

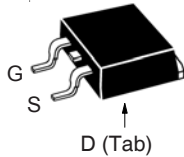
TrenchP™ Power MOSFETs

P-Channel Enhancement Mode
Avalanche Rated

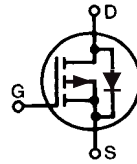
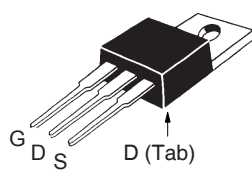
IXTA32P20T
IXTP32P20T
IXTQ32P20T
IXTH32P20T

$V_{DSS} = -200V$
 $I_{D25} = -32A$
 $R_{DS(on)} \leq 130m\Omega$

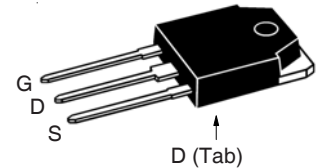
TO-263 AA (IXTA)



TO-220AB (IXTP)

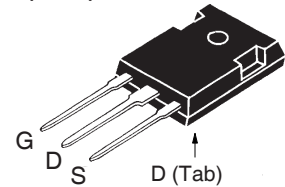


TO-3P (IXTQ)



| Symbol | Test Conditions | Maximum Ratings | |
|---------------|---|--------------------|------------|
| V_{DSS} | $T_J = 25^\circ C$ to $150^\circ C$ | - 200 | V |
| V_{DGR} | $T_J = 25^\circ C$ to $150^\circ C$, $R_{GS} = 1M\Omega$ | - 200 | V |
| V_{GSS} | Continuous | ± 15 | V |
| V_{GSM} | Transient | ± 25 | V |
| I_{D25} | $T_C = 25^\circ C$ | - 32 | A |
| I_{DM} | $T_C = 25^\circ C$, Pulse Width Limited by T_{JM} | - 96 | A |
| I_A | $T_C = 25^\circ C$ | - 32 | A |
| E_{AS} | $T_C = 25^\circ C$ | 1 | J |
| P_D | $T_C = 25^\circ C$ | 300 | W |
| T_J | | -55 ... +150 | $^\circ C$ |
| T_{JM} | | 150 | $^\circ C$ |
| T_{stg} | | -55 ... +150 | $^\circ C$ |
| T_L | 1.6mm (0.062 in.) from Case for 10s | 300 | $^\circ C$ |
| T_{SOLD} | Plastic body for 10s | 260 | $^\circ C$ |
| F_C | Mounting Force (TO-263) | 10..65 / 2.2..14.6 | N/lb. |
| M_d | Mounting Torque (TO-220, TO-247 & TO-3P) | 1.13 / 10 | Nm/lb.in. |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |
| | TO-3P | 5.5 | g |
| | TO-247 | 6.0 | g |

TO-247 (IXTH)



G = Gate D = Drain
S = Source Tab = Drain

Features

- International Standard Packages
- Avalanche Rated
- Extended FBSOA
- Fast Intrinsic Diode
- Low $R_{DS(ON)}$ and Q_G

Advantages

- Easy to Mount
- Space Savings
- High Power Density

Applications

- High-Side Switching
- Push Pull Amplifiers
- DC Choppers
- Automatic Test Equipment
- Current Regulators
- Battery Charger Applications

| Symbol | Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|---|-----------------------|------|--------------------------|
| | | Min. | Typ. | Max. |
| BV_{DSS} | $V_{GS} = 0V$, $I_D = -250\mu A$ | - 200 | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = -250\mu A$ | - 2.0 | | V |
| I_{GSS} | $V_{GS} = \pm 15V$, $V_{DS} = 0V$ | | | ± 100 nA |
| I_{DSS} | $V_{DS} = V_{DSS}$, $V_{GS} = 0V$ $T_J = 125^\circ C$ | | | - 25 μA -1.25 mA |
| $R_{DS(on)}$ | $V_{GS} = -10V$, $I_D = 0.5 \cdot I_{D25}$, Note 1 | | | 130 m Ω |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|---|-----------------------|------|-----------|
| | | Min. | Typ. | Max. |
| g_{fs} | $V_{DS} = -10\text{V}$, $I_D = 0.5 \cdot I_{D25}$, Note 1 | 18 | 30 | S |
| C_{iss} | $V_{GS} = 0\text{V}$, $V_{DS} = -25\text{V}$, $f = 1\text{MHz}$ | | 14.5 | nF |
| C_{oss} | | | 565 | pF |
| C_{rss} | | | 105 | pF |
| $t_{d(on)}$ | Resistive Switching Times $V_{GS} = -10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$ $R_G = 1\Omega$ (External) | | 32 | ns |
| t_r | | | 15 | ns |
| $t_{d(off)}$ | | | 57 | ns |
| t_f | | | 12 | ns |
| $Q_{g(on)}$ | $V_{GS} = -10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$ | | 185 | nC |
| Q_{gs} | | | 66 | nC |
| Q_{gd} | | | 45 | nC |
| R_{thJC} | | | | 0.42 °C/W |
| R_{thCS} | TO-220 | | 0.50 | °C/W |
| | TO-247 & TO-3P | | 0.21 | °C/W |

Source-Drain Diode

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|----------|--|-----------------------|-------|---------------|
| | | Min. | Typ. | Max. |
| I_S | $V_{GS} = 0\text{V}$ | | | -32 A |
| I_{SM} | Repetitive, Pulse Width Limited by T_{JM} | | | -128 A |
| V_{SD} | $I_F = -32\text{A}$, $V_{GS} = 0\text{V}$, Note 1 | | | -1.3 V |
| t_{rr} | $I_F = -16\text{A}$, $-di/dt = -100\text{A}/\mu\text{s}$ $V_R = -100\text{V}$, $V_{GS} = 0\text{V}$ | | 190 | ns |
| Q_{RM} | | | 1.7 | μC |
| I_{RM} | | | -17.8 | A |

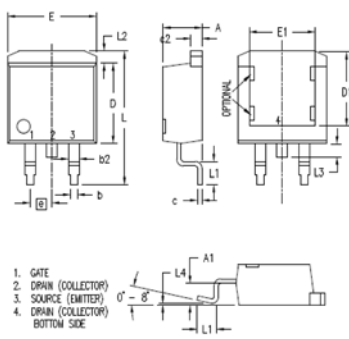
Note 1: Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.

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:

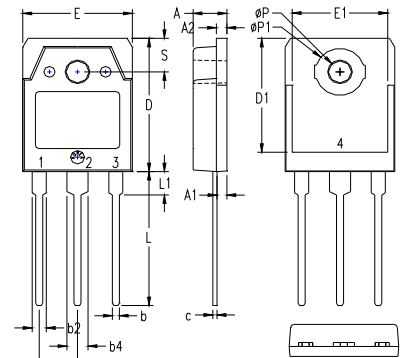
| | | | | | | | | | |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665 | 6,404,065 B1 | 6,683,344 | 6,727,585 | 7,005,734 B2 | 7,157,338B2 |
| 4,860,072 | 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 | |

TO-263 Outline



| 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-3P Outline

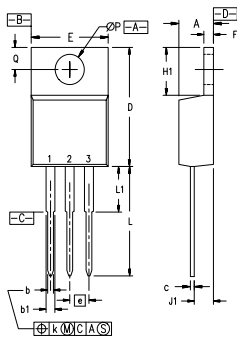


Pins: 1 - Gate 2,4 - Drain
3 - Source

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .185 | .193 | 4.70 | 4.90 |
| A1 | .051 | .059 | 1.30 | 1.50 |
| A2 | .057 | .065 | 1.45 | 1.65 |
| b | .035 | .045 | 0.90 | 1.15 |
| b2 | .075 | .087 | 1.90 | 2.20 |
| b4 | .114 | .126 | 2.90 | 3.20 |
| c | .022 | .031 | 0.55 | 0.80 |
| D | .780 | .791 | 19.80 | 20.10 |
| D1 | .665 | .677 | 16.90 | 17.20 |
| E | .610 | .622 | 15.50 | 15.80 |
| E1 | .531 | .539 | 13.50 | 13.70 |
| e | .215 BSC | | 5.45 BSC | |
| L | .779 | .795 | 19.80 | 20.20 |
| L1 | .134 | .142 | 3.40 | 3.60 |
| L2 | .126 | .134 | 3.20 | 3.40 |
| ØP1 | .272 | .280 | 6.90 | 7.10 |
| S | .193 | .201 | 4.90 | 5.10 |

All metal area are tin plated.

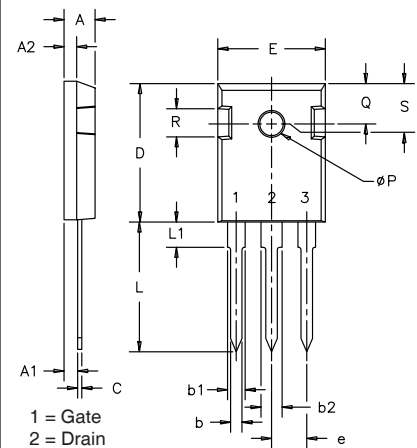
TO-220 Outline



Pins: 1 - Gate 2 - Drain
3 - Source

| 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



1 = Gate
2 = Drain
3 = Source

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .185 | .209 | 4.7 | 5.3 |
| A1 | .087 | .102 | 2.2 | 2.54 |
| A2 | .059 | .098 | 2.2 | 2.6 |
| b | .040 | .055 | 1.0 | 1.4 |
| b1 | .065 | .084 | 1.65 | 2.13 |
| b2 | .113 | .123 | 2.87 | 3.12 |
| C | .016 | .031 | .4 | .8 |
| D | .819 | .845 | 20.80 | 21.46 |
| E | .610 | .640 | 15.75 | 16.26 |
| e | .215 BSC | | 5.45 BSC | |
| L | .780 | .800 | 19.81 | 20.32 |
| L1 | .177 | | 4.50 | |
| ØP | .140 | .144 | 3.55 | 3.65 |
| Q | .212 | .244 | 5.4 | 6.2 |
| R | .170 | .216 | 4.32 | 5.49 |
| S | .242 BSC | | 6.15 BSC | |

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

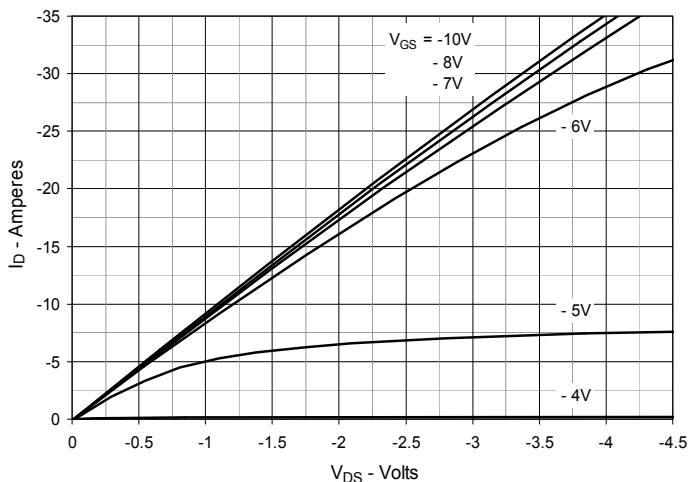


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

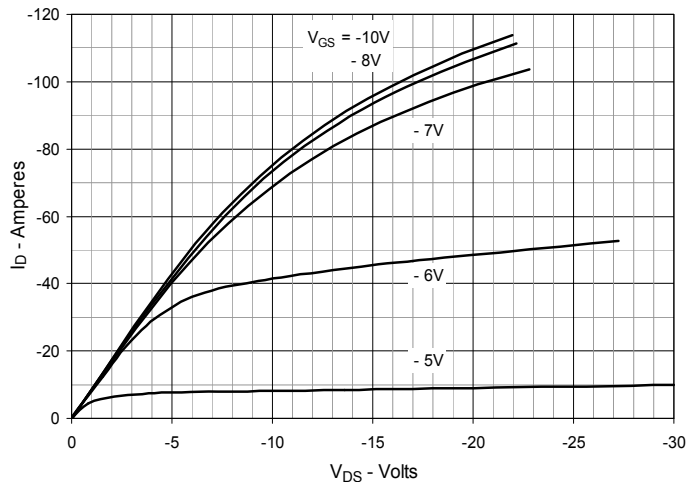


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

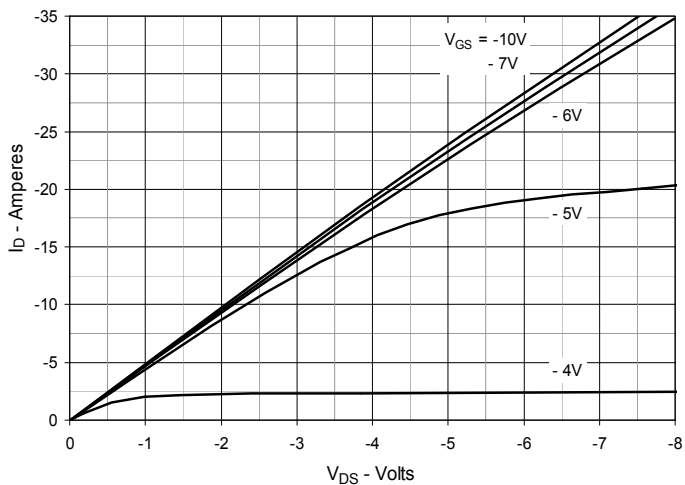


Fig. 4. $R_{DS(on)}$ Normalized to $I_D = -16\text{A}$ Value vs. Junction Temperature

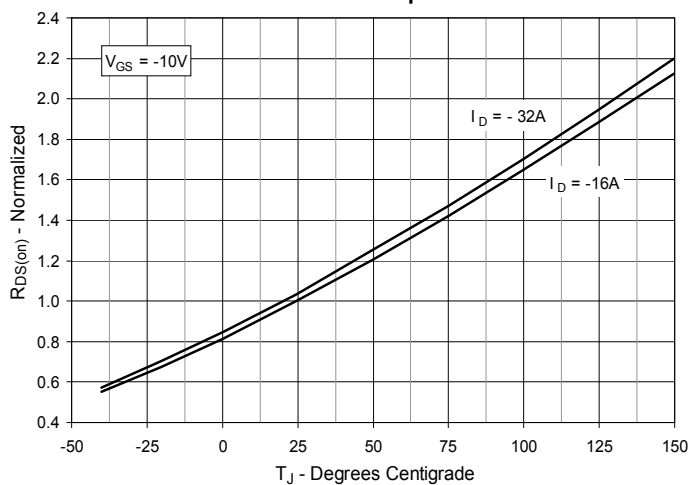


Fig. 5. $R_{DS(on)}$ Normalized to $I_D = -16\text{A}$ Value vs. Drain Current

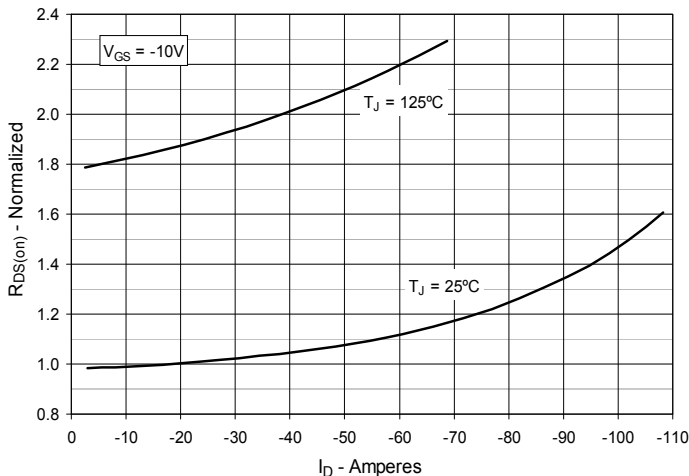


Fig. 6. Maximum Drain Current vs. Case Temperature

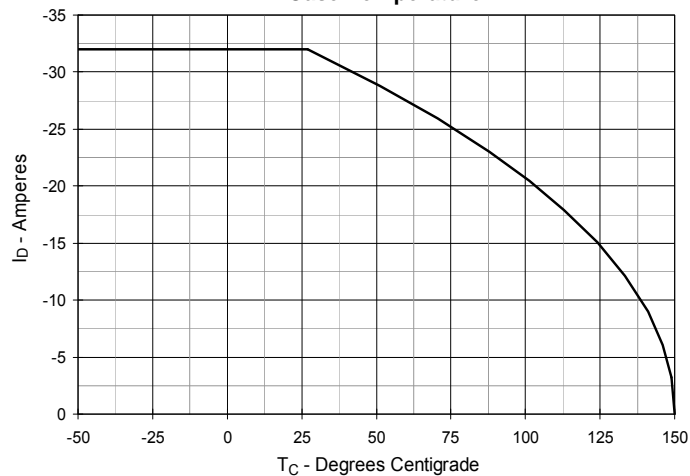


Fig. 7. Input Admittance

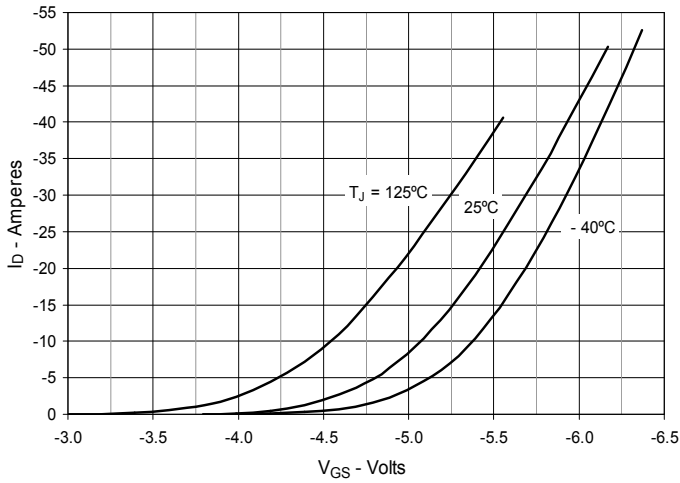


Fig. 8. Transconductance

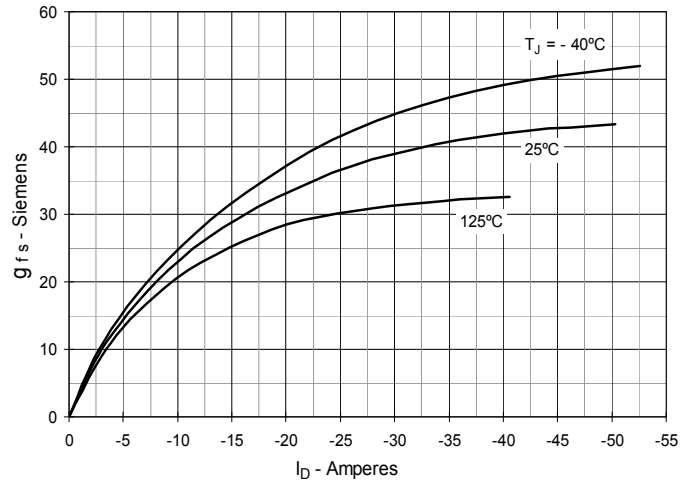


Fig. 9. Forward Voltage Drop of Intrinsic Diode

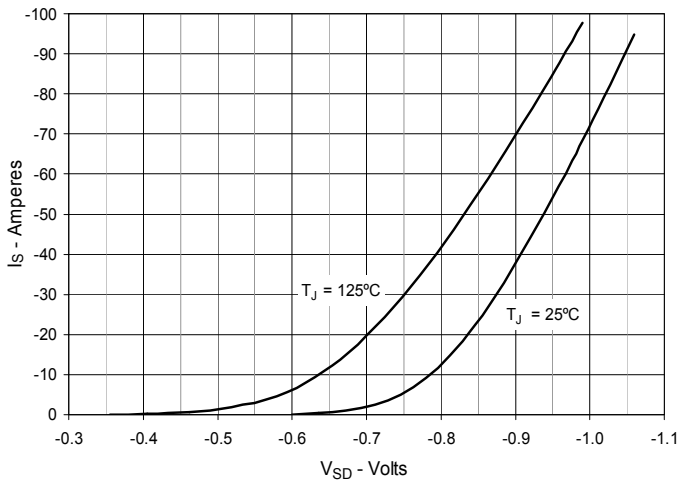


Fig. 10. Gate Charge

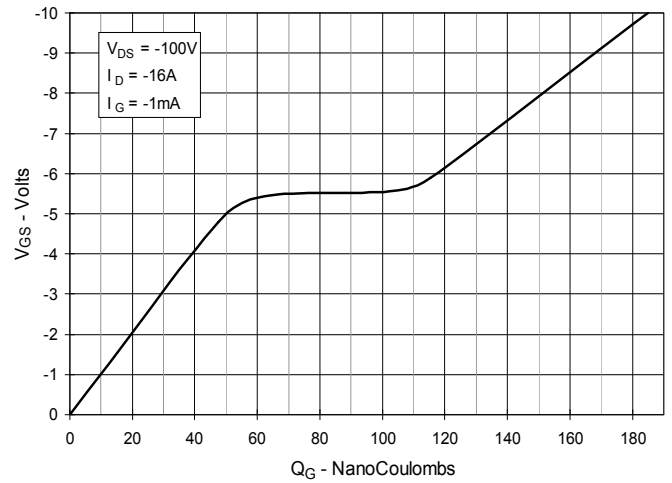


Fig. 11. Capacitance

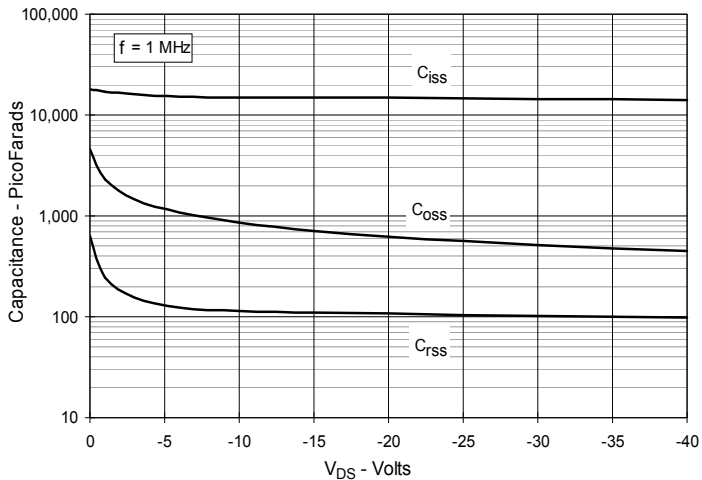


Fig. 12. Forward-Bias Safe Operating Area

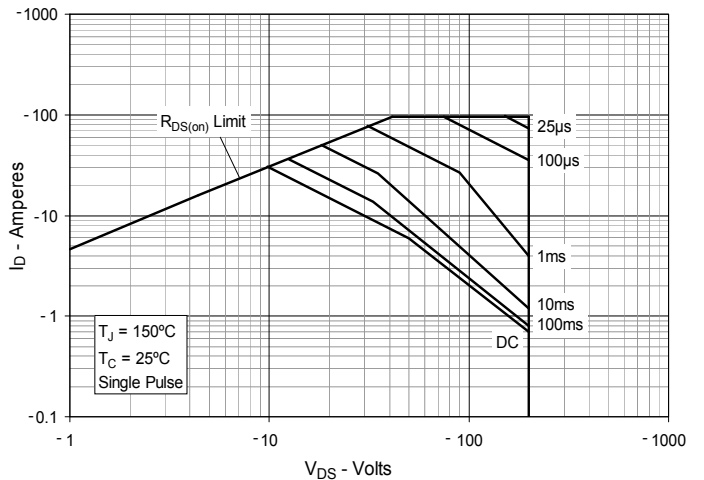


Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature

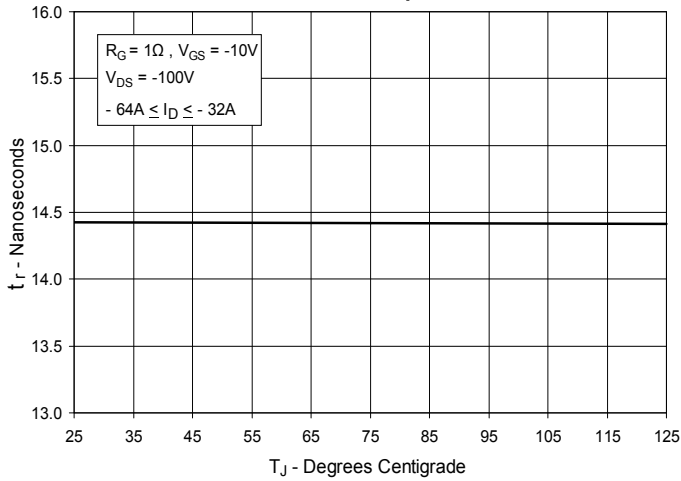


Fig. 14. Resistive Turn-on Rise Time vs. Drain Current

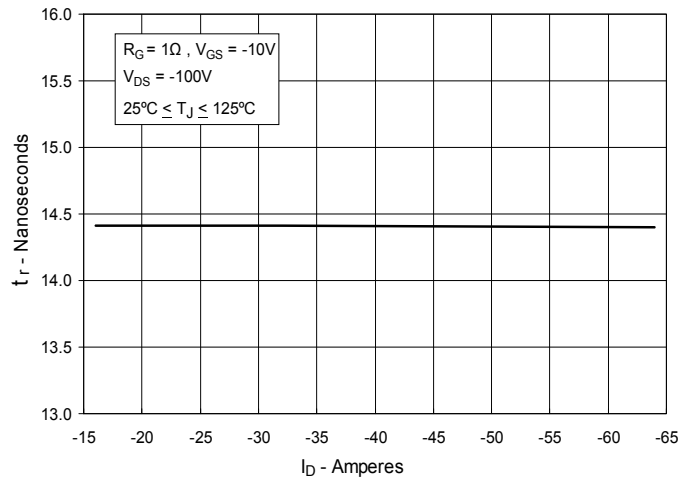


Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance

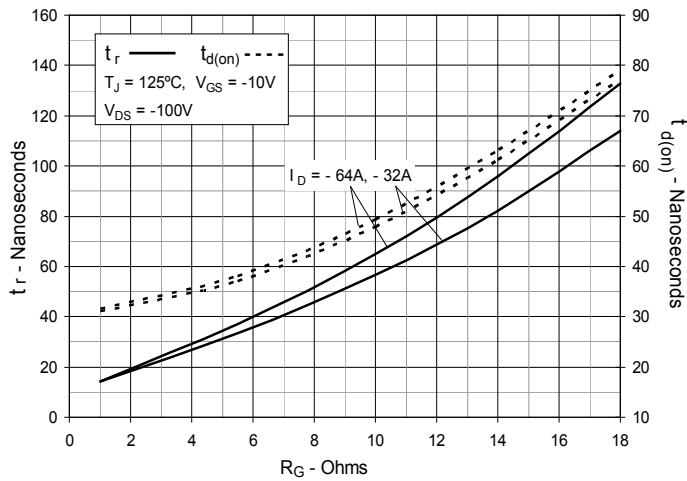


Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature

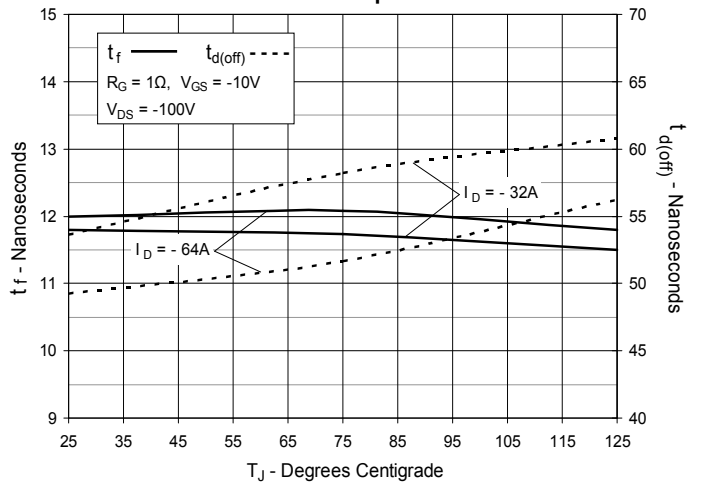


Fig. 17. Resistive Turn-off Switching Times vs. Drain Current

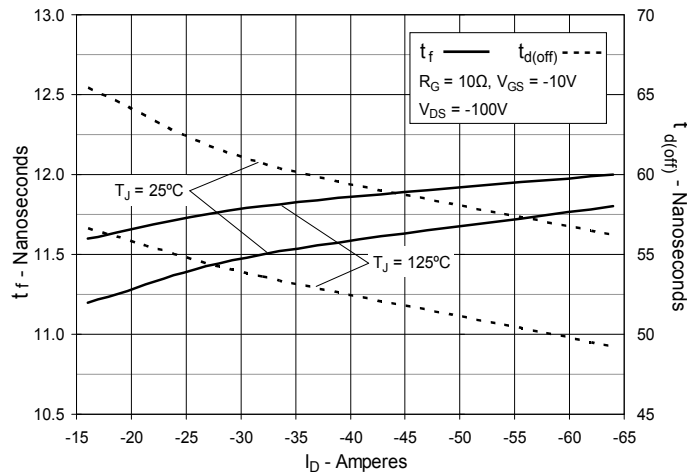


Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance

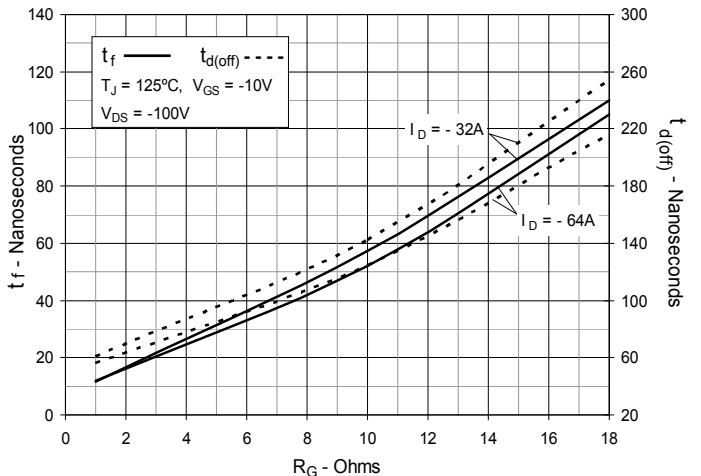
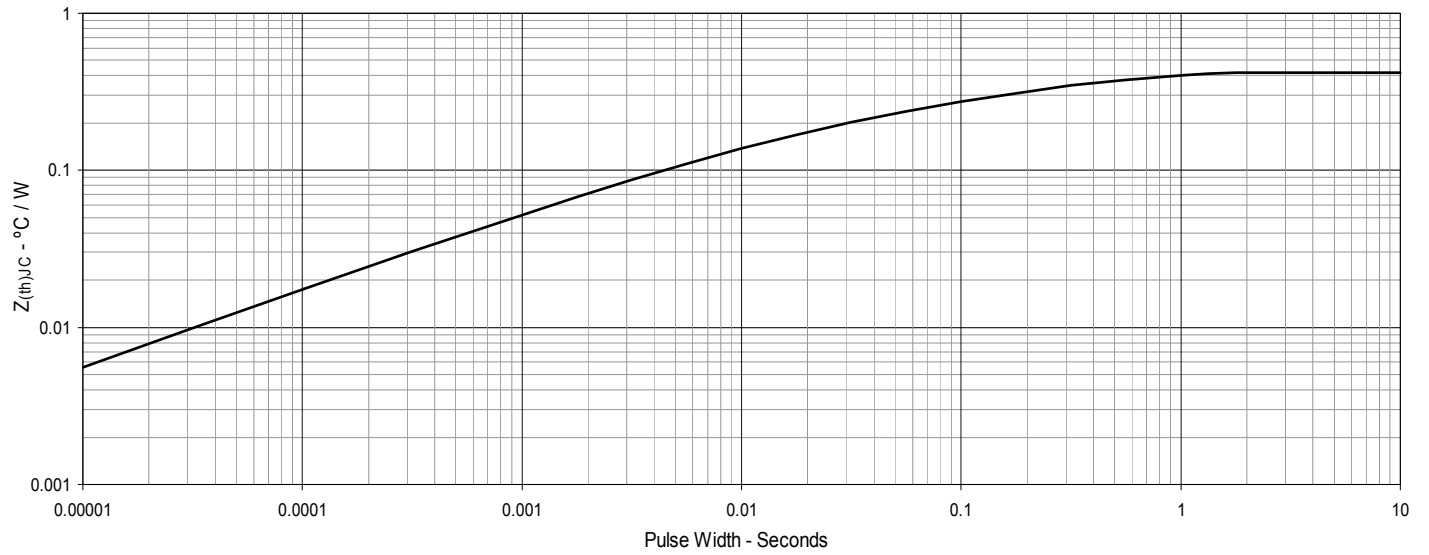


Fig. 19. Maximum Transient Thermal Impedance





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