

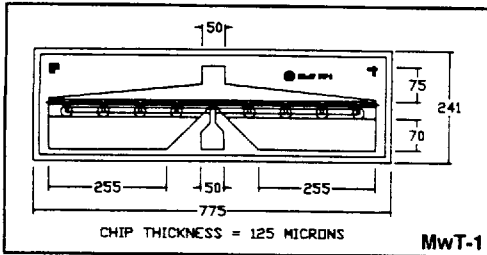


# MwT - 1

## 12 GHz High Gain GaAs FET

**MicroWave Technology**

4268 Solar Way Fremont, CA 94538 510-651-6700 FAX 510-651-2208



### FEATURES

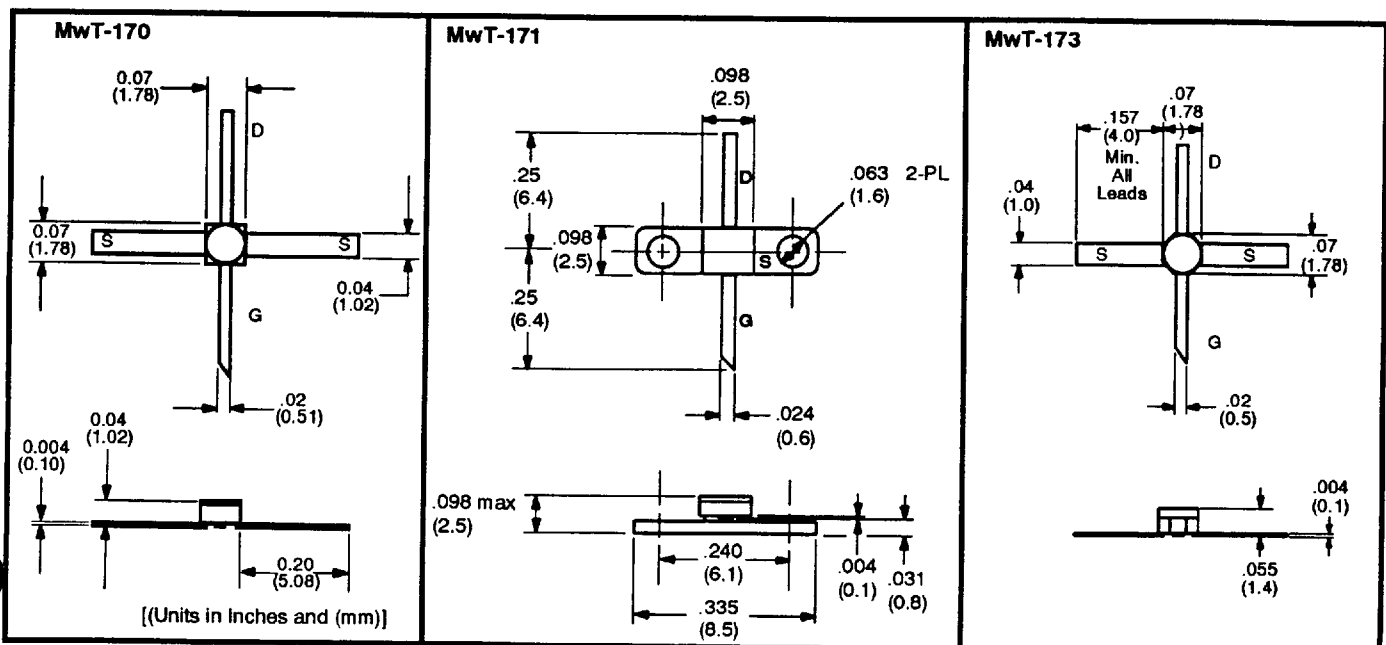
- 10 dB GAIN AT 12 GHz
- EXCELLENT FOR FEEDBACK AMPLIFIER APPLICATIONS, 100 MHz TO 12 GHz
- 0.3 MICRON REFRACTORY METAL / GOLD GATE
- 630 MICRON GATE WIDTH
- CHOICE OF CHIP AND THREE PACKAGE TYPES

### DESCRIPTION

The MwT-1 is a GaAs MESFET device whose nominal quarter-micron gate length and 630 micron gate width make it ideally suited to applications requiring high-gain in the 100 MHz to 12 GHz frequency range. The straight gate geometry of the MwT-1 makes it equally effective for either wideband (ex. 2 to 6 GHz) or narrow-band applications (ex. 2.4 to 2.5 GHz). The chip is produced using MwT's reliable metal system and all devices are screened to insure reliability. All chips are passivated using MwT's patented "Diamond-Like Carbon" process for durability with no degradation in performance. Designers can use MwT's unique BIN selection feature to choose devices from narrow Idss ranges, insuring consistent circuit operation.

### RF SPECIFICATIONS AT Ta = 25°C

SYMBOL	PARAMETERS AND CONDITIONS	FREQ	UNITS	MwT-1GG MwT-170 GG MwT-171GG MwT-173 GG			MwT-1 SG MwT-170 SG MwT-171SG MwT-173 SG			MwT-1 HG MwT-170 HG MwT-171HG MwT-173 HG		
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
SSG	Small Signal Gain VDS=5.0V IDS=0.6 IDSS	12 GHz	dB	8.5	9.0		9.0	9.5		9.0	10.0	
P1dB	Output Power at 1dB Compression VDS=5.0V IDS= 0.6 IDSS	12 GHz	dBm		21.0		21.0	22.0		23.0	24.0	
NFopt	Optimum Noise Figure VDS = 3.0 V IDS = 30 mA	12 GHz	dB		2.5			2.5	3.0		2.5	3.5



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**DC SPECIFICATIONS AT Ta = 25 °C**

SYMBOL	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
Idss	Saturated Drain Current Vds = 4.0 V VGS = 0.0 V	mA	60		240
Gm	Transconductance Vds = 4.0 V VGS = 0.0 V	mS	90	100	
Vp	Pinch-off Voltage Vds = 3.0 V IDS = 4.0 mA	V		-2.0	-5.0
BVGSO	Gate-to-Source Breakdown Voltage Igs = -1.0 mA	V	-5.0	-10.0	
BVGDO	Gate-to-Drain Breakdown Voltage Igd = -1.0 mA	V	-6.0	-10.0	
Rth	Thermal Resistance MwT-1, MwT-171 MwT-170, 173	°C/W			80 180*

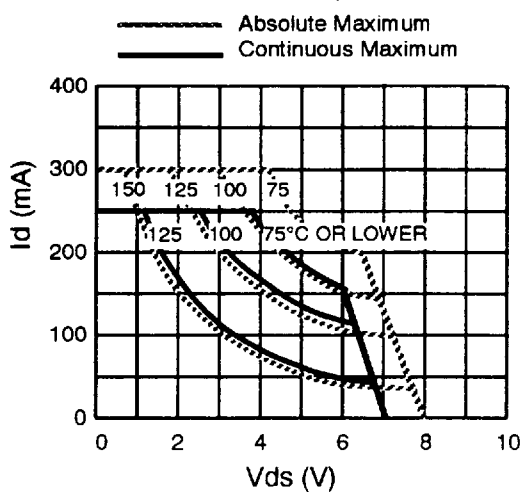
\* Overall Rth depends on case mounting

**MAXIMUM RATINGS AT Ta = 25 °C**

SYMBOL	PARAMETER	UNITS	CONT MAX <sup>1</sup>	ABSOLUTE MAX <sup>2</sup>
VDS	Drain to Source Voltage	V	See Safe Operating Limits	
Tch	Channel Temperature	°C	+150	+175
Tst	Storage Temperature	°C	-65 to +150	+175
Pin	RF Input Power	mW	125	250

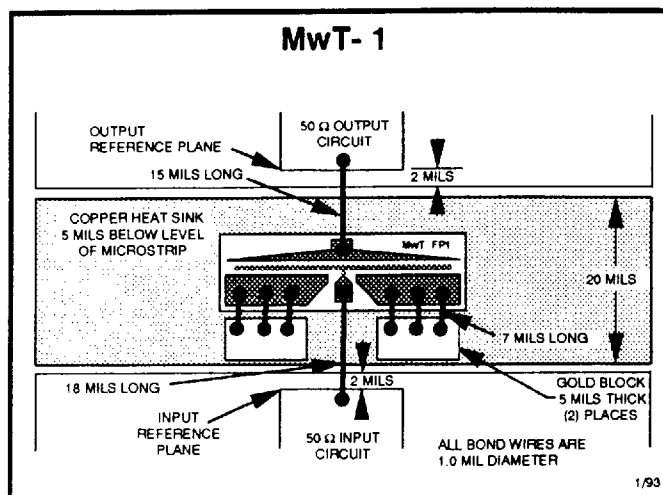
- NOTES: 1. Exceeding any one of these limits in continuous operation may reduce the mean-time-to-failure below the design goals.  
2. Exceeding any one of these limits may cause permanent damage.

**SAFE OPERATING LIMITS vs. Case Temperature**



**RECOMMENDED ASSEMBLY CONFIGURATION**

Shown below is the assembly and bonding configuration used for S-Parameter measurements of the MwT-1 Chip and is recommended for optimum performance. For self-bias applications the gold blocks may be replaced by capacitors. An additional interconnecting bond would then be required. Contact MwT for additional applications information.





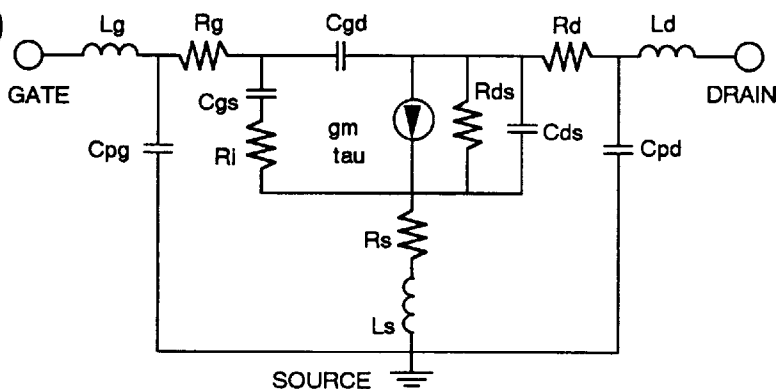
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**TYPICAL COMMON SOURCE SCATTERING PARAMETERS**

MwT-1 CHIP: VDS = 5.0 V, IDS = 0.5 IDSS = 60 mA

FREQUENCY (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1000	.98	-29.3	5.66	159.7	.02	73.9	.36	-16.0
2000	.94	-56.6	5.20	141.0	.04	59.5	.33	-30.7
3000	.88	-80.9	4.62	124.6	.05	47.3	.31	-43.5
4000	.83	-102.1	4.06	110.4	.06	37.2	.28	-54.6
5000	.80	-120.5	3.56	98.1	.07	29.0	.26	-64.6
6000	.77	-136.6	3.14	87.2	.07	22.1	.25	-73.9
7000	.75	-150.7	2.78	77.4	.08	16.2	.24	-82.8
8000	.74	-163.2	2.48	68.3	.08	10.9	.23	-91.5
9000	.74	-174.3	2.23	59.9	.08	6.2	.23	-100.1
10000	.73	175.6	2.02	52.2	.08	1.9	.23	-108.6
12000	.74	158.4	1.68	37.3	.08	-6.1	.24	-125.2
14000	.75	144.0	1.42	23.7	.09	-13.4	.27	-140.7
16000	.76	131.8	1.21	10.9	.09	-20.4	.30	-155.1
18000	.77	121.4	1.04	-1.3	.09	-27.3	.34	-168.1

**DEVICE EQUIVALENT CIRCUIT MODEL**



PARAMETER		VALUE
Gate Bond Wire Inductance	Lg	.314 nH
Gate Pad Capacitance	Cpg	.09 pF
Gate Resistance	Rg	0.83 Ω
Gate-Source Capacitance	Cgs	.64 pF
Channel Resistance	Ri	4.11 Ω
Gate-Drain Capacitance	Cgd	.04 pF
Transconductance	gm	108 mS
Transit time	tau	1.1 psec
Source Resistance	Rs	1.88 Ω
Source Inductance	Ls	.04 nH
Drain-Source Resistance	Rds	85 Ω
Drain-Source Capacitance	Cds	.001 pF
Drain Resistance	Rd	2.90 Ω
Drain Pad Capacitance	Cpd	.145 pF
Drain Inductance	Ld	.240 nH

**BIN SELECTION**

Every MwT-1 wafer produced is 100% DC probed, binned by Idss in 10 ma increments, and sample devices are evaluated for RF performance. Users may select devices from 18 Idss bins to insure consistent matched performance in the circuit. The shaded bins are typically available in smaller quantity and caution is advised before designing these bins into high production applications. Availability in three visual grades insures the most economical solution for the application.

BIN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IDSS (mA)	60-70	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180	180-190	190-200	200-210	210-220	220-230	230-240



# MwT-1

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## TYPICAL COMMON SOURCE SCATTERING PARAMETERS

MwT-170SG: VDS = 5.0 V, IDS = 0.5 IDSS = 60 mA

FREQUENCY (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.00	.92	-46.0	6.56	142.1	.03	60.2	.41	-31.3
2.00	.78	-77.6	5.11	115.9	.05	45.0	.43	-48.4
3.00	.69	-100.8	4.19	97.2	.06	35.6	.41	-57.3
4.00	.62	-125.5	3.73	80.8	.07	30.0	.38	-64.8
5.00	.57	-156.0	3.47	64.6	.08	25.1	.29	-73.0
6.00	.61	174.2	3.25	47.1	.09	17.9	.23	-92.2
7.00	.69	149.3	3.01	29.9	.08	5.3	.17	-128.9
8.00	.81	130.5	2.80	14.7	.08	1.5	.20	-173.6
9.00	.86	116.6	2.57	-3.3	.09	4.8	.29	172.6
10.00	.82	108.4	2.28	-18.7	.12	-9.9	.39	172.0
11.00	.84	97.2	2.11	-33.8	.11	-32.0	.49	165.1
12.00	.86	79.6	2.01	-51.4	.10	-46.9	.55	154.6

MwT-171: VDS = 5.0 V, IDS = 0.6 IDSS = 105 mA

FREQUENCY (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.00	.94	-54.2	7.55	141.6	.03	57.0	.42	-37.8
2.00	.86	-93.0	5.80	113.3	.05	34.8	.37	-63.8
3.00	.81	-118.1	4.54	93.5	.06	21.0	.36	-80.6
4.00	.77	-135.6	3.73	77.8	.06	8.5	.34	-91.0
5.00	.77	-149.5	3.34	63.7	.06	4.2	.37	-99.5
6.00	.76	-165.3	3.07	48.7	.07	-6.5	.36	-109.9
7.00	.76	177.1	2.98	32.2	.07	-17.4	.35	-120.2
8.00	.77	155.3	2.84	14.9	.08	-30.7	.30	-136.0
9.00	.78	132.8	2.69	-2.7	.08	-43.6	.24	-152.7
10.00	.80	112.4	2.58	-20.7	.09	-52.3	.20	-174.6
11.00	.83	94.1	2.44	-38.3	.10	-60.0	.20	162.0
12.00	.83	77.0	2.27	-56.1	.10	-74.0	.24	142.1
14.00	.76	43.8	2.02	-91.3	.11	-92.2	.24	121.1
16.00	.65	1.4	1.66	-132.3	.14	-118.5	.11	97.2
18.00	.59	-41.4	1.38	-168.6	.20	-132.8	.07	-46.4

MwT-173SG: VDS = 5.0 V, IDS = 0.5 IDSS = 75 mA

FREQUENCY (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1.00	.91	-49.9	7.18	143.3	.04	62.6	.46	-28.4
2.00	.79	-86.8	5.72	116.6	.05	47.2	.41	-46.6
3.00	.70	-115.3	4.74	96.3	.07	38.8	.38	-60.1
4.00	.61	-145.3	4.07	77.4	.09	27.2	.32	-69.1
5.00	.57	-177.6	3.71	60.6	.08	20.4	.27	-75.3
6.00	.64	148.3	3.32	39.7	.09	14.3	.21	-99.5
7.00	.73	120.8	2.81	21.5	.09	5.2	.15	-138.6
8.00	.83	103.0	2.43	6.4	.09	-0.2	.17	-176.9
9.00	.82	90.9	1.96	-8.9	.09	-6.6	.23	163.8
10.00	.84	85.3	1.68	-20.1	.10	-16.7	.30	154.5
11.00	.87	79.9	1.51	-29.7	.08	-26.0	.36	148.5
12.00	.89	71.5	1.43	-40.8	.08	-22.5	.39	143.2