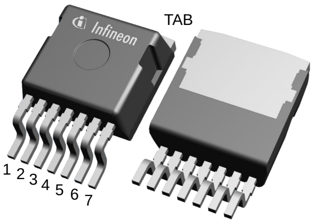
Final datasheet
Automotive CoolSiC™ MOSFET 1700 V in D2PAK

Features

- V_{DSS} = 1700 V at T_{vj} = -55...175°C
- I_{DDC} = 14.9 A at T_C = 25°C
- Optimized for fly-back topologies
- Gate-source voltage (V_{GS}) compatible with most fly-back controllers
- Very low switching losses enabling high switching frequencies
- Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.5 V
- Fully controllable dv/dt for EMI optimization
- Sense (Kelvin) source pin for better gate control and reduced switching losses
- SMT package for automated assembly and reduced system costs
- Efficiency improvement and cooling effort reduction



Halogen-free
Green
Lead-free
RoHS

Potential applications

- DC/DC converter

Product validation

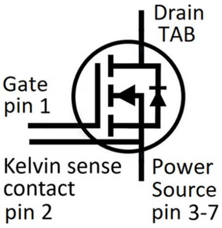
- Qualified for Automotive Applications. Product Validation according to AEC-Q100/101

Description

Pin definition:

- Pin 1 - Gate
- Pin 2 - Kelvin Sense Contact
- Pin 3…7 - Power Source
- Tab - Drain

Note: the source and sense pins are not exchangeable, their exchange might lead to malfunction recommended for forward operation only



Type	Package	Marking
AIMBF170R450M1	PG-TO263-7-U01	A17M1450

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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}				260	°C
MOSFET/body diode thermal resistance, junction-case1)	$R_{th(j-c)}$			0.81	1.05	K/W

1) not subject to production test - verified by design/characterization

2 MOSFET

Table 2 Maximum rated values

Parameter	**Symbol**	**Note or test condition**		**Values**	**Unit**
Drain-source voltage1)	V_{DSS}	T_{vj} = -55...175 °C		1700	V
Continuous DC drain current for $R_{th(j-c,max)}$, limited by $T_{vj(max)}$2)	I_{DDC}	V_{GS} = 20 V	T_c = 25 °C	15	A
			T_c = 100 °C	10.5	
Peak drain current, t_p limited by $T_{vj(max)}$2)	I_{DM}	V_{GS} = 20 V		38	A
Gate-source voltage, max. transient voltage3)	V_{GS}	$t_p \leq 0.5$ µs, $D < 0.01$		-10/23	V
Power dissipation, limited by $T_{vj(max)}$2)	P_{tot}		T_c = 25 °C	142	W
			T_c = 100 °C	71	

1) Tested at Tvj = 25 °C, verified by design / characterization over full temperature range
2) not subject to production test - verified by design/characterization
3) **Important note:** The selection of positive and negative gate-source voltages impacts the long-term behavior of the device. The design guidlines described in Appilcation Note AN2018-09 must be considered to ensure sound opeartion of the device over the planned lifetime

Table 3 Recommended values

Parameter	**Symbol**	**Note or test condition**	**Values**	**Unit**
Recommended turn-on gate voltage	$V_{GS(on)}$		12...20	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	$R_{DS(on)}$	$I_D = 2$ A	$T_{vj} = 25$ °C, $V_{GS(on)} = 20$ V		240	340	mΩ
			$T_{vj} = 25$ °C, $V_{GS(on)} = 18$ V		250		
			$T_{vj} = 25$ °C, $V_{GS(on)} = 12$ V		368		
			$T_{vj} = 100$ °C, $V_{GS(on)} = 20$ V		410		
			$T_{vj} = 175$ °C, $V_{GS(on)} = 20$ V		635		
Gate-source threshold voltage	$V_{GS(th)}$	$I_D = 2.5$ 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		0.09	11	µA
			$T_{vj} = 175$ °C		3.4		
Gate leakage current	I_{GSS}	$V_{DS} = 0$ V	$V_{GS} = -10$ V			-100	nA
			$V_{GS} = 23$ V			100	
Forward transconductance	g_{fs}	$I_D = 2$ A, $V_{DS} = 20$ V			0.9		S
Internal gate resistance	$R_{G,int}$	$f = 1$ MHz, $V_{AC} = 25$ mV			20		Ω
Input capacitance	C_{iss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 1000$ kHz, $V_{AC} = 25$ mV			514		pF
Output capacitance	C_{oss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 1000$ kHz, $V_{AC} = 25$ mV			19		pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 1000$ kHz, $V_{AC} = 25$ mV			1.2		pF
C_{oss} stored energy	E_{oss}	$V_{DS} = 1000$ V, $V_{GS} = 0$ V, $f = 1000$ kHz, $V_{AC} = 25$ mV			12		µJ
Total gate charge	Q_G	$V_{DD} = 1000$ V, $I_D = 2$ A, $V_{GS} = 0/20$ V, turn-on pulse			22.5		nC
Plateau gate charge	$Q_{GS(pl)}$	$V_{DD} = 1000$ V, $I_D = 2$ A, $V_{GS} = 0/20$ V, turn-on pulse			5.6		nC
Gate-drain charge	Q_{GD}	$V_{DD} = 1000$ V, $I_D = 2$ A, $V_{GS} = 0/20$ V, turn-on pulse			3.4		nC
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 1000$ V, $I_D = 2$ A, $V_{GS} = 0/20$ V, $R_{G,ext} = 22\ \Omega$, $L_\sigma = 20$ nH, diode: body diode at $V_{GS} = 0$ V	$T_{vj} = 25$ °C		16.2		ns
			$T_{vj} = 175$ °C		16		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Rise time	t_r	V_{DD} = 1000 V, I_D = 2 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 22 Ω, L_σ = 20 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		8.4		ns
			T_{vj} = 175 °C		8.6		
Turn-off delay time	$t_{d(off)}$	V_{DD} = 1000 V, I_D = 2 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 22 Ω, L_σ = 20 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		32		ns
			T_{vj} = 175 °C		33		
Fall time	t_f	V_{DD} = 1000 V, I_D = 2 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 22 Ω, L_σ = 20 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		32		ns
			T_{vj} = 175 °C		32		
Turn-on energy	E_{on}	V_{DD} = 1000 V, I_D = 2 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 22 Ω, L_σ = 20 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		55		µJ
			T_{vj} = 175 °C		76		
Turn-off energy	E_{off}	V_{DD} = 1000 V, I_D = 2 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 22 Ω, L_σ = 20 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 = 2 A, V_{GS} = 0/20 V, $R_{G,ext}$ = 22 Ω, L_σ = 20 nH, diode: body diode at V_{GS} = 0 V	T_{vj} = 25 °C		68		µJ
			T_{vj} = 175 °C		91		
Virtual junction temperature	$T_{vj(min\ldots max)}$			-55		175	°C

Note: *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} = -55...175 °C	1700	V

(table continues...)

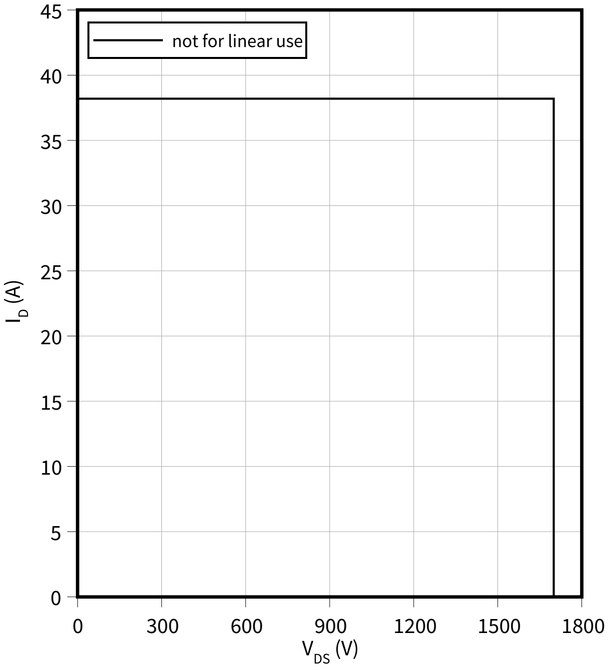
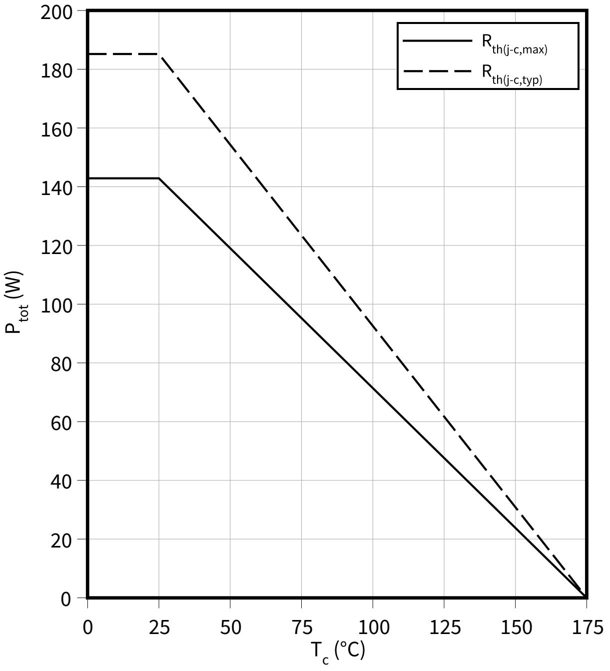
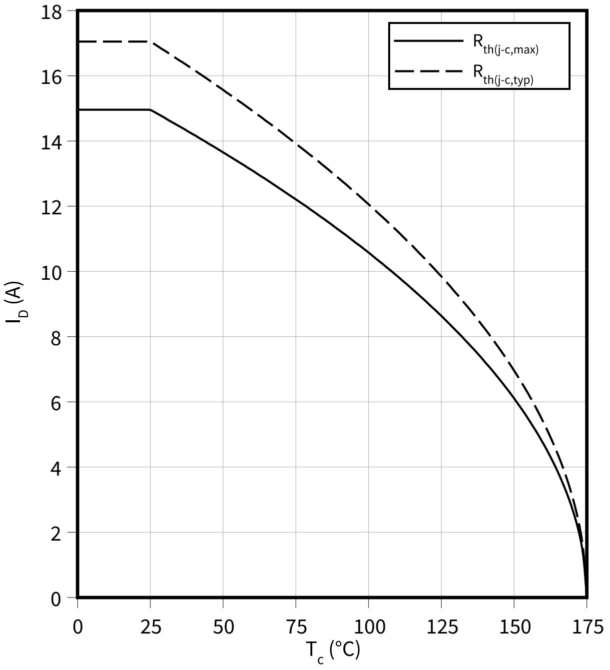
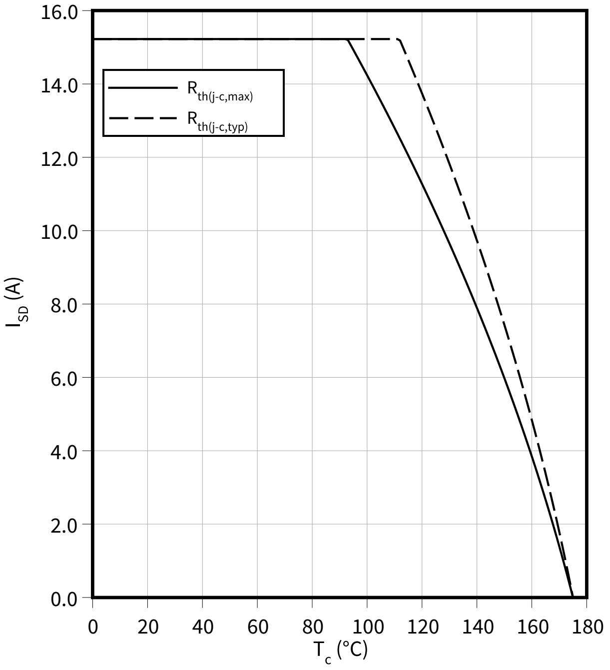
Table 5 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
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	15.2	A
			$T_c = 100$ °C	14.2	
Peak reverse drain current, t_p limited by $T_{vj(max)}$	I_{SM}	$V_{GS} = 0$ V		15.2	A

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source reverse voltage	V_{SD}	$I_{SD} = 2$ A, $V_{GS} = 0$ V	$T_{vj} = 25$ °C		3.2	5	V
			$T_{vj} = 100$ °C		3.1		
			$T_{vj} = 175$ °C		3		
MOSFET forward recovery charge	Q_{fr}	$V_{DD} = 1000$ V, $I_{SD} = 2$ A, $V_{GS} = 0$ V, $-di_{SD}/dt = 1000$ A/µs, Q_{fr} includes also Q_C	$T_{vj} = 25$ °C		34.7		nC
			$T_{vj} = 175$ °C		60.3		
MOSFET peak forward recovery current	I_{frm}	$V_{DD} = 1000$ V, $I_{SD} = 2$ A, $V_{GS} = 0$ V, $-di_{SD}/dt = 1000$ A/µs, Q_{fr} includes also Q_C	$T_{vj} = 25$ °C		4.4		A
			$T_{vj} = 175$ °C		6.5		
Virtual junction temperature	$T_{vj(min\ ...\ max)}$			-55		175	°C

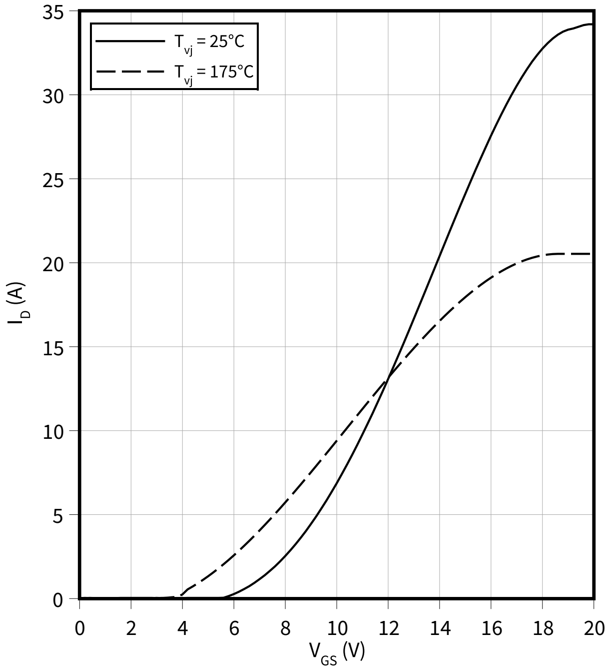
4 Characteristics diagrams

Reverse bias safe operating area (RBSOA) $I_D = f(V_{DS})$ $T_{vj} < 175$ °C, $V_{GS} = 0/20$ V, $T_c = 25$ °C	**Power dissipation as a function of case temperature** $P_{tot} = f(T_c)$ $T_{vj} \leq 175$ °C
	
Maximum DC drain to source current as a function of case temperature $I_D = f(T_c)$	**Maximum source to drain current as a function of case temperature** $I_{SD} = f(T_c)$ $V_{GS} = 0$ V
	

Typical transfer characteristic

$I_D = f(V_{GS})$

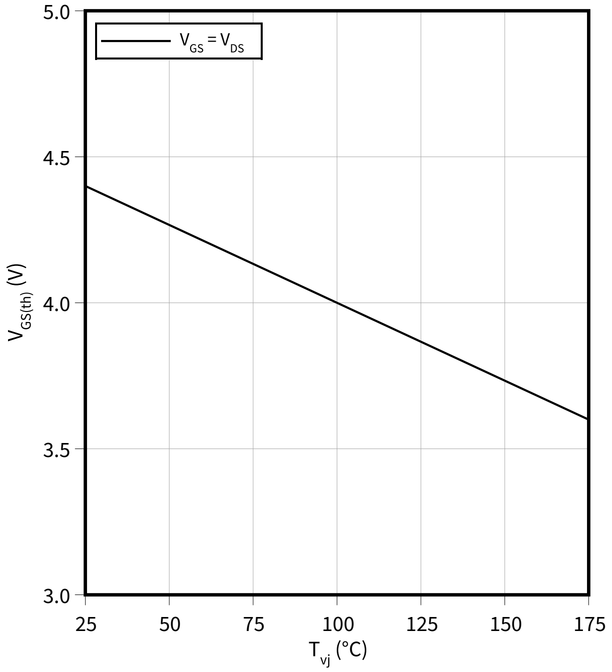
$V_{DS} = 20$ V, $t_p = 20$ µs



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

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

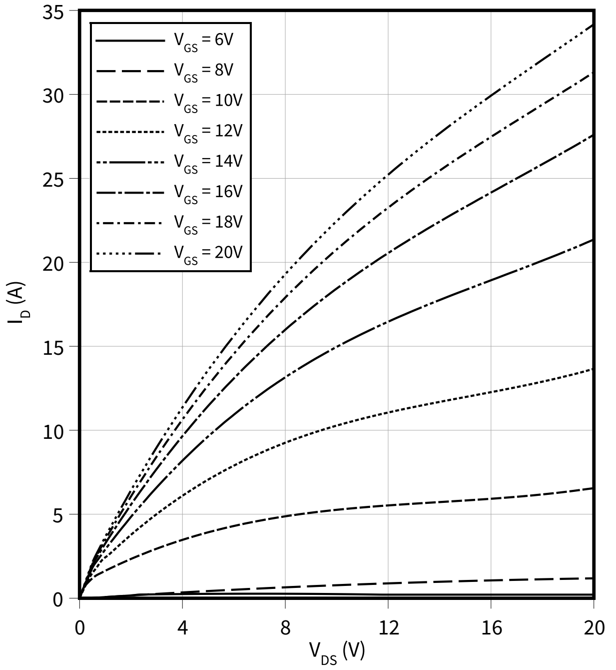
$I_D = 2.5$ mA



Typical output characteristic, V_{GS} as parameter

$I_D = f(V_{DS})$

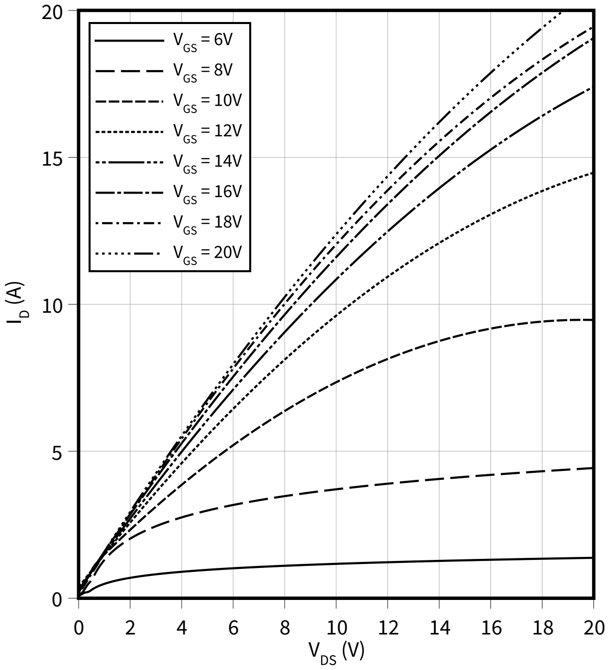
$T_{vj} = 25$ °C, $t_p = 20$ µs



Typical output characteristic, V_{GS} as parameter

$I_D = f(V_{DS})$

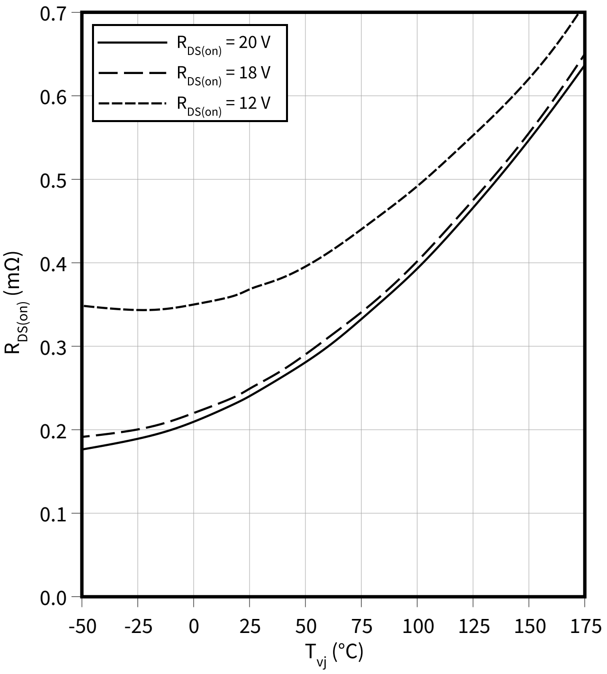
$T_{vj} = 175$ °C, $t_p = 20$ µs



Typical on-state resistance as a function of junction temperature

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

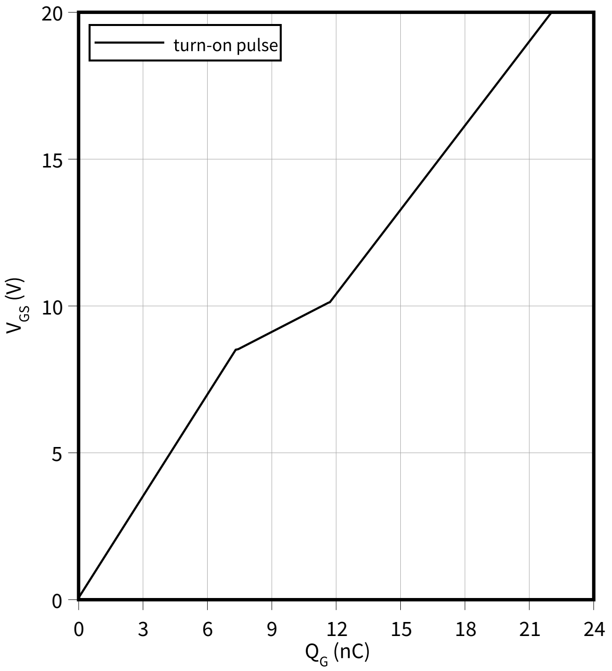
$I_D = 2$ A



Typical gate charge

$V_{GS} = f(Q_G)$

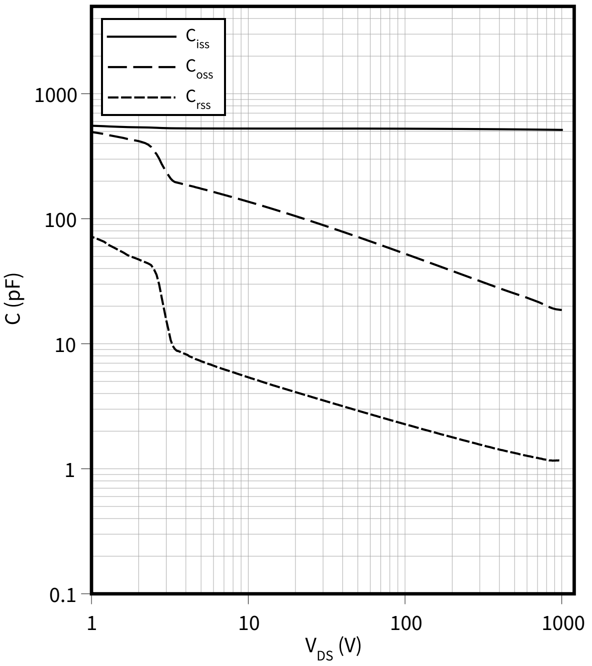
$I_D = 2$ A, $V_{DS} = 1000$ V



Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$

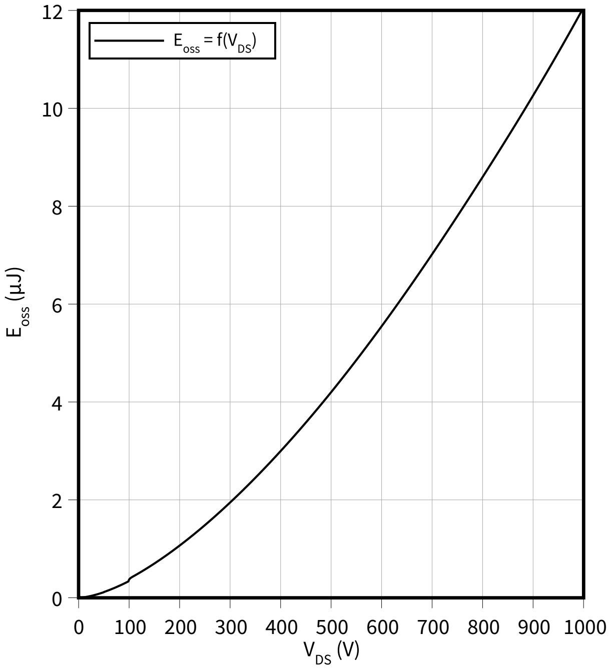
$f = 1000$ kHz, $V_{GS} = 0$ V



Typical C_{oss} stored energy

$E_{oss} = f(V_{DS})$

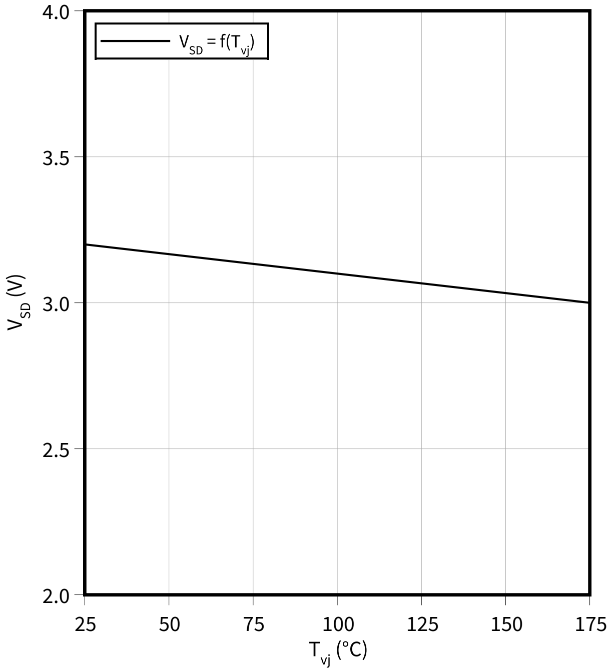
$f = 1000$ kHz, $V_{GS} = 0$ V



Typical reverse drain voltage as function of junction temperature

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

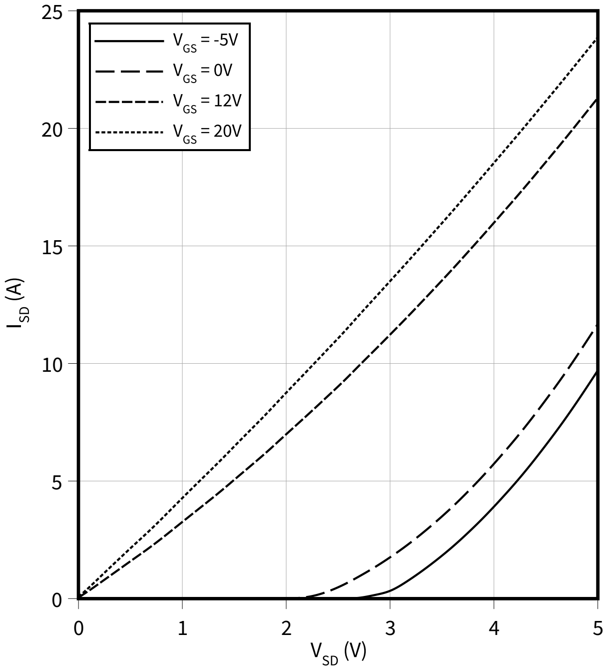
$I_{SD} = 2$ A, $V_{GS} = 0$ V



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

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

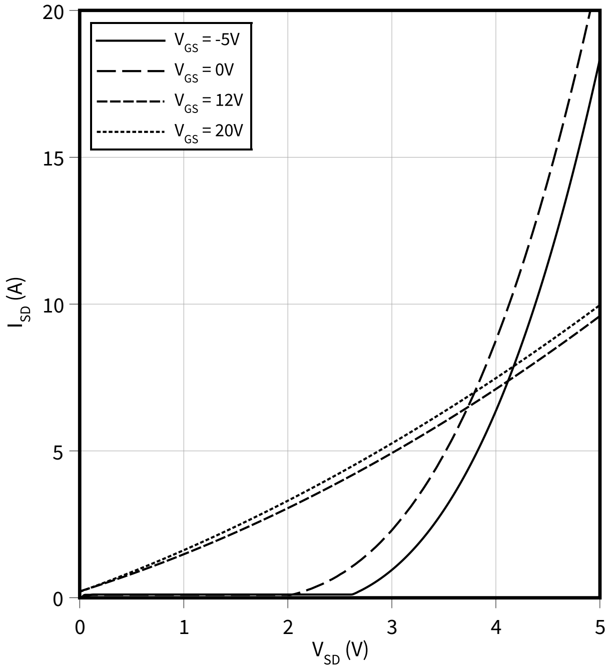
$T_{vj} = 25$ °C, $t_p = 20$ µs



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

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

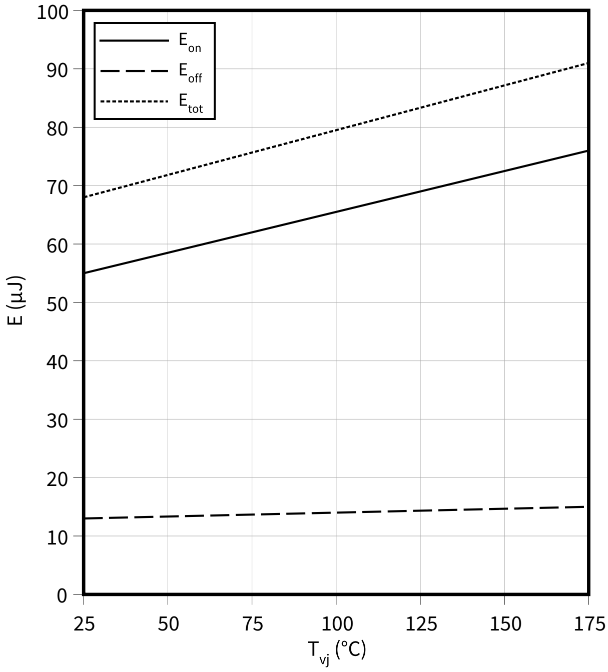
$T_{vj} = 175$ °C, $t_p = 20$ µs



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

$E = f(T_{vj})$

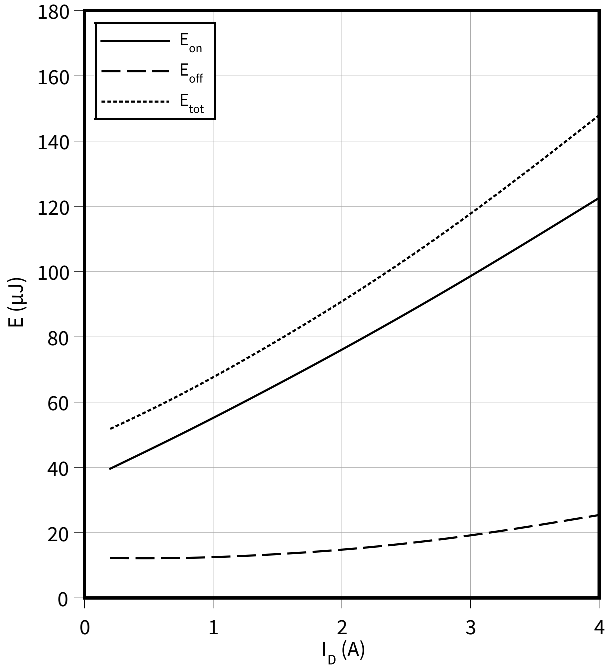
$V_{GS} = 0/20$ V, $I_D = 2$ A, $R_{G,ext} = 22$ Ω, $V_{DD} = 1000$ V



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

$E = f(I_D)$

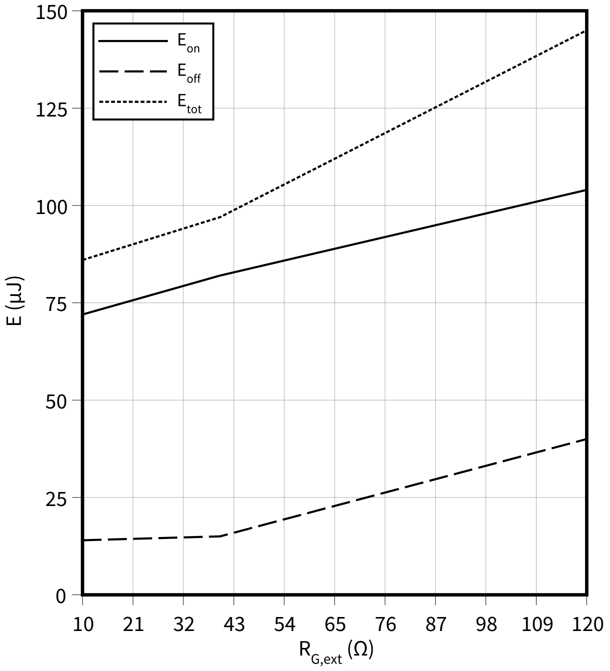
$V_{GS} = 0/20$ V, $T_{vj} = 175$ °C, $R_{G,ext} = 22\ \Omega$, $V_{DD} = 1000$ V



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

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

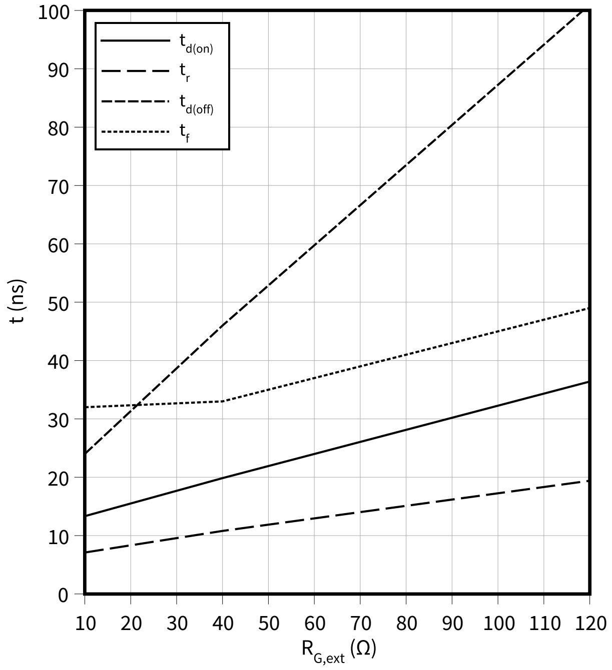
$V_{GS} = 0/20$ V, $I_D = 2$ A, $T_{vj} = 175$ °C, $V_{DD} = 1000$ V



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

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

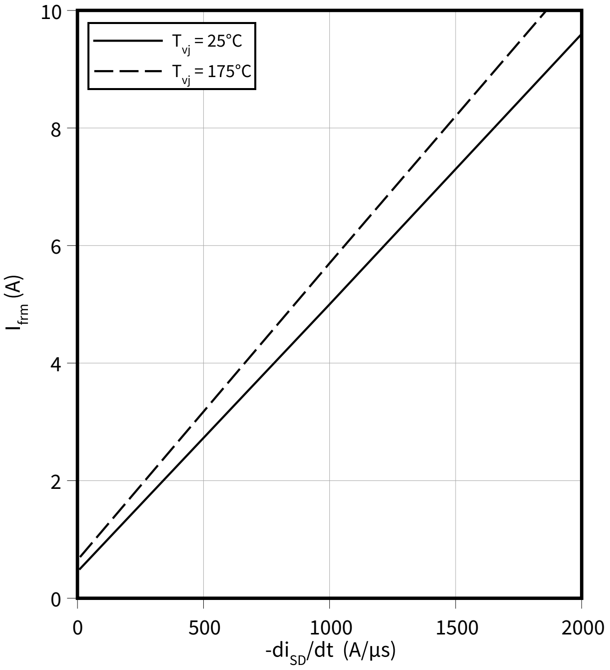
$V_{GS} = 0/20$ V, $I_D = 2$ A, $T_{vj} = 175$ °C, $V_{DD} = 1000$ V



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

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

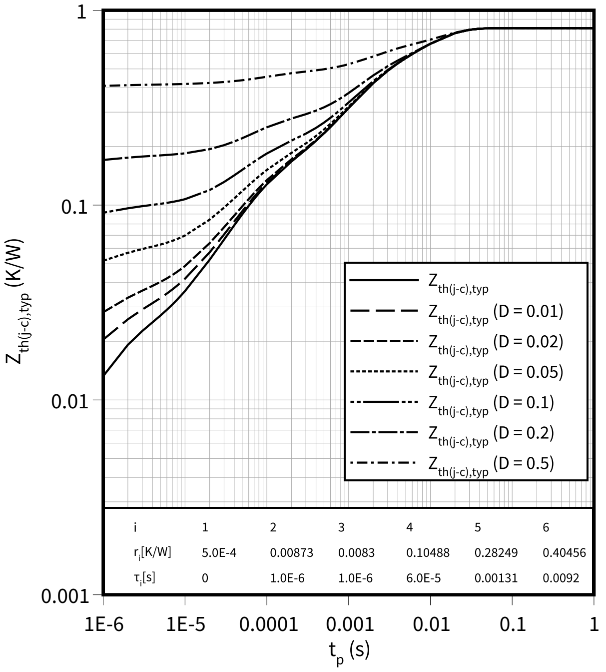
$V_{GS} = 0/20$ V, $I_{SD} = 2$ A, $V_{DD} = 1000$ V



Typ. transient thermal impedance (MOSFET/diode)

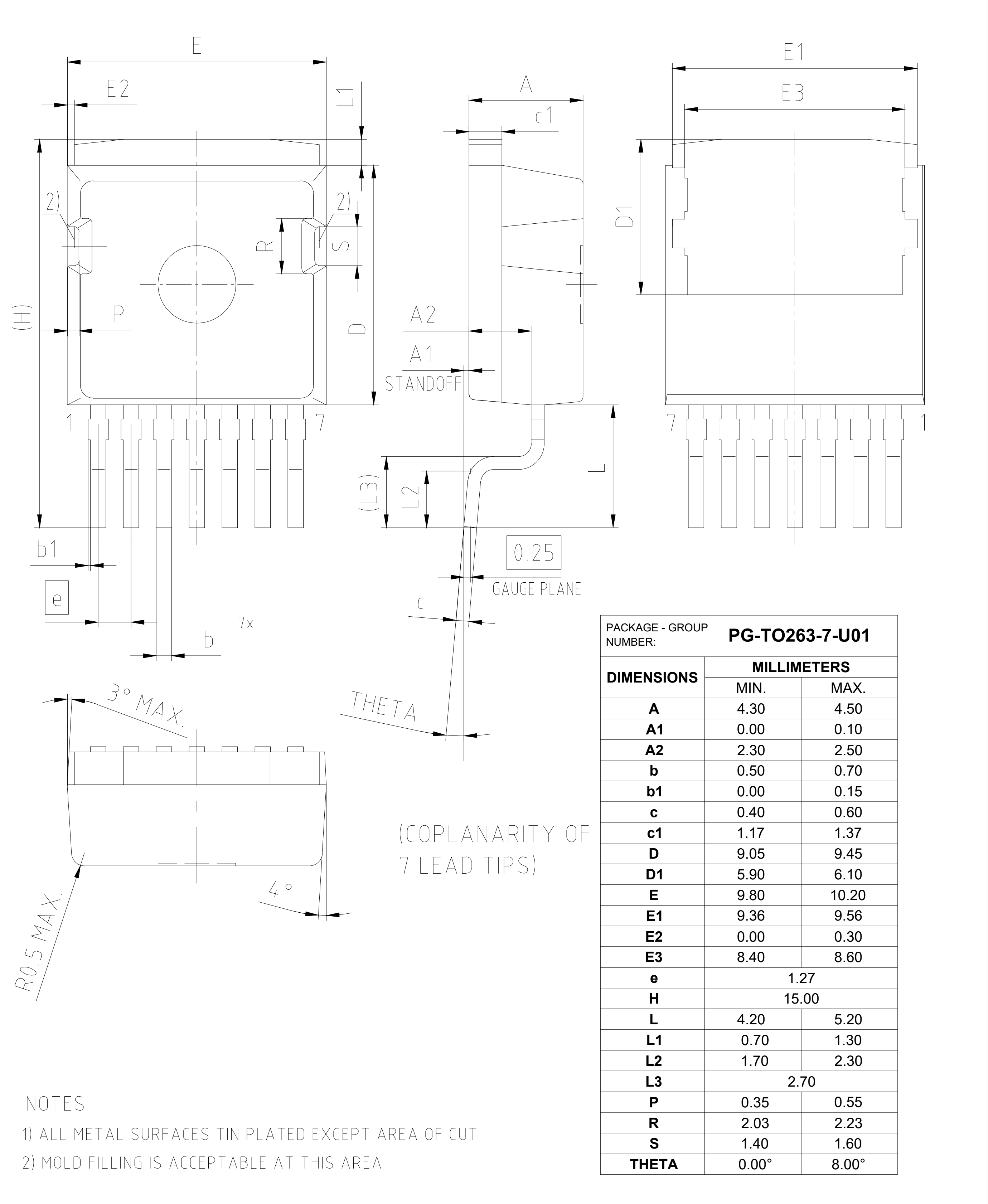
$Z_{th(j-c),typ} = f(t_p)$

$D = t_p/T$



i	1	2	3	4	5	6
r_i[K/W]	5.0E-4	0.00873	0.0083	0.10488	0.28249	0.40456
τ_i[s]	0	1.0E-6	1.0E-6	6.0E-5	0.00131	0.0092

5 Package outlines



PACKAGE - GROUP NUMBER:	PG-TO263-7-U01	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	4.30	4.50
A1	0.00	0.10
A2	2.30	2.50
b	0.50	0.70
b1	0.00	0.15
c	0.40	0.60
c1	1.17	1.37
D	9.05	9.45
D1	5.90	6.10
E	9.80	10.20
E1	9.36	9.56
E2	0.00	0.30
E3	8.40	8.60
e	1.27	
H	15.00	
L	4.20	5.20
L1	0.70	1.30
L2	1.70	2.30
L3	2.70	
P	0.35	0.55
R	2.03	2.23
S	1.40	1.60
THETA	0.00°	8.00°

NOTES:
1) ALL METAL SURFACES TIN PLATED EXCEPT AREA OF CUT
2) MOLD FILLING IS ACCEPTABLE AT THIS AREA

Figure 1

6 Testing conditions

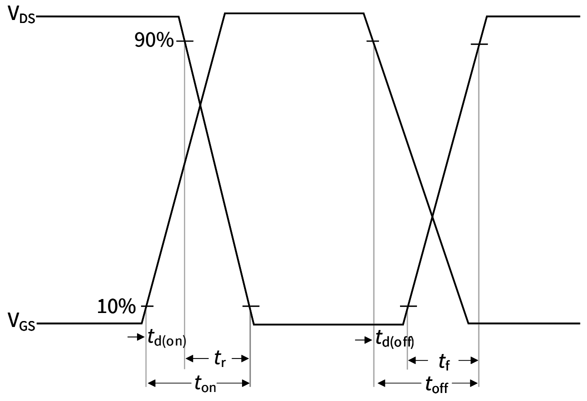


Figure A. **Definition of switching times**

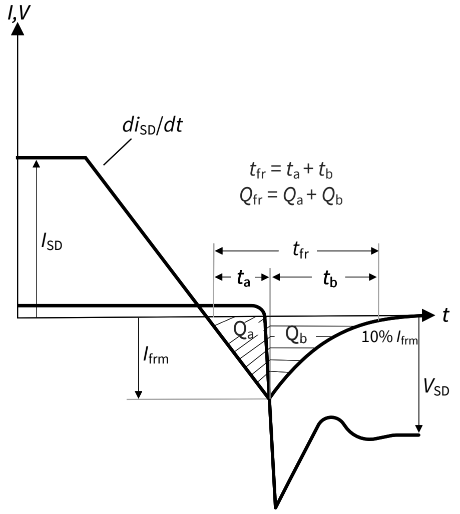


Figure B. **Definition of body diode switching characteristics**

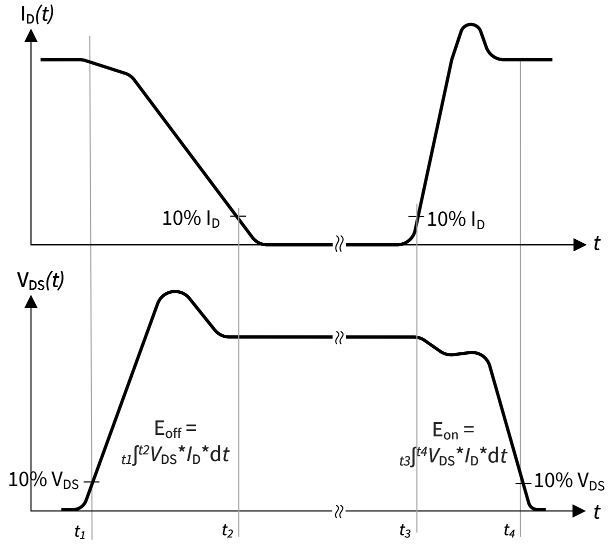


Figure C. **Definition of switching losses**

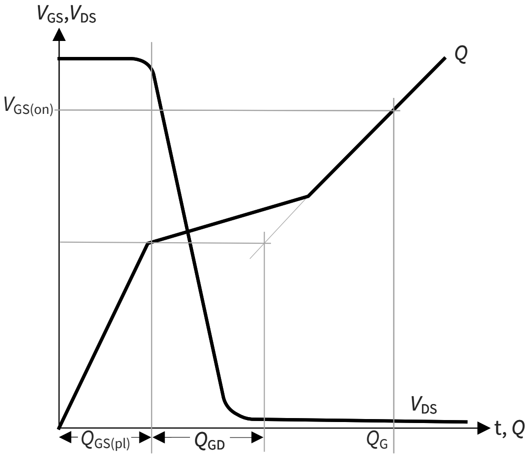


Figure D. **Definition of QGD**

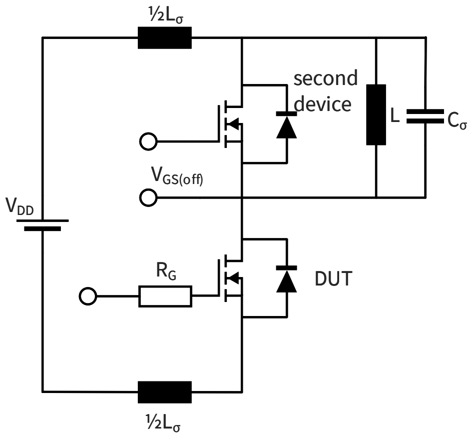


Figure F. **Dynamic test circuit**
Parasitic inductance L_σ,
Parasitic capacitor C_σ,

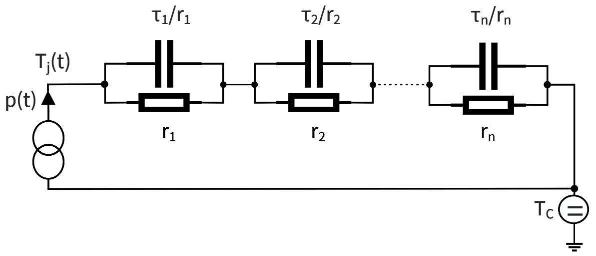


Figure E. **Thermal equivalent circuit**

Figure 2

Revision history

Document revision	Date of release	Description of changes
0.10	2024-11-14	Target datasheet
0.20	2025-12-11	Preliminary datasheet
1.00	2026-03-03	Final datasheet

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