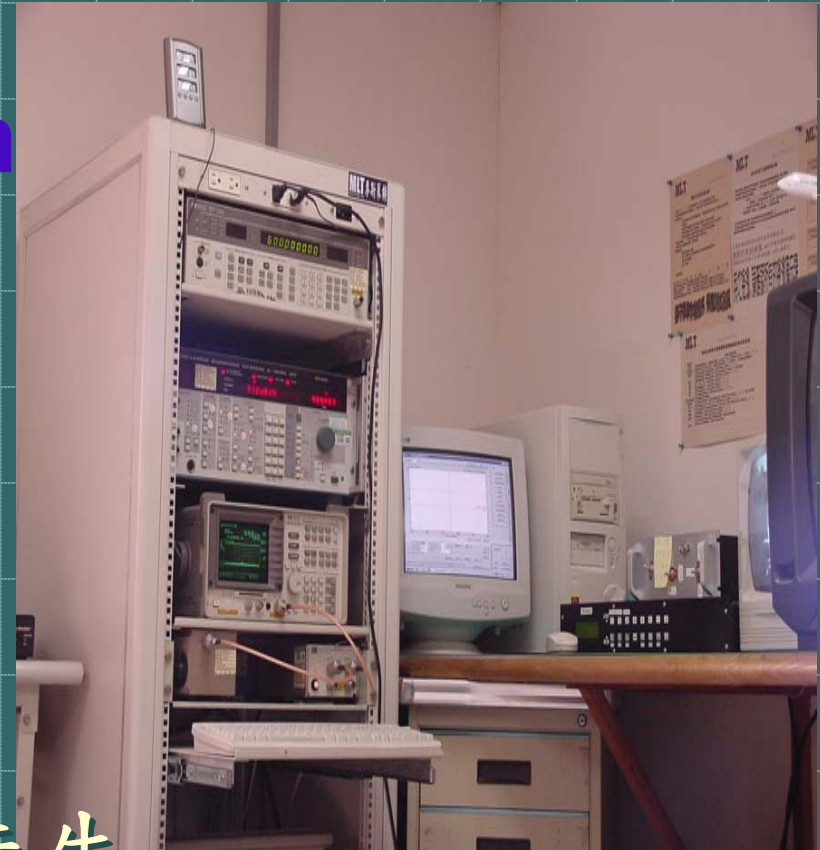


Max Light Technology Co.,Ltd

ITU -T Recommendation
K21(10/2000) Solution

K.21技術研討



講授人員：黃而汶先生

課程內容

如何評估電子產品型式認證 ...14:30

如何評估K.21測試14:50

◎確認產品及測試項目

◎何謂 Lightning Voltage (雷擊)

◎何謂 Power induction and earth potential rise

◎何謂 Mains power contact

◎何謂 Neutral potential rise

◎何謂ESD(與EMC要求有何不同?)

TEA TIME15:50

實際案件討論及應用..16:00

意見交流16:40



如何評估電子產品型式認證

- ◎ 確定欲申請國家
- ◎ 確定產品規格
- ◎ 依據以下三大領域進行產品認證評估
 - ◎ 安全規格(SAFETY)
 - ◎ 電磁相容(EMC)
(Electromagnetic Comp)
 - ◎ 電信規格(PTT)
(Public Telephone T

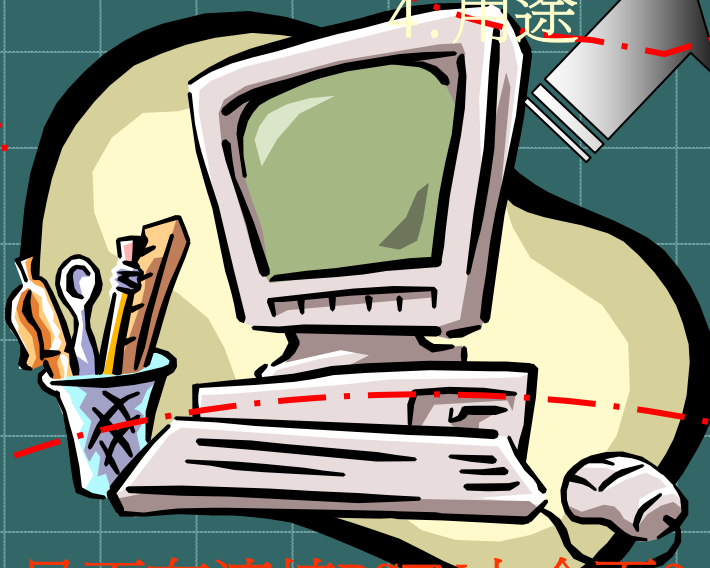


確定產品規格

是否有無線傳輸?

1. 頻率
2. 調變方式
3. 輸出功率
4. 用途

主電源電壓
110V-220V



是否有連接PSTN之介面?

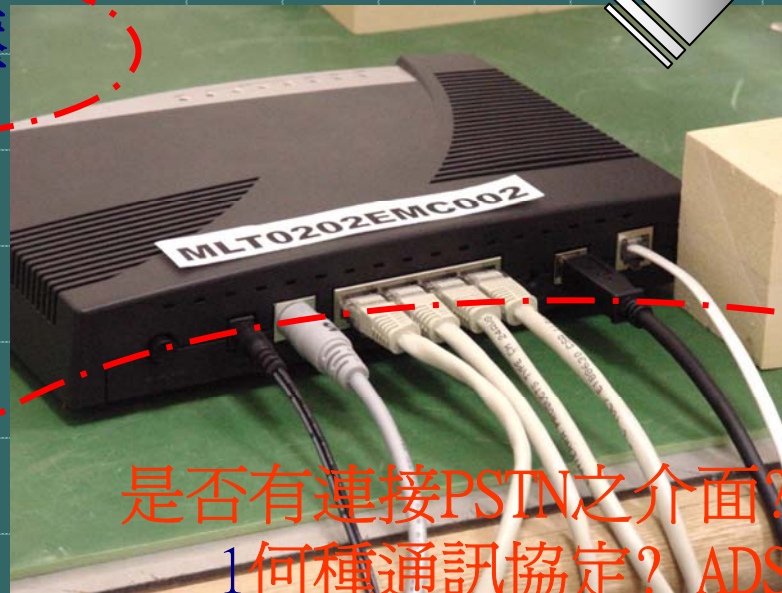
- 1 何種通訊協定?
- 2 是否有複合式介面?

案件評估(美國)

是否有無線傳輸?

1. 頻率 2.4GHz
2. 調變方式 DSSS
3. 輸出功率 30dBm
4. 用途 802.11b & g

主電源電壓
110V-220V



是否有連接PSTN之介面?

- 1 何種通訊協定? ADSL T.413
- 2 是否有複合式介面?

如何評估K. 21測試 (確認產品及測試項目)

Symmetric Port (參考K. 21標準 Page 3)

Test type	No. of ports simultaneously tested	Longitudinal / transverse test	Primary protection	Symmetric port	Test Result
Lightning/ voltage	Single	Longitudinal	No	2.1.1.a	A
		Transverse	No	2.1.1.b	A
		Longitudinal	Yes	2.1.2.a	A
		Transverse	Yes	2.1.2.b	A
Power induction and earth potential rise	Single	Longitudinal	No	2.2.1.a	A
		Transverse	No	2.2.1.b	A
		Longitudinal	Yes	2.2.2.a	A
		Transverse	Yes	2.2.2.b	A
Mains power contact	Single	Longitudinal	No	2.3.1.a	A
		Transverse	No	2.3.1.b	A

如何評估K. 21測試 (確認產品及測試項目)

Mains Power Port (參考K. 21標準 Page 3)

Test type	No. of ports simultaneously tested	Longitudinal / transverse test	Primary protection	Symmetric port	Test Result
Lightning/ voltage	Single	Longitudinal	No	5.1.1.a	A
		Transverse	No	5.1.1.b	A
		Longitudinal	Yes	5.1.2.a	A
		Transverse	Yes	5.1.2.b	A
		*Longitudinal	No	5.1.2.a	A
		*Transverse	No	5.1.2.b	A
Neutral potential rise	Single	Longitudinal	No	5.2.2	A

* This test based on customer's request

如何評估K.21測試

何謂Lightning Voltage(雷擊)

Test Specifications:

Test type	No. of ports simultaneously tested	Longitudinal/transverse test	Primary protection	Symmetric port	Acceptance Criterion
Lightning voltage (Symmetric port)	Single	Longitudinal	No	2.1.1.a	A
		Transverse	No	2.1.1.b	A
		Longitudinal	Yes	2.1.2.a	A
		Transverse	Yes	2.1.2.b	A
Lightning/voltage (AC power)	Single	Longitudinal	No	5.1.1.a	A
		Transverse	No	5.1.1.b	A
		Longitudinal	Yes	5.1.2.a	A
		Transverse	Yes	5.1.2.b	A
		*Longitudinal	No	*5.1.2.a	A
		*Transverse	No	*5.1.2.b	A

* This test based on customer's request

何謂Lightning Voltage(雷擊)

Symmetric Port (測試條件參考K. 21標準 Page 4)

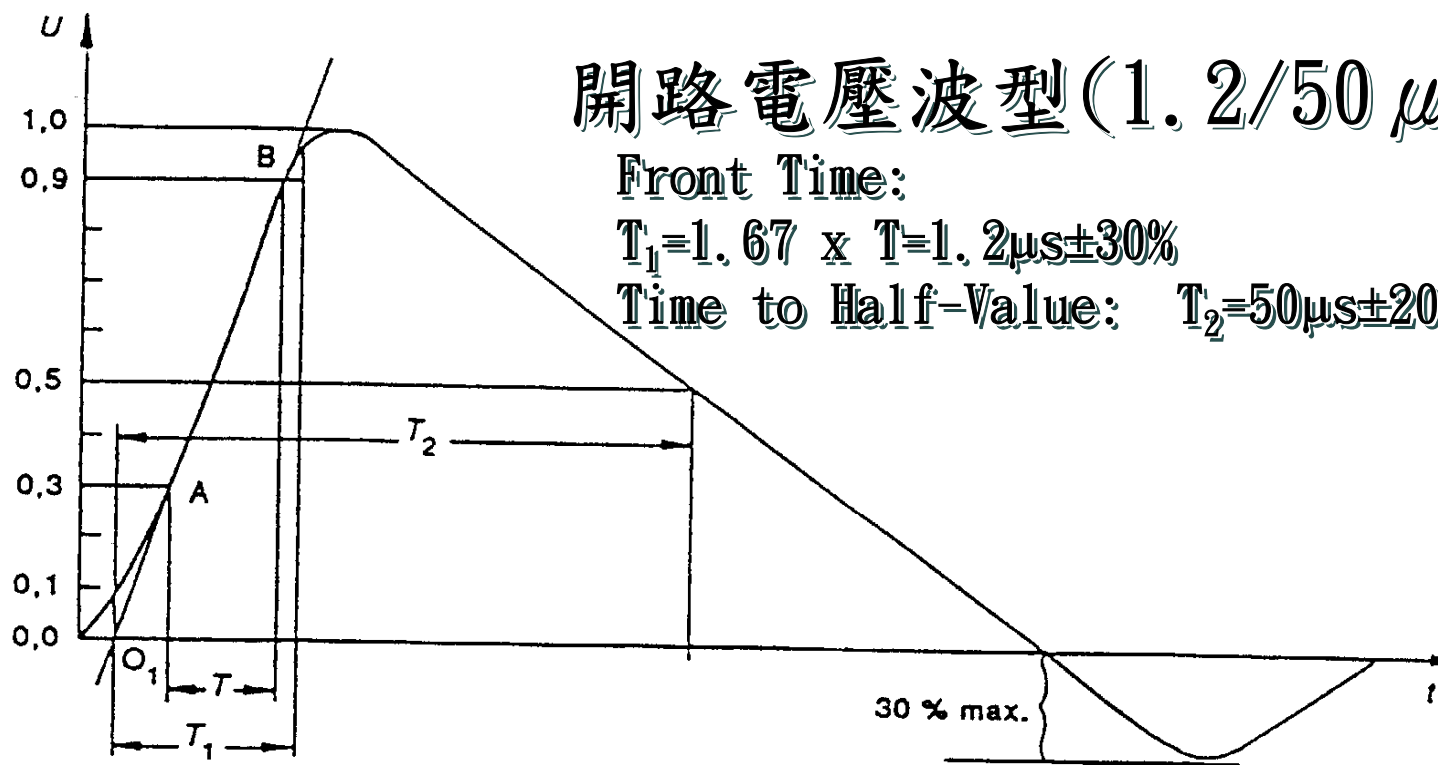
Test No	Test description	Basic test level	No. of tests	Primary Protection	Acceptance Criterion
2.1.1.a	Single port lightning inherent longitudinal	$U_c(\max)=1.5KV$ 10/700us, R=25ohm	5 of each polarity	None	A
2.1.1.b	Single port lightning inherent transverse	$U_c(\max)=1.5KV$ 10/700us, R=25ohm	5 of each polarity	None	A
2.1.2.a	Single port lightning coordination longitudinal	$U_c(\max)=4KV$ 10/700us, R=25ohm	5 of each polarity	Special test protector	A
2.1.2.b	Single port lightning coordination transverse	$U_c(\max)=4KV$ 10/700us, R=25ohm	5 of each polarity	Special test protector	A

何謂Lightning Voltage(雷擊)

Main Power Port(測試條件參考K. 21標準 Page 13)

Test No	Test description	Basic test level	No. of tests	Primary Protection	Result Criterion
5.1.1.a	Lightning mains port longitudinal inherent	$U_c(\max)=2.5KV$ $R=0ohm$	5 of each polarity	None	A
5.1.1.b	Lightning mains port transverse inherent	$U_c(\max)=2.5KV$ $R=0ohm$	5 of each polarity	None	A
5.1.2.a	Lightning mains port longitudinal inherent/coordination	$U_c(\max)=6.0KV$ $R=0ohm$	5 of each polarity	Special test protector	A
5.1.2.b	Lightning mains port transverse inherent/coordination	$U_c(\max)=6.0KV$ $R=0ohm$	5 of each polarity	Special test protector	A

雷擊波型介紹 (CWG/混合波)

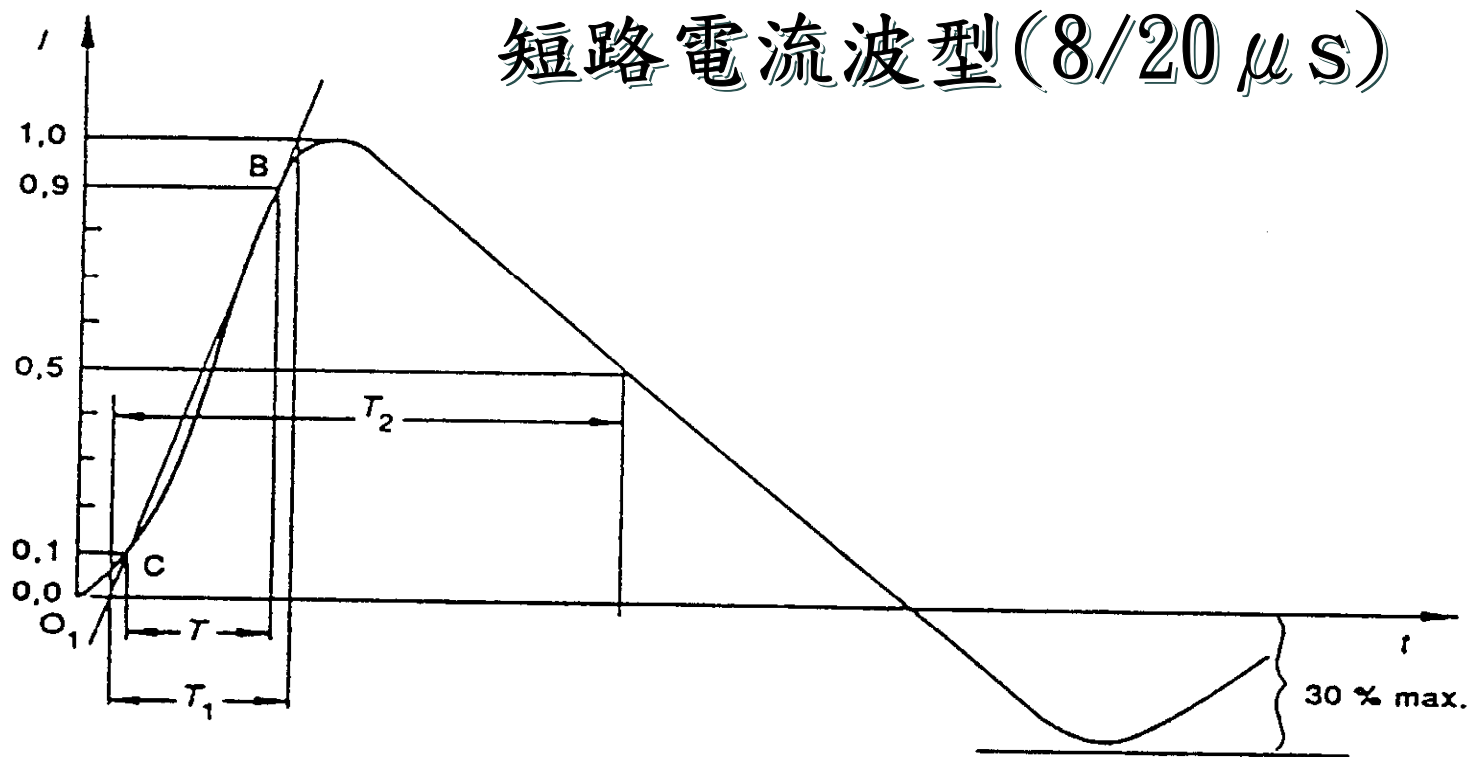


圖一電擊波開路電壓波型(1.2/50 μ s)

$$T_1 = 1.67 \times T = 1.2 \mu\text{s} \pm 30\%$$

$$T_2 = 50 \mu\text{s} \pm 20\%$$

雷擊波型介紹 (CWG/混合波)

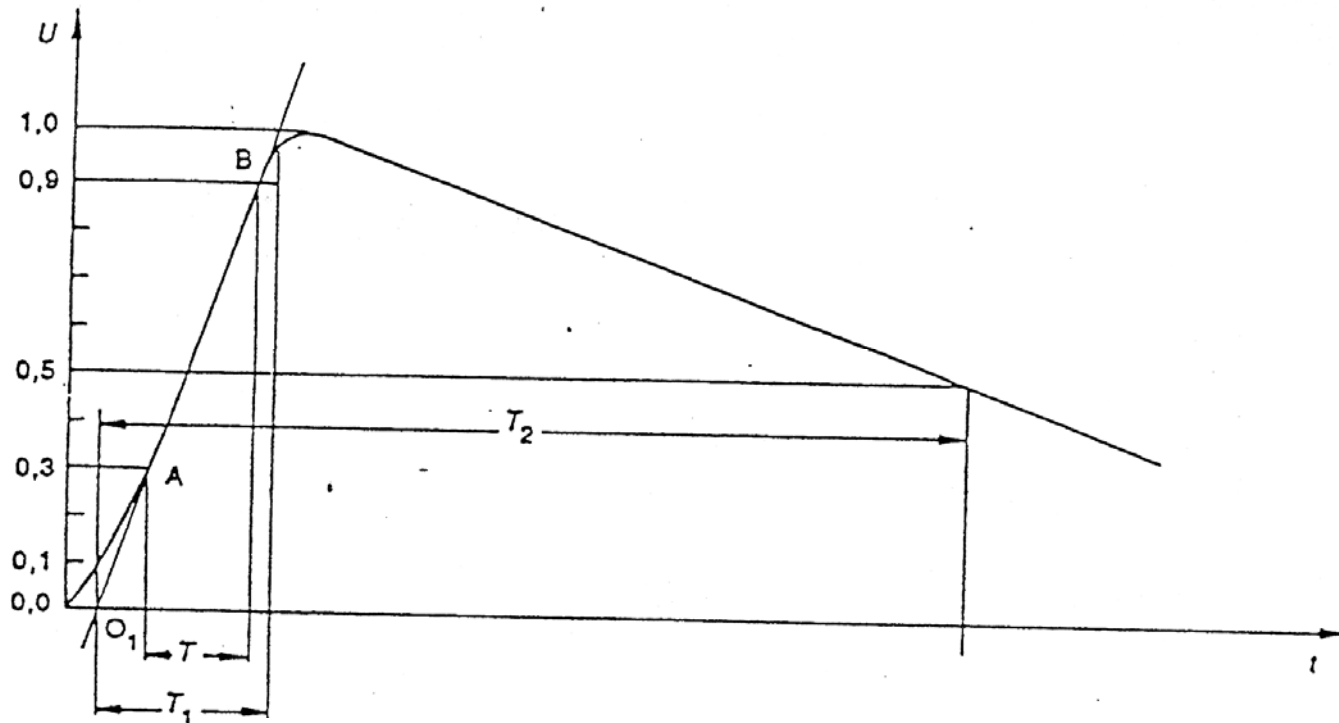


IEC 099195

$$T_1 = 1.25 \times T = 8 \mu\text{s} \pm 20 \%$$

$$T_2 = 20 \mu\text{s} \pm 20 \%$$

雷擊波型介紹 (10/700)

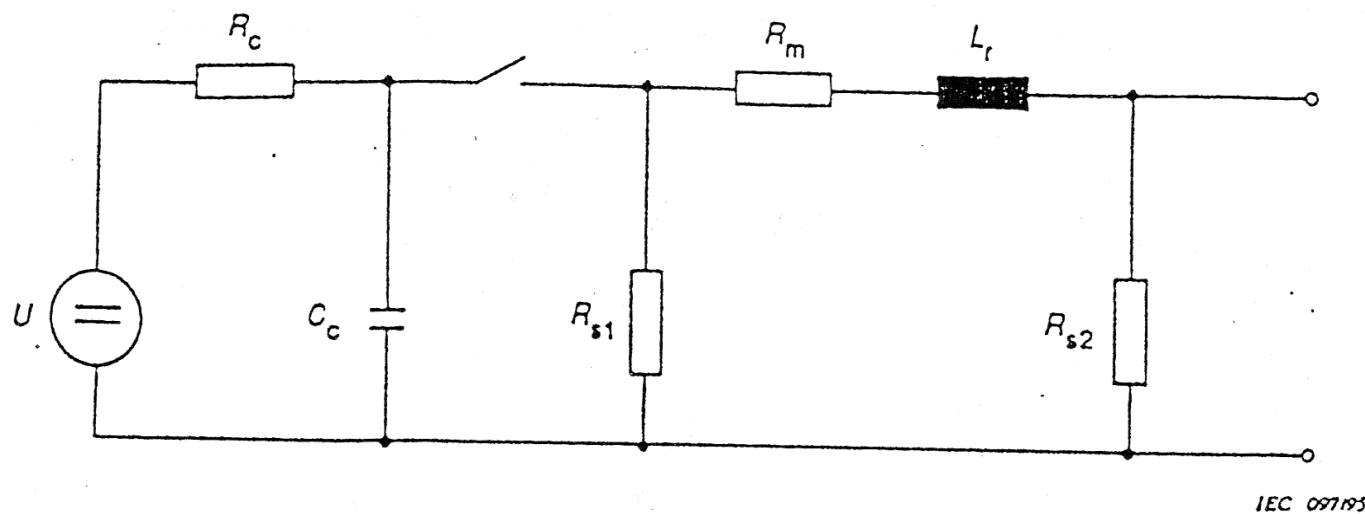


IEC 101/95

Front time: $T_1 = 1.67 \times T = 10 \mu\text{s} \pm 30 \%$
Time to half-value: $T_2 = 700 \mu\text{s} \pm 20 \%$.

Figure 5 – Waveform of open-circuit voltage (10/700 μs)
(waveform definition according to CCITT)

雷擊阻抗介紹 (CWG/混合波)

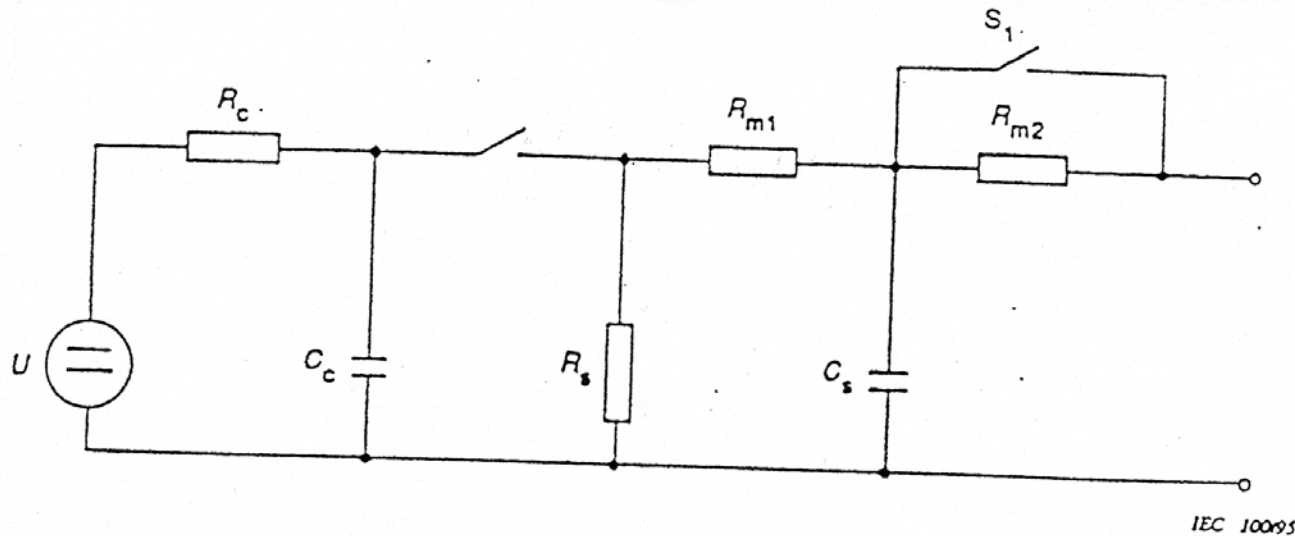


- U High-voltage source
- R_c Charging resistor
- C_c Energy storage capacitor
- R_s Pulse duration shaping resistor
- R_m Impedance matching resistor
- L_r Rise time shaping inductor

P.S 補充資料請參考附件一

Figure 1 – Simplified circuit diagram of the combination wave generator

雷擊阻抗介紹 (10/700us)



- U High-voltage source
- R_c Charging resistor
- C_c Energy storage capacitor (20 μF)
- R_s Pulse duration shaping resistor (50 Ω)
- R_m Impedance matching resistors ($R_{m1} = 15 \Omega$; $R_{m2} = 25 \Omega$)
- C_s Rise time shaping capacitor (0,2 μF)
- S_1 Switch closed when using external matching resistors

Figure 4 – Simplified circuit diagram of the 10/700 μs Impulse generator (according to CCITT, Blue book Vol. IX, figure 1/K.17)

保護元件介紹

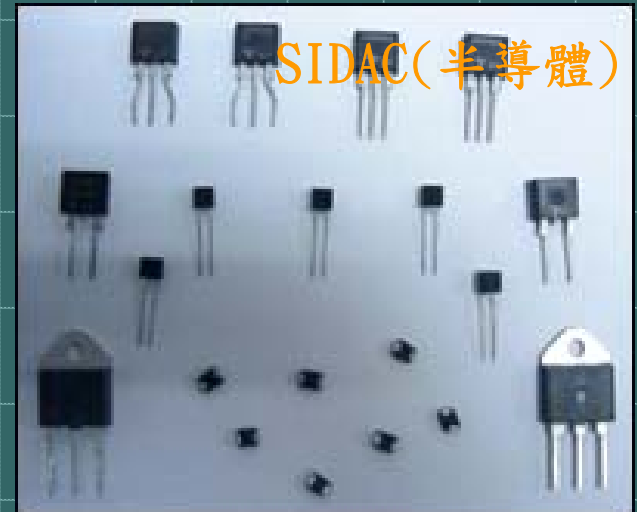
VARISTOR



GAS TUBE



SIDAC(半導體)



DSS(俗稱玻璃管)



保護元件比較

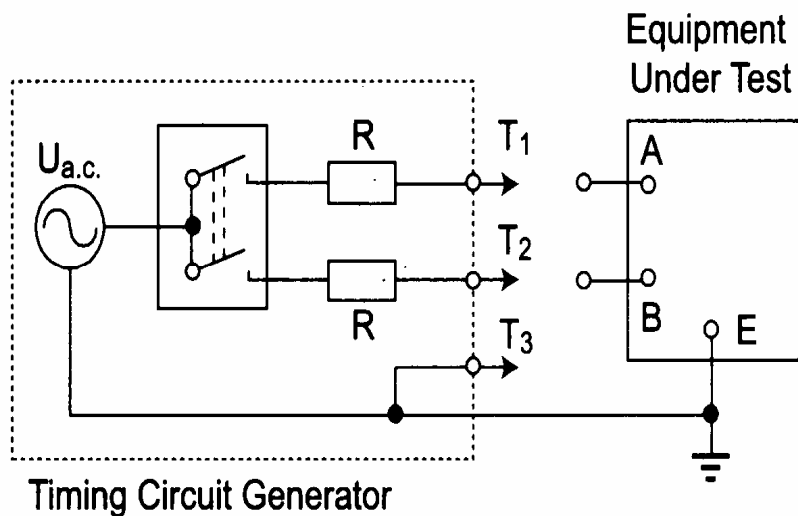
雷擊保護器種類	速度	價格	重復性	其他
VARISTOR	★	★★★	★★	
SIDAC(半導體)	★★★	★&★	★★★	有電容性
DSS(俗稱玻璃管)	★★	★★	★	無電容性
GAS TUBE (俗稱氣體式放電器)	★★	★★	★★★★	無電容性

如何評估K. 21測試

何謂 Power induction and earth potential rise

Test Specifications:

Test type	No. of ports simultaneously tested	Longitudinal/transverse test	Primary protection	Symmetric port	Acceptance Criterion
Power induction and earth potential rise	Single	Longitudinal	No	2. 2. 1. a	A
		Transverse	No	2. 2. 1. b	A
		Longitudinal	Yes	2. 2. 2. a	A
		Transverse	Yes	2. 2. 2. b	A



何謂Power Induction & Earth Potential Rise Symmetric Port (測試條件參考K.21標準 Page 6)

Test No	Test description	Basic test level	No. of tests	Primary Protection	Result Criterion
2.2.1.a	Power induction inherent longitudinal and earth potential rise	Wsp(max)=0.2A2s Frequency=50Hz Uac(max)=600V R=600ohm t=0.2S	5	None	A
2.2.1.b	Power induction inherent transverse	Wsp(max)=0.2A2s Frequency=50Hz Uac(max)=600V R=600ohm t=0.2S	5	None	A
2.2.2.a	Power induction inherent coordination longitudinal and earth potential rise	Wsp(max)=1A2s Frequency=50Hz Uac(max)=600V R=600ohm t=1.0S	5	Special test protector	A
2.2.2.b	Power induction inherent coordination transverse	Wsp(max)=1A2s Frequency=50Hz Uac(max)=600V R=600ohm t=1.0S	5	Special test protector	A

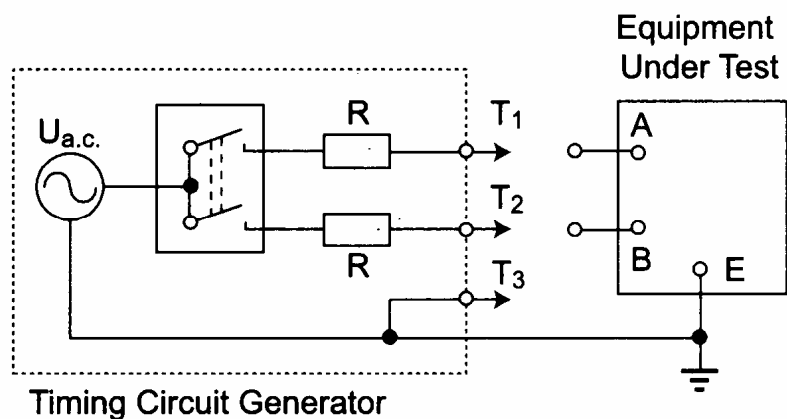
如何評估K. 21測試

何謂 Mains power contact

Test Specifications:

Test type	No. of ports simultaneously tested	Longitudinal/transverse test	Primary protection	Symmetric port	Acceptance Criterion
Mains power contact	Single	Longitudinal	No	2.3.1.a	B
		Transverse	No	2.3.1.b	B

*R : 10 Ω, 20 Ω, 40 Ω, 80 Ω, 160 Ω, 300 Ω, 600 Ω and 1000 Ω



何謂 Mains power contact

Symmetric Port (測試條件參考K.21標準 Page 7)

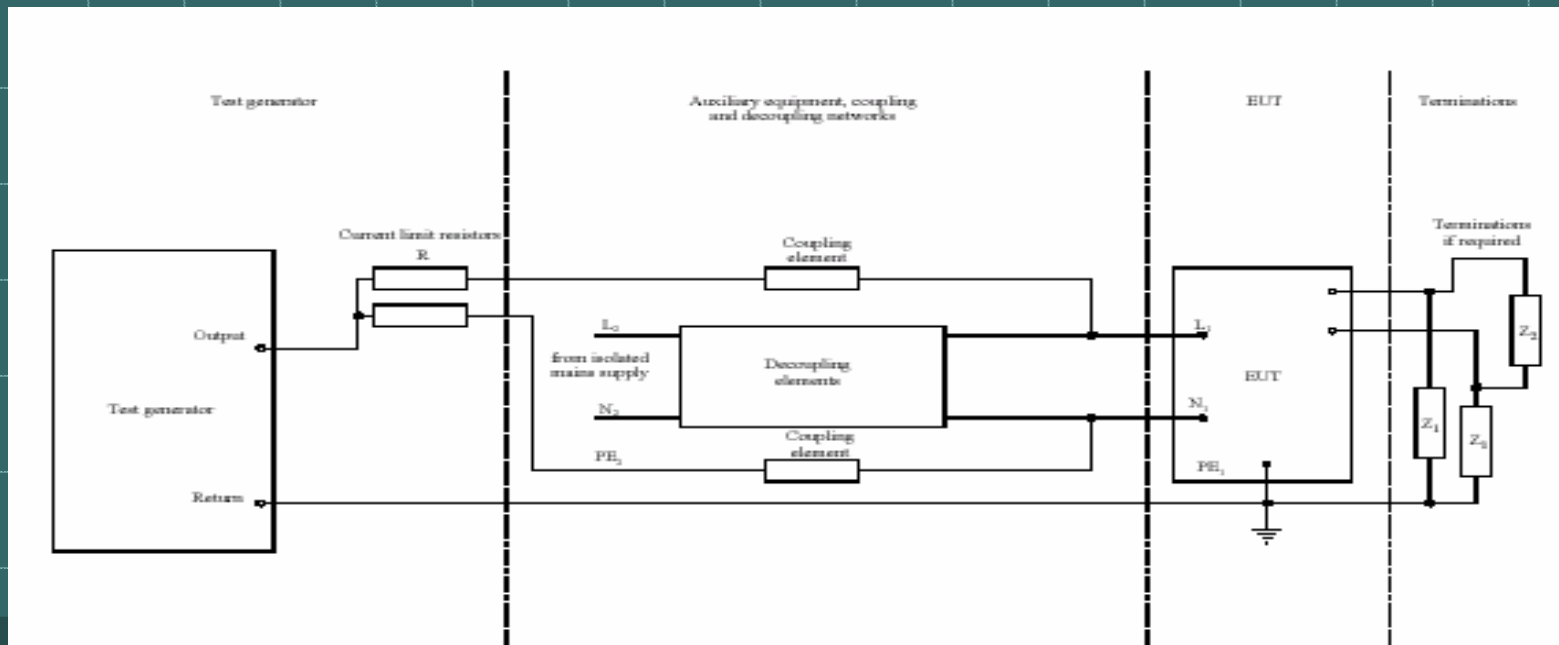
Test No.	Test description	Basic test levels	No. of tests	Primary protection	Result Criteria
2.3.1.a	Main power contact test longitudinal	U a. c. = 230 V Frequency = 50 Hz t = 15 min for each test resistor R = 100hm	1	None	criterion A
2.3.1.a	Main power contact test longitudinal	U a. c. = 230 V Frequency = 50 Hz t = 15 min for each test resistor R = 200hm	1	None	criterion A
2.3.1.a	Main power contact test longitudinal	U a. c. = 230 V Frequency = 50 Hz t = 15 min for each test resistor R = 400hm	1	None	criterion A
2.3.1.a	Main power contact test longitudinal	U a. c. = 230 V Frequency = 50 Hz t = 15 min for each test resistor R = 800hm	1	None	criterion A

如何評估K.21測試

何謂 Neutral potential rise

Test Specifications:

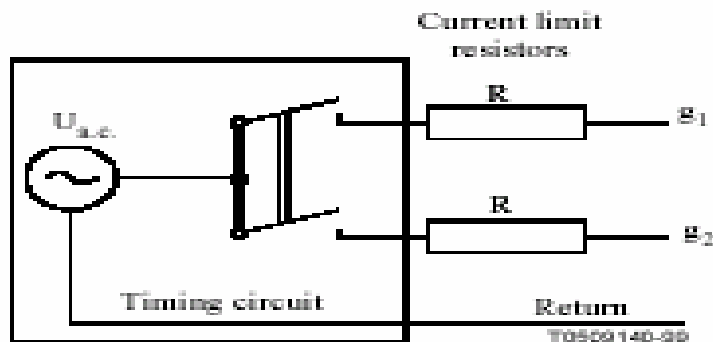
Test type	No. of ports simultaneously tested	Longitudinal/transverse test	Primary protection	Symmetric port	Acceptance Criterion
Neutral potential rise	Single	Longitudinal	No	5.2.2	A



何謂 Neutral potential rise

Main Power Port (測試條件參考K.21標準 Page 13)

Test No.	Test description	Basic test level	No. of tests	Primary Protection	Result Criterion
5.2.2	Neutral potential rise	$U_{a.c.}=600V$ Frequency=50Hz $t=1s$ $R=200\Omega$	5	None	A



For the value of R , refer to the appropriate test table in the appropriate product Recommendation.

NOTE – If national regulations require it, the maximum current may be limited.

如何評估K.21測試

何謂ESD(與EMC要求有何不同?)

Table 6/K.21 – Test conditions for ESD applied to the enclosure

Test No.	Test description	Test circuit	Basic test level	Enhanced test level	Number of tests	Primary protection	Acceptance criteria
6.1.a	air discharge	IEC 61000-4-2 1995	level 3	level 4	5	ma.	A
6.1.b	contact discharge	IEC 61000-4-2 1995	level 3	level 4	5	ma.	A

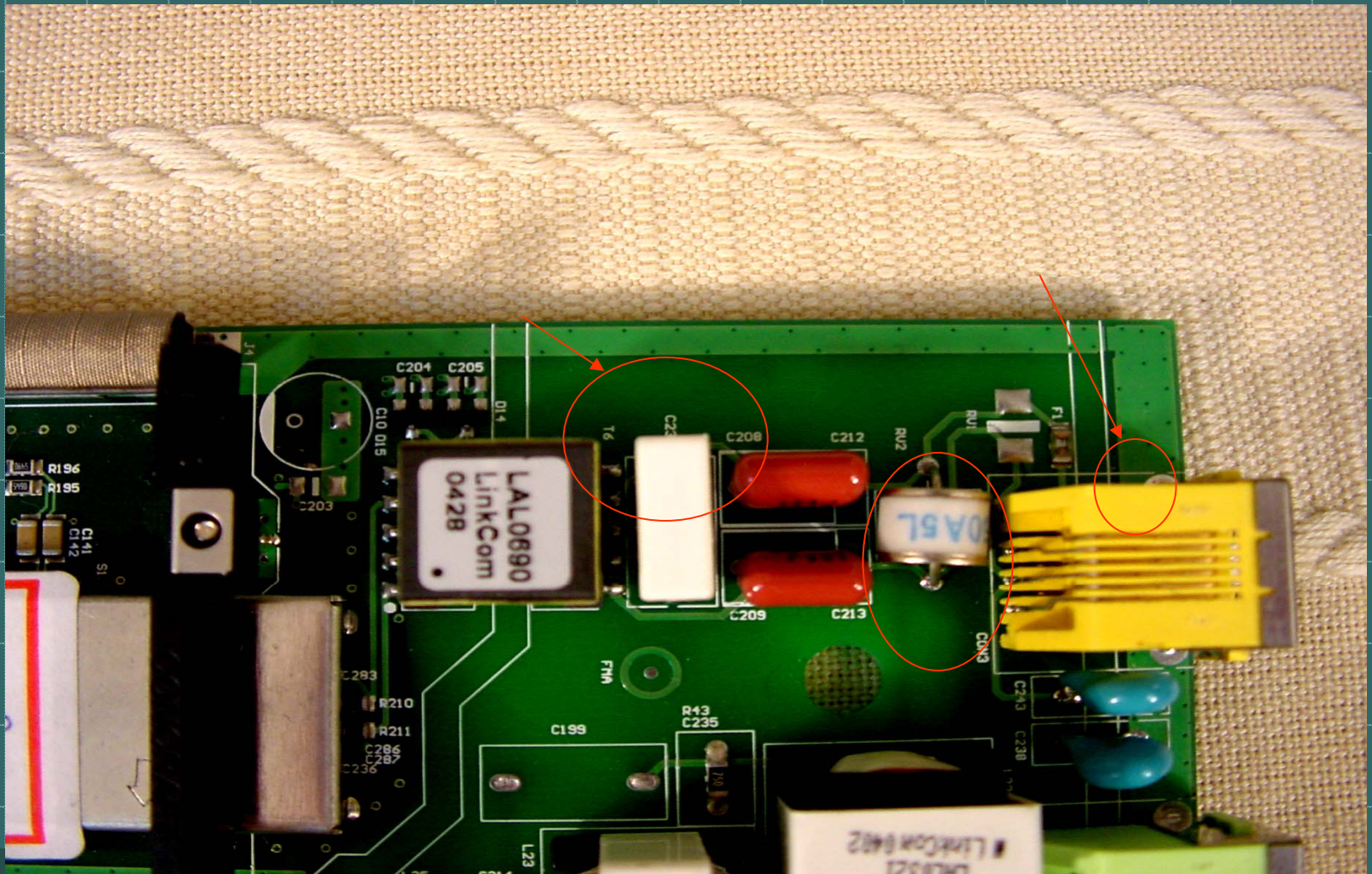
NOTE – The test applies to the equipment enclosure.

Table 1 – Test levels

Ia – Contact discharge		II – Air discharge	
Level	Test voltage (kV)	Level	Test voltage (kV)
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
x*	Special	x*	Special

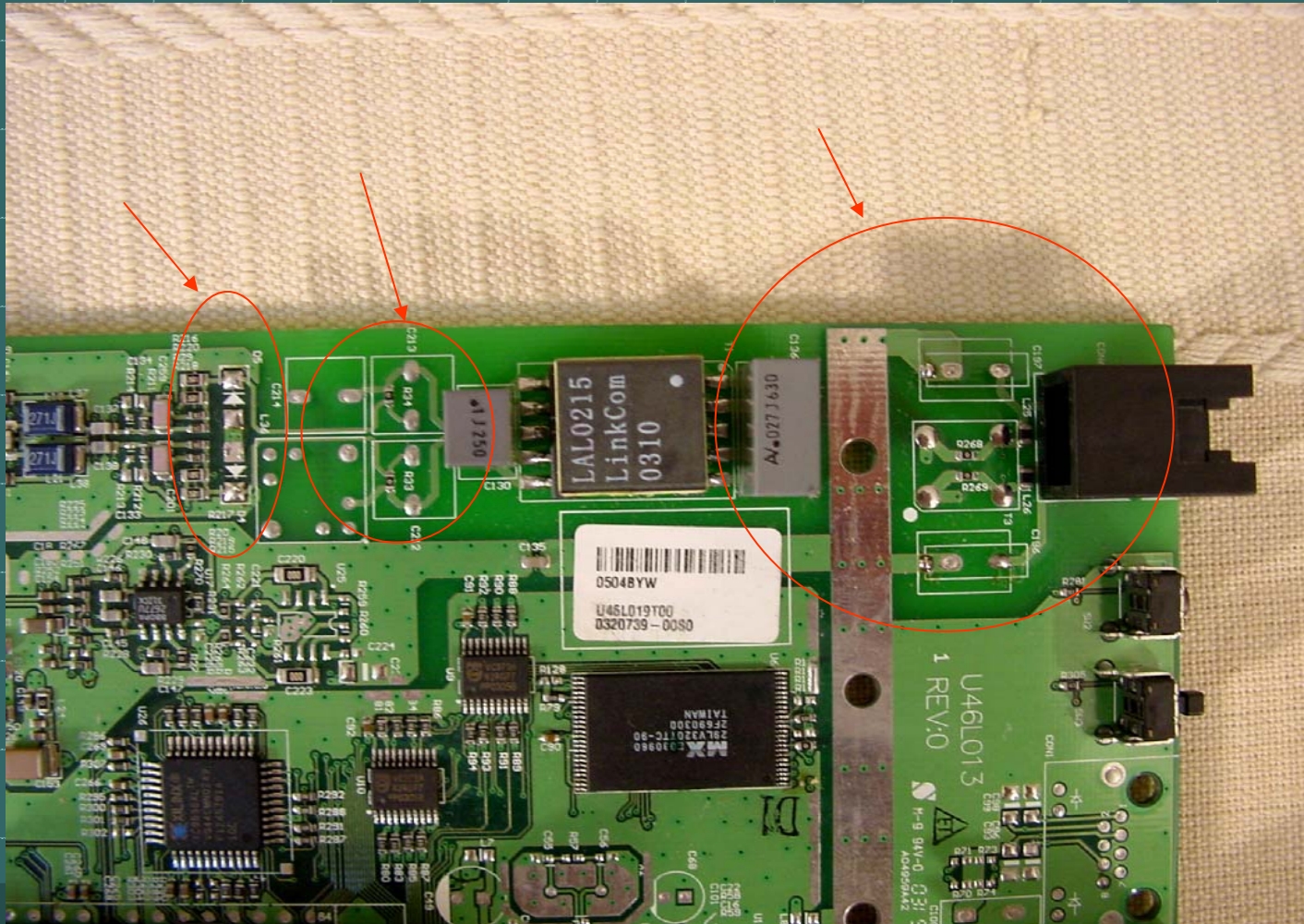
* "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.

實際案件討論及應用



Client's Truth is Our Pride

實際案件討論及應用



Client's Truth is Our Pride

意見交流

謝謝各位！

