英飞凌 IMZC120R026M2H

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

- V_{DSS} = 1200 V 时 T_{vj} = 25°C
- I_{DDC} = 49 A 时 T_C = 100°C
- $R_{DS(on)}$ = 25 mΩ 时 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

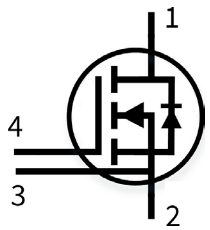
产品验证

- 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
IMZC120R026M2H	PG-TO247-4-U07	12M2H026

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	$R_{th(j-c)}$			0.4	0.52	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	69	A
			$T_c = 100$ °C	49	
Peak drain current, t_p limited by $T_{vj(max)}$ [1]	I_{DM}	$V_{GS} = 18$ V		245	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}	$I_D = 27$ A, $V_{DD} = 50$ V, $L = 0.9$ mH, $T_{vj(start)} = 25$ °C		343	mJ
Avalanche energy, repetitive	E_{AR}	$I_D = 27$ A, $V_{DD} = 50$ V, $L = 4.7$ µH, $T_{vj(start)} = 25$ °C		1.71	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	289	W
			$T_c = 100$ °C	144	

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 = 27 A	T_{vj} = 25 °C, $V_{GS(on)}$ = 18 V		25		mΩ
			T_{vj} = 150 °C, $V_{GS(on)}$ = 18 V		52	69	
			T_{vj} = 175 °C, $V_{GS(on)}$ = 18 V		60		
			T_{vj} = 25 °C, $V_{GS(on)}$ = 15 V		32		
Gate-source threshold voltage	$V_{GS(th)}$	I_D = 8.6 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			240	µA
			T_{vj} = 175 °C		4		
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 = 27 A, V_{DS} = 20 V			18		S
Internal gate resistance	$R_{G,int}$	f = 1 MHz, V_{AC} = 25 mV			5.6		Ω
Input capacitance	C_{iss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			1990		pF
Output capacitance	C_{oss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			85		pF
Reverse transfer capacitance	C_{rss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			7		pF
C_{oss} stored energy	E_{oss}	Calculated based on C_{oss} = f(V_{DD})			36		µJ
Output charge	Q_{oss}	Calculated based on C_{oss} = f(V_{DD})			133		nC
Effective output capacitance, energy related	$C_{o(er)}$	V_{DS} = 0...800 V, V_{GS} = 0 V, Calculated based on E_{oss}			111		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}			166		pF
Total gate charge	Q_G	V_{DD} = 800 V, I_D = 27 A, V_{GS} = 0/18 V, turn-on pulse			60		nC

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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 = 27 A, V_{GS} = 0/18 V, turn-on pulse			13		nC
Gate-drain charge	Q_{GD}	V_{DD} = 800 V, I_D = 27 A, V_{GS} = 0/18 V, turn-on pulse			16		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 27 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		7.5		
Rise time	t_r	V_{DD} = 800 V, I_D = 27 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		6.1		ns
			T_{vj} = 175 °C		5.4		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 800 V, I_D = 27 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		21.3		ns
			T_{vj} = 175 °C		24.9		
Fall time	t_f	V_{DD} = 800 V, I_D = 27 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		9.1		ns
			T_{vj} = 175 °C		10.7		
Turn-on energy	E_{on}	V_{DD} = 800 V, I_D = 27 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		201		µJ
			T_{vj} = 175 °C		344		
Turn-off energy	E_{off}	V_{DD} = 800 V, I_D = 27 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		92		µJ
			T_{vj} = 175 °C		139		
Total switching energy[1)]	E_{tot}	V_{DD} = 800 V, I_D = 27 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		416		µJ
			T_{vj} = 175 °C		835		

（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 = 27 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		186		µJ
			T_{vj} = 175 °C		333		
Turn-off energy at -5 V	E_{off}	V_{DD} = 800 V, I_D = 27 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		38		µJ
			T_{vj} = 175 °C		46		
Total switching energy at -5 V[1)]	E_{tot}	V_{DD} = 800 V, I_D = 27 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		348		µJ
			T_{vj} = 175 °C		797		
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	53	A
			T_c = 100 °C	29	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		147	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} = 27 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} = 27 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		0.23		µC
			T_{vj} = 175 °C		0.62		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 800 V, I_{SD} = 27 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		32.2		A
			T_{vj} = 175 °C		54.2		
MOSFET forward recovery energy	E_{fr}	V_{DD} = 800 V, I_{SD} = 27 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		123		µJ
			T_{vj} = 175 °C		352		
MOSFET forward recovery energy at -5 V	E_{fr}	V_{DD} = 800 V, I_{SD} = 27 A, V_{GS} = -5 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		124		µJ
			T_{vj} = 175 °C		418		
Virtual junction temperature	T_{vj}			-55		175	°C
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h[1]				200	°C

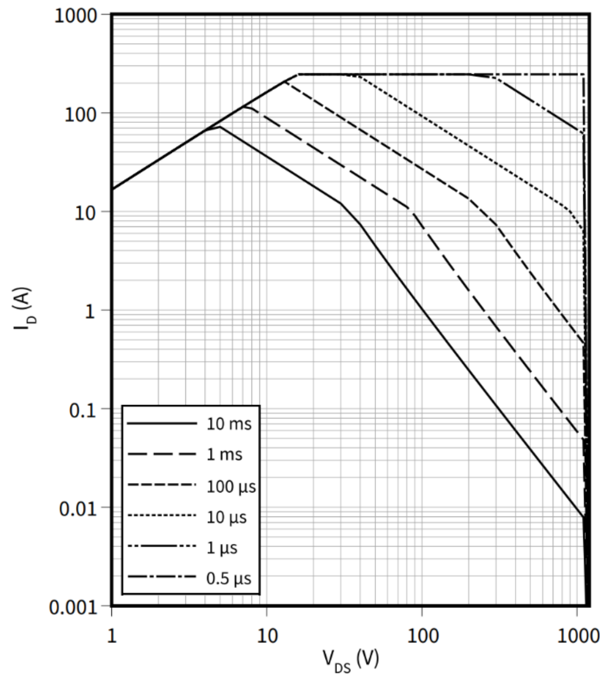
1) 最多 5000 次循环。最大ΔT 限制为 100 K。

4 特性图

Safe operating area (SOA)

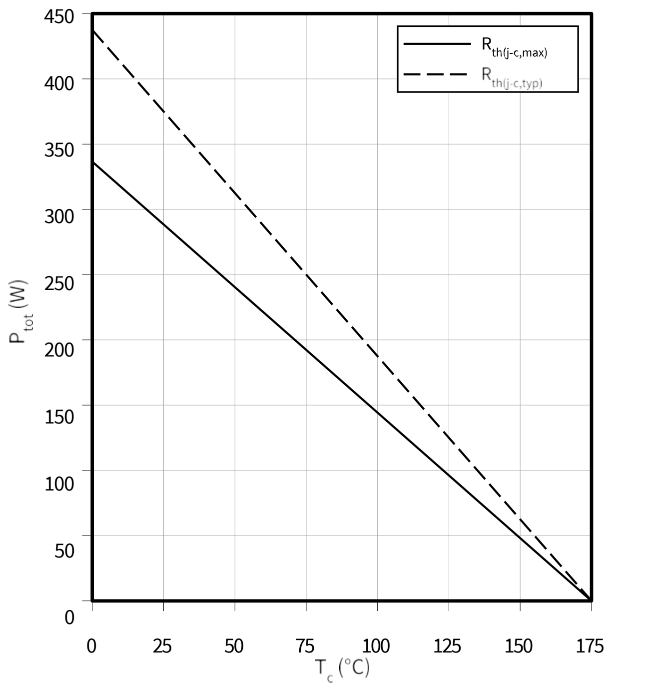
$I_D = f(V_{DS})$

$T_{vj} \leq 175$ °C, $T_c = 25$ °C



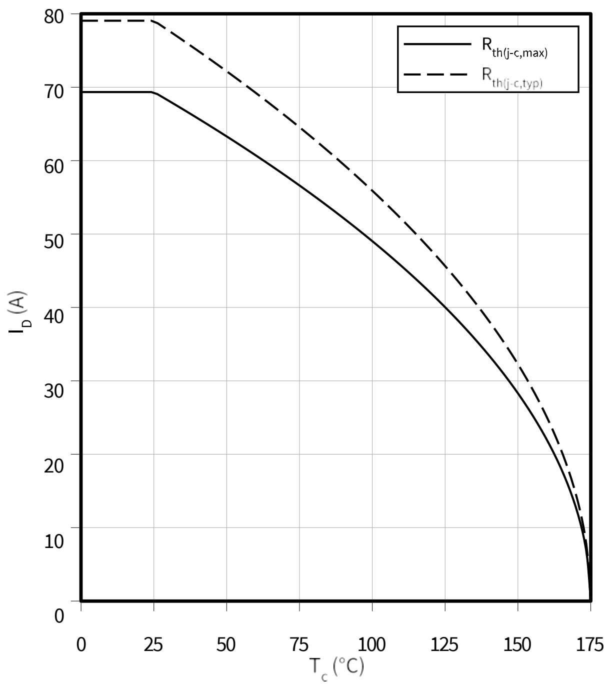
Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$



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

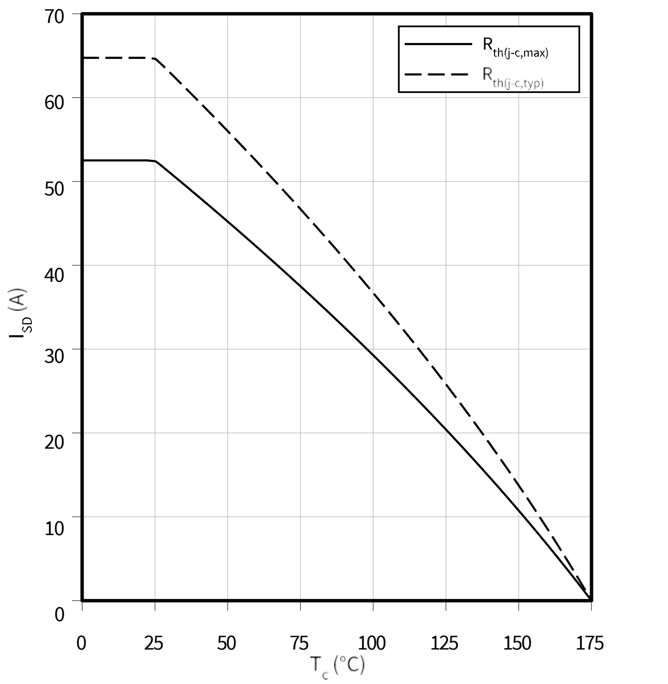
$I_D = f(T_c)$

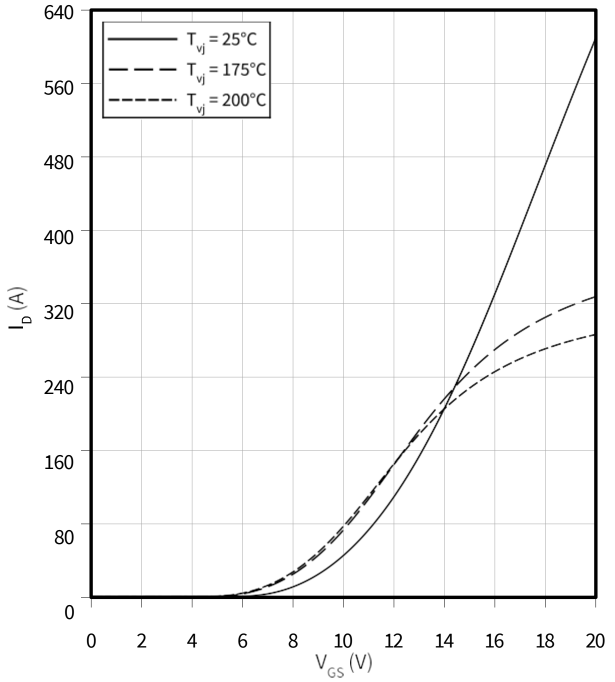
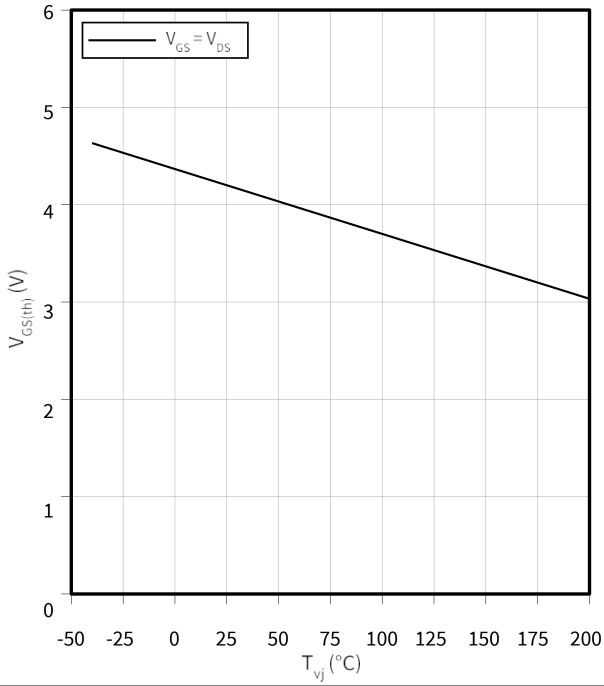
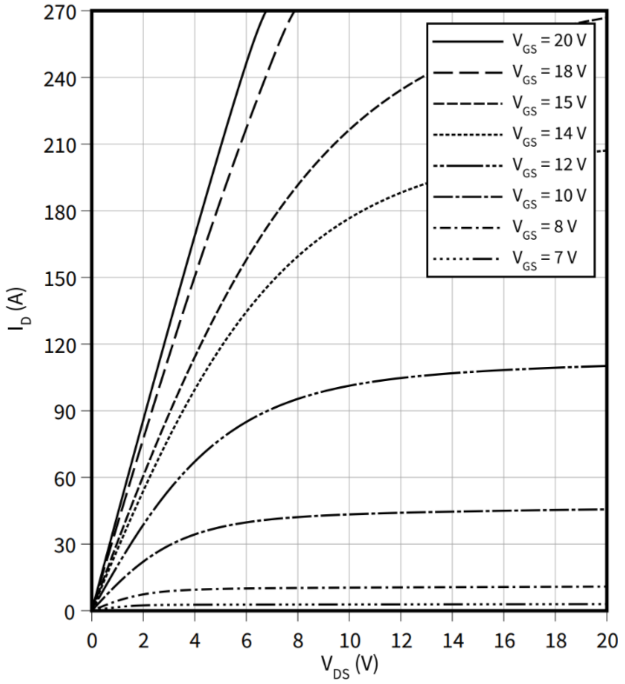
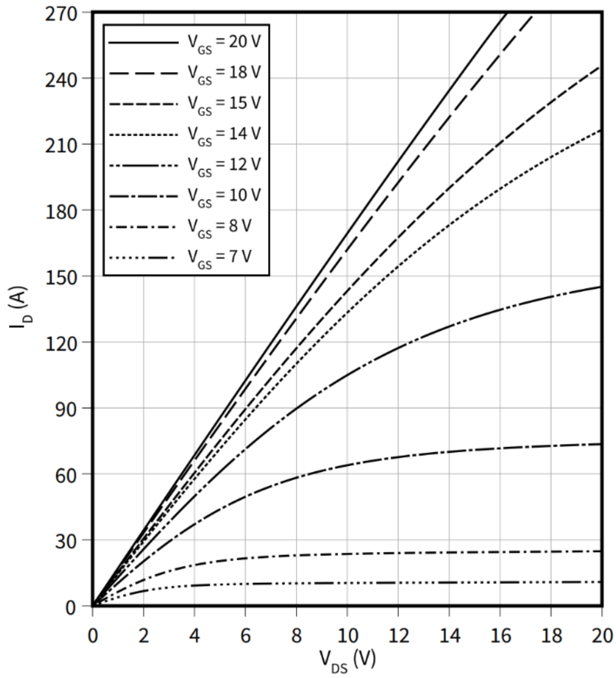


Maximum source to drain current as a function of case temperature limited by bond wire

$I_{SD} = f(T_c)$

$V_{GS} = 0$ V

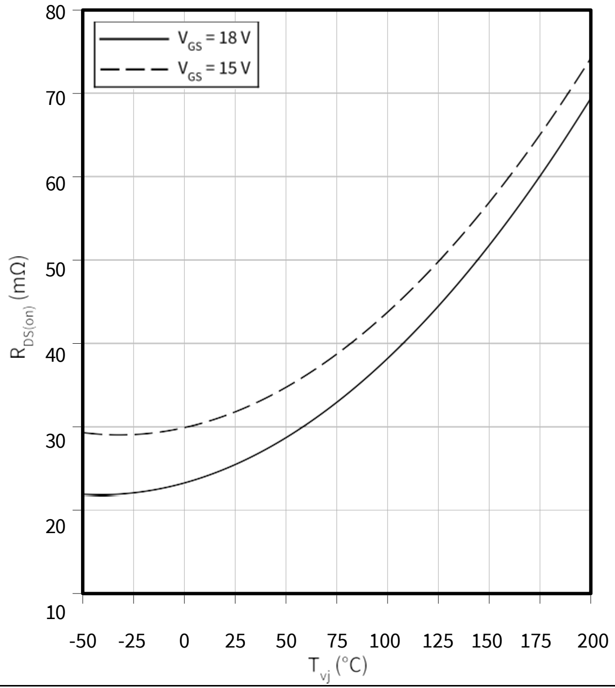


Typical transfer characteristic $I_D = f(V_{GS})$ $V_{DS} = 20$ V, $t_p = 20$ µs	**Typical gate-source threshold voltage as a function of junction temperature** $V_{GS(th)} = f(T_{vj})$ $I_D = 8.6$ mA
	
Typical output characteristic, V_{GS} as a parameter $I_D = f(V_{DS})$ $T_{vj} = 25$ °C, $t_p = 20$ 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

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

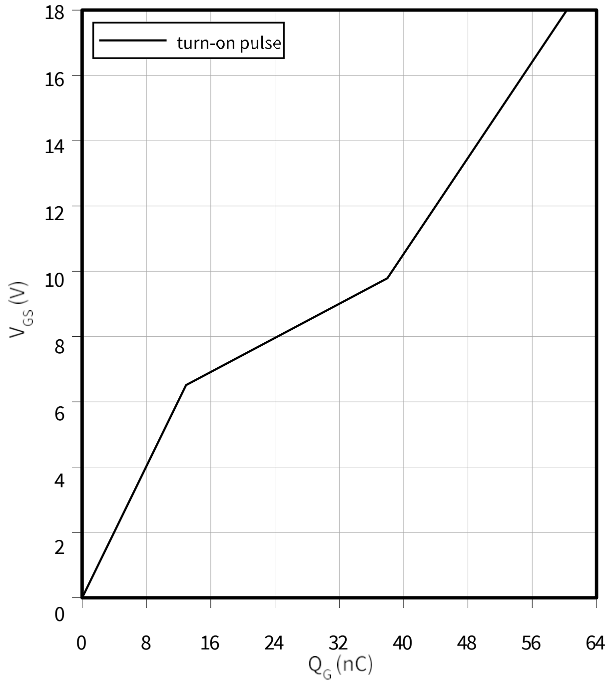
$I_D = 27$ A



Typical gate charge

$V_{GS} = f(Q_G)$

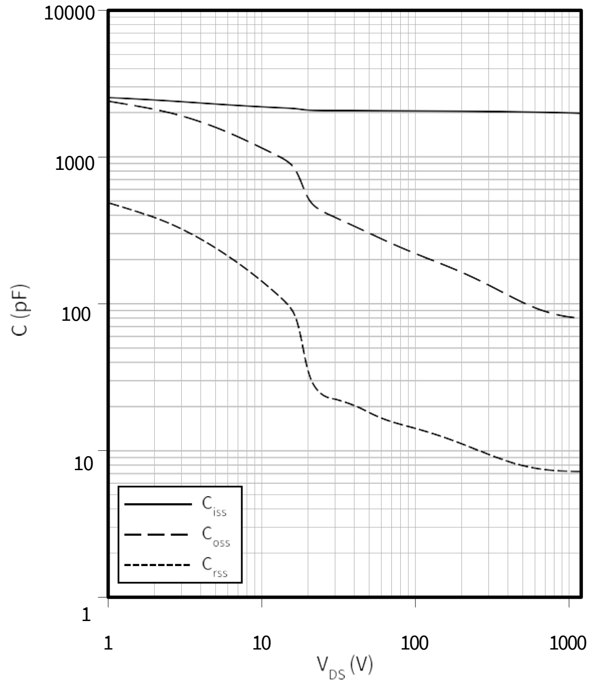
$I_D = 27$ A, $V_{DS} = 800$ V



Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$

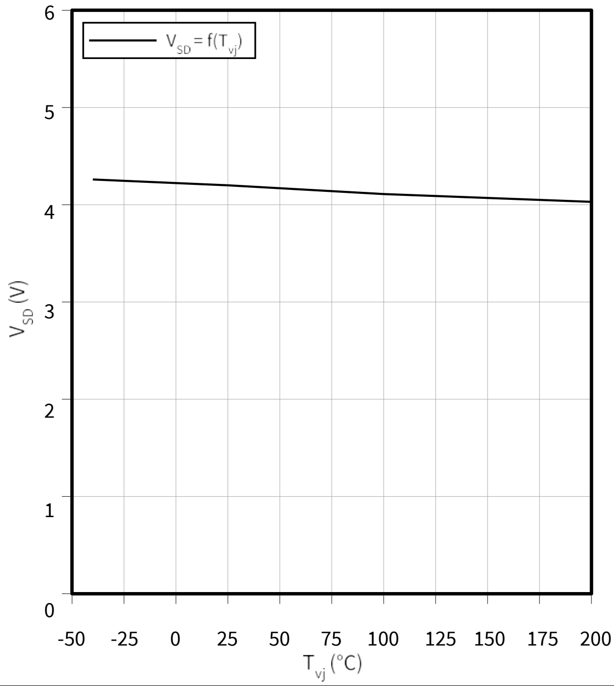
$f = 100$ kHz, $V_{GS} = 0$ V



Typical reverse drain voltage as a function of junction temperature

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

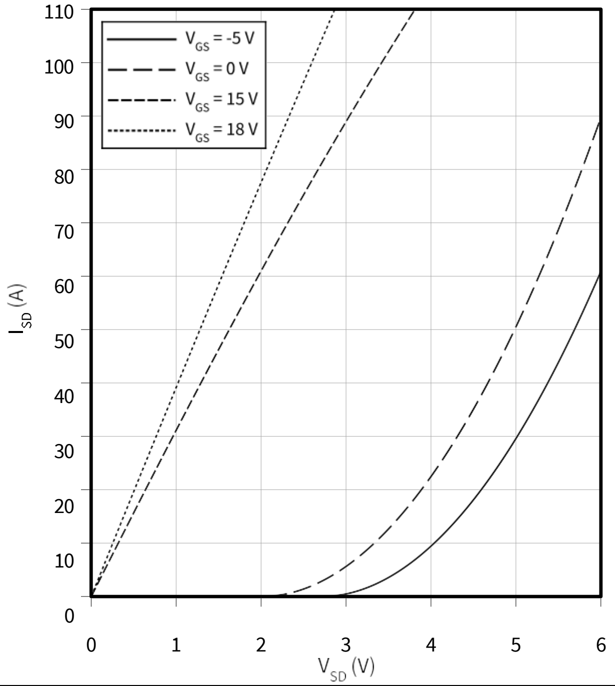
$I_{SD} = 27$ A, $V_{GS} = 0$ V



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

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

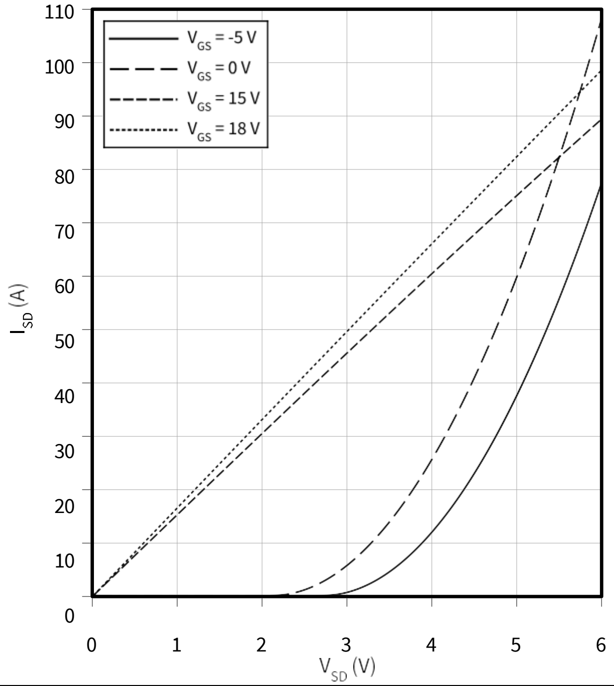
$T_{vj} = 25$ °C, $t_p = 20$ µs



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

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

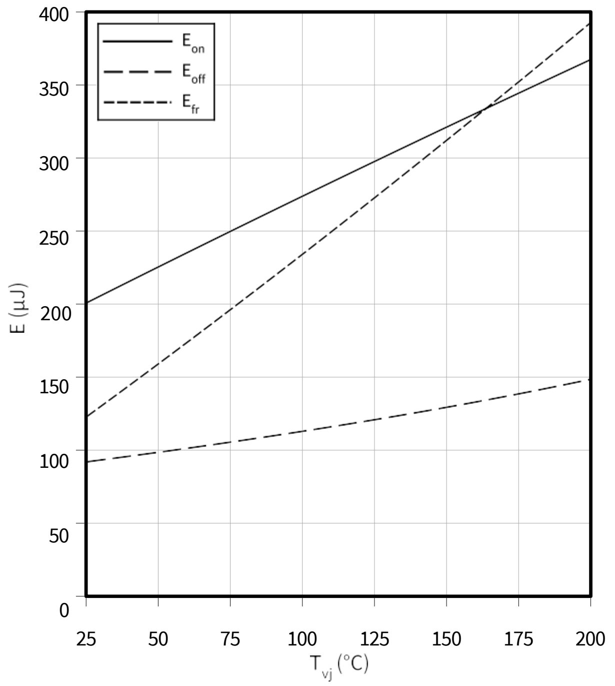
$T_{vj} = 175$ °C, $t_p = 20$ µs



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

$E = f(T_{vj})$

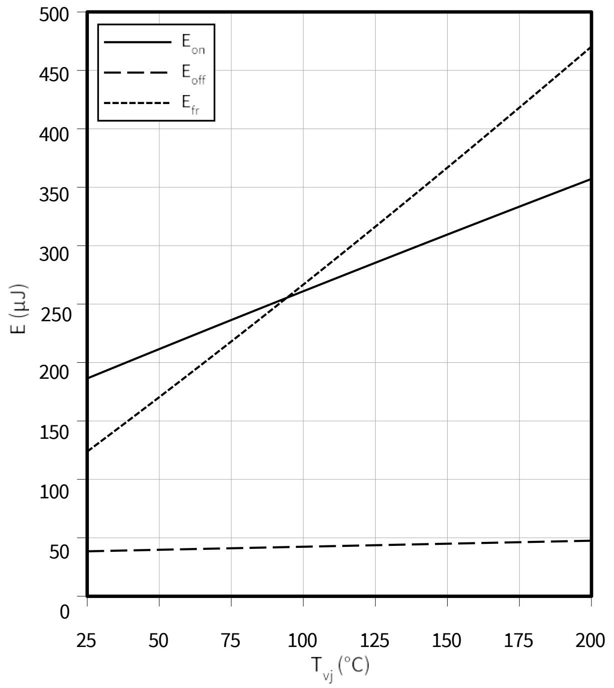
$V_{GS} = 0/18$ V, $I_D = 27$ A, $R_{G,ext} = 2.3$ Ω, $V_{DD} = 800$ V



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

$E = f(T_{vj})$

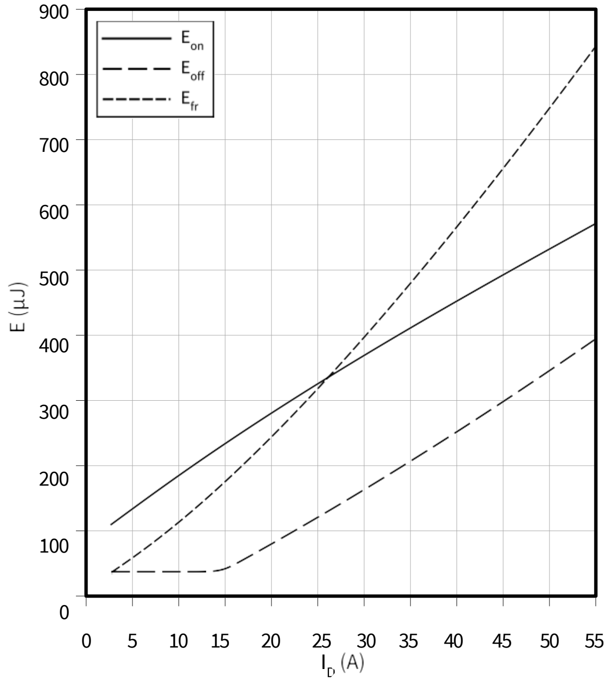
$V_{GS} = -5/18$ V, $I_D = 27$ A, $R_{G,ext} = 2.3$ Ω, $V_{DD} = 800$ V



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

$E = f(I_D)$

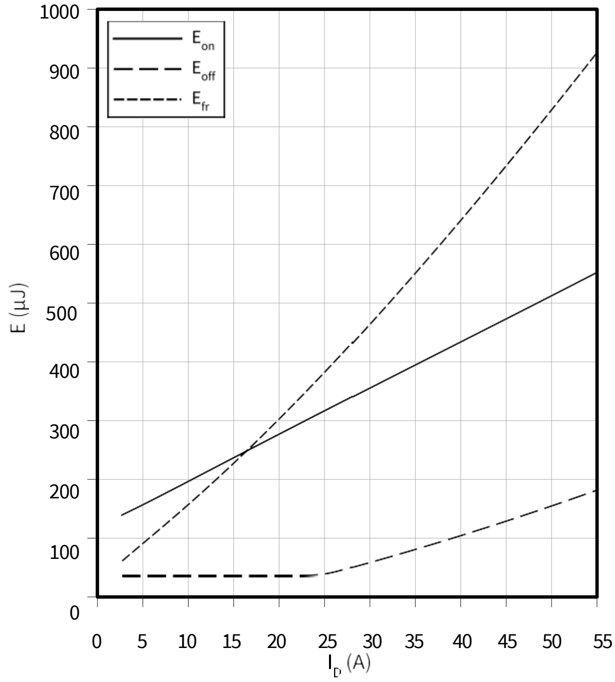
V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 800 V



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

$E = f(I_D)$

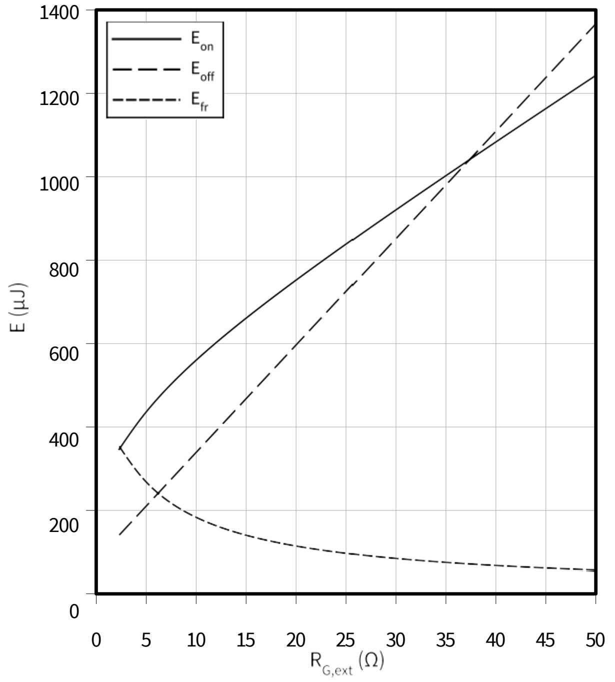
V_{GS} = -5/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 800 V



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

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

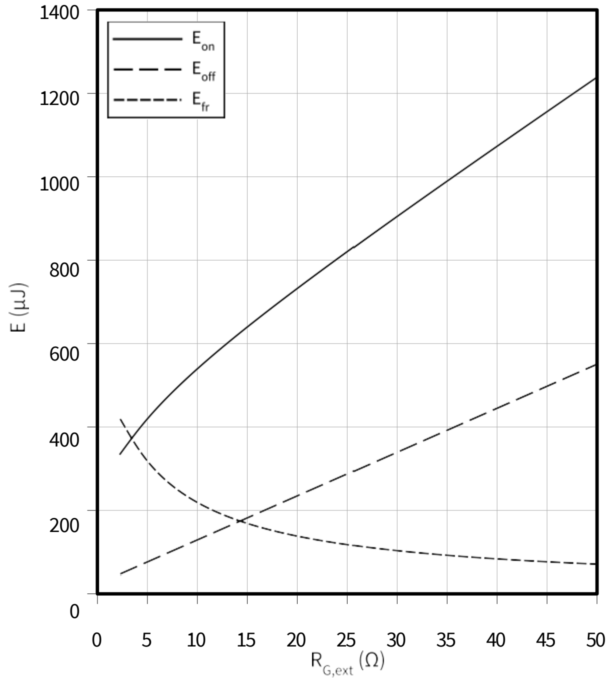
V_{GS} = 0/18 V, I_D = 27 A, T_{vj} = 175 °C, V_{DD} = 800 V



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

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

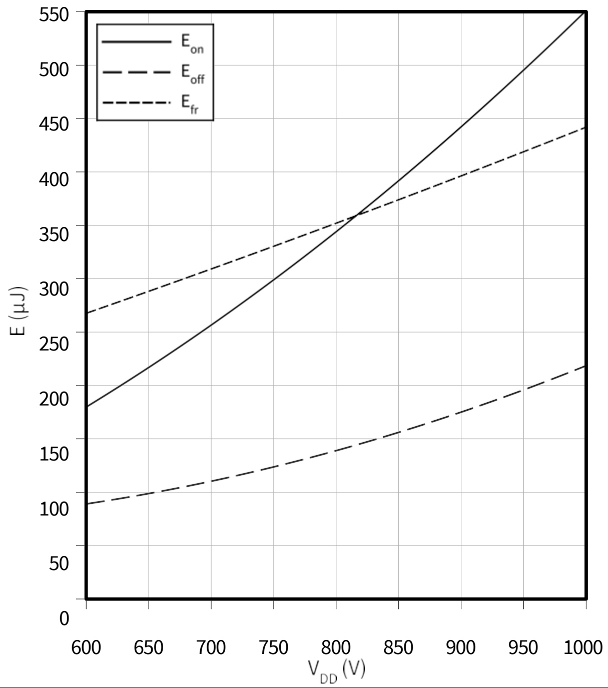
V_{GS} = -5/18 V, I_D = 27 A, T_{vj} = 175 °C, V_{DD} = 800 V



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

$E = f(V_{DD})$

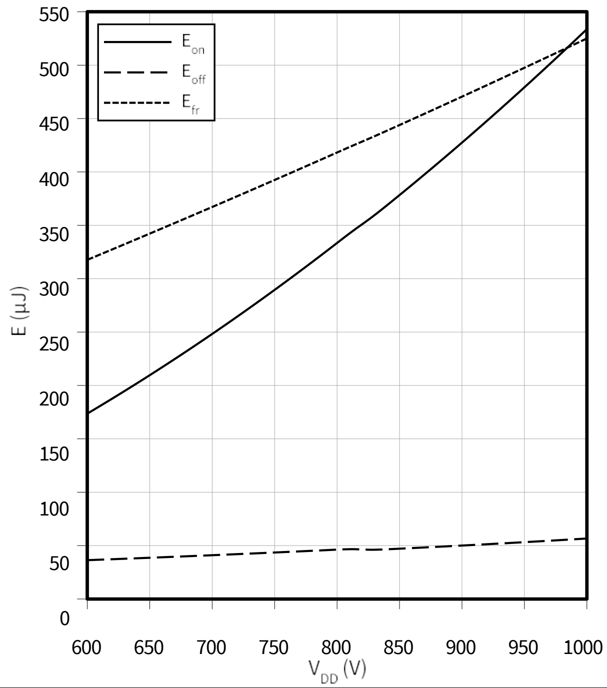
V_{GS} = 0/18 V, I_D = 27 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

$E = f(V_{DD})$

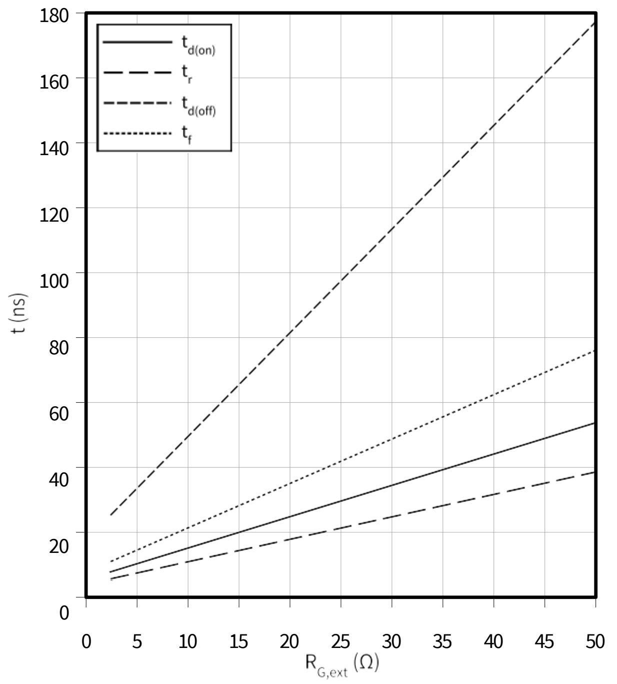
V_{GS} = -5/18 V, I_D = 27 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

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

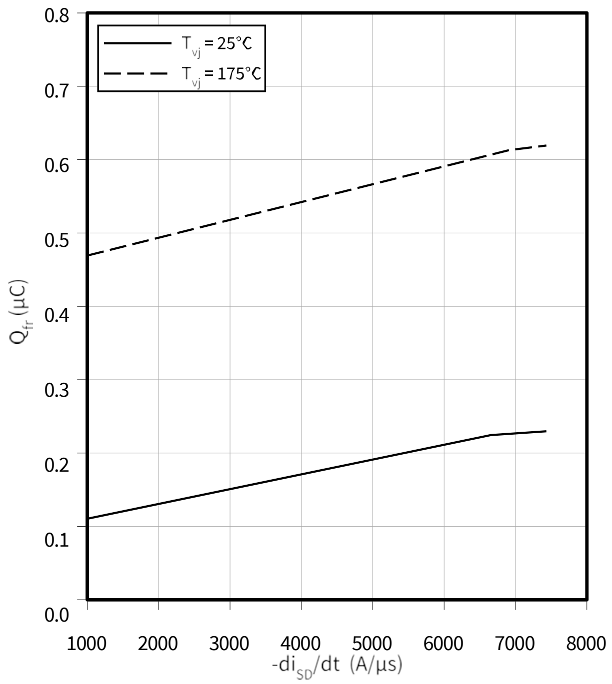
V_{GS} = 0/18 V, I_D = 27 A, T_{vj} = 175 °C, V_{DD} = 800 V



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

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

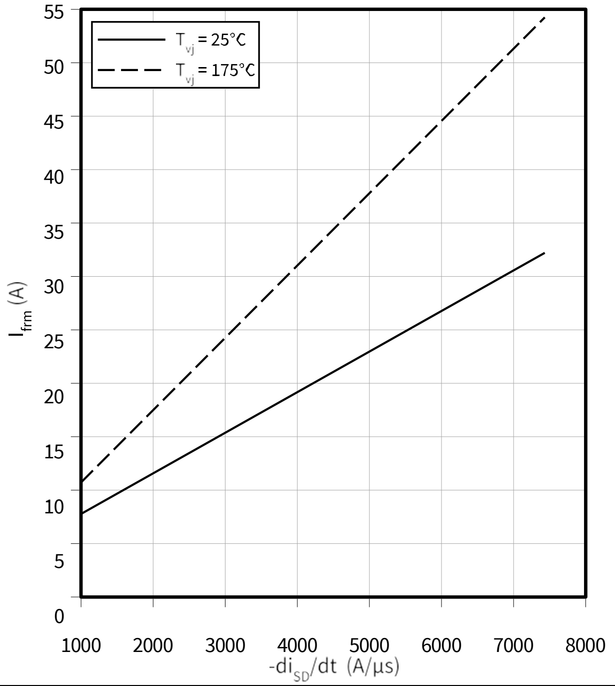
V_{GS} = 0/18 V, I_{SD} = 27 A, V_{DD} = 800 V



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} = 27 A, V_{DD} = 800 V

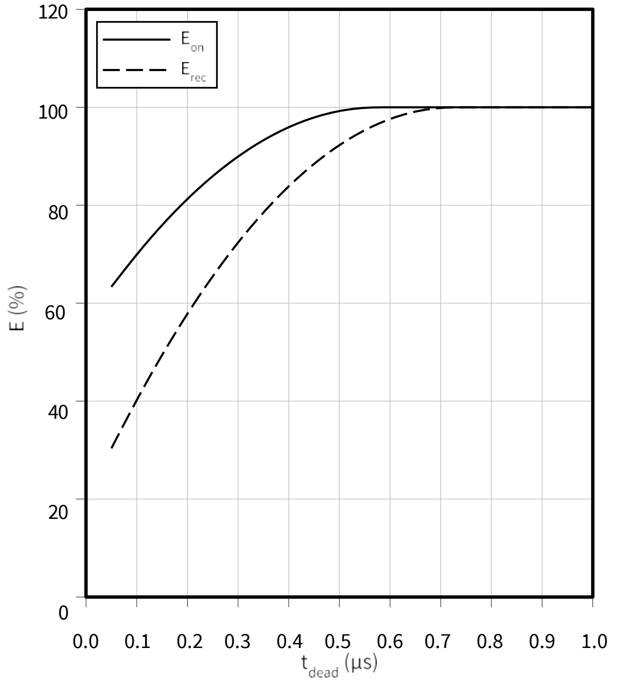


Typical switching energy as a function of dead time / blanking time, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V

$E = f(t_{dead})$

I_D = 27 A, V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω

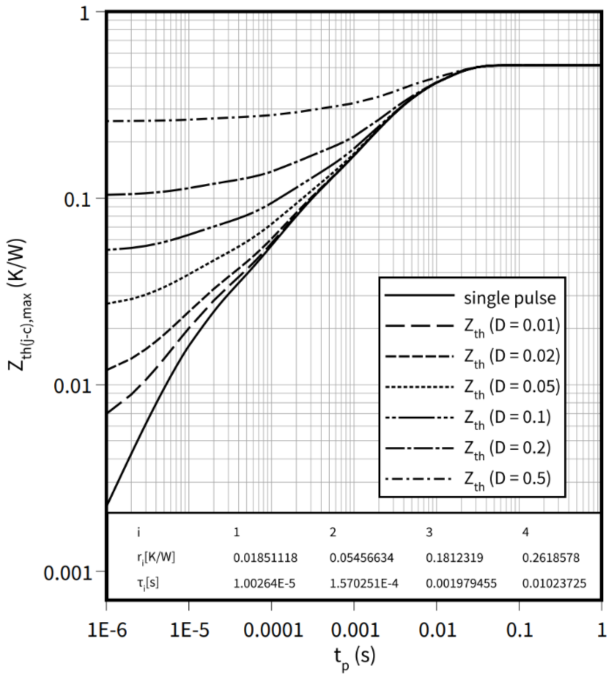
V_{DD} = 800 V



Max. transient thermal impedance (MOSFET/diode)

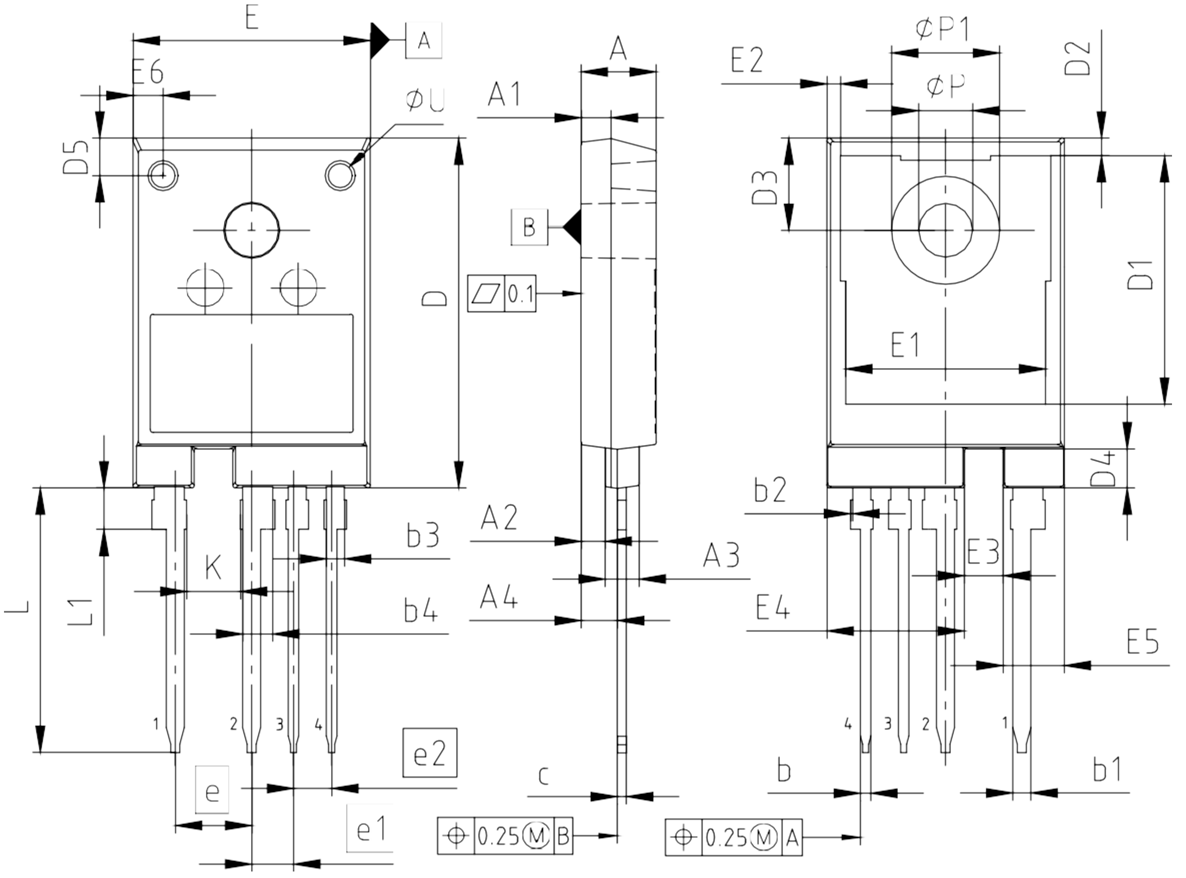
$Z_{th(j-c),max} = f(t_p)$

$D = t_p/T$



i	1	2	3	4
r_i[K/W]	0.01851118	0.05456634	0.1812319	0.2618578
τ_i[s]	1.00264E-5	1.570251E-4	0.001979455	0.01023725

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

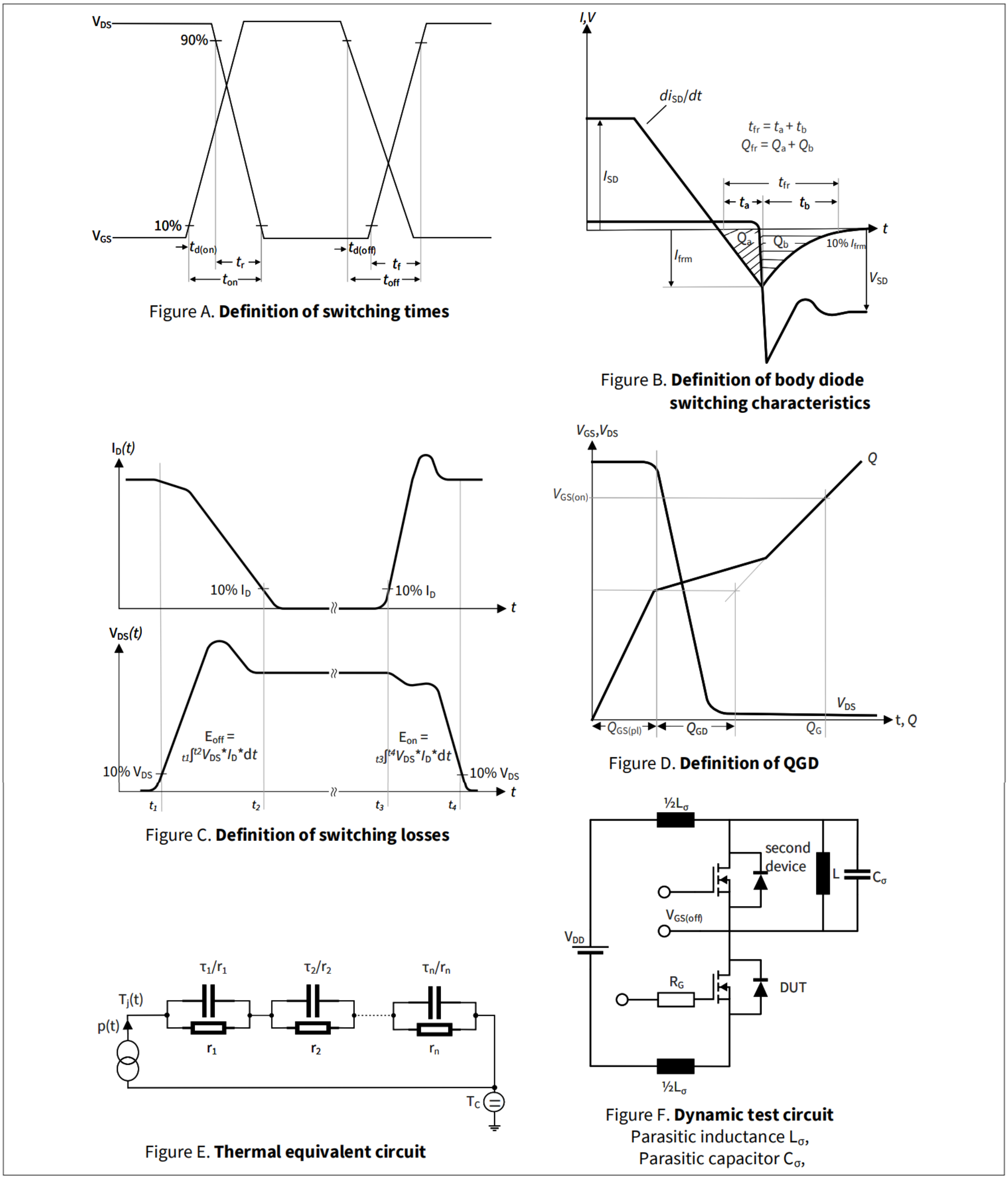


Figure A. **Definition of switching times**

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	2025-02-04	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

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