

2nd Generation thinQ!TM SiC Schottky Diode

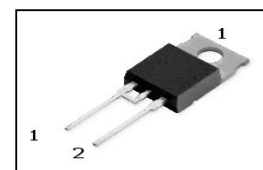
Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery/ No forward recovery
- No temperature influence on the switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Breakdown voltage tested at 5mA²⁾

Product Summary

V_{DC}	600	V
Q_c	30	nC
I_F	12	A

PG-TO220-2-2



thinQ! 2G Diode specially designed for fast switching applications like:

- CCM PFC
- Motor Drives

Type	Package		Marking	Pin 1	Pin 2
IDT12S60C	PG-TO220-2-2		D12S60C	C	A

Maximum ratings, at $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous forward current	I_F	$T_C < 140\text{ }^\circ\text{C}$	12	A
RMS forward current	$I_{F,RMS}$	$f=50\text{ Hz}$	18	
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	$T_C=25\text{ }^\circ\text{C}$, $t_p=10\text{ ms}$	98	
Repetitive peak forward current	$I_{F,RM}$	$T_j=150\text{ }^\circ\text{C}$, $T_C=100\text{ }^\circ\text{C}$, $D=0.1$	49	
Non-repetitive peak forward current	$I_{F,max}$	$T_C=25\text{ }^\circ\text{C}$, $t_p=10\text{ }\mu\text{s}$	410	
i^2t value	$\int i^2 dt$	$T_C=25\text{ }^\circ\text{C}$, $t_p=10\text{ ms}$	48	A ² s
Repetitive peak reverse voltage	V_{RRM}		600	V
Diode ruggedness dv/dt	dv/dt	$V_R=0\dots 480\text{V}$	50	V/ns
Power dissipation	P_{tot}	$T_C=25\text{ }^\circ\text{C}$	115	W
Operating and storage temperature	T_j , T_{stg}		-55 ... 175	$^\circ\text{C}$
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}		-	-	1.3	K/W
Thermal resistance, junction - ambient	R_{thJA}	leaded	-	-	62	
Soldering temperature, wavesoldering only allowed at leads	T_{sold}	1.6mm(0.063 in.) from case for 10s	-	-	260	°C

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

Static characteristics

DC blocking voltage	V_{DC}	$I_R=0.16\text{ mA}$	600	-	-	V
Diode forward voltage	V_F	$I_F=12\text{ A}, T_j=25\text{ °C}$	-	1.5	1.7	
		$I_F=12\text{ A}, T_j=150\text{ °C}$	-	1.7	2.1	
Reverse current	I_R	$V_R=600\text{ V}, T_j=25\text{ °C}$	-	1.5	160	μA
		$V_R=600\text{ V}, T_j=150\text{ °C}$	-	6	1600	

AC characteristics

Total capacitive charge	Q_c	$V_R=400\text{ V}, I_F \leq I_{F,max},$	-	30	-	nC
Switching time ³⁾	t_c	$di_F/dt=200\text{ A}/\mu\text{s},$ $T_j=150\text{ °C}$	-	-	<10	
Total capacitance	C	$V_R=1\text{ V}, f=1\text{ MHz}$	-	530	-	pF
		$V_R=300\text{ V}, f=1\text{ MHz}$	-	70	-	
		$V_R=600\text{ V}, f=1\text{ MHz}$	-	70	-	

¹⁾ J-STD20 and JESD22

²⁾ All devices tested under avalanche conditions, for a time periode of 5ms, at 5mA.

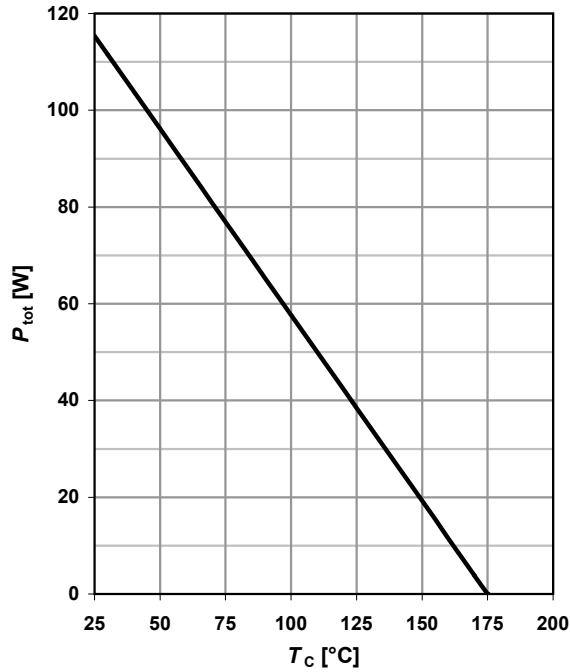
³⁾ t_c is the time constant for the capacitive displacement current waveform (independent from T_j, I_{LOAD} and di/dt), different from t_{rr} , which is dependent on $T_j, I_{LOAD}, di/dt$. No reverse recovery time constant t_{rr} due to absence of minority carrier injection.

⁴⁾ Only capacitive charge occuring, guaranteed by design.

1 Power dissipation

$$P_{tot} = f(T_C)$$

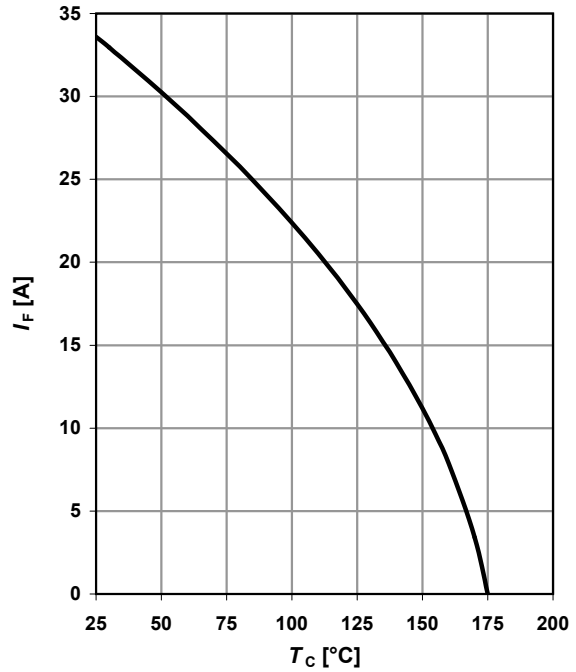
parameter: $R_{thJC(max)}$



2 Diode forward current

$$I_F = f(T_C); T_j \leq 175 \text{ °C}$$

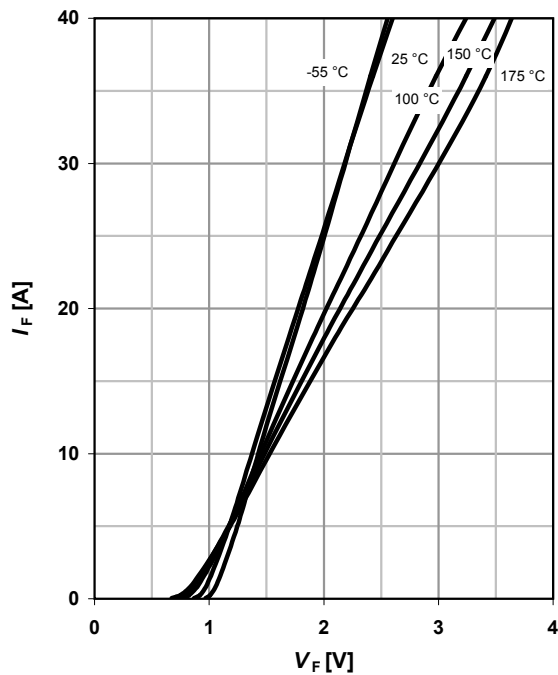
parameter: $R_{thJC(max)}$; $V_{F(max)}$



3 Typ. forward characteristic

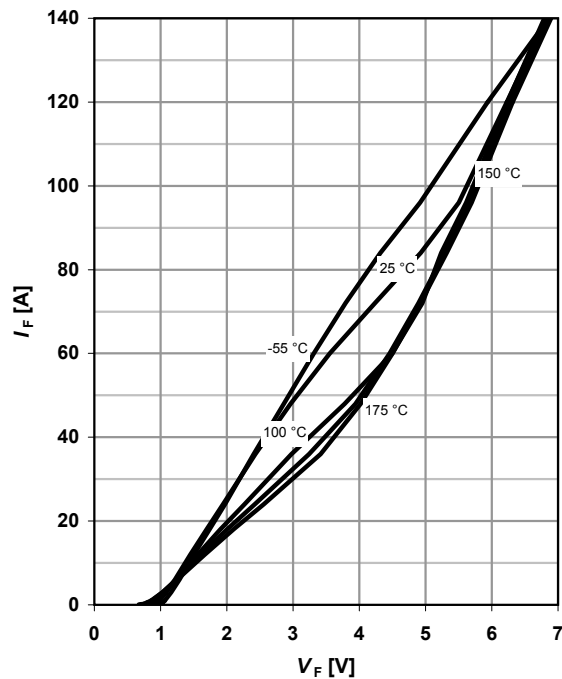
$$I_F = f(V_F); t_p = 400 \text{ }\mu\text{s}$$

parameter: T_j



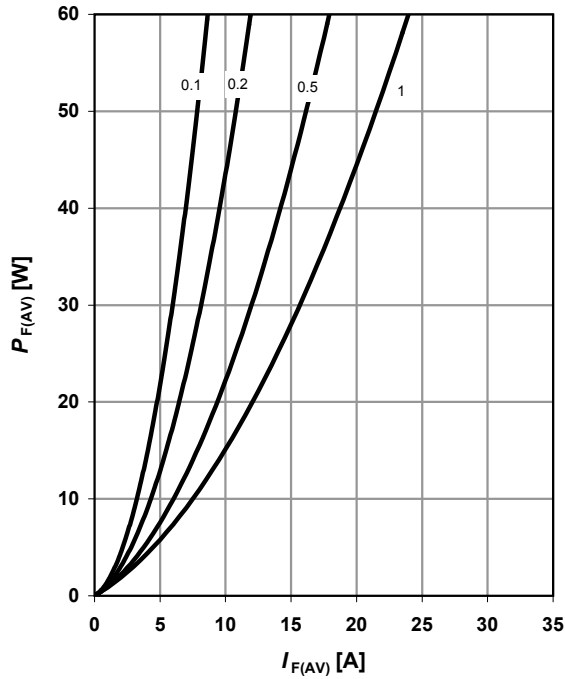
4 Typ. forward characteristic in surge current mode

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



5 Typ. forward power dissipation vs. average forward current

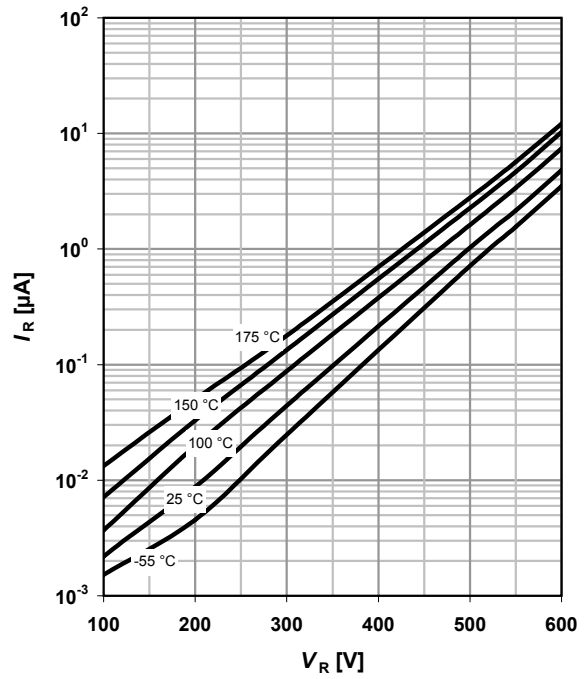
$P_{F,AV}=f(I_F)$, $T_C=100\text{ }^\circ\text{C}$, parameter: $D=t_p/T$



6 Typ. reverse current vs. reverse voltage

$I_R=f(V_R)$

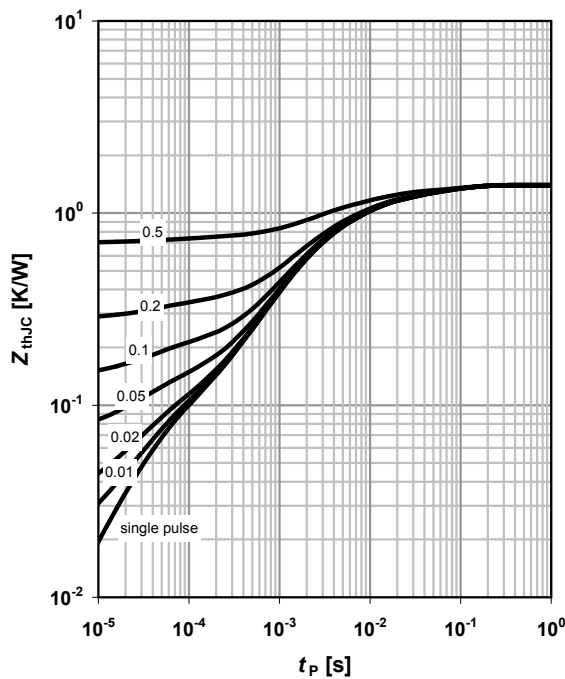
parameter: T_j



7 Transient thermal impedance

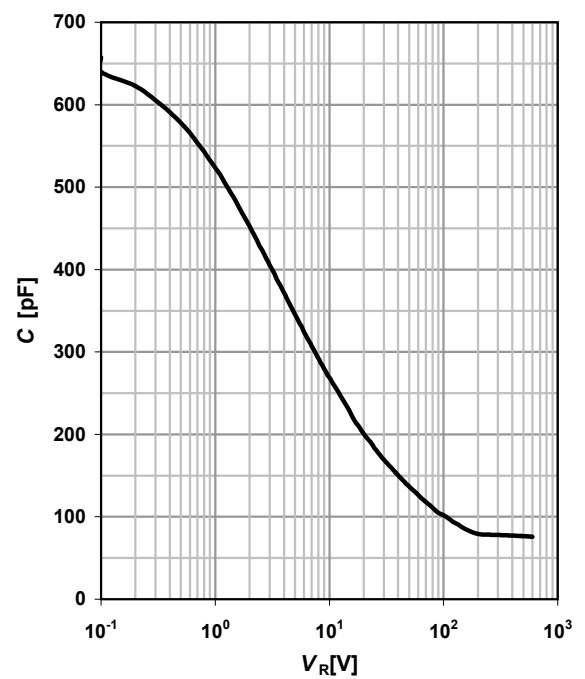
$Z_{thJC}=f(t_p)$

parameter: $D=t_p/T$



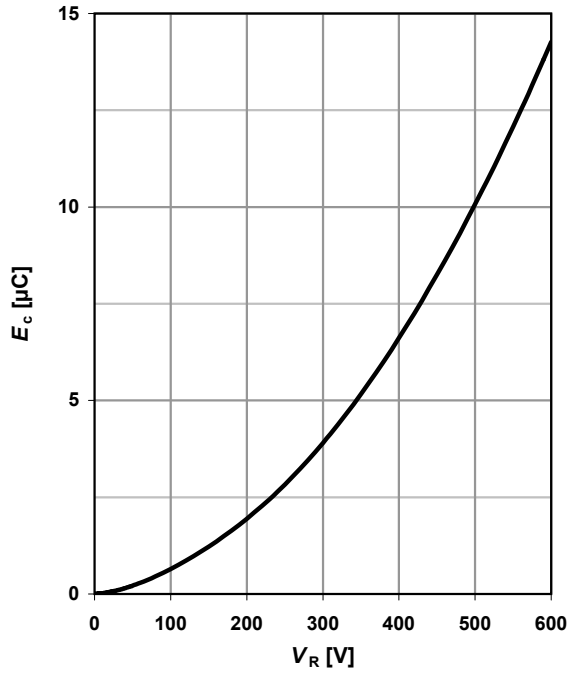
8 Typ. capacitance vs. reverse voltage

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



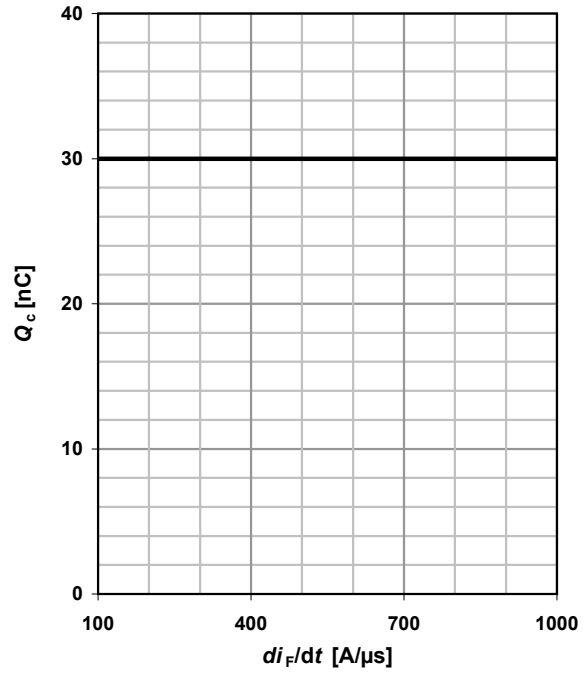
9 Typ. C stored energy

$$E_C = f(V_R)$$

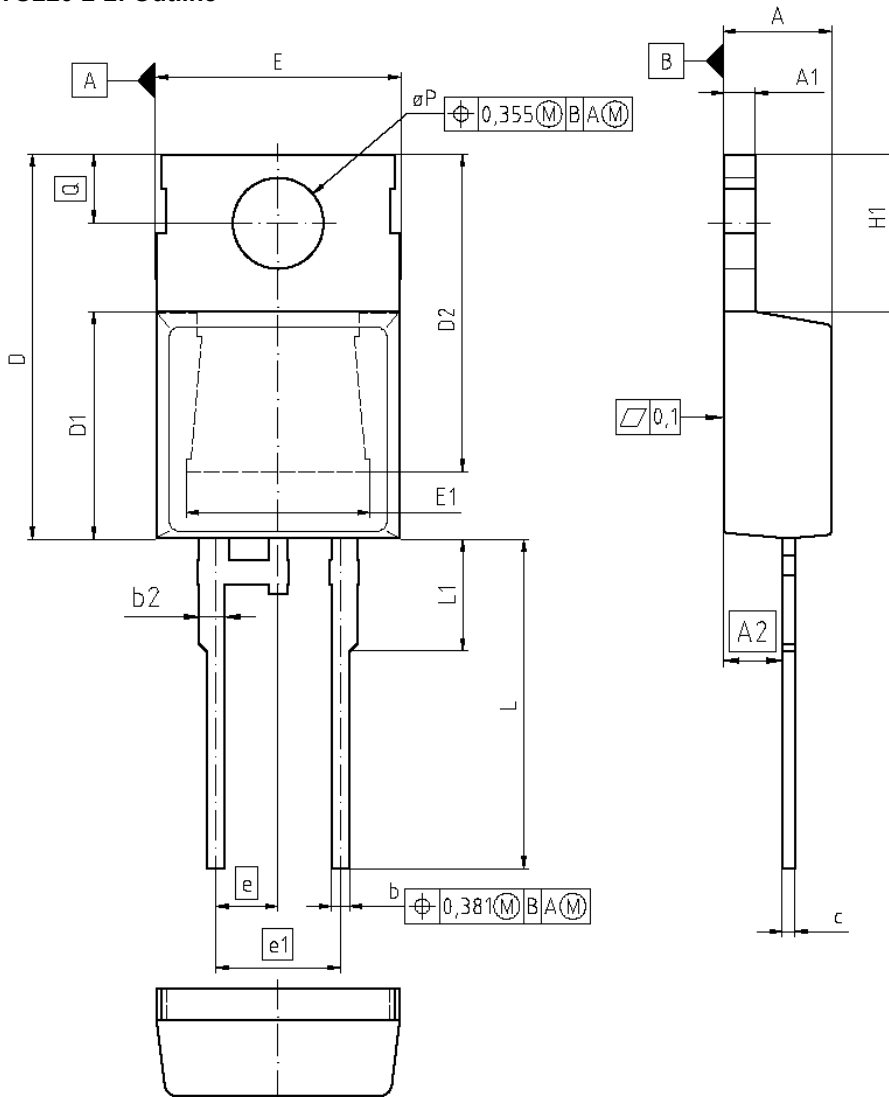


10 Typ. capacitance charge vs. current slope

$$Q_C = f(di_F/dt)^4; T_j = 150 \text{ } ^\circ\text{C}; I_F \leq I_{F,max}$$



PG-TO220-2-2: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.191	4.699	0.165	0.185
A1	1.170	1.400	0.046	0.055
A2	2.215	2.718	0.087	0.107
b	0.635	0.889	0.025	0.035
b2	0.950	1.851	0.037	0.085
c	0.330	0.635	0.013	0.025
D	14.808	15.950	0.583	0.628
D1	8.509	9.450	0.335	0.372
D2	12.850	14.245	0.508	0.561
E	9.877	10.363	0.381	0.408
E1	6.500	8.788	0.256	0.346
e	2.540		0.100	
e1	5.080		0.200	
N	2		2	
H1	5.800	6.900	0.232	0.272
L	12.700	14.000	0.500	0.551
L1	3.048	4.800	0.120	0.189
ϕP	3.550	3.886	0.140	0.153
Q	2.540	3.048	0.100	0.120

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