



NPN Transistor Bare Die, 2N3020

Rev 1.0
21/10/24

General purpose medium power amplifier or switch in bare die form
Complement PNP 2N4033

Features:

- Collector current up to 1A
- Low Leakage Current & 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:

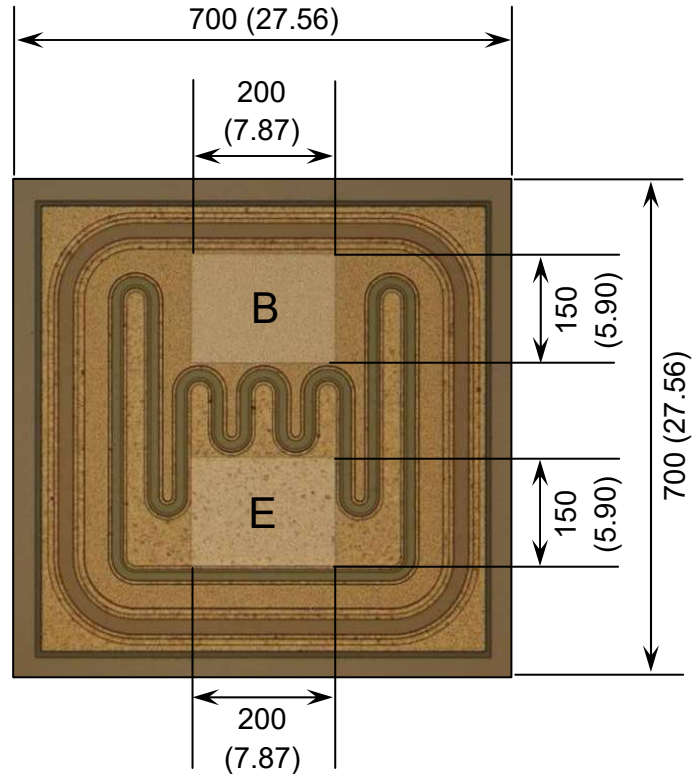
- No suffix - MIL-STD-750 /2072 Visual Inspection
- "H" - MIL-STD-750 /2072 Visual Inspection + MIL-STD-38534 Class H LAT
- "K" - MIL-STD-750 /2072 Visual Inspection + MIL-STD-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

www.siliconsupplies.com/quality/bare-die-lot-qualification

Die Dimensions in μm (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)	700 x 700 27.56 x 27.56	μm mils
Base & Emitter Pad Size	200 x 150 7.87 x 5.90	μm mils
Die Thickness	180 (± 20) 7.09 (± 0.79)	μm mils
Top Metal Composition	Al - 3 μm	
Back Metal Composition	Au - 0.9 μm	





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Absolute Maximum Ratings¹ $T_A = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V_{CBO}	140	V
Collector-Emitter Voltage	V_{CEO}	80	V
Emitter-Base Voltage	V_{EBO}	7	V
Collector Current	I_C	1	A
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
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage ²	$V_{(BR)CBO}$	$I_C = 100\mu\text{A}, I_E = 0$	140	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 30\text{mA}, I_B = 0$	80	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 100\mu\text{A}, I_C = 0$	7	-	-	V
Collector Cut-off Current	I_{CBO}	$V_{CB} = 90\text{V}, I_E = 0$	-	-	0.01	μA
		$V_{CB} = 90\text{V}, I_E = 0, T_A = 150^\circ\text{C}^3$	-	-	10	μA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = 5\text{V}, I_C = 0$	-	-	0.01	μA
ON CHARACTERISTICS						
Forward-Current Transfer Ratio	h_{FE}	$V_{CE} = 10\text{V}, I_C = 0.1\text{mA}$	30	-	200	-
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}$	40	-	200	-
		$V_{CE} = 10\text{V}, I_C = 150\text{mA}$	40	-	200	-
		$V_{CE} = 10\text{V}, I_C = 500\text{mA}^2$	30	-	120	-
		$V_{CE} = 10\text{V}, I_C = 1\text{A}^2$	15	-	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	-	-	0.2	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	0.5	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 10\text{mA}, I_B = 1\text{mA}$	-	-	1.1	V
		$I_C = 150\text{mA}, I_B = 15\text{mA}$	-	-	1.1	V
SMALL SIGNAL CHARACTERISTICS³						
Current Gain – Bandwidth Product	f_T	$V_{CE} = 10\text{V}, I_C = 50\text{mA}, f = 20\text{MHz}$	100	-	-	MHz
Output Capacitance	C_{obo}	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$	-	-	12	pF
Input Capacitance	C_{ibo}	$V_{BE} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$	-	-	60	
Small-Signal Current Gain	h_{fe}	$V_{CE} = 5\text{V}, I_C = 1\text{mA}, f = 1\text{MHz}$	80	-	400	
Collector Base Time Constant	$rb'C_c$	$V_{CB} = 10\text{V}, I_E = 10\text{mA}, f = 4\text{MHz}$	-	-	400	pS

1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired. 2. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 1\%$ 3. Not production testing in die form, characterized by chip design and package verification





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