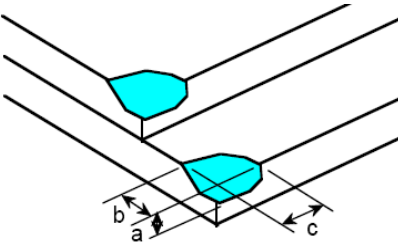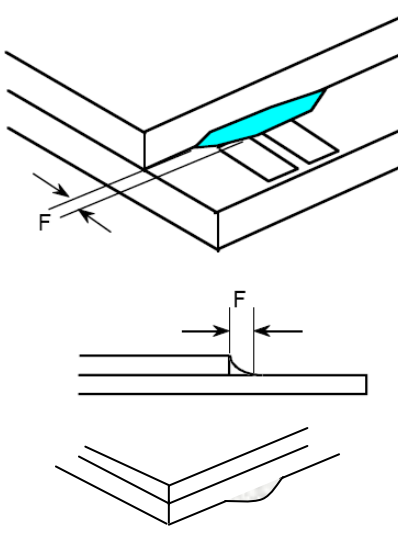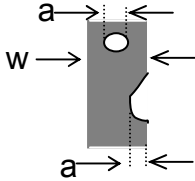
      11.5.2.2 New item must be added on time when it is necessary.

11.6. Inspection Specification

No.	Item	Criteria (Unit: mm)		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\varphi = (a + b)/2$ Distance between 2 defects should more than 3mm apart.		

For item 01, the criteria table:

Size \ Area	Acc. Qty
$\varphi \leqslant 0.20$	Ignore
$0.20 < \varphi \leqslant 0.50$	N ≤ 3
$0.50 < \varphi$	0

No.	Item		Display Area	Total	
02	Electrical Defect (Minor defect)	Bright dot	N ≤ 2	N ≤ 2	Note1
		Dark dot	N ≤ 4	N ≤ 4	
		Total dot	N ≤ 4	N ≤ 4	
		Mura	Not visible through 5% ND filters.		Note 2

Remark:
1. Bright dot caused by scratch and foreign object accords to item 1.

03	Black and White line Scratch Foreign material (Line type) (Minor defect)	

Length	Width	Acc. Qty
/	W ≦ 0.03	Ignore
L ≦ 2.5	0.03 < W ≦ 0.05	3
L ≦ 2.5	0.05 < W ≦ 0.10	2
/	0.1 < W	0
Total		3

Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.

04	Glass Crack (Minor defect)	

Crack is potential to enlarge, any type is not allowed.

05	Glass Chipping Pad Area: (Minor defect)	

Length and Width	Acc. Qty
c > 3.0, b< 1.0	1
c< 3.0, b< 1.0	3
a<Glass Thickness	

06	Glass Chipping Rear of Pad Area: (Minor defect) 		
		Length and Width	**Acc. Qty**
		$c > 3.0, b < 1.0$	1
		$c < 3.0, b < 1.0$	2
		$c < 3.0, b < 0.5$	4
		a<Glass Thickness	

07	Glass Chipping Except Pad Area: (Minor defect) 		
		Length and Width	**Acc. Qty**
		$c > 3.0, b < 1.0$	1
		$c < 3.0, b < 1.0$	2
		$c < 3.0, b < 0.5$	4
		a<Glass Thickness	

08	Glass Corner Chipping: (Minor defect) 		
		Length and Width	**Acc. Qty**
		$c < 3.0, b < 3.0$	Ignore
		a<Glass Thickness	

09	Glass Burr: (Minor defect) 		
		Length	**Acc. Qty**
		$F < 1.0$	Ignore
		Glass burr don't affect assemble and module dimension.	

10	FPC Defect: (Minor defect) a→ ⊙ ← w → ← a→ ←	10.1 Dent, pinhole width a<w/3. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.
11	Bubble on Polarizer (Minor defect)	<table><tr><td>Diameter</td><td>Acc. Qty</td></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table>
12	Dent on Polarizer (Minor defect)	<table><tr><td>Diameter</td><td>Acc. Qty</td></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table>
13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.

14	Touch Panel	D: Diameter W: width L: length
		14.1 Spot: D<0.25 is acceptable
		        0.25≤D≤0.4
		2dots are acceptable and the distance between defects should more than 10 mm.
		        D>0.4 is unacceptable
		14.2 Dent: D>0.40 is unacceptable
		14.3 Scratch: W≤0.03, L≤10 is acceptable,
		        0.03<W≤0.10, L≤10 is acceptable
		Distance between 2 defects should more than 10 mm.
		        W>0.10 is unacceptable.

15	PCB	15.1 No distortion or contamination on PCB terminals. 15.2 All components on PCB must same as documented on the BOM/component layout. 15.3 Follow IPC-A-600F.

16	Soldering	Follow IPC-A-610C standard
17	Electrical Defect (Major defect)	The below defects must be rejected. 17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display. 17.3 No function or no display. 17.4 Current exceeds product specifications. 17.5 LCD viewing angle defect. 17.6 No Backlight. 17.7 Dark Backlight. 17.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

11.7. Classification of Defects

11.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

11.7.2 Two minor defects are equal to one major in lot sampling inspection.

11.8. Identification/marking criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

11.9. Packaging

11.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

11.9.2 Modules inside package box should have compliant mark.

11.9.3 All direct package materials shall offer ESD protection

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.

Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

12. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	**60℃, 96Hrs**	2	GB/T2423.2 -2008
2	Low Temperature Operating	**-20℃, 96Hrs**	2	GB/T2423.1 -2008
3	High Humidity	**40℃, 90%RH, 96Hrs**	2	GB/T2423.3 -2006
4	High Temperature Storage	**65℃, 96Hrs**	2	GB/T2423.2 -2008
5	Low Temperature Storage	**-20℃, 96Hrs**	2	GB/T2423.1 -2008
6	Thermal Cycling Test	-20℃, 60min ~ 60℃, 60min, 20 cycles.	2	GB/T2423.22 -2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	2	GB/T5170.14 -2009
8	Electrical Static Discharge	Air:±4KV 150pF/330Ω 5 times	2	GB/T17626.2 -2006
		Contact:±2KV 150pF/330Ω 5 times		
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8 -1995

Note1.   No defection cosmetic and operational function allowable.

Note2.   Total current Consumption should be below double of initial value

16	Soldering	Follow IPC-A-610C standard
17	Electrical Defect (Major defect)	The below defects must be rejected. 17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display. 17.3 No function or no display. 17.4 Current exceeds product specifications. 17.5 LCD viewing angle defect. 17.6 No Backlight. 17.7 Dark Backlight. 17.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

11.7. Classification of Defects

11.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

11.7.2 Two minor defects are equal to one major in lot sampling inspection.

11.8. Identification/marking criteria

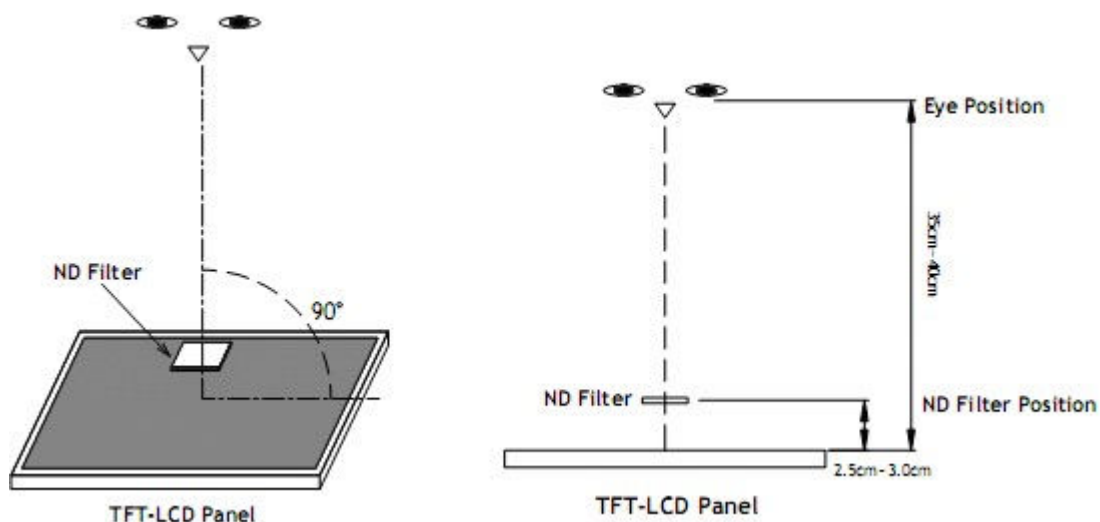Any unit with illegible / wrong /double or no marking/ label shall be rejected.

11.9. Packaging

11.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

11.9.2 Modules inside package box should have compliant mark.

11.9.3 All direct package materials shall offer ESD protection

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.

Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

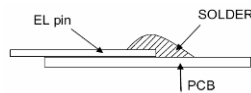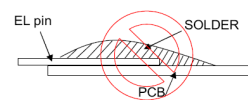Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

13.4.2.6. Solder Wetting
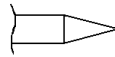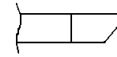

Recommended   Not Recommended

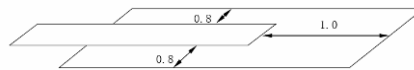13.4.2.7. The type of the solder iron:

Recommended   Not Recommended

13.4.2.8. Solder Pad

13.5. Operation

13.5.1. Do not drive LCD with DC voltage

13.5.2. Response time will increase below lower temperature

13.5.3. Display may change color with different temperature

13.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

13.6. Static Electricity

13.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

13.6.2. The normal static prevention measures should be observed for work clothes and benches.

13.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

13.7. Limited Warranty

13.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

13.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

13.7.3. After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

14. Packaging

TBD

15. Outline Drawing

PIN FUNCTION

PIN	SYMBOL
1	GND
2	VCI
3	VCI
4	IOVCC
5	GND
6	RESET
7	TE
8	GND
9	GND
10	DN3
11	DP3
12	GND
13	DN2
14	DP2
15	GND
16	CKN
17	CKP
18	DN1
19	DP1
20	GND
21	GND
22	DN0
23	DP0
24	GND
25	GND
26	LEDK
27	LEDK
28	LEDA
29	LEDA
30	NC

REVREVISION RECORD

SIGN	DATE

⚠ First Issue

VERSION	DATE
A	2016.08.16
NO.	UNIT
1/1	mm
SCALE	DRAWN

APPROVED CHECKED

MODEL NAME:
TFTL-0107
FILE NAME:
TFTL-0107

gtk GTK UK LTD.

NOTES:
1. Display size:6.8"TFT
2. Viewing direction:FULL VIEW/IPS
3. Display mode:Transmissive/Normal Black
4. Operation temperature:-20°C~+60°C
5. Storage temperature:-20°C~+65°C
6. Driver IC:EK79030
7. Power supply voltage:3.3V
8. Backlight :White(12 LED)/19.2(TYPE)V/40mA
9. ROHS must be complied
* Unspecification tolerance are ±0.2mm