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RoHS

PART NO. : GCB0802C V1.0
-SFYLYHTC06

FOR MESSRS. : _____

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ACCEPTED BY: _____

PROPOSED BY: _____

RECORD OF REVISION

DATE	PAGE	SUMMARY

3. General specifications

3.1 General specifications

PLEASE REFER TO:

“CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-10000)”.

3.2 Quality Assurance and Warranty

PLEASE REFER TO:

“QUALITY ASSURANCE MANUL (MS-10-10001)”.

3.3 This individual specification is prior to general specifications

4. Mechanical data

- Display format: 8 characters x 2 lines
- Microprocessor interface: 8 bits Par all
- LCD type: STN positive Yellow-Green
- Backlight color: Yellow-Green
- Viewing angle: 6 o'clock
- LCD controller: S6A0069 OR equivalent
- Module size: 58x 32 x 12.6 mm
- View area: 37.8x16 mm
- Dot size: 0.56x 0.66 mm
- Dot pitch: 0.7 x 0.6mm
- Driving method: 1/16 duty, 1/5 bias

5. Absolute maximum ratings

5.1 Electrical absolute maximum ratings

<i>I T E M</i>	<i>SYMBOL</i>	<i>MIN.</i>	<i>MAX.</i>	<i>UNIT</i>	<i>COMMENT</i>
POWER SUPPLY FOR LOGIC	V _{DD} -V _{SS}	-0.3	6	V	-----
INPUT VOLTAGE	V _I	V _{SS}	V _{DD}	V	-----
STATIC ELECTRICITY	-----	-----	-----	V	
POWER SUPPLY FOR BACKLIGHT	V _S	0	4.3	V _{im's}	-----
	f _{FL}	-----	-----	KHz	-----
STARTING VOLTAGE FOR BACKLIGHT	-----	-----	-----	V _{rms}	Ta = 25°C
	-----	-----	-----	V _{rms}	Ta = 25°C
POWER SUPPLY FOR LCD	V _{DD} -V ₀	-----	6	V	-----

5.2 Environmental absolute maximum ratings

<i>I T E M</i>	<i>OPERATING</i>		<i>STORAGE</i>		<i>COMMENT</i>
	<i>MIN.</i>	<i>MAX.</i>	<i>MIN.</i>	<i>MAX.</i>	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	-----
HUMIDITY	NOTE (2)		NOTE (2)		NO CONDENSATION
VIBRATION NOTE (3)	-----	0.5G	-----	2G	10~300Hz XYZ DIRECTIONS 1 Hr EACH
SHOCK NOTE (3)	-----	3G	-----	5G	10 msec XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		-----

NOTE (2): Ta ≤ 70°C: 75% RH MAX.

Ta > 70°C: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF
75% RH AT 70°C.

NOTE (3): 1G = 9.8 m/s²

6. Electrical characteristics

Ta = 25°C VDD = 5.0 V

<i>I T E M</i>	<i>SYMBOL</i>	<i>CONDITION</i>	<i>MIN.</i>	<i>TYP.</i>	<i>MAX.</i>	<i>UNIT</i>
Power supply voltage for circuit	VDD-VSS	-----	4.75	5.0	5.25	V
Power supply voltage for LCD drive	VDD-V0	-----	-----	4.7	-----	V
LCD display duty ratio	DUTY	-----	-----	1/16	-----	-----
LED BACKLIGHT	Ifp	I mse0 plus 10% Dutg cyele				mA
		Operating voltage	-----	4.1	4.2	V
		Forward current		60	70	mA
LED Lifetime	-----	VFL= 4.1Vrms fFL= KHz	-----	100,000	-----	Hr
Power supply LCD current	IEE	VDD-V0= 4.7 V	-----	----	-----	mA

LED backlight: Due to the LED backlight working current is XXX Max, and LED chips Vop may be different, Gemini will adjust the backlight resistor according to the LED chips Vop, to meet the brightness maximum.

7. Optical characteristics

Ta = 25°C

VDD-V0 = 4.7V

<i>I T E M</i>	<i>SYMBOL</i>	<i>CONDITION</i>	<i>MIN.</i>	<i>TYP.</i>	<i>MAX.</i>	<i>UNIT</i>	<i>NOTE</i>
Viewing angle	Φ2-Φ1	K ≥ 2.0	-35	-----	20	deg.	1
Contrast ratio	K	Φ = 10° θ = 0°	4.0	-----	-----	-----	1
Response time (at 25°C)	tr (rise)	Φ = 10° θ = 0°	-----	-----	250	ms	1
	tf (fall)	Φ = 10° θ = 0°	-----	-----	250	ms	1
The brightness of backlighting source	B	VFL=4.1Vrms fFL= KHz	-----	200	-----	cd/m²	2

NOTE (1): SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR DEFINITION OF OPTICAL CHARACTERISTICS

NOTE (2): UNDER NORMAL TEMPERATURE AND HUMIDITY IN A DARK ROOM

8. Outline dimension

Customer: Product Model: Customer Approve By: REV. DESCRIPTION OF MODIFY DATE

Top View Dimensions:

- Overall width: 58 ± 0.5
- Overall height: 29 ± 0.3
- Pin pitch (P2): 2.54×6
- Pin 1 location: 15.24
- Pin 2 location: 15.24
- Pin 3 location: 15.24
- Pin 4 location: 15.24
- Pin 5 location: 15.24
- Pin 6 location: 15.24
- Pin 7 location: 15.24
- Pin 8 location: 15.24
- Pin 9 location: 15.24
- Pin 10 location: 15.24
- Pin 11 location: 15.24
- Pin 12 location: 15.24
- Pin 13 location: 15.24
- Pin 14 location: 15.24
- Pin 15 location: 15.24
- Pin 16 location: 15.24
- Pin 17 location: 15.24
- Pin 18 location: 15.24
- Pin 19 location: 15.24
- Pin 20 location: 15.24
- Pin 21 location: 15.24
- Pin 22 location: 15.24
- Pin 23 location: 15.24
- Pin 24 location: 15.24
- Pin 25 location: 15.24
- Pin 26 location: 15.24
- Pin 27 location: 15.24
- Pin 28 location: 15.24
- Pin 29 location: 15.24
- Pin 30 location: 15.24
- Pin 31 location: 15.24
- Pin 32 location: 15.24
- Pin 33 location: 15.24
- Pin 34 location: 15.24
- Pin 35 location: 15.24
- Pin 36 location: 15.24
- Pin 37 location: 15.24
- Pin 38 location: 15.24
- Pin 39 location: 15.24
- Pin 40 location: 15.24
- Pin 41 location: 15.24
- Pin 42 location: 15.24
- Pin 43 location: 15.24
- Pin 44 location: 15.24
- Pin 45 location: 15.24
- Pin 46 location: 15.24
- Pin 47 location: 15.24
- Pin 48 location: 15.24
- Pin 49 location: 15.24
- Pin 50 location: 15.24
- Pin 51 location: 15.24
- Pin 52 location: 15.24
- Pin 53 location: 15.24
- Pin 54 location: 15.24
- Pin 55 location: 15.24
- Pin 56 location: 15.24
- Pin 57 location: 15.24
- Pin 58 location: 15.24
- Pin 59 location: 15.24
- Pin 60 location: 15.24
- Pin 61 location: 15.24
- Pin 62 location: 15.24
- Pin 63 location: 15.24
- Pin 64 location: 15.24
- Pin 65 location: 15.24
- Pin 66 location: 15.24
- Pin 67 location: 15.24
- Pin 68 location: 15.24
- Pin 69 location: 15.24
- Pin 70 location: 15.24
- Pin 71 location: 15.24
- Pin 72 location: 15.24
- Pin 73 location: 15.24
- Pin 74 location: 15.24
- Pin 75 location: 15.24
- Pin 76 location: 15.24
- Pin 77 location: 15.24
- Pin 78 location: 15.24
- Pin 79 location: 15.24
- Pin 80 location: 15.24
- Pin 81 location: 15.24
- Pin 82 location: 15.24
- Pin 83 location: 15.24
- Pin 84 location: 15.24
- Pin 85 location: 15.24
- Pin 86 location: 15.24
- Pin 87 location: 15.24
- Pin 88 location: 15.24
- Pin 89 location: 15.24
- Pin 90 location: 15.24
- Pin 91 location: 15.24
- Pin 92 location: 15.24
- Pin 93 location: 15.24
- Pin 94 location: 15.24
- Pin 95 location: 15.24
- Pin 96 location: 15.24
- Pin 97 location: 15.24
- Pin 98 location: 15.24
- Pin 99 location: 15.24
- Pin 100 location: 15.24

Side View Dimensions:

- Overall height: 12.6
- Mounting hole diameter: $4 - \phi 2.5$
- Mounting hole spacing: 2.7
- Mounting hole offset: 11.5
- Mounting hole offset: 12.6
- Mounting hole offset: 16 ± 0.2
- Mounting hole offset: 26 ± 0.2
- Mounting hole offset: 2.5

Detail View Dimensions:

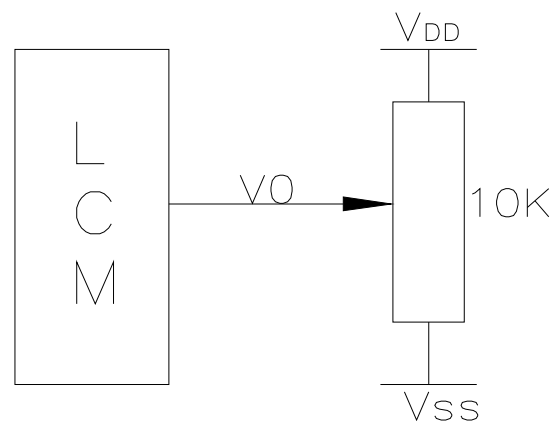
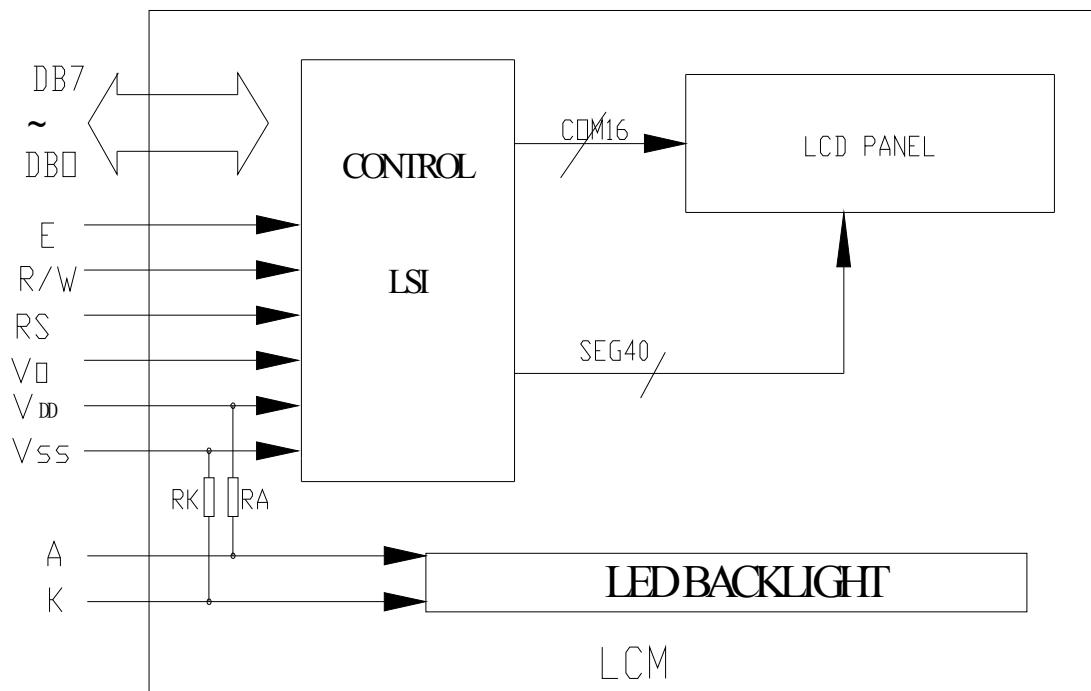
- Overall width: 5.94
- Overall height: 3.55
- Pin pitch (P2): 0.66
- Pin 1 location: 0.66
- Pin 2 location: 0.66
- Pin 3 location: 0.66
- Pin 4 location: 0.66
- Pin 5 location: 0.66
- Pin 6 location: 0.66
- Pin 7 location: 0.66
- Pin 8 location: 0.66
- Pin 9 location: 0.66
- Pin 10 location: 0.66
- Pin 11 location: 0.66
- Pin 12 location: 0.66
- Pin 13 location: 0.66
- Pin 14 location: 0.66
- Pin 15 location: 0.66
- Pin 16 location: 0.66
- Pin 17 location: 0.66
- Pin 18 location: 0.66
- Pin 19 location: 0.66
- Pin 20 location: 0.66
- Pin 21 location: 0.66
- Pin 22 location: 0.66
- Pin 23 location: 0.66
- Pin 24 location: 0.66
- Pin 25 location: 0.66
- Pin 26 location: 0.66
- Pin 27 location: 0.66
- Pin 28 location: 0.66
- Pin 29 location: 0.66
- Pin 30 location: 0.66
- Pin 31 location: 0.66
- Pin 32 location: 0.66
- Pin 33 location: 0.66
- Pin 34 location: 0.66
- Pin 35 location: 0.66
- Pin 36 location: 0.66
- Pin 37 location: 0.66
- Pin 38 location: 0.66
- Pin 39 location: 0.66
- Pin 40 location: 0.66
- Pin 41 location: 0.66
- Pin 42 location: 0.66
- Pin 43 location: 0.66
- Pin 44 location: 0.66
- Pin 45 location: 0.66
- Pin 46 location: 0.66
- Pin 47 location: 0.66
- Pin 48 location: 0.66
- Pin 49 location: 0.66
- Pin 50 location: 0.66
- Pin 51 location: 0.66
- Pin 52 location: 0.66
- Pin 53 location: 0.66
- Pin 54 location: 0.66
- Pin 55 location: 0.66
- Pin 56 location: 0.66
- Pin 57 location: 0.66
- Pin 58 location: 0.66
- Pin 59 location: 0.66
- Pin 60 location: 0.66
- Pin 61 location: 0.66
- Pin 62 location: 0.66
- Pin 63 location: 0.66
- Pin 64 location: 0.66
- Pin 65 location: 0.66
- Pin 66 location: 0.66
- Pin 67 location: 0.66
- Pin 68 location: 0.66
- Pin 69 location: 0.66
- Pin 70 location: 0.66
- Pin 71 location: 0.66
- Pin 72 location: 0.66
- Pin 73 location: 0.66
- Pin 74 location: 0.66
- Pin 75 location: 0.66
- Pin 76 location: 0.66
- Pin 77 location: 0.66
- Pin 78 location: 0.66
- Pin 79 location: 0.66
- Pin 80 location: 0.66
- Pin 81 location: $0.$

8.1 Interface

Pin Assignment

PIN NO.	Symbol	Leve	Function
1	V _{SS}	0V	Ground
2	V _{DD}	5.0V	Power supply for LCM (+)
3	V ₀	--	Contrast Adjust
4	RS	H/L	Register select signal
5	R/W	H/L	Data read / write
6	E	H/L	Enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
A	A	+4.1V/60mA	Power supply for LED (+)
K	K	0	Power supply for LED (+)

9. Block diagram

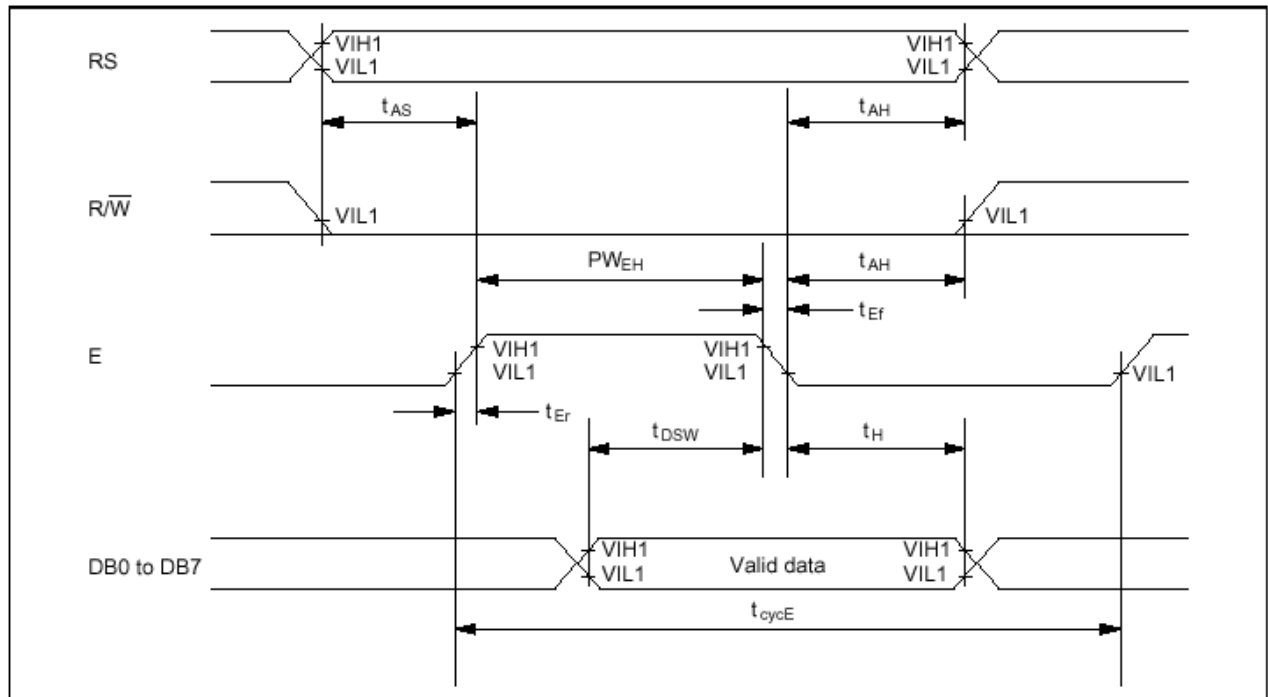


10. Interface Timing Chart

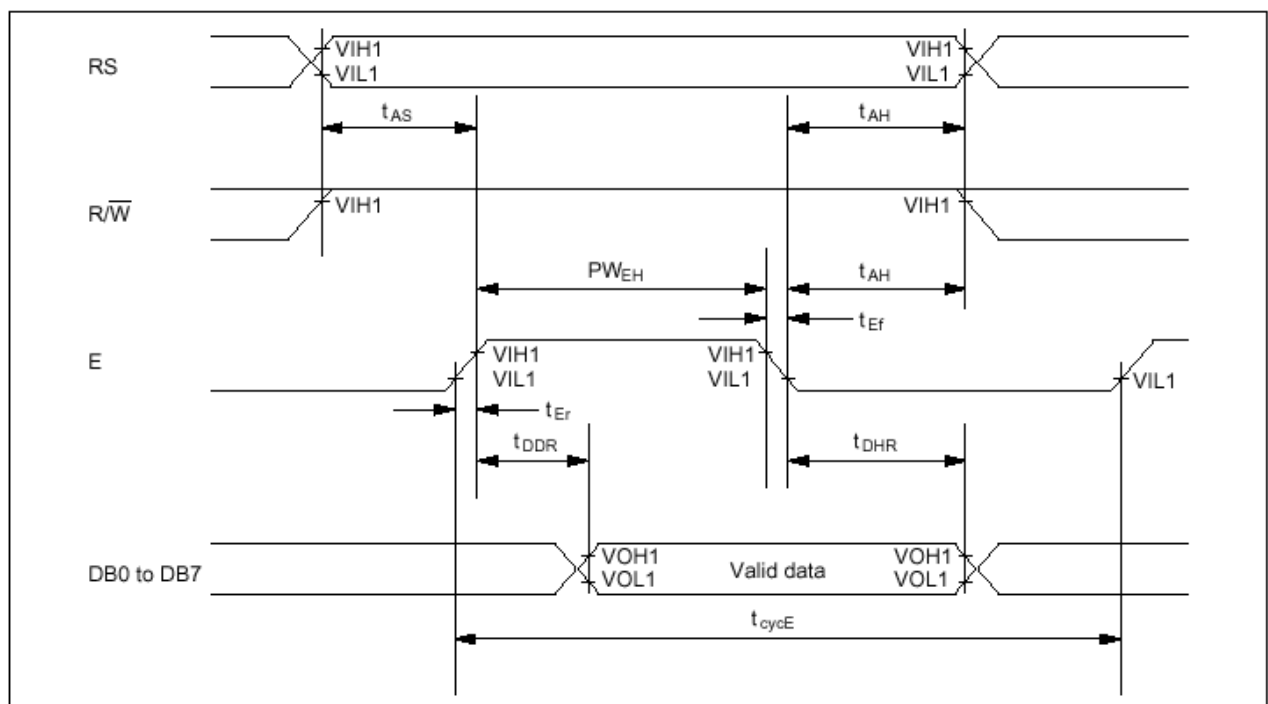
AC Characteristics($V_{DD}=4.5V\sim 5.5V$, $T_a=-30\sim +85^{\circ}C$)

Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode (Refer to Fig-6)	E Cycle Time	t_c	500	-	-	ns
	E Rise / Fall Time	t_R, t_F	-	-	20	
	E Pulse Width (High, Low)	t_w	230	-	-	
	R/W and RS Setup Time	t_{su1}	40	-	-	
	R/W and RS Hold Time	t_{H1}	10	-	-	
	Data Setup Time	t_{su2}	80	-	-	
	Data Hold Time	t_{H2}	10	-	-	
Read Mode (Refer to Fig-7)	E Cycle Time	t_c	500	-	-	ns
	E Rise / Fall Time	t_R, t_F	-	-	20	
	E Pulse Width (High, Low)	t_w	230	-	-	
	R/W and RS Setup Time	t_{su}	40	-	-	
	R/W and RS Hold Time	t_H	10	-	-	
	Data Output Delay Time	t_D	-	-	120	
	Data Hold Time	t_{DH}	5	-	-	

Timing Characteristics



Write Operation



Read Operation

11. Instruction Code

Instruction Table

Instruction	Instruction Code										Description	Execution time (fosc=270 kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM and set DDRAM address to "00H" from AC	1.53 ms
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.53 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39 μ s
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.	39 μ s
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	39 μ s
Function Set	0	0	0	0	1	DL	N	F	-	-	Set interface data length (DL: 8-bit/4-bit), numbers of display line (N: 2-line/1-line) and, display font type (F: 5 \times 11dots/5 \times 8 dots)	39 μ s
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39 μ s
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39 μ s
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 μ s
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43 μ s
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	43 μ s

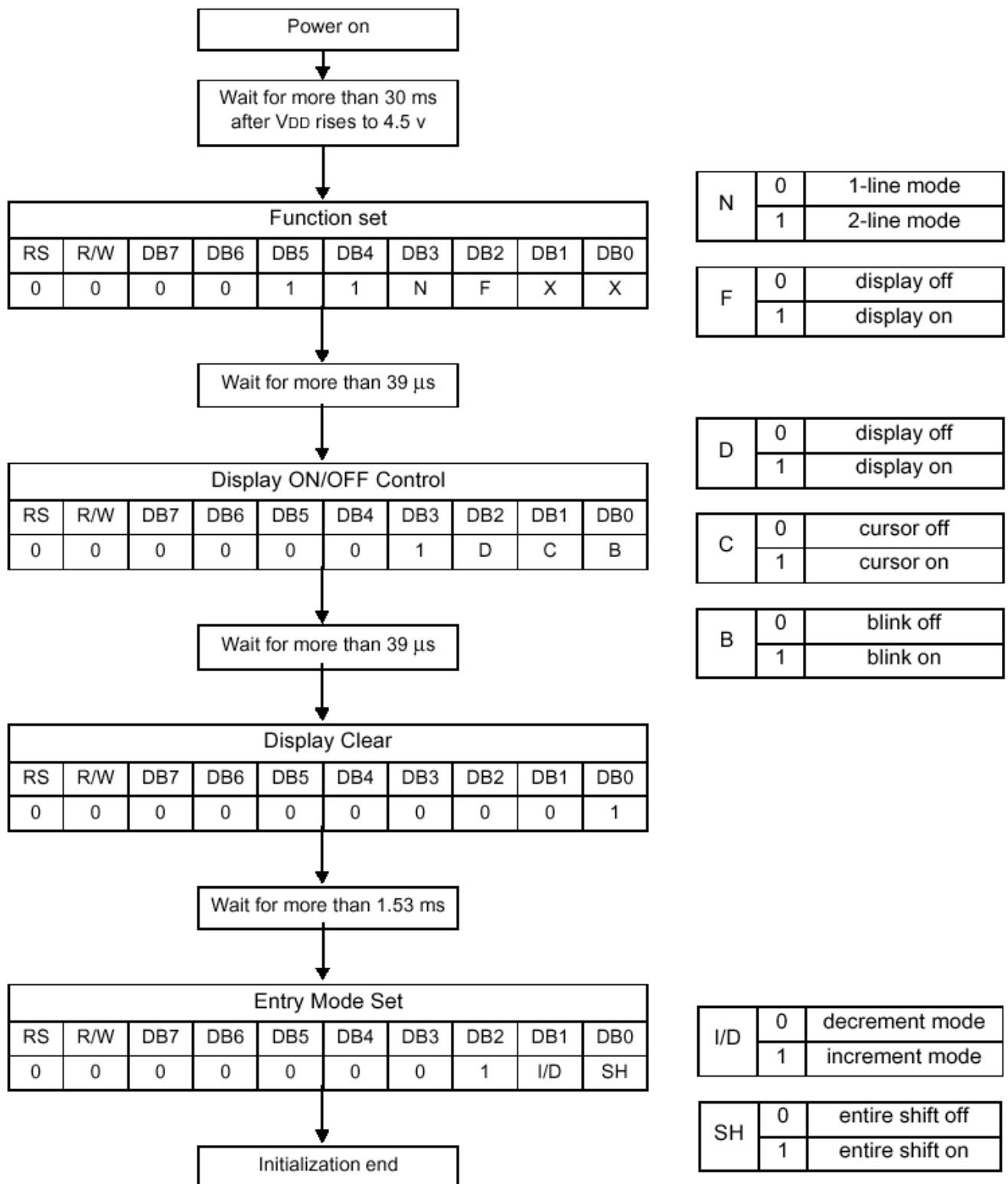
* "-": don't care

NOTE: When an MPU program with checking the Busy Flag(DB7) is made, it must be necessary 1/2Fosc is necessary for executing the next instruction by the falling edge of the 'E' signal after the Busy Flag (DB7) goes to "Low".

DISPLAY CHARACTER ADDRESS CODE

Display position:	1	2	3	4	5	6	7	8											
Address line1:	00	01	02	03	04	05	06	07											
Address line2:	40	41	42	43	44	45	46	47											

8-bit interface mode (Condition: fosc = 270KHZ)



12.Character generator ROM

Lower 4 Bits	Upper 4 Bits	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)			Ø	Q	P	`	P		—	9	≡	α	ρ
xxxx0001	(2)	!	1	A	Q	a	9	。	ア	チ	△		ä	q
xxxx0010	(3)	"	2	B	R	b	r	「	イ	ツ	×		β	θ
xxxx0011	(4)	#	3	C	S	c	s	」	ウ	テ	モ		ε	ω
xxxx0100	(5)	\$	4	D	T	d	t	、	エ	ト	ト		μ	Ω
xxxx0101	(6)	%	5	E	U	e	u	・	オ	ナ	1		ε	Ü
xxxx0110	(7)	&	6	F	V	f	v	ヲ	カ	ニ	ヨ		ρ	Σ
xxxx0111	(8)	'	7	G	W	g	w	ア	キ	ヌ	ラ		g	π
xxxx1000	(1)	(8	H	X	h	x	イ	ク	ネ	リ		γ	×
xxxx1001	(2))	9	I	Y	i	y	ウ	ケ	ル			'	γ
xxxx1010	(3)	*	:	J	Z	j	z	エ	コ	ン	レ		j	〒
xxxx1011	(4)	+	;	K	L	k	l	オ	サ	ヒ	ロ		*	斤
xxxx1100	(5)	,	<	L	¥	1	1	ヤ	シ	フ	ワ		¢	円
xxxx1101	(6)	—	=	M	J	m	j	ユ	ズ	ヘ	ン		も	÷
xxxx1110	(7)	.	>	N	^	n	+	ヨ	セ	ホ	°		ñ	
xxxx1111	(8)	/	?	O	_	o	+	ッ	ソ	マ	°		ö	■

13. Specification of quality assurance

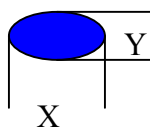
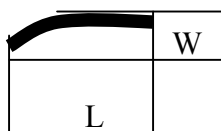
AQL inspection standard

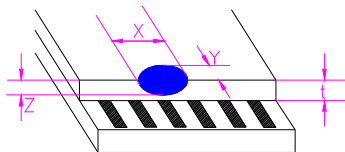
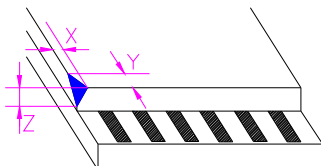
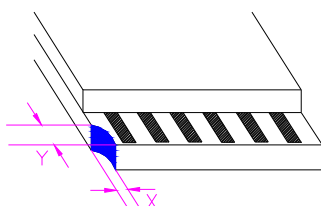
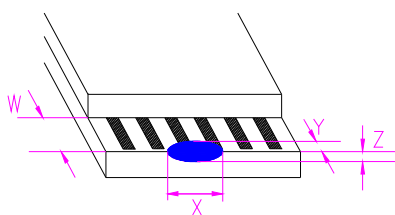
Sampling method: MIL-STD-105E, Level II, single sampling

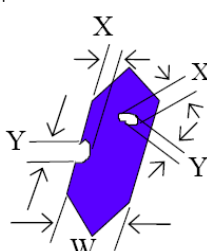
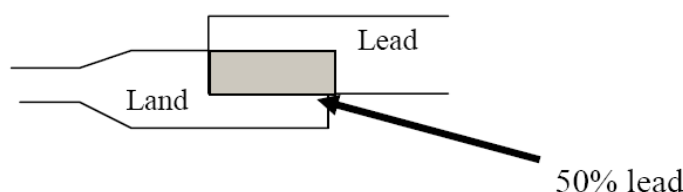
Defect classification (**Note: * is not including**)

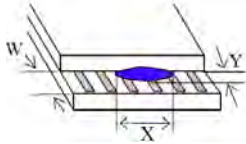
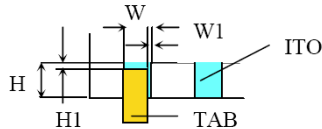
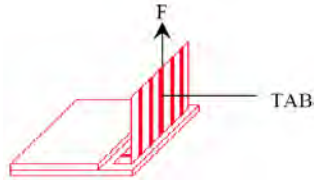
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Back-light	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background color deviation	2	1.0
		Black spot and dust	3	
		Line defect, Scratch	4	
		Rainbow	5	
		Chip	6	
		Pin hole	7	
	Polarizer	Protruded	12	
		Bubble and foreign material	3	
	Soldering	Poor connection	9	
	Wire	Poor connection	10	
	TAB	Position, Bonding strength	13	

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 (including Polarizer)		Point Size	Acceptable Qty.	
			$\phi < 0.10$	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	
	$\phi = (X+Y)/2$	Unit:mm			
4	Line defect, Scratch		Line		Acceptable Qty.
			L	W	
			---	$0.015 \geq W$	Disregard
			$3.0 \geq L$	$0.03 \geq W$	2
			$2.0 \geq L$	$.05 \geq W$	
			$1.0 \geq L$	$0.1 > W$	1
			---	$0.05 < W$	Applied as point defect
5	Rainbow	Not more than two color changes across the viewing area.			

NO.	Item	Criterion																																						
6	<div>Chip</div> <div>Remark:</div> <div>X: Length direction</div> <div>Y: Short direction</div> <div>Z: Thickness direction</div> <div>t: Glass thickness</div> <div>W: Terminal Width</div>	<div><table><tr><th colspan="3">Acceptable criterion</th></tr><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤2</td><td>0.5mm</td><td>≤t/2</td></tr></table></div> <div><table><tr><th colspan="3">Acceptable criterion</th></tr><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤2</td><td>0.5mm</td><td>≤t</td></tr></table></div> <div><table><tr><th colspan="3">Acceptable criterion</th></tr><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3</td><td>≤2</td><td rowspan="2">≤t</td></tr><tr><td colspan="2">shall not reach to ITO</td></tr></table></div> <div><table><tr><th colspan="3">Acceptable criterion</th></tr><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>Disregard</td><td>≤0.2</td><td>≤t</td></tr></table></div>	Acceptable criterion			X	Y	Z	≤2	0.5mm	≤t/2	Acceptable criterion			X	Y	Z	≤2	0.5mm	≤t	Acceptable criterion			X	Y	Z	≤3	≤2	≤t	shall not reach to ITO		Acceptable criterion			X	Y	Z	Disregard	≤0.2	≤t
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7	Segment pattern W = Segment width $\phi = (X+Y)/2$	(1) Pin hole $\phi < 0.10\text{mm}$ is acceptable.  <table border="1" data-bbox="1027 306 1466 479"><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>Unit: mm</p>	Point Size	Acceptable Qty	$\phi \leq 1/4W$	Disregard	$1/4W < \phi \leq 1/2W$	1	$\phi > 1/2W$	0
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$\phi \leq 1/4W$	Disregard									
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$\phi > 1/2W$	0									
8	Back-light	(1) The color of backlight should correspond its specification. (2) Not allow flickering								
9	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. 								
10	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.								
11*	PCB	(1) Not allow screw rust or damage. (2) Not allow missing or wrong putting of component.								

NO.	Item	Criterion
12	Protruded W: Terminal Width	 <p>Acceptable criteria: $Y \leq 0.4$</p>
13	TAB	<p>1. Position</p>  <p> $W1 \leq 1/3W$ $H1 \leq 1/3H$ </p> <p>2 TAB bonding strength test</p>  <p> $P (=F/\text{TAB bonding width}) \geq 650\text{gf/cm}$, (speed rate: 1mm/min) 5pcs per SOA (shipment) </p>
14	Total no. of acceptable Defect	<p>A. Zone Maximum 2 minor non-conformities per one unit. Defect distance: each point to be separated over 10mm</p> <p>B. Zone It is acceptable when it is no trouble for quality and assembly in customer's end product.</p>