# Silicon Carbide Schottky Diode

# IDW20G120C5B

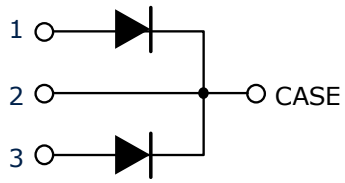
5th Generation thinQ!™ 1200 V SiC Schottky Diode

## Final Datasheet

Rev. 2.0 2014-06-10

## Industrial Power Control

# thinQ!™ SiC Schottky Diode




## Features:

- Revolutionary semiconductor material - Silicon Carbide
- No reverse recovery current / No forward recovery
- Temperature independent switching behavior
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Excellent thermal performance
- Extended surge current capability
- Specified dv/dt ruggedness
- Qualified according to JEDEC[1)] for target applications
- Pb-free lead plating; RoHS compliant




## Benefits

- System efficiency improvement over Si diodes
- Enabling higher frequency / increased power density solutions
- System size/cost savings due to reduced heatsink requirements and smaller magnetics
- Reduced EMI
- Highest efficiency across the entire load range
- Robust diode operation during surge events
- High reliability
- RelatedLinks: www.infineon.com/sic

## Applications

- Solar inverters
- Uninterruptable power supplies
- Motor drives
- Power Factor Correction

## Package pin definitions

- Pin 1 – anode 1
- Pin 2 and backside – cathode
- Pin 3 – anode 2

### Key Performance and Package Parameters (leg/device)

| Type | $V_{DC}$ | $I_F$ | $Q_C$ | $T_{j,max}$ | Marking | Package |
|---|---|---|---|---|---|---|
| IDW20G120C5B | 1200V | 10A / 20A | 53nC / 106nC | 175°C | D2012B5 | PG-TO247-3 |

1) J-STD20 and JESD22

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**Maximum ratings**

| Parameter | Symbol | Value (leg/device) | Unit |
|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RRM}$ | 1200 | V |
| Continuous forward current for $R_{th(j-c,max)}$<br>$T_C$ = 153°C, D=1<br>$T_C$ = 135°C, D=1<br>$T_C$ = 25°C, D=1 | $I_F$ | <br>10 / 20<br>14 / 29<br>31 / 62 | A |
| Surge non-repetitive forward current, sine halfwave<br>$T_C$=25°C, $t_p$=10ms<br>$T_C$=150°C, $t_p$=10ms | $I_{F,SM}$ | <br>95 / 190<br>90 / 180 | A |
| Non-repetitive peak forward current<br>$T_C$ = 25°C, $t_p$=10 µs | $I_{F,max}$ | 887 / 1774 | A |
| i²t value<br>$T_C$ = 25°C, $t_p$=10 ms<br>$T_C$ = 150°C, $t_p$=10 ms | $\int i^2dt$ | <br>45 / 180<br>41 / 162 | A²s |
| Diode d$v$/d$t$ ruggedness<br>$V_R$=0...960 V | d$v$/d$t$ | 80 | V/ns |
| Power dissipation for $R_{th(j-c,max)}$<br>$T_C$ = 25°C | $P_{tot}$ | 125 / 250 | W |
| Operating and storage temperature | $T_j$;$T_{stg}$ | -55…175 | °C |
| Soldering temperature,<br>wavesoldering only allowed at leads<br>1.6mm (0.063 in.) from case for 10 s | $T_{sold}$ | 260 | °C |
| Mounting torque<br>M3 and M4 screws | $M$ | 0.7 | Nm |

**Thermal Resistances**

| Parameter | Symbol | Conditions | Value (leg/device) | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Characteristic** | | | | | | |
| Diode thermal resistance, junction – case | $R_{th(j-c)}$ | | - | 0.9/0.45 | 1.2/0.6 | K/W |
| Thermal resistance, junction – ambient | $R_{th(j-a)}$ | leaded | - | - | 62 | K/W |

## Electrical Characteristics

### Static Characteristic, at Tj=25°C, unless otherwise specified

| Parameter | Symbol | Conditions | Value (leg/device) | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| DC blocking voltage | $V_{DC}$ | $T_j$ = 25°C | 1200 | - | - | V |
| Diode forward voltage | $V_F$ | $I_F$= 10/20 A, $T_j$=25°C<br>$I_F$= 10/20 A, $T_j$=150°C | -<br>- | 1.4<br>1.7 | 1.65<br>2.30 | V |
| Reverse current | $I_R$ | $V_R$=1200V, $T_j$=25°C<br>$V_R$=1200V, $T_j$=150°C | | 6 / 12<br>29 / 58 | 83 / 166<br>420 / 840 | µA |

### Dynamic Characteristics, at $T_j$=25°C, unless otherwise specified

| Parameter | Symbol | Conditions | Value (leg/device) | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Total capacitive charge | $Q_C$ | $V_R$ = 800V, $T_j$=150° C & 25°C<br>$Q_C = \int_0^{V_R} C(V)dV$ | - | 53 / 106 | - | nC |
| Total Capacitance | $C$ | $V_R$=1 V, $f$=1 MHz<br>$V_R$=400 V, $f$=1 MHz<br>$V_R$=800 V, $f$=1 MHz | -<br>-<br>- | 684 /1368<br>48 / 96<br>38 / 76 | -<br>-<br>- | pF |

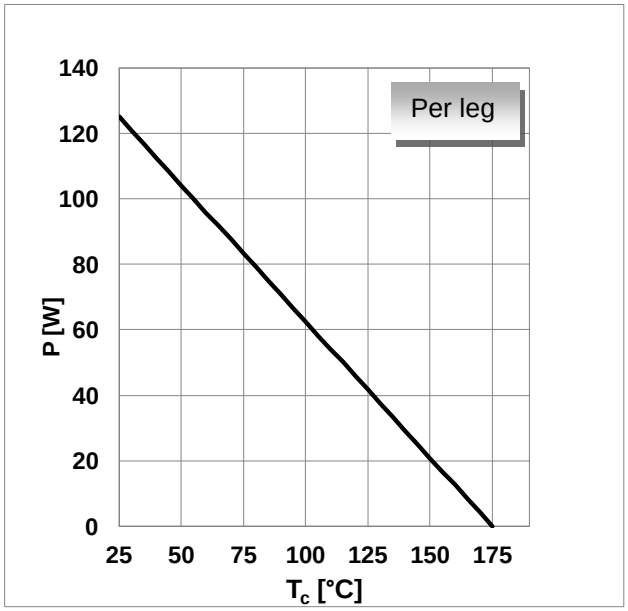



Figure 1. **Power dissipation per leg as function of case temperature,** $P_{tot}=f(T_C)$, $R_{th(j-c),max}$

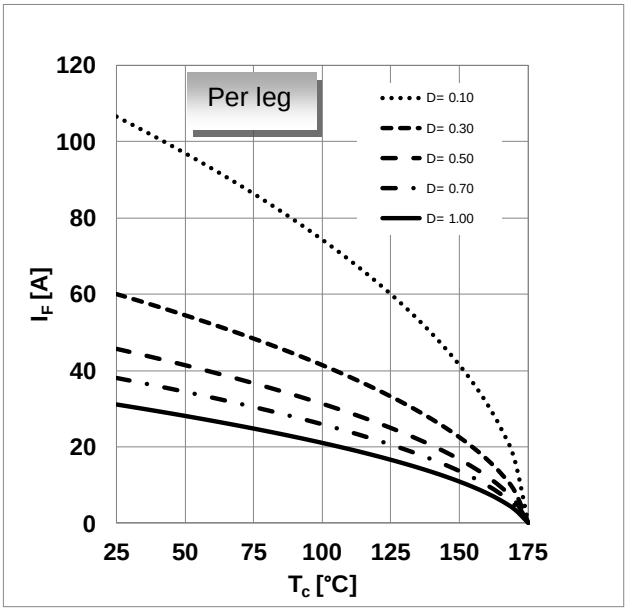



Figure 2. **Diode forward current per leg as function of temperature,** parameter: $T_j \leq 175°C$, $R_{th(j-c),max}$, $D$=duty cycle, $V_{th}$, $R_{diff}$ @ $T_j$=175°C

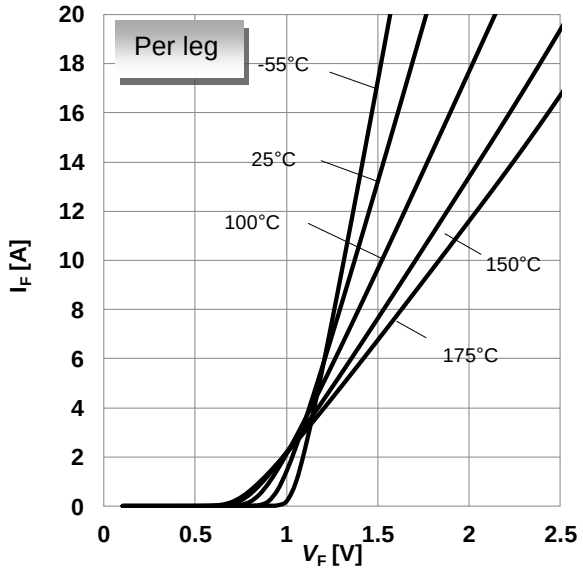



Figure 3. **Typical forward characteristics per leg,** $I_F=f(V_F)$, $t_p$= 10 µs, parameter: $T_j$

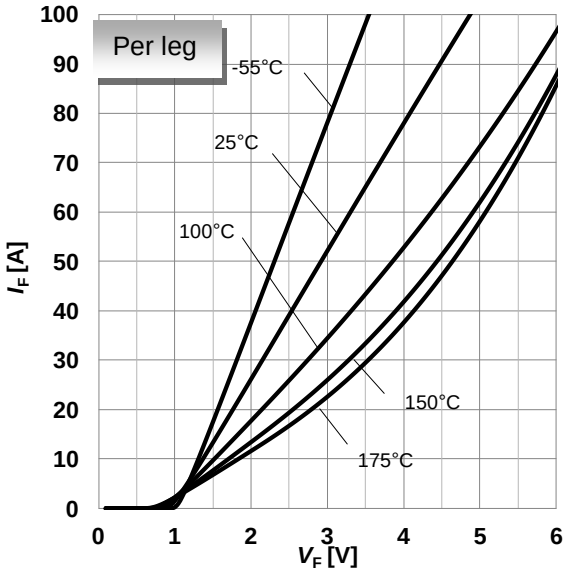



Figure 4. **Typical forward characteristics in surge current per leg,** $I_F=f(V_F)$, $t_p$= 10 µs, parameter: $T_j$

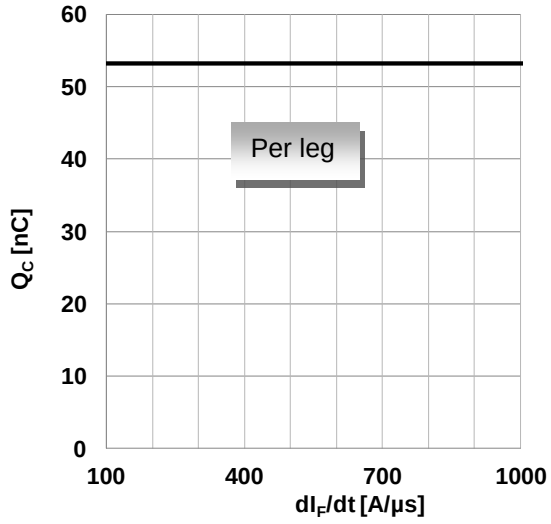



Figure 5. **Typical capacitive charge per leg as function of current slope**[1], $Q_C$=f($dI_F/dt$), $T_j$=150°C

1) guaranteed by design.

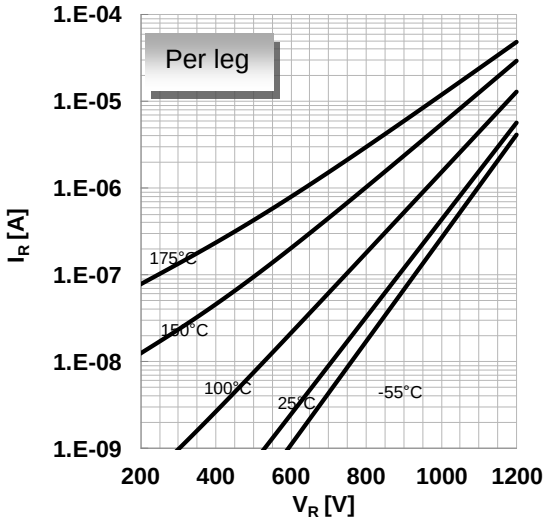



Figure 6. **Typical reverse characteristics per leg,** $I_R$=f($V_R$), parameter: $T_j$

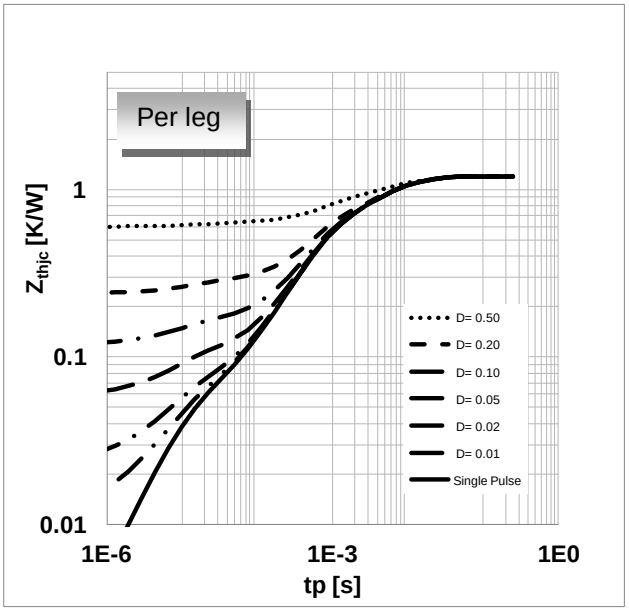



Figure 7. **Max. transient thermal impedance per leg,** $Z_{th,j\text{-}c}$=f($t_P$), parameter: D=$t_P/T$

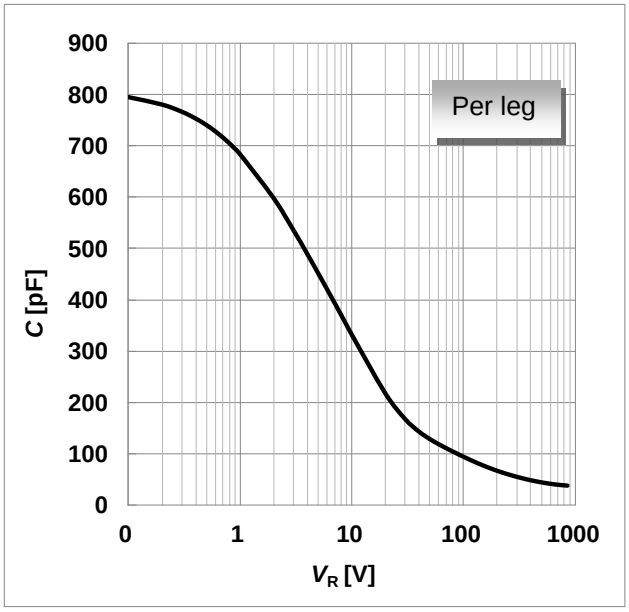



Figure 8. **Typical capacitance per leg as function of reverse voltage,** $C$=f($V_R$); $T_j$=25°C; $f$=1 MHz

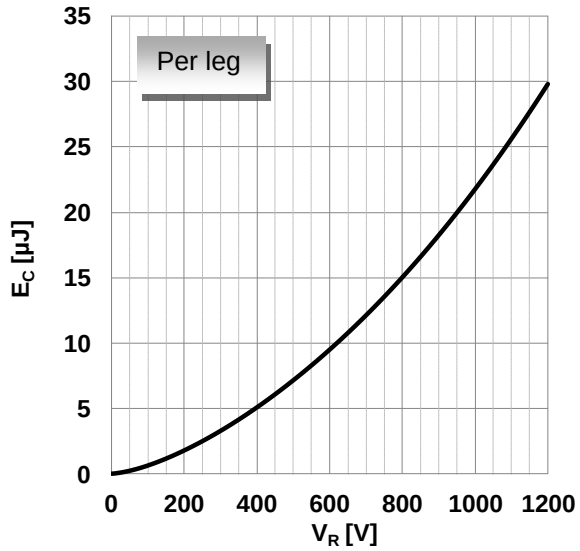
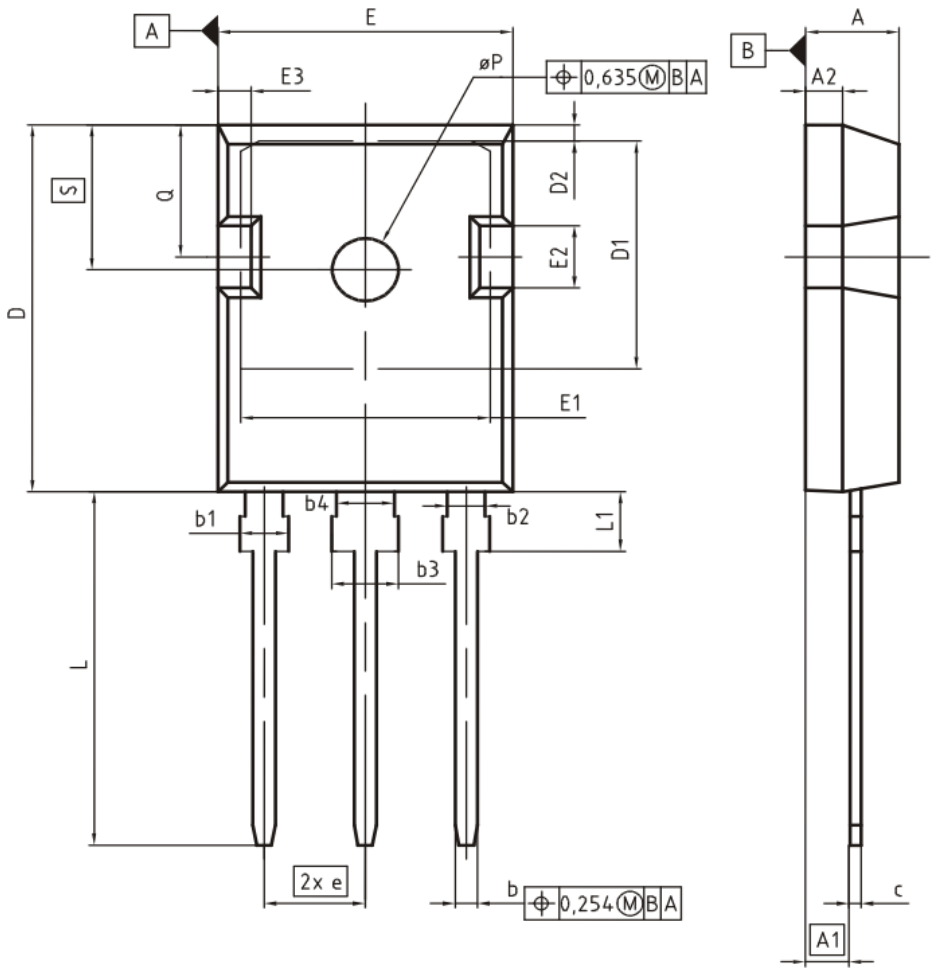



Figure 9. **Typical capacitively stored energy as function of reverse voltage, per leg,** $E_C=f(V_R)$

# PG-TO247-3




| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.83 | 5.21 | 0.190 | 0.205 |
| A1 | 2.27 | 2.54 | 0.089 | 0.100 |
| A2 | 1.85 | 2.16 | 0.073 | 0.085 |
| b | 1.07 | 1.33 | 0.042 | 0.052 |
| b1 | 1.90 | 2.41 | 0.075 | 0.095 |
| b2 | 1.90 | 2.16 | 0.075 | 0.085 |
| b3 | 2.87 | 3.38 | 0.113 | 0.133 |
| b4 | 2.87 | 3.13 | 0.113 | 0.123 |
| c | 0.55 | 0.68 | 0.022 | 0.027 |
| D | 20.80 | 21.10 | 0.819 | 0.831 |
| D1 | 16.25 | 17.65 | 0.640 | 0.695 |
| D2 | 0.95 | 1.35 | 0.037 | 0.053 |
| E | 15.70 | 16.13 | 0.618 | 0.635 |
| E1 | 13.10 | 14.15 | 0.516 | 0.557 |
| E2 | 3.68 | 5.10 | 0.145 | 0.201 |
| E3 | 1.00 | 2.60 | 0.039 | 0.102 |
| e | 5.44 (BSC) | | 0.214 (BSC) | |
| N | 3 | | 3 | |
| L | 19.80 | 20.32 | 0.780 | 0.800 |
| L1 | 4.10 | 4.47 | 0.161 | 0.176 |
| øP | 3.50 | 3.70 | 0.138 | 0.146 |
| Q | 5.49 | 6.00 | 0.216 | 0.236 |
| S | 6.04 | 6.30 | 0.238 | 0.248 |

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0 5 5 7.5mm

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05

## Revision History

IDW20G120C5B

### Revision: 2014-06-10, Rev. 2.0

Previous Revision:

| Revision | Date | Subjects (major changes since last version) |
|---|---|---|
| 2.0 | - | Final data sheet |

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