

# X2-Class HiPerFET™ Power MOSFET

## IXFB150N65X2

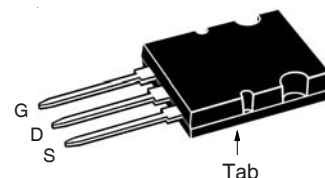
$$\begin{aligned} V_{DSS} &= 650V \\ I_{D25} &= 150A \\ R_{DS(on)} &\leq 17m\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



| Symbol     | Test Conditions                                                          | Maximum Ratings   |                  |
|------------|--------------------------------------------------------------------------|-------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 650               | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 650               | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 30$          | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 40$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 150               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 300               | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 20                | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 4                 | J                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 1560              | W                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 50                | V/ns             |
| $T_J$      |                                                                          | -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               | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                                     | 260               | $^\circ\text{C}$ |
| $F_C$      | Mounting Force                                                           | 30..120 / 6.7..27 | N/lb             |
| Weight     |                                                                          | 10                | g                |

### PLUS264™



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

### Features

- Low  $Q_G$
- Avalanche Rated
- Low Package Inductance

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                          |
|--------------|---------------------------------------------------------------------------|-----------------------|------|--------------------------|
|              |                                                                           | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 3mA$                                               | 650                   |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8mA$                                           | 3.5                   |      | 5.0 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 200$ nA             |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$           |                       |      | 50 $\mu\text{A}$<br>5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                       |                       |      | 17 m $\Omega$            |

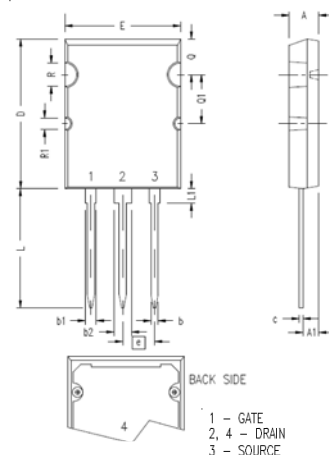
| Symbol                              | Test Conditions<br>(T <sub>J</sub> = 25°C, Unless Otherwise Specified)                                                                                                          | Characteristic Values |      |           |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----------|
|                                     |                                                                                                                                                                                 | Min.                  | Typ. | Max       |
| <b>g<sub>fs</sub></b>               | V <sub>DS</sub> = 10V, I <sub>D</sub> = 60A, Note 1                                                                                                                             | 56                    | 88   | S         |
| <b>R<sub>Gi</sub></b>               | Gate Input Resistance                                                                                                                                                           |                       | 0.57 | Ω         |
| <b>C<sub>iss</sub></b>              | } V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                                                                                                         |                       | 21.0 | nF        |
| <b>C<sub>oss</sub></b>              |                                                                                                                                                                                 |                       | 12.5 | nF        |
| <b>C<sub>rss</sub></b>              |                                                                                                                                                                                 |                       | 42   | pF        |
| <b>Effective Output Capacitance</b> |                                                                                                                                                                                 |                       |      |           |
| <b>C<sub>o(er)</sub></b>            | Energy related } V <sub>GS</sub> = 0V                                                                                                                                           |                       | 600  | pF        |
| <b>C<sub>o(tr)</sub></b>            | Time related } V <sub>DS</sub> = 0.8 • V <sub>DSS</sub>                                                                                                                         |                       | 2800 | pF        |
| <b>t<sub>d(on)</sub></b>            | <b>Resistive Switching Times</b><br>V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>R <sub>G</sub> = 1Ω (External) |                       | 55   | ns        |
| <b>t<sub>r</sub></b>                |                                                                                                                                                                                 |                       | 30   | ns        |
| <b>t<sub>d(off)</sub></b>           |                                                                                                                                                                                 |                       | 100  | ns        |
| <b>t<sub>f</sub></b>                |                                                                                                                                                                                 |                       | 13   | ns        |
| <b>Q<sub>g(on)</sub></b>            | } V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub>                                                                     |                       | 355  | nC        |
| <b>Q<sub>gs</sub></b>               |                                                                                                                                                                                 |                       | 130  | nC        |
| <b>Q<sub>gd</sub></b>               |                                                                                                                                                                                 |                       | 110  | nC        |
| <b>R<sub>thJC</sub></b>             |                                                                                                                                                                                 |                       |      | 0.08 °C/W |
| <b>R<sub>thCS</sub></b>             |                                                                                                                                                                                 |                       | 0.13 | °C/W      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^{\circ}\text{C}$ , Unless Otherwise Specified)                         | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 150 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 600 A         |
| $V_{SD}$ | $I_F = 100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                   |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 75\text{A}$ , $-di/dt = 300\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 190  | ns            |
| $Q_{RM}$ |                                                                                                       |                       | 4.6  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                       | 48.4 | A             |

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

## PLUS264™ (IXFB) Outline

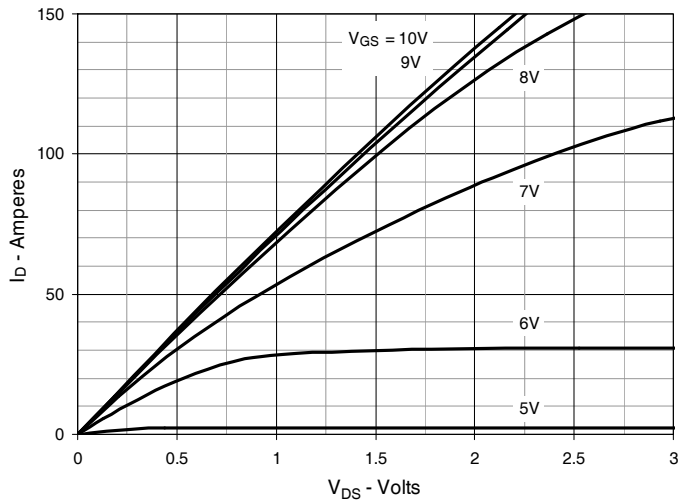
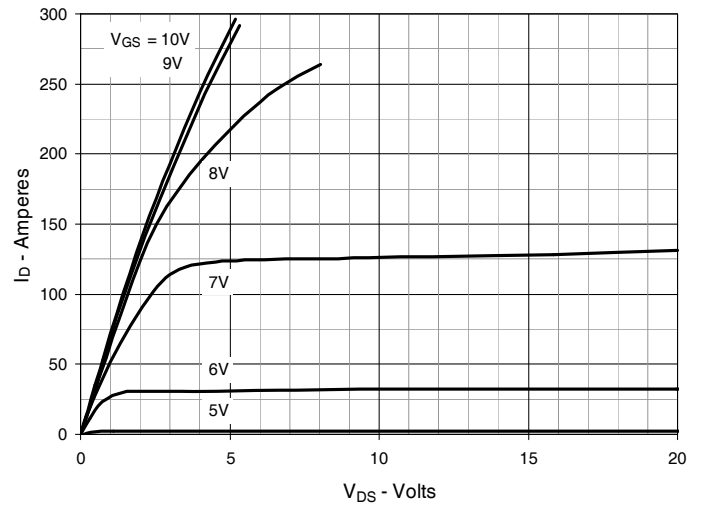
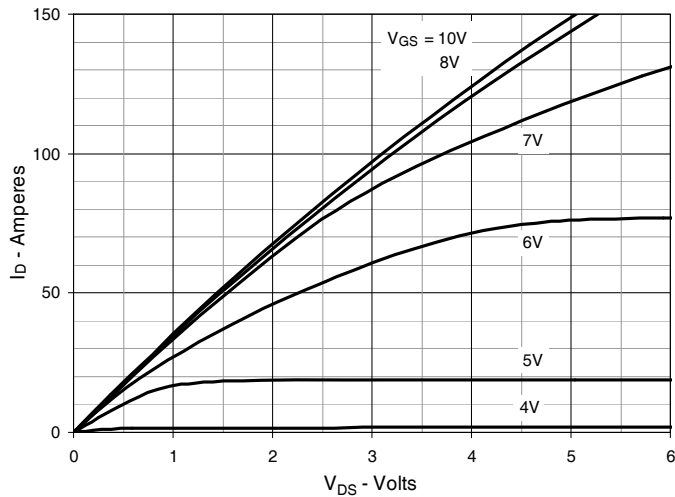
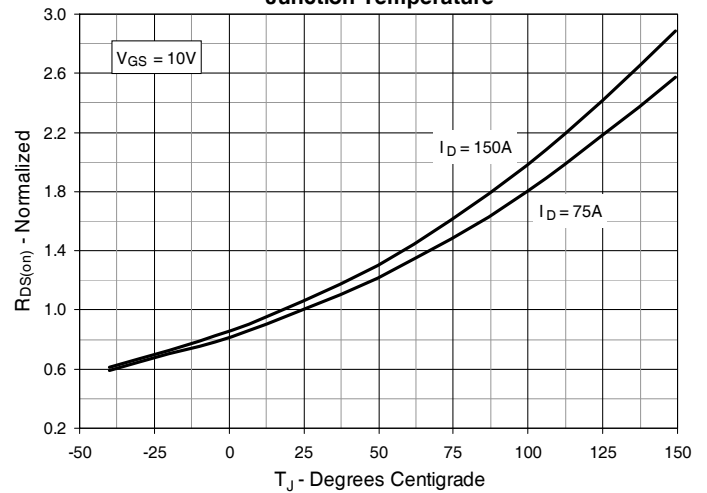
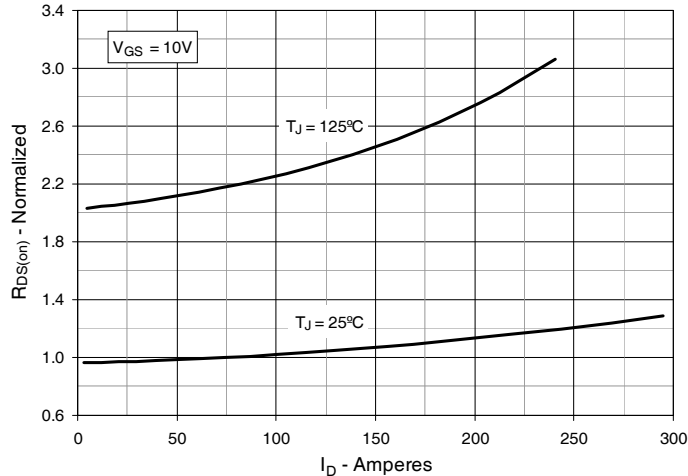
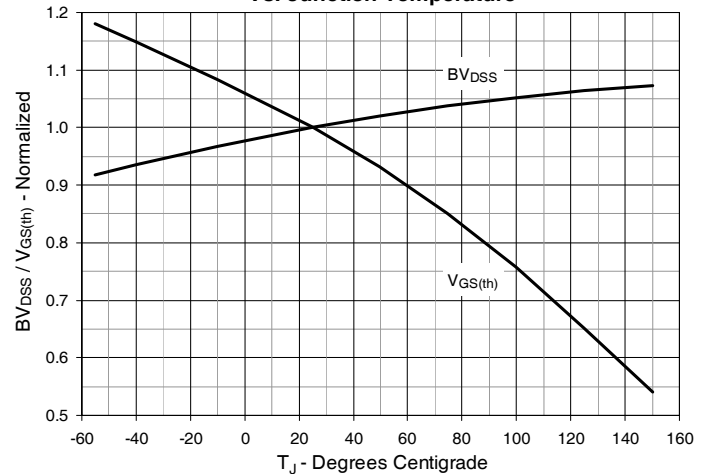


| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .087     | .102  | 2.21        | 2.59  |
| b2  | .110     | .126  | 2.79        | 3.20  |
| c   | .017     | .029  | 0.43        | 0.74  |
| D   | 1.007    | 1.047 | 25.58       | 26.59 |
| E   | .760     | .799  | 19.30       | 20.29 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| Q   | .240     | .256  | 6.10        | 6.50  |
| Q1  | .330     | .346  | 8.38        | 8.79  |
| ØR  | .155     | .187  | 3.94        | 4.75  |
| ØR1 | .085     | .093  | 2.16        | 2.36  |

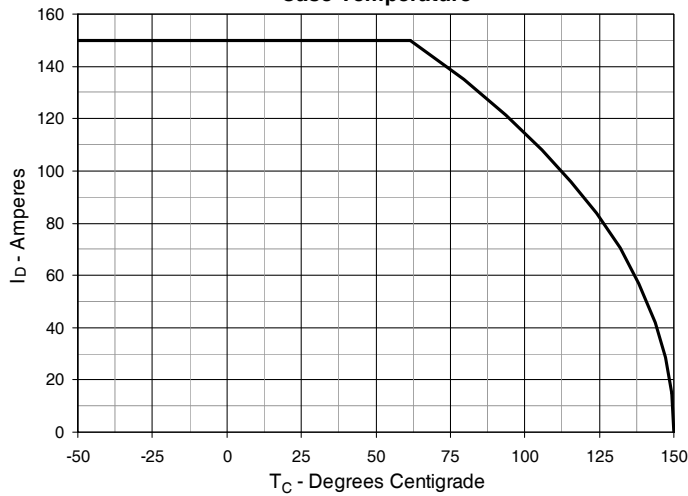
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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

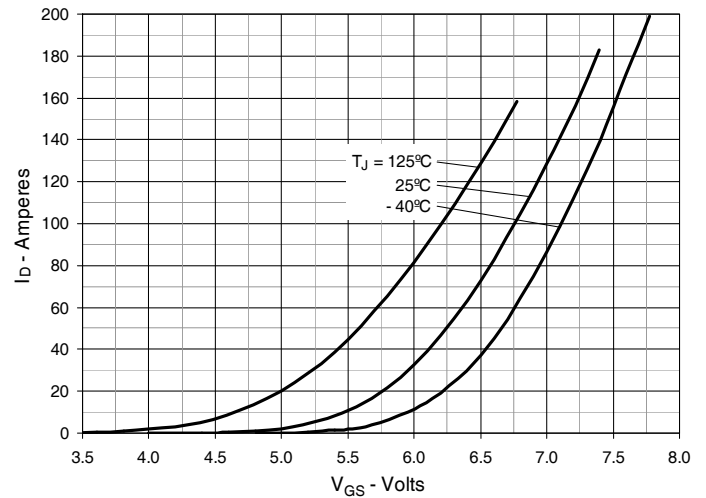
|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 4,835,592 | 4,931,844 | 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 @  $T_J = 125^\circ\text{C}$** 

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 75\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 75\text{A}$  Value vs. Drain Current**

**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**


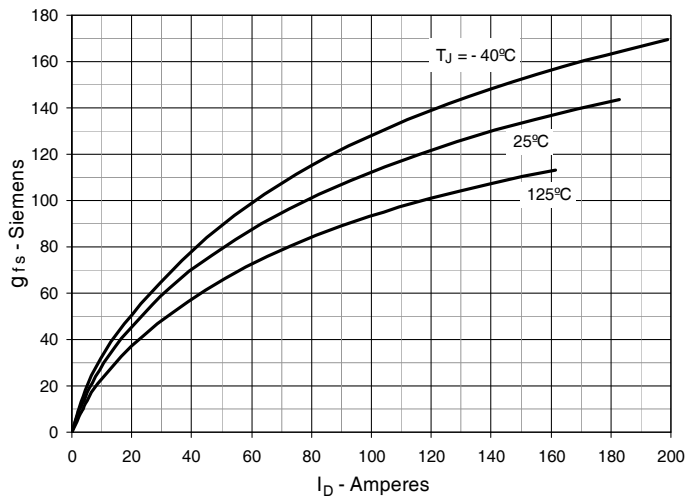
**Fig. 7. Maximum Drain Current vs. Case Temperature**



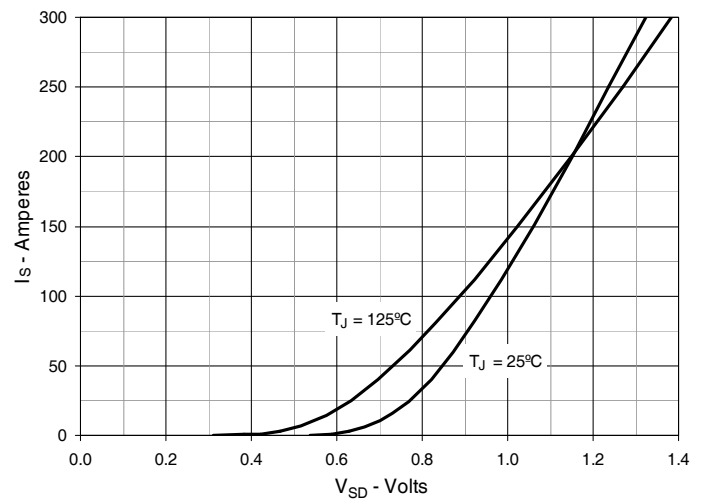
**Fig. 8. Input Admittance**



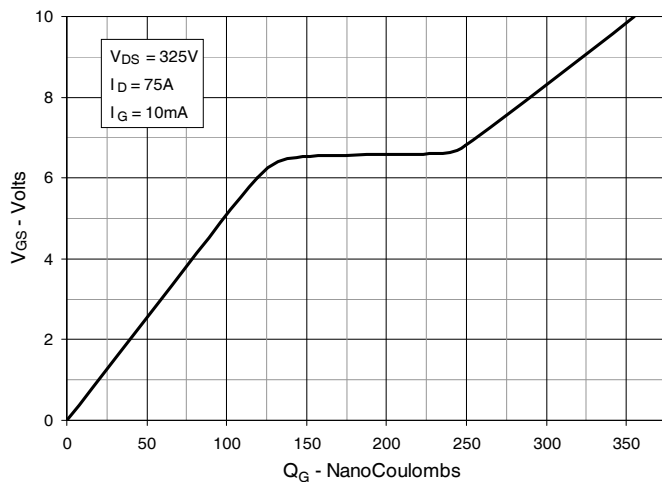
**Fig. 9. Transconductance**



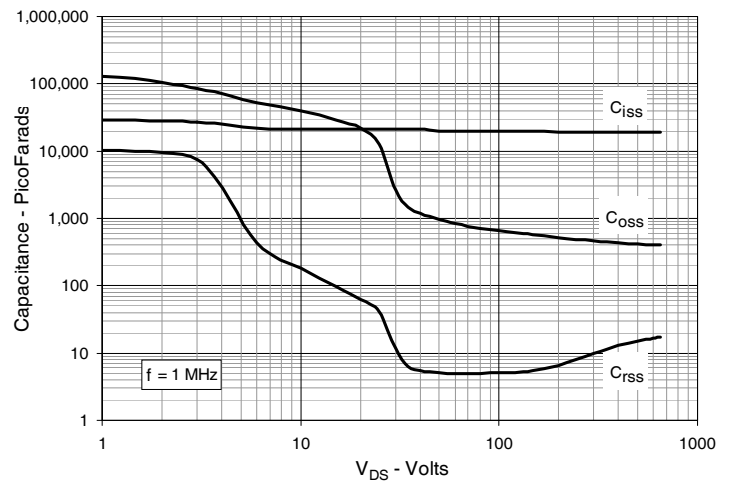
**Fig. 10. Forward Voltage Drop of Intrinsic Diode**



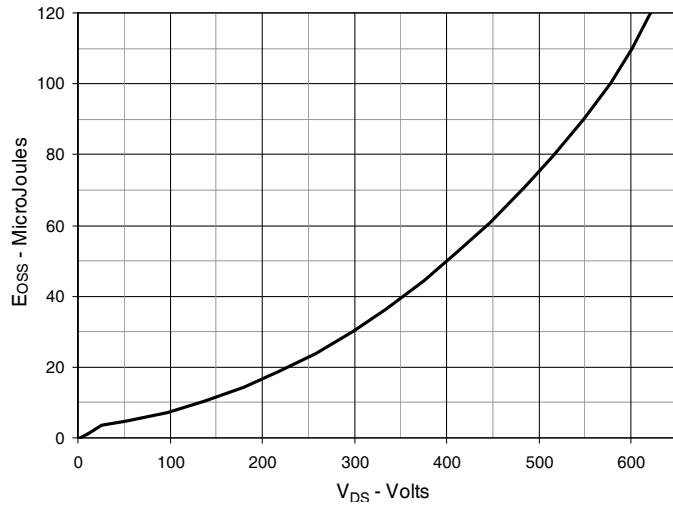
**Fig. 11. Gate Charge**



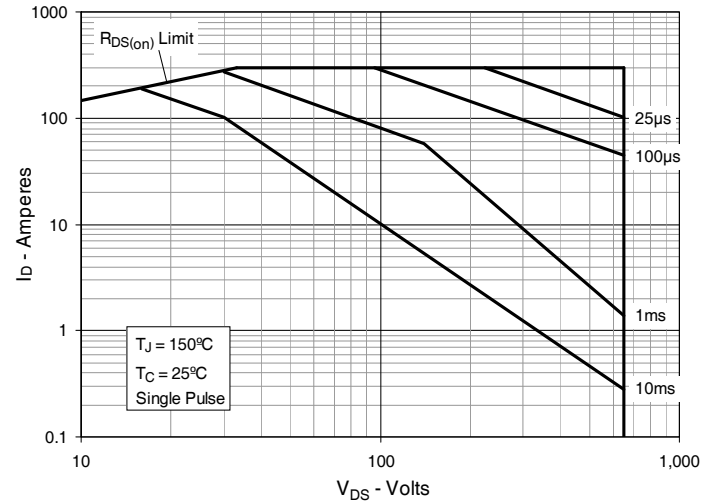
**Fig. 12. Capacitance**



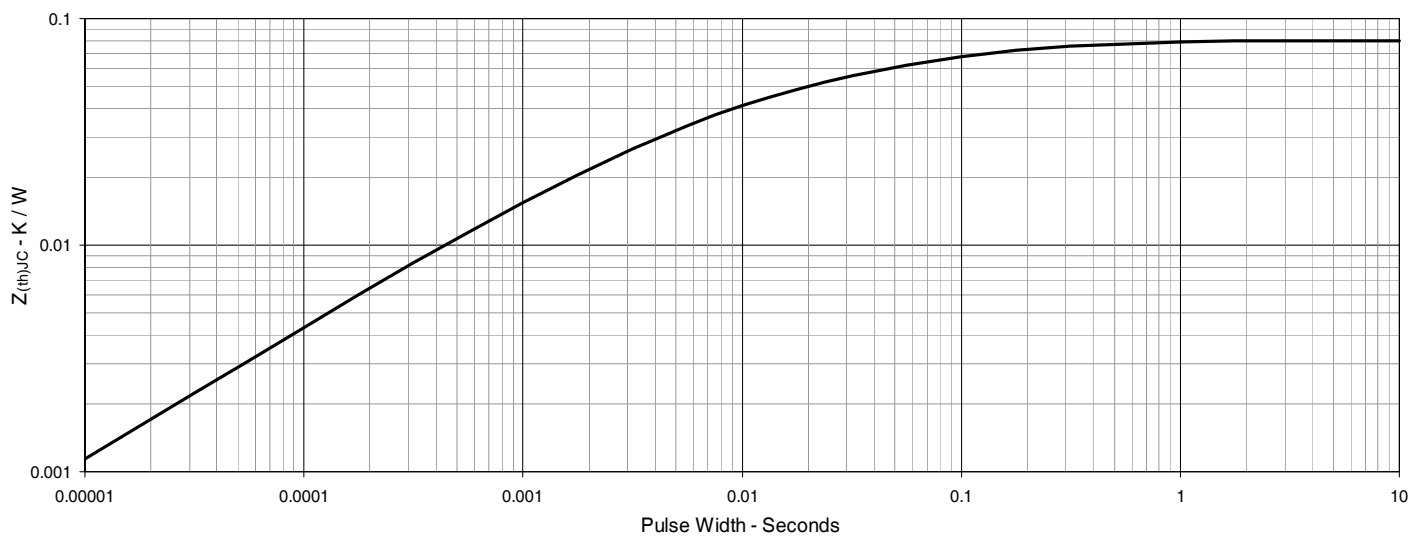
**Fig. 13. Output Capacitance Stored Energy**



**Fig. 14. Forward-Bias Safe Operating Area**



**Fig. 15. Maximum Transient Thermal Impedance**





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