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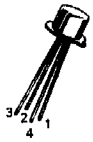
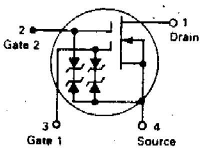
N-CHANNEL DUAL-GATE SILICON-NITRIDE PASSIVATED MOS FIELD-EFFECT TRANSISTORS

MFE211
MFE212

CASE
TO-72





DUAL-GATE MOSFETs

N-CHANNEL — DEPLETION

. . . high Y_{fs} depletion mode dual gate transistors designed for VHF amplifier and mixer applications.

- MFE211 — VHF Amplifier/IF Amplifier
  MFE212 — VHF Mixer
- High Forward Transfer Admittance — $|Y_{fs}|$ = 17–40 mmhos
- Low Reverse Transfer Capacitance — C_{rss} = 0.03 pF (Max)
- Diode Protected Gates

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSX}	20	Vdc
Drain-Gate Voltage	V_{DG1} V_{DG2}	35 35	Vdc
Gate Current	I_{G1} I_{G2}	±10 ±10	mAdc
Drain Current — Continuous	I_D	50	mAdc
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	360 2.4	mW mW/°C
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.2 8.0	Watt mW/°C
Storage Channel Temperature Range	T_{stg}	−65 to +200	°C
Junction Temperature Range	T_J	−65 to +175	°C
Lead Temperature, 1/16" From Seated Surface for 10 Seconds	T_L	300	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (I_D = 10 μAdc, V_{G1S} = V_{G2S} = −4.0 Vdc)		$V_{(BR)DSX}$	20	—	Vdc
Gate 1 — Source Breakdown Voltage(1) (I_{G1} = ±10 mAdc, V_{G2S} = V_{DS} = 0)		$V_{(BR)G1SO}$	±6.0	—	Vdc
Gate 2 — Source Breakdown Voltage(1) (I_{G2} = ±10 mAdc, V_{G1S} = V_{DS} = 0)		$V_{(BR)G2SO}$	±6.0	—	Vdc
Gate 1 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 20 μAdc)	MFE211 MFE212	$V_{G1S(off)}$	−0.5 −0.5	−5.5 −4.0	Vdc
Gate 2 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G1S} = 0, I_D = 20 μAdc)	MFE211 MFE212	$V_{G2S(off)}$	−0.2 −0.2	−2.5 −4.0	Vdc
Gate 1 Leakage Current (V_{G1S} = ±5.0 Vdc, V_{G2S} = V_{DS} = 0) (V_{G1S} = −5.0 Vdc, V_{G2S} = V_{DS} = 0, T_A = 150°C)		I_{G1SS}	— —	±10 −10	mAdc μAdc
Gate 2 Leakage Current (V_{G2S} = ±5.0 Vdc, V_{G1S} = V_{DS} = 0) (V_{G2S} = −5.0 Vdc, V_{G1S} = V_{DS} = 0, T_A = 150°C)		I_{G2SS}	— —	±10 −10	nAdc μAdc
ON CHARACTERISTICS					
Zero-Gate Voltage Drain Current(2) (V_{DS} = 15 Vdc, V_{G1S} = 0, V_{G2S} = 4.0 Vdc)		I_{DSS}	6.0	40	mAdc
SMALL-SIGNAL CHARACTERISTICS					
Forward Transfer Admittance(3) (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, V_{G1S} = 0, f = 1.0 kHz)		$\lvert y_{fs}\rvert$	17	40	mmhos
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 1.0 MHz)		C_{rss}	0.005	0.05	pF

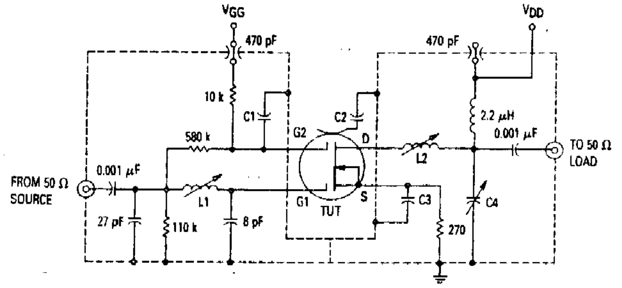
Quality Semi-Conductors

ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

Characteristic			Symbol	Min	Max	Unit
FUNCTIONAL CHARACTERISTICS						
Noise Figure			NF			dB
(V_{DD} = 18 Vdc, V_{GG} = 7.0 Vdc, f = 200 MHz)	(Figure 1)	MFE211		—	3.5	
(V_{DD} = 24 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz)	(Figure 2)	MFE212		—	4.0	
Common Source Power Gain			G_{ps}			dB
(V_{DD} = 18 Vdc, V_{GG} = 7.0 Vdc, f = 200 MHz)	(Figure 1)	MFE211		24	35	
(V_{DD} = 18 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz)	(Figure 3)	MFE211		29	37	
(V_{DD} = 18 Vdc, f_{LO} = 245 MHz, f_{RF} = 200 MHz)	(Figure 3)	MFE212	G_c(5)	21	28	
Bandwidth			BW			MHz
(V_{DD} = 18 Vdc, V_{GG} = 7.0 Vdc, f = 200 MHz)	(Figure 1)	MFE211		5.0	12	
(V_{DD} = 18 Vdc, f_{LO} = 245 MHz, f_{RF} = 200 MHz)	(Figure 3)	MFE212		4.0	7.0	
(V_{DD} = 18 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz)	(Figure 2)	MFE211		3.5	6.0	
Gain Control Gate-Supply Voltage(4)			$V_{GG(GC)}$			Vdc
(V_{DD} = 18 Vdc, ΔG_{ps} = −30 dB, f = 200 MHz)	(Figure 1)	MFE211		—	−2.0	
(V_{DD} = 18 Vdc, ΔG_{ps} = −30 dB, f = 45 MHz)	(Figure 2)	MFE211		—	±1.0	

Notes:

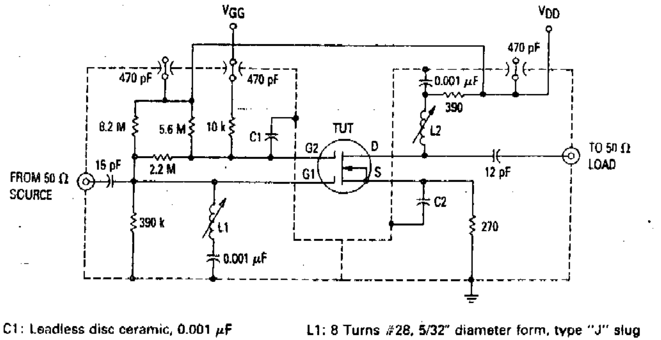
1. All gate breakdown voltages are measured while the device is conducting rated gate current. This ensures that the gate-voltage limiting network is functioning properly.
2. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%.
3. This parameter must be measured with bias voltages applied for less than 5 seconds to avoid overheating. The signal is applied to gate 1 with gate 2 at ac ground.
4. ΔG_{ps} is defined as the change in G_{ps} from the value at V_{GG} = 7.0 volts (MFE211).
5. Power Gain Conversion. Amplitude at input from local oscillator is adjusted for maximum G_c.



C1, C2 & C3: Leadless disc ceramic, 0.001 µF
C4: ARCO 462, 5–80 pF, or equivalent

L1: 3 Turns #18, 3/16″ diameter aluminum slug
L2: 8 Turns #20, 3/16″ diameter aluminum slug

Figure 1. 200 MHz Power Gain, Gain Control Voltage, and Noise Figure Test Circuit for MFE211



C1: Leadless disc ceramic, 0.001 µF
C2: Leadless disc ceramic, 0.01 µF

L1: 8 Turns #28, 5/32″ diameter form, type "J" slug
L2: 9 Turns #28, 5/32″ diameter form, type "J" slug