

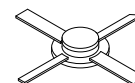
## The RF Line Microwave Linear Power Transistors

... designed primarily for large-signal output and driver amplifier stages in the 1.0 to 4.0 GHz frequency range.

- Designed for Class A or AB, Common-Emitter Linear Power Amplifiers
- Specified 20 Volt, 2.0 GHz Characteristics:  
Output Power — 0.5 Watt  
Power Gain — 10 to 11 dB
- 100% Tested for Load Mismatch at All Phase Angles with  $\infty:1$  VSWR
- Gold Metallization for Improved Reliability
- Diffused Ballast Resistors

**MRW54001**

10–11 dB  
1.0–4.0 GHz  
0.5 WATT  
MICROWAVE LINEAR  
POWER TRANSISTORS



CASE 400-01, STYLE 1  
(TW200)

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	22	Vdc
Collector-Base Voltage	$V_{CES}$	50	Vdc
Emitter-Base Voltage	$V_{EBO}$	3.5	Vdc
Operating Junction Temperature	$T_J$	200	°C
Storage Temperature Range	$T_{stg}$	-65 to +200	°C

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	40	°C/W

### ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 10$ mA, $I_B = 0$ )	$V_{(BR)CEO}$	22	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 10$ mA, $V_{BE} = 0$ )	$V_{(BR)CES}$	50	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 1.0$ mA, $I_E = 0$ )	$V_{(BR)CBO}$	45	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 0.25$ mA, $I_C = 0$ )	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 28$ V, $I_E = 0$ )	$I_{CBO}$	—	—	0.25	mAdc

### ON CHARACTERISTICS

DC Current Gain ( $I_C = 100$ mA, $V_{CE} = 5.0$ V)	$h_{FE}$	20	—	120	—
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### DYNAMIC CHARACTERISTICS

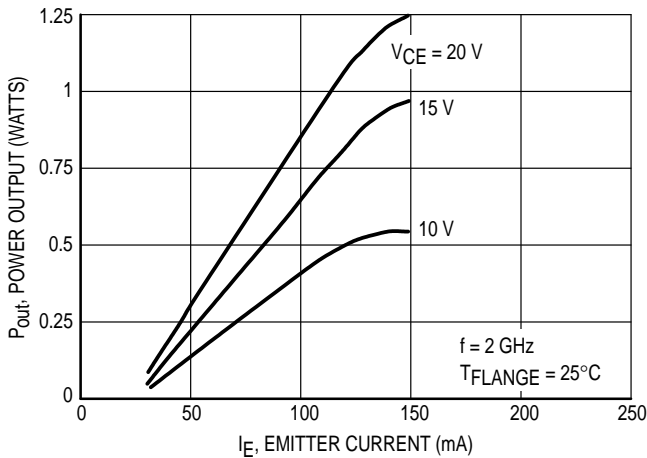
Output Capacitance ( $V_{CB} = 28$ V, $I_E = 0$ , $f = 1.0$ MHz)	$C_{ob}$	—	—	3.5	pF
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(continued)

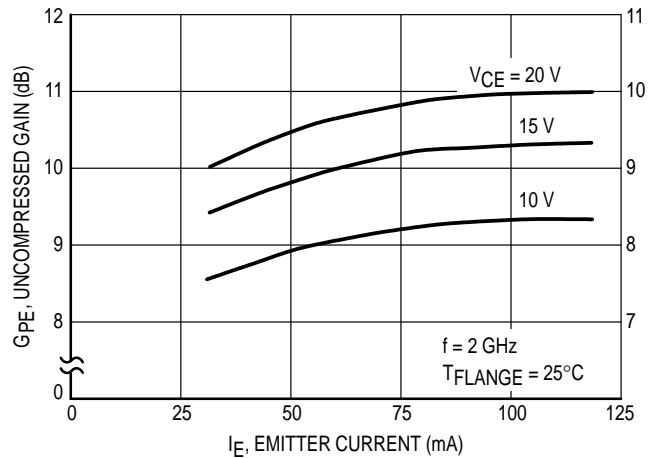
**ELECTRICAL CHARACTERISTICS — continued**

Characteristic	Symbol	Min	Typ	Max	Unit
<b>FUNCTIONAL TESTS</b>					
Common-Emitter Amplifier Power Gain ( $V_{CE} = 20\text{ V}$ , $P_{out} = 0.5\text{ W}$ , $f = 2.0\text{ GHz}$ , $I_E = 120\text{ mA}$ )	$G_{PE}$	10	—	—	dB
Load Mismatch ( $V_{CE} = 20\text{ V}$ , $I_E = 120\text{ mA}$ , $P_{out} = 0.5\text{ W}$ , $f = 2.0\text{ GHz}$ , Load VSWR = $\infty:1$ , All Phase Angles)	$\psi$	No Degradation in Output Power			
Cutoff Frequency ( $V_{CE} = 20\text{ V}$ , $I_E = 120\text{ mA}$ )	$f_t$	4.0	4.5	—	GHz
Gain Linearity ( $V_{CE} = 20\text{ V}$ , $I_E = 120\text{ mA}$ , $f = 2.0\text{ GHz}$ , $P_{O1} = 0.5\text{ W}$ , $P_{O2} = 0.5\text{ mW}$ )	$L_G$	—	—	-0.2 +1.0	dB
Intermodulation Distortion, 3rd Order ( $V_{CE} = 20\text{ V}$ , $I_E = 120\text{ mA}$ , $P_O$ (PEP) = 0.5 W, Tones at 2.0 GHz and 2.005 GHz)	IMD	—	-30	—	dB

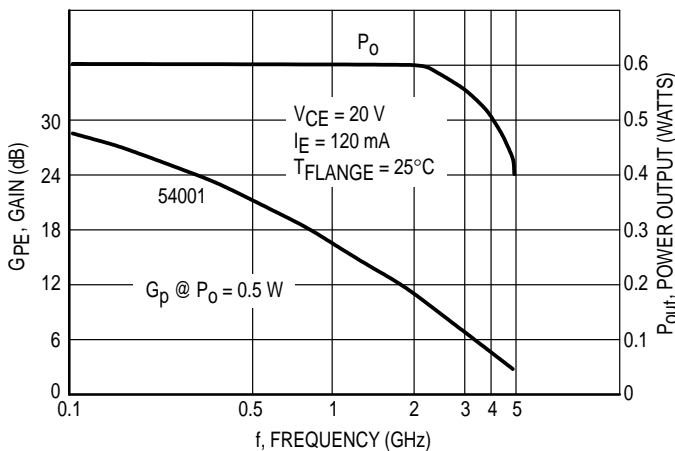
**TYPICAL CHARACTERISTICS**



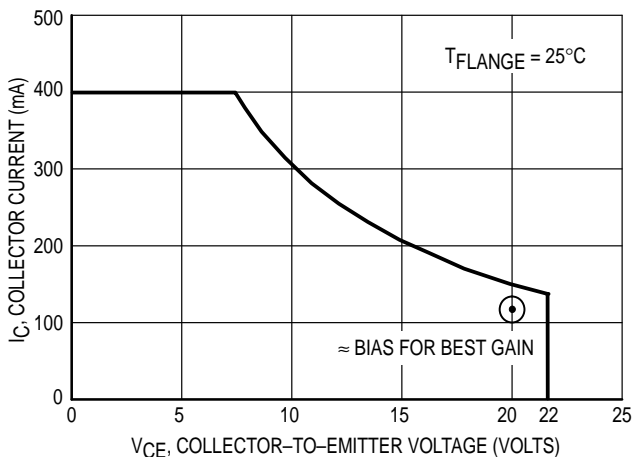
**Figure 1. 1.0 dB Compression Point versus Emitter Current**



**Figure 2. Gain versus Emitter Current**



**Figure 3. Gain and 1.0 dB Compressed Power versus Frequency**

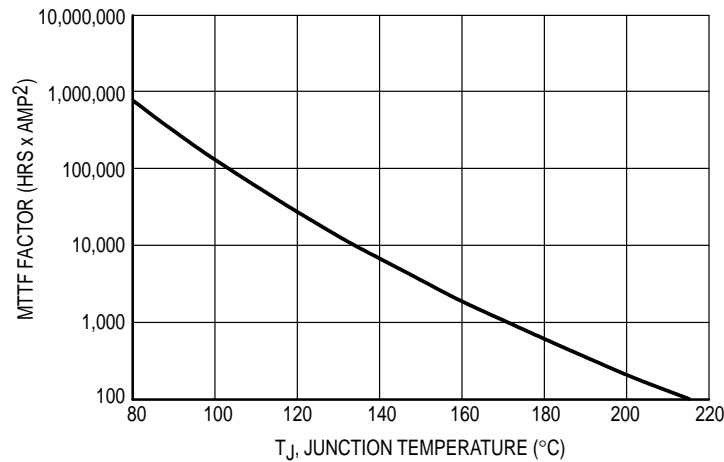


**Figure 4. DC Safe Operating Area**

V <sub>CE</sub> (Volts)	I <sub>C</sub> (mA)	f (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
			Mag	∠φ	Mag	∠φ	Mag	∠φ	Mag	∠φ
20	100	0.5	0.76	-177	6.65	74	0.03	20	0.43	-73
		1.0	0.76	159	3.24	39	0.03	24	0.50	-104
		1.3	0.76	148	2.46	21	0.04	25	0.56	-120
		1.5	0.75	141	2.07	9.0	0.04	24	0.60	-130
		1.7	0.76	134	1.80	-1.0	0.05	24	0.64	-140
		2.0	0.76	124	1.51	-14	0.06	22	0.68	-152
		2.3	0.74	113	1.27	-33	0.06	13	0.74	-167
		2.5	0.73	106	1.15	-43	0.07	9.0	0.76	-173
		2.7	0.72	98	1.06	-52	0.07	5.0	0.77	179
		3.2	0.69	85	0.95	-67	0.08	-4.0	0.82	170
		3.3	0.64	71	0.86	-81	0.09	-14	0.85	161
		3.5	0.61	60	0.81	-94	0.10	-22	0.87	155
		3.7	0.57	47	0.77	-103	0.10	-30	0.80	149
		4.0	0.51	24	0.70	-119	0.11	-44	0.92	141

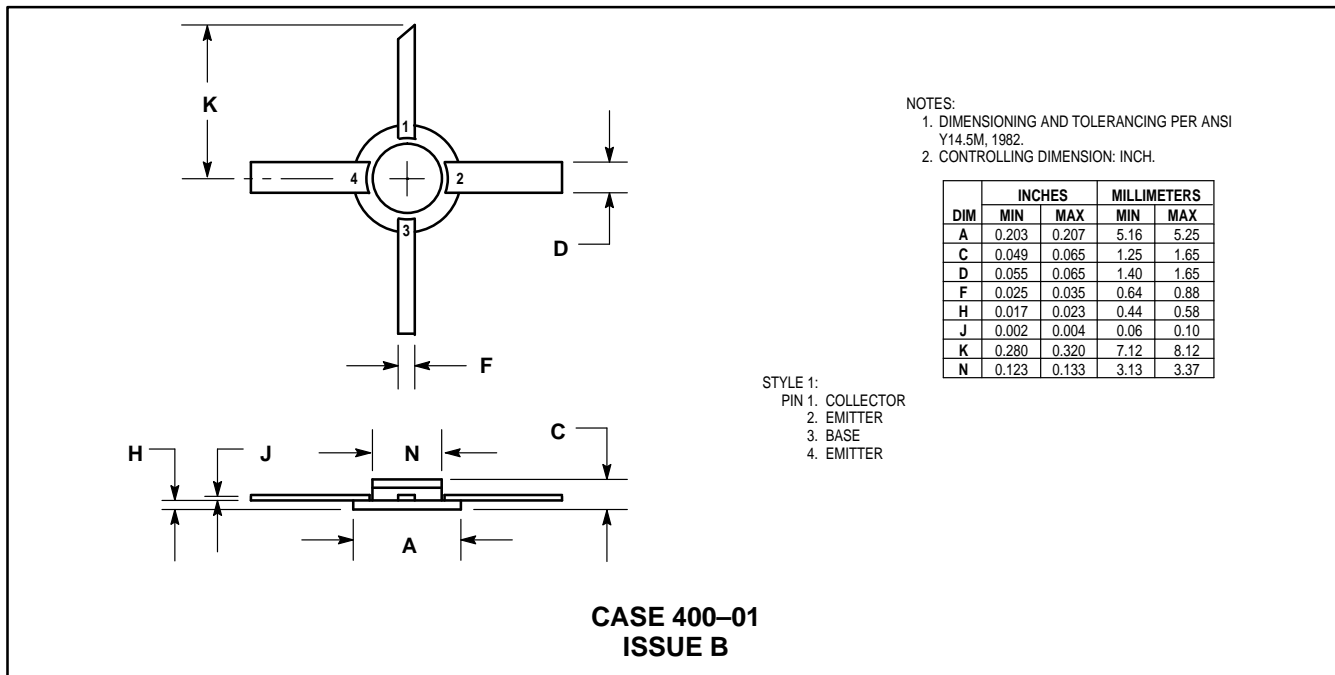
**Table 1. MRW54001 Common Emitter S-Parameters**

The graph shown below displays MTTF in hours x ampere<sup>2</sup> emitter current for each of the devices. Life tests at elevated temperatures have correlated to better than ±10% to the theoretical prediction for metal failure. Divide MTTF by I<sub>C</sub><sup>2</sup> for MTTF in a particular application.



**Figure 5. MTTF Factor versus Junction Temperature**


## PACKAGE DIMENSIONS



NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.203	0.207	5.16	5.25
C	0.049	0.065	1.25	1.65
D	0.055	0.065	1.40	1.65
F	0.025	0.035	0.64	0.88
H	0.017	0.023	0.44	0.58
J	0.002	0.004	0.06	0.10
K	0.280	0.320	7.12	8.12
N	0.123	0.133	3.13	3.37

STYLE 1:  
 PIN 1. COLLECTOR  
 2. EMITTER  
 3. BASE  
 4. EMITTER

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