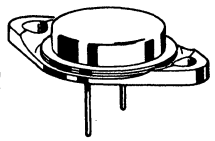
2N3021 thru 2N3026 (SILICON)

CASE 1
(TO-3)



PNP silicon power transistors for Class C power amplifiers, high-current core switching and high-speed switching and amplifier applications.

MAXIMUM RATINGS

Rating	Symbol	2N3021 2N3024	2N3022 2N3025	2N3023 2N3026	Unit
Collector-Base Voltage	V_{CB}	30	45	60	Volts
Collector-Emitter Voltage	V_{CEO}	30	45	60	Volts
Emitter-Base Voltage	V_{EB}	4.0			Volts
Collector Current	I_C	3.0			Amp
Base Current	I_B	0.5			Amp
Power Dissipation	P_D	25			Watts
Junction Operating Temperature Range	T_J	-65 to +175			°C

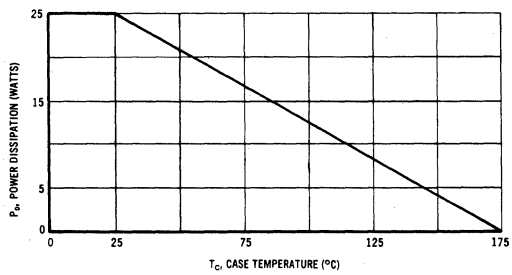
ELECTRICAL CHARACTERISTICS (At 25°C unless otherwise specified)

Characteristics		Symbol	Min	Max	Unit
Emitter-Base Cutoff Current (V_{BE} = 4 Vdc)		I_{EBO}	— 	1.0	mAdc
Collector-Emitter Cutoff Current		I_{CEX}			mAdc
(V_{CE} = 25 Vdc, V_{BE} = 2 Vdc)	2N3021, 2N3024		—	0.2	
(V_{CE} = 40 Vdc, V_{BE} = 2 Vdc)	2N3022, 2N3025		—	0.2	
(V_{CE} = 54 Vdc, V_{BE} = 2 Vdc)	2N3023, 2N3026		—	0.2	
(V_{CE} = 15 Vdc, V_{BE} = 2 Vdc, T_C = 150°C)	2N3021, 2N3024		—	2.0	
(V_{CE} = 25 Vdc, V_{BE} = 2 Vdc, T_C = 150°C)	2N3022, 2N3025		—	2.0	
(V_{CE} = 35 Vdc, V_{BE} = 2 Vdc, T_C = 150°C)	2N3023, 2N3026		—	2.0	
Collector-Emitter Breakdown Voltage*		BV_{CEO}*			Vdc
(I_C = 100 mAdc, I_B = 0)	2N3021, 2N3024		30	—	
(I_C = 50 mAdc, I_B = 0)	2N3022, 2N3025		45	—	
(I_C = 20 mAdc, I_B = 0)	2N3023, 2N3026		60	—	
DC Current Gain		h_{FE}			—
(I_C = 1.0 Adc, V_{CE} = 2 Vdc)	2N3021, 2N3022, 2N3023		20	60	
	2N3024, 2N3025, 2N3026		50	180	
Collector-Emitter Saturation Voltage		V_{CE} (sat)			Vdc
(I_C = 3 Adc, I_B = 0.3 Adc)	2N3021, 2N3022, 2N3023		—	1.5	
	2N3024, 2N3025, 2N3026		—	1.0	
Base-Emitter Saturation Voltage (I_C = 3 Adc, I_B = 0.3 Adc)		V_{BE} (sat)	— 	1.5	Vdc
Small Signal Current Gain (I_C = 0.5 Adc, V_{CE} = 15 Vdc, f = 30 MHz)		h_{fe}	2.0	—	—
Switching Times (I_C = 1 Adc, I_{B1} = I_{B2} = 100 mAdc)		$t_d + t_r$ t_s t_f	— — —	100 325 75	ns

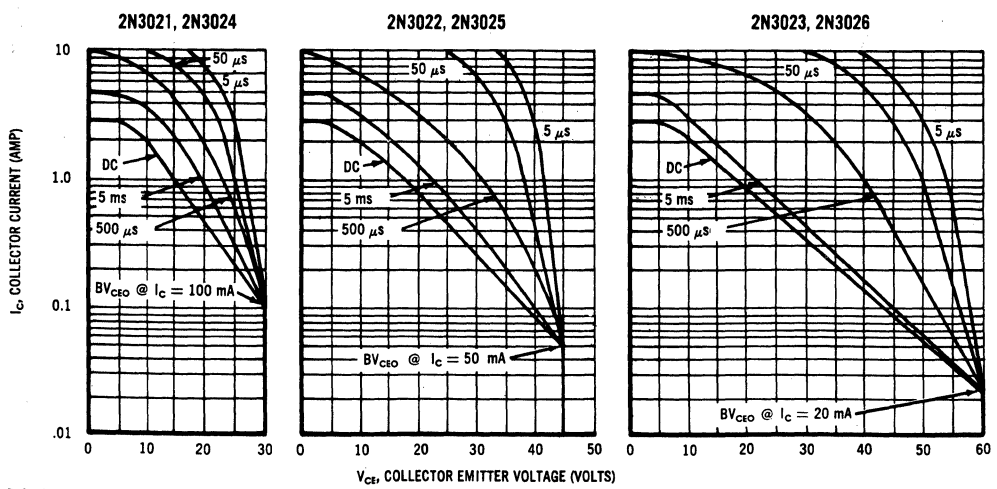
*Perform tests using sweep method to prevent heating.

POWER-TEMPERATURE DERATING CURVE

THESE TRANSISTORS ARE ALSO SUBJECT TO SAFE AREA CURVES AS INDICATED BOTH LIMITS ARE APPLICABLE AND MUST BE OBSERVED



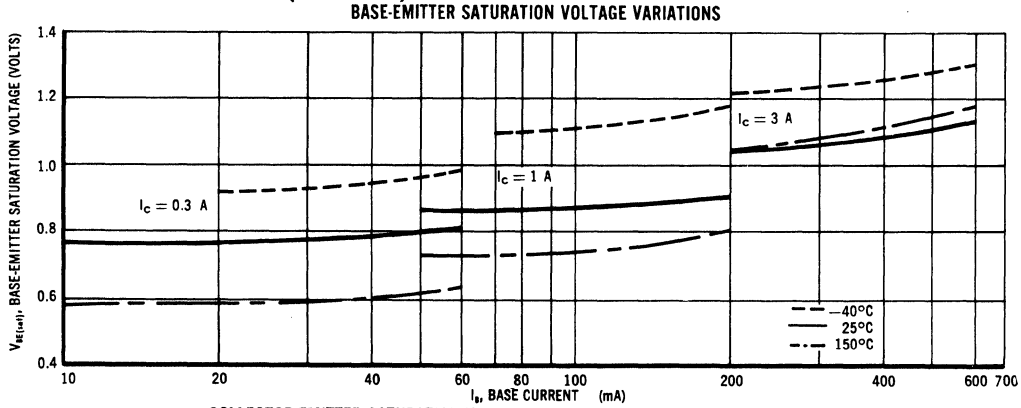
SAFE OPERATING AREAS



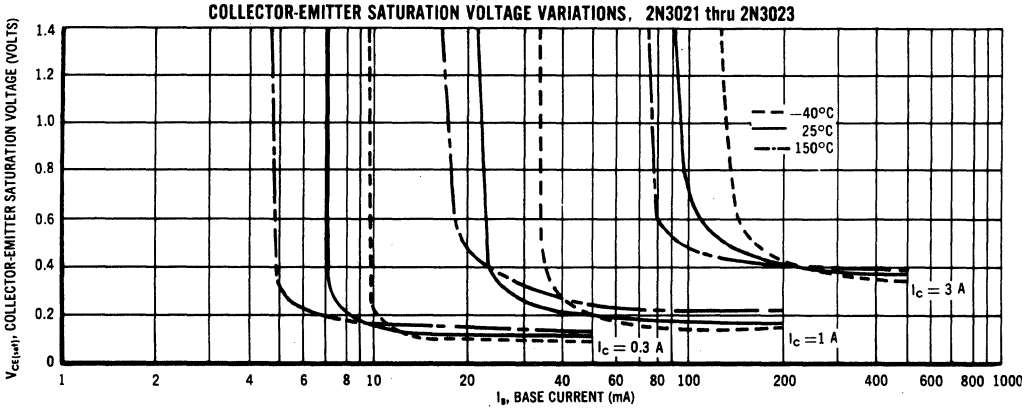
The Safe Operating Area Curves indicate I_C - V_{CE} limits below which the devices will not go into secondary breakdown. As the safe operating areas shown are independent of temperature and duty cycle, these curves can be used as long as the average power derating curve is also taken into consideration to insure operation below the maximum junction temperature.

2N3021 thru 2N3026 (continued)

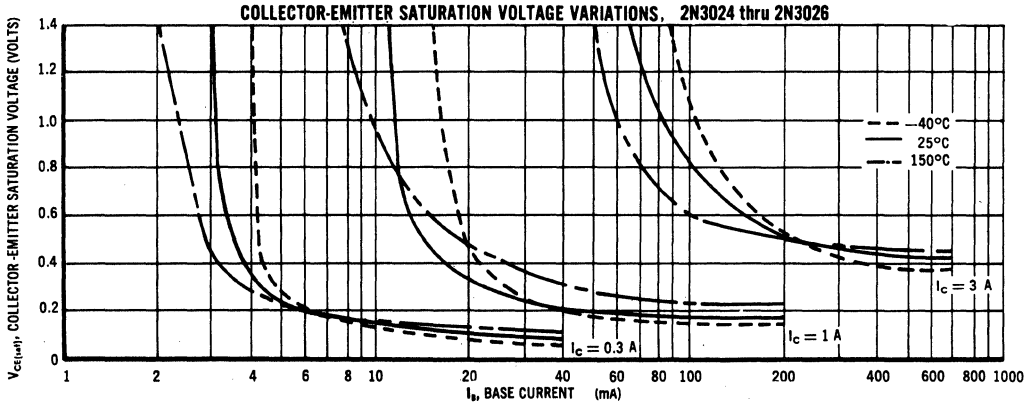
BASE-EMITTER SATURATION VOLTAGE VARIATIONS



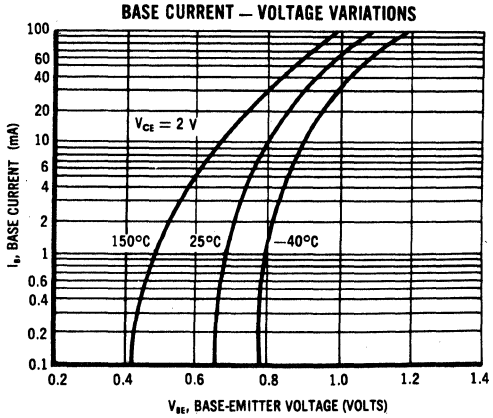
COLLECTOR-EMITTER SATURATION VOLTAGE VARIATIONS, 2N3021 thru 2N3023



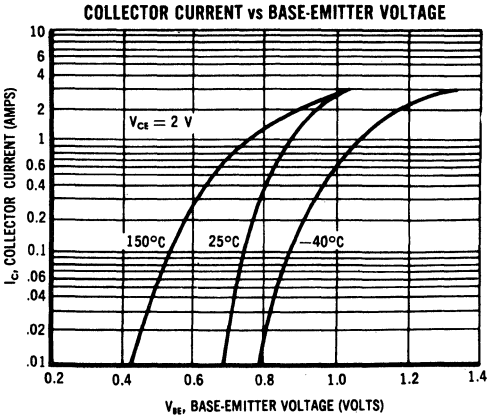
COLLECTOR-EMITTER SATURATION VOLTAGE VARIATIONS, 2N3024 thru 2N3026



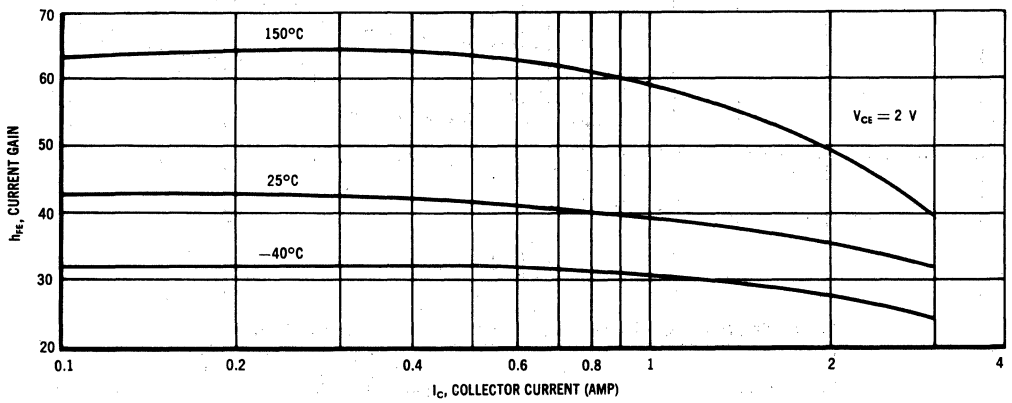
BASE CURRENT — VOLTAGE VARIATIONS



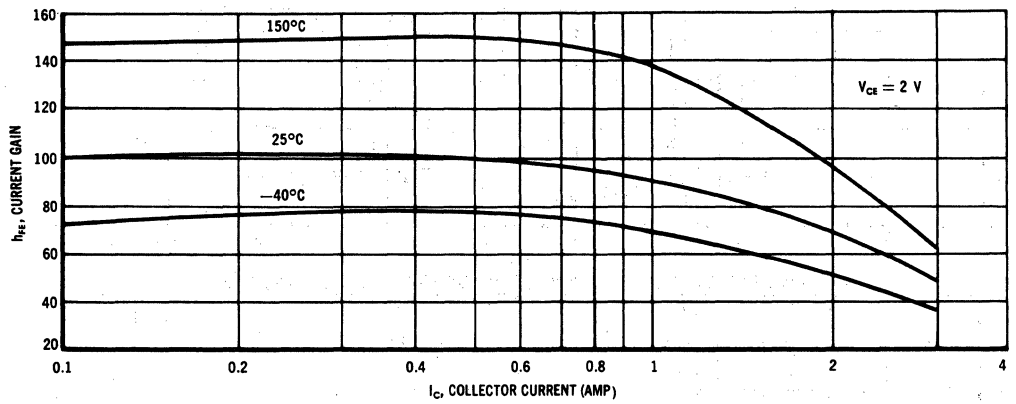
COLLECTOR CURRENT vs BASE-EMITTER VOLTAGE



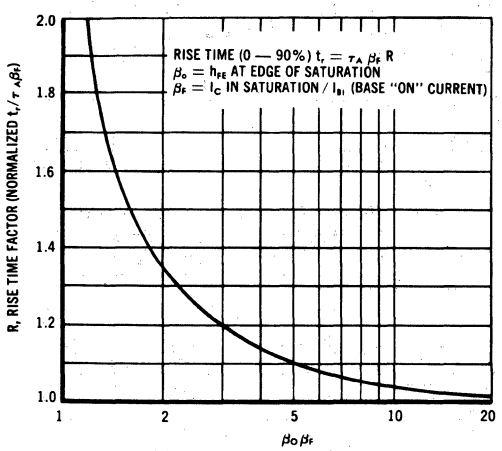
CURRENT GAIN VARIATIONS, 2N3021 thru 2N3023



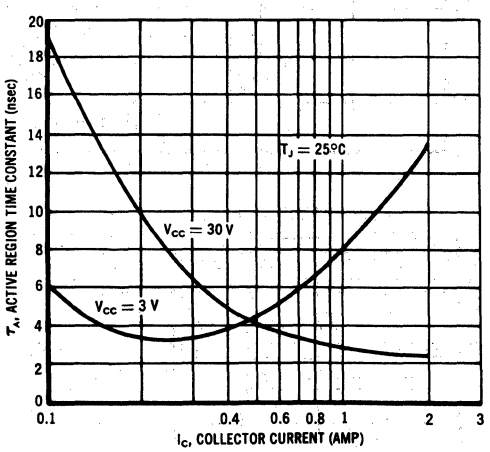
CURRENT GAIN VARIATIONS, 2N3024 thru 2N3026



RISE TIME FACTOR

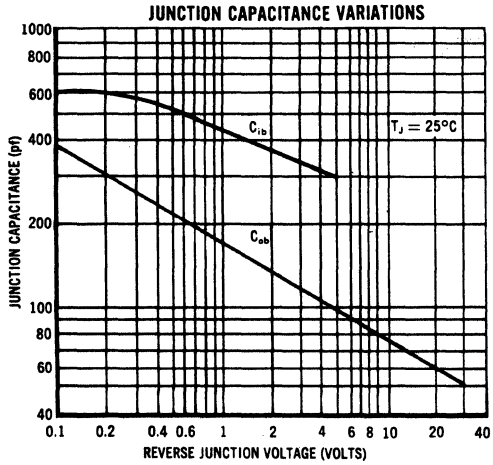


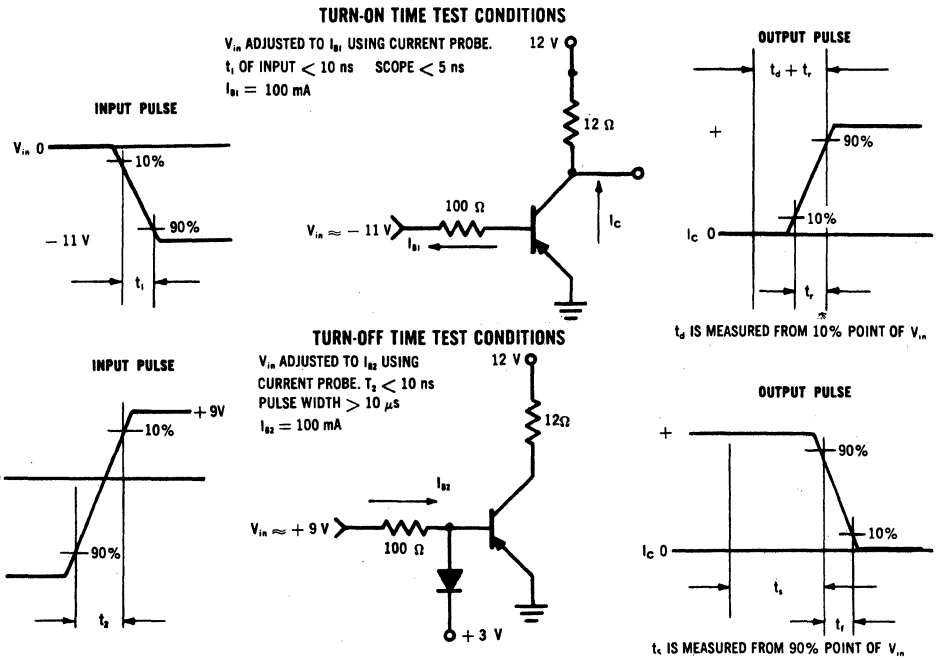
ACTIVE REGION TIME CONSTANT



SWITCHING TIME EQUATIONS

Using charge control theory and data given with this transistor, switching times for a wide variety of conditions can be readily computed.


JUNCTION CAPACITANCE VARIATIONS
JUNCTION CAPACITANCE (pf)
1000
800
600
400
200
100
80
60
40
C_{ib}
C_{ob}
$T_J = 25°C$
0.1
0.2
0.4
0.6
1
2
4
6
8
10
20
40
REVERSE JUNCTION VOLTAGE (VOLTS)


TURN-ON TIME TEST CONDITIONS
V_{in} ADJUSTED TO I_{B1} USING CURRENT PROBE.
t_r OF INPUT < 10 ns SCOPE < 5 ns
I_{B1} = 100 mA
INPUT PULSE
V_{in} 0
10%
90%
− 11 V
t_1
12 V
12 Ω
100 Ω
$V_{in} \approx -11$ V
I_{B1}
I_C
OUTPUT PULSE
$t_d + t_r$
+
90%
10%
I_C 0
t_r
t_d IS MEASURED FROM 10% POINT OF V_{in}
TURN-OFF TIME TEST CONDITIONS
V_{in} ADJUSTED TO I_{B2} USING
CURRENT PROBE. T_r < 10 ns
PULSE WIDTH > 10 μs
I_{B2} = 100 mA
INPUT PULSE
+ 9V
10%
V_{in} 0
90%
− 11 V
t_2
12 V
12Ω
I_{B2}
$V_{in} \approx +9$ V
100 Ω
+ 3 V
OUTPUT PULSE
+
90%
10%
I_C 0
t_s
t_f
t_s IS MEASURED FROM 90% POINT OF V_{in}