

2N3903 2N3904

NPN SILICON PLANAR EPITAXIAL TRANSISTORS

CASE TO-92A

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.



EBC

ABSOLUTE MAXIMUM RATINGS

Collector-Base Voltage
Collector-Emitter Voltage
Emitter-Base Voltage

Collector Current

Total Power Dissipation @ $T_A=25^\circ\text{C}$
@ $T_C=25^\circ\text{C}$

Operating Junction & Storage Temperature

V_{CB0}

V_{CE0}

V_{EB0}

I_C

P_{tot}

T_j, T_{stg}

60V

40V

6V

200mA

350mW

1W

-55 to +150°C

ELECTRICAL CHARACTERISTICS @ $T_A=25^\circ\text{C}$

PARAMETER	SYMBOL	2N3903		2N3904		UNIT	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
Collector-Base Breakdown Voltage	BV_{CB0}	60		60		V	$I_C=10\mu\text{A}$ $I_E=0$
Collector-Emitter Breakdown Voltage	BV_{CE0}^*	40		40		V	$I_C=1\text{mA}$ $I_B=0$
Emitter-Base Breakdown Voltage	BV_{EB0}	6		6		V	$I_E=10\mu\text{A}$ $I_C=0$
Collector Cutoff Current	I_{CEV}		50		50	nA	$V_{CE}=30\text{V}$ $V_{EB}=3\text{V}$
Base Cutoff Current	I_{BEV}		50		50	nA	$V_{CE}=30\text{V}$ $V_{EB}=3\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}^*$	0.2 0.3		0.2 0.3		V	$I_C=10\text{mA}$ $I_B=1\text{mA}$
						V	$I_C=50\text{mA}$ $I_B=5\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}^*$	0.65 0.95		0.65 0.95		V	$I_C=10\text{mA}$ $I_B=1\text{mA}$
						V	$I_C=50\text{mA}$ $I_B=5\text{mA}$
D.C. Current Gain	H_{FE}^*	20		40			$I_C=0.1\text{mA}$ $V_{CE}=1\text{V}$
		35		70			$I_C=1\text{mA}$ $V_{CE}=1\text{V}$
		50	150	100	300		$I_C=10\text{mA}$ $V_{CE}=1\text{V}$
		30		60			$I_C=50\text{mA}$ $V_{CE}=1\text{V}$
		15		30			$I_C=100\text{mA}$ $V_{CE}=1\text{V}$
Current Gain-Bandwidth Product	f_T	250		300		MHz	$I_C=10\text{mA}$ $V_{CE}=20\text{V}$

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

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PARAMETER	SYMBOL	2N3903		2N3904		UNIT	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
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	⁻⁴ x10	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	μS	I _C =1mA V _{CE} =10V f=1kHz
Delay Time	t _d		35		35	ns	V _{CE} =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