

# The RF Line

## NPN Silicon

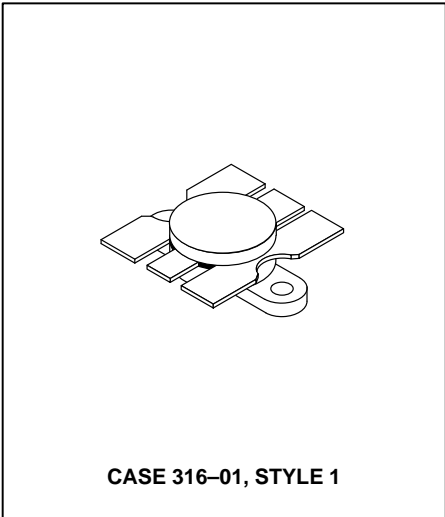
### RF Power Transistor

... designed primarily for wideband large-signal output amplifier stages in 30–200 MHz frequency range.

- Guaranteed Performance at 150 MHz, 28 Vdc  
Output Power = 100 W  
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
- High Output Saturation Power — Ideally Suited for 30 W Carrier/120 W Peak AM Amplifier Service
- Guaranteed Performance in Broadband Test Fixture



**100 W, 30–200 MHz  
CONTROLLED Q  
BROADBAND RF POWER  
TRANSISTOR  
NPN SILICON**



#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	35	Vdc
Collector–Base Voltage	$V_{CBO}$	65	Vdc
Emitter–Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current — Continuous — Peak (10 seconds)	$I_C$	12 18	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above $25^\circ\text{C}$	$P_D$	270 1.54	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	$R_{\theta JC}$	0.65	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

#### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	35	—	—	Vdc
Collector–Emitter Breakdown Voltage ( $I_C = 100\text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	65	—	—	Vdc
Collector–Base Breakdown Voltage ( $I_C = 100\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	65	—	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	5.0	mAdc

#### ON CHARACTERISTICS

DC Current Gain ( $I_C = 5.0\text{ Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	10	25	80	—
---	----------	----	----	----	---

NOTE:

(continued)

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

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

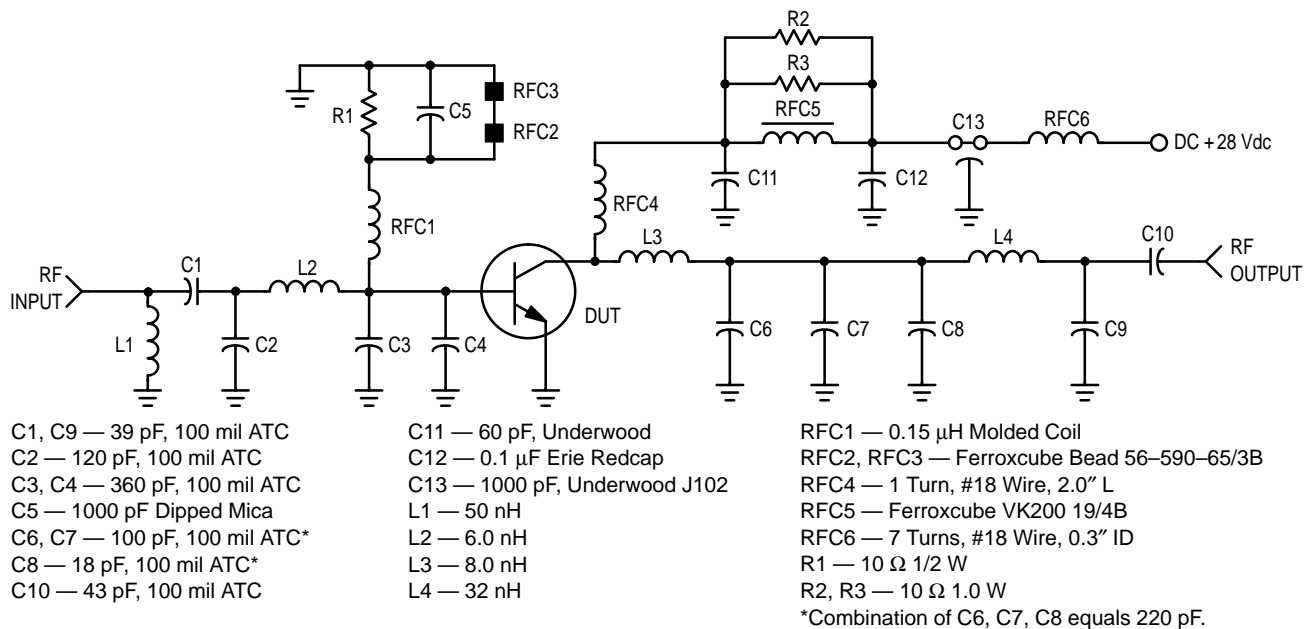
Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

**DYNAMIC CHARACTERISTICS**

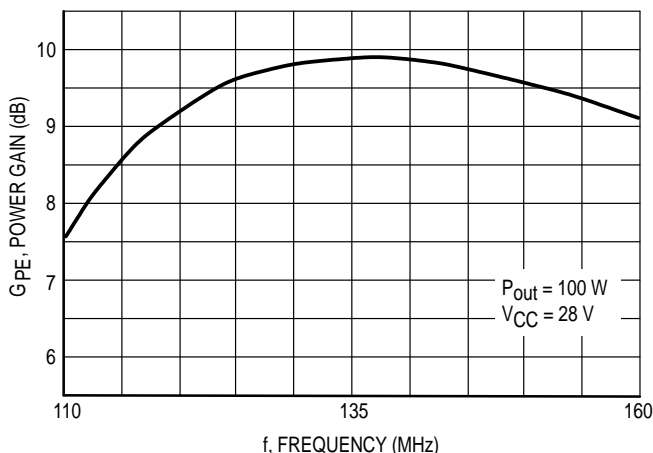
Output Capacitance ( $V_{CB} = 28\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	—	150	175	pF
---	----------	---	-----	-----	----

**FUNCTIONAL TESTS** (Figure 2)

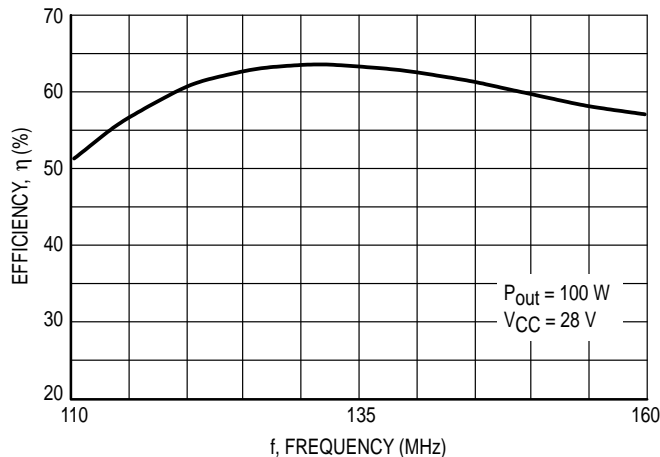
Common-Emitter Amplifier Power Gain ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 100\text{ W}$ , $f = 150\text{ MHz}$ , $I_C (\text{Max}) = 6.5\text{ Adc}$ )	$G_{PE}$	9.0	10	—	dB
Collector Efficiency ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 100\text{ W}$ , $f = 150\text{ MHz}$ , $I_C (\text{Max}) = 6.5\text{ Adc}$ )	$\eta$	55	60	—	%
Load Mismatch ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 100\text{ W CW}$ , $f = 150\text{ MHz}$ , $VSWR = 30:1$ all phase angles)	$\psi$	No Degradation in Output Power			



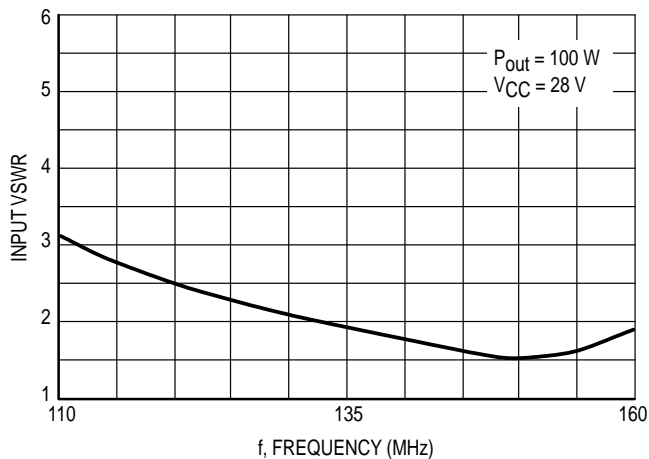
**Figure 1. 110-160 MHz Broadband Amplifier — Test Fixture Schematic**



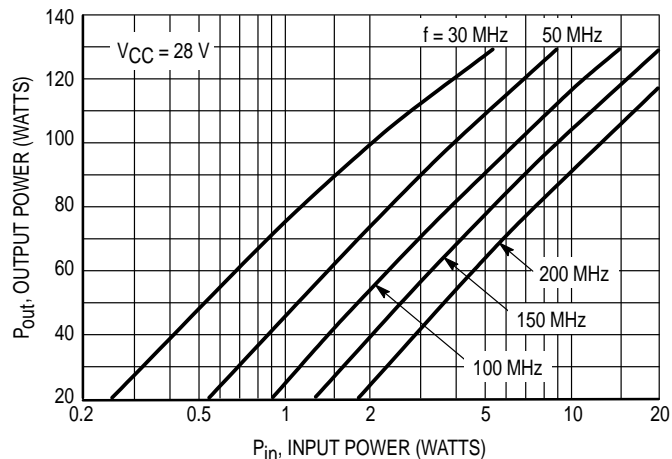
**Figure 2. Power Gain versus Frequency Broadband Test Fixture**



**Figure 3. Efficiency versus Frequency Broadband Test Fixture**

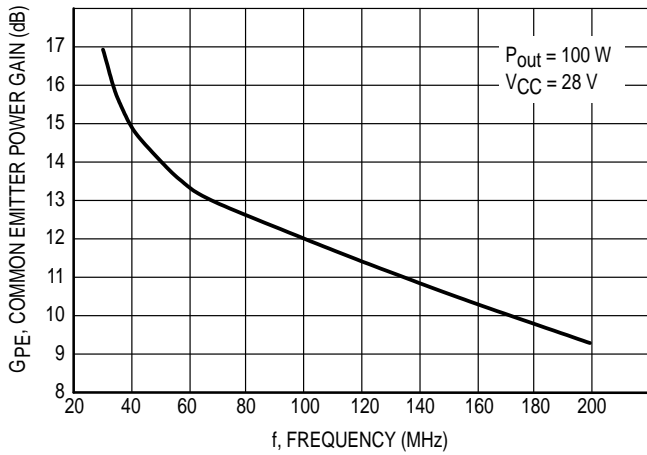


**Figure 4. Input VSWR versus Frequency Broadband Test Fixture**

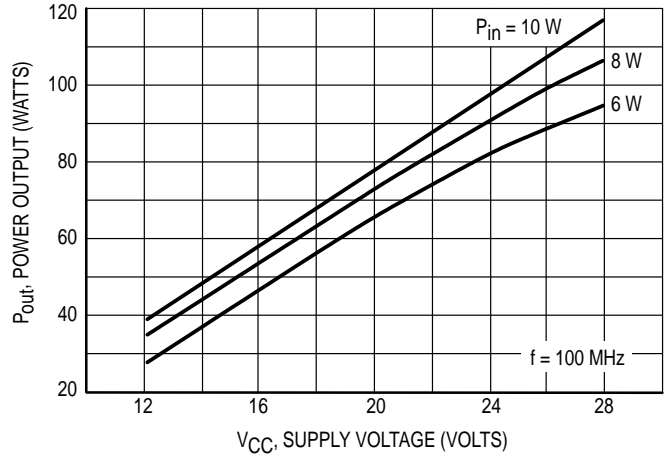


**Figure 5. Output Power versus Input Power**

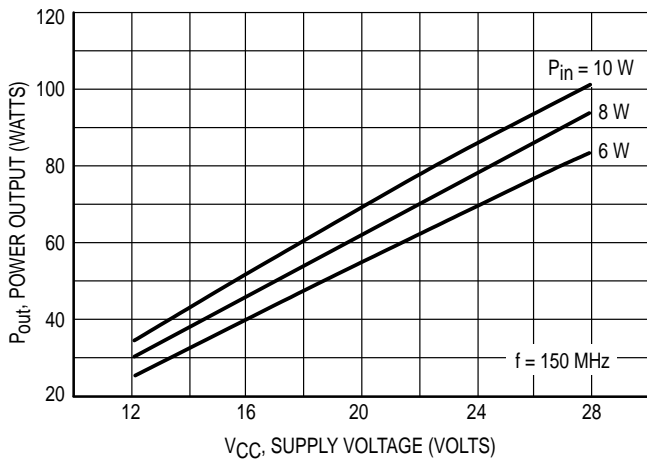
## TYPICAL PERFORMANCE CURVES



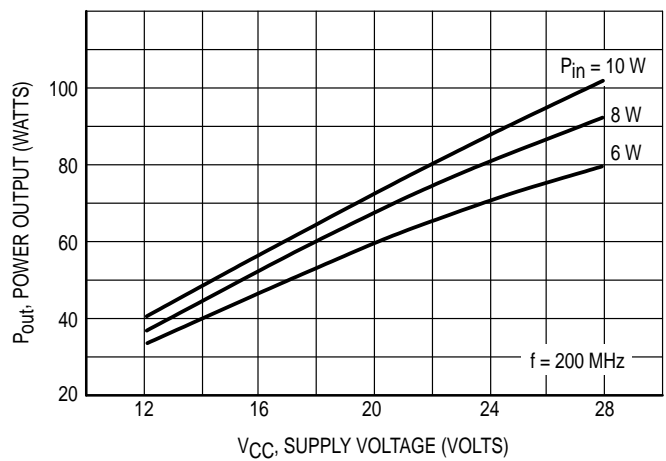
**Figure 6. Power Gain versus Frequency**



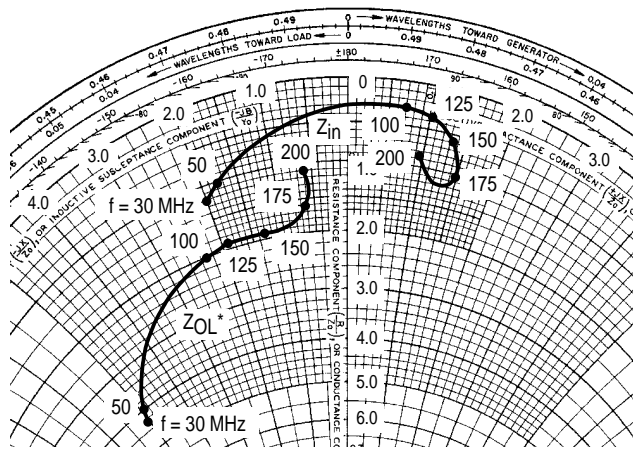
**Figure 7. Power Output versus Supply Voltage**



**Figure 8. Power Output versus Supply Voltage**



**Figure 9. Power Output versus Supply Voltage**



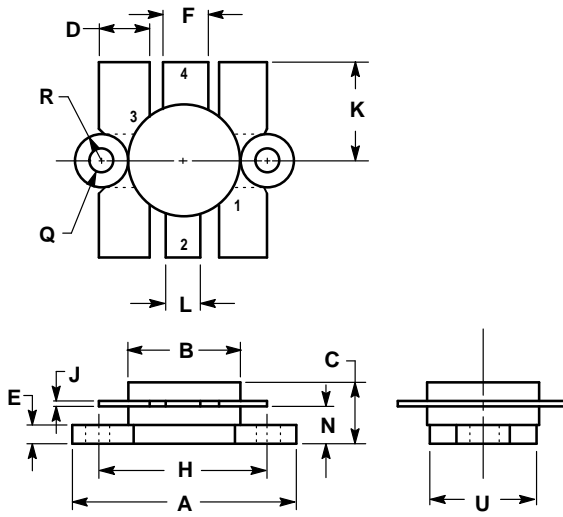
$Z_{OL}^*$  = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

$V_{CC} = 28 \text{ V}, P_{out} = 100 \text{ W}$

f MHz	$Z_{in}$ OHMS	$Z_{OL}^*$ OHMS
30	$1.2 - j2.0$	$4.3 - j5.0$
50	$1.0 - j1.8$	$4.0 - j4.9$
100	$0.3 + j0.7$	$2.0 - j2.3$
125	$0.3 + j1.0$	$1.9 - j1.9$
150	$0.6 + j1.3$	$1.9 - j1.3$
175	$1.0 + j1.5$	$1.6 - j0.6$
200	$0.9 + j1.0$	$1.1 - j0.6$

**Figure 10. 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**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**Literature Distribution Centers:**

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



**MOTOROLA**



MRF317/D

