

2N3728

NPN HIGH PERFORMANCE DIFFERENTIAL AMPLIFIERS

• $\frac{hFE1}{hFE2}$... 0.9-1.0 FROM 100 μ A to 1.0 mA @ 25°C, 0.8-1.0 FROM 100 μ A to 1.0 mA, -55°C to +125°C

• $|V_{BE1}-V_{BE2}|$... 3.0 mV (MAX) FROM 100 μ A to 1.0 mA

• $|\Delta V_{BE}|$... 10 μ V/°C (MAX) FROM 100 μ A to 1.0 mA, -55°C to +125°C

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

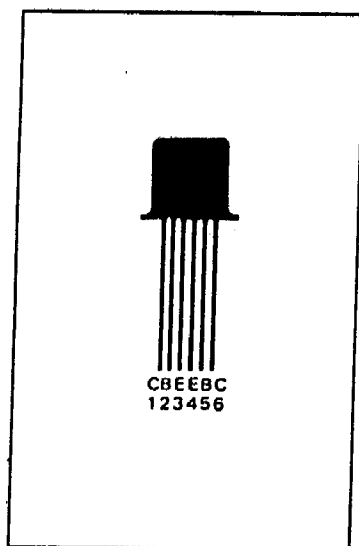
Storage Temperature	-65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	300°C

Maximum Power Dissipation (Notes 2 & 3)

	One Side	Both Sides
Total Dissipation at 25°C Case Temperature	1.0 W	1.6 W
at 100°C Case Temperature	0.67 W	0.91 W
at 25°C Ambient Temperature	0.45 W	0.55 W

Maximum Voltages and Current

VCBO	Collector to Base Voltage	60 V
VCEO	Collector to Emitter Voltage (Note 4)	30 V
VEBO	Emitter to Base Voltage	5.0 V
IC	Collector Current	500 mA
VC1C2	Collector ₁ to Collector ₂ Voltage	±200 V
	Voltage Rating any Lead to Case	±200 V



ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd.)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h _{FE}	DC Current Gain	30	.		I _C = 0.1 mA, V _{CE} = 5.0 V
		45	180		I _C = 1.0 mA, V _{CE} = 5.0 V
		80	280		I _C = 150 mA, V _{CE} = 5.0 V (Note 6)
BV _{CEO}	Collector to Base Breakdown Voltage	60			I _C = 10 μA, I _E = 0
BV _{EB0}	Emitter to Base Breakdown Voltage	5.0			I _C = 0, I _E = 10 μA
V _{CEO(sus)}	Collector to Emitter Sustaining Voltage (Notes 4 & 6)	30			I _C = 10 mA, I _B = 0
V _{CE(sat)}	Collector Saturation Voltage (Note 6)		0.22	V	I _C = 150 mA, I _B = 15 mA
V _{BE(sat)}	Base Saturation Voltage (Note 6)		1.1	V	I _C = 150 mA, I _B = 15 mA
I _{CBO}	Collector Cutoff Current		10	nA	I _E = 0, V _{CB} = 50 V
I _{EBO}	Emitter Cutoff Current		10	μA	I _E = 0, V _{CB} = 50 V, T _A = 150°C
h _{fe}	High Frequency Current Gain	4.0			I _C = 0, V _{EB} = 3.0 V
		2.5	6.0		I _C = 1.0 mA, V _{CE} = 10 V, f = 20 MHz
C _{ob}	Common Base, Open Circuit, Output Capacitance		8.0	pF	I _C = 50 mA, V _{CE} = 10 V, f = 100 MHz
C _{ib}	Common Base, Open Circuit, Input Capacitance		20	pF	I _E = 0, V _{CB} = 10 V, f = 140 kHz
h _{ie}	Input Impedance	1.2	6.0	kΩ	I _C = 0, V _{EB} = 2.0 V, f = 140 kHz
h _{re}	Reverse Voltage Feedback Ratio		300	x10 ⁻⁶	I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz
h _{oe}	Output Conductance		20		I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz
h _{fe}	Forward Current Transfer Ratio	50	200		I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz
NF	Wide Band Noise Figure		7.0	dB	I _C = 0.1 mA, V _{CE} = 5.0 V, f = 15.7 kHz, 3.0 dB pts. @ 25 Hz and 10 kHz, R _S = 1.0 kΩ
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.8	1.0		I _C = 100 μA to 1.0 mA, V _{CE} = 5.0 V
V _{BE1} -V _{BE2}	Base to Emitter Voltage Differential		5.0	mV	I _C = 100 μA to 1.0 mA, V _{CE} = 5.0 V
Δ(V _{BE1} -V _{BE2})	Base to Emitter Voltage Differential		1.6 (20 μV/°C)	mV	I _C = 100 μA to 1.0 mA, V _{CE} = 5.0 V T _A = -55°C to +25°C
Δ(V _{BE1} -V _{BE2})	Base to Emitter Voltage Differential		2.0 (20 μV/°C)	mV	I _C = 100 μA to 1.0 mA, V _{CE} = 5.0 V T _A = +25°C to +125°C

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 384°C/W (derating factor of 2.57 mW/°C) for one side; 318°C/W (derating factor of 3.14 mW/°C) for both sides; junction to case thermal resistance of 175°C/W (derating factor of 5.71 mW/°C) for one side; 109°C/W (derating factor of 9.15 mW/°C) for both sides.
- Rating refers to a high current point where collector to emitter voltage is lowest.
- Lowest of two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
- Pulse conditions: length = 300 μs; duty cycle = 1%.