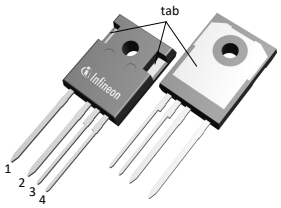
CoolSiC™

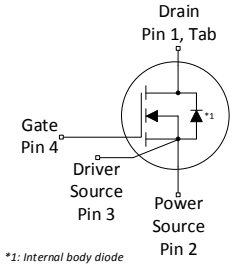
400V CoolSiC™ G2 MOSFET

PG-TO247-4



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 V
- Recommended gate driving voltage 0 V to 18 V
- .XT interconnection technology for best-in-class thermal performance
- 100% avalanche tested



Potential applications

- SMPS
- Solar PV inverters
- Energy storage, UPS and battery formation
- Class-D audio
- Motor drives

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}	400	V
$R_{DS(on),typ}$	36.5	mΩ
I_D	46	A
Q_{oss}	42	nC
E_{oss}	3.0	µJ
Q_G	26	nC

Part number	Package	Marking	Related links
IMZA40R036M2H	PG-TO247-4	40R036M2	-

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1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain current [1]	I_D	-	-	46	A	V_{GS}=18 V, T_C=25 °C
				33		V_{GS}=18 V, T_C=100 °C
Pulsed drain current [2]	$I_{D,pulse}$	-	-	138	A	T_C=25 °C
Avalanche energy, single pulse [3]	E_{AS}	-	-	66	mJ	I_D=11.1 A, R_{GS}=25 Ω
Avalanche energy, repetitive	E_{AR}			0.33		
Gate source voltage (static)	$V_{GS,DC}$	-7	-	23	V	-
Gate source voltage (transient)	$V_{GS,AC}$	-10	-	25	V	t_{pulse}≤500 ns, duty cycle≤1%
Power dissipation	P_{tot}	-	-	139	W	T_C=25 °C
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] See Diagram 3 for more detailed information.

[3] 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}	-	-	1.08	°C/W	-

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 °C, unless otherwise specified

Table 5 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	400	-	-	V	V_{GS}=0 V, I_D=0.4 mA
Gate threshold voltage [4]	$V_{GS(th)}$	3.5	4.5	5.6	V	V_{DS}=V_{GS}, I_D=4 mA
Zero gate voltage drain current	I_{DSS}	-	1	75	µA	V_{DS}=400 V, V_{GS}=0 V, T_j=25 °C
			2	-		V_{DS}=400 V, V_{GS}=0 V, T_j=175 °C
Gate-source leakage current	I_{GSS}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	36.5	45.7	mΩ	V_{GS}=18 V, I_D=11.1 A, T_j=25 °C
			52.4	-		V_{GS}=18 V, I_D=11.1 A, T_j=175 °C
			44.6	-		V_{GS}=15 V, I_D=11.1 A, T_j=25 °C
Gate resistance	R_G	-	5.5	-	Ω	-

[4] Tested after 1ms pulse at V_{GS} = +20V.

Table 6 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	870	-	pF	V_{GS}=0 V, V_{DS}=200 V, f=1 MHz
Output capacitance	C_{oss}		120			
Reverse transfer capacitance	C_{rss}		10			
Effective output capacitance, energy related [5]	$C_{o(er)}$	-	150	-	pF	V_{GS}=0 V, V_{DS}=0...200 V
Effective output capacitance, time related [6]	$C_{o(tr)}$	-	210	-	pF	I_D=constant, V_{GS}=0 V, V_{DS}=0...200 V
Turn-on delay time [7]	$t_{d(on)}$	-	7.4	-	ns	V_{DD}=200 V, V_{GS}=0...18 V, I_D=11.1 A, $R_{G,ext}$=1.8 Ω
Rise time [7]	t_r					
Turn-off delay time [7]	$t_{d(off)}$	-	18.7	-	ns	V_{DD}=200 V, V_{GS}=18...0 V, I_D=11.1 A, $R_{G,ext}$=1.8 Ω
Fall time [7]	t_f		6.5			

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

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

[7] Refer to Table 9 for test setup.

Table 7 Gate Charge Characteristics [8)]

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	7	-	nC	V_{DD}=200 V, I_D=11.1 A, V_{GS}=0 to 18 V
Gate to drain charge	Q_{gd}		5.4			
Gate charge total	Q_g		26			
Gate charge total, sync. FET	$Q_{g(sync)}$	-	24	-	nC	V_{DS}=0.1 V, V_{GS}=0 to 18 V
Output charge	Q_{oss}	-	42	-	nC	V_{DS}=200 V, V_{GS}=0 V
Output Energy	E_{oss}		3.0		µJ	

8) As per JEP192, Guidelines for Gate Charge (Q_G) Test Method for SiC MOSFET.

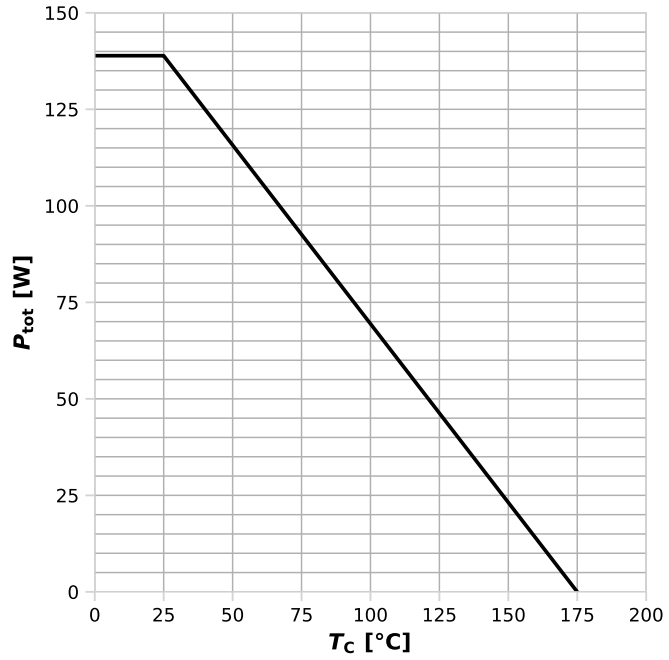
Table 8 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	21	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	138	A	T_C=25 °C, t_{pulse}≤250 ns
Diode forward voltage	V_{SD}	-	3.5	4.3	V	V_{GS}=0 V, I_S=11.1 A, T_j=25 °C
MOSFET forward recovery time	t_{fr}	-	11.2	-	ns	V_R=200 V, I_S=11.1 A, di_S/dt=1000 A/µs
			10.2			V_R=200 V, I_S=11.1 A, di_S/dt=3000 A/µs
MOSFET forward recovery charge [9)]	Q_{fr}	-	49.3	-	nC	V_R=200 V, I_S=11.1 A, di_S/dt=1000 A/µs
			115.7			V_R=200 V, I_S=11.1 A, di_S/dt=3000 A/µs

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

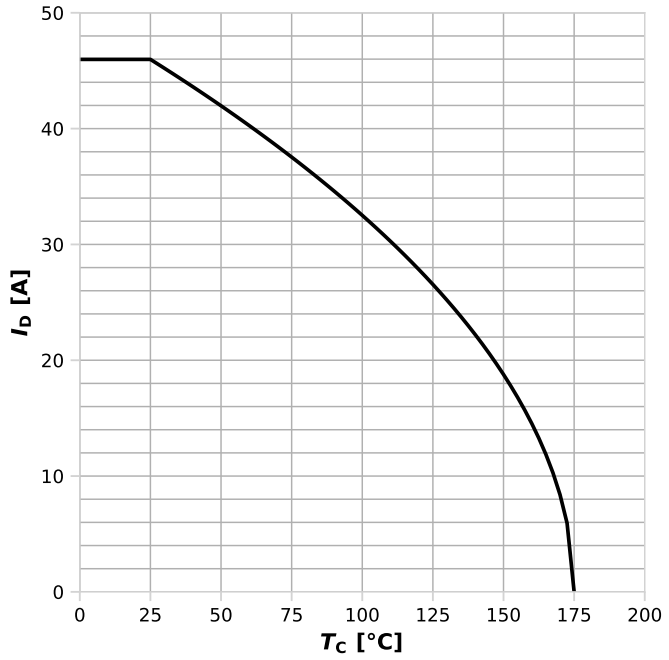
5 Electrical characteristics diagrams

Diagram 1: Power dissipation



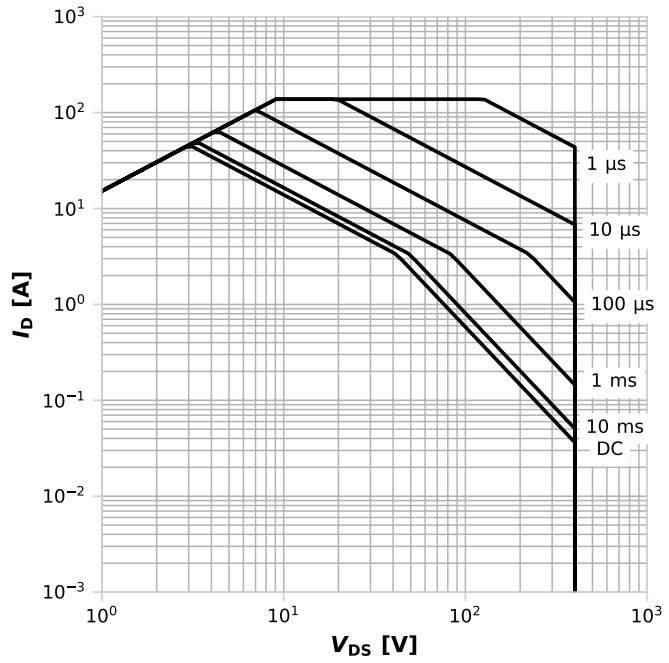
P_{tot}=f(T_C)

Diagram 2: Drain current



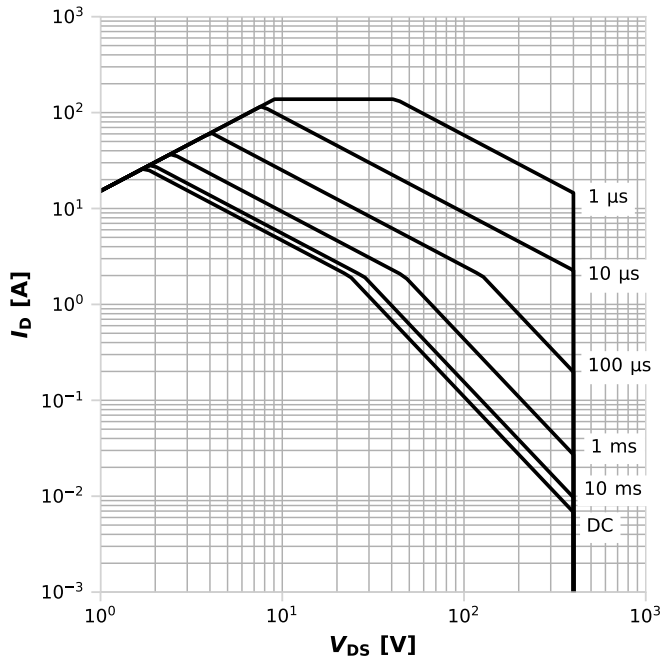
I_D=f(T_C); V_{GS}≥18 V

Diagram 3: Safe operating area



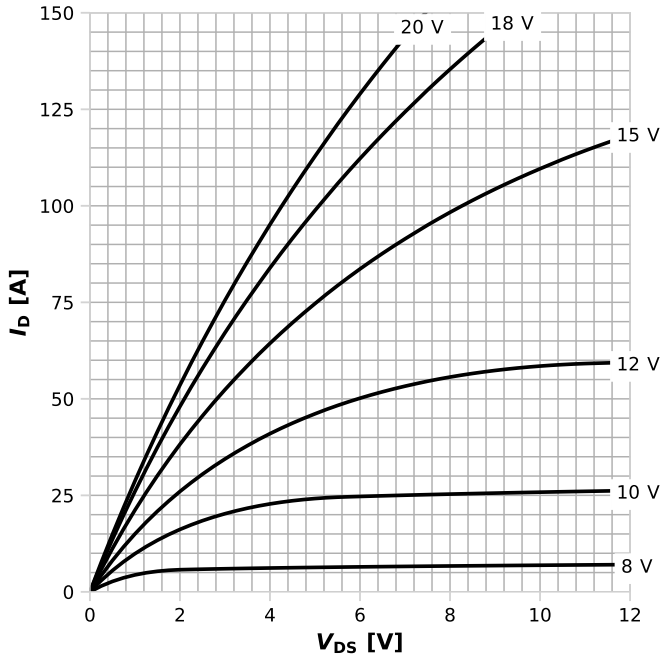
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Safe operating area



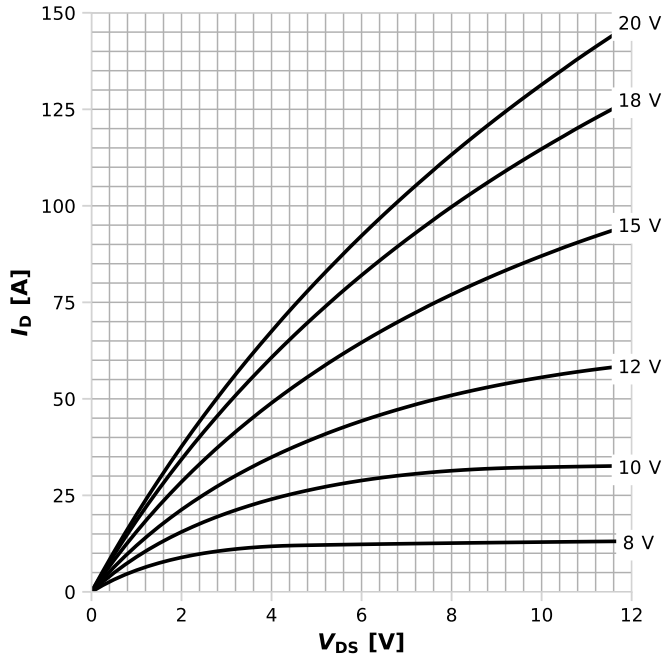
I_D=f(V_{DS}); T_C=125 °C; D=0; parameter: t_p

Diagram 5: Typ. output characteristics



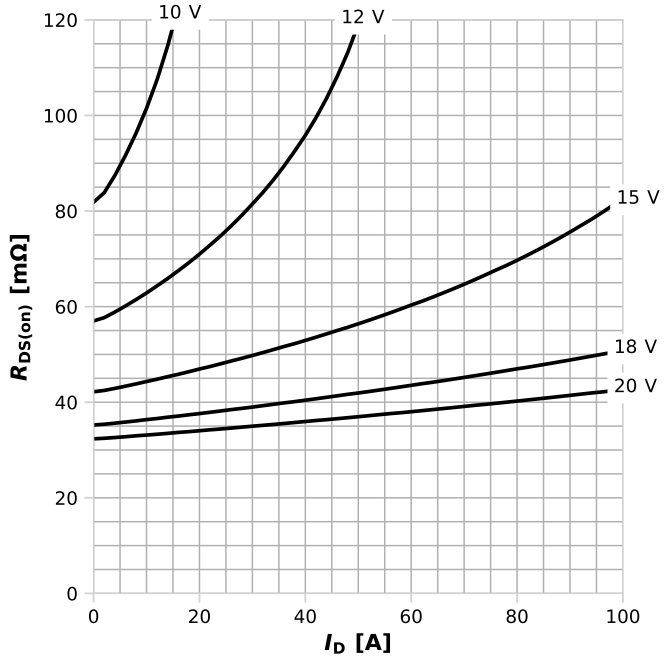
I_D=f(V_{DS}), T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics



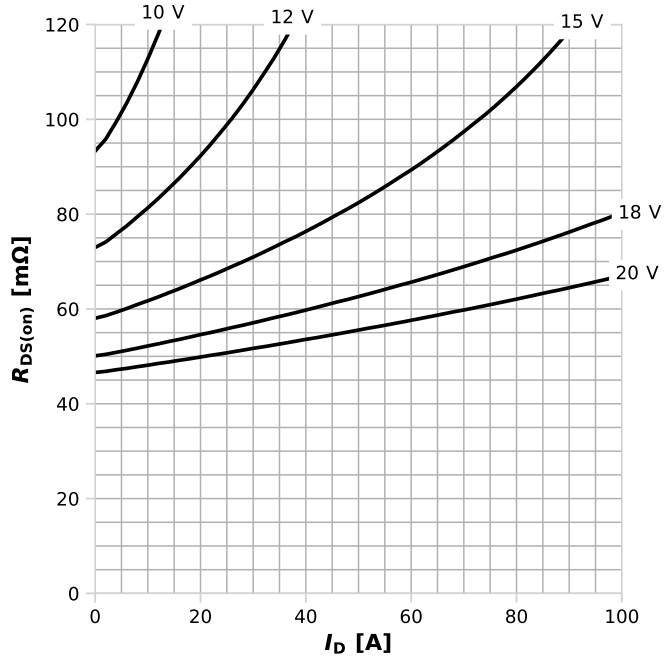
I_D=f(V_{DS}), T_j=175 °C; parameter: V_{GS}

Diagram 7: Typ. drain-source on resistance



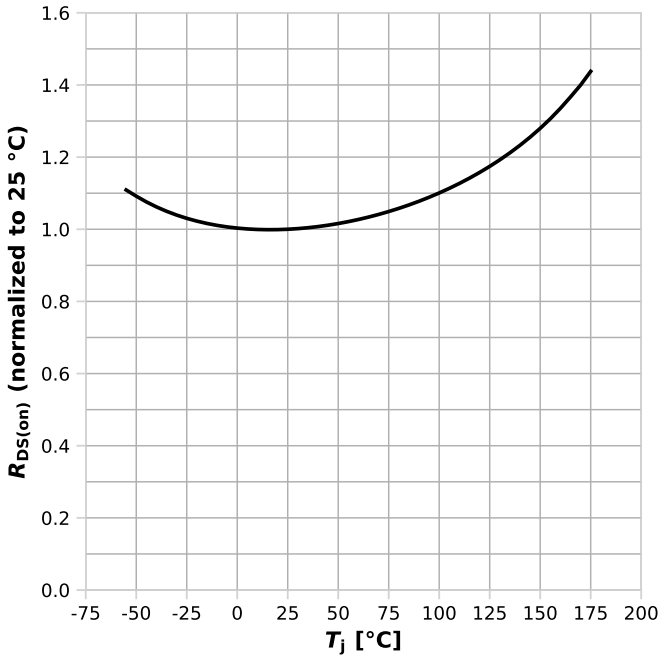
$R_{DS(on)}$=f(I_D), T_j=25 °C; parameter: V_{GS}

Diagram 8: Typ. drain-source on resistance



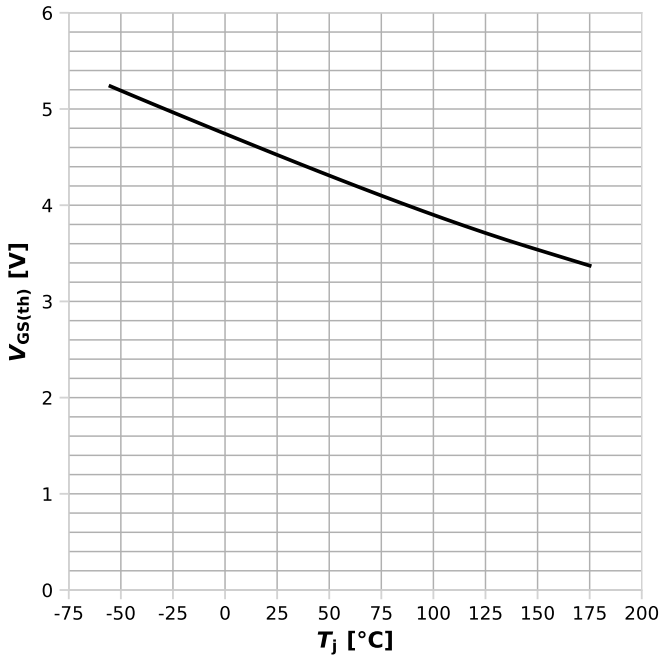
$R_{DS(on)}$=f(I_D), T_j=175 °C; parameter: V_{GS}

Diagram 9: Normalized drain-source on resistance



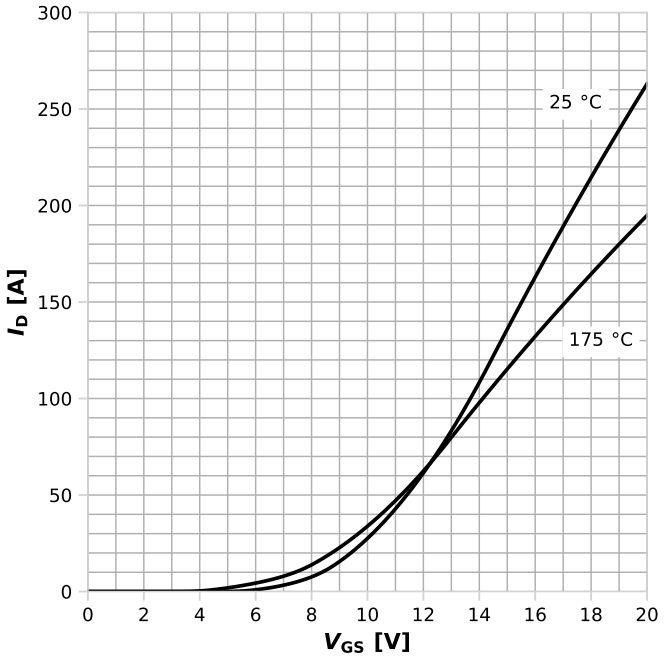
$R_{DS(on)}$=f(T_j), I_D=11.1 A, V_{GS}=18 V

Diagram 10: Typ. gate threshold voltage



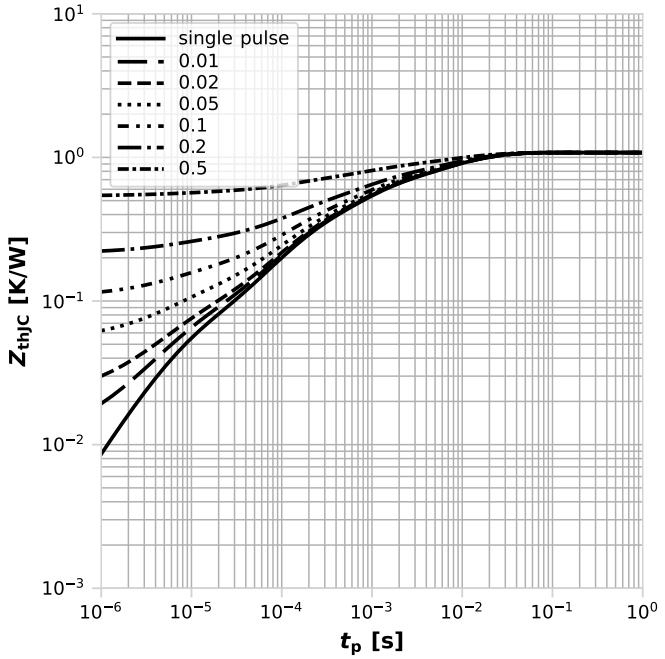
$V_{GS(th}$=f(T_j), V_{GS}=V_{DS}, I_D=4 mA

Diagram 11: Typ. transfer characteristics



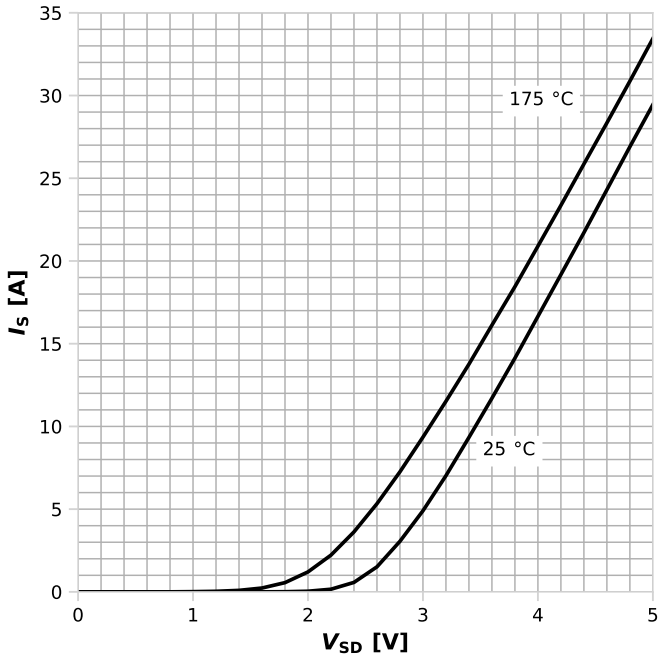
I_D=f(V_{GS}), |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 12: Max. transient thermal impedance



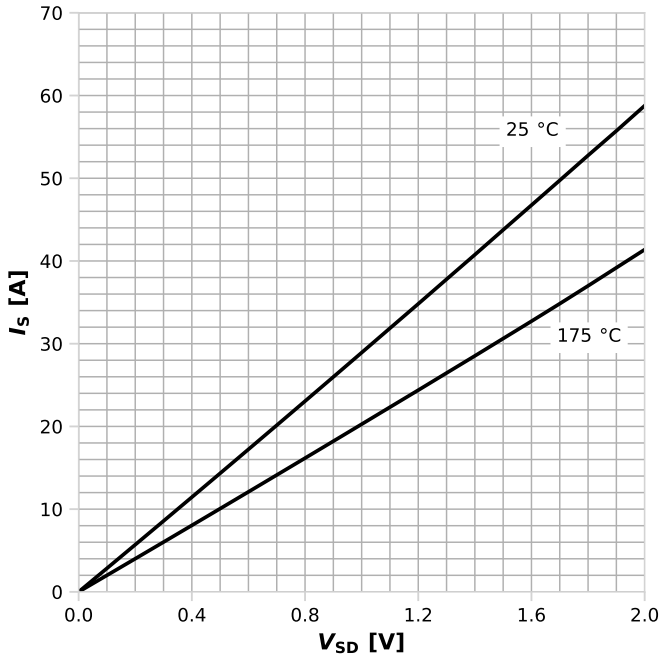
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 13: Reverse output characteristics



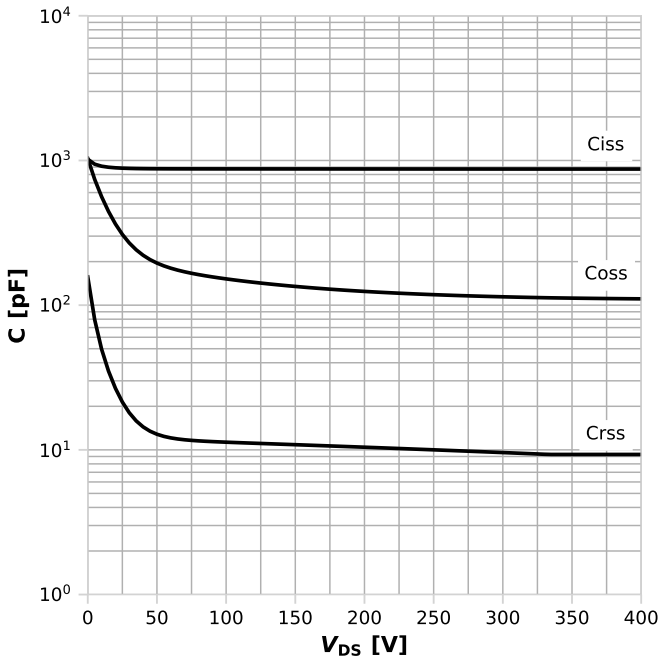
I_F=f(V_{SD}), V_{GS}=0 V; parameter: T_j

Diagram 14: Reverse output characteristics



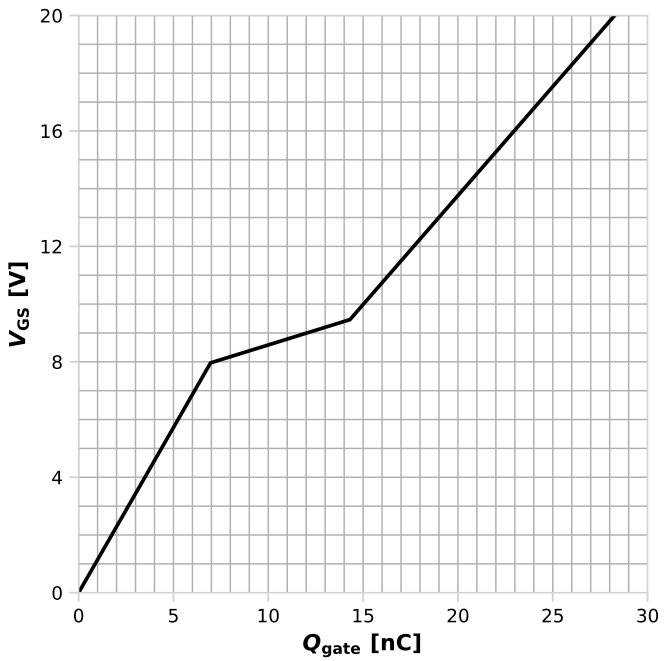
I_F=f(V_{SD}), V_{GS}=18 V; parameter: T_j

Diagram 15: Typ. capacitances



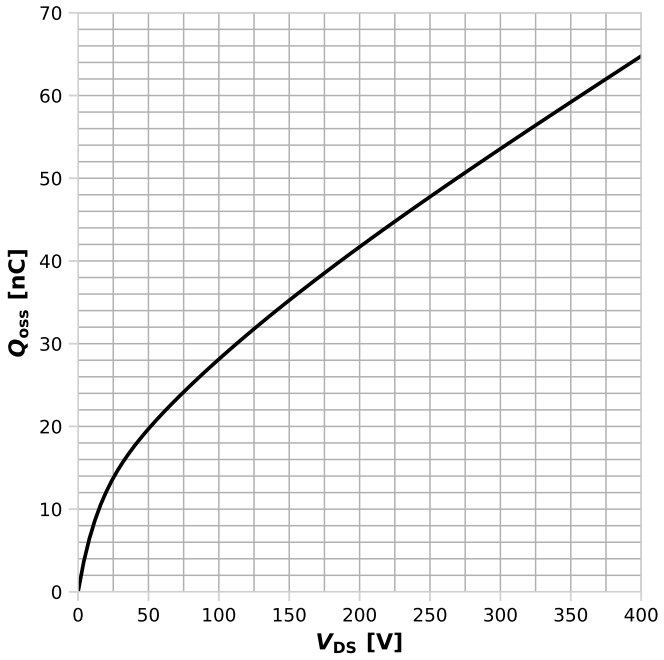
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 16: Typ. gate charge



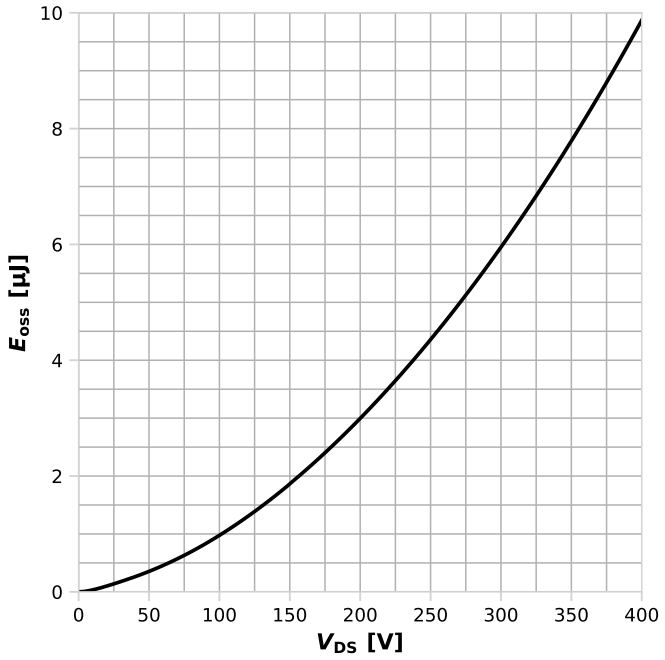
V_{GS}=f(Q_{gate}), V_{DD}=200 V, I_D=11.1 A pulsed, T_j=25 °C

Diagram 17: Typ. output charge



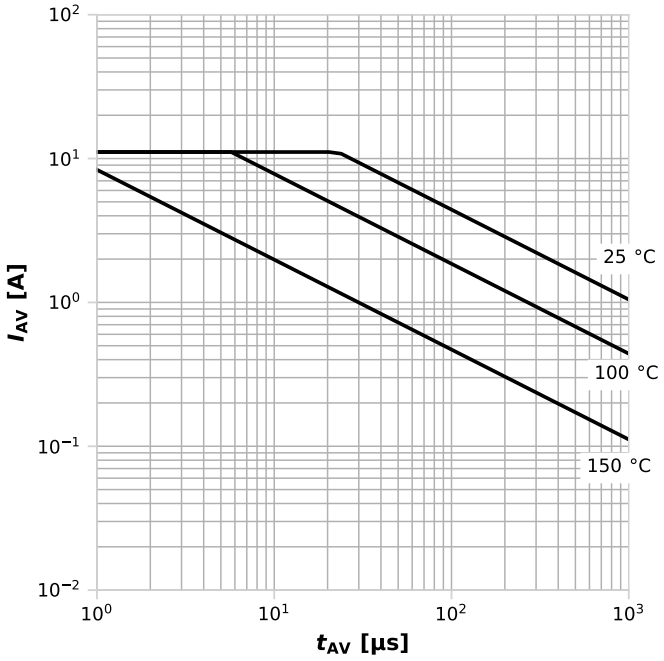
Q_{oss}=f(V_{DS}), V_{GS}=0 V

Diagram 18: Typ. output energy



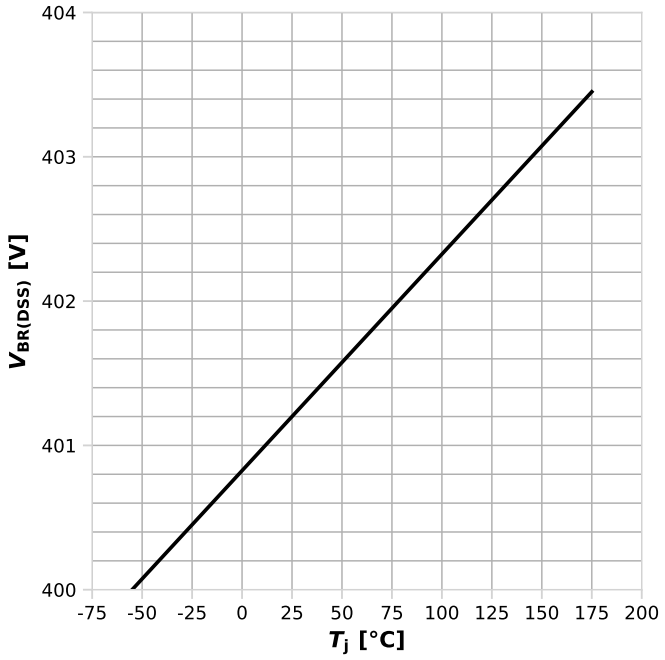
E_{oss}=f(V_{DS}), V_{GS}=0 V

Diagram 19: Avalanche characteristics



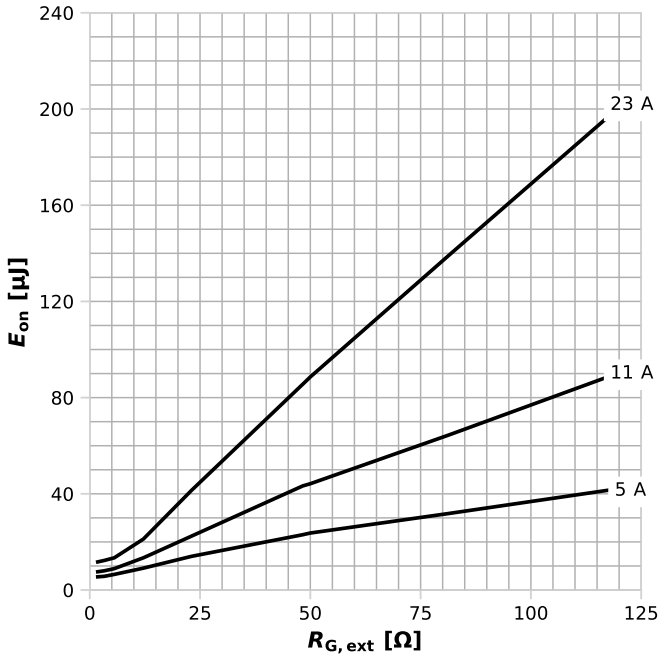
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$

Diagram 20: Min. drain-source breakdown voltage



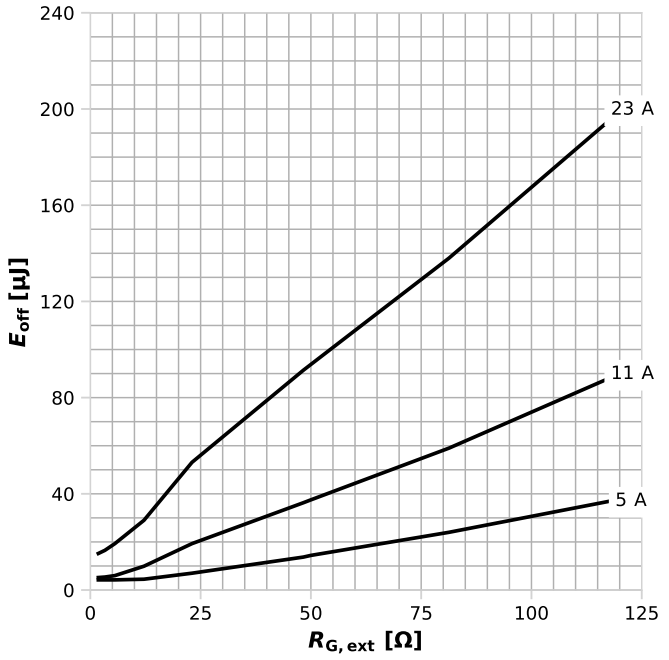
$V_{BR(DSS)}$=f(T_j); I_D=0.4 mA

Diagram 21: Typ. turn-on switching losses



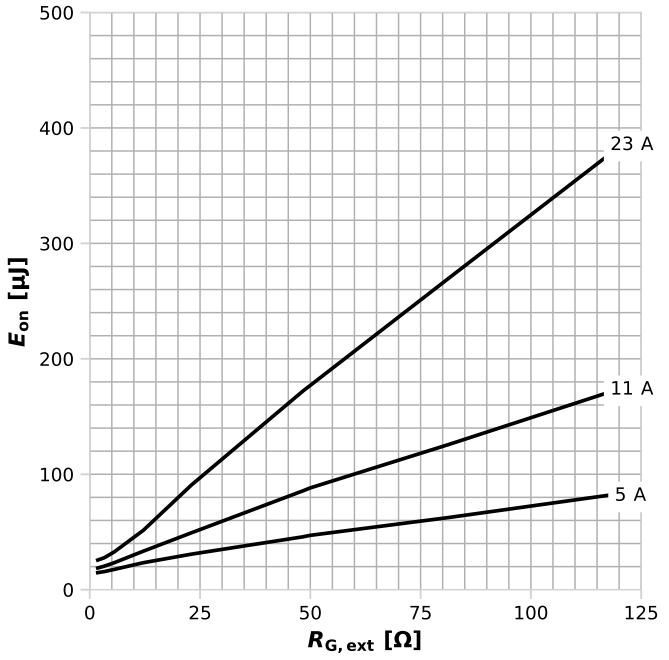
E_{on}=f($R_{g,ext}$), V_{DD}=200 V, V_G=0...18 V; parameter: I_D

Diagram 22: Typ. turn-off switching losses



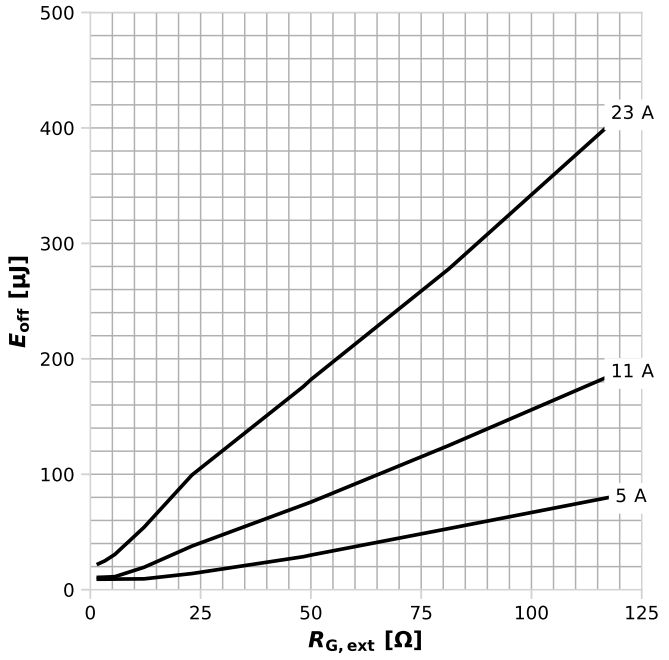
E_{off}=f($R_{g,ext}$), V_{DD}=200 V, V_G=18...0 V; parameter: I_D

Diagram 23: Typ. turn-on switching losses



E_{on}=f($R_{g,ext}$), V_{DD}=320 V, V_G=0...18 V; parameter: I_D

Diagram 24: Typ. turn-off switching losses



E_{off}=f($R_{g,ext}$), V_{DD}=320 V, V_G=18...0 V; parameter: I_D

6 Test circuits

Table 9 Switching times

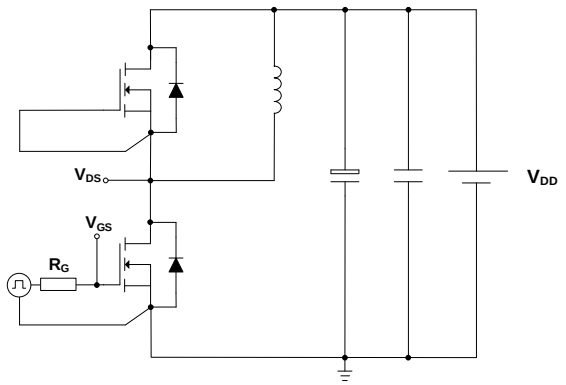
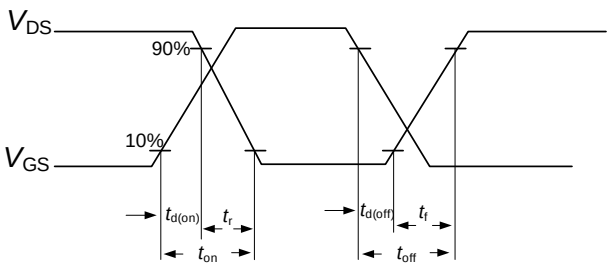
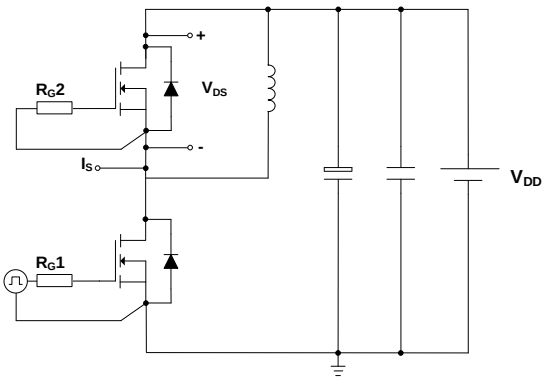
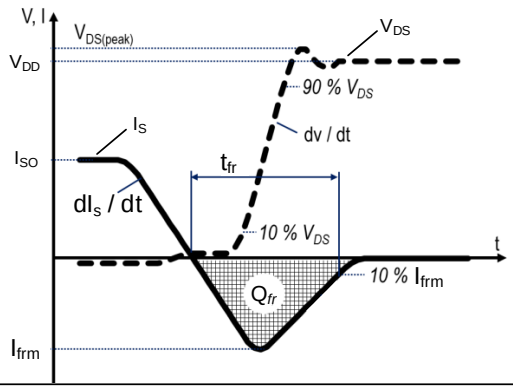
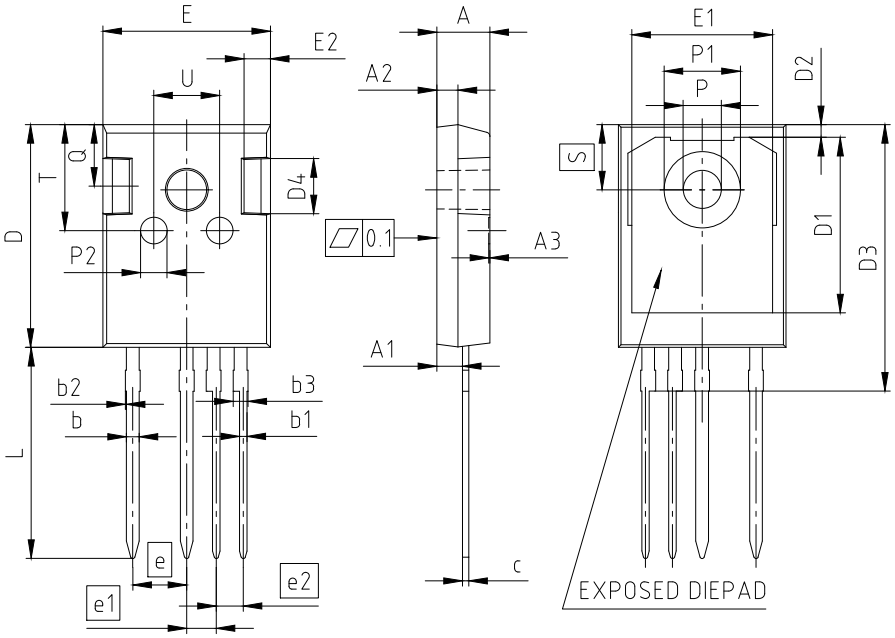
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Body diode characteristics

Test circuit for body diode characteristics	Body diode recovery waveform
	

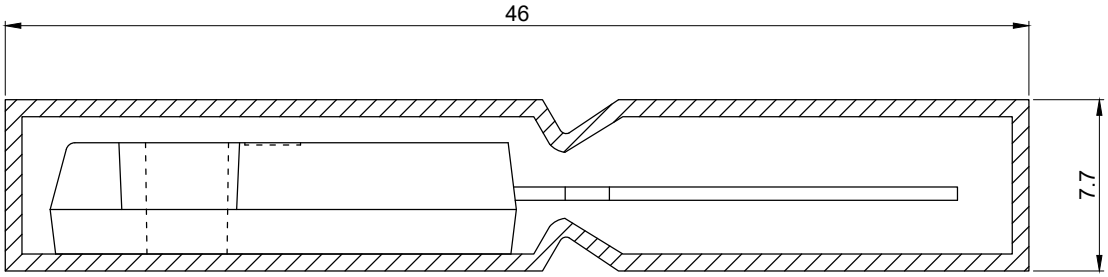
7 Package outlines



NOTES:
DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

PACKAGE - GROUP NUMBER:	PG-TO247-4-U02				
DIMENSIONS	MILLIMETERS		DIMENSIONS	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	4.90	5.10	E	15.70	15.90
A1	2.31	2.51	E1	13.10	13.50
A2	1.90	2.10	E2	2.40	2.60
A3	0.05	0.25	e	5.08	
b	1.10	1.30	e1	2.79	
b1	0.65	0.79	e2	2.54	
b2	---	0.20	N	4	
b3	1.34	1.44	L	19.80	20.10
c	0.58	0.66	øP	3.50	3.70
D	20.90	21.10	øP1	7.00	7.40
D1	16.25	16.85	øP2	2.40	2.60
D2	1.05	1.35	Q	5.60	6.00
D3	24.97	25.27	S	6.15	
D4	4.90	5.10	T	9.80	10.20
			U	6.00	6.40

Figure 1 Outline PG-TO247-4, dimensions in mm



All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]

Figure 2 Packaging variant PG-TO247-4, dimensions in mm

Revision history

IMZA40R036M2H

Revision 2025-07-15, Rev. 1.0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2025-07-15	Release of final datasheet

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