

Trench™
Power MOSFETs

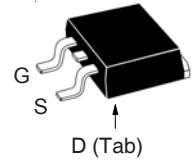
IXTA56N15T
IXTP56N15T

$V_{DSS} = 150V$
 $I_{D25} = 56A$
 $R_{DS(on)} \leq 36m\Omega$

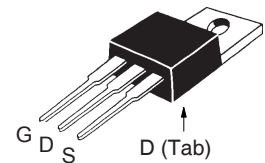
N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Rectifier



TO-263 AA (IXTA)



TO-220AB (IXTP)



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

| Symbol | Test Conditions | Maximum Ratings | |
|------------|--|-----------------|------------|
| V_{DSS} | $T_J = 25^\circ C$ to $175^\circ C$ | 150 | V |
| V_{DGR} | $T_J = 25^\circ C$ to $175^\circ C$, $R_{GS} = 1M\Omega$ | 150 | V |
| V_{GSS} | Continuous | ± 20 | V |
| V_{GSM} | Transient | ± 30 | V |
| I_{D25} | $T_C = 25^\circ C$ | 56 | A |
| I_{DM} | $T_C = 25^\circ C$, Pulse Width Limited by T_{JM} | 140 | A |
| I_A | $T_C = 25^\circ C$ | 5 | A |
| E_{AS} | $T_C = 25^\circ C$ | 500 | mJ |
| dv/dt | $I_S \leq I_{DM}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 175^\circ C$ | 3 | V/ns |
| P_D | $T_C = 25^\circ C$ | 300 | W |
| T_J | | -55 ... +175 | $^\circ C$ |
| T_{JM} | | 175 | $^\circ C$ |
| T_{stg} | | -55 ... +175 | $^\circ C$ |
| T_L | 1.6mm (0.062in.) from Case for 10s | 300 | $^\circ C$ |
| T_{sold} | Plastic Body for 10 seconds | 260 | $^\circ C$ |
| M_d | Mounting Torque (TO-220) | 1.13 / 10 | Nm/lb.in. |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |

Features

- International Standard Packages
- 175°C Operating Temperature
- High Current Handling Capability
- Avalanche Rated
- Fast Intrinsic Rectifier
- Dynamic dv/dt Rated
- Low $R_{DS(on)}$

Advantages

- Easy to Mount
- Space Savings
- High Power Density

Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- DC Choppers
- AC Motor Drives
- Uninterruptible Power Supplies
- High Speed Power Switching Applications

| Symbol | Test Conditions ($T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values | | |
|--------------|---|-----------------------|------|---------------|
| | | Min. | Typ. | Max. |
| BV_{DSS} | $V_{GS} = 0V$, $I_D = 250\mu A$ | 150 | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = 250\mu A$ | 3.0 | | 5.0 V |
| I_{GSS} | $V_{GS} = \pm 20V$, $V_{DS} = 0V$ | | | ± 100 nA |
| I_{DSS} | $V_{DS} = V_{DSS}$, $V_{GS} = 0V$ $T_J = 150^\circ C$ | | | 5 μA |
| | | | | 200 μA |
| $R_{DS(on)}$ | $V_{GS} = 10V$, $I_D = 0.5 \cdot I_{D25}$, Notes 1, 2 | | | 36 m Ω |

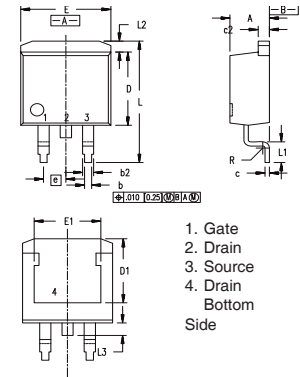
| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|--|-----------------------|------|-------------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $V_{DS} = 10\text{V}$, $I_D = 0.5 \cdot I_{D25}$, Note 1 | 23 | 39 | S |
| C_{iss} | $V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$ | | 2250 | pF |
| C_{oss} | | | 330 | pF |
| C_{rss} | | | 50 | pF |
| $t_{d(on)}$ | Resistive Switching Times $V_{GS} = 10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$ $R_G = 5\Omega$ (External) | | 16 | ns |
| t_r | | | 17 | ns |
| $t_{d(off)}$ | | | 43 | ns |
| t_f | | | 18 | ns |
| $Q_{g(on)}$ | $V_{GS} = 10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 25\text{A}$ | | 34 | nC |
| Q_{gs} | | | 10 | nC |
| Q_{gd} | | | 11 | nC |
| R_{thJC} | | | | 0.50 $^\circ\text{C/W}$ |
| R_{thCH} | TO-220 | 0.50 | | $^\circ\text{C/W}$ |

Source-Drain Diode

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|----------|--|-----------------------|------|-------|
| | | Min. | Typ. | Max. |
| I_S | $V_{GS} = 0\text{V}$ | | | 56 A |
| I_{SM} | Repetitive, Pulse width limited by T_{JM} | | | 160 A |
| V_{SD} | $I_F = 25\text{A}$, $V_{GS} = 0\text{V}$, Note 1 | | | 1.1 V |
| t_{rr} | $I_F = 25\text{A}$, $V_{GS} = 0\text{V}$ $-di/dt = 100\text{A}/\mu\text{s}$, $V_R = 50\text{V}$ | | 100 | ns |

- Notes: 1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
2. On through-hole packages, $R_{DS(on)}$ Kelvin test contact location must be 5mm or less from the package body.

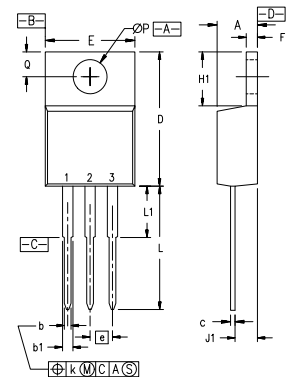
TO-263 Outline



- Gate
- Drain
- Source
- Drain Bottom Side

| 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 - 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 |

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 @ $T_J = 25^\circ\text{C}$

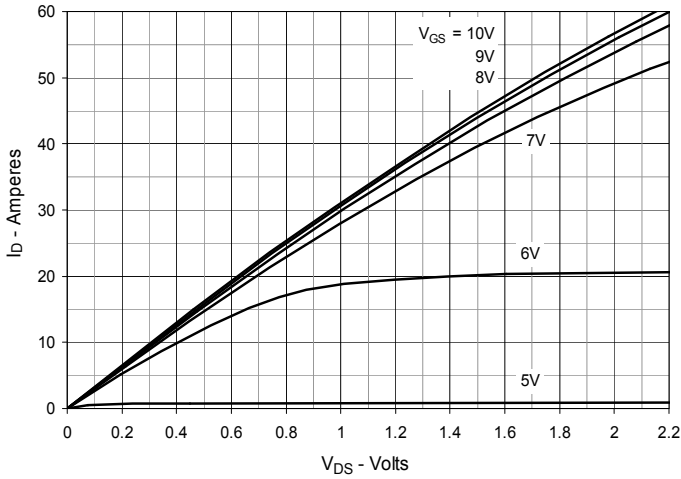


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

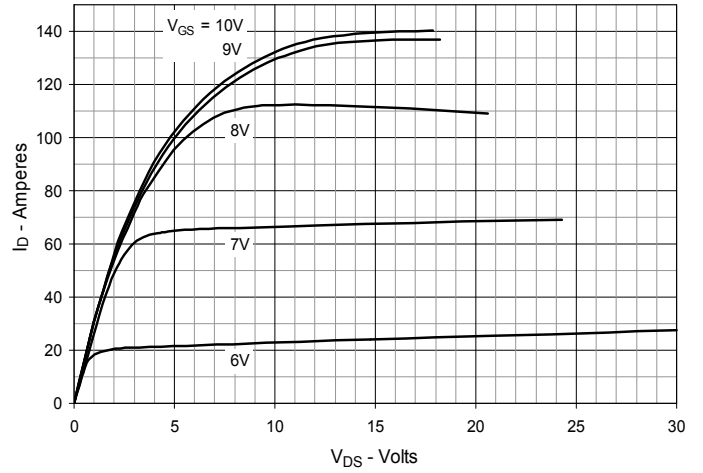


Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

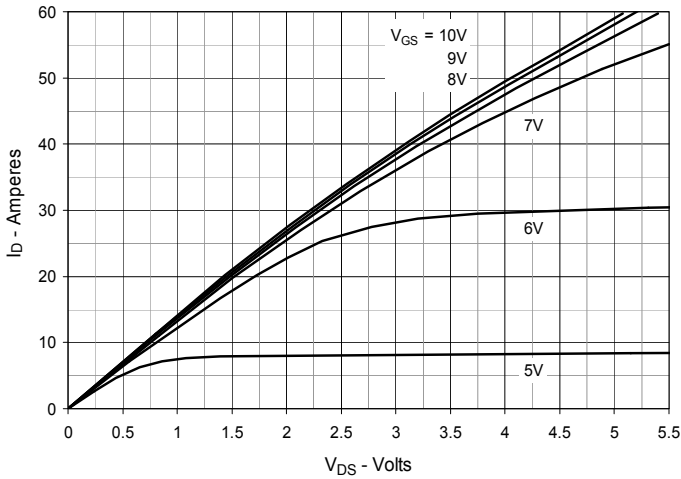


Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 28\text{A}$ Value vs. Junction Temperature

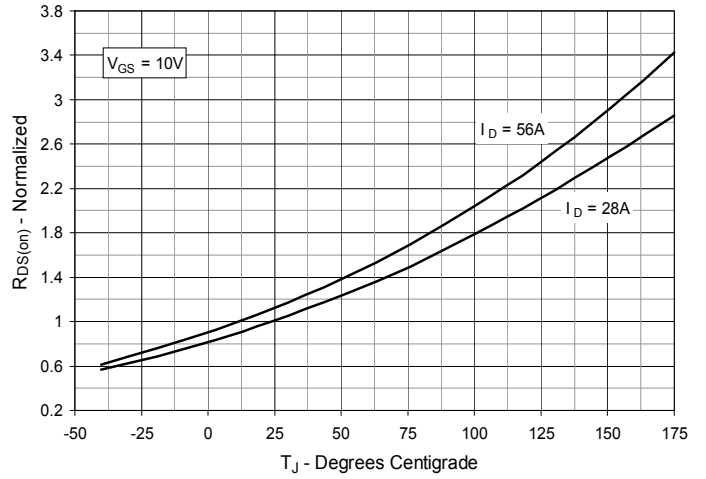


Fig. 5. $R_{DS(on)}$ Normalized to $I_D = 28\text{A}$ Value vs. Drain Current

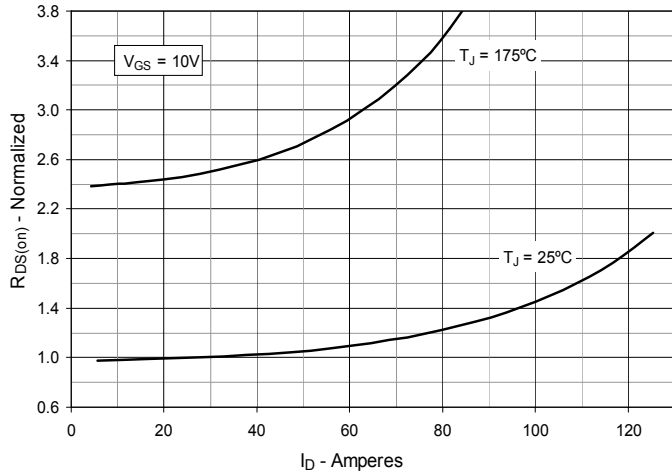


Fig. 6. Drain Current vs. Case Temperature

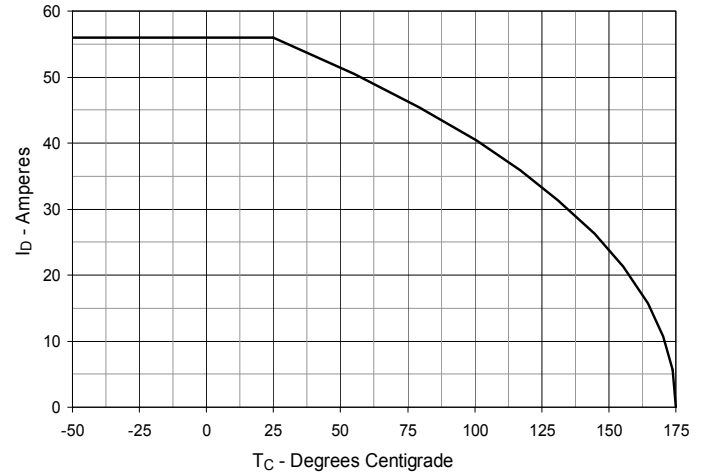


Fig. 7. Input Admittance

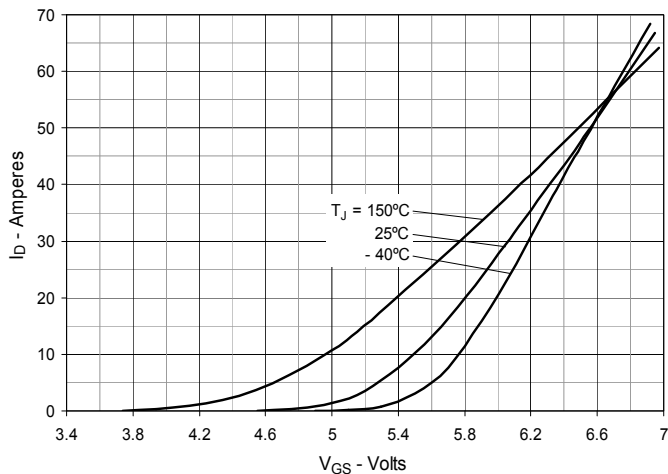


Fig. 8. Transconductance

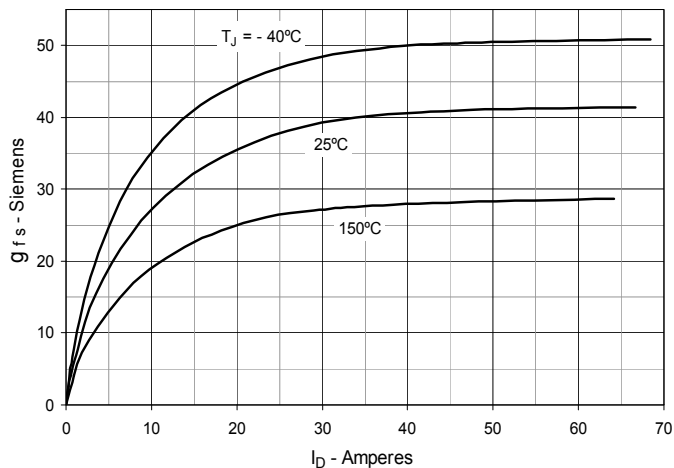


Fig. 9. Forward Voltage Drop of Intrinsic Diode

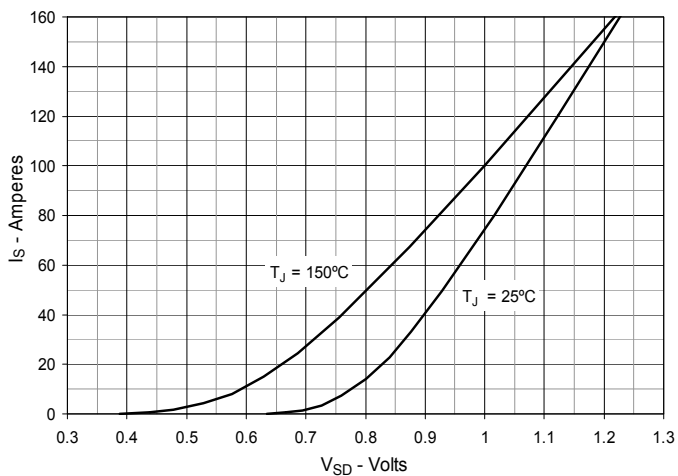


Fig. 10. Gate Charge

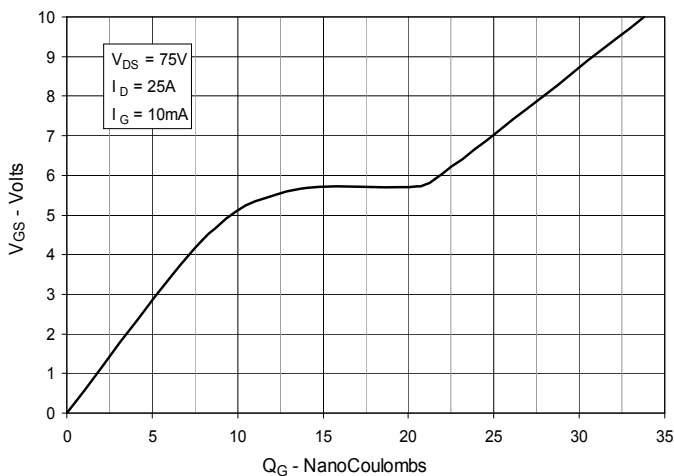


Fig. 11. Capacitance

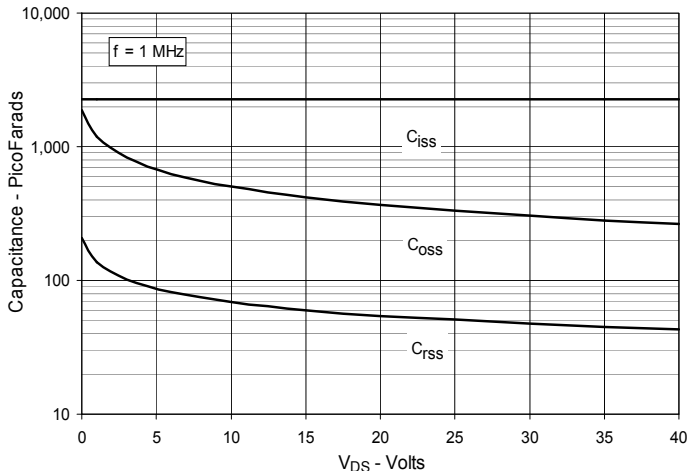
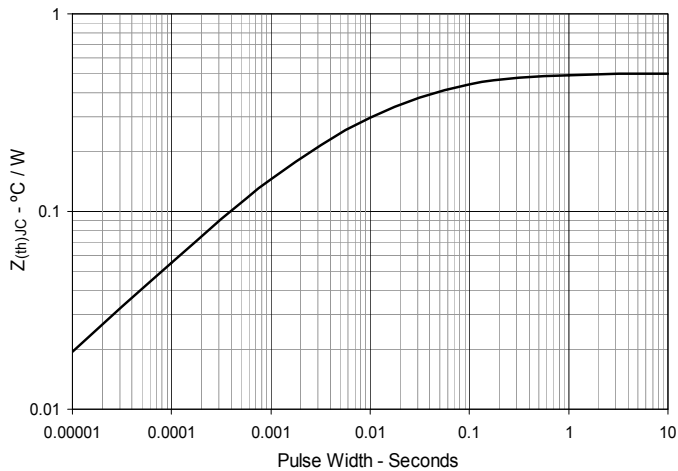
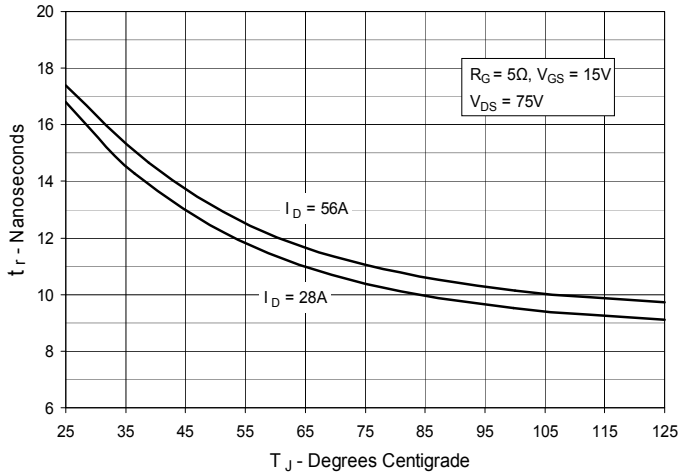


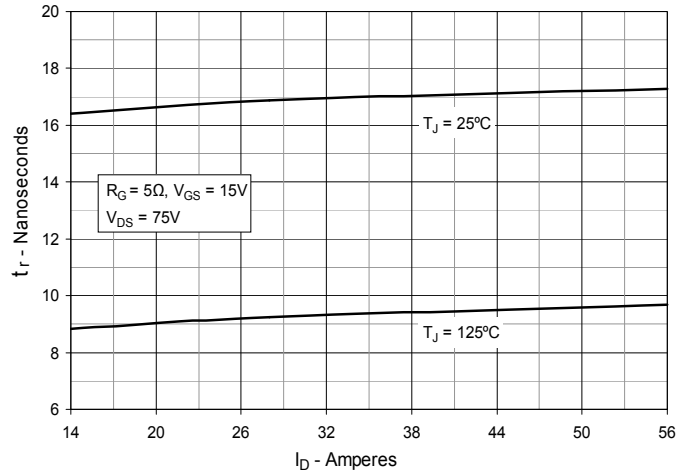
Fig. 12. Maximum Transient Thermal Impedance



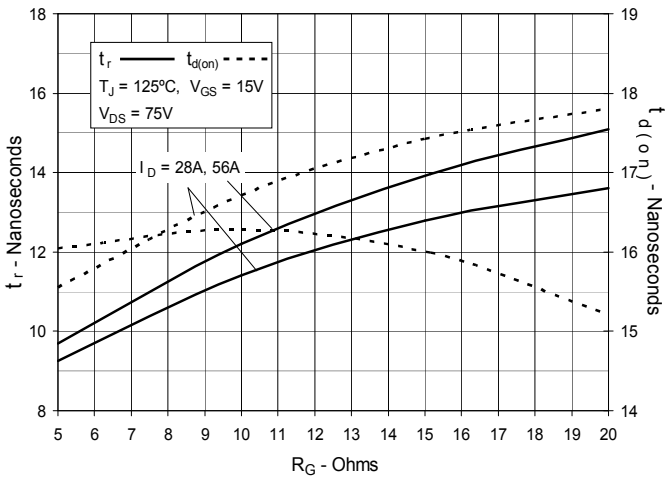
**Fig. 13. Resistive Turn-on
Rise Time vs. Junction Temperature**



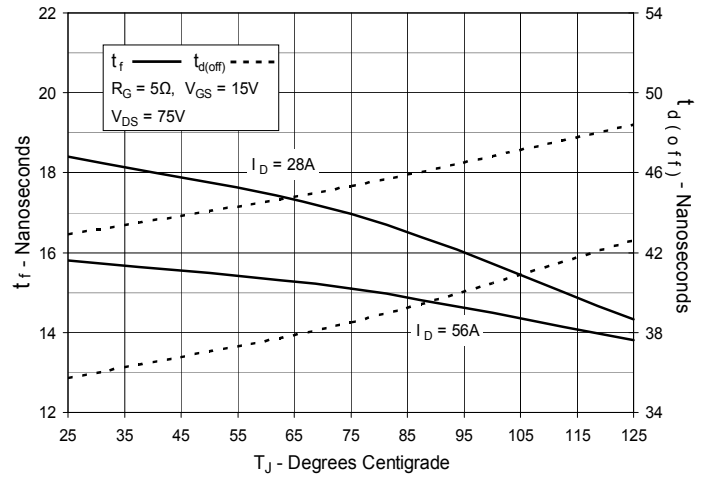
**Fig. 14. Resistive Turn-on
Rise Time vs. Drain Current**



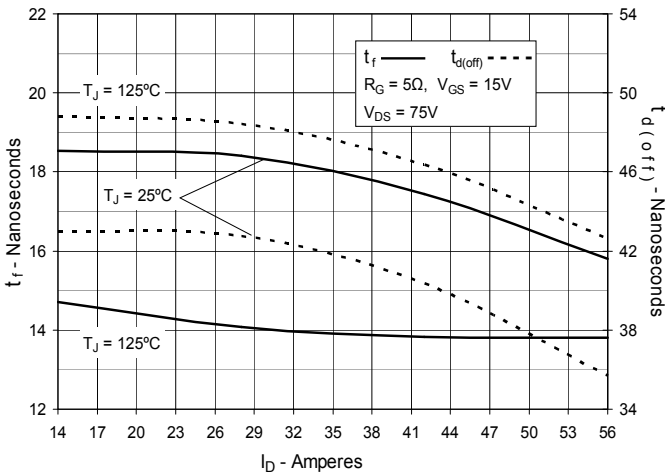
**Fig. 15. Resistive Turn-on
Switching Times vs. Gate Resistance**



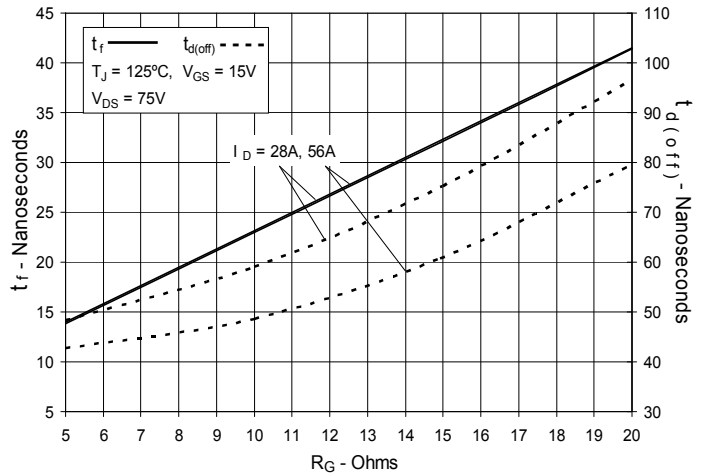
**Fig. 16. Resistive Turn-off
Switching Times vs. Junction Temperature**



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



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





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