



MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI1602B-G

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	2010-01-22
Our Reference	

**MODE OF DISPLAY****Display mode** TN positive TN negativeSTN : Yellow green Grey Blue (negative) FSTN positive FSTN negative**Display condition** Reflective type Transflective type Transmissive type Others**Viewing direction** 6 O' clock 12 O' clock 3 O' clock 9 O' clock

GENERAL DESCRIPTION

Display mode : 16 characters x 2 lines, COG LCD module
 Interface : 4-bit parallel
 Driving method : 1/16 duty, 1/5 bias
 Controller IC : Novatek NT7603 or equivalent
 For the detailed information, please refer to the IC specifications.

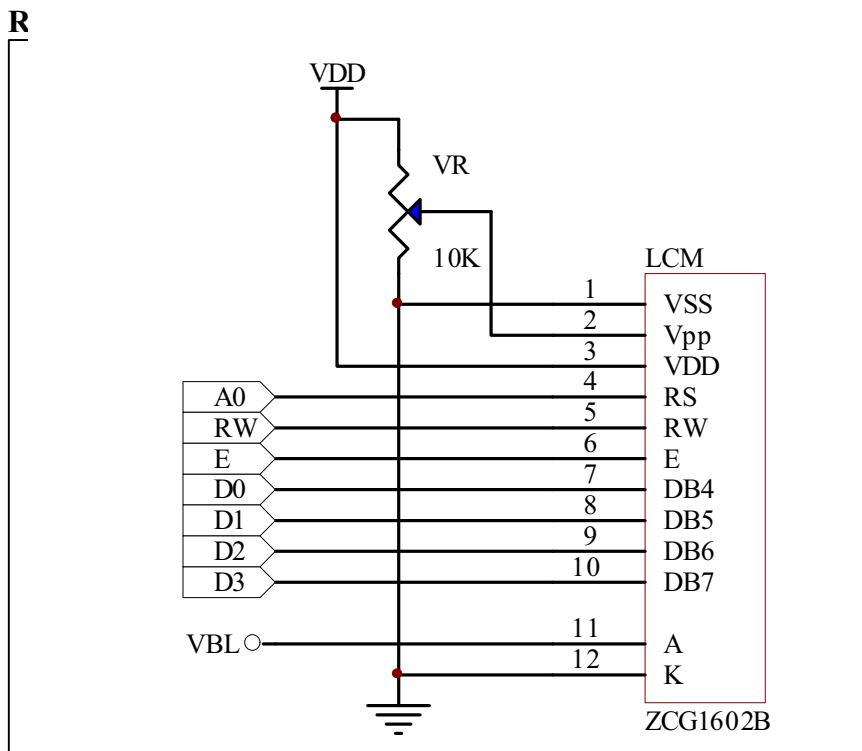
MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
No Backlight (N)	48.2(L)x21.0(W)x2.9(H)	mm	Character Pitch	2.64(L)x3.95(W)	mm
LED Side Backlight (L)	54.0(L)x21.0(W)x6.8(H)	mm	Character Size	2.24(L)x3.55(W)	mm
Array Backlight (A)	48.2(L)x21.0(W)x6.8(H)	mm	Dot Size	0.4(L)x0.4(W)	mm
Viewing Area	43.9(L)x10.0(W)	mm	—	—	—

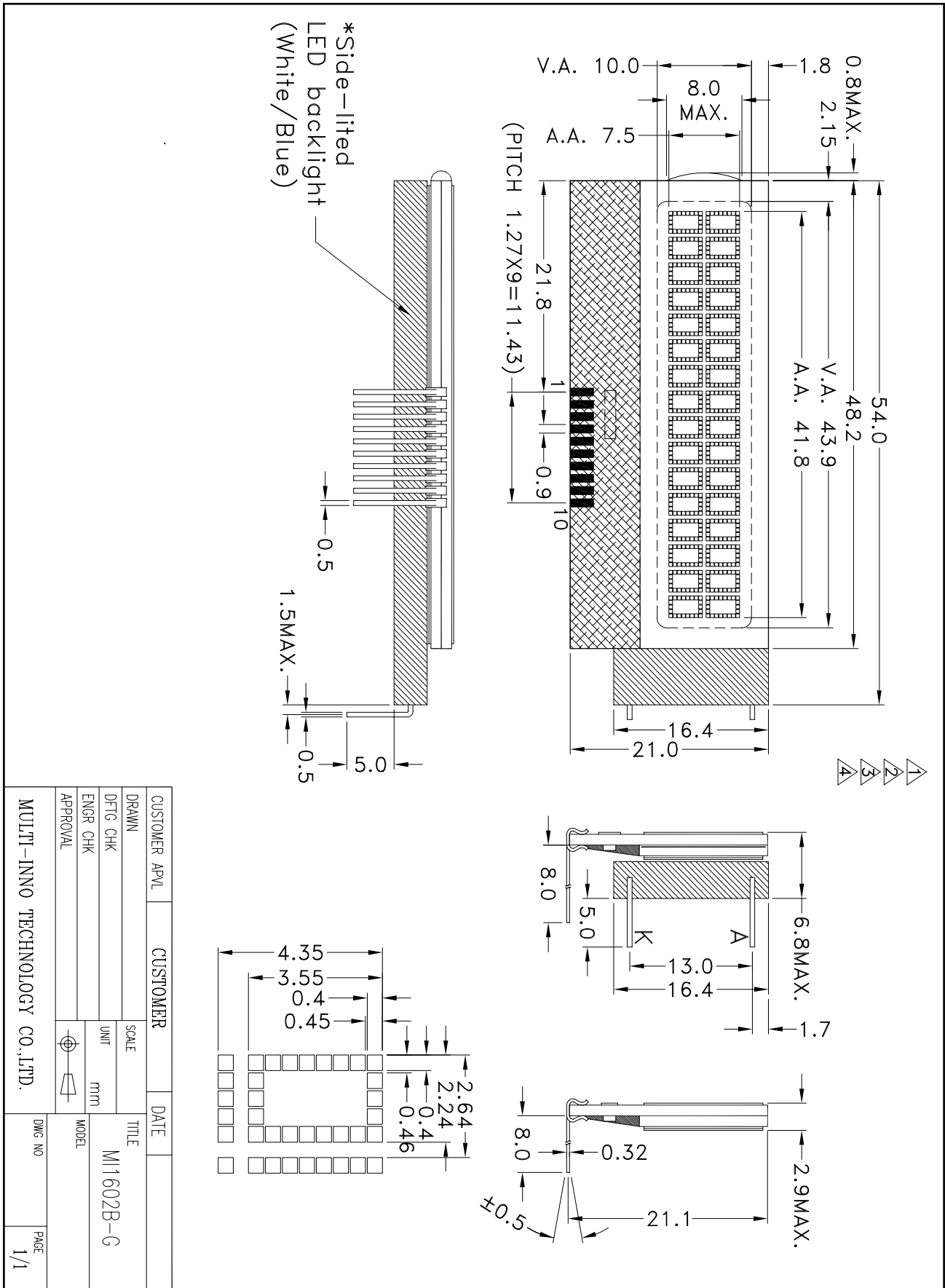
CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	GND	0V power supply	7	DB4	Data bus
2	VPP	Input voltage for LCD	8	DB5	
3	VDD	5V Power supply	9	DB6	
4	RS	Register Select	10	DB7	
5	RW	Read / Write select	11	A	Backlight supply terminal(+)
6	E	Chip Enable	12	K	Backlight supply terminal(-)

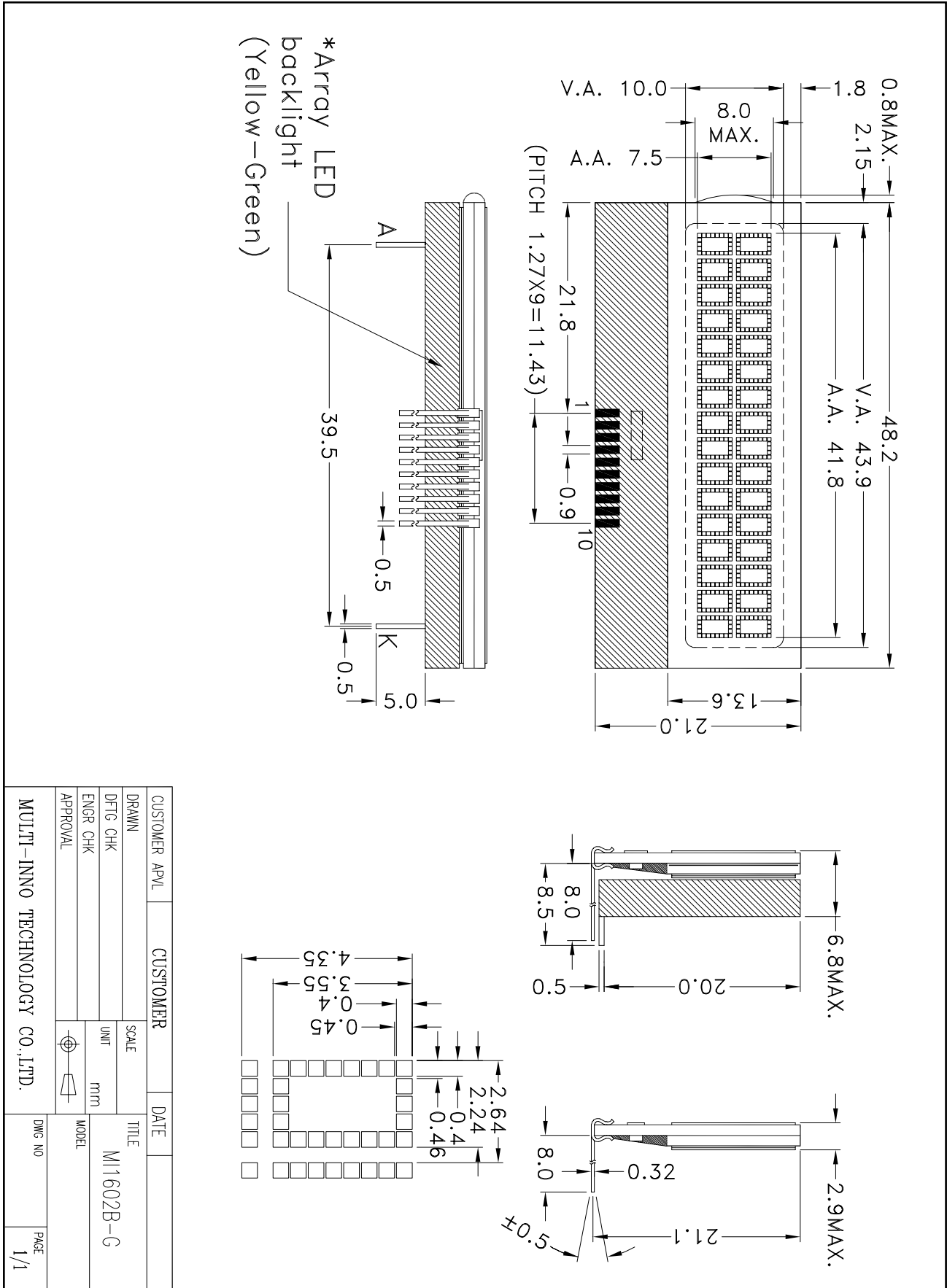
(*)Note: Pin 11, 12 are for side-lited LED backlight revision only.



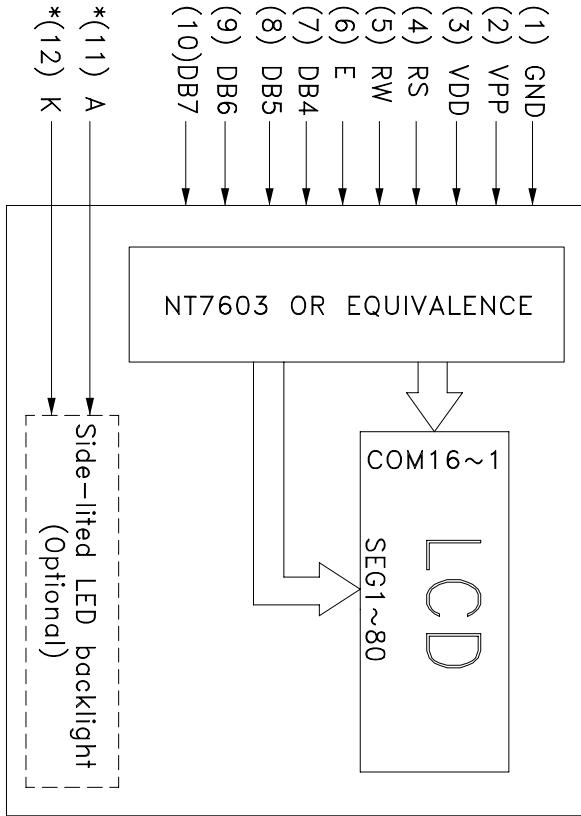
COUNTER DRAWING OF MODULE DIMENSION (SIDE LED BACKLIGHT)



COUNTER DRAWING OF MODULE DIMENSION (ARRAY LED BACKLIGHT)



COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



PIN NUMBER	SYMBOL	FUNCTION
1	GND	0V power supply
2	VPP	Input voltage for LCD
3	VDD	5V power supply
4	RS	Register select
5	RW	Read / Write select
6	E	Chip enable
7	DB4	Data bus
8	DB5	
9	DB6	
10	DB7	
11	A	Backlight supply terminal (+)
12	K	Backlight supply terminal (-)

CUSTOMER APVL	CUSTOMER	DATE
DRAWN	SCALE	TITLE
DFTG CHK	UNIT	MI1602B-G
ENGR CHK	mm	MODEL
APPROVAL		
MULTI-INNO TECHNOLOGY CO.,LTD.		DWG NO
		PAGE
		1/1

**ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, @Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.00	5.25	V	“H”Level Input Voltage	VIH	2.2	—	VDD	V
Supply Current	IDD	—	1.1	1.6	mA	“L”Level Input Voltage	VIL	0.0	—	0.6	V
Input Voltage for LCD	VO	0.30	0.50	0.70	V	—	—	—	—	—	—
Backlight Voltage						Backlight Current					
EL (@ Frequency 400Hz)	—	—	—	—	—	—	—	—	—	—	—
Side-lited LED						Side-lited LED					
White (current@20mA)	VBL	—	3.5	4.3	V	White	IBL	—	20	25	mA
Blue (current@20mA)	VBL	—	3.3	4.0	V	Blue	IBL	—	20	25	mA
Yellow Green (current@60mA)	VBL	—	2.0	2.4	V	Yellow Green	IBL	—	60	75	mA
Red (current@60mA)	VBL	—	2.0	2.4	V	Red	IBL	—	20	25	mA

ABSOLUTE MAXIMUM RATINGS

Please make sure not to exceed the following maximum rating values under the worst application conditions

Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage	VDD	7	7	V
Input Voltage	VT	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	T _{opr}	0 to 50	-20 to 70	°C
Storage Temperature	T _{stg}	-10 to 60	-30 to 80	°C

**Instruction Set**

Instruction	Code										Function	Execution time (max) (f _{osc} = 250KHz)	
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Display Clear	0	0	0	0	0	0	0	0	0	1	Clear entire display area.	1.64ms	
Display/ Cursor Home	0	0	0	0	0	0	0	0	1	*	Restore display from shift and load address counter with DD RAM address 00H.	1.64ms	
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Specify direction of cursor movement and display shift mode. This operation takes place after each data transfer (read/write).	40μs	
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	Specify activation of display (D) cursor (C) and blinking of character at cursor position (B).	40μs	
Display/ Cursor Shift	0	0	0	0	0	1	S/C	R/L	*	*	Shift display or move cursor.	40μs	
Function Set	0	0	0	0	1	DL	N	F	*	*	Set interface data length (DL), number of display line (N), and character font (F).	40μs	
RAM Address Set	0	0	0	1	ACG					Load the address counter with a CG RAM address. Subsequent data access is for CG RAM data.		40μs	
DD RAM Address Set	0	0	1	ADD					Load the address counter with a DD RAM address. Subsequent data access is for DD RAM data.		40μs		
Busy Flag/ Address Counter Read	0	1	AC					Read Busy Flag (BF) and contents of Address Counter (AC).		40μs			
CG RAM/ DD RAM Data Write	1	0	Write data					Write data to CG RAM or DD RAM.		40μs			
CG RAM/ DD RAM Data Read	1	1	Read data					Read data from CG RAM or DD RAM.		40μs			
	I/D = 1 : Increment S = 1 : Display Shift On D = 1 : Display On C = 1 : Cursor Display On B = 1 : Cursor Blink On S/C = 1 : Shift Display R/L = 1 : Shift Right DL = 1 : 8-Bit N = 1 : Dual Line F = 1 : 5x10 dots BF = 1 : Internal Operation BF = 0 : Ready for Instruction					I/D = 0 : Decrement S/C = 0 : Move Cursor R/L = 0 : Shift Left DL = 0 : 4-Bit N = 0 : Signal Line F = 0 : 5x8 dots					DD RAM : Display Data RAM CG RAM : Character Generator RAM ACG : Character Generator RAM Address ADD : Display Data RAM Address AC : Address Counter		

Note 1: Symbol "*" signifies an insignificant bit (disregard).

Note 2: Correct input value for "N" is predetermined for each model.

DISPLAY DD RAM AND CHARACTER POSITION

16x2, 1/16 DUTY CYCLE

	1	2													16	DISPLAY POSITION DD RAM ADDRESS
line 1	00	01												0F	
line 2	40	41												4F	

Power Supply Conditions Using Internal Reset Circuit

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{RON}	Power Supply Rise Time	0.1	-	10	ms	Figure 3
t_{OFF}	Power Supply OFF Time	1	-	-	ms	Figure 3

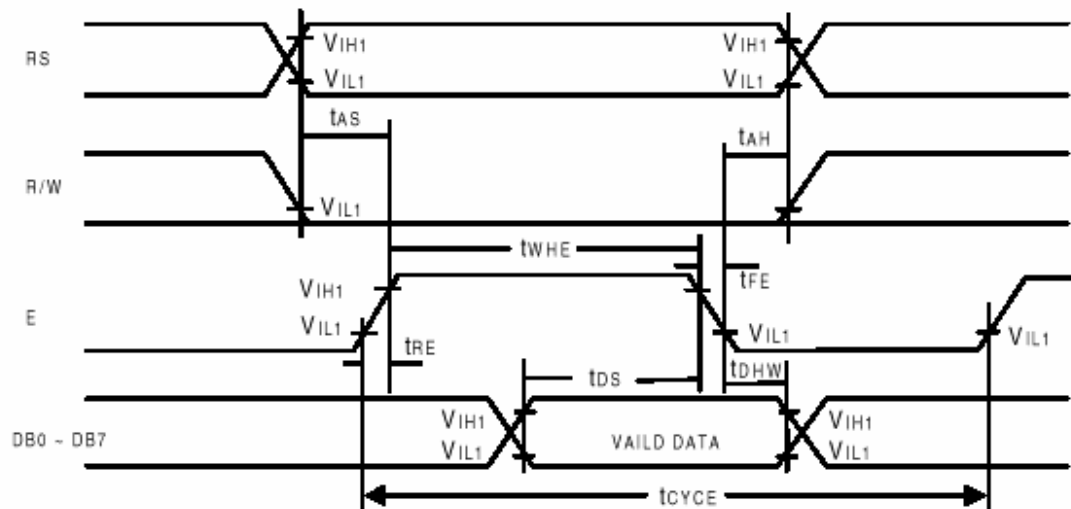
Write Operation


Figure 2. Bus Write Operation Sequence
(Writing out data from NT7603 to MPU)

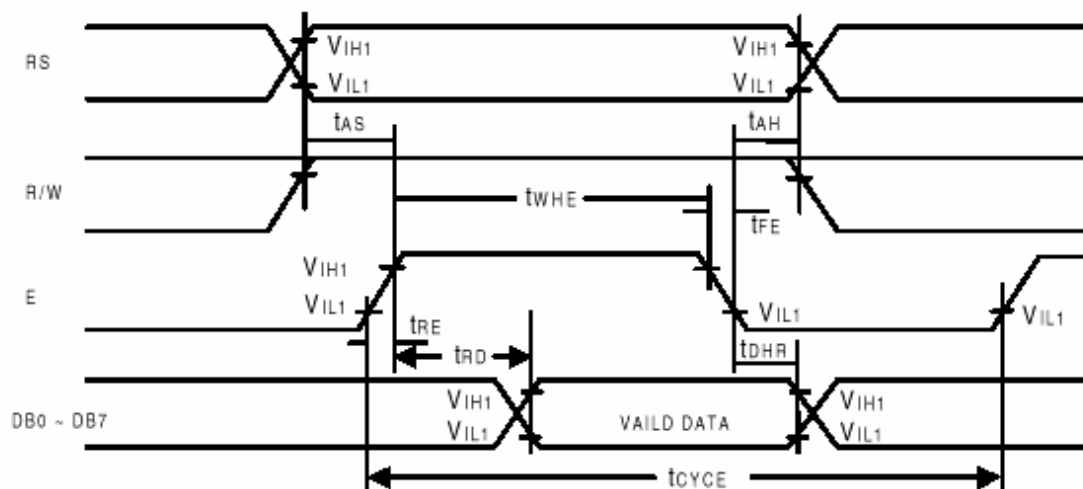
Read Operation


Figure 1. Bus Read Operation Sequence
(Reading out data from NT7603 to MPU)

**ELECTRO-OPTICAL CHARACTERISTICS**

MEASURING CONDITION: POWER SUPPLY = $V_{OP} / 64 \text{ Hz}$
 TEMPERATURE = $22 \pm 5 \text{ }^\circ\text{C}$
 RELATIVE HUMIDITY = $60 \pm 15 \%$

ITEM	SYMBOL	UNIT	TYP. STN
RESPONSE TIME	T_{on}	ms	150
	T_{off}	ms	190
CONTRAST RATIO	Cr	-	15
VIEWING ANGLE (6 O'clock) Cr ≥ 2	V3:00	$^\circ$	45
	V6:00	$^\circ$	70
	V9:00	$^\circ$	45
	V12:00	$^\circ$	60

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

RELIABILITY OF LCD MODULE

ITEM	TEST CONDITION FOR NORMAL TEMPERATURE	TEST CONDITION FOR WIDE TEMPERATURE	TIME
High temperature operating	50 $^\circ\text{C}$	70 $^\circ\text{C}$	240 hours
Low temperature operating	0 $^\circ\text{C}$	-20 $^\circ\text{C}$	240 hours
High temperature storage	60 $^\circ\text{C}$	80 $^\circ\text{C}$	240 hours
Low temperature storage	-10 $^\circ\text{C}$	-30 $^\circ\text{C}$	240 hours
Temperature-humidity storage	40 $^\circ\text{C}$ 90% R.H.	60 $^\circ\text{C}$ 90% R.H.	96 hours
Temperature cycling	-10 $^\circ\text{C}$ to 60 $^\circ\text{C}$ 30 Min Dwell	-30 $^\circ\text{C}$ to 80 $^\circ\text{C}$ 30 Min Dwell	5 cycle
Vibration Test at LCM Level	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	—

SAMPLING METHOD

SAMPLING PLAN: MIL-STD 105E

CLASS OF AQL: LEVEL II/ SINGLE SAMPLING
 MAJOR-0.65% MINOR – 1.5%

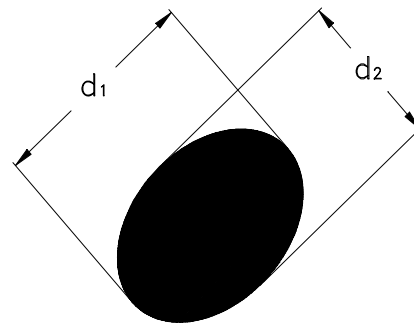
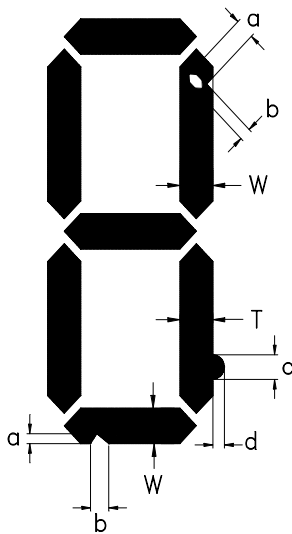
QUALITY STANDARD

DEFECT	CRITERIA	TYPE	FIGURE
SHORT CIRCUIT	-	MAJOR	-
MISSING SEGMENT	-	MAJOR	-
UNEVEN / POOR CONTRAST	-	MAJOR	-
CROSS TALK	-	MAJOR	-
PIN HOLE	$\text{MAX}(a,b) \leq 1/4 W$	MINOR	1
EXCESS SEGMENT	$\text{MAX}(c,d) \leq 1/4 T$	MINOR	1
BUBBLES	$d^* \geq 0.2$ QTY=0	MINOR	2
BLACKS SPOTS	$d \leq 0.3$ N.A.** $0.3 < d \leq 0.4$ QTY \leq 1 $0.4 < d$ QTY=0	MINOR	2
LINE SCRATCHES	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3
BLACK LINE	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3

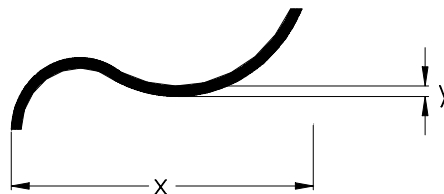
*d = MAX (d₁,d₂)

** N. A . = NOT APPLICABLE

DEFECT TABLE : B



POLARIZER BUBBLES / SPOTS
fig . 2



LINE SCRATCHES / BLACK LINE
fig . 3

QUALITY STANDARD (CONT .)

DEFECT		CRITERIA	TYPE	FIGURE
CHIPS	CONTACT EDGE	$e \leq 1/2T$ $f \leq 1/3W$ $g \leq 3.5$	MINOR	4
	BOTTOM GLASS	$p \leq 1.0$ $q \leq 3.5$ $r \leq 1/2T$		4
	CORNER	$a \leq 1.5$ $b \leq W$		4
	TOP GLASS	$a \leq 3.0$ $b \leq 1/3T$ $c \leq 1/2W$		5
GLASS PROTRUSION		$a \leq 1/4 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : B

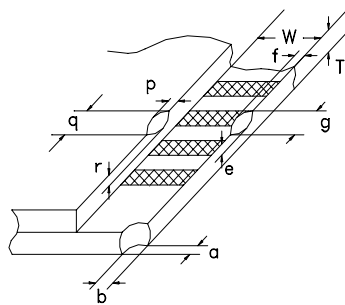


fig . 4

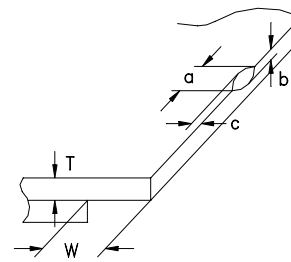


fig . 5

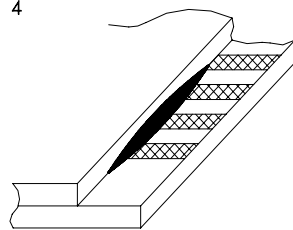


fig . 6



HANDLING PRECAUTIONS

(1) CAUTION OF LCD HANDLING & CLEANING

The polarizing plate on the surface of the panel is made from organic substances. Be very careful for chemicals not to touch the plate or it leads the polarizing plate to deteriorate.

If the use of a chemical is unavoidable, wipe the panel lightly with soft materials, such as gauze and absorbent cotton, soaked in a solvent.

*Usable solvent: Alcohol (ethanol, IPA and the like)

*Appropriate solvent: Ketones, ethyl alcohol

Avoid wiping with a dry cloth, since it could damage the surface of the polarizing plate and others.

(2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommended that any unused input terminal would be connected to V_{DD} or V_{SS} , do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

(3) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed to direct sunshine or high temperature/humidity for long periods.

(4) CAUTION FOR OPERATION

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

Driving voltage should be kept within specified range, excess voltage shortens display life.

Response time increases with decrease in temperature.

Display may turn black or dark Blue at temperature above its operational range; this is however not destructive and the display will return to normal once the temperature falls back to range.

Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured". They will recover once the display is turned off.

Condensation at terminals will cause malfunction and possible electrochemical reaction. Relative humidity of the environment should therefore be kept below 60%.

(5) SAFETY

Liquid crystal may leak out of a damaged LCD, it is recommended to wash off the liquid crystal by using solvents such as acetone or ethanol and should be burned up later.

If any liquid leaks out of a damaged glass cell comes in contact with your hands, wash it off with soap and water immediately.

WARRANTY

Multi-Inno will replace or repair any of her LCD module in accordance with her LCD specification for a period of one year from date of shipment. The warranty liability of Multi-Inno is limited to repair and /or replacement. Multi-Inno will not be responsible for any subsequent or consequential event.