Final datasheet
CoolSiC™ 1700 V SiC Trench MOSFET : Silicon Carbide MOSFET

Features
- V_{DSS} = 1700 V at T_{vj} = 25°C
- I_{DDC} = 5.4 A at T_c = 25°C
- $R_{DS(on)}$ = 1000 mΩ at V_{GS} = 18 V, T_{vj} = 25°C
- Optimized for fly-back topologies
- 12 V / 0 V gate-source voltage compatible with most fly-back controllers
- Very low switching losses
- Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.5 V
- Fully controllable dv/dt for EMI optimization
- .XT interconnection technology for best-in-class thermal performance

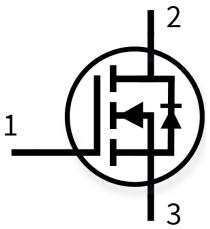


Halogen-free
Green
Lead-free
RoHS

Potential applications
- General purpose drives (GPD)
- EV Charging
- Energy storage systems (ESS)
- String inverter
- Uninterruptible power supplies (UPS)

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

Description
Package pin definition:
- Pin 1 – Gate
- Pin 2 & backside – Drain
- Pin 3 – Source



Type	Package	Marking
IMWH170R1K0M1	PG-TO247-3-U04	170M11K0

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1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal source inductance measured 5 mm (0.197 in.) from case	L_S			13		nH
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
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	$R_{th(j-c)}$			1.64	2.13	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		1700	V
Continuous DC drain current for $R_{th(j-c,max)}$, limited by $T_{vj(max)}$	I_{DDC}	$V_{GS} = 12$ V	$T_c = 25$ °C	5.4	A
			$T_c = 100$ °C	3.8	
Peak drain current, t_p limited by $T_{vj(max)}$ [1)]	I_{DM}	$V_{GS} = 12$ V		13.7	A
Gate-source voltage, max. transient voltage [2)]	V_{GS}	$t_p \leq 0.5$ µs, $D < 0.01$		-10...23	V
Gate-source voltage, max. static voltage	V_{GS}			-7...20	V
Power dissipation, limited by $T_{vj(max)}$	P_{tot}		$T_c = 25$ °C	70	W
			$T_c = 100$ °C	35	

1) Verified by the design/characterization.
2) **Important note:** The selection of positive and negative gate-source voltages impacts the long-term behavior of the device. The design guidelines described in Application Note AN2018-09 must be considered to ensure sound operation of the device over the planned lifetime.

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Table 3 Recommended values

Parameter	Symbol	Note or test condition	Values	Unit
Recommended turn-on gate voltage	$V_{GS(on)}$		12...18	V
Recommended turn-off gate voltage	$V_{GS(off)}$		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 = 1 A	T_{vj} = 25 °C, $V_{GS(on)}$ = 12 V		1000		mΩ
			T_{vj} = 25 °C, $V_{GS(on)}$ = 15 V		809	880	
			T_{vj} = 25 °C, $V_{GS(on)}$ = 18 V		565		
			T_{vj} = 100 °C, $V_{GS(on)}$ = 12 V		1416		
			T_{vj} = 175 °C, $V_{GS(on)}$ = 12 V		2037		
Gate-source threshold voltage	$V_{GS(th)}$	I_D = 1.2 mA, V_{DS} = V_{GS} (tested after 1 ms pulse at V_{GS} = 20 V)	T_{vj} = 25 °C	3.5	4.5	5.7	V
			T_{vj} = 175 °C		3.6		
Zero gate-voltage drain current	I_{DSS}	V_{DS} = 1700 V, V_{GS} = 0 V	T_{vj} = 25 °C		0.4	11	µA
			T_{vj} = 175 °C		6		
Gate leakage current	I_{GSS}	V_{DS} = 0 V	V_{GS} = -10 V			-100	nA
			V_{GS} = 20 V			100	
Forward transconductance	g_{fs}	I_D = 1 A, V_{DS} = 20 V			0.42		S
Internal gate resistance	$R_{G,int}$	f = 1 MHz, V_{AC} = 25 mV			35		Ω
Input capacitance	C_{iss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			233		pF
Output capacitance	C_{oss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			10		pF
Reverse transfer capacitance	C_{rss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			0.8		pF
C_{oss} stored energy	E_{oss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV			1.8		µJ
Total gate charge	Q_G	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, turn-on pulse			5.5		nC
Plateau gate charge	$Q_{GS(pl)}$	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, turn-on pulse			2		nC

(table continues...)

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Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Gate-drain charge	Q_{GD}	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, turn-on pulse			1.4		nC
Turn-on delay time	$t_{d(on)}$	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		15		ns
			T_{vj} = 175 °C		13		
Rise time	t_r	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		9		ns
			T_{vj} = 175 °C		8		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 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 = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		23		ns
			T_{vj} = 175 °C		23		
Turn-on energy	E_{on}	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		48		µJ
			T_{vj} = 175 °C		51		
Turn-off energy	E_{off}	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		13		µJ
			T_{vj} = 175 °C		15		
Total switching energy	E_{tot}	V_{DD} = 1000 V, I_D = 1 A, V_{GS} = 0/12 V, $R_{G,ext}$ = 6.9 Ω, L_σ = 40 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		61		µJ
			T_{vj} = 175 °C		66		
Virtual junction temperature	T_{vj}			-55		175	°C

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***Note**: For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.*

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.

Dynamic test circuit see Fig. F.

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		1700	V
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	V_{GS} = 0 V		13.7	A

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source reverse voltage	V_{SD}	I_{SD} = 1 A, V_{GS} = 0 V	T_{vj} = 25 °C		3.8		V
			T_{vj} = 175 °C		3.5		
MOSFET forward recovery charge	Q_{fr}	V_{DD} = 1000 V, I_{SD} = 1 A, V_{GS} = 0 V, $-di_{SD}/dt$ = 1000 A/µs, Q_{fr} includes also Q_C	T_{vj} = 25 °C		45.1		nC
			T_{vj} = 175 °C		58.1		
MOSFET peak forward recovery current	I_{frm}	V_{DD} = 1000 V, I_{SD} = 1 A, V_{GS} = 0 V, $-di_{SD}/dt$ = 1000 A/µs, Q_{fr} includes also Q_C	T_{vj} = 25 °C		3.6		A
			T_{vj} = 175 °C		4		
MOSFET forward recovery energy	E_{fr}	V_{DD} = 1000 V, I_{SD} = 1 A, V_{GS} = 0 V, $-di_{SD}/dt$ = 1000 A/µs, Q_{fr} includes also Q_C	T_{vj} = 25 °C		0.11		µJ
			T_{vj} = 175 °C		0.21		
Virtual junction temperature	T_{vj}			-55		175	°C

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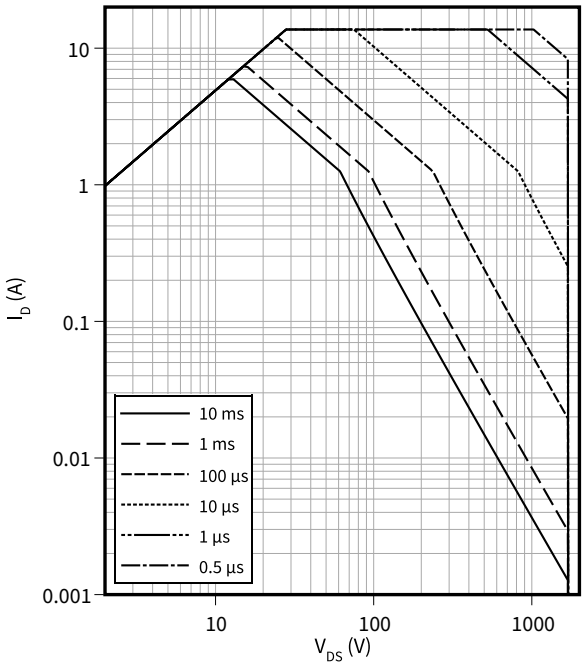
4 Characteristics diagrams

Safe operating area (SOA)

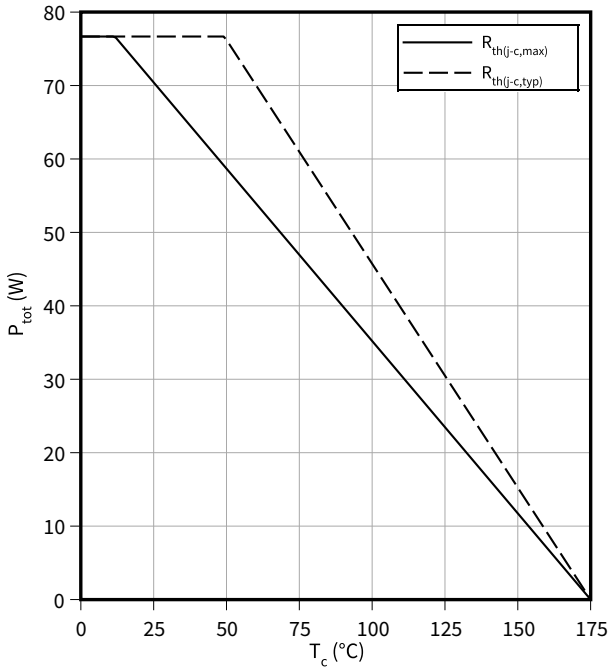
$I_D = f(V_{DS})$

$T_{vj} \leq 175\ °C$, $T_c = 25\ °C$



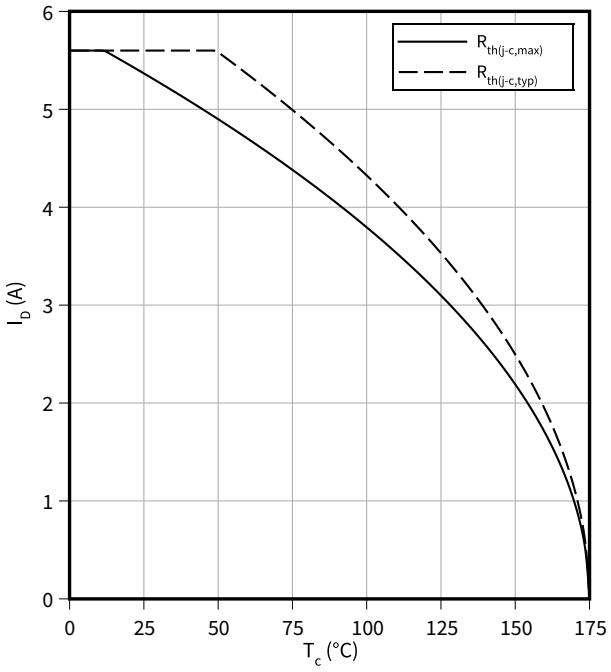
Power dissipation as a function of case temperature limited by bond wire

$P_{tot} = f(T_c)$



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

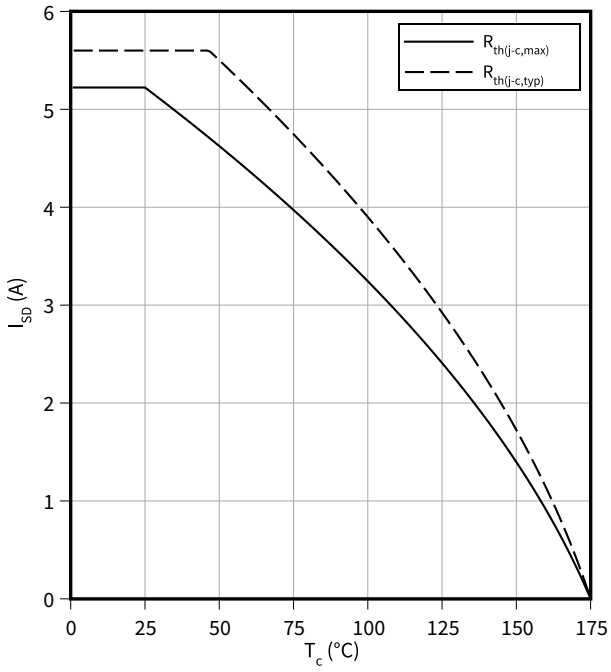
$I_D = f(T_c)$



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

$I_{SD} = f(T_c)$

$V_{GS} = 0\ V$



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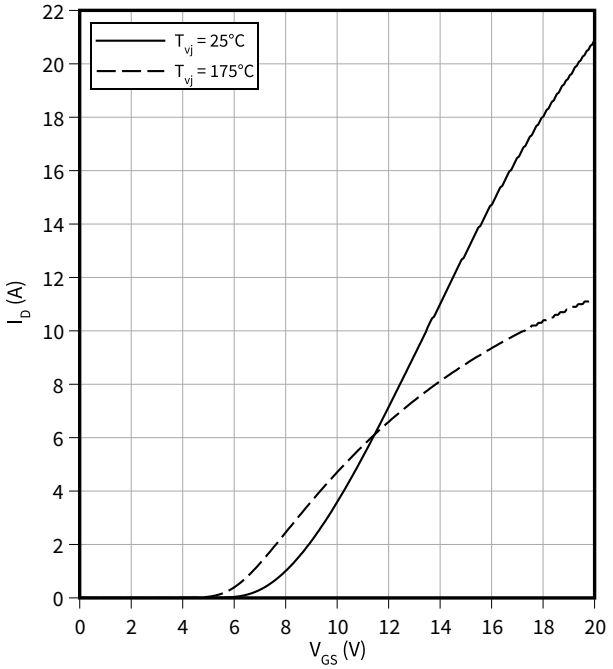
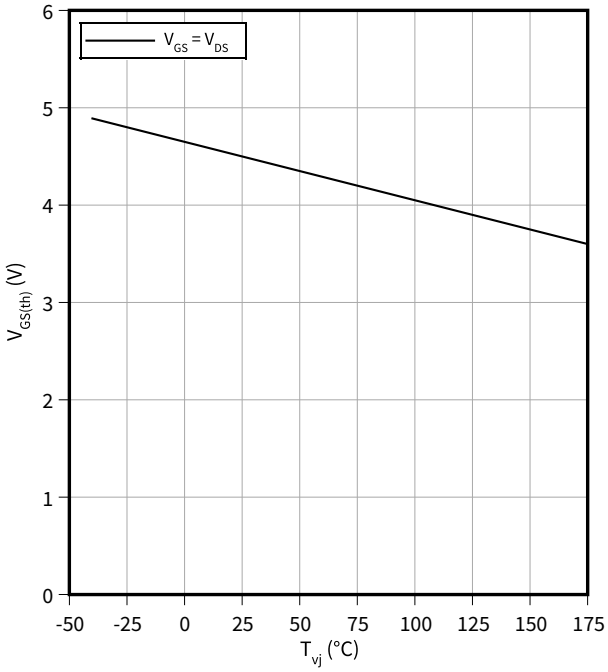
Typical transfer characteristic

$I_D = f(V_{GS})$
V_{DS} = 20 V, t_p = 20 µs



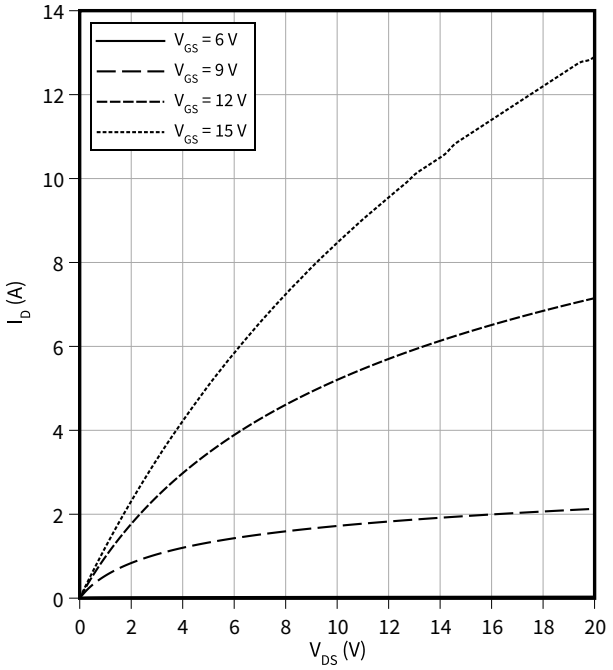
Typical gate-source threshold voltage as a function of junction temperature

$V_{GS(th)} = f(T_{vj})$
I_D = 1.2 mA



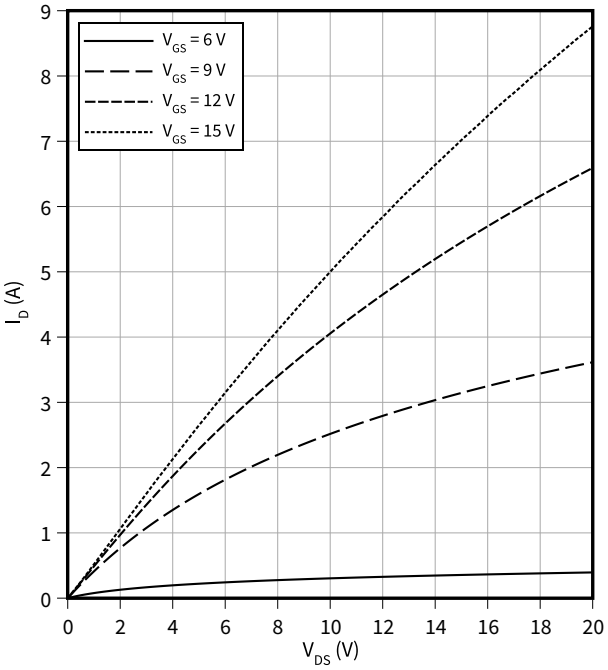
Typical output characteristic, V_{GS} as a parameter

$I_D = f(V_{DS})$
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



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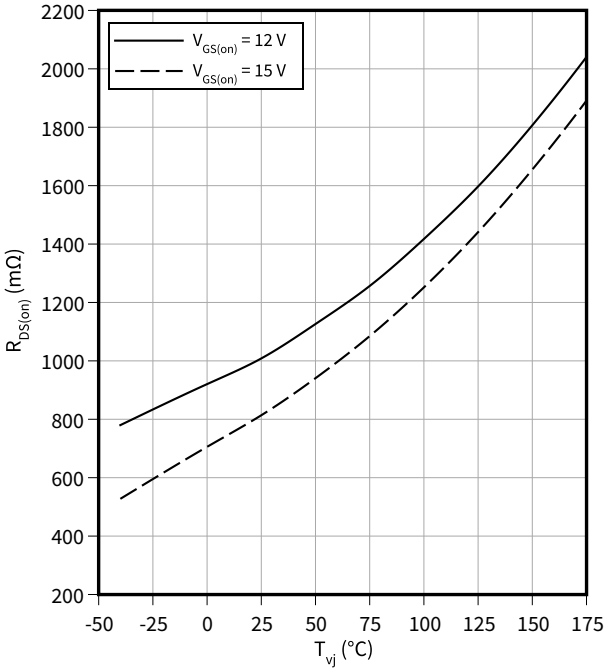
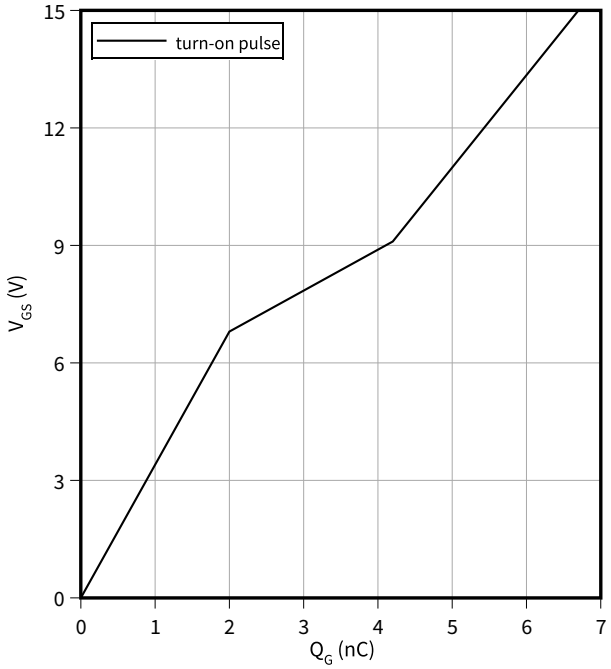
Typical on-state resistance as a function of junction temperature

$R_{DS(on)} = f(T_{vj})$
$I_D = 1$ A



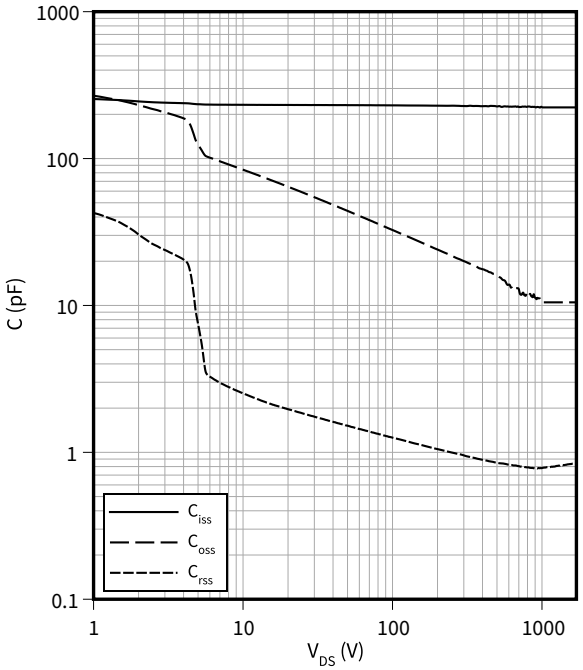
Typical gate charge

$V_{GS} = f(Q_G)$
$I_D = 1$ A, $V_{DS} = 1000$ V



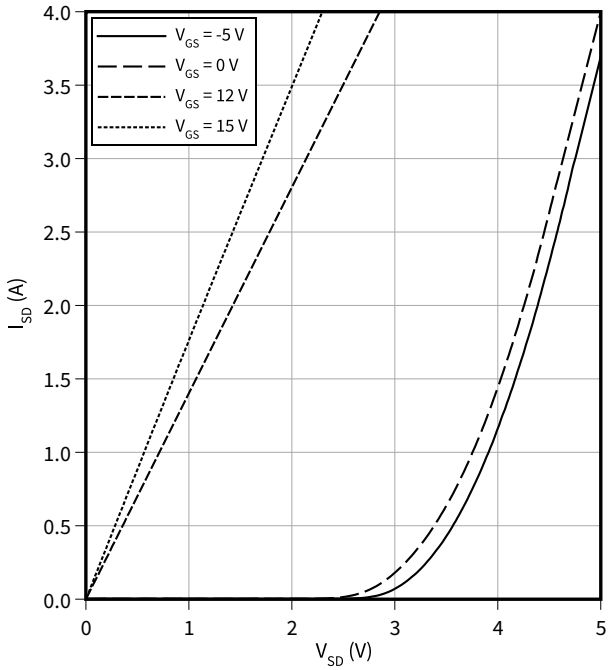
Typical capacitance as a function of drain-source voltage

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



Typical reverse drain 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



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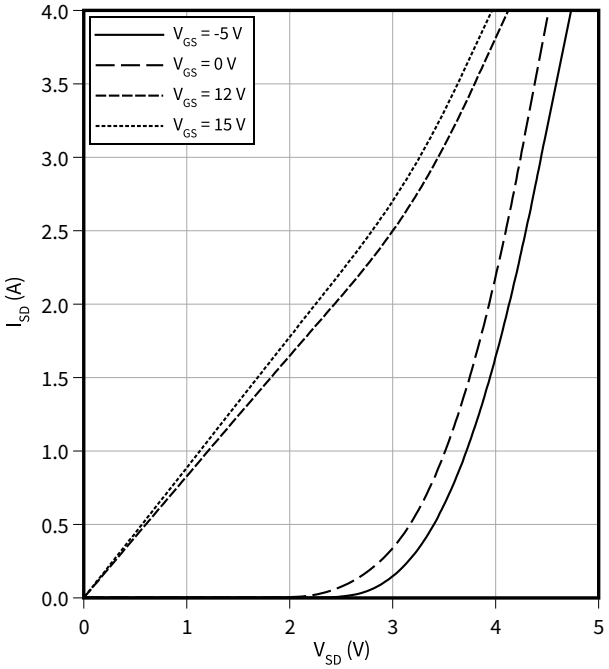
Typical reverse drain current as a function of reverse drain voltage, V_{GS} as a parameter

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

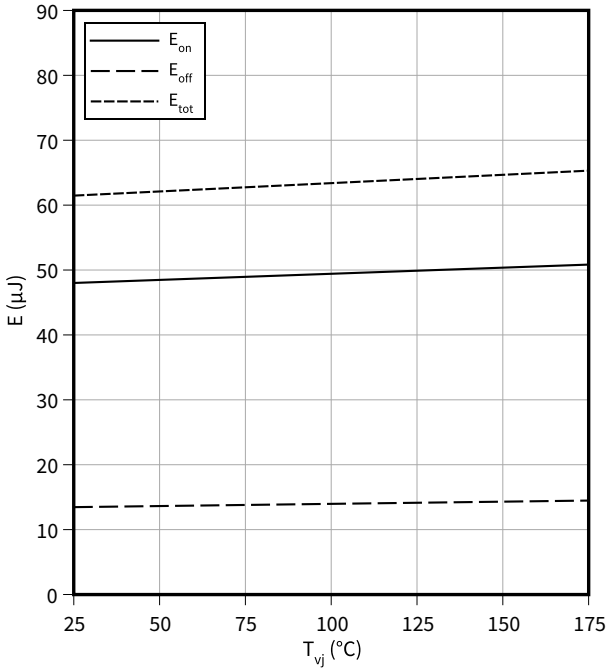
T_{vj} = 175 °C, t_p = 20 µs



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

$E = f(T_{vj})$

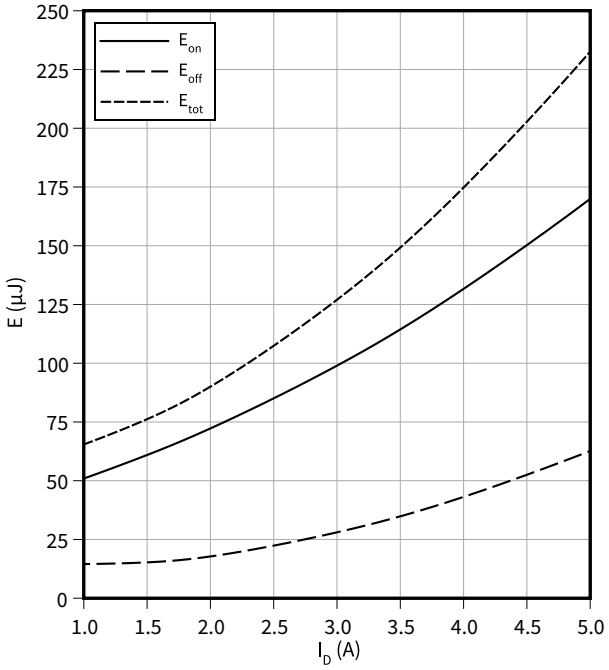
V_{GS} = 0/12 V, I_D = 1 A, $R_{G,ext}$ = 6.9 Ω, V_{DD} = 1000 V



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

$E = f(I_D)$

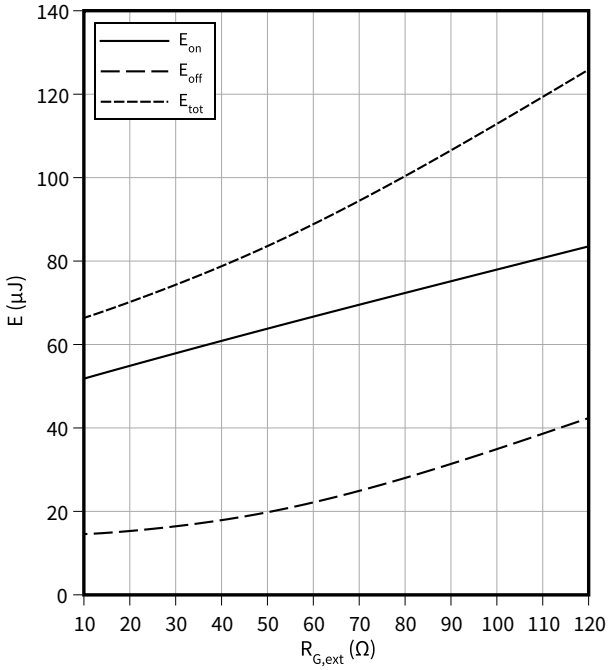
V_{GS} = 0/12 V, T_{vj} = 175 °C, $R_{G,ext}$ = 6.9 Ω, V_{DD} = 1000 V



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} = 0/12 V, I_D = 1 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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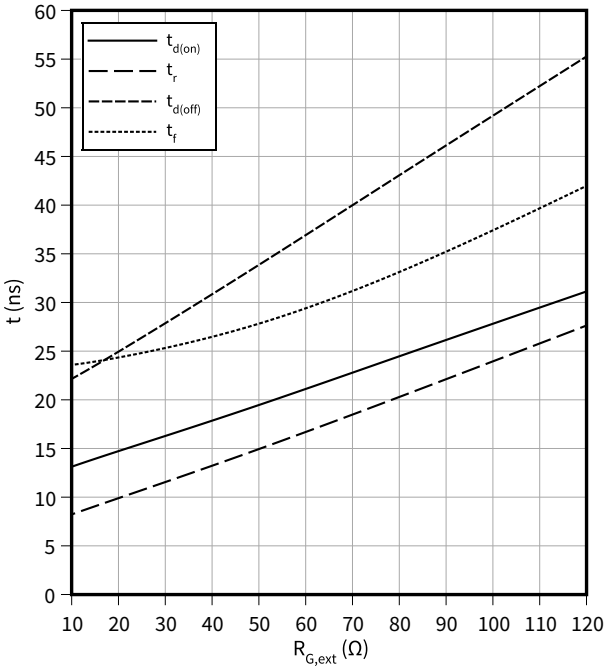
Typical switching times as a function of gate resistance, test circuit in Fig. F, 2nd device own body diode: V_{GS} = 0 V

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

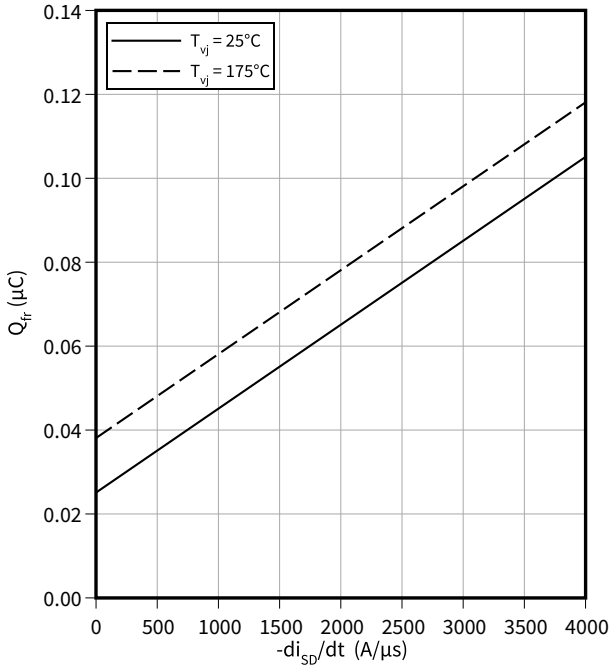
V_{GS} = 0/12 V, I_D = 1 A, T_{vj} = 175 °C, V_{DD} = 1000 V



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

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

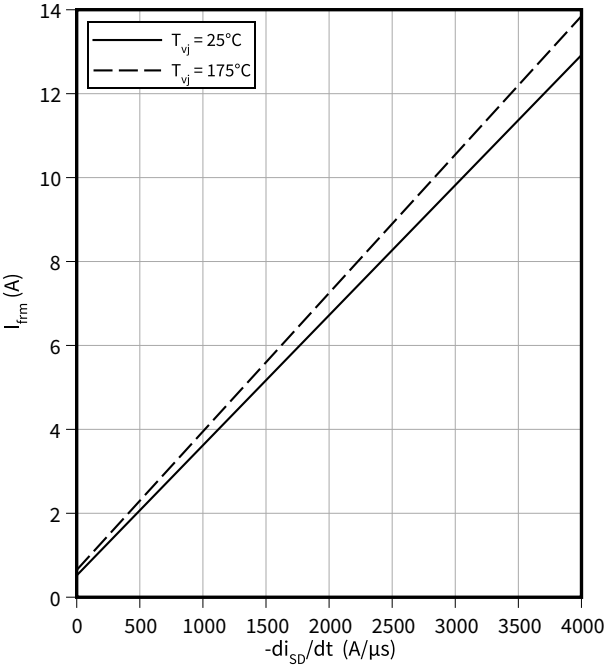
V_{GS} = 0 V, I_{SD} = 1 A, V_{DD} = 1000 V



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

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

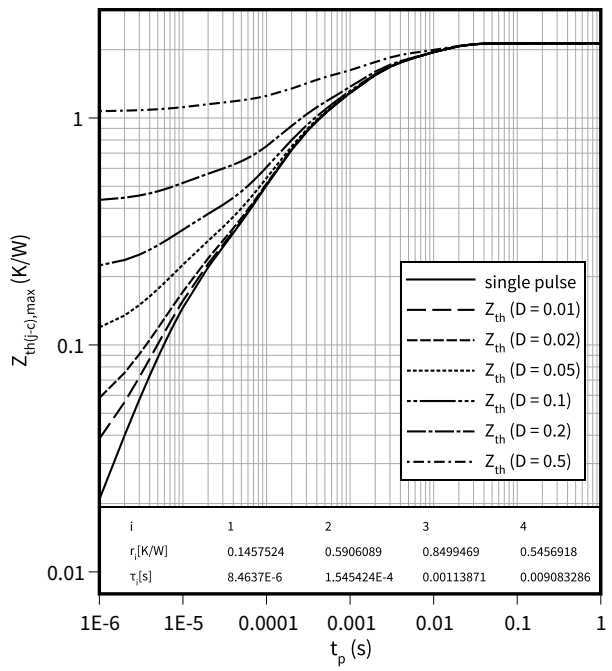
V_{GS} = 0 V, I_{SD} = 1 A, V_{DD} = 1000 V



Max. transient thermal impedance (MOSFET/diode)

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

$D = t_p/T$



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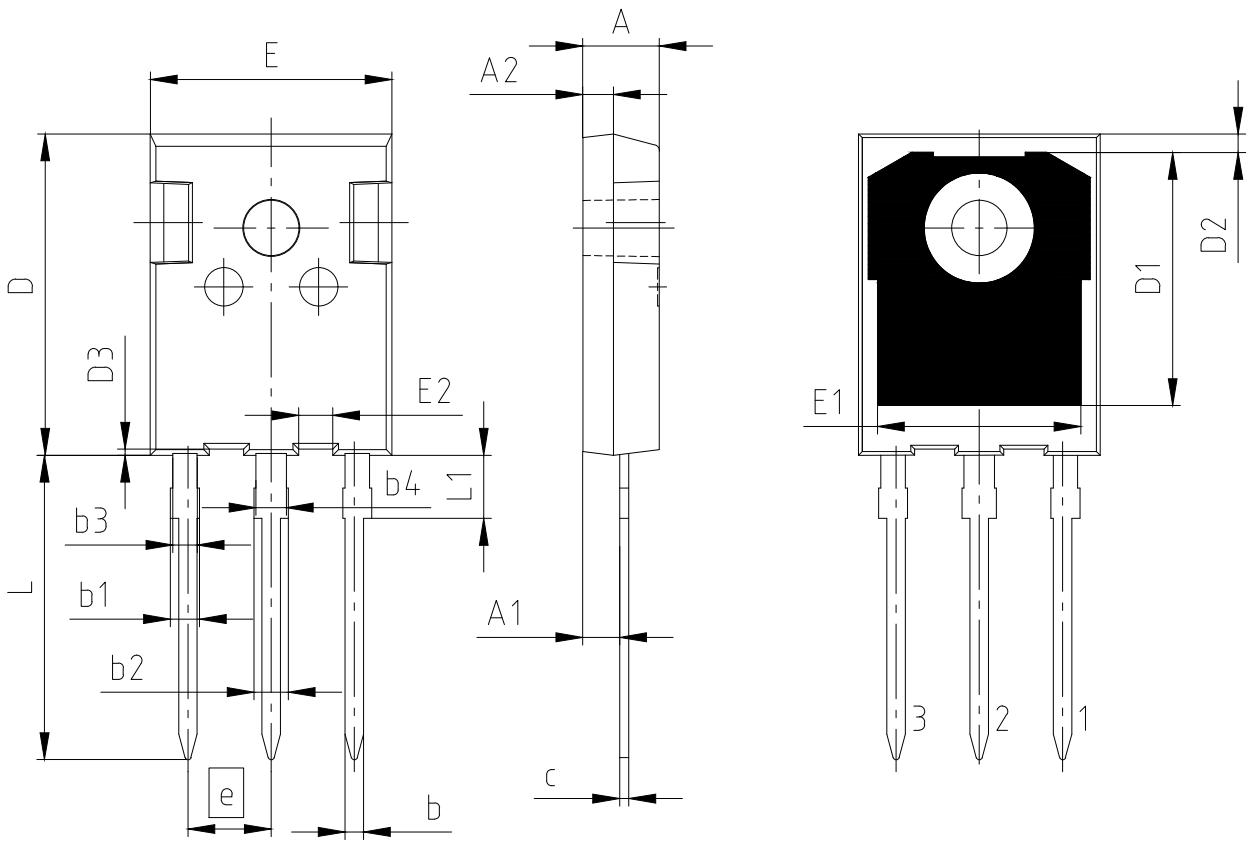
5 Package outlines



PACKAGE - GROUP NUMBER:	PG-TO247-3-U04	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	4.90	5.10
A1	2.31	2.51
A2	1.90	2.10
b	1.16	1.26
b1		1.90
b2		2.30
b3	1.55	1.65
b4	1.96	2.06
c	0.59	0.66
D	20.90	21.10
D1	16.25	16.85
D2	1.05	1.35
D3	0.55	0.65
E	15.70	15.90
E1	13.10	13.50
E2	2.14	2.34
e	5.44	
N	3	
L	19.80	20.10
L1	3.95	4.30

Figure 1

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6 Testing conditions

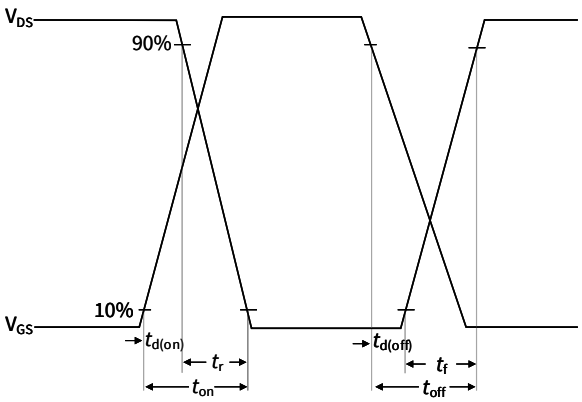

Figure A. **Definition of switching times**

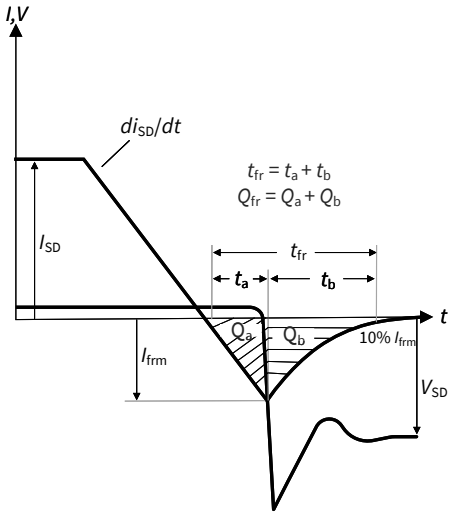

Figure B. **Definition of body diode switching characteristics**

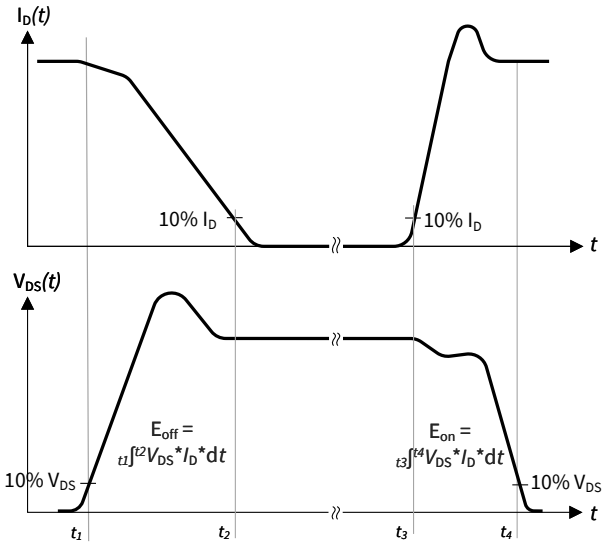

Figure C. **Definition of switching losses**

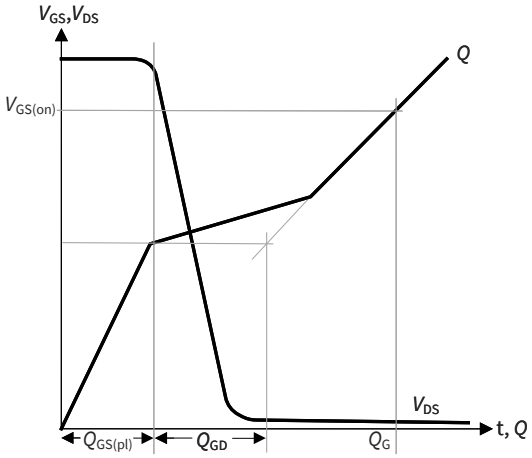

Figure D. **Definition of QGD**

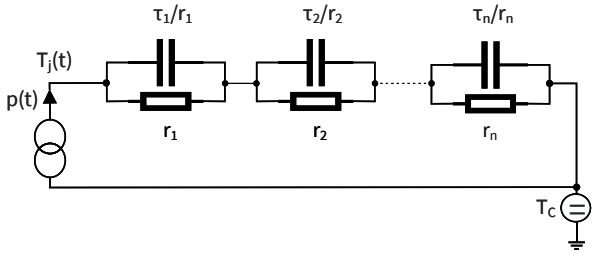

Figure E. **Thermal equivalent circuit**

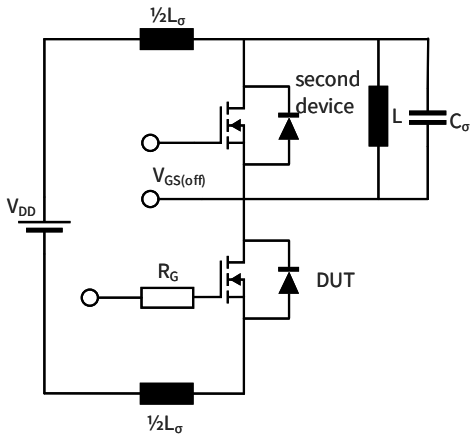

Figure F. **Dynamic test circuit**
Parasitic inductance L_σ,
Parasitic capacitor C_σ,

Figure 2

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Revision history

Document revision	Date of release	Description of changes
1.00	2024-03-25	Final datasheet
1.10	2025-03-22	Changed package name Increased Gate-source voltage, max. transient voltage Added Gate-source voltage, max. static voltage Added diode characteristic parameters in Table 5 and Table 6 Added graphs $I_{SD} = f(V_{SD})$, $I_{SD} = f(T_c)$, $Q_{fr} = f(-di_{SD}/dt)$, $I_{frm} = f(-di_{SD}/dt)$ Corrected graph $I_{DS} = f(T_c)$ Editorial changes
1.20	2026-10-05	Updated recommended turn-on gate voltage Added $R_{DS(on)}$, at $V_{GS(on)}$ = 18 V, T_{vj} = 25°C Replaced RBSOA with FBSOA Editorial changes

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