INVERTER SCR's
700 TO 1000 AMPERES

GE TYPE		C394	C395	C444/C445	C447/C448	C449
CONSTRUCTION		AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE
ELECTRICAL SPECIFICATIONS						
VOLTAGE RANGE		100-600	100-600	100-600	500-1200	1500-1800
FORWARD CONDUCTION						
$I_{T(RMS)}$	Max. forward conduction sinusoidal @ T_C = 65°C, 50% duty (A)					
	@ 60 Hz	700	700	1000	900	850
	@ 600 Hz	650	650	1000	900	800
	@ 1200 Hz	550	550	1000	900	750
	@ 2500 Hz	275	275	1000	800	–
	@ 5000 Hz	150	150	800	615	–
I_{TSM}	Max. peak one cycle, non-repetitive surge current (A)	8000	8000	12,000	10,000	6500
I^2t	Max. I^2t for fusing for 5 to 8.3 msec (A^2 sec)	250,000	250,000	600,000	415,000	–
$R\theta_{JC}$	Max. thermal impedance (°C/W)	.06	.06	.04	.04	.04
$t_d + t_r$	Typical turn-on time (μsec)	2.0	2.0	2.0	2.0	–
t_q	Turn-off time @ rated voltage and T_J V_R = 50V min. (μsec) @ 20V / μsec reapplied	10	15	–	–	–
	@ 200V / μsec reapplied	14	20	10-20	–	40
	@ 400V / μsec reapplied	–	–	15	40-25	–
di/dt	Critical rate-of-rise of on-state current (A/μsec)	800	800	800	800	500
T_J	Junction operating temperature range (°C)	–40 to 125°C	–40 to 125°C	–40 to 125°C	–40 to 125°C	–40 to 125°C
BLOCKING						
dv/dt	Min. critical rate-of-rise off-state voltage exponential to rated V_{DRM} @ Max. T_J (V/μsec)	200	200	200	400	200
FIRING						
I_{GT}	Max. required gate current to trigger (mA) @ –40°C	400	400	400	400	200
	@ 125°C	150	150	150	150	150
V_{GT}	Max. required voltage to trigger (V) @ –40°C	5	5	5	5	5
	@ 125°C (Min.)	.15	.15	.15	.25	.15
VOLTAGE TYPES						
Repetitive Peak Forward and Reverse Voltages						
100		C394A	C395A	C444/C445A		
200		C394B	C395B	C444/C445B		
300		C394C	C395C	C444/C445C		
400		C394D	C395D	C444/C445D		
500		C394E	C395E	C444/C445E	C447/C448E	
600		C394M	C395M	C444/C445M	C447/C448M	
700					C447/C448S	
800					C447/C448N	
900					C447/C448T	
1000					C447/C448P	
1100					C447/C448PA	
1200					C447/C448PB	
1300						
1400						
1500						C449PE
1600						C449PM
1700						C449PS
1800						C449PN
PACKAGE TYPE		1" PRESS PAK	1" PRESS PAK	1" PRESS PAK	1" PRESS PAK	1" PRESS PAK
PACKAGE OUTLINE NO.		276	276	276	276	276

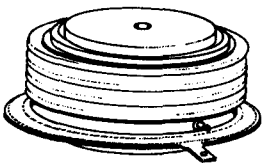
HIGH SPEED

Silicon Controlled Rectifier

1200 Volts, 1000 Amps RMS

C447/C448

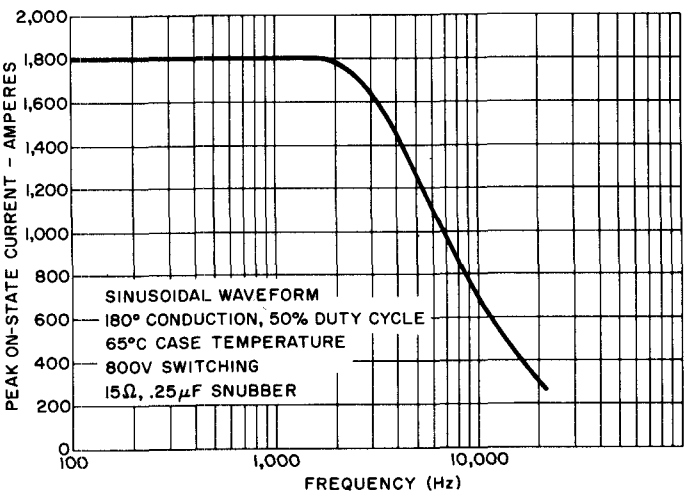
AMPLIFYING GATE



The General Electric C447 and C448 Silicon Controlled Rectifiers are designed for power switching at high frequencies. These are all-diffused Press-Pak devices employing the field-proven, interdigitated amplifying gate system.

FEATURES:

- Interdigitated gate structure to maximize high frequency current switching capability.
- Fully characterized for operation in inverter applications.
- High di/dt ratings.
- High dv/dt capability with selections available.
- Guaranteed maximum turn-off time with selections available.
- Rugged hermetic glazed ceramic package having 1" creepage path.



Equipment designers can use the C447/C448 SCR in demanding applications, such as:

- Choppers
- Inverters
- Regulated Power Supplied
- Sonar Transmitters
- Induction Heaters
- Radio Transmitters
- Cycloconverters
- DC to DC Converters
- High Frequency

FOR SINE WAVE OPERATION

Like the Types C358, C385, C388, C395 and C398, the C447/C448 SCR is rated for:

- Peak Current vs. Pulse Wdith
- Frequency vs. Case Temperature

MAXIMUM ALLOWABLE RATINGS

TYPES	REPETITIVE PEAK OFF-STATE VOLTAGE, V_{DRM}[1] T_J = -40°C to +125°C	REPETITIVE PEAK REVERSE VOLTAGE, V_{RRM}[1] T_J = -40°C to +125°C	NON-REPETITIVE PEAK REVERSE VOLTAGE, V_{RSM}[1] T_J = +125°C
C447/C448E	500 Volts	500 Volts	600 Volts
C447/C448M	600	600	720
C447/C448S	700	700	840
C447/C448N	800	800	960
C447/C448T	900	900	1080
C447/C448P	1000	1000	1200
C447/C448PA	1100	1100	1300
C447/C448PB	1200	1200	1400

[1] Half sinewave waveform, 10 ms max. pulse width.

Peak One-Cycle Surge (Non-Repetitive) On-State Current, I_{TSM} . . . . . 10,000 Amperes
I^2t (for fusing) for times $\geq$ 1.5 milliseconds . . . . . 190,000 (RMS Ampere)^2 Seconds
I^2t (for fusing) for times $\geq$ 8.3 milliseconds . . . . . 415,000 (RMS Ampere)^2 Seconds
Critical Rate-of-Rise of On-State Current, (Non-Repetitive)† . . . . . 800 A/μs
Critical Rate-of-Rise of On-State Current, (Repetitive)† . . . . . 500 A/μs
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
Mounting Force . . . . . 3000 Lb. + 500 Lb. – 0 Lb.
13.3 Kn + 2.2 Kn – 0 Kn

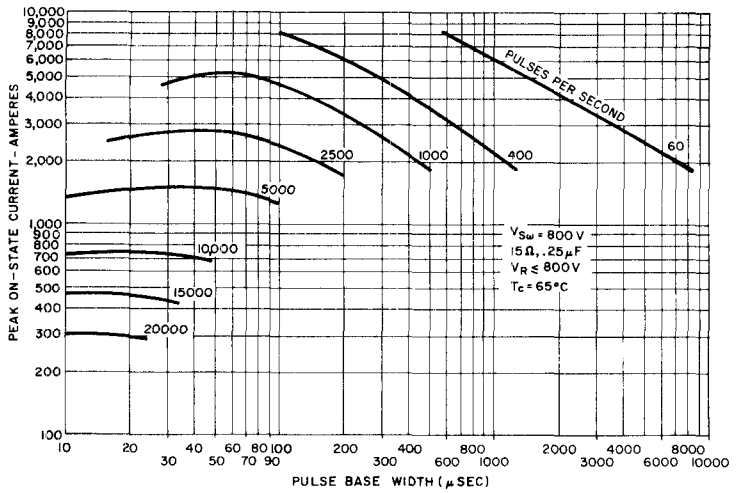
† di/dt ratings established in accordance with EIA–NEMA Standard RS-397, Section 5.2.2.6 for conditions of max. rated V_{DRM}; 20 volts, 20 ohms, gate trigger source with 0.5μs short circuit trigger current rise time.

CHARACTERISTICS

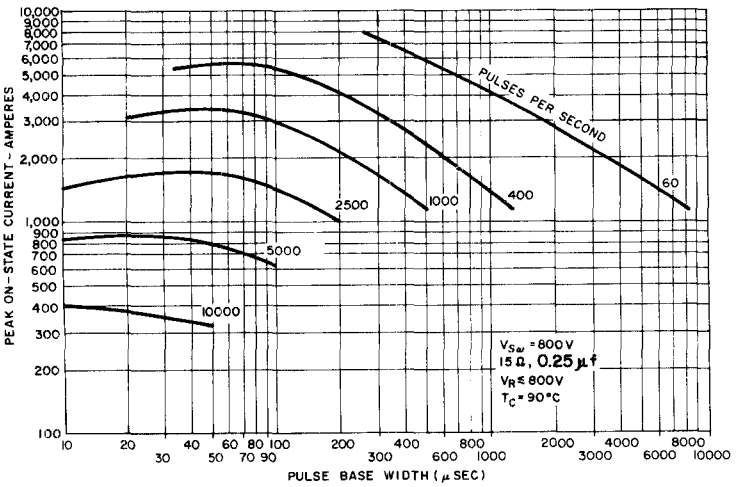
TEST	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITION
Repetitive Peak Reverse and Off-State Current	I_{RRM} and I_{DRM}	–	5	25	mA	T_C = +25°C V = V_{DRM} = V_{RRM}
Repetitive Peak Reverse and Off-State Current	I_{RRM} and I_{DRM}	–	20	45	mA	T_C = +125°C V = V_{DRM} = V_{RRM}
Thermal Resistance	$R_{\theta JC}$	–	–	0.04	°C/Watt	Junction-to-Case, Double-Side Cooled
Critical Rate-of-Rise of Off-State Voltage (Higher values may cause device switching)	dv/dt	400	500	–	V/μsec	T_J = +125°C, Gate Open. 80% of V_{DRM} Reapplied, Linear or Exponential Rising Waveform. Exponential dv/dt = $\frac{0.8\ V_{DRM}}{\tau}$ (.632)
Higher minimum dv/dt selections available – consult factory.						
DC Gate Trigger Current	I_{GT}	–	–	200	mAdc	T_C = +25°C, V_D = 6 Vdc, R_L = 3 Ohms
		–	–	400		T_C = -40°C, V_D = 6 Vdc, R_L = 3 Ohms
		–	–	150		T_C = +125°C, V_D = 6 Vdc, R_L = 3 Ohms
DC Gate Trigger	V_{GT}	–	–	3.0	Vdc	T_C = 25°C to +125°C, V_D = 6 Vdc, R_L = 3 Ohms
		–	–	5.0		T_C = -40°C to 25°C, V_D = 6 Vdc, R_L = 3 Ohms
		0.25	–	–		T_C = 125°C, V_{DRM}, R_L = 1000 Ohms
Peak On-State Voltage	V_{TM}	–	–	2.9	Volts	T_C = +25°C, I_{TM} = 2000 Amps. Peak. Duty Cycle ≤ .01 %
Conventional Circuit Commutated Turn-Off Time (with Reverse Voltage) C448 C447	t_q	 – –	 – –	 25 40	μsec	(1) T_C = +125°C (2) I_{TM} = 500 Amps. (3) V_R = 50 Volts Min. (4) 80% of V_{DRM} Reapplied (5) Rate-of-Rise of Reapplied Off-State Voltage = 400 V/μsec (linear). (6) Commutation di/dt = 25 Amps/μsec (7) Repetition Rate = 1 pps. (8) Gate Bias During Turn-Off Interval = 0 Volts, 100 Ohms.
Conventional Circuit Commutated Turn-Off Time (with Feedback Diode) C448 C447	$t_{q(diode)}$	 – –	 25 40	 † †	μsec	(1) T_C = +125°C (2) I_{TM} = 500 Amps. (3) V_R = 1.5 Volts (4) 80% of V_{DRM} Reapplied (5) Rate-of-Rise of Reapplied Off-State Voltage = 400 V/μsec (linear). (6) Commutation di/dt = 25 Amps/μsec (7) Repetition Rate = 1 pps (8) Gate Bias During Turn-Off Interval = 0 Volts, 100 Ohms

† Consult factory for maximum turn-off time.

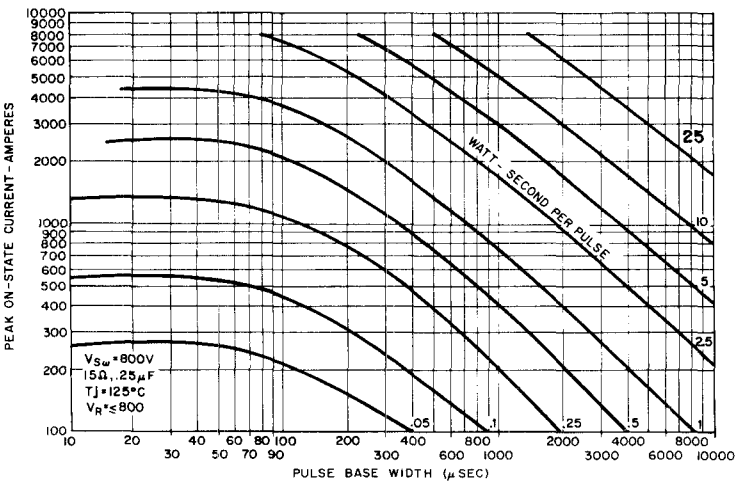
SINEWAVE CURRENT RATING DATA



1. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. PULSE WIDTH (T_C = 65°C)



2. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. PULSE WIDTH (T_C = 90°C)

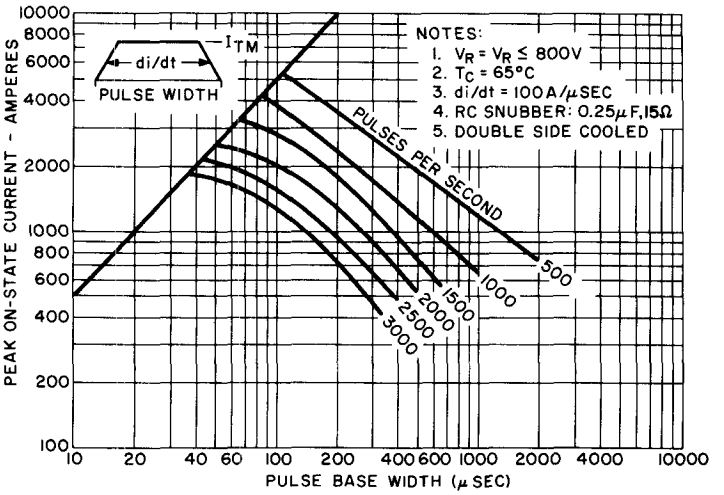


3. ENERGY PER PULSE FOR SINUSOIDAL PULSES

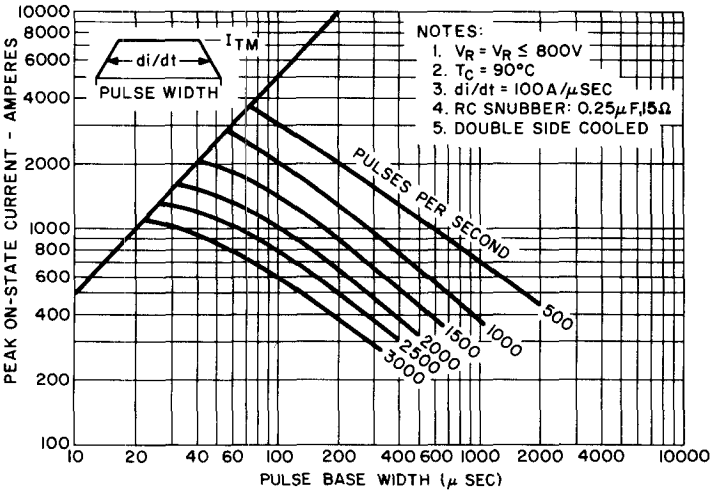
NOTES:

1. Switching Voltage ⩽ 800 Volts.
2. Reverse Voltage Applied = V_R ⩽ 800 Volts.
3. R-C Snubber Circuit = .25μf, 15Ω
4. Double-Side Cooled.

TRAPEZOIDAL WAVE CURRENT DATA



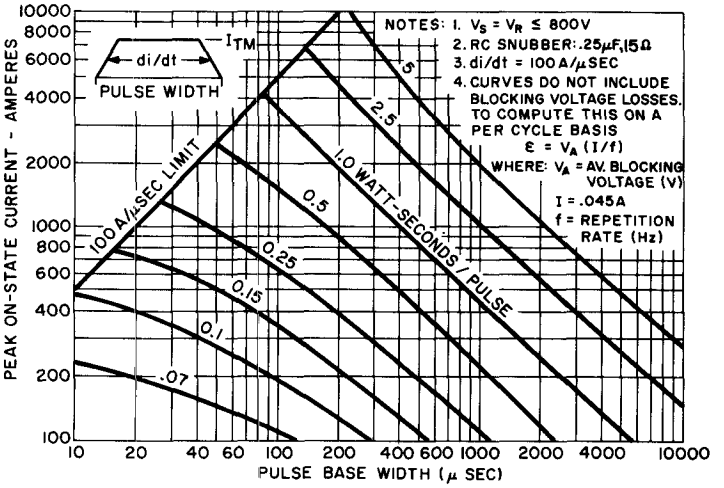
4. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. PULSE WIDTH (T_C = 65°C)



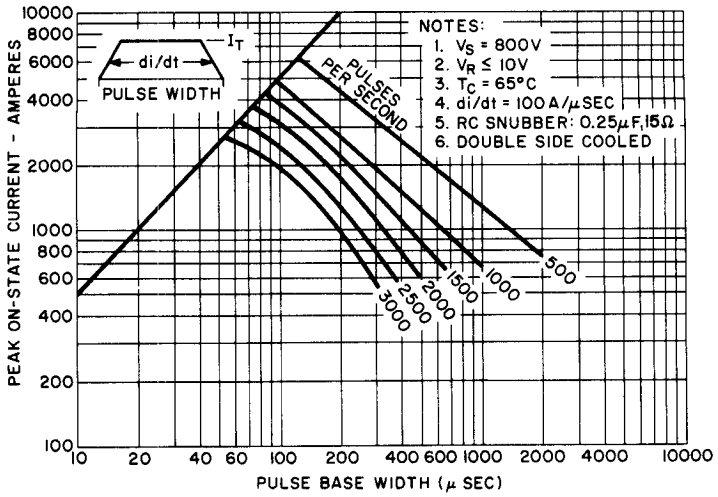
NOTES:

1. Switching Voltage ⩽ 800 Volts.
2. Reverse Voltage ⩽ 800 Volts.
3. R-C Snubber Circuit = 15Ω, .25μf
4. Double-Side Cooled

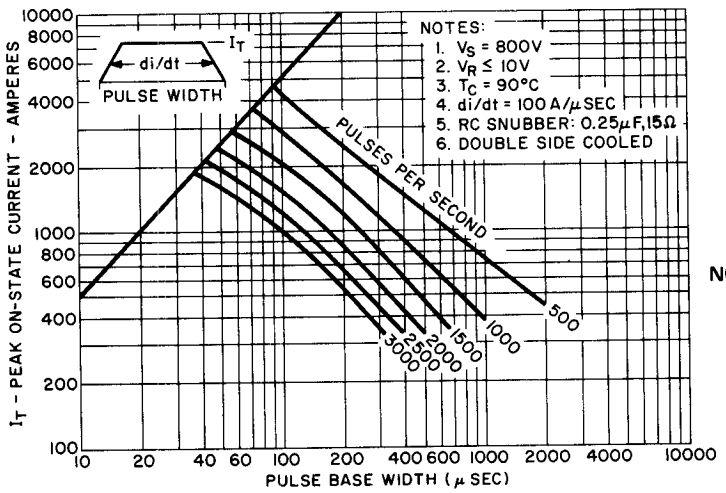
5. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. PEAK WIDTH (T_C = 90°C)



6. ENERGY PER PULSE FOR TRAPEZOIDAL PULSES



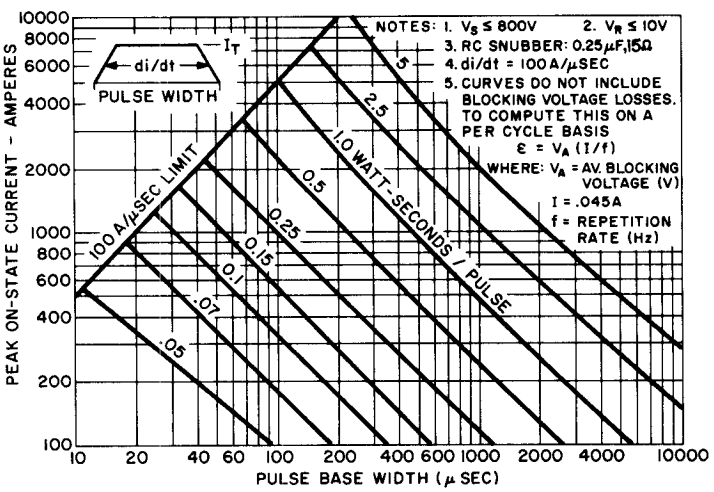
7. MAXIMUM ALLOWABLE ON-STATE CURRENT VS. PULSE WIDTH WITH ANTI-PARALLEL DIODE (T_C = 65°C)



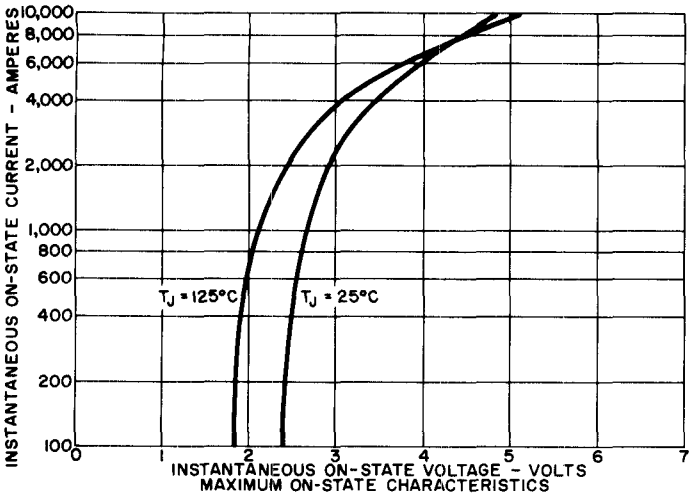
NOTES:

1. Switching Voltage ⩽ 800 Volts.
2. Reverse Voltage ⩽ 10Volts.
3. R-C Snubber Circuit = 15Ω, .25μf
4. Double-Side Cooled

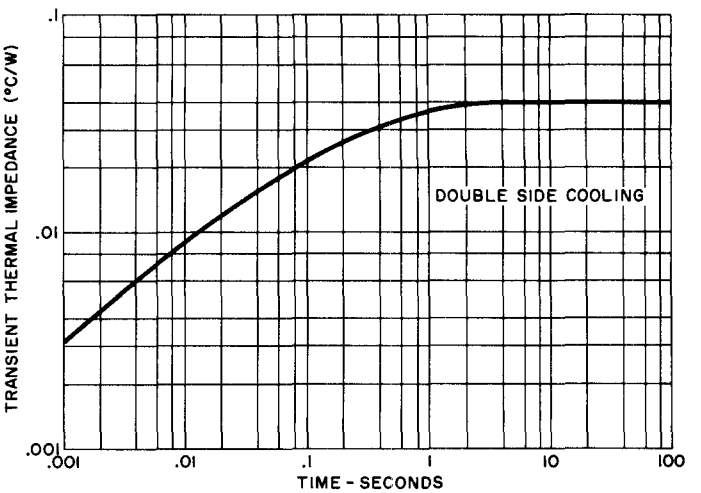
8. MAXIMUM ALLOWABLE ON-STATE CURRENT VS. PULSE WIDTH WITH ANTI-PARALLEL DIODE (T_C = 90°C)



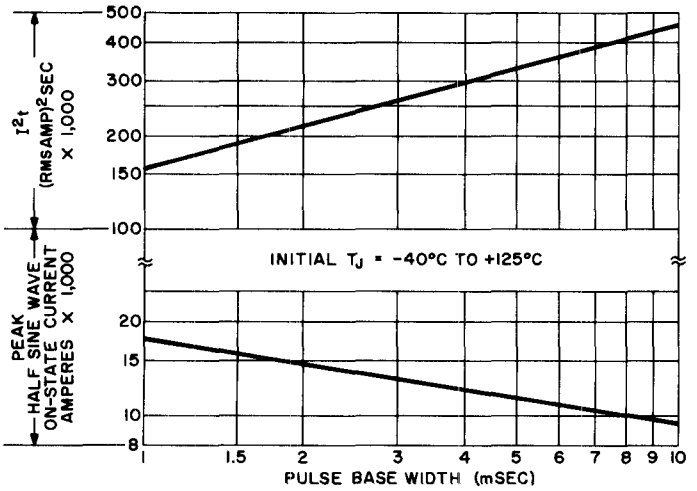
9. ENERGY PER PULSE FOR SINUSOIDAL PULSES WITH ANTI-PARALLEL DIODE



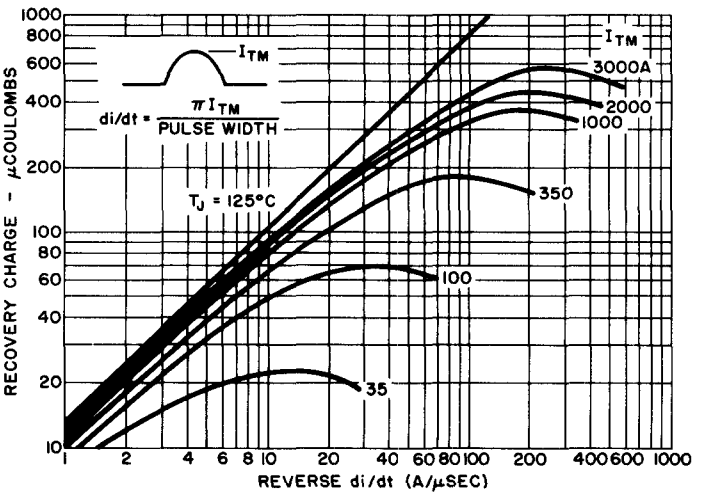
10. ON-STATE CONDUCTION CHARACTERISTIC



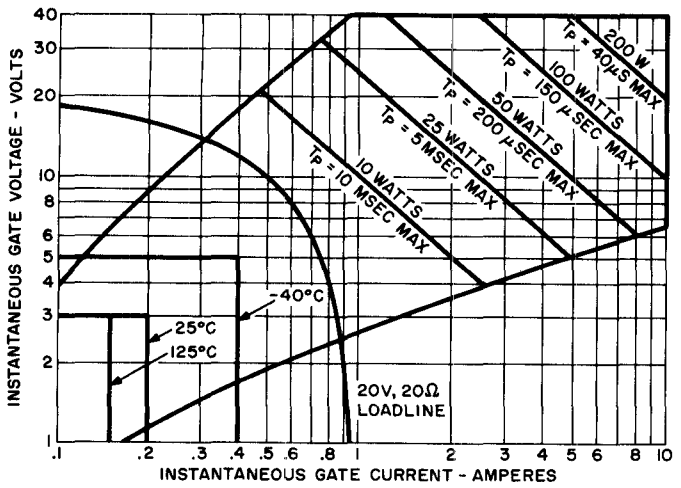
11. TRANSIENT THERMAL IMPEDANCE – JUNCTION-TO-CASE



12. SUB-CYCLE SURGE (NON-REPETITIVE) ON-STATE CURRENT AND I^2t RATING



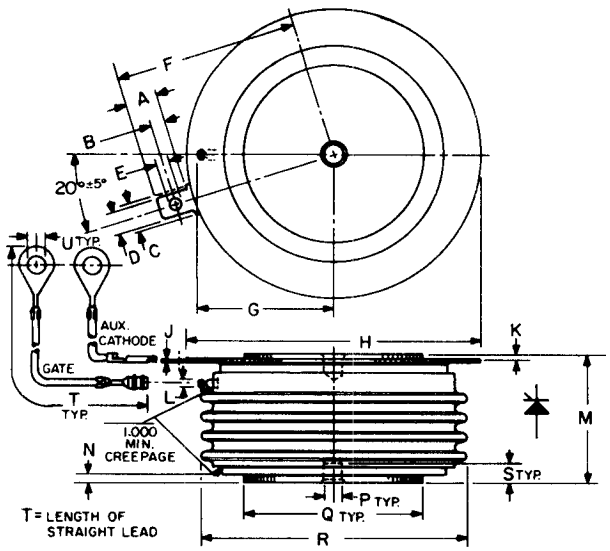
13. TYPICAL RECOVERED CHARGE (125°C)



NOTES:

1. The locus of possible dc trigger points lies outside the boundaries shown at various case temperatures.
2. T_p = rectangular gate current pulse width.
3. 20V – 20 is the minimum gate source load line when rate of circuit current rise > 100 amp/μs. Maximum long term repetitive anode di/dt = 500 amps/μs with 20V – 20Ω gate source.

14. GATE TRIGGER CHARACTERISTICS AND POWER RATINGS



SYM	DECIMAL INCHES MIN.	MAX.	METRIC M.M. MIN.	MAX.
A	.240	.260	6.096	6.604
B	.110	.130	2.794	3.302
C	.245		6.223	
D	.186	.191	4.724	4.851
E	.060	.075	1.524	1.905
F		1.430		36.32
G		1.065		27.051
H	2.200	2.500	55.88	63.50
J	.011	.019	2.794	3.483
K	.030	.130	.762	3.302
L	.056	.060	1.422	1.524
M	1.000	1.065	25.40	27.05
N	.030	.096	.762	2.438
P	.130	.150	3.302	3.810
Q	1.300	1.345	33.02	34.16
R		2.150		54.61
S	.067	.083	1.702	2.11
T	12.200	12.360	309.9	313.9
U	.137	.153	3.480	3.886

OUTLINE DRAWING