

# 2N3904

Silicon NPN Epitaxial  
General Purpose Amplifier

REA03G0001-0200Z

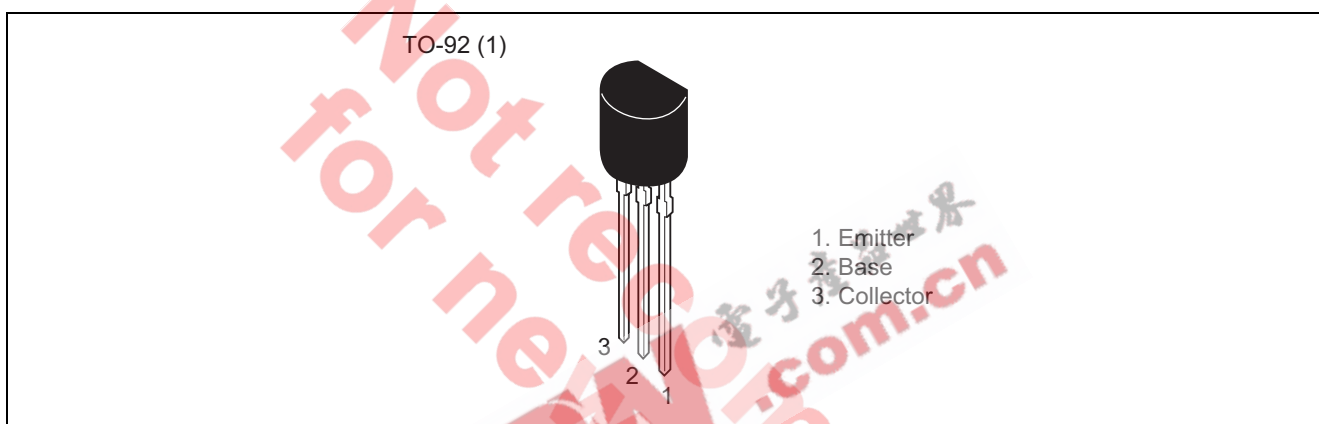
Rev.2.00

Jul.22.2004

## Features

- Low saturation voltage
- General purpose amplifier and switching
- The useful dynamic range extends to 100mA as a switch and to 100MHz as an amplifier

## Outline



## Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

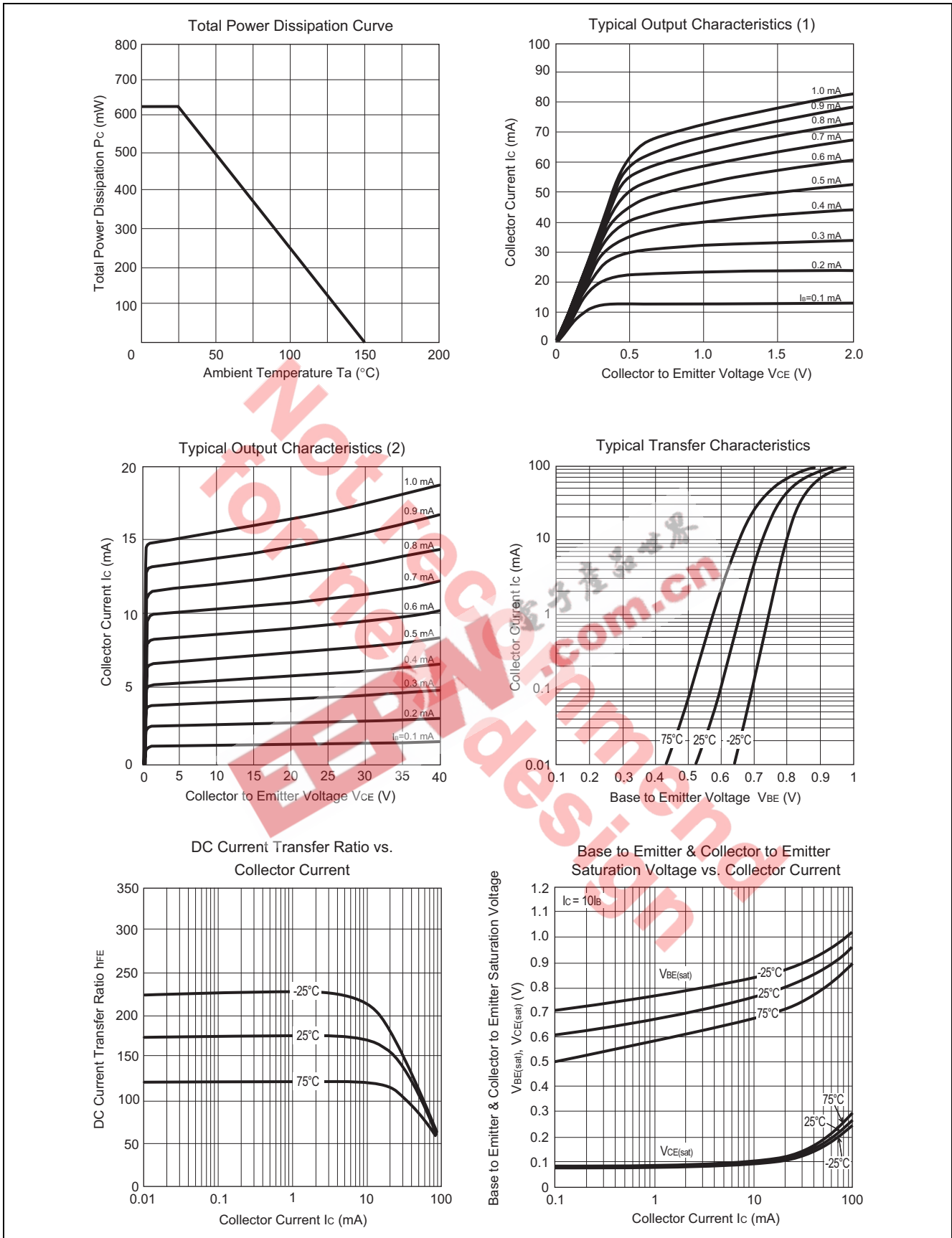
Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	60	V
Collector to emitter voltage	$V_{CEO}$	40	V
Emitter to base voltage	$V_{EBO}$	6	V
Collector current	$I_C$	200	mA
Total power dissipation	$P_C$	625	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

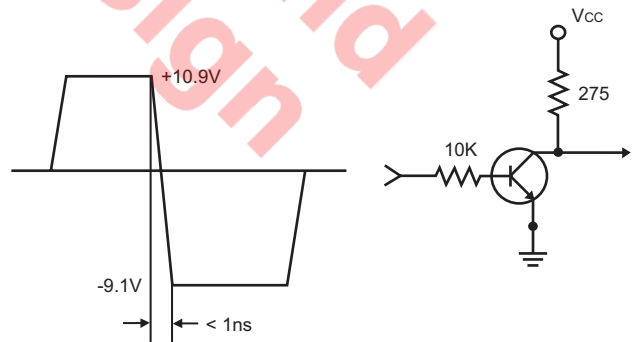
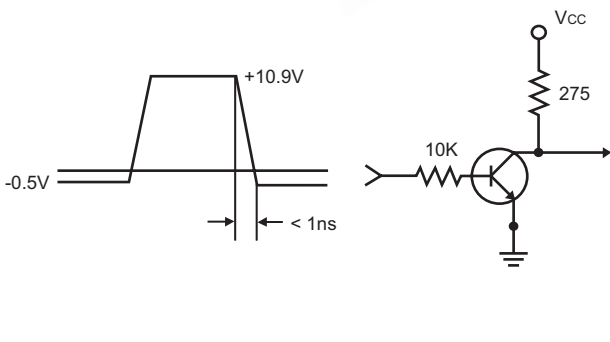
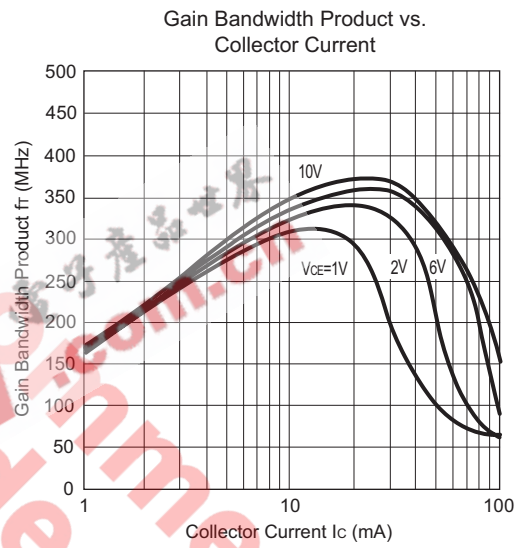
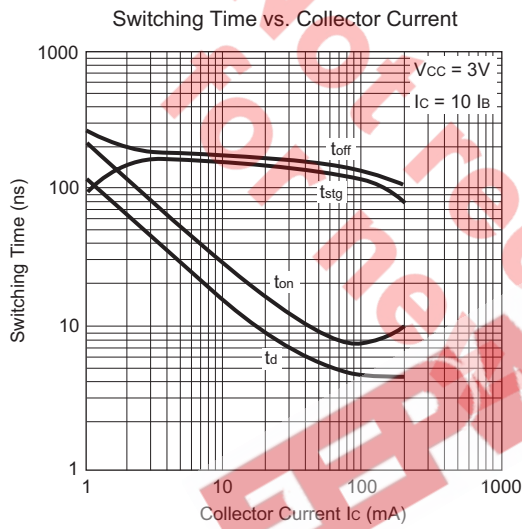
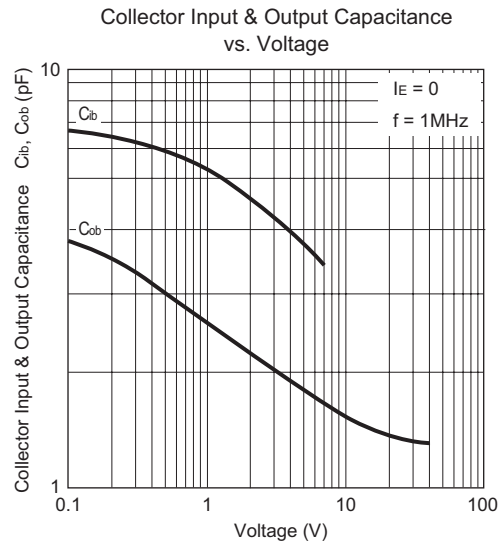
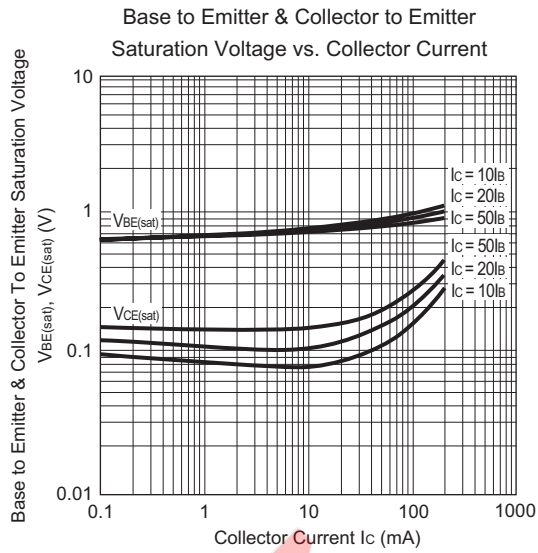
## Electrical Characteristics

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	60	—	—	V	$I_C = 10 \mu A, I_E = 0$
Collector to emitter breakdown voltage	$V_{(BR)CEO}$	40	—	—	V	$I_C = 1 mA, R_{BE} = \infty$
Emitter to base breakdown voltage	$V_{(BR)EBO}$	6	—	—	V	$I_E = 10 \mu A, I_C = 0$
Base cutoff current	$I_{BL}$	—	—	50	nA	$V_{CE} = 30 V, V_{EB} = 3 V$
Collector cutoff current	$I_{CEX}$	—	—	50	nA	$V_{CE} = 30 V, V_{EB} = 3 V$
DC current transfer ratio	$h_{FE}$	40	—	—	—	$V_{CE} = 1 V, I_C = 100 \mu A$
		70	—	—	—	$V_{CE} = 1 V, I_C = 1 mA$
		100	—	300	—	$V_{CE} = 1 V, I_C = 10 mA$
		60	—	—	—	$V_{CE} = 1 V, I_B = 50 mA$
		30	—	—	—	$V_{CE} = 1 V, I_B = 100 mA$
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	—	0.2	V	$I_C = 10 mA, I_B = 1 mA$
		—	—	0.3	V	$I_C = 50 mA, I_B = 5 mA$
Base to emitter saturation voltage	$V_{BE(sat)}$	0.65	—	0.85	V	$I_C = 10 mA, I_B = 1 mA$
		—	—	0.95	V	$I_C = 50 mA, I_B = 5 mA$
Gain bandwidth product	$f_T$	—	540	—	MHz	$V_{CE} = 20 V, I_C = 10 mA$
Collector output capacitance	$C_{ob}$	—	1.9	—	pF	$V_{CE} = 5 V, I_E = 0, f = 1 MHz$
Collector input capacitance	$C_{ib}$	—	5.9	—	pF	$V_{CE} = 0.5 V, I_E = 0, f = 1 MHz$
Noise figure	NF	—	1.0	—	dB	$V_{CE} = 5 V, I_C = 0.1 mA, f = 1 MHz, R_g = 1 k\Omega$

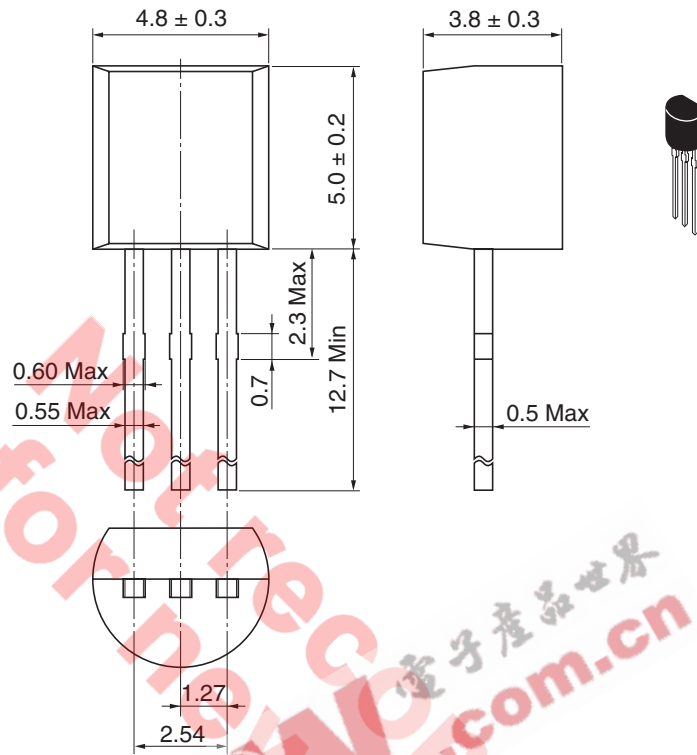
# Main Characteristics





Package Dimensions

As of January, 2003  
Unit: mm



Package Code	TO-92 (1)
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	0.25 g

Ordering Information

Part Name	Quantity	Shipping Container
2N3904	2500pcs	Radial Taping (Hold Box)

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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