## Description

United Silicon Carbide, Inc. offers the 3$^{rd}$ 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.

2.20mm

1.73mm

2.20mm

Anode Pad Opening

1.73mm

RoHS

AEC-Q101

Halogen Free

Green
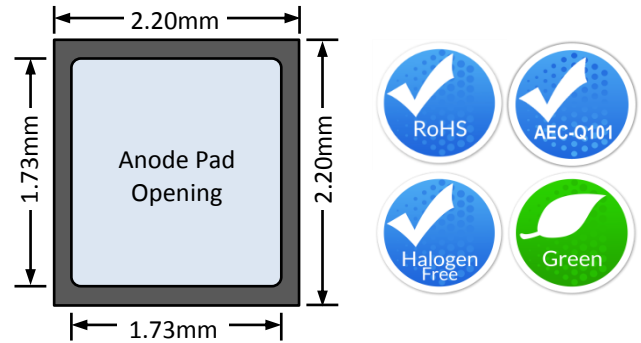
| Part Number | Package |
|---|---|
| UJ3D1210 | Undiced wafer |
| UJ3D1210Z | Die on tape |

## 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
- AEC-Q101 qualified in TO-220/TO-247 packaged devices

## 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°C | $V_{RRM}$ | | 1200 | V |
| Surge peak reverse voltage | $V_{RSM}$ | | 1200 | V |
| Maximum DC forward current [1] | $I_F$ | $T_C$ = 157°C | 10 | A |
| Non-repetitive forward surge current [1] sine halfwave | $I_{FSM}$ | $T_C$ = 25°C, $t_p$ = 10ms | 120 | A |
| | | $T_C$ = 110°C, $t_p$ =10ms | 110 | |
| Repetitive forward surge current [1] sine halfwave, D=0.1 | $I_{FRM}$ | $T_C$ = 25°C, $t_p$ = 10ms | 54.2 | A |
| | | $T_C$ = 110°C, $t_p$ =10ms | 32.3 | |
| Non-repetitive peak forward current [1] | $I_{F,max}$ | $T_C$ = 25°C, $t_p$ =10µs | 720 | A |
| | | $T_C$ = 110°C, $t_p$ =10µs | 720 | |
| Non-repetitive avalanche energy [1] | $E_{AS}$ | $T_j$ = 25°C, L = 10mH, Ipk=4.1A, $V_{DD}$=100V | 88 | mJ |
| Maximum junction temperature | $T_{J,max}$ | | 175 | °C |
| Operating and storage temperature | $T_J$, $T_{STG}$ | | -55 to 175 | °C |

(1)      Assumes a maximum junction-to-case thermal resistance of 0.68°C/W.

## Electrical Characteristics

$T_J$ = +25°C unless otherwise specified

| Parameter | Symbol | Test Conditions | Value | | | Units |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Forward voltage | $V_F$ | $I_F$ = 10A, $T_J$ = 25°C | - | 1.4 | 1.6 | V |
| | | $I_F$ = 10A, $T_J$ =150°C | - | 1.85 | 2.3 | |
| | | $I_F$ = 10A, $T_J$ =175°C | - | 2 | 2.6 | |
| Reverse current | $I_R$ | $V_R$=1200V, $T_J$=25°C | - | 100 | 640 | µA |
| | | $V_R$=1200V, $T_J$=175°C | - | 1000 | | |
| Total capacitive charge [2] | $Q_C$ | $V_R$=800V | | 51 | | nC |
| Total capacitance | C | $V_R$=1V, f=1MHz | | 510 | | pF |
| | | $V_R$=400V, f=1MHz | | 48 | | |
| | | $V_R$=800V, f=1MHz | | 41 | | |
| Capacitance stored energy | $E_C$ | $V_R$=800V | | 15 | | µJ |

(2)     $Q_c$ is independent on $T_j$, $di_F/dt$, and $I_F$ as shown in the application note USCi_AN0011.
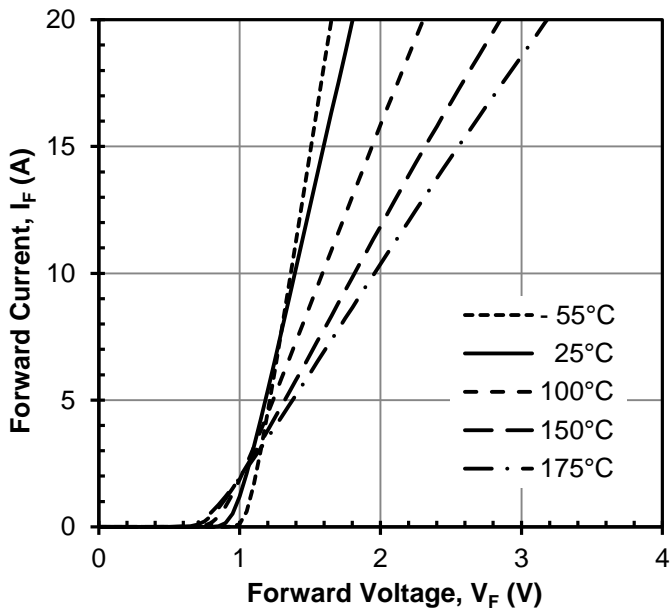
## Typical Performance
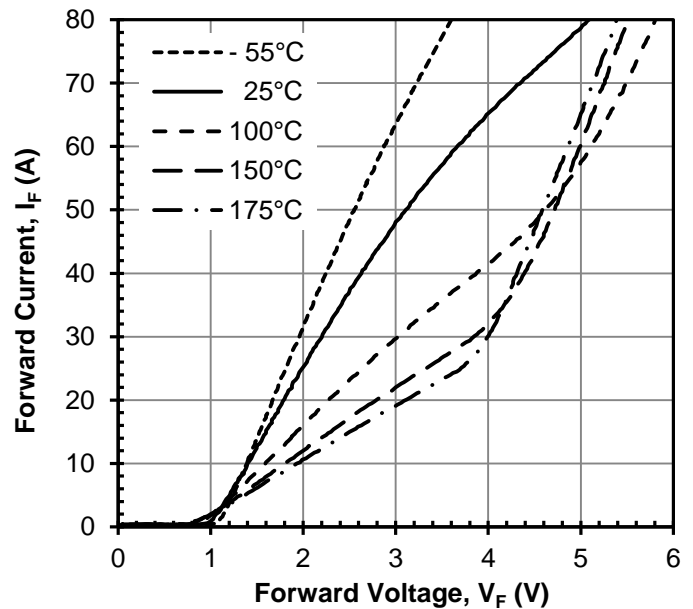


*Figure 1 Typical forward characteristics*



*Figure 2 Typical forward characteristics in surge current*
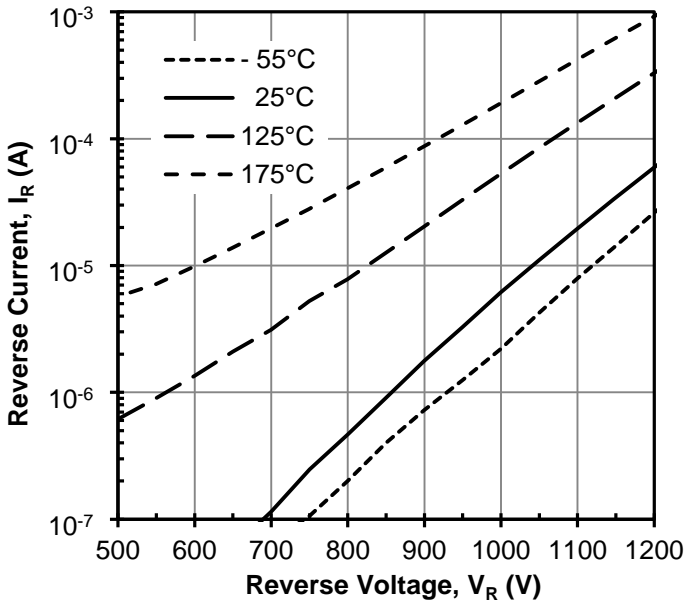
*Figure 3 Typical reverse characteristics*


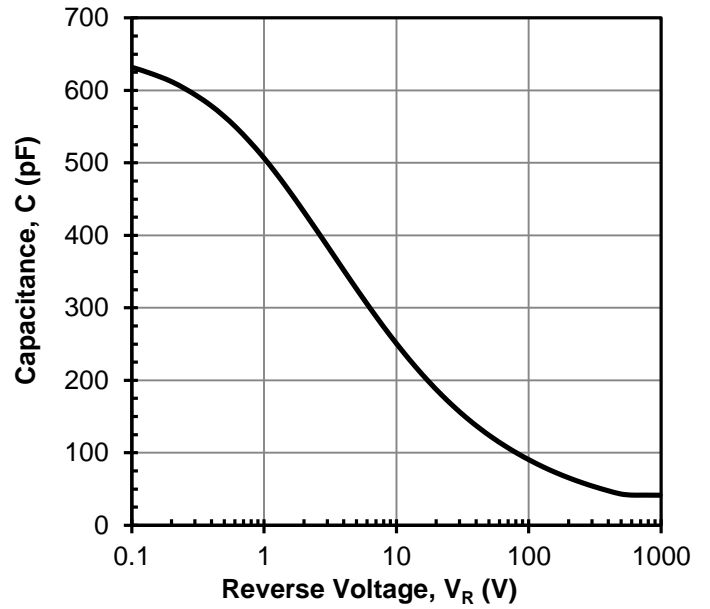
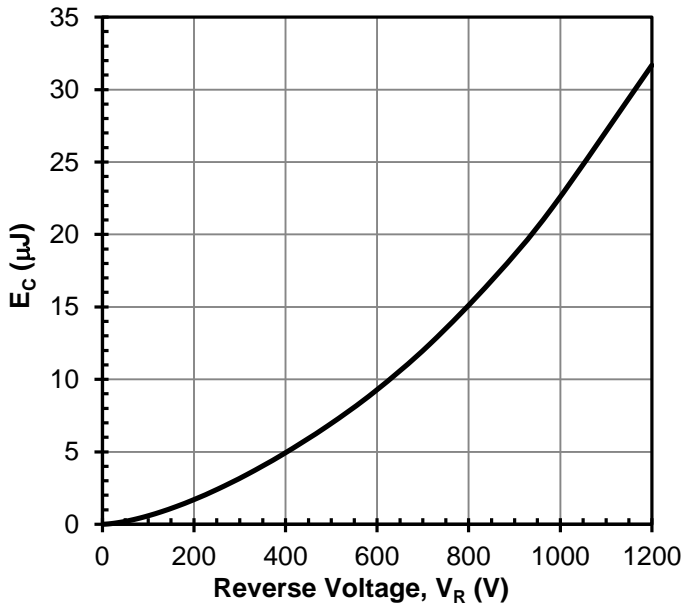*Figure 4 Capacitance vs. reverse voltageat 1MHz*



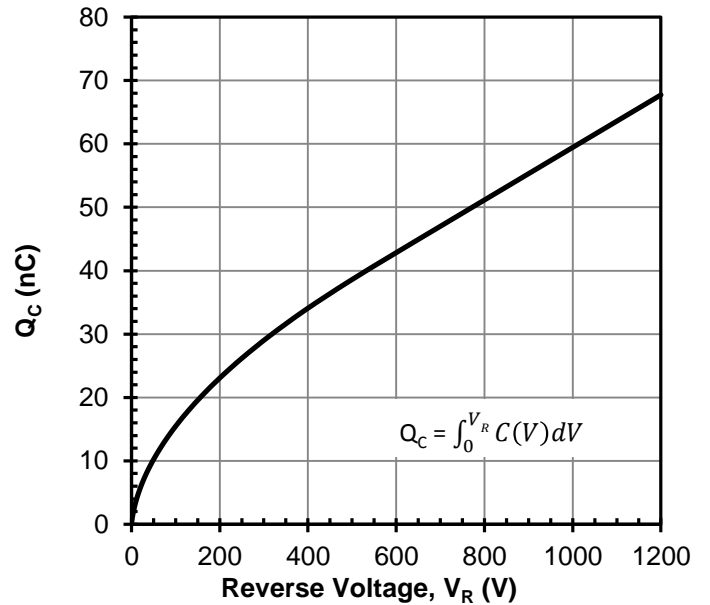*Figure 5 Typical capacitance*
*stored energy vs. reverse voltage*



$$Q_C = \int_0^{V_R} C(V)\,dV$$

*Figure 6 Typical capacitive charge vs. reverse*
*voltage*

## Mechanical Characteristics

| Parameter | Typical Value | Units |
|---|---|---|
| Die Dimensions with Scribe Line (L x W) | 2.20 x 2.20 | mm |
| Scribe Line Width | 80 | µm |
| Top Anode Pad Opening (L x W) | 1.73 x 1.73 | mm |
| Anode Metallization (AlCu) | 5 | µm |
| Cathode Metallization (Ti/Ni/Ag) | 0.1/0.2/1 | µm |
| Frontside Passivation | Polyimide | |
| Wafer Size | 150 | mm |
| Die Thickness | 150 | µm |
| Gross Die Per Wafer | 2,939 | |

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