LINEAR INTEGRATED CIRCUIT

GENERAL PURPOSE TRANSISTOR ARRAY

The TBA 331 is an array of 5 monolithic NPN transistors in a 14-lead dual in-line plastic package. Two transistors are internally connected to form a differential amplifier.
The transistors of the TBA 331 are well suited to low noise general purpose and to a wide variety of applications in low power systems in the DC through VHF range. They may be used as discrete components in conventional circuits; in addition, they provide the very significant inherent integrated circuit advantages of close electrical and thermal matching.

ABSOLUTE MAXIMUM RATINGS

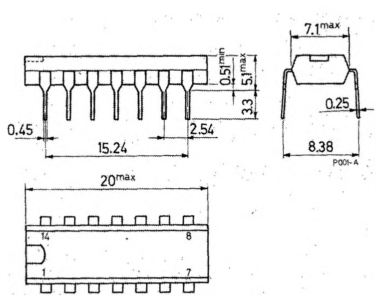
		Each transistor	Total package	
V_{CBO}	Collector-base voltage ($I_E = 0$)	20	–	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	15	–	V
V_{CSS}*	Collector-substrate voltage	20	–	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	–	V
I_C	Collector current	50	–	mA
P_{tot}	Total power dissipation at $T_{amb} \leqslant 55°C$	300	750	mW
T_{stg}, T_j	Storage and junction temperature	-40 to 150		°C
T_{op}	Operating temperature	0 to 85		°C

* The collector of each transistor of the TBA 331 is isolated from the substrate by an integrated diode. The substrate (pin 13) must be connected to the most negative point in the external circuit to maintain isolation between transistors and to provide for normal transistor action.

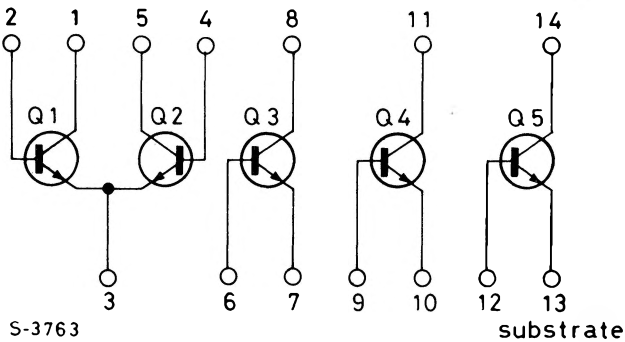
ORDERING NUMBER: TBA 331

MECHANICAL DATA

Dimensions in mm



SCHEMATIC DIAGRAM



THERMAL DATA

			each	Total
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	315° C/W	126° C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit	Fig.
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 10 V		0.002	40	nA	1
I_{CEO}	Collector cutoff current (I_B = 0)	V_{CE} = 10 V		see curve	0.5	μA	2
$\lvert I_{B1}-I_{B2}\rvert$	Input offset current	I_C = 1 mA V_{CE} = 3 V		0.3	2	μA	7

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit	Fig.
V_{CBO}	Collector-base voltage ($I_E = 0$)	$I_C = 10\ \mu A$	20	60		V	–
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	$I_C = 1$ mA	15	24		V	–
V_{CSS}	collector-substrate voltage ($I_{CSS} = 0$)	$I_C = 10\ \mu A$	20	60		V	–
$V_{CE\ (sat)}$	Collector-emitter saturation voltage	$I_B = 1$ mA $I_C = 10$ mA		0.23		V	–
V_{EBO}	Emitter-base voltage ($I_C = 0$)	$I_E = 10\ \mu A$	5	7		V	–
V_{BE}	Base-emitter voltage	$I_E = 1$ mA $V_{CE} = 3$ V $I_E = 10$ mA $V_{CE} = 3$ V		0.715 0.8		V V	4 4
$\|V_{BE1}-V_{BE2}\|$	Input offset voltage	$I_C = 1$ mA $V_{CE} = 3$ V		0.45	5	mV	4-6
$\|V_{BE3}-V_{BE4}\|$	Input offset voltage	$I_C = 1$ mA $V_{CE} = 3$ V		0.45	5	mV	4-6
$\|V_{BE4}-V_{BE5}\|$	Input offset voltage	$I_C = 1$ mA $V_{CE} = 3$ V		0.45	5	mV	4-6
$\|V_{BE5}-V_{BE4}\|$	Input offset voltage	$I_C = 1$ mA $V_{CE} = 3$ V		0.45	5	mV	4-6
$\frac{\Delta V_{BE}}{\Delta T}$	Base-emitter voltage temperature coefficient	$I_C = 1$ mA $V_{CE} = 3$ V		-1.9		mV/°C	5
$\frac{\|V_{BE1}-V_{BE2}\|}{\Delta T}$	Input offset voltage temperature coefficient	$I_C = 1$ mA $V_{CE} = 3$ V		1.1		μV/°C	6

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit.	Fig.
h_{FE}	DC current gain	I_C = 10 mA V_{CE} = 3 V		100		–	3
		I_C = 1 mA V_{CE} = 3 V	40	100		–	3
		I_C = 10 μA V_{CE} = 3 V		54		–	3
f_T	Transition frequency	I_C = 3 mA V_{CE} = 3 V	300	550		MHz	14
NF	Noise figure	I_C = 100 μA V_{CE} = 3 V f = 1 KHz R_g = 1 kΩ		3.25		dB	8
H_{ie}	Input impedance	I_C = 1 mA V_{CE} = 3 V f = 1 kHz		3.5		kΩ	9
h_{fe}	Forward current transfer ratio	I_C = 1 mA V_{CE} = 3 V f = 1 kHz		110		–	9
h_{re}	Reverse voltage transfer ratio	I_C = 1 mA V_{CE} = 3 V f = 1 kHz		1.8×10^{-4}		–	9
h_{oe}	Output admittance	I_C = 1 mA V_{CE} = 3V f = 1 kHz		15.6		μS	9
y_{ie}	Input admittance	I_C = 1 mA V_{CE} = 3 V f = 1 MHz		0.3+j0.04		mS	11
y_{fe}	Forward transadmittance	I_C = 1 mA V_{CE} = 3 V f = 1 MHz		31–j1.5		mS	10
y_{re}	Reverse transadmittance	I_C = 1 mA V_{CE} = 3 V f = 1 MHz		see curve		mS	13

ELECTRICAL CHARACTERISTICS (continued)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.	Fig.
y_{ce}	Output admittance	I_C = 1 mA V_{CE} = 3 V f = 1 MHz		0.001+j0.03		mS	12
C_{EBO}	Emitter-base capacitance	I_C = 0 V_{EB} = 3 V		0.6		pF	–
C_{CBo}	Collector-base capacitance	I_E = 0 V_{CB} = 3 V		0.58		pF	–
C_{CSS}	Collector-sustrate capacitance	I_C = 0 V_{CSS} = 3 V		2.8		pF	–

Fig. 1 - Collector cutoff current vs ambient temperature

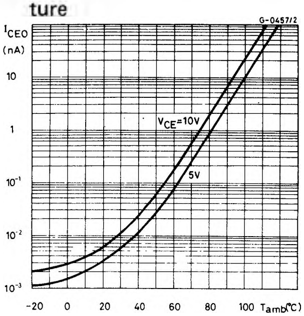


Fig. 2 - DC current gain vs. emitter current.

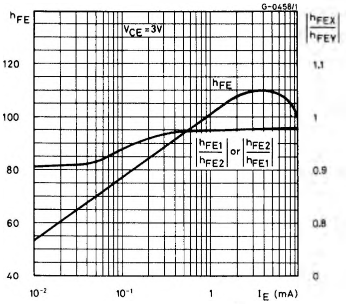


Fig. 3 - Input voltage and input offset voltage vs. emitter current

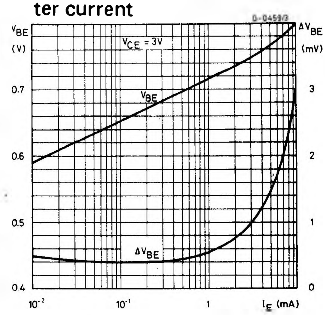


Fig. 4 - Input characteristic for each transistor

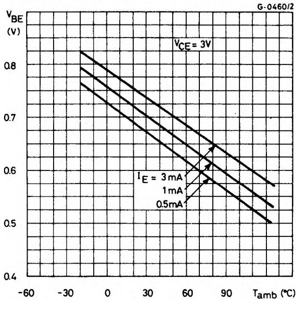


Fig. 5 - Input offset voltage vs. ambient temperature

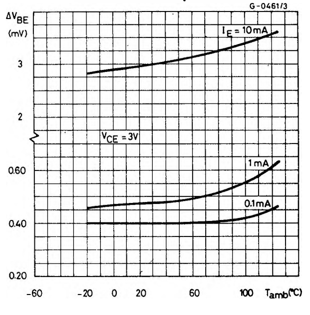


Fig. 6 - Input offset current for matched transistor pair

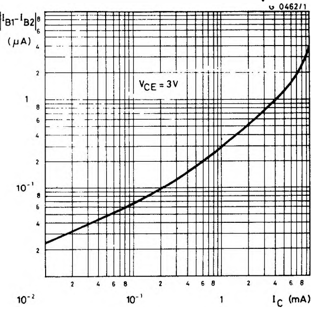


Fig. 7 - Noise figure vs collector current

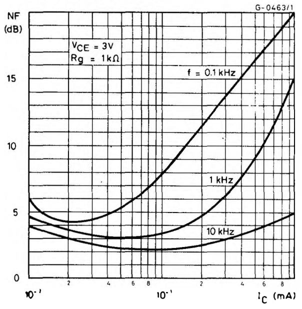


Fig. 8 - Forward admittance

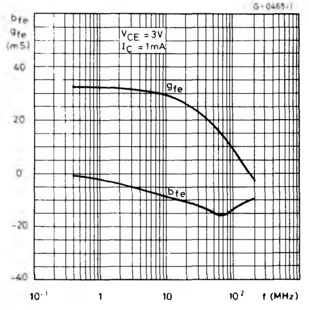


Fig. 9 - Input admittance

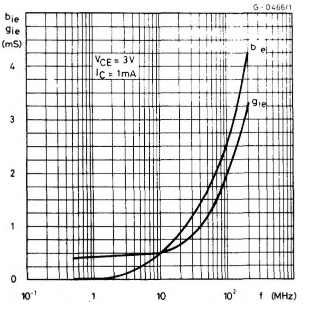


Fig. 10 - Output admittance

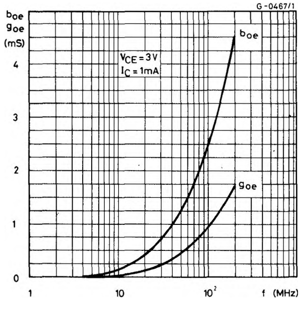


Fig. 11 - Reverse admittance

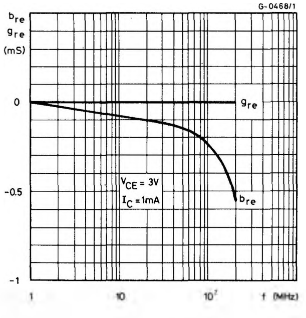


Fig. 12 - Transition frequency