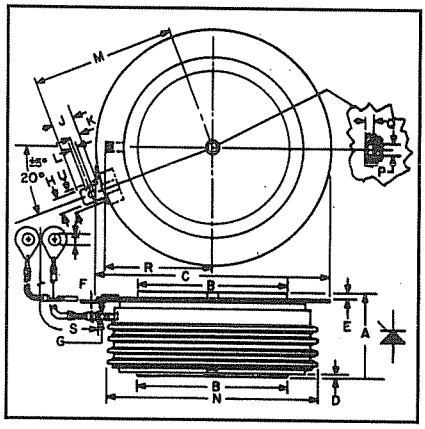
Powerex, Inc. Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

C451

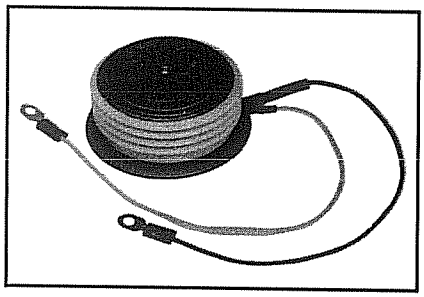
Phase Control SCR

1400-1500 Amperes Avg
500-1800 Volts



C451
Outline Drawing

Dimensions	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	1.020	1.065	25.90	27.05
B	1.845	1.855	46.86	47.12
C	—	2.940	—	74.68
D	.030	—	.76	—
E	.050	—	1.27	—
F	.017	.023	.43	.58
G	.057	.059	1.44	1.50
H	.186	.191	4.72	4.85
J	.245	.255	6.22	6.48
K	.115	.130	2.92	3.30
L	.064	.070	1.62	1.78
M	—	1.800	—	45.72
N	—	2.650	—	67.31
P	.135	.145	3.42	3.68
Q	.070	.100	1.77	2.54
R	—	1.355	—	34.42
S	12.219	12.343	310.36	313.51
T	.137	.153	3.47	3.89



C451
Phase Control SCR
1400-1500 Amperes/500-1800 Volts

Description
Powerex Silicon Controlled Rectifiers (SCR) are designed for phase control applications. These are all-diffused, Press-Pak (Pow-R-Disc) devices employing the field-proven amplifying (di/namic) gate.

Features:
- ☐ Low On-State Voltage
- ☐ High di/dt
- ☐ High dv/dt
- ☐ Hermetic Packaging
- ☐ Excellent Surge and I^2t Ratings

Applications:
- ☐ Power Supplies
- ☐ Battery Chargers
- ☐ Motor Control
- ☐ Light Dimmers
- ☐ VAR Generators

Ordering Information
Example: Select the complete six or seven digit part number you desire from the table – i.e. C451M1 is a 600 Volt, 1500 Ampere Phase Control SCR.

Type	Voltage		Current	
	V_{DRM} V_{RRM}	Code	I_T (avg)	Code
C451	500	E	1500	1
	600	M	1400	2
	700	S		
	800	N		
	900	T		
	1000	P		
	1100	PA		
	1200	PB		
	1300	PC		
	1400	PD		
	1500	PE		
	1600	PM		
	1700	PS		
	1800	PN		

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

C451
Phase Control SCR
1400-1500 Amperes Avg/500-1800 Volts

Absolute Maximum Ratings

	Symbol	C451-1	C451-2	Units
RMS On-State Current	$I_{T(RMS)}$	2350	2200	Amperes
Average On-State Current	$I_{T(av)}$	1500	1400	Amperes
Peak One-Cycle Surge (Non Repetitive) On-State Current (60Hz)	I_{TSM}	23,000	21,000	Amperes
Peak One-Cycle Surge (Non-Repetitive) On-State Current (50Hz)	I_{TSM}	20,800	19,200	Amperes
Critical Rate-of-Rise of On-State Current (Non-Repetitive)	di/dt	400	400	Amperes/μs
Critical Rate-of-Rise of On-State Current (Repetitive)	di/dt	75	75	Amperes/μs
I^2t (for Fusing), One Cycle at 60Hz	I^2t	2,200,000	1,830,000	A^2sec
Peak Gate Power Dissipation	P_{GM}	200	200	Watts
Average Gate Power Dissipation	$P_{G(av)}$	5	5	Watts
Storage Temperature	T_{STG}	−40 to 150	−40 to 150	°C
Operating Temperature	T_J	−40 to 125	−40 to 125	°C
Mounting Force①		5500 to 6000	5500 to 6000	lb.
Mounting Force①		24.5 to 26.7	24.5 to 26.7	kN

Electrical and Thermal Characteristics

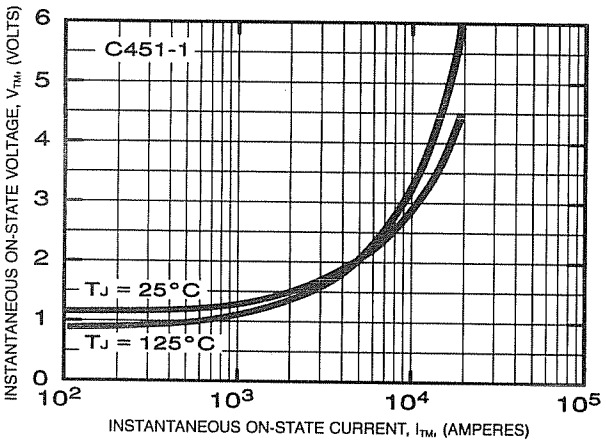
Characteristics	Symbol	Test Conditions	C451-1	C451-2	Units
Current—Conducting State Maximums					
Peak On-State Voltage	V_{TM}	T_J = 25°C; I_{TM} = 3000A Peak, Duty Cycle ≤0.01%	1.70	1.90	Volts
				C451	
Voltage—Blocking State Maximums					
Forward Leakage, Peak	I_{DRM}	T_J = 125°C, V = V_{DRM}		45	mA
Reverse Leakage, Peak	I_{RRM}	T_J = 125°C, V = V_{RRM}		45	mA
Switching					
Typical Turn-Off Time	t_q	T_J = 125°C, I_T = 2000A, Pulse Width = 1000 μsec; V_R = 50V; dv/dt = 200 V/μsec; Linear to .8 V_{DRM}; di_R/dt = 25A/μsec; VG = 0, R_L = 100Ω		150	μsec
Typical Delay Time	t_d	T_J = 25°C, I_T = 50A, Gate Supply = 20V; R_L = 20Ω; Rise Time = 0.1/μsec		.7	μsec
Min. Critical dv/dt exponential to V_{DRM}	dv/dt	T_J = 125°C, 0.8V_{DRM} Applied		400	V/μsec
Thermal					
Maximum Thermal Resistance,① double sided cooling					
Junction to Case	$R_{\theta JC}$			.025	°C/Watt
Case to Sink, Lubricated	$R_{\theta CS}$			.0075	°C/Watt
Gate—Maximum Parameters					
Gate Current to Trigger	I_{GT}	T_J = 25°C, V_D = 20Vdc, R_L = 3Ω		200	mA
Gate Voltage to Trigger	V_{GT}	T_J = −40 to 125°C, V_D = 20Vdc, R_L = 3Ω		5	Volts
Non-Triggering Gate Voltage	V_{GDM}	V_D = rated V_{DRM}, T_J = 125°C, R_L 1000Ω		.15	Volts
Peak Forward Gate Current	I_{GTM}			10	Amperes
Peak Reverse Gate Voltage	V_{GRM}			5	Volts

① Consult recommended mounting procedures.

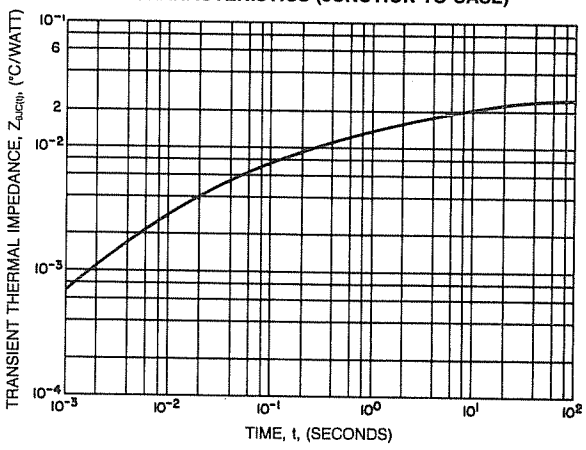
Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

C451
Phase Control SCR
1400-1500 Amperes Avg/500-1800 Volts

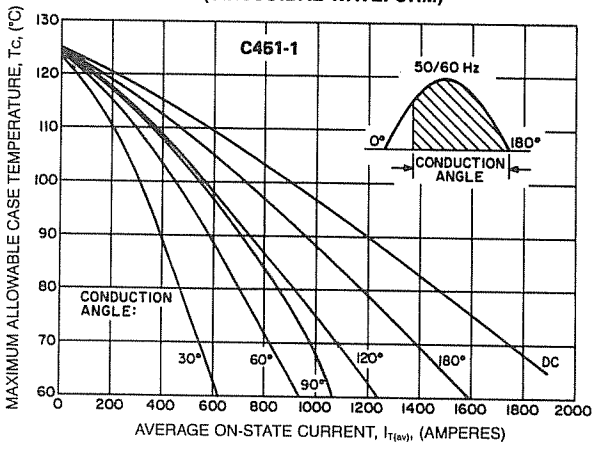
MAXIMUM ON-STATE CHARACTERISTICS



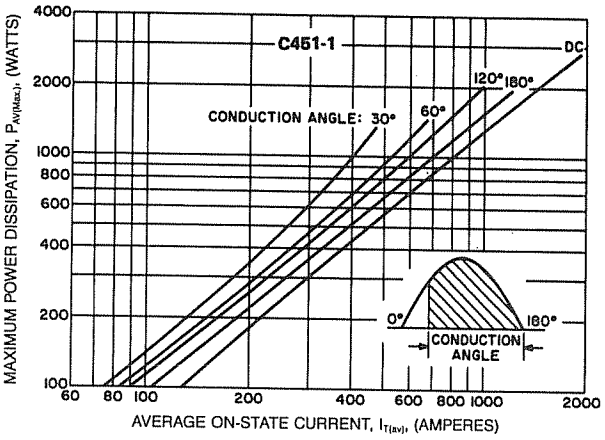
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)



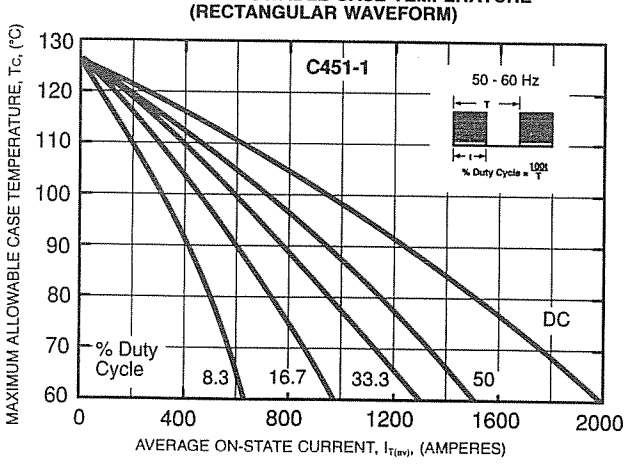
MAXIMUM ALLOWABLE CASE TEMPERATURE (SINUSOIDAL WAVEFORM)



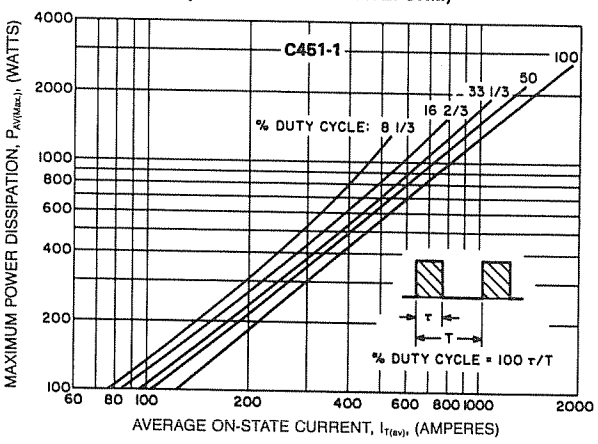
MAXIMUM ON-STATE POWER DISSIPATION (SINUSOIDAL WAVEFORM)



MAXIMUM ALLOWABLE CASE TEMPERATURE (RECTANGULAR WAVEFORM)



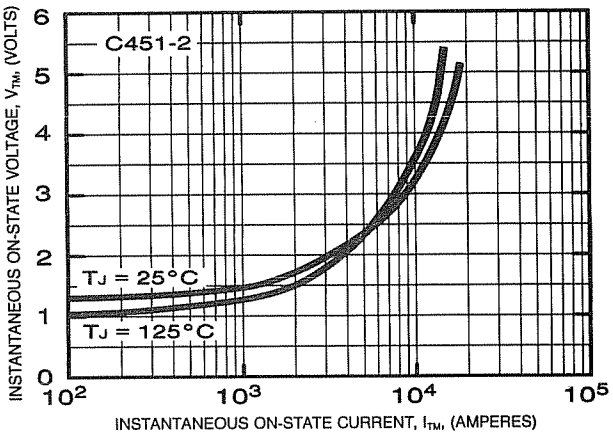
MAXIMUM ON-STATE POWER DISSIPATION (RECTANGULAR WAVEFORM)



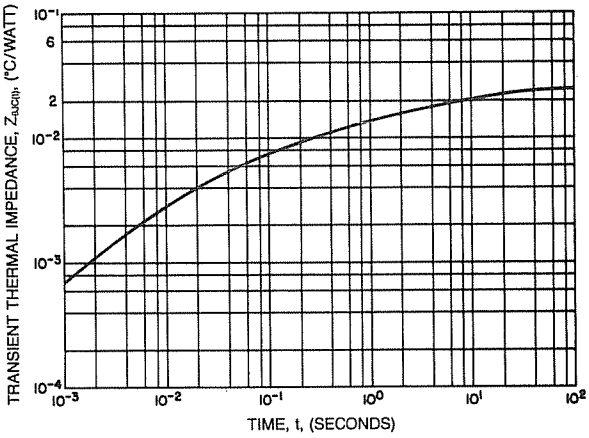
Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

C451
Phase Control SCR
1400-1500 Amperes Avg/500-1800 Volts

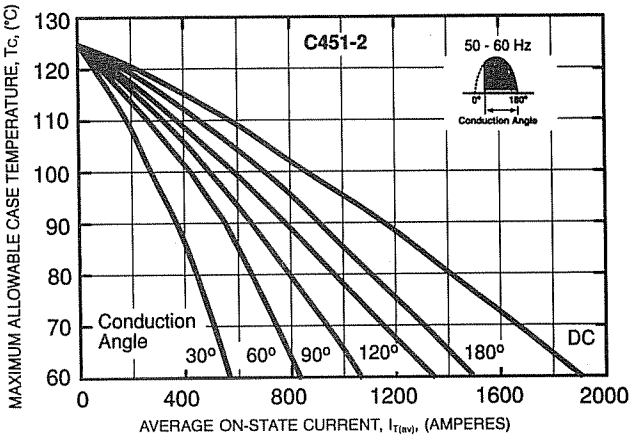
MAXIMUM ON-STATE CHARACTERISTICS



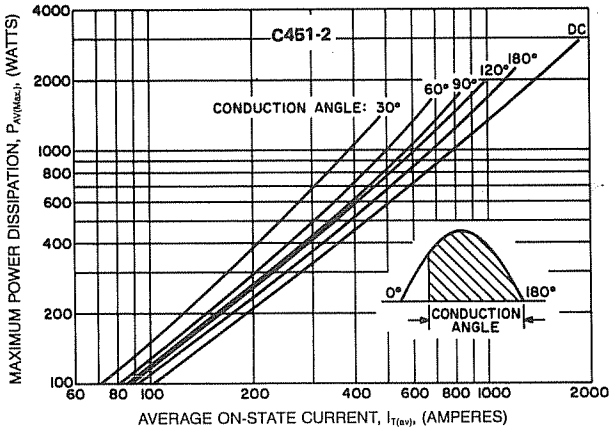
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)



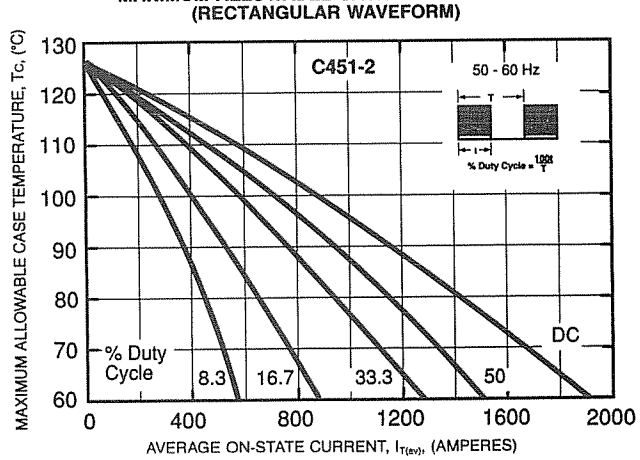
MAXIMUM ALLOWABLE CASE TEMPERATURE (SINUSOIDAL WAVEFORM)



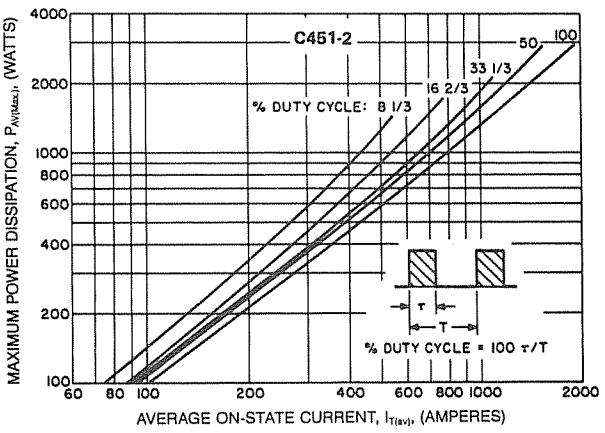
MAXIMUM ON-STATE POWER DISSIPATION (SINUSOIDAL WAVEFORM)



MAXIMUM ALLOWABLE CASE TEMPERATURE (RECTANGULAR WAVEFORM)



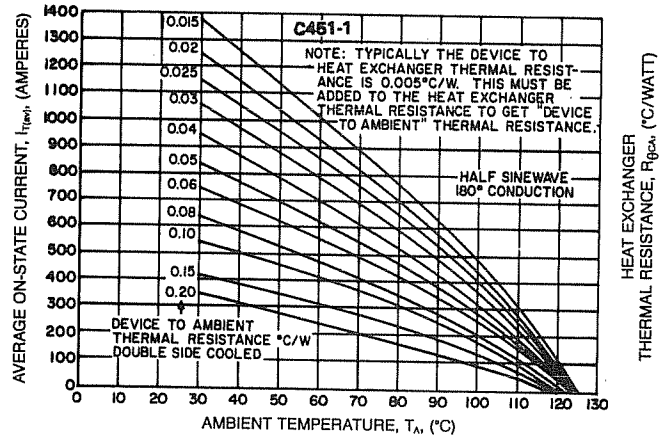
MAXIMUM ON-STATE POWER DISSIPATION (RECTANGULAR WAVEFORM)



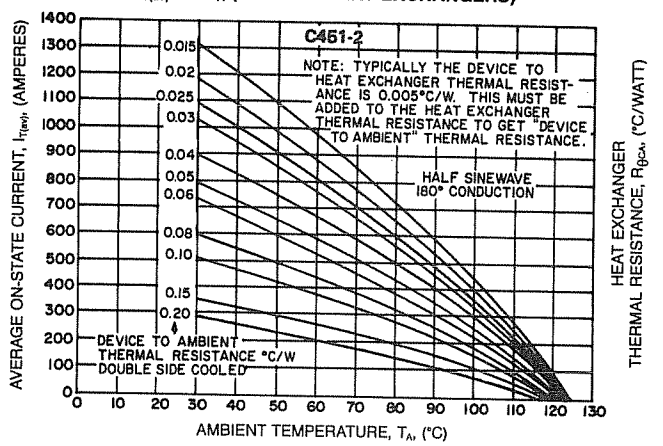
Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

C451
Phase Control SCR
1400-1500 Amperes Avg/500-1800 Volts

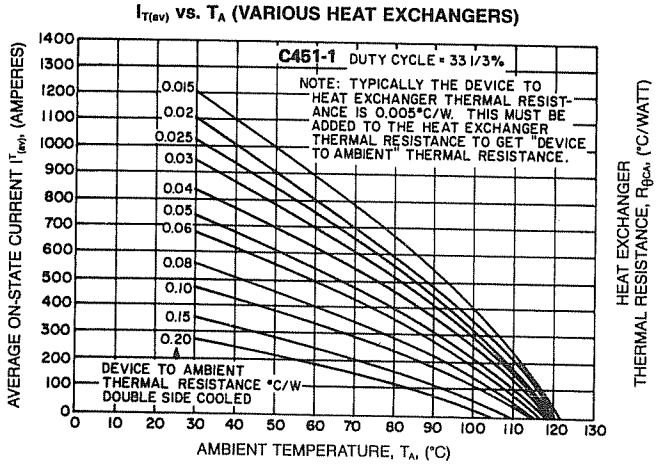
$I_{T(av)}$ vs. T_A (VARIOUS HEAT EXCHANGERS)



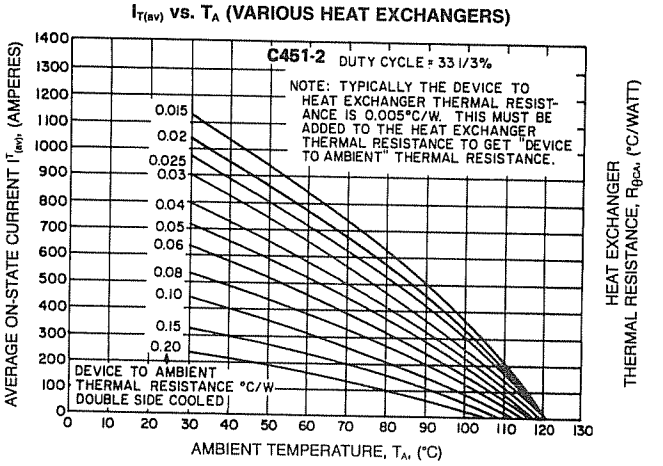
$I_{T(av)}$ vs. T_A (VARIOUS HEAT EXCHANGERS)



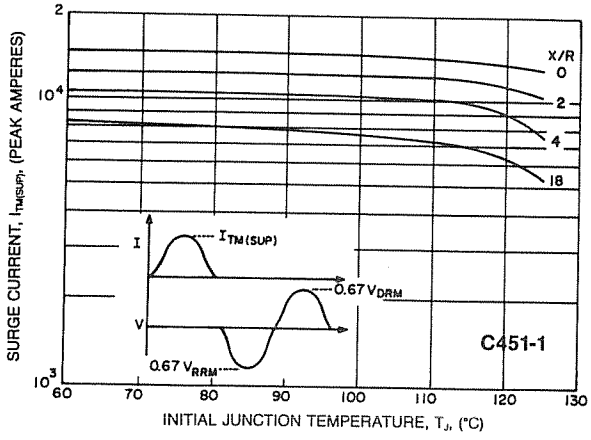
$I_{T(av)}$ vs. T_A (VARIOUS HEAT EXCHANGERS)



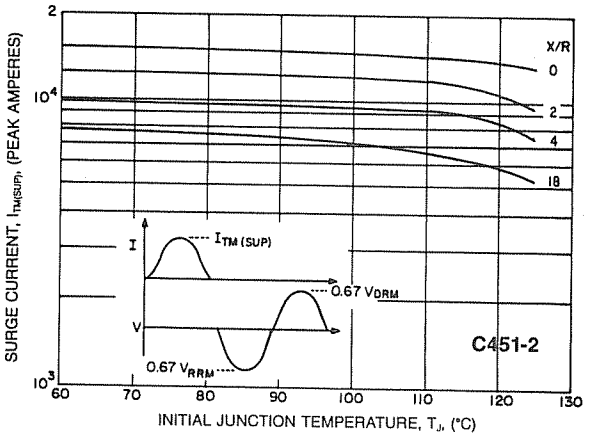
$I_{T(av)}$ vs. T_A (VARIOUS HEAT EXCHANGERS)



SURGE SUPPRESSION RATING



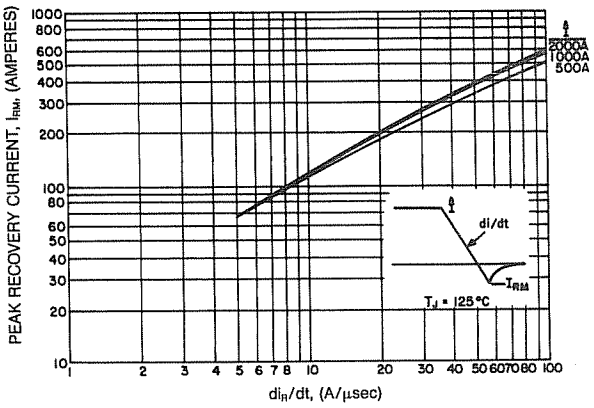
SURGE SUPPRESSION RATING



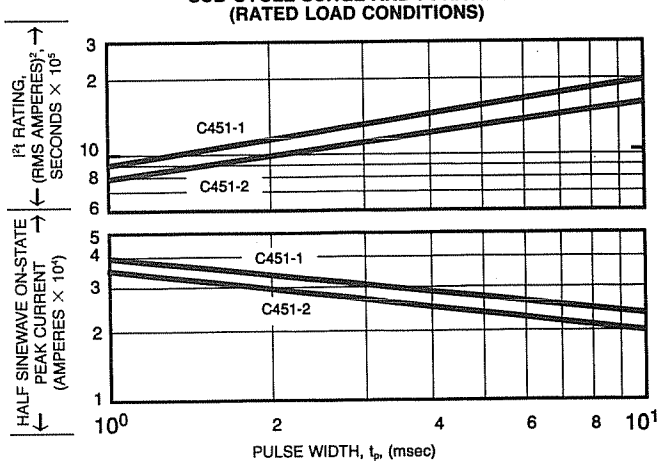
Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

C451
Phase Control SCR
1400-1500 Amperes Avg/500-1800 Volts

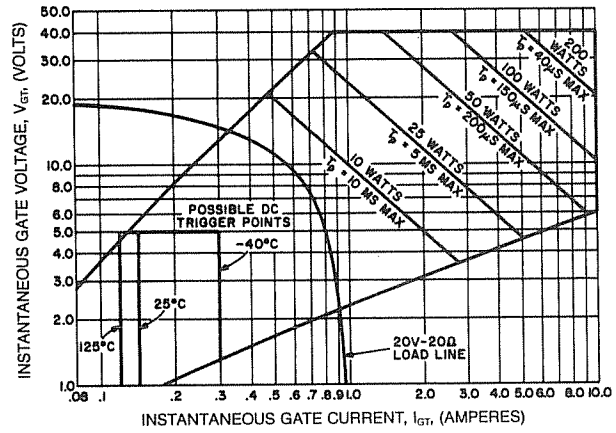
TYPICAL RECOVERY CURRENT



SUB-CYCLE SURGE AND I^2t RATINGS (RATED LOAD CONDITIONS)



GATE CHARACTERISTICS



NOTES:
1. Maximum allowable average gate dissipation = 5 watts.
2. The locus of possible dc trigger points lies outside the boundaries shown at various case temperatures.
3. Tp = rectangular gate current pulse width (5 μs min. duration, 1 μs max. rise time).
4. Maximum long-term, repetitive anode di/dt = 75 amps/μs with 20V-20Ω gate source.