

3rd Generation thinQ!™ SiC Schottky Diode

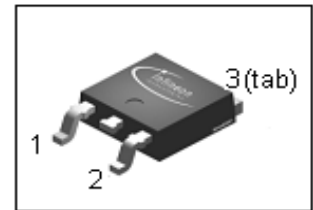
Features

- 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	19	nC
$I_F; T_C < 130\text{ °C}$	12	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
IDD12SG60C	PG-TO252-3	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	$I_{F,max}$	$T_C = 25\text{ °C}, t_p = 10\text{ μs}$	430	
i^2t value	$\int i^2 dt$	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$	17	A ² 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 ² cooling area ⁵⁾	-	50	-	

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

DC blocking voltage	V_{DC}	$I_R=0.05\text{ mA}$, $T_j=25\text{ °C}$	600	-	-	V
Diode forward voltage	V_F	$I_F=12\text{ A}$, $T_j=25\text{ °C}$	-	1.8	2.1	
		$I_F=12\text{ A}$, $T_j=150\text{ °C}$	-	2.2	-	
Reverse current	I_R	$V_R=600\text{ V}$, $T_j=25\text{ °C}$	-	1	100	μA
		$V_R=600\text{ V}$, $T_j=150\text{ °C}$	-	4	1000	

AC characteristics

Total capacitive charge	Q_c	$V_R=400\text{ V}$, $I_F \leq I_{F,max}$, $di_F/dt=200\text{ A}/\mu\text{s}$, $T_j=150\text{ °C}$	-	19	-	nC
Switching time ³⁾	t_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	-	

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.

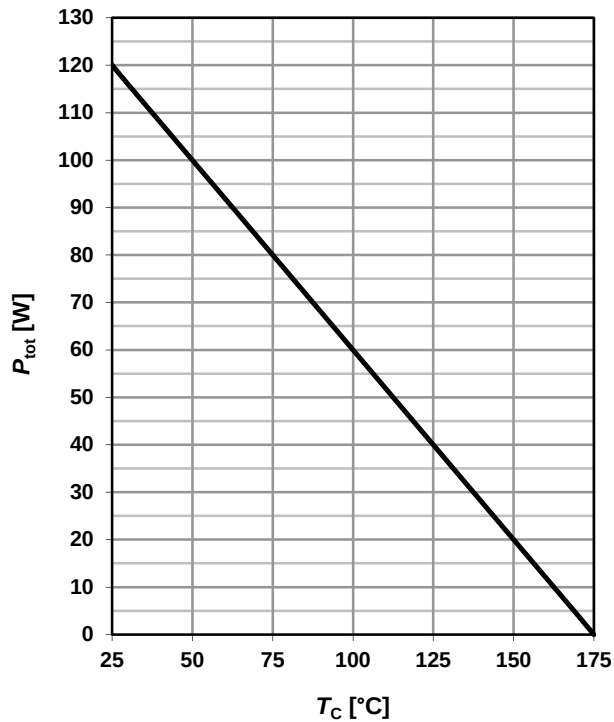
⁴⁾ Under worst case Z_{th} conditions.

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

⁶⁾ Only capacitive charge occuring, guaranteed by design.

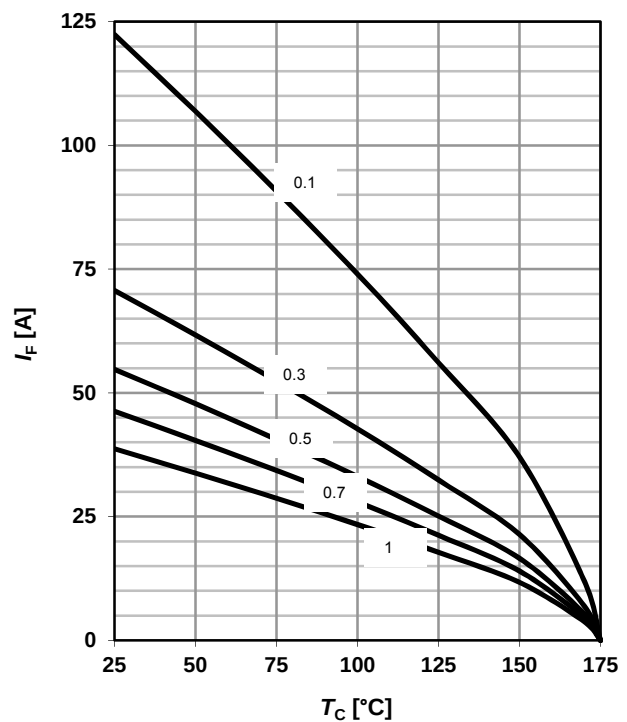
1 Power dissipation

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



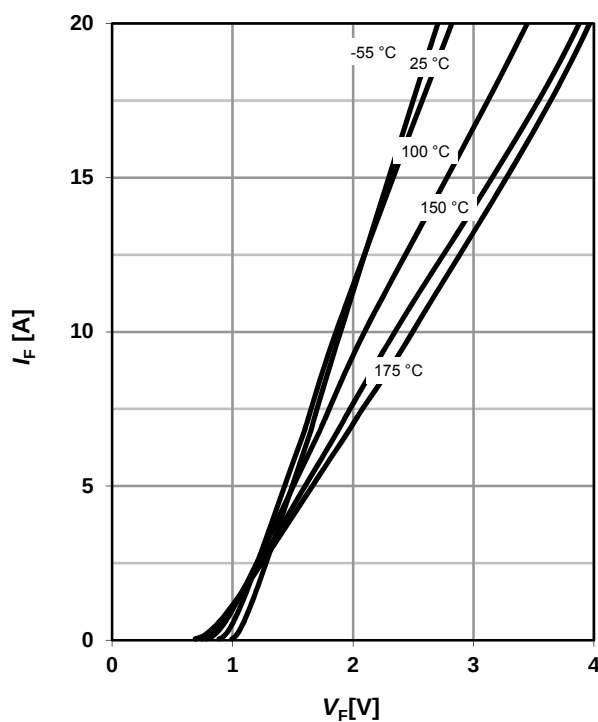
2 Diode forward current

$I_F = f(T_C)^{0.4}$; $T_j \leq 175$ °C; parameter: $D = t_p/T$



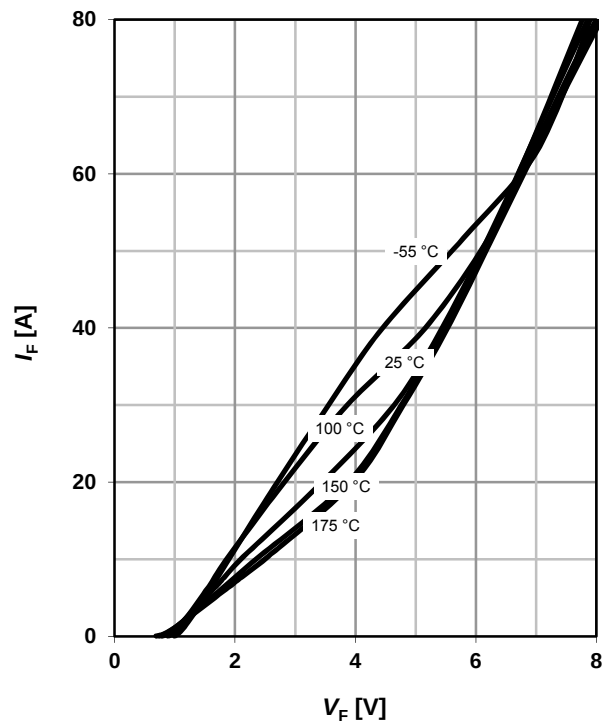
3 Typ. forward characteristic

$I_F = f(V_F)$; $t_p = 400$ µs; parameter: T_j



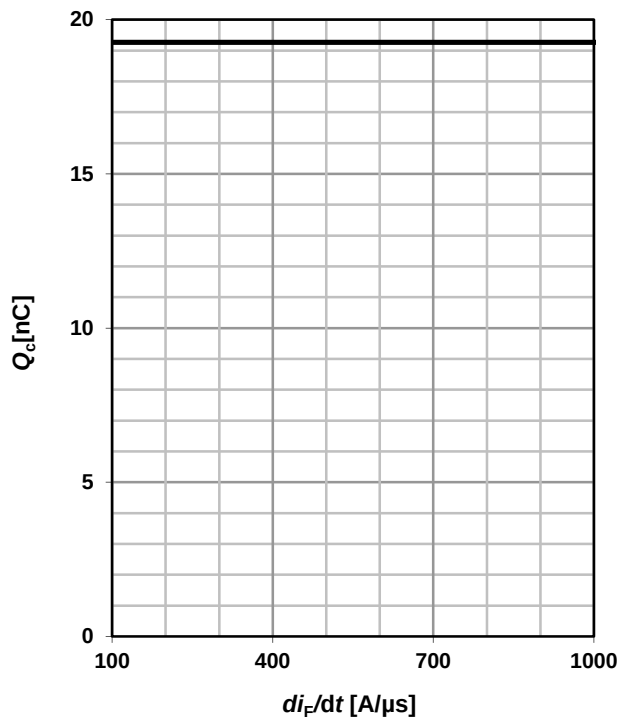
4 Typ. forward characteristic in surge current mode

$I_F = f(V_F)$; $t_p = 400$ µs; parameter: T_j



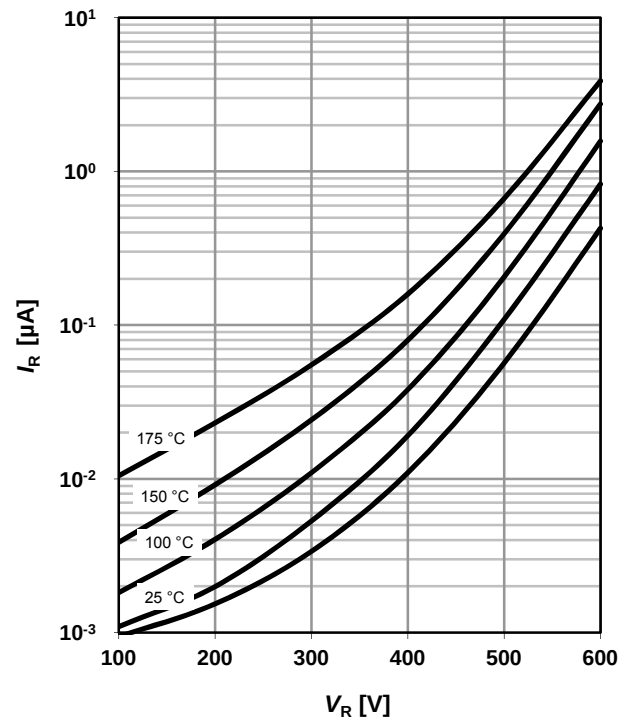
5 Typ. capacitance charge vs. current slope

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



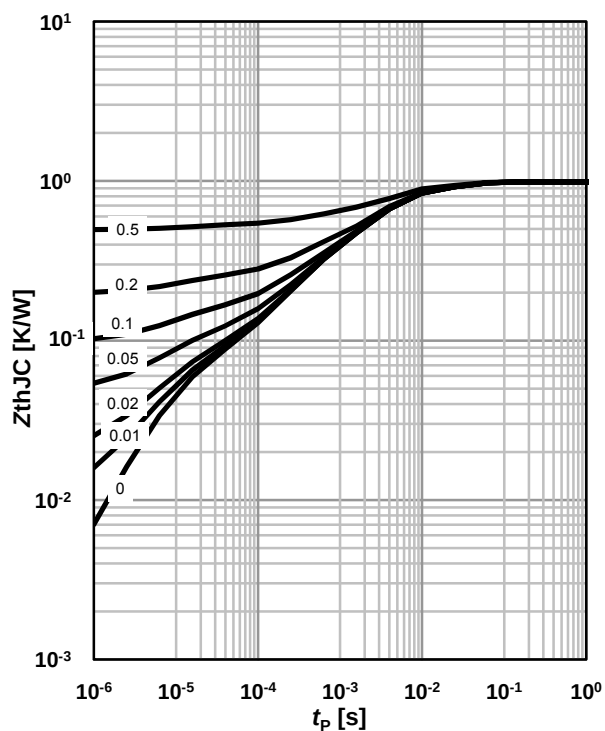
6 Typ. reverse current vs. reverse voltage

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



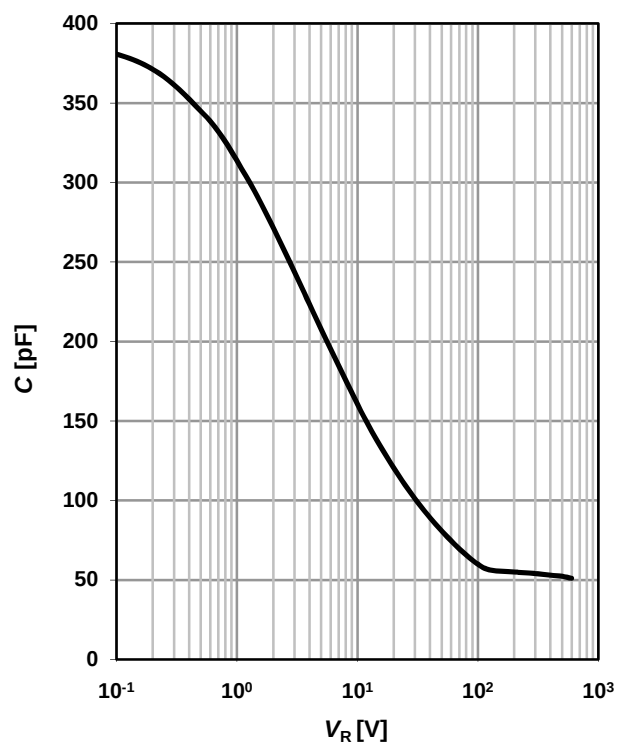
7 Typ. transient thermal impedance

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



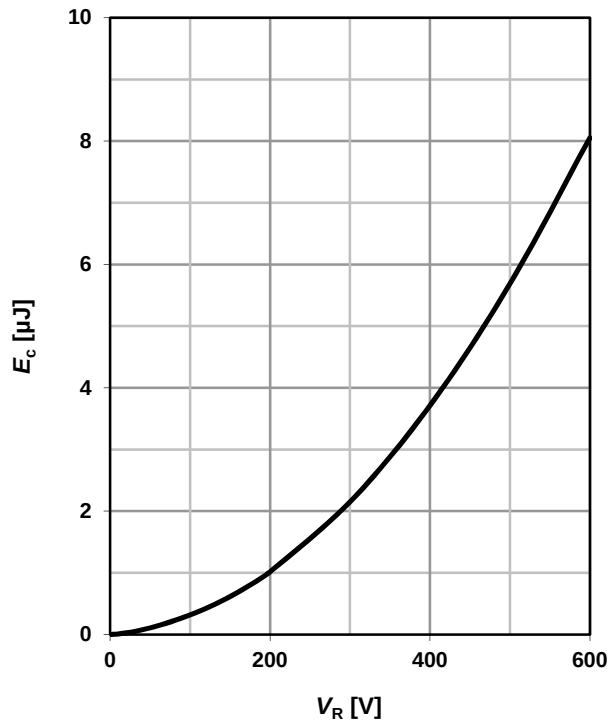
8 Typ. capacitance vs. reverse voltage

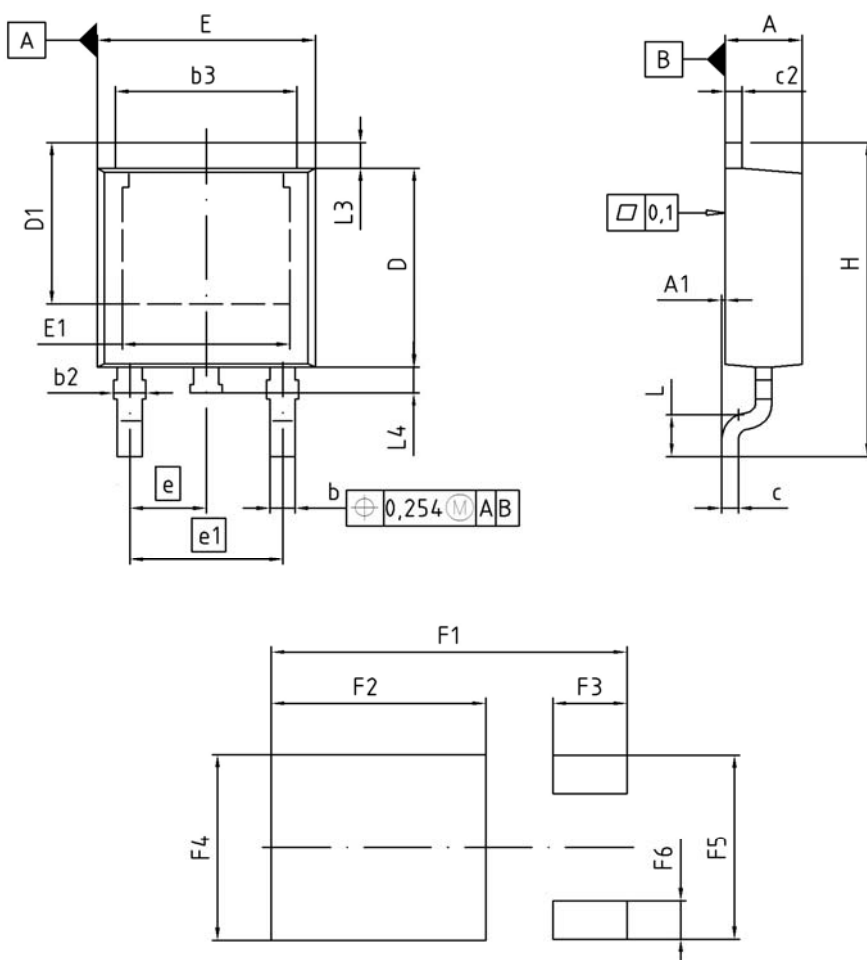
$$C = f(V_R); T_C = 25 \text{ °C}, f = 1 \text{ MHz}$$



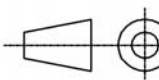
9 Typ. C stored energy

$$E_C = f(V_R)$$



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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