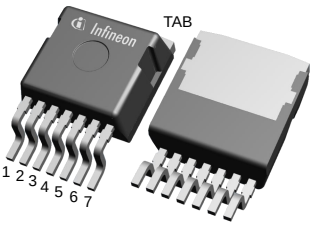
## Final datasheet
## Automotive CoolSiC™ MOSFET 1700 V in D2PAK



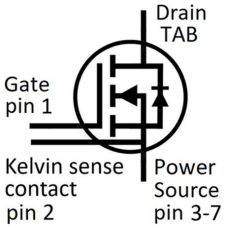

### Features
- $V_{DSS}$ = 1700 V at $T_{vj}$ = -55...175°C
- $I_{DDC}$ = 7.4 A at $T_C$ = 25°C
- Optimized for fly-back topologies
- Gate-source voltage ($V_{GS}$) compatible with most fly-back controllers
- Very low switching losses enabling high switching frequencies
- Benchmark gate threshold voltage, $V_{GS(th)}$ = 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 mode only




| Type | Package | Marking |
|---|---|---|
| AIMBF170R1K0M1 | PG-TO263-7-U01 | A17M11K0 |

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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-case[1)] | $R_{th(j-c)}$ | | | 1.1 | 1.43 | 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 voltage[1)] | $V_{DSS}$ | $T_{vj}$ = -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 | 7.4 | A |
| | | | $T_c$ = 100 °C | 5.6 | |
| Peak drain current, $t_p$ limited by $T_{vj(max)}$[2)] | $I_{DM}$ | $V_{GS}$ = 20 V | | 20 | A |
| Gate-source voltage, max. transient voltage[3)] | $V_{GS}$ | $t_p \leq 0.5$ µs, $D < 0.01$ | | -10/23 | V |
| Power dissipation, limited by $T_{vj(max)}$[2)] | $P_{tot}$ | | $T_c$ = 25 °C | 105 | W |
| | | | $T_c$ = 100 °C | 52 | |

*1)* Tested at Tvj = 25 °C, verified by design / characterization over full temperature range
*2)* Not subject to production test. Parameter 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 guidelines described in Application Note AN2018-09 must be considered to ensure sound operation 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 | $R_{DS(on)}$ | $I_D$ = 1 A | $T_{vj}$ = 25 °C, $V_{GS(on)}$ = 20 V | | 540 | 752 | mΩ |
| | | | $T_{vj}$ = 25 °C, $V_{GS(on)}$ = 18 V | | 565 | | |
| | | | $T_{vj}$ = 25 °C, $V_{GS(on)}$ = 12 V | | 840 | | |
| | | | $T_{vj}$ = 100 °C, $V_{GS(on)}$ = 20 V | | 865 | | |
| | | | $T_{vj}$ = 175 °C, $V_{GS(on)}$ = 20 V | | 1450 | | |
| Gate-source threshold voltage | $V_{GS(th)}$ | $I_D$ = 1.1 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 | | 0.04 | 11 | µA |
| | | | $T_{vj}$ = 175 °C | | 1.5 | | |
| Gate leakage current | $I_{GSS}$ | $V_{DS}$ = 0 V | $V_{GS}$ = -10 V | | | -100 | nA |
| | | | $V_{GS}$ = 23 V | | | 100 | |
| Forward transconductance | $g_{fs}$ | $I_D$ = 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, $f$ = 1000 kHz, $V_{AC}$ = 25 mV | | | 240 | | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = 1000 V, $V_{GS}$ = 0 V, $f$ = 1000 kHz, $V_{AC}$ = 25 mV | | | 10 | | pF |
| Reverse transfer capacitance | $C_{rss}$ | $V_{DS}$ = 1000 V, $V_{GS}$ = 0 V, $f$ = 1000 kHz, $V_{AC}$ = 25 mV | | | 0.6 | | pF |
| $C_{oss}$ stored energy | $E_{oss}$ | $V_{DS}$ = 1000 V, $V_{GS}$ = 0 V, $f$ = 1000 kHz, $V_{AC}$ = 25 mV | | | 6.8 | | µJ |
| Total gate charge | $Q_G$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, turn-on pulse | | | 14 | | nC |
| Plateau gate charge | $Q_{GS(pl)}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, turn-on pulse | | | 3.6 | | nC |
| Gate-drain charge | $Q_{GD}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, turn-on pulse | | | 2.2 | | nC |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 14 | | ns |
| | | | $T_{vj}$ = 175 °C | | 14 | | |

**(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, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 8.4 | | ns |
| | | | $T_{vj}$ = 175 °C | | 8.5 | | |
| Turn-off delay time | $t_{d(off)}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 27 | | ns |
| | | | $T_{vj}$ = 175 °C | | 29 | | |
| Fall time | $t_f$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 41 | | ns |
| | | | $T_{vj}$ = 175 °C | | 40 | | |
| Turn-on energy | $E_{on}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 33 | | µJ |
| | | | $T_{vj}$ = 175 °C | | 43 | | |
| Turn-off energy | $E_{off}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 7 | | µJ |
| | | | $T_{vj}$ = 175 °C | | 7 | | |
| Total switching energy | $E_{tot}$ | $V_{DD}$ = 1000 V, $I_D$ = 1 A, $V_{GS}$ = 0/20 V, $R_{G,ext}$ = 22 Ω, $L_\sigma$ = 20 nH, diode: body diode at $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 40 | | µJ |
| | | | $T_{vj}$ = 175 °C | | 50 | | |
| Virtual junction temperature | $T_{vj(min ... max)}$ | | | -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 $R_{th(j\text{-}c,max)}$, limited by $T_{vj(max)}$ | $I_{SDC}$ | $V_{GS}$ = 0 V | $T_c$ = 25 °C | 6.7 | A |
| | | | $T_c$ = 100 °C | 5.6 | |
| Peak reverse drain current, $t_p$ limited by $T_{vj(max)}$ | $I_{SM}$ | $V_{GS}$ = 0 V | | 6.7 | A |

**Table 6 Characteristic values**

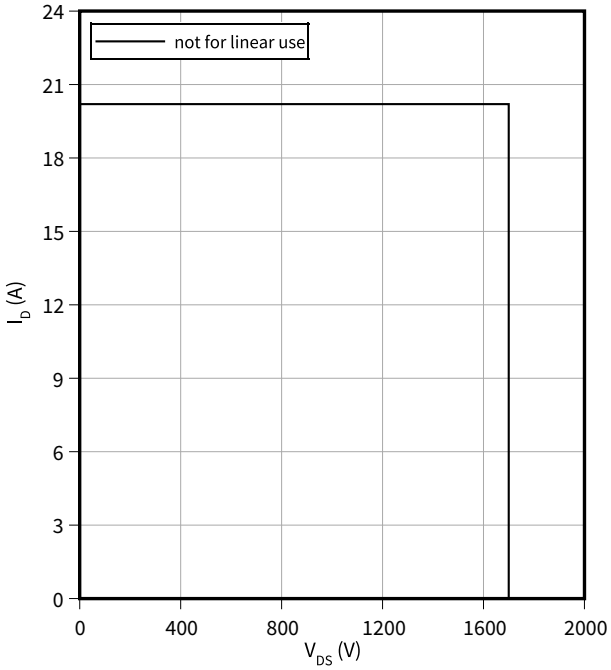
| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Drain-source reverse voltage | $V_{SD}$ | $I_{SD}$ = 1 A, $V_{GS}$ = 0 V | $T_{vj}$ = 25 °C | | 3.2 | 5 | V |
| | | | $T_{vj}$ = 100 °C | | 3.1 | | |
| | | | $T_{vj}$ = 175 °C | | 3 | | |
| MOSFET forward recovery charge | $Q_{fr}$ | $V_{DD}$ = 1000 V, $I_{SD}$ = 1 A, $V_{GS}$ = 0 V, $-di_{SD}/dt$ = 1000 A/µs, $Q_{fr}$ includes also $Q_C$ | $T_{vj}$ = 25 °C | | 15.8 | | nC |
| | | | $T_{vj}$ = 175 °C | | 28.6 | | |
| 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 | | 5 | | A |
| | | | $T_{vj}$ = 175 °C | | 5.7 | | |
| Virtual junction temperature | $T_{vj(min\ ...\ max)}$ | | | -55 | | 175 | °C |

# 4 Characteristics diagrams

### Reverse bias safe operating area (RBSOA)

$I_D = f(V_{DS})$

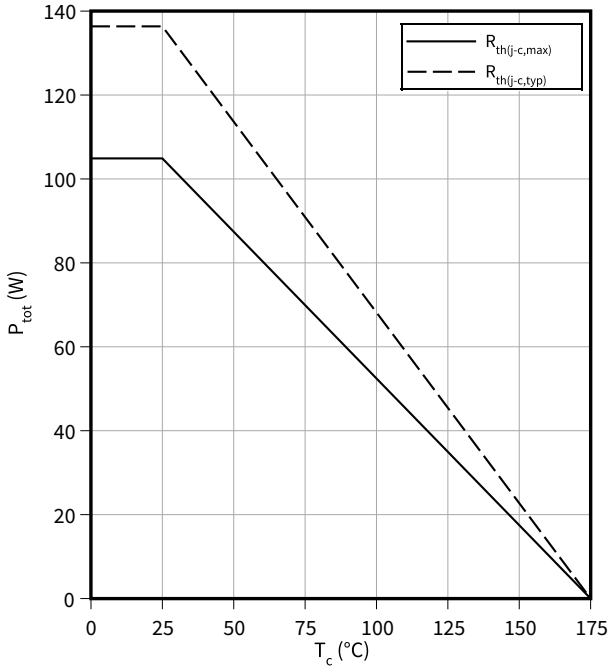
$T_{vj} \leq 175$ °C, $V_{GS} = 0/20$ V, $T_c = 25$ °C




### Power dissipation as a function of case temperature

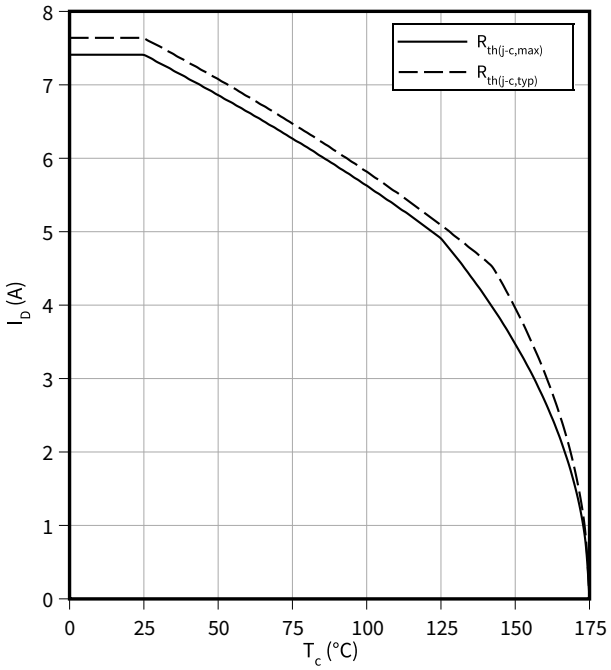
$P_{tot} = f(T_c)$

$T_{vj} \leq 175$ °C




### Maximum DC drain to source current as a function of case temperature

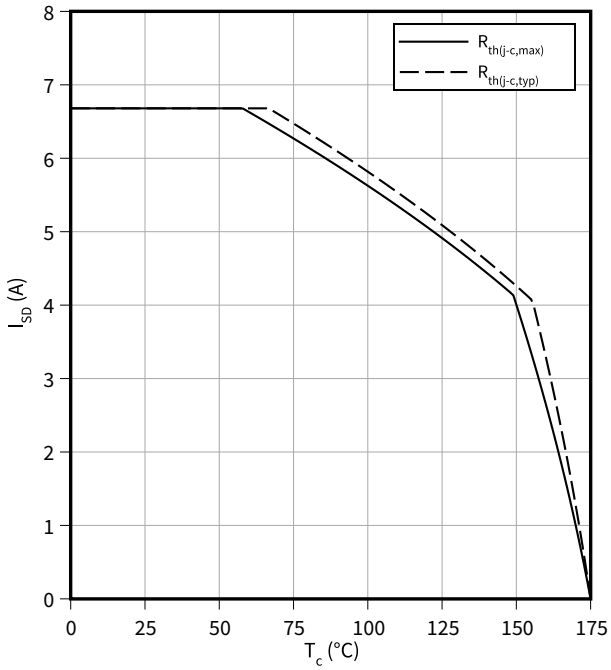
$I_D = f(T_c)$




### Maximum source to drain current as a function of case temperature

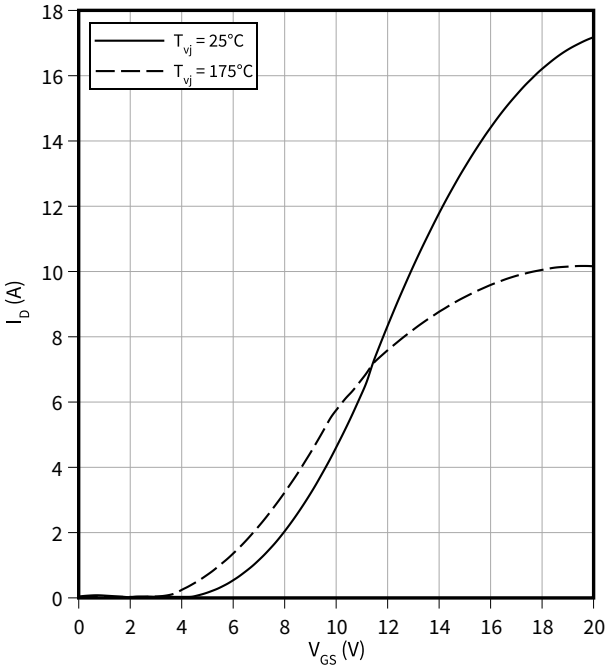
$I_{SD} = f(T_c)$

$V_{GS} = 0$ V



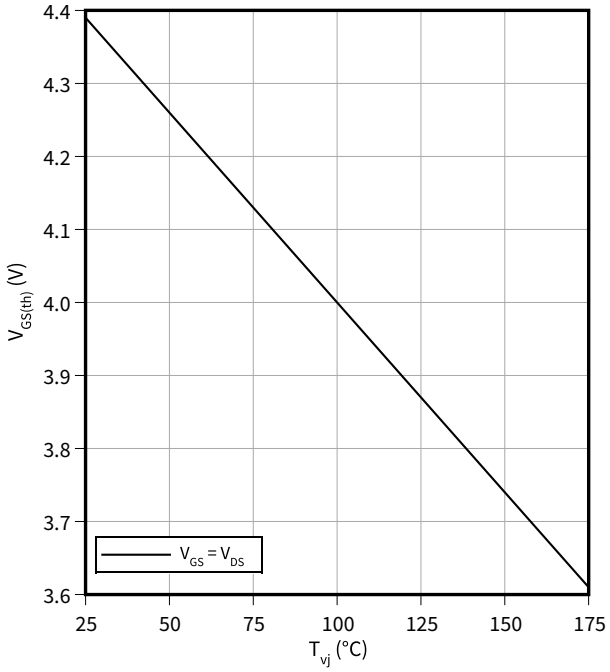
### Typical transfer characteristic

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



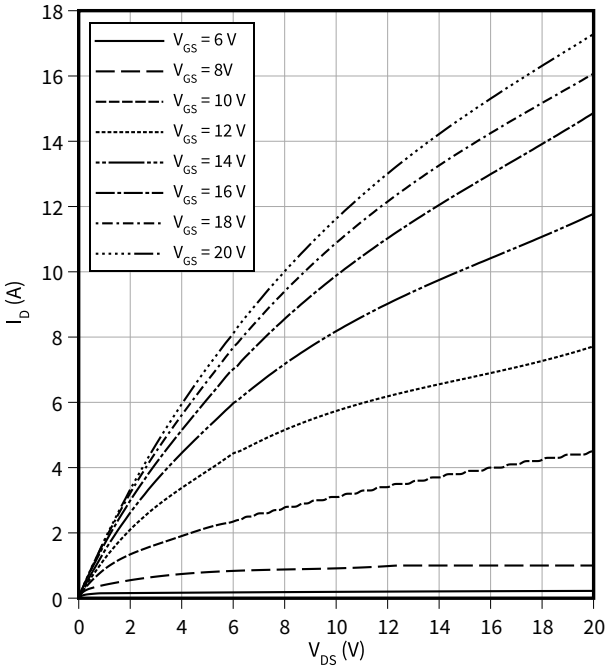

### Typical gate-source threshold voltage as a function of junction temperature

$V_{GS(th)} = f(T_{vj})$
$I_D$ = 1.1 mA



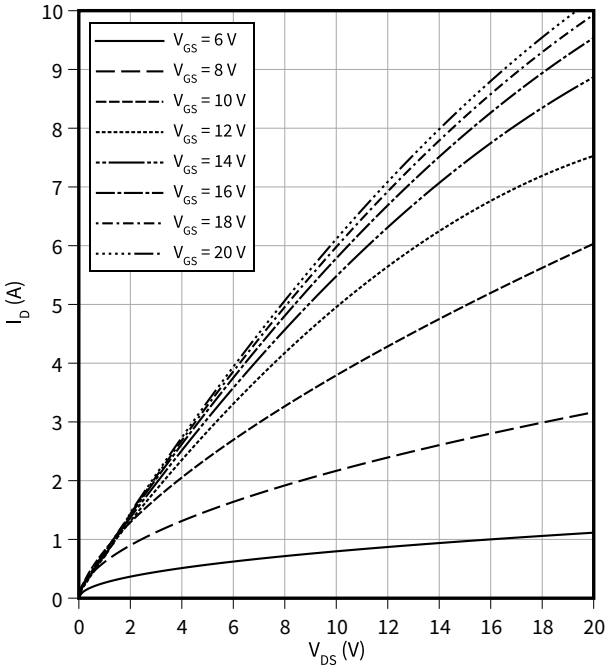

### Typical output characteristic, $V_{GS}$ as parameter

$I_D = f(V_{DS})$
$T_{vj}$ = 25 °C, $t_p$ = 20 µs



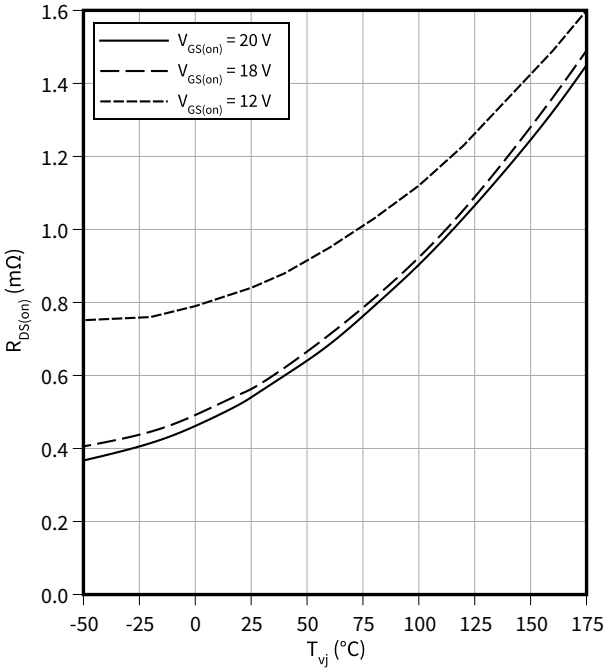

### Typical output characteristic, $V_{GS}$ as parameter

$I_D = f(V_{DS})$
$T_{vj}$ = 175 °C, $t_p$ = 20 µs



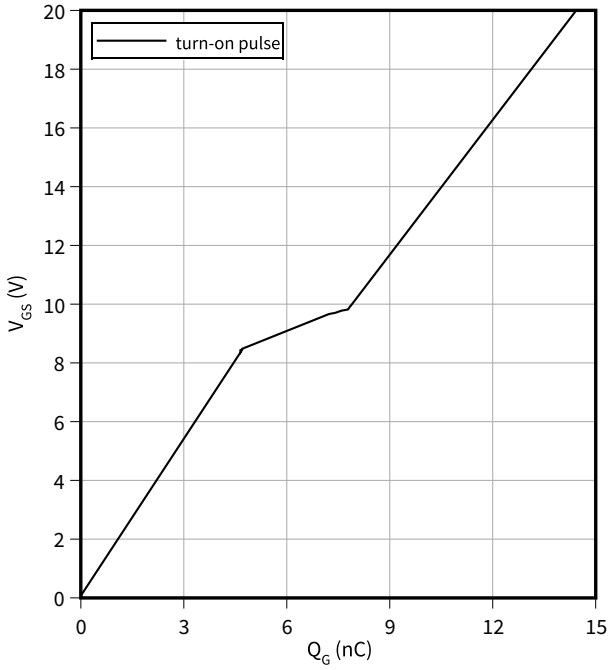
### Typical on-state resistance as a function of junction temperature

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



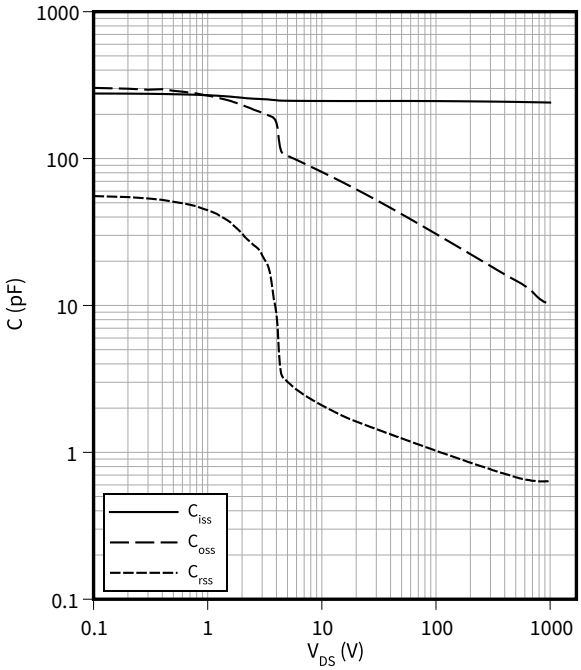

### Typical gate charge

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



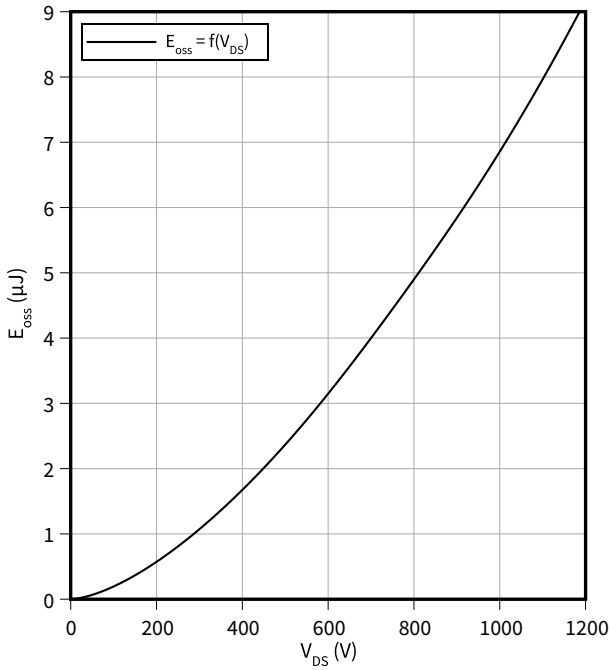

### Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$
$f = 1000$ kHz, $V_{GS} = 0$ V




### Typical $C_{oss}$ stored energy

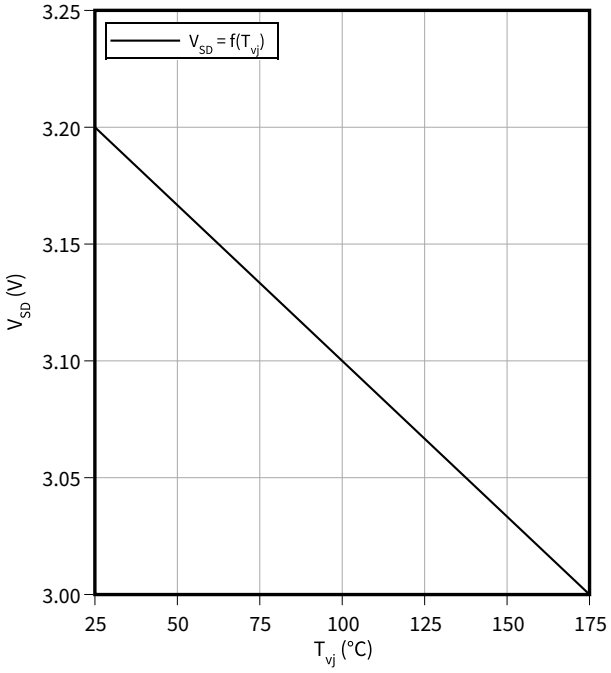
$E_{oss} = f(V_{DS})$
$f = 1000$ kHz, $V_{GS} = 0$ V



### Typical reverse drain voltage as a function of junction temperature

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

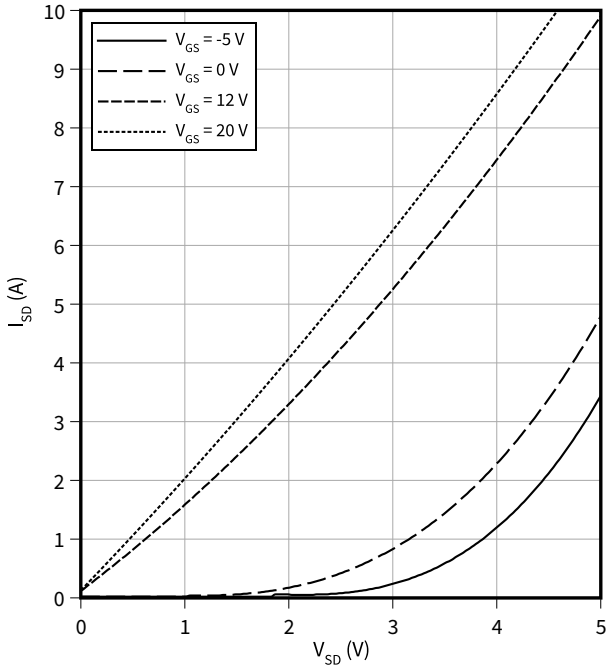
$I_{SD} = 1\ A$, $V_{GS} = 0\ V$




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

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

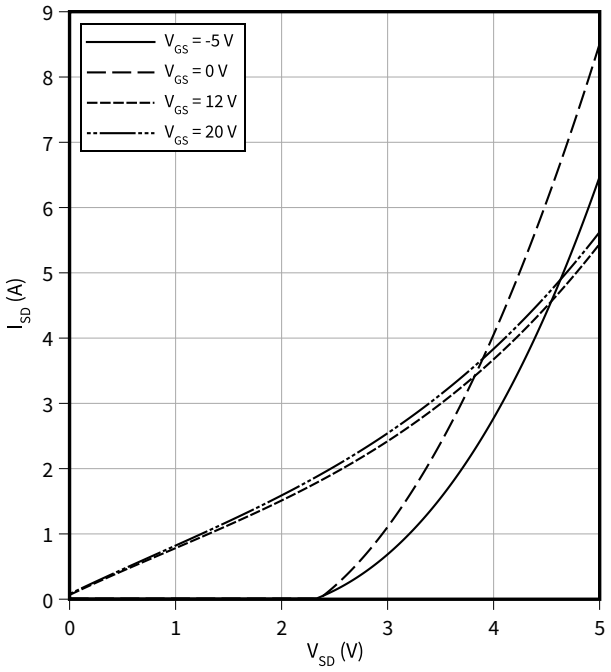
$T_{vj} = 25\ °C$, $t_p = 20\ µs$




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

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

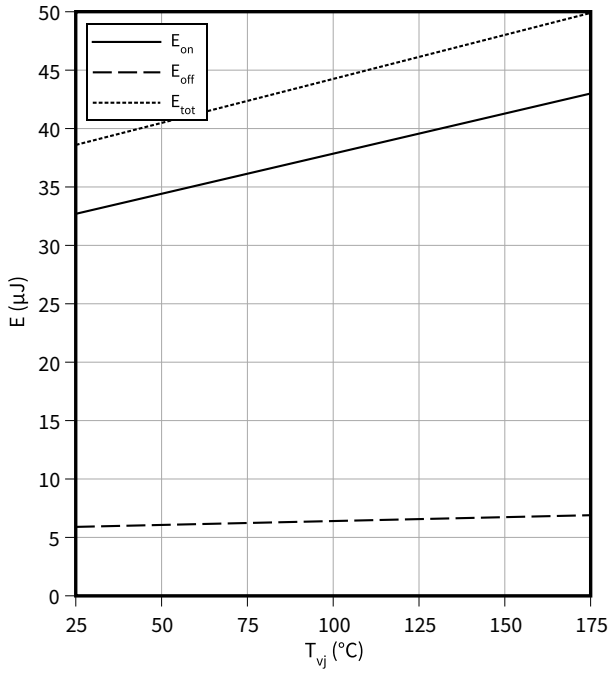
$T_{vj} = 175\ °C$, $t_p = 20\ µs$




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

$E = f(T_{vj})$

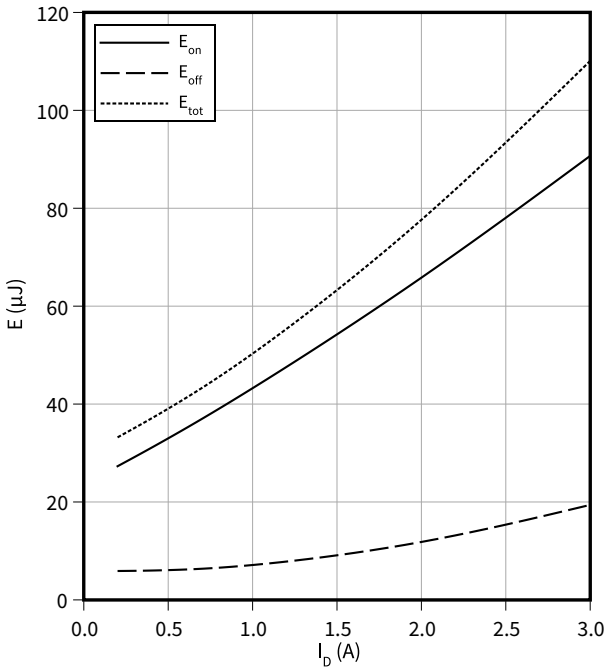
$V_{GS} = 0/20\ V$, $I_D = 1\ A$, $R_{G,ext} = 22\ Ω$, $V_{DD} = 1000\ V$



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

$E = f(I_D)$

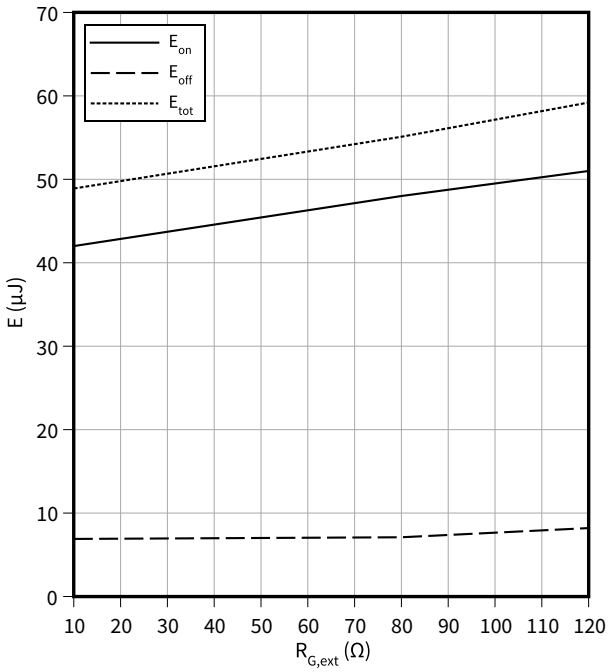
$V_{GS}$ = 0/20 V, $T_{vj}$ = 175 °C, $R_{G,ext}$ = 22 Ω, $V_{DD}$ = 1000 V




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

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

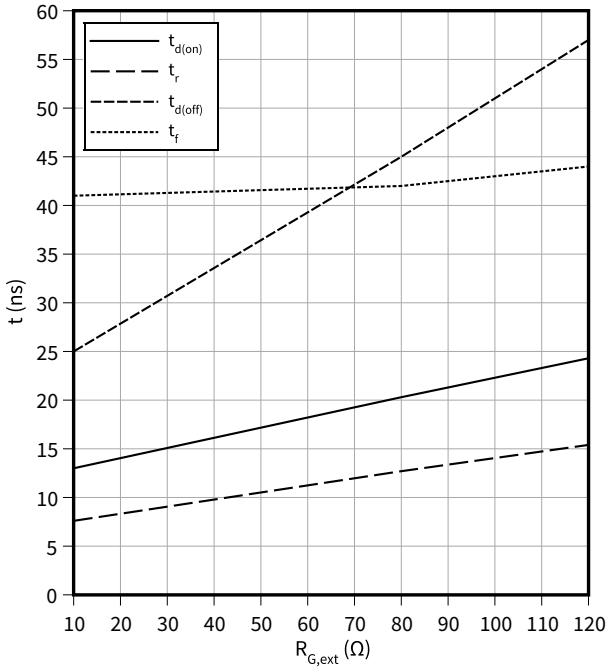
$V_{GS}$ = 0/20 V, $I_D$ = 1 A, $T_{vj}$ = 175 °C, $V_{DD}$ = 1000 V




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

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

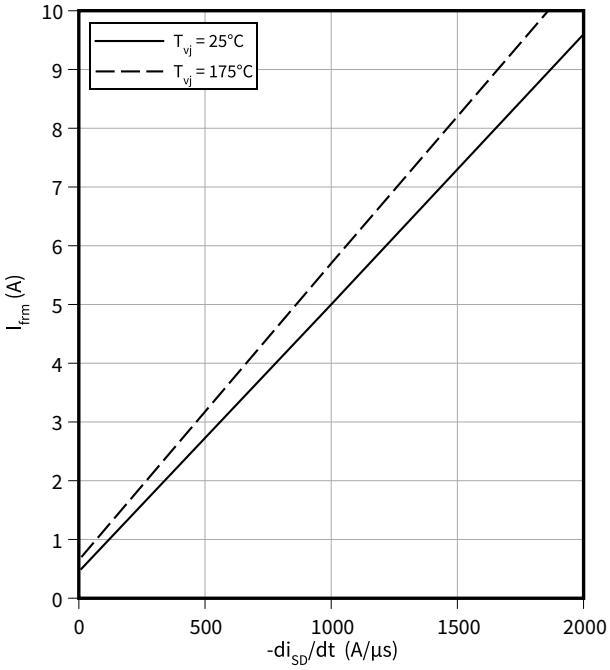
$V_{GS}$ = 0/20 V, $I_D$ = 1 A, $T_{vj}$ = 175 °C, $V_{DD}$ = 1000 V




**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**

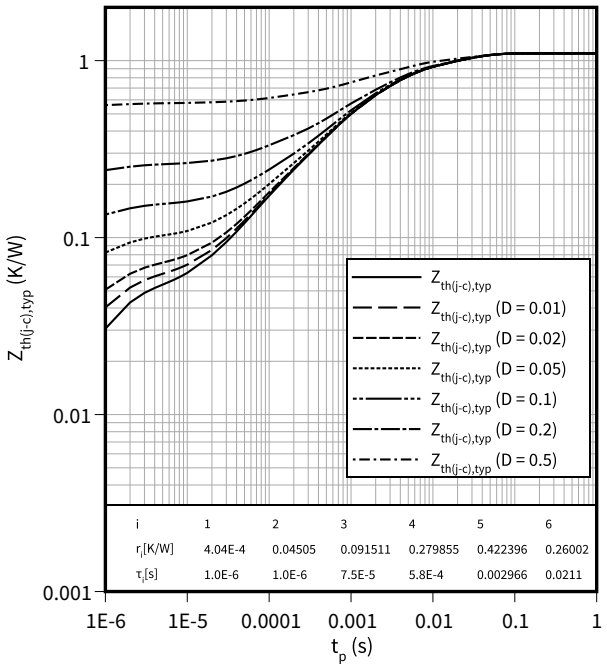
$I_{frm} = f(-di_{SD}/dt)$

$V_{GS}$ = 0/20 V, $I_{SD}$ = 1 A, $V_{DD}$ = 1000 V



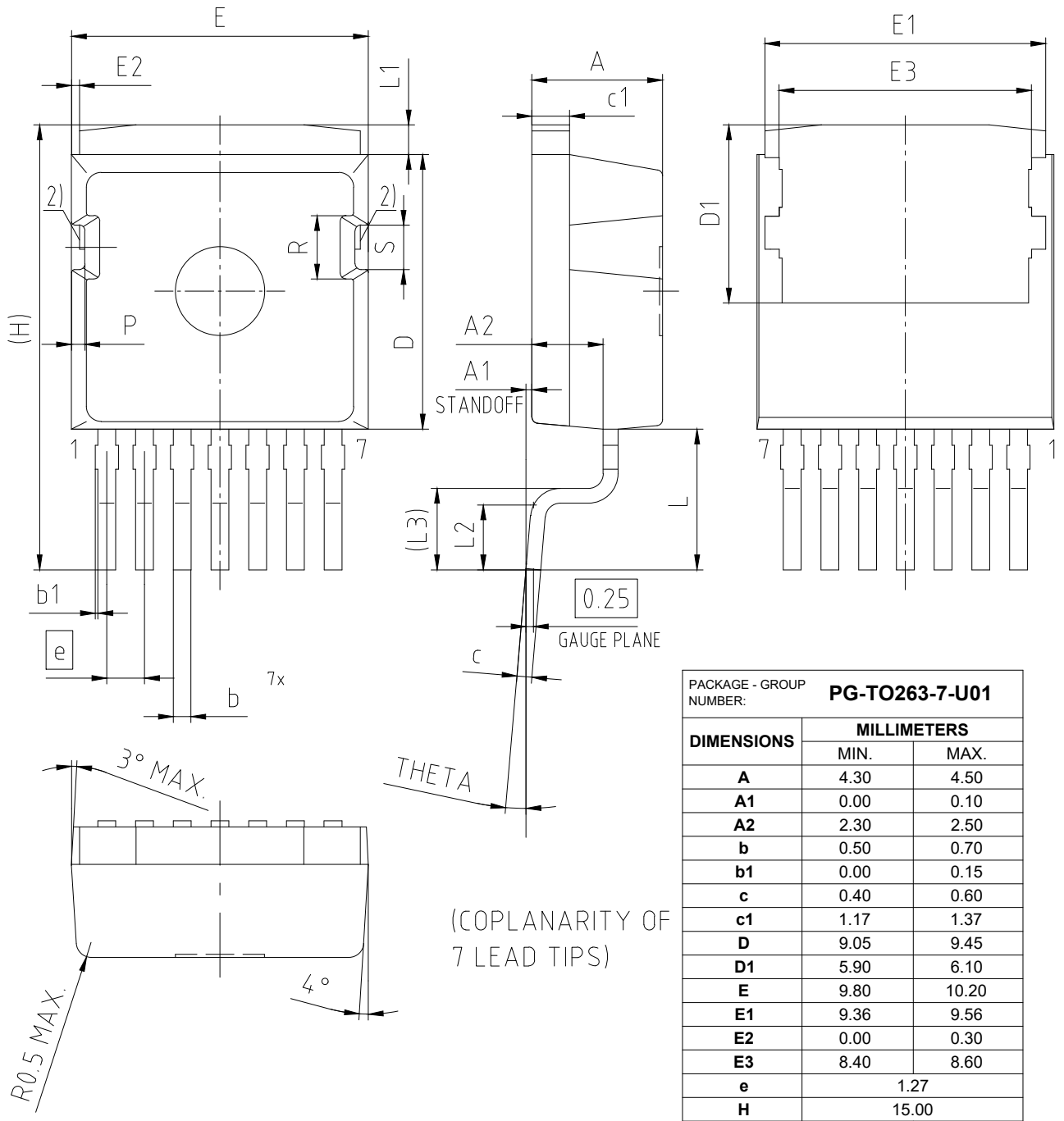
### Typ. transient thermal impedance (MOSFET/diode)

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




| i | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $r_i$[K/W] | 4.04E-4 | 0.04505 | 0.091511 | 0.279855 | 0.422396 | 0.26002 |
| $\tau_i$[s] | 1.0E-6 | 1.0E-6 | 7.5E-5 | 5.8E-4 | 0.002966 | 0.0211 |

# 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° |

**Figure 1**

# 6 Testing conditions

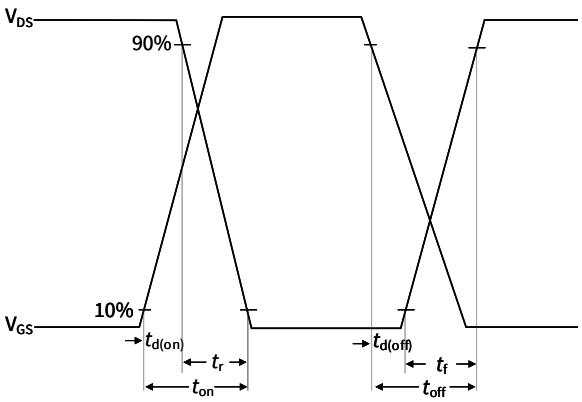



Figure A. **Definition of switching times**

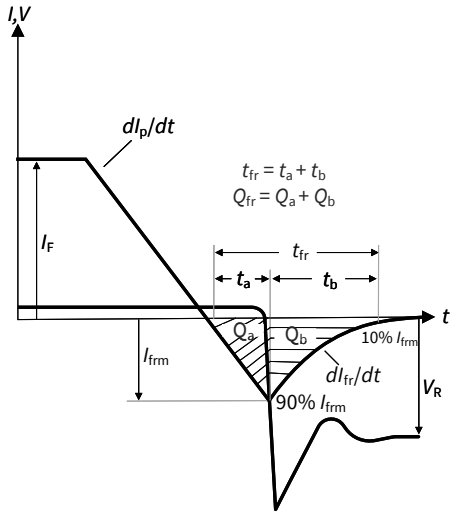



Figure B. **Definition of diode switching characteristics**

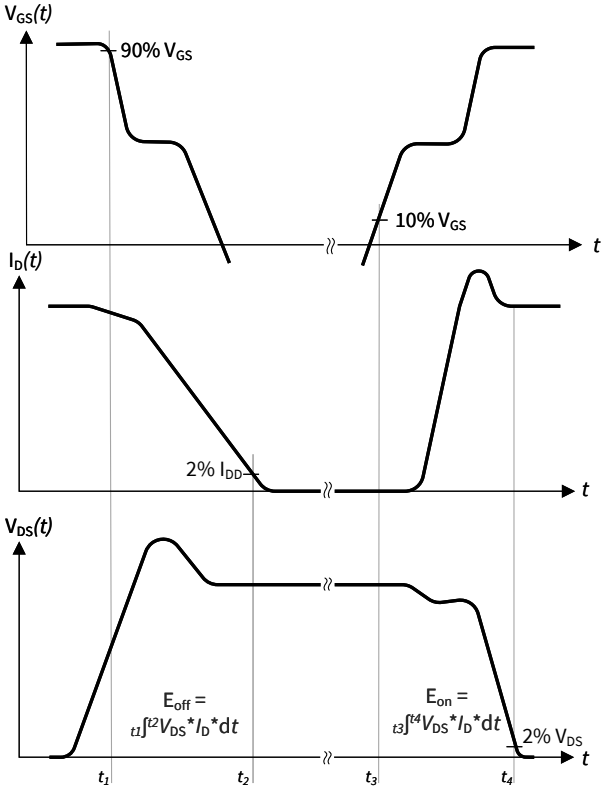



Figure C. **Definition of switching losses**

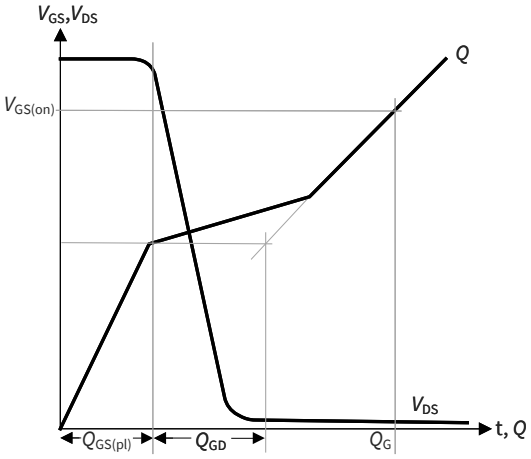



Figure D. **Definition of QGD**

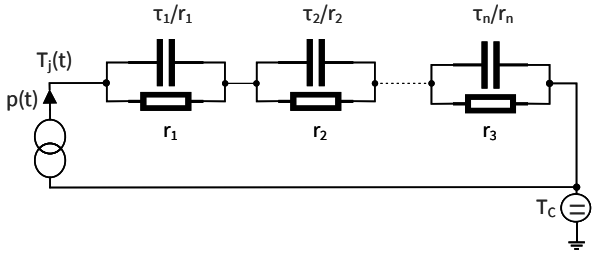



Figure E. **Thermal equivalent circuit**

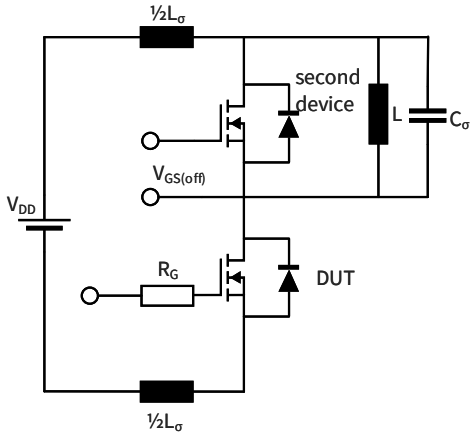



Figure F. **Dynamic test circuit**
Parasitic inductance $L_\sigma$,
Parasitic capacitor $C_\sigma$,

**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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