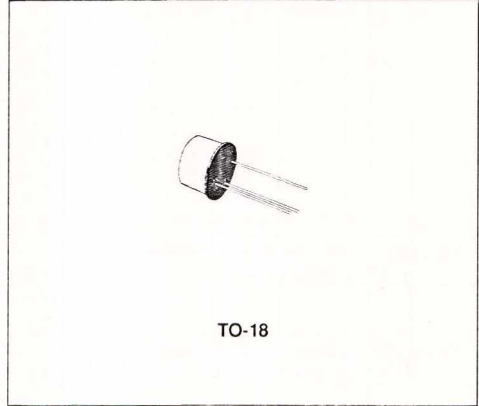


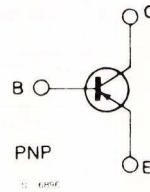
LOW NOISE, LOW LEVEL AMPLIFIERS

DESCRIPTION

The 2N3962, 2N3963, 2N3964 and 2N3965 are silicon planar epitaxial PNP transistors in Jedec TO-18 metal case particularly intended for use in low noise applications. They features are excellent current gain linearity from 1 μ A to 50 mA.



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value			Unit
		2N3964	2N3962 2N3965	2N3963	
V_{CB0}	Collector-base Voltage ($I_E = 0$)	- 45	- 60	- 80	V
V_{CE0}	Collector-emitter Voltage ($I_B = 0$)	- 45	- 60	- 80	V
V_{EB0}	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			$^\circ\text{C}$

THERMAL DATA

$R_{th\ j-case}$	Thermal Resistance Junction-case	Max	146	$^{\circ}C/W$
$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max	487	$^{\circ}C/W$

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cutoff Current ($V_{BE} = 0$)	For 2N3964 $V_{CE} = -40\ V$ $V_{CE} = -40\ V$ $T_{amb} = 150^{\circ}C$ For 2N3962 and 2N3965 $V_{CE} = -50\ V$ $V_{CE} = -50\ V$ $T_{amb} = 150^{\circ}C$ For 2N3963 $V_{CE} = -70\ V$ $V_{CE} = -70\ V$ $T_{amb} = 150^{\circ}C$			-10 -10 -10 -10 -10 -10	nA μA nA μA nA μA
I_{EBO}	Emitter Cutoff Current ($I_C = 0$)	$V_{EB} = -4\ V$			-10	nA
$V_{(BR)CBO}$	Collector-base Breakdown Voltage ($I_E = 0$)	$I_C = -10\ \mu A$ For 2N3964 For 2N3962 and 2N3965 For 2N3963	-45 -60 -80			V V V
$V_{(BR)CES}$	Collector-base Breakdown Voltage ($V_{BE} = 0$)	$I_C = -10\ \mu A$ For 2N3964 For 2N3962 and 2N3965 For 2N3963	-45 -60 -80			V V V
$V_{(BR)CEO}^*$	Collector-emitter Breakdown Voltage ($I_B = 0$)	$I_C = -5\ mA$ For 2N3964 For 2N3962 and 2N3965 For 2N3963	-45 -60 -80			V V V
$V_{(BR)EBO}$	Emitter-base Breakdown Voltage ($I_C = 0$)	$I_E = -10\ \mu A$	-6			V
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = -10\ mA$ $I_B = -0.5\ mA$ $I_C = -50\ mA$ $I_B = -5\ mA$			-0.25 -0.4	V V
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = -10\ mA$ $I_B = -0.5\ mA$ $I_C = -50\ mA$ $I_B = -5\ mA$			-0.9 -0.95	V V
h_{FE}^*	DC Current Gain	For 2N3962 and 2N3963 $I_C = -1\ \mu A$ $V_{CE} = -5\ V$ $I_C = -10\ \mu A$ $V_{CE} = -5\ V$ $I_C = -100\ \mu A$ $V_{CE} = -5\ V$ $I_C = -1\ mA$ $V_{CE} = -5\ V$ $I_C = -10\ mA$ $V_{CE} = -5\ V$ $I_C = -50\ mA$ $V_{CE} = -5\ V$ $I_C = -10\ \mu A$ $V_{CE} = -5\ V$ $T_{amb} = -55^{\circ}C$	60 100 100 100 100 90 40		300 450	

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

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
h_{FE}^*	DC Current Gain	For 2N3962 and 2N3963 $I_C = -50 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $T_{amb} = -55 \text{ }^\circ\text{C}$ $I_C = -1 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $T_{amb} = 100 \text{ }^\circ\text{C}$ For 2N3964 and 2N3965 $I_C = -1 \text{ } \mu\text{A}$ $V_{CE} = -5 \text{ V}$ $I_C = -10 \text{ } \mu\text{A}$ $V_{CE} = -5 \text{ V}$ $I_C = -100 \text{ } \mu\text{A}$ $V_{CE} = -5 \text{ V}$ $I_C = -1 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $I_C = -10 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $I_C = -50 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $I_C = -10 \text{ } \mu\text{A}$ $V_{CE} = -5 \text{ V}$ $T_{amb} = -55 \text{ }^\circ\text{C}$ $I_C = -50 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $T_{amb} = -55 \text{ }^\circ\text{C}$ $I_C = -1 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $T_{amb} = 100 \text{ }^\circ\text{C}$	45		600		
h_{fe}	Small Signal Current Gain	$I_C = -1 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $f = 1 \text{ kHz}$ For 2N3962 and 2N3963 For 2N3964 and 2N3965	100 250		550 700		
f_T	Transition Frequency	$I_C = -0.5 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $f = 20 \text{ MHz}$ For 2N3962 and 2N3963 For 2N3964 and 2N3965	40 50		160 160	MHz MHz	
C_{EBO}	Emitter-base Capacitance	$I_C = 0$ $V_{EB} = -0.5 \text{ V}$ $f = 1 \text{ MHz}$			15	pF	
C_{CBO}	Collector-base Capacitance	$I_E = 0$ $V_{CB} = -5 \text{ V}$ $f = 1 \text{ MHz}$			6	pF	
NF	Noise Figure	$I_C = -20 \text{ } \mu\text{A}$ $V_{CE} = -5 \text{ V}$ $R_G = 10 \text{ k}\Omega$ For 2N3962 and 2N3963 $f = 10 \text{ to } 10\,000 \text{ Hz}$ $f = 100 \text{ Hz}$ $B = 15 \text{ Hz}$ $f = 1 \text{ kHz}$ $B = 150 \text{ Hz}$ $f = 10 \text{ kHz}$ $B = 1.5 \text{ kHz}$ For 2N3964 and 2N3965 $f = 10 \text{ to } 10\,000 \text{ Hz}$ $f = 10 \text{ Hz}$ $B = 2 \text{ Hz}$ $f = 100 \text{ Hz}$ $B = 15 \text{ Hz}$ $f = 1 \text{ kHz}$ $B = 150 \text{ Hz}$ $f = 10 \text{ kHz}$ $B = 1.5 \text{ kHz}$			3 10 3 3	2 8 4 2	dB dB dB dB

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