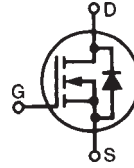


# PolarHV™ HiPerFET Power MOSFET

IXFA 16N50P  
IXFH 16N50P  
IXFP 16N50P

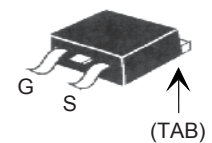
$V_{DSS} = 500 \text{ V}$   
 $I_{D25} = 16 \text{ A}$   
 $R_{DS(on)} \leq 400 \text{ m}\Omega$   
 $t_{rr} \leq 200 \text{ ns}$

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

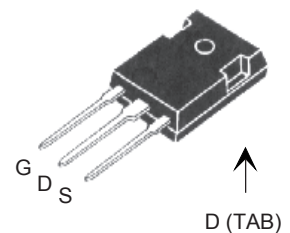


| Symbol     | Test Conditions  | Maximum Ratings |                  |
|------------|--|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$  | 500             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$   | 500             | V                |
| $V_{GS}$   | Continuous   | $\pm 30$        | V                |
| $V_{GSM}$  | Transient  | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$   | 16              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$   | 35              | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$   | 16              | A                |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$   | 25              | mJ               |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$   | 750             | mJ               |
| dv/dt      | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 10 \Omega$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$   | 300             | W                |
| $T_J$      |  | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |  | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |  | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | 1.6 mm (0.062 in.) from case for 10 s  | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic body for 10 s soldering  | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting torque (TO-247 & TO-220)  | 1.13/10         | Nm/lb.in.        |
| Weight     | TO-220   | 4               | g                |
|            | TO-263   | 3               | g                |
|            | TO-247   | 5.5             | g                |

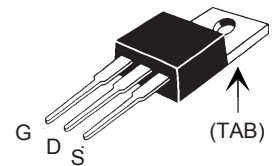
TO-263 (IXTA)



TO-247 (IXFH)



TO-220 (IXTP)



G = Gate      D = Drain  
S = Source      TAB = Drain

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                     | Characteristic Values |      |                      |
|--------------|---|-----------------------|------|----------------------|
|              |   | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$  | 500                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 2.5 \text{ mA}$  | 3.0                   |      | 5.5 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}_{DC}$ , $V_{DS} = 0$   |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ ,<br>$V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$                                      |                       |      | 5 $\mu\text{A}$      |
|              |   |                       |      | 250 $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2\%$ |                       |      | 400 $\text{m}\Omega$ |

## Features

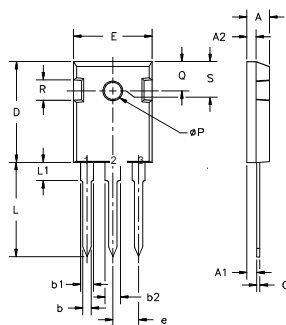
- † International standard packages
- † Unclamped Inductive Switching (UIS) rated
- † Low package inductance  
- easy to drive and to protect

## Advantages

- † Easy to mount
- † Space savings
- † High power density

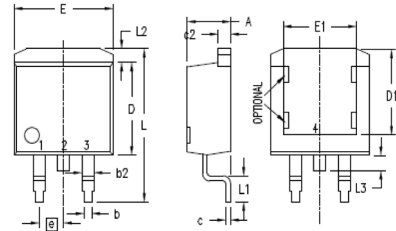
| Symbol       | Test Conditions  | Characteristic Values  |      |                        |
|--------------|--|--|------|------------------------|
|              |  | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |                        |
|              |  | Min.   | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}, \text{ pulse test}$  | 8  | 16   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$  |  | 2250 | pF                     |
| $C_{oss}$    |  |  | 240  | pF                     |
| $C_{rss}$    |  |  | 12   | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_{D25}$<br>$R_G = 10\ \Omega \text{ (External)}$ |  | 23   | ns                     |
| $t_r$        |  |  | 25   | ns                     |
| $t_{d(off)}$ |  |  | 70   | ns                     |
| $t_f$        |  |  | 22   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                      |  | 43   | nC                     |
| $Q_{gs}$     |  |  | 15   | nC                     |
| $Q_{gd}$     |  |  | 12   | nC                     |
| $R_{thJC}$   |  |  |      | $0.42^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-220)   |  | 0.25 | $^\circ\text{C/W}$     |
| $R_{thCS}$   | (TO-247)   |  | 0.21 | $^\circ\text{C/W}$     |

| Symbol   | Test Conditions  | Characteristic Values  |      |               |
|----------|--|--|------|---------------|
|          |  | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |               |
|          |  | Min.   | Typ. | Max.          |
| $I_s$    | $V_{GS} = 0\text{ V}$  |  |      | 16 A          |
| $I_{SM}$ | Repetitive   |  |      | 35 A          |
| $V_{SD}$ | $I_F = I_s, V_{GS} = 0\text{ V},$<br>Pulse test, $t \leq 300\ \mu\text{s}, \text{ duty cycle } d \leq 2\%$ |  |      | 1.5 V         |
| $t_{rr}$ | $I_F = 16\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}$                             |  | 130  | 200 ns        |
| $I_{RM}$ |  |  | 6    | A             |
| $Q_{RM}$ |  |  | 0.6  | $\mu\text{C}$ |

**TO-247 (IXFH) Outline**


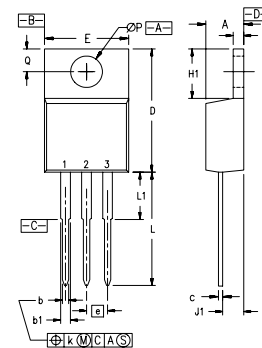
Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - Drain

| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059   | .098  |
| b              | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub> | 2.87       | 3.12  | .113   | .123  |
| C              | .4         | .8    | .016   | .031  |
| D              | 20.80      | 21.46 | .819   | .845  |
| E              | 15.75      | 16.26 | .610   | .640  |
| e              | 5.20       | 5.72  | 0.205  | 0.225 |
| L              | 19.81      | 20.32 | .780   | .800  |
| L <sub>1</sub> |            | 4.50  |        | .177  |
| ∅P             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |
| S              | 6.15       | BSC   | 242    | BSC   |

**TO-263 (IXTA) Outline**


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

| SYM            | INCHES |      | MILLIMETERS |       |
|----------------|--------|------|-------------|-------|
|                | MIN    | MAX  | MIN         | MAX   |
| A              | .160   | .190 | 4.06        | 4.83  |
| A <sub>1</sub> | .080   | .110 | 2.03        | 2.79  |
| b              | .020   | .039 | 0.51        | 0.99  |
| b <sub>2</sub> | .045   | .055 | 1.14        | 1.40  |
| c              | .016   | .029 | 0.40        | 0.74  |
| c <sub>2</sub> | .045   | .055 | 1.14        | 1.40  |
| D              | .340   | .380 | 8.64        | 9.65  |
| D <sub>1</sub> | .315   | .350 | 8.00        | 8.89  |
| E              | .380   | .410 | 9.65        | 10.41 |
| E <sub>1</sub> | .245   | .320 | 6.22        | 8.13  |
| e              | .100   | BSC  | 2.54        | BSC   |
| L              | .575   | .625 | 14.61       | 15.88 |
| L <sub>1</sub> | .090   | .110 | 2.29        | 2.79  |
| L <sub>2</sub> | .040   | .055 | 1.02        | 1.40  |
| L <sub>3</sub> | .050   | .070 | 1.27        | 1.78  |
| L <sub>4</sub> | 0      | .005 | 0           | 0.13  |

**TO-220 (IXTP) Outline**


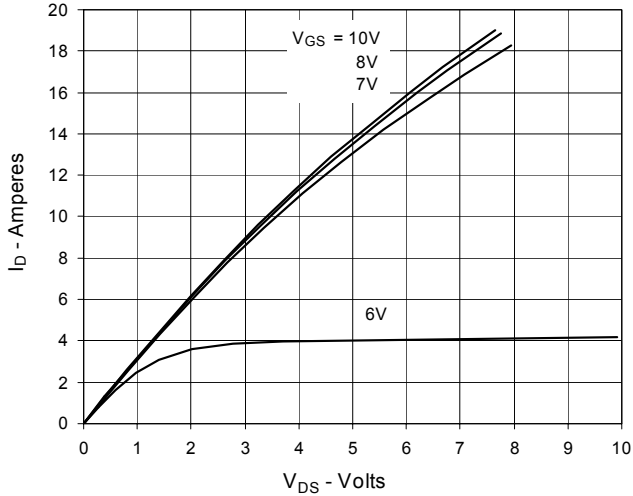
Pins: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

| SYM            | INCHES |      | MILLIMETERS |       |
|----------------|--------|------|-------------|-------|
|                | MIN    | MAX  | MIN         | MAX   |
| A              | .170   | .190 | 4.32        | 4.83  |
| b              | .025   | .040 | 0.64        | 1.02  |
| b <sub>1</sub> | .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  |
| H <sub>1</sub> | .230   | .270 | 5.85        | 6.85  |
| J <sub>1</sub> | .090   | .110 | 2.29        | 2.79  |
| k              | 0      | .015 | 0           | 0.38  |
| L              | .500   | .550 | 12.70       | 13.97 |
| L <sub>1</sub> | .110   | .230 | 2.79        | 5.84  |
| ∅P             | .139   | .161 | 3.53        | 4.08  |
| Q              | .100   | .125 | 2.54        | 3.18  |

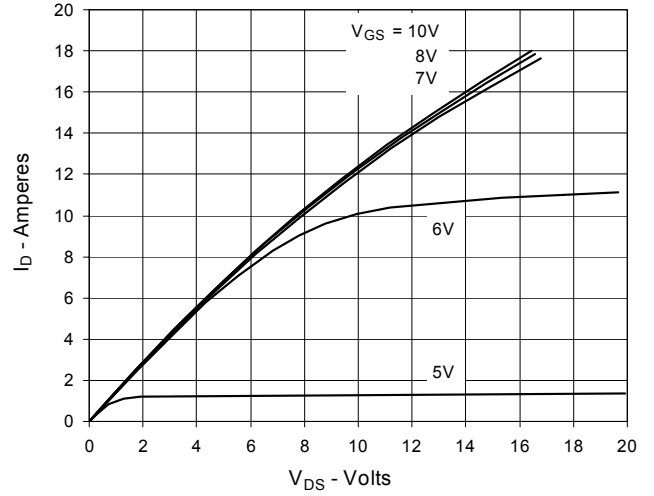
IXYS reserves the right to change limits, test conditions, and dimensions.

|  |           |           |           |           |              |              |             |              |
|--|-----------|-----------|-----------|-----------|--------------|--------------|-------------|--------------|
| IXYS MOSFETs and IGBTs are covered by      | 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    |
| one or more of the following U.S. patents: | 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405B2 | 6,759,692    |
|  | 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 |

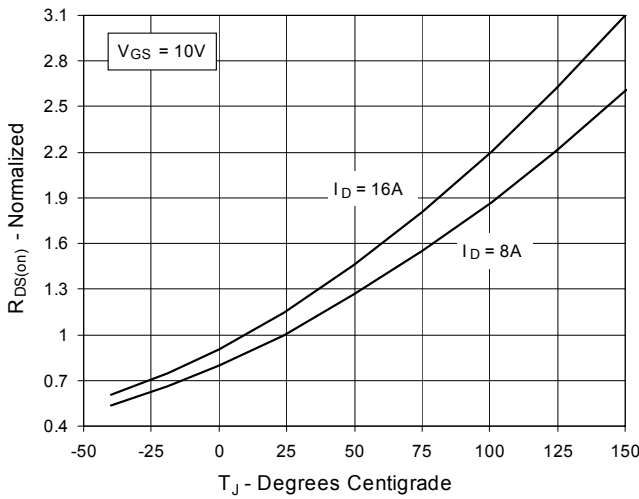
**Fig. 1. Output Characteristics @ 25°C**



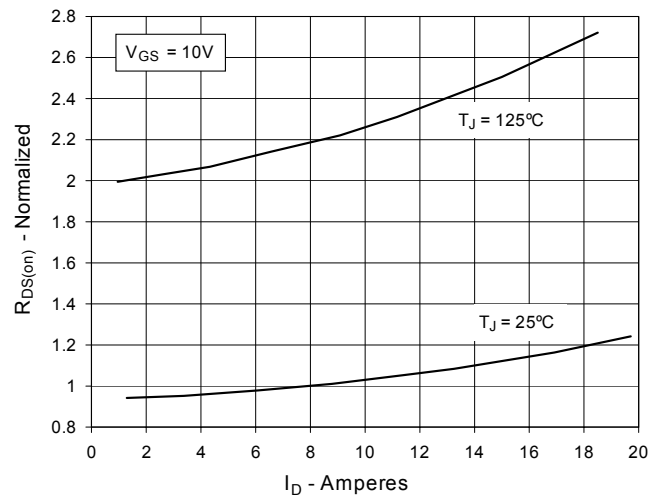
**Fig. 2. Output Characteristics @ 125°C**



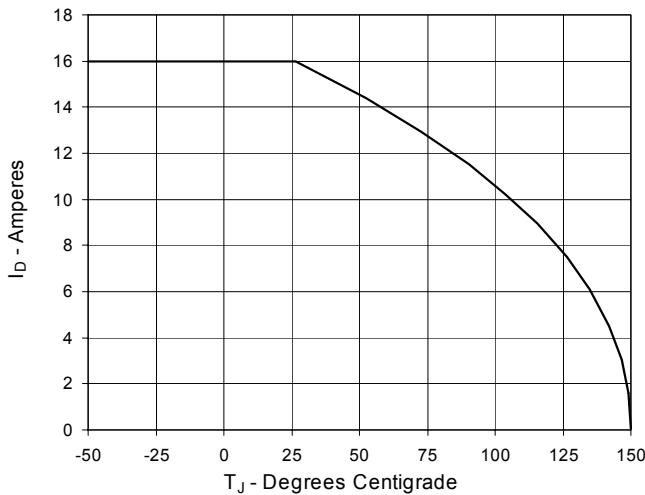
**Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 8A$  vs. Junction Temperature**



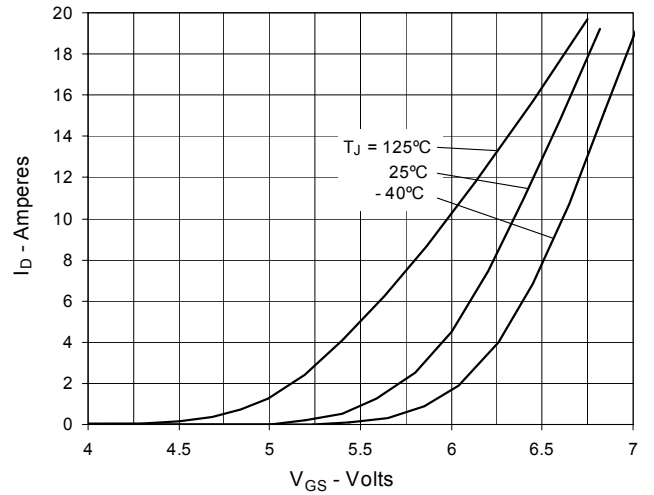
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 8A$  vs. Drain Current**



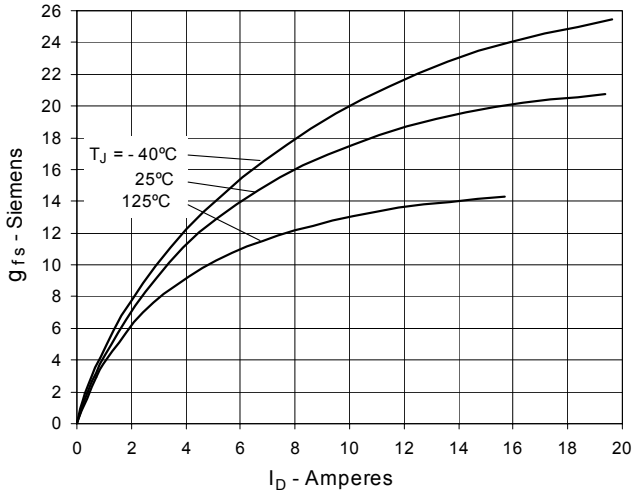
**Fig. 5. Maximum Drain Current vs. Case Temperature**



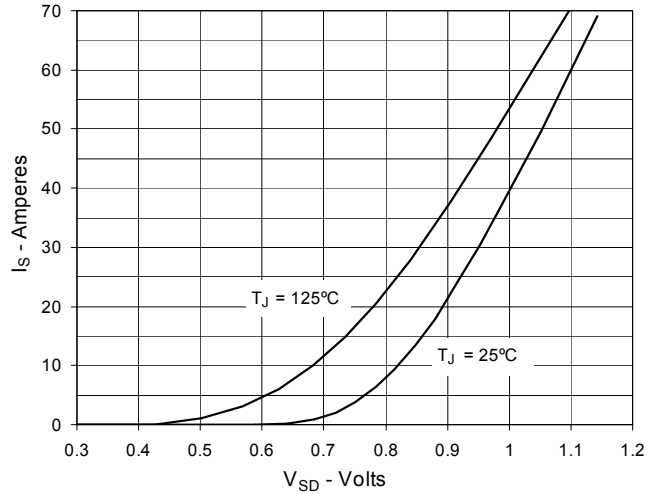
**Fig. 6. Input Admittance**



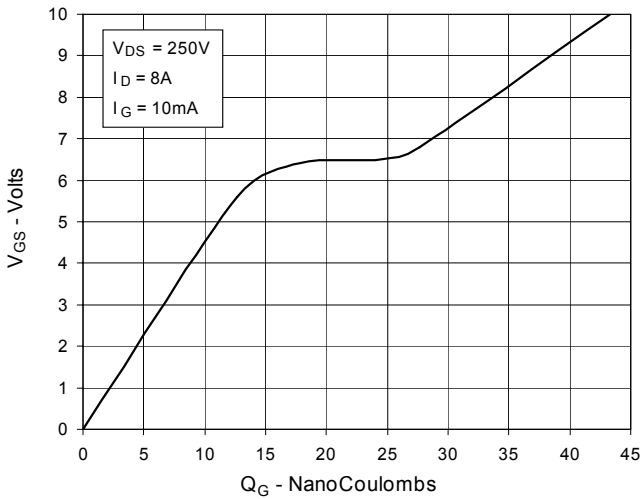
**Fig. 7. Transconductance**



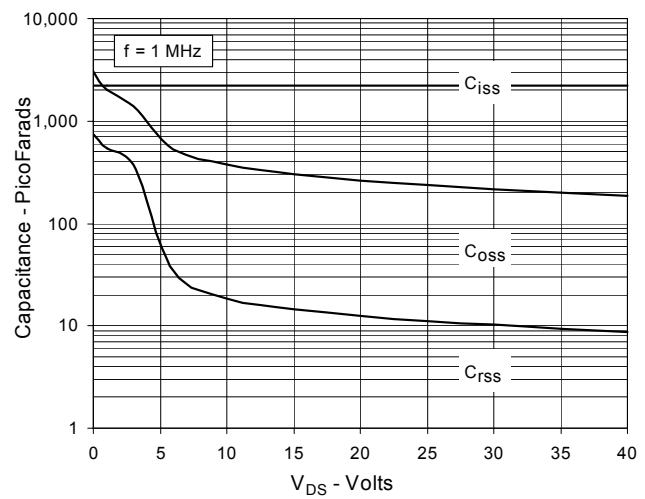
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



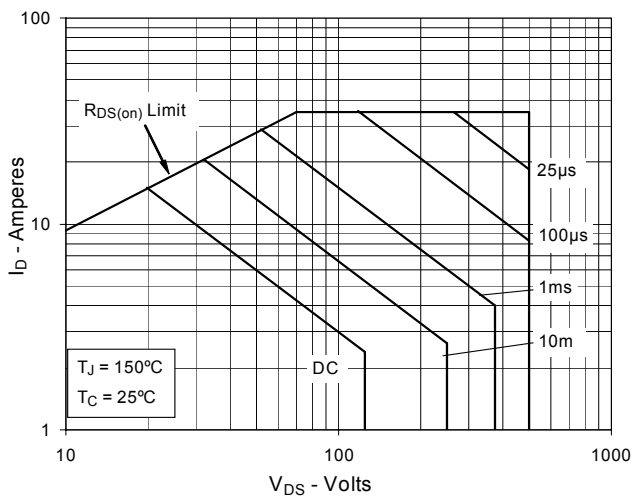
**Fig. 9. Gate Charge**



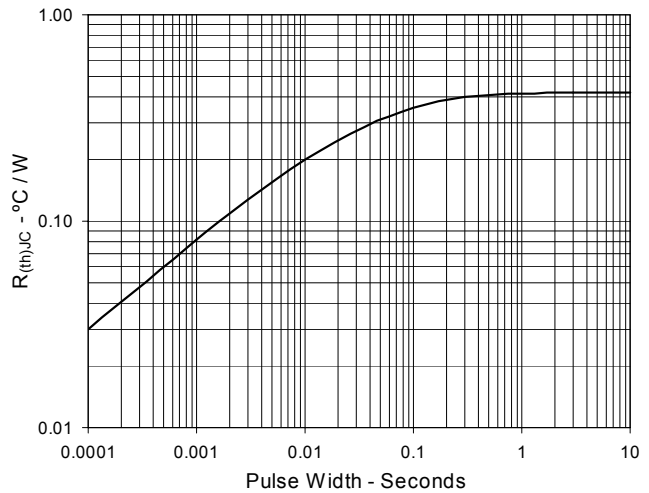
**Fig. 10. Capacitance**



**Fig. 11. Forward-Bias Safe Operating Area**



**Fig. 12. Maximum Transient Thermal Resistance**



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