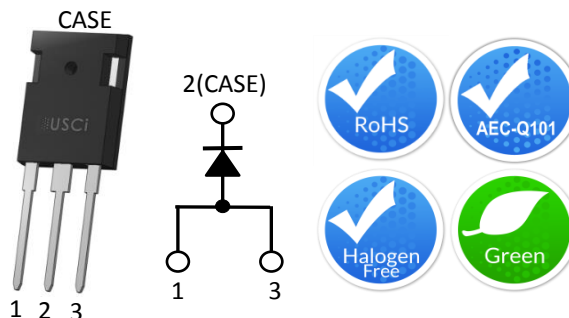


## Description

United Silicon Carbide, Inc. offers the 3<sup>rd</sup> generation of high performance SiC Merged-PiN-Schottky (MPS) diodes. With zero reverse recovery charge and 175°C maximum junction temperature, these diodes are ideally suited for high frequency and high efficiency power systems with minimum cooling requirements.



| Part Number | Package   | Marking   |
|-------------|-----------|-----------|
| UJ3D1250K   | TO-247-3L | UJ3D1250K |

## Features

- ♦ 175°C maximum operating junction temperature
- ♦ Easy paralleling
- ♦ Extremely fast switching not dependent on temperature
- ♦ No reverse or forward recovery
- ♦ Enhanced surge current capability, MPS structure
- ♦ 100% UIS tested
- ♦ AEC-Q101 qualified

## Typical Applications

- ♦ Power converters
- ♦ Industrial motor drives
- ♦ Switching-mode power supplies
- ♦ Power factor correction modules

## Maximum Ratings

| Parameter                                                      | Symbol            | Test Conditions                                   | Value      | Units                |
|----------------------------------------------------------------|-------------------|---------------------------------------------------|------------|----------------------|
| DC blocking voltage                                            | $V_R$             |                                                   | 1200       | V                    |
| Repetitive peak reverse voltage, $T_J=25^\circ\text{C}$        | $V_{RRM}$         |                                                   | 1200       | V                    |
| Surge peak reverse voltage                                     | $V_{RSM}$         |                                                   | 1200       | V                    |
| Maximum DC forward current                                     | $I_F$             | $T_C = 112^\circ\text{C}$                         | 50         | A                    |
| Non-repetitive forward surge current<br>sine halfwave          | $I_{FSM}$         | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ms}$    | 275        | A                    |
| Repetitive forward surge current<br>sine halfwave, $D=0.1$     | $I_{FRM}$         | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ms}$    | 163.5      | A                    |
|                                                                |                   | $T_C = 110^\circ\text{C}$ , $t_p = 10\text{ms}$   | 99.6       |                      |
| Non-repetitive peak forward current                            | $I_{F,max}$       | $T_C = 25^\circ\text{C}$ , $t_p = 10\mu\text{s}$  | 2400       | A                    |
|                                                                |                   | $T_C = 110^\circ\text{C}$ , $t_p = 10\mu\text{s}$ | 2400       |                      |
| $i^2t$ value                                                   | $\int i^2 dt$     | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ms}$    | 378        | $\text{A}^2\text{s}$ |
| Power dissipation                                              | $P_{Tot}$         | $T_C = 25^\circ\text{C}$                          | 319        | W                    |
|                                                                |                   | $T_C = 112^\circ\text{C}$                         | 134        |                      |
| Maximum junction temperature                                   | $T_{J,max}$       |                                                   | 175        | $^\circ\text{C}$     |
| Operating and storage temperature                              | $T_J$ , $T_{STG}$ |                                                   | -55 to 175 | $^\circ\text{C}$     |
| Soldering temperatures, wavesoldering only<br>allowed at leads | $T_{sold}$        | 1.6mm from case for<br>10s                        | 260        | $^\circ\text{C}$     |

## Electrical Characteristics

$T_J = +25^\circ\text{C}$  unless otherwise specified

| Parameter                              | Symbol | Test Conditions                               | Value |      |      | Units         |
|----------------------------------------|--------|-----------------------------------------------|-------|------|------|---------------|
|                                        |        |                                               | Min   | Typ  | Max  |               |
| Forward voltage                        | $V_F$  | $I_F = 50\text{A}, T_J = 25^\circ\text{C}$    | -     | 1.5  | 1.7  | V             |
|                                        |        | $I_F = 50\text{A}, T_J = 150^\circ\text{C}$   | -     | 1.95 | 2.4  |               |
|                                        |        | $I_F = 50\text{A}, T_J = 175^\circ\text{C}$   | -     | 2.2  | 2.7  |               |
| Reverse current                        | $I_R$  | $V_R = 1200\text{V}, T_J = 25^\circ\text{C}$  | -     | 500  | 1250 | $\mu\text{A}$ |
|                                        |        | $V_R = 1200\text{V}, T_J = 175^\circ\text{C}$ | -     | 3500 |      |               |
| Total capacitive charge <sup>(1)</sup> | $Q_C$  | $V_R = 800\text{V}$                           |       | 240  |      | nC            |
| Total capacitance                      | C      | $V_R = 1\text{V}, f = 1\text{MHz}$            |       | 2340 |      | pF            |
|                                        |        | $V_R = 400\text{V}, f = 1\text{MHz}$          |       | 224  |      |               |
|                                        |        | $V_R = 800\text{V}, f = 1\text{MHz}$          |       | 198  |      |               |
| Capacitance stored energy              | $E_C$  | $V_R = 800\text{V}$                           |       | 72   |      | $\mu\text{J}$ |

(1)  $Q_C$  is independent on  $T_J$ ,  $di_F/dt$ , and  $I_F$  as shown in the application note USCi\_AN0011.

## Thermal characteristics

| Parameter                           | symbol          | Test Conditions | Value |      |      | Units              |
|-------------------------------------|-----------------|-----------------|-------|------|------|--------------------|
|                                     |                 |                 | Min   | Typ  | Max  |                    |
| Thermal resistance, junction - case | $R_{\theta JC}$ |                 |       | 0.36 | 0.47 | $^\circ\text{C/W}$ |

## Typical Performance

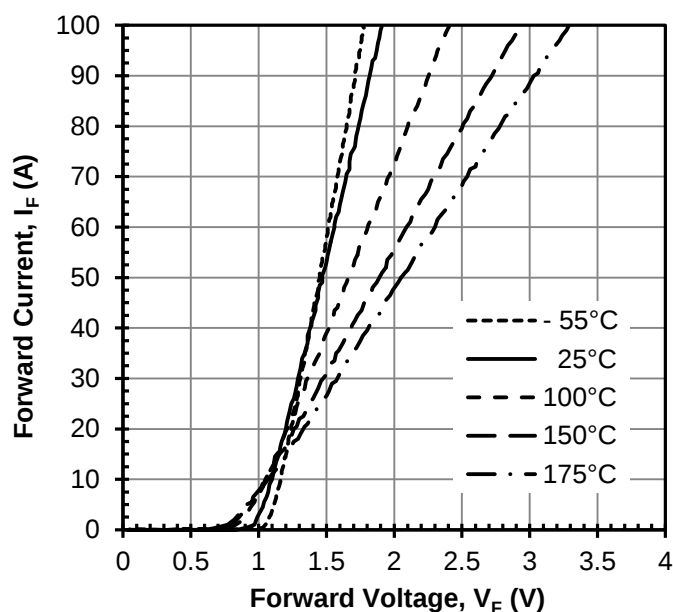


Figure 1 Typical forward characteristics

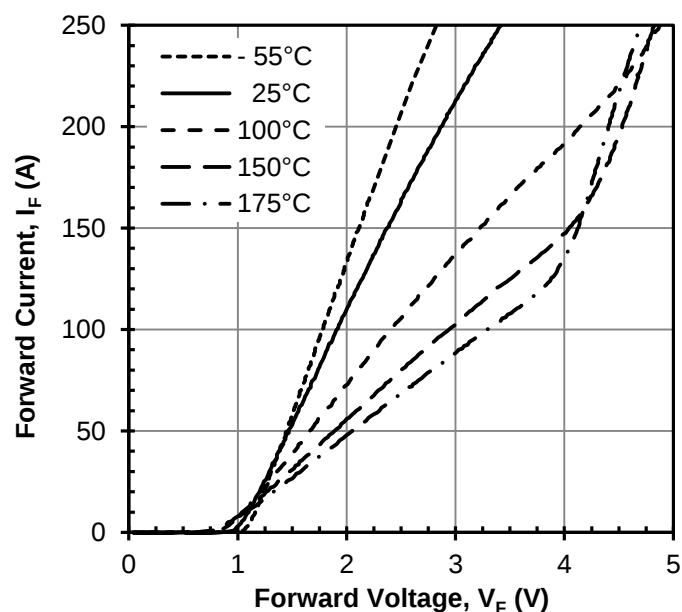
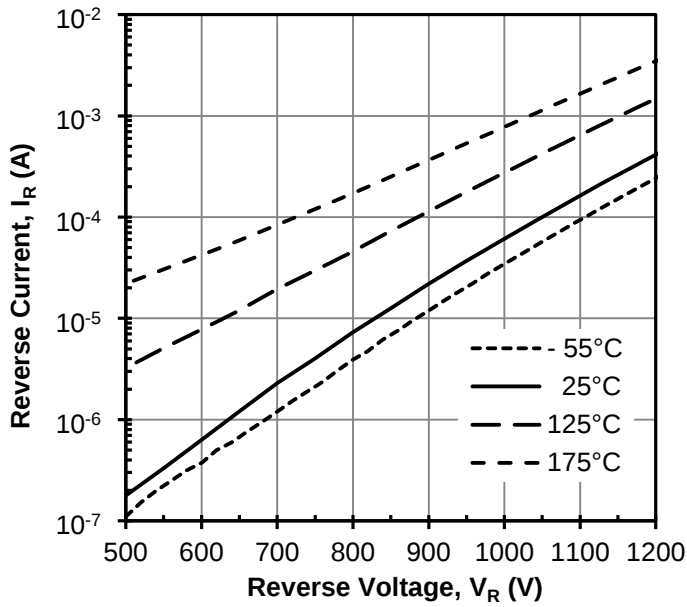
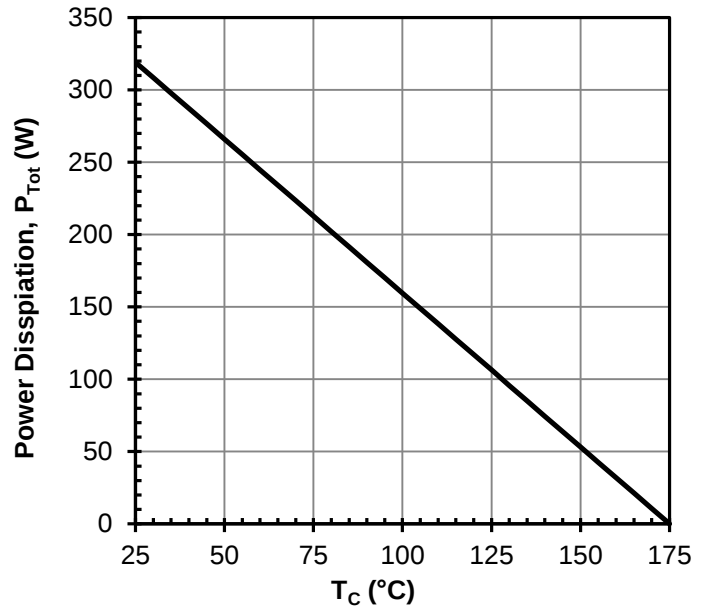


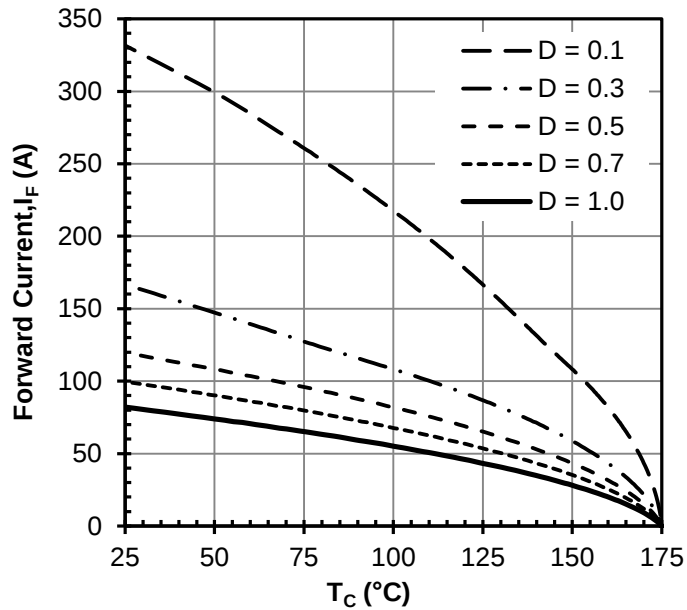
Figure 2 Typical forward characteristics in surge current



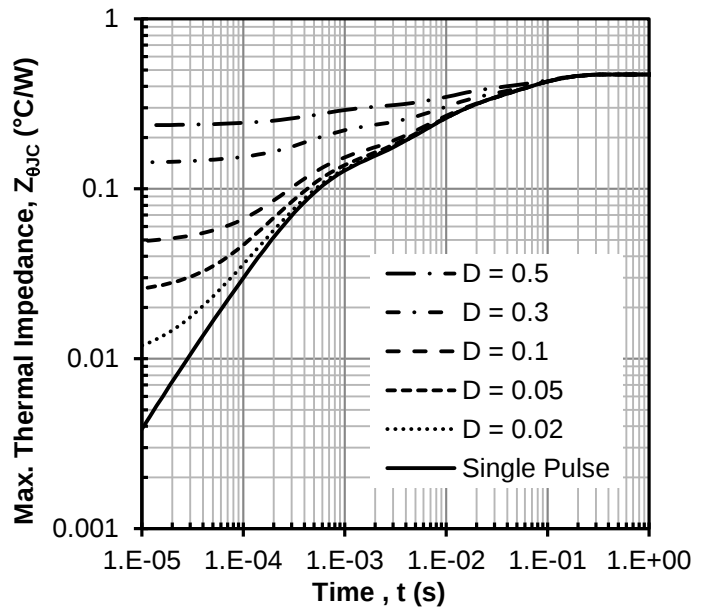
**Figure 3 Typical reverse characteristics**



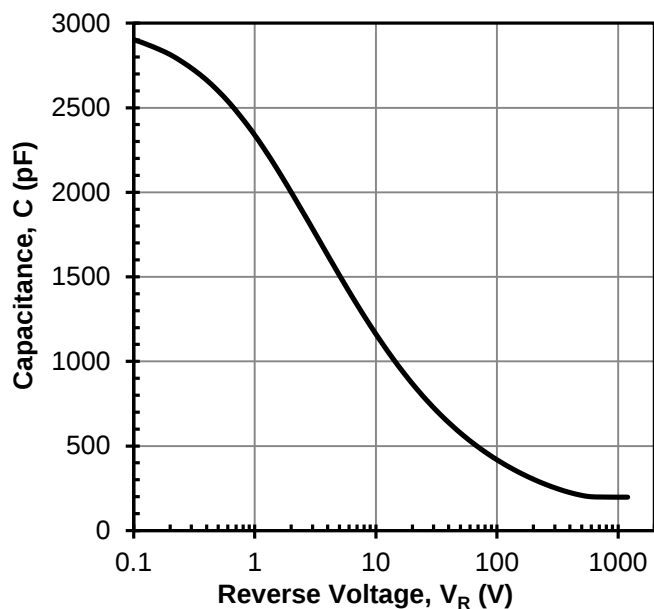
**Figure 4 Power dissipation**



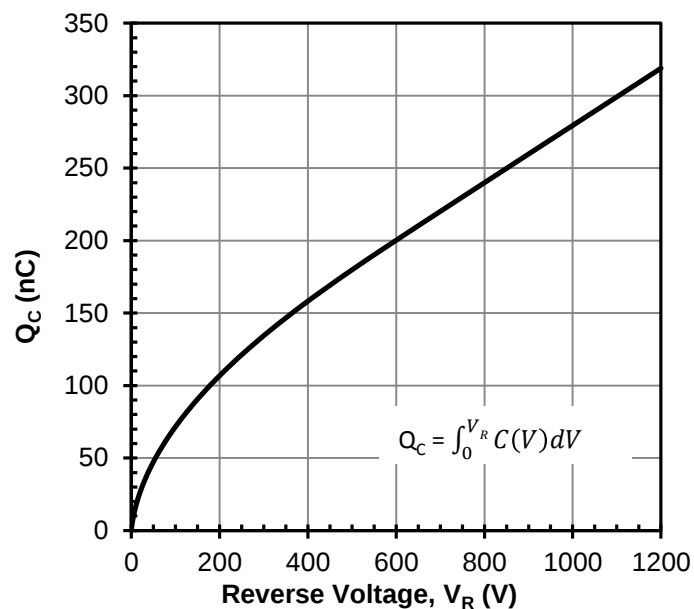
**Figure 5 Diode forward current**



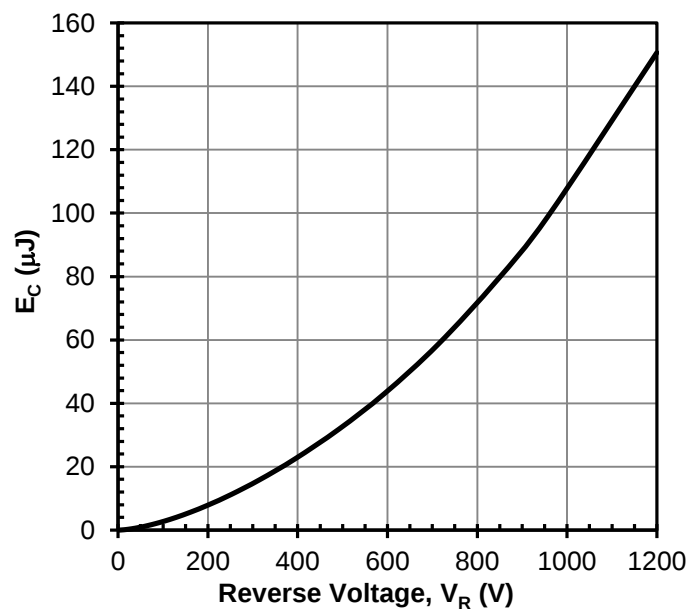
**Figure 6 Maximum transient thermal impedance**



**Figure 7** Capacitance vs. reverse voltage at 1MHz



**Figure 8** Typical capacitive charge vs. reverse voltage



**Figure 9** Typical capacitance stored energy vs. reverse voltage

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