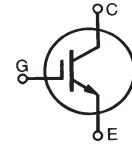


GenX3™
600V IGBT

High-Speed PT IGBTs for
40-100kHz Switching

IXGI48N60C3*
IXGA48N60C3
IXGP48N60C3
IXGH48N60C3
***Obsolete Part Number**

V_{CES} = 600V
I_{C110} = 48A
V_{CE(sat)} ≤ 2.5V
t_{fi(typ)} = 38ns



| Symbol | Test Conditions | Maximum Ratings | |
|-------------------------------|---|---|-----------|
| V _{CES} | T _C = 25°C to 150°C | 600 | V |
| V _{CGR} | T _J = 25°C to 150°C, R _{GE} = 1MΩ | 600 | V |
| V _{GES} | Continuous | ± 20 | V |
| V _{GEM} | Transient | ± 30 | V |
| I _{C25} | T _C = 25°C | 75 | A |
| I _{C110} | T _C = 110°C | 48 | A |
| I _{CM} | T _C = 25°C, 1ms | 250 | A |
| I _A | T _C = 25°C | 30 | A |
| E _{AS} | T _C = 25°C | 300 | mJ |
| SSOA (RBSOA) | V _{GE} = 15V, T _{VJ} = 125°C, R _G = 3Ω Clamped Inductive Load | I _{CM} = 100 V _{CE} ≤ V _{CES} | A |
| P _C | T _C = 25°C | 300 | W |
| T _J | | -55 ... +150 | °C |
| T _{JM} | | 150 | °C |
| T _{stg} | | -55 ... +150 | °C |
| T _L | Maximum Lead Temperature for Soldering | 300 | °C |
| T _{SOLD} | 1.6 mm (0.062in.) from Case for 10s | 260 | °C |
| F _C | Mounting Force (TO-263) | 10..65 / 2.5..14.6 | N/lb. |
| M _d | Mounting Torque (TO-247&TO-220) | 1.13/10 | Nm/lb.in. |
| Weight | TO-262 Lead | 0.4 | g |
| | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |
| | TO-247 | 6.0 | g |

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Avalanche Rated
- Fast Switching
- International Standard Packages

Advantages

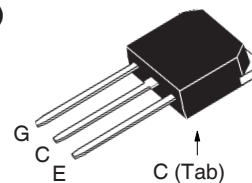
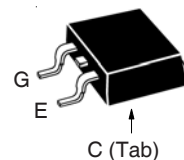
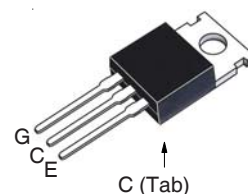
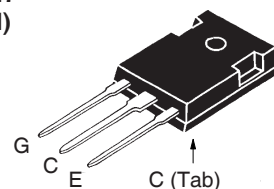
- High Power Density
- Low Gate Drive Requirement

Applications

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

| Symbol | Test Conditions (T _J = 25°C Unless Otherwise Specified) | Characteristic Values | | |
|----------------------|---|-----------------------|------------|-----------------|
| | | Min. | Typ. | Max. |
| BV _{CES} | I _C = 250μA, V _{GE} = 0V | 600 | | V |
| V _{GE(th)} | I _C = 250μA, V _{CE} = V _{GE} | 3.0 | | 5.5 V |
| I _{CES} | V _{CE} = V _{CES} , V _{GE} = 0V T _J = 125°C | | | 25 μA 250 μA |
| I _{GES} | V _{CE} = 0V, V _{GE} = ± 20V | | | ±100 nA |
| V _{CE(sat)} | I _C = 30A, V _{GE} = 15V, Note 1 T _J = 125°C | | 2.3 1.8 | 2.5 V V |

| Symbol ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Test Conditions | Characteristic Values | | |
|--|---|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 30\text{A}, V_{CE} = 10\text{V}$, Note 1 | 20 | 30 | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 1960 | pF |
| C_{oes} | | | 207 | pF |
| C_{res} | | | 66 | pF |
| Q_g | $I_C = 30\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 77 | nC |
| Q_{ge} | | | 16 | nC |
| Q_{gc} | | | 32 | nC |
| $t_{d(on)}$ | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2 | | 19 | ns |
| t_{ri} | | | 26 | ns |
| E_{on} | | | 0.41 | mJ |
| $t_{d(off)}$ | | | 60 | 100 ns |
| t_{fi} | | | 38 | ns |
| E_{off} | | | 0.23 | 0.42 mJ |
| $t_{d(on)}$ | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2 | | 19 | ns |
| t_{ri} | | | 26 | ns |
| E_{on} | | | 0.65 | mJ |
| $t_{d(off)}$ | | | 92 | ns |
| t_{fi} | | | 95 | ns |
| E_{off} | | | 0.57 | mJ |
| R_{thJC} | | | 0.42 | $^\circ\text{C/W}$ |
| R_{thCS} | (TO-247) | | 0.21 | $^\circ\text{C/W}$ |
| | (TO-220) | | 0.50 | $^\circ\text{C/W}$ |

TO-262 Lead (IXGI)

TO-263 (IXGA)

TO-220 (IXGP)

TO-247 (IXGH)


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

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 | 7,157,338B2 |
| | 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 @ $T_J = 25^\circ\text{C}$

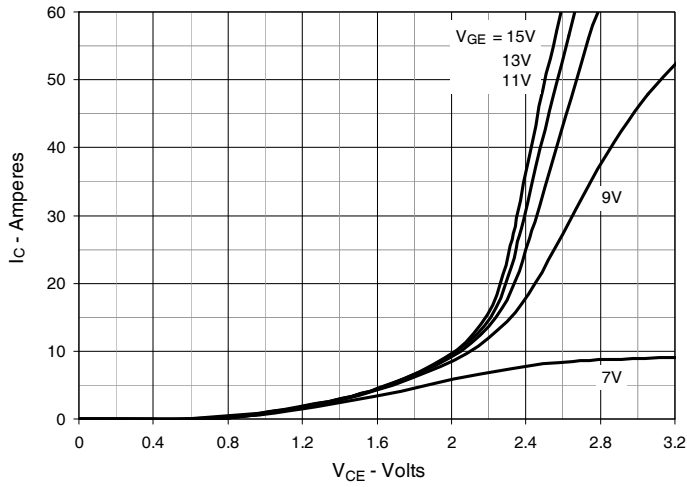


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

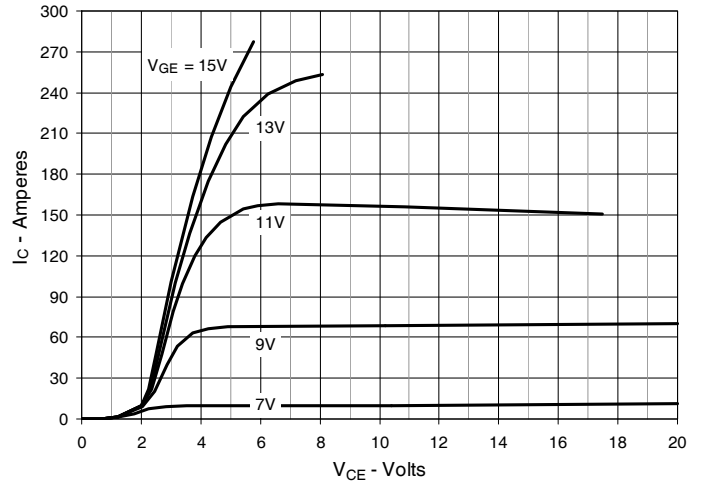


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

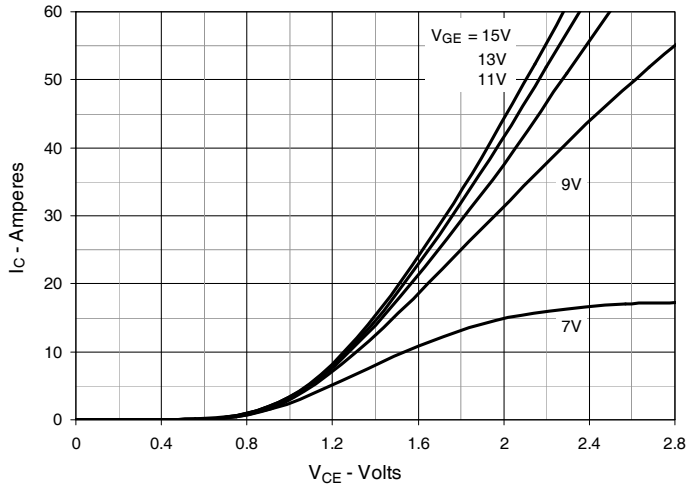


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

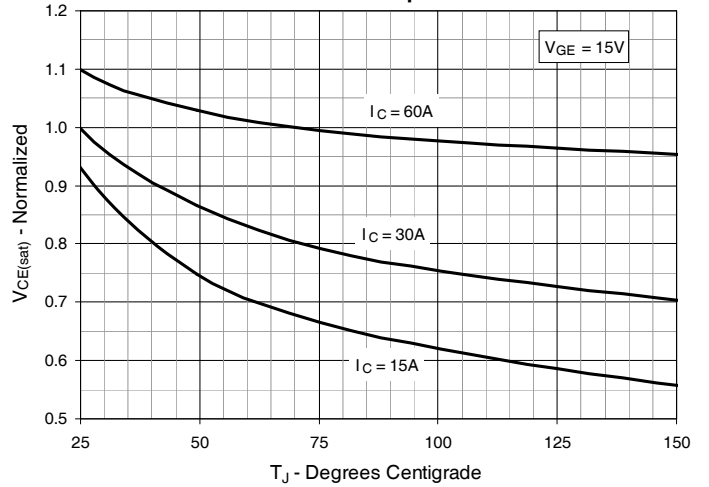


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

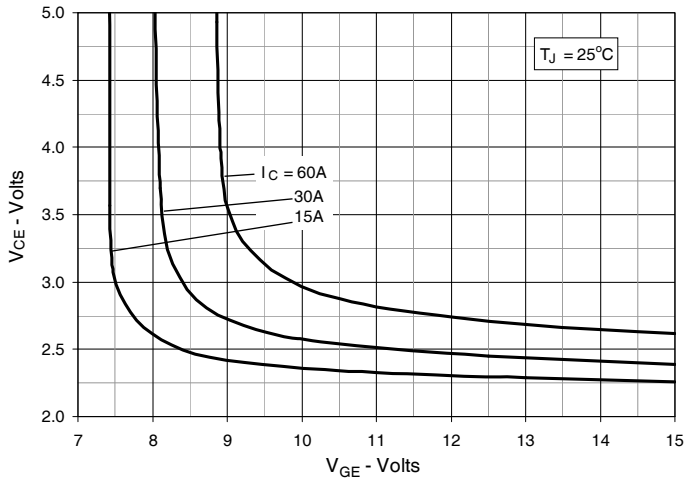


Fig. 6. Input Admittance

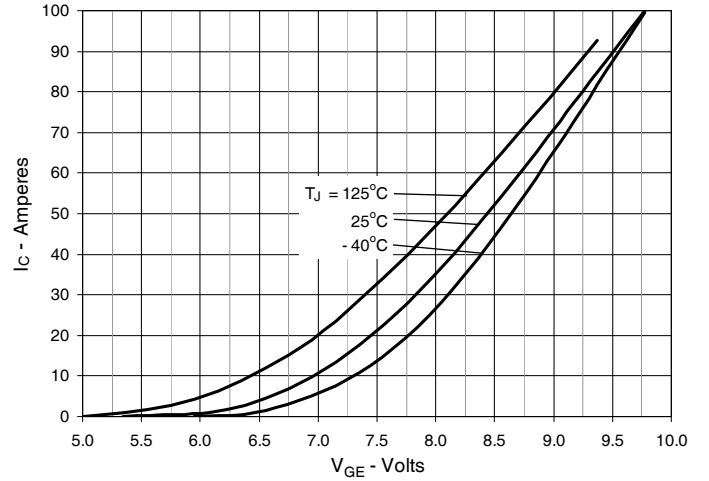


Fig. 7. Transconductance

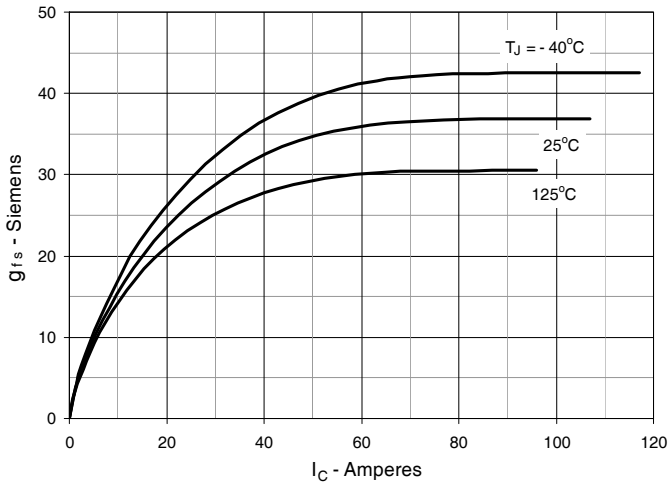


Fig. 8. Gate Charge

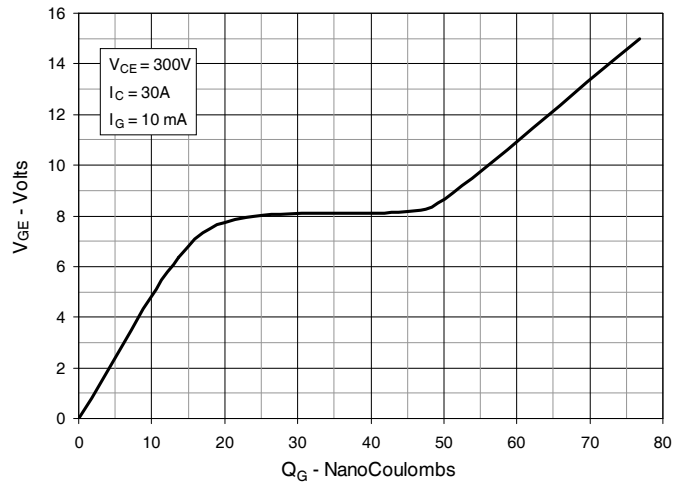


Fig. 9. Capacitance

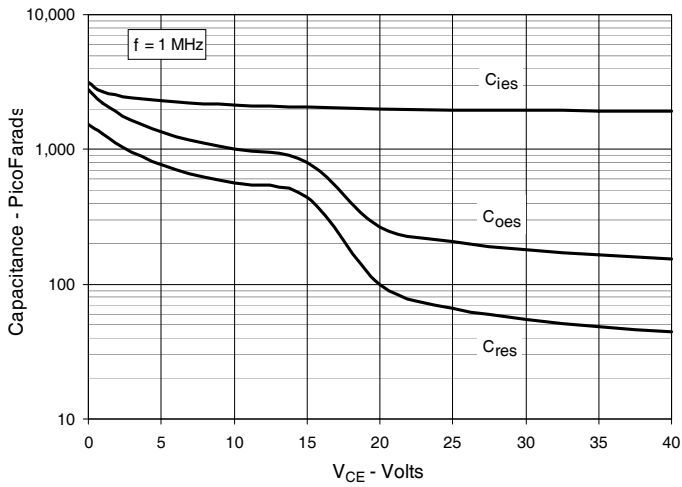


Fig. 10. Reverse-Bias Safe Operating Area

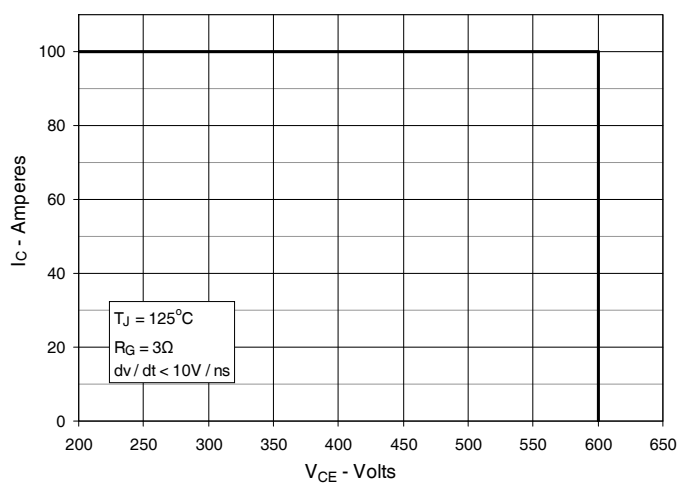


Fig. 11. Maximum Transient Thermal Impedance

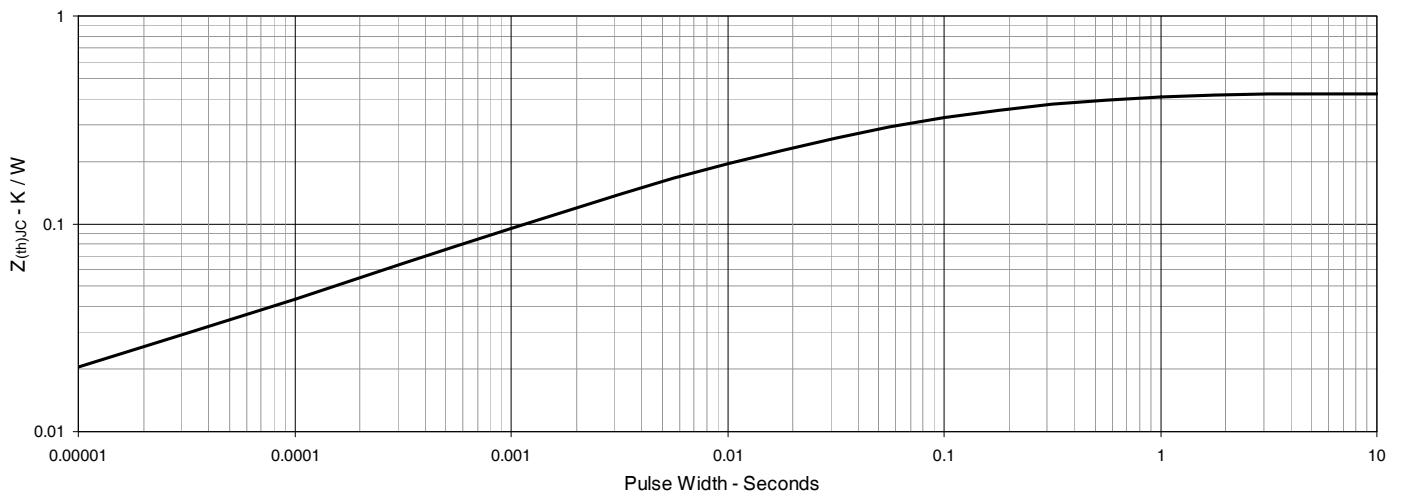


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

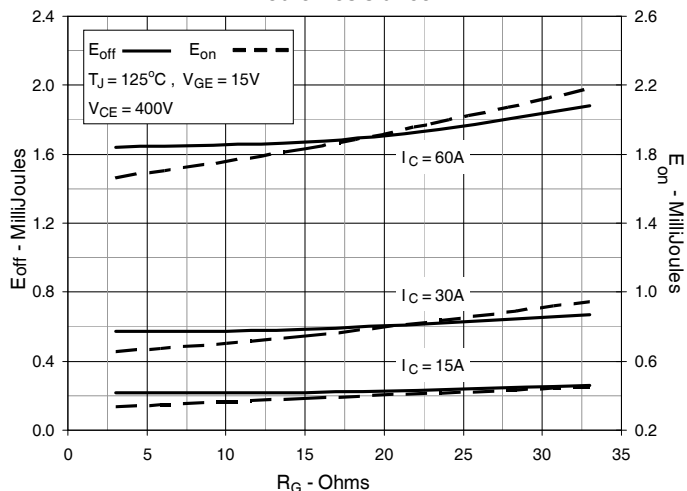


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

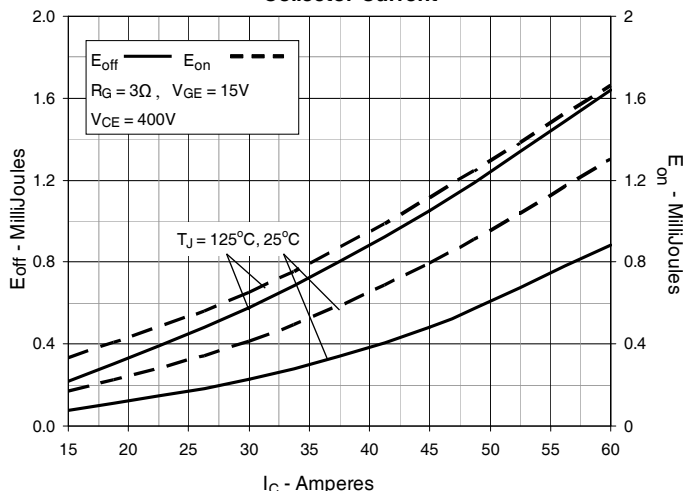


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

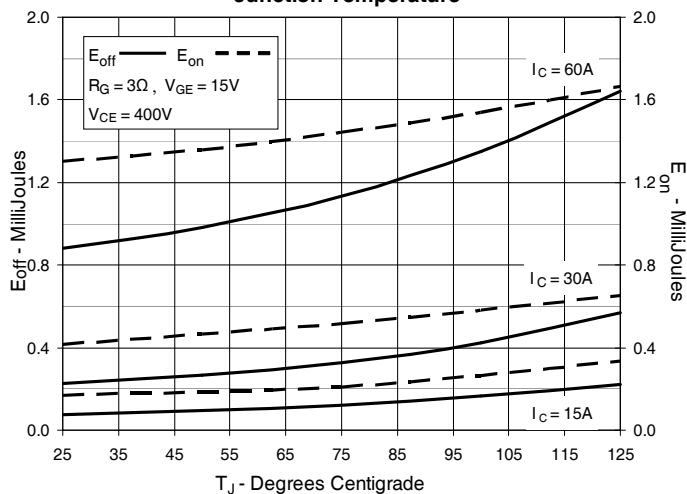


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

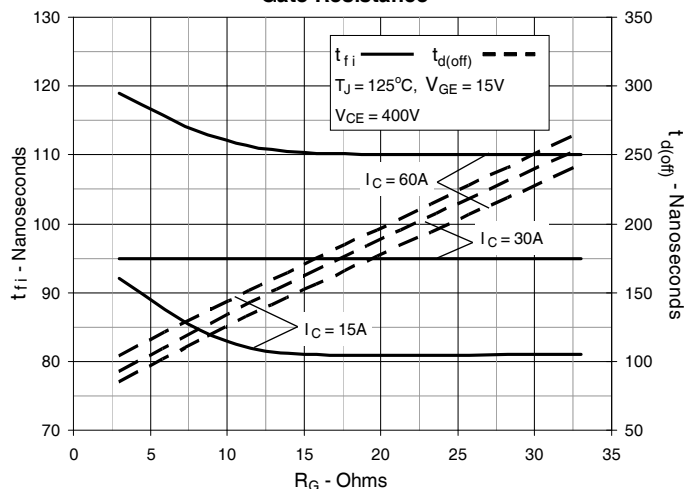


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

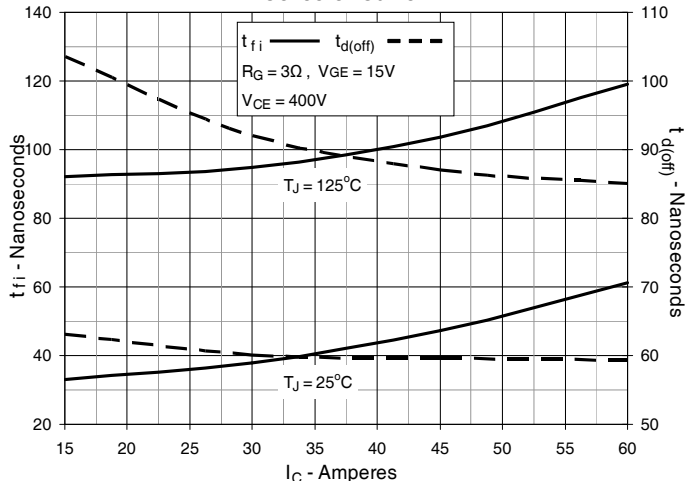


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

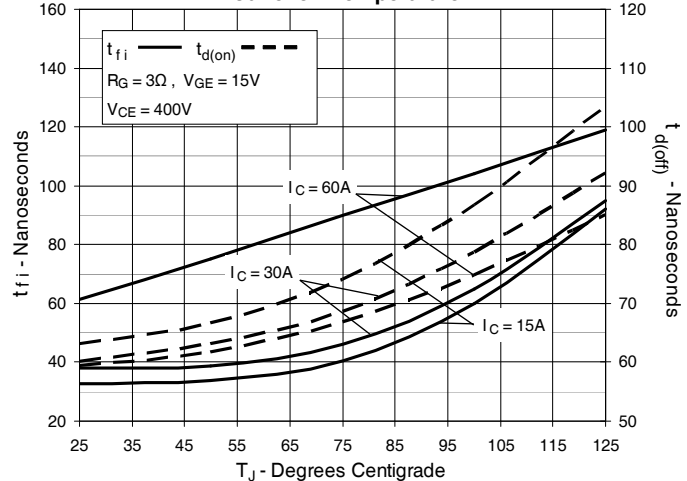


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

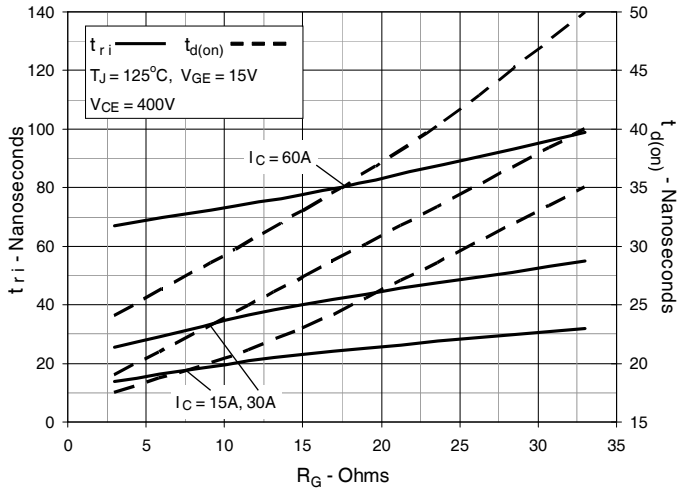


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

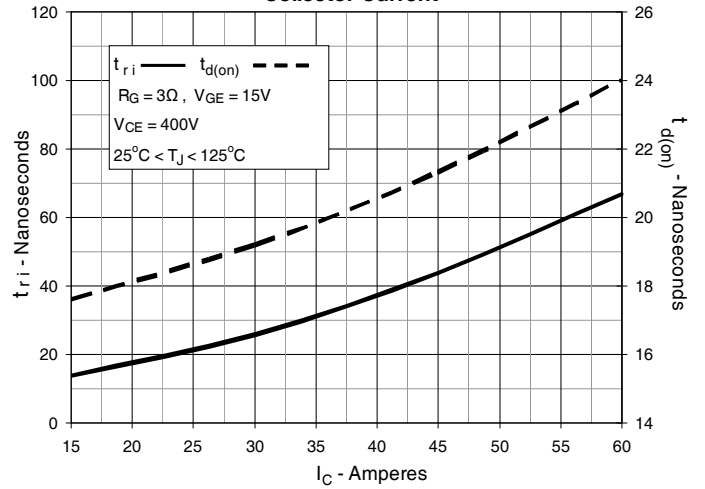
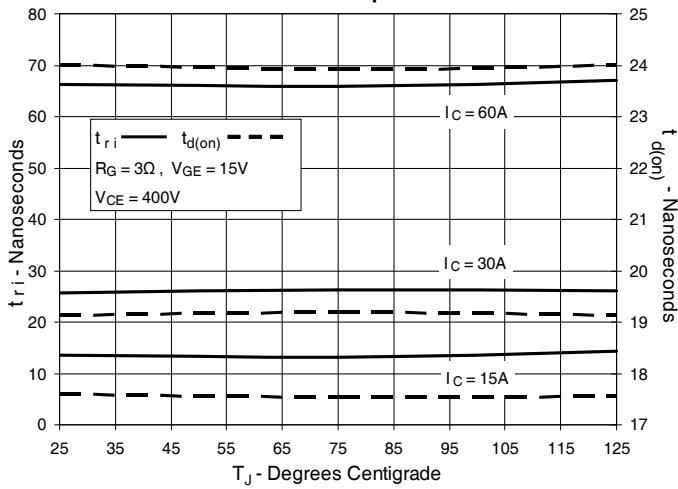
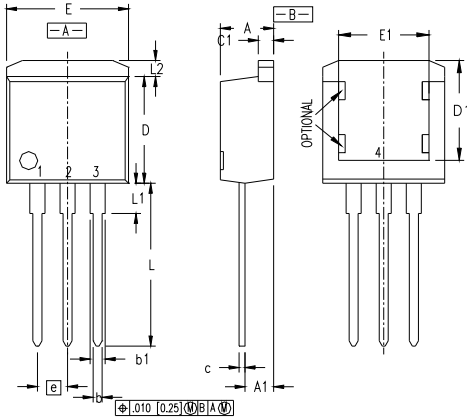


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



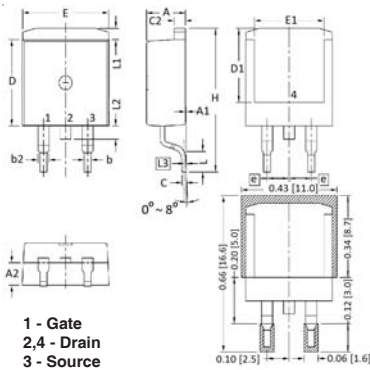
TO - 262 Leaded Outline



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

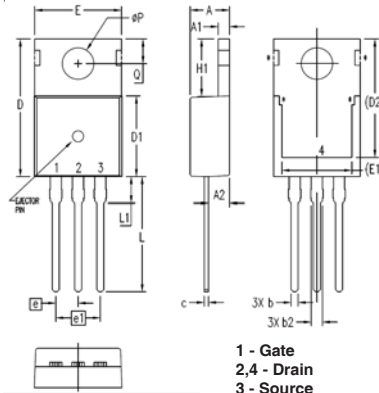
| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .160 | .190 | 4.06 | 4.83 |
| A1 | .080 | .110 | 2.03 | 2.79 |
| b | .025 | .039 | 0.51 | 0.99 |
| b2 | .025 | .039 | 1.14 | 1.40 |
| c | .018 | .029 | 0.46 | 0.74 |
| c2 | .018 | .029 | 1.14 | 1.40 |
| D | .340 | .380 | 8.64 | 9.65 |
| D1 | .315 | .350 | 8.00 | 8.89 |
| E | .380 | .405 | 9.65 | 10.29 |
| E1 | .245 | .320 | 6.22 | 8.13 |
| e | .100 BSC | | 2.54 BSC | |
| L | .500 | .580 | 14.61 | 15.88 |
| L1 | .080 | .130 | 2.29 | 2.79 |
| L2 | .040 | .055 | 1.02 | 1.40 |

TO-263 Outline



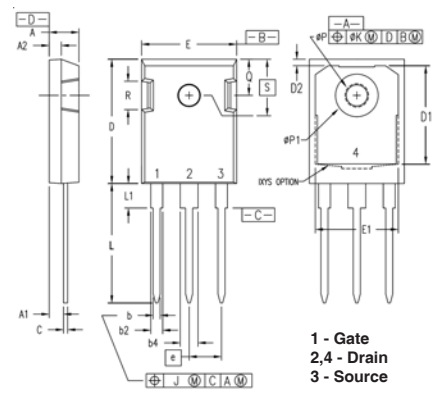
1 - Gate
2,4 - Drain
3 - Source

TO-220 Outline



1 - Gate
2,4 - Drain
3 - Source

TO-247 Outline



1 - Gate
2,4 - Drain
3 - Source

| SYM | INCHES | | MILLIMETER | |
|-----|----------|------|------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .170 | .185 | 4.30 | 4.70 |
| A1 | .000 | .008 | 0.00 | 0.20 |
| A2 | .091 | .098 | 2.30 | 2.50 |
| b | .028 | .035 | 0.70 | 0.90 |
| b2 | .046 | .060 | 1.18 | 1.52 |
| C | .018 | .024 | 0.45 | 0.60 |
| C2 | .049 | .060 | 1.25 | 1.52 |
| D | .340 | .370 | 8.63 | 9.40 |
| D1 | .300 | .327 | 7.62 | 8.30 |
| E | .380 | .410 | 9.65 | 10.41 |
| E1 | .270 | .330 | 6.86 | 8.38 |
| e | .100 BSC | | 2.54 BSC | |
| H | .580 | .620 | 14.73 | 15.75 |
| L | .075 | .105 | 1.91 | 2.67 |
| L1 | .039 | .060 | 1.00 | 1.52 |
| L2 | — | .070 | — | 1.77 |
| L3 | .010 BSC | | 0.254 BSC | |

| 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 |
| ØP | .134 | .150 | 3.40 | 3.80 |
| Q | .106 | .126 | 2.70 | 3.20 |

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .090 | .100 | 2.29 | 2.54 |
| A2 | .075 | .085 | 1.91 | 2.16 |
| b | .045 | .055 | 1.14 | 1.40 |
| b2 | .075 | .087 | 1.91 | 2.20 |
| b4 | .115 | .126 | 2.92 | 3.20 |
| C | .024 | .031 | 0.61 | 0.80 |
| D | .819 | .840 | 20.80 | 21.34 |
| D1 | .650 | .690 | 16.51 | 17.53 |
| D2 | .035 | .050 | 0.89 | 1.27 |
| E | .620 | .635 | 15.75 | 16.13 |
| E1 | .545 | .565 | 13.84 | 14.35 |
| e | .215 BSC | | 5.45 BSC | |
| J | — | .010 | — | 0.25 |
| K | — | .025 | — | 0.64 |
| L | .780 | .810 | 19.81 | 20.57 |
| L1 | .150 | .170 | 3.81 | 4.32 |
| ØP | .140 | .144 | 3.55 | 3.65 |
| ØP1 | .275 | .290 | 6.99 | 7.37 |
| Q | .220 | .244 | 5.59 | 6.20 |
| R | .170 | .190 | 4.32 | 4.83 |
| S | .242 BSC | | 6.15 BSC | |



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