



PRODUCT SPECIFICATION

Part Number

PGG322415-7UFLWA-S

CUSTOMER	
CUSTOMER PART NUMBER	
DESCRIPTION	
APPROVED BY	
DATE	

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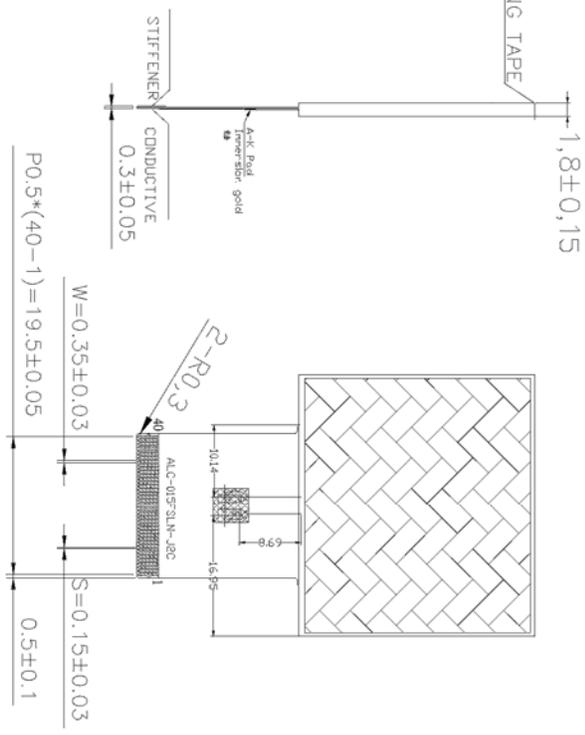
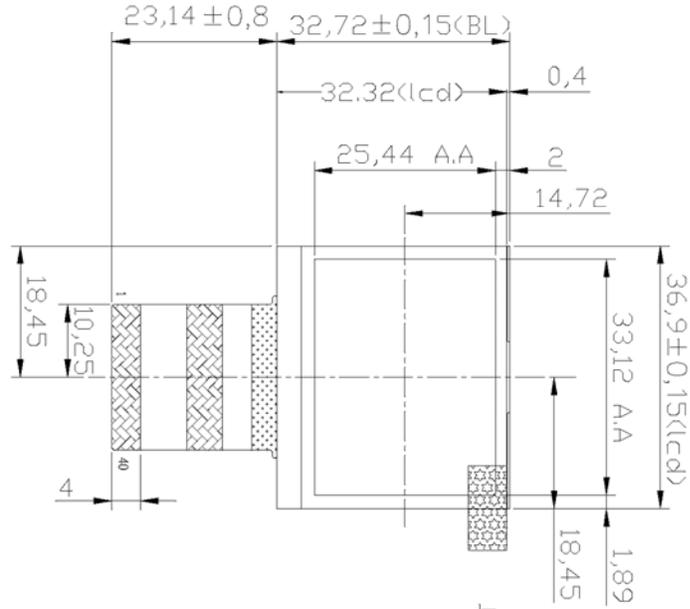
1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by P-tec Corporation.

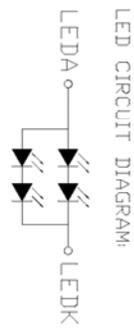
2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	1.5" TFT	--
Dot arrangement	320(RGB)×240	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmissive / Normally White	--
Viewing Direction	12 o'clock(Gray scale inversion)	--
Driver IC	ILI9342C	--
Module size	36.90 (W) * 32.72 (H) * 1.80 (T)	mm
Active area	33.12 (W) * 25.44 (H)	mm
Dot pitch	0.1155 (W) * 0.1155 (H)	mm
Interface	3-line SPI / Parallel 6bits RGB	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	4-Chip White LED	--
Weight	TBD	g

3. External Dimensions



1. Do not scale drawing.
 2. Modification rev. number,
 3. Draft angle 1.5°.
 4. Operating Temperature: -20~+70°C
 - Storage Temperature: -30~+80°C
 5. RoHS must be complied. (Use Lead-free process)
 6. Special characteristic.
- () reference dimension.



4. Interface Description

(Ta=25±2°C)

Pin	Symbol	I/O	Function
1	DUMMY	--	Dummy
2	DUMMY	--	Dummy
3	DUMMY	--	Dummy
4	DUMMY	--	Dummy
5	DUMMY	--	Dummy
6	DUMMY	--	Dummy
7	DUMMY	--	Dummy
8	DUMMY	--	Dummy
9	DUMMY	--	Dummy
10	VCOML	C	Capacitor for CCOM low
11	VCOMH	C	Capacitor for CCOM high
12	GND	--	Ground
13	DUMMY	--	Dummy
14	VCI	I	Power supply for analog circuit blocks
15	DUMMY	--	Dummy
16	DUMMY	--	Dummy
17	DUMMY	--	Dummy
18	DUMMY	--	Dummy
19	LEDK	G	Cathode for LED backlighting
20	DUMMY	--	Dummy
21	DUMMY	--	Dummy
22	LEDA	P	Anode for LED backlighting
23	GND	--	Ground
24	IOVCC	I	Power supply for interface logic circuit
25	VSYNC	I	Vertical sync input. Negative polarity
26	HSYNC	I	Horizontal sync input. Negative polarity
27	DOTCLK	I	Dot clock signal for RGB interface operation
28	GND	--	Ground
29	GND	--	Ground
30	D0	I	Data input
31	D1	I	Data input

32	D2	I	Data input
33	D3	I	Data input
34	D4	I	Data input
35	D5	I	Data input
36	SDA	I	Serial interface data line
37	SCL	C	Serial interface clock line
38	CSX	C	Chip Select input pin
39	NC	--	No connection
40	RESX	I	System reset pin

5. Absolute Maximum Ratings

(Ta=25±2°C)

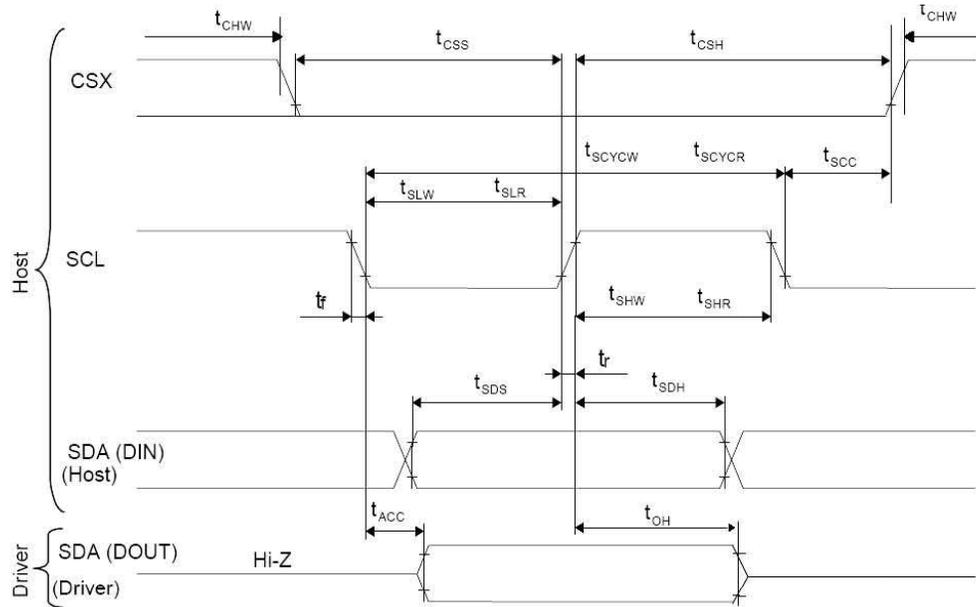
Item	Symbol	Min.	Max.	Unit
Analog Supply Voltage	VCI	-0.3	4.2	
Logic Supply Voltage	IOVCC	-0.3	3.0	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog Supply Voltage	VCI	2.6	2.8	3.3	V	
Logic Supply Voltage	IOVCC	1.65	1.8	2.8	V	--
Input High Voltage	V _{IH}	0.7IOVCC C	--	IOVCC	V	Digital input pins
Input Low Voltage	V _{IL}	GND	--	0.3IOVCC C	V	Digital input pins
Output High Voltage	V _{OH}	0.8IOVCC C	--	IOVCC	V	Digital output pins
Output Low Voltage	V _{OL}	GND	--	0.2IOVCC C	V	Digital output pins
I/O Leak Current	I _{LI}	-0.1	--	0.1	uA	--

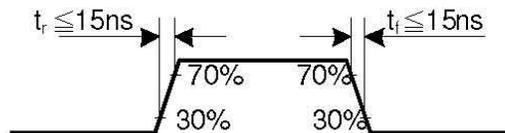
7. Timing Characteristics

7.1 Serial 3-line SPI Interface Timing

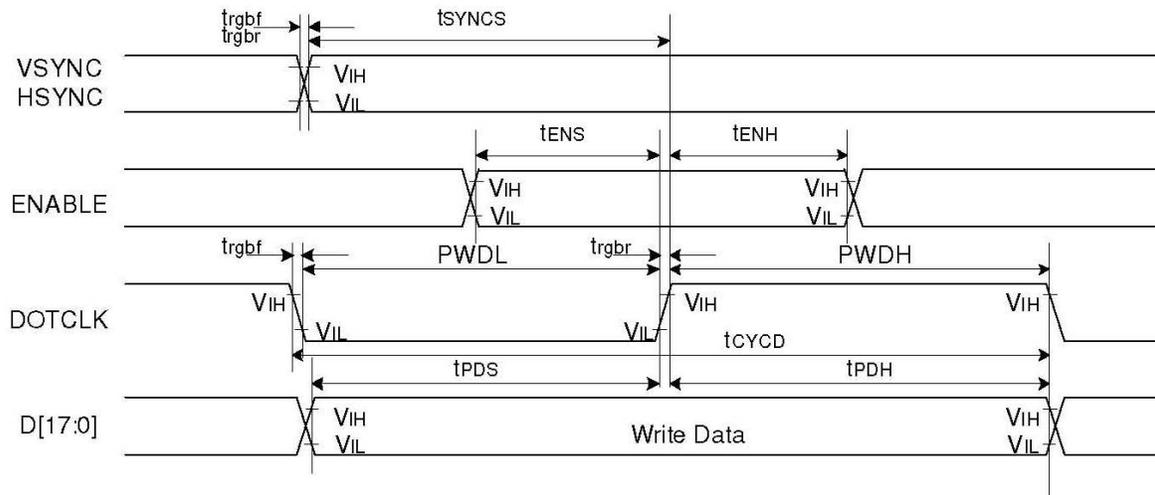


Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	35	-	ns	
	tslw	SCL "L" Pulse Width (Write)	35	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	15	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tch	CSX "H" Pulse Width	40	-	ns	
	tcs	CSX-SCL Time(write)	30	-	ns	
	tcs		30	-	ns	

Note: $T_a = 25\text{ }^\circ\text{C}$, $I_{OVCC}=1.65\text{V to }2.8\text{V}$, $V_{CI}=2.6\text{V to }3.3\text{V}$, $AGND=GND=0\text{V}$

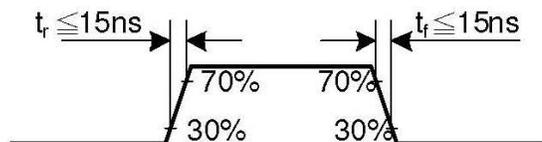


7.2 Parallel 6-bit RGB Interface Timing

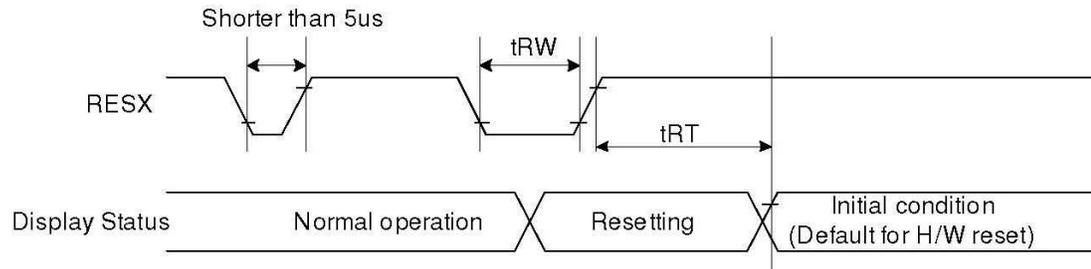


Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	33	-	ns	
	PWDL	DOTCLK low-level period	33	-	ns	
	t_{CYCD}	DOTCLK cycle time(18 bit)	100	-	ns	
	t_{rgrb}, t_{rgrf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	6-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level pulse period	25	-	ns	
	PWDL	DOTCLK low-level pulse period	25	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{rgrb}, t_{rgrf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: $T_a = -30$ to 70 °C, $IOVCC=1.65V$ to $2.8V$, $VCI=2.6V$ to $3.3V$, $AGND=GND=0V$



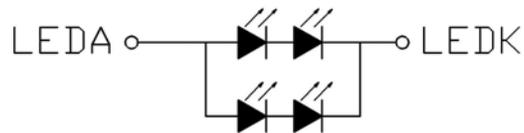
7.3 Reset Timing



Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

8. Backlight Characteristic

LED CIRCUIT DIAGRAM:

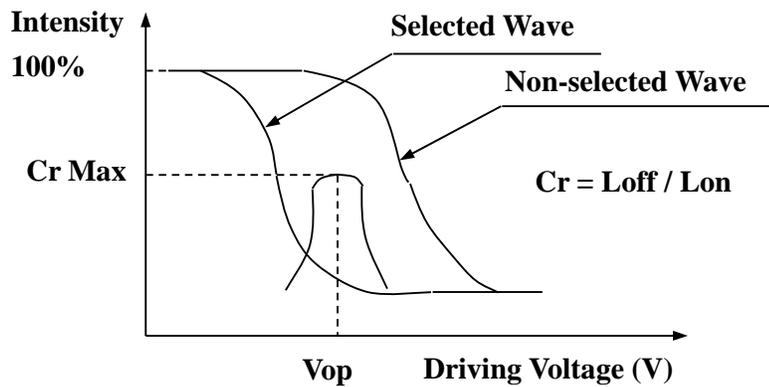
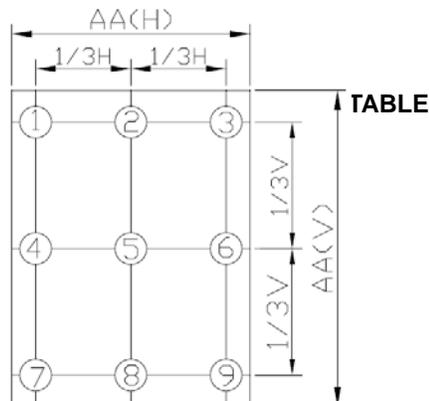


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	5.4	--	6.8	V	If=40mA
Supply Current	If	--	40	--	mA	--
Luminous Intensity for LCM	--	450	500	--	cd/m ²	If=40mA
Backlight Color	White					

9. Optical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
Brightness	BL	$\theta = \varphi = 0^\circ$	450	500	--	cd/m ²	Note2	
Contrast Ratio	CR	$\theta = \varphi = 0^\circ$	--	650	--	--	Note3	
Response Time	Tr	$\theta = \varphi = 0^\circ$		6	12	ms	Note4	
	Tf		--	15	30			
Viewing Angle	Upper	θ	CR \geq 10	10	60	--	--	Note 5
	Down			30	60	--	--	
	Right	φ		45	60	--	--	
	Left			45	55	--	--	
Color Filter Chromaticity	White	X	$\theta = \varphi = 0^\circ$	--	(0.31)	--	--	Note 6
		y		--	(0.34)	--	--	

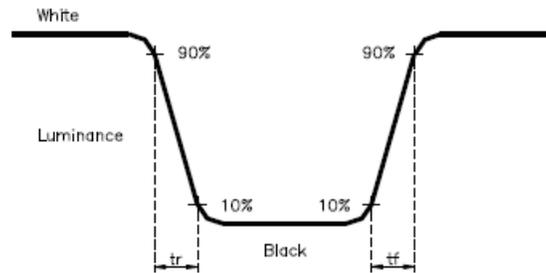
Note 1: Definition of Operation Voltage (Vop)


 Note 2: Definition of Luminance Uniformity : $L = L(\text{MIN}) / L(\text{MAX}) \times 100\%$


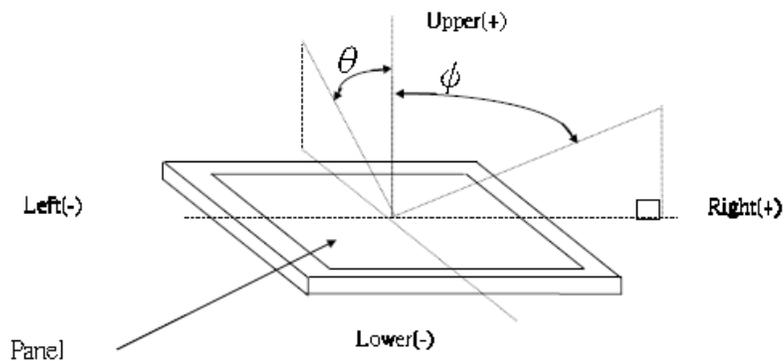
Note 3. Definition of Contrast Ratio:

$$CR = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$$

Note 4. Definition of response time : The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle(θ , ψ) :



Note 6. Light source: C light.

10. Reliability Test Conditions and Methods

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	60°C 240 hrs	<ul style="list-style-type: none"> ◦ No Defect Of Operational Function In Room Temperature Are Allowable. ◦ Leakage current should be below double of initial value.
2	Low Temperature Operating	0°C 240 hrs	
3	High Temperature Non-Operating	70°C 240 hrs	
4	Low Temperature Non-Operating	-20°C 240 hrs	
5	High Temperature/ Humidity Non-Operating	60°C ,90%RH 240 hrs ↔	
6	Temperature Shock Non-Operating	-20°C 70°C (30min) (5min) (30min)	
7	Electrostatic Discharge Test Non-Operating	HBM:±2kV	

Note 1: Test after 24 hours in room temperature.

Note 2: The sampling above is individually for each reliability testing condition.

Note 3: The color fading of polarizing filter should not care.

Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value: 1.0 MΩ-cm)

Note 5: 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.

11. Handling Precautions

11.1 Mounting method

The LCD panel of P-TEC TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is 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.

11.2 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 happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

11.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to IOVCC or GND, 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.

11.4 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 directly to sunshine or high temperature/humidity

11.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes 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 than the operating temperature range and on the other hand at higher temperature LCD's show 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.

11.6 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 anything else.

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

11.7 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

12. Precaution for Use

12.1

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.

12.2

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 P-TEC 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.

13. Packing Method

TBD