Final datasheet

CoolSiC™ 1400 V SiC MOSFET G2 : Silicon Carbide MOSFET with .XT interconnection technology

Eigenschaften



- V_{DSS} = 1400 V at T_{vj} = 25°C
- I_{DDC} = 65 A at T_C = 100°C
- $R_{DS(on)}$ = 19 mΩ at V_{GS} = 18 V, T_{vj} = 25°C
- Very low switching losses
- Short circuit withstand time 2 µs
- Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.2 V
- Robust against parasitic turn on, 0 V turn-off gate voltage can be applied
- Robust body diode for hard commutation
- .XT interconnection technology for best-in-class thermal performance
- Geeignete Infineon Gate-Treiber finden Sie unter https://www.infineon.com/gdfinder

Halogen-free
Green
Lead-free
RoHS

Potenzielle Anwendungen

- General purpose drives (GPD)
- EV Charging
- Online UPS / Industrial UPS
- String inverter
- Energy storage systems (ESS)
- Welding

Produktvalidierung

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

Beschreibung

Pin definition:

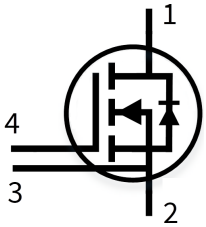
• Pin 1 – Drain

• Pin 2 – Source

• Pin 3 – Kelvin sense contact

• Pin 4 – Gate

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



Type	Package	Marking
IMZC140R019M2H	PG-TO247-4-U07	14M2H019

Inhalt

Beschreibung 1
Eigenschaften 1
Potenzielle Anwendungen 1
Produktvalidierung 1
Inhalt 2
1 Gehäuse 3
2 MOSFET 3
3 Body diode (MOSFET) 6
4 Kennlinien 8
5 Gehäuseabmessungen 15
6 Testing conditions 16
Änderungshistorie 17
Disclaimer 18

1 Gehäuse

Tabelle 1 Charakteristische Werte

Parameter	Symbol	Notiz oder Prüfbedingung	Werte			Einh.
			Min	Typ	Max	
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	Wave soldering only allowed at leads 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	M	M3 screw, Maximum of mounting processes: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				62	K/W
MOSFET/body diode thermal resistance, junction-case	$R_{th(j-c)}$			0.3	0.39	K/W

2 MOSFET

Tabelle 2 Höchstzulässige Werte

Parameter	Symbol	Notiz oder Prüfbedingung		Werte	Einh.
Drain-Source-Spannung	V_{DSS}	$T_{vj} \geq 25$ °C		1400	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	92	A
			$T_c = 100$ °C	65	
Peak drain current, t_p limited by $T_{vj(max)}$ [1)]	I_{DM}	$V_{GS} = 18$ V		325	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		506	mJ
Avalanche energy, repetitive	E_{AR}	$I_D = 40.4$ A, $V_{DD} = 50$ V, $L = 3.1$ µH, $T_{vj(start)} = 25$ °C		2.5	mJ
Short-circuit withstand time	t_{SC}	$V_{DD} \leq 800$ V, $V_{DS,peak} < 1400$ 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	380	W
			$T_c = 100$ °C	190	

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

Tabelle 3 Empfohlene Werte

Parameter	Symbol	Notiz oder Prüfbedingung	Werte	Einh.
Recommended turn-on gate voltage	$V_{GS(on)}$		15...18	V
Recommended turn-off gate voltage	$V_{GS(off)}$		-5...0	V

Tabelle 4 Charakteristische Werte

Parameter	Symbol	Notiz oder Prüfbedingung		Werte			Einh.
				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		19		mΩ
			T_{vj} = 150 °C, $V_{GS(on)}$ = 18 V		41.1	53.8	
			T_{vj} = 175 °C, $V_{GS(on)}$ = 18 V		48		
			T_{vj} = 25 °C, $V_{GS(on)}$ = 15 V		23		
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} = 1400 V, V_{GS} = 0 V	T_{vj} = 25 °C			300	µA
			T_{vj} = 175 °C		5.1		
Gate leakage current	I_{GSS}	V_{DS} = 0 V	V_{GS} = 23 V			120	nA
			V_{GS} = -10 V			-120	
Forward transconductance	g_{fs}	I_D = 40.4 A, V_{DS} = 20 V			26		S
Internal gate resistance	$R_{G,int}$	f = 1 MHz, V_{AC} = 25 mV			2.1		Ω
Input capacitance	C_{iss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			2860		pF
Output capacitance	C_{oss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			99		pF
Reverse transfer capacitance	C_{rss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			9		pF
C_{oss} stored energy	E_{oss}	Calculated based on C_{oss} = f(V_{DD})			63		µJ
Output charge	Q_{oss}	Calculated based on C_{oss} = f(V_{DD})			172		nC
Effective output capacitance, energy related	$C_{o(er)}$	V_{DS} = 0...1000 V, V_{GS} = 0 V, Calculated based on E_{oss}			197		pF
Effective output capacitance, time related	$C_{o(tr)}$	I_D = constant, V_{DS} = 0...1000 V, V_{GS} = 0 V, Calculated based on Q_{oss}			215		pF

(wird fortgesetzt...)

Tabelle 4 (Fortsetzung) Charakteristische Werte

Parameter	Symbol	Notiz oder Prüfbedingung		Werte			Einh.
				Min	Typ	Max	
Total gate charge	Q_G	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, turn-on pulse			78		nC
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, turn-on pulse			22		nC
Gate-drain charge	Q_{GD}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, turn-on pulse			20		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		8.9		ns
			T_{vj} = 175 °C		7.7		
Rise time	t_r	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		5.3		ns
			T_{vj} = 175 °C		4.9		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		21		ns
			T_{vj} = 175 °C		24		
Fall time	t_f	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		8.7		ns
			T_{vj} = 175 °C		9.5		
Turn-on energy	E_{on}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		386		µJ
			T_{vj} = 175 °C		1163		
Turn-off energy	E_{off}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		178		µJ
			T_{vj} = 175 °C		205		
Total switching energy[1)]	E_{tot}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = 0/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		643		µJ
			T_{vj} = 175 °C		1695		

(wird fortgesetzt...)

Tabelle 4 (Fortsetzung) Charakteristische Werte

Parameter	Symbol	Notiz oder Prüfbedingung		Werte			Einh.
				Min	Typ	Max	
Turn-on energy at -5 V	E_{on}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = -5/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = -5 V	T_{vj} = 25 °C		386		µJ
			T_{vj} = 175 °C		1194		
Turn-off energy at -5 V	E_{off}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = -5/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = -5 V	T_{vj} = 25 °C		82		µJ
			T_{vj} = 175 °C		96		
Total switching energy at -5 V[1)]	E_{tot}	V_{DD} = 1000 V, I_D = 40.4 A, V_{GS} = -5/18 V, $R_{G,ext}$ = 2.3 Ω, L_σ = 12 nH, diode: body diode at V_{GS} = -5 V	T_{vj} = 25 °C		547		µJ
			T_{vj} = 175 °C		1627		
Virtual junction temperature	T_{vj}			-55		175	°C

1) including E_{fr}

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

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

3 Body diode (MOSFET)

Tabelle 5 Höchstzulässige Werte

Parameter	Symbol	Notiz oder Prüfbedingung		Werte	Einh.
Drain-source voltage	V_{DSS}	T_{vj} ≥ 25 °C		1400	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	72	A
			T_c = 100 °C	40	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		195	A

Tabelle 6 Charakteristische Werte

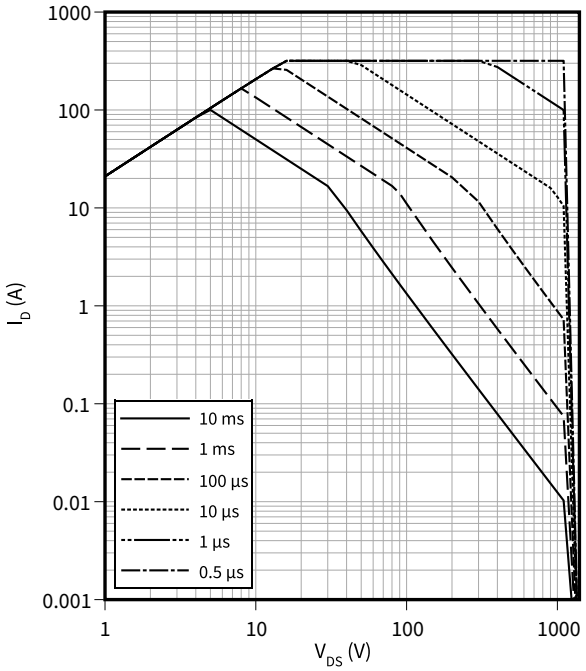
Parameter	Symbol	Notiz oder Prüfbedingung		Werte			Einh.
				Min	Typ	Max	
Drain-source reverse voltage	V_{SD}	I_{SD} = 40.4 A, V_{GS} = 0 V	T_{vj} = 25 °C		4.2	5.5	V
			T_{vj} = 100 °C		4.11		
			T_{vj} = 175 °C		4.05		
MOSFET forward recovery charge	Q_{fr}	V_{DD} = 1000 V, I_{SD} = 40.4 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		0.46		µC
			T_{vj} = 175 °C		1.41		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 1000 V, I_{SD} = 40.4 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		71		A
			T_{vj} = 175 °C		135		
MOSFET forward recovery energy	E_{fr}	V_{DD} = 1000 V, I_{SD} = 40.4 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		79		µJ
			T_{vj} = 175 °C		327		
MOSFET forward recovery energy at -5 V	E_{fr}	V_{DD} = 1000 V, I_{SD} = 40.4 A, V_{GS} = -5 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		79		µJ
			T_{vj} = 175 °C		337		
Virtual junction temperature	T_{vj}			-55		175	°C

4 Kennlinien

Safe operating area (SOA)

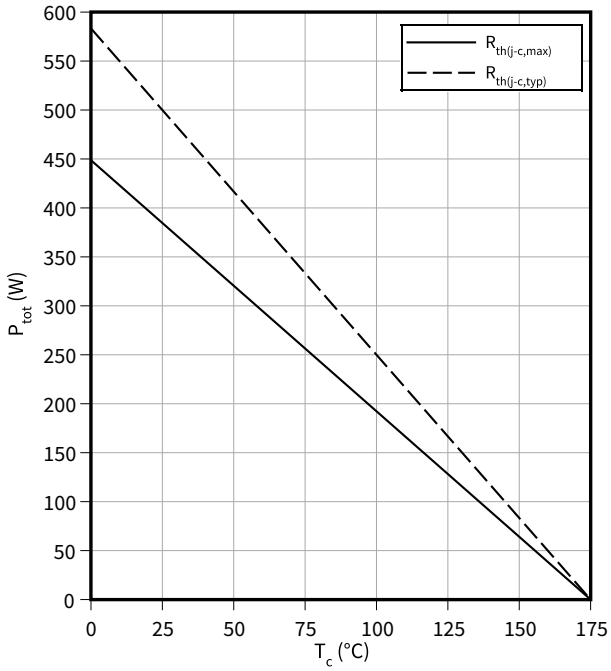
$I_D = f(V_{DS})$

$T_{vj} \leq 175\ °C$, $T_c = 25\ °C$



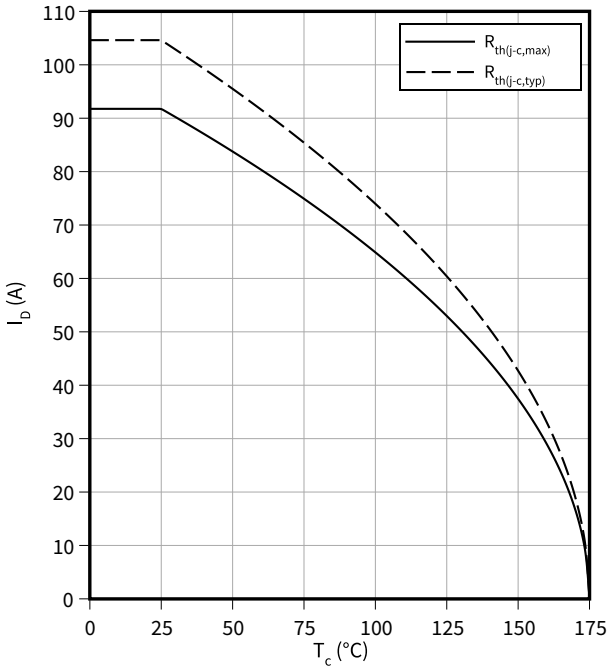
Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$



Maximum DC drain to source current as a function of case temperature limited by bond wire

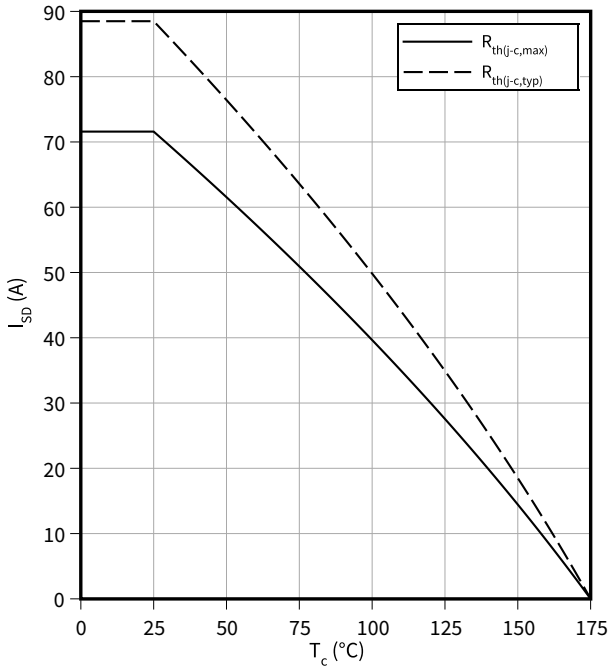
$I_D = f(T_c)$



Maximum source to drain current as a function of case temperature limited by bond wire

$I_{SD} = f(T_c)$

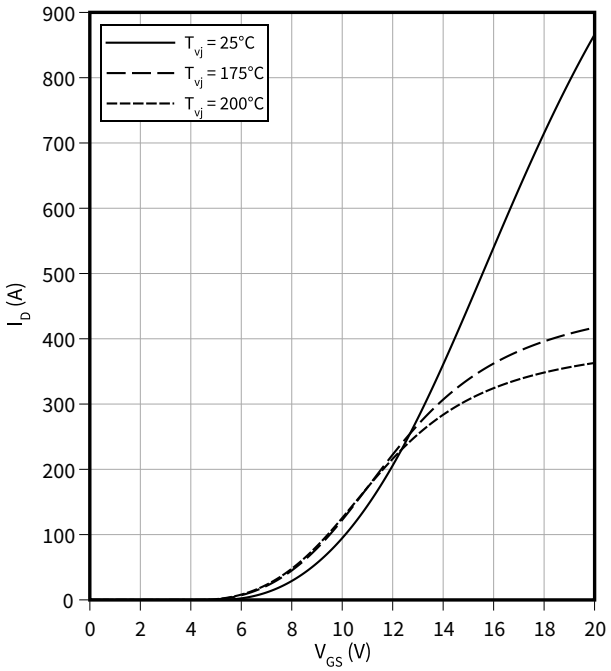
$V_{GS} = 0\ V$



Typical transfer characteristic

$I_D = f(V_{GS})$

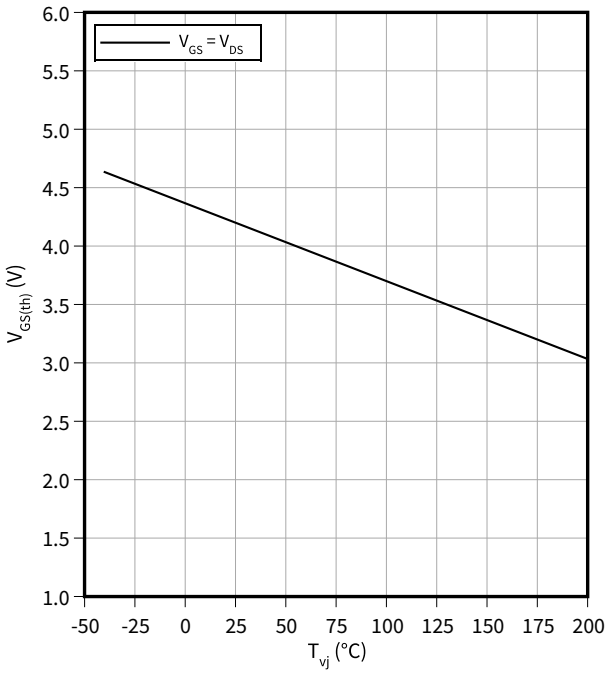
V_{DS} = 20 V, t_p = 20 µs



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

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

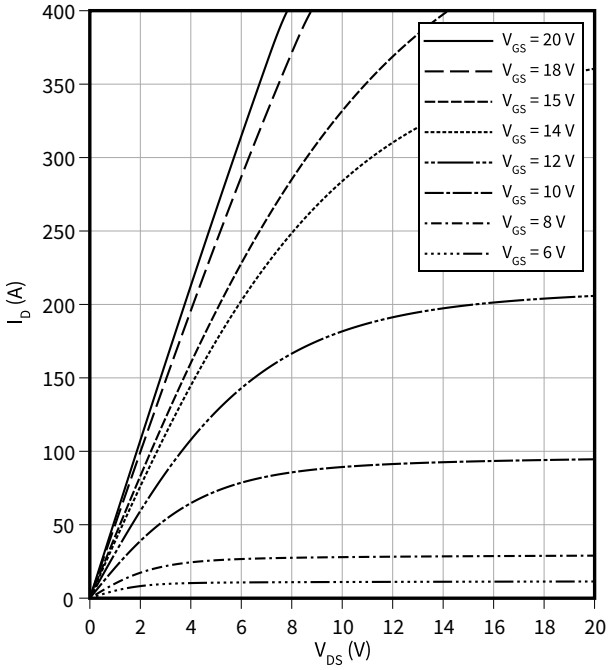
I_D = 12.7 mA



Typical output characteristic, V_{GS} as a parameter

$I_D = f(V_{DS})$

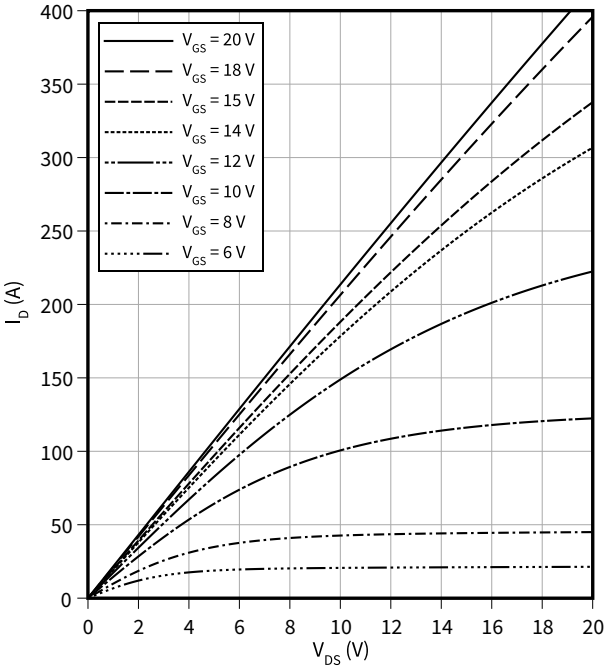
T_{vj} = 25 °C, t_p = 20 µs



Typical output characteristic, V_{GS} as a parameter

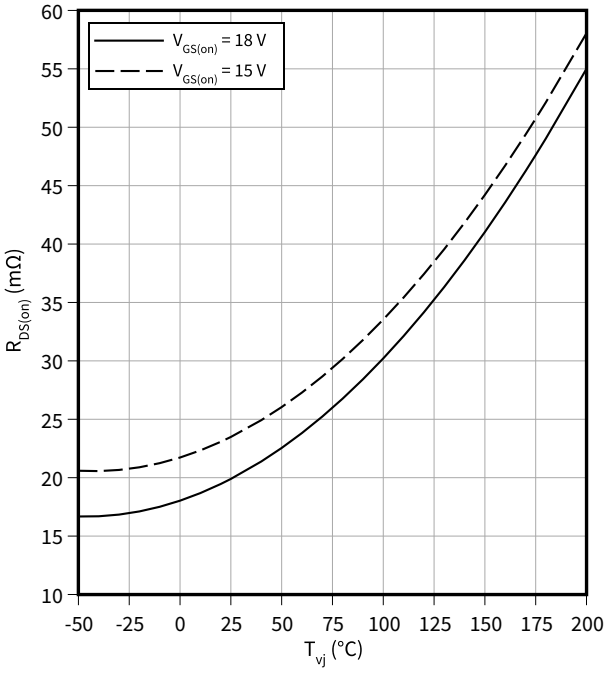
$I_D = f(V_{DS})$

T_{vj} = 175 °C, t_p = 20 µs



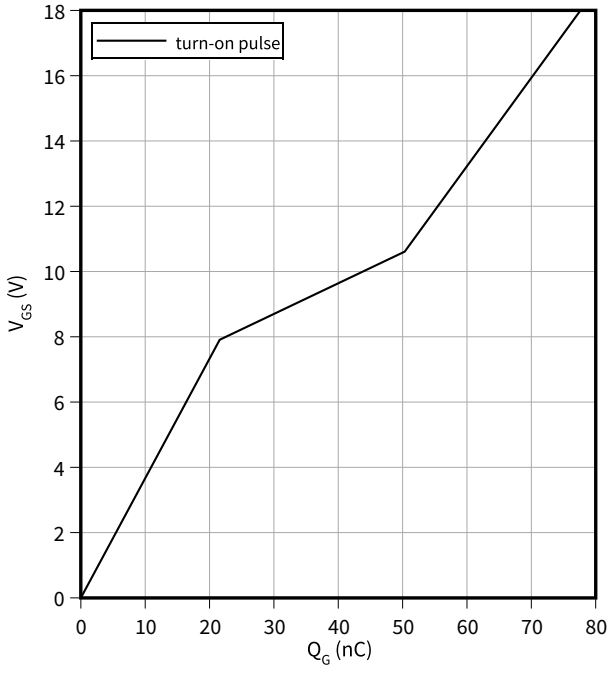
Typical on-state resistance as a function of junction temperature

$R_{DS(on)} = f(T_{vj})$
$I_D = 40.4$ A



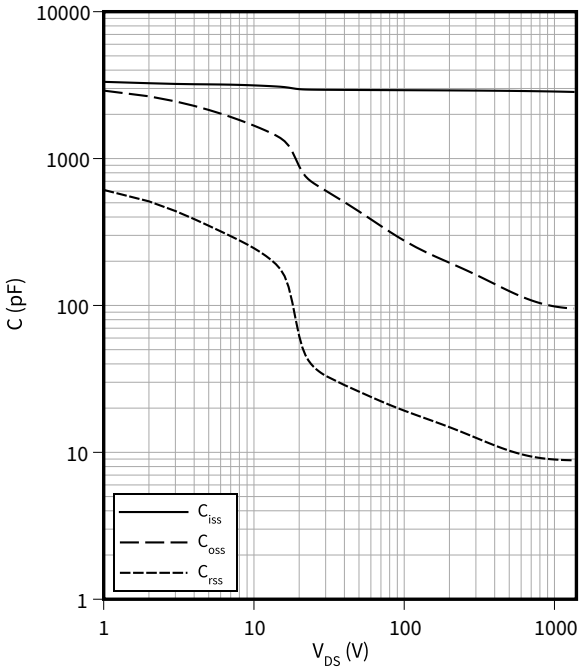
Typical gate charge

$V_{GS} = f(Q_G)$
$I_D = 40.4$ A, $V_{DS} = 1000$ V



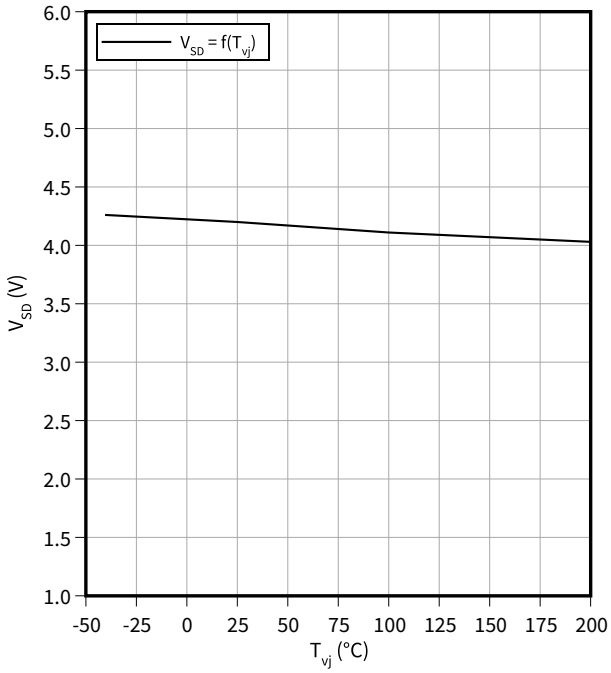
Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$
$f = 100$ kHz, $V_{GS} = 0$ V



Typical reverse drain voltage as a function of junction temperature

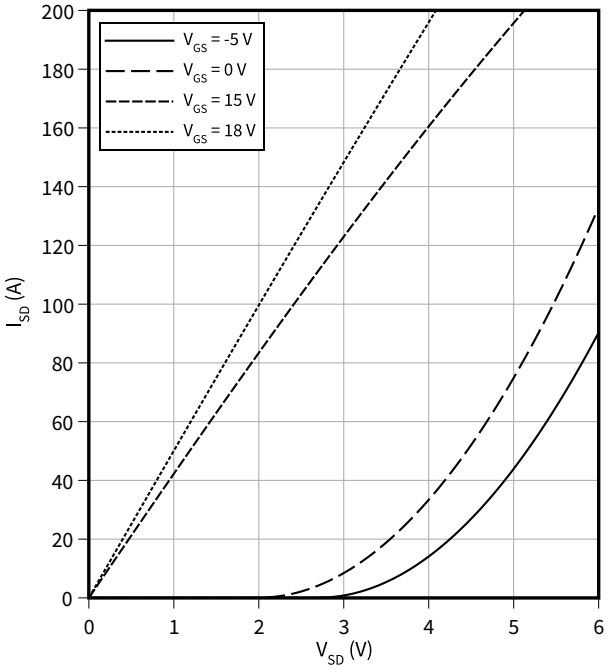
$V_{SD} = f(T_{vj})$
$I_{SD} = 40.4$ A, $V_{GS} = 0$ V



Typical reverse drain current as a function of reverse drain voltage, V_{GS} as a parameter

$I_{SD} = f(V_{SD})$

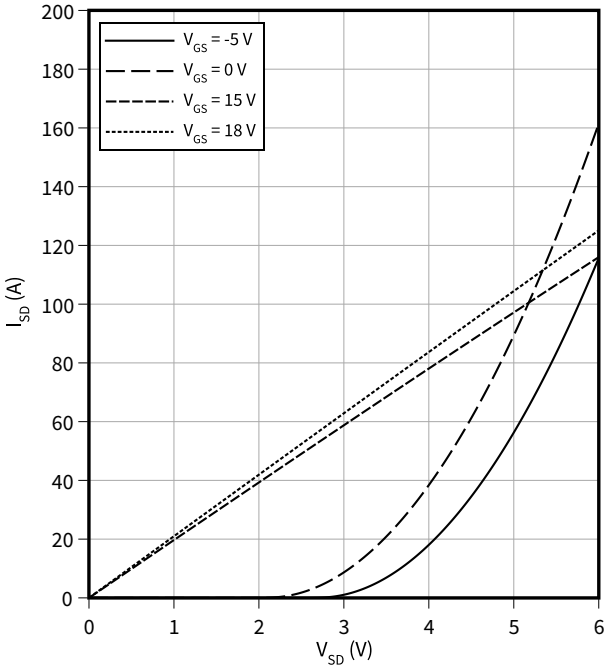
$T_{vj} = 25\ °C$, $t_p = 20\ µs$



Typical reverse drain current as a function of reverse drain voltage, V_{GS} as a parameter

$I_{SD} = f(V_{SD})$

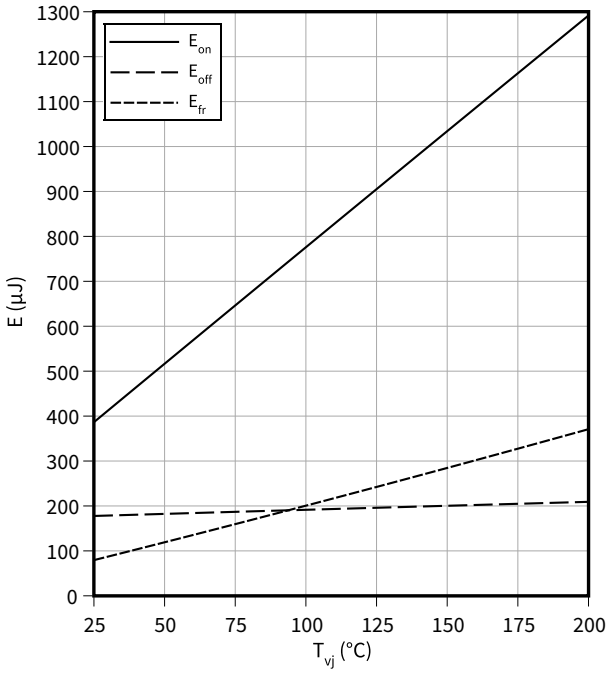
$T_{vj} = 175\ °C$, $t_p = 20\ µs$



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

$E = f(T_{vj})$

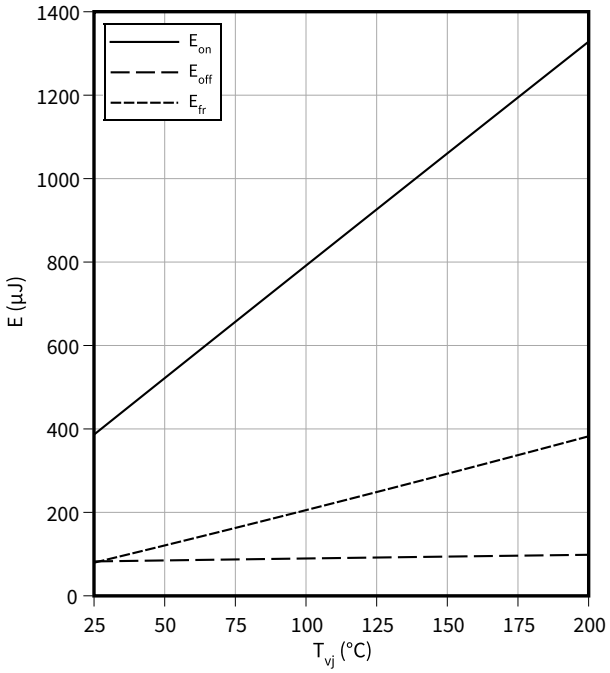
$V_{GS} = 0/18\ V$, $I_D = 40.4\ A$, $R_{G,ext} = 2.3\ Ω$, $V_{DD} = 1000\ V$



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

$E = f(T_{vj})$

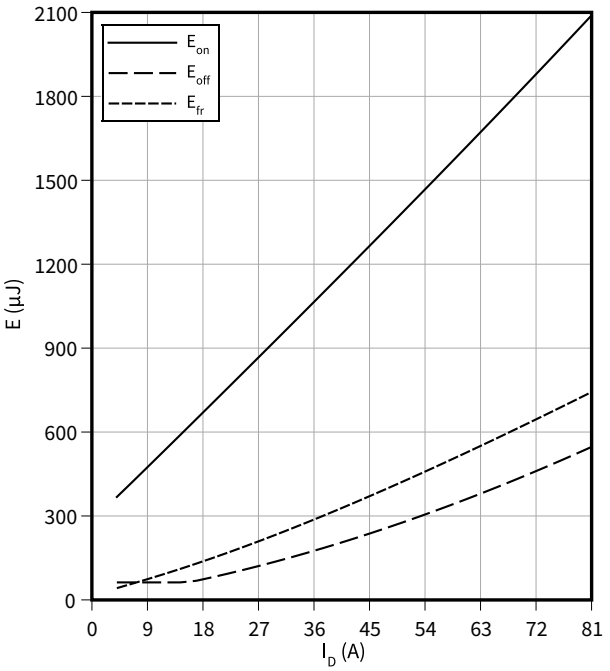
$V_{GS} = -5/18\ V$, $I_D = 40.4\ A$, $R_{G,ext} = 2.3\ Ω$, $V_{DD} = 1000\ V$



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

$E = f(I_D)$

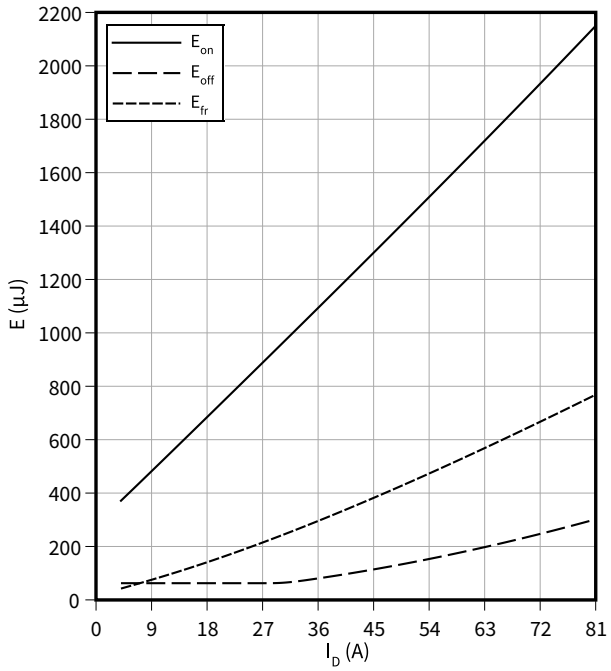
V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 1000 V



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

$E = f(I_D)$

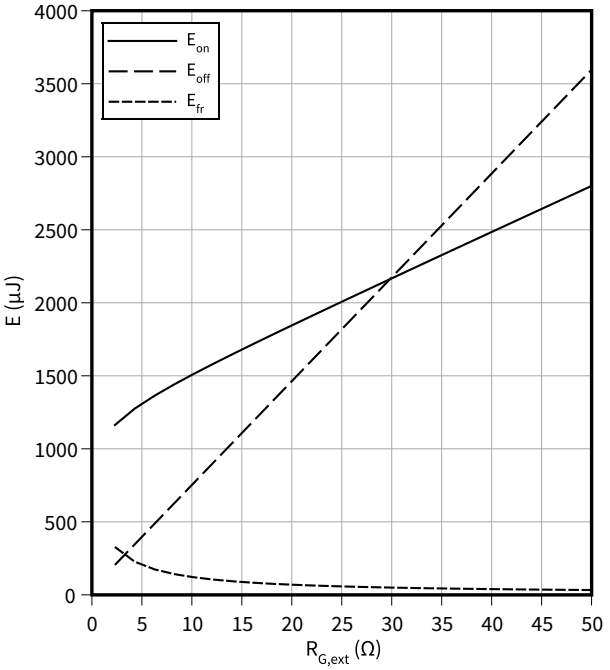
V_{GS} = -5/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 1000 V



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

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

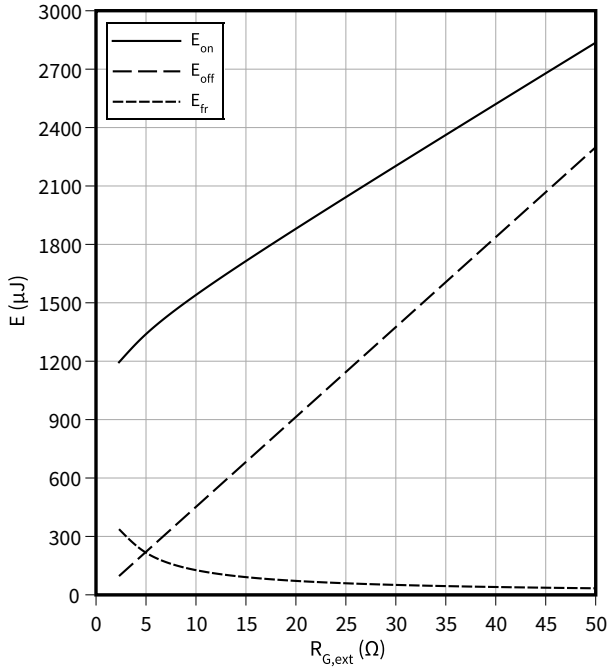
V_{GS} = 0/18 V, I_D = 40.4 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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

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

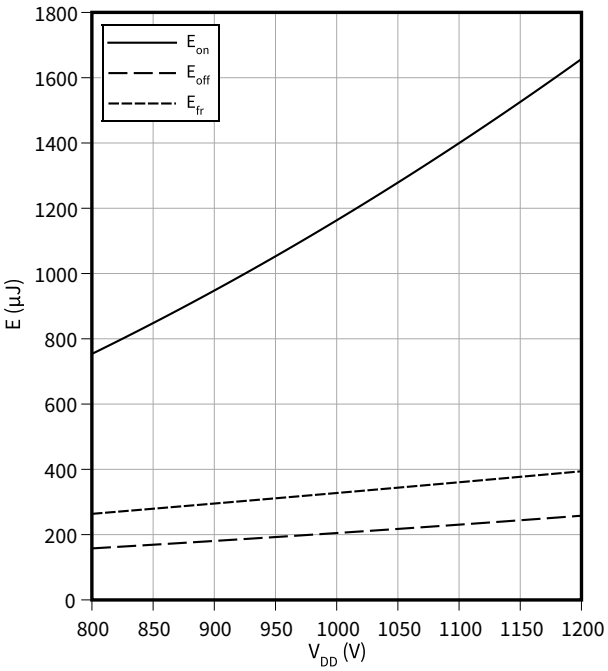
V_{GS} = -5/18 V, I_D = 40.4 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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

E = f(V_{DD})

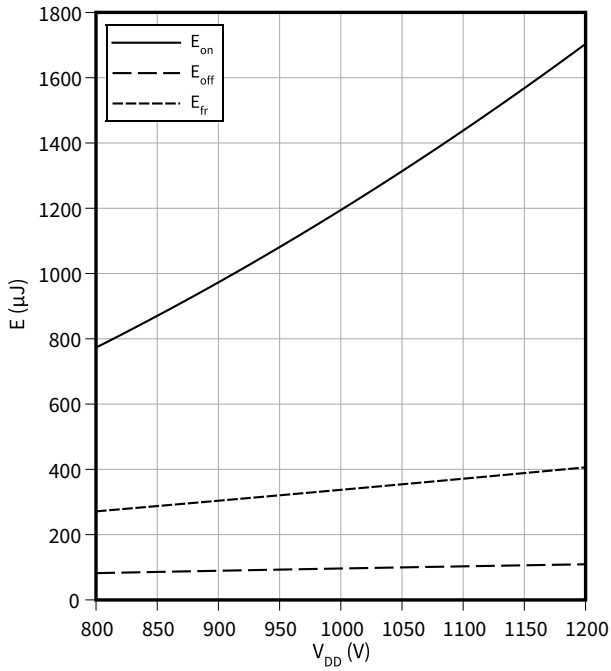
V_{GS} = 0/18 V, I_D = 40.4 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

E = f(V_{DD})

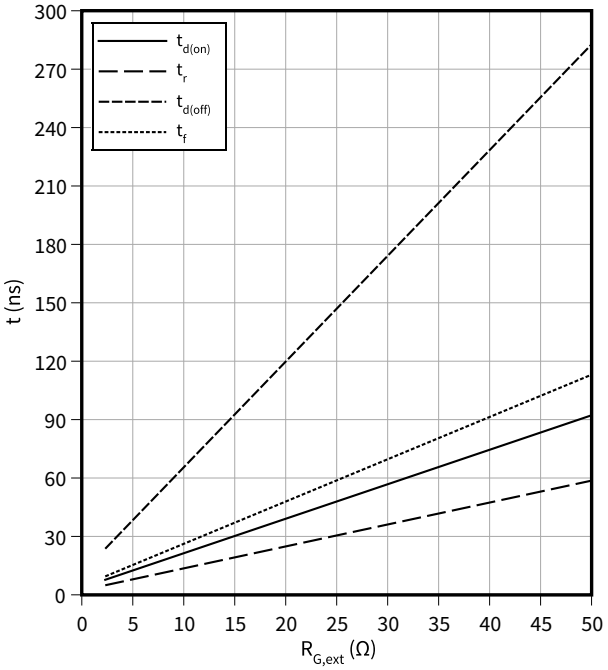
V_{GS} = -5/18 V, I_D = 40.4 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

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

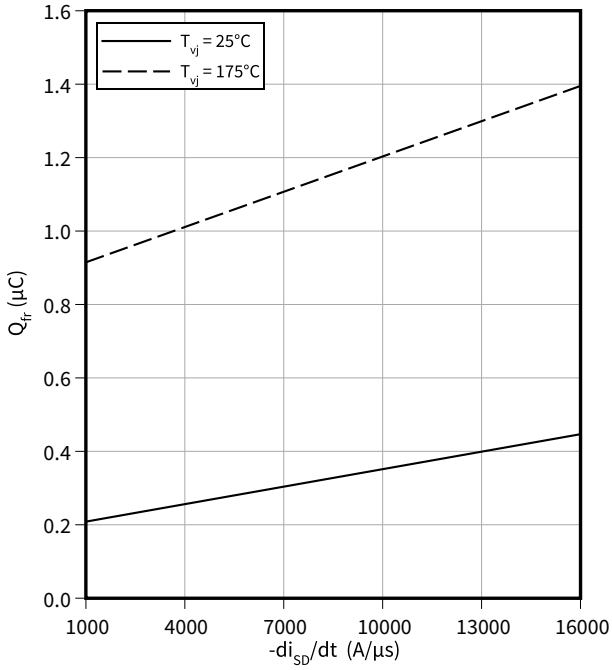
V_{GS} = 0/18 V, I_D = 40.4 A, T_{vj} = 175 °C, V_{DD} = 1000 V



Typical reverse recovery charge as a function of reverse drain current slope, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V

Q_{fr} = f(-di_{SD}/dt)

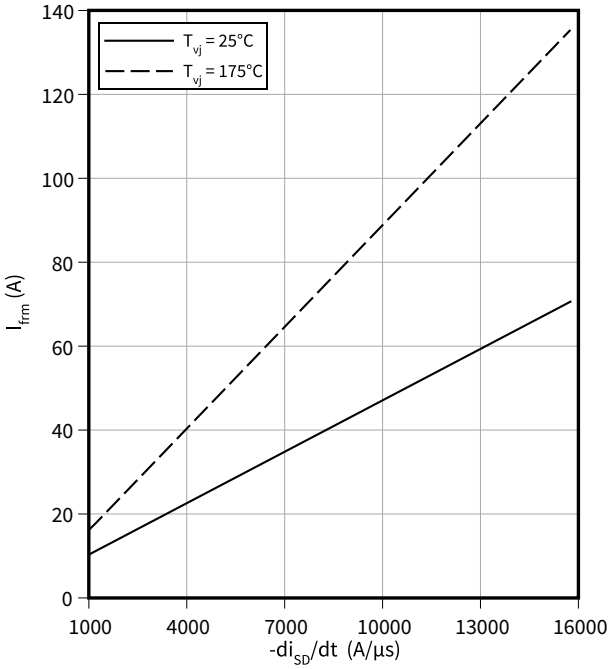
V_{GS} = 0/18 V, I_{SD} = 40.4 A, V_{DD} = 1000 V



Typical reverse recovery current as a function of reverse drain current slope, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V

$I_{frm} = f(-di_{SD}/dt)$

V_{GS} = 0/18 V, I_{SD} = 40.4 A, V_{DD} = 1000 V

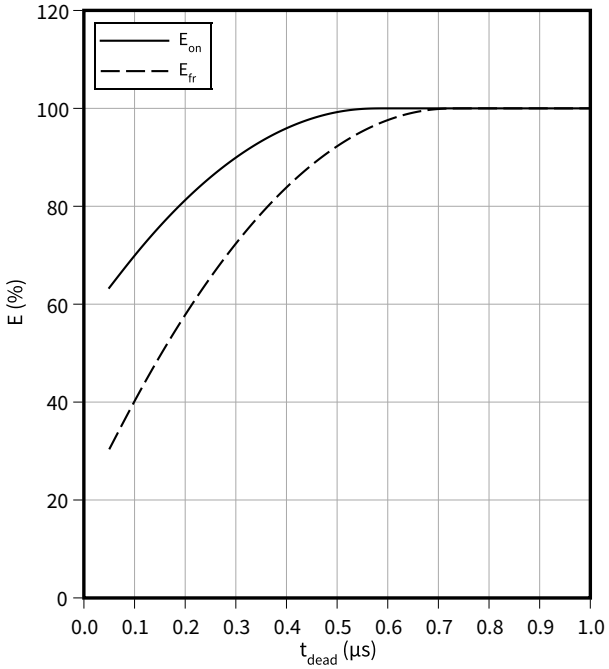


Typical switching energy as a function of dead time / blanking time, test circuit in Fig. F, 2nd device own body diode: V_{GS} = -5 V

$E = f(t_{dead})$

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

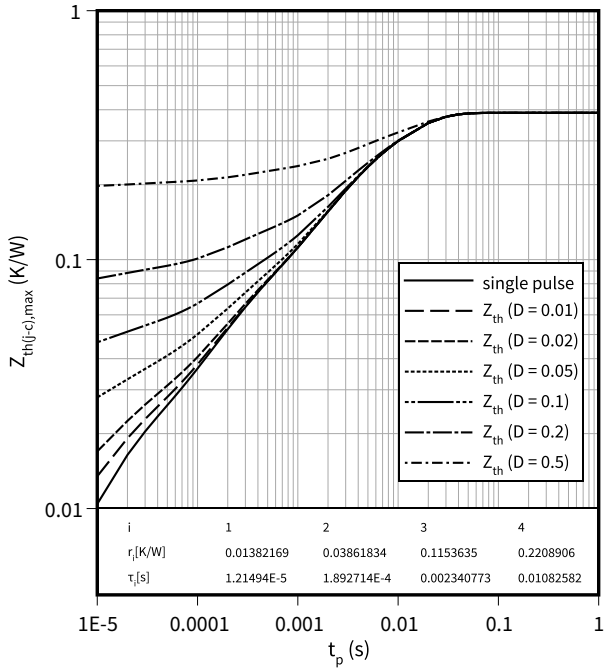
V_{DD} = 1000 V



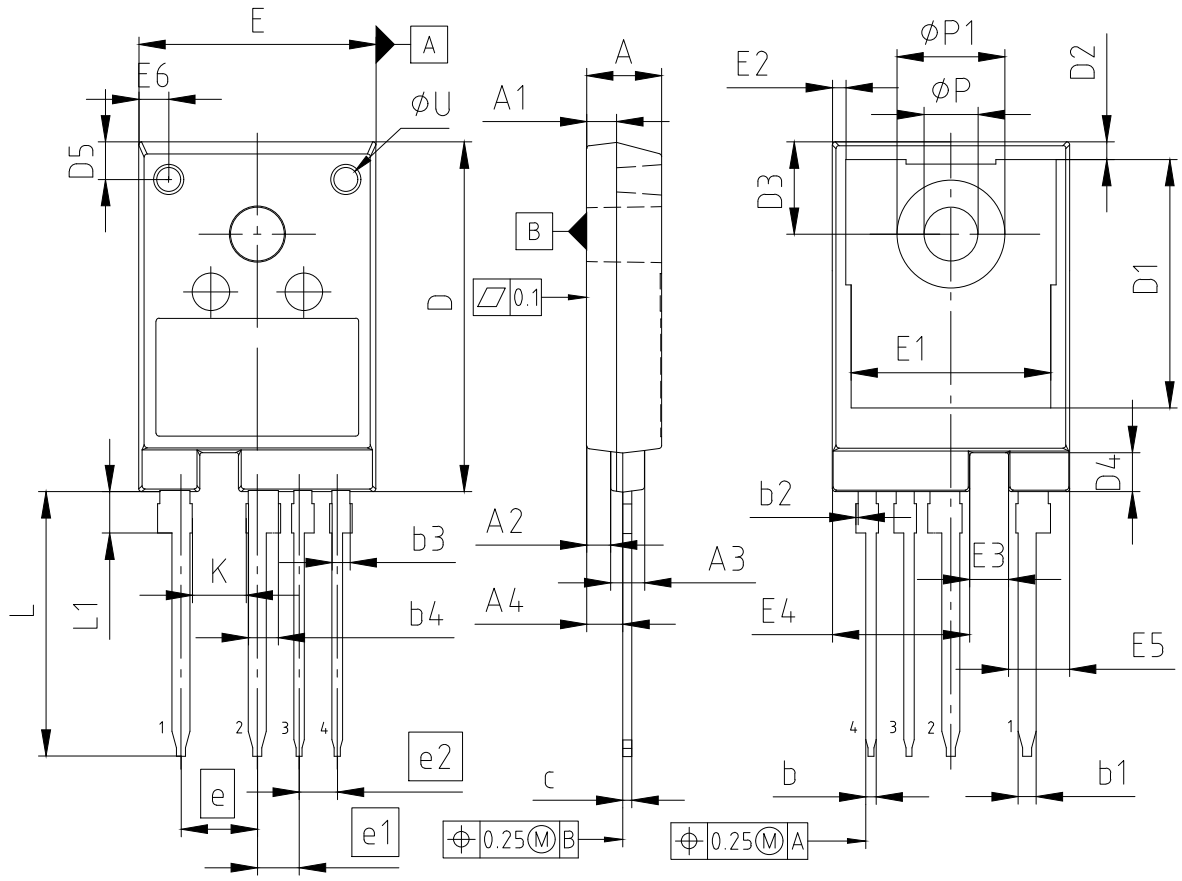
Max. transient thermal impedance (MOSFET/diode)

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

$D = t_p/T$



5 Gehäuseabmessungen



PACKAGE - GROUP NUMBER:	PG-TO247-4-U07				
DIMENSIONS	**MILLIMETERS**		**DIMENSIONS**	**MILLIMETERS**	
	MIN.	MAX.		MIN.	MAX.
A	4.90	5.10	**E**	15.60	16.00
A1	1.90	2.10	**E1**	13.10	13.50
A2	1.50	1.70	**E2**	0.60	1.20
A3	2.16	2.36	**E3**	2.48	2.68
A4	2.31	2.51	**E4**	9.05	9.25
b	0.60	0.80	**E5**	3.97	4.17
b1	1.10	1.30	**E6**	1.80	2.20
b2	---	0.15	**e**	5.08	
b3	1.10	1.30	**e1**	2.79	
b4	1.90	2.10	**e2**	2.54	
c	0.50	0.70	**K**	3.50	---
D	23.10	23.50	**L**	17.50	17.80
D1	16.25	16.85	**L1**	2.61	2.91
D2	0.97	1.37	**N**	4	
D3	6.00	6.30	**ØP1**	7.00	7.40
D4	2.50	2.70	**ØP**	3.50	3.70
D5	2.30	2.70	**ØU**	1.40	1.80

NOTES: DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS
N IS THE NUMBER OF LEADS

Abbildung 1

6 Testing conditions

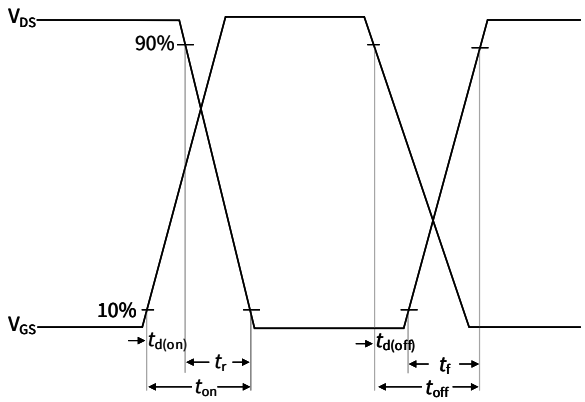


Figure A. **Definition of switching times**

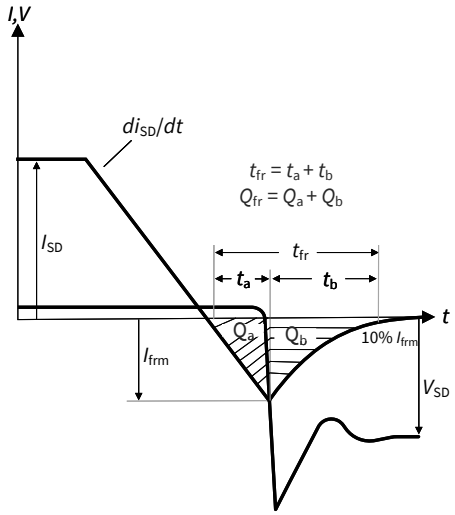


Figure B. **Definition of body diode switching characteristics**

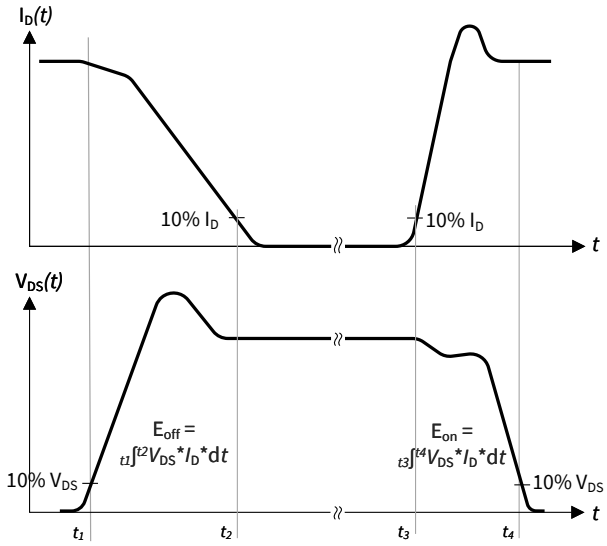


Figure C. **Definition of switching losses**

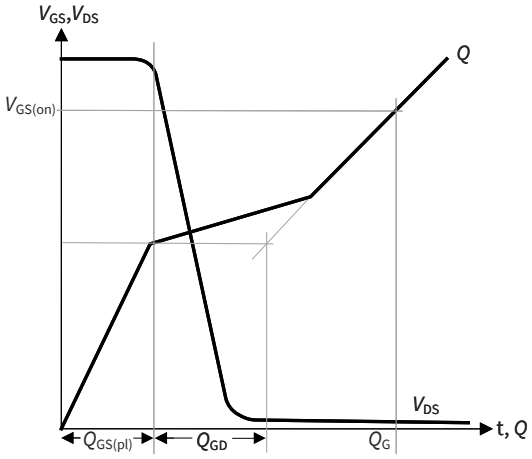


Figure D. **Definition of QGD**

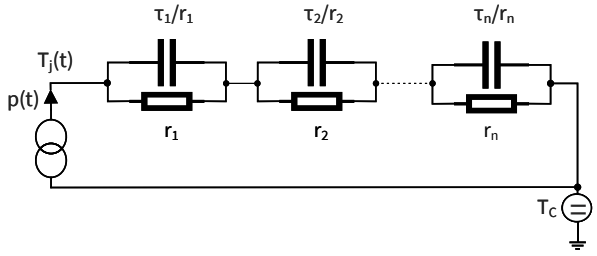


Figure E. **Thermal equivalent circuit**

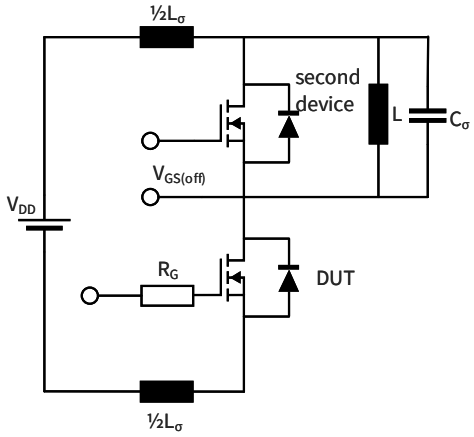


Figure F. **Dynamic test circuit**
Parasitic inductance L_σ,
Parasitic capacitor C_σ,

Abbildung 2

Änderungshistorie

Dokumentenrevision	Freigabedatum	Beschreibung der Änderungen
0.10	2025-05-28	Preliminary datasheet
1.00	2025-06-12	Final datasheet

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2025-06-12

Published by

Infineon Technologies AG

81726 Munich, Germany

© 2025 Infineon Technologies AG

All Rights Reserved.

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-ABM848-002

Wichtiger Hinweis

Die in diesem Dokument enthaltenen Angaben stellen keinesfalls Garantien für die Beschaffenheit oder Eigenschaften des Produktes ("Beschaffenheitsgarantie") dar.

Für Beispiele, Hinweise oder typische Werte, die in diesem Dokument enthalten sind, und/oder Angaben, die sich auf die Anwendung des Produktes beziehen, ist jegliche Gewährleistung und Haftung von Infineon Technologies ausgeschlossen, einschließlich, ohne hierauf beschränkt zu sein, die Gewähr dafür, dass kein geistiges Eigentum Dritter verletzt ist.

Des Weiteren stehen sämtliche, in diesem Dokument enthaltenen Informationen, unter dem Vorbehalt der Einhaltung der in diesem Dokument festgelegten Verpflichtungen des Kunden sowie aller im Hinblick auf das Produkt des Kunden sowie die Nutzung des Infineon Produktes in den Anwendungen des Kunden anwendbaren gesetzlichen Anforderungen, Normen und Standards durch den Kunden.

Die in diesem Dokument enthaltenen Daten sind ausschließlich für technisch geschultes Fachpersonal bestimmt. Die Beurteilung der Eignung dieses Produktes für die beabsichtigte Anwendung sowie die Beurteilung der Vollständigkeit der in diesem Dokument enthaltenen Produktdaten für diese Anwendung obliegt den technischen Fachabteilungen des Kunden.

Bitte beachten Sie, dass dieses Produkt nicht gemäß den AEC Q100 oder AEC Q101 Dokumenten des Automotive Electronics Council qualifiziert ist.

Warnhinweis

Aufgrund der technischen Anforderungen können Produkte gesundheitsgefährdende Substanzen enthalten. Bei Fragen zu den in diesem Produkt enthaltenen Substanzen, setzen Sie sich bitte mit dem nächsten Vertriebsbüro von Infineon Technologies in Verbindung.

Sofern Infineon Technologies nicht ausdrücklich in einem schriftlichen, von vertretungsberechtigten Infineon Mitarbeitern unterzeichneten Dokument zugestimmt hat, dürfen Produkte von Infineon Technologies nicht in Anwendungen eingesetzt werden, in welchen vernünftigerweise erwartet werden kann, dass ein Fehler des Produktes oder die Folgen der Nutzung des Produktes zu Personenverletzungen führen.