Silicon Carbide Schottky Diode

IDW40G120C5B

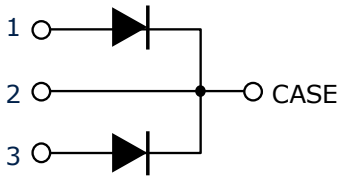
5th Generation CoolSiC™ 1200 V SiC Schottky Diode

Final Datasheet

Rev. 2.2 2021-03-01

Industrial Power Control

CoolSiC™ SiC Schottky Diode



Features:

- Revolutionary semiconductor material - Silicon Carbide
- No reverse recovery current / No forward recovery
- Temperature independent switching behavior
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Excellent thermal performance
- Extended surge current capability
- Specified dv/dt ruggedness
- Qualified according to JEDEC[1)] for target applications
- Pb-free lead plating; RoHS compliant

Benefits

- System efficiency improvement over Si diodes
- Enabling higher frequency / increased power density solutions
- System size/cost savings due to reduced heatsink requirements and smaller magnetics
- Reduced EMI
- Highest efficiency across the entire load range
- Robust diode operation during surge events
- High reliability
- RelatedLinks: www.infineon.com/sic

Applications

- Solar inverters
- Uninterruptable power supplies
- Motor drives
- Power Factor Correction

Package pin definitions

- Pin 1 – anode 1
- Pin 2 and backside – cathode
- Pin 3 – anode 2

Key Performance and Package Parameters (leg/device)

Type	V_{DC}	I_F	Q_C	$T_{j,max}$	Marking	Package
IDW40G120C5B	1200V	20 / 40 A	101 / 202nC	175°C	D4012B5	PG-TO247-3

1) J-STD20 and JESD22

Table of Contents

Maximum ratings

Parameter	Symbol	Value (leg/device)	Unit
Repetitive peak reverse voltage	V_{RRM}	1200	V
Continuous forward current for $R_{th(j-c,max)}$ T_C = 148°C, D=1 T_C = 135°C, D=1 T_C = 25°C, D=1	I_F	 20 / 40 25 / 51 55 / 110	A
Surge non-repetitive forward current, sine halfwave T_C=25°C, t_p=10ms T_C=150°C, t_p=10ms	$I_{F,SM}$	 145 / 290 140 / 280	A
Non-repetitive peak forward current T_C = 25°C, t_p=10 µs	$I_{F,max}$	1575 / 3150	A
i²t value T_C = 25°C, t_p=10 ms T_C = 150°C, t_p=10 ms	$\int i^2dt$	 105 / 420 98 / 392	A²s
Diode dv/dt ruggedness V_R=0...960 V	dv/dt	150	V/ns
Power dissipation for $R_{th(j-c,max)}$ T_C = 25°C	P_{tot}	201 / 402	W
Operating and storage temperature	T_j;T_{stg}	-55…175	°C
Soldering temperature, wavesoldering only allowed at leads 1.6mm (0.063 in.) from case for 10 s	T_{sold}	260	°C
Mounting torque M3 and M4 screws	M	0.7	Nm

Thermal Resistances

Parameter	Symbol	Conditions	Value (leg/device)			Unit
			min.	typ.	max.	
Characteristic						
Diode thermal resistance, junction – case	$R_{th(j-c)}$		-	0.6/0.3	0.8/0.4	K/W
Thermal resistance, junction – ambient	$R_{th(j-a)}$	leaded	-	-	62	K/W

Electrical Characteristics

Static Characteristic, at Tj=25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value (leg/device)			Unit
			min.	typ.	max.	
DC blocking voltage	V_{DC}	T_j = 25°C	1200	-	-	V
Diode forward voltage	V_F	I_F= 20/40 A, T_j=25°C I_F= 20/40 A, T_j=150°C	- -	1.4 1.7	1.65 2.30	V
Reverse current	I_R	V_R=1200 V, T_j=25°C V_R=1200 V, T_j=150°C		12 / 23 59 / 118	166 / 332 850 / 1700	µA

Dynamic Characteristics, at T_j=25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value (leg/device)			Unit
			min.	typ.	max.	
Total capacitive charge	Q_C	V_R = 800 V, T_j=150°C & 25°C $Q_C = \int_0^{V_R} C(V)dV$	-	101 / 202	-	nC
Total Capacitance	C	V_R=1 V, f=1 MHz V_R=400 V, f=1 MHz V_R=800 V, f=1 MHz	- - -	1296/2592 92 / 183 73 / 146	- - -	pF

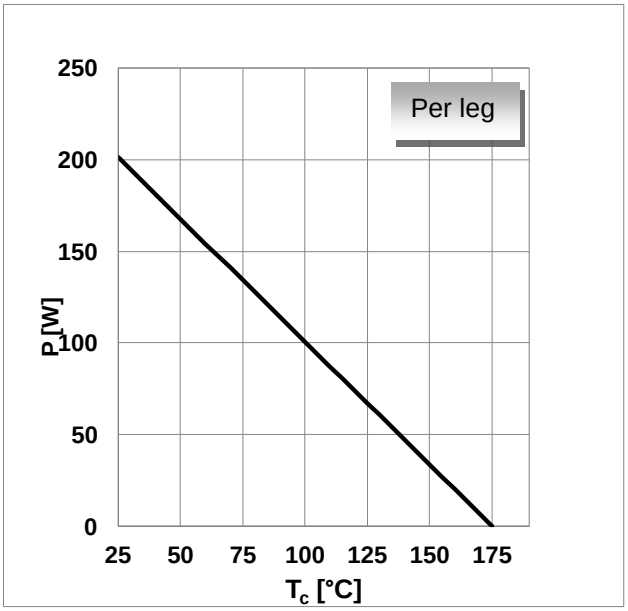


Figure 1. **Power dissipation per leg as function of case temperature,** $P_{tot}=f(T_C)$, $R_{th(j-c),max}$

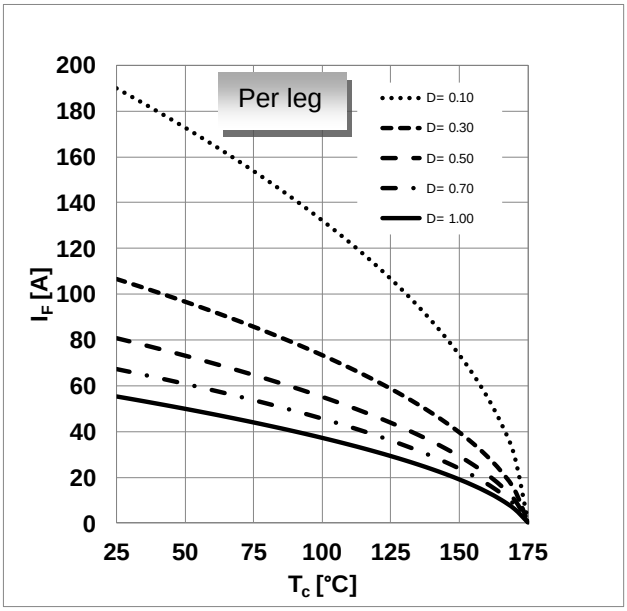


Figure 2. **Diode forward current per leg as function of temperature,** parameter: $T_j \leq 175°C$, $R_{th(j-c),max}$, D=duty cycle, V_{th}, R_{diff} @ T_j=175°C

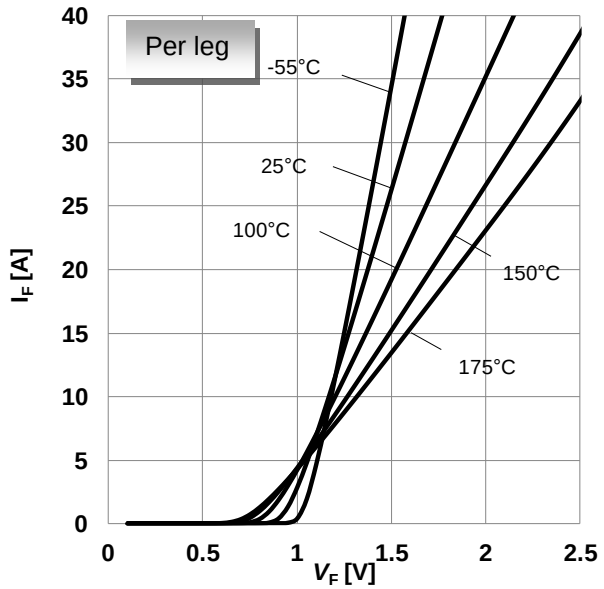


Figure 3. **Typical forward characteristics per leg,** $I_F=f(V_F)$, t_p= 10 µs, parameter: T_j

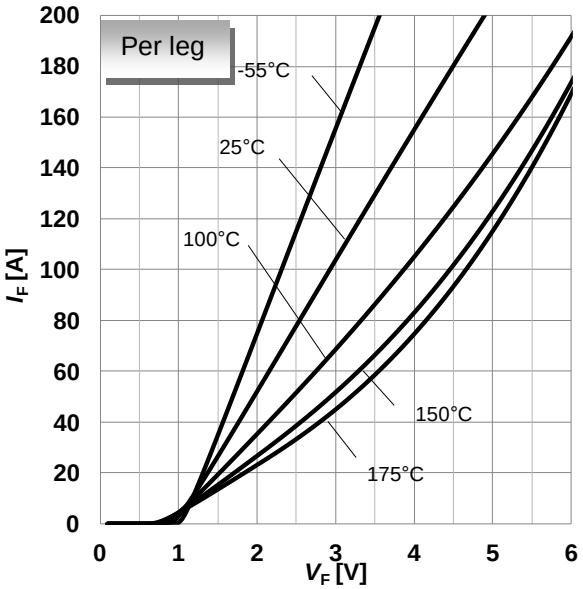


Figure 4. **Typical forward characteristics in surge current per leg,** $I_F=f(V_F)$, t_p= 10 µs, parameter: T_j

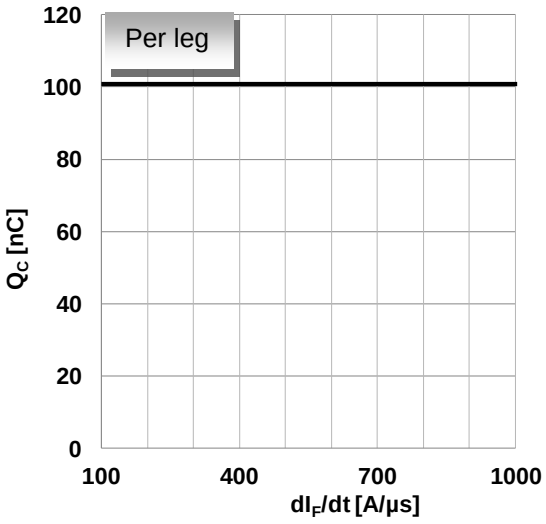


Figure 5. **Typical capacitive charge per leg as function of current slope**[1], Q_C=f(dI_F/dt), T_j=150°C

1) guaranteed by design.

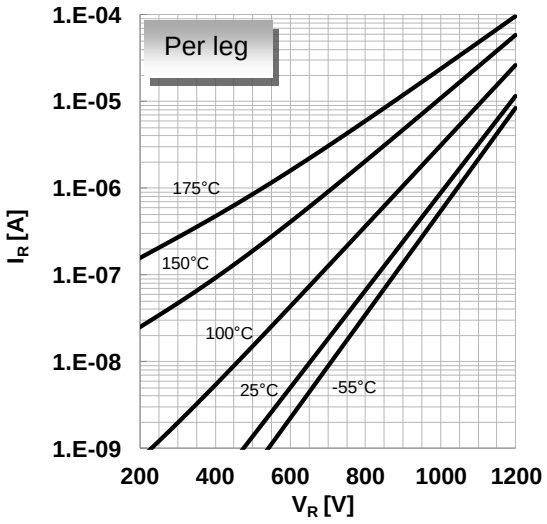


Figure 6. **Typical reverse characteristics per leg,** I_R=f(V_R), parameter: T_j

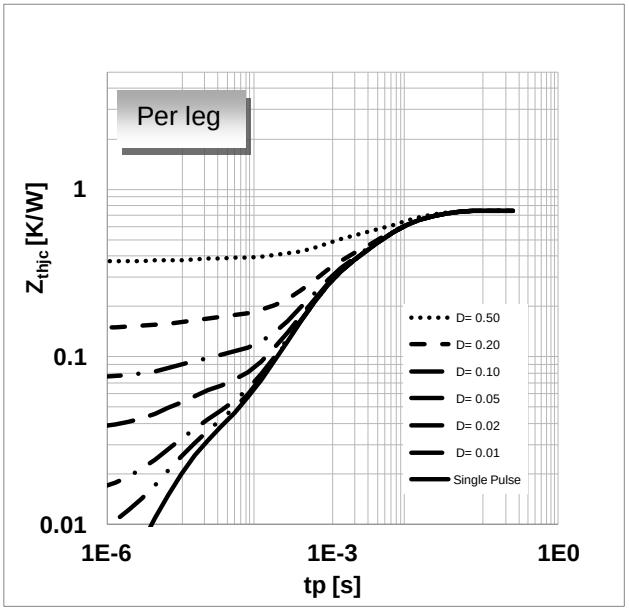


Figure 7. **Max. transient thermal impedance per leg,** $Z_{th,j-c}$=f(t_P), parameter: D=t_P/T

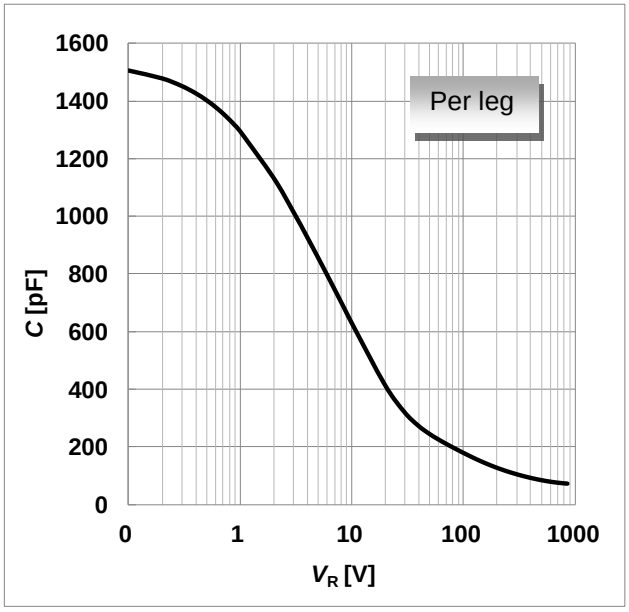


Figure 8. **Typical capacitance per leg as function of reverse voltage,** C=f(V_R); T_j=25°C; f=1 MHz

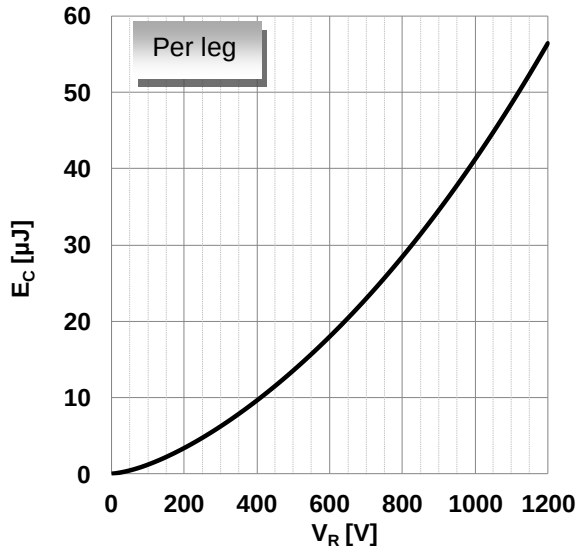
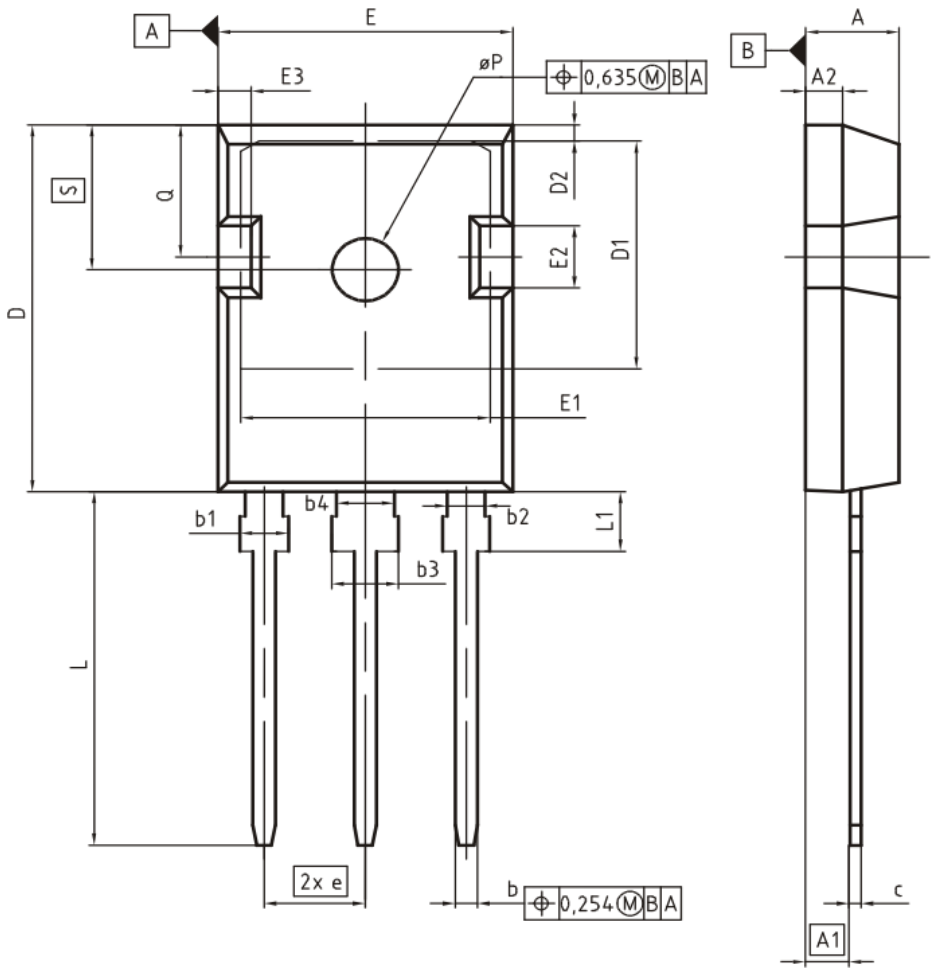


Figure 9. **Typical capacitively stored energy as function of reverse voltage, per leg,** $E_C=f(V_R)$

PG-TO247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

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SCALE 0 5 5 7.5mm

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REVISION
05

Revision History

IDW40G120C5B

Revision: 2021-03-01, Rev. 2.2

Previous Revision:

Revision	Date	Subjects (major changes since last version)
2.0	2014-06-10	Final data sheet
2.1	2017-07-21	Editorial Changes
2.2	2021-03-01	Increased d*v*/d*t* ruggedness

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