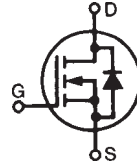


### Polar3™ HiPerFET™ Power MOSFET

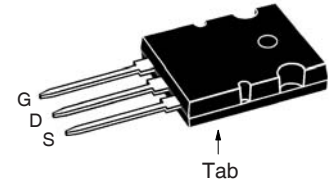
### IXFK120N30P3 IXFX120N30P3

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

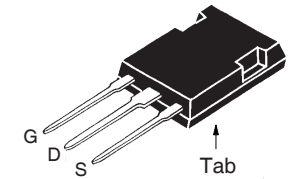


$$\begin{aligned} V_{DSS} &= 300V \\ I_{D25} &= 120A \\ R_{DS(on)} &\leq 27m\Omega \\ t_{rr} &\leq 250ns \end{aligned}$$

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 $150^\circ\text{C}$                          | 300               | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 300               | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$          | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 120               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 300               | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 60                | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 3                 | J                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 1130              | W                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 35                | V/ns             |
| $T_J$      |                                                                          | -55 ... +150      | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 150               | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | -55 ... +150      | $^\circ\text{C}$ |
| $T_L$      | Maximum Lead Temperature for Soldering                                   | 300               | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                                     | 260               | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-264)                                                 | 1.13/10           | Nm/lb.in         |
| $F_c$      | Mounting Force (PLUS247)                                                 | 20..120 / 4.5..27 | N/lb             |
| Weight     | TO-264                                                                   | 10                | g                |
|            | PLUS247                                                                  | 6                 | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                           |
|--------------|---------------------------------------------------------------------------|-----------------------|------|---------------------------|
|              |                                                                           | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                               | 300                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                           | 3.0                   |      | 5.0 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 200$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$           |                       |      | 25 $\mu A$<br>750 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                       |                       |      | 27 m $\Omega$             |

#### Features

- Dynamic  $dv/dt$  Rating
- Avalanche Rated
- Fast Intrinsic Diode
- Low  $Q_G$
- Low  $R_{DS(on)}$
- 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
- High Speed Power Switching Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                          | Characteristic Values |      |                    |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                                                                                                    | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 54                    | 90   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 8630 | pF                 |
| $C_{oss}$    |                                                                                                                                                    |                       | 1406 | pF                 |
| $C_{rss}$    |                                                                                                                                                    |                       | 20   | pF                 |
| $R_{Gi}$     | Gate Input Resistance                                                                                                                              |                       | 1.5  | $\Omega$           |
| $t_{d(on)}$  | <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) |                       | 26   | ns                 |
| $t_r$        |                                                                                                                                                    |                       | 13   | ns                 |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 60   | ns                 |
| $t_f$        |                                                                                                                                                    |                       | 11   | 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                 |
| $Q_{gs}$     |                                                                                                                                                    |                       | 40   | nC                 |
| $Q_{gd}$     |                                                                                                                                                    |                       | 53   | nC                 |
| $R_{thJC}$   |                                                                                                                                                    |                       | 0.11 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                    |                       | 0.15 | $^\circ\text{C/W}$ |

### Source-Drain Diode

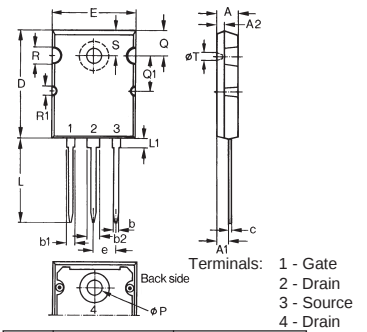
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                           | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 120 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 480 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                                           |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 60\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 2.2  | ns            |
| $Q_{RM}$ |                                                                                                       |                       | 19.6 | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                       |      | A             |

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

### PRELIMINARY TECHNICAL INFORMATION

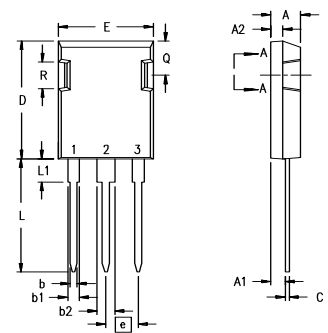
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

### TO-264 AA Outline



| Dim. | Millimeter Min. | Millimeter Max. | Inches Min. | Inches 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        |

### PLUS 247™ Outline

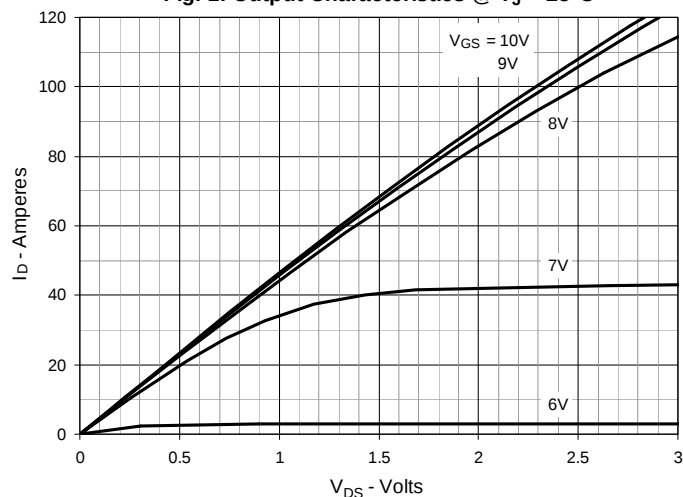
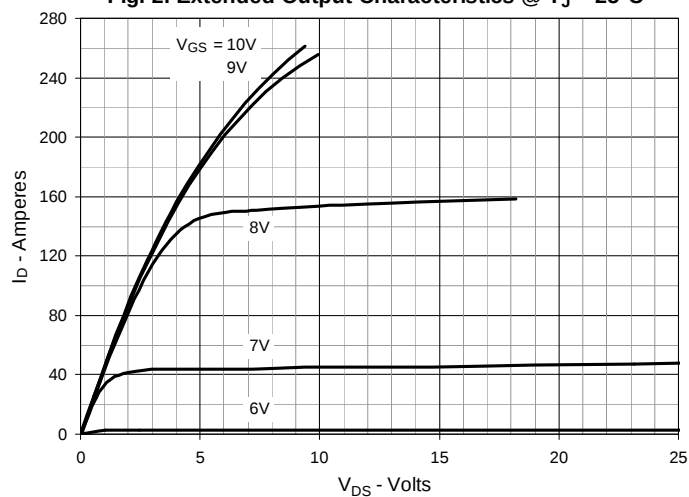
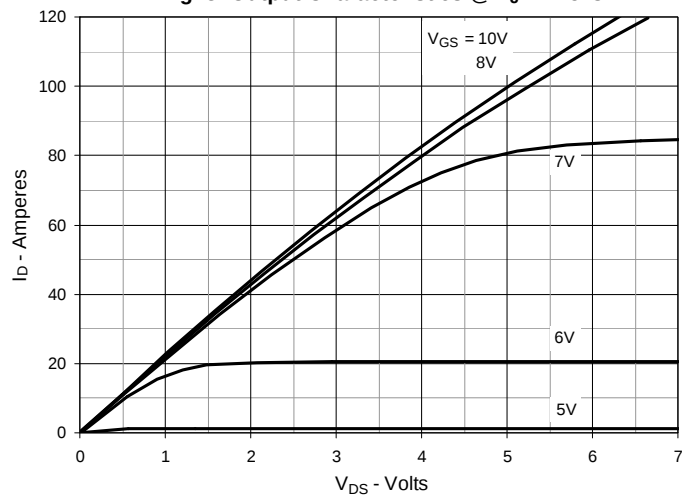
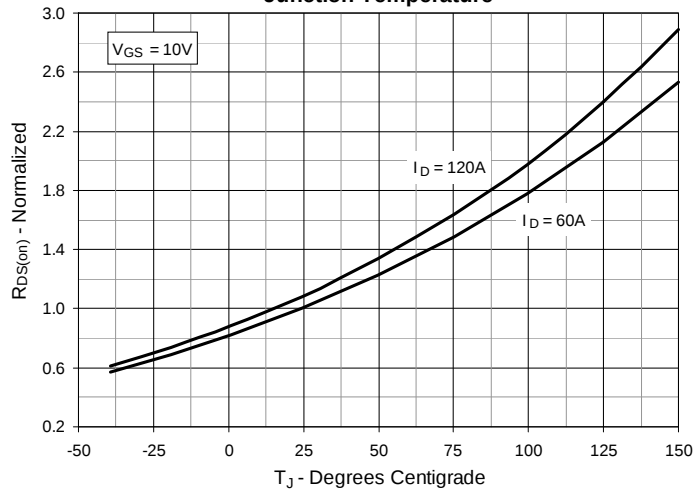
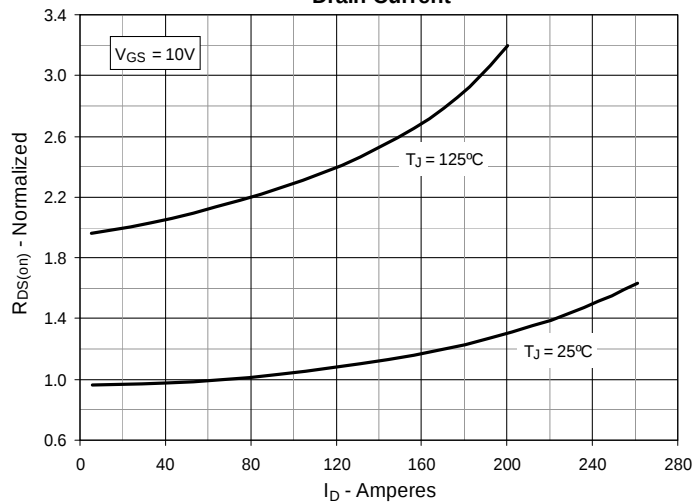
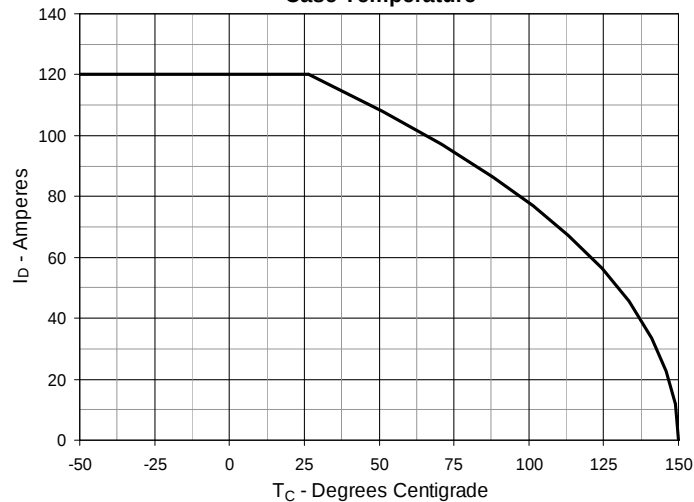


Terminals: 1 - Gate  
2 - Drain  
3 - Source

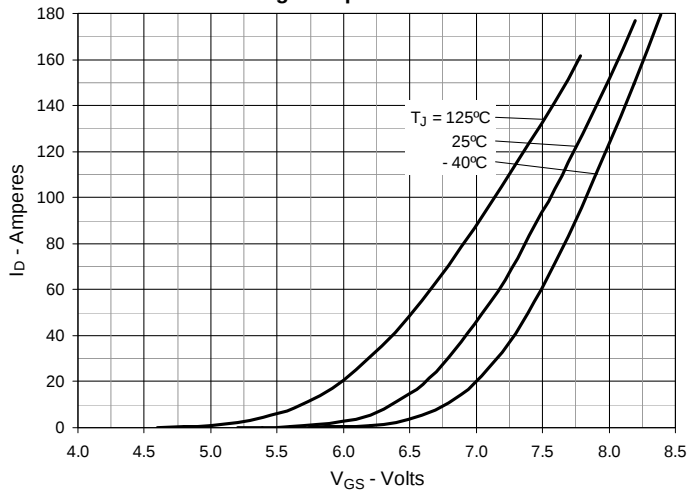
| Dim. | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|------|-----------------|-----------------|-------------|-------------|
| A    | 4.83            | 5.21            | .190        | .205        |
| A1   | 2.29            | 2.54            | .090        | .100        |
| A2   | 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        | .244        |
| R    | 4.32            | 4.83            | .170        | .190        |

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

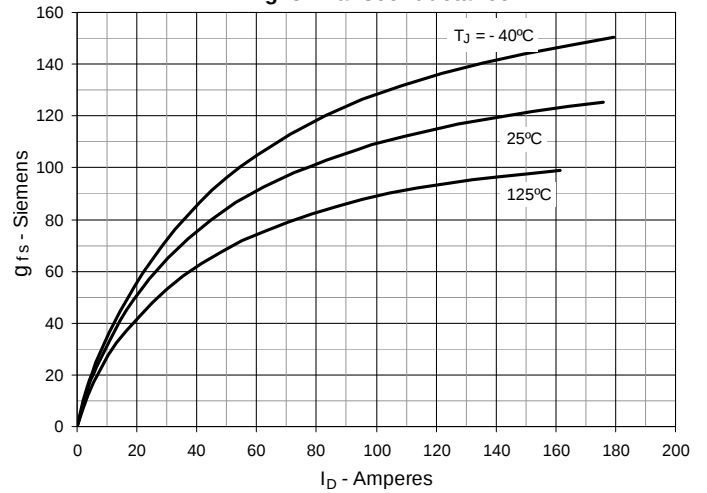
|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 @  $T_J = 125^\circ\text{C}$** 

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 60\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 60\text{A}$  Value vs. Drain Current**

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


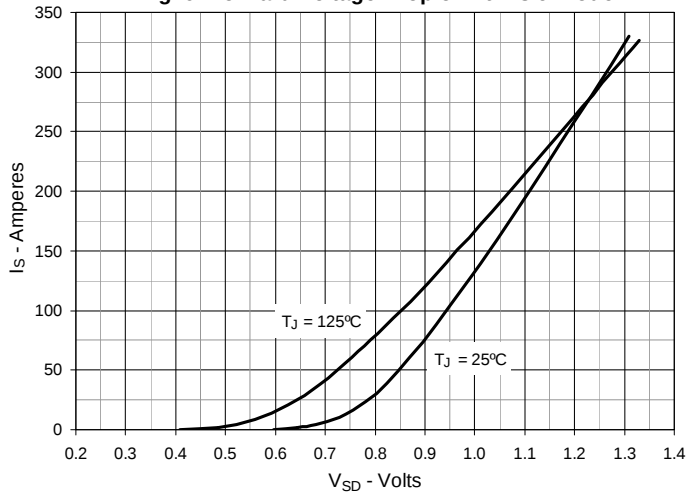
**Fig. 7. Input Admittance**



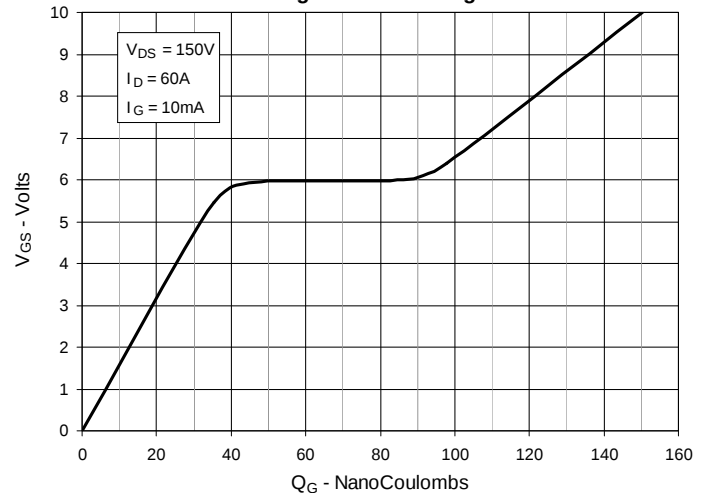
**Fig. 8. Transconductance**



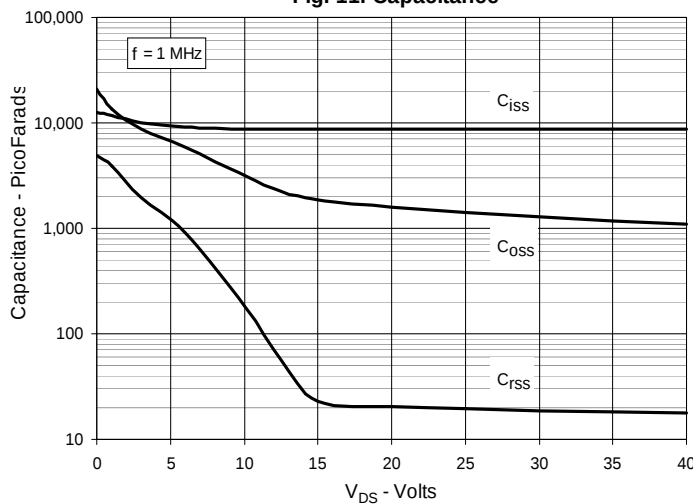
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

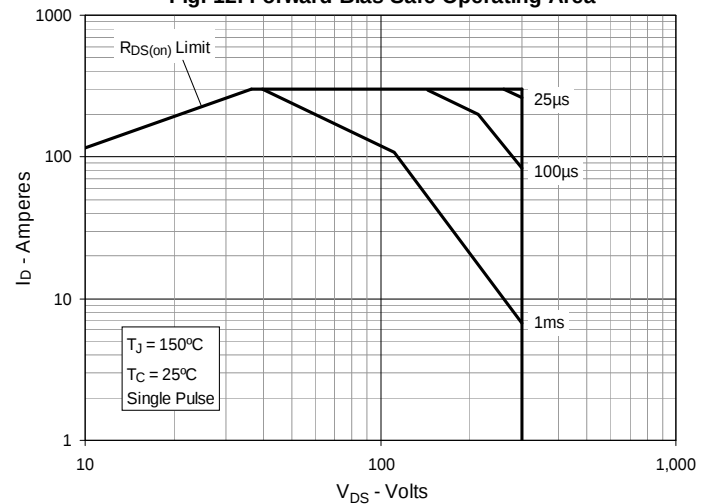


Fig. 13. Maximum Transient Thermal Impedance

