



MOTOROLA
Semiconductors



SILICON CONTROLLED RECTIFIERS

... designed primarily for half-wave ac control applications, such as motor controls, heating controls and power supplies; or wherever half-wave silicon gate-controlled, solid-state devices are needed.

- Glass Passivated Junctions and Center Gate Fire for Greater Parameter Uniformity and Stability
- Blocking Voltage to 800 Volts

MAXIMUM RATINGS ($T_J = 125^\circ\text{C}$ unless otherwise noted.)

Rating	Symbol	Value	Unit
*Peak Repetitive Reverse Blocking Voltage (1)	V _{RRM}	25 50 100 150 200 250 300 400 500 600 700 800	Volts
2N681			
2N682			
2N683			
2N684			
2N685			
2N686			
2N687			
2N688			
2N689			
2N690			
2N691			
2N692			
*Non-Repetitive Peak Reverse Voltage	V _{RRSM}	35 75 150 225 300 350 400 500 600 720 840 960	Volts
2N681			
2N682			
2N683			
2N684			
2N685			
2N686			
2N687			
2N688			
2N689			
2N690			
2N691			
2N692			
*RMS On-State Current (All Conduction Angles)	I _{T(RMS)}	25	Amp
*Average On-State Current ($T_C = 65^\circ\text{C}$)	I _{T(AV)}	16	Amp
*Peak Non-Repetitive Surge Current (One cycle, 60 Hz, preceded and followed by rated current and voltage)	I _{TSM}	150	Amp
Circuit Fusing Considerations ($T_J = -40$ to $+125^\circ\text{C}$, $t = 1.0$ to 8.3 ms)	I ² _t	93	A ² _s
*Peak Gate Power	P _{GM}	5.0	Watts
*Average Gate Power	P _{G(AV)}	0.5	Watt
*Peak Forward Gate Current 2N681-2N689 2N690-2N692	I _{GM}	2.0	Amp
		1.2	Amp
*Peak Gate Voltage — Forward	V _{FGM}	10	Volts
Reverse	V _{VRGM}	5.0	Volts
*Operating Junction Temperature Range	T _J	-65 to +125	°C
*Storage Temperature Range	T _{stg}	-65 to +150	°C

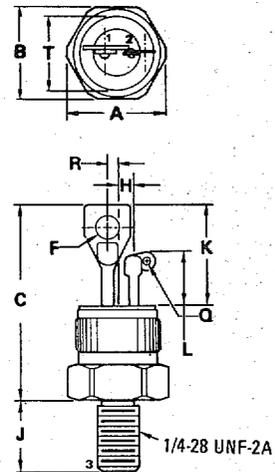
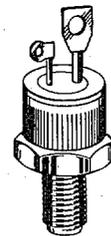
(1) V_{RRM} for all types can be applied on a continuous dc basis without incurring damage. Ratings apply for zero or negative gate voltage. Devices should not be tested for blocking capability in a manner such that the voltage supplied exceeds the rated blocking voltage.

* Indicates JEDEC Registered Data.

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2N681
thru
2N692

THYRISTORS
25 AMPERE RMS
25-800 VOLTS



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	15.34	15.60	0.604	0.614
B	14.00	14.20	0.551	0.559
C	26.67	30.23	1.050	1.190
F	3.43	4.06	0.135	0.160
H	2.29	REF	0.090	REF
J	10.67	11.56	0.420	0.455
K	15.75	17.02	0.620	0.670
L	7.62	8.89	0.300	0.350
Q	1.40	1.65	0.055	0.065
R	1.65	REF	0.065	REF
T	12.73	12.83	0.501	0.505

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

CASE 263-02

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.0	$^{\circ}C/W$

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

Characteristic	Symbol	Min	Typ	Max	Unit
*Peak Repetitive Forward Blocking Voltage ($T_J = 125^{\circ}C$)	V_{DRM}				Volts
2N681		25	—	—	
2N682		50	—	—	
2N683		100	—	—	
2N684		150	—	—	
2N685		200	—	—	
2N686		250	—	—	
2N687		300	—	—	
2N688		400	—	—	
2N689		500	—	—	
2N690		600	—	—	
2N691		700	—	—	
2N692		800	—	—	
*Average Forward or Reverse Blocking Current (Rated V_{DRM} or V_{RRM} , gate open, $T_J = 125^{\circ}C$)	$I_{D(AV)}, I_{R(AV)}$				mA
2N681-2N684		—	—	6.5	
2N685		—	—	6.0	
2N686		—	—	5.5	
2N687		—	—	5.0	
2N688		—	—	4.0	
2N689		—	—	3.0	
2N690		—	—	2.5	
2N691		—	—	2.25	
2N692		—	—	2.0	
Peak Forward or Reverse Blocking Current (Rated V_{DRM} or V_{RRM} , gate open, $T_J = 125^{\circ}C$)	I_{DRM}, I_{RRM}	—	—	2.0	mA
*Peak On-State Voltage ($I_{TM} = 50.3$ A peak, Pulse Width ≤ 1.0 ms, Duty Cycle $\leq 2.0\%$)	V_{TM}	—	—	2.0	Volts
Gate Trigger Current, Continuous dc ($V_{AK} = 12$ Vdc, $R_L = 50 \Omega$) *($V_{AK} = 12$ Vdc, $R_L = 50 \Omega$, $T_C = -65^{\circ}C$)	I_{GT}	—	6.0	40	mA
Gate Trigger Voltage, Continuous dc ($V_{AK} = 12$ Vdc, $R_L = 50 \Omega$) *($V_{AK} = 12$ Vdc, $R_L = 50 \Omega$, $T_J = -65^{\circ}C$)	V_{GT}	—	0.65	2.0	Volts
*Gate Non-Trigger Voltage (Rated V_{DRM} , $R_L = 50 \Omega$, $T_J = 125^{\circ}C$)	V_{GD}	—	—	0.25	Volts
Holding Current ($V_{AK} = 12$ Vdc, Gate Open)	I_H	—	7.3	50	mA
Critical Rate of Rise of Off-State Voltage (Rated V_{DRM} , Exponential Waveform, $T_J = 125^{\circ}C$, Gate Open)	dv/dt	—	30	—	V/ μ s

* Indicates JEDEC Registered Data.

FIGURE 1 - AVERAGE CURRENT DERATING

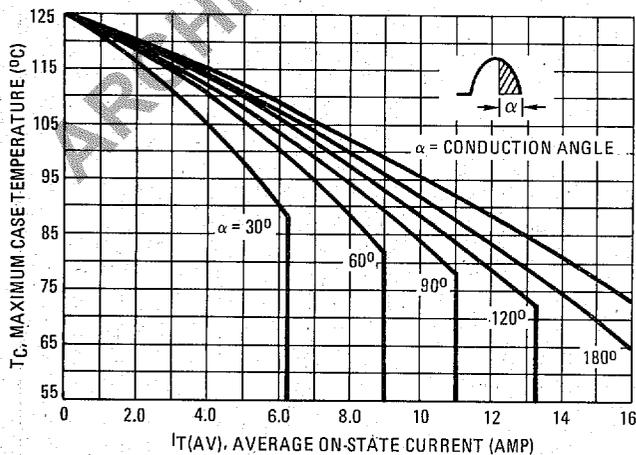


FIGURE 2 - MAXIMUM ON-STATE POWER DISSIPATION

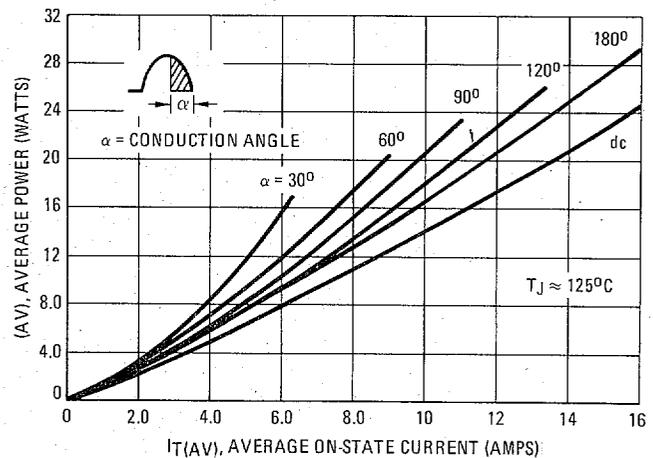


FIGURE 3 - MAXIMUM ON-STATE CHARACTERISTICS

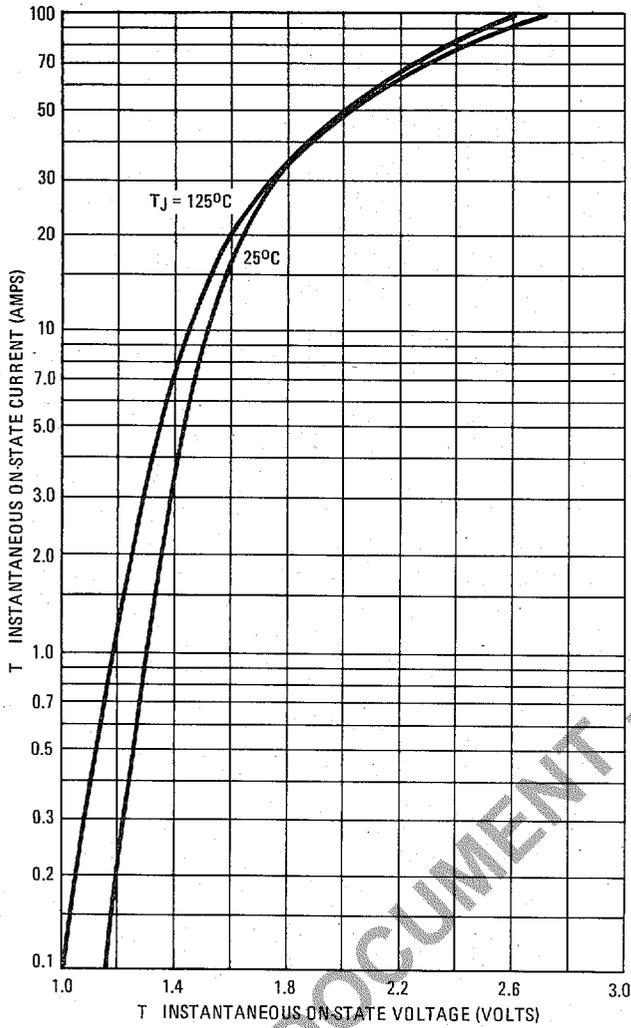


FIGURE 4 - MAXIMUM NON-REPETITIVE SURGE CURRENT

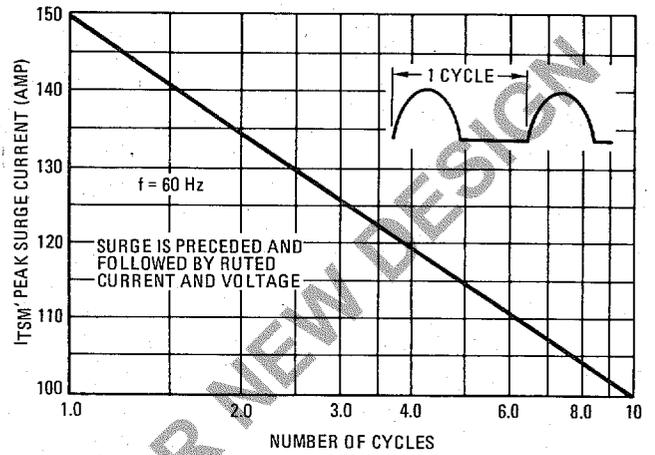


FIGURE 5 - CHARACTERISTICS AND SYMBOLS

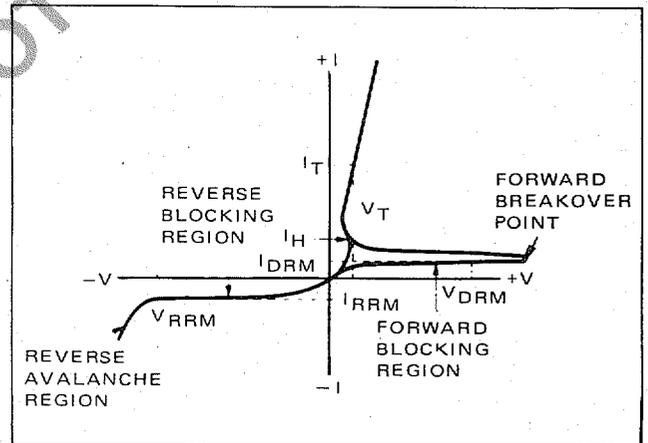
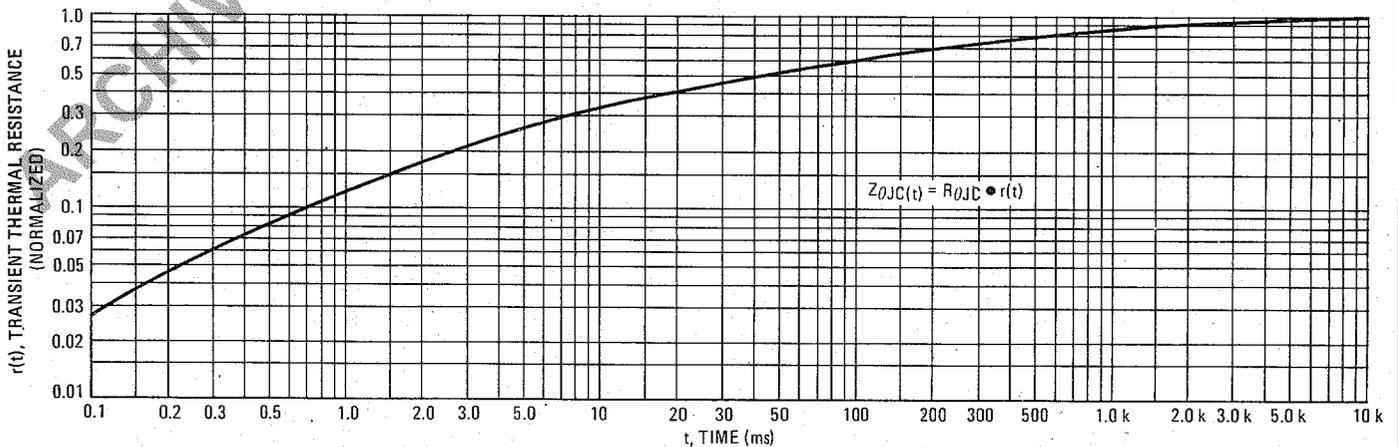


FIGURE 6 - THERMAL RESPONSE



TYPICAL CHARACTERISTICS

FIGURE 7 - PULSE TRIGGER CURRENT

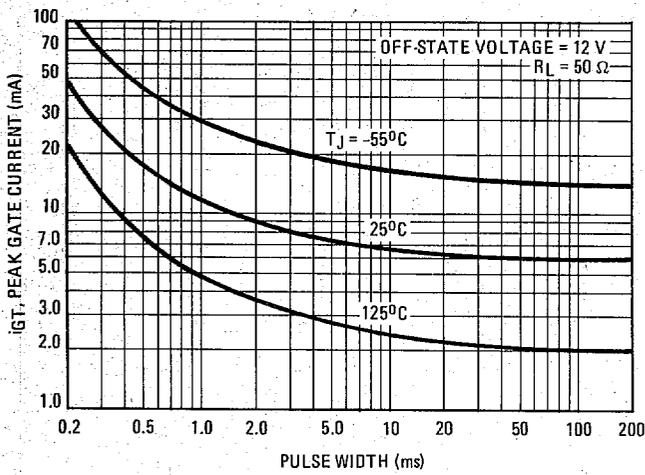


FIGURE 8 - GATE TRIGGER CURRENT

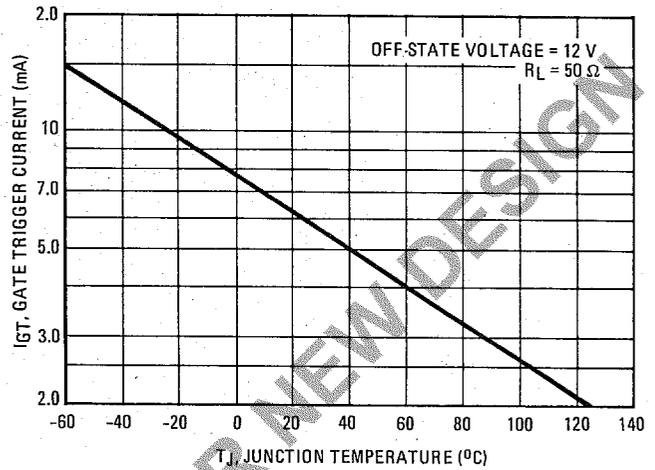


FIGURE 9 - GATE TRIGGER VOLTAGE

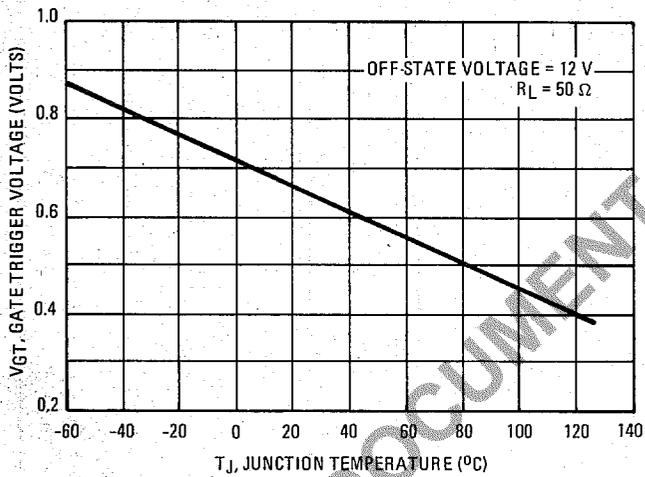
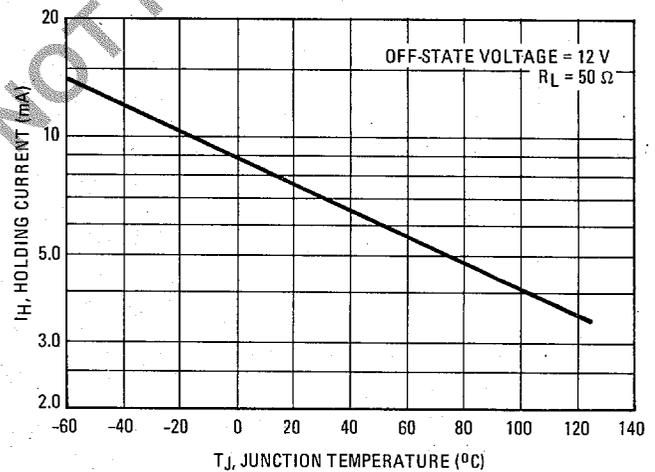


FIGURE 10 - HOLDING CURRENT



THYRISTER APPLICATION NOTES

- AN-189 Solid-State Pulse Width Modulation DC Motor Control
- AN-240 SCR Power Control Fundamentals
- AN-295 Suppressing RFI in Thyristor Circuits
- AN-413 Unijunction Trigger Circuits for Gated Thyristors
- AN-441 SCR Slaving Circuits
- AN-443 Directional and Speed Control for Series, Universal and Shunt Motors
- AN-450 Induction Motor Speed Control
- AN-453 Zero Point Switching Techniques
- AN-482 Electronic Speed Control of Appliance Motors

- AN-526 Theory, Characteristics and Applications of Silicon Unilateral and Bilateral Switches
- AN-527 Theory, Characteristics and Applications of the Programmable Unijunction Transistor
- AN-568 A Fuse-Thyristor Coordinator Primer

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