DIGITRON™ Semiconductors

High-reliability discrete products
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# 3N211-3N213

## DUAL GATE MOSFET VHF AMPLIFIER

### FEATURES

- Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.
- Available as non-RoHS (Sn/Pb plating), standard, and as RoHS by adding "-PBF" suffix.

### MAXIMUM RATINGS

| Rating | Symbol | 3N211<br>3N212 | 3N213 | Unit |
|---|---|---|---|---|
| **Drain Source Voltage** | $V_{DS}$ | 27 | 35 | Vdc |
| **Drain Gate Voltage** | $V_{DG1}$<br>$V_{DG2}$ | 35<br>35 | 40<br>40 | Vdc |
| **Drain Current** | $I_D$ | 50 | | mAdc |
| **Gate Current** | $I_{G1}$<br>$I_{G2}$ | ±10<br>±10 | | mAdc |
| **Total Device Dissipation @ $T_A$ = 25°C**<br>**Derate above 25°C** | $P_D$ | 360<br>2.4 | | mW<br>mW/°C |
| **Total Device Dissipation @ $T_C$ = 25°C**<br>**Derate above 25°C** | $P_D$ | 1.2<br>8.0 | | Watt<br>mW/°C |
| **Lead Temperature, 1/16" from Seated Surface for 10 seconds** | $T_L$ | 300 | | °C |
| **Junction Temperature Range** | $T_J$ | -65 to +175 | | °C |
| **Storage Temperature Range** | $T_{stg}$ | -65 to +175 | | °C |

### ELECTRICAL CHARACTERISTICS ($T_C$ = 25°C)

| Characteristics | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| **Drain Source Breakdown Voltage** [1]<br>($I_D$ = 10 µAdc, $V_{G1S}$ = $V_{G2S}$ = -4.0 Vdc) | 3N211, 3N212<br>3N213 | $V_{(BR)DSX}$ | 25<br>30 | -<br>- | Vdc |
| **Instantaneous Drain Source Breakdown Voltage**<br>($I_D$ = 10 µAdc, $V_{G1S}$ = $V_{G2S}$ = -4.0 Vdc) | 3N211, 3N212<br>3N213 | $V_{(BR)DSX}$ | 27<br>35 | -<br>- | Vdc |
| **Gate 1 – Source Breakdown Voltage** [2]<br>($I_{G1}$ = ±10 mAdc, $V_{G2S}$ = $V_{DS}$ = 0) | | $V_{(BR)G1SO}$ | ±6.0 | - | Vdc |
| **Gate 2 – Source Breakdown Voltage** [2]<br>($I_{G2}$ = ±10 mAdc, $V_{G1S}$ = $V_{DS}$ = 0) | | $V_{(BR)G2SO}$ | ±6.0 | - | Vdc |
| **Gate 1 Leakage Current**<br>($V_{G1S}$ = ±5.0 Vdc, $V_{G2S}$ = $V_{DS}$ = 0)<br>($V_{G1S}$ = -5.0 Vdc, $V_{G2S}$ = $V_{DS}$ = 0, $T_A$ = 150°C) | | $I_{G1SS}$ | -<br>- | ±10<br>-10 | nAdc<br>µAdc |
| **Gate 2 Leakage Current**<br>($V_{G2S}$ = ±5.0 Vdc, $V_{G1S}$ = $V_{DS}$ = 0)<br>($V_{G2S}$ = -5.0 Vdc, $V_{G1S}$ = $V_{DS}$ = 0, $T_A$ = 150°C) | | $I_{G2SS}$ | -<br>- | ±10<br>-10 | nAdc<br>µAdc |
| **Gate 1 to Source Cutoff Voltage**<br>($V_{DS}$ = 15 Vdc, $V_{G2S}$ = 4.0 Vdc, $I_D$ = 20 µ Adc) | 3N211, 3N213<br>3N212 | $V_{G1S(off)}$ | -0.5<br>-0.5 | -5.5<br>-4.0 | Vdc |
| **Gate 2 Source to Cutoff Voltage**<br>($V_{DS}$ = 15 Vdc, $V_{G1S}$ = 0, $I_D$ = 20 µAdc) | 3N211<br>3N212, 3N213 | $V_{G2S(off)}$ | -0.2<br>-0.2 | -2.5<br>-4.0 | Vdc |
| **ON CHARACTERISTICS** | | | | | |
| **Zero Gate Voltage Drain Current** [3]<br>($V_{DS}$ = 15 Vdc, $V_{G1S}$ = 0, $V_{G2S}$ = 4.0 Vdc) | | $I_{DSS}$ | 6.0 | 40 | mAdc |

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# 3N211-3N213

## DUAL GATE MOSFET VHF AMPLIFIER

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C)

| Characteristics | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| **Forward Transfer Admittance** [4]<br>($V_{DS}$ = 15 Vdc, $V_{G2S}$ = 4.0 Vdc, $V_{G1S}$ = 0, f = 1.0 kHz) | 3N211, 3N212<br>3N213 | $\lvert y_{fs} \rvert$ | 17<br>15 | 40<br>35 | mmhos |
| **Reverse Transfer Capacitance**<br>($V_{DS}$ = 15 Vdc, $V_{G2S}$ = 4.0 Vdc, $I_D$ = 1.0 mAdc, f = 1.0 MHz) | | $C_{rss}$ | 0.005 | 0.05 | pF |
| **FUNCTIONAL CHARACTERISTICS** | | | | | |
| **Noise Figure**<br>($V_{DD}$ = 18 Vdc, $V_{GG}$ = 7.0 Vdc, f = 200 MHz)<br>($V_{DD}$ = 24 Vdc, $V_{GG}$ =6.0 Vdc, f = 45 MHz) | <br>3N211<br>3N211, 3N213 | NF | <br>-<br>- | <br>3.5<br>4.0 | dB |
| **FUNCTIONAL CHARACTERISTICS (con't)** | | | | | |
| **Common Source Power Gain** | | $G_{ps}$ | | | |
| ($V_{DD}$ = 18 Vdc, $V_{GG}$ = 7.0 Vdc, f = 200 MHz) | 3N211 | | 24 | 35 | |
| ($V_{DD}$ = 24 Vdc, $V_{GG}$ = 6.0 Vdc, f = 45 MHz) | 3N211 | | 29 | 37 | dB |
| ($V_{DD}$ = 24 Vdc, $V_{GG}$ = 6.0 Vdc, f = 45 MHz) | 3N213 | | 27 | 35 | |
| ($V_{DD}$ = 18 Vdc, $f_{LO}$ = 245 MHz, $f_{RF}$ = 200 MHz) | 3N212 | $G_c$ [6] | 21 | 28 | |
| **Bandwidth** | | BW | | | |
| ($V_{DD}$ = 18 Vdc, $V_{GG}$ = 7.0 Vdc, f = 200 MHz) | 3N211 | | 5.0 | 12 | MHz |
| ($V_{DD}$ = 18 Vdc, $f_{LO}$ = 245 MHz, $f_{RF}$ = 200 MHz) | 3N212 | | 4.0 | 7.0 | |
| ($V_{DD}$ = 24 Vdc, $V_{GG}$ = 6.0 Vdc, f = 45 MHz) | 3N211, 3N213 | | 3.5 | 6.0 | |
| **Gain Control Gate Supply Voltage** [5] | | $V_{gg(gc)}$ | | | |
| ($V_{DD}$ = 18 Vdc, Δ Gps = -30 dB, f = 200 MHz) | 3N211 | | - | -2.0 | Vdc |
| ($V_{DD}$ = 24 Vdc, Δ Gps = -30 dB, f = 45 MHz) | 3N211, 3N213 | | - | ±1.0 | |

(1) Measured after five seconds of applied voltage.
(2) All gate breakdown voltages are measured while the device is conducting rated gate current. This ensures that the gate voltage limiting network is functioning properly.
(3) Pulse test: Pulse width = 300µs, Duty cycle ≤ 2.0%.
(4) This parameter must be measured with bias voltages applied for less than 5 seconds to avoid overheating. The signal is applied to gate 1 with gate 2 at ac ground.
(5) Δ Gps is defined as the change in $G_{ps}$ from the value at $V_{GG}$ = 7.0 Volts (3N211) and $V_{GG}$ = 6.0 Volts (3N213).
(6) Power Gain Conversion. Amplitude at input from local oscillator is adjusted for maximum $G_c$.

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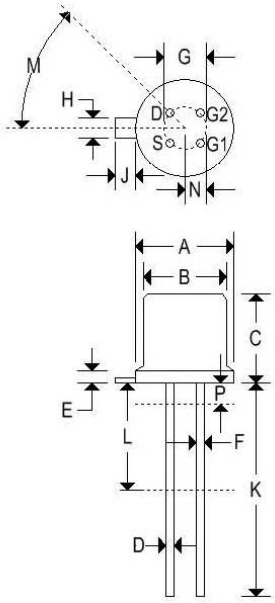
## DUAL GATE MOSFET VHF AMPLIFIER

**MECHANICAL CHARACTERISTICS**

| | |
|---|---|
| **Case:** | TO-72 |
| **Marking:** | Body painted, alpha-numeric |
| **Pin out:** | See below |




| | TO-72 | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | - | 0.230 | - | 5.840 |
| B | - | 0.195 | - | 4.950 |
| C | - | 0.210 | - | 5.330 |
| D | - | 0.021 | - | 0.530 |
| E | - | 0.030 | - | 0.760 |
| F | - | 0.019 | - | 0.480 |
| G | 0.100 BSC | | 2.540 BSC | |
| H | - | 0.046 | - | 1.170 |
| J | - | 0.048 | - | 1.220 |
| K | 0.500 | - | 12.700 | - |
| L | 0.250 | - | - | 6.350 |
| M | 45° BSC | | 45° BSC | |
| N | 0.050 BDC | | 1.270 BSC | |
| P | - | 0.050 | - | 1.270 |