SOLIDSTATE SWITCH FOR DC-OPERATED GADGETS

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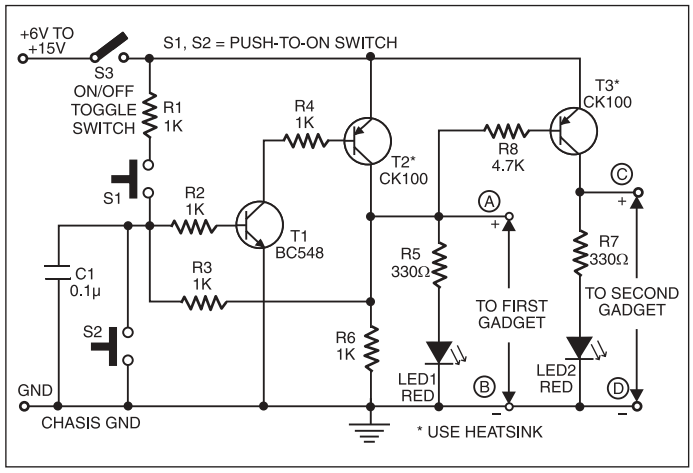
This solidstate DC switch can be assembled using just three transistors and some passive components. It can be used to switch on one gadget while switching off the second gadget with momentary operation of switch. To reverse the operation, you just have to momentarily depress another switch.

The circuit operates over 6V-15V DC supply voltage. It uses positive feedback from transistor T2 to transistor T1 to keep this transistor pair in latched state (on/off), while the state of the third transistor stage is the complement of transistor T2's conduction state.

Initially when switch S3 is closed, both transistors T1 and T2 are off, as no forward bias is available to these, while the base of transistor T3 is effectively grounded via resistors R8 and R6 (shunted by the load of the first gadget). As a result, transistor T3 is forward biased and gadget 2 gets the supply. This is indicated by glowing of LED2.



When switch S1 is momentarily depressed, T1 gets the base drive and it grounds the base of transistor T2 via resistor R4. Hence transistor T2 (pnp) also conducts. The positive voltage available at the collector of transistor T2 is fed back to the base of transistor T1 via resistor R3. Hence a latch is formed and transistor T2 (as also transistor T1) continues to conduct, which activates gadget 1 and LED1 glows.

Conduction of transistor T2 causes its collector to be pulled towards positive rail. Since the collector of T2 is connected to the base of pnp transistor T3, it causes transistor T3 to cut off, switching off the supply to gadget 2) as well as extinguishing LED2. This status is maintained until switch S2 is momentarily pressed. Depression of switch S2 effectively grounds the base of transistor T1, which cuts off and thus virtually opens the base-emitter circuit of transistor T2 and thus cutting it off. This is the same condition as was obtained initially. This condition can be reversed by momentarily pressing switch S1 as explained earlier.

***EFY lab note**. During testing, it was noticed that for proper operation of the circuit, gadget 1 must draw a current of more than 100 mA (i.e. the resistance of gadget 1 must be less than 220 ohms) to sustain the latched 'on' state. But this stipulation is not applicable for gadget 2. A maximum current of 275 mA could be drawn by any gadget.*

The total cost of this circuit is around Rs 30.