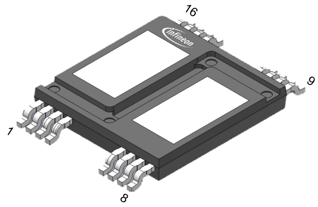
Final datasheet

CoolSiC™ 1200 V SiC MOSFET G2 and Schottky diode G5 : Boost topology with top side cooling and .XT interconnection technology



Halogen-free

Green

Lead-free

RoHS

Features

- V_{DSS} = 1200 V at T_{vj} = 25°C
- I_{DDC} = 74 A at T_c = 25°C
- $R_{DS(on)}$ = 17.1 mΩ at V_{GS} = 18 V, T_{vj} = 25°C
- I_F = 50 A
- Internal layout optimized for fast switching
- Very low switching losses and no reverse recovery current
- High surge current capable Schottky diode
- Short circuit withstand time 2 µs
- Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.2 V
- .XT interconnection technology for best-in-class thermal performance
- Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder

Potential applications

- String inverter
- EV Charging
- DIN Rail & Rack Mount (Power Supply)
- Commercial Lighting Fixture

Product validation

- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

Description

Pin definition:

1 – Gate (G_1)

2 – Kelvin sense (K_1)

3-4 – Source (S_1)

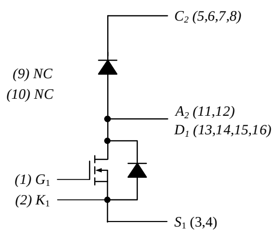
5-8 & Case 2 – Cathode (C_2)

9, 10 – not connected (NC)

11-12 – Anode (A_2)

13-16 & Case 1 – Drain (D_1)

Note: The source and sense pins are not exchangeable, their exchange might lead to malfunction.



Type	Package	Marking
IMSQ120R017M2HB	PG-HDSOP-16-U03	12M2B017

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1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	Reflow soldering (MSL2 according to JEDEC J-STD-020)			260	°C
Thermal resistance, junction-ambient	$R_{th(j-a)}$				62	K/W
MOSFET/body diode thermal resistance, junction-case	$R_{th(j-c)}$			0.2	0.26	K/W
Schottky diode thermal resistance, junction-case	$R_{th(j-c)}$			0.15	0.19	K/W
Comparative Tracking Index	*CTI*	IEC 60112 (material group 1 according to IEC 60664-1)	600			V

2 MOSFET

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}	$T_{vj} \geq 25$ °C		1200	V
Continuous DC drain current for $R_{th(j-c,max)}$, limited by $T_{vj(max)}$	I_{DDC}	$V_{GS} = 18$ V	$T_c = 25$ °C	96	A
			$T_c = 100$ °C	73	
Peak drain current, t_p limited by $T_{vj(max)}$[1]	I_{DM}	$V_{GS} = 18$ V		365	A
Gate-source voltage, max. transient voltage	V_{GS}	$t_p \leq 0.5$ µs, $D < 0.01$		-10/25	V
Gate-source voltage, max. static voltage[2]	V_{GS}			-7/23	V
Avalanche energy, single pulse	E_{AS}	$I_D = 40.4$ A, $V_{DD} = 50$ V, $L = 0.6$ mH, $T_{vj(start)} = 25$ °C		508	mJ
Avalanche energy, repetitive	E_{AR}	$I_D = 40.4$ A, $V_{DD} = 50$ V, $L = 3.1$ µH, $T_{vj(start)} = 25$ °C		2.54	mJ
Short-circuit withstand time	t_{SC}	$V_{DD} \leq 800$ V, $V_{DS,peak} < 1200$ V, $V_{GS(on)} = 15$ V, $T_{vj(start)} = 25$ °C		2	µs
Power dissipation, limited by $T_{vj(max)}$	P_{tot}		$T_c = 25$ °C	573	W
			$T_c = 100$ °C	286	

1) Verified by design.
2) The maximum gate-source voltage in the application design should be in accordance to IPC-9592B.

Table 3 **Recommended values**

Parameter	Symbol	Note or test condition	Values	Unit
Recommended turn-on gate voltage	$V_{GS(on)}$		15...18	V
Recommended turn-off gate voltage	$V_{GS(off)}$		-5...0	V

Table 4 **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source on-state resistance	$R_{DS(on)}$	I_D = 40.4 A	T_{vj} = 25 °C, $V_{GS(on)}$ = 18 V		17.1		mΩ
			T_{vj} = 25 °C, $V_{GS(on)}$ = 15 V		21.4		
			T_{vj} = 150 °C, $V_{GS(on)}$ = 18 V		35	45	
			T_{vj} = 175 °C, $V_{GS(on)}$ = 18 V		40.6		
Gate-source threshold voltage	$V_{GS(th)}$	I_D = 12.7 mA, $V_{DS} = V_{GS}$ (tested after 1 ms pulse at V_{GS} = 20 V)	T_{vj} = 25 °C	3.5	4.2	5.1	V
			T_{vj} = 175 °C		3.2		
Zero gate-voltage drain current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V	T_{vj} = 25 °C			20	µA
			T_{vj} = 175 °C		6		
Gate leakage current	I_{GSS}	V_{DS} = 0 V	V_{GS} = -10 V			-120	nA
			V_{GS} = 23 V			120	
Forward transconductance	g_{fs}	I_D = 40.4 A, V_{DS} = 20 V			26.6		S
Internal gate resistance	$R_{G,int}$	f = 1 MHz, V_{AC} = 25 mV			3		Ω
Input capacitance	C_{iss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			2910		pF
Output capacitance	C_{oss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			126		pF
Reverse transfer capacitance	C_{rss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			11		pF
C_{oss} stored energy	E_{oss}	Calculated based on $C_{oss} = f(V_{DD})$			53		µJ
Output charge	Q_{oss}	Calculated based on $C_{oss} = f(V_{DD})$			196.3		nC
Effective output capacitance, energy related	$C_{o(er)}$	V_{DS} = 0...800 V, V_{GS} = 0 V, Calculated based on E_{oss}			165.6		pF
Effective output capacitance, time related	$C_{o(tr)}$	I_D = constant, V_{DS} = 0...800 V, V_{GS} = 0 V, Calculated based on Q_{oss}			245.4		pF
Total gate charge	Q_G	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, turn-on pulse			79		nC

(table continues...)

Table 4 **(continued) Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, turn-on pulse			18		nC
Gate-drain charge	Q_{GD}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, turn-on pulse			19		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, $L_σ$ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		12.4		ns
			T_{vj} = 175 °C		9.5		
Rise time	t_r	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, $L_σ$ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		8.1		ns
			T_{vj} = 175 °C		7.2		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, $L_σ$ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		25		ns
			T_{vj} = 175 °C		29.2		
Fall time	t_f	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, $L_σ$ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		10.8		ns
			T_{vj} = 175 °C		12.7		
Turn-on energy	E_{on}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, $L_σ$ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		406		µJ
			T_{vj} = 175 °C		382		
Turn-off energy	E_{off}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, $L_σ$ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		162		µJ
			T_{vj} = 175 °C		201		

(table continues...)

Table 4 **(continued) Characteristic values**

Parameter	Symbol	Note or test condition		Values Min.	Values Typ.	Values Max.	Unit
Total switching energy	E_{tot}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		568		µJ
			T_{vj} = 175 °C		583		
Turn-on energy at -5 V	E_{on}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = -5/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		406		µJ
			T_{vj} = 175 °C		382		
Turn-off energy at -5 V	E_{off}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = -5/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		84		µJ
			T_{vj} = 175 °C		93		
Total switching energy at -5 V	E_{tot}	V_{DD} = 800 V, I_D = 40.4 A, V_{GS} = -5/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 9 nH, diode: package integrated SiC Schottky diode	T_{vj} = 25 °C		628		µJ
			T_{vj} = 175 °C		623		
Virtual junction temperature	T_{vj}			-55		175	°C

Note: *The chip technology was characterized up to 200 kV/µs. The measured dV/dt was limited by measurement test setup and package.*

3 Body diode (MOSFET)

Table 5 **Maximum rated values**

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}	T_{vj} ≥ 25 °C		1200	V
Continuous reverse drain current for $R_{th(j-c,max)}$, limited by $T_{vj(max)}$	I_{SDC}	V_{GS} = 0 V	T_c = 25 °C	99	A
			T_c = 100 °C	56.6	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		252	A

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source reverse voltage	V_{SD}	I_{SD} = 40 A, V_{GS} = 0 V	T_{vj} = 25 °C		4.2	5.5	V
			T_{vj} = 100 °C		4.1		
			T_{vj} = 175 °C		4		
Virtual junction temperature	T_{vj}			-55		175	°C

4 SiC Diode

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} \geq 25$ °C		1200	V
Continuous forward current for $R_{th(j\text{-}c,max)}$	I_F		T_c = 25 °C	167	A
			T_c = 135 °C	79	
			T_c = 155 °C	50	
Surge repetitive forward current, sine halfwave	$I_{F,RM}$	t_p = 10 ms	T_c = 25 °C	200	A
			T_c = 100 °C	150	
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	t_p = 10 ms	T_c = 25 °C	288	A
			T_c = 150 °C	248	
Non-repetitive peak forward current	$I_{F,max}$	t_p = 10 µs		1700	A
I^2t- value	$\int I^2 t$	t_p = 10 ms	T_c = 25 °C	415	A^2s
			T_c = 150 °C	308	
Diode dv/dt ruggedness	dv/dt	V_R = 0...960 V		150	V/ns
Avalanche energy, single pulse	E_{AS}	I_D = 50 A, L = 0.5 mH		165	mJ
Power dissipation for $R_{th(j\text{-}c,max)}$	P_{tot}		T_c = 25 °C	789	W
			T_c = 100 °C	394	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
DC blocking voltage	V_{DC}	I_R = 500 µA	1200			V

(table continues...)

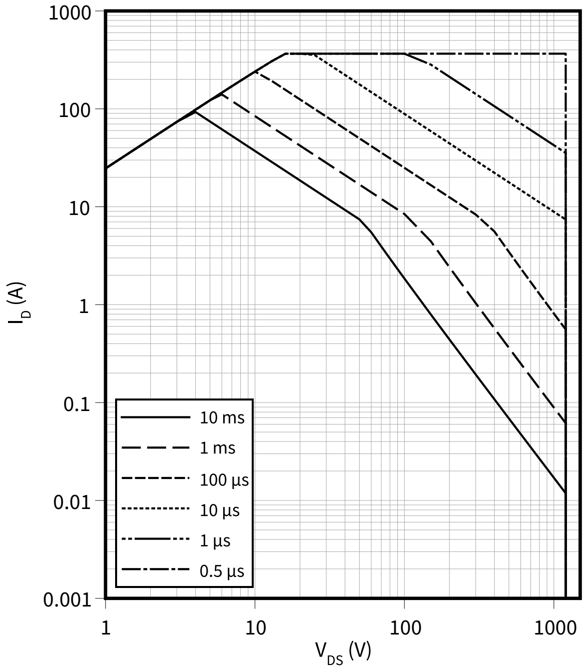
Table 8 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values Min.	Values Typ.	Values Max.	Unit
Diode forward voltage	V_F	I_F = 50 A	T_{vj} = 25 °C		1.45	1.8	V
			T_{vj} = 125 °C		1.69		
			T_{vj} = 150 °C		1.8		
Reverse current	I_R	V_R = 1200 V	T_{vj} = 25 °C		26	400	µA
			T_{vj} = 150 °C		130		
Total capacitive charge	Q_C	V_R = 800 V, T_{vj} = 25 °C & 150 °C, $Q_C = \int_0^{V_R} C(V)dV$			223		nC
Total capacitance	C	f = 100 kHz	V_R = 1 V		2890		pF
			V_R = 400 V		204		
			V_R = 800 V		160		
Virtual junction temperature	T_{vj}			-55		175	°C

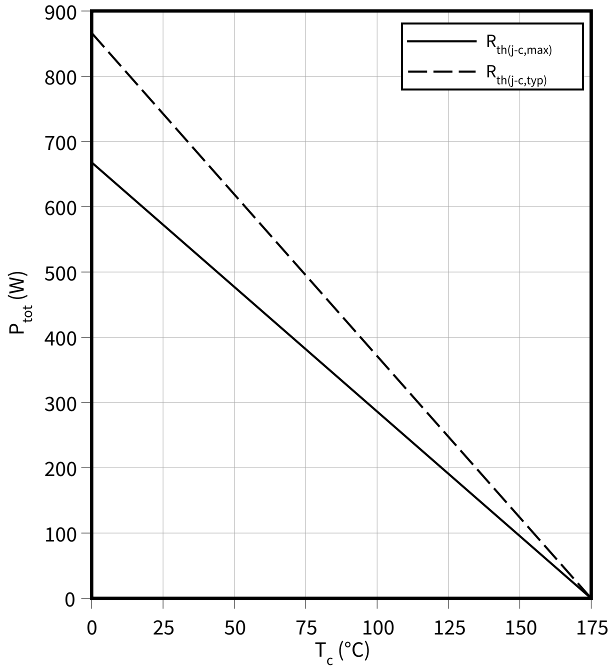
***Note**: Characteristics at T_{vj} = 25°C, unless otherwise specified.*

5 Characteristics diagrams

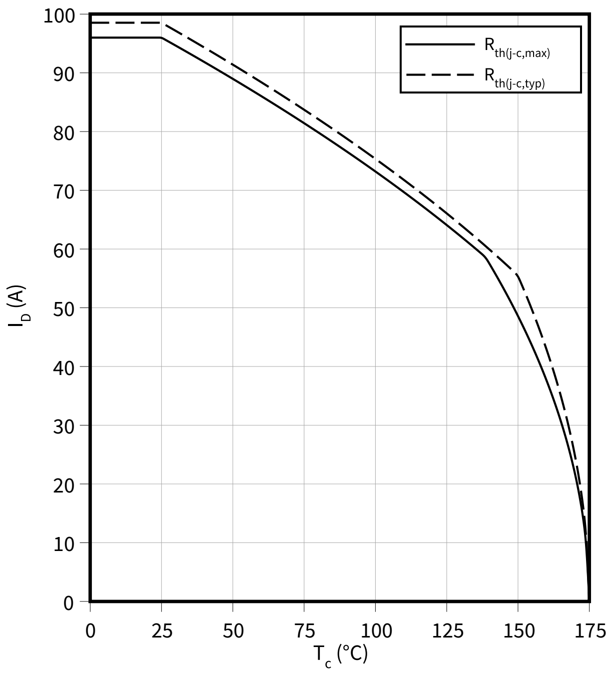
Safe operating area (SOA)
$I_D = f(V_{DS})$
$T_{vj} \leq 175$ °C, $T_c = 25$ °C



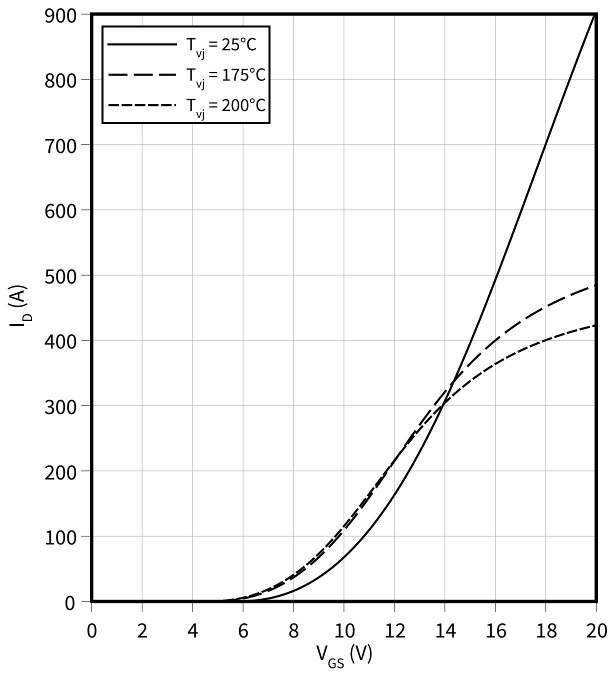
Power dissipation of MOSFET/body diode as a function of case temperature
$P_{tot} = f(T_c)$



Maximum DC drain to source current as a function of case temperature limited by bond wire
$I_D = f(T_c)$



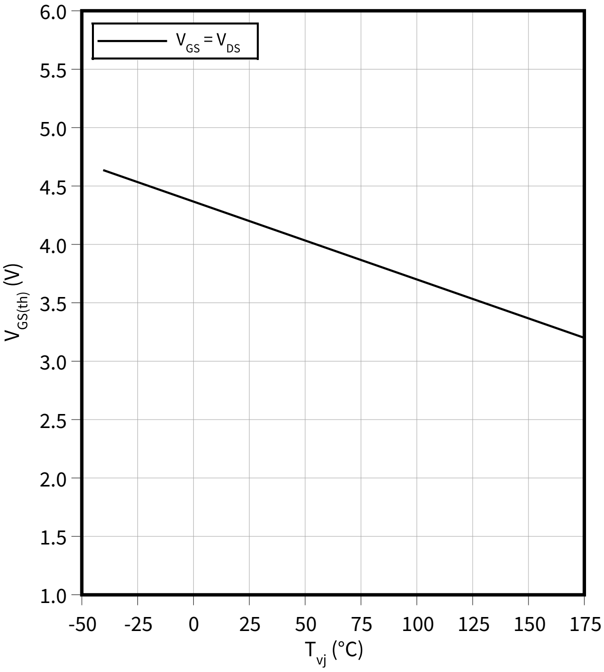
Typical transfer characteristic
$I_D = f(V_{GS})$
$V_{DS} = 20$ V, $t_p = 20$ µs



Typical gate-source threshold voltage as a function of junction temperature

$V_{GS(th)} = f(T_{vj})$

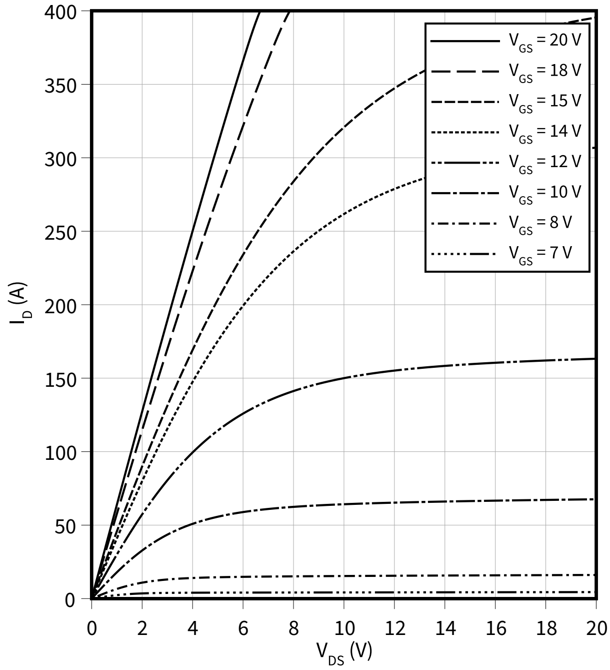
$I_D = 12.7$ mA



Typical output characteristic, V_{GS} as a parameter

$I_D = f(V_{DS})$

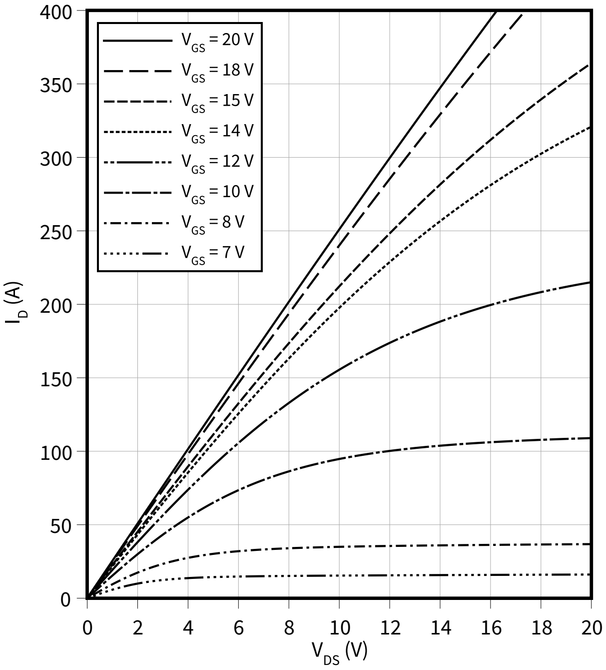
$T_{vj} = 25$ °C, $t_p = 20$ µs



Typical output characteristic, V_{GS} as a parameter

$I_D = f(V_{DS})$

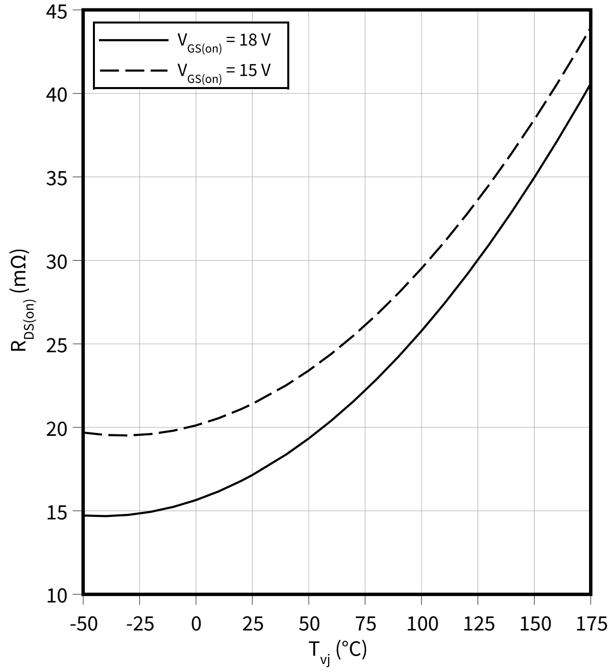
$T_{vj} = 175$ °C, $t_p = 20$ µs



Typical on-state resistance as a function of junction temperature

$R_{DS(on)} = f(T_{vj})$

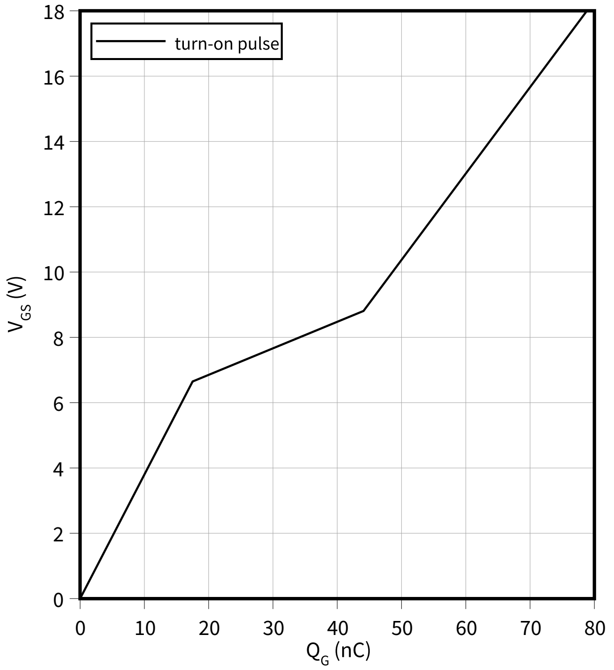
$I_D = 40.4$ A



Typical gate charge

$V_{GS} = f(Q_G)$

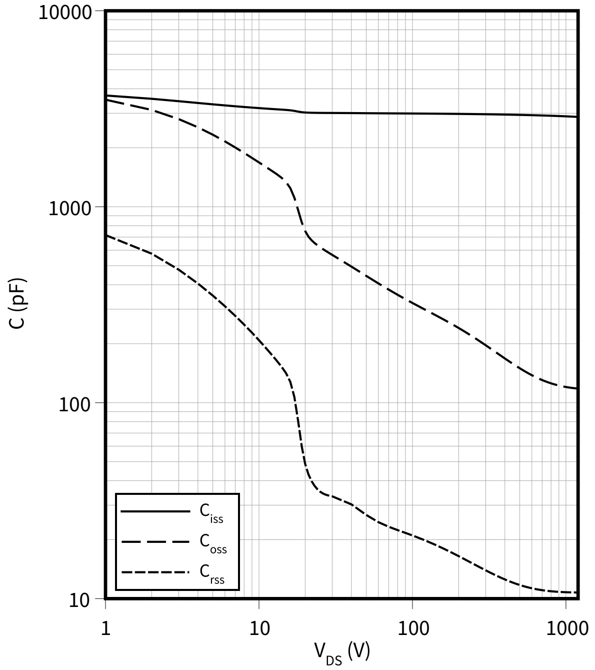
$I_D = 40.4$ A, $V_{DS} = 800$ V



Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$

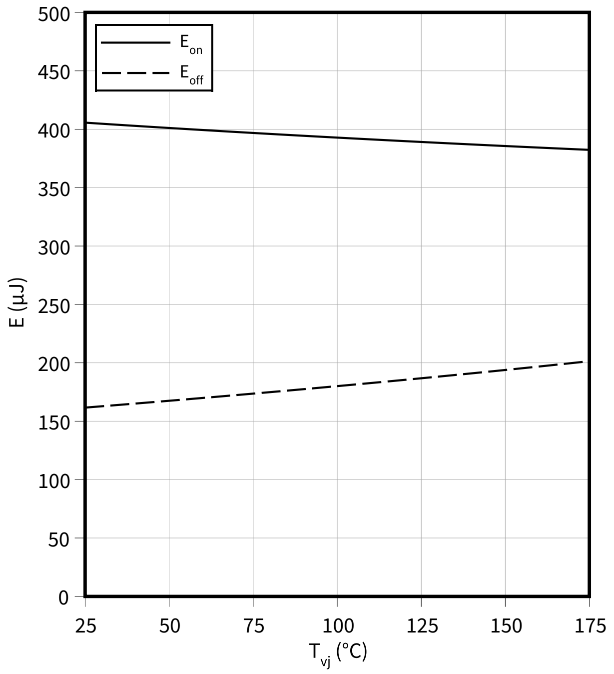
$f = 100$ kHz, $V_{GS} = 0$ V



Typical switching energy as a function of junction temperature, test circuit in Fig. F, 2nd device package integrated Schottky diode: $V_{GS} = 0$ V

$E = f(T_{vj})$

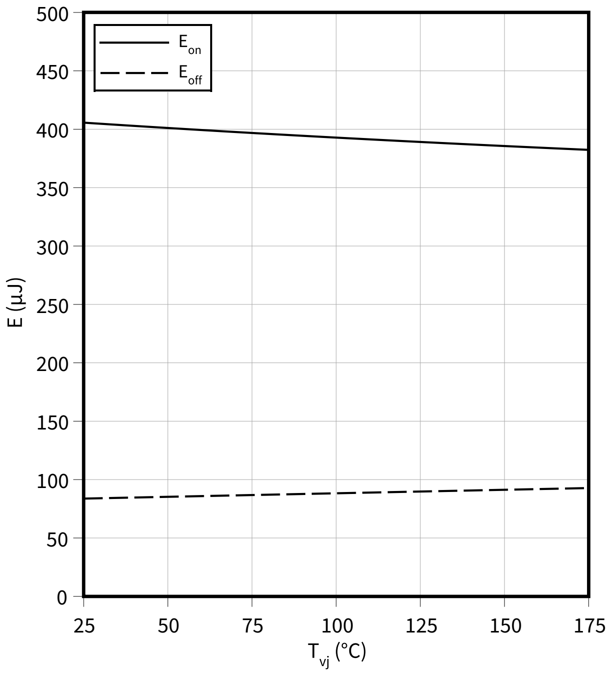
$V_{GS} = 0/18$ V, $I_D = 40.4$ A, $R_{G,ext} = 2.3$ Ω, $V_{DD} = 800$ V



Typical switching energy as a function of junction temperature, test circuit in Fig. F, 2nd device package integrated Schottky diode: $V_{GS} = -5$ V

$E = f(T_{vj})$

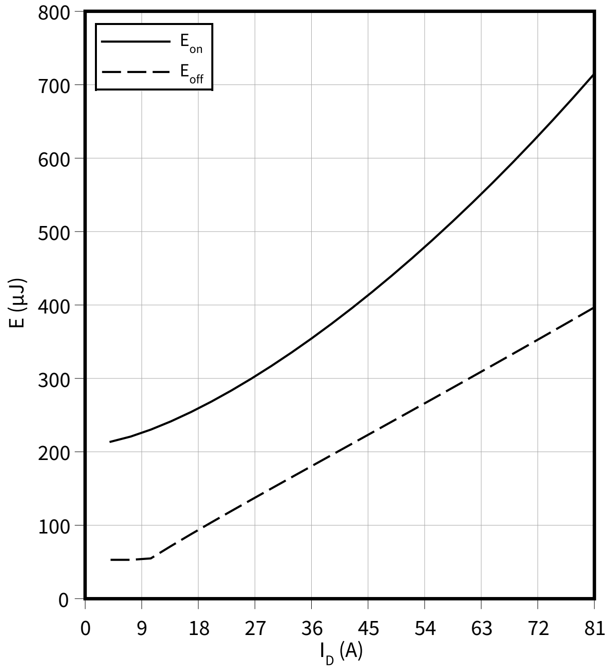
$V_{GS} = -5/18$ V, $I_D = 40.4$ A, $R_{G,ext} = 2.3$ Ω, $V_{DD} = 800$ V



Typical switching energy as a function of drain current, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = 0 V

$E = f(I_D)$

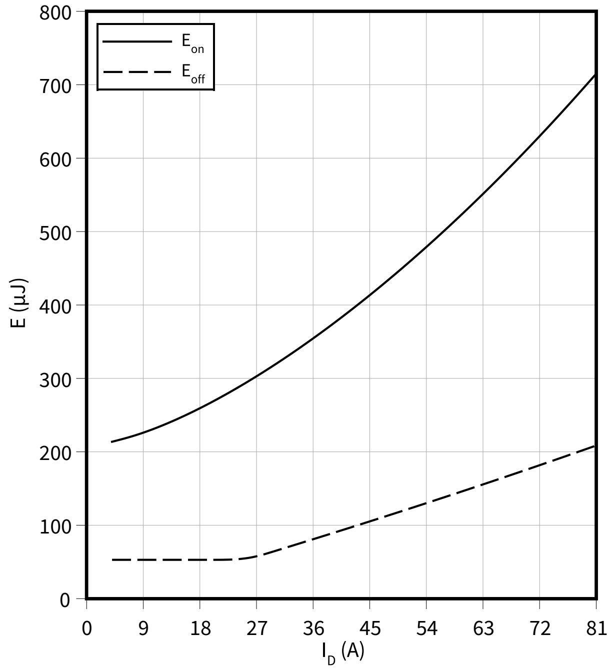
V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 800 V



Typical switching energy as a function of drain current, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = -5 V

$E = f(I_D)$

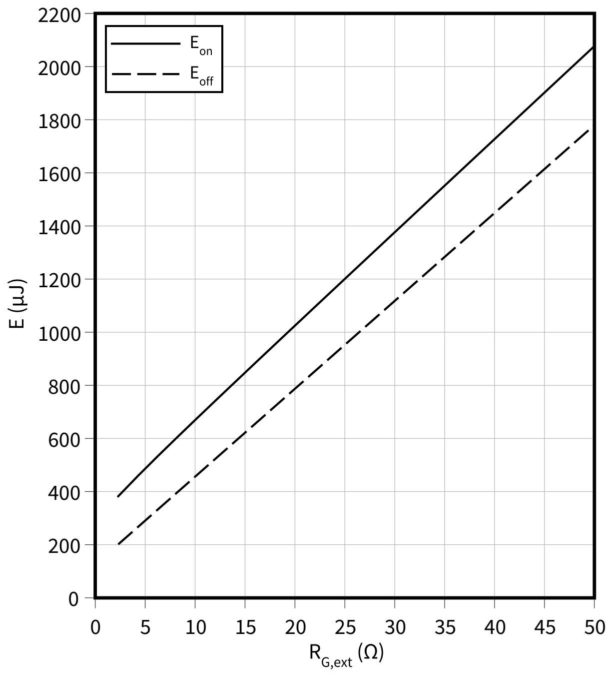
V_{GS} = -5/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 800 V



Typical switching energy as a function of gate resistance, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = 0 V

$E = f(R_{G,ext})$

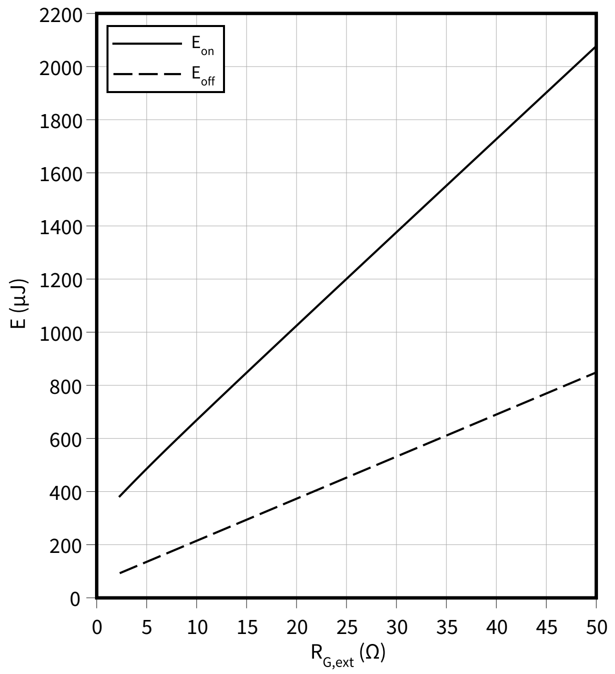
V_{GS} = 0/18 V, I_D = 40.4 A, T_{vj} = 175 °C, V_{DD} = 800 V



Typical switching energy as a function of gate resistance, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = -5 V

$E = f(R_{G,ext})$

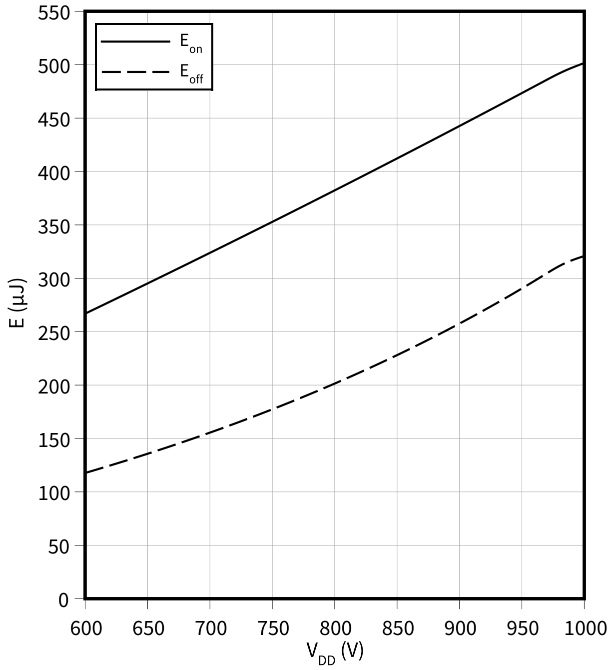
V_{GS} = -5/18 V, I_D = 40.4 A, T_{vj} = 175 °C, V_{DD} = 800 V



Typical switching energy as a function of DC link voltage, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = 0 V

$E = f(V_{DD})$

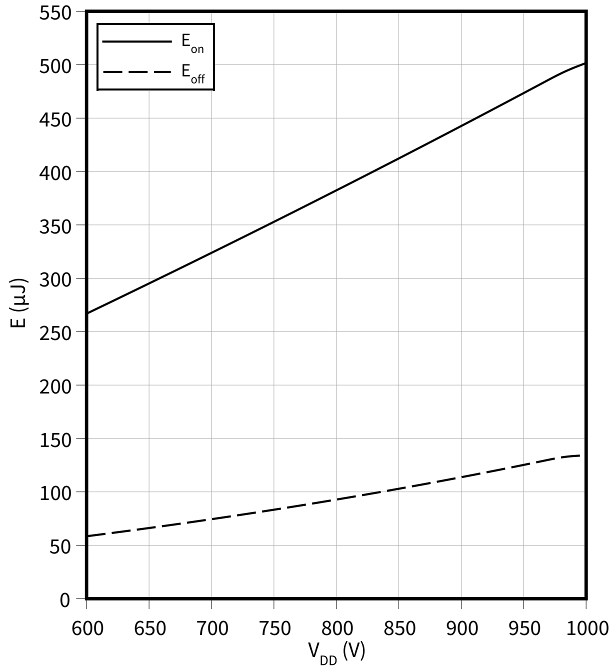
V_{GS} = 0/18 V, I_D = 40.4 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



Typical switching energy as a function of DC link voltage, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = -5 V

$E = f(V_{DD})$

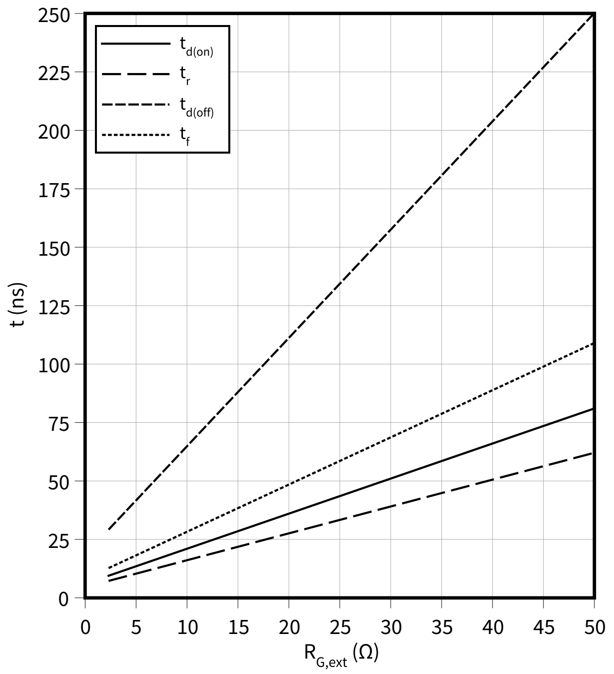
V_{GS} = -5/18 V, I_D = 40.4 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



Typical switching times as a function of gate resistance, test circuit in Fig. F, 2nd device package integrated Schottky diode: V_{GS} = 0 V

$t = f(R_{G,ext})$

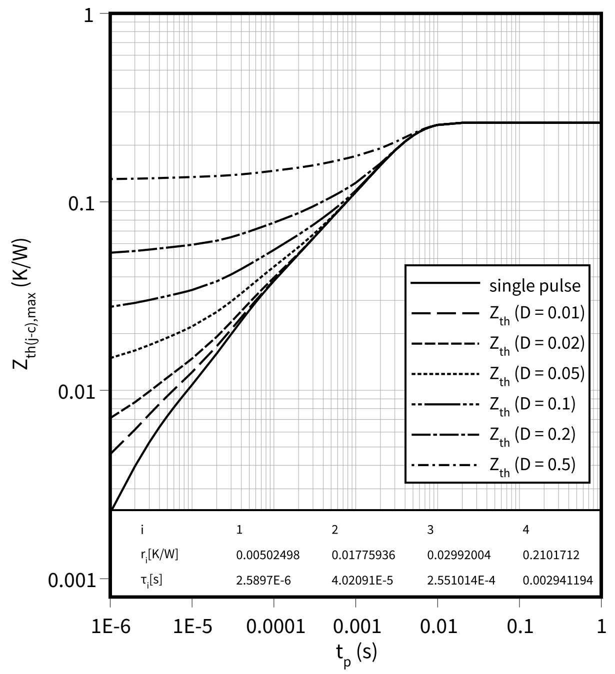
V_{GS} = 0/18 V, I_D = 40.4 A, T_{vj} = 175 °C, V_{DD} = 800 V



Max. transient thermal impedance (MOSFET/diode)

$Z_{th(j-c),max} = f(t_p)$

$D = t_p/T$

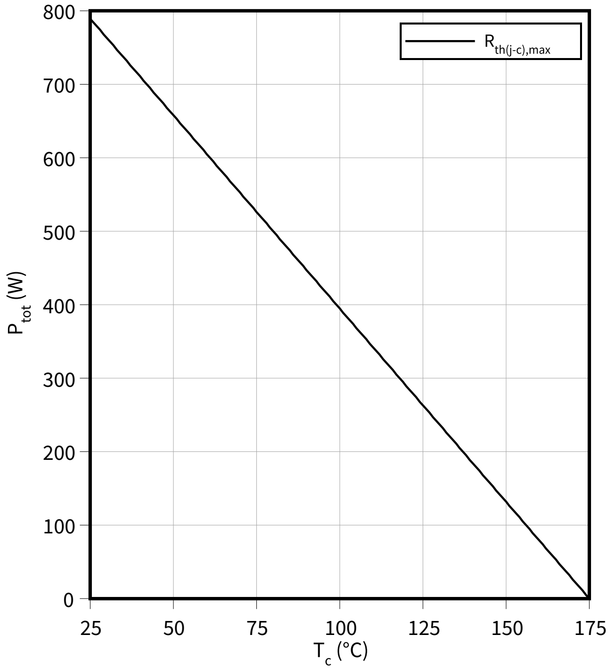


i	1	2	3	4
r_i[K/W]	0.00502498	0.01775936	0.02992004	0.2101712
$τ_i$[s]	2.5897E-6	4.02091E-5	2.551014E-4	0.002941194

SiC Schottky diode: Power dissipation as function of case temperature

$P_{tot} = f(T_c)$

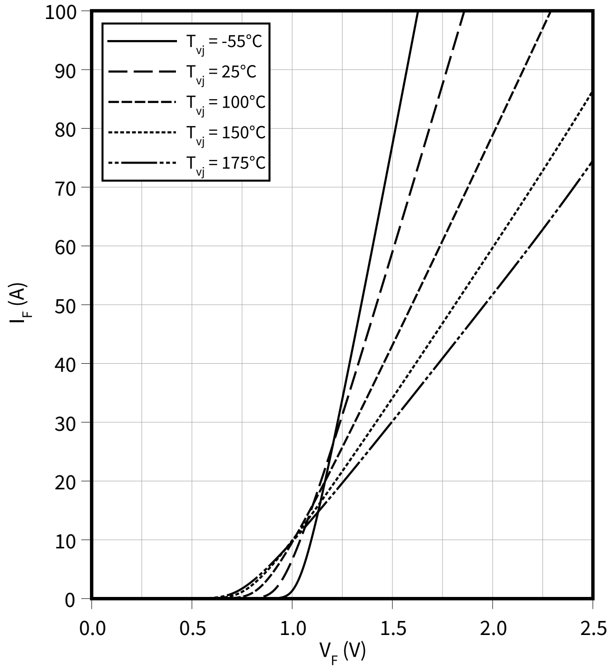
$T_{vj} \leq 175$ °C



SiC Schottky diode: Typical forward characteristics

$I_F = f(V_F)$

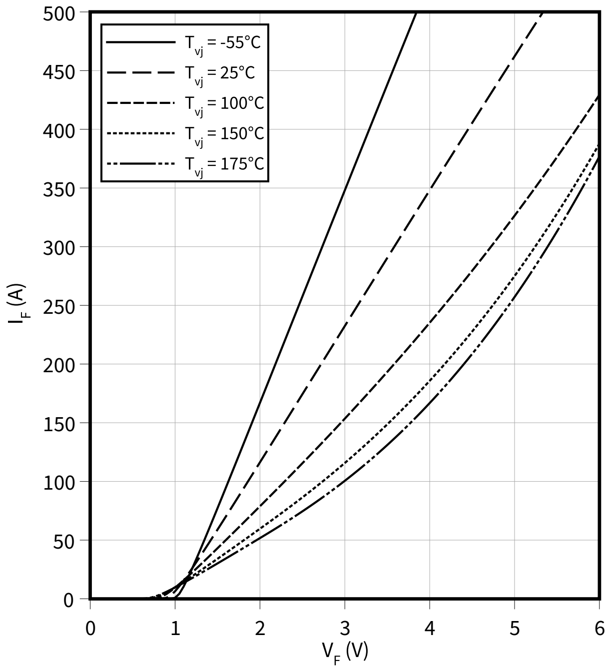
$t_p = 10$ µs



SiC Schottky diode: Typical forward characteristics in surge current

$I_F = f(V_F)$

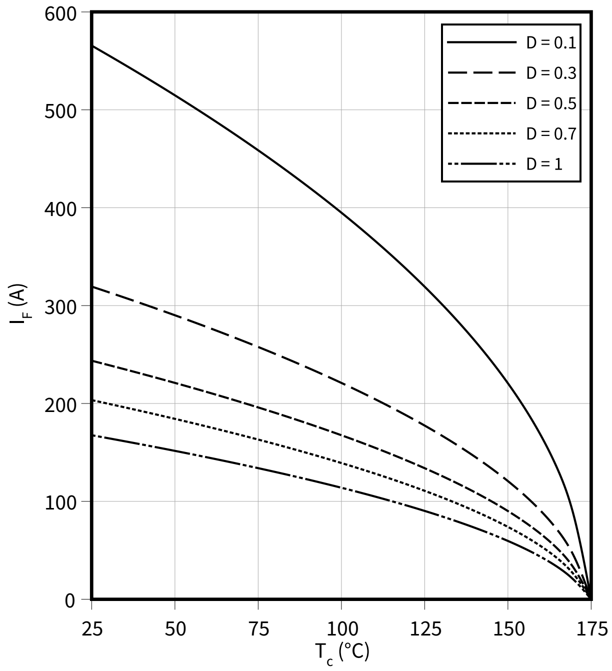
$t_p = 10$ µs



SiC Schottky diode: Forward current as function of temperature

$I_F = f(T_c)$

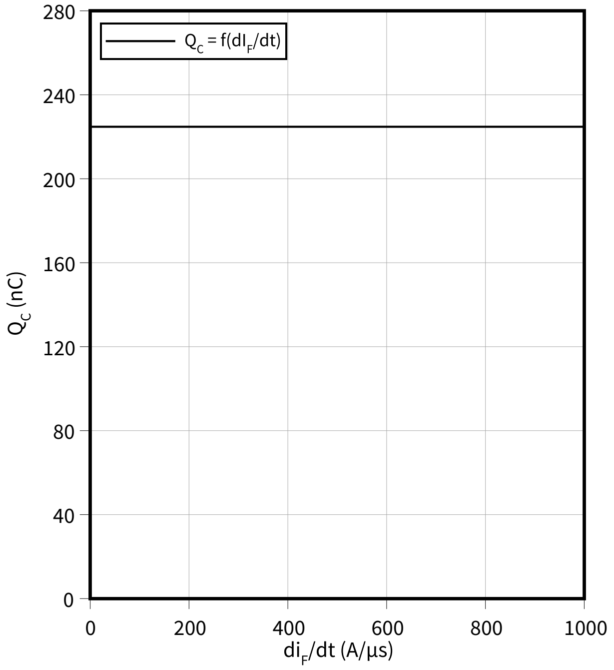
$T_{vj} \leq 175$ °C



SiC Schottky diode: Typical capacitive charge as function of current slope

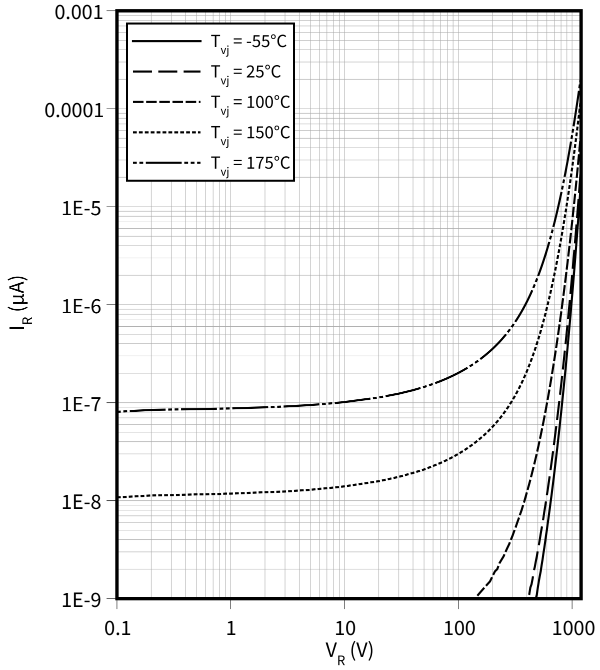
$Q_C = f(di_F/dt)$

$T_{vj} = 25\ °C$, $V_R = 800\ V$



SiC Schottky diode: Typical reverse characteristics

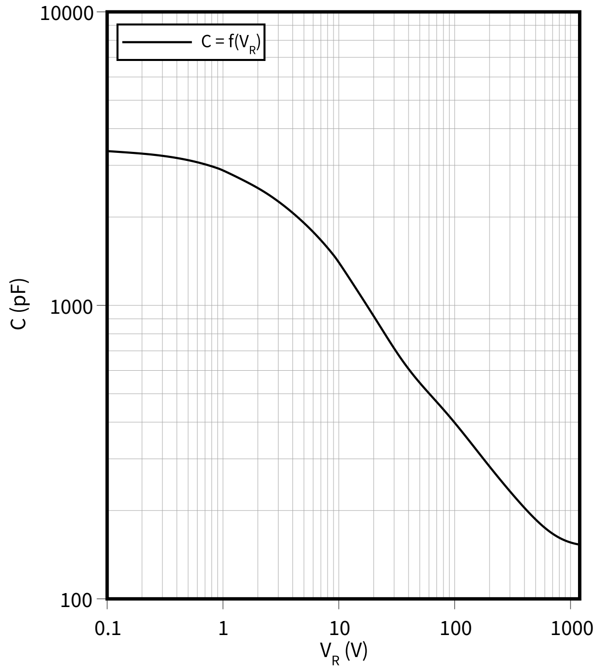
$I_R = f(V_R)$



SiC Schottky diode: Typical capacitance as function of reverse voltage

$C = f(V_R)$

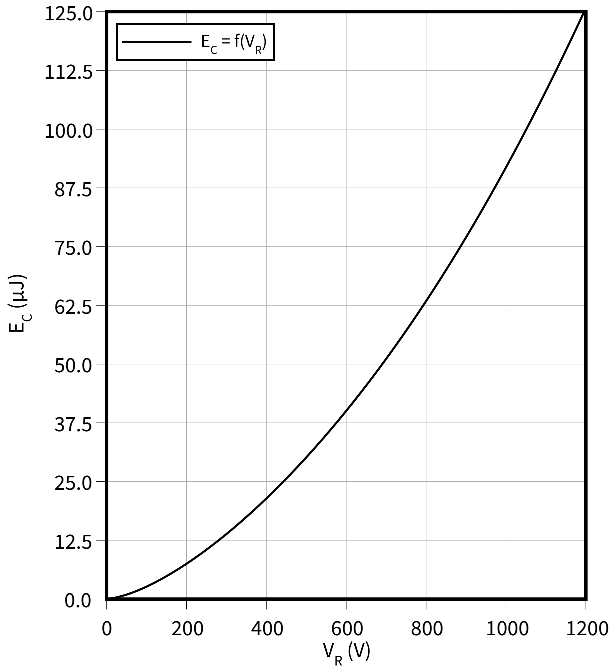
$T_{vj} = 25\ °C$, $f = 100\ kHz$



SiC Schottky diode: Typical capacitively stored energy as function of reverse voltage

$E_C = f(V_R)$

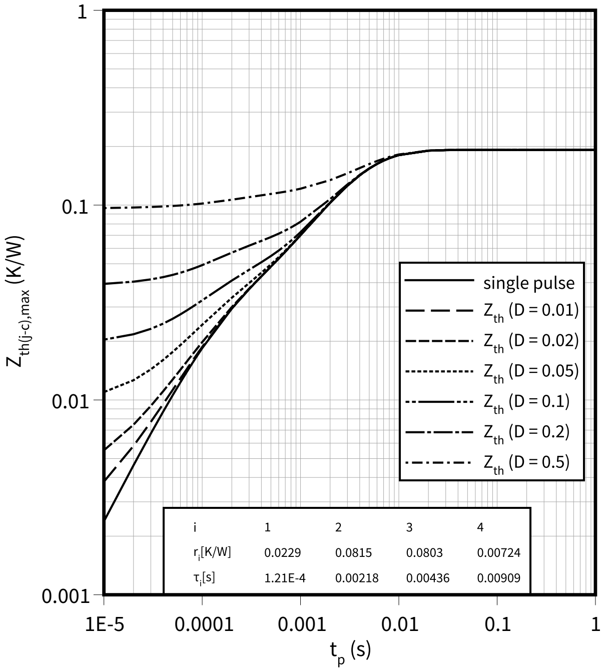
$f = 100\ kHz$



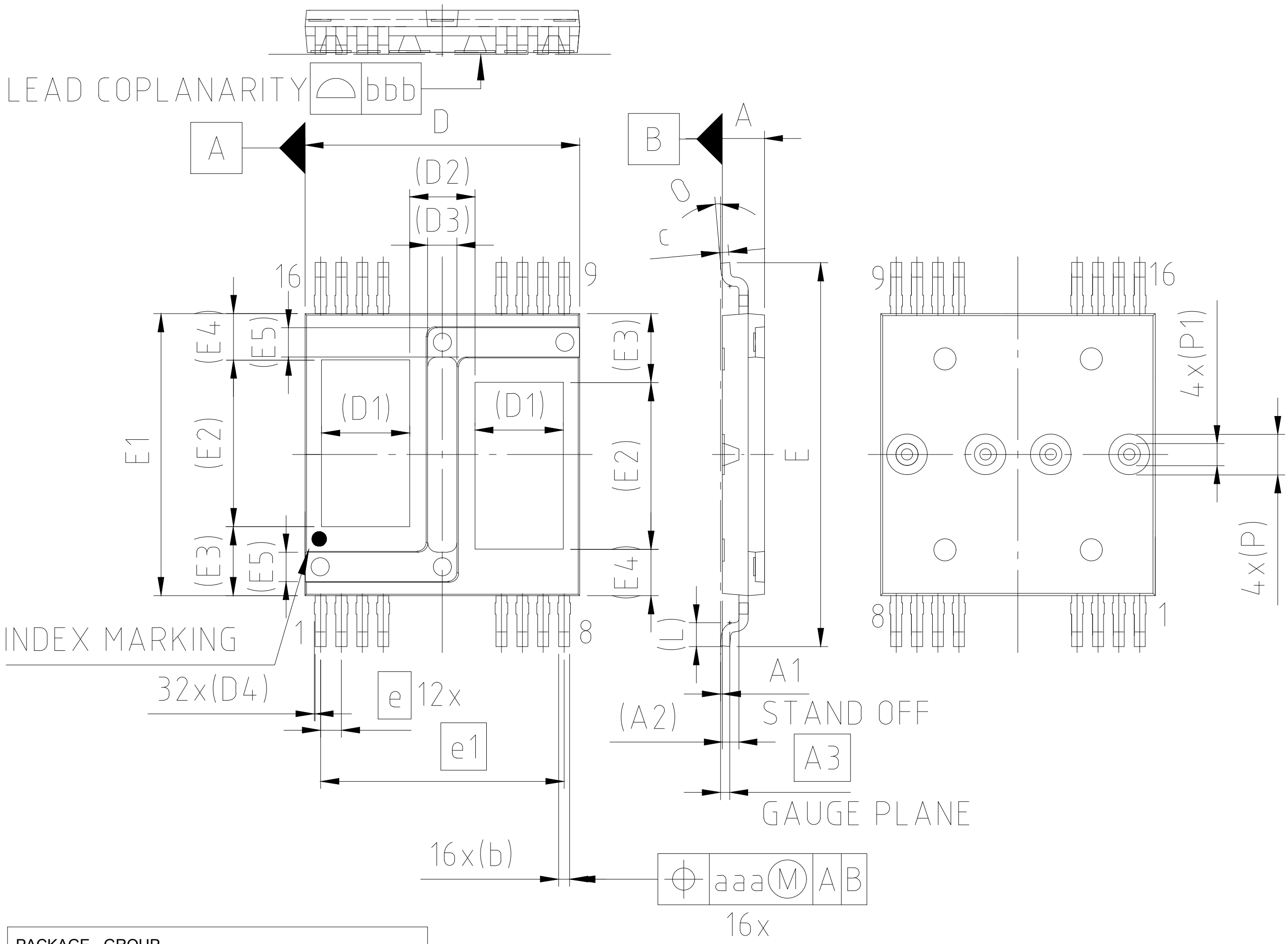
SiC Schottky diode: Max. transient thermal impedance

$Z_{th(j-c),max} = f(t_p)$

$D = t_p/T$



6 Package outlines



PACKAGE - GROUP NUMBER:	**PG-HDSOP-16-U03**	

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	2.25	2.35
A1	0.00	0.15
A2	0.90	
A3	0.50	
b	0.60	
c	0.46	0.58
D	14.90	15.10
D1	4.82	
D2	3.56	
D3	1.60	
D4	0.15	
E	20.81	21.11
E1	15.30	15.50
E2	9.10	
E3	3.76	
E4	2.54	
E5	1.60	

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
e	1.14	
e1	13.30	
L	1.30	
N	16	
O	0.00°	8°
P	2.20	
P1	1.20	
aaa	0.25	
bbb	0.10	

NOTES:
ALL METAL SURFACES TIN PLATED EXCEPT AREA OF CUT
DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

Figure 1

7 Testing conditions

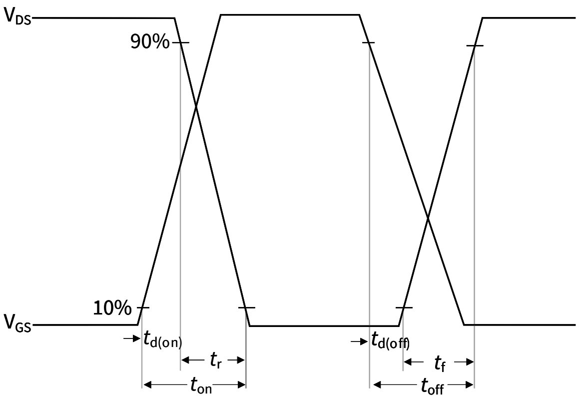


Figure A. **Definition of switching times**

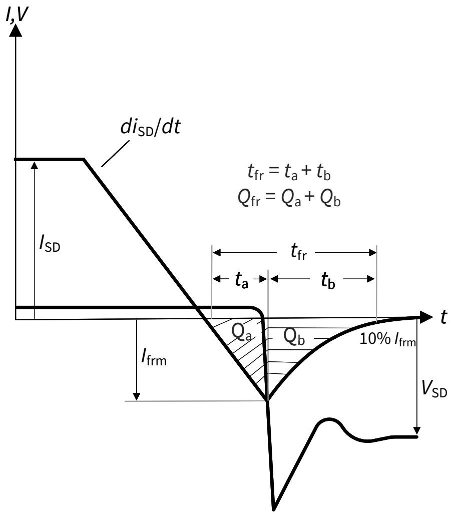


Figure B. **Definition of body diode switching characteristics**

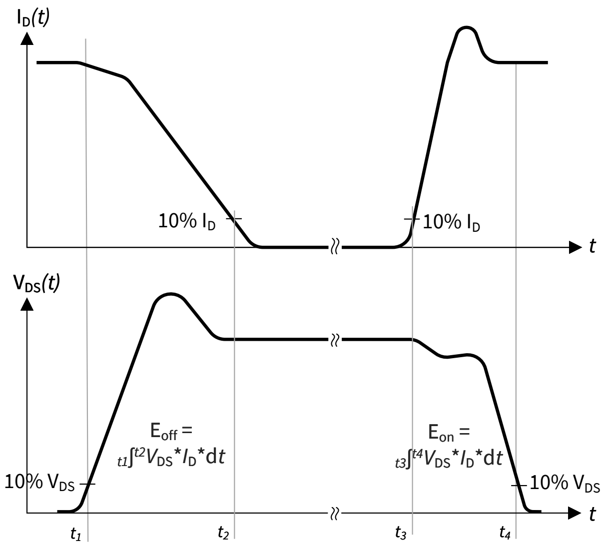


Figure C. **Definition of switching losses**

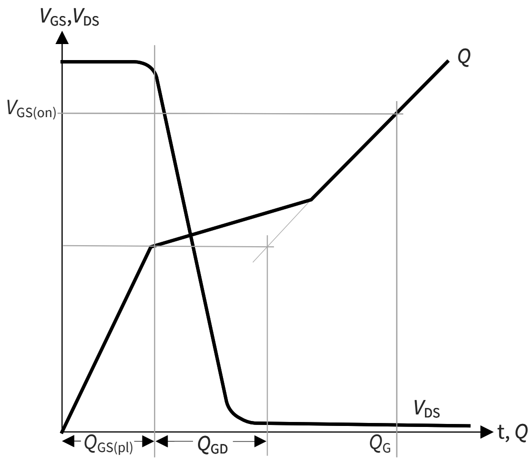


Figure D. **Definition of QGD**

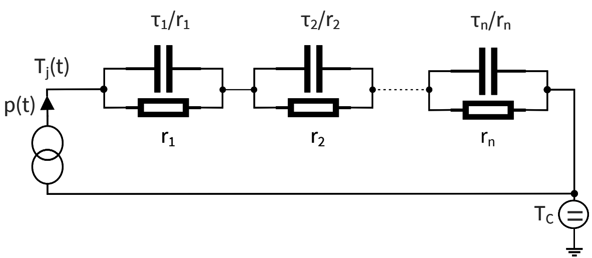


Figure E. **Thermal equivalent circuit**

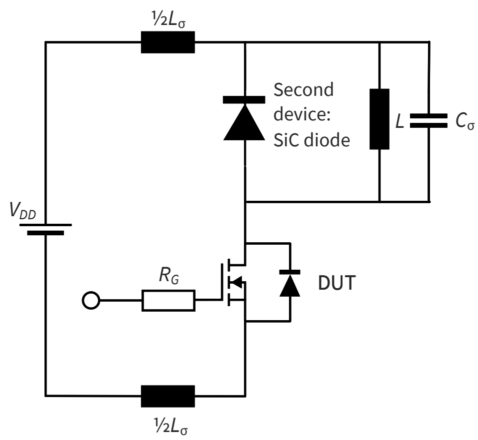


Figure F. **Dynamic test circuit for MOSFET**
Parasitic inductance L_σ,
Parasitic capacitor C_σ,

Figure 2

Revision history

Document revision	Date of release	Description of changes
0.10	2024-01-24	Target datasheet
0.20	2024-11-20	Updated Avalanche energy, single pulse E_{AS} in Table 5 Editorial changes
1.00	2026-06-25	Final datasheet

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