SGS-THOMSON MICROELECTRONICS
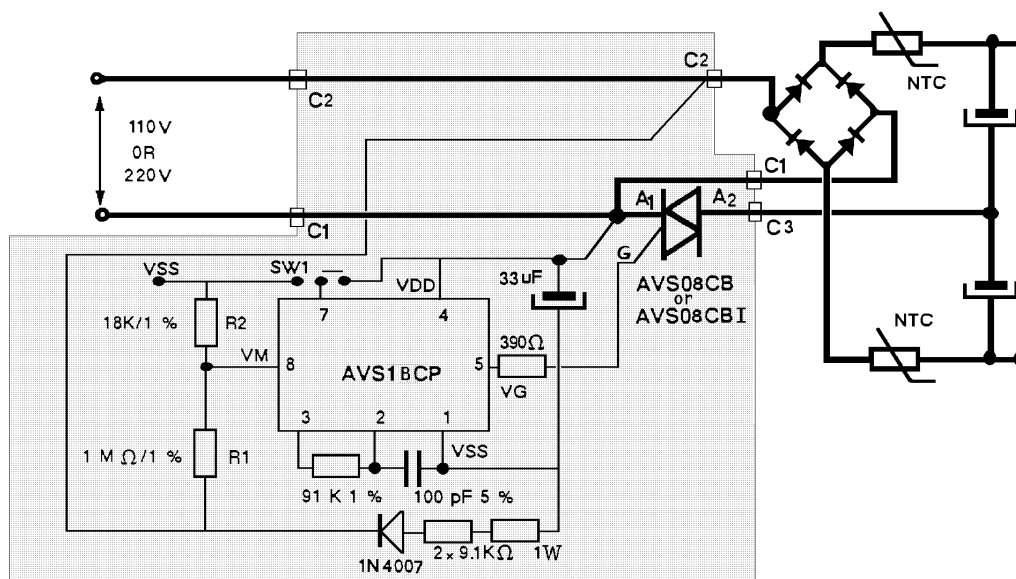
HOW TO USE THE AVS 08

PRELIMINARY NOTE

I DESCRIPTION OF THE AVS 08 :

The AVS08, is an automatic mains selector to be used in on line SMP supply with Power up to 200W. It is made of two devices.

This switch modifies automatically the structure of the input diodes bridge in order to keep a same DC voltage range.

The AVS is compatible with 50 and 60 Hz mains frequency and operates on two mains voltage ranges :
- On range I (110 V_{RMS}) the AC voltage varies from 88 to 132 V and the triac is ON : the bridge operates as voltage doubling circuit.

- On range II (220 V_{RMS}) the AC voltage varies from 176 V to 276 V and the triac is OFF : the circuit operates as full wave bridge.

II PERFORMANCE OF THE AVS :

The control of the switch is made by the comparison of the mains voltage (VM on pin 8) with internal threshold voltages (VTH and VH on pin 8).

When mains voltage increases from range I to range II the triac conduction is completly stopped before one mains period because VM > VTH.

When mains voltage drops from range II to range I VM becomes lower than VTH - VH. There are two options (V mode on pin 7) :

- V mode = VDD ; the triac triggering is valided 8 mains periods after power on reset.

- V mode = VSS ; the triac control remains locked to range II until circuit reset.

III USE OF THE AVS :

Calculation of the oscillator :

The oscillator frequency is determined by the mains frequency (50 and 60 Hz) and the gate control : its required value must be 45 KHz $\pm$ 5%; so the value of components is :

C = 100 pF/5%
R = 91 KOhms/1%

The frequency control is made on pin 3.

Adjustement of the mains mode change :

The measure of the mains voltage is made by a detection of the peak value.
The change of mains range is made by adjustement of resistor bridge and we advice :

800 kOhms < R1 + R2 < 2 mOhms

Calculation of the change from range I to range II (on pin 8) :

$$[VTH . (R1 + R2)]/(R2 . \sqrt{2}) + Vreg / \sqrt{2} = \text{max.RMS voltage on Range I}$$

Vreg typ = - 9 V and VTH typ = 4.25 V

Calculation of the change from Range II to range I :

$$[(VTH - VH) . (R1 + R2)/R2 . \sqrt{2}] + Vreg / \sqrt{2} = \text{min . RMS voltage on range II}$$

Vreg typ = - 9 V and VH typ = 0.4 V

Performance of the power on reset :

The power on reset permits the charge of the bulk capacitors of the SMP supply through soft start circuit.
The triac triggering is valided (on range I) after the validation of power on reset (charge of supply capacitor C) and a temporization of 8 mains periods.
T delay = delay time between power on and triac triggering

$$Td = 0{,}89 . Vreg . R . C/[(V_{RMS} . \sqrt{2}/\pi) - R . Iss] + 8/f$$

f = mains frequency

R = supply resistor = 18 kOhms

C = supply capacitor = 33 μF

V_{RMS} = mains voltage

Iss = quiescent supply current of AVS

Supply of the controller :

The structure of the supply regulator is a shunt regulator and its current must be lower than Iss max = 25 mA.

In order to have a good behavior of the circuit against mains voltage spikes the pin 4 (VDD) of the integrated circuit has to be connected straightly with the A1 of the triac. In same way the supply diode rectifier and R1 have to be connected to the diode bridge (see typical application diagram).

Triac control :

Between pin 5 and triac gate there is a resistor in order to limit the gate current; its value is given by the controller supply and triac ; the required value is 390 Ohms (5%).

Thermal rating of triac :

The knowlegde of the RMS triac current and the current pulse width tp in worst case conditions allows to calculate the losses, PT dissipated by the triac : Figure 1 of DC general characteristics of triac gives these losses PT. The external heatsink R_{TH} can be also calculated with PT and ambient temperature Tamb.

$$Tj - Tc = R_{TH} \text{ j-c AC} \times PT$$
$$Tc - Tamb = R_{TH} \times PT$$
$$tp = \alpha / 21600$$

for example :

if tp = 2ms and I_{TRMS} = 3A

PT = 2W and α = 43$°$

Tc = 92$°$C if Tj = 100$°$C

R_{TH} = 21$°$C/W

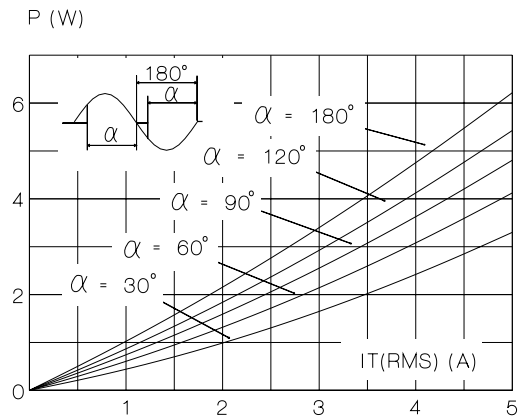if Tj = 100$°$C and Tamb < 50$°$C

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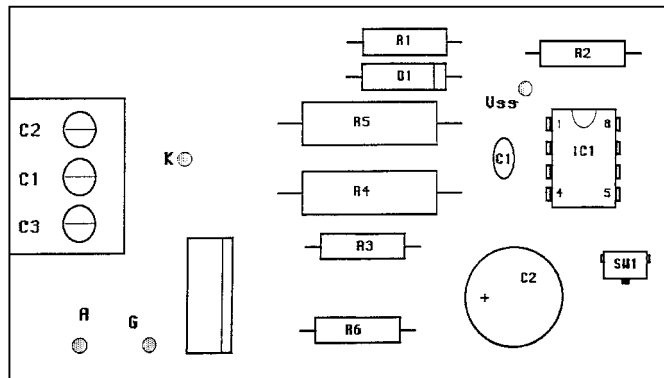MICROELECTRONICS

Example on AVS08 :


Figure 1 of the AV08 data sheet

Annex : AVS demo board

COMPONENT LIST FOR AVS08.

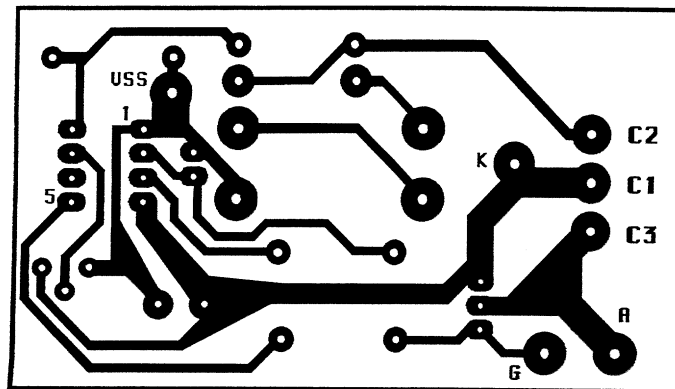| DESIGNATION	QTE	REFERENCE	OBSERVATIONS	MARQUE
PRINTED CIRCUIT	1	4751		
RESISTANCE	1	R1	1 MOhms 1%	
RESISTANCE	1	R2	18 KOhms 1%	
RESISTANCE	1	R3	91 KOhms 1%	
RESISTANCE	2	R4	9.1 KOhms 1W	
RESISTANCE	1	R6	390 Ohms 5%	
DIODE	1	D1	1N4007	
CONDENSATOR	1	C1	100 pF 5%	
CONDENSATOR	1	C2	33μF 16V RADIAL	
TRIAC	1	IC2	AVS08CB	SGS-THOMSON
INTEGRATED CIRCUIT	1	IC1	AVS1BCP08	SGS-THOMSON
SUPPORT	1		CI 8 PINS	
INVERTER	1	SW1	MINIDIP	
SOCKET	1	SL 3W	3 PINS	WEIDMULLER
PLUG	1	BL3	3 PINS	WEIDMULLER

Products PIN out

TO 220 AB
(Plastic)

VSS	1		8	VM
Osc/in	2		7	Mode
Osc/Out	3		6	Nc
VDD	4		5	VG

DIP-8
(Plastic)
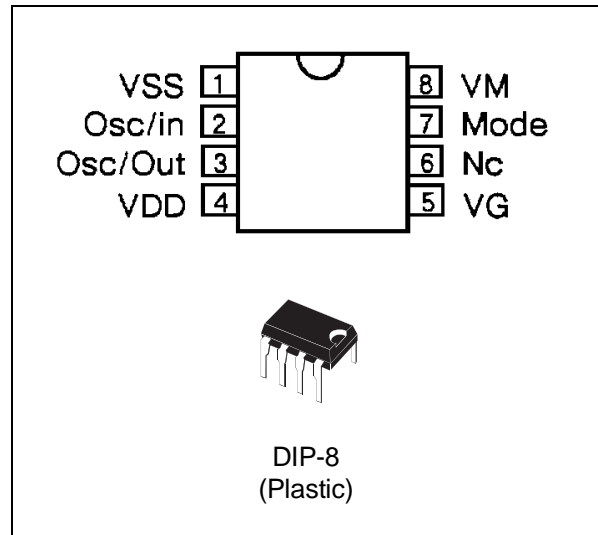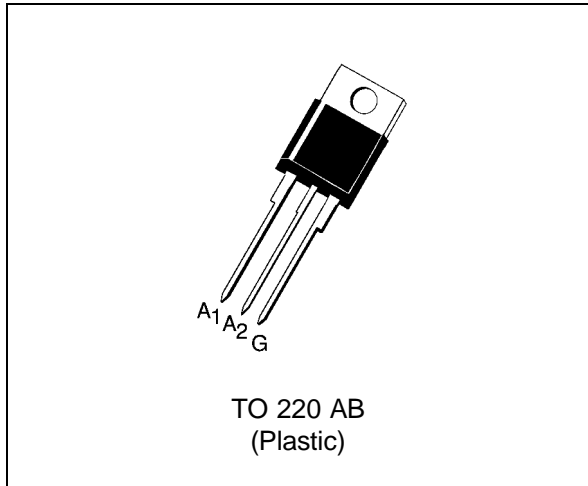
Components layout

Printed circuit layout (Copper side) : 1/1 scale

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