

Polar™ Power MOSFET
HiperFET™

IXFA12N50P
IXFP12N50P

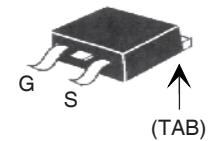
V_{DSS} = 500V
I_{D25} = 12A
R_{DS(on)} ≤ 500mΩ

N-Channel Enhancement Mode
Avalanche Rated

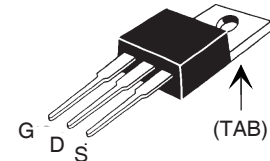


| Symbol | Test Conditions | Maximum Ratings | |
|-------------------|--|-----------------|-----------|
| V _{DSS} | T _J = 25°C to 150°C | 500 | V |
| V _{DGR} | T _J = 25°C to 150°C, R _{GS} = 1MΩ | 500 | V |
| V _{GSS} | Continuous | ±30 | V |
| V _{GSM} | Transient | ±40 | V |
| I _{D25} | T _C = 25°C | 12 | A |
| I _{DM} | T _C = 25°C, pulse width limited by T _{JM} | 30 | A |
| I _A | T _C = 25°C | 12 | A |
| E _{AS} | T _C = 25°C | 600 | mJ |
| dV/dt | I _S ≤ I _{DM} , V _{DD} ≤ V _{DSS} , T _J ≤ 150°C | 20 | V/ns |
| P _D | T _C = 25°C | 200 | W |
| T _J | | -55 ... +150 | °C |
| T _{JM} | | 150 | °C |
| T _{stg} | | -55 ... +150 | °C |
| T _L | 1.6mm (0.062) from case for 10s | 300 | °C |
| T _{SOLD} | Plastic body for 10s | 260 | °C |
| M _d | Mounting torque (TO-220) | 1.13 / 10 | Nm/lb.in. |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |

TO-263 (IXFA)



TO-220 (IXFP)



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

Features

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

Advantages

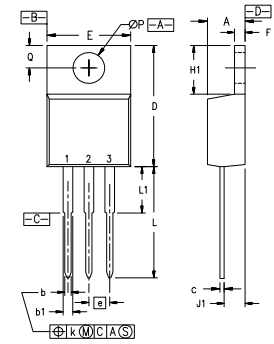
- Easy to mount
- Space savings
- High power density

| Symbol | Test Conditions | Characteristic Values | | |
|---------------------|---|-----------------------|------|---------|
| | | Min. | Typ. | Max. |
| BV _{DSS} | V _{GS} = 0V, I _D = 250μA | 500 | | V |
| V _{GS(th)} | V _{DS} = V _{GS} , I _D = 1mA | 3.0 | | 5.5 V |
| I _{GSS} | V _{GS} = ±30V, V _{DS} = 0V | | | ±100 nA |
| I _{DSS} | V _{DS} = V _{DSS} | | | 5 μA |
| | V _{GS} = 0V | | | 250 μA |
| R _{DS(on)} | V _{GS} = 10V, I _D = 0.5 • I _{D25} , Note 1 | | | 500 mΩ |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, unless otherwise specified) | Characteristic Values | | |
|---|---|-----------------------|-------------------------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $V_{DS} = 20\text{V}$, $I_D = 0.5 \cdot I_{D25}$, Note 1 | 7.5 | 13 | S |
| C_{iss} C_{oss} C_{rss} | $V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$ | | 1830 | pF |
| | | | 182 | pF |
| | | | 16 | pF |
| $t_{d(on)}$ t_r $t_{d(off)}$ t_f | Resistive Switching Times $V_{GS} = 10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$ $R_G = 50\Omega$ (External) | | 22 | ns |
| | | | 27 | ns |
| | | | 65 | ns |
| | | | 20 | ns |
| $Q_{g(on)}$ Q_{gs} Q_{gd} | $V_{GS} = 10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$ | | 29 | nC |
| | | | 11 | nC |
| | | | 10 | nC |
| R_{thJC} R_{thCS} | (TO-220) | 0.50 | 0.62 $^\circ\text{C/W}$ | $^\circ\text{C/W}$ |

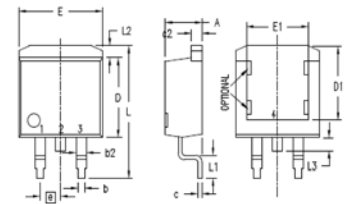
| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | |
|----------------------------------|--|---|------|---------------|
| | | Min. | Typ. | Max. |
| I_S | $V_{GS} = 0\text{V}$ | | | 12 A |
| I_{SM} | Repetitive, pulse width limited by T_{JM} | | | 48 A |
| V_{SD} | $I_F = I_S$, $V_{GS} = 0\text{V}$, Note 1 | | | 1.5 V |
| t_{rr} Q_{RM} I_{RM} | $I_F = 6\text{A}$, $-di/dt = 150\text{A}/\mu\text{s}$, $V_R = 100\text{V}$, $V_{GS} = 0\text{V}$ | | 2.8 | 300 ns |
| | | | 18.2 | μC |
| | | | | A |

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

TO-220 (IXFP) Outline


Pins: 1 - Gate 2 - Drain

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .170 | .190 | 4.32 | 4.83 |
| b | .025 | .040 | 0.64 | 1.02 |
| b1 | .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 |
| H1 | .230 | .270 | 5.85 | 6.85 |
| J1 | .090 | .110 | 2.29 | 2.79 |
| k | 0 | .015 | 0 | 0.38 |
| L | .500 | .550 | 12.70 | 13.97 |
| L1 | .110 | .230 | 2.79 | 5.84 |
| ØP | .139 | .161 | 3.53 | 4.08 |
| Q | .100 | .125 | 2.54 | 3.18 |

TO-263 (IXFA) Outline


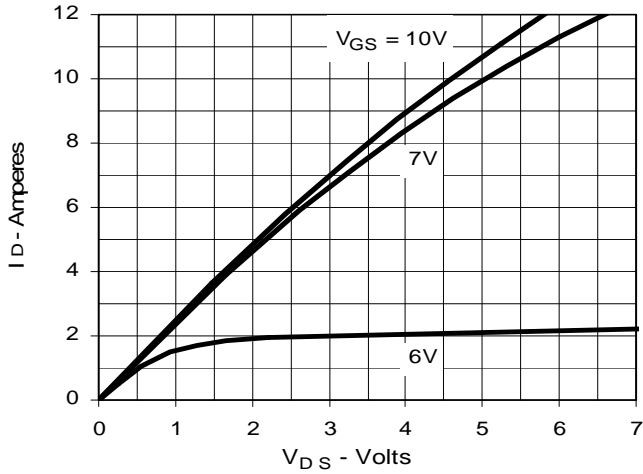
1. GATE
 2. DRAIN (COLLECTOR)
 3. SOURCE (EMITTER)
 4. DRAIN (COLLECTOR)
- BOTTOM SIDE

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .160 | .190 | 4.06 | 4.83 |
| A1 | .080 | .110 | 2.03 | 2.79 |
| b | .020 | .039 | 0.51 | 0.99 |
| b2 | .045 | .055 | 1.14 | 1.40 |
| c | .016 | .029 | 0.40 | 0.74 |
| c2 | .045 | .055 | 1.14 | 1.40 |
| D | .340 | .380 | 8.64 | 9.65 |
| D1 | .315 | .350 | 8.00 | 8.89 |
| E | .380 | .410 | 9.65 | 10.41 |
| E1 | .245 | .320 | 6.22 | 8.13 |
| e | .100 BSC | | 2.54 BSC | |
| L | .575 | .625 | 14.61 | 15.88 |
| L1 | .090 | .110 | 2.29 | 2.79 |
| L2 | .040 | .055 | 1.02 | 1.40 |
| L3 | .050 | .070 | 1.27 | 1.78 |
| L4 | 0 | .005 | 0 | 0.13 |

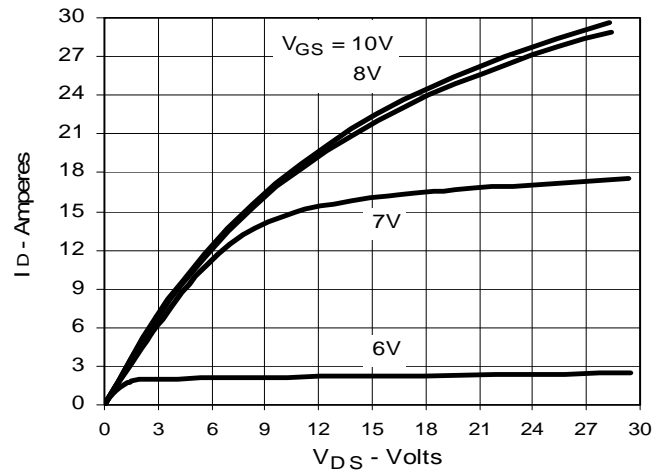
IXYS reserves the right to change limits, test conditions, and dimensions.

| | | | | | | | | | | |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
| | 4,850,072 | 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 | |

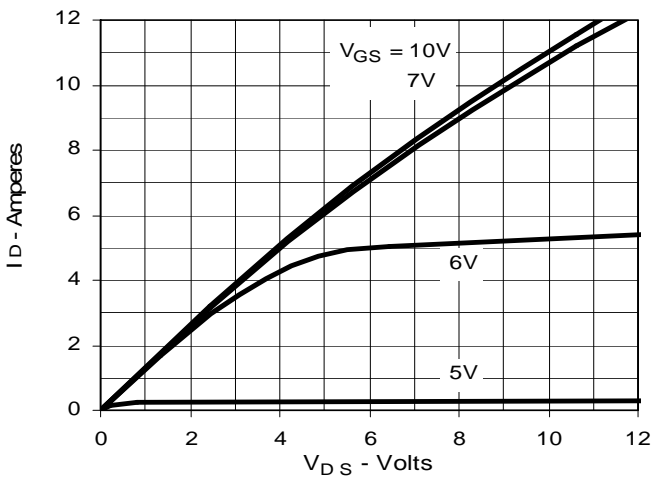
**Fig. 1. Output Characteristics
@ 25°C**



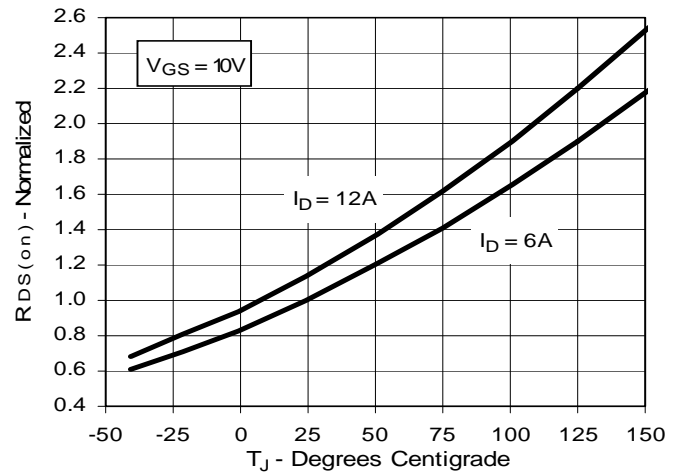
**Fig. 2. Extended Output Characteristics
@ 25°C**



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



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 6A$ Value
vs. Junction Temperature**



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D = 6A$ Value
vs. Drain Current**

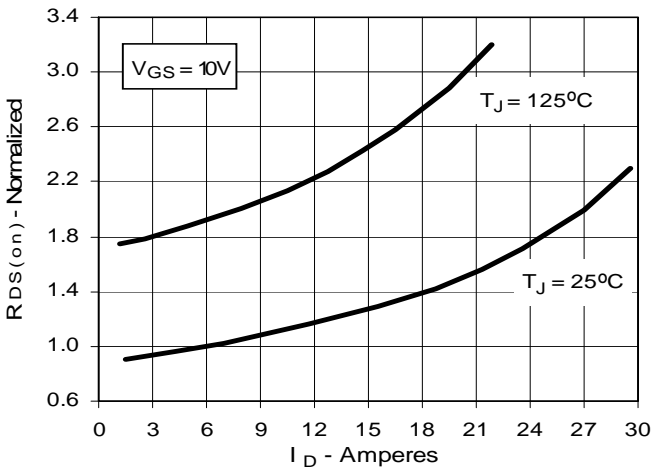


Fig. 6. Drain Current vs. Case Temperature

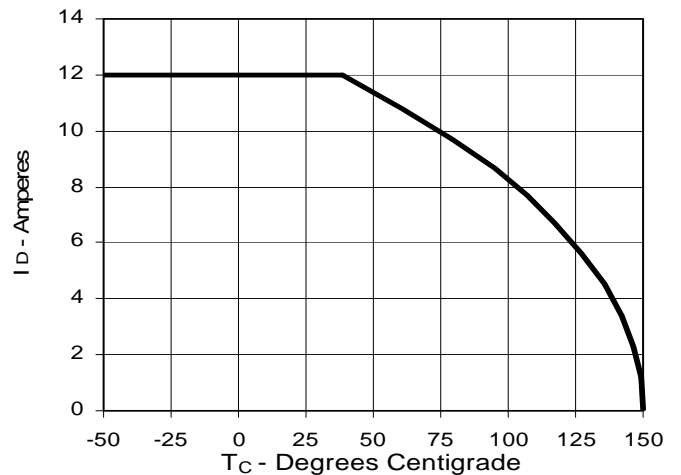


Fig. 7. Input Admittance

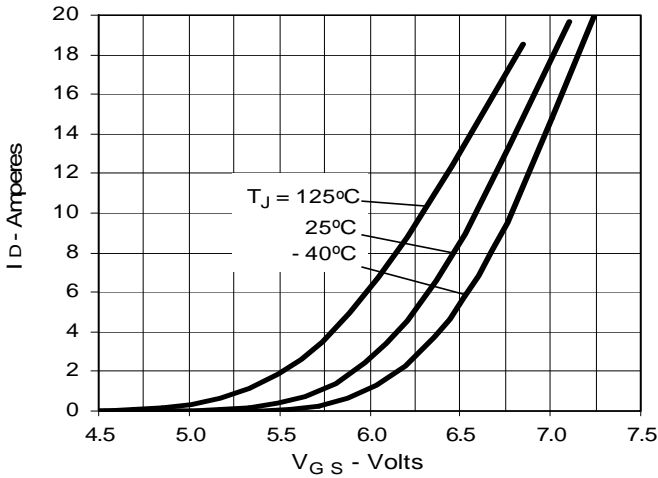


Fig. 8. Transconductance

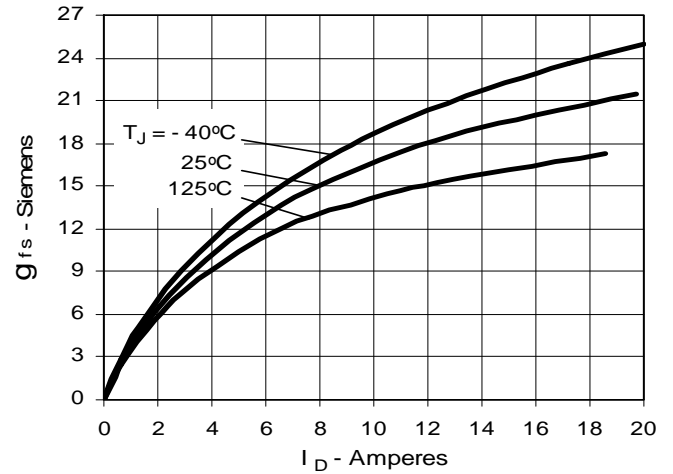


Fig. 9. Source Current vs. Source-To-Drain Voltage

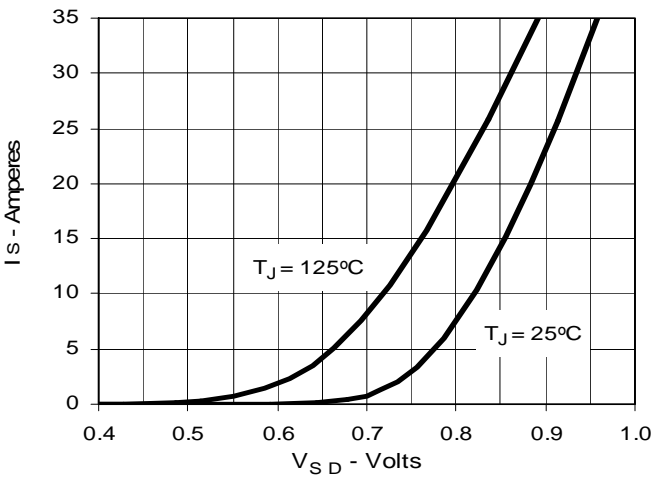


Fig. 10. Gate Charge

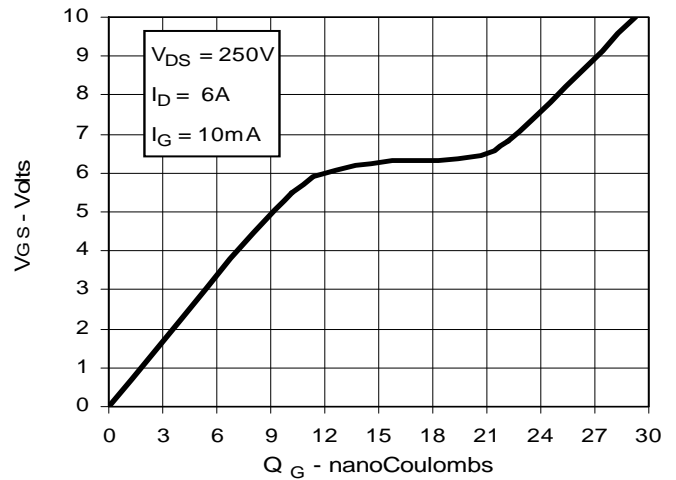


Fig. 11. Capacitance

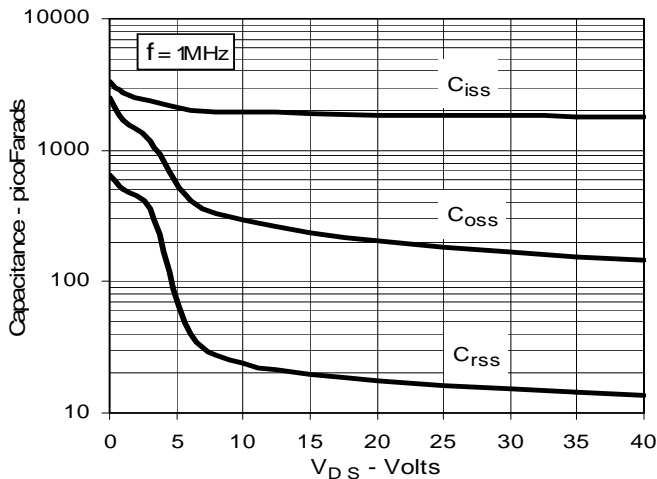


Fig. 12. Forward-Bias Safe Operating Area

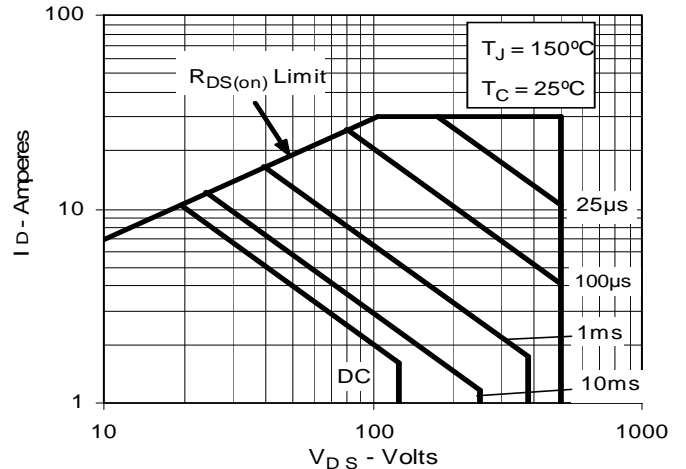


Fig. 13. Maximum Transient Thermal Impedance





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