

2N 3962
2N 3964
2N 3965

SILICON PLANAR PNP

LOW NOISE, LOW LEVEL AMPLIFIERS

The 2N 3962, 2N 3964 and 2N 3965 are silicon planar epitaxial PNP transistors in Jedec TO-18 metal case particularly intended for use in low noise applications. Their features are excellent current gain linearity from 1 μ A to 50 mA.

Datasheet.DIRECT

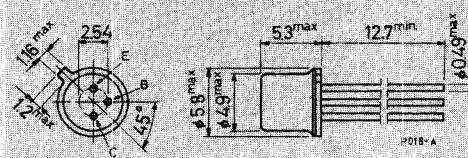
ABSOLUTE MAXIMUM RATINGS

		2N 3964	2N 3962 2N 3965
V_{CBO}	Collector-base voltage ($I_E = 0$)	-45 V	-60 V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	-45 V	-60 V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-6 V	
I_C	Collector current		-200 mA
P_{tot}	Total power dissipation at $T_{amb} \leq 25^\circ\text{C}$ at $T_{case} \leq 25^\circ\text{C}$		0.36 W 1.2 W
T_{stg}, T_j	Storage and junction temperature		-65 to 200 °C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to TO-18)

2N 3962**2N 3964****2N 3965****THERMAL DATA**

$R_{th\ j-case}$	Thermal resistance junction-case	max	146	$^{\circ}\text{C}/\text{W}$
$R_{th\ j-amb}$	Thermal resistance junction-ambient	max	487	$^{\circ}\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES} Collector cutoff current ($V_{BE} = 0$)	for 2N 3964 $V_{CE} = -40\text{V}$ $V_{CE} = -40\text{V}$ $T_{amb} = 150^{\circ}\text{C}$ for 2N 3962 and 2N 3965 $V_{CE} = -50\text{V}$ $V_{CE} = -50\text{V}$ $T_{amb} = 150^{\circ}\text{C}$	-10 -10	nA μA	-10 -10	nA μA
I_{EBO} Emitter cutoff current ($I_C = 0$)	$V_{EB} = -4\text{V}$	-10	nA	-10	nA
$V_{(BR)CBO}$ Collector-base breakdown voltage ($I_E = 0$)	$I_C = -10 \mu\text{A}$ for 2N 3964 for 2N 3962 and 2N 3965	-45 -60	V	V	V
$V_{(BR)CES}$ Collector-emitter breakdown voltage ($V_{BE} = 0$)	$I_C = -10 \mu\text{A}$ for 2N 3964 for 2N 3962 and 2N 3965	-45 -60	V	V	V
$V_{CEO(sus)}$ * Collector-emitter sustaining voltage ($I_B = 0$)	$I_C = -5 \text{ mA}$ for 2N 3964 for 2N 3962 and 2N 3965	-45 -60	V	V	V
$V_{(BR)EBO}$ Emitter-base breakdown voltage ($I_C = 0$)	$I_E = -10 \mu\text{A}$	-6	V	V	V
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_C = -10 \text{ mA}$ $I_B = -0.5 \text{ mA}$ $I_C = -50 \text{ mA}$ $I_B = -5 \text{ mA}$	-0.25 -0.4	V	V	V
$V_{BE(sat)}$ Base-emitter saturation voltage	$I_C = -10 \text{ mA}$ $I_B = -0.5 \text{ mA}$ $I_C = -50 \text{ mA}$ $I_B = -5 \text{ mA}$	-0.9 -0.95	V	V	V
h_{FE} DC current gain	for 2N 3962 $I_C = -1 \mu\text{A}$ $V_{CE} = -5\text{V}$ $I_C = -10 \mu\text{A}$ $V_{CE} = -5\text{V}$ $I_C = -100 \mu\text{A}$ $V_{CE} = -5\text{V}$ $I_C = -1 \text{ mA}$ $V_{CE} = -5\text{V}$ $I_C = -10 \text{ mA}$ $V_{CE} = -5\text{V}$ $I_C = -50 \text{ mA}$ $V_{CE} = -5\text{V}$ $I_C = -10 \mu\text{A}$ $V_{CE} = -5\text{V}$ $T_{amb} = -55^{\circ}\text{C}$	60 100 100 100 100 100 90 40	300 450	— — — — — — — —	— — — — — — — —

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ELECTRICAL CHARACTERISTICS (continued)

Parameter	Test conditions	Min.	Typ.	Max.	Unit
h_{FE}	DC current gain for 2N 3962 $I_C = -50 \text{ mA}$ $V_{CE} = -5V$ $T_{amb} = -55^\circ\text{C}$ $I_C = -1 \text{ mA}$ $V_{CE} = -5V$ $T_{amb} = 100^\circ\text{C}$ for 2N 3964 and 2N 3965 $I_C = -1 \mu\text{A}$ $V_{CE} = -5V$ $I_C = -10 \mu\text{A}$ $V_{CE} = -5V$ $I_C = -100 \mu\text{A}$ $V_{CE} = -5V$ $I_C = -1 \text{ mA}$ $V_{CE} = -5V$ * $I_C = -10 \text{ mA}$ $V_{CE} = -5V$ * $I_C = -50 \text{ mA}$ $V_{CE} = -5V$ $I_C = -10 \mu\text{A}$ $V_{CE} = -5V$ $T_{amb} = -55^\circ\text{C}$ * $I_C = -50 \text{ mA}$ $V_{CE} = -5V$ $T_{amb} = -55^\circ\text{C}$ $I_C = -1 \text{ mA}$ $V_{CE} = -5V$ $T_{amb} = 100^\circ\text{C}$	45	600	—	—
h_{fe}	Small signal current current gain $I_C = -1 \text{ mA}$ $V_{CE} = -5V$ $f = 1 \text{ kHz}$ for 2N 3962 for 2N 3964 and 2N 3965	100 250	550 700	—	—
f_T	Transition frequency $I_C = -0.5 \text{ mA}$ $V_{CE} = -5V$ $f = 20 \text{ MHz}$ for 2N 3962 for 2N 3964 and 2N 3965	40 50	160 160	MHz MHz	
C_{EBO}	Emitter-base capacitance $I_C = 0$ $V_{EB} = -0.5V$ $f = 1 \text{ MHz}$		15	pF	
C_{CBO}	Collector-base capacitance $I_E = 0$ $V_{CB} = -5V$ $f = 1 \text{ MHz}$		6	pF	
NF	Noise figure $I_C = -20 \mu\text{A}$ $V_{CE} = -5V$ $R_g = 10 \text{ k}\Omega$ for 2N 3962 $f = 10 \text{ to } 10\,000 \text{ Hz}$ $f = 100 \text{ Hz}$ $B = 15 \text{ Hz}$ $f = 1 \text{ kHz}$ $B = 150 \text{ Hz}$ $f = 10 \text{ kHz}$ $B = 1.5 \text{ kHz}$ for 2N 3964 and 2N 3965 $f = 10 \text{ to } 10\,000 \text{ Hz}$ $f = 10 \text{ Hz}$ $B = 2 \text{ Hz}$ $f = 100 \text{ Hz}$ $B = 15 \text{ Hz}$ $f = 1 \text{ kHz}$ $B = 150 \text{ Hz}$ $f = 10 \text{ kHz}$ $B = 1.5 \text{ kHz}$	3 10 3 3 3 2 8 4 2 2	dB dB dB dB dB dB dB dB dB dB		

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2N 3965

ELECTRICAL CHARACTERISTICS (continued)

Parameter	Test conditions	Min.	Typ.	Max.	Unit
h_{ie} Input impedance	$I_C = -1 \text{ mA}$ $V_{CE} = -5V$ $f = 1 \text{ kHz}$ for 2N 3962 for 2N 3964 and 2N 3965	2.5 6		17 20	$\text{k}\Omega$ $\text{k}\Omega$
h_{re} Reverse voltage ratio	$I_C = -1 \text{ mA}$ $V_{CE} = -5V$ $f = 1 \text{ kHz}$			10×10^{-4}	—
h_{oe} Output admittance	$I_C = -1 \text{ mA}$ $V_{CE} = -5V$ $f = 1 \text{ kHz}$ for 2N 3962 for 2N 3964 and 2N 3965	5 5		40 50	μS μS

* Pulsed: pulse duration = 300 μs , duty cycle = 1%