

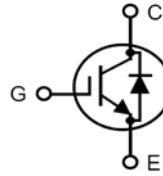
XPT™ 650V IGBT
GenX3™ w/Diode
IXYA15N65C3D1
IXYP15N65C3D1

$$V_{CES} = 650V$$

$$I_{C110} = 15A$$

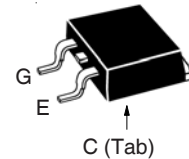
$$V_{CE(sat)} \leq 2.5V$$

$$t_{fi(typ)} = 28ns$$

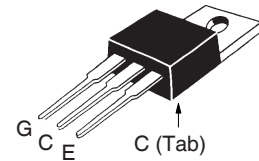
 Extreme Light Punch Through
 IGBT for 20-60kHz Switching


| Symbol | Test Conditions | Maximum Ratings | |
|----------------|--|-------------------------|------------|
| V_{CES} | $T_J = 25^\circ C$ to $175^\circ C$ | 650 | V |
| V_{CGR} | $T_J = 25^\circ C$ to $175^\circ C$, $R_{GE} = 1M\Omega$ | 650 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ C$ | 38 | A |
| I_{C110} | $T_C = 110^\circ C$ | 15 | A |
| I_{F110} | $T_C = 110^\circ C$ | 23 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 80 | A |
| I_A | $T_C = 25^\circ C$ | 5 | A |
| E_{AS} | $T_C = 25^\circ C$ | 100 | mJ |
| SSOA | $V_{GE} = 15V$, $T_{VJ} = 150^\circ C$, $R_G = 20\Omega$ | $I_{CM} = 30$ | A |
| (RBSOA) | Clamped Inductive Load | @ $V_{CE} \leq V_{CES}$ | |
| t_{sc} | $V_{GE} = 15V$, $V_{CE} = 360V$, $T_J = 150^\circ C$ | 8 | μs |
| (SCSOA) | $R_G = 82\Omega$, Non Repetitive | | |
| P_C | $T_C = 25^\circ C$ | 200 | W |
| T_J | | -55 ... +175 | $^\circ C$ |
| T_{JM} | | 175 | $^\circ C$ |
| T_{stg} | | -55 ... +175 | $^\circ C$ |
| T_L | Maximum Lead Temperature for Soldering | 300 | $^\circ C$ |
| T_{SOLD} | 1.6 mm (0.062in.) from Case for 10s | 260 | $^\circ C$ |
| M_d | Mounting Torque (TO-220) | 1.13/10 | Nm/lb.in |
| F_C | Mounting Force (TO-263) | 10..65 / 2.2..14.6 | N/lb |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |

TO-263 AA (IXYA)



TO-220AB (IXYP)



G = Gate C = Collector
 E = Emitter Tab = Collector

Features

- Optimized for 20-60kHz Switching
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Fast Diode
- Short Circuit Capability
- International Standard Packages

Advantages

- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

Applications

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

| Symbol | Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified) | Characteristic Values | | |
|---------------|---|-----------------------|------|---------------------------|
| | | Min. | Typ. | Max. |
| BV_{CES} | $I_C = 250\mu A$, $V_{GE} = 0V$ | 650 | | V |
| $V_{GE(th)}$ | $I_C = 250\mu A$, $V_{CE} = V_{GE}$ | 3.5 | | V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 150^\circ C$ | | | 10 μA 400 μA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 15A$, $V_{GE} = 15V$, Note 1 $T_J = 150^\circ C$ | 1.96 2.45 | | 2.50 V V |

| Symbol Test Conditions | | Characteristic Values | | |
|--|---|-----------------------|-----------|------|
| (T _J = 25°C Unless Otherwise Specified) | | Min. | Typ. | Max. |
| g_{fs} | I _C = 15A, V _{CE} = 10V, Note 1 | 5.0 | 8.5 | S |
| C_{ies} | V _{CE} = 25V, V _{GE} = 0V, f = 1MHz | | 583 | pF |
| C_{oes} | | | | |
| C_{res} | | | | |
| Q_{g(on)} | I _C = 15A, V _{GE} = 15V, V _{CE} = 0.5 • V _{CES} | | 19 | nC |
| Q_{ge} | | | | |
| Q_{gc} | | | | |
| t_{d(on)} | Inductive load, T _J = 25°C I _C = 15A, V _{GE} = 15V V _{CE} = 400V, R _G = 20Ω Note 2 | | 15 | ns |
| t_{ri} | | | | |
| E_{on} | | | | |
| t_{d(off)} | | | | |
| t_{fi} | | | | |
| E_{off} | 0.23 | 0.40 | mJ | |
| t_{d(on)} | Inductive load, T _J = 150°C I _C = 15A, V _{GE} = 15V V _{CE} = 400V, R _G = 20Ω Note 2 | | 15 | ns |
| t_{ri} | | | | |
| E_{on} | | | | |
| t_{d(off)} | | | | |
| t_{fi} | | | | |
| E_{off} | 0.24 | | mJ | |
| R_{thJC} | TO-220 | 0.50 | 0.75 °C/W | |
| R_{thCS} | | | °C/W | |

Reverse Diode (FRED)

| Symbol Test Conditions | | Characteristic Values | | |
|---|--|-----------------------|------|-----------|
| (T _J = 25°C, Unless Otherwise Specified) | | Min. | Typ. | Max. |
| V_F | I _F = 10A, V _{GE} = 0V, Note 1 T _J = 125°C | | 1.7 | 3.0 V |
| I_{RM} | I _F = 12A, V _{GE} = 0V, -di _F /dt = 100A/μs, V _R = 100V, T _J = 125°C | | 2.5 | A |
| t_{rr} | | | | |
| t_{rr} | I _F = 1A, V _{GE} = 0V, -di _F /dt = 100A/μs, V _R = 30V | | 30 | ns |
| R_{thJC} | | | | 1.85 °C/W |

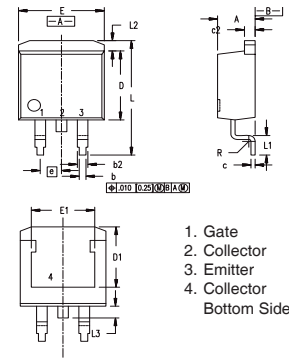
Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE} (clamp), T_J or R_G.

PRELIMINARY TECHNICAL INFORMATION

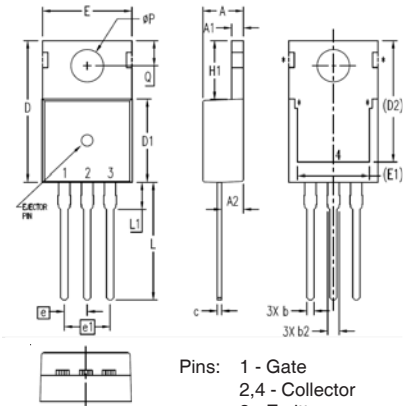
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

TO-263 Outline



| Dim. | Millimeter | | Inches | |
|------|------------|-------|--------|------|
| | Min. | Max. | Min. | Max. |
| A | 4.06 | 4.83 | .160 | .190 |
| b | 0.51 | 0.99 | .020 | .039 |
| b2 | 1.14 | 1.40 | .045 | .055 |
| c | 0.40 | 0.74 | .016 | .029 |
| c2 | 1.14 | 1.40 | .045 | .055 |
| D | 8.64 | 9.65 | .340 | .380 |
| D1 | 8.00 | 8.89 | .280 | .320 |
| E | 9.65 | 10.41 | .380 | .405 |
| E1 | 6.22 | 8.13 | .270 | .320 |
| e | 2.54 | BSC | .100 | BSC |
| L | 14.61 | 15.88 | .575 | .625 |
| L1 | 2.29 | 2.79 | .090 | .110 |
| L2 | 1.02 | 1.40 | .040 | .055 |
| L3 | 1.27 | 1.78 | .050 | .070 |
| L4 | 0 | 0.13 | 0 | .005 |

TO-220 Outline



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

| SYM | INCHES | | MILLIMETERS | |
|------|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .169 | .185 | 4.30 | 4.70 |
| A1 | .047 | .055 | 1.20 | 1.40 |
| A2 | .079 | .106 | 2.00 | 2.70 |
| b | .024 | .039 | 0.60 | 1.00 |
| b2 | .045 | .057 | 1.15 | 1.45 |
| c | .014 | .026 | 0.35 | 0.65 |
| D | .587 | .626 | 14.90 | 15.90 |
| D1 | .335 | .370 | 8.50 | 9.40 |
| (D2) | .500 | .531 | 12.70 | 13.50 |
| E | .382 | .406 | 9.70 | 10.30 |
| (E1) | .283 | .323 | 7.20 | 8.20 |
| e | .100 BSC | | 2.54 BSC | |
| e1 | .200 BSC | | 5.08 BSC | |
| H1 | .244 | .268 | 6.20 | 6.80 |
| L | .492 | .547 | 12.50 | 13.90 |
| L1 | .110 | .154 | 2.80 | 3.90 |
| ∅P | .134 | .150 | 3.40 | 3.80 |
| Q | .106 | .126 | 2.70 | 3.20 |

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 | 7,157,338B2 |
| | 4,860,072 | 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 | |

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

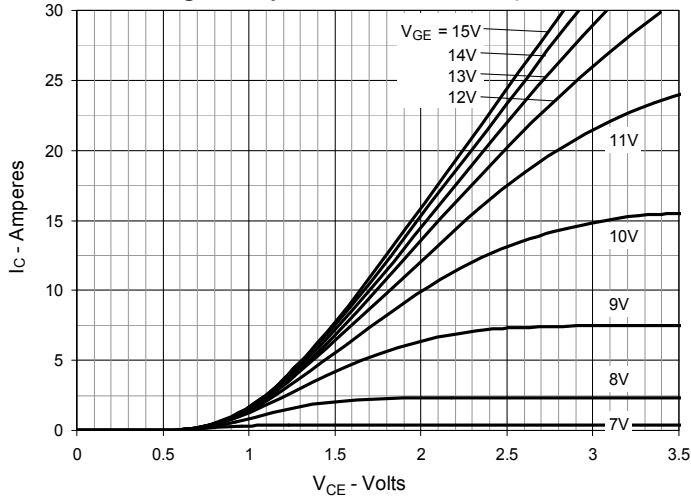


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

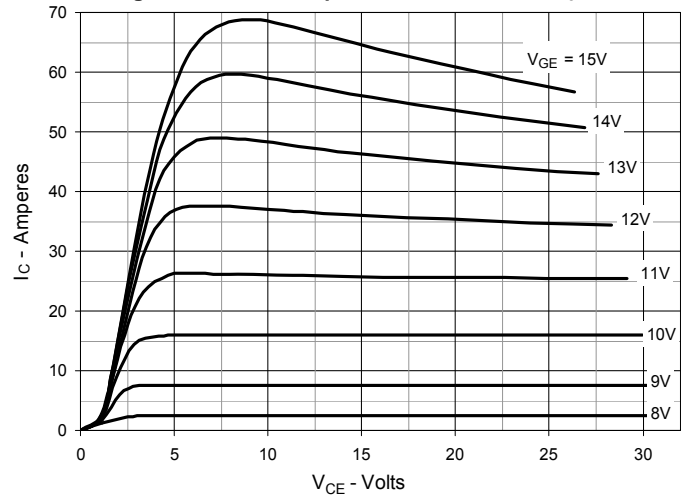


Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

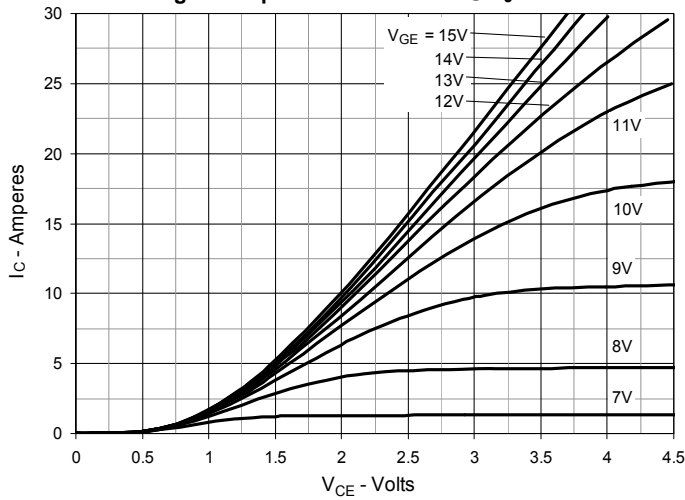


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

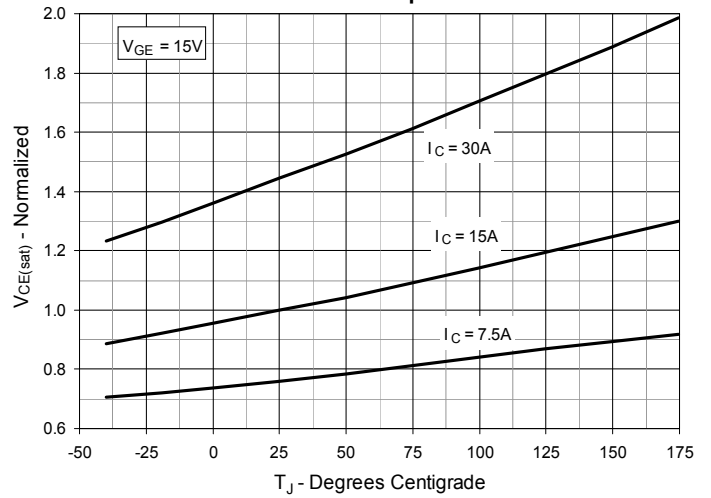


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

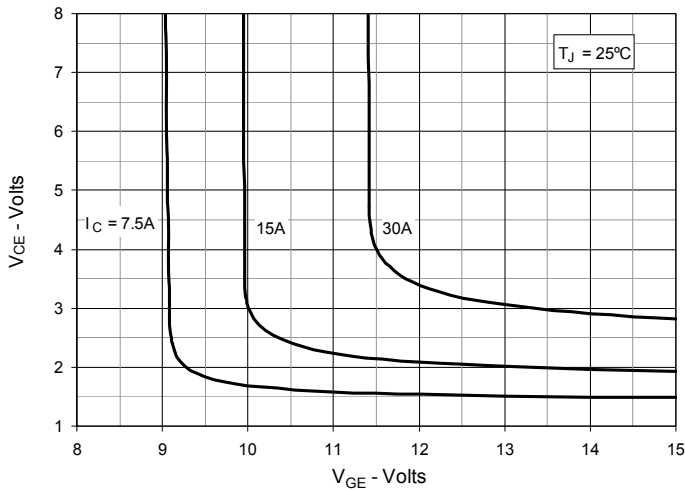


Fig. 6. Input Admittance

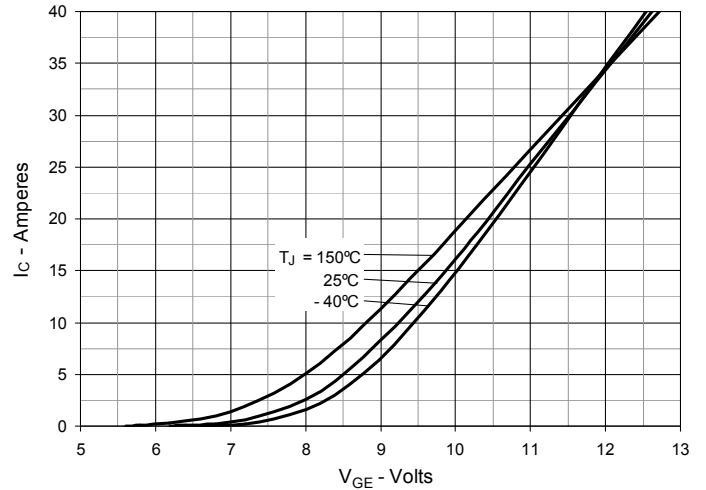


Fig. 7. Transconductance

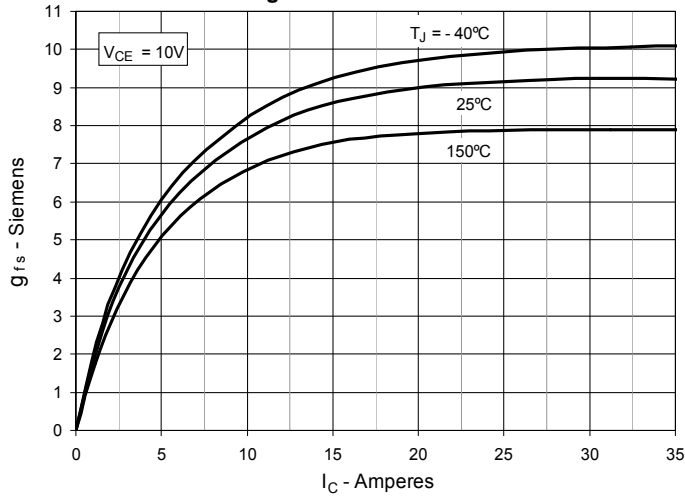


Fig. 8. Gate Charge

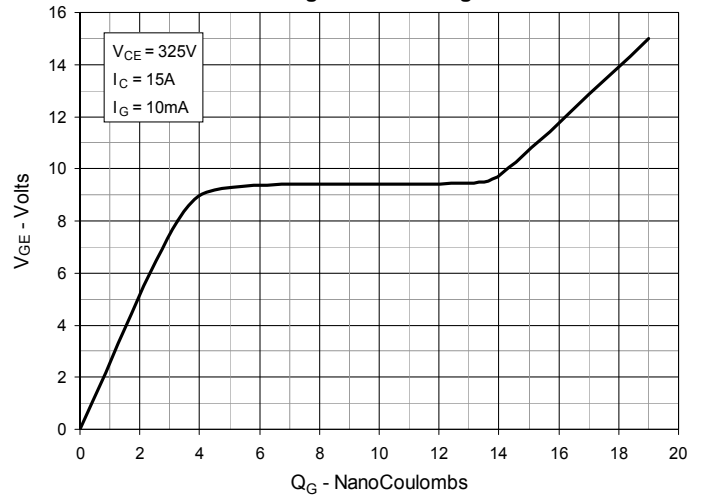


Fig. 9. Capacitance

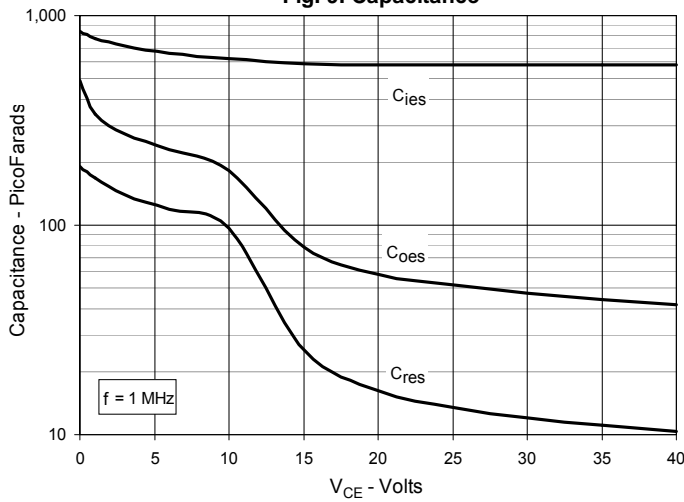


Fig. 10. Reverse-Bias Safe Operating Area

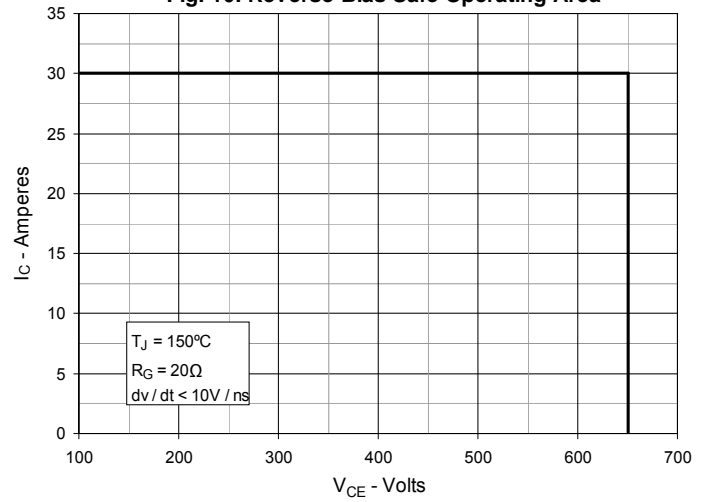


Fig. 11. Maximum Transient Thermal Impedance

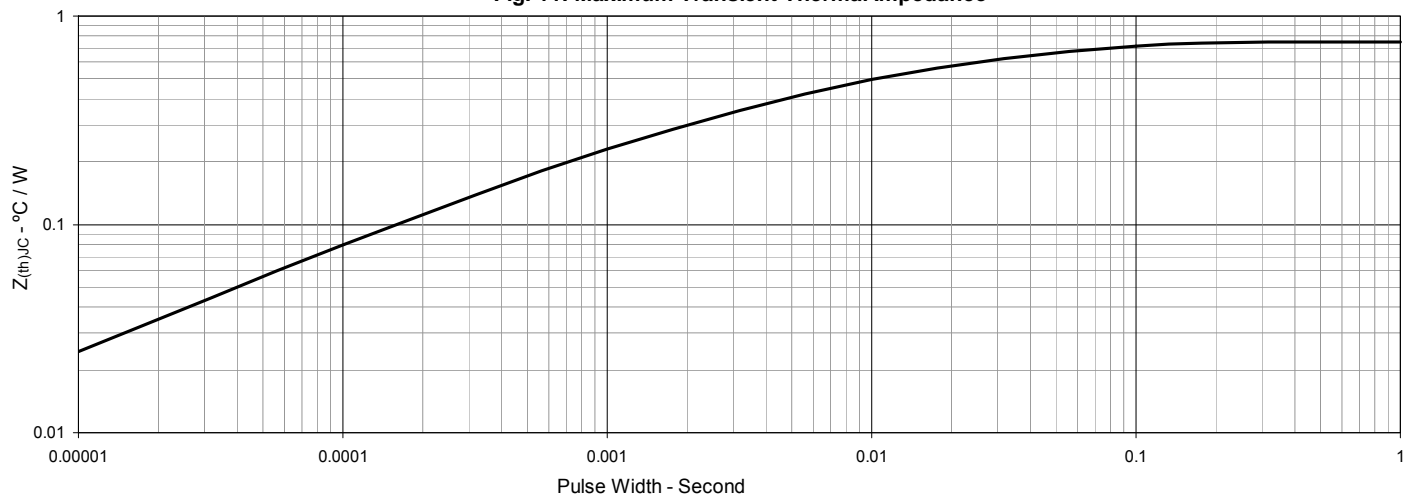


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

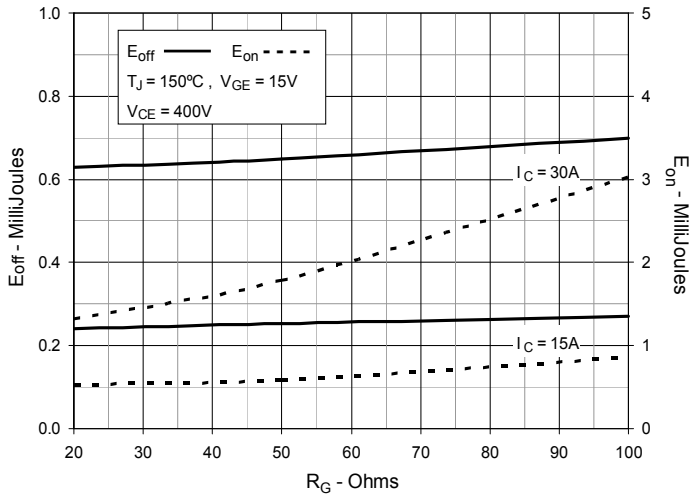


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

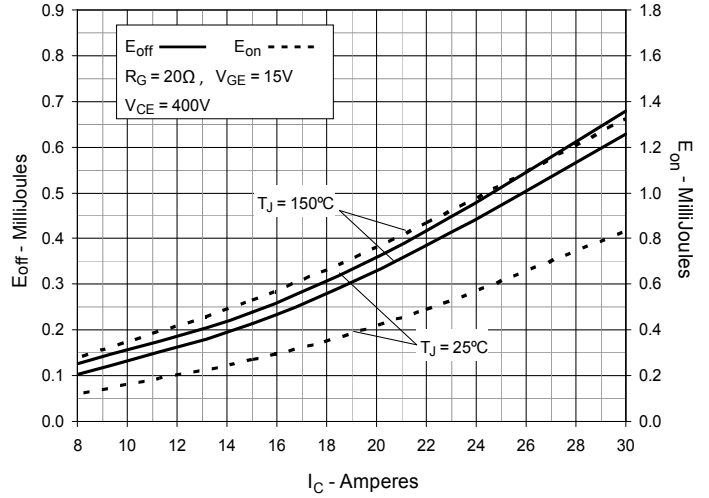


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

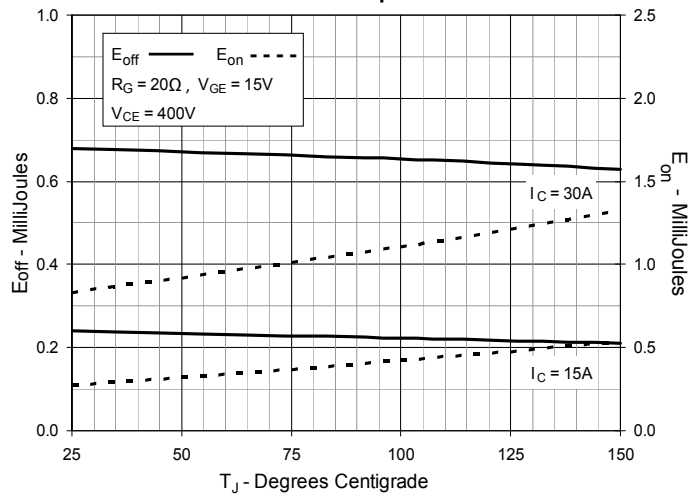


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

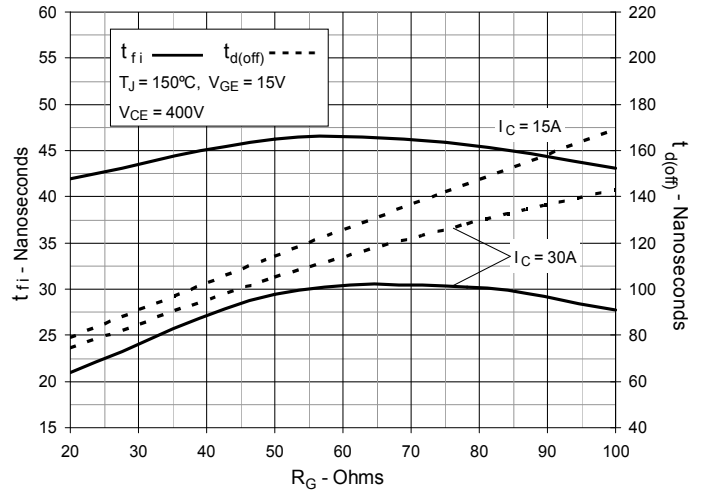


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

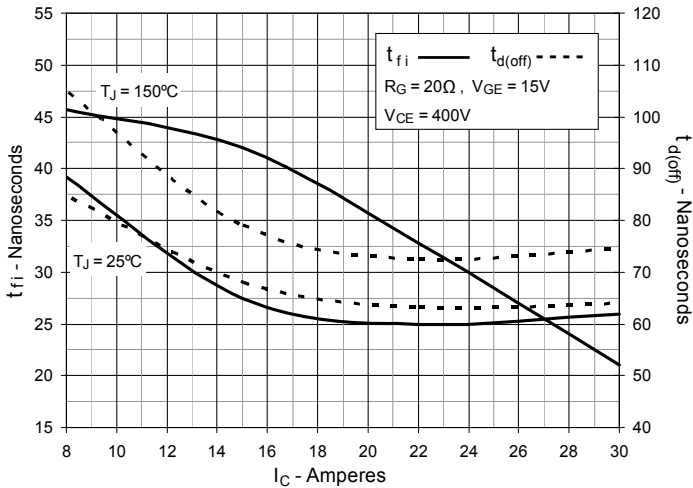


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

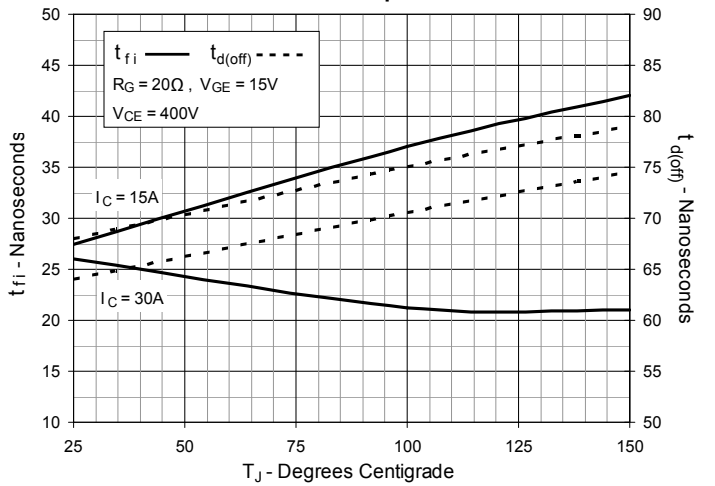


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

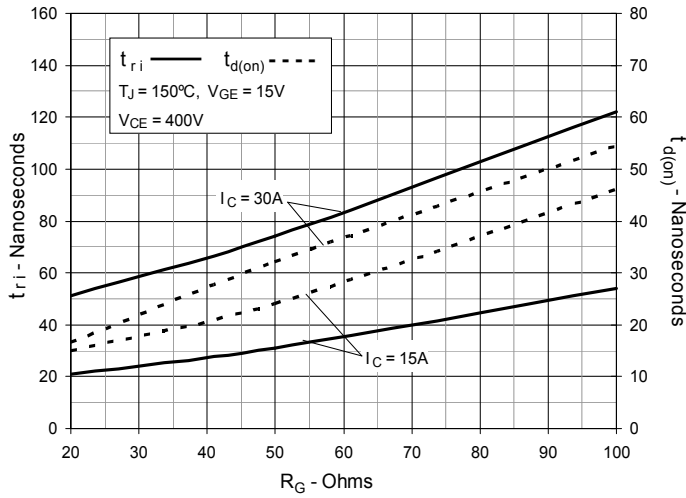


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

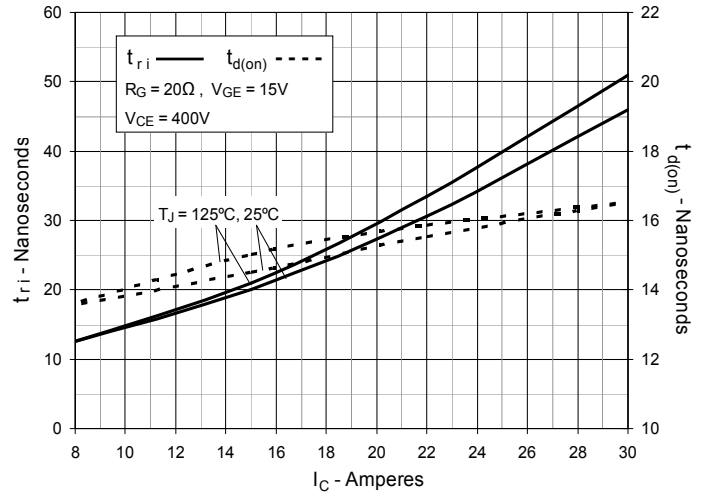


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

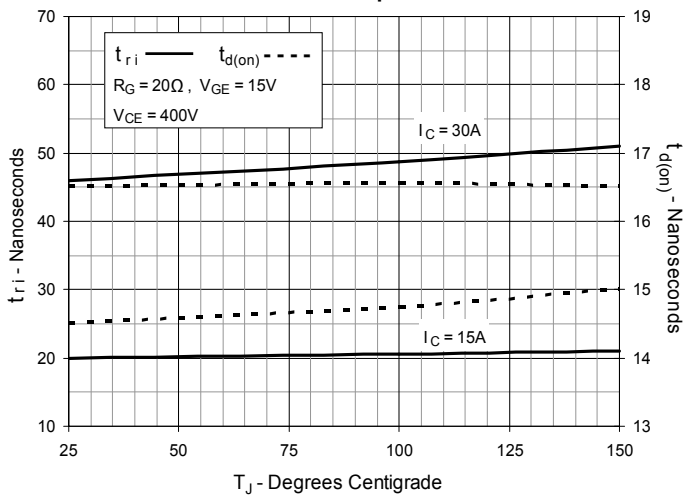
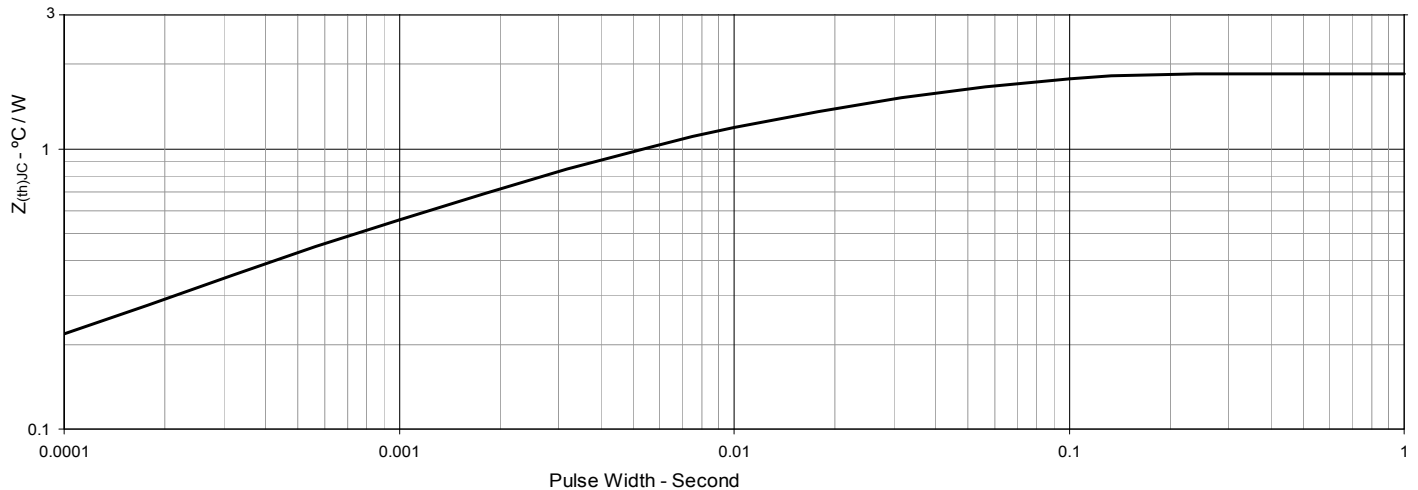


Fig. 21. Maximum Transient Impedance for Diode



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