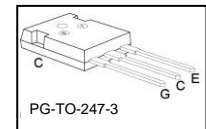
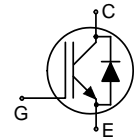


Low Loss DuoPack : IGBT in 2nd generation **TrenchStop®** technology
with soft, fast recovery anti-parallel Emitter Controlled Diode

- Short circuit withstand time – 10µs
- Designed for :
 - Frequency Converters
 - Uninterrupted Power Supply
- **TrenchStop®** 2nd generation for 1200 V applications offers :
 - very tight parameter distribution
 - high ruggedness, temperature stable behavior
- Easy paralleling capability due to positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Low Gate Charge
- Very soft, fast recovery anti-parallel Emitter Controlled HE Diode
- Qualified according to JEDEC¹ 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 | $V_{CE(sat), T_j=25^\circ C}$ | $T_{j,max}$ | Marking Code | Package |
|-------------|----------|-------|-------------------------------|-------------|--------------|-------------|
| IKW15N120T2 | 1200V | 15A | 1.75V | 175°C | K15T1202 | PG-TO-247-3 |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|--------------|------------|------|
| Collector-emitter voltage | V_{CE} | 1200 | V |
| DC collector current ($T_j = 150^\circ C$) | I_C | | A |
| $T_C = 25^\circ C$ | | 30 | |
| $T_C = 110^\circ C$ | | 15 | |
| Pulsed collector current, t_p limited by $T_{j,max}$ | $I_{C,puls}$ | 60 | |
| Turn off safe operating area | - | 60 | |
| $V_{CE} \leq 1200V, T_j \leq 175^\circ C$ | | | |
| Diode forward current ($T_j = 150^\circ C$) | I_F | | |
| $T_C = 25^\circ C$ | | 25 | |
| $T_C = 110^\circ C$ | | 15 | |
| Diode pulsed current, t_p limited by $T_{j,max}$ | $I_{F,puls}$ | 60 | |
| Gate-emitter voltage | V_{GE} | ± 20 | V |
| Short circuit withstand time ²⁾ | t_{SC} | 10 | µs |
| $V_{GE} = 15V, V_{CC} \leq 600V, T_{j,start} \leq 175^\circ C$ | | | |
| Power dissipation | P_{tot} | 235 | W |
| $T_C = 25^\circ C$ | | | |
| Operating junction temperature | T_j | -40...+175 | °C |
| Storage temperature | T_{stg} | -55...+150 | |
| Soldering temperature, 1.6mm (0.063 in.) from case for 10s Wavesoldering only, temperature on leads only | - | 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} | | 0.63 | K/W |
| Diode thermal resistance, junction – case | R_{thJCD} | | 1.12 | |
| Thermal resistance, junction – ambient | R_{thJA} | | 40 | |

Electrical Characteristic, at $T_j = 25^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|--------------------------------------|---------------|---|-------|------|------|------|
| | | | min. | typ. | max. | |
| Static Characteristic | | | | | | |
| Collector-emitter breakdown voltage | $V_{(BR)CES}$ | $V_{GE}=0V, I_C=500\mu A$ | 1200 | - | - | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $V_{GE} = 15V, I_C=15A$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$ $T_j=175^\circ\text{C}$ | - | 1.7 | 2.2 | |
| | | | - | 2.1 | - | |
| | | | - | 2.2 | - | |
| Diode forward voltage | V_F | $V_{GE}=0V, I_F=15A$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$ $T_j=175^\circ\text{C}$ | - | 1.75 | 2.2 | |
| | | | - | 1.8 | - | |
| | | | - | 1.75 | - | |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $I_C=0.6mA, V_{CE}=V_{GE}$ | 5.2 | 5.8 | 6.4 | |
| Zero gate voltage collector current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$ $T_j=175^\circ\text{C}$ | - | - | 0.4 | mA |
| | | | - | - | 4.0 | |
| | | | - | - | 20 | |
| Gate-emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V$ | - | - | 600 | nA |
| Transconductance | g_{fs} | $V_{CE}=20V, I_C=15A$ | - | 8 | - | S |

Dynamic Characteristic

| | | | | | | |
|---|-------------|--|---|----------|---|----|
| Input capacitance | C_{iss} | $V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$ | - | 1000 | - | pF |
| Output capacitance | C_{oss} | | - | 100 | - | |
| Reverse transfer capacitance | C_{riss} | | - | 56 | - | |
| Gate charge | Q_{Gate} | $V_{CC}=960V, I_C=15A$ $V_{GE}=15V$ | - | 93 | - | nC |
| Internal emitter inductance measured 5mm (0.197 in.) from case | L_E | | - | 13 | - | nH |
| Short circuit collector current ¹⁾ | $I_{C(SC)}$ | $V_{GE}=15V, t_{SC} \leq 10\mu s$ $V_{CC} = 600V,$ $T_{j,start} = 25^\circ C$ $T_{j,start} = 175^\circ C$ | - | 82 60 | - | A |

Switching Characteristic, Inductive Load, at $T_j=25^\circ C$

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|--------------|--|-------|------|------|------------|
| | | | min. | typ. | max. | |
| IGBT Characteristic | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $T_j=25^\circ C,$ $V_{CC}=600V, I_C=15A,$ $V_{GE}=0/15V,$ $R_G=41.8\Omega,$ $L_\sigma^{2)}=126nH,$ $C_\sigma^{2)}=34pF$ Energy losses include "tail" and diode reverse recovery. | - | 32 | - | ns |
| Rise time | t_r | | - | 25 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 362 | - | |
| Fall time | t_f | | - | 95 | - | mJ |
| Turn-on energy | E_{on} | | - | 1.25 | - | |
| Turn-off energy | E_{off} | | - | 0.8 | - | |
| Total switching energy | E_{ts} | - | 2.05 | - | | |
| Anti-Parallel Diode Characteristic | | | | | | |
| Diode reverse recovery time | t_{rr} | $T_j=25^\circ C,$ $V_R=600V, I_F=15A,$ $di_F/dt=450A/\mu s$ | - | 300 | - | ns |
| Diode reverse recovery charge | Q_{rr} | | - | 1.3 | | μC |
| Diode peak reverse recovery current | I_{rrm} | | - | 10 | | A |
| Diode peak rate of fall of reverse recovery current during t_b | di_{rr}/dt | | - | 215 | - | A/ μs |

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

²⁾ Leakage inductance L_σ and Stray capacity C_σ due to dynamic test circuit in Figure E.

Switching Characteristic, Inductive Load, at $T_j=175^\circ\text{C}$

| Parameter | Symbol | Conditions | Value | | | Unit | |
|--|--------------|---|--|------|------|------------------------|----|
| | | | min. | typ. | max. | | |
| IGBT Characteristic | | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $T_j=175^\circ\text{C}$ $V_{CC}=600\text{V}, I_C=15\text{A},$ $V_{GE}=0/15\text{V},$ $R_G=41.8\Omega,$ $L_\sigma^{1)}=315\text{nH},$ $C_\sigma^{1)}=34\text{pF}$ Energy losses include "tail" and diode reverse recovery. | - | 31 | - | ns | |
| Rise time | t_r | | - | 30 | - | | |
| Turn-off delay time | $t_{d(off)}$ | | - | 450 | - | | |
| Fall time | t_f | | - | 176 | - | | |
| Turn-on energy | E_{on} | | Energy losses include "tail" and diode reverse recovery. | - | 1.5 | - | mJ |
| Turn-off energy | E_{off} | | | - | 1.3 | - | |
| Total switching energy | E_{ts} | | | - | 2.8 | - | |
| Anti-Parallel Diode Characteristic | | | | | | | |
| Diode reverse recovery time | t_{rr} | $T_j=175^\circ\text{C}$ $V_R=600\text{V}, I_F=15\text{A},$ $di_F/dt=460\text{A}/\mu\text{s}$ | - | 460 | - | ns | |
| Diode reverse recovery charge | Q_{rr} | | - | 2.65 | - | μC | |
| Diode peak reverse recovery current | I_{rrm} | | - | 13 | - | A | |
| Diode peak rate of fall of reverse recovery current during t_b | di_{rr}/dt | | - | 123 | | $\text{A}/\mu\text{s}$ | |

¹⁾ Leakage inductance L_σ and Stray capacity C_σ due to dynamic test circuit in Figure E.

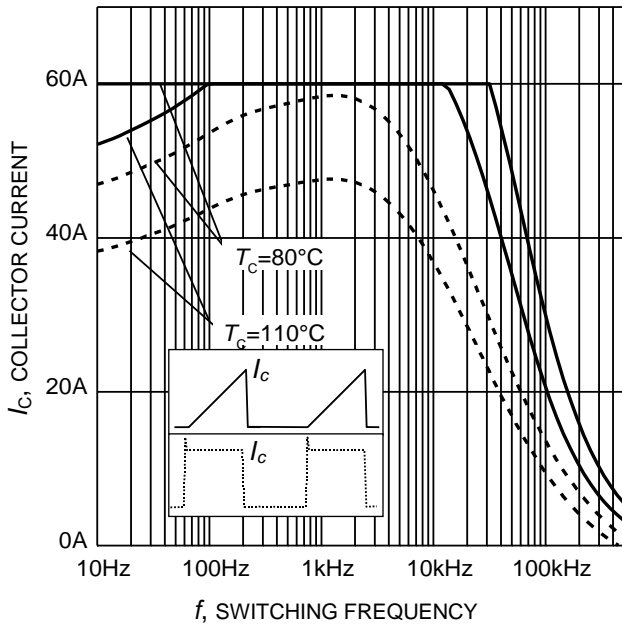


Figure 1. Collector current as a function of switching frequency
 ($T_j \leq 175^\circ\text{C}$, $D = 0.5$, $V_{CE} = 600\text{V}$,
 $V_{GE} = 0/+15\text{V}$, $R_G = 41.8\Omega$)

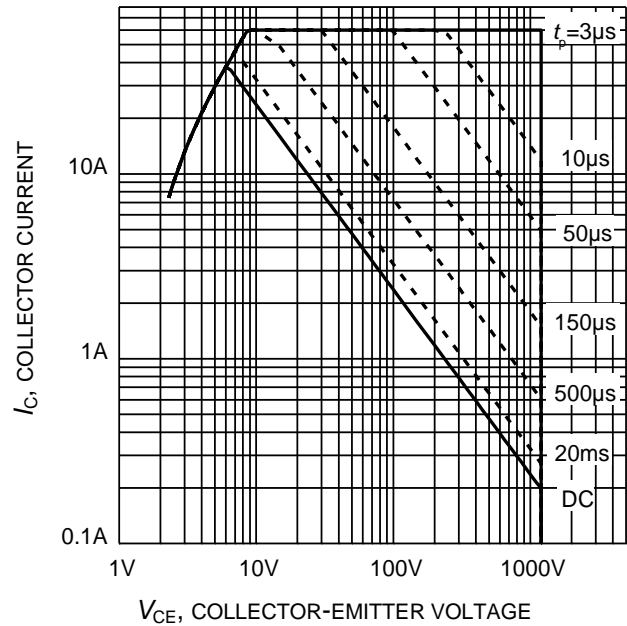


Figure 2. Safe operating area
 ($D = 0$, $T_C = 25^\circ\text{C}$,
 $T_j \leq 175^\circ\text{C}$; $V_{GE} = 15\text{V}$)

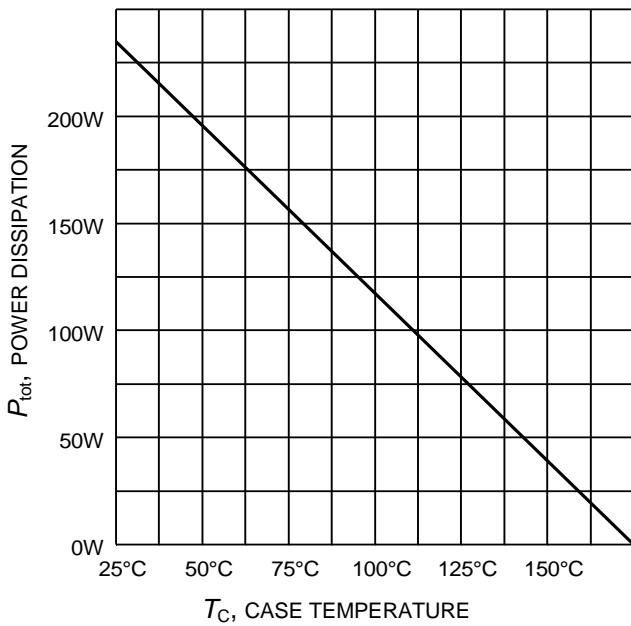


Figure 3. Maximum power dissipation as a function of case temperature
 ($T_j \leq 175^\circ\text{C}$)

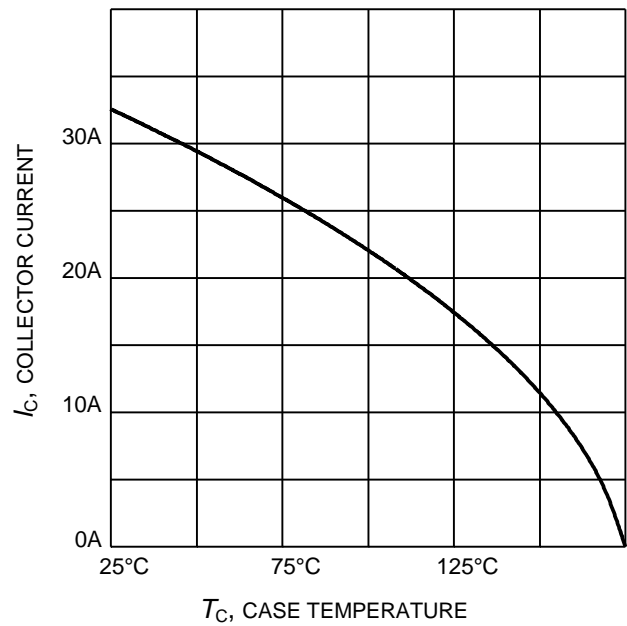


Figure 4. Maximum DC Collector current as a function of case temperature
 ($V_{GE} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)

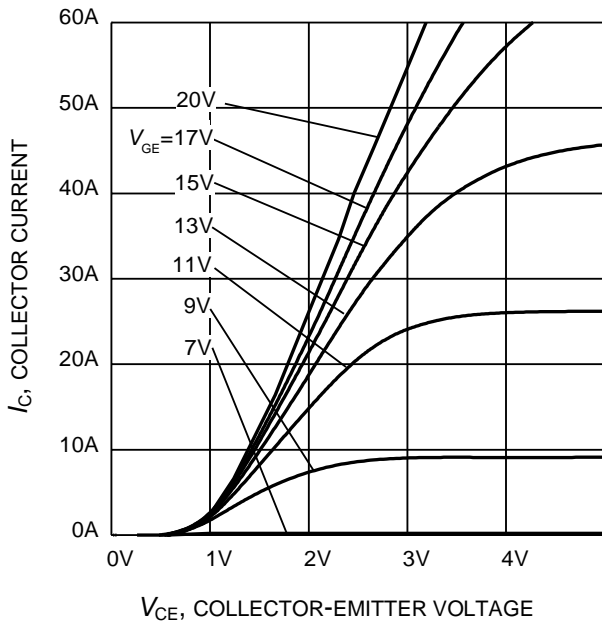


Figure 5. Typical output characteristic
($T_j = 25^\circ\text{C}$)

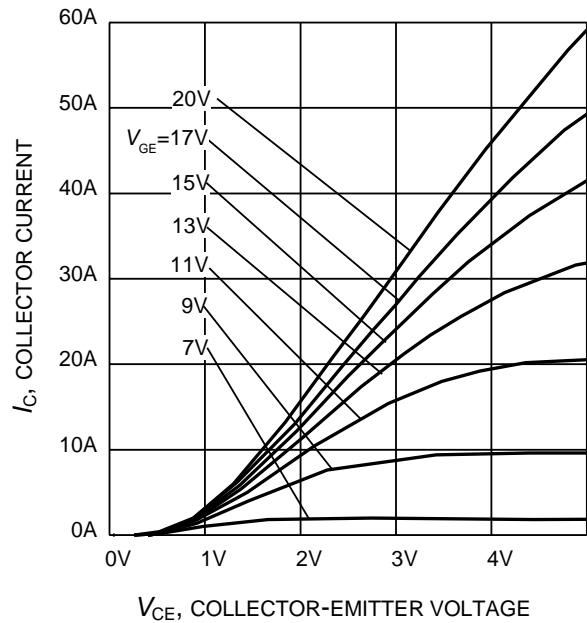


Figure 6. Typical output characteristic
($T_j = 175^\circ\text{C}$)

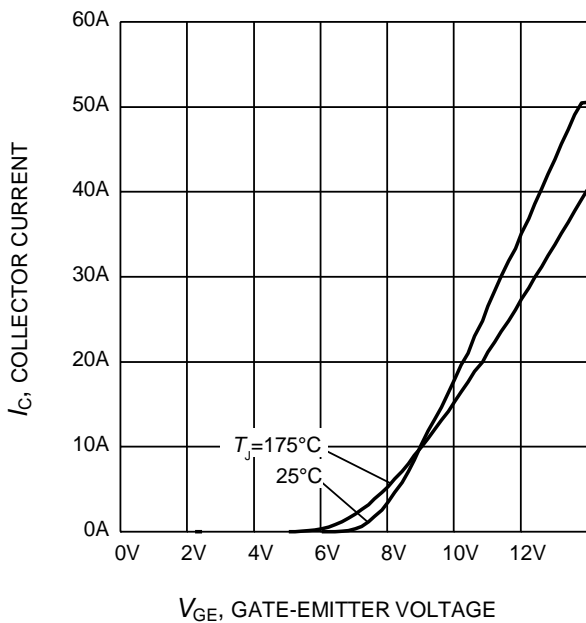


Figure 7. Typical transfer characteristic
($V_{CE} = 20\text{V}$)

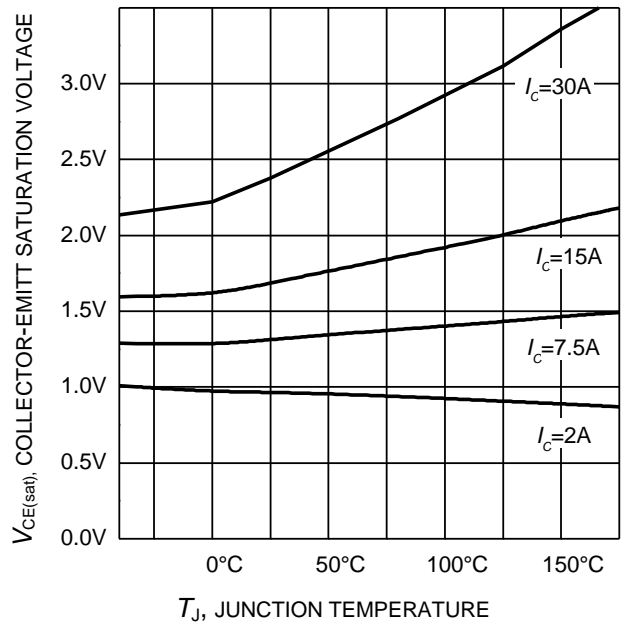


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
($V_{GE} = 15\text{V}$)

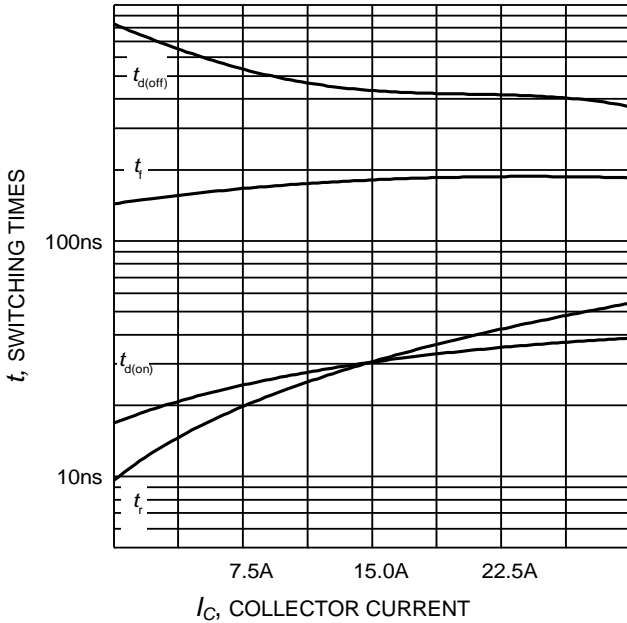


Figure 9. Typical switching times as a function of collector current
 (inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=41.8\Omega$, Dynamic test circuit in Figure E)

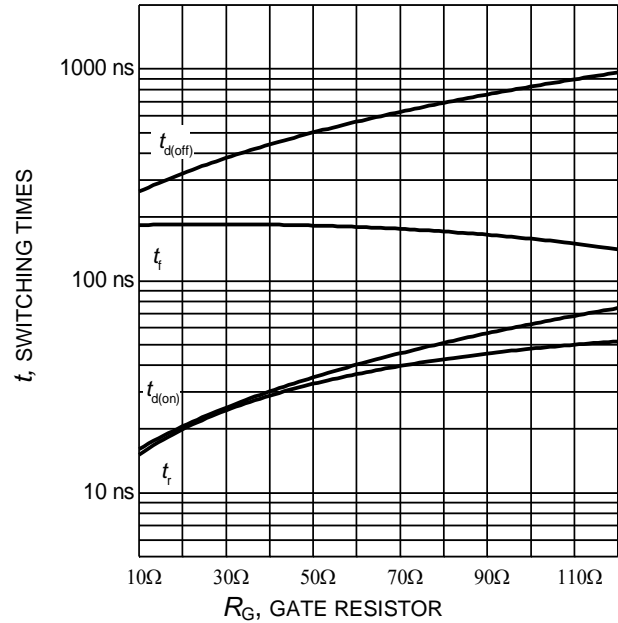


Figure 10. Typical switching times as a function of gate resistor
 (inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=15\text{A}$, Dynamic test circuit in Figure E)

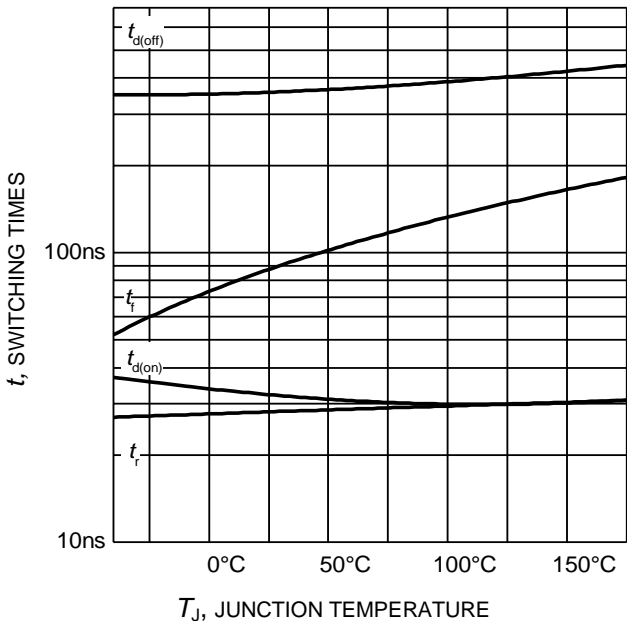


Figure 11. Typical switching times as a function of junction temperature
 (inductive load, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=15\text{A}$, $R_G=41.8\Omega$, Dynamic test circuit in Figure E)

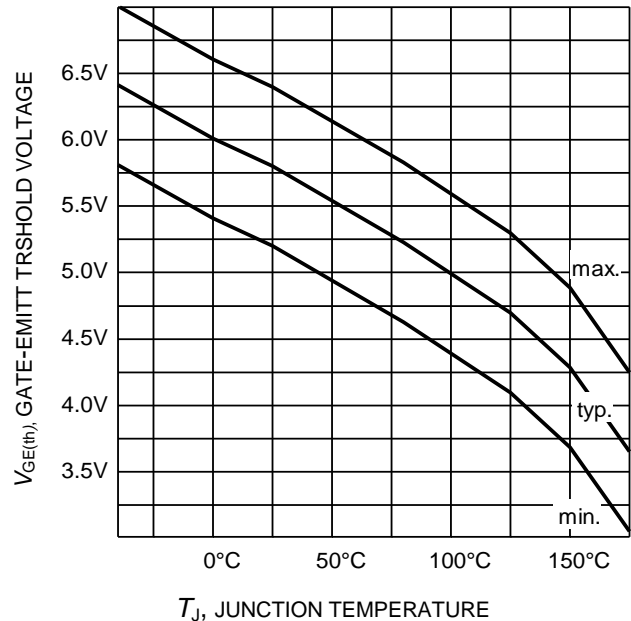


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
 ($I_C = 600\mu\text{A}$)

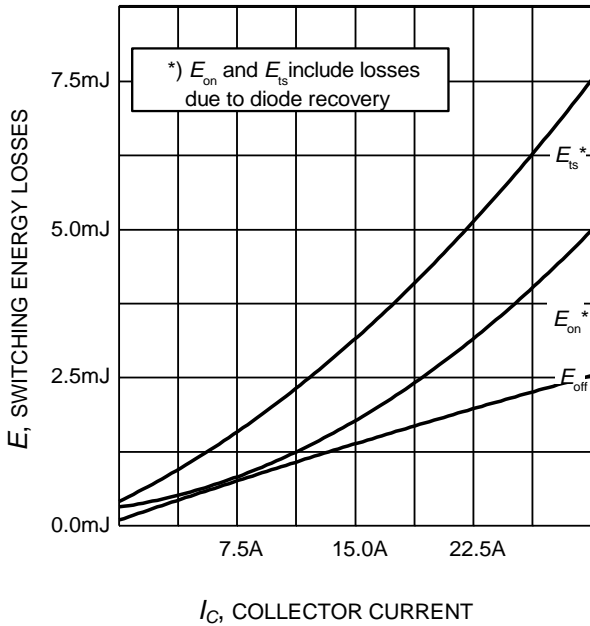


Figure 13. Typical switching energy losses as a function of collector current
 (inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=41.8\Omega$, Dynamic test circuit in Figure E)

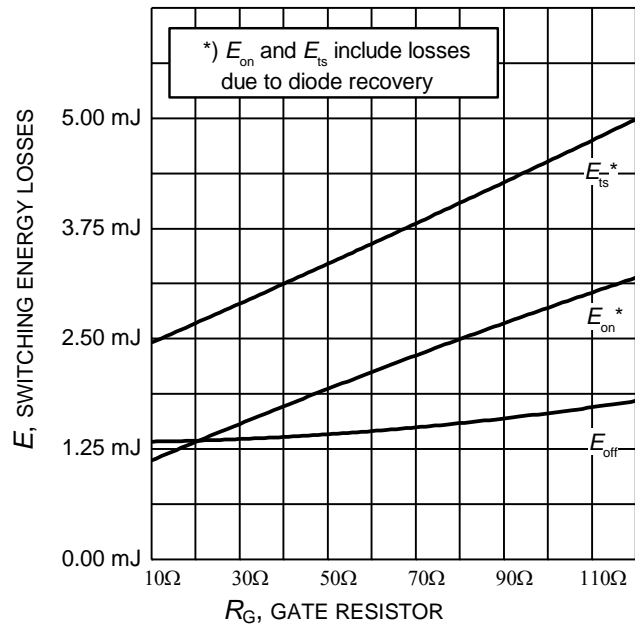


Figure 14. Typical switching energy losses as a function of gate resistor
 (inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=15\text{A}$, Dynamic test circuit in Figure E)

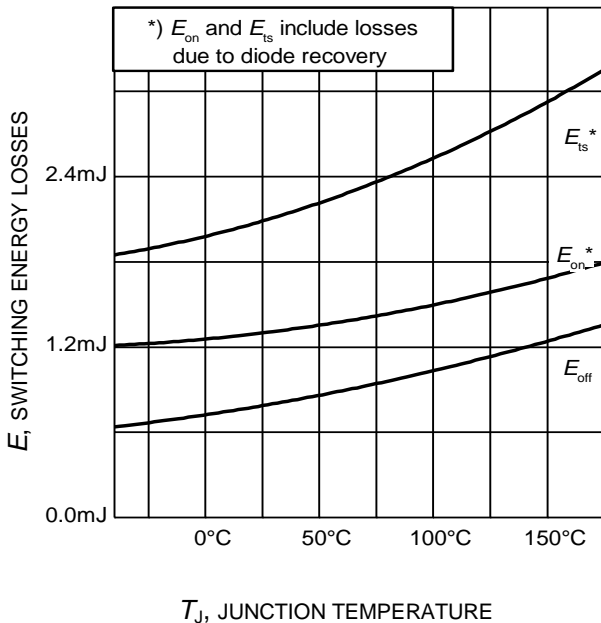


Figure 15. Typical switching energy losses as a function of junction temperature
 (inductive load, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=15\text{A}$, $R_G=41.8\Omega$, Dynamic test circuit in Figure E)

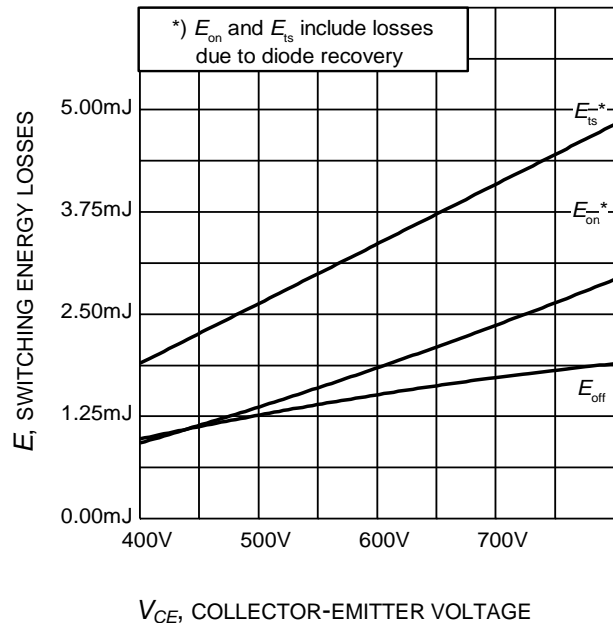


Figure 16. Typical switching energy losses as a function of collector emitter voltage
 (inductive load, $T_J=175^\circ\text{C}$, $V_{GE}=0/15\text{V}$, $I_C=15\text{A}$, $R_G=41.8\Omega$, Dynamic test circuit in Figure E)

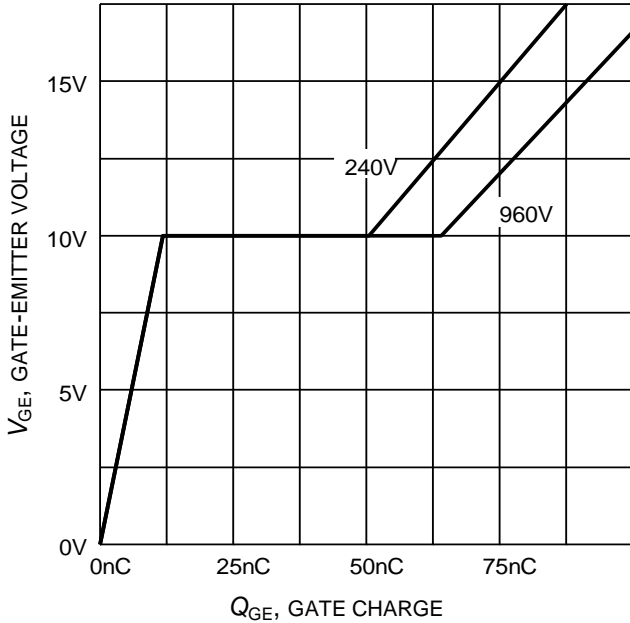


Figure 17. Typical gate charge
($I_C=15\text{ A}$)

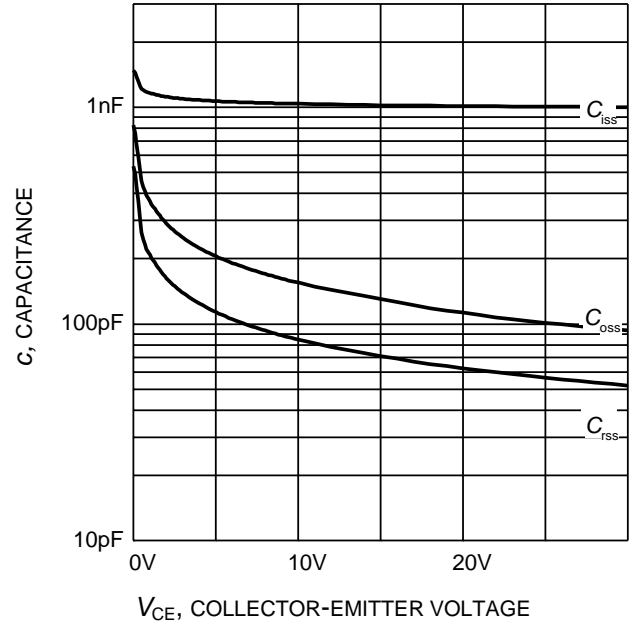


Figure 18. Typical capacitance as a function of collector-emitter voltage
($V_{GE}=0\text{V}$, $f = 1\text{ MHz}$)

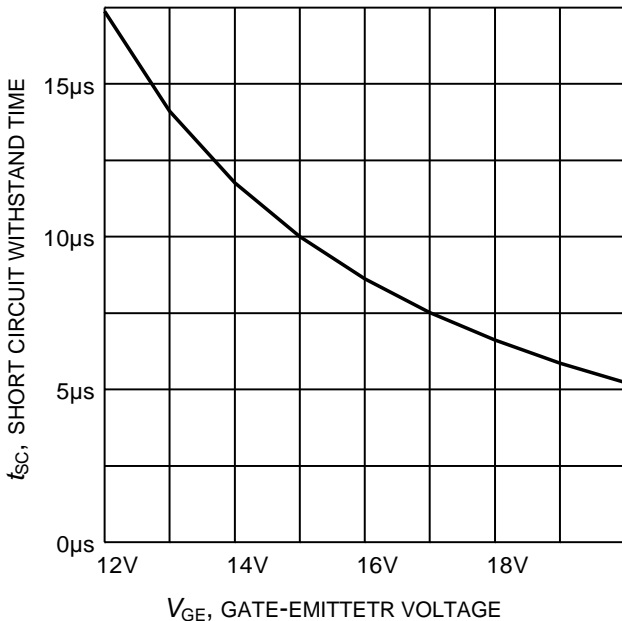


Figure 19. Short circuit withstand time as a function of gate-emitter voltage
($V_{CE}=600\text{V}$, start at $T_j \leq 175^\circ\text{C}$)

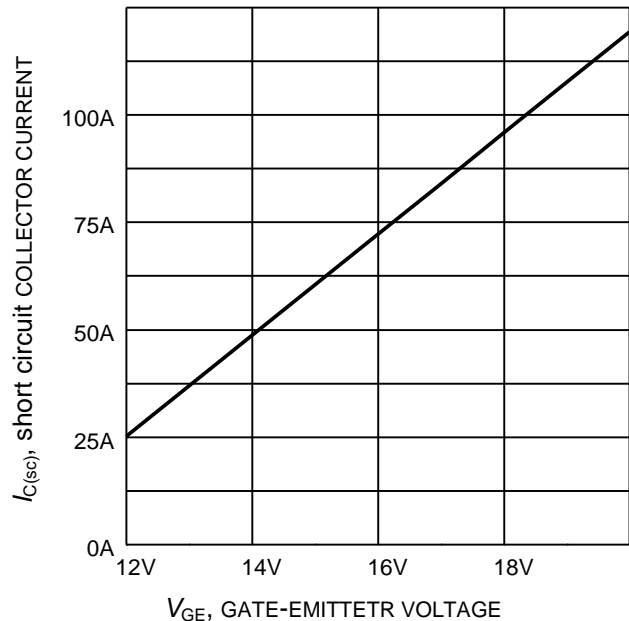


Figure 20. Typical short circuit collector current as a function of gate-emitter voltage
($V_{CE} \leq 600\text{V}$, $T_{j,start} = 175^\circ\text{C}$)

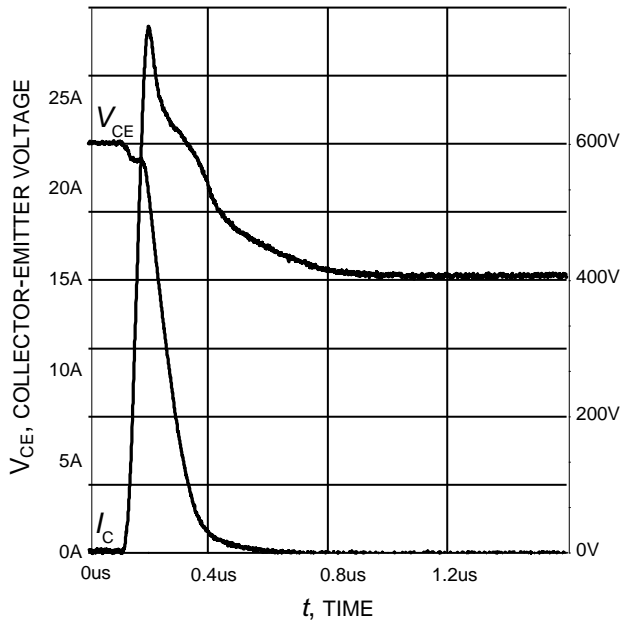


Figure 21. Typical turn on behavior
 ($V_{GE}=0/15V$, $R_G=41.8\Omega$, $T_j = 175^\circ C$,
 Dynamic test circuit in Figure E)

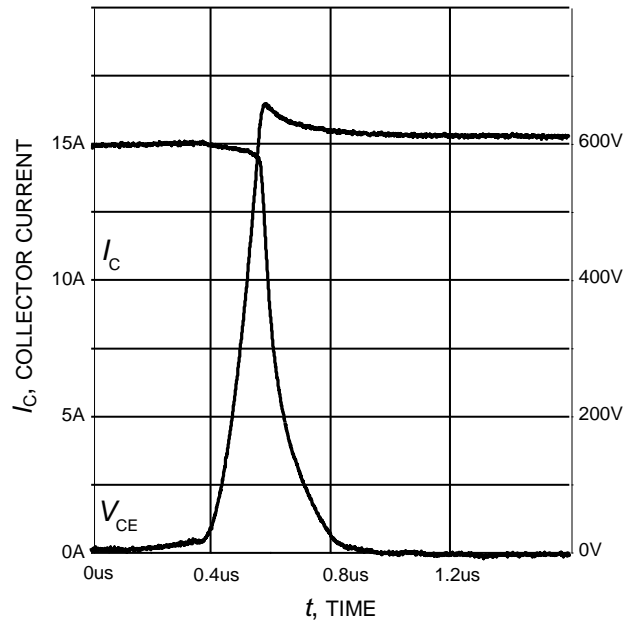


Figure 22. Typical turn off behavior
 ($V_{GE}=15/0V$, $R_G=41.8\Omega$, $T_j = 175^\circ C$,
 Dynamic test circuit in Figure E)

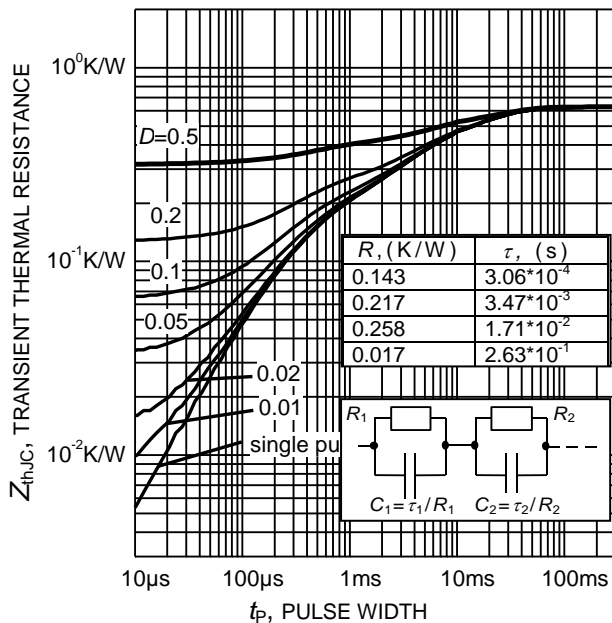


Figure 23. IGBT transient thermal resistance
 ($D = t_p / T$)

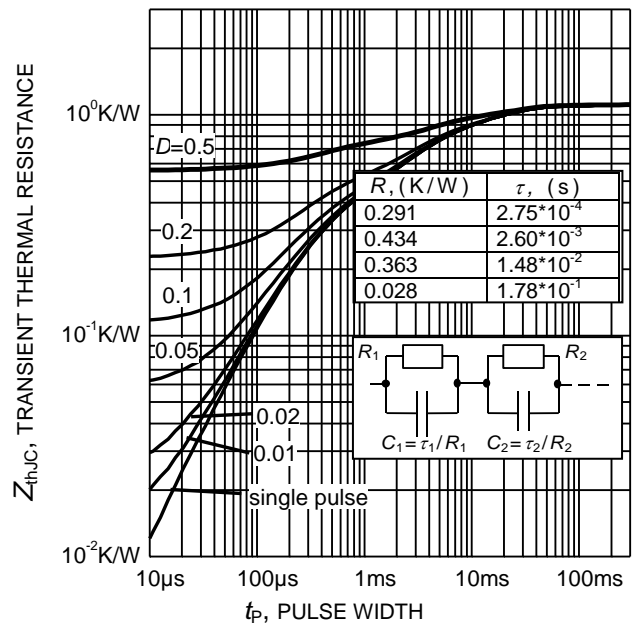


Figure 24. Diode transient thermal impedance as a function of pulse width
 ($D = t_p / T$)

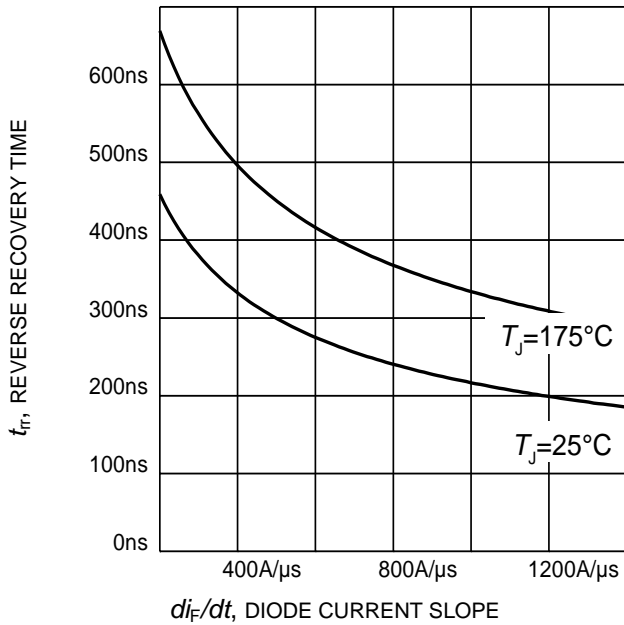


Figure 23. Typical reverse recovery time as a function of diode current slope
 ($V_R=600\text{V}$, $I_F=15\text{A}$,
 Dynamic test circuit in Figure E)

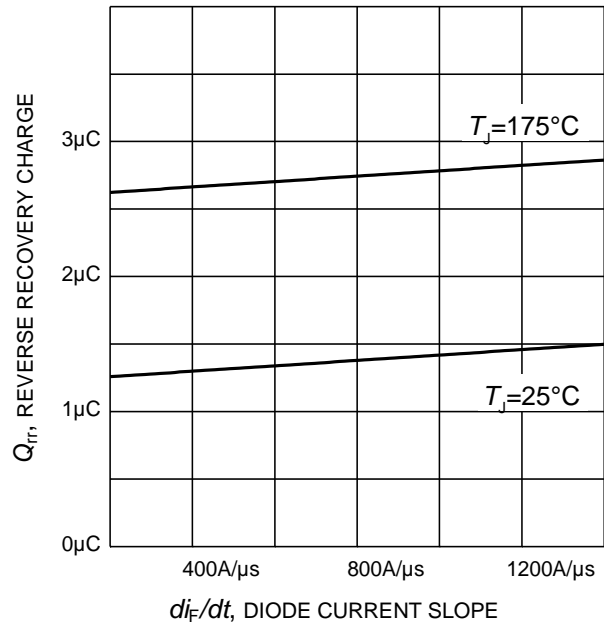


Figure 24. Typical reverse recovery charge as a function of diode current slope
 ($V_R=600\text{V}$, $I_F=15\text{A}$,
 Dynamic test circuit in Figure E)

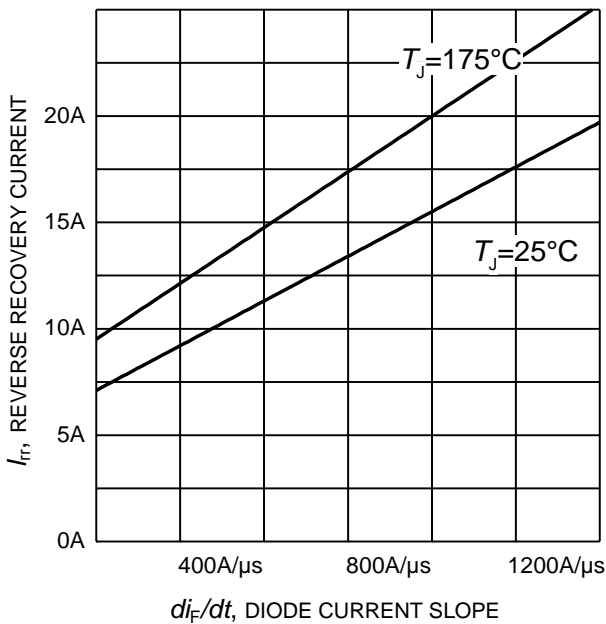


Figure 25. Typical reverse recovery current as a function of diode current slope
 ($V_R=600\text{V}$, $I_F=15\text{A}$,
 Dynamic test circuit in Figure E)

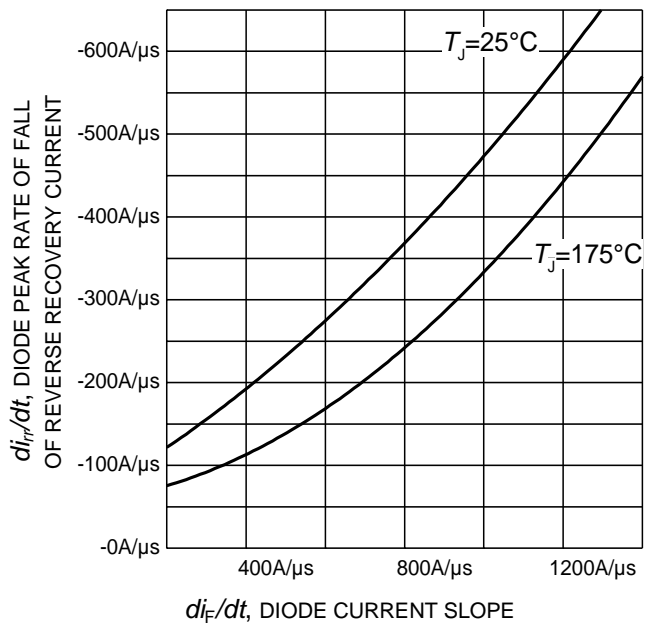


Figure 26. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope
 ($V_R=600\text{V}$, $I_F=15\text{A}$,
 Dynamic test circuit in Figure E)

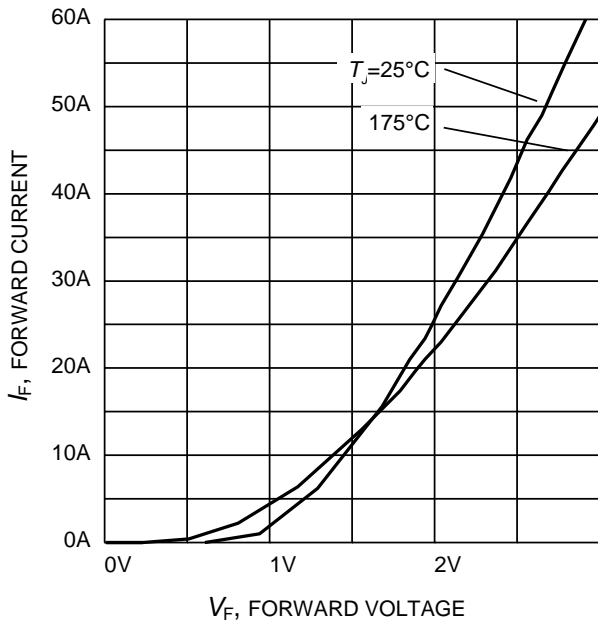


Figure 27. Typical diode forward current as a function of forward voltage

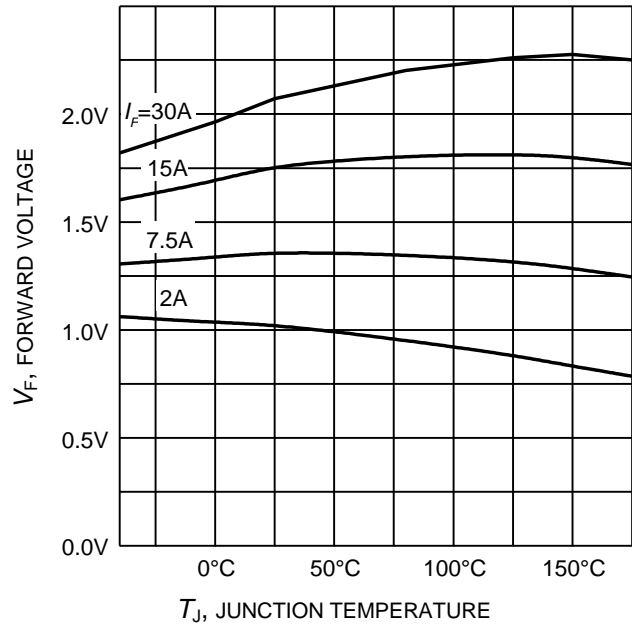
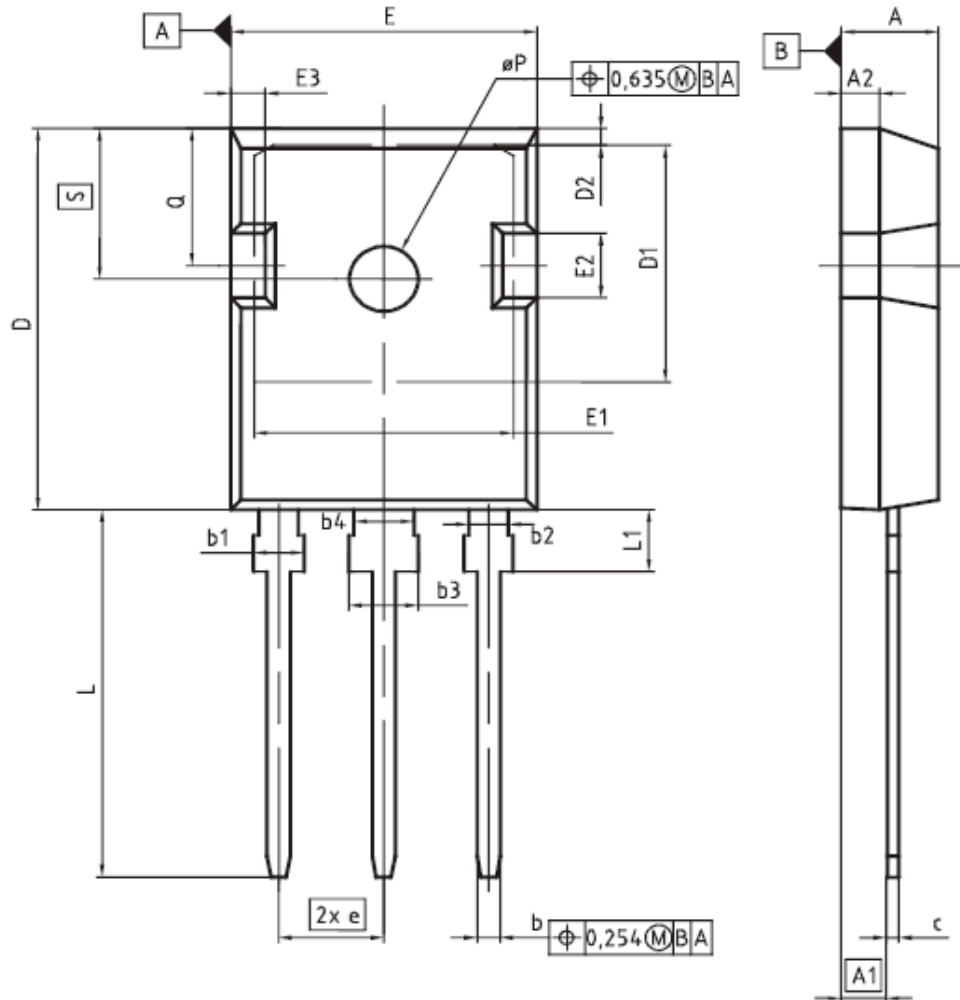


Figure 28. Typical diode forward voltage as a function of junction temperature

PG-TO247-3



| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4,83 | 5,21 | 0,190 | 0,205 |
| A1 | 2,27 | 2,54 | 0,089 | 0,100 |
| A2 | 1,85 | 2,16 | 0,073 | 0,085 |
| b | 1,07 | 1,33 | 0,042 | 0,052 |
| b1 | 1,90 | 2,41 | 0,075 | 0,095 |
| b2 | 1,90 | 2,16 | 0,075 | 0,085 |
| b3 | 2,87 | 3,38 | 0,113 | 0,133 |
| b4 | 2,87 | 3,13 | 0,113 | 0,123 |
| c | 0,55 | 0,68 | 0,022 | 0,027 |
| D | 20,80 | 21,10 | 0,819 | 0,831 |
| D1 | 16,25 | 17,65 | 0,640 | 0,695 |
| D2 | 0,95 | 1,35 | 0,037 | 0,053 |
| E | 15,70 | 16,13 | 0,618 | 0,635 |
| E1 | 13,10 | 14,15 | 0,516 | 0,557 |
| E2 | 3,68 | 5,10 | 0,145 | 0,201 |
| E3 | 1,00 | 2,60 | 0,039 | 0,102 |
| e | 5,44 (BSC) | | 0,214 (BSC) | |
| N | 3 | | 3 | |
| L | 19,80 | 20,32 | 0,780 | 0,800 |
| L1 | 4,10 | 4,47 | 0,161 | 0,176 |
| øP | 3,50 | 3,70 | 0,138 | 0,146 |
| Q | 5,49 | 6,00 | 0,216 | 0,236 |
| S | 6,04 | 6,30 | 0,238 | 0,248 |

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| SCALE 0 |
| EUROPEAN PROJECTION |
| |
| ISSUE DATE 09-07-2010 |
| REVISION 05 |

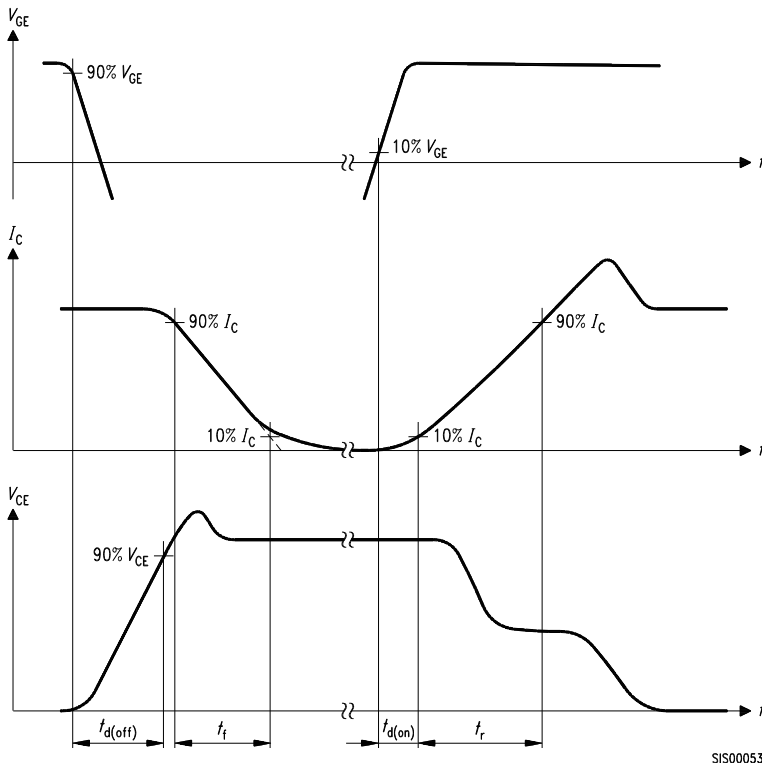


Figure A. Definition of switching times

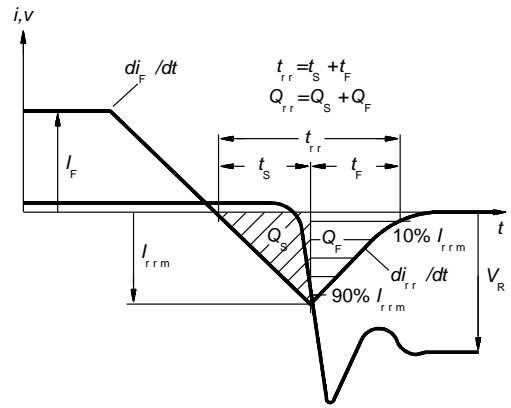


Figure C. Definition of diodes switching characteristics

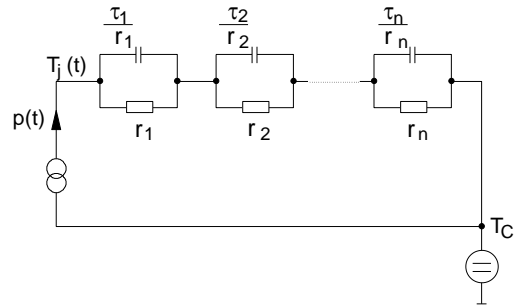


Figure D. Thermal equivalent circuit

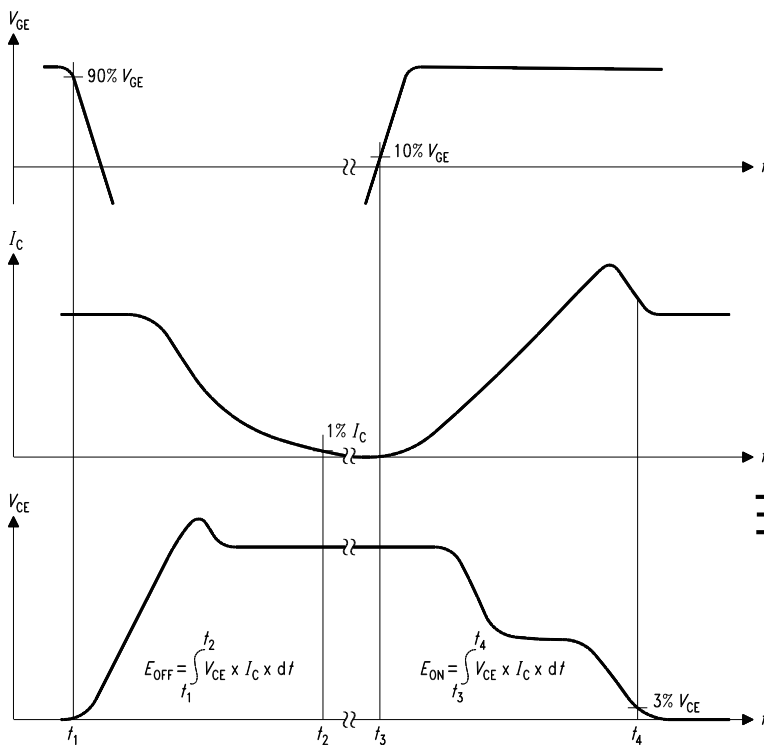


Figure B. Definition of switching losses

SIS00050

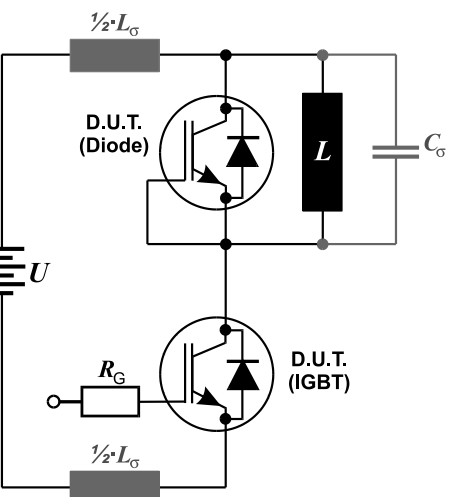


Figure E. Dynamic test circuit

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Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com).

Warnings

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