Final datasheet

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

Features

- V_{DSS} = 1400 V at T_{vj} = 25°C
- I_{DDC} = 53 A at T_C = 100°C
- $R_{DS(on)}$ = 24 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
- 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
- String inverter
- Energy storage systems (ESS)
- Welding

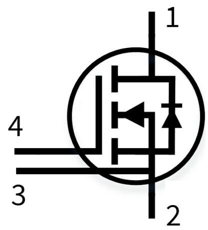
Product validation

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

Description

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
IMZC140R024M2H	PG-TO247-4-U07	14M2H024

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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	$R_{th(j-c)}$			0.35	0.46	K/W

2 MOSFET

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}	$T_{vj} \geq 25$ °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	74	A
			$T_c = 100$ °C	53	
Peak drain current, t_p limited by $T_{vj(max)}$ 1)	I_{DM}	$V_{GS} = 18$ V		265	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}	$I_D = 32.1$ A, $V_{DD} = 50$ V, $L = 0.8$ mH, $T_{vj(start)} = 25$ °C		401	mJ
Avalanche energy, repetitive	E_{AR}	$I_D = 32.1$ A, $V_{DD} = 50$ V, $L = 3.9$ µH, $T_{vj(start)} = 25$ °C		2	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	330	W
			$T_c = 100$ °C	160	

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	$R_{DS(on)}$	$I_D = 32.1$ A	$T_{vj} = 25$ °C, $V_{GS(on)} = 18$ V		24		mΩ
			$T_{vj} = 150$ °C, $V_{GS(on)} = 18$ V		51.6	67.6	
			$T_{vj} = 175$ °C, $V_{GS(on)} = 18$ V		60		
			$T_{vj} = 25$ °C, $V_{GS(on)} = 15$ V		30		
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}	$V_{DS} = 1400$ V, $V_{GS} = 0$ V	$T_{vj} = 25$ °C			240	μA
			$T_{vj} = 175$ °C		4.1		
Gate leakage current	I_{GSS}	$V_{DS} = 0$ V	$V_{GS} = 23$ V			120	nA
			$V_{GS} = -10$ V			-120	
Forward transconductance	g_{fs}	$I_D = 32.1$ A, $V_{DS} = 20$ V			21		S
Internal gate resistance	$R_{G,int}$	$f = 1$ MHz, $V_{AC} = 25$ mV			2.5		Ω
Input capacitance	C_{iss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 100$ kHz, $V_{AC} = 25$ mV			2290		pF
Output capacitance	C_{oss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 100$ kHz, $V_{AC} = 25$ mV			78		pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 100$ kHz, $V_{AC} = 25$ mV			7		pF
C_{oss} stored energy	E_{oss}	Calculated based on $C_{oss} = f(V_{DD})$			50		μJ
Output charge	Q_{oss}	Calculated based on $C_{oss} = f(V_{DD})$			137		nC
Effective output capacitance, energy related	$C_{o(er)}$	$V_{DS} = 0...1000$ V, $V_{GS} = 0$ V, Calculated based on E_{oss}			156		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}			171		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} = 1000 V, I_D = 32.1 A, V_{GS} = 0/18 V, turn-on pulse			62		nC
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 1000 V, I_D = 32.1 A, V_{GS} = 0/18 V, turn-on pulse			17.4		nC
Gate-drain charge	Q_{GD}	V_{DD} = 1000 V, I_D = 32.1 A, V_{GS} = 0/18 V, turn-on pulse			16.2		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 1000 V, I_D = 32.1 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		7.8		ns
			T_{vj} = 175 °C		6.8		
Rise time	t_r	V_{DD} = 1000 V, I_D = 32.1 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		4.6		ns
			T_{vj} = 175 °C		4.3		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 1000 V, I_D = 32.1 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		19		ns
			T_{vj} = 175 °C		21		
Fall time	t_f	V_{DD} = 1000 V, I_D = 32.1 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		7.6		ns
			T_{vj} = 175 °C		8.3		
Turn-on energy	E_{on}	V_{DD} = 1000 V, I_D = 32.1 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		288		µJ
			T_{vj} = 175 °C		888		
Turn-off energy	E_{off}	V_{DD} = 1000 V, I_D = 32.1 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		121		µJ
			T_{vj} = 175 °C		140		
Total switching energy[1)]	E_{tot}	V_{DD} = 1000 V, I_D = 32.1 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		482		µJ
			T_{vj} = 175 °C		1332		

(table continues...)

Table 4 **(continued) Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on energy at -5 V	E_{on}	V_{DD} = 1000 V, I_D = 32.1 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		288		µJ
			T_{vj} = 175 °C		912		
Turn-off energy at -5 V	E_{off}	V_{DD} = 1000 V, 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		55		µJ
			T_{vj} = 175 °C		65		
Total switching energy at -5 V[1)]	E_{tot}	V_{DD} = 1000 V, 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		416		µJ
			T_{vj} = 175 °C		1290		
Virtual junction temperature	T_{vj}			-55		175	°C

1) including E_{fr}

Note: *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)

Table 5 **Maximum rated values**

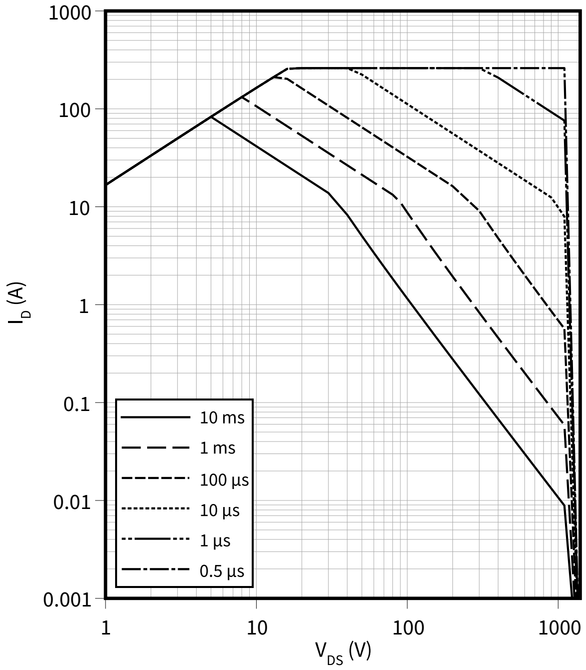
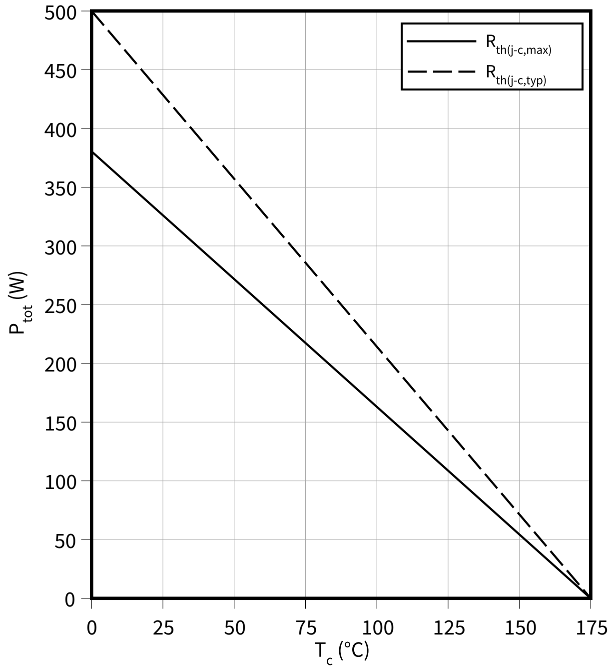
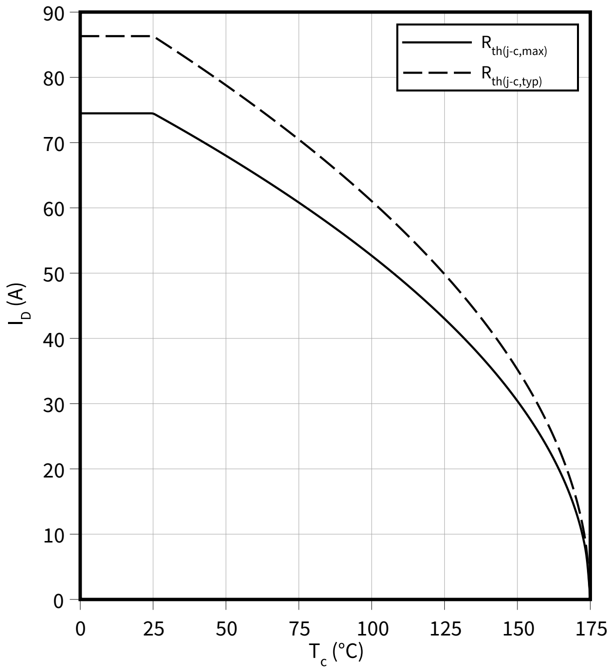
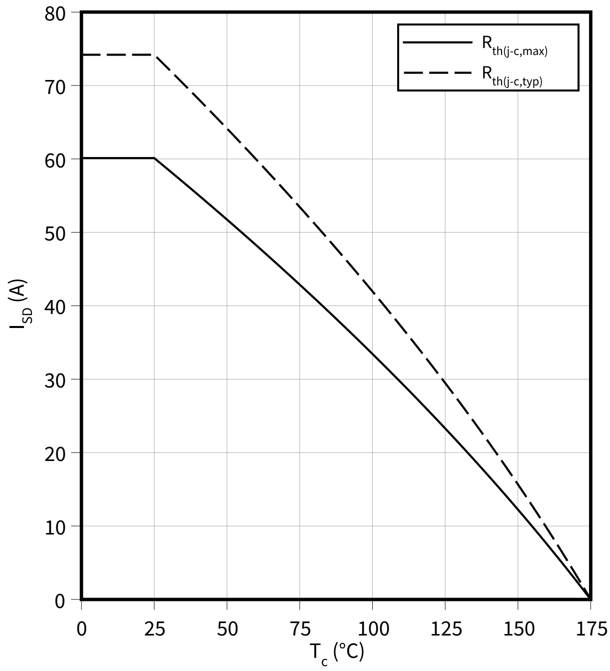
Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}	T_{vj} ≥ 25 °C		1400	V
Continuous reverse drain current for $R_{th(j\text{-}c,max)}$, limited by $T_{vj(max)}$	I_{SDC}	V_{GS} = 0 V	T_c = 25 °C	60	A
			T_c = 100 °C	33	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		159	A

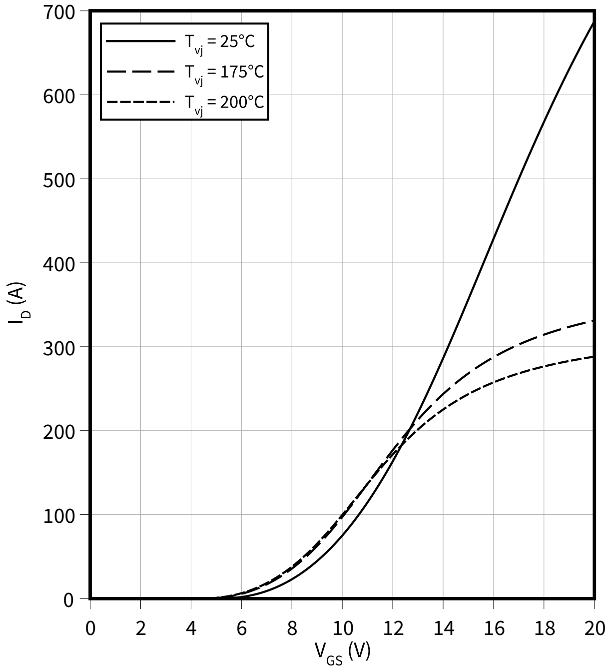
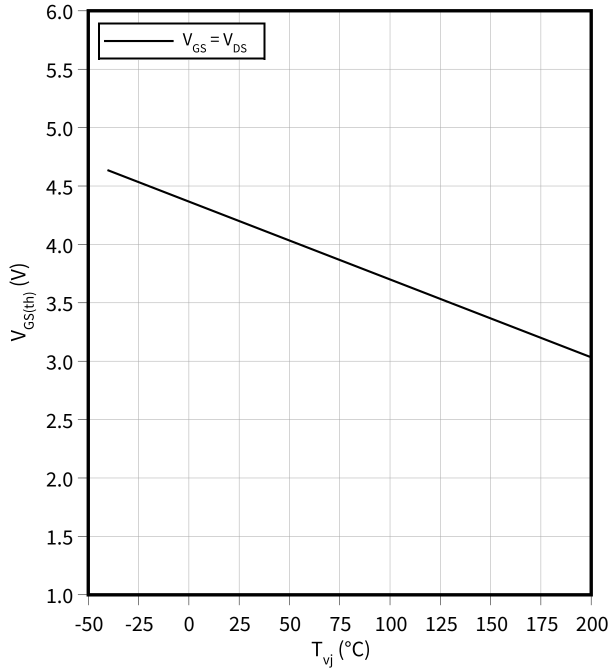
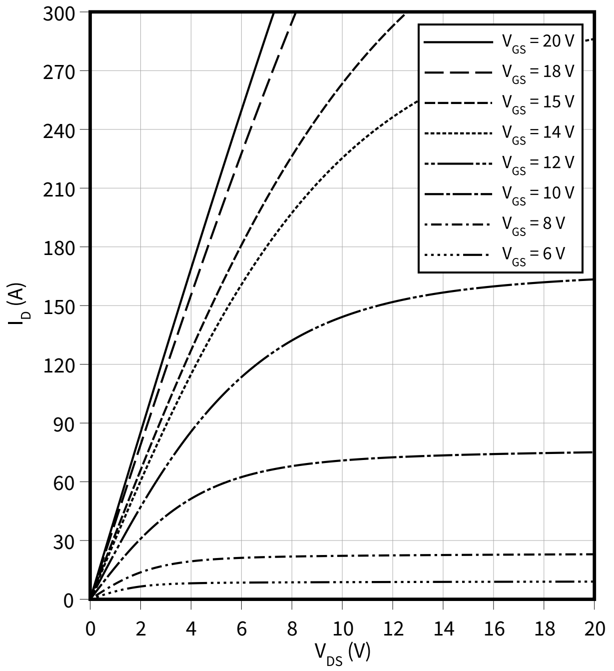
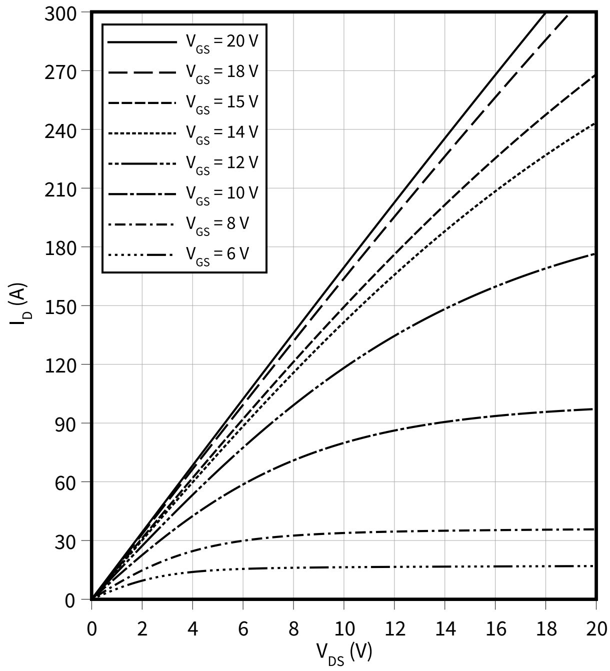
Table 6 **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source reverse voltage	V_{SD}	I_{SD} = 32.1 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} = 32.1 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		0.34		µC
			T_{vj} = 175 °C		1.06		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 1000 V, I_{SD} = 32.1 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		59		A
			T_{vj} = 175 °C		116		
MOSFET forward recovery energy	E_{fr}	V_{DD} = 1000 V, I_{SD} = 32.1 A, V_{GS} = 0 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		73		µJ
			T_{vj} = 175 °C		304		
MOSFET forward recovery energy at -5 V[1)]	E_{fr}	V_{DD} = 1000 V, I_{SD} = 32.1 A, V_{GS} = -5 V, $R_{GS(on)}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		73		µJ
			T_{vj} = 175 °C		313		
Virtual junction temperature	T_{vj}			-55		175	°C

1) including E_{fr}

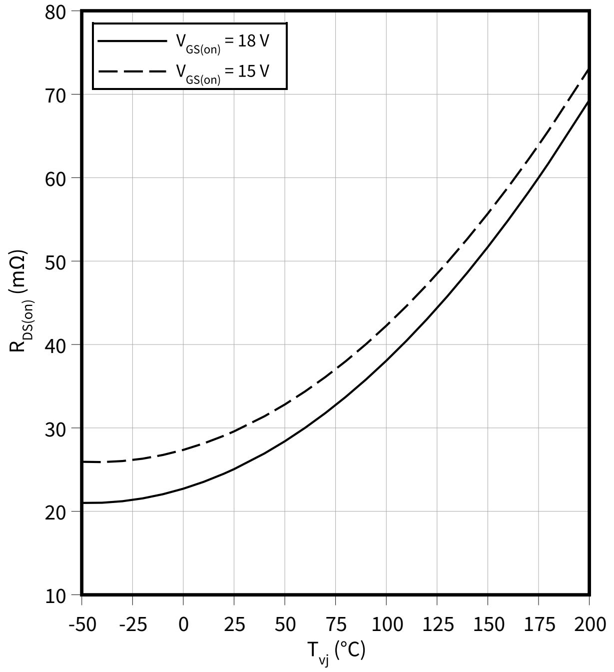
4 Characteristics diagrams

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 $V_{GS(th)} = f(T_{vj})$ $I_D = 10.1$ 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
	

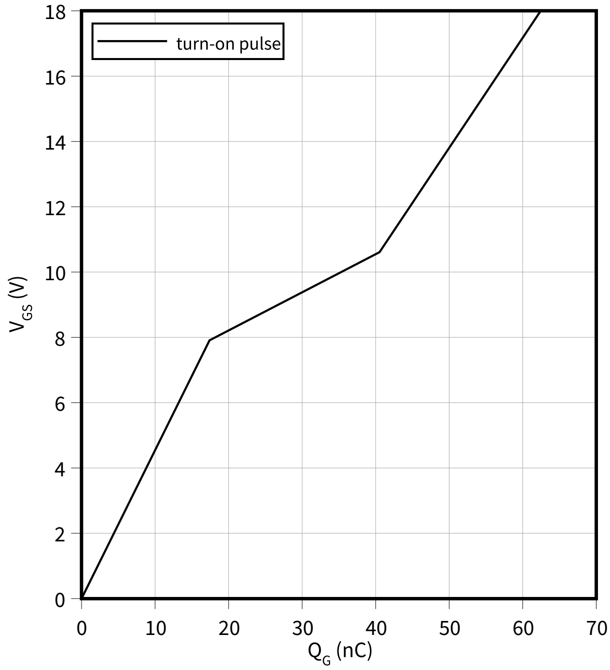
Typical on-state resistance as a function of junction temperature

$R_{DS(on)} = f(T_{vj})$
$I_D = 32.1$ A



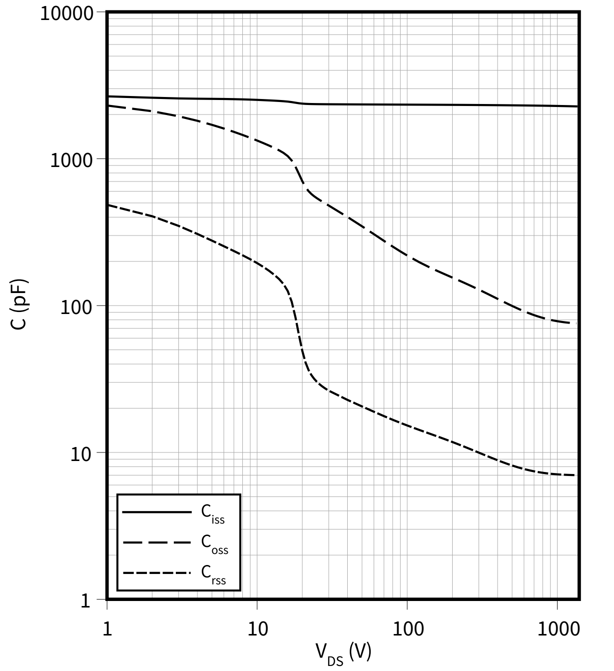
Typical gate charge

$V_{GS} = f(Q_G)$
$I_D = 32.1$ A, $V_{DS} = 1000$ V



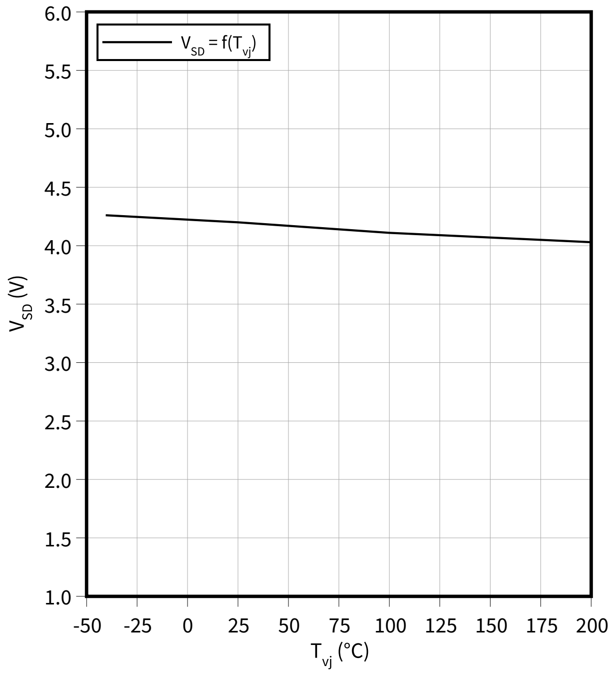
Typical capacitance as a function of drain-source voltage

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



Typical reverse drain voltage as a function of junction temperature

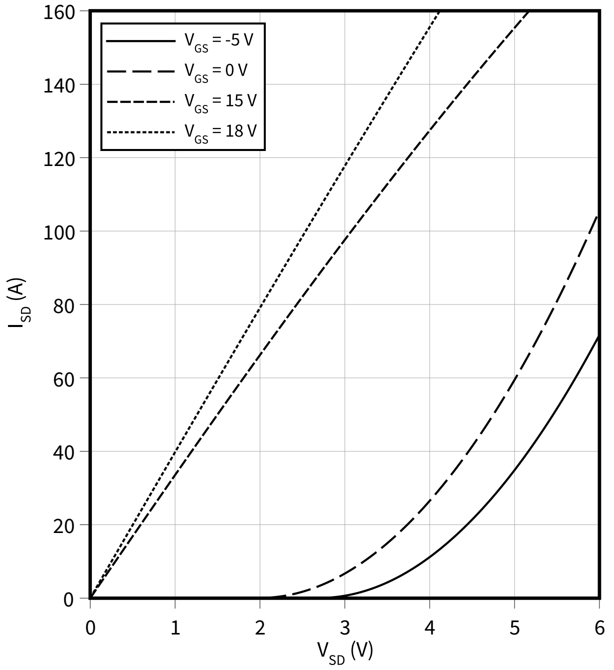
$V_{SD} = f(T_{vj})$
$I_{SD} = 32.1$ A, $V_{GS} = 0$ V



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

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

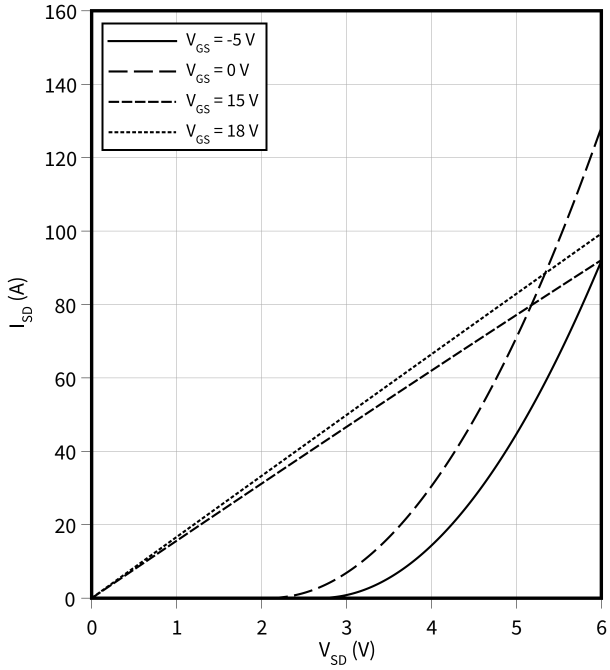
$T_{vj} = 25\ °C$, $t_p = 20\ µs$



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

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

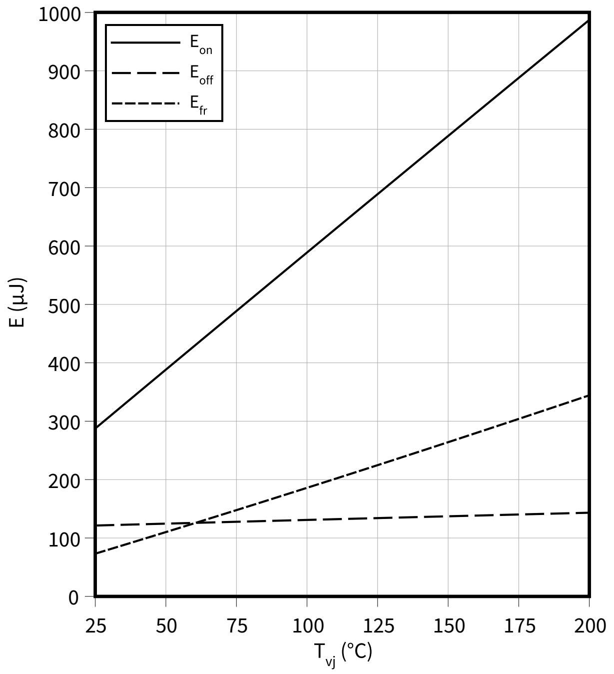
$T_{vj} = 175\ °C$, $t_p = 20\ µs$



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

$E = f(T_{vj})$

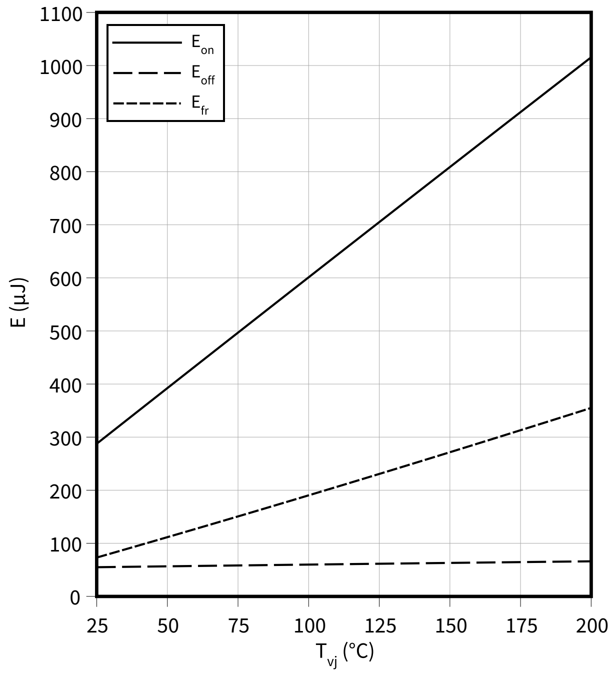
$V_{GS} = 0/18\ V$, $I_D = 32.1\ A$, $R_{G,ext} = 2.3\ \Omega$, $V_{DD} = 1000\ V$



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

$E = f(T_{vj})$

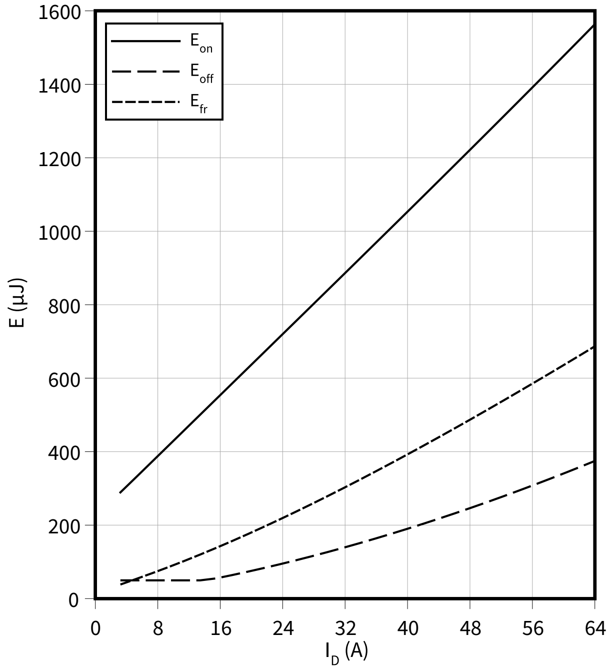
$V_{GS} = -5/18\ V$, $I_D = 32.1\ A$, $R_{G,ext} = 2.3\ \Omega$, $V_{DD} = 1000\ V$



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

$E = f(I_D)$

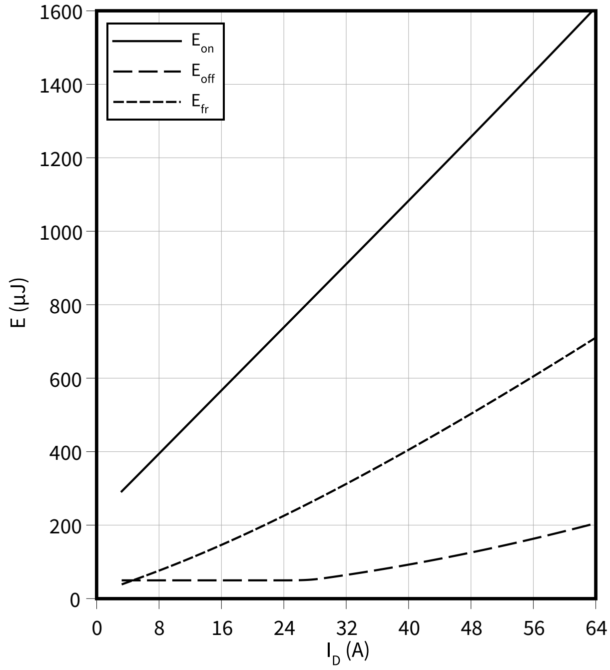
V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 1000 V



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

$E = f(I_D)$

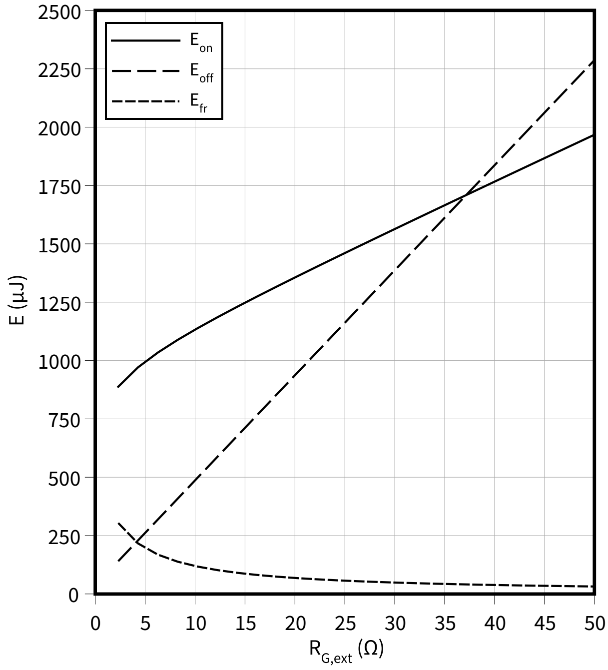
V_{GS} = -5/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 1000 V



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

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

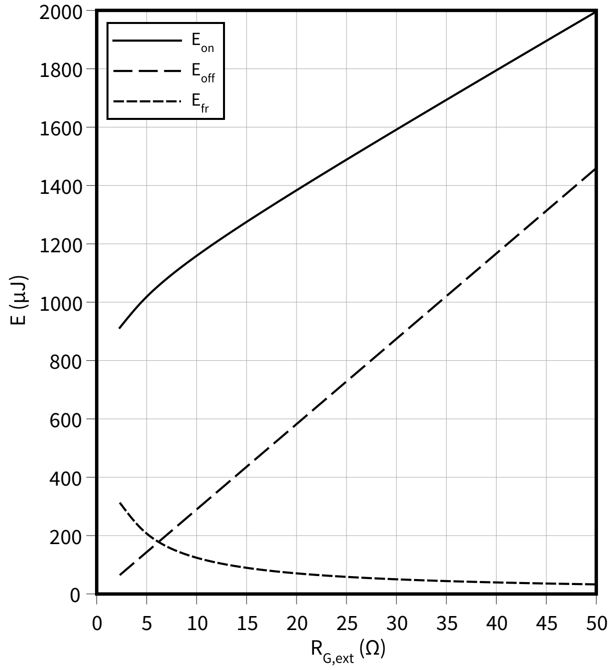
V_{GS} = 0/18 V, I_D = 32.1 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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

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

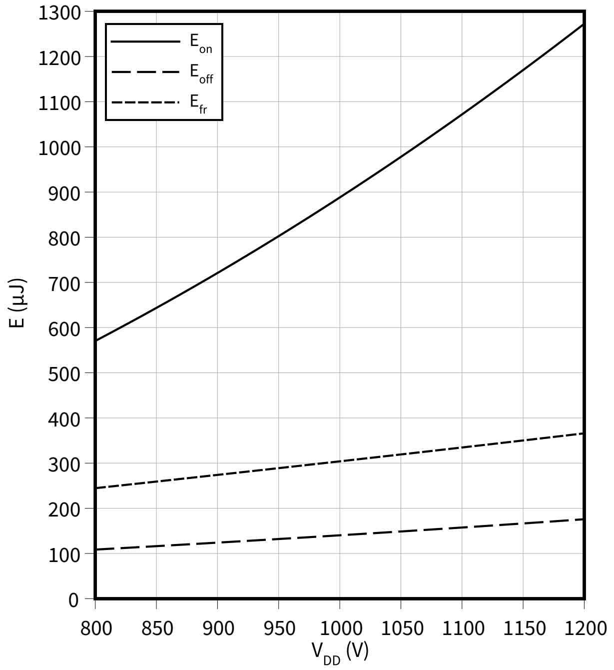
V_{GS} = -5/18 V, I_D = 32.1 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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

$E = f(V_{DD})$

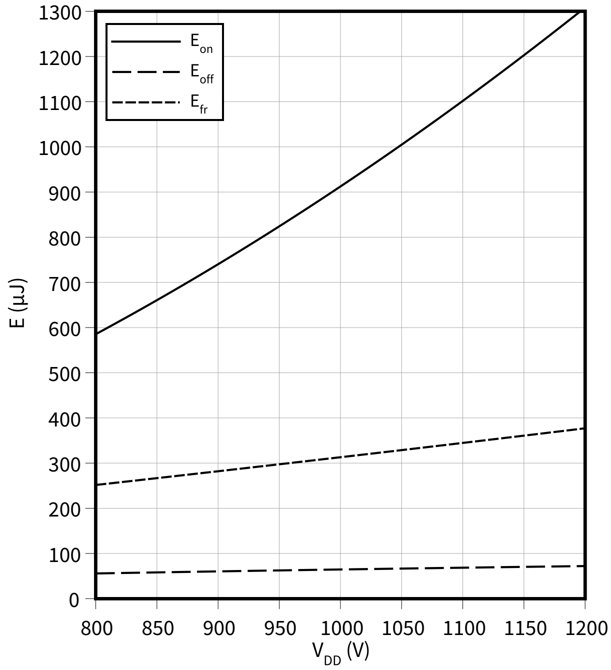
V_{GS} = 0/18 V, I_D = 32.1 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

$E = f(V_{DD})$

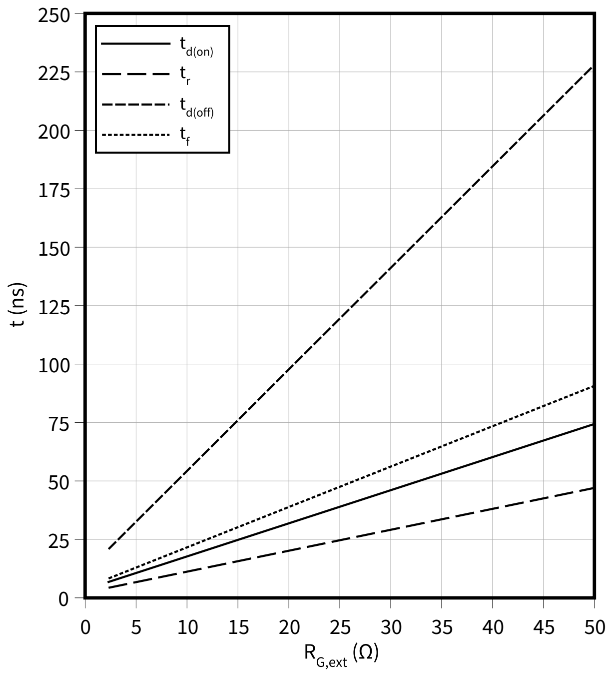
V_{GS} = -5/18 V, I_D = 32.1 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω



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

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

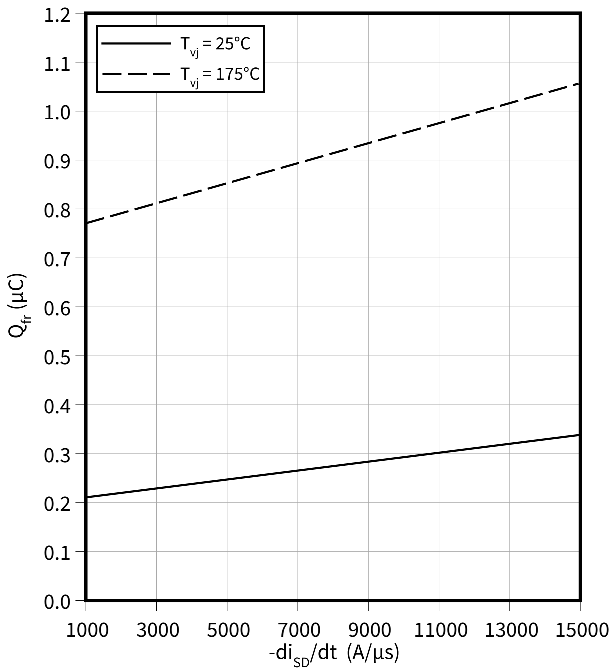
V_{GS} = 0/18 V, I_D = 32.1 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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

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

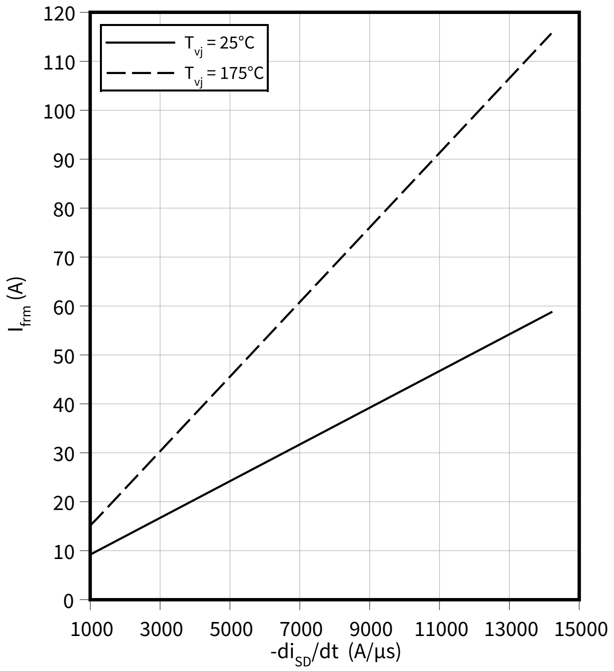
V_{GS} = 0/18 V, I_{SD} = 32.1 A, V_{DD} = 1000 V



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} = 32.1 A, V_{DD} = 1000 V

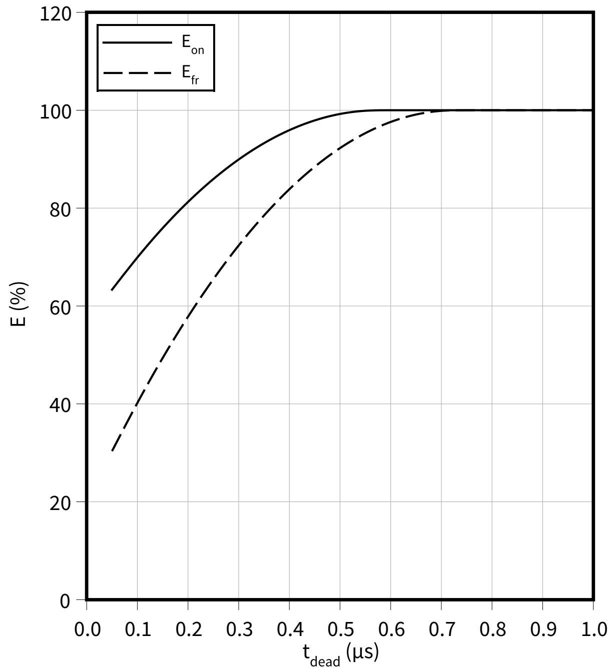


Typical switching energy as a function of dead time / blanking time, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V

$E = f(t_{dead})$

I_D = 32.1 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{GS} = 0/18 V

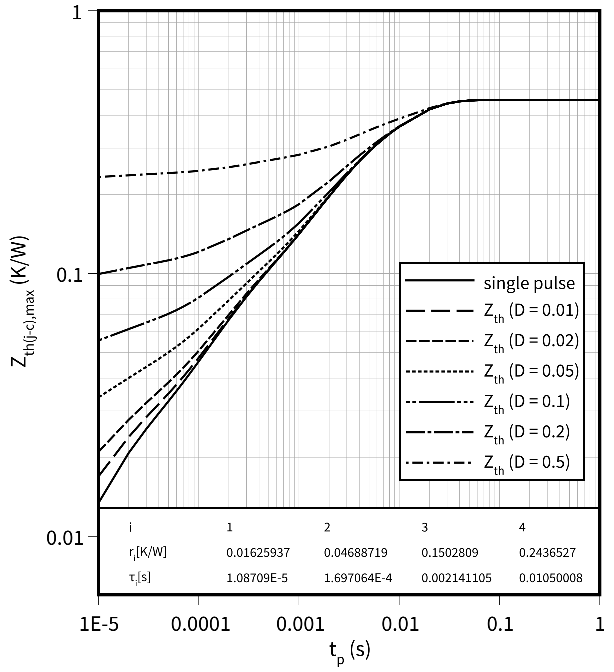
V_{DD} = 1000 V



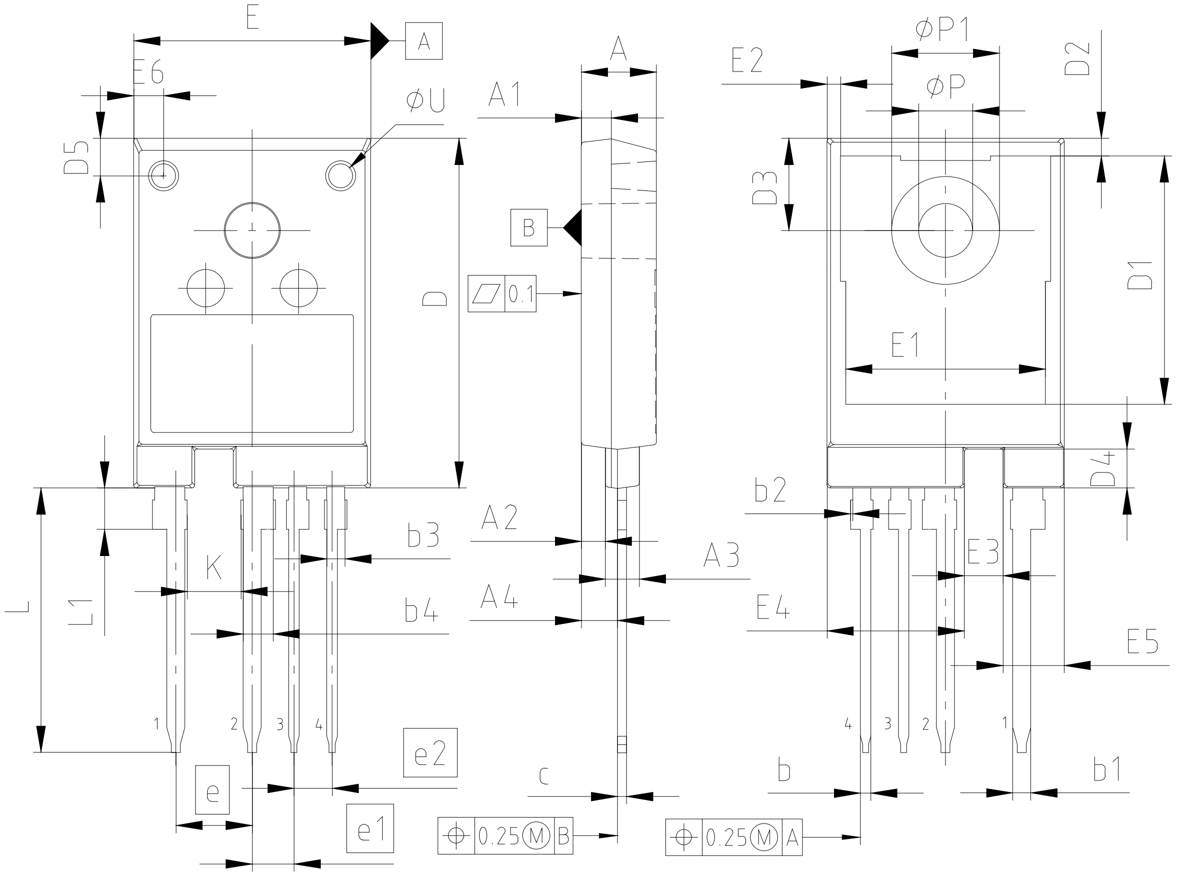
Max. transient thermal impedance (MOSFET/diode)

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

$D = t_p/T$



5 Package outlines



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

Figure 1

6 Testing conditions

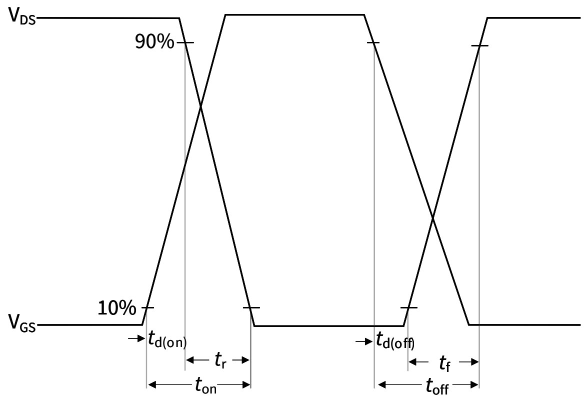


Figure A. **Definition of switching times**

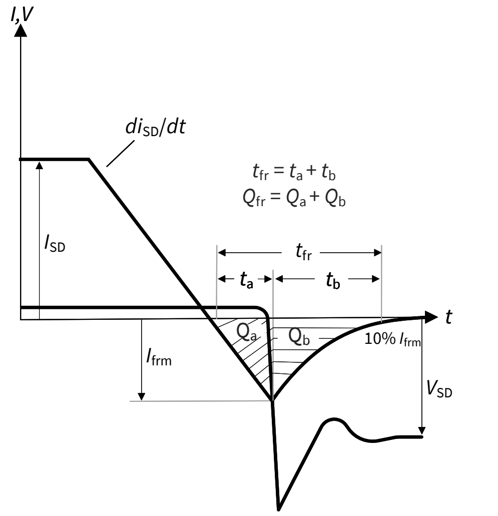


Figure B. **Definition of body diode switching characteristics**

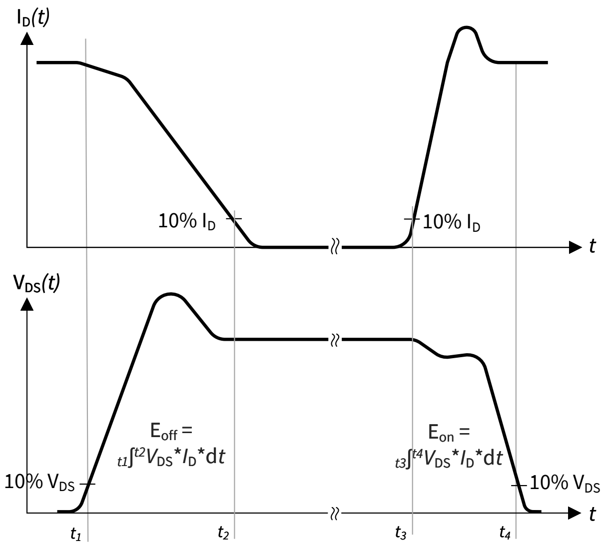


Figure C. **Definition of switching losses**

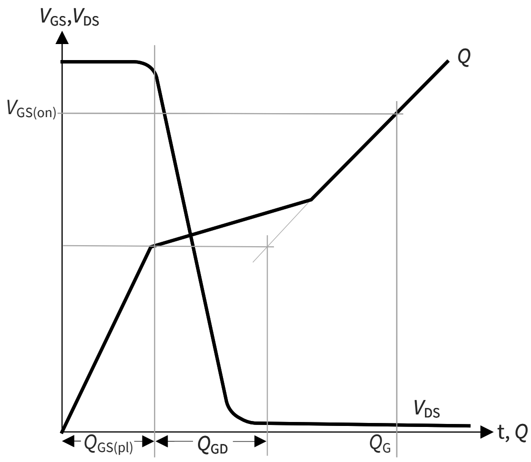


Figure D. **Definition of QGD**

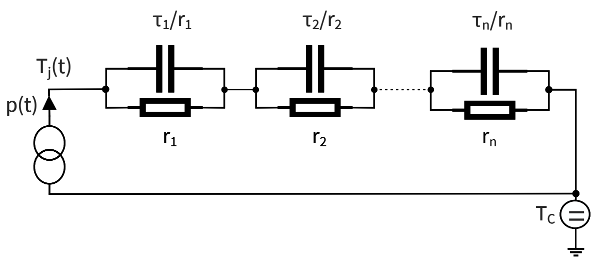


Figure E. **Thermal equivalent circuit**

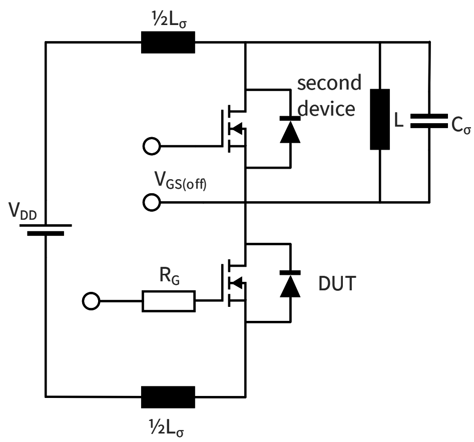


Figure F. **Dynamic test circuit**
Parasitic inductance L_{σ},
Parasitic capacitor C_{σ},

Figure 2

Revision history

Document revision	Date of release	Description of changes
0.10	2025-05-28	Preliminary datasheet
1.00	2025-06-12	Final datasheet

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