

SPECIFICATION

(ISO9001:2008)

PRODUCT :	LCM
MODEL NO. :	HGO1286410T-F-LWH-LSV-U
SUPPLIER :	TSINGTEK DISPLAY CO.LTD
REVISION :	В

www.china-lcdmodules.com E-mail:sales@tsingtek.com REV . B

Rev NO.	Rev Date	CONTENS	REMARKS
А	Apr. 1,2011	First Release	
В	Mar. 12,2012	RoHS Compliant	

PRODUCT CODING SYSTEM

- HGO 128 64 10 T-F- LW H- LSV- U
- (1) (2) (3) (4) (5) (6) (7) (8)
 - (1): Brand and Display Type
 - HGO→Tsingtek COG Type
 - (2): Graphic \rightarrow row dots \times column dots
 - (3): Series No.
 - (4): Display Mode
 - T- F→FSTN Transmissive
 - (5): Backlight Type
 - LW→LED White
 - (6): Temperature
 - H→Wide Temperature
 - (7): Power Supply
 - LSV→3.3V With Temperature Compensation
 - (8): Viewing Direction

U→12:00

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1. BASIC SPECIFICATION

1.1 DISPLAY SPECIFICATION

ITEM	SPECIFICATION
DISPLAY TYPE	FSTN/ POSITIVE/TRANSMISSIVE
COLOR	DISPLAY DOT: BLACK
COLOR	DISPLAY BACKGROUNTND:WHITE
INPUT DATA	68 PARALLEL
DUTY	1/65DUTY
VIEW ANGLE	12 O'CLOCK
CONTROLLER	UC1701
BEZEL	0.6T
BACKLIGHT	LED(WHITE)
OPERATING TEMPERATURE	-20 °C ~70 °C
STORAGE TEMPERATURE	$-30 {}^{\rm o}{\rm C} \sim 80 {}^{\rm o}{\rm C}$
OTHERS	

1.2 MECHANICAL SPECIFICATION

ITEM	SPECIFICATION	UNIT	NOTE
DIMENSIONAL OUTLINE	93.0(W)×70.0(H)×13.0MAX.(T)	mm	
VIEW AREA	72.0(W)×40.0(H)	mm	
EFFECTIVE V/AREA	66.52(W)×33.24(H)	mm	
NUMBER OF DOTS	128Dots×64Dots		
DOT PITCH	0.52(W)×0.52(H)	mm	
DOT SIZE	0.48(W)×0.48(H)	mm	

1.3 BLOCK DIAGRAM



1.4 DIMENSIONAL OUTLINE



1.5 TERMINAL FUNCTIONS

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	Vss	0V	GND
2	VDD	+3.3V	Power Supply for logic
3	NC	-	No connection
4	A0	H/L	H: Data L: Instruction code
5	R/W	H/L	H: Read signal L: Write signal
6	Е	H/L	Chip enable signal
7~14	DB0-DB7	H/L	Data bus line
15	/CS	L	Chip select signal
16	NC	-	No connection
17	/REST	L	Reset signal, active "L"
18	NC	-	No connection
19	LEDA	+3.3V	Power Supply for LED backlight
20	LEDK	0V	Fower Suppry for LED backlight

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1.6 CONTRAST ADJUST METHOD

This model's contrast adjustment method is by internal instructions. The details please refer to the instruction table.

2. ABSOLUTE MAXIMUM RATINGS

(Ta=25 °C, Vss=0V)

PARAMETER	SYMBOL	RATINGS	UNITS
POWER SUPPLY FOR LOGIC	VDD-VSS	$-0.3 \sim 7.0$	V
POWER SUPPLY FOR LCD DRIVER	V0-VSS	-0.3 ~ 15.0	V
INPUT VOLTAGE	Vin	$Vss \sim Vdd$	V
OPERATING TEMPERATURE	Topr	-20 ~70	°C
STORAGE TEMPERATURE	Tstg	$-30 \sim 80$	°C

3. ELECTRICAL & OPTICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS

(Ta=25 °C, Vss=0V)

ITEM	SYMBOL	CONDITION	MIN	ТҮРЕ	MAX.	UNIT	NOTE
LOGIC CIRCUIT POWER SUPPLY VOLTAGE	VDD –VSS		2.8	3.3	3.8	V	
INPUT VOLTAGE	Vih		0.7Vdd		VDD	V	
INPUT VOLTAGE	VIL		GND		0.3 VDD	V	
OUTPUT VOLTAGE	Vон		0.7 Vdd		Vdd	V	
OUTPUT VOLTAGE	Vol		GND		0.3Vdd	V	
LOGIC CIRCUIT POWER SUPPLY CURRENT	Idd	VDD –VSS =3.3V		250		uA	
RECOMMENDED LCD DRIVING VOLTAGE	*VLCD Φ=0 θ=0	Ta=25 °C		10.0		V	

*Note: VLCD is produced by module's inside circuit, do not need the external input. The customer

only need to offer +3.3V voltage which is stated in the interface definition.

3.2 LED BACKLIGHT SPECIFICATION

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS		
FORWARD VOLTAGE	Vf	2.9	3.1	3.3	V	If 45 m		
COLOR	OLOR WHITE							

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4.TIMING CHARACTERISTICS

Parallel bus timing characteristics(for 6800 MCU):



Symbol	Signal	Desci	ription	Condition	Min.	Max.	Units
t _{AS68}	CD	Address	setup time		0	1993	nS
t _{AH68}	CD	Address	hold time		0	5 <u>55</u> 5	115
t _{CSSA68}	CS1/CS0	Chin select	setup time		5		nS
tcsH68	031/030	Chip select	hold time		5	_	115
towns		System	read		120		nS
CY68		cycle time	write		80	_	115
t _{PWR68}	W/R1	Pulse width	read		60		nS
t _{PWW68}	VVIXI	r uise width	write		40		110
turnuca		High pulse	read		60		nS
LHPW68		width	write		40	1993	110
t _{DS68}		Data	setup time		30	222	nS
t _{DH68}	t _{DH68}	hold time		0	_	115	
t _{ACC68} t _{OD68}		Read access time Output disable time		C _L = 100pF	- 50	60 -	nS

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5. COMMANDS

Command Table

The following is a list of host commands supported by UC1701x

C/D : 0: Control 1: Data

W/R: 0: Write cycle 1: Read cycle

Useful data bits - Don't care

	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default	
1	Write Data Byte	1	0	#	#	#	#	#	#	#	#	Write 1 byte	N/A	
2	Read Data Byte	1	1	#	#	#	#	#	#	#	#	Read 1 byte	N/A	
3	Get Status	0	1	BZ	MX	DE	RST	0	0	0	0	Get status		
4	Set Column Addess LSB	0	0	0	0	0	0	#	#	#	#	Set CA[3:0]	0	
4	Set Column Addess MSB	0	0	0	0	0	1	#	#	#	#	Set CA[7:4]	0	
5	Set Power Control	0	0	0	0	1	0	1	#	#	#	Set PC[2:0]	000b	
6	Set Scroll Line	0	0	0	1	#	#	#	#	#	#	Set SL[5:0]	0	
7	Set Page Address	0	0	1	0	1	1	#	#	#	#	Set PA[3:0]	0	
8	Set VLCD Resistor Ratio	0	0	0	0	1	0	0	#	#	#	Set PC[5:3]	100b	
0	Set Electronic Volume	0	0	1	0	0	0	0	0	0	1	Sat DM[5:0]	2011	
9	(double-byte command)	0	0	0	0	#	#	#	#	#	#	Set PM[5.0]	2011	
10	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0b	
11	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0b	
12	Set Display Enable	0	0	1	0	1	0	1	1	1	#	Set DC[2]	0b	
13	Set SEG Direction	0	0	1	0	1	0	0	0	0	#	Set LC[0]	0b	
14	Set COM Direction	0	0	1	1	0	0	#	-	-	-	Set LC[1]	0b	
15	System reset	0	0	1	1	1	0	0	0	1	0	System Reset	N/A	
16	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A	
17	Set LCD Bias Ratio	0	0	1	0	1	0	0	0	1	#	Set BR	0b	
18	Set Cursor Update Mode	0	0	1	1	1	0	0	0	0	0	AC3=1,	N/A	
	-											CR=CA		
19	Reset Cursor Update Mode	0	0	1	1	1	0	1	1	1	0	AC3=0, CA=CR	N/A	
												Display OFF		
23	Set power save	0	0	#	#	#	#	#	#	#	#	& All Pixel	N/A	
	Set power save	Ũ	Ű	π	π			11				ON	1 1/ 2 1	
	Set Adv.program control 0			1	1	1	1	1	0	1	0	SetTC,		
25	(double-byte command)	0	0	#	0	0	1	0	0	#	#	WA[1:0]	90H	

COMMAND DESCRIPTION

1. Write Data Byte to Memory

Action	C/D	W/R	D7 D6	D5 D4	D3	D2 D1	D0
Write data	1	0	8-	-bit data v	rite to	SRAM	

2. Read Data Byte from Memory

Action	C/D	W/R	D7 D6	D5	D4	D3	D2	D1	D0
Read data	1	1	8-k	oit data	rea	d fron	n SRA	١M	

Write/Read Data Byte (Command 1,2) access Display Data RAM based on Page Address (PA) register and Column Address (CA) register. PA and CA can also be programmed directly by issuing Set Page Address and Set Column Address commands.

3. Get Status

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Get Status	0	1	ΒZ	MX	DE	RST	0	0	0	0

BZ: BZ=1 when busy. The system accepts commands only when BZ=0.

MX: Mirror X. Status of register LC[0]

DE: Display Enable flag. DE=1 when display is enabled.

RST: RST flag. RST=1 when reset is in progress.

4. Set Column Address

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Column Address LSB, CA[3:0]	0	0	0	0	0	0	CA3	CA2	CA1	CA0
Set Column Address MSB, CA[7:4]	0	0	0	0	0	1	CA7	CA6	CA5	CA4

Set the SRAM column address before Write/Read memory from host interface.

CA value range: 0~131

5. Set Power Control

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Power Control, PC[2:0]	0	0	0	0	1	0	1	PC2	PC1	PC0

Set PC[2:0] to enable the built-in charge pump.

- PC[2] : 0 Boost OFF PC[1] : 0 – Voltage Regular OFF
- 1 Boost ON
- 1 Voltage Regular ON
- PC[0]: 0 Voltage Follower OFF
- 1 Voltage Follower ON

6. Set Scroll Line

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Scroll Line, SL[5:0]	0	0	0	1	SL5	SL4	SL3	SL2	SL1	SL0

Set the scroll line number. Range : 0~63

Scroll line setting will scroll the displayed image up by SL rows. Icon output CIC will not be affected by Set Scroll Line command.



7. Set Page Address

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Page Address, PA[3:0]	0	0	1	0	1	1	PA3	PA2	PA1	PA0

Set the SRAM page address before write/read memory from host interface. Each page of SRAM corresponds to 8 COM lines on LCD panel, except for the last page. The last page corresponds to the icon output CIC.

Possible value = 0~8.

8. Set V_{LCD} Resistor Ratio

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set V _{LCD} Resistor Ratio, PC[5:3]	0	0	0	0	1	0	0	PC5	PC4	PC3

Configure PC[5:3] to set internal Resistor Ratio, Rb/Ra, for the V_{LCD} Voltage regulator to adjust the contrast of the display panel:

PC[5:3]: 000b~111b - 1+Rb/Ra ratio. Default: 100b. Refer to VLCD Quick Reference for "1+Rb/Ra" ratio.

V_{LCD}=((1+Rb/Ra) x Vev) x (1+(T-25)xC_T%)

Vev=(1-(63-PM)/162)xV_{REF}

where Rb and Ra are internal resistors,

V_{REF} is on-chip contrast voltage, and PM is a vaule of electronic volume

9. Set Electronic Volume

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Electronic Volume, DM(5:0)	0	0	1	0	0	0	0	0	0	1
Set Electionic Volume, Piw[5.0]	0	U	0	0	PM5	PM4	PM3	PM2	PM1	PM0

Set PM[5:0] for electronic volume "PM" for VLCD voltage regulator to adjust contrast of LCD panel display Effective range : 0~63. Default : 32

10. Set All Pixel ON

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set All Pixel ON, DC [1]	0	0	1	0	1	0	0	1	0	DC1

Set DC[1] to force all SEG drivers to output ON signals. This function has no effect on the existing data stored in display RAM. Default : 0

11. Set Inverse Display

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Inverse Display, DC [0]	0	0	1	0	1	0	0	1	1	DC0

Set DC[0] to force all SEG drivers to output the inverse of the data (bit-wise) stored in display RAM. This function has no effect on the existing data stored in display RAM.

12. Set Display Enable

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Display Enable, DC[2]	0	0	1	0	1	0	1	1	1	DC2

This command is for programming register DC[2]. When DC[2] is set to 1, UC1701x will first exit from sleep mode, restore the power and then turn on COM drivers and SEG drivers.

13. Set SEG Direction

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Segment Direction, LC[0]	0	0	1	0	1	0	0	0	0	MX
			-							

Set LC[0] for SEG (column) mirror (MX). Default: 0

MX is implemented by reversing the mapping order between RAM and SEG (column) electrodes. The data stored in RAM is not affected by MX command. Yet, MX has immediate effect on the display image.

14. Set COM Direction

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Common Direction, LC[1]	0	0	1	1	0	0	MY	-	-	-

Set LC[1] for COM (row) mirror (MY).

MY is implemented by reversing the mapping between RAM and COM (row) electrodes. The data stored in RAM is not affected by MY command. Yet, MY has immediate effect on the display image.

15. System Reset

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
System Reset	0	0	1	1	1	0	0	0	1	0

This command will activate the system reset.

Control register values will be reset to their default values. Data store in RAM will not be affected.

16. NOP

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
No Operation	0	0	1	1	1	0	0	0	1	1

This command is used for "no operation".

17. Set LCD Bias Ratio

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Bias Ratio, BR	0	0	1	0	1	0	0	0	1	BR

Select voltage bias ratio required for LCD. Default: 0

The setting of Bias ratio varies according to Duty:

DUTY	BR = 0	BR = 1
1/65	1/9	1/7
1/49	1/8	1/6
1/33	1/6	1/5
1/55	1/8	1/6

18. Set Cursor Update Mode

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Cursor Update Mode	0	0	1	1	1	0	0	0	0	0

This command is used for set cursor update mode function. When cursor update mode sets, UC1701x will update register CR with the value of register CA. The column address CA will increment with write RAM data operation but the address wraps around will be suspended no matter what WA setting is. However, the column address will not increment in read RAM data operation. The set cursor update mode can be used to implement "write after read RAM" function. The column address (CA) will be restored to the value, which is before the set cursor update mode command, when reset cursor update mode.

The purpose of this pair commands and their feature is to support "write after read" function for cursor implementation.

19. Reset Cursor Update Mode

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Reset Cursor Update Mode	0	0	1	1	1	0	1	1	1	0

Set AC3=0 and CA=CR.

23. Set Power Save

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Power Save (Compound Command)	0	0	#	#	#	#	#	#	#	#

25. Set Advanced Program Control 0

Action	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Adv. Program Control, APC0 [7:0]	0	0	1	1	1	1	1	0	1	0
(Double-byte command)	0	U	TC	0	0	1	0	0	WA1	WAO

TC : APC0 [7], V_{BIAS} temperature compensation coefficient (%-per-degree-C)

Temperature compensation curve definition: TC : 0b = -0.05%/°C, 1

1b = -0.11%/°C

WA : APC0 [1:0], Automatic column/row wrap around.

WA[0] : 0: PA WA disable	1: PA WA enable.
WA[1] : 0: CA WA disable	1: CA WA enable.

6. QUALITY SPECIFICATIONS

6.1 ACCEPTABLE QUALITY LEVEL

Inspection items	Sampling procedures	AQL
	GB2828-81	
Visual-operating	Inspection level II	0.65
(Electro-optical)	Normal inspection	0.05
	Single sample inspection	
	GB2828-81	
Visual not operating	Inspection level II	1.5
visual-not operating	Normal inspection	1.5
	Single sample inspection	
	GB2828-81	
Dimension macquant	Inspection level II	1.5
Dimension measurement	Normal inspection	1.5
	Single sample inspection	

6.2 INSPECTION CONDITIONS (THE ENVIRONMENTAL)

-Room temperature: 25 ± 3 °C -Humidity: $65\pm20\%$ RH

6.3 INSPECTION STANDARDS

6.3.1 VISUAL WHILE OPERATING

Items to be inspected	Inspection standard
. No display	. If any pattern is not active at all, they can be rejected.
. Irregular operating	 No irregular operating are allowed Appeared different display, which they should be chosen in the pattern, or appeared in different position where they should be chosen.
.Irregular display	. Any segment doesn't active, they can be rejected.
. Over current	. The total current required to activate the module should not be exceed the MAX current in specification.
.View angles	. Valves that don't meet the minimum value noted in the specification. they can be rejected.
.Contrast	. Valves that don't meet the minimum value noted in the specification, they can be reject.
.LCD operate voltage	. Meet the specification.

6.3.2Visual while not operating

Module dimension	. Meet the module outline drawing, not exceed the tolerance.
LCD panel scratch	.Following scratches inside the effective viewing area considered as the defects when their width & length are larger than the following combinations. Number: one or more Width: 0.15 length: 5.0 two or more Width: 0.10 length: 3.0 three or more Width: 0.05 length: 2.0 When the defects exceed this, it can be rejected.

7.RELIABILITY

Test Item	Content of Test	Test Condition	
High temperature	Endurance test applying the high storage temperature for a	60℃	
storage	long time	120hrs	
Low temperature	Endurance test applying the low storage temperature for a	-10°C	
storage	long time	120hrs	
High temperature	Endurance test applying the electic stress (Voltage and	50℃	
operation	Current) and the thermal stress to the element for a long time	120hrs	
Low temperature	Endurance test applying the electic stress under low	0°C	
operation	temperature for a long time	120hrs	
High temperature	Endurance test applying the high temperature and high	60℃,90%RH	
/Humidity storage	humidity storage for a long time	120hrs	
Temperature cycle	Endurance test applying the low and high		
	Temperature cycle		
	$-10^{\circ}\text{C} \rightarrow 25^{\circ}\text{C} \rightarrow 60^{\circ}\text{C}$	- 10℃/60℃	
	30min←5min←30min	10 cycle	
	1 cycle		
Vibration test		10~55Hz	
	Endurance test annihing the vibration during transportation	1.5mmp-p	
	and using	One cycle 60 seconds	
	and using	to 3 directions of	
		X,Y,Z	

Note 1: Condensation of water is not permitted on the module.

Note 2: The module should be inspected after 4 hour storage in normal

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8.TEST REPORT

(VDD=3.3V,Ta=25°C)

Item	Condition	Standard	Note
High temp. storage	80°C,120 hrs	Appearance without defect	
Low temp. storage	−30°C,120 hrs	Appearance without defect	
High temp. operation	70°C,120 hrs	Appearance without defect	
Low temp. operation	−20°C,120 hrs	Appearance without defect	
High temp. & humi. Storage	60℃,90% RH,120 hrs	Appearance without defect	
	-10°C,30min→+25°C,		10 1
Thermal shock	5min→+60°C,30min	Appearance without defect	10 cycles

9. PRECAUTIONS FOR USING LCD MODULES

9.1 Precaution

To our module ,we have made accurately assembly and debugging .So customer should do as follows:

- (1) Modules use LCD elements, so we must be treated as such avoid intense shock \checkmark impact \checkmark extrusion and falls from a height.
- (2) Avoid to twist and disassemble module's buckle legs.
- (3) Avoid to operate modules on the table if it's surface have printed circuit
- (4) Avoid to touch , adjust and modify the rubber that connects LCD and PCB.
- (5) Liquid crystal is harmful Substances .When liquid crystal leaked out and contacted to your hand, body or clothes ,you must wash it immediately with soap.

9.2 Caution Of Mounting

The panel of the LCD module consists of two thin glass plates with polarizes which easily get damaged since the module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD modules.

9.3 Caution Of LCD Handling & 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 polarizes surface. Do not use the following solvent:

- -Water
- -Ketone
- Aromatics

9.4 Caution Against Static Charge

The LCD modules use COMS LSI drivers. So we recommend that you connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on and ground your body. work/assembly table. And assembly equipment to protect against static electricity. the following ways are recommended.

- (1) If you doesn't intend to mount, please don't take module from bag. The module's packaging bag is handled by antistatic technology.
- (2) If you intend to operate module that you must make sure your body is good grounding, keeping your body and module at the same level.
- (3) The operating equipment requires to good grounding, especially the driver .In order to avoid interference we must make sure good grounding and no leakage.
- (4) Each module have a protective film .It is used to avoid the polaroid LCD is scratched or polluted .Please peel off the Protective Film slowly ,or else will produce static .
- (5) The humidity range at workshop: $50 \sim 60\%$ RH

9.5 Current Protection Devices

Module was not equipped with current protection devices, so we must prepared the current protection devices for using.

9.6 Caution For Operation

-It is indispensable to drive LCM within the specified voltage limit since the higher voltage than the limit shortens LCM life.

-Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD, which will come back in the specified operating temperature range.

- -If the display area is pushed hard during operation. Some font will be abnormally displayed but it resumes normal condition after turning off once.
- -A slight dew depositing on terminals is a cause for Electro-chemical reaction resulting in terminal open circuit.

Under the maximum operating temperature, 50%RH or less is required

9.7 Caution For Soldering

If need soldering, we must notice as follows:

- * Except the connect position of INPUT and OUTPUT doesn't allow to soldering.
- X Soldering iron required to be insulated.
- (1) Soldering Conditions:

Iron Temperature : $280^{\circ}C \pm 10^{\circ}C$

Soldering Time: < 3-4S

Soldering Materials: Low melting point, can be fully molten solder

(2) Caution for repeat soldering:

Because connect line is through module's pad connected to module. Removing the line we

must wait until the solder is completely melted . If solder doesn't completely melted , it is easily lead to the pad damage or loss.Using "XI QIANG" is the best way to remove the connect line .Besides, we must notice that repeat soldering doesn't allow more than three time.

9.8 Packaging And Storage

When module needs to store a long time ,we should do as follows. If storage method is improper, it will have an effect on the Polaroid ,causing display not good. Meanwhile pads are easily oxidized lead to soldering didn't easily .

- (1) As far as possible to use the original packaging bag.
- (2) If we intend to store bulk modules ,we should put them in anti-static bag and sealing .
- (3) To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.
- (4) The reasonable storage method is low humidity, temperature in 0° C to 35° C
- (5) Storing with no touch on polarizes surface by the anythingelse.

10.PRECAUTIONS FOR CUSTOMER

- (1) A limit sample should be provided by the both parties on an occasion when the both parties agree its necessity.Judgement by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.
- (2) On the following occasions, the handling of problem should be decided through discussion and agreement between representative 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 specification change or operating condition change in customer is reported to TSINGTEK, 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 size.