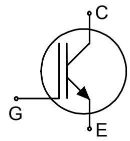
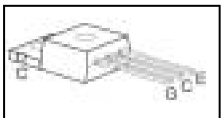
# SGP30N60
# SGW30N60

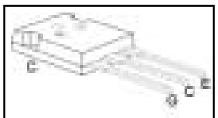
## Fast IGBT in NPT-technology




- 75% lower $E_{off}$ compared to previous generation
  combined with low conduction losses
- Short circuit withstand time – 10 µs
- Designed for:
  - Motor controls
  - Inverter
- NPT-Technology for 600V applications offers:
  - very tight parameter distribution
  - high ruggedness, temperature stable behaviour
  - parallel switching capability



PG-TO-220-3-1



PG-TO-247-3-21

- Qualified according to JEDEC[1] for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models : http://www.infineon.com/igbt/

| Type | $V_{CE}$ | $I_C$ | $V_{CE(sat)}$ | $T_j$ | Marking | Package |
|---|---|---|---|---|---|---|
| SGP30N60 | 600V | 30A | 2.5V | 150°C | G30N60 | PG-TO-220-3-1 |
| SGW30N60 | 600V | 30A | 2.5V | 150°C | G30N60 | PG-TO-247-3-21 |

**Maximum Ratings**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CE}$ | 600 | V |
| DC collector current | $I_C$ | | A |
| $T_C$ = 25°C | | 41 | |
| $T_C$ = 100°C | | 30 | |
| Pulsed collector current, $t_p$ limited by $T_{jmax}$ | $I_{Cpuls}$ | 112 | |
| Turn off safe operating area<br>$V_{CE} \leq$ 600V, $T_j \leq$ 150°C | - | 112 | |
| Gate-emitter voltage | $V_{GE}$ | ±20 | V |
| Avalanche energy, single pulse<br>$I_C$ = 30 A, $V_{CC}$ = 50 V, $R_{GE}$ = 25 Ω,<br>start at $T_j$ = 25°C | $E_{AS}$ | 165 | mJ |
| Short circuit withstand time[2]<br>$V_{GE}$ = 15V, $V_{CC} \leq$ 600V, $T_j \leq$ 150°C | $t_{SC}$ | 10 | µs |
| Power dissipation<br>$T_C$ = 25°C | $P_{tot}$ | 250 | W |
| Operating junction and storage temperature | $T_j$ , $T_{stg}$ | -55...+150 | °C |
| Soldering temperature,<br>wavesoldering, 1.6mm (0.063 in.) from case for 10s | $T_s$ | 260 | |

[1] J-STD-020 and JESD-022
[2] Allowed number of short circuits: <1000; time between short circuits: >1s.

**Thermal Resistance**

| Parameter | Symbol | Conditions | Max. Value | Unit |
|---|---|---|---|---|
| **Characteristic** | | | | |
| IGBT thermal resistance, junction – case | $R_{thJC}$ | | 0.5 | K/W |
| Thermal resistance, junction – ambient | $R_{thJA}$ | PG-TO-220-3-1<br>PG-TO-247-3-21 | 62<br>40 | |

**Electrical Characteristic,** at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | Typ. | max. | |
| **Static Characteristic** | | | | | | |
| Collector-emitter breakdown voltage | $V_{(BR)CES}$ | $V_{GE}$=0V, $I_C$=500µA | 600 | - | - | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $V_{GE}$ = 15V, $I_C$=30A<br>$T_j$=25°C<br>$T_j$=150°C | <br>1.7<br>- | <br>2.1<br>2.5 | <br>2.4<br>3.0 | |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $I_C$=700µA, $V_{CE}$=$V_{GE}$ | 3 | 4 | 5 | |
| Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$=600V, $V_{GE}$=0V<br>$T_j$=25°C<br>$T_j$=150°C | <br>-<br>- | <br>-<br>- | <br>40<br>3000 | µA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$=0V, $V_{GE}$=20V | - | - | 100 | nA |
| Transconductance | $g_{fs}$ | $V_{CE}$=20V, $I_C$=30A | - | 20 | - | S |
| **Dynamic Characteristic** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{CE}$=25V, | - | 1600 | 1920 | pF |
| Output capacitance | $C_{oss}$ | $V_{GE}$=0V, | - | 150 | 180 | |
| Reverse transfer capacitance | $C_{rss}$ | $f$=1MHz | - | 92 | 110 | |
| Gate charge | $Q_{Gate}$ | $V_{CC}$=480V, $I_C$=30A<br>$V_{GE}$=15V | - | 140 | 182 | nC |
| Internal emitter inductance measured 5mm (0.197 in.) from case | $L_E$ | PG-TO-220-3-1<br>PG-TO-247-3-21 | -<br>- | 7<br>13 | - | nH |
| Short circuit collector current[2)] | $I_{C(SC)}$ | $V_{GE}$=15V, $t_{SC}$≤10µs<br>$V_{CC}$ ≤ 600V,<br>$T_j$ ≤ 150°C | - | 300 | - | A |

[2)] Allowed number of short circuits: <1000; time between short circuits: >1s.

**Switching Characteristic, Inductive Load,** at $T_j$=25 °C

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **IGBT Characteristic** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $T_j$=25°C, $V_{CC}$=400V, $I_C$=30A, $V_{GE}$=0/15V, $R_G$=11Ω, $L_\sigma$[1] =180nH, $C_\sigma$[1] =900pF Energy losses include "tail" and diode reverse recovery. | - | 44 | 53 | ns |
| Rise time | $t_r$ | | - | 34 | 40 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 291 | 349 | |
| Fall time | $t_f$ | | - | 58 | 70 | |
| Turn-on energy | $E_{on}$ | | - | 0.64 | 0.77 | mJ |
| Turn-off energy | $E_{off}$ | | - | 0.65 | 0.85 | |
| Total switching energy | $E_{ts}$ | | - | 1.29 | 1.62 | |

**Switching Characteristic, Inductive Load,** at $T_j$=150 °C

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **IGBT Characteristic** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $T_j$=150°C $V_{CC}$=400V, $I_C$=30A, $V_{GE}$=0/15V, $R_G$= 11Ω, $L_\sigma$[1] =180nH, $C_\sigma$[1] =900pF Energy losses include "tail" and diode reverse recovery. | - | 44 | 53 | ns |
| Rise time | $t_r$ | | - | 34 | 40 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 324 | 389 | |
| Fall time | $t_f$ | | - | 67 | 80 | |
| Turn-on energy | $E_{on}$ | | - | 0.98 | 1.18 | mJ |
| Turn-off energy | $E_{off}$ | | - | 0.92 | 1.19 | |
| Total switching energy | $E_{ts}$ | | - | 1.90 | 2.38 | |

[1] Leakage inductance $L_\sigma$ and Stray capacity $C_\sigma$ due to dynamic test circuit in Figure E.

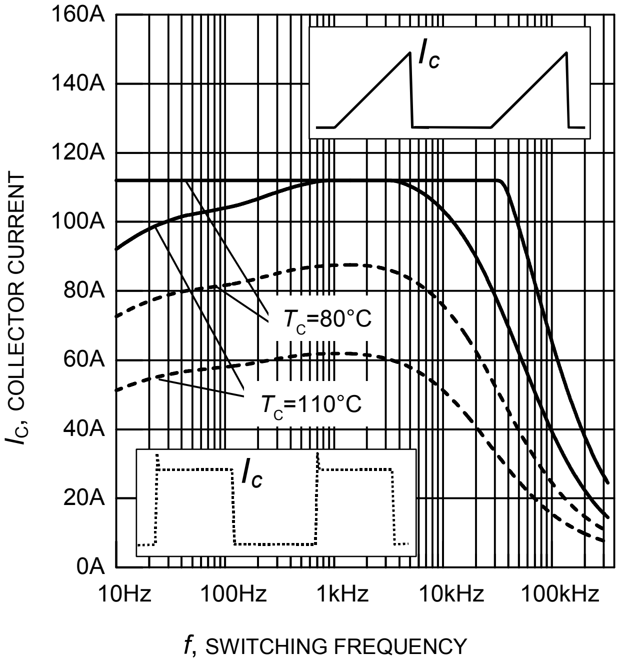



**Figure 1. Collector current as a function of switching frequency**
($T_j \leq 150°C$, $D = 0.5$, $V_{CE} = 400V$, $V_{GE} = 0/+15V$, $R_G = 11\Omega$)

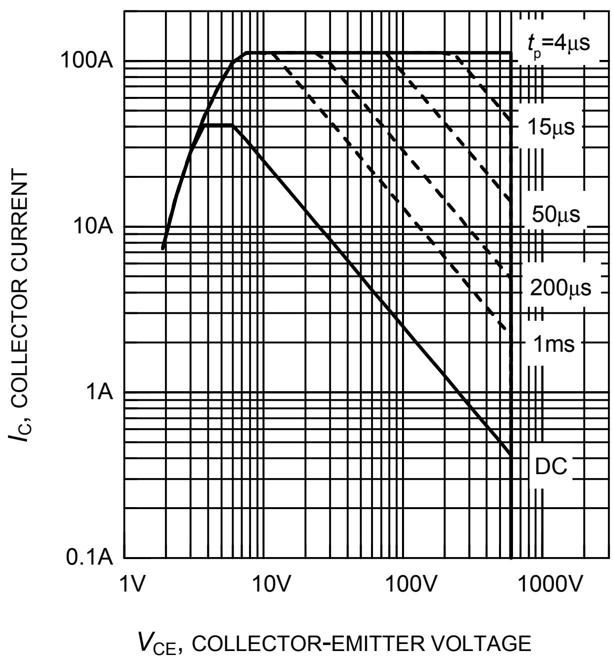



**Figure 2. Safe operating area**
($D = 0$, $T_C = 25°C$, $T_j \leq 150°C$)

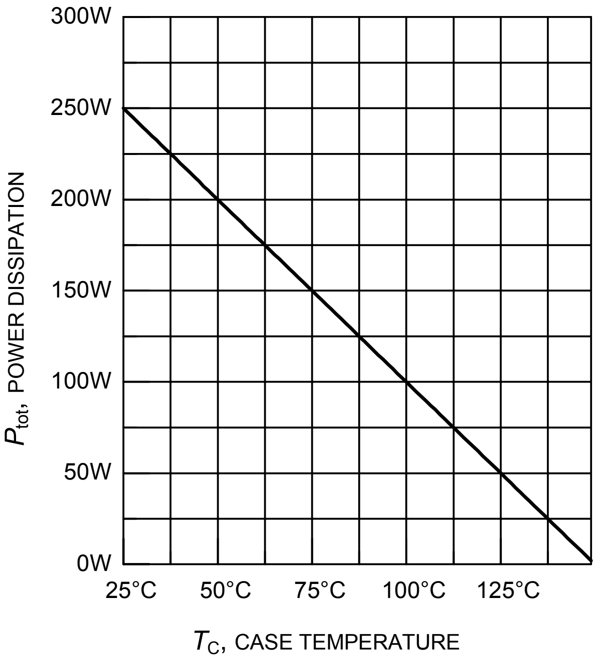



**Figure 3. Power dissipation as a function of case temperature**
($T_j \leq 150°C$)

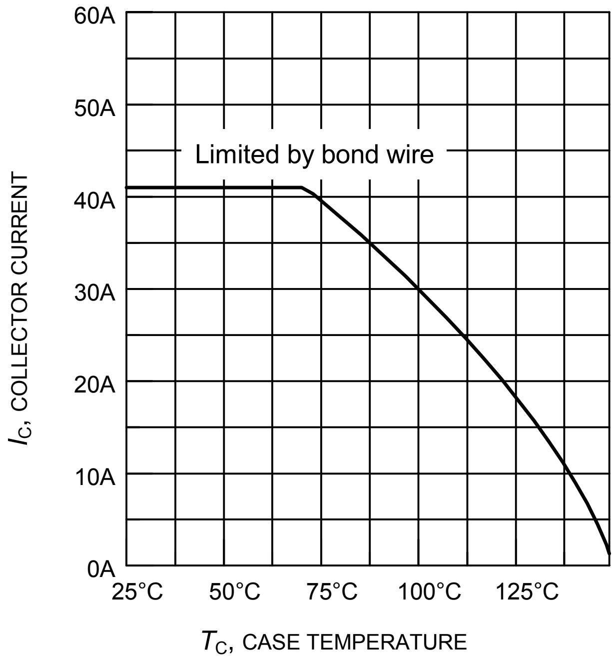



**Figure 4. Collector current as a function of case temperature**
($V_{GE} \leq 15V$, $T_j \leq 150°C$)

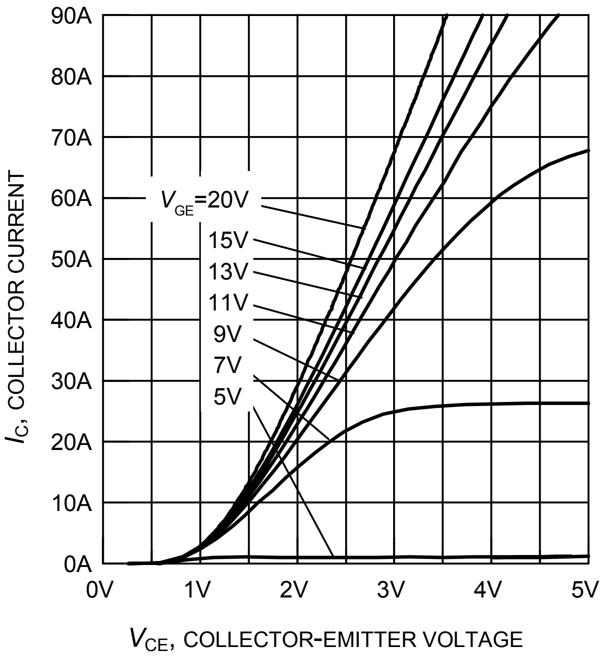



**Figure 5. Typical output characteristics**
($T_j$ = 25°C)

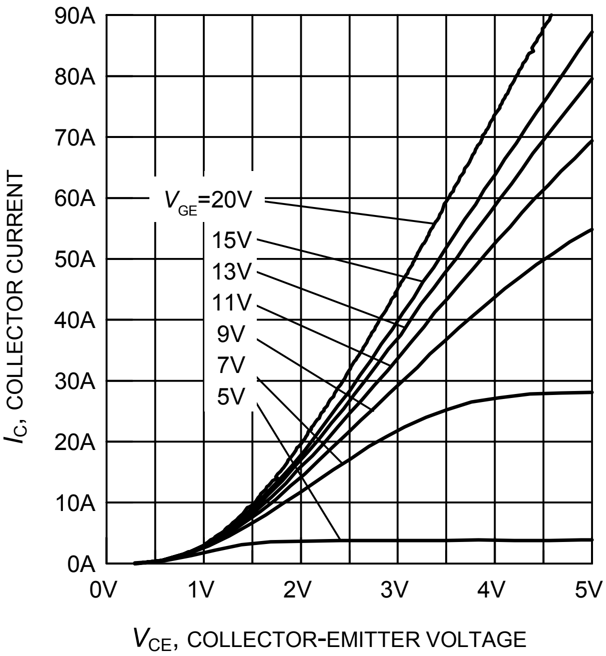



**Figure 6. Typical output characteristics**
($T_j$ = 150°C)

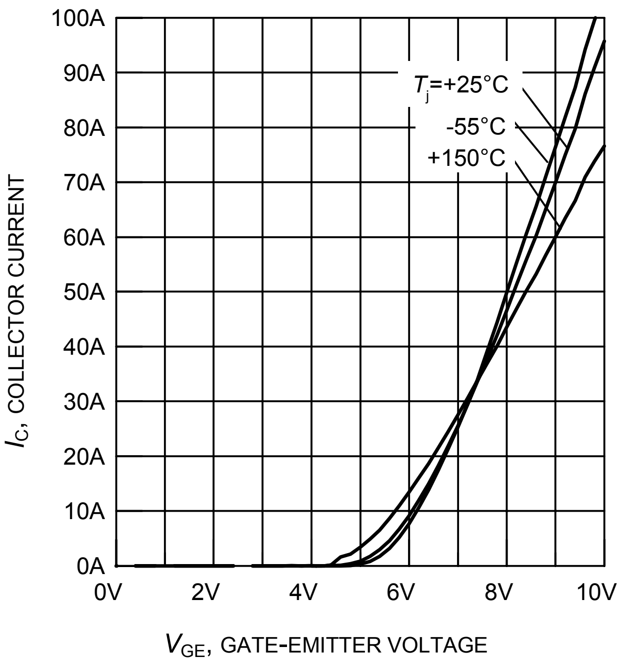



**Figure 7. Typical transfer characteristics**
($V_{CE}$ = 10V)

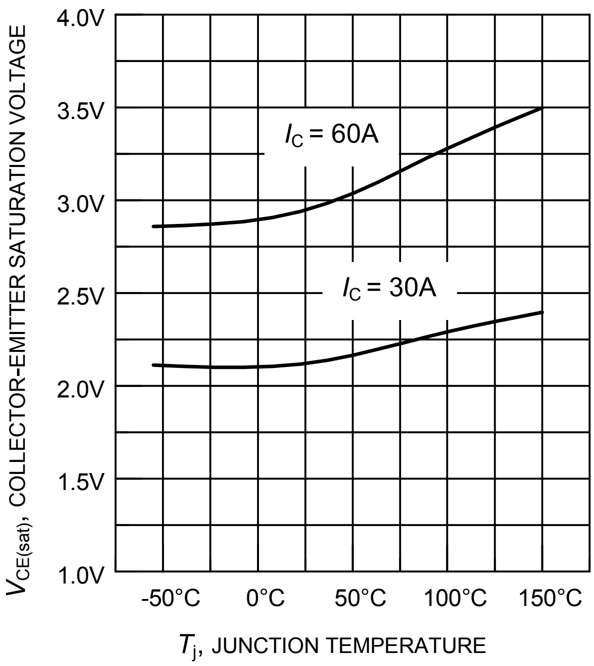



**Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature**
($V_{GE}$ = 15V)

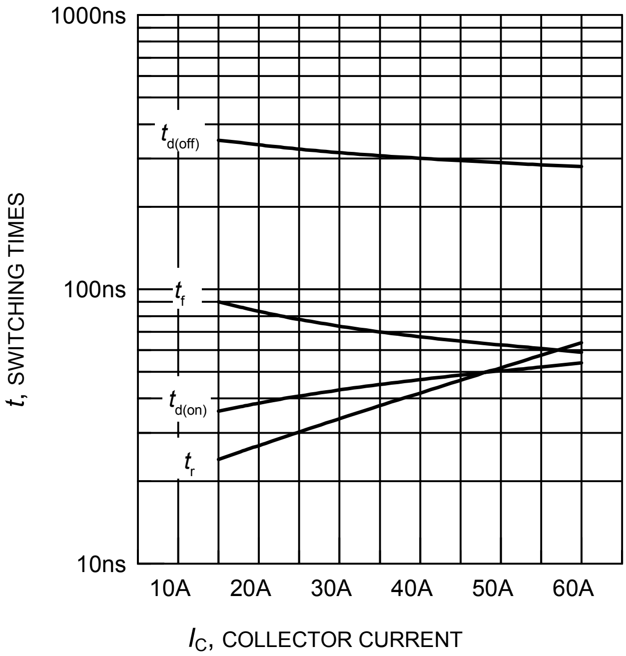



**Figure 9. Typical switching times as a function of collector current**
(inductive load, $T_j$ = 150°C, $V_{CE}$ = 400V, $V_{GE}$ = 0/+15V, $R_G$ = 11Ω, Dynamic test circuit in Figure E)

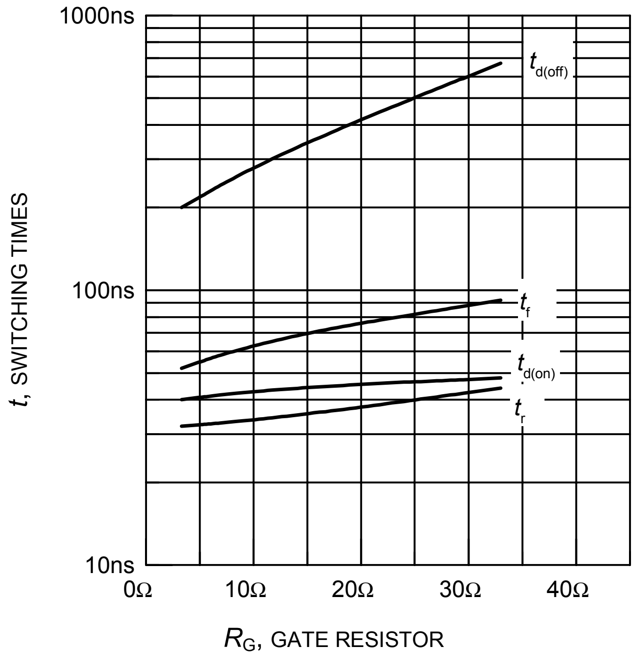



**Figure 10. Typical switching times as a function of gate resistor**
(inductive load, $T_j$ = 150°C, $V_{CE}$ = 400V, $V_{GE}$ = 0/+15V, $I_C$ = 30A, Dynamic test circuit in Figure E)

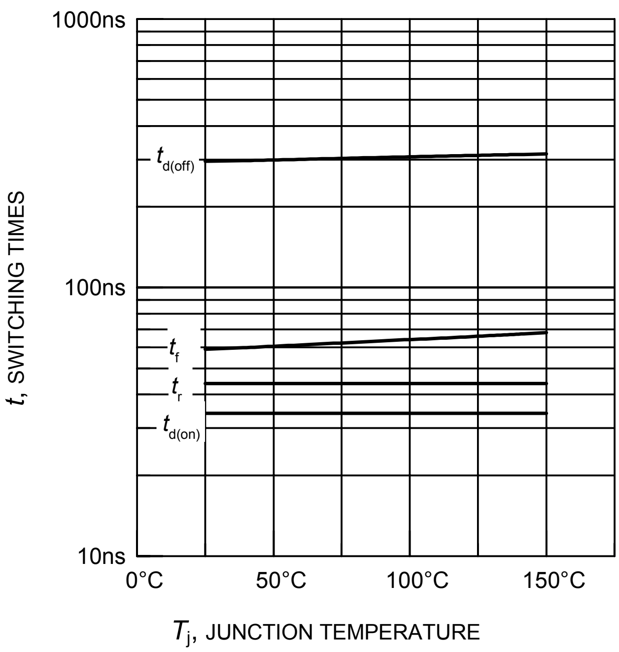



**Figure 11. Typical switching times as a function of junction temperature**
(inductive load, $V_{CE}$ = 400V, $V_{GE}$ = 0/+15V, $I_C$ = 30A, $R_G$ = 11Ω, Dynamic test circuit in Figure E)

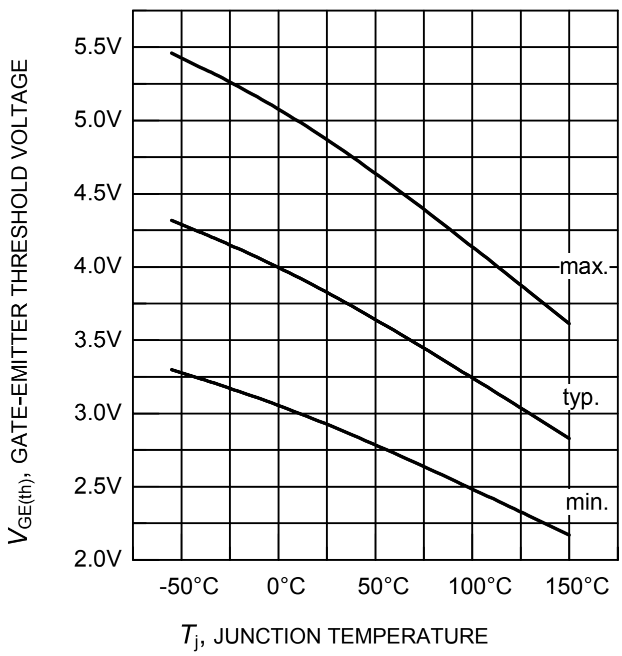



**Figure 12. Gate-emitter threshold voltage as a function of junction temperature**
($I_C$ = 0.7mA)

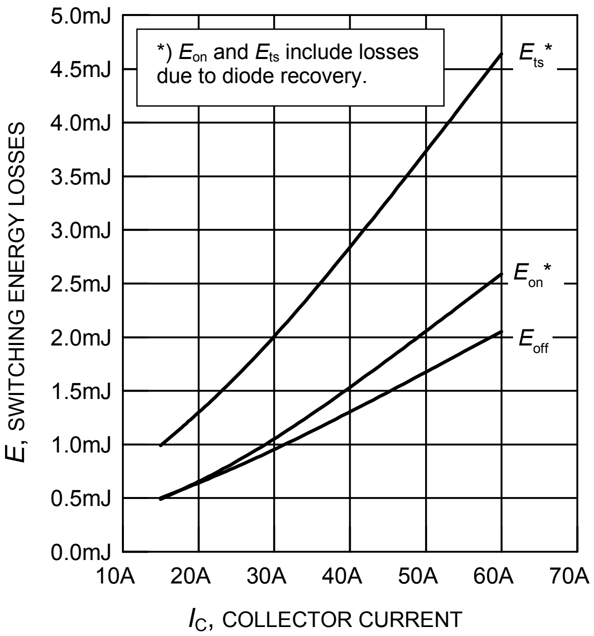



**Figure 13. Typical switching energy losses as a function of collector current**
(inductive load, $T_j$ = 150°C, $V_{CE}$ = 400V, $V_{GE}$ = 0/+15V, $R_G$ = 11Ω, Dynamic test circuit in Figure E)

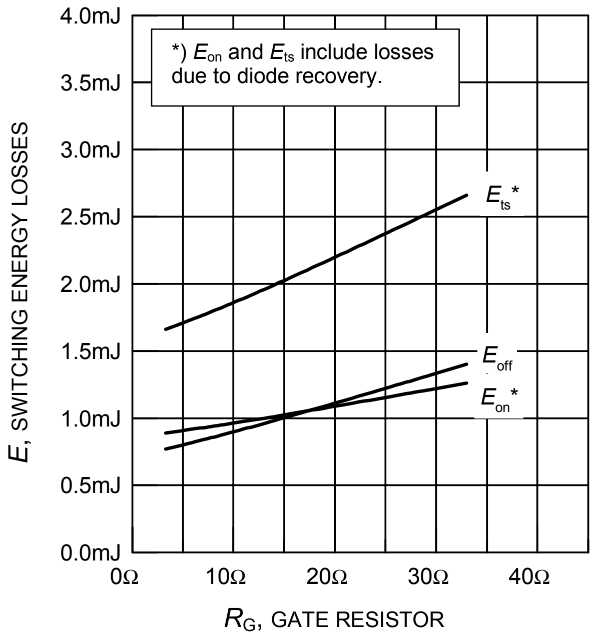



**Figure 14. Typical switching energy losses as a function of gate resistor**
(inductive load, $T_j$ = 150°C, $V_{CE}$ = 400V, $V_{GE}$ = 0/+15V, $I_C$ = 30A, Dynamic test circuit in Figure E)

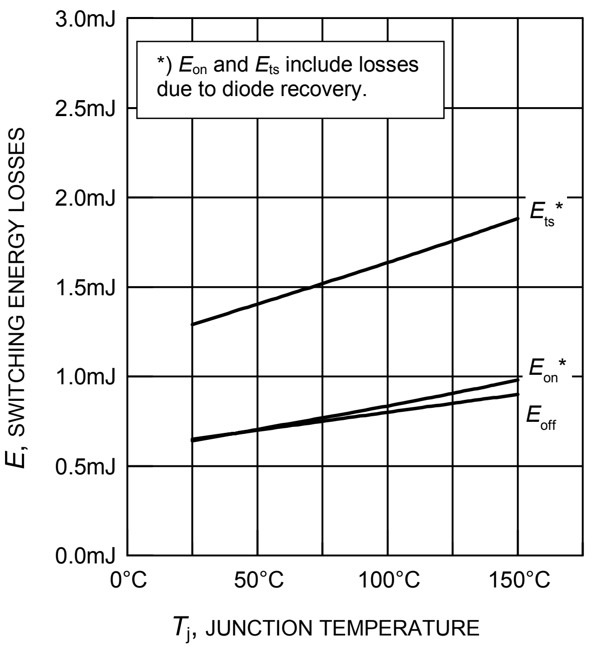



**Figure 15. Typical switching energy losses as a function of junction temperature**
(inductive load, $V_{CE}$ = 400V, $V_{GE}$ = 0/+15V, $I_C$ = 30A, $R_G$ = 11Ω, Dynamic test circuit in Figure E)

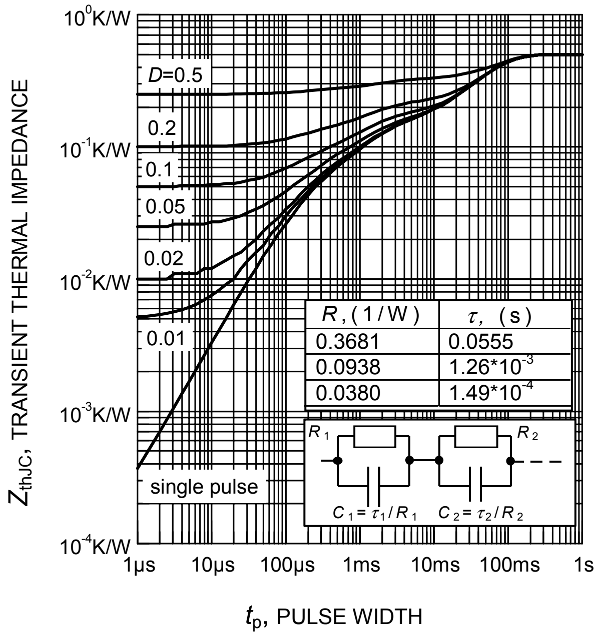



**Figure 16. IGBT transient thermal impedance as a function of pulse width**
($D = t_p / T$)

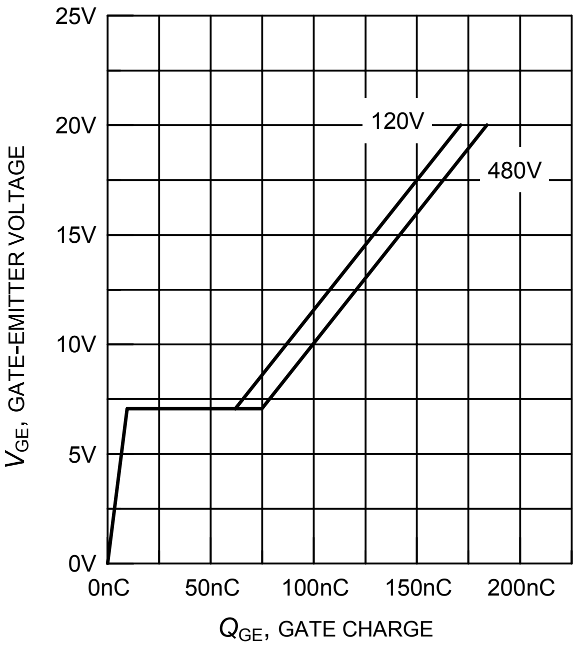



**Figure 17. Typical gate charge**
($I_C$ = 30A)

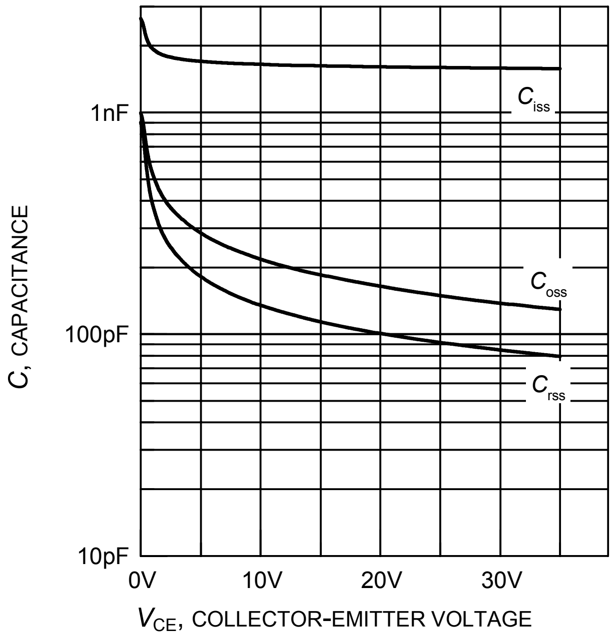



**Figure 18. Typical capacitance as a function of collector-emitter voltage**
($V_{GE}$ = 0V, $f$ = 1MHz)

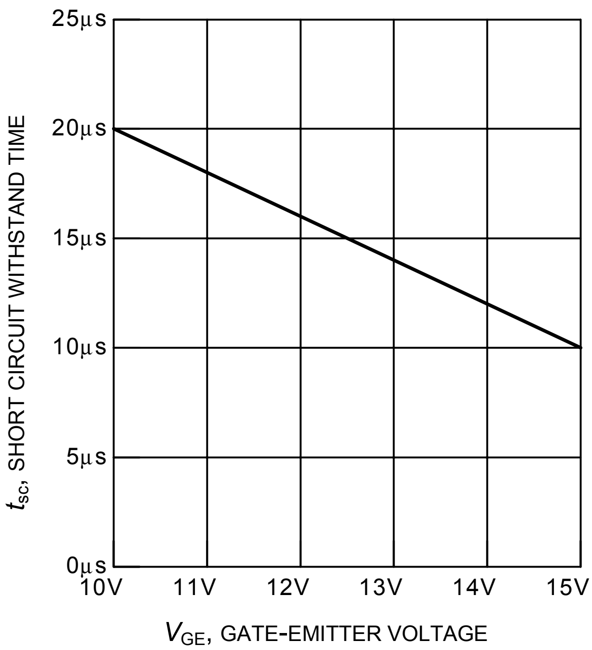



**Figure 19. Short circuit withstand time as a function of gate-emitter voltage**
($V_{CE}$ = 600V, start at $T_j$ = 25°C)

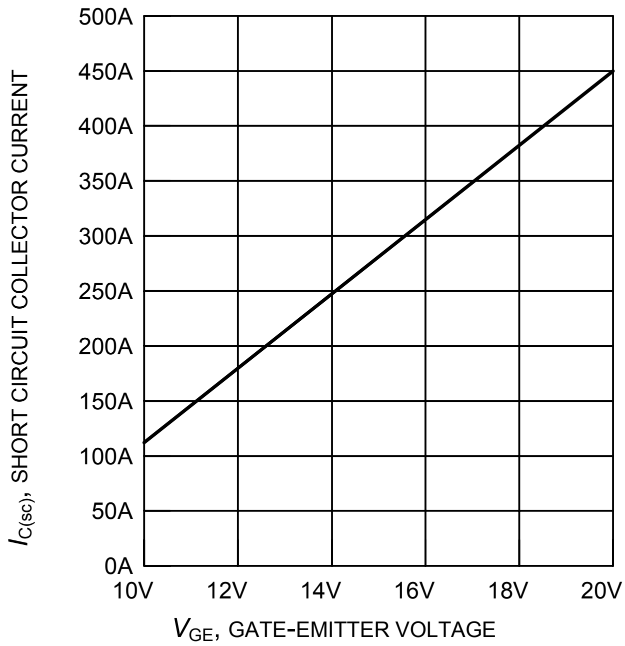



**Figure 20. Typical short circuit collector current as a function of gate-emitter voltage**
($V_{CE} \leq$ 600V, $T_j$ = 150°C)

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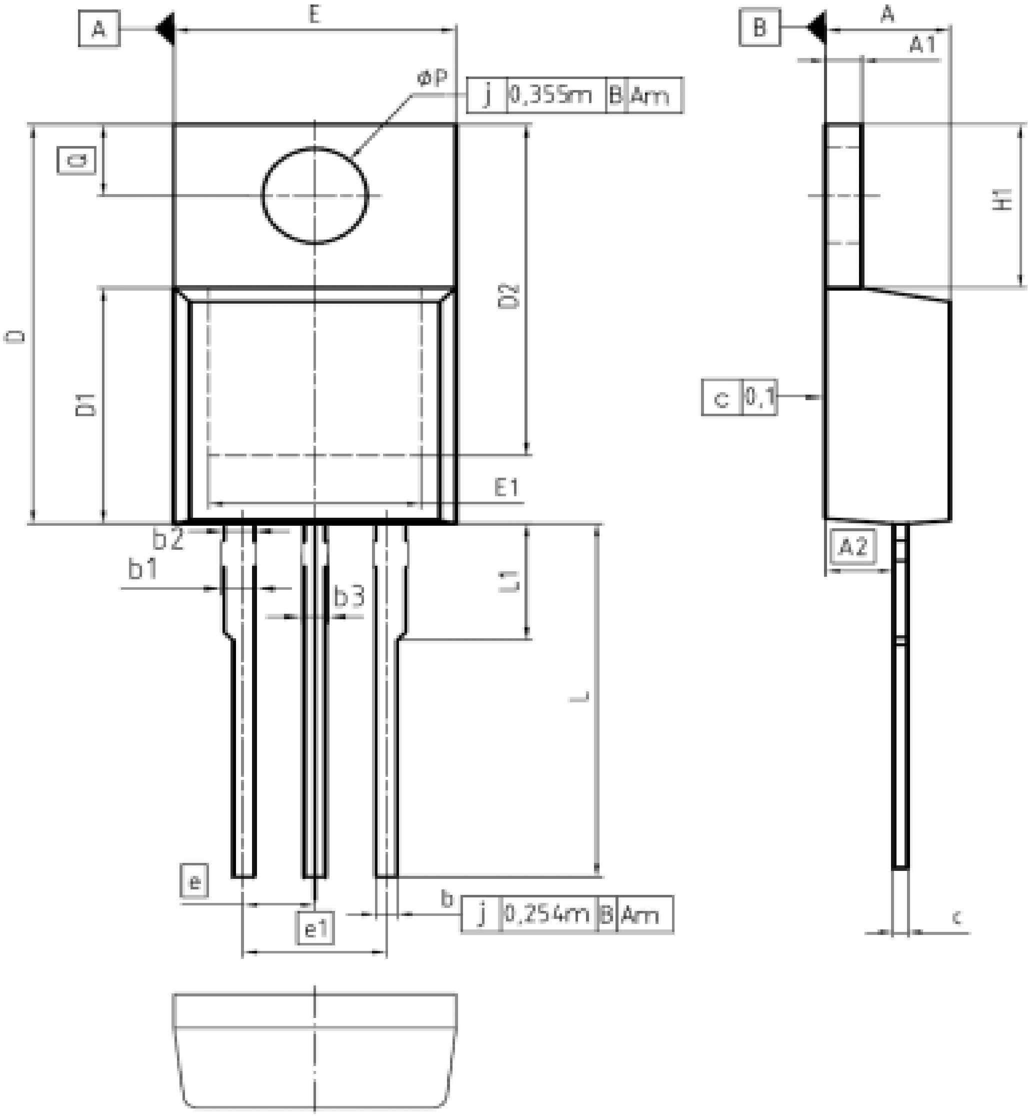


| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.30 | 4.57 | 0.169 | 0.180 |
| A1 | 1.17 | 1.40 | 0.046 | 0.055 |
| A2 | 2.15 | 2.72 | 0.085 | 0.107 |
| b | 0.65 | 0.86 | 0.026 | 0.034 |
| b1 | 0.95 | 1.40 | 0.037 | 0.055 |
| b2 | 0.95 | 1.15 | 0.037 | 0.045 |
| b3 | 0.65 | 1.15 | 0.026 | 0.045 |
| c | 0.33 | 0.60 | 0.013 | 0.024 |
| D | 14.81 | 15.95 | 0.583 | 0.628 |
| D1 | 8.51 | 9.45 | 0.335 | 0.372 |
| D2 | 12.19 | 13.10 | 0.480 | 0.516 |
| E | 9.70 | 10.36 | 0.382 | 0.408 |
| E1 | 6.50 | 8.60 | 0.256 | 0.339 |
| e | 2.54 | | 0.100 | |
| e1 | 5.08 | | 0.200 | |
| N | 3 | | 3 | |
| H1 | 5.90 | 6.90 | 0.232 | 0.272 |
| L | 13.00 | 14.00 | 0.512 | 0.551 |
| L1 | - | 4.80 | - | 0.189 |
| øP | 3.60 | 3.89 | 0.142 | 0.153 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |

DOCUMENT NO.
Z8B00003318

SCALE 0 2.5 0 2.5 5mm

EUROPEAN PROJECTION

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05

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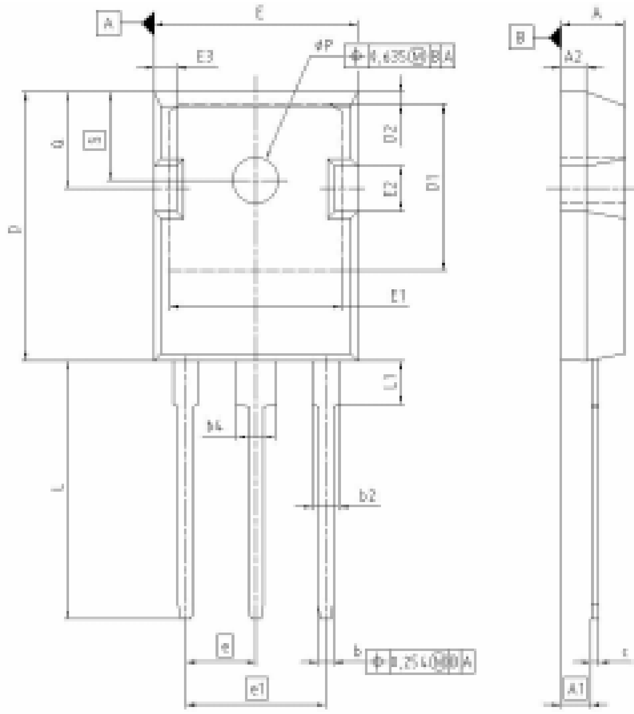


| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.903 | 5.157 | 0.193 | 0.203 |
| A1 | 2.273 | 2.527 | 0.089 | 0.099 |
| A2 | 1.853 | 2.107 | 0.073 | 0.083 |
| b | 1.073 | 1.327 | 0.042 | 0.052 |
| b2 | 1.903 | 2.388 | 0.075 | 0.094 |
| b4 | 2.870 | 3.454 | 0.113 | 0.136 |
| c | 0.549 | 0.752 | 0.022 | 0.030 |
| D | 20.823 | 21.077 | 0.820 | 0.830 |
| D1 | 17.323 | 17.831 | 0.682 | 0.702 |
| D2 | 1.063 | 1.317 | 0.042 | 0.052 |
| E | 15.773 | 16.027 | 0.621 | 0.631 |
| E1 | 13.893 | 14.147 | 0.547 | 0.557 |
| E2 | 3.683 | 3.937 | 0.145 | 0.155 |
| E3 | 1.683 | 1.937 | 0.066 | 0.076 |
| e | 5.450 | | 0.215 | |
| e1 | 10.900 | | 0.430 | |
| N | 3 | | 3 | |
| L | 20.053 | 20.307 | 0.789 | 0.799 |
| L1 | 4.168 | 4.472 | 0.164 | 0.176 |
| øP | 3.559 | 3.661 | 0.140 | 0.144 |
| Q | 5.493 | 5.747 | 0.216 | 0.226 |
| S | 6.043 | 6.297 | 0.238 | 0.248 |

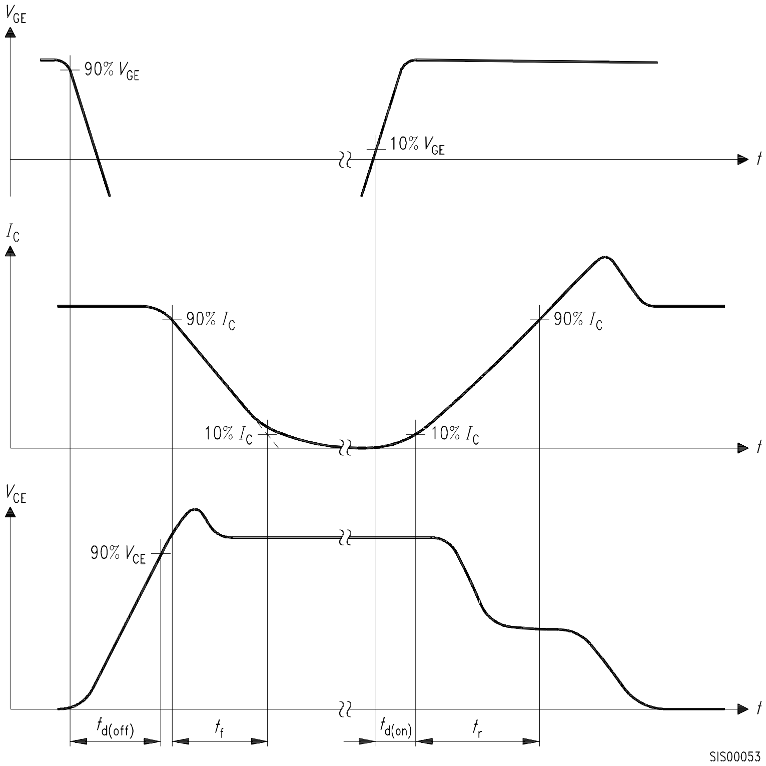


Figure A. Definition of switching times

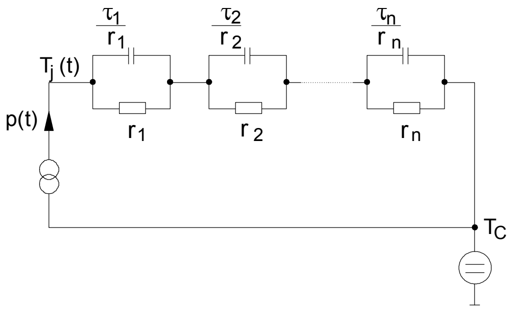


**Figure D. Thermal equivalent circuit**

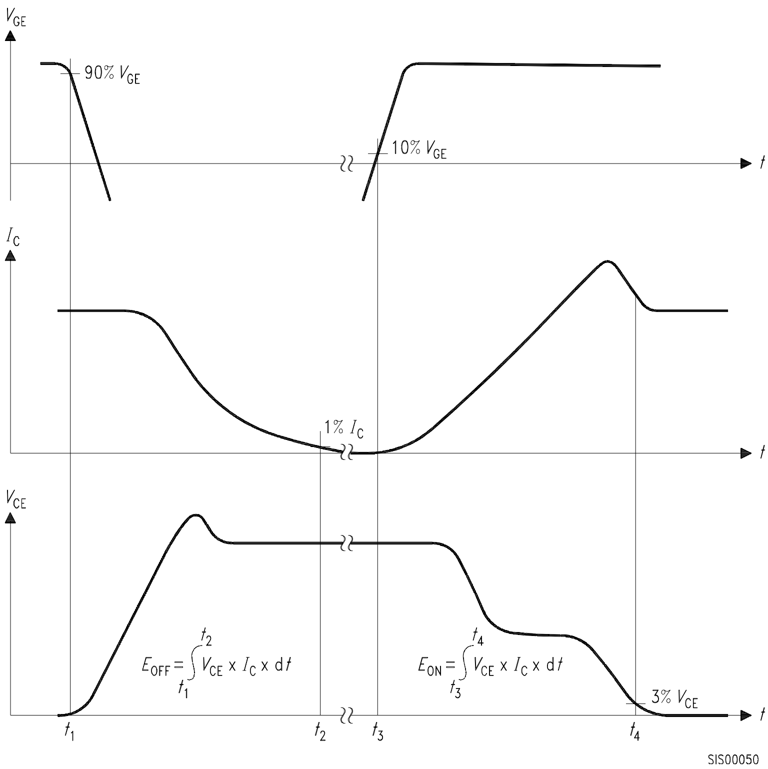


Figure B. Definition of switching losses

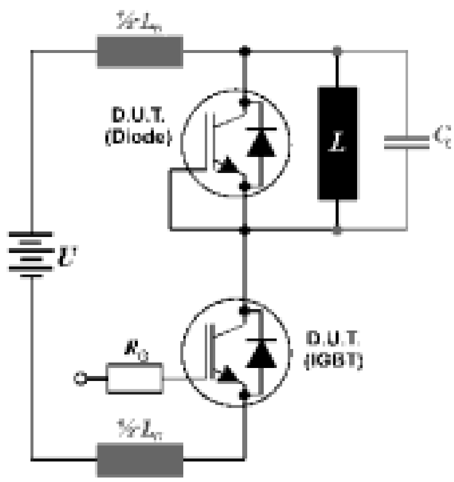


**Figure E. Dynamic test circuit**
Leakage inductance $L_\sigma$ =180nH
and Stray capacity $C_\sigma$ =900pF.

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