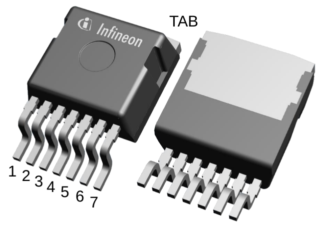
## Final datasheet
## Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology




Halogen-free

RoHS

AEC Qualified

### Features

- $V_{CE}$ = 1200 V
- $I_C$ = 15 A
- Very low $V_{CEsat}$ = 1.65 V (typ.) at $I_{Cnom}$ = 15 A, 25°C
- Short circuit robust $t_{sc}$ = 4 µs at $V_{CE}$ = 800 V, $V_{GE}$ = 15 V
- Smooth switching characteristics
- Wide range of dv/dt controllability
- TO263-7 package with high creepage distance > 5.8 mm, 400 ≤ CTI < 600
- High reliability and operating lifetime

### Potential applications

- xEV auxiliary drives
- Automotive HV heaters

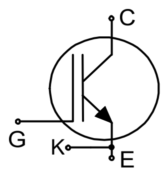
### Product validation

- Qualified according to AEC-Q101 for automotive applications
- Qualified Reflow device according to JEDEC J-STD-020 MSL1

### Description

Pin definition:

- Pin 1 (G)- Gate
- Pin 2 (K) - Kelvin Emitter
- Pin 3…7 (E) - Emitter
- Tab (C) - Collector




| Type | Package | Marking |
| --- | --- | --- |
| AIGBG15N120S7 | PG-TO263-7-U01 | AGBG15S7 |

# Table of contents

# 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 | $T_{sold}$ | reflow soldering (MSL1 according to JEDEC J-STD-020) | | | 260 | °C |
| IGBT thermal resistance, junction-case | $R_{th(j-c)}$ | | | 0.65 | 0.85 | K/W |

# 2 IGBT

**Table 2 Maximum rated values**

| Parameter | Symbol | Note or test condition | | Values | Unit |
|---|---|---|---|---|---|
| Collector-emitter voltage[1)] | $V_{CE}$ | $T_{vj}$ = -40...175 °C | | 1200 | V |
| DC collector current, limited by $T_{vjmax}$ | $I_C$ | | $T_c$ = 25 °C | 33 | A |
| | | | $T_c$ = 100 °C | 23 | |
| Pulsed collector current, $t_p$ limited by $T_{vjmax}$ | $I_{Cpulse}$ | | | 45 | A |
| Turn-off safe operating area | | $V_{CE} \leq 1200$ V, $t_p \leq 1$ µs, $T_{vj} \leq 175$ °C | | 45 | A |
| Gate-emitter voltage | $V_{GE}$ | | | ±20 | V |
| Transient gate-emitter voltage | $V_{GE}$ | $t_p \leq 0.5$ µs, $D < 0.01$ | | ±25 | V |
| Short-circuit withstand time | $t_{SC}$ | $V_{CC} \leq 800$ V, $V_{GE}$ = 15 V, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, $T_{vj}$ = 175 °C | | 4 | µs |
| Power dissipation | $P_{tot}$ | | $T_c$ = 25 °C | 176 | W |
| | | | $T_c$ = 100 °C | 88 | |

1) Tested at $T_{vj}$=25°C, verified by design/characterization over full temperature range

**Table 3 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Collector-emitter saturation voltage | $V_{CEsat}$ | $I_C$ = 15 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | | 1.65 | 2 | V |
| | | | $T_{vj}$ = 175 °C | | 2 | | |
| Gate-emitter threshold voltage | $V_{GEth}$ | $I_C$ = 0.3 mA, $V_{CE} = V_{GE}$ | | 5.15 | 5.7 | 6.45 | V |

**(table continues...)**

**Table 3 (continued) Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Zero gate-voltage collector current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | | 40 | µA |
| | | | $T_{vj}$ = 175 °C | | 1000 | | |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = 20 V | | | | 100 | nA |
| Transconductance | $g_{fs}$ | $I_C$ = 15 A, $V_{CE}$ = 20 V, $T_{vj}$ = 175 °C | | | 5.9 | | S |
| Short-circuit collector current | $I_{SC}$ | $V_{CC}$ ≤ 800 V, $V_{GE}$ = 15 V, $t_{SC}$ ≤ 4 µs, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s | $T_{vj}$ = 25 °C | | 94.5 | | A |
| | | | $T_{vj}$ = 175 °C | | 77.1 | | |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 25 V, $V_{GE}$ = 0 V, $f$ = 100 kHz | | | 2.2 | | nF |
| Output capacitance | $C_{oes}$ | $V_{CE}$ = 25 V, $V_{GE}$ = 0 V, $f$ = 100 kHz | | | 37 | | pF |
| Reverse transfer capacitance | $C_{res}$ | $V_{CE}$ = 25 V, $V_{GE}$ = 0 V, $f$ = 100 kHz | | | 10 | | pF |
| Gate charge | $Q_G$ | $V_{CC}$ = 960 V, $I_C$ = 15 A, $V_{GE}$ = 0/15 V | | | 93 | | nC |
| Turn-on delay time | $t_{d(on)}$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 10.1 | | ns |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 11 | | |
| Rise time (inductive load) | $t_r$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 4.8 | | ns |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 5.9 | | |
| Turn-off delay time | $t_{d(off)}$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 108.6 | | ns |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 176 | | |
| Fall time (inductive load) | $t_f$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 104.2 | | ns |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 160.7 | | |
| Turn-on energy | $E_{on}$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 0.19 | | mJ |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 0.24 | | |

**(table continues...)**

**Table 3 (continued) Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Turn-off energy | $E_{off}$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 0.9 | | mJ |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 1.49 | | |
| Total switching energy | $E_{ts}$ | $V_{CC}$ = 800 V, $V_{GE}$=15 V, $R_{G(on)}$ = 4.5 Ω, $R_{G(off)}$ = 4.5 Ω | $T_{vj}$ = 25 °C, $I_C$ = 15 A | | 1.09 | | mJ |
| | | | $T_{vj}$ = 175 °C, $I_C$ = 15 A | | 1.73 | | |
| Operating junction temperature | $T_{vj}$ | | | -40 | | 175 | °C |

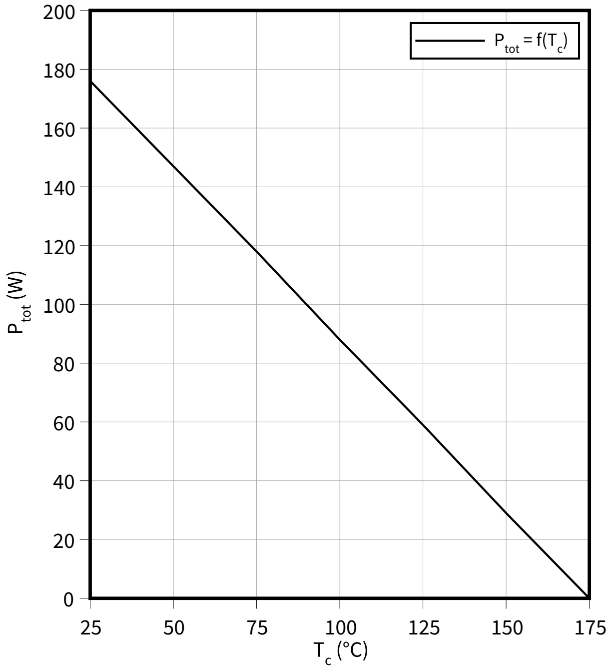
***Note**: Electrical Characteristic at $T_{vj}$ = 25°C, unless otherwise specified.*

# 3 Characteristics diagrams

**Power dissipation as a function of case temperature**

$P_{tot} = f(T_c)$

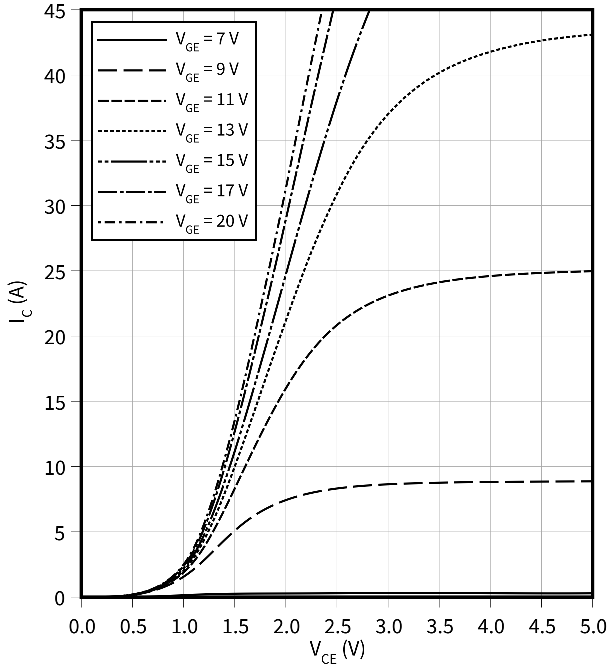
$T_{vj} \leq 175\ °C$




**Typical output characteristic**

$I_C = f(V_{CE})$

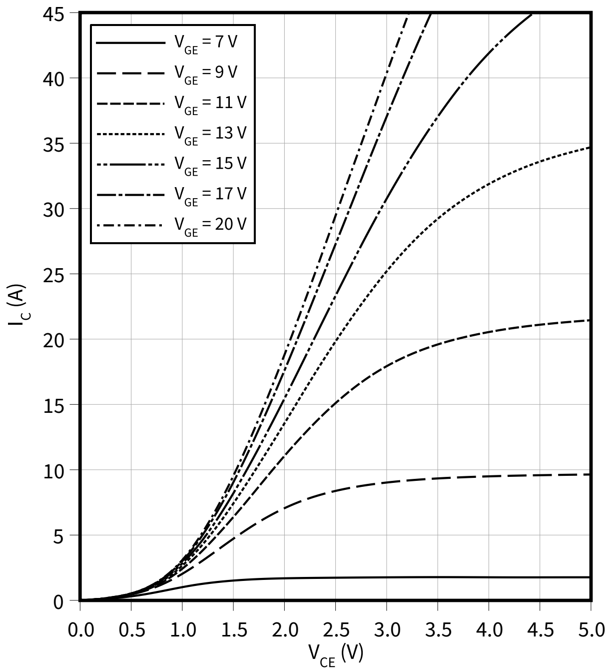
$T_{vj} = 25\ °C$




**Typical output characteristic**

$I_C = f(V_{CE})$

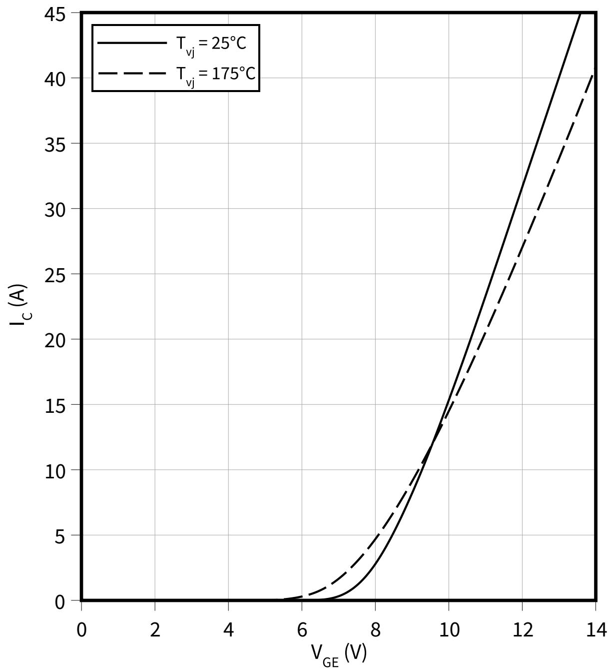
$T_{vj} = 175\ °C$

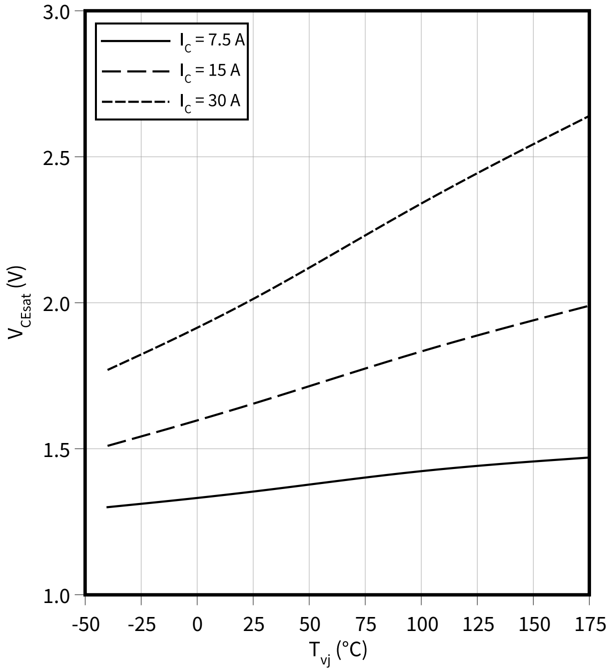
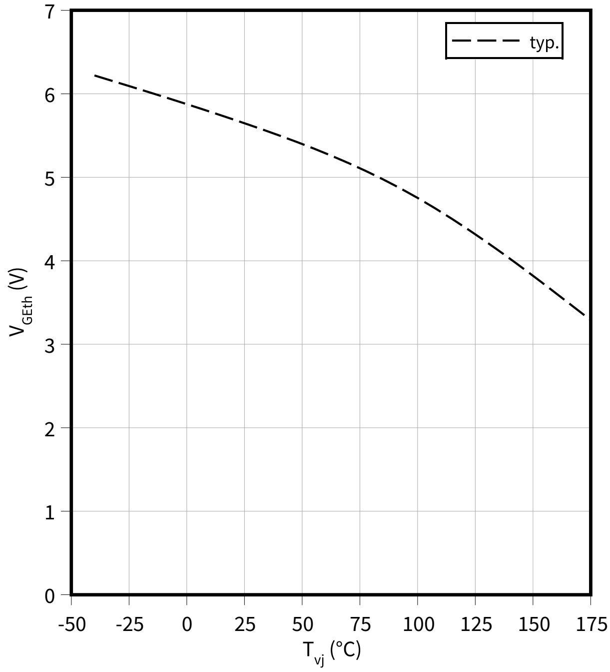
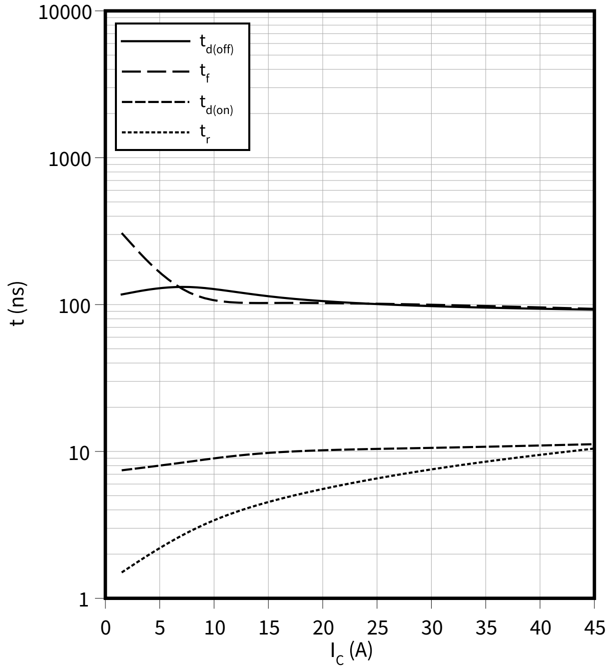
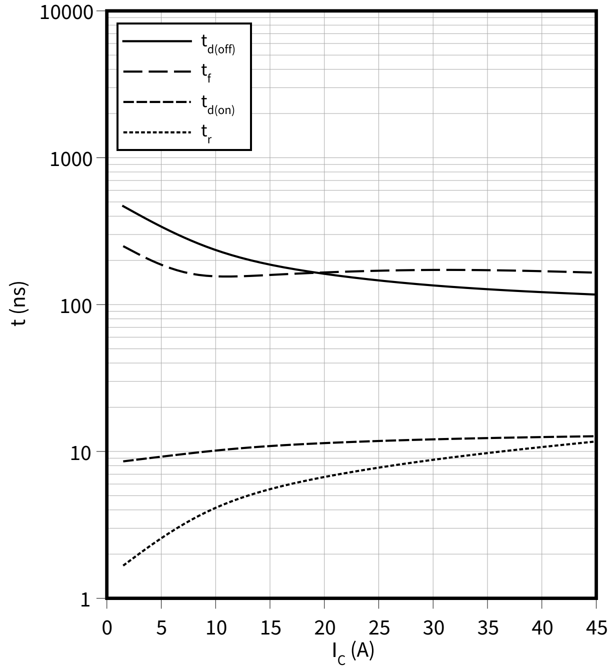



**Typical transfer characteristic**

$I_C = f(V_{GE})$

$V_{CE} = 20\ V$

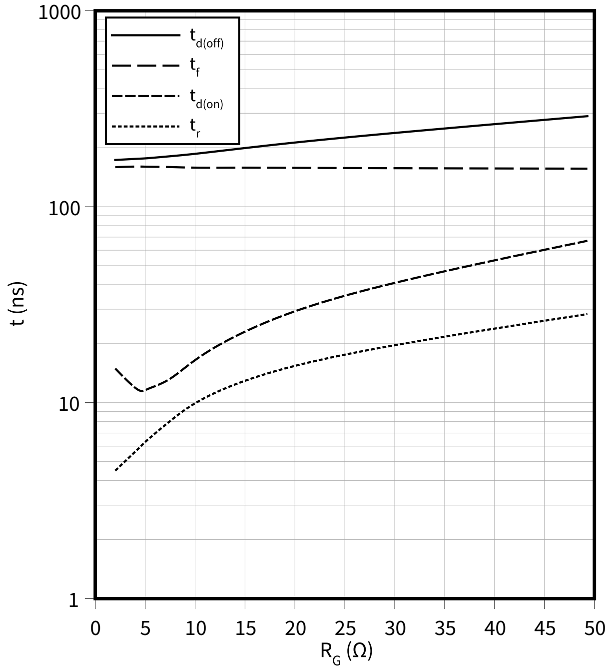


| **Typical collector-emitter saturation voltage as a function of junction temperature**<br>$V_{CEsat} = f(T_{vj})$ | **Gate-emitter threshold voltage as a function of junction temperature**<br>$V_{GEth} = f(T_{vj})$<br>$I_C = 0.3$ mA |
|---|---|
|  |  |
| **Typical switching times as a function of collector current**<br>$t = f(I_C)$<br>$V_{CC} = 800$ V, $T_{vj} = 25$ °C, $R_G = 4.5$ Ω | **Typical switching times as a function of collector current**<br>$t = f(I_C)$<br>$R_G = 4.5$ Ω, $V_{CC} = 800$ V, $T_{vj} = 175$ °C |
|  |  |

**Typical switching times as a function of gate resistor**

$t = f(R_G)$

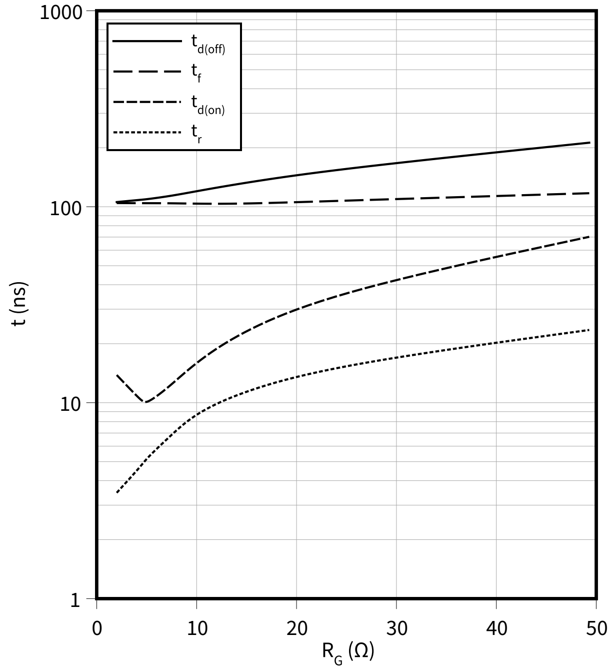
$I_C = 15$ A, $V_{CC} = 800$ V, $T_{vj} = 175$ °C




**Typical switching times as a function of gate resistor**

$t = f(R_G)$

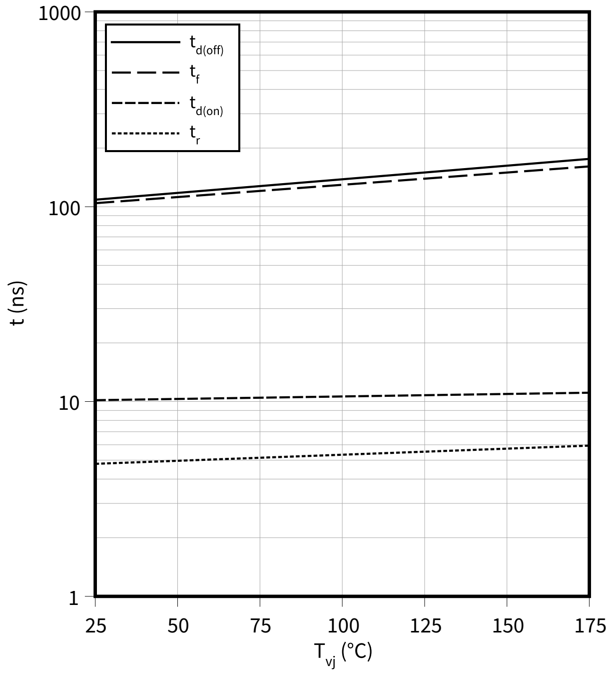
$I_C = 15$ A, $V_{CC} = 800$ V, $T_{vj} = 25$ °C




**Typical switching times as a function of junction temperature**

$t = f(T_{vj})$

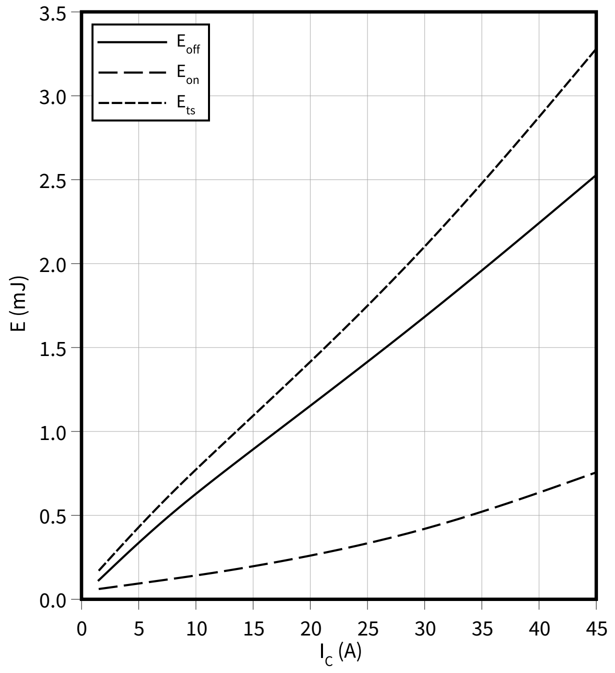
$I_C = 15$ A, $V_{CC} = 800$ V, $R_G = 4.5$ Ω




**Typical switching energy losses as a function of collector current**

$E = f(I_C)$

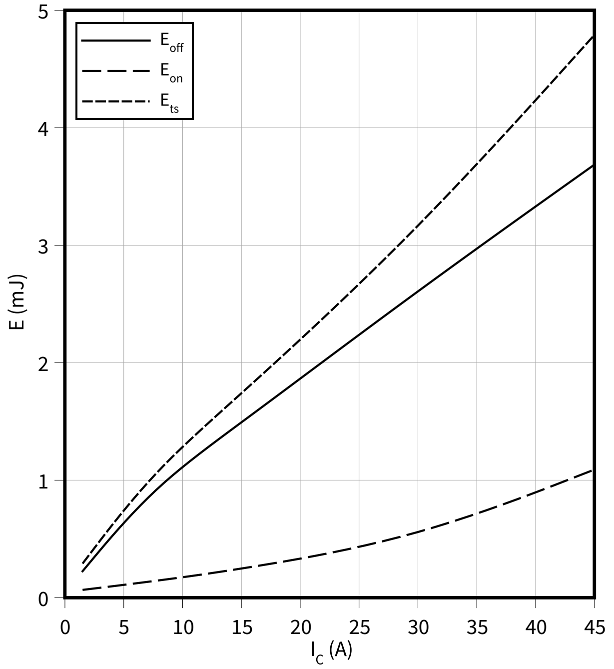
$V_{CC} = 800$ V, $T_{vj} = 25$ °C, $R_G = 4.5$ Ω



**Typical switching energy losses as a function of collector current**

$E = f(I_C)$

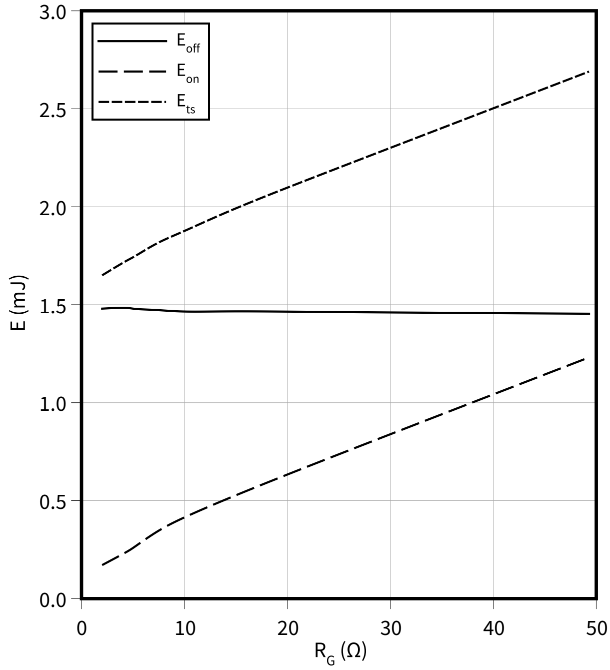
$V_{CC} = 800$ V, $T_{vj} = 175$ °C, $R_G = 4.5\ \Omega$




**Typical switching energy losses as a function of gate resistor**

$E = f(R_G)$

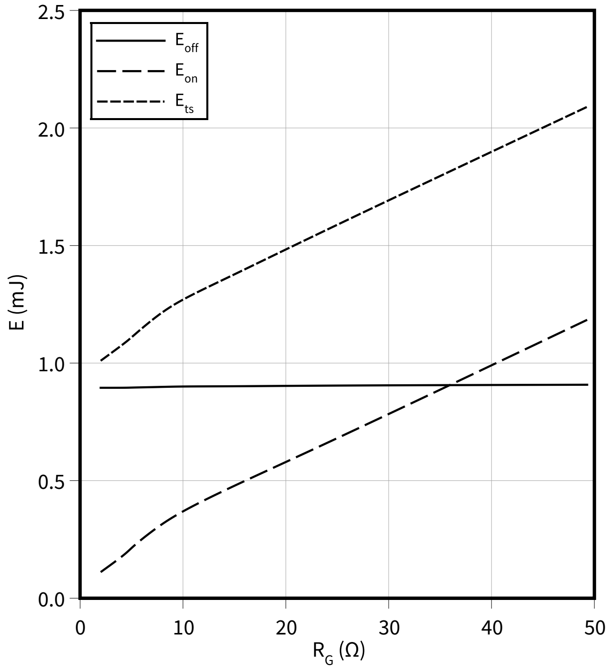
$I_C = 15$ A, $V_{CC} = 800$ V, $T_{vj} = 175$ °C




**Typical switching energy losses as a function of gate resistor**

$E = f(R_G)$

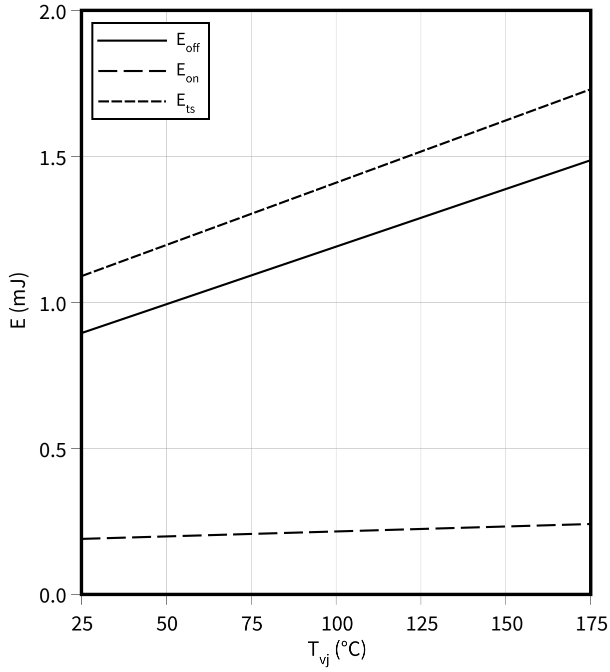
$I_C = 15$ A, $V_{CC} = 800$ V, $T_{vj} = 25$ °C




**Typical switching energy losses as a function of junction temperature**

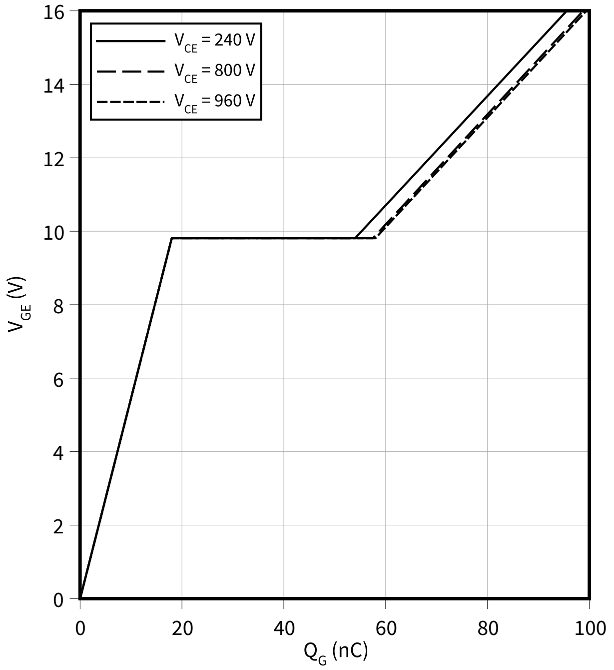
$E = f(T_{vj})$

$I_C = 15$ A, $V_{CC} = 800$ V, $R_G = 4.5\ \Omega$



### Typical gate charge

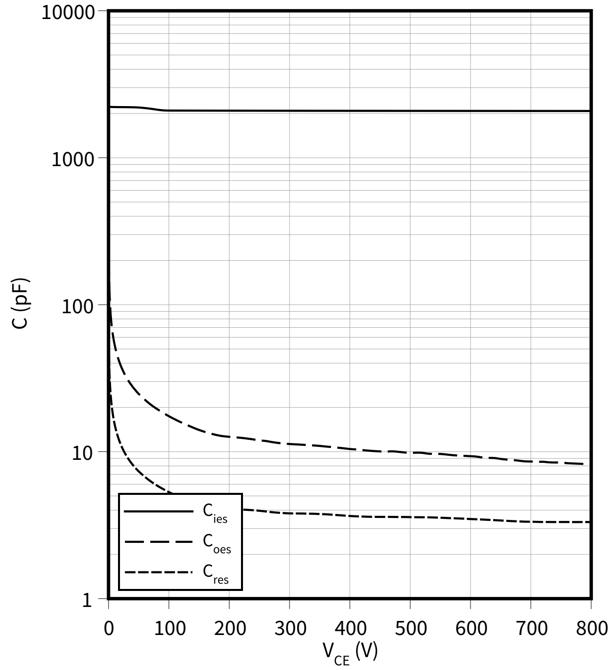
$V_{GE} = f(Q_G)$




### Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

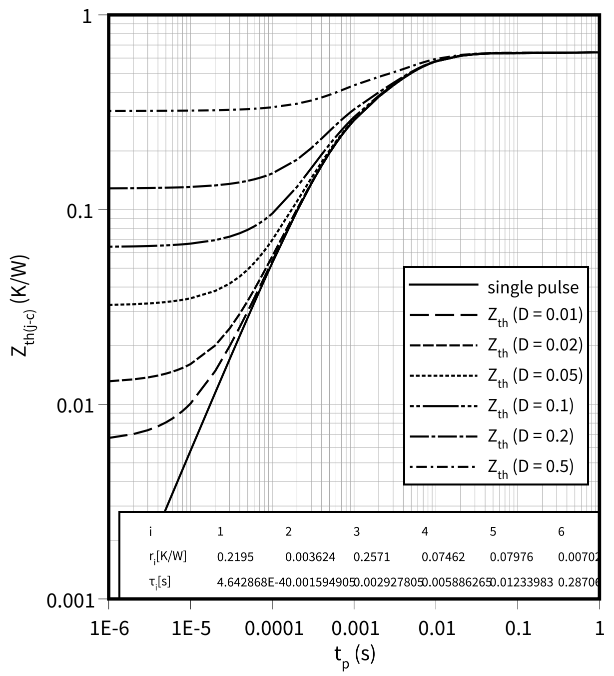
$f = 100$ kHz, $V_{GE} = 0$ V



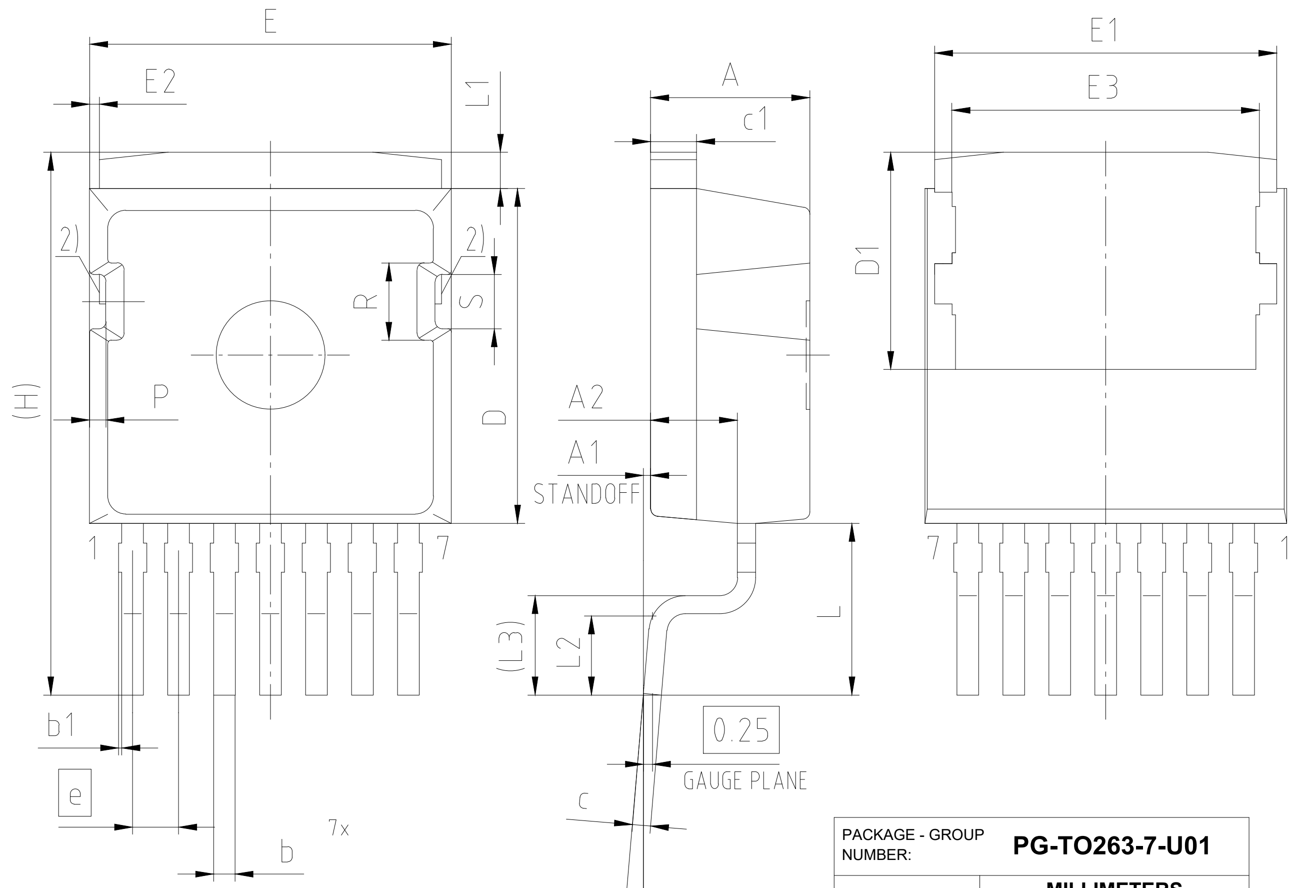

### IGBT typical transient thermal impedance as a function of pulse width

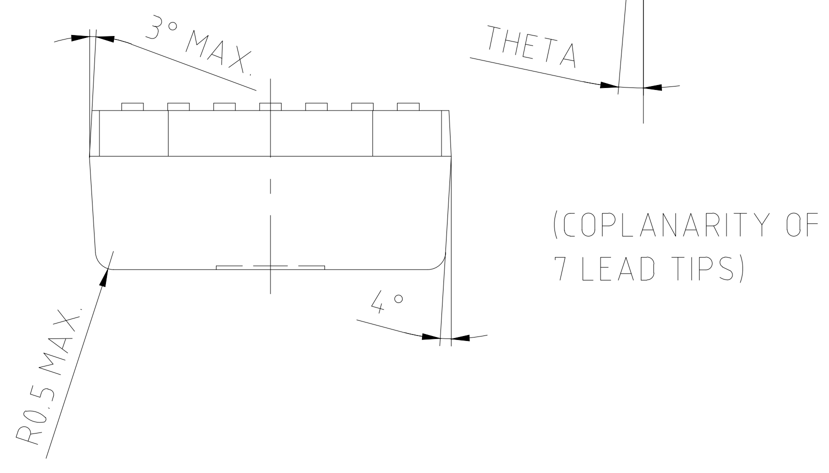
$Z_{th(j\text{-}c)} = f(t_p)$

$D = t_p/T$



# 4 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**

# 5 Testing conditions

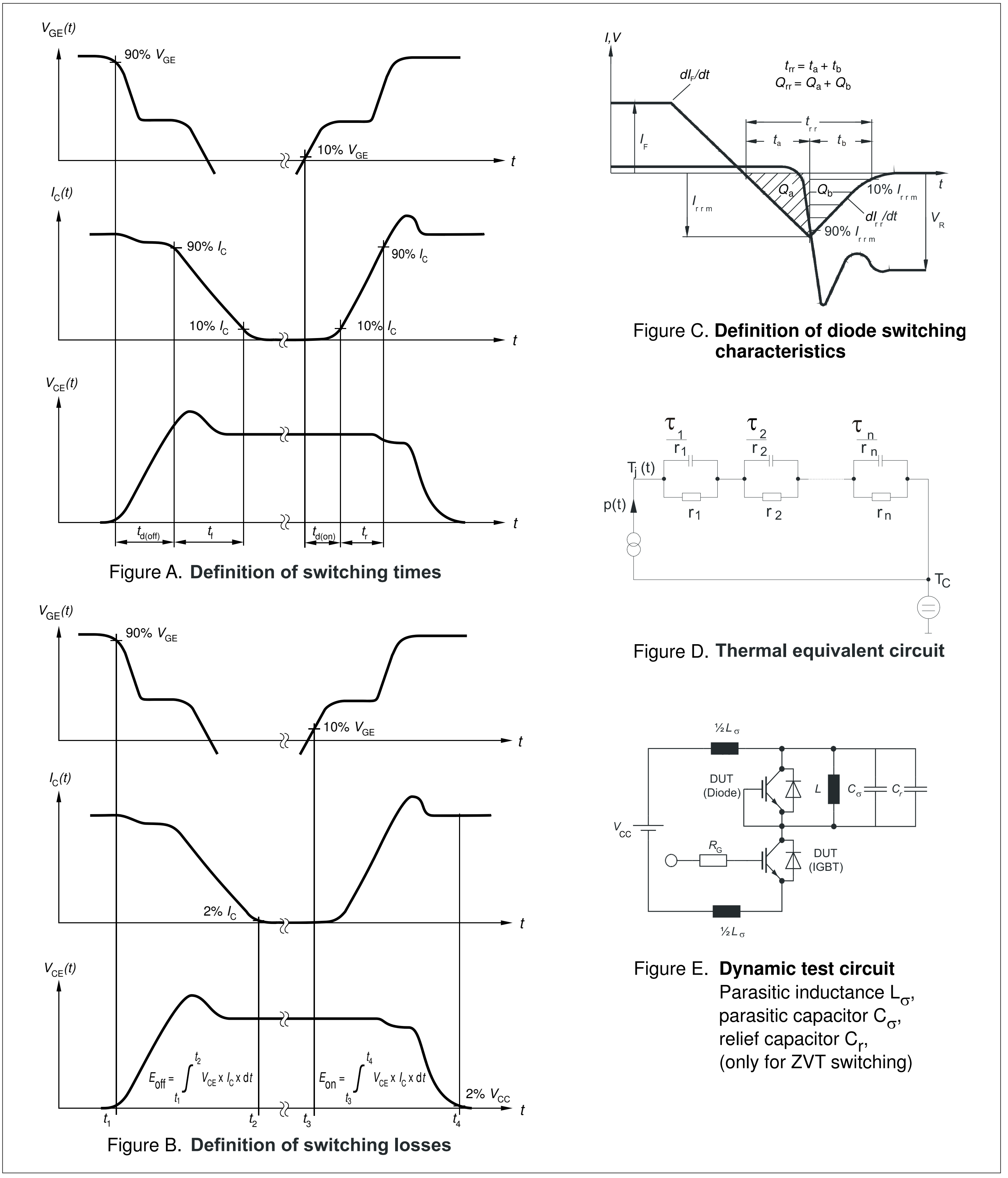



Figure A. **Definition of switching times**

Figure B. **Definition of switching losses**

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

Figure D. **Thermal equivalent circuit**

Figure E. **Dynamic test circuit**
Parasitic inductance $L_\sigma$,
parasitic capacitor $C_\sigma$,
relief capacitor $C_r$,
(only for ZVT switching)

**Figure 2**

## Revision history

| Document revision | Date of release | Description of changes |
|---|---|---|
| 0.10 | 2024-03-14 | Target datasheet |
| 0.20 | 2025-04-29 | Preliminary datasheet |
| 1.00 | 2025-09-18 | Final datasheet |

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