2N3903 2N3904

NPN SILICON PLANAR EPITAXIAL TRANSISTORS

2N3903, 2N3904 are NPN silicon planar epitaxial transistors designed for general purpose switching and amplifier applications. They are complementary to PNP types 2N3905 and 2N3906.

CASE TO-92A

EBC

ABSOLUTE MAXIMUM RATINGS

Collector-Base Voltage	V_{CBO}	60V
Collector-Emitter Voltage	V_{CEO}	40V
Emitter-Base Voltage	V_{EBO}	6V
Collector Current	I_C	200mA
Total Power Dissipation @ T_A=25°C	P_{tot}	350mW
@ T_C=25°C		1W
Operating Junction & Storage Temperature	Tj, Tstg	-55 to +150°C

ELECTRICAL CHARACTERISTICS @ T_A=25°C

PARAMETER	SYMBOL	2N3903 MIN	2N3903 MAX	2N3904 MIN	2N3904 MAX	UNIT	TEST CONDITIONS
Collector-Base Breakdown Voltage	BV_{CBO}	60		60		V	I_C=10μA I_E=0
Collector-Emitter Breakdown Voltage	BV_{CEO}*	40		40		V	I_C=1mA I_B=0
Emitter-Base Breakdown Voltage	BV_{EBO}	6		6		V	I_E=10μA I_C=0
Collector Cutoff Current	I_{CEV}		50		50	nA	V_{CE}=30V V_{EB}=3V
Base Cutoff Current	I_{BEV}		50		50	nA	V_{CE}=30V V_{EB}=3V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$*		0.2		0.2	V	I_C=10mA I_B=1mA
			0.3		0.3	V	I_C=50mA I_B=5mA
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$*	0.65	0.85	0.65	0.85	V	I_C=10mA I_B=1mA
			0.95		0.95	V	I_C=50mA I_B=5mA
D.C. Current Gain	H_{FE}*	20		40			I_C=0.1mA V_{CE}=1V
		35		70			I_C=1mA V_{CE}=1V
		50	150	100	300		I_C=10mA V_{CE}=1V
		30		60			I_C=50mA V_{CE}=1V
		15		30			I_C=100mA V_{CE}=1V
Current Gain-Bandwidth Product	f_T	250		300		MHz	I_C=10mA V_{CE}=20V

* Pulse Test : Pulse Width=0.3ms, Duty Cycle=1%

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PARAMETER	SYMBOL	2N3903 MIN	2N3903 MAX	2N3904 MIN	2N3904 MAX	UNIT	TEST CONDITIONS
Output Capacitance	Cob		4		4	pF	V_{CB}=5V I_E=0 f=100kHz
Input Capacitance	Cib		8		8	pF	V_{EB}=0.5V I_C=0 f=100kHz
Noise Figure	NF		6		5	dB	I_C=100µA V_{CE}=5V R_S=1KΩ f=10Hz to 15.7kHz
Input Impedance	h_{ie}	0.5	8	1	10	kΩ	I_C=1mA V_{CE}=10V f=1kHz
Voltage Feedback Ratio	h_{re}	0.1	5	0.5	8	$\times 10^{-4}$	I_C=1mA V_{CE}=10V f=1kHz
Small Signal Current Gain	h_{fe}	50	200	100	400		I_C=1mA V_{CE}=10V f=1kHz
Output Admittance	h_{oe}	1	40	1	40	µ℧	I_C=1mA V_{CE}=10V f=1kHz
Delay Time	t_d		35		35	ns	V_{cc}=3V V_{BE}=0.5V I_C=10mA
Rise Time	t_r		35		35	ns	I_{B1}=1mA
Storage Time	t_s		175		200	ns	V_{cc}=3V I_{B1}=I_{B2}=1mA
Fall Time	t_f		50		50	ns	I_C=10mA