



FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

MONO LCD MODULE

MODEL : WG1206H8FSW6G-B VER:1.0

【 】 Preliminary Specification

【◆】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

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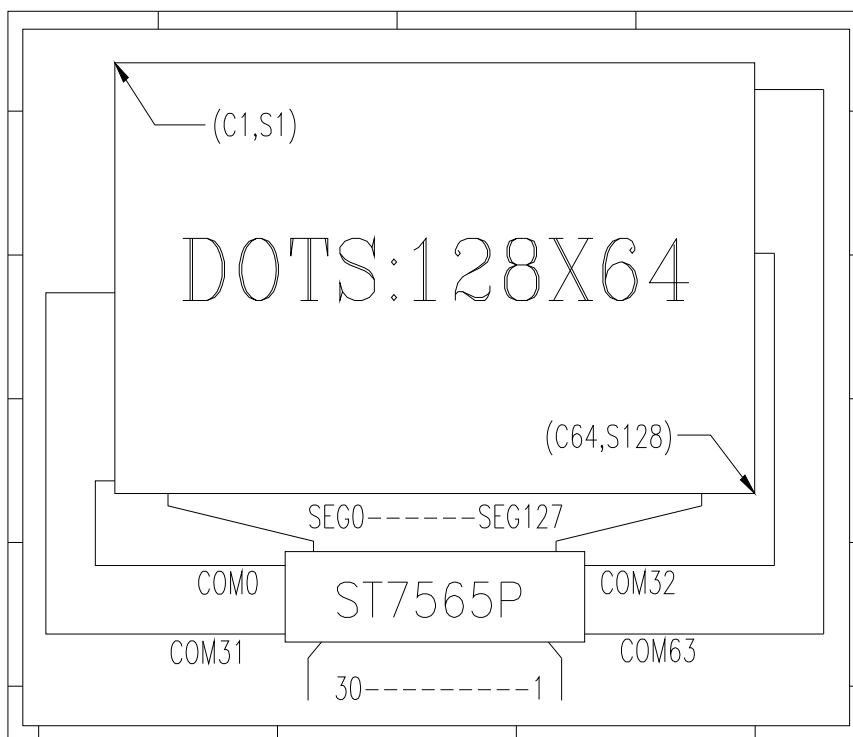
CONTENTS

1 FUNCTION & FEATURES	1
2 BLOCK DIAGRAM.....	1
3 DIMENSIONAL CD DRAWING	2
4 POWER SUPPL	3
5 PIN DESCRIPTION	3
6 MAXIMUM ABSOLUTE LIMIT (T=25°C).....	5
7 ELECTRICAL CHARACTERISTICS	5
7.1DC Characteristics(T=25°C)	5
7.2 Backlight Specifications (Ta=25°C).....	5
7.3 AC Characteristics	6
9 QUALITY SPECIFICATIONS.....	10
9.1 Defect classification.....	10
9.2 Note on defect classification.....	11
9.3. Reliability of LCM.....	17
10.DESCRIBE TO THE PART NO:	17
11 GUARTANTEE	17

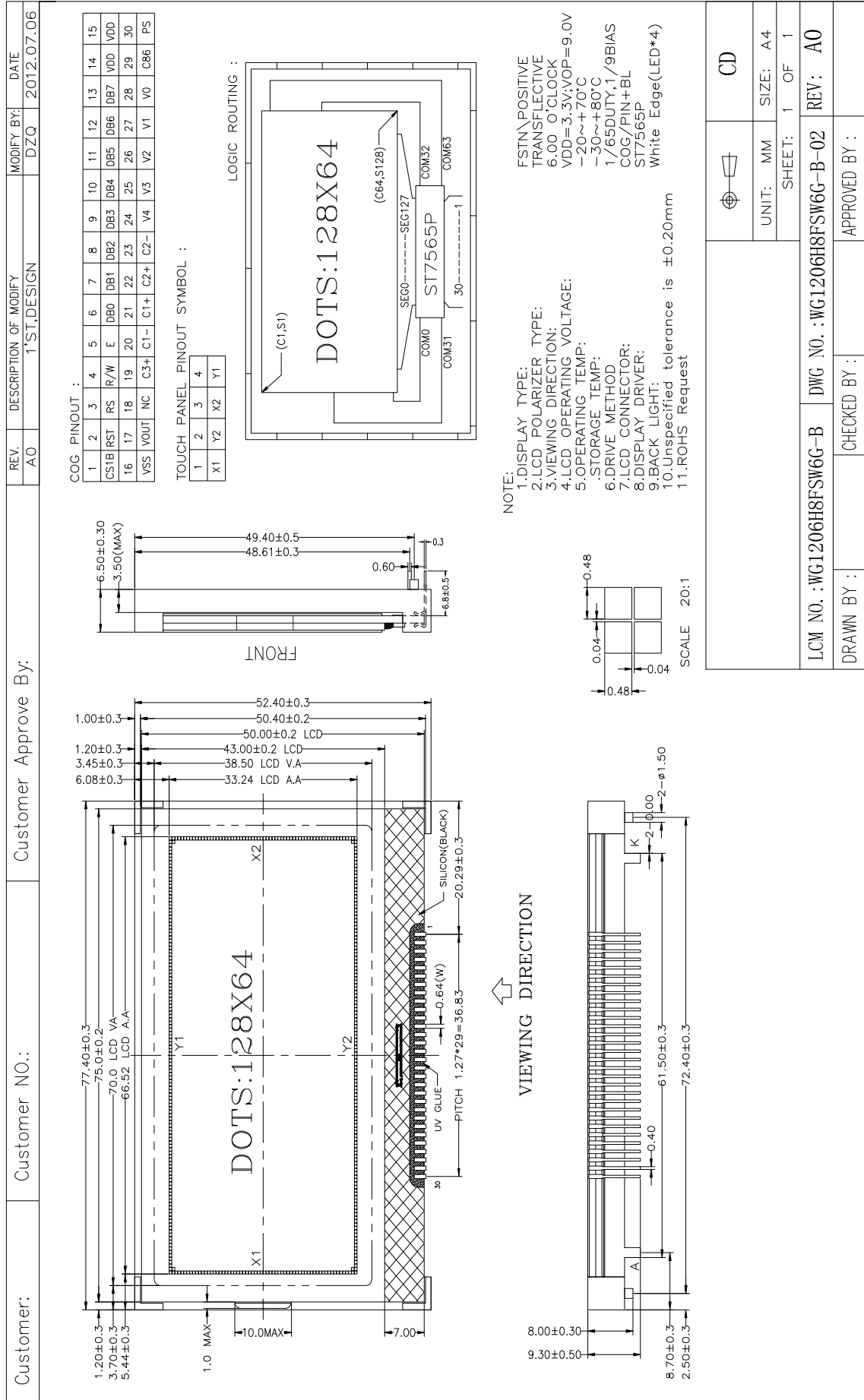
1 FUNCTION & FEATURES

ITEM	Normal dimensions
Display Format	128*64 Dots Graphic
Module dimension	77.4(W)*52.4(H)*6.5 (T) mm
Viewing area	70.0(W)*38.5(H) mm
Duty/bias	1/65Duty,1/9Bias
LCD mode	FSTN/POSITIVE/TRANSFLECTIVE
Viewing direction	6:00 O'clock

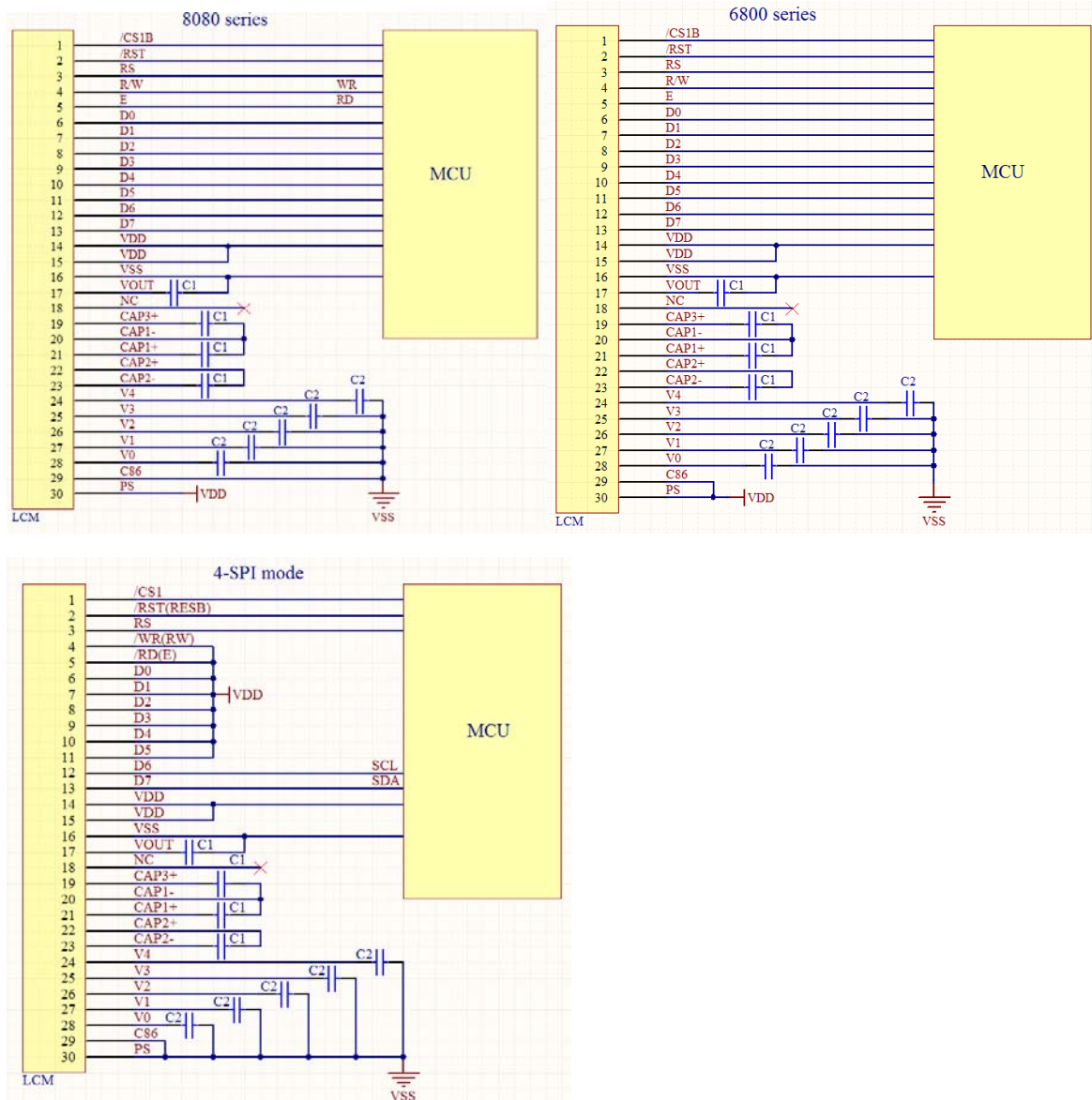
2 BLOCK DIAGRAM



3 DIMENSIONAL CD DRAWING



4 POWER SUPPL



5 PIN DESCRIPTION

Pin no.	Symbol	Function
1	CS1B	chip select signal.
2	RST	When /RES is set to "L", the register settings are initialized (cleared).
3	RS	This is connect to the least significant bit of the normal MPU address bus, and itdetermines whether the data bits are data or command. A0 = "H": Indicates that D0 to D7 are display data. A0 = "L": Indicates that D0 to D7 are control data.
4	R/W	<ul style="list-style-type: none"> • When connected to 8080 series MPU, this pin is treated as the "/WR" signal of the 8080 MPU and is LOW-active. The signals on the data bus are latched at the rising edge of the /WR signal. • When connected to 6800 series MPU, this pin is treated as the "R/W" signal of the 6800 MPU and decides the access type : When R/W = "H": Read.When R/W = "L": Write.

5	E	<ul style="list-style-type: none"> When connected to 8080 series MPU, this pin is treated as the "/RD" signal of the 8080 MPU and is LOW-active. The data bus is in an output status when this signal is "L". When connected to 6800 series MPU, this pin is treated as the "E" signal of the 6800 MPU and is HIGH-active. This is the enable clock input terminal of the 6800 Series MPU.
6~13	DB[0..7]	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus. When the serial interface (SPI-4) is selected (P/S = "L") : D7 : serial data input (SI) ; D6 : the serial clock input (SCL). D0 to D5 should be connected to VDD or floating. When the chip select is not active, D0 to D7 are set to high impedance.
14~15	VDD	Power supply.
16	VSS	Ground.
17	VOUT	DC/DC voltage converter. Connect a capacitor between this terminal and VSS or VDD.
18	NC	No connecting..
19	C3+	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
20	C1-	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.
21	C1+	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
22	C2+	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal.
23	C2-	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal.
24~28	V[4..0]	<p>This is a multi-level power supply for the liquid crystal drive. The voltage Supply applied is determined by the liquid crystal cell, and is changed through the use of a resistive voltage divided or through changing the impedance using an op. amp. Voltage levels are determined based on Vss, and must maintain the relative magnitudes shown below.</p> $V0 \cong V1 \cong V2 \cong V3 \cong V4 \cong V_{ss}$
29	C86	This is the MPU interface selection pin. C86 = "H": 6800 Series MPU interface. C86 = "L": 8080 Series MPU interface.
30	PS	<p>This pin configures the interface to be parallel mode or serial mode.</p> <p>P/S = "H": Parallel data input/output. P/S = "L": Serial data input.</p>

6 MAXIMUM ABSOLUTE LIMIT (T=25°C)

Item	Symbol	Standard value	Unit
supply voltage	V _{DD}	0.3~+3.6	V
Input voltage	V _{LCD}	0.3~+13.0	V
Operating temperature	T _{opr}	-20~+70	°C
Storage temperature	T _{stg}	-30~+80	°C

Note: Voltage greater than above may damage the module. All voltages are specified relative to VSS=0V

7 ELECTRICAL CHARACTERISTICS

7.1DC Characteristics(T=25°C)

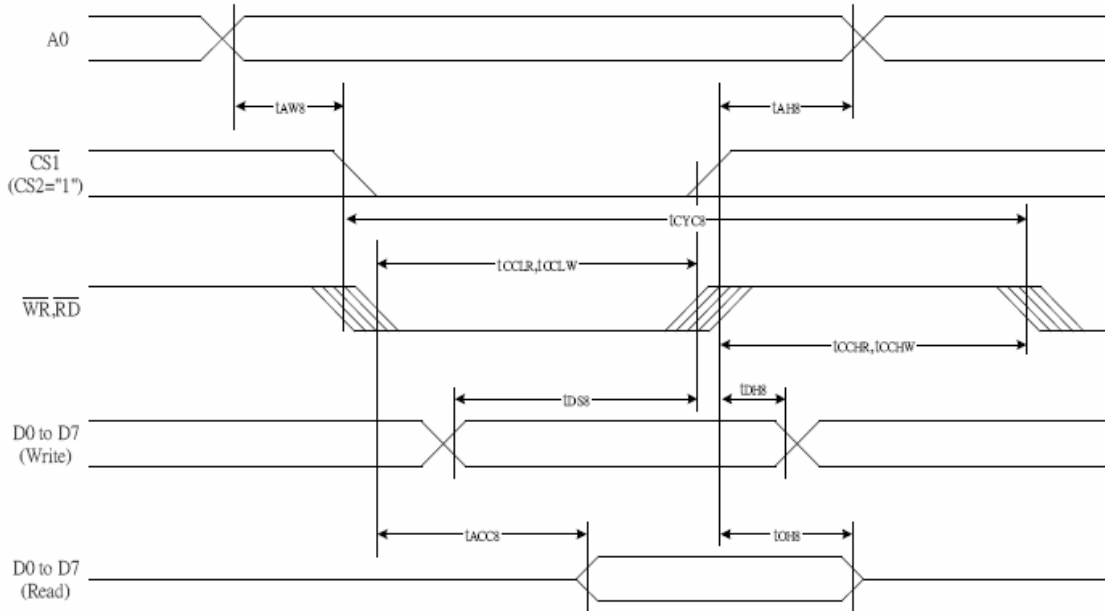
Item	Symbol	Min	Typ	Max	Unit	Applicable terminal	Test condition
Operating voltage	V _{DD}	3.1	3.3	3.5	V	-	Ta=25°C
Supply current	I _{DD}	-	-	3	mA	-	Ta=25°C
Input voltage	V _{IL}	VSS	-	0.2 V _{DD}	V	-	Ta=25°C
	V _{IH}	0.8 V _{DD}	-	V _{DD}	V		Ta=25°C
Output voltage	V _{OL}	VSS	-	0.2 V _{DD}	V	-	Ta=25°C
	V _{OH}	0.8 V _{DD}	-	V _{DD}	V		Ta=25°C
Input leakage current	I _{IKG}	-1.0	-	1.0	μA	-	Ta=25°C
LCD driving voltage	V _{LCD}	8.8	9.0	9.2	V	-	Ta=25°C

7.2 Backlight Specifications (Ta=25°C)

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	V _f	-	3.1	-	V	If=60mA
Color	white					

7.3 AC Characteristics

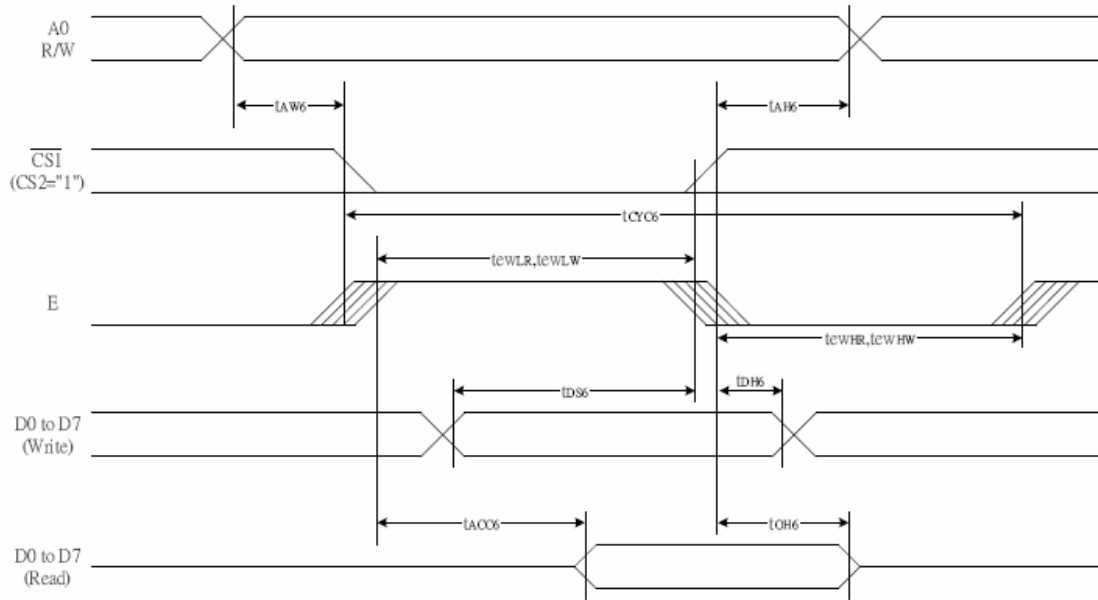
System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)



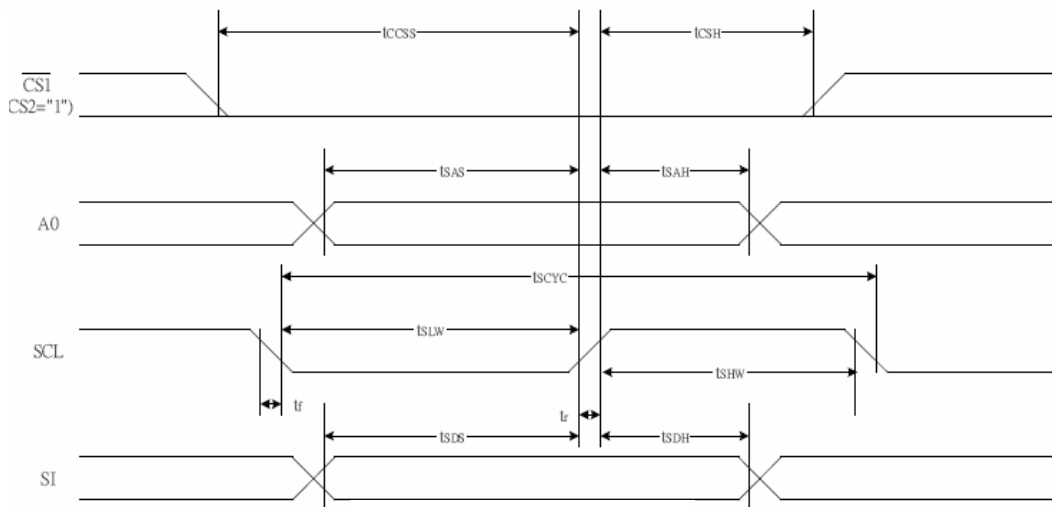
Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8		0	—	Ns
Address setup time		tAW8		0	—	
System cycle time		tCYC8		240	—	
Enable L pulse width (WRITE)	WR	tCCLW		80	—	
Enable H pulse width (WRITE)		tCCHW		80	—	
Enable L pulse width (READ)	RD	tCCLR		140	—	
Enable H pulse width (READ)		tCCHR		80	—	
WRITE Data setup time	D0 to D7	tDS8		40	—	
WRITE Address hold time		tDH8		0	—	
READ access time		tACC8	CL = 100 pF	—	70	
READ Output disable time		tOH8	CL = 100 pF	5	50	



○System Bus Read/Write Characteristics 2 (For the 6800 Series MPU)



Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		240	—	
Enable L pulse width (WRITE)	WR	tEHLW		80	—	
Enable H pulse width (WRITE)		tEHWL		80	—	
Enable L pulse width (READ)	RD	tEHLR		80	—	
Enable H pulse width (READ)		tEHRW		140	—	
WRITE Data setup time	D0 to D7	tDS6		40	—	
WRITE Address hold time		tDH6		0	—	
READ access time		tACC6	CL = 100 pF	—	70	
READ Output disable time		tOH6	CL = 100 pF	5	50	

Serial Interface


Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period		T_{scyc}		50	—	ns
SCL "H" pulse width	SCL	T_{shw}		25	—	
SCL "L" pulse width	SCL	T_{slw}		25	—	
Address setup time	A0	T_{sas}		20	—	
Address hold time	A0	T_{sah}		10	—	
Data setup time	SI	T_{sds}		20	—	
Data hold time	SI	T_{sdh}		10	—	
CS-SCL time	CS	T_{css}		20	—	
SCL-CS time	CS	T_{csh}		40	—	

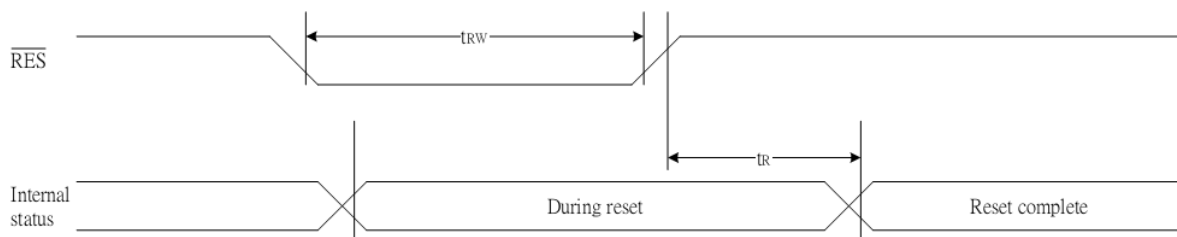
Reset Timing


Figure 41

Table 36

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tr		—	—	1.0	us
Reset "L" pulse width	\overline{RES}	trw		1.0	—	—	us

8 Instruction Description

(Note) *: disabled data

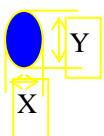
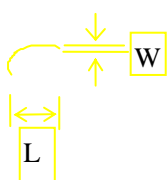
Command	Command Code										Function		
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1		D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address	
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.	
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.	
(5) Status read	0	0	1	Status				0	0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM	
(7) Display data read	1	0	1	Read data								Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	1	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0	0	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode	
(17) V ₀ voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode	
(18) Electronic volume mode set Electronic volume register set	0	1	0	1	0	0	0	0	0	0	0	1	Set the V ₀ output voltage electronic volume register
(19) Static indicator ON/OFF Static indicator register set	0	1	0	1	0	1	0	1	1	0	0	1	0: OFF, 1: ON Set the flashing mode
(20) Booster ratio set	0	1	0	1	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver													Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	*	Command for IC test. Do not use this command

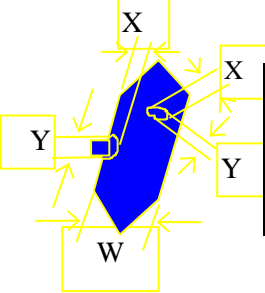
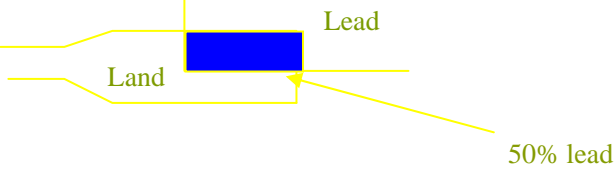
9 QUALITY SPECIFICATIONS

9.1 Defect classification

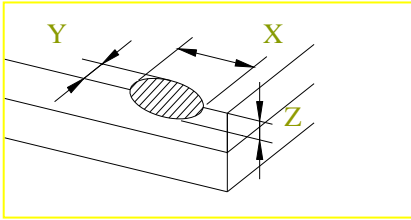
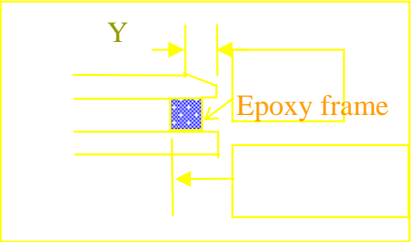
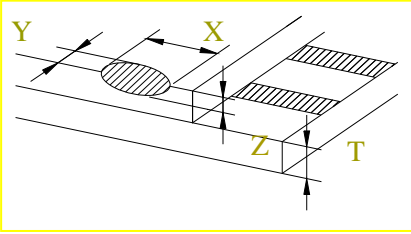
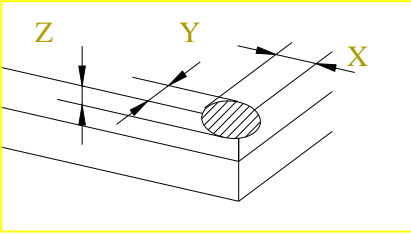
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		Contrast defect (dim, ghost)		
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction	2	
		Wrong Back-light	7	
	Non-display	Flat cable or pin reverse	9	
		Wrong or missing component	10	
	Minor	Display state	Background color deviation	
Black spot and dust			3	
Line defect			4	
Scratch				
Rainbow			5	
Pin hole			6	
Polarizer		Bubble and foreign material	3	
		Scratch	4	
PCB		Scratch	4	
Soldering		Poor connection	8	
Wire		Poor connection	9	

9.2 Note on defect classification

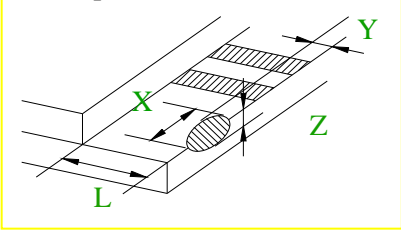
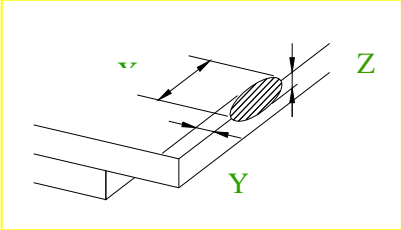
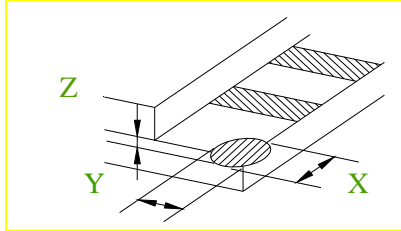
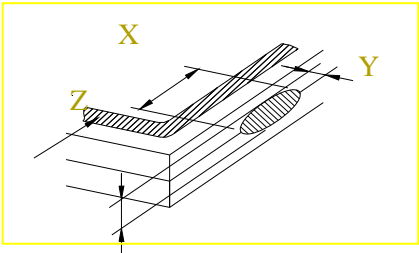
No.	Item	Criterion																				
1	Short or open circuit	Not allow																				
	LC leakage																					
	Flickering																					
	No display																					
	Wrong viewing direction																					
	Wrong Back-light																					
2	Contrast defect	Refer to approval sample																				
	Background color deviation																					
3	Point defect, Black spot, dust (incl. Polarizer) $\phi = (X+Y)/2$	 <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Point Size</th> <th>Acceptable Qty.</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.10$</td> <td>Disregard</td> </tr> <tr> <td>$0.10 < \phi \leq 0.20$</td> <td>3</td> </tr> <tr> <td>$0.20 < \phi \leq 0.25$</td> <td>2</td> </tr> <tr> <td>$0.25 < \phi \leq 0.30$</td> <td>1</td> </tr> <tr> <td>$\phi > 0.30$</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: right;">Unit: mm</p>	Point Size	Acceptable Qty.	$\phi \leq 0.10$	Disregard	$0.10 < \phi \leq 0.20$	3	$0.20 < \phi \leq 0.25$	2	$0.25 < \phi \leq 0.30$	1	$\phi > 0.30$	0								
Point Size	Acceptable Qty.																					
$\phi \leq 0.10$	Disregard																					
$0.10 < \phi \leq 0.20$	3																					
$0.20 < \phi \leq 0.25$	2																					
$0.25 < \phi \leq 0.30$	1																					
$\phi > 0.30$	0																					
4	Line defect	 <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Line</th> <th>Acceptable Qty.</th> </tr> <tr> <th>L</th> <th>W</th> <th></th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$0.015 \geq W$</td> <td>Disregard</td> </tr> <tr> <td>$3.0 \geq L$</td> <td>$0.03 \geq W$</td> <td rowspan="2">2</td> </tr> <tr> <td>$2.0 \geq L$</td> <td>$0.05 \geq W$</td> </tr> <tr> <td>$1.0 \geq L$</td> <td>$0.1 > W$</td> <td>1</td> </tr> <tr> <td>---</td> <td>$0.05 < W$</td> <td>Applied as point defect</td> </tr> </tbody> </table> <p style="text-align: right;">Unit: mm</p>	Line		Acceptable Qty.	L	W		---	$0.015 \geq W$	Disregard	$3.0 \geq L$	$0.03 \geq W$	2	$2.0 \geq L$	$0.05 \geq W$	$1.0 \geq L$	$0.1 > W$	1	---	$0.05 < W$	Applied as point defect
Line		Acceptable Qty.																				
L	W																					
---	$0.015 \geq W$	Disregard																				
$3.0 \geq L$	$0.03 \geq W$	2																				
$2.0 \geq L$	$0.05 \geq W$																					
$1.0 \geq L$	$0.1 > W$	1																				
---	$0.05 < W$	Applied as point defect																				
5	Rainbow	Not more than two color changes across the viewing area.																				

No.	Item	Criterion								
6	Segment pattern $W = \text{Segment width}$ $\phi = (X+Y)/2$	(1) Pin hole $\phi < 0.10\text{mm}$ is acceptable.  <table border="1" data-bbox="933 555 1391 721"> <thead> <tr> <th>Point Size</th> <th>Acceptable Qty</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 1/4W$</td> <td>Disregard</td> </tr> <tr> <td>$1/4W < \phi \leq 1/2W$</td> <td>1</td> </tr> <tr> <td>$\phi > 1/2W$</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: right;">Unit: mm</p>	Point Size	Acceptable Qty	$\phi \leq 1/4W$	Disregard	$1/4W < \phi \leq 1/2W$	1	$\phi > 1/2W$	0
Point Size	Acceptable Qty									
$\phi \leq 1/4W$	Disregard									
$1/4W < \phi \leq 1/2W$	1									
$\phi > 1/2W$	0									
7	Back-light	(1) The color of backlight should correspond its specification. (2) Not allow flickering								
8	Soldering	(1) Not allow heavy dirty and solder ball on PCB. (The size of dirty refer to point and dust defect) (2) Over 50% of lead should be soldered on Land. 								
9	Wire	(1) Copper wire should not be rusted (2) Not allow crack on copper wire connection. (3) Not allow reversing the position of the flat cable. (4) Not allow exposed copper wire inside the flat cable.								
10	PCB	(1) Not allow screw rust or damage. (2) Not allow missing or wrong putting of component.								

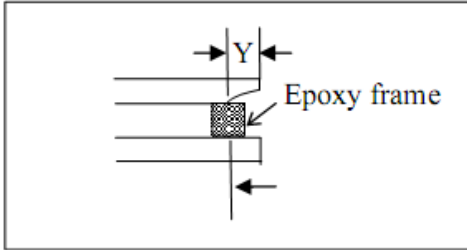
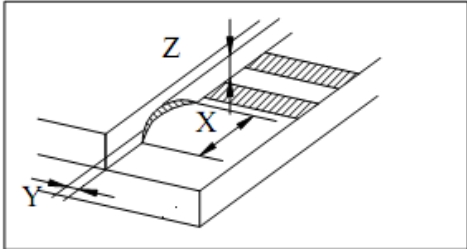
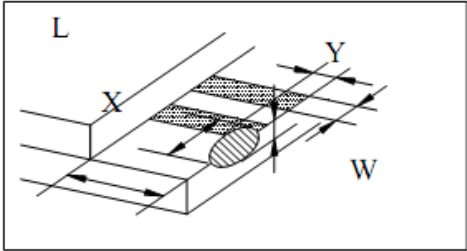


11	LCD	<p>2.1.1 chip on the surface</p>     <table border="1" data-bbox="799 1431 1377 1724"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$>1/8A$</td> <td>$\leq 0.3\text{mm}$</td> <td>$\leq 1/2T$</td> </tr> <tr> <td rowspan="2">$\leq 1/8A$</td> <td>Not enter into epoxy frame</td> <td>$\leq T$</td> </tr> <tr> <td>Not enter into the inner edge of epoxy</td> <td>$\leq 1/2T$</td> </tr> </tbody> </table>	X	Y	Z	$>1/8A$	$\leq 0.3\text{mm}$	$\leq 1/2T$	$\leq 1/8A$	Not enter into epoxy frame	$\leq T$	Not enter into the inner edge of epoxy	$\leq 1/2T$
X	Y	Z											
$>1/8A$	$\leq 0.3\text{mm}$	$\leq 1/2T$											
$\leq 1/8A$	Not enter into epoxy frame	$\leq T$											
	Not enter into the inner edge of epoxy	$\leq 1/2T$											

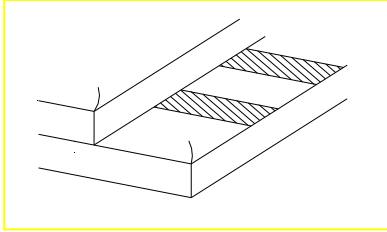
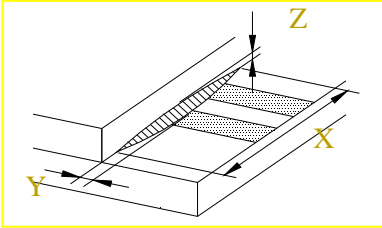


11	LCD	<p>2.1.2 chip on the terminal</p>    <table border="1" data-bbox="730 1137 1393 1384"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$>1/8A$</td> <td>$\leq 0.3\text{mm}$</td> <td>$\leq 1/2T$</td> </tr> <tr> <td>$\leq 1/8A$</td> <td>$\leq 1/2L$</td> <td>$\leq T$</td> </tr> <tr> <td>$\leq 1/8A$ 且 $\leq 1\text{mm}$</td> <td>$\leq L$</td> <td>$\leq T$</td> </tr> <tr> <td>$\leq 1/8A$ 且 $\leq 2\text{mm}$</td> <td>$\leq L$</td> <td>$\leq 1/2T$</td> </tr> </tbody> </table> <p>Note: the distance between crack and contact pad must be greater than the width of 1st contact pad</p> <p>2.1.3 chip out on between side</p> 	X	Y	Z	$>1/8A$	$\leq 0.3\text{mm}$	$\leq 1/2T$	$\leq 1/8A$	$\leq 1/2L$	$\leq T$	$\leq 1/8A$ 且 $\leq 1\text{mm}$	$\leq L$	$\leq T$	$\leq 1/8A$ 且 $\leq 2\text{mm}$	$\leq L$	$\leq 1/2T$
X	Y	Z															
$>1/8A$	$\leq 0.3\text{mm}$	$\leq 1/2T$															
$\leq 1/8A$	$\leq 1/2L$	$\leq T$															
$\leq 1/8A$ 且 $\leq 1\text{mm}$	$\leq L$	$\leq T$															
$\leq 1/8A$ 且 $\leq 2\text{mm}$	$\leq L$	$\leq 1/2T$															



11	LCD	<div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">X</th> <th style="text-align: center;">Y</th> <th style="text-align: center;">Z</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">\leq 1/8A</td> <td style="text-align: center;">Not enter into epoxy frame</td> <td style="text-align: center;">$Z \leq 2T$</td> </tr> <tr> <td></td> <td style="text-align: center;">Not enter into 1/2 epoxy frame</td> <td style="text-align: center;">$Z \leq 1/2T$</td> </tr> </tbody> </table> <p style="text-align: center;">2.1.4 including corner chip and side chip</p> <div style="text-align: center;">  </div> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">X</th> <th style="text-align: center;">Y</th> <th style="text-align: center;">Z</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$>1/8A$</td> <td style="text-align: center;">$\leq 1/6L$</td> <td rowspan="3" style="text-align: center;">$\leq 1/2T$</td> </tr> <tr> <td style="text-align: center;">$\leq 1/8A$</td> <td style="text-align: center;">$\leq 1/3L$</td> </tr> <tr> <td style="text-align: center;">$\leq 1/4W$</td> <td style="text-align: center;">$\leq 2/3L$</td> </tr> </tbody> </table>	X	Y	Z	\leq 1/8A	Not enter into epoxy frame	$Z \leq 2T$		Not enter into 1/2 epoxy frame	$Z \leq 1/2T$	X	Y	Z	$>1/8A$	$\leq 1/6L$	$\leq 1/2T$	$\leq 1/8A$	$\leq 1/3L$	$\leq 1/4W$	$\leq 2/3L$
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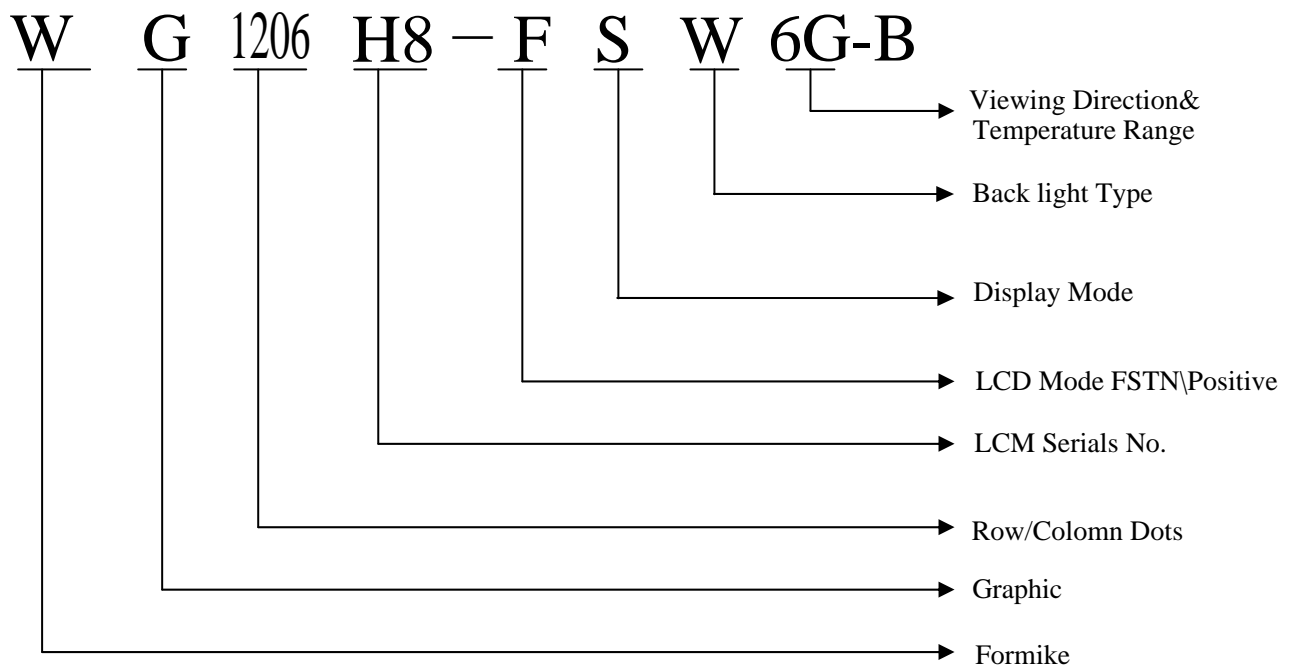
11	LCD	<p>2.2 Chip out</p>  <ol style="list-style-type: none"> 1) Chip out is that crackles extend to inner edge . 2) Crackles round epoxy frame will be rejected. 3) Chip out on the terminal will be rejected: $Z=T$ length $>1\text{mm}$ or $Z<T$ length $>2\text{mm}$ 4) The chip out at ITO will be rejected. 							
		<p>2.3 Poor cutting</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$>1/8A$</td> <td>≤ 0.3</td> <td>$\leq 1/2T$</td> </tr> <tr> <td>$\leq 1/8A$</td> <td>According to drawing</td> <td>$1/2T \leq Z \leq T$</td> </tr> </tbody> </table> <p>Any one out of the specification will be rejected.</p>	X	Y	Z	$>1/8A$	≤ 0.3	$\leq 1/2T$	$\leq 1/8A$
X	Y	Z							
$>1/8A$	≤ 0.3	$\leq 1/2T$							
$\leq 1/8A$	According to drawing	$1/2T \leq Z \leq T$							

9.3. Reliability of LCM

Reliability test condition:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	+80°C	72	No abnormalities in functions and appearance
High temp. Operating	+70°C	72	
Low temp. Storage	-30°C	72	
Low temp. Operating	-20°C	72	
Humidity	60°C/ 90%RH	72	
Temp. Cycle	-20°C ← 25°C → +70°C (1 hour ← 5 min → 1 hour)	10cycles	

10.DESCRIBE TO THE PART NO:



11 GUARANTEE

Our products could meet requirements of the environment. Formike's RoHS is introduced European Union Directive 200295EC (RoHS) Requirements and Update.