TRIACS

how TRIAC dimmer circuits work

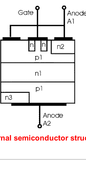
TRIACs are like 2 parallel SCRs

They are thus able to switch both sides of an AC sine wave

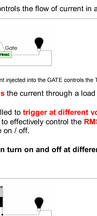
They are often switched using DIACS

They can be used to control AC loads by switch action or the progressive trimming of the sine wave

Through the use of **optical coupling** they can be safely interfaced with computer control circuits

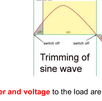


TRIACS are like 2 parallel SCRs and can handle both sides of a sine wave.



Here is the **internal semiconductor structure** of a TRIAC

A **pushbutton switch** controls the flow of current in a load

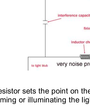


Current injected into the GATE controls the TRIAC

A TRIAC switch controls the current through a load

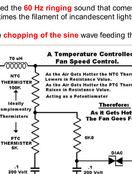
Because it can be controlled to **trigger at different voltage points** on the sine wave it can be used to effectively control the **RMS power delivered** to the load rather just crude on / off.

It's like a switch that can turn on and off at different times on the sine wave.



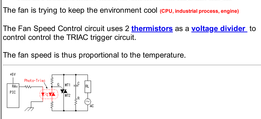
The TRIAC is a gate controlled switch.

Low voltage logic circuits are fragile and expensive they should be electrically isolated from the high voltage TRIAC circuit using an **Optocoupler module chip**

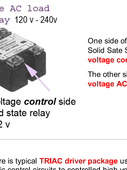


RMS power and voltage to the load are controlled by **trimming of the AC** sine wave.

Progressive trimming of the VAC sine wave cuts back power delivered to the load (lights heater motor)



An oscilloscope connected to the load of a TRIAC controlled load shows the progressive trimming of the SINE wave that effectively controls the RMS power to the load.

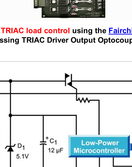


The variable resistor sets the point on the sine wave where trimming occurs effectively dimming or illuminating the light

The capacitor and inductor attempt to minimize interference that is generated by the snapping effect of the TRIAC on the sine wave ..... like striking a bell ringing, harmonics (some RF even) are created in the circuit that can interfere with other devices

Typical home light dimmer uses a TRIAC

Mains cannot transmit this high intensity without their SCRs too!



Here is the actual view of the circuit above.

Note the **inductor** and the **capacitor** are used for phase shifting and noise filtering.

Have you ever noticed the **60 Hz ringing** sound that comes from light dimmers and sometimes the filament of incandescent lights that are dimmer controlled?
It is the result of the **chopping of the sine** wave feeding the light.

The fan is trying to keep the environment cool (CPU, industrial process, engine)

The Fan Speed Control circuit uses 2 **thermistors** as a **voltage divider** to control control the TRIAC trigger circuit.

The fan speed is thus proportional to the temperature.

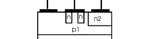
Here a **low voltage logic** circuit is used to control a higher voltage AC load (heater motor).
An Optocoupler is used to keep the low voltage circuit safe from the higher voltage.

One side of this
Solid Sate Switch is the **low voltage control**

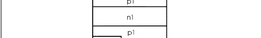
The other side is for **high voltage AC** load control

Here is typical **TRIAC driver package** used to interface low logic control circuits to controlled high voltage AC loads.\

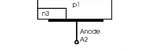
The Optocoupler circuit and TRIAC are contained in the same package.



Actual module for TRIAC load control using the Fairchild MOC3062 6-Pin DIP 600V Zero Crossing TRIAC Driver Output Optocoupler



A programmable TRIAC crock-pot controller.



Fairchild MOC3041 Optocoupler **interfacing** a computer and AC load