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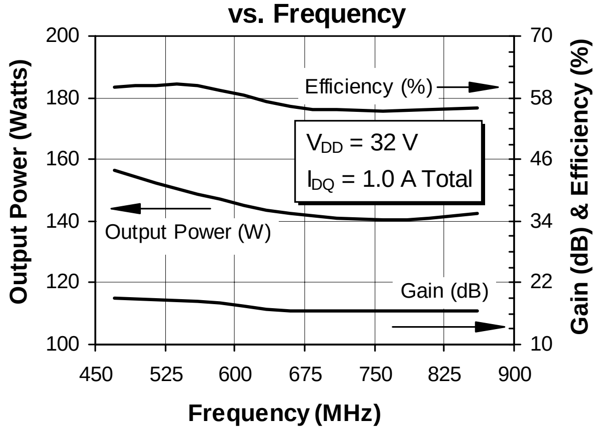
PTF 10037
120 Watts, 470–860 MHz
LDMOS Field Effect Transistor

Description

The 10037 is an internally matched, common source N-channel enhancement-mode lateral MOSFET intended for large signal amplifier applications from 470 to 860 MHz. It is rated at 120 watts minimum output power. Nitride surface passivation and gold metallization ensure excellent device lifetime and reliability. 100% lot traceability is standard.

- ***INTERNALLY MATCHED*** for ease of circuit design
- Performance at 860 MHz, 32 Volts
  - Output Power = 120 Watts Typ
  - Power Gain = 14.0 dB Typ
  - Efficiency = 50% Typ
- Performance at 860 MHz, 28 Volts
  - Output Power = 100 Watts
  - Power Gain = 14.0 dB Typ
  - Efficiency = 50% Typ
- Gold Metallization
- Silicon Nitride Passivated
- Back Side Common Source

Typical P_{OUT}, Gain & Efficiency (at P-1dB) vs. Frequency



Package 20240

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	±20	Vdc
Operating Junction Temperature	T_J	200	°C
Total Device Dissipation at T_{flange} = 25°C Above 25°C derate by	P_D	290 1.67	Watts W/°C
Storage Range	T_{STG}	–40 to +150	°C
Thermal Resistance	$R_{\theta JC}$	0.6	°C/W

4/29/98

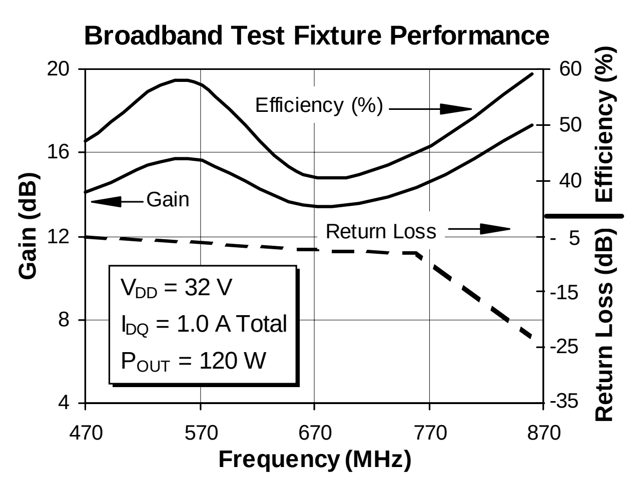
Electrical Characteristics (100% Tested)

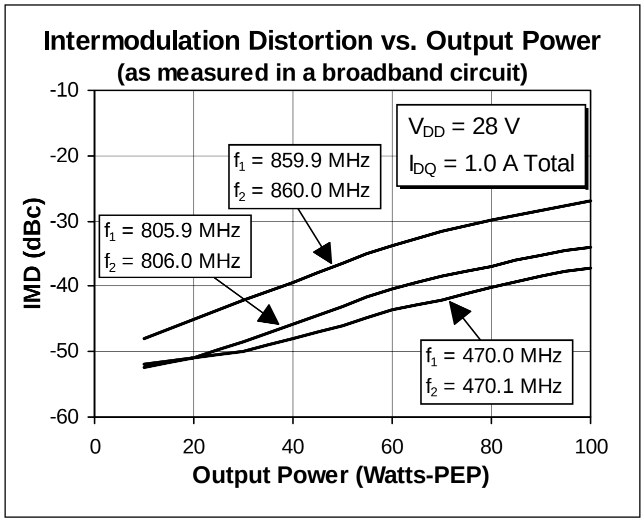
Characteristic	Conditions	Symbol	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 5 mA	$V_{(BR)DSS}$	65	—	—	Volts
Drain-Source Leakage Current	V_{DS} = 28 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 75 mA	$V_{GS(th)}$	—	3.0	—	Volts
Forward Transconductance	V_{DS} = 10 V, I_D = 3 A	g_{fs}	—	2.5	—	Siemens

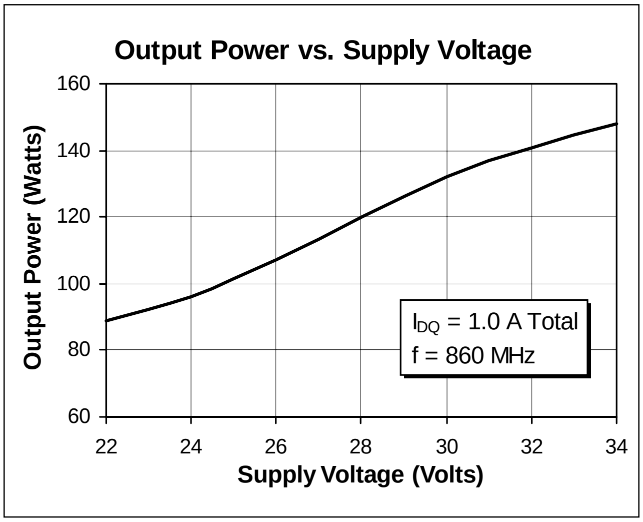
RF Specifications (100% Tested)

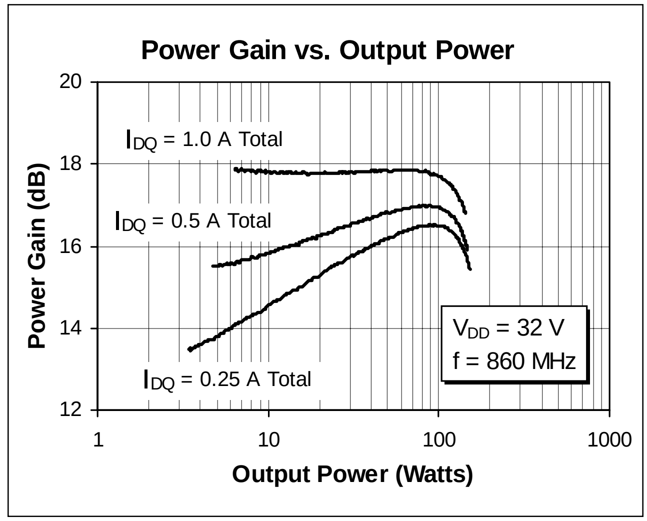
Characteristic	Symbol	Min	Typ	Max	Units
Gain (V_{DD} = 32 V, P_{out} = 120 W, I_{DQ} = 1.0 A Total, f = 860 MHz)	G_{ps}	12.0	14.0	—	dB
Drain Efficiency (V_{DD} = 32 V, P_{out} = 120 W, I_{DQ} = 1.0 A Total, f = 860 MHz)	η	45	50	—	%
Power Output at 1 dB Compression (V_{DD} = 32 V, I_{DQ} = 1.0 A Total, f = 860 MHz)	P-1dB	115	125	—	Watts
Load Mismatch Tolerance (V_{DD} = 32 V, P_{out} = 120 W, I_{DQ} = 1.0 A Total, f = 860.0 MHz— all phase angles at frequency of test)	Ψ	—	—	5:1	—

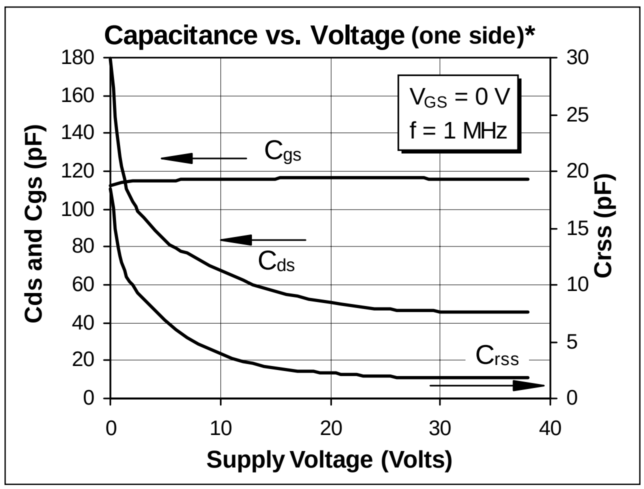
Typical Performance







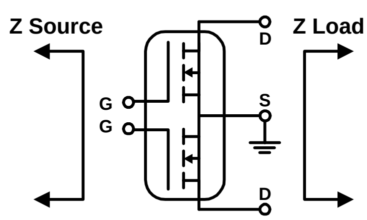




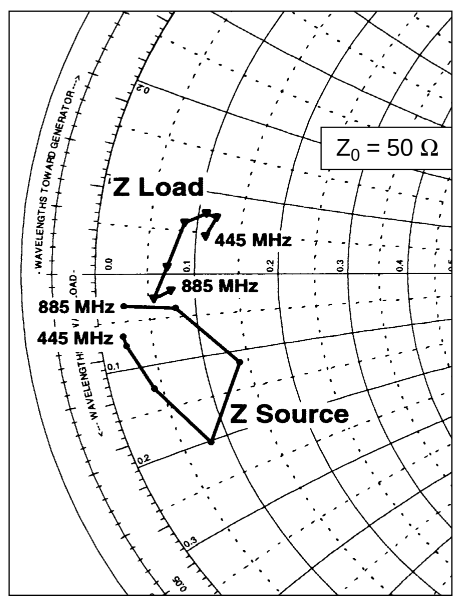
*This part is internally matched. Measurements of the finished product will not yield these figures.

Impedance Data

V_{DD} = 32 V, P_{out} = 120 W, I_{DQ} = 1.0 A Total



Frequency	Z Source		Z Load	
MHz	R	jX	R	jX
445	1.1	-3.3	5.5	2.3
470	1.2	-3.8	6.0	3.5
560	2.1	-6.3	5.4	3.7
660	4.0	-10.1	4.3	3.0
760	7.0	-5.8	3.5	0.4
860	3.9	-2.0	2.8	-1.4
885	1.3	-1.7	3.7	-1.0



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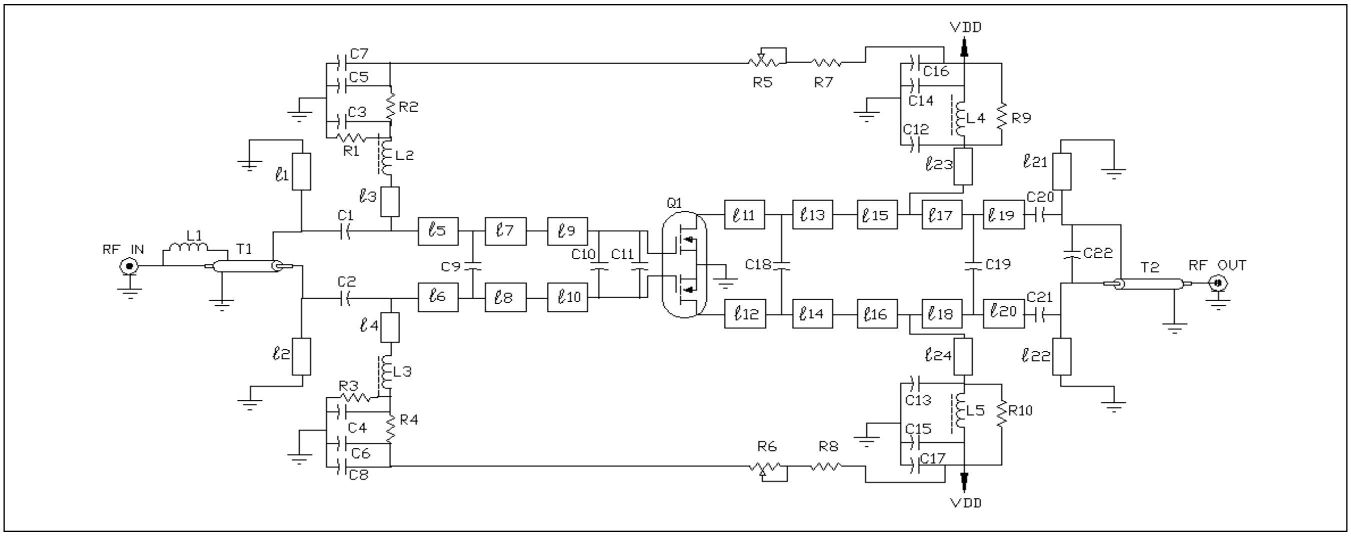
Typical Scattering Parameters (one side)

(V_{DS} = 28 V, I_D = 4 A)

f	S11		S21		S12		S22	
(MHz)	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
400	0.966	178.5	1.564	14	0.003	-46.5	0.919	-164.8
410	0.965	178.3	1.535	12.7	0.003	-47.5	0.922	-165.1
420	0.964	178.2	1.509	11.5	0.003	-49.2	0.925	-165.3
430	0.964	177.9	1.487	10.3	0.003	-50.4	0.929	-165.6
440	0.963	177.7	1.464	9	0.003	-50.8	0.933	-165.9
450	0.962	177.5	1.445	7.7	0.003	-49.9	0.937	-166.2
460	0.961	177.2	1.431	6.6	0.003	-51.7	0.941	-166.3
470	0.958	177.1	1.417	5.4	0.003	-50.9	0.944	-166.5
480	0.956	176.9	1.409	4.3	0.003	-51.4	0.946	-166.7
490	0.955	176.7	1.405	3.1	0.003	-52.8	0.948	-166.9
500	0.953	176.4	1.405	1.8	0.003	-54.9	0.951	-167
510	0.951	176.2	1.41	0.5	0.003	-53.1	0.955	-167.2
520	0.949	175.9	1.417	-1	0.003	-56.5	0.957	-167.3
530	0.947	175.6	1.429	-2.6	0.003	-55.8	0.959	-167.6
540	0.944	175.3	1.441	-4.2	0.003	-53.3	0.961	-167.8
550	0.942	175	1.457	-6	0.003	-57.1	0.963	-168.2
560	0.936	174.7	1.476	-8	0.003	-58.2	0.966	-168.4
570	0.931	174.4	1.497	-10	0.003	-59.6	0.967	-168.7
580	0.926	174.1	1.522	-12.2	0.003	-61.1	0.969	-168.9
590	0.918	173.8	1.55	-14.4	0.003	-64.9	0.973	-169.1
600	0.911	173.5	1.587	-16.7	0.003	-67.7	0.977	-169.2
610	0.904	173.3	1.632	-19.3	0.003	-74.1	0.98	-169.4
620	0.893	173	1.684	-22.2	0.003	-74	0.985	-169.6
630	0.882	172.7	1.743	-25.6	0.003	-78.8	0.986	-169.9
640	0.869	172.6	1.81	-29.4	0.003	-83.7	0.991	-170.1
650	0.854	172.5	1.879	-33.9	0.003	-87.4	0.993	-170.5
660	0.836	172.7	1.95	-38.9	0.004	-94.1	0.996	-170.9
670	0.817	173.1	2.016	-44.5	0.004	-100.9	0.997	-171.1
680	0.798	174	2.078	-51	0.004	-109	0.998	-171.6
690	0.781	175.3	2.124	-58.1	0.004	-116.1	0.998	-172.1
700	0.768	177	2.135	-66.1	0.004	-124.8	0.998	-172.5
710	0.764	179.2	2.113	-74.3	0.004	-135.3	0.995	-173.1
720	0.769	-178.6	2.048	-82.6	0.004	-145.9	0.991	-173.6
730	0.783	-176.7	1.946	-90.6	0.004	-155.8	0.986	-173.9
740	0.804	-175.3	1.829	-98.2	0.004	-164.9	0.98	-174.1
750	0.828	-174.5	1.692	-105.2	0.004	-172.9	0.975	-174.2
760	0.851	-174.2	1.55	-111.6	0.004	175.4	0.97	-174.2
770	0.871	-174.2	1.414	-117.1	0.004	168.7	0.967	-174.2
780	0.889	-174.4	1.286	-122.2	0.003	160	0.964	-174.1
790	0.906	-174.7	1.169	-126.8	0.003	155.1	0.963	-174.2
800	0.919	-175.2	1.062	-130.6	0.003	147.2	0.96	-174.1
810	0.93	-175.6	0.966	-134.1	0.003	141.7	0.96	-174.1
820	0.94	-176.1	0.88	-137.3	0.003	138.1	0.959	-174.2
830	0.948	-176.5	0.804	-140.1	0.003	135.3	0.958	-174.2
840	0.953	-177.1	0.734	-142.6	0.003	130.4	0.958	-174.2
850	0.96	-177.4	0.672	-144.9	0.003	126.5	0.958	-174.2
860	0.963	-177.9	0.616	-146.7	0.003	123.4	0.958	-174.3
870	0.966	-178.3	0.566	-148.4	0.003	119.6	0.958	-174.2
880	0.97	-178.7	0.523	-149.8	0.003	120.5	0.96	-174.3
890	0.972	-179	0.485	-151.1	0.003	115.9	0.961	-174.2
900	0.973	-179.3	0.452	-152.3	0.003	117.8	0.962	-174.4
910	0.976	-179.6	0.421	-153.5	0.003	113.5	0.962	-174.5
920	0.978	-179.9	0.394	-154.7	0.003	110.1	0.963	-174.6
930	0.979	179.9	0.368	-155.8	0.003	108.3	0.961	-174.6
940	0.982	179.6	0.346	-156.8	0.003	108.2	0.962	-174.7
950	0.983	179.3	0.325	-157.9	0.003	105.5	0.962	-174.9
960	0.983	179.1	0.305	-158.8	0.003	106.6	0.961	-174.8
970	0.985	178.8	0.287	-159.8	0.003	105.2	0.963	-174.9
980	0.985	178.5	0.269	-160.9	0.003	105.6	0.964	-175
990	0.984	178.4	0.254	-161.7	0.003	106.5	0.964	-175
1000	0.987	178.1	0.239	-162.3	0.003	104.6	0.965	-175.1

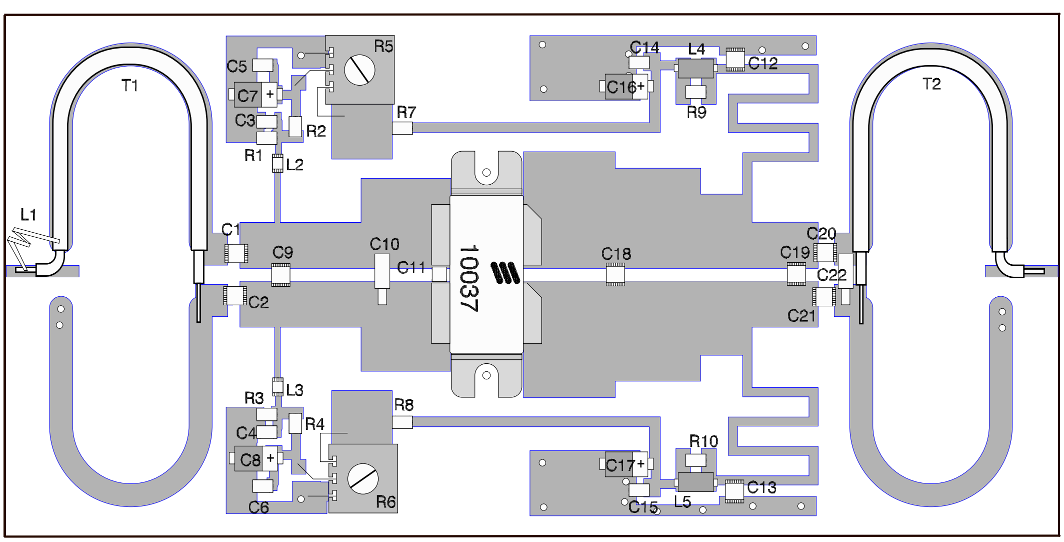
Test Circuit



Block diagram for f = 470–860 MHz broadband circuit

Q1	10037	
L1	1 Turn, #22 AWG, 0.12” I.D.	
L2, L3	10 nH	SMT Coil
L4, L5	4x8 mm	Ferrite Bead
ℓ1, ℓ2, ℓ21, ℓ22	0.25 λ 680 MHz	Microstrip 25 Ω
ℓ3, ℓ4	0.065 λ 800 MHz	Microstrip 70 Ω
ℓ5, ℓ6	0.010 λ 800 MHz	Microstrip 18.5 Ω
ℓ7, ℓ8	0.07 λ 800 MHz	Microstrip 18.5 Ω
ℓ9, ℓ10	0.060 λ 800 MHz	Microstrip 10.2 Ω
ℓ11, ℓ12	0.0525 λ 800 MHz	Microstrip 8.1 Ω
ℓ13, ℓ14	0.061 λ 800 MHz	Microstrip 9.3 Ω
ℓ15, ℓ16	0.032 λ 800 MHz	Microstrip 12.13 Ω
ℓ17, ℓ18	0.021 λ 800 MHz	Microstrip 22.6 Ω
ℓ19, ℓ20	0.01 λ 800 MHz	Microstrip 22.6 Ω
ℓ23, ℓ24	0.25 λ 680 MHz	Microstrip 60 Ω
C1, C2, C20, C21	51 pF	Chip Cap ATC 100 B

C3, C4, C12, C13	91 pF	Chip Cap ATC 100 B
C5, C6, C14, C15	0.1 µF	SMT K1206
C7, C8, C16, C17	10 µF	Electrolytic Capacitor
C9	11 pF	Chip Cap ATC 100 B
C10, C22	0.6–6.0 pF	Variable Capacitor, Johanson Trimmer
C11	4.7 pF	Chip Cap ATC 100 A
C18	13.0 pF	Chip Cap ATC 100 B
C19	3.6 pF	Chip Cap ATC 100 B
R1, R3	200 Ω	1/8 W K 1206 SMT Resistor
R2, R4	200 Ω	1/8 W K 1206 SMT Resistor
R5, R6	1 K Ω	1/4 W Potentiometer
R7, R8	500 Ω	1/4 W Resistor
R9, R10	1.8 Ω	1/4 W Resistor
T1, T2	UT-85-25 Balun Coaxial	
Circuit Board	0.028” G200, ε_r = 4.55 @ 1 MHz, 2 oz. Copper, AlliedSignal	



Components layout (not to scale)

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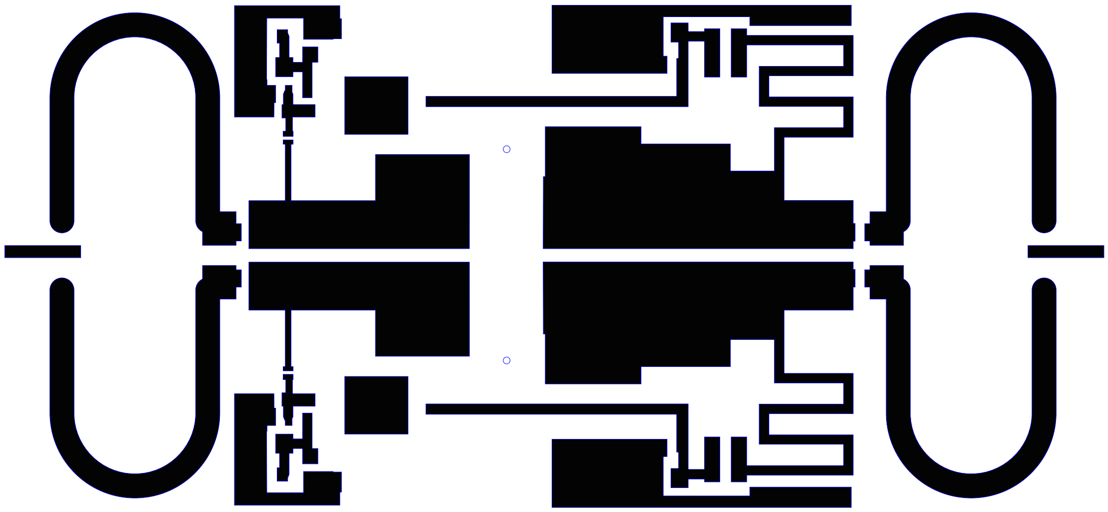

Test circuit artwork (1 inch  *)*

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