



# PNP Transistor Bare Die, 2N2905

Rev 1.0

02/09/17

**General purpose medium power amplifier or switch in bare die form**

Complement to NPN 2N2222A

## Features:

- High DC Current Gain 0.1mA to 500mA
- Low Collector-Emitter 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.

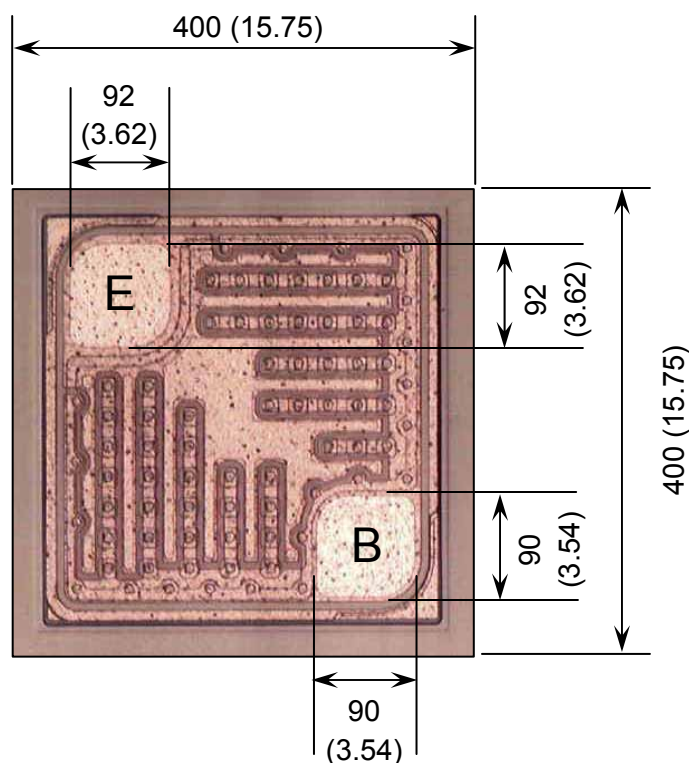
For further information on LAT process flows see below.

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

## 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

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



**E = EMITTER B = BASE**

**DIE BACK = COLLECTOR**

## Mechanical Specification

Die Size (Excluding Saw Street)	400 x 400 9.84 x 10.63	$\mu\text{m}$ mils
Base Pad Size	90 x 90 3.54 x 3.54	$\mu\text{m}$ mils
Emitter Pad Size	92 x 92 3.62 x 3.62	$\mu\text{m}$ 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	$V_{CEO}$	-40	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
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = -10\mu A$	-60	-	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = -10mA$	-40	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = -10\mu A$	-5	-	-	V
Collector Cut-off Current	$I_{CEX}$	$V_{CE} = -30V, V_{EB} = -0.5V$	-	-	-50	nA
	$I_{CBO}$	$V_{CB} = -50V$	-	-	-20	nA
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = -4V$	-	-	-50	nA
ON CHARACTERISTICS						
Forward-Current Transfer Ratio	$h_{FE}$	$V_{CE} = -10V, I_C = -0.1mA$	35	-	-	-
		$V_{CE} = -10V, I_C = -1mA$	50	-	-	-
		$V_{CE} = -10V, I_C = -10mA$	75	-	-	-
		$V_{CE} = -10V, I_C = -500mA$	30	-	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -150mA, I_B = -15mA$	-	-	-0.4	V
		$I_C = -500mA, I_B = -50mA$	-	-	-1.6	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = -150mA, I_B = -15mA$	-	-	-1.3	V
		$I_C = -500mA, I_B = -50mA$	-	-	-2.6	V
SMALL SIGNAL CHARACTERISTICS <sup>1</sup>						
Transition Frequency	$f_T$	$V_{CE} = -20V, I_E = 50mA$	200	-	-	MHz
Output Capacitance	$C_{obo}$	$V_{CB} = -10V, I_E = 0, f = 1MHz$	-	-	8	pF
Input Capacitance	$C_{ibo}$	$V_{EB} = -2V, I_C = 0, f = 1MHz$	-	-	30	
SWITCHING CHARACTERISTICS <sup>1</sup>						
Delay Time	$t_d$	$V_{CC} = -30V,$ $I_C = -150mA, I_{B1} = -15mA$	-	-	10	ns
Rise Time	$t_r$		-	-	40	
Storage Time	$t_s$	$V_{CC} = -6V, I_C = -150mA$ $I_{B1} = I_{B2} = -15mA$	-	-	80	
Fall Time	$t_f$		-	-	30	

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

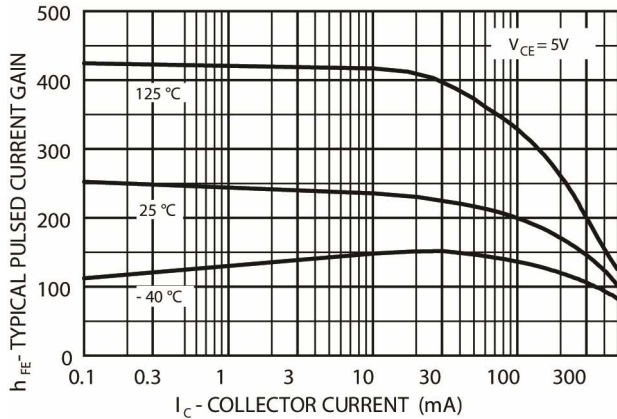




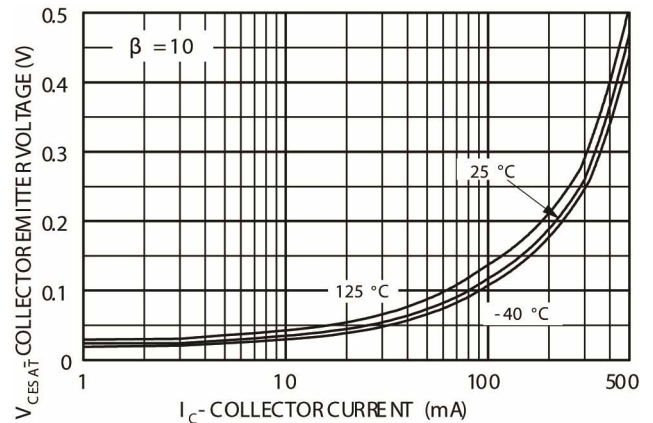
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Rev 1.0  
02/09/17

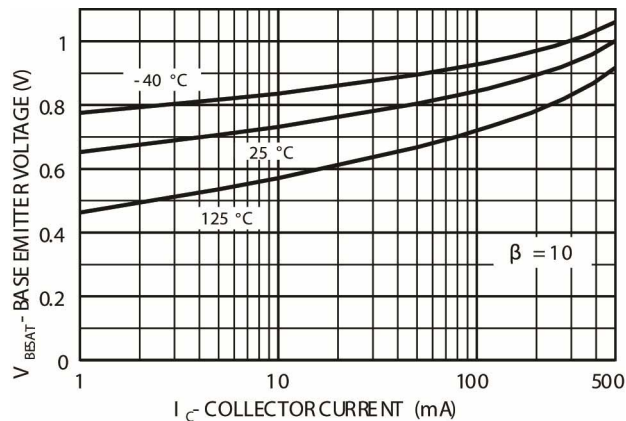
## Typical Electrical Characteristics



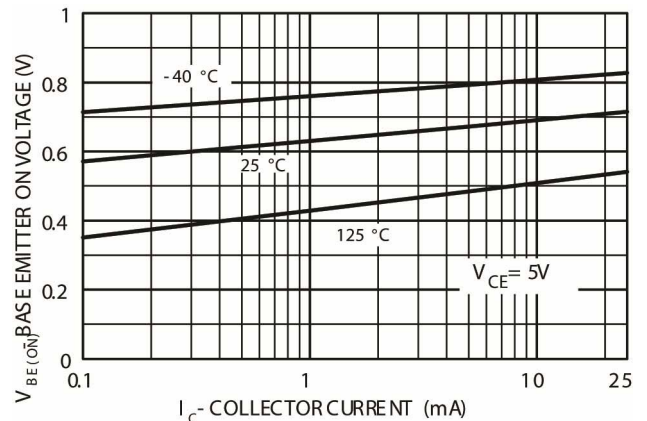
**Fig 1** - Typical Pulsed Current Gain versus Collector Current



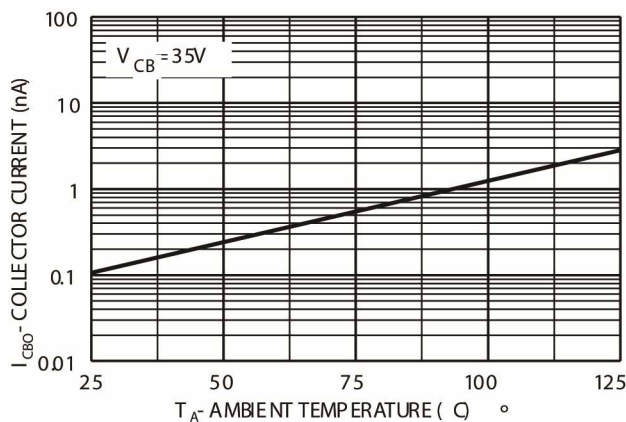
**Fig 2** - Collector-Emitter Saturation Voltage versus Collector Current



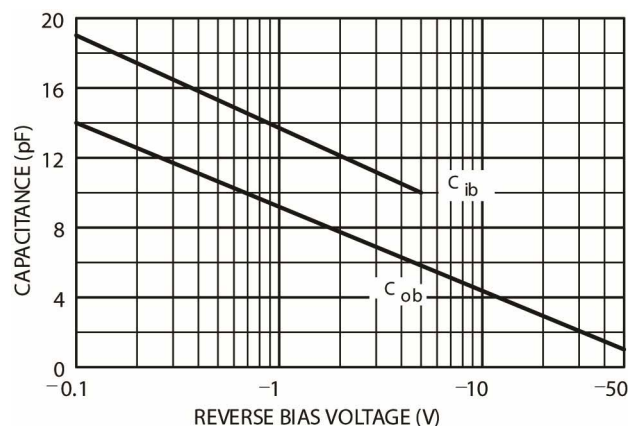
**Fig 3** - Base-Emitter Saturation Voltage versus Collector Current



**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

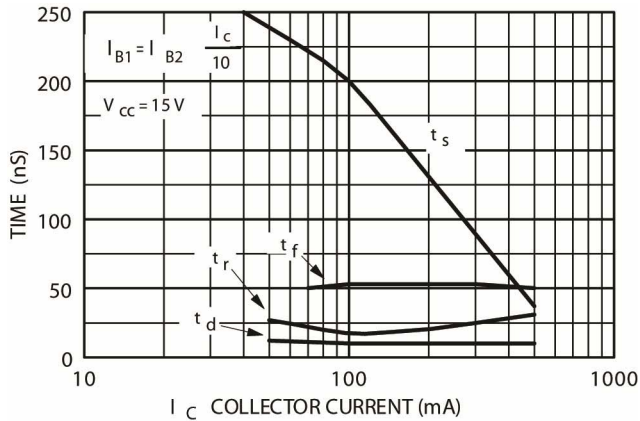




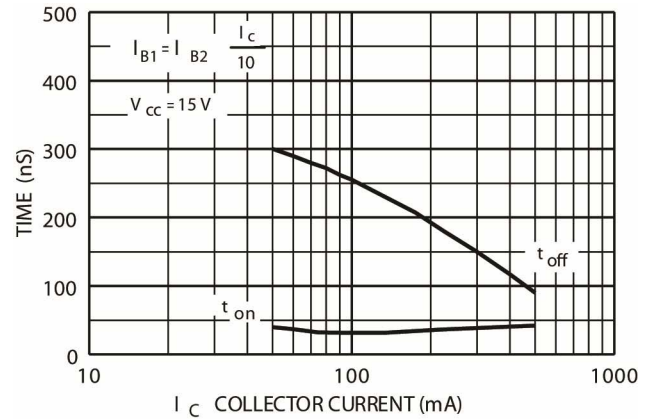
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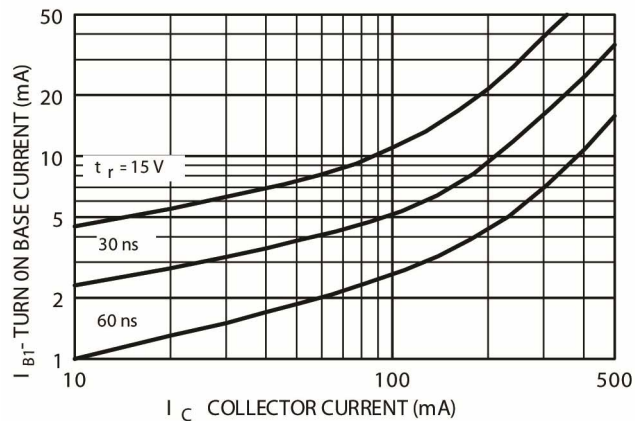
## Typical Electrical Characteristics (Continued)



**Fig 7** – Switching Times versus Collector Current



**Fig 8** - Turn On and Turn Off Times versus Collector Current



**Fig 9** – Rise Time versus Collector and Turn On Base Currents

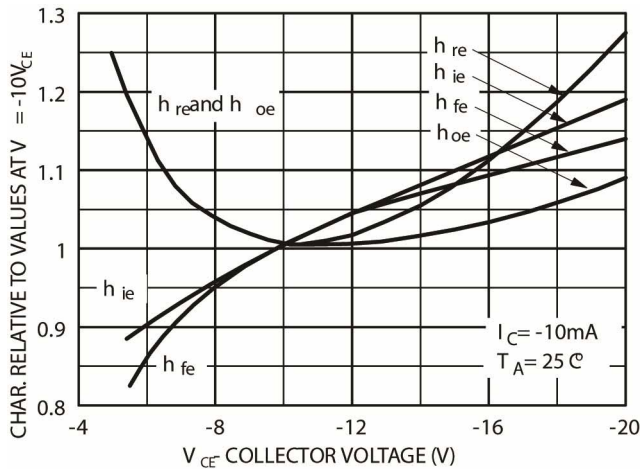




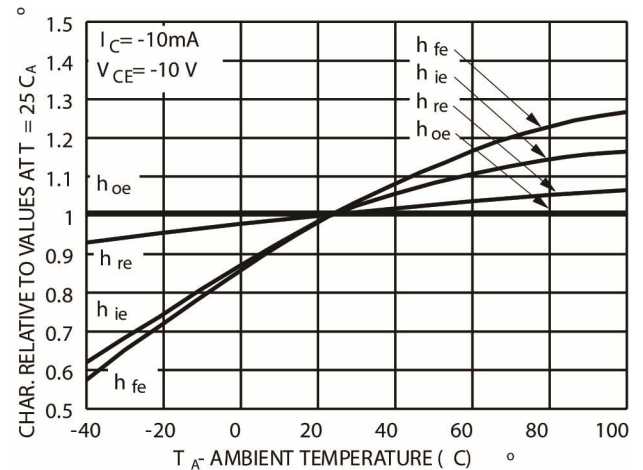
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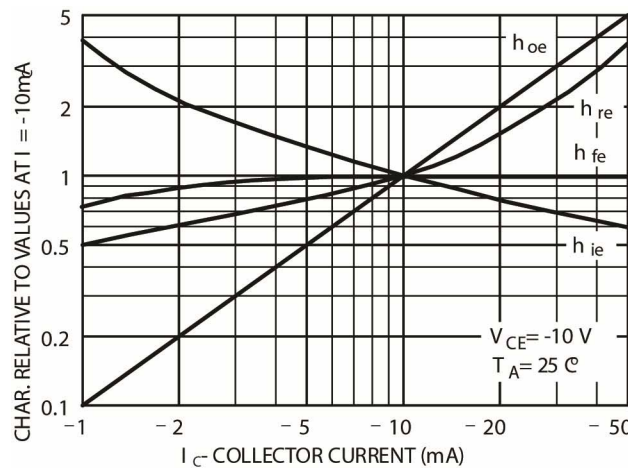
## Typical Electrical Characteristics (Continued)



**Fig 10 – Common Emitter Characteristics**



**Fig 11 – Common Emitter Characteristics**



**Fig 12 – Common Emitter Characteristics**

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