

The RF Line NPN Silicon Power Transistor

20W, 400MHz, 28V

Rev. V1

Designed primarily for wideband large-signal driver and predriver amplifier stages in the 200–500 MHz frequency range.

- Guaranteed performance at 400 MHz, 28 V
Output power = 20 W
Power gain = 10 dB min.
Efficiency = 50% min.
- 100% tested for load mismatch at all phase angles with 30:1 VSWR
- Gold metallization system for high reliability
- Computer-controlled wirebonding gives consistent input impedance

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	2.2 3.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	55 310	Watts mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	–65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.2	$^\circ\text{C/W}$

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 ($I_C = 20\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	33	—	—	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 20\text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	60	—	—	Vdc
Collector–Base Breakdown Voltage ($I_C = 20\text{ mAdc}$, $I_E = 0$)	$V_{(BR)CBO}$	60	—	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 2.0\text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	2.0	mAdc

ON CHARACTERISTICS

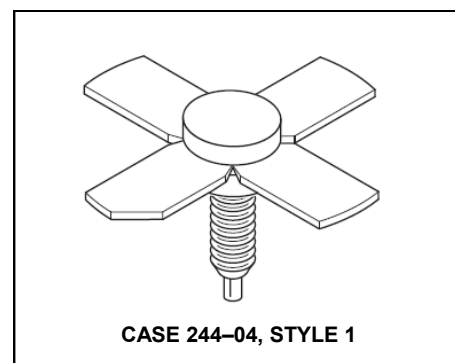
DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	20	—	80	—
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NOTE:

(continued)

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

Product Image



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

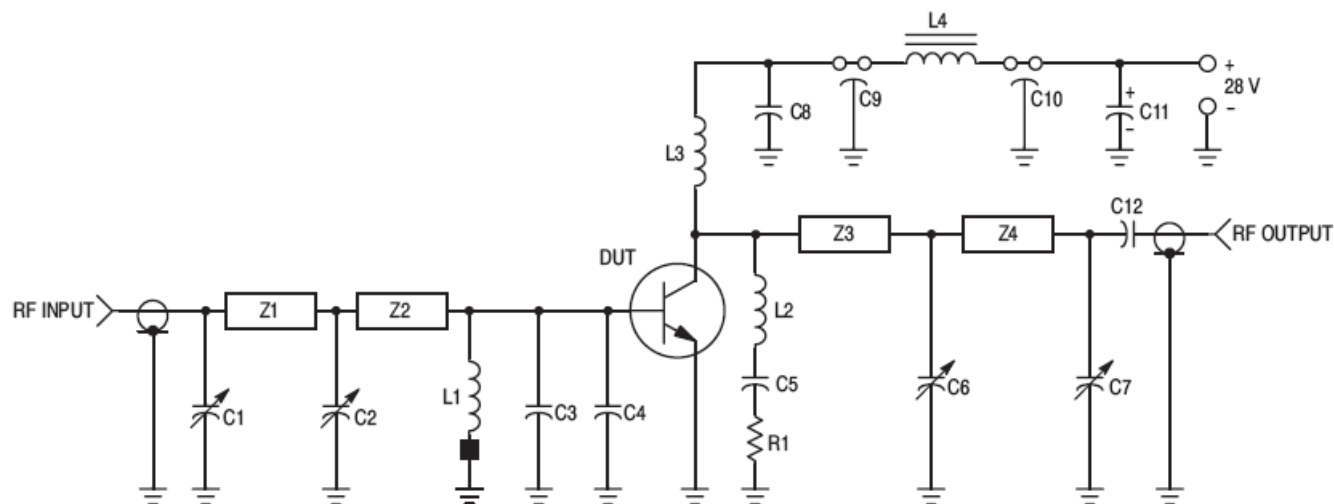
Characteristic	Symbol	Min	Typ	Max	Unit
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DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 28\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	20	24	pF
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FUNCTIONAL TESTS (Figure 1)

Common-Emitter Amplifier Power Gain ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 20\text{ W}$, $f = 400\text{ MHz}$)	G_{PE}	10	11	—	dB
Collector Efficiency ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 20\text{ W}$, $f = 400\text{ MHz}$)	η	50	60	—	%
Load Mismatch ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 20\text{ W}$, $f = 400\text{ MHz}$, VSWR = 30:1 all phase angles)	ψ	No Degradation in Output Power			



C1, C2, C6 — 1.0–20 pF Johanson Trimmer (JMC 5501)
 C3, C4 — 47 pF ATC Chip Capacitor
 C5, C8 — 0.1 μF Erie Redcap
 C7 — 0.5–10 pF Johanson Trimmer (JMC 5201)
 C9, C10 — 680 pF Feedthru
 C11 — 1.0 μF 50 Volt Tantalum
 C12 — 0.018 μF Vitramon Chip Capacitor
 L1 — 0.33 μH Molded Choke with Ferroxcube Bead
 (Ferroxcube 56–590–65/4B) on Ground End

L2 — 6 Turns #20 Enamel, 1/4" ID, Closewound
 L3 — 4 Turns #20 Enamel, 1/8" ID, Closewound
 L4 — Ferroxcube VK200–19/4B
 R1 — 5.1 Ω 1/4 Watt
 Z1 — Microstrip 0.1" W x 1.35" L
 Z2 — Microstrip 0.1" W x 0.55" L
 Z3 — Microstrip 0.1" W x 0.8" L
 Z4 — Microstrip 0.1" W x 1.75" L
 Board — Glass Teflon $\epsilon_r = 2.56$, $t = 0.062$ "
 Input/Output Connectors — Type N

Figure 1. 400 MHz Test Circuit Schematic

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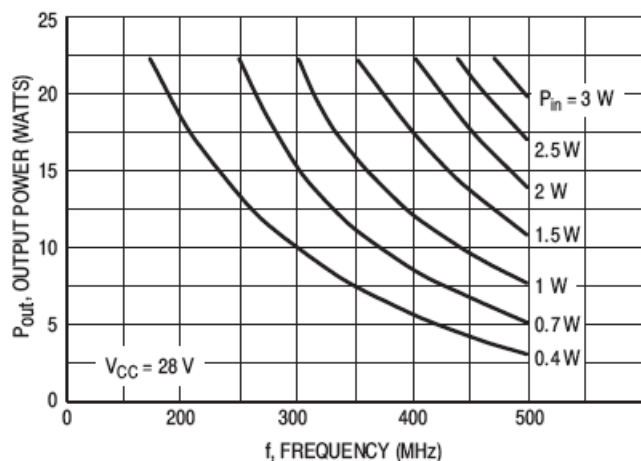


Figure 2. Output Power versus Frequency

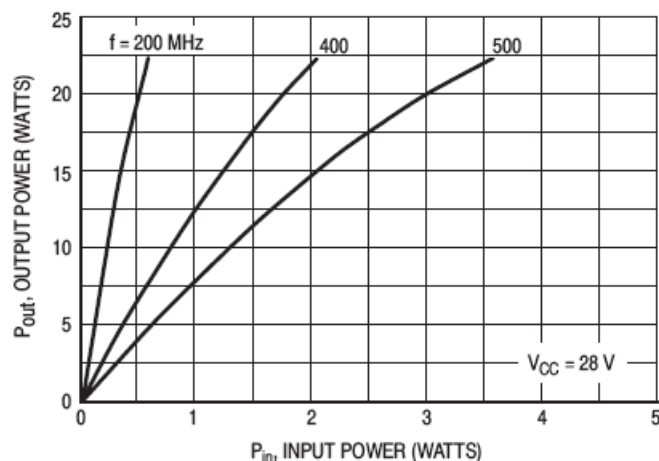


Figure 3. Output Power versus Input Power

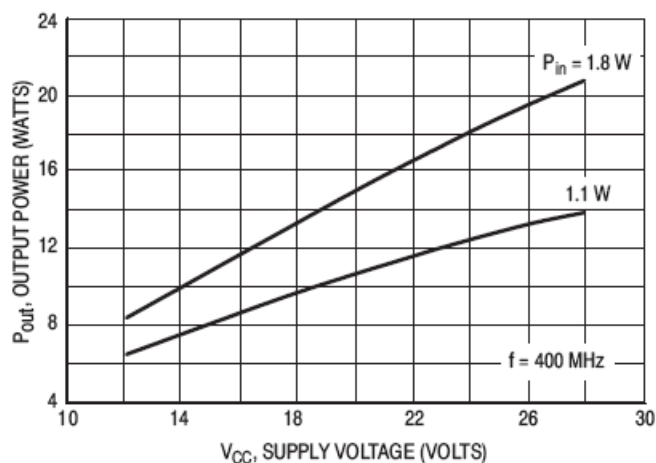


Figure 4. Output Power versus Supply Voltage

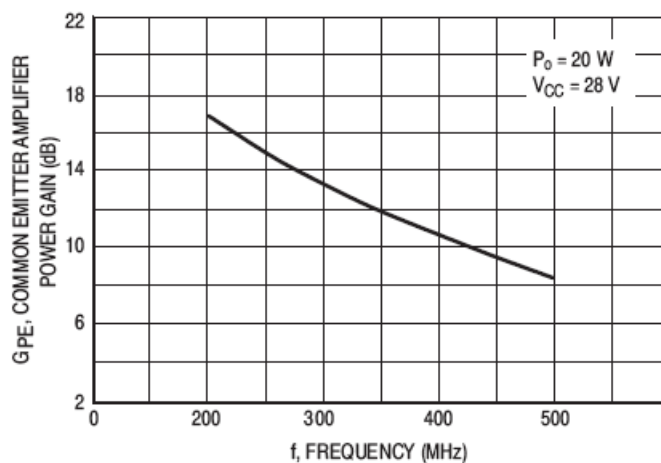


Figure 5. Power Gain versus Frequency

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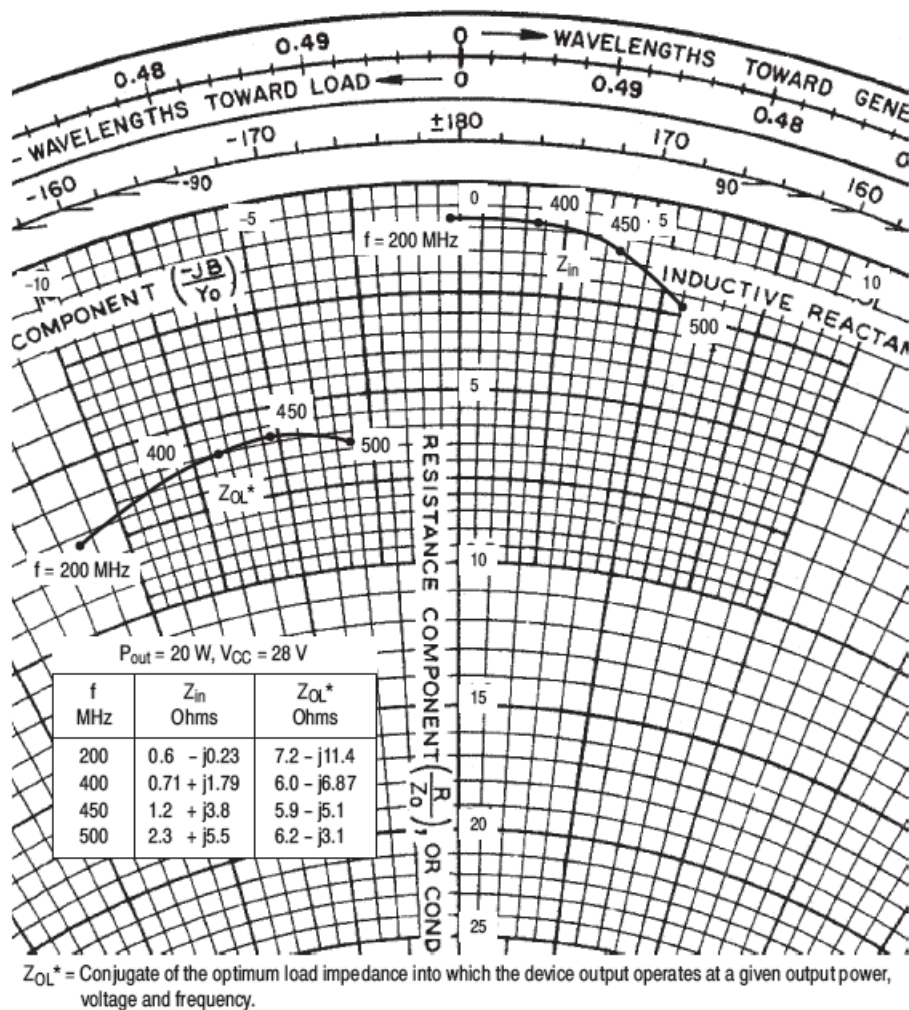
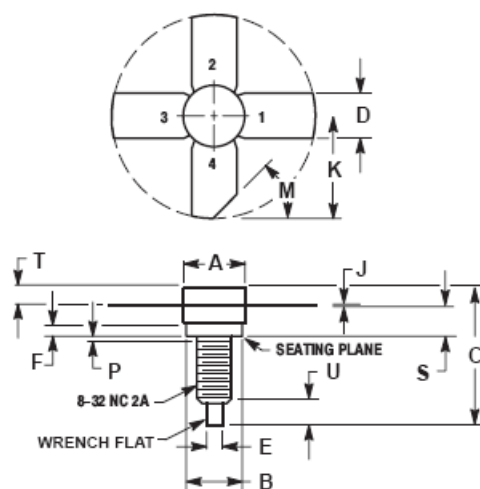


Figure 6. Series Equivalent Impedance

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PACKAGE DIMENSIONS



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	14.99	16.51	0.590	0.650
D	5.46	5.96	0.215	0.235
E	1.40	1.65	0.055	0.065
G	1.52	---	0.060	---
J	0.08	0.17	0.003	0.007
K	11.05	---	0.435	---
M	45° NOM		45° NOM	
P	---	1.27	---	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.77	0.055	0.070
U	2.92	3.68	0.115	0.145

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

CASE 244-04
ISSUE J

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