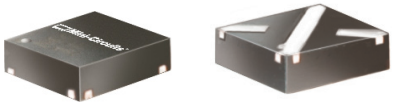
Ultra Low Noise, Low Current

E-PHEMT

0.45-6GHz

Product Features

- Low Noise Figure, 0.5 dB
- Gain, 16 dB at 2 GHz
- High Output IP3, +25 dBm
- Low Current, 15mA
- Wide bandwidth
- External biasing and matching required



TAV-551+

CASE STYLE: FG873
PRICE: $0.99 ea. QTY. (20)

+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

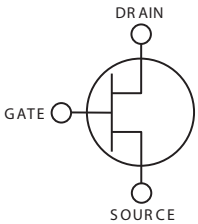
Typical Applications

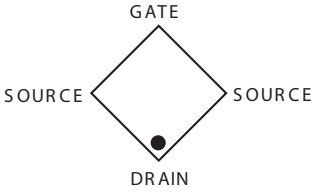
- Cellular
- ISM
- GSM
- WCDMA
- WiMax
- WLAN
- UNII and HIPERLAN

General Description

TAV-551+ is an ultra-low noise, high IP3 transistor device, manufactured using E-PHEMT* technology enabling it to work with a single positive supply voltage. It has outstanding Noise Figure, particularly below 2.5 GHz, and when combining this noise figure with high IP3 performance in a single device it makes it an ideal amplifier for demanding base station applications. We offer these units assembled into a complete module, 50Ω in/out, noise matched and fully specified. For more information please see our TAMP family of models on our web site.

simplified schematic and pin description





Function	Pad Number	Description
Source	2 & 4	Source terminal, normally connected to ground
Gate	3	Gate used for RF input
Drain	1	Drain used for RF output

* Enhancement mode Pseudomorphic High Electron Mobility Transistor.

Electrical Specifications at T_{AMB}=25°C, Frequency 0.45 to 6 GHz

Symbol	Parameter	Condition		Min.	Typ.	Max.	Units
DC Specifications							
V_{GS}	Operational Gate Voltage	V_{DS}=3V, I_{DS}=15 mA		0.22	0.34	0.46	V
V_{TH}	Threshold Voltage	V_{DS}=3V, I_{DS}=4 mA		0.18	0.26	0.38	V
I_{DSS}	Saturated Drain Current	V_{DS}=3V, V_{GS}=0 V			1.0	5.0	µA
G_M	Transconductance	V_{DS}=3V, Gm=Δ I_{DS}/ΔV_{GS} ΔV_{GS}=V_{GS1}-V_{GS2} V_{GS1}=V_{GS} at I_{DS}=15 mA V_{GS2}=V_{GS1}+0.05V		215	251	285	mS
I_{GSS}	Gate leakage Current	V_{GD}=V_{GS}=-3V				95	µA
RF Specifications, Z_0=50 Ohms (Figure 1)							
NF(1)	Noise Figure	V_{DS}=3V, I_{DS}=15 mA	f=0.9 GHz		0.4		
			f=2.0 GHz		0.5	0.9	
			f=3.9 GHz		0.95		dB
			f=5.8 GHz		1.7		
		V_{DS}=4V, I_{DS}=15 mA	f=2.0 GHz		0.4		
Gain	Gain	V_{DS}=3V, I_{DS}=15 mA	f=0.9 GHz		21.3		
			f=2.0 GHz	15.0	16.3	17.3	
			f=3.9 GHz		11.3		dB
			f=5.8 GHz		8.4		
		V_{DS}=4V, I_{DS}=15 mA	f=2.0 GHz		16.3		
OIP3	Output IP3	V_{DS}=3V, I_{DS}=15 mA	f=0.9 GHz		22.1		
			f=2.0 GHz		23.5		
			f=3.9 GHz		25.0		dBm
			f=5.8 GHz		26.0		
		V_{DS}=4V, I_{DS}=15 mA	f=2.0 GHz		24.0		
P1dB(2)	Power output at 1 dB Compression	V_{DS}=3V, I_{DS}=15 mA	f=0.9 GHz		17.0		
			f=2.0 GHz		17.5		
			f=3.9 GHz		18.7		dBm
			f=5.8 GHz		19.2		
		V_{DS}=4V, I_{DS}=15 mA	f=2.0 GHz		20.1		

Absolute Maximum Ratings(3)

Symbol	Parameter	Max.	Units
V_{DS}(4)	Drain-Source Voltage	5	V
V_{GS}(4)	Gate-Source Voltage	-5 to 0.7	V
V_{GD}(4)	Gate-Drain Voltage	-5 to 0.7	V
I_{DS}(4)	Drain Current	100	mA
I_{GS}	Gate Current	2	mA
P_{DISS}	Total Dissipated Power	550	mW
P_{IN}(5)	RF Input Power	17	dBm
T_{CH}	Channel Temperature	150	°C
T_{OP}	Operating Temperature	-40 to 85	°C
T_{STD}	Storage Temperature	-65 to 150	°C
Θ_{JC}	Thermal Resistance	112	°C/W

Notes:
(1) Includes test board loss (measured in Mini-Circuits test board TB-154).
(2) Drain current was allowed to increase during compression measurements.
(3) Operation of this device above any one of these parameters may cause permanent damage.
(4) Assumes DC quiescent conditions.
(5) I_{GS} is limited to 2 mA during test.

Characterization Test Circuit

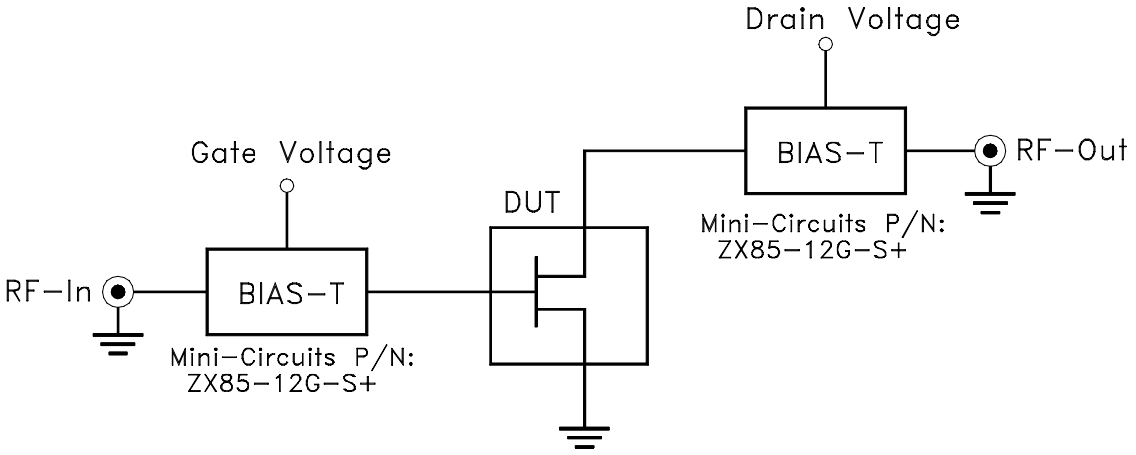


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Test Board TB-154

Gain, Output power at 1dB compression (P1 dB) and output IP3 (OIP3) are measured using R&S Network Analyzer ZVA-24.
Noise Figure measured using Agilent's Noise Figure meter N8975A and noise source N4000A.

Conditions:

1. Drain voltage (with reference to source, V_{DS})= 3 or 4V as shown.
2. Gate Voltage (with reference to source, V_{GS}) is set to obtain desired Drain-Source current (IDS) as shown in graphs or specification table.
3. Gain: Pin= -25dBm
4. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.
5. No external matching components used.

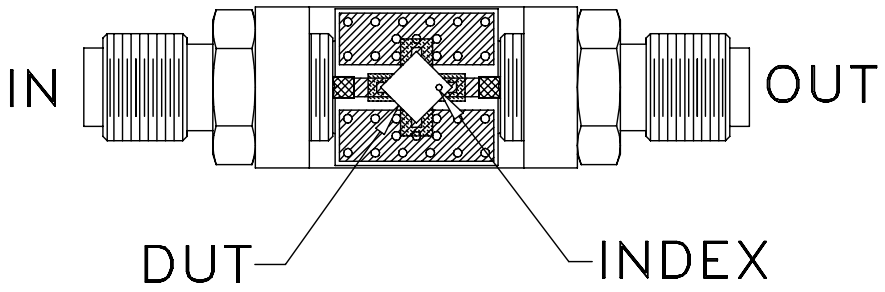
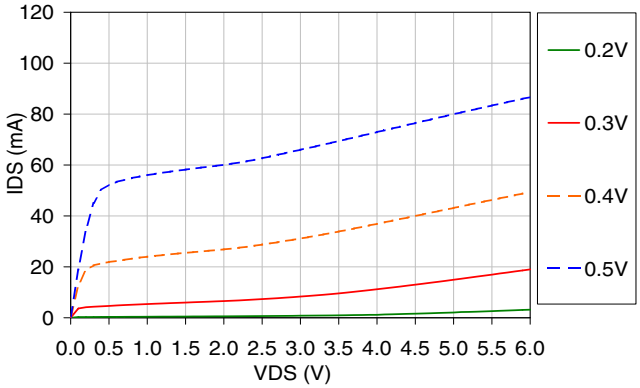


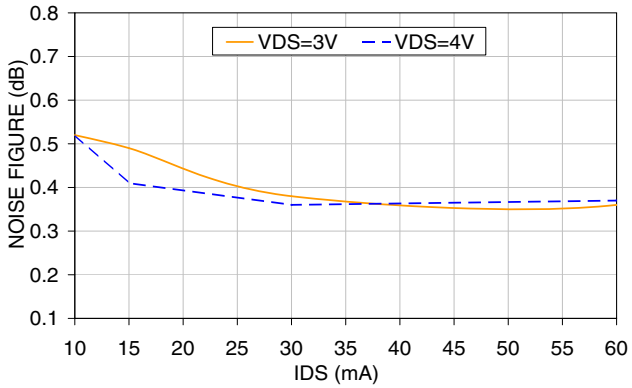
Fig 2. Test Board used for characterization, Mini-Circuits P/N TB-154 (Material: Rogers 4350, Thickness: 0.02")

Typical Performance Curves

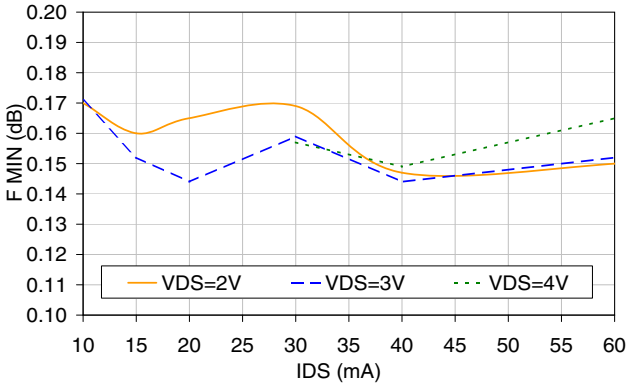
I-V (VGS=0.1V PER STEP) (2)



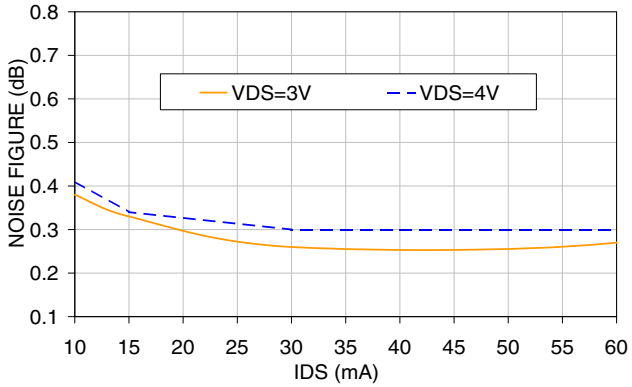
NOISE FIGURE vs IDS @ 2 GHz (1)



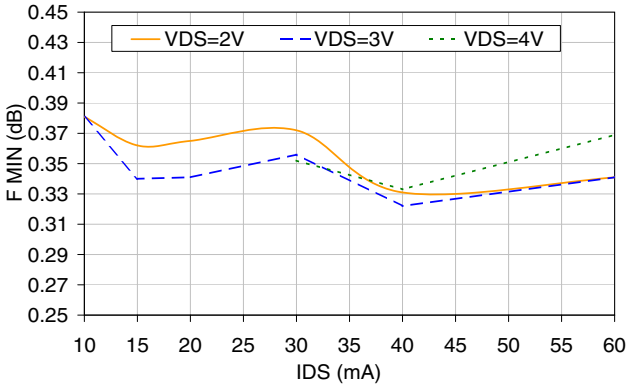
F Min vs IDS @ 0.9 GHz (3)



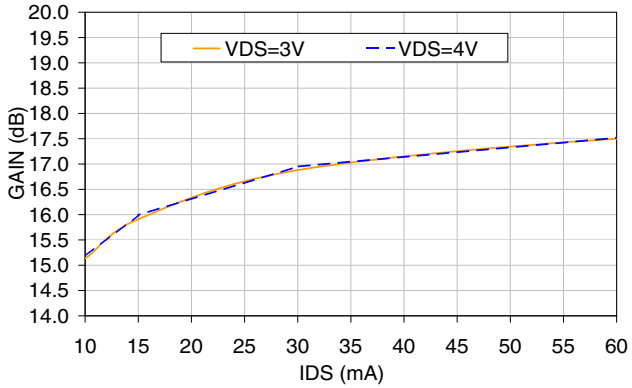
NOISE FIGURE vs IDS @ 0.9 GHz (1)



F Min vs IDS @ 2 GHz (3)

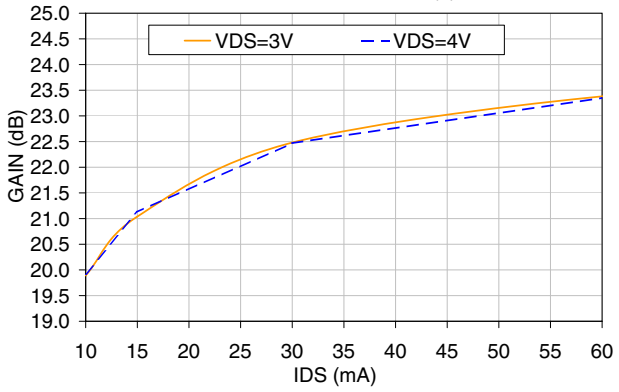


GAIN vs IDS @ 2 GHz (1)

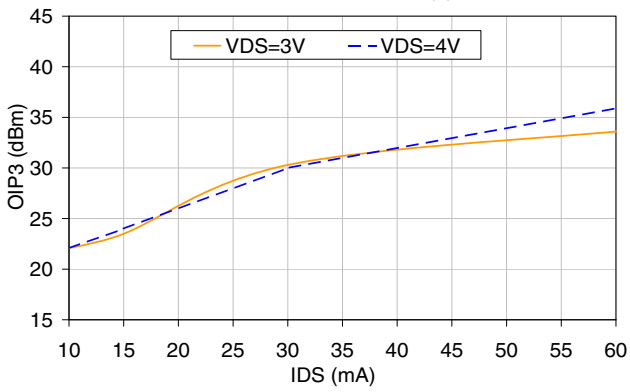


(1) Includes test board loss, set-up and conditions per Figure 1.
(2) Measured using HP4155B semiconductor parameter analyzer.
(3) F Min is minimum Noise Figure.
(4) Drain current was allowed to increase during compression measurement.

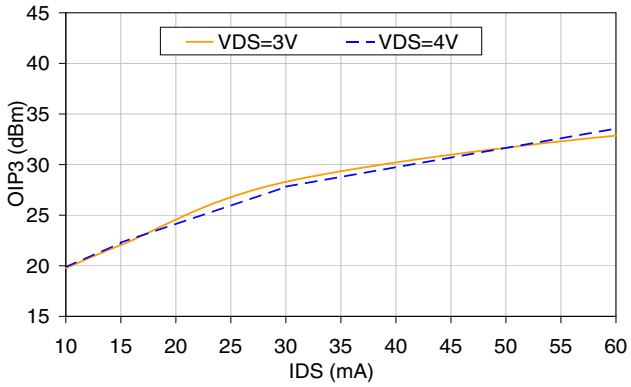
GAIN vs IDS @ 0.9 GHz (1)



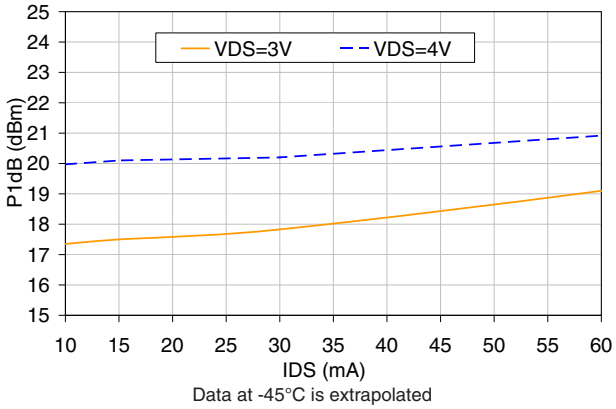
OIP3 vs IDS @ 2GHz (1)



OIP3 vs IDS @ 0.9 GHz (1)

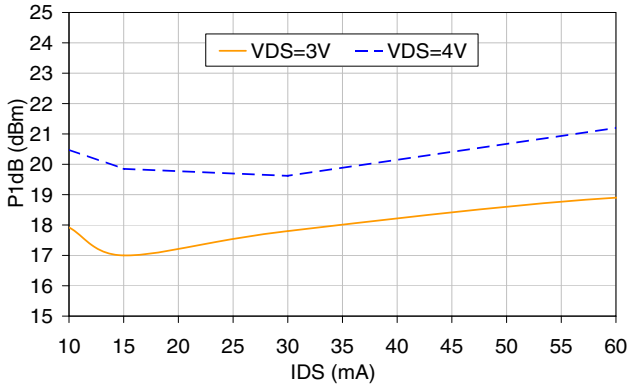


P1dB vs IDS @ 2 GHz (1,4)

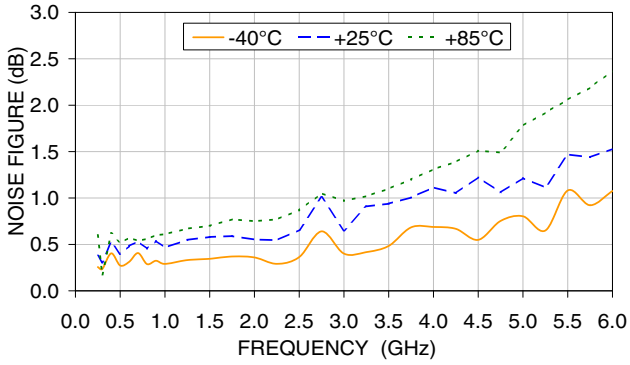


Data at -45°C is extrapolated

P1dB vs IDS @ 0.9 GHz (1,4)



NF vs FREQUENCY & TEMPERATURE (1)
@ VDS=3V, IDS=15mA



(1) Includes test board loss, set-up and conditions per Figure 1.
(2) Measured using HP4155B semiconductor parameter analyzer.
(3) F Min is minimum Noise Figure.
(4) Drain current was allowed to increase during compression measurement.

GAIN vs FREQUENCY & TEMPERATURE (1)
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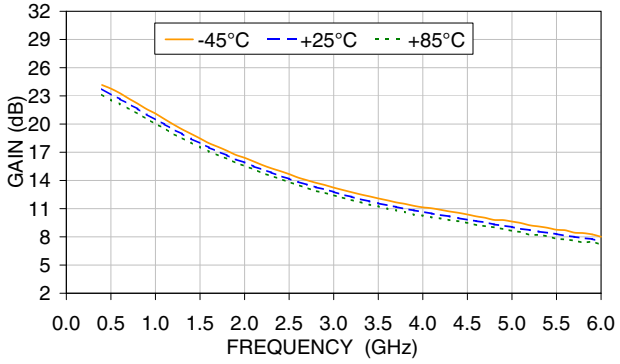
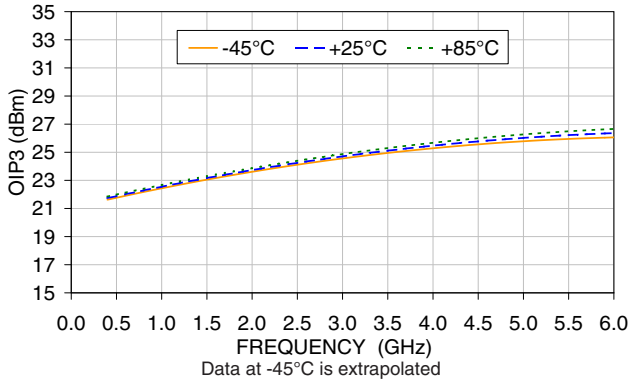


OIP3 vs FREQUENCY & TEMPERATURE (1)
@ VDS=3V, IDS=15mA



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P1dB vs FREQUENCY & TEMPERATURE (1,4)
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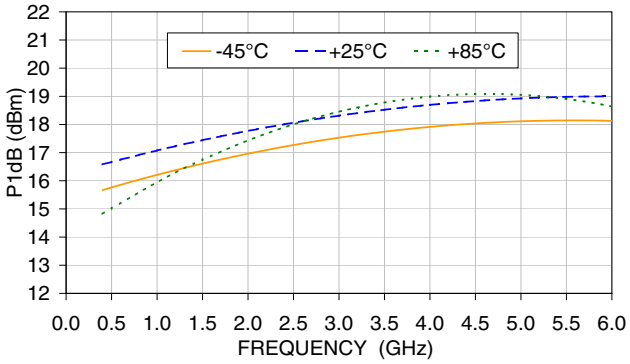
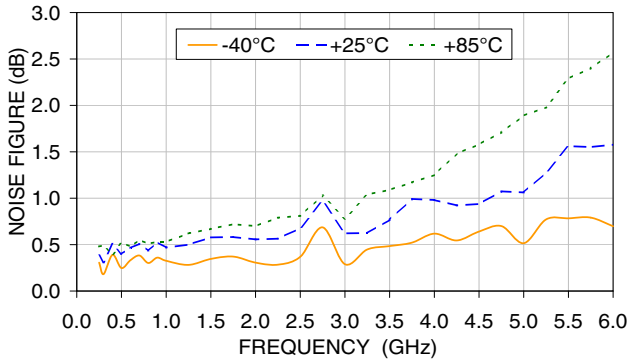
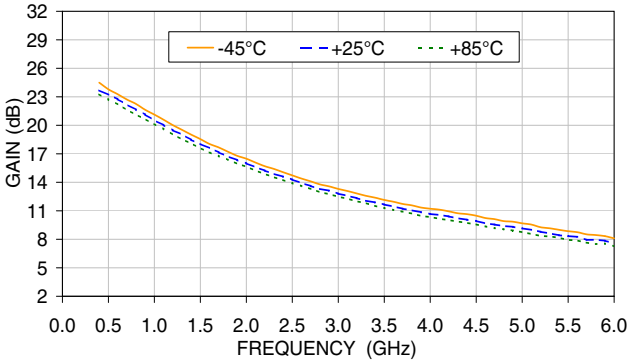


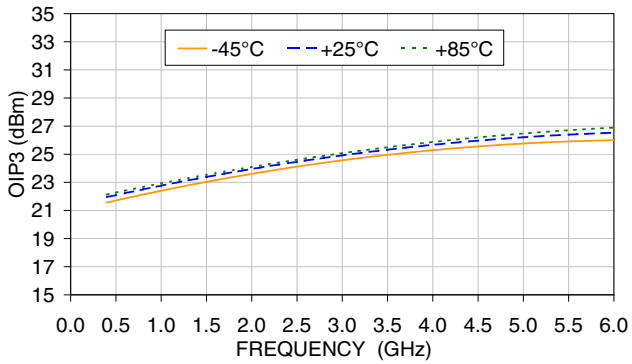
NF vs FREQUENCY & TEMPERATURE (1)
@ VDS=4V, IDS=15mA



GAIN vs FREQUENCY & TEMPERATURE (1)
@ VDS=4V, IDS=15mA



OIP3 vs FREQUENCY & TEMPERATURE (1)
@ VDS=4V, IDS=15mA



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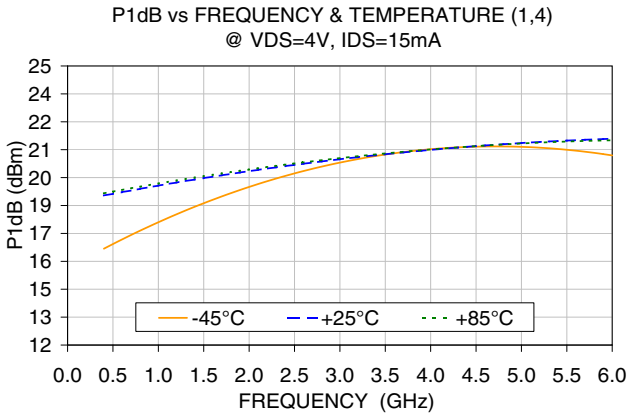

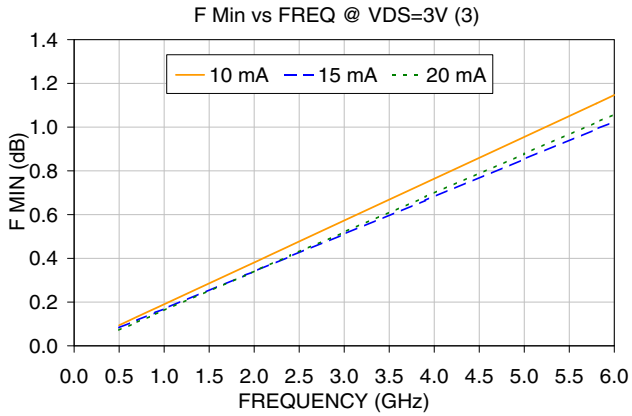

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Reference Plane Location for S and Noise Parameters *(see data in pages 8-11)*

(Refer to Application Note AN-60-040)

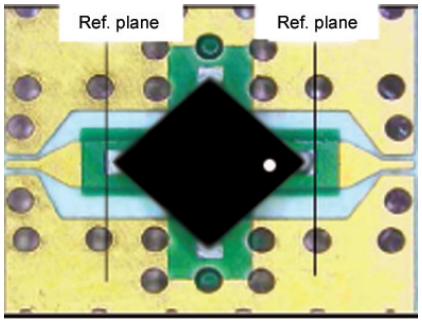


Fig 3. Reference Plane Location

Notes:

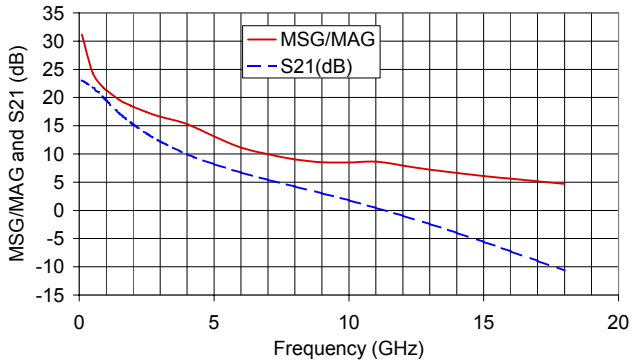
Noise parameters were measured over 0.5 to 6 GHz by Modelithics® using a solid state tuner-based NP noise parameter test system available from Maury Microwave. F Min, optimimum source reflection coefficient and noise resistance values are calculated values based on a set of measurements made at approximately 16 different impedances. Some data smoothing was applied to arrive at the presented data set.

S-parameters were measured by Modelithics® on an Anritsu Lightning vector network analyzer over 0.1 to 18GHz using 350um pitch RF probes from GGB industries combined with customized thru-reflect-line (TRL) calibration standards. The reference plane is at the device package leads, as shown in the picture.

Typical S-parameters, V_{DS}=3V and I_{DS}=10 mA (Fig. 3)

	S11		S21			S12		S22		
Freq. (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG/MAG (dB)
0.1	1.00	-12.7	14.21	23.05	172.0	0.011	81.4	0.75	-8.17	31.2
0.5	0.93	-58.8	12.37	21.85	140.6	0.045	57.0	0.66	-36.56	24.3
0.9	0.84	-94.8	9.95	19.96	116.8	0.066	37.7	0.54	-57.56	21.8
1.0	0.82	-102.7	9.41	19.47	111.7	0.070	34.1	0.51	-62.13	21.3
1.5	0.75	-134.4	7.24	17.20	90.7	0.080	19.3	0.39	-79.90	19.6
1.9	0.72	-153.9	6.03	15.61	77.1	0.084	11.1	0.33	-91.22	18.6
2.0	0.72	-158.2	5.79	15.25	74.0	0.084	9.1	0.32	-93.86	18.4
2.5	0.71	-177.5	4.80	13.62	59.6	0.087	1.4	0.27	-105.83	17.4
3.0	0.70	165.7	4.09	12.23	46.4	0.089	-4.9	0.23	-117.43	16.6
4.0	0.69	137.4	3.15	9.96	22.1	0.092	-15.5	0.18	-140.41	15.3
5.0	0.70	112.9	2.57	8.19	-0.6	0.096	-24.3	0.15	-167.87	13.1
6.0	0.72	90.6	2.17	6.71	-22.6	0.103	-32.7	0.14	158.44	11.2
7.0	0.74	69.7	1.87	5.42	-44.2	0.111	-41.9	0.15	121.27	10.0
8.0	0.77	49.8	1.63	4.22	-65.5	0.121	-52.1	0.19	88.24	9.0
9.0	0.80	30.2	1.42	3.02	-86.7	0.131	-64.6	0.26	60.44	8.5
10.0	0.84	10.7	1.23	1.79	-108.1	0.139	-78.2	0.34	36.60	8.5
11.0	0.87	-8.2	1.05	0.46	-129.3	0.144	-93.1	0.43	15.42	8.7
12.0	0.90	-26.4	0.90	-0.93	-150.0	0.145	-108.6	0.51	-3.96	7.9
13.0	0.91	-44.3	0.76	-2.40	-170.6	0.143	-124.7	0.59	-22.58	7.2
14.0	0.93	-61.0	0.63	-3.97	169.7	0.137	-140.6	0.65	-40.31	6.6
15.0	0.94	-73.8	0.53	-5.58	153.5	0.130	-153.7	0.72	-54.43	6.1
16.0	0.96	-83.9	0.43	-7.26	139.6	0.119	-163.9	0.76	-66.50	5.6
17.0	0.96	-95.1	0.36	-8.93	124.9	0.109	-175.0	0.80	-79.64	5.2
18.0	0.95	-106.9	0.29	-10.68	109.7	0.100	174.4	0.83	-93.87	4.7

MAXIMUM STABLE GAIN (MSG)/MAXIMUM AVAILABLE GAIN (MAG) vs. FREQUENCY
VDS=3V & IDS=10mA



Typical Noise Parameters, V_{DS}=3V and I_{DS}=10 mA (Fig. 3)

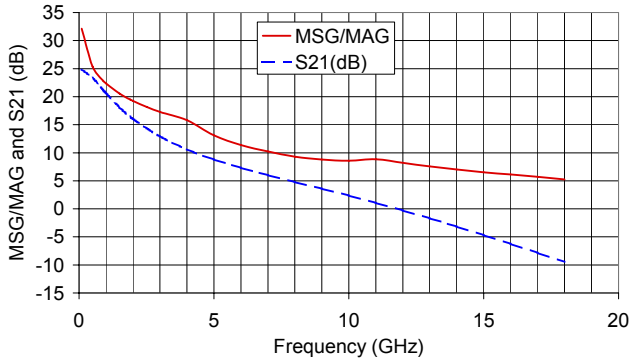
Freq. (GHz)	F Min. (dB)	ΓOpt (Magnitude)	ΓOpt (Angle)	Rn/50	Ga Associated Gain (dB)
0.5	0.09	0.37	25.6	0.10	25.8
0.7	0.13	0.38	35.9	0.09	23.8
0.9	0.17	0.40	46.2	0.08	22.0
1.0	0.19	0.41	51.2	0.07	21.2
1.9	0.36	0.46	95.0	0.04	16.3
2.0	0.38	0.47	99.7	0.04	16.0
2.4	0.46	0.49	118.1	0.04	14.7
3.0	0.57	0.52	144.5	0.04	13.3
3.9	0.75	0.54	-178.4	0.06	11.8
5.0	0.96	0.56	-137.2	0.11	10.7
5.8	1.11	0.55	-110.1	0.16	10.0
6.0	1.15	0.55	-103.7	0.18	9.8

Notes:
F Min.: Minimum Noise Figure
ΓOpt: Optimum Source Reflection Coefficient
Rn: Equivalent noise resistance

Typical S-parameters, V_{DS}=3V and I_{DS}=15 mA (Fig. 3)

	S11		S21			S12		S22		
Freq. (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG/MAG (dB)
0.1	1.00	-14.1	17.46	24.84	171.0	0.011	81.8	0.69	-9.71	32.1
0.5	0.91	-64.6	14.68	23.33	137.4	0.043	55.7	0.59	-42.24	25.4
0.9	0.81	-101.9	11.40	21.14	113.2	0.059	36.4	0.46	-65.39	22.8
1.0	0.79	-109.9	10.71	20.59	108.2	0.062	33.0	0.43	-70.37	22.4
1.5	0.73	-141.1	8.03	18.10	87.9	0.071	20.5	0.33	-89.71	20.6
1.9	0.70	-159.8	6.62	16.42	74.9	0.075	13.5	0.27	-102.27	19.5
2.0	0.70	-163.9	6.34	16.04	71.9	0.075	12.0	0.26	-105.26	19.2
2.5	0.69	177.6	5.23	14.37	58.1	0.079	5.7	0.22	-119.09	18.2
3.0	0.68	161.5	4.43	12.94	45.3	0.082	0.2	0.18	-132.67	17.3
4.0	0.68	134.3	3.39	10.62	21.8	0.089	-9.0	0.14	-160.91	15.8
5.0	0.69	110.6	2.76	8.82	-0.4	0.097	-18.2	0.12	166.12	13.1
6.0	0.71	88.9	2.32	7.31	-21.8	0.107	-27.8	0.13	130.04	11.4
7.0	0.74	68.4	1.99	6.00	-43.0	0.117	-38.6	0.16	97.11	10.2
8.0	0.76	48.8	1.74	4.78	-63.8	0.127	-50.4	0.21	70.19	9.3
9.0	0.80	29.5	1.51	3.58	-84.6	0.137	-64.1	0.28	47.25	8.8
10.0	0.83	10.2	1.31	2.35	-105.6	0.144	-78.3	0.36	26.76	8.6
11.0	0.87	-8.5	1.13	1.06	-126.3	0.147	-93.4	0.44	7.89	8.8
12.0	0.89	-26.6	0.97	-0.29	-146.6	0.147	-109.1	0.52	-9.88	8.2
13.0	0.91	-44.3	0.82	-1.70	-167.0	0.144	-125.0	0.58	-27.32	7.6
14.0	0.93	-61.0	0.69	-3.17	173.4	0.138	-140.6	0.64	-44.02	7.0
15.0	0.94	-73.7	0.58	-4.69	157.4	0.130	-153.7	0.70	-57.24	6.5
16.0	0.96	-83.9	0.49	-6.26	143.3	0.118	-163.6	0.75	-68.66	6.1
17.0	0.96	-94.9	0.41	-7.84	128.5	0.109	-175.1	0.79	-81.23	5.7
18.0	0.95	-106.8	0.34	-9.48	112.8	0.100	174.2	0.81	-95.04	5.2

MAXIMUM STABLE GAIN (MSG)/MAXIMUM AVAILABLE GAIN (MAG) vs. FREQUENCY
VDS=3V & IDS=15mA



Typical Noise Parameters, V_{DS}=3V and I_{DS}=15 mA (Fig. 3)

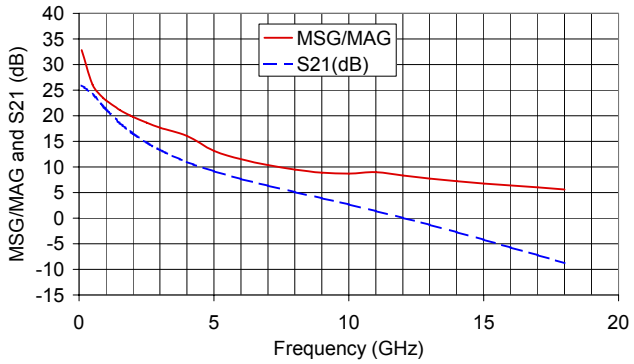
Freq. (GHz)	F Min. (dB)	ΓOpt (Magnitude)	ΓOpt (Angle)	Rn/50	Ga Associated Gain (dB)
0.5	0.08	0.35	25.2	0.08	26.4
0.7	0.12	0.36	35.8	0.07	24.3
0.9	0.15	0.37	46.2	0.06	22.6
1.0	0.17	0.38	51.3	0.06	21.8
1.9	0.32	0.42	95.9	0.04	17.0
2.0	0.34	0.43	100.7	0.04	16.6
2.4	0.41	0.44	119.4	0.04	15.3
3.0	0.51	0.47	146.3	0.04	13.9
3.9	0.67	0.49	-176.0	0.06	12.4
5.0	0.85	0.50	-134.1	0.11	11.1
5.8	0.99	0.51	-106.5	0.16	10.3
6.0	1.03	0.50	-100.0	0.17	10.1

Notes:
F Min.: Minimum Noise Figure
ΓOpt: Optimum Source Reflection Coefficient
Rn: Equivalent noise resistance

Typical S-parameters, V_{DS}=3V and I_{DS}=20 mA (Fig. 3)

	S11		S21			S12		S22		
Freq. (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG/MAG (dB)
0.1	1.00	-14.9	19.82	25.94	170.5	0.010	87.2	0.65	-11.30	32.8
0.5	0.90	-68.4	16.23	24.20	135.2	0.040	53.6	0.54	-46.49	26.1
0.9	0.80	-106.4	12.30	21.80	111.0	0.055	36.2	0.41	-71.23	23.5
1.0	0.78	-114.4	11.51	21.22	106.1	0.057	33.3	0.38	-76.62	23.0
1.5	0.72	-145.0	8.52	18.61	86.2	0.065	22.0	0.29	-97.45	21.2
1.9	0.69	-163.4	6.98	16.88	73.6	0.069	16.0	0.24	-111.25	20.0
2.0	0.69	-167.3	6.68	16.49	70.7	0.070	14.5	0.23	-114.53	19.8
2.5	0.68	174.7	5.49	14.78	57.2	0.075	9.1	0.19	-129.96	18.6
3.0	0.67	159.1	4.64	13.34	44.7	0.079	4.0	0.16	-145.36	17.7
4.0	0.67	132.5	3.54	10.98	21.6	0.088	-5.1	0.13	-177.47	16.1
5.0	0.69	109.3	2.88	9.17	-0.2	0.098	-14.7	0.12	147.40	13.2
6.0	0.71	87.9	2.41	7.65	-21.4	0.109	-25.2	0.14	113.68	11.5
7.0	0.73	67.7	2.07	6.32	-42.3	0.120	-37.1	0.18	85.11	10.4
8.0	0.76	48.3	1.80	5.11	-62.9	0.132	-49.5	0.23	61.45	9.5
9.0	0.79	29.2	1.57	3.89	-83.3	0.141	-63.7	0.29	40.79	8.9
10.0	0.83	10.0	1.36	2.67	-104.0	0.147	-78.5	0.37	21.58	8.7
11.0	0.86	-8.7	1.17	1.39	-124.4	0.149	-93.8	0.45	3.68	9.0
12.0	0.89	-26.6	1.01	0.07	-144.6	0.148	-109.3	0.52	-13.33	8.3
13.0	0.91	-44.3	0.86	-1.30	-164.7	0.145	-125.2	0.59	-30.14	7.7
14.0	0.93	-61.0	0.73	-2.74	175.9	0.139	-140.7	0.64	-46.34	7.2
15.0	0.94	-73.6	0.62	-4.20	160.0	0.130	-153.6	0.70	-59.12	6.8
16.0	0.96	-83.7	0.52	-5.72	146.0	0.119	-163.2	0.74	-70.10	6.4
17.0	0.96	-94.8	0.44	-7.22	131.2	0.109	-174.6	0.78	-82.42	6.0
18.0	0.95	-106.7	0.36	-8.78	115.2	0.101	174.7	0.80	-95.97	5.6

MAXIMUM STABLE GAIN (MSG)/MAXIMUM AVAILABLE GAIN (MAG) vs. FREQUENCY
VDS=3V & IDS=20mA



Typical Noise Parameters, V_{DS}=3V and I_{DS}=20 mA (Fig. 3)

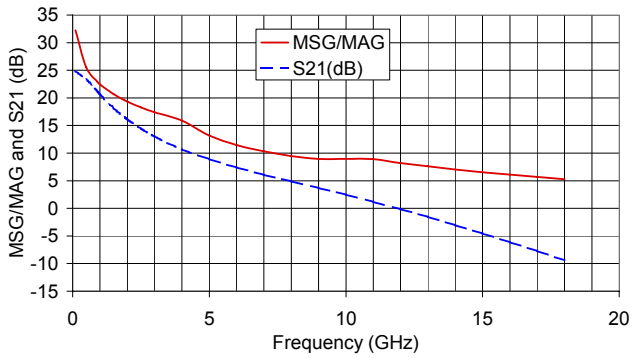
Freq. (GHz)	F Min. (dB)	ΓOpt (Magnitude)	ΓOpt (Angle)	Rn/50	Ga Associated Gain (dB)
0.5	0.07	0.30	16.9	0.09	26.1
0.7	0.11	0.32	28.9	0.08	24.3
0.9	0.14	0.33	40.7	0.07	22.6
1.0	0.16	0.34	46.5	0.06	21.9
1.9	0.32	0.40	96.1	0.04	17.3
2.0	0.34	0.40	101.3	0.04	17.0
2.4	0.41	0.43	121.6	0.03	15.8
3.0	0.52	0.45	150.2	0.04	14.4
3.9	0.68	0.48	-170.9	0.05	12.9
5.0	0.88	0.50	-129.8	0.10	11.5
5.8	1.02	0.50	-104.4	0.16	10.5
6.0	1.06	0.50	-98.7	0.17	10.3

Notes:
F Min.: Minimum Noise Figure
ΓOpt: Optimum Source Reflection Coefficient
Rn: Equivalent noise resistance

Typical S-parameters, V_{DS}=4V and I_{DS}=15 mA (Fig. 3)

Freq. (GHz)	S11		S21			S12		S22		MSG/MAG (dB)
	Mag.	Avg.	Mag.	Avg.	dB	Mag.	Ang.	Mag.	Ang.	
0.1	1.00	-14.1	17.47	24.85	171.0	0.010	82.0	0.70	-9.56	32.2
0.5	0.91	-64.1	14.72	23.36	137.6	0.041	55.0	0.60	-41.18	25.5
0.9	0.81	-101.4	11.45	21.18	113.4	0.059	36.8	0.47	-63.63	22.9
1.0	0.79	-109.3	10.76	20.64	108.4	0.061	33.6	0.44	-68.52	22.5
1.5	0.73	-140.6	8.09	18.16	88.1	0.070	20.6	0.33	-87.06	20.7
1.9	0.70	-159.4	6.67	16.48	75.0	0.073	13.9	0.28	-99.01	19.6
2.0	0.70	-163.5	6.39	16.11	72.1	0.074	12.3	0.26	-101.74	19.3
2.5	0.69	177.9	5.27	14.43	58.2	0.078	5.8	0.22	-114.83	18.3
3.0	0.68	161.9	4.47	13.01	45.4	0.081	0.5	0.19	-127.53	17.4
4.0	0.68	134.5	3.42	10.69	21.8	0.088	-8.7	0.14	-153.81	15.9
5.0	0.69	110.7	2.78	8.89	-0.3	0.095	-17.7	0.12	174.29	13.2
6.0	0.71	89.0	2.34	7.40	-21.8	0.105	-27.0	0.12	137.36	11.5
7.0	0.74	68.5	2.02	6.09	-43.0	0.116	-37.9	0.15	102.05	10.3
8.0	0.76	48.9	1.75	4.88	-63.9	0.126	-49.4	0.20	73.74	9.5
9.0	0.80	29.6	1.53	3.69	-84.8	0.136	-63.1	0.26	49.94	8.9
10.0	0.83	10.3	1.33	2.47	-105.8	0.143	-77.3	0.34	28.74	9.0
11.0	0.87	-8.5	1.15	1.18	-126.6	0.147	-92.5	0.43	9.54	8.9
12.0	0.89	-26.6	0.98	-0.15	-147.1	0.148	-108.1	0.51	-8.53	8.2
13.0	0.91	-44.5	0.84	-1.55	-167.6	0.145	-124.3	0.57	-26.10	7.6
14.0	0.93	-61.3	0.71	-3.03	172.6	0.140	-140.1	0.64	-43.02	7.0
15.0	0.94	-74.1	0.59	-4.56	156.4	0.131	-153.3	0.70	-56.54	6.5
16.0	0.96	-84.4	0.49	-6.15	142.1	0.120	-163.4	0.75	-68.00	6.1
17.0	0.96	-95.6	0.41	-7.73	127.1	0.110	-174.8	0.79	-80.81	5.7
18.0	0.95	-107.5	0.34	-9.39	111.2	0.101	173.9	0.81	-94.81	5.3

MAXIMUM STABLE GAIN (MSG)/MAXIMUM AVAILABLE GAIN (MAG) vs. FREQUENCY
VDS=4V & IDS=15mA

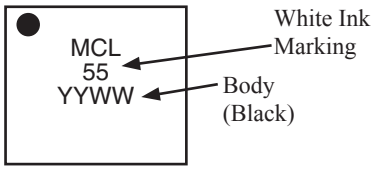


Typical Noise Parameters, V_{DS}=4V and I_{DS}=15 mA (Fig. 3)

Freq. (GHz)	F Min. (dB)	ΓOpt (Magnitude)	ΓOpt (Angle)	Rn/50	Ga Associated Gain (dB)
0.5	0.08	0.36	24.7	0.08	26.4
0.7	0.12	0.37	35.2	0.07	24.4
0.9	0.15	0.38	45.5	0.06	22.6
1.0	0.17	0.38	50.6	0.06	21.8
1.9	0.32	0.42	95.1	0.04	17.0
2.0	0.33	0.43	99.8	0.04	16.6
2.4	0.40	0.44	118.4	0.04	15.4
3.0	0.50	0.46	145.3	0.04	13.9
3.9	0.65	0.48	-176.9	0.06	12.4
5.0	0.84	0.50	-134.8	0.10	11.2
5.8	0.98	0.50	-107.0	0.15	10.3
6.0	1.01	0.50	-100.4	0.17	10.1

Notes:
F Min.: Minimum Noise Figure
ΓOpt: Optimum Source Reflection Coefficient
Rn: Equivalent noise resistance

Product Marking



Additional Detailed Technical Information

Additional information is available on our web site www.minicircuits.com. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: FG873
Plastic low profile 3mm x 3mm, lead finish: tin/silver/nickel

Suggested Layout for PCB Design: PL-301

Tape & Reel: F68

Characterization Test Board: TB-154+

Environmental Ratings: ENV08T2

ESD Rating

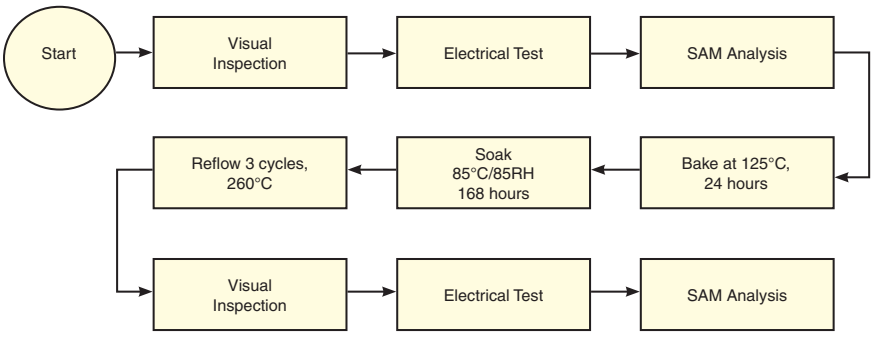
Human Body Model (HBM): Class 1A (250 V to < 500 V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (40 V) in accordance with ANSI/ESD STM 5.2 - 1999

MSL Rating

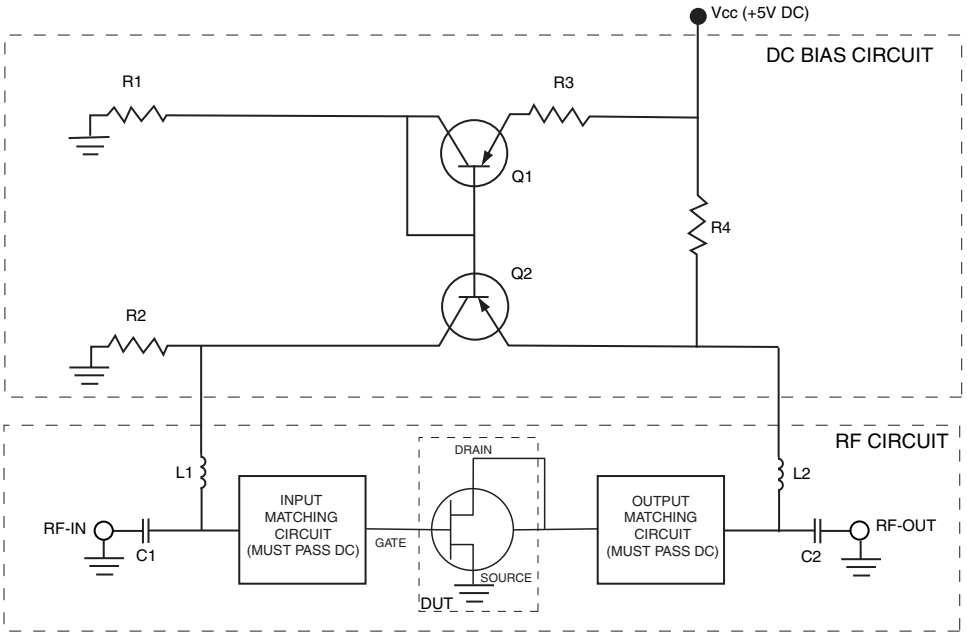
Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020D

MSL Test Flow Chart



Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

Recommended Application Circuit



VDS, V (nom)	3	4
IDS, mA (nom)	15mA	15mA
R1	4320	4320
R2	4320	4320
R3	3570	1210
R4	133	68.1
Q1	MMBT3906*	MMBT3906*
Q2	MMBT3906*	MMBT3906*
C1	0.01µF	0.01µF
C2	0.01µF	0.01µF
L1**	840nH	840nH
L2**	840nH	840nH

* Fairchild Semiconductor™ part number
** Piconics™ part number CC45T47K240G5

Optimized Amplifier Circuits

For band specific, drop-in modules, and as an alternative to designing circuits, please refer to Mini-Circuits TAMP and RAMP series models which are based upon SAV/TAV E-PHEMT's and include all DC blocking, bias, matching and stabilization circuitry, without need for any external components.