

# Silicon Carbide (SiC) Diode – EliteSiC, TO247-3, 20 A, 1200 V SiC Merged PiN-Schottky (MPS) Dual Diode

## UJ3D1220KSD

### Description

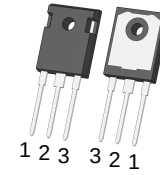
onsemi offers the 3<sup>rd</sup> generation of high performance SiC Merged-PiN-Schottky (MPS) diodes. With zero reverse recovery charge and 175 °C maximum junction temperature, these diodes are ideally suited for high frequency and high efficiency power systems with minimum cooling requirements.

### Features

- Maximum Operating Temperature of 175 °C
- 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
- This Device is Pb-Free, Halogen Free and is ROHS Compliant

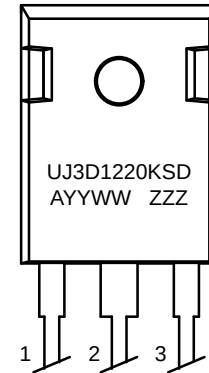
### Typical Applications

- Power Converters
- Industrial Motor Drives
- Switch Mode Power Supplies
- Power Factor Correction Modules



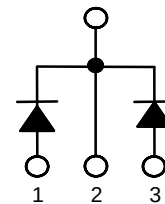
TO247-3  
CASE 340AK

### MARKING DIAGRAM



UJ3D1220KSD = Specific Device Code  
A = Assembly Location  
YY = Year  
WW = Work Week  
ZZZ = Lot ID

### PIN CONNECTIONS



### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

# UJ3D1220KSD

## MAXIMUM RATINGS

| Parameter                                                           | Symbol         | Test Conditions                                                     | Value (Leg/Device) | Unit                 |
|---------------------------------------------------------------------|----------------|---------------------------------------------------------------------|--------------------|----------------------|
| DC Blocking Voltage                                                 | $V_R$          |                                                                     | 1200               | V                    |
| Repetitive Peak Reverse Voltage, $T_J = 25\text{ }^{\circ}\text{C}$ | $V_{RRM}$      |                                                                     | 1200               | V                    |
| Surge Peak Reverse Voltage                                          | $V_{RSM}$      |                                                                     | 1200               | V                    |
| Maximum DC Forward Current                                          | $I_F$          | $T_C = 158\text{ }^{\circ}\text{C}$                                 | 10/20              | A                    |
| Non-repetitive Forward Surge Current Sine Halfwave                  | $I_{FSM}$      | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$           | 120/240            | A                    |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$          | 110/220            |                      |
| Repetitive Forward Surge Current Sine Halfwave, $D = 0.1$           | $I_{FRM}$      | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$           | 56.7/113.4         | A                    |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$          | 33.6/67.2          |                      |
| Non-repetitive Peak Forward Current                                 | $I_{F,max}$    | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$  | 720/1440           | A                    |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$ | 720/1440           |                      |
| $i^2t$ Value                                                        | $\int i^2 dt$  | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$           | 72/288             | $\text{A}^2\text{s}$ |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$          | 60/240             |                      |
| Power Dissipation                                                   | $P_{tot}$      | $T_C = 25\text{ }^{\circ}\text{C}$                                  | 234.4/468.8        | W                    |
|                                                                     |                | $T_C = 158\text{ }^{\circ}\text{C}$                                 | 26.6/53.2          |                      |
| 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         | $T_{sold}$     | 1.6 mm from case for 10 s                                           | 260                | $^{\circ}\text{C}$   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

| Parameter                            | Symbol          | Test Conditions | Value (Leg/Device) |            |           | Unit                 |
|--------------------------------------|-----------------|-----------------|--------------------|------------|-----------|----------------------|
|                                      |                 |                 | Min                | Typ        | Max       |                      |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ |                 | -                  | 0.49/0.245 | 0.64/0.32 | $^{\circ}\text{C/W}$ |

## ELECTRICAL CHARACTERISTICS ( $T_J = +25\text{ }^{\circ}\text{C}$ unless otherwise specified)

| Parameter                        | Symbol | Test Conditions                                                       | Value (Leg/Device) |          |         | Unit          |
|----------------------------------|--------|-----------------------------------------------------------------------|--------------------|----------|---------|---------------|
|                                  |        |                                                                       | Min                | Typ      | Max     |               |
| Forward Voltage                  | $V_F$  | $I_F = 10\text{ A}/20\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$  | -                  | 1.4      | 1.6     | V             |
|                                  |        | $I_F = 10\text{ A}/20\text{ A}$ , $T_J = 150\text{ }^{\circ}\text{C}$ | -                  | 1.85     | 2.3     |               |
|                                  |        | $I_F = 10\text{ A}/20\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$ | -                  | 2        | 2.6     |               |
| Reverse Current                  | $I_R$  | $V_R = 1200\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$            | -                  | 10/20    | 110/220 | $\mu\text{A}$ |
|                                  |        | $V_R = 1200\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$           | -                  | 450/900  | -       |               |
| Total Capacitive Charge (Note 1) | $Q_C$  | $V_R = 800\text{ V}$                                                  | -                  | 51/102   | -       | nC            |
| Total Capacitance                | $C$    | $V_R = 1\text{ V}$ , $f = 1\text{ MHz}$                               | -                  | 510/1020 | -       | pF            |
|                                  |        | $V_R = 400\text{ V}$ , $f = 1\text{ MHz}$                             | -                  | 48/96    | -       |               |
|                                  |        | $V_R = 800\text{ V}$ , $f = 1\text{ MHz}$                             | -                  | 41/82    | -       |               |
| Capacitance Stored Energy        | $E_C$  | $V_R = 800\text{ V}$                                                  | -                  | 15/30    | -       | $\mu\text{J}$ |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1.  $Q_C$  is independent on  $T_J$ ,  $di_F/dt$ , and  $I_F$  as shown in the application note [AND90316/D](#)

TYPICAL PERFORMANCE DIAGRAMS (PER LEG)

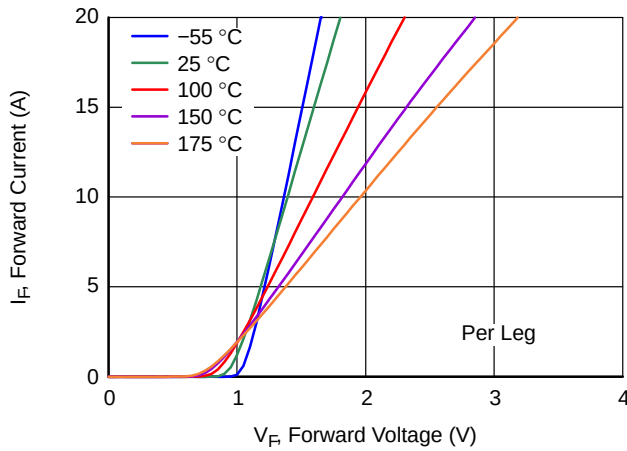


Figure 1. Typical Forward Characteristics

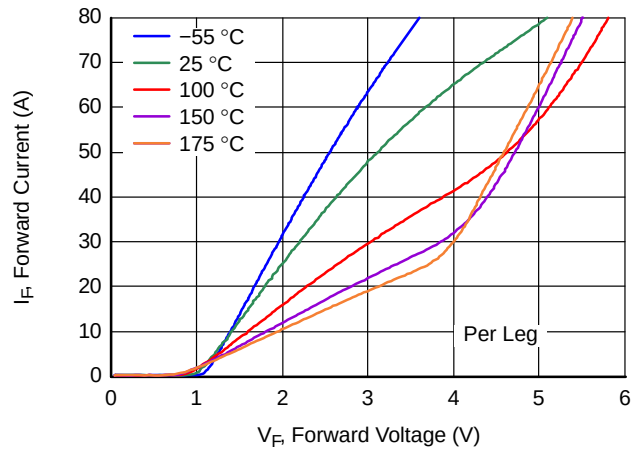


Figure 2. Typical Forward Characteristics in Surge Current

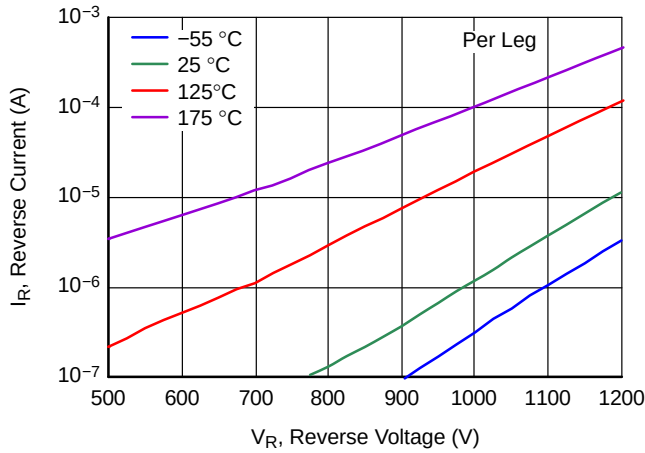


Figure 3. Typical Reverse Characteristics

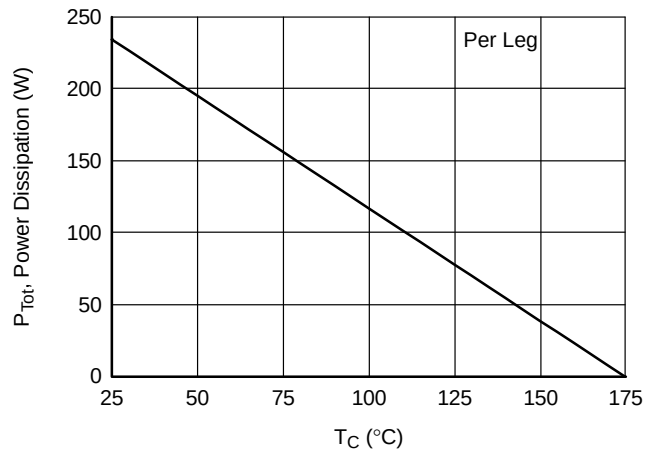


Figure 4. Power Dissipation

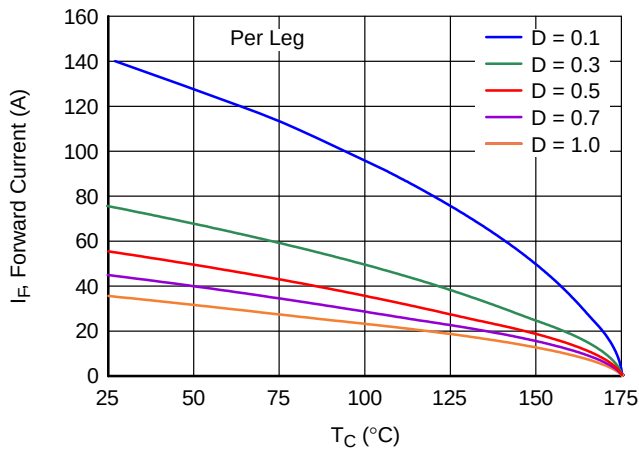


Figure 5. Diode Forward Current

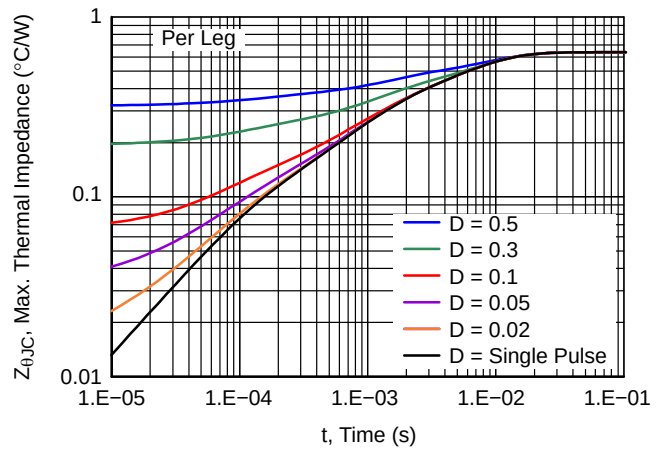
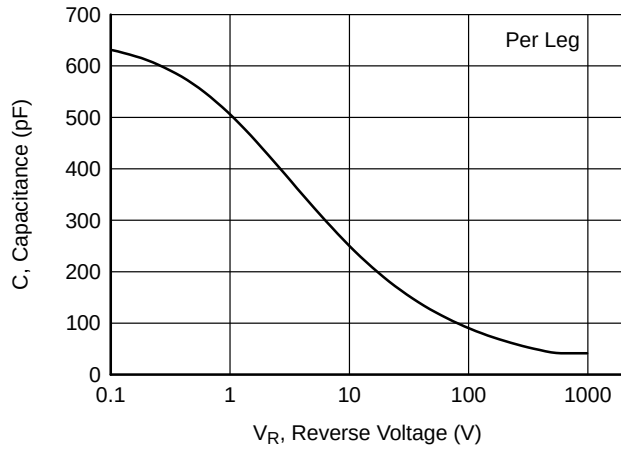


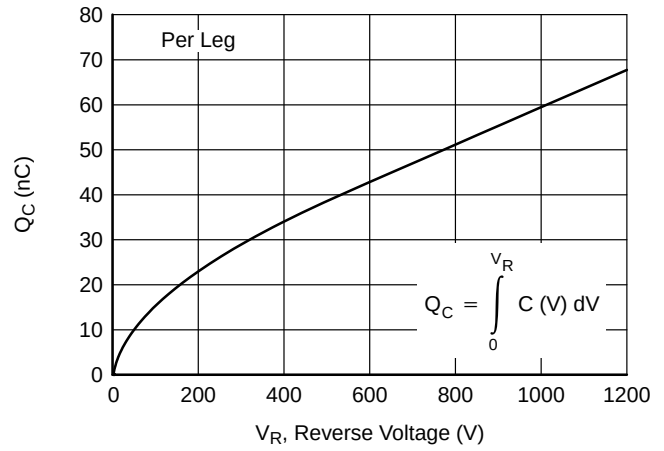
Figure 6. Maximum Transient Thermal Impedance

# UJ3D1220KSD

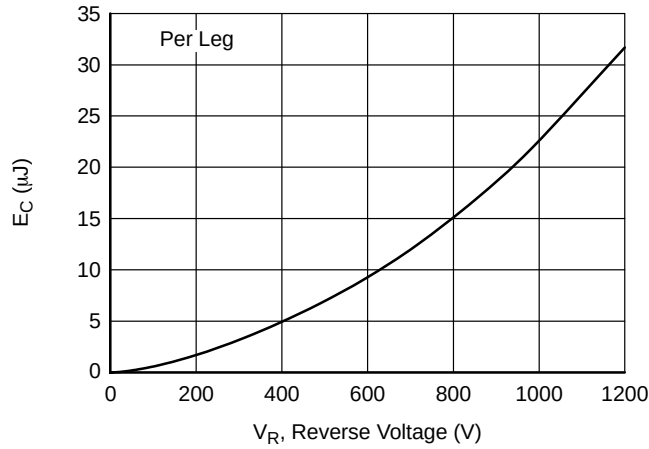
## TYPICAL PERFORMANCE DIAGRAMS (PER LEG) (CONTINUED)



**Figure 7. Capacitance vs. Reverse Voltage at 1 MHz**



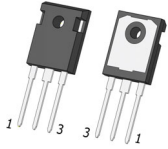
**Figure 8. Typical Capacitive Charge vs. Reverse Voltage**



**Figure 9. Typical Capacitance Stored Energy vs. Reverse Voltage**

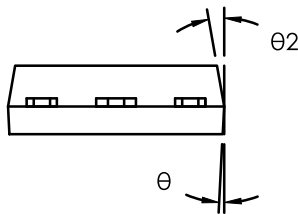
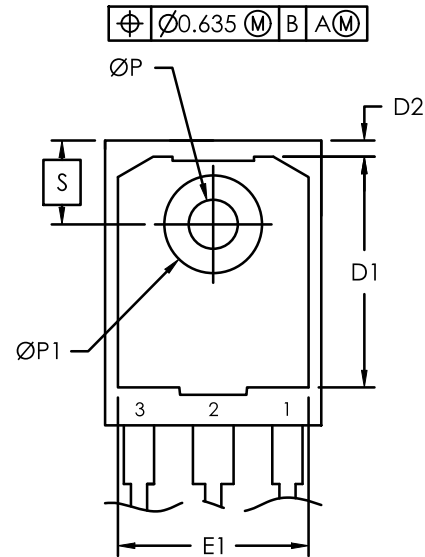
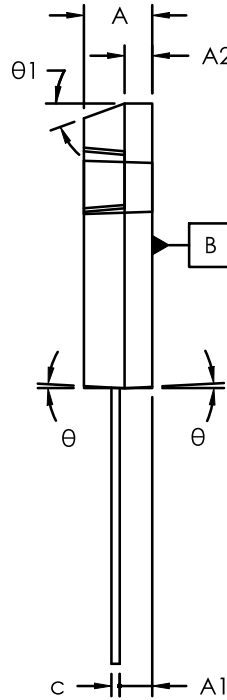
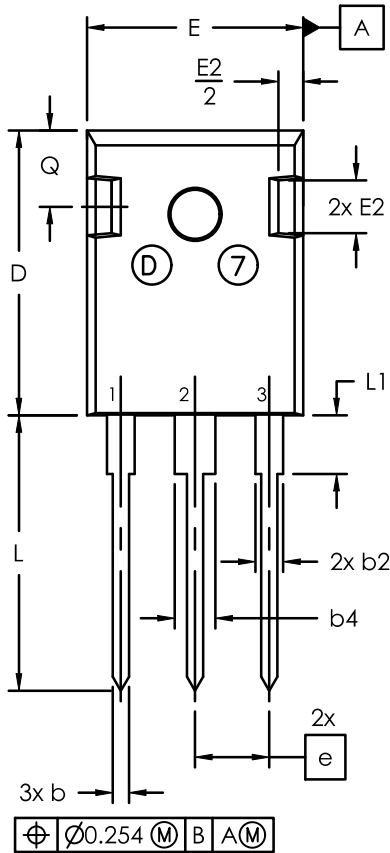
### ORDERING INFORMATION

| Part Number | Marking     | Package                            | Shipping   |
|-------------|-------------|------------------------------------|------------|
| UJ3D1220KSD | UJ3D1220KSD | TO247-3<br>(Pb-Free, Halogen Free) | 600 / Tube |



TO247-3 15.90x20.96x5.03, 5.44P  
CASE 340AK  
ISSUE B

DATE 14 APR 2025



NOTE:

1. Dimensioning and tolerancing as per ASME Y14.5 - 2018
2. Controlling dimension : millimeters
3. Package Outline in compliance with JEDEC standard var. AD.
4. Dimensions D & E does not include mold flash.
5. ØP to have max draft angle of 1.7° to the top with max. hole diameter of 3.91mm.

| SYM | millimeters |       |       |
|-----|-------------|-------|-------|
|     | MIN         | NOM   | MAX   |
| A   | 4.70        | 5.03  | 5.31  |
| A1  | 2.21        | 2.40  | 2.59  |
| A2  | 1.50        | 2.03  | 2.49  |
| b   | 0.99        | 1.20  | 1.40  |
| b2  | 1.65        | 2.03  | 2.39  |
| b4  | 2.59        | 3.00  | 3.43  |
| c   | 0.38        | 0.60  | 0.89  |
| D   | 20.70       | 20.96 | 21.46 |
| D1  | 13.08       | —     | —     |
| D2  | 0.51        | 1.19  | 1.35  |
| E   | 15.49       | 15.90 | 16.26 |
| e   | 5.44 BSC    |       |       |
| E1  | 13.00       | 13.30 | 13.60 |
| E2  | 3.43        | 3.89  | 5.20  |
| L   | 19.62       | 20.27 | 20.32 |
| L1  | —           | —     | 4.50  |
| ØP  | 3.40        | 3.60  | 3.80  |
| ØP1 | 7.06        | 7.19  | 7.39  |
| Q   | 5.38        | 5.62  | 6.20  |
| S   | 6.15 BSC    |       |       |
| Ø   | 3°          |       |       |
| Ø1  | 20°         |       |       |
| Ø2  | 10°         |       |       |

DOCUMENT NUMBER: 98AON88794E

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DESCRIPTION: TO247-3 15.90x20.96x5.03, 5.44P

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