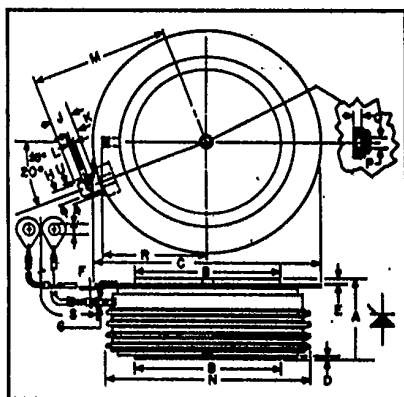


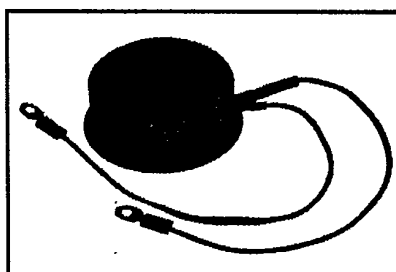
**POWEREX****C451**

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

**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/dnamic) gate.

**Features:**

- ☐ Low On-State Voltage
- ☐ High di/dt
- ☐ High dv/dt
- ☐ Hermetic Packaging
- ☐ Excellent Surge and I<sup>2</sup>t 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 <sub>nom</sub> | Code | I <sub>t</sub> (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/ $\mu s$ |
| Critical Rate-of-Rise of On-State Current (Repetitive)        | $di/dt$      | 75           | 75           | Amperes/ $\mu s$ |
| $I^2t$ (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   | $^{\circ}C$      |
| Operating Temperature                                         | $T_J$        | -40 to 125   | -40 to 125   | $^{\circ}C$      |
| Mounting Force <sup>①</sup>                                   |              | 5500 to 6000 | 5500 to 6000 | lb.              |
| Mounting Force <sup>①</sup>                                   |              | 24.5 to 26.7 | 24.5 to 26.7 | kN               |

### Electrical and Thermal Characteristics

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

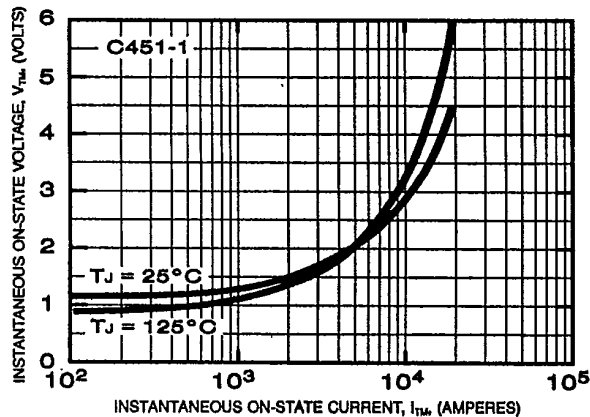
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

### C451

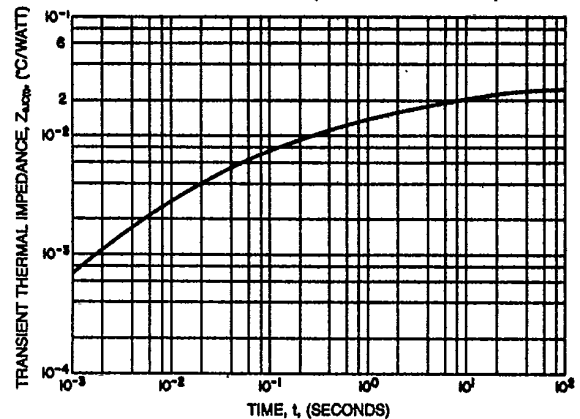
#### Phase Control SCR

1400-1500 Amperes Avg/500-1800 Volts

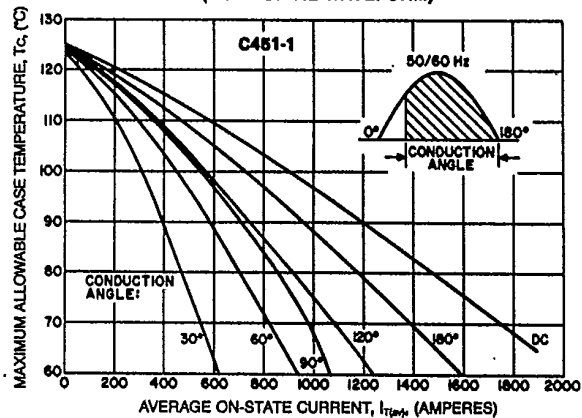
MAXIMUM ON-STATE CHARACTERISTICS



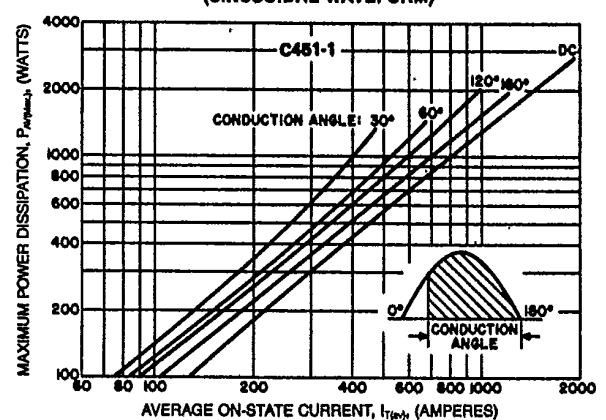
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)



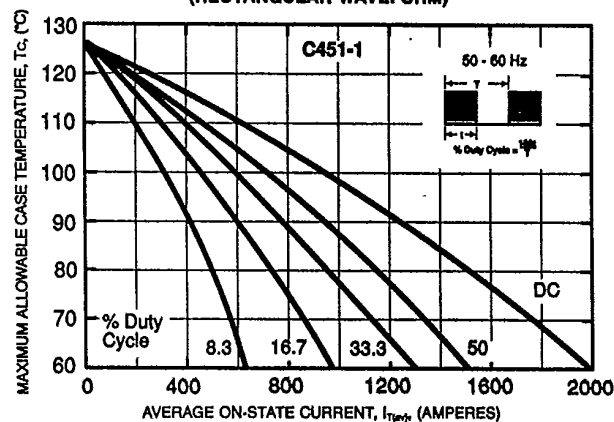
MAXIMUM ALLOWABLE CASE TEMPERATURE (SINUSOIDAL WAVEFORM)



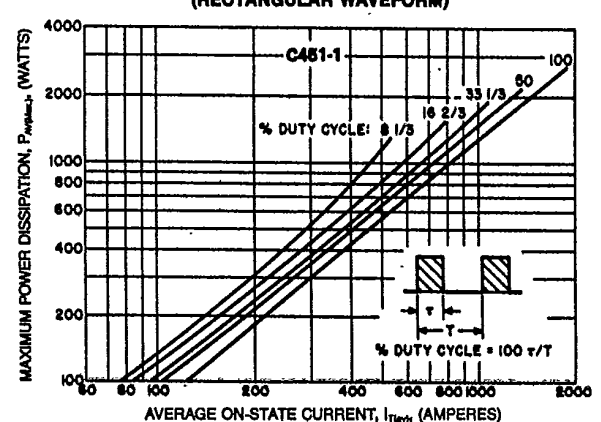
MAXIMUM ON-STATE POWER DISSIPATION (SINUSOIDAL WAVEFORM)



MAXIMUM ALLOWABLE CASE TEMPERATURE (RECTANGULAR WAVEFORM)



MAXIMUM ON-STATE POWER DISSIPATION (RECTANGULAR WAVEFORM)





Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

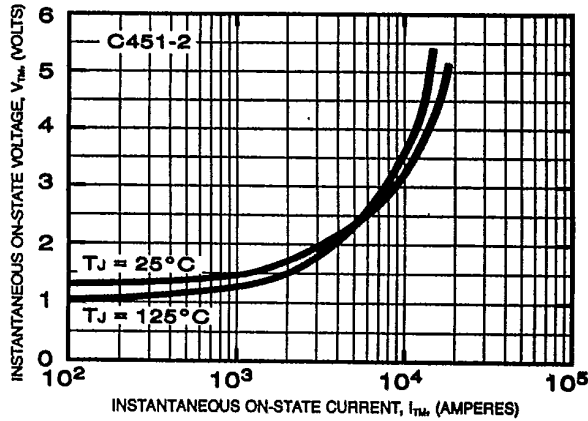
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

### C451

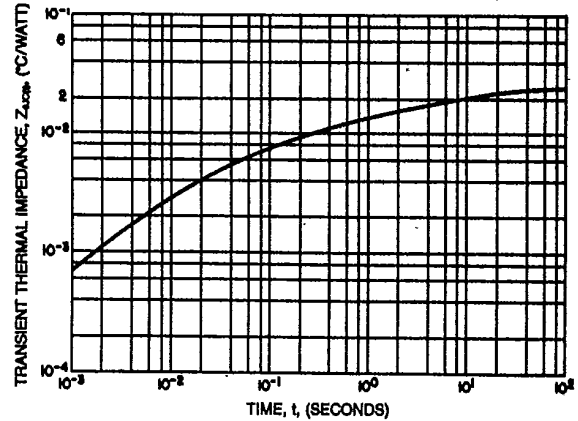
#### Phase Control SCR

1400-1500 Amperes Avg/500-1800 Volts

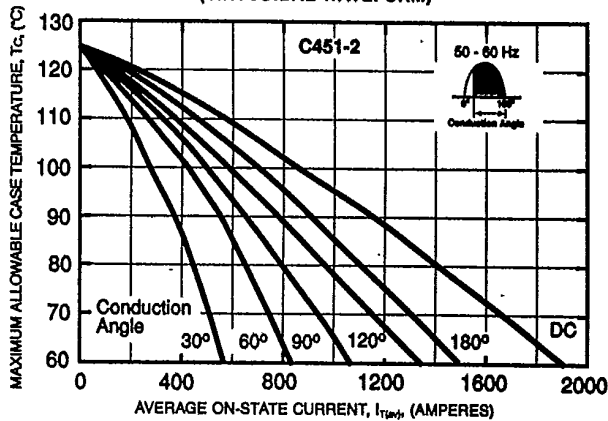
MAXIMUM ON-STATE CHARACTERISTICS



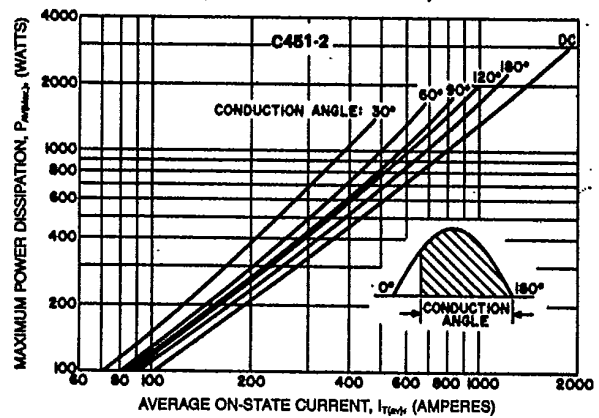
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)



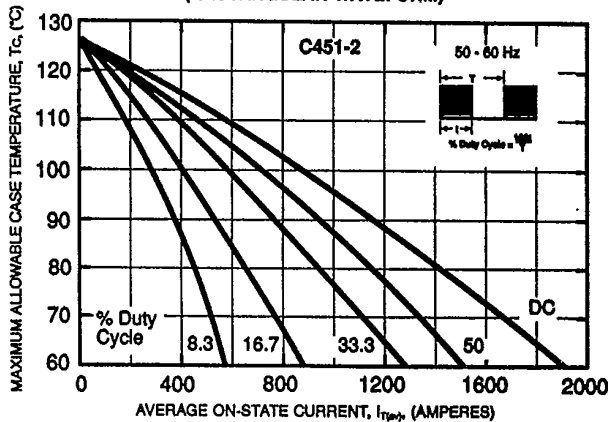
MAXIMUM ALLOWABLE CASE TEMPERATURE (SINUSOIDAL WAVEFORM)



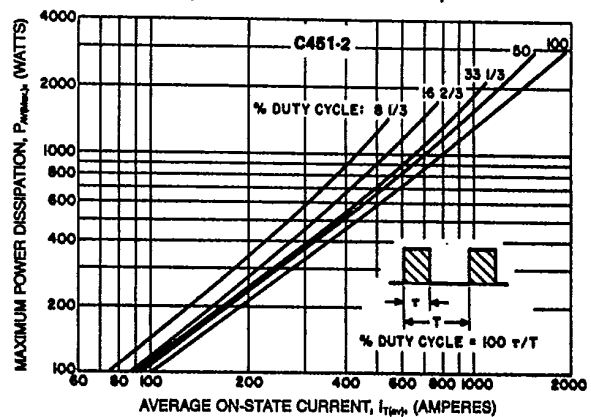
MAXIMUM ON-STATE POWER DISSIPATION (SINUSOIDAL WAVEFORM)



MAXIMUM ALLOWABLE CASE TEMPERATURE (RECTANGULAR WAVEFORM)



MAXIMUM ON-STATE POWER DISSIPATION (RECTANGULAR WAVEFORM)





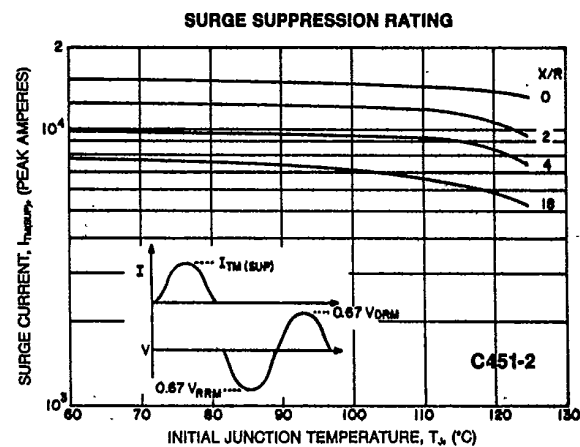
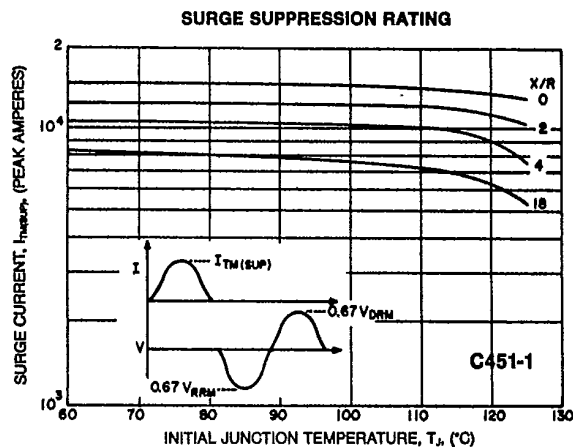
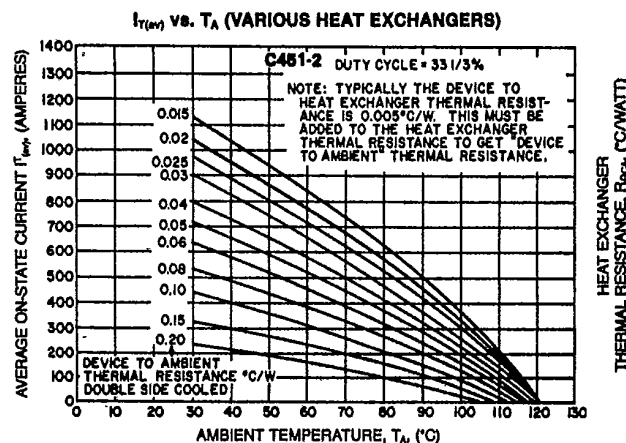
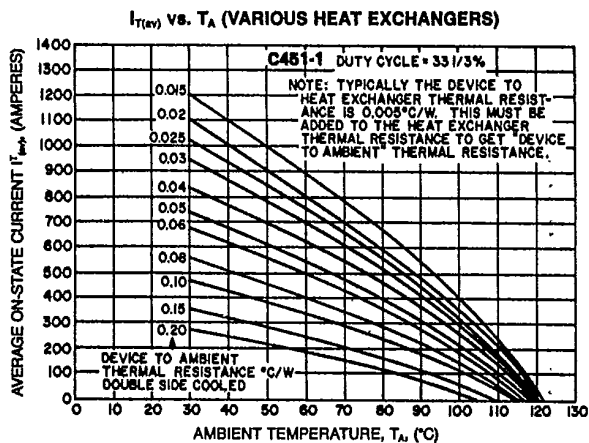
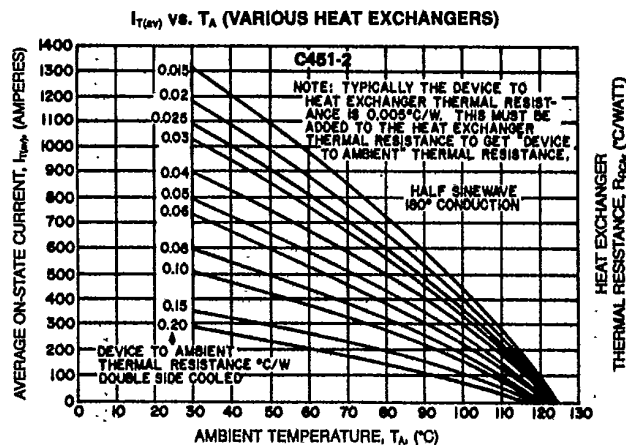
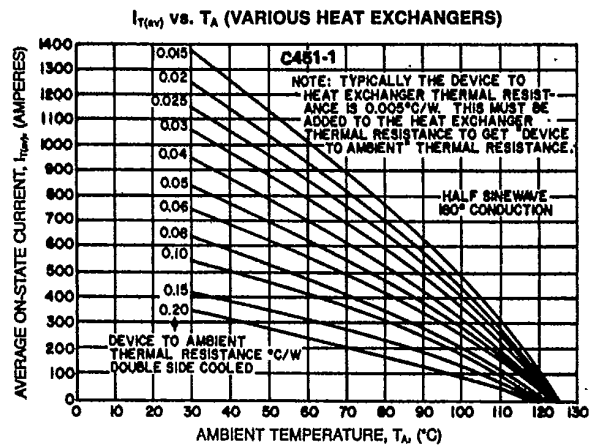
Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

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





Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272

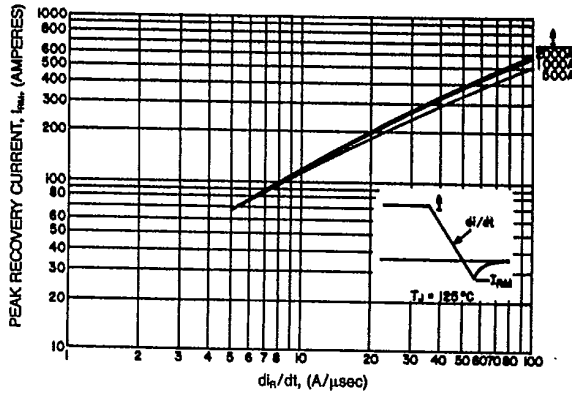
Powerex Europe, S.A., 428 Ave. G. Durand, BP107, 72003 LeMans, France (43) 72.75.15

### C451

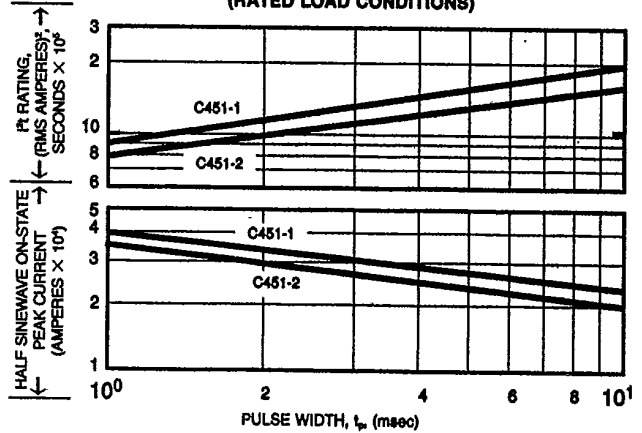
#### Phase Control SCR

1400-1500 Amperes Avg/500-1800 Volts

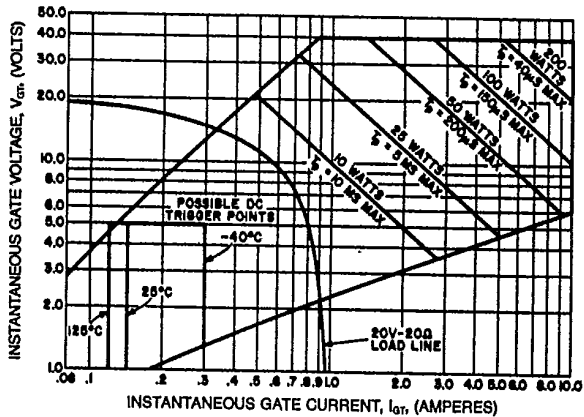
TYPICAL RECOVERY CURRENT



SUB-CYCLE SURGE AND  $I_T$  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.  $T_p$  = rectangular gate current pulse width (5  $\mu$ s min. duration, 1  $\mu$ s max. rise time).
4. Maximum long-term, repetitive anode  $di/dt$  = 75 amps/ $\mu$ s with 20V-20 $\Omega$  gate source.