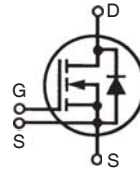


# TrenchT4™ Power MOSFET

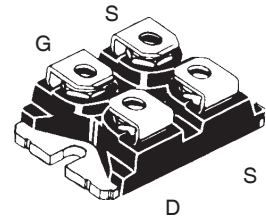
## IXTN660N04T4

$$\begin{aligned} V_{DSS} &= 40V \\ I_{D25} &= 660A \\ R_{DS(on)} &\leq 0.85m\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



miniBLOC, SOT-227  
E153432



G = Gate  
S = Source  
D = Drain

Either Source Terminal S can be used as the Source Terminal or the Kelvin Source ( Gate Return ) Terminal.

| 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                    |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$ (Chip Capability)                            | 660                          | A                    |
| $I_{L(RMS)}$ | External Lead Current Limit                                           | 200                          | A                    |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$            | 1800                         | A                    |
| $I_A$        | $T_C = 25^\circ\text{C}$                                              | 330                          | A                    |
| $E_{AS}$     | $T_C = 25^\circ\text{C}$                                              | 5                            | J                    |
| $P_D$        | $T_C = 25^\circ\text{C}$                                              | 1040                         | W                    |
| $T_J$        |                                                                       | -55 ... +175                 | $^\circ\text{C}$     |
| $T_{JM}$     |                                                                       | 175                          | $^\circ\text{C}$     |
| $T_{stg}$    |                                                                       | -55 ... +175                 | $^\circ\text{C}$     |
| $V_{ISOL}$   | 50/60 Hz, RMS<br>$I_{ISOL} \leq 1\text{mA}$                           | t = 1 minute<br>t = 1 second | 2500 V~<br>3000 V~   |
| $M_d$        | Mounting Torque<br>Terminal Connection Torque                         | 1.5/13<br>1.3/11.5           | Nm/lb.in<br>Nm/lb.in |
| Weight       |                                                                       | 30                           | g                    |

### Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- $175^\circ\text{C}$  Operating Temperature
- Isolation Voltage 2500 V~
- High Current Handling Capability
- Fast Intrinsic Diode
- Avalanche Rated
- Low  $R_{DS(on)}$

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- DC-DC Converters and Off-Line UPS
- Primary-Side Switch
- High Speed Power Switching Applications

| Symbol       | Test Conditions                                                | Characteristic Values |                      |
|--------------|----------------------------------------------------------------|-----------------------|----------------------|
|              | $(T_J = 25^\circ\text{C}, \text{ Unless Otherwise Specified})$ | Min.                  | Typ.                 |
| $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                                  | 40                    |                      |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$                              | 2.0                   | 4.0                  |
| $I_{GSS}$    | $V_{GS} = \pm 15V, V_{DS} = 0V$                                |                       | $\pm 200$ nA         |
| $I_{DSS}$    | $V_{DS} = V_{DSS}, V_{GS} = 0V$<br>$T_J = 150^\circ\text{C}$   |                       | 10 $\mu A$<br>1.5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 100A, \text{ Note 1}$                     |                       | 0.85 m $\Omega$      |

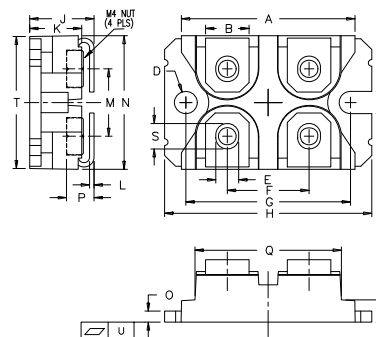
| Symbol       | Test Conditions<br>( $T_J = 25^{\circ}\text{C}$ , Unless Otherwise Specified)                                                                      | Characteristic Values |       |                      |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------|----------------------|
|              |                                                                                                                                                    | Min.                  | Typ.  | Max.                 |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1                                                                                                | 110                   | 180   | S                    |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 44.0  | nF                   |
| $C_{oss}$    |                                                                                                                                                    |                       | 6.5   | nF                   |
| $C_{rss}$    |                                                                                                                                                    |                       | 3.5   | nF                   |
| $R_{GI}$     | Gate Input Resistance                                                                                                                              |                       | 2.5   | $\Omega$             |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{DSS}$<br>$R_G = 1\Omega$ (External) |                       | 40    | ns                   |
| $t_r$        |                                                                                                                                                    |                       | 430   | ns                   |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 386   | ns                   |
| $t_f$        |                                                                                                                                                    |                       | 260   | ns                   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{DSS}$                                                                   |                       | 860   | nC                   |
| $Q_{gs}$     |                                                                                                                                                    |                       | 240   | nC                   |
| $Q_{gd}$     |                                                                                                                                                    |                       | 290   | nC                   |
| $R_{thJC}$   |                                                                                                                                                    |                       | 0.144 | $^{\circ}\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                    | 0.05                  |       | $^{\circ}\text{C/W}$ |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^{\circ}\text{C}$ , Unless Otherwise Specified)                          | Characteristic Values |      |        |
|----------|--------------------------------------------------------------------------------------------------------|-----------------------|------|--------|
|          |                                                                                                        | Min.                  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                   |                       |      | 660 A  |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                            |                       |      | 2640 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>$V_R = 30\text{V}$ |                       | 60   | ns     |
| $I_{RM}$ |                                                                                                        |                       | 2.1  | A      |
| $Q_{RM}$ |                                                                                                        |                       | 63   | nC     |

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

## SOT-227B (IXTN) Outline



(M4 screws (4x) supplied)

| SYM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 1.240  | 1.255 | 31.50       | 31.88 |
| B   | .307   | .323  | 7.80        | 8.20  |
| C   | .161   | .169  | 4.09        | 4.29  |
| D   | .161   | .169  | 4.09        | 4.29  |
| E   | .161   | .169  | 4.09        | 4.29  |
| F   | .587   | .595  | 14.91       | 15.11 |
| G   | 1.186  | 1.193 | 30.12       | 30.30 |
| H   | 1.496  | 1.505 | 38.00       | 38.23 |
| J   | .460   | .481  | 11.68       | 12.22 |
| K   | .351   | .378  | 8.92        | 9.60  |
| L   | .030   | .033  | 0.76        | 0.84  |
| M   | .496   | .506  | 12.60       | 12.85 |
| N   | .990   | 1.001 | 25.15       | 25.42 |
| O   | .078   | .084  | 1.98        | 2.13  |
| P   | .195   | .235  | 4.95        | 5.97  |
| Q   | 1.045  | 1.059 | 26.54       | 26.90 |
| R   | .155   | .174  | 3.94        | 4.42  |
| S   | .186   | .191  | 4.72        | 4.85  |
| T   | .968   | .987  | 24.59       | 25.07 |
| U   | -.002  | .004  | -0.05       | 0.1   |

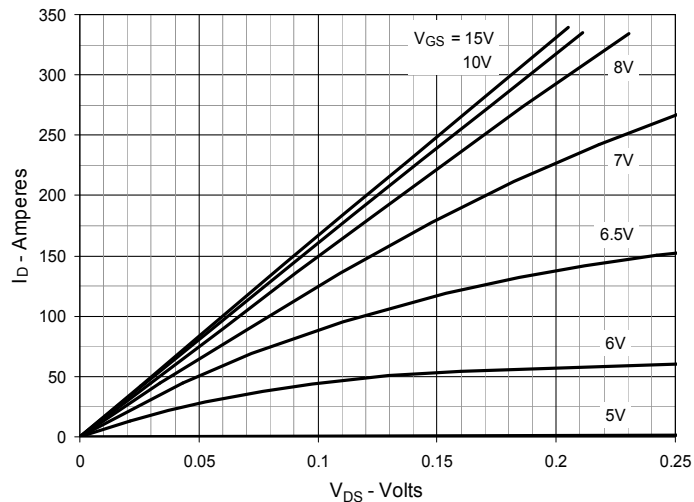
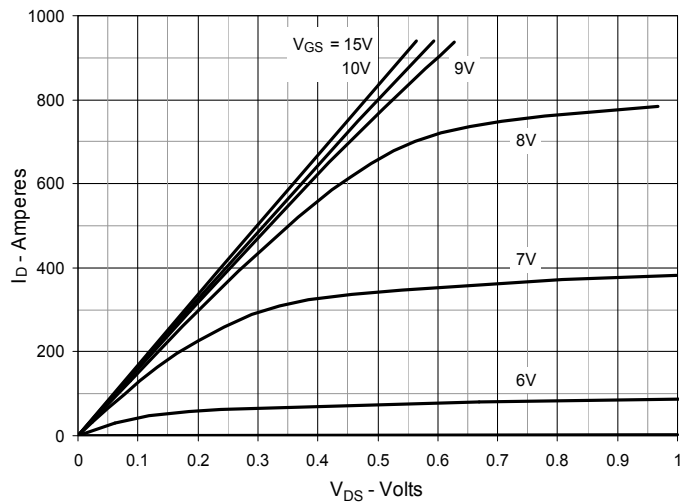
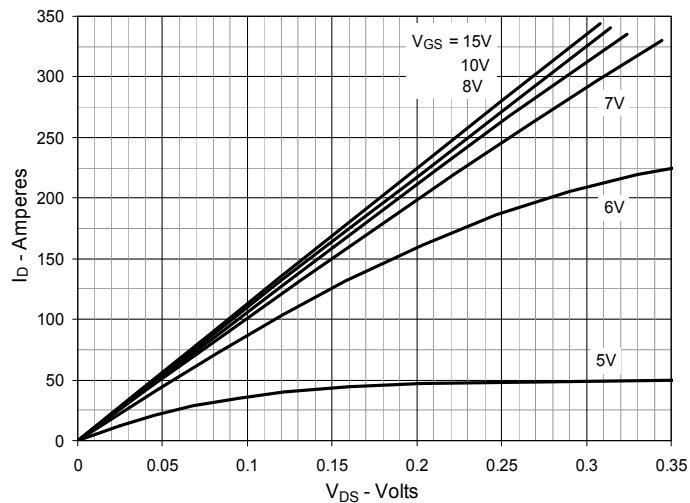
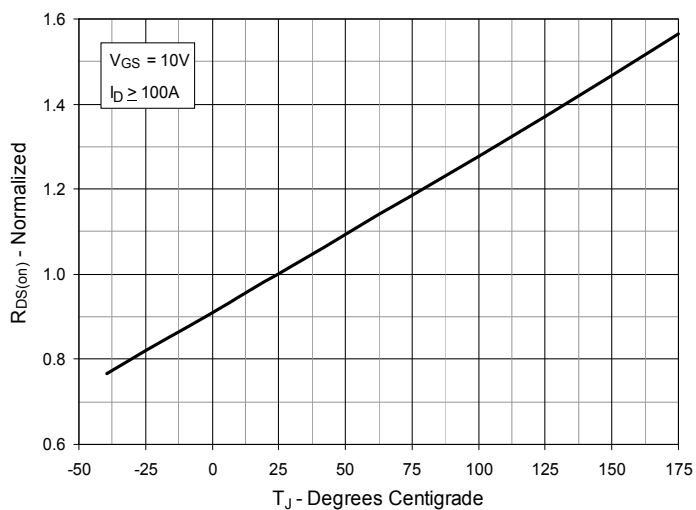
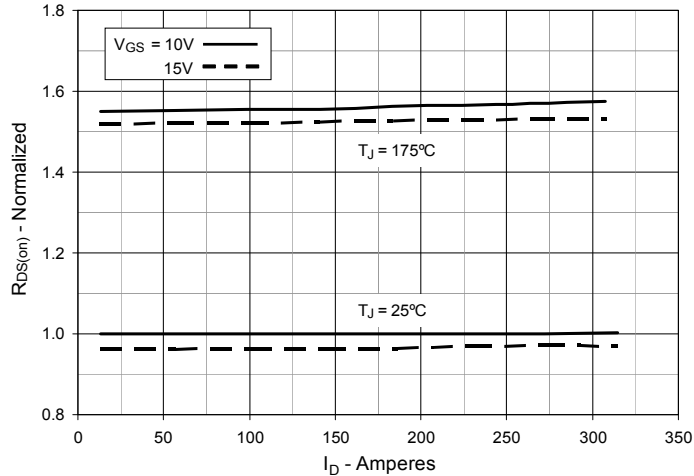
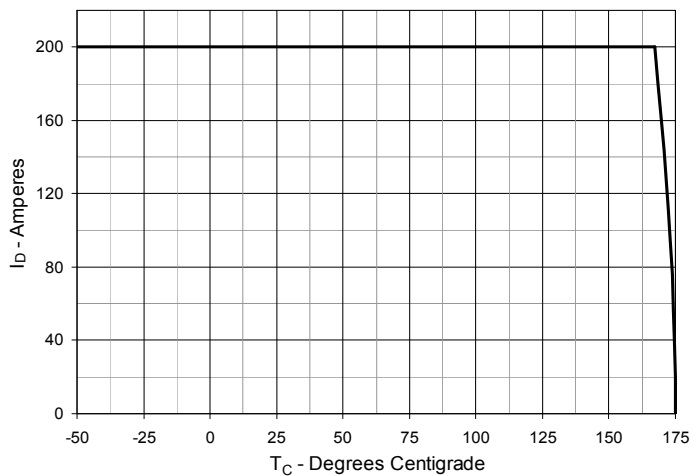
## ADVANCE TECHNICAL INFORMATION

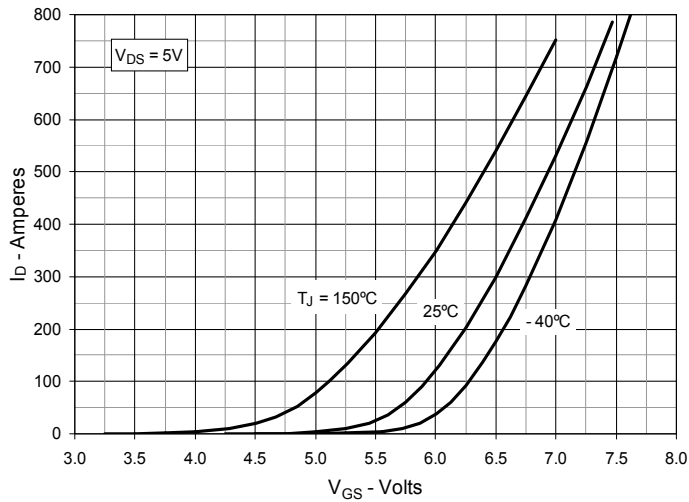
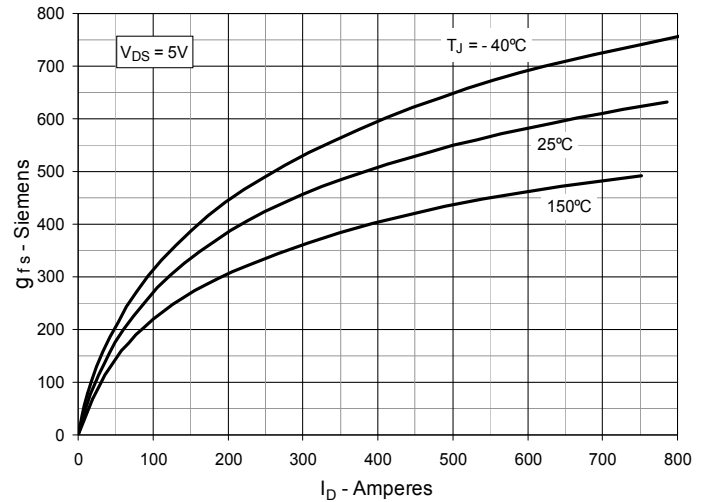
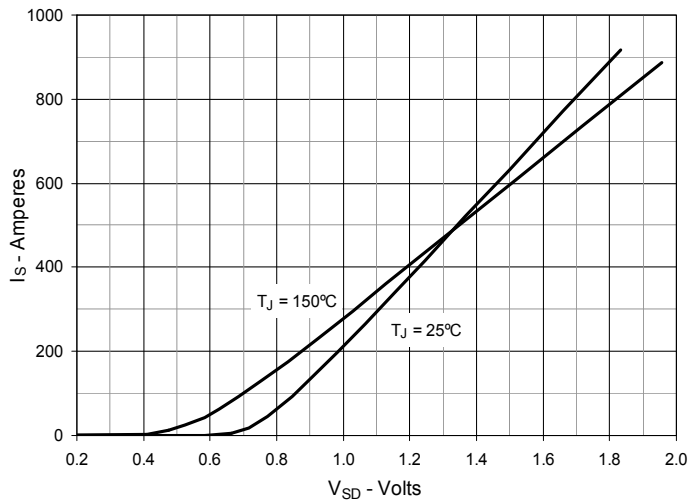
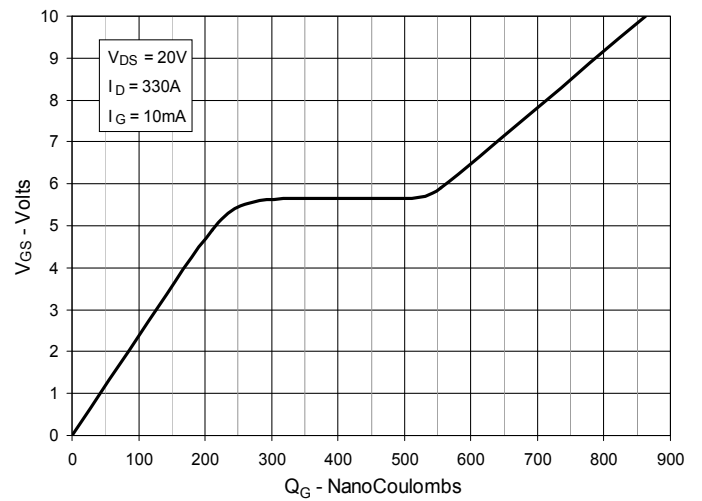
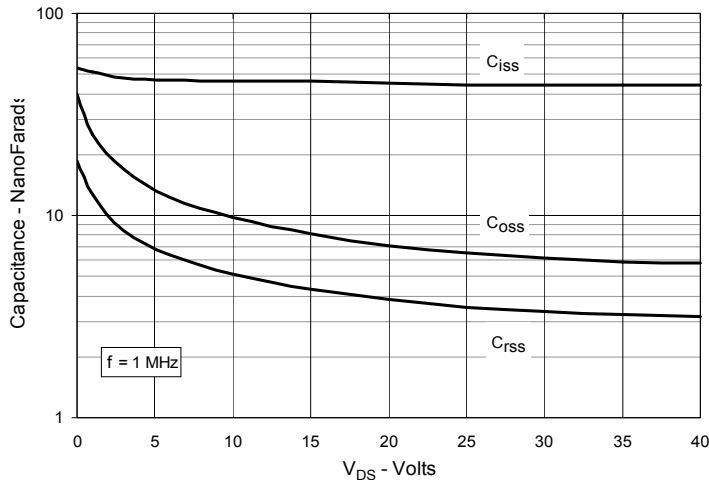
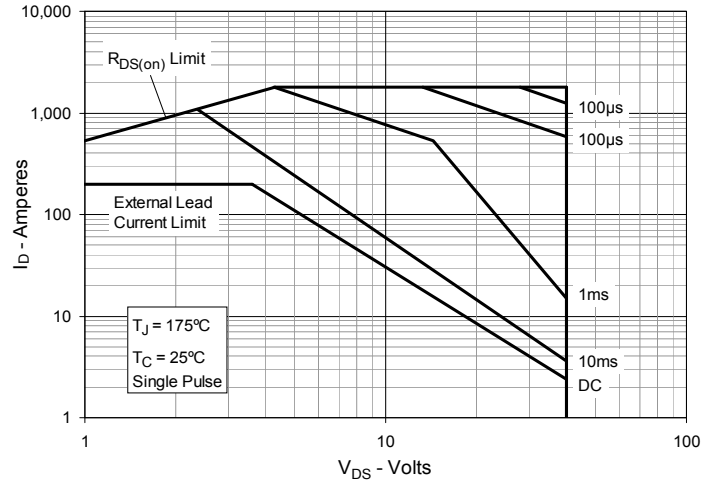
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

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

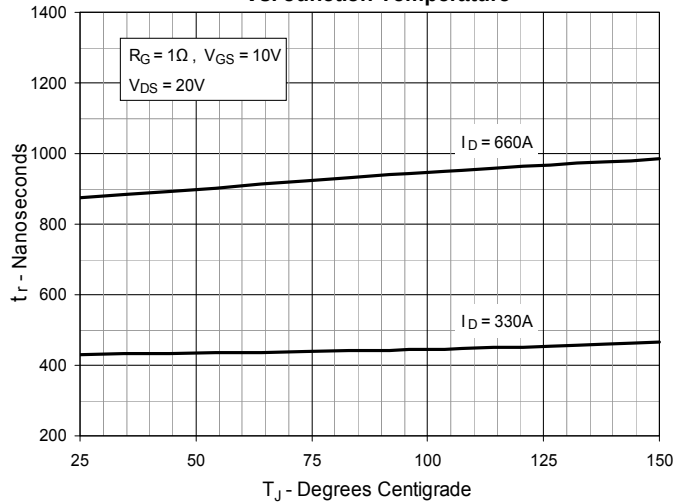
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

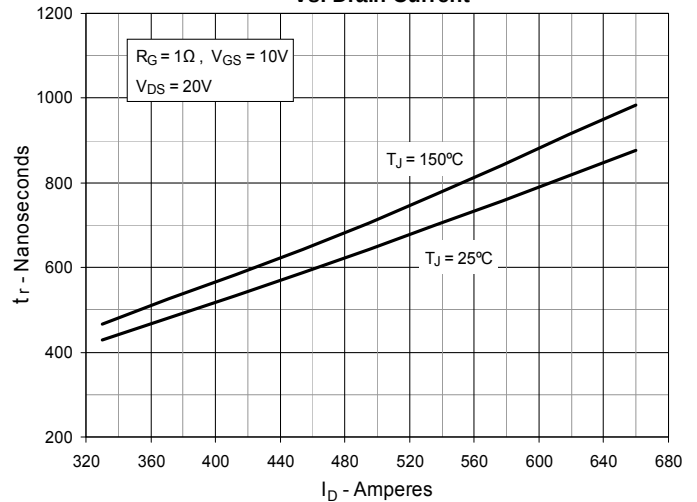
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

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

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

**Fig. 4. Normalized  $R_{DS(on)}$  vs. Junction Temperature**

**Fig. 5. Normalized  $R_{DS(on)}$  to  $I_D = 100\text{A}$  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**


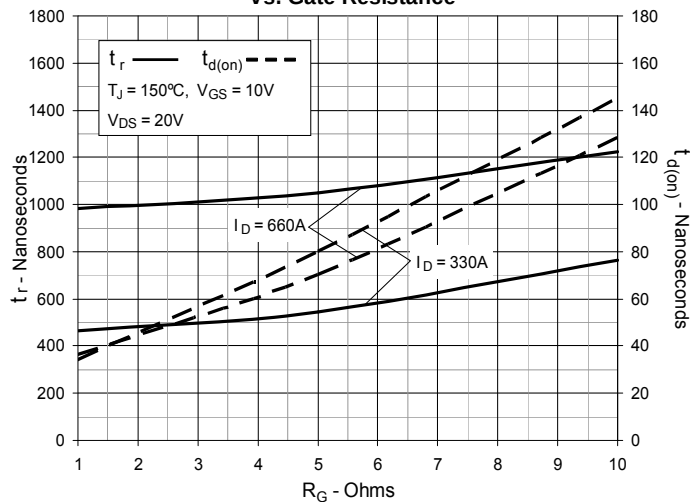
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



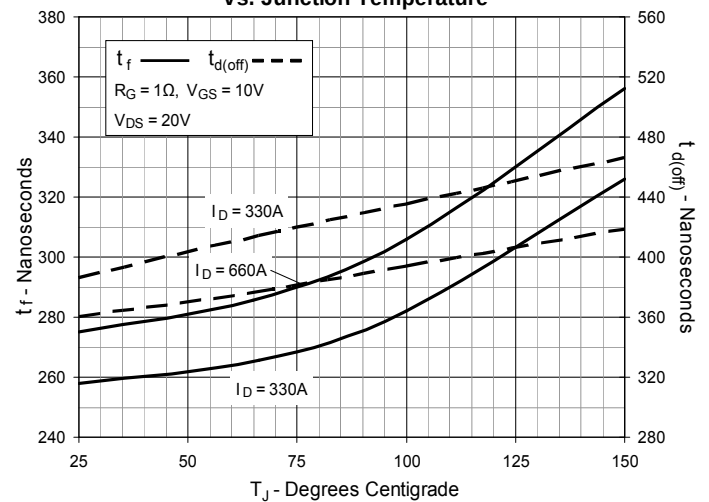
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



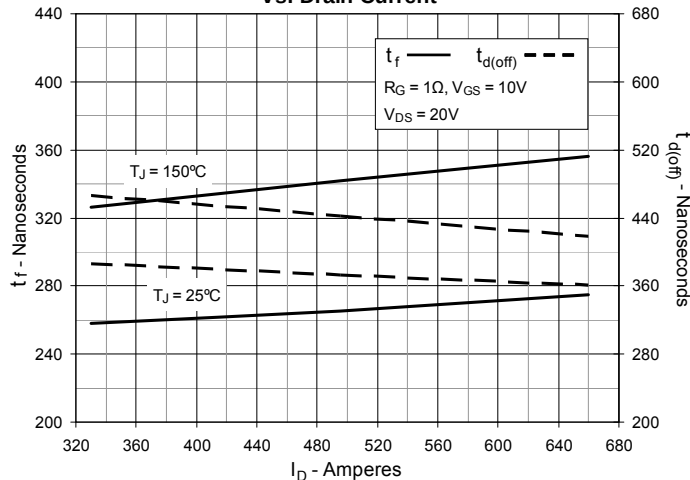
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

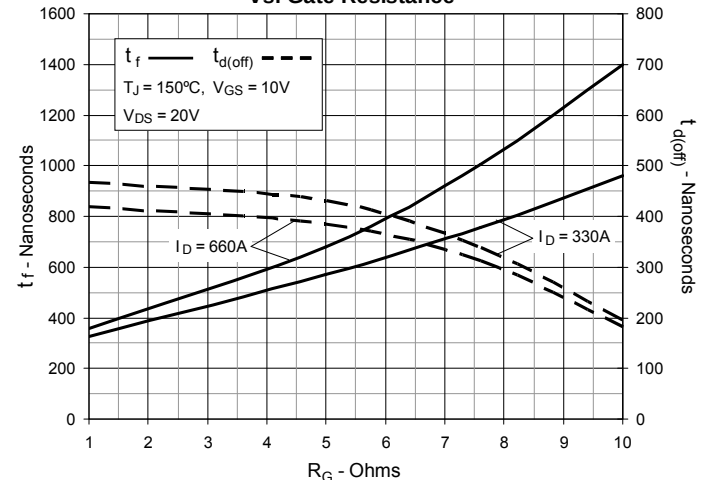
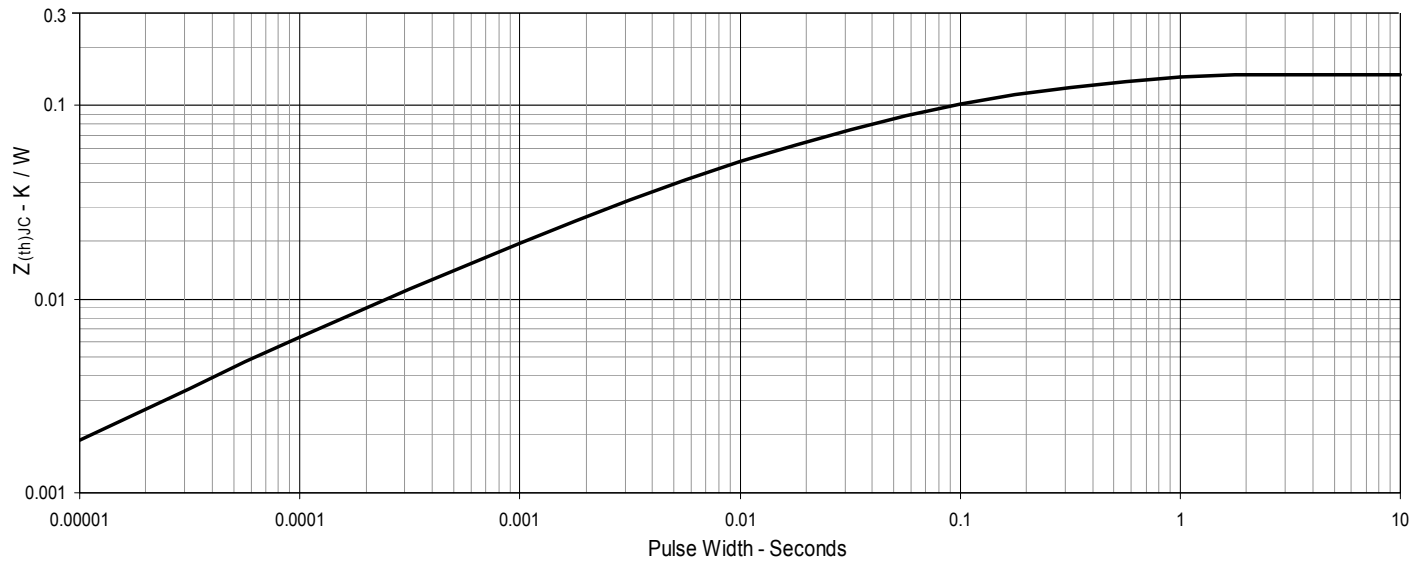


Fig. 19. Maximum Transient Thermal Impedance





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