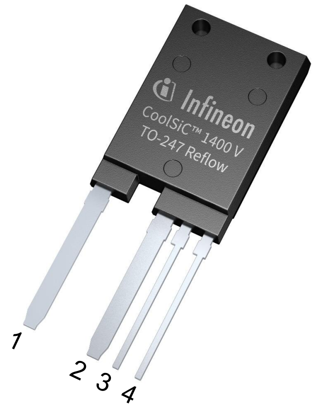
Final datasheet

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} = 58 A at T_C = 100°C
- $R_{DS(on)}$ = 24 mΩ at V_{GS} = 18 V, T_{vj} = 25°C
- Very low switching losses
- Package backside suitable for reflow soldering at 260°C, 3 times
- Overload operation up to T_{vj} = 200°C
- 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
- Wide power pins (2 mm) for high current capability
- Resistive weldable pins for direct busbar connections
- TO247PLUS package with high creepage distance 10.8 mm and CTI ≥ 600 V
- Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder



Halogen-free
Green
Lead-free
RoHS

Potential applications

- Commercial, construction and agricultural vehicles (CAV)
- EV Charging
- Online UPS / Industrial UPS
- String inverter
- Energy storage systems (ESS)
- General purpose drives (GPD)

Product validation

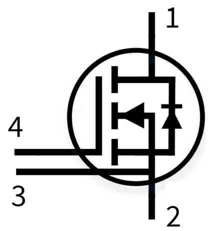
- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

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
IMYR140R024M2H	PG-TO247-4-U08	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 1.6 mm (0.063 in.) from case for 10 s			260	°C
		Reflow soldering (MSL2 according to JEDEC J-STD-020)			260	
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
Comparative Tracking Index	*CTI*	IEC 60112 (material group 1 according to IEC 60664-1)	600			V

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	82	A
			$T_c = 100$ °C	58	
Peak drain current, t_p limited by $T_{vj(max)}$ 1)	I_{DM}	$V_{GS} = 18$ V		260	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	326	W
			$T_c = 100$ °C	163	

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			22		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			7.1		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}			155		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			72		nC
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 1000 V, I_D = 32.1 A, V_{GS} = 0/18 V, turn-on pulse			23.8		nC
Gate-drain charge	Q_{GD}	V_{DD} = 1000 V, I_D = 32.1 A, V_{GS} = 0/18 V, turn-on pulse			14		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		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		4.1		ns
			T_{vj} = 175 °C		3.8		
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		18		ns
			T_{vj} = 175 °C		20		
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		412		µJ
			T_{vj} = 175 °C		903		
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		78		µJ
			T_{vj} = 175 °C		104		
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		670		µJ
			T_{vj} = 175 °C		1597		

(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		371		µJ
			T_{vj} = 175 °C		943		
Turn-off energy at -5 V	E_{off}	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		68		µJ
			T_{vj} = 175 °C		72		
Total switching energy at -5 V[1)]	E_{tot}	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		561		µJ
			T_{vj} = 175 °C		1630		
Virtual junction temperature	T_{vj}			-55		175	°C
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h[2)]				200	°C

1) including E_{fr}
2) up to 5000 cycles. Maximum ΔT limited to 100 K.

***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 $R_{th(j-c,max)}$, limited by $T_{vj(max)}$	I_{SDC}	V_{GS} = 0 V	T_c = 25 °C	60	A
			T_c = 100 °C	33.7	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		174	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, $R_{G,ext}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		0.28		µC
			T_{vj} = 175 °C		1.09		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 1000 V, I_{SD} = 32.1 A, V_{GS} = 0 V, $R_{G,ext}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		50		A
			T_{vj} = 175 °C		100		
MOSFET forward recovery energy	E_{fr}	V_{DD} = 1000 V, I_{SD} = 32.1 A, V_{GS} = 0 V, $R_{G,ext}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		180		µJ
			T_{vj} = 175 °C		590		
MOSFET forward recovery energy at -5 V	E_{fr}	V_{DD} = 1000 V, I_{SD} = 32.1 A, V_{GS} = -5 V, $R_{G,ext}$ = 2.3 Ω, Q_{fr} includes also Q_C	T_{vj} = 25 °C		122		µJ
			T_{vj} = 175 °C		615		
Virtual junction temperature	T_{vj}			-55		175	°C
Virtual junction temperature	$T_{vj(over)}$	overload, cumulative max. 100 h[1)]				200	°C

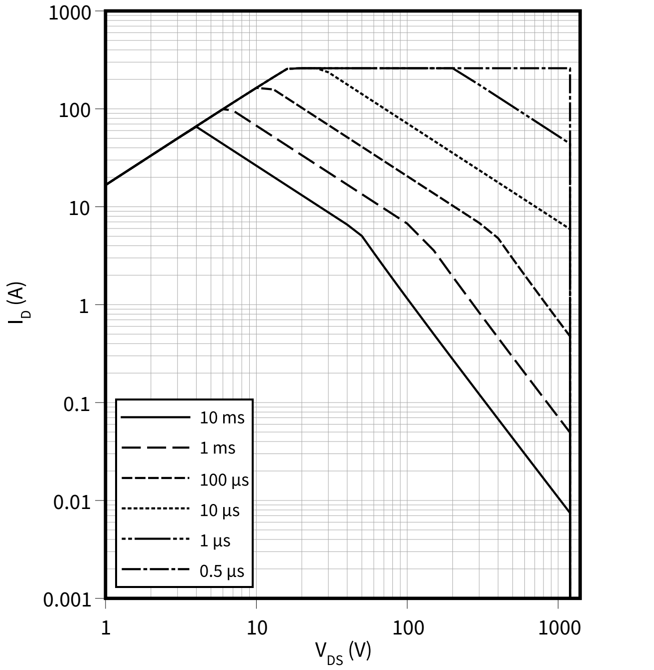
1) up to 5000 cycles. Maximum ΔT limited to 100 K.

4 Characteristics diagrams

Safe operating area (SOA)

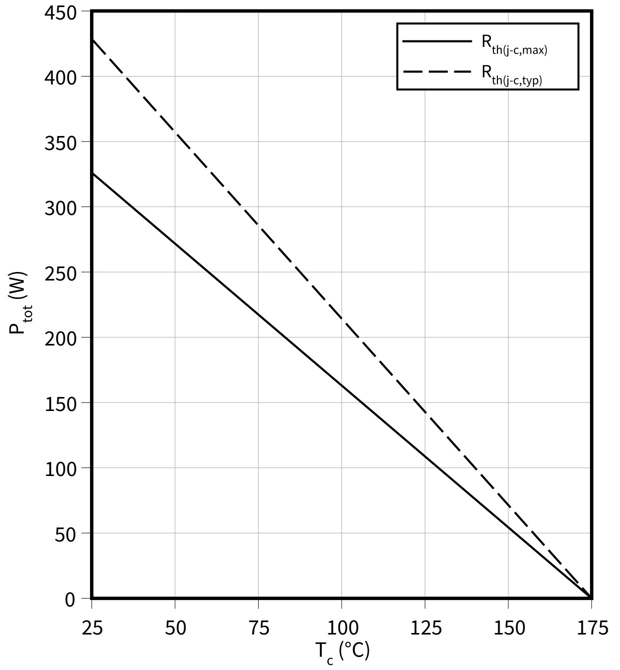
$I_D = f(V_{DS})$

$T_{vj} \leq 175\ °C$, $T_c = 25\ °C$



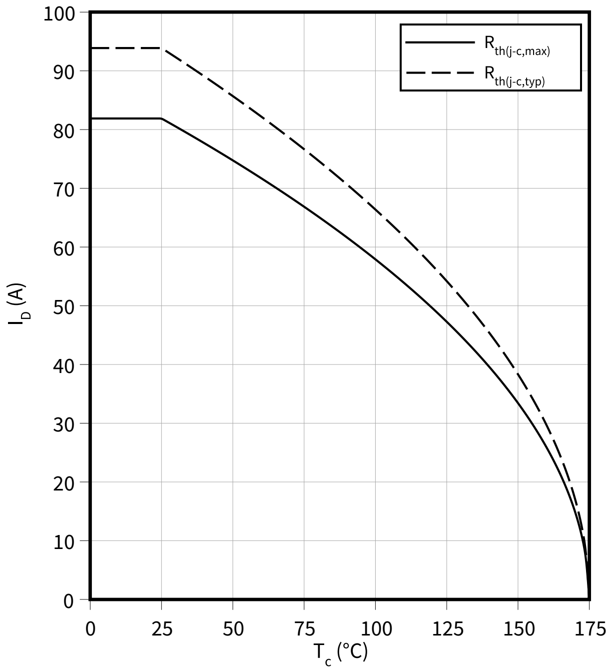
Power dissipation as a function of case temperature limited by bond wire

$P_{tot} = f(T_c)$



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

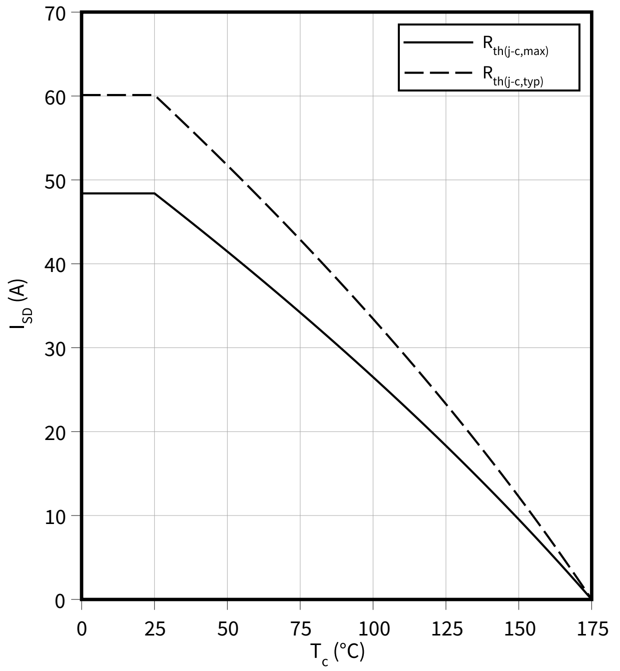
$I_D = f(T_c)$



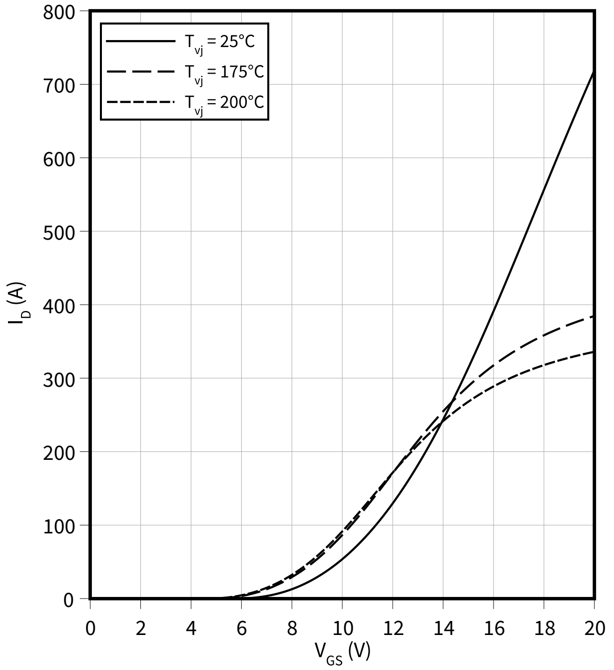
Maximum source to drain current as a function of case temperature limited by bond wire

$I_{SD} = f(T_c)$

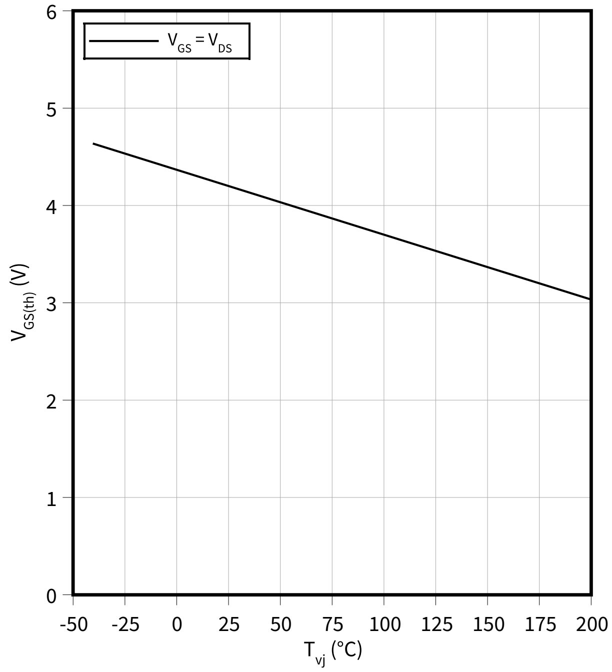
$V_{GS} = 0\ V$



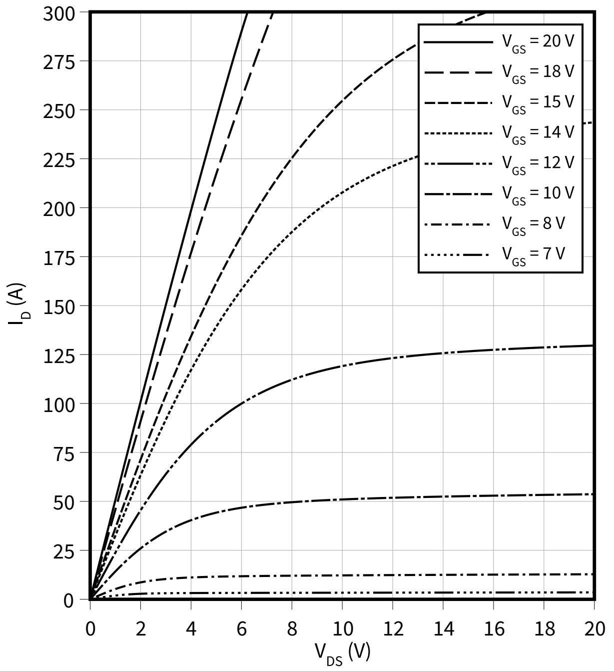
Typical transfer characteristic
$I_D = f(V_{GS})$
$V_{DS} = 20\ V$, $t_p = 20\ \mu s$



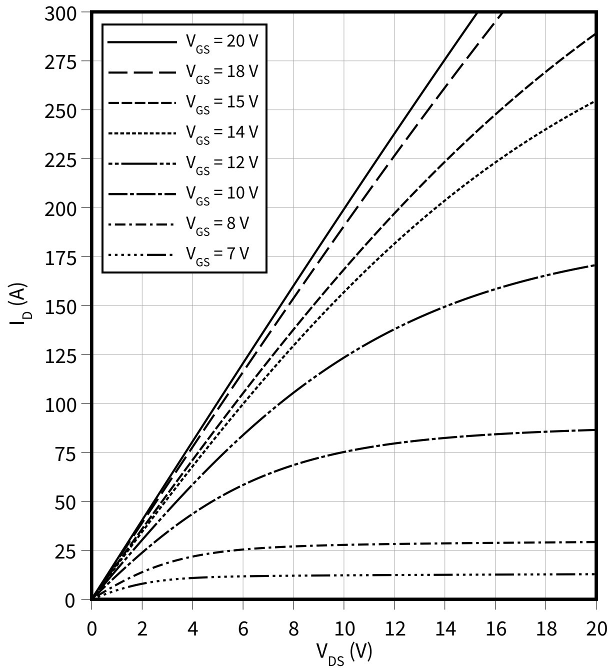
Typical gate-source threshold voltage as a function of junction temperature
$V_{GS(th)} = f(T_{vj})$
$I_D = 10.1\ mA$



Typical output characteristic, V_{GS} as a parameter
$I_D = f(V_{DS})$
$T_{vj} = 25\ °C$, $t_p = 20\ \mu s$



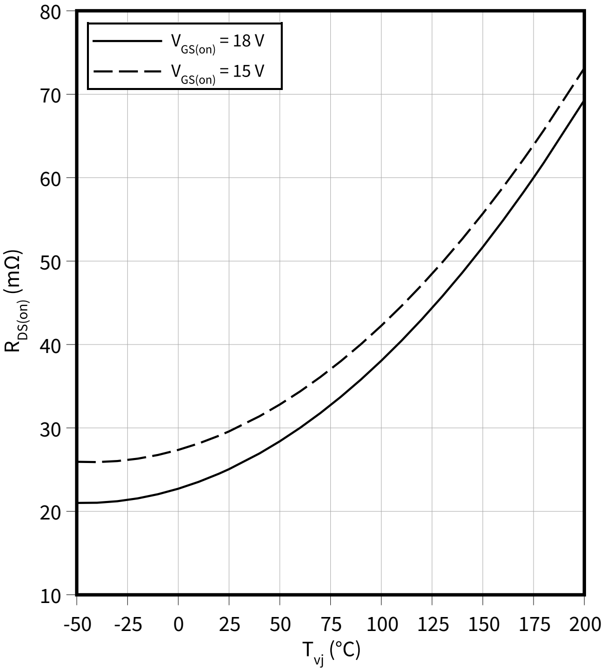
Typical output characteristic, V_{GS} as a parameter
$I_D = f(V_{DS})$
$T_{vj} = 175\ °C$, $t_p = 20\ \mu s$



Typical on-state resistance as a function of junction temperature

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

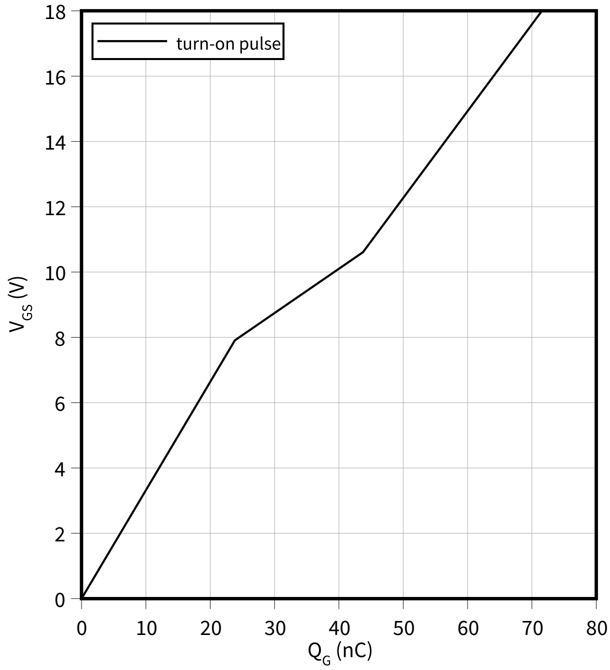
$I_D = 32.1$ A



Typical gate charge

$V_{GS} = f(Q_G)$

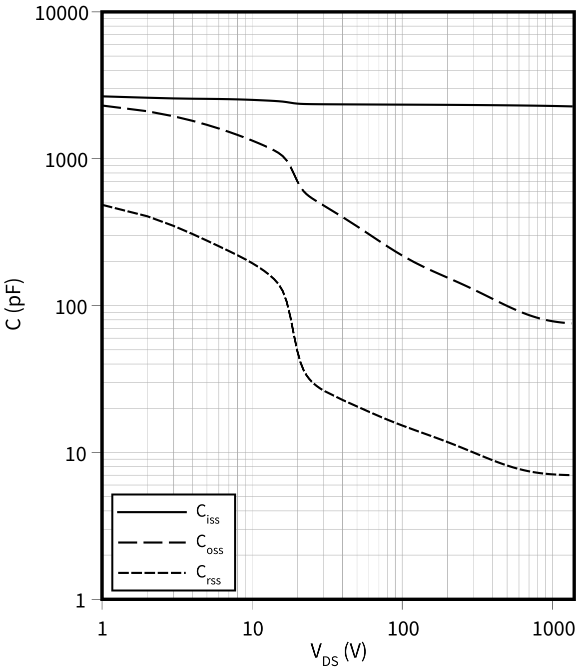
$I_D = 32.1$ A, $V_{DS} = 1000$ V



Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$

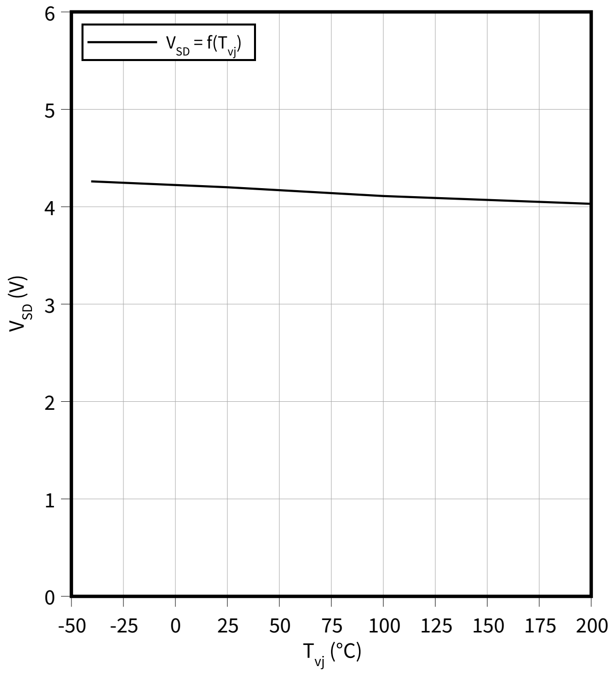
f = 100 kHz, $V_{GS} = 0$ V



Typical reverse drain voltage as a function of junction temperature

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

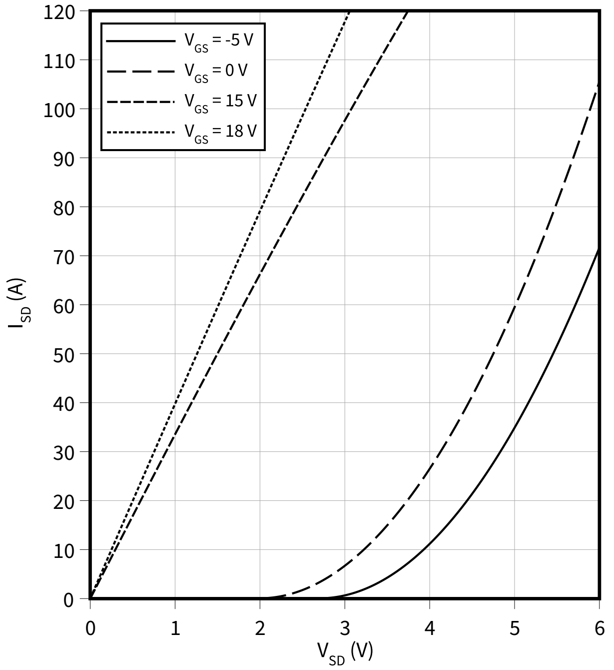
$I_{SD} = 32.1$ A, $V_{GS} = 0$ V



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

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

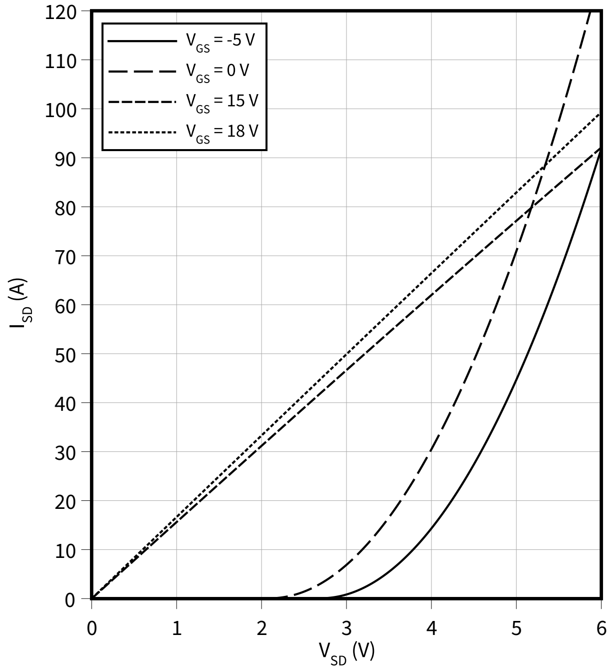
$T_{vj} = 25\ °C$, $t_p = 20\ \mu s$



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

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

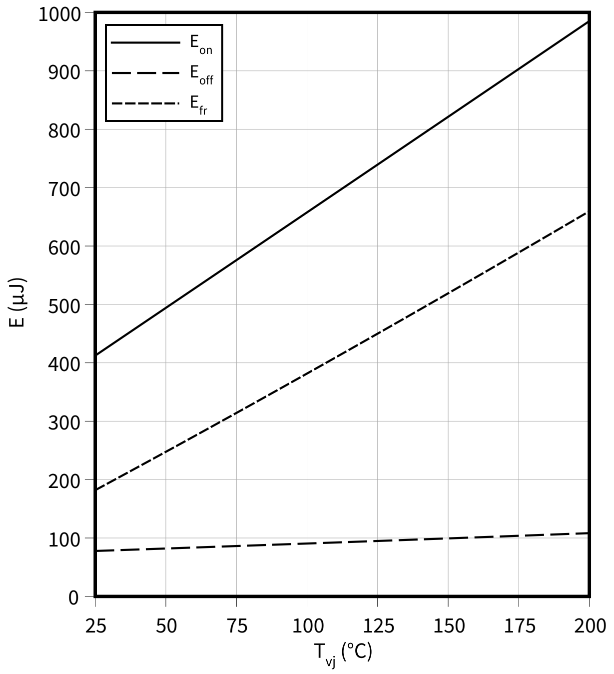
$T_{vj} = 175\ °C$, $t_p = 20\ \mu s$



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

$E = f(T_{vj})$

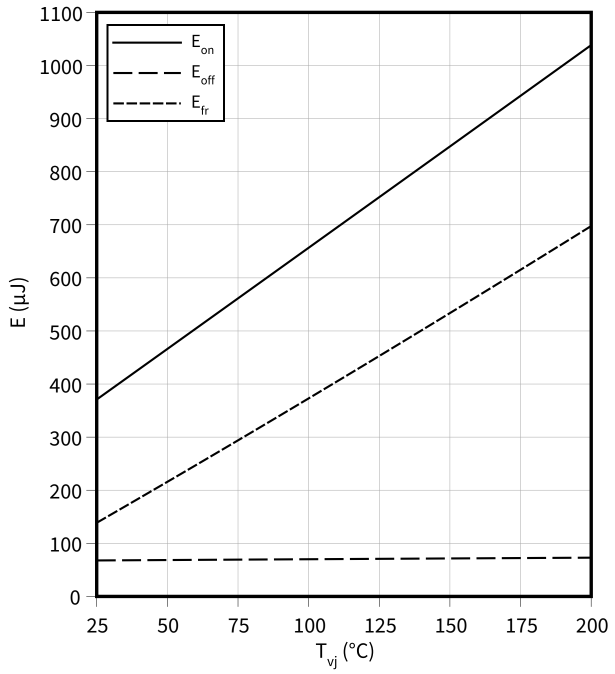
$V_{GS} = 0/18\ V$, $I_D = 32.1\ A$, $R_{G,ext} = 2.3\ \Omega$, $V_{DD} = 1000\ V$



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

$E = f(T_{vj})$

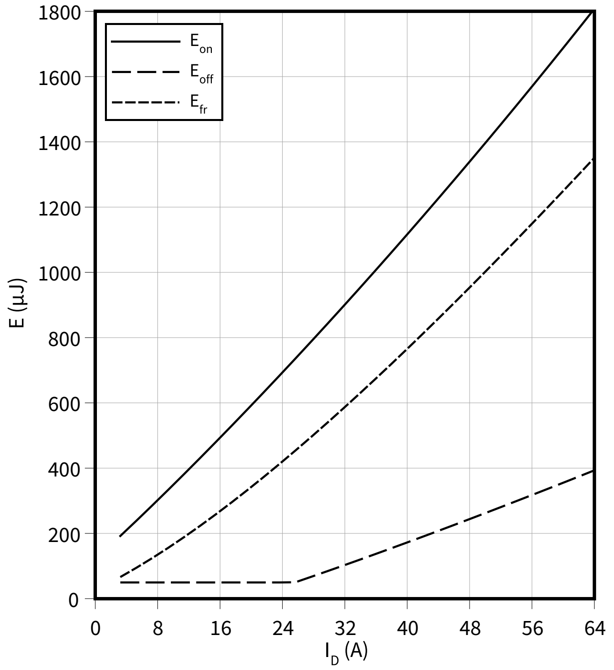
$V_{GS} = -5/18\ V$, $I_D = 32.1\ A$, $R_{G,ext} = 2.3\ \Omega$, $V_{DD} = 1000\ V$



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)

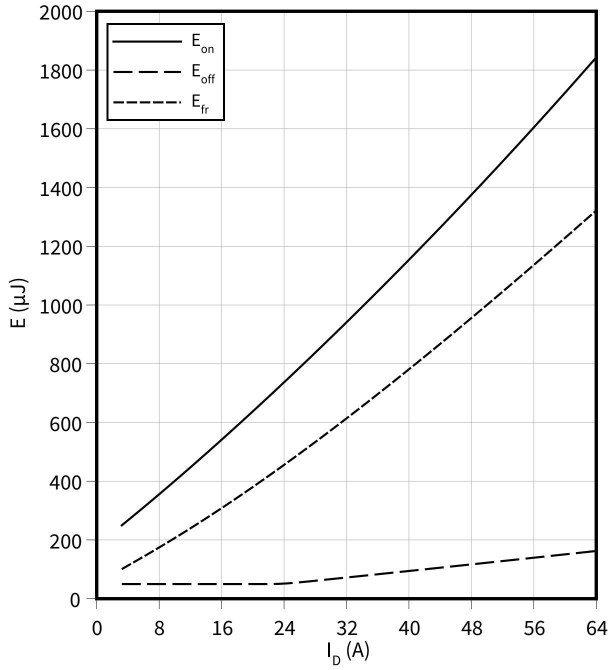
V_{GS} = 0/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 1000 V



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)

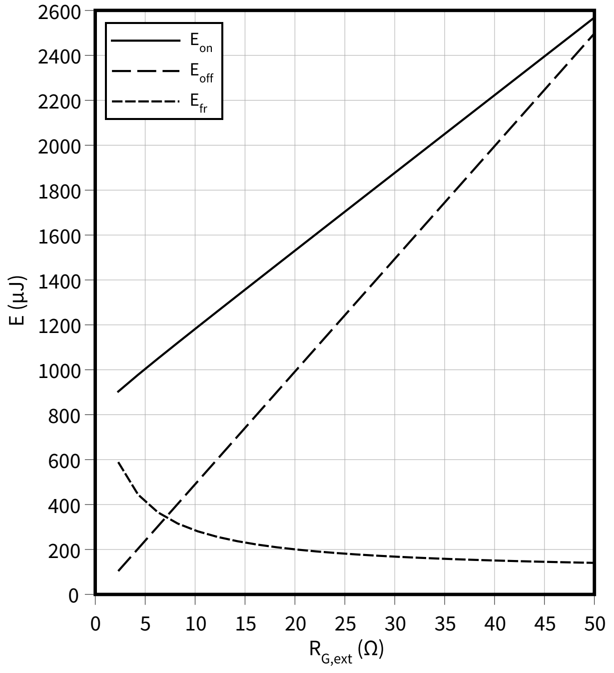
V_{GS} = -5/18 V, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω, V_{DD} = 1000 V



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($R_{G,ext}$)

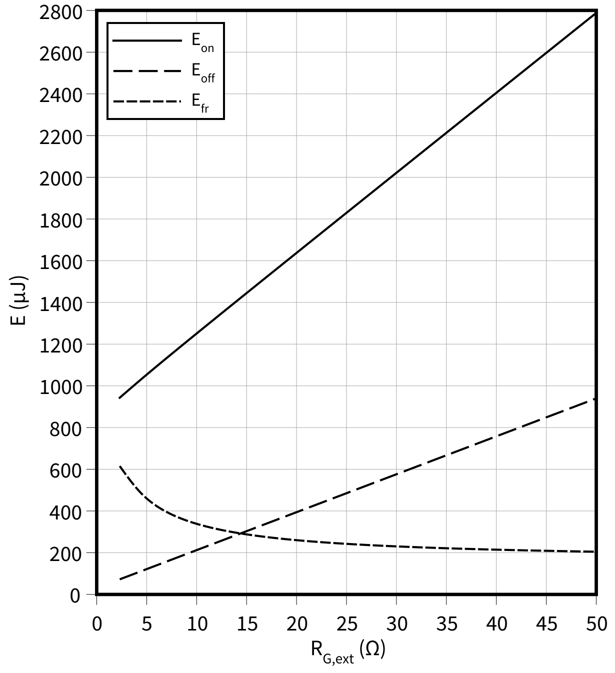
V_{GS} = 0/18 V, I_D = 32.1 A, T_{vj} = 175 °C, V_{DD} = 1000 V

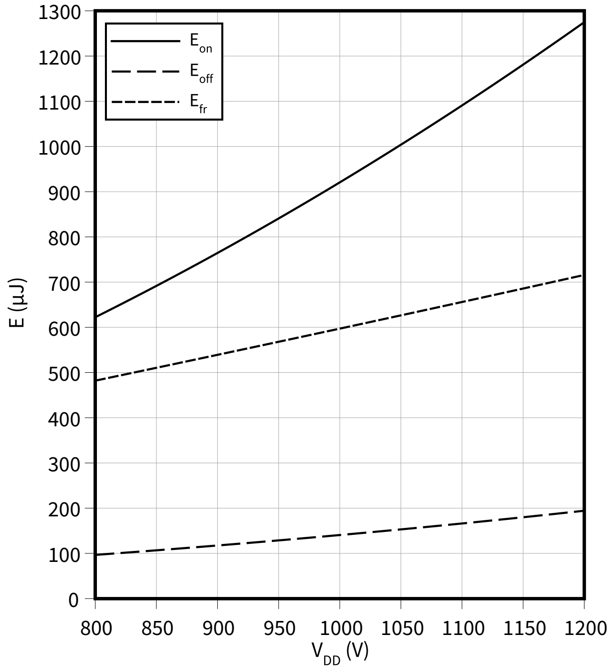
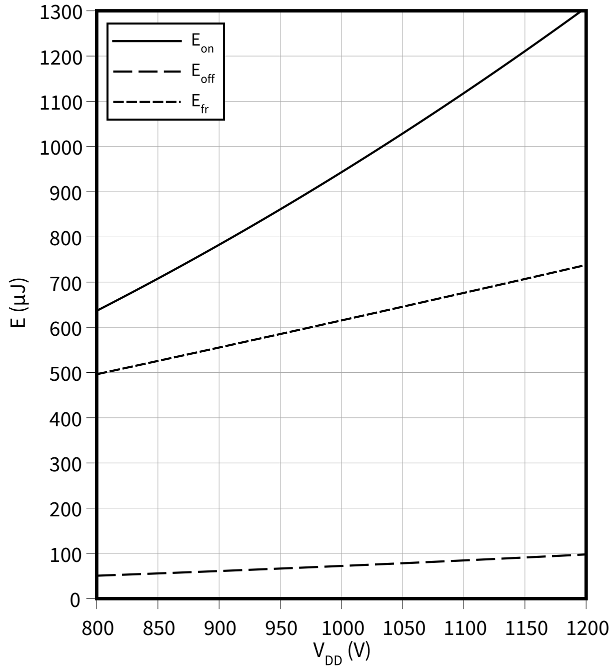
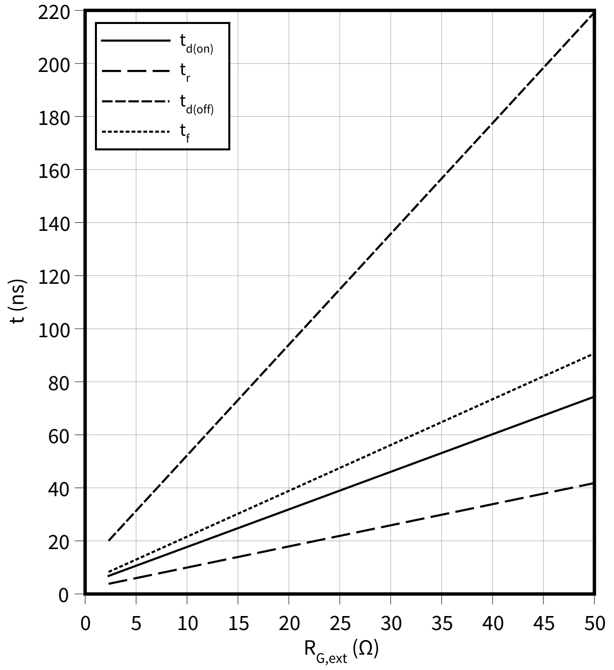
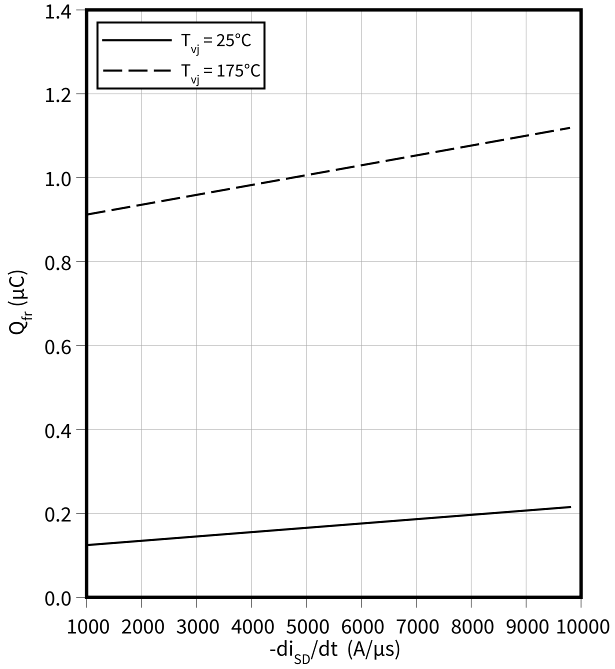


Typical switching energy as a function of gate resistance, test circuit in Fig. F, 2nd device own body diode: V_{GS} = -5 V

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

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

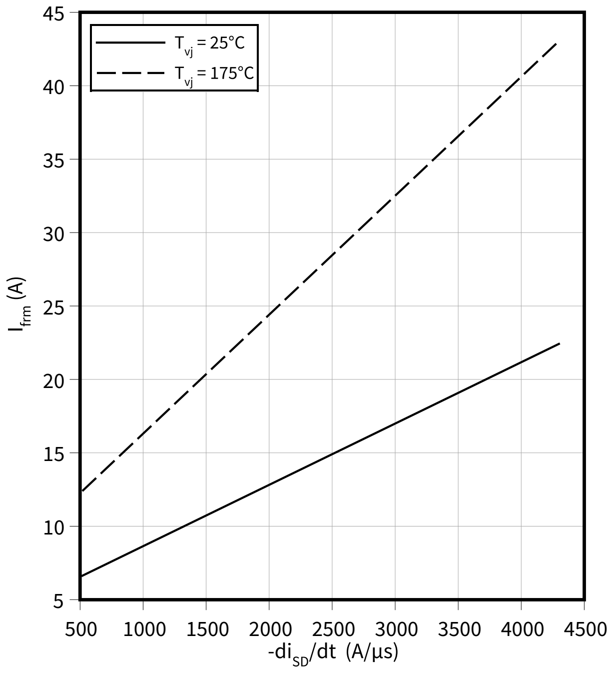


Typical switching energy as a function of DC link voltage, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V $E = f(V_{DD})$ V_{GS} = 0/18 V, I_D = 32.1 A, T_{vj} = 175 °C, $R_{G,ext}$ = 2.3 Ω	**Typical switching energy as a function of DC link voltage, test circuit in Fig. F, 2nd device 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

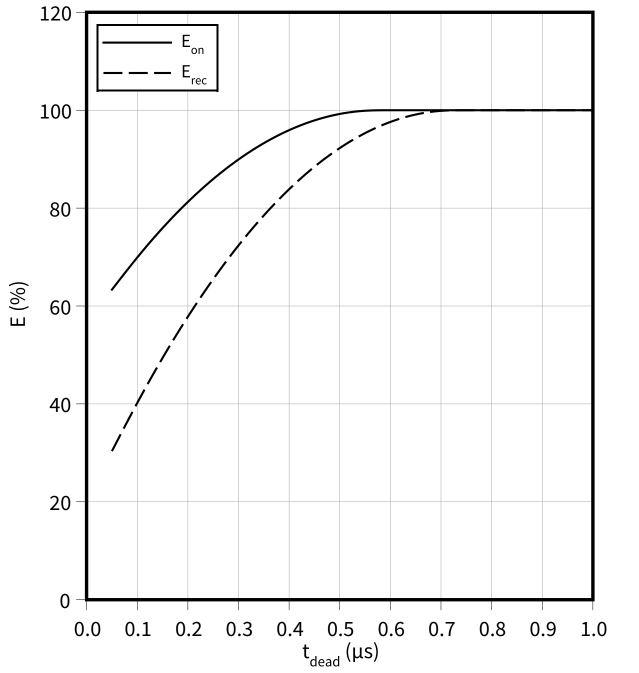


Typical switching energy as a function of dead time / blanking time, test circuit in Fig. F, 2nd device own body diode: V_{GS} = -5 V

$E = f(t_{dead})$

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

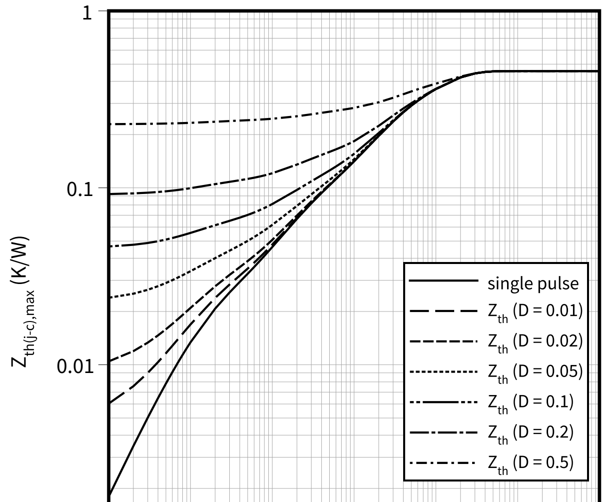
V_{DD} = 1000 V



Max. transient thermal impedance (MOSFET/diode)

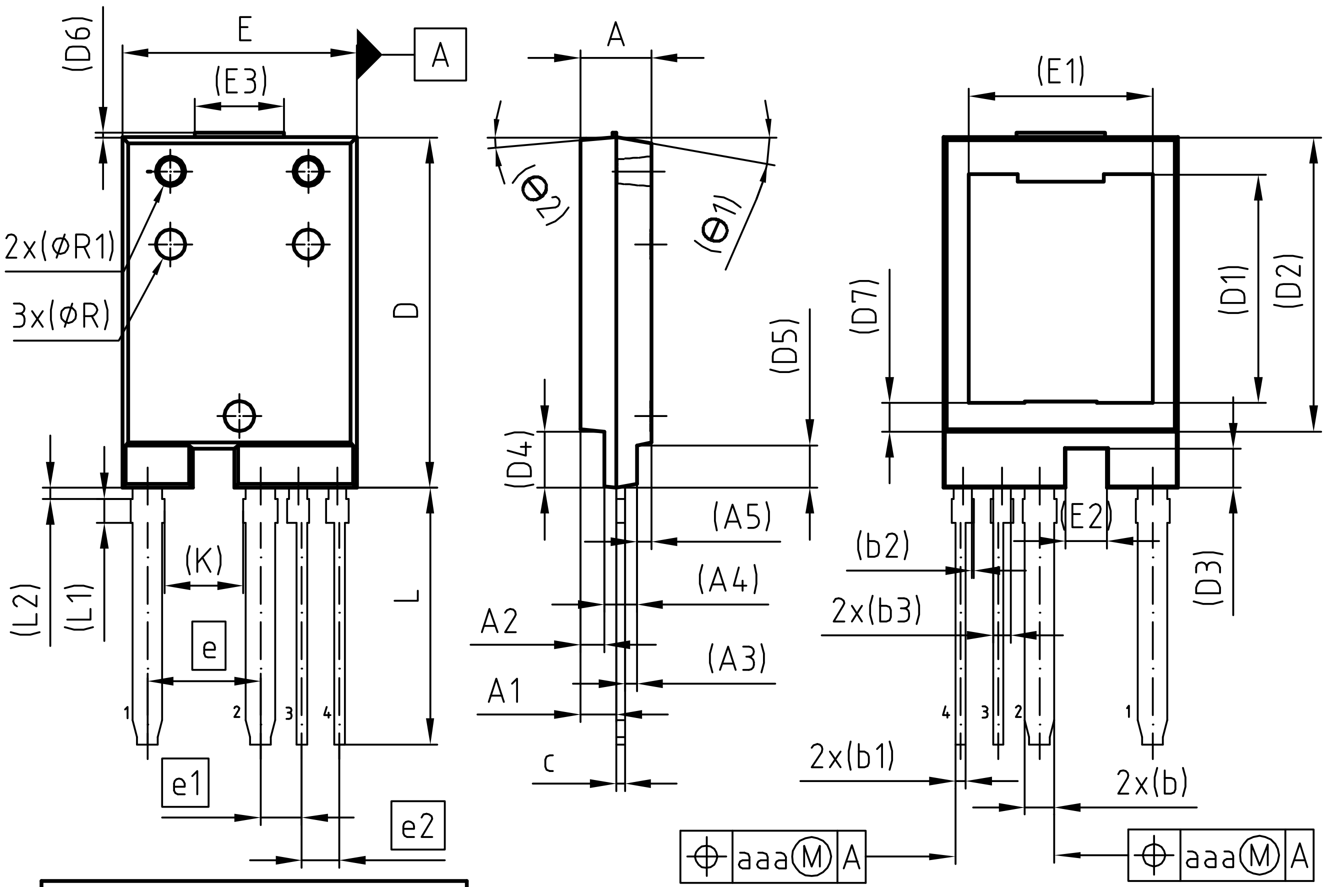
$Z_{th(j-c),max} = f(t_p)$

$D = t_p/T$



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 Package outlines



PACKAGE - GROUP NUMBER:	PG-TO247-4-U08	
DIMENSIONS	**MILLIMETERS** MIN.	MAX.
A	4.70	4.90
A1	2.23	2.59
A2	1.51	1.71
A3	0.80	
A4	2.20	
A5	0.99	
b	2.00	
b1	0.70	
b2	---	0.15
b3	1.20	
c	0.50	0.70
D	23.40	23.80
D1	15.39	
D2	19.82	
D3	2.60	
D4	3.78	
D5	2.85	
D6	---	0.30
D7	1.92	

DIMENSIONS	**MILLIMETERS** MIN.	MAX.
E	15.60	16.00
E1	12.38	
E2	2.80	
E3	6.00	
e	7.62	
e1	2.79	
e2	2.54	
K	5.32	
L	17.00	17.60
L1	1.60	
L2	0.76	
N	4	
Θ1	10°	
Θ2	5°	
R	2.00	
R1	2.00	
aaa	0.25	

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

Figure 1

6 Testing conditions

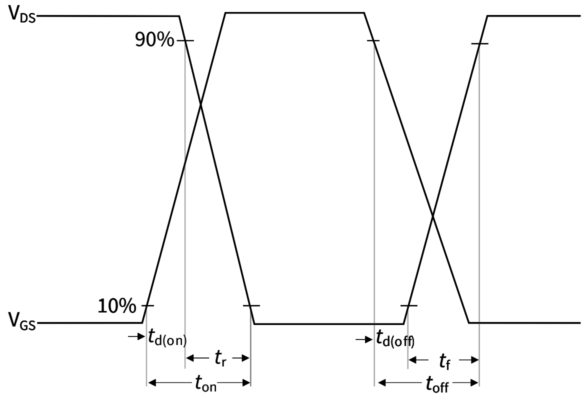


Figure A. **Definition of switching times**

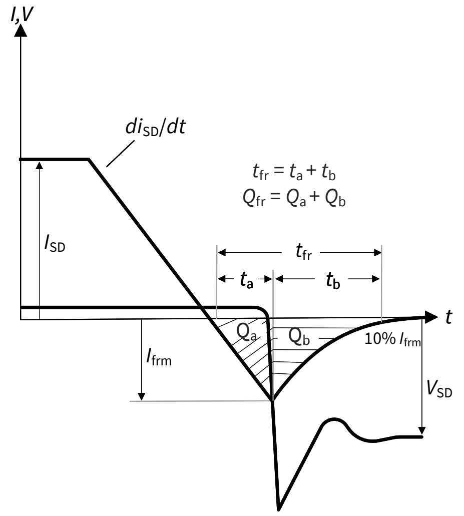


Figure B. **Definition of body diode switching characteristics**

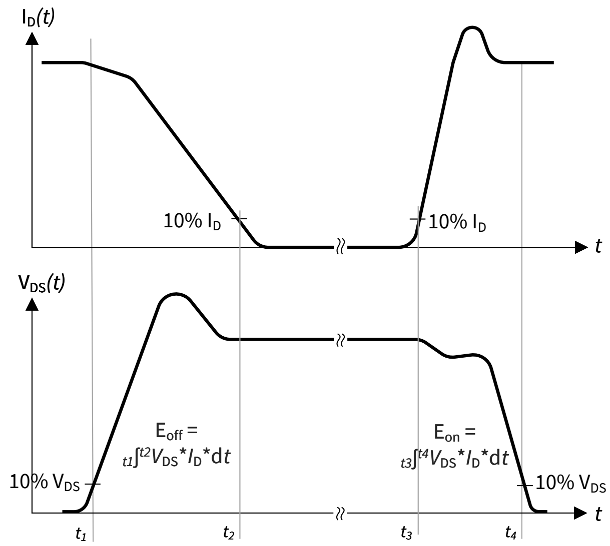


Figure C. **Definition of switching losses**

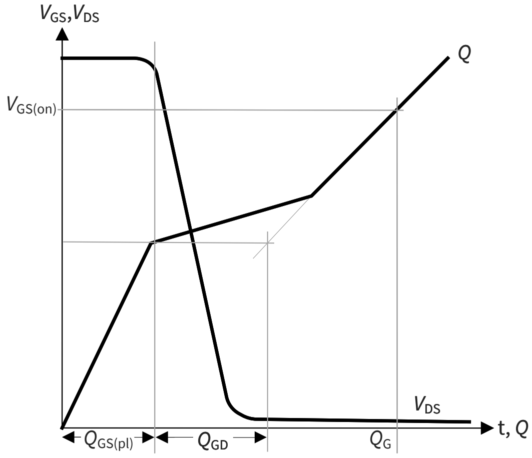


Figure D. **Definition of QGD**

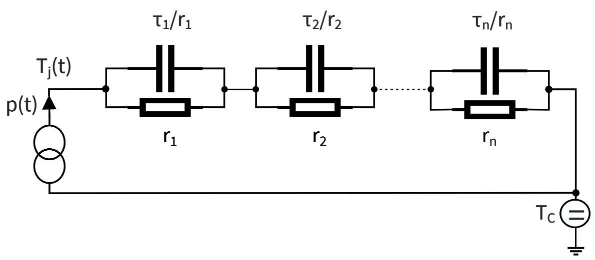


Figure E. **Thermal equivalent circuit**

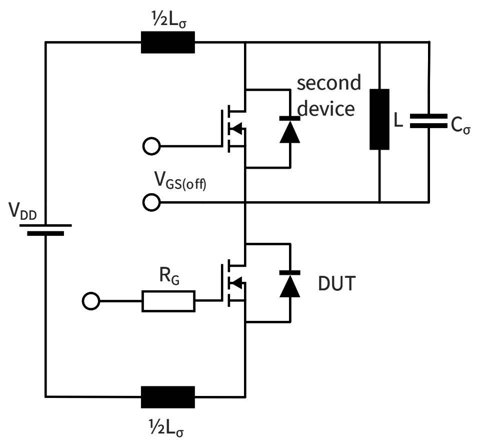


Figure F. **Dynamic test circuit**
Parasitic inductance L_σ,
Parasitic capacitor C_σ,

Figure 2

Revision history

Document revision	Date of release	Description of changes
1.00	2025-02-27	Final datasheet
1.10	2025-10-13	Added note for CTI information in Table 1 Increased I_{DM} in Table 2 Added switching information for V_{GS} = -5/18 V in Table 4 and 6 and corresponding diagrams Added I_{SDC} in Table 5 Corrected test conditions and adapt values of the body diode in Table 6 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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