

2N3906 Transistor | PNP Transistor, Specifications, Pinout, Applications

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There are many transistors in the market but some stand out from the rest. One such transistor is the 2N3906 PNP Transistor. In this guide, we will take a closer look at this transistor and list out some of its important specifications. We will also see the pinout and packaging of 2N3906 Transistor and a couple of common applications.

Outline

- Introduction to 2N3906 PNP Transistor
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Introduction to 2N3906 PNP Transistor

The 2N3906 is a general-purpose Bi-Polar PNP Transistor. It is one of the popular discrete transistors that circuit designers, hobbyists and makers use in their electronics projects.

Motorola Semiconductor released the 2N3906 as well as its NPN counterpart, the 2N3904 back in the 60's.

We can use this transistor for both amplification as well as switching applications. The TO-92 package is the most common package for 2N3906 with both straight leads and bent leads.

Apart from TO-92, it is also available in a couple of SMD packages as well. SOT-23 and SOT-223 are the main SMD packages, where the SOT-23 variant has a part name as MMBT3906 while the SOT-223 variant has the part name as PZT3906.

The onsemi semiconductor company is the primary producer of 2N3906 transistors in TO-92 package with some small-time companies such as Micro Commercial Company, NTE Electronics and Comchip Technology are also producing them.

Previously, some big semiconductor companies (Fairchild – NXP, STMicroelectronics) also produced the 2N3906 Transistors, but as of today, only onsemi acts as the main producer.

The SOT-223 package is very rare (and Digi-Key listed it as obsolete) but the SOT-23 package is still popular. Some companies that manufacture SOT23 variant of 2N3906 are onsemi, Diodes Incorporated, TSMC, Micro Commercial Company, Panjit International Inc.

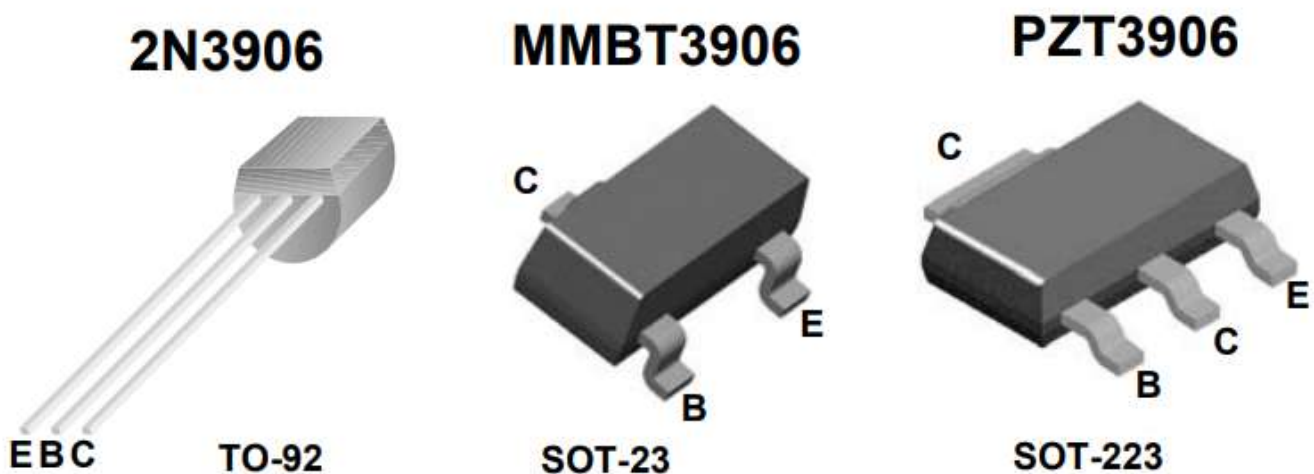
2N3906 Transistor Pinout

Before looking at the specifications of 2N3906 PNP Transistor, let us quickly take a peek at the circuit symbol and also the pinout of different packages of 23906 Transistor.

As it is a BJT, it has three terminals: Base (B), Emitter (E) and Collector (C). There is nothing special about the circuit symbol as it is essentially a regular PNP Transistor. But none the less, here is the circuit symbol of 2N3906 Transistor.

Image

Coming to the pinout, we took the three popular packages (TO092, SOT-23 and SOT-223) and made 3D models with pinouts. The following image shows the pinout of 2N3906 Transistor.



Important Specifications of 2N3906

Let us now see some important specifications of 2N3906 PNP Transistor. The two main specifications for any Bipolar Transistor are its Collector-to-Emitter Voltage and the Collector Current.

For 2N3906, the typical collector-to-emitter voltage (V_{CEO}) is $-40V$ and the collector current (I_C) is $-200mA$. Apart from these two another important specification is the Emitter-Base Voltage (V_{EBO}), which $-5V$.

We will see other important specifications with the help of the following table.

Parameter	Symbol	Value
Collector – Emitter Voltage	V_{CEO}	$-40V$
Collector – Base Voltage	V_{CBO}	$-40V$
Emitter – Base Voltage	V_{EBO}	$-5V$
Continuous Collector Current	I_C	$-200mA$
Total Power Dissipation at $25^{\circ}C$	P_D	$625mW$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	$-55^{\circ}C$ to $150^{\circ}C$
Thermal Resistance (Junction to Case)	$R_{\theta JC}$	$83.3^{\circ}C/W$
Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$	$200^{\circ}C/W$
DC Current Gain ($I_C = -10\text{ mA}$, $V_{CE} = -1V$)	h_{FE}	Minimum 100, Maximum 300
Current Gain – Bandwidth Product	f_T	$250MHz$
Rise Time ($V_{CC} = -3V$, $V_{BE} = -0.5V$, $I_C = -10mA$, $I_{B1} = -1mA$)	t_r	$35ns$
Fall Time ($V_{CC} = -3V$, $I_C = -10mA$, $I_{B1} = I_{B1} = -1mA$)	t_f	$75ns$

We listed out only few important parameters of 2N3906 Transistor in the table. For more information on all the parameters and specifications, we suggest you to refer to the official datasheet.

What are the Applications of 2N3906?

From the above list of parameters and specifications, we can figure out some applications of the 2N3906 Transistor. Due to its very low rise-time and fall time values, we can use the 2N3906 as a fast-switching transistor.

The collector to emitter voltage is significantly high at -40V. So, we can easily switch loads at higher voltages. But an important point about 2N3906 PNP Transistors is its low collector current.

Since it has a relatively low continuous collector current of -200mA, you cannot use this transistor for loads that draw more than 200mA.

Coming to the amplification applications, the DC Current gain (h_{FE}) of 2N3906 is in the range of 100 to 300. This number may seem small, but we can use 2N3906 as a low-power amplifier. But keep an eye on its power dissipation it is rated for only 625mW of total power dissipation.

Conclusion

The 2N3906 is a very popular Bipolar Transistor. It is a PNP Transistor with very high collector – emitter voltage (-40V) and relatively low collector current (-200mA). We can use this transistor as a low-power amplifier as well as a fast-switching transistor. We saw the pinout of various packages of 2N2906 Transistor, few important parameters and specifications and also couple of applications.