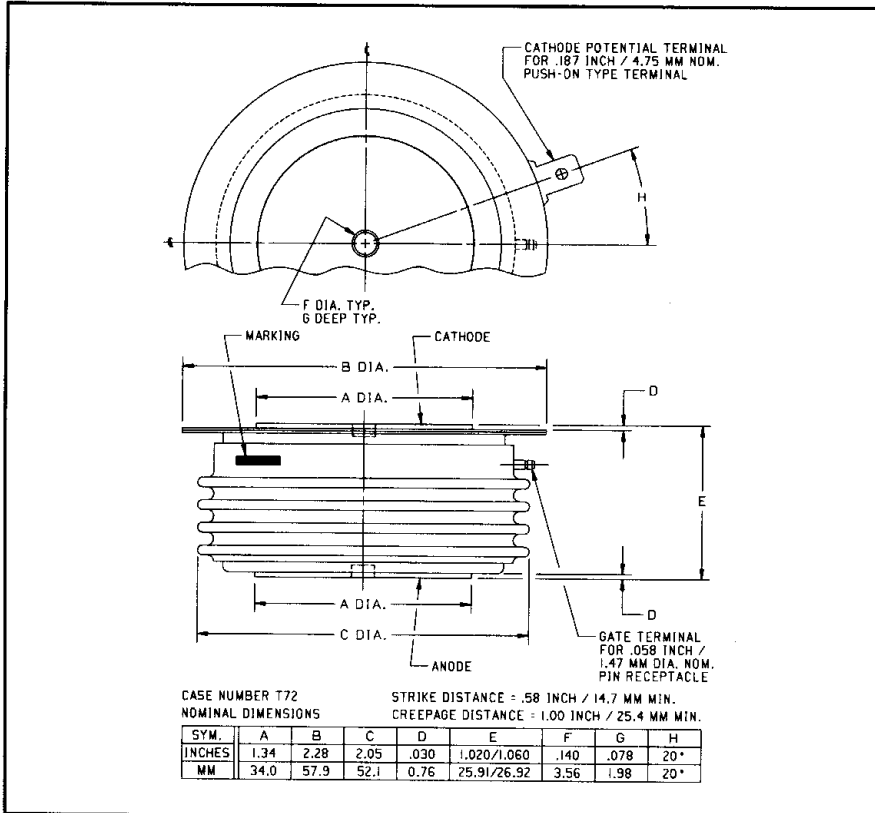


Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (412) 925-7272  
Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

### Phase Control SCR 450 Amperes Average 2400 Volts



C390 (Outline Drawing)



C390 Phase Control SCR  
450 Amperes Average, 2400 Volts

#### Ordering Information:

Select the complete five or six digit part number you desire from the table, i.e. C390LD is a 2400 Volt, 450 Ampere Phase Control SCR.

| Type | Voltage                              |      | Current |
|------|--------------------------------------|------|---------|
|      | V <sub>DRM</sub><br>V <sub>RRM</sub> | Code |         |
| C390 | 600                                  | M    | 450     |
|      | 800                                  | N    |         |
|      | 1000                                 | P    |         |
|      | 1200                                 | PB   |         |
|      | 1400                                 | PD   |         |
|      | 1600                                 | PM   |         |
|      | 1800                                 | PN   |         |
|      | 2000                                 | L    |         |
|      | 2200                                 | LB   |         |
|      | 2400                                 | LD   |         |

#### 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<sup>2</sup>t Ratings

#### Applications:

- ☐ Power Supplies
- ☐ Battery Chargers
- ☐ Motor Control



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**C390**  
**Phase Control SCR**  
450 Amperes Average, 2400 Volts

#### Absolute Maximum Ratings

|                                                               | Symbol              | C390         | Units                  |
|---------------------------------------------------------------|---------------------|--------------|------------------------|
| RMS On-State Current @ $T_C = 73^\circ\text{C}$               | $I_{T(\text{RMS})}$ | 700          | Amperes                |
| Average On-State Current @ $T_C = 73^\circ\text{C}$           | $I_{T(\text{av})}$  | 450          | Amperes                |
| Peak One-Cycle Surge (Non Repetitive) On-State Current (60Hz) | $I_{TSM}$           | 8000         | Amperes                |
| Peak One-Cycle Surge (Non-Repetitive) On-State Current (50Hz) | $I_{TSM}$           | 7600         | Amperes                |
| Critical Rate-of-Rise of On-State Current (Non-Repetitive)    | $di/dt$             | 800          | Amperes/ $\mu\text{s}$ |
| Critical Rate-of-Rise of On-State Current (Repetitive)        | $di/dt$             | 500          | Amperes/ $\mu\text{s}$ |
| $I^2t$ (for Fusing), 8.3 milliseconds                         | $I^2t$              | 265,000      | $\text{A}^2\text{sec}$ |
| Peak Gate Power Dissipation, 40 $\mu\text{sec}$ Pulse         | $P_{GM}$            | 200          | Watts                  |
| Average Gate Power Dissipation                                | $P_{G(\text{av})}$  | 5            | Watts                  |
| Storage Temperature                                           | $T_{STG}$           | -40 to 150   | $^\circ\text{C}$       |
| Operating Temperature                                         | $T_J$               | -40 to 125   | $^\circ\text{C}$       |
| Mounting Force                                                |                     | 2000 to 2500 | lb.                    |
| Mounting Force                                                |                     | 8.9 to 11.1  | kN                     |

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## C390

### Phase Control SCR

450 Amperes Average, 2400 Volts

## Electrical and Thermal Characteristics

| Characteristics                                                         | Symbol          | Test Conditions                                                                                                                                                                                                                                                                                                                      | C390  | Units                        |
|-------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------|
| <b>Voltage—Blocking State Maximums</b>                                  |                 |                                                                                                                                                                                                                                                                                                                                      |       |                              |
| Forward Leakage, Peak                                                   | $I_{DRM}$       | $T_J = 125^\circ\text{C}$ , $V = V_{DRM}$                                                                                                                                                                                                                                                                                            | 45    | mA                           |
| Reverse Leakage, Peak                                                   | $I_{RRM}$       | $T_J = 125^\circ\text{C}$ , $V = V_{RRM}$                                                                                                                                                                                                                                                                                            | 45    | mA                           |
| <b>Current—Conducting State Maximums</b>                                |                 |                                                                                                                                                                                                                                                                                                                                      |       |                              |
| Peak On-State Voltage                                                   | $V_{TM}$        | $T_C = 25^\circ\text{C}$ , $I_{TM} = 3000$ A Peak, Duty Cycle $\leq 0.01\%$                                                                                                                                                                                                                                                          | 2.4   | Volts                        |
| <b>Switching</b>                                                        |                 |                                                                                                                                                                                                                                                                                                                                      |       |                              |
| Typical Turn-Off Time                                                   | $t_q$           | $T_J = 125^\circ\text{C}$ ; $I_{TM} = 500$ Amps; $V_R = 50$ Volts Min.;<br>$V_{DRM}$ (Reapplied); Rate-of-Rise of Reapplied<br>Off-State Voltage = $20\text{V}/\mu\text{sec}$ (linear);<br>Commutation $di/dt = 25$ Amps/ $\mu\text{sec}$ ;<br>Repetition Rate = 1 pps; Gate Bias During<br>Turn-Off Interval = 0 Volts, $100\Omega$ | 125   | $\mu\text{sec}$              |
| Typical Delay Time                                                      | $t_d$           | $T_J = 25^\circ\text{C}$ , $I_{TM} = 50$ Adc, $V_{DRM}$ Rated.<br>Gate Supply: 20 Volts, $20\Omega$ , $0.1 \mu\text{sec}$<br>Max. Rise Time                                                                                                                                                                                          | 0.4   | $\mu\text{sec}$              |
| Min. Critical $dv/dt$ exponential to $V_{DRM}$                          | $dv/dt$         | $T_J = 125^\circ\text{C}$ , Gate Open                                                                                                                                                                                                                                                                                                | 200   | $\text{V}/\mu\text{sec}$     |
| <b>Thermal</b>                                                          |                 |                                                                                                                                                                                                                                                                                                                                      |       |                              |
| Maximum Thermal Resistance,<br>double sided cooling<br>Junction to Case | $R_{\theta JC}$ |                                                                                                                                                                                                                                                                                                                                      | 0.06  | $^\circ\text{C}/\text{Watt}$ |
| Case to Sink, Lubricated                                                | $R_{\theta CS}$ |                                                                                                                                                                                                                                                                                                                                      | 0.020 | $^\circ\text{C}/\text{Watt}$ |
| <b>Gate—Maximum Parameters</b>                                          |                 |                                                                                                                                                                                                                                                                                                                                      |       |                              |
| Gate Current to Trigger                                                 | $I_{GT}$        | $T_J = 25^\circ\text{C}$ , $V_D = 6\text{Vdc}$ , $R_L = 3\Omega$                                                                                                                                                                                                                                                                     | 150   | mA                           |
| Gate Voltage to Trigger                                                 | $V_{GT}$        | $T_J = -40^\circ\text{C}$ to $125^\circ\text{C}$ , $V_D = 6\text{Vdc}$ , $R_L = 3\Omega$                                                                                                                                                                                                                                             | 5     | Volts                        |
| Non-Triggering Gate Voltage                                             | $V_{GDM}$       | $T_C = 125^\circ\text{C}$ , $V_D = \text{Rated}$ , $R_L = 1000\Omega$                                                                                                                                                                                                                                                                | 0.15  | Volts                        |
| Peak Forward Gate Current                                               | $I_{GTM}$       |                                                                                                                                                                                                                                                                                                                                      | 10    | Amperes                      |
| Peak Reverse Gate Voltage                                               | $V_{GRM}$       |                                                                                                                                                                                                                                                                                                                                      | 5     | Volts                        |

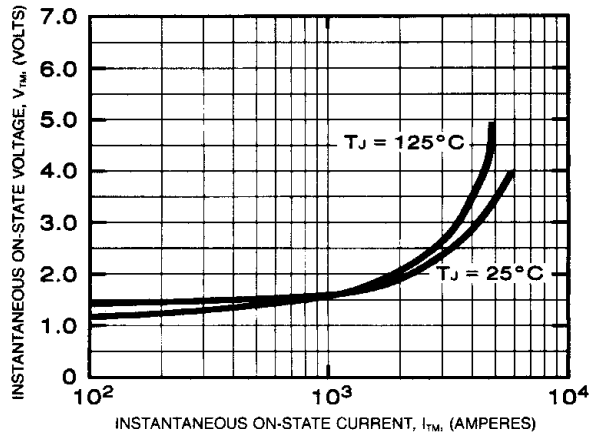
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## C390

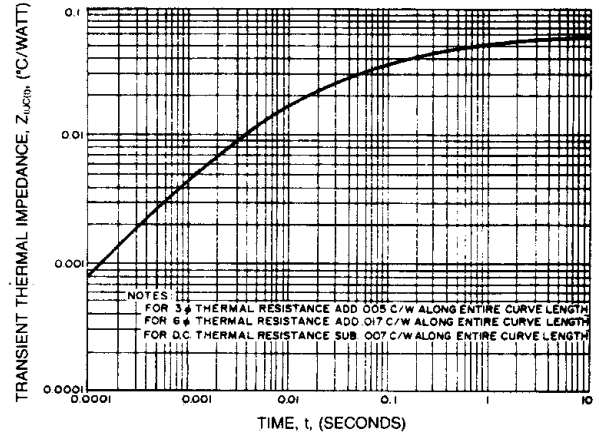
### Phase Control SCR

450 Amperes Average, 2400 Volts

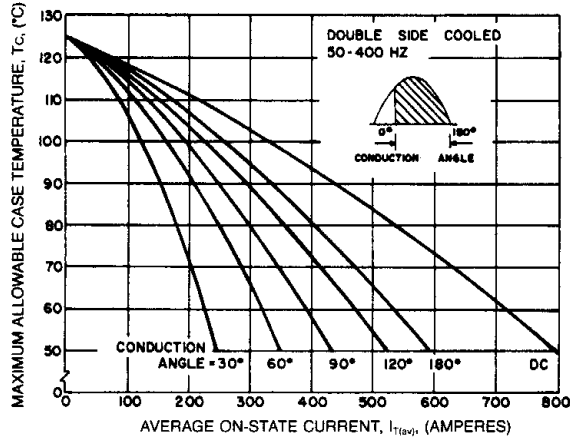
MAXIMUM ON-STATE CHARACTERISTICS



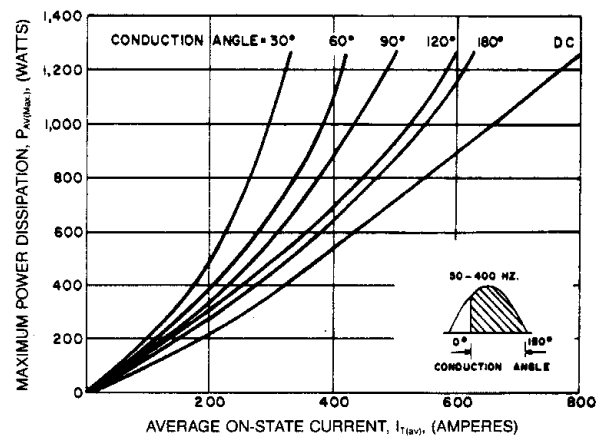
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO CASE)



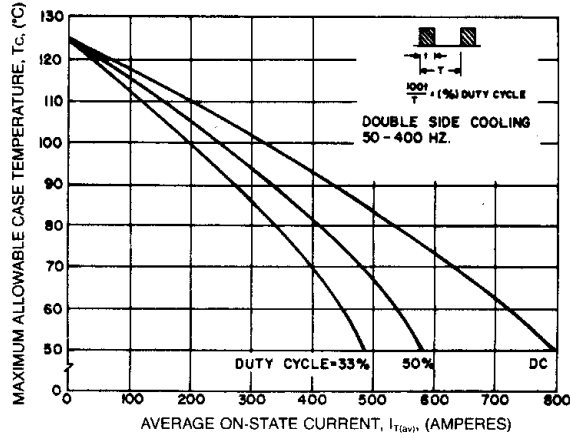
MAXIMUM ALLOWABLE CASE TEMPERATURE (SINUSOIDAL WAVEFORM)



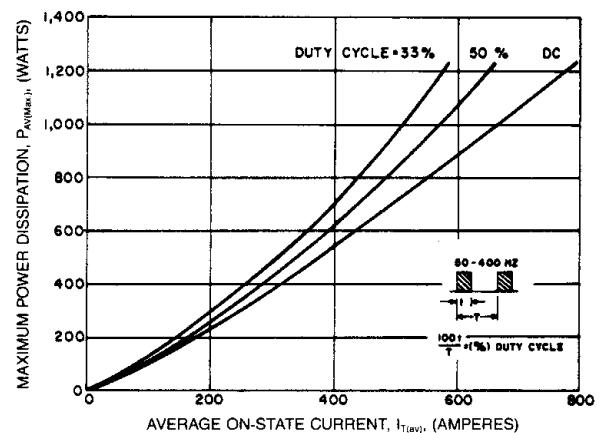
MAXIMUM ON-STATE POWER DISSIPATION (SINUSOIDAL WAVEFORM)



MAXIMUM ALLOWABLE CASE TEMPERATURE (RECTANGULAR WAVEFORM)



MAXIMUM ON-STATE POWER DISSIPATION (RECTANGULAR WAVEFORM)



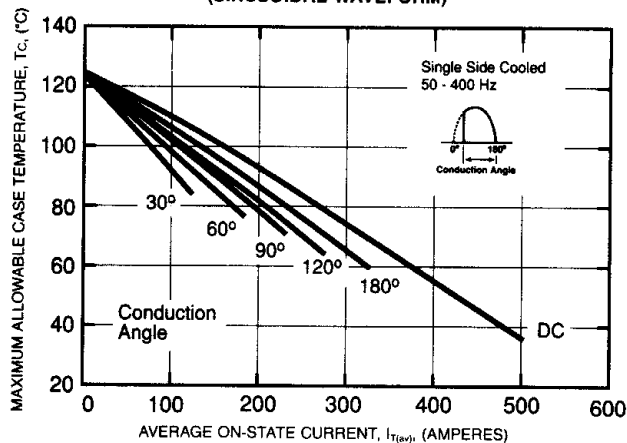
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## C390

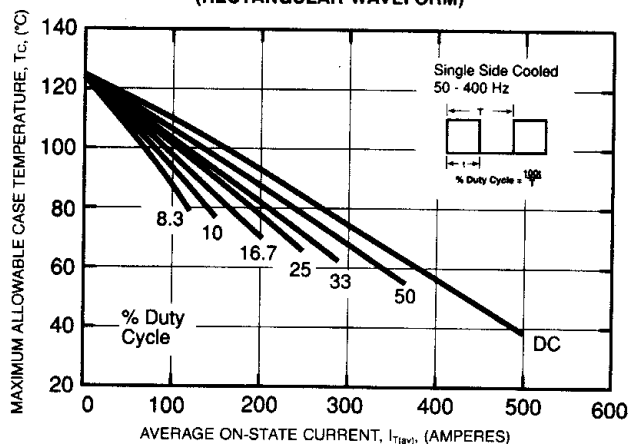
### Phase Control SCR

450 Amperes Average, 2400 Volts

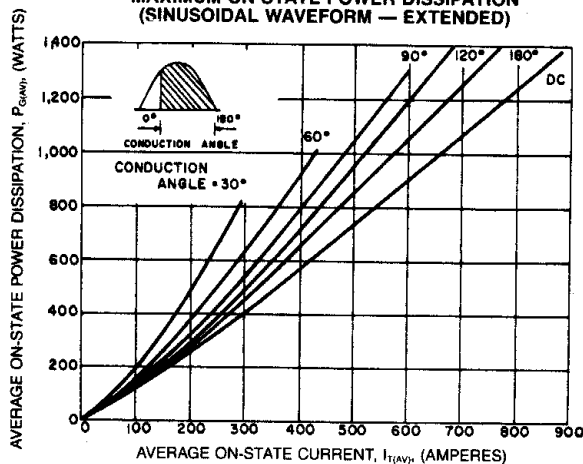
MAXIMUM ALLOWABLE CASE TEMPERATURE  
(SINUSOIDAL WAVEFORM)



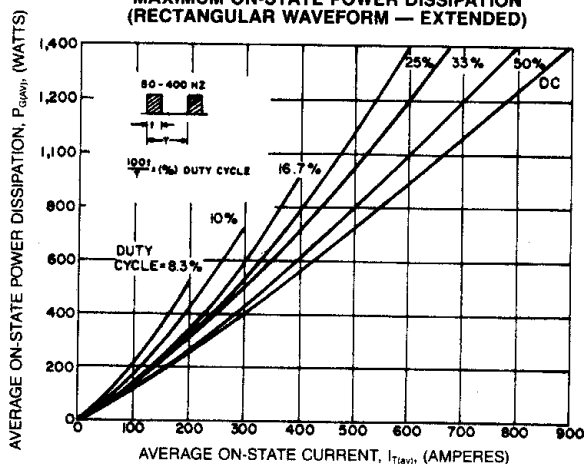
MAXIMUM ALLOWABLE CASE TEMPERATURE  
(RECTANGULAR WAVEFORM)



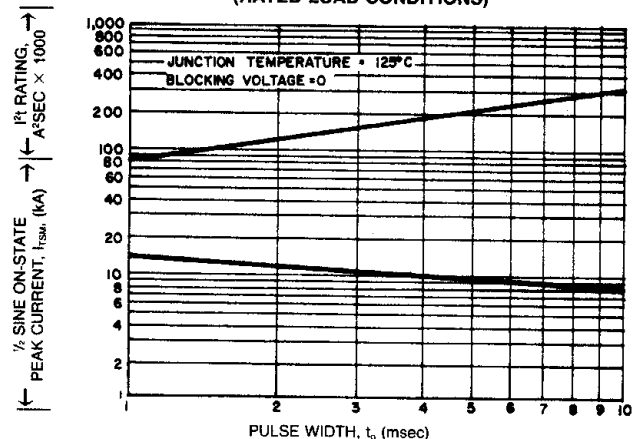
MAXIMUM ON-STATE POWER DISSIPATION  
(SINUSOIDAL WAVEFORM — EXTENDED)



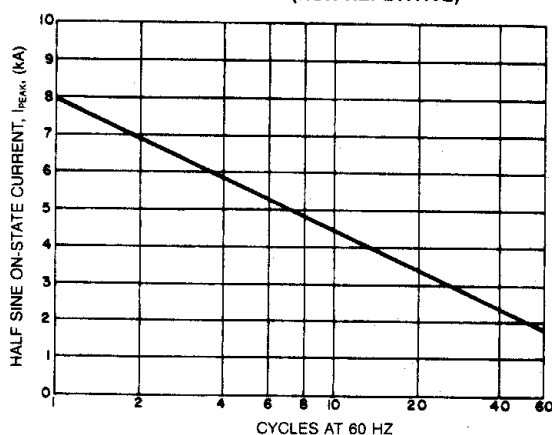
MAXIMUM ON-STATE POWER DISSIPATION  
(RECTANGULAR WAVEFORM — EXTENDED)



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



MAXIMUM ALLOWABLE SURGE ON-STATE  
CURRENT (NON-REPETITIVE)



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C390

Phase Control SCR

450 Amperes Average, 2400 Volts

## GATE CHARACTERISTICS

