

CoolSiC™
440V CoolSiC™ G2 MOSFET with extended V_{DS}

Features

- Ideal for high frequency switching and synchronous rectification
- Commutation robust fast body diode with low Q_{fr}
- Low $R_{DS(on)}$ dependency on temperature
- Benchmark gate threshold voltage, $V_{GS(th)} = 4.5\text{ V}$
- Recommended gate driving voltage 0 V to 18 V
- .XT interconnection technology for best-in-class thermal performance
- 100% avalanche tested
- Fully tested in production to guarantee extended $V_{(BR)DSS}$

Potential applications

- Application specific MOSFET designed to power AI
- High Power SMPS for server, datacenter and telecom rectifiers

Product validation

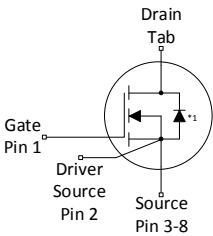
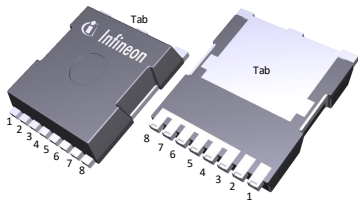
Qualified for industrial applications according to the relevant tests of JEDEC JESD47, JESD22 and J-STD-020.

Table 1 Key performance parameters

Parameter	Value	Unit
V_{DS}	440	V
$V_{DS,tr}$	455	V
$R_{DS(on),typ}$	25.4	mΩ
I_D	68	A
Q_{oss}	59	nC
E_{oss}	4.2	μJ
Q_G	36	nC

Part number	Package	Marking	Related links
IMT44R025M2H	PG-HSOF-8	44R025M2	-

TOLL



*1: Internal body diode

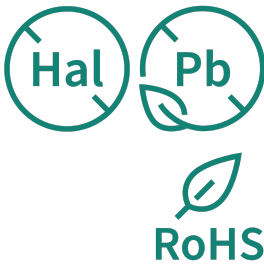




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1 Maximum ratings

at $T_A=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D	-	-	68	A	$V_{GS}=18\text{ V}$, $T_C=25\text{ °C}$
				48		$V_{GS}=18\text{ V}$, $T_C=100\text{ °C}$
				9		$V_{GS}=18\text{ V}$, $T_A=25\text{ °C}$, $R_{THJA}=40\text{ °C/W}$ ²⁾
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	204	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	93	mJ	$I_D=15.7\text{ A}$, $R_{GS}=25\text{ }\Omega$
Avalanche energy, repetitive	E_{AR}			0.47		
Gate source voltage (static)	$V_{GS,DC}$	-7	-	23	V	-
Gate source voltage (transient)	$V_{GS,AC}$	-10	-	25	V	$t_{pulse}\leq 500\text{ ns}$, duty cycle $\leq 1\%$
Power dissipation	P_{tot}	-	-	214	W	$T_C=25\text{ °C}$
				3.8		$T_A=25\text{ °C}$, $R_{THJA}=40\text{ °C/W}$ ²⁾
Storage temperature	T_{stg}	-55	-	150	°C	-
Operating junction temperature	T_j			175		

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ See Diagram 3 for more detailed information.

⁴⁾ See Diagram 19 for more detailed information.

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.7	°C/W	-
Thermal resistance, junction - ambient, 6 cm ² cooling area ⁵⁾	R_{thJA}			40		

⁵⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

3 Operating range

Table 4 Operating range

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Recommended turn-on voltage	$V_{GS(on)}$	-	18	-	V	-
Recommended turn-off voltage	$V_{GS(off)}$		0			

4 Electrical characteristics

at $T_j=25^\circ\text{C}$, unless otherwise specified

Table 5 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	440	-	-	V	$V_{GS}=0\text{ V}$, $I_D=0.56\text{ mA}$
Transient drain-source breakdown voltage ⁶⁾	$V_{(BR)DSS,tr}$	455	-	-	V	$V_{GS}=0\text{ V}$, $I_D=5.6\text{ mA}$, $t_{pulse}\leq 10\text{ ms}$, duty cycle $\leq 50\%$
Gate threshold voltage ⁷⁾	$V_{GS(th)}$	3.5	4.5	5.6	V	$V_{DS}=V_{GS}$, $I_D=5.6\text{ mA}$
Zero gate voltage drain current	I_{DSS}	-	1	75	μA	$V_{DS}=400\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25^\circ\text{C}$
			2	-		$V_{DS}=400\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=175^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	1	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	25.4	32.1	m Ω	$V_{GS}=18\text{ V}$, $I_D=15.7\text{ A}$, $T_j=25^\circ\text{C}$
			36.5	-		$V_{GS}=18\text{ V}$, $I_D=15.7\text{ A}$, $T_j=175^\circ\text{C}$
			31.1	-		$V_{GS}=15\text{ V}$, $I_D=15.7\text{ A}$, $T_j=25^\circ\text{C}$
Gate resistance	R_G	-	3.3	5.0	Ω	-

⁶⁾ Guaranteed by design, rated for transient startup overvoltages to comply with IPC-9592B derating guidelines.

⁷⁾ Tested after 1ms pulse at $V_{GS} = +20\text{V}$.

Table 6 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	1200	1690	pF	$V_{GS}=0\text{ V}$, $V_{DS}=200\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}		180	-		
Reverse transfer capacitance	C_{rss}		14	-		
Effective output capacitance, energy related ⁸⁾	$C_{o(er)}$	-	211	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=0\dots 200\text{ V}$
Effective output capacitance, time related ⁹⁾	$C_{o(tr)}$	-	290	-	pF	$I_D=\text{constant}$, $V_{GS}=0\text{ V}$, $V_{DS}=0\dots 200\text{ V}$
Turn-on delay time	$t_{d(on)}$	-	12.5	-	ns	$V_{DD}=200\text{ V}$, $V_{GS}=0\dots 18\text{ V}$, $I_D=15.7\text{ A}$, $R_{G,ext}=1.8\text{ }\Omega$
Rise time	t_r		11.9			
Turn-off delay time	$t_{d(off)}$	-	19.9	-	ns	$V_{DD}=200\text{ V}$, $V_{GS}=18\dots 0\text{ V}$, $I_D=15.7\text{ A}$, $R_{G,ext}=1.8\text{ }\Omega$
Fall time	t_f		7.9			

⁸⁾ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 200 V.

⁹⁾ $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 200 V.

Table 7 Gate Charge Characteristics ¹⁰⁾

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	9.8	-	nC	$V_{DD}=200\text{ V}$, $I_D=15.7\text{ A}$, $V_{GS}=0\text{ to }18\text{ V}$
Gate to drain charge	Q_{gd}		7.5			
Gate charge total	Q_g		36			
Gate charge total, sync. FET	$Q_{g(sync)}$	-	34	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }18\text{ V}$
Output charge	Q_{oss}	-	59	-	nC	$V_{DS}=200\text{ V}$, $V_{GS}=0\text{ V}$
Output Energy	E_{oss}		4.2		μJ	

¹⁰⁾ As per JEP192, Guidelines for Gate Charge (Q_g) Test Method for SiC MOSFET.

Table 8 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	32	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	204	A	$T_C=25\text{ °C}$, $t_{pulse} \leq 250\text{ ns}$
Diode forward voltage	V_{SD}	-	3.5	4.3	V	$V_{GS}=0\text{ V}$, $I_S=15.7\text{ A}$, $T_J=25\text{ °C}$
MOSFET forward recovery time	t_{fr}	-	13.6	-	ns	$V_R=200\text{ V}$, $I_S=15.7\text{ A}$, $di_S/dt=1000\text{ A}/\mu\text{s}$
			8.9			$V_R=200\text{ V}$, $I_S=15.7\text{ A}$, $di_S/dt=4000\text{ A}/\mu\text{s}$
MOSFET forward recovery charge ¹¹⁾	Q_{fr}	-	55	-	nC	$V_R=200\text{ V}$, $I_S=15.7\text{ A}$, $di_S/dt=1000\text{ A}/\mu\text{s}$
			116			$V_R=200\text{ V}$, $I_S=15.7\text{ A}$, $di_S/dt=4000\text{ A}/\mu\text{s}$

¹¹⁾ Q_{fr} includes Q_{oss} . Refer to Table 10 for test setup.

5 Electrical characteristics diagrams

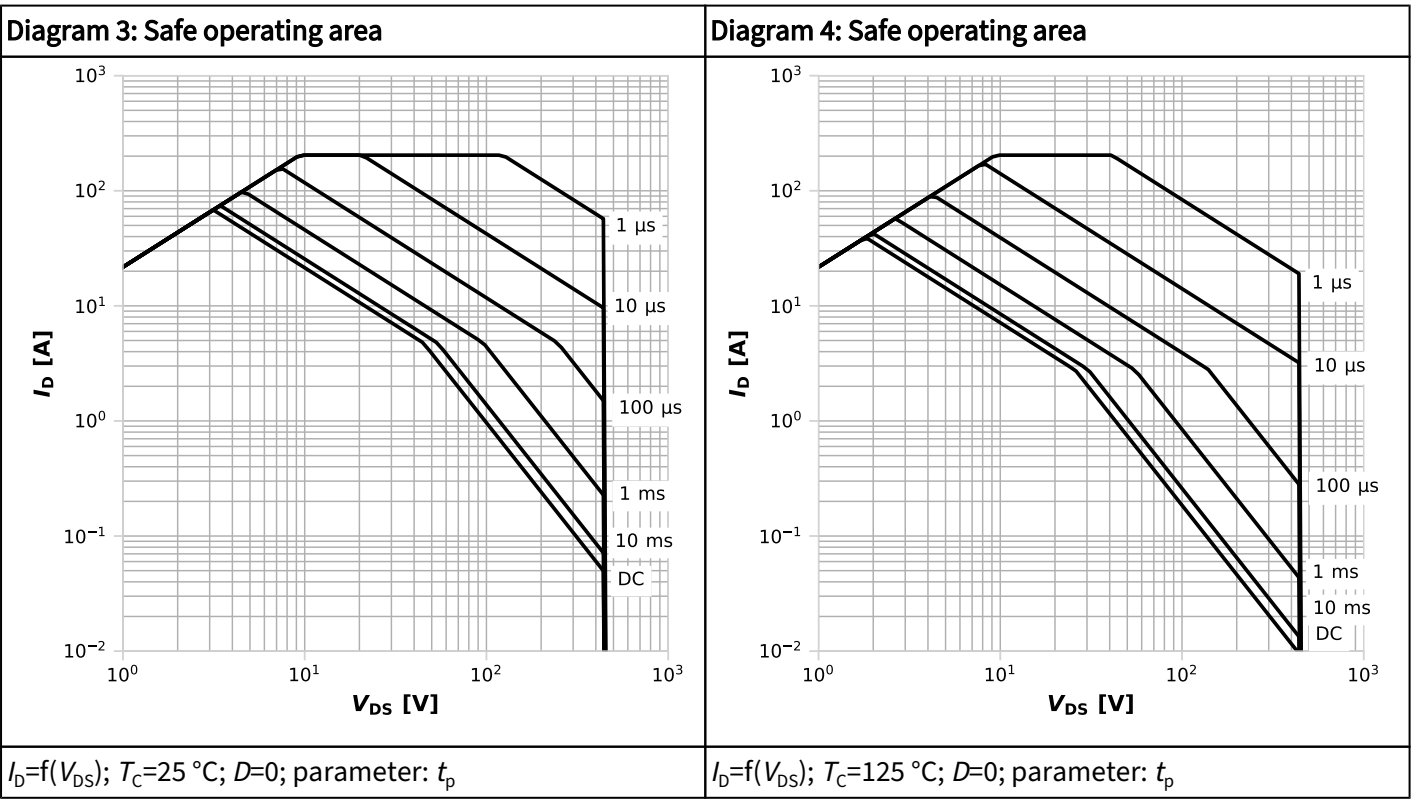
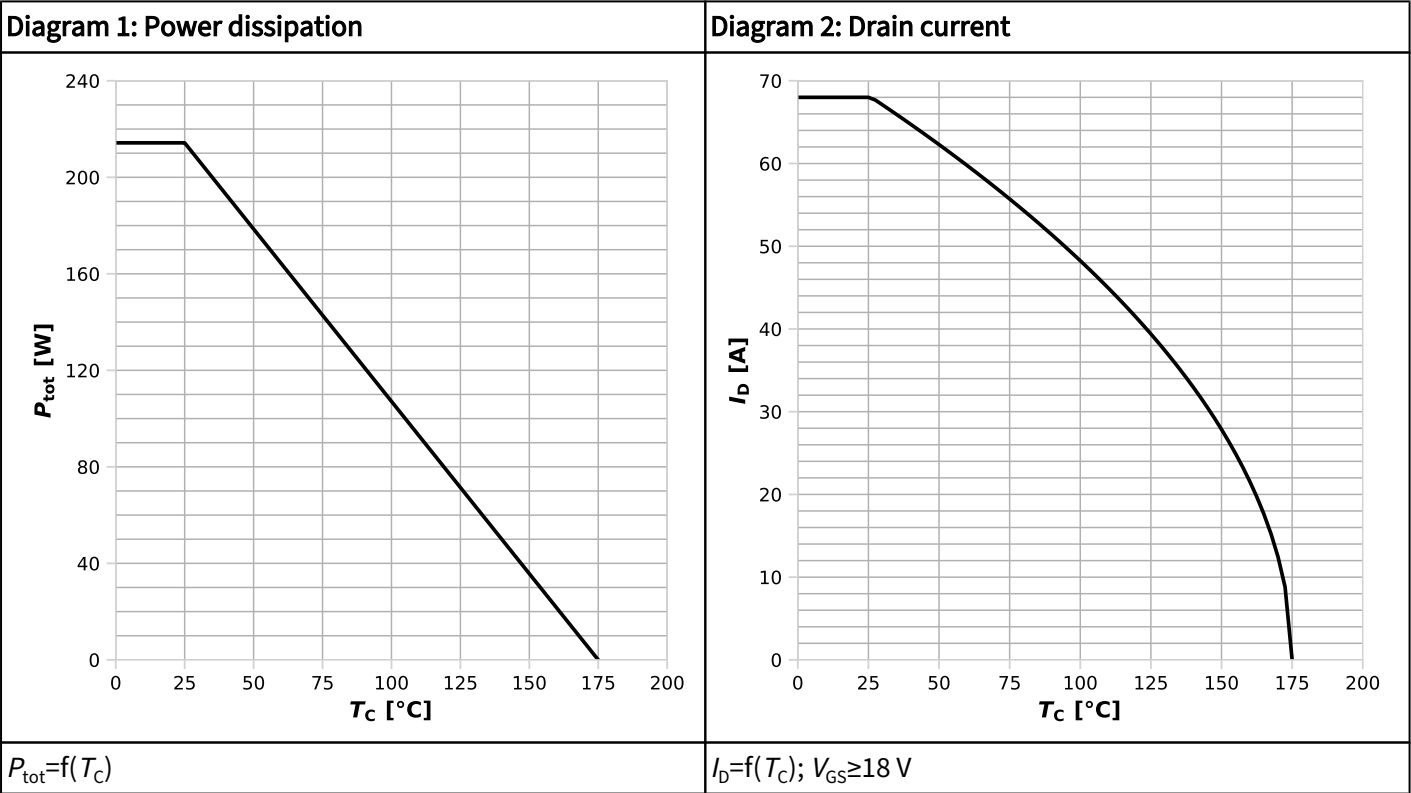
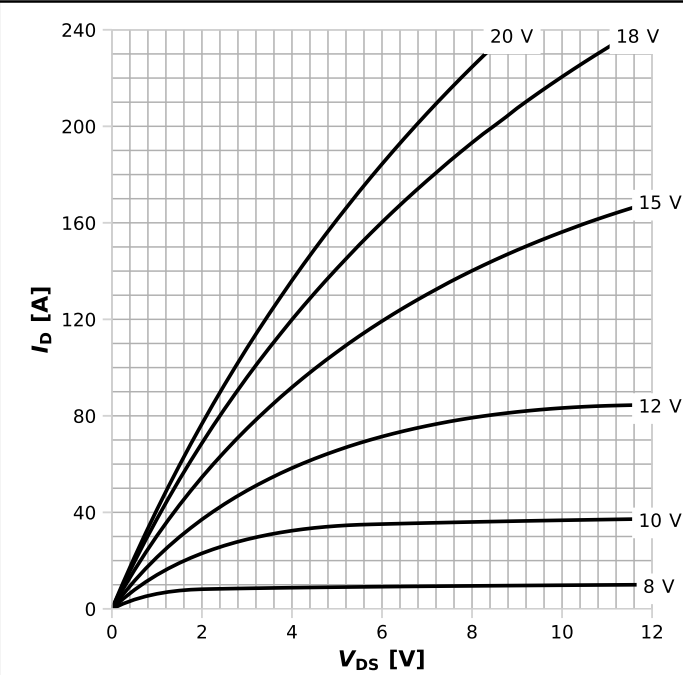
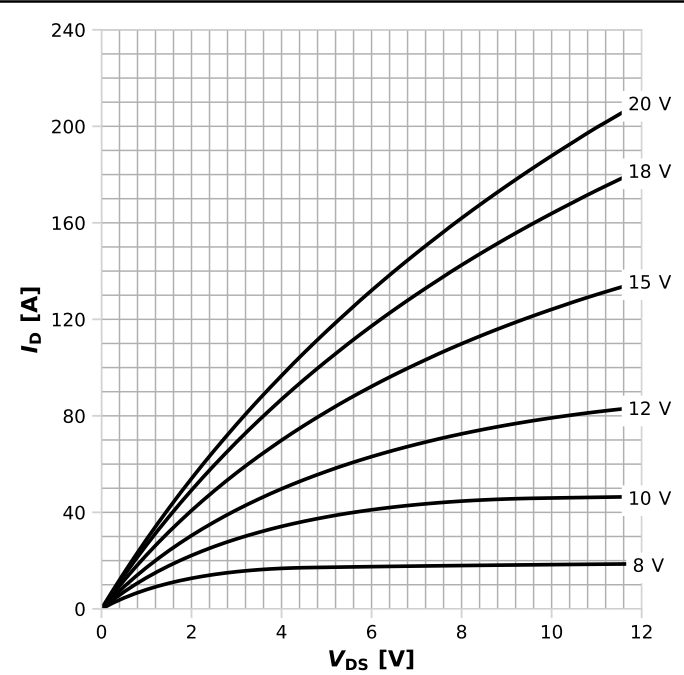


Diagram 5: Typ. output characteristics



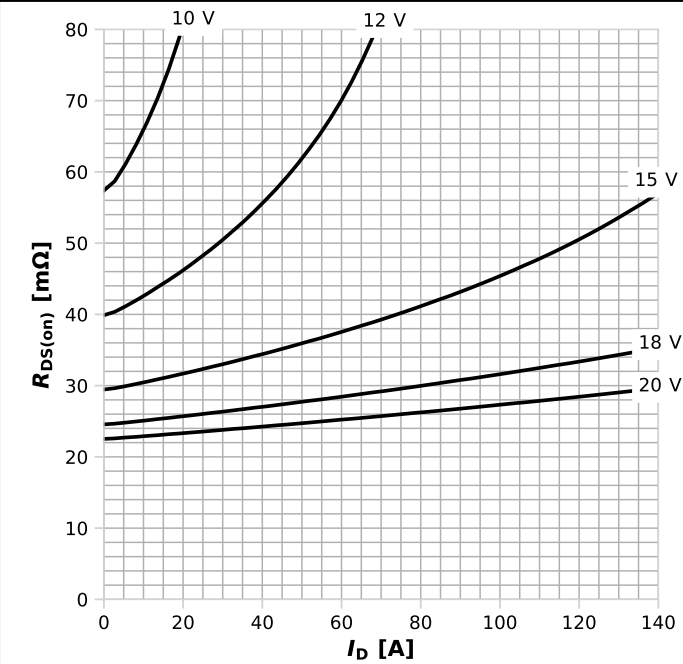
$I_D = f(V_{DS})$, $T_j = 25\text{ °C}$; parameter: V_{GS}

Diagram 6: Typ. output characteristics



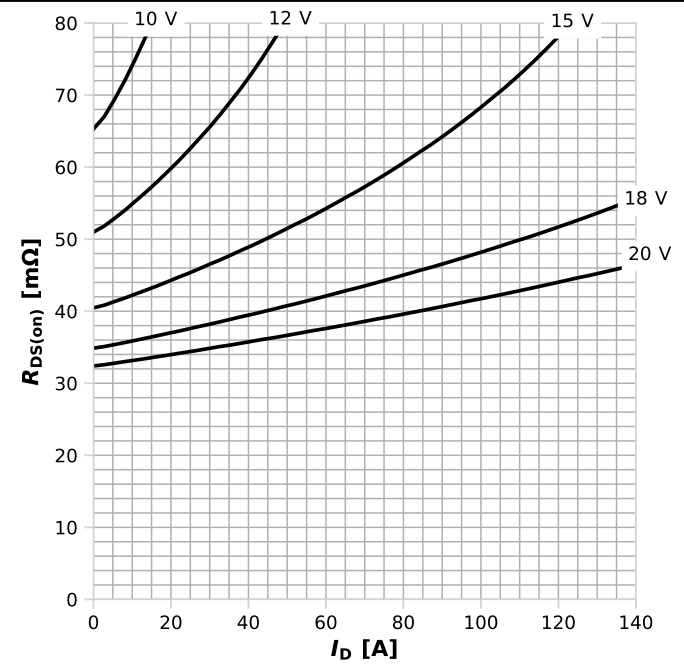
$I_D = f(V_{DS})$, $T_j = 175\text{ °C}$; parameter: V_{GS}

Diagram 7: Typ. drain-source on resistance

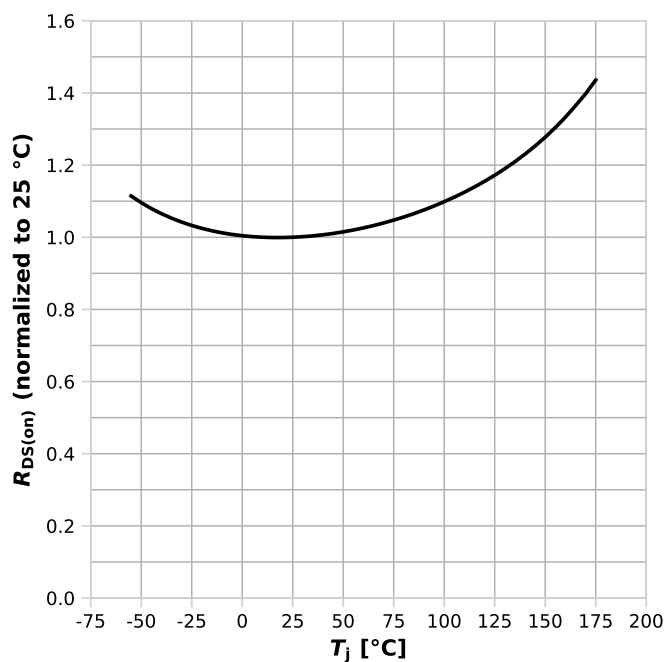


$R_{DS(on)} = f(I_D)$, $T_j = 25\text{ °C}$; parameter: V_{GS}

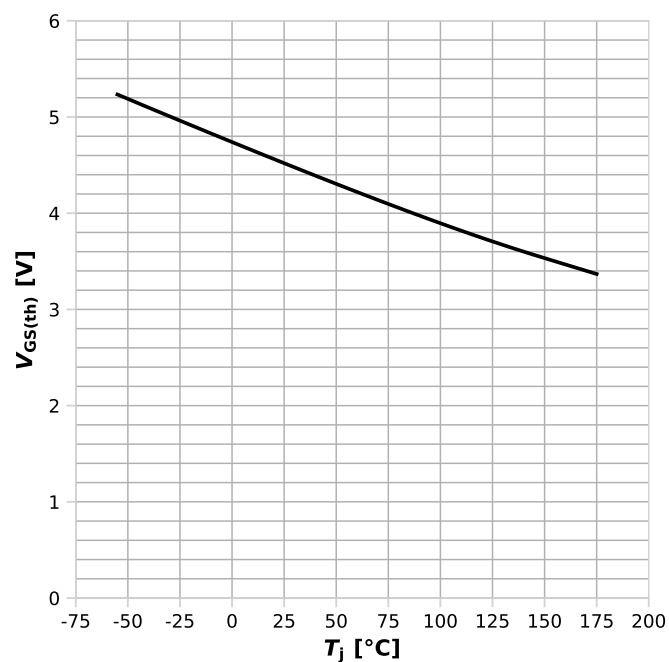
Diagram 8: Typ. drain-source on resistance



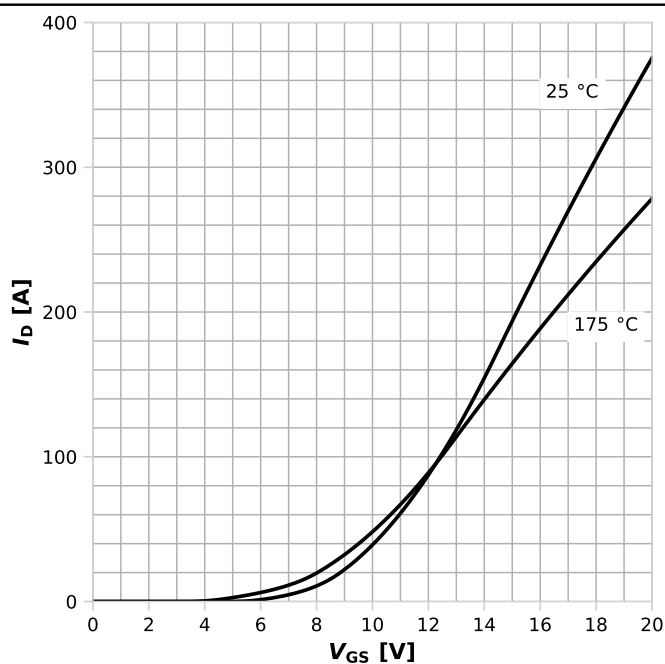
$R_{DS(on)} = f(I_D)$, $T_j = 175\text{ °C}$; parameter: V_{GS}

Diagram 9: Normalized drain-source on resistance


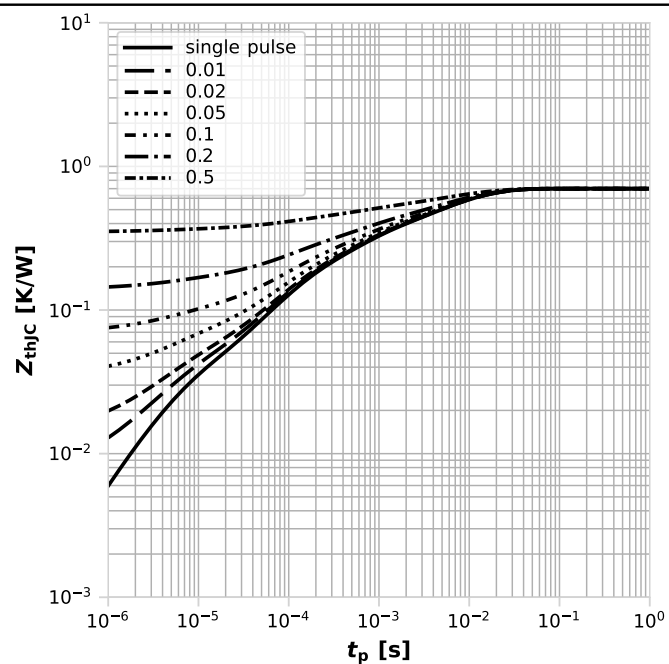
$$R_{DS(on)} = f(T_j), I_D = 15.7 \text{ A}, V_{GS} = 18 \text{ V}$$

Diagram 10: Typ. gate threshold voltage


$$V_{GS(th)} = f(T_j), V_{GS} = V_{DS}, I_D = 5.6 \text{ mA}$$

Diagram 11: Typ. transfer characteristics


$$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max}, \text{ parameter: } T_j$$

Diagram 12: Max. transient thermal impedance


$$Z_{thJC} = f(t_p), \text{ parameter: } D = t_p / T$$

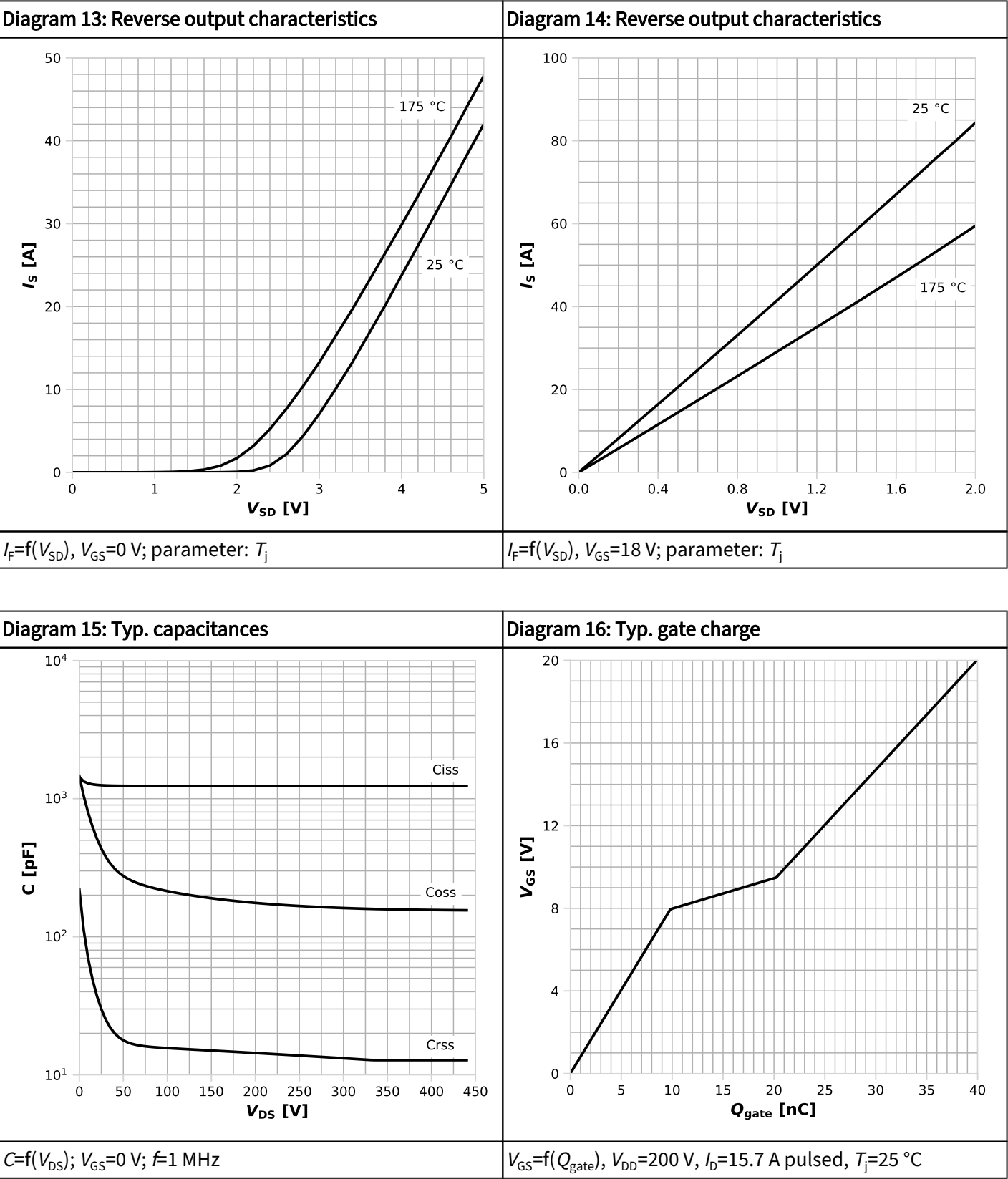
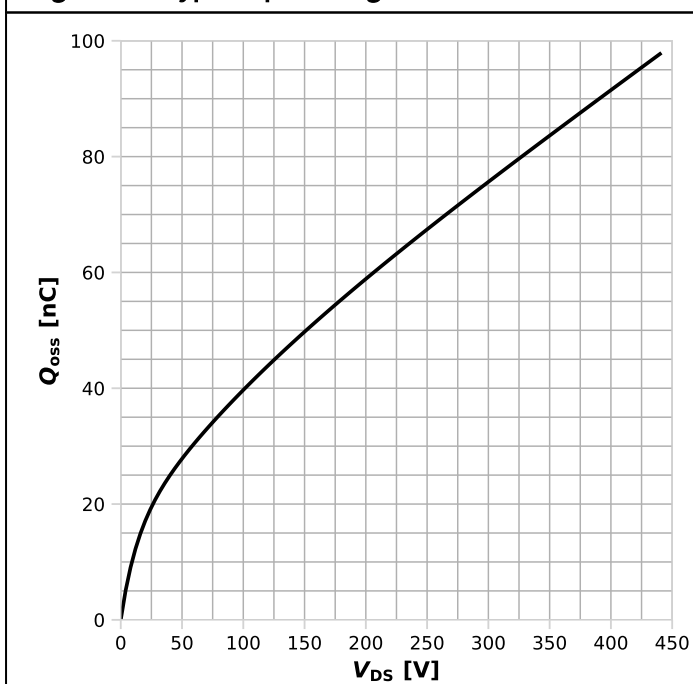
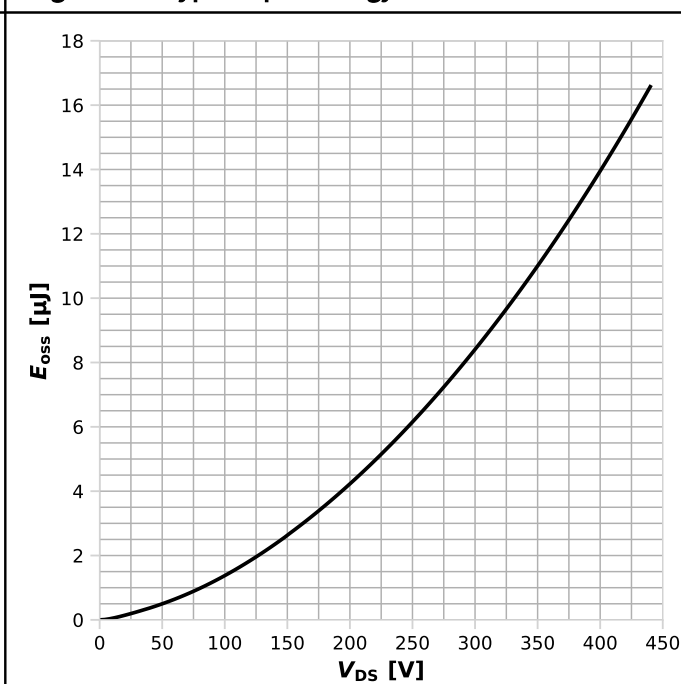


Diagram 17: Typ. output charge



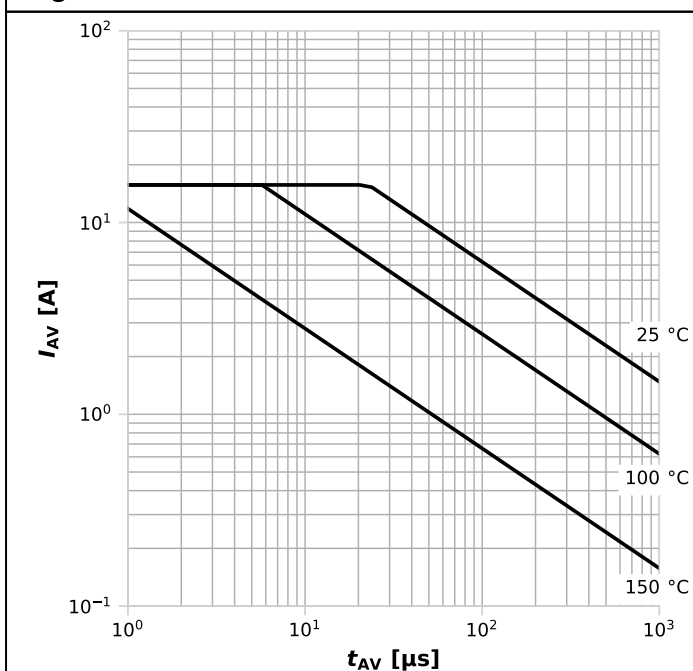
$$Q_{oss}=f(V_{DS}), V_{GS}=0\text{ V}$$

Diagram 18: Typ. output energy



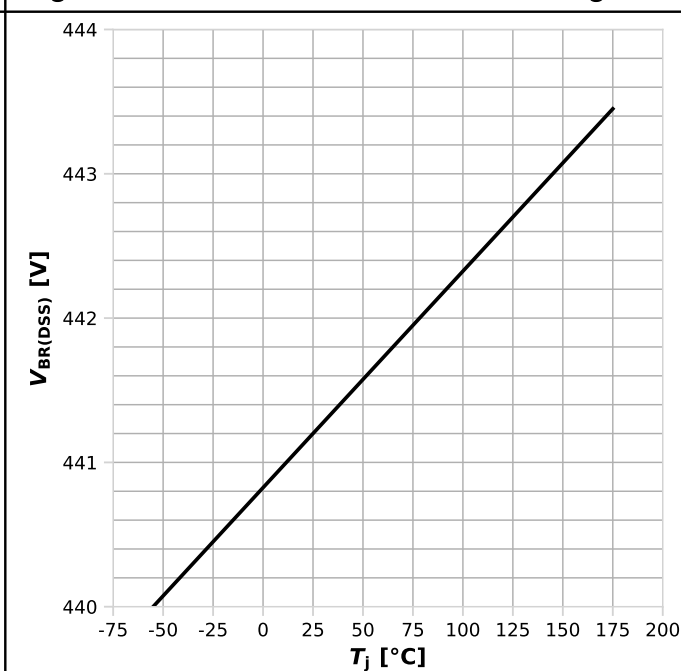
$$E_{oss}=f(V_{DS}), V_{GS}=0\text{ V}$$

Diagram 19: Avalanche characteristics

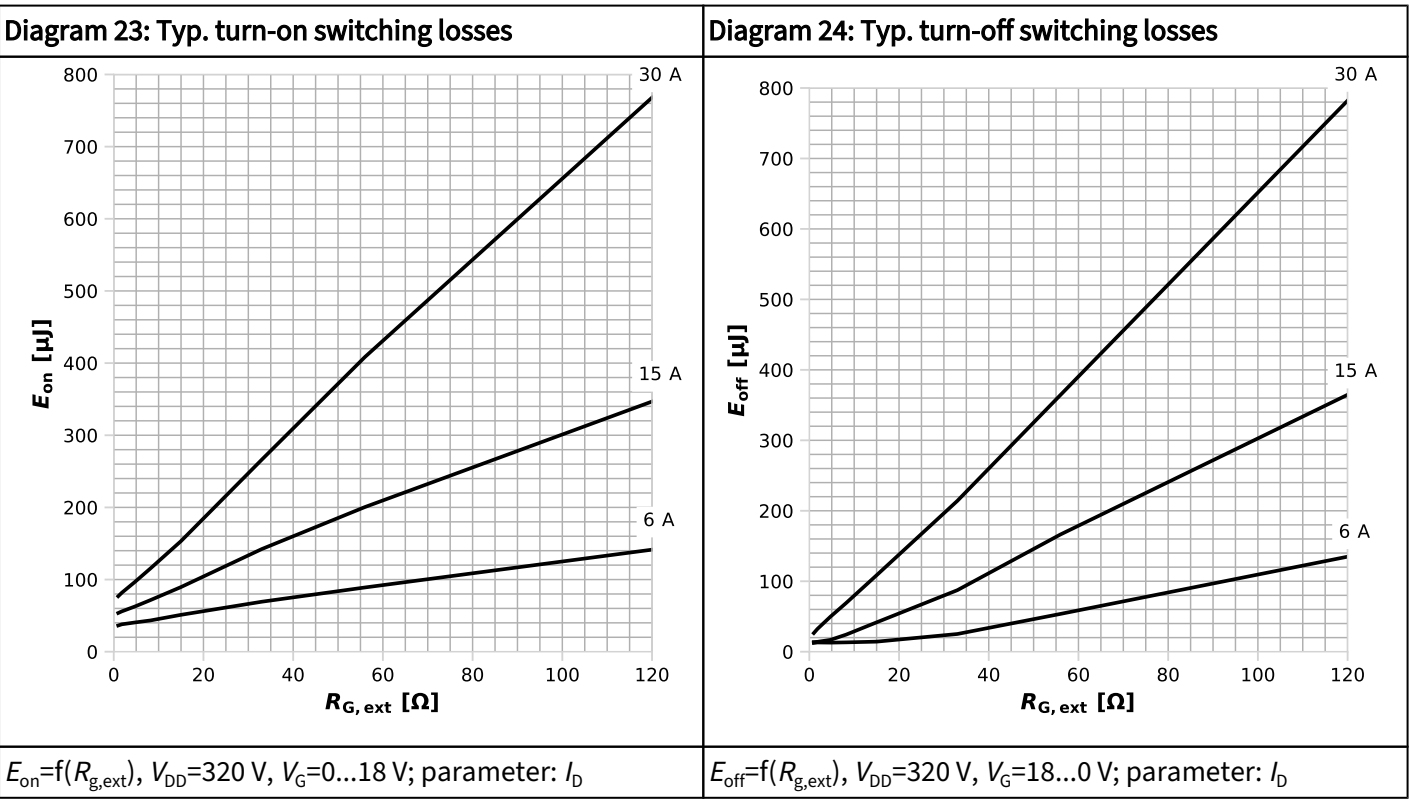
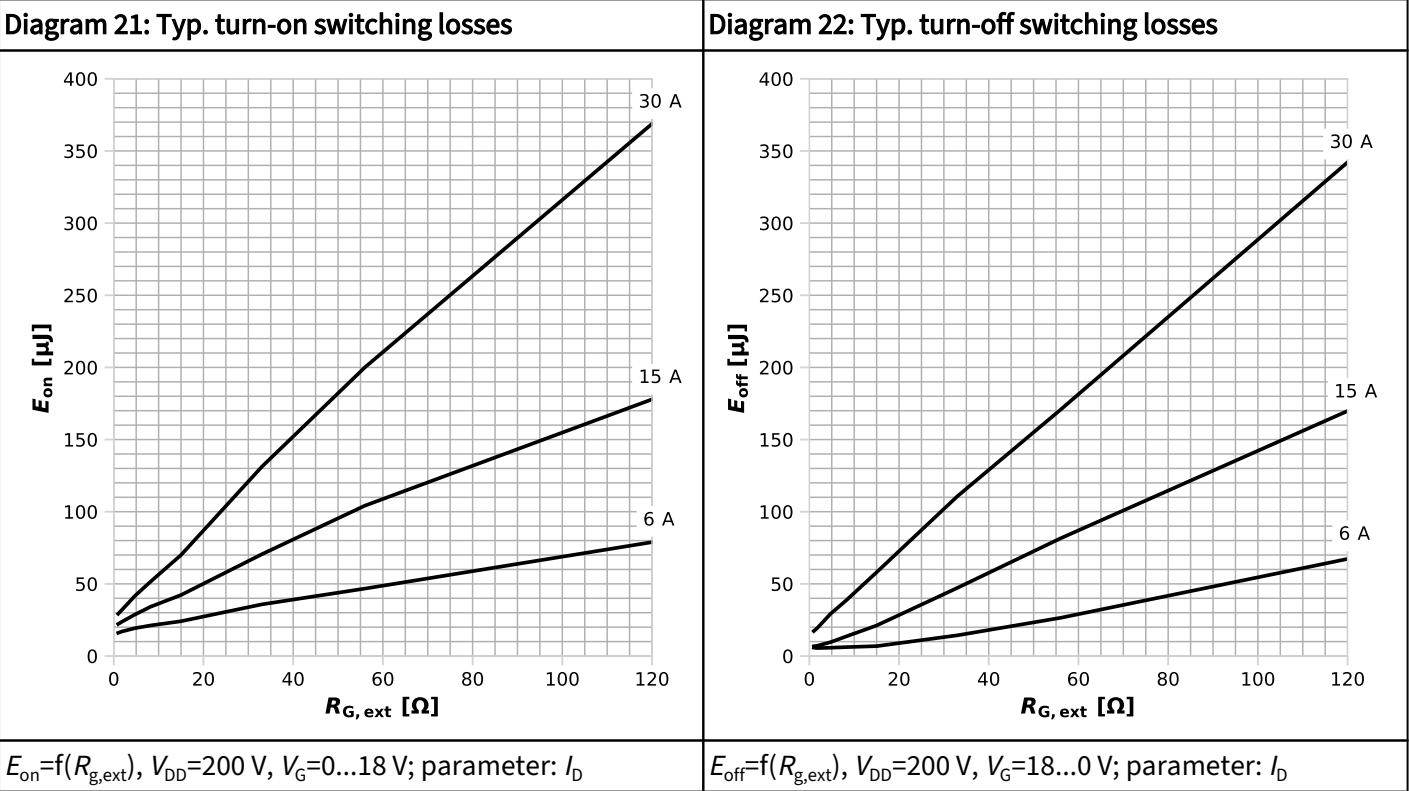


$$I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega; \text{parameter: } T_{j,\text{start}}$$

Diagram 20: Min. drain-source breakdown voltage



$$V_{BR(DSS)}=f(T_j); I_D=0.56\text{ mA}$$



6 Test circuits

Table 9 Switching times

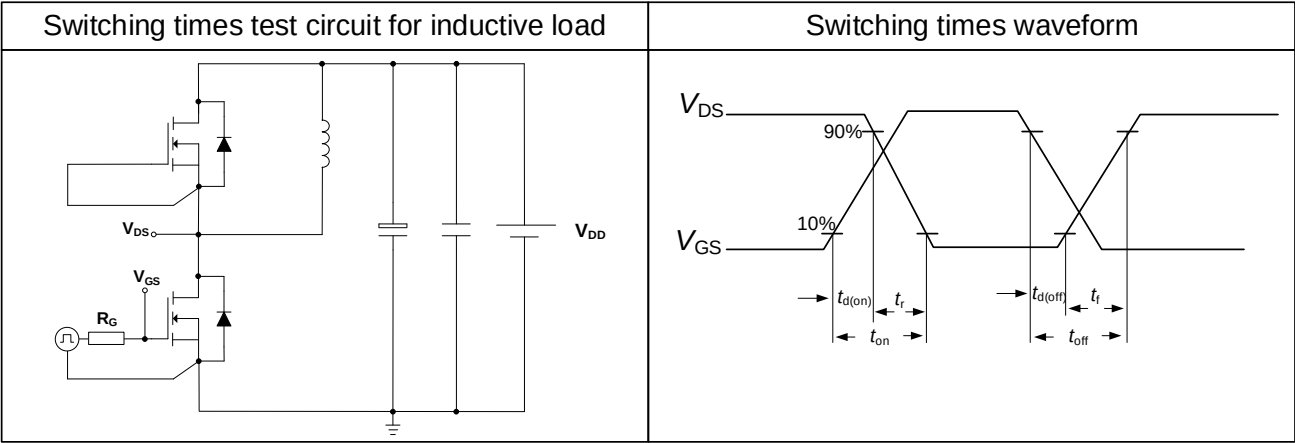
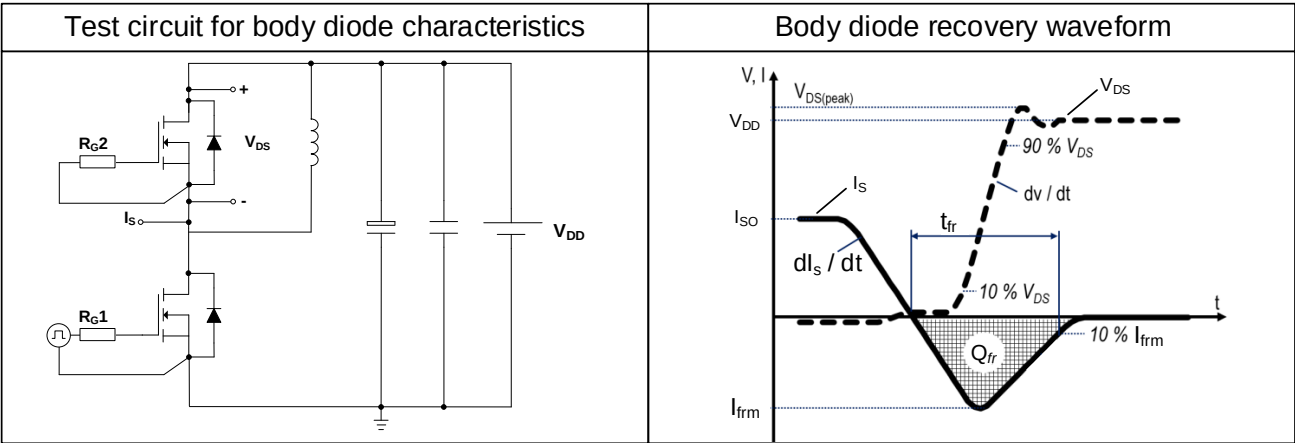
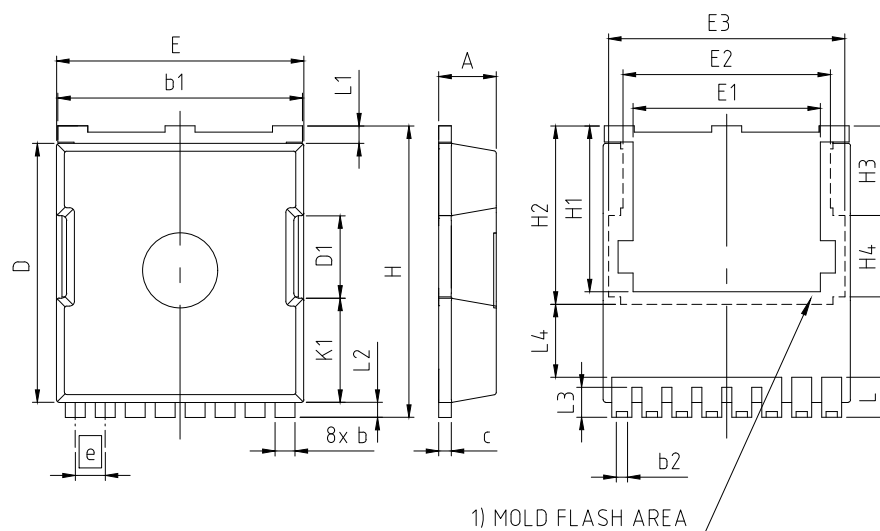


Table 10 Body diode characteristics



7 Package outlines



PACKAGE - GROUP NUMBER: PG-HSOF-8-U02		
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	2.20	2.40
b	0.70	0.90
b1	9.70	9.90
b2	0.42	0.50
c	0.40	0.60
D	10.28	10.58
D1	3.30	
E	9.70	10.10
E1	7.50	
E2	8.50	
E3	9.46	
e	1.20 (BSC)	
H	11.48	11.88
H1	6.55	6.95
H2	7.15	
H3	3.59	
H4	3.26	
N	8	
K1	4.18	
L	1.40	1.80
L1	0.50	0.90
L2	0.50	0.70
L3	1.00	1.30
L4	2.62	2.81

1) PARTIALLY COVERED WITH MOLD FLASH

Figure 1 Outline PG-HSOF-8, dimensions in mm

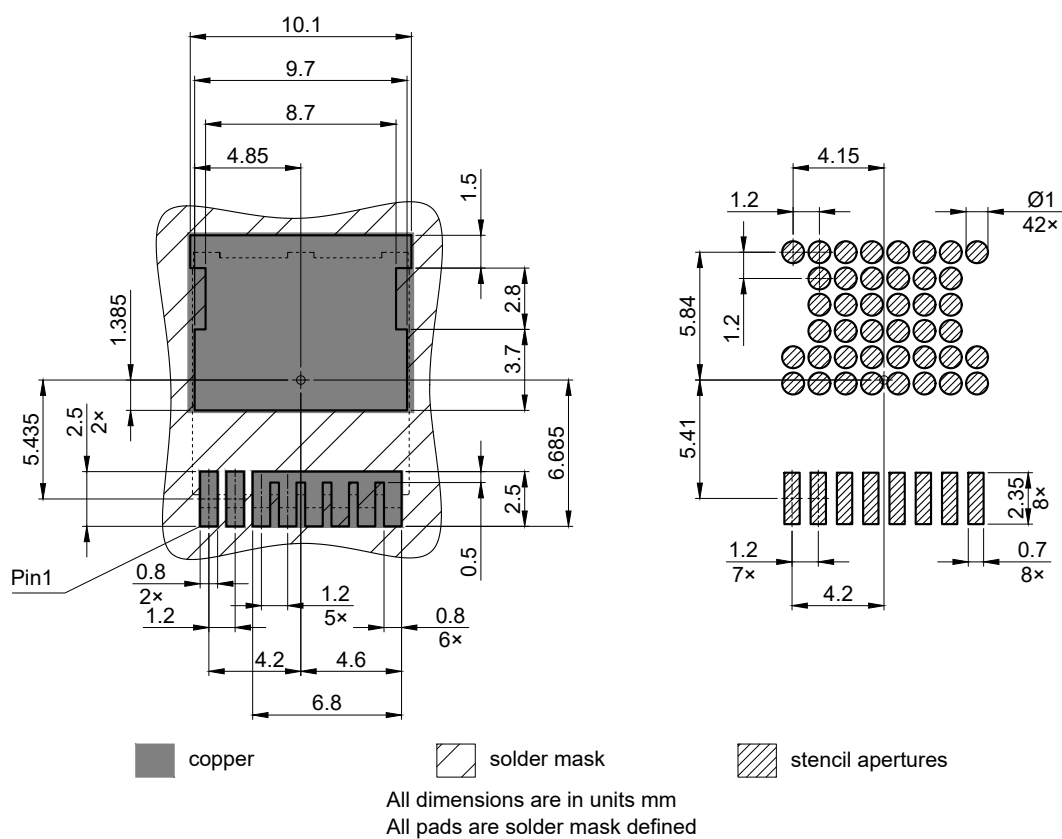
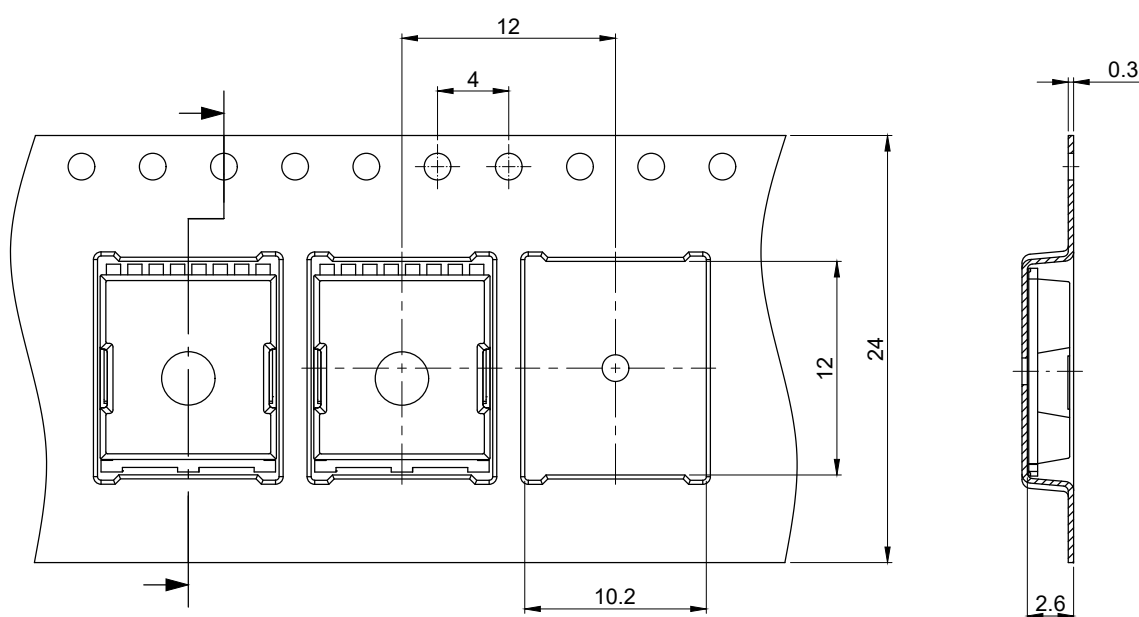


Figure 2 Footprint drawing PG-HSOF-8, dimensions in mm



All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [

Figure 3 Packaging variant PG-HSOF-8, dimensions in mm

Revision history

IMT44R025M2H

Revision 2025-05-27, Rev. 1.0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2025-05-27	Release of final datasheet

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Infineon Technologies AG

81726 München, Germany

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