



# NPN Transistor Bare Die, 2N3302

Rev 1.0  
02/09/17

General purpose medium power amplifier or switch in bare die form

## Features:

- Collector current up to 500mA
- Low Leakage Current
- Low Saturation Voltage
- High Reliability Gold Back Metal
- High Reliability tested grades for Military + Space

## Ordering Information:

The following part suffixes apply:

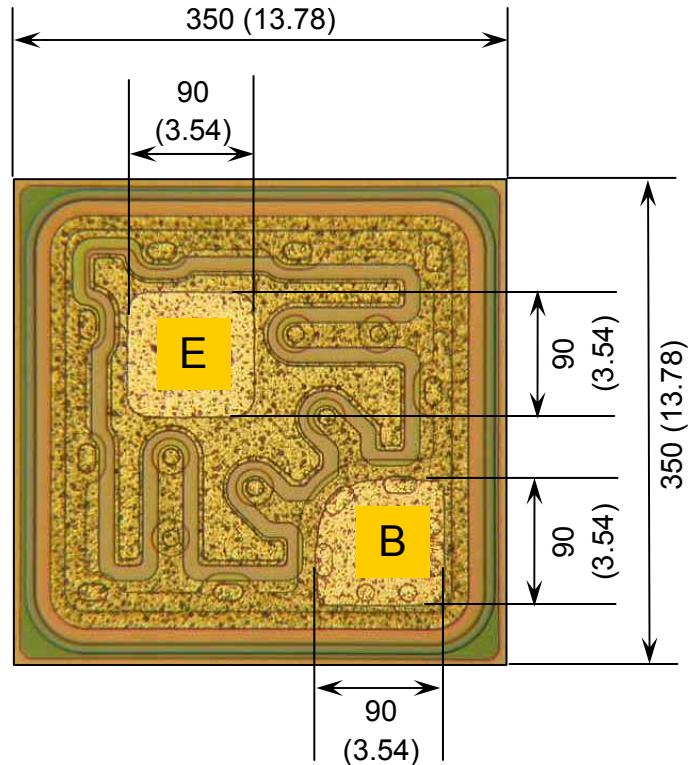
- No suffix - MIL-STD-750 /2072 Visual Inspection
- "H" - MIL-STD-750 /2072 Visual Inspection  
+ MIL-PRF-38534 Class H LAT
- "K" - MIL-STD-750 /2072 Visual Inspection  
+ MIL-PRF-38534 Class K LAT

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)	350 x 350 13.78 x 13.78	$\mu\text{m}$ mils
Base Pad Size Emitter Pad Size	90 x 90 3.54 x 3.54	$\mu\text{m}$ 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 $\mu\text{m}$	





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

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	30	V
Emitter-Base Voltage	$V_{EBO}$	5	V
Collector Current	$I_C$	500	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	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}$	60	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 10\text{mA}$	30	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}$	5	-	-	V
Collector Cut-off Current	$I_{CES}$	$V_{CE} = 50\text{V}, V_{BE} = 0$	-	-	10	nA
		$V_{CE} = 50\text{V}, V_{BE} = 0, T_A = 150^\circ\text{C}$	-	-	10	$\mu\text{A}$
Emitter Cut-off Current	$I_{EBO}$	$V_{BE} = 3\text{V}, I_C = 0$	-	-	10	nA
<b>ON CHARACTERISTICS</b>						
Forward-Current Transfer Ratio	$h_{FE}$	$V_{CE} = 10\text{V}, I_C = 0.1\text{mA}$	35	-	-	-
		$V_{CE} = 10\text{V}, I_C = 1\text{mA}$	50	-	-	-
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}$	75	-	-	-
		$V_{CE} = 1\text{V}, I_C = 150\text{mA}$	50	-	-	-
		$V_{CE} = 10\text{V}, I_C = 150\text{mA}$	100	-	300	-
		$V_{CE} = 10\text{V}, I_C = 500\text{mA}$	50	-	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	-	-	0.22	V
		$I_C = 300\text{mA}, I_B = 30\text{mA}$	-	-	0.45	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	0.6	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	-	-	1.1	V
		$I_C = 300\text{mA}, I_B = 30\text{mA}$	-	-	1.3	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	1.5	V
<b>SMALL-SIGNAL CHARACTERISTICS<sup>1</sup></b>						
Transition Frequency	$f_T$	$V_{CE} = 10\text{V}, I_C = 50\text{mA}, f = 100\text{MHz}$	250	-	-	MHz
Output Capacitance	$C_{obo}$	$V_{CB} = 10\text{V}, I_E = 0, f = 140\text{kHz}$	-	-	8	pF
Input Capacitance	$C_{ibo}$	$V_{BE} = 2\text{V}, I_C = 0, f = 140\text{kHz}$	-	-	20	
<b>SWITCHING CHARACTERISTICS<sup>1</sup></b>						
Turn-On Time	$t_{on}$	$V_{CC} = 25\text{V}, I_C = 300\text{mA}$ $I_{B1} = 30\text{mA}$	-	-	60	ns
Turn-Off Time	$t_{off}$	$V_{CC} = 25\text{V}, I_C = 300\text{mA}$ $I_{B1} = I_{B2} = 30\text{mA}$	-	-	150	

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





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