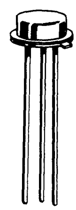
2N5229 (SILICON)
2N5230
2N5231

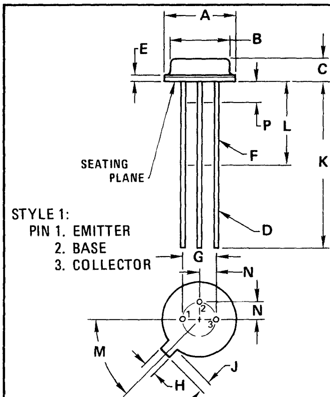
PNP SILICON ANNULAR TRANSISTORS

. . . designed for low-level, chopper applications requiring high speed operation. This series of devices offers excellent characteristics for use in servo-loop, sensing instrumentation and control amplifier for motor drive systems. These transistors can also be used as replacement devices for alloy-type transistors where high BV_{EBO} is required.

- Low Offset Voltage – $V_{EC(off)}$ = 0.5 mVdc (Max) @ I_B = 100 μAdc
- Low Dynamic "ON" Series Resistance – $r_{ec(ON)}$ = 6.0 Ohms (Max) @ I_B = 1.0 mAdc
- Space Saving TO-46 Package

PNP SILICON CHOPPER 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	1.65	2.16	0.065	0.085
D	0.406	0.533	0.016	0.021
E	–	1.02	–	0.040
F	0.305	0.483	0.012	0.019
G	2.54 BSC		0.100 BSC	
H	0.914	1.17	0.036	0.046
J	0.711	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 26-03
TO-46

MAXIMUM RATINGS

Rating	Symbol	2N5229	2N5230	2N5231	Unit
*Collector-Emitter Voltage	V_{CEO}	10	20	30	Vdc
*Collector-Base Voltage	V_{CB}	15	30	50	Vdc
*Emitter-Base Voltage	V_{EB}	15	30	50	Vdc
*Collector Current – Continuous	I_C	← 50 →			mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	← 0.5 → ← 2.86 →			Watt mW/°C
*Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	← 2.0 → ← 12 →			Watts 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	Max	Unit
OFF CHARACTERISTICS					
Emitter-Collector Breakdown Voltage (I_E = 10 μAdc, I_B = 0)	2N5229	BV_{ECO}	10	–	Vdc
	2N5230		20	–	
	2N5231		30	–	
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	2N5229	BV_{CBO}	15	–	Vdc
	2N5230		30	–	
	2N5231		50	–	
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	2N5229	BV_{EBO}	15	–	Vdc
	2N5230		30	–	
	2N5231		50	–	
Collector Cutoff Current (V_{CB} = 12 Vdc, I_E = 0)	2N5229	I_{CBO}	–	1.0	nAdc
(V_{CB} = 25 Vdc, I_E = 0)	2N5230		–	1.0	
(V_{CB} = 40 Vdc, I_E = 0)	2N5231		–	1.0	
Emitter Cutoff Current (V_{EB} = 12 Vdc, I_C = 0)	2N5229	I_{EBO}	–	1.0	nAdc
(V_{EB} = 25 Vdc, I_C = 0)	2N5230		–	1.0	
(V_{EB} = 40 Vdc, I_C = 0)	2N5231		–	1.0	
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 μAdc, V_{CE} = 1.0 Vdc)		h_{FE}	50	–	–
(I_C = 200 μAdc, V_{CE} = 0.5 Vdc) (Inverted Connection)			15	–	
Offset Voltage (I_B = 100 μAdc, I_E = 0)	2N5229,2N5230	$V_{EC(off)}$	–	0.5	mVdc
	2N5231		–	0.8	
(I_B = 1.0 mAdc, I_E = 0)	2N5229		–	0.8	
	2N5230,2N5231		–	1.0	
DYNAMIC CHARACTERISTICS					
Collector-Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 140 kHz)		C_{cb}	–	5.0	pF
Emitter-Base Capacitance (V_{EB} = 10 Vdc, I_C = 0, f = 140 kHz)		C_{eb}	–	4.0	pF
Small-Signal Current Gain (I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc, f = 4.0 MHz)		h_{fe}	2.0	–	–
"ON" Series Resistance (I_B = 1.0 mAdc, I_E = 0, I_e = 100 μA RMS, f = 1.0 kHz)	2N5229	r_{ec} (on)	1.0	6.0	Ohms
	2N5230		2.0	8.0	
	2N5231		2.0	10	

*Indicates JEDEC Registered Data.

TYPICAL CHARACTERISTICS

FIGURE 1 – EMITTER-COLLECTOR VOLTAGE versus BASE CURRENT

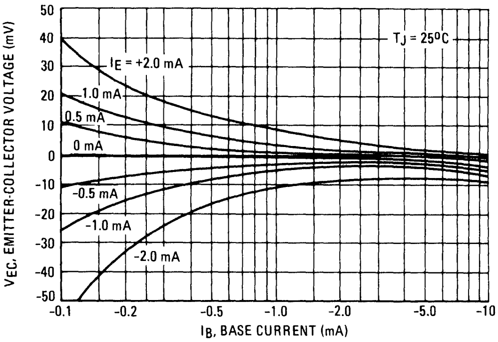


FIGURE 2 – EMITTER-COLLECTOR VOLTAGE versus JUNCTION TEMPERATURE

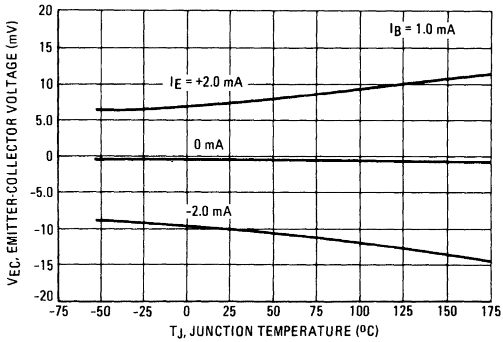


FIGURE 3 – EMITTER-COLLECTOR "ON" RESISTANCE versus BASE CURRENT

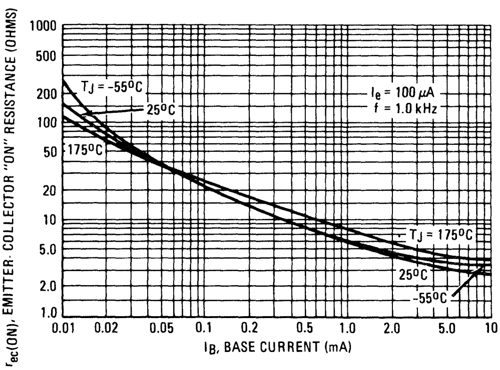


FIGURE 4 – EMITTER-COLLECTOR "ON" RESISTANCE TEMPERATURE COEFFICIENT versus BASE CURRENT

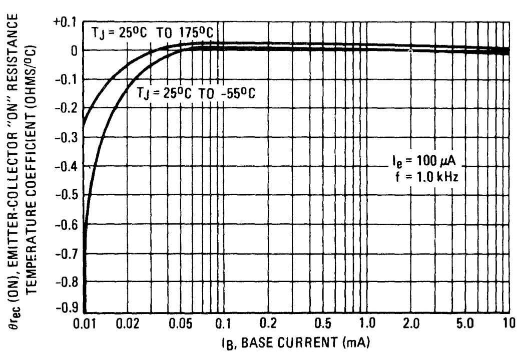


FIGURE 5 – CURRENT GAIN versus COLLECTOR CURRENT

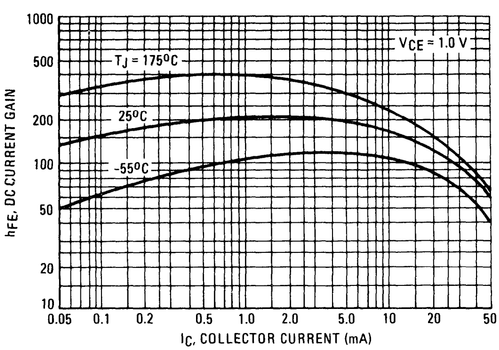


FIGURE 6 – CURRENT GAIN (Inverted Connection) versus EMITTER CURRENT

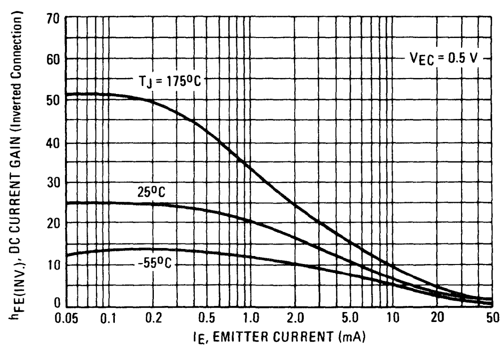


FIGURE 7 — COLLECTOR CUTOFF CURRENT versus JUNCTION TEMPERATURE

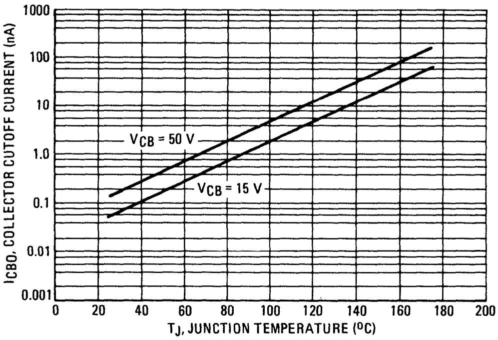


FIGURE 8 — EMITTER CUTOFF CURRENT versus JUNCTION TEMPERATURE

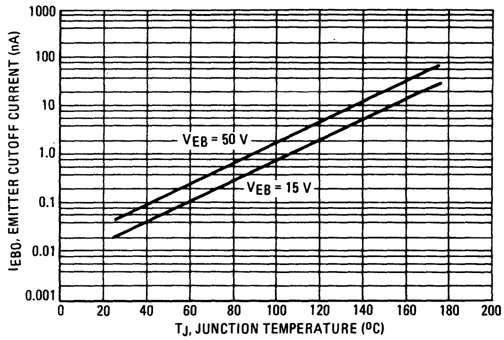


FIGURE 9 — COLLECTOR-EMITTER SATURATION VOLTAGE versus COLLECTOR CURRENT

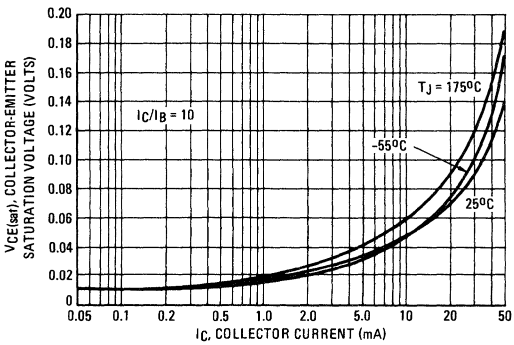


FIGURE 10 — JUNCTION CAPACITANCE versus REVERSE BIAS VOLTAGE