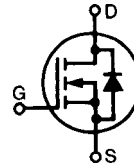


## HiPerFET™ Power MOSFETs

N-Channel Enhancement Mode  
High dv/dt, Low  $t_{rr}$ , HDMOS™ Family

Obsolete:  
~~IXFM21N50~~  
~~IXFM24N50~~

~~IXFH/IXFM21N50~~  
~~IXFH/IXFM/IXFT24N50~~  
IXFH/IXFT26N50

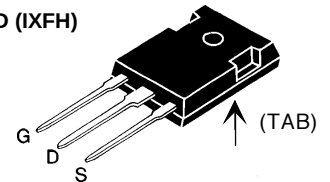


| $V_{DSS}$ | $I_{D25}$ | $R_{DS(on)}$  |
|-----------|-----------|---------------|
| 500 V     | 21 A      | 0.25 $\Omega$ |
| 500 V     | 24 A      | 0.23 $\Omega$ |
| 500 V     | 26 A      | 0.20 $\Omega$ |

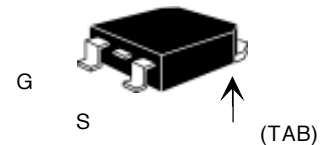
$t_{rr} \leq 250$  ns

| 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 $150^\circ\text{C}$ ; $R_{GS} = 1$ M $\Omega$                                                     | 500                         | V                |
| $V_{GS}$  | Continuous                                                                                                                    | $\pm 20$                    | V                |
| $V_{GSM}$ | Transient                                                                                                                     | $\pm 30$                    | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                      | 21N50                       | 21 A             |
|           |                                                                                                                               | 24N50                       | 24 A             |
|           |                                                                                                                               | 26N50                       | 26 A             |
|           |                                                                                                                               |                             |                  |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                    | 21N50                       | 84 A             |
|           |                                                                                                                               | 24N50                       | 96 A             |
|           |                                                                                                                               | 26N50                       | 104 A            |
|           |                                                                                                                               |                             |                  |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                      | 21N50                       | 21 A             |
|           |                                                                                                                               | 24N50                       | 24 A             |
|           |                                                                                                                               | 26N50                       | 26 A             |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                      | 30                          | mJ               |
| dv/dt     | $I_S \leq I_{DM}$ , $di/dt \leq 100$ A/ $\mu$ s, $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2$ $\Omega$ | 5                           | 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                         | $^\circ\text{C}$ |
| $M_d$     | Mounting torque                                                                                                               | 1.13/10                     | Nm/lb.in.        |
| Weight    |                                                                                                                               | TO-204 = 18 g, TO-247 = 6 g |                  |

TO-247 AD (IXFH)

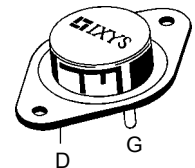


TO-268 (D3) Case Style



~~TO-204 AE (IXFM)~~

Package not available



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

### Features

- International standard packages
- Low  $R_{DS(on)}$  HDMOS™ process
- Rugged polysilicon gate cell structure
- Unclamped Inductive Switching (UIS) rated
- Low package inductance - easy to drive and to protect
- Fast intrinsic Rectifier

### Applications

- DC-DC converters
- Synchronous rectification
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- AC motor control
- Temperature and lighting controls
- Low voltage relays

### Advantages

- Easy to mount with 1 screw (TO-247) (isolated mounting screw hole)
- High power surface mountable package
- High power density

| Symbol       | Test Conditions                     | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |              |
|--------------|-------------------------------------|-----------------------------------------------------------------------------------|------|--------------|
|              |                                     | min.                                                                              | typ. | max.         |
| $V_{DSS}$    | $V_{GS} = 0$ V, $I_D = 250$ $\mu$ A | 500                                                                               |      | V            |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4$ mA    | 2                                                                                 |      | 4 V          |
| $I_{GSS}$    | $V_{GS} = \pm 20$ V, $V_{DS} = 0$   |                                                                                   |      | $\pm 100$ nA |
| $I_{DSS}$    | $V_{DS} = 0.8 \cdot V_{DSS}$        | $T_J = 25^\circ\text{C}$                                                          |      | 200 $\mu$ A  |
|              | $V_{GS} = 0$ V                      | $T_J = 125^\circ\text{C}$                                                         |      | 1 mA         |



IXFH21N50  
IXFM21N50

IXFH24N50  
IXFM24N50  
IXFT24N50

IXFH26N50  
IXFM26N50  
IXFT26N50

| Symbol                                        | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                           | Characteristic Values   |                      |                                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|-------------------------------------------------|
|                                               |                                                                                                                       | Min.                    | Typ.                 | Max.                                            |
| $R_{DS(on)}$                                  | $V_{GS} = 10\text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$ | 21N50<br>24N50<br>26N50 |                      | 0.25 $\Omega$<br>0.23 $\Omega$<br>0.20 $\Omega$ |
| $g_{fs}$                                      | $V_{DS} = 10\text{ V}$ ; $I_D = 0.5 I_{D25}$ , pulse test                                                             | 11                      | 21                   | S                                               |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$           | $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                                                   |                         | 4200<br>450<br>135   | pF<br>pF<br>pF                                  |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 V_{DSS}$ , $I_D = 0.5 I_{D25}$<br>$R_G = 2\text{ }\Omega$ (External)           |                         | 16<br>33<br>65<br>30 | 25 ns<br>45 ns<br>80 ns<br>40 ns                |
| $Q_{g(on)}$<br>$Q_{gs}$<br>$Q_{gd}$           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 V_{DSS}$ , $I_D = 0.5 I_{D25}$                                                 |                         | 135<br>28<br>62      | 160 nC<br>40 nC<br>85 nC                        |
| $R_{thJC}$<br>$R_{thCK}$                      | (TO-247 Case Style)                                                                                                   |                         | 0.25                 | 0.42 K/W<br>K/W                                 |

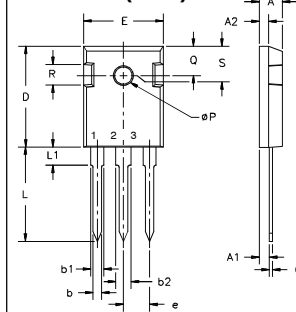
#### Source-Drain Diode

Characteristic Values  
( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol   | Test Conditions                                                                                                | Min.                    | Typ.     | Max.                           |
|----------|----------------------------------------------------------------------------------------------------------------|-------------------------|----------|--------------------------------|
| $I_S$    | $V_{GS} = 0\text{ V}$                                                                                          | 21N50<br>24N50<br>26N50 |          | 21 A<br>24 A<br>26 A           |
| $I_{SM}$ | Repetitive;<br>pulse width limited by $T_{JM}$                                                                 | 21N50<br>24N50<br>26N50 |          | 84 A<br>96 A<br>104 A          |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$ |                         |          | 1.5 V                          |
| $t_{rr}$ | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                                                          |                         |          | 250 ns<br>400 ns               |
| $Q_{RM}$ | $I_F = I_S$<br>$-di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_R = 100\text{ V}$                                   |                         | 1<br>2   | $\mu\text{C}$<br>$\mu\text{C}$ |
| $I_{RM}$ | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                                                          |                         | 10<br>15 | A<br>A                         |

Note 1: Add "S" suffix for TO-247 SMD package option (ex: IXFH24N50S)

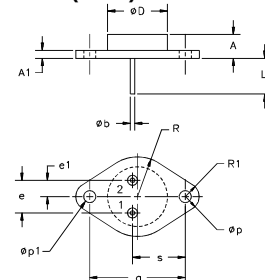
#### TO-247 AD (IXFH) Outline



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

| Dim.            | Millimeter<br>Min. | Max.  | Inches<br>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  |
| $\varnothing P$ | 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   |

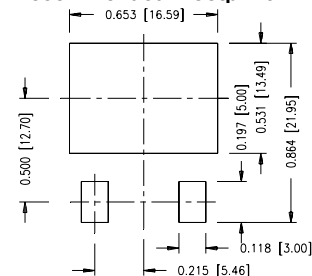
#### TO-204 AE (IXFM) Outline



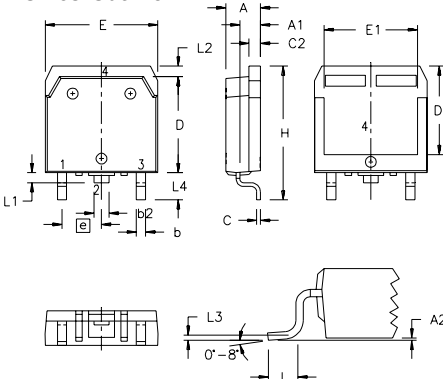
Pins: 1 - Gate, 2 - Source, Case - Drain

| Dim.              | Millimeter<br>Min. | Max.  | Inches<br>Min. | Max. |
|-------------------|--------------------|-------|----------------|------|
| A                 | 6.4                | 11.4  | .250           | .450 |
| A <sub>1</sub>    | 1.53               | 3.42  | .060           | .135 |
| $\varnothing b$   | 1.45               | 1.60  | .057           | .063 |
| $\varnothing D$   |                    | 22.22 |                | .875 |
| e                 | 10.67              | 11.17 | .420           | .440 |
| e <sub>1</sub>    | 5.21               | 5.71  | .205           | .225 |
| L                 | 11.18              | 12.19 | .440           | .480 |
| $\varnothing p$   | 3.84               | 4.19  | .151           | .165 |
| $\varnothing p_1$ | 3.84               | 4.19  | .151           | .165 |
| q                 | 30.15              | BSC   | 1.187          | BSC  |
| R                 | 12.58              | 13.33 | .495           | .525 |
| R <sub>1</sub>    | 3.33               | 4.77  | .131           | .188 |
| s                 | 16.64              | 17.14 | .655           | .675 |

#### Min. Recommended Footprint



#### TO-268 Outline



| SYM            | INCHES |          | MILLIMETERS |          |
|----------------|--------|----------|-------------|----------|
|                | MIN    | MAX      | MIN         | MAX      |
| A              | .193   | .201     | 4.90        | 5.10     |
| A <sub>1</sub> | .106   | .114     | 2.70        | 2.90     |
| A <sub>2</sub> | .001   | .010     | 0.02        | 0.25     |
| b              | .045   | .057     | 1.15        | 1.45     |
| b <sub>2</sub> | .075   | .083     | 1.90        | 2.10     |
| C              | .016   | .026     | 0.40        | 0.65     |
| C <sub>2</sub> | .057   | .063     | 1.45        | 1.60     |
| D              | .543   | .551     | 13.80       | 14.00    |
| D <sub>1</sub> | .488   | .500     | 12.40       | 12.70    |
| E              | .624   | .632     | 15.85       | 16.05    |
| E <sub>1</sub> | .524   | .535     | 13.30       | 13.60    |
| e              |        | .215 BSC |             | 5.45 BSC |
| H              | .736   | .752     | 18.70       | 19.10    |
| L              | .094   | .106     | 2.40        | 2.70     |
| L <sub>1</sub> | .047   | .055     | 1.20        | 1.40     |
| L <sub>2</sub> | .039   | .045     | 1.00        | 1.15     |
| L <sub>3</sub> |        | .010 BSC |             | 0.25 BSC |
| L <sub>4</sub> | .150   | .161     | 3.80        | 4.10     |

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  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

Fig. 1 Output Characteristics

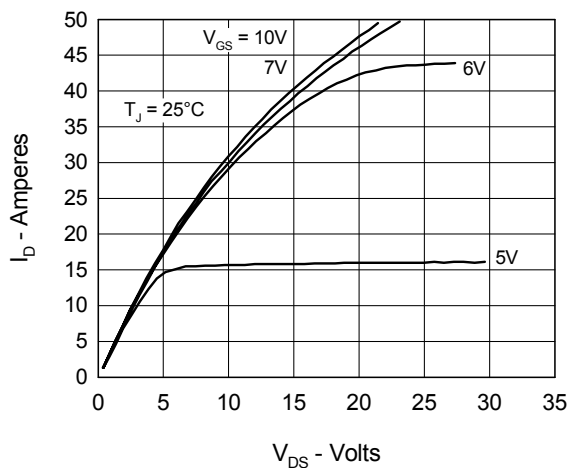


Fig. 2 Input Admittance

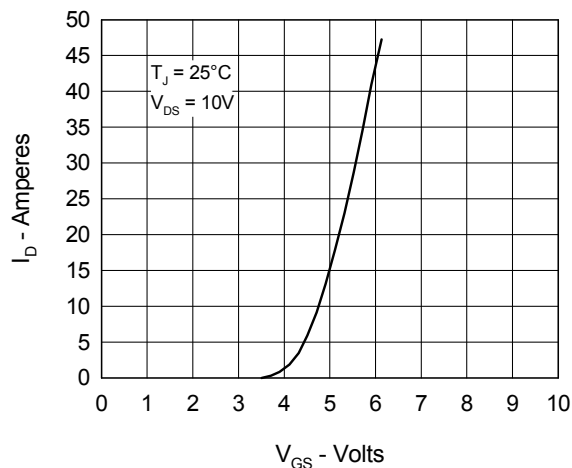
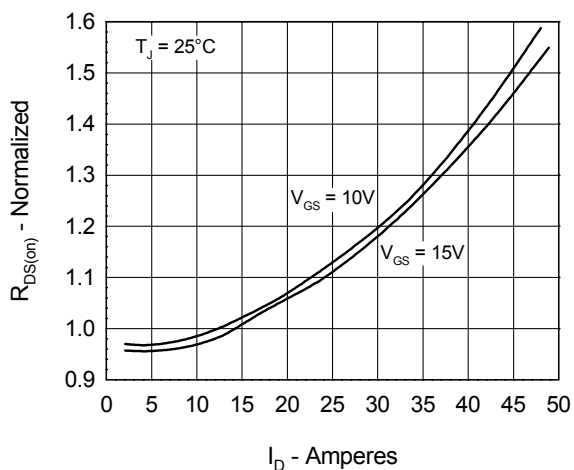

Fig. 3  $R_{DS(on)}$  vs. Drain Current


Fig. 4 Temperature Dependence of Drain to Source Resistance

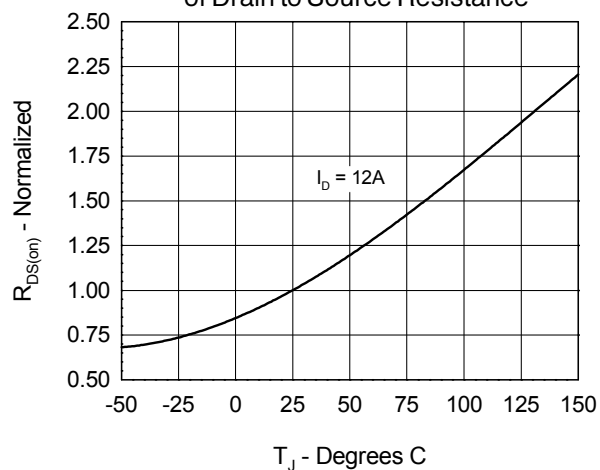


Fig. 5 Drain Current vs. Case Temperature

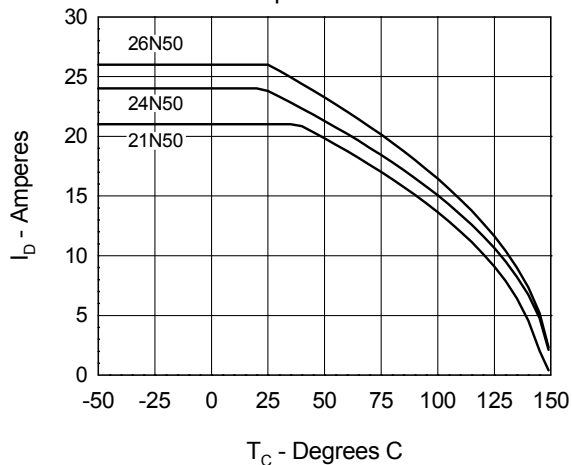


Fig. 6 Temperature Dependence of Breakdown and Threshold Voltage

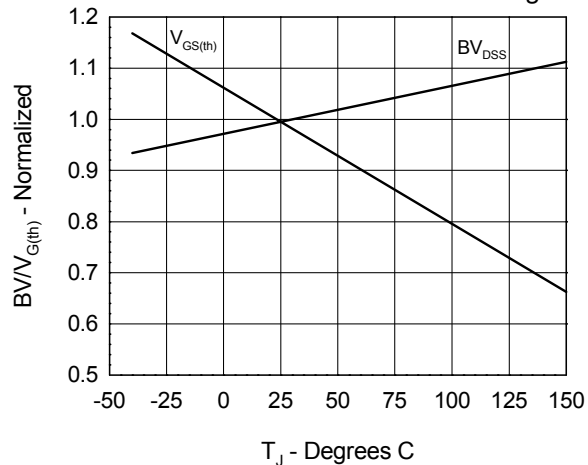


Fig.7 Gate Charge Characteristic Curve

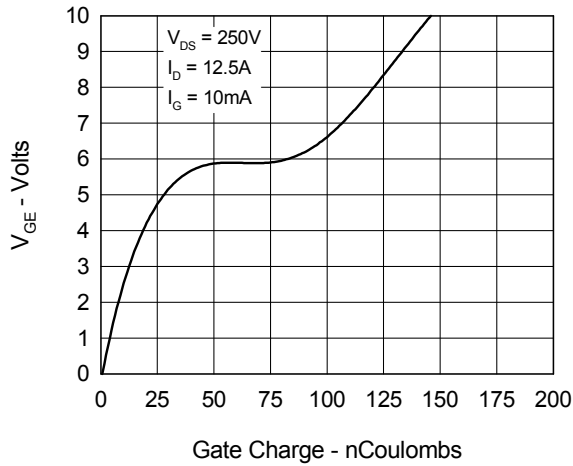


Fig.9 Capacitance Curves

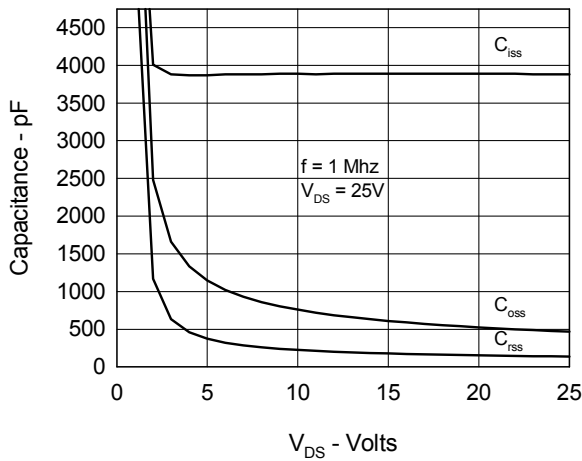


Fig.11 Transient Thermal Impedance

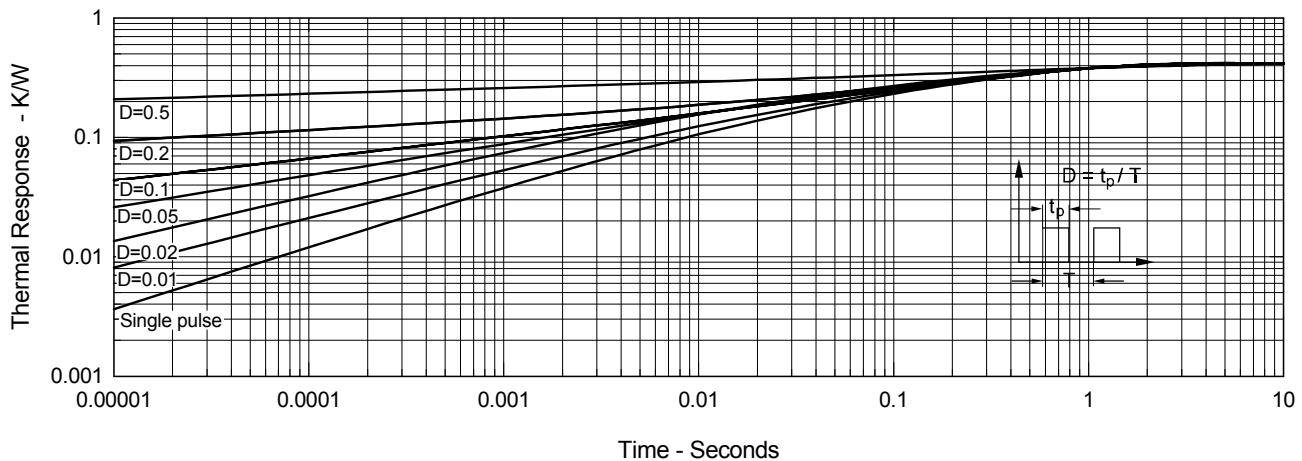


Fig.8 Forward Bias Safe Operating Area

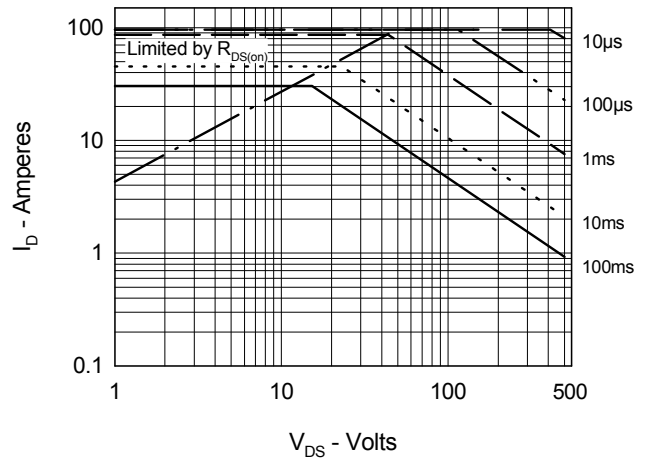
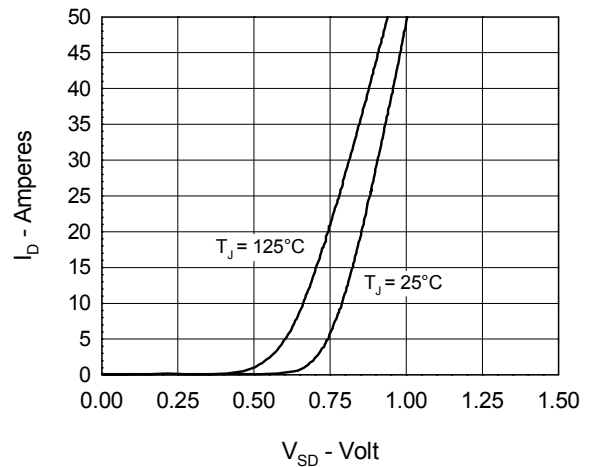


Fig.10 Source Current vs. Source to Drain Voltage





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