

# High Power Silicon Controlled Rectifier

**1300 VOLTS      110 ARMS**

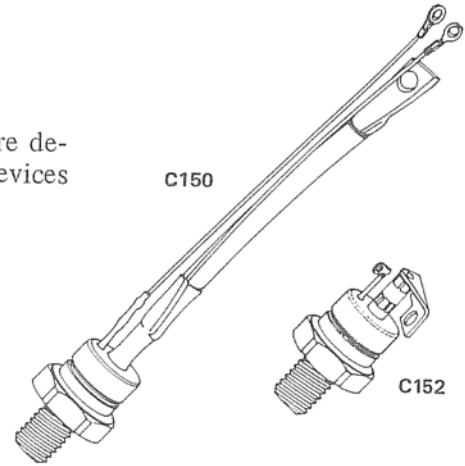
**C150,2**



The General Electric C150 and C152 Silicon Controlled Rectifiers are designed for phase control applications. These are all-diffused, Pic-Pac devices employing the field-proven amplifying gate.

**FEATURES:**

- High di/dt Rating
- High dv/dt Capability with Selections Available
- Excellent Surge and I<sup>2</sup>t Ratings Providing Easy Fusing
- Rugged Hermetic Package with Long Creepage Path



### MAXIMUM ALLOWABLE RATINGS

| TYPE         | REPETITIVE PEAK OFF-STATE VOLTAGE, $V_{DRM}^1$<br>$T_J = -40^\circ\text{C to } +125^\circ\text{C}$ | REPETITIVE PEAK REVERSE VOLTAGE, $V_{RRM}^1$<br>$T_J = -40^\circ\text{C to } +125^\circ\text{C}$ | NON-REPETITIVE PEAK REVERSE VOLTAGE, $V_{RSM}^1$<br>$T_J = +125^\circ\text{C}$ |
|--------------|--|--|--|
| C150, C152E  | 500 Volts  | 500 Volts  | 600 Volts  |
| C150, C152M  | 600  | 600  | 720  |
| C150, C152S  | 700  | 700  | 850  |
| C150, C152N  | 800  | 800  | 950  |
| C150, C152T  | 900  | 900  | 1075   |
| C150, C152P  | 1000   | 1000   | 1200   |
| C150, C152PA | 1100   | 1100   | 1325   |
| C150, C152PB | 1200   | 1200   | 1450   |
| C150, C152PC | 1300   | 1300   | 1550   |

<sup>1</sup> Half sinewave waveform, 10 msec. max. pulse width.

|   |  |
|---|--|
| RMS On-State Current, $I_{T(RMS)}$ . . . . .  | 100 Amperes (All Conduction Angles)  |
| Average On-State Current, $I_{T(AV)}$ . . . . .                                     | Depends on Conduction Angle (See Charts 1 and 4)                           |
| Peak One-Cycle Surge (Non-Repetitive) On-State Current, $I_{TSM}$ (60 Hz) . . . . . | 1500 Amperes   |
| Peak One-Cycle Surge (Non-Repetitive) On-State Current, $I_{TSM}$ (50 Hz) . . . . . | 1400 Amperes   |
| Critical Rate-of-Rise of On-State Current (Non-Repetitive)* . . . . .               | 800 A/ $\mu$ s   |
| Critical Rate-of-Rise of On-State Current (Repetitive)* . . . . .                   | 500 A/ $\mu$ s   |
| I <sup>2</sup> t (for fusing), for times $\geq$ 1.5 milliseconds . . . . .          | 7000 (RMS Ampere) <sup>2</sup> Seconds                                     |
| Peak Gate Power Dissipation, $P_{GM}$ . . . . .                                     | 10 Watts   |
| Average Gate Power Dissipation, $P_{G(AV)}$ . . . . .                               | 2 Watts  |
| Storage Temperature, $T_{stg}$ . . . . .  | -40°C to +150°C  |
| Operating Temperature, $T_J$ . . . . .  | -40°C to +125°C  |
| Stud Torque . . . . .   | 125 Lbs.-In. (Min.) – 150 Lbs.-In. (Max.)<br>14 N-m (Min.) – 17 N-m (Max.) |

\*di/dt ratings established in accordance with EIA-NEMA Standard RS-397, Section 5.2.2.6 for conditions of  $V_{DRM}$  stated above; 20 volts, 20 ohms gate trigger source with 0.5  $\mu$ sec short circuit trigger current rise time.

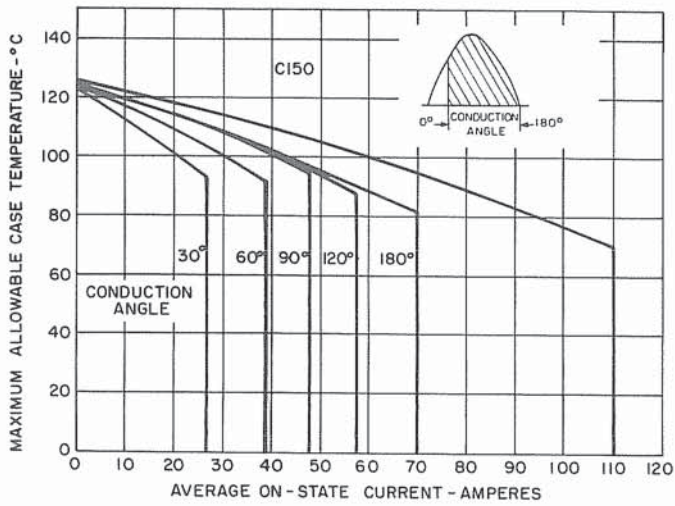
## CHARACTERISTICS

| TEST  | SYMBOL                  | MIN. | TYP. | MAX. | UNITS                        | TEST CONDITIONS   |
|---|-------------------------|------|------|------|------------------------------|---|
| Repetitive Peak Reverse and Off-State Current   | $I_{DRM}$ and $I_{RRM}$ |      |      |      | mA                           | $T_J = +25^\circ\text{C}$<br>$V_{DRM} = V_{RRM} =$  |
| C150, C152E   |                         | —    | 3    | 10   |                              | 500 Volts Peak  |
| C150, C152M   |                         | —    | 3    | 10   |                              | 600   |
| C150, C152S   |                         | —    | 3    | 10   |                              | 700   |
| C150, C152N   |                         | —    | 3    | 10   |                              | 800   |
| C150, C152T   |                         | —    | 3    | 10   |                              | 900   |
| C150, C152P   |                         | —    | 3    | 10   |                              | 1000  |
| C150, C152PA  |                         | —    | 3    | 10   |                              | 1100  |
| C150, C152PB  |                         | —    | 3    | 6    |                              | 1200  |
| C150, C152PC  |                         | —    | 3    | 5    |                              | 1300  |
| Repetitive Peak Reverse and Off-State Current   | $I_{DRM}$ and $I_{RRM}$ |      |      |      | mA                           | $T_J = +125^\circ\text{C}$<br>$V_{DRM} = V_{RRM}$   |
| C150, C152E   |                         | —    | 15   | 20   |                              | 500 Volts Peak  |
| C150, C152M   |                         | —    | 15   | 20   |                              | 600   |
| C150, C152S   |                         | —    | 15   | 20   |                              | 700   |
| C150, C152N   |                         | —    | 15   | 20   |                              | 800   |
| C150, C152T   |                         | —    | 15   | 20   |                              | 900   |
| C150, C152P   |                         | —    | 15   | 20   |                              | 1000  |
| C150, C152PA  |                         | —    | 15   | 20   |                              | 1100  |
| C150, C152PB  |                         | —    | 10   | 13   |                              | 1200  |
| C150, C152PC  |                         | —    | 8    | 11   |                              | 1300  |
| Thermal Resistance  | $R_{\theta JC}$         | —    | .2   | .3   | $^\circ\text{C}/\text{Watt}$ | Junction-to-Case  |
| Critical Rate-of-Rise of Off-State Voltage (Higher values may cause device switching) | $dv/dt$                 | 200  | 500  | —    | $\text{V}/\mu\text{sec}$     | $T_J = +125^\circ\text{C}$ , Rated $V_{DRM}$ , Using Linear Exponential Rising Waveform. Gate Open Circuited.<br>Exponential $dv/dt = \frac{V_{DRM}}{\tau} (.632)$  |
| Higher minimum $dv/dt$ selections available – consult factory.                        |                         |      |      |      |                              |   |
| Holding Current   | $I_H$                   | —    | 20   | 500  | mAdc                         | $T_C = +25^\circ\text{C}$ , Anode Supply = 24 Vdc. Initial Forward Current = 2 Amps.  |
| Turn-On Delay Time  | $t_d$                   | —    | 1    | —    | $\mu\text{sec}$              | $T_C = +25^\circ\text{C}$ , $I_T = 50$ Adc, $V_{DRM} = \text{Rated}$ . Gate Supply: 10 Volt Open Circuit, 20 Ohm, 0.1 $\mu\text{sec}$ max. rise time  |
| Gate Pulse Width Necessary to Trigger   |                         | —    | 8    | 10   | $\mu\text{sec}$              | $T_C = +25^\circ\text{C}$ . Gate Supply: 20 Volt Open Circuit, 40 Ohm, 0.5 $\mu\text{sec}$ rise time. $I_T = 1.0$ Amps. for High $di/dt$ Capability. See Chart 9.   |
| DC Gate Trigger Current   | $I_{GT}$                | —    | 50   | 150  | mAdc                         | $T_C = +25^\circ\text{C}$ , $V_D = 6$ Vdc, $R_L = 3$ Ohms   |
|   |                         | —    | 75   | 200  |                              | $T_C = -40^\circ\text{C}$ , $V_D = 6$ Vdc, $R_L = 3$ Ohms   |
|   |                         | —    | 15   | 125  |                              | $T_C = +125^\circ\text{C}$ , $V_D = 6$ Vdc, $R_L = 3$ Ohms  |
| DC Gate Trigger Voltage   | $V_{GT}$                | —    | 1.25 | 3.0  | Vdc                          | $T_C = -40^\circ\text{C}$ to $+120^\circ\text{C}$ , $V_D = 6$ Vdc, $R_L = 3$ Ohms   |
|   |                         | 0.15 | —    | —    |                              | $T_C = +125^\circ\text{C}$ , $V_D = \text{Rated}$ , $R_L = 1000$ Ohms   |
| Peak On-State Voltage   | $V_{TM}$                | —    | 2.0  | 2.6  | Volts                        | $T_C = +25^\circ\text{C}$ , $I_{TM} = 500$ Amps. Peak. Duty Cycle $\leq 0.01\%$   |
| Circuit Commutated Turn-Off Time**  | $t_q$                   | —    | 100  | †    | $\mu\text{sec}$              | (1) $T_J = +125^\circ\text{C}$<br>(2) $I_{TM} = 50$ Amps<br>(3) $V_R = 50$ Volts Min.<br>(4) $V_{DRM}$ (Reapplied) = Rated<br>(5) Rate-of-Rise of Reapplied Off-State Voltage = $20\text{V}/\mu\text{sec}$ Linear |

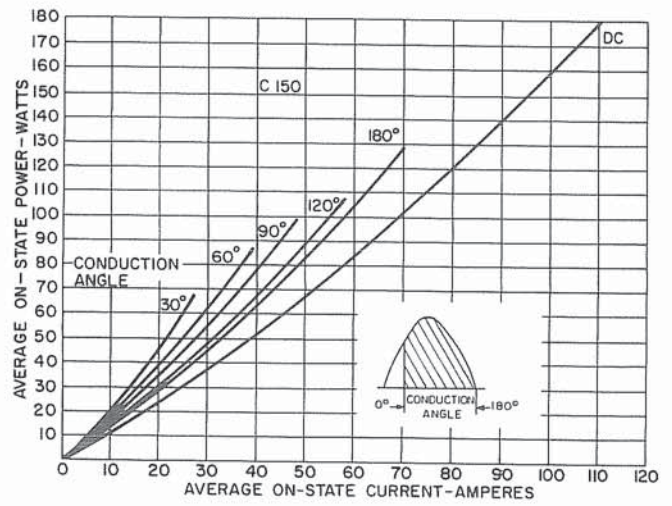
† Consult factory if guaranteed turn-off time is required.

\*\* Typical turn-off time increases 30%, if  $I_{TM}$  is increased to 500 amps. 819

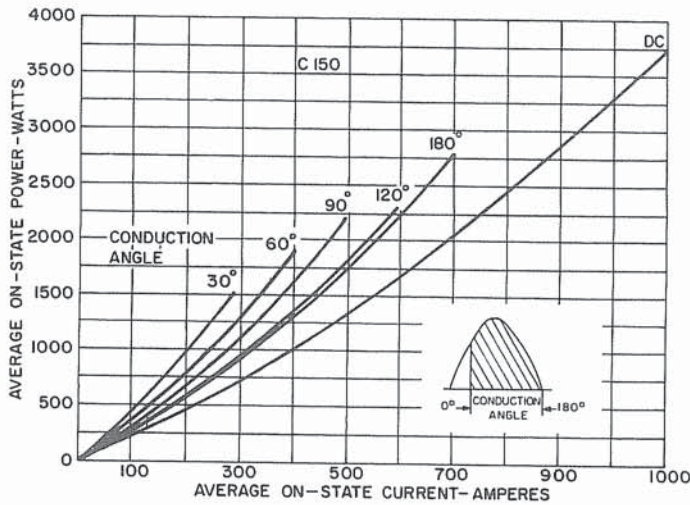
**C150, C152**



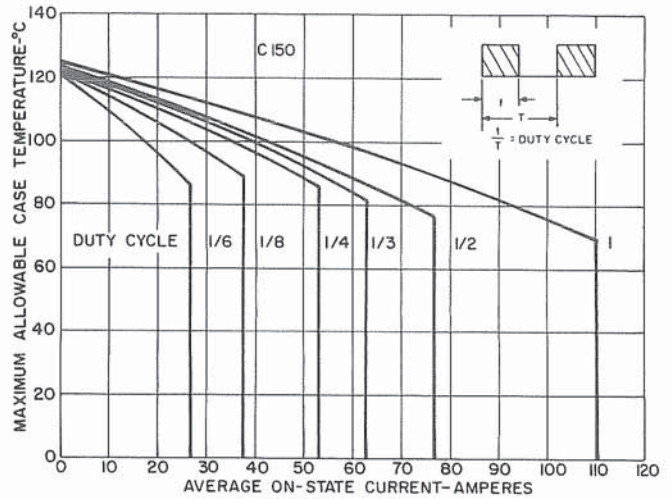
**1. MAXIMUM ALLOWABLE CASE TEMPERATURE FOR SINUSOIDAL CURRENT WAVEFORM 50 TO 400 CPS**



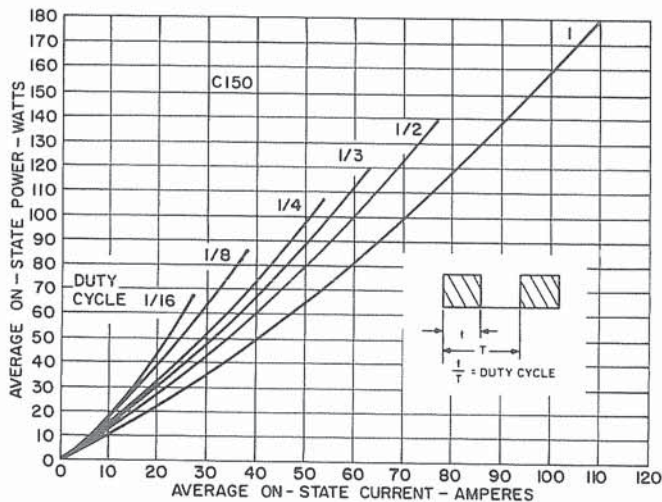
**2. MAXIMUM ON-STATE POWER DISSIPATION FOR SINUSOIDAL CURRENT WAVEFORM**



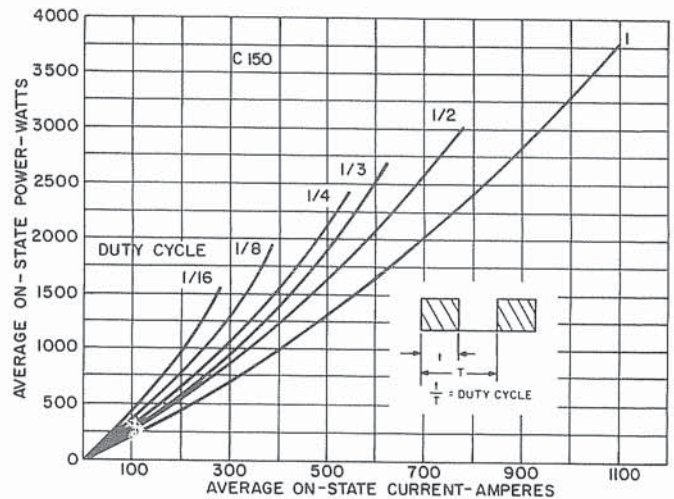
**3. MAXIMUM ON-STATE POWER DISSIPATION FOR SINUSOIDAL CURRENT WAVEFORM (EXTENDED RANGE)**



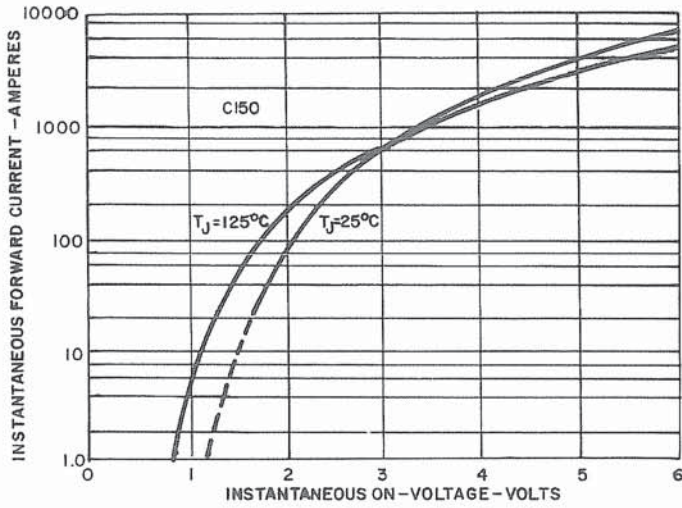
**4. MAXIMUM ALLOWABLE CASE TEMPERATURE FOR RECTANGULAR CURRENT WAVEFORM - 50 TO 400 CPS**



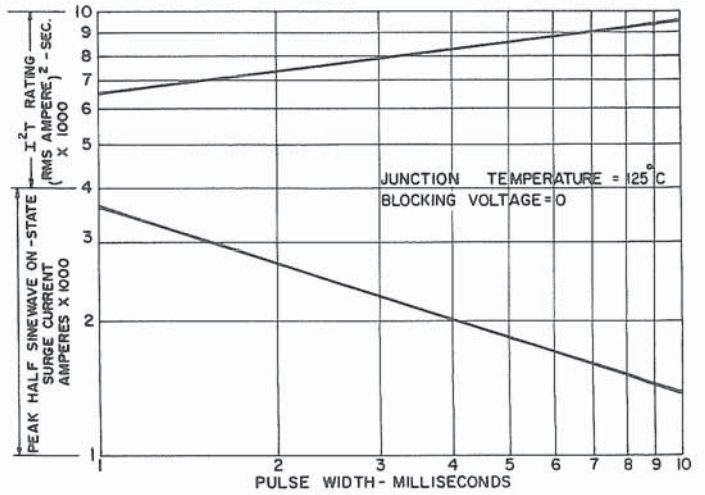
**5. MAXIMUM ON-STATE POWER DISSIPATION FOR RECTANGULAR CURRENT WAVEFORM**



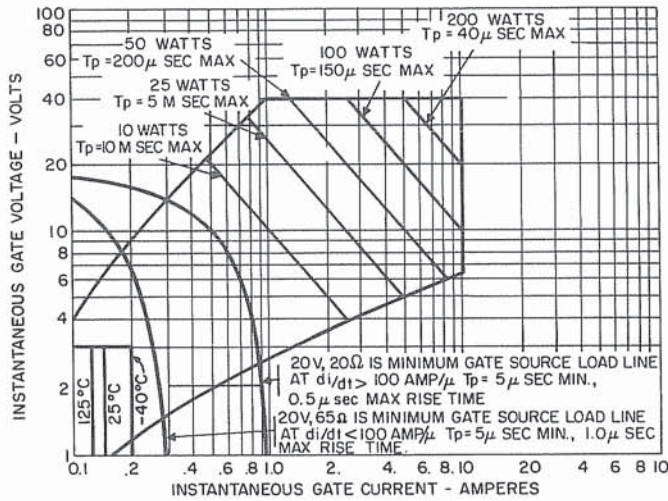
**6. ON-STATE POWER DISSIPATION FOR RECTANGULAR CURRENT WAVEFORM**



7. C150 FORWARD CONDUCTION CHARACTERISTIC, ON-STATE



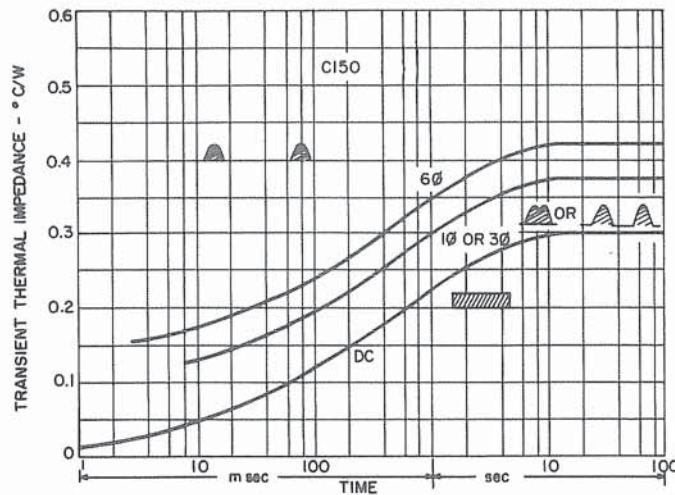
8. SUB-CYCLE SURGE RATING FOLLOWING RATED LOAD CONDITIONS



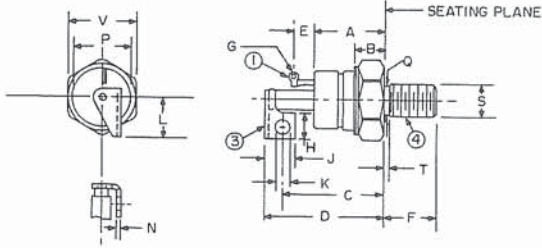
9. GATE TRIGGERING CHARACTERISTICS

NOTES:

1. Maximum allowable gate power dissipation = 2 Watts.
2. The locus of possible DC trigger points lie outside the boundaries shown at various case temperatures.
3.  $T_p$  = Rectangular Gate Current Pulse Width.



10. TRANSIENT THERMAL IMPEDANCE - JUNCTION-TO-CASE

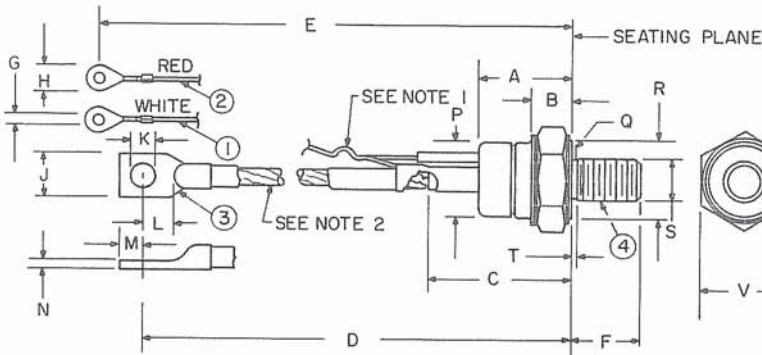


| MODEL | TERMINAL<br>① | TERMINAL<br>③ | TERMINAL<br>④ | S<br>THREAD SIZE |
|-------|---------------|---------------|---------------|------------------|
| C152  | GATE          | CATHODE<br>+  | ANODE<br>-    | 1/2-20 UNF-2A    |

| SYM | INCHES |       | METRIC<br>MM |       | SYM | INCHES |       | METRIC<br>MM |       | NOTES |
|-----|--------|-------|--------------|-------|-----|--------|-------|--------------|-------|-------|
|     | MIN.   | MAX.  | MIN.         | MAX.  |     | MIN.   | MAX.  | MIN.         | MAX.  |       |
| A   | 1.020  | 1.140 | 25.90        | 28.96 | L   | .590   | .640  | 14.98        | 16.26 |       |
| B   | .390   | .500  | 9.90         | 12.70 |     |        |       |              |       |       |
| C   | 1.460  | REF.  | 7.92         | REF.  | N   | .058   | .070  | 1.47         | 1.78  |       |
| D   | 1.660  | 1.800 | 42.16        | 45.72 |     |        |       |              |       |       |
| E   | .312   | REF.  | 7.92         | REF.  | P   | .840   | .910  | 21.33        | 23.11 |       |
| F   | .797   | .827  | 20.24        | 21.01 |     |        |       |              |       |       |
| G   | .060   | .075  | 1.52         | 1.91  | Q   | .425   | .499  | 10.79        | 12.67 |       |
| H   | .385   | .415  | 9.77         | 10.54 | T   | —      | .060  | —            | 1.52  | 2     |
| J   | .445   | .485  | 11.30        | 12.32 | V   | 1.052  | 1.063 | 26.72        | 27.00 |       |
| K   | .198   | .212  | 5.02         | 5.38  |     |        |       |              |       |       |

NOTES:

1. One nut and one lockwasher supplied with each unit. Material of hardware is steel, cad plated.
2. "T" dimension is area of unthreaded portion. Complete threads are within 2.5 threads of seating plane.
3. Angular orientation of terminals is undefined.



| MODEL | TERMINAL<br>① | TERMINAL<br>②  | TERMINAL<br>③ | TERMINAL<br>④ | S<br>THREAD SIZE |
|-------|---------------|----------------|---------------|---------------|------------------|
| C150  | GATE          | AUX<br>CATHODE | CATHODE<br>+  | ANODE<br>-    | 1/2 20UNF-2A     |

| SYM | INCHES |       | METRIC<br>MM |        | SYM | INCHES |       | METRIC<br>MM |       | NOTES |
|-----|--------|-------|--------------|--------|-----|--------|-------|--------------|-------|-------|
|     | MIN.   | MAX.  | MIN.         | MAX.   |     | MIN.   | MAX.  | MIN.         | MAX.  |       |
| A   | 1.020  | 1.140 | 25.90        | 28.96  | L   | .330   | —     | 8.38         | —     |       |
| B   | .390   | .500  | 9.90         | 12.70  | M   | .275   | .325  | 6.98         | 8.26  |       |
| C   | 1.570  | 1.750 | 39.87        | 44.45  | N   | .065   | .095  | 1.65         | 2.41  |       |
| D   | 6.000  | 6.390 | 152.40       | 162.31 | P   | .840   | .910  | 21.33        | 23.11 |       |
| E   | 6.850  | 7.500 | 173.99       | 190.50 | Q   | .425   | .499  | 10.79        | 12.67 |       |
| F   | .797   | .827  | 20.24        | 21.01  | R   | .920   | —     | 23.36        | —     | 4     |
| G   | .140   | .150  | 3.55         | 3.81   | T   | —      | .060  | —            | 1.57  | 5     |
| H   | —      | .300  | —            | 7.62   |     |        |       |              |       |       |
| J   | .500   | .610  | 12.70        | 15.49  | V   | 1.052  | 1.063 | 26.72        | 27.00 |       |
| K   | .260   | .281  | 6.60         | 7.14   |     |        |       |              |       |       |

NOTES:

1. Gate and auxiliary cathode leads supplied lightly twisted together.
2. Flexible copper lead.
3. One nut and one lockwasher supplied with each unit. Material of hardware is steel, cad plated.
4. "R" dimension is diameter of effective seating area.
5. "T" dimension is area of unthreaded portion. Complete threads are within 2.5 threads of seating plane.
6. Angular orientation of terminals is undefined.

