

# High Voltage Power MOSFET

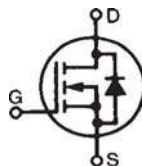
## IXTH04N300P3HV

$$V_{DSS} = 3000V$$

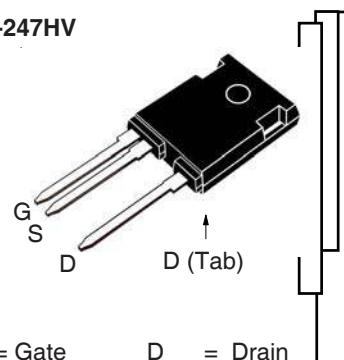
$$I_{D25} = 0.40A$$

$$R_{DS(on)} \leq 190\Omega$$

N-Channel Enhancement Mode



TO-247HV



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

| Symbol        | Test Conditions   | Maximum Ratings |                  |
|---------------|---|-----------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                       | 3000            | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$ | 3000            | V                |
| $V_{GSS}$     | Continuous  | $\pm 20$        | V                |
| $V_{GSM}$     | Transient   | $\pm 30$        | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$  | 0.40            | A                |
| $I_{D110}$    | $T_C = 110^\circ\text{C}$   | 0.24            | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$            | 0.80            | A                |
| $P_D$         | $T_C = 25^\circ\text{C}$  | 104             | W                |
| $T_J$         |   | - 55 ... +150   | $^\circ\text{C}$ |
| $T_{JM}$      |   | 150             | $^\circ\text{C}$ |
| $T_{stg}$     |   | - 55 ... +150   | $^\circ\text{C}$ |
| $T_L$         | Maximum Lead Temperature for Soldering                                | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$    | 1.6 mm (0.062in.) from Case for 10s                                   | 260             | $^\circ\text{C}$ |
| $M_d$         | Mounting Torque   | 1.13/10         | Nm/lb.in         |
| <b>Weight</b> |   | 6               | g                |

### Features

- High Blocking Voltage
- High Voltage Package

### Advantages

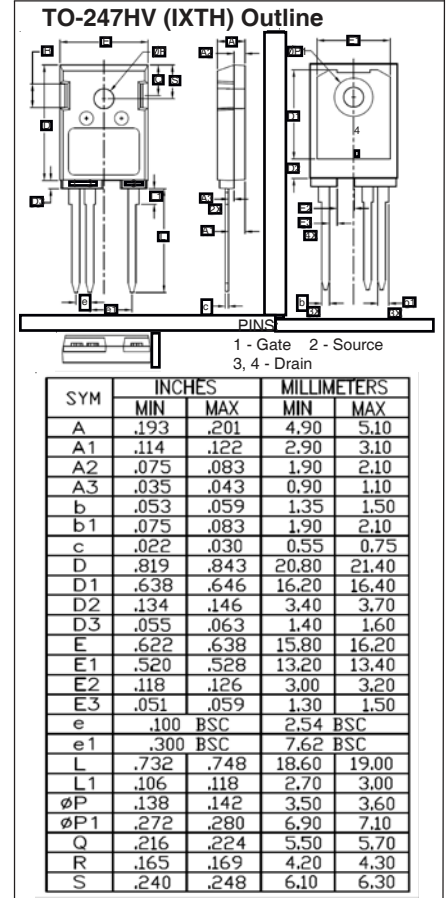
- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High Voltage Power Supplies
- Capacitor Discharge Applications
- Pulse Circuits
- Laser and X-Ray Generation Systems

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                                       |
|--------------|---|-----------------------|------|---------------------------------------|
|              |   | Min.                  | Typ. | Max.                                  |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu\text{A}$                                      | 3000                  |      | V                                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$                                  | 2.0                   |      | 4.0 V                                 |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$  |                       |      | $\pm 100$ nA                          |
| $I_{DSS}$    | $V_{DS} = 0.8 \cdot V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$   |                       |      | 10 $\mu\text{A}$<br>250 $\mu\text{A}$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.20A$ , Note 1                                     |                       |      | 190 $\Omega$                          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |                        |
|--------------|---|-----------------------|------|------------------------|
|              |   | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 60\text{V}$ , $I_D = 0.20\text{A}$ , Note 1   | 0.17                  | 0.28 | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$  |                       | 283  | pF                     |
| $C_{oss}$    |   |                       | 18   | pF                     |
| $C_{rss}$    |   |                       | 5    | pF                     |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 50\text{V}$ , $I_D = 0.40\text{A}$<br>$R_G = 10\Omega$ (External) |                       | 12   | ns                     |
| $t_r$        |   |                       | 20   | ns                     |
| $t_{d(off)}$ |   |                       | 35   | ns                     |
| $t_f$        |   |                       | 26   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 1.5\text{kV}$ , $I_D = 0.5 \cdot I_{D25}$   |                       | 13.0 | nC                     |
| $Q_{gs}$     |   |                       | 1.0  | nC                     |
| $Q_{gd}$     |   |                       | 8.7  | nC                     |
| $R_{thJC}$   |   |                       |      | 1.2 $^\circ\text{C/W}$ |
| $R_{thCS}$   |   | 0.21                  |      | $^\circ\text{C/W}$     |



### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)     | Characteristic Values |      |               |
|----------|---|-----------------------|------|---------------|
|          |   | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$ , Note 1   |                       |      | 0.4 A         |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$                                     |                       |      | 1.6 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                     |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 0.4\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 1.1  | $\mu\text{s}$ |
| $Q_{RM}$ |   |                       | 6.2  | $\mu\text{C}$ |
| $I_{RM}$ |   |                       | 11.2 | A             |

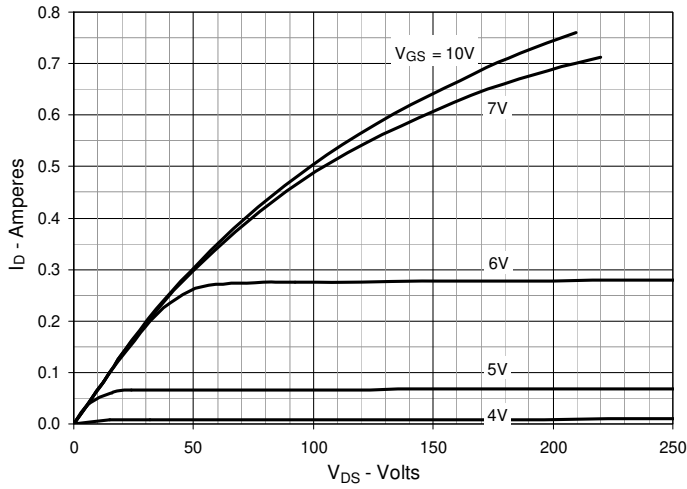
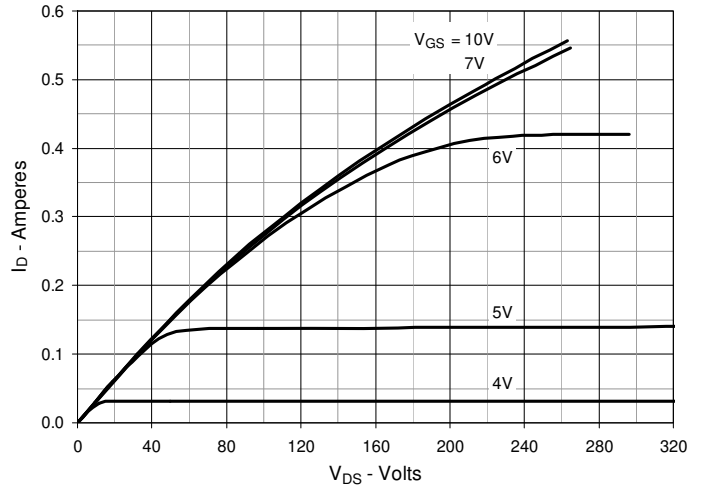
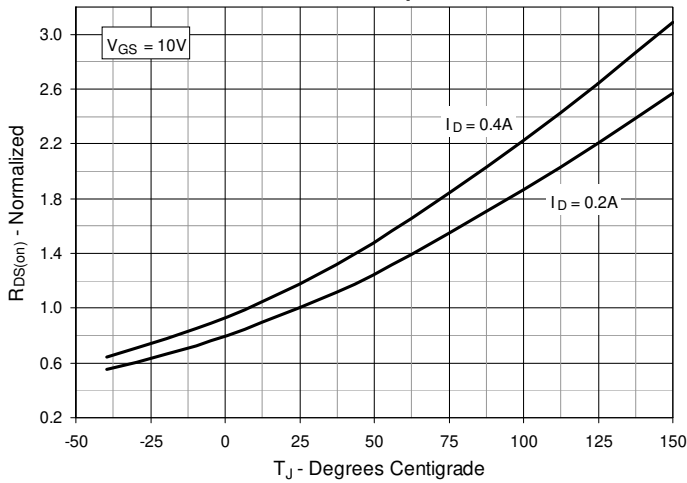
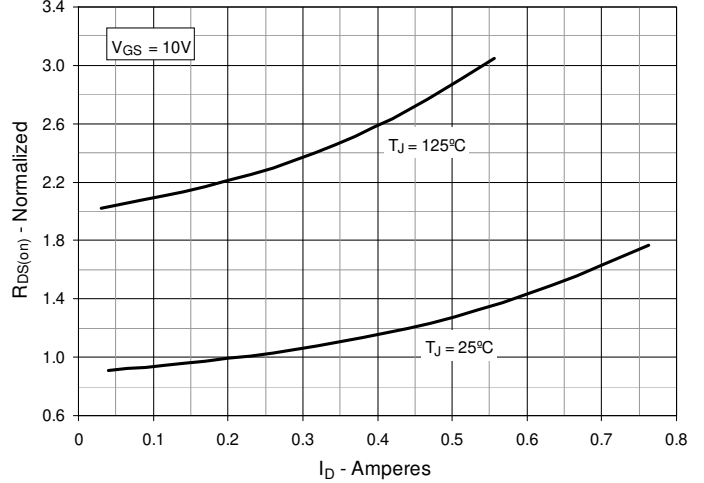
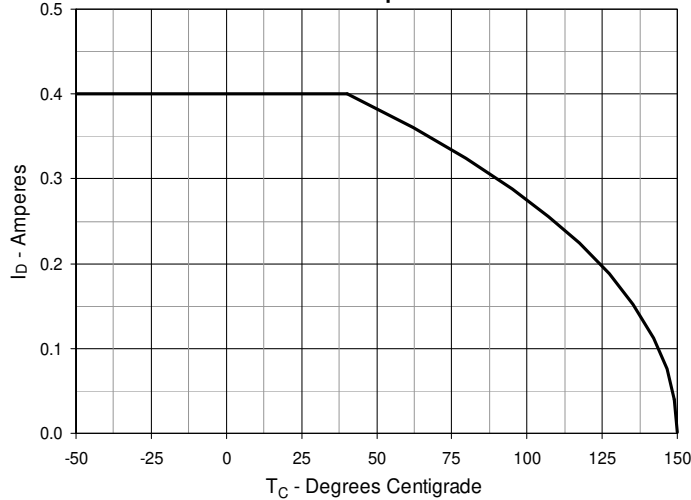
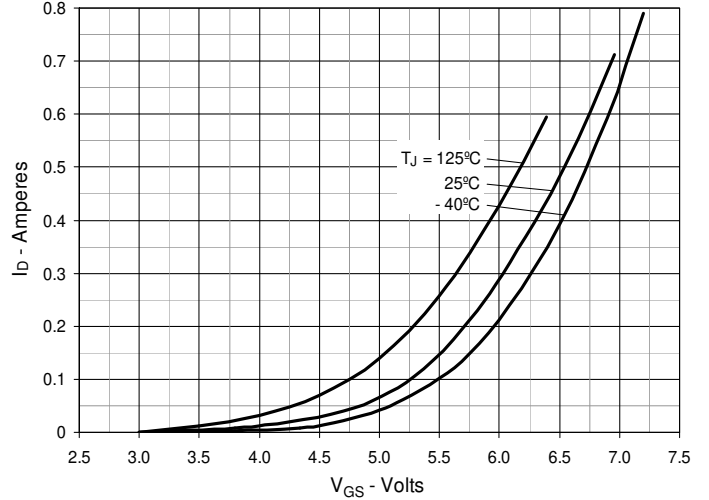
Note: 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

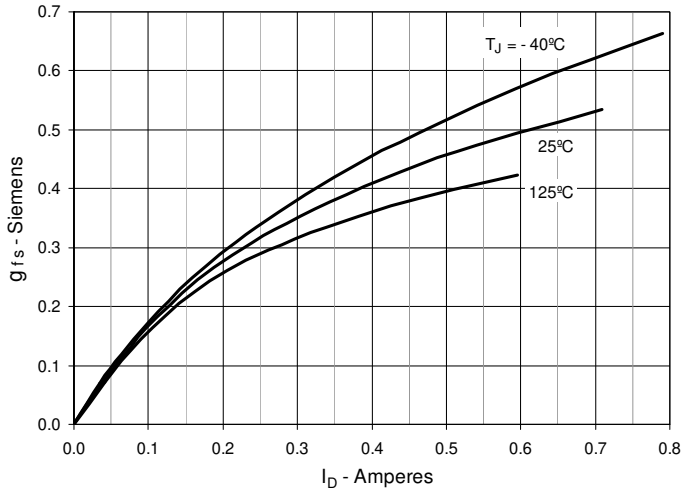
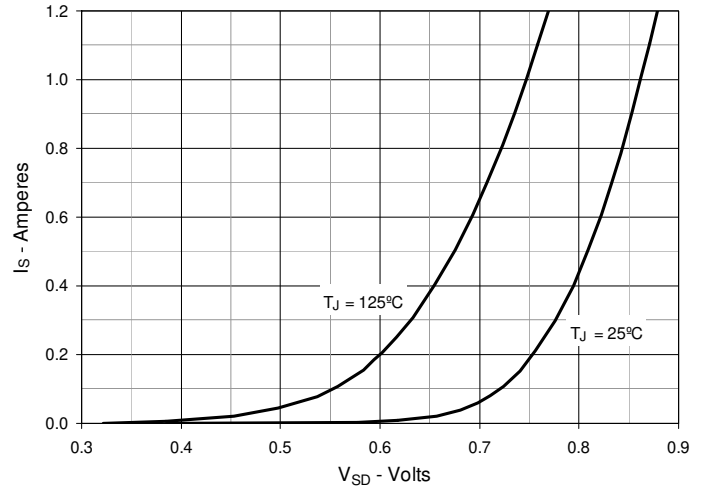
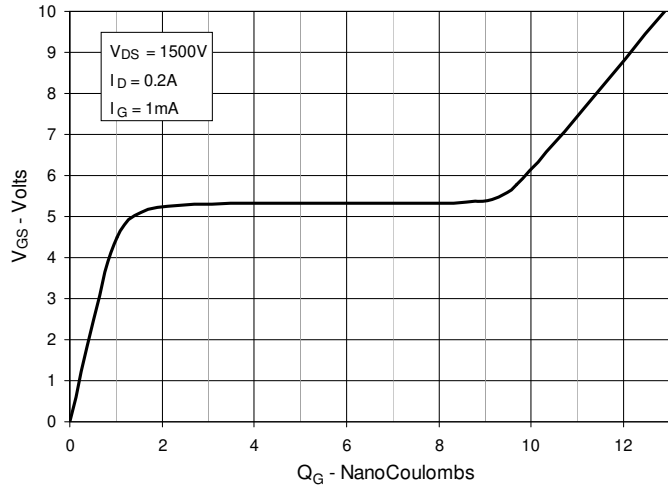
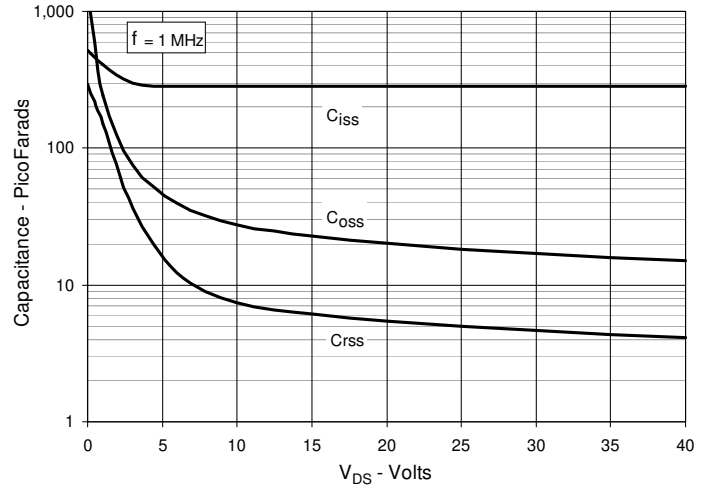
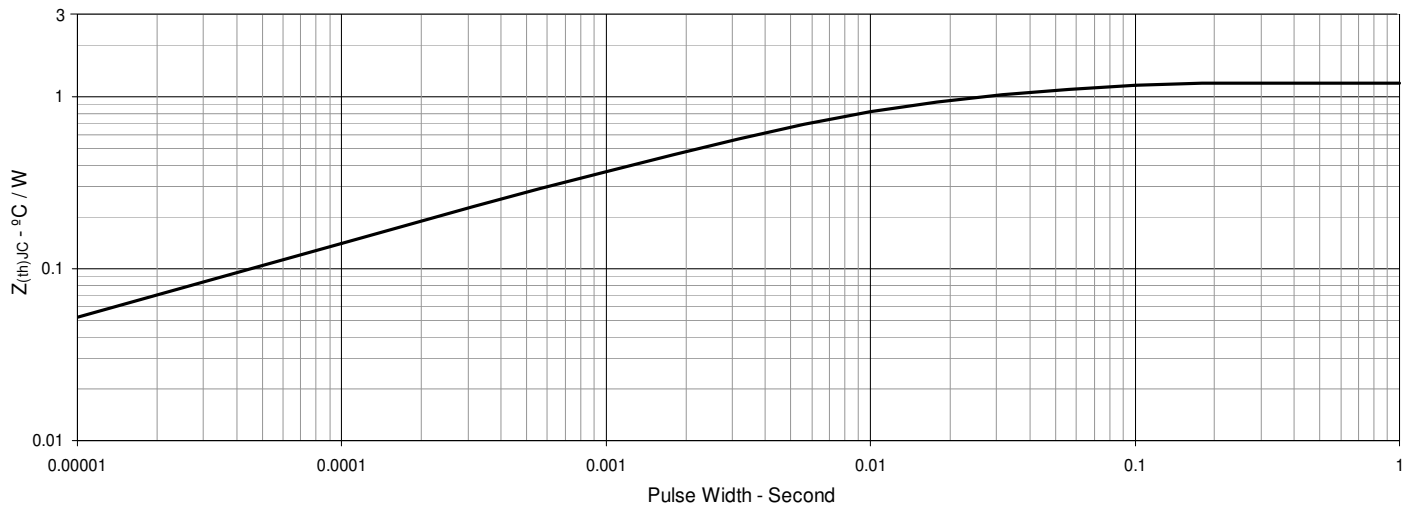
### ADVANCE TECHNICAL INFORMATION

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.

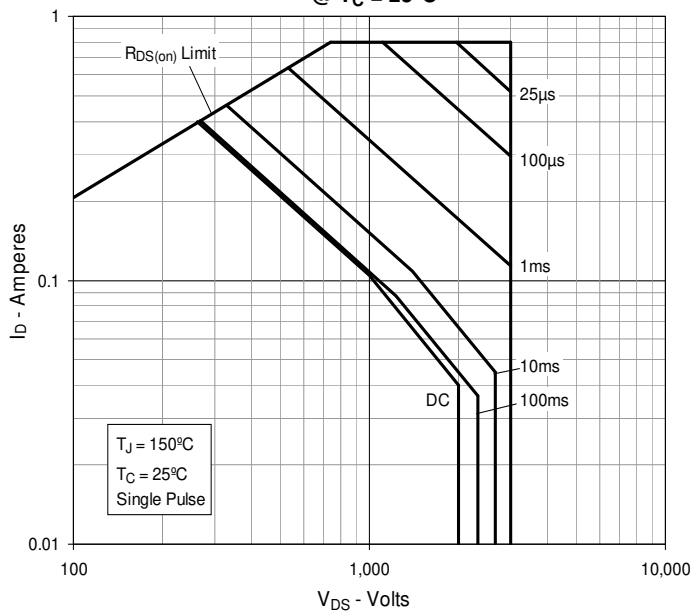
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|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|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

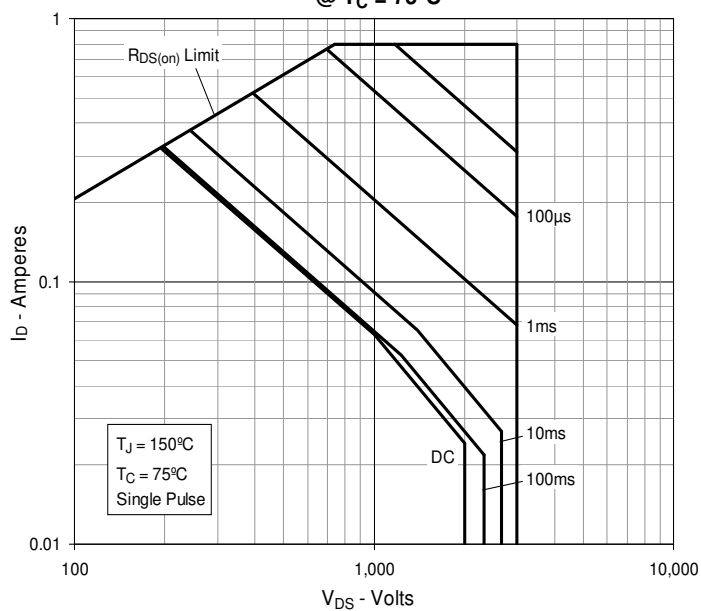
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$** 

**Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 0.2\text{A}$  Value vs. Junction Temperature**

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 0.2\text{A}$  Value vs. Drain Current**

**Fig. 5. Maximum Drain Current vs. Case Temperature**

**Fig. 6. Input Admittance**


**Fig. 7. Transconductance**

**Fig. 8. Forward Voltage Drop of Intrinsic Diode**

**Fig. 9. Gate Charge**

**Fig. 10. Capacitance**

**Fig. 11. Maximum Transient Thermal Impedance**


**Fig. 12. Forward-Bias Safe Operating Area**  
@  $T_C = 25^\circ\text{C}$



**Fig. 13. Forward-Bias Safe Operating Area**  
@  $T_C = 75^\circ\text{C}$





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