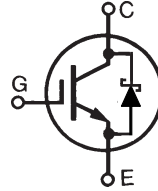


GenX3™ 600V IGBTs w/ SiC Anti-Parallel Diode

IXGA30N60C3C1*
IXGP30N60C3C1
IXGH30N60C3C1

*Obsolete Part Number



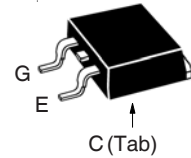
High-Speed PT IGBTs for
40 - 100kHz Switching

| Symbol | Test Conditions | Maximum Ratings | |
|-------------------------------|--|-----------------------------------|------------------|
| V_{CES} | $T_C = 25^\circ\text{C}$ to 150°C | 600 | V |
| V_{CGR} | $T_J = 25^\circ\text{C}$ to 150°C , $R_{GE} = 1\text{M}\Omega$ | 600 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ\text{C}$ | 60 | A |
| I_{C110} | $T_C = 110^\circ\text{C}$ | 30 | A |
| I_{F110} | $T_C = 110^\circ\text{C}$ | 13 | A |
| I_{CM} | $T_C = 25^\circ\text{C}$, 1ms | 150 | A |
| SSOA (RBSOA) | $V_{GE} = 15\text{V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 5\Omega$ Clamped Inductive Load | $I_{CM} = 60$ @ $\leq V_{CES}$ | A |
| P_C | $T_C = 25^\circ\text{C}$ | 220 | W |
| T_J | | -55 ... +150 | $^\circ\text{C}$ |
| T_{JM} | | 150 | $^\circ\text{C}$ |
| T_{stg} | | -55 ... +150 | $^\circ\text{C}$ |
| T_L | 1.6mm (0.062 in.) from Case for 10s | 300 | $^\circ\text{C}$ |
| T_{SOLD} | Plastic Body for 10 seconds | 260 | $^\circ\text{C}$ |
| M_d | Mounting Torque (TO-220 & TO-247) | 1.13/10 | Nm/lb.in. |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |
| | TO-247 | 6.0 | g |

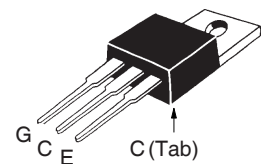
| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values | | |
|---------------|--|-----------------------|------------|---------------------------------------|
| | | Min. | Typ. | Max. |
| $V_{GE(th)}$ | $I_C = 250\mu\text{A}$, $V_{CE} = V_{GE}$ | 3.0 | | 5.5 V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0\text{V}$ $T_J = 125^\circ\text{C}$ | | | 25 μA 300 μA |
| I_{GES} | $V_{CE} = 0\text{V}$, $V_{GE} = \pm 20\text{V}$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 20\text{A}$, $V_{GE} = 15\text{V}$, Note 1 $T_J = 125^\circ\text{C}$ | | 2.6 1.8 | V V |

$V_{CES} = 600\text{V}$
 $I_{C110} = 30\text{A}$
 $V_{CE(sat)} \leq 3.0\text{V}$
 $t_{fi(typ)} = 47\text{ns}$

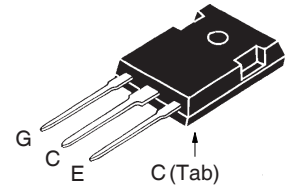
TO-263 AA (IXGA)



TO-220AB (IXGP)



TO-247 (IXGH)



G = Gate D = Collector
S = Emitter Tab = Collector

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Schottky Diode
- International Standard Packages

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

- High Frequency Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values | | |
|--------------|---|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 20\text{A}, V_{CE} = 10\text{V}$, Note 1 | 9 | 16 | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 1075 | pF |
| C_{oes} | | | 196 | pF |
| C_{res} | | | 29 | pF |
| Q_g | $I_C = 20\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 38 | nC |
| Q_{ge} | | | 8 | nC |
| Q_{gc} | | | 17 | nC |
| $t_{d(on)}$ | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 300\text{V}, R_G = 5\Omega$ Note 2 | | 17 | ns |
| t_{ri} | | | 20 | ns |
| E_{on} | | | 0.12 | mJ |
| $t_{d(off)}$ | | | 42 | 75 ns |
| t_{fi} | | | 47 | ns |
| E_{off} | | | 0.09 | 0.18 mJ |
| $t_{d(on)}$ | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 300\text{V}, R_G = 5\Omega$ Note 2 | | 16 | ns |
| t_{ri} | | | 21 | ns |
| E_{on} | | | 0.16 | mJ |
| $t_{d(off)}$ | | | 70 | ns |
| t_{fi} | | | 90 | ns |
| E_{off} | | | 0.33 | mJ |
| R_{thJC} | | | 0.56 | $^\circ\text{C/W}$ |
| R_{thCS} | TO-220 | 0.50 | | $^\circ\text{C/W}$ |
| | TO-247 | 0.21 | | $^\circ\text{C/W}$ |

Reverse Diode (SiC)

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values | | |
|------------|--|-----------------------|--------------|-------------------------|
| | | Min. | Typ. | Max. |
| V_F | $I_F = 10\text{A}, V_{GE} = 0\text{V}$, Note 1 $T_J = 125^\circ\text{C}$ | | 1.65 1.80 | V V |
| R_{thJC} | | | | 1.10 $^\circ\text{C/W}$ |

Notes

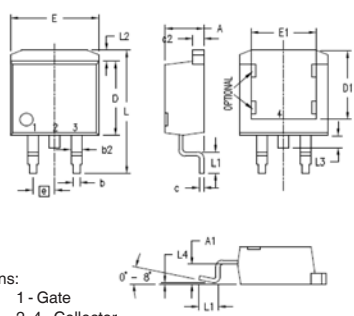
1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
2. Switching times & energy losses may increase for higher $V_{CE}(\text{Clamp})$, T_J or R_G .

IXYS Reserves the Right to Change Limits, Test Conditions and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665 | 6,404,065 B1 | 6,683,344 | 6,727,585 | 7,005,734 B2 | 7,157,338 B2 |
| 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343 | 6,710,405 B2 | 6,759,692 | 7,063,975 B2 | |
| 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505 | 6,710,463 | 6,771,478 B2 | 7,071,537 | |

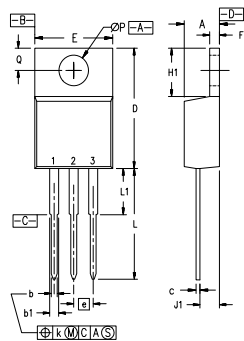
TO-263 (IXGA) Outline



Pins:
1 - Gate
2, 4 - Collector
3 - Emitter

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .160 | .190 | 4.06 | 4.83 |
| A1 | .080 | .110 | 2.03 | 2.79 |
| b | .020 | .039 | 0.51 | 0.99 |
| b2 | .045 | .055 | 1.14 | 1.40 |
| c | .016 | .029 | 0.40 | 0.74 |
| c2 | .045 | .055 | 1.14 | 1.40 |
| D | .340 | .380 | 8.64 | 9.65 |
| D1 | .315 | .350 | 8.00 | 8.89 |
| E | .380 | .410 | 9.65 | 10.41 |
| E1 | .245 | .320 | 6.22 | 8.13 |
| e | .100 BSC | | 2.54 BSC | |
| L | .575 | .625 | 14.61 | 15.88 |
| L1 | .090 | .110 | 2.29 | 2.79 |
| L2 | .040 | .055 | 1.02 | 1.40 |
| L3 | .050 | .070 | 1.27 | 1.78 |
| L4 | 0 | .005 | 0 | 0.13 |

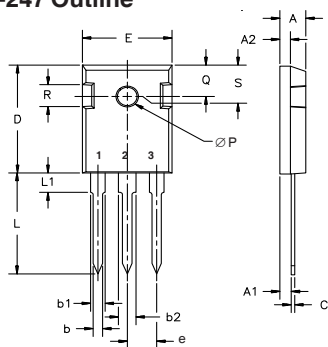
TO-220 (IXGP) Outline



Pins: 1 - Gate
2, 4 - Collector
3 - Emitter

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .170 | .190 | 4.32 | 4.83 |
| b | .025 | .040 | 0.64 | 1.02 |
| b1 | .045 | .065 | 1.15 | 1.65 |
| c | .014 | .022 | 0.35 | 0.56 |
| D | .580 | .630 | 14.73 | 16.00 |
| E | .390 | .420 | 9.91 | 10.66 |
| e | .100 BSC | | 2.54 BSC | |
| F | .045 | .055 | 1.14 | 1.40 |
| H1 | .230 | .270 | 5.85 | 6.85 |
| J1 | .090 | .110 | 2.29 | 2.79 |
| k | 0 | .015 | 0 | 0.38 |
| L | .500 | .550 | 12.70 | 13.97 |
| L1 | .110 | .230 | 2.79 | 5.84 |
| ØP | .139 | .161 | 3.53 | 4.08 |
| Q | .100 | .125 | 2.54 | 3.18 |

TO-247 Outline



Pins: 1 - Gate
2 - Collector
3 - Emitter

| Dim. | Millimeter | | Inches | |
|----------------|------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.7 | 5.3 | .185 | .209 |
| A ₁ | 2.2 | 2.54 | .087 | .102 |
| A ₂ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| b ₁ | 1.65 | 2.13 | .065 | .084 |
| b ₂ | 2.87 | 3.12 | .113 | .123 |
| C | .4 | .8 | .016 | .031 |
| D | 20.80 | 21.46 | .819 | .845 |
| E | 15.75 | 16.26 | .610 | .640 |
| e | 5.20 | 5.72 | 0.205 | 0.225 |
| L | 19.81 | 20.32 | .780 | .800 |
| L1 | | 4.50 | | .177 |
| ØP | 3.55 | 3.65 | .140 | .144 |
| Q | 5.89 | 6.40 | 0.232 | 0.252 |
| R | 4.32 | 5.49 | .170 | .216 |

Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

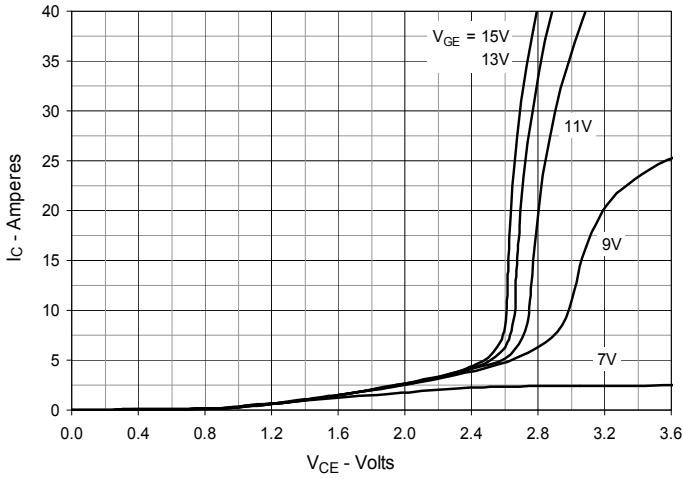


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

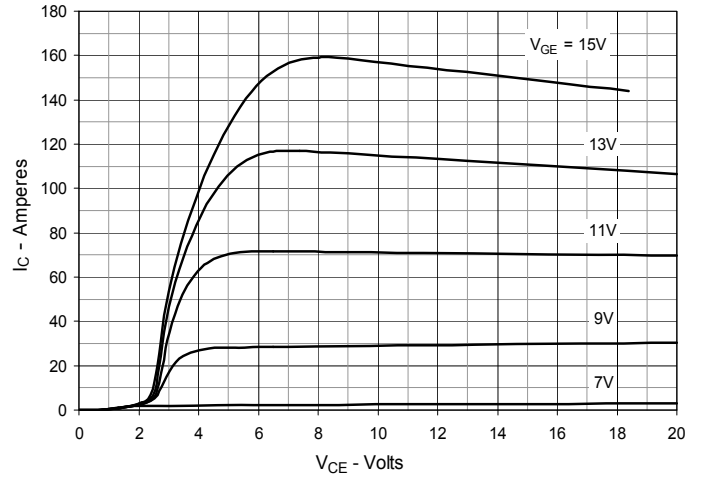


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

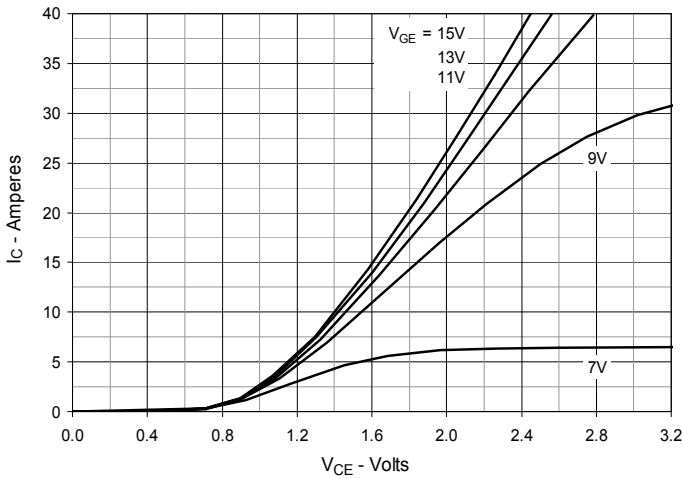


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

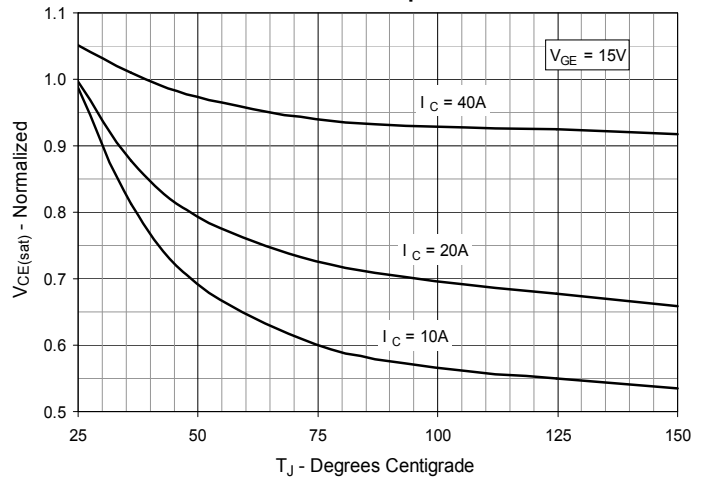


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

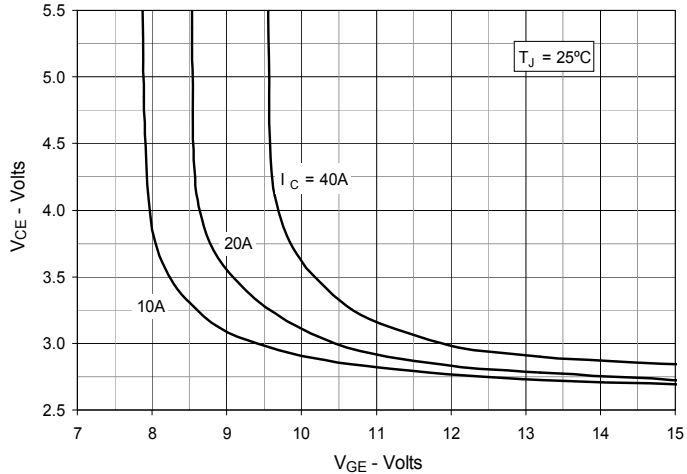


Fig. 6. Input Admittance

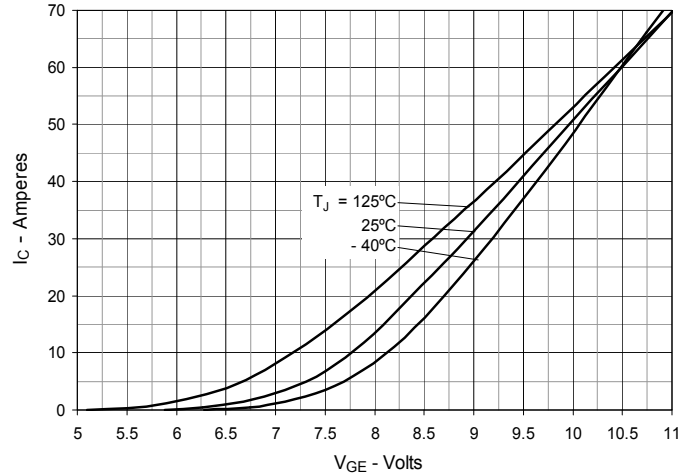


Fig. 7. Transconductance

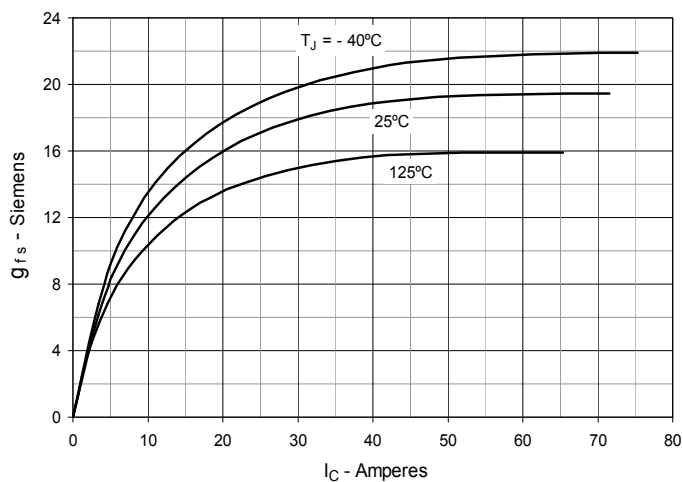


Fig. 8. Gate Charge

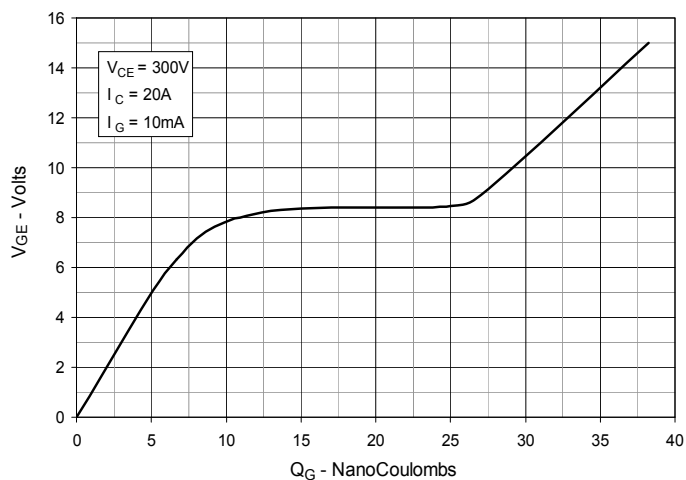


Fig. 9. Capacitance

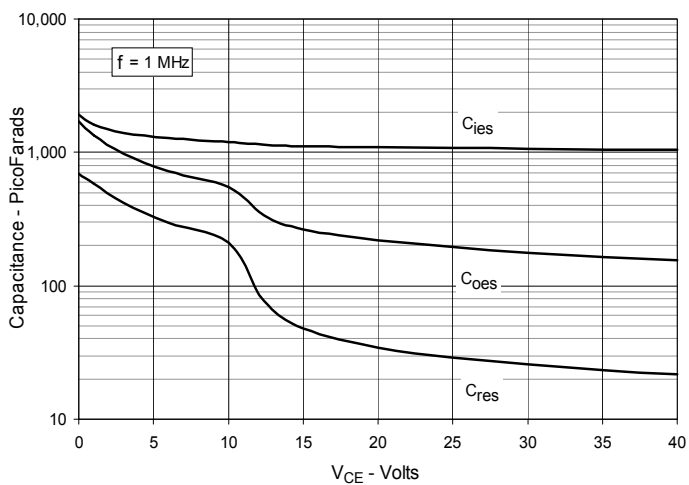


Fig. 10. Reverse-Bias Safe Operating Area

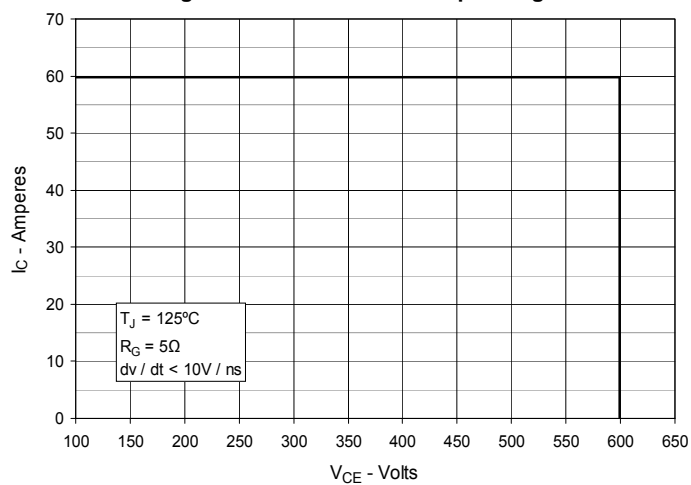


Fig. 11. Maximum Transient Thermal Impedance for IGBT

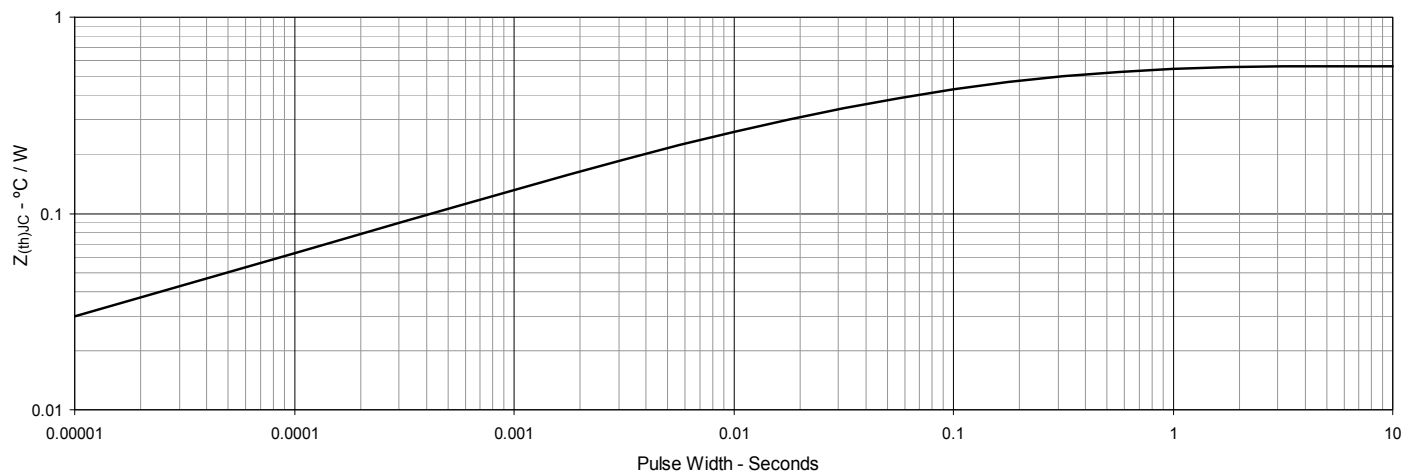


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

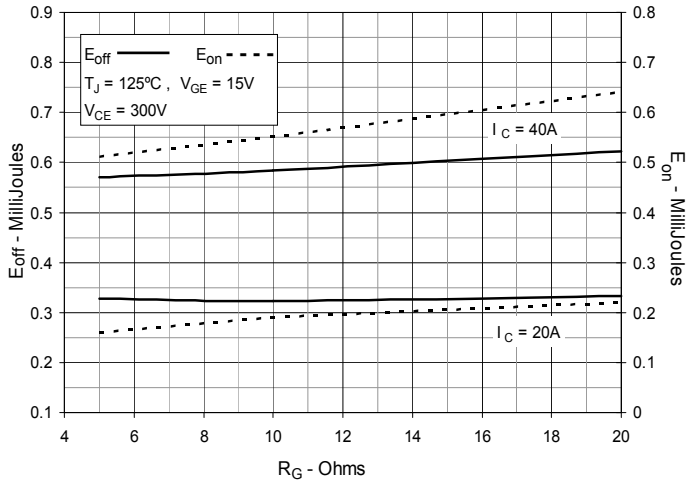


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

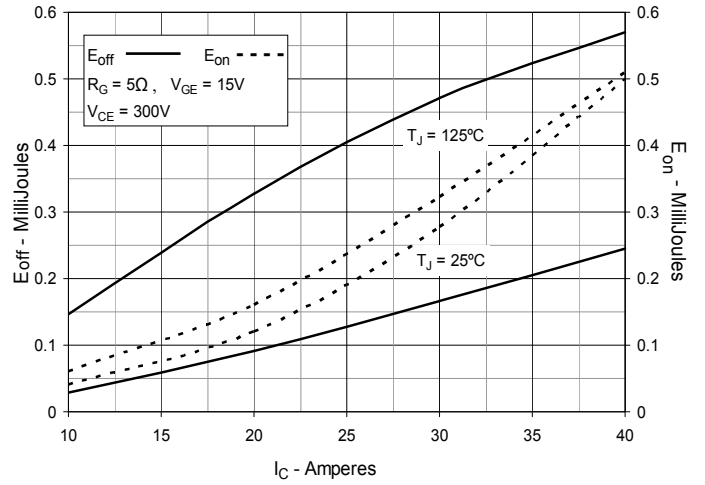


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

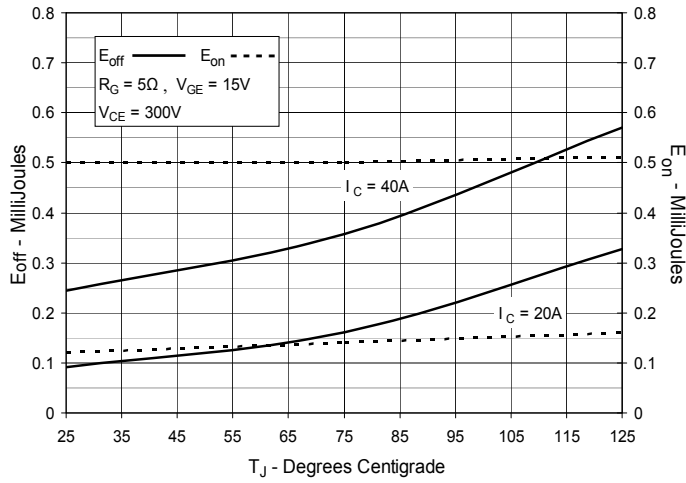


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

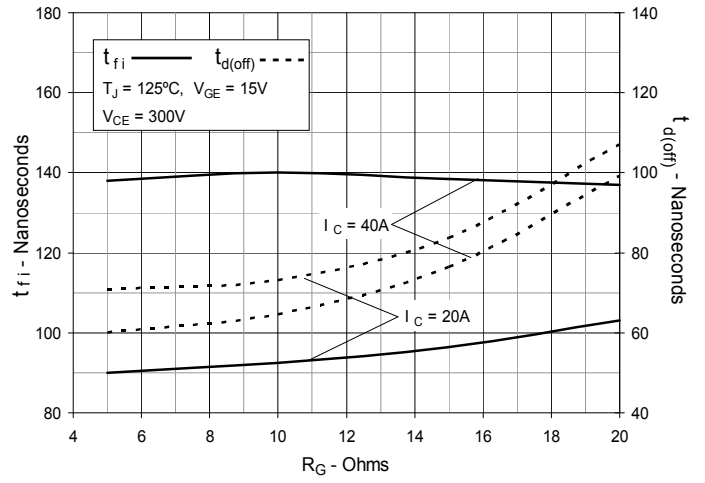


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

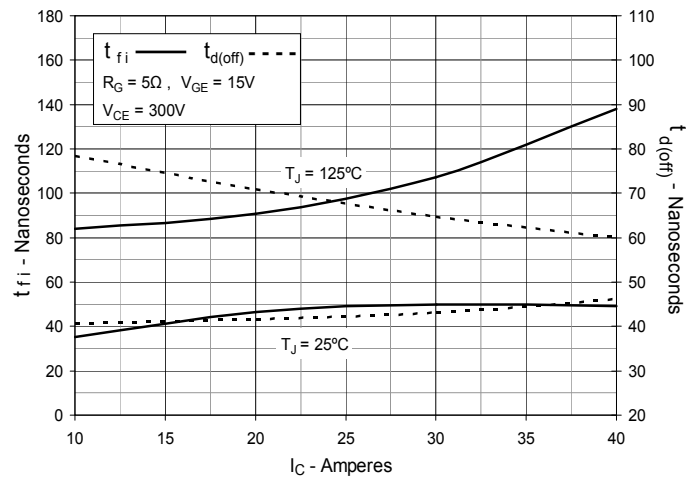


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

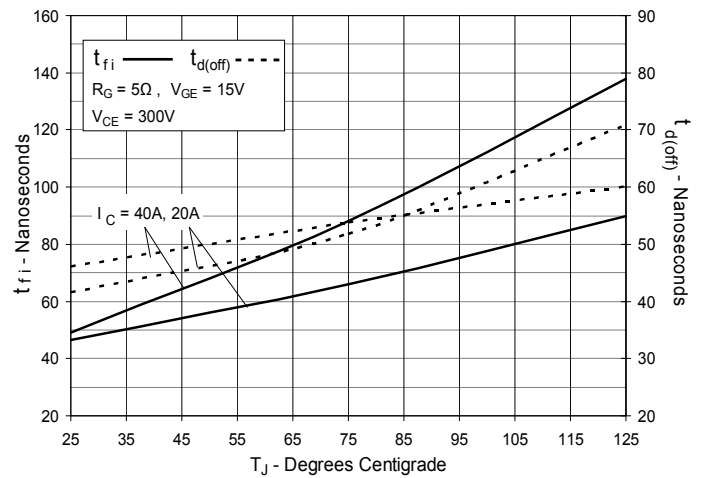


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

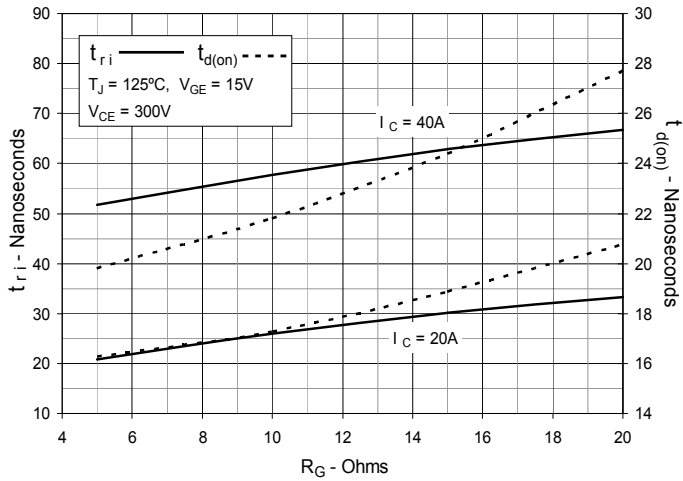


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

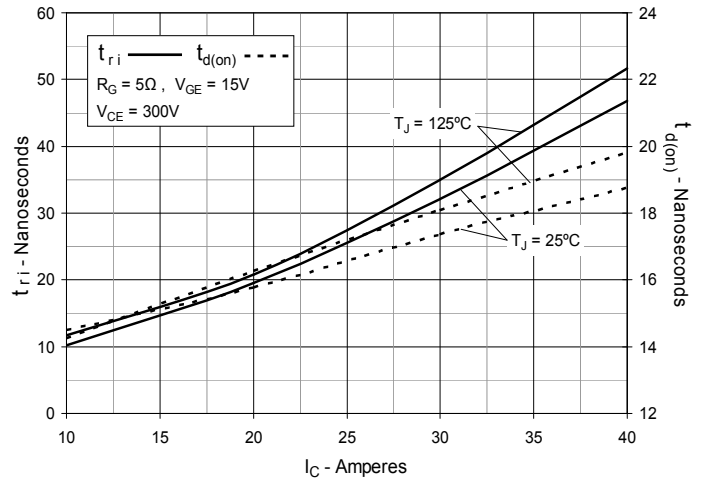


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

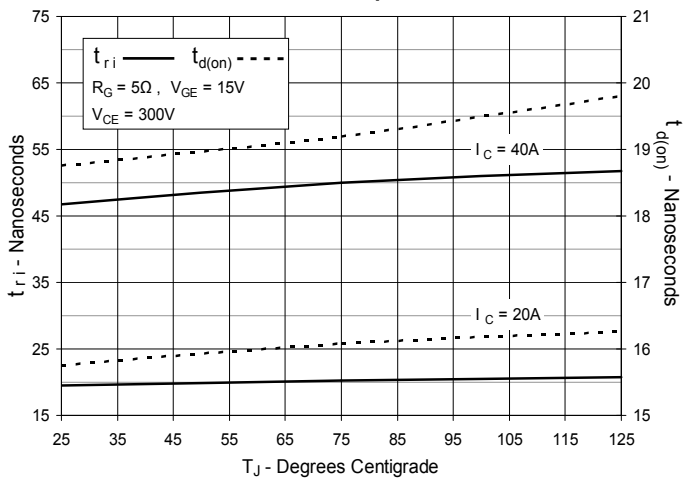


Fig. 21. Forward Current vs. Forward Voltage

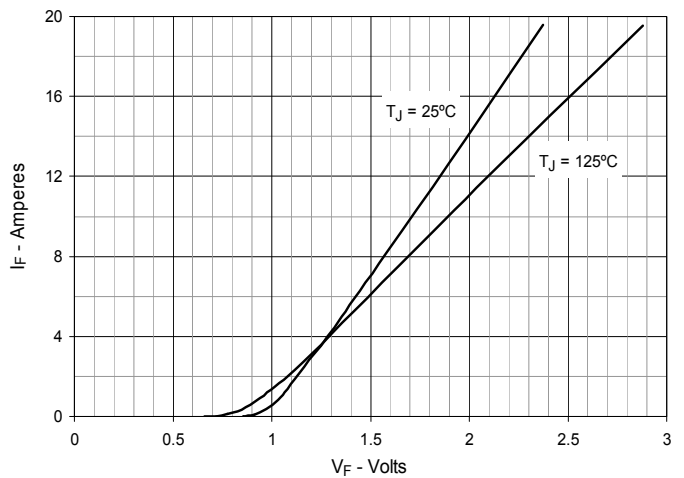
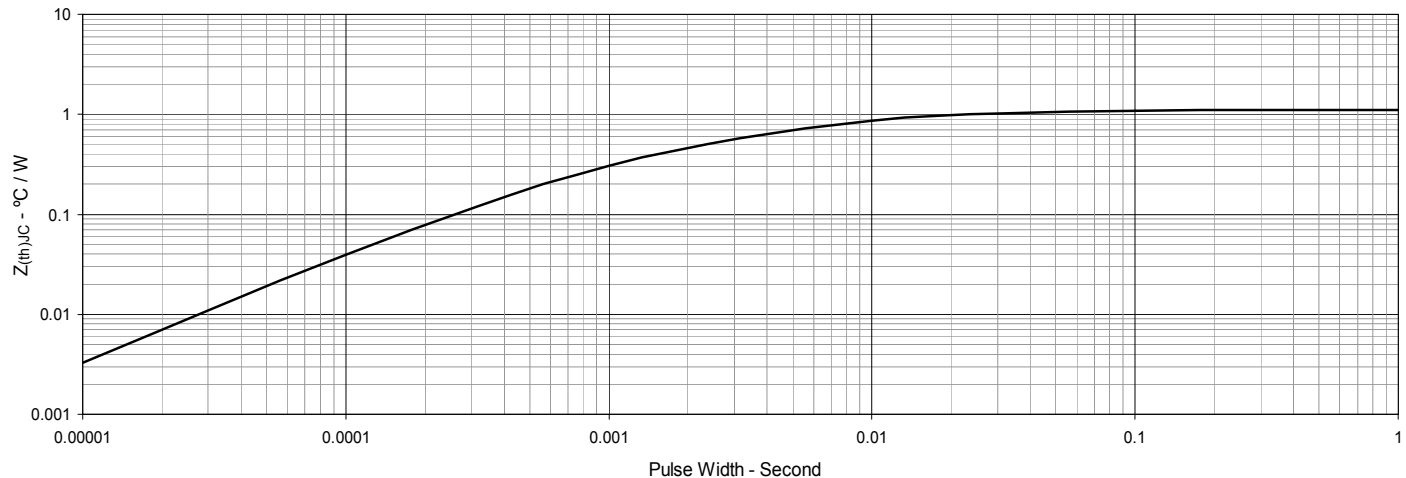


Fig. 22. Maximum Transient Thermal Impedance for Diode





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