

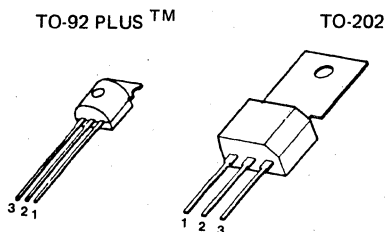


NA31 (NPN) NA32 (PNP) 2 Amp complementary power transistors

features

- 30 Volt/2 Amp rating
- 1.2 Watts practical power dissipation (TO-92 PLUSTM)
- 1.75 Watts free air power dissipation (TO-202)
- Low $V_{CE(sat)}$ and $V_{BE(sat)}$ characteristics at $I_C = 1.2A$, $I_B = 30\text{ mA}$
- Matched HFE groupings for complementary applications
- "Epoxy B" packaging concept for excellent reliability

1 packages and lead coding



applications

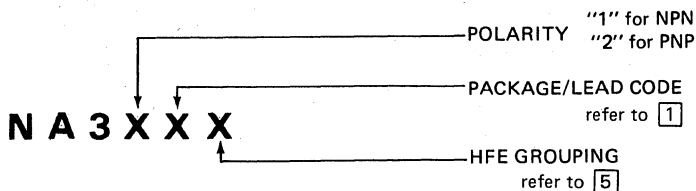
- 4-Watt audio power amplifiers
- Medium power switching circuits
- Converter/Inverter circuits
- TV receivers

PACKAGE CODE		LEAD		
TO-92 PLUS	TO-202	1	2	3
X	K	E	B	C
Y	L	E	C	B
Z	M	B	C	E

2 maximum ratings

PARAMETER	SYMBOL	RATING	UNIT
Collector-Emitter Voltage	V_{CEO}	30	V_{DC}
Collector-Base Voltage	V_{CB}	35	V_{DC}
Emitter-Base Voltage	V_{EB}	5.0	V_{DC}
Collector Current (continuous)	$I_C (\text{max})$	2.0	A
Power Dissipation ($T_A = 25^\circ\text{C}$)	P_D		
TO-92 PLUS		0.75	W
TO-202		1.75	W
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D		
TO-92 PLUS		2.5	W
TO-202		10	W
Thermal Resistance			
TO-92 PLUS	θ_{JA}/θ_{JC}	167/50	$^\circ\text{C/W}$
TO-202	θ_{JA}/θ_{JC}	72/12.5	$^\circ\text{C/W}$
Temperature, Junction and Storage	T_j, T_{stg}	-55 to +150	$^\circ\text{C}$

3 ordering information



4 electrical characteristics

$$T_C = 25^\circ\text{C}$$

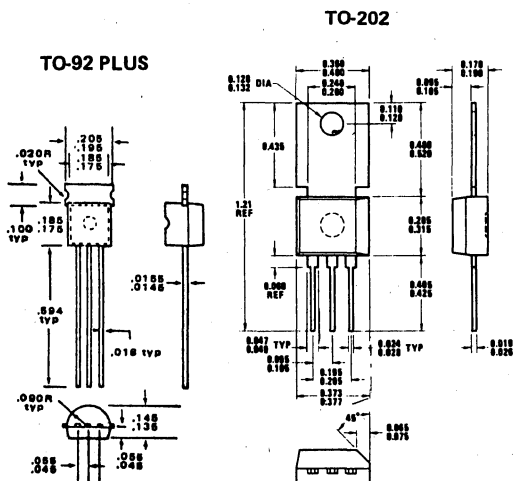
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
V_{CEO}	Collector-Emitter Sustaining Voltage	$I_C = 1 \text{ mA}$	30			V
V_{CBO}	Collector-Base Breakdown Voltage	$I_C = 100 \mu\text{A}$	35			V
V_{EBO}	Emitter-Base Breakdown Voltage	$I_E = 10 \mu\text{A}$	5			V
I_{CEO}	Collector-Emitter Leakage Current	$V_{CE} = 25\text{V}$			100	μA
I_{CBO}	Collector-Base Leakage Current	$V_{CB} = 30\text{V}$			1	μA
$V_{BE(ON)}$	Base-Emitter Voltage	$I_C = 15 \text{ mA}, V_{CE} = 5\text{V}$	600	650	700	mV
$V_{BE(SAT)}$	Base-Emitter Saturation Voltage	$I_C = 1.2\text{A}, I_B = 30 \text{ mA}$		0.95	1.2	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$I_C = 1.2\text{A}, I_B = 30 \text{ mA}$		0.5	1	V
$V_{BE(SAT)}$	Base-Emitter Saturation Voltage	$I_C = 1.2\text{A}, I_B = 120 \text{ mA}$		1.0	1.4	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$I_C = 1.2\text{A}, I_B = 120 \text{ mA}$		0.25	0.5	V
C_{OB}	Collector Output Capacitance NPN types PNP types	$V_{CB} = 10\text{V}, f = 1 \text{ MHz}$		10 17		pF pF
f_t	Current Gain Bandwidth Product	$I_C = 300 \text{ mA}, V_{CE} = 5\text{V}$	20			MHz

5 HFE groupings

GROUPING	PARAMETER	CONDITIONS	MIN	TYP	MAX	RATIO
G	DC Current Gain	$I_C = 300 \text{ mA}, V_{CE} = 5 \text{ V}$	68	85	110	1:1.6
H	DC Current Gain	$I_C = 300 \text{ mA}, V_{CE} = 5 \text{ V}$	100	127	160	1:1.6
I	DC Current Gain	$I_C = 300 \text{ mA}, V_{CE} = 5 \text{ V}$	140	180	240	1:1.6
J	DC Current Gain	$I_C = 300 \text{ mA}, V_{CE} = 5 \text{ V}$	200	260	350	1:1.6
X	DC Current Gain	$I_C = 300 \text{ mA}, V_{CE} = 5 \text{ V}$	30	58	110	1:3.5
Y	DC Current Gain	$I_C = 300 \text{ mA}, V_{CE} = 5 \text{ V}$	100	190	350	1:3.5

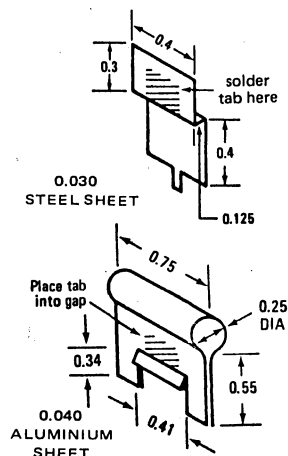
6 physical dimensions

7 heatsink information

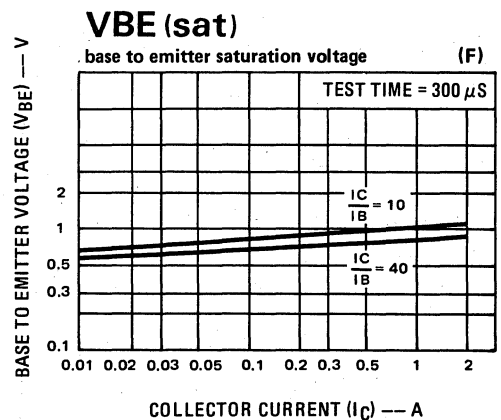
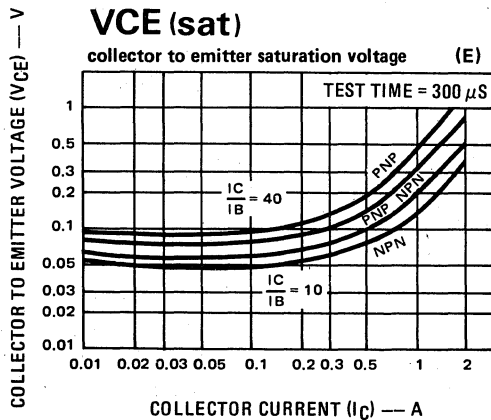
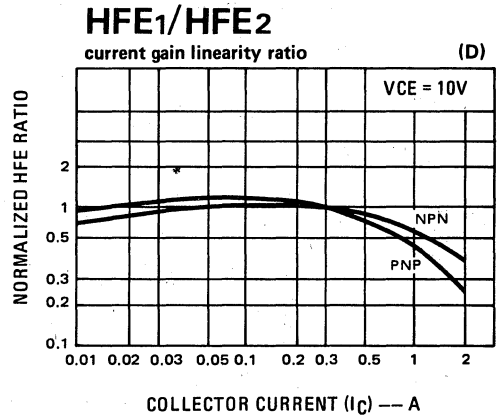
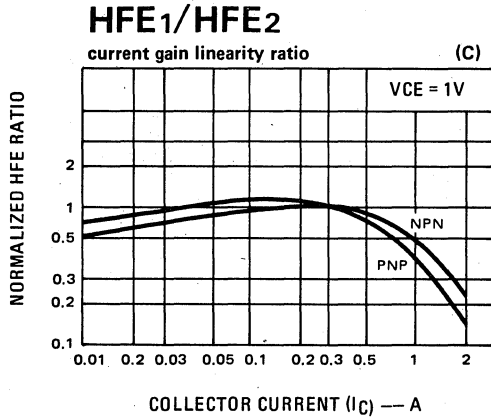
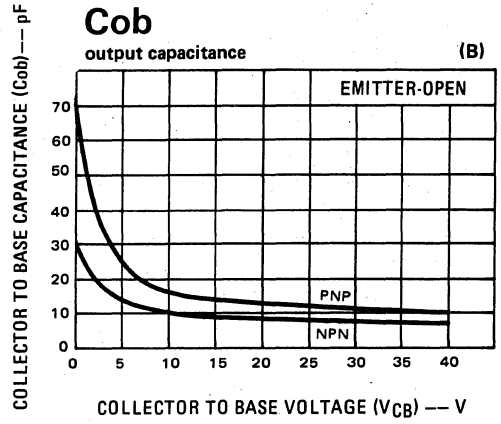
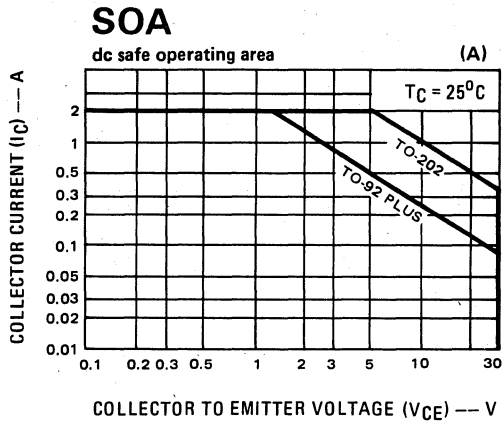


- TO-92 PLUS package with heatsink shown on right permits 1.6 Watts power dissipation and combined Thermal Resistance $\theta_{JA} = 78^{\circ}\text{C/W}$. If used without heatsink and PCB land area at collector lead > 1 sq. inch, $P_D = 1.2\text{W}$.

- TO-202 package with heatsink shown on right permits 3 Watts P_D and $\theta_{JA} = 42^\circ\text{C/W}$.



8 typical performance characteristics



9 typical applications

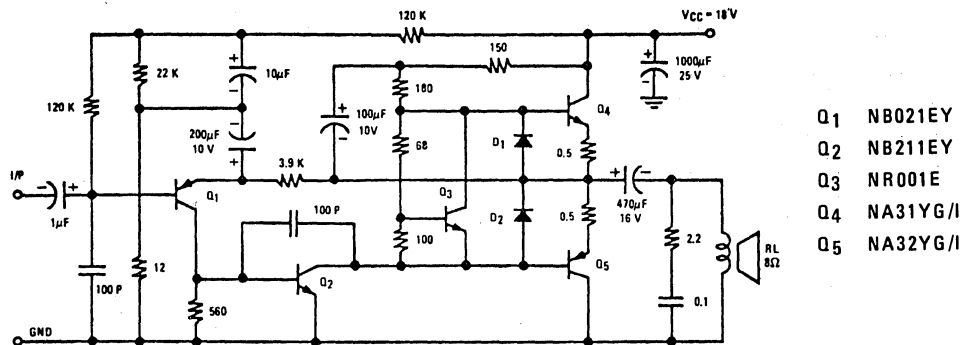


Figure A. 4 Watt / 8 Ohm OTL Amplifier

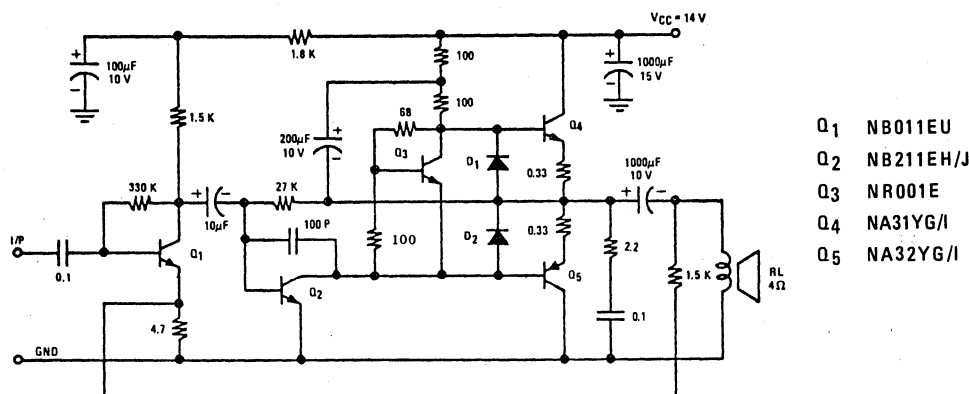


Figure B. 4 Watt / 4 Ohm OTL Amplifier

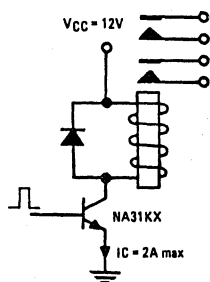


Figure C. Relay Driver

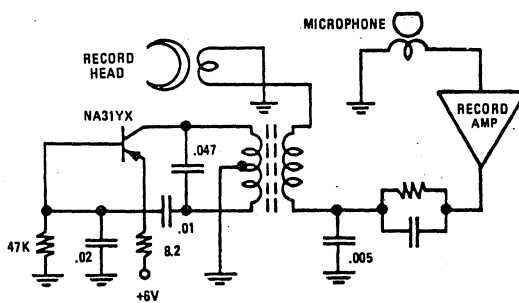


Figure D. Cassette Bias Oscillator