

# Polar™ Power MOSFET

**IXTA14N60P**  
**IXTP14N60P**  
**IXTQ14N60P**

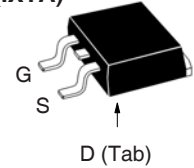
**V<sub>DSS</sub> = 600V**  
**I<sub>D25</sub> = 14A**  
**R<sub>DS(on)</sub> ≤ 550mΩ**

Enhancement Mode  
Avalanche Rated

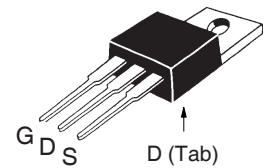


| Symbol            | Test Conditions   | Maximum Ratings |           |
|-------------------|---|-----------------|-----------|
|                   |   | Value           | Unit      |
| V <sub>DSS</sub>  | T <sub>J</sub> = 25°C to 150°C                                | 600             | V         |
| V <sub>DGR</sub>  | T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ         | 600             | V         |
| V <sub>GSS</sub>  | Continuous  | ±30             | V         |
| V <sub>GSM</sub>  | Transient   | ±40             | V         |
| I <sub>D25</sub>  | T <sub>C</sub> = 25°C   | 14              | A         |
| I <sub>DM</sub>   | T <sub>C</sub> = 25°C, pulse width limited by T <sub>JM</sub> | 42              | A         |
| I <sub>A</sub>    | T <sub>C</sub> = 25°C   | 14              | A         |
| E <sub>AS</sub>   | T <sub>C</sub> = 25°C   | 900             | mJ        |
| P <sub>D</sub>    | T <sub>C</sub> = 25°C   | 300             | W         |
| T <sub>J</sub>    |   | -55 ... +150    | °C        |
| T <sub>JM</sub>   |   | 150             | °C        |
| T <sub>stg</sub>  |   | -55 ... +150    | °C        |
| T <sub>L</sub>    | Maximum Lead Temperature for Soldering                        | 300             | °C        |
| T <sub>SOLD</sub> | Plastic Body for 10s  | 260             | °C        |
| M <sub>d</sub>    | Mounting torque (TO-220 & TO-3P)                              | 1.13/10         | Nm/lb.in. |
| Weight            | TO-263  | 2.5             | g         |
|                   | TO-220  | 3.0             | g         |
|                   | TO-3P   | 5.5             | g         |

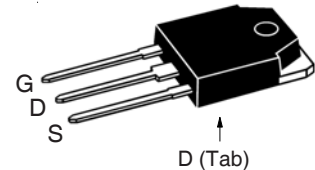
TO-263 AA (IXTA)



TO-220AB (IXTP)



TO-3P (IXTQ)



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

## Features

- International Standard Packages
- Fast Intrinsic Rectifier
- Avalanche Rated
- Low R<sub>DS(ON)</sub> and Q<sub>G</sub>
- 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 <sub>J</sub> = 25°C, unless otherwise specified)              | Characteristic Values |      |                |
|---------------------|---|-----------------------|------|----------------|
|                     |   | Min.                  | Typ. | Max.           |
| BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA  | 600                   |      | V              |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                          | 3.0                   |      | 5.5 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> , V <sub>GS</sub> = 0V<br>T <sub>J</sub> = 125°C |                       |      | 5 μA<br>100 μA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             | 450                   | 550  | mΩ             |

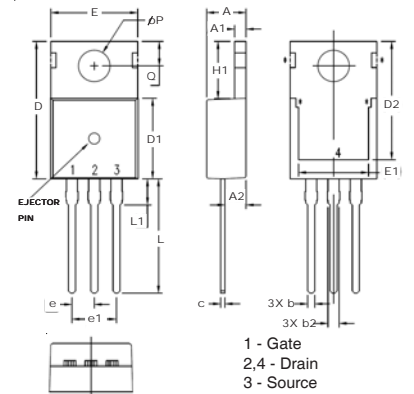
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)   | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 20V, I_D = 0.5 \cdot I_{D25'}$ , Note 1   | 7                     | 13   | S                  |
| $C_{iss}$    | $V_{GS} = 0V, V_{DS} = 25V, f = 1\text{MHz}$  |                       | 2500 | pF                 |
| $C_{oss}$    |   |                       | 215  | pF                 |
| $C_{rss}$    |   |                       | 13   | pF                 |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25'}$<br>$R_G = 10\Omega$ (External) |                       | 23   | ns                 |
| $t_r$        |   |                       | 27   | ns                 |
| $t_{d(off)}$ |   |                       | 70   | ns                 |
| $t_f$        |   |                       | 26   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25'}$  |                       | 36   | nC                 |
| $Q_{gs}$     |   |                       | 16   | nC                 |
| $Q_{gd}$     |   |                       | 12   | nC                 |
| $R_{thJC}$   |   |                       | 0.42 | $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-220)  | 0.50                  |      | $^\circ\text{C/W}$ |
|              | (TO-3P)   | 0.25                  |      | $^\circ\text{C/W}$ |

**Source-Drain Diode**

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |       |
|----------|---|-----------------------|------|-------|
|          |   | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0V$   |                       |      | 14 A  |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$                                 |                       |      | 42 A  |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0V$ , Note 1   |                       |      | 1.5 V |
| $t_{rr}$ | $I_F = 14A, -di/dt = 100A/\mu\text{s}$<br>$V_R = 100V, V_{GS} = 0V$         |                       | 500  | ns    |

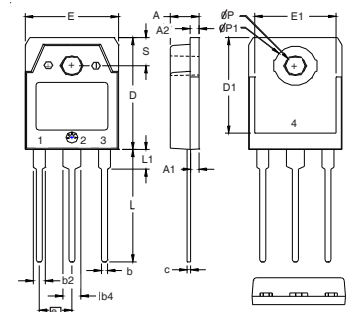
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ ; duty cycle,  $d \leq 2\%$ .

**TO-220 Outline**



| SYM      | INCHES   |      | MILLIMETERS |       |
|----------|----------|------|-------------|-------|
|          | MIN      | MAX  | MIN         | MAX   |
| A        | .169     | .185 | 4.30        | 4.70  |
| A1       | .047     | .055 | 1.20        | 1.40  |
| A2       | .079     | .106 | 2.00        | 2.70  |
| b        | .024     | .039 | 0.60        | 1.00  |
| b2       | .045     | .057 | 1.15        | 1.45  |
| c        | .014     | .026 | 0.35        | 0.65  |
| D        | .587     | .626 | 14.90       | 15.90 |
| D1       | .335     | .370 | 8.50        | 9.40  |
| (D2)     | .500     | .531 | 12.70       | 13.50 |
| E        | .382     | .406 | 9.70        | 10.30 |
| (E1)     | .283     | .323 | 7.20        | 8.20  |
| e        | .100 BSC |      | 2.54 BSC    |       |
| e1       | .200 BSC |      | 5.08 BSC    |       |
| H1       | .244     | .268 | 6.20        | 6.80  |
| L        | .492     | .547 | 12.50       | 13.90 |
| L1       | .110     | .154 | 2.80        | 3.90  |
| $\phi P$ | .134     | .150 | 3.40        | 3.80  |
| Q        | .106     | .126 | 2.70        | 3.20  |

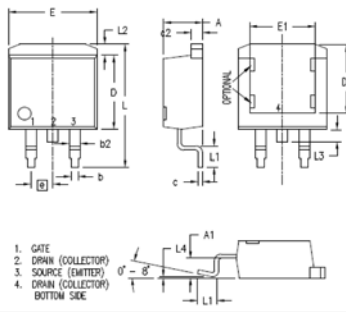
**TO-3P Outline**



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

| SYM       | INCHES   |      | MILLIMETERS |       |
|-----------|----------|------|-------------|-------|
|           | MIN      | MAX  | MIN         | MAX   |
| A         | .185     | .193 | 4.70        | 4.90  |
| A1        | .051     | .059 | 1.30        | 1.50  |
| A2        | .057     | .065 | 1.45        | 1.65  |
| b         | .035     | .045 | 0.90        | 1.15  |
| b2        | .075     | .087 | 1.90        | 2.20  |
| b4        | .114     | .126 | 2.90        | 3.20  |
| c         | .022     | .031 | 0.55        | 0.80  |
| D         | .780     | .799 | 19.80       | 20.30 |
| D1        | .665     | .677 | 16.90       | 17.20 |
| E         | .610     | .622 | 15.50       | 15.80 |
| E1        | .531     | .539 | 13.50       | 13.70 |
| e         | .215 BSC |      | 5.45 BSC    |       |
| L         | .779     | .795 | 19.80       | 20.20 |
| L1        | .134     | .142 | 3.40        | 3.60  |
| $\phi P$  | .126     | .134 | 3.20        | 3.40  |
| $\phi P1$ | .272     | .280 | 6.90        | 7.10  |
| S         | .193     | .201 | 4.90        | 5.10  |

**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  |

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 7,157,338B2  
by one or more of the following U.S. patents: 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 @  $T_J = 25^\circ\text{C}$

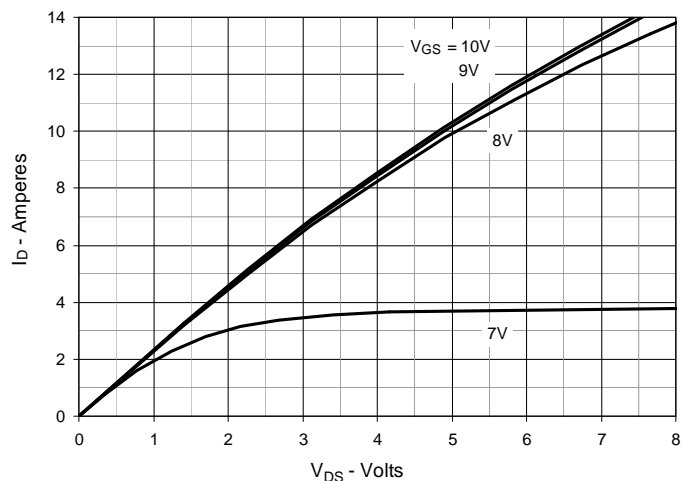


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

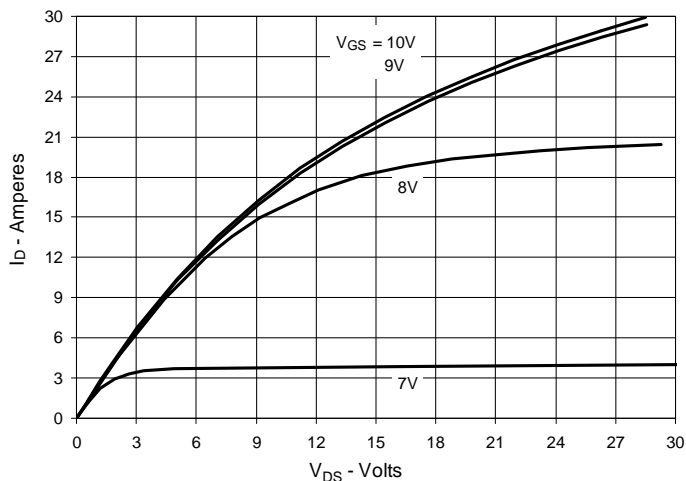


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

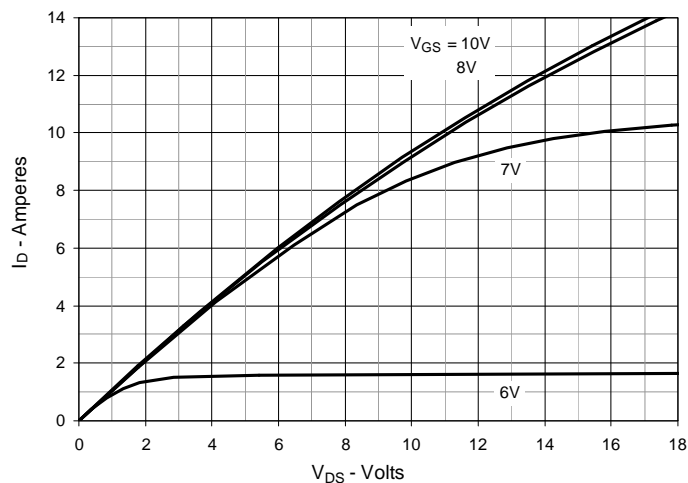


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 7\text{A}$  Value vs. Junction Temperature

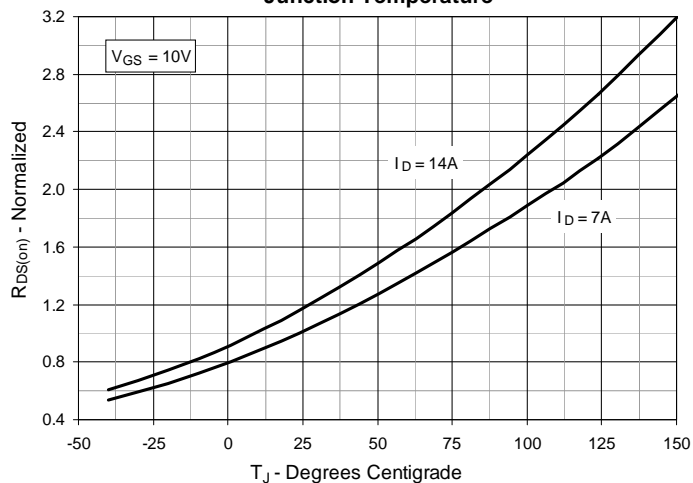


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 7\text{A}$  Value vs. Drain Current

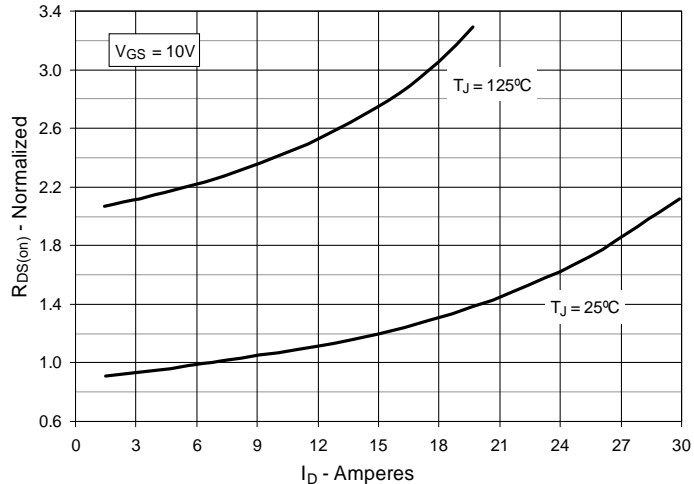


Fig. 6. Maximum Drain Current vs. Case Temperature

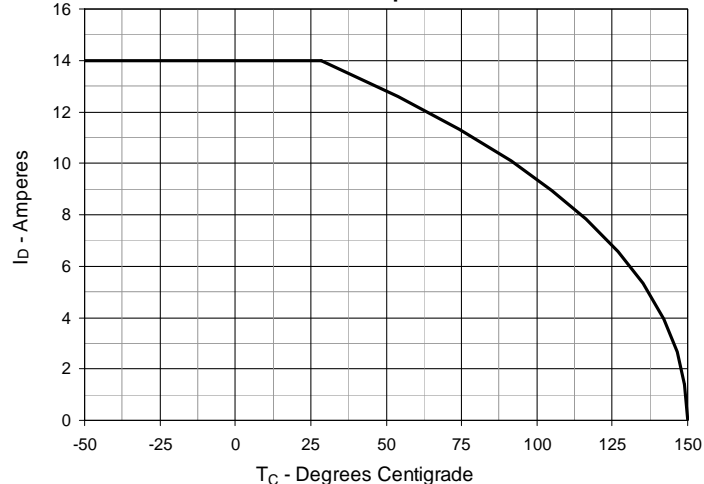


Fig. 7. Input Admittance

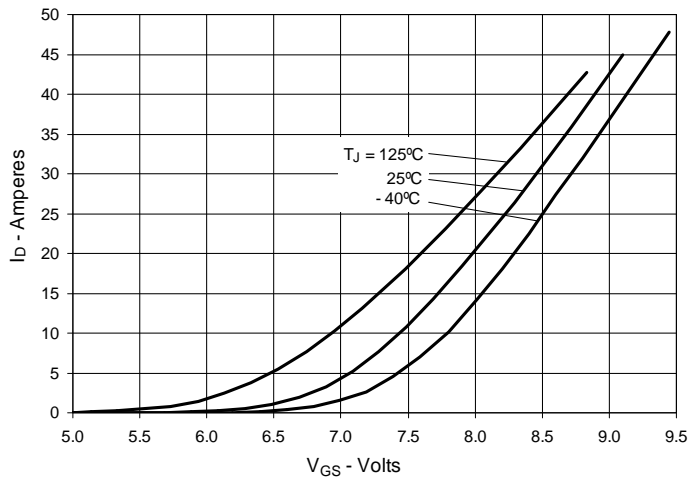


Fig. 8. Transconductance

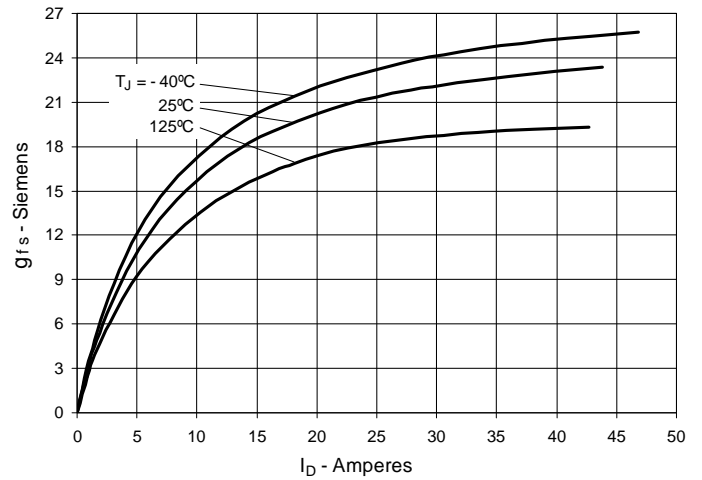


Fig. 9. Forward Voltage Drop of Intrinsic Diode

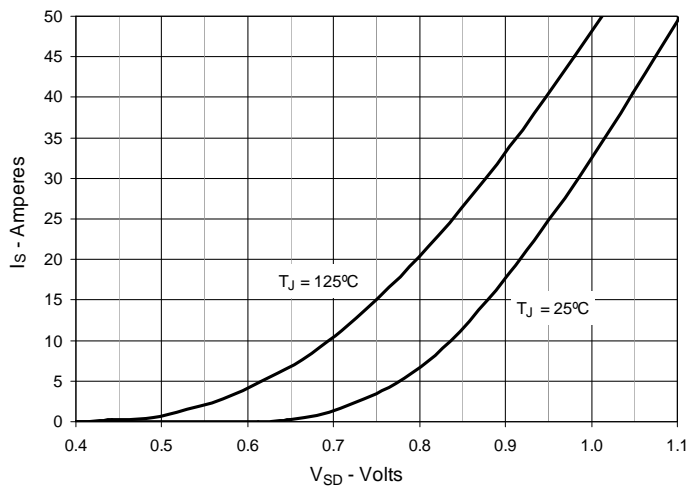


Fig. 10. Gate Charge

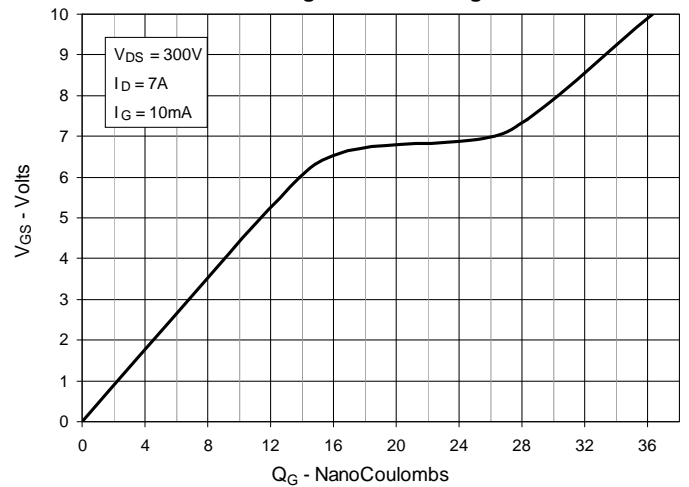


Fig. 11. Capacitance

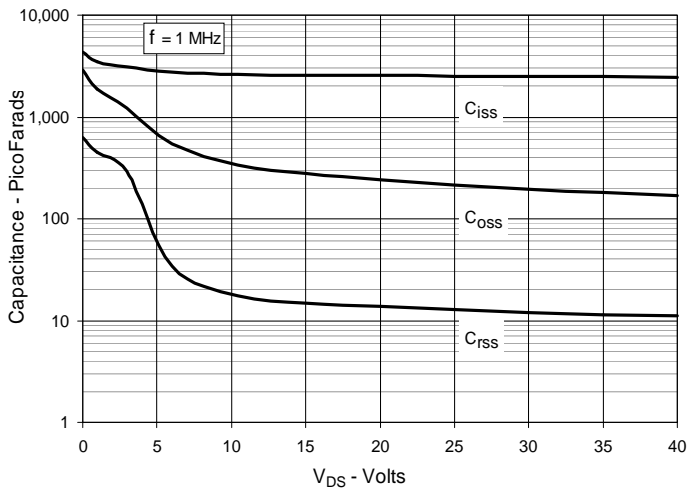


Fig. 12. Forward-Bias Safe Operating Area

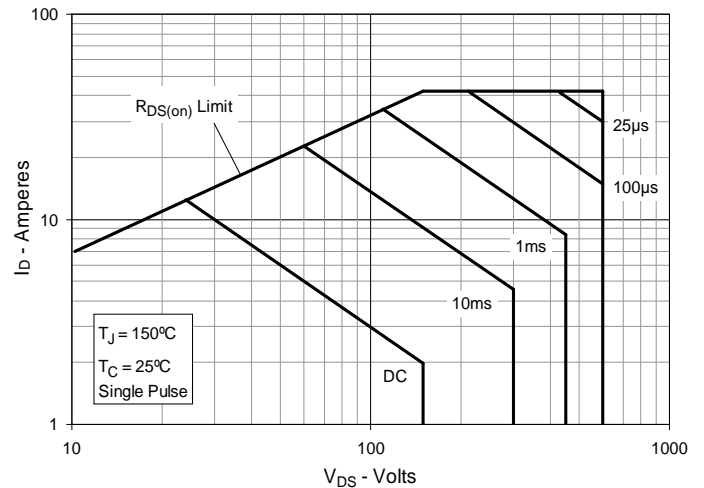
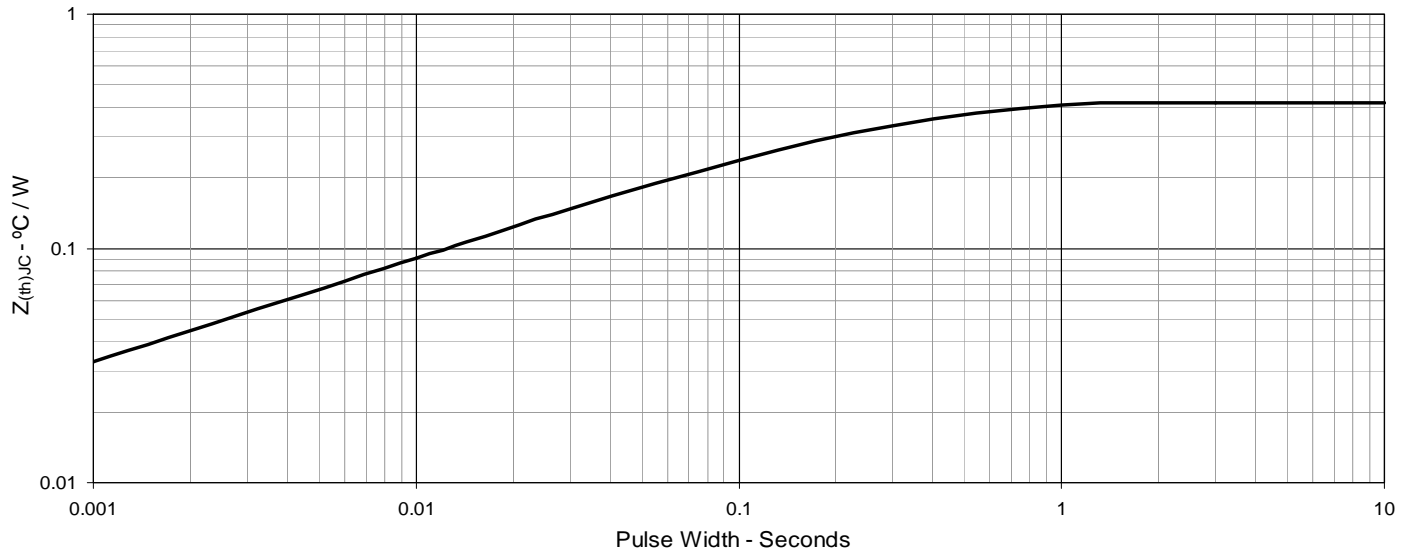


Fig. 13. Maximum Transient Thermal Impedance





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