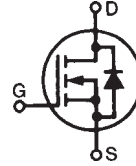


### TrenchT4™ Power MOSFET

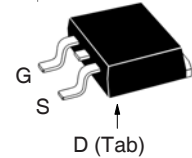
### IXTA270N04T4 IXTA270N04T4-7

$$\begin{aligned} V_{DSS} &= 40V \\ I_{D25} &= 270A \\ R_{DS(on)} &\leq 2.2m\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated

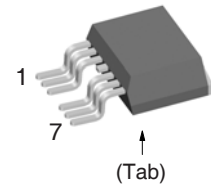


TO-263 AA



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

TO-263 (7-Leads)



Pins: 1 - Gate  
2, 3, 5, 6, 7 - Source  
4 (Tab) - Drain

| Symbol     | Test Conditions                                                       | Maximum Ratings   |                  |
|------------|-----------------------------------------------------------------------|-------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                       | 40                | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$ | 40                | V                |
| $V_{GSM}$  | Transient                                                             | $\pm 15$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                              | 270               | A                |
| $I_{LRMS}$ | Lead Current Limit, RMS                                               | 160               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$            | 800               | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                              | 135               | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                              | 750               | mJ               |
| $I_A$      | $T_C = 25^\circ\text{C}$                                              | 270               | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                              | 350               | mJ               |
| $P_D$      | $T_C = 25^\circ\text{C}$                                              | 375               | W                |
| $T_J$      |                                                                       | -55 ... +175      | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                       | 175               | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                       | -55 ... +175      | $^\circ\text{C}$ |
| $T_L$      | Maximum Lead Temperature for Soldering                                | 300               | $^\circ\text{C}$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s                                   | 260               | $^\circ\text{C}$ |
| $F_C$      | Mounting Force (TO-263)                                               | 10.65 / 2.2..14.6 | N/lb             |
| Weight     | TO-263                                                                | 2.5               | g                |
|            | TO-263 (7Leads)                                                       | 3.0               | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                |
|--------------|---------------------------------------------------------------------------|-----------------------|------|----------------|
|              |                                                                           | Min.                  | Typ. | Max.           |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                          | 40                    |      | V              |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                      | 2.0                   |      | 4.0 V          |
| $I_{GSS}$    | $V_{GS} = \pm 15V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 200$ nA   |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$                                        |                       |      | 5 $\mu A$      |
|              | $T_J = 150^\circ\text{C}$                                                 |                       |      | 750 $\mu A$    |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 50A$ , Note 1                                     |                       |      | 2.2 m $\Omega$ |

#### Features

- International Standard Packages
- $175^\circ\text{C}$  Operating Temperature
- High Current Handling Capability
- Avalanche Rated
- Low  $R_{DS(on)}$

#### Advantages

- Easy to Mount
- Space Savings
- High Power Density

#### Applications

- Synchronous Buck Converters
- High Current Switching Power Supplies
- Battery Powered Electric Motors
- Resonant-Mode Power Supplies
- Electronics Ballast Application
- Class D Audio Amplifiers

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                  | Characteristic Values |      |                         |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                              | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1                                                                                          | 90                    | 150  | S                       |
| $R_{Gi}$     | Gate Input Resistance                                                                                                                        |                       | 1.4  | $\Omega$                |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                             |                       | 9140 | pF                      |
| $C_{oss}$    |                                                                                                                                              |                       | 1450 | pF                      |
| $C_{rss}$    |                                                                                                                                              |                       | 980  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 135\text{A}$<br>$R_G = 2\Omega$ (External) |                       | 18   | ns                      |
| $t_r$        |                                                                                                                                              |                       | 28   | ns                      |
| $t_{d(off)}$ |                                                                                                                                              |                       | 72   | ns                      |
| $t_f$        |                                                                                                                                              |                       | 23   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                             |                       | 182  | nC                      |
| $Q_{gs}$     |                                                                                                                                              |                       | 45   | nC                      |
| $Q_{gd}$     |                                                                                                                                              |                       | 67   | nC                      |
| $R_{thJC}$   |                                                                                                                                              |                       |      | 0.40 $^\circ\text{C/W}$ |

#### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                            | Characteristic Values |      |        |
|----------|--------------------------------------------------------------------------------------------------------|-----------------------|------|--------|
|          |                                                                                                        | Min.                  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                   |                       |      | 270 A  |
| $I_{SM}$ | Repetitive, Pulse width limited by $T_{JM}$                                                            |                       |      | 1080 A |
| $V_{SD}$ | $I_F = 100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                    |                       |      | 1.4 V  |
| $t_{rr}$ | $I_F = 150\text{A}$ , $V_{GS} = 0\text{V}$<br>$-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 30\text{V}$ |                       | 48   | ns     |
| $I_{RM}$ |                                                                                                        |                       | 1.8  | A      |
| $Q_{RM}$ |                                                                                                        |                       | 43   | nC     |

- 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.

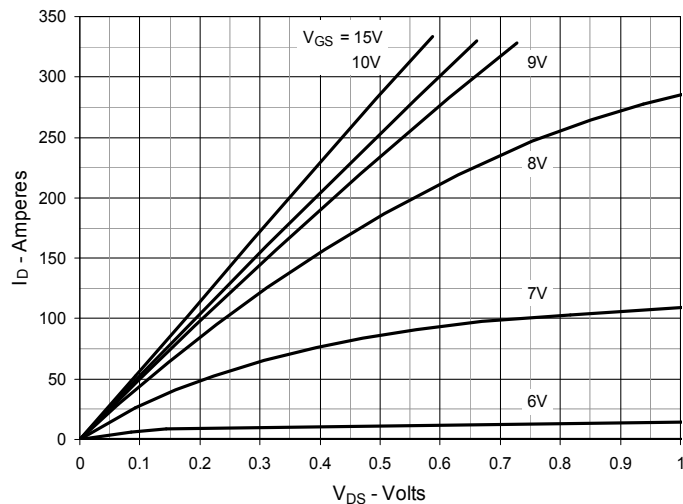
#### PRELIMINARY TECHNICAL INFORMATION

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.

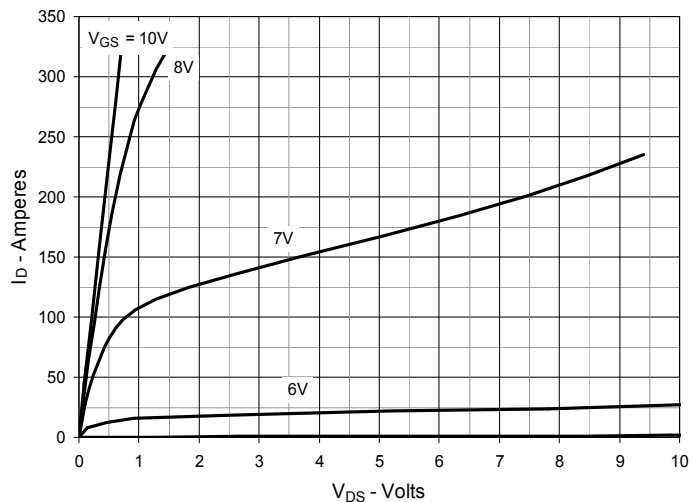
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    |             |

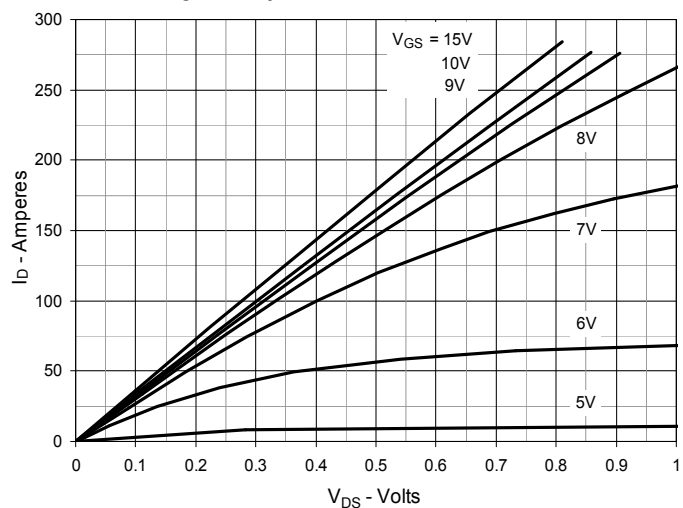
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



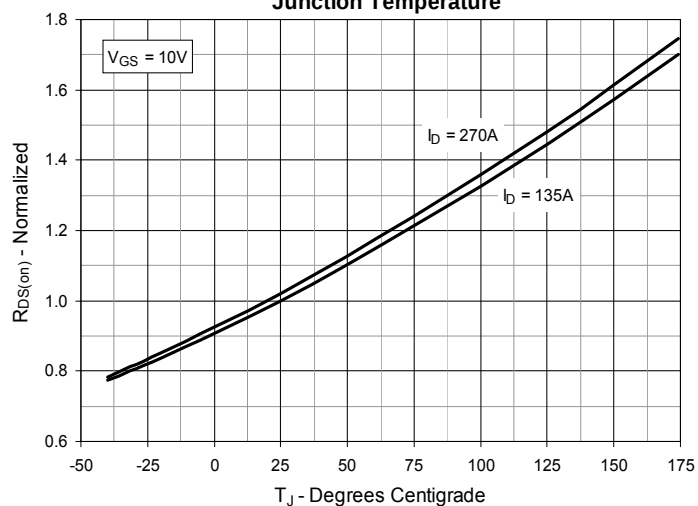
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



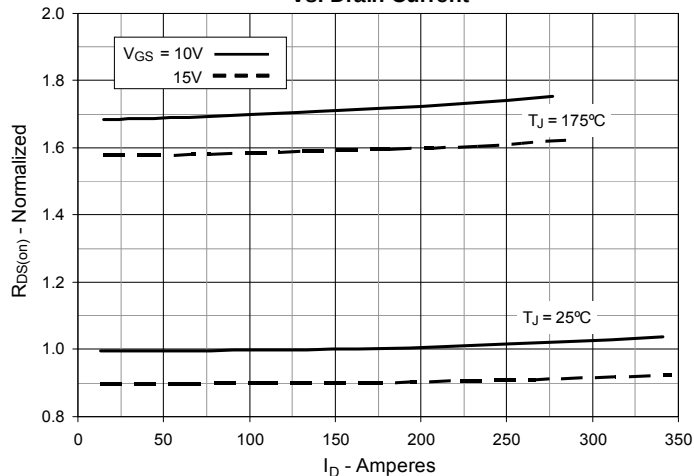
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



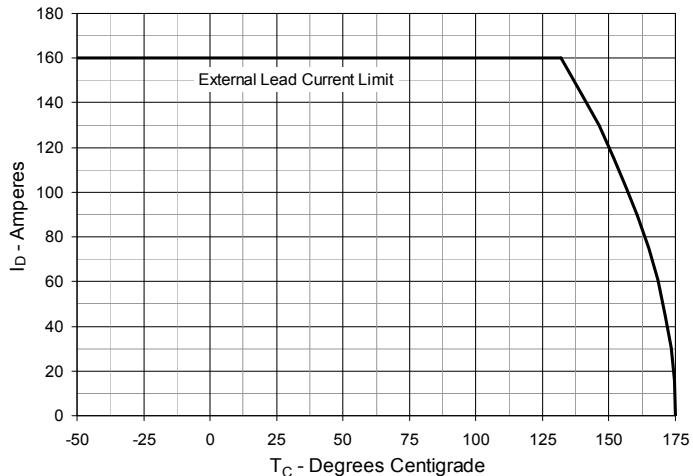
**Fig. 4. Normalized  $R_{DS(on)}$  to  $I_D = 135\text{A}$  Value vs. Junction Temperature**



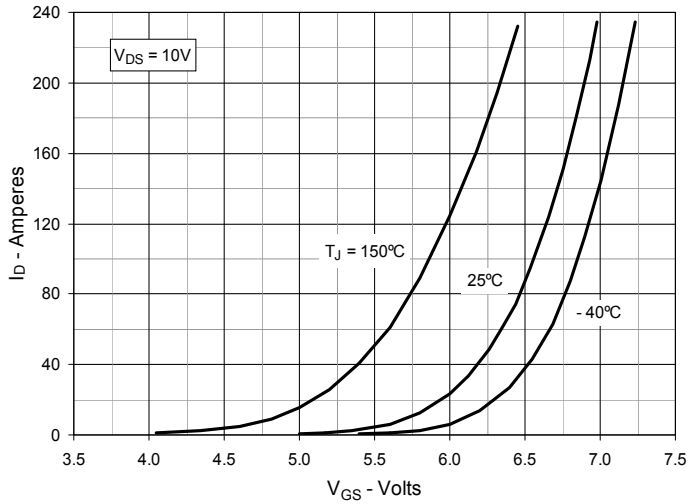
**Fig. 5. Normalized  $R_{DS(on)}$  to  $I_D = 135\text{A}$  vs. Drain Current**



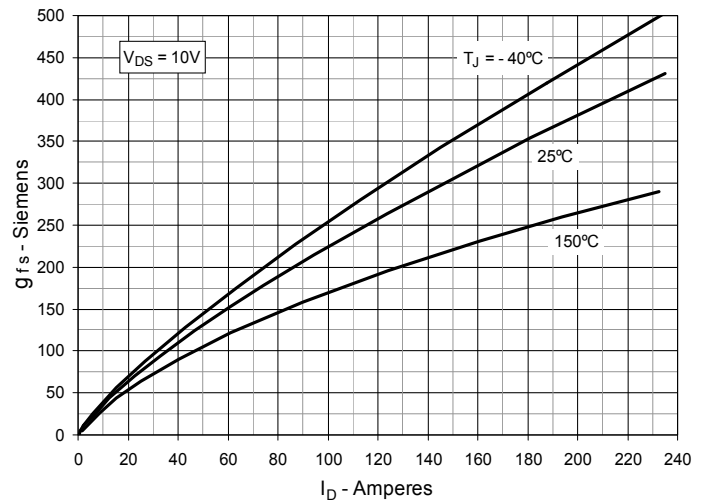
**Fig. 6. Drain Current vs. Case Temperature**



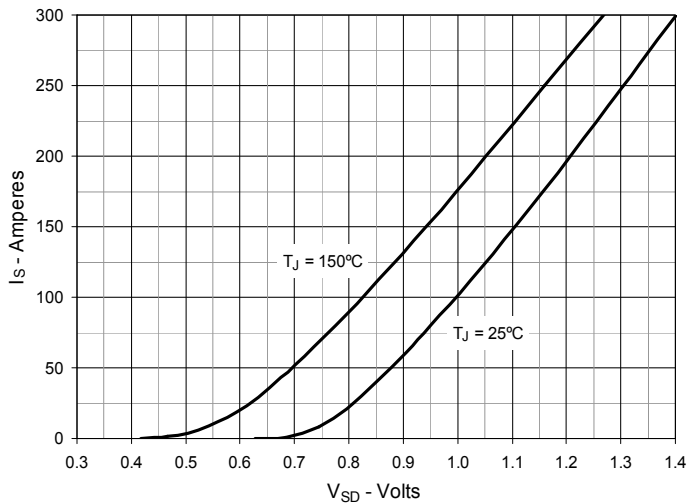
**Fig. 7. Input Admittance**



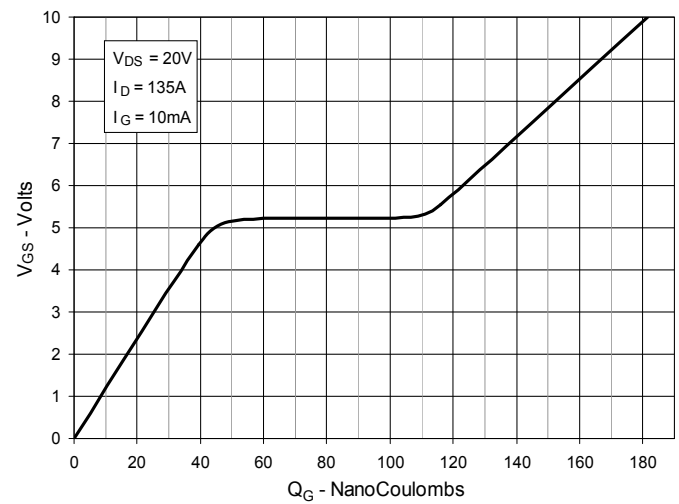
**Fig. 8. Transconductance**



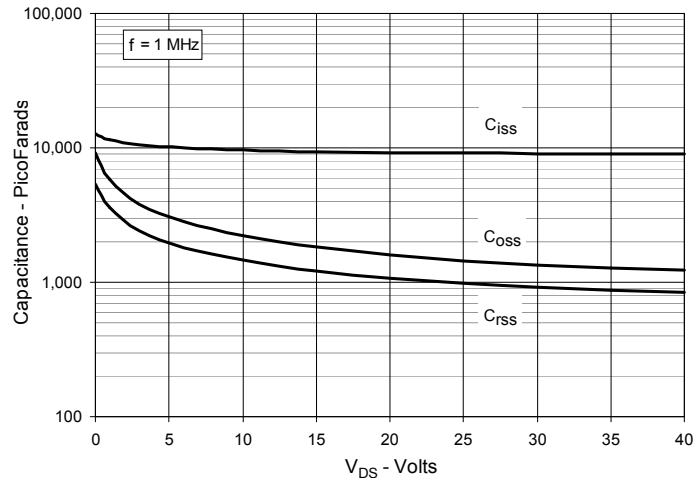
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



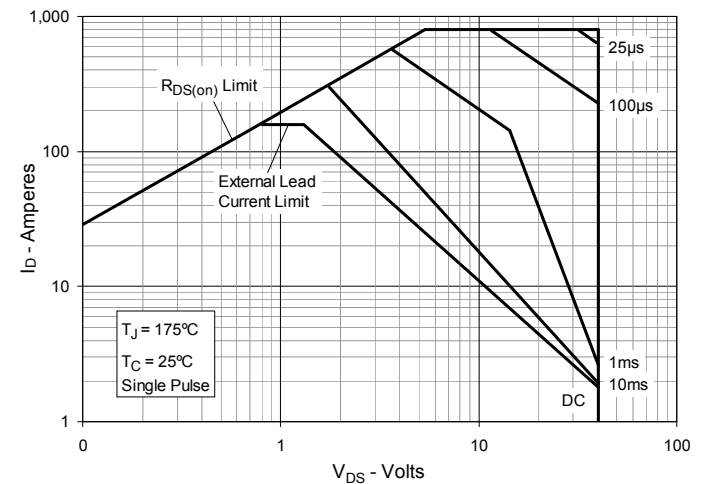
**Fig. 10. Gate Charge**



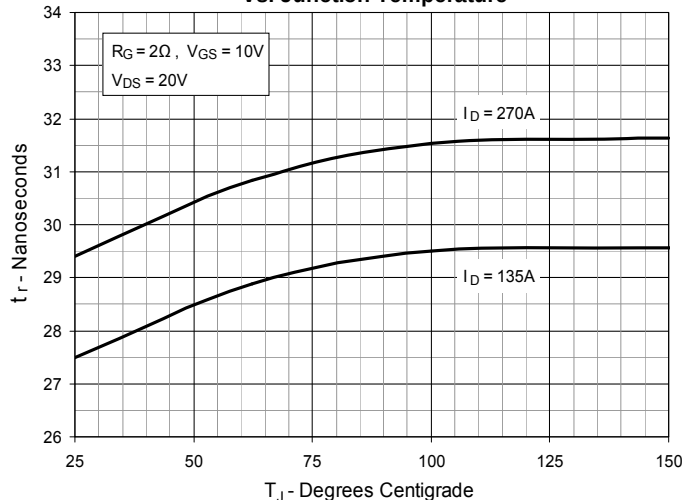
**Fig. 11. Capacitance**



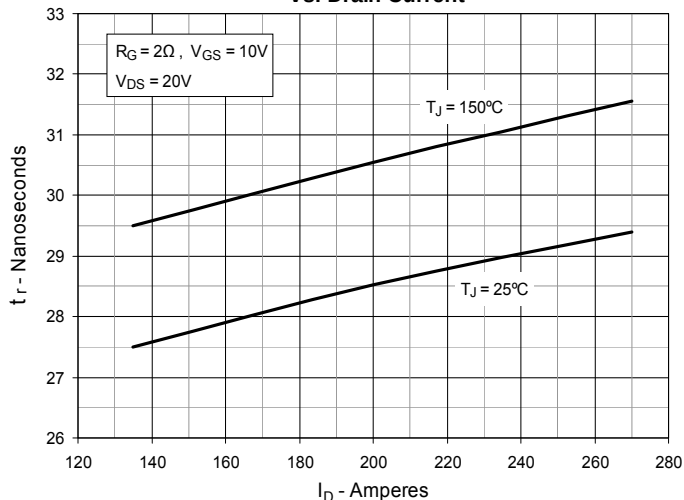
**Fig. 12. Forward-Bias Safe Operating Area**



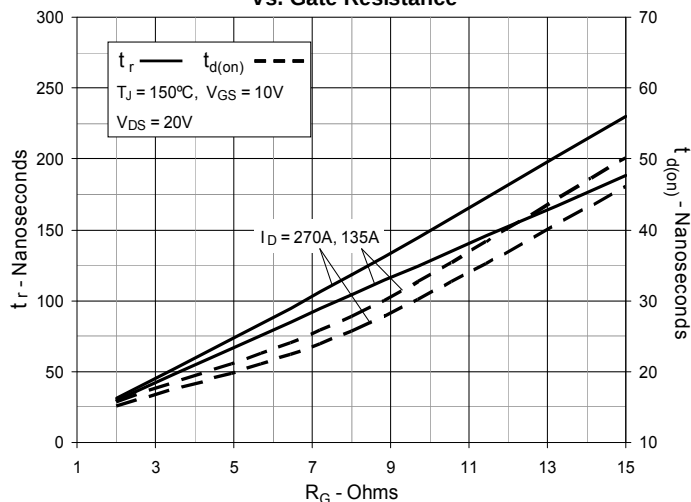
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



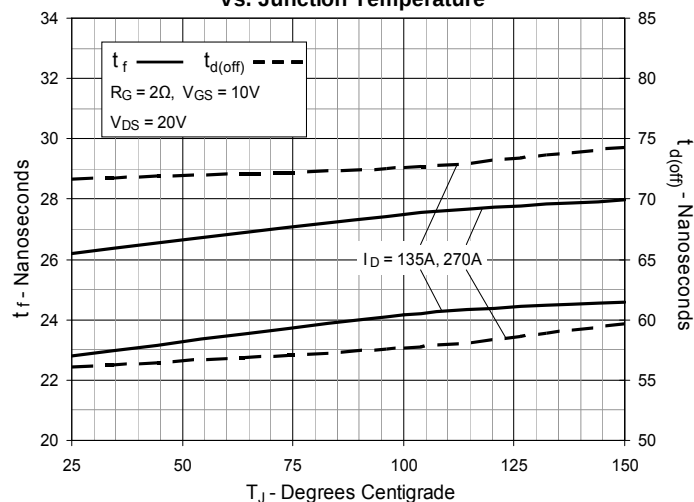
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



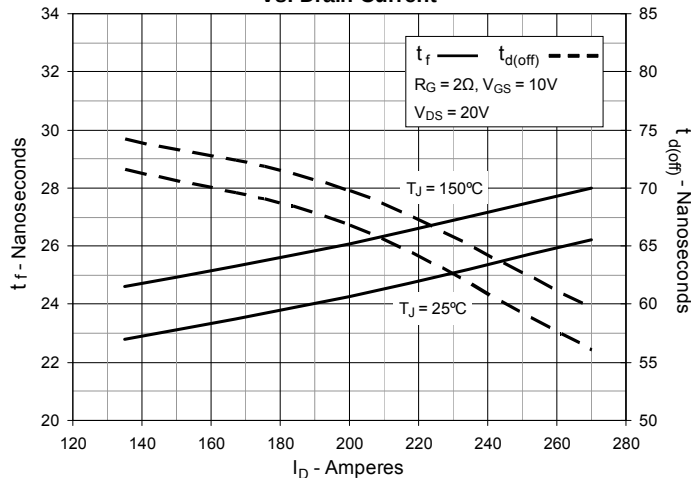
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

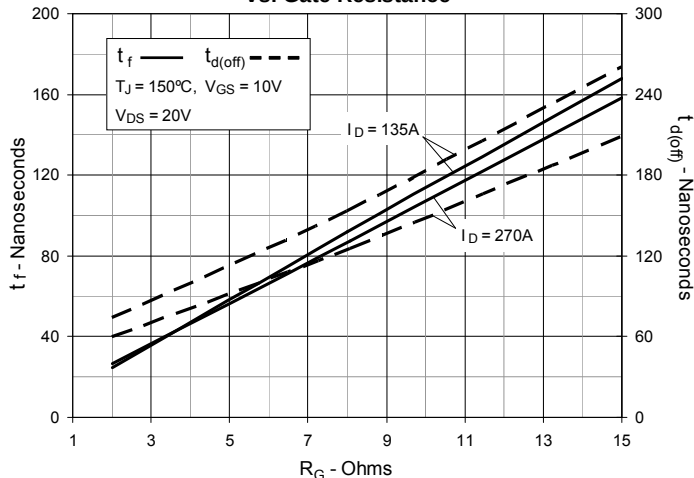
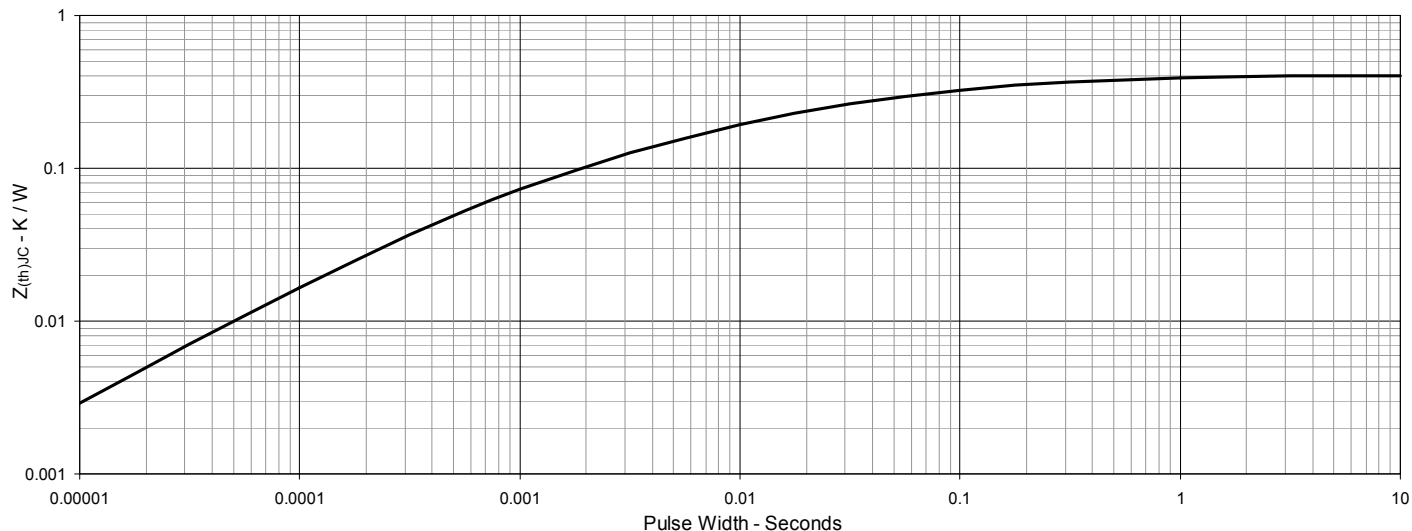
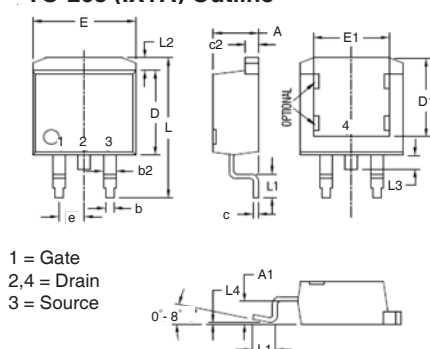


Fig. 19. Maximum Transient Thermal Impedance

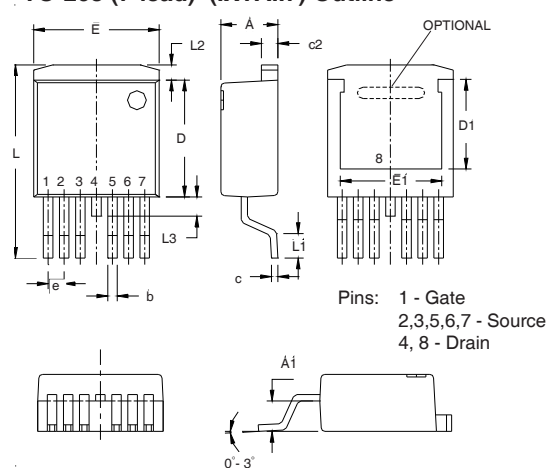


## TO-263 (IXTA) Outline



| 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-263 (7-lead) (IXTA..7) Outline



| SYM | INCHES   |      | MILLIMETER |       |
|-----|----------|------|------------|-------|
|     | MIN      | MAX  | MIN        | MAX   |
| A   | .170     | .185 | 4.30       | 4.70  |
| A1  | .085     | .104 | 2.15       | 2.65  |
| b   | .026     | .035 | 0.65       | 0.90  |
| c   | .016     | .024 | 0.40       | 0.60  |
| c2  | .049     | .055 | 1.25       | 1.40  |
| D   | .355     | .370 | 9.00       | 9.40  |
| D1  | .272     | .280 | 6.90       | 7.10  |
| E   | .386     | .402 | 9.80       | 10.20 |
| E1  | .311     | .319 | 7.90       | 8.10  |
| e   | .050 BSC |      | 1.27 BSC   |       |
| L   | .591     | .614 | 15.00      | 15.60 |
| L1  | .091     | .110 | 2.30       | 2.80  |
| L2  | .039     | .059 | 1.00       | 1.50  |
| L3  | .000     | .059 | 0.00       | 1.50  |



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