MOTOROLA Semiconductors

2N4167 thru 2N4174
2N4183 thru 2N4190

SILICON CONTROLLED RECTIFIERS

8-AMPERE RMS
25 thru 600 VOLTS

REVERSE BLOCKING TRIODE THYRISTOR

. . . multi-purpose PNPN silicon controlled rectifiers suited for industrial, consumer, and mulitary applications. Offered in a choice of space-saving, economical packages for mounting versatility.

- Uniform Low-Level Noise-Immune Gate Triggering — I_{GT} = 10 mA (Typ) @ T_C = 25°C
- Low Forward "On" Voltage — v_T = 1.0 V (Typ) @ 5.0 Amp @ 25°C
- High Surge-Current Capability — I_{TSM} = 100 Amp Peak
- Shorted Emitter Construction

MAXIMUM RATINGS

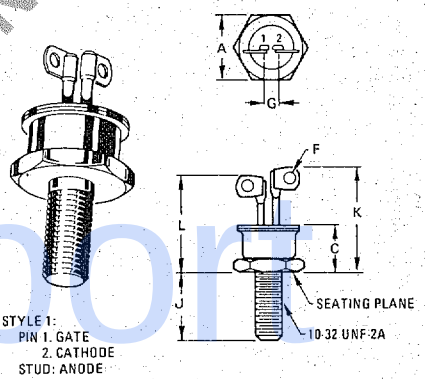
(Apply over operating temperature range and for all case types unless otherwise noted)

Rating	Symbol	Value	Unit
*Peak Repetitive Forward and Reverse Blocking Voltage (1) 2N4167, 83,	V_{DRM} or V_{RRM}	25	Volts
2N4168, 84,		50	
2N4169, 85,		100	
2N4170, 86,		200	
2N4171, 87,		300	
2N4172, 88,		400	
2N4173, 89,		500	
2N4174, 90,		600	
Forward Current RMS	$I_{T(RMS)}$	8.0	Amp
*Peak Forward Surge Current (One cycle, 60 Hz, T_J = -40 to +100°C)	I_{TSM}	100	Amp
Circuit Fusing (T_J = -40 to +100°C; t ≤ 8.3 ms)	I^2t	40	A^2s
*Peak Gate Power	P_{GM}	5.0	Watt
*Average Gate Power	$P_{G(AV)}$	0.5	Watt
*Peak Gate Current	I_{GM}	2.0	Amp
Peak Gate Voltage (2)	V_{GM}	10	Volts
*Operating Temperature Range	T_J	-40 to +100	°C
*Storage Temperature Range	T_{stg}	-40 to +150	°C
Stud Torque		15	in. lb.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	$R\theta_{JC}$	1.5	2.5*	°C/W
Thermal Resistance, Case to Ambient (See Fig. 11) 2N4183-98	$R\theta_{CA}$	50	—	°C/W

(1) 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 concurrently with a negative potential applied to the anode.
*Indicates JEDEC Registered Data

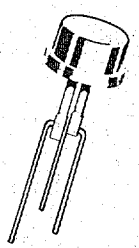


STYLE 1:
PIN 1. GATE
2. CATHODE
STUD: ANODE

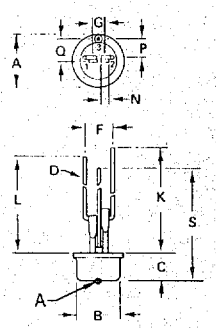
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	—	11.10	—	0.437
C	—	7.87	—	0.310
F	1.78 TYP		0.070 TYP	
G	2.29	2.79	0.090	0.110
J	10.72	11.48	0.422	0.452
K	—	16.76	—	0.660
L	—	15.49	—	0.610

NOTE:
1. DIM "G" MEASURED AT CAN.

2N4167–74
CASE 86-01



NOTES:
1. DIM. "G" MEASURED AT CAN.
2. LEAD NO. 3 ±7.5° DISPLACEMENT.



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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	—	10.92	—	0.430
B	—	8.89	—	0.350
C	—	5.97	—	0.235
D	0.76	0.86	0.030	0.034
F	4.83	5.33	0.190	0.210
G	2.29	2.79	0.090	0.110
K	33.53	—	1.320	—
L	31.50 TYP		1.240 TYP	
N	1.65	1.91	0.065	0.075
P	3.43	3.68	0.135	0.145
Q	4.57	5.08	0.180	0.200
S	30.48	—	1.20	—

2N4183–90
CASE 87L-01

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
*Peak Forward Blocking Current (V_D = Rated V_{DRM} @ T_J = 100°C, gate open)	I_{DRM}	–	–	2.0	mA
*Peak Reverse Blocking Current (V_R = Rated V_{RRM} @ T_J = 100°C, gate open)	I_{RRM}	–	–	2.0	mA
Gate Trigger Current (Continuous dc) (1) (V_D = 7.0 Vdc, R_L = 100 Ω)	I_{GT}	–	10	30	mA
*(V_D = 7.0 Vdc, R_L = 100 Ω, T_C = -40°C)		–	–	60	
Gate Trigger Voltage (Continuous dc) (V_D = 7.0 Vdc, R_L = 100 Ω)	V_{GT}	–	0.75	1.5	Volts
*(V_D = 7.0 Vdc, R_L = 100 Ω, T_C = -40°C)		–	–	2.5	
*(V_D = 7.0 Vdc, R_L = 100 Ω, T_J = 100°C)		0.2	–	–	
*Forward "On" Voltage (pulsed, 1.0 ms max, duty cycle ≤ 1%) (I_{TM} = 15.7 A)	V_{TM}	–	1.4	2.0	Volts
Holding Current (V_D = 7.0 Vdc, gate open)	I_H	–	10	30	mA
*(V_D = 7.0 Vdc, gate open, T_C = -40°C)		–	–	60	
Turn-On Time (t_d + t_r) (I_G = 20 mAdc, I_F = 5.0 Adc, V_D = Rated V_{DRM})	t_{on}	–	1.0	–	μs
Turn-Off Time (I_F = 5.0 Adc, I_R = 5.0 Adc)	t_{off}	–	15	–	μs
(I_F = 5.0 Adc, I_R = 5.0 Adc, T_J = 100°C, V_D = Rated V_{DRM}) (dv/dt = 30 V/μs)		–	25	–	
Forward Voltage Application Rate (Exponential) (Gate open, T_J = 100°C, V_D = Rated V_{DRM})	dv/dt	–	50	–	V/μs

(1) For optimum operation, i.e. faster turn-on, lower switching losses, best di/dt capability, recommended I_{GT} = 200 mA minimum.
*Indicates JEDEC Registered Data

TYPICAL TRIGGER CHARACTERISTICS

FIGURE 1 – PULSE CURRENT TRIGGERING

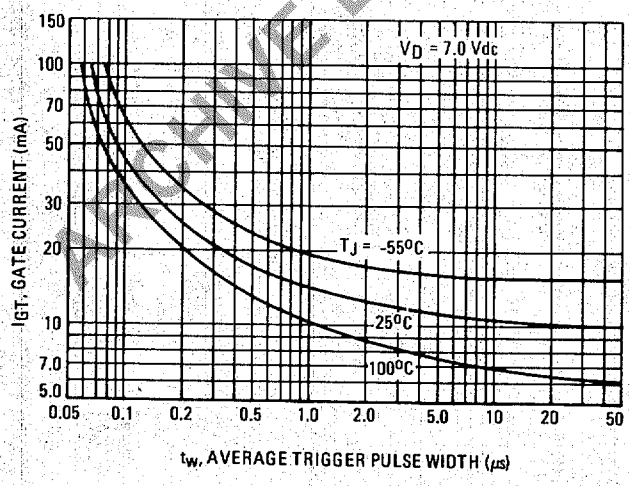
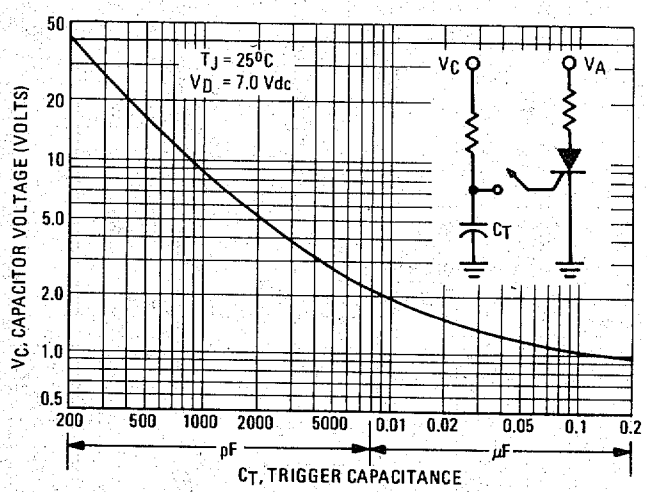


FIGURE 2 – CAPACITIVE DISCHARGE TRIGGERING



CURRENT DERATING

FIGURE 3 – MAXIMUM CASE TEMPERATURE

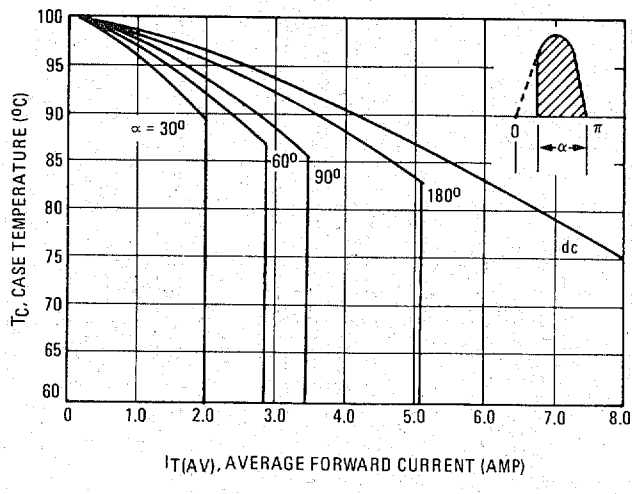


FIGURE 4 – MAXIMUM AMBIENT TEMPERATURE

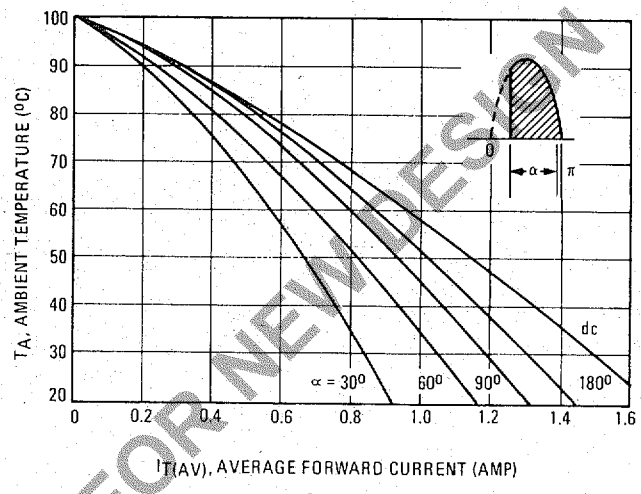


FIGURE 5 – POWER DISSIPATION

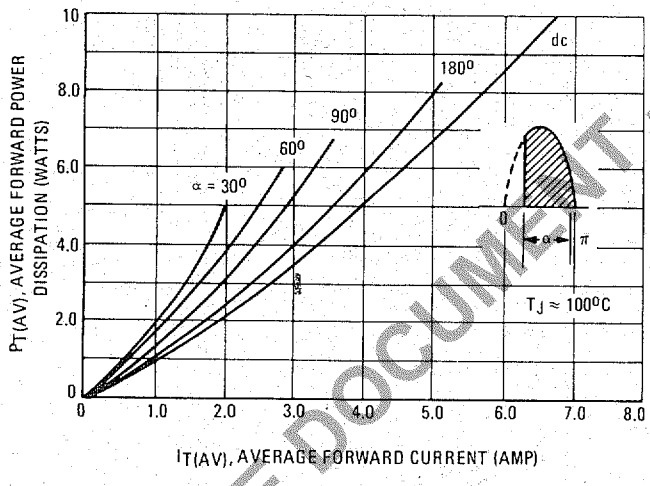


FIGURE 6 – MAXIMUM SURGE CAPABILITY

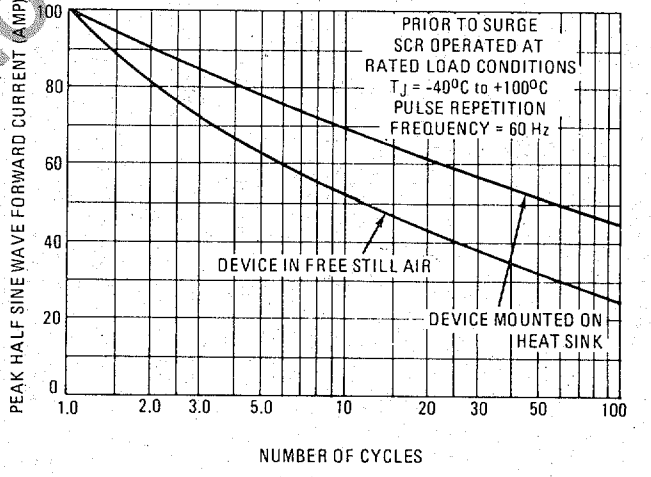


FIGURE 7 – THERMAL RESPONSE

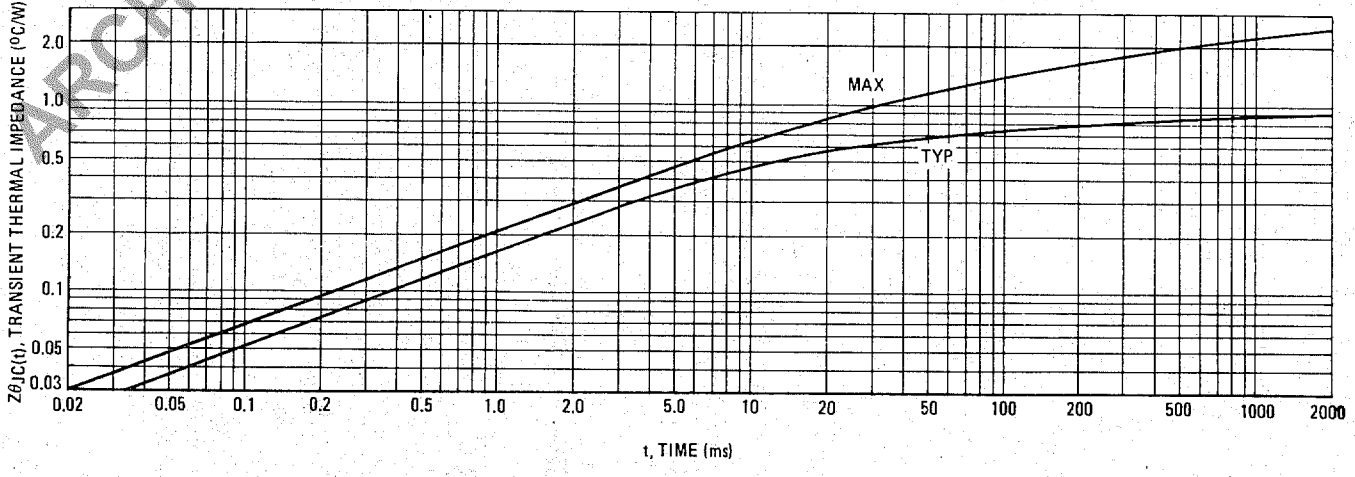


FIGURE 8 – FORWARD VOLTAGE

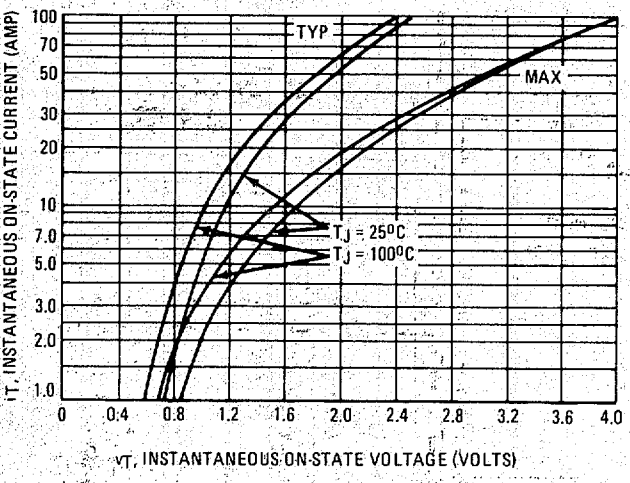


FIGURE 9 – HOLDING CURRENT

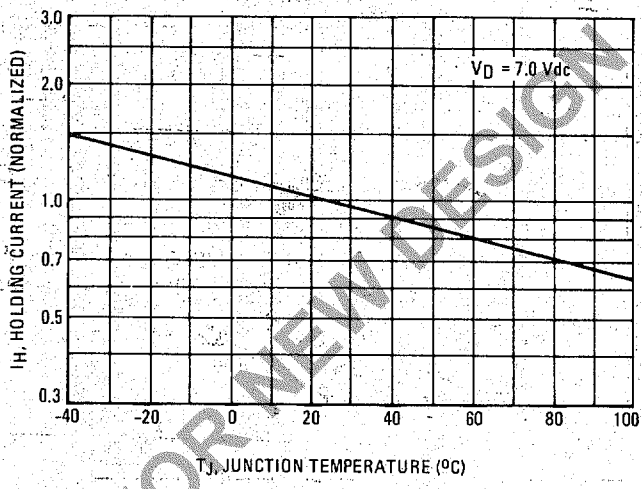


FIGURE 10 – TYPICAL THERMAL RESISTANCE OF PLATES

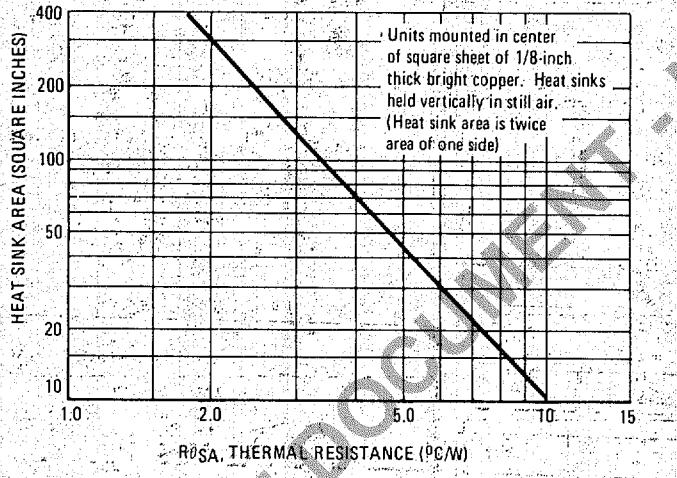


FIGURE 11 – CASE-TO-AMBIENT THERMAL RESISTANCE