

SPECIFICATIONS

PRODUCT : LCD MODULE

MODEL NO.: LTF180BS

CUSTOMER			LONGTECH		
APPROVED	CHECKED	CHECKED	APPROVED	CHECKED	PREPARED

APPROVED FOR SPECIFICATIONS PRELIMINARY

APPROVED FOR SPECIFICATIONS AND SAMPLE

厦门龙特电子科技有限公司

LONGTECH OPTICS CO., LTD.

RECORDS OF REVISION

DATE	REVISED NO.	REVISED DESCRIPTIONS	PREPARED	CHECKED	APPROVED
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CONTENTS

1.	GENERAL SPECIFICATIONS	-----	3
2.	FEATURES	-----	3
3.	MACHANICAL SPECIFICATIONS	-----	3
4.	OUTLINE DIMESIONS	-----	4
5.	INTERFACE ASSIGNMENT	-----	5
6.	BLOCK DIAGRAM	-----	6
7.	TIMING CHARACTERISTICS	-----	7
8.	RESET TIMING CHARACTERISTICS	-----	8
9.	DDRAM ARRANGMENT	-----	9
10.	ABSOLUTE MAXIMUM RATINGS	-----	10
11.	ELECTRICAL CHARACTERISTICS	-----	10
12.	LED BACKLIGHT CHARACTERISTICS	-----	11
13.	OPTICAL CHARACTERISTICS	-----	12
14.	ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS	-----	15
15.	RELIABILITY	-----	15
16.	THE STANDARD OF INSPECTION	-----	16
17.	USING LCD MODULES	-----	19

STANDARD DOC.	PRODUCT SPEC.	MODULE NO.	LTF180BS	Page	3
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1. GENERAL SPECIFICATIONS

1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered by Longtech Optics to Customer

1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

1-3 MODULE NAME:

LTF180BS

2. FEATURES

2-1 MAIN LCD (LARGE)

- (1) Display Type: Transmissive, TFT , Positive, COG, 6 o'clock
- (2) Driving Method: 1. 77TFT
- (3) Built-in controller: ILI9163
- (4) Backlight: WHITE LED

3. MECHANICAL SPECIFICATIONS

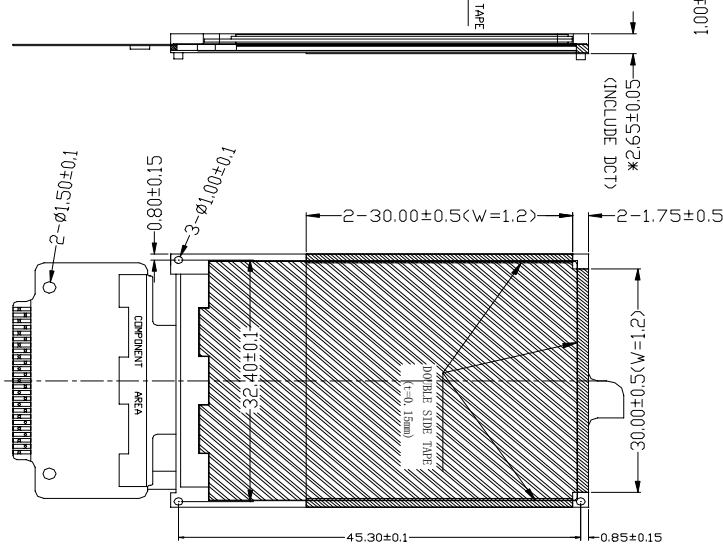
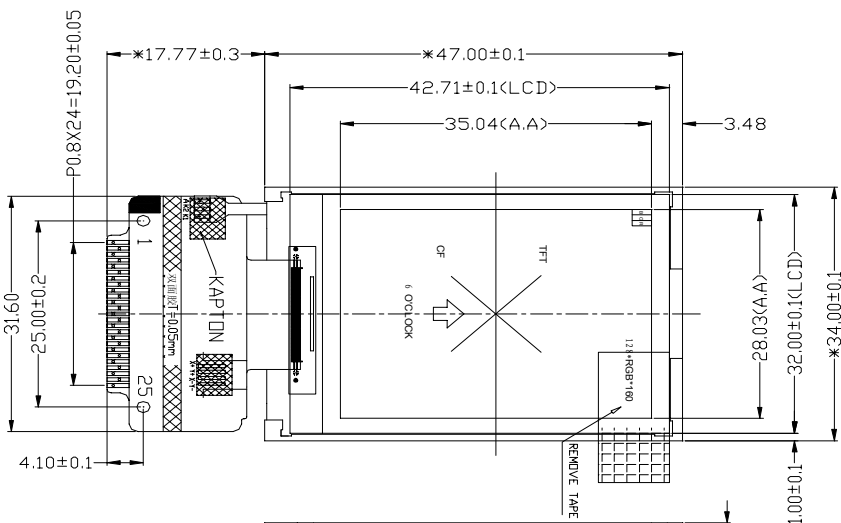
ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMENSIONS	34.0*47.0*2.65mm	mm
ACTIVE AREA	28.032 *35.040	mm
DISP.CONSTRUCTION	128RGB *160 Dots	---
ASSY.TYPE	COG+FPC+BL	---
BACKLIGHT	WHITE LED	---
WEIGHT		—

4.OUTLINE DIMENSIONS

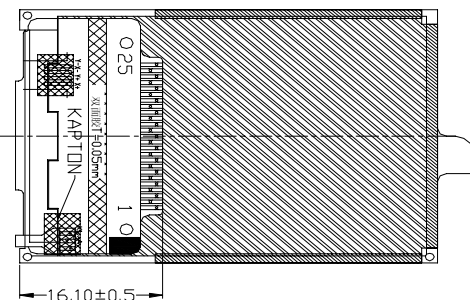
No.	PIN NAME
1	GND
2	X+
3	Y+
4	X-
5	Y-
6	GND
7	VDD
8	/CS
9	RS
10	/WR
11	RD
12	D0
13	D1
14	D2
15	D3
16	D4
17	D5
18	D6
19	D7
20	/LCD_RESET
21	GND
22	LED1-
23	LED2-
24	(NC(LED3-))
25	LED+

NOTE:

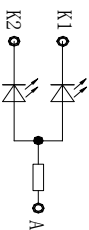
1. GENERAL TOLERANCE: ± 0.2 .
2. (..) IS REFERENCE DIMENSION.
3. * CRITICAL DIMENSION
4. COMPLIABLY ROHS.



弯折参考图，出货为展开方式



BACKLIGHT LED CIRCUIT



Item	Value
Display Type	TFT
Front Panelizer	NORAL WHITE TRANSPARENT
Operating Method	
Viewing Angle	6 O'CLOCK
LCD Driver IC	U9163
Operating Voltage	VDD=2.8V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
High Temperature/Humidity Storage	
Interfaces	

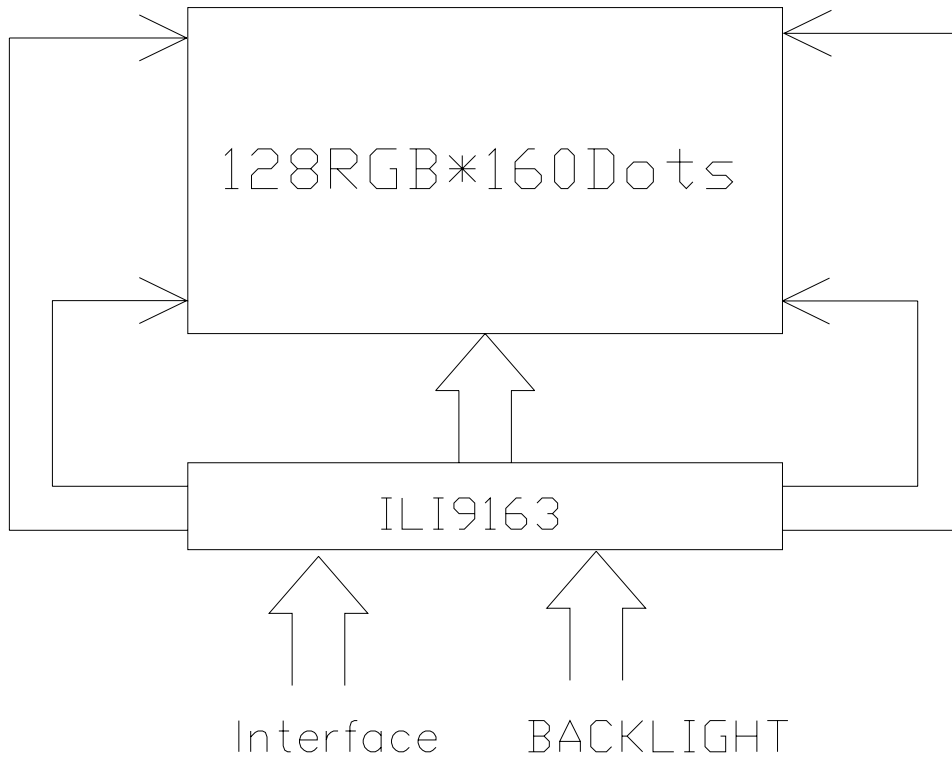
VER.	SYMBOL	AMENDMENT	DATE	APPROVAL	TITLE
01	first issue		08-08-09	customer's approval	MODULE SPEC.
					DRAWING NO. LTF180BS
					DRIVER CHECKED
					BE CHECKED
					PE CHECKED
					APPROVED
					CUSTOMER'S APPROVAL
					DESIGN SIGN
					DATE
					LONGTECH OPTICS CO., LTD.
					UNIT mm
					SCALE 1 OF 1
					SHEET 1 OF 1

STANDARD DOC.	PRODUCT SPEC.	MODULE NO.	LTF180BS	Page	5
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5. INTERFACE ASSIGNMENT

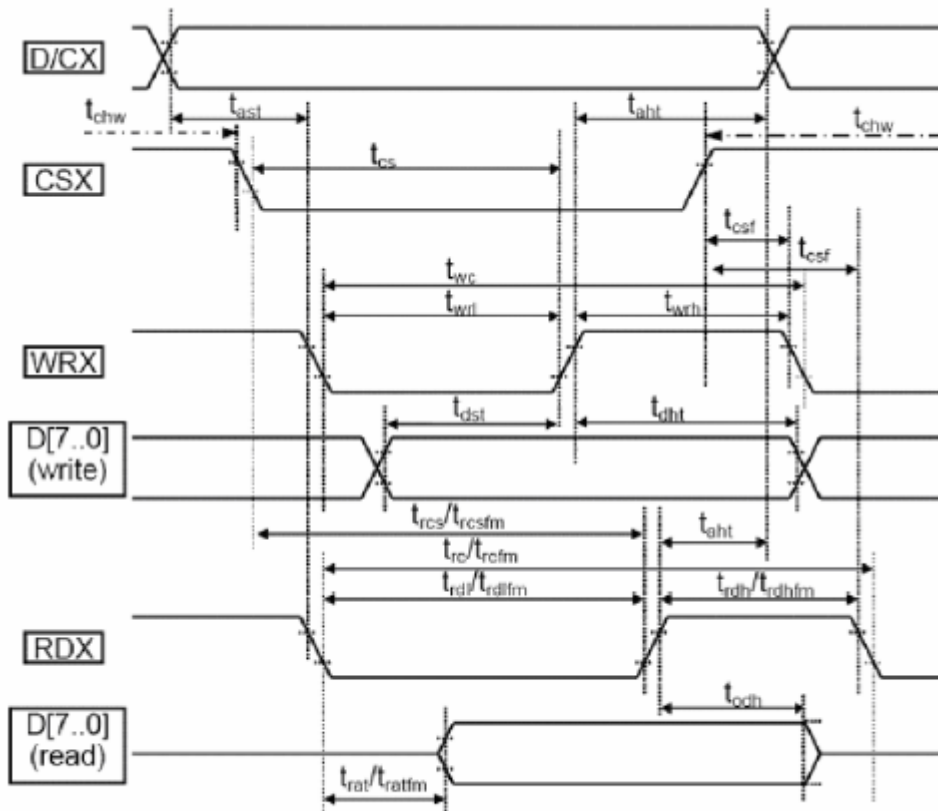
PIN NO.	SYMBOL	I/O	FUNCTION
1	GND	I	POWER GROUND
2	X+	open	No connect
3	Y+	open	No connect
4	X-	open	No connect
5	Y-	open	No connect
6	GND	I	POWER GROUND
7	VDD	I	POWER SUPPLY
8	/CS	I	CHIP SELECT PIN
9	RS	I	COMMAND AND DATA REGISTER SELECT PIN
10	/WR	I	WRITE SIGNAL
11	/RD	I	READ SIGNAL
12	D0	I/O	DATA input pin
13	D1	I/O	DATA input pin
14	D2	I/O	DATA input pin
15	D3	I/O	DATA input pin
16	D4	I/O	DATA input pin
17	D5	I/O	DATA input pin
18	D6	I/O	DATA input pin
19	D7	I/O	DATA input pin
20	/RESET	I	RESET PIN
21	GND	I	POWER GROUND
22	LED1-	I	POWER SUPPLY- FOR BACKLIGHT ANODE
23	LED2-	I	POWER SUPPLY- FOR BACKLIGHT ANODE
24	NC(LED3-)	I	No connect
25	LED+	I	POWER SUPPLY+ FOR BACKLIGHT ANODE

6. BLOCK DIAGRA



7.TIMING CHARACTERISTICS

ILI9163 TIMING CHARACTERISTICS:



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Signal	Symbol	Parameter	min	max	unit	description
D/CX	tast	Address setup time	0		ns	
	taht	Address hold time(Write/Read)	10		ns	
CSX	tchw	CSX"H" Pulse Width	0		ns	
	tcs	Chip Select setup time (Write)	10		ns	
	trcs	Chip Select setup time (Read ID)	45		ns	
	trcsfm	Chip Select setup time (Read FM)	355		ns	
	tcsf	Chip Select Wait time(Write/read)	10		ns	

WRX	twc	Write cycle	66	ns		
	twrh	Control pulse H duration	15	ns		
	twrl	Control pulse L duration	15	ns		
RDX	trc	Read cycle (ID)	160	ns	When read ID data	
	trdh	Control pulse H duration(ID)	90	ns		
	trdl	Control pulse L duration(ID)	45	ns		
RDX	trcfm	Read cycle (FM)	450	ns	When read from frame memory	
	trdhfm	Control pulse H duration (FM)	90	ns		
	trdlfm	Control pulse L duration (FM)	355	ns		
D[17..0]	tdst	Data setup time	10	ns	For maximum CL = 30pF For minimum CL = 8pF	
	tdht	Data hold time	10	ns		
	trat	Read access time (ID)		40		ns
	tratfm	Read access time (FM)		340		ns
	todh	Output disable time	20	80		ns

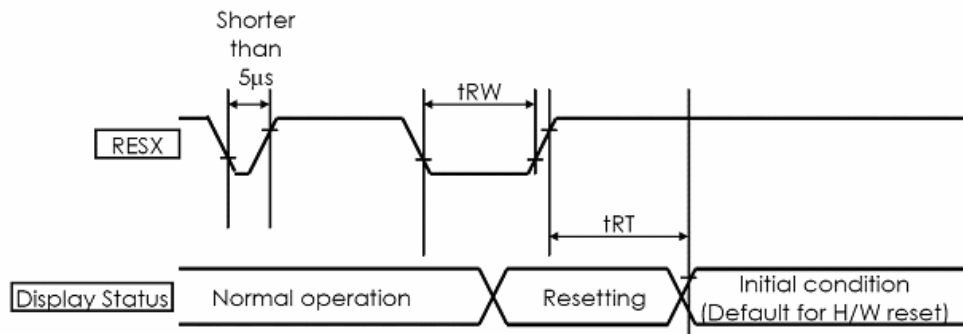
Note 1: VDDI 1.65 to 3.3V, VDD=2.6 to 3.3V, AGND=GND=0V, Ta=-30 to 70 °C (to +85°C no damage)

Note 2: This input signal rise time and fall time (tr, tf) is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for input signals

8. RESET TIMING CHARACTERISTICS

ILI9163 RESET TIMING CHARACTERISTICS:

Reset Input Timing



(VSS=0V, VDDI=1.65V to 1.95V, VDD=2.6V to 2.9V, Ta = -30 to 70°C)

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
tRESW	*1) Reset low pulse width	RESX	10	-	-	-	µs
tREST	*2) Reset complete width	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

Note

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

9.DDRAMARRANGMENT

132RGB x 162 resolution (GM[2:0] = "000", SMX=SMY=SRGB='0')



Gate	Source Out		\$1	\$2	\$3	\$4	\$5	\$6	----	\$391	\$392	\$393	\$394	\$395	\$396	\$A		
	RA	MY=0	MY=1	RGB=0	RGB=1	RGB=0	RGB=1	RGB=0	RGB=1	RGB Order	RGB=0	RGB=1	RGB=0	RGB=1	RGB=0	RGB=1	ML=0	ML=1
				R1	G1	B1	R2	G2	B2	----	R131	G131	B131	R132	G132	B132	1	162
1	1	162	R1	G1	B1	R2	G2	B2	----	R131	G131	B131	R132	G132	B132	1	162	
2	2	161							----							2	161	
3	3	160							----							3	160	
4	4	159							----							4	159	
5	5	158							----							5	158	
6	6	157							----							6	157	
7	7	156							----							7	156	
8	8	155							----							8	155	
9	9	154							----							9	154	
10	10	153							----							10	153	
11	11	152							----							11	152	
12	12	151							----							12	151	
:	:	:	:	:	:	:	:	:	----	:	:	:	:	:	:	:	:	
:	:	:	:	:	:	:	:	:	----	:	:	:	:	:	:	:	:	
:	:	:	:	:	:	:	:	:	----	:	:	:	:	:	:	:	:	
:	:	:	:	:	:	:	:	:	----	:	:	:	:	:	:	:	:	
155	155	8							----							155	8	
156	156	7							----							156	7	
157	157	6							----							157	6	
158	158	5							----							158	5	
159	159	4							----							159	4	
160	160	3							----							160	3	
161	161	2							----							161	2	
162	162	1							----							162	1	
CA	MX-0		1			2			----	131			132					
	MX-1		132			131			----	2			1					

10. ABSOLUTE MAXIMUM RATING

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	3.3	V	1, 2
Logic Signal Input /Output Voltage	V_{IOVCC}	-0.3	$V_{DD}+0.3$	V	
Operating Temperature	Top	-20	+70	°C	
Storage Temperature	Tst	-30	+80	°C	

Notes:

- If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
- $V_{DD} > V_{SS}$ must be maintained.

11. ELECTRICAL CHARACTERISTICS

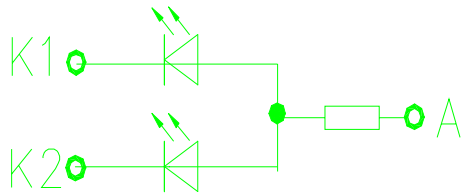
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Input voltage	'H'	V_{IH}	$V_{DD}=2.8V$	$0.8V_{DD}$	-	V_{DD}	V
	'L'	V_{IL}	$V_{DD}=2.8V$	V_{SS}	-	$0.2V_{DD}$	V
Output Voltage	'H'	V_{OH}	-	$0.8V_{DD}$	-	V_{DD}	V
	'L'	V_{OL}	-	V_{SS}	-	$0.2V_{DD}$	V
Current Consumption	I_{CC1}	Normal mode	-	25.5	-	mA	1,3
	I_{CC2}	Standby mode	-	-	-	mA	2

Note:

- Display full white. Backlight on state.
- IC on standby mode.
- the default voltage is 3.2V, for N lights in series, the power is that the current multiply N.

12. LED BACKLIGHT CHARACTERISTICS

12-1 POWER SUPPLY FOR LED BACKLIGHT



BACKLIGHT LED CIRCUIT

12-2 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	LIGHT SOURCE	CONDITIONS	STANDARD VALUE			UNIT
				MIN	TYP	MAX	
PARAMETER	V	WHITE	If =30mA	3.0	3.2	3.4	V
LUMINOUS INTENSITY	lv	WHITE		100	120	180	cd/m ²
CHROMATICCITY COORD	X	WHITE	If =30mA	0.25	—	0.29	—
	Y						

13. OPTICAL CHARACTERISTICS

Parameters and specifications

Item	Symbol	Specifications			Unit	Note
		Min.	Typ.	Max.		
Transmittance	T%	-	6.0	-	%	[1]Here the transmittance and response time are design value. [2]Chromaticity measuring machine: CFT-01. Reference Only
Contrast ratio	Cr ($\Theta=0^\circ$)	150	250	-		
Response time (25°C)	Rise time T_r	-	15	30	ms	
	Fall time T_f	-	35	50	ms	
Viewing angle ($Cr \geq 10$)	Θ_{21}	-	35	-	deg	
	Θ_{22}	-	15	-		
	Θ_{12}	-	45	-		
	Θ_{11}	-	45	-		
Chromaticity of CF	Red	x	0.604	0.624	0.644	
		y	0.302	0.322	0.342	
		Y	15.6	20.6	25.6	
	Green	x	0.268	0.288	0.308	
		y	0.54	0.56	0.58	
		Y	53.6	58.6	63.6	
	Blue	x	0.127	0.147	0.167	
		y	0.097	0.117	0.137	
		Y	8.3	13.3	18.3	
	White	x		0.307		
		y		0.328		
		Y		30.8		
Color gamut of CF (NTSC%)	S		58		%	

The Transmittance is defined as:

$$Tr = \frac{I_t}{I_o} \times 100\%$$

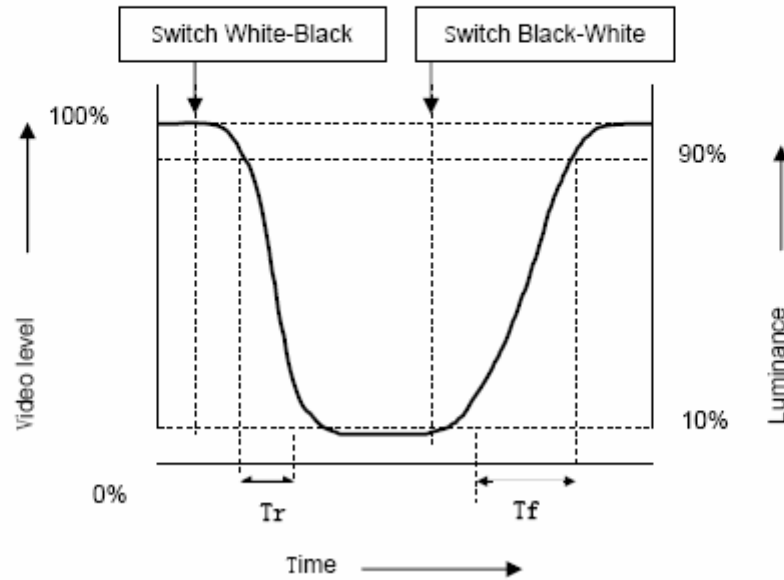
here,

I_o : the brightness of the light source.

I_t : the brightness after panel transmission.

[2] Response Time(Tr、 Tf)

The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.

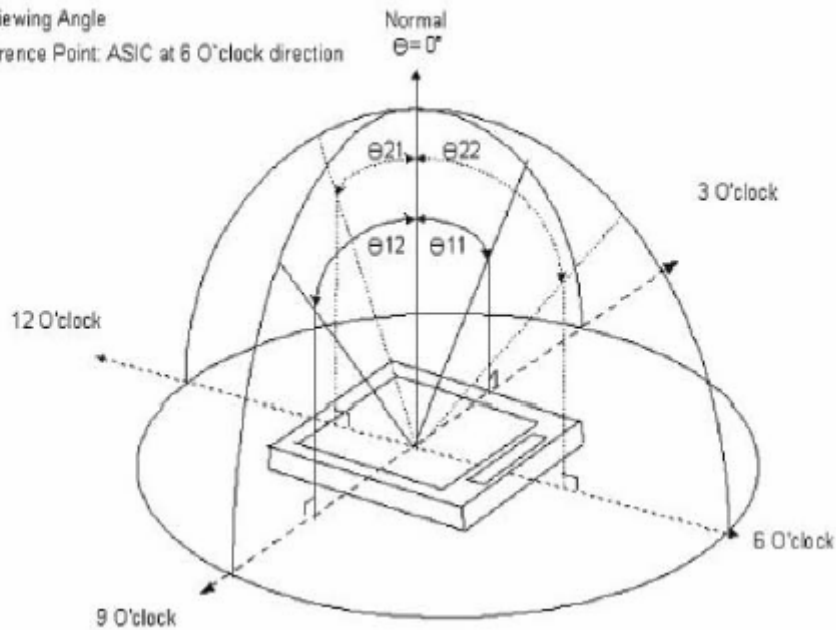
**[3] Contrast ratio (Cr)**

The contrast ratio (Cr), measured on a module, is the ratio between the luminance (L_w) in a full white area (R=G=B=1) and the luminance (L_d) in a dark area (R=G=B=0):

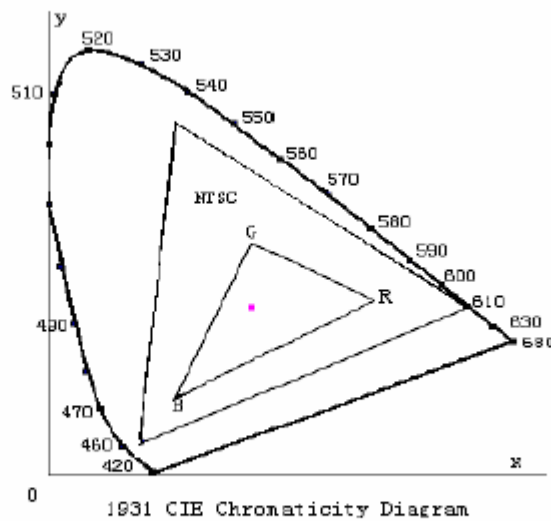
$$Cr = \frac{L_w}{L_d}$$

[4] Viewing angle diagram θ : Viewing Angle

Reference Point: ASIC at 6 O'clock direction

**[5] Definition of color gamut**

Measuring machine: CFT-01. NTSC'S Primaries: R(x,y,Y), G(x,y,Y), B(x,y,Y).

**Fig. 1931 CIE chromaticity diagram**

$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

STANDARD DOC.	PRODUCT SPEC.	MODULE NO.	LTF180BS	Page	15
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14. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING TEMPERATURE	TOPR	-20°C ~ +70°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE TEMPERATURE	TSTG	-30°C ~ +80°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
HUMIDITY	—		WITHOUT CONDENSATION

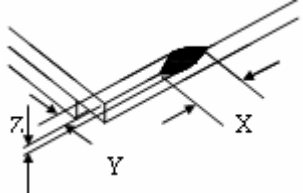
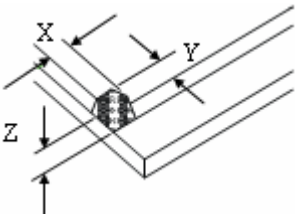
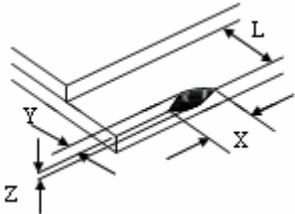
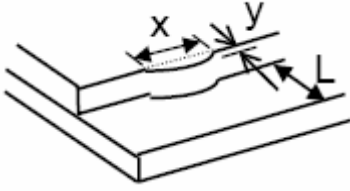
15. RELIABILITY

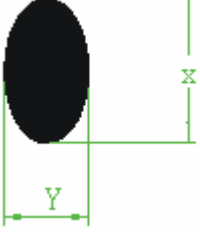
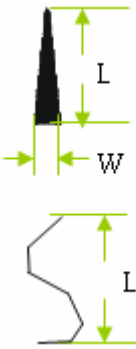
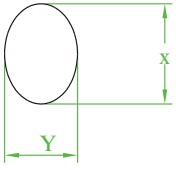
16-1 RELIABILITY TEST

ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERATURE +60°C 72HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 20°C 72HRS	
STORAGE TEMPERATURE	HIGH TEMPERATURE +70°C 120HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 30°C 120HRS	
HUMIDITY	50°C 90%RH 72HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
VIBRATION	<ul style="list-style-type: none"> • Operating Time: thirty minutes exposure for each direction (X,Y,Z) • Sweep Frequency: 10~55Hz (1 min) • Amplitude: 1.5mm 	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
THERMAL SHOCK	-20°C (30mins) ←5°C (5mins)→+60°C (30mins) 10 cycles	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

16.THE STANDARD OF INSPECTION

16-1 Inspection items and specification for appearance (power off)

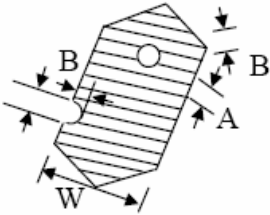
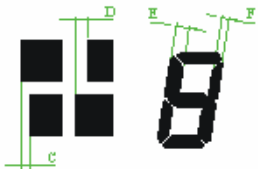
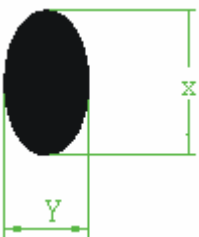
No.	Item	Criterion	AQL																						
1	Dimension	Dimension out of the specification	1.0																						
2	Glass crack	<p>1、 General crack</p>  <table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$\geq K/8$</td> <td>Not over A area</td> <td>$\leq T$</td> </tr> </table> <p>2、 corner</p>  <table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$\geq K/8$</td> <td>Not over A area</td> <td>No check</td> </tr> </table> <p>3、 contact pad crack</p>  <table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$\geq K/8$</td> <td>$\geq L/3$</td> <td>No check</td> </tr> </table> <p>4、 Substrate protuberance and internal crack</p>  <table border="1"> <tr> <td>X</td> <td>Y</td> </tr> <tr> <td>$\geq K/8$</td> <td>$\geq L/3$</td> </tr> </table> <p>Transfer position crack: $\leq L/5$</p>	X	Y	Z	$\geq K/8$	Not over A area	$\leq T$	X	Y	Z	$\geq K/8$	Not over A area	No check	X	Y	Z	$\geq K/8$	$\geq L/3$	No check	X	Y	$\geq K/8$	$\geq L/3$	2.50
X	Y	Z																							
$\geq K/8$	Not over A area	$\leq T$																							
X	Y	Z																							
$\geq K/8$	Not over A area	No check																							
X	Y	Z																							
$\geq K/8$	$\geq L/3$	No check																							
X	Y																								
$\geq K/8$	$\geq L/3$																								

3	Black dot \ White dot	 <p>X: long diameter Y: short diameter D: average of diameter $D=(X+Y)/2$</p>	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">D</th> <th colspan="2">Acceptable of defect</th> </tr> <tr> <th>A/B Area</th> <th>C Area</th> </tr> </thead> <tbody> <tr> <td>$D < 0.2$</td> <td colspan="2">No check</td> </tr> <tr> <td>$0.2 \leq D < 0.3$</td> <td colspan="2">2</td> </tr> <tr> <td>$0.3 \leq D \leq 0.5$</td> <td colspan="2">1</td> </tr> <tr> <td>$D > 0.5$</td> <td colspan="2">0</td> </tr> </tbody> </table>	D	Acceptable of defect		A/B Area	C Area	$D < 0.2$	No check		$0.2 \leq D < 0.3$	2		$0.3 \leq D \leq 0.5$	1		$D > 0.5$	0		2.50				
D	Acceptable of defect																								
	A/B Area	C Area																							
$D < 0.2$	No check																								
$0.2 \leq D < 0.3$	2																								
$0.3 \leq D \leq 0.5$	1																								
$D > 0.5$	0																								
4	Line defect	 <p>L: Length W: Width Defect of polarizer (Scratches、Spot) : According to the limit specimen</p>	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Length</th> <th rowspan="2">Whidth</th> <th colspan="2">Acceptable of defect</th> </tr> <tr> <th>A/B Area</th> <th>C Area</th> </tr> </thead> <tbody> <tr> <td>accept</td> <td>$W \leq 0.02$</td> <td>No check</td> <td rowspan="2">No check</td> </tr> <tr> <td>$L \leq 3$</td> <td>$W \leq 0.05$</td> <td>2</td> </tr> <tr> <td rowspan="2">$L \leq 2.5$</td> <td>$W \leq 0.05$</td> <td>2</td> <td rowspan="2">As round type</td> </tr> <tr> <td>$W > 0.05$</td> <td colspan="2"></td> </tr> </tbody> </table>	Length	Whidth	Acceptable of defect		A/B Area	C Area	accept	$W \leq 0.02$	No check	No check	$L \leq 3$	$W \leq 0.05$	2	$L \leq 2.5$	$W \leq 0.05$	2	As round type	$W > 0.05$			2.50	
Length	Whidth	Acceptable of defect																							
		A/B Area	C Area																						
accept	$W \leq 0.02$	No check	No check																						
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	$W > 0.05$																								
5	Polarizer Bubble		<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">D</th> <th colspan="2">Acceptable of defect</th> </tr> <tr> <th>A/B Area</th> <th>C Area</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.2$</td> <td colspan="2">No check</td> </tr> <tr> <td>$0.2 \leq D \leq 0.5$</td> <td colspan="2">3</td> </tr> <tr> <td>$0.5 \leq D \leq 1.0$</td> <td colspan="2">2</td> </tr> <tr> <td>$D > 1.0$</td> <td colspan="2">0</td> </tr> </tbody> </table>	D	Acceptable of defect		A/B Area	C Area	$D \leq 0.2$	No check		$0.2 \leq D \leq 0.5$	3		$0.5 \leq D \leq 1.0$	2		$D > 1.0$	0		2.50				
D	Acceptable of defect																								
	A/B Area	C Area																							
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$0.2 \leq D \leq 0.5$	3																								
$0.5 \leq D \leq 1.0$	2																								
$D > 1.0$	0																								
6	External print of panel	1、 Transfigure、 pin hole: same as segment transfiguer 2、 Print width: print width $\geq 1/2$ standard width is acceptable			2.50																				
7	Silicon glue	The area of painting silicon glue must cover the ITO circuit.			2.50																				
8	Defect of PCB	1、 The char 、 wrong edition、 bresking off circuit、 crack and air-logged orifice are unreceivable for PCB. 2、 gold finger of PCB can not be oxidative、 smudgy and broken..			2.50																				

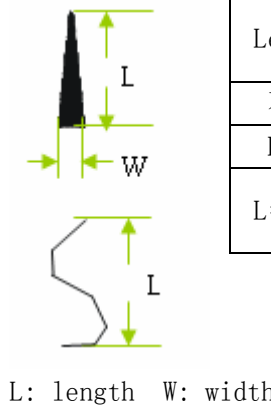
STANDARD DOC.	PRODUCT SPEC.	MODULE NO.	LTF180BS	Page	18
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9	SMT organ	1、 deflexion of component $\leq 1/3$ width of component 2、 Trying to keep dot of soldering tin orbicular 3、 Damage 、 break、 wrong assembly and unseal are unreceivable for component.	2.50
10	Steel Frame	1、 Break and distortion are unreceivable for frame. 2、 If there is one nick which can not lead to cast or hole of painting, we allow that following: Length ≤ 5 mm;Width ≤ 0.3 mm	2.50

16-2 Inspection items and specification for display defect (power on)

1	Electrical Defect	Segment missing	Not allow	1.0													
		Segment short	Not allow														
		Non-display	Not allow														
2	Pin hole	<p>1、 Pin hole</p>  <table border="1" style="margin-left: 20px;"> <tr> <td>width</td> <td>Acceptable of defect</td> </tr> <tr> <td>$W < 0.4$</td> <td>$D \leq 0.2$ & $D \leq 1/2W$</td> </tr> <tr> <td>$W \geq 0.4$</td> <td>$D \leq 0.25$ & $D \leq 1/3W$</td> </tr> </table> <p>* $D = (A+B)/2$ $D \leq 0.1$ acceptable</p>	width	Acceptable of defect	$W < 0.4$	$D \leq 0.2$ & $D \leq 1/2W$	$W \geq 0.4$	$D \leq 0.25$ & $D \leq 1/3W$	2.50								
width	Acceptable of defect																
$W < 0.4$	$D \leq 0.2$ & $D \leq 1/2W$																
$W \geq 0.4$	$D \leq 0.25$ & $D \leq 1/3W$																
3	Display pattern	 <table border="1" style="margin-left: 20px;"> <tr> <td>Width</td> <td>Acceptable of defect</td> </tr> <tr> <td>$W < 0.4$</td> <td>$C、D、G \leq 1/2W$</td> </tr> <tr> <td>$W \geq 0.4$</td> <td>$C、D、G \leq 0.2$</td> </tr> </table> <p>W: Design dimension C、D: discrepant dimension $G = E-F$</p>	Width	Acceptable of defect	$W < 0.4$	$C、D、G \leq 1/2W$	$W \geq 0.4$	$C、D、G \leq 0.2$	1.0								
Width	Acceptable of defect																
$W < 0.4$	$C、D、G \leq 1/2W$																
$W \geq 0.4$	$C、D、G \leq 0.2$																
4	Black/white dot	 <table border="1" style="margin-left: 20px;"> <tr> <td rowspan="2">D</td> <td colspan="2">Acceptable QTY</td> </tr> <tr> <td>A/B Area</td> <td>C Area</td> </tr> <tr> <td>$D < 0.1$</td> <td>No check</td> <td rowspan="4">No check</td> </tr> <tr> <td>$0.1 \leq D < 0.2$</td> <td>2</td> </tr> <tr> <td>$0.2 \leq D \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$D > 0.25$</td> <td>0</td> </tr> </table> <p>X: long diameter Y: shot diameter D: average diameter $D = (X+Y)/2$</p>	D	Acceptable QTY		A/B Area	C Area	$D < 0.1$	No check	No check	$0.1 \leq D < 0.2$	2	$0.2 \leq D \leq 0.25$	1	$D > 0.25$	0	2.50
D	Acceptable QTY																
	A/B Area	C Area															
$D < 0.1$	No check	No check															
$0.1 \leq D < 0.2$	2																
$0.2 \leq D \leq 0.25$	1																
$D > 0.25$	0																

STANDARD DOC.	PRODUCT SPEC.	MODULE NO.	LTF180BS		Page	19
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5	Line defect		Length	Width	Acceptable QTY		2.50
			不计	$W \leq 0.02$	No check	C Area	
			$L \leq 3$	$W \leq 0.03$	2	No check	
			$L \leq 2.5$	$0.03 < W \leq 0.05$	2		
	$W > 0.05$	Sa round type					

17.USING LCD MODULES

17-1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
- (4) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, wipe gently with absorbent cotton or other soft material like chamois soaked in Isopropyl alcohol or Ethyl alcohol. Do not scrub hard to avoid damaging the display surface.
- (5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on.
- (9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).
- (10) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- (11) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

18-2 PRECAUTION FOR HANDING LCD MODULES

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the

STANDARD DOC.	PRODUCT SPEC.	MODULE NO.	LTF180BS	Page	20
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module or making any alterations or modifications to it.

- (1) Do not alter, modify or change the the shape of the tab on the metal frame.
- (2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- (3) Do not damage or modify the pattern writing on the printed circuit board.
- (4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- (5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (6) Do not drop, bend or twist LCM. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- (7) In order to avoid the cracking of the FPC,you should to pay attention to the area of FPC where the FPC was bent .the edge of coverlay;the area of surface of Ni-Au plating,the area of soldering land,the area of through hole.

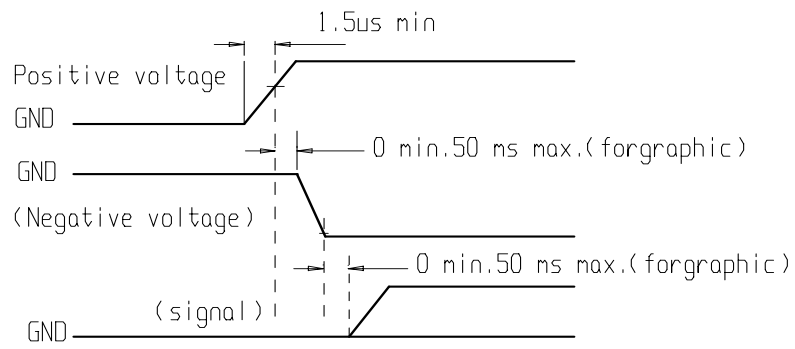
17-3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handing LCM. To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules. - Exposed area of the printed circuit board. - Terminal electrode sections.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

17-4 PRECAUTIONS FOR OPERATION

- (1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- (4) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (5) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- (6) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.
- (7) When turning the power on, input each signal after the positive/negative voltage becomes stable.



17-5 STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- 3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)
- (4) Environmental conditions :
 - Do not leave them for more than 160hrs. at 70°C.
 - Should not be left for more than 48hrs. at -20°C.

17-6 SAFETY

- (1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

17-7 LIMITED WARRANTY

Unless agreed between Longtech and customer, Longtech will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Longtech acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to Longtech within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Longtech limited to repair and/or replacement on the terms set forth above. Longtech will not be responsible for any subsequent or consequential events.

17-8 RETURN LCM UNDER WARRANTY

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.