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by MRW3001/D

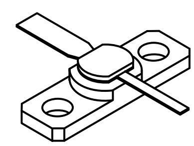
The RF Line
Microwave Power Transistors

MRW3001
MRW3003
MRW3005

. . . designed primarily for large–signal output and driver amplifier stages in the 1.5 to 3.0 GHz frequency range.

- Designed for Class B or C, Common Base Linear Power Amplifiers
- Specified 28 Volt, 3.0 GHz Characteristics:
  Output Power — 1.0 to 5.0 Watts
  Power Gain — 5.0 to 7.0 dB Min
  Collector Efficiency — 30% Min
- Gold Metallization for Improved Reliability
- Diffused Ballast Resistors
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

5.0 – 7.0 dB
1.5 – 3.0 GHz
1.0 – 5.0 WATTS
MICROWAVE
POWER TRANSISTORS



CASE 328A–03, STYLE 1
(GP–13)
MRW3001, 3003, 3005

MAXIMUM RATINGS

Rating	Symbol	3001	3003	3005	Unit
Collector–Base Voltage	V_{CBO}	45			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, RF, Junction to Case	$R_{\theta JC}$	35	17	8.5	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector–Emitter Breakdown Voltage		$V_{(BR)CES}$				Vdc
(I_C = 10 mA, V_{BE} = 0)	MRW3001		50	—	—	
(I_C = 30 mA, V_{BE} = 0)	MRW3003		50	—	—	
(I_C = 50 mA, V_{BE} = 0)	MRW3005		50	—	—	
Collector–Base Breakdown Voltage		$V_{(BR)CBO}$				Vdc
(I_C = 1.0 mA, I_E = 0)	MRW3001		45	—	—	
(I_C = 3.0 mA, I_E = 0)	MRW3003		45	—	—	
(I_C = 5.0 mA, I_E = 0)	MRW3005		45	—	—	
Emitter–Base Breakdown Voltage (I_E = 1.0 mA, I_C = 0)		$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current (V_{CB} = 28 V, I_E = 0)	MRW3001	I_{CBO}	—	—	0.5	mAdc
	MRW3003		—	—	0.75	
	MRW3005		—	—	1.25	
ON CHARACTERISTICS						
DC Current Gain		h_{FE}				—
(I_C = 100 mA, V_{CE} = 5.0 V)	MRW3001		10	—	120	
(I_C = 300 mA, V_{CE} = 5.0 V)	MRW3003		10	—	120	
(I_C = 500 mA, V_{CE} = 5.0 V)	MRW3005		10	—	120	

(continued)

MOTOROLA

ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS						
Output Capacitance (V_{CB} = 28 V, I_E = 0, f = 1.0 MHz)	MRW3001 MRW3003 MRW3005	C_{ob}	— — —	3.5 5.7 8.4	4.0 7.0 10	pF
FUNCTIONAL TESTS						
Common–Base Amplifier Power Gain (V_{CE} = 28 V, P_{out} = 1.0 W, f = 3.0 GHz) (V_{CE} = 28 V, P_{out} = 3.0 W, f = 3.0 GHz) (V_{CE} = 28 V, P_{out} = 5.0 W, f = 3.0 GHz)	 MRW3001 MRW3003 MRW3005	G_{PB}	 7.0 6.0 5.0	 — — —	 — — —	dB
Collector Efficiency (V_{CE} = 28 V, P_{out} = 1.0 W, f = 3.0 GHz) (V_{CE} = 28 V, P_{out} = 3.0 W, f = 3.0 GHz) (V_{CE} = 28 V, P_{out} = 5.0 W, f = 3.0 GHz)	 MRW3001 MRW3003 MRW3005	η_c	 30 30 30	 — — —	 — — —	%
Load Mismatch (V_{CE} = 28 V, f = 3.0 GHz, Load VSWR = ∞:1, All Phase Angles) P_{out} = 1.0 W P_{out} = 3.0 W P_{out} = 5.0 W	 MRW3001 MRW3003 MRW3005	ψ	No Degradation in Output Power			

MRW3001
TYPICAL CHARACTERISTICS

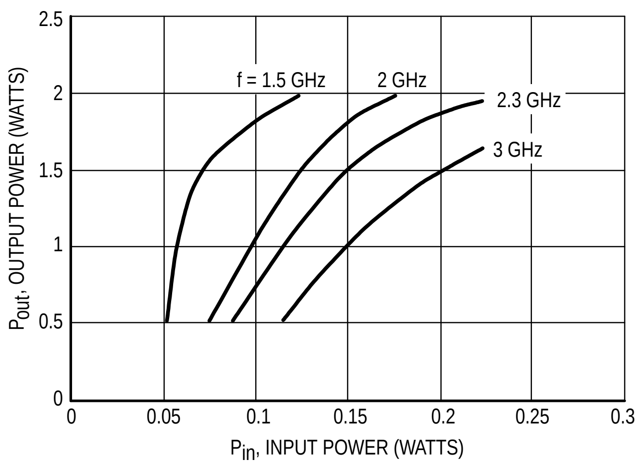


Figure 1. Output Power versus Input Power

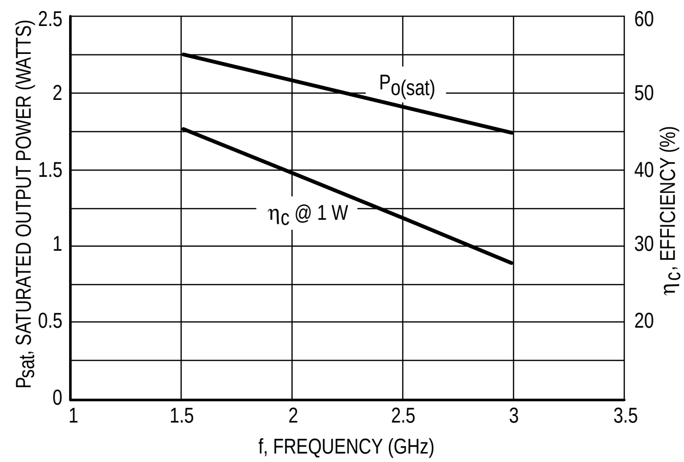


Figure 2. P_{sat} and η versus Frequency

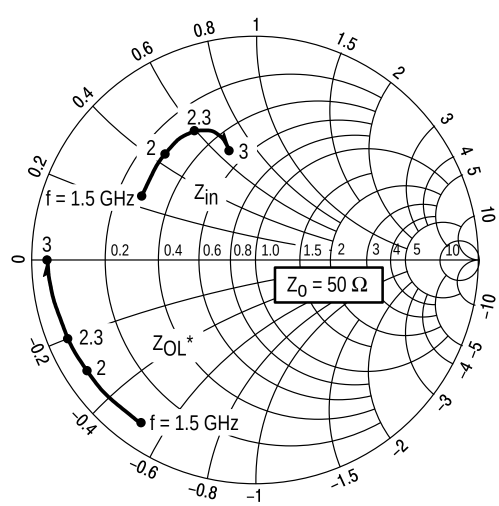


Figure 3. Series Equivalent Input/Output Impedance

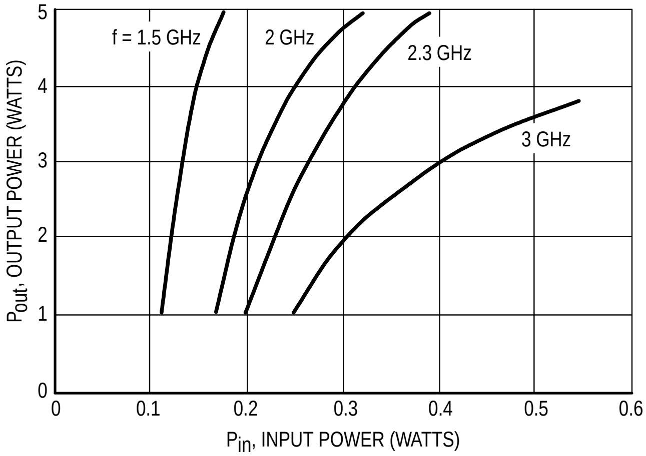


Figure 4. Output Power versus Input Power

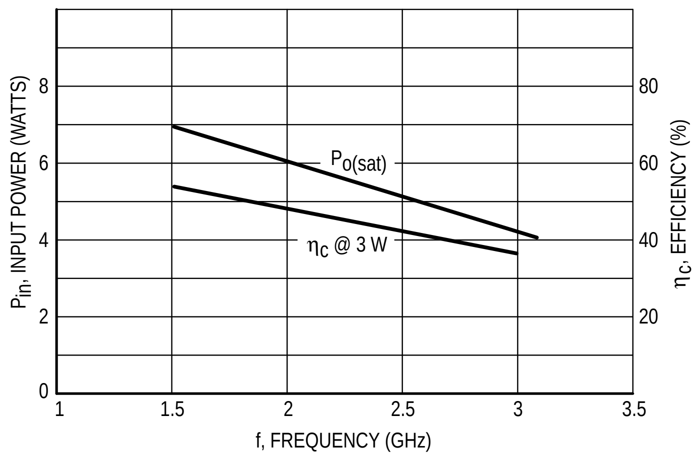


Figure 5. P_{sat} and η versus Frequency

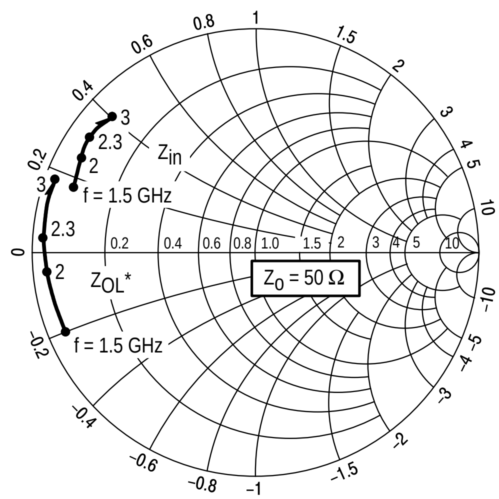


Figure 6. Series Equivalent Input/Output Impedance

TYPICAL CHARACTERISTICS

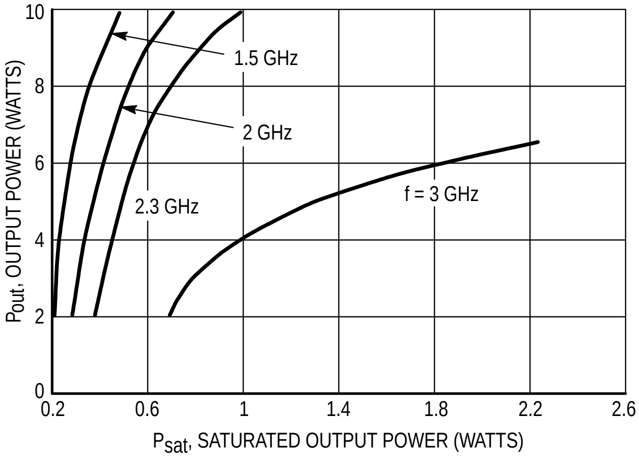


Figure 7. Output Power versus Input Power

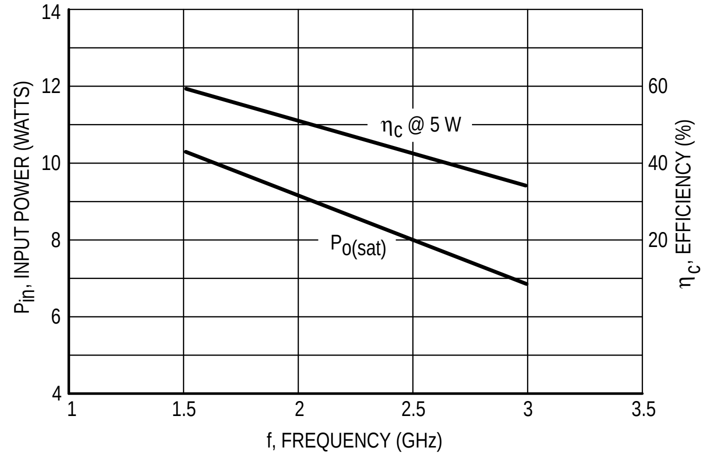


Figure 8. P_{sat} and η versus Frequency

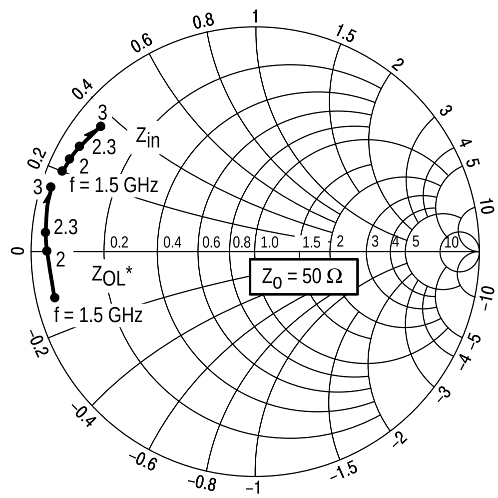


Figure 9. Series Equivalent Input/Output Impedance

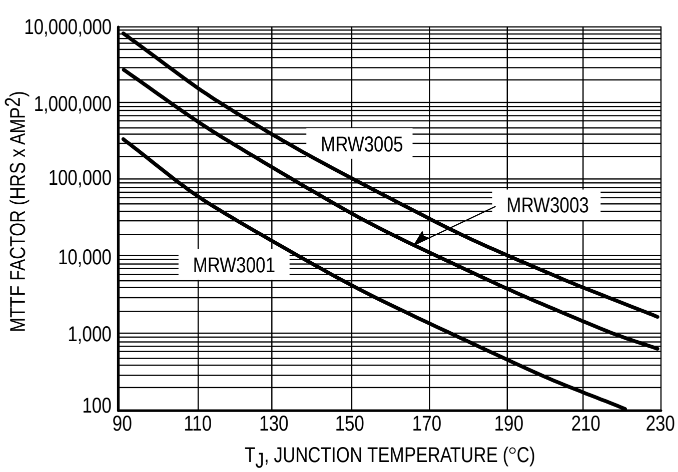


Figure 10. MTTF Factor versus Junction Temperature

MTTF Factor
(Normalized to 1.0 ampere^2 Continuous Duty)

The graph shown displays MTTF in hours x ampere^2 emitter current for each of the 3.0 GHz devices. Life tests at elevated temperatures have correlated to better than ±10% to the theoretical prediction for metal failure. **CAUTION** — A calculation is required to obtain actual metal life. Sample MTTF calculations based on operating conditions are shown below.

Junction Temperature — °C

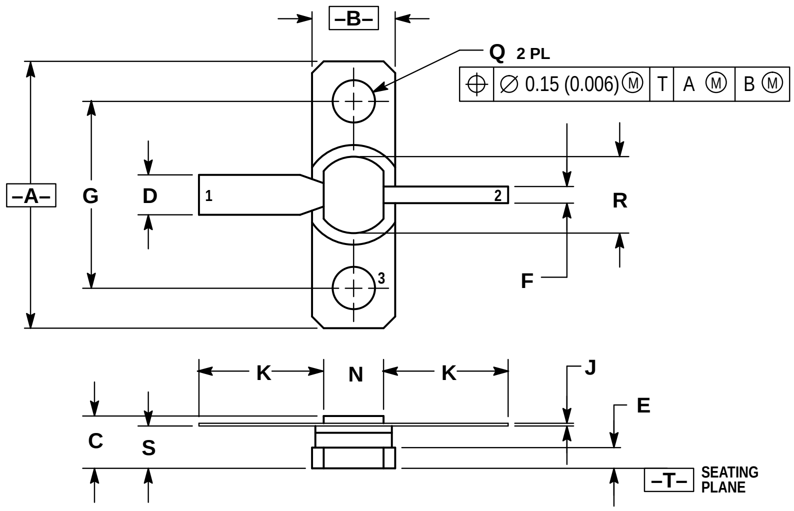
To calculate metal lifetime under any set of conditions, obtain actual data or estimate from typical performance curves. Solve for T_J (°C):

$$(1)\ T_J = \theta_{JF}\left(\frac{P_{out} \times 100}{\eta_C\ \%} + P_{in} - P_{out}\right) + T_{FLANGE}$$

Enter graph of MTF factor versus T_J. Obtain MTF factor. Calculate metal life by:

$$(2)\ \text{Metal Life in Hours} = \frac{\text{MTF Factor}}{I_C^2\ (\text{Amps})}$$

PACKAGE DIMENSIONS



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

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.795	0.805	20.20	20.45
B	0.245	0.255	6.23	6.47
C	0.145	0.170	3.69	4.31
D	0.115	0.125	2.93	3.17
E	0.055	0.065	1.40	1.65
F	0.045	0.055	1.15	1.39
G	0.562 BSC		14.27 BSC	
J	0.003	0.006	0.08	0.15
K	0.260	0.375	6.60	9.52
N	0.175	0.185	4.45	4.69
Q	0.120	0.135	3.05	3.42
R	0.225	0.235	5.72	5.97
S	0.120	0.130	3.05	3.30

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

CASE 328A–03
ISSUE D

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