



# INDICATOR TUBE

+ - × ÷ 1234567890 KC KV KΩ 1234567890 % °C PH  
567890 % °C PH + - × ÷ 1234567890 KC KV KΩ 1234  
KC KV KΩ 1234567890 % °C PH + - × ÷ 1234567890  
+ - × ÷ 1234567890 KC KV KΩ 1234567890 % °C PH  
567890 % °C PH + - × ÷ 1234567890 KC KV KΩ 123  
KC KV KΩ 1234567890 % °C PH + - × ÷ 1234567890  
+ - × ÷ 1234567890 KC KV KΩ 1234567890 % °C PH  
567890 % °C PH + - × ÷ 1234567890 KC KV KΩ 123  
KC KV KΩ 1234567890 % °C PH + - × ÷ 1234567890  
+ - × ÷ 1234567890 KC KV KΩ 1234567890 % °C PH  
56/890 % °C PH + - × ÷ 1234567890 KC KV KΩ 123  
KC KV KΩ 1234567890 % °C PH + - × ÷ 1234567890  
+ - × ÷ 1234567890 KC KV KΩ 1234567890 % °C PH  
567890 % °C PH + - × ÷ 1234567890 KC KV KΩ 123  
KC KV KΩ 1234567890 % °C PH + - × ÷ 1234567890  
+ - × ÷ 1234567890 KC KV KΩ 1234567890 % °C PH  
567890 % °C PH + - × ÷ 1234567890 KC KV KΩ 123  
KC KV KΩ 1234567890 % °C PH + - × ÷ 1234567890



CD66  
CD66P



GR-111  
GR-111P



GR-116D  
GR-116P



MG-17G



MG-137



MG-157



CD28



CD25



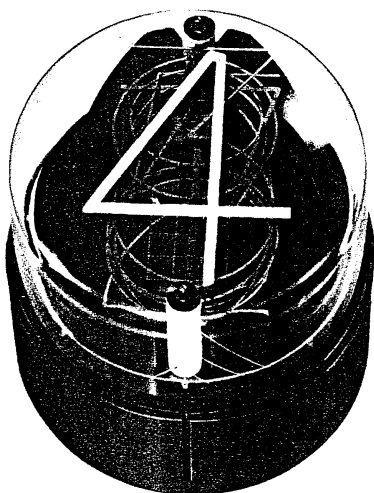
CD13



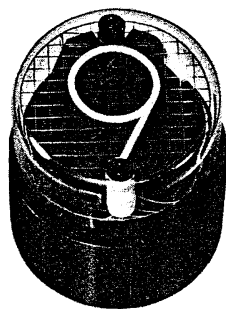
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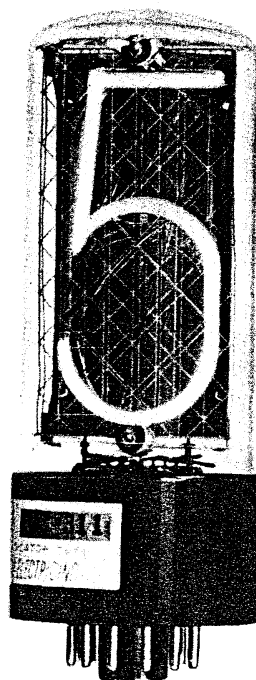
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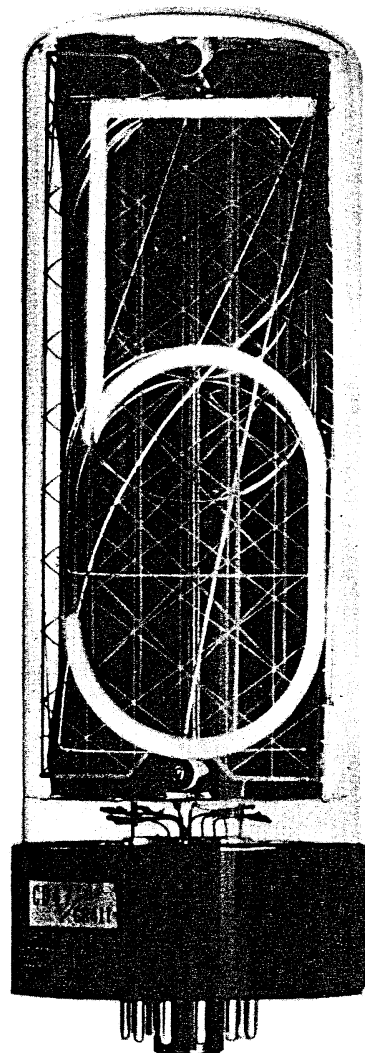
CD27



CD11



GR-311



GR-414



GR-211

|                              |                                                                                              | TOP VIEW TYPE (DC OPERATION)             |                                          |                                          |                                           |                                          |                                         |                                          |                                           | SIDE VIEW TYPE                                          |                                                        |                                           |                                                       |
|------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------|------------------------------------------|-----------------------------------------|------------------------------------------|-------------------------------------------|---------------------------------------------------------|--------------------------------------------------------|-------------------------------------------|-------------------------------------------------------|
| REFERENCE NUMBER             |                                                                                              | CD11                                     | CD12                                     | CD13                                     | CD24                                      | CD25                                     | CD27                                    | CD28                                     | CD43                                      | GR-110                                                  | GR-116D                                                | GR-111                                    | CD66                                                  |
| Outline Drawing              |                                                                                              |                                          |                                          |                                          |                                           |                                          |                                         |                                          |                                           |                                                         |                                                        |                                           |                                                       |
| Pin Connections              |                                                                                              |                                          |                                          |                                          |                                           |                                          |                                         |                                          |                                           |                                                         |                                                        |                                           |                                                       |
| Socket                       |                                                                                              | TSB — 14P                                | TSB — 12P                                | TSM — 11P                                | TSB — 13P                                 | TSR — 11P                                | TSB — 12P                               | TSM — 13P                                | TSR — 11P                                 |                                                         |                                                        |                                           |                                                       |
| Construction                 |                                                                                              | 0 ~ 9                                    | 0 ~ 9                                    | 0 ~ 9                                    | 0 ~ 9                                     | 0 ~ 9                                    | 0 ~ 9                                   | 0 ~ 9                                    | 0 ~ 9                                     | 0 ~ 9<br>Decimal Point                                  | 0 ~ 9<br>Decimal Point<br>Left • Right                 | 0 ~ 9<br>Decimal Point                    | 0 ~ 9<br>Decimal Point                                |
| ELECTRICAL SPECIFICATIONS    | Supply Voltage (Vdc) Ebb                                                                     | MIN. 170 ST. — MAX. —                    | MIN. 200 ST. — MAX. —                    | MIN. 170 ST. — MAX. —                    | MIN. 170 ST. — MAX. —                     | MIN. 170 ST. — MAX. —                    | MIN. 200 ST. — MAX. —                   | MIN. 170 ST. — MAX. —                    | MIN. 170 ST. — MAX. —                     | MIN. 170 ST. — MAX. —                                   | MIN. 175 ST. — MAX. —                                  | MIN. 170 ST. — MAX. —                     | MIN. 170 ST. — MAX. —                                 |
|                              | Ionization Voltage (Vdc) Ez                                                                  | — — 170                                  | — — 170                                  | — — 170                                  | — — 170                                   | — — 170                                  | — — 170                                 | — — 170                                  | — — 170                                   | — — 170                                                 | — — 170                                                | — — 170                                   | — — 170                                               |
|                              | Cathode Current (mA dc)<br>Numerical Cathode ik<br>Decimal Point ik(•)                       | 1.5 2.5 3.5<br>(Ebb = 170Vdc, Rp = 10kΩ) | 3.5 5.0 6.5<br>(Ebb = 200Vdc, Pp = 12kΩ) | 0.6 0.9 1.2<br>(Ebb = 170Vdc, Pp = 33kΩ) | 1.5 2.25 3.0<br>(Ebb = 170Vdc, Rp = 10kΩ) | 1.5 2.5 3.5<br>(Ebb = 170Vdc, Rp = 10kΩ) | 7.5 10 12.5<br>(Ebb = 200Vdc, Rp = 5kΩ) | 1.0 1.8 2.5<br>(Ebb = 170Vdc, Rp = 15kΩ) | 1.5 2.25 3.0<br>(Ebb = 170Vdc, Rp = 10kΩ) | 1.2 1.9 2.6<br>(Ebb = 190Vdc, Rk = 27kΩ)                | 2.2 3 3.8<br>(Ebb = 180Vdc, Rk = 15kΩ)                 | 1.5 2.25 3.0<br>(Ebb = 190Vdc, Rp = 20kΩ) | 1.5 2.25 3.0<br>(Ebb = 170Vdc, Rp = 12kΩ)             |
|                              | Average Each Cathode<br>Power Dissipation (w)<br>Numerical Cathode Pk<br>Decimal Point Pk(•) | — — 0.5                                  | — — 1                                    | — — 0.2                                  | — — 0.5                                   | — — 0.5                                  | — — 2                                   | — — 0.4                                  | — — 0.5                                   | 0.15 0.3 0.5<br>(Ebb = 190Vdc Rk(•) = 180kΩ)<br>— — 0.5 | 0.2 0.4 0.6<br>(Ebb = 180Vdc Rk(•) = 100kΩ)<br>— — 0.5 | — 0.4 —<br>— — 0.5                        | 0.3 0.5 0.7<br>(Ebb = 170Vdc Rk(•) = 50kΩ)<br>— — 0.5 |
| ABSOLUTE RATINGS             | Peak Cathode Current(mA dc)<br>Numerical Cathode ik<br>Decimal Point ik(•)                   | — — 4.0                                  | — — 10                                   | — — 1.5                                  | — — 3.5                                   | — — 4.0                                  | — — 12.5                                | — — 3                                    | — — 3.5                                   | — — 3.0<br><br>0.8                                      | — — 4<br><br>1.3                                       | — — 3.5                                   | — — 3.5                                               |
|                              | Range of Average Cathode<br>Current (mA dc)<br>Numerical Cathode<br>Decimal Point            | 1.5 ~ 3.5                                | 3.5 ~ 6.5                                | 0.6 ~ 1.2                                | 1.5 ~ 3.0                                 | 1.5 ~ 3.5                                | 7.5 ~ 12.5                              | 1.0 ~ 2.5                                | 1.5 ~ 3.0                                 | 1.2 ~ 2.6<br><br>0.15 ~ 0.5                             | 2.2 ~ 3.8<br><br>0.2 ~ 0.6                             | 1.5 ~ 3.0                                 | 1.5 ~ 3.0                                             |
|                              | Ambient Temperature (for<br>storage) Ts (deg C)                                              | —65 ~ +70                                | —65 ~ +70                                | —65 ~ +70                                | —65 ~ +70                                 | —65 ~ +70                                | —65 ~ +70                               | —65 ~ +70                                | —65 ~ +70                                 | —65 ~ +70                                               | —65 ~ +70                                              | —65 ~ +70                                 | —65 ~ +70                                             |
|                              | Operating Ambient Tempera-<br>ture Tc (deg C)                                                | —10 ~ +55                                | —10 ~ +55                                | —10 ~ +55                                | —10 ~ +55                                 | —10 ~ +55                                | —10 ~ +55                               | —10 ~ +55                                | —10 ~ +55                                 | —10 ~ +55                                               | —10 ~ +55                                              | —10 ~ +55                                 | —10 ~ +55                                             |
| MECHANICAL DATA              | Maximum Viewing Angle (deg)<br>(approx)                                                      | 160                                      | 160                                      | 160                                      | 160                                       | 160                                      | 160                                     | 160                                      | 160                                       | 90                                                      | 100                                                    | 100                                       | 100                                                   |
|                              | Weight (g)<br>(approx)                                                                       | 25                                       | 75                                       | 4                                        | 12                                        | 13                                       | 130                                     | 9                                        | 10                                        | 2.3                                                     | 4<br>(INCL. STAND-OFF)                                 | 7                                         | 10                                                    |
| TYPICAL OPERATING CONDITIONS | Supply Voltage (Vdc)                                                                         | 170 200 250 300                          | 200 250 300                              | 170 200 250 300                          | 170 200 250 300                           | 170 200 250 300                          | 200 250 300                             | 170 200 250 300                          | 170 200 250 300                           | 190 200 230                                             | Rk 180 200                                             | 190 200 250 300                           | 190 200 250 300                                       |
|                              | Anode Series Resistor (KΩ)<br>Decimal Point Series Resistor (KΩ)<br>Pulse Duration (mS)      | 10 22 42 62<br>180 200 300               | 12 22 32                                 | 33 65 120 180                            | 10 24 47 68                               | 10 22 43 62                              | 5 10 15                                 | 15 35 65 100                             | 10 24 47 68                               | Rk27 33 47<br>180 200 300                               | Rk 15 20<br>100 150                                    | Rp20 24 47 68                             | Rk20 24 47 68<br>91 110 200 300                       |

| (DC OPERATION)                                                                             |                                                                                        |                                                                                         | (PULSE OPERATION)                                                                                                       |                                                                                                                         |                                                                                                                          |                                                                                                                      |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| GR-414                                                                                     | GR-211                                                                                 | GR-311                                                                                  | GR-110                                                                                                                  | GR-116p                                                                                                                 | GR-111p                                                                                                                  | CD66P                                                                                                                |
|                                                                                            |                                                                                        |                                                                                         |                                                                                                                         |                                                                                                                         |                                                                                                                          |                                                                                                                      |
|                                                                                            |                                                                                        |                                                                                         |                                                                                                                         |                                                                                                                         |                                                                                                                          |                                                                                                                      |
| TSB - 12P                                                                                  | TSB - 14P                                                                              | TSB - 12P                                                                               |                                                                                                                         |                                                                                                                         |                                                                                                                          |                                                                                                                      |
| 0 ~ 9                                                                                      | 0 ~ 9                                                                                  | 0 ~ 9                                                                                   | 0 ~ 9<br>Decimal Point                                                                                                  | 0 ~ 9<br>Decimal Point<br>Left • Right                                                                                  | 0 ~ 9<br>Decimal Point                                                                                                   | 0 ~ 9<br>Decimal Point                                                                                               |
| MIN. ST. MAX.<br>250 — —<br>— — 200<br>17.5 25 32.5<br>(Ebb = 250Vdc, Rp = 5.1kΩ)<br>— — 5 | MIN. ST. MAX.<br>200 — —<br>— — 170<br>3.5 5 6.5<br>(Ebb = 200Vdc, Rp = 12kΩ)<br>— — 1 | MIN. ST. MAX.<br>200 — —<br>— — 170<br>12 15 18<br>(Ebb = 21.5Vdc, Rp = 5kΩ)<br>— — 2.5 | MIN. ST. MAX.<br>190 — —<br>— — 170<br>5<br>(duty $\frac{1}{10}$ Ebb = 190Vdc, Rp = 6.8kΩ)<br>0.9<br>— — 0.3<br>— — 0.1 | MIN. ST. MAX.<br>175 — —<br>— — 170<br>14<br>(duty $\frac{1}{20}$ Ebb = 200Vdc, Rp = 2.5kΩ)<br>4<br>— — 0.45<br>— — 0.1 | MIN. ST. MAX.<br>190 — —<br>— — 170<br>5.5<br>(duty $\frac{1}{10}$ Ebb = 190Vdc, Rp = 5kΩ)<br>0.9<br>— — 0.45<br>— — 0.1 | MIN. ST. MAX.<br>190 — —<br>— — 190<br>15<br>(duty $\frac{1}{10}$ Ebb = 190Vdc, Rp = 2kΩ)<br>3<br>— — 0.5<br>— — 0.1 |
| — — 35                                                                                     | — — 10                                                                                 | — — 18                                                                                  | 2.4 ~ 8                                                                                                                 | 11 ~ 17                                                                                                                 | 3 ~ 8                                                                                                                    | 9 ~ 20                                                                                                               |
| 17.5 ~ 32.5                                                                                | 3.5 ~ 6.5                                                                              | 10.0 ~ 18.0                                                                             | 0.4 ~ 2                                                                                                                 | 1 ~ 6                                                                                                                   | 0.7 ~ 1.5                                                                                                                | 1 ~ 6                                                                                                                |
| —65 ~ +70                                                                                  | —65 ~ +70                                                                              | —65 ~ +70                                                                               | 0.25 ~ 0.8                                                                                                              | 0.5 ~ 1.9                                                                                                               | 0.3 ~ 0.8                                                                                                                | 1 ~ 2                                                                                                                |
| —10 ~ +55                                                                                  | —10 ~ +55                                                                              | —10 ~ +55                                                                               | 0.04 ~ 0.2                                                                                                              | 0.05 ~ 0.6                                                                                                              | 0.07 ~ 0.15                                                                                                              | 0.1 ~ 0.5                                                                                                            |
| —65 ~ +70                                                                                  | —65 ~ +70                                                                              | —65 ~ +70                                                                               | —65 ~ +70                                                                                                               | —65 ~ +70                                                                                                               | —65 ~ +70                                                                                                                | —65 ~ +70                                                                                                            |
| —10 ~ +55                                                                                  | —10 ~ +55                                                                              | —10 ~ +55                                                                               | —10 ~ +55                                                                                                               | —10 ~ +55                                                                                                               | —10 ~ +55                                                                                                                | —10 ~ +55                                                                                                            |
| 120<br>230                                                                                 | 120<br>35                                                                              | 120<br>125                                                                              | 90<br>2.3                                                                                                               | 100<br>4<br>(INCL. STAND-OFF)                                                                                           | 100<br>7                                                                                                                 | 100<br>9                                                                                                             |
| 250 300<br>Rp 5.1 6.8                                                                      | 200 250 300<br>Rp 12 22 32                                                             | 200 250 300<br>Rp 4.3 7.5 11                                                            | 190 200 230<br>Rk 6.8 9.1 15<br>36 47 82<br>0.05 ~ 0.5                                                                  | 200 235<br>Rp 2.5 5<br>0.05 ~ 0.5                                                                                       | 190 200 250 300<br>Rp 5 7 18 27<br>0.05 ~ 0.5                                                                            | 190 200 250<br>Rp 2 2.7 7.4<br>0.05 ~ 0.5                                                                            |

# (DC OPERATION)

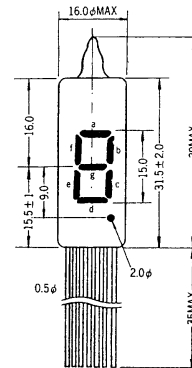
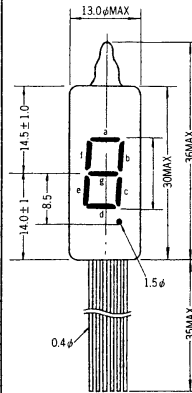
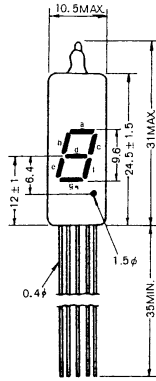
## REFERENCE NUMBER (7 Segment)

**MG-17G**

**MG-137**

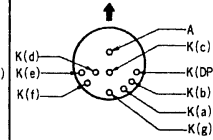
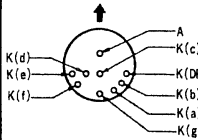
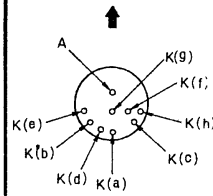
**MG-157**

## Outline Drawing



## Pin Connections

A : ANODE  
K : CATHODE  
I.C : INTER CONNECTION  
NP : NO PIN  
NC : NO CONNECTION



## Socket

## Construction

### ELECTRICAL SPECIFICATIONS

Supply Voltage (Vdc) Ebb  
Ionization Voltage (Vdc) Ez  
Cathode Current (mA<sub>dc</sub>)  
Numerical Cathode ik  
Decimal Point ik(·)

| MIN. | ST.  | MAX. |
|------|------|------|
| 180  |      |      |
|      |      | 160  |
| 0.28 | 0.35 | 0.42 |
| 0.14 | 0.18 | 0.22 |

| MIN. | ST.  | MAX. |
|------|------|------|
| 170  |      |      |
|      |      | 170  |
| 0.35 | 0.45 | 0.55 |
| 0.08 | 0.10 | 0.12 |

| MIN. | ST.  | MAX. |
|------|------|------|
| 170  |      |      |
|      |      | 170  |
| 0.4  | 0.6  | 0.8  |
| 0.1  | 0.15 | 0.2  |

### ABSOLUTE RATINGS

Peak Cathode Current (mA<sub>dc</sub>)  
Numerical Cathode ik  
Decimal Point ik(·)  
Range of Average Cathode Current (mA<sub>dc</sub>)  
Numerical Cathode  
Decimal Point  
Ambient Temperature (for storage) Ts (deg C)  
Operating Ambient Temperature Tc (deg C)

|     |   |     |
|-----|---|-----|
| 1.6 |   |     |
| 0.6 |   |     |
| 0.2 | ~ | 0.6 |
| 0.1 | ~ | 0.4 |
| -65 | ~ | +70 |
| -10 | ~ | +60 |

|      |   |      |
|------|---|------|
| 0.6  |   |      |
| 0.15 |   |      |
| 0.3  | ~ | 0.6  |
| 0.07 | ~ | 0.15 |
| -65  | ~ | +70  |
| -10  | ~ | +60  |

|      |   |     |
|------|---|-----|
| 1.0  |   |     |
| 0.3  |   |     |
| 0.3  | ~ | 1.0 |
| 0.07 | ~ | 0.3 |
| +65  | ~ | +70 |
| +10  | ~ | +60 |

### MECHANICAL DATA

Maximum Viewing Angle (deg)  
(approx)  
Weight (g)  
(approx)

|     |
|-----|
| 120 |
| 3   |

|     |
|-----|
| 120 |
| 4   |

|     |
|-----|
| 120 |
| 6   |

### TYPICAL OPERATING CONDITIONS

Supply Voltage (Vdc)  
Anode Series Resistor (KΩ)  
Decimal Point Series Resistor (KΩ)

|     |     |     |     |
|-----|-----|-----|-----|
| 180 | 200 | 250 | 300 |
| 110 | 160 | 300 | 430 |
| 240 | 330 | 620 | 910 |

|     |     |     |
|-----|-----|-----|
| 170 | 190 | 210 |
| 62  | 100 | 130 |
| 240 | 360 | 510 |

|     |     |     |
|-----|-----|-----|
| 170 | 190 | 210 |
| 62  | 110 | 150 |
| 270 | 470 | 680 |

# (PULSE OPERATION)

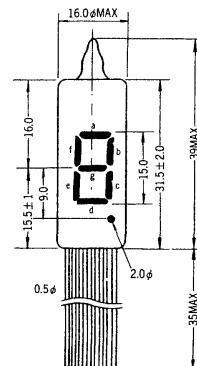
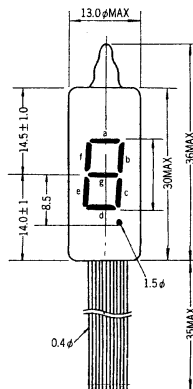
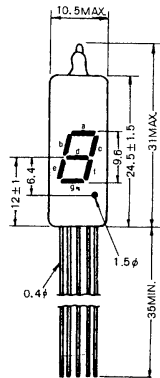
## REFERENCE NUMBER (7 Segment)

**MG-17G**

**MG-137**

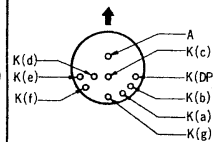
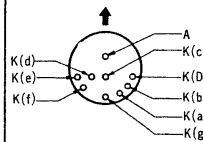
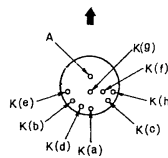
**MG-157**

## Outline Drawing



## Pin Connections

A : ANODE  
K : CATHODE  
IC : INTER CONNECTION  
NP : NO PIN  
NC : NO CONNECTION



## Socket

## Construction

### ELECTRICAL SPECIFICATIONS

Supply Voltage (Vdc) Ebb  
Ionization Voltage (Vdc) Ez  
Cathode Current (mA<sub>dc</sub>)  
Numerical Cathode ik  
Decimal Point ik(·)

MIN. ST. MAX.  
190  
170  
1.2mA  
0.4mA  
(duty 1/10 Ebb=200vdc  
Rk=43kΩ Rk(·)=120kΩ)

MIN. ST. MAX.  
180  
180  
2mA  
0.5mA  
(duty 1/10 Ebb=200vdc  
Rk=30kΩ Rk(·)=120kΩ)

MIN. ST. MAX.  
180  
180  
1.75mA  
0.6mA  
(duty 1/10 Ebb=280kΩ  
Rk=36kΩ Rk(·)=100kΩ)

### ABSOLUTE RATINGS

Peak Cathode Current (mA<sub>dc</sub>)  
Numerical Cathode ik  
Decimal Point ik(·)  
Range of Average Cathode  
Current (mA<sub>dc</sub>)  
Numerical Cathode  
Decimal Point  
Ambient Temperature (for  
storage) Ts (deg C)  
Operating Ambient Tempera-  
ture Tc (deg C)

1 ~ 4  
0.4 ~ 1.5  
0.04 ~ 0.6  
0.02 ~ 0.4  
50 ~ 300  
-65 ~ +70  
-10 ~ +60

1 ~ 4  
0.35 ~ 1.0  
0.04 ~ 0.6  
0.02 ~ 0.4  
50 ~ 500  
-65 ~ +70  
-10 ~ +60

1.0 ~ 4.0  
0.35 ~ 1.0  
0.1 ~ 0.6  
0.04 ~ 0.15  
50 ~ 500  
-65 ~ +70  
-10 ~ +55

### MECHANICAL DATA

Maximum Viewing Angle (deg)  
(approx)  
Weight (g)  
(approx)

120  
3

120  
4

120  
6

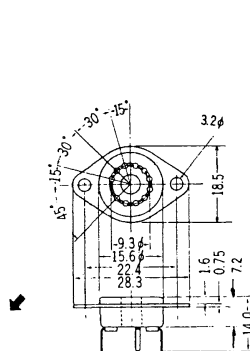
### TYPICAL OPERATING CONDITIONS

Supply Voltage (Vdc)  
Anode Series Resistor (KΩ)  
Decimal Point Series Resistor (KΩ)  
Pulse Duration (mS)

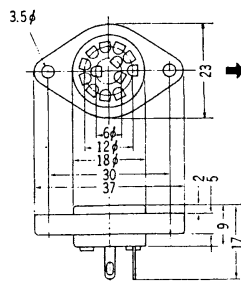
190 200 250  
36 43 82  
90 120 240

180 200 220  
20 30 40  
82 120 150

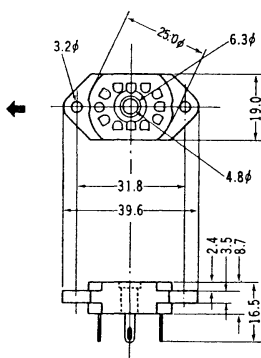
180 200 220  
24 36 47  
68 100 120



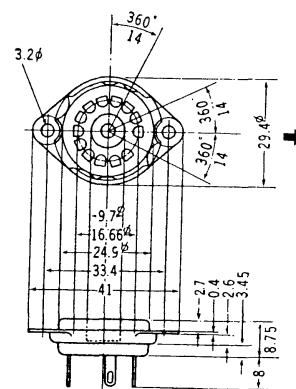
**TSM-11P**  
CD 13



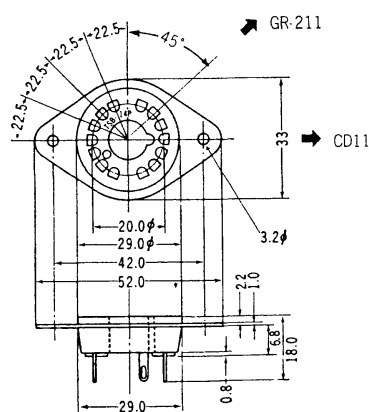
**TSM-13P**  
CD 28



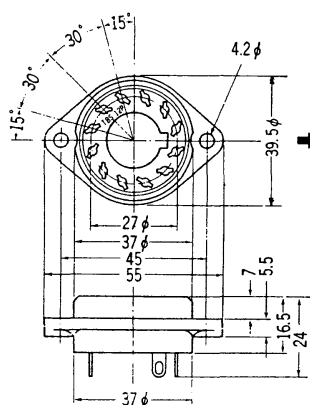
**TSR-11P**  
CD 25, CD 43



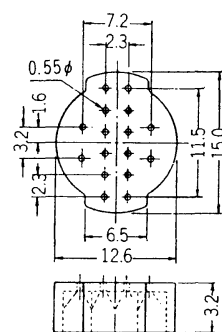
**TSB-13P**  
CD 24



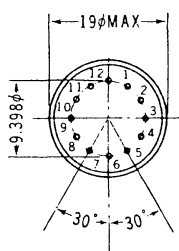
**TSB-14P**  
CD11, GR-211



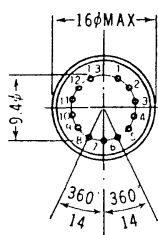
**TSB-12P**  
CD12, CD27, GR-414, GR-311



**GR-116D**  
**GR-116P**



**CD 66**  
CD 66p



**GR-111**  
**GR-111p**



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