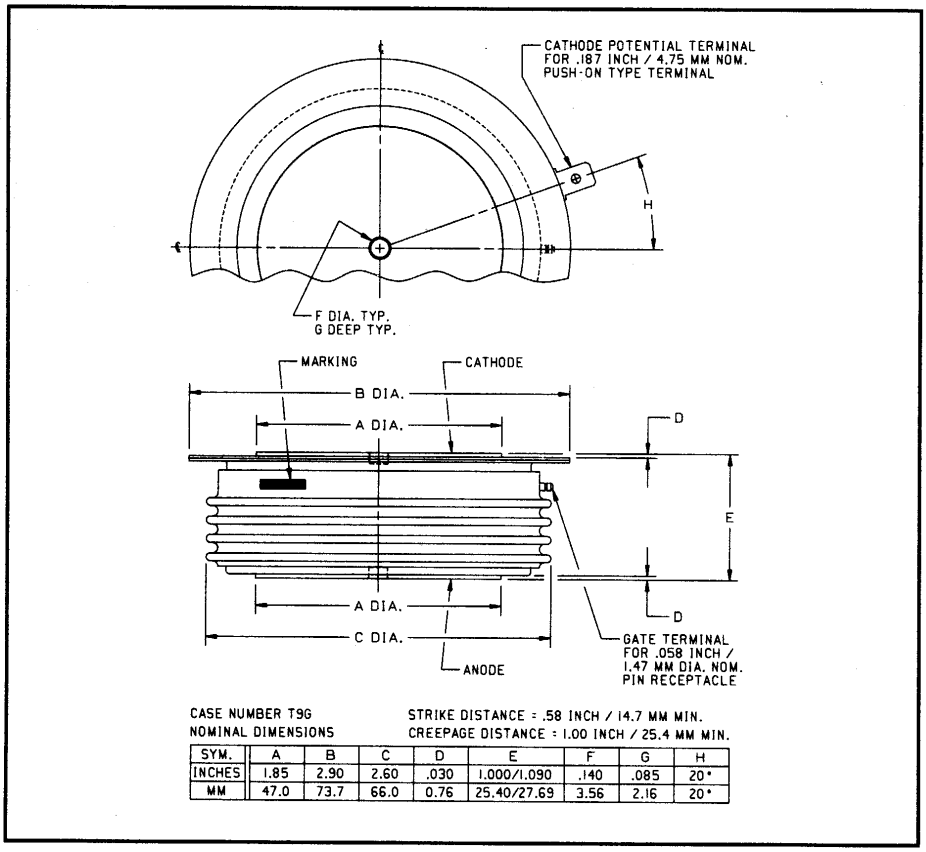
Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (412) 925-7272
Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

# Phase Control SCR
## 1500 Amperes Average
## 2400 Volts




CASE NUMBER T9G
NOMINAL DIMENSIONS

STRIKE DISTANCE = .58 INCH / 14.7 MM MIN.
CREEPAGE DISTANCE = 1.00 INCH / 25.4 MM MIN.

| SYM. | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| INCHES | 1.85 | 2.90 | 2.60 | .030 | 1.000/1.090 | .140 | .085 | 20° |
| MM | 47.0 | 73.7 | 66.0 | 0.76 | 25.40/27.69 | 3.56 | 2.16 | 20° |

**C451** (Outline Drawing)


**C451 Phase Control SCR**
1500 Amperes Average, 2400 Volts

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

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

## Applications:
- ☐ Power Supplies
- ☐ Motor Control
- ☐ VAR Generators

## Ordering Information:
Select the complete five or six digit part number you desire from the table, i.e. C451LD is a 2400 Volt, 1500 Ampere Phase Control SCR.

| Type | Voltage $V_{DRM}$ $V_{RRM}$ | Code | Current $I_{T(av)}$ |
|---|---|---|---|
| C451 | 1400 | PD | 1500 |
| | 1600 | PM | |
| | 1800 | PN | |
| | 2000 | L | |
| | 2200 | LB | |
| | 2400 | LD | |

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## Absolute Maximum Ratings

| Characteristics | Symbol | C451 | Units |
|---|---|---|---|
| Non-repetitive Transient Peak Reverse Voltage | $V_{RSM}$ | $V_{RRM}$ + 100V | Volts |
| RMS On-state Current, $T_C$ = 64°C | $I_{T(rms)}$ | 2350 | Amperes |
| Average Current 180° Sine Wave, $T_C$ = 64°C | $I_{T(av)}$ | 1500 | Amperes |
| RMS On-state Current, $T_C$ = 55°C | $I_{T(rms)}$ | 2590 | Amperes |
| Average Current 180° Sine Wave, $T_C$ = 55°C | $I_{T(av)}$ | 1650 | Amperes |
| Peak One Cycle Surge On-state Current (Non-repetitive) 60Hz | $I_{tsm}$ | 23000 | Amperes |
| Peak One Cycle Surge On-state Current (Non-repetitive) 50Hz | $I_{tsm}$ | 20800 | Amperes |
| Critical Rate-of-rise of On-state Current (Non-repetitive) | di/dt | 400 | A/µsec |
| Critical Rate-of-rise of On-state Current (Repetitive) | di/dt | 75 | A/µsec |
| $I^2t$ (for Fusing) for One Cycle, 60Hz | $I^2t$ | $2.2 \times 10^6$ | $A^2$sec |
| Peak Gate Power Dissipation | $P_{GM}$ | 200 | Watts |
| Average Gate Power Dissipation | $P_{G(av)}$ | 5 | Watts |
| Operating Temperature | $T_j$ | -40 to +125°C | °C |
| Storage Temperature | $T_{stg}$ | -40 to +150°C | °C |
| Approximate Weight | | 1 | lb. |
| | | 454 | g |
| Mounting Force | | 5500 to 6000 | lb. |
| | | 2450 to 2670 | kg. |

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## Electrical Characteristics, $T_j$ = 25°C Unless Otherwise Specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Repetitive Peak Reverse Leakage Current | $I_{RRM}$ | $T_j$ = 125°C, $V_R = V_{RRM}$ | | | 45 | mA |
| Repetitive Peak Forward Leakage Current | $I_{DRM}$ | $T_j$ = 125°C, $V_D = V_{DRM}$ | | | 45 | mA |
| Peak On-state Voltage | $V_{TM}$ | $I_{TM}$ = 3000A Peak<br>Duty Cycle < 0.1% | | | 1.7 | Volts |
| Threshold Voltage, Low-level | $V_{(TO)1}$ | $T_j$ = 125°C, I = 15%, $I_{T(av)}$ to $\pi I_{T(av)}$ | | | 0.87956 | Volts |
| Slope Resistance, Low-level | $r_{T1}$ | | | | 0.2271 | mΩ |
| Threshold Voltage, High-level | $V_{(TO)2}$ | $T_j$ = 125°C, I = $\pi I_{T(av)}$ to $I_{TSM}$ | | | 0.59931 | Volts |
| Slope Resistance, High-level | $r_{T2}$ | | | | 0.2781 | mΩ |
| $V_{TM}$ Coefficients, Low-level | | $T_j$ = 125°C, I = 15% $I_{T(av)}$ to $\pi I_{T(av)}$ | | | | |
| | | | | | $A_1$ = 0.83982 | |
| | | | | | $B_1$ = 4.972E-04 | |
| | | | | | $C_1$ = 2.032E-04 | |
| | | | | | $D_1$ = 0.002154 | |
| $V_{TM}$ Coefficients, High-level | | $T_j$ = 125°C, I = $\pi I_{T(av)}$ to $I_{TSM}$ | | | | |
| | | | | | $A_2$ = 12.127 | |
| | | | | | $B_2$ = -1.8090 | |
| | | | | | $C_2$ = 1.429E-04 | |
| | | | | | $D_2$ = 0.064436 | |
| Typical Delay Time | $t_d$ | $I_T$ = 50A, Gate = 20V, 20Ω,<br>0.1µsec Rise | | 0.7 | | µsec |
| Typical Turn-off Time | $t_q$ | $T_j$ = 125°C, $I_T$ = 2000A,<br>$di_R/dt$ = 25A/µsec Reapplied<br>dv/dt = 200V/µsec Linear to<br>80% $V_{DRM}$, $V_R$ = 50V,<br>Gate = 0V, $R_{GK}$ = 100Ω | | 150 | | µsec |
| Minimum Critical dv/dt - Exponential to $V_{DRM}$ | dv/dt | $T_j$ = 125°C | 400 | | | V/µsec |
| Gate Trigger Current | $I_{GT}$ | $T_j$ = 25°C,<br>$V_D$ = 20$V_{DC}$, $R_L$ = 3Ω | | | 200 | mA |
| Gate Trigger Voltage | $V_{GT}$ | $T_j$ = -40°C to +125°C,<br>$V_D$ = 20V, $R_L$ = 3Ω | | | 5.0 | Volts |
| Non-Triggering Gate Voltage | $V_{GDM}$ | $T_j$ = 125°C,<br>$V_D = V_{DRM}$, $R_L$ = 1000Ω | | | 0.15 | Volts |
| Peak Forward Gate Current | $I_{GTM}$ | | | | 10 | A |
| Peak Reverse Gate Voltage | $V_{GRM}$ | | | | 5 | Volts |

### Thermal Characteristics

| | | | |
|---|---|---|---|
| Maximum Thermal Resistance, Double Sided Cooling | | | |
| Junction-to-Case | $R_{\theta(j-c)}$ | 0.025 | °C/W |
| Case-to-Sink | $R_{\theta(c-s)}$ | 0.0075 | °C/W |

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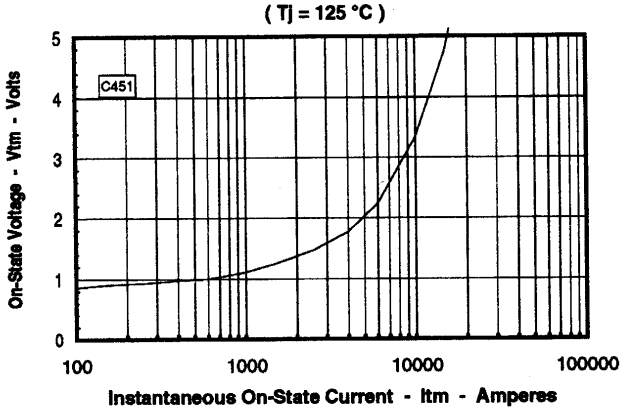
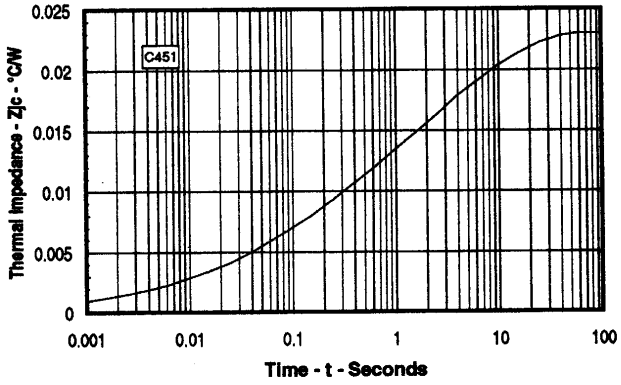
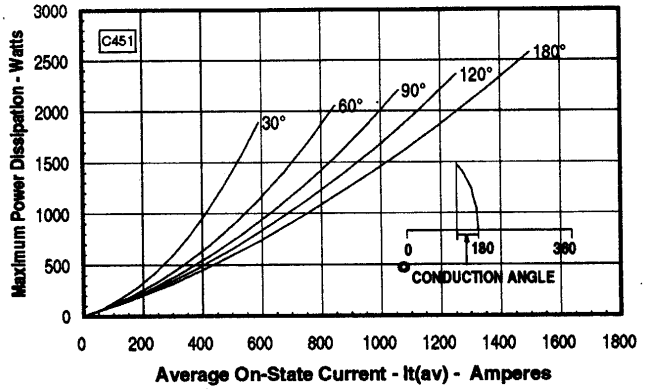
**Maximum On-State Forward Voltage Drop**
**( TJ = 125 °C )**



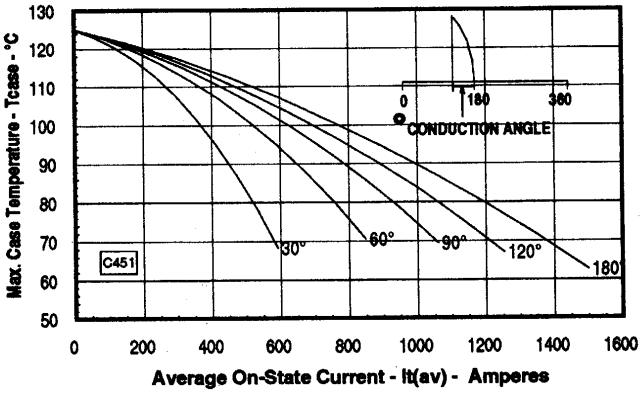

**Maximum Transient Thermal Impedance**
**(Junction to Case)**



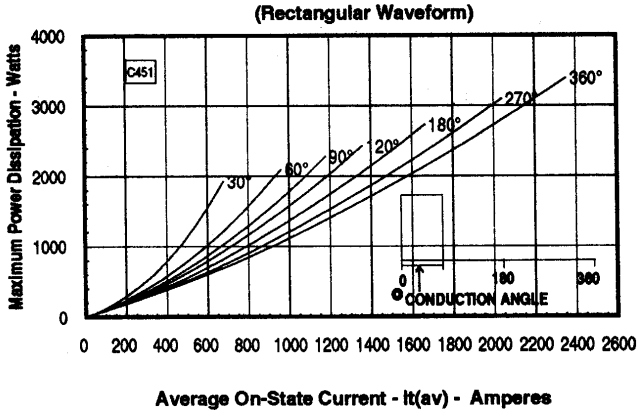

**Maximum On-State Power Dissipation**
**(Sinusoidal Waveform)**




**Maximum Allowable Case Temperature**
**(Sinusoidal Waveform)**




**Maximum On-State Power Dissipation**
**(Rectangular Waveform)**




**Maximum Allowable Case Temperature**
**(Rectangular Waveform)**