2N5160

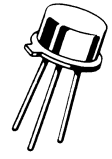
The RF Line

PNP SILICON
AMPLIFIER
TRANSISTOR

PNP SILICON RF POWER TRANSISTORS

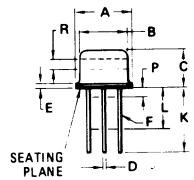
. . . designed for amplifier, frequency multiplier or oscillator applications in military and industrial equipment. Suitable for use as Class A, B, or C output driver, or pre-driver stages in VHF and UHF.

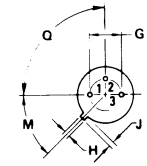
- High Power Gain – G_{PE} = 8.0 dB (Min) @ f = 400 MHz, 14.5 dB (Typ) @ 175 MHz – No Emitter Tuning
- Power Output – P_{out} = 1.0 Watt (Min) @ f = 400 MHz = 1.5 Watt (Typ) @ f = 175 MHz
- Resists Burnout When Load is Shorted or Opened
- Designed for Use in Complementary Circuits with 2N3866



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CB}	60	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Collector Current	I_C	0.4	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C





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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	6.10	6.60	0.240	0.260
D	0.406	0.533	0.016	0.021
E	0.229	3.18	0.009	0.125
F	0.406	0.483	0.016	0.019
G	4.83	5.33	0.190	0.210
H	0.711	0.864	0.028	0.034
J	0.737	1.02	0.029	0.040
K	12.70	–	0.500	–
L	6.35	–	0.250	–
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
Q	90° NOM		90° NOM	
R	2.54	–	0.100	–

All JEDEC dimensions and notes apply.

CASE 79-02
TO-39

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (I_C = 5.0 mAdc, I_B = 0)	$V_{(BR)CEO(sus)}$	40	-	-	Vdc
Emitter-Base Breakdown Voltage (I_E = 0.1 mAdc, I_C = 0)	$V_{(BR)EBO(sus)}$	4.0	-	-	Vdc
Collector Cutoff Current (V_{CE} = 28 Vdc, I_B = 0)	I_{CEO}	-	-	20	μAdc
Collector Cutoff Current (V_{CE} = 60 Vdc, V_{BE} = 0)	I_{CES}	-	-	0.1	mAdc
Collector Cutoff Current (V_{CB} = 28 Vdc, I_E = 0)	I_{CBO}	-	-	1.0	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 50 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	10	-	-	-
DYNAMIC CHARACTERISTICS					
Current-Gain-Bandwidth Product (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)	f_T	500	900	-	MHz
Collector-Base Capacitance (V_{CB} = 28 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	C_{cb}	-	2.5	4.0	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CE} = 28 Vdc, P_{in} = 0.16 Watt, f = 400 MHz)	G_{PE}	8.0	8.8	-	dB
(V_{CE} = 28 Vdc, P_{in} = 50 mW, f = 175 MHz)		-	14.5	-	
Power Output (V_{CE} = 28 Vdc, P_{in} = 0.16 Watt, f = 400 MHz)	P_{out}	1.0	1.2	-	Watt
(V_{CE} = 28 Vdc, P_{in} = 50 mW, f = 175 MHz)		-	1.4	-	
Collector Efficiency (V_{CE} = 28 Vdc, P_{in} = 0.16 Watt, f = 400 MHz)	η	45	55	-	%

3

FIGURE 1 – 400-MHz TEST CIRCUIT

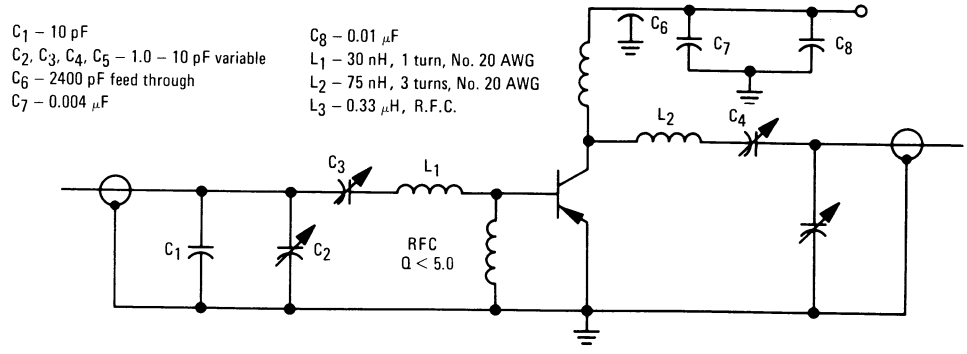


FIGURE 2 – POWER OUTPUT versus FREQUENCY

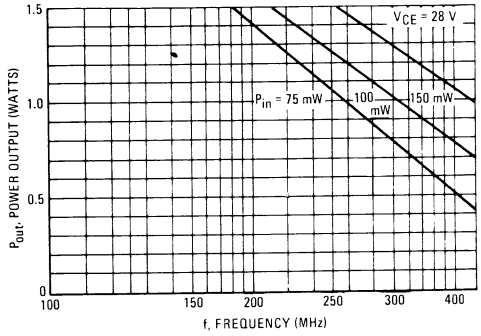


FIGURE 3 – POWER OUTPUT versus POWER INPUT

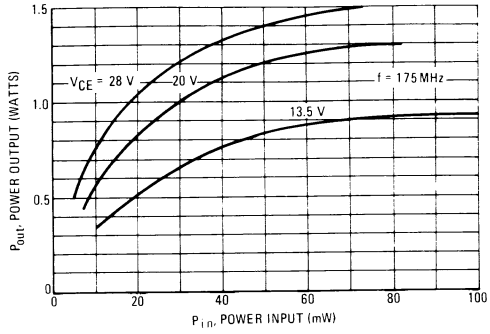


FIGURE 4 – PARALLEL INPUT IMPEDANCE versus FREQUENCY

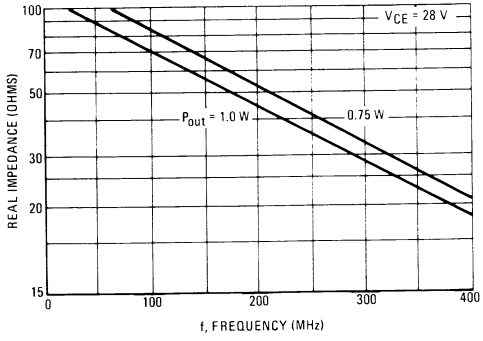


FIGURE 5 – PARALLEL INPUT IMPEDANCE versus FREQUENCY

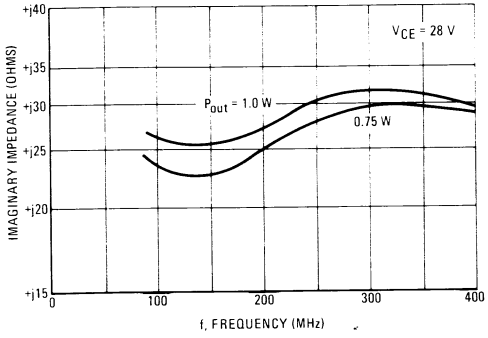


FIGURE 6 – PARALLEL OUTPUT CAPACITANCE versus FREQUENCY

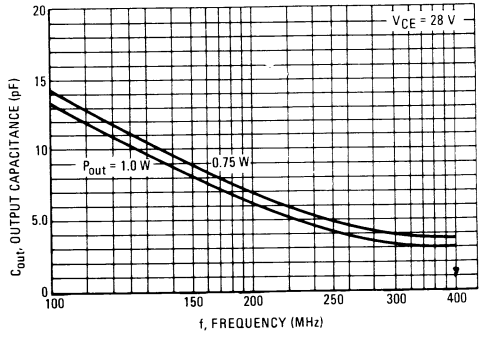


FIGURE 7 – CURRENT-GAIN–BANDWIDTH PRODUCT versus COLLECTOR CURRENT

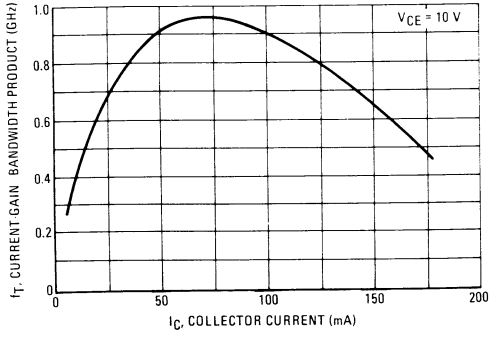


FIGURE 8 – 2N5160 300-MHz COMPLEMENTARY POWER OUTPUT CIRCUIT

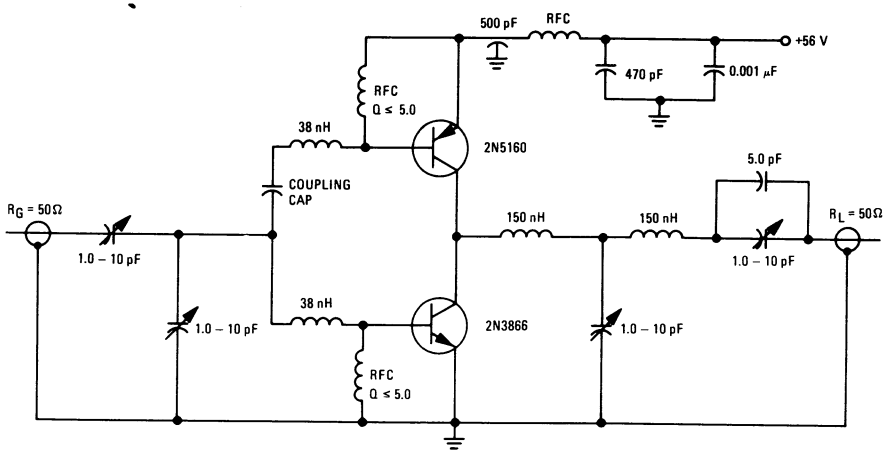
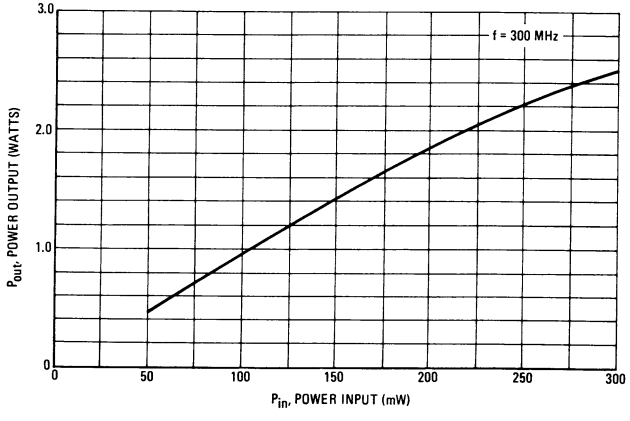


FIGURE 9 – COMPLEMENTARY CIRCUIT – POWER OUTPUT versus POWER INPUT



2N5179

The RF Line

4.5 dB @ 200 MHz

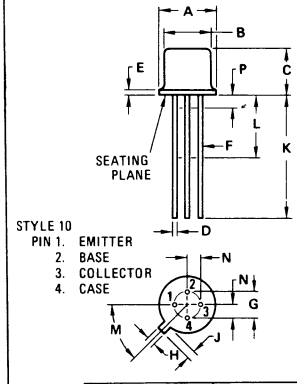
HIGH FREQUENCY TRANSISTOR

NPN SILICON

NPN SILICON RF HIGH FREQUENCY TRANSISTOR

. . . designed primarily for use in high-gain, low-noise amplifier, oscillator, and mixer applications. Can also be used in UHF converter applications.

- High Current-Gain – Bandwidth Product –
  f_T = 1.4 GHz (Typ) @ I_C = 10 mAdc
- Low Collector-Base Time Constant –
  $r_b'C_c$ = 14 ps (Max) @ I_E = 2.0 mAdc
- Characterized with Scattering Parameters
- Low Noise Figure –
  NF = 4.5 dB (Max) @ f = 200 MHz



STYLE 10
PIN 1. EMITTER
2. BASE
3. COLLECTOR
4. CASE

*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage Applicable 1.0 to 20 mAdc	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CB}	20	Vdc
Emitter-Base Voltage	V_{EB}	2.5	Vdc
Collector Current	I_C	50	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	200 1.14	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	300 1.71	mW mW/°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

*Indicates JEDEC Registered Data.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.170	0.210
D	0.41	0.53	0.016	0.021
E	–	0.76	–	0.030
F	0.41	0.48	0.016	0.019
G	2.54 BSC		0.100 BSC	
H	0.91	1.17	0.036	0.046
J	0.71	1.22	0.028	0.048
K	12.70	–	0.500	–
L	6.35	–	0.250	–
M	45° BSC		45° BSC	
N	1.27 BSC		0.050 BSC	
P	–	1.27	–	0.050

ALL JEDEC dimensions and notes apply

CASE 20-03
TO-72

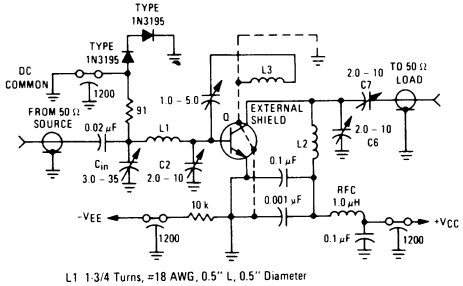
*ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (I_C = 3.0 mAdc, I_B = 0)	$V_{CEO(sus)}$	12	–	Vdc
Collector-Base Breakdown Voltage (I_C = 0.001 mAdc, I_E = 0)	$V_{(BR)CBO}$	20	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 0.01 mAdc, I_C = 0)	$V_{(BR)EBO}$	2.5	–	Vdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0) (V_{CB} = 15 Vdc, I_E = 0, T_A = 150°C)	I_{CBO}	– –	0.02 1.0	μAdc
ON CHARACTERISTICS				
DC Current Gain (I_C = 3.0 mAdc, V_{CE} = 1.0 Vdc)	h_{FE}	25	250	–
Collector-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)	$V_{CE(sat)}$	–	0.4	Vdc
Base-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)	$V_{BE(sat)}$	–	1.0	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain – Bandwidth Product ① (I_C = 5.0 mAdc, V_{CE} = 6.0 Vdc, f = 100 MHz)	f_T	900	2000	MHz
Collector-Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	C_{cb}	–	1.0	pF
Small-Signal Current Gain (I_C = 2.0 mAdc, V_{CE} = 6.0 Vdc, f = 1.0 kHz)	h_{fe}	25	300	–
Collector-Base Time Constant (I_E = 2.0 mAdc, V_{CB} = 6.0 Vdc, f = 31.9 MHz)	$r_b' C_c$	3.0	14	ps
Noise Figure (See Figure 1) (I_C = 1.5 mAdc, V_{CE} = 6.0 Vdc, R_S = 50 ohms, f = 200 MHz)	NF	–	4.5	dB
FUNCTIONAL TEST				
Common-Emitter Amplifier Power Gain (See Figure 1) (V_{CE} = 6.0 Vdc, I_C = 5.0 mAdc, f = 200 MHz)	G_{pe}	15	–	dB
Power Output (See Figure 2) (V_{CB} = 10 Vdc, I_E = 12 mAdc, f≥500 MHz)	P_{out}	20	–	mW

*Indicates JEDEC Registered Values.

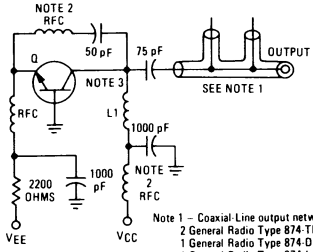
① f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

FIGURE 1 – 200 MHz AMPLIFIER POWER GAIN AND NOISE FIGURE CIRCUIT



L1 1-3/4 Turns, #18 AWG, 0.5" L, 0.5" Diameter
L2 2 Turns, #16 AWG, 0.5" L, 0.5" Diameter
L3 2 Turns, #13 AWG, 0.25" L, 0.5" Diameter (Position 1/4" from L2)

FIGURE 2 – 500 MHz OSCILLATOR CIRCUIT



Note 1 – Coaxial-Line output network consisting of:
2 General Radio Type 874-TEE or equivalent
1 General Radio Type 874-D20 Adjustable Stub or equivalent
1 General Radio Type 874-LA Adjustable Line or equivalent
1 General Radio Type 874-WN3 Short-circuit termination or equivalent
Note 2 – RFC = 0.2 μH Ohmite #2-460 or equivalent
Note 3 – Lead Number 4 (case) floating
L1 – 2 turns #16 AWG wire, 3/8 inch OD, 1-1/4 inch long
Q = 2N5179

FIGURE 3 – NOISE FIGURE versus FREQUENCY

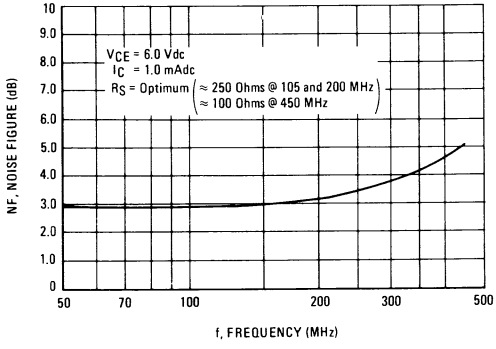


FIGURE 4 – NOISE FIGURE versus SOURCE RESISTANCE and COLLECTOR CURRENT

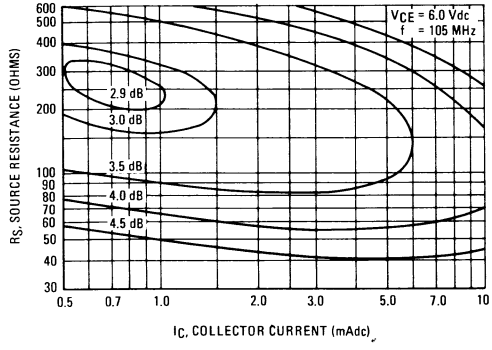


FIGURE 5 – NOISE FIGURE versus SOURCE RESISTANCE and COLLECTOR CURRENT

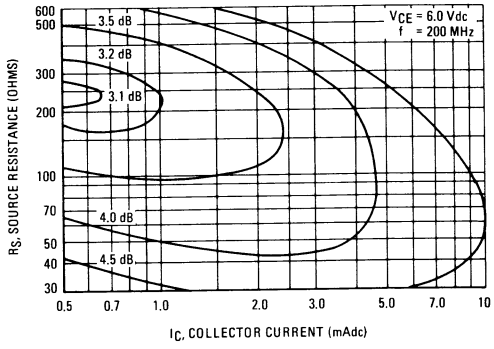


FIGURE 6 – CURRENT-GAIN-BANDWIDTH PRODUCT

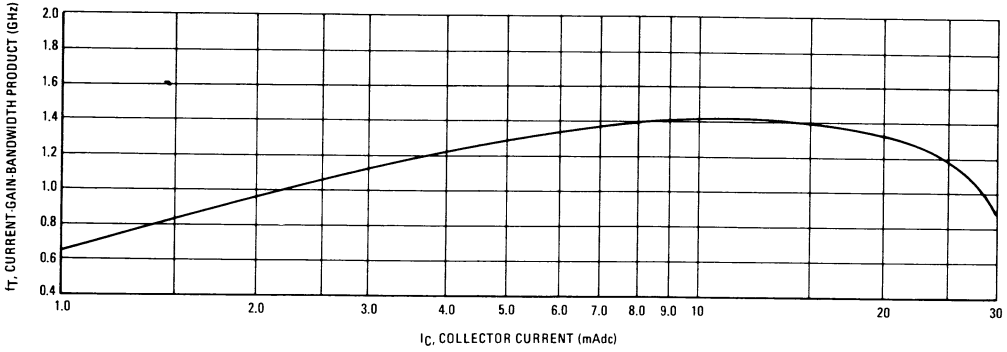


FIGURE 7 – INPUT ADMITTANCE versus FREQUENCY

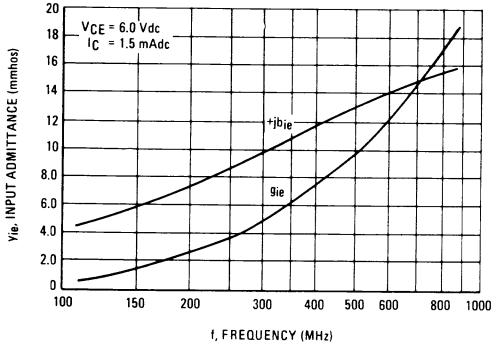


FIGURE 8 – OUTPUT ADMITTANCE versus FREQUENCY

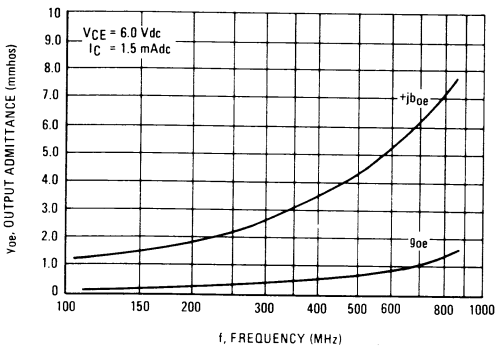


FIGURE 9 – FORWARD TRANSFER ADMITTANCE versus FREQUENCY

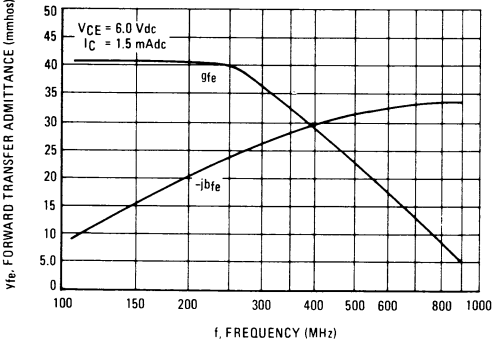


FIGURE 10 – REVERSE TRANSFER ADMITTANCE versus FREQUENCY

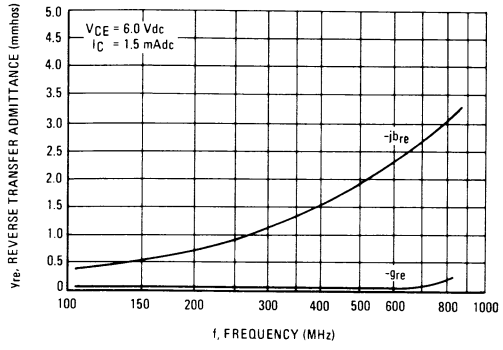


FIGURE 11— S_{11}, INPUT REFLECTION COEFFICIENT

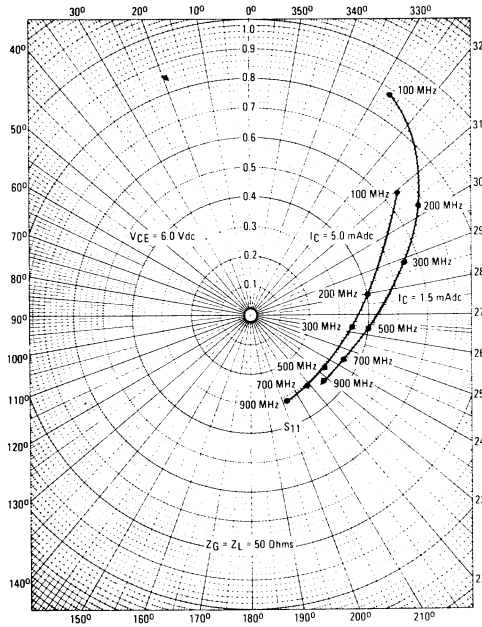


FIGURE 12 – S_{22}, OUTPUT REFLECTION COEFFICIENT

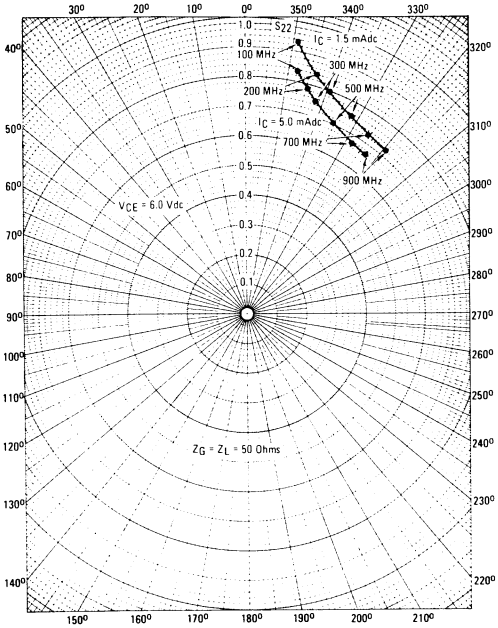


FIGURE 13 – S_{12}, REVERSE TRANSMISSION COEFFICIENT

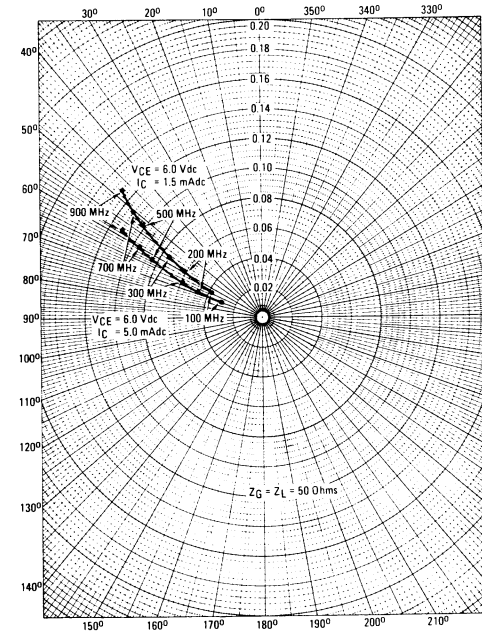


FIGURE 14 – S_{21}, FORWARD TRANSMISSION COEFFICIENT

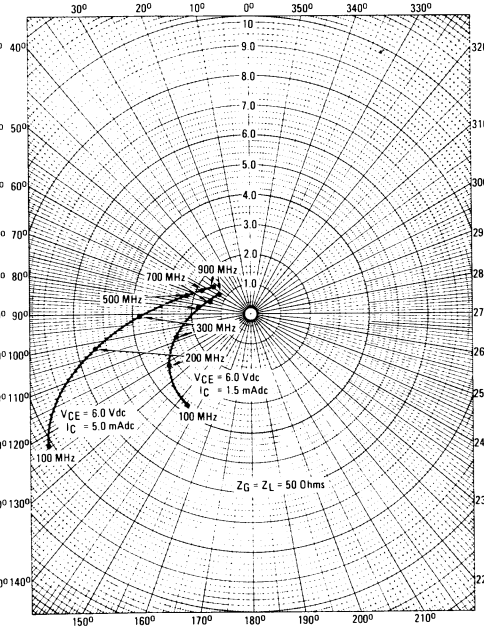


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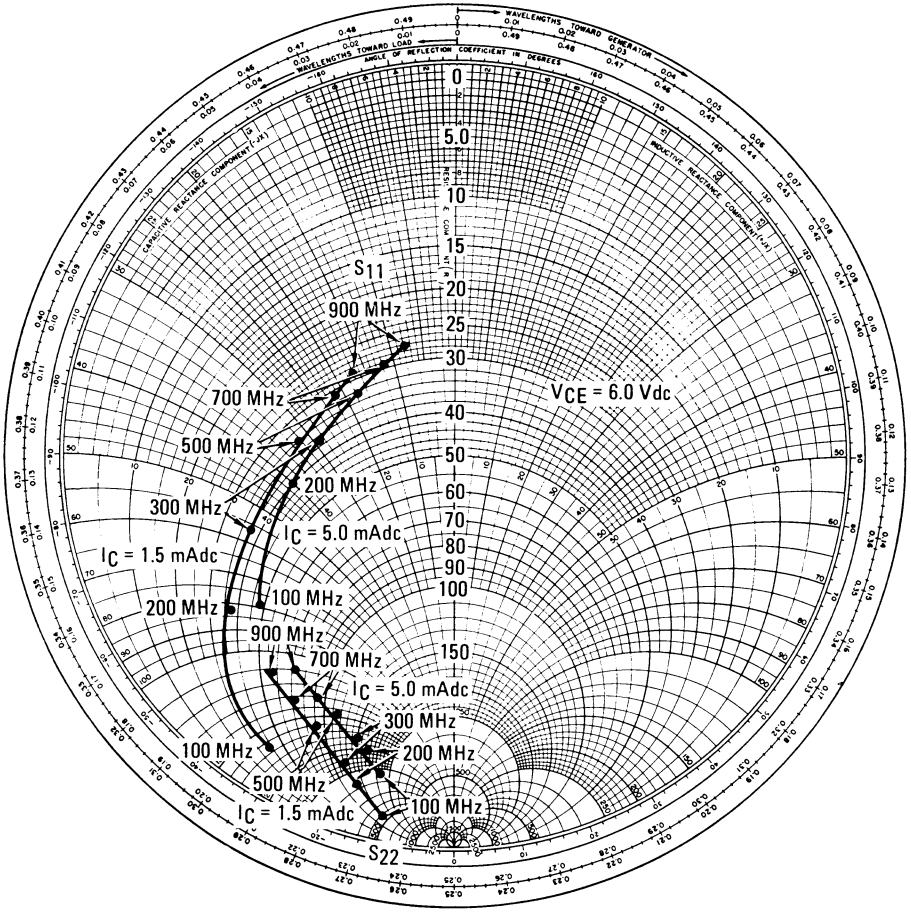
FIGURE 15 – S_{11}, INPUT REFLECTION COEFFICIENT AND S_{22}, OUTPUT REFLECTION COEFFICIENT



2N5583

The RF Line

PNP SILICON HIGH-FREQUENCY TRANSISTOR

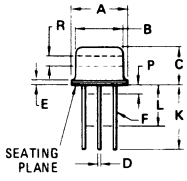
. . . designed for applications in high frequency amplifiers and non-saturated switching circuits. High gain-bandwidth product characteristic provides excellent performance in a variety of small signal and linear amplifier applications.

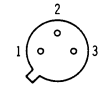
- High Current-Gain–Bandwidth Product –
  f_T = 1300 (Min) @ I_C = 100 mAdc
- Low Collector-Base Time Constant –
  $r_b'C_c$ = 8.0 ps (Typ) @ I_C = 50 mAdc

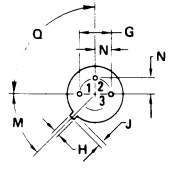
1.3 GHz @ 100 mAdc

HIGH-FREQUENCY TRANSISTOR

PNP SILICON







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

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
*Collector-Emitter Voltage	V_{CEO}	30	Vdc
*Collector-Base Voltage	V_{CB}	30	Vdc
*Emitter-Base Voltage	V_{EB}	3.0	Vdc
*Collector Current – Continuous	I_C	500	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.0 5.71	Watt mW/°C
*Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
*Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C

*Indicates JEDEC Registered Data.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	6.10	6.60	0.240	0.260
D	0.406	0.533	0.016	0.021
E	0.229	3.18	0.009	0.125
F	0.406	0.483	0.016	0.019
G	4.83	5.33	0.190	0.210
H	0.711	0.864	0.028	0.034
J	0.737	1.02	0.029	0.040
K	12.70	–	0.500	–
L	6.35	–	0.250	–
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
Q	90° NOM		90° NOM	
R	2.54	–	0.100	–

All JEDEC dimensions and notes apply.

CASE 79-02
TO-39

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Figure No.	Symbol	Min	Typ	Max	Unit
***OFF CHARACTERISTICS**						
Collector-Emitter Breakdown Voltage (Note 1) (I_C = 10 mAdc, I_B = 0)	–	$V_{(BR)CEO}$	30	–	–	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	–	$V_{(BR)CBO}$	30	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	–	$V_{(BR)EBO}$	3.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 20 Vdc, I_E = 0)	4	I_{CBO}	–	–	50	nAdc
Emitter Cutoff Current (V_{EB} = 2.0 Vdc, I_C = 0)	–	I_{EBO}	–	–	0.5	μAdc
***ON CHARACTERISTICS**						
DC Current Gain (Note 1)	1	h_{FE}				–
(I_C = 40 mAdc, V_{CE} = 2.0 Vdc)			20	40	–	
(I_C = 100 mAdc, V_{CE} = 2.0 Vdc)			25	40	100	
(I_C = 300 mAdc, V_{CE} = 5.0 Vdc)			15	22	–	
Collector-Emitter Saturation Voltage (Note 1) (I_C = 100 mAdc, I_B = 10 mAdc)	2,3	$V_{CE(sat)}$	–	0.6	0.8	Vdc
Base-Emitter On Voltage (Note 1) (I_C = 100 mAdc, V_{CE} = 2.0 Vdc)	3	$V_{BE(on)}$	–	0.84	1.8	Vdc
SMALL-SIGNAL CHARACTERISTICS						
*Current-Gain—Bandwidth Product	7	f_T				MHz
(I_C = 40 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)			1000	1300	–	
(I_C = 100 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)			1300	1500	–	
*Collector-Base Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 100 kHz)	5	C_{cb}	–	2.5	5.0	pF
*Emitter-Base Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 100 kHz)	5	C_{eb}	–	18	35	pF
Collector-Base Time Constant (I_C = 50 mAdc, V_{CB} = 10 Vdc, f = 63.6 MHz)	8	$r_b'C_c$	–	8.0	–	ps
SWITCHING CHARACTERISTICS						
Delay Time (V_{CC} = 31.4 Vdc, I_C = 150 mAdc, R_C = 160 Ohms, R_E = 26.6 Ohms)	9,10	t_d	–	1.0	–	ns
Rise Time	9,10	t_r	–	2.1	–	ns
Fall Time	9,10	t_f	–	1.8	–	ns

*Indicates JEDEC Registered Data.
Note 1: Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle = 2.0%.

FIGURE 1 – DC CURRENT GAIN

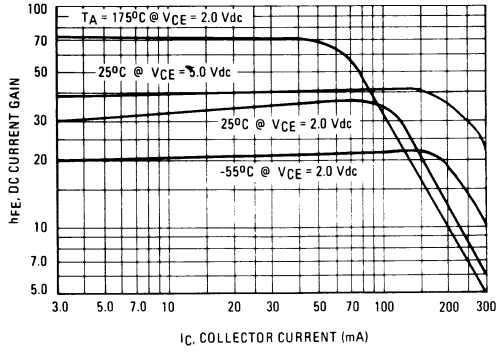


FIGURE 2 – COLLECTOR SATURATION REGION

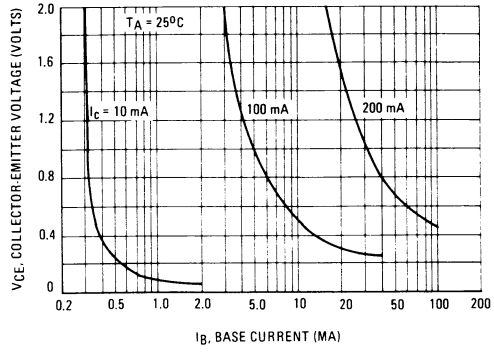


FIGURE 3 – "ON" VOLTAGES

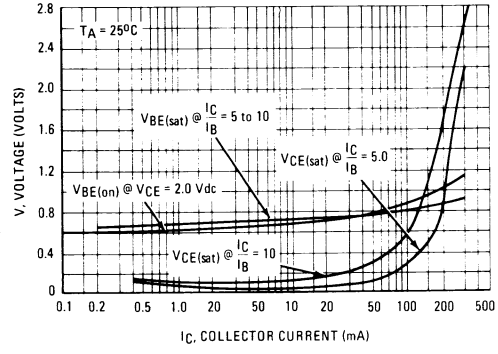


FIGURE 4 – COLLECTOR CURRENT versus BASE VOLTAGE

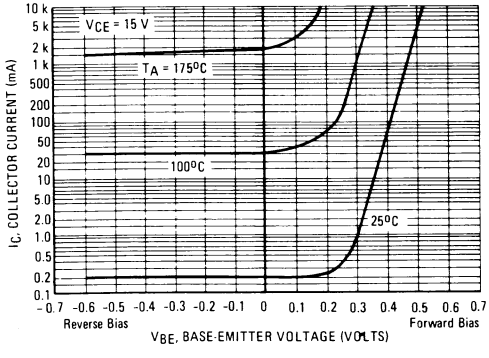


FIGURE 5 – CAPACITANCES

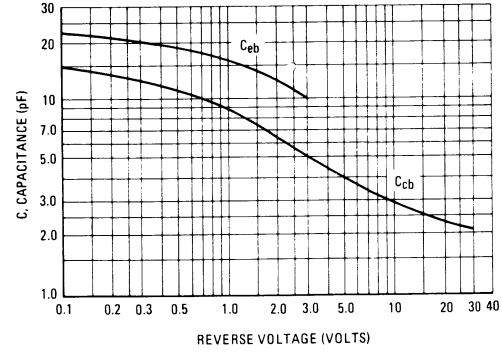


FIGURE 6 – TEMPERATURE COEFFICIENTS

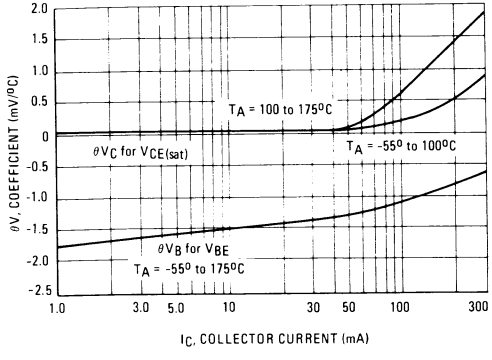


FIGURE 7 – CURRENT-GAIN–BANDWIDTH PRODUCT

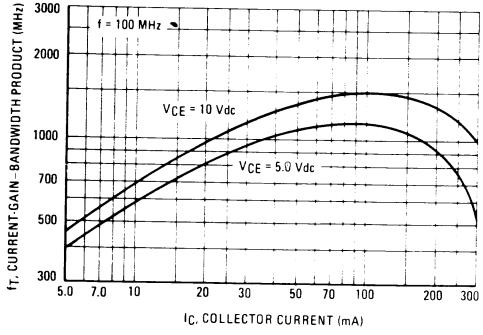


FIGURE 8 – COLLECTOR-BASE TIME CONSTANT

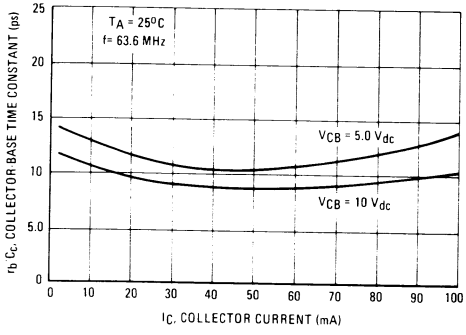


FIGURE 9 – SWITCHING TIMES

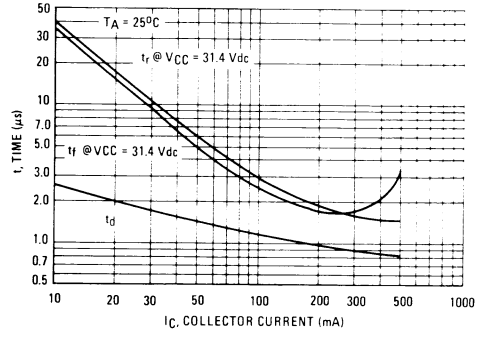
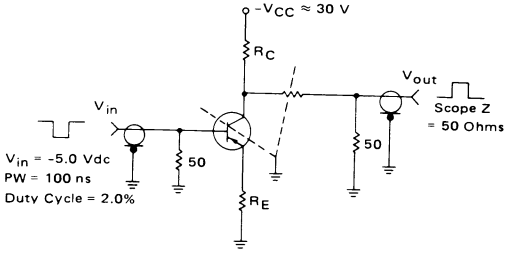


FIGURE 10 – SWITCHING TIMES TEST CIRCUIT



IC mA	RC Ohms	RE Ohms	VCC Volts
50	526	80	34.4
150	160	26.6	31.4
300	78	13.3	30.6
500	46.5	8.0	30.3

2N5641

The RF Line

NPN SILICON RF POWER TRANSISTOR

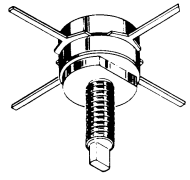
. . . designed primarily for wideband large-signal amplifier stages in the 125-175 MHz frequency range.

- Specified 28 Volt, 175 MHz Characteristics –
  Output Power = 7.0 Watts
  Minimum Gain = 8.4 dB
  Efficiency = 60%
- Characterized from 125 to 175 MHz
- Includes Series Equivalent Impedances

7.0 W – 175 MHz

RF POWER
TRANSISTOR

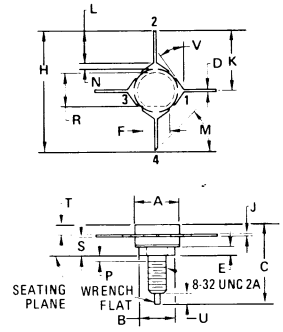
NPN SILICON



*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	35	Vdc
Collector-Base Voltage	V_{CB}	65	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Collector Current – Continuous	I_C	1.0	Adc
Total Device Dissipation @ $T_C = 25^oC$ Derate above 25^oC	P_D	15 86	Watts $mW/^oC$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	^oC

*Indicates JEDEC Registered Data.



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

NOTE:
1. DIM "N" IS FROM DIA "A" TO ANGLE "V"

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.63	19.46	0.694	0.766
D	0.64	0.89	0.025	0.035
E	1.78	2.03	0.070	0.080
F	5.59	5.84	0.220	0.230
H	26.16	27.69	1.030	1.090
J	0.10	0.15	0.004	0.006
K	13.08	13.84	0.515	0.545
L	7.11	7.37	0.280	0.290
M	40°	50°	40°	50°
N	1.27	1.52	0.050	0.060
P		1.27		0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.16	2.41	0.085	0.095
U	2.54	3.30	0.100	0.130
V	10°	20°	10°	20°

CASE 144B-03

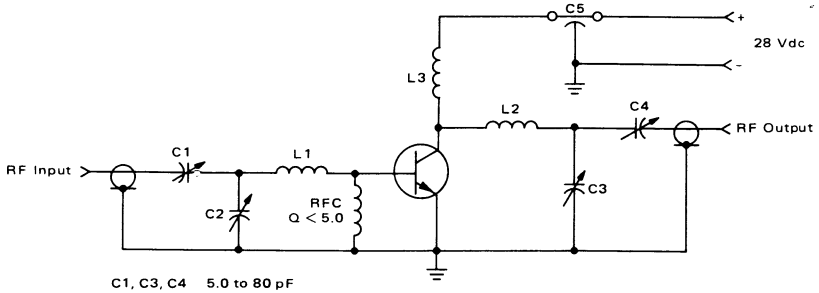
***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (Note 1) (I_C = 200 mAdc, I_B = 0)	$V_{(BR)CEO}$	35	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 200 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	65	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 30 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	C_{ob}	–	8.5	15	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (Figure 1) (P_{out} = 7.0 Watts, V_{CE} = 28 Vdc, f = 175 MHz)	G_{PE}	8.4	12.5	–	dB
Collector Efficiency (Figure 1) (P_{out} = 7.0 Watts, V_{CE} = 28 Vdc, f = 175 MHz)	η	60	–	–	%

Note 1: Pulsed through 25 mH inductor.
*Indicates JEDEC Registered Data.

3

FIGURE 1 – 175 MHz TEST CIRCUIT SCHEMATIC



C1, C3, C4	5.0 to 80 pF
C2	9.0 - 180 pF
C5	0.1 μF
L1	1-1/4 Straight #14 AWG
L2	3 Turns #16 AWG, 14" I.D.
L3	0.22 μH

FIGURE 2 – OUTPUT POWER versus FREQUENCY

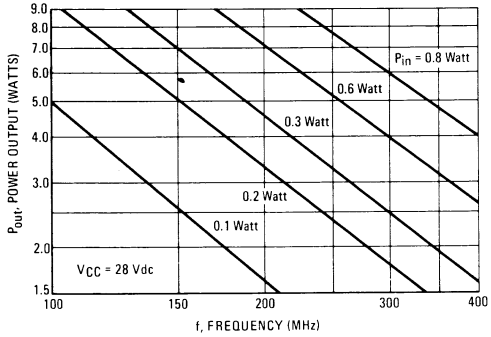


FIGURE 3 – OUTPUT POWER versus FREQUENCY

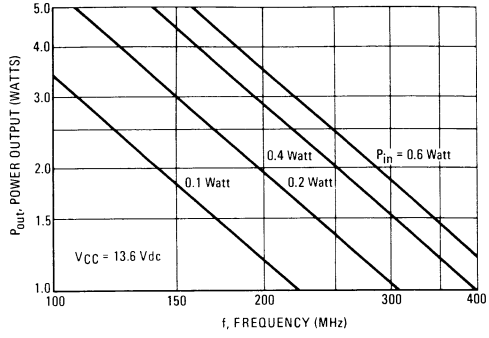
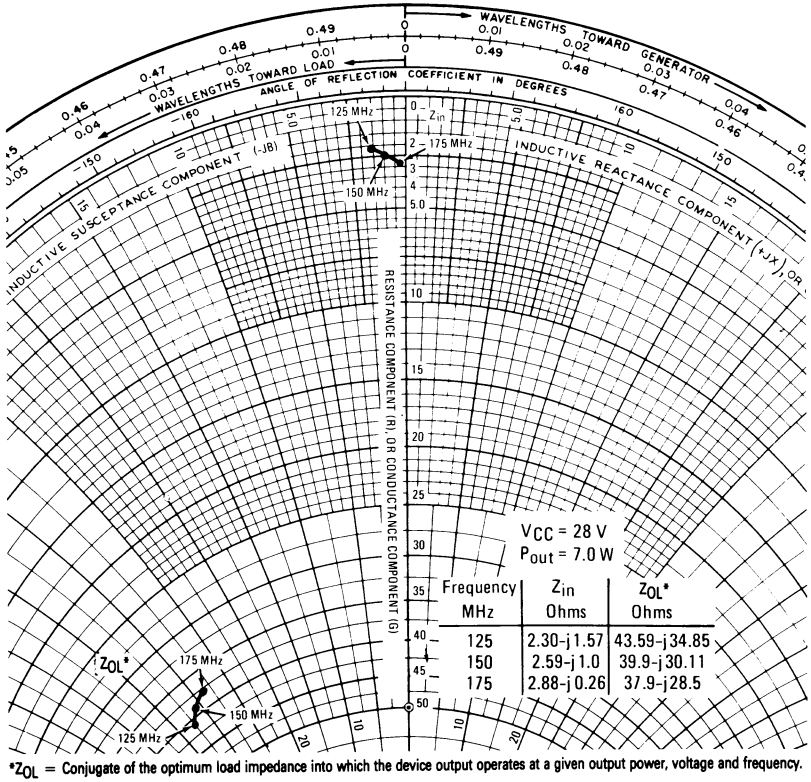


FIGURE 4 – SERIES EQUIVALENT IMPEDANCE



Frequency MHz	Z_{in} Ohms	Z_{OL}* Ohms
125	2.30-j1.57	43.59-j34.85
150	2.59-j1.0	39.9-j30.11
175	2.88-j0.26	37.9-j28.5

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

2N5642

The RF Line

NPN SILICON RF POWER TRANSISTOR

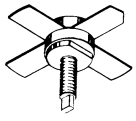
. . . designed primarily for wideband large-signal amplifier stages in the 125-175 MHz frequency range.

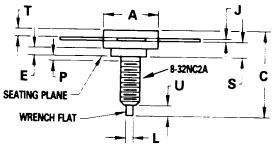
- Specified 28 Volt, 175 MHz Characteristics –
  Output Power = 20 Watts
  Minimum Gain = 8.2 dB
  Efficiency = 60%
- Characterized from 125 to 175 MHz
- Includes Series Equivalent Impedances

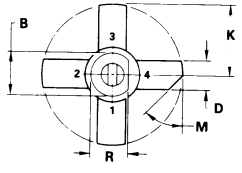
20 W – 175 MHz

RF POWER TRANSISTOR

NPN SILICON







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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	→	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

CASE 145A-09

*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	35	Vdc
Collector-Base Voltage	V_{CB}	65	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Collector Current – Continuous	I_C	3.0	Adc
Total Device Dissipation @ $T_C = 25^oC$ Derate above 25^oC	P_D	30 171	Watts mW/^oC
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	^oC

*Indicates JEDEC Registered Data.

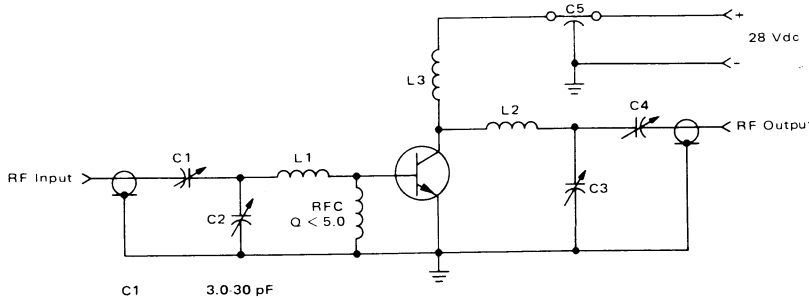
***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (Note 1) (I_C = 200 mAdc, I_B = 0)	$V_{(BR)CEO}$	35	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 200 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	65	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 200 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 30 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	C_{ob}	–	22	35	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (Figure 1) (P_{out} = 20 Watts, V_{CE} = 28 Vdc, f = 175 MHz)	G_{PE}	8.2	10.2	–	dB
Collector Efficiency (Figure 1) (P_{out} = 20 Watts, V_{CE} = 28 Vdc, f = 175 MHz)	η	60	–	–	%

Note 1: Pulsed through 25 mH inductor.
*Indicates JEDEC Registered Data.

3

FIGURE 1 – 175 MHz TEST CIRCUIT SCHEMATIC



C1	3.0-30 pF
C2, C3, C4	9.0-180 pF
C5	0.1 μF
L1	1" Straight #14 AWG
L2	1 Turn #16 AWG, 1/4" I.D.
L3	0.22 μH

FIGURE 2 – OUTPUT POWER versus FREQUENCY

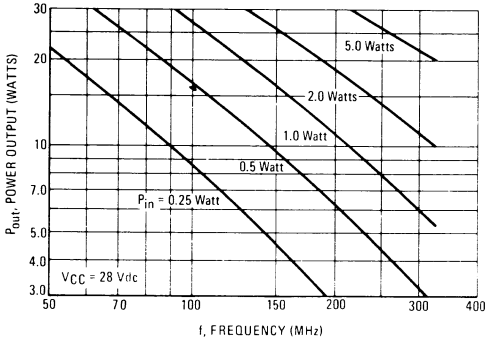


FIGURE 3 – OUTPUT POWER versus FREQUENCY

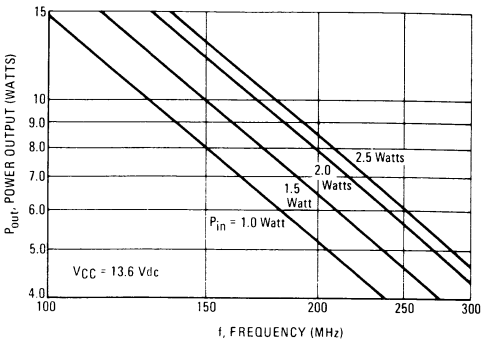
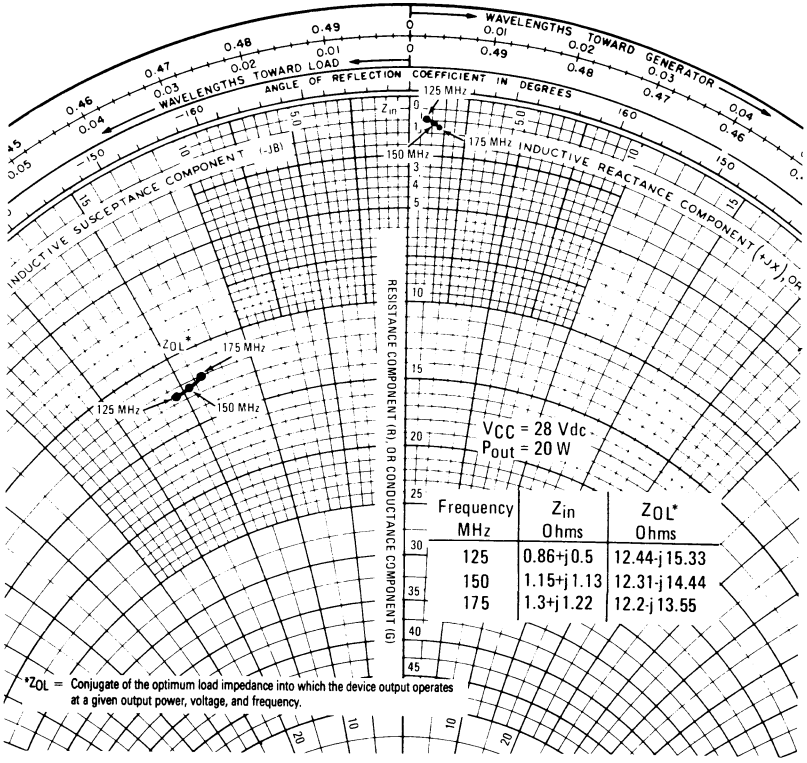


FIGURE 4 – SERIES EQUIVALENT IMPEDANCE



2N5643

The RF Line

40 W – 175 MHz

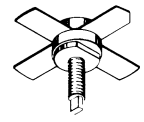
RF POWER
TRANSISTOR

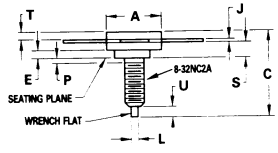
NPN SILICON

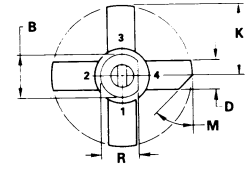
NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for wideband large-signal amplifier stages in the 125-175 MHz frequency range.

- Specified 28 Volt, 175 MHz Characteristics –
  Output Power = 40 Watts
  Minimum Gain = 7.6 dB
  Efficiency = 60%
- Characterized from 125 to 175 MHz
- Includes Series Equivalent Impedances







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

DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	—	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

CASE 145A-09

*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	35	Vdc
Collector-Base Voltage	V_{CB}	65	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Collector Current – Continuous	I_C	5.0	Adc
Total Device Dissipation @ $T_C = 25^oC$ Derate above 25^oC	P_D	60 342	Watts $mW/^oC$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	^oC

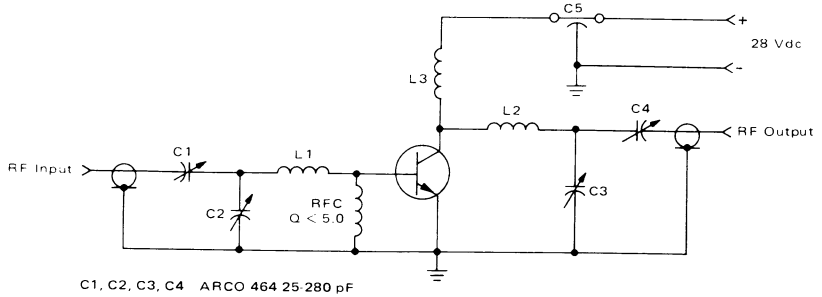
*Indicates JEDEC Registered Data.

*ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (Note 1) (I_C = 200 mAdc, I_B = 0)	$V_{(BR)CEO}$	35	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 200 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	65	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 30 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	C_{ob}	–	45	65	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (Figure 1) (P_{out} = 40 Watts, V_{CE} = 28 Vdc, f = 175 MHz)	G_{PE}	7.6	8.1	–	dB
Collector Efficiency (Figure 1) (P_{out} = 40 Watts, V_{CE} = 28 Vdc, f = 175 MHz)	η	60	–	–	%

Note 1: Pulsed through 25 mH inductor.
*Indicates JEDEC Registered Data.

FIGURE 1 – 175 MHz TEST CIRCUIT SCHEMATIC



C1, C2, C3, C4	ARCO 464 25-280 pF
C5	0.1 μF
L1	1" Straight #14 AWG
L2	1 Turn #16 AWG, 1/4" I.D.
L3	0.22 μH

FIGURE 2 – OUTPUT POWER versus FREQUENCY

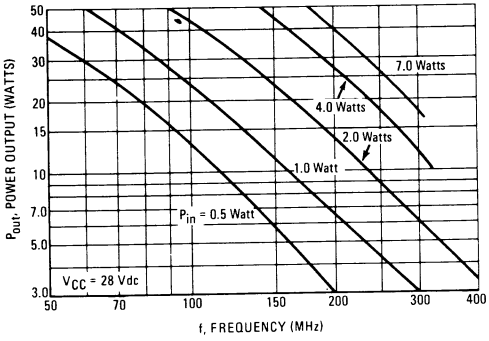


FIGURE 3 – OUTPUT POWER versus FREQUENCY

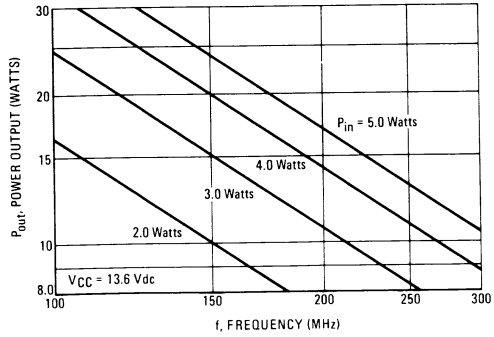
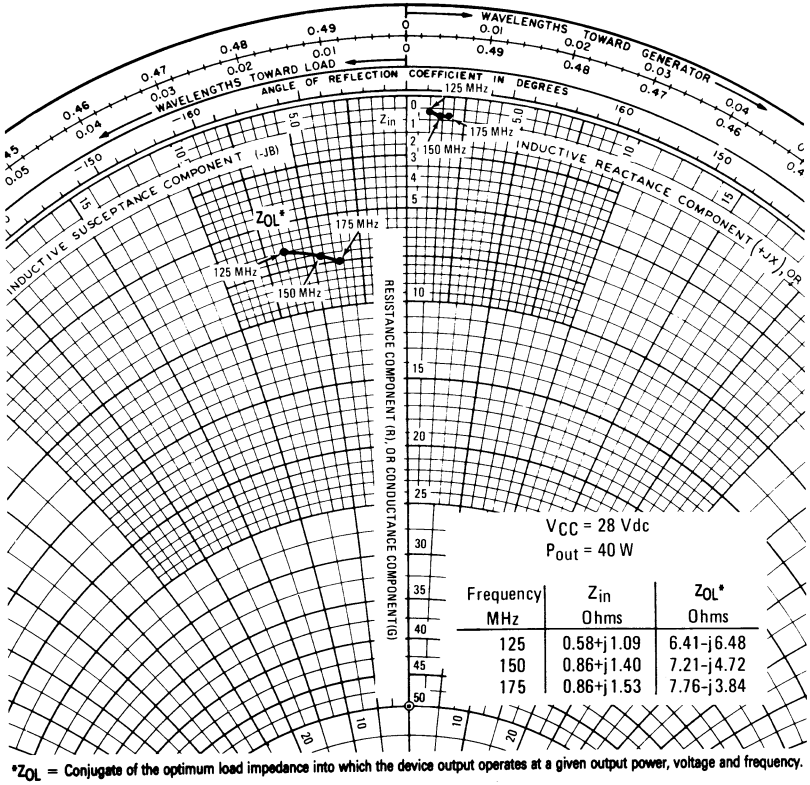


FIGURE 4 – SERIES EQUIVALENT IMPEDANCE



Frequency MHz	Z_{in} Ohms	Z_{OL}* Ohms
125	0.58+j1.09	6.41-j6.48
150	0.86+j1.40	7.21-j4.72
175	0.86+j1.53	7.76-j3.84

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