

**Final datasheet**

**CoolSiC™ 1200 V SiC MOSFET G2 : Silicon Carbide MOSFET with .XT interconnection technology**

**Features**

- $V_{DSS} = 1200\text{ V}$  at  $T_{vj} = 25^\circ\text{C}$
- $I_{DC} = 20\text{ A}$  at  $T_C = 100^\circ\text{C}$
- $R_{DS(on)} = 78\text{ m}\Omega$  at  $V_{GS} = 18\text{ V}$ ,  $T_{vj} = 25^\circ\text{C}$
- Very low switching losses
- Overload operation up to  $T_{vj} = 200^\circ\text{C}$
- Short circuit withstand time  $2\ \mu\text{s}$
- Benchmark gate threshold voltage,  $V_{GS(th)} = 4.2\text{ V}$
- 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
- Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>



- Halogen-free
- Green
- Lead-free
- RoHS

**Potential applications**

- General purpose drives (GPD)
- EV Charging
- Online UPS/Industrial UPS
- Solar power optimizer
- String inverter
- Energy Storage Systems (ESS)
- Welding

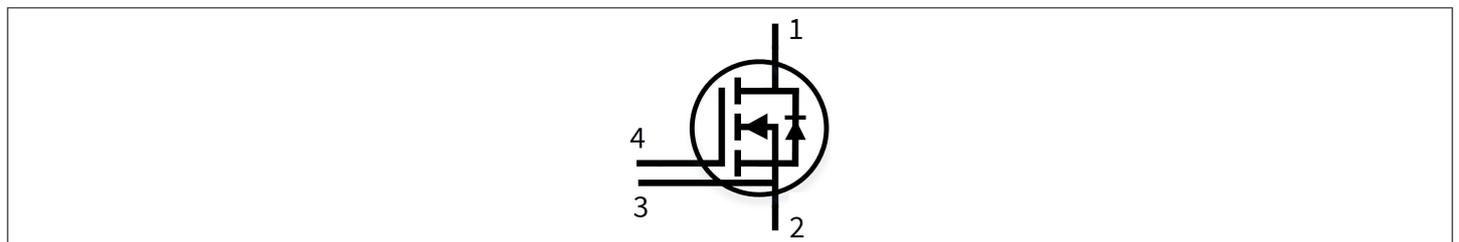
**Product validation**

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

**Description**

- 1 – drain
- 2 – source
- 3 – Kelvin sense contact
- 4 – gate

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



Type	Package	Marking
IMZC120R078M2H	PG-TO247-4-U07	12M2H078

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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	$T_{sold}$	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	$R_{th(j-c)}$			0.8	1.04	K/W

## 2 MOSFET

**Table 2** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Drain-source voltage	$V_{DSS}$	$T_{vj} \geq 25\text{ °C}$	1200	V	
Continuous DC drain current for $R_{th(j-c,max)}$ , limited by $T_{vj(max)}$	$I_{DDC}$	$V_{GS} = 18\text{ V}$	$T_c = 25\text{ °C}$	28	A
			$T_c = 100\text{ °C}$	20	
Peak drain current, $t_p$ limited by $T_{vj(max)}$ <sup>1)</sup>	$I_{DM}$	$V_{GS} = 18\text{ V}$	60	A	
Gate-source voltage, max. transient voltage	$V_{GS}$	$t_p \leq 0.5\ \mu\text{s}$ , $D < 0.01$	-10...25	V	
Gate-source voltage, max. static voltage <sup>2)</sup>	$V_{GS}$		-7...23	V	
Avalanche energy, single pulse	$E_{AS}$	$I_D = 9\text{ A}$ , $V_{DD} = 50\text{ V}$ , $L = 2.8\text{ mH}$ , $T_{vj(start)} = 25\text{ °C}$	112	mJ	
Avalanche energy, repetitive	$E_{AR}$	$I_D = 9\text{ A}$ , $V_{DD} = 50\text{ V}$ , $L = 14.1\ \mu\text{H}$ , $T_{vj(start)} = 25\text{ °C}$	0.56	mJ	
Short-circuit withstand time	$t_{SC}$	$V_{DD} \leq 800\text{ V}$ , $V_{DS,peak} < 1200\text{ V}$ , $V_{GS(on)} = 15\text{ V}$ , $T_{vj(start)} = 25\text{ °C}$	2	$\mu\text{s}$	
Power dissipation, limited by $T_{vj(max)}$	$P_{tot}$		$T_c = 25\text{ °C}$	143	W
			$T_c = 100\text{ °C}$	71	

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	$R_{DS(on)}$	$I_D = 9\text{ A}$	$T_{vj} = 25\text{ °C}$ , $V_{GS(on)} = 18\text{ V}$		78		mΩ
			$T_{vj} = 150\text{ °C}$ , $V_{GS(on)} = 18\text{ V}$		159	204	
			$T_{vj} = 175\text{ °C}$ , $V_{GS(on)} = 18\text{ V}$		185		
			$T_{vj} = 25\text{ °C}$ , $V_{GS(on)} = 15\text{ V}$		97		
Gate-source threshold voltage	$V_{GS(th)}$	$I_D = 2.8\text{ mA}$ , $V_{DS} = V_{GS}$ (tested after 1 ms pulse at $V_{GS} = 20\text{ V}$ )	$T_{vj} = 25\text{ °C}$	3.5	4.2	5.1	V
			$T_{vj} = 175\text{ °C}$		3.2		
Zero gate-voltage drain current	$I_{DSS}$	$V_{DS} = 1200\text{ V}$ , $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			80	μA
			$T_{vj} = 175\text{ °C}$		1		
Gate leakage current	$I_{GSS}$	$V_{DS} = 0\text{ V}$	$V_{GS} = 23\text{ V}$			120	nA
			$V_{GS} = -10\text{ V}$			-120	
Forward transconductance	$g_{fs}$	$I_D = 9\text{ A}$ , $V_{DS} = 20\text{ V}$		6			S
Internal gate resistance	$R_{G,int}$	$f = 1\text{ MHz}$ , $V_{AC} = 25\text{ mV}$		10			Ω
Input capacitance	$C_{iss}$	$V_{DD} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 100\text{ kHz}$ , $V_{AC} = 25\text{ mV}$		700			pF
Output capacitance	$C_{oss}$	$V_{DD} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 100\text{ kHz}$ , $V_{AC} = 25\text{ mV}$		28			pF
Reverse transfer capacitance	$C_{rss}$	$V_{DD} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 100\text{ kHz}$ , $V_{AC} = 25\text{ mV}$		2			pF
$C_{oss}$ stored energy	$E_{oss}$	$V_{DD} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 100\text{ kHz}$ , $V_{AC} = 25\text{ mV}$		12			μJ
Output charge	$Q_{oss}$	$V_{DD} = 800\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 100\text{ kHz}$ , $V_{AC} = 25\text{ mV}$ , Calculated by $C_{oss} * f(V_{DS}) @ 100\text{ kHz}$		43			nC
Effective output capacitance, energy related	$C_{o(er)}$	$V_{DD} = 0...800\text{ V}$ , $V_{GS} = 0\text{ V}$		38			pF
Effective output capacitance, time related	$C_{o(tr)}$	$I_D = \text{constant}$ , $V_{DD} = 0...800\text{ V}$ , $V_{GS} = 0\text{ V}$		54			pF

(table continues...)

**Table 4 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_G$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , turn-on pulse		21		nC
Plateau gate charge	$Q_{GS(pl)}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , turn-on pulse		5		nC
Gate-to-drain charge	$Q_{GD}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , turn-on pulse		5		nC
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		3.6	ns
			$T_{vj} = 175\text{ }^\circ\text{C}$		3.2	
Rise time	$t_r$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		5.9	ns
			$T_{vj} = 175\text{ }^\circ\text{C}$		5.5	
Turn-off delay time	$t_{d(off)}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		7.9	ns
			$T_{vj} = 175\text{ }^\circ\text{C}$		13.9	
Fall time	$t_f$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		3.9	ns
			$T_{vj} = 175\text{ }^\circ\text{C}$		4.6	
Turn-on energy	$E_{on}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		65	$\mu\text{J}$
			$T_{vj} = 175\text{ }^\circ\text{C}$		135	
Turn-off energy	$E_{off}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		15	$\mu\text{J}$
			$T_{vj} = 175\text{ }^\circ\text{C}$		25	

(table continues...)

3 Body diode (MOSFET)

**Table 4** (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Total switching energy <sup>1)</sup>	$E_{tot}$	$V_{DD} = 800\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 0/18\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $R_{GS(off)} = 2.3\ \Omega$ , $L_\sigma = 18\text{ nH}$ , diode: body diode at $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$	151		$\mu\text{J}$
			$T_{vj} = 175\text{ }^\circ\text{C}$	340		
Virtual junction temperature	$T_{vj}$		-55		175	$^\circ\text{C}$
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h <sup>2)</sup>			200	$^\circ\text{C}$

1) including  $E_{fr}$

2) up to 5000 cycles. Maximum  $\Delta T$  limited to 100 K.

**Note:** The chip technology was characterized up to 200 kV/ $\mu\text{s}$ . The measured  $dV/dt$  was limited by measurement test setup and package.

Characteristics at  $T_{vj} = 25^\circ\text{C}$ , unless otherwise specified.

### 3 Body diode (MOSFET)

**Table 5** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Drain-source voltage	$V_{DSS}$	$T_{vj} \geq 25\text{ }^\circ\text{C}$	1200	V
Peak reverse drain current, $t_p$ limited by $T_{vj(max)}$	$I_{SM}$	$V_{GS} = 0\text{ V}$	60	A

**Table 6** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Drain-source reverse voltage	$V_{SD}$	$I_{SD} = 9\text{ A}$ , $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$	4.2	5.5	V
			$T_{vj} = 100\text{ }^\circ\text{C}$	4.11		
			$T_{vj} = 175\text{ }^\circ\text{C}$	4.05		
MOSFET forward recovery charge	$Q_{fr}$	$V_{DD} = 800\text{ V}$ , $I_{SD} = 9\text{ A}$ , $V_{GS} = 0\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $Q_{fr}$ includes also $Q_C$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.18		$\mu\text{C}$
			$T_{vj} = 175\text{ }^\circ\text{C}$	0.33		
MOSFET peak forward recovery current	$I_{frm}$	$V_{DD} = 800\text{ V}$ , $I_{SD} = 9\text{ A}$ , $V_{GS} = 0\text{ V}$ , $R_{GS(on)} = 2.3\ \Omega$ , $Q_{fr}$ includes also $Q_C$	$T_{vj} = 25\text{ }^\circ\text{C}$	14.9		A
			$T_{vj} = 175\text{ }^\circ\text{C}$	31		

(table continues...)

**Table 6** (continued) **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
MOSFET forward recovery energy	$E_{fr}$	$V_{DD} = 800 \text{ V}$ , $I_{SD} = 9 \text{ A}$ , $V_{GS} = 0 \text{ V}$ , $R_{GS(on)} = 2.3 \Omega$ , $Q_{fr}$ includes also $Q_C$	$T_{vj} = 25 \text{ }^\circ\text{C}$		71	$\mu\text{J}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$		180	
Virtual junction temperature	$T_{vj}$		-55		175	$^\circ\text{C}$
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h <sup>1)</sup>			200	$^\circ\text{C}$

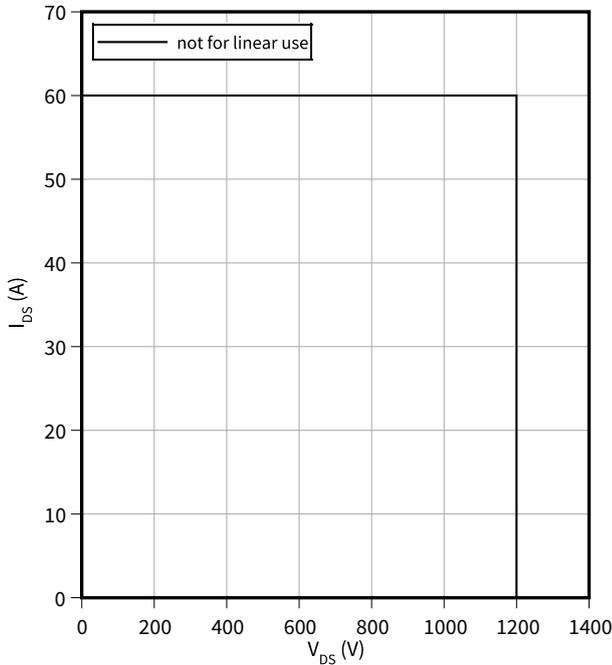
1) up to 5000 cycles. Maximum  $\Delta T$  limited to 100 K.

## 4 Characteristics diagrams

### Reverse bias safe operating area (RBSOA)

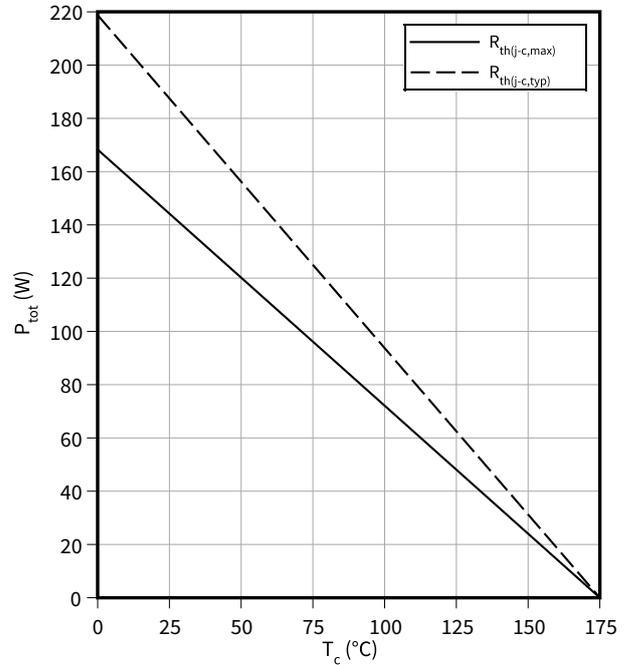
$$I_{DS} = f(V_{DS})$$

$$T_{vj} \leq 200 \text{ }^\circ\text{C}, V_{GS} = 0/18 \text{ V}, T_c = 25 \text{ }^\circ\text{C}$$



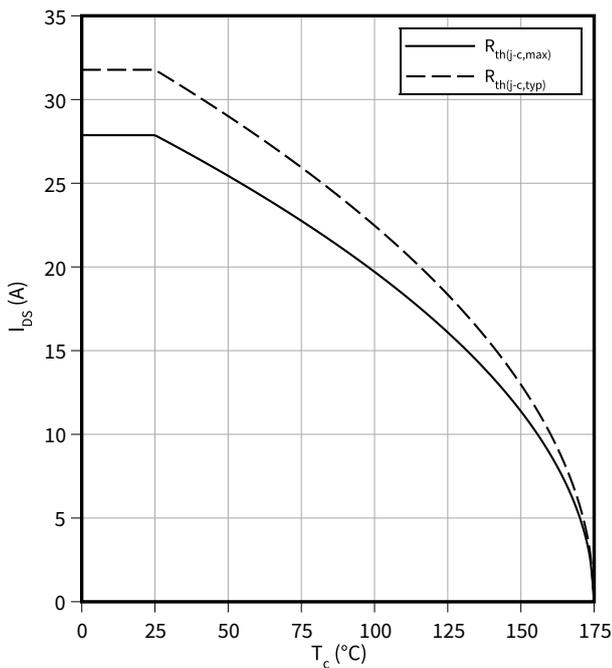
### Power dissipation as a function of case temperature

$$P_{tot} = f(T_c)$$



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

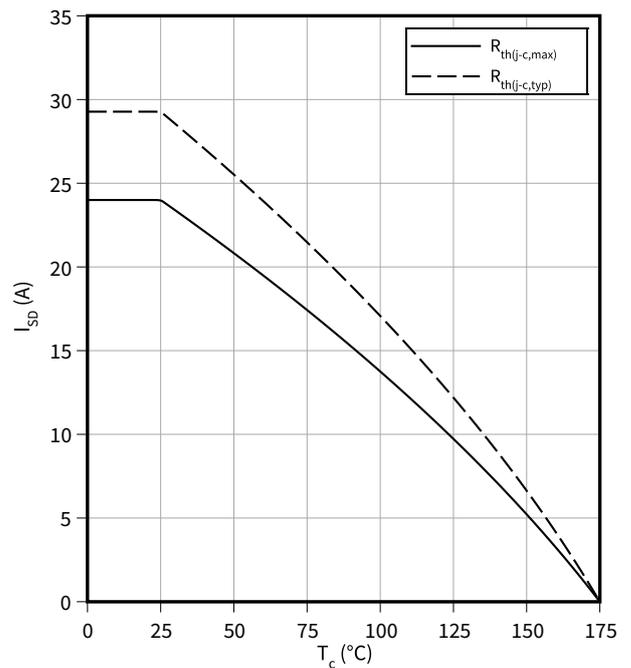
$$I_{DS} = f(T_c)$$



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

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

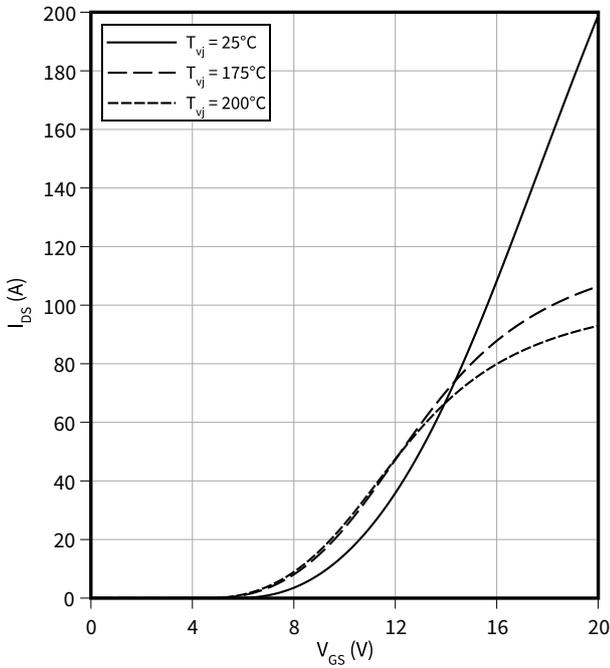
$$V_{GS} = 0 \text{ V}$$



4 Characteristics diagrams

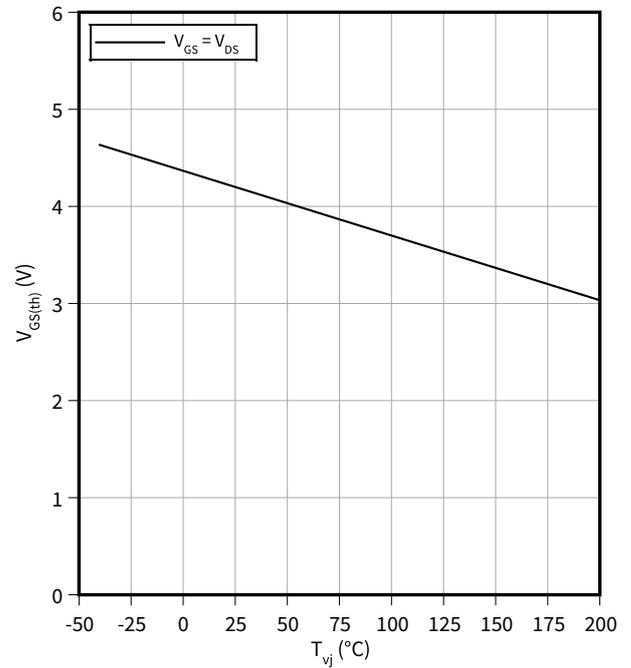
**Typical transfer characteristic**

$I_{DS} = f(V_{GS})$   
 $V_{DS} = 20\text{ V}$ ,  $t_p = 20\ \mu\text{s}$



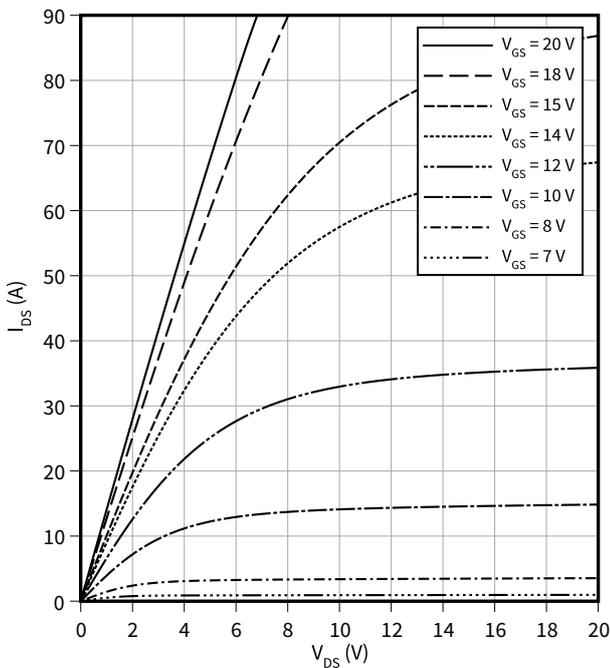
**Typical gate-source threshold voltage as a function of junction temperature**

$V_{GS(th)} = f(T_{vj})$   
 $I_D = 2.8\text{ mA}$



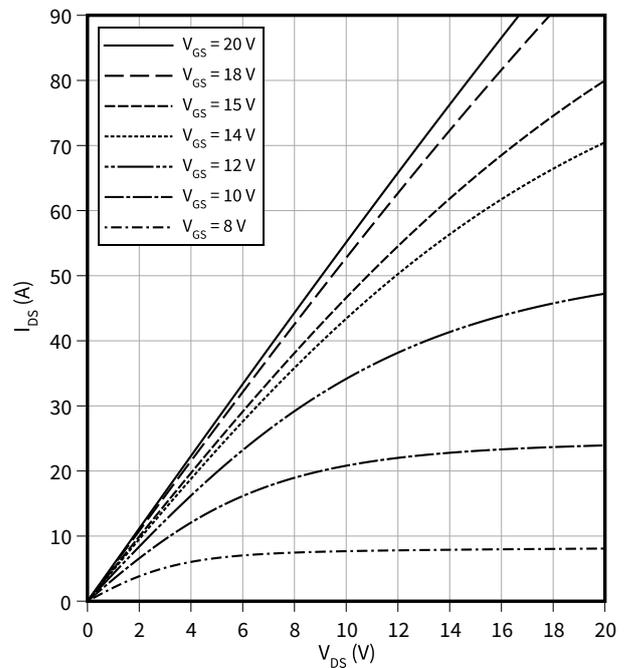
**Typical output characteristic,  $V_{GS}$  as parameter**

$I_{DS} = f(V_{DS})$   
 $T_{vj} = 25\ ^\circ\text{C}$ ,  $t_p = 20\ \mu\text{s}$



**Typical output characteristic,  $V_{GS}$  as parameter**

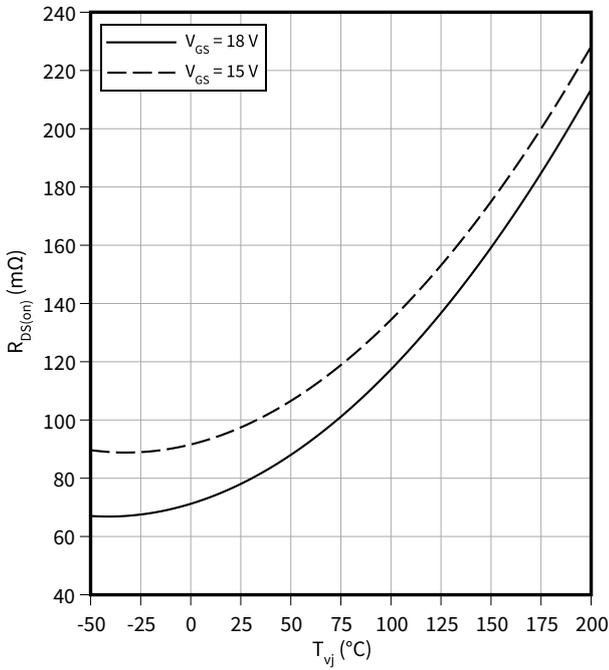
$I_{DS} = f(V_{DS})$   
 $T_{vj} = 175\ ^\circ\text{C}$ ,  $t_p = 20\ \mu\text{s}$



4 Characteristics diagrams

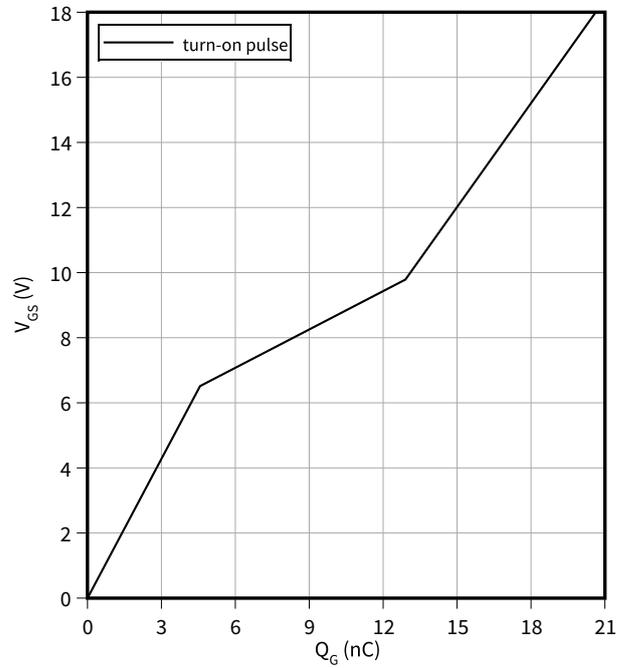
**Typical on-state resistance as a function of junction temperature**

$R_{DS(on)} = f(T_{vj})$   
 $I_D = 9\text{ A}$



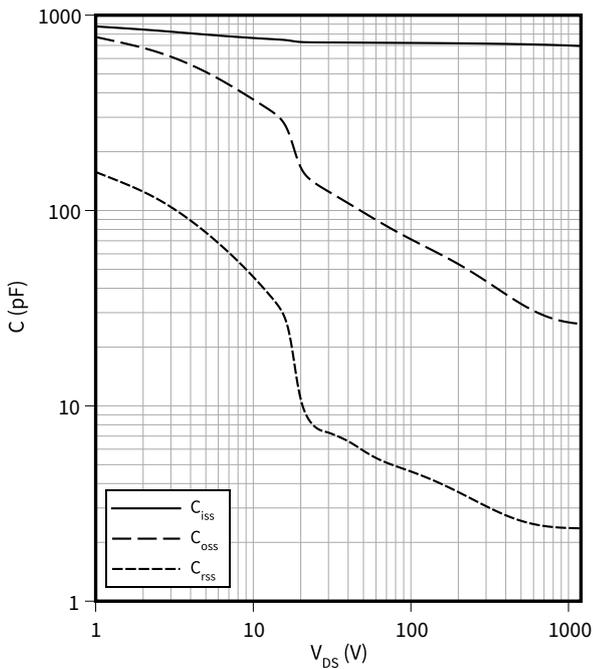
**Typical gate charge**

$V_{GS} = f(Q_G)$   
 $I_D = 9\text{ A}, V_{DS} = 800\text{ V}$



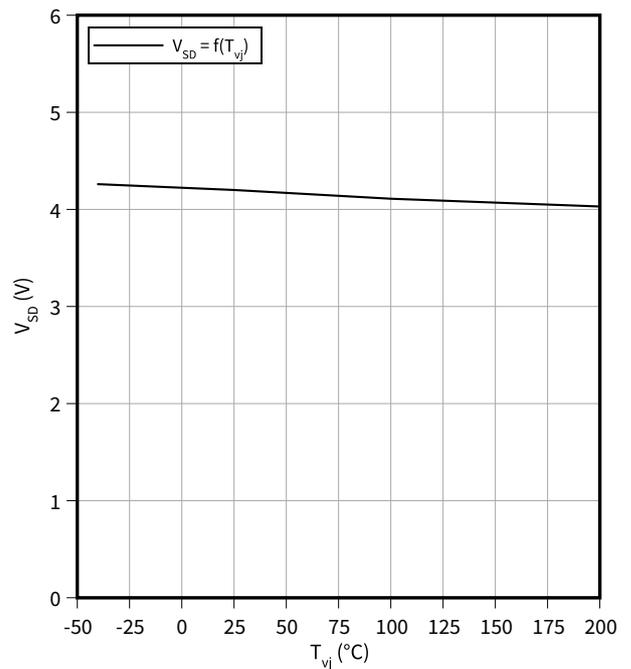
**Typical capacitance as a function of drain-source voltage**

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



**Typical reverse drain voltage as function of junction temperature**

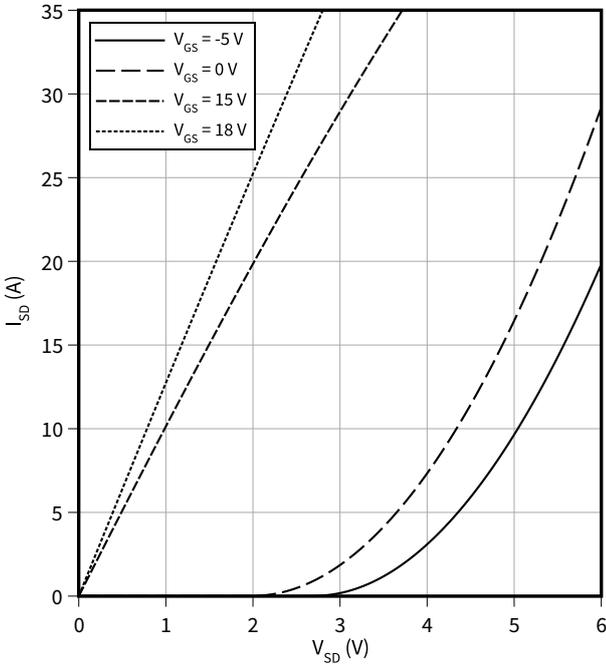
$V_{SD} = f(T_{vj})$   
 $I_{SD} = 9\text{ A}, V_{GS} = 0\text{ V}$



4 Characteristics diagrams

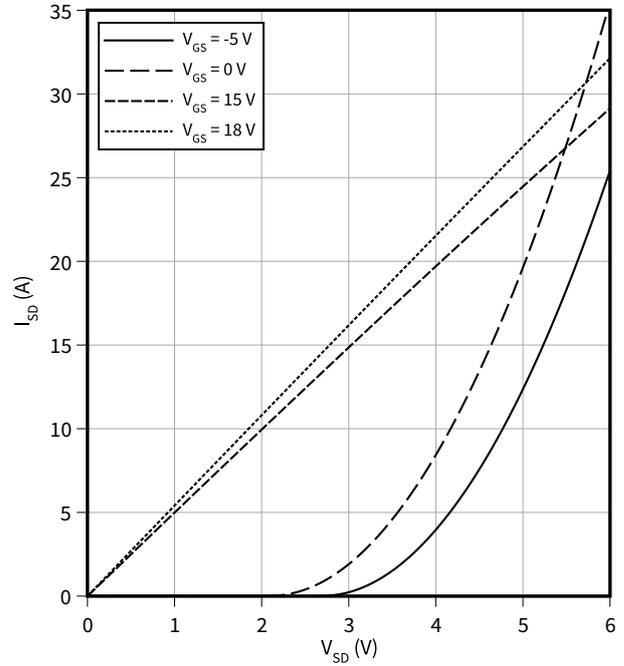
**Typical reverse drain current as function of reverse drain voltage,  $V_{GS}$  as parameter**

$I_{SD} = f(V_{SD})$   
 $T_{vj} = 25\text{ °C}$ ,  $t_p = 20\text{ }\mu\text{s}$



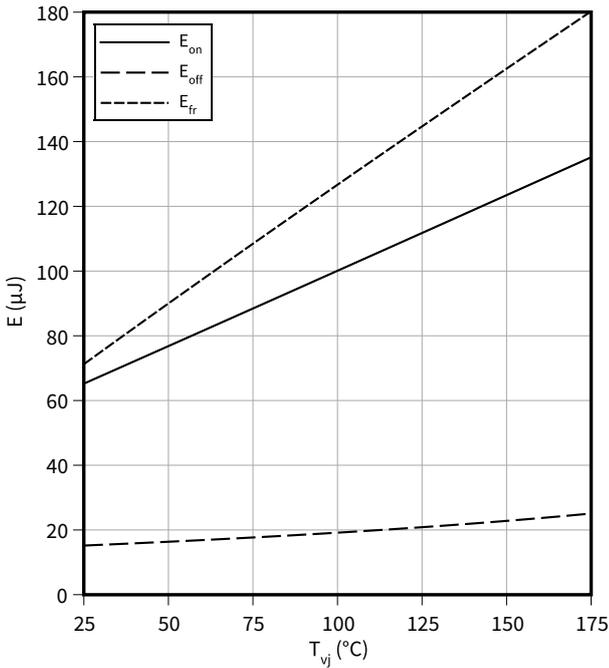
**Typical reverse drain current as function of reverse drain voltage,  $V_{GS}$  as parameter**

$I_{SD} = f(V_{SD})$   
 $T_{vj} = 175\text{ °C}$ ,  $t_p = 20\text{ }\mu\text{s}$



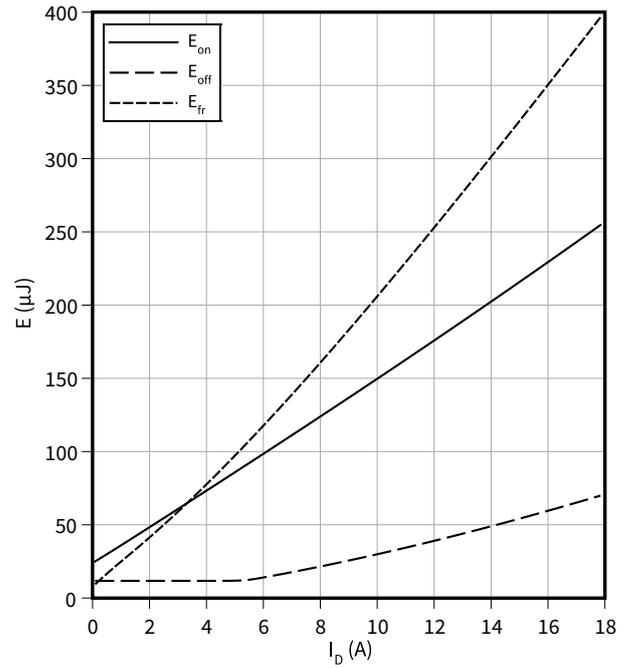
**Typical switching energy as a function of junction temperature, test circuit in Fig. F, 2nd device own body diode:  $V_{GS} = 0\text{ V}$**

$E = f(T_{vj})$   
 $V_{GS} = 0/18\text{ V}$ ,  $I_D = 9\text{ A}$ ,  $R_{G,ext} = 2.3\text{ }\Omega$ ,  $V_{DD} = 800\text{ V}$



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

$E = f(I_D)$   
 $V_{GS} = 0/18\text{ V}$ ,  $T_{vj} = 175\text{ °C}$ ,  $R_{G,ext} = 2.3\text{ }\Omega$ ,  $V_{DD} = 800\text{ V}$

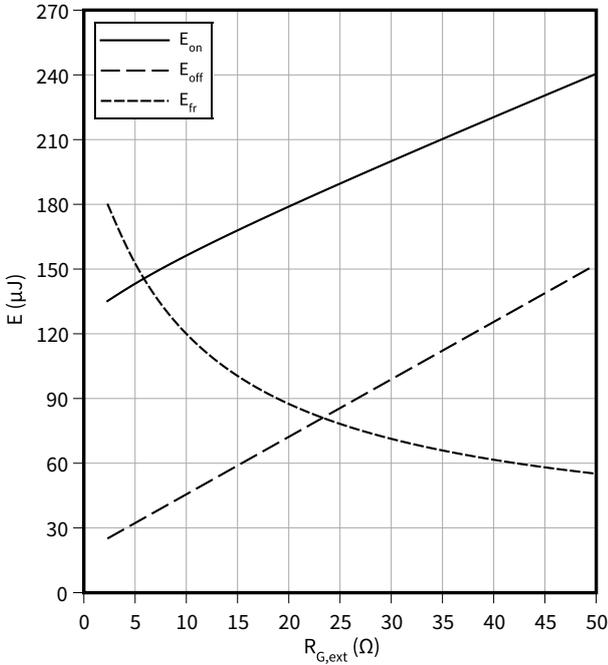


4 Characteristics diagrams

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

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

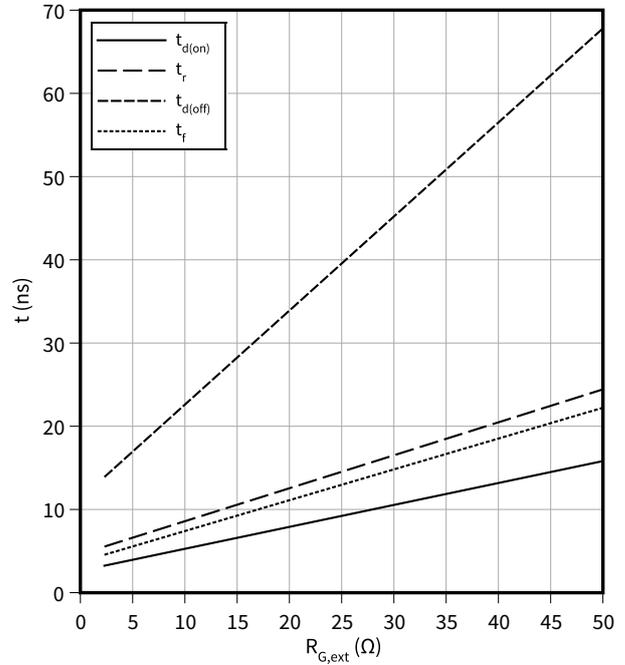
$V_{GS} = 0/18\text{ V}$ ,  $I_D = 9\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{DD} = 800\text{ V}$



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

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

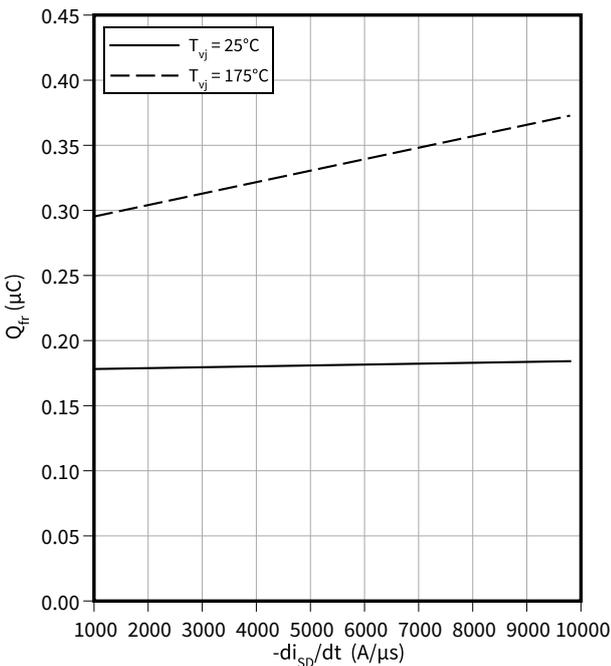
$V_{GS} = 0/18\text{ V}$ ,  $I_D = 9\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{DD} = 800\text{ V}$



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

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

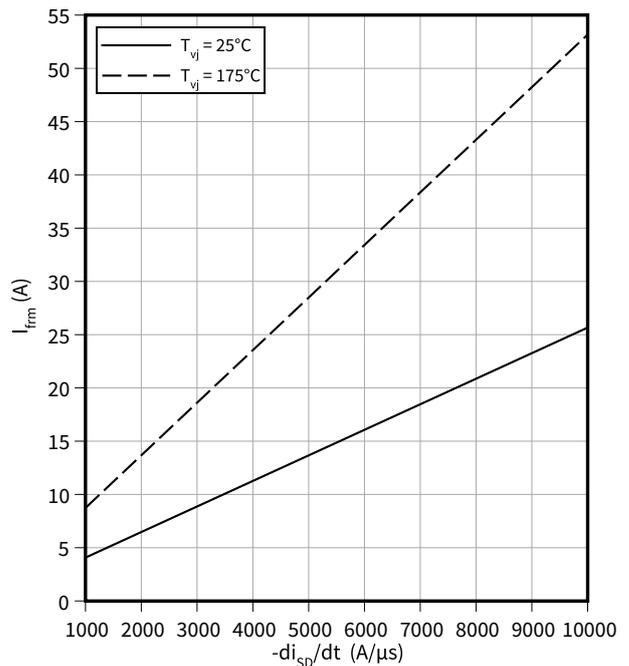
$V_{GS} = 0/18\text{ V}$ ,  $I_{SD} = 9\text{ A}$ ,  $V_{DD} = 800\text{ V}$



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

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

$V_{GS} = 0/18\text{ V}$ ,  $I_{SD} = 9\text{ A}$ ,  $V_{DD} = 800\text{ V}$



4 Characteristics diagrams

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

$E = f(t_{\text{dead}})$

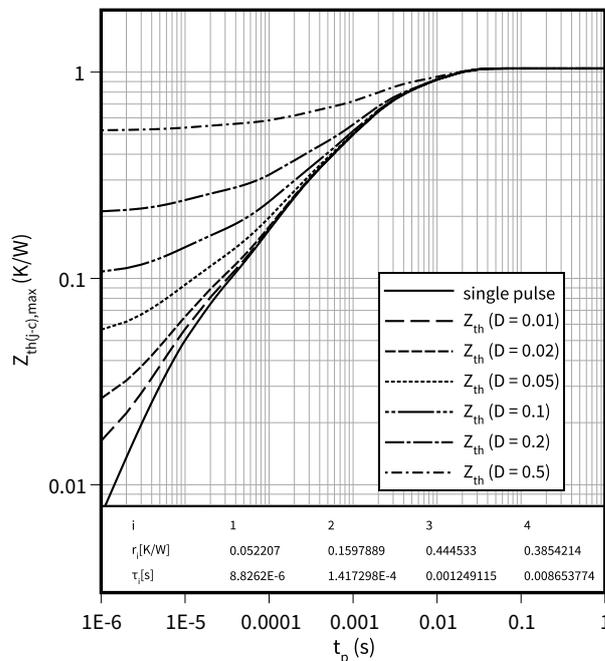
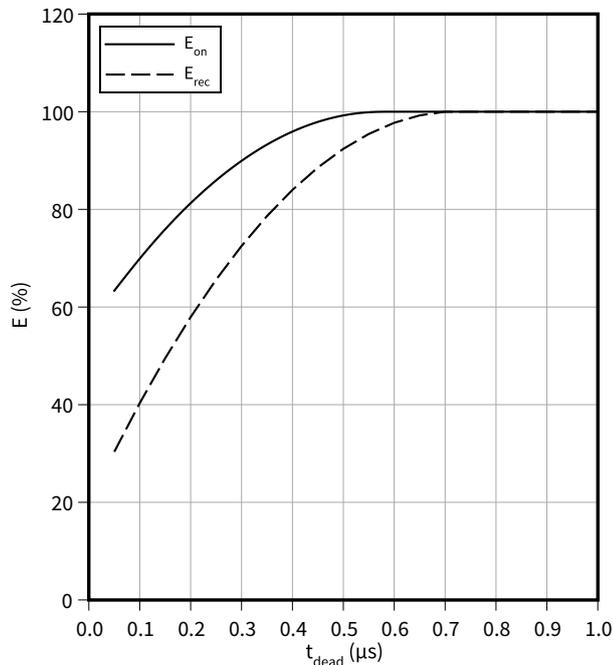
$I_D = 9\text{ A}$ ,  $V_{GS} = 0/18\text{ V}$ ,  $T_{vj} = 175\text{ °C}$ ,  $R_{G,\text{ext}} = 2.3\ \Omega$

$V_{DD} = 800\text{ V}$

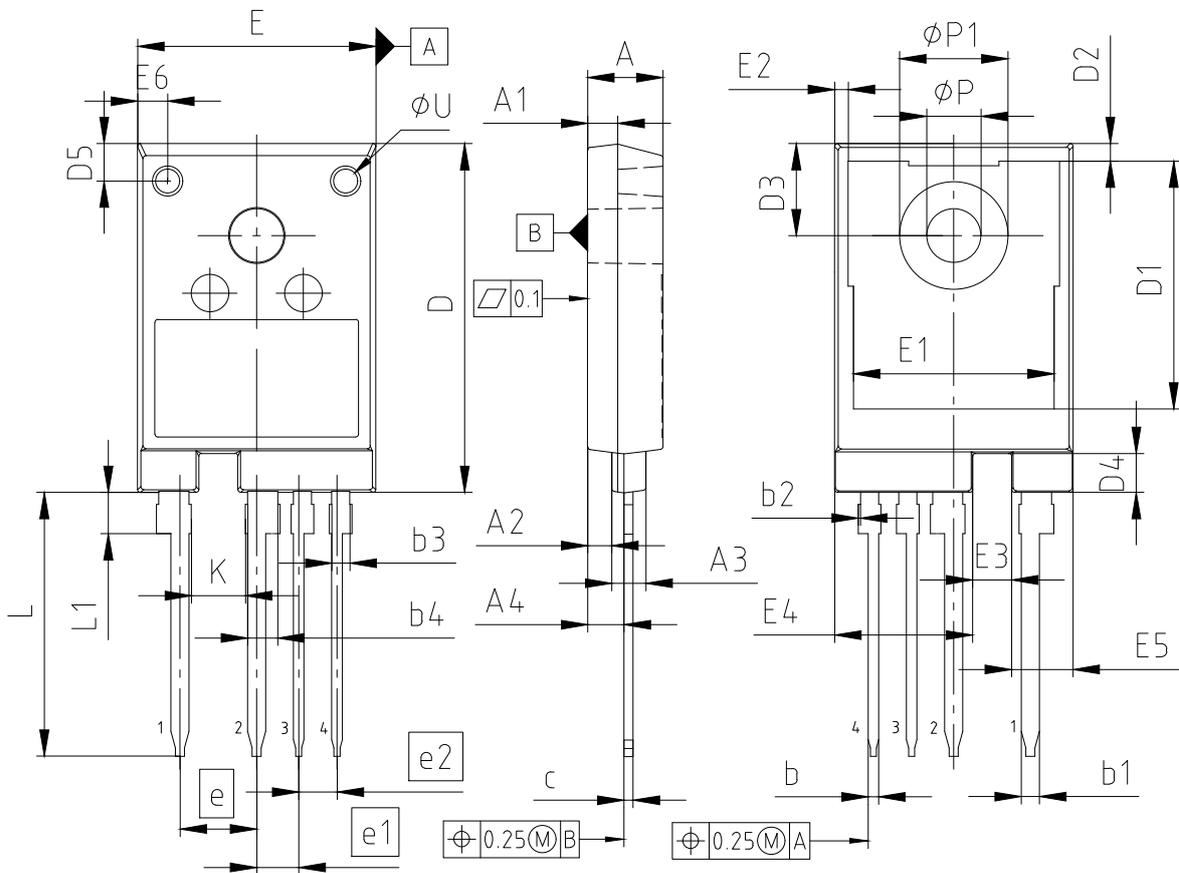
**Max. transient thermal impedance (MOSFET/diode)**

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

$D = t_p/T$



## 5 Package outlines



PACKAGE - GROUP NUMBER: **PG-T0247-4-U07**

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

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

Figure 1

## 6 Testing conditions

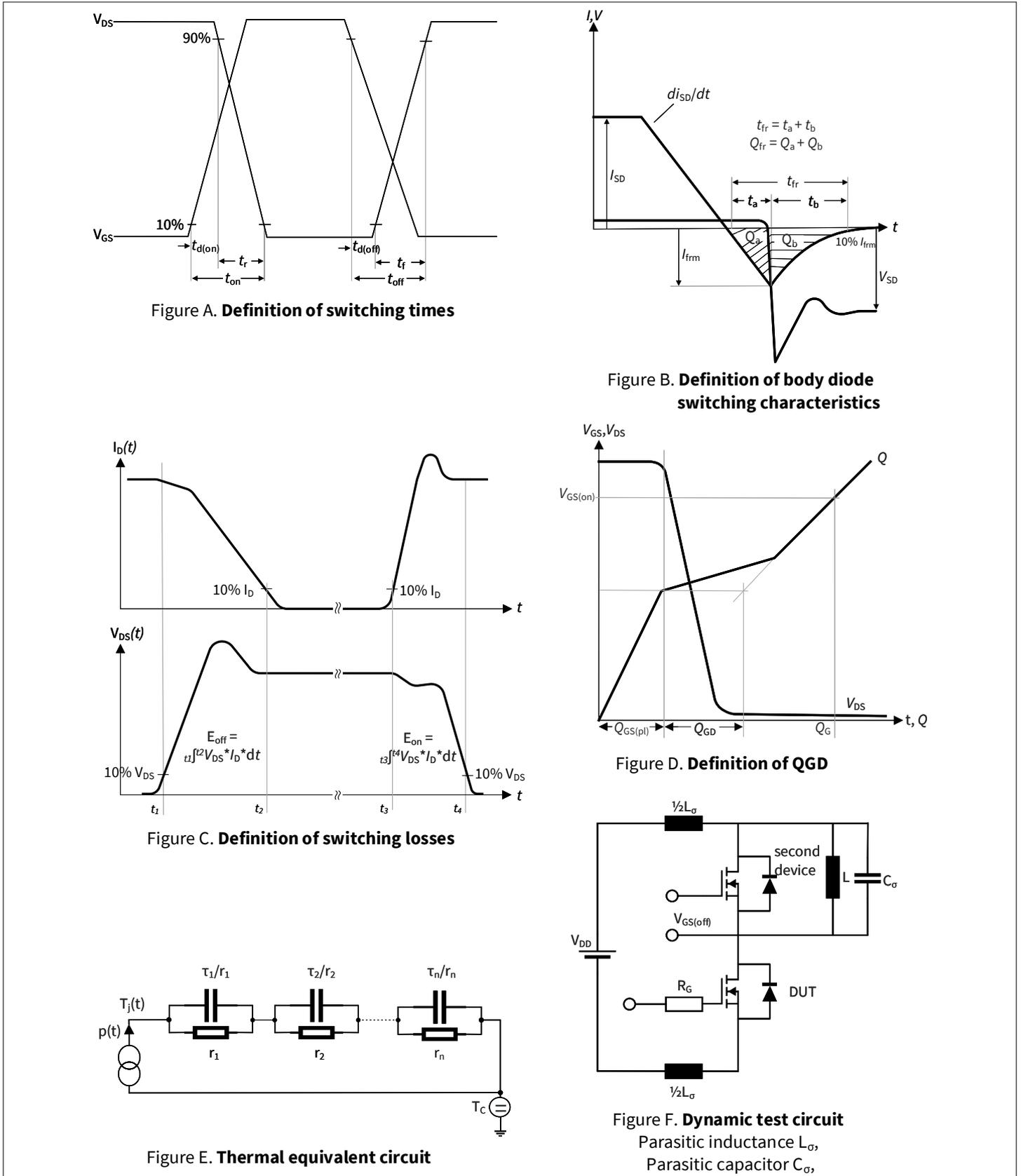


Figure 2

Revision history

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## Revision history

Document revision	Date of release	Description of changes
0.10	2024-09-06	Preliminary datasheet
1.00	2024-09-27	Final datasheet

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**IFX-ABL430-002**

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