

# Silicon Carbide Schottky Diode

## IDW30G120C5B

5<sup>th</sup> Generation thinQ!™ 1200 V SiC Schottky Diode

### Final Datasheet

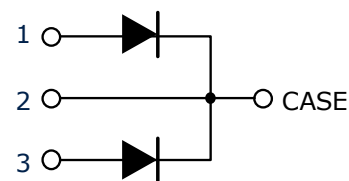
Rev. 2.0 2014-06-10

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<sup>1)</sup> 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](http://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 <sub>DC</sub> | I <sub>F</sub> | Q <sub>C</sub> | T <sub>j,max</sub> | Marking | Package    |
|--------------|-----------------|----------------|----------------|--------------------|---------|------------|
| IDW30G120C5B | 1200 V          | 15 / 30 A      | 77 / 154 nC    | 175°C              | D3012B5 | 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>$T_C = 150^{\circ}C$ , $D=1$<br>$T_C = 135^{\circ}C$ , $D=1$<br>$T_C = 25^{\circ}C$ , $D=1$ | $I_F$          | 15 / 30<br>20 / 40<br>44 / 87 | A                |
| Surge non-repetitive forward current, sine halfwave<br>$T_C=25^{\circ}C$ , $t_p=10ms$<br>$T_C=150^{\circ}C$ , $t_p=10ms$                        | $I_{F,SM}$     | 120 / 240<br>115 / 230        | A                |
| Non-repetitive peak forward current<br>$T_C = 25^{\circ}C$ , $t_p=10 \mu s$                                                                     | $I_{F,max}$    | 1230 / 2460                   | A                |
| $i^2t$ value<br>$T_C = 25^{\circ}C$ , $t_p=10 ms$<br>$T_C = 150^{\circ}C$ , $t_p=10 ms$                                                         | $\int i^2 dt$  | 72 / 288<br>66 / 264          | A <sup>2</sup> s |
| Diode $dv/dt$ ruggedness<br>$V_R=0...960 V$                                                                                                     | $dv/dt$        | 80                            | V/ns             |
| Power dissipation for $R_{th(j-c,max)}$<br>$T_C = 25^{\circ}C$                                                                                  | $P_{tot}$      | 166 / 332                     | W                |
| Operating and storage temperature                                                                                                               | $T_j; T_{stg}$ | -55...175                     | $^{\circ}C$      |
| Soldering temperature,<br>wavesoldering only allowed at leads<br>1.6mm (0.063 in.) from case for 10 s                                           | $T_{sld}$      | 260                           | $^{\circ}C$      |
| Mounting torque<br>M3 and M4 screws                                                                                                             | $M$            | 0.7                           | Nm               |

### Thermal Resistances

| Thermal Resistances                       |                      |            |                    |          |         |      |
|-------------------------------------------|----------------------|------------|--------------------|----------|---------|------|
| Parameter                                 | Symbol               | Conditions | Value (leg/device) |          |         | Unit |
|                                           |                      |            | min.               | typ.     | max.    |      |
| Characteristic                            |                      |            |                    |          |         |      |
| Diode thermal resistance, junction – case | R <sub>th(j-c)</sub> |            | -                  | 0.7/0.35 | 0.9/0.5 | K/W  |
| Thermal resistance, junction – ambient    | R <sub>th(j-a)</sub> | leaded     | -                  | -        | 62      | K/W  |

## Electrical Characteristics

### Static Characteristic, at T<sub>j</sub>=25°C, unless otherwise specified

| Parameter             | Symbol          | Conditions                                      | Value (leg/device) |         |            | Unit |
|-----------------------|-----------------|-------------------------------------------------|--------------------|---------|------------|------|
|                       |                 |                                                 | min.               | typ.    | max.       |      |
| DC blocking voltage   | V <sub>DC</sub> | T <sub>j</sub> = 25°C                           | 1200               | -       | -          | V    |
| Diode forward voltage | V <sub>F</sub>  | I <sub>F</sub> = 15/30 A, T <sub>j</sub> =25°C  | -                  | 1.4     | 1.65       | V    |
|                       |                 | I <sub>F</sub> = 15/30 A, T <sub>j</sub> =150°C | -                  | 1.7     | 2.30       |      |
| Reverse current       | I <sub>R</sub>  | V <sub>R</sub> =1200 V, T <sub>j</sub> =25°C    |                    | 9 / 17  | 124 / 248  | μA   |
|                       |                 | V <sub>R</sub> =1200 V, T <sub>j</sub> =150°C   |                    | 44 / 88 | 640 / 1280 |      |

### Dynamic Characteristics, at T<sub>j</sub>=25°C, unless otherwise specified

| Parameter               | Symbol         | Conditions                                           | Value (leg/device) |            |      | Unit |
|-------------------------|----------------|------------------------------------------------------|--------------------|------------|------|------|
|                         |                |                                                      | min.               | typ.       | max. |      |
| Total capacitive charge | Q <sub>C</sub> | V <sub>R</sub> = 800V, T <sub>j</sub> =150° C & 25°C | -                  | 77 / 154   | -    | nC   |
|                         |                | $Q_C = \int_0^{V_R} C(V) dV$                         |                    |            |      |      |
| Total Capacitance       | C              | V <sub>R</sub> =1 V, f=1 MHz                         | -                  | 990 / 1980 | -    | pF   |
|                         |                | V <sub>R</sub> =400 V, f=1 MHz                       | -                  | 70 / 140   | -    |      |
|                         |                | V <sub>R</sub> =800 V, f=1 MHz                       | -                  | 55 / 111   | -    |      |



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

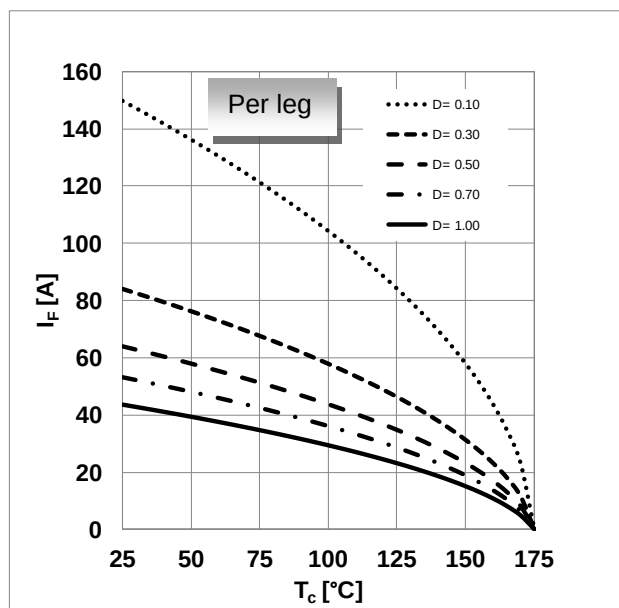


Figure 2. Diode forward current per leg as function of temperature, parameter:  $T_j \leq 175^\circ\text{C}$ ,  $R_{\text{th(j-c),max}}$ ,  $D$ =duty cycle,  $V_{\text{th}}$ ,  $R_{\text{diff}}$  @  $T_j = 175^\circ\text{C}$

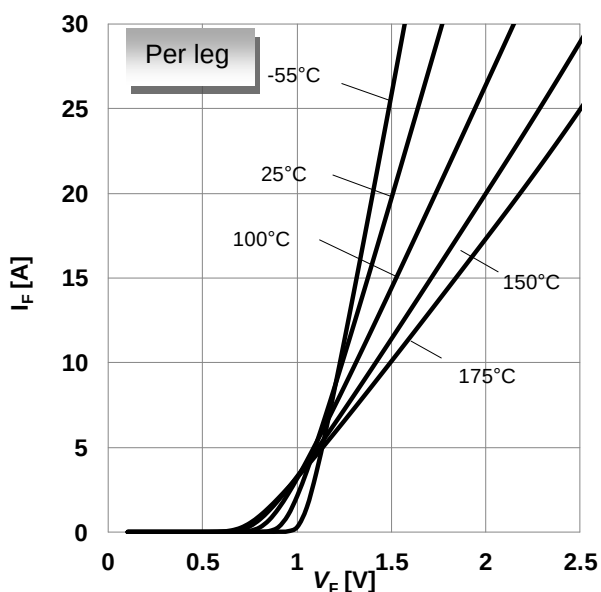


Figure 3. Typical forward characteristics per leg,  $I_F = f(V_F)$ ,  $t_p = 10 \mu\text{s}$ , parameter:  $T_j$

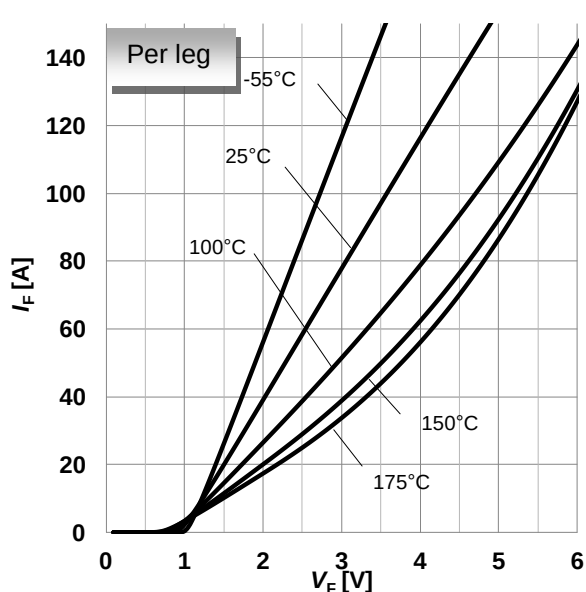


Figure 4. Typical forward characteristics in surge current per leg,  $I_F = f(V_F)$ ,  $t_p = 10 \mu\text{s}$ , parameter:  $T_j$

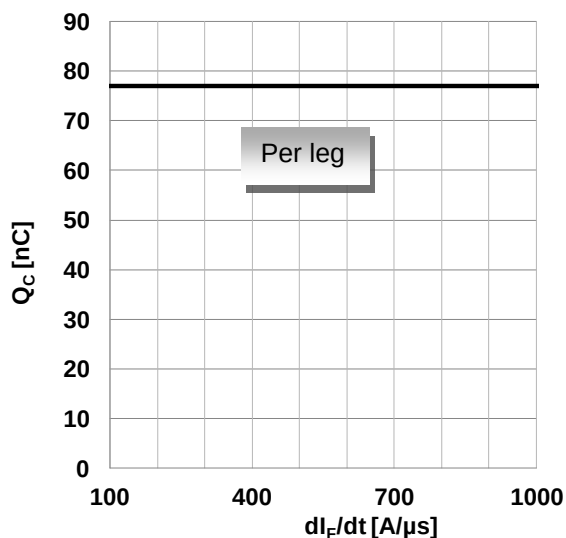


Figure 5. **Typical capacitive charge per leg as function of current slope**<sup>1</sup>,  $Q_C = f(di_F/dt)$ ,  $T_j = 150^\circ\text{C}$

1) guaranteed by design.

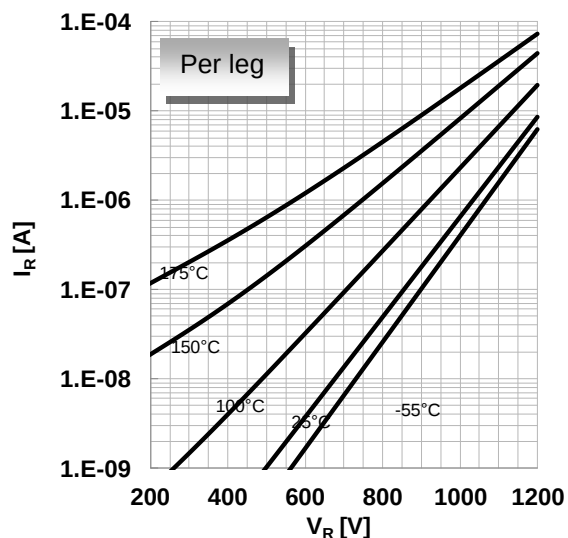


Figure 6. **Typical reverse characteristics per leg**,  $I_R = f(V_R)$ , parameter:  $T_j$

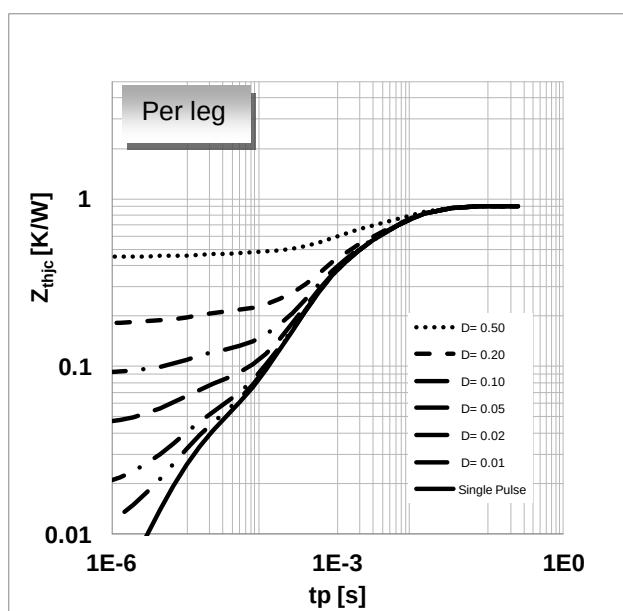


Figure 7. **Max. transient thermal impedance per leg**,  $Z_{th,j-c} = f(t_p)$ , parameter:  $D = t_p/T$

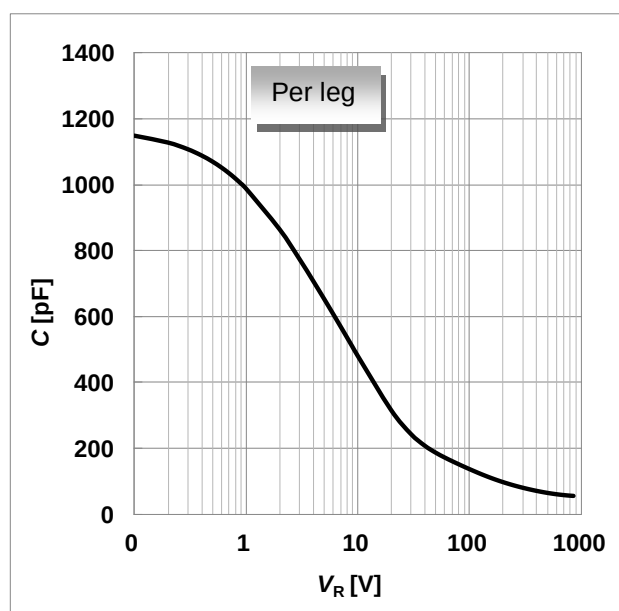


Figure 8. **Typical capacitance per leg as function of reverse voltage**,  $C = f(V_R)$ ;  $T_j = 25^\circ\text{C}$ ;  $f = 1\text{ MHz}$

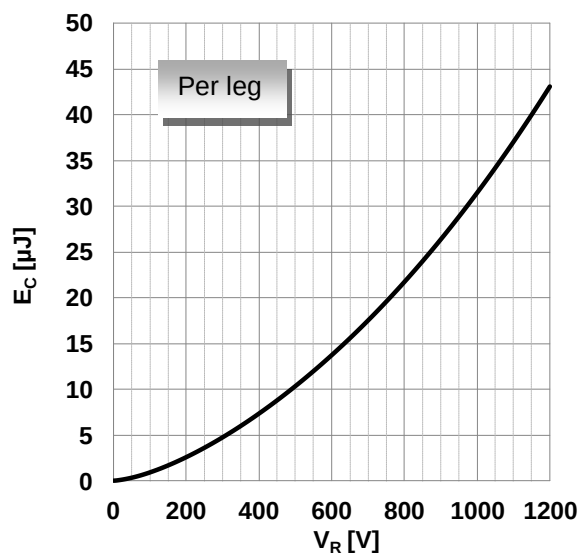
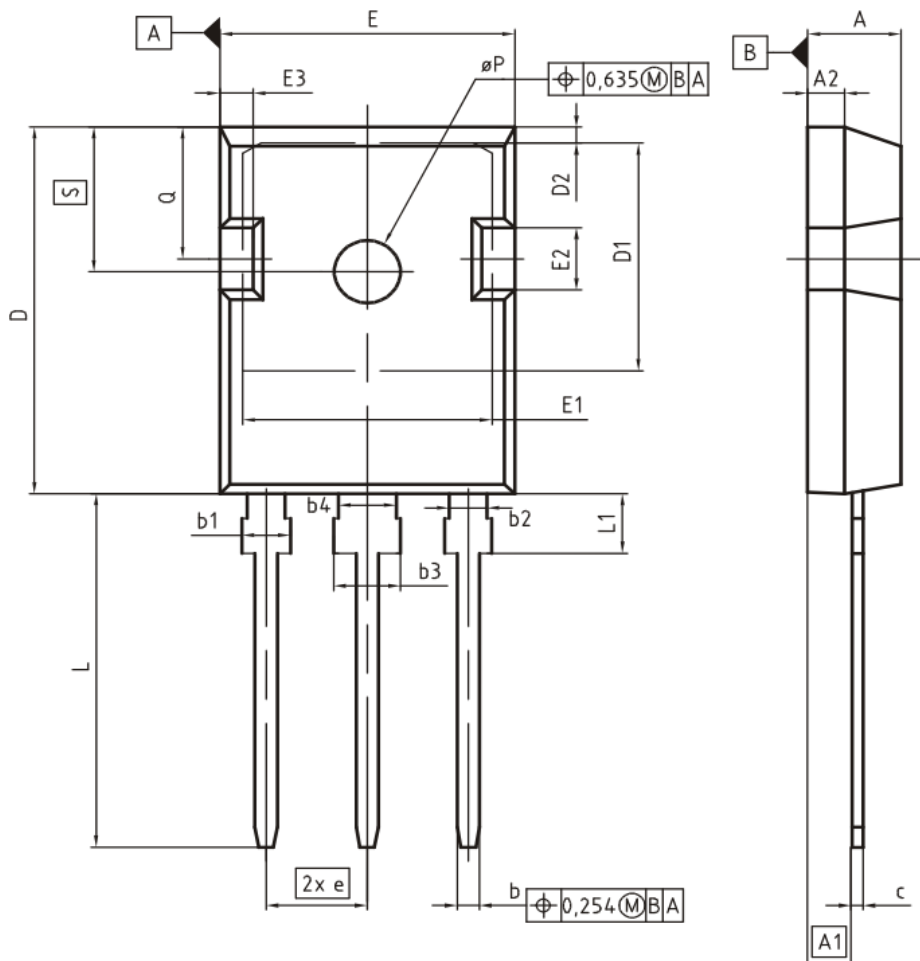


Figure 9. Typical capacitively stored energy as function of reverse voltage, per leg,  $E_C=f(V_R)$



## 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 |
| 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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## Revision History

IDW30G120C5B

### 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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