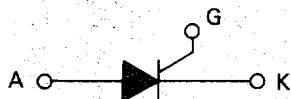


**MOTOROLA**

# SEMICONDUCTORS

P.O. BOX 20912 • PHOENIX, ARIZONA 85036



## 25 AMPERES RMS SILICON CONTROLLED RECTIFIERS

... designed primarily for half-wave ac control applications, such as motor controls, heating controls and power supply crowbar circuits.

- Glass Passivated Junctions with Center Gate Fire for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Constructed for Low Thermal Resistance, High Heat Dissipation and Durability
- Blocking Voltage to 1000 Volts
- 300 A Surge Current Capability

### MAXIMUM RATINGS

| Rating                                                                     | Symbol                                | Value       | Unit             |
|----------------------------------------------------------------------------|---------------------------------------|-------------|------------------|
| Peak Reverse Blocking Voltage (1)                                          | $V_{RRM}$                             |             | Volts            |
| *2N6504                                                                    |                                       | 50          |                  |
| *2N6505                                                                    |                                       | 100         |                  |
| *2N6506                                                                    |                                       | 200         |                  |
| MCR225-5                                                                   |                                       | 300         |                  |
| *2N6507                                                                    |                                       | 400         |                  |
| MCR225-7                                                                   |                                       | 500         |                  |
| *2N6508                                                                    |                                       | 600         |                  |
| MCR225-9                                                                   |                                       | 700         |                  |
| *2N6509                                                                    |                                       | 800         |                  |
| MCR225-12                                                                  |                                       | 1000        |                  |
| Forward Current ( $T_C = 85^\circ\text{C}$ )<br>(All Conduction Angles)    | $I_T(\text{RMS})$<br>$I_T(\text{AV})$ | 25<br>16    | Amps             |
| Peak Nonrepetitive Surge Current — 8.3 ms<br>(1/2 Cycle, Sine Wave) 1.5 ms | $I_{TSM}$                             | 300<br>350  | Amps             |
| Forward Peak Gate Power                                                    | $P_{GM}$                              | 20          | Watts            |
| Forward Average Gate Power                                                 | $P_{G(\text{AV})}$                    | 0.5         | Watt             |
| Forward Peak Gate Current                                                  | $I_{GM}$                              | 2.0         | Amps             |
| Operating Junction Temperature Range                                       | $T_J$                                 | -40 to +125 | $^\circ\text{C}$ |
| Storage Temperature Range                                                  | $T_{stg}$                             | -40 to +150 | $^\circ\text{C}$ |

### \*THERMAL CHARACTERISTICS

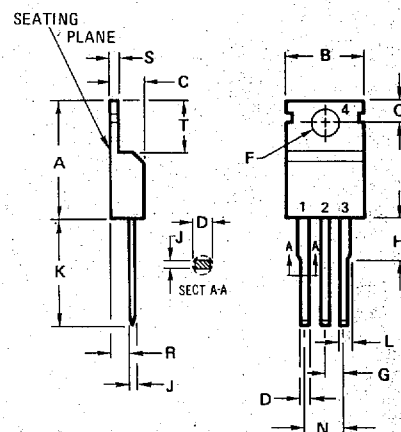
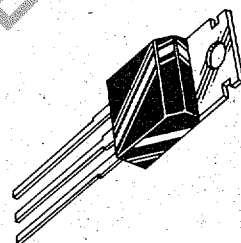
| Characteristic                       | Symbol          | Max | Unit               |
|--------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 1.5 | $^\circ\text{C/W}$ |

(1)  $V_{RRM}$  for all types can be applied on a continuous dc basis without incurring damage. Ratings apply for zero or negative gate voltage. Devices should not be tested for blocking capability in a manner such that the voltage supplied exceeds the rated blocking voltage.

**2N6504 thru 2N6509**  
**MCR225-5**  
**MCR225-7**  
**MCR225-9**  
**MCR225-12**

### THYRISTORS

**25 AMPERES RMS**  
**50-1000 VOLTS**



STYLE 1:  
 PIN 1. CATHODE  
 2. ANODE  
 3. GATE  
 4. ANODE

| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 14.23       | 15.87 | 0.560  | 0.625 |
| B   | 9.66        | 10.66 | 0.380  | 0.420 |
| C   | 3.56        | 4.82  | 0.140  | 0.190 |
| D   | 0.51        | 1.14  | 0.020  | 0.045 |
| F   | 3.531       | 3.733 | 0.139  | 0.147 |
| G   | 2.29        | 2.79  | 0.090  | 0.110 |
| H   | —           | 6.35  | —      | 0.250 |
| J   | 0.31        | 1.14  | 0.012  | 0.045 |
| K   | 12.70       | 14.27 | 0.500  | 0.562 |
| L   | 1.14        | 1.77  | 0.045  | 0.070 |
| N   | 4.83        | 5.33  | 0.190  | 0.210 |
| Q   | 2.54        | 3.04  | 0.100  | 0.120 |
| R   | 2.04        | 2.92  | 0.080  | 0.115 |
| S   | 0.51        | 1.39  | 0.020  | 0.055 |
| T   | 5.85        | 6.85  | 0.230  | 0.270 |

**CASE 221-02**  
**TO-220AB**

All JEDEC dimensions and notes apply

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted.)

| Characteristic                                                                                                          | Symbol    | Min  | Typ | Max | Unit                   |
|-------------------------------------------------------------------------------------------------------------------------|-----------|------|-----|-----|------------------------|
| Peak Forward Blocking Voltage<br>( $T_J = 125^\circ\text{C}$ )                                                          | $V_{DRM}$ |      |     |     | Volts                  |
| *2N6504                                                                                                                 |           | 50   | —   | —   |                        |
| *2N6505                                                                                                                 |           | 100  | —   | —   |                        |
| *2N6506                                                                                                                 |           | 200  | —   | —   |                        |
| MCR225-5                                                                                                                |           | 300  | —   | —   |                        |
| *2N6507                                                                                                                 |           | 400  | —   | —   |                        |
| MCR225-7                                                                                                                |           | 500  | —   | —   |                        |
| *2N6508                                                                                                                 |           | 600  | —   | —   |                        |
| MCR225-9                                                                                                                |           | 700  | —   | —   |                        |
| *2N6509                                                                                                                 |           | 800  | —   | —   |                        |
| MCR225-12                                                                                                               |           | 1000 | —   | —   |                        |
| *Peak Forward Blocking Current<br>(Rated $V_{DRM}$ @ $T_J = 125^\circ\text{C}$ )                                        | $I_{DRM}$ | —    | —   | 2.0 | mA                     |
| *Peak Reverse Blocking Current<br>(Rated $V_{RRM}$ @ $T_J = 125^\circ\text{C}$ )                                        | $I_{RRM}$ | —    | —   | 2.0 | mA                     |
| *Forward "On" Voltage (1)<br>( $I_{TM} = 50\text{ A}$ )                                                                 | $V_{TM}$  | —    | —   | 1.8 | Volts                  |
| *Gate Trigger Current (Continuous dc)<br>(Anode Voltage = 12 Vdc, $R_L = 100\text{ Ohms}$ )                             | $I_{GT}$  | —    | —   | 40  | mA                     |
| $T_C = 25^\circ\text{C}$                                                                                                |           | —    | 25  | 75  |                        |
| $T_C = -40^\circ\text{C}$                                                                                               |           |      |     |     |                        |
| *Gate Trigger Voltage (Continuous dc)<br>(Anode Voltage = 12 Vdc, $R_L = 100\text{ Ohms}$ , $T_C = -40^\circ\text{C}$ ) | $V_{GT}$  | —    | 1.0 | 1.5 | Volts                  |
| Gate Non-Trigger Voltage<br>(Anode Voltage = Rated $V_{DRM}$ , $R_L = 100\text{ Ohms}$ , $T_J = 125^\circ\text{C}$ )    | $V_{GD}$  | 0.2  | —   | —   | Volts                  |
| *Holding Current<br>(Anode Voltage = 12 Vdc, $T_C = -40^\circ\text{C}$ )                                                | $I_H$     | —    | 35  | 40  | mA                     |
| *Turn-On Time<br>( $I_{TM} = 25\text{ A}$ , $I_{GT} = 50\text{ mAdc}$ )                                                 | $t_{gt}$  | —    | 1.5 | 2.0 | $\mu\text{s}$          |
| Turn-Off Time ( $V_{DRM} = \text{rated voltage}$ )<br>( $I_{TM} = 25\text{ A}$ , $I_R = 25\text{ A}$ )                  | $t_q$     | —    | 15  | —   | $\mu\text{s}$          |
| ( $I_{TM} = 25\text{ A}$ , $I_R = 25\text{ A}$ , $T_J = 125^\circ\text{C}$ )                                            |           | —    | 35  | —   |                        |
| Critical Rate of Rise of Off-State Voltage<br>(Gate Open, Rated $V_{DRM}$ , Exponential Waveform)                       | $dv/dt$   | —    | 50  | —   | $\text{V}/\mu\text{s}$ |

\*Indicates JEDEC Registered Data.

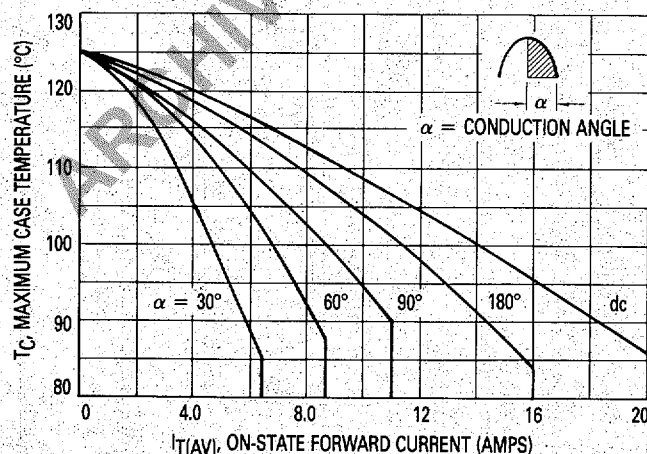
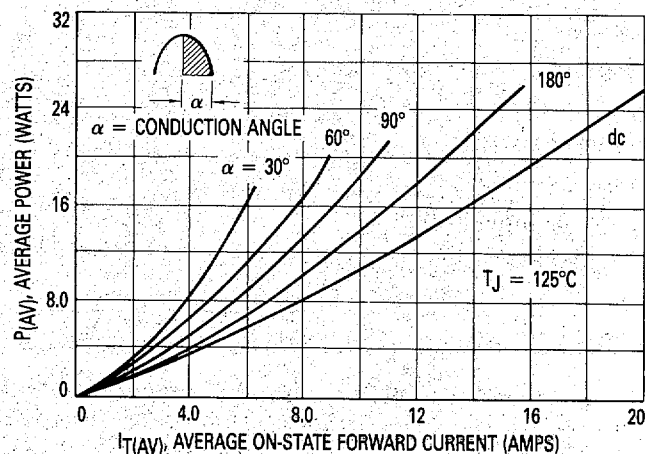
(1) Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .**FIGURE 1 — AVERAGE CURRENT DERATING****FIGURE 2 — MAXIMUM ON-STATE POWER DISSIPATION**

FIGURE 3 — MAXIMUM FORWARD VOLTAGE

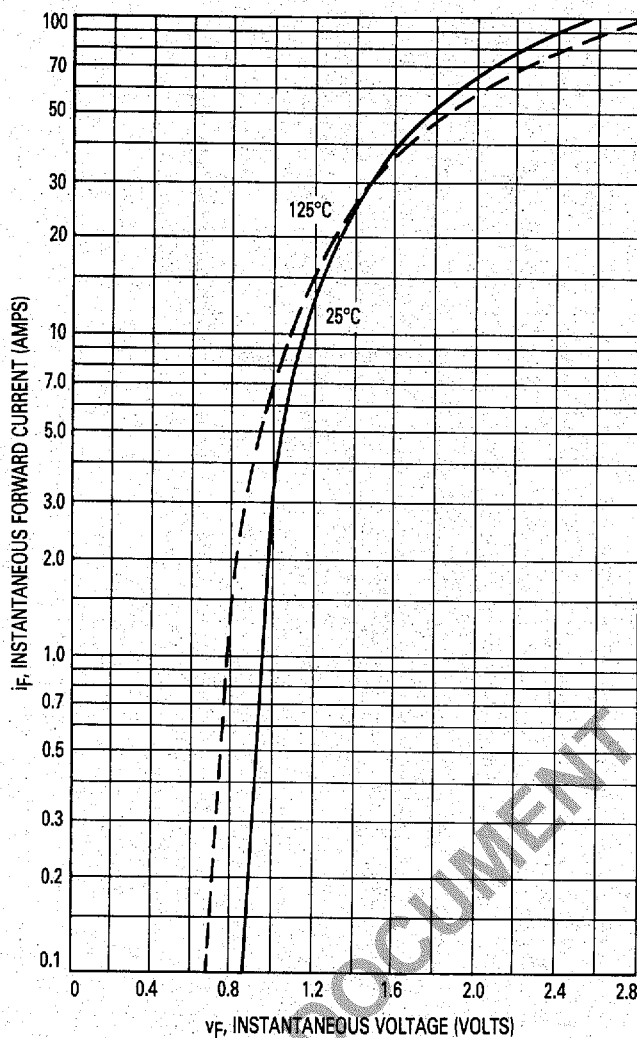


FIGURE 4 — MAXIMUM NON-REPETITIVE SURGE CURRENT

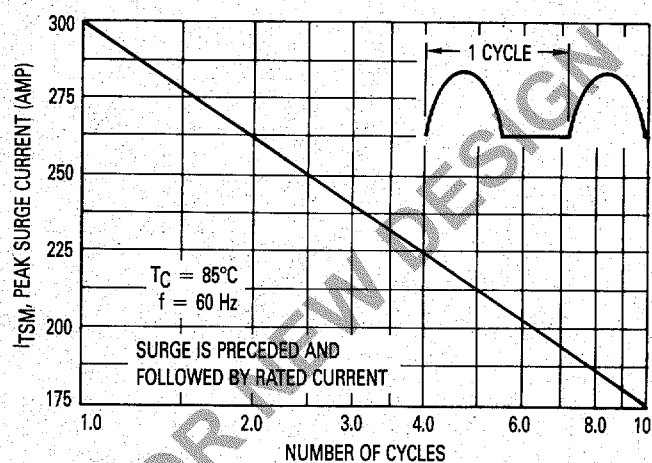


FIGURE 5 — CHARACTERISTICS AND SYMBOLS

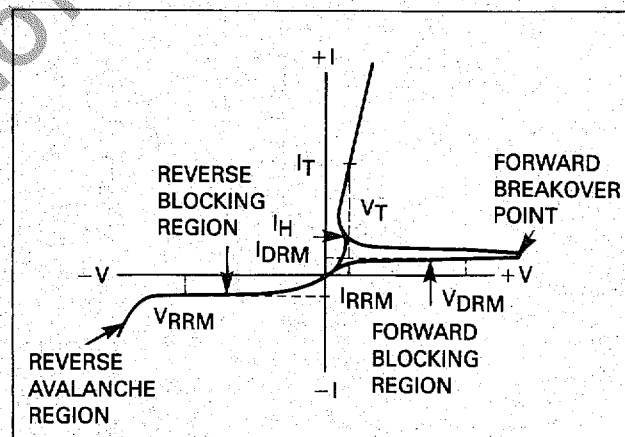
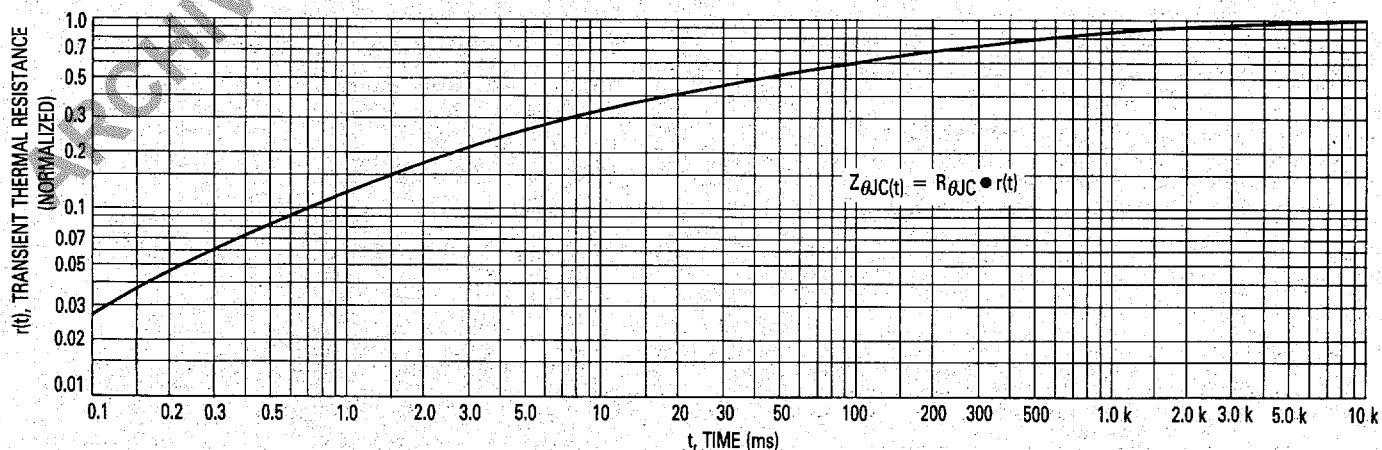


FIGURE 6 — THERMAL RESPONSE





## TYPICAL TRIGGER CHARACTERISTICS

FIGURE 7 — GATE TRIGGER CURRENT

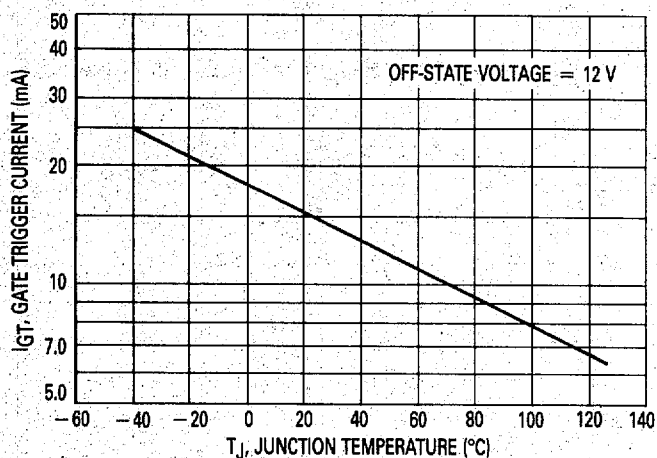


FIGURE 8 — GATE TRIGGER VOLTAGE

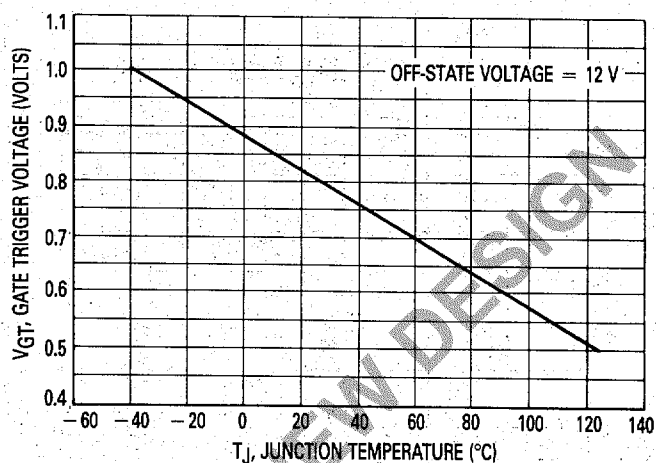
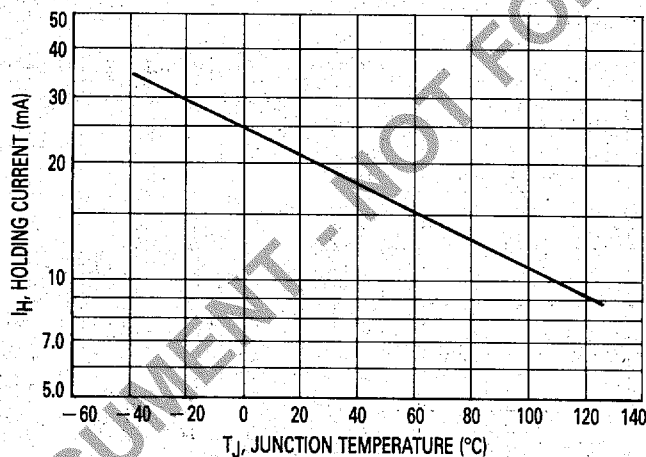


FIGURE 9 — HOLDING CURRENT



## THYRISTOR APPLICATION NOTES

- AN-240 SCR Power Control Fundamentals
- AN-295 Suppressing RFI in Thyristor Circuits
- AN-443 Directional and Speed Control for Series, Universal and Shunt Motors
- AN-482 Electronic Speed Control of Appliance Motors
- AN-527 Theory, Characteristics and Applications of the Programmable Unijunction Transistor
- AN-725 A Low-Cost 80 V-1.5 A Color TV Power Supply

To obtain copies of these notes list the AN number(s) on your company letterhead and send your request to:

Technical Information Center  
 Motorola Semiconductor Products, Inc.  
 P.O. Box 20912  
 Phoenix, Arizona 85036

Motorola reserves the right to make changes without further notice to any products herein to improve reliability, function or design. Motorola does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights nor the rights of others. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Employment Opportunity/Affirmative Action Employer.



**MOTOROLA** Semiconductor Products Inc.

BOX 20912 • PHOENIX, ARIZONA 85036 • A SUBSIDIARY OF MOTOROLA INC.