



# PNP Transistor Bare Die, 2N3905

Rev 1.0  
02/09/17

General purpose amplifier or saturated switch in bare die form  
Complement to NPN 2N3904

## Features:

- Low Leakage Current 50nA Max
- Low Collector Output Capacitance 4.5pF Max
- Characterized at temperature extremes
- High Reliability Gold Back Metal
- High Reliability tested grades for Military + Space

## Ordering Information:

The following part suffixes apply:

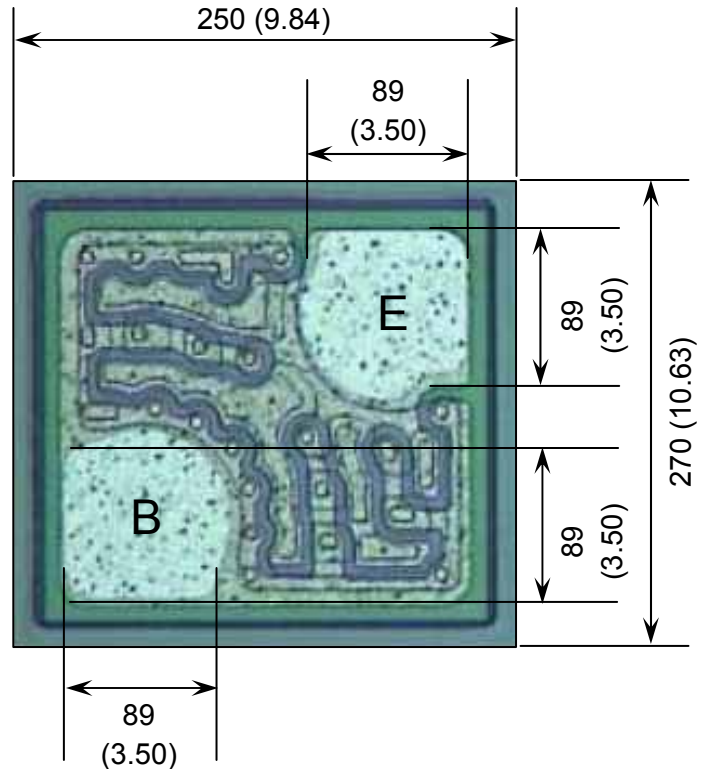
- No suffix - MIL-STD-750 /2072 Visual Inspection
- "H" - MIL-STD-750 /2072 Visual Inspection  
+ MIL-PRF-38534 Class H LAT
- "K" - MIL-STD-750 /2072 Visual Inspection  
+ MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

[www.siliconsupplies.com/quality/bare-die-lot-qualification](http://www.siliconsupplies.com/quality/bare-die-lot-qualification)

## Die Dimensions in $\mu\text{m}$ (mils)



**E** = EMITTER **B** = BASE

**DIE BACK** = COLLECTOR

## Supply Formats:

- Default – Die in Waffle Pack (400 per tray capacity)
- Sawn Wafer on Tape – Specific request
- Unsawn Wafer – Specific request
- With additional electrical selection – Specific request
- Sawn as pairs or adjacent pair pick – Specific request

## Mechanical Specification

Die Size (Excluding Saw Street)	250 x 270 9.84 x 10.63	$\mu\text{m}$ mils
Base Pad Size Emitter Pad Size	89 x 89 3.50 x 3.50	$\mu\text{m}$ mils
Die Thickness	180 ( $\pm 20$ ) 7.09 ( $\pm 0.79$ )	$\mu\text{m}$ mils
Top Metal Composition	Al - 1.3 $\mu\text{m}$	
Back Metal Composition	AuAs - 0.9 $\mu\text{m}$	





# PNP Transistor Bare Die, 2N3905

Rev 1.0  
07/07/17

## Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	$V_{CBO}$	-40	V
Collector-Emitter Voltage	$V_{CEO}$	-40	V
Emitter-Base Voltage	$V_{EBO}$	-6	V
Collector Current	$I_C$	-200	mA
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to 150	$^\circ\text{C}$

## Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = -100\mu\text{A}$	-40	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = -1\text{mA}$	-40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = -10\mu\text{A}$	-6	-	-	V
Collector Cut-off Current	$I_{CEX}$	$V_{CE} = -30\text{V}, V_{EB} = -3\text{V}$	-	-	-50	nA
Base Cut-off Current	$I_{BL}$	$V_{CE} = -30\text{V}, V_{EB} = -3\text{V}$	-	-	-50	nA
<b>ON CHARACTERISTICS</b>						
Forward-Current Transfer Ratio	$h_{FE}$	$V_{CE} = -1\text{V}, I_C = -0.1\text{mA}$	30	-	-	-
		$V_{CE} = -1\text{V}, I_C = -1\text{mA}$	40	-	-	-
		$V_{CE} = -1\text{V}, I_C = -10\text{mA}$	50	-	150	-
		$V_{CE} = -1\text{V}, I_C = -50\text{mA}$	30	-	-	-
		$V_{CE} = -1\text{V}, I_C = -100\text{mA}$	15	-	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	-	-	-0.25	V
		$I_C = -50\text{mA}, I_B = -5\text{mA}$	-	-	-0.4	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	0.66	-	0.84	V
		$I_C = -50\text{mA}, I_B = -5\text{mA}$	-	-	0.95	V
<b>SMALL SIGNAL CHARACTERISTICS<sup>1</sup></b>						
Transition Frequency	$f_T$	$V_{CE} = -20\text{V}, I_E = -10\text{mA}$	200	-	-	MHz
Output Capacitance	$C_{obo}$	$V_{CB} = -5\text{V}, I_E = 0, f = 1\text{MHz}$	-	-	4.5	pF
Input Capacitance	$C_{ibo}$	$V_{EB} = -0.5\text{V}, I_C = 0, f = 1\text{MHz}$	-	-	10	
<b>SWITCHING CHARACTERISTICS<sup>1</sup></b>						
Delay Time	$t_d$	$V_{CC} = -3\text{V}, V_{BE} = 0.5\text{V}$ $I_C = -10\text{mA}, I_{B1} = -1\text{mA}$	-	-	35	ns
Rise Time	$t_r$		-	-	35	
Storage Time	$t_s$	$V_{CC} = -3\text{V}, I_C = -10\text{mA}$ $I_{B1} = I_{B2} = -1\text{mA}$	-	-	200	
Fall Time	$t_f$		-	-	60	

Note 1: Not production testing in die form, characterized by chip design and tested in package LAT.

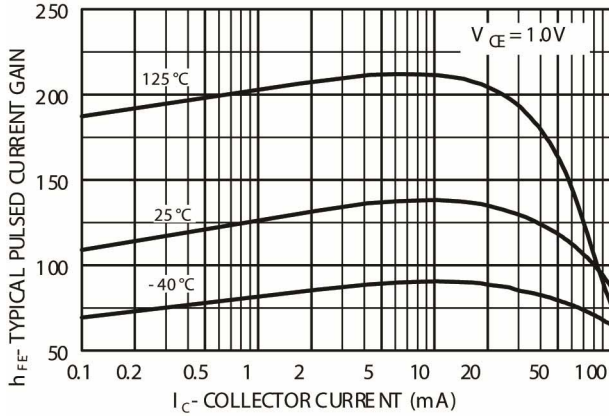




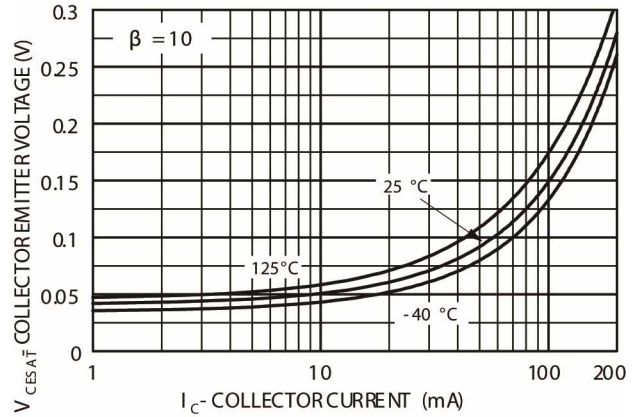
# PNP Transistor Bare Die, 2N3905

Rev 1.0  
07/07/17

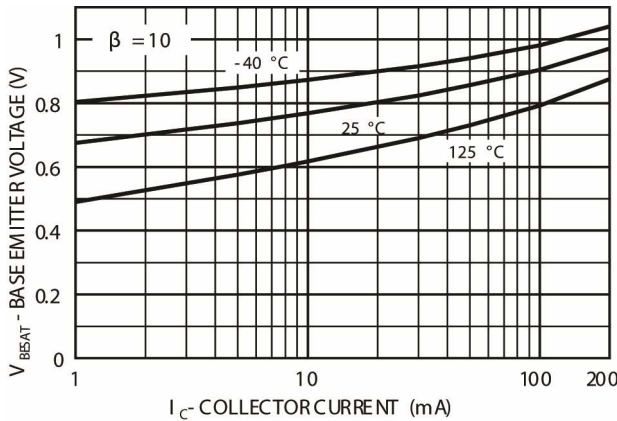
## Typical Electrical Characteristics



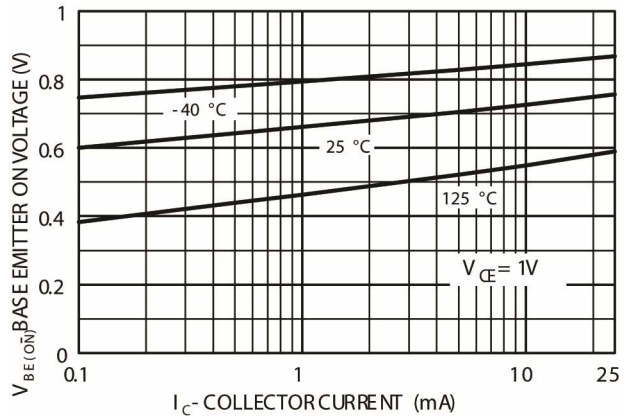
**Fig 1** - Typical Pulsed Current Gain versus Collector Current



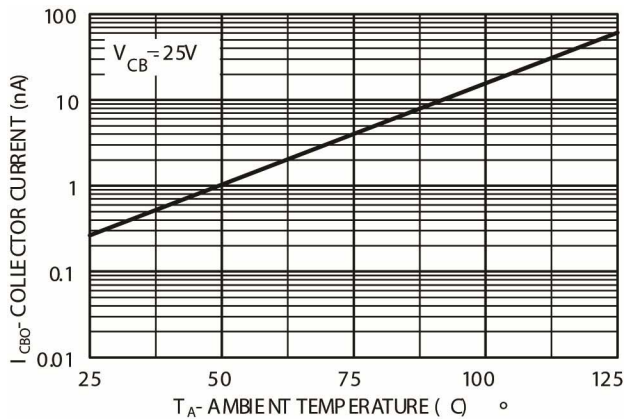
**Fig 2** - Collector-Emitter Saturation Voltage versus Collector Current



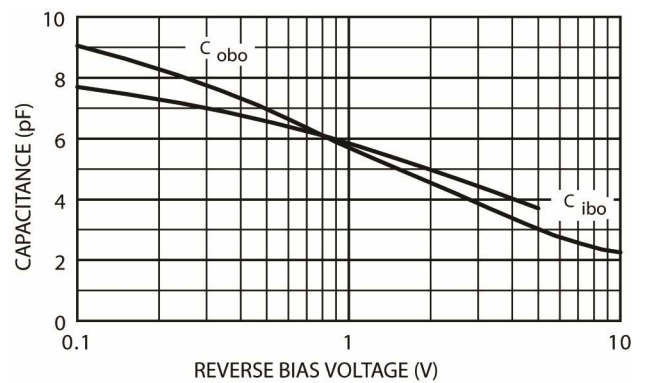
**Fig 3** - Base-Emitter Saturation Voltage versus Collector Current



**Fig 4** - Base-Emitter ON Voltage versus Collector Current



**Fig 5** - Collector-Cut-off Current versus Ambient Temperature



**Fig 6** - Capacitance versus Reverse Bias Voltage

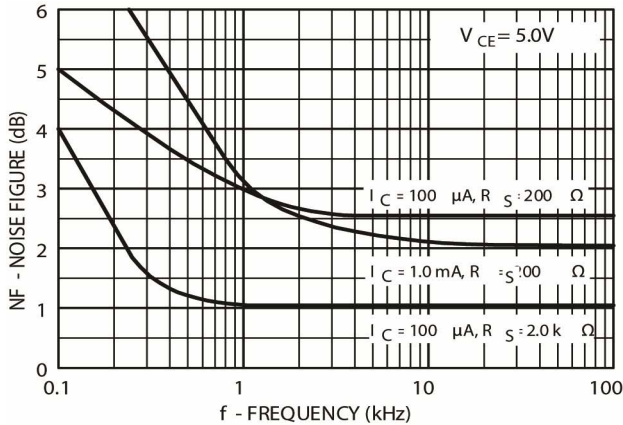




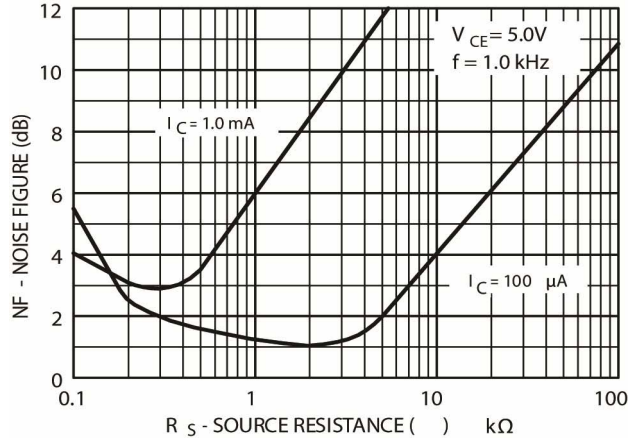
# PNP Transistor Bare Die, 2N3905

Rev 1.0  
07/07/17

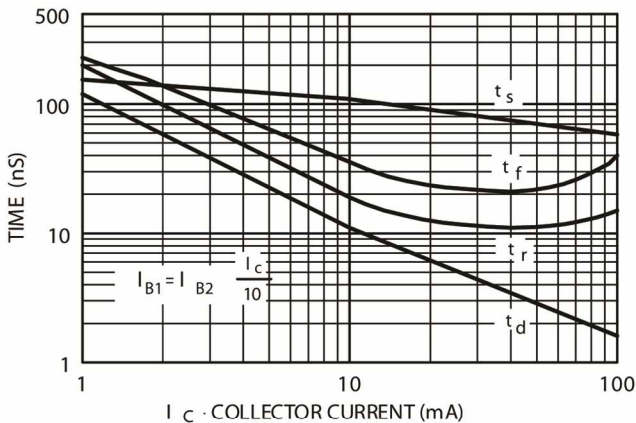
## Typical Electrical Characteristics (Continued)



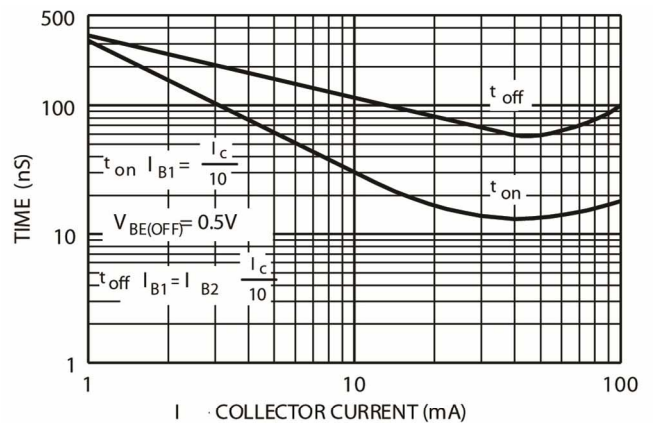
**Fig 7** – Noise Figure versus Frequency



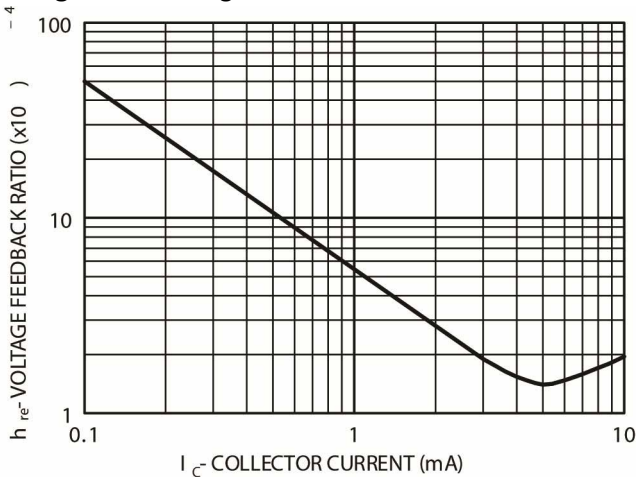
**Fig 8** - Noise Figure versus Source Resistance



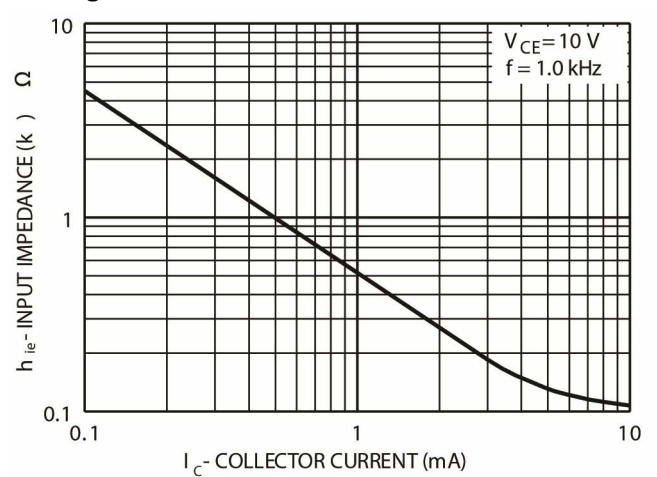
**Fig 9** – Switching Times versus Collector Current



**Fig 10** – Turn-On Time versus Collector Current



**Fig 11** – Voltage Feedback Ratio



**Fig 12** – Input Impedance





# PNP Transistor Bare Die, 2N3905

Rev 1.0  
07/07/17

## Typical Electrical Characteristics (Continued)

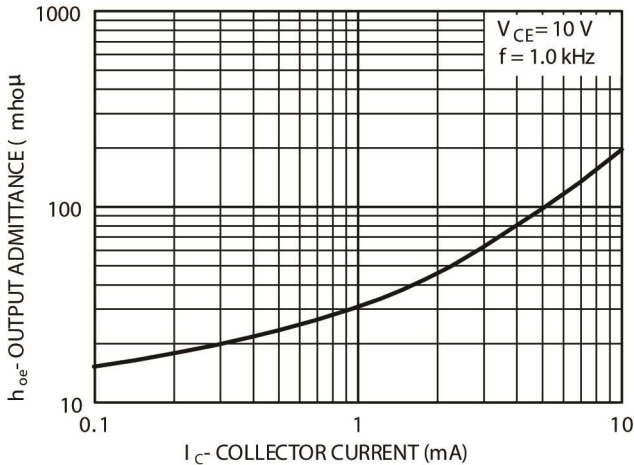


Fig 13 – Output Admittance

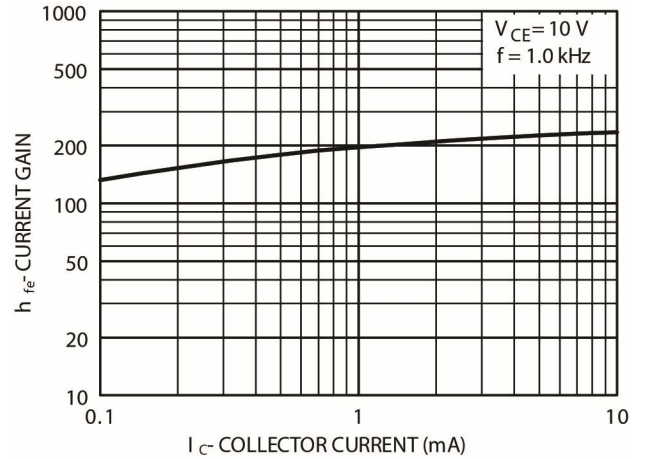


Fig 14 – Current Gain

**DISCLAIMER:** The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Silicon Supplies Ltd hereby disclaims any and all warranties and liabilities of any kind.

**LIFE SUPPORT POLICY:** Silicon Supplies Ltd components may be used in life support devices or systems only with the express written approval of Silicon Supplies Ltd, if a failure of such components can reasonably be expected to cause the failure of that life support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

