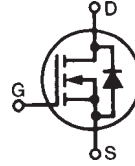


## Polar™ Power MOSFET HiPerFET™

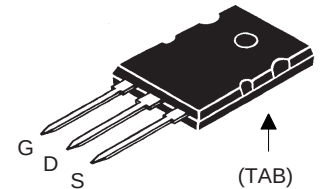
## IXFK64N50P IXFX64N50P

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

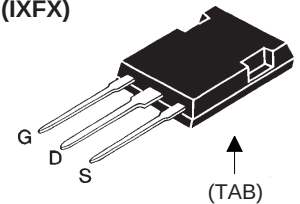


$$\begin{aligned} V_{DSS} &= 500V \\ I_{D25} &= 64A \\ R_{DS(on)} &\leq 85m\Omega \\ t_{rr} &\leq 200ns \end{aligned}$$

TO-264 (IXFK)



PLUS247 (IXFX)



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

| Symbol        | Test Conditions                                                          | Maximum Ratings            |                    |
|---------------|--------------------------------------------------------------------------|----------------------------|--------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 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                  |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$                                                 | 64                         | A                  |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 150                        | A                  |
| $I_A$         | $T_C = 25^\circ\text{C}$                                                 | 64                         | A                  |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$                                                 | 2.5                        | J                  |
| $dV/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 20                         | 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 (0.062 in.) from Case for 10s                                      | 300                        | $^\circ\text{C}$   |
| $T_{SOLD}$    | Plastic Body for 10s                                                     | 260                        | $^\circ\text{C}$   |
| $M_d$         | Mounting Force (PLUS247)<br>Mounting Torque (TO-264)                     | 20..120/4.5..27<br>1.13/10 | N/lb.<br>Nm/lb.in. |
| <b>Weight</b> | PLUS247<br>TO-264                                                        | 6<br>10                    | g<br>g             |

### Features

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

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- DC-DC Converters
- Battery Chargers
- Switched-Mode and Resonant-Mode Power Supplies
- DC Choppers
- AC and DC Motor Drives
- Uninterrupted Power Supplies
- High Speed Power Switching Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                             | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 500                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8mA$                                             | 3.0                   |      | 5.5 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 200$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | 25 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 85 m $\Omega$      |

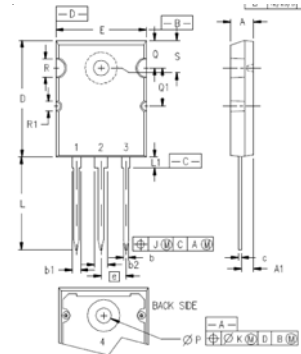
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                        | Characteristic Values |      |                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              |                                                                                                                                                    | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 30                    | 50   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 9700 | nF                     |
| $C_{oss}$    |                                                                                                                                                    |                       | 970  | pF                     |
| $C_{rss}$    |                                                                                                                                                    |                       | 30   | 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>$R_G = 2\Omega$ (External) |                       | 30   | ns                     |
| $t_r$        |                                                                                                                                                    |                       | 25   | ns                     |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 85   | ns                     |
| $t_f$        |                                                                                                                                                    |                       | 22   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 150  | nC                     |
| $Q_{gs}$     |                                                                                                                                                    |                       | 50   | nC                     |
| $Q_{gd}$     |                                                                                                                                                    |                       | 50   | nC                     |
| $R_{thJC}$   |                                                                                                                                                    | 0.15                  |      | $0.15^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                    |                       |      | $^\circ\text{C/W}$     |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                           | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 64 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 250 A         |
| $V_{SD}$ | $I_F = 64\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                    |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 25\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ | 0.6                   | 6.0  | 200 nS        |
| $Q_{RM}$ |                                                                                                       |                       |      | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                       |      | A             |

Note 1: Pulse Test,  $t \leq 300\mu\text{s}$ ; Duty Cycle,  $d \leq 2\%$ .

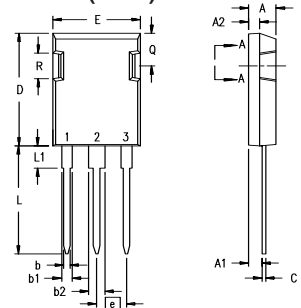
### TO-264 (IXFK) Outline



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

| 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    |       |
| J   | .000     | .010  | 0.00        | 0.25  |
| K   | .000     | .010  | 0.00        | 0.25  |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| ØP  | .122     | .138  | 3.10        | 3.51  |
| 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  |
| S   | .243     | .253  | 6.17        | 6.43  |

### PLUS 247™ (IXFX) Outline



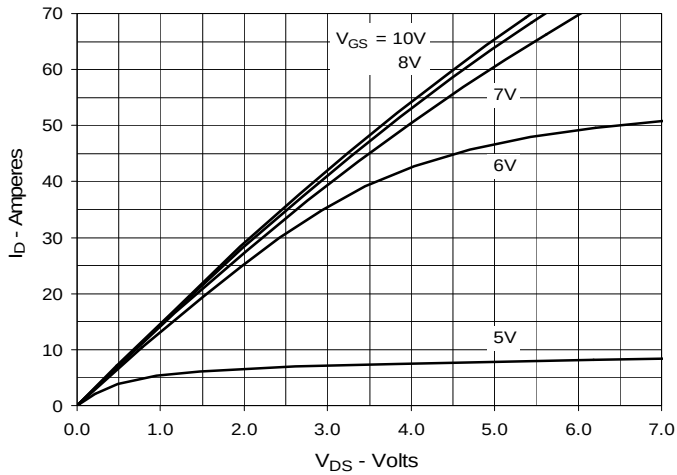
Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)  
4 - Drain (Collector)

| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.83       | 5.21  | .190     | .205  |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100  |
| A <sub>2</sub> | 1.91       | 2.16  | .075     | .085  |
| b              | 1.14       | 1.40  | .045     | .055  |
| b <sub>1</sub> | 1.91       | 2.13  | .075     | .084  |
| b <sub>2</sub> | 2.92       | 3.12  | .115     | .123  |
| C              | 0.61       | 0.80  | .024     | .031  |
| D              | 20.80      | 21.34 | .819     | .840  |
| E              | 15.75      | 16.13 | .620     | .635  |
| e              | 5.45 BSC   |       | .215 BSC |       |
| L              | 19.81      | 20.32 | .780     | .800  |
| L1             | 3.81       | 4.32  | .150     | .170  |
| Q              | 5.59       | 6.20  | .220     | 0.244 |
| R              | 4.32       | 4.83  | .170     | .190  |

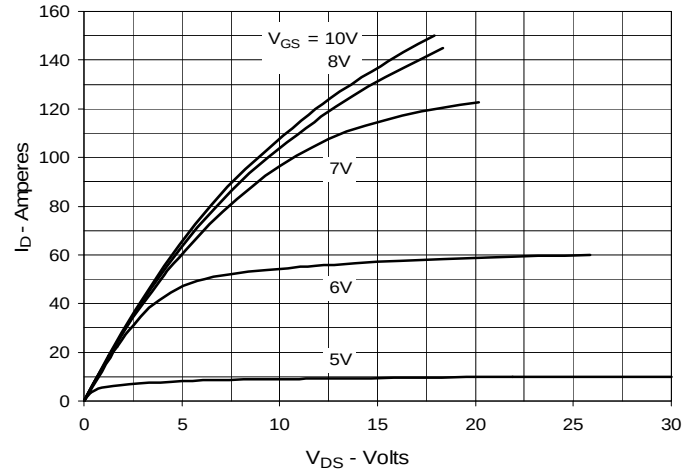
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |              |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 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 | 7,157,338 B2 |
|                                                                                  | 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    |              |

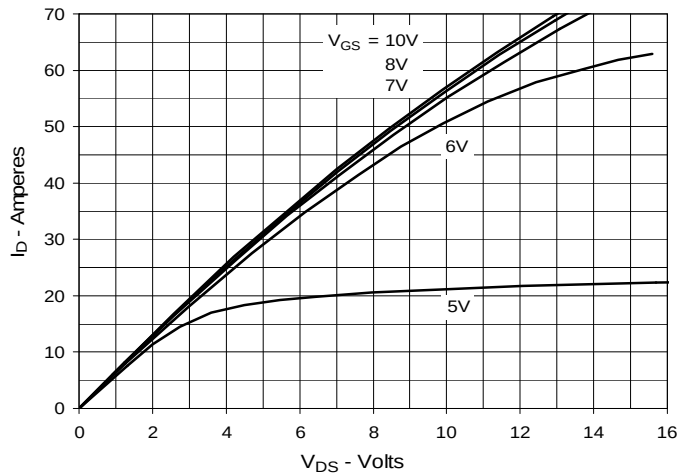
**Fig. 1. Output Characteristics**  
**@ 25°C**



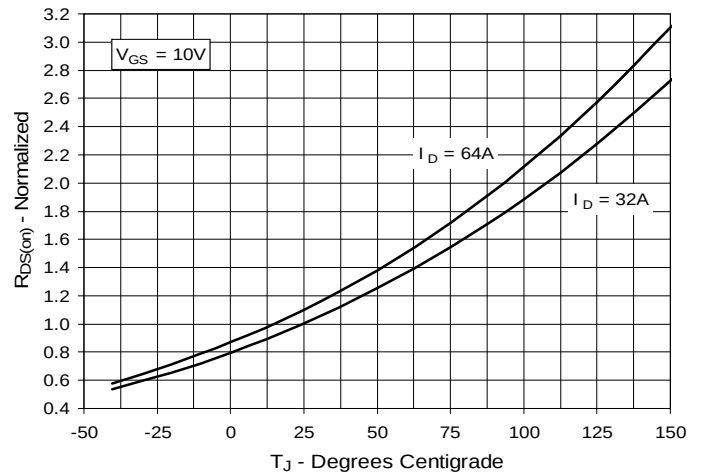
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



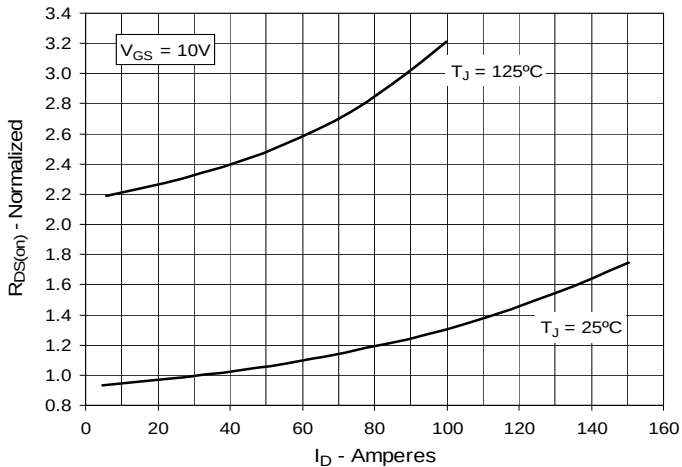
**Fig. 3. Output Characteristics**  
**@ 125°C**



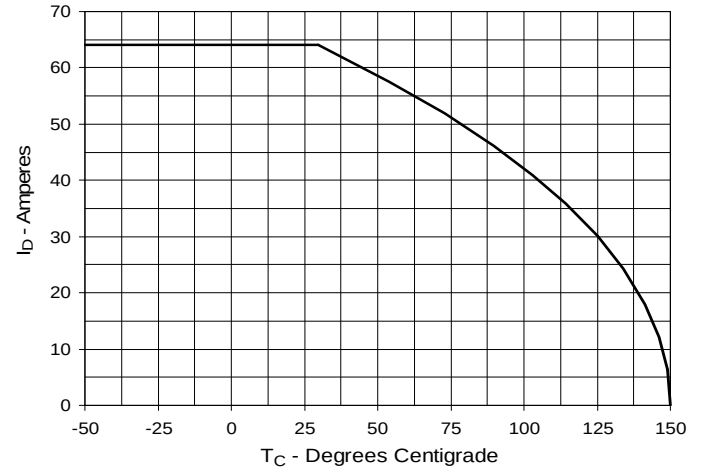
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 32A$  Value**  
**vs. Junction Temperature**



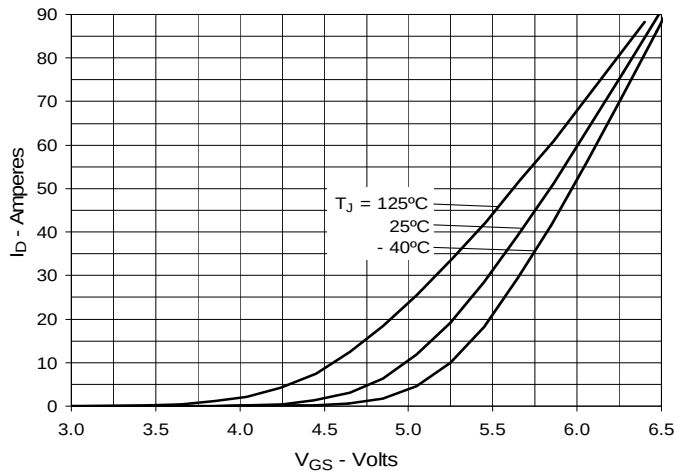
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 32A$  Value**  
**vs. Drain Current**



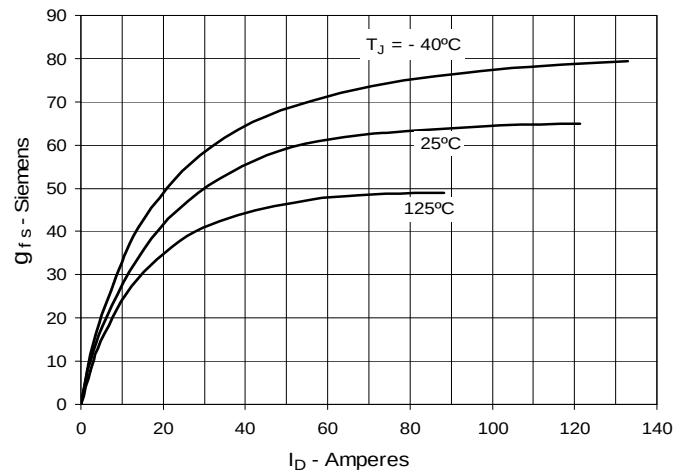
**Fig. 6. Maximum Drain Current vs.**  
**Case Temperature**



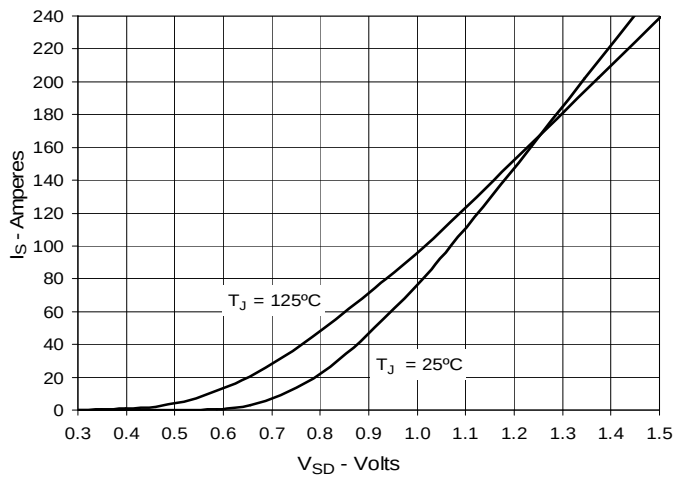
**Fig. 7. Input Admittance**



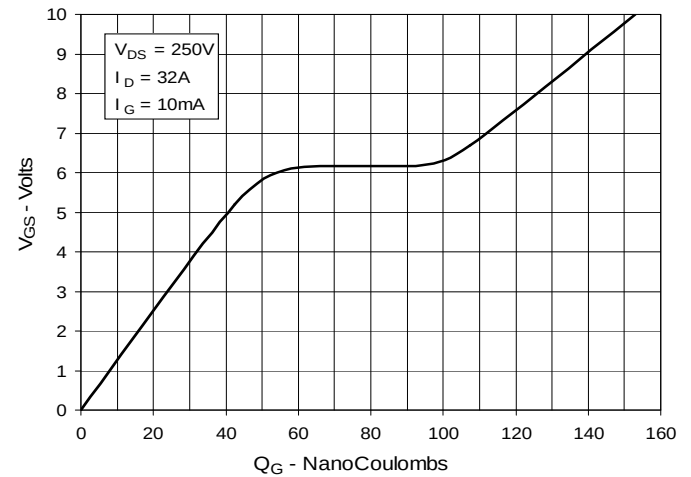
**Fig. 8. Transconductance**



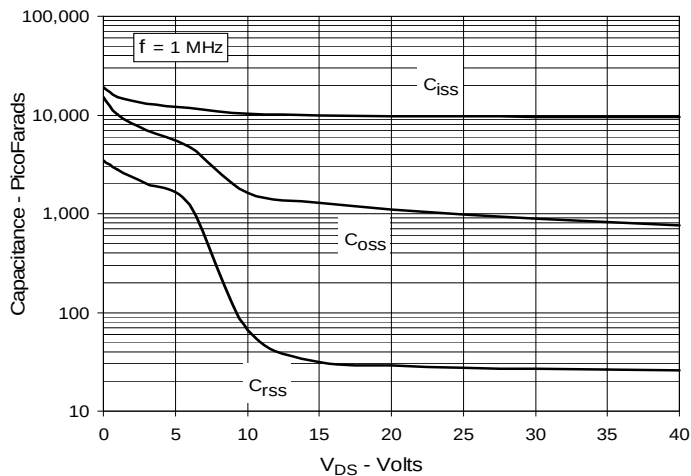
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



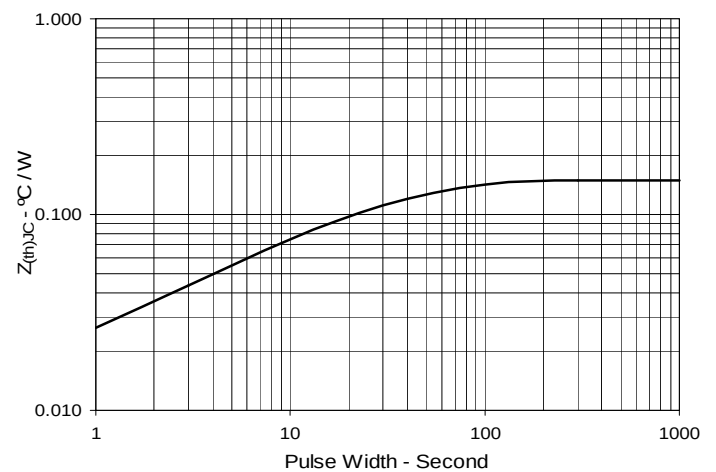
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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





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