

**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

Each country publishes its standard, which can be summarized by the times t_1 and t_2 , the peak voltage of the wave and the surge generator diagram. Table 1 gives on inexhaustive list of the standards .

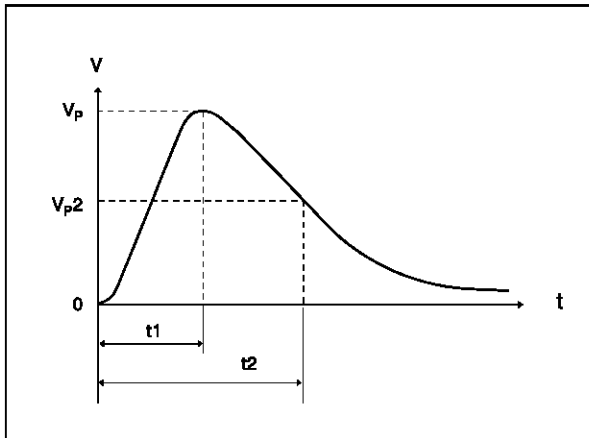
2. LIGHTNING SURGES

The lightning overvoltage is simulated by a biexponential wave, which is defined by the rise time t_1 and the duration t_2 between the start and the time at which the falling edge crosses half the peak value (fig.1)

Table 1 : Lightning surge standards

COUNTRY	AUTHORITY	WAVEFORM (μ s)
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

Figure 1 : Standard wave



APPLICATION NOTE

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

Figure 2 : 10/700 μ s wave generator

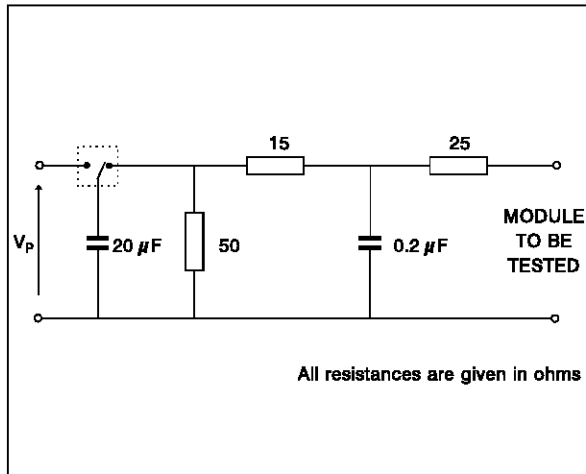


Figure 3 : 1.2/50 μ s wave generator

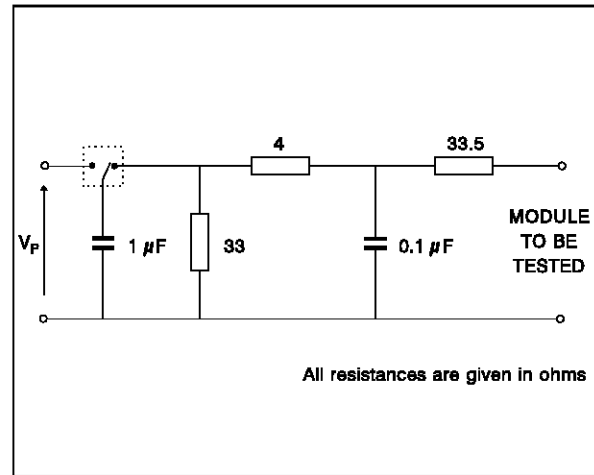


Figure 4 : 0.5/700 μ s wave generator

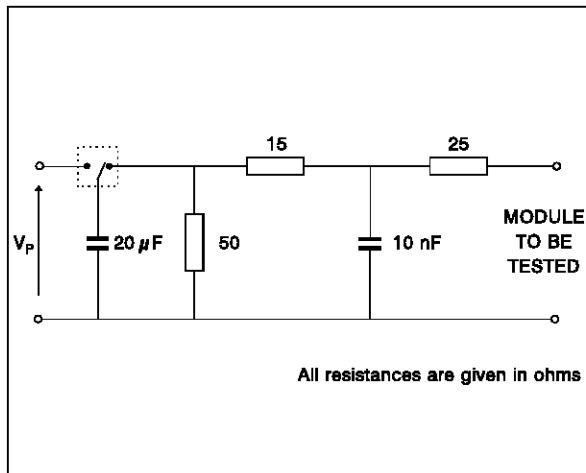


Figure 5 : 10/560 μ s wave generator

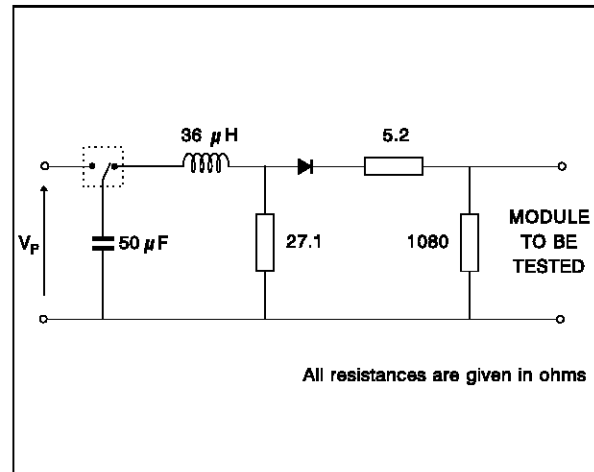


Figure 6 : 1/1000 μ s wave generator

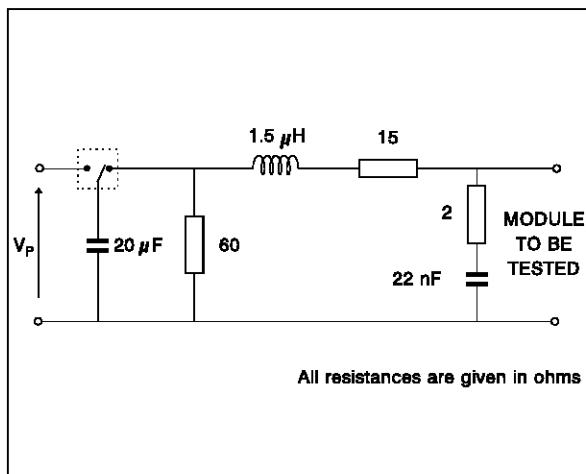


Figure 7 : 10/160 μ s wave generator

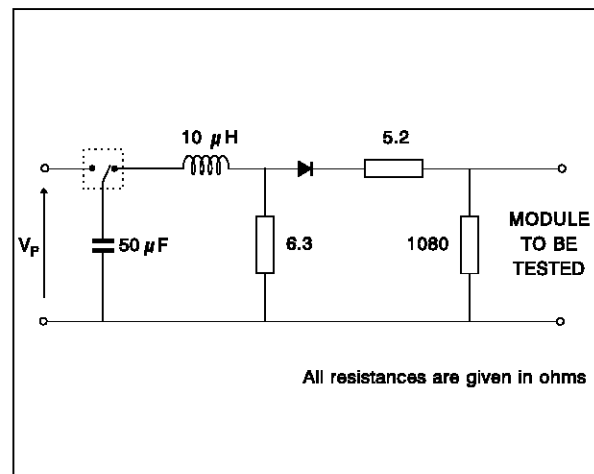
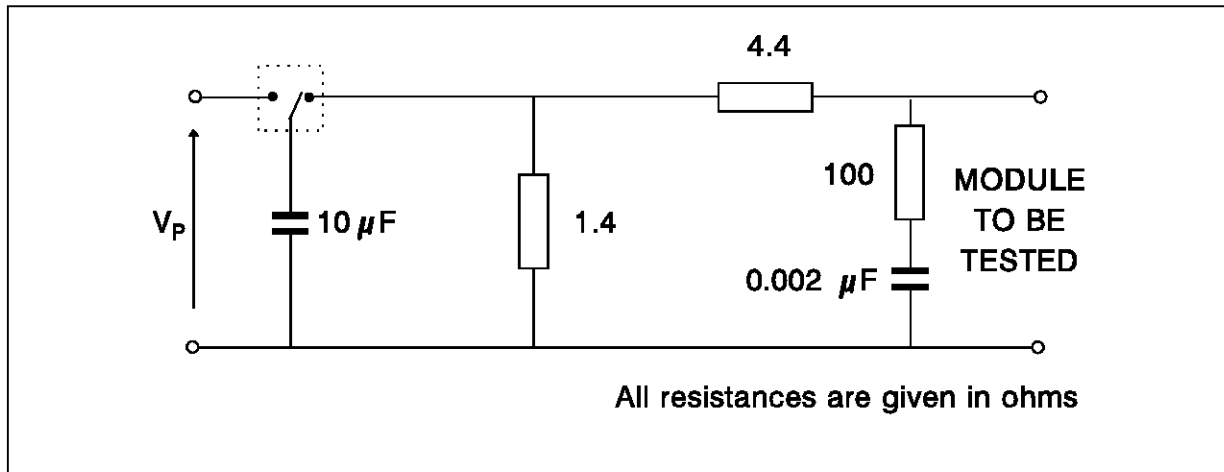


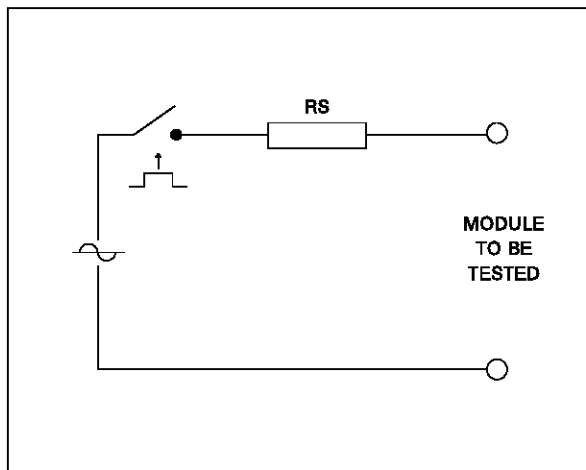
Figure 8 : 2/10 μ s wave generator



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	40 TO 400	15mn
	0 TO 650	150	1s
	0 TO 430 (50 Hz)	150	2s
FRANCE	0 TO 1000	20	Trains of - 1s "on" - 1s "off" - 1s "on"
	> 1000 (50 Hz)	3000	
GERMANY	300 (50 Hz or 16.6Hz)	600	200 ms
ITALY	300	600	500 ms
	650	200	500 ms
	220	10 or 600	15 mn
USA	0 - 50	150	15 mn
	50 - 100	600	15 mn
	100 - 600	600	60 x 1s application

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

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