



POWERTIP TECH. CORP.
DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer : RYSTON

Model Type : LCD Module

Sample Code : PC1601ARS-AEA-A-S0

Mass Production Code : _____

Edition : 0

Customer Sign	Sales Sign	Approved By	Prepared By
		 	

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Out Going Inspection Specification



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1. SPECIFICATIONS

1.1 Features

- 16-characters, one-lines liquid crystal display of 5*8 dot matrix
- 1/16 Duty, 1/4 bias
- STN LCD, positive, gray
- Reflective LCD
- 6 o'clock viewing angle
- 8 bits parallel data input

1.2 Mechanical Specifications

- Outline dimension : 80.0mm(L)* 36.5mm(W)*9.7mm max.(H)
- Viewing area : 64.5mm *13.8mm
- Active area : 59.62mm *6.65mm
- Dot size : 0.55mm *0.75mm
- Dot pitch : 0.63mm *0.83mm
- Character Size : 3.07mm *6.56mm

1.3 Absolute Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Power supply Voltage	VDD	-	-0.3	7.0	V
LCD drive Supply voltage	VDD-VO	-	-0.3	VDD+0.3	V
Input voltage	VIN	-	-0.3	VDD+0.3	V
Operating temperature	TOPR	-	0	50	°C
Storage temperature	TSTG	-	-20	70	°C
Humidity	HD	-	-	90	%RH

1.4 DC Electrical Characteristics

VDD=+5V_{+10%}, VSS=0V, TA=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply voltage	VDD	-	4.5	5.0	5.5	V
“H” input voltage	VIH	-	2.0	-	VDD	V
“L” input voltage	VIL	-	VSS	-	0.8	V
“H” output voltage	VOH	-	2.4	-	-	V
“L” output voltage	VOL	-	-	-	0.4	V
Supply current	IDD	VDD=5V	-	1.93	2.3	mA
LCD driving voltage	VOP	VDD-VO	-	4.11	4.51	V



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1.5 Optical Characteristics

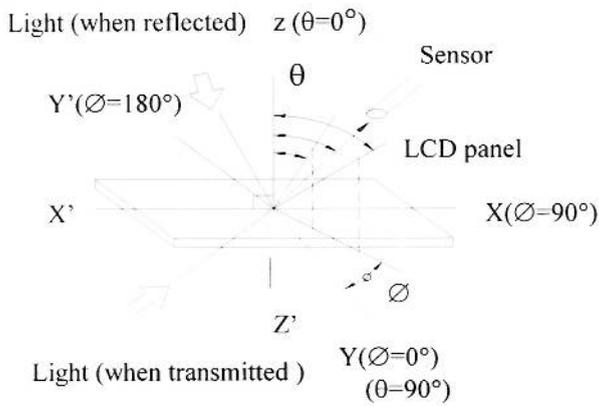
1/16 duty, 1/4 bias, $V_{OPR}=4.5V$, $T_a=25^{\circ}C$

Item	Symbol	Conditions	Min.	Typ.	Max	Reference
Viewing angle	θ	Front-Rear $\varnothing=270^{\circ}$	60	-	80	Notes 1 & 2
		Left-Right $\varnothing=180^{\circ}$	60	-	120	
Contrast	C	$\theta=5^{\circ}$, $\varnothing=0^{\circ}$	-	5	-	Note 3
Response time(rise)	T_r	$\theta=5^{\circ}$, $\varnothing=0^{\circ}$	-	200	300	Note 4
Response time(fall)	T_f	$\theta=5^{\circ}$, $\varnothing=0^{\circ}$	-	200	300	Note 4

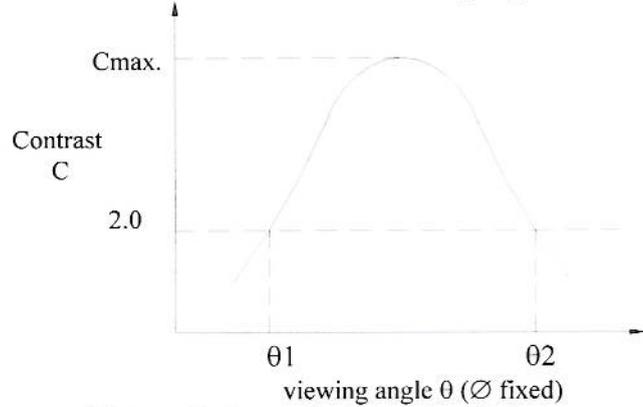
Parameter	Symbol	Temperature ($^{\circ}C$)	Standard			Unit
			Min	Typ	Max	
Driving voltage	V_{OP}	0	-	5.1	-	V
		25	-	4.5	-	
		50	-	4.0	-	



Note 1: Definition of angles θ and \varnothing



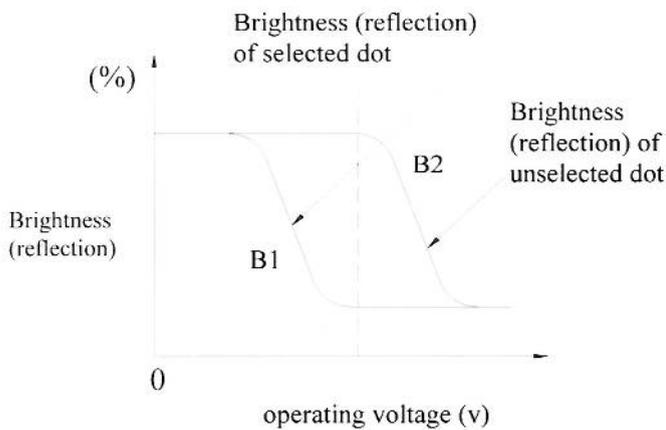
Note 2: Definition of viewing angles θ_1 and θ_2



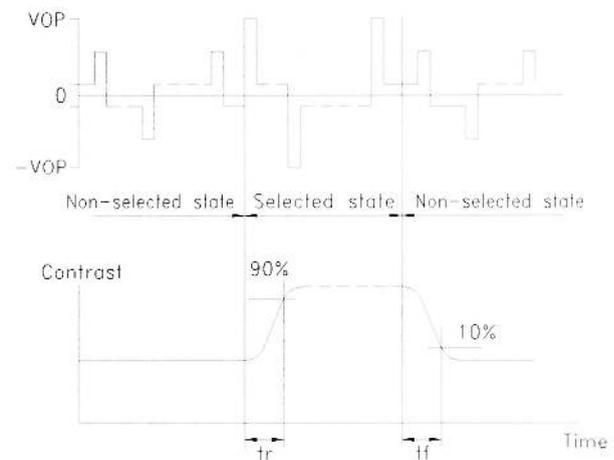
Note : Optimum viewing angle with the naked eye and viewing angle θ at C_{max} . Above are not always the same

Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



Note 4: Definition of response time



Note: Measured with a transmissive LCD panel which is displayed 1 cm²

V_{OPR} : Operating voltage
 t_r : Response time (rise)

f_{FRM} : Frame frequency
 t_f : Response time (fall)



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2. MODULE STRUCTURE

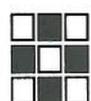
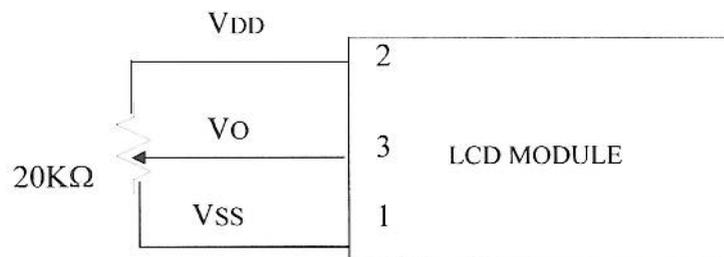
2.1 Counter Drawing

*See Appendix 1

2.2 Interface Pin Description

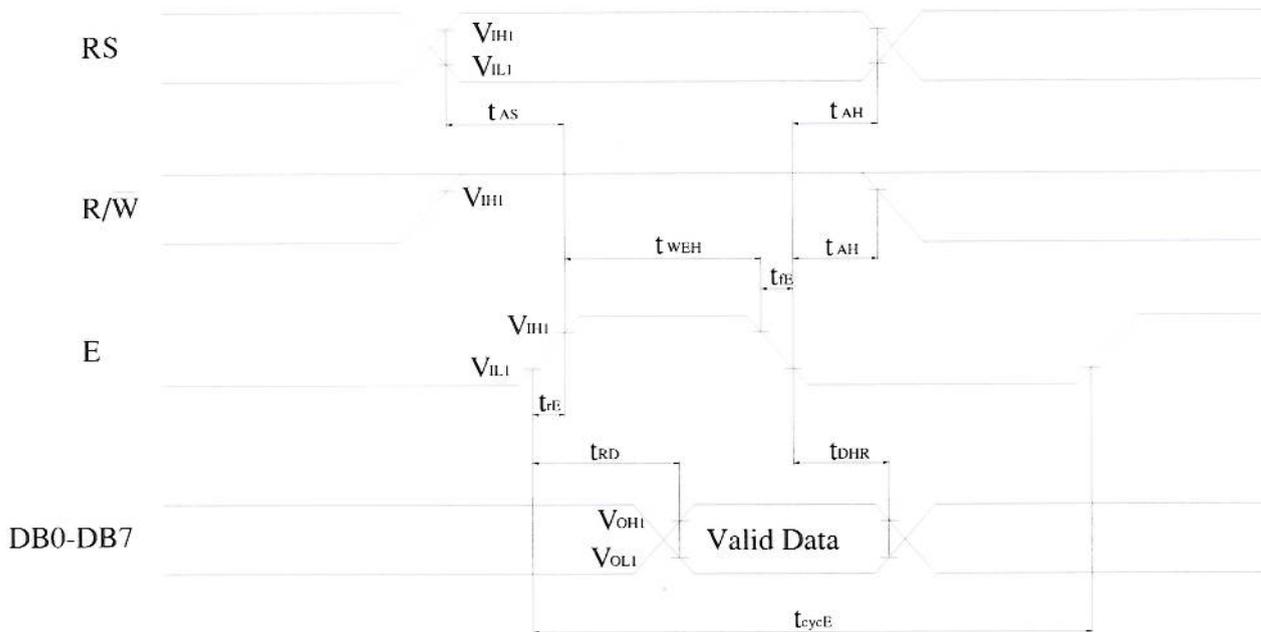
Pin No.	Symbol	Signal Description
1	VSS	Power Supply ($V_{SS}=0$)
2	VDD	Power Supply ($V_{DD}>V_{SS}$)
3	VO	Operating voltage for LCD
4	RS	Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
5	$\overline{R/W}$	Read/Write signal input is used to select the read/write mode High = Read mode, Low = Write mode
6	E	Start enable signal to read or write the data
7~10	DB0 ~ DB3	Four low order bi-directional three-state data bus lines. Use for data transfer between the MPU and the LCD module. These four are not used during 4-bit operation.
11~14	DB4 ~ DB7	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. DB7 can be used as a busy flag.
15	A	Power supply for LED B / L (+)
16	K	Power supply for LED B / L (-)

Contrast Adjust

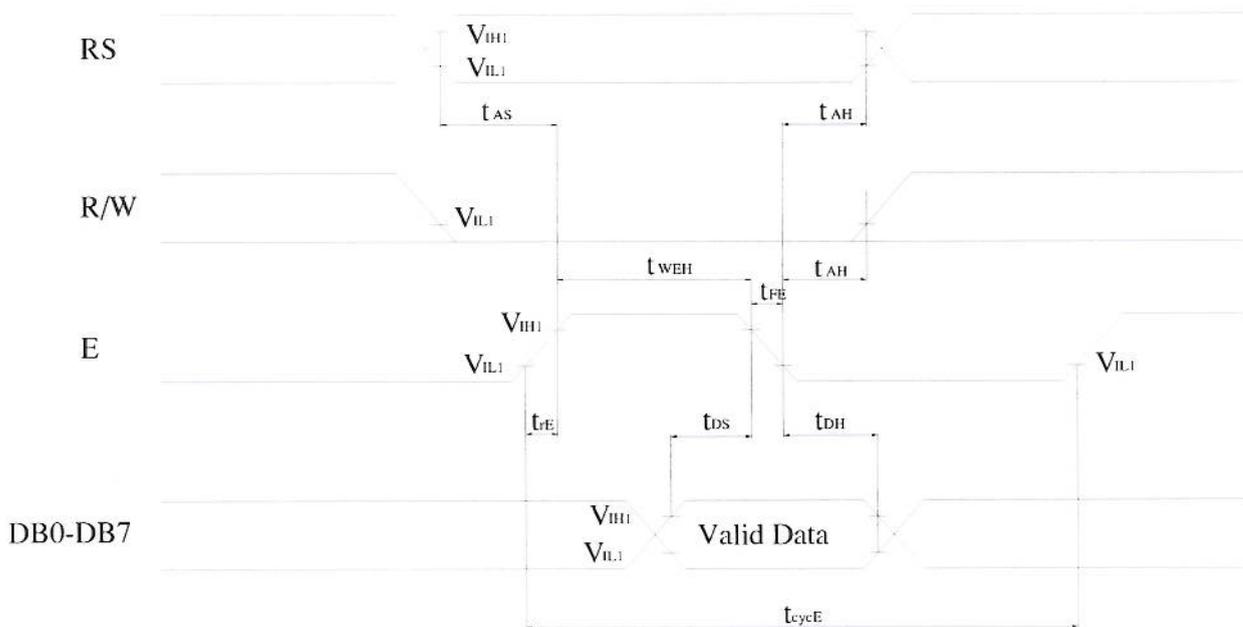


2.3 Timing Characteristics

• Read cycle



• Write cycle



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• Read cycle

 $V_{DD}=5.0V \pm 10\%$, $V_{SS}=0$, $T_a=-20 \sim +75^\circ C$

Characteristics	Symbol	Condition	Rating		Unit
			min	max	
Enable cycle time	t_{cycE}	-	500	-	ns
Enable "H" level pulsewidth	t_{WEH}	-	220	-	ns
Enable rise/fall time	t_{rE}, t_{fE}	-	-	25	ns
RS, $\overline{R/W}$ setup time	t_{AS}	-	40	-	ns
RS, $\overline{R/W}$ address hold time	t_{AH}	-	10	-	ns
Read data setup time	t_{RD}	$C_L=100pF$	-	120	ns
Read data hold time	t_{DHR}	-	20	-	ns

• Write cycle

Characteristics	Symbol	Condition	Rating		Unit
			min	max	
Enable cycle time	t_{cycE}	-	500	-	ns
Enable "H" level pulsewidth	t_{WEH}	-	220	-	ns
Enable rise/fall time	t_{rE}, t_{fE}	-	-	25	ns
RS, $\overline{R/W}$ setup time	t_{AS}	-	40	-	ns
RS, $\overline{R/W}$ address hold time	t_{AH}	-	10	-	ns
Data setup time	t_{DS}	-	60	-	ns
Write data hold time	t_{DH}	-	10	-	ns



2.4 Display Command

Instructions	Instruction Code										Description	Cycle Time (max.)	
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Clear Display	0	0	0	0	0	0	0	0	0	1		Clear all display data and sets DDRAM address 0 in the address counter.	410 clocks
Return Home	0	0	0	0	0	0	0	0	0	1	×	Set DDRAM address 0 in the address counter. Also returns any shifted data to home. The contents of DDRAM remain unchanged.	410 clocks
Entry Mode Set	0	0	0	0	0	0	0	0	1	I/D	S	Specifies the direction in which the cursor moves and whether the display is to be shifted or nor, when data is written to or read from memory	10 clocks
Display ON/OFF	0	0	0	0	0	0	0	1	D	C	B	Sets all display on/off (D) cursor on/off ©, and character blinking in the cursor position (B).	10 clocks
Cursor or Display Shift	0	0	0	0	0	0	1	S/C	R/L	×	×	Moves the cursor and shifts the display without changing the contents of DDRAM.	10 clocks
System Set	0	0	0	0	0	1	IF	N	F	×	×	Sets the interface data length(IF), number of characters to be displayed (N), and character font(F).	10 clocks
Set CGRAM Address	0	0	0	1	A _{CG}							Set CGRAM addresses, followed by transfer of CGRAM data.	10 clocks
Set DDRAM Address	0	0	1	A _{DD}							Set DDRAM addresses, followed by transfer of DDRAM data.	10 clocks	
Read Busy Flag and Address	0	1	BF	A _{CC}							Reads the busy flag (BF) which indicates internal operation and the contents of the address counter.	0	
Write Data to CG or DDRAM	1	0	Write Data							Writes data to DDRAM or CGRAM.	10 clocks		
Read Data from CG or DDRAM	1	1	Read Data							Reads data from DDRAM or CGRAM.	10 clocks		

※ "× ":don't care



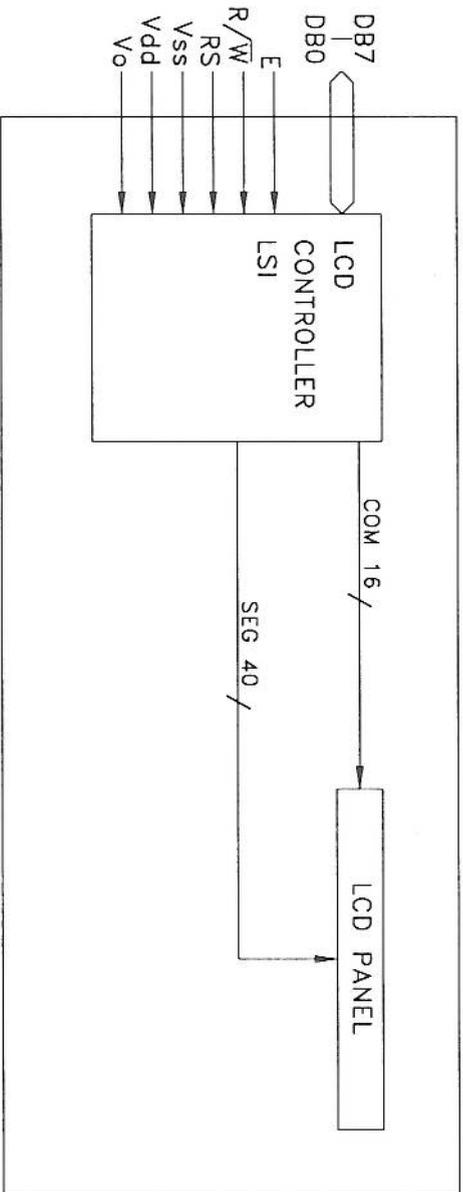
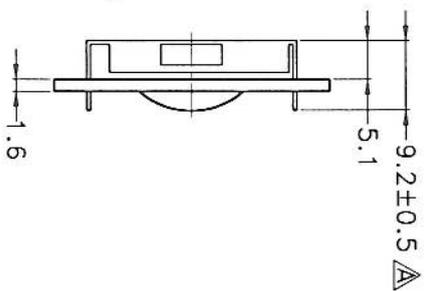
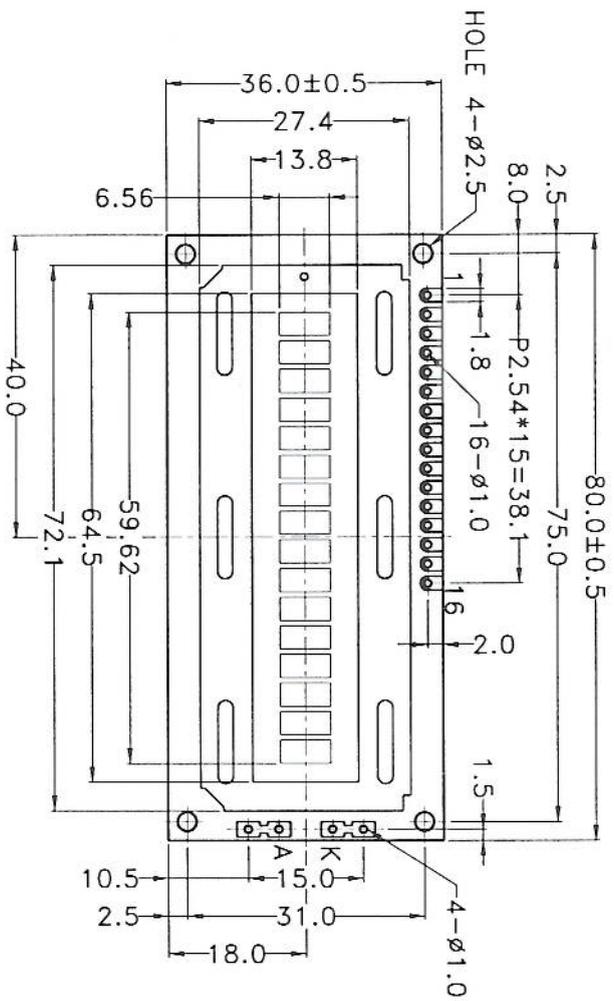
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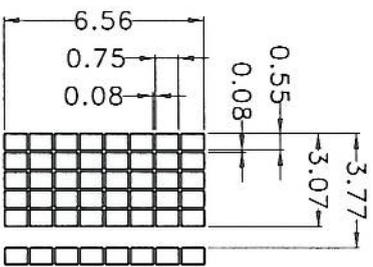
2.5 Character Pattern

Lower Bits	Upper Bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)			0	1	2	3	4	5				一	夕	三	四	五
xxxx0001	CG RAM (2)		!	1	A	Q	a	9				。	ア	チ	△	△	△
xxxx0010	CG RAM (3)		"	2	B	R	b	r				「	イ	ツ	※	◎	◎
xxxx0011	CG RAM (4)		#	3	C	S	c	s				」	ウ	テ	〒	◎	◎
xxxx0100	CG RAM (5)		¥	4	D	T	d	t				、	エ	ト	ト	四	◎
xxxx0101	CG RAM (6)		%	5	E	U	e	u				。	オ	ナ	一	◎	◎
xxxx0110	CG RAM (7)		&	6	F	V	f	v				ヲ	カ	ニ	ヨ	◎	◎
xxxx0111	CG RAM (8)		'	7	G	W	g	w				マ	キ	又	ラ	◎	◎
xxxx1000	CG RAM (1)		(	8	H	X	h	x				イ	ク	キ	リ	、	◎
xxxx1001	CG RAM (2)		)	9	I	Y	i	y				ウ	ケ	、	ル	、	◎
xxxx1010	CG RAM (3)		*	:	J	Z	j	z				エ	コ	、	レ	、	◎
xxxx1011	CG RAM (4)		+	;	K	[	k	[				オ	サ	ヒ	◎	◎	◎
xxxx1100	CG RAM (5)		,	<	L	¥	l	¥				カ	シ	フ	フ	◎	◎
xxxx1101	CG RAM (6)		-	=	M	J	m	j				ユ	ズ	、	、	◎	◎
xxxx1110	CG RAM (7)		.	>	N	^	n	+				ヨ	セ	ホ	、	◎	◎
xxxx1111	CG RAM (8)		/	?	O	_	o	+				ツ	ソ	マ	、	◎	◎





The tolerance unless classified $\pm 0.3\text{mm}$



SCALE: 4/1

PIN NO.	SIGNAL
1	VSS
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K



RTIP TECHNOLOGY

SCALE:	MODEL NAME
1/1	PC 1601ARS-AEA-A
UNIT:	TITLE
mm	COUNTER DRAWING
EDI: PAGE:	DRAWN NO.
A 1/1	PC-95017-007

APPROVED: 何文彦 (He Wenyan) 88.9.16

DESIGNER: 程愛卿 (Cheng Aiqing) 88.9.16

Y/c-yq

Out Going Inspection Specification

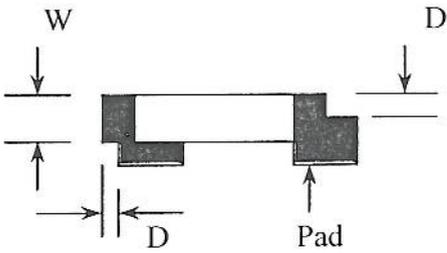
Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II °

Defect Level : Major Defect AQL 0.65; Minor Defect AQL 1.0 °

Equipment : Gauge , MIL-STD , Powertip Tester , Sample °

Specification :

N O	Item	Specification	Judge	Level
1	Part Number	Inconsistent with the P/N on the flow chart of production	N.G.	Major
2	Quantity	Inconsistent Q'TY with the flow chart of production	N.G.	Major
3	Electronic characteristics $A=(L+W)\div 2$	Display short	N.G.	Major
		Missing line	N.G.	Major
		Dot missing $A > 1/2$ Dot size	N.G.	Major
		No function	N.G.	Major
		Out put data error	N.G.	Major
4	Appearance $A=(L+W)\div 2$ Dirty particle (Include scratch , bubble)	Material difference with flow chart	N.G.	Major
		LCD Assembled in opposite direction	N.G.	Major
		Bezel assembled in opposite direction	N.G.	Major
		Shadow within LCD $V/A + 1.0$ mm	N.G.	Major
		Dirty particle $A > 0.4$ mm	N.G.	Minor
		Dirty particle length > 3.0 mm And $0.01\text{mm} < \text{Width} \leq 0.05\text{mm}$ (Width $> 0.05\text{mm}$ Measure by area)	N.G.	Minor
		Without protective film	N.G.	Minor
		Conductive rubber over bezel	N.G.	Minor
5	PCB Appearance $A=(L+W)\div 2$	Burned PCB	N.G.	Major
		Green paint stripped & visible circuit $A > 1.0$ mm (Finish coat not counted in)	N.G.	Minor
		A particle across the circuit	N.G.	Minor
		Circuit split $> 1/2$ Circuit width	N.G.	Minor
		Any circuit risen	N.G.	Minor
		$0.2\text{mm} < \text{Tin ball area } A \leq 0.4\text{mm}$ And Q'TY > 4 Pieces	N.G.	Minor
		Tin ball area $A > 0.4\text{mm}$	N.G.	Minor

N O	Item	Specification	Judge	Level
6	Molding appearance $A=(L+W)\div 2$	Too soft : Shape by touch changed	N.G.	Major
		Insufficient epoxy : IC circuit or IC pad visible	N.G.	Minor
		Excessive epoxy : Diameter $> 20\text{mm}$ Or High $> 2.5\text{mm}$	N.G.	Minor
		Pin hole through to IC and $A > 0.2\text{mm}$	N.G.	Minor
7	Bezel appearance $A=(L+W)\div 2$	Angle between frame and TAB $> 45^\circ +10$	N.G.	Minor
		Electroplate strip $A > 1.0\text{mm}$ (Top view only)	N.G.	Minor
		Rust (Top view only)	N.G.	Minor
		Crack	N.G.	Minor
8	Backlight electric characteristics $A=(L+W)\div 2$	Error backlight color	N.G.	Major
		No function	N.G.	Major
		Any LED dot no function	N.G.	Major
		PIN soldering without tin $A > 1/2$ solder pad	N.G.	Minor
		Solder PIN high $> 1.5\text{mm}$	N.G.	Minor
9	LCD Appearance $A=(L+W)\div 2$	Polarize rise over V/A	N.G.	Minor
i0	Assembly parts $A=(L+W)\div 2$	Components mark unclearly	N.G.	Minor
		Components' distance more than 0.7mm firm the PCB	N.G.	Minor
		Error position not in center $D > 1/4W$	N.G.	Minor
				
		Non- solder area $>$ Twice solder area	N.G.	Minor
		Flux area $A > 1/4$ solder area	N.G.	Minor
		Component broken	N.G.	Minor