

### 3<sup>rd</sup> Generation thinQ!<sup>TM</sup> SiC Schottky Diode

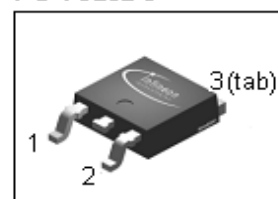
#### Features

- 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 JEDEC<sup>1)</sup> for target applications
- Breakdown voltage tested at 20mA<sup>2)</sup>
- Optimized for high temperature operation
- Lowest Figure of Merit  $Q_C/I_F$
- Halogen-free according to IEC 61249-2-21 definition

#### Product Summary

$V_{DC}$	600	V
$Q_C$	19	nC
$I_F; T_C < 130\text{ °C}$	12	A

#### PG-T0252-3



#### 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
IDD12SG60C	PG-T0252-3	D12G60C	n.c.	A	C

#### Maximum ratings

Parameter	Symbol	Conditions	Value	Unit
Continuous forward current	$I_F$	$T_C < 130\text{ °C}$	12	A
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$	59	
		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$	51	
Non-repetitive peak forward current	$I_{F,max}$	$T_C = 25\text{ °C}, t_p = 10\text{ }\mu\text{s}$	430	
$i^2t$ value	$\int i^2 dt$	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$	17	A <sup>2</sup> s
		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$	12	
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	$P_{tot}$	$T_C = 25\text{ °C}$	125	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	$R_{thJC}$		-	-	1.2	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	SMD version, device on PCB, minimal footprint	-	-	75	
		SMD version, device on PCB, 6 cm <sup>2</sup> cooling area <sup>5)</sup>	-	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	$V_F$	$I_F=12\text{ A}, T_j=25\text{ }^\circ\text{C}$	-	1.8	2.1	
		$I_F=12\text{ A}, T_j=150\text{ }^\circ\text{C}$	-	2.2	-	
Reverse current	$I_R$	$V_R=600\text{ V}, T_j=25\text{ }^\circ\text{C}$	-	1	100	$\mu\text{A}$
		$V_R=600\text{ V}, T_j=150\text{ }^\circ\text{C}$	-	4	1000	

**AC characteristics**

Total capacitive charge	$Q_c$	$V_R=400\text{ V}, I_F \leq I_{F,max},$ $di_F/dt=200\text{ A}/\mu\text{s},$	-	19	-	nC
Switching time <sup>3)</sup>	$t_c$	$T_j=150\text{ }^\circ\text{C}$	-	-	<10	ns
Total capacitance	$C$	$V_R=1\text{ V}, f=1\text{ MHz}$	-	310	-	pF
		$V_R=300\text{ V}, f=1\text{ MHz}$	-	50	-	
		$V_R=600\text{ V}, f=1\text{ MHz}$	-	50	-	

<sup>1)</sup> J-STD20 and JESD22

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

<sup>3)</sup>  $t_c$  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.

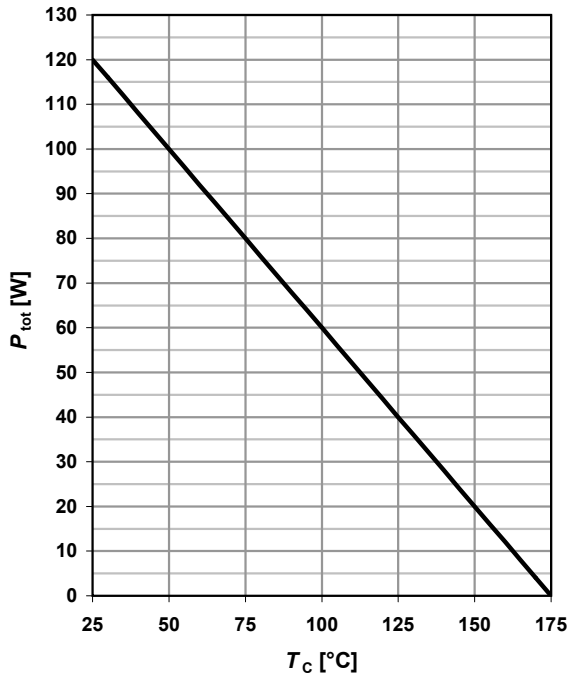
<sup>4)</sup> Under worst case  $Z_{th}$  conditions.

<sup>5)</sup> Device on 40mm\*40mm\*1.5 epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70 $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air

<sup>6)</sup> Only capacitive charge occuring, guaranteed by design.

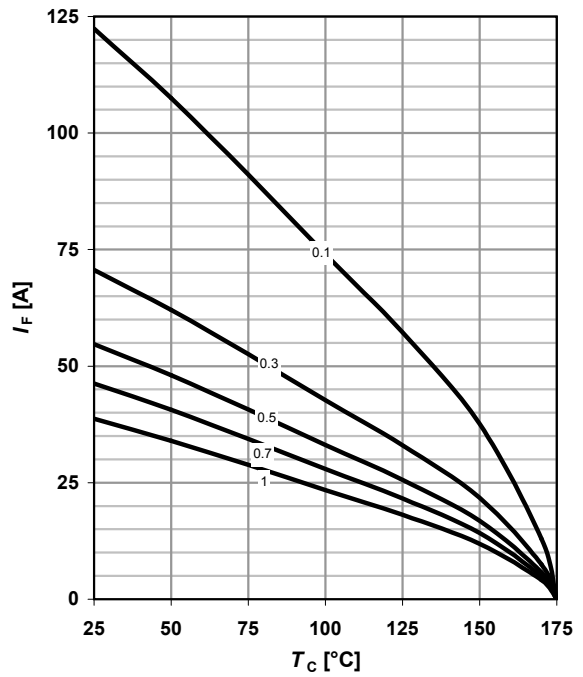
**1 Power dissipation**

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



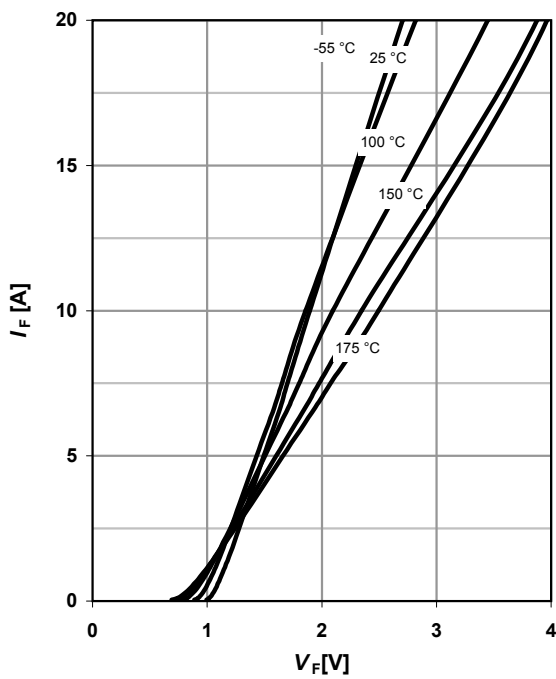
**2 Diode forward current**

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



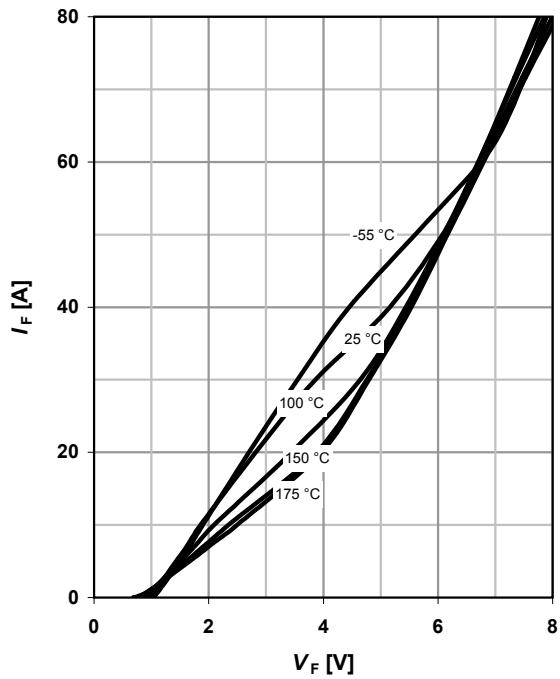
**3 Typ. forward characteristic**

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



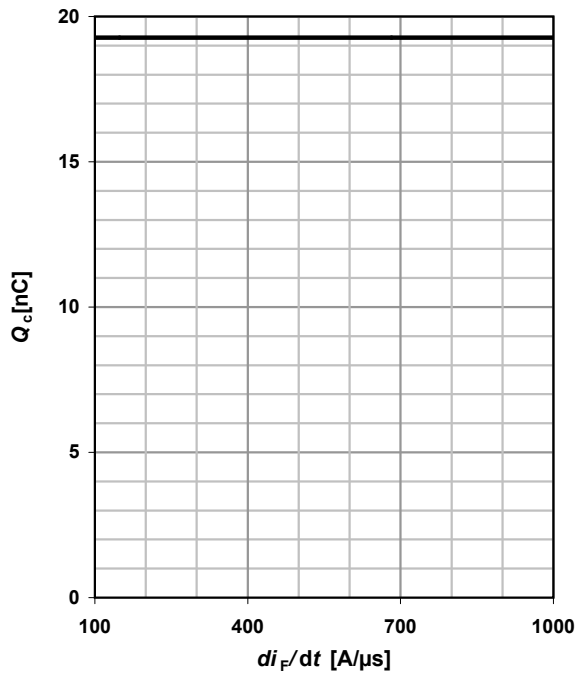
**4 Typ. forward characteristic in surge current mode**

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



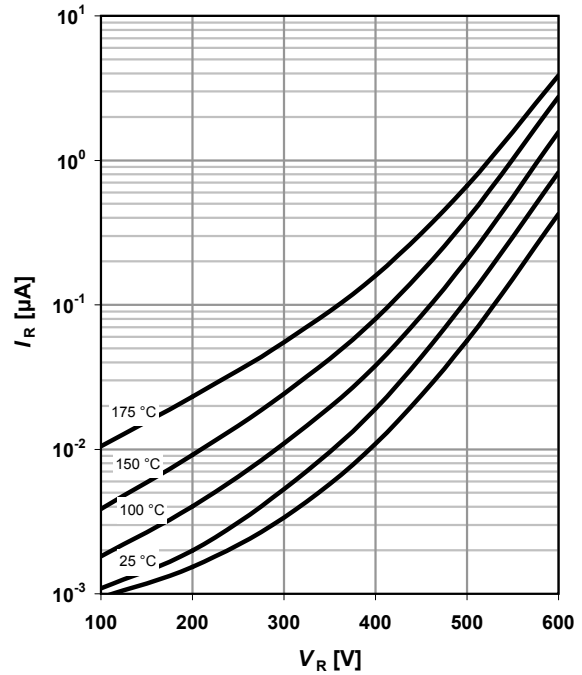
**5 Typ. capacitance charge vs. current slope**

$$Q_C = f(di_F/dt)^{0.6}; I_F \leq I_{F,max}$$



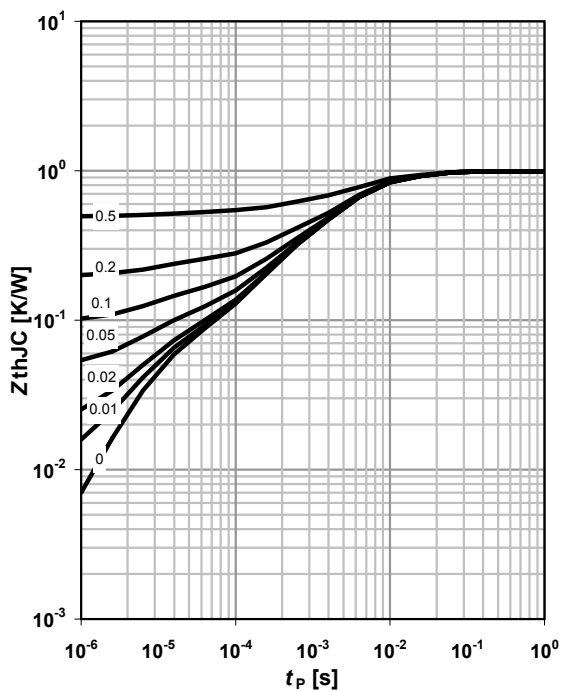
**6 Typ. reverse current vs. reverse voltage**

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



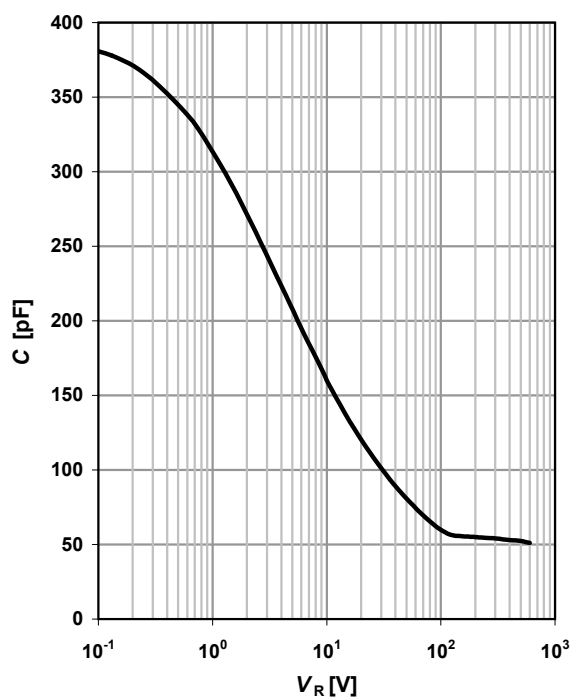
**7 Typ. transient thermal impedance**

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



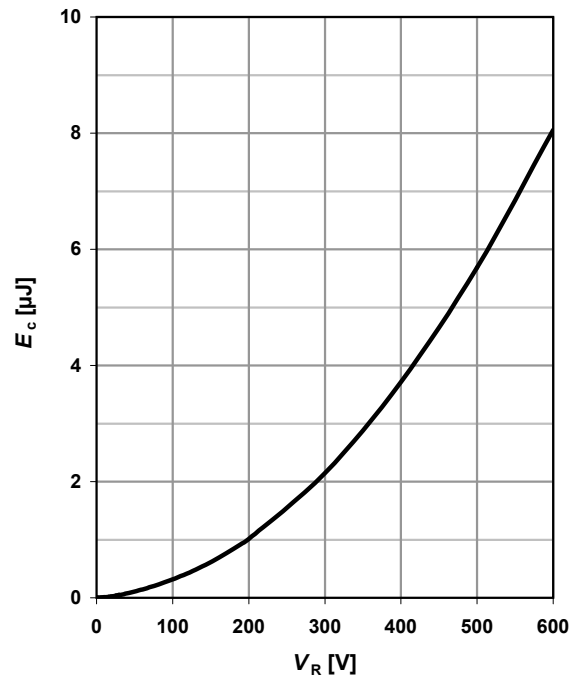
**8 Typ. capacitance vs. reverse voltage**

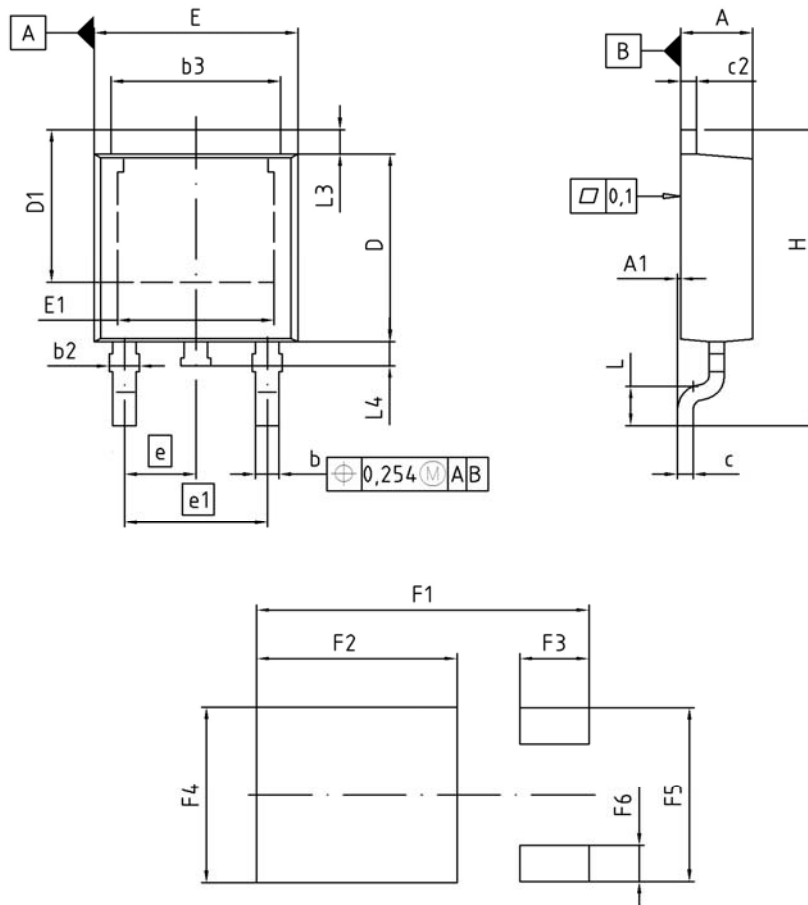
$$C = f(V_R); T_C = 25 \text{ °C}, f = 1 \text{ MHz}$$



**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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