

3rd Generation thinQ!™ SiC Schottky Diode

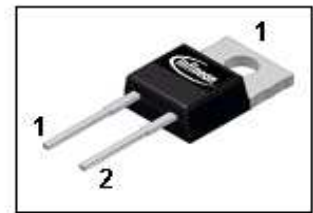
Features

- 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-TO220-2



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
IDH12SG60C	PG-TO220-2	D12G60C	C	A

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, wavesoldering only allowed at leads	T_{sld}	1.6mm (0.063 in.) from case for 10s	260	
Mounting torque		M3 and M3.5 screws	60	Ncm

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}	Thermal resistance, junction- ambient, leaded	-	-	62	

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.

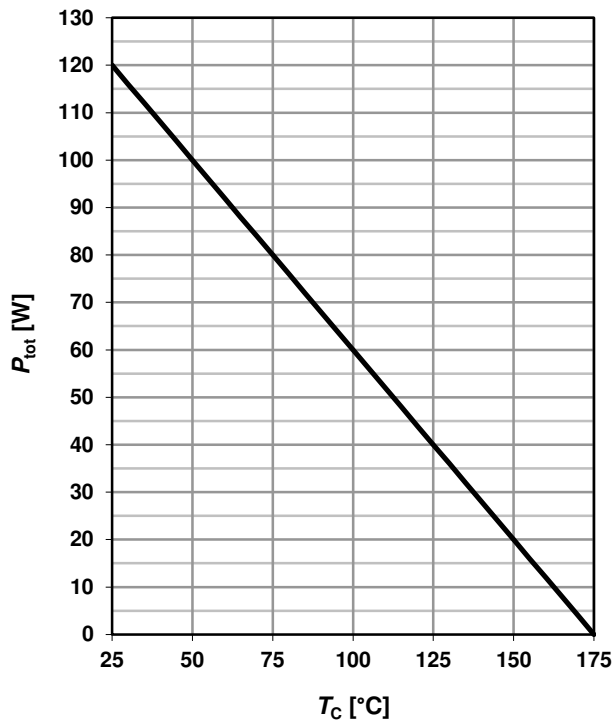
³⁾ t_c is the time constant for the capacitive displacement current waveform (independent from T_j , I_{LOAD} and di/dt), different from t_{rr} which is dependent on T_j , I_{LOAD} and di/dt . No reverse recovery time constant t_{rr} due to absence of minority carrier injection.

⁴⁾ Under worst case Z_{th} conditions.

⁵⁾ Only capacitive charge occuring, guaranteed by design.

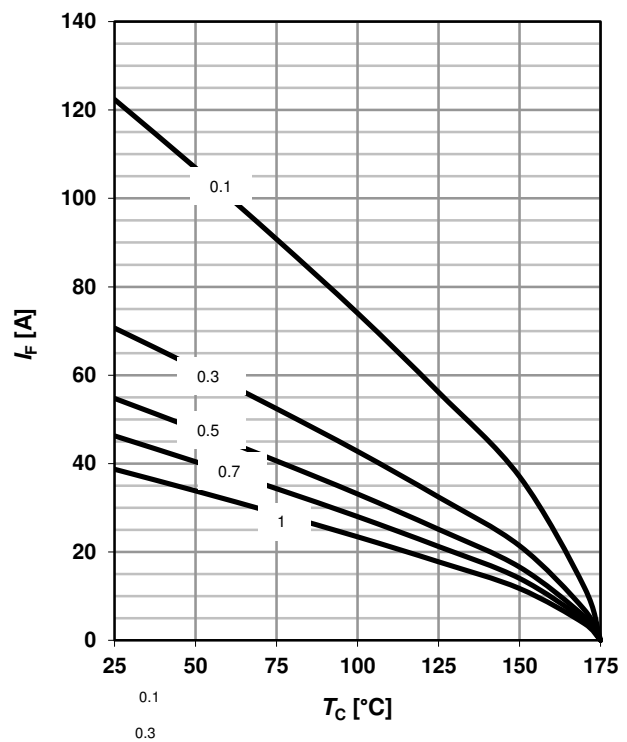
1 Power dissipation

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



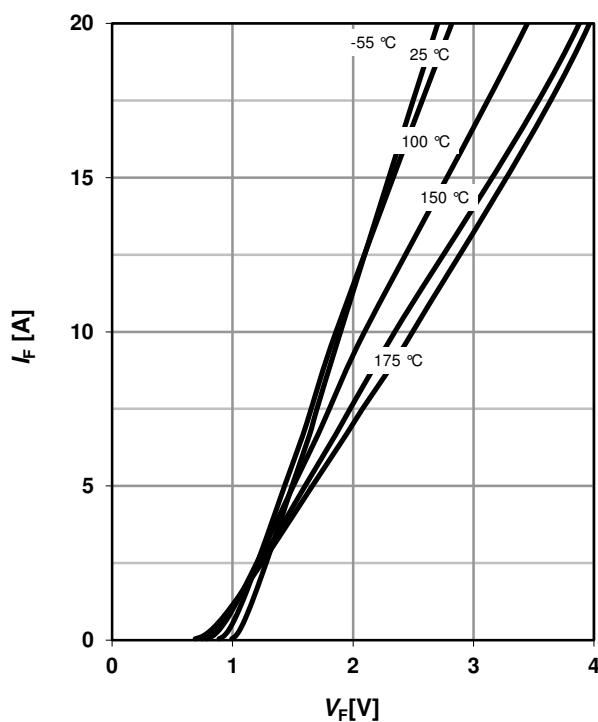
2 Diode forward current

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



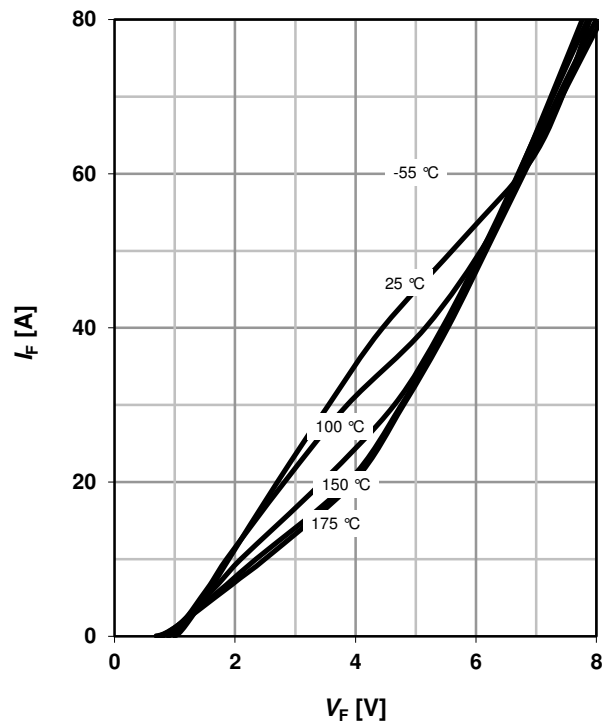
3 Typ. forward characteristic

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



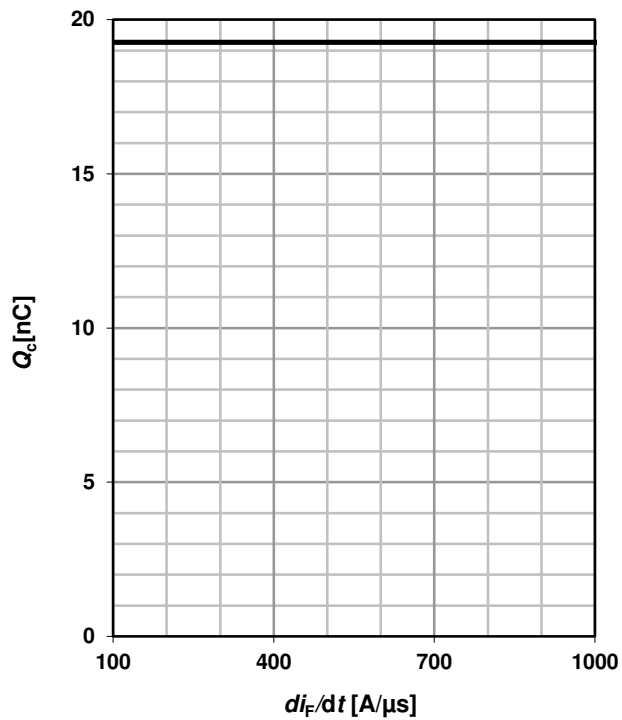
4 Typ. forward characteristic in surge current mode

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



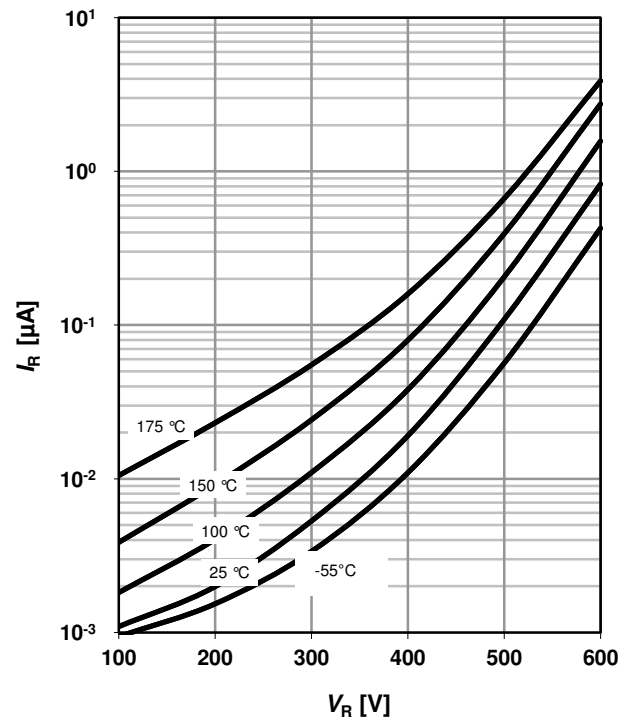
5 Typ. capacitance charge vs. current slope

$$Q_C = f(di_F/dt)^{0.5}; I_F \leq I_{F,max}$$



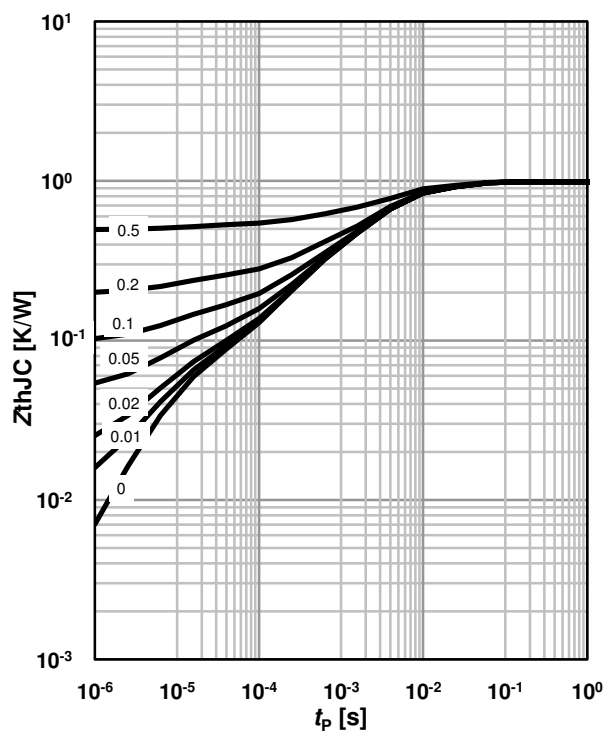
6 Typ. reverse current vs. reverse voltage

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



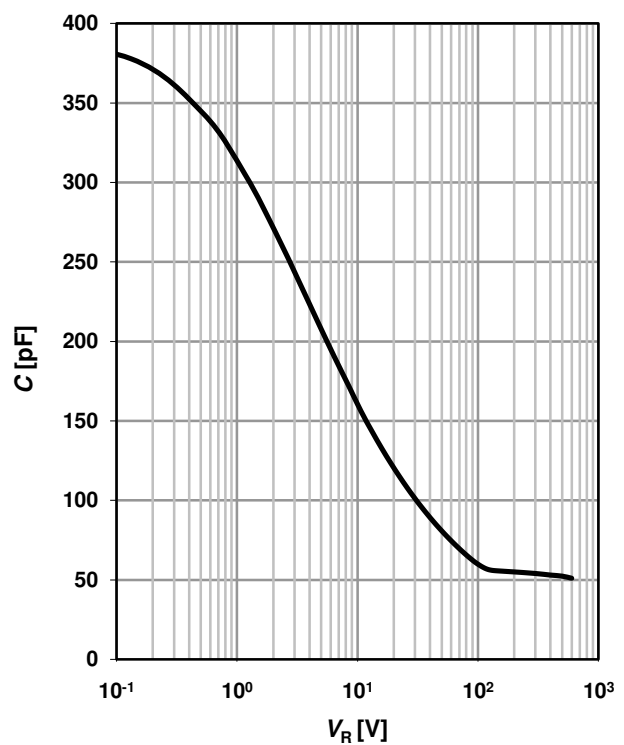
7 Typ. transient thermal impedance

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



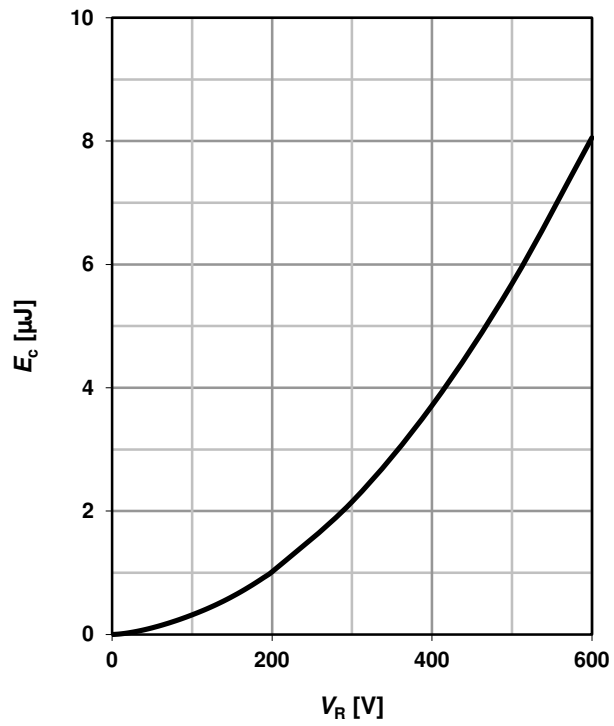
8 Typ. capacitance vs. reverse voltage

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

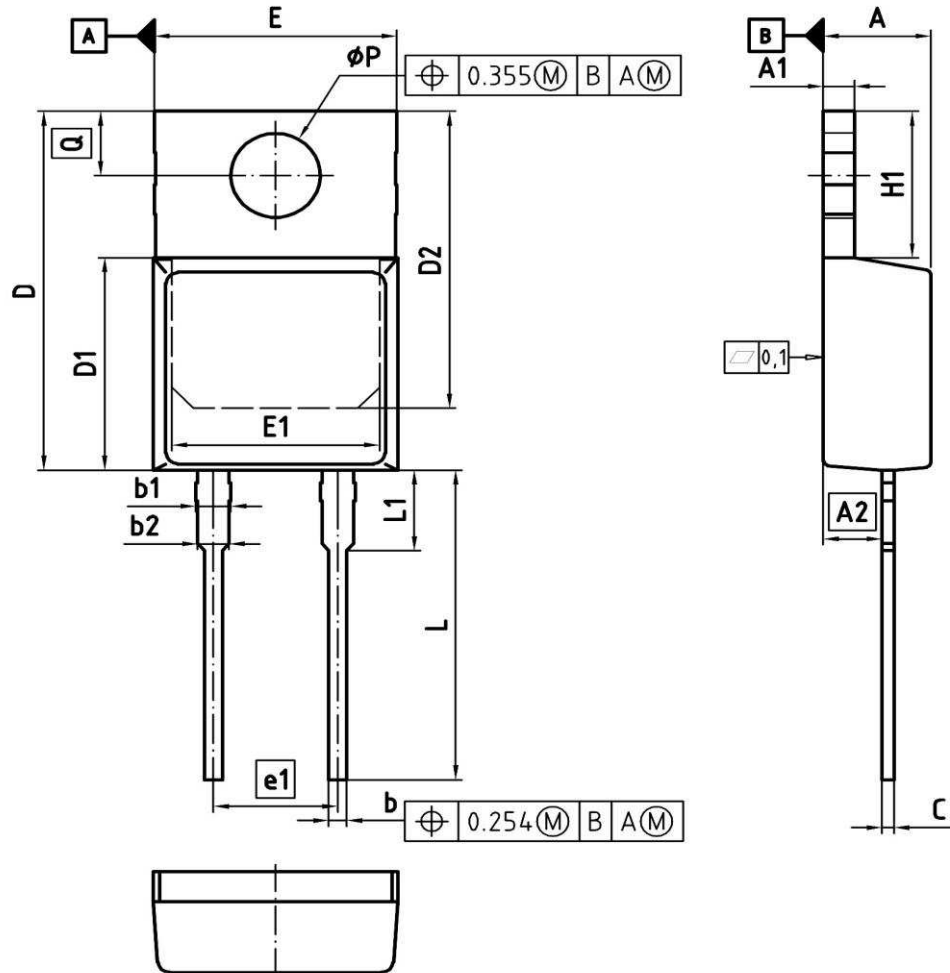


9 Typ. C stored energy

$$E_C = f(V_R)$$



PG-TO220-2: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.50	0.169	0.177
A1	1.17	1.37	0.046	0.054
A2	2.30	2.50	0.091	0.098
b	0.65	0.85	0.026	0.033
b1	1.19	1.69	0.047	0.066
b2	1.19	1.39	0.047	0.055
c	0.40	0.60	0.016	0.024
D	15.35	15.95	0.604	0.628
D1	9.05	9.45	0.356	0.372
D2	12.30	13.05	0.484	0.514
E	9.80	10.20	0.386	0.402
E1	7.25	8.60	0.285	0.339
e1	5.08		0.200	
N	2		2	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	3.30	3.70	0.130	0.146
øP	3.55	3.70	0.140	0.146
Q	2.60	3.00	0.102	0.118

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