

2N6410 NPN (SILICON)

2N6411 PNP

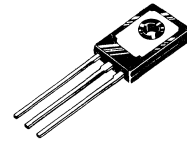
COMPLEMENTARY SILICON ANNULAR POWER PLASTIC TRANSISTORS

... designed for low voltage, low-power, high-gain audio amplifier applications.

- Collector-Emitter Sustaining Voltage –
 $V_{CE(sus)} = 25 \text{ Vdc (Min) @ } I_C = 10 \text{ mAdc}$
- High DC Current Gain – $h_{FE} = 70 \text{ (Min) @ } I_C = 500 \text{ mAdc}$
 $= 45 \text{ (Min) @ } I_C = 2.0 \text{ Adc}$
 $= 10 \text{ (Min) @ } I_C = 4.0 \text{ Adc}$
- Low Collector-Emitter Saturation Voltage –
 $V_{CE(sat)} = 0.35 \text{ Vdc (Max) @ } I_C = 500 \text{ mAdc}$
 $= 0.8 \text{ Vdc (Max) @ } I_C = 2.0 \text{ Adc}$
- High Current-Gain – Bandwidth Product –
 $f_T = 50 \text{ MHz (Min) @ } I_C = 100 \text{ mAdc}$
- Pin Compatible with TO-220AB Package

4 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON

**25 VOLTS
15 WATTS**



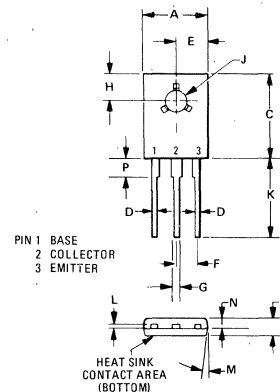
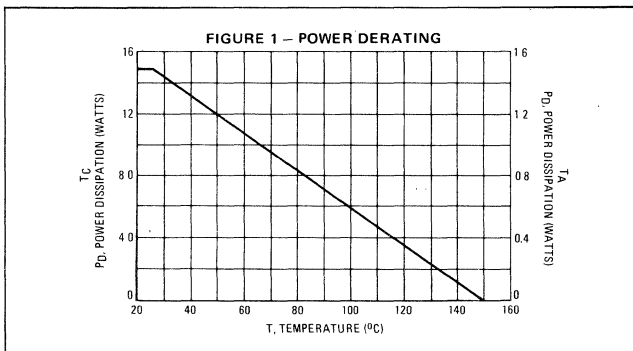
*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	25	Vdc
Collector-Base Voltage	V_{CBO}	40	Vdc
Emitter-Base Voltage	V_{EB}	6.0	Vdc
Collector Current – Continuous	I_C	4.0	Adc
Peak		8.0	Adc
Base Current	I_B	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	15 0.12	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	8.34	$^\circ\text{C/W}$

*Indicates JEDEC Registered Data.



PIN 1 BASE
2 COLLECTOR
3 EMITTER

HEAT SINK CONTACT AREA (BOTTOM)

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.295	0.305	7.490	7.750
B	0.095	0.105	2.410	2.670
C	0.425	0.435	10.800	11.050
D	0.020	0.026	0.508	0.660
E	0.145	0.155	3.680	3.940
F	0.093 TP		2.360 TP	
G	0.025	0.035	0.635	0.889
H	0.148	0.158	3.760	4.010
J	0.115	0.118	2.920	3.000
K	0.595	0.645	15.110	16.380
L	0.015	0.025	0.381	0.635
M	3 $^\circ$ TYP		3 $^\circ$ TYP	
N	0.045	0.055	1.140	1.400
P	0.085	0.095	2.160	2.410

CASE 77-03

2N6410 NPN/2N6411 PNP (continued)

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) (I _C = 10 mA _{dc} , I _B = 0)	V _{CE(sus)}	25	—	V _{dc}
Collector Cutoff Current (V _{CE} = 20 V _{dc} , I _B = 0)	I _{CEO}	—	100	μA _{dc}
Collector Cutoff Current (V _{CE} = 40 V _{dc} , V _{BE(off)} = 1.5 V _{dc}) (V _{CE} = 20 V _{dc} , V _{BE(off)} = 1.5 V _{dc} , T _C = 125°C)	I _{CEX}	—	1.0 0.1	μA _{dc} mA _{dc}
Emitter Cutoff Current (V _{EB} = 6.0 V _{dc} , I _C = 0)	I _{EBO}	—	1.0	μA _{dc}
ON CHARACTERISTICS (1)				
DC Current Gain (I _C = 500 mA _{dc} , V _{CE} = 2.0 V _{dc}) (I _C = 2.0 A _{dc} , V _{CE} = 2.0 V _{dc}) (I _C = 4.0 A _{dc} , V _{CE} = 2.0 V _{dc})	h _{FE}	70 45 10	— 180 —	—
Collector-Emitter Saturation Voltage (I _C = 500 mA _{dc} , I _B = 50 mA _{dc}) (I _C = 2.0 A _{dc} , I _B = 200 mA _{dc}) (I _C = 4.0 A _{dc} , I _B = 400 mA _{dc})	V _{CE(sat)}	— — —	0.35 0.8 1.5	V _{dc}
Base-Emitter Saturation Voltage (I _C = 2.0 A _{dc} , I _B = 200 mA _{dc})	V _{BE(sat)}	—	1.6	V _{dc}
Base-Emitter On Voltage (I _C = 2.0 A _{dc} , V _{CE} = 2.0 V _{dc})	V _{BE(on)}	—	1.6	V _{dc}
DYNAMIC CHARACTERISTICS				
Current-Gain — Bandwidth Product (I _C = 100 mA _{dc} , V _{CE} = 10 V _{dc} , f = 10 MHz)	f _T	50	—	MHz
Output Capacitance (V _{CB} = 10 V _{dc} , I _C = 0, f = 0.1 MHz)	C _{ob}	— —	80 120	pF
Small-Signal Current Gain (I _C = 500 mA _{dc} , V _{CE} = 10 V _{dc} , f = 1.0 kHz)	h _{fe}	50	—	—

* Indicates JEDEC Registered Data.

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

FIGURE 2 — SWITCHING TIME TEST CIRCUIT

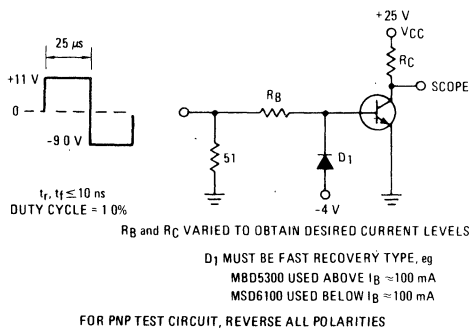


FIGURE 3 — TURN-ON TIME

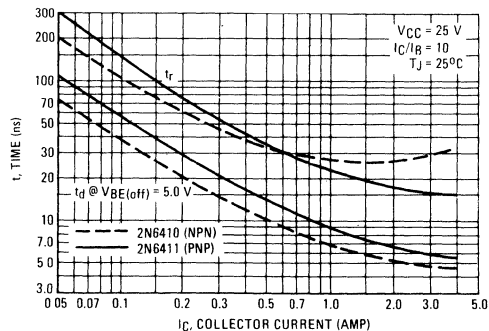


FIGURE 4 – THERMAL RESPONSE

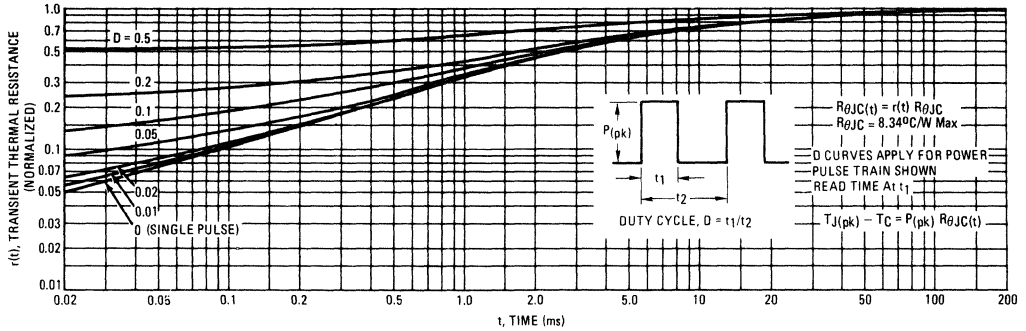
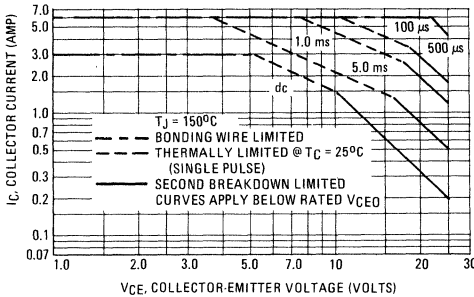


FIGURE 5 – ACTIVE REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation; i.e. the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{j(pk)} = 150^{\circ}\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{j(pk)} \leq 150^{\circ}\text{C}$. $T_{j(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown. (See AN-415A)

FIGURE 6 – TURN-OFF TIME

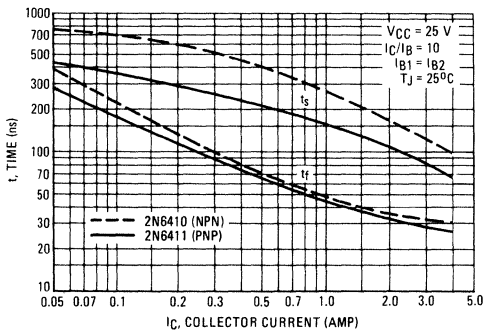
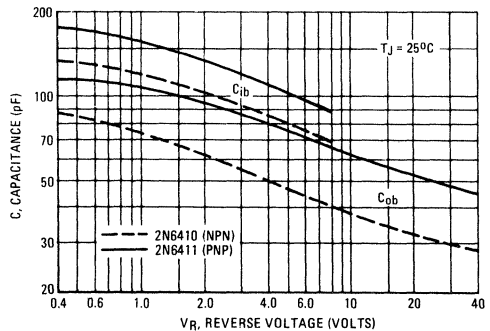


FIGURE 7 – CAPACITANCE



NPN
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PNP
2N6411

FIGURE 8 – DC CURRENT GAIN

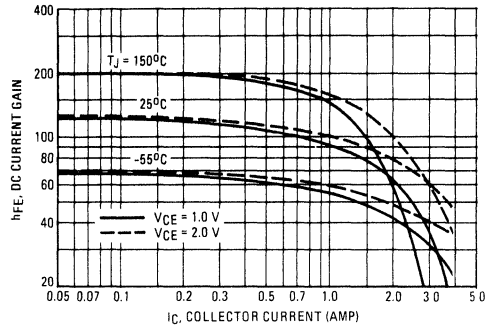
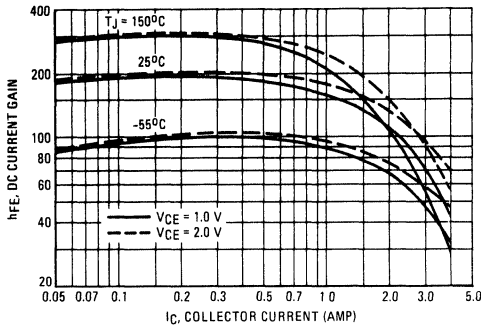


FIGURE 9 – "ON" VOLTAGE

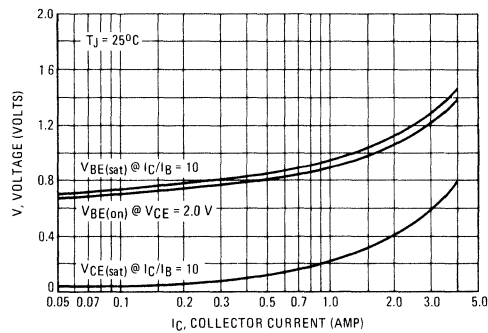
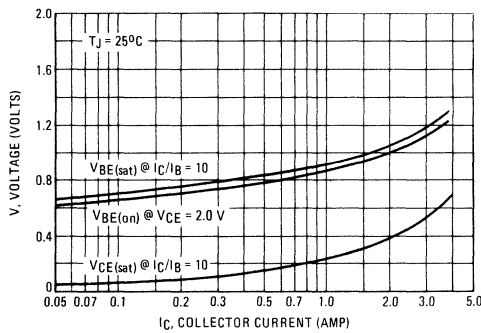


FIGURE 10 – TEMPERATURE COEFFICIENTS

