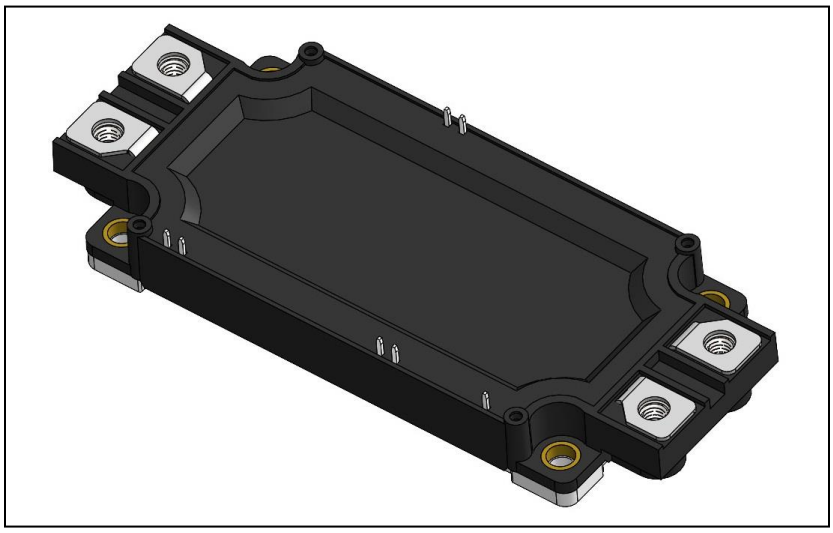
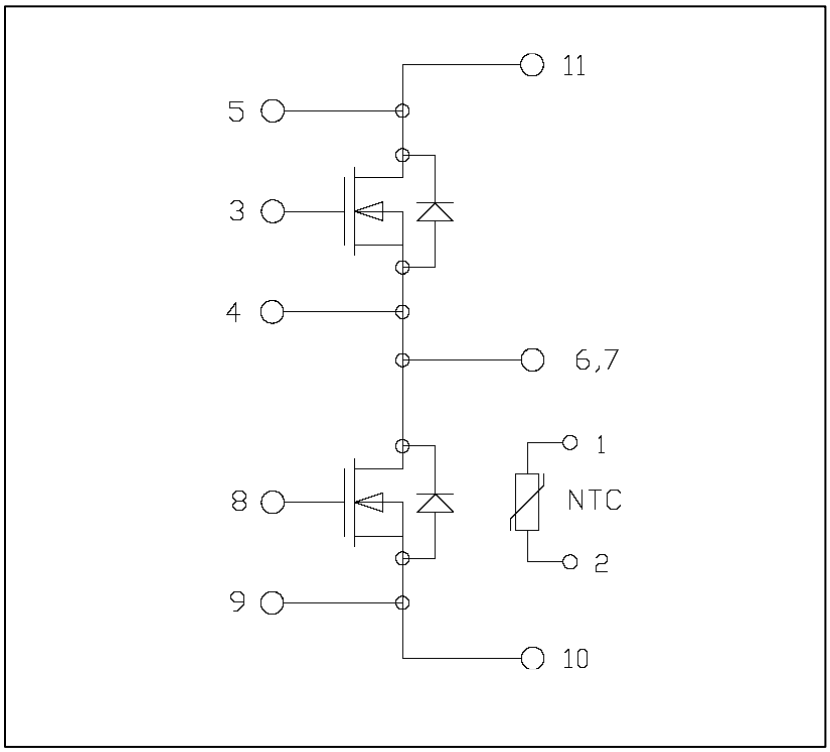
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

***Silicon Carbide***
***Dual MOSFET Module***
***400 Amperes / 1700 Volts / 3.6 mΩ***



## Dual SiC MOSFET Module
## 400 Amperes / 1700 Volts




**Description:**
Powerex Silicon Carbide MOSFET Modules are designed for use in high frequency applications. Each module consists of two MOSFET Silicon Carbide Transistors with each transistor having a reverse connected super-fast recovery free-wheel silicon carbide Schottky diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

**Features:**
☐ Junction Temperature: 175°C
☐ Industry Leading $R_{DS(on)}$
☐ High Speed Switching
☐ Low Switching Losses
☐ Low Capacitance
☐ Low Drive Requirement
☐ High Power Density
☐ Zero Reverse Recovery from Diode
☐ Isolated Baseplate
☐ Aluminum Nitride Isolation

**Applications:**
☐ Energy Saving Power Systems
☐ High Frequency Type Power Systems
☐ High Temperature Power Systems

Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

***Silicon Carbide***
***Dual MOSFET Module***
***400 Amperes / 1700 Volts / 3.6 mΩ***

## Absolute Maximum Ratings, $T_j$ = 25°C unless otherwise specified

| Characteristics | Symbol | QJD1740SA1 | Units |
|---|---|---|---|
| Drain-Source Voltage (G-S Short) | $V_{DSS}$ | 1700 | Volts |
| Gate-Source Voltage, DC, D-S short | $V_{GSS}$ | ±20 | Volts |
| Drain Current (Continuous) at $T_C$=48°C*1 | $I_D$ | 400 | Amperes |
| Drain Current (Pulse, Repetitive)*2 , $T_{vj}$=150°C*3 | $I_{D(pulse)}$ | 600 | Amperes |
| Maximum Power Dissipation ($T_C$=25°C, $T_J$< 175°C) *1 | $P_D$ | 1640 | Watts |
| Maximum Junction Temperature | $T_{J\,max}$ | 175 | °C |
| Operating Junction Temperature, Continuous operation (under switching) | $T_{j\,op}$ | -40 to 150 | °C |
| Maximum Case Temperature*1 | $T_{c\,max}$ | 125 | °C |
| Storage Temperature | $T_{stg}$ | -40 to 125 | °C |
| Mounting Torque, M5 Mounting Screws | _ | 3.5 | N-m |
| Terminal Connection Torque, M6 Terminal Screws | _ | 4.5 | N-m |
| Module Weight (Typical) | _ | 420 | Grams |
| Isolation Voltage | $V_{ISO}$ | 4000 | Volts |

*1 Case temperature ($T_c$) and heat sink temperature ($T_s$) are defined on the each surface (mounting side) of base plate and heat sink under the chips.
*2 Pulse width and repetition rate should be such that device junction temperature ($T_J$) does not exceed $T_{J\,(MAX)}$ rating.
*3 Junction temperature ($T_{vj}$) should not increase beyond $T_{J\,(MAX)}$ rating.

## DC Characteristics, $T_J$=25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Drain Source Leakage Current | $I_{DSS}$ | $V_{DS}$=1700V, $V_{GS}$=-15V | - | - | 1.0 | mA |
| Gate Source Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=15V | - | - | 0.5 | µA |
| Gate Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=10V, $I_D$=150mA | 1.8 | - | 3.2 | Volts |
| Drain Source On-Resistance (chip) | $R_{DS(on)}$ | $V_{GS}$=15V $I_D$=400A | - | 7.3 | - | mΩ |
| | | $T_J$=150°C | - | 10.74 | - | mΩ |
| Internal Gate Source Series Resistance | $R_g$ | Per Switch | - | 0.375 | - | Ω |
| Stray Inductance | $L_s$ | P-N | - | 15 | - | nH |

Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

***Silicon Carbide***
***Dual MOSFET Module***
***400 Amperes / 1700 Volts / 3.6 mΩ***

## Dynamic Characteristics, $T_J$=25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Input Capacitance | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=10V | - | 36.6 | - | nF |
| Output Capacitance | $C_{OSS}$ | | - | 22.6 | - | nF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | - | 1.3 | - | nF |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{DD}$=900V, $V_{GS}$= ±15V<br>$I_D$=400A, $R_G$=1Ω, $T_J$=150°C<br>Inductive Load, per Pulse | - | 200 | - | ns |
| Rise Time | $t_R$ | | - | 50 | - | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | - | 220 | - | ns |
| Fall Time | $t_F$ | | - | 30 | - | ns |
| Turn-On Energy | $E_{on}$ | $V_{DD}$=900V, $V_{GS}$= ±15V<br>$I_D$=400A, $R_G$=1Ω, $T_J$=150°C<br>Inductive Load, per Pulse | - | 21.4 | - | mJ |
| Turn-Off Energy | $E_{off}$ | | - | 6.6 | - | mJ |
| Total Gate Charge | $Q_G$ | $V_{DD}$=900V, $V_{GS}$=0 to 15V<br>$I_D$=400A, $T_j$=25°C | - | 1066 | - | nC |

## Anti-parallel Diode, $T_J$=25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=-15V $I_S$=400A | - | 1.64 | - | V |
| | | $T_J$=150°C | - | 2.52 | - | V |

## Thermal Resistance Characteristics

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{th(j-c)}$ | Per MOSFET | - | - | 0.091 | °C/W |
| Thermal Resistance, Junction to Case | $R_{th(j-c)}$ | Per Diode | - | - | 0.098 | °C/W |
| Contact Thermal Resistance | $R_{th(c-s)}$ | Per Module, Thermal Grease Applied<br>λ=0.9 W/(mK) | - | 0.015 | - | °C/W |

## NTC Thermistor Part

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Zero Power Resistance | $R_{25}$ | $T_C$=25°C | 4.85 | 5.00 | 5.15 | kΩ |
| Deviation of Resistance | ΔR/R | $T_C$=100°C, $R_{100}$=493Ω | -7.3 | - | +7.8 | % |
| B constant | $B_{(25/50)}$ | $B_{(25/50)}=\ln(R_{25}/R_{50}) / (1/T_{25} - 1/T_{50})$*4 | __ | 3375 | __ | K |
| Power Dissipation | $P_{25}$ | $T_C$=25°C | __ | __ | 10 | mW |

*4 R25: Resistance at Absolute Temperature T25 (K), R50: Resistance at Absolute Temperature T50 (K), T25 = 25(°C) + 273.15 = 298.15(K), T50 = 50(°C) + 273.15 = 323.15(K)

Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

***Silicon Carbide***
***Dual MOSFET Module***
***400 Amperes / 1700 Volts / 3.6 mΩ***