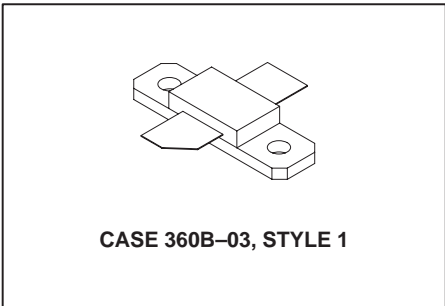


The RF MOSFET Line
RF Power
Field Effect Transistor
N-Channel Enhancement-Mode Lateral
MOSFET

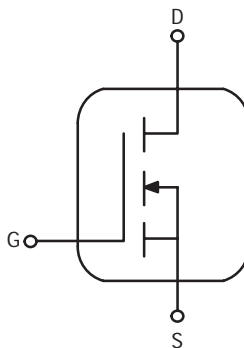
MRF3010

10 W, 1.6 GHz, 28 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFET



Designed for IMARSAT satellite up link at 1.6 to 1.64 GHz, 28 volts, Class AB, CW amplifier applications.

- Guaranteed Performance @ 1.6 GHz, 28 Volts
Output Power = 10 Watts
Minimum Gain = 9.5 dB @ 10 Watts
Minimum Efficiency = 45% @ 10 Watts
- High Gain, Rugged Device
- Bottom Side Source Eliminates DC Isolators, Reducing Common Mode Inductances
- Broadband Performance of This Device Makes It Ideal for Applications from 800 to 1700 MHz, Common-Source Class AB Operation.
- Typical Performance at Class A Operation:
 $P_{out} = 2$ Watts, $V_{DD} = 28$ Volts, $I_{DQ} = 1$ A,
Gain = 12.5 dB, IMD = -32 dB
- Characterized with Small-Signal S-Parameters from 500 to 2500 MHz
- Capable of Handling 30:1 VSWR, @ 28 Vdc
- Circuit Board Available Upon Request by Contacting RF Tactical Marketing in Phoenix, AZ
- LDMOS Model Available at: <http://motorola.com/sps/rf/designtds/>



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	± 20	Vdc
Storage Temperature Range	T_{stg}	-65 to +150	$^{\circ}C$
Operating Junction Temperature	T_J	200	$^{\circ}C$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.6	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_C = 25^{\circ}C$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-Source Breakdown Voltage ($V_{GS} = 0$, $I_D = 1 \mu A$)	$V_{(BR)DSS}$	65	-	-	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 28$ V, $V_{GS} = 0$)	I_{DSS}	-	-	10	μA_{dc}
Gate-Source Leakage Current ($V_{GS} = 20$ V, $V_{DS} = 0$)	I_{GSS}	-	-	1	μA_{dc}

NOTE - **CAUTION** - MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

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NOT RECOMMENDED FOR NEW DESIGN

ELECTRICAL CHARACTERISTICS – continued ($T_C = 25^\circ\text{C}$ unless otherwise noted)

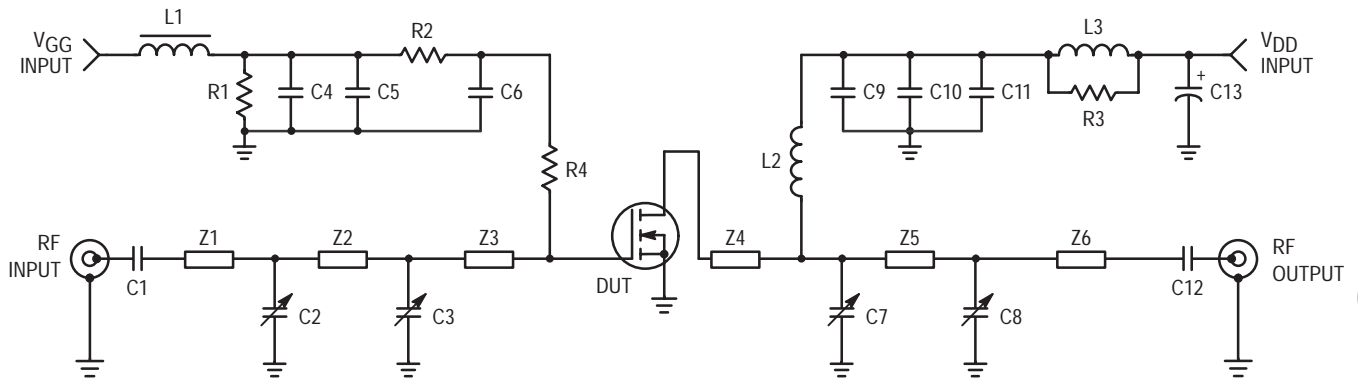
Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
Gate Threshold Voltage ($V_{DS} = 10\text{ V}$, $I_D = 50\text{ mA}$)	$V_{GS(th)}$	2	2.5	5	Vdc
Drain–Source On–Voltage ($V_{GS} = 10\text{ V}$, $I_D = 1\text{ A}$)	$V_{DS(on)}$	–	1.5	–	Vdc
Forward Transconductance ($V_{DS} = 10\text{ V}$, $I_D = 1\text{ A}$)	g_{fs}	0.35	0.55	–	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance ($V_{DS} = 28\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$)	C_{iss}	–	15	–	pF
Output Capacitance ($V_{DS} = 28\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$)	C_{oss}	–	9	–	pF
Reverse Transfer Capacitance ($V_{DS} = 28\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$)	C_{rss}	–	0.7	–	pF

FUNCTIONAL CHARACTERISTICS

Common Source Power Gain ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_{DQ} = 50\text{ mA}$, $f = 1.6\text{ GHz}$)	G_{ps}	9.5	10.5	–	dB
Drain Efficiency ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_{DQ} = 50\text{ mA}$, $f = 1.6\text{ GHz}$)	η	45	50	–	%
Output Mismatch Stress ($V_{DS} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_{DQ} = 50\text{ mA}$, $f = 1600\text{ MHz}$, Load VSWR 30:1 at All Phase Angles)	Ψ	No Degradation in Output Power			
Series Equivalent Input Impedance ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_{DQ} = 50\text{ mA}$, $f = 1.6\text{ GHz}$)	Z_{in}	–	$3.1 + j7.18$	–	Ω
Series Equivalent Output Impedance ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_{DQ} = 50\text{ mA}$, $f = 1.6\text{ GHz}$)	Z_{ol}	–	$6.16 - j4.75$	–	Ω



- | | | | |
|------------------|---|----|--------------------------------|
| C1, C6, C10, C12 | 24 pF, "A" Chip Capacitor, ATC | R2 | 220 Ω , 1/4 W Resistor |
| C2, C3, C7, C8 | 0.8–8.0 pF, Variable Capacitor, Johansen Gigatrim | R3 | 10 k Ω , 2 W Resistor |
| C4, C11 | 240 pF, "A" Chip Capacitor, ATC | R4 | 10 k Ω , 1/8 W Resistor |
| C5, C9 | 0.1 μF , Ceramic Capacitor | Z1 | 0.081" x 0.42" Microstrip |
| C13 | 50 μF , 50 V, Electrolytic Capacitor | Z2 | 0.081" x 1.24" Microstrip |
| L1 | Ferroxcube VK200–19/4B | Z3 | 0.32" x 0.48" Microstrip |
| L2 | 2 Turns, 0.175" ID, 20 AWG, Close Wound | Z4 | 0.35" x 0.5" Microstrip |
| L3 | 10 Turns, 20 AWG, Close Wound | Z5 | 0.15" x 0.44" Microstrip |
| R1 | 1 k Ω , 1/4 W Resistor | Z6 | 0.081" x 1.165" Microstrip |

Figure 1. 1.6 GHz Test Circuit Schematic

TYPICAL CHARACTERISTICS

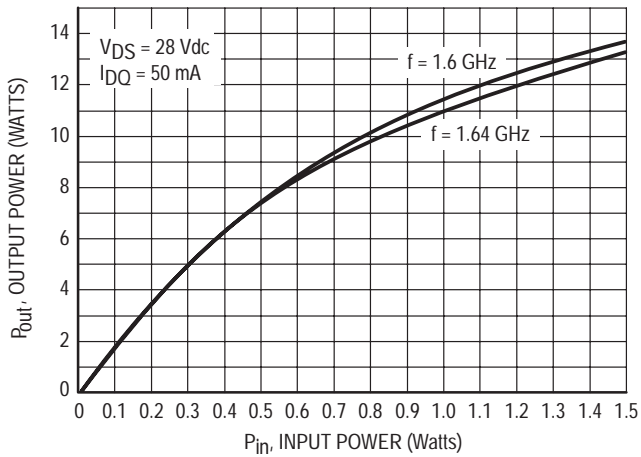


Figure 2. Output Power versus Input Power

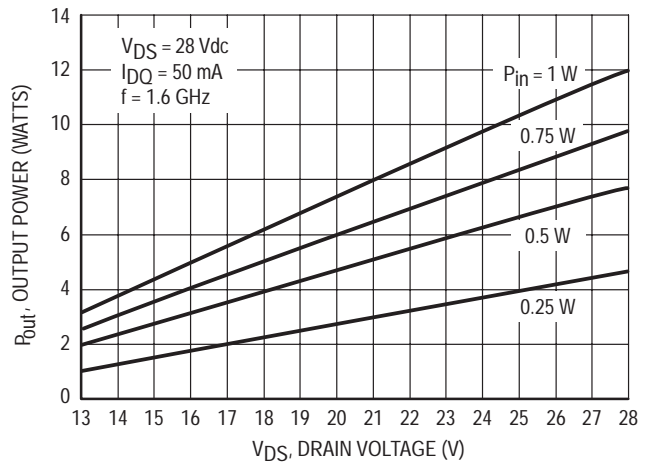


Figure 3. Output Power versus Drain Voltage

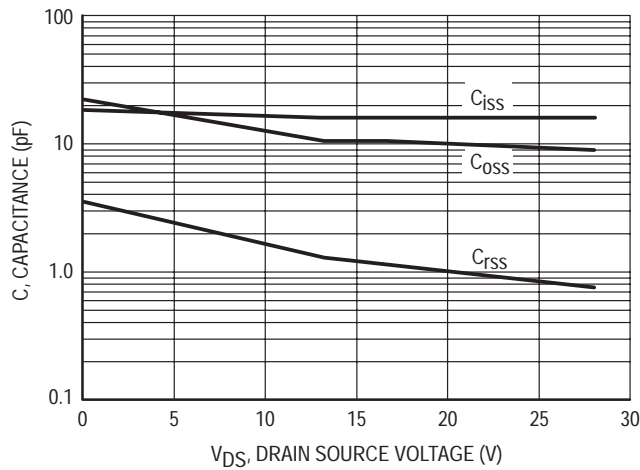


Figure 4. Capacitance versus Drain Voltage

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NOT RECOMMENDED FOR NEW DESIGN

f MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	S ₁₁	∠	S ₂₁	∠	S ₁₂	∠	S ₂₂	∠
500	0.806	-164	4.98	54	0.026	-18	0.598	-125
510	0.805	-164	4.87	53	0.024	-18	0.604	-126
520	0.803	-165	4.75	52	0.024	-20	0.610	-127
530	0.805	-165	4.66	52	0.023	-20	0.619	-128
540	0.803	-166	4.55	51	0.023	-21	0.623	-128
550	0.806	-166	4.45	50	0.023	-22	0.628	-129
600	0.818	-169	4.00	45	0.021	-27	0.646	-132
650	0.822	-171	3.64	41	0.018	-20	0.663	-135
700	0.832	-174	3.35	38	0.017	-28	0.683	-138
750	0.838	-175	3.06	34	0.014	-32	0.704	-141
800	0.843	-178	2.84	30	0.012	-23	0.722	-143
820	0.847	-179	2.74	29	0.011	-21	0.724	-144
840	0.852	-179	2.67	27	0.008	-27	0.725	-145
860	0.855	180	2.59	26	0.009	-17	0.732	-146
880	0.858	179	2.52	25	0.006	-16	0.741	-147
900	0.859	179	2.46	24	0.004	-6	0.752	-147
920	0.860	178	2.39	22	0.006	24	0.758	-147
940	0.865	177	2.34	21	0.009	34	0.777	-148
960	0.874	176	2.29	19	0.011	25	0.790	-150
980	0.876	175	2.22	18	0.010	21	0.780	-152
1000	0.876	175	2.16	16	0.010	25	0.782	-152
1010	0.877	174	2.13	16	0.009	21	0.782	-153
1020	0.877	174	2.11	16	0.008	26	0.786	-153
1030	0.875	174	2.08	15	0.008	28	0.788	-153
1040	0.878	173	2.06	15	0.009	28	0.791	-153
1050	0.877	173	2.03	14	0.010	40	0.795	-154
1060	0.884	173	2.01	13	0.009	38	0.793	-154
1070	0.882	172	1.99	13	0.009	52	0.795	-154
1080	0.887	172	1.96	12	0.008	54	0.796	-155
1090	0.886	171	1.94	12	0.009	51	0.803	-155
1100	0.888	171	1.92	11	0.010	44	0.803	-156
1120	0.889	170	1.88	10	0.010	56	0.809	-156
1140	0.888	170	1.84	8	0.013	56	0.817	-157
1160	0.892	169	1.80	7	0.014	60	0.826	-157
1180	0.895	168	1.77	6	0.014	62	0.836	-158
1200	0.898	167	1.73	5	0.015	62	0.841	-159
1220	0.906	167	1.70	4	0.017	68	0.847	-160
1240	0.905	166	1.67	2	0.017	66	0.849	-161
1260	0.904	165	1.64	1	0.018	63	0.862	-162
1280	0.902	164	1.60	0	0.019	56	0.861	-163
1300	0.906	163	1.55	-1	0.021	55	0.867	-163

Table 1. Common Source S-Parameters (V_{DS} = 28 V, I_D = 750 mA)

f MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	S ₁₁	φ	S ₂₁	φ	S ₁₂	φ	S ₂₂	φ
1320	0.901	162	1.52	-2	0.018	49	0.866	-164
1340	0.906	162	1.49	-3	0.021	61	0.873	-165
1360	0.907	161	1.47	-4	0.022	61	0.875	-166
1380	0.905	161	1.44	-5	0.022	58	0.877	-167
1400	0.901	160	1.42	-7	0.021	58	0.881	-168
1420	0.900	159	1.39	-7	0.022	57	0.884	-168
1440	0.903	158	1.37	-9	0.022	58	0.885	-169
1460	0.912	158	1.34	-10	0.021	56	0.887	-170
1480	0.905	161	1.44	-5	0.022	58	0.877	-167
1500	0.910	156	1.30	-11	0.024	56	0.889	-171
1520	0.903	156	1.27	-12	0.023	57	0.891	-172
1540	0.899	155	1.26	-13	0.025	58	0.892	-173
1560	0.902	154	1.24	-15	0.026	56	0.893	-173
1570	0.902	153	1.22	-15	0.026	52	0.894	-174
1580	0.906	153	1.22	-16	0.024	53	0.892	-174
1590	0.906	153	1.21	-16	0.025	51	0.892	-174
1600	0.909	152	1.20	-17	0.026	49	0.892	-175
1610	0.911	152	1.20	-17	0.028	49	0.891	-175
1620	0.912	152	1.19	-17	0.026	53	0.889	-175
1630	0.907	151	1.18	-18	0.026	51	0.888	-176
1640	0.905	151	1.17	-18	0.027	55	0.889	-176
1650	0.895	150	1.16	-18	0.024	53	0.889	-177
1660	0.893	150	1.15	-19	0.027	52	0.889	-177
1670	0.890	150	1.14	-19	0.027	53	0.891	-177
1680	0.894	149	1.13	-20	0.026	51	0.891	-178
1690	0.899	148	1.12	-20	0.027	49	0.889	-178
1700	0.899	148	1.12	-21	0.027	53	0.888	-178
1750	0.905	147	1.09	-24	0.028	51	0.881	-180
1800	0.887	144	1.06	-26	0.029	50	0.889	179
1850	0.893	142	1.03	-28	0.029	50	0.885	178
1900	0.888	141	1.00	-31	0.031	51	0.883	176
1950	0.883	138	0.99	-34	0.032	51	0.888	176
2000	0.887	135	0.97	-36	0.032	44	0.887	174
2050	0.875	134	0.94	-38	0.035	46	0.894	173
2100	0.885	130	0.93	-42	0.037	45	0.894	172
2150	0.882	128	0.93	-45	0.038	37	0.905	170
2200	0.865	125	0.91	-47	0.040	37	0.907	169
2250	0.875	121	0.90	-50	0.040	30	0.911	168
2300	0.864	118	0.89	-54	0.037	27	0.915	165
2350	0.857	114	0.88	-56	0.042	31	0.917	163
2400	0.849	111	0.87	-59	0.042	23	0.906	162
2500	0.841	102	0.86	-66	0.040	13	0.887	160

Table 1. Common Source S-Parameters ($V_{DS} = 28$ V, $I_D = 750$ mA) (continued)

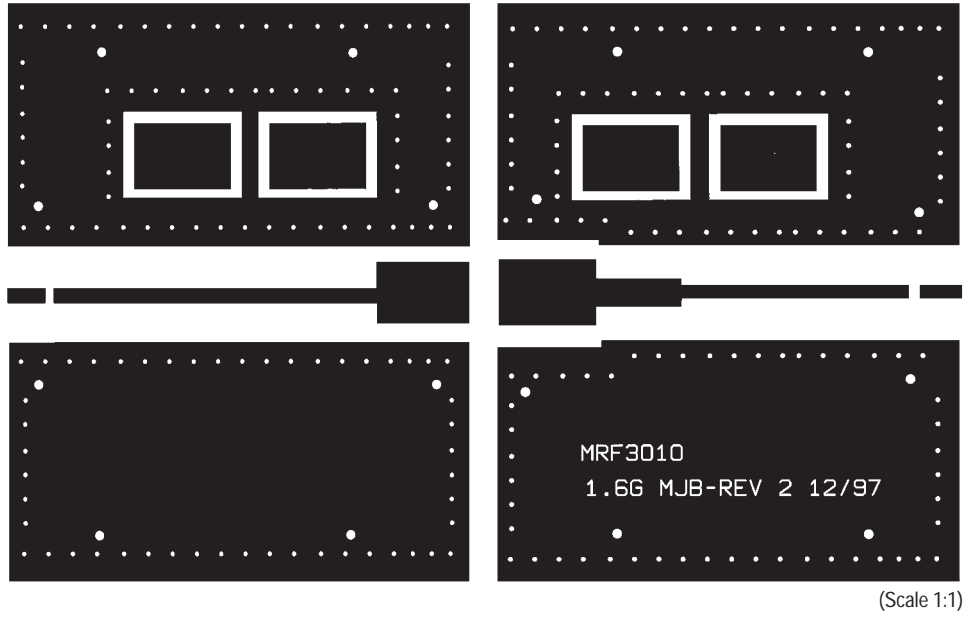
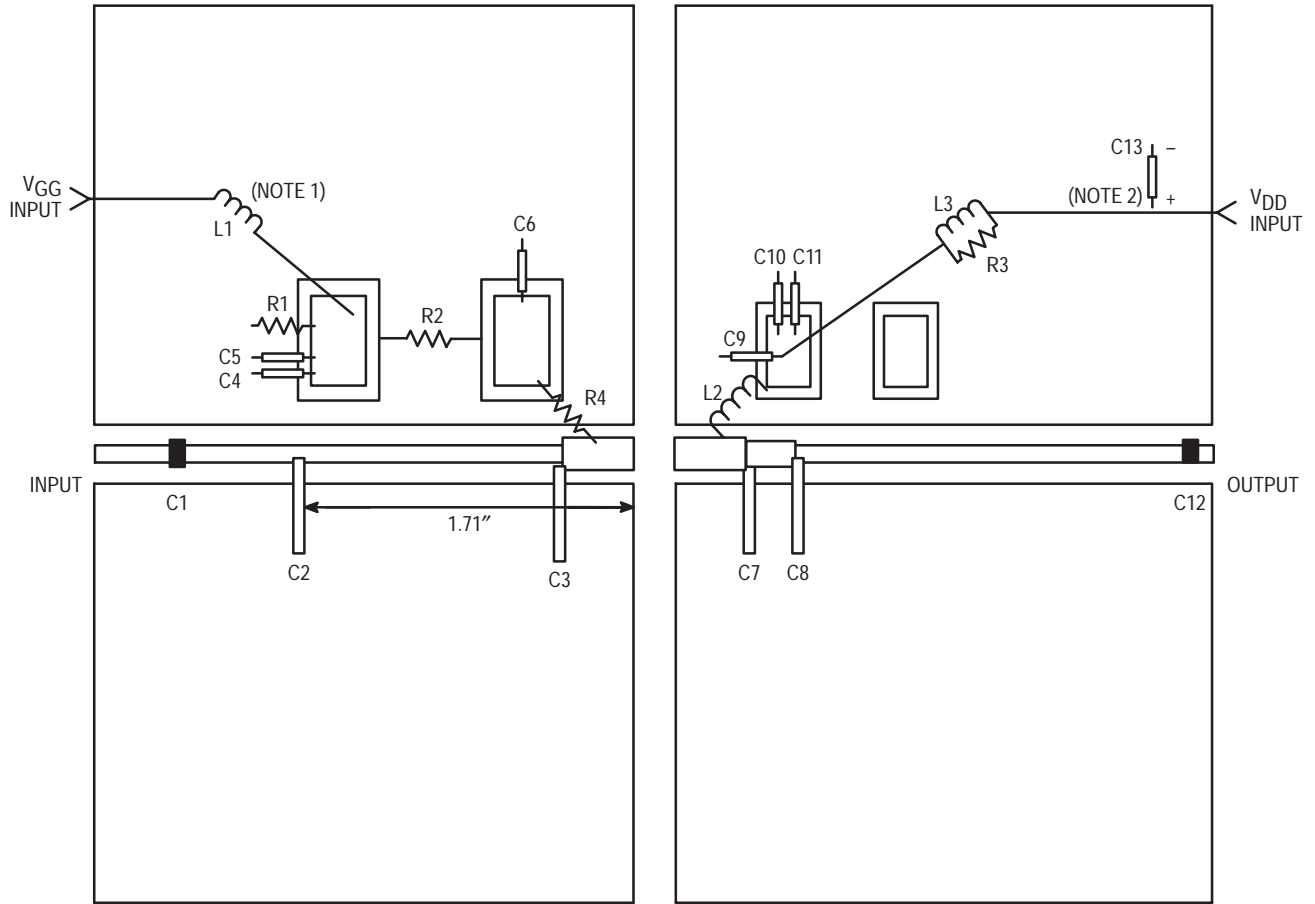


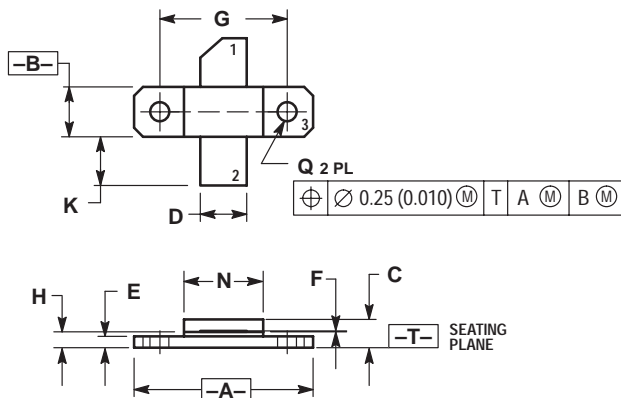
Figure 5. Photomaster for MRF3010
(Reduced 25% in printed data book, DL110/D)



- | | | | |
|------------------|---|------------------------------------|-----------------------|
| C1, C6, C10, C12 | 24 pF, "A" Chip Capacitor, ATC | R1 | 1 kΩ, 1/4 W Resistor |
| C2, C3, C7, C8 | 0.8–8.0 pF, Variable Capacitor, Johansen Gigatrim | R2 | 220 Ω, 1/4 W Resistor |
| C4, C11 | 240 pF, "A" Chip Capacitor, ATC | R3 | 10 kΩ, 2 W Resistor |
| C5, C9 | 0.1 μF, Ceramic Capacitor | R4 | 10 kΩ, 1/8 W Resistor |
| C13 | 50 μF, 50 V, Electrolytic Capacitor | | |
| L1 | VK200 | NOTES: | |
| L2 | 2 Turns, 0.175" ID, 20 AWG, Close Wound | (1) L1 is gate input from Endplate | |
| L3 | 10 Turns, 20 AWG, Close Wound | (2) L3 is wrapped around R3 | |

Figure 6. 1.6 GHz Test Circuit Layout

PACKAGE DIMENSIONS



**CASE 360B-03
ISSUE D**

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION H IS MEASURED 0.030" AWAY FROM EDGE OF FLANGE.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.790	0.810	20.07	20.57
B	0.220	0.240	5.59	6.09
C	0.125	0.175	3.18	4.45
D	0.205	0.225	5.21	5.71
E	0.050	0.070	1.27	1.77
F	0.004	0.006	0.11	0.15
G	0.562 BSC		14.27 BSC	
H	0.077	0.087	1.96	2.21
K	0.215	0.255	5.47	6.47
N	0.350	0.370	8.89	9.39
Q	0.120	0.140	3.05	3.55

- STYLE 1:
PIN 1. DRAIN
2. GATE
3. SOURCE

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