

## 2<sup>nd</sup> Generation thinQ!<sup>TM</sup> SiC Schottky Diode

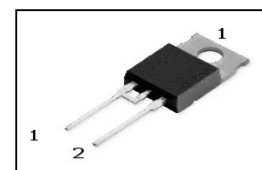
### Features

- 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 JEDEC<sup>1)</sup> for target applications
- Breakdown voltage tested at 5mA<sup>2)</sup>

### 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 <sup>2</sup> 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.	
<b>Thermal characteristics</b>						
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	$\mu\text{A}$
		$V_R=600\text{ V}, T_j=150\text{ °C}$	-	6	1600	

**AC characteristics**

Total capacitive charge	$Q_c$	$V_R=400\text{ V}, I_F \leq I_{F,max},$	-	30	-	nC
Switching time <sup>3)</sup>	$t_c$	$di_F/dt=200\text{ A}/\mu\text{s},$ $T_j=150\text{ °C}$	-	-	<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	-	

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

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

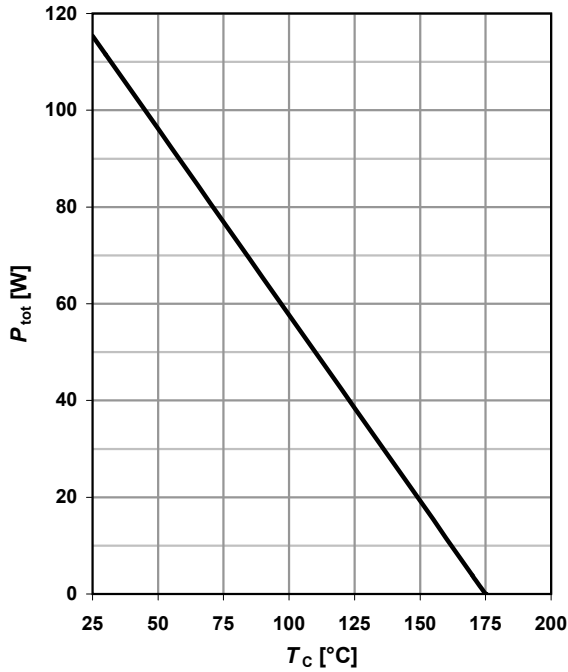
<sup>3)</sup>  $t_c$  is the time constant for the capacitive displacement current waveform (independent from  $T_j, I_{LOAD}$  and  $di/dt$ ), different from  $t_{rr}$ , which is dependent on  $T_j, I_{LOAD}, di/dt$ . No reverse recovery time constant  $t_{rr}$  due to absence of minority carrier injection.

<sup>4)</sup> Only capacitive charge occuring, guaranteed by design.

**1 Power dissipation**

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

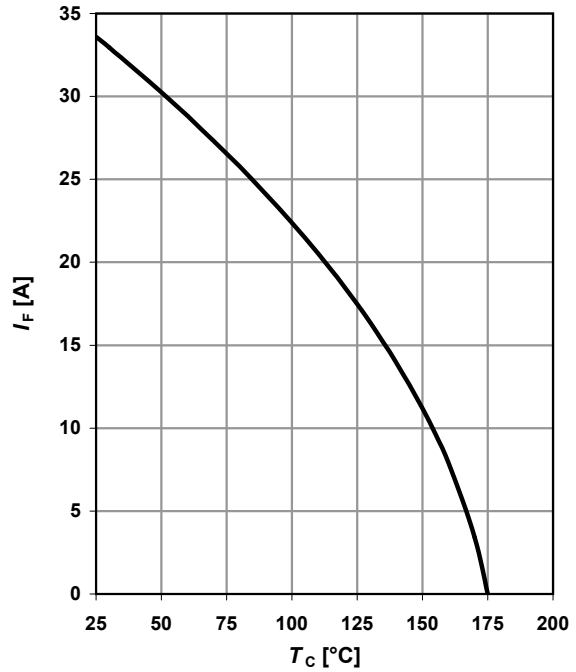
parameter:  $R_{thJC(max)}$



**2 Diode forward current**

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

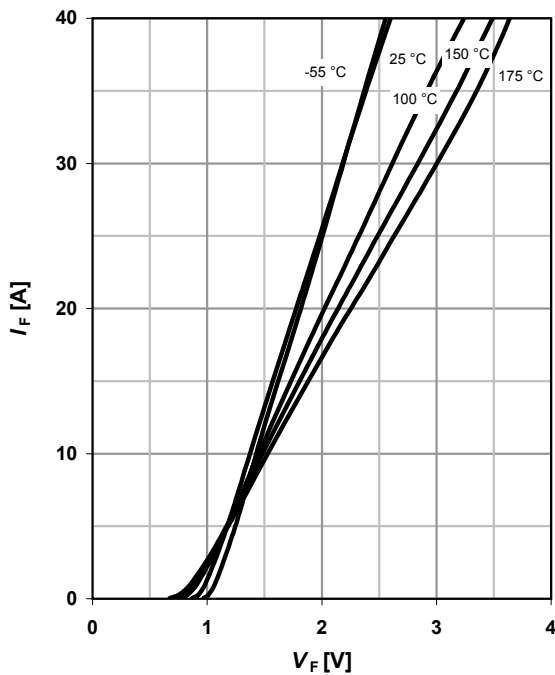
parameter:  $R_{thJC(max)}$ ;  $V_{F(max)}$



**3 Typ. forward characteristic**

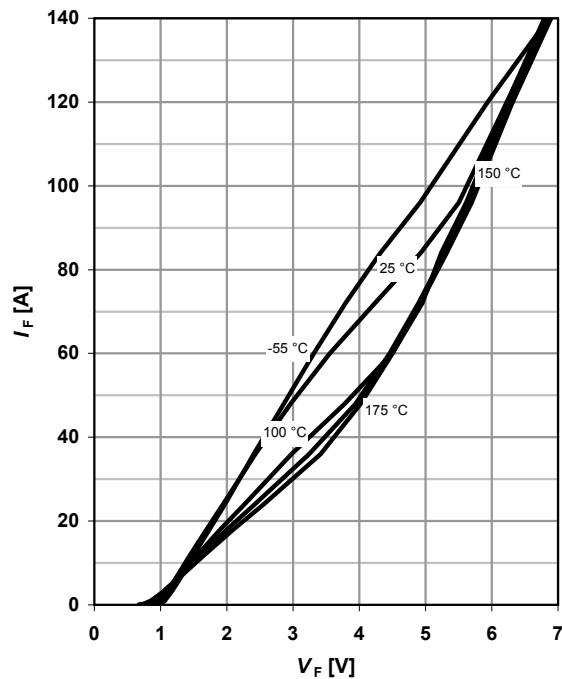
$$I_F = f(V_F); t_p = 400 \text{ }\mu\text{s}$$

parameter:  $T_j$



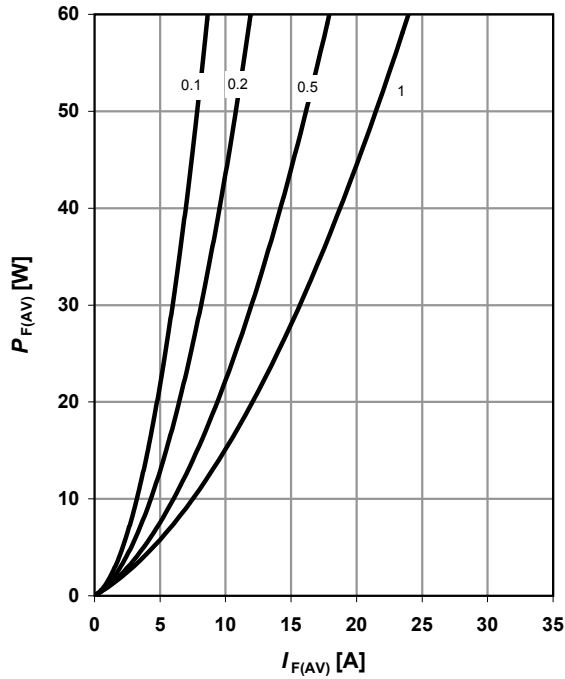
**4 Typ. forward characteristic in surge current mode**

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



**5 Typ. forward power dissipation vs. average forward current**

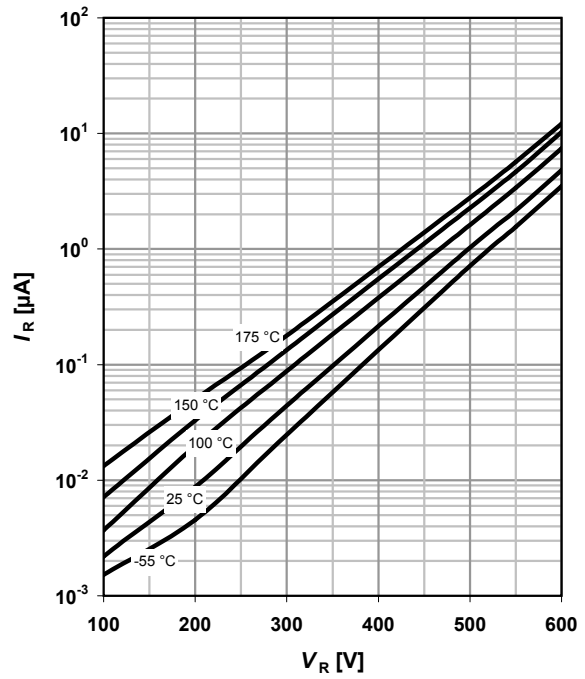
$P_{F,AV}=f(I_F)$ ,  $T_C=100\text{ }^\circ\text{C}$ , parameter:  $D=t_p/T$



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

$I_R=f(V_R)$

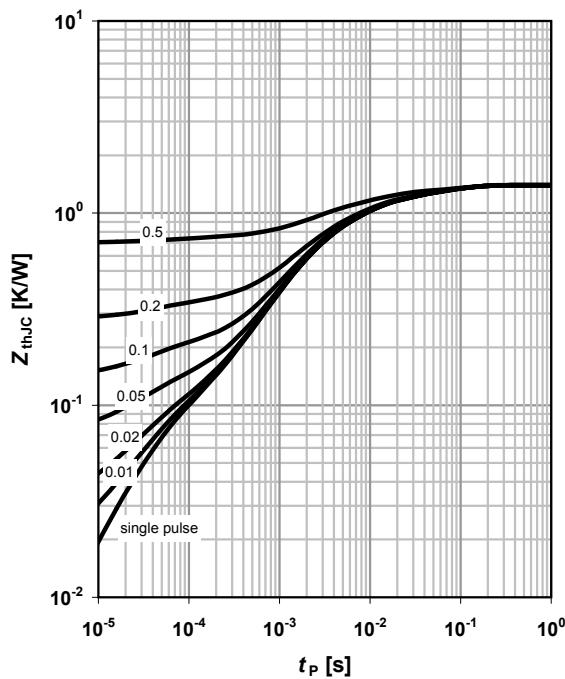
parameter:  $T_j$



**7 Transient thermal impedance**

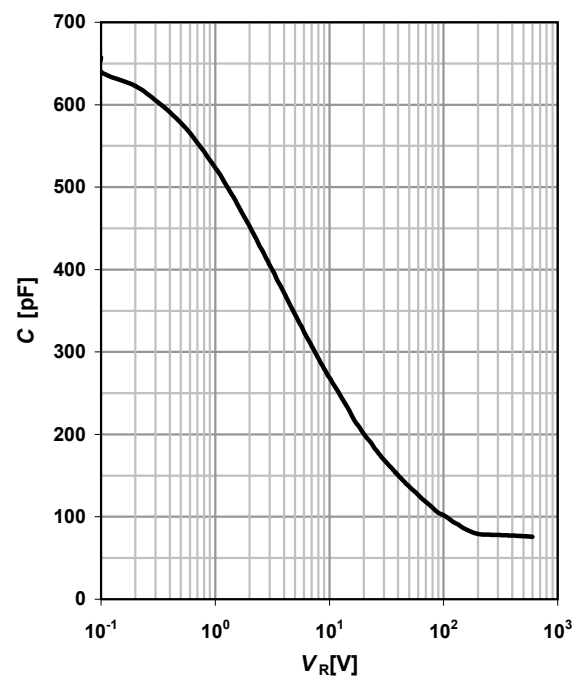
$Z_{thJC}=f(t_p)$

parameter:  $D=t_p/T$



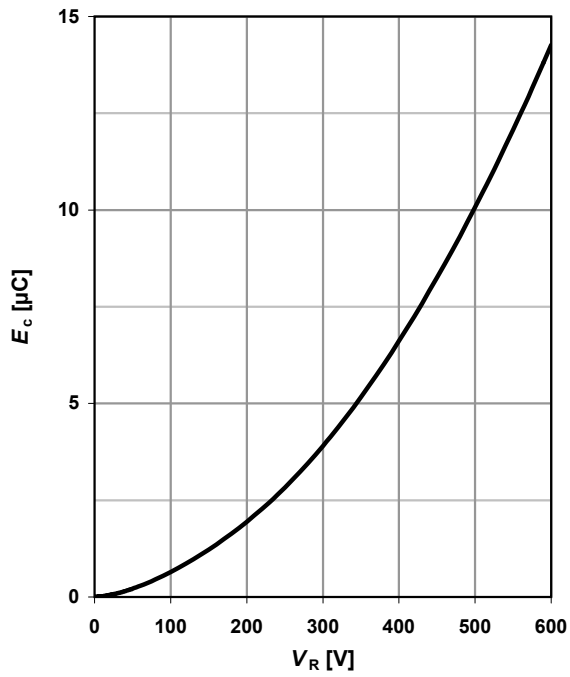
**8 Typ. capacitance vs. reverse voltage**

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



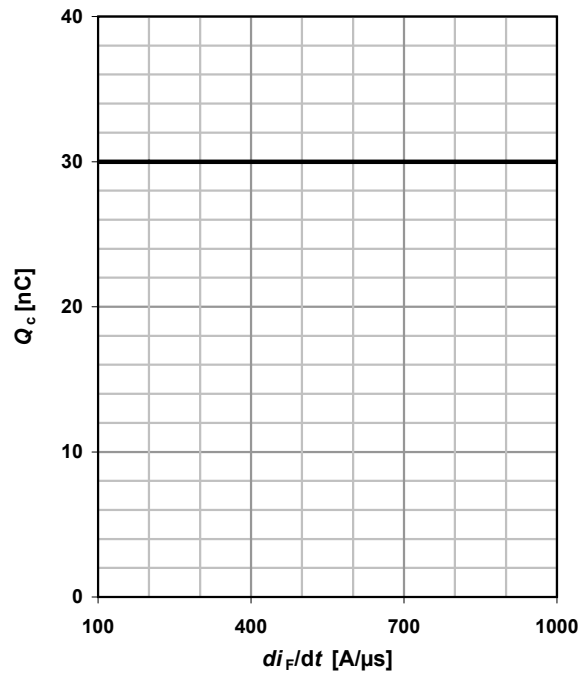
9 Typ. C stored energy

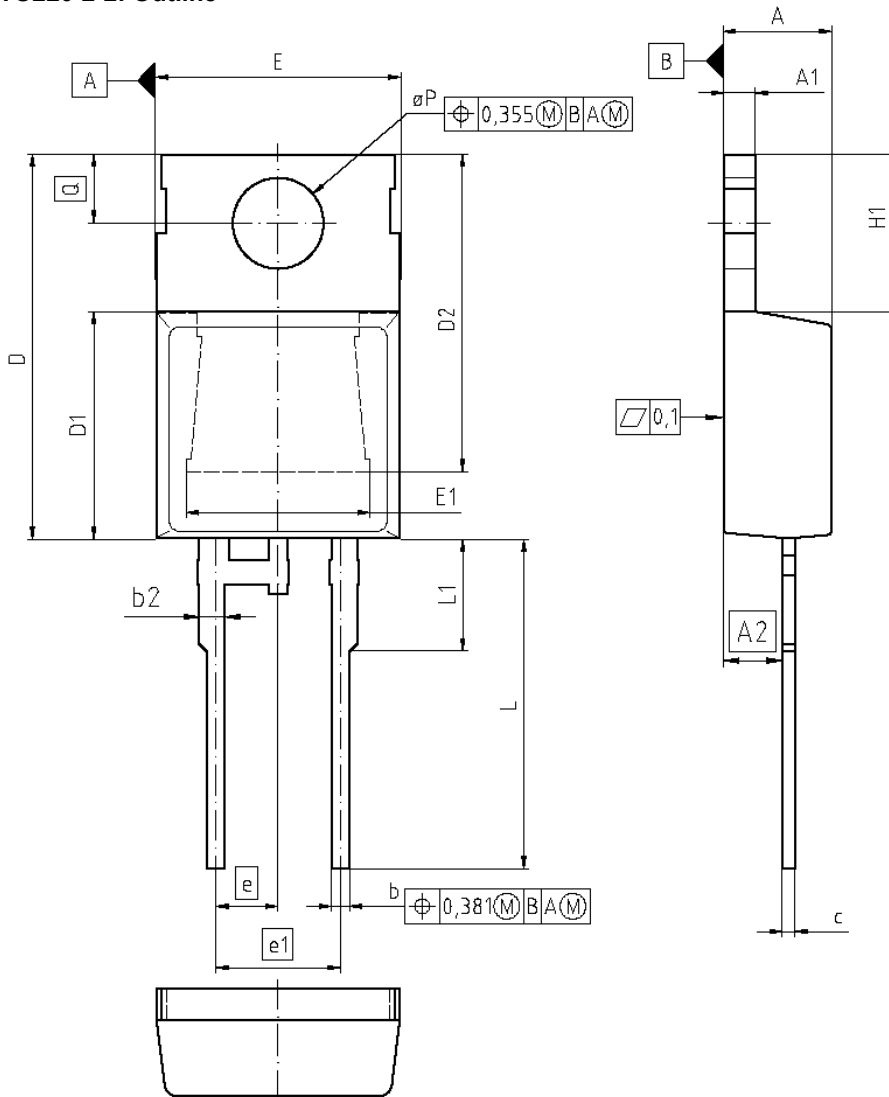
$$E_C = f(V_R)$$



10 Typ. capacitance charge vs. current slope

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



**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	10.383	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
#P	3.550	3.886	0.140	0.153
Q	2.540	3.048	0.100	0.120

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