2x16 COG Alphanumeric Modules

CI064-4001-XX

Description

IDS have introduced an unprecedented array of technologies and backlight colours to enhance your product design.

Utilising our industry standard 2x16 COG module, designers can now have the flexibility to develop a product with the style and look they need, including an RGB option.

We also support this product with Arduino and Pi code, breakout boards and demos to make implementation as quick as possible.
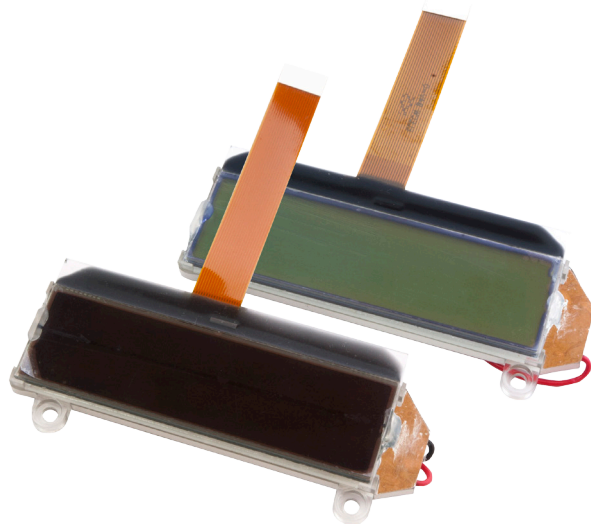
Technical Features

Format : 16 characters*2 line

Various LCD modes : STN Positive, STN Negative, FSTN Positive, FSTN Negative, FFSTN Negative

Various LED Backlight Colour : White, Green, Blue, Orange, Yellow/Green, RGB

Viewing direction : 12 o'clock

Driving scheme : 1/16 Duty cycle, 1/5 Bias

Low power operation

Power supply voltage range (VDD): 2.7 to 3.45V

Internal Memory : CGROM (10,080bits) : CGRAM (64*8bits) : DDRAM (80*8bits)

Easy interface with a 4-bit or 8-bit MPU

Viewing area : 63.50mm(L) x 16.50mm(W)

Character pitch : 5.94mm(L) x 3.55mm(W)

Character size : 5.56mm(L) x 2.96mm(W)

Dot pitch : 0.70mm(L) x 0.60mm(W)

Dot size : 0.66mm(L) x 0.56mm(W)

Accessories

IDS have designed a break-out board for their CI064-4001-xx range of standard COG displays.

The IDB-CI064-4001-xx-02 enables our CI064-4001-xx COG displays to be used with the industry standard 16 pin interface, and on the standard 0.1" header.

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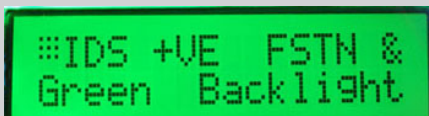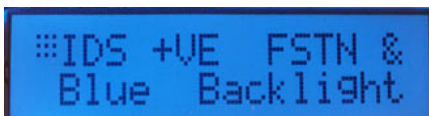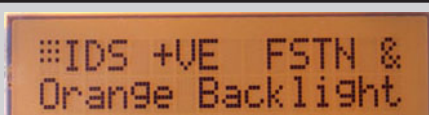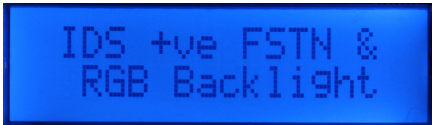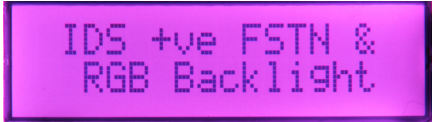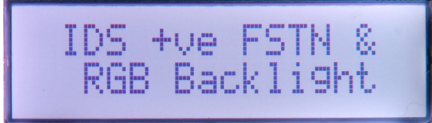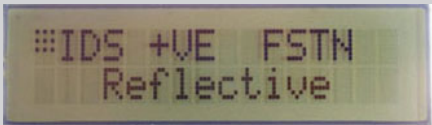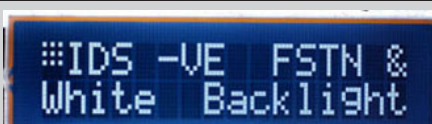
Revision History

Date	Page	Description	
10/01/17	1	Change Vdd power rail from 5v to 3v3	AA
10/01/17	5	Block diagram pin order change	AA
10/01/17	6	Pin description table change	AA
10/01/17	6	Change Vdd power rail from 5v to 3v3	AA

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Product Options
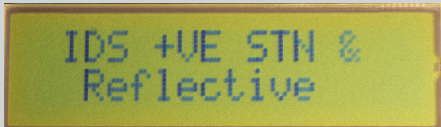
Part Number	Description	
CI064-4001-17	2x16 LCD STN POS TFL WH B/L	IDS +VE STN & White Backlight
CI064-4001-18	2x16 LCD STN POS TFL GR B/L	IDS +VE STN & Green Backlight
CI064-4001-19	2x16 LCD STN POS TFL BL B/L	IDS +VE STN & Blue Backlight
CI064-4001-20	2x16 LCD STN POS TFL OR B/L	IDS +VE STN & Orange Backlight
CI064-4001-21	2x16 LCD STN POS TFL RGB B/L	IDS +ve STN & RGB Backlight

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Part Number	Description	
CI064-4001-22	2x16 LCD STN POS TFL YG B/L	
CI064-4001-23	2x16 LCD STN POS TFL RED B/L	
CI064-4001-24	2x16 LCD FSTN POS TFL WH B/L	
CI064-4001-25	2x16 LCD FSTN POS TFL GR B/L	
CI064-4001-26	2x16 LCD FSTN POS TFL BL B/L	
CI064-4001-27	2x16 LCD FSTN POS TFL OR B/L	

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Part Number	Description	
CI064-4001-28	2x16 LCD FSTN POS TFL RGB B/L	IDS +ve FSTN & RGB Backlight
CI064-4001-29	2x16 LCD FSTN POS TFL YG B/L	IDS +ve FSTN & Yel/Gr Backlight
CI064-4001-30	2x16 LCD FSTN POS TFL RED B/L	IDS +VE FSTN & Red Backlight
CI064-4001-47	2x16 LCD FSTN POS REF GRY NO B/L	IDS +VE FSTN Reflective
CI064-4001-31	2x16 LCD STN NEG TRM BL WH B/L	IDS -VE STN & White Backlight
CI064-4001-32	2x16 LCD FSTN NEG TRM BLK WH B/L	IDS -VE FSTN & White Backlight

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Part Number	Description	
CI064-4001-33	2x16 LCD FSTN NEG TRM BLK GR B/L	
CI064-4001-34	2x16 LCD FSTN NEG TRM BLK BL B/L	
CI064-4001-35	2x16 LCD FSTN NEG TRM BLK OR B/L	
CI064-4001-36	2x16 LCD FSTN NEG TRM BLK RGB B/L	
CI064-4001-37	2x16 LCD FSTN NEG TRM BLK YG B/L	
CI064-4001-38	2x16 LCD FSTN NEG TRM BLK RED B/L	

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Part Number	Description	
CI064-4001-39	2x16 LCD FFSTN NEG TRM BLK WH B/L	IDS -VE FFSTN & White Backlight
CI064-4001-40	2x16 LCD FFSTN NEG TRM BLK GR B/L	IDS -VE FFSTN & Green Backlight
CI064-4001-41	2x16 LCD FFSTN NEG TRM BLK BL B/L	IDS -VE FFSTN & White Backlight
CI064-4001-42	2x16 LCD FFSTN NEG TRM BLK OR B/L	IDS -VE FFSTN & Orange Backlight
CI064-4001-43	2x16 LCD FFSTN NEG TRM BLK RGB B/L	IDS -VE FFSTN & RGB Backlight

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Part Number	Description	
CI064-4001-44	2x16 LCD FFSTN NEG TRM BLK YG B/L	
CI064-4001-45	2x16 LCD FFSTN NEG TRM BLK RED B/L	
CI064-4001-46	2x16 LCD STN POS REF YEL NO B/L	

Mechanical Details

Please refer to the separate mechanical drawings for each display

Block Diagram

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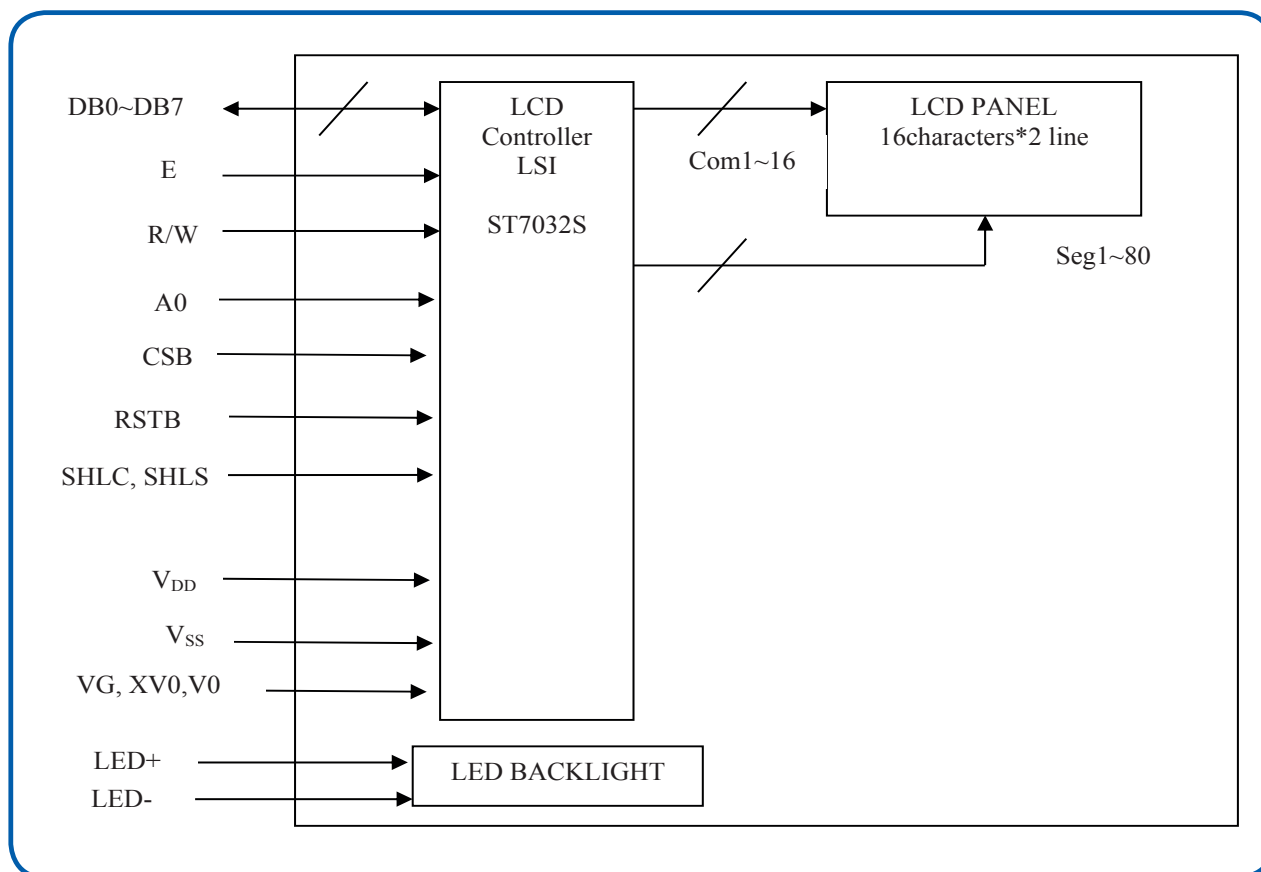
Power Supply
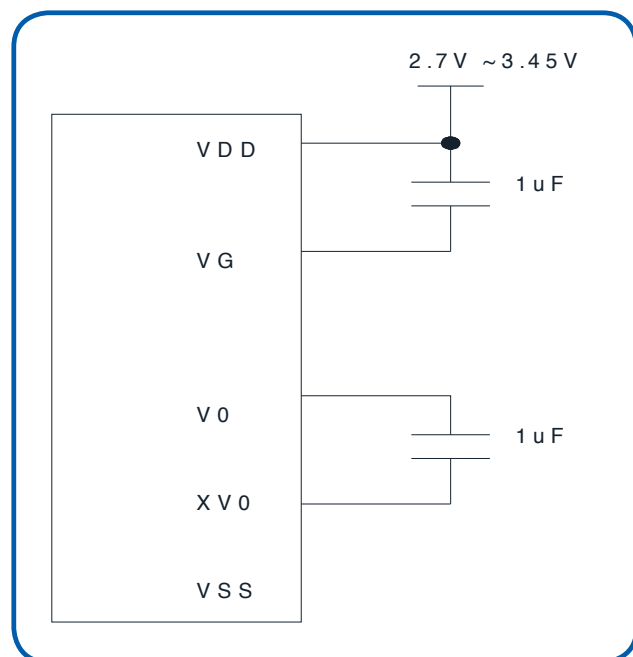
Pin Description

Pin no	Symbol	Function
1	RSTB	External reset, low active. If only power on reset is required
2	A0	Selects register date "H" and instruction "L"
3	CSB	Chip select pin, low active
4	R/W	Use as read/write select input
5	E	Use as read/write enable signal
6	DB0	Display data signal.
7	DB1	
8	DB2	
9	DB3	
10	DB4	
11	DB5	
12	DB6	
13	DB7	
14	VSS	Power supply (0V)
15	VDD	Power supply (+2.7V ~ 3.45V)
16	VG	LCD driving voltage for segment circuits
17	Vo	Voltage level for LCD driving
18	XVo	LCD driving voltage for common circuits at positive frame
A	LED+	Anode of LED backlight
K	LED-	Cathode of LED backlight

Maximum Absolute Limit (T=25°C)

Item	Symbol	Standard Value	Unit
Power supply voltage for logic	V_{DD}	-0.3~+3.45	V
Driver supply voltage for LCD (V0-VDD)	V_{LCD}	-0.3~7	V
Input voltage	V_{IN}	-0.3~VDD+0.3	V
Operating temperature	Topr	-20~+70	°C
Storage temperature	Tstg	-30~+80	°C

Electrical Characteristics (DC Characteristics (VDD=2.7~3.3V,Ta=25°C))

Item	Symbol	Min	Typ	Max	Unit	Applicable Terminal	Test Condition
Operating voltage	V_{DD}	2.7	3.3	3.45	V	-	
Supply current	I_{DD}	-	0.5	1	mA	-	
Input voltage	V_{IL}	VSS	-	0.3VDD	V	Except OS C1	-
	V_{IH}	0.7VDD	-	V_{DD}	V	Except OS C1	-
Output voltage	V_{OL}	-	-	0.2VDD	V	DB0~DB7	I_{OL}=1.0 mA
	V_{OH}	0.8VDD	-	V_{DD}	V	-	I_{OH}=1.0 mA
Input leakage current	I_{IKG}	-1	-	1	µA	E	V_{IN}=0 or V_{DD}
Low input current	I_{IL}	-50	-125	-250	µA	RS,R/W,D0~D7	V_{DD}=5V
Oscillation frequency	fosc	67	74	81	Hz	-	V_{DD}=3.0V, FR[2:0]=010
LCD driving voltage	V_{LCD}	-	4.5	-	V	V_0 - XV_0	Ta=25°C

AC Characteristics (6800 Interface)

Characteristic	Signal	Symbol	VDD=1.8V		VDD=2.8V		VDD=3.3V		Unit
			Min	Max	Min	Max	Min	Max	
Control setup time	A0, R/W	t AW6	20	-	20	-	20	-	ns
Control hold time	A0, R/W	t AH6	20	-	20	-	20	-	ns
System, write cycle time	E	tCYC6	650	-	400	-	250	-	ns
Enable H pulse time	E	tEWHW	230	-	200	-	200	-	ns
Enable L pulse time	E	tEWLW	320	-	150	-	110	-	ns
Data setup time (write)	DB[7:0]	tDS6	130	-	100	-	80	-	ns
Data hold time (write)	DB[7:0]	tDH6	60	-	40	-	20	-	ns
Data access time, C_L=100pF	DB[7:0]	tACC6	-	640	-	500	-	400	ns
Data output hold time, C_L=100pF	DB[7:0]	tOH6	450	-	300	-	150	-	ns
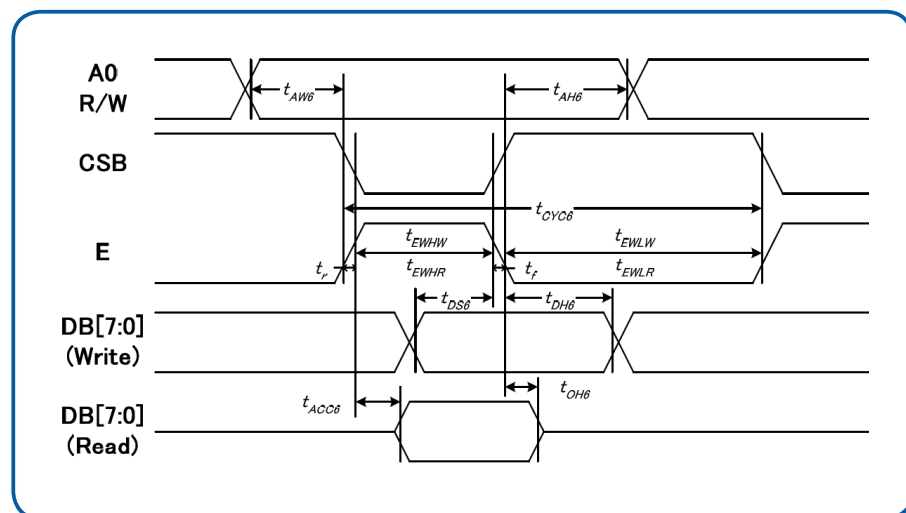
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Note:
1. All timing is specified using 20% and 80% of VDD1 as the reference.
2. The input signal rising time and falling time (tr, tf) is specified at 15ns or less. When the system cycle time is extremely fast (tr + tf) ≤ (tCYC6 - tEWLW -tEWHW) for (tr + tf) ≤ (tCYC6 - tEWLR - tEWHR) are specified.
3. tEWLW and tEWLR are specified as the overlap between CSB being "L" and E begin "H".

AC Characteristics (8080 Interface)

Characteristic	Signal	Symbol	VDD=1.8V		VDD=2.8V		VDD=3.3V		Unit
			Min	Max	Min	Max	Min	Max	
Address setup time	A0	t AW8	20	-	20	-	20	-	ns
Address hold time	A0	t AH8	20	-	20	-	20	-	ns
System, write cycle time	/WR	tCYC8	630	-	400	-	250	-	ns
Write L pulse width	/WR	tCCLW	130	-	80	-	80	-	ns
Write H pulse width	/WR	tCCHW	320	-	150	-	110	-	ns
Data setup time (write)	DB[7:0]	tDS8	130	-	100	-	80	-	ns
Data hold time (write)	DB[7:0]	tDH8	80	-	40	-	20	-	ns
Read L pulse width	/RD	tCCLR	90		35		30		ns
Read H pulse width	/RD	tCCHR	25		15		15		ns
Data access time, C$_L$=100pF	DB[7:0]	tACC8	-	240	-	220	-	180	ns
Data output hold time, C$_L$=100pF	DB[7:0]	tOH8	120	-	100	-	80	-	ns

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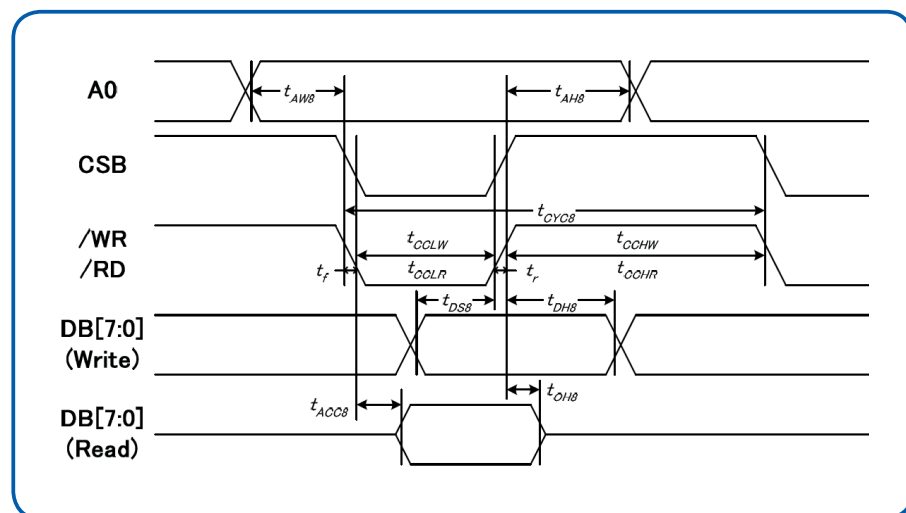A division of Intelligent Group Solutions Ltd

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Note:

1. All timing is specified using 20% and 80% of VDD1 as the reference.

2. The input signal rising time and falling time (tr, tf) is specified at 15ns or less. When the system cycle time is extremely fast (tr + tf) ≤ (tCYC8 - tCCLW - tCCHW) for (tr + tf) ≤ (tCYC8 - tCCLR - tCCHR) are specified.

3. tCCLW and tCCLR are specified as the overlap between CSB being "L" and /WR (.RD) begin "L".

Backlight Specification

Please refer to the separate mechanical drawings for each display

Control and Display Command

Command	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Clear display	0	0	0	0	0	0	0	0	0	1	Display clear and set AC to "00H"
Return home	0	0	0	0	0	0	0	0	1	X	Set DDRAM addres to "00H" from AC and retufn cursor ands screen to its original position if shifted. The contents of DDRAM are not changed.
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	Set cursor move direction and control display shift. These operations are performed during data write and read.
Display on/off	0	0	0	0	0	0	1	D	C	B	D=1: Entire display ON C=1: Cursor On B=1: Cursor Blink On
Function Set	0	0	0	0	1	DL	N	DH	0	IS	DL: Select parallel interface data bus (4 or 8 bits) N: Set display line number (1 or 2 lines) DH: Ser double height font (OFF/ON) IS: Select instruction table
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address into address counter
Read Status	0	1	0	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Read the content of AC (address counter)
Write data from RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM/ICONRAM)
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data into internal RAM (DDRAM/CGRAM/ICONRAM)

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Instruction table 0 (IS=0)

Instruction	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	X	X	S/C and R/L: Set cursor moving and display shift control bit and the direction, without changing DDRAM data.
Set CGRAM	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGREM address in address counter

Instruction table 1 (IS=1)

Instruction	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Internal OSC frequency/Bias Selection	0	0	0	0	0	1	BS	F2	F1	F0	BS: Set Bias (BS=1: 1/4 bias; BS=0: 1/5 bias) F[2.0]: Set internal OSC for frame frequency.
Set ICON address	0	0	0	1	0	0	AC3	AC2	AC1	AC0	Set ICON address in address counter
Power/ICON control/ Contrast set	0	0	0	1	0	1	Ion	Bon	C5	C4	Ion: ICON display on/off. Bon: set booster circuit on/off. C5.C4: Contrast set for internal follower mode.
Follower control	0	0	0	1	1	0	Fon	0	0	0	Fon: set internal follower circuit ON/OFF
Contrast set	0	0	0	1	1	1	C3	C2	C1	C0	Contrast set for internal follower mode.

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Standard Character Pattern

b7-b4 / b3-b0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)															
0001	(2)															
0010	(3)															
0011	(4)															
0100	(5)															
0101	(6)															
0110	(7)															
0111	(8)															
1000																
1001																
1010																
1011																
1100																
1101																
1110																
1111																

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Relationship Between DDRAM and CGRAM

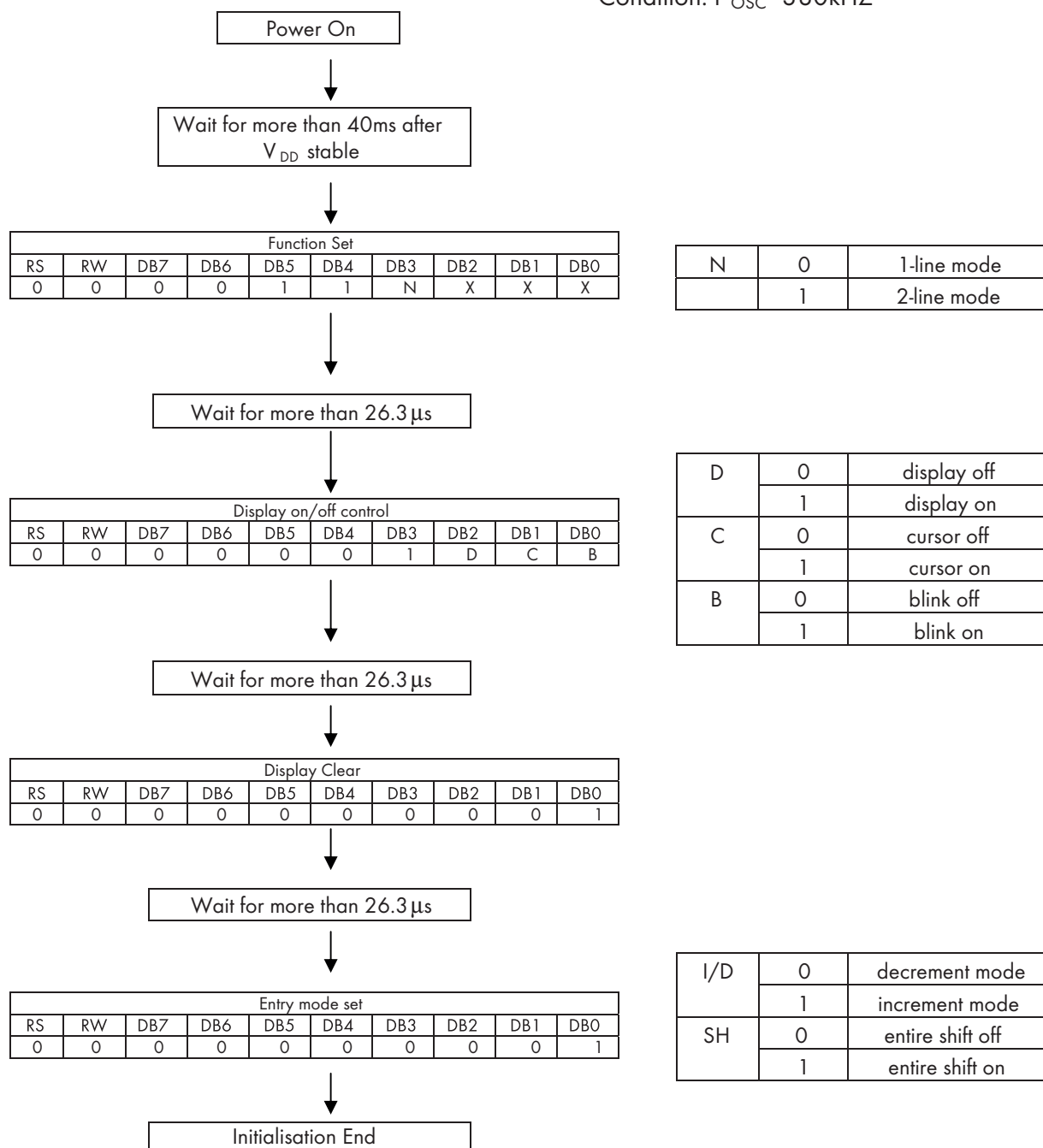| Character code(DDRAM data)								CGRAM address						CGRAM data								Pattern number
D7	D6	D5	D4	D3	D2	D1	D0	A5	A4	A3	A2	A1	A0	P7	P6	P5	P4	P3	P2	P1	P0	
0	0	0	0	x	0	0	0	0	0	0	0	0	0	x	x	x	1	1	1	1	1	
				-					-		0	0	1		-				1			
				-					-		0	1	0		-				1			
				-					-		0	1	1		-				1			Pattern 1
				-					-		1	0	0		-				1			
				-					-		1	0	1		-				1			
				-					-		1	1	0		-				1			
				-					-		1	1	1		-				0			
0	0	0	0	x	0	0	1	0	0	1	0	0	0	x	x	x	0	1	1	0	0	
				-					-						-		1	0	0	1	0	
				-					-						-		1	0	1	0	0	
				-					-						-		0	1	0	0	0	
				-					-						-		1	0	1	0	1	Pattern 2
				-					-						-		1	0	0	1	0	
				-					-						-		0	1	1	0	1	
				-					-						-		0	0	0	0	0	
				-							-								-			-
				-							-								-			-
				-							-								-			-
0	0	0	0	x	1	1	1	1	1	1	0	0	0	x	x	x	1	1	1	1	1	
				-							0	0	1		-		0	0	1	0	0	
				-							0	1	0		-		0	0	1	0	0	
				-							0	1	1		-		0	0	1	0	0	
				-							1	0	0		-		0	0	1	0	0	Pattern 8
				-							1	0	1		-		0	0	1	0	0	
				-							1	1	0		-		0	0	1	0	0	
				-							1	1	1		-		0	0	0	0	0	

CGRAM has up to 5*8 dots 8 characters.

By writing font data to CGRAM, user defined characters can be used

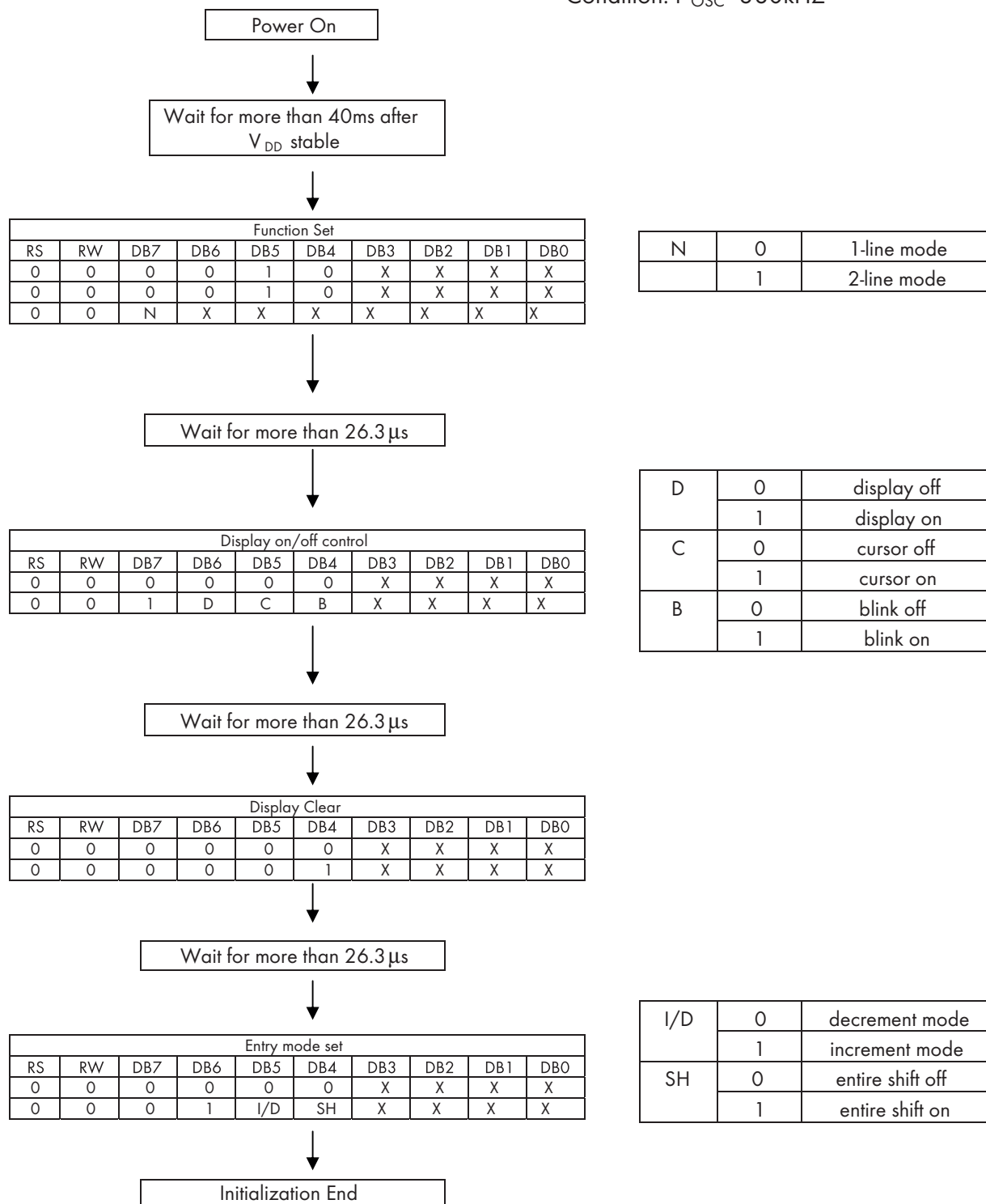Intelligent Display Solutions, Unit 2, Berkshire Business Centre, Berkshire Drive, Thatcham, Berkshire, RG19 4EW
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Initialising by Instruction

13-1. 8-bit interface mode

Condition: f $_{OSC}$=380kHZ

Power On

↓

Wait for more than 40ms after V $_{DD}$ stable

↓

Function Set									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	X	X	X

N	0	1-line mode
	1	2-line mode

↓

Wait for more than 26.3µs

↓

Display on/off control									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	C	B

D	0	display off
	1	display on
C	0	cursor off
	1	cursor on
B	0	blink off
	1	blink on

↓

Wait for more than 26.3µs

↓

Display Clear									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

↓

Wait for more than 26.3µs

↓

Entry mode set									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

I/D	0	decrement mode
	1	increment mode
SH	0	entire shift off
	1	entire shift on

↓

Initialisation End

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13-3. 4-bit interface mode

Condition: $f_{OSC}=380kHZ$

Power On

↓

Wait for more than 40ms after V_{DD} stable

↓

Function Set									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	X	X	X	X
0	0	0	0	1	0	X	X	X	X
0	0	N	X	X	X	X	X	X	X

N	0	1-line mode
	1	2-line mode

↓

Wait for more than 26.3μs

↓

Display on/off control									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	1	D	C	B	X	X	X	X

D	0	display off
	1	display on
C	0	cursor off
	1	cursor on
B	0	blink off
	1	blink on

↓

Wait for more than 26.3μs

↓

Display Clear									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	1	X	X	X	X

↓

Wait for more than 26.3μs

↓

Entry mode set									
RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	1	I/D	SH	X	X	X	X

I/D	0	decrement mode
	1	increment mode
SH	0	entire shift off
	1	entire shift on

↓

Initialization End

Software Examples

1. Power supply on: Initialized by the internal power on reset circuit

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY

2. Function set: 8-bits, 2 lines, 5*7dot

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
0	0	0	0	1	1	1	0	x	x	

3. Display on/off control: Display On / Cursor On / Blink Off

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
0	0	0	0	0	0	1	1	1	0	_

4. Entry mode set: Increment

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
0	0	0	0	0	0	0	1	1	0	_

5. Write data to DDRAM: write T

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
1	0	0	1	0	1	0	1	0	0	T_

6. Write data to DDRAM: write R

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
1	0	0	1	0	1	0	0	1	0	TR_

7. Write data to DDRAM: write T

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
1	0	0	1	0	1		1	0	0	TRI-T

8. Write Second Line Command: 0x40

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
0	0	1	1	0	0	0	0	0	0	TRI-T _

9. Write data to DDRAM: write E

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
1	0	0	1	0	1	0	1	0	0	TRI-T T_

10. Return Home

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
0	0	0	0	0	0	0	0	1	x	TRI_T TMBC

11. Clear Display

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	LCD DISPLAY
0	0	0	0	0	0	0	0	0	1	_

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Quality Specifications

Standard of the product appearance test

Manner of appearance test: The inspection should be performed in using 20W x 2

Fluorescent lamps. Distance between LCM and fluorescent lamps should be 100 cm or more. Distance between LCM and inspector eyes should be 30 cm or more.

Viewing direction for inspection is 45° from vertical against LCM
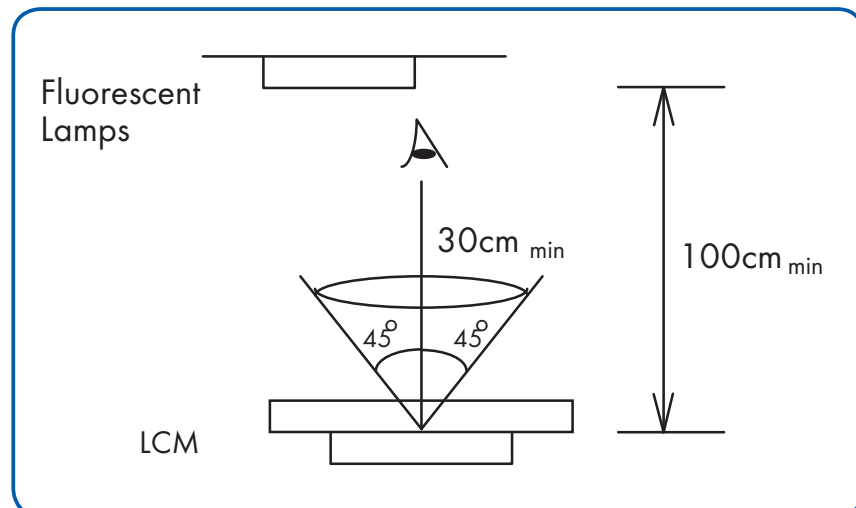
Definition of zone:
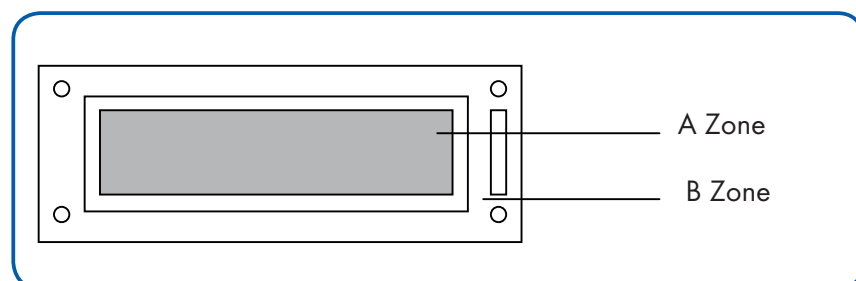
A Zone: Display area (LCD)

B Zone: PCB

Specification of quality assurance

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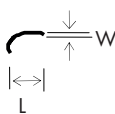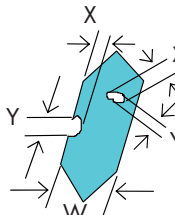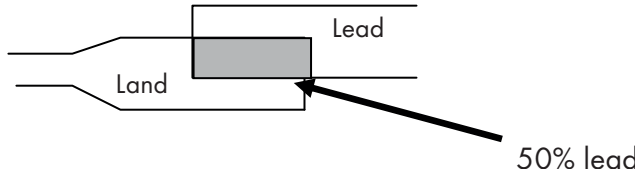
Sampling method: MIL-STD-105E, Level II, single sampling

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	

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) $\square = (X+Y)/2$	

Point Size	Acceptable Qty.
$\varphi \leq 0.10$	Disregard
$0.10 < \varphi \leq 0.20$	3
$0.20 < \varphi \leq 0.25$	2
$0.25 < \varphi \leq 0.30$	1
$\varphi > 0.30$	0

Unit ： mm

No.	Item	Criterion
4	Line defect	 Unit: mm
5	Rainbow	Not more than two color changes across the viewing area.
6	Segment pattern W = Segment width □ = (X+Y)/2	(1) Pin hole □ < 0.10mm is acceptable. Unit: mm
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.

For item 4, the table:

Line		Acceptable Qty.
L	W	
−	0.015≥ W	Disregard
3.0≥ L	0.03≥ W	2
2.0≥ L	0.05≥ W	
1.0≥ L	0.1 >W	1
−	0.05<W	Applied as point defect

For item 6, the table:

Point Size	Acceptable Qty
φ≤1/4 W	Disregard
1/4W<φ≤1/2 W	1
φ>1/2W	0

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Reliability of LCM

Item	Condition	Time (hrs)	Assessment
High temp. Storage	70°C	240	No abnormalities in functions and appearance
High temp. Operating	50°C	240	
Low temp. Storage	-20°C	240	
Low temp. Operating	0°C	240	
Humidity	40°C/ 90%RH	240	
Temp. Cycle	-20°C ← 25°C → 70°C (30 min ← 5 min → 30min)	10cycles	

Recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (20+8°C), normal humidity (below 65% RH), and in the area not exposed to direct sun light.

Precaution for using LCM

LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.

2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothane, do not use water, ketone or aromatics and never scrub hard.

3. Do not tamper in any way with the tabs on the metal frame.

4. Do not make any modification on the PCB without consulting IDS.

5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.

7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.

2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.

3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.

4. The modules should be kept in anti-static bags or other containers resistant to static for storage.

5. Only properly grounded soldering irons should be used.

6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

7. The normal static prevention measures should be observed for work clothes and working benches.

8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.

2. Use soldering irons with proper grounding and no leakage.

3. Soldering temperature: 280°C+10°C

4. Soldering time: 3 to 4 second.

5. Use eutectic solder with resin flux filling.

6. If flux is used, the LCD surface should be protected to avoid spattering flux.

7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.

2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.

3. Driving voltage should be kept within specified range; excess voltage will shorten display life.

4. Response time increases with decrease in temperature.

5. Display color may be affected at temperatures above its operational range.

Operation Precautions:

1. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.

2. For long-term storage over 40°C is required, the relative humidity should be kept below 60%. Avoid direct sunlight.

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