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2N3423 • 2N3424

DUAL NPN LOW NOISE SENSE AND HIGH FREQUENCY DIFFERENTIAL AMPLIFIERS

DIFFUSED SILICON PLANAR EPITAXIAL TRANSISTORS

- $\frac{h_{FE1}}{h_{FE2}}$ . . . 10% @ 3.0 mA
- $|V_{BE1}\text{-}V_{BE2}|$ . . . 5.0 mV (MAX) @ 3.0 mA
- $|\Delta(V_{BE1}\text{-}V_{BE2})|$ . . . 20 μV/°C (MAX) @ 3.0 mA, −55°C to +125°C
- f_T . . . 600 MHz (MIN) @ 4.0 mA
- NF . . . 3.5 dB (TPY) @ 60 Hz

See TO5-9 Package Outline

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		0.6 W	1.2 W
at 100°C Case Temperature		0.25 W	0.5 W
at 25°C Ambient Temperature		0.3 W	0.45 W
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		30 V
V_{CEO}	Collector to Emitter Voltage (Note 4)		15 V
V_{EBO}	Emitter to Base Voltage		3.0 V
I_C	Collector Current		50 mA
V_{C1C2}	$Collector_1$ to $Collector_2$ Voltage		±200 V
	Voltage Rating Any Lead to Case		±200 V

MATCHING CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3423 MIN.	2N3423 MAX.	2N3424 MIN.	2N3424 MAX.	UNITS	TEST CONDITIONS
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.8	1.0	0.9	1.0		I_C = 3.0 mA, V_{CE} = 3.0 V
$\lvert V_{BE1}\text{-}V_{BE2}\rvert$	Base to Emitter Voltage Differential		10		5.0	mV	I_C = 3.0 mA, V_{CE} = 3.0 V
$\lvert\Delta(V_{BE1}\text{-}V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		3.2 (40 μV/°C)		1.6 (20 μV/°C)	mV	I_C = 3.0 mA, V_{CE} = 3.0 V, T_A = −55°C to +25°C
$\lvert\Delta(V_{BE1}\text{-}V_{BE2})\rvert$	Base to Emitter Voltage Differential Change		4.0 (40 μV/°C)		2.0 (20 μV/°C)	mV	I_C = 3.0 mA, V_{CE} = 3.0 V, T_A = +25°C to +125°C

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	20			I_C = 3.0 mA, V_{CE} = 1.0 V
		20	200		I_C = 3.0 mA, V_{CE} = 3.0 V
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	I_C = 1.0 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I_C = 0, I_E = 10 μA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 6)	15		V	I_C = 3.0 mA, I_B = 0

Additional Electrical Characteristics on following page.

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 584°C/W (derating factor of 1.72 mW/°C) for one side; 389°C/W (derating factor of 2.57 mW/°C) for both sides; junction to case thermal resistance 290°C/W (derating factor of 3.44 mW/°C) for one side; 145°C/W (derating factor of 6.85 mW/°C) for both sides.
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Lowest of two h_{FE} readings is taken as h_{FE1} for purpose of this ratio.
6. Pulse conditions: length = 300 μs; duty cycle = 1%.
7. For product family characteristic curves, refer to Section 5

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

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector Saturation Voltage		0.4	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		1.0	V	I_C = 10 mA, I_B = 1.0 mA
I_{CBO}	Collector Cutoff Current		10	nA	I_E = 0, V_{CB} = 15 V
			1.0	μA	I_E = 0, V_{CB} = 15 V, T_A = 150°C
I_{EBO}	Emitter Cutoff Current		10	μA	I_C = 0, V_{EB} = 3.0 V
h_{fe}	High Frequency Current Gain	6.0	12		I_C = 4.0 mA, V_{CE} = 10 V, f = 100 MHz
C_{ob}	Common to Base Output Capacitance		1.7	pF	I_E = 0, V_{CB} = 10 V, f = 140 kHz
			3.0	pF	I_E = 0, V_{CB} = 0, f = 140 kHz
C_{ib}	Common to Base Input Capacitance		2.0	pF	I_C = 0, V_{EB} = 0.5 V, f = 140 kHz
$RE_{(hie)}$	Real Part of Common Emitter Input Impedance		45	Ω	I_C = 3.0 mA, V_{CE} = 3.0 V, f = 350 MHz
NF	Noise Figure	3.5 (TYP)		dB	I_C = 1.0 mA, V_{CE} = 6.0 V, f = 60 MHz, R_G = 400 Ω