

# The RF Line NPN Silicon RF Power Transistor

... designed primarily for wideband large-signal output amplifier stages in the 100 to 500 MHz frequency range.

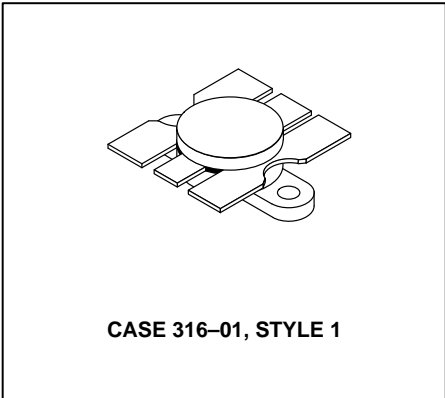
- Guaranteed Performance @ 400 MHz, 28 Vdc  
Output Power = 40 Watts  
Minimum Gain = 9.0 dB
- Built-In Matching Network for Broadband Operation
- 100% Tested for Load Mismatch at all Phase Angles with 30:1 VSWR
- Gold Metallization System for High Reliability Applications



**40 W, 225 to 400 MHz  
CONTROLLED "Q"  
BROADBAND RF POWER  
TRANSISTOR  
NPN SILICON**

## 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
Collector Current — Continuous — Peak	$I_C$	4.5 6.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above $25^\circ\text{C}$	$P_D$	110 0.63	Watts W/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$



## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.6	$^\circ\text{C}/\text{W}$

## 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 ( $I_C = 40 \text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CEO}$	33	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 40 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	60	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 4.0 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 40 \text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	60	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	4.0	mAdc

## ON CHARACTERISTICS

DC Current Gain ( $I_C = 2.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	20	50	80	—
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## DYNAMIC CHARACTERISTICS

Output Capacitance ( $V_{CB} = 28 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	45	60	pF
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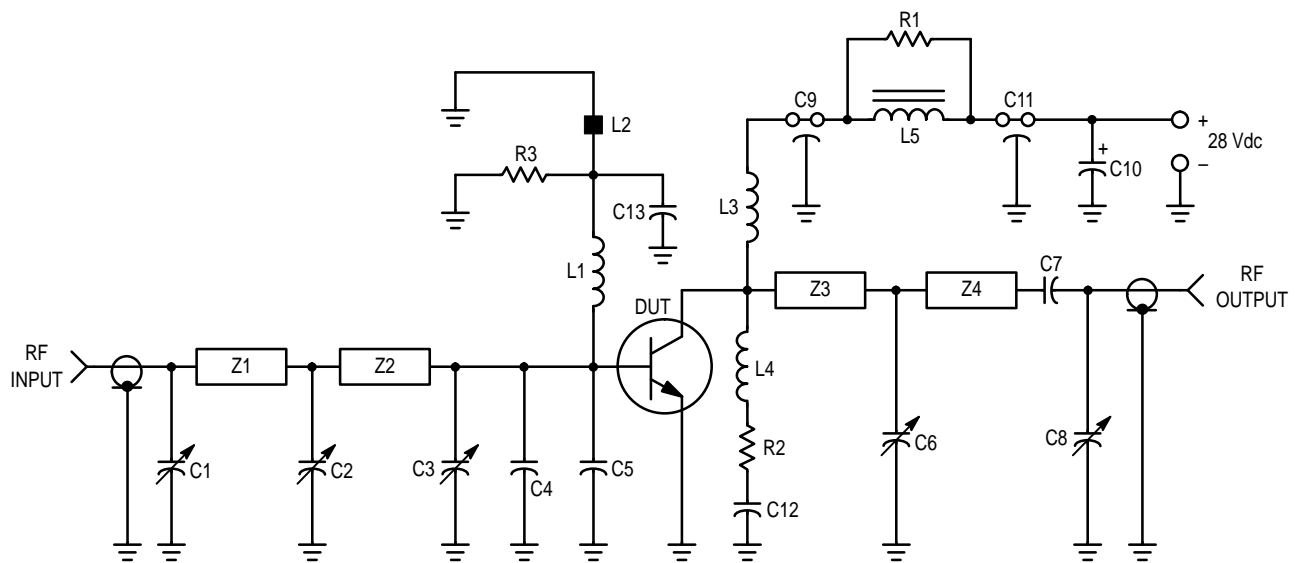
NOTE:

1. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>FUNCTIONAL TESTS</b> (Figure 1)					
Common-Emitter Amplifier Power Gain ( $V_{CC} = 28\text{ Vdc}$ , $P_{Out} = 40\text{ W}$ , $f = 400\text{ MHz}$ , $I_C\text{ Max} = 2.85\text{ Adc}$ )	$G_{PE}$	9.0	11	—	dB
Collector Efficiency ( $V_{CC} = 28\text{ Vdc}$ , $P_{Out} = 40\text{ W}$ , $f = 400\text{ MHz}$ , $I_C\text{ Max} = 2.85\text{ Adc}$ )	$\eta$	50	—	—	%
Load Mismatch ( $V_{CC} = 28\text{ Vdc}$ , $P_{Out} = 40\text{ W CW}$ , $f = 400\text{ MHz}$ , $VSWR = 30:1$ All Phase Angles)	$\psi$	No Degradation in Output Power			



- C1 — 1.0–10 pF Johanson, Capacitor (JMC 5201)
- C2, C3, C6, C8 — 1.0–20 pF Johanson Capacitor
- C4, C5 — 36 pF ATC “B” Style Chip Capacitor
- C7, C9, C13 — 100 pF UNELCO Capacitor
- C11 — 680 pF Feedthru
- C10 — 1.0  $\mu\text{F}$  50 V Tantalum
- C12 — 0.1  $\mu\text{F}$  Erie Redcap
- L1 — 8 Turns #26 AWG Enameled, 1/16” ID Closewound
- L2, L5 — Ferroxcube VK200–19/4B Ferrite Choke

- L3 — 8 Turns #20 AWG Enameled, 1/4” ID Closewound
- L4 — 4 Turns #26 AWG 0.1” ID
- R1 — 10 Ohm 2.0 W Carbon
- R2, R3 — 10 Ohm 1.0 W Carbon
- Z1 — Microstrip 0.19” W x 1.28” L
- Z2 — Microstrip 0.28” W x 1.0” L
- Z3 — Microstrip 0.31” W x 1.0” L
- Z4 — Microstrip 0.31” W x 0.9” L
- Board — Glass Teflon  $\epsilon_r = 2.56$   $t = 0.062$ ”
- Input/Output Connectors — Type N UG58 A/U

**Figure 1. 400 MHz Test Amplifier**

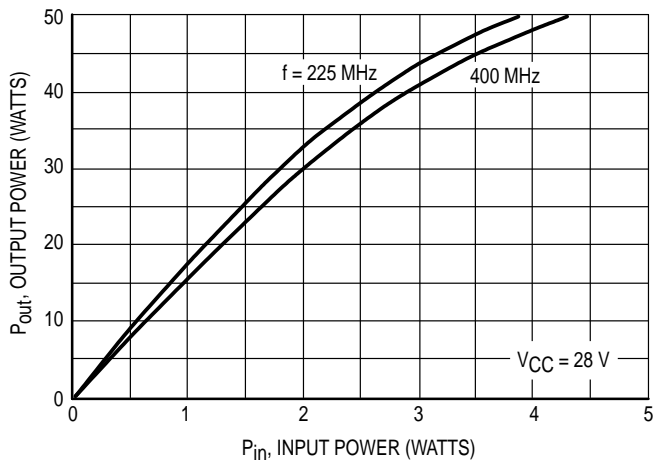


Figure 2. Output Power versus Input Power

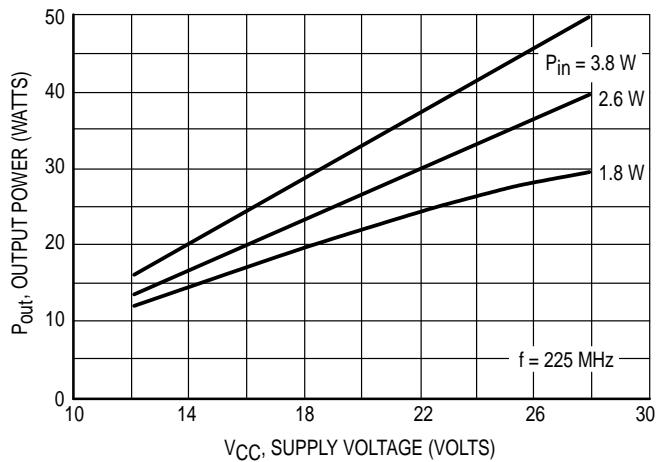


Figure 3. Output Power versus Supply Voltage

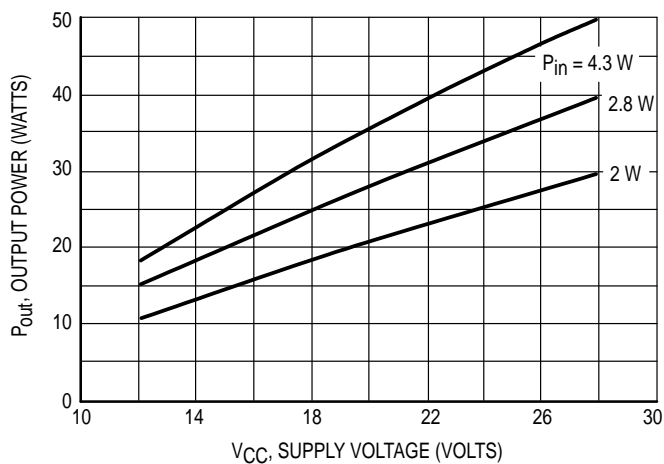
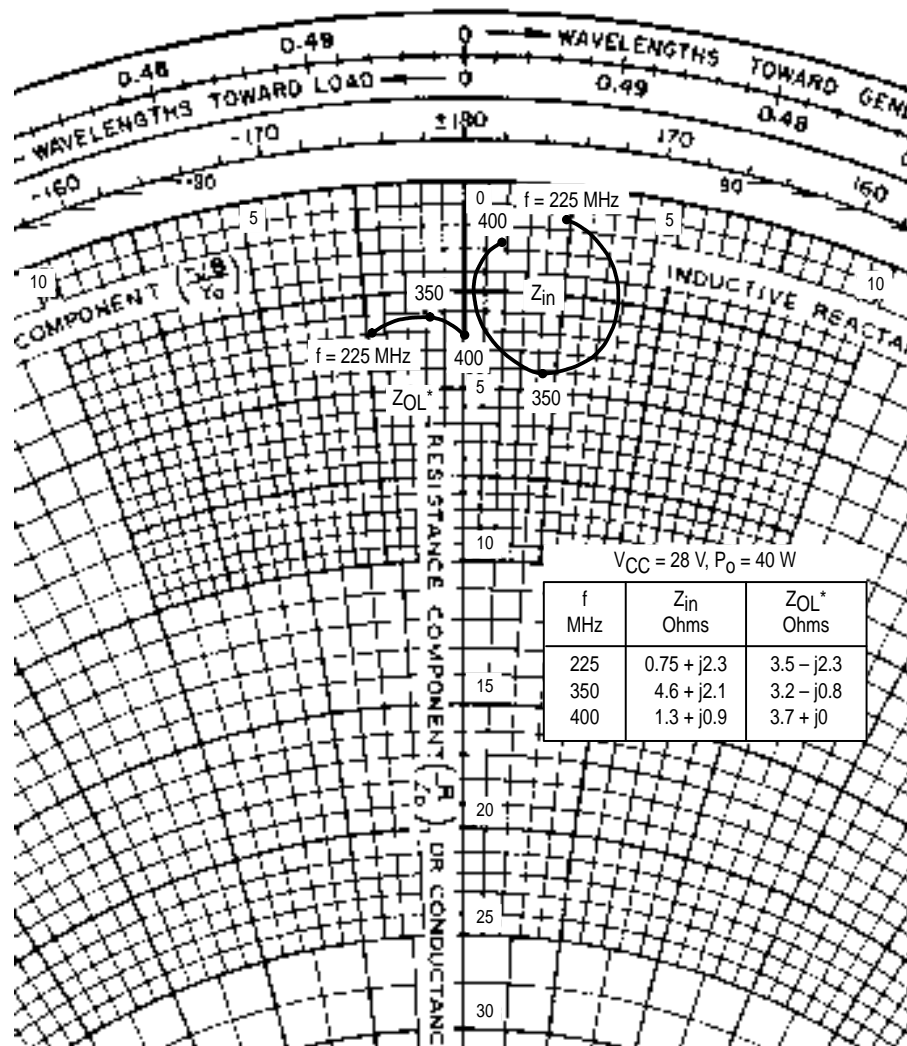


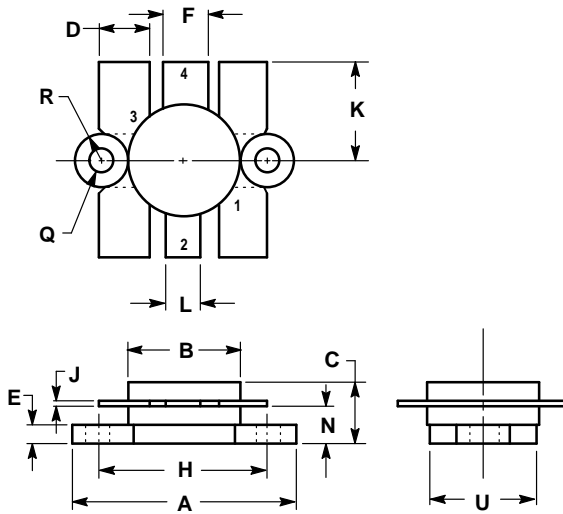
Figure 4. Output Power versus Supply Voltage  
 $f = 400\text{ MHz}$



$Z_{OL}^*$  = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

Figure 5. Series Equivalent Input-Output Impedance

# 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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