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Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	1 / 21

LCD MODULE SPECIFICATION FOR CUSTOMER'S APPROVAL

CUSTOMER : _____

MODULE TYPE : NMTG-S12864BFYHSGY-C

APPROVED BY: (FOR CUSTOMER USE ONLY)

Approved by	Checked by		Made by
			



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	2 / 21

Revise Records

Rev.	Date	Contents	Written	Approved
A	2011/02/24	Initial Edition	Jill Hsu	Steele Lee

Special Notes

Note1.	Avant IC updated edition.
Note2.	
Note3.	
Note4.	
Note5.	



Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	3 / 21

CONTENTS

ITEM	PAGE
FEATURES	4
GENERAL SPECIFICATION	5
ABSOLUTE MAXIMUM RATING	5
ELECTRICAL OPTICAL	6
BACKLIGHT ABSOLUTE MAXIMUM RATING	6
ELECTRICAL CHARACTERISTIC	7
OPTICAL CHARACTERISTIC	7
INTERFACE PIN ASSIGNMENT	10
BLOCK DIAGRAM	11
POWER SUPPLY DIAGRAM	11
TIMING CHARACTERISTICS	12
DISPLAY COMMANDS	14
MEMORY MAPPING	15
ADDRESS CONFIGURATION OF DISPLAY DATA RAM	16
RELIABILITY TEST	17
APPEARANCE CHECK	17
HANDLING PRECAUTIONS	18
LCD PRODUCT QUALITY STANDARD	19
WARRANTY	20
DIMENSIONAL OUTLINES	21



Microtips Technology Inc.

Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	4 / 21

SPECIFICATION FOR
LIQUID CRYSTAL DISPLAY MODULE
MODEL NO. : NMTG-S12864BFYHSGY-C

View Direction	<input checked="" type="checkbox"/> 6 O'clock		<input type="checkbox"/> 12 O'clock		
LCD Type	<input type="checkbox"/> FSTN Positive		<input type="checkbox"/> FSTN Negative		
	<input type="checkbox"/> STN Gray	<input checked="" type="checkbox"/> STN Yellow Green	<input type="checkbox"/> STN Blue		
Rear Polarizer	<input type="checkbox"/> Reflective	<input checked="" type="checkbox"/> Transflective		<input type="checkbox"/> Transmissive	
Backlight Type	<input checked="" type="checkbox"/> LED	<input type="checkbox"/> EL	<input checked="" type="checkbox"/> Internal Power		<input checked="" type="checkbox"/> 5V input
		<input type="checkbox"/> CCFL	<input type="checkbox"/> External Power		<input type="checkbox"/> 24V input
Backlight Color	<input type="checkbox"/> White	<input type="checkbox"/> Amber	<input type="checkbox"/> Blue Green	<input checked="" type="checkbox"/> Yellow Green	<input type="checkbox"/> Other
Temperature Range	<input type="checkbox"/> Normal		<input checked="" type="checkbox"/> Wide		<input type="checkbox"/> Super Wide
EL Driver IC	<input type="checkbox"/> Build-in		<input checked="" type="checkbox"/> Not Build-in		
Touch Screen	<input type="checkbox"/> With		<input checked="" type="checkbox"/> Without		
LCD LSI	SBN640G21 / SBN0064G-D				

TO BE VERY CAREFUL !

The LCD driver ICs are made by CMOS process, which are very easy to be damaged by static charge, make sure the user is grounded when handling the LCM.



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	5 / 21

GENERAL SPECIFICATION

Item	Content
Display Resolution	128(W)×64(H)
Dimensional Outline(mm)	75.0(W)×52.7(H)×9.0max(D)
Dot Size	0.40(W)mm×0.40(H)mm
Dot Pitch	0.43(W)mm×0.43(H)mm
Display mode	Transflective/ Positive Type
Circuit	Avant IC
Interface	Data (D0~D7), D/I, R/W, E, RST, CS1, CS2, V _{EE}

ABSOLUTE MAXIMUM RATING

(1) Electrical Absolute 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 _{EE}	-0.3	19.0	Volt	--
Input Voltage	V _I	-0.3	V _{DD} +0.3	Volt	--
Current for LED backlight	--	--	200	mA	--
Static Electricity	--	--	--	--	Note 1

Note 1: Operator should be grounded during handling LCM.

(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°C	+50°C	-20°C	+70°C	-20°C	+70°C	-30°C	+80°C
Humidity(without condensation)	Note 2,4		Note 3,5		Note 4,5		Note 4,6	

Note 2: Ta ≤ 50°C : 80% RH max

Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 3: Ta at -20°C will be <48hrs at 70°C will be <120hrs when humidity is higher than 75%.

Note 4: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 5: Ta ≤ 70°C : 75RH max

Ta > 70°C : absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 6: Ta at -30°C will be <48hrs, at 80 °C will be <120hrs when humidity is higher than 75%.



Microtips Technology Inc.

Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	6 / 21

ELECTRICAL OPTICAL

Characteristics

Ta = 25°C

Parameter	Symbol	Rating			Unit	Test Condition
		Min.	Typ	Max.		
Total Forward Voltage	VF	3.8	4.05	4.3	V	--
Average Luminous Intensity	IV	18	25	--	cd/m ²	--
Luminous Tolerance	IV-m	50	--	--	%	--
Chromaticity Coordinate *	X	0.4000	0.4441	0.4878	--	--
Chromaticity Coordinate *	y	0.5906	0.5547	0.5152	--	--

Note1: This product must be in VF MAX. under the testing.

Note2: The current should be set at 2x50mA when the finished goods is under the testing.

BACKLIGHT ABSOLUTE MAXIMUM RATING

Ta = 25°C

Parameter	Symbol	Rating	Unit
Power Dissipation	Po	860	W
Peak Forward Current	IF	200	mA
Reverse Voltage	VR	8	V
Operating Temperature Range	TOPR	-20°C TO + 70°C	--
Storage Temperature Range	TSTO	-30°C TO + 80°C	--



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	7 / 21

ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ	Max.	Unit
Power Supply for Logic	$V_{DD} - V_{SS}$	--	4.5	5.0	5.5	Volt
Input Voltage	V_{IL}	L level	0	--	0.8	Volt
	V_{IH}	H level	$V_{DD}-2.2$	--	V_{DD}	Volt
Power Supply Current for LCM	$I_{DD}(\text{LED B/L OFF})$	$V_{DD} = 5.0V$ $T_a = 25^\circ C$ $V_{DD} - V_{EE} = 10.3V$ $V_{LED} = 5.0V$	--	1.5	1.8	mA
	I_{EE}		--	0.6	1.0	--
	I_{LED}		--	100	150	--
Power Supply for EL Backlight	V_{EL}		--	100V/ 400Hz	--	--

OPTICAL CHARACTERISTICS

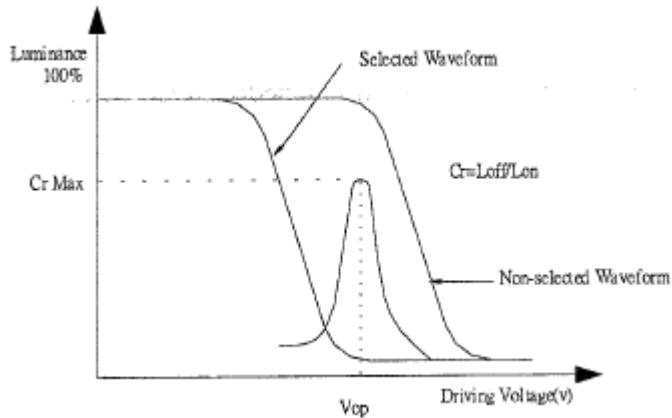
Item	Symbol	Condition	Min.	Typ	Max.	Unit	note
LCM Recommend LCD Module Driving Voltage	V_{op}	$T_a = -20^\circ C$	9.14	9.64	10.14	Volt	1.
		$T_a = 25^\circ C$	8.60	9.10	9.60		
		$T_a = 70^\circ C$	8.06	8.56	9.06		
Viewing Angle	Front-Back	$\theta = 0^\circ$	30	92	--	deg.	3.
	Left-Right	$\theta = 0^\circ$	60	90	--	deg.	
Rise Time	T_r	$V_{DD} - V_{EE} = 10.3V$ $T_a = 25^\circ C$	--	90	220	mS	2.
Fall Time	T_f		--	210	200		
Contrast	Cr		2.0	6.0	--		



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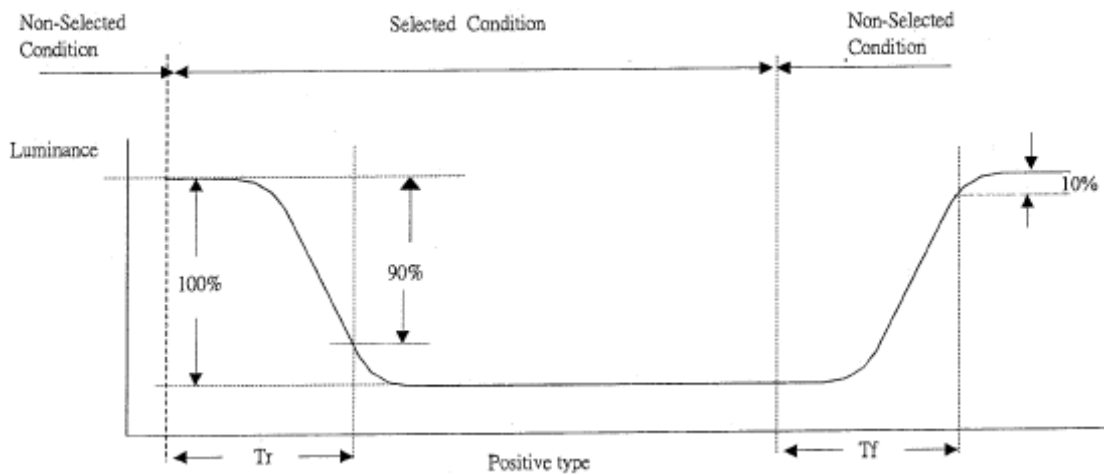
Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	8 / 21

[Note 1] Definition of Operation Voltage (Vop)



$\theta = 0^\circ \quad \phi = 0^\circ$

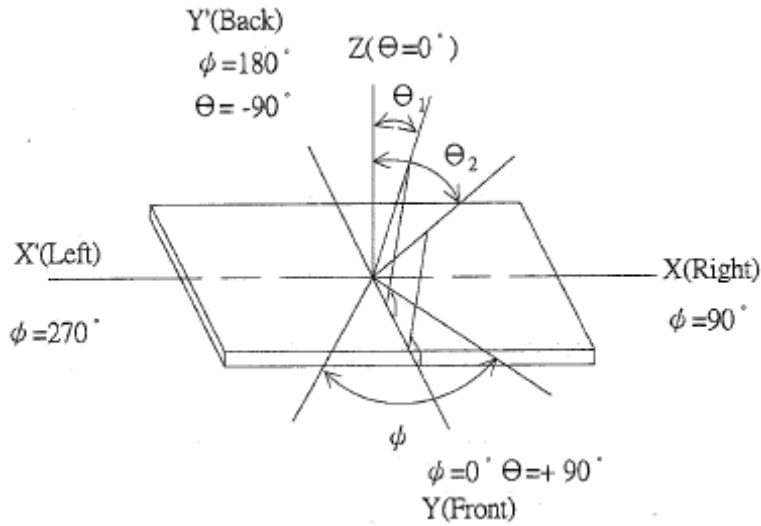
[Note 2] Definition of Response Time (Tr, Tf)



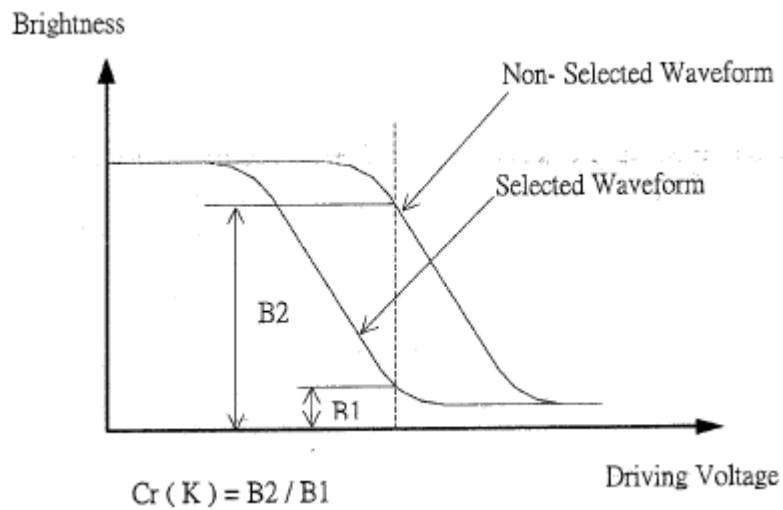
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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	9 / 21

[Note 3] Definition of Angle θ & ϕ



[Note 4] Description of Contrast Ratio (K)



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	10 / 21

INTERFACE PIN ASSIGNMENT

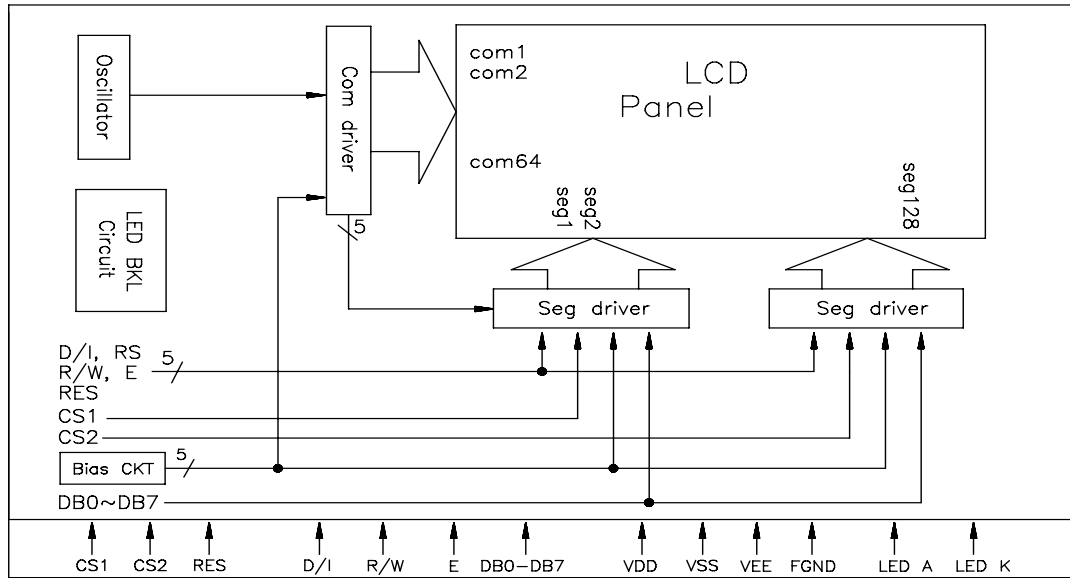
Pin No.	Pin Out	I/O	Description
1.	V _{DD}	--	Logic supply voltage
2.	V _{SS}	--	GND
3.	V _{EE}	--	Supply Voltage for LCD panel.
4. | 11.	DB0 | DB7	I/O	Data bus. 3-state I/O common terminal.
12.	/CS1	I	Chip-select for the left half of the display. Active LOW.
13.	/CS2	I	Chip-select for the right half of the display. Active LOW.
14.	/RST	I	Setting the RES signal to Low level can initialize the following registers. 1. ON/OFF register 0 set(Display off) 2. Display start line register 0 set(display starts from line 0) After releasing reset, this condition can be changed only by software.
15.	R/W	I	Read/Write R/W=high : Data of DB0~DB7 can be read by CPU. R/W=low : Data of DB0~DB7 can be written into LCD driver IC at the falling edge of E when CS1 and CS2 is high.
16.	D/I	I	Data/Instruction D/I=high : Indicates that data of DB0~DB7 is display data. D/I=low : Indicates that data of DB0~DB7 is instruction.
17.	E	I	Enable When write(R/W=low) : Data of DB0~DB7 is latched at the fall of E When read(R/W=high) : Data is read while E is at high level.
18.	FGND	--	Frame Ground
19.	BKL _A	--	Power supply for backlight. (4.2V/100~150 mA DC for LED backlight, 110V/400Hz AC for EL)
20.	BKL _K	--	



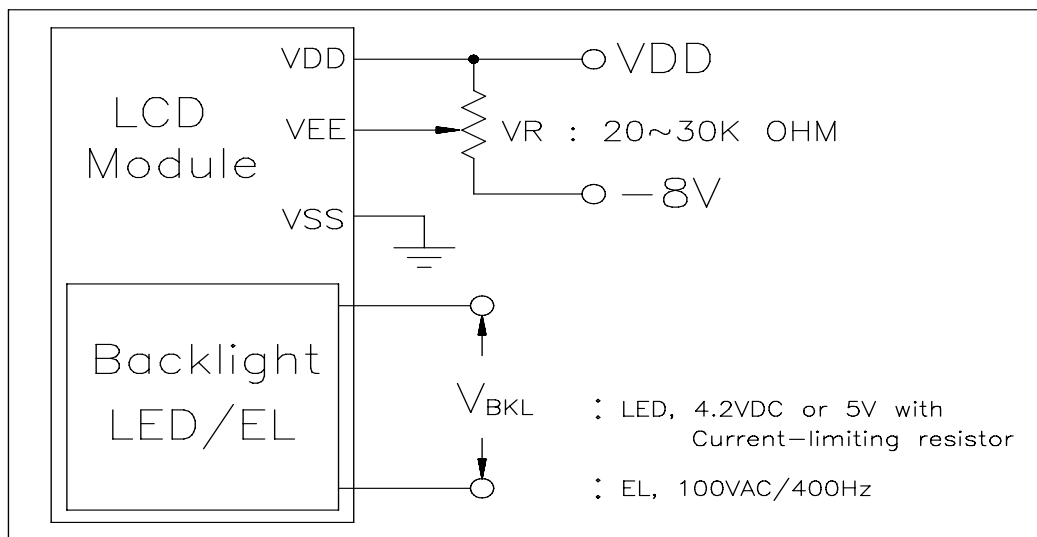
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Messrs.				
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.
			A	Feb. 24, 11
			Page.	11 / 21

BLOCK DIAGRAM



POWER SUPPLY



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	12 / 21

TIMING CHARACTERISTICS

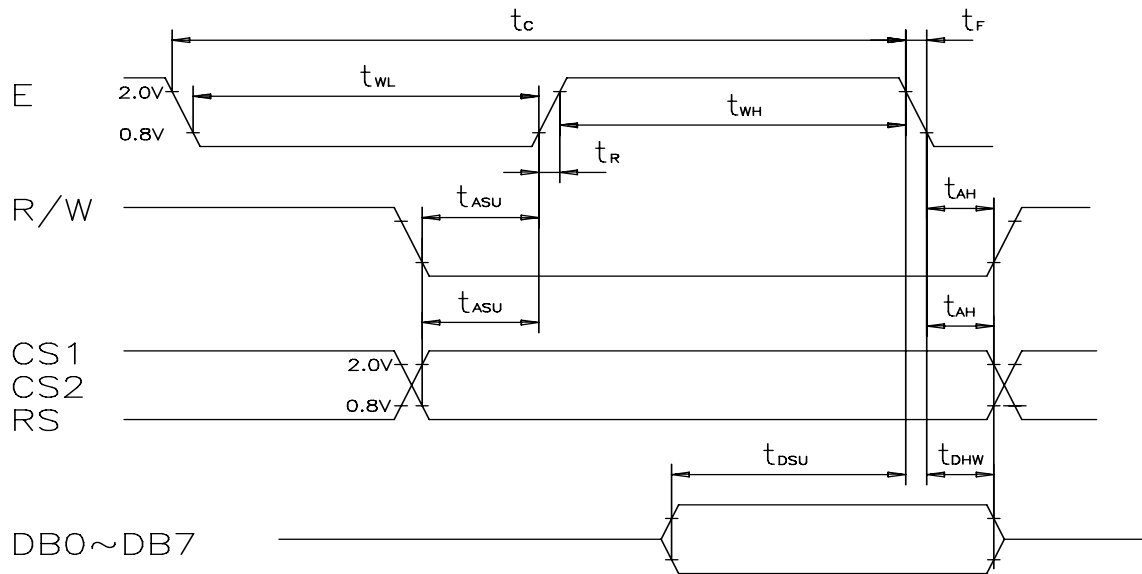
MPU interface timing: ($V_{SS}=0V$, $V_{DD}=4.5V\sim 5.5V$, $T_a=-20$ to $60^{\circ}C$)

Item	Symbol	Min.	Typ.	Max.	Unit
E Cycle Time	t_C	1000	--	--	ns
E High Level Width	t_{WH}	450	--	--	ns
E Low Level Width	t_{WL}	450	--	--	ns
E Rise Time	t_R	--	--	25	ns
E Fall Time	t_F	--	--	25	ns
Address Setup Time	t_{ASU}	140	--	--	ns
Address Hold Time	t_{AH}	10	--	--	ns
Data Setup Time	t_{DSU}	200	--	--	ns
Data Delay Time	t_D	--	--	320	ns
Data Hold Time(Write)	t_{DHW}	10	--	--	ns
Data Hold Time(Read)	t_{DHR}	20	--	--	ns

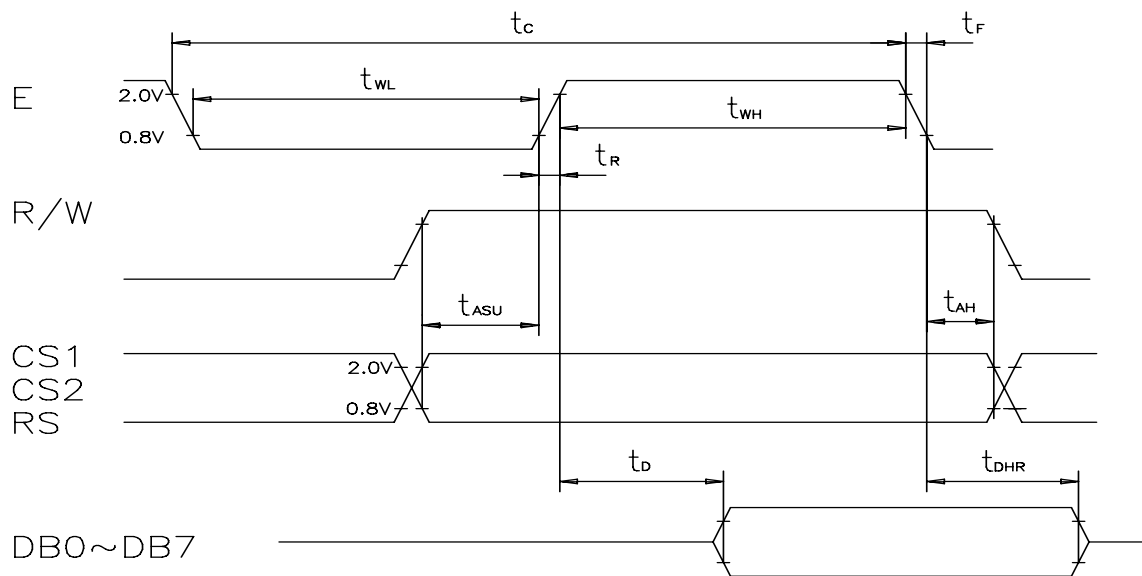


Microtips Technology Inc.

Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	13 / 21



MPU Write Timing



MPU Read Timing



Microtips Technology Inc.

Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	14 / 21

DISPLAY COMMANDS

The display commands shown below control the internal state of the LCD driver ICs. Commands are sent from CPU to LCD module for the display control.

Command	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display ON/OFF	0	0	0	0	1	1	1	1	1	1/0	To control the display ON or OFF. The internal status and display RAM data are not affected. 0:OFF, 1:ON	
Set address (Y address)	0	0	0	1	Y address (0~63)						To set the Y address in the Y address counter.	
Set page (X address)	0	0	1	0	1	1	1	Page(0~7)			To set the X address at the X address register.	
Display Start Line	0	0	1	1	Display Start Line(0~63)						To indicate the display data RAM displayed at the top of the screen.	
Status Read	0	1	Busy	0	ON/OFF	Reset	0	0	0	0	To read status of the LCD controller IC: Busy 0:Ready, 1: In operation ON/OFF: 0:Display ON, 1:Display OFF Reset: 0:Normal, 1:Reset	
Write display data	1	0	Write Data									To write data into display data RAM. Y address is increased by 1 after this command.
Read Display data	1	1	Read Data									To read data from display data RAM to the data bus.



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	15 / 21

MEMORY MAPPING

Relationship between RAM data and display

		RAM Y address(Y0 ~Y127)							Data						
1st page(X=0)	Line 0→	0	1	1	1	0	0	.....	0	0	1	0	0	0	←DB0(LSB)
	Line 1→	1	0	0	0	1	0	.....	0	0	1	1	0	0	←DB1
	Line 2→	1	0	0	0	1	0	.....	0	0	1	0	1	0	←DB2
	Line 3→	1	0	0	0	1	0	.....	0	0	1	0	1	0	←DB3
	.....	1	1	1	1	1	0	.....	0	0	1	0	0	0	←DB4
	.....	1	0	0	0	1	0	.....	1	1	1	0	0	0	←DB5
	.....	1	0	0	0	1	0	.....	1	1	1	0	0	0	←DB6
	Line 7→	0	0	0	0	0	0	.....	0	0	0	0	0	0	←DB7(MSB)
2nd page(X=1)	Line 8→	1	1	1	1	0	0	.....	0	1	1	1	0	0	←DB0(LSB)
	Line 9→	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB1
	Line 10→	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB2
	.....	1	1	1	1	0	0	.....	1	1	1	0	1	0	←DB3
	.....	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB4
	.....	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB5
	.....	1	1	1	1	0	0	.....	0	1	1	1	0	0	←DB6
	Line 15→	0	0	0	0	0	0	.....	0	0	0	0	0	0	←DB7(MSB)
.....	
8th page(X=7)	Line 56→	1	0	0	0	1	0	.....	0	0	0	0	0	0	←DB0(LSB)
	.....	1	0	0	0	1	0	.....	0	0	0	0	0	0	←DB1
	.....	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB2
	.....	1	1	1	1	1	0	.....	1	0	1	0	1	0	←DB3
	1	0	0	0	1	0	1	0	0	1	0	0	←DB4
	1	0	0	0	1	0	1	0	0	1	0	0	←DB5
	Line 62→	1	0	0	0	1	0	0	1	1	0	1	0	←DB6
	Line 63→	0	0	0	0	0	0	←DB7(MSB)



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	16 / 21

ADDRESS CONFIGURATION OF DISPLAY DATA RAM

		Y address	
		0 1 2 3	126 127
X=0→	DB0	Page0	
	To DB7	Line0 Line7	
X=1→	DB0	Page1	
	To DB7	Line8 Line15	
X=2→	DB0	Page2	
	To DB7	Line16 Line23	
X=3→	DB0	Page3	
	To DB7	Line24 Line31	
X=4→	DB0	Page4	
	To DB7	Line32 Line39	
X=5→	DB0	Page5	
	To DB7	Line40 Line47	
X=6→	DB0	Page6	
	To DB7	Line48 Line55	
X=7→	DB0	Page7	
	To DB7	Line56 Line63	

Address configuration of Display Data RAM



Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	17 / 21

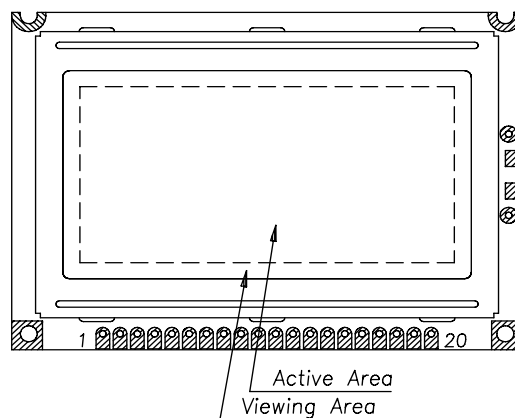
RELIABILITY TEST

No	Item	Conditions		Note
1.	High Temp. Operation	70°C	240 Hr	--
2.	High Temp. Storage	80°C	240 Hr	--
3.	Low Temp. Operation	-20°C	240 Hr	--
4.	Low Temp. Storage	-30°C	240 Hr	--
5.	High Temp./Humid Storage	40°C 90%RH	240 Hr	--
6.	Thermal Shock	-20°C ,30min +40°C ,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

APPEARANCE CHECK

CONDIITON OF APPEARANCE CHECK:

(1) Specimen shall be checked by eyes in distance of 30cm under 40w-fluorescence lamp.



(2) Checking direction shall be in 45 degree from perpendicular line op specimen surface.



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Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	18 / 21

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-procolol

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.



Microtips Technology Inc.

Messrs.					
Product Specification	Model:	NMTG-S12864BFYHSGY-C	Rev. No.	Issued Date.	Page.
			A	Feb. 24, 11	20 / 21

WARRANTY

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.

DIMENSIONAL OUTLINES

- See the next page.....



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