LIQUID CRYSTAL DISPLAY MODULE

Product Specification

PRODUCT NUMBER	CG5418BB128G64WF

INTERNAL APPROVALS		
Product Manager	Engineering	Document Control

TABLE OF CONTENTS

Product No.	CG5418BB128G64WF	REV. B		Page	2 / 19

REVISION RECORD

Rev.	Date	Page	Par.	Comment	ECN no.
A	01/02/08	--	--	Initial DCA Release	E3616
B	07/17/08	4	1	Added IC Controller to "MAIN FEATURES".	E3794
		4	1	Added notes to "Characteristics of B/L".	
		5	2	Added Notes to drawing.	

Product No.	CG5418BB128G64WF	REV. B		Page	3 / 19

1 MAIN FEATURES

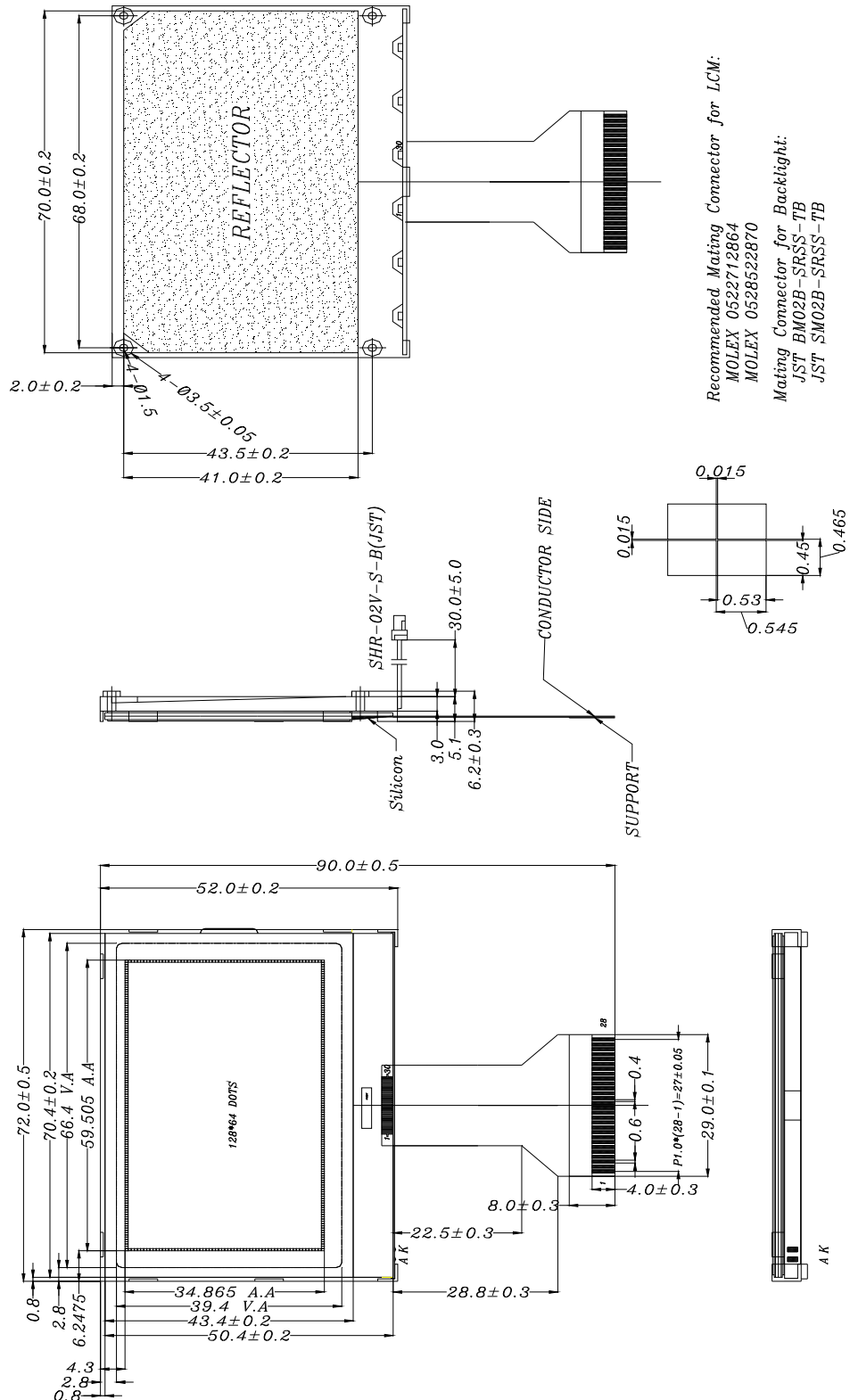| ITEM	CONTENTS	UNIT
Outline Dimension	72.0 ± 0.5 (W) x 52.0 ± 0.2 (H) x 5.1 (D)	mm
Display Format	128 x 64	Dots
Viewing Area	66.4 (W) x 39.4 (H)	mm
Dot Size	0.45 x 0.53	mm
LCD Type	FSTN / Positive type display	-
Backlight	LED / Blue	-
View Angle	6:00	O'clock
Duty Ratio	1/64	Duty
Bias	1/9	Bias
Module Operating Voltage	3.3	V
LCD Operating Voltage	9.7	V
IC Controller	SPLC501C	-
Operating Temperature	-20 ~ 70	°C
Storage Temperature	-30 ~ 85	°C
RoHS Complaint	Yes	-

CHARACTERISTICS OF BACKLIGHT (LED UNIT):

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Input Voltage	V_{IN}	2.85	3.2	3.5	V	IF=90mA
Forward Current	I_F	-	90	120	mA	-
Luminous	L_V	-	60	-	cd/m²	IF=90mA
Color	Blue					

Note 1: LED Lifetime (Half brightness) is estimated to be 30,000 hrs. At 15mA/LED (25°C).
Note 2: Please refer to the PWM white paper at http://www.densitron.com/displays/lcd_support.aspx
for background on extending LED backlight lifetimes.

Product No.	CG5418BB128G64WF	REV. B		Page	4 / 19

2   MECHANICAL DRAWING

REFLECTOR

70.0±0.2
68.0±0.2
2.0±0.2
4-Φ1.5
4-Φ3.5±0.05
43.5±0.2
41.0±0.2
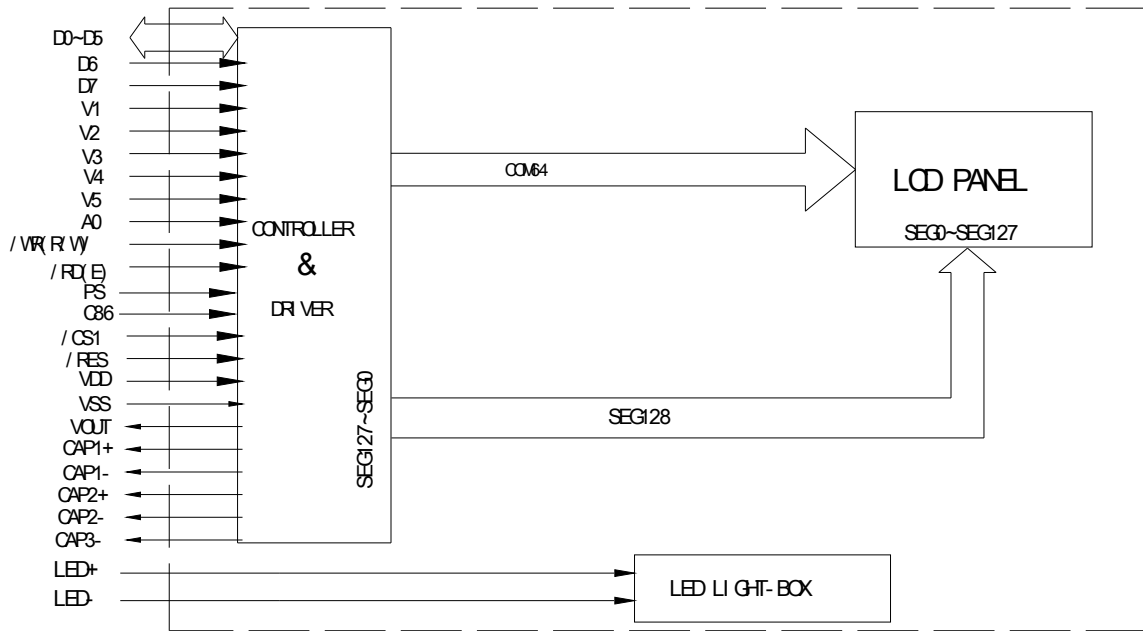
Recommended Mating Connector for LCM:
MOLEX 0522712864
MOLEX 0528522870

Mating Connector for Backlight:
JST BM02B-SRSS-TB
JST SM02B-SRSS-TB

SHR-02V-S-B(JST)
30.0±5.0
CONDUCTOR SIDE
Silicon
3.0
5.1
6.2±0.3
SUPPORT

0.015
0.015
0.465
0.45
0.53
0.545

90.0±0.5
52.0±0.2
72.0±0.5
70.4±0.2   V.A
66.4   V.A
59.505   A.A
128*64 DOTS
28
0.4
0.6
P1.0*(28-1)=27±0.05
29.0±0.1
8.0±0.3
22.5±0.3
4.0±0.3
28.8±0.3
0.8
2.8
6.2475
34.865   A.A
39.4   V.A
43.4±0.2
50.4±0.2
4.3
2.8
0.8
A K

Product No.	CG5418BB128G64WF	REV. B		Page	5 / 19

2.1 WIRING DIAGRAM

2.2 RECOMMENDED POWER SUPPLY

$C_1 = 1.0 \sim 4.7 \ \mu F$
$C_2 = 0.1 \sim 2.2 \ \mu F$

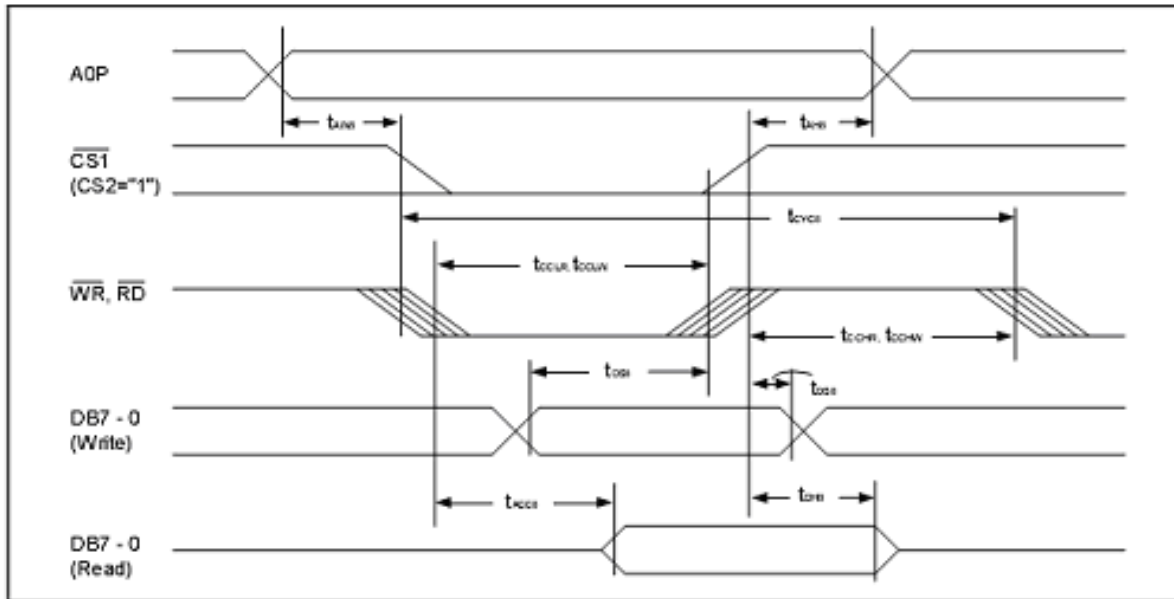| Product No.	CG5418BB128G64WF	REV. B		Page	6 / 19
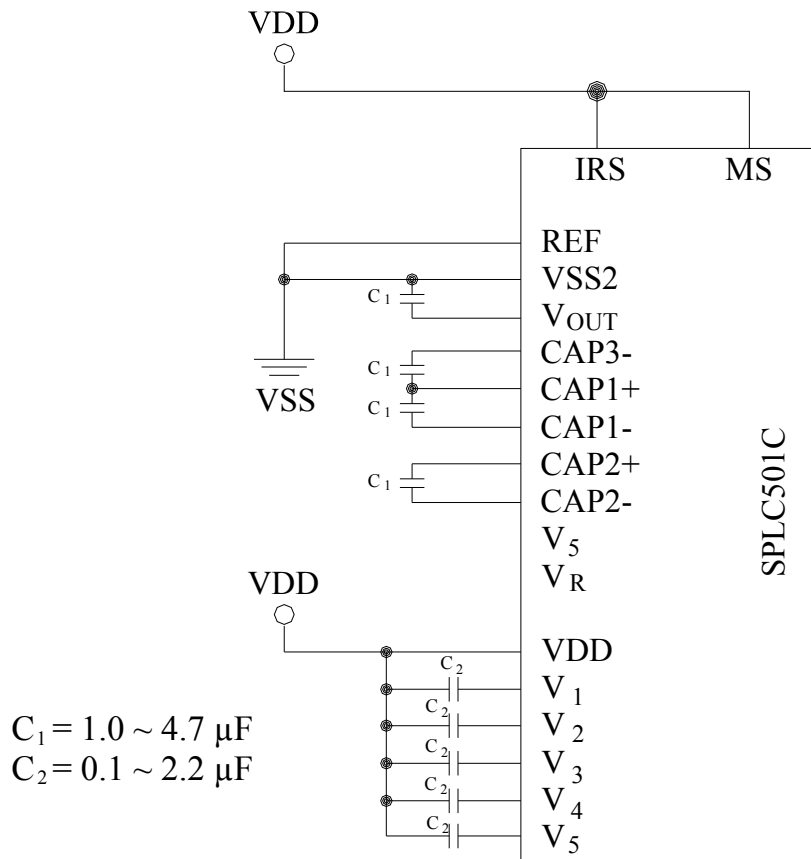
3   PIN CONNECTIONS

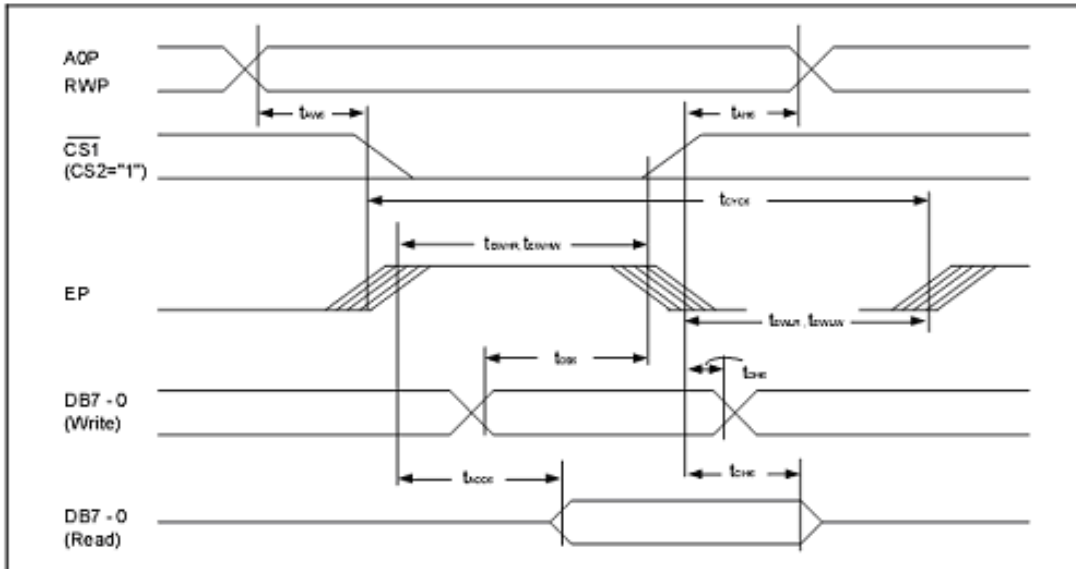| Pin No.	Symbol	Level	Function
1	P/S	INPUT	This is the parallel data input/ serial data input switch terminal
2	C86	INPUT	This is the MPU interface switch terminal
3-7	V5-V1	INPUT	This is a multi-level power supply for the liquid crystal drive $VDD \geq V1 \geq V2 \geq V3 \geq V4 \geq V5$
8	CAP2+	OUTPUT	DC/DC voltage converter capacitor 2 positive connection
9	CAP2-	OUTPUT	DC/DC voltage converter capacitor 2 negative connection
10	CAP1-	OUTPUT	DC/DC voltage converter capacitor 1 negative connection
11	CAP1+	OUTPUT	DC/DC voltage converter capacitor 1 positive connection
12	CAP3-	OUTPUT	DC/DC voltage converter capacitor 3 negative connection
13	VOUT	OUTPUT	DC/DC converter output
14	VSS	0V (GND)	Ground
15	VDD	3.3V	Power supply for logic
16-23	D7-D0	H/L	Data bit
24	/RD(E)	H/L	Signal to select read and write
25	/WR(R/W)	H/L	Signal to select read and write
26	A0	H/L	Control / data select signal
27	/RES	H, H-L	Reset signal
28	/CS1	H/L	Chip select signal

4 TIMING CHARACTERISTICS

System bus read/write characteristics 1 (For the 8080 Series MPU)

(VDD = 2.7V to 4.5V, T_A = 25℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0P	t_{AH8}		0	-	ns
Address setup time		t_{AW8}		0	-	ns
System cycle time	A0P	t_{CYC8}		300	-	ns
Control L pulse width ($\overline{WR}$)	$\overline{WR}$	t_{CCLW}		60	-	ns
Control L pulse width ($\overline{RD}$)	$\overline{RD}$	t_{CCLR}		120	-	ns
Control H pulse width ($\overline{WR}$)	$\overline{WR}$	t_{CCHW}		60	-	ns
Control H pulse width ($\overline{RD}$)	$\overline{RD}$	t_{CCHR}		60	-	ns
Data setup time	DB7 - 0	t_{DS8}		40	-	ns
Address hold time		t_{DH8}		15	-	ns
$\overline{RD}$ access time		t_{ACC8}	C_L = 100pF	-	140	ns
Output disable time		t_{OH8}		10	100	ns

Product No.	CG5418BB128G64WF	REV. B		Page	8 / 19

FORM No. DT-029 V2

System bus read/write characteristics 2 (6800 series MPU)

(VDD = 2.7V to 4.5V, $T_A = 25\,^\circ\text{C}$)

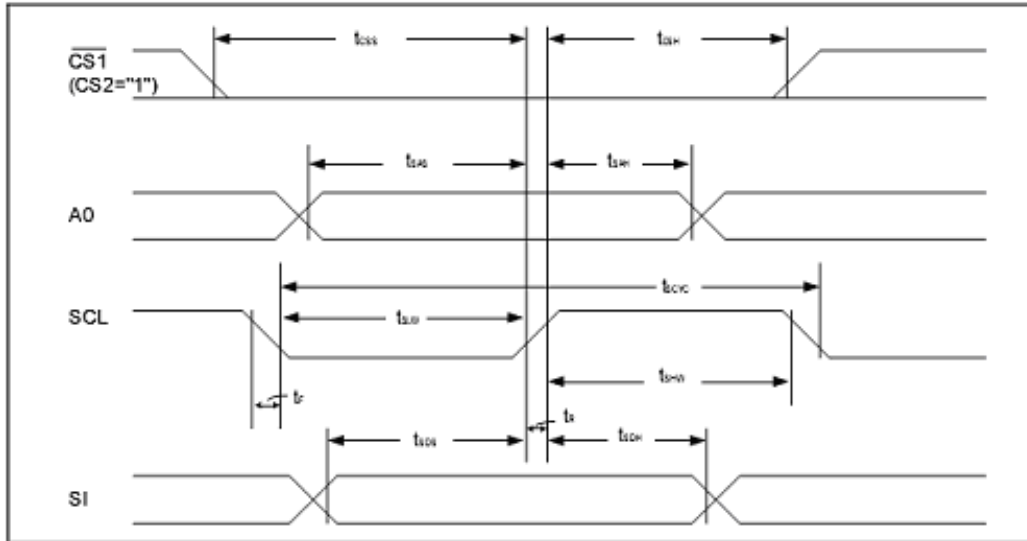| Item		Signal	Symbol	Condition	Rating		Units
					Min.	Max.	
Address hold time		A0P	t_{AH6}		0	-	ns
Address setup time			t_{AW6}		0	-	ns
System cycle time		A0P	t_{CYC6}		300	-	ns
Data setup time		DB7 - 0	t_{DS6}	C_L = 100pF	40	-	ns
Data hold time			t_{DH6}		15	-	ns
Access time			t_{ACC6}		-	140	ns
Output disable time			t_{OH6}		10	100	ns
Enable H pulse time	Read	EP	t_{EWHR}		120	-	ns
	Write		t_{EWHW}		60	-	ns
Enable L pulse time	Read	EP	t_{EWLR}		60	-	ns
	Write		t_{EWLW}		60	-	ns

Product No.	CG5418BB128G64WF	REV. B		Page	9 / 19

FORM No. DT-029 V2

The serial interface

(VDD = 2.7V to 4.5V, T$_A$ = 25℃)
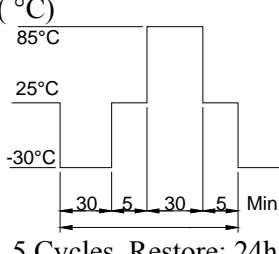
Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	250	-	ns
SCL 'H' pulse width		tSHW	-	100	-	ns
SCL 'L' pulse width		tSLW	-	100	-	ns
Address setup time	A0P	tSAS	-	150	-	ns
Address hold time		tSAH	-	150	-	ns
Data setup time	SI	tSDS	-	100	-	ns
Data hold time		tSDH	-	100	-	ns
CS-SCL time	CS	tCSS	-	150	-	ns
		tCSH	-	150	-	ns

Product No.	CG5418BB128G64WF	REV. B		Page	10 / 19

5 ELECTRO-OPTICAL CHARACTERISTICS

(Temp. = 23 ± 3 °C, Hum. = $70 \pm 5\%$ RH) Vdd=5.0V

| Item		Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage (Logic)		$V_{DD} - V_{SS}$	-	3.0	3.3	3.6	V
LCD Operating Voltage		$V_{DD} - V_O$	-20°C	-	10.1	-	V
			25°C	-	9.7	-	V
			70°C	-	9.3	-	V
Response Time		Ton	-	-	60	-	ms
		Toff	-	-	316	-	ms
Contrast		CR	-	3	-	-	-
Viewing Angle	12H	Θ1	CR ≥ 3.0	-	45	-	Deg.
	6H	Θ2		-	55	-	
	3H	Θ3		-	50	-	
	9H	Θ4		-	50	-	
LCD Threshold Voltage		Vth	25°C	-	7.78	-	V

6 RELIABILITY TEST

No.	Items	Test Condition	Equipment	Test Result
1	High Temp. Storage	Temp.: 85 ± 2°C, Time: 96h Restore: 24h	Tenny	Passed
2	Low Temp. Storage	Temp.: -30 ± 3°C, Time: 96h Restore: 24h	Tenny	Passed
3	High Temp. Operating	Temp.: 70 ± 2°C, Time: 24h Restore: 24h, Vop: 5V	Tenny	Passed
4	Low Temp. Operating	Temp.: -20 ± 2°C, Time: 24h Restore: 24h, Vop: 5V	Tenny	Passed
5	High Temp. / High Humidity Storage	Temp.: 40 ± 2°C, Hum: 95 % RH Time: 96h, Restore: 24h	Tenny	Passed
6	Thermal Shock	Temp.: (°C) 85°C 25°C -30°C 30 5 30 5 Min 5 Cycles, Restore: 24h	Tenny	Passed

7 THE LCD MEASURING METHOD AND EQUIPMENT

1. Threshold Voltage and Response Time Measuring
    (1) Equipment

Oscilloscope

Waveform Generator
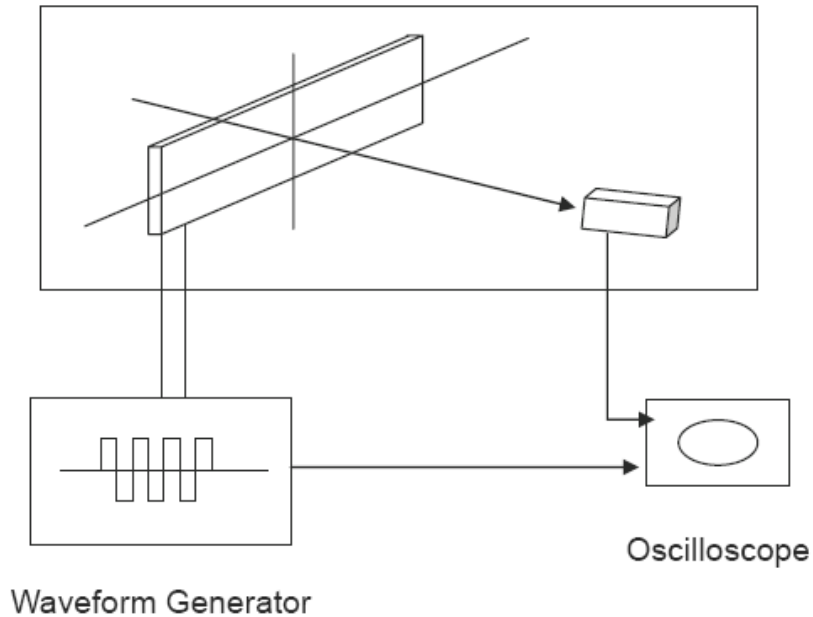
    (2) Definition
    A. Threshold Voltage (Vth)

Product No.	CG5418BB128G64WF	REV. B		Page	12 / 19
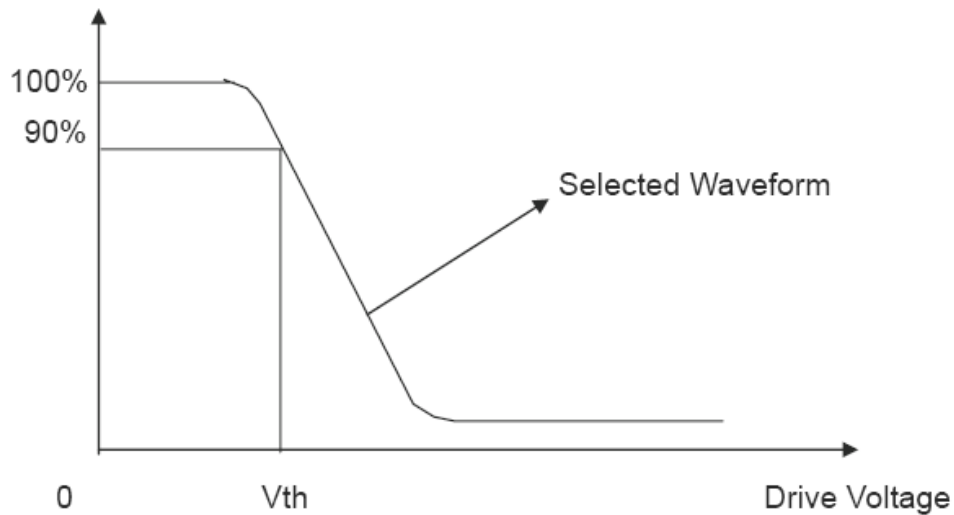
B. Response Time
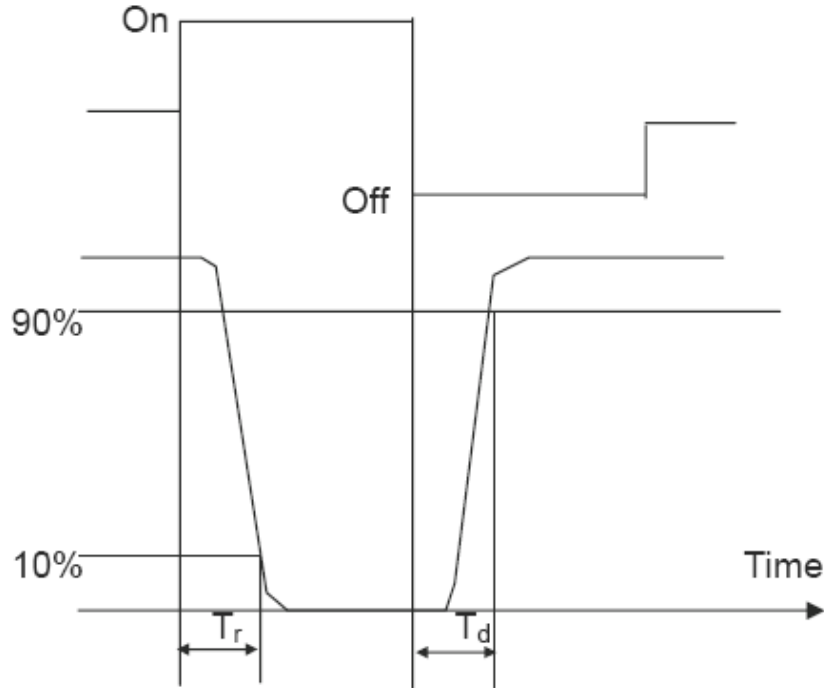
2. Contrast Measuring
(1) Equipment
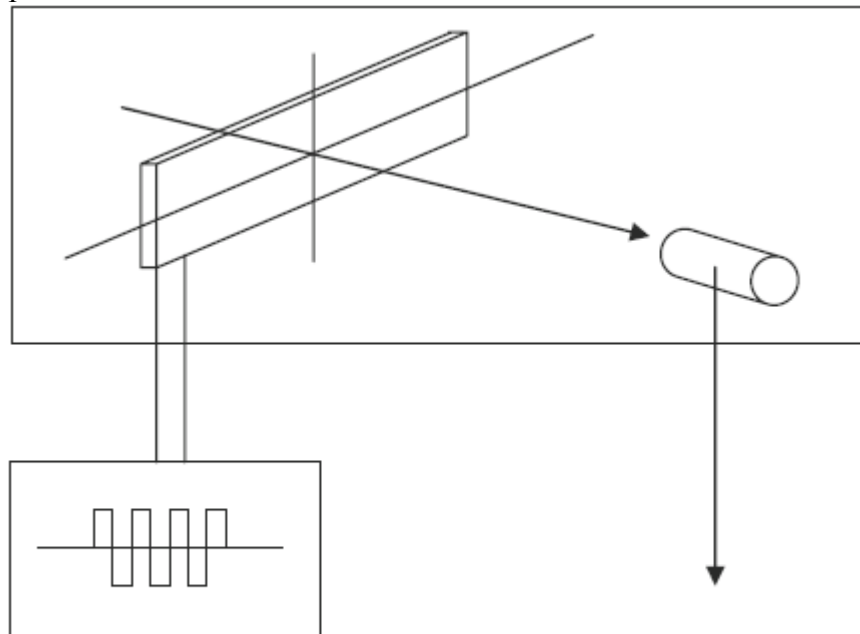
Spectrophotometer

Waveform Generator

Product No.	CG5418BB128G64WF	REV. B		Page	13 / 19

(2) Definition:

A. Viewing Angle:

B. Contrast Ratio (Positive)

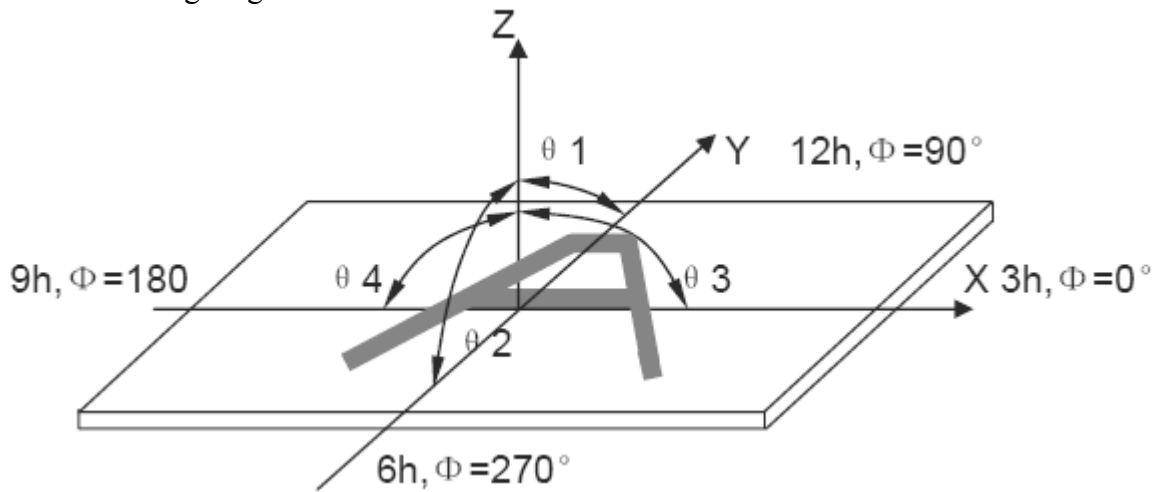$$CR= \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

FORM No. DT-029 V2

8 INSTRUCTIONS SETS

Command	Command Code											Function
	A0P	$\overline{RD}$	$\overline{WR}$	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
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				Set 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 driver voltage bias ratio SPLC501C..........0:1/9, 1:1/7
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_5 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	0	1	0	1	0	0	0	0	0	0	1	Set the V_5 output voltage electronic volume register
Electronic volume register set	0	1	0	*	*	Electronic volume value						

Product No.	LMR5428EB240G64SF	REV. B		Page	15 / 19

Command	A0P	$\overline{RD}$	$\overline{WR}$	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
19). Static indicator ON/OFF				1	0	1	0	1	1	0	0	0: OFF, 1: ON
											1	
Static indicator Register set				*	*	*	*	*	*	Mode		Set the flashing mode
20). Page Blink	0	1	0	1	1	0	1	0	1	0	1	
Page selection	0	1	0	P7	P6	P5	P4	P3	P2	P1	P0	P7 - 0: 1 - blinking page
												0 - no blinking, normal display
21). Driving Mode Set	0	1	0	1	1	0	1	0	0	1	0	Set the driving mode register
Mode selection	0	1	0	D1	D0	0	0	0	0	0	0	Driving capability (D1, D0): (1,1)>(0,0)>(0,1)>(1,0)
22). Power saver												Display OFF and display all points ON compound command
23). NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
24). Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use
				1	1	0	1	0	1	0	0	this command

Product No.	CG5418BB128G64WF	REV. B	Page	16 / 19

9 STANDARD SPECIFICATIONS FOR PRODUCT QUALITY

1. Manner of Test:

    1.1. The test must be under 40w fluorescent light, and the distance of view must be at 30 cm.

    1.2. The test direction is based on around 15°- 45° of vertical line.

2. Definition of Defects
    2.1 Major Defects

        A: Non-Display

        B: Segment Missing

        C: Over Current

        D: Segment Short

        E: Sealant Disharden

        F: Wrong Polarizer Direction

    2.2 Minor Defects: The Others.

3. Major defects should be in AQL 0.25, and the minor in AQL 1.00.

FORM No. DT-029 V2

4. Inspection Item and Standards

Item	The standard of quality inspection	Checking Manner	Quality Ratio
1. Frame	Smooth and even surface, no crack, no scratch, no rust, and not be wrenched out of shape. The range between convex and concave is: d ≤ 0.35 mm and the frame must be connected to the ground.	Check With Eyes And Using Vernier Caliper, Multimeter	100%
2. LCD	1. The major defects would be rejected. 2. No scratch and no dusty on the LCD glass surface. 3. D ≤ 0.15 mm n≤2 diameter of bubble: d≤0.5 n≤2 damaged size of polarizer: d ≤ 0.15 mm, n≤2. 4. No scratch and dusty between the LCD and led.	Check It When Displaying	100%
3. The Relative Position of LCD and Frame	1. The LCD should not be twisted. 2. The LCD graphic should be in the middle position of the frame.	Check With Eyes	100%
4. The Relative Position of PCB Panel and Frame	1. The frame installing direction must be correct. 2. The twisted angle of the pin is from 45° to 60°. 3. The pin is vertical to PCB panel and it should be in the middle position of the installing holes.	Check With Eyes	100%
5. LED	1. The led would be blue. 2. The led would be uniform.	Check With Eyes	100%
6. Function Test	1. The major defects must be reject. 2. Test flow chart (see attached chart) 3. Background changes evenly and no disorderly displaying phenomenon. 4. Display no shortage.	Check It When Displaying	100%

Note: D ~ Diameter   N ~ Quantity   Unit: mm

Product No.	CG5418BB128G64WF	REV. B		Page	18 / 19

FORM No. DT-029 V2

10 HANDLING PRECAUTIONS

Safety
If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes.
If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design
Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.
When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean. Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning
Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotriflorothane. Do not wipe the display surface with dry or hard materials that will damage the polariser surface. Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge
As the display uses C-MOS LSI drivers, connect any unused input terminal to VDD or VSS. Do not input any signals before power is turned on. Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging
Displays use LCD elements, and must be treated as such. Avoid strong shock and drop from a height.
To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation
It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life. Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation. Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged. If the display area is pushed on hard during operation, some graphics will be abnormally displayed but returns to a normal condition after turning off the display once. Even a small amount of condensation on the contact pads (terminals) can cause an electro-chemical reaction which causes missing rows and columns. Give careful attention to avoid condensation.

Storage
Store the display in a dark place where the temperature is 25°C ± 10°C and the humidity below 50%RH.
Store the display in a clean environment, free from dust, organic solvents and corrosive gases.
Do not crash, shake or jolt the display (including accessories).

Product No.	CG5418BB128G64WF	REV. B		Page	19 / 19

FORM No. DT-029 V2