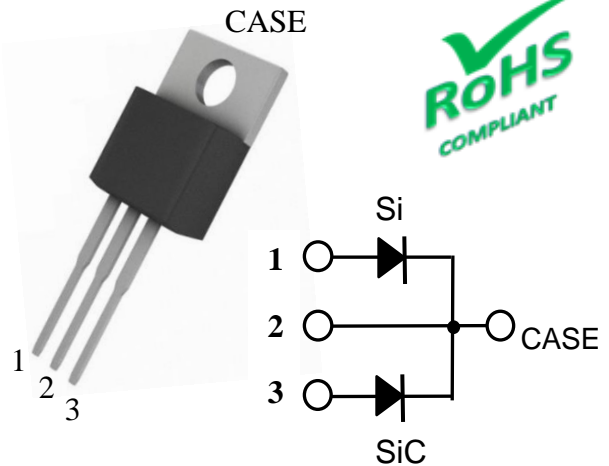


Features

- Co-packaged surge bypass diode
- 175°C SiC maximum operating junction temperature
- Extremely fast switching not dependent on temperature
- Essentially no reverse or forward recovery
- Positive temperature coefficient for safe operation and ease of paralleling
- RoHS compliant

Typical Applications

- Power converters
- Switching-mode power supplies
- Power factor correction modules

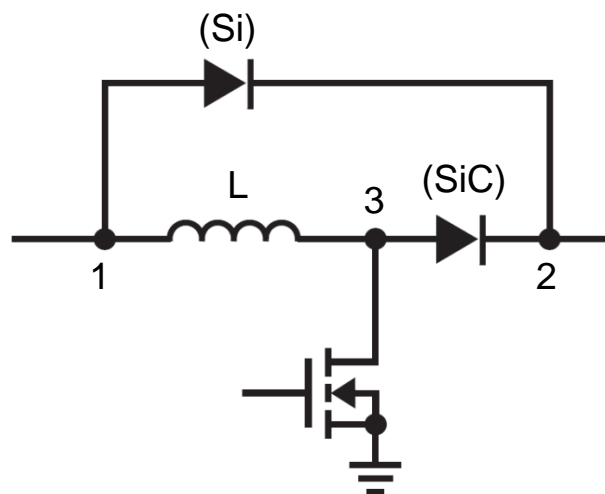


| Part Number | Package | Marking |
|-------------------|-----------------|-------------------|
| UJDS06510T | TO-220-3 | UJDS06510T |

Descriptions

United Silicon Carbide, Inc offers the xR series of high-performance SiC Schottky diodes. With zero reverse recovery charge and 175°C maximum junction temperature, USCI's diodes are ideally suited for high-frequency and high-efficiency power systems with minimum cooling requirements. This product co-packages a surge bypass silicon diode to reduce component count in PFC circuits.

Typical Connection in a PFC Circuit



Maximum Ratings

SiC Schottky Diode

| Parameter | Symbol | Test Conditions | Value | Units |
|---|----------------|--|------------|------------------|
| DC Blocking Voltage | V_{DC} | | 650 | V |
| Repetitive Peak Reverse Voltage, $T_j=25^\circ\text{C}$ | V_{RRM} | | 650 | V |
| Surge Peak Reverse Voltage | V_{RSM} | | 650 | V |
| Maximum DC Forward Current | I_F | $T_C = 138^\circ\text{C}$ | 10 | A |
| Non-Repetitive Forward Surge Current | I_{FSM} | $T_C = 25^\circ\text{C}$, 8.3ms Half Sine Pulse | 50 | A |
| Non-Repetitive Peak Forward Current | $I_{F,max}$ | $T_C = 25^\circ\text{C}$, 10 μs | 455 | A |
| Non-Repetitive Avalanche Energy | E_{AS} | $T_j = 25^\circ\text{C}$, $L = 5\text{mH}$, $I_{pk}=5.5\text{A}$, $V_{DD}=100\text{V}$ | 84 | mJ |
| Power Dissipation | P_{Tot} | $T_C = 25^\circ\text{C}$ | 93 | W |
| | | $T_C = 138^\circ\text{C}$ | 23 | |
| Maximum Junction Temperature | $T_{J,max}$ | | 175 | $^\circ\text{C}$ |
| Operating and Storage Temperature | T_j, T_{STG} | | -55 to 175 | $^\circ\text{C}$ |

Si Diode

| Parameter | Symbol | Test Conditions | Value | Units |
|---|----------------|---|------------|------------------|
| DC Blocking Voltage | V_{DC} | | 600 | V |
| Repetitive Peak Reverse Voltage, $T_j=25^\circ\text{C}$ | V_{RRM} | | 600 | V |
| Surge Peak Reverse Voltage | V_{RSM} | | 600 | V |
| Maximum DC Forward Current | I_F | $T_C = 150^\circ\text{C}$ | 10 | A |
| Non-Repetitive Forward Surge Current | I_{FSM} | $T_C = 25^\circ\text{C}$, 8.3ms Half Sine Pulse | 100 | A |
| Non-Repetitive Peak Forward Current | $I_{F,max}$ | $T_C = 25^\circ\text{C}$, 10 μs | 750 | A |
| Power Dissipation | P_{Tot} | $T_C = 25^\circ\text{C}$ | 107 | W |
| | | $T_C = 150^\circ\text{C}$ | 17 | |
| Maximum Junction Temperature | $T_{J,max}$ | | 175 | $^\circ\text{C}$ |
| Operating and Storage Temperature | T_j, T_{STG} | | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | symbol | Component | Value | | | Units |
|--------------------|-----------------|-----------|-------|-----|-----|---------------------------|
| | | | Min | Typ | Max | |
| Thermal Resistance | $R_{\theta JC}$ | SiC Diode | | | 1.6 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance | $R_{\theta JC}$ | Si Diode | | | 1.4 | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics

SiC Schottky Diode ($T_J = +25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Conditions | Value | | | Units |
|-------------------------|--------|---|-------|------|------|---------------|
| | | | Min | Typ | Max | |
| Forward Voltage | V_F | $I_F = 10\text{A}, T_J = 25^\circ\text{C}$ | - | 1.5 | 1.7 | V |
| | | $I_F = 10\text{A}, T_J = 150^\circ\text{C}$ | - | 1.8 | 2.1 | |
| | | $I_F = 10\text{A}, T_J = 175^\circ\text{C}$ | - | 1.95 | 2.25 | |
| Reverse Current | I_R | $V_R = 650\text{V}, T_J = 25^\circ\text{C}$ | - | 25 | 250 | μA |
| | | $V_R = 650\text{V}, T_J = 175^\circ\text{C}$ | - | 50 | 800 | |
| Total Capacitive Charge | Q_C | $V_R = 400\text{V}, I_F = 10\text{A},$ $di/dt = 250\text{A}/\mu\text{s}$ | | 16 | | nC |
| Total Capacitance | C | $V_R = 1\text{V}, f = 1\text{MHz}$ | | 290 | | pF |
| | | $V_R = 300\text{V}, f = 1\text{MHz}$ | | 31 | | |
| | | $V_R = 600\text{V}, f = 1\text{MHz}$ | | 28 | | |

Si Diode ($T_J = +25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Conditions | Value | | | Units |
|-----------------------|----------|---|-------|------|------|---------------|
| | | | Min | Typ | Max | |
| Forward Voltage | V_F | $I_F = 10\text{A}, T_J = 25^\circ\text{C}$ | - | 1.4 | - | V |
| | | $I_F = 10\text{A}, T_J = 150^\circ\text{C}$ | - | 1.16 | 1.38 | |
| | | $I_F = 10\text{A}, T_J = 175^\circ\text{C}$ | - | 1.12 | 1.34 | |
| Reverse Current | I_R | $V_R = 600\text{V}, T_J = 25^\circ\text{C}$ | - | - | 10 | μA |
| | | $V_R = 600\text{V}, T_J = 150^\circ\text{C}$ | - | - | 250 | |
| Reverse Recovery Time | t_{rr} | $V_R = 30\text{V}, I_F = 1\text{A},$ $di/dt = 50\text{A}/\mu\text{s},$ Ramp Recovery | - | - | 75 | ns |
| | | $V_R = 30\text{V}, I_F = 1\text{A},$ $di/dt = 100\text{A}/\mu\text{s},$ Ramp Recovery | - | 35 | - | |

Typical Performance
SiC Schottky Diode

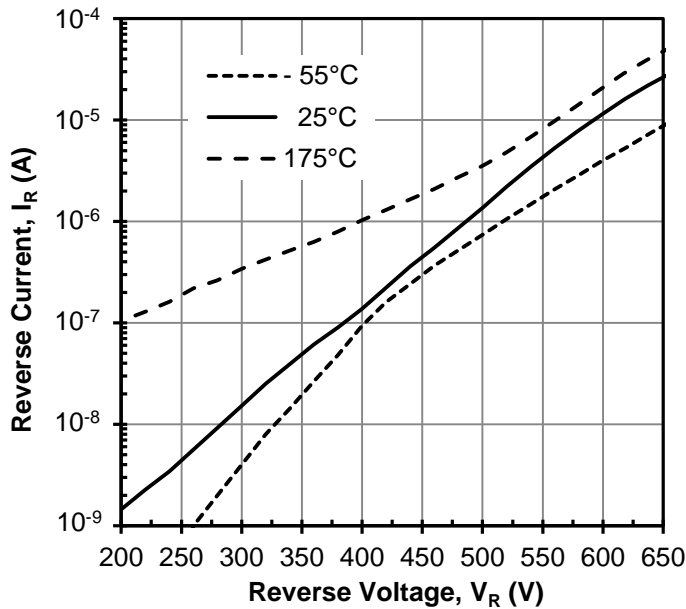


Figure 1 Typical reverse characteristics

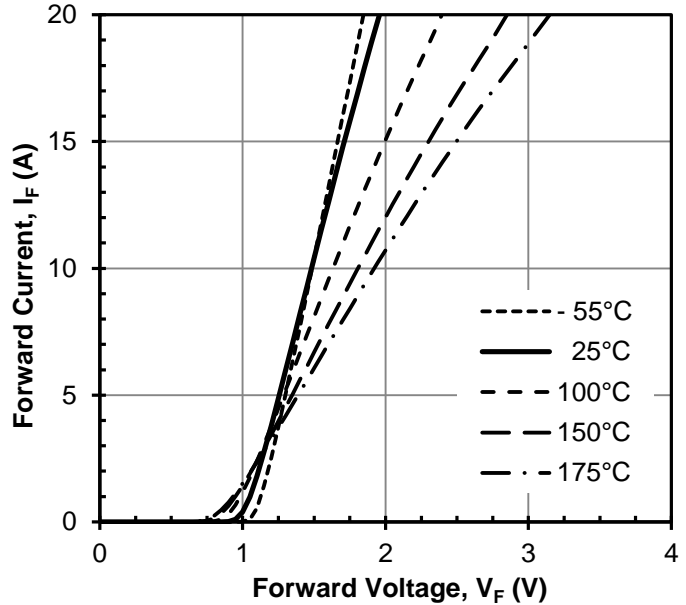


Figure 2 Typical forward characteristics

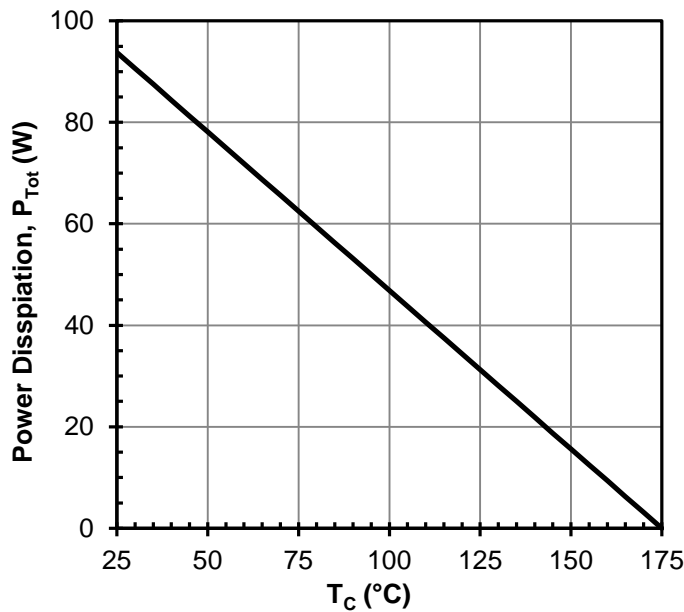


Figure 3 Power dissipation

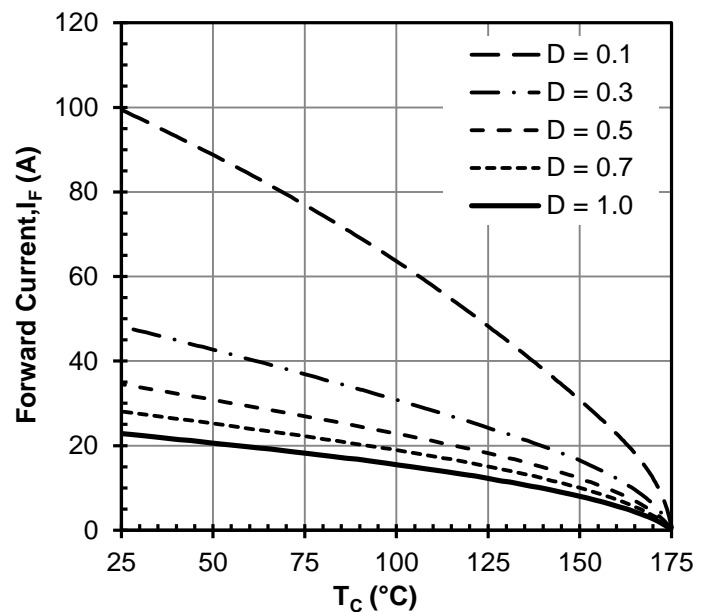


Figure 4 Diode forward current

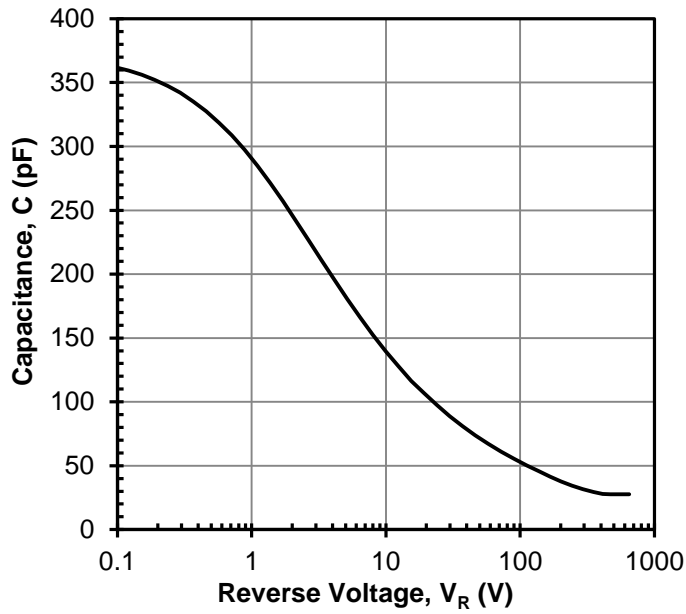


Figure 5 Capacitance vs. reverse voltage

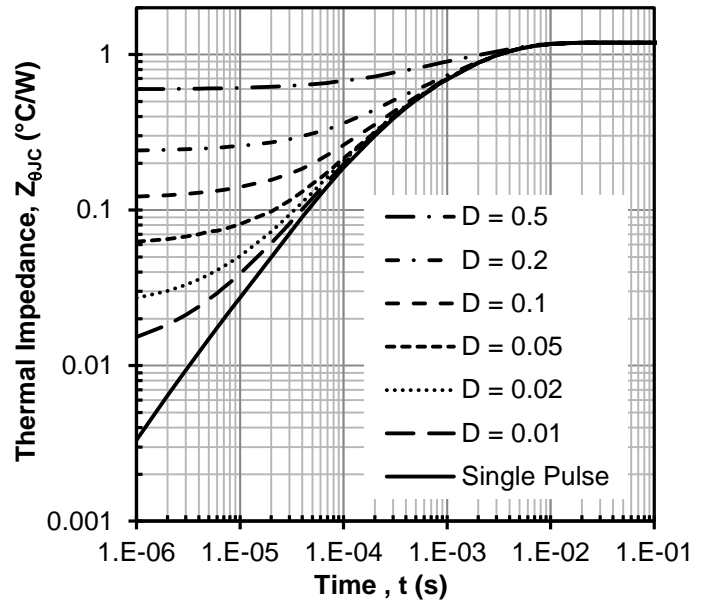


Figure 6 Transient thermal impedance

Si Diode

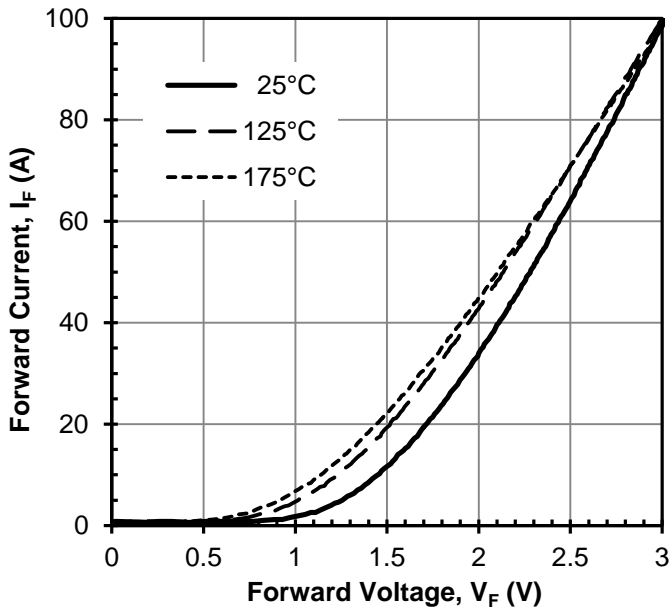
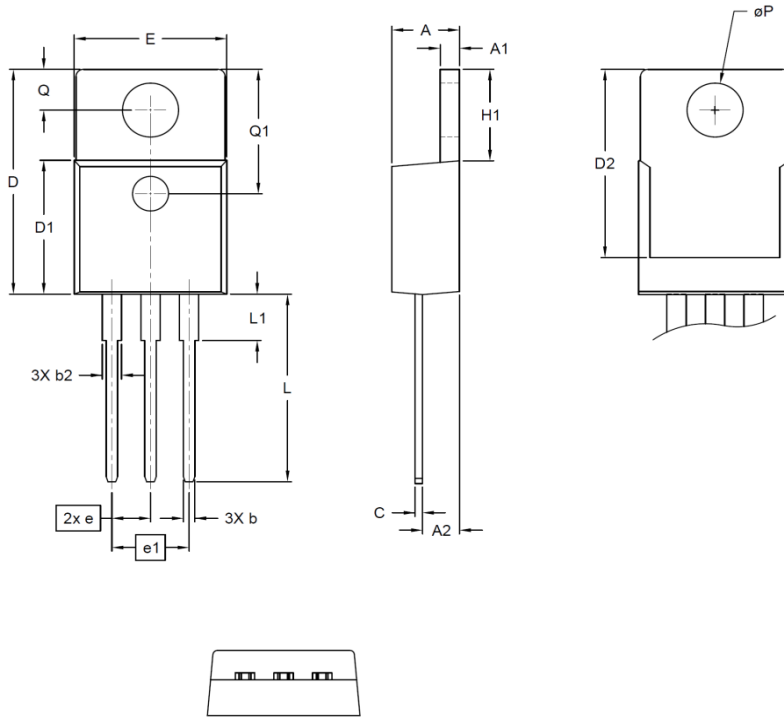


Figure 7 Typical forward characteristics

Mechanical Characteristics



| | INCH | | | MILLIMETER | | |
|----|-----------|------|------|------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | .140 | .175 | .190 | 3.56 | 4.45 | 4.83 |
| A1 | .020 | .050 | .055 | 0.51 | 1.27 | 1.40 |
| A2 | .080 | .096 | .115 | 2.03 | 2.44 | 2.92 |
| b | .015 | .030 | .040 | 0.38 | 7.62 | 1.02 |
| b2 | .040 | .050 | .070 | 1.02 | 1.27 | 1.78 |
| C | .014 | .019 | .030 | 0.36 | 0.48 | 0.76 |
| D | .560 | .605 | .650 | 14.22 | 15.37 | 16.51 |
| D1 | .330 | .360 | .370 | 8.38 | 9.14 | 9.40 |
| D2 | .480 | .507 | .517 | 12.19 | 12.88 | 13.13 |
| E | .380 | .386 | .420 | 9.65 | 9.80 | 10.67 |
| e | .100 BSC. | | | 2.54 BSC. | | |
| e1 | .200 BSC. | | | 5.08 BSC. | | |
| L | .495 | .505 | .580 | 12.57 | 12.82 | 14.73 |
| L1 | ---- | .125 | .250 | ---- | 3.18 | 6.35 |
| ØP | .139 | .145 | .161 | 3.53 | 3.68 | 4.09 |
| H1 | .230 | .245 | .270 | 5.84 | 6.22 | 6.86 |
| Q | .100 | .110 | .135 | 2.54 | 2.79 | 3.43 |
| Q1 | .330 | .335 | .340 | 8.38 | 8.51 | 8.64 |

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