SGS-THOMSON MICROELECTRONICS

APPLICATION NOTE

PROTECTION STANDARDS APPLICABLE TO SWITCHING EQUIPMENT

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1. INTRODUCTION

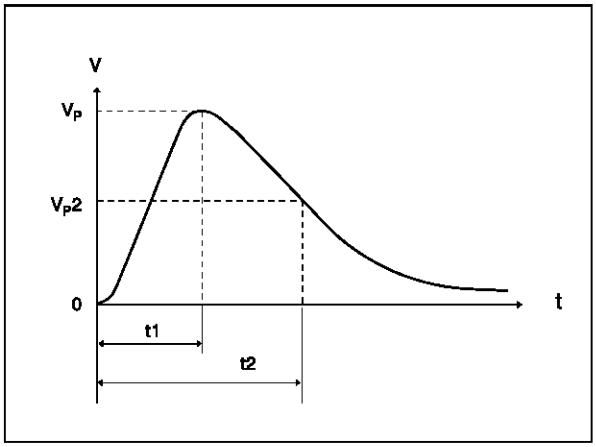
The purpose of this document is to summarize the main telecommunication standards with regard to the protection requirements against two types of overvoltage :

- lightning surges
- power crossing perturbations

2. LIGHTNING SURGES

The lightning overvoltage is simulated by a biexponentional wave, which is defined by the rise time t1 and the duration t2 between the start and the time at which the falling edge crosses half the peak value (fig.1)

Figure 1 : Standard wave



Each country publishes its standard, which can be summarized by the times t1 and t2, the peak voltage of the wave and the surge generator diagram. Table 1 gives on inexhaustive list of the standards .

Table 1 : Lightning surge standards

COUNTRY	AUTHORITY	WAVEFORM (µs)
ENGLAND	BRITISH TELECOM	10/700
FRANCE	PTT	0.5/700
GERMANY	BUNDESPOST	10/700
ITALY	SIP	10/700 1/1000
SPAIN	COMPANY TELEFONICA DE ESPANA	1/1000
SWEDEN	TELEVERKET	10/700
SWITZERLAND	PTT - BETRIEBE	10/700 1.2/50
USA	BELL	10/1000 10/360 2/10
	FCC	10/560 10/160 2/10

The following figures give the schematics of the surge generators mainly used :

Figure 2 : 10/700 µs wave generator

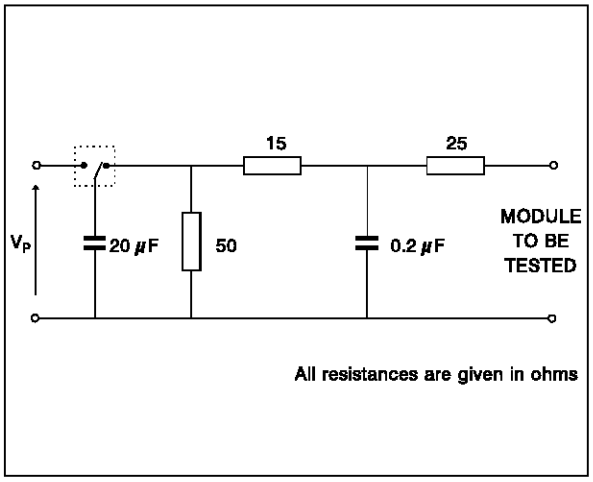


Figure 3 : 1.2/50 µs wave generator

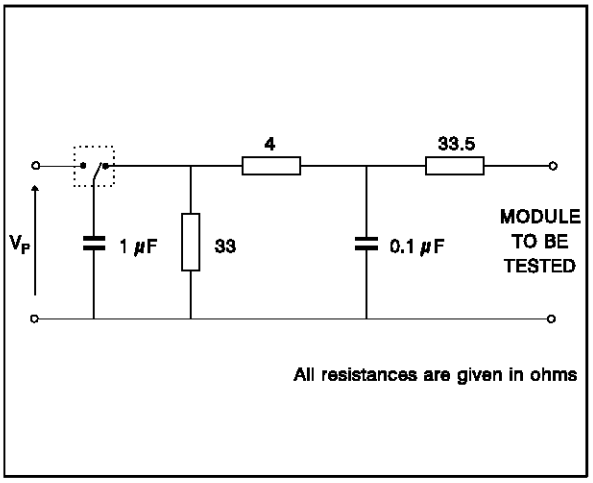


Figure 4 : 0.5/700 µs wave generator

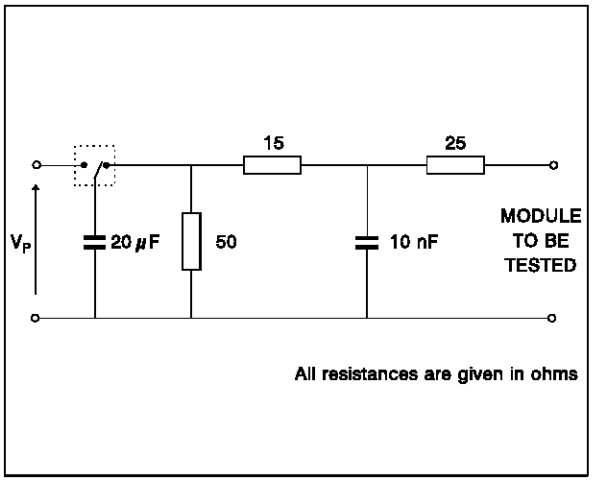


Figure 5 : 10/560 µs wave generator

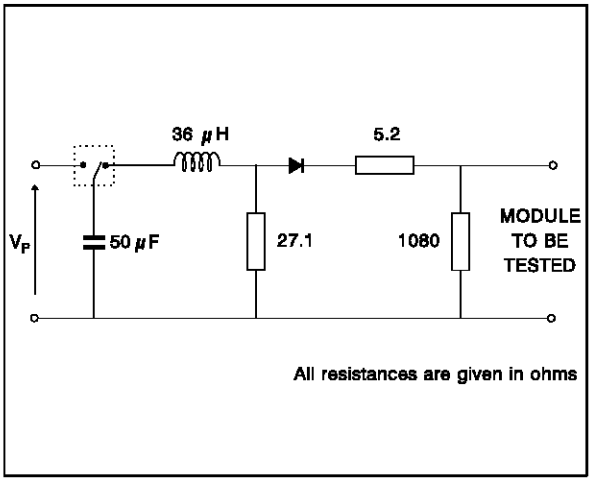


Figure 6 : 1/1000 µs wave generator

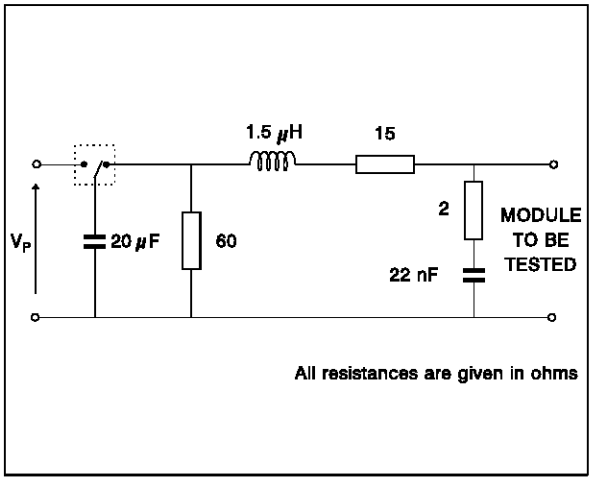


Figure 7 : 10/160 µs wave generator

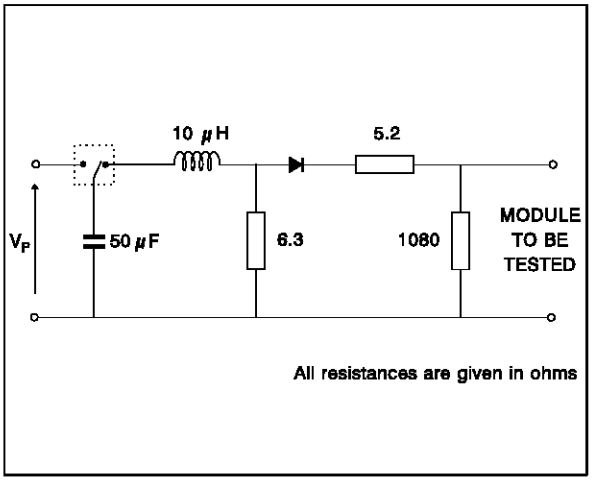
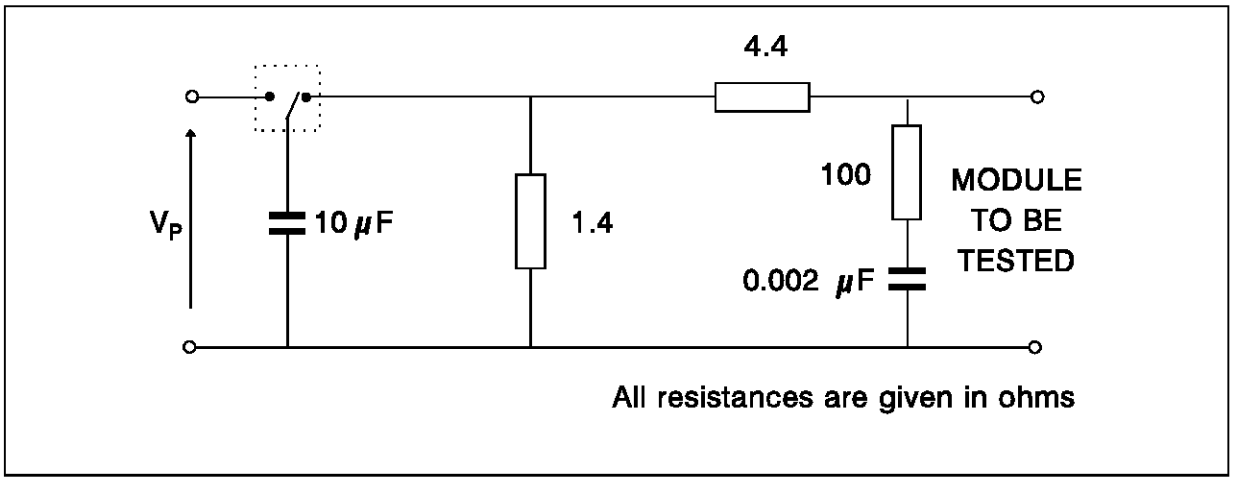


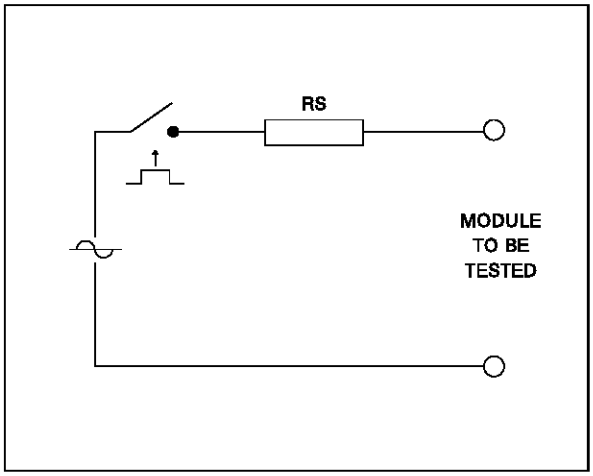
Figure 8 : 2/10 µs wave generator



3. CROSSING OR PROXIMITY WITH MAINS AC LINES :

Crossing or proximity is simulated by a sine wave generator (50 or 60 Hz) connected through a series resistor for a defined time (fig.9).

Figure 9 : Crossing simulation generator



4. CONCLUSION

Telecommunications is a field in which the protection against overvoltages is well defined by standards. The SGS-THOMSON range of protection devices enables all of these to be covered.

Table 2 give some example of crossing simulations.

Table 2 : Power crossing simulations

COUNTRY	VOLTAGE Volts RMS	SERIES RESISTOR (Ohms)	DURATION
ENGLAND	0 TO 250 0 TO 650 0 TO 430 (50 Hz)	40 TO 400 150 150	15mn 1s 2s
FRANCE	0 TO 1000 > 1000 (50 Hz)	20 3000	Trains of - 1s "on" - 1s "off" -1s "on" 10 times with 10mn between trains
GERMANY	300 (50 Hz or 16.6Hz)	600	200 ms
ITALY	300 650 220	600 200 10 or 600	500 ms 500 ms 15 mn
USA	0 - 50 50 - 100 100 - 600	150 600 600	15 mn 15 mn 60 x 1s application

Note : Protection resistors on the line card inputs decrase the peak surge current.
These elements have to be taken into account during the line card design to optimize the protection function.