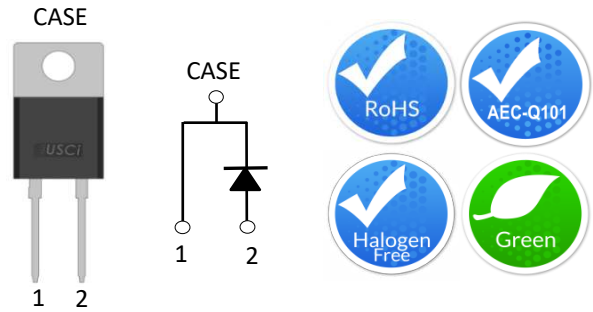


## Description

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     |
|-------------|-----------|-------------|
| UJ3D06504TS | TO-220-2L | UJ3D06504TS |

## 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
- ◆ Excellent thermal performance, Ag sintered
- ◆ 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   | $V_R$          |  | 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                                  | $I_F$          | $T_C = 156^\circ\text{C}$                      | 4          | A                    |
| Non-repetitive forward surge current sine halfwave          | $I_{FSM}$      | $T_C = 25^\circ\text{C}, t_p = 10\text{ms}$    | 29         | A                    |
|   |                | $T_C = 110^\circ\text{C}, t_p = 10\text{ms}$   | 26         |                      |
| Repetitive forward surge current sine halfwave, $D=0.1$     | $I_{FRM}$      | $T_C = 25^\circ\text{C}, t_p = 10\text{ms}$    | 23.2       | A                    |
|   |                | $T_C = 110^\circ\text{C}, t_p = 10\text{ms}$   | 13.6       |                      |
| Non-repetitive peak forward current                         | $I_{F,max}$    | $T_C = 25^\circ\text{C}, t_p = 10\mu\text{s}$  | 260        | A                    |
|   |                | $T_C = 110^\circ\text{C}, t_p = 10\mu\text{s}$ | 260        |                      |
| $i^2t$ value  | $\int i^2 dt$  | $T_C = 25^\circ\text{C}, t_p = 10\text{ms}$    | 4.2        | $\text{A}^2\text{s}$ |
|   |                | $T_C = 110^\circ\text{C}, t_p = 10\text{ms}$   | 3.4        |                      |
| Power dissipation   | $P_{Tot}$      | $T_C = 25^\circ\text{C}$                       | 71.4       | W                    |
|   |                | $T_C = 156^\circ\text{C}$                      | 9          |                      |
| 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 allowed at leads | $T_{sold}$     | 1.6mm from case for 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                        | $V_F$  | $I_F=4\text{A}, T_J=25^\circ\text{C}$    | -     | 1.5  | 1.7  | V             |
|  |        | $I_F=4\text{A}, T_J=150^\circ\text{C}$   | -     | 1.9  | 2.1  |               |
|  |        | $I_F=4\text{A}, T_J=175^\circ\text{C}$   | -     | 2.05 | 2.25 |               |
| Reverse current                        | $I_R$  | $V_R=650\text{V}, T_J=25^\circ\text{C}$  | -     | 0.7  | 25   | $\mu\text{A}$ |
|  |        | $V_R=650\text{V}, T_J=175^\circ\text{C}$ | -     | 5    |      |               |
| Total capacitive charge <sup>(1)</sup> | $Q_C$  | $V_R=400\text{V}$                        |       | 9.3  |      | nC            |
| Total capacitance                      | C      | $V_R=1\text{V}, f=1\text{MHz}$           |       | 118  |      | pF            |
|  |        | $V_R=300\text{V}, f=1\text{MHz}$         |       | 16   |      |               |
|  |        | $V_R=600\text{V}, f=1\text{MHz}$         |       | 15   |      |               |
| Capacitance stored energy              | $E_C$  | $V_R=400\text{V}$                        |       | 1.4  |      | $\mu\text{J}$ |

(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 | $R_{\theta JC}$ |                 |       | 1.6 | 2.1 | $^\circ\text{C}/\text{W}$ |

## Typical Performance

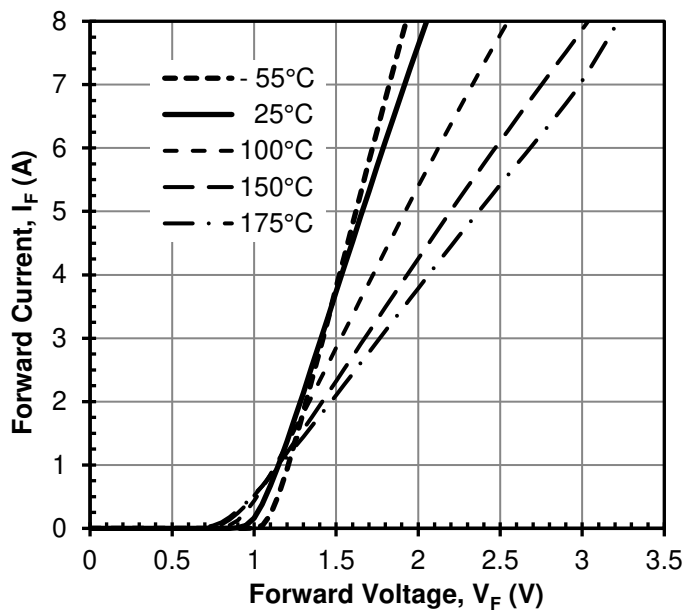


Figure 1 Typical forward characteristics

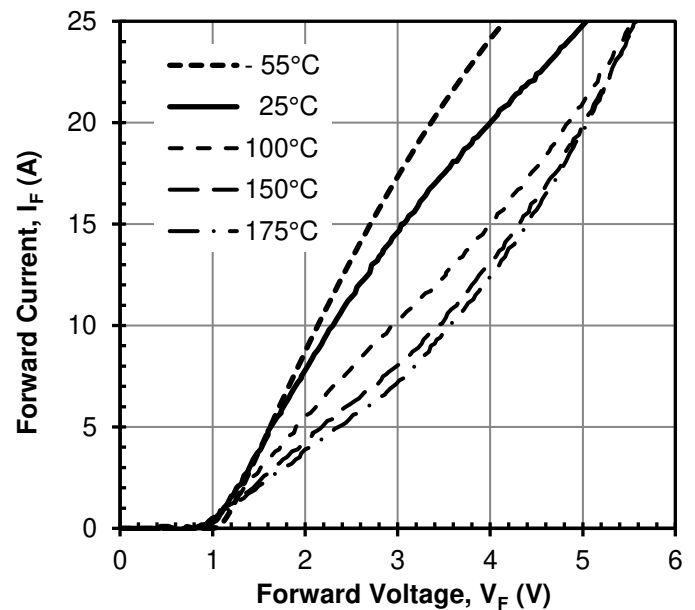
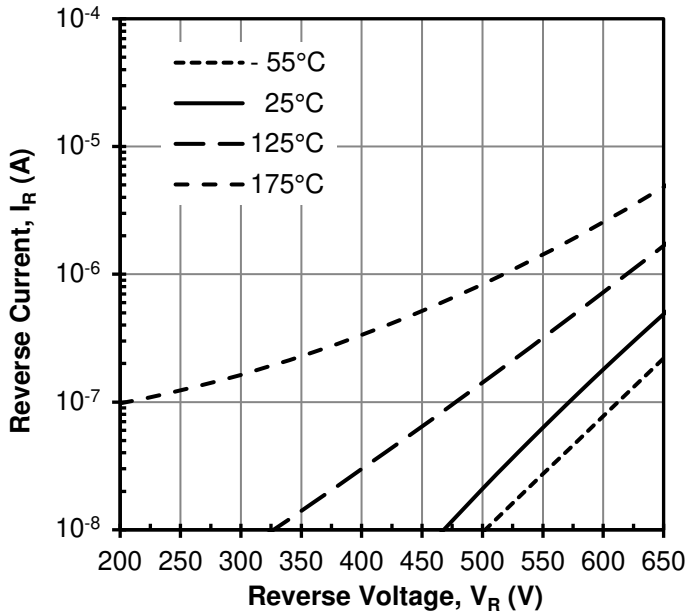
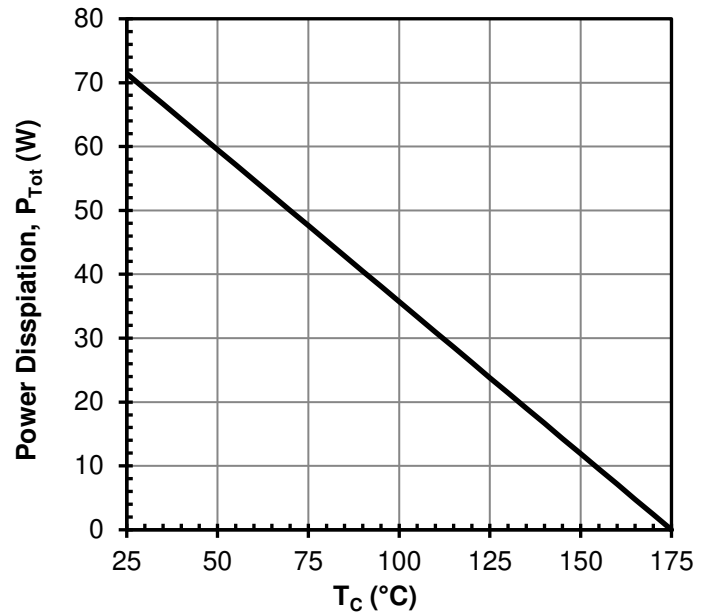
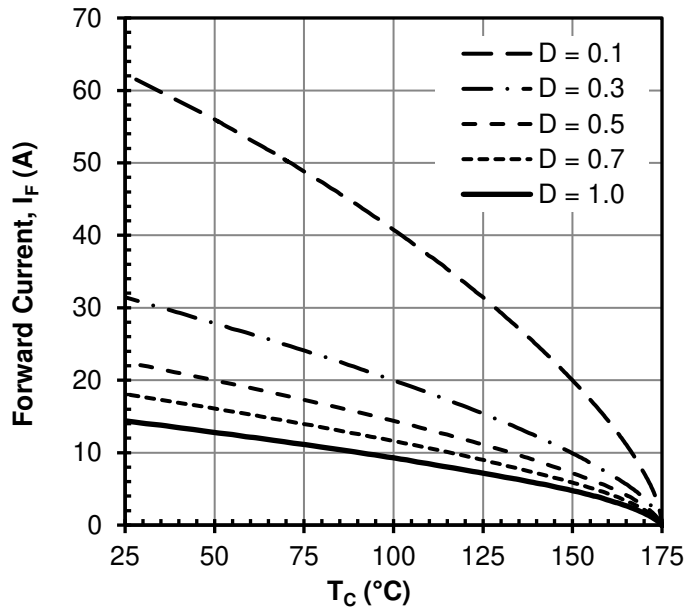
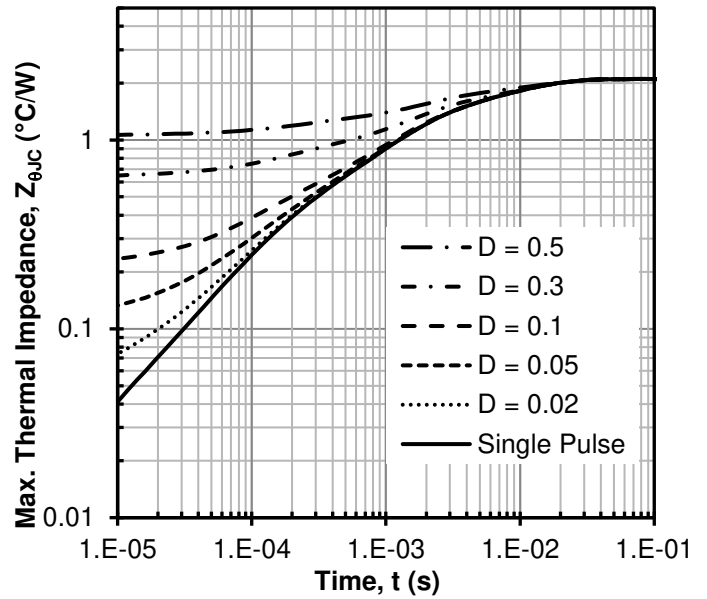
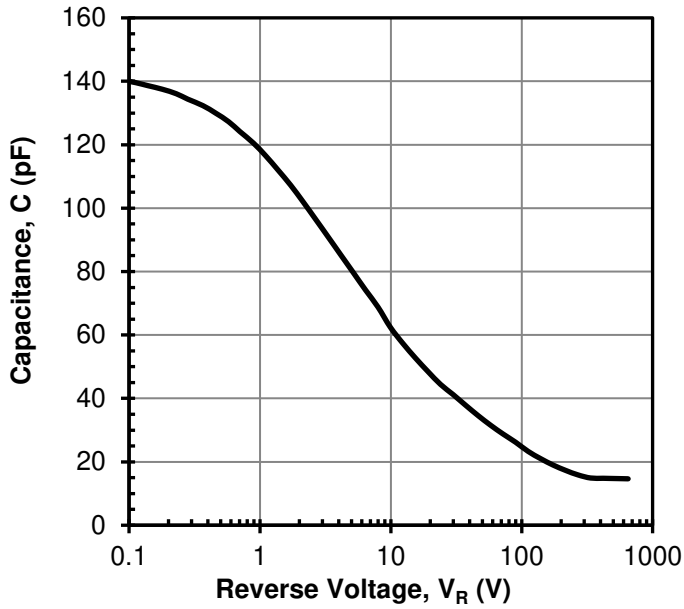
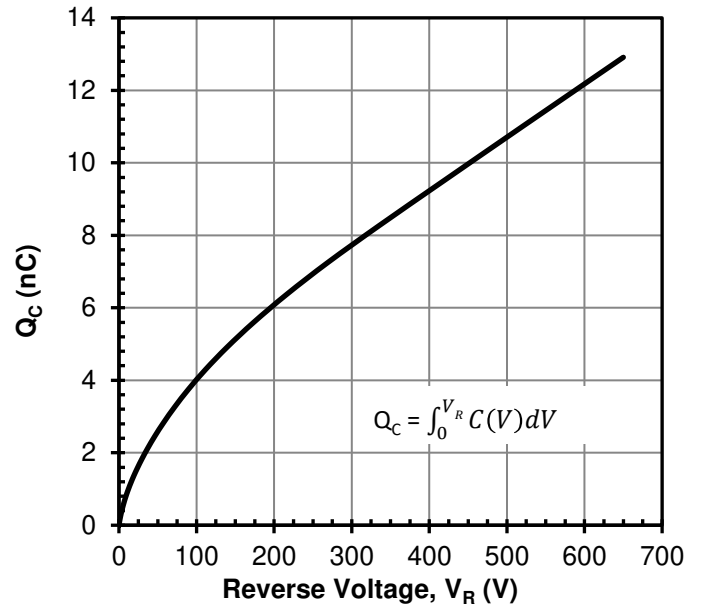


Figure 2 Typical forward characteristics in surge current

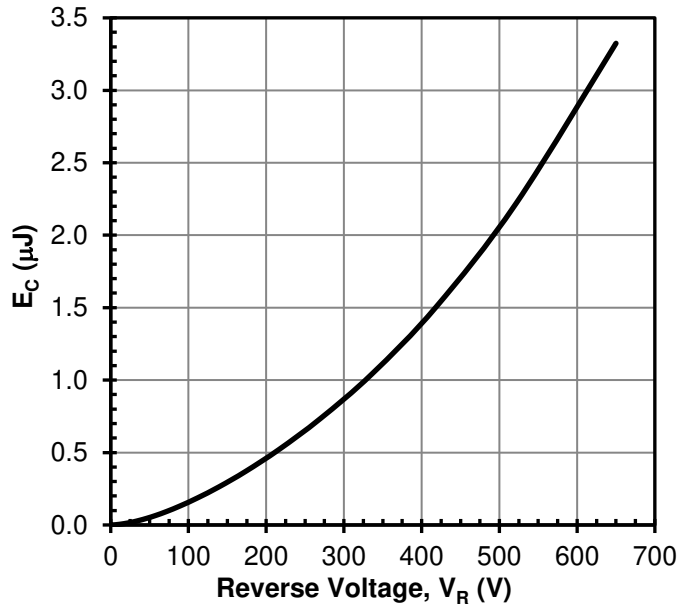

**Figure 3 Typical reverse characteristics**

**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

**Disclaimer**

United Silicon Carbide, Inc. reserves the right to change or modify any of the products and their inherent physical and technical specifications without prior notice. United Silicon Carbide, Inc. assumes no responsibility or liability for any errors or inaccuracies within.

Information on all products and contained herein is intended for description only. No license, express or implied, to any intellectual property rights is granted within this document.

United Silicon Carbide, Inc. assumes no liability whatsoever relating to the choice, selection or use of the United Silicon Carbide, Inc. products and services described herein.