

# HiPerFET™ Power MOSFETs Q-CLASS

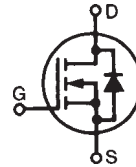
Single MOSFET Die

N-Channel Enhancement Mode  
Avalanche Rated, Low Q<sub>g</sub>  
High dV/dt, Low t<sub>rr</sub>

IXFK/IXFX 48N50Q  
IXFK/IXFX 44N50Q

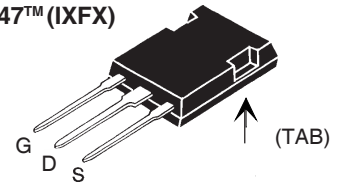
| V <sub>DSS</sub> | I <sub>D25</sub> | R <sub>DS(on)</sub> |
|------------------|------------------|---------------------|
| 500 V            | 48 A             | 100 mΩ              |
| 500 V            | 44 A             | 120 mΩ              |

t<sub>rr</sub> ≤ 250 ns

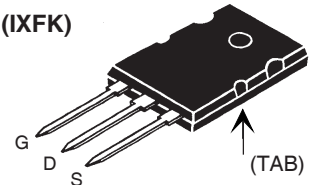


| Symbol           | Test Conditions   | Maximum Ratings |           |
|------------------|---|-----------------|-----------|
| V <sub>DSS</sub> | T <sub>J</sub> = 25 C to 150 C  | 500             | V         |
| V <sub>DGR</sub> | T <sub>J</sub> = 25 C to 150 C; R <sub>GS</sub> = 1 MΩ  | 500             | V         |
| V <sub>GS</sub>  | Continuous  | ±20             | V         |
| V <sub>GSM</sub> | Transient   | ±30             | V         |
| I <sub>D25</sub> | T <sub>C</sub> = 25 C   | 44N50 44        | A         |
|                  |   | 48N50 48        | A         |
| I <sub>DM</sub>  | T <sub>C</sub> = 25 C, pulse width limited by T <sub>JM</sub>   | 44N50 176       | A         |
|                  |   | 48N50 192       | A         |
| I <sub>AR</sub>  | T <sub>C</sub> = 25 C   | 48              | A         |
| E <sub>AR</sub>  | T <sub>C</sub> = 25 C   | 60              | mJ        |
| E <sub>AS</sub>  | T <sub>C</sub> = 25 C   | 2.5             | J         |
| dv/dt            | I <sub>S</sub> ≤ I <sub>DM</sub> , di/dt ≤ 100 A/ s, V <sub>DD</sub> ≤ V <sub>DSS</sub><br>T <sub>J</sub> ≤ 150 C, R <sub>G</sub> = 2 Ω | 15              | V/ns      |
| P <sub>D</sub>   | T <sub>C</sub> = 25 C   | 500             | 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>   | 1.6 mm (0.063 in.) from case for 10 s   | 300             | C         |
| M <sub>d</sub>   | Mounting torque   | TO-264 0.4/6    | Nm/lb.in. |
| Weight           |   | PLUS 247        | 6 g       |
|                  |   | TO-264          | 10 g      |

PLUS 247™ (IXFX)



TO-264 AA (IXFK)



G = Gate  
S = Source

D = Drain  
TAB = Drain

### Features

- IXYS advanced low Q<sub>g</sub> process
- Low gate charge and capacitances
  - easier to drive
  - faster switching
- International standard packages
- Low R<sub>DS(on)</sub>
- Rated for unclamped Inductive load switching (UIS) rated
- Molding epoxies meet UL 94 V-0 flammability classification

### Applications

- DC-DC converters
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- AC motor control
- Temperature and lighting controls

### Advantages

- PLUS 247™ package for clip or spring mounting
- Space savings
- High power density

| Symbol              | Test Conditions   | Characteristic Values<br>(T <sub>J</sub> = 25 C, unless otherwise specified) |      |               |
|---------------------|---|--|------|---------------|
|                     |   | min.   | typ. | max.          |
| V <sub>DSS</sub>    | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA  | 500  |      | V             |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 4 mA                             | 2.0  |      | 4.0 V         |
| I <sub>GSS</sub>    | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0  |  |      | ±100 nA       |
| I <sub>DSS</sub>    | V <sub>DS</sub> = V <sub>DSS</sub><br>V <sub>GS</sub> = 0 V<br>T <sub>J</sub> = 125 C |  |      | 100 A<br>2 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>Note 1             | 44N50  |      | 120 mΩ        |
|                     |   | 48N50  |      | 100 mΩ        |

| Symbol                    | Test Conditions  | Characteristic Values                               |      |      |     |
|---------------------------|--|---|------|------|-----|
|                           |  | (T <sub>J</sub> = 25 C, unless otherwise specified) |      |      |     |
|                           |  | min.  | typ. | max. |     |
| <b>g<sub>fs</sub></b>     | V <sub>DS</sub> = 10 V; I <sub>D</sub> = 0.5 • I <sub>D25</sub> Note 1   | 30  | 42   |      | S   |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz   |   | 7000 |      | pF  |
| <b>C<sub>oss</sub></b>    |  |   | 960  |      | pF  |
| <b>C<sub>rss</sub></b>    |  |   | 230  |      | pF  |
| <b>t<sub>d(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>R <sub>G</sub> = 1 Ω (External), |   | 33   |      | ns  |
| <b>t<sub>r</sub></b>      |  |   | 22   |      | ns  |
| <b>t<sub>d(off)</sub></b> |  |   | 75   |      | ns  |
| <b>t<sub>f</sub></b>      |  |   | 10   |      | ns  |
| <b>Q<sub>g(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub>                                     |   | 190  |      | nC  |
| <b>Q<sub>gs</sub></b>     |  |   | 40   |      | nC  |
| <b>Q<sub>gd</sub></b>     |  |   | 86   |      | nC  |
| <b>R<sub>thJC</sub></b>   |  |   | 0.26 |      | K/W |
| <b>R<sub>thCK</sub></b>   |  | 0.15  |      |      | K/W |

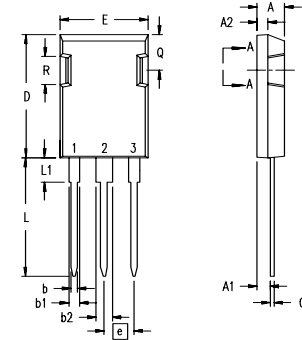
| Source-Drain Diode    |   | Characteristic Values                               |      |        |
|-----------------------|---|---|------|--------|
|                       |   | (T <sub>J</sub> = 25 C, unless otherwise specified) |      |        |
| Symbol                | Test Conditions   | min.  | typ. | max.   |
| <b>I<sub>S</sub></b>  | V <sub>GS</sub> = 0 V   |   |      | 48 A   |
| <b>I<sub>SM</sub></b> | Repetitive;<br>pulse width limited by T <sub>JM</sub>           |   |      | 192 A  |
| <b>V<sub>SD</sub></b> | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V, Note 1 |   |      | 1.5 V  |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 25A, -di/dt = 100 A/ s, V <sub>R</sub> = 100 V |   |      | 250 ns |
| <b>Q<sub>RM</sub></b> |   |   | 1.0  | C      |
| <b>I<sub>RM</sub></b> |   |   | 10   | A      |

Note: 1. Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %

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 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1 4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

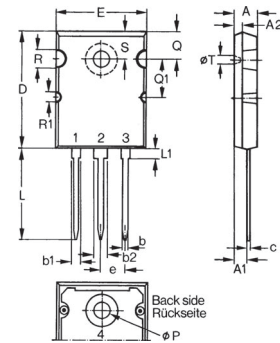
### PLUS 247™ Outline



Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)  
4 - Drain (Collector)

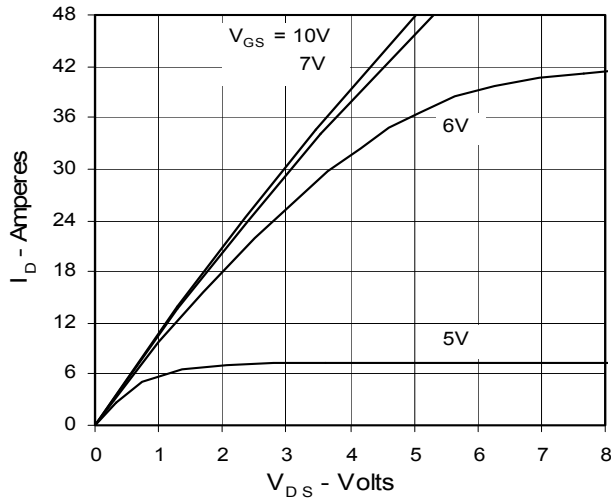
| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.83       | 5.21  | .190     | .205  |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100  |
| A <sub>2</sub> | 1.91       | 2.16  | .075     | .085  |
| b              | 1.14       | 1.40  | .045     | .055  |
| b <sub>1</sub> | 1.91       | 2.13  | .075     | .084  |
| b <sub>2</sub> | 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  |

### TO-264 AA Outline

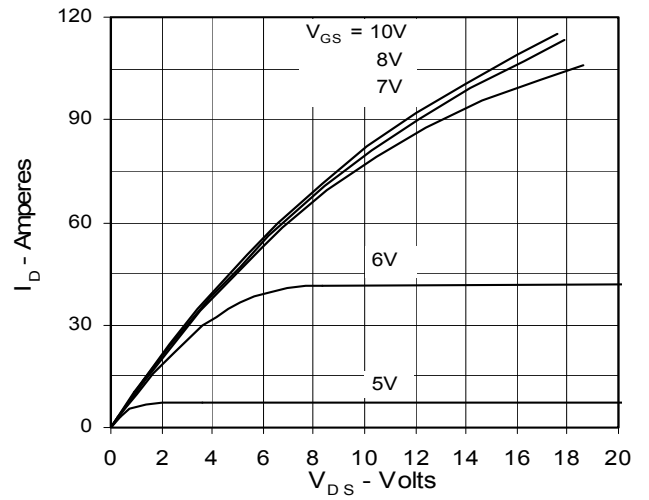


| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.82       | 5.13  | .190     | .202  |
| A1   | 2.54       | 2.89  | .100     | .114  |
| A2   | 2.00       | 2.10  | .079     | .083  |
| b    | 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  |

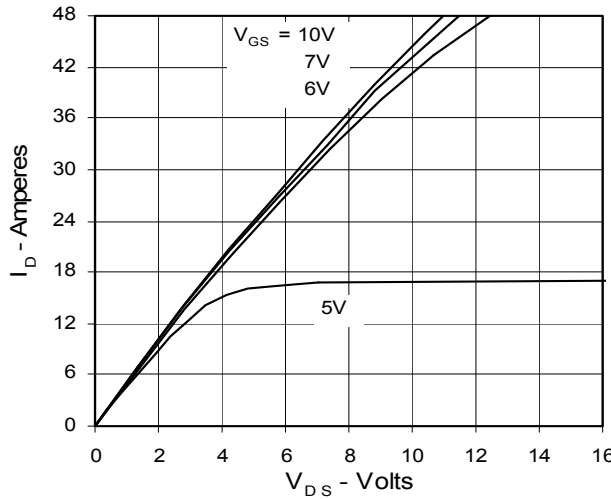
**Fig. 1. Output Characteristics @ 25 Deg. C**



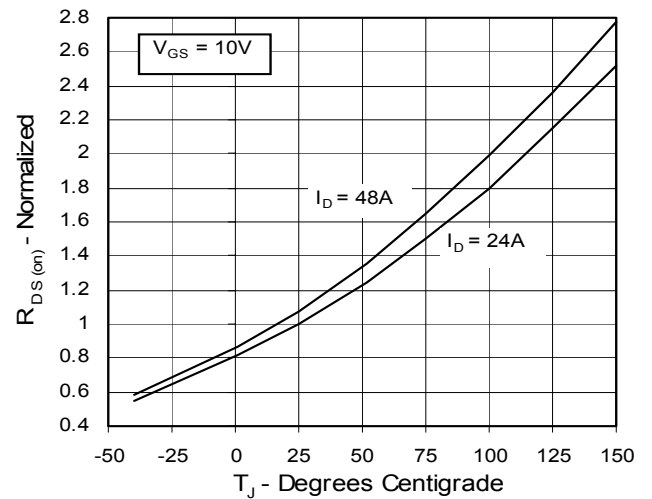
**Fig. 2. Extended Output Characteristics @ 25 deg. C**



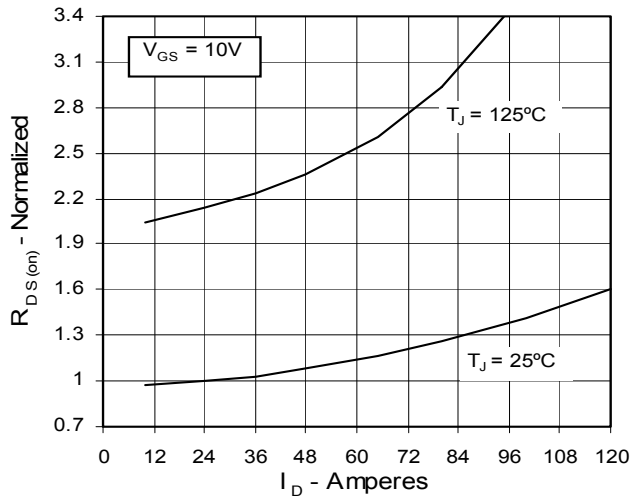
**Fig. 3. Output Characteristics @ 125 Deg. C**



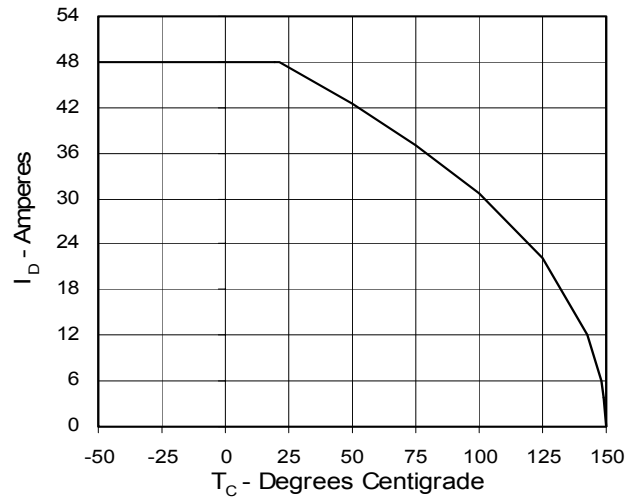
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs. Junction Temperature**



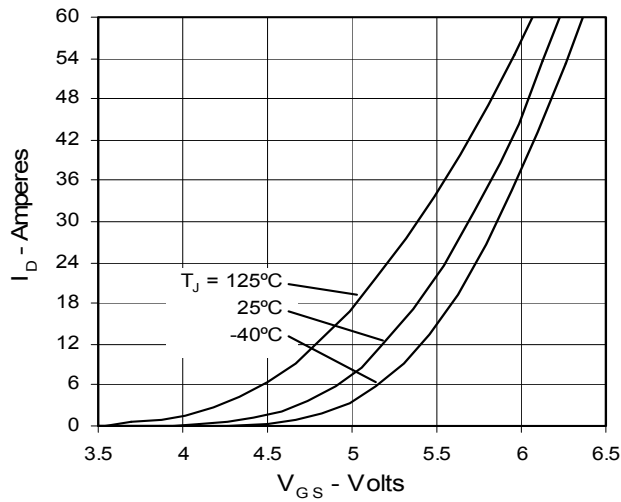
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  $I_D$**



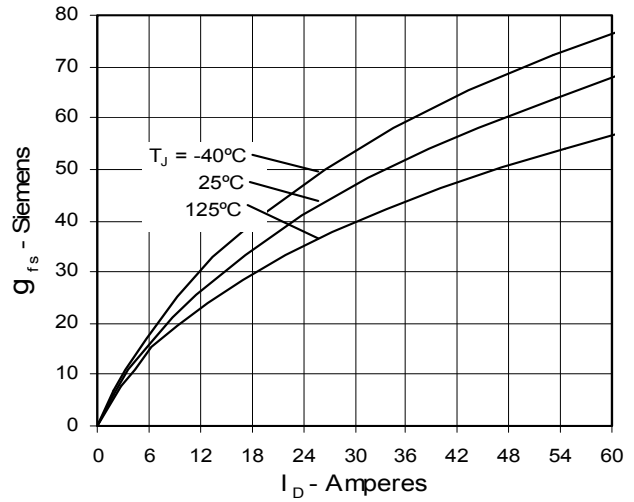
**Fig. 6. Drain Current vs. Case Temperature**



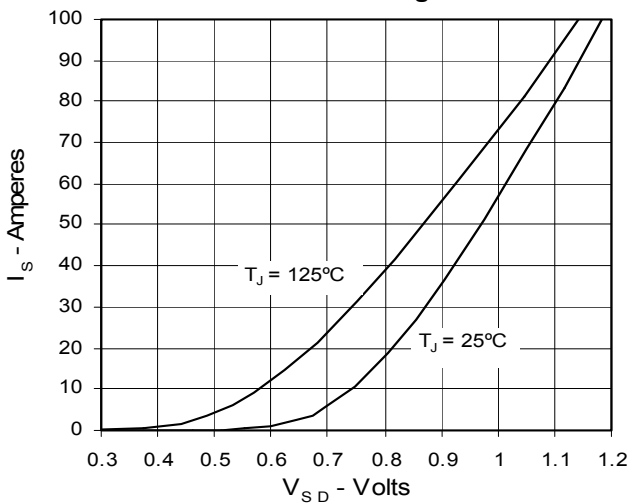
**Fig. 7. Input Admittance**



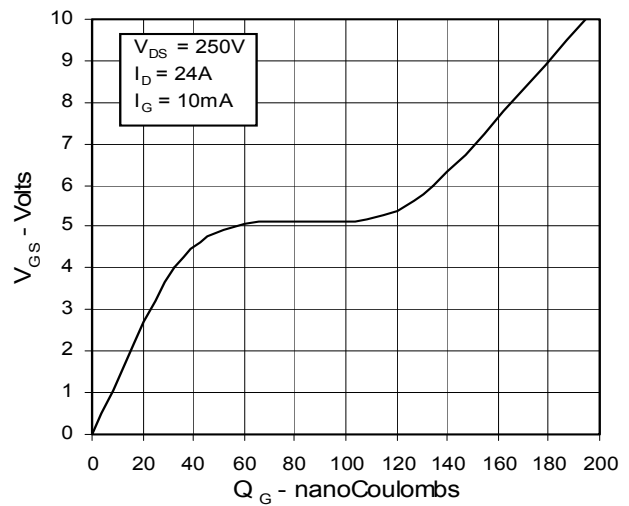
**Fig. 8. Transconductance**



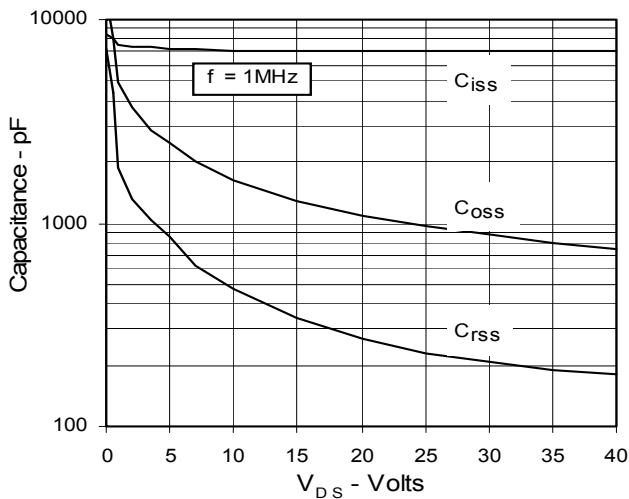
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



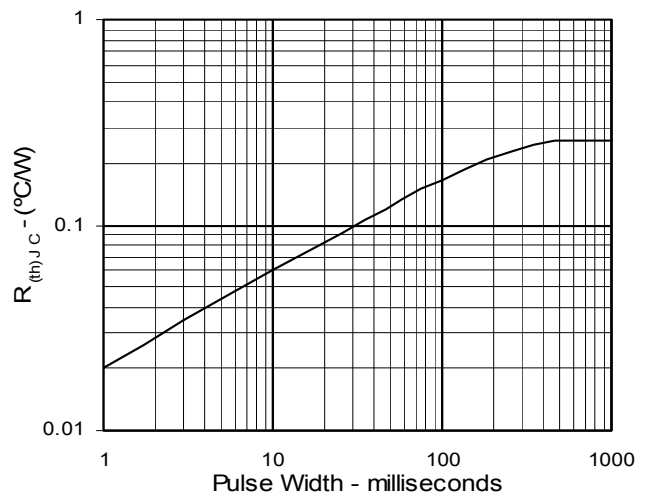
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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



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