TRIAC & MICROCONTROLLERS : THE EASY CONNECTION

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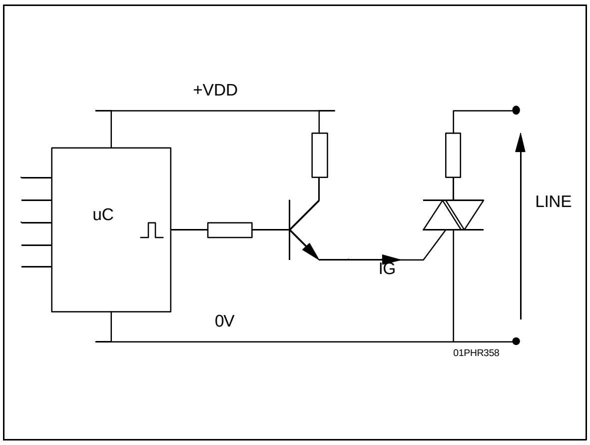
The aim of this note is to show how to connect an SGS-THOMSON triac and an SGS-THOMSON microcontroller.

I - CONVENTIONAL SOLUTION

For many years the triac has been used to switch load on the AC mains and thanks to the low cost of microcontrollers (µC) this solution is widely used in the appliance market.

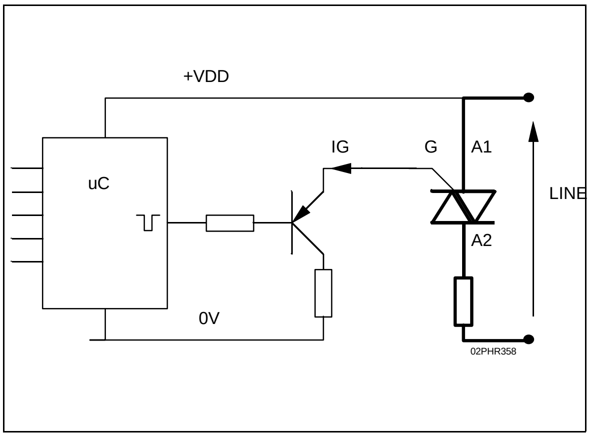
All the system use a buffer transistor between the output port of the microcontroller and the triac as shown in the figure 1.

Figure 1 : **Drive in the 1st and 4th quadrants.**



Because of the low sensivity of the triac in the 4th quadrant this type of drive is often unpractical, and is replaced by the topology of the figure 2 :

Figure 2 : **Conventional drive in the 2nd and 3rd quadrants.**



To save cost, manufacturers want to use fewer and fewer components and of course want to remove the buffer transistor, but a problem arises.

Due to the low output current of the microcontroller, the triac had to be very sensitive and consequently was not able to withstand for example the static dv/dt, and the commutation.

II - NEW SGS-THOMSON SOLUTION

Two parameters have been improved :

- The sensitivity of the triacs.
- The output capability of the microcontrollers in terms of sunk current.

A microcontroller is now able to drive one standard triac or several sensitive triacs, without buffer transistors (see figure 3).

Figure 3 : **An easy connection !**

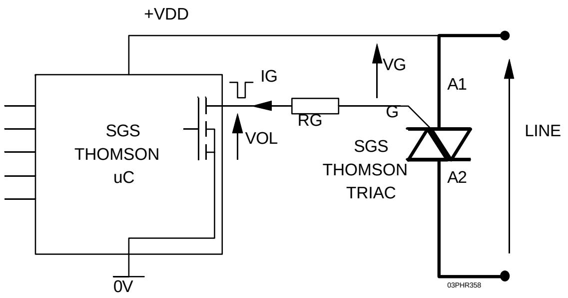


Figure 4 shows the output capability of a range of controllers and the sensitivity of the triacs.

EXAMPLE :

For +5V supply voltage and a LOGIC LEVEL triac with I_{GT} = 10 mA, we have :

$$R_G = \frac{V_{DD} - V_G - V_{OL}}{I_G}$$

Where : V_{DD} supply voltagage
V_{OL} output low voltage of the microcontroller
V_G gate - anode 1 voltage at I_G

With : V_{DD} = +5 V
V_{OL} = 1.3 V
V_G = 1.5 V
I_G = 20 mA

Therefore : R_G = 110 Ohms

Figure 4 : Triac and microcontroller characteristics.

MICROCONTROLLERS & OUTPUT CAPABILITIES	TRIAC	SENSITIVITY	GATE PARAMETERS	CONNECTION
ST621x SERIES ST622x SERIES IOL=20mA AT VOL=1.3V IVSS=100mA	T & TW SERIES Tx05 SERIES	IGT=5mA	VG =1.5V AT IG = 10mA	1 PORT/TRIAC
	S & SW SERIES Tx10 SERIES	IGT=10mA	VG =1.5V AT IG=20mA	1 PORT/TRIAC
	C SERIES	IGT=25mA	VG =1.5V AT IG =50mA	2 PORTS IN PARALLEL/TRIAC
	CW SERIES	IGT=35mA	VG = 2V AT IG =70mA	3 PORTS IN PARALLEL/TRIAC
	B & BW SERIES	IGT=50mA	VG = 2V AT IG= 100mA	4 PORTS IN PARALLEL/TRIAC

To take into account of the dispersion on R_G , V_{DD} and on the temperature variation, we generaly choose about:

$I_G = 2 .I_{GT}$ (I_{GT}=Specified gate trigger current)
tp > 20µs

Where tp is the pulse duration of gate current.

III - CONCLUSION

Use SGS-THOMSON sensitive triacs driven by an SGS-THOMSON microcontrollers and remove the buffer transistors.

This can be achieved thanks to the high current capability of our microcontrollers which are compatible with our new sensitive triacs (T410, T, TW, S, SW series).

Furthemore a non sensitive triac can be driven by several output ports in parallel.

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