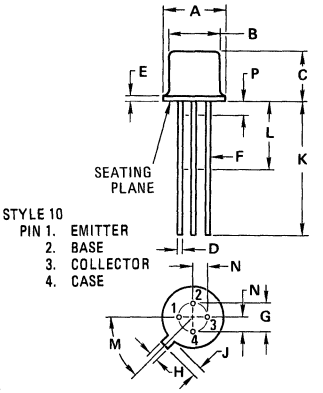
2N5841 (SILICON)
2N5842

NPN SILICON RF TRANSISTORS

. . . designed to provide ultra-fast switching times in current-mode circuits at collector currents to 80 mAdc.

- High Current-Gain–Bandwidth Product – @ I_C = 25 mAdc
  f_T = 2.2 GHz (Min) 2N5841
  1.7 GHz (Min) 2N5842
- Low Collector-Base Capacitance –
  C_{cb} = 1.5 pF (Max) @ V_{CB} = 4.0 Vdc
- Fast Non-Saturated Switching Times – @ I_C = 30 mAdc
  Typical Values
  $t_{d(on)}$ = 0.4 ns
  t_r = 0.18 ns
  $t_{d(off)}$ = 0.3 ns
  t_f = 0.20 ns

NPN SILICON
RF TRANSISTORS



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

*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	10	Vdc
Collector-Base Voltage	V_{CB}	20	Vdc
Emitter-Base Voltage	V_{EB}	3.0	Vdc
Collector Current – Continuous	I_C	100	mAdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	350 2.0	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C

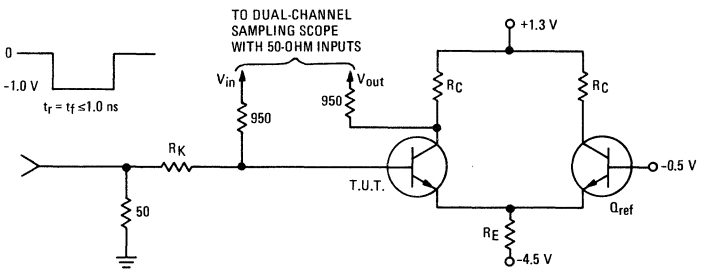
*Indicates JEDEC Registered Data.

*ELECTRICAL CHARACTERISTICS (T_C = 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)		$V_{CEO(sus)}$	10	–	–	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)		BV_{CBO}	20	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)		BV_{EBO}	3.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 10 Vdc, I_E = 0)		I_{CBO}	–	–	20	nAdc
Emitter Cutoff Current (V_{BE} = 2.5 Vdc, I_C = 0)		I_{EBO}	–	–	100	μAdc
ON CHARACTERISTICS						
DC Current Gain (I_C = 25 mAdc, V_{CE} = 4.0 Vdc)	2N5841 2N5842	h_{FE}	25 25	– –	200 250	–
Base-Emitter On Voltage (I_C = 25 mAdc, V_{CE} = 4.0 Vdc)		$V_{BE(on)}$	–	–	1.5	Vdc
DYNAMIC CHARACTERISTICS						
Current-Gain—Bandwidth Product		f_T				GHz
(I_C = 10 mAdc, V_{CE} = 4.0 Vdc, f = 200 MHz)	2N5841		2.0	2.6	–	
	2N5842		–	2.0	–	
(I_C = 25 mAdc, V_{CE} = 4.0 Vdc, f = 200 MHz)	2N5841		2.2	2.7	–	
	2N5842		1.7	2.0	–	
(I_C = 50 mAdc, V_{CE} = 4.0 Vdc, f = 200 MHz)	2N5841		–	2.2	–	
	2N5842		–	1.5	–	
Collector-Base Capacitance (V_{CB} = 4.0 Vdc, I_E = 0, f = 100 MHz)		C_{cb}	–	0.9	1.5	pF
Emitter-Base Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 100 MHz)		C_{eb}	–	0.7	1.1	pF
Collector-Base Time Constant		$r_b'C_c$				ps
(I_C = 25 mAdc, V_{CE} = 4.0 Vdc, f = 31.8 MHz)	2N5841		–	18	25	
	2N5842		–	25	40	
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	(I_C = 30 mAdc)	$t_{d(on)}$	–	0.40	–	ns
Rise Time		t_r	–	0.18	–	ns
Turn-Off Delay Time	(I_C = 30 mAdc)	$t_{d(off)}$	–	0.30	–	ns
Fall Time		t_f	–	0.20	–	ns

*Indicates JEDEC Registered Data

FIGURE 1 – SWITCHING TIMES TEST CIRCUIT



V_{in} and V_{out} are attenuated 20:1 at scope inputs. Before attenuation, $V_{in} = V_{out} = 1.0$ V.
Q_{ref} is a transistor of the same type as the transistor under test.

I_C mA	R_E Ohms	R_C Ohms	R_K Ohms
1.0	3.8 k	1.0 k	950
2.0	1.9 k	500	450
4.0	950	250	200
6.0	635	167	117
8.0	475	125	75
10	380	100	50
20	190	50	0
40	95	25	0
60	64	16-17	0
80	48	12-13	0
100	38	10	0

FIGURE 2 – CURRENT GAIN BANDWIDTH PRODUCT

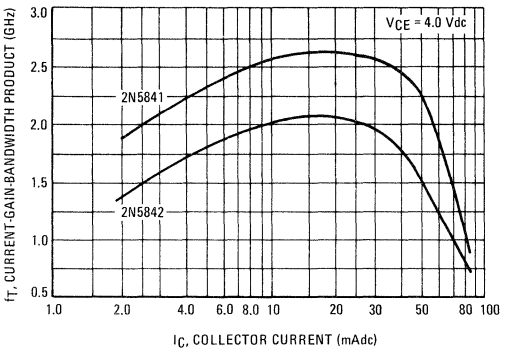


FIGURE 3 – COLLECTOR-BASE TIME CONSTANT

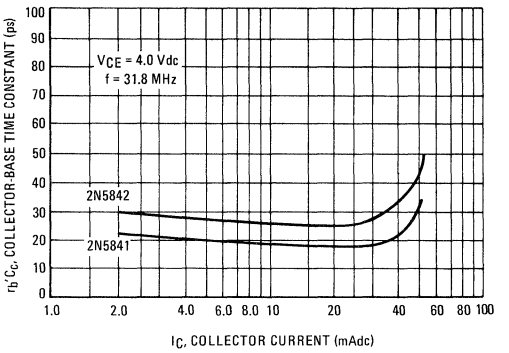


FIGURE 4 – SWITCHING TIMES

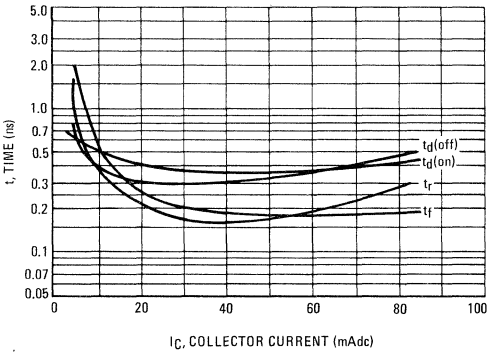


FIGURE 5 – CAPACITANCES

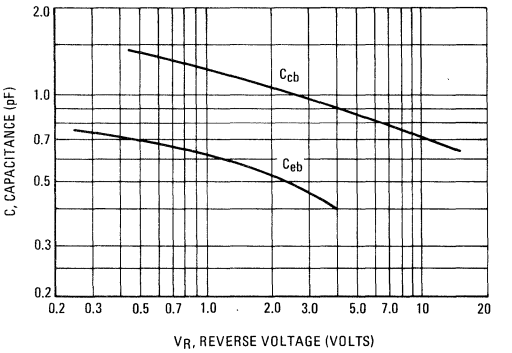


FIGURE 6 – BASE-EMITTER VOLTAGE versus CURRENT

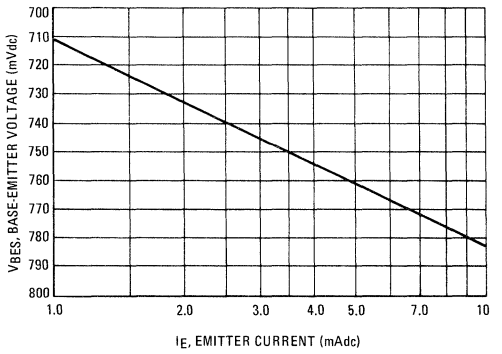
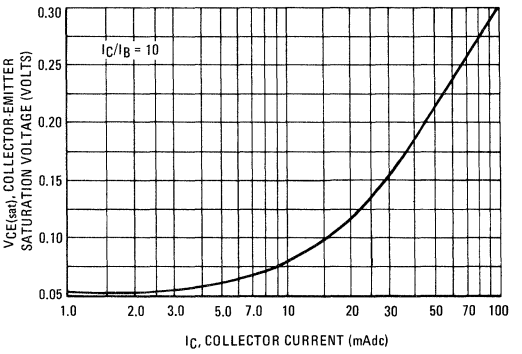


FIGURE 7 – COLLECTOR-EMITTER SATURATION VOLTAGE



V_{CE} = 4.0 Vdc, I_C = 10 mAdc

FIGURE 8 – INPUT ADMITTANCE versus FREQUENCY

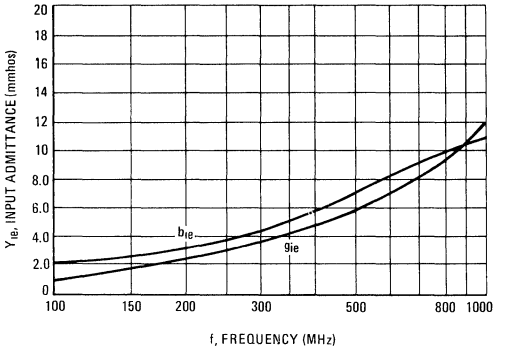


FIGURE 9 – OUTPUT ADMITTANCE versus FREQUENCY

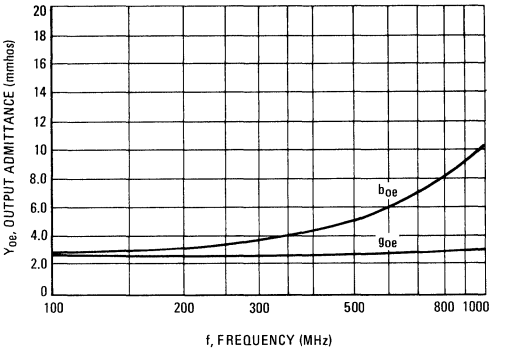


FIGURE 10 – FORWARD TRANSFER ADMITTANCE versus FREQUENCY

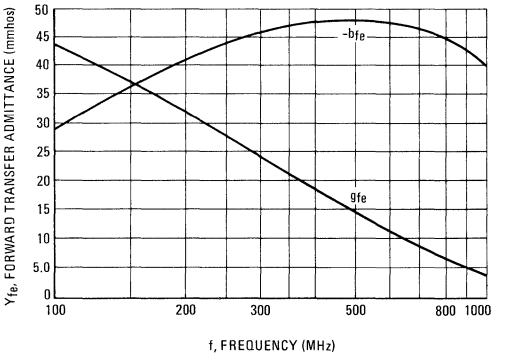
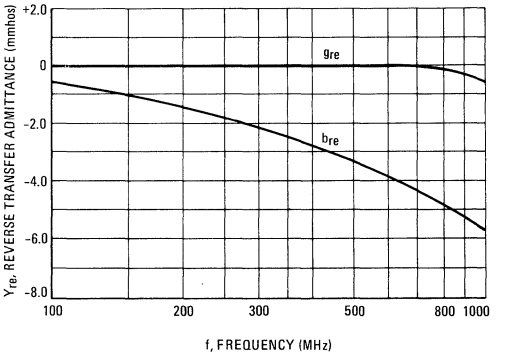
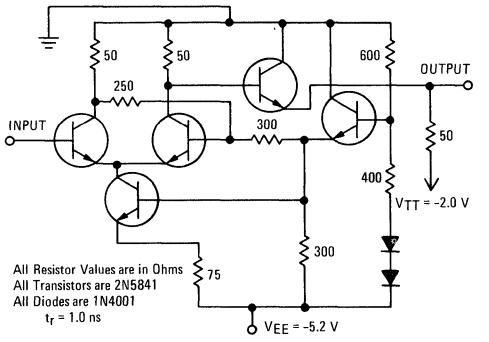


FIGURE 11 – REVERSE TRANSFER ADMITTANCE versus FREQUENCY

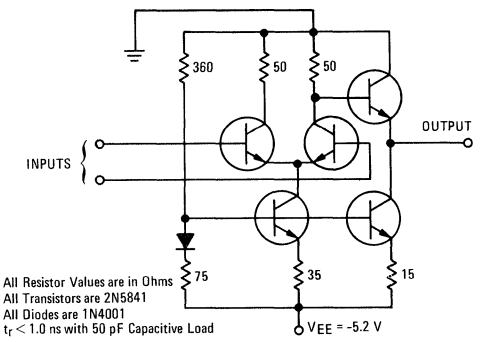


NON-SATURATED SWITCHING APPLICATIONS

SCHMITT TRIGGER



HIGH-SPEED CLOCK DRIVER



V_{CE} = 4.0 Vdc, I_C = 10 mAdc

FIGURE 12 – S_{11}, INPUT REFLECTION COEFFICIENT

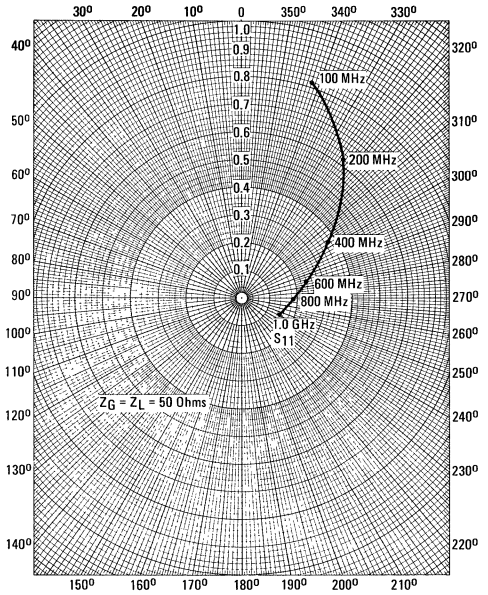


FIGURE 13 – S_{22}, OUTPUT REFLECTION COEFFICIENT

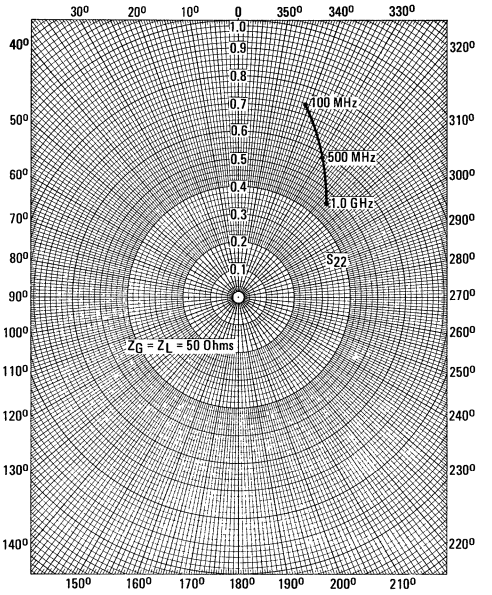


FIGURE 14 – S_{21}, FORWARD TRANSMISSION COEFFICIENT

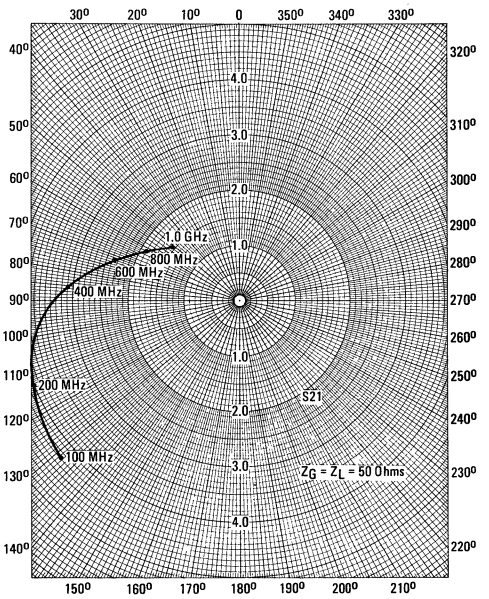
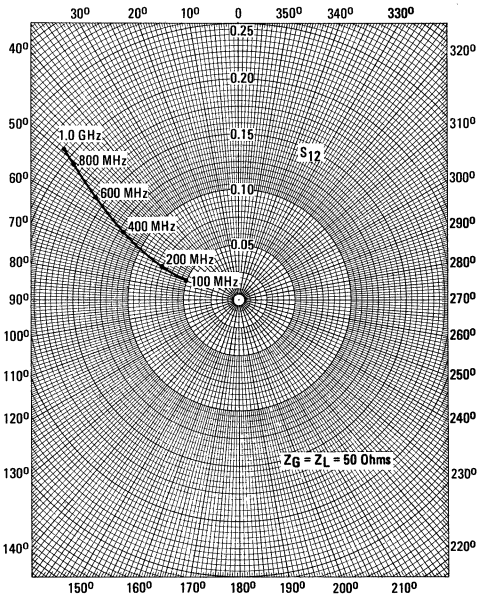


FIGURE 15 – S_{12}, REVERSE TRANSMISSION COEFFICIENT



V_{CE} = 4.0 Vdc, I_C = 10 mAdc

FIGURE 16 – S_{11}, INPUT REFLECTION COEFFICIENT

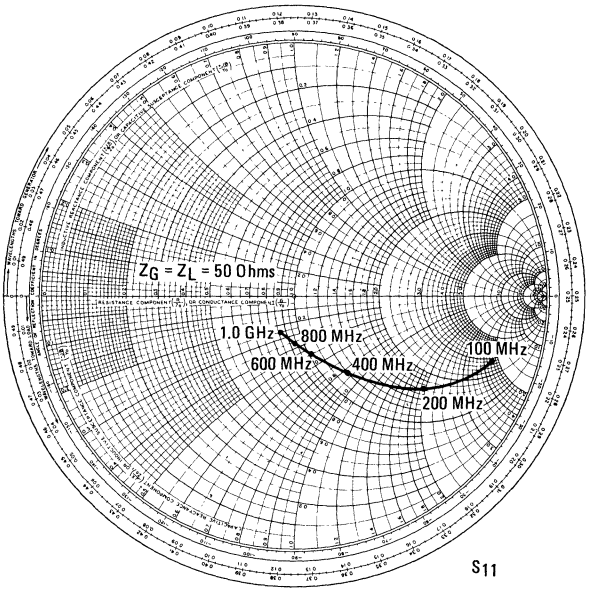


FIGURE 17 – S_{22}, OUTPUT REFLECTION COEFFICIENT