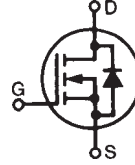


## Polar™ HiperFET™ Power MOSFET

**IXFK170N20P**  
**IXFX170N20P**

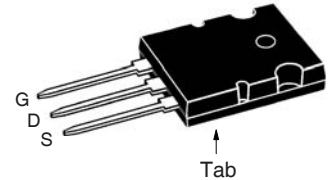
**V<sub>DSS</sub> = 200V**  
**I<sub>D25</sub> = 170A**  
**R<sub>DS(on)</sub> ≤ 14mΩ**

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

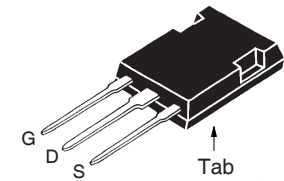


| Symbol            | Test Conditions  | Maximum Ratings            |                  |
|-------------------|--|----------------------------|------------------|
| V <sub>DSS</sub>  | T <sub>J</sub> = 25°C to 175°C   | 200                        | V                |
| V <sub>DGR</sub>  | T <sub>J</sub> = 25°C to 175°C, R <sub>GS</sub> = 1MΩ  | 200                        | 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  | 170                        | A                |
| I <sub>LRMS</sub> | Lead Current Limit   | 160                        | A                |
| I <sub>DM</sub>   | T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub>                                  | 400                        | A                |
| I <sub>A</sub>    | T <sub>C</sub> = 25°C  | 85                         | A                |
| E <sub>AS</sub>   | T <sub>C</sub> = 25°C  | 4                          | J                |
| dv/dt             | I <sub>S</sub> ≤ I <sub>DM</sub> , V <sub>DD</sub> ≤ V <sub>DSS</sub> , T <sub>J</sub> ≤ 175°C | 20                         | V/ns             |
| P <sub>D</sub>    | T <sub>C</sub> = 25°C  | 1250                       | W                |
| T <sub>J</sub>    |  | -55 ... +175               | °C               |
| T <sub>JM</sub>   |  | 175                        | °C               |
| T <sub>stg</sub>  |  | -55 ... +175               | °C               |
| L                 | Maximum Lead Temperature for Soldering   | 300                        | °C               |
| T <sub>SOLD</sub> | 1.6 mm (0.062in.) from Case for 10s  | 260                        | °C               |
| M <sub>d</sub>    | Mounting Force (PLUS247)<br>Mounting Torque (TO-264)   | 20..120/4.5..27<br>1.13/10 | N/lb<br>Nm/lb.in |
| Weight            | PLUS247<br>TO-264  | 6<br>10                    | g<br>g           |

TO-264 (IXFK)



PLUS247 (IXFX)



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

### Features

- Dynamic dv/dt Rating
- Avalanche Rated
- Fast Intrinsic Diode
- Low Q<sub>G</sub>
- Low R<sub>DS(on)</sub>
- Low Drain-to-Tab Capacitance
- Low Package Inductance

### Advantages

- Easy to Mount
- Space Savings

### Applications

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

| 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> = 3mA  | 200                   |      | V             |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1mA                            | 2.5                   |      | 4.5 V         |
| I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |                       |      | ±200 nA       |
| I <sub>DSS</sub>    | V <sub>DS</sub> = V <sub>DSS</sub> , V <sub>GS</sub> = 0V<br>T <sub>J</sub> = 150°C |                       |      | 50 μA<br>1 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             |                       |      | 14 mΩ         |

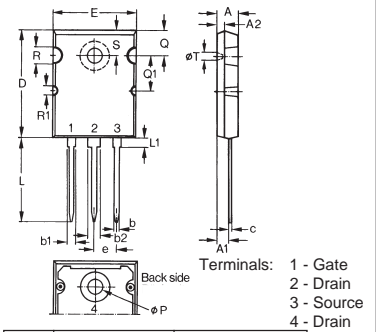
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |                    |
|--------------|--|-----------------------|------|--------------------|
|              |  | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1  | 45                    | 75   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |                       | 11.4 | nF                 |
| $C_{oss}$    |  |                       | 2440 | pF                 |
| $C_{rss}$    |  |                       | 70   | 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>$R_G = 1\Omega$ (External) |                       | 40   | ns                 |
| $t_r$        |  |                       | 25   | ns                 |
| $t_{d(off)}$ |  |                       | 50   | ns                 |
| $t_f$        |  |                       | 14   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$   |                       | 185  | nC                 |
| $Q_{gs}$     |  |                       | 80   | nC                 |
| $Q_{gd}$     |  |                       | 60   | nC                 |
| $R_{thJC}$   |  |                       | 0.12 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |  | 0.15                  |      | $^\circ\text{C/W}$ |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                           | Characteristic Values |      |               |
|----------|---|-----------------------|------|---------------|
|          |   | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$  |                       |      | 170 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$   |                       |      | 510 A         |
| $V_{SD}$ | $I_F = 85\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.3 V         |
| $t_{rr}$ | $I_F = 85\text{A}$ , $-di/dt = 150\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 1.6  | 200 ns        |
| $Q_{RM}$ |   |                       | 20   | $\mu\text{C}$ |
| $I_{RM}$ |   |                       |      | A             |

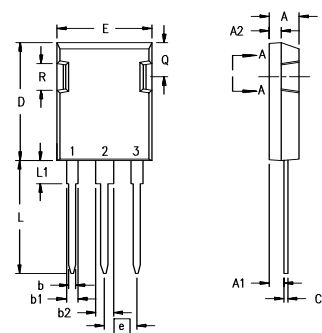
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

### TO-264 AA Outline



| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.82       | 5.13  | .190     | .202  |
| A1   | 2.54       | 2.89  | .100     | .114  |
| A2   | 2.00       | 2.10  | .079     | .083  |
| b    | 1.12       | 1.42  | .044     | .056  |
| b1   | 2.39       | 2.69  | .094     | .106  |
| b2   | 2.90       | 3.09  | .114     | .122  |
| c    | 0.53       | 0.83  | .021     | .033  |
| D    | 25.91      | 26.16 | 1.020    | 1.030 |
| E    | 19.81      | 19.96 | .780     | .786  |
| e    | 5.46 BSC   |       | .215 BSC |       |
| J    | 0.00       | 0.25  | .000     | .010  |
| K    | 0.00       | 0.25  | .000     | .010  |
| L    | 20.32      | 20.83 | .800     | .820  |
| L1   | 2.29       | 2.59  | .090     | .102  |
| P    | 3.17       | 3.66  | .125     | .144  |
| Q    | 6.07       | 6.27  | .239     | .247  |
| Q1   | 8.38       | 8.69  | .330     | .342  |
| R    | 3.81       | 4.32  | .150     | .170  |
| R1   | 1.78       | 2.29  | .070     | .090  |
| S    | 6.04       | 6.30  | .238     | .248  |
| T    | 1.57       | 1.83  | .062     | .072  |

### PLUS247™ Outline



| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.83       | 5.21  | .190     | .205  |
| A1   | 2.29       | 2.54  | .090     | .100  |
| A2   | 1.91       | 2.16  | .075     | .085  |
| b    | 1.14       | 1.40  | .045     | .055  |
| b1   | 1.91       | 2.13  | .075     | .084  |
| b2   | 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 | 7,157,338B2 |
|  | 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 @  $T_J = 25^\circ\text{C}$

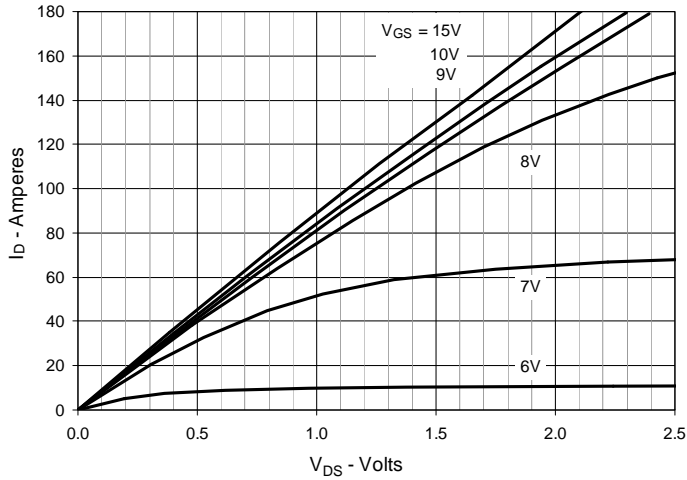


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

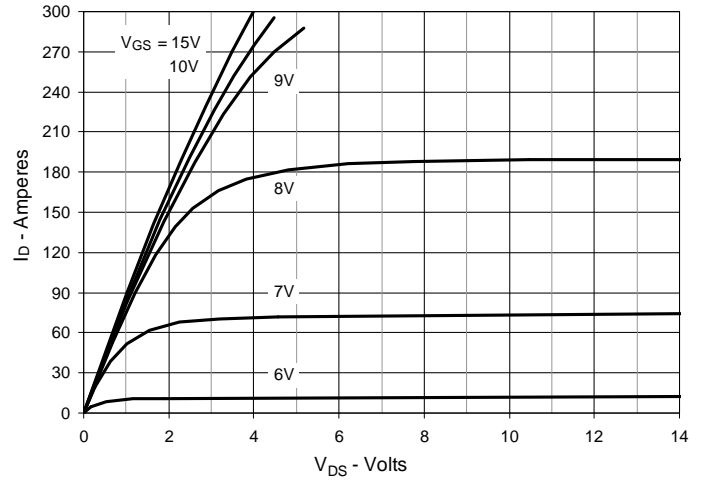


Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$

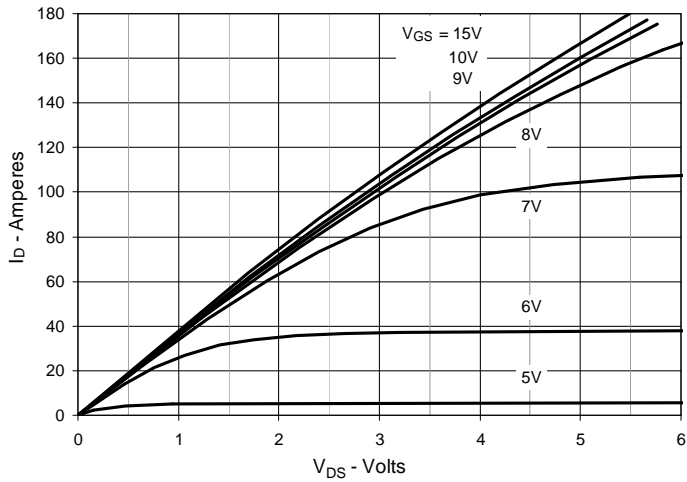


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 85\text{A}$  Value vs. Junction Temperature

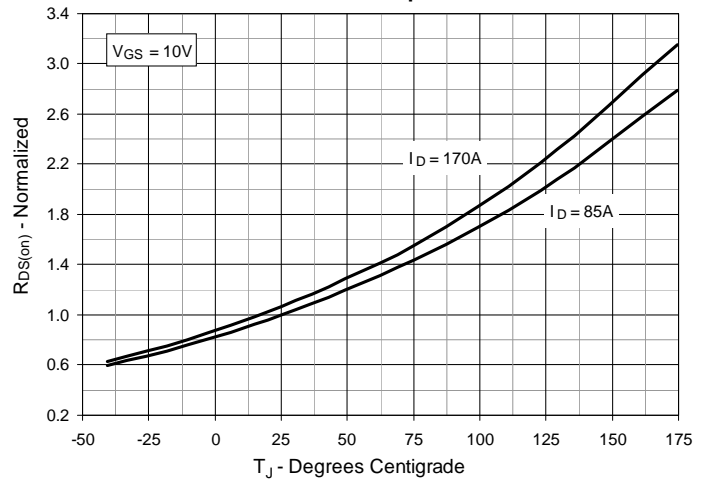


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 85\text{A}$  Value vs. Drain Current

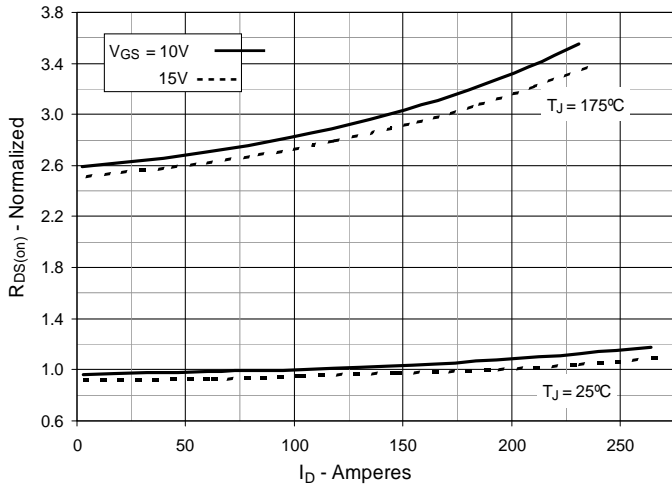
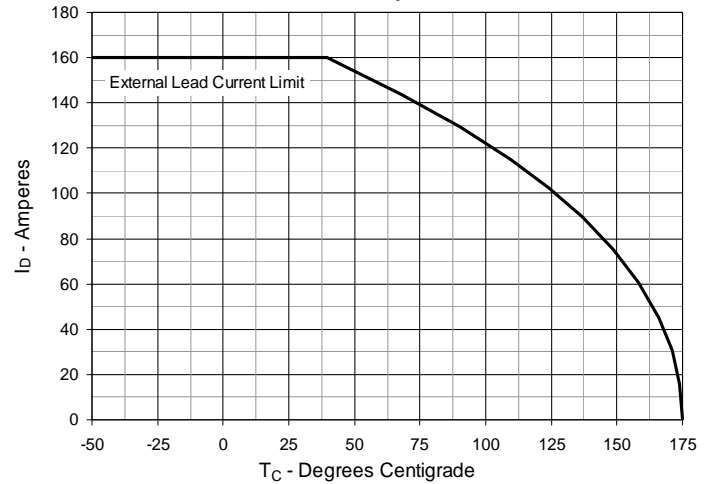
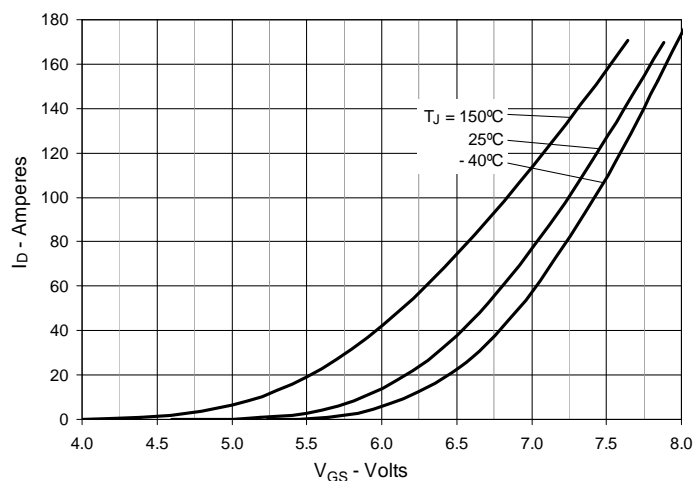


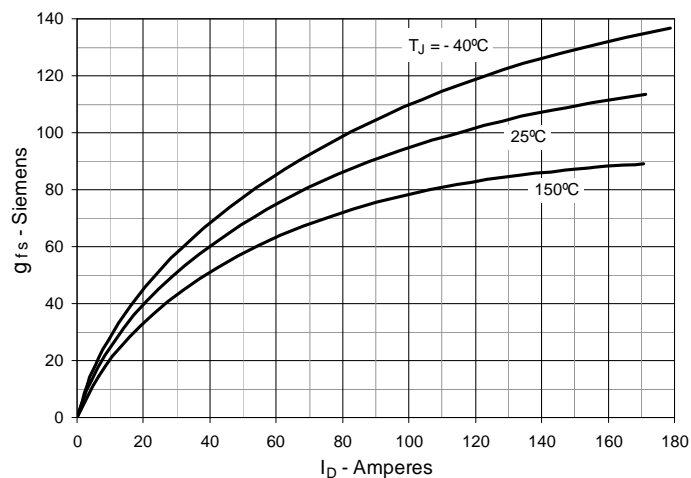
Fig. 6. Maximum Drain Current vs. Case Temperature



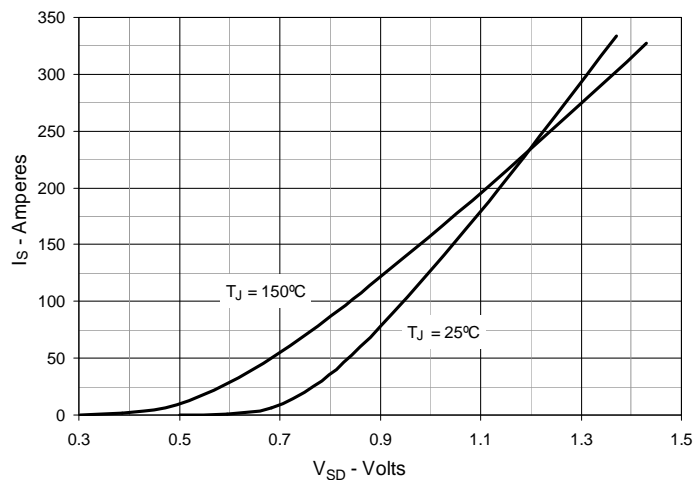
**Fig. 7. Input Admittance**



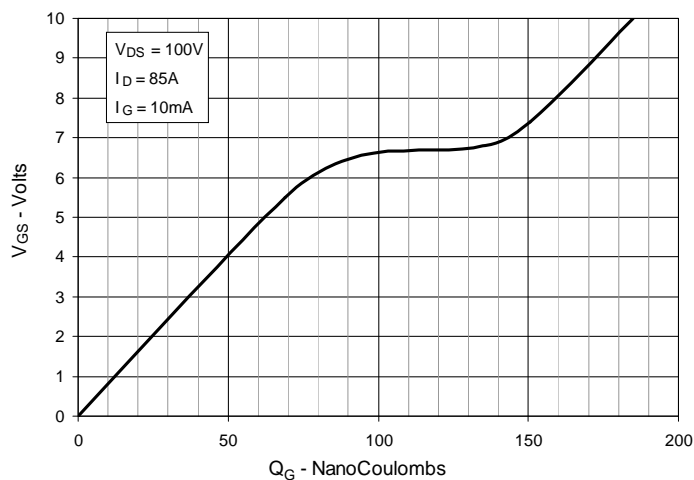
**Fig. 8. Transconductance**



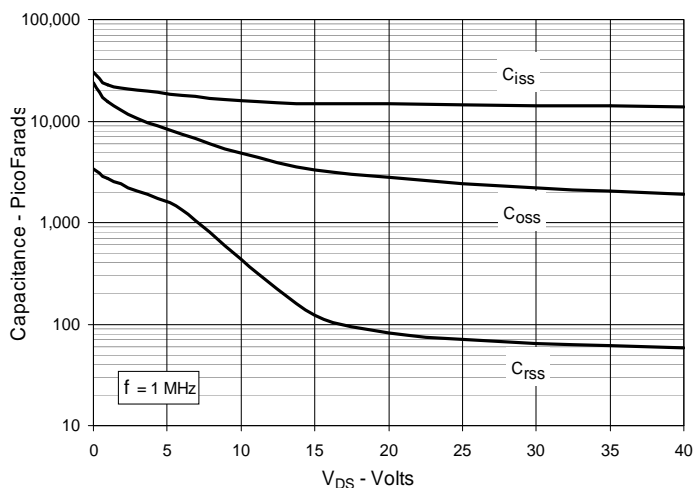
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

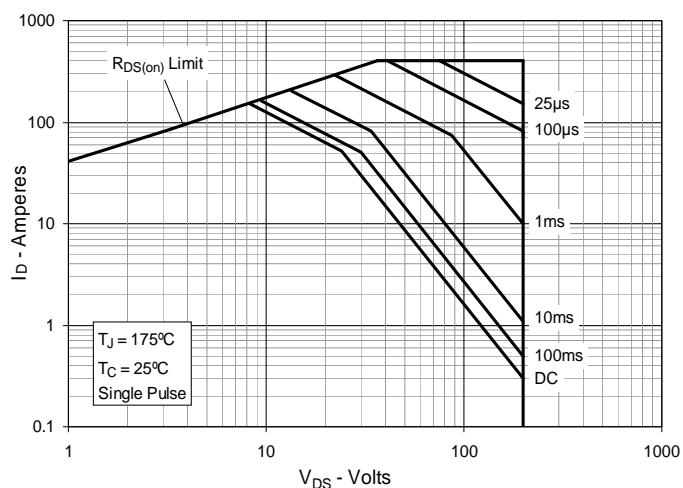
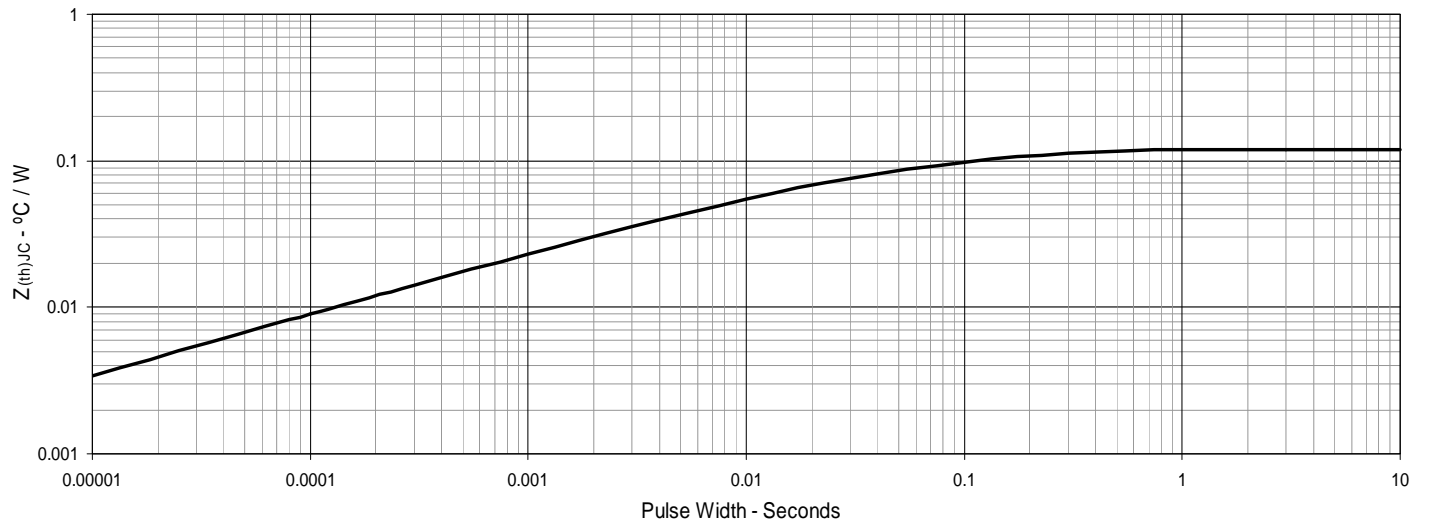


Fig. 13. Maximum Transient Thermal Impedance





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