

## Polar2™ HiperFET™ Power MOSFET

## IXFH42N50P2 IXFT42N50P2

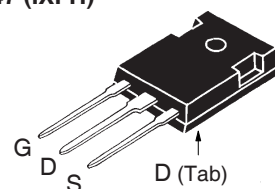
$$\begin{aligned} V_{DSS} &= 500V \\ I_{D25} &= 42A \\ R_{DS(on)} &\leq 145m\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

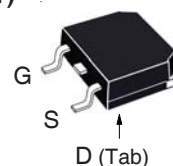


| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 500             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 500             | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 30$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 42              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 126             | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 42              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 1.4             | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 15              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 830             | W                |
| $T_J$      |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | 1.6mm (0.062in.) from Case for 10s                                       | 300             | $^\circ\text{C}$ |
| $T_{sold}$ | Plastic Body for 10 seconds                                              | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-247)                                                 | 1.13 / 10       | Nm/lb.in.        |
| Weight     | TO-247                                                                   | 6               | g                |
|            | TO-268                                                                   | 4               | g                |

TO-247 (IXFH)



TO-268 (IXFT)



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

### Features

- International Standard Packages
- Fast Intrinsic Diode
- Avalanche Rated
- Low  $R_{DS(on)}$  and  $Q_G$
- Low Package Inductance

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- 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.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                               | 500                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                           | 2.5                   |      | 4.5 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 100$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$           |                       |      | 10 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                       |                       |      | 145 m $\Omega$     |

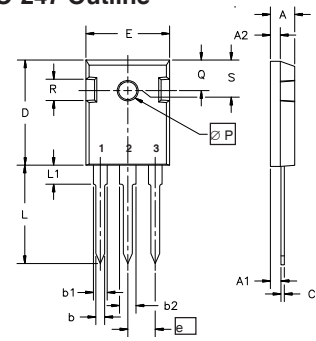
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                    | Characteristic Values |      |                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              |                                                                                                                                              | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 20\text{V}, I_D = 0.5 \cdot I_{D25}, \text{Note 1}$                                                                                | 23                    | 36   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$                                                                                   |                       | 5300 | pF                     |
| $C_{oss}$    |                                                                                                                                              |                       | 555  | pF                     |
| $C_{rss}$    |                                                                                                                                              |                       | 43   | pF                     |
| $t_{d(on)}$  | <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>$R_G = 3\Omega$ (External) |                       | 23   | ns                     |
| $t_r$        |                                                                                                                                              |                       | 12   | ns                     |
| $t_{d(off)}$ |                                                                                                                                              |                       | 42   | ns                     |
| $t_f$        |                                                                                                                                              |                       | 9    | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 92   | nC                     |
| $Q_{gs}$     |                                                                                                                                              |                       | 26   | nC                     |
| $Q_{gd}$     |                                                                                                                                              |                       | 36   | nC                     |
| $R_{thJC}$   |                                                                                                                                              |                       | 0.21 | $0.15^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                              |                       |      | $^\circ\text{C/W}$     |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                      | Characteristic Values |      |                    |
|----------|------------------------------------------------------------------------------------------------|-----------------------|------|--------------------|
|          |                                                                                                | Min.                  | Typ. | Max.               |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                           |                       |      | 42 A               |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                    |                       |      | 168 A              |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{V}, \text{Note 1}$                                                 |                       |      | 1.3 V              |
| $t_{rr}$ | $I_F = 21\text{A}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 85\text{V}, V_{GS} = 0\text{V}$ |                       | 12   | 250 ns             |
| $I_{RM}$ |                                                                                                |                       |      | A                  |
| $Q_{RM}$ |                                                                                                |                       |      | $1.05 \mu\text{C}$ |

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

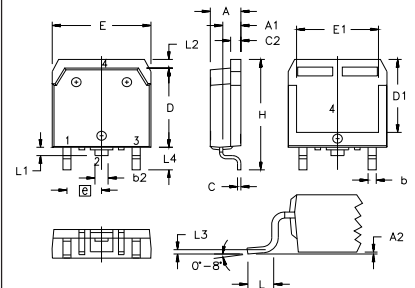
## TO-247 Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source

| 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  |
| ØP             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |
| S              | 6.15       | BSC   | .242   | BSC   |

## TO-268 Outline



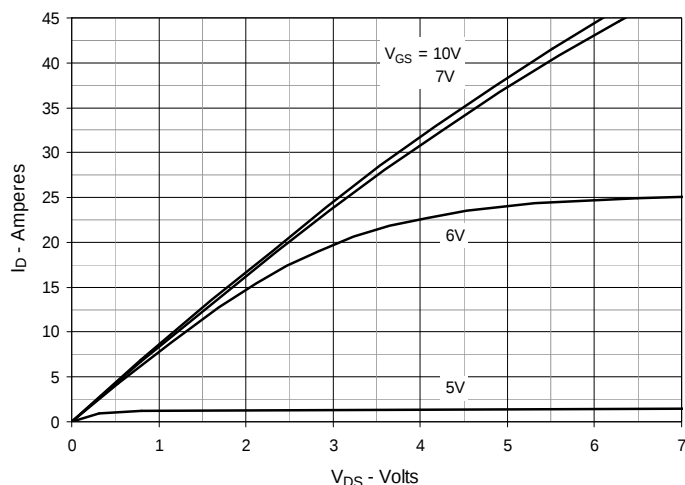
Terminals: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

| 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  |

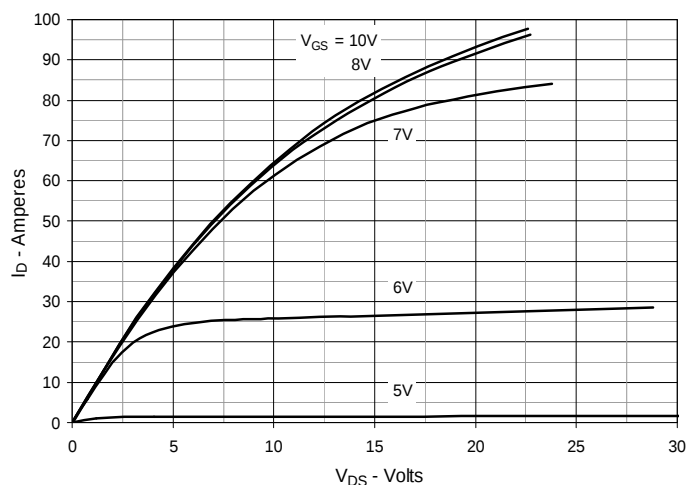
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and IGBTs are covered 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 |
|                                                                                  | 4,850,072 | 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    |             |

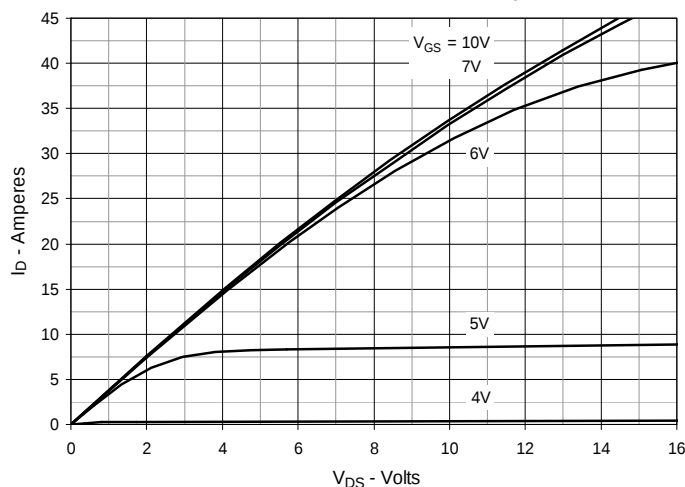
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



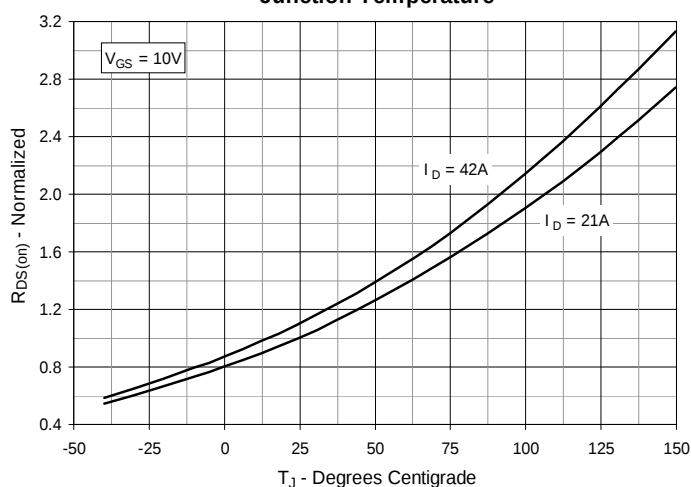
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



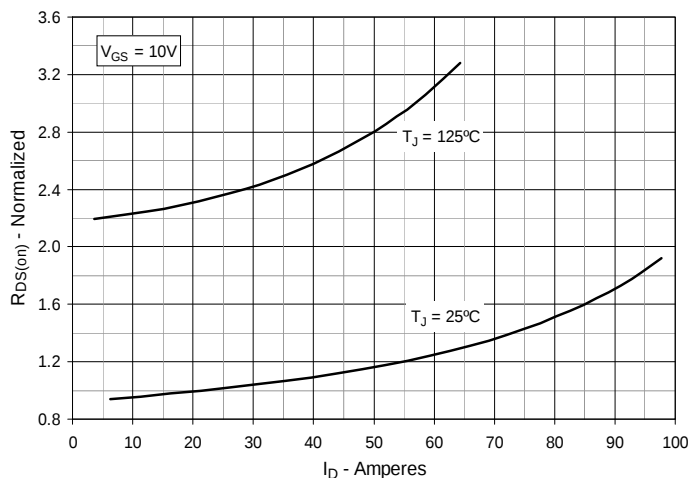
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



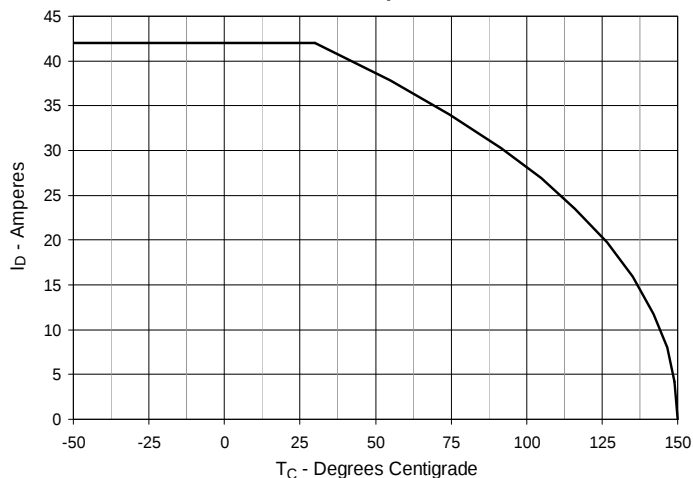
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 21\text{A}$  Value vs. Junction Temperature**



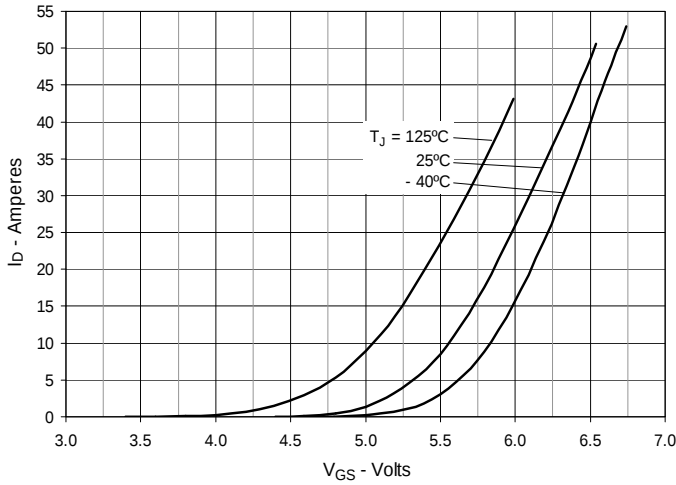
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 21\text{A}$  Value vs. Drain Current**



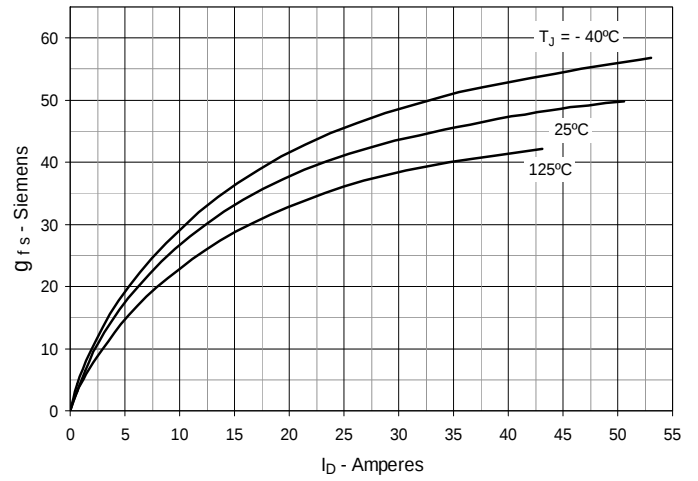
**Fig. 6. Maximum Drain Current vs. Case Temperature**



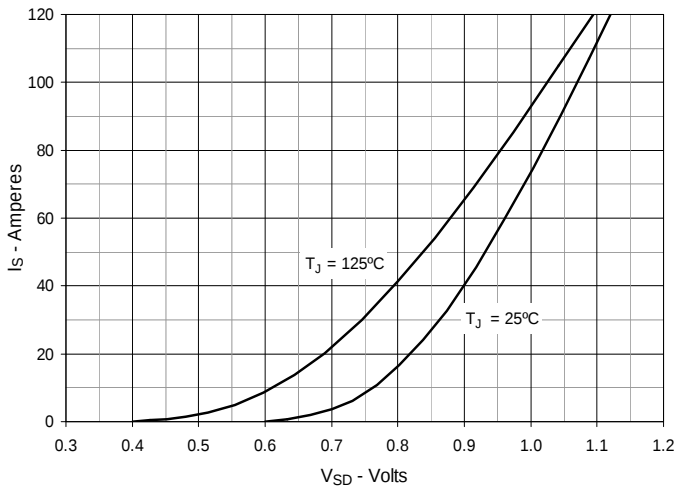
**Fig. 7. Input Admittance**



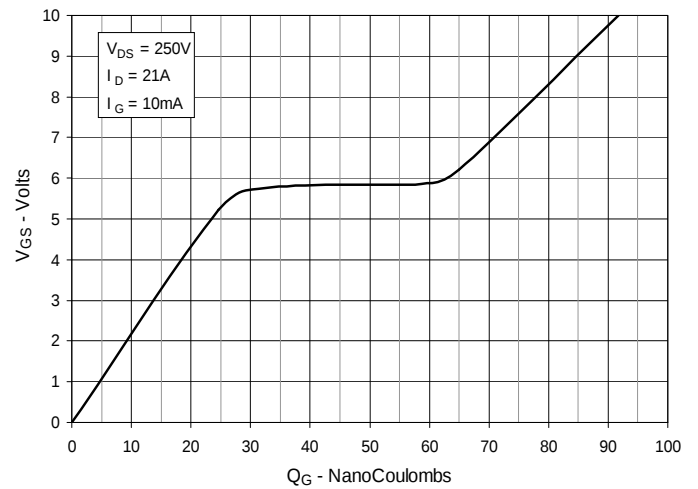
**Fig. 8. Transconductance**



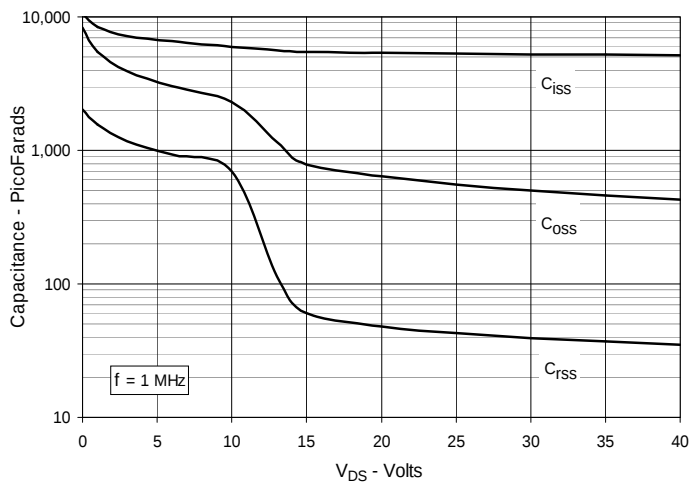
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



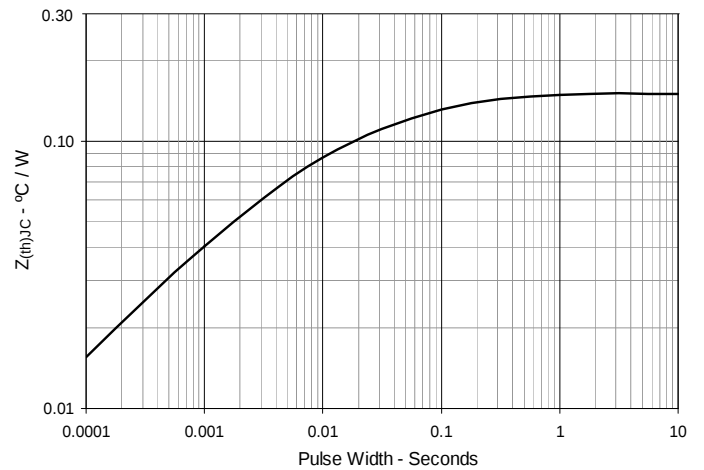
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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





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