International
IOR Rectifier

Provisional Data Sheet No. PD-9.432B

# HEXFET® POWER MOSFET

# JANTX2N6800
# JANTXV2N6800
# [REF:MIL-PRF-19500/557]
# [GENERIC:IRFF330]

## N-CHANNEL

### 400 Volt, 1.0Ω HEXFET

HEXFET technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry achieves very low on-state resistance combined with high transconductance.

HEXFET transistors also feature all of the well-establish advantages of MOSFETs, such as voltage control, very fast switching, ease of paralleling and electrical parameter temperature stability. They are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits, and virtually any application where high reliability is required.

### Product Summary

| Part Number | $BV_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| JANTX2N6800<br>JANTXV2N6800 | 400V | 1.0Ω | 3.0A |

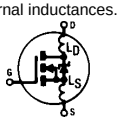
### Features:

- Avalanche Energy Rating
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed

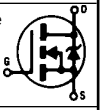
## Absolute Maximum Ratings

| | Parameter | JANTX2N6800, JANTXV2N6800 | Units |
|---|---|---|---|
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 25°C | Continuous Drain Current | 3.0 | A |
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 100°C | Continuous Drain Current | 2.0 | |
| $I_{DM}$ | Pulsed Drain Current ① | 12.0 | |
| $P_D$ @ $T_C$ = 25°C | Max. Power Dissipation | 25 | W |
| | Linear Derating Factor | 0.20 | W/K ⑤ |
| $V_{GS}$ | Gate-to-Source Voltage | ±20 | V |
| dv/dt | Peak Diode Recovery dv/dt ③ | 4.0 | V/ns |
| $T_J$<br>$T_{STG}$ | Operating Junction<br>Storage Temperature Range | -55 to 150 | °C |
| | Lead Temperature | 300 (0.063 in. (1.6mm) from case for 10.5 seconds) | |
| | Weight | 0.98 (typical) | g |

## Electrical Characteristics @ Tj = 25°C (Unless Otherwise Specified)

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-to-Source Breakdown Voltage | 400 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 1.0 mA |
| $\Delta BV_{DSS}/\Delta T_J$ | Temperature Coefficient of Breakdown Voltage | — | 0.37 | — | V/°C | Reference to 25°C, $I_D$ = 1.0 mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-State Resistance | — | — | 1.0 | Ω | $V_{GS}$ = 10V, $I_D$ = 2.0A ④ |
| | | — | — | 1.15 | | $V_{GS}$ = 10V, $I_D$ = 3.0A |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| gfs | Forward Transconductance | 2.0 | — | — | S (℧) | $V_{DS}$ > 15V, $I_{DS}$ = 2.0A ④ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | — | — | 25 | µA | $V_{DS}$ = 0.8 x Max Rating, $V_{GS}$ = 0V |
| | | — | — | 250 | | $V_{DS}$ = 0.8 x Max Rating, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source Leakage Forward | — | — | 100 | nA | $V_{GS}$ = 20V |
| $I_{GSS}$ | Gate-to-Source Leakage Reverse | — | — | -100 | | $V_{GS}$ = -20V |
| $Q_g$ | Total Gate Charge | 19.1 | — | 33 | nC | $V_{GS}$ = 10V, $I_D$ = 3.0A |
| $Q_{gs}$ | Gate-to-Source Charge | 1.0 | — | 5.8 | | $V_{DS}$ = Max. Rating x 0.5 |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | 6.7 | — | 19.9 | | see figures 6 and 13 |
| $t_{d(on)}$ | Turn-On Delay Time | — | — | 30 | ns | $V_{DD}$ = 200V, $I_D$ = 3.0A, |
| $t_r$ | Rise Time | — | — | 35 | | $R_G$ = 7.5Ω, $V_{GS}$ = 10V |
| $t_{d(off)}$ | Turn-Off Delay Time | — | — | 55 | | |
| $t_f$ | Fall Time | — | — | 35 | | see figure 10 |
| $L_D$ | Internal Drain Inductance | — | 5.0 | — | nH | Measured from the drain lead, 6mm (0.25 in.) from package to center of die. |
| $L_S$ | Internal Source Inductance | — | 15 | — | | Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad. |
| | | | | | | Modified MOSFET symbol showing the internal inductances.   |
| $C_{iss}$ | Input Capacitance | — | 620 | — | pF | $V_{GS}$ = 0V, $V_{DS}$ = 25V |
| $C_{oss}$ | Output Capacitance | — | 200 | — | | f = 1.0 MHz |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 75 | — | | see figure 5 |

## Source-Drain Diode Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 3.0 | A | Modified MOSFET symbol showing the integral reverse p-n junction rectifier.   |
| $I_{SM}$ | Pulse Source Current (Body Diode) ① | — | — | 12.0 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.4 | V | $T_j$ = 25°C, $I_S$ = 3.0A, $V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | — | — | 700 | ns | $T_j$ = 25°C, $I_F$ = 3.0A, di/dt ≤ 100A/µs |
| $Q_{RR}$ | Reverse Recovery Charge | — | — | 6.2 | µC | $V_{DD}$ ≤ 50V ④ |
| $t_{on}$ | Forward Turn-On Time | Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S$ + $L_D$. | | | | |

## Thermal Resistance

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | — | — | 5.0 | K/W | |
| $R_{thJA}$ | Junction-to-Ambient | — | — | 175 | | Typical socket mount |

**JANTX2N6800, JANTXV2N6800 Device**

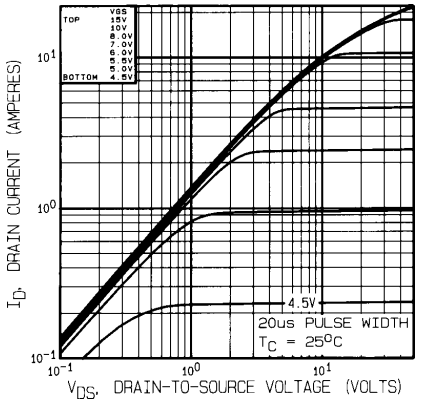



**Fig. 1 — Typical Output Characteristics**
**$T_C$ = 25°C**

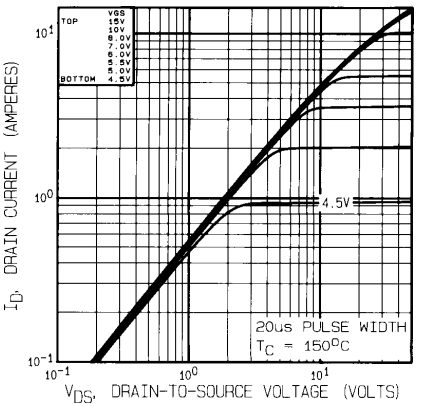



**Fig. 2 — Typical Output Characteristics**
**$T_C$ = 150°C**

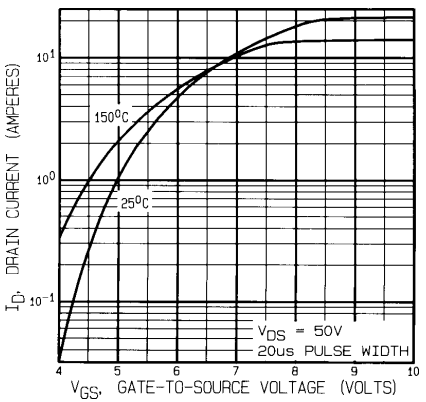



**Fig. 3 — Typical Transfer Characteristics**

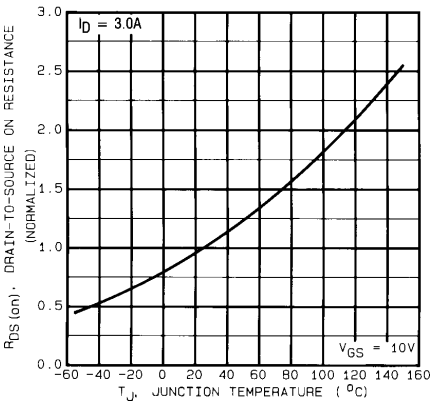



**Fig. 4 — Normalized On-Resistance Vs.Temperature**

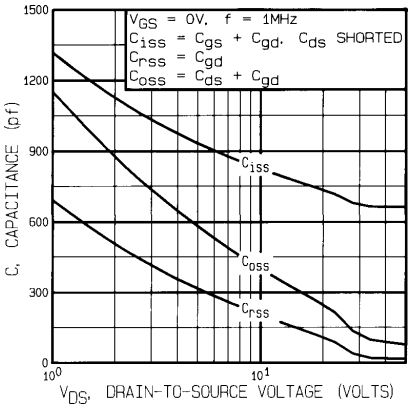



**Fig. 5 — Typical Capacitance Vs. Drain-to-Source Voltage**

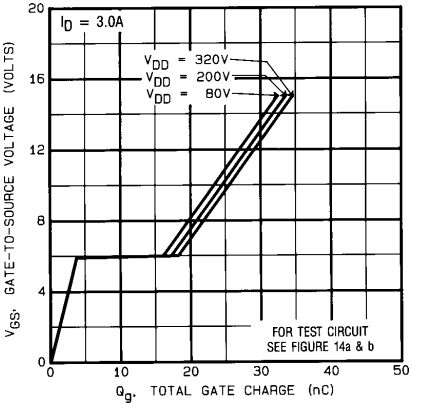



**Fig. 6 — Typical Gate Charge Vs. Gate-to-Source Voltage**

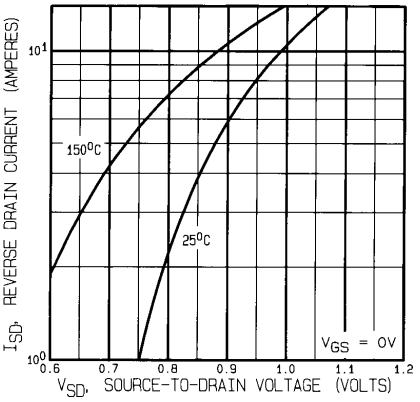



Fig. 7 — Typical Source-to-Drain Diode Forward Voltage

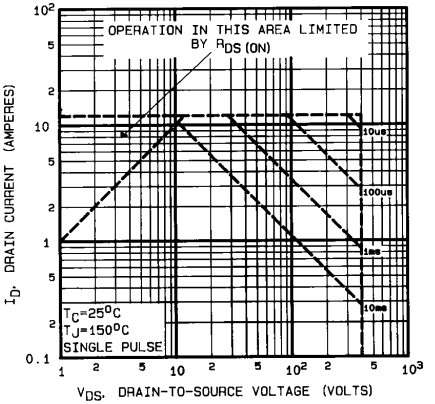



Fig. 8 — Maximum Safe Operating Area

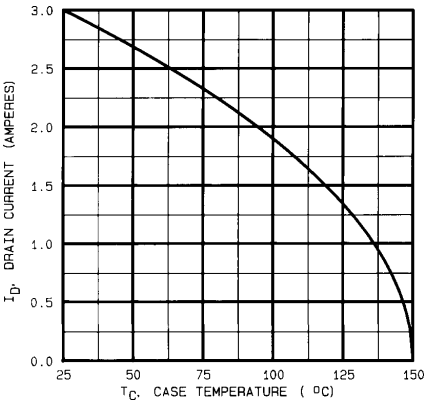



Fig. 9 — Maximum Drain Current Vs. Case Temperature

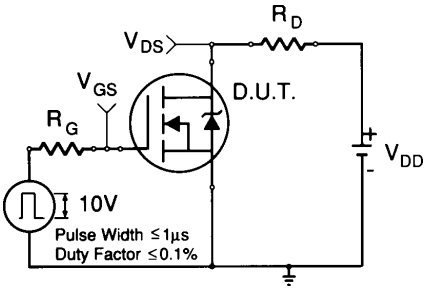



Fig. 10a — Switching Time Test Circuit

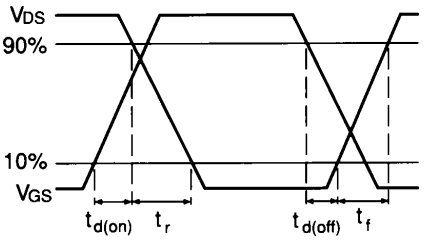



Fig. 10b — Switching Time Waveforms

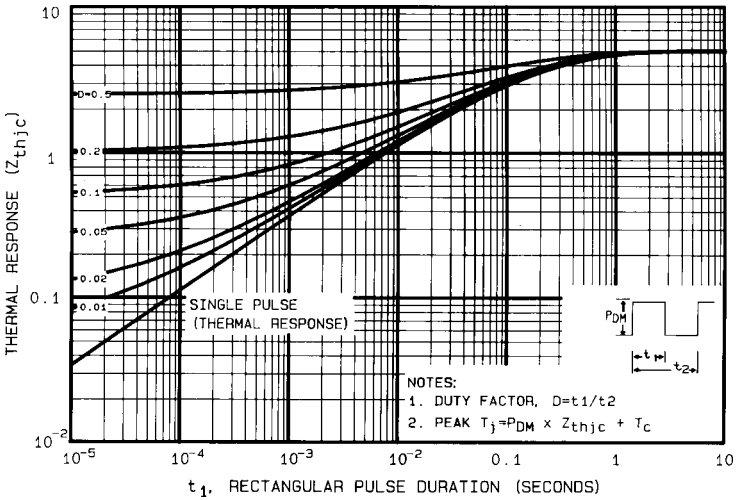



**Fig. 11 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration**

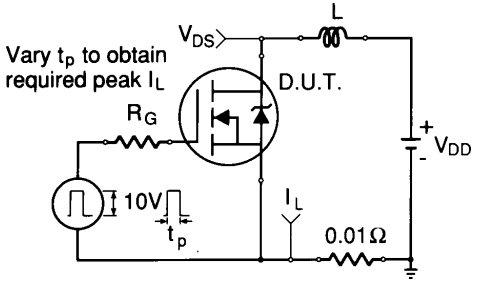



**Fig. 12a — Unclamped Inductive Test Circuit**

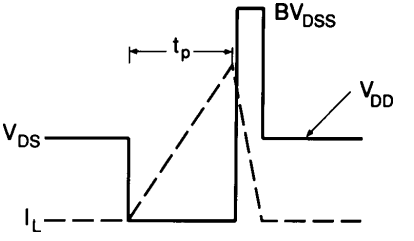



**Fig. 12b — Unclamped Inductive Waveforms**

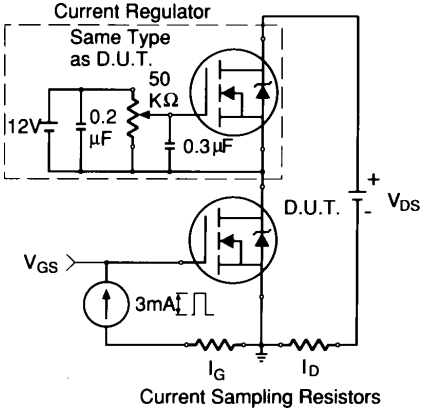



**Fig. 13a — Gate Charge Test Circuit**

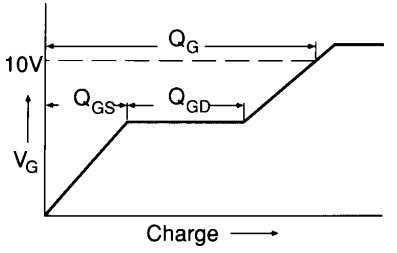



**Fig. 13b — Basic Gate Charge Waveform**

**JANTX2N6800, JANTXV2N6800 Device**

① Repetitive Rating; Pulse width limited by maximum junction temperature. (see figure 11)

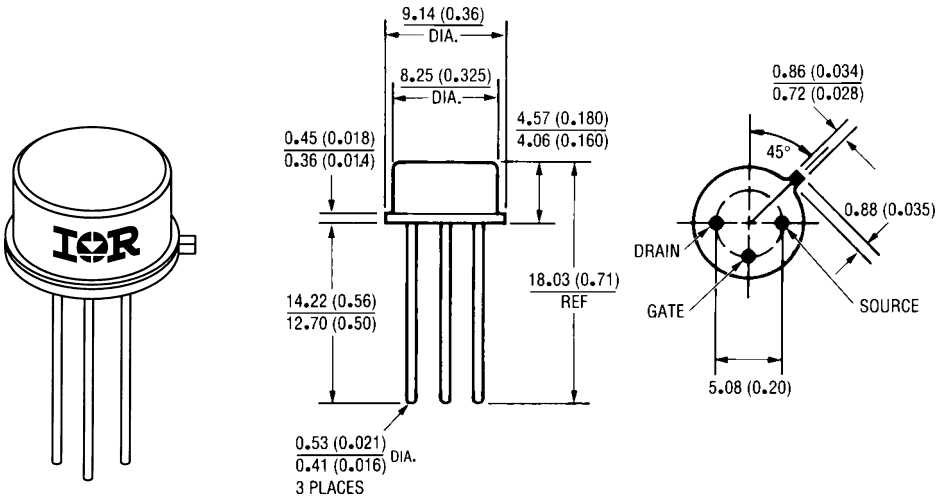
② @ $V_{DD}$ = 50V, Starting $T_J$ = 25°C, $E_{AS}$ = [0.5 * L * ($I_L^2$) * [$BV_{DSS}$/($BV_{DSS}$-$V_{DD}$)] Peak $I_L$ = 3.0A, $V_{GS}$ = 10V, 25 ≤ $R_G$ ≤ 200Ω

③ $I_{SD}$ ≤ 3.0A, di/dt ≤ 90A/µs, $V_{DD}$ ≤ $BV_{DSS}$, $T_J$ ≤ 150°C

④ Pulse width ≤ 300 µs; Duty Cycle ≤ 2%

⑤ K/W = °C/W
W/K = W/°C

## Case Outline and Dimensions — TO-205AF (Modified TO-39)




All dimensions are shown millimeters (inches)

International
IOR Rectifier

**WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
**EUROPEAN HEADQUARTERS:** Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020
**IR CANADA:** 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897
**IR GERMANY:** Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
**IR ITALY:** Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
**IR FAR EAST:** K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo Japan 171 Tel: 81 3 3983 0086
**IR SOUTHEAST ASIA:** 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 0316 Tel: 65 221 8371

*http://www.irf.com/* *Data and specifications subject to change without notice.* *10/96*