

## The RF Line NPN Silicon Power Transistor

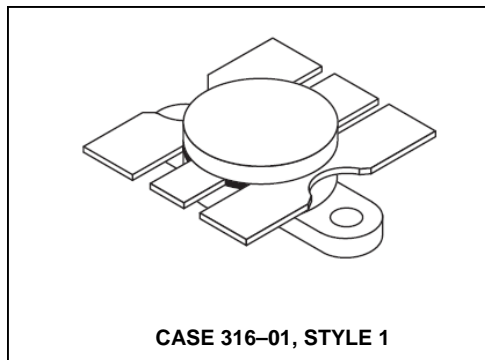
### 60W, 225 to 400MHz, 28V

M/A-COM Products  
Released - Rev. 07.07

Designed primarily for wideband large-signal output amplifier stages in the 225 to 400 MHz frequency range.

- Guaranteed performance in 225 to 400 MHz broadband amplifier @ 28 Vdc  
Output power = 60 W over 225 to 400 MHz band  
Minimum gain = 7.8 dB @ 400 MHz
- Built-in matching network for broadband operation using double match technique
- 100% tested for load mismatch at all phase angles with 30:1 VSWR
- Gold metallization system for high reliability applications

### Product Image



### MAXIMUM RATINGS\*

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	33	Vdc
Collector-Base Voltage	$V_{CBO}$	60	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above $25^\circ\text{C}$	$P_D$	146 0.83	Watts $\text{W}/^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +200	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.2	$^\circ\text{C}/\text{W}$

### 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 ( $I_C = 50 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	33	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	60	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 5.0 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	2.0	mAdc

NOTE:

(continued)

- These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

\* Indicates JEDEC Registered Data.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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#### ON CHARACTERISTICS

DC Current Gain ( $I_C = 1.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	10	—	100	—
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#### DYNAMIC CHARACTERISTICS

Output Capacitance ( $V_{CB} = 28 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	67	75	pF
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#### BROADBAND FUNCTIONAL TESTS (Figure 6)

Common-Emitter Amplifier Power Gain ( $V_{CC} = 28 \text{ Vdc}$ , $P_{out} = 60 \text{ W}$ , $f = 225\text{--}400 \text{ MHz}$ )	$G_{PE}$	7.8	8.5	—	dB
Electrical Ruggedness ( $P_{out} = 60 \text{ W}$ , $V_{CC} = 28 \text{ Vdc}$ , $f = 400 \text{ MHz}$ , VSWR 30:1 all phase angles)	$\Psi$	No Degradation in Output Power			—

#### NARROW BAND FUNCTIONAL TESTS (Figure 1)

Common-Emitter Amplifier Power Gain ( $V_{CC} = 28 \text{ Vdc}$ , $P_{out} = 60 \text{ W}$ , $f = 400 \text{ MHz}$ )	$G_{PE}$	7.8	10	—	dB
Collector Efficiency ( $V_{CC} = 28 \text{ Vdc}$ , $P_{out} = 60 \text{ W}$ , $f = 400 \text{ MHz}$ )	$\eta$	55	—	—	%

\* Indicates JEDEC Registered Data.

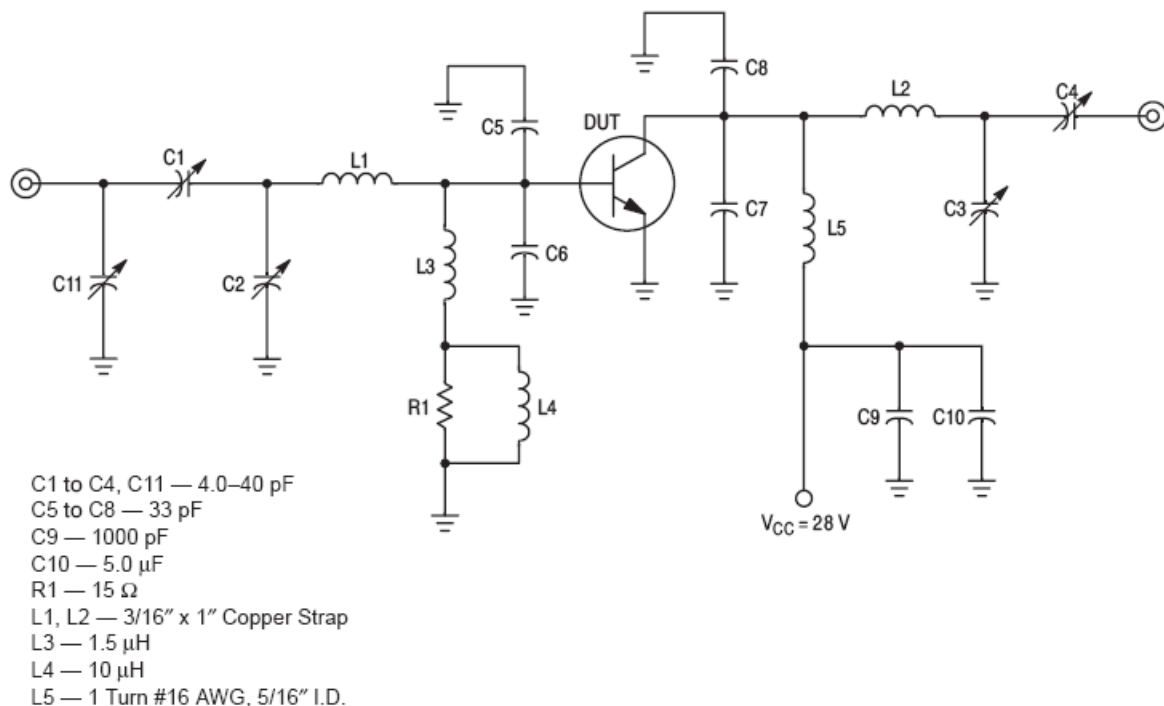


Figure 1. 400 MHz Test Amplifier (Narrow Band)

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## NARROW BAND DATA

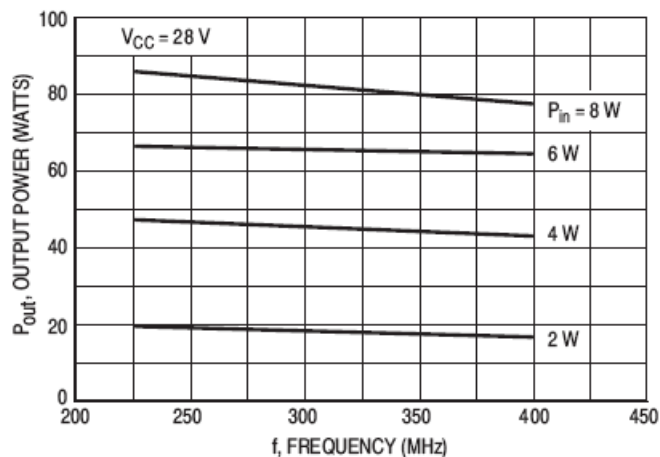


Figure 2. P<sub>out</sub> versus Frequency

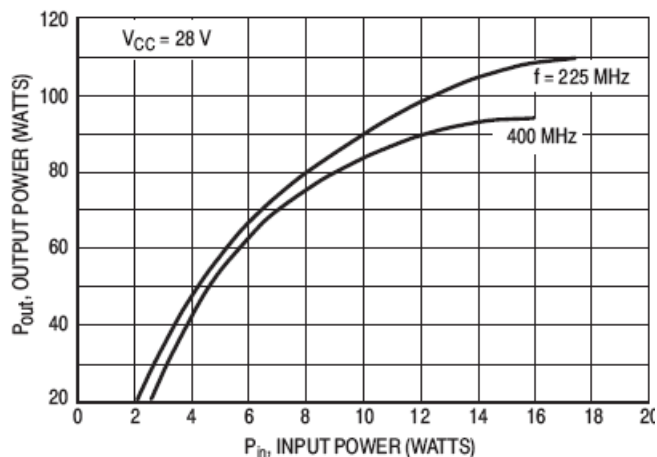


Figure 3. Output Power versus Input Power

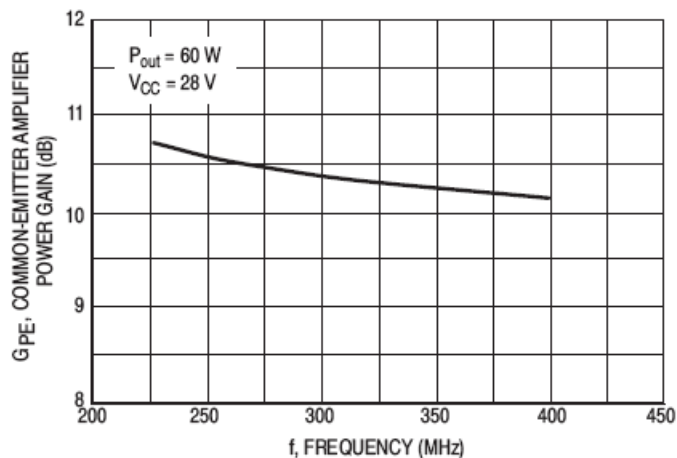


Figure 4. Power Gain versus Frequency

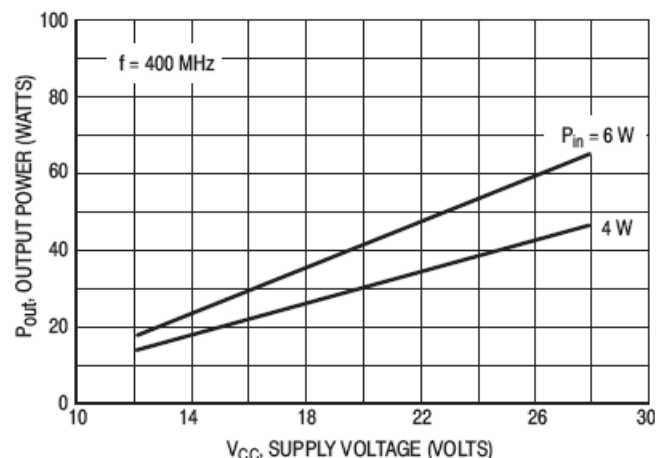


Figure 5. Output Power versus Supply Voltage

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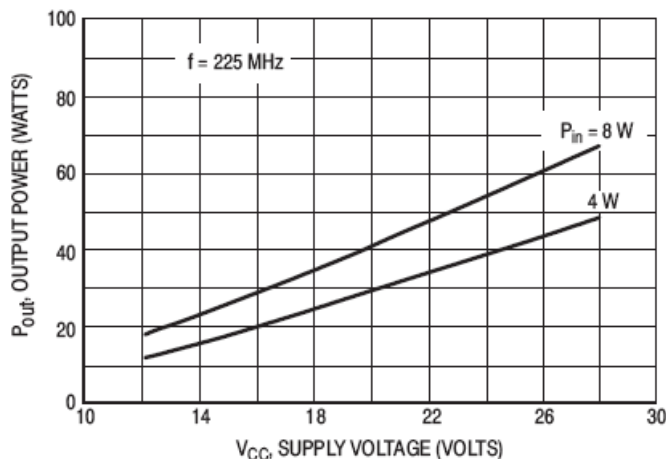
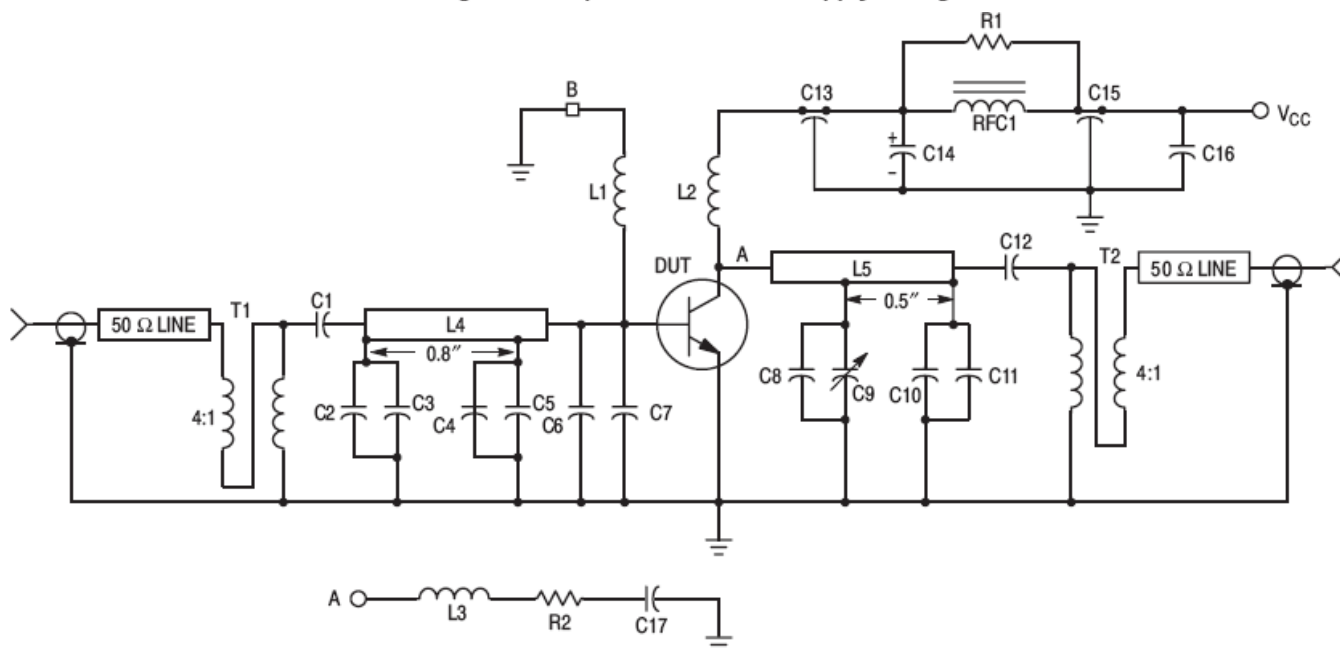


Figure 6. Output Power versus Supply Voltage



C1 — 68 pF  
C2, C4, C8, C10 — 27 pF  
C3, C5, C11 — 10 pF  
C6, C7 — 51 pF  
C9 — 1.0–10 pF JOHANSON  
C12 — 100 pF  
C13, C15 — 680 pF  
C14, C16 — 1.0 μF, 35 V Tantalum  
C17 — 0.1 μF, ERIE Red Cap

RFC1 — Ferrite Bead Choke, Ferroxcube VK200 19/4B  
B — Ferroxcube 56-590-65/4B Ferrite Bead  
T1, T2 — 25 Ohms (UT25) Miniature Coaxial Cable, 1 turn  
R1 — 11 Ω, 1.0 W  
R2 — 20 Ω, 1/4 W  
L1 — 10 Turns, #22 AWG, 1/8" I.D.  
L2 — 4 Turns, #16 AWG, 1/4" I.D.  
L3 — 6 Turns, #24 AWG, 1/8" I.D.  
L4, L5 — 1" x 0.25" Microstrip Line  
Board Material 0.031" Thick Teflon-Fiberglass

Figure 7. 225 to 400 MHz Broadband Test Circuit Schematic

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BROADBAND DATA (Circuit, Figure 7)

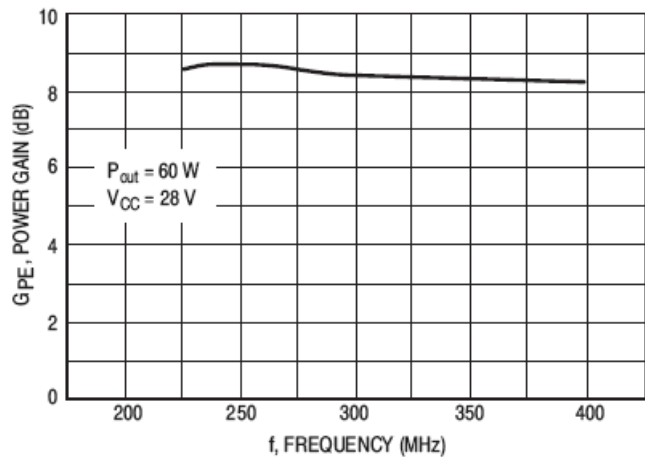


Figure 8. Power Gain versus Frequency

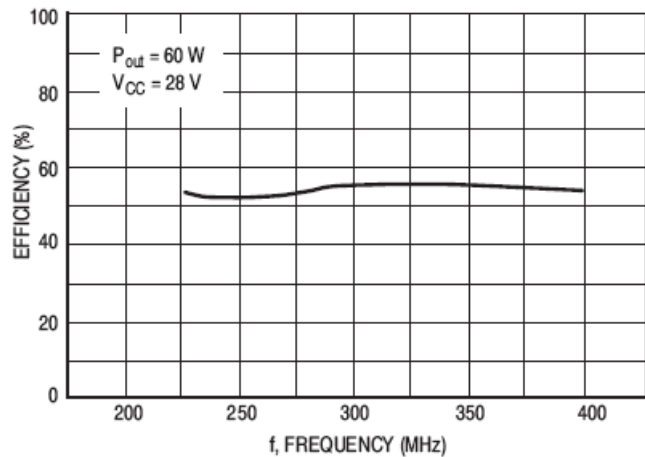


Figure 9. Efficiency versus Frequency

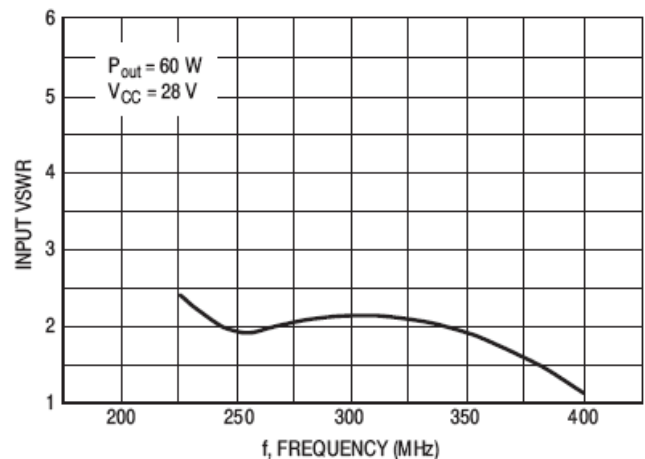


Figure 10. Input VSWR versus Frequency

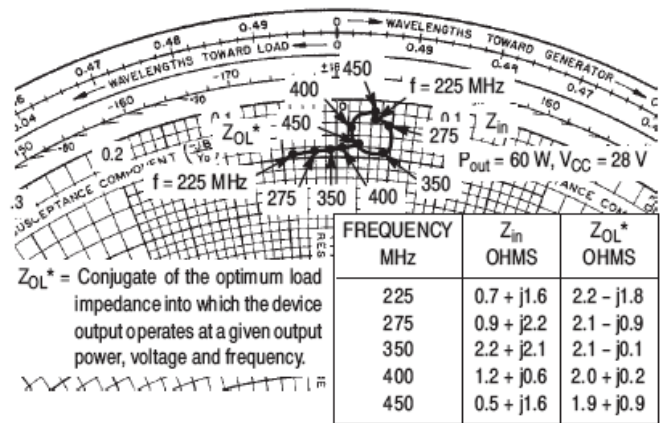


Figure 11. Series Equivalent Input-Output Impedance

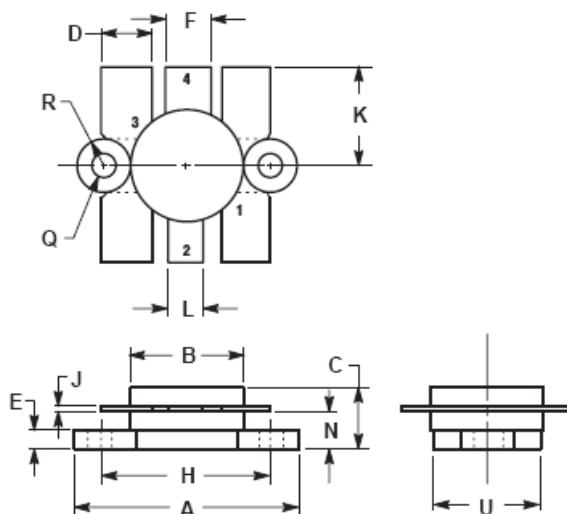
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### PACKAGE DIMENSIONS



#### NOTES:

1. FLANGE IS ISOLATED IN ALL STYLES.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	24.38	25.14	0.960	0.990
B	12.45	12.95	0.490	0.510
C	5.97	7.62	0.235	0.300
D	5.33	5.58	0.210	0.220
E	2.16	3.04	0.085	0.120
F	5.08	5.33	0.200	0.210
H	18.29	18.54	0.720	0.730
J	0.10	0.15	0.004	0.006
K	10.29	11.17	0.405	0.440
L	3.81	4.06	0.150	0.160
N	3.81	4.31	0.150	0.170
Q	2.92	3.30	0.115	0.130
R	3.05	3.30	0.120	0.130
U	11.94	12.57	0.470	0.495

#### STYLE 1:

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

CASE 316-01  
ISSUE D

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