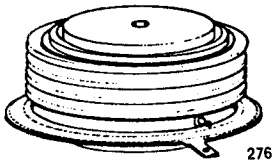

276

INVERTER SCR's
500 TO 700 AMPERES

GE TYPE		C387	C388	C397	C398	C392	C393
CONSTRUCTION		AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE	AMPLIFYING GATE
ELECTRICAL SPECIFICATIONS							
VOLTAGE RANGE		500-1200	500-1200	500-1200	500-1200	100-600	100-600
FORWARD CONDUCTION							
$I_{T(RMS)}$	Max. forward conduction sinusoidal @ T_C = 65°C, 50% duty (A)						
	@ 60 Hz	550	550	700	700	500	500
	@ 600 Hz	530	530	650	650	450	450
	@ 1200 Hz	455	455	550	550	400	400
	@ 2500 Hz	225	225	275	275	210	210
	@ 5000 Hz	120	120	150	150	145	145
I_{TSM}	Max. peak one cycle, non-repetitive surge current (A)	5500	5500	7500	7500	5500	5500
I^2t	Max. I^2t for fusing for 5 to 8.3 msec (A^2 sec)	120,000	120,000	230,000	230,000	100,000	100,000
$R\theta_{JC}$	Max. thermal impedance (°C/W)	.06	.06	.06	.06	.06	.06
$t_d + t_r$	Typical turn-on time (μsec)	2	2	2	2	2	2
t_q	Turn-off time @ rated voltage and T_J V_R = 50 V min. (μsec) @ 20V/μsec reapplied	30	20	40	30	10	15
	@ 100V/μsec reapplied	35	25	50	35	12	18
	@ 200V/μsec reapplied	40	30	60	40	14	20
di/dt	Critical rate-of-rise of on-state current (A/μsec)	500	500	800	800	800	800
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	−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	200	200	200
FIRING							
I_{GT}	Max. required gate current to trigger (mA) @ −40°C	300	300	300	300	400	400
	@ 125°C	125	125	125	125	150	150
V_{GT}	Max. required voltage to trigger (V) @ −40°C	5	5	5	5	5	5
	@ 125°C (Min.)	.15	.15	.15	.15	.15	.15
VOLTAGE TYPES							
Repetitive Peak Forward and Reverse Voltages							
100						C392A	C393A
200						C392B	C393B
300						C392C	C393C
400						C392D	C393D
500		C387E	C388E	C397E	C398E	C392E	C393E
600		C387M	C388M	C397M	C398M	C392M	C393M
700		C387S	C388S	C397S	C398S		
800		C387N	C388N	C397N	C398N		
900		C387T	C388T	C397T	C398T		
1000		C387P	C388P	C397P	C398P		
1100		C387PA	C388PA	C397PA	C398PA		
1200		C387PB	C388PB	C397PB	C398PB		
PACKAGE TYPE		1" PRESS PAK	1" PRESS PAK	1" PRESS PAK	1" PRESS PAK	1" PRESS PAK	1" PRESS PAK
PACKAGE OUTLINE NO.		276	276	276	276	276	276

HIGH SPEED

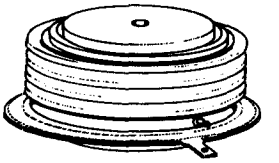
Silicon Controlled Rectifier

1200 Volts, 650 A RMS

C397/C398

AMPLIFYING GATE

The General Electric C397 and C398 Silicon Controlled Rectifiers are designed for power switching at high frequencies. These are all-diffused Press-Pak devices employing the field-proven amplifying gate.

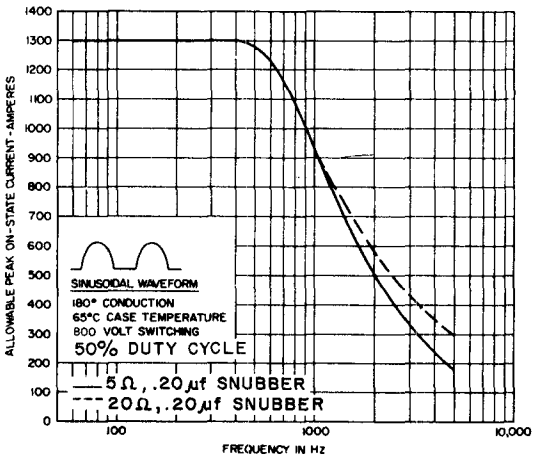


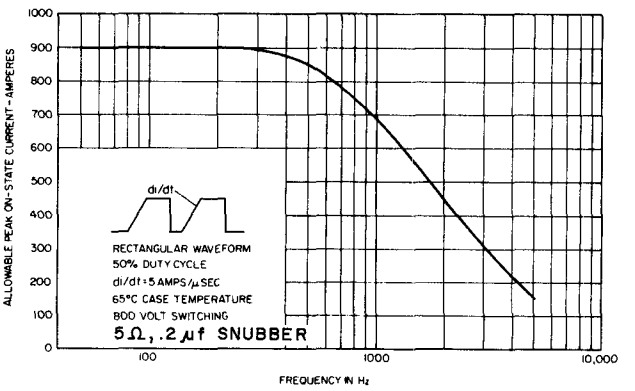
FEATURES:

- Fully characterized for operation in inverter and chopper applications.
- High di/dt ratings.
- High dv/dt capability with selections available.
- Rugged hermetic glazed ceramic package having 1″ creepage path.

IMPORTANT: Mounting instructions on the mounting clamp specifications at back of this sheet **must** be followed.

HIGH FREQUENCY CURRENT RATINGS





Equipment designers can use the C397/C398 SCR's in demanding applications, such as:

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

FOR SINEWAVE OPERATION

Like the Type C140/141, C158/159 and C358 SCR's, the C397/C398 SCR is rated for:

- Peak Current

vs.

- Pulse Width
- Frequency
- Case Temperature

FOR RECTANGULAR WAVE OPERATION

GE now introduces a new, high-frequency rating for the C397/398 SCR, which is:

- Peak Current

vs.

- di/dt of Leading Edge
- Frequency
- Duty Cycle
- 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
C397/C398E	500 Volts	500 Volts	600 Volts
C397/C398M	600	600	720
C397/C398S	700	700	840
C397/C398N	800	800	960
C397/C398T	900	900	1080
C397/C398P	1000	1000	1200
C397/C398PA	1100	1100	1300
C397/C398PB	1200	1200	1400

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

Peak One Cycle Surge (Non-Repetitive) On-State Current, I_{TSM} . . . . . 7500 Amperes
I^2t (for fusing) for times ⩾ 1.5 milliseconds . . . . . 95,000 (RMS Ampere)^2 Seconds
I^2t (for fusing) for times ⩾ 8.3 milliseconds . . . . . 230,000 (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 Required . . . . . 2000 Lb. ± 10%
8.9 KN ± 10%

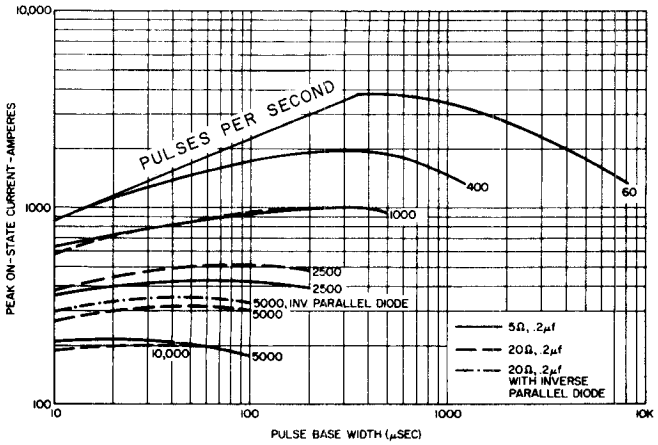
†di/dt ratings established in accordance with EIA-NEMA Standard RS-397, Section 5.2.2.6 for conditions of max. rated V_{DRM}; 20 volts, 20 ohms gate trigger source with 0.5 μs short circuit current rise time.

CHARACTERISTICS

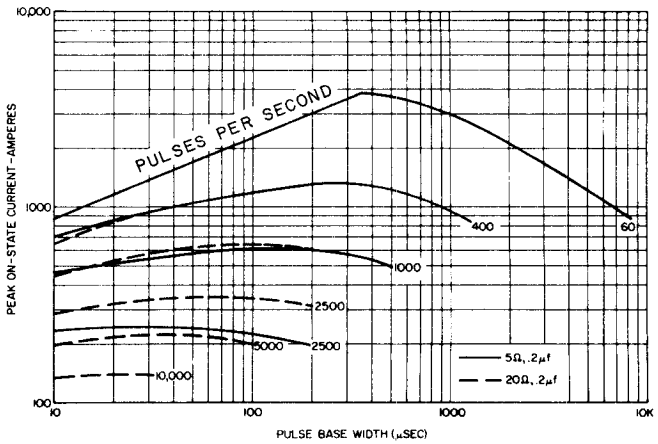
TEST	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITION
Repetitive Peak Reverse and Off-State Current	I_{RRM} and I_{DRM}	–	5	20	mA	T_J = +25°C V = V_{DRM} = V_{RRM}
Repetitive Peak Reverse and Off-State Current	I_{RRM} and I_{DRM}	–	20	45	mA	T_J = 125°C V = V_{DRM} = V_{RRM}
Thermal Resistance	$R_{\theta JC}$	–	.05	.06	°C/Watt	Junction-to-Case (DC) (Double-Side Cooled)
Critical Rate-of-Rise of Off-State Voltage (Higher values may cause device switching)	dv/dt	200	500	–	V/μsec	T_J = 125°C, Gate Open. V_{DRM} = Rated, Linear or Exponential Rising Waveform. Exponential dv/dt = $\frac{V_{DRM}}{\tau}$ (.632)
Higher minimum dv/dt selections available – consult factory.						
DC Gate Trigger Current	I_{GT}	–	50	150	mAdc	T_C = +25°C, V_D = 6 Vdc, R_L = 3 Ohms
		–	75	300		T_C = -40°C, V_D = 6 Vdc, R_L = 3 Ohms
		–	15	125		T_C = +125°C, V_D = 6 Vdc, R_L = 3 Ohms
DC Gate Trigger Voltage	V_{GT}	–	3	5	Vdc	T_C = -40°C to 25°C, V_D = 6 Vdc, R_L = 3 Ohms
		–	1.25	3.0		T_C = 25°C to +125°C, V_D = 6 Vdc, R_L = 3 Ohms
		0.15	–	–		T_C = 125°C, V_{DRM}, R_L = 1000 Ohms
Peak On-State Voltage	V_{TM}	–	2.7	3.0	Volts	T_C = +25°C, I_{TM} = 3000 Amps Peak. Duty Cycle ≤ .01%. Pulse Width = 1 ms.
Turn-On Delay Time	t_d	–	0.5	–	μsec	T_C = +25°C, I_{TM} = 50 Adc, V_{DRM}. Gate Supply: 20 volt open circuit, 20 ohms, 0.1 μsec max. rise time. ††, †††
Conventional Circuit Commutated Turn-Off Time (with Reverse Voltage)	t_q				μsec	(1) T_C = +125°C (2) I_{TM} = 500 Amps. (3) V_R = 50 Volts Min. (4) V_{DRM} (Reapplied) (5) Rate-of-rise of reapplied off-state voltage = 20 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
C398		–	20	†		
C397		–	35	†		
C398		–	30	40		(1) T_C = +125°C (2) I_{TM} = 500 Amps. (3) V_R = 50 Volts Min. (4) V_{DRM} (Reapplied) (5) Rate-of-rise of reapplied off-state voltage = 200 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
C397		–	45	60		
Conventional Circuit Commutated Turn-Off Time (with Feedback Diode)	$t_{q(diode)}$				μsec	(1) T_C = +125°C (2) I_{TM} = 500 Amps (3) V_R = 1 Volt (4) V_{DRM} (Reapplied) (5) Rate-of-rise of reapplied off-state voltage = 200 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
C398		–	40	†		
C397		–	60	†		

†Consult factory for specified maximum turn-off time.
††Delay time may increase significantly as the gate drive approaches the I_{GT} of the Device Under Test.
†††Current risetime as measured with a current probe, or voltage risetime across a non-inductive resistor.

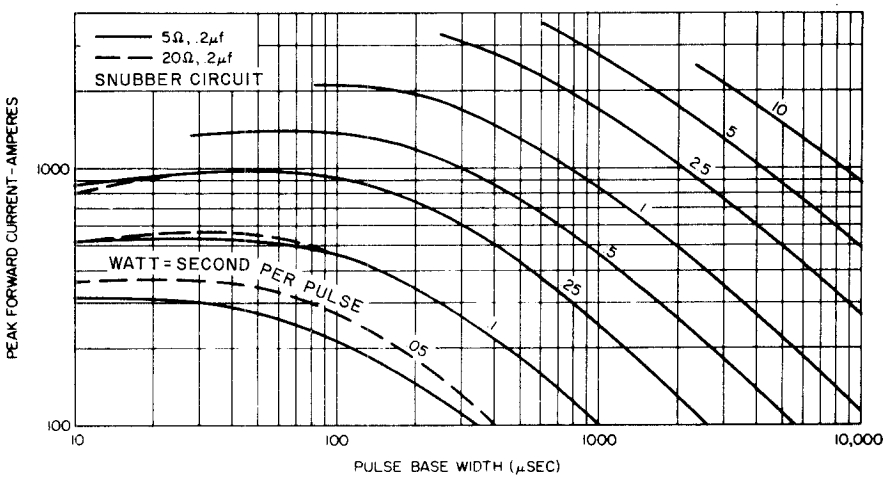
SINE WAVE CURRENT RATING DATA



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

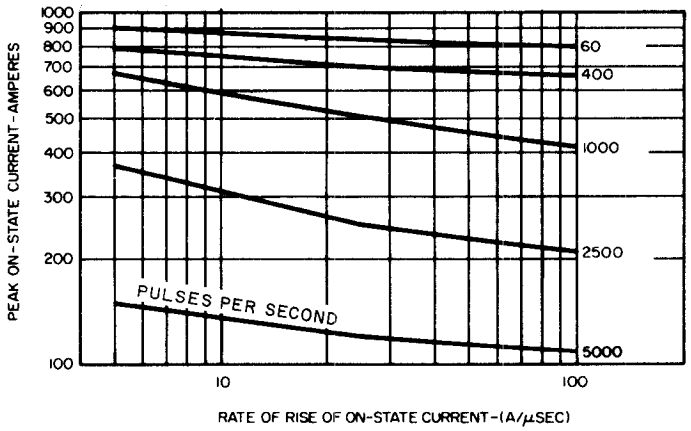
NOTES:

(Pertaining to Sine and Rectangular or Wave Current Ratings)

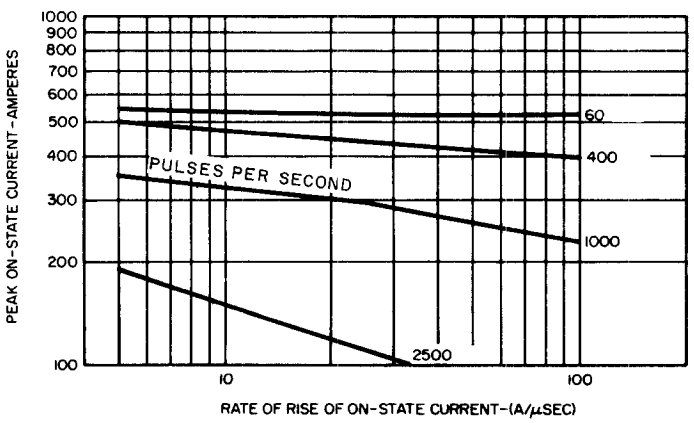
1. Switching voltage $\leqslant$ 800 volts.
2. Reverse voltage applied = $V_R \leqslant$ 800 V.
3. Max. energy dissipated during reverse recovery is 15% of total W-S/P shown or 0.03 W-S/P whichever is least for operation with inverse diode.
4. Required gate drive:
   20 volts, 65 ohms, 1 μsec risetime for less than 100 amps/μsec
   20 volts, 20 ohms, 5 μsec risetime for greater than 100 amps/μsec.
5. RC Snubber ckt. = .2 μf, 5Ω
6. Double-Side Cooled.
7. Values of W-S/P are for T_J = 125°C.

RECTANGULAR WAVE CURRENT RATING DATA

DUTY CYCLE – 50%

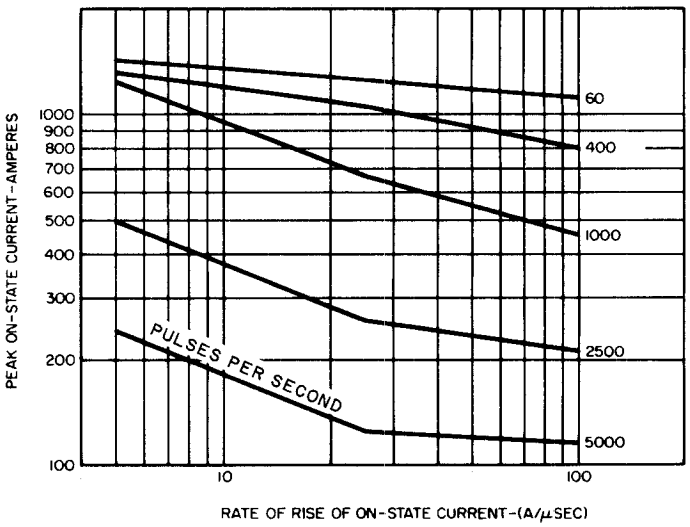


4. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS di/dt (T_C = 65°C)

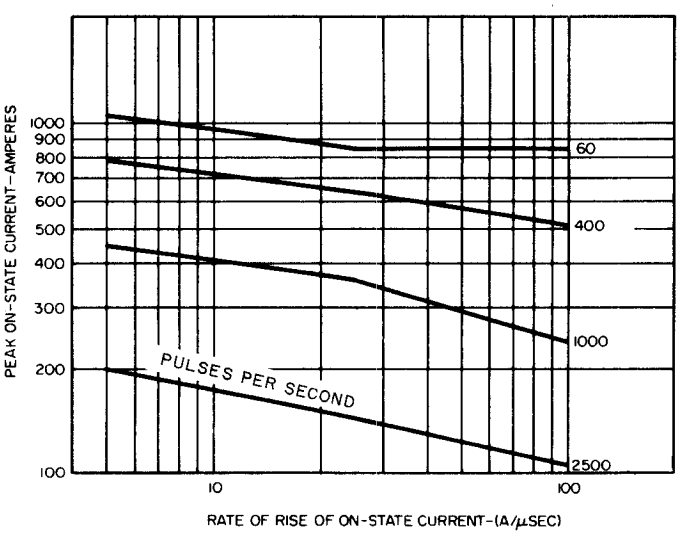


5. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt (T_C = 90°C)

DUTY CYCLE – 25%



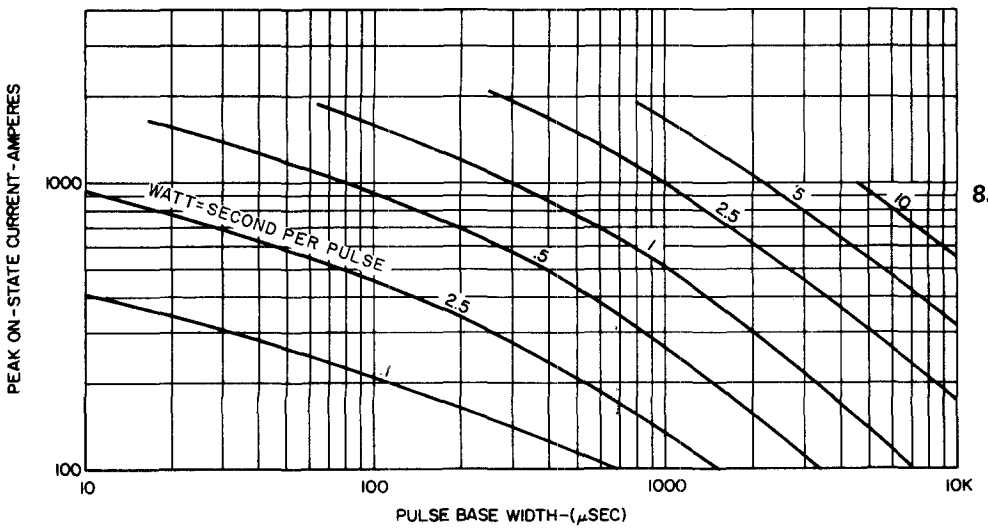
6. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt (T_C = 65°C)



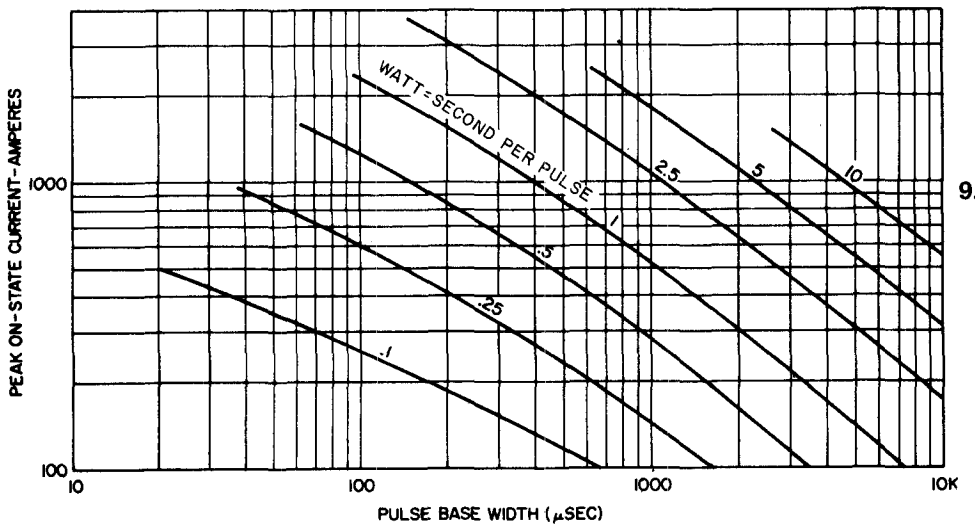
7. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt (T_C = 90°C)

NOTES: (SEE SINE WAVE DATA)

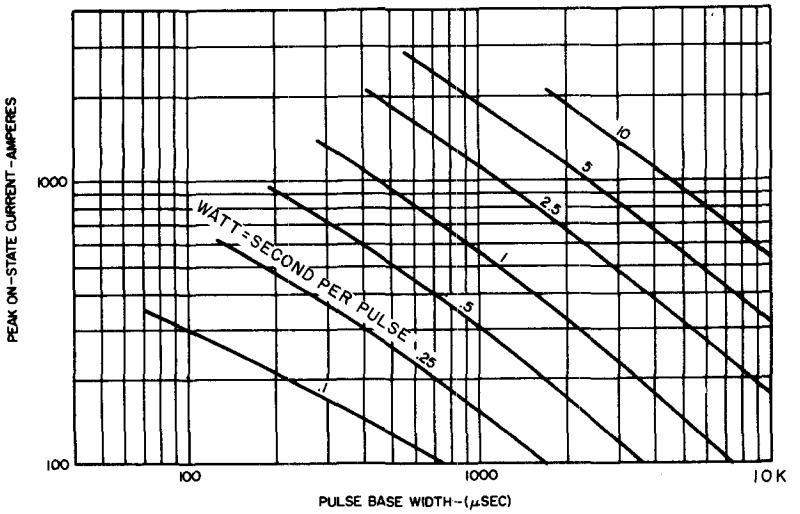
WATT–SECOND PER PULSE



8. ENERGY PER PULSE VS. PEAK CURRENT AND PULSE WIDTH (di/dt = 100 A/μsec)

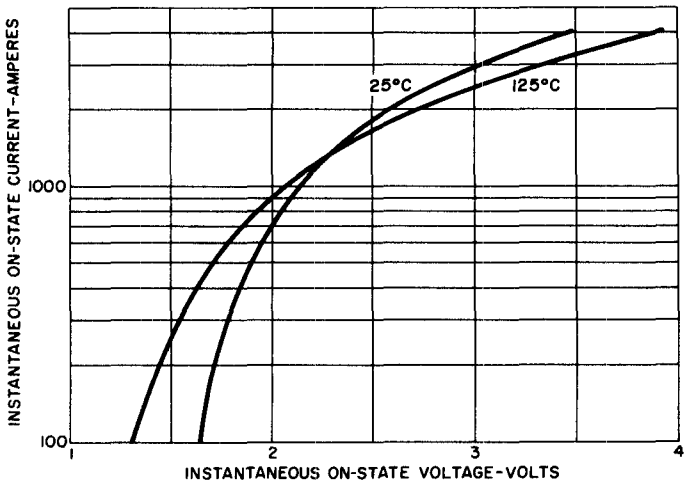


9. ENERGY PER PULSE VS. PEAK CURRENT AND PULSE WIDTH (di/dt = 25 A/μsec)

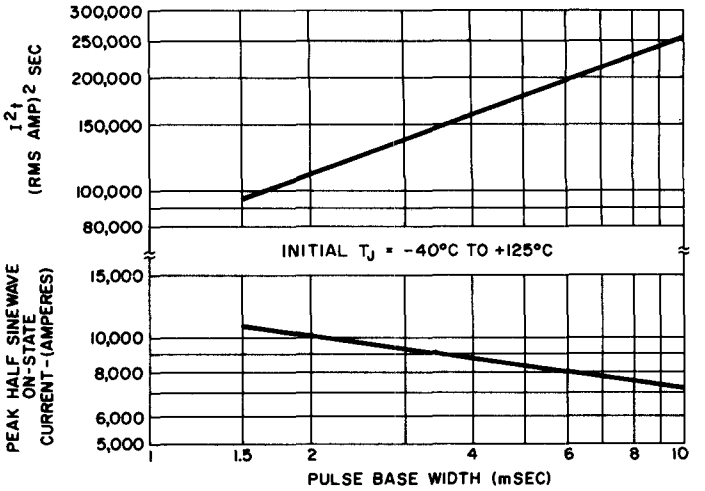


10. ENERGY PER PULSE VS. PEAK CURRENT AND PULSE WIDTH (di/dt = 5 A/μsec)

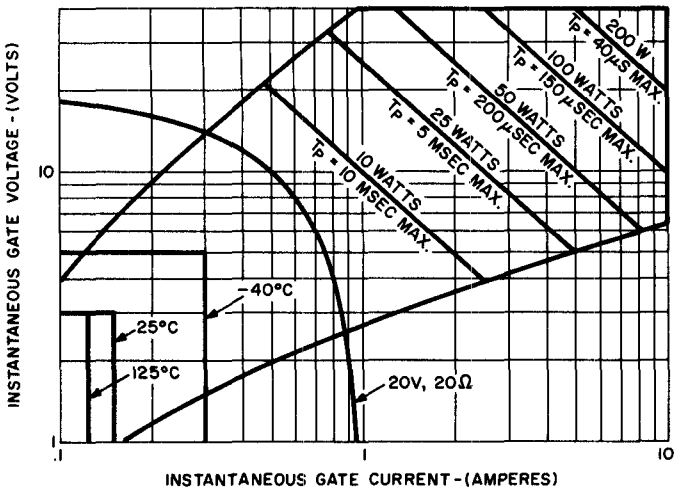
NOTES: (SEE SINE WAVE DATA)



11. MAXIMUM ON-STATE CHARACTERISTICS



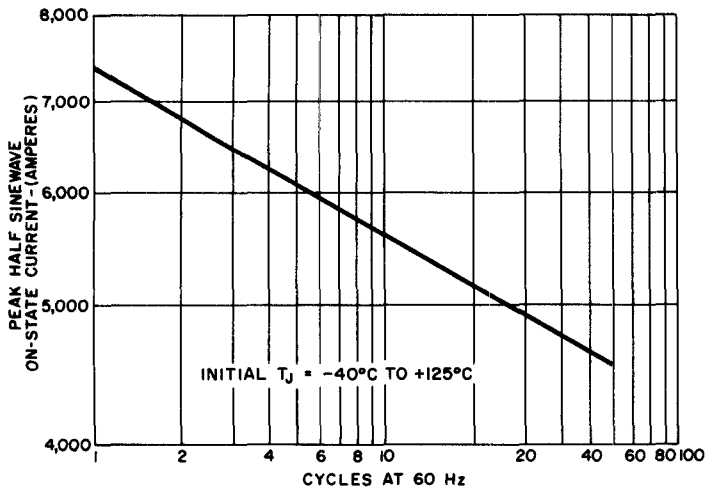
14. SUB-CYCLE SURGE (NON-REPETITIVE) ON-STATE CURRENT AND I^2t RATING



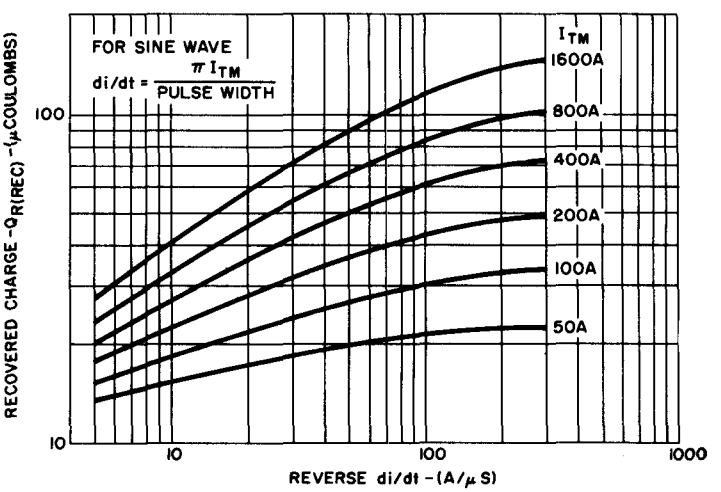
12. GATE TRIGGER CHARACTERISTICS AND POWER RATINGS

NOTES:

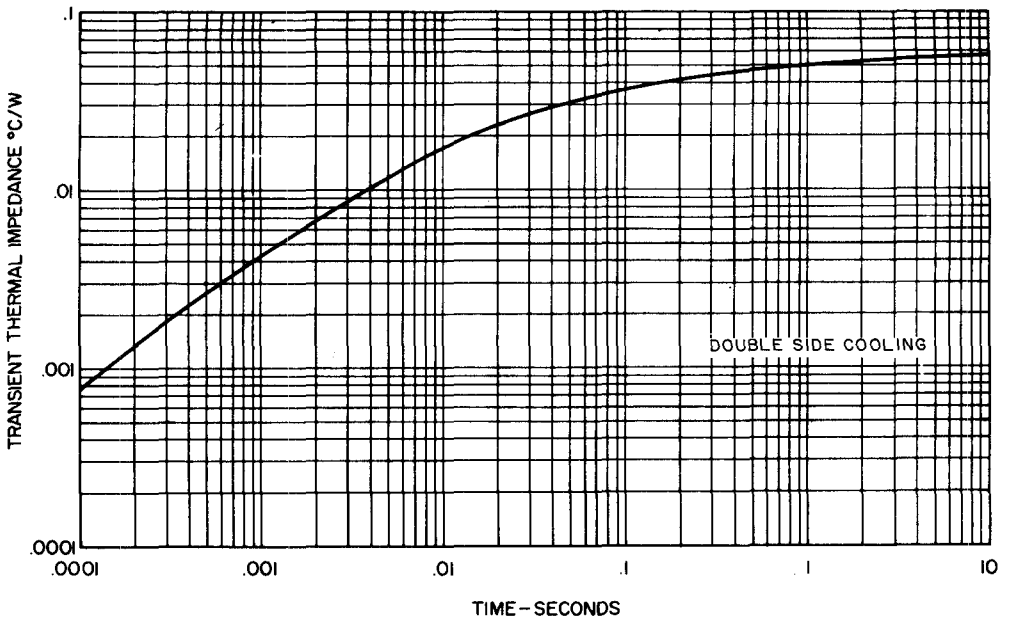
1. The locus of possible dc trigger points lies outside the boundaries shown at various case temperatures.
2. 20V – 20 is the minimum gate source load line when rate of circuit current rise $>$ 100 amp/μs or anode rate of current rise $>$ 200 amps/μs (Tp = 5 μs min., 0.5 μs max. rise time.)
   Maximum long term repetitive anode di/dt = 500 amps/μs with 20V – 20Ω gate source.



13. SURGE (NON-REPETITIVE) ON-STATE CURRENT

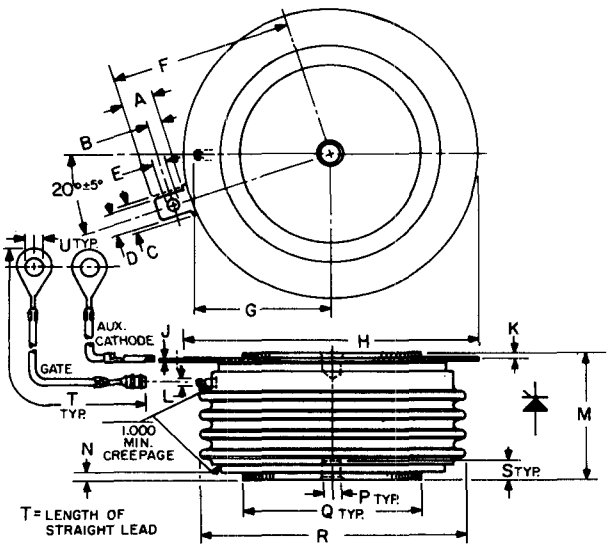


15. TYPICAL RECOVERED CHARGE (125°C) SINEWAVE CURRENT WAVEFORM



16. TRANSIENT THERMAL IMPEDANCE – JUNCTION-TO-CASE

OUTLINE DRAWING



SYM	DECIMAL INCHES MIN.	DECIMAL INCHES MAX.	METRIC M.M. MIN.	METRIC M.M. 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		27.061
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	1.70	2.11
T	12.200	12.360	309.9	313.9
U	.137	.153	3.480	3.886