

# DIGITRON SEMICONDUCTORS

3N211-3N213

DUAL-GATE VHF AMPLIFIER  
N-CHANNEL - DEPLETION

## 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>$I_{G2}$   | $\pm 10$<br>$\pm 10$ |          | mAdc                         |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$                  | 360<br>2.4           |          | mW<br>mW/ $^\circ\text{C}$   |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$                  | 1.2<br>8.0           |          | Watt<br>mW/ $^\circ\text{C}$ |
| Lead Temperature, 1/16" from Seated Surface for 10 seconds                             | $T_L$                  | 300                  |          | $^\circ\text{C}$             |
| Junction Temperature Range   | $T_J$                  | -65 to +175          |          | $^\circ\text{C}$             |
| Storage Temperature Range  | $T_{stg}$              | -65 to +175          |          | $^\circ\text{C}$             |

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ$ unless otherwise noted)

| Characteristics   | Symbol                | Min            | Max          | Unit            |                         |
|---|-----------------------|----------------|--------------|-----------------|-------------------------|
| <b>OFF CHARACTERISTICS</b>  |                       |                |              |                 |                         |
| Drain Source Breakdown Voltage <sup>(1)</sup><br>( $I_D = 10 \mu\text{Adc}$ , $V_{G1S} = V_{G2S} = -4.0 \text{ Vdc}$ )  | 3N211, 3N212<br>3N213 | $V_{(BR)DSX}$  | 25<br>30     | -<br>-          | Vdc                     |
| Instantaneous Drain Source Breakdown Voltage<br>( $I_D = 10 \mu\text{Adc}$ , $V_{G1S} = V_{G2S} = -4.0 \text{ Vdc}$ )   | 3N211, 3N212<br>3N213 | $V_{(BR)DSX}$  | 27<br>35     | -<br>-          | Vdc                     |
| Gate 1 – Source Breakdown Voltage <sup>(2)</sup><br>( $I_{G1} = \pm 10 \text{ mAdc}$ , $V_{G2S} = V_{DS} = 0$ )   |                       | $V_{(BR)G1S0}$ | $\pm 6.0$    | -               | Vdc                     |
| Gate 2 – Source Breakdown Voltage <sup>(2)</sup><br>( $I_{G2} = \pm 10 \text{ mAdc}$ , $V_{G1S} = V_{DS} = 0$ )   |                       | $V_{(BR)G2S0}$ | $\pm 6.0$    | -               | Vdc                     |
| Gate 1 Leakage Current<br>( $V_{G1S} = \pm 5.0 \text{ Vdc}$ , $V_{G2S} = V_{DS} = 0$ )<br>( $V_{G1S} = -5.0 \text{ Vdc}$ , $V_{G2S} = V_{DS} = 0$ , $T_A = 150^\circ\text{C}$ )         |                       | $I_{G1SS}$     | -<br>-       | $\pm 10$<br>-10 | nAdc<br>$\mu\text{Adc}$ |
| Gate 2 Leakage Current<br>( $V_{G2S} = \pm 5.0 \text{ Vdc}$ , $V_{G1S} = V_{DS} = 0$ )<br>( $V_{G2S} = -5.0 \text{ Vdc}$ , $V_{G1S} = V_{DS} = 0$ , $T_A = 150^\circ\text{C}$ )         |                       | $I_{G2SS}$     | -<br>-       | $\pm 10$<br>-10 | nAdc<br>$\mu\text{Adc}$ |
| Gate 1 to Source Cutoff Voltage<br>( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $I_D = 20 \mu\text{Adc}$ )   | 3N211, 3N212<br>3N212 | $V_{G1S(off)}$ | -0.5<br>-0.5 | -5.5<br>-4.0    | Vdc                     |
| Gate 2 Source to Cutoff Voltage<br>( $V_{DS} = 15 \text{ Vdc}$ , $V_{G1S} = 0$ , $I_D = 20 \mu\text{Adc}$ )   | 3N211<br>3N212, 3N213 | $V_{G2S(off)}$ | -0.2<br>-0.2 | -2.5<br>-4.0    | Vdc                     |
| <b>ON CHARACTERISTICS</b>   |                       |                |              |                 |                         |
| Zero Gate Voltage Drain Current <sup>(3)</sup><br>( $V_{DS} = 15 \text{ Vdc}$ , $V_{G1S} = 0$ , $V_{G2S} = 4.0 \text{ Vdc}$ )   |                       | $I_{DSS}$      | 6.0          | 40              | mAdc                    |
| <b>SMALL SIGNAL CHARACTERISTICS</b>   |                       |                |              |                 |                         |
| Forward Transfer Admittance <sup>(4)</sup><br>( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $V_{G1S} = 0$ , $f = 1.0 \text{ kHz}$ )                                       | 3N211, 3N212<br>3N213 | $ y_{fs} $     | 17<br>15     | 40<br>35        | mmhos                   |
| Reverse Transfer Capacitance<br>( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $I_D = 1.0 \text{ mAdc}$ , $f = 1.0 \text{ MHz}$ )  |                       | $C_{rss}$      | 0.005        | 0.05            | pF                      |
| <b>FUNCTIONAL CHARACTERISTICS</b>   |                       |                |              |                 |                         |
| Noise Figure<br>( $V_{DD} = 18 \text{ Vdc}$ , $V_{GG} = 7.0 \text{ Vdc}$ , $f = 200 \text{ MHz}$ )<br>( $V_{DD} = 24 \text{ Vdc}$ , $V_{GG} = 6.0 \text{ Vdc}$ , $f = 45 \text{ MHz}$ ) | 3N211<br>3N211, 3N213 | NF             | -<br>-       | 3.5<br>4.0      | dB                      |

# DIGITRON SEMICONDUCTORS

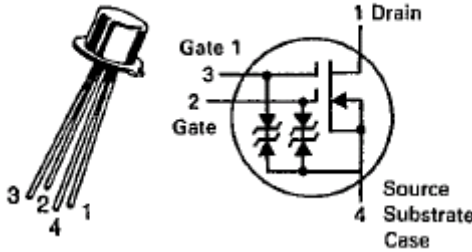
3N211-3N213

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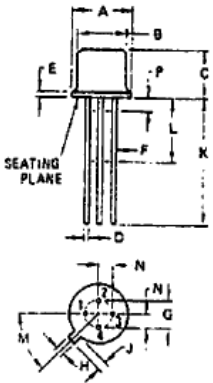
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25° unless otherwise noted)**

| Characteristics  | Symbol              | Min | Max  | Unit |              |
|--|---------------------|-----|------|------|--------------|
| <b>FUNCTIONAL CHARACTERISTICS (con't)</b>  |                     |     |      |      |              |
| <b>Common Source Power Gain</b><br>(V <sub>DD</sub> = 18 Vdc, V <sub>GG</sub> = 7.0 Vdc, f = 200 MHz)            | G <sub>ps</sub>     | 24  | 35   | dB   |              |
| (V <sub>DD</sub> = 24 Vdc, V <sub>GG</sub> = 6.0 Vdc, f = 45 MHz)  |                     |     |      |      | 3N211        |
| (V <sub>DD</sub> = 24 Vdc, V <sub>GG</sub> = 6.0 Vdc, f = 45 MHz)  |                     |     |      |      | 3N213        |
| (V <sub>DD</sub> = 18 Vdc, f <sub>LO</sub> = 245 MHz, f <sub>RF</sub> = 200 MHz)                                 |                     |     |      |      | 3N212        |
| <b>Bandwidth</b><br>(V <sub>DD</sub> = 18 Vdc, V <sub>GG</sub> = 7.0 Vdc, f = 200 MHz)                           | BW                  | 5.0 | 12   | MHz  |              |
| (V <sub>DD</sub> = 18 Vdc, f <sub>LO</sub> = 245 MHz, f <sub>RF</sub> = 200 MHz)                                 |                     |     |      |      | 3N212        |
| (V <sub>DD</sub> = 24 Vdc, V <sub>GG</sub> = 6.0 Vdc, f = 45 MHz)  |                     |     |      |      | 3N211, 3N213 |
| <b>Gain Control Gate Supply Voltage<sup>(5)</sup></b><br>(V <sub>DD</sub> = 18 Vdc, Δ Gps = -30 dB, f = 200 MHz) | V <sub>gg(gc)</sub> | -   | -2.0 | Vdc  |              |
| (V <sub>DD</sub> = 24 Vdc, Δ Gps = -30 dB, f = 45 MHz)   |                     |     |      |      | 3N211, 3N213 |

- (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<sub>ps</sub> from the value at V<sub>GG</sub> = 7.0 Volts (3N211) and V<sub>GG</sub> = 6.0 Volts (3N213).
- (6) Power Gain Conversion. Amplitude at input from local oscillator is adjusted for maximum G<sub>c</sub>.



**TO-72**



| Dim | 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   | -         | 0.0480 | -           | 1.220 |
| K   | 0.500     | -      | 12.700      | -     |
| L   | 0.250     | -      | 6.350       | -     |
| M   | 45°C BSC  | -      | 45°C BSC    | -     |
| N   | 0.050 BSC | -      | 1.270 BSC   | -     |
| P   | -         | 0.050  | -           | 1.270 |

Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).  
Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.