

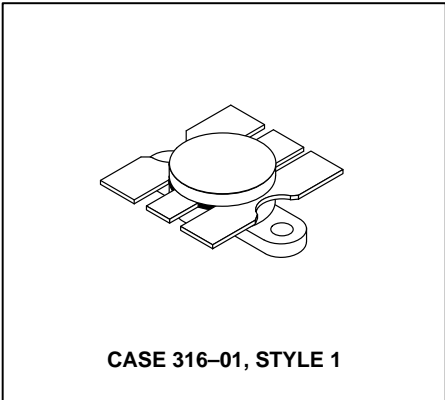
The RF Line

NPN Silicon

RF Power Transistor



**25 W, 470 MHz
CONTROLLED Q
RF POWER
TRANSISTOR
NPN SILICON**



... designed for 12.5 Volt UHF large-signal amplifier applications in industrial and commercial FM equipment operating to 512 MHz.

- Specified 12.5 Volt, 470 MHz Characteristics —
Output Power = 25 Watts
Minimum Gain = 6.2 dB
Efficiency = 60%
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Built-In Matching Network for Broadband Operation
- Tested for Load Mismatch Stress at all Phase Angles with 20:1 VSWR @ 16-Volt High Line and 50% Overdrive
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	4.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	103 0.59	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	$R_{\theta JC}$	1.7	$^\circ\text{C}/\text{W}$

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 ($I_C = 20 \text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 20 \text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5.0 \text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 15 \text{ Vdc}$, $V_{BE} = 0$, $T_C = 25^\circ\text{C}$)	I_{CES}	—	—	5.0	mAdc

(continued)

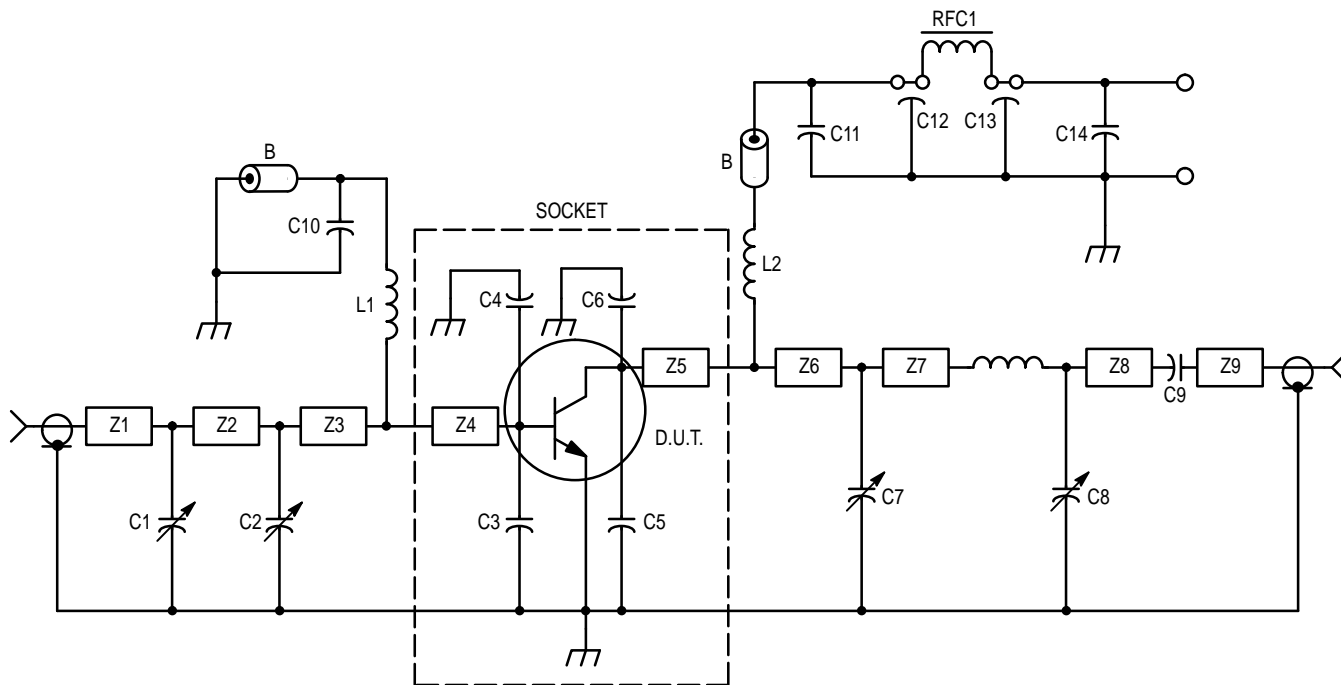
ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain ($I_C = 4.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$)	h_{FE}	40	70	100	—
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 12.5 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{ob}	—	60	85	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain ($V_{CC} = 12.5 \text{ Vdc}$, $P_{out} = 25 \text{ W}$, $I_C (\text{MAX}) = 3.6 \text{ Adc}$, $f = 470 \text{ MHz}$)	G_{pe}	6.2	7.0	—	dB
Input Power ($V_{CC} = 12.5 \text{ Vdc}$, $P_{out} = 25 \text{ W}$, $f = 470 \text{ MHz}$)	P_{in}	—	5.0	6.0	Watts
Collector Efficiency ($V_{CC} = 12.5 \text{ Vdc}$, $P_{out} = 25 \text{ W}$, $I_C (\text{MAX}) = 3.6 \text{ Adc}$, $f = 470 \text{ MHz}$)	η	55	60	—	%
Output Mismatch Stress ($V_{CC} = 16 \text{ Vdc}$, $P_{in} = \text{Note 1}$, $f = 470 \text{ MHz}$, $V_{SWR} = 20:1$, All Phase Angles)	ψ^*	No Degradation in Output Power			
Series Equivalent Input Impedance ($V_{CC} = 12.5 \text{ Vdc}$, $P_{out} = 25 \text{ W}$, $f = 470 \text{ MHz}$)	Z_{in}	—	$1.2 + j3.3$	—	Ohms
Series Equivalent Output Impedance ($V_{CC} = 12.5 \text{ Vdc}$, $P_{out} = 25 \text{ W}$, $f = 470 \text{ MHz}$)	Z_{OL}	—	$1.9 + j2.1$	—	Ohms

NOTE:

1. $P_{in} = 150\%$ of Drive Requirement for 25 W Output at 12.5 Vdc.

* ψ = Mismatch stress factor — the electrical criterion established to verify the device resistance to load mismatch failure. The mismatch stress test is accomplished in the standard test fixture (Figure 1) terminated in a 20:1 minimum load mismatch at all phase angles.



C1, C2, C7, C8 — 1.0–20 pF Johanson Variable
 C3 — 27 pF 100 mil ATC
 C4 — 30 pF 100 mil ATC
 C5, C6 — 33 pF 100 mil ATC
 C9 — 250 pF 100 mil ATC
 C10 — 100 pF UNELCO
 C11, C14 — 1.0 μF 35 V TANTALUM

C12, C13 — 680 pF Feedthrough
 L1 — 5" #22 AWG 0.100" ID
 L2 — 5" #20 AWG 0.187" ID
 RFC1 — Ferroxcube VK200–20–4B
 B — Ferroxcube Bead 56–590–65–3B
 Z1 — 0.25" x 0.20" Microstrip
 Z2 — 1.63" x 0.20" Microstrip

Z3 — 0.20" x 0.20" Microstrip
 Z4, Z5 — 1/2" #18 AWG bent in a "V" shape 1/8" Wide
 Z6 — 0.20" x 0.20" Microstrip
 Z7 — 0.70" x 0.20" Microstrip
 Z8 — 0.33" x 0.20" Microstrip
 Z9 — 0.50" x 0.20" Microstrip
 Board — 62.5 mil Glass Teflon, $\epsilon_r = 2.55$

Figure 1. Test Circuit Schematic

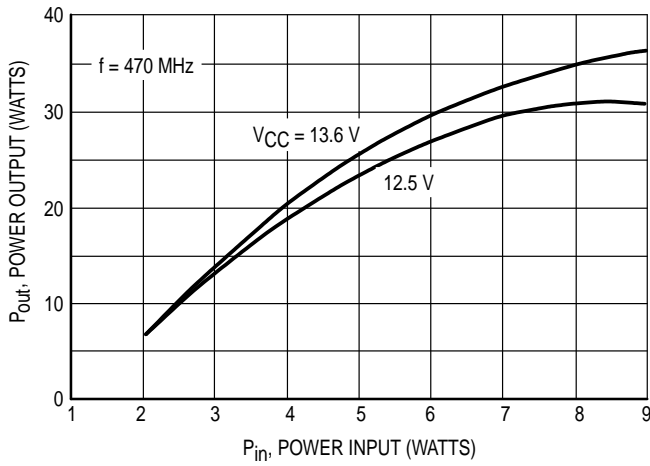


Figure 2. Power Output versus Power Input

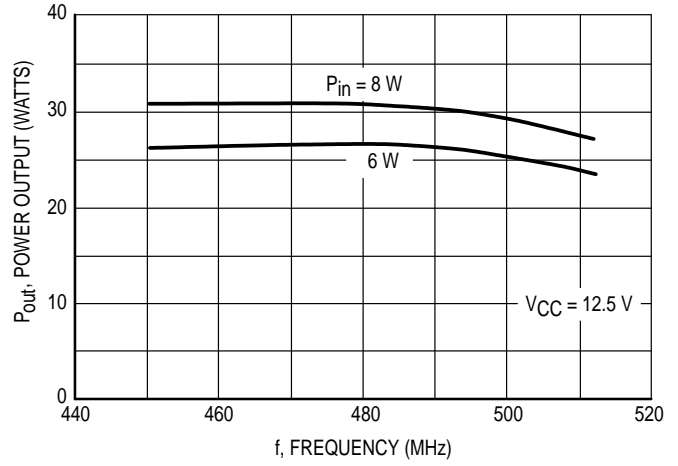


Figure 3. Power Output versus Frequency

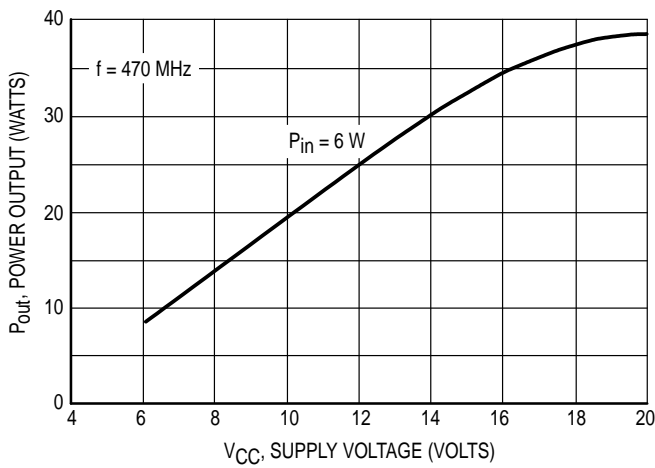


Figure 4. Power Output versus Supply Voltage

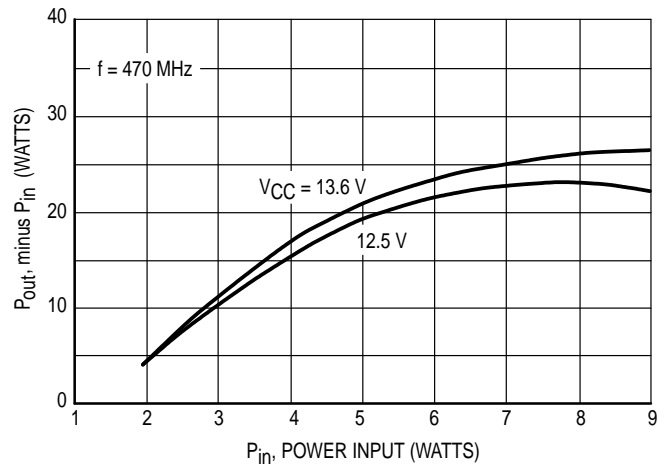
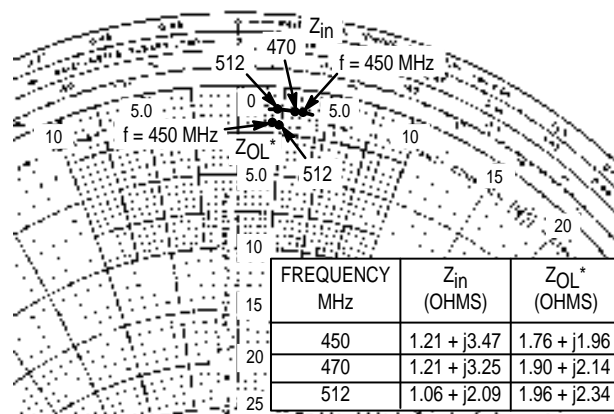


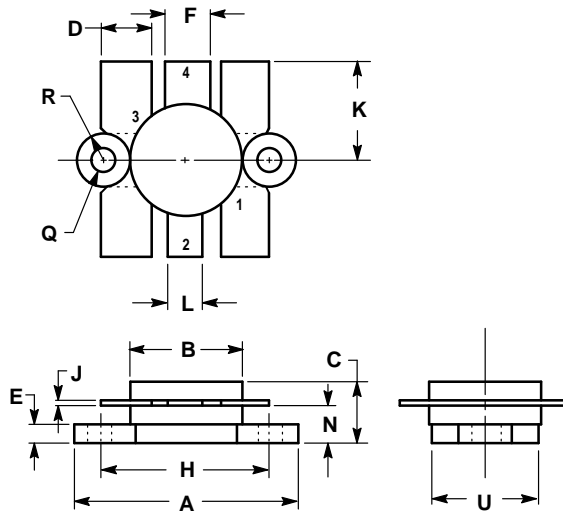
Figure 5. Power Saturation Profile



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

Figure 6. 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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