飞优特科技（深圳）有限公司

FUTURE S&T(SHEN ZHEN)CO.,LTD

Approval Sheet

Customer ：_____ Part No.：FG12864FD-BLBW

Sample Approved：_____ Sample Quantity：_____

Sample Date：_____

1:Outlook

Items	Description	Result
Outer Dimension	Length、Width、Height、Positioning Hole、I/O Position	☐ OK ☐ NG
LCD Color	LCD Background Color	☐ OK ☐ NG
LED Color	LED Lighting Color	☐ OK ☐ NG
Others	Customer Additional Request	☐ OK ☐ NG
Outlook Description：		

2:Electrical Characteristics

Items	Description	Result
LCD Voltage	LCD Driving Voltage:V_{LCD}	☐ OK ☐ NG
Viewing Angle	LCD Operating Viewing Angle	☐ OK ☐ NG
LCM Current Consumption	LCM current consumption satisfy customer request	☐ OK ☐ NG
LED Current Consumption	LED lighting Current Consumption satisfy customer request	☐ OK ☐ NG
Electrical Characteristics Description：		

Conclusion： ☐ **Can go to M/P according to samples**

☐ **Need to be revised according to above description**

Approved By:		**Verified By:**	

DOCUMENT REVISION HISTORY

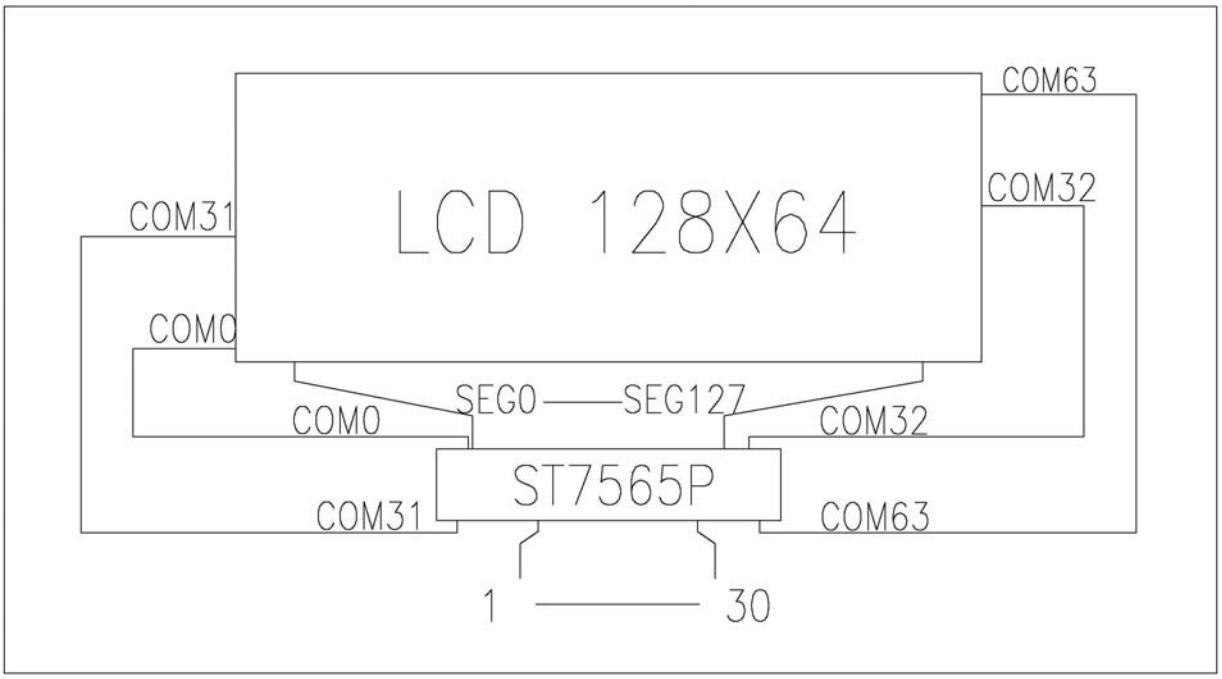
Sample Version	DOC. Version	DATE	DESCRIPTION	CHANGED BY
A0	00	2016-03-17	First Design	DZH

CONTENTS

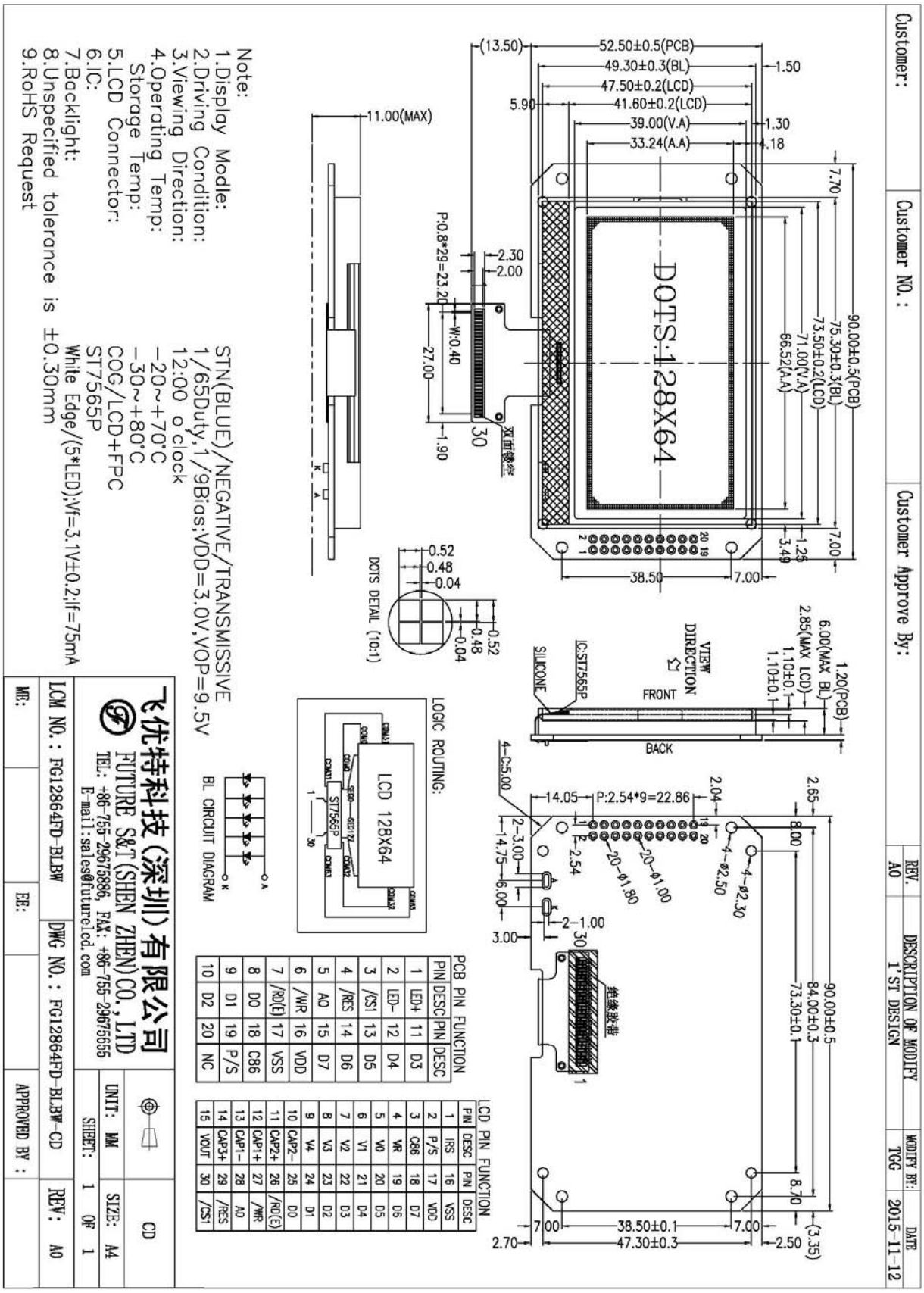
1 FUNCTION & FEATURES

ITEM	Normal dimensions
Display Format	128*64 Dots
Module dimension	90.0(W)*52.5 (H)*11.0(T_Max) mm
Viewing area	71.0(W)*39.00 (H) mm
Duty/bias	1/65Duty,1/9Bias
LCD mode	STN(Blue)/Negative/Transmissive
Viewing direction	12:00 O'clock

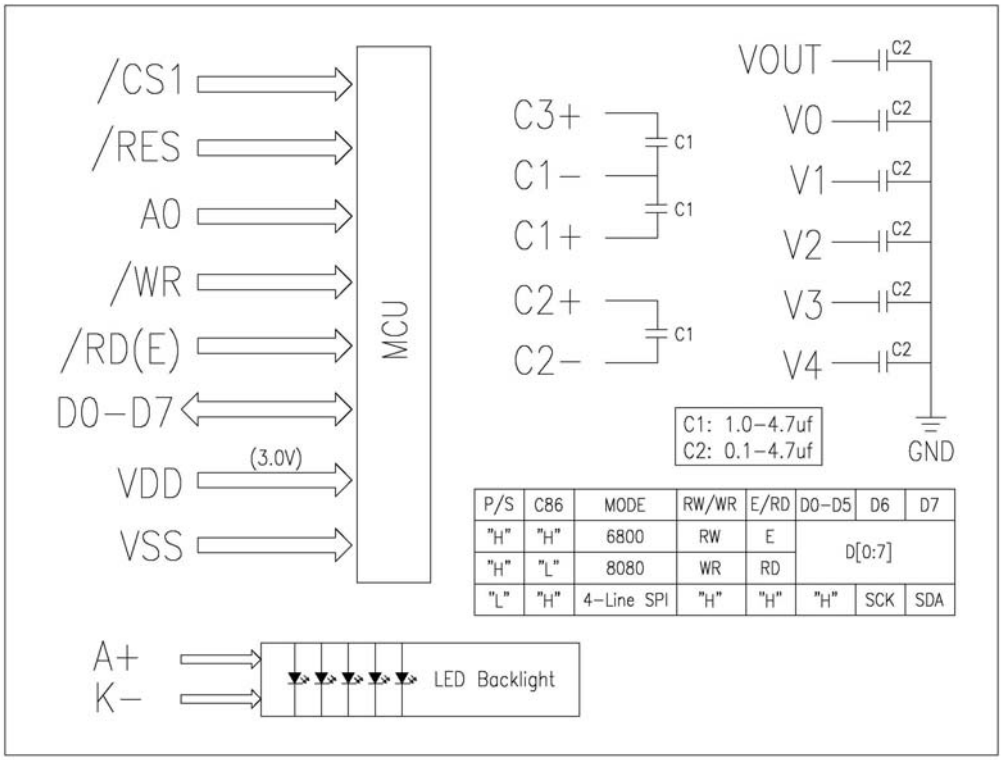
2 BLOCK DIAGRAM



3 DIMENSIONAL CD DRAWING



4 POWER SUPPLY



P/S	C86	MODE	RW/WR	E/RD	D0-D5	D6	D7
"H"	"H"	6800	RW	E	D[0:7]		
"H"	"L"	8080	WR	RD			
"L"	"H"	4-Line SPI	"H"	"H"	"H"	SCK	SDA

5 PIN DESCRIPTION

1	LED+	Power Supply for LED B/L (+)
2	LED-	Power Supply for LED B/L (-)
3	/CS1	Enable chip.
4	/RES	External reset pin.
5	A0	Instruction/Data Register Select.
6	/WR	Data Read/Write
7	/RD(E)	Enable Signal/Read
8-15	D0-D7	Data Bus Line
16	VDD	Power supply(VDD=3.0V).
17	VSS	Power ground(VSS=0V).
18	C86	MPU interface switch terminal.
19	P/S	Parallel/Serial interface selection input.
20	NC	NC

6 MAXIMUM ABSOLUTE LIMIT (T=25℃)

Item	Symbol	Standard value	Unit
supply voltage	V_{DD}	0.3~3.6	V
LCD driving voltage	V_{LCD}	0.3~13.5	V
Operating temperature	Topr	-20~+70	°C
Storage temperature	Tstg	-30~+80	°C

7 ELECTRICAL CHARACTERISTICS

7.1 DC Characteristics(T=25°C，VSS=0V)

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	V_{DD}	2.8	3.3	3.5	V	-
Operating current	I_{CC}	-	1	3	mA	VDD=3.3V
Input voltage	V_{IL}	V_{SS}	-	$0.2V_{DD}$	V	-
	V_{IH}	$0.8V_{DD}$	-	V_{DD}	V	
Output voltage	V_{OL}	V_{SS}	-	$0.2V_{DD}$	V	I_{OL}=+0.5mA
	V_{OH}	0.8VDD	-	VDD	V	I_{OH}=-0.5mA
Input leakage current	I_{LI}	-1.0	-	1.0	uA	VIN=VDD or VSS
Output leakage current	I_{LO}	-3.0	-	3.0	uA	VIN=VDD or VSS
LCD driving voltage	V_{LCD}	9.3	9.5	9.7	V	V0-VSS

Note：VSS=0V.

7.2 Backlight Specifications (Ta=25°C)

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf(DC)	2.9	3.1	3.3	V	If=75mA
Color	White					

7.3 AC Characteristics

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

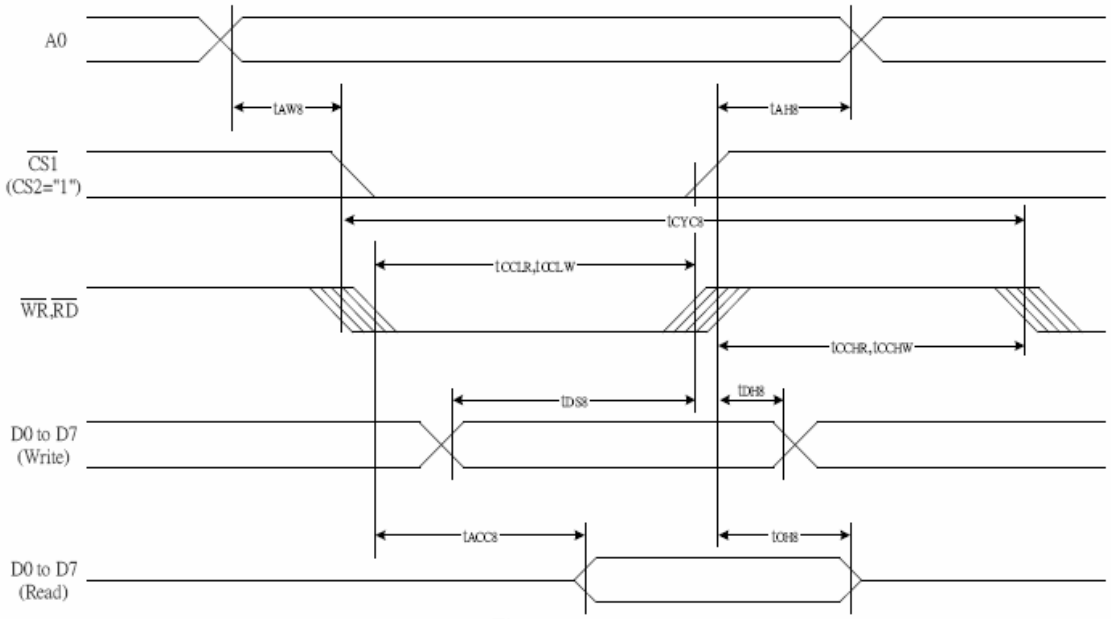


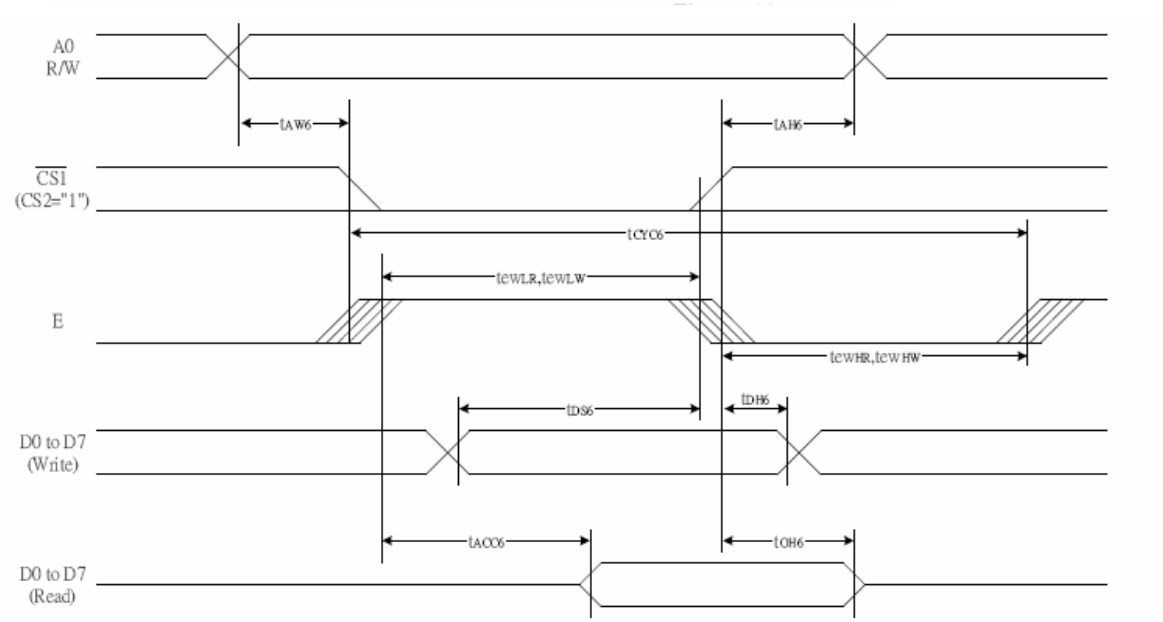
Figure 37

Table 24

(V_{DD} = 3.3V, Ta = –30 to 85℃)

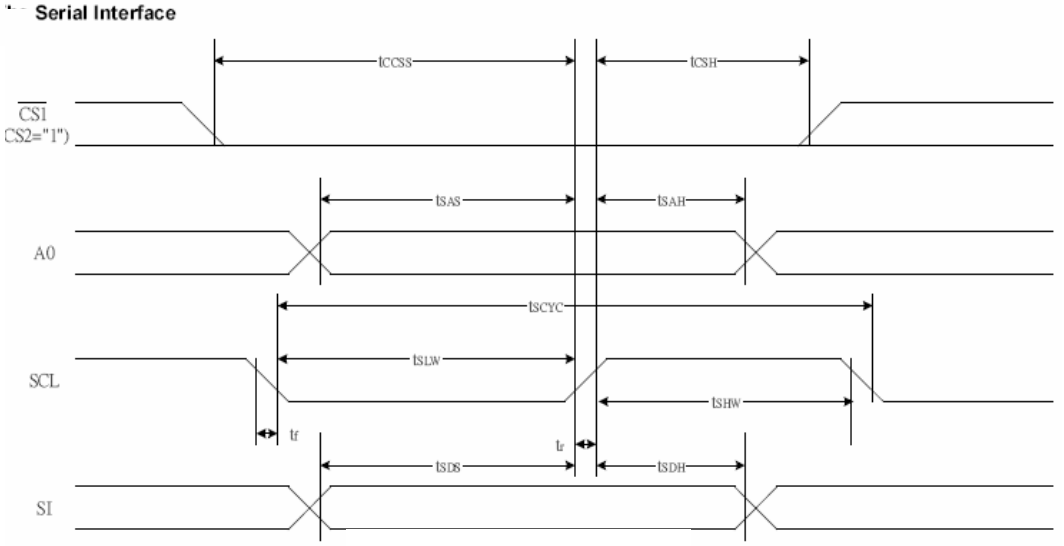
Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t_{AH8}		0	—	Ns
Address setup time		t_{AW8}		0	—	
System cycle time		t_{CYC8}		240	—	
Enable L pulse width (WRITE)	WR	t_{CCLW}		80	—	
Enable H pulse width (WRITE)		t_{CCHW}		80	—	
Enable L pulse width (READ)	RD	t_{CCLR}		140	—	
Enable H pulse width (READ)		t_{CCHR}		80		
WRITE Data setup time	D0 to D7	t_{DS8}		40	—	
WRITE Address hold time		t_{DH8}		0	—	
READ access time		t_{ACC8}	C_L = 100 pF	—	70	
READ Output disable time		t_{OH8}	C_L = 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	tEWLW		80	—	
Enable H pulse width (WRITE)		tEWHW		80	—	
Enable L pulse width (READ)	RD	tEWLR		80	—	
Enable H pulse width (READ)		tEWHR		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	SCL	Tscyc		50	—	ns
SCL "H" pulse width		Tshw		25	—	
SCL "L" pulse width		TSLW		25	—	
Address setup time	A0	TSAS		20	—	
Address hold time		Tsah		10	—	
Data setup time	SI	Tsds		20	—	
Data hold time		TSDH		10	—	
CS-SCL time	CS	Tcss		20	—	
CS-SCL time		Tcsh		40	—	

Reset Timing

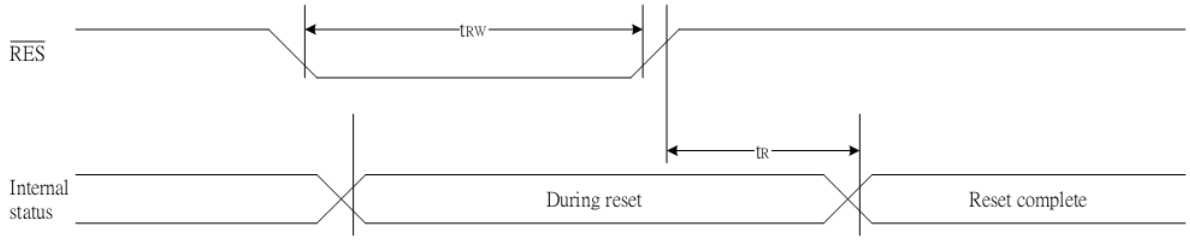


Figure 41

Table 36

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	1.0	us
Reset "L" pulse width	/RES	tRW		1.0	—	—	us

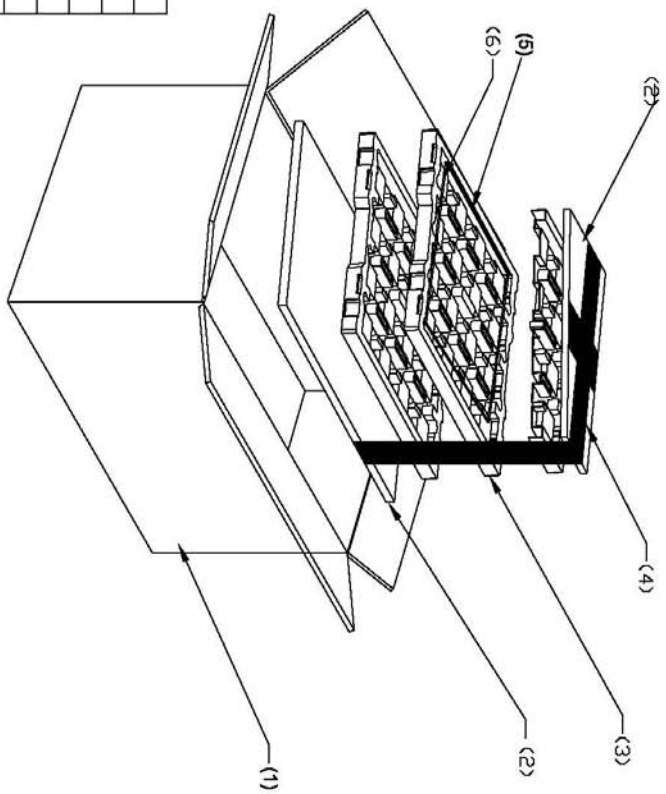
8 INSTRUCTION DESCRIPTION

Table 16: Table of ST7565P Commands (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 Column address set lower bit	0 0	1 1	0 0	0 0	0 0	0 0	1 0	Most significant column address Least significant column address				Sets the most significant 4 bits of the display RAM 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	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	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0 1	*	*	*	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 Electronic volume value	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	0 0	1 0	0 0	1 0	1 0	0 0	0 1 Mode	0: OFF, 1: ON Set the flashing mode
(20) Booster ratio set	0	1	0	1 0	1 0	1 0	1 0	1 0	0 0	0 step-up value	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	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

9 PACKAGE

NO	NAME	UNIT	QTY PER	SPEC	MATERIAL
1	CARTON	PCS	1	390*342*385	PAPER
2	PAPER BOARD	PCS	6	370*335*10	PU
3	G12864FD-PSPK-A0	PCS	21	360*330*18	PET
4	ADHESIVE TAP	M	3	1	PE
5	PEARL PAD	PCS	21	360*310*0.75	EPE(Red)
6	MODULE	PCS	252	90*52.5*8.4	



Specification:

One sub-carton contains 21 layers packings, 12 modules live in each packing. Each bottom and top side a stiff board is added to stiffen the packings and on the top a empty ps is put. then using adhesive tape for enlacing. One sub-carton are placed in the outside carton.

One carton can contain 21*12=252 modules.

Customer: | Customer NO.: | Customer Approve By:

REV.	DESCRIPTION OF MODIFY	MODIFY BY	DATE
A0	1ST.DESIGN	TGG	2015-11-12

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PKG | UNIT: MM | SIZE: A4 | SHEET: 1 OF 1

LCM NO.:FG12864FD-BJBW | DWG NO.: G12864FD-PKG | REV: A0

DRAWN BY : | CHECKED BY : | APPROVED BY :

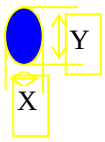
10 QUALITY SPECIFICATIONS

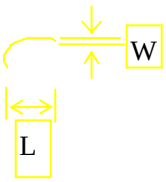
10.1 Defect classification

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	2	1.5
		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	

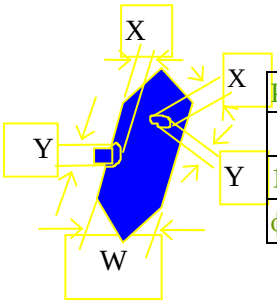
10.2 Note on defect classification

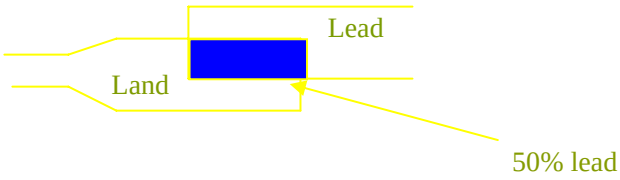
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td rowspan="6">1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td>LC leakage</td></tr>
<tr><td>Flickering</td></tr>
<tr><td>No display</td></tr>
<tr><td>Wrong viewing direction</td></tr>
<tr><td>Wrong Back-light</td></tr>
<tr><td>2</td><td>Contrast defect
Background color deviation</td><td>Refer to approval sample</td></tr>
<tr><td>3</td><td>Point defect,
Black spot, dust
(incl. Polarizer)

ϕ = (X+Y)/2</td><td> 

<table>
<tr><th>Point Size</th><th>Acceptable Qty.</th></tr>
<tr><td>ϕ≤0.10</td><td>Disregard</td></tr>
<tr><td rowspan="2">0.10<ϕ≤0.15</td><td>Positive:3</td></tr>
<tr><td>Negative:2</td></tr>
<tr><td rowspan="2">0.15<ϕ≤0.2</td><td>Positive:2</td></tr>
<tr><td>Negative:1</td></tr>
<tr><td>ϕ>0. 2</td><td>0</td></tr>
</table>
Unit：mm</td></tr>
<tr><td>4</td><td>Line defect</td><td> 

<table>
<tr><th colspan="2">Line</th><th>Acceptable Qty.</th></tr>
<tr><td>L</td><td>W</td><td></td></tr>
<tr><td>---</td><td>0.015≥W</td><td>Disregard</td></tr>
<tr><td>3.0≥L</td><td>0.03≥W</td><td rowspan="2">2</td></tr>
<tr><td>2.0≥L</td><td>0.05≥W</td></tr>
<tr><td>1.0≥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>
</table>
Unit: mm</td></tr>
<tr><td>5</td><td>Rainbow</td><td>Not more than two color changes across the viewing area.</td></tr>
</table>

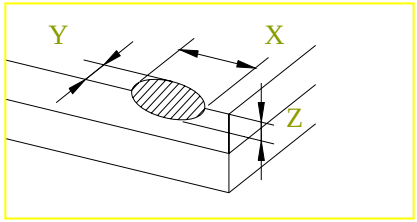
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>6</td><td>Segment
pattern
W = Segment width
ϕ = (X+Y)/2</td><td>(1) Pin hole
ϕ < 0.10mm is acceptable.
 

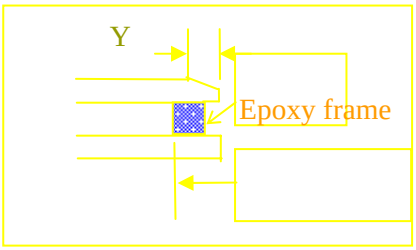
<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>ϕ≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W< ϕ≤1/2W</td><td>1</td></tr>
<tr><td>ϕ>1/2W</td><td>0</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>7</td><td>Back-light</td><td>(1) The color of backlight should correspond its specification.
(2) Not allow flickering</td></tr>
<tr><td>8</td><td>Soldering</td><td>(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.
 
</td></tr>
<tr><td>9</td><td>Wire</td><td>(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.</td></tr>
<tr><td>10</td><td>PCB</td><td>(1) Not allow screw rust or damage.
(2) Not allow missing or wrong putting of component.</td></tr>
</table>

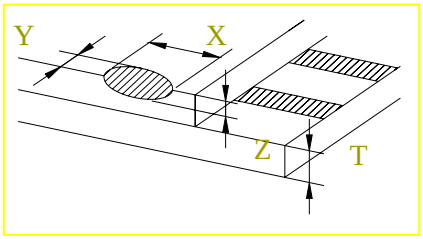
11

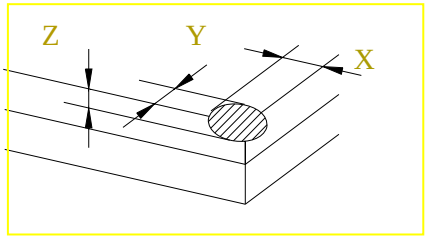
LCD

2.1.1 chip on the surface

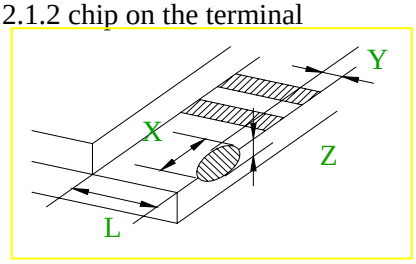
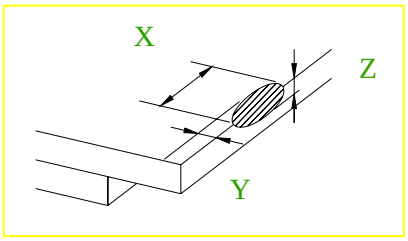
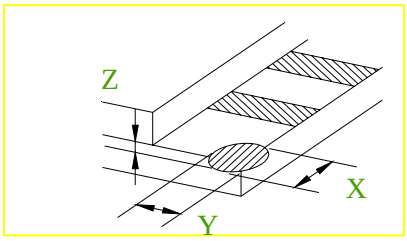








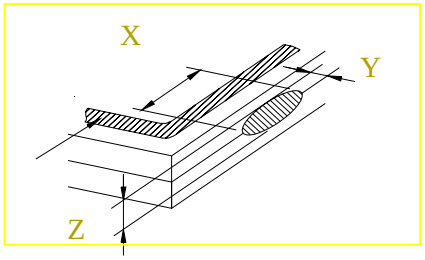
X	Y	Z
>1/8A	≤0.3mm	≤1/2T
≤1/8A	Not enter into epoxy frame	≤T
	Not enter into the inner edge of epoxy	≤1/2T

11	LCD	2.1.2 chip on the terminal   

X	Y	Z
>1/8A	≤0.3mm	≤1/2T
≤1/8A	≤1/2L	≤T
≤1/8A 且≤1mm	≤L	≤T
≤1/8A 且≤2mm	≤L	≤1/2T

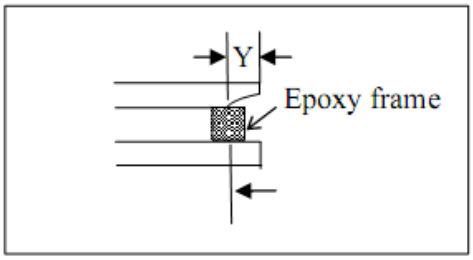
Note: the distance between crack and contact pad must be greater than the width of 1st contact pad

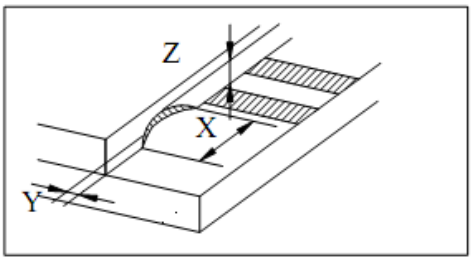
2.1.3chip out on between side



11

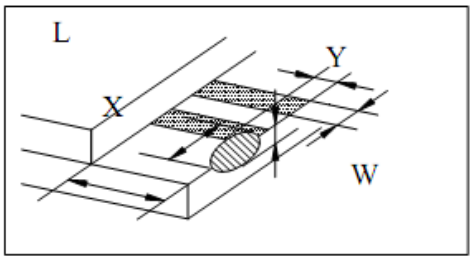
LCD



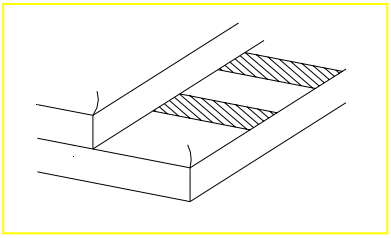
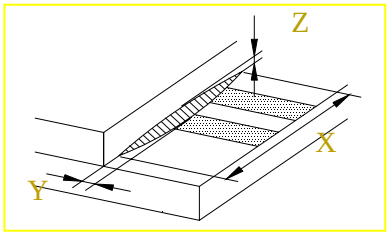


X	Y	Z
≤ 1/8A	Not enter into epoxy frame	Z≤2T
	Not enter into 1/2 epoxy frame	Z≤1/2T

2.1.4 including corner chip and side chip



X	Y	Z
>1/8A	≤1/6L	≤1/2T
≤1/8A	≤1/3L	
≤1/4W	≤2/3L	

<table>
<tr>
<td rowspan="2">11</td>
<td rowspan="2">LCD</td>
<td>2.2 Chip out
 
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 >1mm
or Z<T length >2mm
4) The chip out at ITO will be rejected.</td>
</tr>
<tr>
<td>2.3 Poor cutting
 

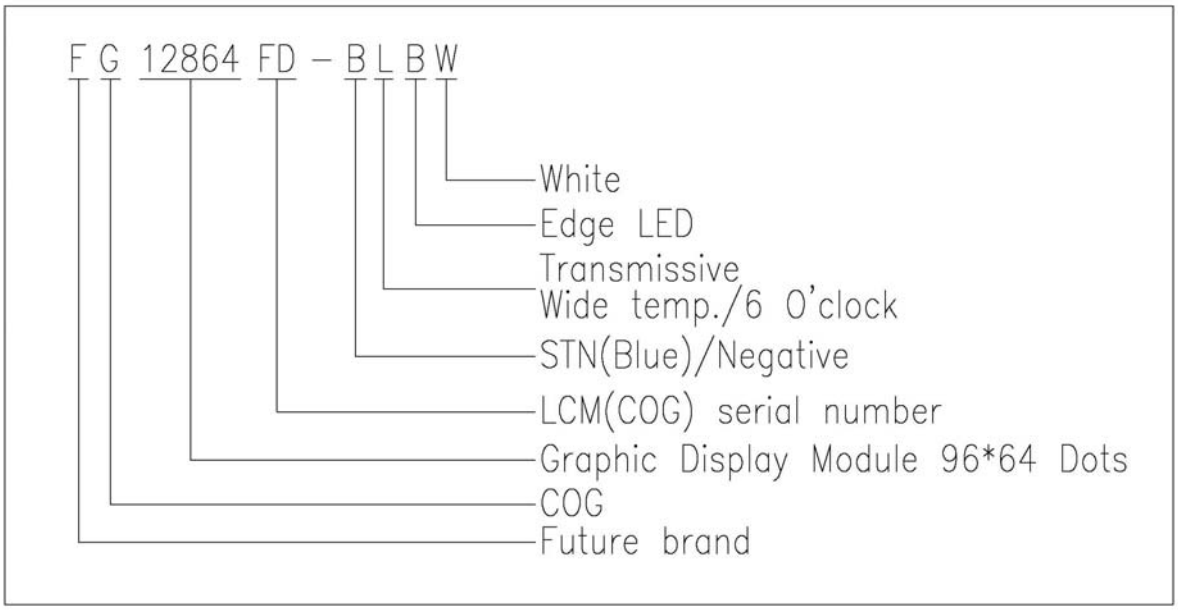
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>>1/8A</td><td>≤0.3</td><td>≤1/2T</td></tr>
<tr><td>≤ 1/8A</td><td>According to drawing</td><td>1/2T≤Z≤T</td></tr>
</table>
Any one out of the specification will be rejected.</td>
</tr>
</table>

10.3 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	40°C/ 90%RH	72	
Temp. Cycle	-10°C ← 25°C →+60°C (1 hour ← 5 min → 1 hour)	10cycles	

11 DESCRIBE TO THE PART NO:



12 GUARTANTEE

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