LIQUID CRYSTAL DISPLAY MODULE
MODEL: NMTC-S16100XFYHSAY-16
Customer's No.:

Acceptance

Microtips Technology Inc.
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Approved and Checked by

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微 端 2017/09/05 連俊傑	微 端 2017/09/05 韋有乾	微 端 2017/09/05 洪振益	微 端 2017/09/05 許瓊窈

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Revise Records

Rev.	Date	Contents	Written	Approved
A.	2017/09/05	See Note 1.	Jill Hsu	Danny Lien

Special Notes

Note 1.	The LCD module is compliant with RoHS.
Note 2.	
Note 3.	
Note 4.	
Note 5.	
Note 6.	
Note 7.	

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Contents

The Microtips Customized LCD module, model: NMTC-S16100XFYHSAY-16 is compliant with RoHS

1. **GENERAL SPECIFICATIONS**

Operating Temperature.	:	Min. -20°C ～ Max. 70°C
Storage Temperature.	:	Min. -30°C ～ Max. 80°C
Display Format	:	16 Characters x 1 line
Character Size	:	3.1 mm x 6.59 mm
Character Pitch	:	3.77 mm
Dot Size	:	0.58 (W) mm $\times$ 0.78 (H) mm
Dot Pitch	:	0.63 (W) x 0.83 (H) mm
Outline Dimensions	:	80.0 (W) x 36.0 (H) x 14.5 max. (D) mm
Weight	:	N/A
LCD Type	:	STN / Yellow Green Mode / Transflective
Viewing Direction	:	6:00
Backlight Color	:	Array LED (Yellow Green)
LCD LSI	:	ST 7066
Drawings	:	As attached drawings

2. ELECTRICAL SPECIFICATIONS

2.1 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for Logic	$V_{DD} - V_{SS}$	-0.3	7.0	Volt	--
Power Supply for LCD	$V_{DD} - V_o$	0	15.0	Volt	--
Input Voltage	V_{IN}	-0.3	V_{DD} +0.3	Volt	--
Supply Current for LED backlight	I_{LED}	--	220	mA	--

Note: Operator should be grounded during handling LCM.

2.2 Environmental Absolute Maximum Ratings

Item	Normal Temperature				Wide Temperature			
	Operating		Storage		Operating		Storage	
	Max,	Min.	Max,	Min.	Max,	Min.	Max,	Min.
Ambient Temperature	0℃	+50℃	-20℃	+70℃	-20℃	+60℃	-30℃	+70℃
Humidity(without condensation)	Note 2, 4		Note 3, 5		Note 4, 5		Note 4, 6	

Note 1: Ta≦50℃: 80% RH max
Note 2: Ta>50℃: Absolute humidity must be lower than the humidity of 85% RH at 50℃
Note 3: Ta at -20℃ will be < 48hrs at 70℃will be < 120hrs when humidity is higher than 70%.
Note 4: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.
Note 5: Ta≦70℃: 75RH max
     Ta > 70℃: absolute humidity must be lower than the humidity of 75% RH at 70℃
Note 6: Ta at -30℃ will be < 48hrs, at 80 ℃ will be < 120hrs when humidity is higher than 70%.

2.3   Lighting Specifications

2.3.1   Absolute Maximum Ratings

Ta = 25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Forward Current	I_F	--	--	--	130	mA
Reverse Voltage	V_R	--	--	--	4.2	V
LED Power Dissipation	P_D	--	--	--	260	W

2.3.2   Operating Characteristics

Ta = 25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Forward Voltage	V_F	I_F = 130mA	3.8	4.2	4.5	V
Luminous Intensity	Iv	I_F = 130mA	140	220	--	cd/m^2
Reverse Current	I_R	V_R = 8V	--	--	1.3	uA
Luminous Tolerance**	--	I_F = 130mA	75	--	--	%
Peak Wavelength	λ P	I_F = 20mA Per chip	571	573	576	nm

*Measured from backlight surface.
**Luminance tolerance = (Max. – Min. / Max) x 100%

Internal Circuit Diagram
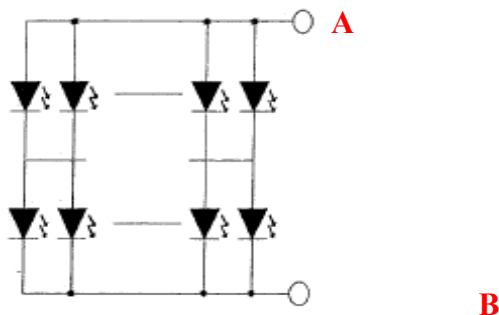
A: Anode   K: Cathode
LED Numbers: 13 x 2 = 26

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3. OPTICAL SPECIFICATIONS

3.1 LCD Driving Voltage

| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
LCM Recommend LCD Module Driving Voltage		Vop	Ta = -20℃	4.59	4.73	4.87	Volt	Note 1
			Ta = 25℃	4.0	4.2	4.4		
			Ta = 70℃	3.95	4.07	4.19		
Frame Frequency		fF		32	64	128	Hz	--
DC Resistance		R_{LC}		100	--	--	MΩ	--
Viewing Angle Cr≧2	Φ= 0°	$\theta 1$	Ta = 25℃	--	40	--	Degree	Note 3
	Φ= 180°	$\theta 2$		--	40	--		
	Φ= 90°	$\theta 3$		--	50	--		
	Φ= 270°	$\theta 4$		--	55	--		
Response Time	Rise Time	T_r		--	250	750	mS	Note 2
	Fall Time	T_f		--	300	900		
Contrast Ratio		Cr		--	10	--	--	Note 4

[Note 1] Definition of Operation Voltage (Vop)
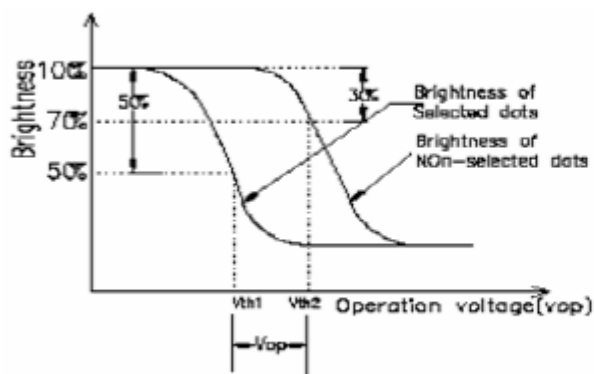
Positive type   **Negative type**

Conditions:

Vth 1: (1) Temperature: See Individual Specification.
      (2) Viewing Angle (θ): Minimum Value in Individual Specification
      (3) Driving Frequency: Maximum Value in Individual Specification.
      (4) Waveform: Selected Waveform.
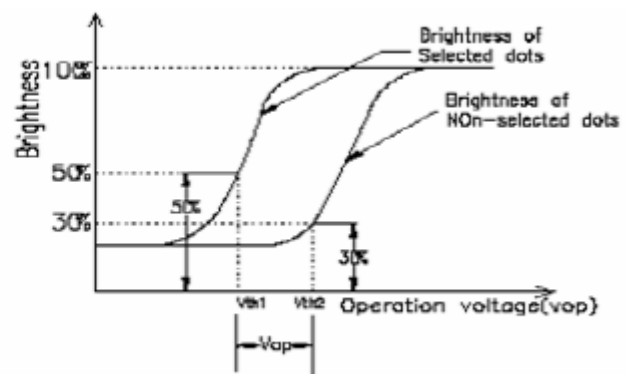
Vth 2: (1) Temperature: See Individual Specification.
      (2) Viewing Angle (θ): Maximum Value in Individual Specification
      (3) Driving Frequency: Maximum Value in Individual Specification.
      (4) Waveform: Non – Selected Waveform.

[Note 2] Definition of Response Time (Tr, Tf)
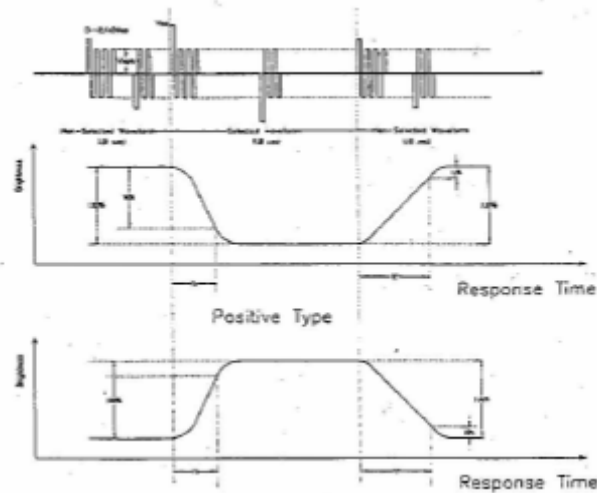
Negative Type

Conditions:
1. Viewing Angle (θ): Minimum Value in Individual Specification
2. Operating Voltage (Vop): See Individual Specification.
3. Driving Frequency: Typical Value in Individual Specification
4. Driving Waveform: See Individual Specification.
5. Measuring Temperature: See Individual Specification.

[Note 3] Definition of Viewing Direction and Angles
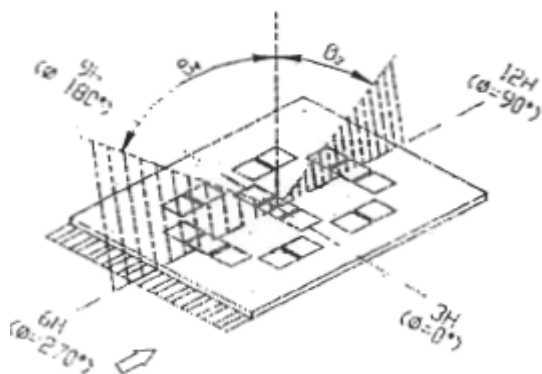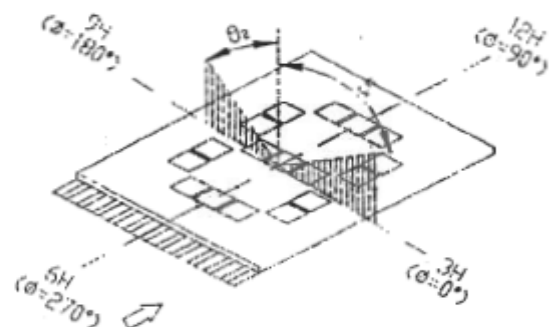
Viewing Direction   **Viewing Direction**

Viewing Angles: ($\theta 1, \theta 2, \theta 3, \theta 4$) measuring conditions:
1. Temperature: See Individual Specification
2. Operating Voltage (Vop): See Individual Specification
3. Contrast Ratio (Cr) Minimum: Cr = 2
4. Driving Frequency: See Individual Specification

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[Note 4] Definition of Contrast Ratio (Cr)

    1.   Brightness – Operating Voltage Curve
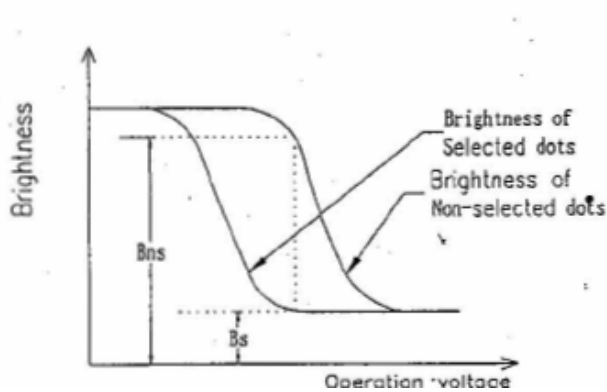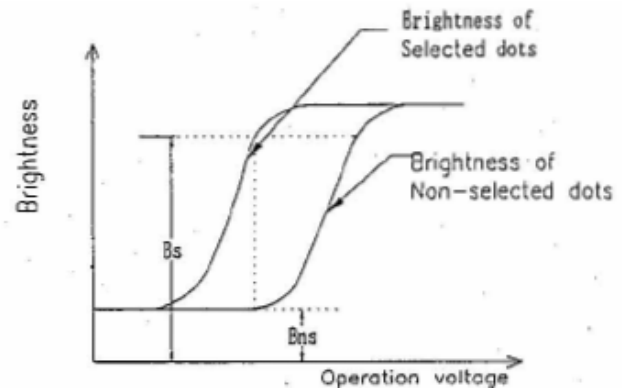
                  Positive type   **Negative type**

Conditions:
1. Operating Voltage: Vop
2. Temperature: See Individual Specification
3. Viewing Angles: See Individual Specification
4. Driving Frequency: Typical Value in Individual Specification
5. Driving Waveform: 1/N Duty, 1/a Bias waveform

    2.   Definition of Contrast Ratio (Cr)

$$\text{Positive Type: } Cr = \frac{\text{Brightness of Non – Selected dots (Bns)}}{\text{Brightness of Selected dots (Bs)}}$$

$$\text{Negative Type } Cr = \frac{\text{Brightness of Selected dots (Bs)}}{\text{Brightness of Non – Selected dots (Bns)}}$$

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4. I/O TERMINAL

Pin Assignment

Pin no.	Pin out	Description
1.	V_{SS}	Ground
2.	V_{DD}	Logic Circuit Power Supply
3.	Vo	Power Supply For LCD Panel
4.	RS	Data / Instruction Register Select
5.	R/W	Read / Write Select
6.	E	Enable Signal
7. ~ 14.	DB0 ~ DB7	3 – State I/O Data Bus
15.	BKL1	Power Supply for Backlight. See JUMPER EXPLANATION below.
16.	BKL2	100V / 400Hz AC for EL, 4.2V or 120 ~ 180mA DC for LED backlight Don't care if no backlight

JUMPER EXPLANATION
1. JP2 and JP3 are both short: Pin15 is short with pin2 and pin16 is short with pin1. Backlight powered up via V_{DD} (pin2) and V_{SS} (pin1). Customer does not need to supply power to pin15 and pin16.
2. JP2 short and JP3 open: Pin 15 is short with Pin2 and pin16 is NOT short with pin1. Backlight is powered with V_{DD} (same as logic circuit) and customer should keep pin 15 floating or connected to V_{DD}. Customer could control the backlight independently ON or OFF with pin16 L or H.
3. JP2 open and JP3 short: Pin 15 is NOT short with pin 2 and pin16 is short with pin1. Backlight is common VSS with logic and customer should keep pin16 floating or connected to GND (V_{SS}). Customer could control the backlight ON or OFF with pin15 H or L
4. JP2 and JP3 are both open: The backlight is fully independent with the logic, control the backlight via pin15 / pin16 or A / K.
5. J1 short: Bezel and screw holes connected to GND. J1 open: Bezel and screw holes floating
6. Never change the J2 and J3, it may burn off your system.

Note: J1, JP2 and JP3 are #0805 0 ohm resistors on the rear side of the PCB
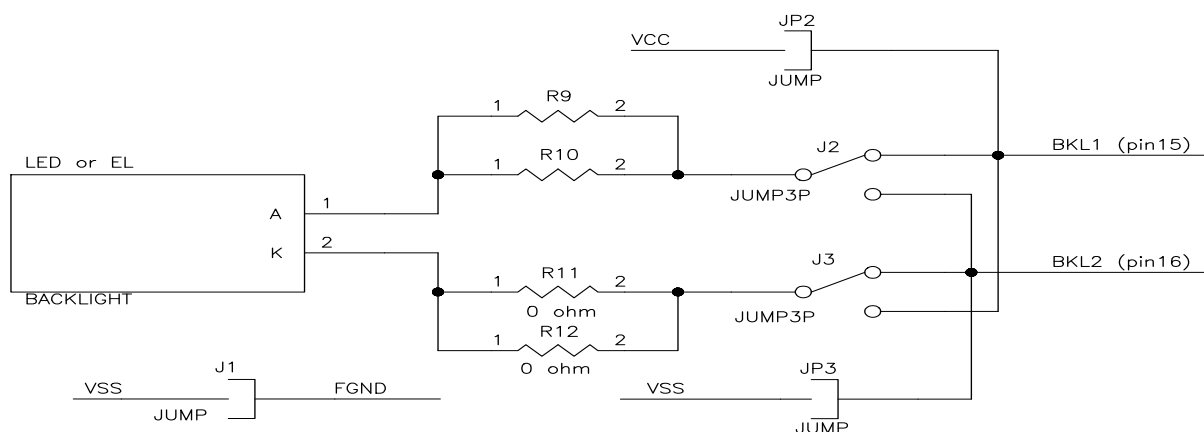
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Block Diagram

Power Supply

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5. TIMING CHARACTERISTICS

AC Characteristics (V_{SS}= 0V, V_{DD} = 4.5V to 5.0V, Ta = 0 to 50℃)

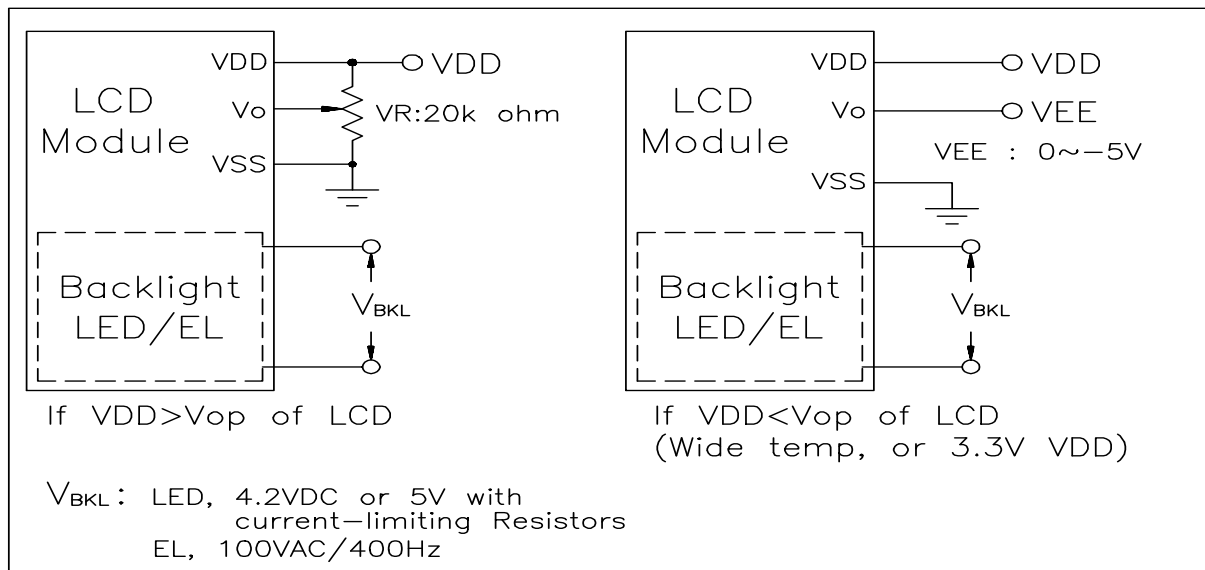| Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode	E Cycle Time	t_C	500	--	--	ns
	E Rise / Fall Time	t_R, t_F	--	--	20	ns
	E Pulse Width (High, Low)	t_W	230	--	--	ns
	R/W And RS Setup Time	t_{SU1}	40	--	--	ns
	R/W And RS Hold Time	t_{H1}	10	--	--	ns
	Data Setup Time	t_{SU2}	80	--	--	ns
	Data Hold Time	t_{H2}	10	--	--	ns
Read Mode	E Cycle Time	t_C	500	--	--	ns
	E Rise / Fall Time	t_R, t_F	--	--	20	ns
	E Pulse Width (High, Low)	t_W	230	--	--	ns
	R/W And RS Setup Time	t_{SU}	40	--	--	ns
	R/W And RS Hold Time	t_H	10	--	--	ns
	Data Setup Time	t_D	--	--	120	ns
	Data Hold Time	t_{DH}	5	--	--	ns

AC Characteristics (V_{SS}= 0V, V_{DD} = 2.7V to 4.5V, Ta = 0 to 50℃)

Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode	E Cycle Time	t_C	1000	--	--	ns
	E Rise / Fall Time	t_R, t_F	--	--	25	ns
	E Pulse Width (High, Low)	t_W	450	--	--	ns
	R/W And RS Setup Time	t_{SU1}	60	--	--	ns
	R/W And RS Hold Time	t_{H1}	20	--	--	ns
	Data Setup Time	t_{SU2}	195	--	--	ns
	Data Hold Time	t_{H2}	10	--	--	ns
Read Mode	E Cycle Time	t_C	1000	--	--	ns
	E Rise / Fall Time	t_R, t_F	--	--	25	ns
	E Pulse Width (High, Low)	t_W	450	--	--	ns
	R/W And RS Setup Time	t_{SU}	60	--	--	ns
	R/W And RS Hold Time	t_H	20	--	--	ns
	Data Setup Time	t_D	--	--	360	ns
	Data Hold Time	t_{DH}	5	--	--	ns

6. READ / WRITE TIMING CHART
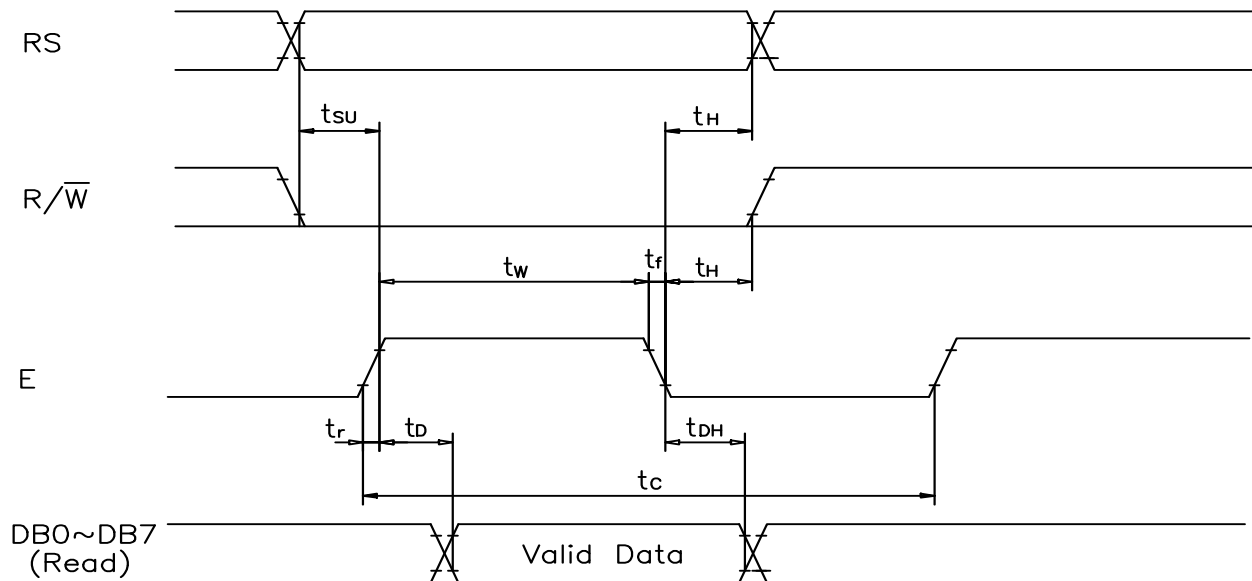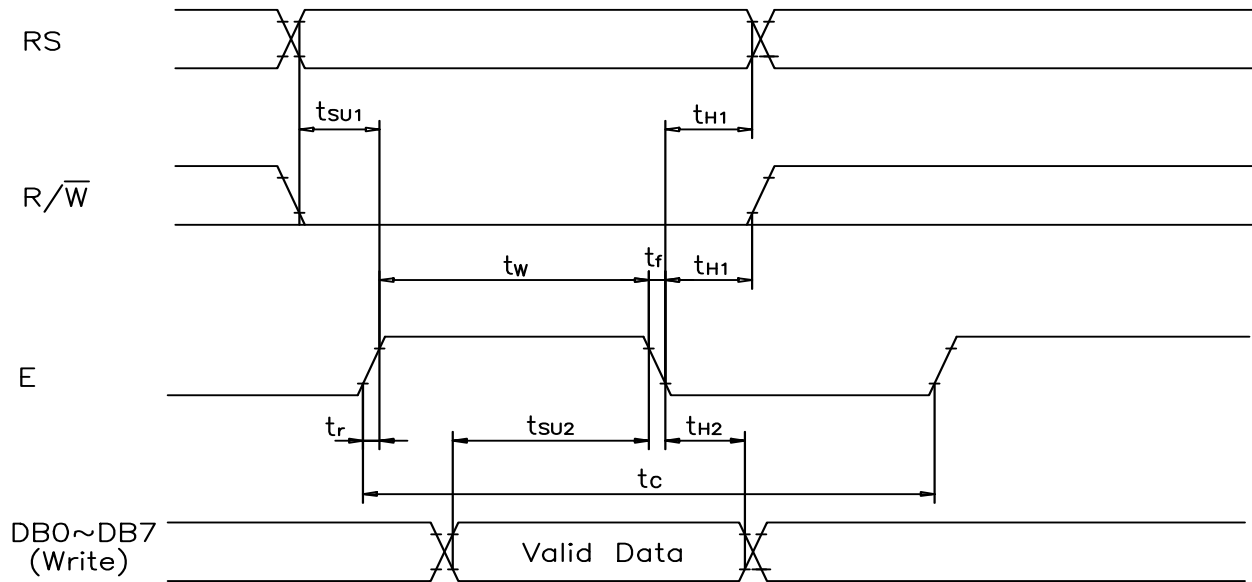
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7. <u>COMMANDS</u>

Instruction	Instruction Code										Description	Execution time (f_{OSC} is 270kHz)
	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	1.53mS
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.	1.53mS
Entry Mode	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and make shift of entire display enable.	39 μS
Display ON/OFF	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 μS
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 DDRAM data.	39 μS
Function Set	0	0	0	0	1	DL	N	F	*	*	Set interface data length (DL: 4 – bit / 8 – bit), numbers of display line (N: 1 – line / 2 – line), display font type(F: 5 X 8 dots / 5 X 11 dots)	39 μS
Set CG RAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39 μS
Set DD RAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39 μS
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 μS
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM / CGRAM).	43 μS
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM / CGRAM).	43 μS

* means don't care

8.   COMMANDS DESCRIPTION

Clear Display

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

Clear all the display data by writing "20H" (space code) to all DDRAM address, and set DDRAM address to "00H" into AC (address counter). Return cursor to the original status. namely, bring the cursor to the left edge on first line of the display. Make entry mode increment (I/D = "1").

Return Home

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	1	*

Return Home is cursor return home instruction. Set DDRAM address to "00H" into the address counter.
  Return cursor to its original site and return display to its original status, if shifted. Content of
  DDRAM is not changed.

Entry Mode Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	1	I/D	SH

Set the moving direction of cursor and display.
I/D: Increment / decrement of DDRAM address (cursor or blink)
    When I/D = "High", cursor/blink moves to right and DDRAM address is increased by 1.
    When I/D = "Low", cursor/blink moves to left and DDRAM address is decreased by 1.
    * CGRAM operates the same as DDRAM, when read from or write to CGRAM.
SH: Shift of entire display
    When DDRAM read (CGRAM read/write) operation or SH = "Low", shift of entire display is not performed.
     If SH = "High" and DDRAM write operation, shift of entire display is performed according to I/D value
     (I/D = "1", shift left, I/D = "0": shift right).

Display ON/OFF Control

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	C	B

Control display / cursor / blink ON/OFF 1 bit register.

D: Display ON/OFF control bit

When D = "High", entire display is turned on.

When D = "Low", display is turned off, but display data is remained in DDRAM.

C: Cursor ON/OFF control bit

When C = "High", cursor is turned on.

When C = "Low", cursor is disappeared in current display, but I/D register remains its data.

B: Cursor Blink ON/OFF control bit

When B = "High", cursor blink is on, that performs alternate between all the high data and display character at the cursor position.

When B = "Low", blink is off.

Cursor or Display Shift

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	1	S/C	R/L	*	*

Without writing or reading of display data, shift right / left cursor position or display.

This instruction is used to correct or search display data. (Refer to Table 4)

During 2 – line mode display, cursor moves to the 2nd line after 40th digit of 1st line.

Note that display shift is performed simultaneously in all the line.

When displayed data is shifted repeatedly, each line shifted individually.

When display shift is performed, the contents of address counter are not changed.

S/C	R/L	Operation
0	0	Shift cursor to the left, AC is decreased by 1.
0	1	Shift cursor to the right, AC is increased by 1.
1	0	Shift all of the display to the left, cursor moves according to the display.
1	1	Shift all of the display to the right, cursor moves according to the display.

Function Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
00	0	0	0	1	DL	N	F	*	*

DL: Interface data length control bit
   When DL = "High", it means 8-bit bus mode with MPU.
   When DL = "Low", it means 4-bit bus mode with MPU. So to speak, DL is a signal to select 8 – bit or
   4 – bit bus mode. When 4 – bit bus mode, it needs to transfer 4 – bit data by two times.
N: Display line number control bit
   When N = "Low", it means 1 – line display mode.
   When N = "High", 2 – line display mode is set.
F: Display font type control bit
   When F = "Low", it means 5 X 8 dots format display mode
   When F = "High", 5 x11 dots format display mode.

Set CG RAM Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0

Set CGRAM address to AC.
This instruction makes CGRAM data available from MPU.

Set DD RAM Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0

Set DDRAM address to AC.
This instruction makes DDRAM data available from MPU.
When 1 – line display mode (N = 0), DDRAM address is from "00H" to "4FH".
In 2 – line display mode (N = 1), DDRAM address in the 1st line is from "00H" to "27H", and
DDRAM address in the 2nd line is from "40H" to "67H".

Read Busy Flag and Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0

This instruction shows whether ST 7066 is in internal operation or not. If the resultant BF is High, it means
the internal operation is in progress and you have to wait until BF to be Low, and then the next
instruction can be performed. In this instruction you can read also the value of address counter.

Write Data to RAM

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Write binary 8 – bit data to DDRAM / CGRAM.
The selection of RAM from DDRAM, CGRAM, is set by the previous address set instruction: DDRAM
  address set, CGRAM address set. RAM set instruction can also determine the AC direction to RAM. After
  write operation, the address is automatically increased/decreased by 1, according to the entry mode.

Read Data to RAM

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Read binary 8 – bit data from DDRAM / CGRAM.
The selection of RAM is set by the previous address set instruction. If address set instruction of RAM is not
  performed before this instruction, the data that read first is invalid, because the direction of AC is not determined.
  If you read RAM data several times without RAM address set instruction before read operation, you can get
  correct RAM data from the second, but the first data would be incorrect, because there is no time margin to transfer
  RAM data.
In case of DDRAM read operation, cursor shift instruction plays the same role as DDRAM address
set instruction : it also transfers RAM data to output data register. After read operation address counter is
  automatically increased / decreased by 1 according to the entry mode. After CGRAM read operation, display
  shift may not be executed correctly.

Note: In case of RAM write operation, after this AC is increased / decreased by 1 like read operation. In this time,
AC indicates the next address position, but you can read only the previous data by read instruction.

9. DD RAM ADDRESSING

For 16×1 or 8×1 Display

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

For 16×2 or 8×2 Display

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

For 16×4 Display

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F

For 20 × 2 Display

Character	1	2	3	4	5	6	7	8	9	10	⋯	⋯	17	18	19	20
DD RAM Address	00	01	02	03	04	05	06	07	08	09	⋯	⋯	10	11	12	13
	40	41	42	43	44	45	46	47	48	49	⋯	⋯	50	51	52	53

For 20 × 4 Display

Character	1	2	3	4	5	6	7	8	9	10	⋯	⋯	17	18	19	20
	00	01	02	03	04	05	06	07	08	09	⋯	⋯	10	11	12	13
DD RAM Address	40	41	42	43	44	45	46	47	48	49	⋯	⋯	50	51	52	53
	14	15	16	17	18	19	1A	1B	1C	1D	⋯	⋯	24	25	26	27
	54	55	56	57	58	59	5A	5B	5C	5D	⋯	⋯	64	65	66	67

For 40 × 2 Display

Character	1	2	3	4	5	6	7	8	9	10	⋯	⋯	37	38	39	40
DD RAM Address	00	01	02	03	04	05	06	07	08	09	⋯	⋯	24	25	26	27
	40	41	42	43	44	45	46	47	48	49	⋯	⋯	64	65	66	67

For 40 × 4 Display

Character	E	1	2	3	4	5	6	7	8	9	10	⋯	⋯	37	38	39	40
DD RAM Address	E1	00	01	02	03	04	05	06	07	08	09	⋯	⋯	24	25	26	27
		40	41	42	43	44	45	46	47	48	49	⋯	⋯	64	65	66	67
	E2	00	01	02	03	04	05	06	07	08	09	⋯	⋯	24	25	26	27
		40	41	42	43	44	45	46	47	48	49	⋯	⋯	64	65	66	67

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10. CG RAM MAPPING

Character Code (DD RAM data) 7 6 5 4 3 2 1 0 (High Low)		CG RAM Address 5 4 3 2 1 0 (High Low)		Character Patterns (CG RAM data) 7 6 5 4 3 2 1 0 (High Low)	
0 0 0 0 * 0 0 0		0 0 0 · 0 0 0		* * * · 0 1 1 0 0	←Character Pattern
		· 0 0 1		· 1 0 0 1 0	
		· 0 1 0		· 0 0 1 0 0	
		· 0 1 1		· 0 1 0 0 0	
		· 1 0 0		· 1 1 1 1 0	
		· 1 0 1		· 0 0 0 0 0	
		· 1 1 0		· 0 0 0 0 0	
		· 1 1 1		· 0 0 0 0 0	←Cursor
0 0 0 0 * 0 0 1		0 0 1 · 0 0 0		* * * · 1 1 1 1 1	
		· 0 0 1		· 1 0 0 0 1	
		· 0 1 0		· 1 0 1 0 1	
		· 0 1 1		· 1 0 1 1 1	←Character Pattern
		· 1 0 0		· 1 0 1 0 1	
		· 1 0 1		· 1 0 0 0 1	
		· 1 1 0		· 1 1 1 1 1	
		· 1 1 1		· 0 0 0 0 0	←Cursor
⋮	⋮	⋮	⋮	⋮	
0 0 0 0 * 1 1 1		1 1 1 · 0 0 0		* * * · 1 1 1 1 1	
		· 0 0 1		· 1 0 0 0 1	
		· 0 1 0		· 1 1 1 0 1	
		· 0 1 1		· 1 0 0 0 1	←Character Pattern
		· 1 0 0		· 1 0 1 1 1	
		· 1 0 1		· 1 0 0 0 1	
		· 1 1 0		· 1 1 1 1 1	
		· 1 1 1		· 0 0 0 0 0	←Cursor

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11. CHARACTER FONT TABLE

12. RELIABILITY TEST

No	Item	Conditions		Note
1.	High Temp. Operation	70℃	240 HR	--
2.	High Temp. Storage	80℃	240 HR	--
3.	Low Temp. Operation	-20℃	240 HR	--
4.	Low Temp. Storage	-30℃	240 HR	--
5.	High Temp. / Humid Storage	60℃ 90% RH	240 HR	--
6.	Thermal Shock	-20℃, 30min +60℃, 30min	10 cycles	--
7.	Vibration Test (IEC – 68 – 2 – 6)	Frequency: 10~55 Hz Duration: 20 times, 6 min / time Amplitude: 0.75 mm	--	--
8.	Shock (IEC 68 – 2 – 27)	Duration: 11 mS Acceleration: 100g	--	X, Y, Z direction

13. APPEARANCE CHECK

CONDIITON OF APPEARANCE CHECK:
(a) Specimen shall be checked by eyes in distance of 30cm under 40w – fluorescence lamp.
(b) Checking direction shall be in 45 degree from perpendicular line op specimen surface.
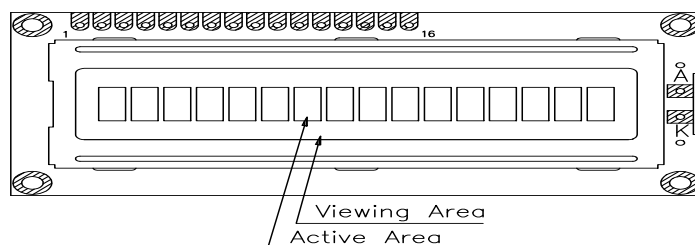
Viewing Area
Active Area

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14.   HANDLING PRECAUTIONS

(1)   Treat polarizer very carefully since it is easy to be damaged.

(2)   When cleaning the display surface, use soft cloth (e.g. gauss) with a solvent (recommended below)
and wipe lightly.
- ◆ ethyl alcohol
- ◆ iso – prcolol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvents:
- ◆ water
- ◆ ketone
- ◆ aromatics

(3)   Direct current causes electro-chemical reaction with remarkable degradation of the display quality.
Give careful consideration to prevent direct current at ON/OFF timing and during operation.

(4)   Avoid strong shock and drop from the height.

(5)   To prevent LCD panels from degradation, do not operate or store them exposed directly to sunshine
or high temperature / humidity.

(6)   Give careful consideration to avoid electrical static discharge with causes uneven contrast.

(7)   Even a small condensation on the contact pads (terminals) causes electro-chemical reaction which
makes missing row and column. Give careful attention to avoid condensation.
When assembling with zebra connector, clean the surface of the pads with alcohol and keep the air very clean.

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15. LCD PRODUCT QUALITY STANDARD

<div align="right">DISPLAY APPEARANCE</div>

No	Item	Criteria

1.	Inclusions (Black spot, white spot, dust)	(1) Round type
		   Diameter mm (a*) no of defect*
		   $a \leqq 0.20$ neglect
		   $0.20 < a \leqq 0.35$ 5max
		   $0.35 < a$ none
		(2) Linear type
		   Length mm (l) width mm (W) no. of defect
		   na $W \leqq 0.03$ neglect
		   $1 \leqq 3$ $0.03 < W \leqq 0.08$ 6
		   $3 < 1$ $0.08 < W$ none

2.	Scratch	1. Scratch on protective film is permitted.
		2. Scratch on polarizer shall be as follow:
		  (1) Round type
		    Diameter mm (a*) no of defect
		      $a \leqq 0.15$ neglect
		   $0.15 < a \leqq 0.20$ 2 max
		   $0.20 < a$ none
		  (2) Linear type
		    be judged bye 1. – (2) linear type

3.	Dent	Diameter < 1.5mm
4.	Bubble	Not exceeding 0.5mm average diameter is acceptable between glass and polarizing film
5.	Pin hole	$(a + b) / 2 \leqq 0.15$mm maximum number: ignored $0.15 < (a + b) / 2 \leqq 0.20$mm maximum number: 10

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No	Item	Criteria
6.	Dot defect	(a + b) /2 ≦ 0.20mm maximum number: ignored 0.20＜(a + b) /2 ≦ 0.30mm maximum number: 5 x = width
7.	Contrast irregularity (Spot)	Diameter spec no of defect a ≦ 0.50mm neglect 0.50＜a ≦ 0.75 5 0.75＜a ≦ 1.00 3 1.00＜a none
8.	Dot width	Design width ± 15%
9.	Color tone and uniformity	Obvious uneven color is not permitted

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16. <u>WARRANTY</u>

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.
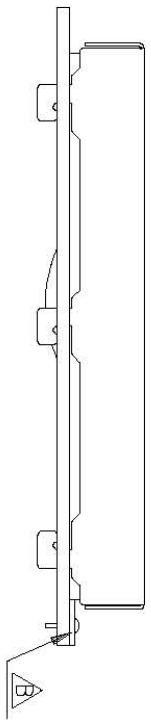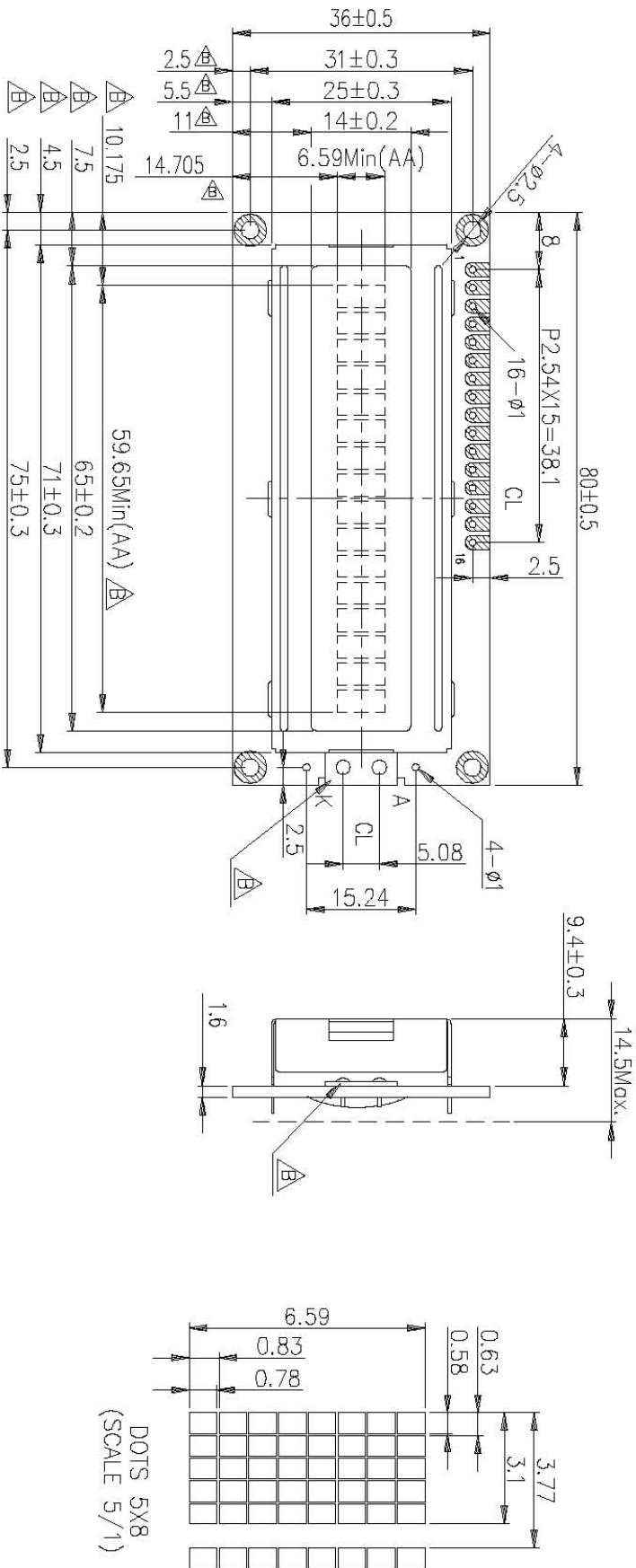
1 13 months guarantee starts from the date code.

2 We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.

3 We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.

4 We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.

5 We cannot accept responsibility for industrial property, which may arise through the use of your product, with exception to those issues relating directly to the structure or method of manufacturing of our product. Microtips-origin longer than one year from Microtips production.

17. <u>DIMENSIONAL OUTLINES</u>

- See the next page……..

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PIN ASSIGNMENT(CN1)

1.	Vss	5.	R/W	9.	DB2	13.	DB6
2.	Vdd	6.	E	10.	DB3	14.	DB7
3.	Vee	7.	DB0	11.	DB4	15.	LEDA
4.	RS	8.	DB1	12.	DB5	16.	LEDK

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	NO.				
	PART NAME	M-16100XH			
Card	DRAWN	CHECK	APP'D	Q'TY	UNIT:MM
	Chris Lo	PatChang		05/19/04'	DATE:

SCALE: 1 / 1 FOR MODULE: MTC-16100X(H)

MATERIAL

FINISH

DWG NO.: C16100X1

FILE: Dwg\Design\LCM\MTC\MTC-16100X\2D

SHEET 1 / 1   Rev: **B**

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON
FRACTIONS DECIMALS ANGLES
0.10 0.5'

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	Production Release	Chris Lo			07/22/99'
B	Show LED Position &Modify Dimension	Card	PatChang		05/19/04'

36±0.5
31±0.3
25±0.3
14±0.2
6.59Min(AA)
2.5
5.5
11
14.705
10.175
7.5
4.5
2.5
80±0.5
59.65Min(AA)
75±0.3
71±0.3
65±0.2
P2.54X15=38.1
16-Ø1
CL
2.5
8
2.5
CL
5.08
4-Ø1
15.24

9.4±0.3
14.5Max.
1.6

6.59
0.83
0.78
0.63
0.58
3.77
3.1
DOTS 5X8
(SCALE 5/1)

Mouser Electronics

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