

The RF Line

NPN Silicon

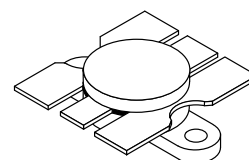
RF Power Transistor

... 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 Watts 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

2N6439

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



CASE 316-01, STYLE 1

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°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)

1. 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.

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)	ψ	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 ($V_{CC} = 28 \text{ Vdc}$, $P_{out} = 60 \text{ W}$, $f = 400 \text{ MHz}$)	η	55	—	—	%

* Indicates JEDEC Registered Data.

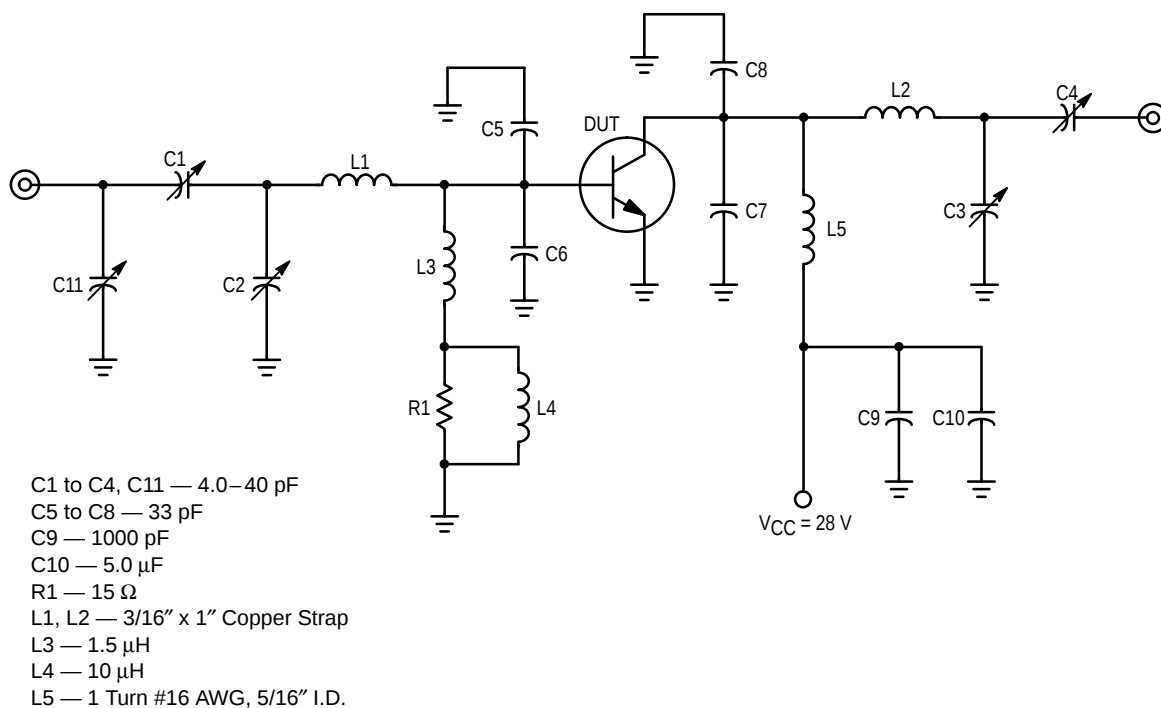


Figure 1. 400 MHz Test Amplifier (Narrow Band)

NARROW BAND DATA

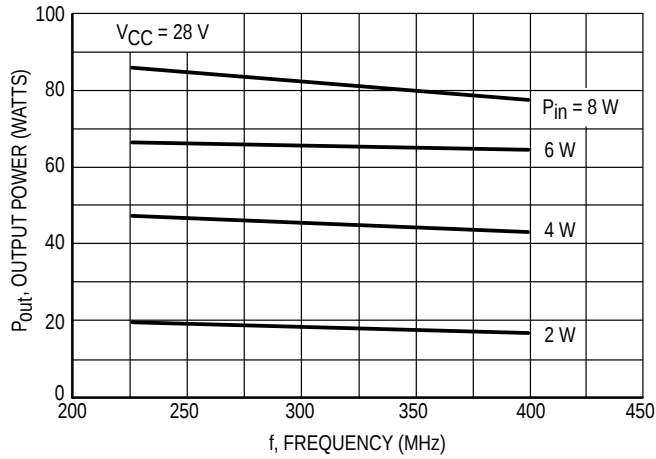


Figure 2. P_{out} versus Frequency

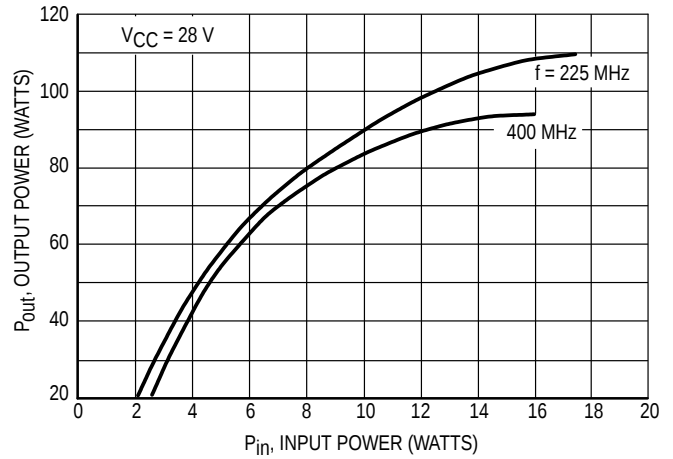


Figure 3. Output Power versus Input Power

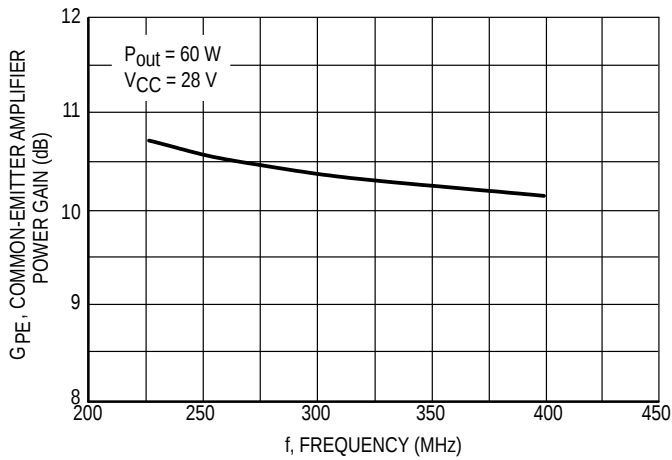


Figure 4. Power Gain versus Frequency

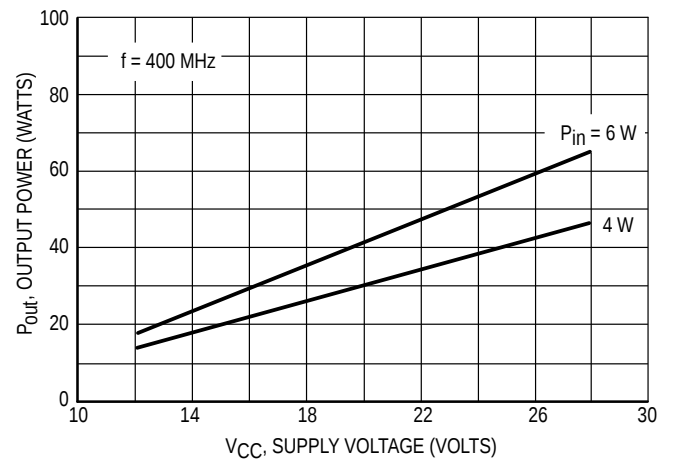


Figure 5. Output Power versus Supply Voltage

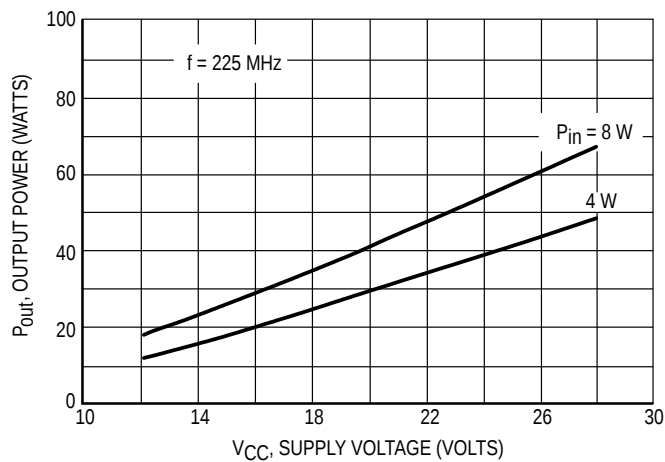


Figure 6. Output Power versus Supply Voltage

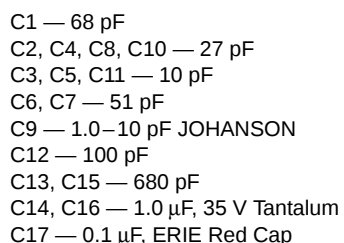


Figure 7. 225 to 400 MHz Broadband Test Circuit Schematic

Graph showing GPE Power Gain (dB) versus Frequency (MHz) for $P_{out} = 60\text{ W}$ and $V_{CC} = 28\text{ V}$. The gain is approximately 8.5 dB from 225 MHz to 275 MHz, then decreases to about 8.2 dB at 400 MHz.

Graph of Efficiency (%) vs. Frequency (MHz) for the 60 W Class D amplifier. The efficiency is relatively constant, ranging from approximately 52% to 56% across the frequency range from 225 MHz to 395 MHz. The graph shows a slight dip around 250 MHz and a slight rise around 300 MHz.

f, FREQUENCY (MHz)	Efficiency (%)
225	53
250	52
275	53
300	55
325	56
350	55
375	54
395	53

MOTOROLA RF DEVICE DATA

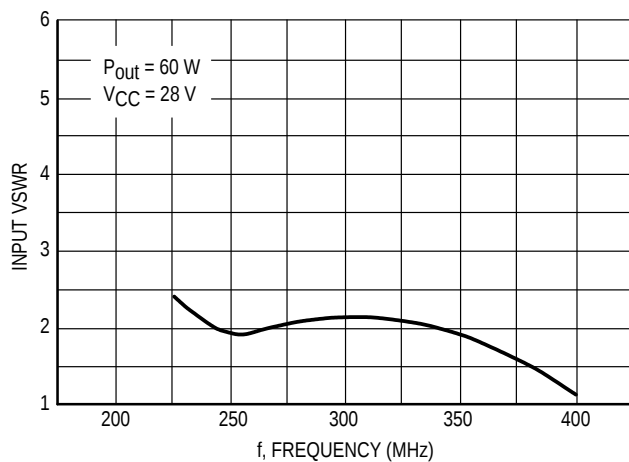


Figure 10. Input VSWR versus Frequency

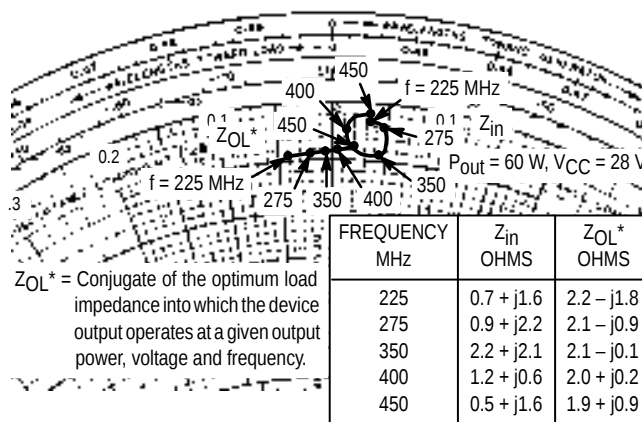
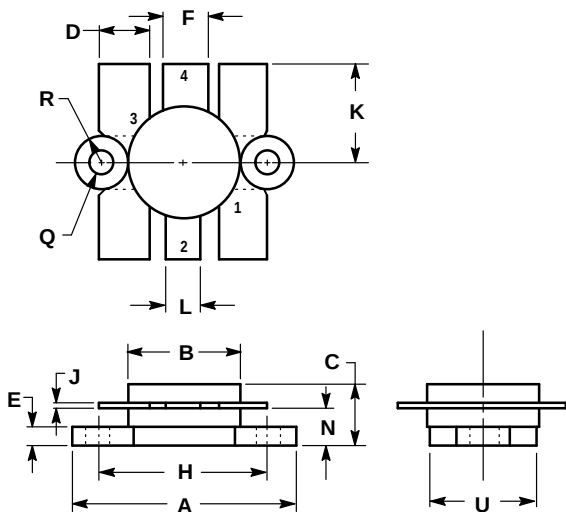


Figure 11. Series Equivalent Input-Output Impedance

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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