# IXYS

## HiPerFET™ Power MOSFETs

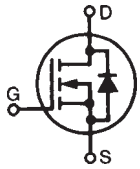
## IXFA 3N120
## IXFP 3N120

$V_{DSS}$ = 1200 V
$I_{D25}$ = 3 A
$R_{DS(on)}$ = 4.5 Ω

$t_{rr} \leq 300$ ns

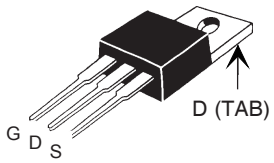
N-Channel Enhancement Mode
Avalanche Rated, Low $Q_g$, High dv/dt

Preliminary Data Sheet

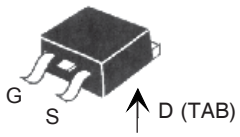



| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | 1200 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C; $R_{GS}$ = 1 MΩ | 1200 | V |
| $V_{GS}$ | Continuous | ±20 | V |
| $V_{GSM}$ | Transient | ±30 | V |
| $I_{D25}$ | $T_C$ = 25°C | 3 | A |
| $I_{DM}$ | $T_C$ = 25°C, pulse width limited by $T_{JM}$ | 12 | A |
| $I_{AR}$ | $T_C$ = 25°C | 3 | A |
| $E_{AR}$ | $T_C$ = 25°C | 20 | mJ |
| $E_{AS}$ | | 700 | mJ |
| dv/dt | $I_S \leq I_{DM}$, di/dt ≤ 100 A/µs, $V_{DD} \leq V_{DSS}$, $T_J \leq 150$°C, $R_G$ = 4.7 Ω | 10 | V/ns |
| $P_D$ | $T_C$ = 25°C | 200 | W |
| $T_J$ | | -55 to +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 to +150 | °C |
| $T_L$ | 1.6 mm (0.063 in) from case for 10 s | 300 | °C |
| $M_d$ | Mounting torque (TO-220) | 1.13/10 | Nm/lb.in. |
| Weight | TO-220 | 4 | g |
| | TO-263 | 2 | g |

**TO-220 (IXFP)**




**TO-263 (IXFA)**




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

| Symbol | Test Conditions | | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|---|
| $V_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 1 mA | | 1200 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 1.5 mA | | 2.5 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ±20 $V_{DC}$, $V_{DS}$ = 0 | | | | ±100 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$ | $T_J$ = 25°C | | | 50 | µA |
| | $V_{GS}$ = 0 V | $T_J$ = 125°C | | | 2 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D = 0.5\ I_{D25}$ Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 % | | | | 4.5 | Ω |

### Features

- Low gate charge and capacitances
  - easier to drive
  - faster switching
- International standard packages
- Low $R_{DS\ (on)}$
- Rated for unclamped Inductive load Switching (UIS)
- Molding epoxies meet UL 94 V-0 flammability classification

### Advantages

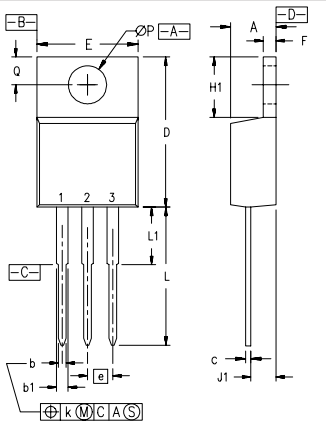
- Easy to mount
- Space savings
- High power density

| Symbol | Test Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 20 V; $I_D$ = 0.5 • $I_{D25}$, pulse test | 1.5 | 2.5 | | S |
| $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | | 1050 | | pF |
| $C_{oss}$ | | | 100 | | pF |
| $C_{rss}$ | | | 25 | | pF |
| $t_{d(on)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ $R_G$ = 4.7 Ω (External), | | 17 | | ns |
| $t_r$ | | | 15 | | ns |
| $t_{d(off)}$ | | | 32 | | ns |
| $t_f$ | | | 18 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 39 | | nC |
| $Q_{gs}$ | | | 9 | | nC |
| $Q_{gd}$ | | | 22 | | nC |
| $R_{thJC}$ | | | | 0.62 | K/W |
| $R_{thCK}$ | (TO-220) | | 0.25 | | K/W |

**Source-Drain Diode**

| Symbol | Test Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0 V | | | 3 | A |
| $I_{SM}$ | Repetitive; pulse width limited by $T_{JM}$ | | | 12 | A |
| $V_{SD}$ | $I_F = I_S$, $V_{GS}$ = 0 V, Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 % | | | 1.5 | V |
| $t_{rr}$ | $I_F = I_S$, -di/dt = 100 A/μs, $V_R$ = 100 V | | | 300 | ns |
| $Q_{RM}$ | | | 0.4 | | μC |
| $I_{RM}$ | | | 1.2 | | A |

**TO-220 (IXFP) Outline**

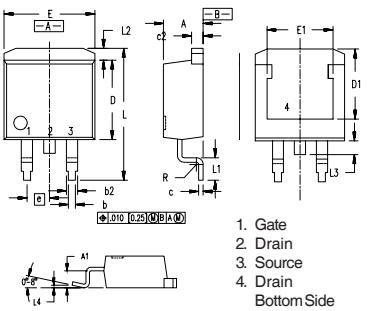



Pins: 1 - Gate 2 - Drain
3 - Source 4 - Drain
Bottom Side

| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS 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 |

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-220 AB.

**TO-263 (IXFA) Outline**




1. Gate
2. Drain
3. Source
4. Drain
Bottom Side

| Dim. | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|---|---|---|---|---|
| A | 4.06 | 4.83 | .160 | .190 |
| A1 | 2.03 | 2.79 | .080 | .110 |
| b | 0.51 | 0.99 | .020 | .039 |
| b2 | 1.14 | 1.40 | .045 | .055 |
| c | 0.46 | 0.74 | .018 | .029 |
| c2 | 1.14 | 1.40 | .045 | .055 |
| D | 8.64 | 9.65 | .340 | .380 |
| D1 | 7.11 | 8.13 | .280 | .320 |
| E | 9.65 | 10.29 | .380 | .405 |
| E1 | 6.86 | 8.13 | .270 | .320 |
| e | 2.54 | BSC | .100 | BSC |
| L | 14.61 | 15.88 | .575 | .625 |
| L1 | 2.29 | 2.79 | .090 | .110 |
| L2 | 1.02 | 1.40 | .040 | .055 |
| L3 | 1.27 | 1.78 | .050 | .070 |
| L4 | 0 | 0.38 | 0 | .015 |
| R | 0.46 | 0.74 | .018 | .029 |

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

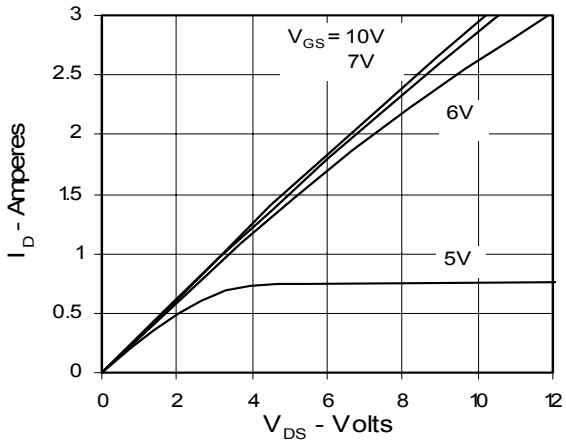



**Fig. 2. Extended Output Characteristics @ 25 deg. C**

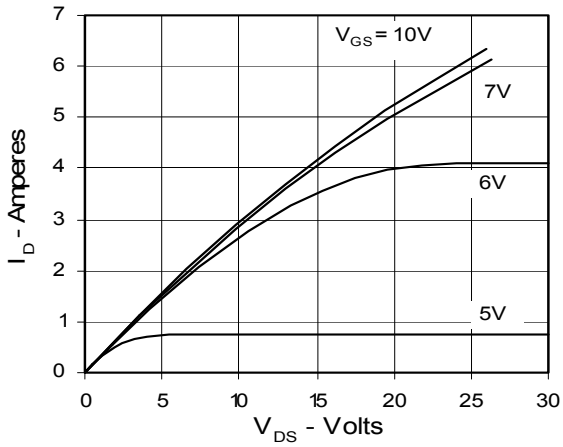



**Fig. 3. Output Characteristics @ 125 Deg. C**

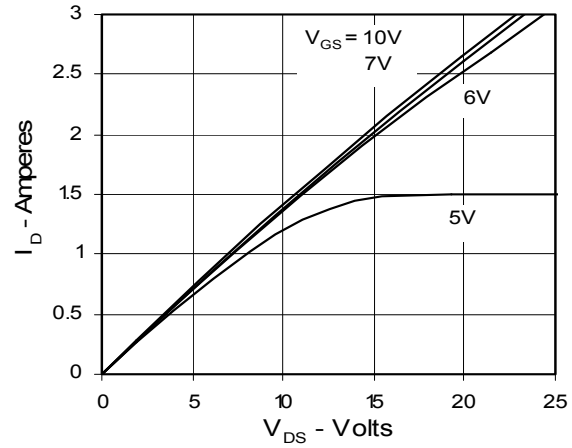



**Fig. 4. $R_{DS(on)}$ Normalized to $I_{D25}$ Value vs. Junction Temperature**

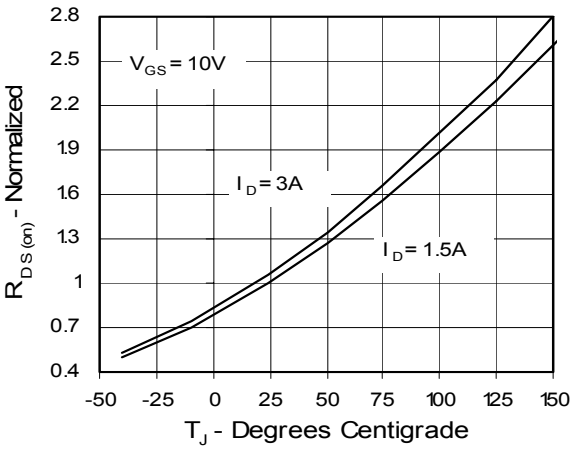



**Fig. 5. $R_{DS(on)}$ Normalized to $I_{D25}$ Value vs. $I_D$**

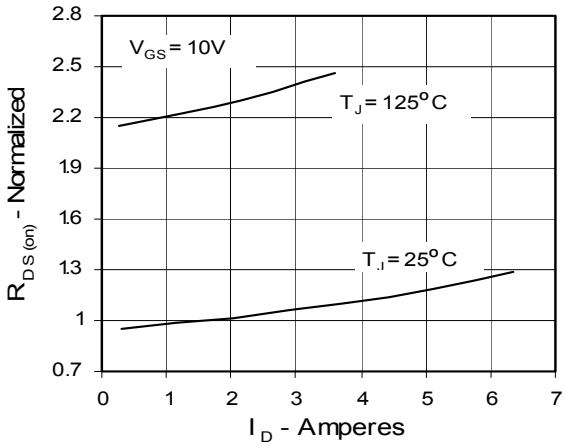



**Fig. 6. Drain Current vs. Case Temperature**

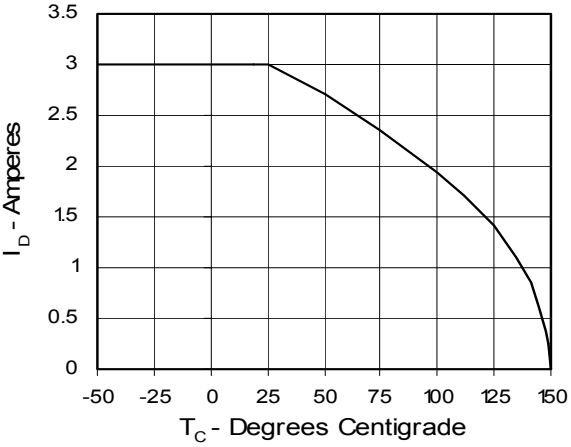


**Fig. 7. Input Admittance**

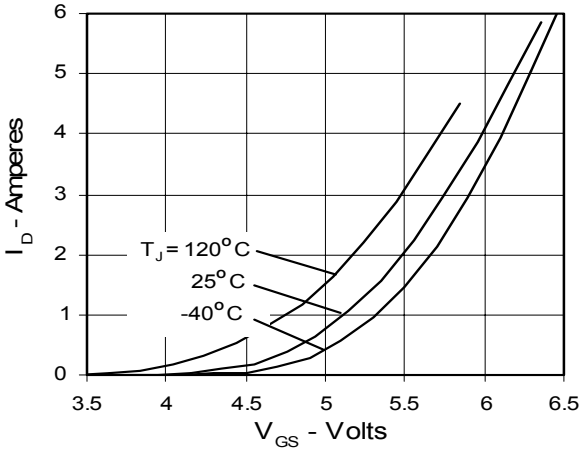



**Fig. 8. Transconductance**

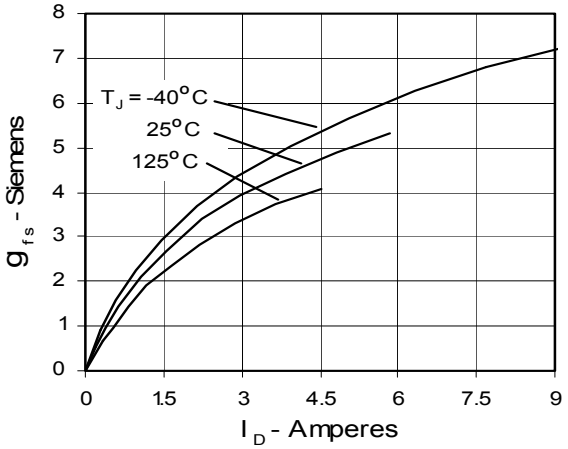



**Fig. 9. Source Current vs. Source-To-Drain Voltage**

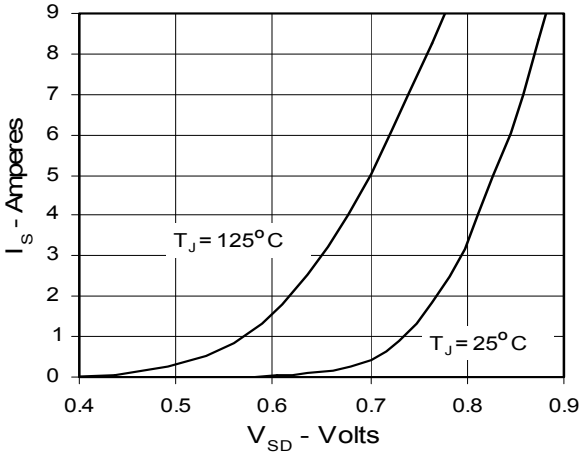



**Fig. 10. Gate Charge**

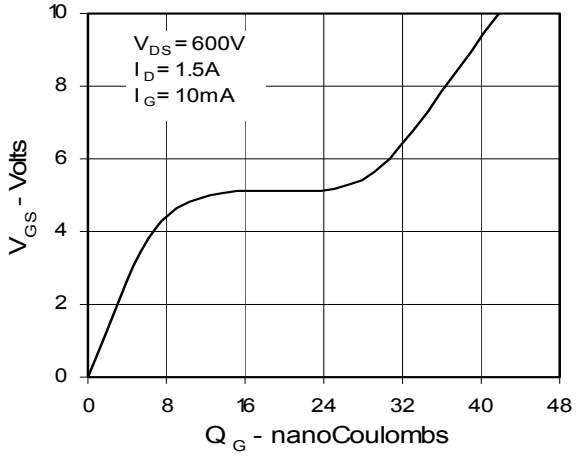



**Fig. 11. Capacitance**

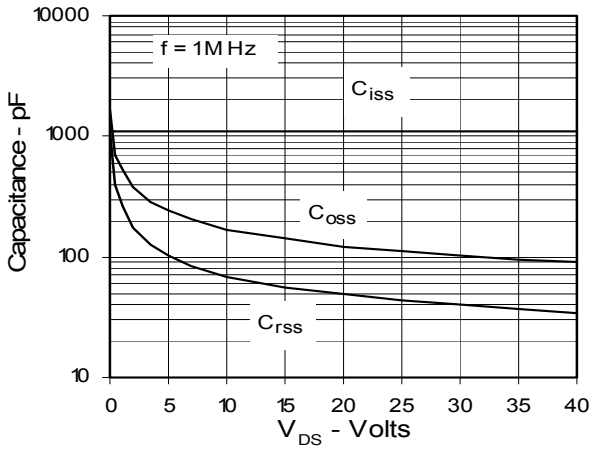
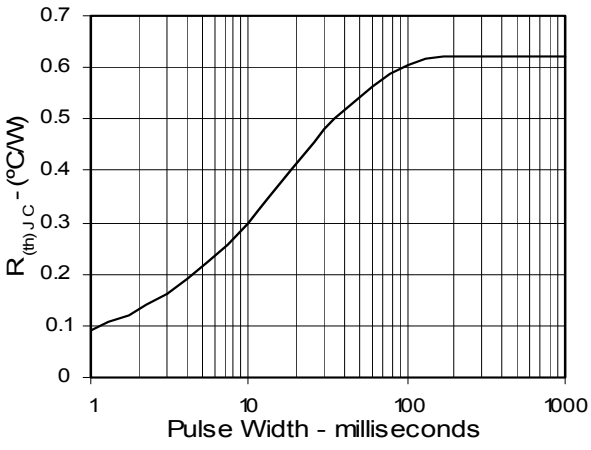



**Fig. 12. Maximum Transient Thermal Resistance**



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