

T-25-15

Silicon Controlled Rectifiers Reverse Blocking Triode Thyristors

... designed for industrial and consumer applications such as power supplies, battery chargers, temperature, motor, light and welder controls.

- Supplied in Either Pressfit or Stud Package
- High Surge Current Rating — $I_{TSM} = 240$ Amps
- Low On-State Voltage — 1.2 V (Typ) @ $I_{TM} = 20$ Amps
- Practical Level Triggering and Holding Characteristics — 40 mA (Max) and 50 mA (Max) @ $T_C = 25^\circ\text{C}$

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
*Peak Forward and *Repetitive Reverse Blocking Voltage, Notes 1 and 2 MCR5164, 2N5168 MCR5165, 2N5169 MCR5166, 2N5170 MCR5167, 2N5171	V_{DRM} or V_{RRM}	50 200 400 600	Volts
*Non-Repetitive Peak Reverse Blocking Voltage MCR5164, 2N5168 MCR5165, 2N5169 MCR5166, 2N5170 MCR5167, 2N5171	V_{RSM}	75 300 500 700	Volts
On-State Current RMS	$I_T(\text{RMS})$	20	Amps
Average On-State Current ($T_C = 67^\circ\text{C}$)	$I_T(\text{AV})$	13	Amps
Circuit Fusing ($t = 8.3$ ms)	I^2t	240	A^2s
*Peak Non-Repetitive Surge Current (One cycle, 60 Hz, $T_C = 67^\circ\text{C}$) Preceded and followed by rated current and voltage	I_{TSM}	240	Amps
*Peak Gate Power (Maximum Pulse Width = 10 μs)	P_{GM}	5	Watts
*Average Gate Power	$P_{G(\text{AV})}$	0.5	Watt
*Peak Forward Gate Current (Maximum Pulse Width = 10 μs)	I_{GM}	2	Amps
Peak Gate Voltage	V_{GM}	10	Volts
*Operating Junction Temperature Range	T_J	-40 to +100	$^\circ\text{C}$
*Storage Temperature Range	T_{stg}	-40 to +150	$^\circ\text{C}$
Stud Torque 2N5168-2N5171		30	in. lb.

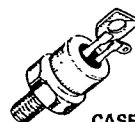
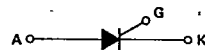
*Indicates JEDEC registered data.

Notes: 1. V_{DRM} 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 applied exceeds the rated blocking voltage.

2. Devices should not be operated with a positive bias applied to the gate concurrent with a negative potential applied to the anode.

**2N5168
thru
2N5171
MCR5164
thru
MCR5167**

**SCRs
20 AMPERES RMS
50 thru 600 VOLTS**



**CASE 263-04
STYLE 1
2N5168 thru 2N5171**



**CASE 174-04
(TO-203AA)
STYLE 1
MCR5164 thru MCR5167**

MOTOROLA THYRISTOR DEVICE DATA

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THERMAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
*Thermal Resistance, Junction to Case MCR5164, 65, 66, 67 2N5168, 69, 70, 71	$R_{\theta JC}$	1 1.1	1.5 1.6	°C/W

Note 2. Devices should not be operated with a positive bias applied to the gate concurrent with a negative potential applied to the anode.

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

Characteristic	Symbol	Min	Max	Unit
*Peak Forward or Reverse Blocking Current (Rated V_{DRM} or V_{RRM} , gate open) $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_{DRM}, I_{RRM}	— —	10 5	μA mA
Gate Trigger Current (Continuous dc), Note 1 ($V_D = 7\text{ Vdc}$, $R_L = 100\ \Omega$) *($V_D = 7\text{ Vdc}$, $R_L = 100\ \Omega$, $T_C = -40^\circ\text{C}$)	I_{GT}	— —	40 75	mA
Gate Trigger Voltage (Continuous dc) ($V_D = 7\text{ Vdc}$, gate open) *($V_D = 7\text{ Vdc}$, $R_L = 100\ \Omega$, $T_C = -40^\circ\text{C}$) *($V_D = \text{Rated } V_{DRM}$, $R_L = 100\ \Omega$, $T_J = 100^\circ\text{C}$)	V_{GT}	— — 0.2	1.5 2.5 —	Volts
Peak On-State Voltage (Pulse Width = 1 ms max, duty cycle $\leq 1\%$) ($I_{TM} = 20\text{ A}$) *($I_{TM} = 41\text{ A}$)	V_{TM}	— 8	1.5 1.7	Volts
Holding Current ($V_D = 7\text{ Vdc}$, gate open) *($V_D = 7\text{ Vdc}$, gate open, $T_C = -40^\circ\text{C}$)	I_H	— —	50 90	mA
Gate Controlled Turn-On Time ($t_d + t_r$) ($I_{TM} = 20\text{ A}$, $I_{GT} = 40\text{ mAdc}$, $V_D = \text{Rated } V_{DRM}$)	t_{gt}	Typical 1		μs
Circuit Commutated Turn-Off Time ($I_{TM} = 10\text{ A}$, $I_R = 10\text{ A}$) ($I_{TM} = 10\text{ A}$, $I_R = 10\text{ A}$, $T_J = 100^\circ\text{C}$) ($V_D = V_{DRM} = \text{rated voltage}$) ($dv/dt = 30\text{ V}/\mu\text{s}$)	t_q	20 30		μs
Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}$, Exponential Wave Form, Gate open, $T_J = 100^\circ\text{C}$)	dv/dt	50		$\text{V}/\mu\text{s}$

*Indicates JEDEC registered data.

Note 1. Devices should not be operated with a positive bias applied to the gate concurrent with a negative potential applied to the anode.

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EFFECT OF TEMPERATURE UPON TYPICAL TRIGGER CHARACTERISTICS

FIGURE 1 - GATE TRIGGER CURRENT

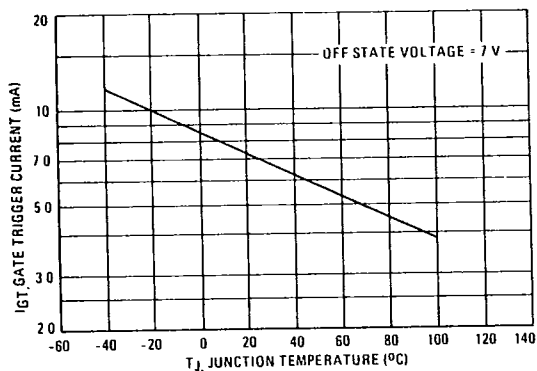
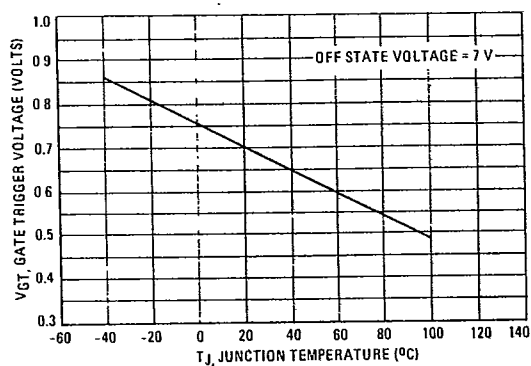


FIGURE 2 - GATE TRIGGER VOLTAGE



MAXIMUM ALLOWABLE NON-REPETITIVE SURGE CURRENT

FIGURE 3 - 60 Hz SURGES

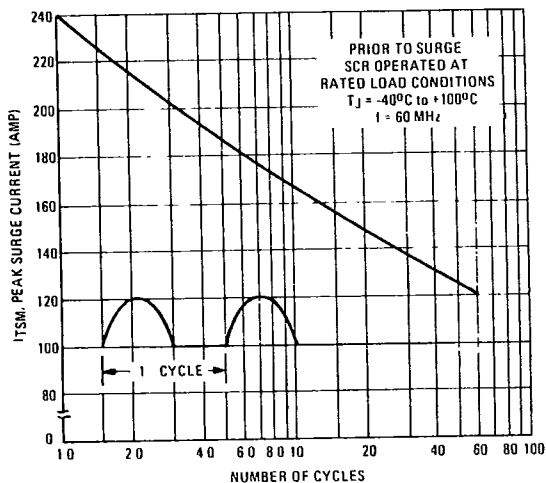


FIGURE 4 - SUB-CYCLE SURGES

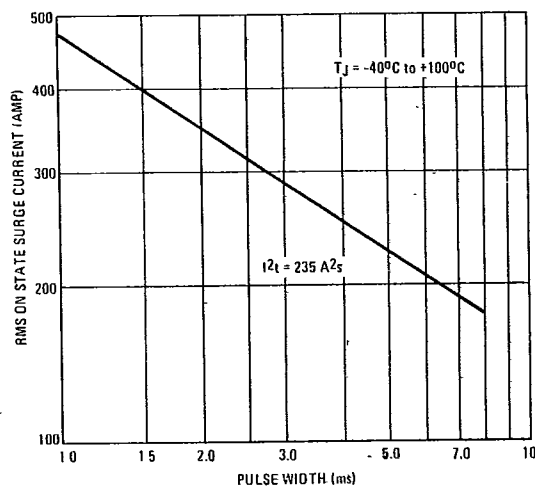


FIGURE 5 - GATE TRIGGER CHARACTERISTICS

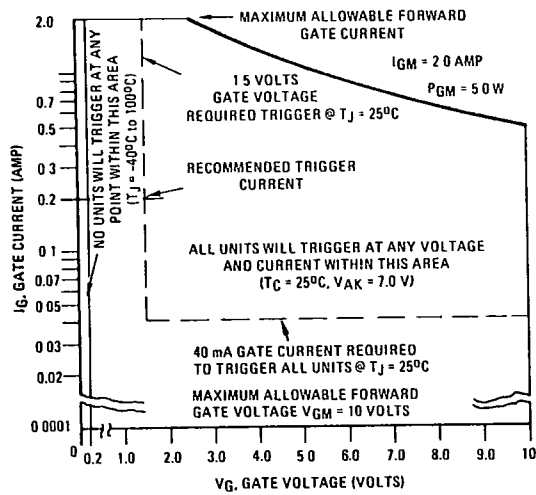
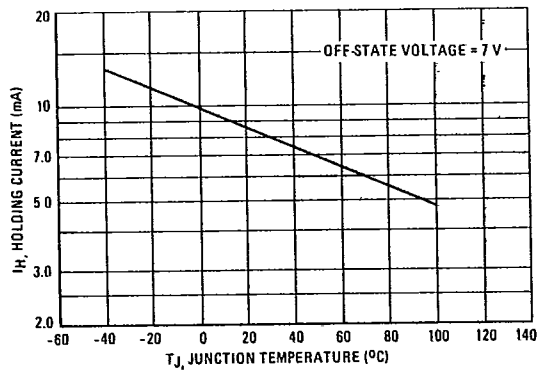


FIGURE 6 - EFFECT OF TEMPERATURE ON TYPICAL HOLDING CURRENT



DERATING AND DISSIPATION FOR RESISTIVE AND INDUCTIVE LOADS ($f = 60$ to 400 Hz, SINE WAVE)

FIGURE 7 - AVERAGE CURRENT DERATING

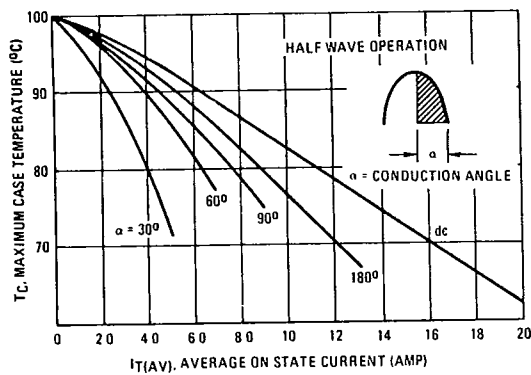
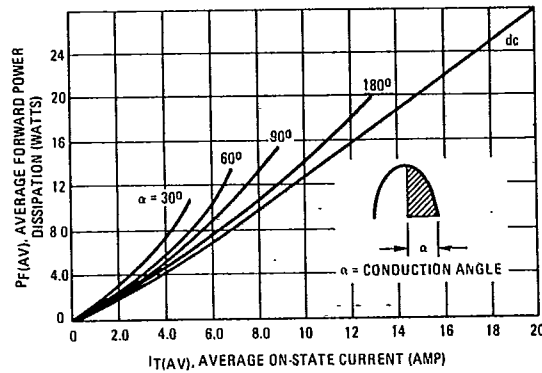


FIGURE 8 - ON-STATE POWER DISSIPATION



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FIGURE 9 - ON-STATE CHARACTERISTICS

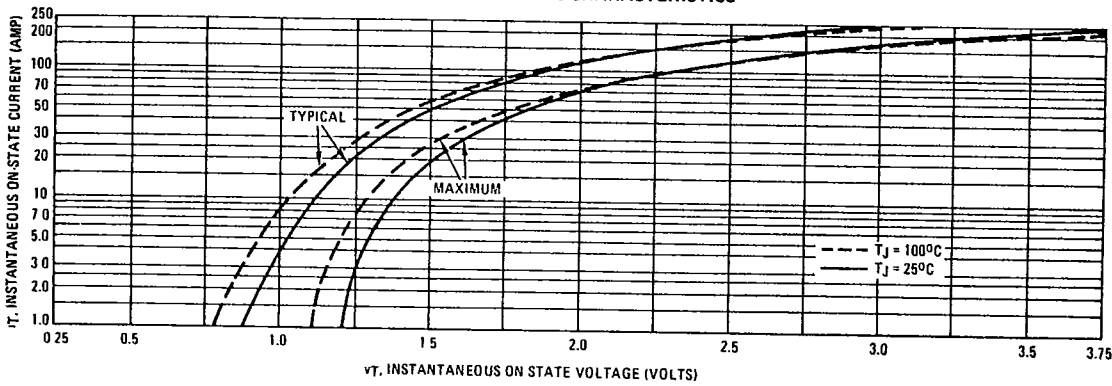


FIGURE 10 - TYPICAL THERMAL RESISTANCE OF PLATES

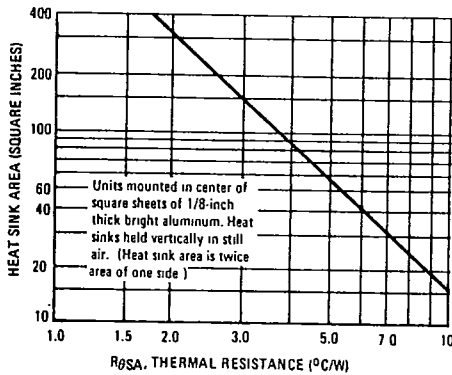


FIGURE 11 - MOUNTING DETAILS FOR PRESSFIT THYRISTORS

