

3rd Generation thinQ!TM SiC Schottky Diode

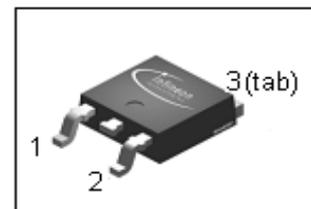
Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery / No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Breakdown voltage tested at 20mA²⁾
- Optimized for high temperature operation
- Lowest Figure of Merit Q_C/I_F

Product Summary

| | | |
|----------------------------|-----|----|
| V_{DC} | 600 | V |
| Q_C | 6 | nC |
| $I_F; T_C < 130\text{ °C}$ | 5 | A |

PG-TO252-3



thinQ! 3G Diode designed for fast switching applications like:

- SMPS e.g.; CCM PFC
- Motor Drives; Solar Applications; UPS



| Type | Package | Marking | Pin 1 | Pin 2 | Pin 3 |
|------------|------------|---------|-------|-------|-------|
| IDD05SG60C | PG-TO252-3 | D05G60C | n.c. | A | C |

Maximum ratings

| Parameter | Symbol | Conditions | Value | Unit |
|---|----------------|---|-------------|------------------|
| Continuous forward current | I_F | $T_C < 130\text{ °C}$ | 5 | A |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$ | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$ | 26 | |
| | | $T_C = 150\text{ °C}, t_p = 10\text{ ms}$ | 18 | |
| Non-repetitive peak forward current | $I_{F,max}$ | $T_C = 25\text{ °C}, t_p = 10\text{ }\mu\text{s}$ | 150 | |
| i^2t value | $\int i^2 dt$ | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$ | 3.2 | A ² s |
| | | $T_C = 150\text{ °C}, t_p = 10\text{ ms}$ | 2 | |
| Repetitive peak reverse voltage | V_{RRM} | $T_j = 25\text{ °C}$ | 600 | V |
| Diode dv/dt ruggedness | dv/dt | $V_R = 0 \dots 480\text{ V}$ | 50 | V/ns |
| Power dissipation | P_{tot} | $T_C = 25\text{ °C}$ | 56 | W |
| Operating and storage temperature | T_j, T_{stg} | | -55 ... 175 | °C |
| Soldering temperature, reflow soldering (max) | T_{sold} | reflow MSL1 | 260 | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Thermal characteristics

| | | | | | | |
|--|------------|--|---|----|-----|-----|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 2.7 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | SMD version, device on PCB, minimal footprint | - | - | 75 | |
| | | SMD version, device on PCB, 6 cm ² cooling area ⁵⁾ | - | 50 | - | |

Electrical characteristics, at $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified
Static characteristics

| | | | | | | |
|-----------------------|----------|--|-----|-----|-----|---------------|
| DC blocking voltage | V_{DC} | $I_R=0.05\text{ mA}, T_j=25\text{ }^\circ\text{C}$ | 600 | - | - | V |
| Diode forward voltage | V_F | $I_F=5\text{ A}, T_j=25\text{ }^\circ\text{C}$ | - | 2.1 | 2.3 | |
| | | $I_F=5\text{ A}, T_j=150\text{ }^\circ\text{C}$ | - | 2.8 | - | |
| Reverse current | I_R | $V_R=600\text{ V}, T_j=25\text{ }^\circ\text{C}$ | - | 0.4 | 30 | μA |
| | | $V_R=600\text{ V}, T_j=150\text{ }^\circ\text{C}$ | - | 1.5 | 350 | |

AC characteristics

| | | | | | | |
|------------------------------|-------|---|---|-----|-----|---------------|
| Total capacitive charge | Q_C | $V_R=400\text{ V}, I_F \leq I_{F,max}, di_F/dt=200\text{ A}/\mu\text{s}, T_j=150\text{ }^\circ\text{C}$ | - | 6 | - | nC |
| Switching time ³⁾ | t_c | | - | - | <10 | ns |
| Total capacitance | C | $V_R=1\text{ V}, f=1\text{ MHz}$ | - | 110 | - | μF |
| | | $V_R=300\text{ V}, f=1\text{ MHz}$ | - | 15 | - | |
| | | $V_R=600\text{ V}, f=1\text{ MHz}$ | - | 15 | - | |

¹⁾ J-STD20 and JESD22

²⁾ All devices tested under avalanche conditions, for a time periode of 10ms, at 20mA.

³⁾ t_c is the time constant for the capacitive displacement current waveform (independent from T_j , I_{LOAD} and di/dt), different from t_{rr} which is dependent on T_j , I_{LOAD} and di/dt . No reverse recovery time constant t_{rr} due to absence of minority carrier injection.

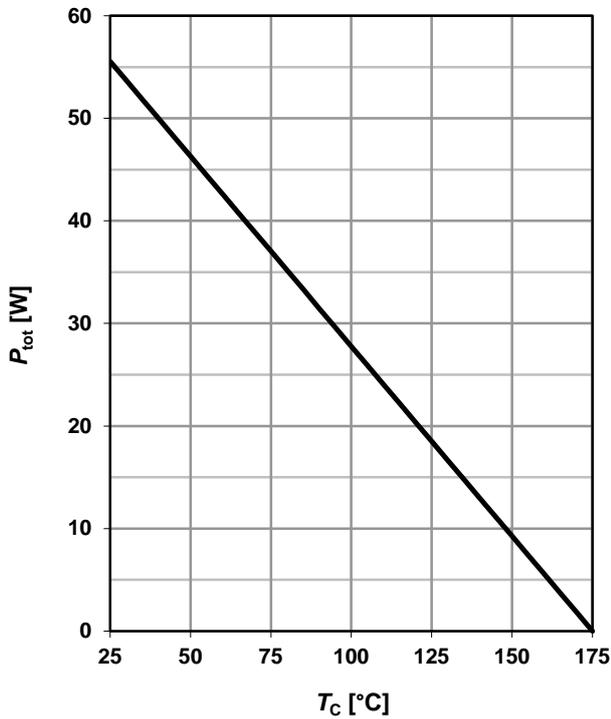
⁴⁾ Under worst case Z_{th} conditions.

⁵⁾ Device on 40mm*40mm*1.5 epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air

⁶⁾ Only capacitive charge occuring, guaranteed by design.

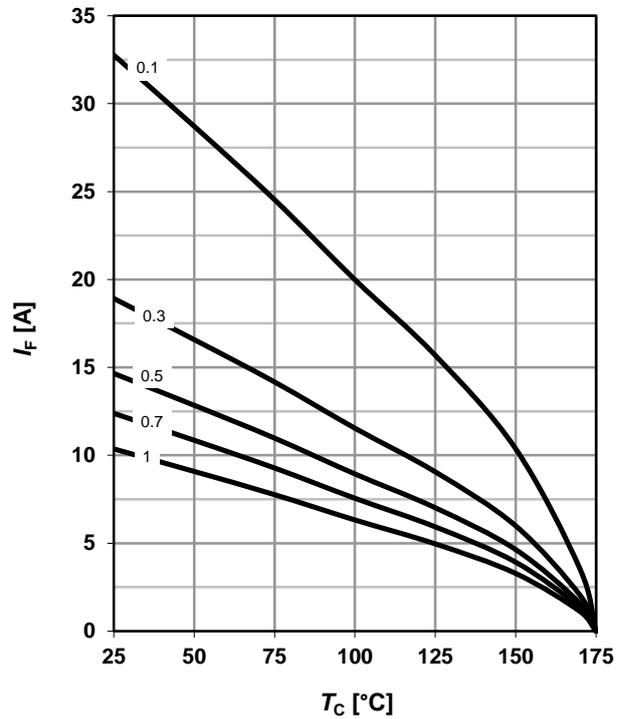
1 Power dissipation

$P_{tot}=f(T_C)$; parameter: $R_{thJC(max)}$



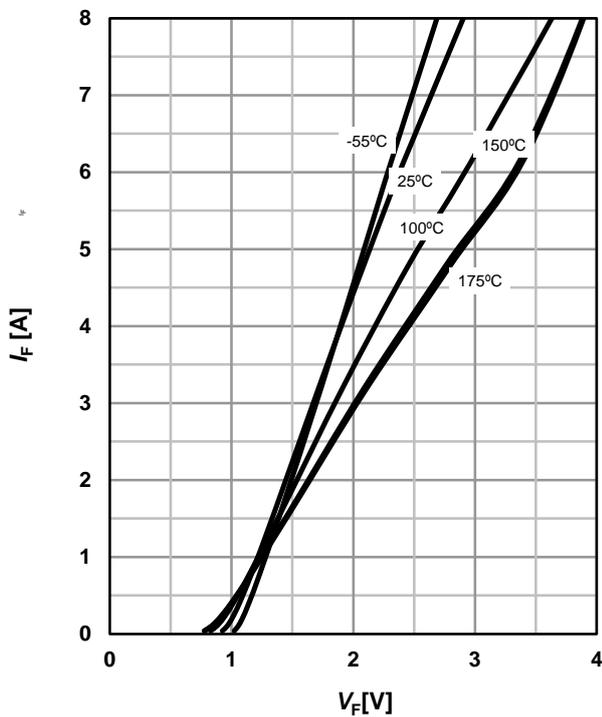
2 Diode forward current

$I_F=f(T_C)^4$; $T_j \leq 175\text{ °C}$; parameter: $D = t_p/T$



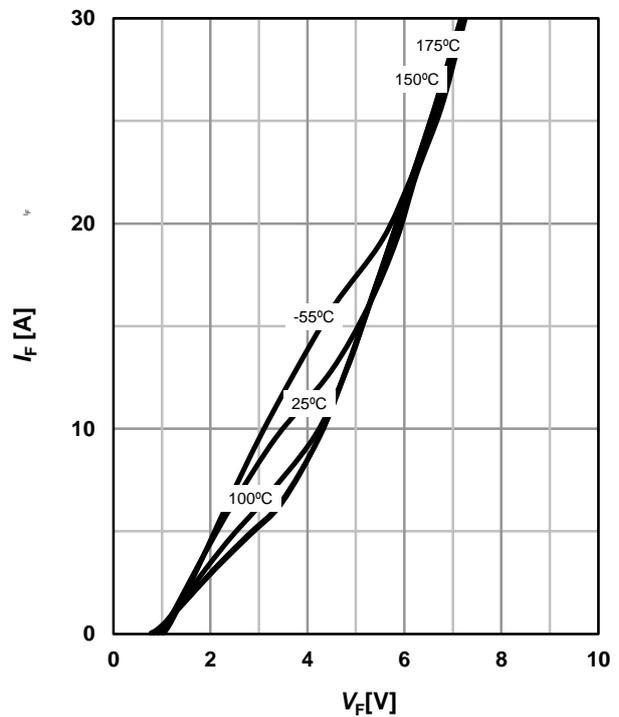
3 Typ. forward characteristic

$I_F=f(V_F)$; $t_p=400\text{ }\mu\text{s}$; parameter: T_j



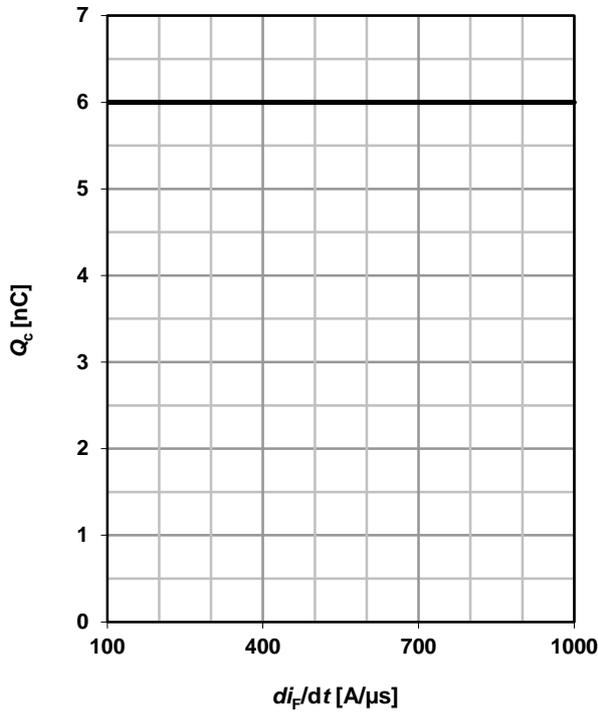
4 Typ. forward characteristic in surge current mode

$I_F=f(V_F)$; $t_p=400\text{ }\mu\text{s}$; parameter: T_j



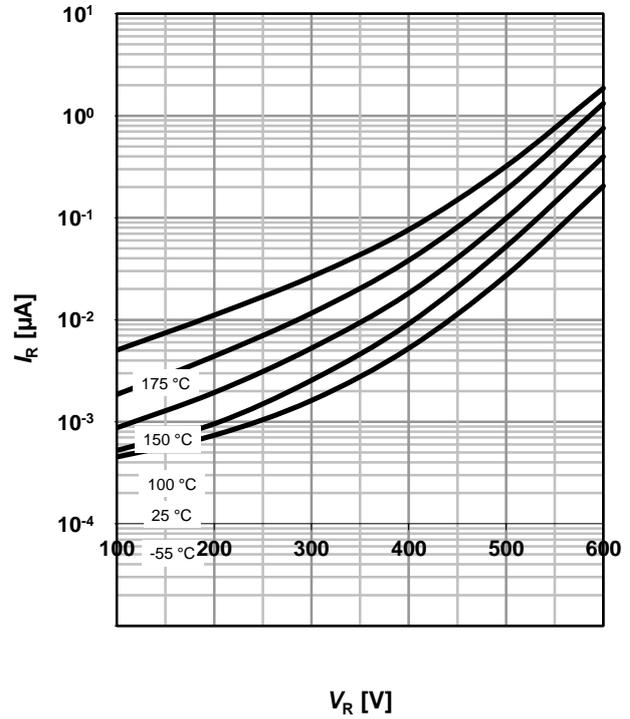
5 Typ. capacitance charge vs. current slope

$$Q_C = f(di_F/dt)^6; I_F \leq I_{F,max}$$



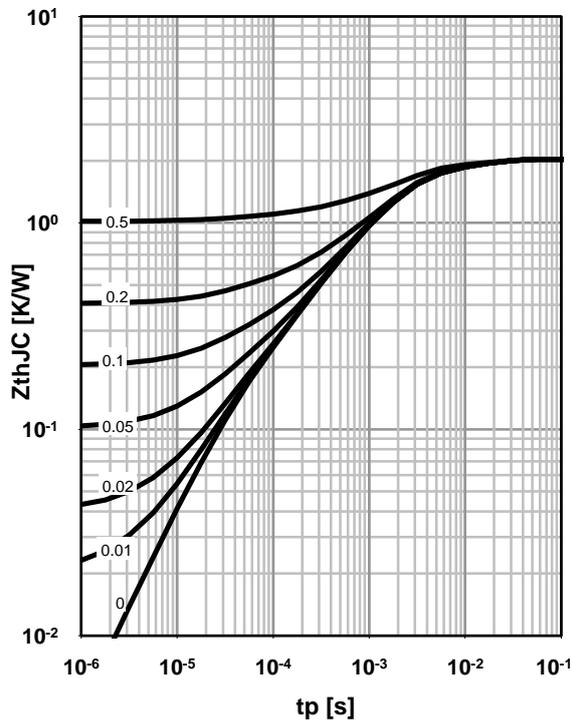
6 Typ. reverse current vs. reverse voltage

$$I_R = f(V_R); \text{ parameter: } T_j$$



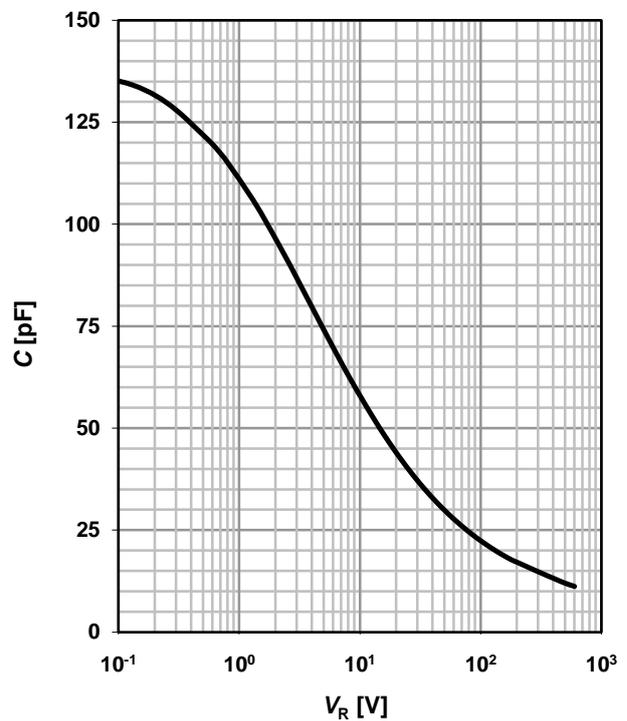
7 Transient thermal impedance

$$Z_{thJC} = f(t_p); \text{ parameter: } D = t_p/T$$



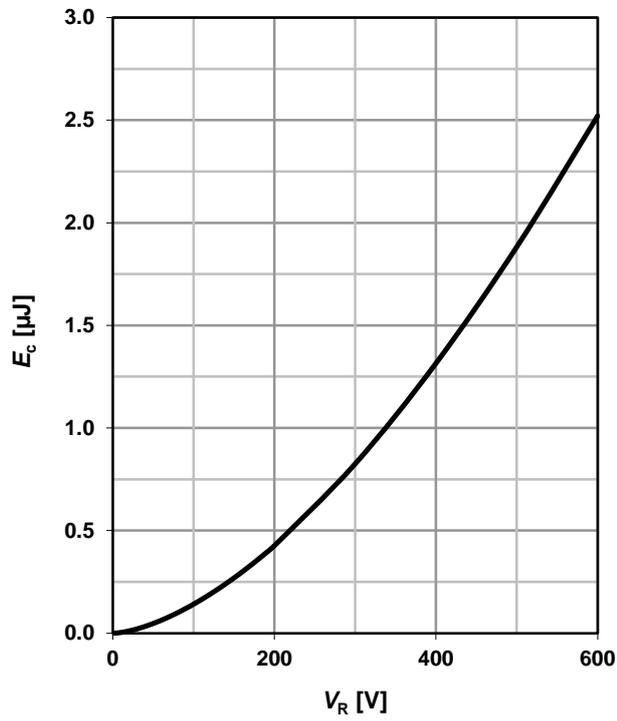
8 Typ. capacitance vs. reverse voltage

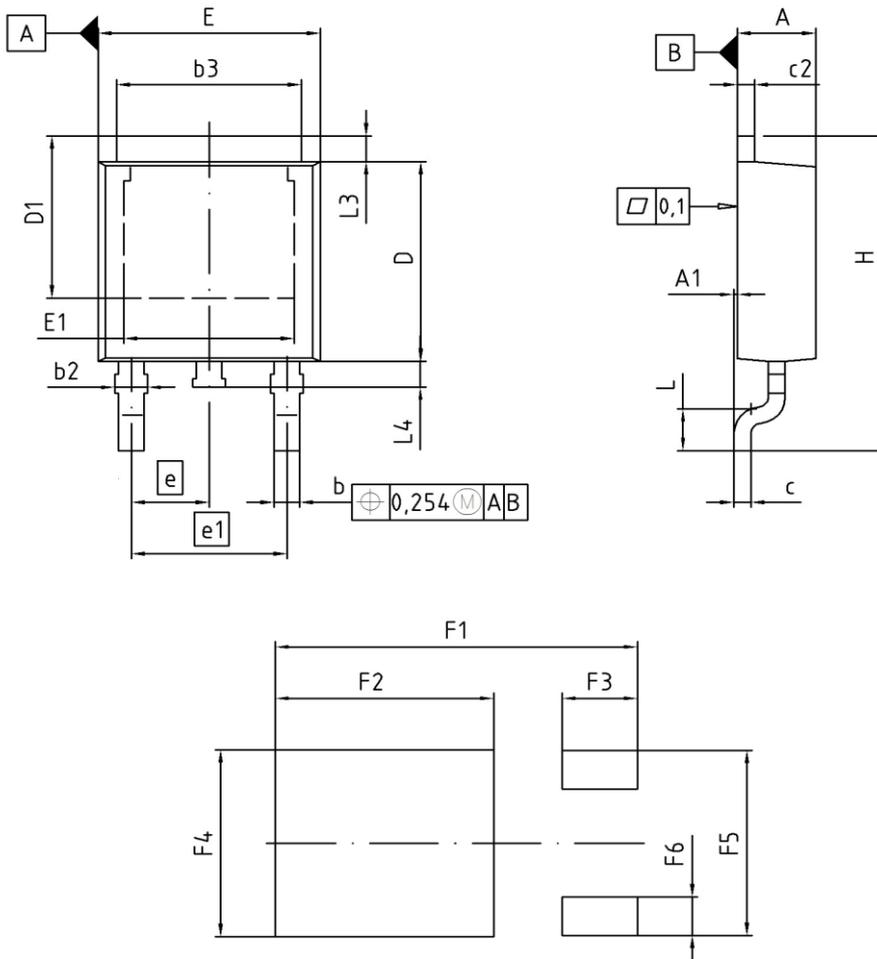
$$C = f(V_R); T_C = 25 \text{ °C}, f = 1 \text{ MHz}$$



9 Typ. C stored energy

$$E_C = f(V_R)$$



PG-TO252-3: Outline


| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 2.16 | 2.41 | 0.085 | 0.095 |
| A1 | 0.00 | 0.15 | 0.000 | 0.006 |
| b | 0.64 | 0.89 | 0.025 | 0.035 |
| b2 | 0.65 | 1.15 | 0.026 | 0.045 |
| b3 | 5.00 | 5.50 | 0.197 | 0.217 |
| c | 0.46 | 0.60 | 0.018 | 0.024 |
| c2 | 0.46 | 0.98 | 0.018 | 0.039 |
| D | 5.97 | 6.22 | 0.235 | 0.245 |
| D1 | 5.02 | 5.84 | 0.198 | 0.230 |
| E | 6.40 | 6.73 | 0.252 | 0.265 |
| E1 | 4.70 | 5.21 | 0.185 | 0.205 |
| e | 2.29 | | 0.090 | |
| e1 | 4.57 | | 0.180 | |
| N | 3 | | 3 | |
| H | 9.40 | 10.48 | 0.370 | 0.413 |
| L | 1.18 | 1.70 | 0.046 | 0.067 |
| L3 | 0.90 | 1.25 | 0.035 | 0.049 |
| L4 | 0.51 | 1.00 | 0.020 | 0.039 |
| F1 | 10.50 | 10.70 | 0.413 | 0.421 |
| F2 | 6.30 | 6.50 | 0.248 | 0.256 |
| F3 | 2.10 | 2.30 | 0.083 | 0.091 |
| F4 | 5.70 | 5.90 | 0.224 | 0.232 |
| F5 | 5.66 | 5.86 | 0.223 | 0.231 |
| F6 | 1.10 | 1.30 | 0.043 | 0.051 |

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