LIQUID CRYSTAL DISPLAY MODULE
MODEL: MTG-E8619-A3
Customer's No.:

Acceptance

Approved and Checked by

Approved by	Checked by		Made by
微 端 2005/11/5 張秀美	微 端 2005/11/5 石國良	微 端 2005/11/5 連俊傑	微 端 2005/11/5 馬中平

Revise Records

Rev.	Date	Contents	Written	Approved
A	2005/11/5	Initial Release	David Ma	Debbie Chang

Special Notes

Note1.	With reverse contact side of FFC cable , R10=R16=open. Change to new glass supplier : 25C-32240MD1
Note2.	
Note3.	
Note4.	
Note5.	

Contents

1. General Specifications 4
2. Electrical Specifications 5
   - 2.1 Absolute Maximum Ratings 5
   - 2.2 DC Characteristics 5
   - 2.3 AC Characteristics 5
   - 2.4 Timing Chart 6
   - 2.5 Comparison of Display and Data 7
   - 2.6 Power Supply ON/OFF Sequence 7
   - 2.7 Spec. for CCFL back-light 8
3. Optical Specifications 9
   - 3.1 LCD Driving Voltage Recommended 9
   - 3.2 Optical Characteristics 10
   - 3.3 Definition of Viewing Angle and Optimum Viewing Area 10
   - 3.4 Definition of Viewing Angle θ_f and θ_b 11
   - 3.5 Definition of Contrast C 11
4. I/O Terminal 11
   - 4.1 Pin Assignment 12
   - 4.2 Example of Power Supply 12
   - 4.3 Block Diagram 12
5. Reliability Test 13
   - 5.1 Test Item 14
   - 5.2 Judgment Standard 14
6. Appearance Standards 15
   - 6.1 Inspection Conditions 16
   - 6.2 Definition of Applicable Zones 16
   - 6.3 Standards 16
7. Handling and Precautions 18
8. Warranty: 19
9. Dimensional Outlines 20

1. General Specifications

Operating Temperature	:	Min. -20°C ～ Max. 70°C
Storage Temperature	:	Min. -30°C ～ Max. 80°C
Dot Pixels	:	320 (W) x 240 (H) dots
Dot Size	:	0.34 (W) x 0.34 (H) mm
Dot Pitch	:	0.36 (W) x 0.36 (H) mm
Viewing Area	:	122.0 (W) x 92.0 (H) mm
Outline Dimensions	:	167.1* (W) x 109.0** (H) x 11.0 max. (D) mm
		* Without Connector Cable
		** Without FFC Connector
Weight	:	N/A
LCD Type	:	STN/ Negative, Blue mode/ Transmissive
Viewing Direction	:	6:00
Data Transfer	:	4-bit parallel data transfer
Backlight	:	With CCFL
Drawings	:	As attached drawings

2. Electrical Specifications

2.1 Absolute Maximum Ratings

V_{SS} = 0V

Parameter	Symbol	Conditions	Min.	Max.	Units
Supply Voltage (Logic)	V_{DD} - V_{SS}	--	- 0.3	7.0	V
Supply Voltage (LCD Drive)	V_{DD} - V_{EE}	--	0	35.0	V
Input Voltage	V_I	--	- 0.3	V_{DD} + 0.3	V

2.2 DC Characteristics

Ta = 25°C, V_{SS} = 0V

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Supply Voltage (Logic)	V_{DD} - V_{SS}	--	2.7	--	5.5	V
Supply Voltage (LCD Drive)	V_{DD} - V_{EE}	--	12.0	--	32.0	V
	V_{DD} - V_O	Shown in 3.1				V
High Level (Input Voltage)	V_{IH}	--	0.8 x V_{DD}	--	V_{DD}	V
Low Level (Input Voltage)	V_{IL}	--	0	--	0.2 x V_{DD}	V
High Level (Output Voltage)	V_{OH}	I_{OH} = -0.4mA	V_{DD} -0.4	--	--	V
Low Level (Output Voltage)	V_{OL}	I_{OL} = 0.4mA	--	--	0.4	V
Supply Current	I_{DD}	V_{DD} = 5.0V	--	5.0	--	mA
	I_{EE}	V_{DD} =5.0V	--	3.0	--	mA
Frame	f_F	Duty = 50%	32	64	128	Hz

2.3 AC Characteristics

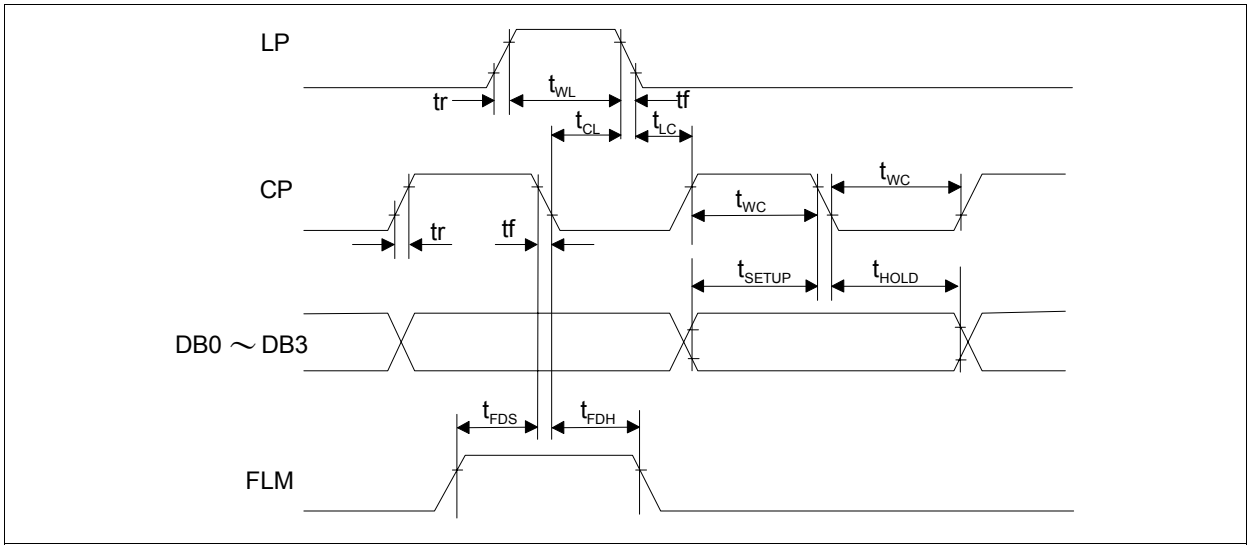
V_{DD} = 5.0V±10%

Parameter	Symbol	Min.	Max.	Units
CP Pulse Time	f_{CP}	--	6.0	MHz
Clock Pulse Width	t_{WC}	50	--	ns
Load Pulse Width	t_{WL}	63	--	ns
Data Setup Time	t_{SEPUP}	30	--	ns
Data Hold Time	t_{HOLD}	30	--	ns
Clock Pulse Setup Time	t_{CL}	80	--	ns
Clock Pulse Hold Time	t_{LC}	110	--	ns
Rise/Fall Time	tr, tf	--	Note1	ns
FLM Setup Time	t_{FDS}	100	50	ns
FLM Hold Time	t_{FDH}	100	--	ns

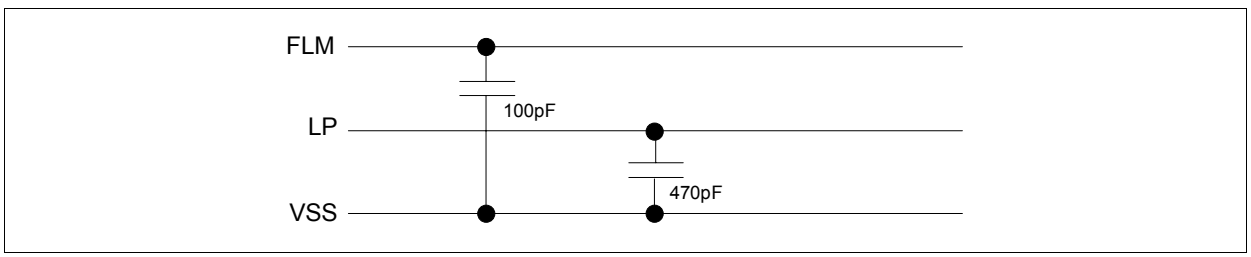
Note1: The rise and fall times (tr, tf) must satisfy the following relationship (a. and b.).

a. tr, tf < $\frac{1}{2fcp}$ - t_{WC}

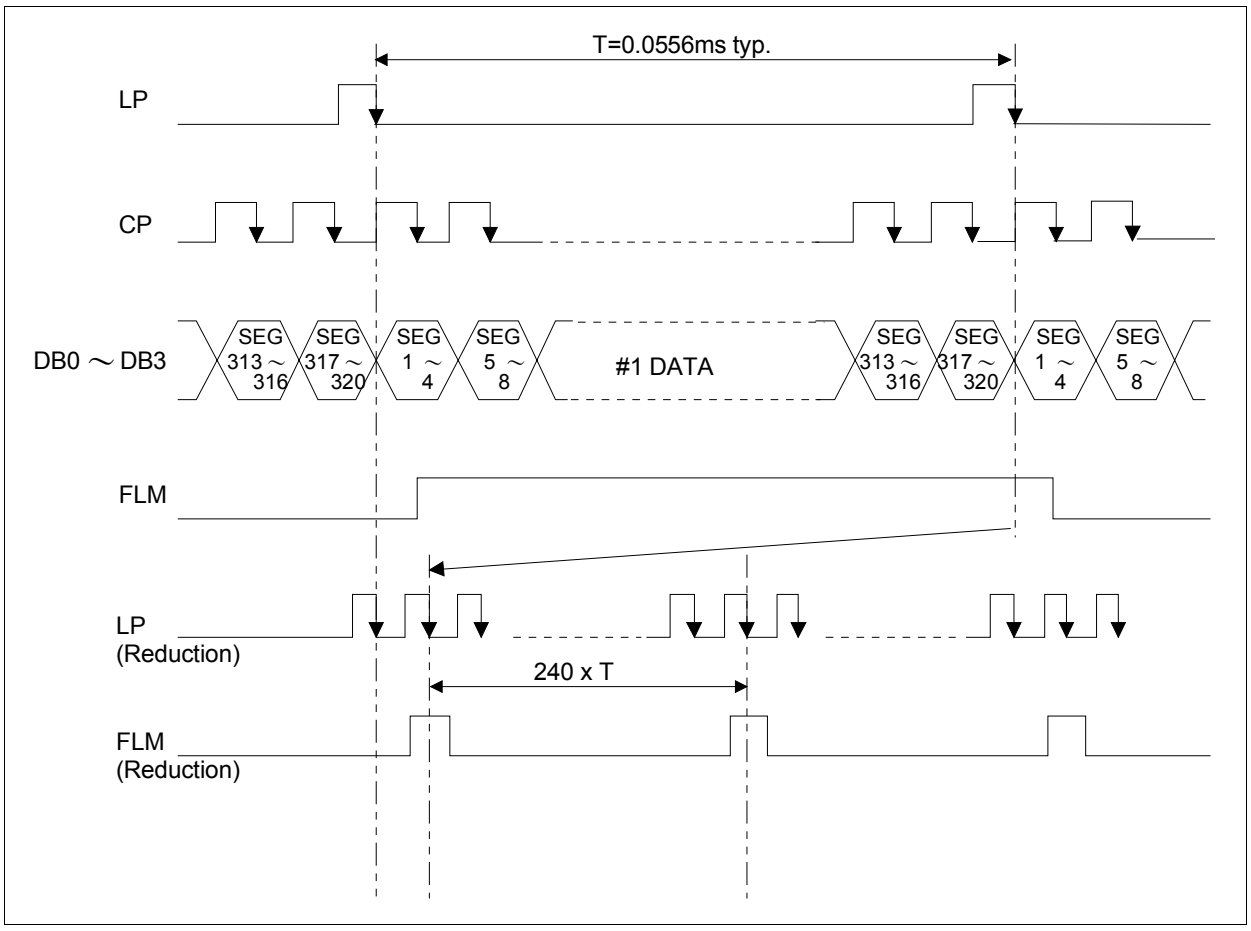
b. tr, tf < 50ns



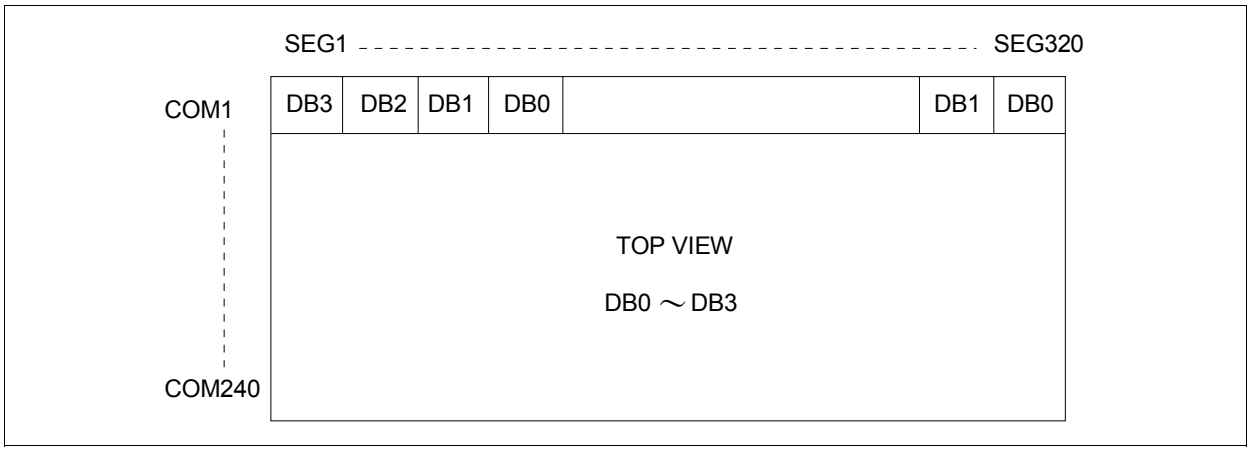
This module contains these capacitors. Please be careful about timing characteristics.



2.4 Timing Chart

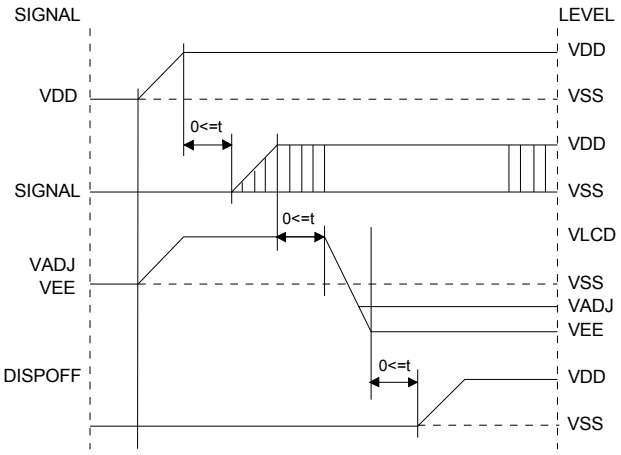


2.5 Comparison of Display and Data

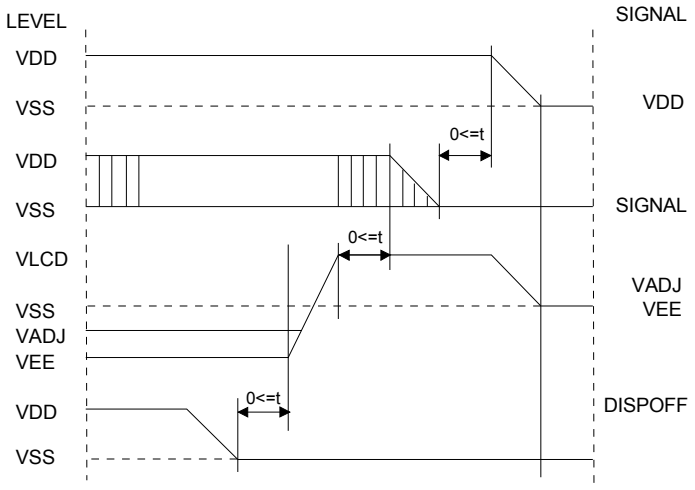


2.6 Power Supply ON/OFF Sequence

2.6.1 ON Sequence



2.6.2 OFF Sequence



Please maintain the above sequence when turning on and off the power supply of the module. If DISPOFF is supplied to the module while internal alternate signal for LCD driving (M) is unstable, DC component will be supplied to the LCD panel. This may cause damage to the LCD module.

2.7 Spec. for CCFL back-light

Ta = 25 °C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	Notes
Lamp Voltage	V_L	IL=5mA	245	270	295	Vrms	1)
Lamp Current	I_L	--	4.5	5.0	5.5	mArms	2)
Starting Voltage	V_S	Ta=25°C	--	--	455	Vrms	3)
		Ta = 0°C	--	--	680	Vrms	3)
Operation Frequency	--	IL=5mA	30	--	100	kHz	3)
Surface Luminance	L	IL=5mA	820	840	855	cd/m^2	4)
Average Life	T_{AL}	IL=5mA	--	17000	--	hrs	5)

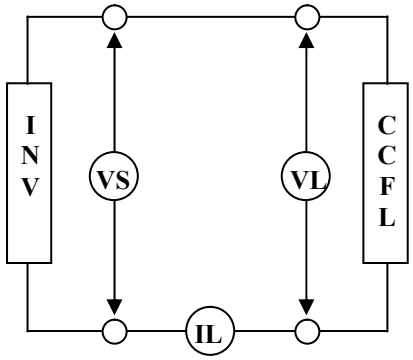
Note 1). The voltage (r.m.s.) to maintain the electric discharge of the lamp. It is measured after lighting for 3 minutes .

Note 2). The current (r.m.s.) to flow through the lamp with the electric discharge. It is measured after lighting for 3 minutes.

Note 3). The voltage at starting the electric discharge when the voltage is increased gradually from 0V.

Note 4). Surface Luminance is specified the average of luminance measured by the 9 points of backlight module surface after 20 minutes power on.

Note 5). CFL life is defined as the time for which the initial luminance is attenuated by 50% of the luminance value. Average Life represents the time elapsed at the point of time when the residual ratio becomes below 50% when plural lamps are lighted in comparison with the definition of life mentioned above.



CCFL Testing Circuit

3. Optical Specifications

3.1 LCD Driving Voltage Recommended

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
LCD Driving Voltage Note 1	V_{DD}-V_O	Ta = -20 °C	23.81	24.55	25.28	V
		Ta = 25 °C	22.98	23.70	24.41	V
		Ta = 70 °C	22.36	23.05	23.74	V

Note 1 : Voltage (Applied actual waveform to LCD panel) for the best contrast. The range of minimum and maximum shows tolerance of the operating voltage. The specified contrast ratio and response time are not guaranteed over the entire range.

3.2 Optical Characteristics

Ta=25 °C, 1/240 Duty, 1/17 Bias, V_{DD} = 5.0V (Note 4), θ = 0°, ϕ = 270°

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Units
Contrast Ratio Note 1		C	θ = 0°, ϕ = 0°	3	5.0	--	--
Viewing Angle (Shown in 3.3)		Front-Back	θ_f- θ_b, ϕ = 0°	+25	to	-20	deg.
		Left-Right	θ_l- θ_r, ϕ = 0°	+20	to	-20	deg.
Response Time	Rise Note 2	T_{ON}	Ta = -20 °C	--	--	--	msec
	Decay Note 3	T_{OFF}	Ta = -20 °C	--	--	--	msec
	Rise Note 2	T_{ON}	Ta = 25 °C	--	150	200	msec
	Decay Note 3	T_{OFF}	Ta = 25 °C	--	250	300	msec
	Rise Note 2	T_{ON}	Ta = 70 °C	--	--	--	msec
	Decay Note 3	T_{OFF}	Ta = 70 °C	--	--	--	msec

Note 1 : Contrast ratio is defined as follows.
CR = L_{OFF} / L_{ON}
L_{ON} : Luminance of the ON segments, L_{OFF} : Luminance of the OFF segments

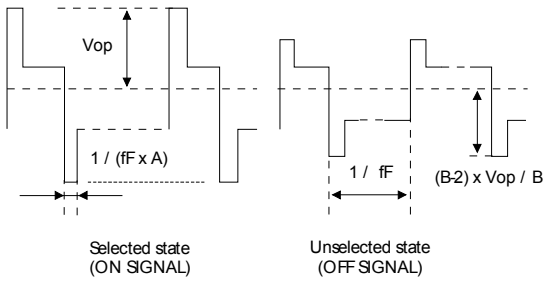
Note 2 : The time that the luminance level reaches 90% of the saturation level from 0% when ON signal is applied.

Note 3 : The time that the luminance level reaches 10% of the saturation level from 100% when OFF signal is applied.

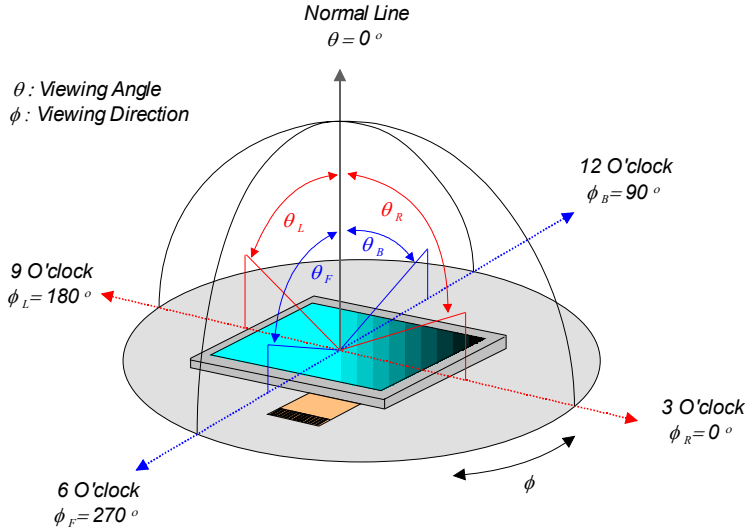
Note 4 : Definition of Driving Voltage V_D. Assuming that the typical driving waveforms shown below are applied to the LCD Panel at /A Duty - 1/B Bias (A : Duty Number, B : Bias Number). Driving voltage V_D is defined s follows: V_D = (Vth1+Vth2) / 2

Vth1 : The voltage VO-P that should provide 50% of the saturation level in the luminance at the segment which the ON signal is applied to.

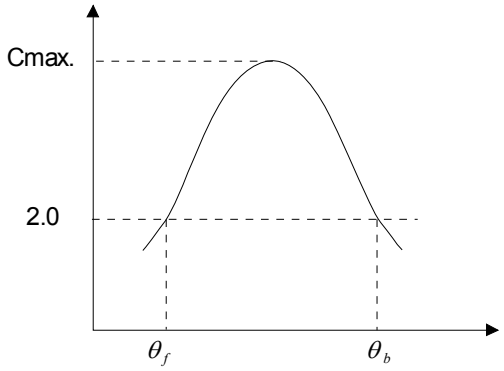
Vth2 : The voltage VO-P that should provide 50% of the saturation level in the luminance at the segment which the OFF signal is applied to.



3.3 Definition of Viewing Angle and Optimum Viewing Area



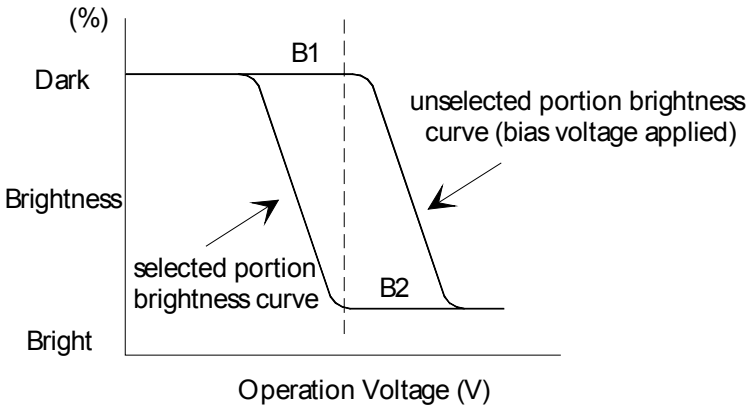
3.4 Definition of Viewing Angle θ_f and θ_b



Viewing angles θ (ϕ fixed)

Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same.

3.5 Definition of Contrast C, *C= Brightness of selected dot (B1)/ Brightness of unselected dot (B2)*



4. I/O Terminal

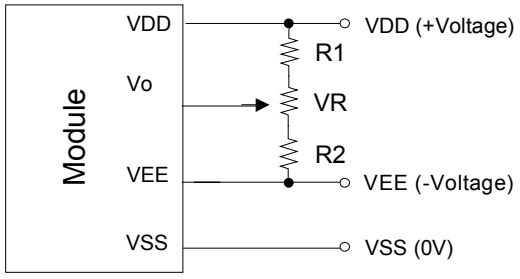
4.1 Pin Assignment

LCD (CN1)

No.	Pin No.	Symbol	Function
1	13	Vo	Voltage level for LCD contrast adjustment
2	12	V_{EE}	Power supply for LCD drive
3	4	D3	Display data 3
4	3	D2	Display data 2
5	2	D1	Display data 1
6	1	D0	Display data 0
7	5	NC/M	Non-connection
8	10	V_{SS}	Ground
9	11	V_{DD}	Power supply for logic
10	7	CP2	Clock signal for shifting data
11	6	CP1	Data latch signal
12	8	S	Fist line marker
13	9	DISP OFF	Display control signal H: Display on L: Display off
14	14	F.G.	Frame Ground

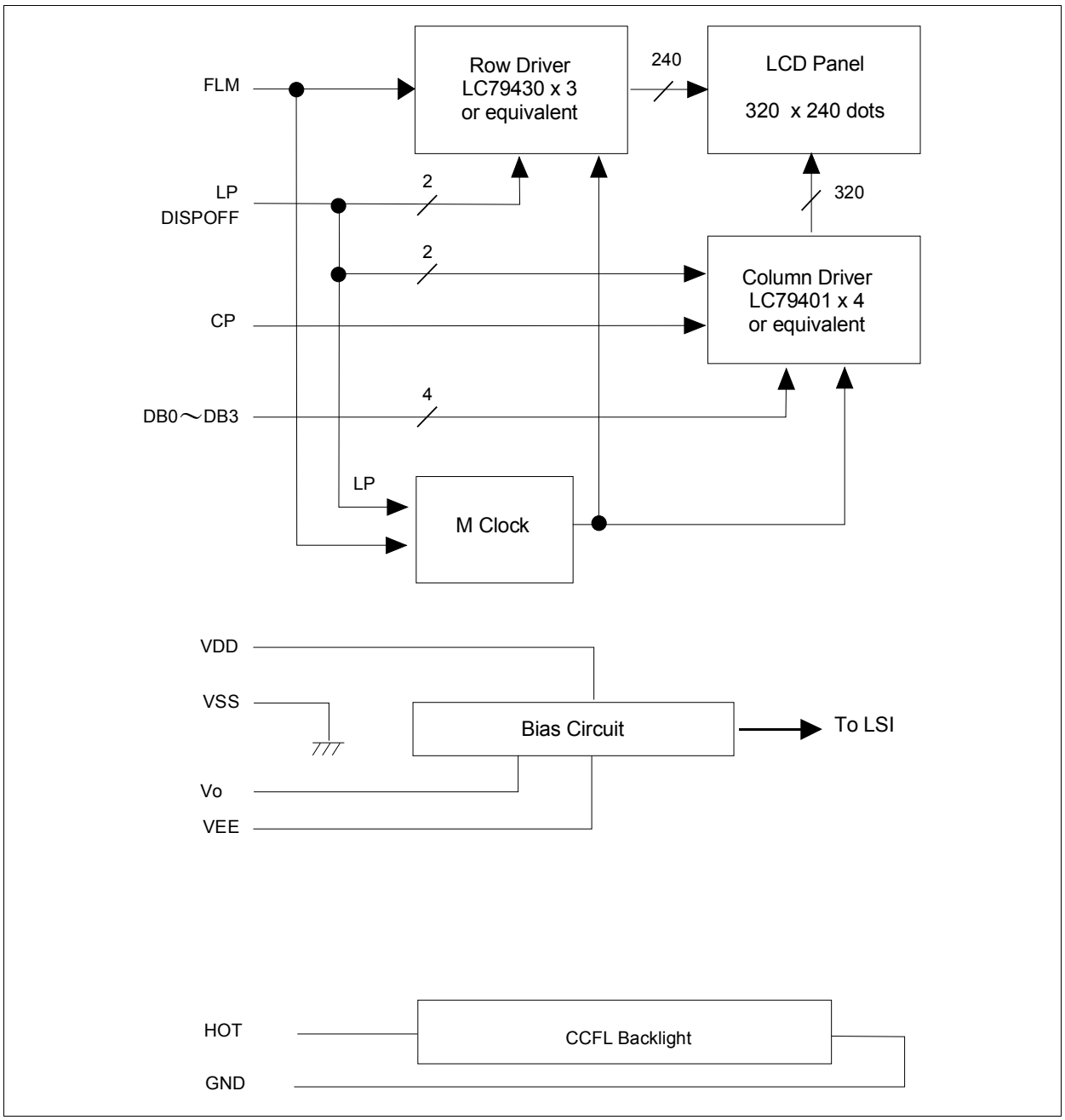
4.2 Example of Power Supply

It is recommended to apply a potentiometer for the contrast adjust due to the tolerance of the driving voltage and its temperature dependence.



R1+R2+VR=10 ～ 20KΩ

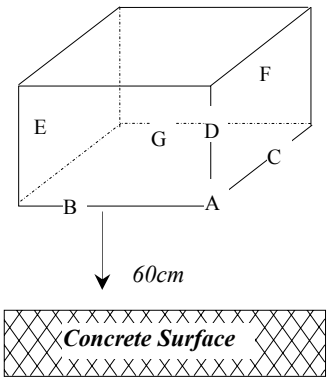
4.3 Block Diagram



5. Reliability Test

5.1 Test Item

No change on display and in operation under the following test condition.

No.	Test Item	Description	Condition	Note
1.	High Temperature (Operation)	Durability test under long time high temperature with electrical stress (voltage, current)	70°C ± 2°C 96hrs	
2.	High Temperature (Storage)	Durability test under long time high temperature storage	80°C ± 2°C 96hrs	4
3.	Low Temperature (Operation)	Durability test under long time low temperature with electrical stress (voltage, current)	-20°C ± 2°C, 96hrs	3
4.	Low Temperature (Storage)	Durability test under long time low temperature storage	-30°C ± 2°C, 96hrs	3, 4
5.	Damp Proof Test	Durability test under long time high temperature and high humidity	40°C± 2°C, 90～95% RH 96hrs	3 , 4
6.	Vibration Test	Total fixed amplitude: 1.5mm Vibration frequency: 10～55Hz One cycle 60 seconds to 3 directions of X, Y, Z for each 15 minutes	- -	5
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping* *A corner: once* *Edge dropping* *B, C, D edge: once* *Face dropping* *E, F, G face: once*		

Note 1: Unless otherwise specified, tests will be conducted under the following condition,
Temperature : 25°C ± 2°C
Humidity : 65% ± 5%
Note 2: Unless otherwise specified, tests will be not conducted under functioning state.
Note 3: No dew condensation to be observed.
Note 4: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
Note 5: Vibration test will be conducted to the product itself without putting it in a container.

5.2 Judgment Standard

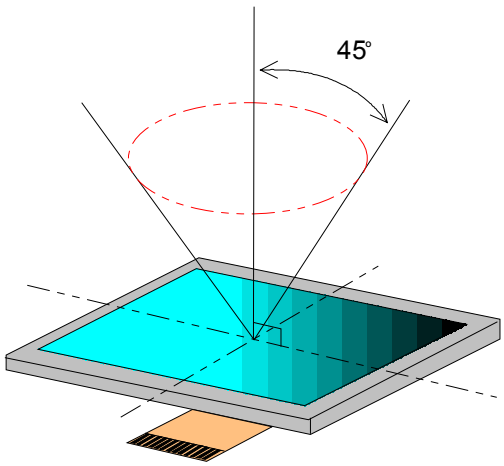
Failure Mode	Test Item							Judgment Standard
	1	2	3	4	5	6	7	
Orientation	*	*	*	*	*			No remarkable degradation of appearance under bias/ non-bias condition
Current Value (IAC)	*	*	*	*	*			No remarkable increase
Contrast	*		*	*	*			No remarkable poor contrast
Domain	*	*	*	*	*			Less than 20% of all dots have reverse tilt of more than on third of one dot area.
Bubble (Inside Cell)	*	*	*	*	*	*		As per “Appearance Standard” (Note. In-cluding one which disappear after 25°C 2H)
Polarizer	*				*	*		As per “Appearance Standard” no remarkable appearance change
Glass Damage							*	As per “Appearance Standard”

Note. 1. * is strong linkage between Failure Mode and Test Item.
2. Number of Test Item should be referred to former page.
3. Judgment and Standard value should be fixed by other inspection standard and criteria samples.

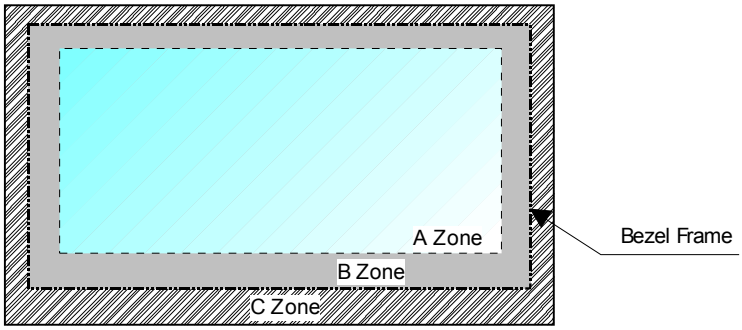
6. Appearance Standards

6.1 Inspection Conditions

The LCD shall be inspected under 40W white fluorescent light. The distance between the eyes and the sample shall be more than 30cm. All directions for inspecting the sample should be within 45° against perpendicular line.



6.2 Definition of Applicable Zones

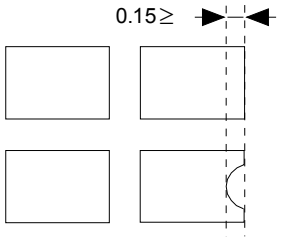
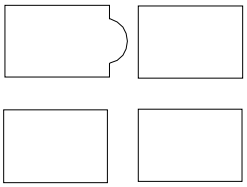
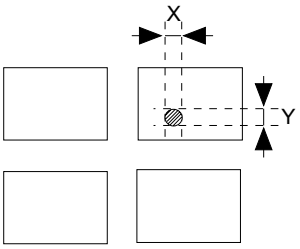
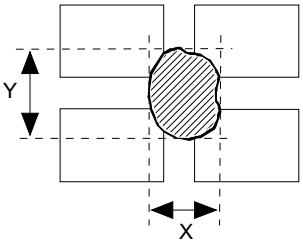


A Zone : Active display area
B Zone : Area from outside of "A Zone" to validity viewing area
C Zone : Rest parts
A Zone + B Zone = Validity viewing area

6.3 Standards

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1.</td><td>Black and White Spots, Foreign Substances</td><td>
(1) Round Shape
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>D ≤ 0.2</td><td>*</td><td>*</td><td>*</td></tr>
<tr><td>0.2 < D ≤ 0.3</td><td>3</td><td>5</td><td>*</td></tr>
<tr><td>0.3 < D ≤ 0.4</td><td>2</td><td>3</td><td>*</td></tr>
<tr><td>0.4 < D ≤ 0.5</td><td>0</td><td>1</td><td>*</td></tr>
<tr><td>0.5 < D</td><td>0</td><td>0</td><td>*</td></tr>
</table>
D = (Long + Short)/2 *: Disregard
(2) Line Shape
<table>
<tr><th>Zone
X (mm)</th><th>Zone
Y (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th></th><th></th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>- -</td><td>0.03 ≥ W</td><td>*</td><td>*</td><td>*</td></tr>
<tr><td>2.0 ≥ L</td><td>0.05 ≥ W</td><td>3</td><td>3</td><td>*</td></tr>
<tr><td>1.0 ≥ L</td><td>0.1 ≥ W</td><td>3</td><td>3</td><td>*</td></tr>
<tr><td>- -</td><td>0.1 < W</td><td colspan="3">In the same way (1)</td></tr>
</table>
X : Length Y: Width *: Disregard
Total defects shall not exceed 5.
</td></tr>
<tr><td>2.</td><td>Air Bubbles (between glass & polarizer)</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>D ≤ 0.3</td><td>*</td><td>*</td><td>*</td></tr>
<tr><td>0.3 < D ≤ 0.4</td><td>3</td><td>*</td><td>*</td></tr>
<tr><td>0.4 < D ≤ 0.6</td><td>2</td><td>3</td><td>*</td></tr>
<tr><td>0.6 < D</td><td>0</td><td>0</td><td>*</td></tr>
</table>
*: Disregard
Total defects shall not exceed 3.
</td></tr>
</table>

To be continued……

No.	Parameter	Criteria
3.	The Shape of Dot	(1) Dot Shape (with Dent)  As per the sketch of left hand. (2) Dot Shape (with Projection)  Should not be connected to next dot. (3) Pin Hole  (X+Y)/2 ≤ 0.2mm (Less than 0.1mm is no counted.) (4) Deformation  (X+Y)/2 ≤ 0.2mm Total acceptable number: 1/dot, 5/cell (Defect number of (4): 1pc.)
4.	Polarizer Scratches	Not to be conspicuous defects.
5.	Polarizer Dirts	I f the stains are removed easily from LCDP surface, the module is not defective.
6.	Complex Foreign Substance Defects	Black spots, line shaped foreign substance or air bubbles between glass & polarizer should be 5pcs maximum in total.
7.	Distance between different Foreign Substance defects	D ≤ 0.2 : 20mm or more 0.2 < D : 40mm or more

7. Handling and Precautions

The Following precautions will guide you in handling our product correctly.

1 Liquid crystal display devices

1.1 The liquid crystal display device panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.
1.2 The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.

2 Care of the liquid crystal display module against static electricity discharge.

2.1 When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect work tables against the hazards of electrical shock.
2.2 Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
2.3 Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.

3 When the LCD module alone must be stored for long periods of time:

3.1 Protect the modules from high temperature and humidity.
3.2 Keep the modules out of direct sunlight or direct exposure to ultra-violet rays.
3.3 Protect the modules from excessive external forces.

4 Use the module with a power supply that is equipped with an over current protector circuit, since the module is not provided with this protective feature.

5 Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

6 Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

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

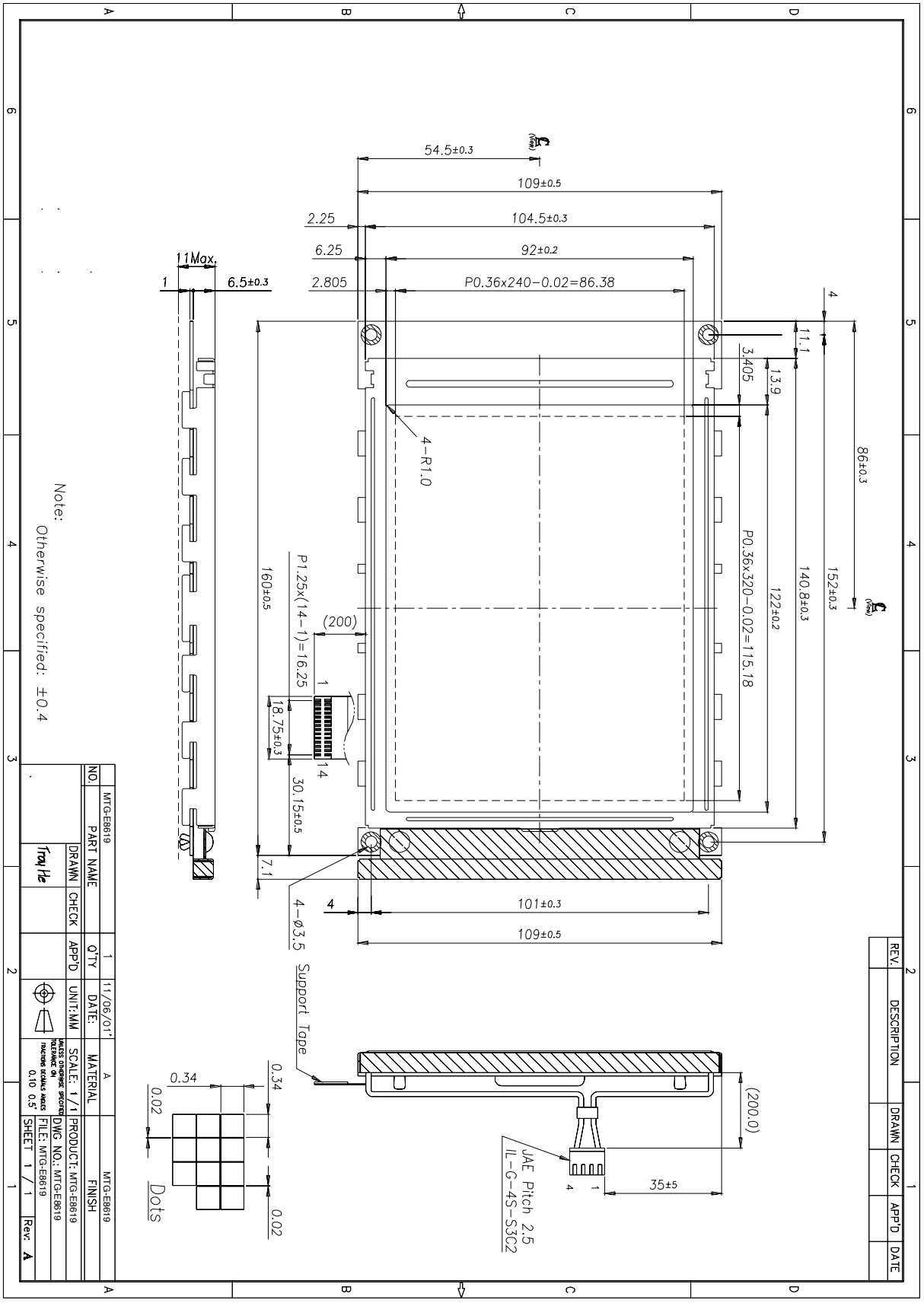
2 We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.

3 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.

4 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.

9. Dimensional Outlines

- See the next page……..


54.5±0.3
109±0.5
2.25
104.5±0.3
6.25
92±0.2
2.805
P0.36x240−0.02=86.38
11Max.
1
6.5±0.3
4
11.1
3.405
13.9
4−R1.0
86±0.3
P0.36x320−0.02=115.18
140.8±0.3
152±0.3
160±0.5
P1.25x(14−1)=16.25
(200)
1
18.75±0.3
14
30.15±0.5
7.1
4
101±0.3
109±0.5
4−ø3.5
Support Tape
0.34
0.34
0.02
0.02
Dots
(200.0)
JAE Pitch 2.5
IL−G−4S−S3C2
4
1
35±5
Note:
Otherwise specified: ±0.4
MTG-E8619
PART NAME
DRAWN
CHECK
APP'D
Q'TY
1
DATE:
11/06/01'
UNIT: MM
SCALE: 1/1
MATERIAL
A
PRODUCT: MTG-E8619
FINISH
MTG-E8619
DWG NO.: MTG-E8619
FILE: MTG-E8619
SHEET 1 / 1
Rev. A
REV.
DESCRIPTION
DRAWN
CHECK
APP'D
DATE