

The RF Line

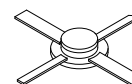
Microwave Linear Power Transistors

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

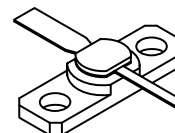
- Designed for Class A or AB, Common-Emitter Linear Power Amplifiers
- Specified 20 Volt, 2.0 GHz Characteristics:
Output Power — 0.5 Watt
Power Gain — 10 to 11 dB
- 100% Tested for Load Mismatch at All Phase Angles with $\infty:1$ VSWR
- Gold Metallization for Improved Reliability
- Diffused Ballast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

MRW54001
MRW54601

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



CASE 400-01, STYLE 1
(TW200)
MRW54001



CASE 328A-03, STYLE 1
(GP-13)
MRW54601

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
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain ($V_{CE} = 20\text{ V}$, $P_{out} = 0.5\text{ W}$, $f = 2.0\text{ GHz}$, $I_E = 120\text{ mA}$)	MRW54001 G_{PE}	10	—	—	dB
Common-Emitter Amplifier Power Gain ($V_{CE} = 20\text{ V}$, $P_{out} = 0.5\text{ W}$, $f = 2.0\text{ GHz}$, $I_E = 120\text{ mA}$)	MRW54601 G_{PE}	11	—	—	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)	ψ	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_0 (PEP) = 0.5 W, Tones at 2.0 GHz and 2.005 GHz)	IMD	—	-30	—	dB

TYPICAL CHARACTERISTICS

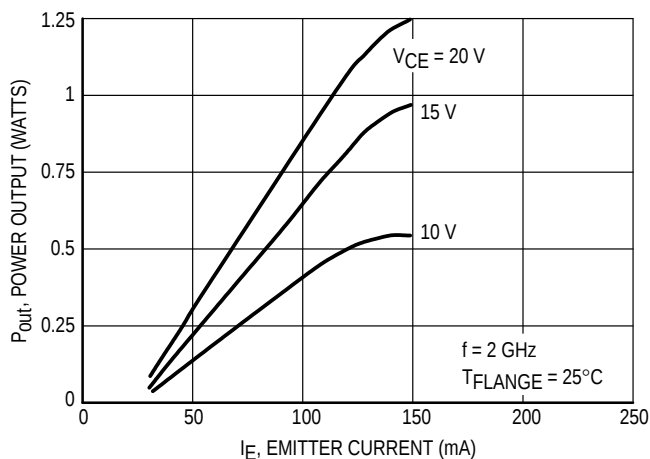


Figure 1. 1.0 dB Compression Point versus Emitter Current

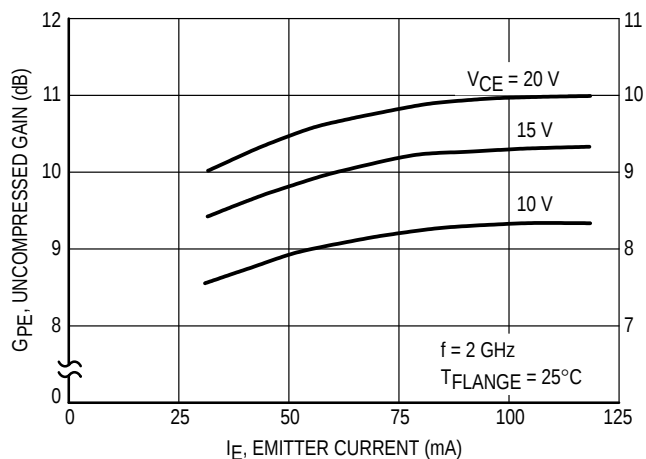


Figure 2. Gain versus Emitter Current

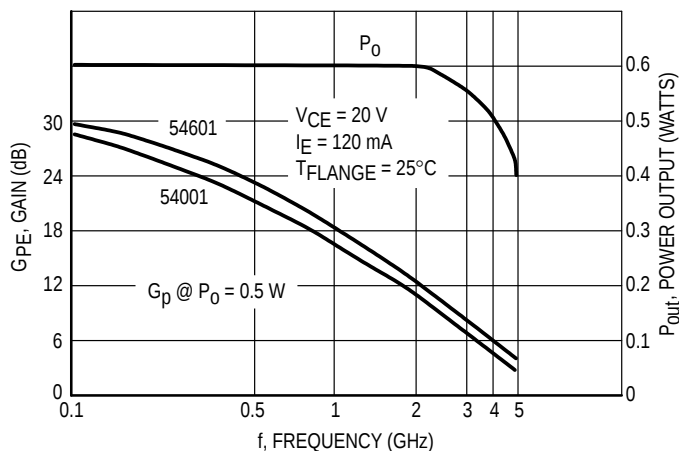


Figure 3. Gain and 1.0 dB Compressed Power versus Frequency

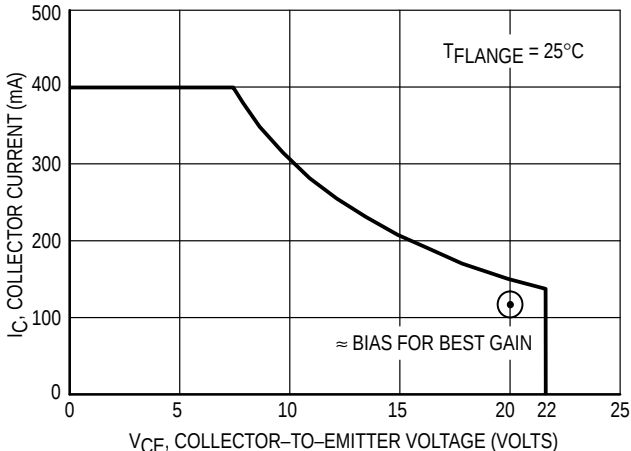


Figure 4. DC Safe Operating Area

V _{CE} (Volts)	I _C (mA)	f (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
			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

V _{CE} (Volts)	I _C (mA)	f (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
			Mag	φ	Mag	φ	Mag	φ	Mag	φ
20	100	0.5	0.77	-178	6.17	84	0.04	32	0.32	-57
		1.0	0.79	159	3.11	56	0.05	38	0.28	-75
		1.3	0.80	149	2.40	44	0.05	41	0.29	-88
		1.5	0.81	144	2.06	34	0.06	41	0.30	-98
		1.7	0.82	138	1.81	28	0.06	43	0.32	-108
		2.0	0.83	130	1.52	16	0.08	42	0.35	-121
		2.3	0.85	127	1.29	7.0	0.09	41	0.39	-135
		2.5	0.86	123	1.17	-1.0	0.10	39	0.41	-142
		2.7	0.87	119	1.06	-5.0	0.10	39	0.43	-150
		3.0	0.89	113	0.96	-16	0.12	35	0.48	-162
		3.3	0.89	105	0.83	-25	0.13	31	0.53	-172
		3.5	0.91	102	0.76	-31	0.14	27	0.57	-178
		3.7	0.93	98	0.70	-35	0.15	25	0.59	176
		4.0	0.89	90	0.62	-44	0.17	19	0.66	166

Table 2. MRW54601 Common Emitter S-Parameters

The graph shown below displays MTTF in hours x ampere² 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_C² for MTTF in a particular application.

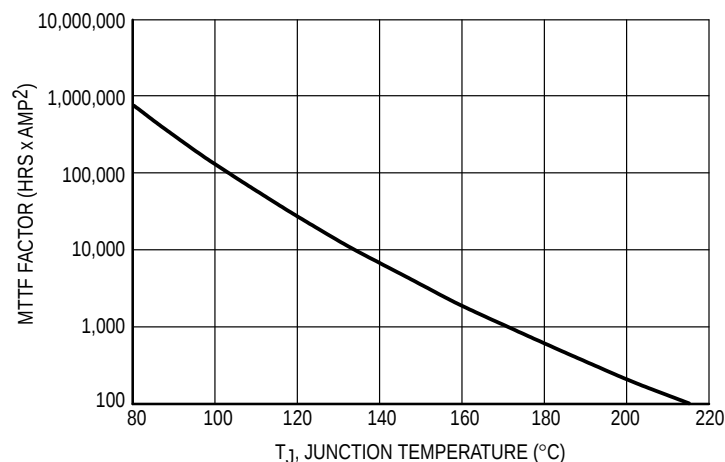
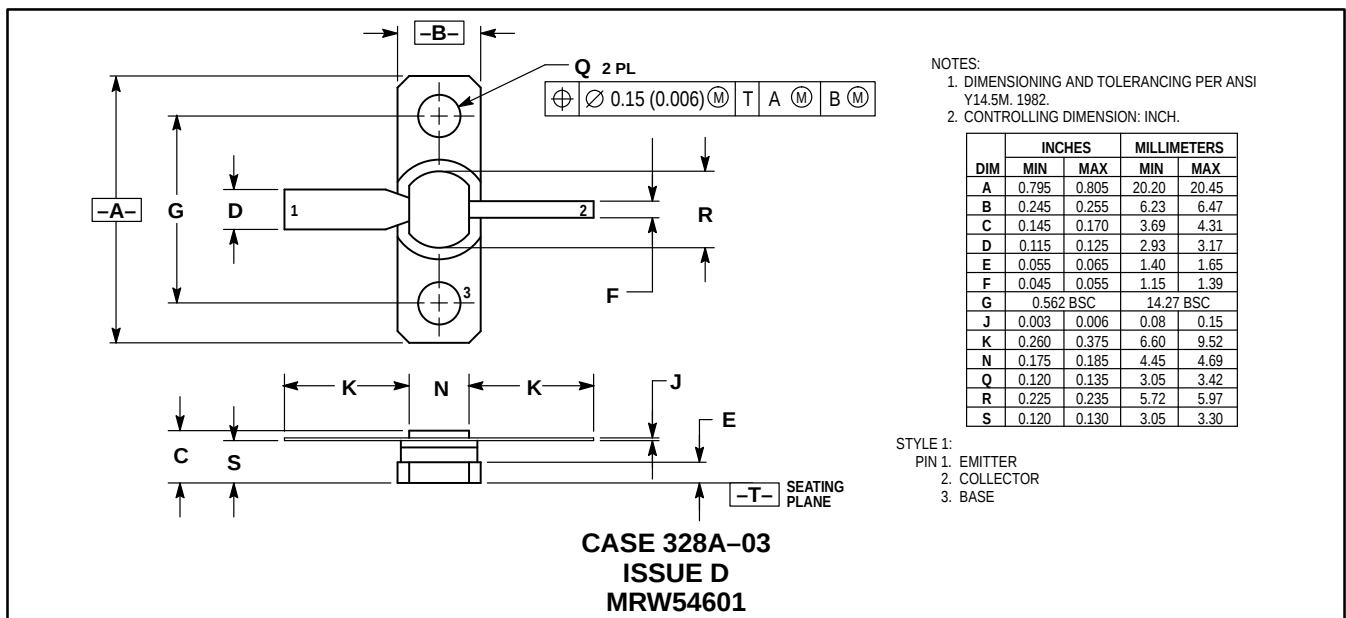
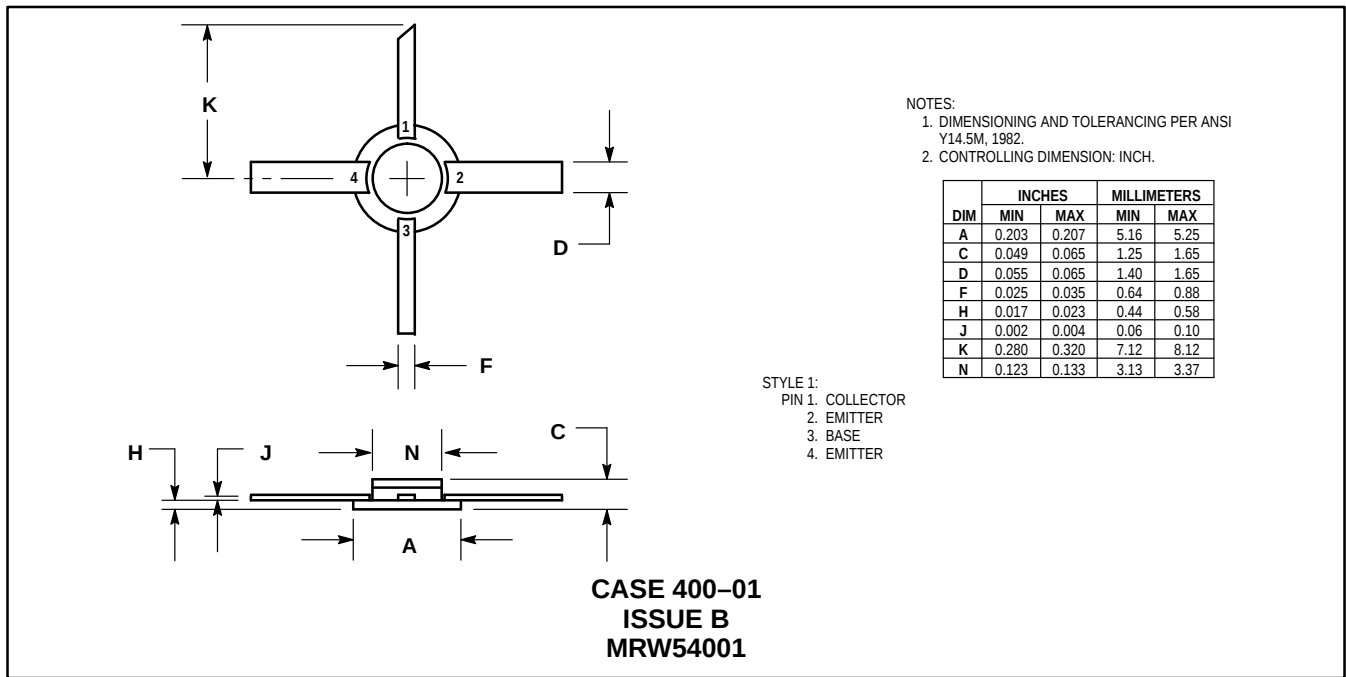


Figure 5. MTTF Factor versus Junction Temperature

PACKAGE DIMENSIONS



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MRW54001/D

