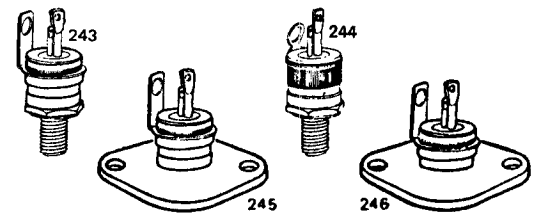


PHASE CONTROL SCR's 7.4 TO 25 AMPERES



GE TYPE	C10	C11	C15	C116	C122-3*	C220-2	C126	C36	C37
JEDEC	2N1770A-77A	2N1770-78	—	—	—	—	—	2N1842-50	—
ELECTRICAL SPECIFICATIONS									
VOLTAGE RANGE	25-400	25-600	25-800	50-600	25-600	25-600	25-600	25-600	25-900
FORWARD CONDUCTION									
$I_{T(RMS)}$ Max. RMS on-state current (A)	7.4	7.4	8	8	8	10	12	16	25
$I_{T(AV)}$ Max. average on-state current @ 180° conduction (A) @ T_C (°C)	4.7 @ 105°C	4.7 @ 105°C	5.1 @ 50°C	5.1 @ 40°C	5.2 @ 78°C	6.3 @ 68°C	7.8 @ 78°C	10.0 @ 35°C	16.0 @ 35°C
I_{TSM} Max. peak one cycle, non-repetitive surge current (A)	60	60	60	90	80	90	120	125	125
I^2t Max. I^2t for fusing for > 1.5 msec (A^2 sec)	.5	.5	—	27	27	27	—	—	40
V_{TM} Max. peak on-state voltage @ 25°C, 180° conduction, rated $I_{T(AV)}$ (V)	1.8	1.8	1.85	1.57	2.2	2.0	1.82	2.9	2.25
$R_{\theta JC}$ Max. internal thermal resistance, dc, junction-to-case (°C/W)	3.1	3.1	3.1	8.0	2.0	—	1.8	2.5	1.0
I_H Max. holding current @ 25°C (mA)	25	—	30	30	30	30	30	20	10
t_q Typical turn-off time (μsec) @ 100°C	—	—	—	50	—	—	—	50	—
① 125°C	40	40	—	—	—	—	—	—	—
$t_d + t_r$ Typical turn-on time (μsec)	1.0	1.0	1.0	—	—	2.5	—	3	3
di/dt Max. rate-of-rise turned-on current (A/μsec)	60	40	40	30	100	100	100	20	20
T_J Junction operating temperature range (°C)	—65 to 150	—65 to 125	—65 to 105	—40 to 110	—40 to 100	—40 to 100	—40 to 110	—40 to 100	—40 to 105
BLOCKING									
dv/dt Typical critical rate-of-rise of off-state voltage. Exponential @ max. rated T_J (V/μsec)	20	50	50	50	50	50	50	100	100
FIRING									
I_{GT} Max. required gate current to trigger (mA) @ —65°C	30	30	50	—	—	—	—	—	—
① —40°C	—	—	—	40	40	40	40	150	150
① 25°C	15	15	35	25	25	25	25	80	80
V_{GT} Max. required gate voltage to trigger (V) @ —65°C	2	2	2.5	—	—	—	—	—	—
① —40°C	—	—	—	2.0	2.0	2.0	2.0	3.5	3.5
① 25°C	1.35	1.35	—	1.5	1.5	1.5	1.5	—	—
V_{GT} Min. required gate voltage to trigger (V) @ 100°C	—	—	0.3	—	0.2	0.2	—	0.3	0.25
① 110°C	—	—	—	0.2	—	—	0.2	—	—
① 125°C	—	0.3	—	—	—	—	—	—	—
① 150°C	0.2	—	—	—	—	—	—	—	—
VOLTAGE TYPES									
Repetitive Peak Forward and Reverse Voltages									
25	2N1770A C10U	2N1770 C11U	C15U	—	—	C220U C222U	—	2N1842 C36U	C37U
50	2N1771A C10F	2N1771 C11F	C15F	C116F1	C122F C123F	C220F C222F	C126F	2N1843 C36F	C37F
100	2N1772A C10A	2N1772 C11A	C15A	C116A1	C122A C123A	C220A C222A	C126A	2N1844 C36A	C17A
150	2N1773A C10G	2N1773 C11G	C15G	—	—	—	—	2N1845 C36G	—
200	2N1774A C10B	2N1774 C11B	C15B	C116B1	C122B C123B	C220B C222B	C126B	2N1846 C36B	C37B
250	2N1775A C10H	2N1775 C11H	C15H	—	—	—	—	2N1847 C36H	—
300	2N1776A C10C	2N1776 C11C	C15C	C116C1	C122C C123C	C220C C222C	C126C	2N1848 C36C	C37C
400	2N1777A C10D	2N1777 C11D	C15D	C116D1	C122D C123D	C220D C222D	C126D	2N1849 C36D	C37D
500	—	2N1778 C11E	C15E	C116E1	C122E C123E	C220E C222E	C126E	2N1850 C36E	C37E
600	—	2N2619 C11M	C15M	C116M1	C122M C123M	C220M C222M	C126M	C36M	C37M
700	—	—	—	—	—	—	—	C26S	C37S
800	—	—	—	—	—	—	—	C26N	C37N
PACKAGE OUTLINE NO.	104	104	104	173	230.2 (C122) 230.1 (C123)	241 (C222) 242, 3, 4, 5 & 6 (C220)	230.2	107	107

*C123 isolated version of C122.

SCR

C10 SERIES

2N1770A-2N1777A

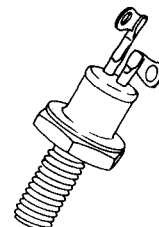
The General Electric C10 Series (2N1770A-2N1777A) Silicon Controlled Rectifier is a reverse blocking triode thyristor semiconductor for use in low power switching and phase control applications requiring blocking voltages up to 400 volts, and RMS load currents up to 7.4 amperes.

This series device is designed to meet MIL-S-19500/168 , and has full blocking voltage ratings from -65°C to $+150^{\circ}\text{C}$.

The following G. E. Co., low-current SCR types are also available in the same package outline:

C11 (2N1770-2N1778, 2N2619) (Pub. #150.21)— $T_J = 125^{\circ}\text{C}$, up to 600V PRV

C15 (Pub. #150.22)— $T_J = 105^{\circ}\text{C}$, up to 600V PRV



MAXIMUM ALLOWABLE RATINGS

TYPE	PEAK FORWARD BLOCKING VOLTAGE, V_{FOM} $T_C = -65^{\circ}\text{C to } +150^{\circ}\text{C}$	REPETITIVE PEAK REVERSE VOLTAGE, V_{ROM} (rep) ⁽¹⁾ $T_C = -65^{\circ}\text{C to } +150^{\circ}\text{C}$	NON-REPETITIVE PEAK REVERSE VOLTAGE (<5.0 MILLISEC.), V_{RSM} (non-rep) ⁽¹⁾ $T_C = -65^{\circ}\text{C to } +150^{\circ}\text{C}$
C10U (2N1770A)	25 Volts*	25 Volts*	35 Volts*
C10F (2N1771A)	50 Volts*	50 Volts*	75 Volts*
C10A (2N1772A)	100 Volts*	100 Volts*	150 Volts*
C10G (2N1773A)	150 Volts*	150 Volts*	225 Volts*
C10B (2N1774A)	200 Volts*	200 Volts*	300 Volts*
C10H (2N1775A)	250 Volts*	250 Volts*	350 Volts*
C10C (2N1776A)	300 Volts*	300 Volts*	400 Volts*
C10D (2N1777A)	400 volts*	400 Volts*	500 Volts*

⁽¹⁾ Values apply for zero or negative gate voltage only. Maximum case to ambient thermal resistance for which maximum V_{FOM} and V_{ROM} ratings apply = 18°C per watt.

Peak Forward Voltage, PFV _____ 480 volts
 RMS Forward Current, On-State _____ 7.4 amperes (all conduction angles)
 Average Forward Current, On-State, Half Sine Wave, I_O _____ 4.7 amperes at $T_C = 105^{\circ}\text{C}$ *
 Average Forward Current, On-State _____ Depends on conduction angle (see Chart 3, 5 and 7)
 Peak One-cycle Surge Forward Current, I_{FM} (surge) _____ 60 amperes*
 I^2t (for fusing) _____ Calculate from Chart 9
 Turn-On Current Limit _____ See Chart 10
 Peak Gate Power Dissipation, P_{GM} _____ 5 watts*
 Average Gate Power Dissipation, $P_{G(AV)}$ _____ 0.5 watts*
 ** Peak Gate Current, I_{GFM} _____ 2 amperes*
 ** Peak Gate Voltage, Forward and Reverse, V_{GFM} and V_{GRM} _____ 10 volts*
 Storage Temperature, T_{stg} _____ $-65^{\circ}\text{C to } +150^{\circ}\text{C}$ *
 Operating Temperature, T_J _____ $-65^{\circ}\text{C to } +150^{\circ}\text{C}$ *
 Stud Torque _____ 15 lb-in (17 kg-cm)

*Indicates data included on JEDEC type number registration.

**NOT TO EXCEED GATE POWER RATINGS

C10 SERIES

CHARACTERISTICS

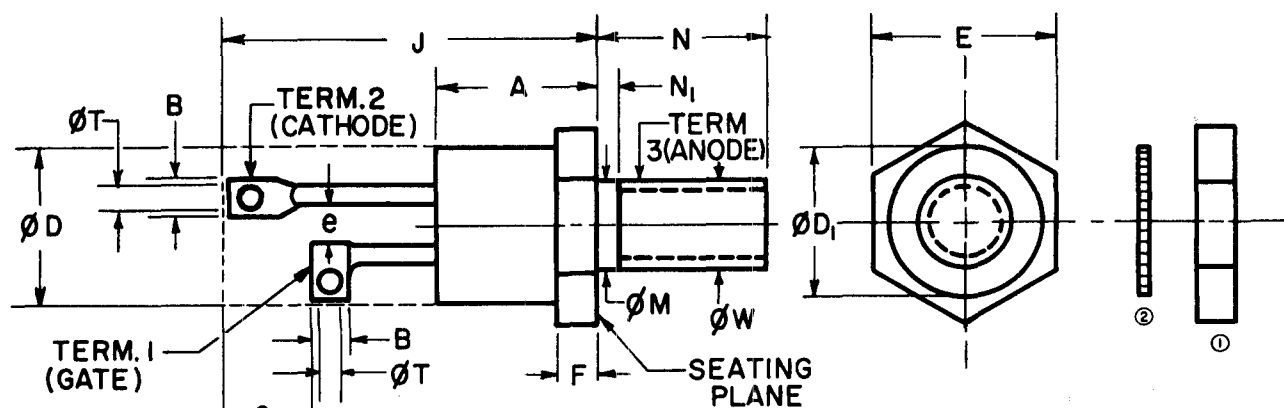
TEST	SYMBOL	MIN.	MAX.	UNITS	TEST CONDITIONS
PEAK REVERSE OR FORWARD BLOCKING CURRENT† C10U (2N1770A) C10F (2N1771A) C10A (2N1772A) C10G (2N1773A) C10B (2N1774A) C10H (2N1775A) C10C (2N1776A) C10D (2N1777A)	I_{ROM} or I_{FOM}	—	9.0 9.0 9.0 8.0 6.0 5.0 4.0 2.0	mA	$T_C = -65^{\circ}\text{C to } +150^{\circ}\text{C}$ $V_{ROM} = V_{FOM} = 25\text{V Peak}$ $V_{ROM} = V_{FOM} = 50\text{V Peak}$ $V_{ROM} = V_{FOM} = 100\text{V Peak}$ $V_{ROM} = V_{FOM} = 150\text{V Peak}$ $V_{ROM} = V_{FOM} = 200\text{V Peak}$ $V_{ROM} = V_{FOM} = 250\text{V Peak}$ $V_{ROM} = V_{FOM} = 300\text{V Peak}$ $V_{ROM} = V_{FOM} = 400\text{V Peak}$
FULL CYCLE AVG. REVERSE OR FORWARD BLOCKING CURRENT† C10U (2N1770A) C10F (2N1771A) C10A (2N1772A) C10G (2N1773A) C10B (2N1774A) C10H (2N1775A) C10C (2N1776A) C10D (2N1777A)	$I_{RX (AV)}$ or $I_{FX (AV)}$	—	4.5* 4.5* 4.5* 4.0* 3.0* 2.5* 2.0* 1.0*	mA	$T_C = +105^{\circ}\text{C}, I_O = 4.7\text{A}$ 180° Conduction Angle $V_{RXM} = V_{FXM} = 25\text{V Peak}$ $V_{RXM} = V_{FXM} = 50\text{V Peak}$ $V_{RXM} = V_{FXM} = 100\text{V Peak}$ $V_{RXM} = V_{FXM} = 150\text{V Peak}$ $V_{RXM} = V_{FXM} = 200\text{V Peak}$ $V_{RXM} = V_{FXM} = 250\text{V Peak}$ $V_{RXM} = V_{FXM} = 300\text{V Peak}$ $V_{RXM} = V_{FXM} = 400\text{V Peak}$
GATE TRIGGER CURRENT	I_{GT}	—	15 30*	mAdc mAdc	$T_C = +25^{\circ}\text{C}, V_{FX} = 12\text{Vdc}, R_L = 250\text{ ohms}$ $T_C = -65^{\circ}\text{C}, V_{FX} = 12\text{Vdc}, R_L = 250\text{ ohms}$
GATE TRIGGER VOLTAGE	V_{GT}	—	2.0* 0.2*	Vdc Vdc	$T_C = -65^{\circ}\text{C to } +150^{\circ}\text{C}, V_{FX} = 12\text{Vdc}, R_L = 250\text{ ohms}$ $T_C = +150^{\circ}\text{C}, V_{FXM} = \text{Rated } V_{FOM}, R_L = 250\text{ ohms}$
PEAK ON-VOLTAGE	V_{FM}	—	1.85	V	$T_C = +25^{\circ}\text{C}, I_{FM} = 15\text{A Peak}, 1\text{ millisecond wide pulse. Duty cycle } \leq 1\%$
HOLDING CURRENT	I_{HO}	—	25	mAdc	$T_C = +25^{\circ}\text{C}, \text{Anode supply} = 24\text{Vdc}, \text{Gate Supply} = 7\text{V}, 20\text{ ohms. Initial forward current pulse} = 0.5\text{A}, 0.1\text{ millisecond to } 10\text{ milliseconds wide.}$
EFFECTIVE THERMAL RESISTANCE (DC)	θ_{J-C}	—	3.1	$^{\circ}\text{C/watt}$	Junction to case.

†Values apply for zero or negative gate voltage only. Maximum case to ambient thermal resistance for which maximum V_{FOM} and V_{ROM} ratings apply equals 18°C/watt .

*Indicates data included on JEDEC type number registration.

OUTLINE DRAWING

(Complies with JEDEC registered TO-64 outline)

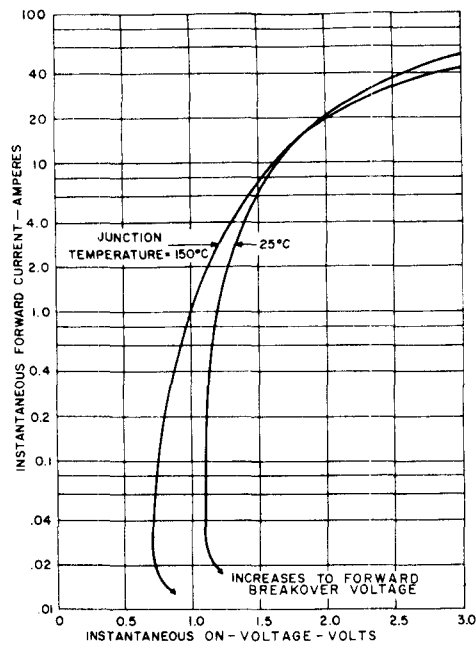


NOTES:

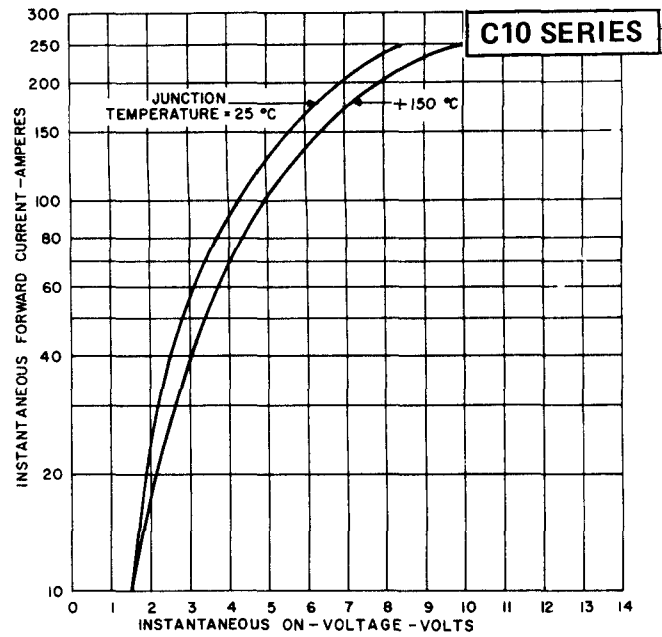
- (1) Contour and orientation of fixed terminal lugs are optional.
- (2) The outline contour (with exception of hexagon) is optional within zone defined by ϕD and J .
- (3) Minimum diameter of seating plane.
- (4) A chamfer (or undercut) on one or both ends of hexagonal portion is optional.
- (5) Minimum difference in terminal lengths to establish datum line for numbering terminals.
- (6) Pitch diameter—thread 10-32 NF-2A (Coated). Reference (Screw Thread Standards for Federal Services 1957) Handbook 1957 H28.
- (7) Minimum spacing between terminals.
- (8) Insulating kit available upon request.

- (1) 10-32 STEEL NUT
CADMIUM PLATED
- (2) LOCKWASHER,
CADMIUM PLATED
STEEL

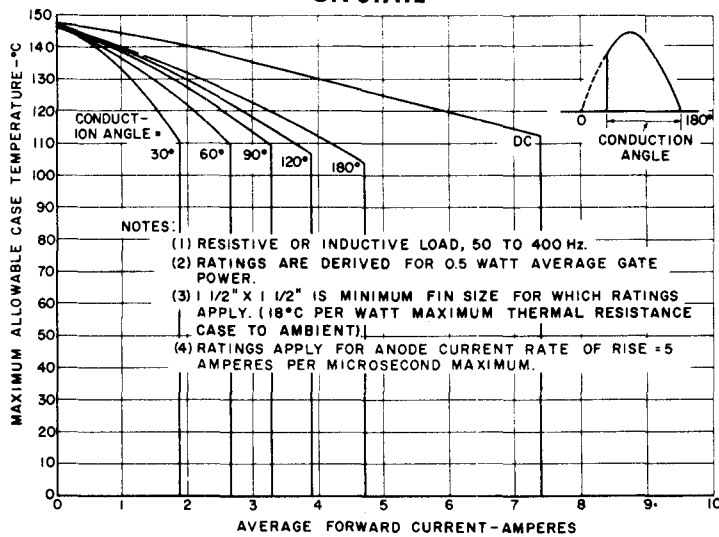
SYMBOL	INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.	NOTES
A	.300	.400	7.62	10.16	
B	.080	.136	2.03	3.45	1
ϕD		.424		10.77	2
ϕD_1	.400		10.16		3, 4
E	.424	.437	10.77	11.10	
e	.013		.330		7
e_1	.060		1.52		5
F	.060	.175	1.52	4.45	4
J	.700	.855	17.78	21.72	2
ϕM	.163	.189	4.14	4.80	
N	.400	.453	10.16	11.51	
N_1		.078		1.98	
ϕT	.040	.075	1.02	1.91	
ϕW	.1658	.1697	4.212	4.310	6



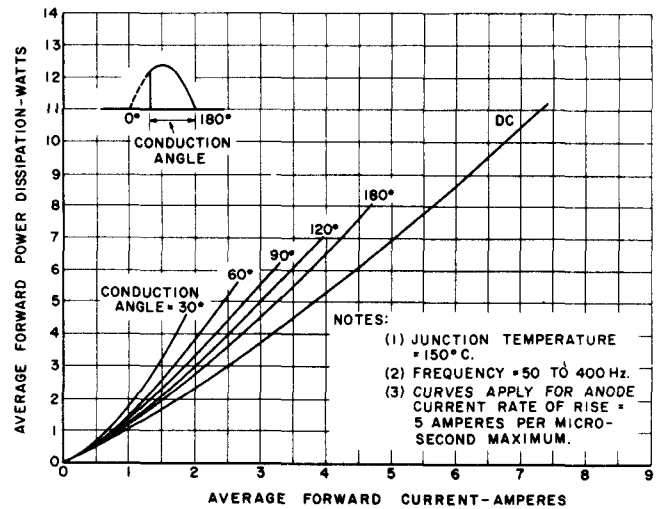
1 MAXIMUM FORWARD CHARACTERISTICS—ON-STATE



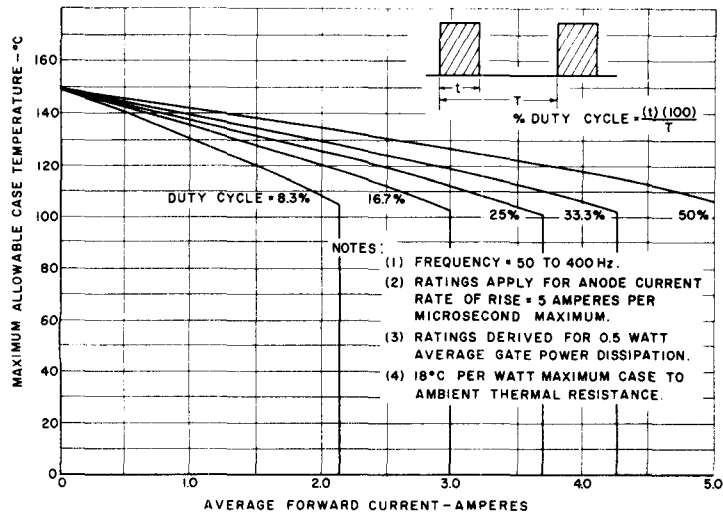
2 MAXIMUM FORWARD CHARACTERISTICS, HIGH CURRENT LEVEL—ON-STATE



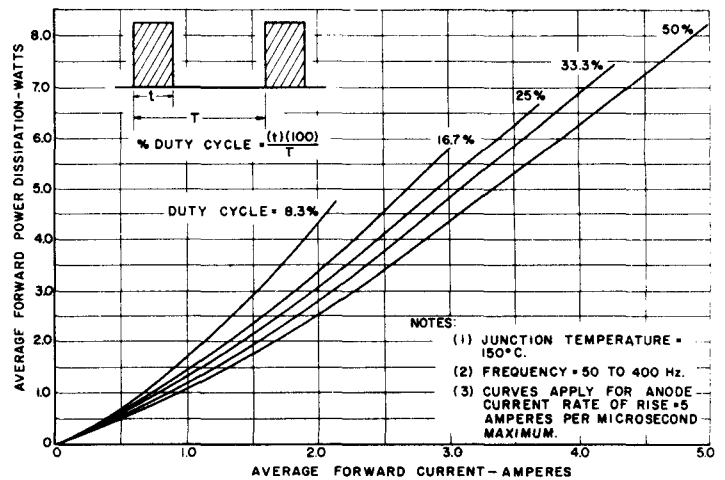
3 MAXIMUM ALLOWABLE CASE TEMPERATURE FOR HALF WAVE RECTIFIED SINE WAVE OF CURRENT



4 FORWARD POWER DISSIPATION FOR HALF WAVE RECTIFIED SINE WAVE OF CURRENT



5 MAXIMUM ALLOWABLE CASE TEMPERATURE FOR RECTANGULAR CURRENT WAVEFORM

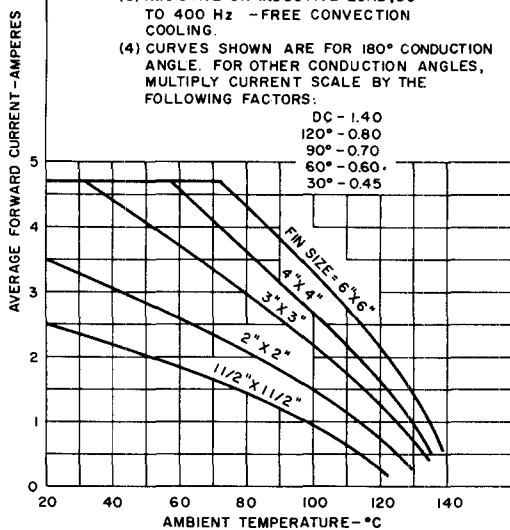


6 FORWARD POWER DISSIPATION FOR RECTANGULAR CURRENT WAVEFORM

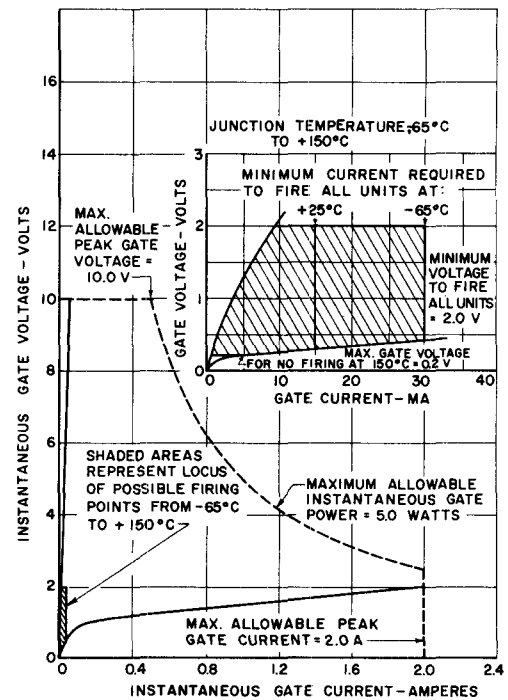
C10 SERIES

- NOTES: (1) SUGGESTED COOLING FIN DESIGNS. FINAL DESIGN SHOULD BE CHECKED TO ASSURE THAT STUD TEMPERATURE DOES NOT EXCEED VALUE SPECIFIED IN CHART 3
(2) ALL FINS 1/16" THICK COPPER-FINS PAINTED-STUD MOUNTED DIRECTLY TO FIN-MINIMUM FIN SPACING 1 INCH.
(3) RESISTIVE OR INDUCTIVE LOAD, 50 TO 400 Hz - FREE CONVECTION COOLING.
(4) CURVES SHOWN ARE FOR 180° CONDUCTION ANGLE. FOR OTHER CONDUCTION ANGLES, MULTIPLY CURRENT SCALE BY THE FOLLOWING FACTORS:

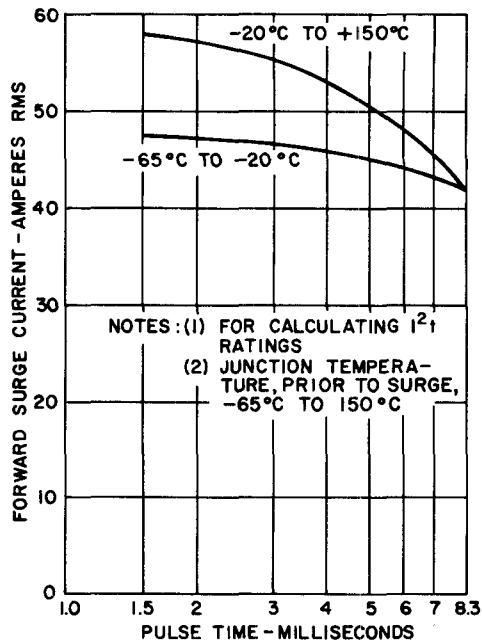
DC - 1.40
120° - 0.80
90° - 0.70
60° - 0.60
30° - 0.45



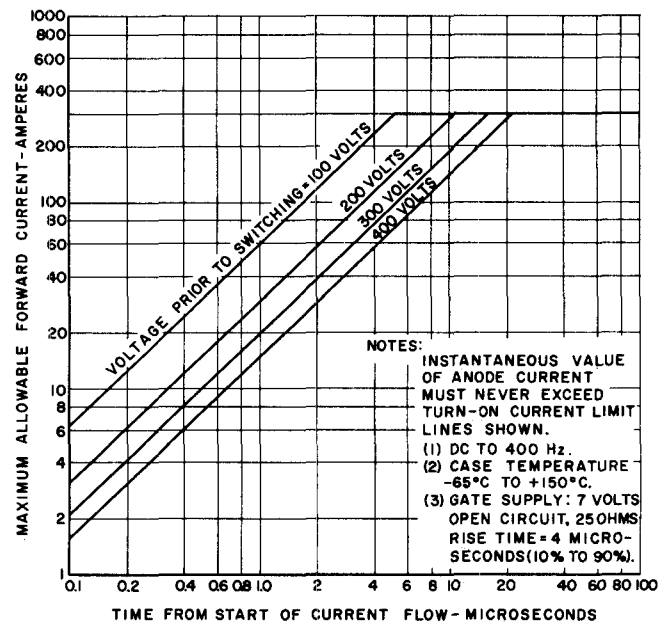
7 MAXIMUM FORWARD CURRENT VS. AMBIENT TEMPERATURE FOR VARIOUS FIN SIZES



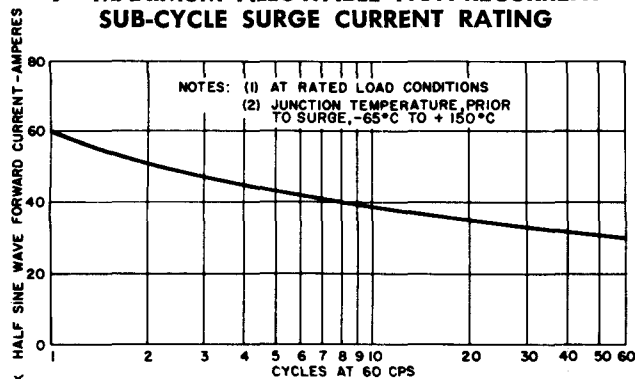
8 TRIGGERING CHARACTERISTICS



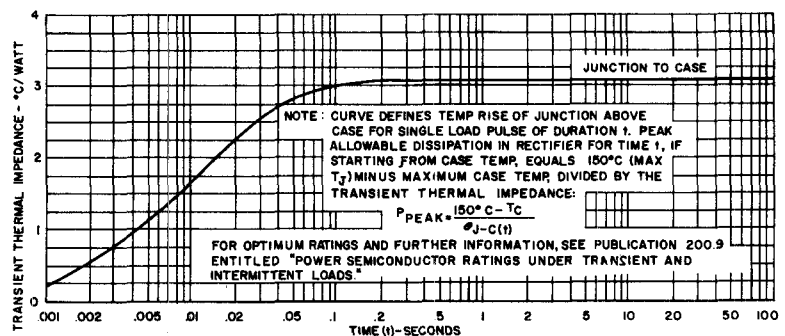
9 MAXIMUM ALLOWABLE NON-RECURRENT SUB-CYCLE SURGE CURRENT RATING



10 TURN-ON CURRENT LIMIT



11 MAXIMUM ALLOWABLE NON-RECURRENT PEAK SURGE FORWARD CURRENT



12 MAXIMUM TRANSIENT THERMAL IMPEDANCE