

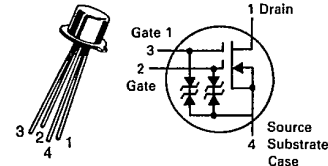
6367254 MOTOROLA SC (XSTRS/R F)

96D 82620 D

T-31-25

**3N211**  
**3N212**  
**3N213**

**CASE 20-03, STYLE 9**  
**TO-72 (TO-206AF)**



**DUAL-GATE MOSFET**  
**VHF AMPLIFIER**

**N-CHANNEL — DEPLETION**

Refer to MPF211 for graphs.

### MAXIMUM RATINGS

Rating	Symbol	3N211 3N212	3N213	Unit
Drain-Source Voltage	$V_{DS}$	27	35	Vdc
Drain-Gate Voltage	$V_{DG1}$ $V_{DG2}$	35 35	40 40	Vdc
Drain Current	$I_D$	50		mAdc
Gate Current	$I_{G1}$ $I_{G2}$	$\pm 10$ $\pm 10$		mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	360	2.4	mW mW/°C
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.2	8.0	Watt 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

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### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Drain-Source Breakdown Voltage(1) ( $I_D = 10 \mu\text{Adc}$ , $V_{G1S} = V_{G2S} = -4.0 \text{ Vdc}$ )	$V_{(BR)DSX}$	25 30	—	Vdc
Instantaneous Drain-Source Breakdown Voltage) ( $I_D = 10 \mu\text{Adc}$ , $V_{G1S} = V_{G2S} = -4.0 \text{ Vdc}$ )	$V_{(BR)DSX}$	27 35	—	Vdc
Gate 1-Source Breakdown Voltage(2) ( $I_{G1} = \pm 10 \text{ mAdc}$ , $V_{G2S} = V_{DS} = 0$ )	$V_{(BR)G1SO}$	$\pm 6.0$	—	Vdc
Gate 2-Source Breakdown Voltage(2) ( $I_{G2} = \pm 10 \text{ mAdc}$ , $V_{G1S} = V_{DS} = 0$ )	$V_{(BR)G2SO}$	$\pm 6.0$	—	Vdc
Gate 1 Leakage Current ( $V_{G1S} = \pm 5.0 \text{ Vdc}$ , $V_{G2S} = V_{DS} = 0$ ) ( $V_{G1S} = -5.0 \text{ Vdc}$ , $V_{G2S} = V_{DS} = 0$ , $T_A = 150^\circ\text{C}$ )	$I_{G1SS}$	—	$\pm 10$ -10	nAdc $\mu\text{Adc}$
Gate 2 Leakage Current ( $V_{G2S} = \pm 5.0 \text{ Vdc}$ , $V_{G1S} = V_{DS} = 0$ ) ( $V_{G2S} = -5.0 \text{ Vdc}$ , $V_{G1S} = V_{DS} = 0$ , $T_A = 150^\circ\text{C}$ )	$I_{G2SS}$	—	$\pm 10$ -10	nAdc $\mu\text{Adc}$
Gate 1 to Source Cutoff Voltage ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $I_D = 20 \mu\text{Adc}$ )	$V_{G1S(off)}$	-0.5 -0.5	-6.5 -4.0	Vdc
Gate 2 to Source Cutoff Voltage ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G1S} = 0$ , $I_D = 20 \mu\text{Adc}$ )	$V_{G2S(off)}$	-0.2 -0.2	-2.5 -4.0	Vdc
<b>ON CHARACTERISTICS</b>				
Zero-Gate-Voltage Drain Current(3) ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G1S} = 0$ , $V_{G2S} = 4.0 \text{ Vdc}$ )	$I_{DSS}$	6.0	40	mAdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Forward Transfer Admittance(4) ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $V_{G1S} = 0$ , $f = 1.0 \text{ kHz}$ )	$ y_{fs} $	17 15	40 35	mmhos
Reverse Transfer Capacitance ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $I_D = 1.0 \text{ mAdc}$ , $f = 1.0 \text{ MHz}$ )	$C_{rss}$	0.005	0.05	pF
<b>FUNCTIONAL CHARACTERISTICS</b>				
Noise Figure ( $V_{DD} = 18 \text{ Vdc}$ , $V_{GG} = 7.0 \text{ Vdc}$ , $f = 200 \text{ MHz}$ ) ( $V_{DD} = 24 \text{ Vdc}$ , $V_{GG} = 6.0 \text{ Vdc}$ , $f = 45 \text{ MHz}$ )	NF	—	3.5 4.0	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82621 D

3N211, 3N212, 3N213

T-31-25

**ELECTRICAL CHARACTERISTICS** (continued) ( $T_A = 25^\circ\text{C}$  unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
Common Source Power Gain ( $V_{DD} = 18\text{ Vdc}$ , $V_{GG} = 7.0\text{ Vdc}$ , $f = 200\text{ MHz}$ ) ( $V_{DD} = 24\text{ Vdc}$ , $V_{GG} = 6.0\text{ Vdc}$ , $f = 45\text{ MHz}$ ) ( $V_{DD} = 24\text{ Vdc}$ , $V_{GG} = 6.0\text{ Vdc}$ , $f = 45\text{ MHz}$ ) ( $V_{DD} = 18\text{ Vdc}$ , $f_{LO} = 245\text{ MHz}$ , $f_{RF} = 200\text{ MHz}$ )	3N211 3N211 3N213 3N212	$G_{ps}$ 24 29 27 21	35 37 35 28	dB
Bandwidth ( $V_{DD} = 18\text{ Vdc}$ , $V_{GG} = 7.0\text{ Vdc}$ , $f = 200\text{ MHz}$ ) ( $V_{DD} = 18\text{ Vdc}$ , $f_{LO} = 245\text{ MHz}$ , $f_{RF} = 200\text{ MHz}$ ) ( $V_{DD} = 24\text{ Vdc}$ , $V_{GG} = 6.0\text{ Vdc}$ , $f = 45\text{ MHz}$ )	3N211 3N212 3N211,213	BW 5.0 4.0 3.5	12 7.0 6.0	MHz
Gain Control Gate-Supply Voltage(5) ( $V_{DD} = 18\text{ Vdc}$ , $\Delta G_{ps} = -30\text{ dB}$ , $f = 200\text{ MHz}$ ) ( $V_{DD} = 24\text{ Vdc}$ , $\Delta G_{ps} = -30\text{ dB}$ , $f = 45\text{ MHz}$ )	3N211 2N211,213	$V_{GG}(GC)$ — —	— -2.0 $\pm 1.0$	Vdc

(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 =  $300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

(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)  $\Delta G_{ps}$  is defined as the change in  $G_{ps}$  from the value at  $V_{GG} = 7.0\text{ Volts}$  (3N211) and  $V_{GG} = 6.0\text{ Volts}$  (3N213).(6) Power Gain Conversion. Amplitude at input from local oscillator is adjusted for maximum  $G_c$ .