

HIGH SPEED Silicon Controlled Rectifier 600 VOLTS 110A RMS

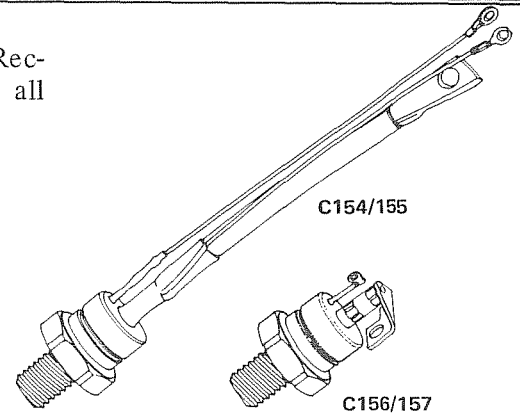
C154, C156
C155, C157



The General Electric C154, C155, C156 and C157 Silicon Controlled Rectifiers are designed for power switching at high frequencies. These are all diffused Pic-Pac devices employing the field proven amplifying gate.

FEATURES:

- High di/dt ratings.
- High dv/dt capability with selections available.
- Excellent surge and I²t ratings providing easy fusing.
- Guaranteed maximum turn-off time with selections available.
- Rugged hermetic package with long creepage path.



MAXIMUM ALLOWABLE RATINGS

TYPES	REPETITIVE PEAK OFF-STATE VOLTAGE, V_{DRM}^1 $T_J = -40^\circ\text{C to } +125^\circ\text{C}$	REPETITIVE PEAK REVERSE VOLTAGE, V_{RRM}^1 $T_J = -40^\circ\text{C to } +125^\circ\text{C}$	NON-REPETITIVE PEAK REVERSE VOLTAGE, V_{RSM}^1 $T_J = +125^\circ\text{C}$
C154A, C155A, C156A, C157A	100 Volts	100 Volts	160 Volts
C154B, C155B, C156B, C157B	200	200	260
C154C, C155C, C156C, C157C	300	300	380
C154D, C155D, C156D, C157D	400	400	480
C154E, C155E, C156E, C157E	500	500	600
C154M, C155M, C156M, C157M	600	600	720

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

RMS On-State Current, $I_{T(RMS)}$	110 Amperes
Peak One Cycle Surge (Non-Repetitive) On-State Current, I_{TSM} (60 Hz)	1800 Amperes
Peak One Cycle Surge (Non-Repetitive) On-State Current, I_{TSM} (50 Hz)	1700 Amperes
Critical Rate-of-Rise of On-State Current, Non-Repetitive	800 A/ μ s †
Critical Rate-of-Rise of On-State Current, Repetitive	500 A/ μ s †
I ² t (for fusing) for times \geq 1.5 milliseconds	9,500 (RMS Ampere) ² Seconds
I ² t (for fusing) for times \geq 8.3 milliseconds	13,500 (RMS Ampere) ² Seconds
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
Stud Torque	150 Lb.-In. (Max.), 125 Lb.-In. (Min.) 17 N-m (Max.), 14 N-m (Min.)

† 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 μ s short circuit trigger current rise time.

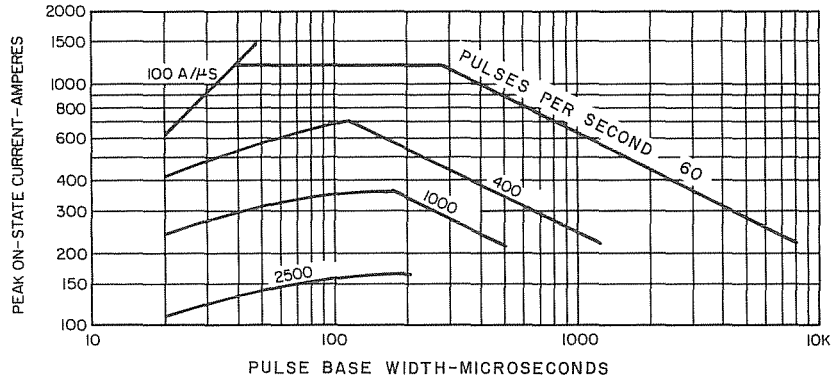
CHARACTERISTICS

TEST	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Repetitive Peak Reverse and Off-State Current	I_{RRM} and I_{DRM}	—	5	12	mA	$T_J = +25^\circ\text{C}$ $V = V_{DRM} = V_{RRM}$
Repetitive Peak Reverse and Off-State Current	I_{RRM} and I_{DRM}	—	12	17	mA	$T_J = 125^\circ\text{C}$ $V = V_{DRM} = V_{RRM}$
Thermal Resistance	$R_{\theta JC}$	—	.2	.3	$^\circ\text{C/Watt}$	Junction-to-Case
Critical Rate-of-Rise of Off-State Voltage (Higher values may cause device switching)	dv/dt				$\text{V}/\mu\text{sec}$	$T_J = +125^\circ\text{C}$, Gate Open. $V_{DRM} = \text{Rated}$, Linear or Exponential Rising Waveform Exponential $dv/dt = \frac{V_{DRM}}{\tau} (.632)$
C154/C156		200	500	—		
C155/C157		100	300	—		
For higher minimum dv/dt selections — consult factory.						
Holding Current	I_H	—	100	—	mAdc	$T_C = +25^\circ\text{C}$, Anode Supply = 24 Vdc, Initial On-State Current = 2 Amps.
DC Gate Trigger Current	I_{GT}	—	50	150	mAdc	$T_C = +25^\circ\text{C}$, $V_D = 6\text{ Vdc}$, $R_L = 3\text{ Ohms}$
		—	100	200		$T_C = -40^\circ\text{C}$, $V_D = 6\text{ Vdc}$, $R_L = 3\text{ Ohms}$
		—	30	120		$T_C = +125^\circ\text{C}$, $V_D = 6\text{ Vdc}$, $R_L = 3\text{ Ohms}$
DC Trigger Voltage	V_{GT}	—	3.0	5.0	Vdc	$T_C = -40^\circ\text{C}$ to 0°C , $V_D = 6\text{ Vdc}$, $R_L = 3\text{ Ohms}$
		—	1.25	3.0		$T_C = 0^\circ\text{C}$ to $+125^\circ\text{C}$, $V_D = 6\text{ Vdc}$, $R_L = 3\text{ Ohms}$
		0.15	—	—		$T_C = +125^\circ\text{C}$, V_{DRM} , $R_L = 1000\text{ Ohms}$
Peak On-State Voltage	V_{TM}	—	2.2	3.0	Volts	$T_C = +25^\circ\text{C}$, $I_{TM} = 500\text{ Amps}$. Peak Duty Cycle $\leq .01\%$
Turn-On Delay Time	t_d	—	1	—	μsec	$T_C = +25^\circ\text{C}$, $I_T = 50\text{ Adc}$, 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	—	8	10	μsec	(1) $T_C = +125^\circ\text{C}$ (2) $I_{TM} = 150\text{ Amps}$. (3) $V_R = 50\text{ Volts Min}$. (4) V_{DRM} (Reapplied) (5) Rate-of-Rise of Reapplied Off-State Voltage = 20 $\text{V}/\mu\text{sec}$ (linear) (6) Commutation $di/dt = 5\text{ Amps}/\mu\text{sec}$. (7) Duty Cycle $\leq .01\%$ (8) Gate Bias During Turn-Off Interval = 0 Volts, 100 Ohms
		—	12	20		
C154/C156		—	8	10		
C155/C157		—	12	20		
Conventional Circuit Commutated Turn-Off Time (with Feedback Diode)	$t_{q(\text{diode})}$	—	12	†	μsec	(1) $T_C = +125^\circ\text{C}$ (2) $I_{TM} = 150\text{ Amps}$. (3) $V_R = 1\text{ Volt}$ (4) V_{DRM} (Reapplied) (5) Rate-of-Rise of Reapplied Off-State Voltage = 20 $\text{V}/\mu\text{sec}$ (6) Commutation $di/dt = 5\text{ Amps}/\mu\text{sec}$ (7) Duty Cycle $\leq .01\%$ (8) Gate Bias During Turn-Off Interval = 0 Volts, 100 Ohms
		—	15	†		
C154/C156		—	12	†		
C155/C157		—	15	†		

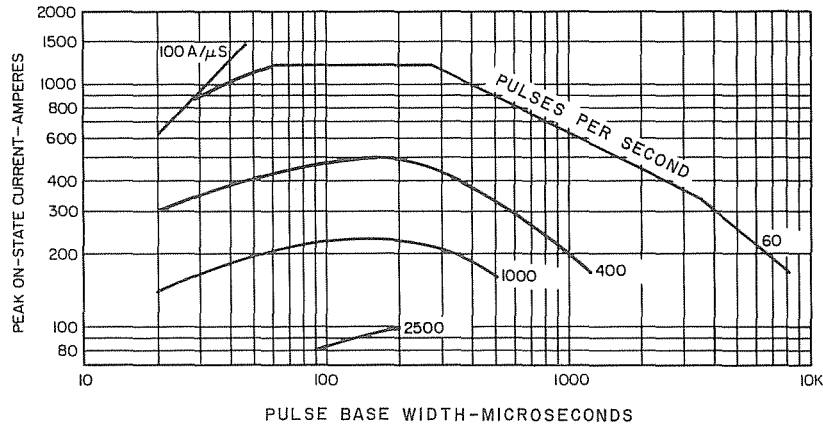
†Consult factory for specified maximum turn-off time.

SINE WAVE DATA

C154, C156
C155, C157



1. Maximum allowable peak on-state current vs. pulse width ($T_C = 65^\circ\text{C}$)



2. Maximum allowable peak on-state current vs. pulse width ($T_C = 90^\circ\text{C}$)

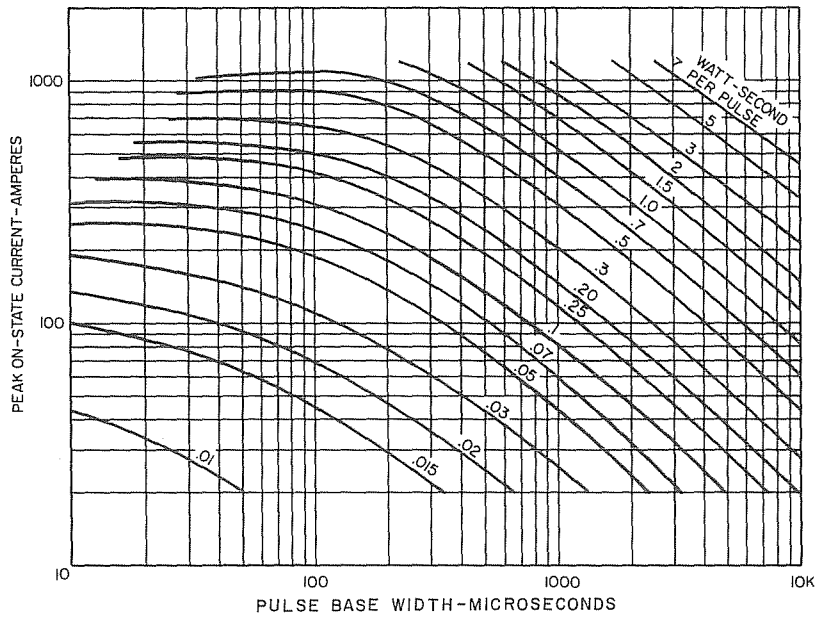
NOTES:

(Pertaining to Sine and Rectangular Wave Current Ratings)

1. Switching voltage ≤ 400 volts.
2. Maximum ckt. $dv/dt = 100$ volts/ μsec .
3. Required gate drive:
20 volts, 20 ohms, .5 μsec rise time.
4. Reverse voltage applied = $V_R \leq 400$ volts.
5. R-C Snubber ckt. = .25 μf , 5 ohms.
6. Max. energy dissipated during reverse recovery to be 15% of total W-S/P shown or 0.03 W-S/P, whichever is least.
7. Values of W-S/P are for $T_j = 125^\circ\text{C}$.

C154, C156
C155, C157

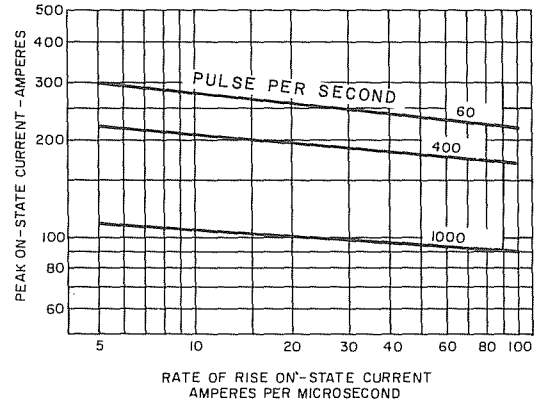
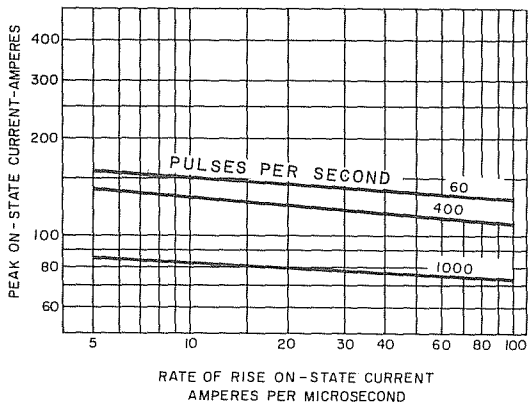
SINE WAVE DATA



3. ENERGY PER PULSE FOR SINUSOIDAL PULSES

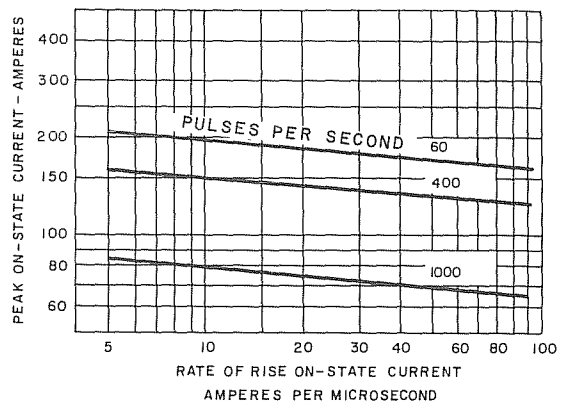
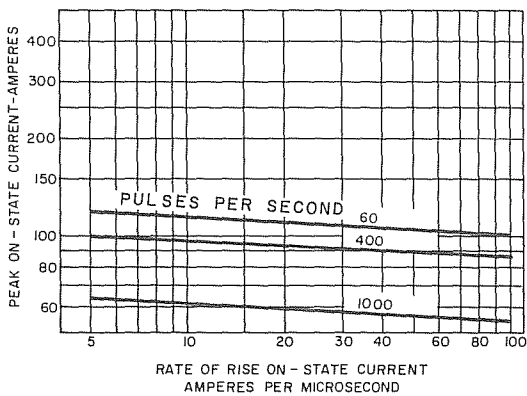
50% DUTY CYCLE

25% DUTY CYCLE



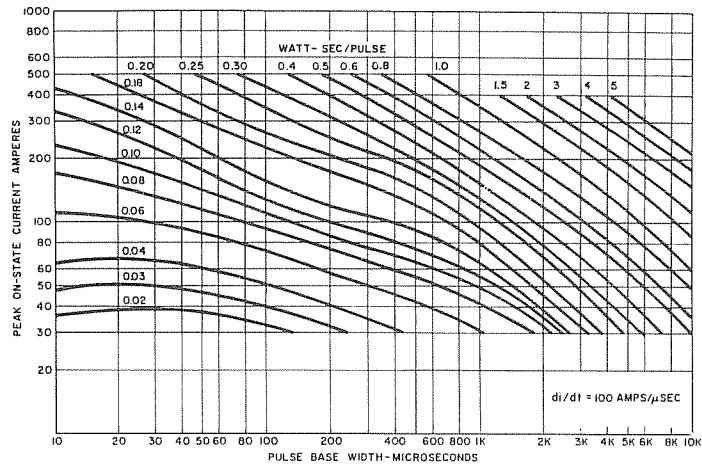
4. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt ($T_C = 65^\circ C$)

5. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt ($T_C = 65^\circ C$)

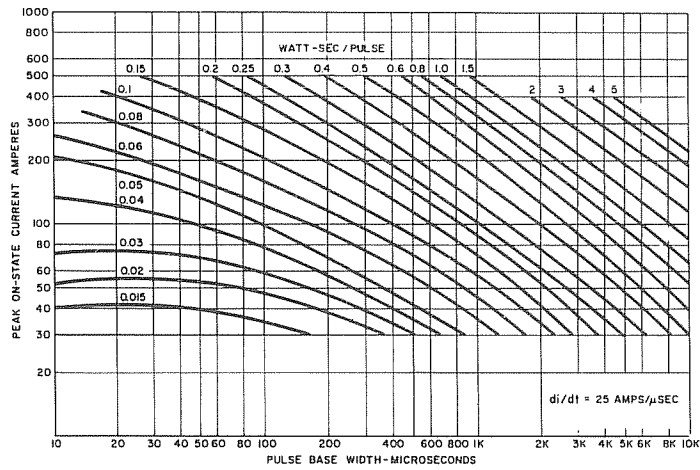


6. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt ($T_C = 90^\circ C$)

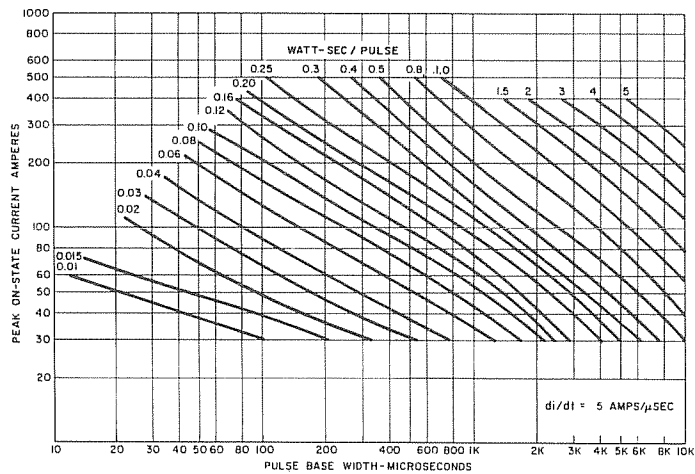
7. MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT VS. di/dt ($T_C = 90^\circ C$)



8. ENERGY PER PULSE VS. PEAK CURRENT AND PULSE WIDTH ($di/dt = 100 \text{ A}/\mu\text{sec}$)



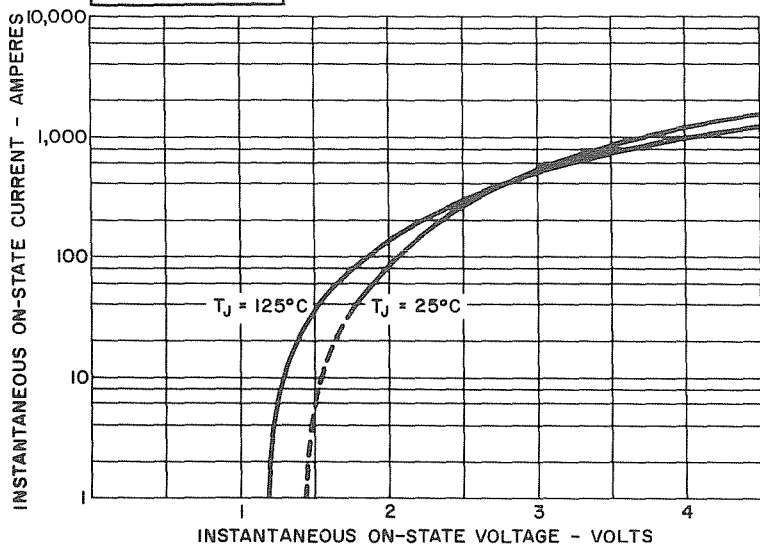
9. ENERGY PER PULSE VS. PEAK CURRENT AND PULSE WIDTH ($di/dt = 25 \text{ A}/\mu\text{sec}$)



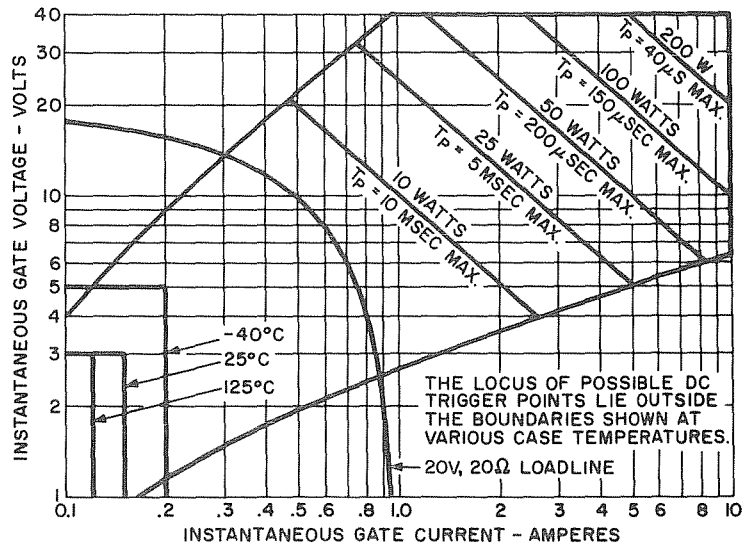
10. ENERGY PER PULSE VS. PEAK CURRENT AND PULSE WIDTH ($di/dt = 5 \text{ A}/\mu\text{sec}$)

C154, C156

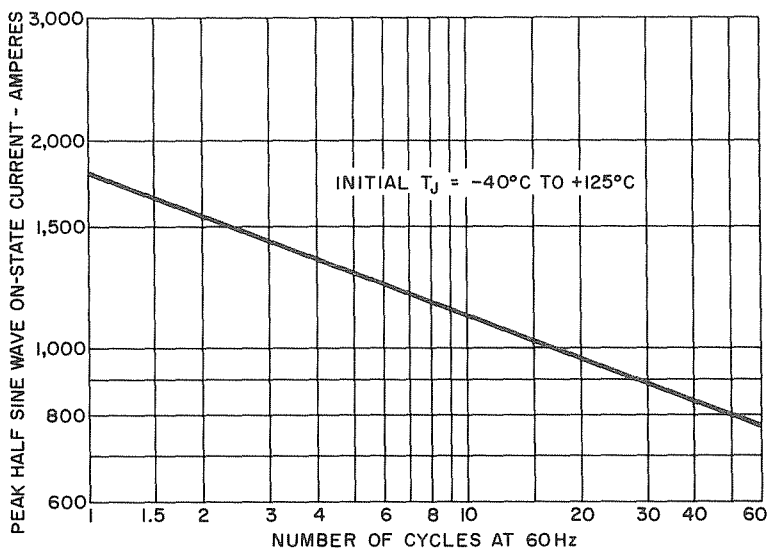
C155, C157



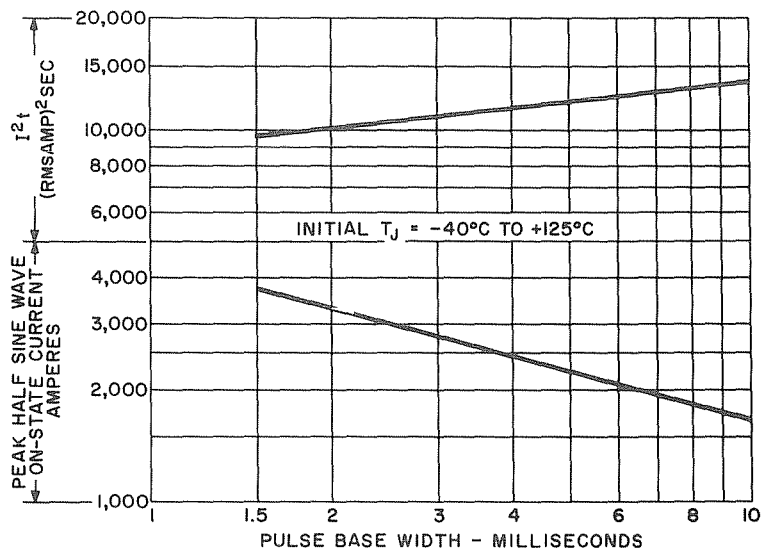
11. MAXIMUM ON-STATE CHARACTERISTICS



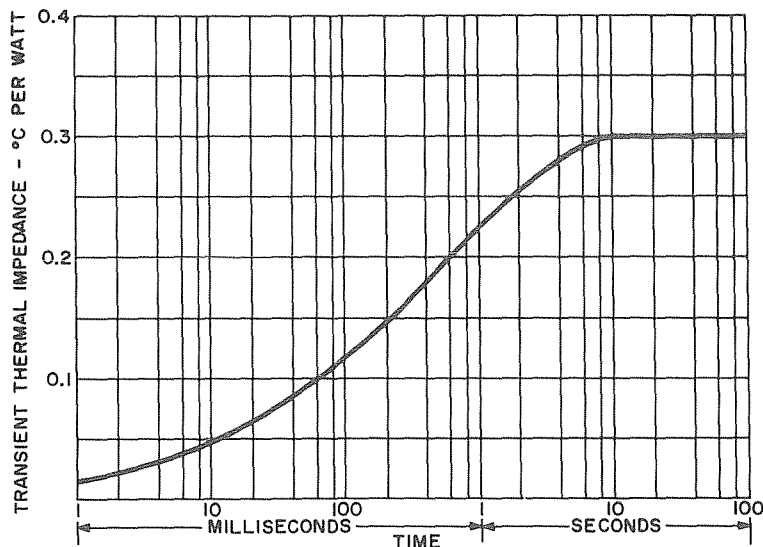
12. GATE TRIGGER CHARACTERISTICS AND POWER RATINGS



13. MAXIMUM ALLOWABLE SURGE (NON-REPETITIVE) CURRENT



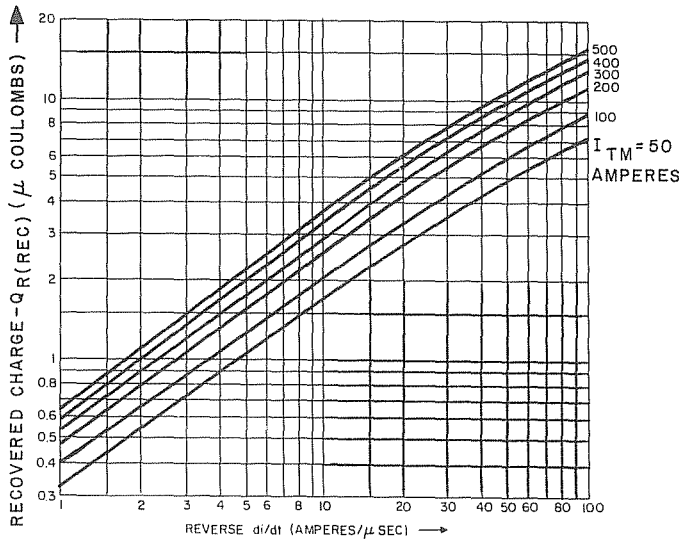
14. SUB-CYCLE SURGE (NON-REPETITIVE) ON-STATE CURRENT AND I²t RATING



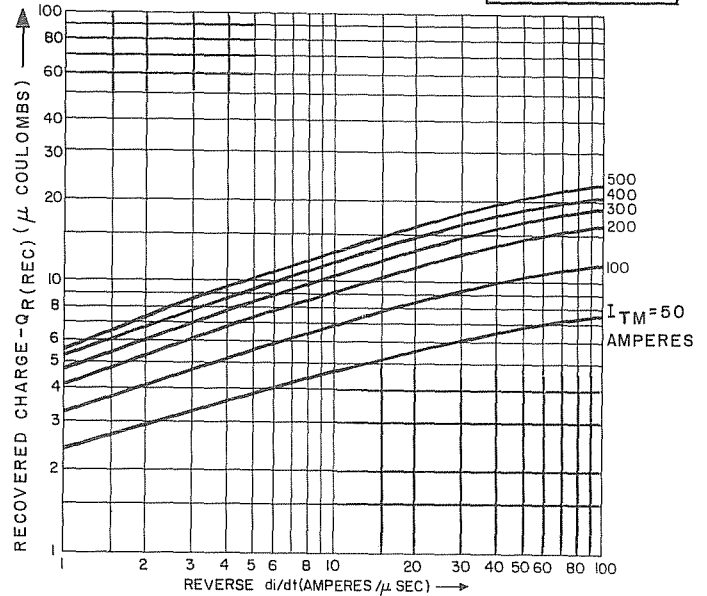
15. TRANSIENT THERMAL IMPEDANCE - JUNCTION-TO-CASE

RECOVERED CHARGE DATA

C154, C156
C155, C157

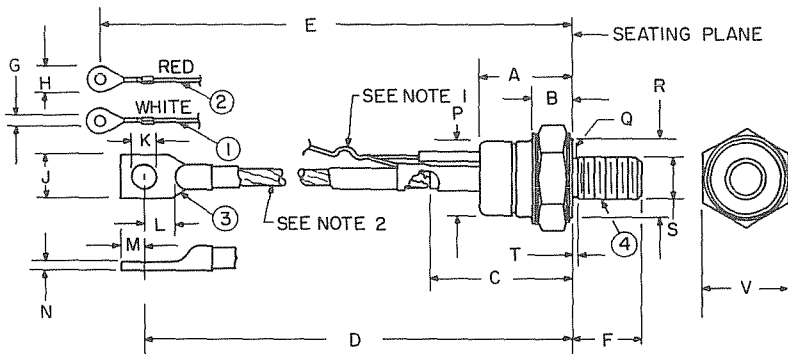


17. TYPICAL RECOVERED CHARGE DATA ($T_J = 125^\circ\text{C}$)
SINEWAVE CURRENT WAVEFORM



16. TYPICAL RECOVERED CHARGE DATA ($T_J = 25^\circ\text{C}$)
SINEWAVE CURRENT WAVEFORM

OUTLINE DRAWING

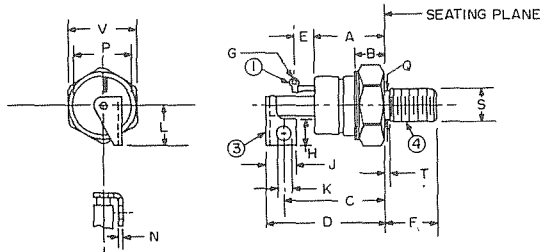
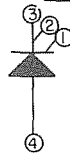


MODEL	TERMINAL ①	TERMINAL ②	TERMINAL ③	TERMINAL ④	S THREAD SIZE
C154, C155	GATE	AUX CATHODE	CATHODE +	ANODE -	1/2 20UNF-2A

NOTES:

- GATE & AUX. CATHODE LEADS SUPPLIED LIGHTLY TWISTED TOGETHER.
- FLEXIBLE COPPER LEAD.
- ONE NUT AND ONE LOCKWASHER SUPPLIED WITH EACH UNIT. MATERIAL OF HARDWARE IS STEEL, CAD PLATED.
- "R" DIM. IS DIA. OF EFFECTIVE SEATING AREA.
- "T" DIM. IS AREA OF UNTHREADED PORTION. COMPLETE THDS. ARE WITHIN 2.5 THREADS OF SEATING PLANE.
- ANGULAR ORIENTATION OF TERMINALS IS UNDEFINED.

SYM	INCHES		METRIC MM		SYM	INCHES		METRIC MM		NOTES
	MIN.	MAX.	MIN.	MAX.		MIN.	MAX.	MIN.	MAX.	
A	1.020	1.140	25.90	28.96	L	.330	—	8.38	—	
B	.390	.500	9.90	12.70	M	.275	.325	6.98	8.26	
C	1.570	1.750	39.87	44.45	N	.065	.095	1.65	2.41	
D	6.000	6.390	152.40	162.31	P	.840	.910	21.33	23.11	
E	6.850	7.500	173.99	190.50	Q	.425	.499	10.79	12.67	
F	.797	.827	20.24	21.01	R	.920	—	23.36	—	4
G	.140	.150	3.55	3.81	T	—	.060	—	1.57	5
H	—	.300	—	7.62	—	—	—	—	—	
J	.500	.610	12.70	15.49	V	1.052	1.063	26.72	27.00	
K	.260	.281	6.60	7.14	—	—	—	—	—	



MODEL	TERMINAL ①	TERMINAL ③	TERMINAL ④	S THREAD SIZE
C156, C157	GATE	CATHODE +	ANODE -	1/2-20 UNF-2A

NOTES:

- ONE NUT AND ONE LOCKWASHER SUPPLIED WITH EACH UNIT. MATERIAL OF HARDWARE IS STEEL, CAD PLATED.
- "T" DIM. IS AREA OF UNTHREADED PORTION. COMPLETE THDS. ARE WITHIN 2.5 THREADS OF SEATING PLANE.
- ANGULAR ORIENTATION OF TERMINALS IS UNDEFINED.

SYM	INCHES		METRIC MM		SYM	INCHES		METRIC MM		NOTES
	MIN.	MAX.	MIN.	MAX.		MIN.	MAX.	MIN.	MAX.	
A	1.020	1.140	25.90	28.96	L	.590	.640	14.98	16.26	
B	.390	.500	9.90	12.70						
C	1.460	REF.	7.92	REF.	N	.058	.070	1.47	1.78	
D	1.660	1.800	42.16	45.72						
E	.312	REF.	7.92	REF.	P	.840	.910	21.33	23.11	
F	.797	.827	20.24	21.01						
G	.060	.075	1.52	1.91	Q	.425	.499	10.79	12.67	
H	.385	.415	9.77	10.54	T	—	.060	—	1.52	2
J	.445	.485	11.30	12.32	V	1.052	1.063	26.72	27.00	
K	.198	.212	5.02	5.38						