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# IXYS

## Polar™ Power MOSFETs

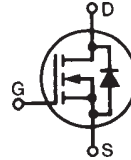
## IXTY1R4N100P IXTA1R4N100P IXTP1R4N100P

$$V_{DSS} = 1000V$$

$$I_{D25} = 1.4A$$

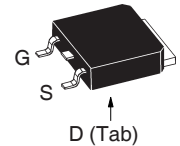
$$R_{DS(on)} \leq 11.8\Omega$$

N-Channel Enhancement Mode  
Avalanche Rated

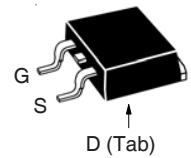


| Symbol     | Test Conditions  | Maximum Ratings  |            |
|------------|--|------------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                                | 1000             | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 1000             | V          |
| $V_{GSS}$  | Continuous   | $\pm 20$         | V          |
| $V_{GSM}$  | Transient  | $\pm 30$         | V          |
| $I_{D25}$  | $T_C = 25^\circ C$   | 1.4              | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 3.0              | A          |
| $I_A$      | $T_C = 25^\circ C$   | 1.4              | A          |
| $E_{AS}$   | $T_C = 25^\circ C$   | 100              | mJ         |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 10               | V/ns       |
| $P_D$      | $T_C = 25^\circ C$   | 63               | W          |
| $T_J$      |  | -55 ... +150     | $^\circ C$ |
| $T_{JM}$   |  | 150              | $^\circ C$ |
| $T_{stg}$  |  | -55 ... +150     | $^\circ C$ |
| $T_L$      | 1.6mm (0.062) from Case for 10s                                    | 300              | $^\circ C$ |
| $T_{SOLD}$ | Plastic Body for 10s   | 260              | $^\circ C$ |
| $F_C$      | Mounting Force (TO-263)  | 10..65/2.2..14.6 | N/lb.      |
| $M_d$      | Mounting Torque (TO-220)   | 1.13 / 10        | Nm/lb.in.  |
| Weight     | TO-252   | 0.35             | g          |
|            | TO-263   | 2.50             | g          |
|            | TO-220   | 3.00             | g          |

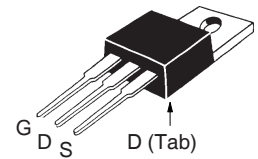
TO-252 (IXTY)



TO-263 AA (IXTA)



TO-220AB (IXTP)



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

### Features

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

### 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

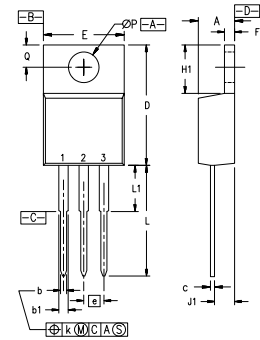
| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                          |
|--------------|---|-----------------------|------|--------------------------|
|              |   | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                      | 1000                  |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 50\mu A$                                   | 2.5                   |      | 4.5 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 50$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 5 $\mu A$<br>150 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 11.8 $\Omega$            |



**IXTY1R4N100P IXTA1R4N100P  
IXTP1R4N100P**

| 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  | 0.70                  | 1.10 | S   |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$           | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$  |                       | 450  | pF  |
|   |   |                       | 27   | pF  |
|   |   |                       | 6    | pF  |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | <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>$R_G = 30\Omega$ (External) |                       | 25   | ns  |
|   |   |                       | 35   | ns  |
|   |   |                       | 65   | ns  |
|   |   |                       | 28   | ns  |
| $Q_{g(on)}$<br>$Q_{gs}$<br>$Q_{gd}$           | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$  |                       | 17.8 | nC  |
|   |   |                       | 2.8  | nC  |
|   |   |                       | 9.9  | nC  |
| $R_{thJC}$<br>$R_{thCS}$                      | TO-220  | 0.50                  |      | $2.0^\circ\text{C/W}$<br>$^\circ\text{C/W}$ |

**TO-220 (IXTP) Outline**



Pins: 1 - Gate 2 - Drain  
3 - Source

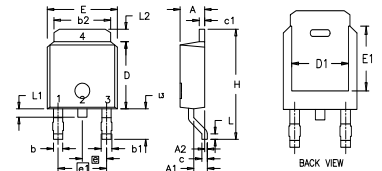
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

**Source-Drain Diode**

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                              | Characteristic Values |      |       |
|----------|--|-----------------------|------|-------|
|          |  | Min.                  | Typ. | Max   |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 1.4 A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$  |                       |      | 4.2 A |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.5 V |
| $t_{rr}$ | $I_F = 1.4\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ ,<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 750  | ns    |

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

**TO-252 (IXTY) Outline**



Pins: 1 - Gate 2,4 - Drain  
3 - Source

| Dim. | Millimeter |       | Inches    |       |
|------|------------|-------|-----------|-------|
|      | Min.       | Max.  | Min.      | Max.  |
| A    | 2.19       | 2.38  | 0.086     | 0.094 |
| A1   | 0.89       | 1.14  | 0.035     | 0.045 |
| A2   | 0          | 0.13  | 0         | 0.005 |
| b    | 0.64       | 0.89  | 0.025     | 0.035 |
| b1   | 0.76       | 1.14  | 0.030     | 0.045 |
| b2   | 5.21       | 5.46  | 0.205     | 0.215 |
| c    | 0.46       | 0.58  | 0.018     | 0.023 |
| c1   | 0.46       | 0.58  | 0.018     | 0.023 |
| D    | 5.97       | 6.22  | 0.235     | 0.245 |
| D1   | 4.32       | 5.21  | 0.170     | 0.205 |
| E    | 6.35       | 6.73  | 0.250     | 0.265 |
| E1   | 4.32       | 5.21  | 0.170     | 0.205 |
| e    | 2.28 BSC   |       | 0.090 BSC |       |
| e1   | 4.57 BSC   |       | 0.180 BSC |       |
| H    | 9.40       | 10.42 | 0.370     | 0.410 |
| L    | 0.51       | 1.02  | 0.020     | 0.040 |
| L1   | 0.64       | 1.02  | 0.025     | 0.040 |
| L2   | 0.89       | 1.27  | 0.035     | 0.050 |
| L3   | 2.54       | 2.92  | 0.100     | 0.115 |

**TO-263 (IXTA) Outline**

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c2  | .045     | .055 | 1.14        | 1.40  |
| D   | .340     | .380 | 8.64        | 9.65  |
| D1  | .315     | .350 | 8.00        | 8.89  |
| E   | .380     | .410 | 9.65        | 10.41 |
| E1  | .245     | .320 | 6.22        | 8.13  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| L   | .575     | .625 | 14.61       | 15.88 |
| L1  | .090     | .110 | 2.29        | 2.79  |
| L2  | .040     | .055 | 1.02        | 1.40  |
| L3  | .050     | .070 | 1.27        | 1.78  |
| L4  | 0        | .005 | 0           | 0.13  |

1. GATE  
2. DRAIN (COLLECTOR)  
3. SOURCE (EMITTER)  
4. DRAIN (COLLECTOR)  
BOTTOM SIDE

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

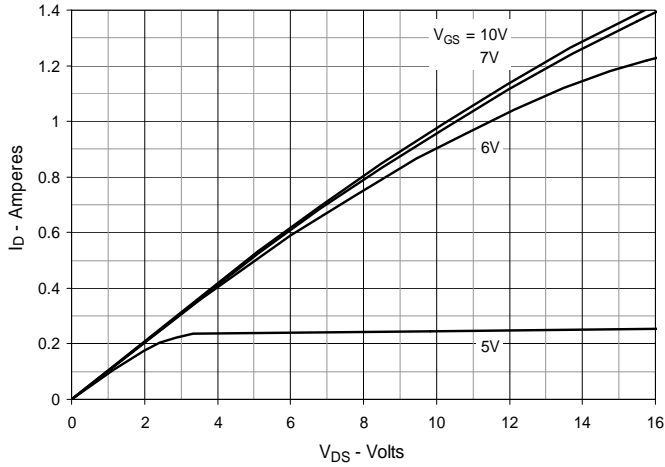
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

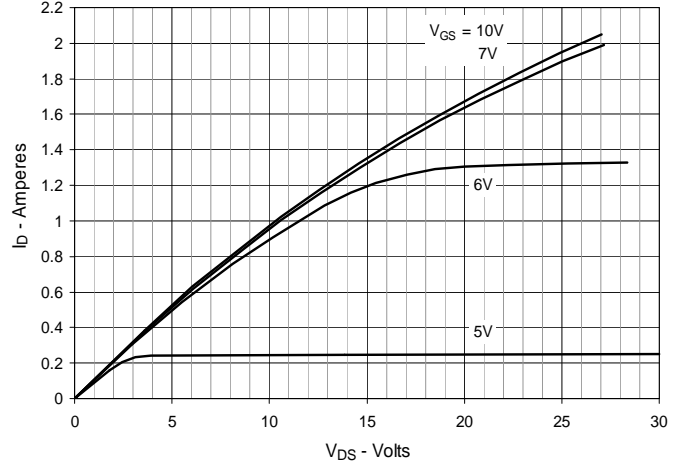


**IXTY1R4N100P IXTA1R4N100P  
IXTP1R4N100P**

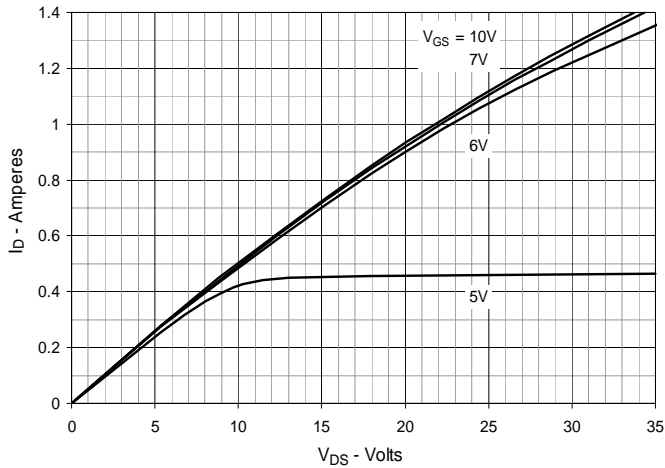
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



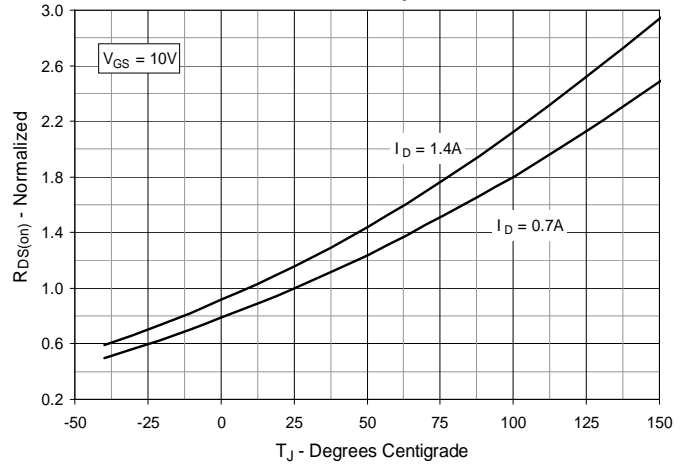
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



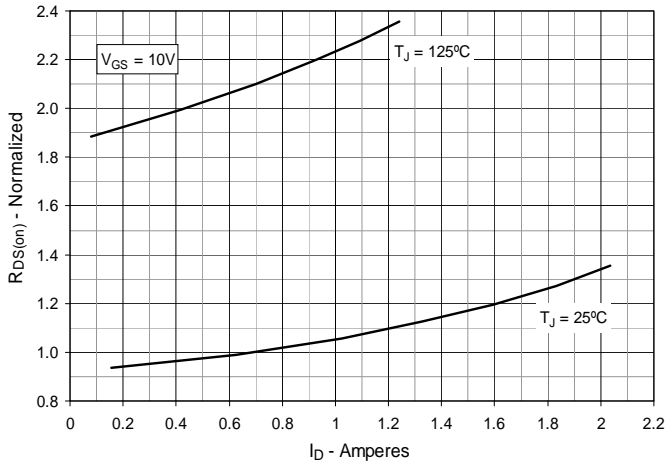
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



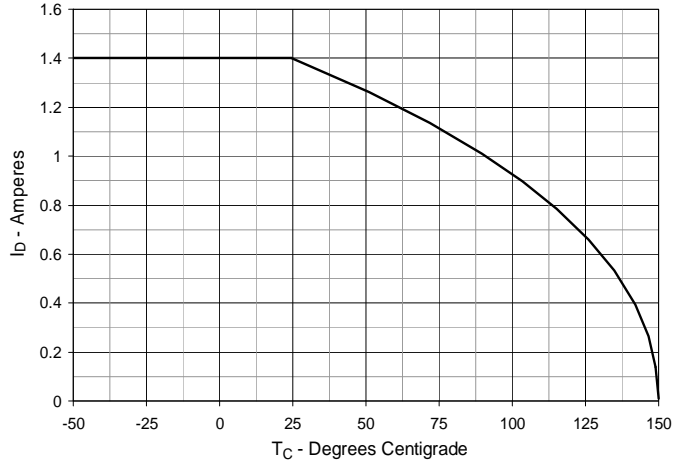
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 0.7\text{A}$  Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 0.7\text{A}$  Value vs. Drain Current**



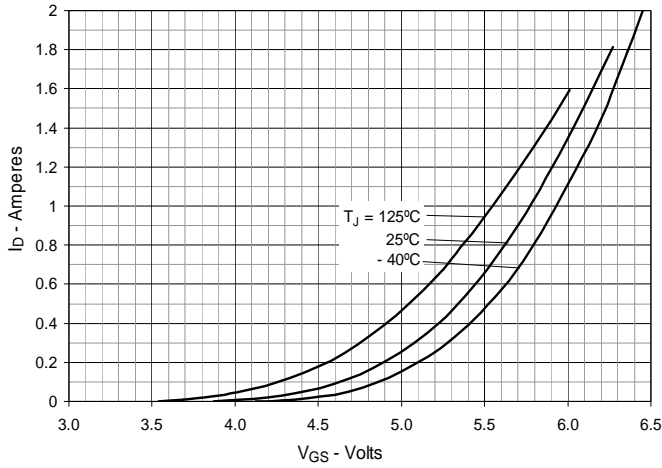
**Fig. 6. Maximum Drain Current vs. Case Temperature**



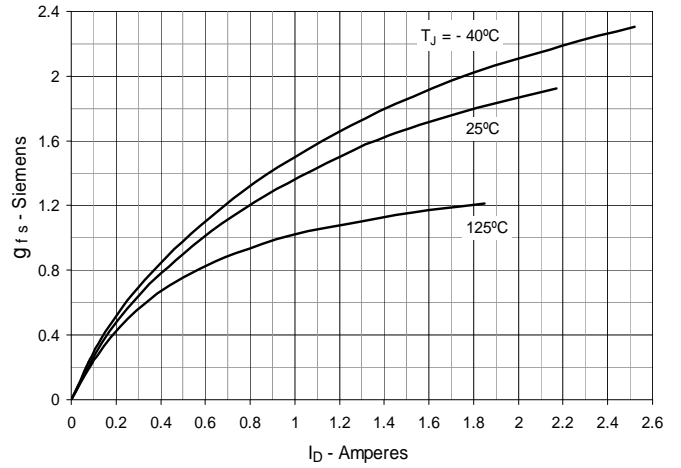


**IXTY1R4N100P IXTA1R4N100P IXTP1R4N100P**

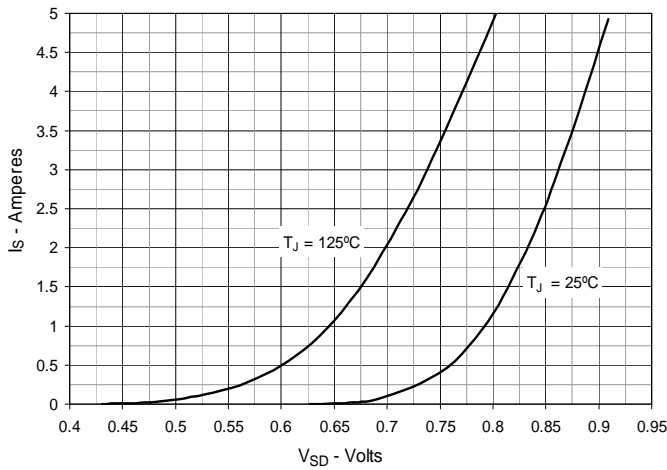
**Fig. 7. Input Admittance**



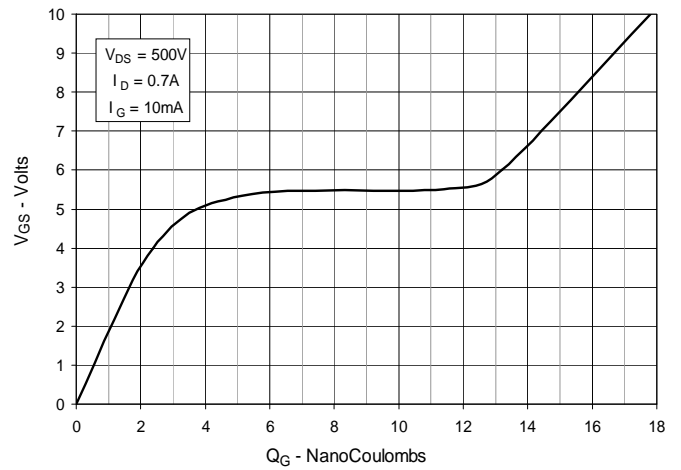
**Fig. 8. Transconductance**



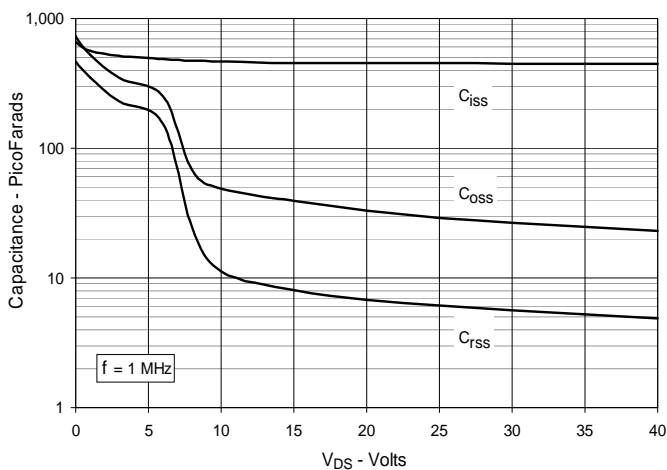
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



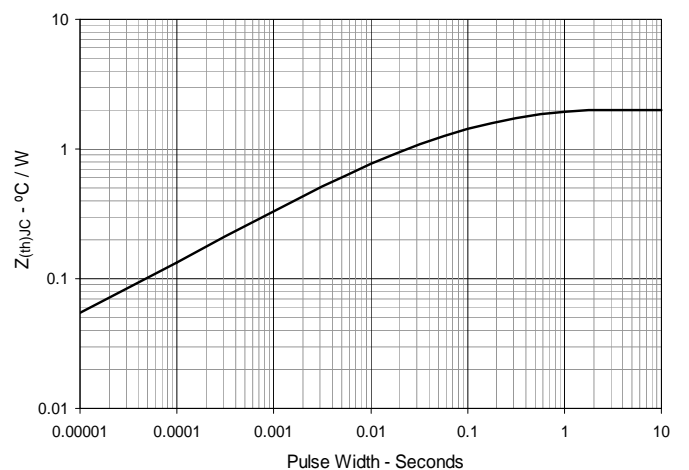
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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



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