

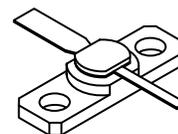
## The RF Line Microwave Power Transistors

... 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.

**MRW3001**  
**MRW3003**  
**MRW3005**

**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 ( $T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 10\text{ mA}$ , $V_{BE} = 0$ ) ( $I_C = 30\text{ mA}$ , $V_{BE} = 0$ ) ( $I_C = 50\text{ mA}$ , $V_{BE} = 0$ )	MRW3001 MRW3003 MRW3005	$V_{(BR)CES}$	50 50 50	— — —	— — —	Vdc
Collector-Base Breakdown Voltage ( $I_C = 1.0\text{ mA}$ , $I_E = 0$ ) ( $I_C = 3.0\text{ mA}$ , $I_E = 0$ ) ( $I_C = 5.0\text{ mA}$ , $I_E = 0$ )	MRW3001 MRW3003 MRW3005	$V_{(BR)CBO}$	45 45 45	— — —	— — —	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 1.0\text{ mA}$ , $I_C = 0$ )		$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 28\text{ V}$ , $I_E = 0$ )	MRW3001 MRW3003 MRW3005	$I_{CBO}$	— — —	— — —	0.5 0.75 1.25	mAdc

### ON CHARACTERISTICS

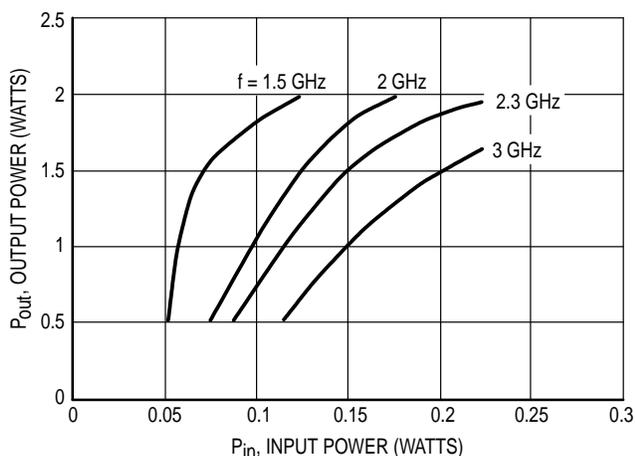
DC Current Gain ( $I_C = 100\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ ) ( $I_C = 300\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ ) ( $I_C = 500\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	MRW3001 MRW3003 MRW3005	$h_{FE}$	10 10 10	— — —	120 120 120	—
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(continued)

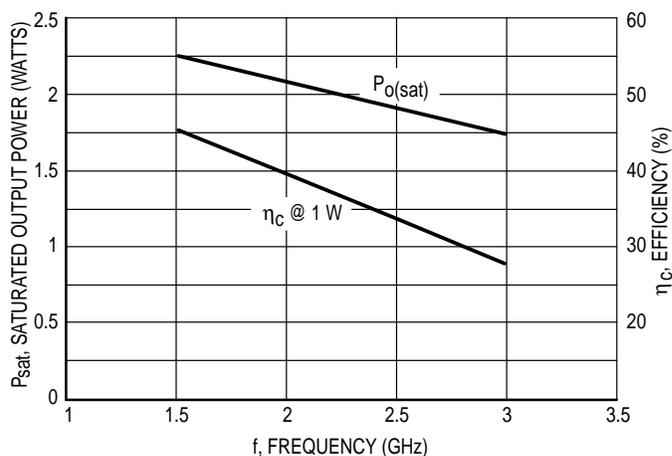
**ELECTRICAL CHARACTERISTICS — continued** ( $T_C = 25^\circ\text{C}$  unless otherwise noted.)

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

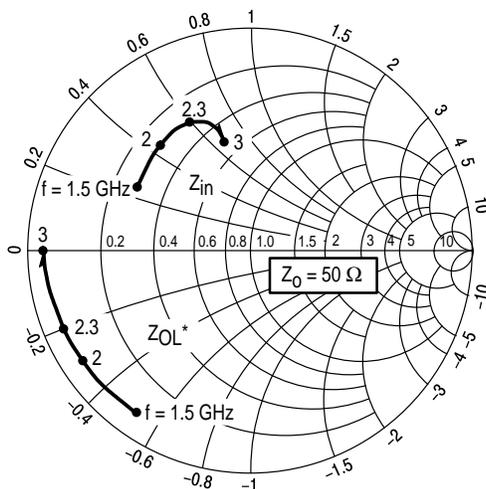
**MRW3001  
TYPICAL CHARACTERISTICS**



**Figure 1. Output Power versus Input Power**



**Figure 2.  $P_{sat}$  and  $\eta$  versus Frequency**



**Figure 3. Series Equivalent Input/Output Impedance**

## MRW3003 TYPICAL CHARACTERISTICS

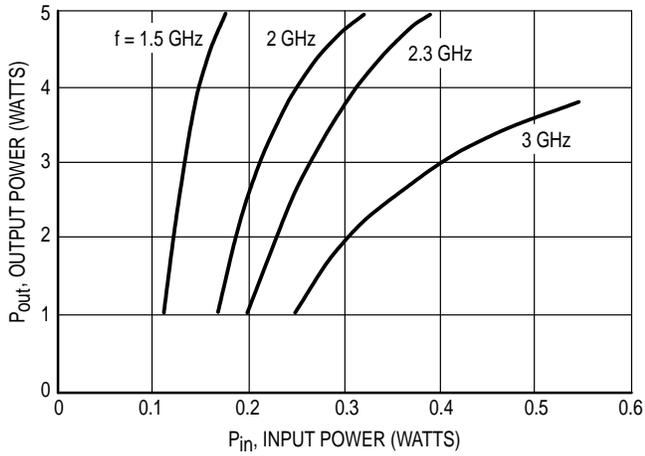


Figure 4. Output Power versus Input Power

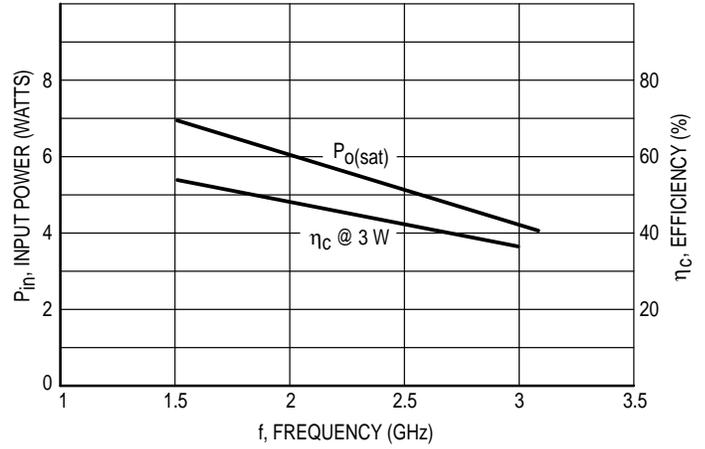


Figure 5.  $P_{sat}$  and  $\eta$  versus Frequency

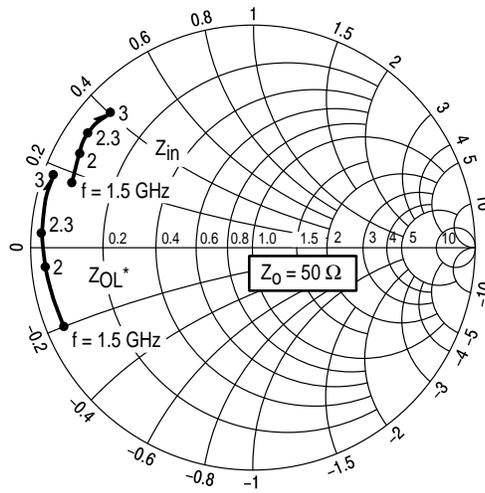


Figure 6. Series Equivalent Input/Output Impedance

## MRW3005 TYPICAL CHARACTERISTICS

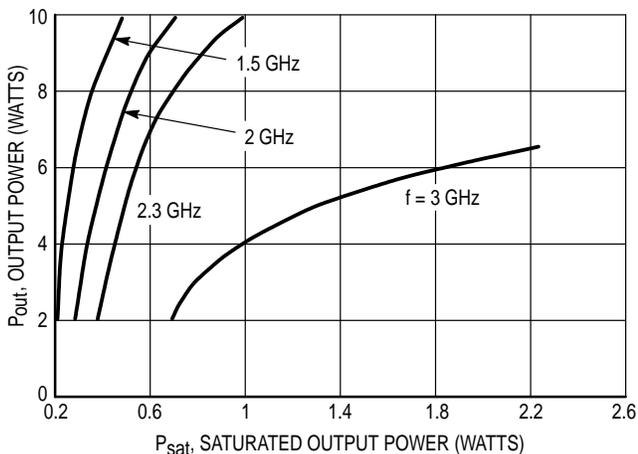


Figure 7. Output Power versus Input Power

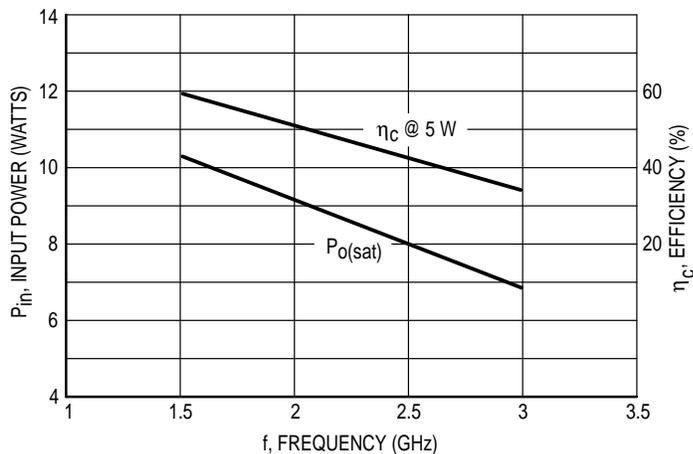


Figure 8.  $P_{sat}$  and  $\eta$  versus Frequency

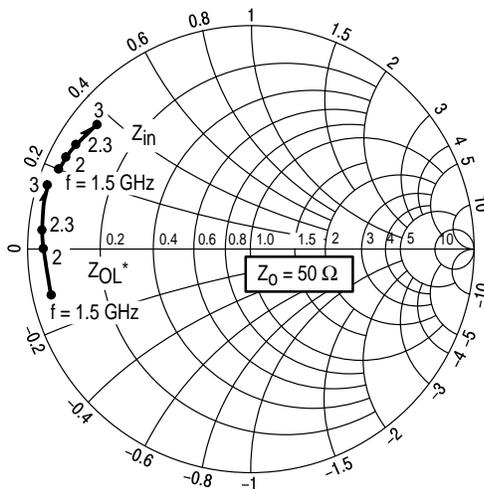


Figure 9. Series Equivalent Input/Output Impedance

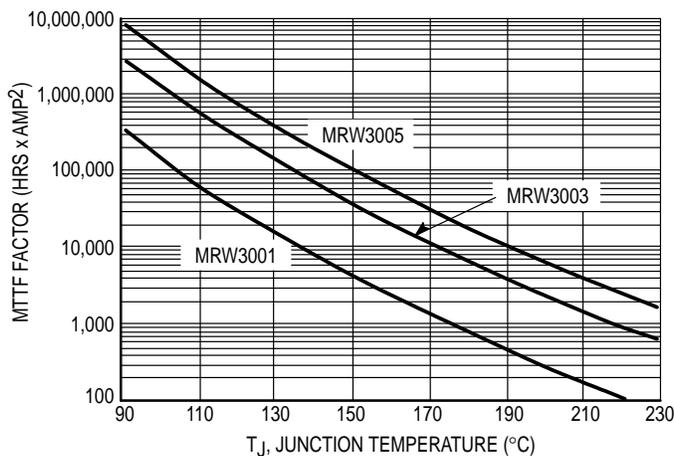


Figure 10. MTF Factor versus Junction Temperature

### MTF Factor (Normalized to 1.0 ampere<sup>2</sup> Continuous Duty)

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

Junction Temperature — °C

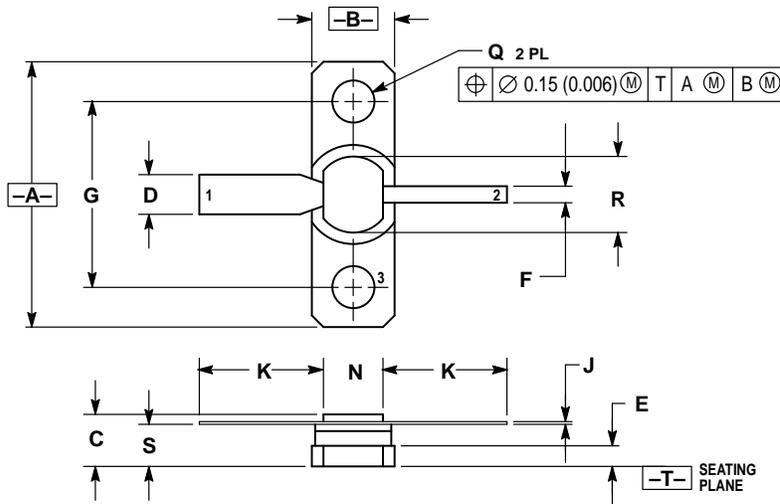
To calculate metal lifetime under any set of conditions, obtain actual data or estimate from typical performance curves. Solve for  $T_J$  (°C):

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

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		MILLIMETERS	
	MIN	MAX	MIN	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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MRW3001/D

