

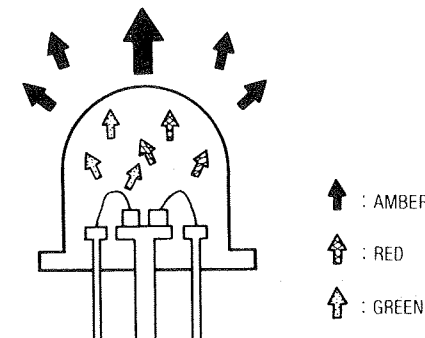
2-3 LED DOT MATRIX MODULE

[1] OVERVIEW

Information display is steadily becoming advanced, more complex and more diversified. As a world leader in opto-electronics technology, Toshiba has developed a 16×16 LED dot matrix module. This module can be used to realize displays as well as TV. Toshiba's module are compact, slim and lightweight set designs. Heat radiation has also been improved with unique heatsink designs, and connections are extremely simple. 16 gradient control is also possible on each dot and each color. It is suitable for a wide range of applications ranging from simple messages boards to graphic boards, entertainment and projectors.

[2] FEATURES

1. Slim and lightweight
2. High speed operation 20MHz (Gradient type: 30MHz)
3. High heat radiation design
4. Multi color display (Red, Green, Amber)
5. With a simple interface, the same quality display as that of a CRT for personal computer is available.
6. Gradient control is possible on each dot and each color (Gradient type).
7. Total brightness of each color can be adjusted by switches (Gradient type).



This display uses one red LED chip and one green LED chip sealed into the same case. Thus, a single LED can be lighted for red or green display, or both can be lighted together to produce amber.

[3] APPLICATIONS

1. For the departure/arrival schedule in a railway station or airport.
2. For instructions and as a guide in factory or office.
3. As a guide to sales and special events in department store and public place.

[4] PRODUCT LINEUP

STANDARD TYPE ($\phi 5\text{mm}$)

| ITEM | | | DESCRIPTION | | | |
|---|--------------|----------------|---------------|------------|-----------|-----------|
| TYPE NAME | | SINGLE POWER | — | — | TL5M501B2 | TLGM501B2 |
| | | DUAL POWER | TLMM501C3 | TLMM504B2U | — | — |
| DISPLAY COLOR | | | R, G, A | R, G, A | R | G |
| DOT SIZE | | | φ5mm | φ5mm | φ5mm | φ5mm |
| DOT PITCH | | | 6mm | 6mm | 6mm | 6mm |
| NUMBER OF DOTS | | | 256 | 256 | 256 | 256 |
| WEIGHT (TYP.) | | | 170g | 185g | 165g | 165g |
| CURRENT V _{cc} = 5V (Typ.) | SINGLE POWER | — | 2.4A | 2.4A | 1.4A | 1.4A |
| | DUAL POWER | CIRCUIT LED | 0.1A | 0.1A | 0.1A | 0.1A |
| | | | 2.3A | 2.3A | 1.3A | 1.3A |
| | | | LED LAMP NAME | | TL5G116 | TL5G264 |

* R : RED G : GREEN A : AMBER

STANDARD TYPE ($\phi 3\text{mm}$)

| ITEM | | | DESCRIPTION | | |
|---|--------------|---------|-------------|-----------|-----------|
| TYPE NAME | SINGLE POWER | | TLMM502B2 | TLSM502A1 | TLGM502A1 |
| | DUAL POWER | | — | — | — |
| DISPLAY COLOR | | | R, G, A | R | G |
| DOT SIZE | | | φ3mm | φ3mm | φ3mm |
| DOT PITCH | | | 4mm | 4mm | 4mm |
| NUMBER OF DOTS | | | 256 | 256 | 256 |
| WEIGHT (TYP.) | | | 95g | 85g | 85g |
| CURRENT V _{cc} = 5V (Typ.) | SINGLE POWER | — | 2.4A | 1.4A | 1.4A |
| | DUAL POWER | CIRCUIT | 0.1A | 0.1A | 0.1A |
| | | LED | 2.3A | 1.3A | 1.3A |
| | | | | | |
| LED LAMP NAME | | | TLSG126 | TLS124 | TLG124A |

* R : RED G : GREEN A : AMBER

WIDER DOT PITCH TYPE

| ITEM | | DESCRIPTION | |
|--|---------|-------------------|-------------------|
| TYPE NAME | | TLMM505A1 | TLMM509A1U |
| DISPLAY COLOR | | R, G, A | R, G, A |
| DOT SIZE | | $\phi 5\text{mm}$ | $\phi 5\text{mm}$ |
| DOT PITCH | | 7.62mm | 7.62mm |
| NUMBER OF DOTS | | 256 | 256 |
| WEIGHT (TYP.) | | 260g | 270g |
| CURRENT $V_{cc} = 5\text{V}$ (Typ.) | CIRCUIT | 0.1A | 0.1A |
| | LED | 2.3A | 2.3A |
| LED LAMP NAME | | TLSG116 | TLSG264 |

* R : RED G : GREEN A : AMBER

HIGH EFFICIENCY TYPE

| ITEM | | DESCRIPTION | |
|--|---------|-------------------|-------------------|
| TYPE NAME | | TLRCM501A1 | TLRCM502A1 |
| DISPLAY COLOR | | RC | RC |
| DOT SIZE | | $\phi 5\text{mm}$ | $\phi 3\text{mm}$ |
| DOT PITCH | | 6mm | 4mm |
| NUMBER OF DOTS | | 256 | 256 |
| WEIGHT (TYP.) | | 165g | 85g |
| CURRENT $V_{cc} = 5\text{V}$ (Typ.) | CIRCUIT | 0.1A | 0.1A |
| | LED | 1.3A | 1.3A |
| LED LAMP NAME | | TLRC180A | TLRC160 |

* RC : HIGH EFFICIENCY RED

GRADIENT TYPE

| ITEM | | DESCRIPTION | | |
|--|---------|-------------------|-------------------|-------------------|
| TYPE NAME | | TLMM506A1 | TLMM508A1U | TLMM507A1 |
| DISPLAY COLOR | | R, G, A | R, G, A | R, G, A |
| DOT SIZE | | $\phi 5\text{mm}$ | $\phi 5\text{mm}$ | $\phi 3\text{mm}$ |
| DOT PITCH | | 6mm | 6mm | 4mm |
| NUMBER OF DOTS | | 256 | 256 | 256 |
| WEIGHT (TYP.) | | (170g) | (185g) | (95g) |
| CURRENT $V_{cc} = 5\text{V}$ (TYP.) | CIRCUIT | 0.1A | 0.1A | 0.1A |
| | LED | 2.3A | 2.3A | 2.3A |
| LED LAMP NAME | | TLSG116 | TLSG264 | TLSG126 |

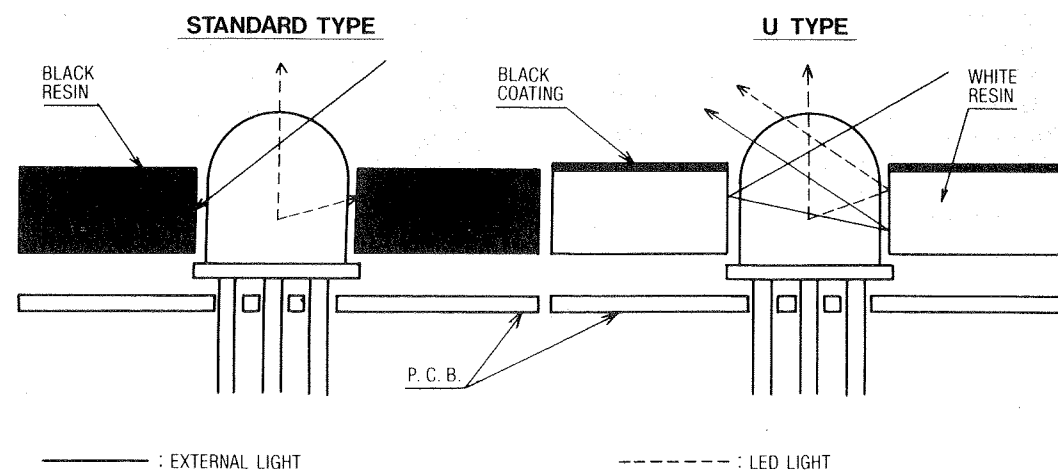
* R : RED G : GREEN A : AMBER

Note: TLMM501C3, TLMM502B2 have white and black reflector types. ("U" Type)

[5] PRODUCT NAMING

T L M M 501 C3 □
 (A) (B) (C) (D) (E) (F) (G)

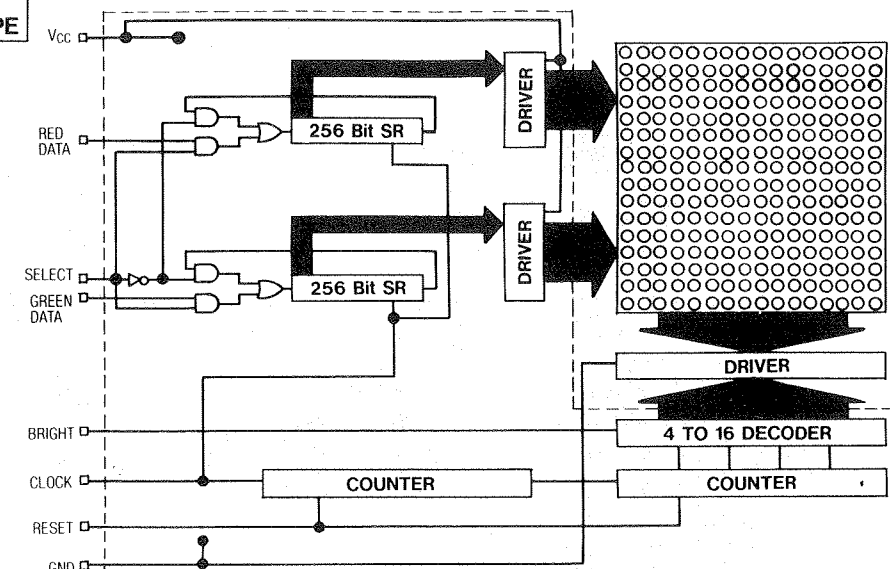
- (A) TOSHIBA (B) LED
 (C) COLOR R: RED G: GREEN RC: HIGH EFFICIENCY RED
 M: RED, GREEN, AMBER
 (D) MODULE (E) SERIAL No. (F) PRODUCT REVISION CODE
 (G) BLACK RESIN TYPE: NOT ATTACHED
 WHITE RESIN TYPE: U is ATTACHED



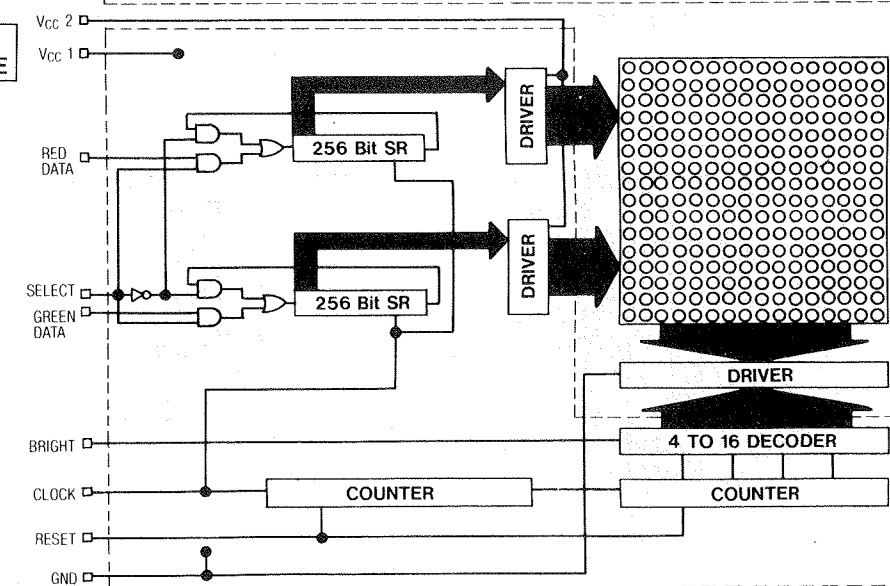
1. The black resin type does not reflect much external light. Therefore, high contrast can be obtained, which is effective for bright surroundings.
2. The white resin type reflects much external light and contrast is low. But, LED light is efficiently reflected to improve the optical characteristics.

[6] BLOCK DIAGRAM

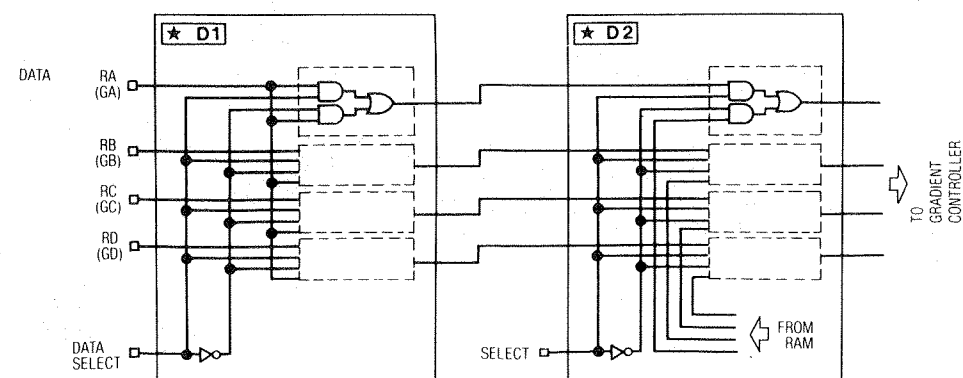
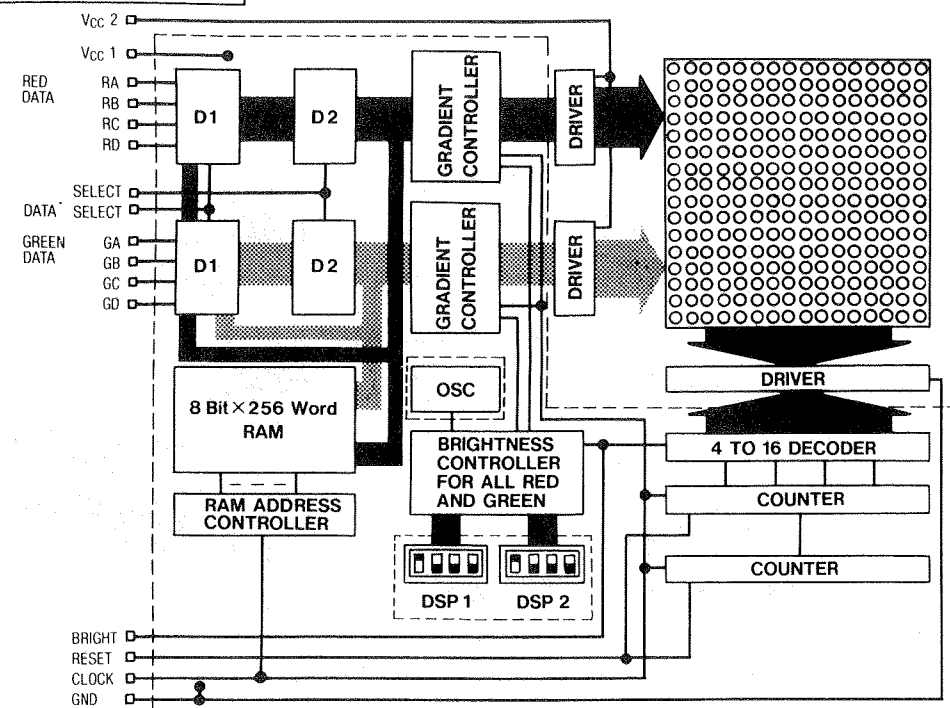
SINGLE POWER TYPE



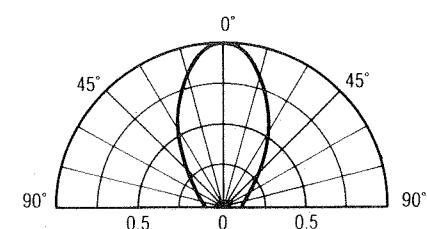
DUAL POWER TYPE



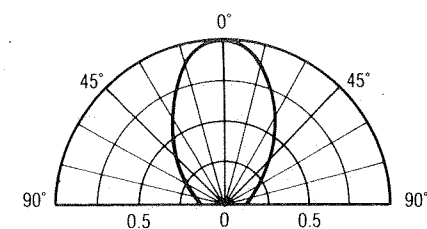
GRADIENT CONTROL TYPE



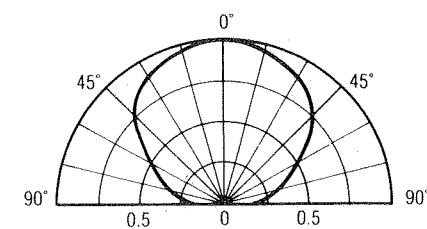
[7] VIEWING ANGLE



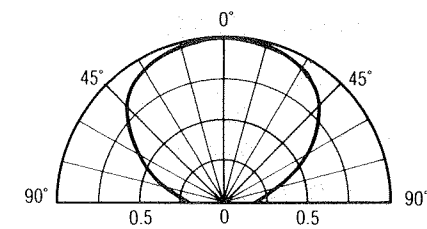
TLMM501C3/505A1/506A1



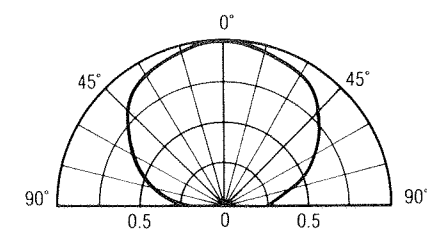
TLMM501C3



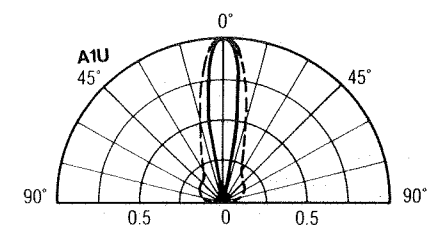
TLMM502A1/B2/507A1



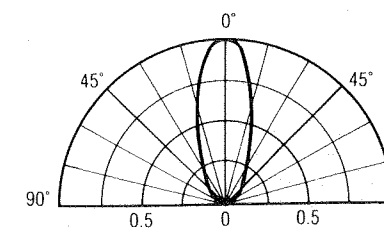
TLMM502A1U/B2U



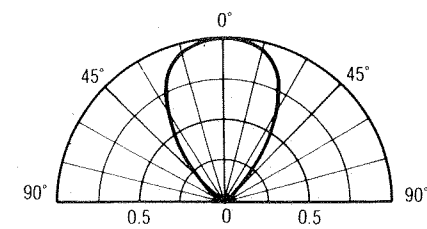
TLMM504B2U/509A1U



TLRCM501A1
TLRCM502A1



TLMS501B2
TLGM501B2



TLMS502A1
TLGM502A1

[8] MAXIMUM RATINGS (Ta = 25°C)

| ITEM | SYMBOL | CONDITION | UNIT |
|-----------------------|------------------|------------------|-------------------------------|
| SUPPLY VOLTAGE | SINGLE POWER | V _{CC} | 5.25 |
| | DUAL POWER | V _{CC1} | 7 |
| | | V _{CC2} | 5.25 |
| CLOCK FREQUENCY | STANDARD TYPE | f | 20 |
| | GRADIENT TYPE | f | 30 |
| INPUT VOLTAGE | SINGLE POWER | V _{IN} | -0.3 ~ V _{CC} + 0.3 |
| | DUAL POWER | V _{IN} | -0.3 ~ V _{CC1} + 0.3 |
| OPERATING TEMPERATURE | T _{opr} | -10 ~ 60* | °C |
| STORAGE TEMPERATURE | T _{stg} | -20 ~ 85 | °C |

* LED surface temperature must be maintained below 70°C. So loading the ventilation fan is recommendable.

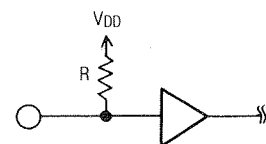
[9] RECOMMENDABLE DRIVE CONDITION

| ITEM | SYMBOL | CONDITION | UNIT |
|-----------------------|------------------|------------------|--------|
| SUPPLY VOLTAGE | SINGLE POWER | V _{CC} | 5 |
| | DUAL POWER | V _{CC1} | 5 ± 5% |
| | | V _{CC2} | 5 |
| OPERATING TEMPERATURE | T _{opr} | 0 ~ 50 | °C |

[10] INPUT LEVEL

| ITEM | SYMBOL | Min. | Typ. | Max. | UNIT |
|-----------|-----------------|------|------|------|------|
| INPUT "L" | V _{IL} | — | — | 0.8 | V |
| INPUT "H" | V _{IH} | 2.2 | — | — | V |

* All input is pulled up by 50kΩ



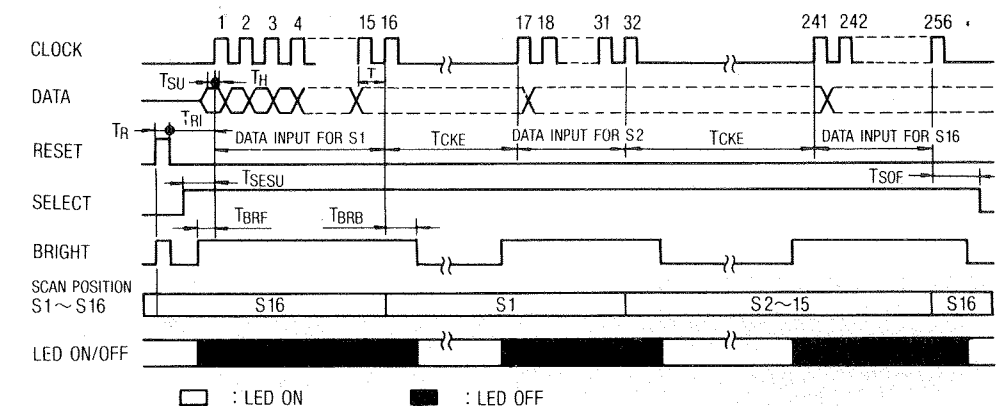
INPUT BUFFER (R = 50kΩ)

[11] FUNCTION

1. STANDARD TYPE

- V_{CC} : Power supply of the module (single power)
 - V_{CC1} : Power supply for the circuit (dual power)
 - V_{CC2} : Power supply for the LED (dual power)
 - GND : Ground of the module
 - RED DATA : Data input for red color
 - GREEN DATA : Data input for green color
 - SELECT : Data input control
 - "H": Data input and display
 - "L": Data input enable and displayed by memorized data
 - BRIGHT : Display on or off control
 - "H": Display on
 - "L": Display off
 - CLOCK : For data input and display
 - RESET : For initializing scan position
- Are not cleared the memorized data

TIMING CHART



| ITEM | SYMBOL | Min. (nS) | Max. (nS) |
|----------------------------|-------------------|-----------|-----------|
| CLOCK FREQUENCY (Dr = 1/2) | T | — | 50 |
| DATA SETUP TIME | T _{SU} | 10 | — |
| DATA HOLD TIME | T _H | 10 | — |
| CLOCK ENABLE TIME | T _{CKE} | NOTE 1 | — |
| RESET SETUP TIME | T _{RI} | 10 | — |
| RESET HOLD TIME | T _{RH} | 20 | — |
| SELECT SETUP TIME | T _{SESU} | 10 | — |
| SELECT OFF TIME | T _{SOF} | 10 | — |
| BRIGHT INPUT TIME (FRONT) | T _{BRF} | 7000 | — |
| BRIGHT INPUT TIME (BACK) | T _{BRB} | NOTE 2 | — |

NOTE 1) Brightness of LED is decided by T_{CKE} width. Because, this time is on time for S1~S16.

2) TLMM505A1, TLMM509A1U : 4500
except for the above type : 3000

2. GRADIENT TYPE

- VCC1 : Power supply for the Circuit
- VCC2 : Power supply for the LED
- GND : Ground of the module
- RED DATA (RA~RD) : Data input for red color
- GREEN DATA (GA~GD) : Data input for green color
- DATA SELECT (DSE) : Input data select either 4bit or 1bit

| RA (GA) | RB (GB) | RC (GC) | RD (GD) | DSE | ON TIME |
|---------|---------|---------|---------|-----|---------|
| 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 2 |
| 1 | 1 | 0 | 0 | 1 | 3 |
| 0 | 0 | 1 | 0 | 1 | 4 |
| 1 | 0 | 1 | 0 | 1 | 5 |
| 0 | 1 | 1 | 0 | 1 | 6 |
| 1 | 1 | 1 | 0 | 1 | 7 |
| 0 | 0 | 0 | 1 | 1 | 8 |
| 1 | 0 | 0 | 1 | 1 | 9 |
| 0 | 1 | 0 | 1 | 1 | A |
| 1 | 1 | 0 | 1 | 1 | B |
| 0 | 0 | 1 | 1 | 1 | C |
| 1 | 0 | 1 | 1 | 1 | D |
| 0 | 1 | 1 | 1 | 1 | E |
| 1 | 1 | 1 | 1 | 1 | F |
| 0 | * | * | * | 0 | 0 |
| 1 | * | * | * | 0 | F |

*Don't care

●SELECT : DATA INPUT CONTROL

"H" : Data input and display

"L" : Data input enable and displayed memorized data

●BRIGHT : Display on or off control

"H" : Display on

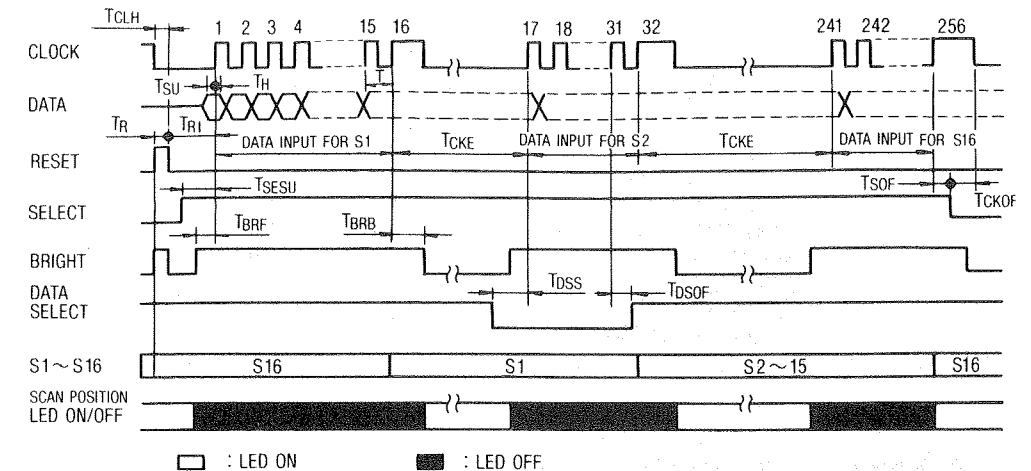
"L" : Display off

●CLOCK : For data input and display

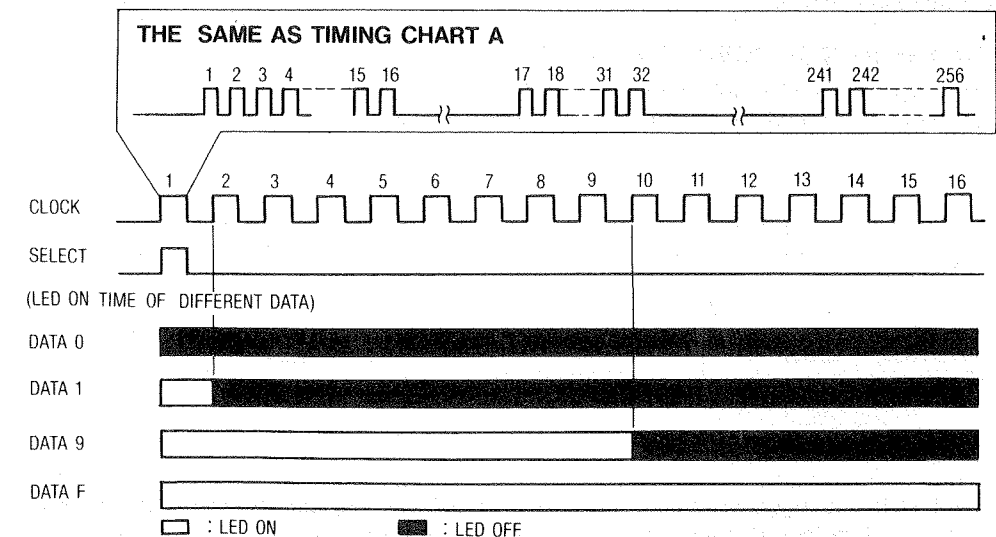
●RESET : For initializing scan position

Are not cleared the memorized data

TIMING CHART A



TIMING CHART B (GRADIENT CONTROL)



| | | | | | | |
|-----|------------|--|--------------------------|-------------------|-----------|-----------|
| | UP | | ITEM | SYMBOL | Min. (nS) | Max. (nS) |
| S1 | ○○○○○○○○○○ | | CLOCK FREQUENCY | T | — | 33.3 |
| S2 | ○○○○○○○○○○ | | DATA SETUP TIME | T _{SU} | 10 | — |
| S3 | ○○○○○○○○○○ | | DATA HOLD TIME | T _H | 10 | — |
| | ○○○○○○○○○○ | | CLOCK ENABLE TIME | T _{CKE} | NOTE 1 | — |
| | ○○○○○○○○○○ | | RESET SETUP TIME | T _{RI} | 10 | — |
| | ○○○○○○○○○○ | | RESET HOLED TIME | T _R | 20 | — |
| S15 | ○○○○○○○○○○ | | SELECT SETUP TIME | T _{SESU} | 10 | — |
| S16 | ○○○○○○○○○○ | | SELECT OFF TIME | T _{SOF} | 10 | — |
| | | | BRIGHT HOLD TIME (FRONT) | T _{BRF} | 7000 | — |
| | | | BRIGHT HOLD TIME (BACK) | T _{BRB} | 1500 | — |
| | | | DSE SETUP TIME | T _{DSS} | 10 | — |
| | | | DSE OFF TIME | T _{Dsof} | 10 | — |
| | | | CLOCK OFF TIME | T _{CKOF} | 10 | — |
| | | | CLOCK LOW HOLD TIME | T _{CLH} | 10 | — |

NOTE 1) Brightness of LED is decided by T_{CKE} width. Because, this time is on time for S1~S16.

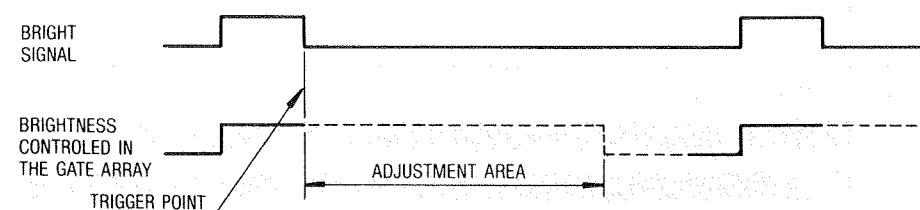
★★★

In case of gradient function, procedure is as follows:

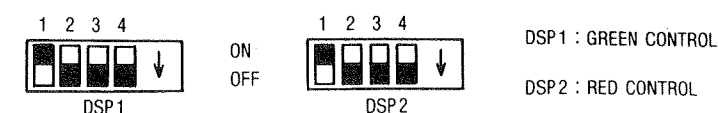
- (1) TIMING CHART A
- (2) Set select signal to "L"
- (3) TIMING CHART B

◎ TOTAL BRIGHTNESS CONTROL FUNCTION

Gradient type module has total brightness control function. It is controlled by switch on the circuit board of module. please set the position as follows.



This control system is triggered at fall of brightness signal. And adjustment pulse width is fixed in the circuit. Therefore, if input cycle of brightness signal is shorter than full controled pulse width of this function, adjustment steps are decreased.

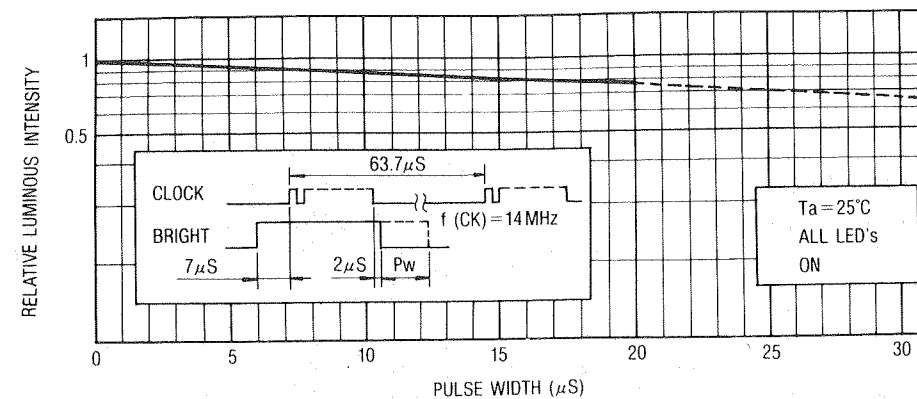


◎ REFERENCE VALUE

| SWITCH POSITION | | | | PULSE WIDTH |
|-----------------|-----|-----|-----|--------------|
| 1 | 2 | 3 | 4 | |
| OFF | OFF | OFF | OFF | 34.5 μ S |
| ON | OFF | OFF | OFF | 0 |
| OFF | ON | OFF | OFF | 2.3 |
| ON | ON | OFF | OFF | 4.6 |
| OFF | OFF | ON | OFF | 6.9 |
| ON | OFF | ON | OFF | 9.2 |
| OFF | ON | ON | OFF | 11.5 |
| ON | ON | ON | OFF | 13.8 |

| SWITCH POSITION | | | | PULSE WIDTH |
|-----------------|-----|-----|----|--------------|
| 1 | 2 | 3 | 4 | |
| OFF | OFF | OFF | ON | 16.1 μ S |
| ON | OFF | OFF | ON | 18.4 |
| OFF | ON | OFF | ON | 20.7 |
| ON | ON | OFF | ON | 23 |
| OFF | OFF | ON | ON | 25.3 |
| ON | OFF | ON | ON | 27.6 |
| OFF | ON | ON | ON | 29.9 |
| ON | ON | ON | ON | 32.2 |

[12] BRIGHTNESS CHARACTERISTICS



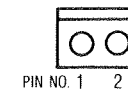
◎ LUMINOUS INTENSITY (TYP.)

| TYPE NAME | LUMINOUS INTENSITY (cd/m ²) | | |
|---------------|---|-------|-------|
| | RED | GREEN | AMBER |
| TLMM501B2 | 190 | 190 | 300 |
| TLMM501B2 | 280 | — | — |
| TLGM501B2 | — | 320 | — |
| TLMM504B2U | 70 | 70 | 110 |
| TLMM502A1/B2 | 160 | 160 | 250 |
| TLMM502A1/B2 | 300 | — | — |
| TLGM502A1/B2 | — | 230 | — |
| TLMM505A1 | 110 | 110 | 170 |
| TLMM509A1U | 30 | 30 | 50 |
| TLRCM501A1/B2 | 5000 | — | — |
| TLRCM502A1/B2 | 5800 | — | — |
| TLMM506A1 | 190 | 190 | 300 |
| TLMM507A1 | 160 | 160 | 250 |
| TLMM508A1U | 70 | 70 | 110 |

[13] PIN CONNECTIONS

SINGLE
POWER TYPE

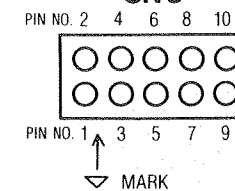
CN1



CN2

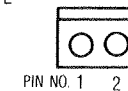


CN3

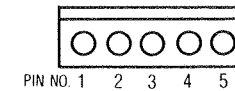


DUAL
POWER TYPE

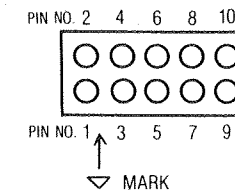
CN1



CN2



CN3



CN1

| | |
|---|--------|
| 1 | GND |
| 2 | SELECT |

CN2 (SINGLE POWER)

| | |
|---|--------|
| 1 | Vcc |
| 2 | GND |
| 3 | GND |
| 4 | SELECT |

CN2 (DUAL POWER)

| | |
|---|--------|
| 1 | Vcc1 |
| 2 | Vcc2 |
| 3 | GND |
| 4 | GND |
| 5 | SELECT |

CN3 (MULTI COLOR)

| | | | |
|---|------------|----|--------|
| 1 | GND | 6 | CLOCK |
| 2 | RED DATA | 7 | GND |
| 3 | GND | 8 | BRIGHT |
| 4 | GREEN DATA | 9 | GND |
| 5 | GND | 10 | RESET |

CN3 (SINGLE COLOR)

| | | | |
|---|-------|----|--------|
| 1 | GND | 6 | CLOCK |
| 2 | DATA* | 7 | GND |
| 3 | GND | 8 | BRIGHT |
| 4 | DATA* | 9 | GND |
| 5 | GND | 10 | RESET |

* SHORTED IN THE CIRCUIT BOARD OF MODULE

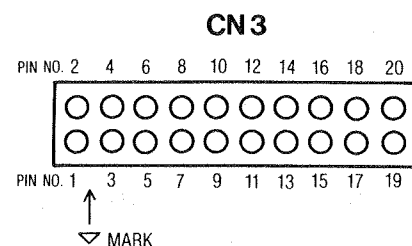
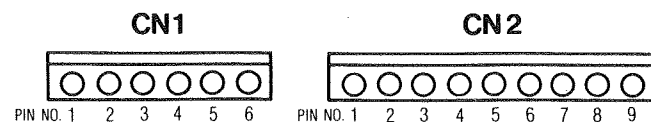
* CONNECTOR TYPE NAME

CN1 : 171825 - 2 (AMP (JAPAN), Ltd.)

CN2 : 171825 - 4 SINGLE POWER, 171825 - 5 DUAL POWER (AMP (JAPAN), Ltd.)

CN3 : FCN - 744P010 - AU/R (FUJITSU Ltd.)

GRADIENT
TYPE



CN1

| | |
|---|--------|
| 1 | RESET |
| 2 | GND |
| 3 | CLOCK |
| 4 | GND |
| 5 | BRIGHT |
| 6 | GND |

CN2

| | | | |
|---|-------|----|--------|
| 1 | Vcc1 | 6 | CLOCK |
| 2 | Vcc2 | 7 | GND |
| 3 | GND | 8 | BRIGHT |
| 4 | RESET | 9 | GND |
| 5 | GND | 10 | — |

CN3

| | | | | | | | |
|---|---------|----|---------|----|---------|----|-----------|
| 1 | GND | 6 | DATA RC | 11 | GND | 16 | DATA GD |
| 2 | DATA RA | 7 | GND | 12 | DATA GB | 17 | GND |
| 3 | GND | 8 | DATA RD | 13 | GND | 18 | D* SELECT |
| 4 | DATA RB | 9 | GND | 14 | DATA GC | 19 | GND |
| 5 | GND | 10 | DATA GA | 15 | GND | 20 | SELECT |

*: DATA SELECT

***CONNECTOR TYPE NAME**

CN1 : 171825-6 (AMP (JAPAN), Ltd.)
CN2 : 171825-9 (AMP (JAPAN), Ltd.)
CN3 : FCN-744P020-AU/R (FUJITSU Ltd.)

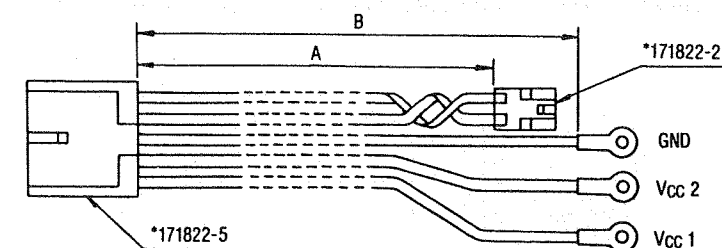
[14] ACCESSORIES

| TYPE NAME | | ACCESSORIES No. |
|---|----------|--------------------|
| TL5M501B2 TLGM501B2 TLRCM501A1 | Attached | — |
| TLMM501C3 TLMM504B2U | *Option | AC551 (AC553) |
| TLMM502A1 TL5M502A1 TLGM502A1 TLRCM502A1 | Attached | — |
| TLMM502B2 | *Option | AC552 (AC554) |
| TLMM505A1 TLMM509A1U | | AC551 or AC552 |
| TLMM506A1 TLMM508A1U | | AC() ** |
| TLMM507A1 | | AC() ** |

* If you need the accessories, please ask to our salesman about the cost and the delivery.
And, if you make your self, please keep the length shorter than the follows.

** UNDER DEVELOPMENT

EXAMPLE OF CABLE DIMENSION



Recommendable cable length
A : 100 ± 5 (mm) MAX.
B : 150 ± 5 (mm) MAX.

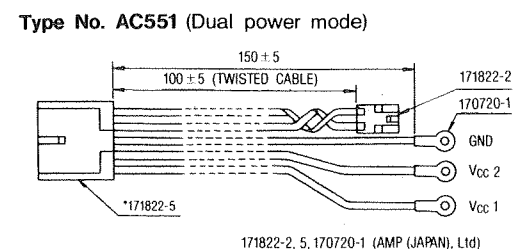
* Recommendable connector
171822-2, 5
(AMP (JAPAN), Ltd)

Note:
If you use dual power type
Module as single use.
Please short the terminal
of Vcc1 and Vcc2.

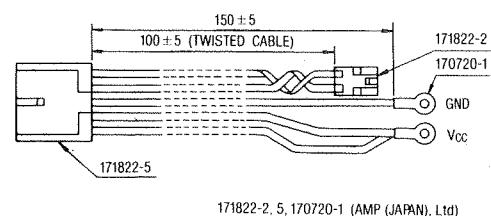
OPTION CABLE DIMENSION

1) For $\phi 5\text{mm}$

(Unit in mm)

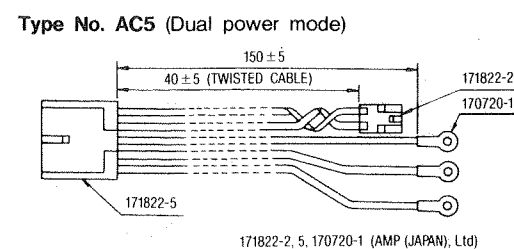


Type No. AC553 (Single power mode)

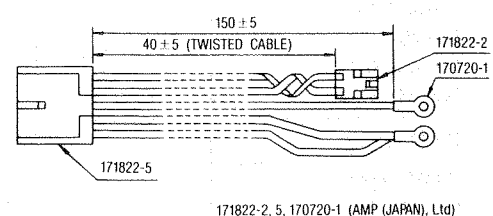


2) For $\phi 3\text{mm}$

(Unit in mm)

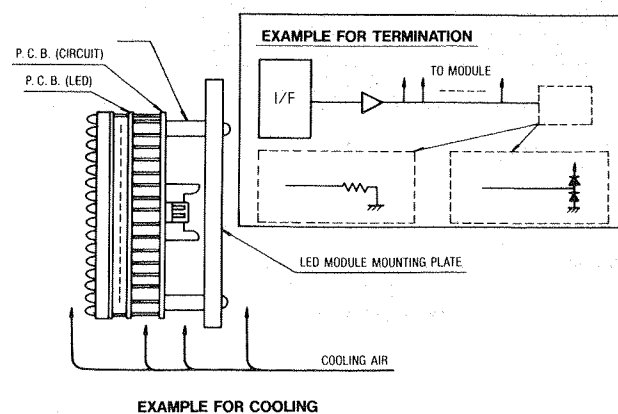


Type No. AC55 (Single power mode)

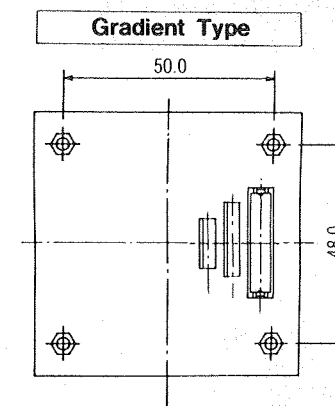
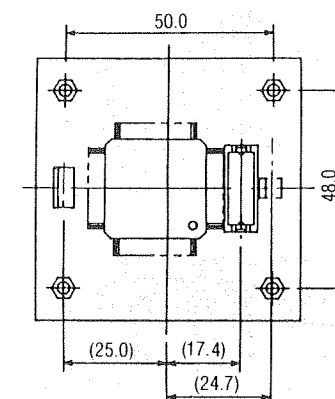
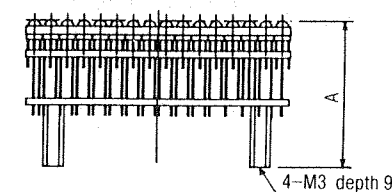
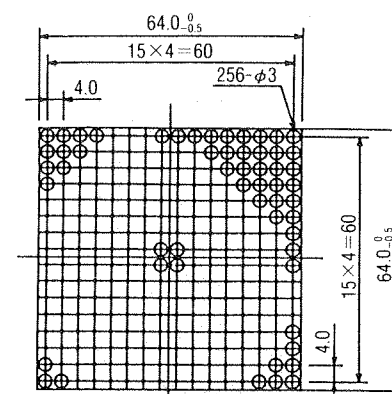


[15] PRECAUTION

- Please pay attention to radiate the heat in case of many LED DOT MATRIX MODULES are arrangement at large size display.
- Please do not give a mechanical shock to avoid reformation of the LED DOT MATRIX MODULE.
- Please do not touch surface of the LED DOT MATRIX MODULE of TLMM×××A1U/B2U/C3U type at shape edge or hard things. Because, it is very easier to scratch.
- Twisted cable or shielded wire is recommendable for safety operation from high frequency noise.

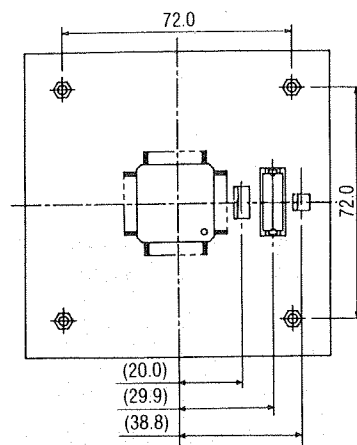
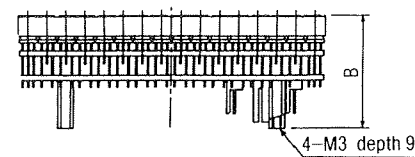
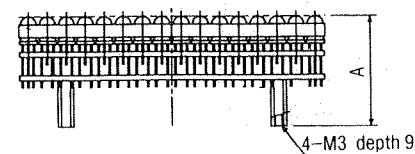
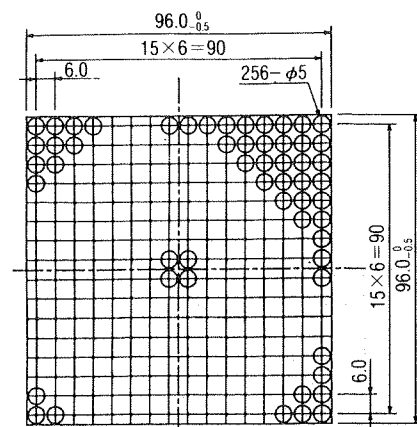


[16] DIMENSIONS

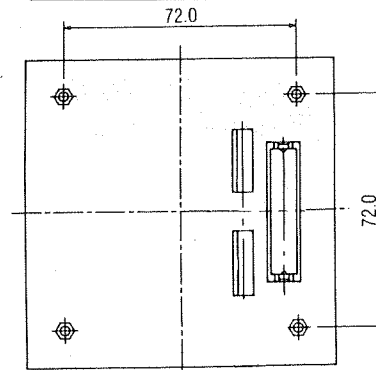


- Note 1) Tolerance is ± 0.5
 2) Unit in mm
 3) Size of A

| TYPE No. | A |
|---------------|------|
| TLMM502A1, B2 | 35.6 |
| TLGM502A1 | 35.2 |
| TL5M502A1 | 35.2 |
| TLRCM502A1 | 35.4 |
| TLMM507A1 | 35.6 |

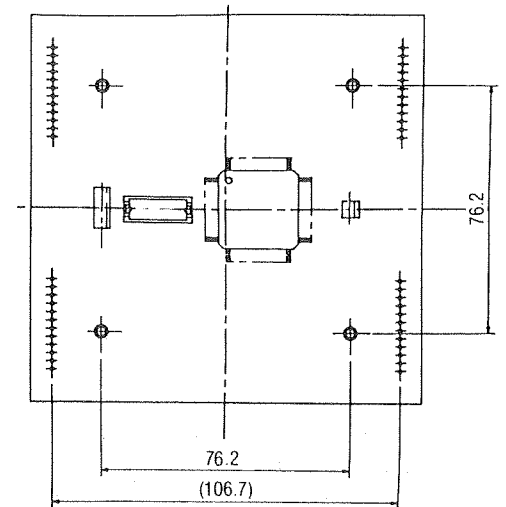
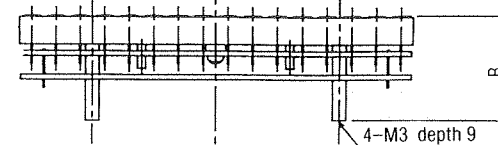
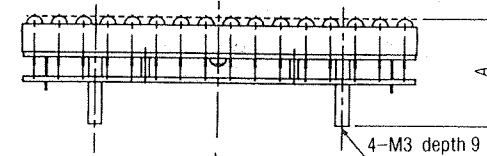
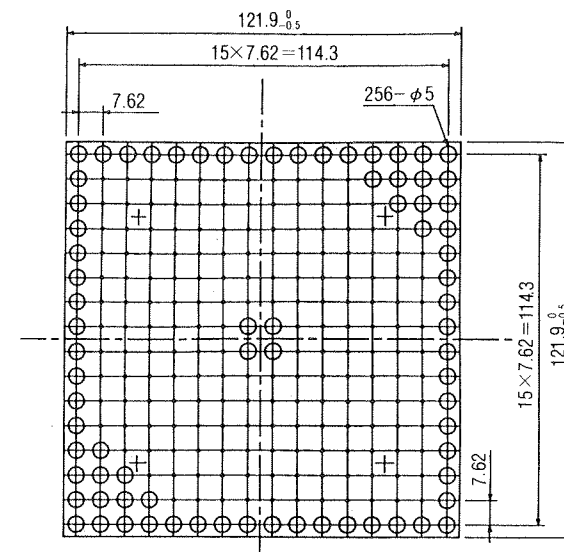


Gradient Type



- Note 1) Tolerance is ± 0.5
 2) Unit in mm
 3) Size of A and B

| TYPE No. | A | B |
|------------|------|------|
| TLMM501B2 | 35.4 | — |
| TLGM501B2 | 35.7 | — |
| TL5M501B2 | 35.7 | — |
| TLRCM501A1 | 36.2 | — |
| TLMM504A1U | — | 35.4 |
| TLMM506A1 | 35.4 | — |
| TLMM508A1U | — | 35.4 |



- Note 1) Tolerance is ± 0.5
 2) Unit in mm
 3) Size of A and B

| TYPE No. | A | B |
|------------|------|------|
| TLMM505A1 | 35.4 | — |
| TLMM509A1U | — | 35.4 |