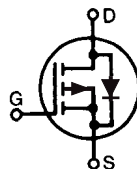


## PolarP™ Power MOSFET

## IXTK40P50P IXTX40P50P

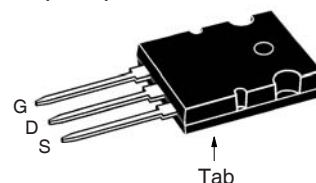
$$\begin{aligned} V_{DSS} &= -500V \\ I_{D25} &= -40A \\ R_{DS(on)} &\leq 230m\Omega \end{aligned}$$

P-Channel Enhancement Mode  
Avalanche Rated

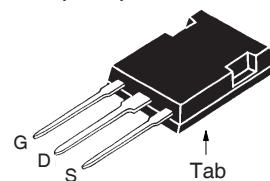


| Symbol     | Test Conditions                                                          | Maximum Ratings            |                  |
|------------|--------------------------------------------------------------------------|----------------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ 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                                                               | $\pm 20$                   | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$                   | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | - 40                       | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | - 120                      | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | - 40                       | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 3.5                        | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 10                         | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 890                        | W                |
| $T_J$      |                                                                          | -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                        | $^\circ\text{C}$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case 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 |
| Weight     | PLUS247<br>TO-264                                                        | 6<br>10                    | g<br>g           |

TO-264 (IXTK)



PLUS247 (IXTX)



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

### Features

- International Standard Packages
- Rugged PolarP™ Process
- Avalanche Rated
- Fast Intrinsic Diode
- Low Package Inductance

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High-Side Switches
- Push Pull Amplifiers
- DC Choppers
- Automatic Test Equipment
- Current Regulators

| 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                             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -1mA$                                            | - 2.0                 |      | - 4.5 V                       |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | - 50 $\mu A$<br>- 250 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                        |                       |      | 230 m $\Omega$                |

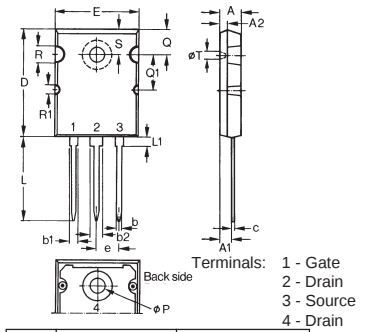
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                         | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                                                                                                     | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = -10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 23                    | 38   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 11.5 | nF                 |
| $C_{oss}$    |                                                                                                                                                     |                       | 1150 | pF                 |
| $C_{rss}$    |                                                                                                                                                     |                       | 93   | 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) |                       | 37   | ns                 |
| $t_r$        |                                                                                                                                                     |                       | 59   | ns                 |
| $t_{d(off)}$ |                                                                                                                                                     |                       | 90   | ns                 |
| $t_f$        |                                                                                                                                                     |                       | 34   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 205  | nC                 |
| $Q_{gs}$     |                                                                                                                                                     |                       | 55   | nC                 |
| $Q_{gd}$     |                                                                                                                                                     |                       | 75   | nC                 |
| $R_{thJC}$   |                                                                                                                                                     |                       | 0.14 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                     | 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.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                     |                       |      | - 40 A        |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                              |                       |      | -160 A        |
| $V_{SD}$ | $I_F = -20\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                      |                       |      | - 3.0 V       |
| $t_{rr}$ | $I_F = -20\text{A}$ , $-di/dt = -150\text{A}/\mu\text{s}$<br>$V_R = -100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 477  | ns            |
| $Q_{RM}$ |                                                                                                          |                       | 14.5 | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                          |                       | - 61 | A             |

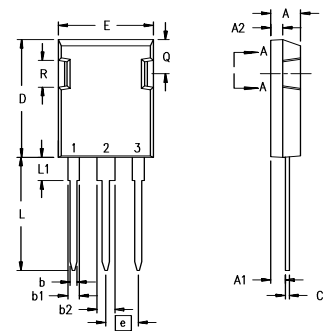
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

## 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



Terminals: 1 - Gate  
2 - Drain  
3 - Source

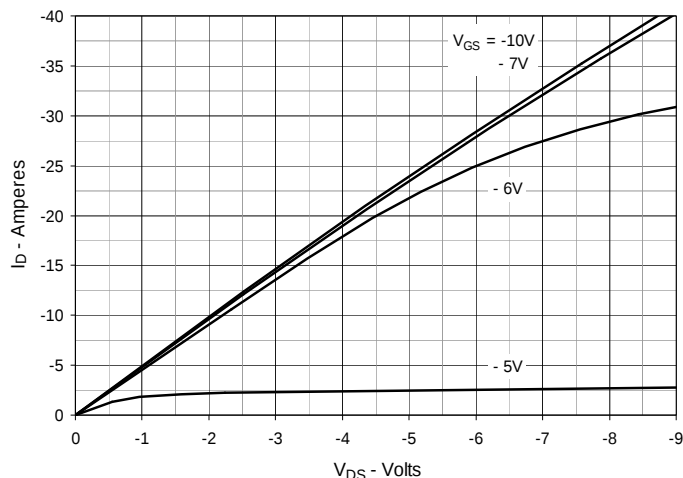
| Dim. | Millimeter |       | Inches   |      |
|------|------------|-------|----------|------|
|      | Min.       | Max.  | Min.     | Max. |
| A    | 4.83       | 5.21  | .190     | .205 |
| A1   | 2.29       | 2.54  | .090     | .100 |
| A2   | 1.91       | 2.16  | .075     | .085 |
| b    | 1.14       | 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     | .244 |
| R    | 4.32       | 4.83  | .170     | .190 |

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

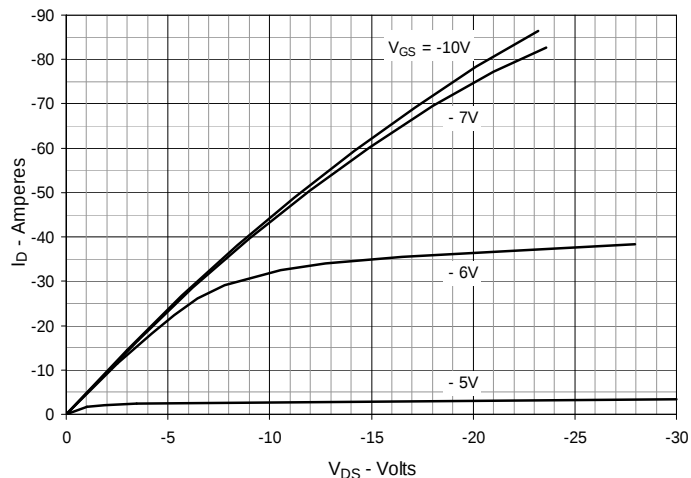
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

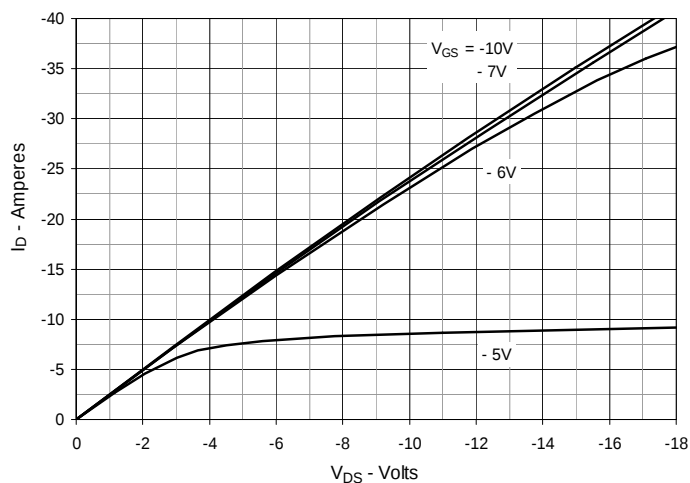
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



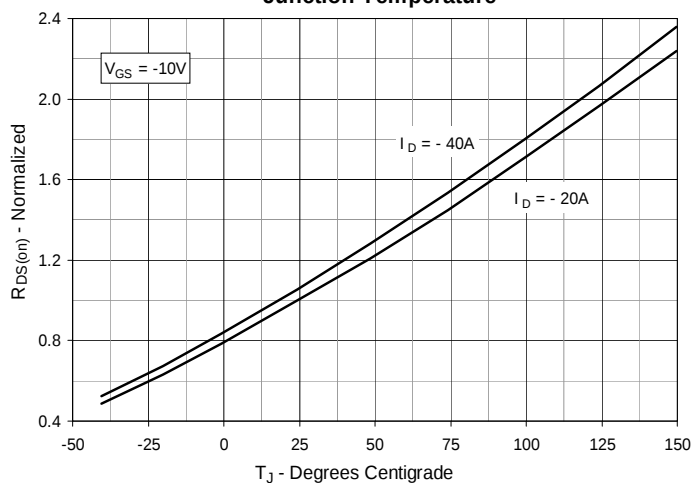
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



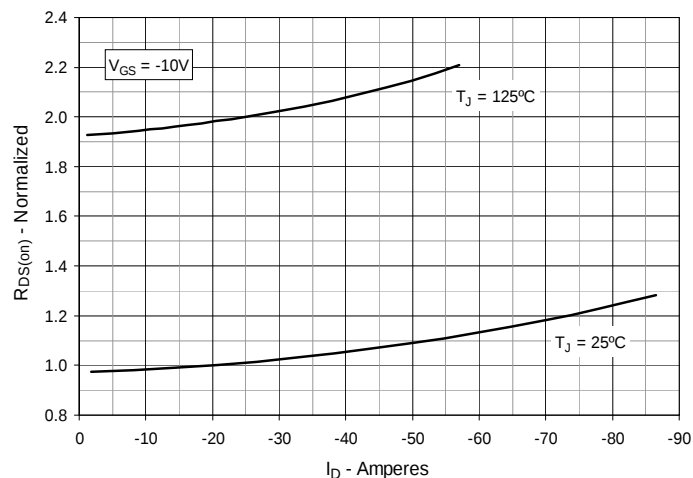
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



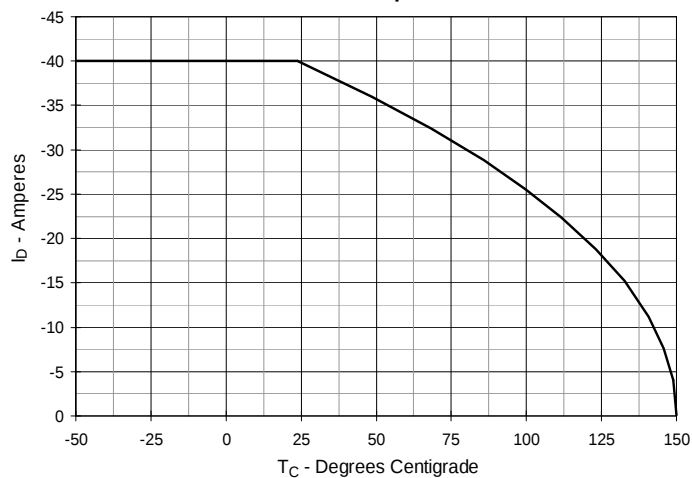
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -20\text{A}$  Value vs. Junction Temperature**



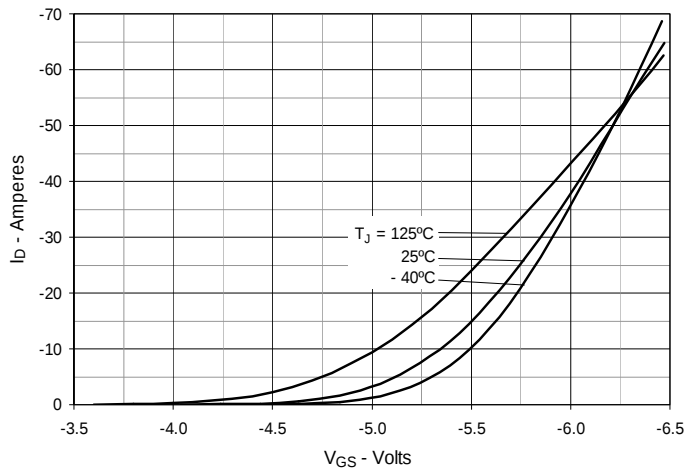
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -20\text{A}$  Value vs. Drain Current**



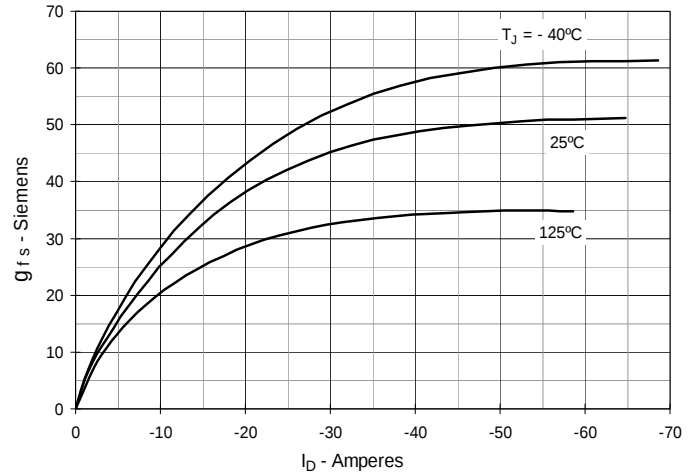
**Fig. 6. Maximum Drain Current vs. Case Temperature**



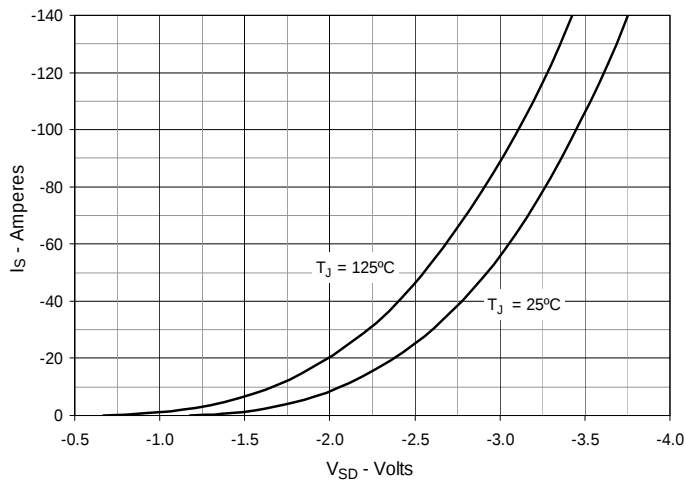
**Fig. 7. Input Admittance**



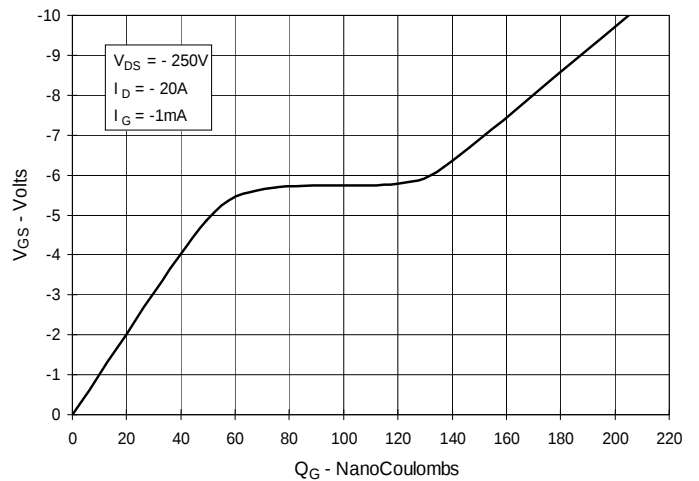
**Fig. 8. Transconductance**



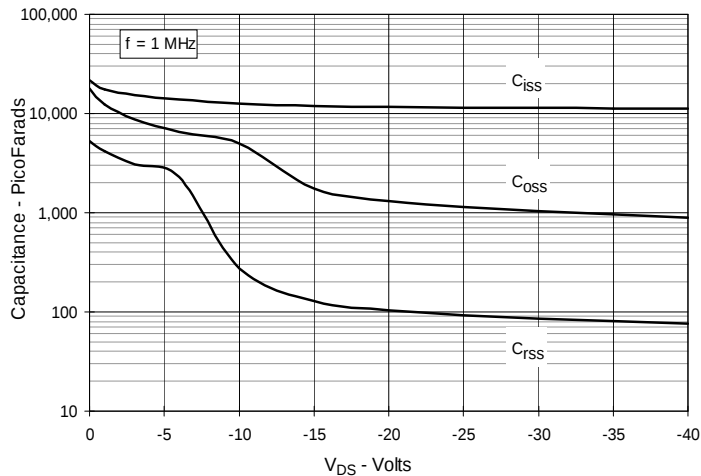
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

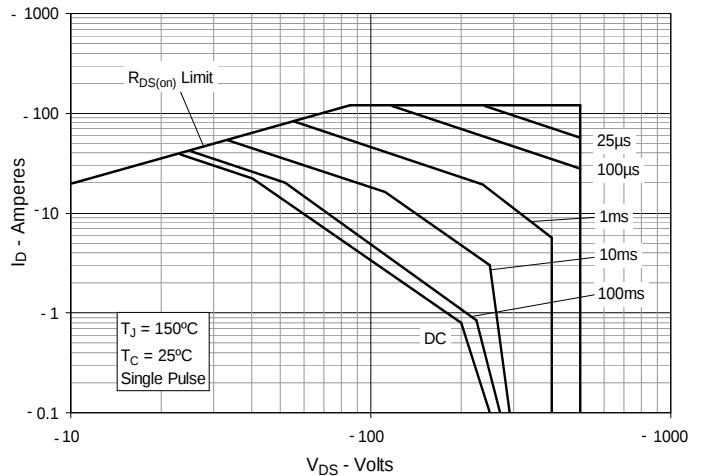


Fig. 13. Maximum Transient Thermal Impedance

