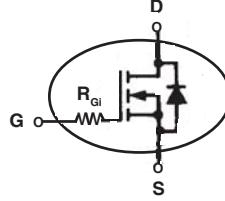


# Linear L2™ Power MOSFET with extended FBSOA

N-Channel Enhancement Mode

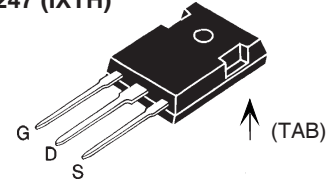
**IXTH30N50L2**  
**IXTQ30N50L2**  
**IXTT30N50L2**

**V<sub>DSS</sub> = 500V**  
**I<sub>D25</sub> = 30A**  
**R<sub>DS(on)</sub> ≤ 200mΩ**

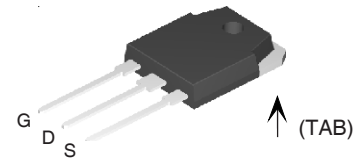


| Symbol            | Test Conditions   | Maximum Ratings |           |
|-------------------|---|-----------------|-----------|
| V <sub>DSS</sub>  | T <sub>J</sub> = 25°C to 150°C                                | 500             | V         |
| V <sub>DGR</sub>  | T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ         | 500             | V         |
| V <sub>GSS</sub>  | Continuous  | ±20             | V         |
| V <sub>GSM</sub>  | Transient   | ±30             | V         |
| I <sub>D25</sub>  | T <sub>C</sub> = 25°C   | 30              | A         |
| I <sub>DM</sub>   | T <sub>C</sub> = 25°C, pulse width limited by T <sub>JM</sub> | 60              | A         |
| I <sub>AR</sub>   | T <sub>C</sub> = 25°C   | 30              | A         |
| E <sub>AR</sub>   | T <sub>C</sub> = 25°C   | 50              | mJ        |
| E <sub>AS</sub>   |   | 1.5             | J         |
| P <sub>D</sub>    | T <sub>C</sub> = 25°C   | 400             | W         |
| T <sub>J</sub>    |   | -55 to +150     | °C        |
| T <sub>JM</sub>   |   | +150            | °C        |
| T <sub>stg</sub>  |   | -55 to +150     | °C        |
| T <sub>L</sub>    | 1.6mm (0.063in) from case for 10s                             | 300             | °C        |
| T <sub>SOLD</sub> | Plastic body for 10s  | 260             | °C        |
| M <sub>d</sub>    | Mounting torque (TO-247, TO-3P)                               | 1.13/10         | Nm/lb.in. |
| Weight            | TO-247  | 6.0             | g         |
|                   | TO-3P   | 5.5             | g         |
|                   | TO-268  | 5.0             | g         |

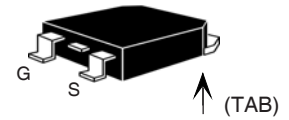
TO-247 (IXTH)



TO-3P (IXTQ)



TO-268 (IXTT)



G = Gate    D = Drain  
 S = Source    TAB = Drain

## Features

- Designed for linear operation
- International standard packages
- Unclamped Inductive Switching (UIS) rated.
- Molding epoxies meet UL 94 V-0 flammability classification
- Integrated gate resistor for easy paralleling
- Guaranteed FBSOA at 75°C

## Applications

- Solid state circuit breakers
- Soft start controls
- Linear amplifiers
- Programmable loads
- Current regulators

| Symbol  | Test Conditions   | Characteristic Values |      |         |
|---|---|-----------------------|------|---------|
|   |   | Min.                  | Typ. | Max.    |
| (T <sub>J</sub> = 25°C, unless otherwise specified) |   |                       |      |         |
| BV <sub>DSS</sub>                                   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                            | 500                   |      | V       |
| V <sub>GS(th)</sub>                                 | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA              | 2.5                   |      | 4.5 V   |
| I <sub>GSS</sub>                                    | V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V                            |                       |      | ±100 nA |
| I <sub>DSS</sub>                                    | V <sub>DS</sub> = V <sub>DSS</sub>                                      |                       |      | 50 μA   |
|   | V <sub>GS</sub> = 0V      T <sub>J</sub> = 125°C                        |                       |      | 300 μA  |
| R <sub>DS(on)</sub>                                 | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1 |                       |      | 200 mΩ  |

| Symbol   | Test Conditions  | Characteristic Values |      |      |                    |
|--|--|-----------------------|------|------|--------------------|
|  |  | Min.                  | Typ. | Max. |                    |
| $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |  |                       |      |      |                    |
| $g_{fs}$   | $V_{DS} = 10\text{V}, I_D = 0.5 \cdot I_{D25}$ , Note 1  | 9                     | 12   | 15   | S                  |
| $C_{iss}$  | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$   |                       | 8100 |      | pF                 |
| $C_{oss}$  |  |                       | 530  |      | pF                 |
| $C_{rss}$  |  |                       | 115  |      | pF                 |
| $R_{Gi}$   | Integrated gate input resistor   |                       | 3.5  |      | $\Omega$           |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 0\Omega$ (External) |                       | 35   |      | ns                 |
| $t_r$  |  |                       | 117  |      | ns                 |
| $t_{d(off)}$   |  |                       | 94   |      | ns                 |
| $t_f$  |  |                       | 40   |      | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$   |                       | 240  |      | nC                 |
| $Q_{gs}$   |  |                       | 58   |      | nC                 |
| $Q_{gd}$   |  |                       | 135  |      | nC                 |
| $R_{thJC}$   | (TO-247, TO-3P)  |                       |      | 0.31 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |  |                       | 0.25 |      | $^\circ\text{C/W}$ |

### Safe Operating Area Specification

| Symbol | Test Conditions  | Min. | Typ. | Max. |
|--------|--|------|------|------|
| SOA    | $V_{DS} = 400\text{V}, I_D = 0.5\text{A}, T_C = 75^\circ\text{C}, t_p = 2\text{s}$ | 200  |      | W    |

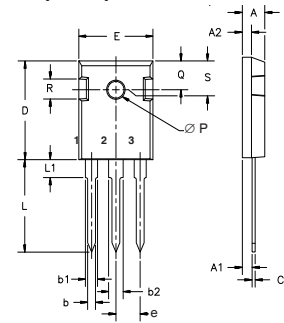
### Source-Drain Diode

Characteristic Values  
( $T_J = 25^\circ\text{C}, \text{ unless otherwise specified}$ )

| Symbol   | Test Conditions  | Min. | Typ. | Max. |    |
|----------|--|------|------|------|----|
| $I_s$    | $V_{GS} = 0\text{V}$   |      |      | 30   | A  |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$                      |      |      | 120  | A  |
| $V_{SD}$ | $I_F = I_s, V_{GS} = 0\text{V}, \text{ Note 1}$                  |      |      | 1.5  | V  |
| $t_{rr}$ | $I_F = I_s, -di/dt = 100\text{A}/\mu\text{s}, V_R = 100\text{V}$ |      | 500  |      | ns |

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

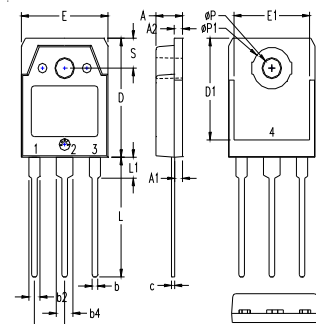
### TO-247 (IXTH) Outline



Terminals: 1 - Gate  
2 - Drain  
3 - Source  
Tab - Drain

| Dim.            | Millimeter |       | Inches |       |
|-----------------|------------|-------|--------|-------|
|                 | Min.       | Max.  | Min.   | Max.  |
| A               | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub>  | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub>  | 2.2        | 2.6   | .059   | .098  |
| b               | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub>  | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub>  | 2.87       | 3.12  | .113   | .123  |
| C               | .4         | .8    | .016   | .031  |
| D               | 20.80      | 21.46 | .819   | .845  |
| E               | 15.75      | 16.26 | .610   | .640  |
| e               | 5.20       | 5.72  | 0.205  | 0.225 |
| L               | 19.81      | 20.32 | .780   | .800  |
| L <sub>1</sub>  |            | 4.50  |        | .177  |
| $\varnothing P$ | 3.55       | 3.65  | .140   | .144  |
| R               | 5.89       | 6.40  | 0.232  | 0.252 |
| S               | 4.32       | 5.49  | .170   | .216  |
|                 |            |       | 242    | BSC   |

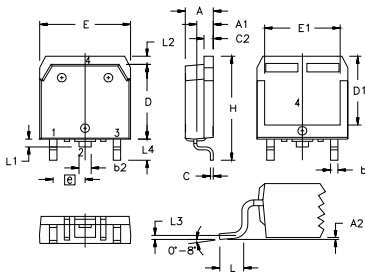
### TO-3P (IXTQ) Outline



1 - GATE  
2 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)  
4 - DRAIN (COLLECTOR)

| SYM              | INCHES |          | MILLIMETERS |          |
|------------------|--------|----------|-------------|----------|
|                  | MIN    | MAX      | MIN         | MAX      |
| A                | .185   | .193     | 4.70        | 4.90     |
| A <sub>1</sub>   | .051   | .059     | 1.30        | 1.50     |
| A <sub>2</sub>   | .057   | .065     | 1.45        | 1.65     |
| b                | .035   | .045     | 0.90        | 1.15     |
| b <sub>2</sub>   | .075   | .087     | 1.90        | 2.20     |
| b <sub>4</sub>   | .114   | .126     | 2.90        | 3.20     |
| c                | .022   | .031     | 0.55        | 0.80     |
| C                | .780   | .799     | 19.80       | 20.30    |
| D <sub>1</sub>   | .665   | .677     | 16.90       | 17.20    |
| E                | .610   | .622     | 15.50       | 15.80    |
| E <sub>1</sub>   | .531   | .539     | 13.50       | 13.70    |
| e                |        | .215 BSC |             | 5.45 BSC |
| L                | .779   | .795     | 19.80       | 20.20    |
| L <sub>1</sub>   | .134   | .142     | 3.40        | 3.60     |
| $\varnothing P$  | .126   | .134     | 3.20        | 3.40     |
| $\varnothing P1$ | .272   | .280     | 6.90        | 7.10     |
| S                | .193   | .201     | 4.90        | 5.10     |

### TO-268 (IXTT) Outline

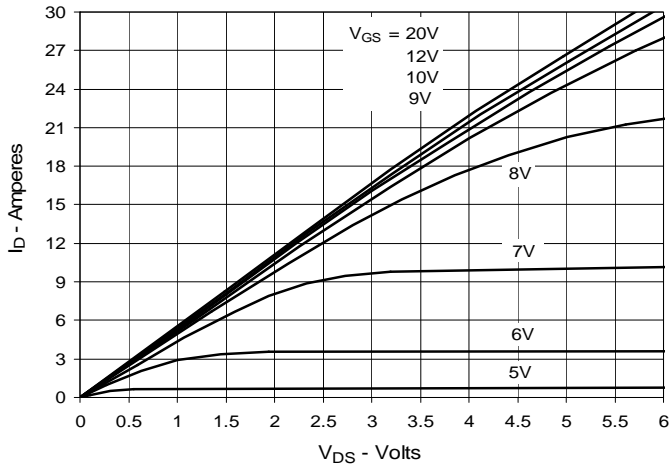


| SYM            | INCHES |          | MILLIMETERS |          |
|----------------|--------|----------|-------------|----------|
|                | MIN    | MAX      | MIN         | MAX      |
| A              | .193   | .201     | 4.90        | 5.10     |
| A <sub>1</sub> | .106   | .114     | 2.70        | 2.90     |
| A <sub>2</sub> | .001   | .010     | 0.02        | 0.25     |
| b              | .045   | .057     | 1.15        | 1.45     |
| b <sub>2</sub> | .075   | .083     | 1.90        | 2.10     |
| C              | .016   | .026     | 0.40        | 0.65     |
| C <sub>2</sub> | .057   | .063     | 1.45        | 1.60     |
| D              | .543   | .551     | 13.80       | 14.00    |
| D <sub>1</sub> | .488   | .500     | 12.40       | 12.70    |
| E              | .624   | .632     | 15.85       | 16.05    |
| E <sub>1</sub> | .524   | .535     | 13.30       | 13.60    |
| e              |        | .215 BSC |             | 5.45 BSC |
| H              | .736   | .752     | 18.70       | 19.10    |
| L              | .094   | .106     | 2.40        | 2.70     |
| L <sub>1</sub> | .047   | .055     | 1.20        | 1.40     |
| L <sub>2</sub> | .039   | .045     | 1.00        | 1.15     |
| L <sub>3</sub> |        | .010 BSC |             | 0.25 BSC |
| L <sub>4</sub> | .150   | .161     | 3.80        | 4.10     |

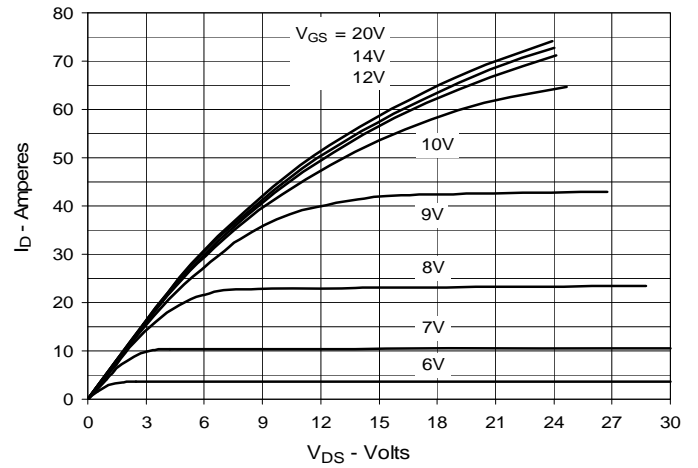
IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered 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 7,157,338 B2  
by one or more of the following U.S. patents: 4,850,072 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

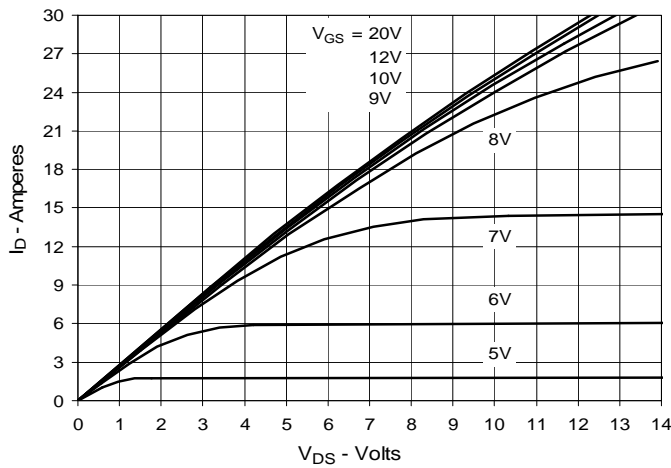
**Fig. 1. Output Characteristics**  
@  $T_J = 25^\circ\text{C}$



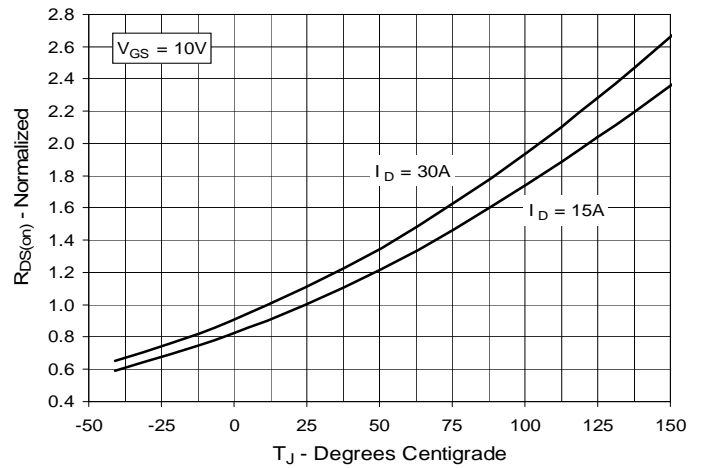
**Fig. 2. Extended Output Characteristics**  
@  $T_J = 25^\circ\text{C}$



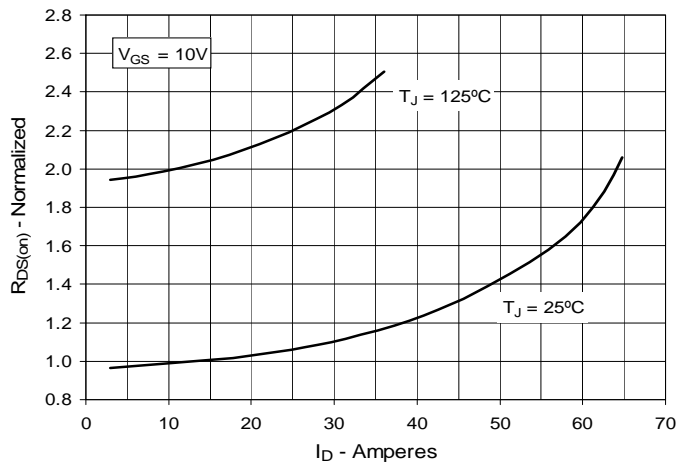
**Fig. 3. Output Characteristics**  
@  $T_J = 125^\circ\text{C}$



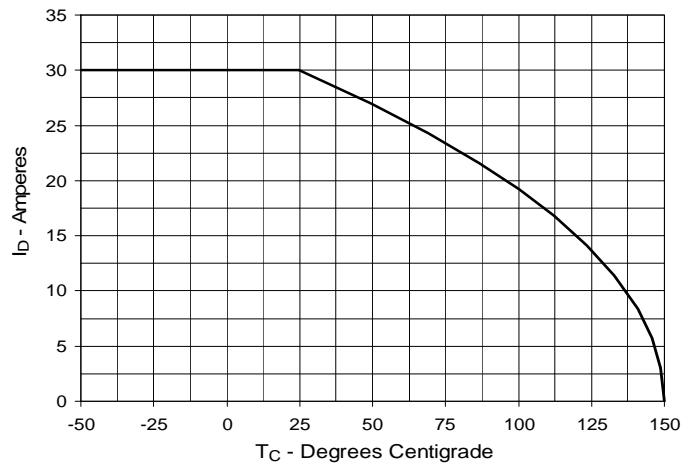
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 15\text{A}$  Value vs. Junction Temperature**



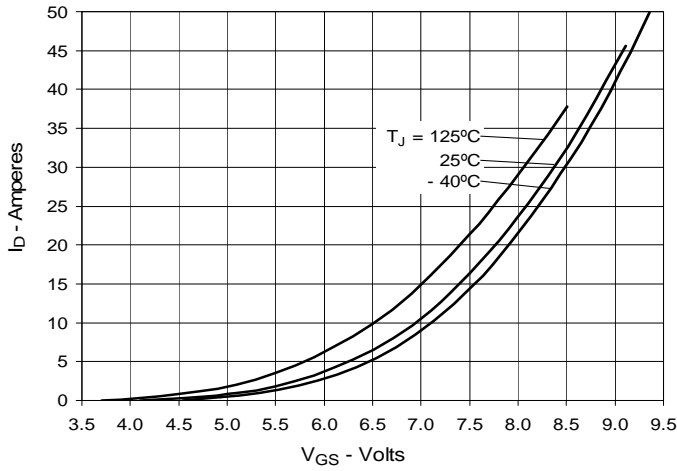
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 15\text{A}$  Value vs. Drain Current**



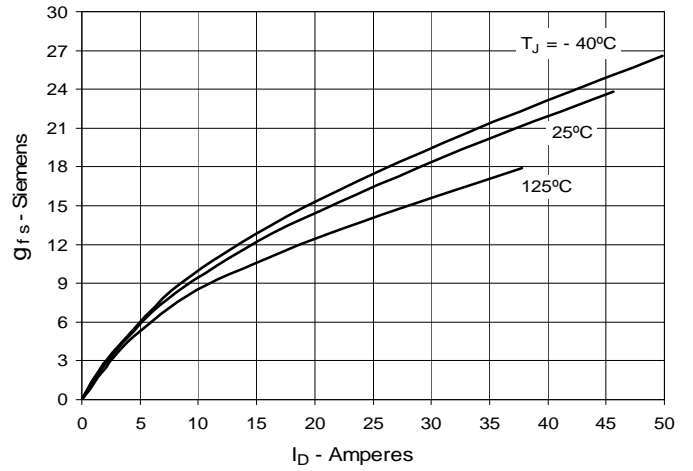
**Fig. 6. Maximum Drain Current vs. Case Temperature**



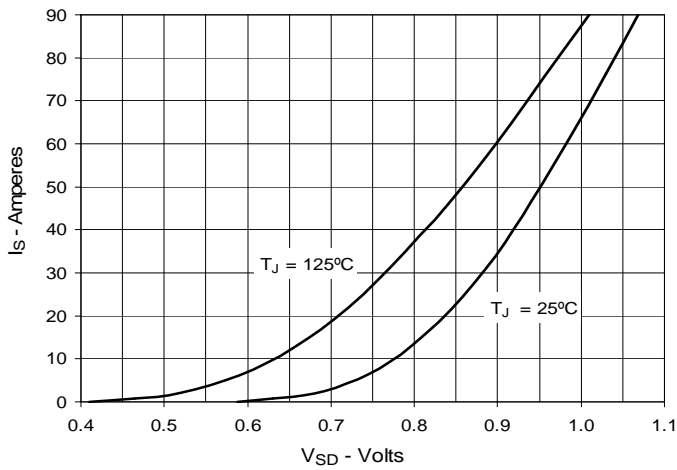
**Fig. 7. Input Admittance**



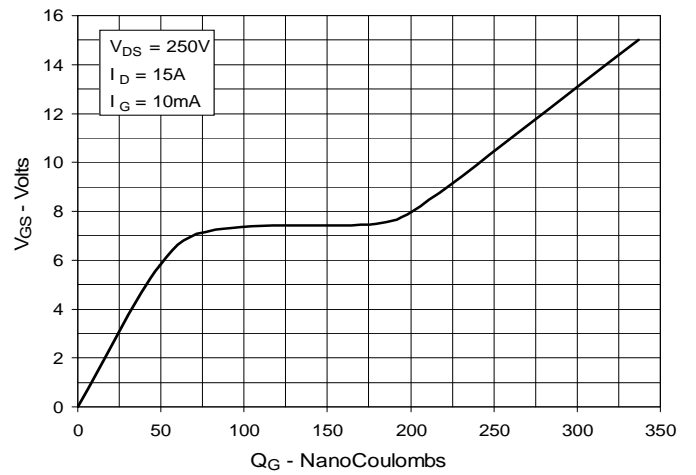
**Fig. 8. Transconductance**



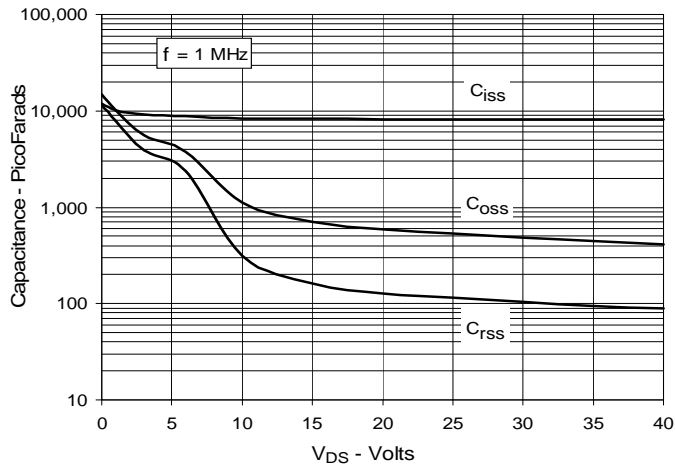
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



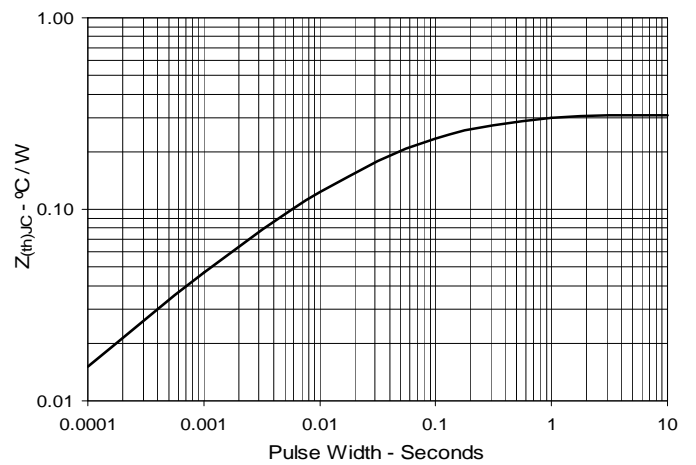
**Fig. 10. Gate Charge**



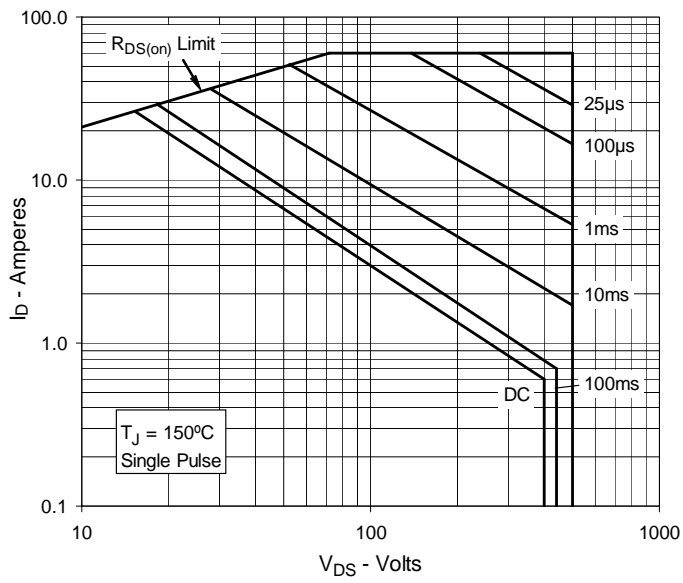
**Fig. 11. Capacitance**



**Fig. 12. Maximum Transient Thermal Impedance**



**Fig. 13. Forward-Bias Safe Operating Area**  
@  $T_C = 25^\circ\text{C}$



**Fig. 14. Forward-Bias Safe Operating Area**  
@  $T_C = 75^\circ\text{C}$

