



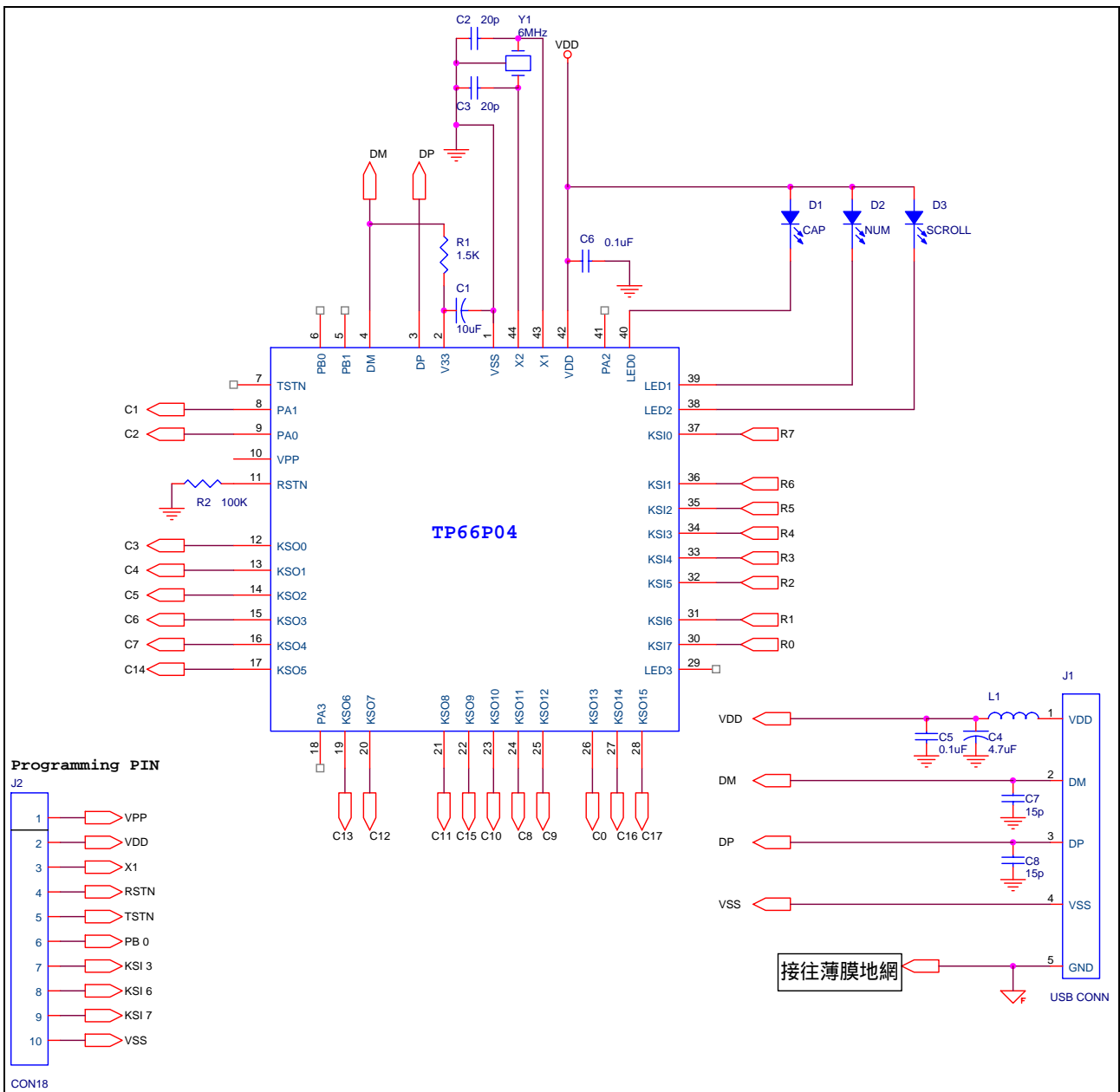
PRODUCT NAME
TP66P03, TP66P04

TITLE

U+P Keyboard for EMI and ESD Test report

APPLICATION NOTE

一. Application Circuit

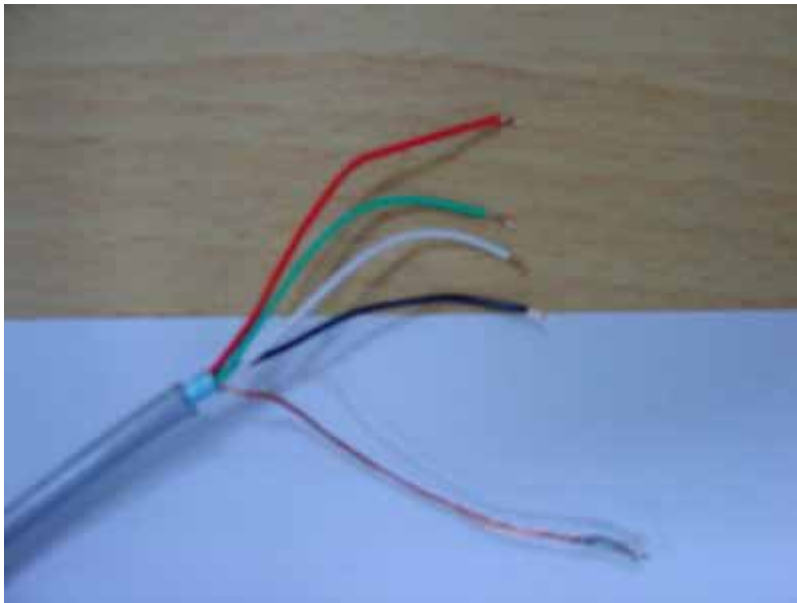


二. BOM 表

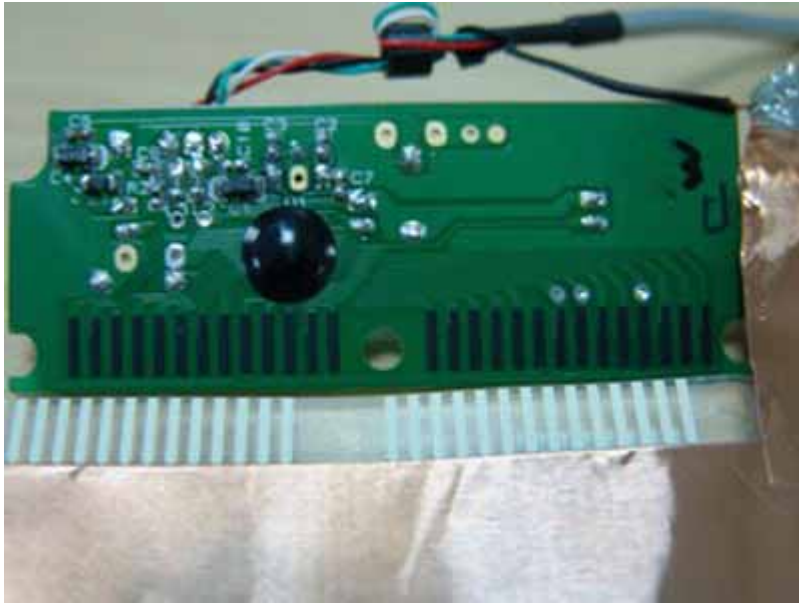
編號	元件數量	元件編號	元件數值	尺寸	備註
1	1	R1	1.5K	SMD 0603	
2	1	R2	100K	DIP 1/4W	
3	1	C1	10uF	A Case	
4	2	C2, C3	30p	SMD 0603	靠近 Y1/CRYSTAL
5	1	C4	4.7uF	A Case	靠近 J1/CONN
6	2	C5, C6	0.1uF	SMD 0603	C5 和 C4 靠近 J1/CONN, C6 靠近 IC
7	2	C7, C8	15P	SMD 0603	靠近 J1/CONN
8	1	L1	Bead 202	SMD 0805	靠近 J1/CONN
9	3	D1, D2, D3	LED	DIP	
10	1	Y1	CRYSTAL/6M	6MHz	靠近 IC, 外殼接地
11	1	U1	TP66P06	DICE	

P.S "此測試結果僅針對與測試報告中相同的 PCB Layout, USB 線材與 Housing 等條件, 對於不同的設計條件須視實際需要做調整, 以符合 EMC 的規範."

三.使用對策:線材帶 Core , Membrane 鋪銅
使用線材 KB1(無編織網有銅箔)



1.2 PCB 背面



1.3 PCB+ Housing



1.4 Membrane 鋪銅



1.5 組合



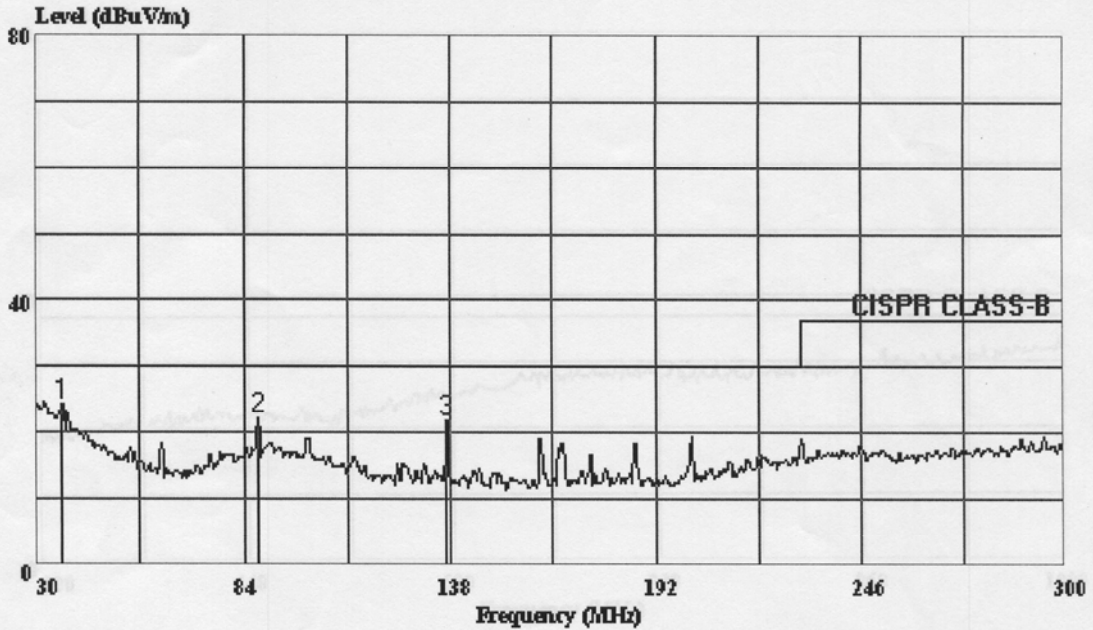
1.6 EMI Test Report
Vertical-Low Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 386 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:09:21



(Chamber A)

Trace: 385

Ref Trace:

Condition: CHAMBER A(J-4) VERTICAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-2
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

Page: 1

	Read			Limit	Over	
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	36.480	30.10	-5.70	24.40	30.00	-5.60 Peak
2	87.780	33.00	-10.70	22.30	30.00	-7.70 Peak
3	136.920	36.60	-14.94	21.66	30.00	-8.34 Peak

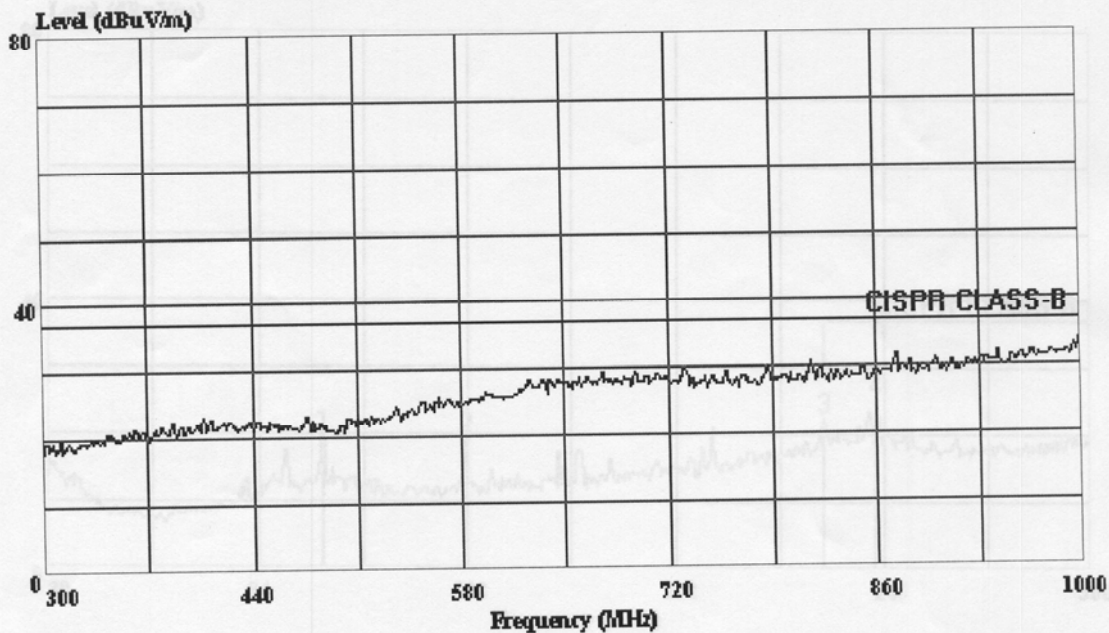
Vertical-High Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 384 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:08:18



(Chamber A)

Trace:

Ref Trace:

Condition: CHAMBER A(J-4) VERTICAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-2
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

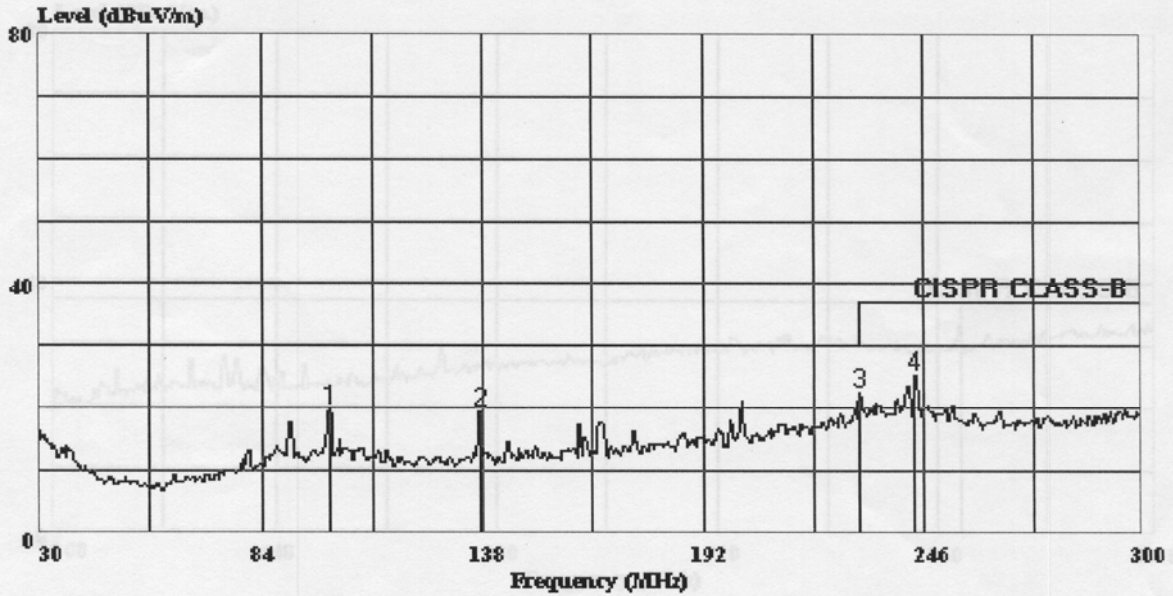
Horizontal- Low Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 388 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:11:17



(Chamber A)

Trace: 387

Ref Trace:

Condition: CHAMBER A(J-4) HORIZONTAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-2
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

Page: 1

	Read			Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark	
MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	100.470	34.40	-14.60	19.80	30.00	-10.20	Peak
2	137.190	35.60	-16.05	19.55	30.00	-10.45	Peak
3	230.070	32.20	-9.67	22.53	37.00	-14.47	Peak
4	243.570	34.20	-8.82	25.38	37.00	-11.62	Peak

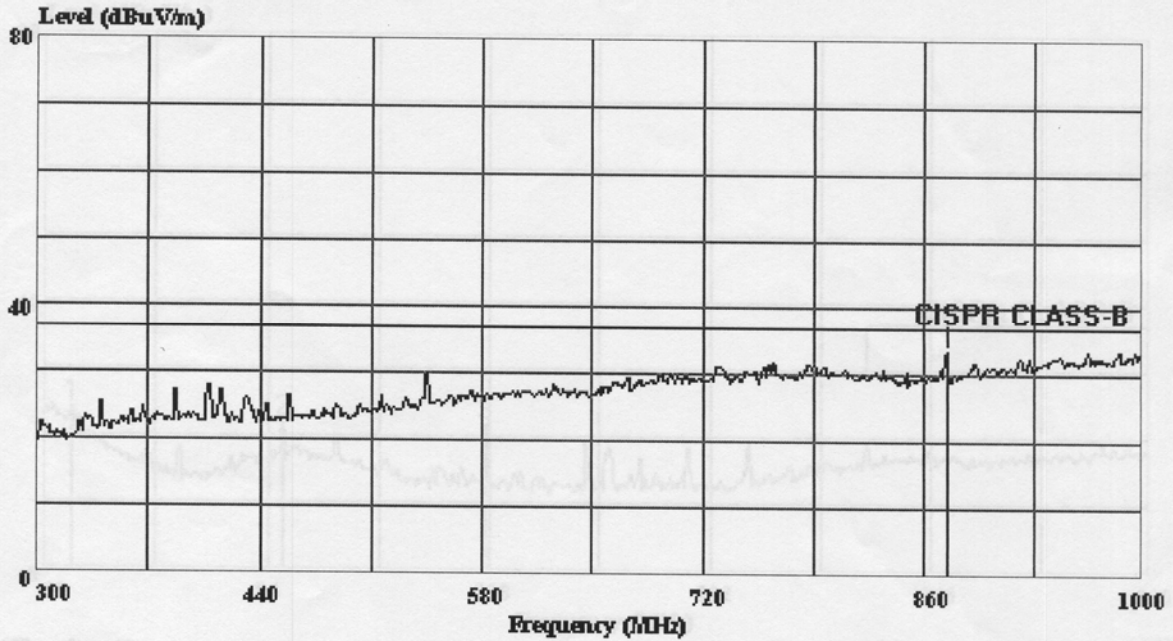
Horizontal-High Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 390 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:13:03



(Chamber A)

Trace: 389

Ref Trace:

Condition: CHAMBER A(J-4) HORIZONTAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-2
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

Page: 1

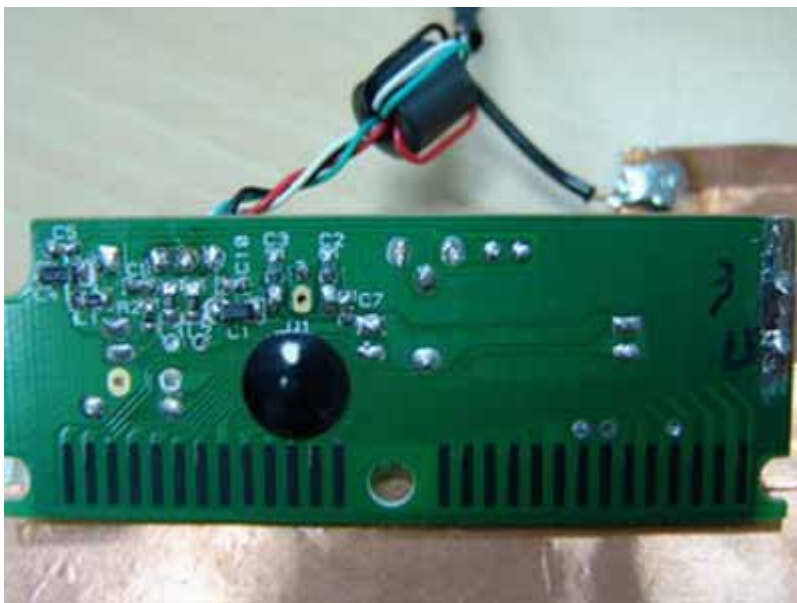
	Freq MHz	Read	Factor	Level	Limit	Over	Remark
		Level dBuV		Level dBuV/m	Line dBuV/m	Limit dB	
1	874.000	32.20	1.22	33.42	37.00	-3.58	Peak

2.中 Core

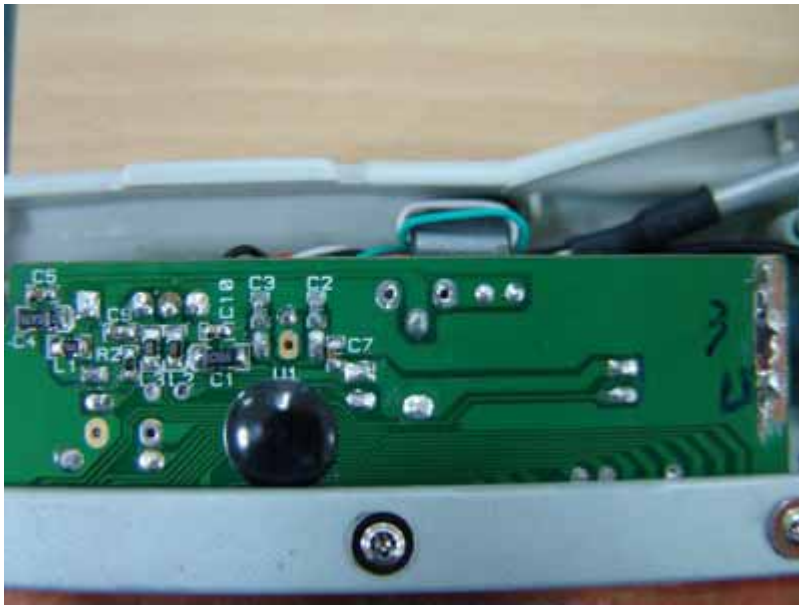
2.1 PCB 正面



2.2 PCB 背面



2.3 PCB+ Housing



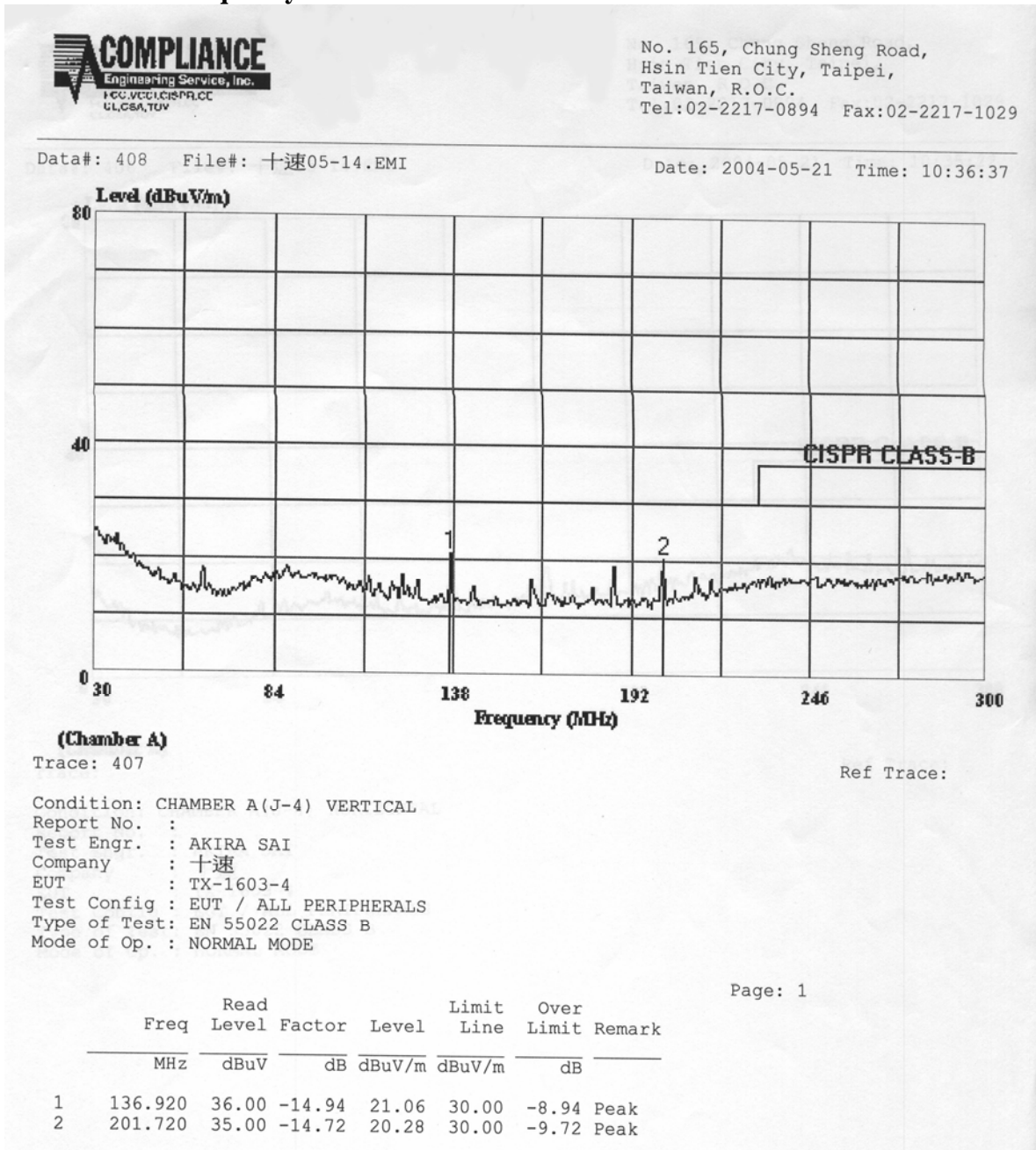
2.4 Membrane 鋪銅



2.5 組合



2.6 EMI Test Report
Vertical-Low Frequency



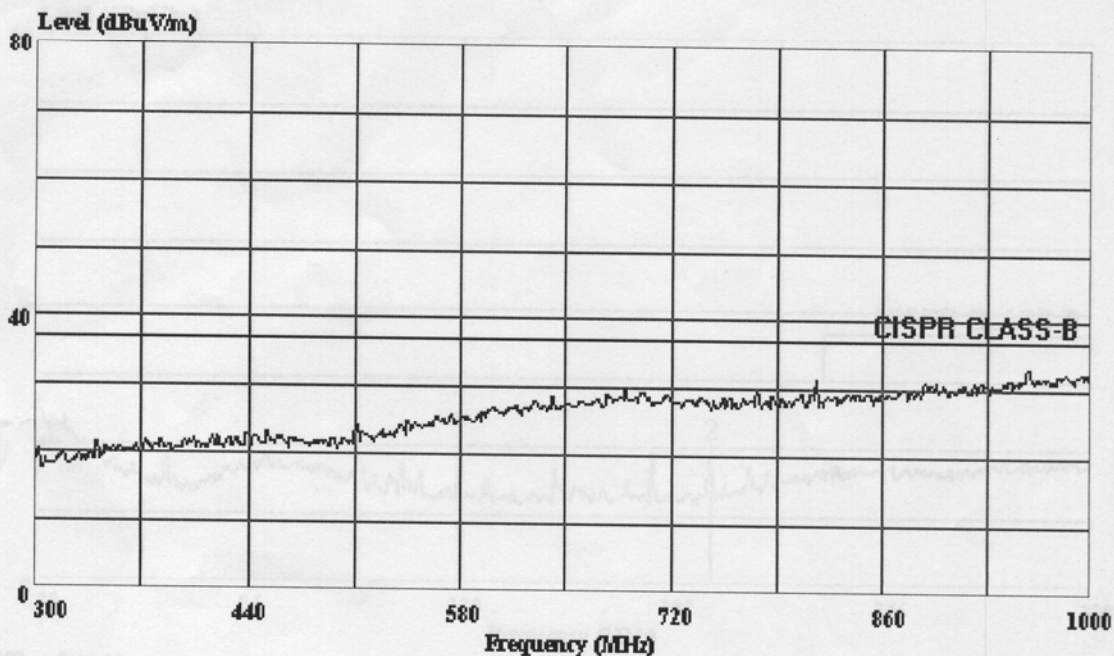
Vertical-High Frequency



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Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 409 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:37:31



(Chamber A)

Trace:

Ref Trace:

Condition: CHAMBER A(J-4) VERTICAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-4
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

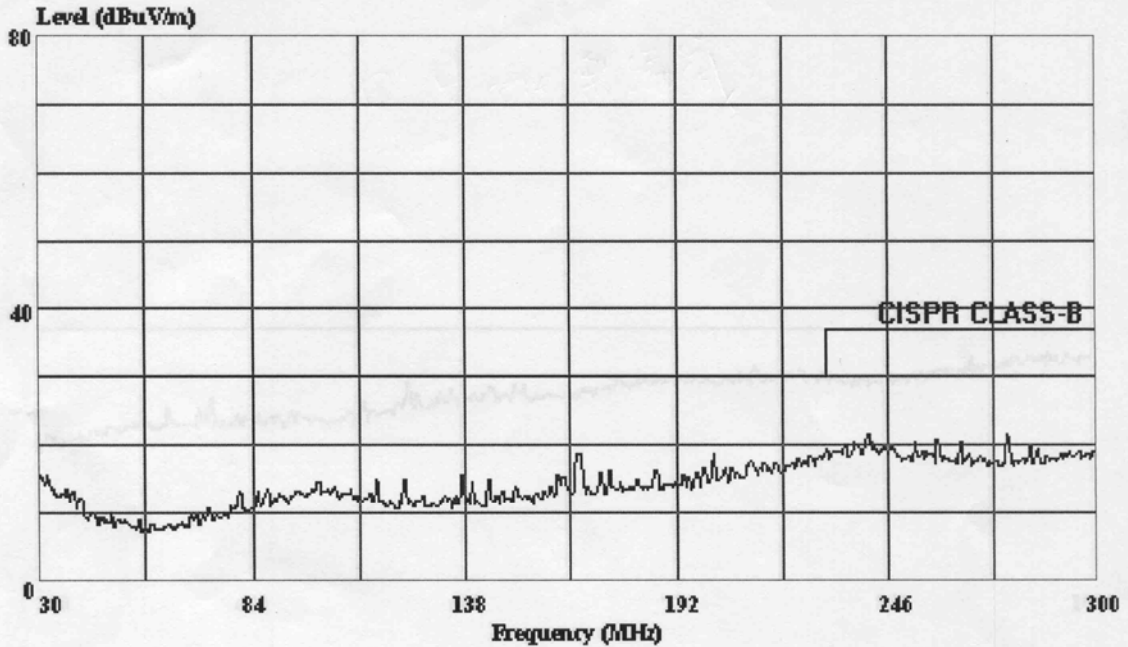
Horizontal- Low Frequency



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Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 406 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:35:22



(Chamber A)

Trace:

Ref Trace:

Condition: CHAMBER A(J-4) HORIZONTAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-4
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

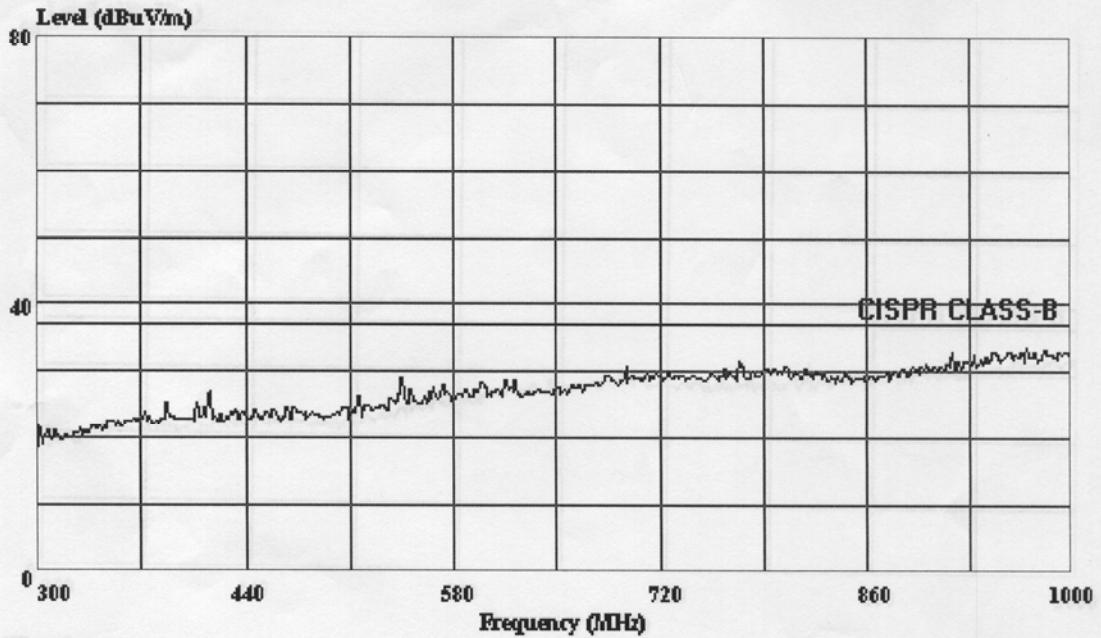
Horizontal- High Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 405 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:34:24



(Chamber A)

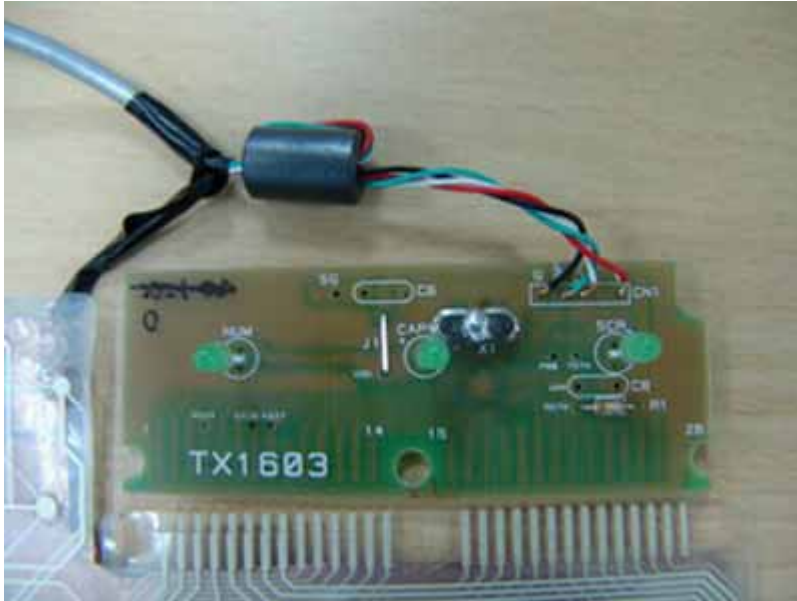
Trace:

Ref Trace:

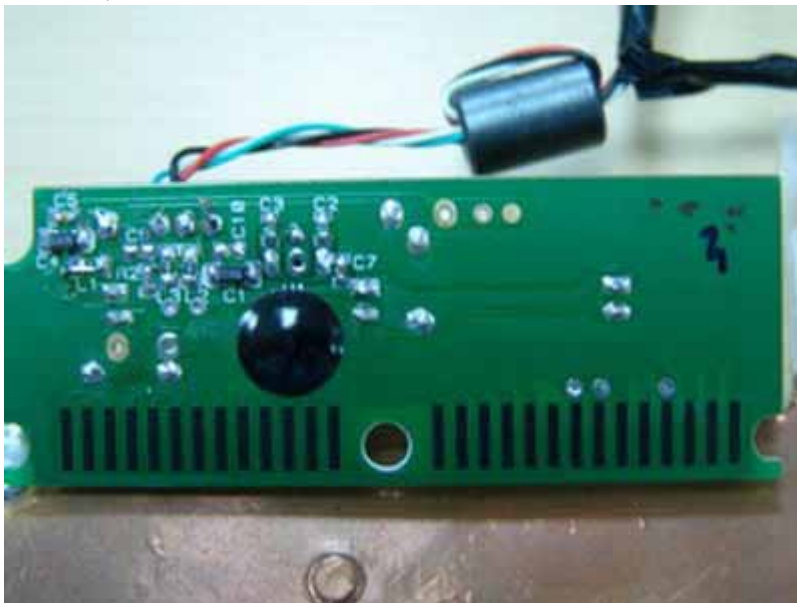
Condition: CHAMBER A(J-4) HORIZONTAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-4
Test Config: EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

3.大 Core

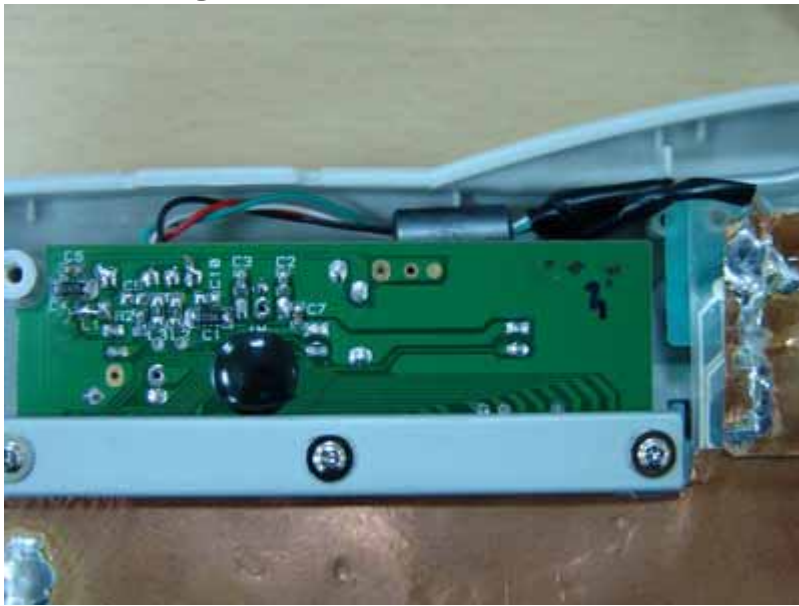
3.1 PCB 正面



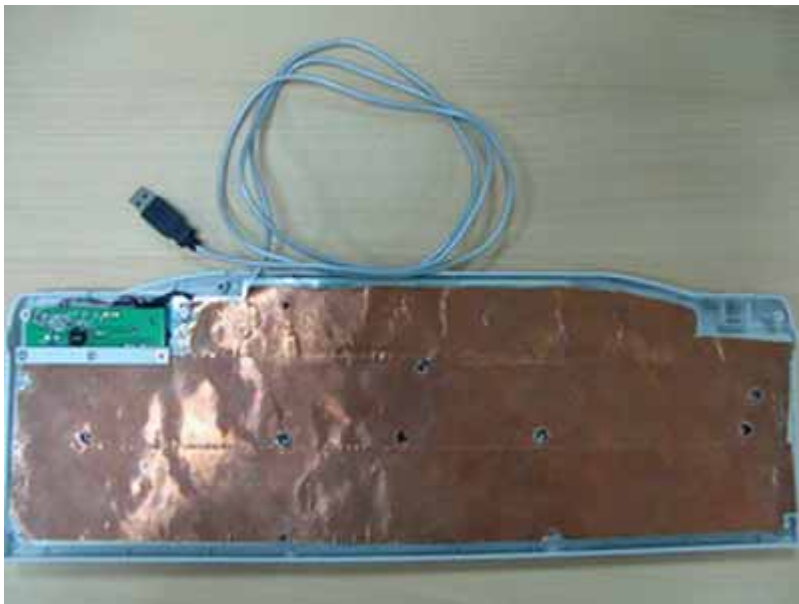
3.2 PCB 背面



3.3PCB+ Housing



3.4Membrane 鋪銅



3.5 組合



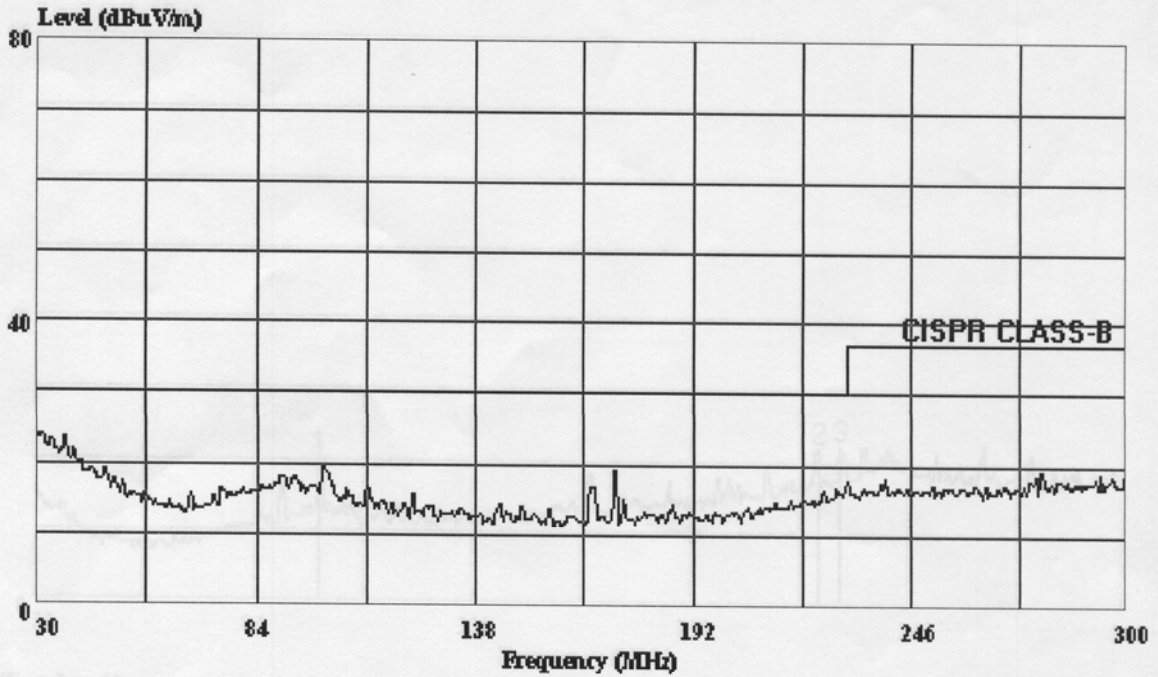
3.6 EMI Test Report
Vertical-Low Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel: 02-2217-0894 Fax: 02-2217-1029

Data#: 420 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:54:22



(Chamber A)

Trace:

Ref Trace:

Condition: CHAMBER A(J-4) VERTICAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-6
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

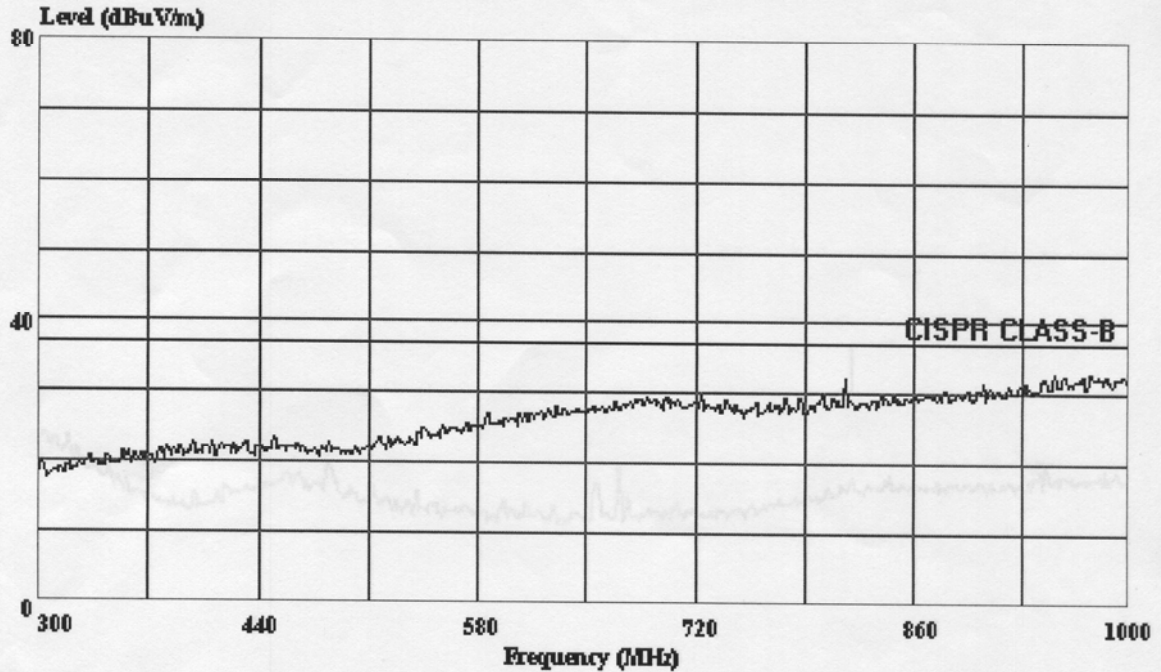
Vertical-High Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 419 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:53:28



(Chamber A)

Trace:

Ref Trace:

Condition: CHAMBER A(J-4) VERTICAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-6
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

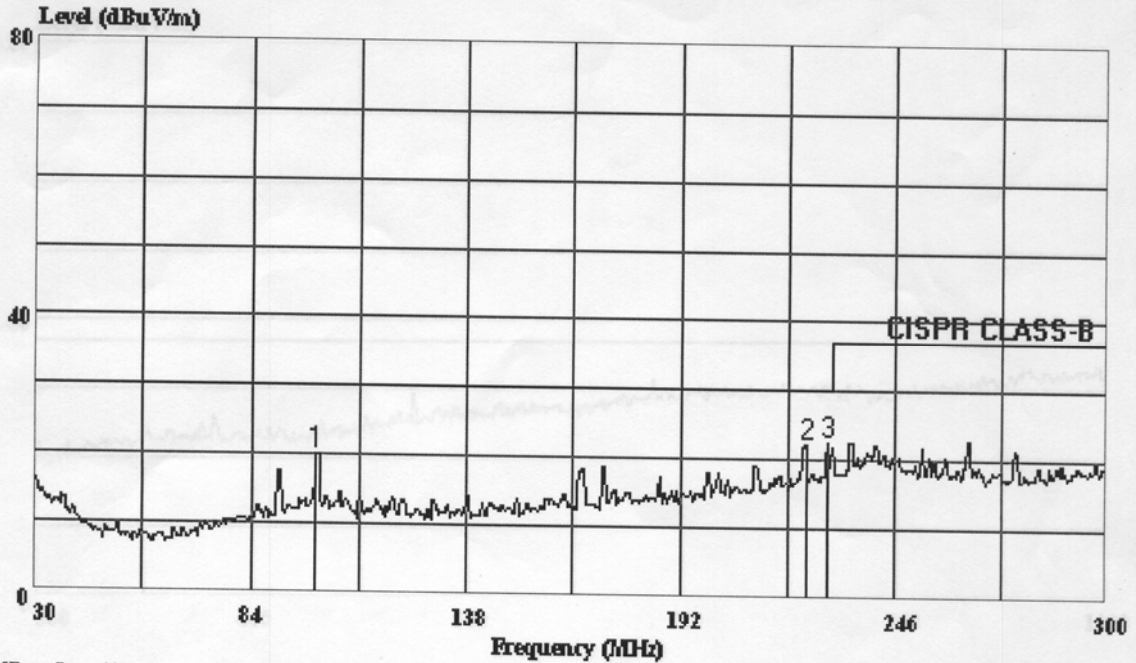
Horizontal- Low Frequency



No. 165, Chung Sheng Road,
Hsin Tien City, Taipei,
Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 417 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:48:27



(Chamber A)

Trace: 416

Ref Trace:

Condition: CHAMBER A(J-4) HORIZONTAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-6
Test Config: EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

Page: 1

	Read Freq	Level	Factor	Level	Limit	Over	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	100.200	34.60	-14.57	20.03	30.00	-9.97	Peak
2	223.320	32.60	-10.54	22.06	30.00	-7.94	Peak
3	228.720	32.40	-9.84	22.56	30.00	-7.44	Peak

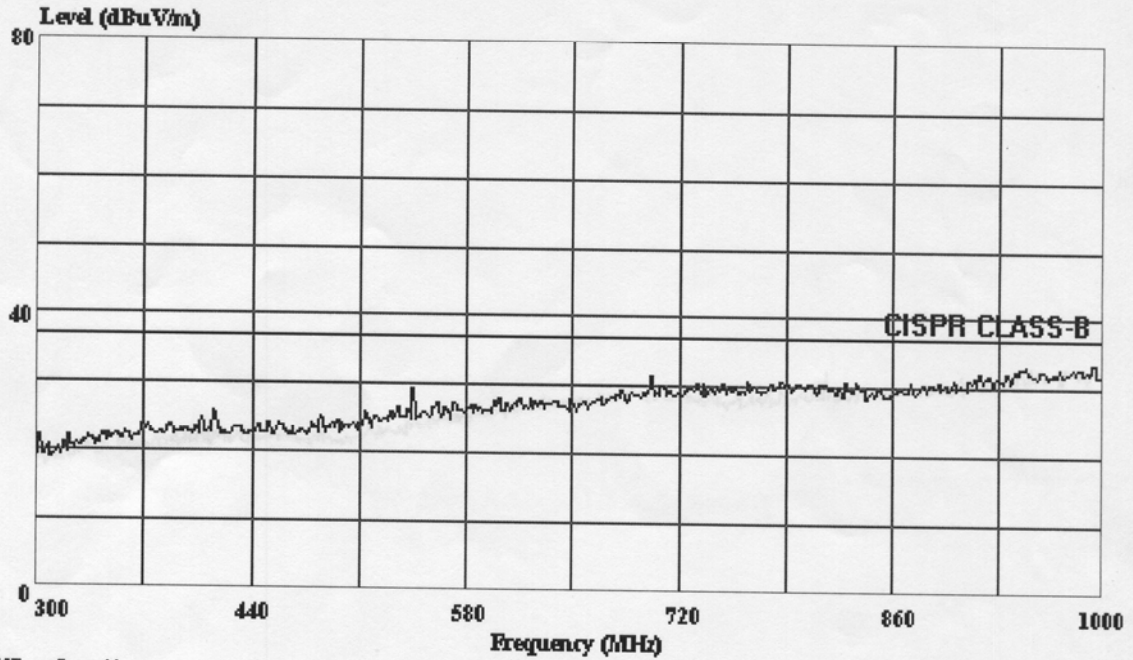
Horizontal- High Frequency



No. 165, Chung Sheng Road,
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Taiwan, R.O.C.
Tel:02-2217-0894 Fax:02-2217-1029

Data#: 418 File#: 十速05-14.EMI

Date: 2004-05-21 Time: 10:49:25



(Chamber A)

Trace:

Ref Trace:

Condition: CHAMBER A(J-4) HORIZONTAL
Report No. :
Test Engr. : AKIRA SAI
Company : 十速
EUT : TX-1603-6
Test Config : EUT / ALL PERIPHERALS
Type of Test: EN 55022 CLASS B
Mode of Op. : NORMAL MODE

四.Comparison Sheet:

以下為相同電路,搭配不同 Size Core 的組合.(僅供參考)

表 1.

	小Core		中 Core		大 Core	
	Frep/MHz	Over Limit /dB	Frep/MHz	Over Limit /dB	Frep/MHz	Over Limit /dB
Vertical-Low Frequency	36.480 87.780 136.920	-5.60 -7.70 -8.43	136.920	-8.94	OK	OK
Vertical-High Frequency	OK	OK	OK	OK	OK	OK
Horizontal- Low Frequency	100.470 137.190 230.070 243.570	-10.20 -10.45 -14.47 -11.62	OK	OK	100.200 223.320 228.720	-9.97 -7.94 -7.44
Horizontal- High Frequency	OK	OK	OK	OK	OK	OK

五. ESD
5.1



程智科技股份有限公司
Compliance Certification Services Inc.

表格編號: FM-022A
版本: R03
文件編號: PA-022

Electrostatic Discharge Test Record



Customer: <u>士達</u>	Test Date: <u>2004/6/11</u>
EUT Name: <u>Keyboard</u>	Temp: <u>20</u> °C; Hum: <u>60</u> %; Press <u>1015</u> mbar
M/N: <u>TP66P03- A case</u>	Tester: <u>Alex Pan</u>
Test Mode: <u>Normal</u>	Supervisor: <u>Spring Wang</u>

Item	Voltage (kV)		Results		Remark
			Pass	Fail	
Air Discharge	+	8	✓		
	-	8	✓		
Contact Discharge	+	4	✓		
	-	4	✓		
Indirect Discharge HCP	+	4	✓		垂直水平板打-4KV 皆會使 Keyboard 產生誤動作再恢復
	-	4	✓		
Indirect Discharge VCP (Front)	+	4	✓		
	-	4	✓		
Indirect Discharge VCP (Left)	+	4	✓		
	-	4	✓		
Indirect Discharge VCP (Back)	+	4	✓		
	-	4	✓		
Indirect Discharge VCP (Right)	+	4	✓		
	-	4	✓		

Criteria : A B C

5.2


程智科技股份有限公司 表格編號: FM-022A
 Compliance Certification Services Inc. 版本: R03
 文件編號: PA-022

Electrostatic Discharge Test Record



Customer: <u>士凌</u>	Test Date: <u>2004/6/11</u>
EUT Name: <u>Keyboard</u>	Temp: <u>20</u> °C; Hum: <u>60</u> %; Press <u>1015</u> mbar
M/N: <u>TP66P04-A case</u>	Tester: <u>Alex Pan</u>
Test Mode: <u>Normal</u>	Supervisor: <u>Spring Wang</u>

Item	Voltage (kV)		Results		Remark
			Pass	Fail	
Air Discharge	+	8	✓		
	-	8	✓		
Contact Discharge	+	4	✓		
	-	4	✓		
Indirect Discharge HCP	+	4	✓		垂直水平板打-4KV 皆會使 Keyboard 產生誤動作再恢復
	-	4	✓		
Indirect Discharge VCP (Front)	+	4	✓		
	-	4	✓		
Indirect Discharge VCP (Left)	+	4	✓		
	-	4	✓		
Indirect Discharge VCP (Back)	+	4	✓		
	-	4	✓		
Indirect Discharge VCP (Right)	+	4	✓		
	-	4	✓		

Criteria : A B C

PS.ESD 對於不同的外殼(Housing)條件會有直接影響,本報告僅根據此測試依據.

六. EFT
6.1



程智科技股份有限公司
Compliance Certification Services Inc.

表格編號: FM-024A
版本: R03
文件編號: PA-024

Electrical Fast Transient/Burst Test Record



Customer: 士凌 Test Date: 2004/6/11
 EUT Name: Keyboard Temp: 20 °C; Hum: 60 %; Press 1015 mbar
 M/N: TP66P03- A case Test Mode: Normal
 Voltage: Direct 1 kV Tester: Alex Pan Supervisor: Spring Wang
 Clamp _____ kV

Inject Line	Inject Method	Results		Inject Line	Inject Method	Results	
		Pass	Fail			Pass	Fail
L1	Direct	√			Clamp		
N	Direct	√			Clamp		
PE	Direct	√			Clamp		
L1+N	Direct	√			Clamp		
L1+PE	Direct	√			Clamp		
N+PE	Direct	√			Clamp		
L1+N+PE	Direct	√			Clamp		
	Direct				Clamp		
	Direct				Clamp		
	Direct				Clamp		
	Direct				Clamp		

Remark : L1+N+PE 打出KV 時, 會使 Keyboard 產生誤動作, 再恢復

Criteria : A B C

6.2


程智科技股份有限公司 表格編號: FM-024A
 Compliance Certification Services Inc. 版 本: R03
 文件編號: PA-024



Electrical Fast Transient/Burst Test Record

Customer: 十凌 Test Date: 2004/6/11
 EUT Name: Keyboard Temp: 20 °C; Hum: 60 %; Press 1015 mbar
 M/N: TP66P04- A case Test Mode: Normal
 Voltage: Direct 1 kV
 Clamp _____ kV Tester: Alex Pan Supervisor: Spring Wang

Inject Line	Inject Method	Results		Inject Line	Inject Method	Results	
		Pass	Fail			Pass	Fail
L1	Direct	✓			Clamp		
N	Direct	✓			Clamp		
PE	Direct	✓			Clamp		
L1+N	Direct	✓			Clamp		
L1+PE	Direct	✓			Clamp		
N+PE	Direct	✓			Clamp		
L1+N+PE	Direct	✓			Clamp		
	Direct				Clamp		
	Direct				Clamp		
	Direct				Clamp		
	Direct				Clamp		

Remark: L1+N+PE 打±1KV 時, 會使 Keyboard 產生誤動作, 再恢復

Criteria: A B C