



# PNP Transistor Bare Die, 2N5401

Rev 1.0  
02/09/17

General purpose high voltage amplifier or switch in bare die form  
Complement to PNP 2N5551

## Features:

- High Collector Breakdown Voltage
- Low Collector Saturation Voltage
- Characterized at temperature extremes
- High Reliability Gold Back Metal
- High Reliability tested grades for Military + Space

## Ordering Information:

The following part suffixes apply:

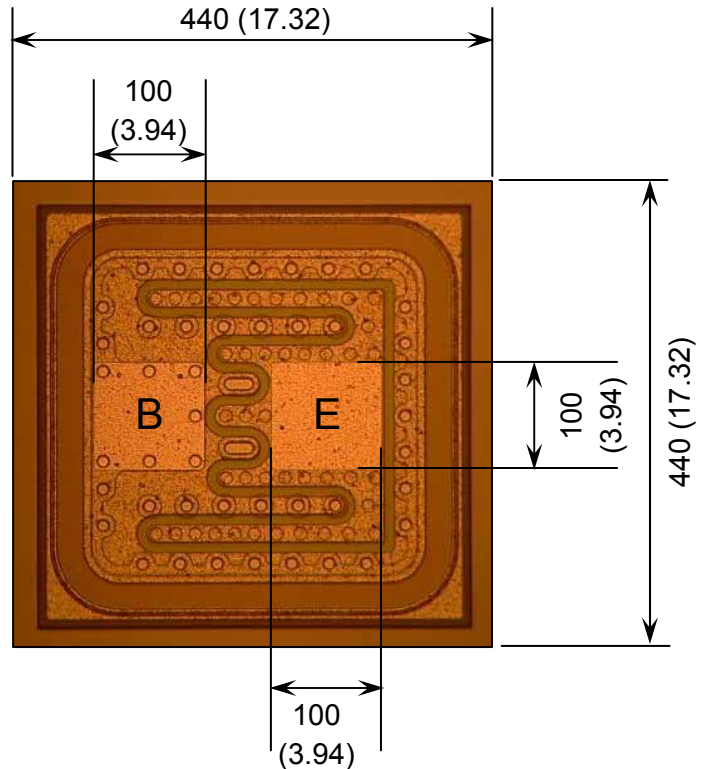
- No suffix - MIL-STD-750 /2072 Visual Inspection
- "H" - MIL-STD-750 /2072 Visual Inspection + MIL-PRF-38534 Class H LAT
- "K" - MIL-STD-750 /2072 Visual Inspection + MIL-PRF-38534 Class K LAT

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)	440 x 440 17.32 x 17.32	$\mu\text{m}$ mils
Base & Emitter Pad Size	100 x 100 3.94 x 3.94	$\mu\text{m}$ mils
Die Thickness	230 ( $\pm 20$ ) 9.06 ( $\pm 0.79$ )	$\mu\text{m}$ mils
Top Metal Composition	Al - 1.3 $\mu\text{m}$	
Back Metal Composition	AuAs - 0.9 $\mu\text{m}$	





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

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	$V_{CBO}$	-160	V
Collector-Emitter Voltage	$V_{CEO}$	-150	V
Emitter-Base Voltage	$V_{EBO}$	-5	V
Collector Current	$I_C$	-600	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	$V_{(BR)CBO}$	$I_C = -100\mu\text{A}, I_E = 0\text{A}$	-160	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = -1\text{mA}, I_B = 0\text{A}$	-150	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = -10\mu\text{A}, I_C = 0\text{A}$	-5	-	-	V
Collector Cut-off Current	$I_{CBO}$	$V_{CB} = -120\text{V}, I_E = 0\text{A}$	-	-	-50	nA
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = -3\text{V}, I_C = 0\text{A}$	-	-	-50	nA
<b>ON CHARACTERISTICS</b>						
Forward-Current Transfer Ratio	$h_{FE}$	$V_{CE} = -5\text{V}, I_C = -1\text{mA}$	50	-	-	-
		$V_{CE} = -5\text{V}, I_C = -10\text{mA}$	60	-	240	-
		$V_{CE} = -5\text{V}, I_C = -50\text{mA}$	50	-	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	-	-	-0.2	V
		$I_C = -50\text{mA}, I_B = -5\text{mA}$	-	-	-0.5	V
Base Saturation Voltage	$V_{BE(sat)}$	$I_C = -10\text{mA}, I_B = -1\text{mA}$	-	-	-1	V
		$I_C = -50\text{mA}, I_B = -5\text{mA}$	-	-	-1	V
<b>SMALL SIGNAL CHARACTERISTICS<sup>1</sup></b>						
Transition Frequency	$f_T$	$V_{CE} = -10\text{V}, I_E = -10\text{mA}$	100	-	300	MHz
Output Capacitance	$C_{obo}$	$V_{CB} = -10\text{V}, I_E = 0, f = 1\text{MHz}$	-	-	6	pF

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

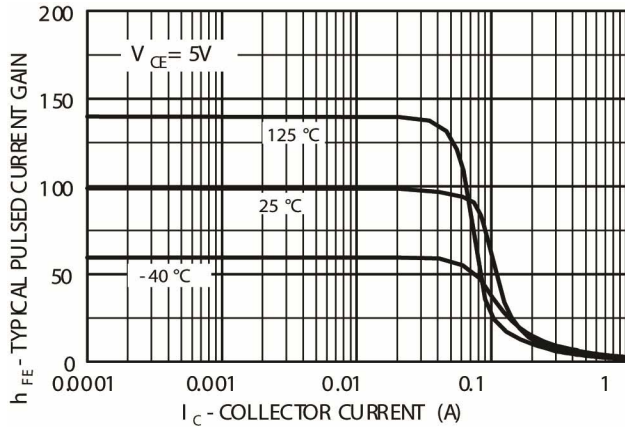




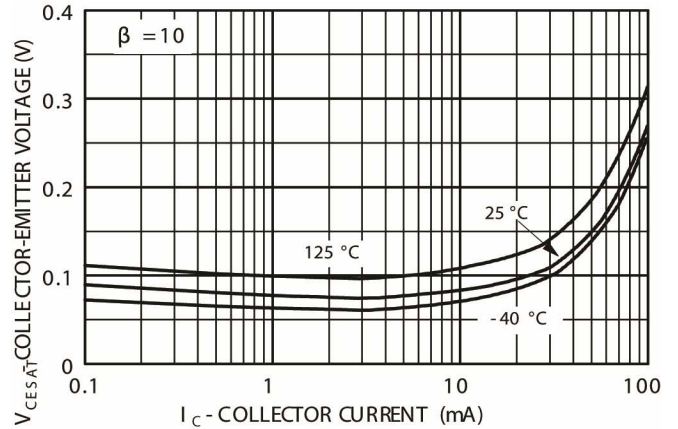
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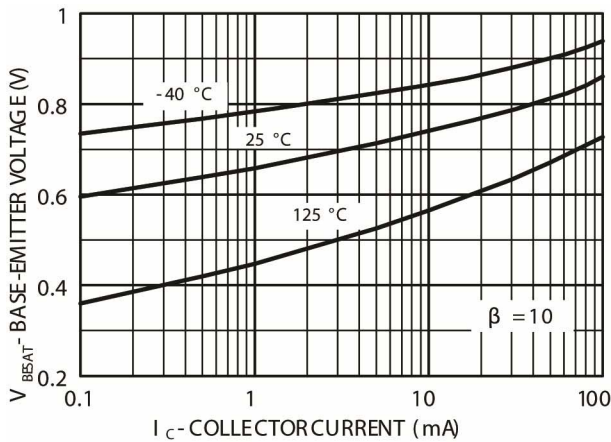
## Typical Electrical Characteristics



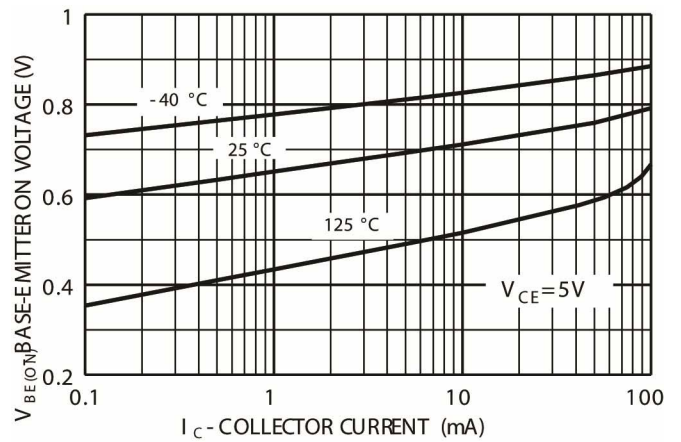
**Fig 1 - Typical Pulsed Current Gain versus Collector Current**



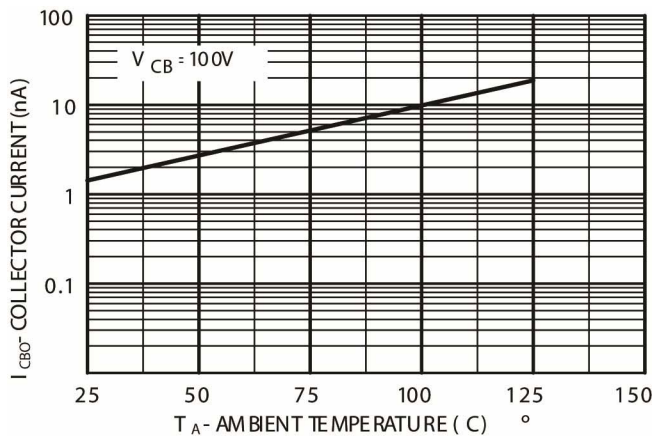
**Fig 2 - Collector-Emmitter Saturation Voltage versus Collector Current**



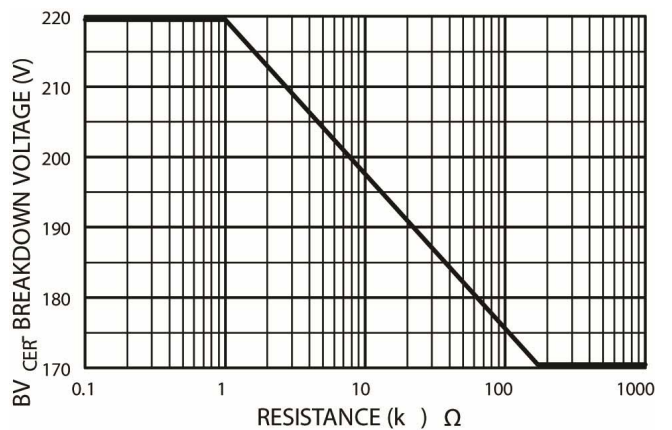
**Fig 3 - Base-Emmitter Saturation Voltage versus Collector Current**



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



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



**Fig 6 - Collector-Emmitter Breakdown Voltage with Resistance Between Emitter-Base**

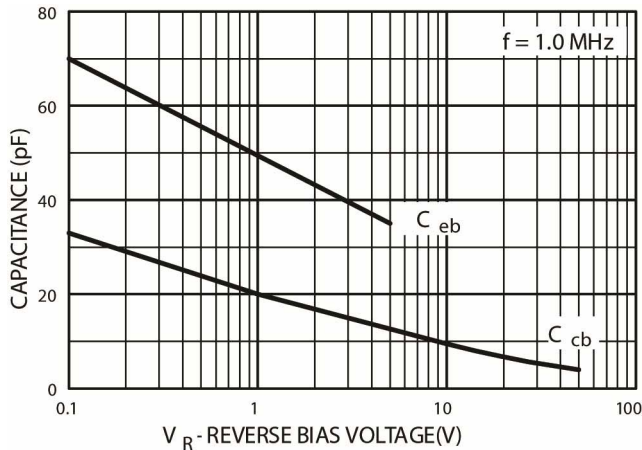




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## Typical Electrical Characteristics (Continued)



**Fig 7** – Input and Output Capacitance versus Reverse Voltage

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