2N6796, JANTX2N6796 JANTXV2N6796
2N6798, JANTX2N6798 JANTXV2N6798

2N6800, JANTX2N6800, JANTXV2N6800
2N6802, JANTX2N6802, JANTXV2N6802

# JANTX, JANTXV POWER MOSFET IN TO-205 AF PACKAGE, QUALIFIED TO MIL-PRF-19500/557

100 V, 200 V, 400 V & 500 V, N-Channel,
Enhancement Mode MOSFET Power Transistor

## FEATURES

- Low $R_{DS(on)}$
- Ease of Paralleling
- Qualified to MIL-PRF-19500/557

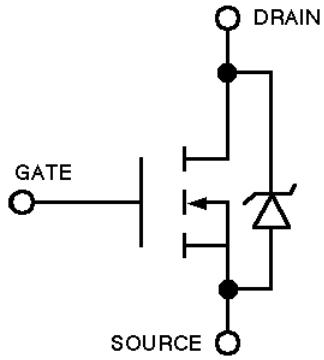
## DESCRIPTION

This hermetically packaged QPL product features the latest advanced MOSFET technology. It is ideally suited for Military requirements where small size, high performance and high reliability are required, and in applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high energy pulse circuits.

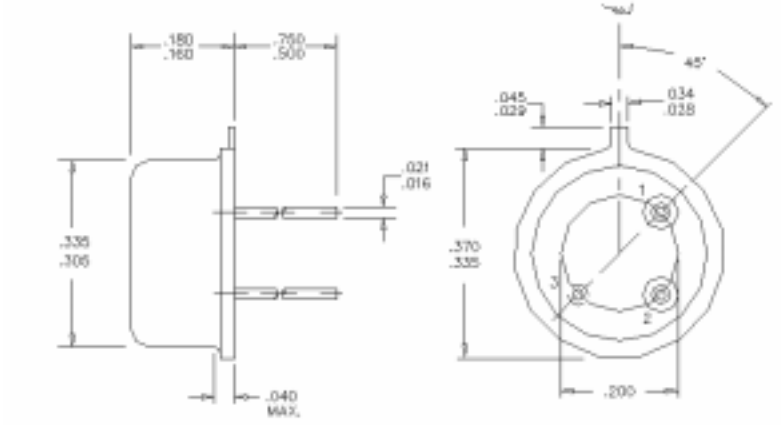
## PRIMARY ELECTRICAL CHARACTERISTICS @ $T_C$ = 25 C

| PART NUMBER | $V_{DS}$, Volts | $R_{DS(on)}$ | $I_D$, Amps |
|---|---|---|---|
| 2N6796 | 100 | .18 | 8.0 |
| 2N6798 | 200 | .40 | 5.5 |
| 2N6800 | 400 | 1.00 | 3.0 |
| 2N6802 | 500 | 1.50 | 2.5 |

## SCHEMATIC




## MECHANICAL OUTLINE




Pin Connection
Pin 1: Source
Pin 2: Gate
Pin 3: Drain
(Case)



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## ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25°C unless otherwise noted

| Parameter | | JANTXV, JANTX, 2N6796 | Units |
|---|---|---|---|
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 25°C | Continuous Drain Current | 8.0 | A |
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 100°C | Continuous Drain Current | 5.0 | A |
| $I_{DM}$ | Pulsed Drain Current[1] | 32 | A |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 25 | W |
| | Linear Derating Factor | 0.2 | W/°C |
| $V_{GS}$ | Gate-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy [2] | 4.3 [4] | mJ |
| $T_J$<br>$T_{STG}$ | Operating Junction<br>Storage Temperature Range | -55 to 150 | °C |
| | Lead Temperature | 300(.06 from case for 10 sec) | °C |

## ELECTRICAL CHARACTERISTICS @ $T_J$ = 25°C (Unless Otherwise Specified)

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | 100 | | | V | $V_{GS}$ = 0V, $I_D$ = 1.0 mA, |
| $R_{DS(on)}$ | Static Drain-to-Source On-State Resistance | – | – | .18 | | $V_{GS}$ = 10 V, $I_D$ = 5.0 A [3] |
| | | – | – | .195 | | $V_{GS}$ = 10 V, $I_D$ = 8.0 A [3] |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | – | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | – | – | 25 | µA | $V_{DS}$ = 80 V, $V_{GS}$ = 0V |
| | | – | – | 250 | | $V_{DS}$ = 80 V, $V_{GS}$ = 0V, $T_J$ = 125 °C |
| $I_{GSS}$ | Gate -to-Source Leakage Forward | – | – | 100 | nA | $V_{GS}$ = 20 V |
| $I_{GSS}$ | Gate -to-Source Leakage Reverse | – | – | -100 | nA | $V_{GS}$ = -20 V |
| $Q_{G(on)}$ | On-state Gate Charge | – | – | 28.5 | nC | $V_{GS}$ = 10 V, $I_D$ = 8A |
| $Q_{GS}$ | Gate-to-Source Charge | – | – | 6.3 | nC | $V_{DS}$ = 50 V |
| $Q_{Gd}$ | Gate-to-Drain ("Miller") Charge | – | – | 16.6 | nC | See note 4 |
| $t_{d(on)}$ | Turn-On Delay Time | – | – | 30 | ns | $V_{DD}$ = 30 V, $I_D$ = 5.0 A, $R_G$ = 7.5 |
| $t_r$ | Rise Time | – | – | 75 | ns | See note 4 |
| $t_{d(off)}$ | Turn-Off Delay Time | – | – | 40 | ns | |
| $t_f$ | Fall Time | – | – | 45 | ns | |

### Source-Drain Diode Ratings and Characteristics

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Diode Forward Voltage | – | – | 1.5 | V | $T_J$ = 25°C, $I_S$ = 8.0A [3], $V_{GS}$ = 0 V [3] |
| $t_{rr}$ | Reverse Recovery Time | – | – | 300 | ns | $T_J$ = 25°C, $I_F$ = 8.0 A, di/dt ≤ 100 A/µs |

[3]

### Thermal Resistance

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | – | – | 5.0 | °C/W | Mounting surface flat, smooth, and greased |
| $R_{thCS}$ | Case-to-sink | – | 0.21 | – | | |
| $R_{thJA}$ | Junction-to-Ambient | – | – | 175 | | Typical socket mount |

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. @$V_{DD}$ = 25 V, Starting $T_J$ = 25 °C, L = 100 µH ± 10%, $R_G$ = 25 , Peak $I_L$ = 8.0 A
3. Pulse width ≤ 300 µs; Duty Cycle ≤ 2 %
4. See MIL-S-19500/557

## ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25°C unless otherwise noted

| Parameter | | JANTXV, JANTX, 2N6798 | Units |
|---|---|---|---|
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 25°C | Continuous Drain Current | 5.5 | A |
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 100°C | Continuous Drain Current | 3.5 | A |
| $I_{DM}$ | Pulsed Drain Current [1] | 22 | A |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 25 | W |
| | Linear Derating Factor | 0.2 | W/°C |
| $V_{GS}$ | Gate-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy [2] | 2.0 [4] | mJ |
| $T_J$<br>$T_{STG}$ | Operating Junction<br>Storage Temperature Range | -55 to 150 | °C |
| | Lead Temperature | 300(.06 from case for 10 sec) | °C |

## ELECTRICAL CHARACTERISTICS @ $T_J$ = 25°C (Unless Otherwise Specified)

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | 200 | | | V | $V_{GS}$ = 0V, $I_D$ = 1.0 mA, |
| $R_{DS(on)}$ | Static Drain-to-Source On-State Resistance | – | – | .40 | | $V_{GS}$ = 10 V, $I_D$ = 3.5 A [3] |
| | | – | – | .42 | | $V_{GS}$ = 10 V, $I_D$ = 5.5 A [3] |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | – | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | – | – | 25 | µA | $V_{DS}$ = 160 V, $V_{GS}$ = 0V |
| | | – | – | 250 | | $V_{DS}$ = 160 V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate -to-Source Leakage Forward | – | – | 100 | nA | $V_{GS}$ = 20 V |
| $I_{GSS}$ | Gate -to-Source Leakage Reverse | – | – | -100 | nA | $V_{GS}$ = -20 V |
| $Q_{G(on)}$ | On-state Gate Charge | – | – | 42.1 | nC | $V_{GS}$ = 10 V, $I_D$ = 5.5 A |
| $Q_{GS}$ | Gate-to-Source Charge | – | – | 5.3 | nC | $V_{DS}$ = 100 V |
| $Q_{Gd}$ | Gate-to-Drain ("Miller") Charge | – | – | 28.1 | nC | See note 4 |
| $t_{d(on)}$ | Turn-On Delay Time | – | – | 30 | ns | $V_{DD}$ = 77 V, $I_D$ = 3.5 A, $R_G$ = 7.5 |
| $t_r$ | Rise Time | – | – | 50 | ns | See note 4 |
| $t_{d(off)}$ | Turn-Off Delay Time | – | – | 50 | ns | |
| $t_f$ | Fall Time | – | – | 40 | ns | |

### Source-Drain Diode Ratings and Characteristics

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Diode Forward Voltage | – | – | 1.4 | V | $T_J$ = 25°C, $I_S$ = 5.5 A [3], $V_{GS}$ = 0 V [3] |
| $t_{rr}$ | Reverse Recovery Time | – | – | 500 | ns | $T_J$ = 25°C, $I_F$ = 5.5 A, di/dt ≤ 100 A/µs [3] |

### Thermal Resistance

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | – | – | 5.0 | °C/W | Mounting surface flat, smooth, and greased |
| $R_{thCS}$ | Case-to-sink | – | 0.21 | – | | |
| $R_{thJA}$ | Junction-to-Ambient | – | – | 175 | | Typical socket mount |

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. @$V_{DD}$ = 50 V, Starting $T_J$ = 25°C, L = 100 µH ± 10%, $R_G$ = 25 , Peak $I_L$ = 5.5 A
3. Pulse width ≤ 300 µs; Duty Cycle ≤ 2 %
4. See MIL-S-19500/557

## ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25°C unless otherwise noted

| Parameter | | JANTXV, JANTX, 2N6800 | 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 | A |
| $I_{DM}$ | Pulsed Drain Current[1] | 14 | A |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 25 | W |
| | Linear Derating Factor | 0.2 | W/°C |
| $V_{GS}$ | Gate-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy [2] | 0.51 [4] | mJ |
| $T_J$<br>$T_{STG}$ | Operating Junction<br>Storage Temperature Range | -55 to 150 | °C |
| | Lead Temperature | 300(.06 from case for 10 sec) | °C |

## ELECTRICAL CHARACTERISTICS @ $T_J$ = 25°C (Unless Otherwise Specified)

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | 400 | | | V | $V_{GS}$ = 0V, $I_D$ = 1.0 mA, |
| $R_{DS(on)}$ | Static Drain-to-Source On-State Resistance | – | – | 1.0 | | $V_{GS}$ = 10 V, $I_D$ = 2.0 A [3] |
| | | – | – | 1.10 | | $V_{GS}$ = 10 V, $I_D$ = 3.0 A [3] |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | – | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | – | – | 25 | µA | $V_{DS}$ = 320 V, $V_{GS}$ = 0V |
| | | – | – | 250 | | $V_{DS}$ = 320 V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate -to-Source Leakage Forward | – | – | 100 | nA | $V_{GS}$ = 20 V |
| $I_{GSS}$ | Gate -to-Source Leakage Reverse | – | – | -100 | nA | $V_{GS}$ = -20 V |
| $Q_{g(on)}$ | On-state Gate Charge | – | – | 33 | nC | $V_{GS}$ = 10 V, $I_D$ = 3.0A |
| $Q_{GS}$ | Gate-to-Source Charge | – | – | 5.8 | nC | $V_{DS}$ = 200 V |
| $Q_{Gd}$ | Gate-to-Drain ("Miller") Charge | – | – | 16.6 | nC | See note 4 |
| $t_{d(on)}$ | Turn-On Delay Time | – | – | 30 | ns | $V_{DD}$ = 176 V, $I_D$ = 2 A, $R_G$ = 7.5 |
| $t_r$ | Rise Time | – | – | 35 | ns | See note 4 |
| $t_{d(off)}$ | Turn-Off Delay Time | – | – | 55 | ns | |
| $t_f$ | Fall Time | – | – | 35 | ns | |

### Source-Drain Diode Ratings and Characteristics

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Diode Forward Voltage | – | – | 1.4 | V | $T_J$ = 25°C, $I_S$ = 3 A [3], $V_{GS}$ = 0 V |
| $t_{rr}$ | Reverse Recovery Time | – | – | 700 | ns | $T_J$ = 25°C, $I_F$ = 3.0 A, di/dt ≤ 100A/µs [3] |

### Thermal Resistance

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | – | – | 5.0 | °C/W | Mounting surface flat, smooth, and greased |
| $R_{thCS}$ | Case-to-sink | – | 0.21 | – | | |
| $R_{thJA}$ | Junction-to-Ambient | – | – | 175 | | Typical socket mount |

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. @$V_{DD}$ = 50 V, Starting $T_J$ = 25°C, L = 100 µH ± 10%, $R_G$ = 25 , Peak $I_L$ = 3.0 A
3. Pulse width ≤ 300 µs; Duty Cycle ≤ 2 %
4. See MIL-S-19500/557

## ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25°C unless otherwise noted

| Parameter | | JANTXV, JANTX, 2N6802 | Units |
|---|---|---|---|
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 25°C | Continuous Drain Current | 2.5 | A |
| $I_D$ @ $V_{GS}$ = 10V, $T_C$ = 100°C | Continuous Drain Current | 1.5 | A |
| $I_{DM}$ | Pulsed Drain Current[1] | 11 | A |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 25 | W |
| | Linear Derating Factor | 0.20 | W/°C |
| $V_{GS}$ | Gate-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy [2] | .35 [4] | mJ |
| $T_J$<br>$T_{STG}$ | Operating Junction<br>Storage Temperature Range | -55 to 150 | °C |
| | Lead Temperature | 300 (.06 from case for 10 sec) | °C |

## ELECTRICAL CHARACTERISTICS @ $T_J$ = 25°C (Unless Otherwise Specified)

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | 500 | | | V | $V_{GS}$ = 0V, $I_D$ = 1.0 mA, |
| $R_{DS(on)}$ | Static Drain-to-Source On-State Resistance | – | – | 1.5 | | $V_{GS}$ = 10 V, $I_D$ = 1.5 A [3] |
| | | – | – | 1.6 | | $V_{GS}$ = 10 V, $I_D$ = 2.5 A [3] |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | – | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | – | – | 25 | µA | $V_{DS}$ = 400 V, $V_{GS}$ = 0V |
| | | – | – | 250 | | $V_{DS}$ = 400 V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate -to-Source Leakage Forward | – | – | 100 | nA | $V_{GS}$ = 20 V |
| $I_{GSS}$ | Gate -to-Source Leakage Reverse | – | – | -100 | nA | $V_{GS}$ = -20 V |
| $Q_{G(on)}$ | On-state Gate Charge | – | – | 29.5 | nC | $V_{GS}$ = 10 V, $I_D$ = 2.5 A |
| $Q_{GS}$ | Gate-to-Source Charge | – | – | 4.5 | nC | $V_{DS}$ = 250 V |
| $Q_{Gd}$ | Gate-to-Drain ("Miller") Charge | – | – | 28.1 | nC | See note 4 |
| $t_{d(on)}$ | Turn-On Delay Time | – | – | 30 | ns | $V_{DD}$ = 225 V, $I_D$ = 1.5 A, $R_G$ = 7.5 |
| $t_r$ | Rise Time | – | – | 30 | ns | See note 4 |
| $t_{d(off)}$ | Turn-Off Delay Time | – | – | 55 | ns | |
| $t_f$ | Fall Time | – | – | 30 | ns | |

### Source-Drain Diode Ratings and Characteristics

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Diode Forward Voltage | – | – | 1.4 | V | $T_J$ = 25°C, $I_S$ = 2.5 A [3], $V_{GS}$ = 0 V |
| $t_{rr}$ | Reverse Recovery Time | – | – | 900 | ns | $T_J$ = 25°C, $I_F$ = 2.5 A, di/dt ≤ 100A/µs [3] |

### Thermal Resistance

| Parameter | | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction-to-Case | – | – | 5.0 | °C/W | Mounting surface flat, smooth, and greased |
| $R_{thCS}$ | Case-to-sink | – | 0.21 | – | | |
| $R_{thJA}$ | Junction-to-Ambient | – | – | 175 | | Typical socket mount |

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. @$V_{DD}$ = 50 V, Starting $T_J$ = 25°C, L = 100 uH ± 10%, $R_G$ = 25 , Peak $I_L$ = 2.5 A
3. Pulse width ≤ 300 µs; Duty Cycle ≤ 2 %
4. See MIL-S-19500/557