

# International

## IOR Rectifier

### HEXFET® POWER MOSFET

Provisional Data Sheet No. PD-9.549B

## JANTX2N6804

## JANTXV2N6804

### [REF:MIL-PRF-19500/562]

### [GENERIC:IRF9130]

### P-CHANNEL

#### -100 Volt, 0.30Ω 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-established 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 <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|--------------|-------------------|---------------------|----------------|
| JANTX2N6804  | -100V             | 0.30Ω               | -11A           |
| JANTXV2N6804 |                   |                     |                |

#### Features:

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

#### Absolute Maximum Ratings


|   | Parameter                       | JANTX2N6804, JANTXV2N6804                          | Units |
|---|---------------------------------|--|-------|
| I <sub>D</sub> @ V <sub>GS</sub> = -10V, T <sub>C</sub> = 25°C  | Continuous Drain Current        | -11  | A     |
| I <sub>D</sub> @ V <sub>GS</sub> = -10V, T <sub>C</sub> = 100°C | Continuous Drain Current        | -7   |       |
| I <sub>DM</sub>   | Pulsed Drain Current ①          | -50  |       |
| P <sub>D</sub> @ T <sub>C</sub> = 25°C                          | Max. Power Dissipation          | 75   | W     |
|   | Linear Derating Factor          | 0.60   | W/K ⑤ |
| V <sub>GS</sub>   | Gate-to-Source Voltage          | ±20  | V     |
| E <sub>AS</sub>   | Single Pulse Avalanche Energy ② | 81   | mJ    |
| I <sub>AR</sub>   | Avalanche Current ①             | -11  | A     |
| E <sub>AR</sub>   | Repetitive Avalanche Energy ①   | 7.5  | mJ    |
| dv/dt   | Peak Diode Recovery dv/dt ③     | -5.5   | V/ns  |
| T <sub>J</sub>  | Operating Junction              | -55 to 150   | °C    |
| T <sub>STG</sub>  | Storage Temperature Range       |  |       |
|   | Lead Temperature                | 300 (0.063 in. (1.6mm) from case for 10.5 seconds) |       |
|   | Weight                          | 11.5 (typical)                                     | g     |

## JANTX2N6804, JANTXV2N6804 Device

### Electrical Characteristics @ $T_j = 25^\circ\text{C}$ (Unless Otherwise Specified)

|                              | Parameter                                    | Min. | Typ.   | Max. | Units               | Test Conditions  |
|------------------------------|--|------|--------|------|---------------------|--|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage            | -100 | —      | —    | V                   | $V_{GS} = 0V$ , $I_D = -1.0\text{ mA}$   |
| $\Delta BV_{DSS}/\Delta T_j$ | Temperature Coefficient of Breakdown Voltage | —    | -0.087 | —    | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = -1.0\text{ mA}$   |
| $R_{DS(on)}$                 | Static Drain-to-Source                       | —    | —      | 0.30 | $\Omega$            | $V_{GS} = -10V$ , $I_D = -7A$ ④  |
|                              | On-State Resistance                          | —    | —      | 0.35 |                     | $V_{GS} = -10V$ , $I_D = -11A$   |
| $V_{GS(th)}$                 | Gate Threshold Voltage                       | -2.0 | —      | -4.0 | V                   | $V_{DS} = V_{GS}$ , $I_D = -250\mu A$  |
| $g_{fs}$                     | Forward Transconductance                     | 3    | —      | —    | S (④)               | $V_{DS} > -15V$ , $I_{DS} = -7A$ ④   |
| $I_{DSS}$                    | Zero Gate Voltage Drain Current              | —    | —      | -25  | $\mu A$             | $V_{DS} = 0.8 \times \text{Max Rating}$ , $V_{GS} = 0V$  |
|                              |  | —    | —      | -250 |                     | $V_{DS} = 0.8 \times \text{Max Rating}$<br>$V_{GS} = 0V$ , $T_j = 125^\circ\text{C}$               |
| $I_{GSS}$                    | 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                            | 1.5  | —      | 29   | nC                  | $V_{GS} = -10V$ , $I_D = -11A$<br>$V_{DS} = \text{Max. Rating} \times 0.5$<br>see figures 6 and 13 |
| $Q_{gs}$                     | Gate-to-Source Charge                        | 1.0  | —      | 7.1  |                     |  |
| $Q_{gd}$                     | Gate-to-Drain ("Miller") Charge              | 2.0  | —      | 21   |                     |  |
| $t_{d(on)}$                  | Turn-On Delay Time                           | —    | —      | 60   | ns                  | $V_{DD} = -50V$ , $I_D = -11A$ ,<br>$R_G = 7.5\Omega$ , $V_{GS} = -10V$<br><br>see figure 10       |
| $t_r$                        | Rise Time                                    | —    | —      | 140  |                     |  |
| $t_{d(off)}$                 | Turn-Off Delay Time                          | —    | —      | 140  |                     |  |
| $t_f$                        | Fall Time                                    | —    | —      | 140  |                     |  |
| $L_D$                        | 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                   | —    | 13     | —    |                     | Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.                  |
| $C_{iss}$                    | Input Capacitance                            | —    | 860    | —    | pF                  | $V_{GS} = 0V$ , $V_{DS} = -25V$<br>$f = 1.0\text{ MHz}$<br>see figure 5                            |
| $C_{oss}$                    | Output Capacitance                           | —    | 350    | —    |                     |  |
| $C_{rss}$                    | Reverse Transfer Capacitance                 | —    | 125    | —    |                     |  |

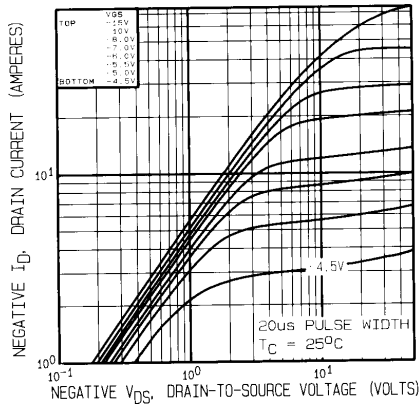
### Source-Drain Diode Ratings and Characteristics

|                 | Parameter                              | Min.   | Typ. | Max. | Units | Test Conditions   |
|-----------------|--|--|------|------|-------|---|
| I <sub>S</sub>  | Continuous Source Current (Body Diode) | —  | —    | -11  | A     | Modified MOSFET symbol showing the integral reverse p-n junction rectifier.  |
| I <sub>SM</sub> | Pulse Source Current (Body Diode) ①    | —  | —    | -50  |       |   |
| V <sub>SD</sub> | Diode Forward Voltage                  | —  | —    | -4.7 | V     | T <sub>j</sub> = 25°C, I <sub>S</sub> = -11A, V <sub>GS</sub> = 0V ④  |
| t <sub>rr</sub> | Reverse Recovery Time                  | —  | —    | 250  | ns    | T <sub>j</sub> = 25°C, I <sub>F</sub> = -11A, di/dt ≤ -100A/μs<br>V <sub>DD</sub> ≤ -50V ④  |
| Q <sub>RR</sub> | Reverse Recovery Charge                | —  | —    | 3.0  | μC    |   |
| t <sub>on</sub> | Forward Turn-On Time                   | Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L <sub>S</sub> + L <sub>D</sub> . |      |      |       |   |

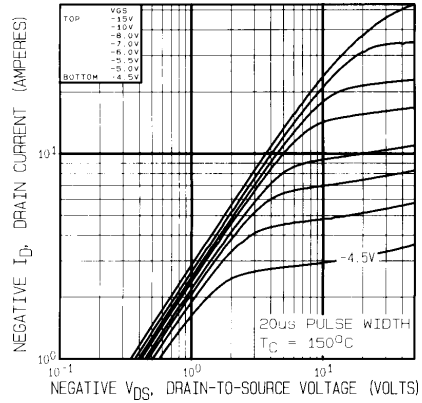
### Thermal Resistance

|            | Parameter           | Min. | Typ. | Max. | Units | Test Conditions      |
|------------|---------------------|------|------|------|-------|----------------------|
| $R_{thJC}$ | Junction-to-Case    | —    | —    | 1.67 | K/W   | Typical socket mount |
| $R_{thJA}$ | Junction-to-Ambient | —    | —    | 30   |       |                      |

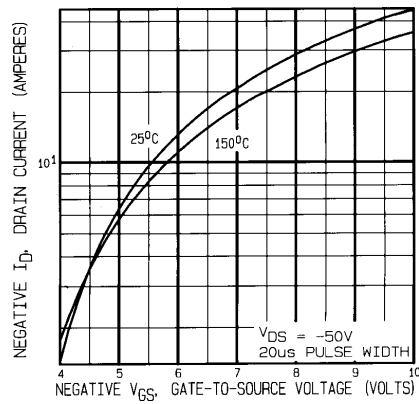
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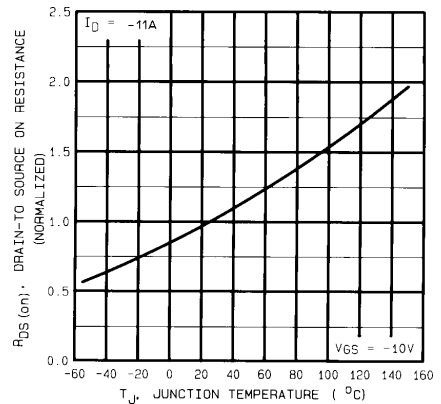
**Fig. 1 — Typical Output Characteristics**  
 $T_C = 25^\circ\text{C}$



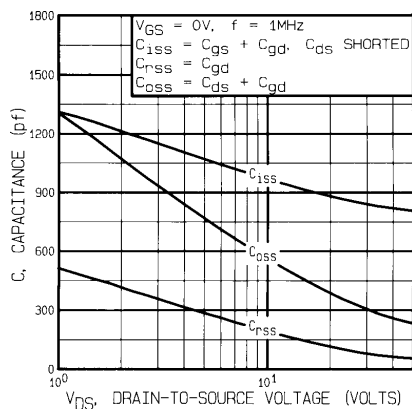
**Fig. 2 — Typical Output Characteristics**  
 $T_C = 150^\circ\text{C}$



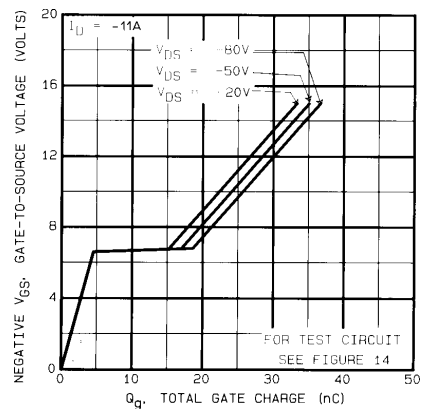
**Fig. 3 — Typical Transfer Characteristics**



**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**

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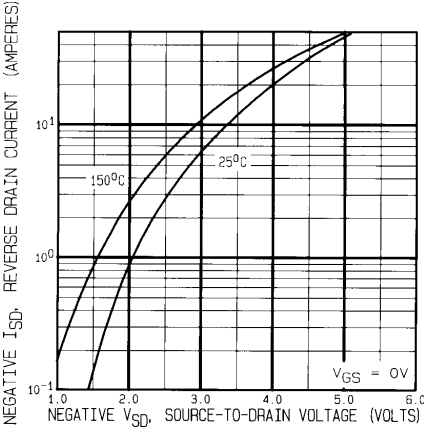


Fig. 7 — Typical Source-to-Drain Diode Forward Voltage

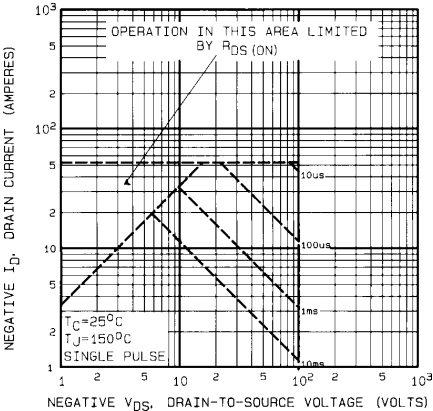


Fig. 8 — Maximum Safe Operating Area

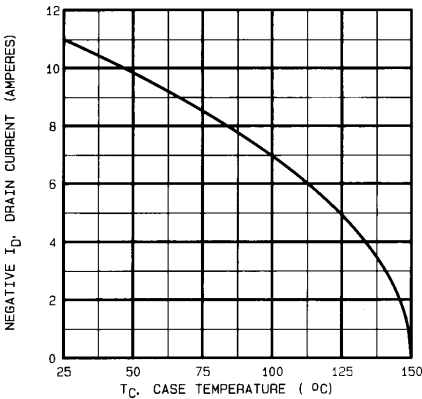


Fig. 9 — Maximum Drain Current Vs. Case Temperature

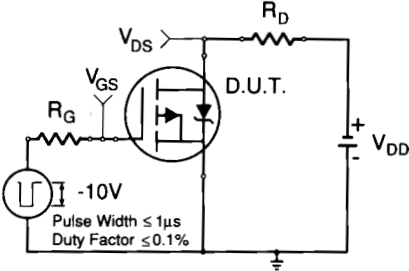


Fig. 10a — Switching Time Test Circuit

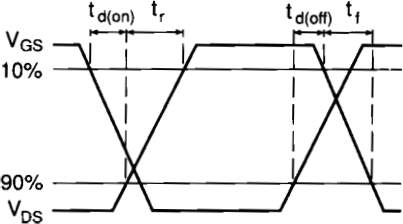


Fig. 10b — Switching Time Waveforms

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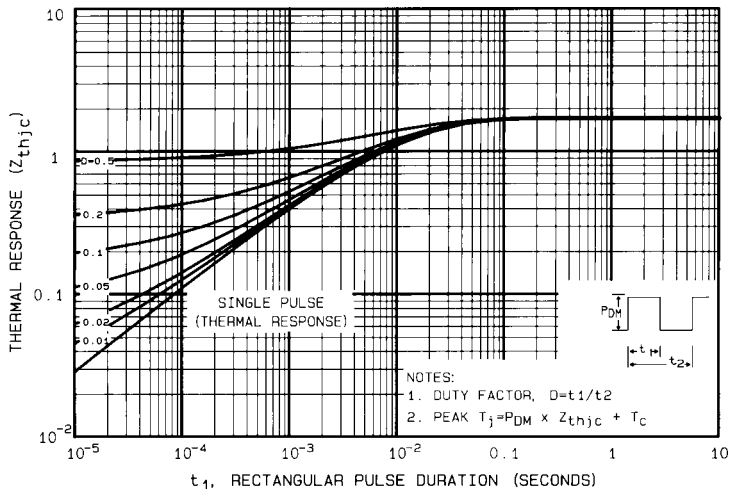


Fig. 11 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

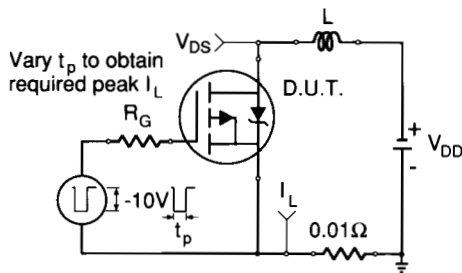


Fig. 12a — Unclamped Inductive Test Circuit

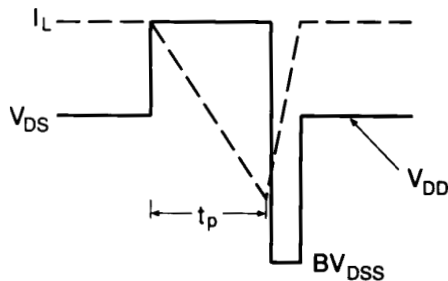


Fig. 12b — Unclamped Inductive Waveforms

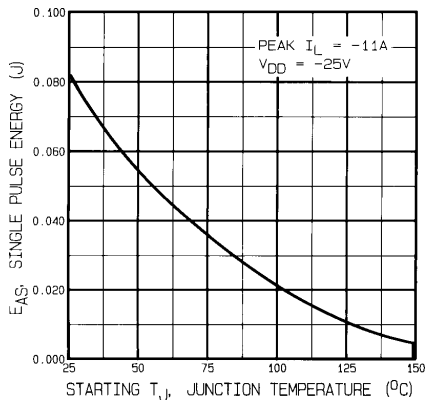


Fig. 12c — Max. Avalanche Energy vs. Current

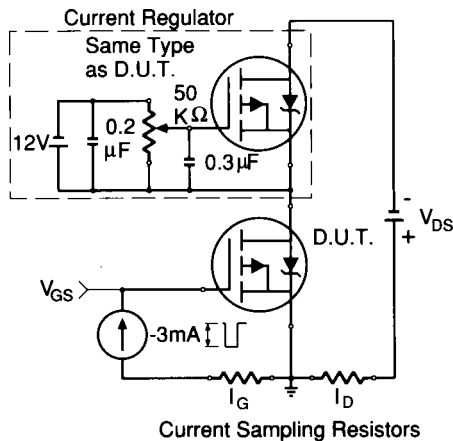
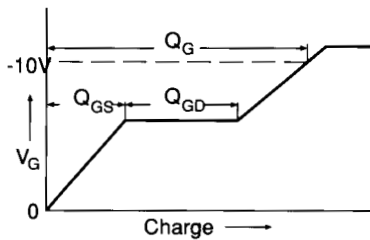


Fig. 13a — Gate Charge Test Circuit

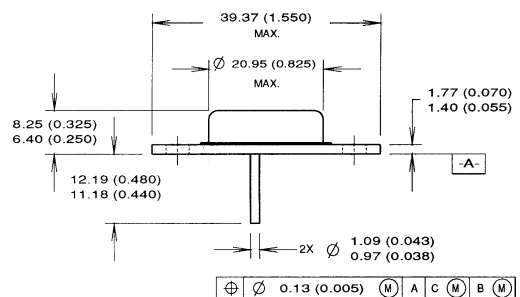
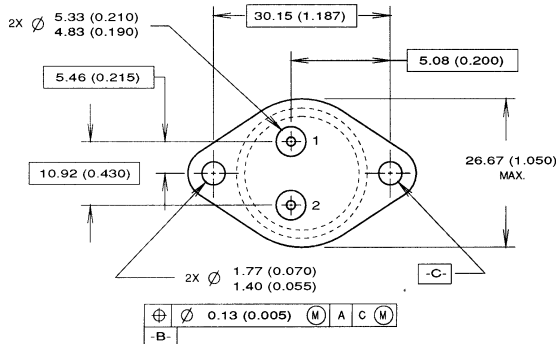
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**Fig. 13b — Basic Gate Charge Waveform**

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.  
(see figure 11)
- ② @  $V_{DD} = -25V$ , Starting  $T_J = 25^{\circ}C$ ,  
 $EAS = [0.5 * L * (I_L^2) * [BV_{DSS}/(BV_{DSS} - V_{DD})]]$   
 Peak  $I_L = -11A$ ,  $V_{GS} = -10V$ ,  $25 \leq R_G \leq 200\Omega$
- ③  $I_{SD} \leq -11A$ ,  $di/dt \leq -140A/\mu s$ ,  
 $V_{DD} \leq BV_{DSS}$ ,  $T_J \leq 150^{\circ}C$
- ④ Pulse width  $\leq 300 \mu s$ ; Duty Cycle  $\leq 2\%$
- ⑤  $K/W = ^{\circ}C/W$   
 $W/K = W/^{\circ}C$

## Case Outline and Dimensions — TO-204AA (Modified TO-3)



All dimensions are shown millimeters (inches)

International  
**IOR** Rectifier

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*Data and specifications subject to change without notice.*

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