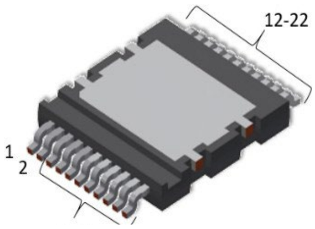
最终数据表

英飞凌CoolSiC ™汽车 MOSFET 1200 V，采用 HDSOP-22-3 封装



Halogen-free

AEC Qualified

Lead-free

RoHS

特性

- T_{vj} = -55...175°C 时 V_{DSS} = 1200 V
- T_C = 25°C时 I_{DDC} = 34 A
- $R_{DS\,(on)}$ = 80mΩ （V_{GS} = 20V、T_{vj} = 25°C 时）
- 新的性能优化芯片技术 (Gen1p)，改善了 R_{DSon} * A
- 业界领先的开关能量特性，可降低开关损耗并减少冷却需求
- 最低的器件电容值，可实现更高的开关速度和更高的功率密度
- 低 C_{rss} /C_{iss} 电容比值和高 $V_{GS(th)}$ 的组合，可避免寄生导通并实现单极性栅极驱动
- 降低了总栅极电荷 Q_G，可降低驱动功率和损耗
- 提高了建议开启电压 ($V_{GS(on)}$ = 20 V) 以降低 $R_{DS(on)}$
- .XT 芯片粘接技术，实现业界领先的热性能
- 低封装杂散电感，可实现更快、更干净的开关动作
- 带有开尔文（Kelvin) 源极引脚，实现更好的栅极控制并降低开关损耗
- 爬电距离 > 4.75 毫米接头 V_{rms} （最大值） > 950 V，基于 IEC60664 材料组 I、污染等级 2
- SMT 封装，便于自动化装配并降低系统成本
- 低等级 $R_{顶}$侧冷却封装，可实现最佳热性能和功率密度

潜在应用

- 车载充电器
- 直流/直流转换器
- 辅助驱动

产品验证

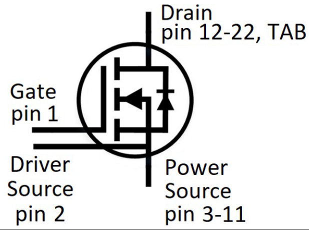
- 适合汽车应用。根据 AEC-Q100/101 进行产品验证

描述

引脚定义：

- Pin 1 - 栅极
- 引脚 2 - 驱动源
- 引脚 3...11 - 乘方 来源
- 引脚 12...22，TAB - 漏极

注意：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
AIMCQ120R080M1T	PG-HDSOP-22-3	12A080M1

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}				260	°C
MOSFET/body diode thermal resistance, junction-case[1)]	$R_{th(j\text{-}c)}$			0.54	0.71	K/W

1) 无需经过生产测试 - 经过设计/特性验证

2 MOSFET

表2 最大额定值

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage[1)]	V_{DSS}	T_{vj} = -55...175 °C		1200	V
Continuous DC drain current for $R_{th(j\text{-}c,max)}$, limited by $T_{vj(max)}$ [2)]	I_{DDC}	V_{GS} = 20 V	T_c = 25 °C	34	A
			T_c = 100 °C	24	
Peak drain current, t_p limited by $T_{vj(max)}$ [2)]	I_{DM}	V_{GS} = 20 V		86	A
Gate-source voltage, max. transient voltage[3)]	V_{GS}	$t_p \leq 0.5$ µs, $D < 0.01$		-10/25	V
Gate-source voltage, max. static voltage[3)]	V_{GS}			-5/23	V
Avalanche energy, single pulse	E_{AS}	I_D = 7.6 A, V_{DD} = 50 V, L = 4.76 mH		136	mJ
Power dissipation, limited by $T_{vj(max)}$ [2)]	P_{tot}		T_c = 25 °C	211	W
			T_c = 100 °C	106	

1) 在 Tvj=25°C 下进行测试，并通过全温度范围内的设计/特性验证
2) 无需经过生产测试 - 经过设计/特性验证
3) **重要注释：**正负栅极源电压的选择会影响器件的长期行为。为了确保器件在计划使用寿命内的正常运行，必须考虑应用说明AN2018-09中描述的设计指南。

表 3 建议值

Parameter	Symbol	Note or test condition	Values	Unit
Recommended turn-on gate voltage	$V_{GS(on)}$		20	V
Recommended turn-off gate voltage	$V_{GS(off)}$		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 = 10 A	T_{vj} = 25 °C, $V_{GS(on)}$ = 20 V		80	100	mΩ
			T_{vj} = 100 °C, $V_{GS(on)}$ = 20 V		112		
			T_{vj} = 175 °C, $V_{GS(on)}$ = 20 V		159		
			T_{vj} = 25 °C, $V_{GS(on)}$ = 18 V		84		
Gate-source threshold voltage	$V_{GS(th)}$	I_D = 3.3 mA, V_{DS} = V_{GS} (tested after 1 ms pulse at V_{GS} = 20 V)	T_{vj} = 25 °C	3.7	4.4	5.1	V
			T_{vj} = 175 °C		3.6		
Zero gate-voltage drain current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V	T_{vj} = 25 °C		0.3	10	µA
			T_{vj} = 175 °C		10		
Gate leakage current	I_{GSS}	V_{DS} = 0 V	V_{GS} = 25 V			100	nA
			V_{GS} = -10 V			-100	
Forward transconductance	g_{fs}	I_D = 10 A, V_{DS} = 20 V			6.2		S
Short-circuit withstand time[1)]	t_{SC}	V_{DD} ≤ 800 V, $V_{DS,peak}$ < 1200 V, $T_{vj(start)}$ = 25 °C, $R_{G,ext}$ = 2 Ω	$V_{GS(on)}$ = 20 V		1.5		µs
			$V_{GS(on)}$ = 18 V		2		
			$V_{GS(on)}$ = 15 V		2.5		
Internal gate resistance	$R_{G,int}$	f = 1 MHz, V_{AC} = 25 mV			3.8		Ω
Input capacitance	C_{iss}	V_{DD} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			671		pF
Output capacitance	C_{oss}	V_{DD} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			35		pF
Reverse transfer capacitance	C_{rss}	V_{DD} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			2		pF
C_{oss} stored energy	E_{oss}	V_{DD} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			14		µJ
Total gate charge	Q_G	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, turn-on pulse			24		nC
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, turn-on pulse			7		nC
Gate-to-drain charge	Q_{GD}	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, turn-on pulse			4		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		6.6		ns
			T_{vj} = 175 °C		6.4		

（表格续下页……）

表 4（续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Rise time	t_r	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		4		ns
			T_{vj} = 175 °C		4.7		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		11.8		ns
			T_{vj} = 175 °C		12.5		
Fall time	t_f	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		11.1		ns
			T_{vj} = 175 °C		12		
Turn-on energy	E_{on}	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		71		µJ
			T_{vj} = 175 °C		91		
Turn-off energy	E_{off}	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		30		µJ
			T_{vj} = 175 °C		30		
Total switching energy	E_{tot}	V_{DD} = 800 V, I_D = 10 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 2 Ω, L_σ = 13 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		101		µJ
			T_{vj} = 175 °C		121		
Virtual junction temperature	T_{vj}			-55		175	°C

1) 无需经过生产测试 - 经过设计/特性验证

注释： 特征参数在Tvj = 25°C下测定，除非另有说明。

3 体二极管（MOSFET）

表5 最大额定值

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage[1]	V_{DSS}	T_{vj} = -55...175 °C		1200	V
Continuous reverse drain current for $R_{th(j-c,max)}$, limited by $T_{vj(max)}$[2]	I_{SDC}	V_{GS} = 0 V	T_c = 25 °C	22.7	A
			T_c = 100 °C	20.5	
Peak reverse drain current, t_p limited by $T_{vj(max)}$[2]	I_{SM}	V_{GS} = 0 V		22.7	A

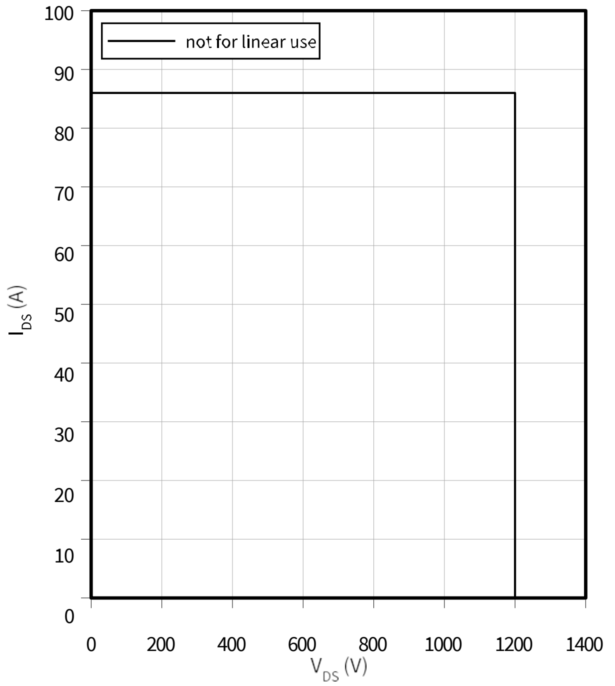
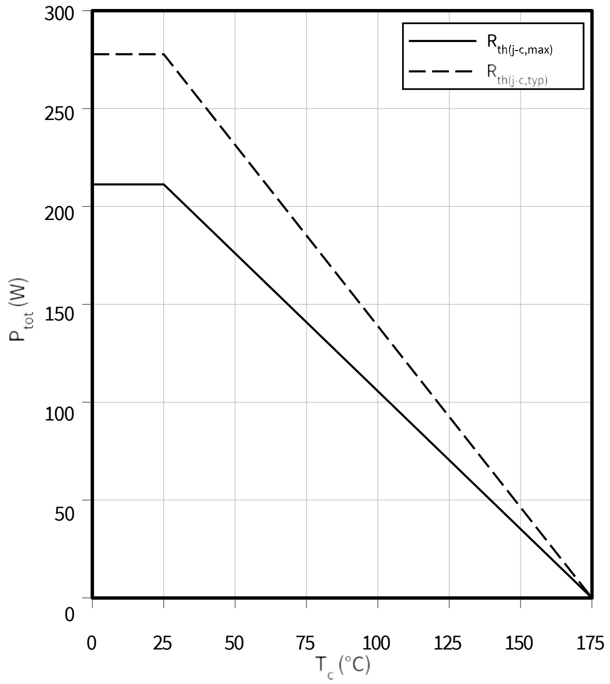
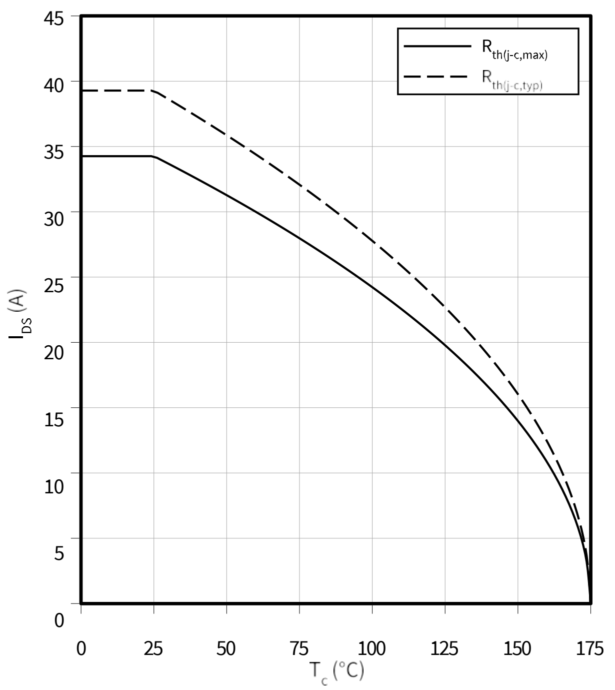
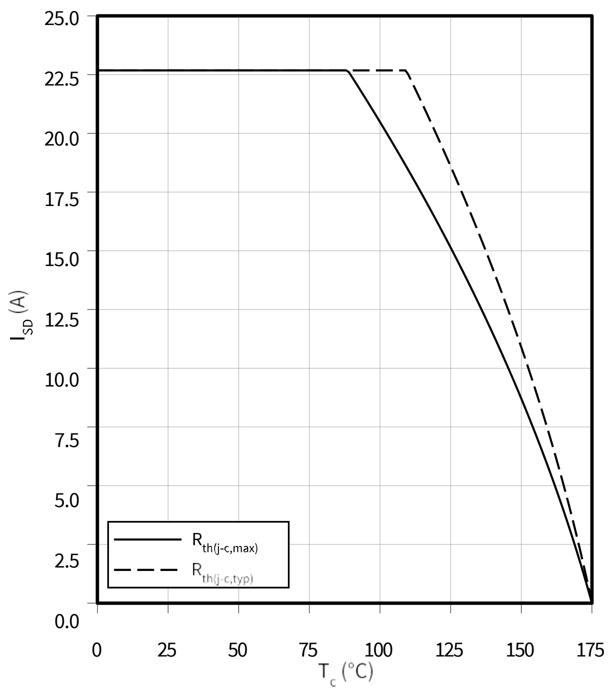
1) 在 Tvj=25°C 下进行测试，并通过全温度范围内的设计/特性验证

2) 无需经过生产测试 - 经过设计/特性验证

表6 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source reverse voltage	V_{SD}	I_{SD} = 10 A, V_{GS} = 0 V	T_{vj} = 25 °C		3.9	5	V
			T_{vj} = 100 °C		3.8		
			T_{vj} = 175 °C		3.7		
MOSFET forward recovery charge	Q_{fr}	V_{DD} = 800 V, I_{SD} = 10 A, V_{GS} = 0 V, $-di_{SD}/dt$ = 1000 A/µs, Q_{fr} includes also Q_C	T_{vj} = 25 °C		134		nC
			T_{vj} = 175 °C		190		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 800 V, I_{SD} = 10 A, V_{GS} = 0 V, $-di_{SD}/dt$ = 1000 A/µs, Q_{fr} includes also Q_C	T_{vj} = 25 °C		8.1		A
			T_{vj} = 175 °C		8.6		
Virtual junction temperature	T_{vj}			-55		175	°C

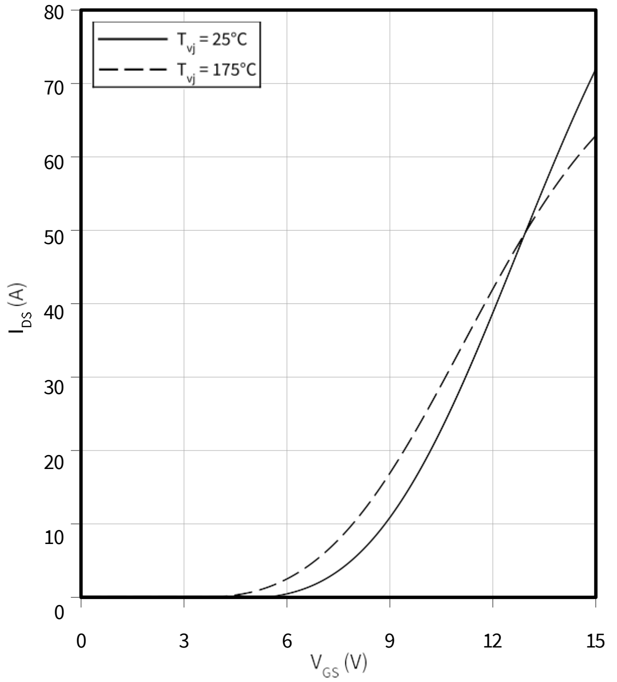
4 特性图

Reverse bias safe operating area (RBSOA) $I_{DS} = f(V_{DS})$ $T_{vj} \leq 175$ °C, $V_{GS} = 0/20$ V, $T_c = 25$ °C	**Power dissipation as a function of case temperature** $P_{tot} = f(T_c)$ $T_{vj} \leq 175$ °C
 	
Maximum DC drain to source current as a function of case temperature $I_{DS} = f(T_c)$	**Maximum source to drain current as a function of case temperature** $I_{SD} = f(T_c)$ $V_{GS} = 0$ V
 	

Typical transfer characteristic

$I_{DS} = f(V_{GS})$

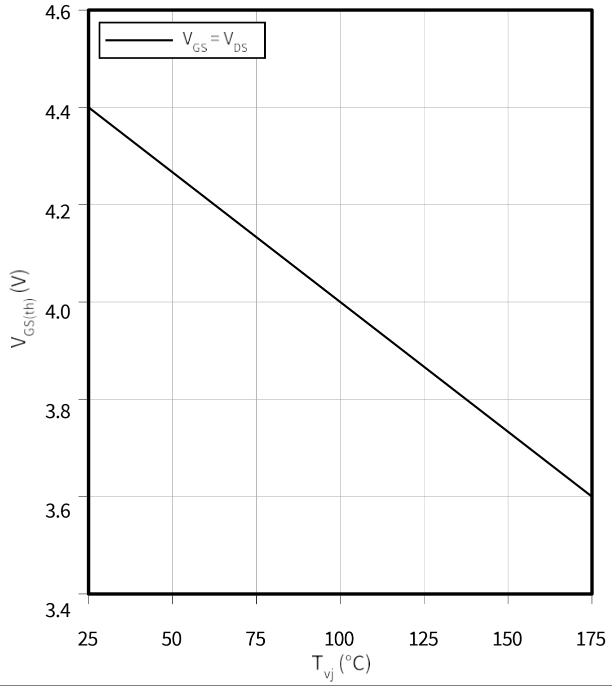
$V_{DS} = 20$ V, $t_p = 20$ µs



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

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

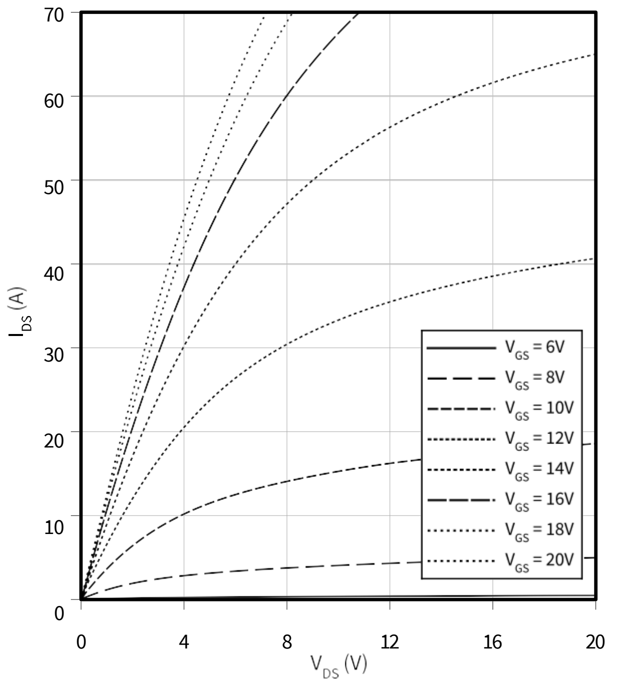
$I_D = 3.3$ mA



Typical output characteristic, V_{GS} as parameter

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

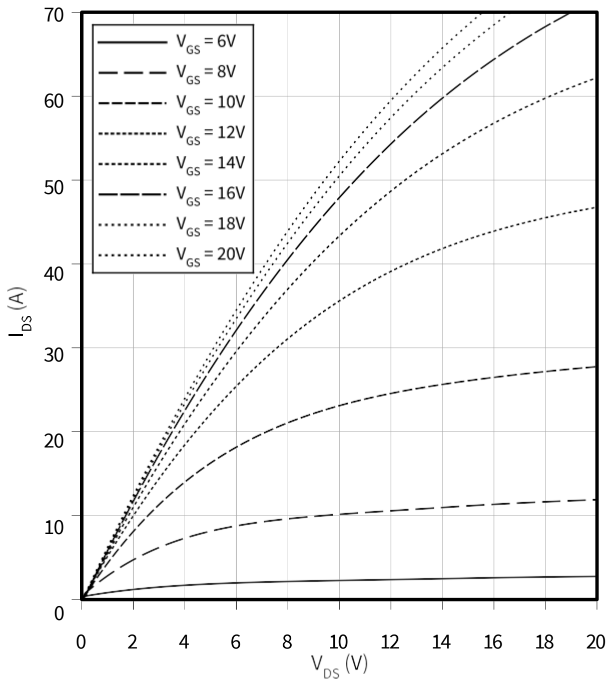
$T_{vj} = 25$ °C, $t_p = 20$ µs

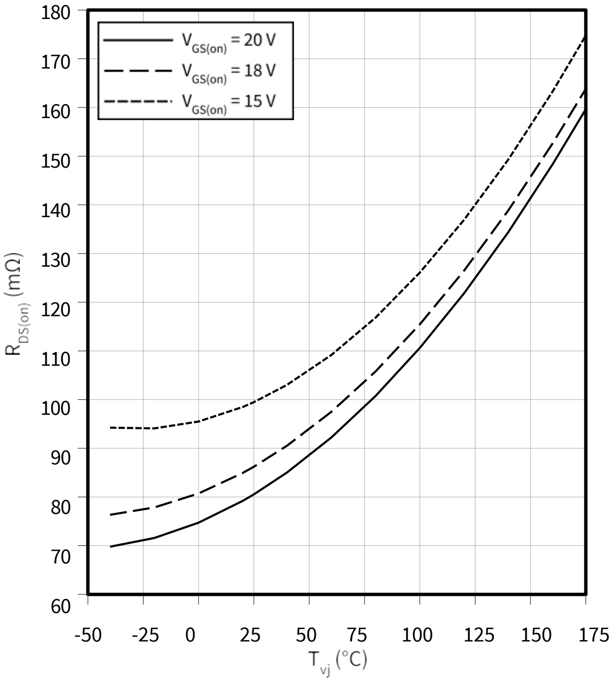
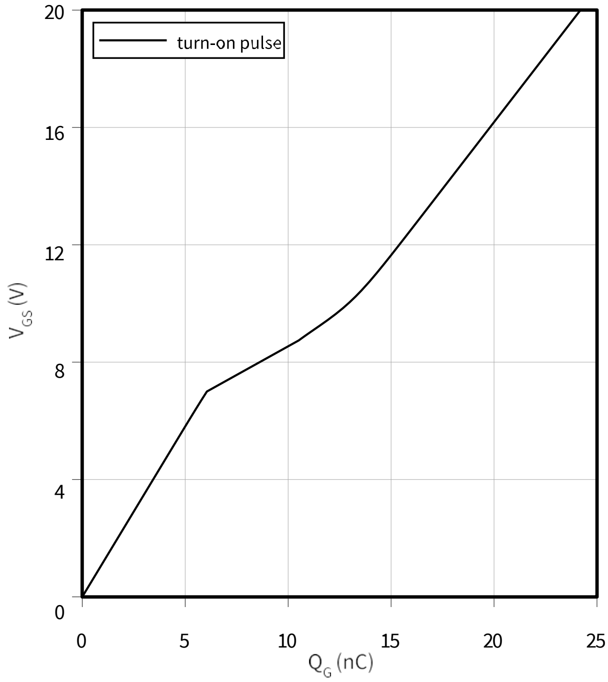
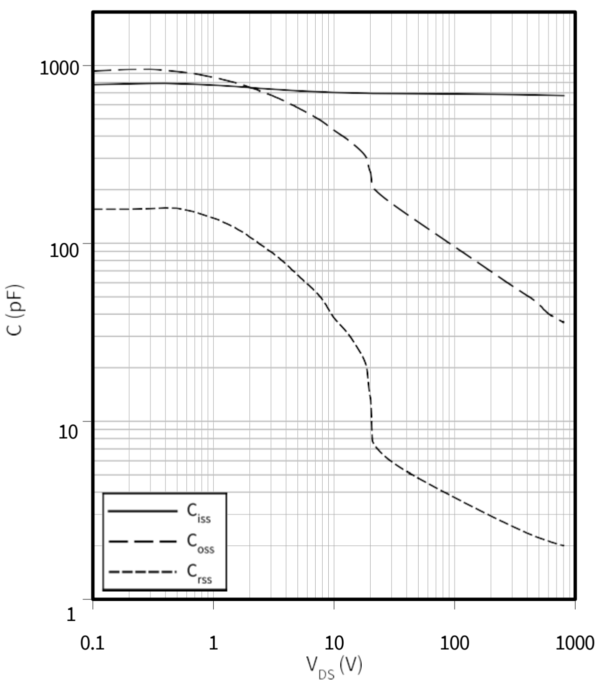
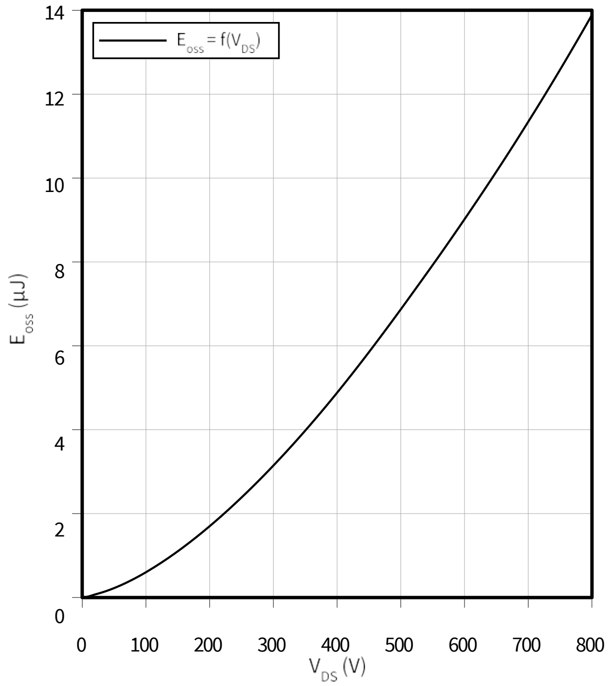


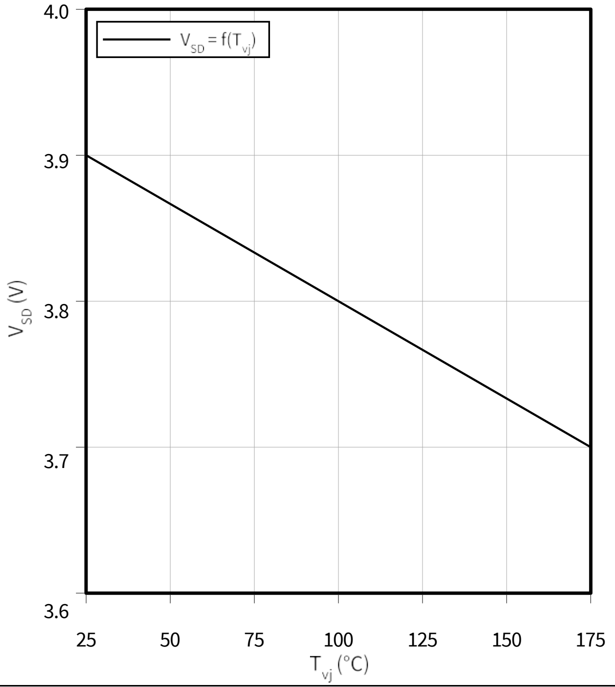
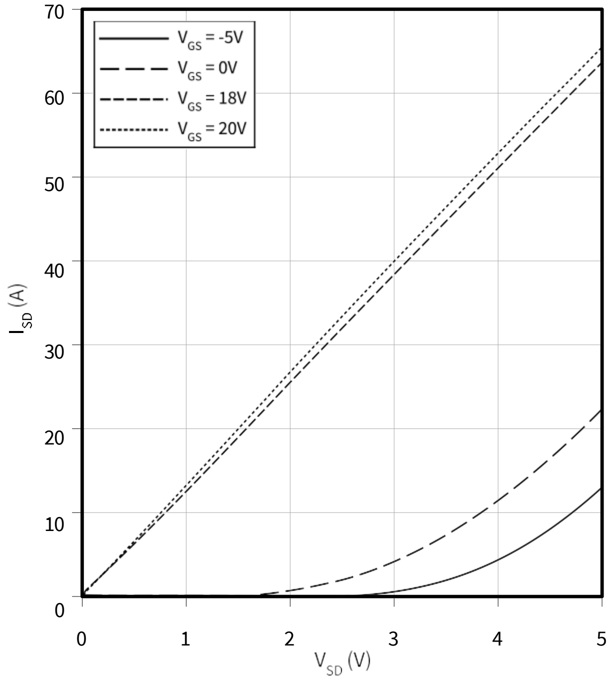
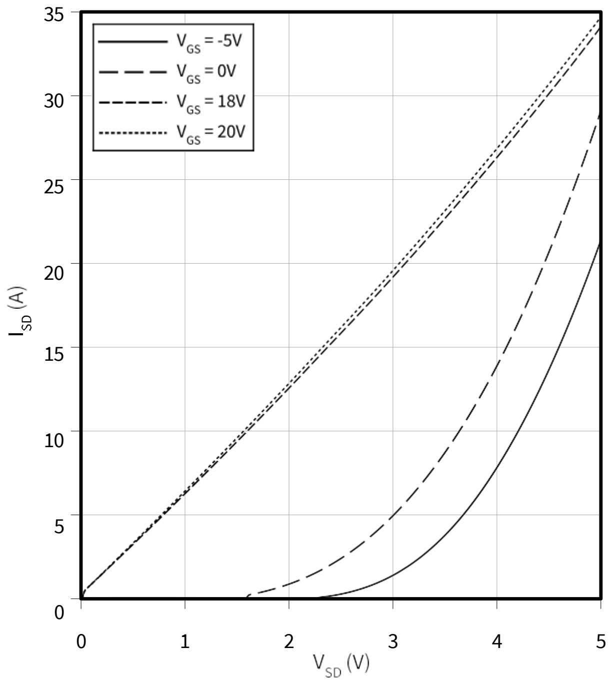
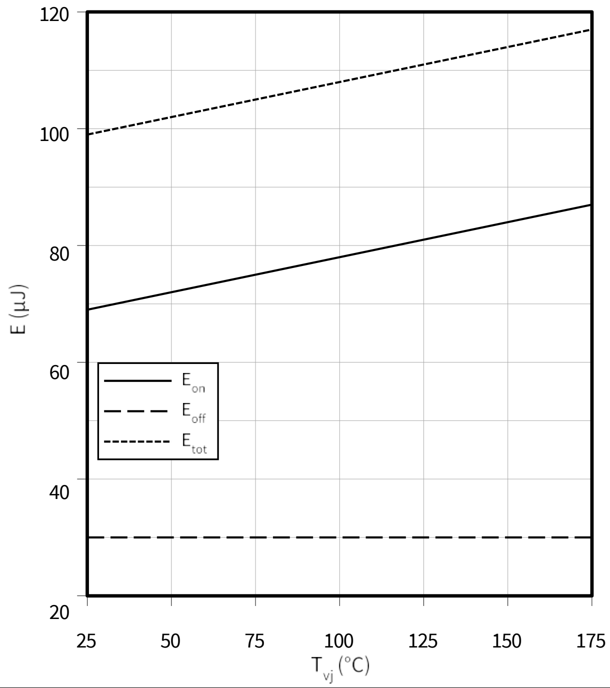
Typical output characteristic, V_{GS} as parameter

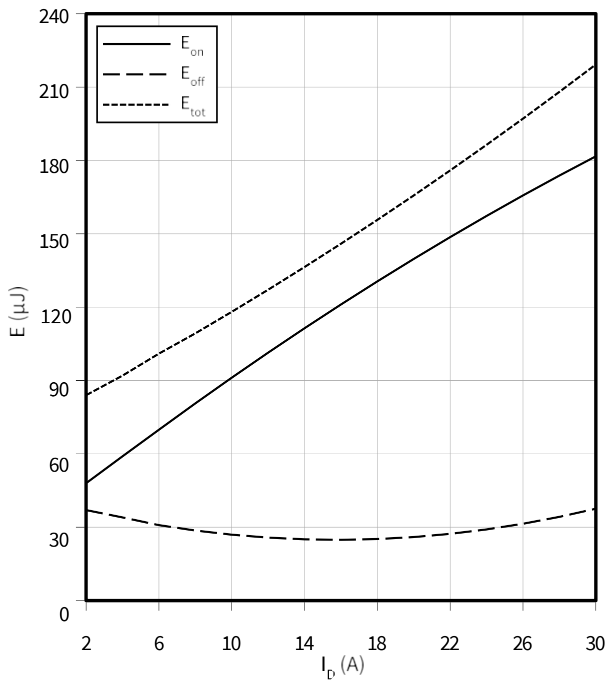
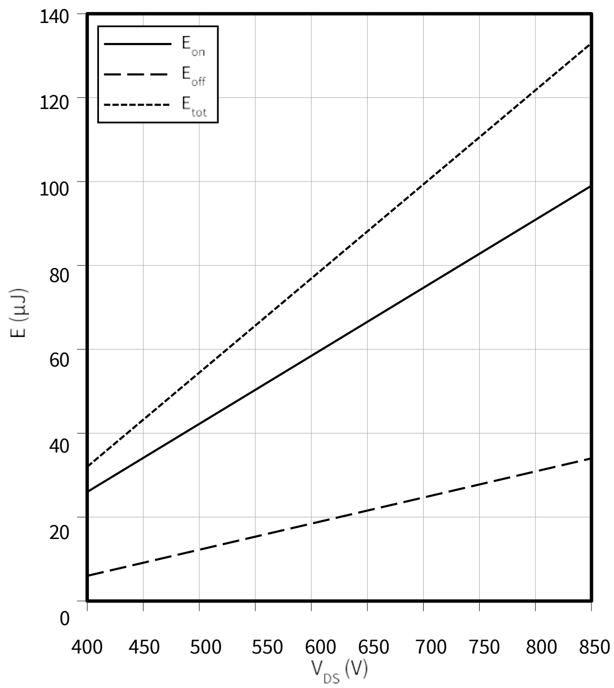
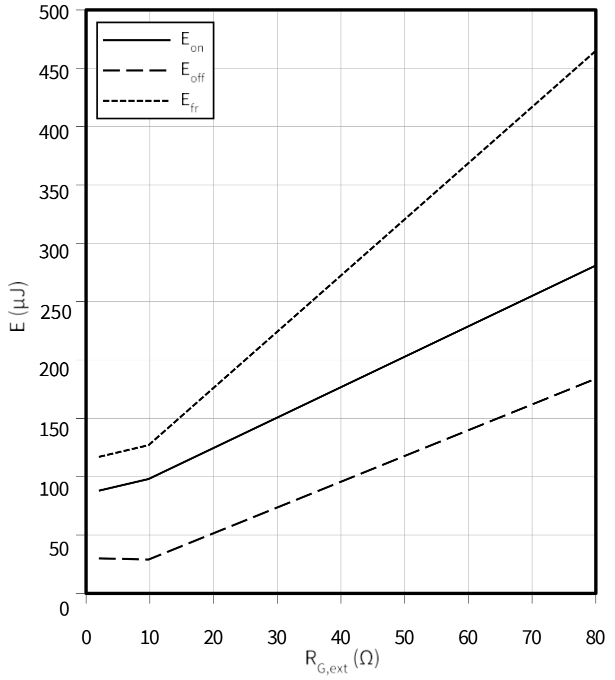
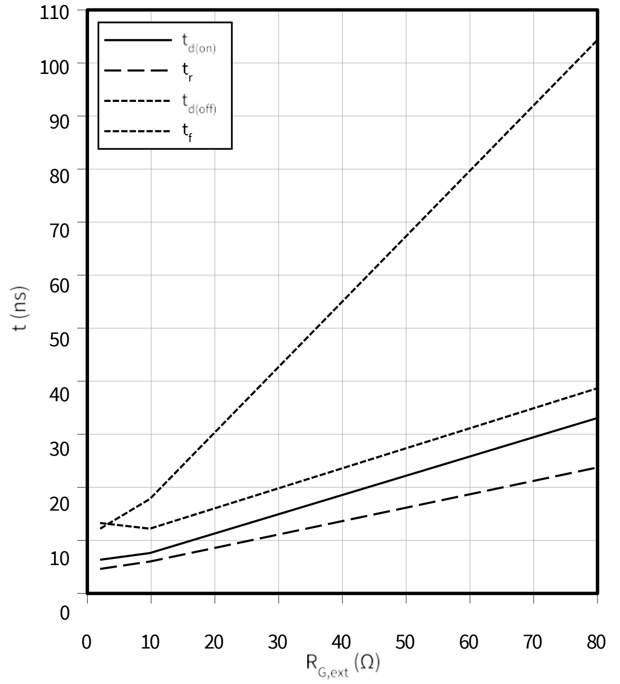
$I_{DS} = f(V_{DS})$

$T_{vj} = 175$ °C, $t_p = 20$ µs

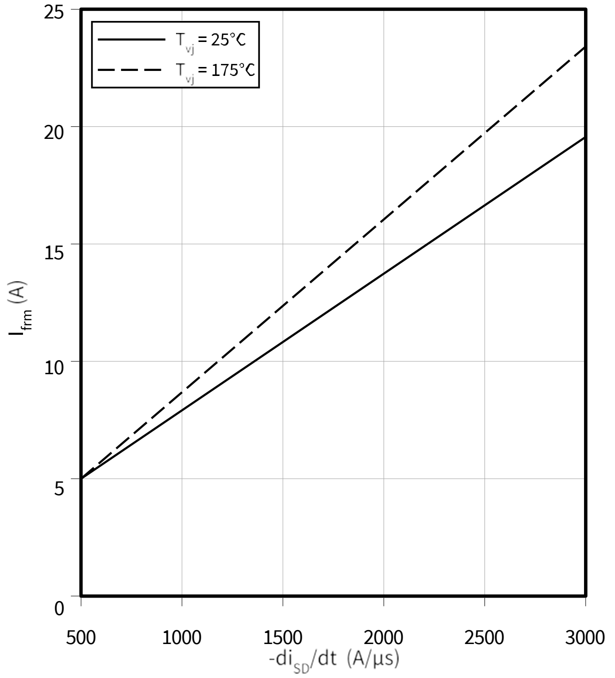


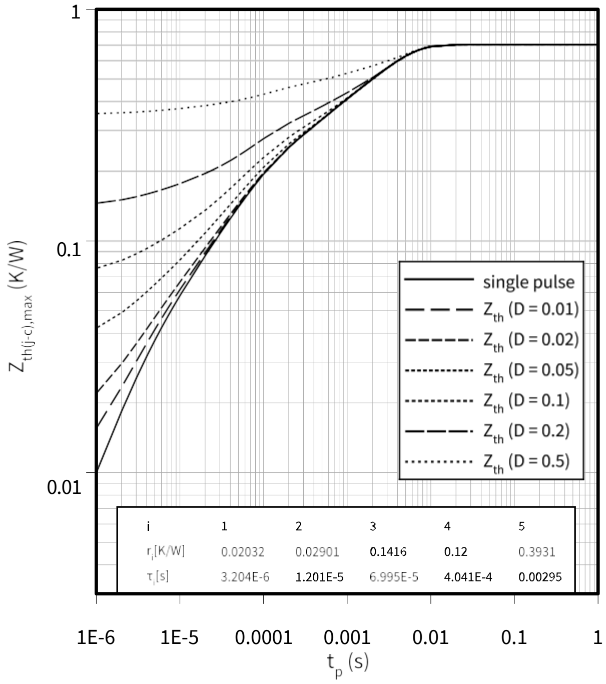
Typical on-state resistance as a function of junction temperature $R_{DS(on)} = f(T_{vj})$ $I_D = 10$ A	**Typical gate charge** $V_{GS} = f(Q_G)$ $I_D = 10$ A, $V_{DS} = 800$ V
	
Typical capacitance as a function of drain-source voltage $C = f(V_{DS})$ f = 100 kHz, $V_{GS} = 0$ V	**Typical C_{oss} stored energy** $E_{oss} = f(V_{DS})$ f = 100 kHz, $V_{GS} = 0$ V
	

Typical reverse drain voltage as function of junction temperature $V_{SD} = f(T_{vj})$ $I_{SD} = 10$ A, $V_{GS} = 0$ V	**Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter** $I_{SD} = f(V_{SD})$ $T_{vj} = 25$ °C, $t_p = 20$ µs
	
Typical reverse drain current as function of reverse drain voltage, V_{GS} as 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** $E = f(T_{vj})$ $V_{GS} = 0/20$ V, $I_D = 10$ A, $R_{G,ext} = 2$ Ω, $V_{DD} = 800$ V
	

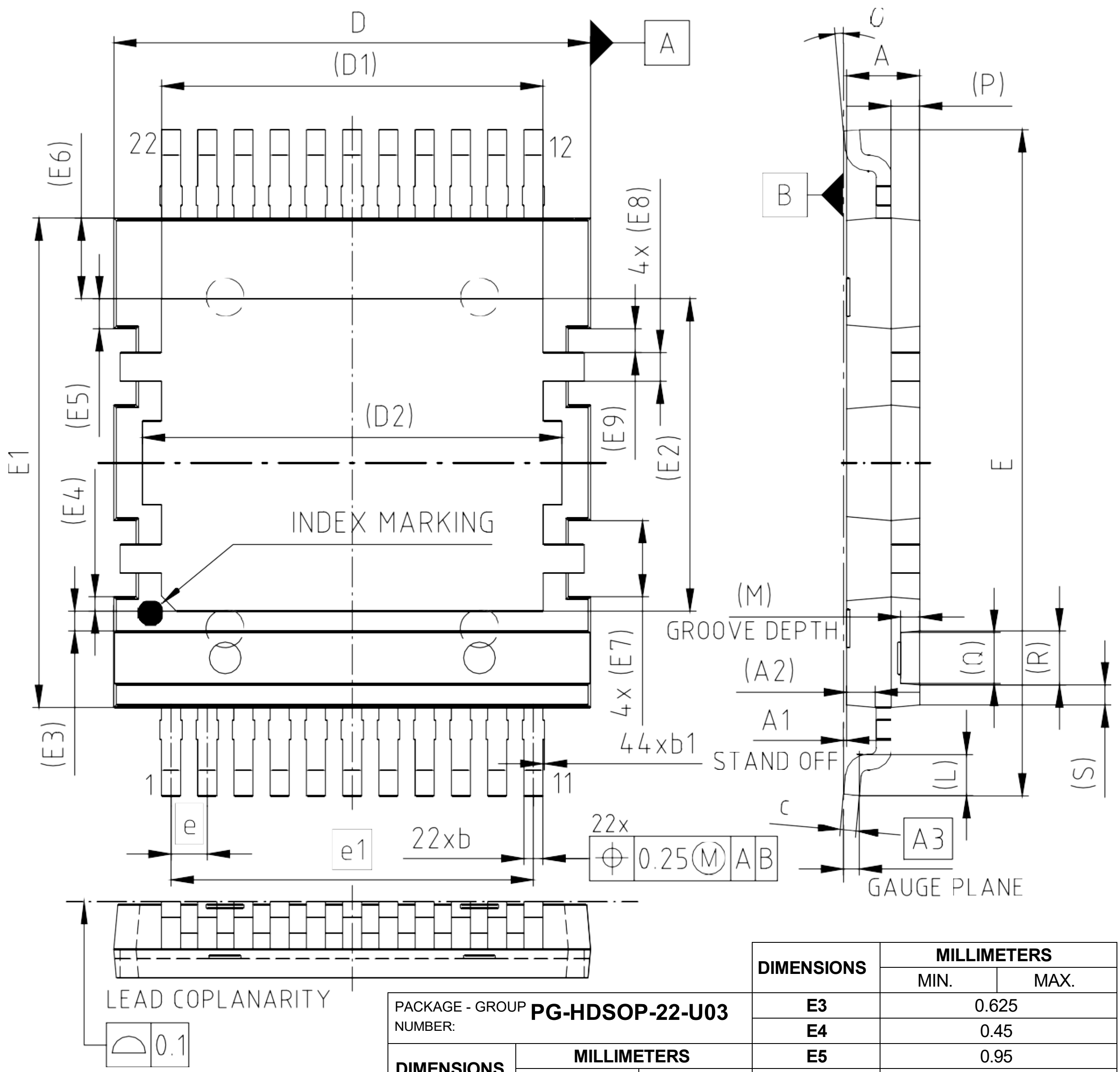
Typical switching energy as a function of drain current, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V $E = f(I_D)$ V_{GS} = 0/20 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2 Ω, V_{DD} = 800 V	**Typical switching energy as a function of drain voltage, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V** $E = f(V_{DS})$ V_{GS} = 0/20 V, I_D = 10 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2 Ω
	
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} = 0/20 V, I_D = 10 A, T_{vj} = 175 °C, V_{DD} = 800 V	**Typical switching times as a function of gate resistance** $t = f(R_{G,ext})$ I_D = 10 A, V_{GS} = 0/20 V, T_{vj} = 175 °C, V_{DD} = 800 V
	

Typical MOSFET peak forward recovery current as a function of reverse drain current slope $I_{frm} = f(-di_{SD}/dt)$ $V_{GS} = 0/20$ V, $I_{SD} = 10$ A, $V_{DD} = 800$ V	**Max. transient thermal impedance (MOSFET/diode)** $Z_{th(j-c),max} = f(t_p)$ $D = t_p/T$





5 封装外形



NOTES:

ALL METAL SURFACES TIN PLATED EXCEPT AREA OF CUT

DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

PACKAGE - GROUP NUMBER: **PG-HDSOP-22-U03**

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	2.25	2.35
A1	0.00	0.15
A2	0.90	
A3	0.50	
b	0.50	0.70
b1	---	0.15
c	0.46	0.58
D	14.90	15.10
D1	12.00	
D2	13.20	
E	20.81	21.11
E1	15.30	15.50
E2	9.83	

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
E3	0.625	
E4	0.45	
E5	0.95	
E6	2.53	
E7	2.40	
E8	0.90	
E9	0.75	
e	1.14	
e1	11.4	
L	1.30	
M	0.60	
N	22	
O	0°	8°
P	0.90	
Q	1.60	
R	1.70	
S	0.631	

图 1

6 测试条件

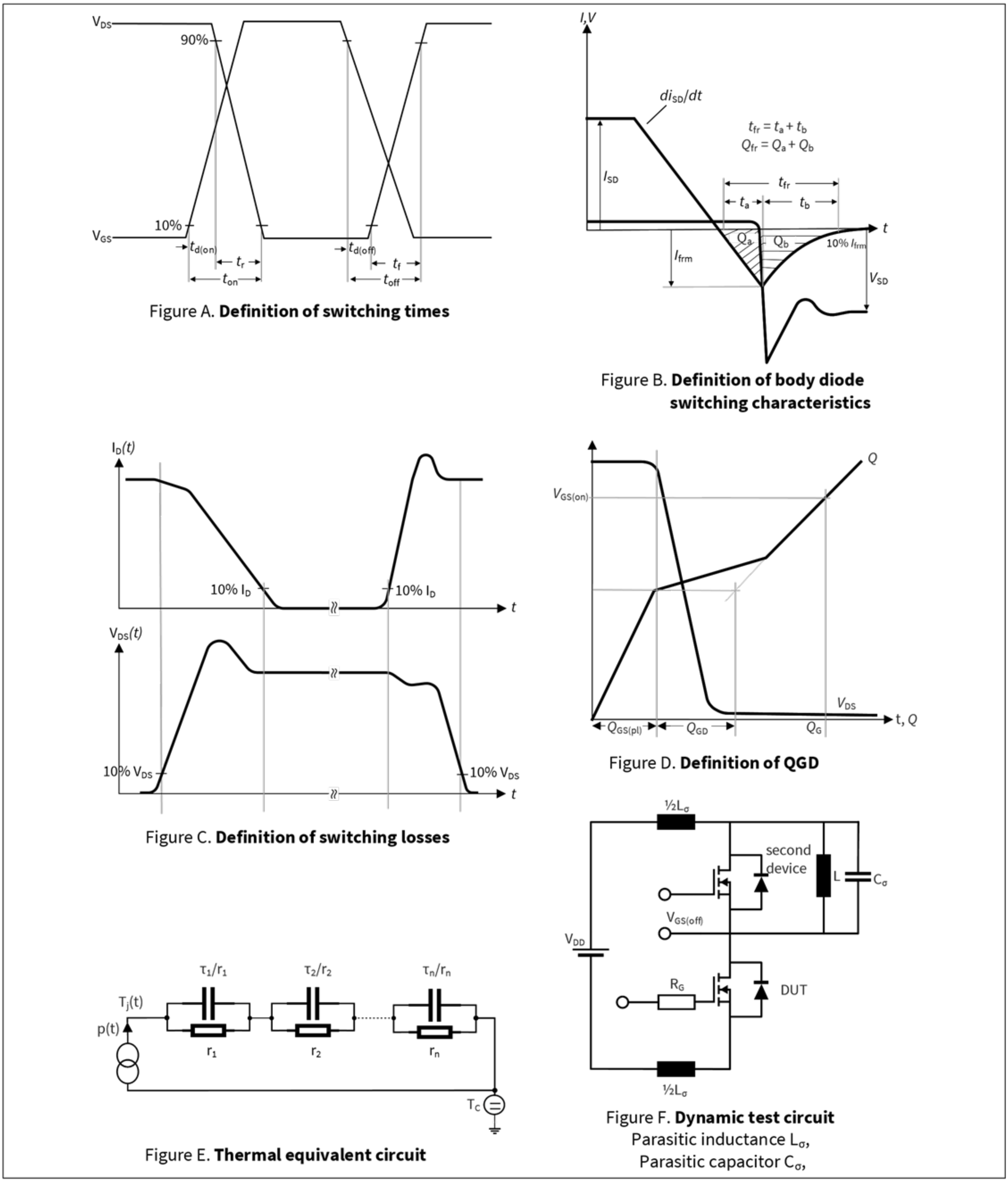


Figure A. **Definition of switching times**

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	2023-01-17	Target datasheet
0.20	2024-07-01	Preliminary datasheet
1.00	2024-07-22	Final datasheet

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