英飞凌IMZC120R022M2H

CoolSiC™ 1200 V SiC MOSFET G2

采用 .XT 互连技术的碳化硅 MOSFET

Halogen-free
Green
Lead-free
RoHS

特性

- T_{vj} = 25°C时V_{DSS} = 1200 V
- I_{DDC} = 57 A at T_C = 100°C
- $R_{DS(on)}$ = 22 mΩ at V_{GS} = 18 V, T_{vj} = 25°C
- 开关损耗非常低
- 过载运行最高结温可达 T_{vj} = 200°C
- 短路耐受时间 2 µs
- 基准栅极阈值电压，$V_{GS(th)}$ = 4.2 V
- 具有抗寄生导通能力，可应用 0 V 关断栅极电压
- 坚固的体二极管，适用于硬换向
- .XT 互连技术，实现、行业领先的热性能
- 合适的英飞凌栅极驱动器可在 https://www.infineon.com/gdfinder 找到

潜在应用

- 通用驱动器（GPD）
- 电动汽车充电桩
- 在线式UPS/工业UPS
- 组串式逆变器
- 储能系统(ESS)
- 焊接

产品验证

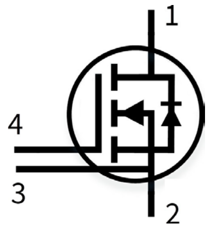
- 符合JEDEC47/20/22相关测试的工业应用要求

描述

引脚定义：

- 引脚 1 – 漏极
- 引脚 2 – 源
- 引脚 3 – 开尔文检测触点
- 引脚 4 – 栅极

注：源极引脚和检测引脚不可互换，互换可能会导致故障



Type	Package	Marking
IMZC120R022M2H	PG-TO247-4-U07	12M2H022

本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。为确认准确性，请务必访问 infineon.com 参考最新的英文版本（控制文档）。

目录

1 封装

表 1 特征值

Parameter	Symbol	Note or test condition	Values			Unit
			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	$R_{th(j-c)}$			0.35	0.46	K/W

2 MOSFET

表2 最大额定值

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	80	A
			$T_c = 100$ °C	57	
Peak drain current, t_p limited by $T_{vj(max)}$ [1]	I_{DM}	$V_{GS} = 18$ V		285	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}	$I_D = 32$ A, $V_{DD} = 50$ V, $L = 0.8$ mH, $T_{vj(start)} = 25$ °C		403	mJ
Avalanche energy, repetitive	E_{AR}	$I_D = 32$ A, $V_{DD} = 50$ V, $L = 3.9$ µH, $T_{vj(start)} = 25$ °C		2.02	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	329	W
			$T_c = 100$ °C	164	

1) 已通过设计验证。
2) 应用设计中的最大栅源电压应符合IPC-9592B的规定。

表 3 建议值

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

表4 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source on-state resistance	$R_{DS(on)}$	I_D = 32 A	T_{vj} = 25 °C, $V_{GS(on)}$ = 18 V		22		mΩ
			T_{vj} = 150 °C, $V_{GS(on)}$ = 18 V		44	56	
			T_{vj} = 175 °C, $V_{GS(on)}$ = 18 V		51		
			T_{vj} = 25 °C, $V_{GS(on)}$ = 15 V		27		
Gate-source threshold voltage	$V_{GS(th)}$	I_D = 10.1 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			270	µA
			T_{vj} = 175 °C		5		
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 = 32 A, V_{DS} = 20 V			22		S
Internal gate resistance	$R_{G,int}$	f = 1 MHz, V_{AC} = 25 mV			4.5		Ω
Input capacitance	C_{iss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			2330		pF
Output capacitance	C_{oss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			100		pF
Reverse transfer capacitance	C_{rss}	V_{DS} = 800 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})			42		µJ
Output charge	Q_{oss}	Calculated based on C_{oss} = f(V_{DD})			156		nC
Effective output capacitance, energy related	$C_{o(er)}$	V_{DS} = 0...800 V, V_{GS} = 0 V, Calculated based on E_{oss}			131		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}			195		pF
Total gate charge	Q_G	V_{DD} = 800 V, I_D = 32 A, V_{GS} = 0/18 V, turn-on pulse			71		nC

（表格续下页......）

表 4 （续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 800 V, I_D = 32 A, V_{GS} = 0/18 V, turn-on pulse			15		nC
Gate-drain charge	Q_{GD}	V_{DD} = 800 V, I_D = 32 A, V_{GS} = 0/18 V, turn-on pulse			19		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 32 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		10		ns
			T_{vj} = 175 °C		7.7		
Rise time	t_r	V_{DD} = 800 V, I_D = 32 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		6.2		ns
			T_{vj} = 175 °C		5.5		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 800 V, I_D = 32 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		21.8		ns
			T_{vj} = 175 °C		25.4		
Fall time	t_f	V_{DD} = 800 V, I_D = 32 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		9.3		ns
			T_{vj} = 175 °C		10.9		
Turn-on energy	E_{on}	V_{DD} = 800 V, I_D = 32 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		248		µJ
			T_{vj} = 175 °C		428		
Turn-off energy	E_{off}	V_{DD} = 800 V, I_D = 32 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		105		µJ
			T_{vj} = 175 °C		160		
Total switching energy[1]	E_{tot}	V_{DD} = 800 V, I_D = 32 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		487		µJ
			T_{vj} = 175 °C		971		

（表格续下页……）

表 4 （续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on energy at -5 V	E_{on}	V_{DD} = 800 V, I_D = 32 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		229		µJ
			T_{vj} = 175 °C		410		
Turn-off energy at -5 V	E_{off}	V_{DD} = 800 V, I_D = 32 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		42		µJ
			T_{vj} = 175 °C		50		
Total switching energy at -5 V[1)]	E_{tot}	V_{DD} = 800 V, I_D = 32 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		406		µJ
			T_{vj} = 175 °C		915		
Virtual junction temperature	T_{vj}			-55		175	°C
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h[2)]				200	°C

1) 包括 E_{fr}
2) 最多 5000 次循环。最大Δ T 限制为 100 K。

注：芯片技术的特征是高达200 kV/µs。测量的dV/dt 受到测量测试设置和封装的限制。

除非另有规定，*特性均为 T_{vj} = 25°C。*

3 体二极管（MOSFET）

表5 最大额定值

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	60	A
			T_c = 100 °C	33	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		171	A

表6 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source reverse voltage	V_{SD}	I_{SD} = 32 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} = 800 V, I_{SD} = 32 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		0.27		µC
			T_{vj} = 175 °C		0.75		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 800 V, I_{SD} = 32 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		35.6		A
			T_{vj} = 175 °C		60.3		
MOSFET forward recovery energy	E_{fr}	V_{DD} = 800 V, I_{SD} = 32 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		134		µJ
			T_{vj} = 175 °C		383		
MOSFET forward recovery energy at -5 V	E_{fr}	V_{DD} = 800 V, I_{SD} = 32 A, V_{GS} = -5 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		135		µJ
			T_{vj} = 175 °C		455		
Virtual junction temperature	T_{vj}			-55		175	°C
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h[1)]				200	°C

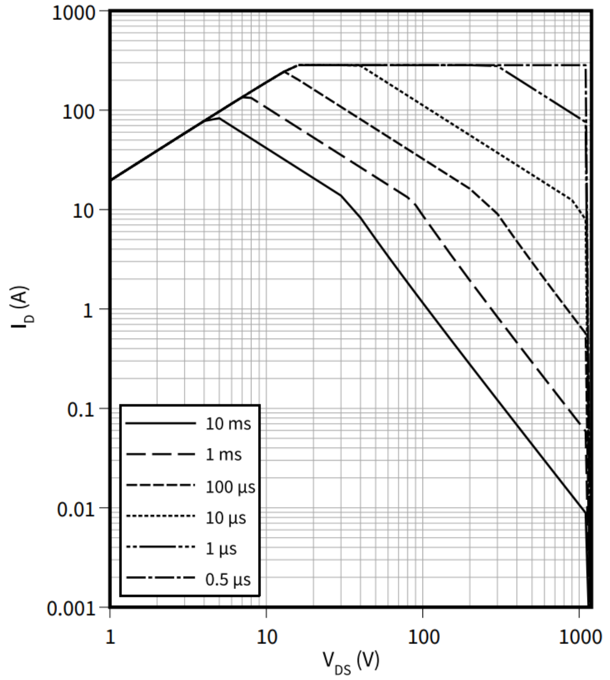
1) 最多 5000 次循环。最大Δ T 限制为 100 K。

4 特性图

Safe operating area (SOA)

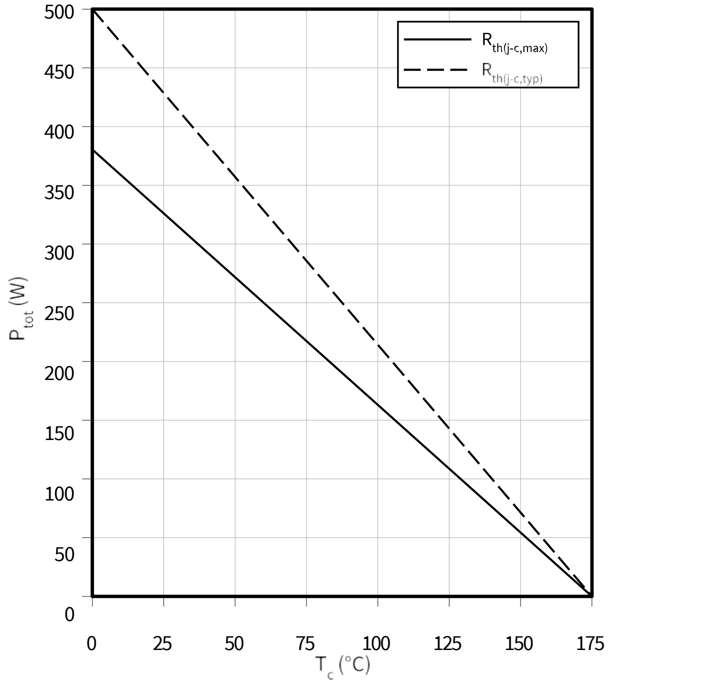
$I_D = f(V_{DS})$

$T_{vj} \leq 175$ °C, $T_c = 25$ °C



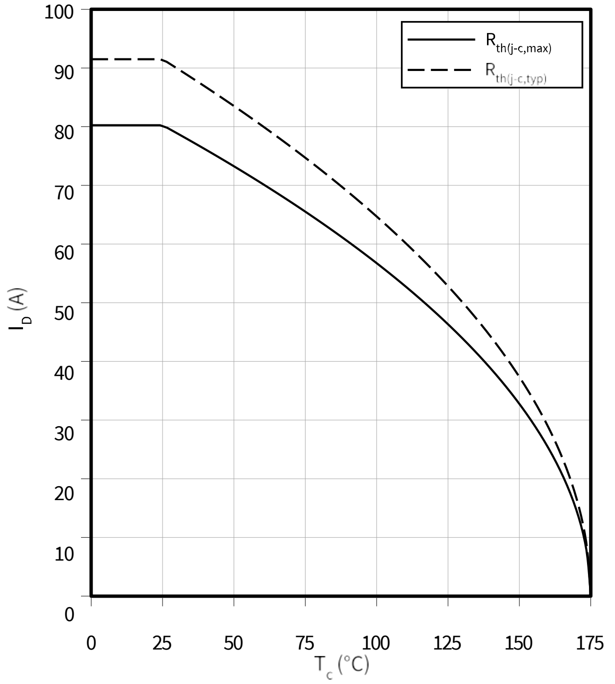
Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$



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

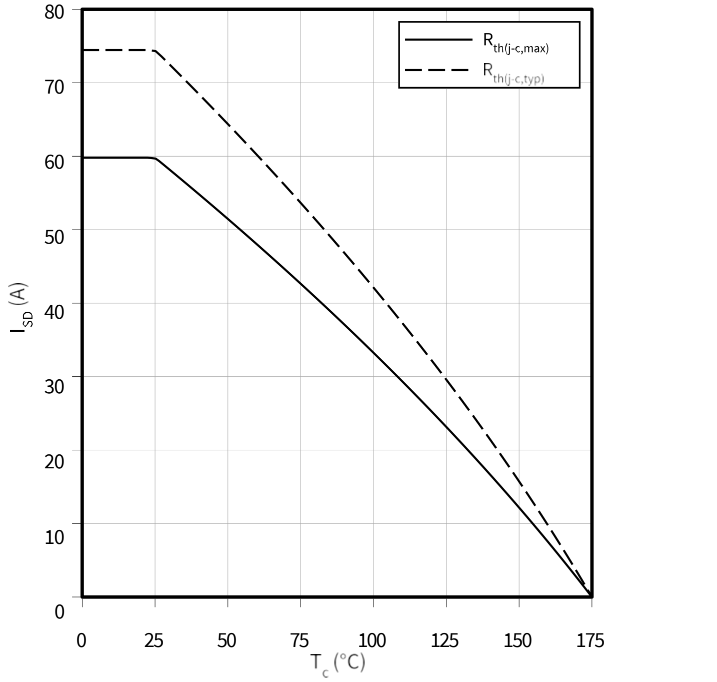
$I_D = f(T_c)$



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

$I_{SD} = f(T_c)$

$V_{GS} = 0$ V

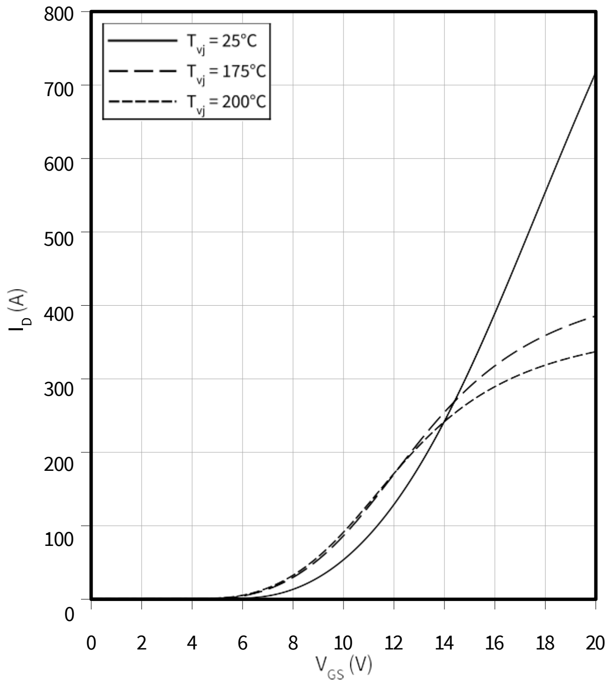


4 特性图

Typical transfer characteristic

$I_D = f(V_{GS})$

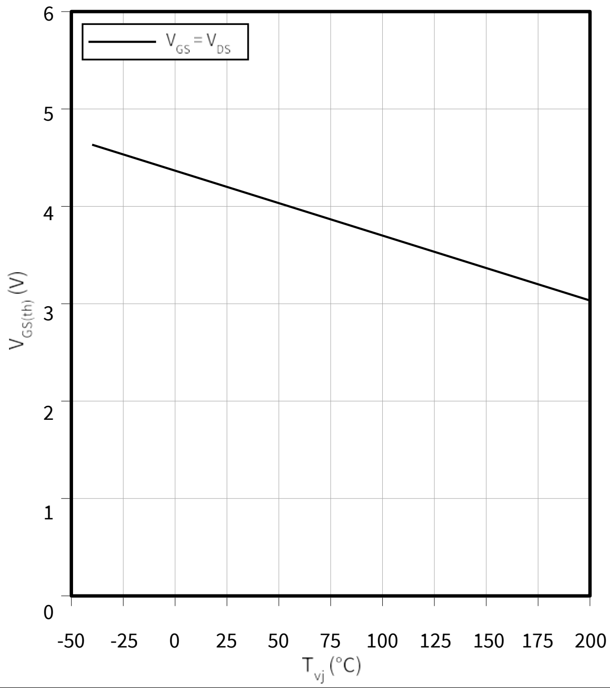
$V_{DS} = 20$ V, $t_p = 20$ µs



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

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

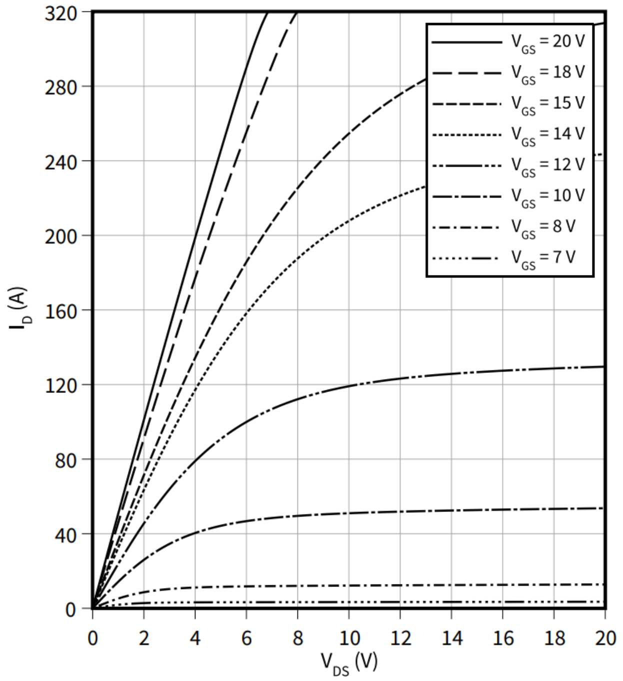
$I_D = 10.1$ mA



Typical output characteristic, V_{GS} as a parameter

$I_D = f(V_{DS})$

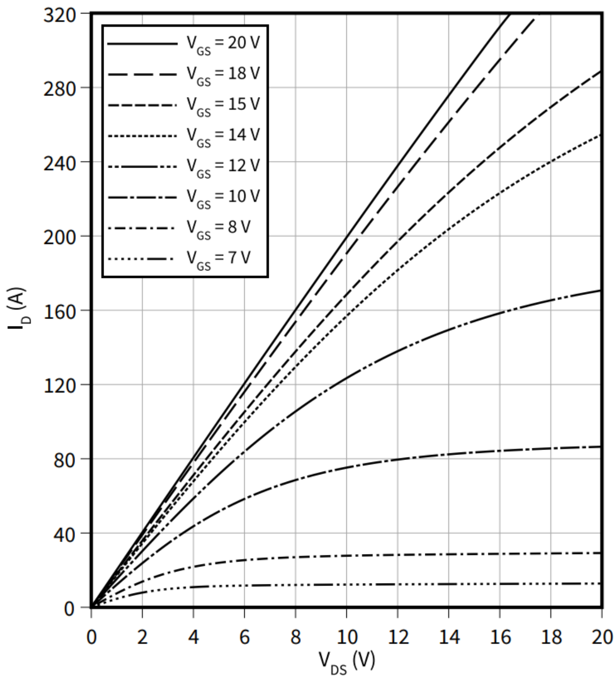
$T_{vj} = 25$ °C, $t_p = 20$ µs



Typical output characteristic, V_{GS} as a parameter

$I_D = f(V_{DS})$

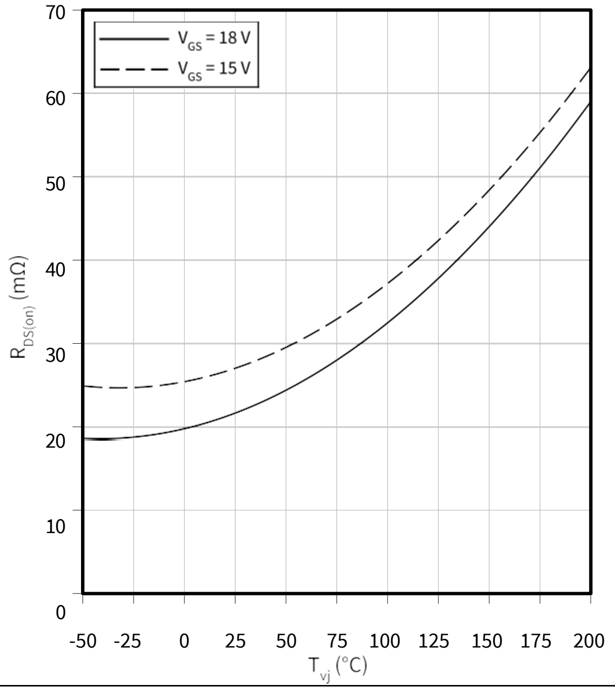
$T_{vj} = 175$ °C, $t_p = 20$ µs



Typical on-state resistance as a function of junction temperature

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

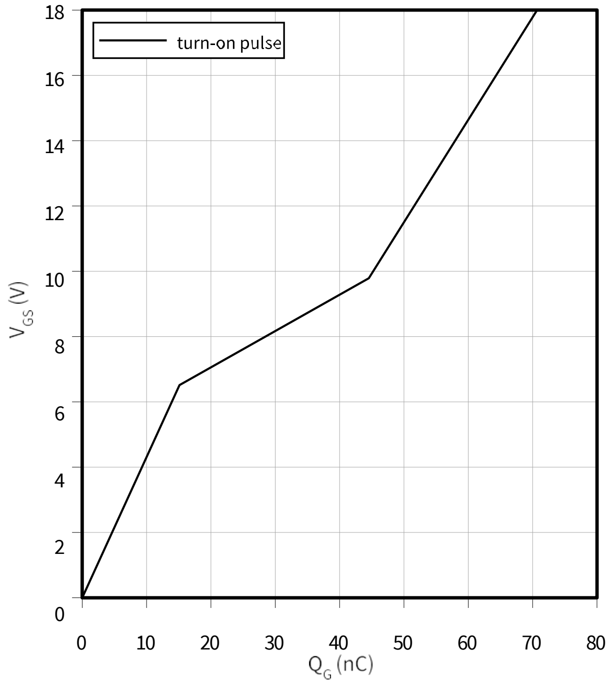
$I_D = 32$ A



Typical gate charge

$V_{GS} = f(Q_G)$

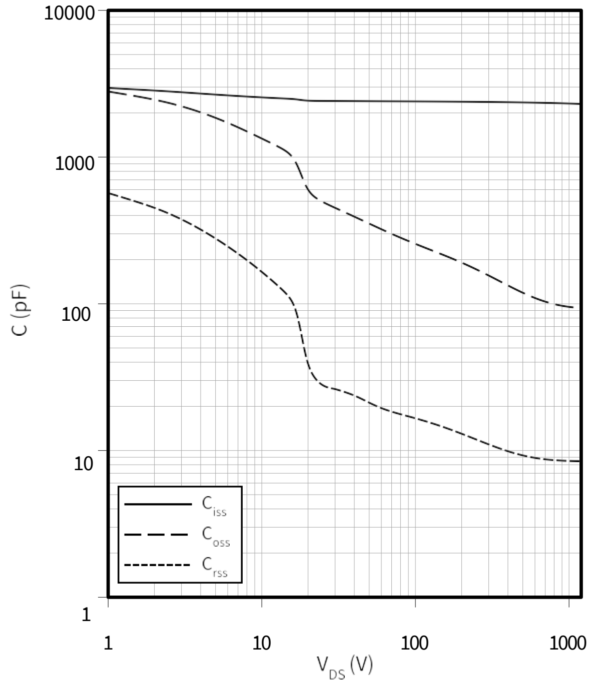
$I_D = 32$ A, $V_{DS} = 800$ V



Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$

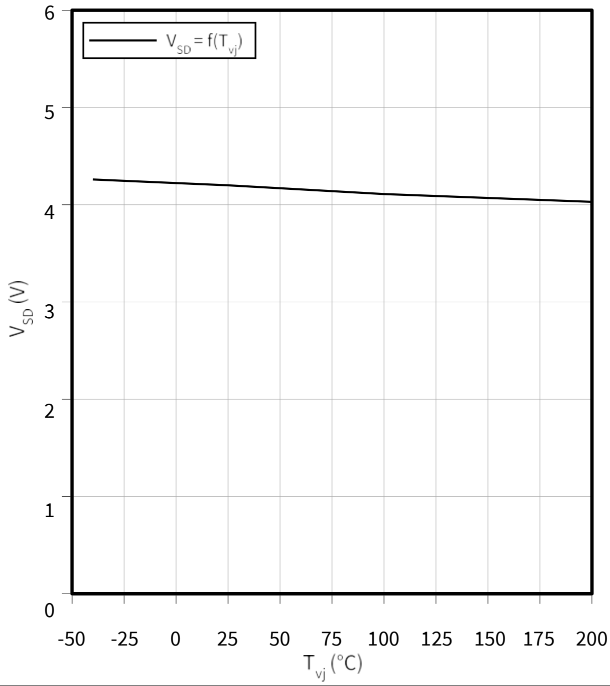
f = 100 kHz, $V_{GS} = 0$ V



Typical reverse drain voltage as a function of junction temperature

$V_{SD} = f(T_{vj})$

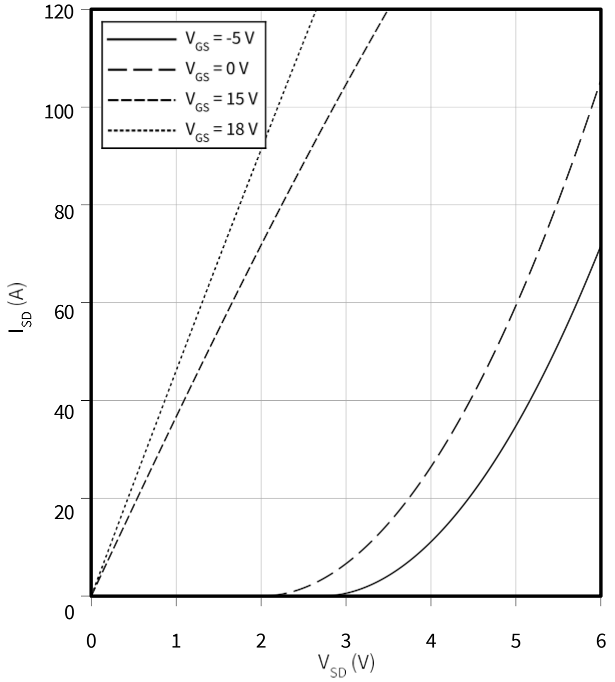
$I_{SD} = 32$ A, $V_{GS} = 0$ V



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

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

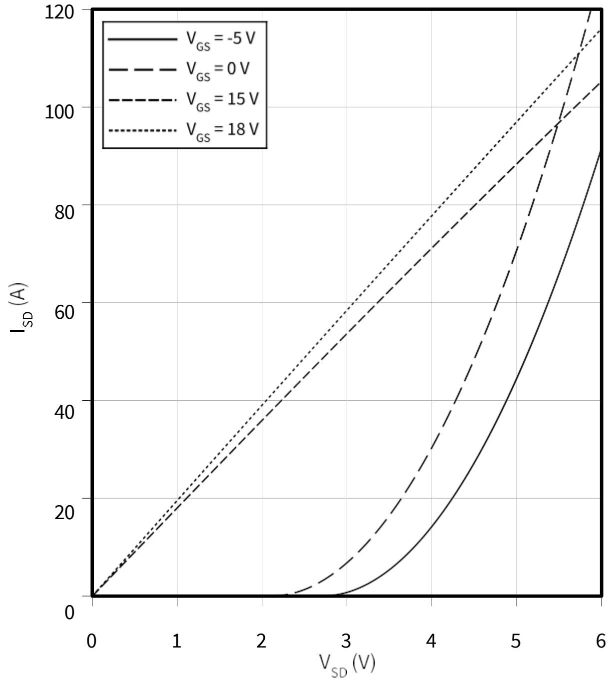
$T_{vj} = 25\ °C$, $t_p = 20\ µs$



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

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

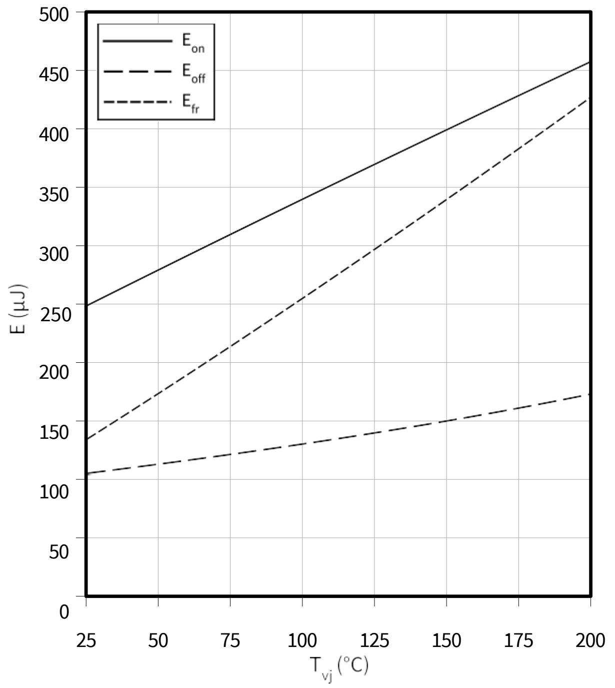
$T_{vj} = 175\ °C$, $t_p = 20\ µs$



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

$E = f(T_{vj})$

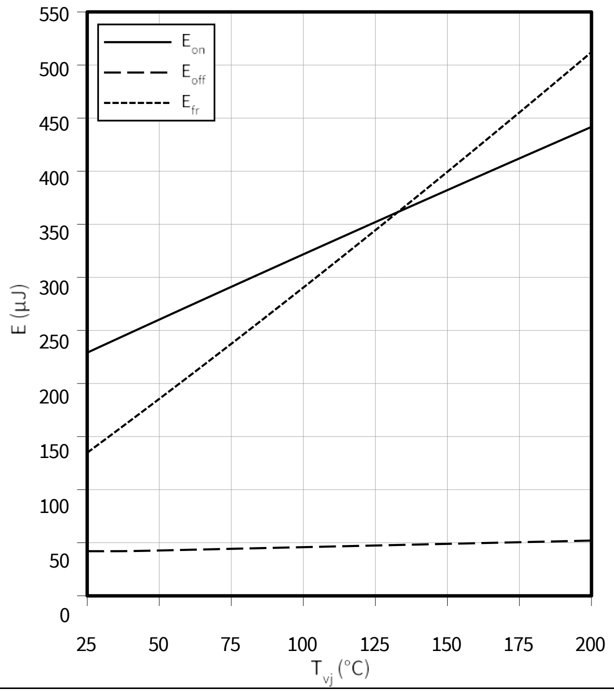
$V_{GS} = 0/18\ V$, $I_D = 32\ A$, $R_{G,ext} = 2.3\ Ω$, $V_{DD} = 800\ V$

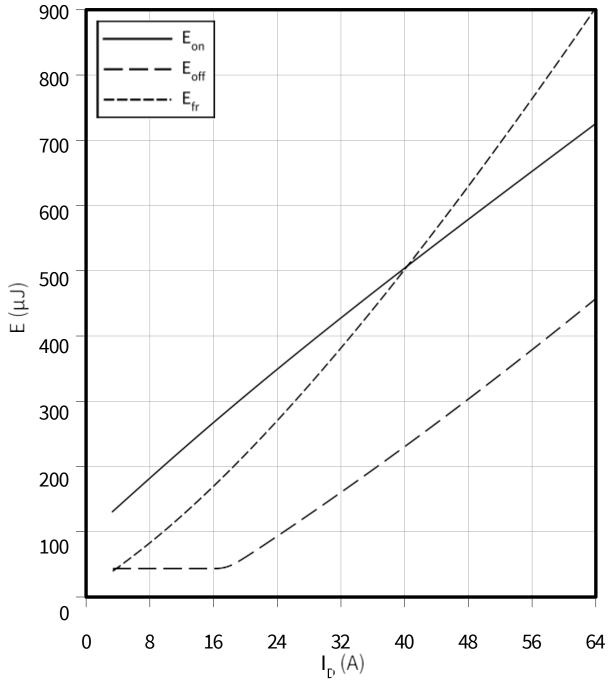
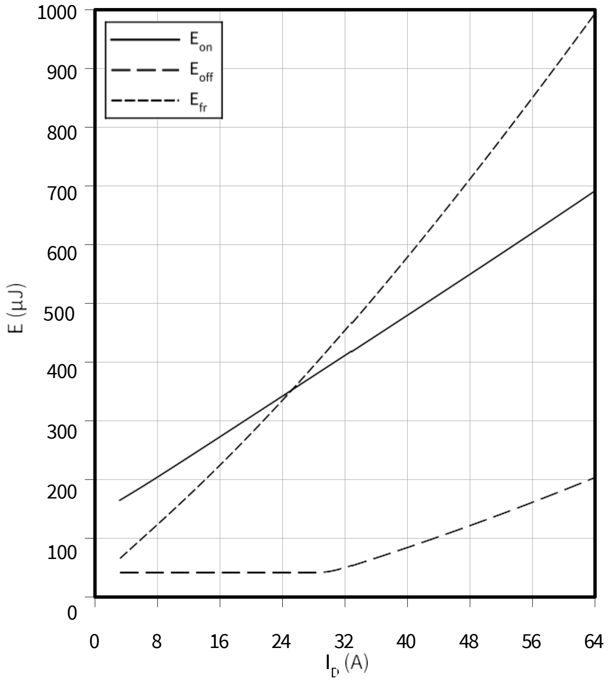
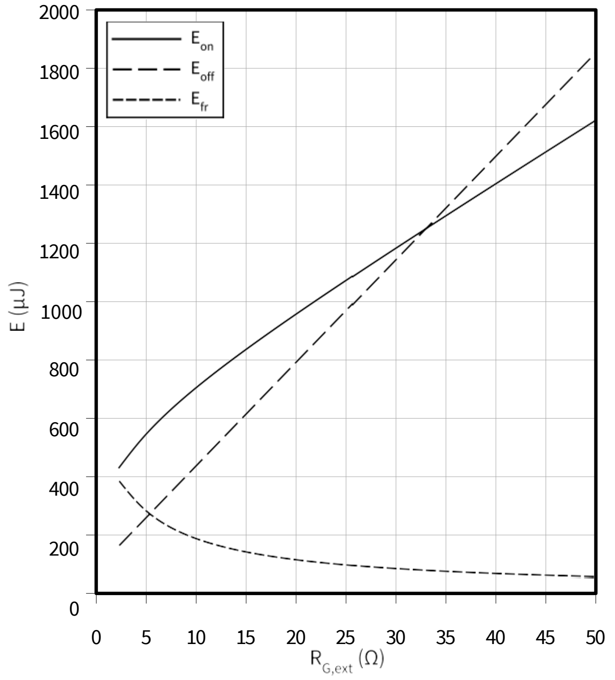
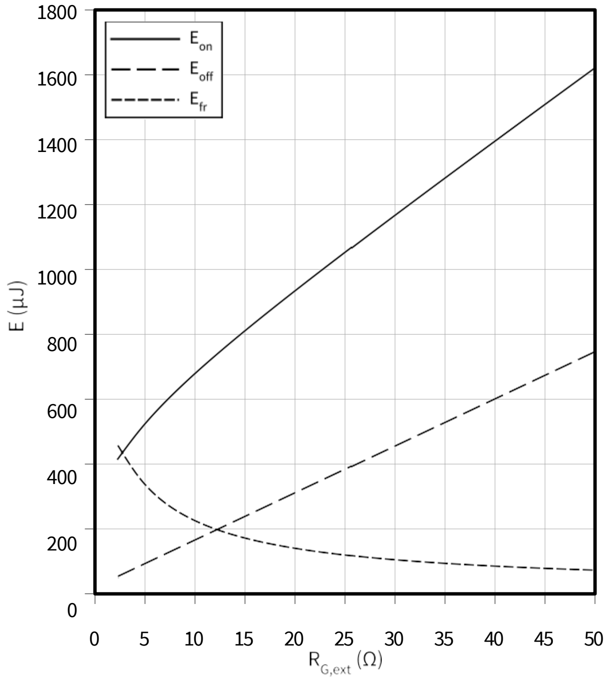


Typical switching energy as a function of junction temperature, test circuit in Fig. F, 2nd device own body diode: V_{GS} = -5 V

$E = f(T_{vj})$

$V_{GS} = -5/18\ V$, $I_D = 32\ A$, $R_{G,ext} = 2.3\ Ω$, $V_{DD} = 800\ V$

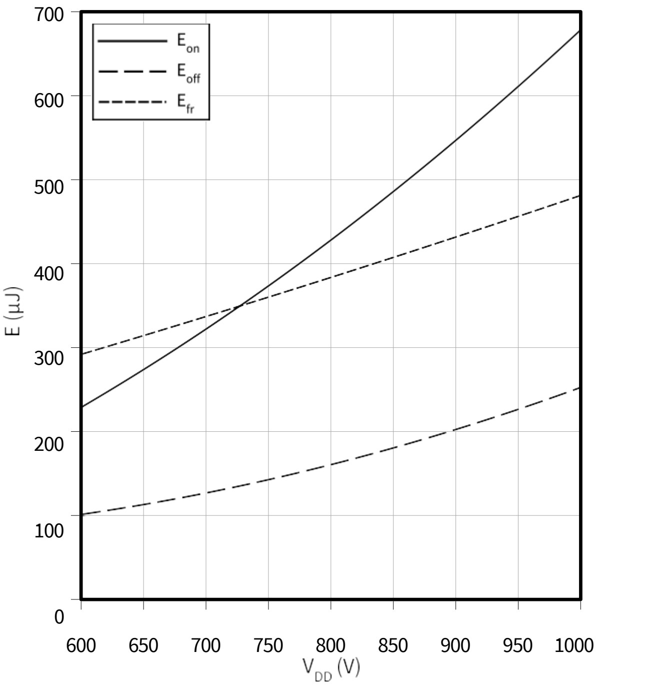


Typical switching energy as a function of drain current, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V E = f(I_D) V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 800 V	**Typical switching energy as a function of drain current, test circuit in Fig. F, 2nd device own body 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} = 800 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 = 32 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 own body diode: V_{GS} = -5 V** E = f($R_{G,ext}$) V_{GS} = -5/18 V, I_D = 32 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 own body diode: V_{GS} = 0 V

$E = f(V_{DD})$

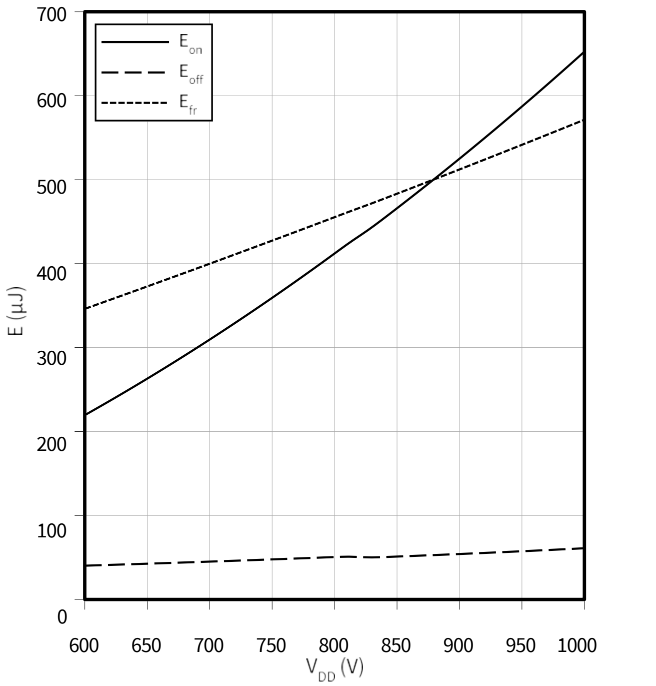
V_{GS} = 0/18 V, I_D = 32 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

$E = f(V_{DD})$

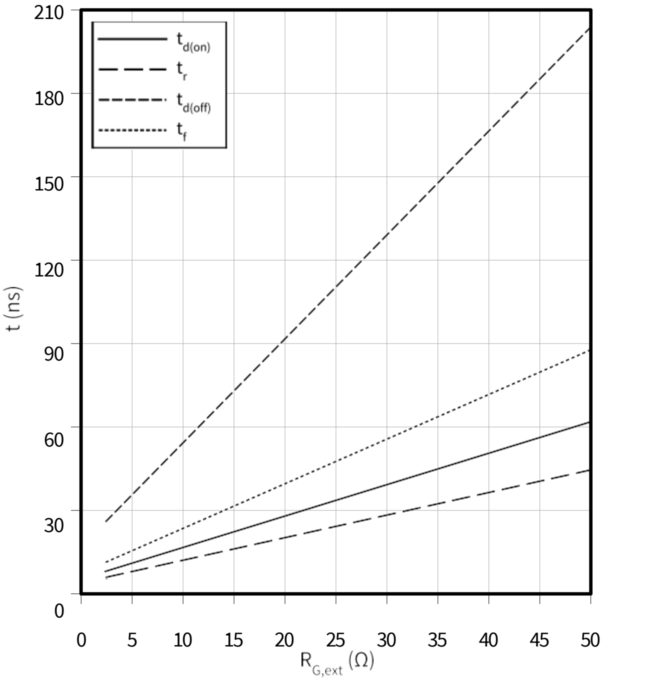
V_{GS} = -5/18 V, I_D = 32 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

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

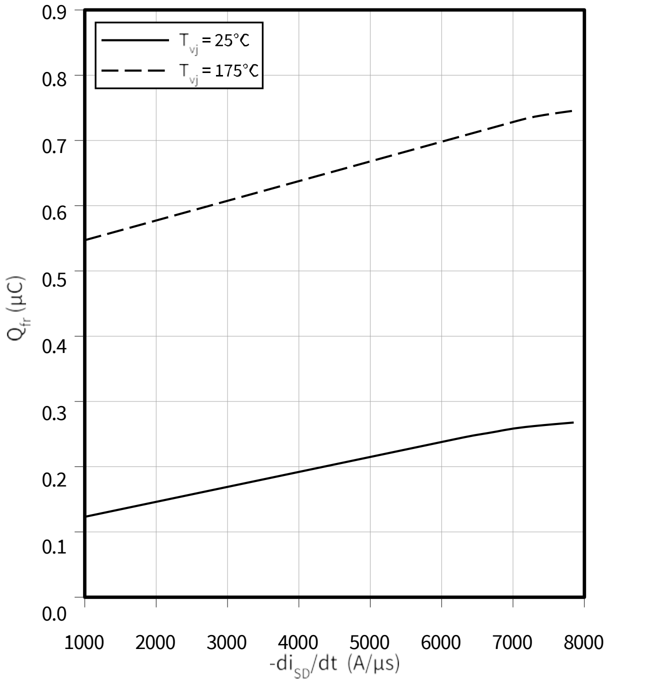
V_{GS} = 0/18 V, I_D = 32 A, T_{vj} = 175 °C, V_{DD} = 800 V



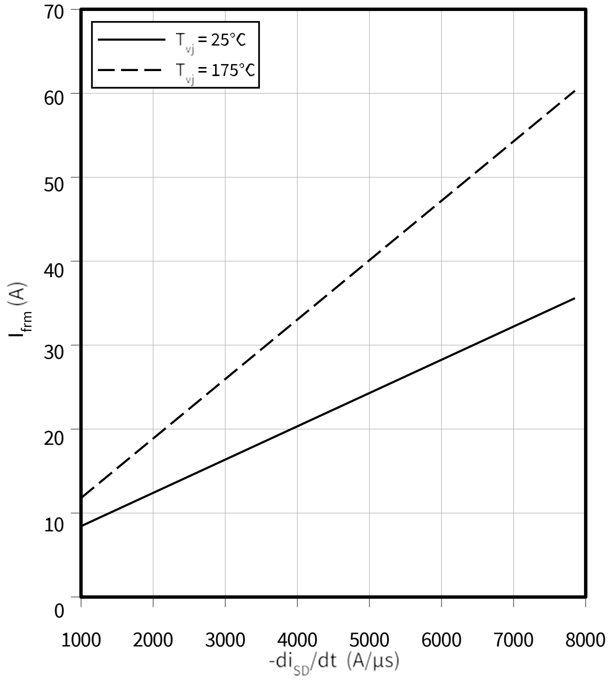
Typical reverse recovery charge as a function of reverse drain current slope, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V

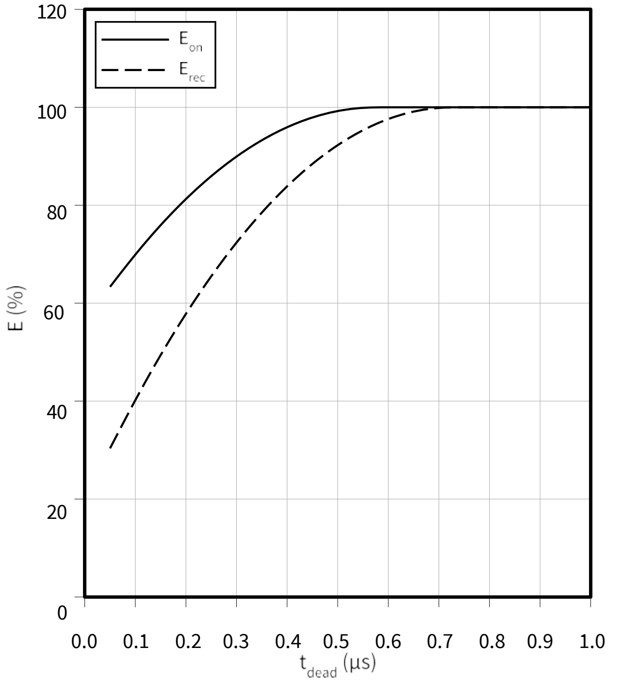
$Q_{fr} = f(-di_{SD}/dt)$

V_{GS} = 0/18 V, I_{SD} = 32 A, V_{DD} = 800 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} = 32 A, V_{DD} = 800 V	**Typical switching energy as a function of dead time / blanking time, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V** E = f(t_{dead}) I_D = 32 A, V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω V_{DD} = 800 V

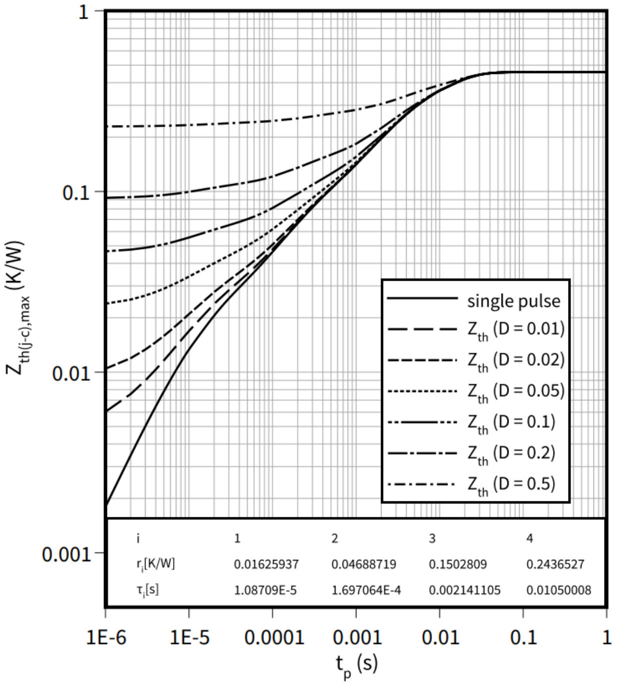




Max. transient thermal impedance (MOSFET/diode)

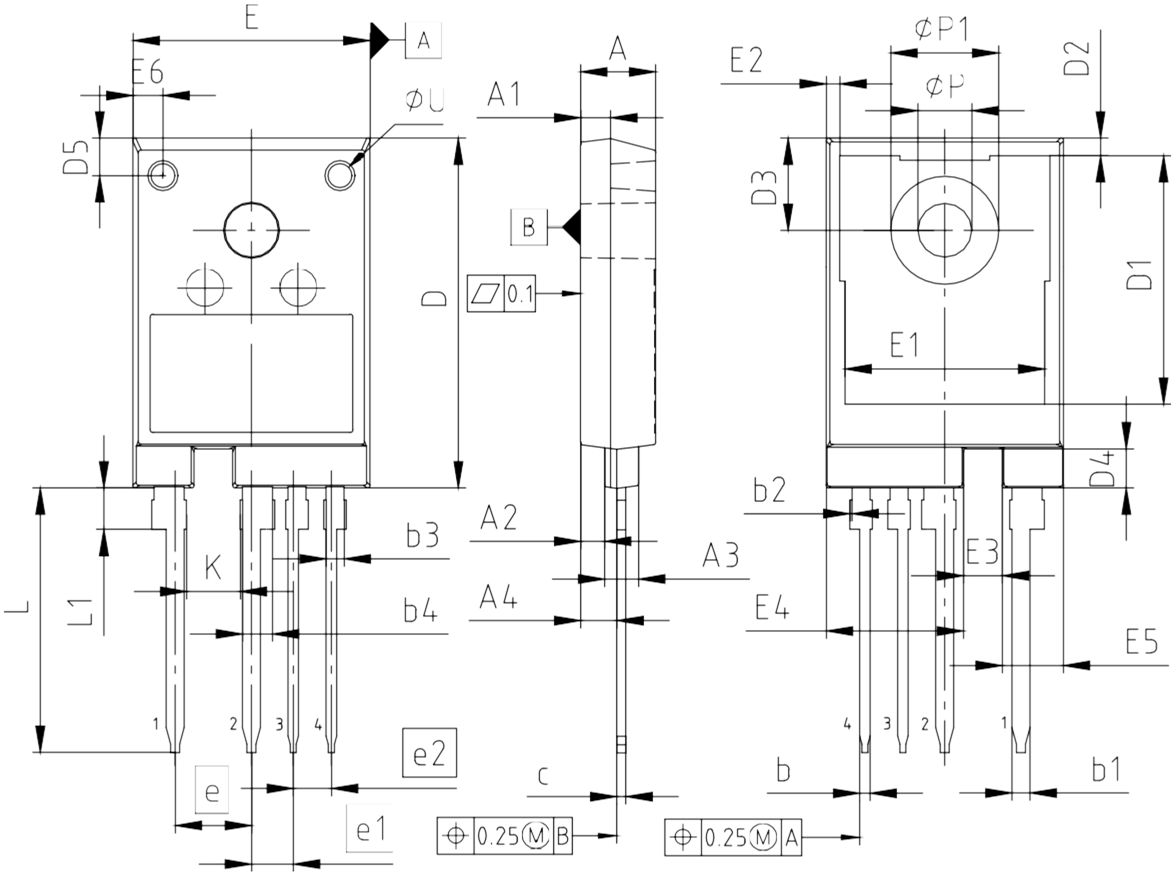
$Z_{th(j-c),max}$ = f(t_p)

D = t_p/T



i	1	2	3	4
r_i[K/W]	0.01625937	0.04688719	0.1502809	0.2436527
τ_i[s]	1.08709E-5	1.697064E-4	0.002141105	0.01050008

5 封装外形



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

图 1

6 测试条件

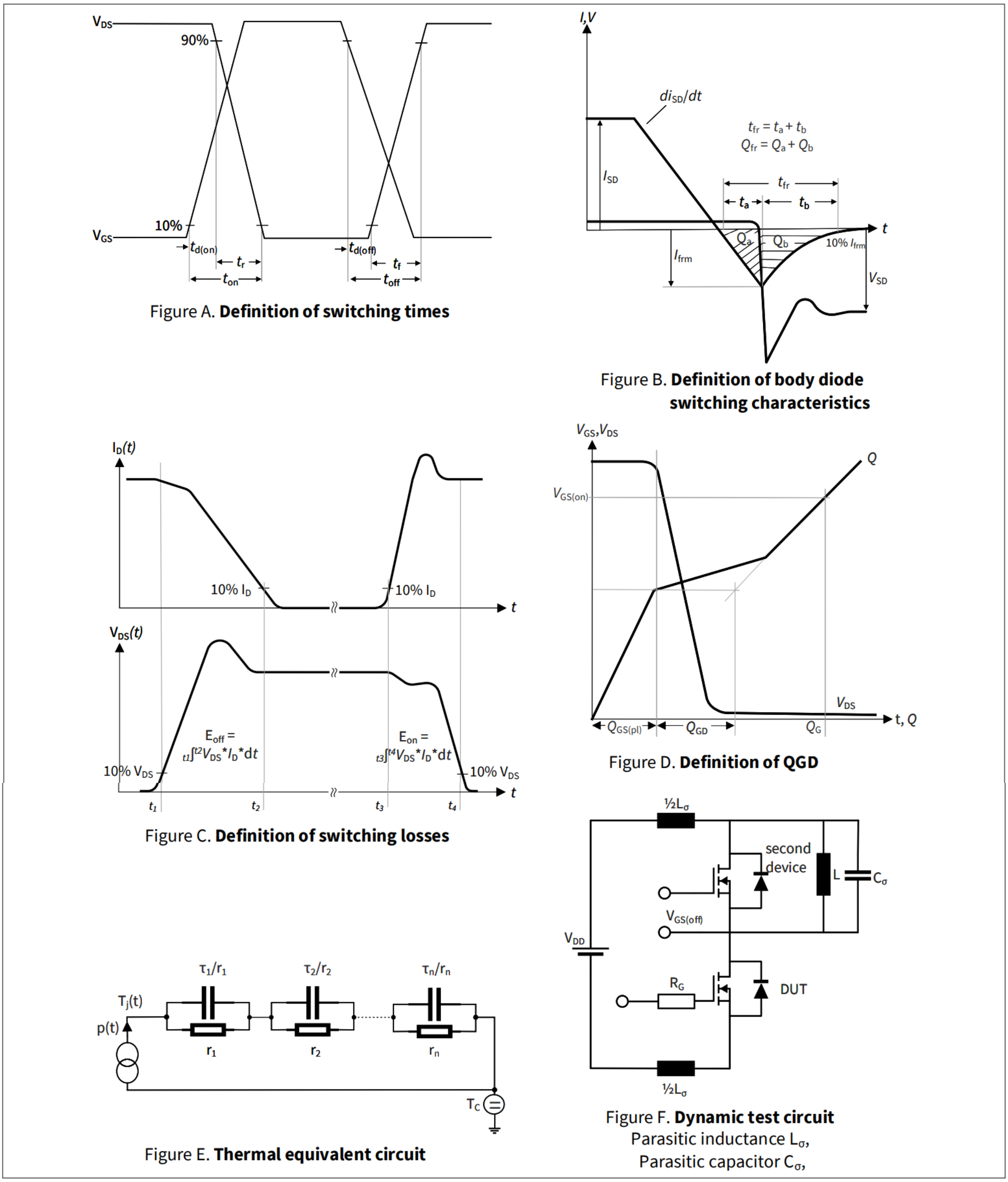


Figure A. **Definition of switching times**

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},

图 2

修订记录

Document revision	Date of release	Description of changes
0.10	2024-09-06	Preliminary datasheet
1.00	2024-09-27	Final datasheet
1.10	2025-02-06	Updated “Potential Applications” on Page 1 Correction of switching parameters in Table 4 and corresponding graphs Correction of body diode characteristic values in Table 6 and corresponding graphs Editorial changes
1.20	2025-07-04	Increased I_{DM} in Table 2 Added switching information for V_{GS} = -5/18 V in Table 5 and 6 and corresponding diagrams Added I_{SDC} in Table 5 Added SOA diagram on page 8 Added diagram E = f(V_{DD}) @ V_{GS} = 0/18 V Added diagram E = f(V_{DD}) @ V_{GS} = -5/18 V Editorial changes

免责声明

请注意，本文件的原文使用英文撰写，为方便客户浏览英飞凌提供了中文译文。该中文译文仅供参考，并不可作为任何论点之依据。
由于翻译过程中可能使用了自动化程序，以及语言翻译和转换过程中的差异，最后的中文译文与最新的英文版本原文含义可能存在不尽相同之处。
因此，我们同时提供该中文译文版本的最新英文原文供您阅读，请参见 http://www.infineon.com
英文原文和中文译文版本之间若存有任何歧异，以最新的英文版本为准，并且仅认可英文版本为正式文件。

您如果使用本文件，即表示您同意并理解上述说明。英飞凌不对因翻译过程中可能存在的任何不完整或不准确信息而产生的任何直接或间接损失或损害负责。英飞凌不承担中文译文版本的完整性和准确性责任。如果您不同意上述说明，请不要使用本文件。

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

版本 **2025-12-24**

Infineon Technologies AG 出版，
德国 **Neubiberg 85579**

Do you have a question about this document?

Email:

erratum@infineon.com