MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI1604F

Revision	
Engineering	
Date	
Our Reference	

TABLE OF CONTENTS

1．TABLE OF DATE-REVISION

| Date	Item	Revision points

2．SCOPE

This specification is applied to the liquid crystal display modules **MI104F** operated with 1/16 duty ,1/5 bias using custom IC designed to KS0070B AND KS0063B OR EQUIVALENT. This individual specification is general specifications.

3．DISPLAY CONTENT AND MECHANICAL CHARACTERISTIC

ITEM	STANDARD VALUE	UNIT
Number of characters	16 * 4	——
Module dimension	87.0 * 60.0 * MAX14.0	mm

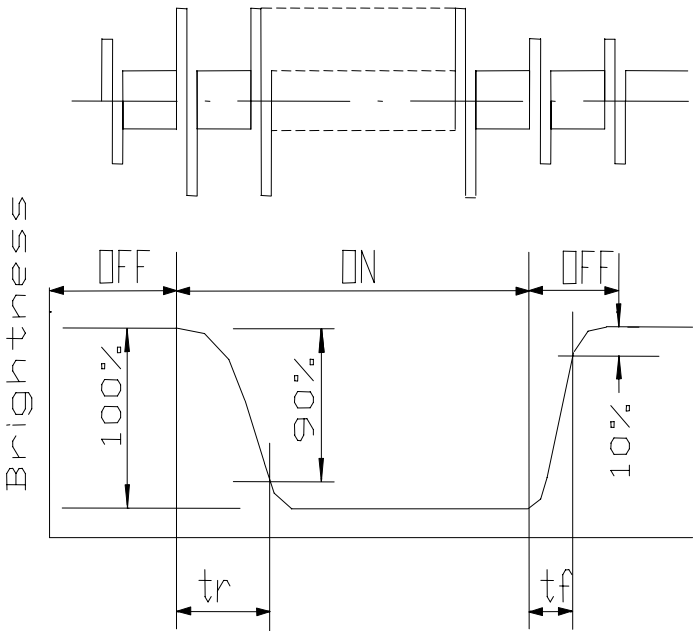| View display area	61.8 * 25.2	mm
Operating temp	-30~70	℃
Storage temp	-40~80	℃
Duty	1/16	
Viewing direction	6 O'CLOCK	
Display mode	STN Yellow-green POSITIVE mode VOP=4.2 V	
Display type	Transflective	
Driver IC	KS0070B AND KS0063B OR EQUIVALENT.	
Back_light	YELLOW-GREEN,BOTTOM VLED+ - VLED-=4.1V	

4. BLOCK DIAGRAM
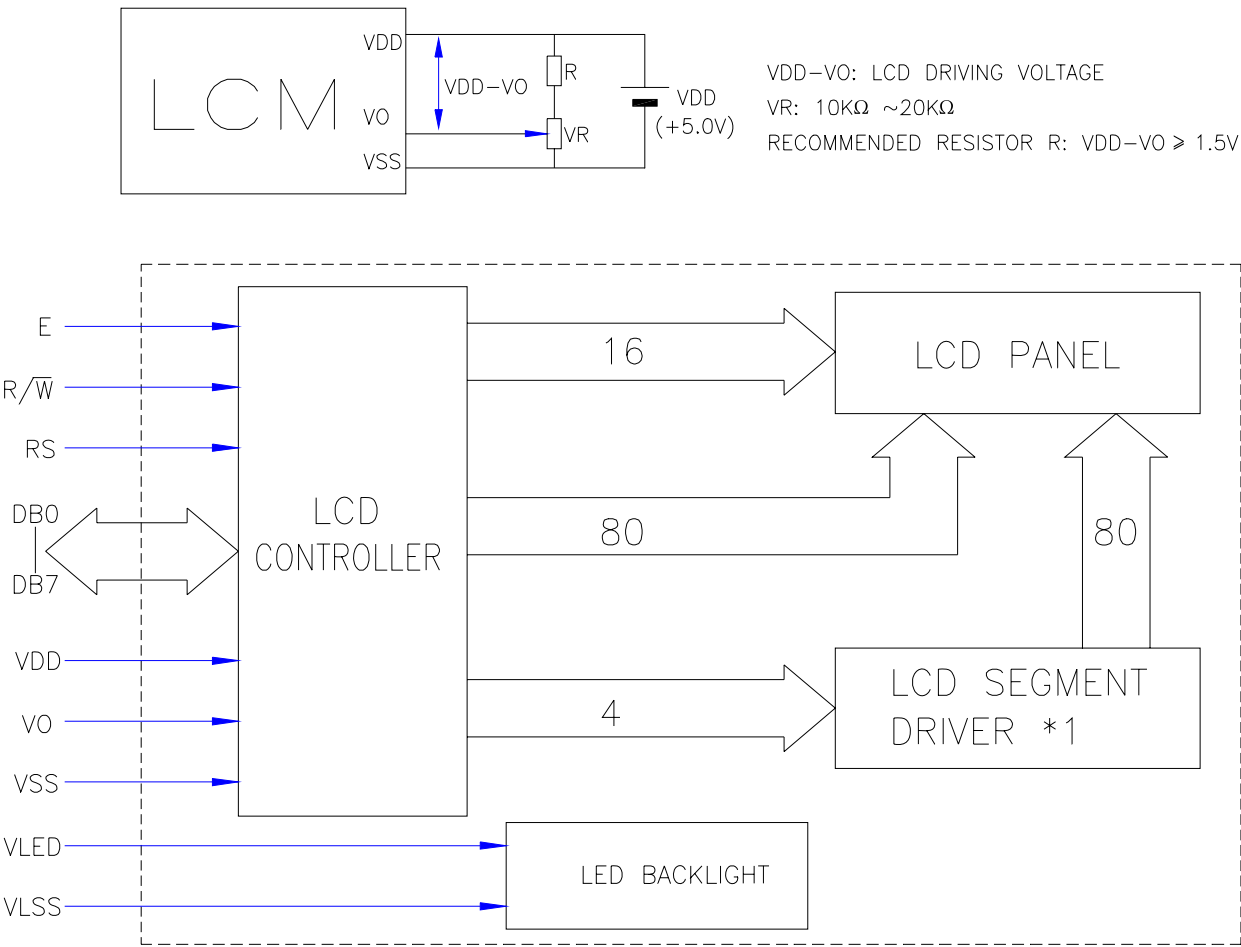
5. ELECTRO-OPTICAL CHARACTERISTIC

5.1 STN Type

Item	Symbol	Condition	Min	Typ	Max	Units
Contrast	K	$\upsilon=0°$ $\Phi=0°$	5 : 1	——	——	deg.
Viewing	υ	K=5 $\Phi=0°$	$\upsilon_2 2\upsilon_1 = 30$	——	——	deg.
Angle		K=5 $\upsilon=10°$	$\Phi=630$	——	——	deg.
Response	T_{on}	258C	——	——	250	ms
time	T_{off}	258C	——	——	250	ms

5.2   Definition of Optical Response Time

5.3   Definition of Driving Voltage (Vlcd)

Vlcd=(V10,ON +V90,OFF)/2

$$K= \frac{\text{brightness of selected segment (B1)}}{\text{brightness of non-selected segment (B2)}}$$

B2

Brightness curve for
non-selected segment

Brightness (%)

B1

Setpoint driving voltage
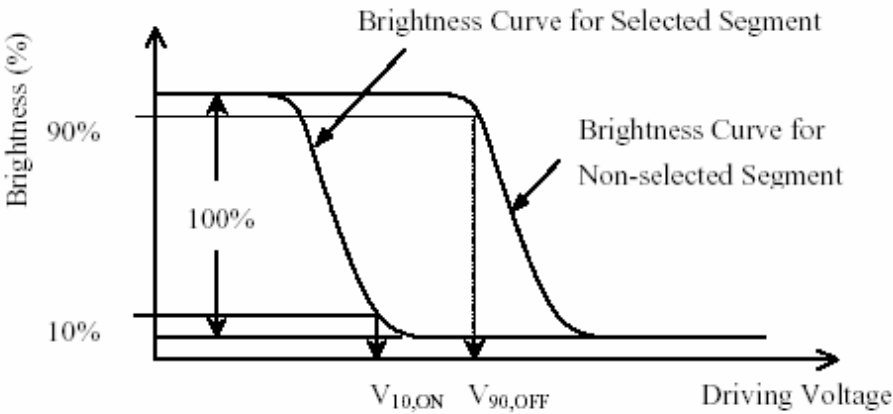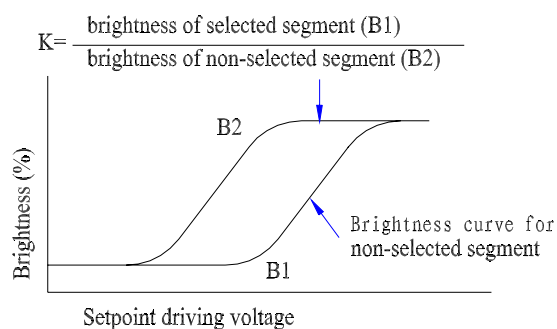
5.4 Definition of Viewing Angle θ and Φ

θ =0°

31°

∅=90°

∅=180°

17°

∅

方位角 ∅=0°

∅=270°
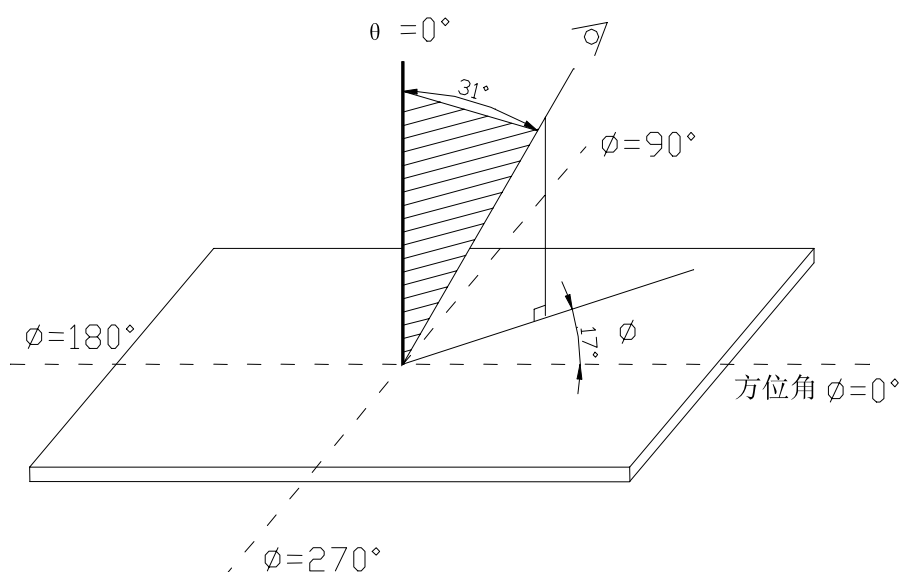
6．RELIABILITY

The LCD module should have no failure in the following reliability test.

TEST ITEM	TEST CONDITIONS	NOTE
HIGH TEMPERATURE STORAGE	80℃, 200hr.	Note
LOW TEMPERATURE STORAGE	-40℃, 200hr	Note
HUMIDITY STORAGE	60℃, 90%RH, 96hr.	Note
HIGH TEMPERATURE OPERATION	70℃, typical operating conditions, 200hr.	Note
LOW TEMPERATURE OPERATION	-30℃, typical operating conditions, 200hr.	Note
TEMPERATURE CYCLING	-20 ℃ ~70 ℃ 10min, between each step temp. 50min, at each step temp. 5 cycles.	Note
MECHANICAL VIBRATION	10 ~ 100 Hz sweep, 4G, amp1 = 10mm(max) XYZ for 60min, each.	Note
MECHANICAL SHOCK	10 ~ 55Hz, 50G. XYZ for 1 time, each.	Note

NOTE 1: The module should not have condensation of water on the module.

NOTE 2: The module shelled be inspected after 1 hour storage in normal conditions (15~35℃, 45~65%RH).

7. HANDLING PRECAUTION

7.1 Handling precautions

1．The display panel is made of glass. Do not subject it to a mechanical shock or impact by dropping it.
2．If the display panel is damaged and the liquid crystal substance leaks out , be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
3．Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
4．The polarizer covering the display surface of the **LCD** module is soft and easily scratched. Handle this polarizer carefully.
5．If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten a cloth with one of the following solvents:
   - Isopropyl alcohol
   -Ethyl alcohol
6．Solvents other than those above mentioned may damage the polarizer.
   Especially, do not use the following: water, ketene, aromatic solvents.
7．Extra care to minimize corrosion of the electrode. Water droplets, moisture condensation or a current flow in a high-humidity environm-
   ent accelerates corrosion of the electrode.
8．Install the LCD module by using the mounting holes. When mounting the LCD module, make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
9．Do not attempt to disassemble or process the LCD module.
10．NC terminal should be open. Do not connect anything.
11．If the logic circuit power is off, do not apply the input signals.
12．To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

● Be sure to ground the body when handing he LCD module.
● Tools required for assembling, such as soldering irons, must be properly grounded.
● To reduce the amount of static electricity generated, do not conduct   assembling and other work under dry conditions.
● The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

7.2 STORAGE CONDITIONS

When storing. avoid the LCD module to be exposed to direct sunlight
of fluorescent lamps. For stability, to keep it away form high temperature and high humidity environment
(The best condition is :23±5℃, 45±10%RH). ESD protection is necessary for long-term storage also.

7.3 Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD module have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be recovered by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD Module resulting from destruction caused by static electricity etc. exercise care to avoid holding the following sections when handling the modules.
-Exposed area of the printed circuit board.
-Terminal electrode sections.

8. TIMING AND ELECTRICAL CHARACTERISTICS

8.1 TIMING CHARACTERISTICS

(VDD=2.7V to 5.5V, Ta=-30 to +85℃)

Mode	Item	Symbol	Min	Type	Max	Unit
Write Mode (Refer to Figure 1)	E Cycle Time	tc	1000	—	—	ns
	E Rise / Fall Time	tr, tf	—	—	25	ns
	E Pulse Width (High, Low)	tw	450	—	—	ns
	R/W and RS Setup Time	tsu1	60	—	—	ns
	R/W and RS Hold Time	th1	20	—	—	ns
	Data Setup Time	tsu2	195	—	—	ns
	Data Hold Time	th2	10	—	—	ns
Read mode (refer to figure 2)	E Cycle Time	tc	1000	—	—	ns
	E Rise / Fall Time	tr,tf	—	—	25	ns
	E Pulse Width (High, Low)	tw	450	—	—	ns
	R/W and RS Setup Time	tsu	60	—	—	ns
	R/W and RS Hold Time	th	20	—	—	ns
	Data Output Time	t_D	—	—	360	ns
	Data Hold Time	t_{DH}	5	—	—	ns
Interface Mode with Extension Driver (refer to figure 3)	Clock Pulse Width (High, Low)	tw	800	—	—	ns
	Clock Rise/Fall Time	tr, tf	—	—	25	ns
	Clock Setup Time	tsu1	500	—	—	ns
	Data Setup Time	tsu2	300	—	—	ns
	Data Hold Time	t_D	300	—	—	ns
	M Delay Time	t_{DH}	-1000	—	1000	ns
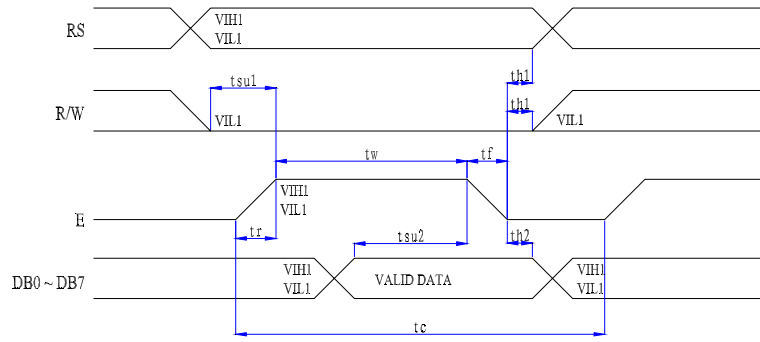
Figure 1. Write Mode Timing Diagram
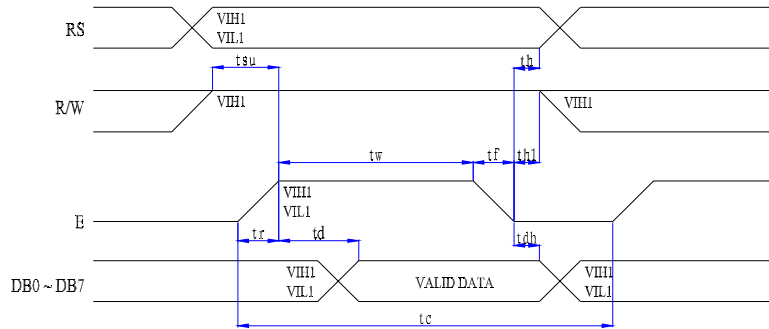
Figure 2. Read Mode Timing Diagram
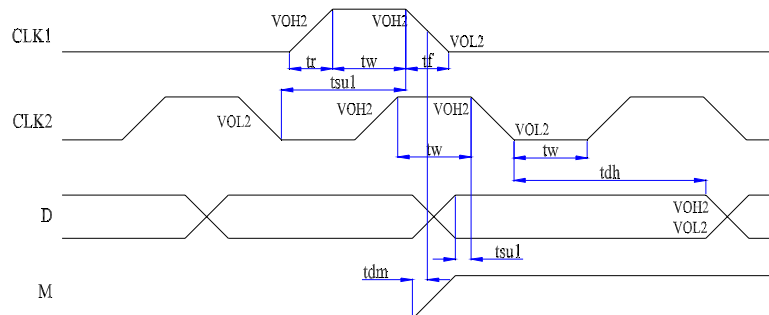
Figure 3. Interface Mode with Extension Driver Timing Diagram

8.2 ELECTRICAL CHARACTERISTICS

DC Characteristics(VDD=4.5V to 5.5V, Ta=-30 to +85℃)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP	MAX.	UNIT
H LEVEL INPUT VOLTAGE	VIH	——	2.2	——	——	V
L LEVEL INPUT VOLTAGE	VIL	——	——	——	0.6	V
H LEVEL OUTPUT VOLTAGE	VOH	-IOH=0.205mA	2.4	——	——	V
L LEVEL OUTPUT VOLTAGE	VOL	IOL=1.2mA	——	——	0.4	V
POWER SUPPLY CURRENT (LOGIC)	IDD	VDD=5.0V	——	1.0	4	mA
RECOMMENDED LCD DRIVING	VDD-V0 DUTY=1/16	Ta=0℃	——	4.6	——	V
		Ta=25℃	——	4.2	——	V

VOLTAGE	$\Phi = 25^{0}$	Ta=50℃	——	3.8	——	V
CLOCKOSCILLATION FREQUENCY	FOSC	Ta=25℃	——	270	——	KHz

9. INTERFACE

No.	Symbol	Function	Note
1	VSS	Ground (0V)	
2	VDD	Power Suply for Logic Circuit	
3	VO	Power Supply for Driving the LCD	
4	RS	Data/Instruction select	
5	R/W	Read/Write select	
6	E	Enable signal	
7~14	DB0~DB7	Data Bus Line	
15	VLED	LED BACKLIGHT(+)	4.1V
16	VLSS	LED BACKLIGHT(-)	0V

10. FUNCTIONAL DESCRIPTION

Instruction	Instruction Code										Description instruction code	Execution time (fosc=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	X	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted	1.53ms
Entry mode set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and make shift of entire display	39us
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.	39us
Cursor or display shift	0	0	0	0	0	1	S/C	R/L	X	X	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	39us
Function set	0	0	0	0	1	DL	N	F	X	X	Set interface data length (DL: 4-bit/8-bit), numbers of display line (N: 1-line/2-line), display font type (F:5x8dots/5x11dots)	39us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39us

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.	0us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	43us

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

11. LED BACKLIGHT ELECTRO-OPTICAL CHARACTERISTIC

The modules **MI1604F** has YELLOW-GREEN LED BACK LIGHT, we can prepare all types LED B/L of our customer'request .

ELECTRICAL/OPTICAL CHARACTERISTICS:

ITEM	TYE	UNIT
Porward Voltage	4.1	V
Forward Current	300	mA
Power Dissdipation	——	W
Luminous Intensity	120	cd/m^2
Emission Wavelength	568	nm
Spectral Range	30	nm
Operating Temp	$-30\sim70$	°C
Storage Temp	$-40\sim80$	°C
Unmarked tolerance	±0.3	mm

12. MODULE DRAWING

DISPLAY DATA ADDRESS:

CHARACTER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LINE1	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
LINE2	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
LINE3	90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
LINE4	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF

NOTES:

1. DISPLAY TYPE: STN, YELLOW-GREEN, TRANSFLECTIVE/POSITIVE.
2. DRIVER=KS0070B AND KS0063B (1/16 DUTY, 1/5 BIAS)
3. VIEWING DIRECTION: 6 O'CLOCK.
4. PIN CONNECTION:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VSS	VDD	Vo	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	VLED	VSS

5. OPERATING TEMP.: -30~70°C.
6. STORAGE TEMP.: -40°C~80°C.
7. LED BACKLIGHT: YELLOW-GREEN,BOTTOM.
8. ALL UNMARKED TOLERANCES: ±0.5mm
9. RoHS COPLIANT

Unmarked Tolerance:±0.5mm

87.00
85.00±0.3
82.00±0.3
71.40±0.3
61.80±0.3(V.A)
56.20
60.00
55.00±0.3
42.00±0.3
25.20±0.3(V.A)
24.00±0.3
20.80
2.50
10.00
P2.54X15=38.10±0.3
16-φ1.00
4-φ2.50

9.00
MAX14.00
1.60±0.3

DISPLAY PATTERN:

5.35
4.75
0.55
0.60
0.55
0.60
2.95
3.55

CUSTOMER			DATE	
CUSTOMER APVL		SCALE	TITLE	
DRAWN				
DFTG CHK		UNIT	MODEL	MI1604F
ENGR CHK		mm		
APPROVAL			DWG NO	PAGE 1/1

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