SWITCH TYPES

Poles and Throws, Open and Closed

A switch must have at least two terminals, one for the current to (potentially) go in, another to (potentially) come out. That only describes the simplest version of a switch though. More often than not, a switch has more than two pins. So how do all of those terminals line up with the internal workings of the switch? This is where knowing how many poles and throws a switch has is essential.

The number of **poles*** on a switch defines how many separate circuits the switch can control. So a switch with one pole, can only influence one single circuit. A four-pole switch can separately control four different circuits.

A switch's **throw**-count defines how many positions each of the switch's poles can be connected to. For example, if a switch has two throws, each circuit (pole) in the switch can be connected to one of two terminals.

Knowing how many poles and throws a switch has, it can be more specifically classified. Commonly you'll see switches defined as "single-pole, single-throw", "single-pole, double-throw", "double-pole, double-throw", which are more often abbreviated down to SPST, SPDT, and DPDT, respectively.

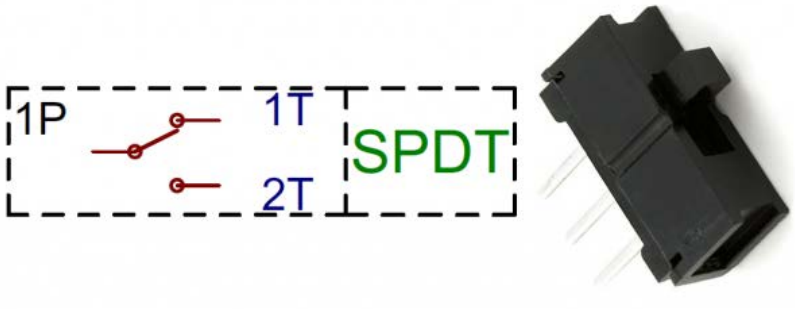
SPST

A single-pole, single-throw (**SPST**) switch is as simple as it gets. It's got one output and one input. The switch will either be closed or completely disconnected. SPSTs are perfect for on-off switching. They're also a very common form of momentary switches. SPST switches should only require **two terminals**.

The circuit symbol for an SPST switch in the off position and a through-hole, right-angle, maintained, SPST, rocker switch.

SPDT

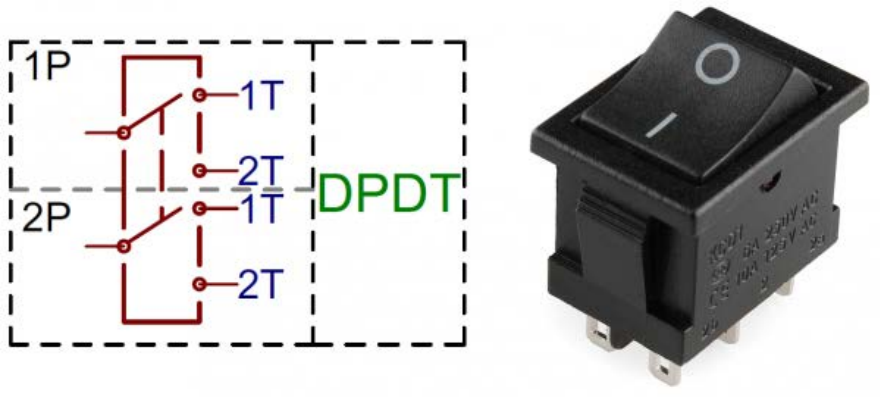
Another common switch-type is the **SPDT**. SPDTs have three terminals: one common pin and two pins which vie for connection to the common. SPDTs are great for selecting between two power sources, swapping inputs, or whatever it is you do with two circuits trying to go one place. Most simple slide switches are of the SPDT variety. SPDT switches should usually have **three terminals**. (Sidenote: in a pinch an SPDT can actually be made into an SPST by just leaving one of the switch throws unconnected).



An SPDT switch circuit symbol, and an SPDT slide switch.

DPDT

Adding another pole to the SPDT creates a double-pole, double-throw (**DPDT**) switch. Basically two SPDT switches, which can control two separate circuits, but are always switched together by a single actuator. DPDTs should have **six terminals**.



A DPDT circuit symbol, and a 6-terminal DPDT rocker switch.

XPYT

Switches with more than two poles or throws are not too common, but they're out there (in all their oddly-shaped, difficult-to-connect-to glory). Once we get past one or two poles/throws, we just start sticking numbers in the abbreviation. Here's a 4PDT switch, for example, it can control four separate circuits, 2 positions per circuit:

A massive 4PDT circuit symbol, and an physically massive 4PDT toggle switch.

* Just remember: it's "poles", not "pulls". Seasoned engineers just *love* picking on poor saps who were only looking for a "single-pull, double-throw" switch. (Not speaking from experience

here or anything… I mean, in my defence, I didn't read it in a book, just heard it ambiguously pronounced by the professor. Meanies.)

Normally Open/Closed

When a momentary switch is not actuated, it's in a "normal" state. Depending on how the button is constructed, its normal state can be either an open circuit or a short circuit. When a button is open until actuated, it's said to be**normally open** (abbreviated *NO*). When you actuate an NO switch, you're closing the circuit, which is why these are also called "push-to-make" switches.

Conversely, if a button usually acts like a short circuit unless actuated, it's called a **normally closed** (*NC*) switch. NC switches are "push-to-break"; actuating the switch creates an open circuit.

Among the two types, you're probably much more likely to encounter a normally open momentary switch.

Source : https://learn.sparkfun.com/tutorials/switch-basics#poles-and-throws-open-and-closed