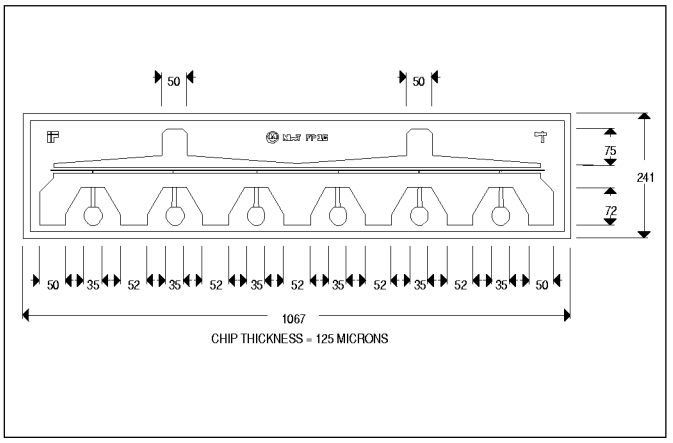
MICROWAVE TECHNOLOGY

MwT-16
26 GHz High Power GaAs FET



- **0.5 WATT POWER OUTPUT AT 12 GHz**
- **+39 dBm THIRD ORDER INTERCEPT**
- **HIGH ASSOCIATED GAIN**
- **0.3 MICRON REFRACTORY METAL/GOLD GATE**
- **900 MICRON GATE WIDTH**
- **DIAMOND-LIKE CARBON PASSIVATION**

DESCRIPTION

The MwT-16 is a GaAs MESFET device whose nominal quarter-micron gate length and 900 micron gate width make it ideally suited to applications requiring high-power output in the 2 GHz to 18 GHz frequency range. The straight gate geometry of the MwT-16 makes it equally effective for either wideband (e.g. 6 to 18 GHz) or narrow-band applications. 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 increased durability. 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				MwT-16 HP	
SYMBOL	PARAMETERS AND CONDITIONS	FREQ	UNITS	MIN	TYP
P1dB	Output Power at 1dB Compression VDS=6.0 V IDS=150 mA	12 GHz	dBm	26.0	27.0
SSG	Small Signal Gain VDS=6.0 V IDS=150 mA	12 GHz	dB	7.5	8.5
PAE	Power Added Efficiency VDS=6.0 V IDS=150 mA	12GHz	%	25	35
IDSS	Recommended IDSS Range for Optimum P1dB		mA		240-330

AVAILABLE IN CHIP FORM ONLY

DC SPECIFICATIONS AT Ta = 25 °C

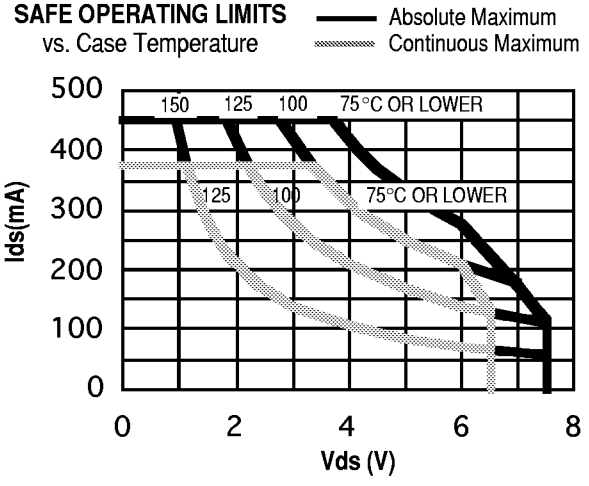
SYMBOL	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
Idss	Saturated Drain Current Vds=4.0 V VGS=0.0 V	mA	90		360
Gm	Transconductance Vds=2.0 V VGS=0.0 V	mS	108	130	
Vp	Pinch-off Voltage Vds=3.0 V IDS=6.0 mA	V		-2.0	-5.0
BVGSO	Gate-to-Source Breakdown Voltage Igs=-0.6 mA	V	-6.0	-12.0	
BVGDO	Gate-to-Drain Breakdown Voltage Igd=-0.6 mA	V	-8.0	-12.0	
Rth	Thermal Resistance MwT-16 Chip	°C/W		55	

MAXIMUM RATINGS AT Ta = 25 ° C

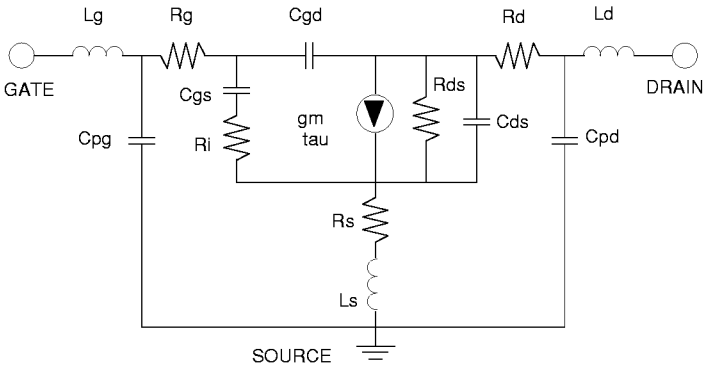
SYMBOL	PARAMETER	UNITS	CONT MAX[1]	ABSOLUTE MAX[2]
VDS	Drain to Source Voltage	V	See Safe Operating Limits	
Tch	Channel Temperature	°C	+150	+175
Tst	Storage Temperature	°C	-65 to +150	+175
Pin	RF Input Power	mW	280	430

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



DEVICE EQUIVALENT CIRCUIT MODEL

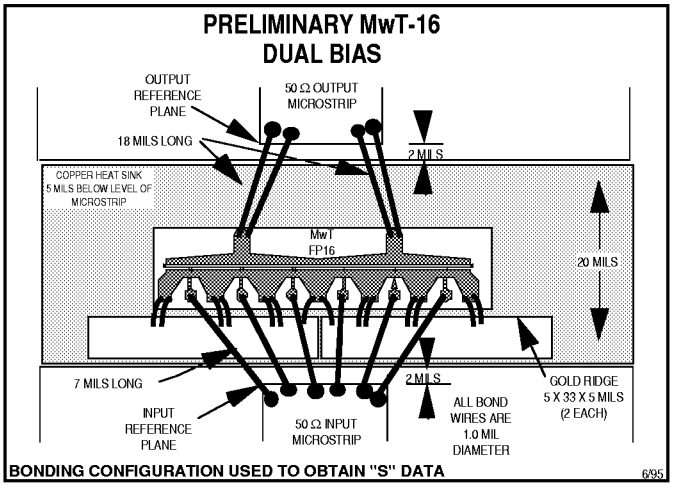


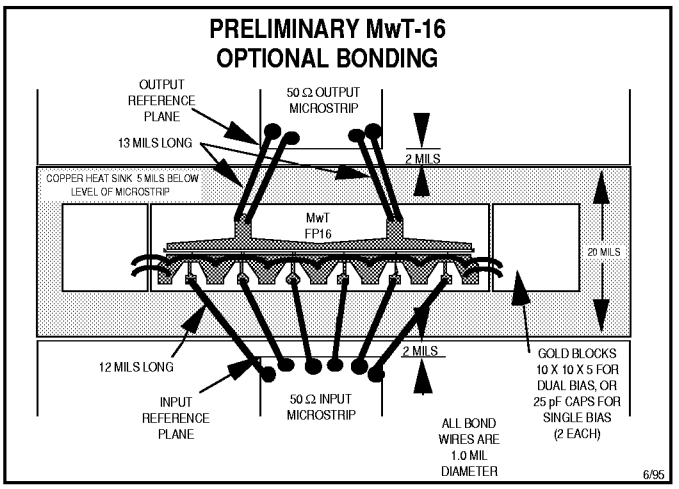
PARAMETER		VALUE	
Gate Bond Wire Inductance	Lg	0.05	nH
Gate Pad Capacitance	Cpg	0.50	pF
Gate Resistance	Rg	0.30	Ω
Gate-Source Capacitance	Cgs	0.85	pF
Channel Resistance	Ri	1.0	Ω
Gate-Drain Capacitance	Cgd	0.06	pF
Transconductance	gm	140.0	mS
Transit time	tau	1.9	psec

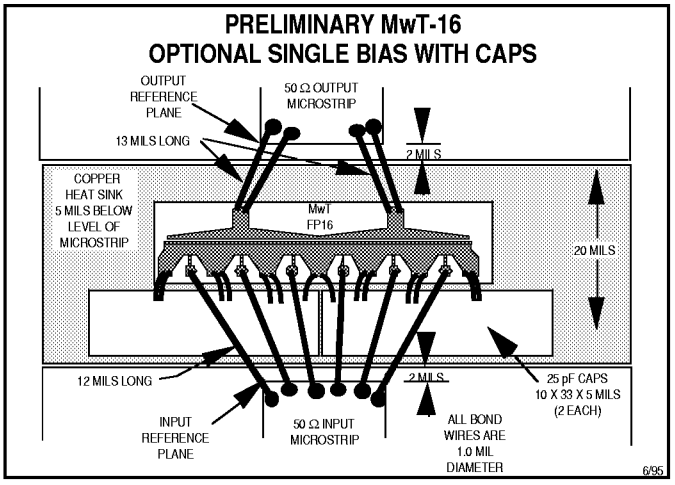
PARAMETER		VALUE	
Source Resistance	Rs	0.60	Ω
Source Inductance	Ls	0.04	nH
Drain-Source Resistance	Rds	150.0	Ω
Drain-Source Capacitance	Cds	0.01	pF
Drain Resistance	Rd	1.0	Ω
Drain Pad Capacitance	Cpd	0.20	pF
Drain Inductance	Ld	0.09	nH

RECOMMENDED ASSEMBLY CONFIGURATION

Shown below is the assembly and bonding configuration used for S-Parameter measurements of the MwT-16 chip. This configuration is recommended for optimum performance. For single-bias applications the gold blocks may be replaced by capacitors. An additional interconnecting bond would then be required. Contact MwT for additional applications information.







BIN SELECTION

Every MwT-16 wafer has been probed for Idss and the data stored on computer disk. Customers may select from Idss values in any of 18 current bins, as shown below, to insure consistent performance in their circuit. The shaded bins are typically available in smaller quantity and caution is advised before designing these bins into high production applications. MwT's "Smart Wafer Picker" reads the stored Idss Data from the disk and devices from customer selected bins are quickly and automatically picked from the wafer and loaded into shipping containers.

BIN#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IDSS (mA)	90-105	105-120	120-135	135-150	150-165	165-180	180-195	195-210	210-225	225-240	240-255	255-270	270-285	285-300	300-315	315-330	330-345	345-360

BIN ACCURACY

Due to the effects of temperature, dc loading and probe tip varnishing, the IDSS from the "on wafer" probing of any MwT device may differ after it has been attached to a proper heat sink and tested in an RF or DC circuit.

Because of the aforementioned effects, the IDSS distribution may deviate as much as +/- 1 bin within the range identified on the label of each die shipping container, and +/- 2 bins within the selected range.

DEVICE HANDLING PROCEDURE

1) Open package in clean room environment only.
2) GaAs FETs are sensitive to electrostatic discharge. Precautions should be taken in handling, die attachment, and bonding to assure that Maximum Ratings are not exceeded as a result of electrical discharge.
3) Chips have been cleaned and are ready for die attachment. DO NOT attempt to re-clean.
4) Assembly should be performed with parts no hotter than 300° C. All circuit components (such as resistors and capacitors) should be assembled completely before the FET is die attached. Assembly should be performed as quickly as possible. In general, no chip should be left at 300°C for over 2 minutes.
5) Die attach with clean AuSn alloy under forming gas at 280 to 300° C. Scrub chip down with tweezers. Thermal resistance is critically dependent on this operation.
6) Thermasonic wedge bonding is recommended. A .0015 in. bond flat wedge at 125 to 150° C should be used with a heater stage temperature of 200 to 225° C. Apply 15 to 20 grams of bond force to .001 in. diameter gold wire with an elongation of 2 to 5%.
7) Store in a clean, dry, inert environment such as nitrogen at room temperature.
8) CAUTION: Handling of chips other than as specified above may cause permanent damage.

TYPICAL COMMON SOURCE SCATTERING PARAMETERS

MwT-16 CHIP: VDS = 6.0 V, IDS = 0.6 IDSS = 150 mA

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1000	.98	-55.3	8.48	147.8	.029	60.6	.47	-27.6
2000	.94	-92.0	6.51	123.9	.045	43.6	.40	-43.2
3000	.91	-116.0	5.02	107.4	.053	30.6	.36	-55.0
4000	.89	-130.7	4.03	96.0	.054	23.9	.35	-64.1
5000	.89	-141.5	3.35	86.5	.052	23.1	.34	-71.6
6000	.90	-149.8	2.86	77.7	.054	19.2	.35	-80.3
7000	.89	-156.1	2.45	70.0	.051	15.5	.37	-88.4
8000	.88	-160.8	2.14	63.3	.048	13.5	.40	-96.0
9000	.89	-164.2	1.89	57.7	.046	10.7	.42	-102.6
10000	.89	-167.4	1.71	51.9	.040	12.2	.46	-108.9
12000	.92	-172.9	1.41	41.4	.025	26.7	.51	-119.6
14000	.92	-177.0	1.17	30.9	.034	40.6	.58	-126.6
16000	.90	-179.1	.95	22.4	.030	44.2	.65	-133.0
18000	.91	179.1	.82	15.8	.025	52.0	.70	-137.5
20000	.92	177.0	.70	9.3	.026	82.2	.76	-141.1
22000	.91	176.0	.61	3.4	.033	77.5	.79	-142.4
24000	.90	174.8	.54	-3.0	.040	68.6	.79	-144.2
26000	.93	174.0	.50	-8.3	.023	77.5	.82	-145.1