

Silicon Carbide Schottky Diode

IDW40G120C5B

5th Generation thinQ!TM 1200 V SiC Schottky Diode

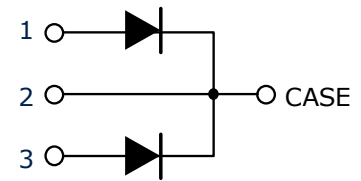
Final Datasheet

Rev. 2.0 2014-06-10

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 JEDEC¹⁾ 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 |
|--------------|-----------------|----------------|----------------|--------------------|---------|------------|
| IDW40G120C5B | 1200V | 20 / 40 A | 101 / 202nC | 175°C | D4012B5 | 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 $R_{th(j-c,max)}$ $T_C = 148^\circ\text{C}$, $D=1$ $T_C = 135^\circ\text{C}$, $D=1$ $T_C = 25^\circ\text{C}$, $D=1$ | I_F | 20 / 40 25 / 51 55 / 110 | A |
| Surge non-repetitive forward current, sine halfwave $T_C=25^\circ\text{C}$, $t_p=10\text{ms}$ $T_C=150^\circ\text{C}$, $t_p=10\text{ms}$ | $I_{F,SM}$ | 145 / 290 140 / 280 | A |
| Non-repetitive peak forward current $T_C = 25^\circ\text{C}$, $t_p=10 \mu\text{s}$ | $I_{F,max}$ | 1575 / 3150 | A |
| i^2t value $T_C = 25^\circ\text{C}$, $t_p=10 \text{ms}$ $T_C = 150^\circ\text{C}$, $t_p=10 \text{ms}$ | $\int i^2 dt$ | 105 / 420 98 / 392 | A ² s |
| Diode dv/dt ruggedness $V_R=0\dots960 \text{V}$ | dv/dt | 80 | V/ns |
| Power dissipation for $R_{th(j-c,max)}$ $T_C = 25^\circ\text{C}$ | P_{tot} | 201 / 402 | W |
| Operating and storage temperature | $T_j; T_{stg}$ | -55...175 | $^\circ\text{C}$ |
| Soldering temperature, wavesoldering only allowed at leads 1.6mm (0.063 in.) from case for 10 s | T_{sold} | 260 | $^\circ\text{C}$ |
| Mounting torque 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 | $R_{th(j-c)}$ | | - | 0.6/0.3 | 0.8/0.4 | K/W |
| Thermal resistance, junction – ambient | $R_{th(j-a)}$ | leaded | - | - | 62 | K/W |

Electrical Characteristics
Static Characteristic, at T_j=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 = 20/40 A, T _j =25°C | - | 1.4 | 1.65 | V |
| | | I _F = 20/40 A, T _j =150°C | - | 1.7 | 2.30 | |
| Reverse current | I _R | V _R =1200 V, T _j =25°C | | 12 / 23 | 166 / 332 | μA |
| | | V _R =1200 V, T _j =150°C | | 59 / 118 | 850 / 1700 | |

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 = 800 V, T _j =150°C & 25°C | - | 101 / 202 | - | nC |
| | | $Q_C = \int_0^{V_R} C(V) dV$ | | | | |
| Total Capacitance | C | V _R =1 V, f=1 MHz | - | 1296/2592 | - | pF |
| | | V _R =400 V, f=1 MHz | - | 92 / 183 | - | |
| | | V _R =800 V, f=1 MHz | - | 73 / 146 | - | |

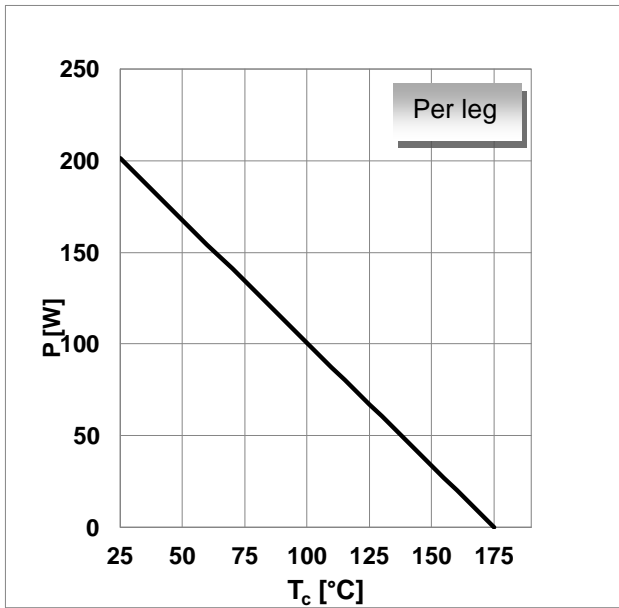


Figure 1. Power dissipation per leg as function of case temperature, $P_{tot}=f(T_C)$, $R_{th(j-c),max}$

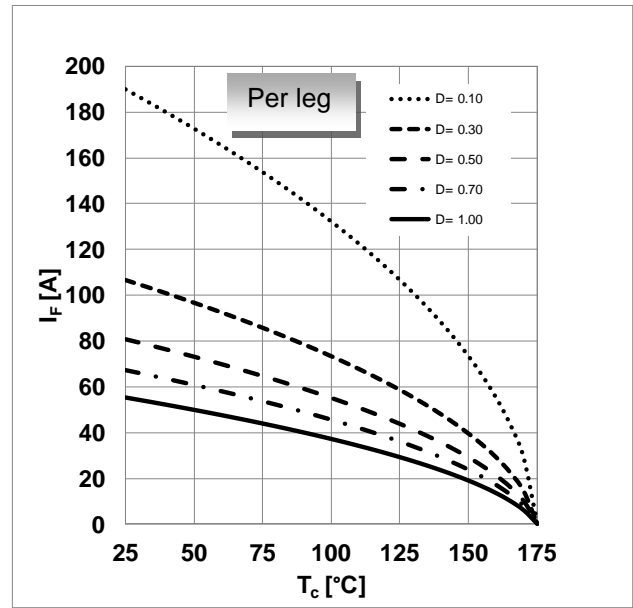


Figure 2. Diode forward current per leg as function of temperature, parameter: $T_j \leq 175^\circ\text{C}$, $R_{th(j-c),max}$, D =duty cycle, V_{th} , R_{diff} @ $T_j=175^\circ\text{C}$

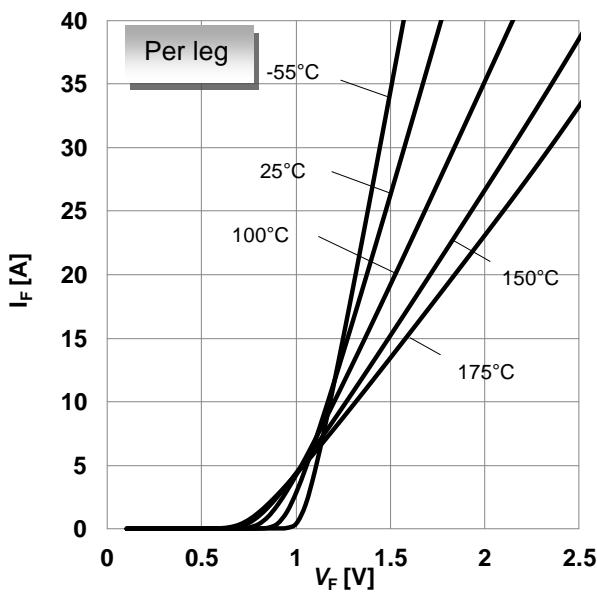


Figure 3. Typical forward characteristics per leg, $I_F=f(V_F)$, $t_p=10 \mu\text{s}$, parameter: T_j

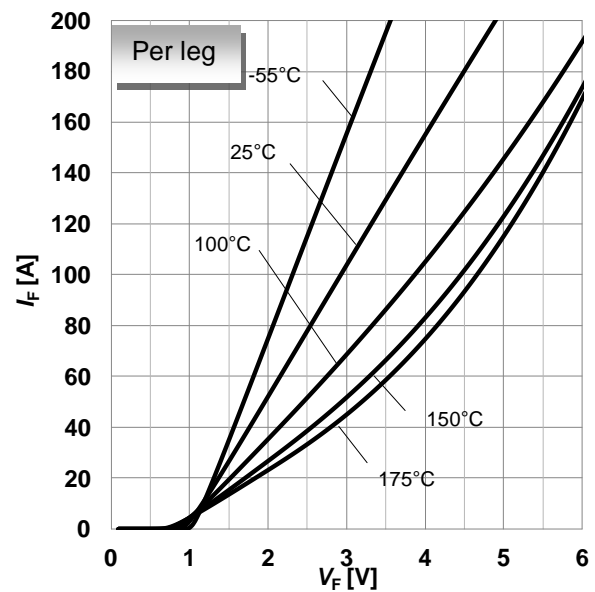


Figure 4. Typical forward characteristics in surge current per leg, $I_F=f(V_F)$, $t_p=10 \mu\text{s}$, parameter: T_j

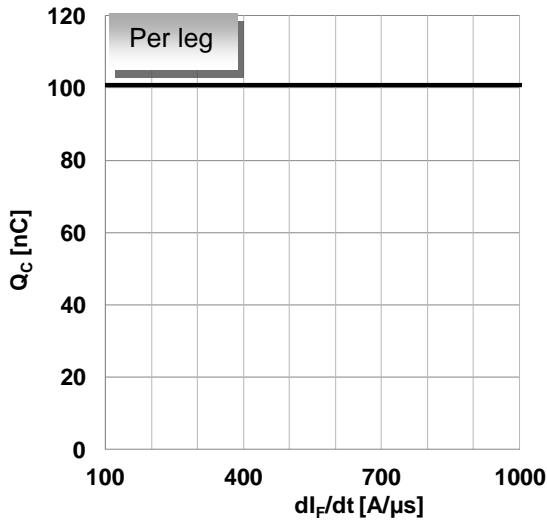


Figure 5. Typical capacitive charge per leg as function of current slope¹, $Q_C=f(dl_F/dt)$, $T_j=150^\circ\text{C}$
 1) guaranteed by design.

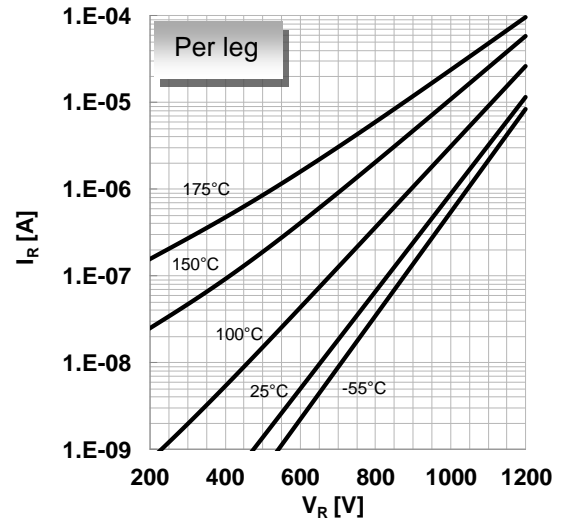


Figure 6. Typical reverse characteristics per leg, $I_R=f(V_R)$, parameter: T_j

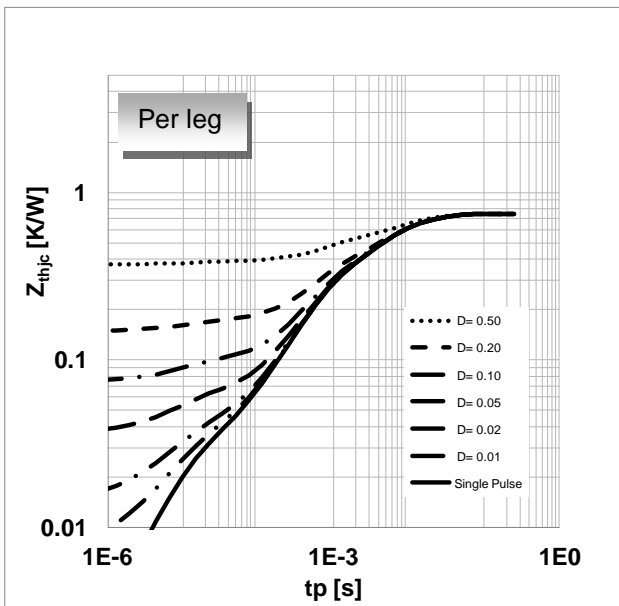


Figure 7. Max. transient thermal impedance per leg, $Z_{th,jc}=f(t_p)$, parameter: $D=t_p/T$

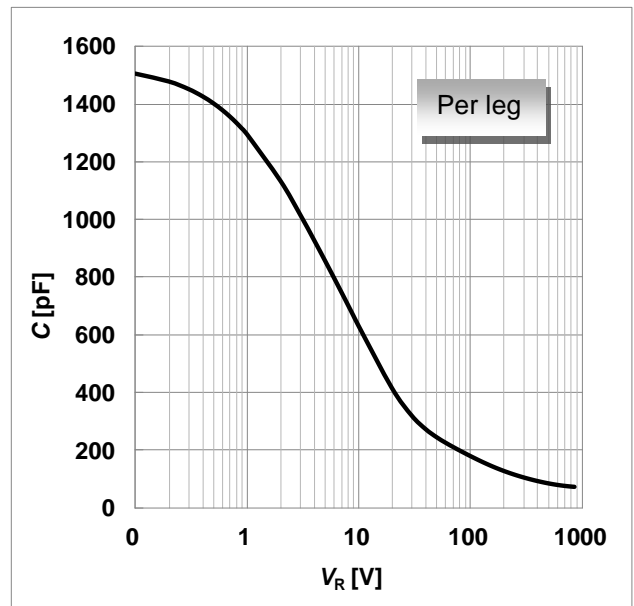


Figure 8. Typical capacitance per leg as function of reverse voltage, $C=f(V_R)$; $T_j=25^\circ\text{C}$; $f=1\text{ MHz}$

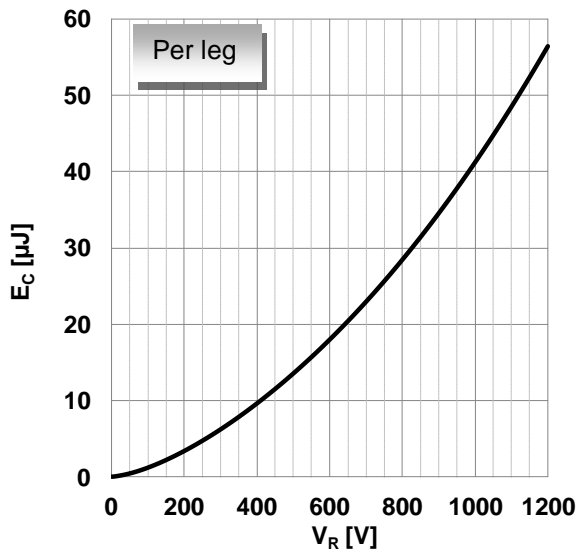
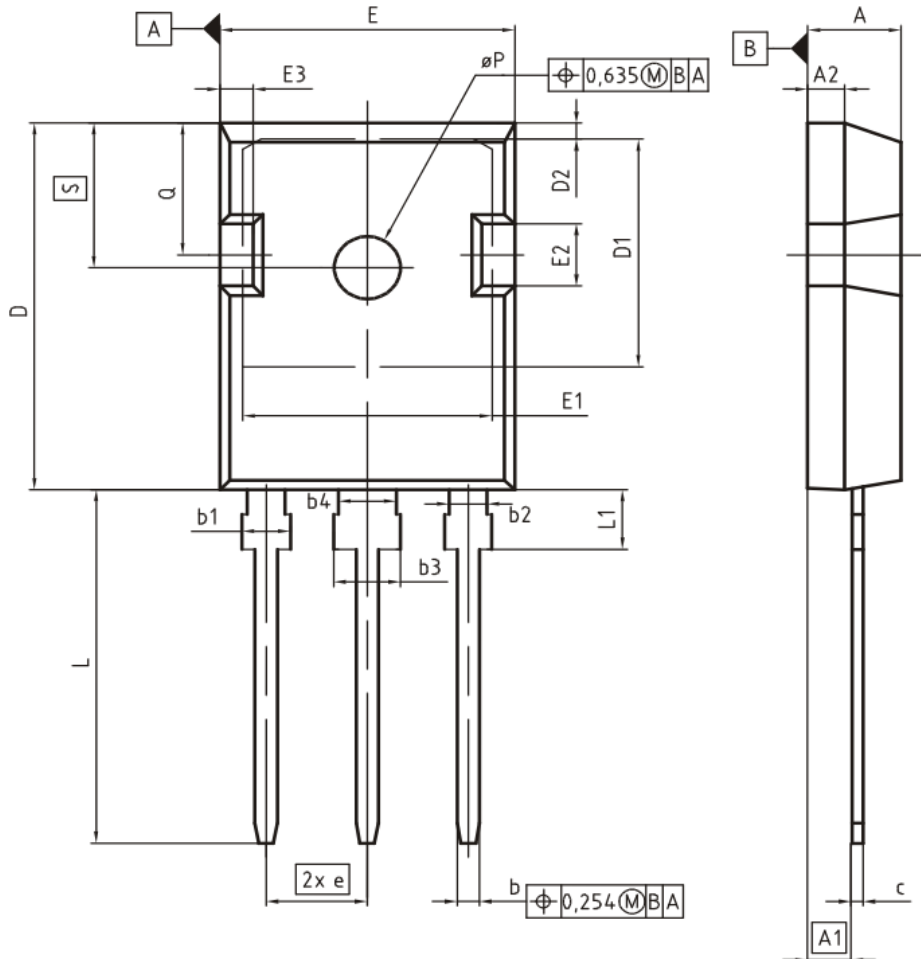


Figure 9. Typical capacitively stored energy as function of reverse voltage, per leg, $E_C=f(V_R)$

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 |
| ϕP | 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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05

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Previous Revision:

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

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