Power electronics DC AC converters inverters wikipedia

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Power Electronics is the study of switching electronic circuits in order to control the flow of electrical energy. Power Electronics is the technology behind switching power supplies, power converters, power inverters, motor drives, and motor soft starters.

Motors and most other actuation devices are typically indirectly connected to the power supply through a power transistor which acts as a switch, either allowing energy to flow from the power supply to the motor, or disconnecting the motor from power.(The CPU, also connected to the transistor, chooses exactly when to turn it on or off).

When the switch is turned on, most of the power coming from the power supply goes to the motor.Unfortunately, some of the power is trapped by unwanted parasitic resistance in the power transistors, heating them up.Often a heatsink is necessary to keep the transistor from overheating and self-destructing.Practically all modern desktop or laptop PCs require a heat sink on the CPU and on the graphics chip.(A typical robot requires a heatsink on its power transistors, but not on its small CPU).

"Application note AN533: thermal management precautions for handling and mounting"[2]describes "how to calculate a suitable heatsink for a semiconductor device" looks like this applies to all power semiconductors -- FET, BJT, Triac, SRC, etc gives thermal resistance for DPAK and D2PAK for FR4 alone, FR4 plus heatsink, Insulated Metallic Substrate (IMS), and IMS plus heatsink.

Turning on a triac is easy:Typically digital logic is connected so its Vdd is connected to the triac A1 pin.Some digital logic output pin is connected to a small resistor connected to the triac gate pin.When the digital logic pulls the gate pin low (towards Vss), the triac is triggered and turns all the way on.

Turning the triac off is a little more difficult rst the digital logic output drives the gate pin high (so it is the same voltage as the common A1 pin).But the triac remains on until the current through the triac drops to less than the holding current. Normally triacs are used with 50 Hz or 60 Hz AC, so the triac may stay on as long as 10 ms after the digital logic tries to turn it off.

After the triac is off, A2 acts like is disconnected and isolated from the rest of the triac (as long as the external circuit doesn"t drive it outside its voltage rating, typically plus or minus several hundred volts).

By far, the most common silicon device to drive AC loads connected to mains voltage is the triac.[1]A triac works better than a BJT or a FET transistor as a switch when controlling AC power.A triac can remain off while A2 can swing up and down hundreds of volts (relative to A1 and the gate) "s difficult to keep a BJT or FET transistor from spontaneously turning on in the "reverse" direction.

PNP transistors work better than triacs as switches when controlling DC power.A PNP transistor can quickly turn off even when full current is flowing through them.A triac will stay on indefinitely when DC current flows through it.