



Test Report for Part 15

Report number: STD-FCC-06020

Type of EUT: LCD Monitor

Model number: XG20ST

Applicant: DOOSOL SYSTEM Co.,Ltd.

Applied standards: FCC Part 15 Subpart B(Class B)

The above mentioned EUT had been tested by EMC Laboratory of Standard Engineering Company in order to confirm the compliance with the requirements of FCC rules and this test was executed in accordance with the measurement method specified in ANSI C63.4-2003

I hereby certify that the accuracy of test-data is true and correct with my best knowledge and belief. Also I prove this measurement was performed by qualified person.

Date of tested: 2006-12-05

Date of Issued: 2006-12-06

Tested by: 
SM Kim / Test Engineer

Approved by: 
SS Seo / Senior Researcher



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1. General Information

1.1 Product information

Description of EUT : LCD Monitor

Model number : XG20ST

Specification : Adapter Input : 100-240Va.c., 50/60Hz, 1.8A
Output : 19Vd.c., 3.16A

Applied Standard : FCC Part 15 subpart B (Class B)

Test method : ANSI C63.4 - 2003

1.2 Client information

Applicant : DOOSOL SYSTEM Co.,Ltd.

Address : NO.206 Ilsan Techno Town, 1141-1 Backsuck-Dong,
Ilsandong-Gu, Goyang-City, Kyonggido, Korea.

Phone No. : +82-31-907-1997

Fax. No. : +82-31-908-1997

Contact person : Kim, Won Ho / Manager / whkim@doosol.com

Manufacturer : DOOSOL SYSTEM Co.,Ltd.

Address : NO.206 Ilsan Techno Town, 1141-1 Backsuck-Dong,
Ilsandong-Gu, Goyang-City, Kyonggido, Korea.

Phone No.: +82-31-907-1997

Fax. No.: +82-31-908-1997



2. Information of EMC Laboratory

Name of test laboratory

Standard Engineering Co., Ltd.

Location

377-11 Sinjang-Ri, Eumam-Myeon, Seosan-Si Chungnam, Korea

Phone No. : +82-41-663-9436~7

Fax. No. : +82-41-663-9434

FCC Filing Number : 624439

Environment of Laboratory

This location can keep accuracy in measuring more than anywhere because surrounding noise ambient is low and silent excellently to be suitable in EMI's measuring.

Map



3. Procedure of measurement

3.1 Conducted emissions

3.1.1 Configuration of measurement

This measurement executed in shield-room and EUT was tested on 0.8m height wooden table located on the floor with 0.1m distance from the reference ground plane.

EUT's rear part had a distance from VCP(Vertical Conducted Plane) with 0.4m length and LISN placed on the grounded plane with 1m distance from EUT's side part .

Excess power cord and cables fixed in bundle style of 30~40cm length with non-inductive material, and power line was connected to power source through LISN to detect maximum EMI without external RFI from aux. instruments.

For the measurement, 'H' scroll pattern was applied to the EUT with maximum resolution (1600x1200) in order to detect maximum electromagnetic disturbance from the EUT.

Measuring equipments and EUT confirmed that warming-up was performed during enough time and calibration of antenna as well as calibration of measuring equipment also completed beforehand.

This measurement was performed on condition of worst-case emission.

3.1.2 Detector function selection and bandwidth

During conducted emission measurement, a radio noise meter that has a CISPR quasi-peak detector with 10 kHz IF bandwidth of 6 dB was utilized.

3.1.3 Frequency range to be scanned

For conducted emissions measurement, frequency range of 150 kHz to 30 MHz included, was investigated.

3.1.4 Line impedance stabilization network (LISN)

A LISN with characteristics that conform to the requirements of ANSI C63.4-2003 was used for the measurement of conducted power-line radio noise; (50 micro-henries / 50 ohms). Chassis and earth-points for grounding of the LISN were earth-grounded.

3.2 Radiated Emissions

3.2.1 Configuration of measurement

Preliminary measurement was performed in 3 meter semi-anechoic chamber to detect correct EMI frequency. For detecting the EMI frequency in semi-anechoic chamber, TRILOG antenna used on 30-1000MHz band.

Final measurement was executed at 3 meters OATS(Open Area Test Site) using Quasi-peak detector and TRILOG antenna.

EUT was placed on 0.8m height wooden table located on the floor with 0.1m distance from the reference ground plane.

Excess power cord and other excess cables fixed in bundle style of 30~40cm length with non-inductive material to detect maximum EMI emission from EUT.

For the measurement, 'H' scroll pattern was applied to the EUT with maximum resolution (1600x1200) in order to detect maximum electromagnetic disturbance from the EUT.

Measuring equipments and EUT confirmed that warming-up was performed during enough time and calibration of antenna as well as calibration of measuring equipment also completed beforehand.

Measurement antenna height was varied 1 to 4 meters and set position in both horizontal and vertical plane to search maximum EMI emission frequency.

3.2.2 Detector function selection and bandwidth

In radiated emissions measurement, a field strength meter that has a CISPR quasi-peak detector was used. The 6 dB bandwidth of the detector of instrument is 120 kHz over frequency range of 30 to 1000 MHz.

3.3 Method of Calculations

3.3.1 Unit of Conducted emission measurement

Conducted Emission Test results for conducted emissions are reported in micro-volts.

3.3.2 Unit of Radiated emission measurement

Test results of radiated emissions measurement are reported in micro-volts per meter at the specific distance. Using the unit of dBuV on the test instrument, the indication unit was converted to field strength unit of uV/m as following method;

$$F (uV/m) = 10^{\{(R+CL+AF)/20\}} (uV/m)$$

F: Field Strength in uV/m, R: Meter Reading Level in dB(uV),

CL: Cable Loss from antenna to meter in dB,

AF: Antenna Factor of receiving antenna in dB(/m)

Sample calculation (Radiated emission)

Emission level is calculated as follows;

Emission Level(dBuV/m)

= Reading Level + Ant. Factor + Cable Loss – Amp Gain

Margin Level is calculated as follows;

Margin(dBuV) = Limit Level – Emission Level

Example) Standard limit = 40 dBuV/m,

Reading Level = 10 dBuV,

Ant. Factor = 15 dB,

Cable Loss= 1 dB

External Amp Gain= 0 dB

Emission Level(dBuV/m) = 10 + 15 + 1 - 0 = 26 (dBuV/m)

Margin(dBuV) = 40 – 26 = 14 (dBuV)

4. Environments of measurement

4.1 Conditions of environment

Shield room	Temperature	18 °C
	Humidity	43 %
	Pressure	1020 hPa
OATS	Temperature	12 °C
	Humidity	61 %
	Pressure	1020 hPa

4.2 Measurement uncertainty

All measurements, especially EUT's measurement includes uncertain level that can happen for the reason as following;

Variation of antenna factor by changes of height, center, polarization, directivity.

Uncertainty factor by change of measurement distance, site's imperfection.

Radiated emissions measurements: ± 4 dB

Power line conducted emission measurements: ± 3 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurement uncertainty was calculated in accordance with NAMAS NIS 81 : The treatment of uncertainty in EMC measurement.”

The measurement uncertainty was given with a confidence of 95%.

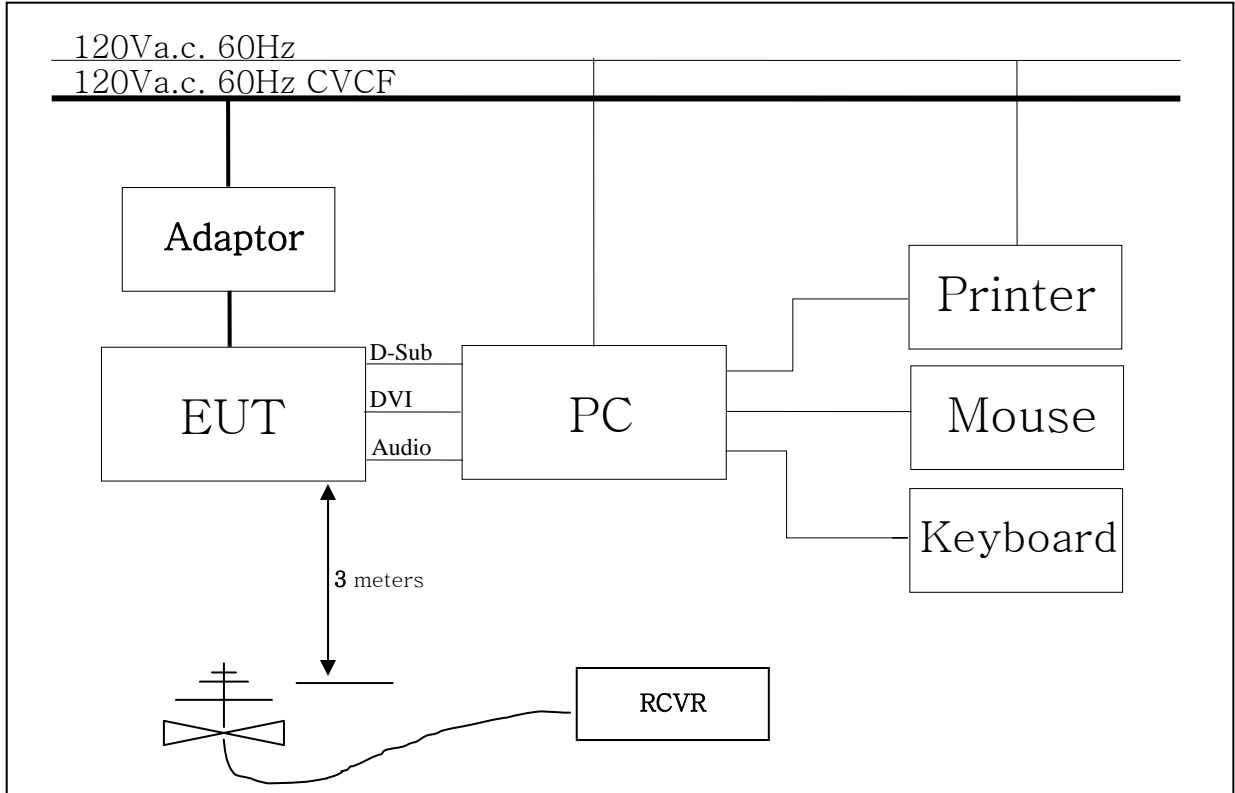
4.3 List of Test equipments

Used	Equipment	Maker	Model No.	S/No.	Cal.due date.
<input checked="" type="checkbox"/>	EMI Test Receiver	Rhode & Schwarz	ESIB7	100119	05/24/2007
<input checked="" type="checkbox"/>	Spectrum Analyzer	ADVANTEST	R3132	130300485	09/15/2007
<input type="checkbox"/>	Artificial Mains	Rhode & Schwarz	ESH2-Z5	100064	09/15/2007
<input checked="" type="checkbox"/>	Artificial Mains	Rhode & Schwarz	ESH3-Z5	100204	09/15/2007
<input type="checkbox"/>	Signal Generator	Rhode & Schwarz	SML03	101003	01/27/2007
<input type="checkbox"/>	Absorbing Clamp	Rhode & Schwarz	MDS-21	100076	09/21/2007
<input checked="" type="checkbox"/>	TRILOG Antenna	Schwarzbeck	VULB9163	164	05/24/2007
<input type="checkbox"/>	2 Wire ISN	Rhode & Schwarz	ENY22	10086	N/A
<input type="checkbox"/>	4 Wire ISN	Rhode & Schwarz	ENY41	100095	N/A
<input checked="" type="checkbox"/>	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100137	N/A
<input type="checkbox"/>	Attenuator	Rhode & Schwarz	DNF	100041	N/A
<input type="checkbox"/>	Attenuator	Rhode & Schwarz	MDS-2	100274	N/A
<input type="checkbox"/>	Ferrite Clamp	Rhode & Schwarz	EZ-24	100002	N/A

4.4 List of Peripherals & Cables

Used	Descriptions	Maker	Type	S/No.	Approval
<input checked="" type="checkbox"/>	Reference PC set	Jooyontech	JTET320	JT03ZAB01ZDC146	Class B CE/FCC MIC/VCCI
<input checked="" type="checkbox"/>	Reference Printer	EPSON	P730A	60H0187628	
<input type="checkbox"/>	Reference Printer	HP	Deskjet 540	US52M1B0NF	
<input type="checkbox"/>	DC Power Supply	HP	6574A	US36340515	CE
<input checked="" type="checkbox"/>	M/W Cable/2GHz 5m	H+Suhner	SF104/2x11BNC	14354	
<input type="checkbox"/>	M/W Cable/2GHz10m	“	“	14353	
<input type="checkbox"/>	M/W Cable/18GHz18m	“	SF104/2x11N	6025	
<input checked="" type="checkbox"/>	M/W Cable/18GHz18m	“	“	6026	
<input type="checkbox"/>	M/W Cable/18GHz10m	“	“	6027	
<input checked="" type="checkbox"/>	M/W Cable/2GHz43m	Thermax	MS-P400		
<input type="checkbox"/>	Color monitor/composit	Samsung	SCM-14		
<input type="checkbox"/>	Function Generator	HP	3311A	1244A25104	
<input checked="" type="checkbox"/>	CCD Color Camera	Sung Eun	PSS-C5327		

4.5 Configuration of EUT



Used Peripherals

Descriptions	Maker	Type	S/No.	Remarks
EUT	DOOSOL SYSTEM Co.,Ltd.	PL-177D	N/A	
Adapter	HUA JUNG COMP. Co., Ltd.	HASU05K	N/A	
Personal Computer	Jooyontech Co., Ltd.	JTET320	JT03ZAB01ZDC146	
Printer	EPSON	Action 3250	60H0187628	
Mouse	DELL	MO56UD	337000527	
Key-board	SAMSUNG	KB3T082SPXAB	3BH-1735	

EUT Operation

Scrolling "H" Pattern D-Sub & DVI Mode. (1600 x 1200, 60Hz)

4.6 Rating and Physical Characteristics

Display	UXGA screen TFT-LCD Aspect Ratio : 4:3 Resolution : 1600x1200 Screen Size : 20.1(diagonal) Brightness : 300 cd/m2 Contrast : 800:1 Response Time : 8ms Color Capacity :16.7 Million color
Video	Digital : 480i/p, 720i/p, 1080i/p 3D Comb / De-Interlacer / Picture Mode
Audio	Power Amp : 2.5Watts x 2(RMS) Stereo, MTS
Function	PIP / POP / PBP / Picture&Sound Swap / Picture Size : 4:3 / Wide / Zoom / Sleep Timer / Auto Setting
Input Signal	Component(DTV/DVD) / Composite / RF
Ouput Signal	Analog RGB / DVI / S-Video / Audiox2 / PC-Audio PC-Audio
PC Compatibility	Resolution : UXGA(60Hz) Auto Color and Position Adjustment Brightness and Contrast Control Phase Control, Sharpness Control
Key Features	VESA Standard mountiong holes

5. Result of Measurement

5.1 Conducted Emission

5.1.1 Test data

Frequency [MHz]	Line	Limit[dBuV]		Result[dBuV]		Factor [dB]	Margin[dBuV]	
		QP	AV	QP	AV		QP	AV
D-Sub Mode								
0.160	N	65.46	55.46	42.50	16.30	14.16	22.96	39.16
0.165	L	65.21	55.21	42.58	19.21	14.15	22.63	36.00
0.190	N	64.04	54.04	48.07	39.89	14.06	15.97	14.15
0.260	L	61.43	51.43	32.97	18.30	13.81	28.46	33.13
0.285	N	60.67	50.67	37.56	30.30	13.72	23.11	20.37
0.325	L	59.58	49.58	30.21	21.16	13.58	29.37	28.42
0.420	N	57.45	47.45	27.07	18.53	13.24	30.38	28.92
0.515	N	56.00	46.00	24.49	17.76	12.91	31.51	28.24
0.805	N	56.00	46.00	29.11	26.53	11.88	26.89	19.47
DVI Mode								
0.190	N	64.04	54.04	48.01	40.01	14.06	16.03	14.03
0.230	N	62.45	52.45	35.72	25.30	13.92	26.73	27.15
0.295	N	60.38	50.38	30.61	15.77	13.69	29.77	34.61
0.330	L	59.45	49.45	35.88	29.03	13.56	23.57	20.42
0.360	N	58.73	48.73	27.80	16.56	13.46	30.93	32.17
0.520	L	56.00	46.00	28.67	25.87	12.89	27.33	20.13
0.850	N	56.00	46.00	32.51	28.07	11.72	23.49	17.93

* Detector function was set into Quasi-peak & Average mode.

* Factor = LISN Factor + Cable loss + Pulse Limiter

5.1.2 Result

Complied

5.2 Radiated Emission

5.2.1 Test data

Frequency [MHz]	Polarization [Ver/Hor]	Limit [dBuV/m]	Result [dBuV/m]	Factor [dB]	Margin [dBuV/m]
D-Sub Mode					
36.00	V	40.00	31.86	12.56	8.14
170.84	V	43.50	40.14	9.32	3.36
208.36	V	43.50	39.85	11.58	3.65
228.12	V	46.00	36.60	12.36	9.40
366.60	H	46.00	42.26	16.43	3.74
512.24	V	46.00	40.75	18.68	5.25
831.36	H	46.00	35.58	24.03	10.42
DVI Mode					
32.08	V	40.00	25.46	11.94	14.54
170.84	V	43.50	40.13	9.32	3.37
208.08	V	43.50	35.27	11.57	8.23
228.16	V	46.00	36.73	12.36	9.27
366.56	H	46.00	41.29	16.43	4.71
512.28	V	46.00	39.46	18.68	6.54
702.00	H	46.00	42.65	22.26	3.35
853.88	V	46.00	42.51	24.39	3.49

* Detector function was set into Quasi-peak mode.

* Factor = Antenna factor + Cable loss

* External Amp Gain : 0 dB

5.2.1 Result

Complied

6. Attachments

6.1 Sample Label



Labeling Requirements per section 2.925 & 15.19

The label shown shall be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.



6.2 Photographs of Set-up

Conducted emission test (Front)



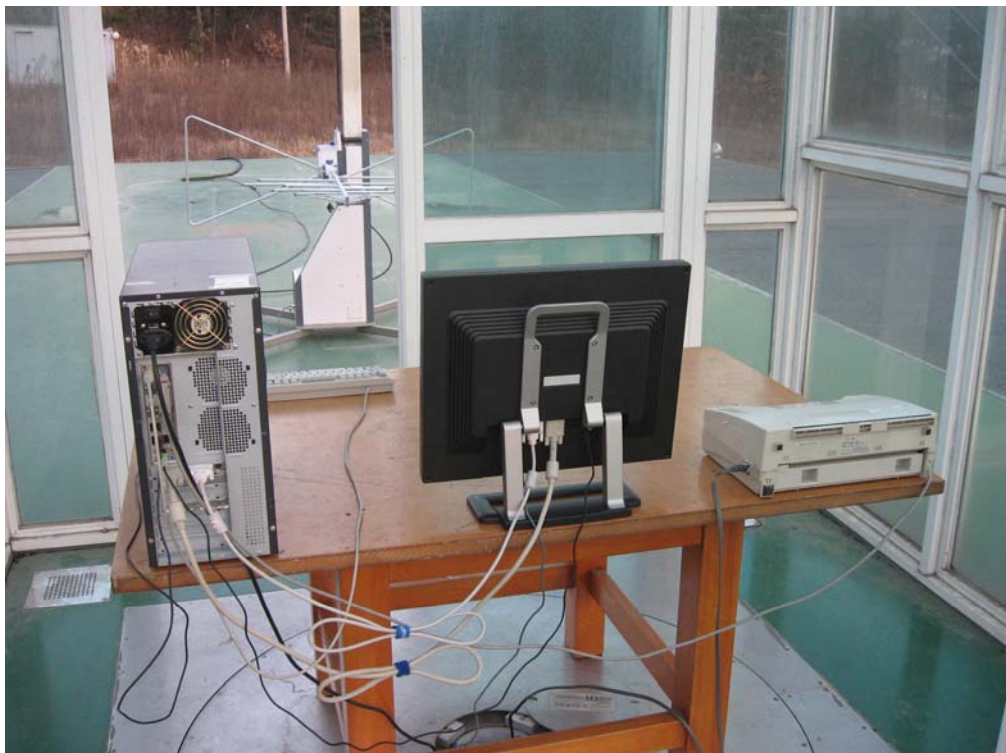
Conducted emission test (Rear)



Radiated Emission (Front)



Radiated Emission (Rear)



6.3 Photographs of EUT

Front View



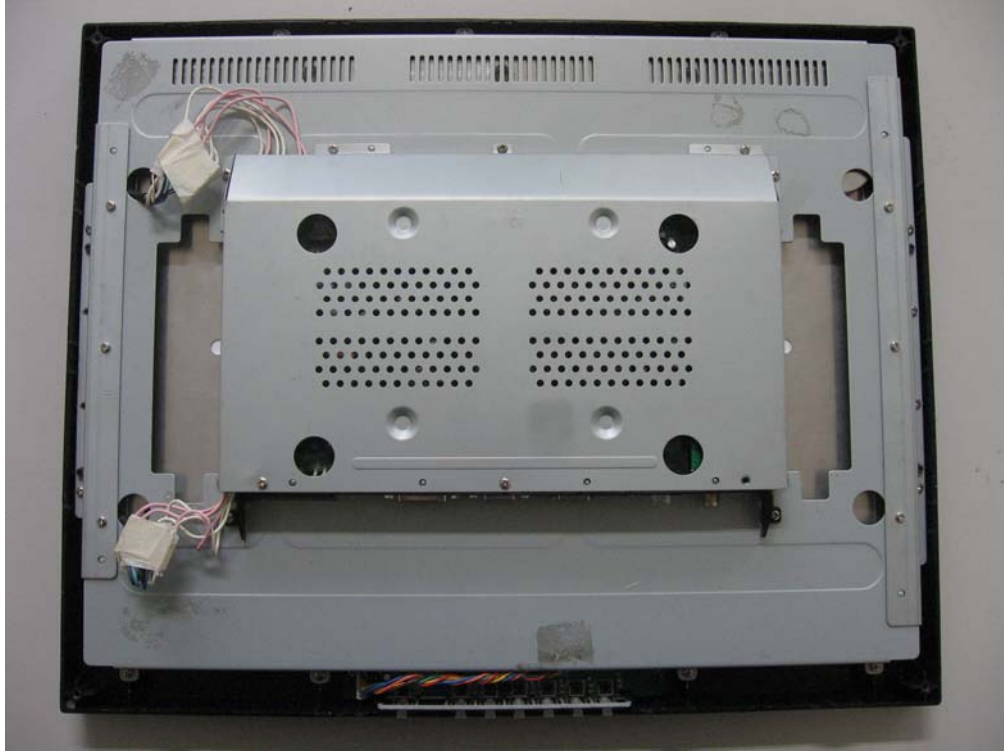
Rear View



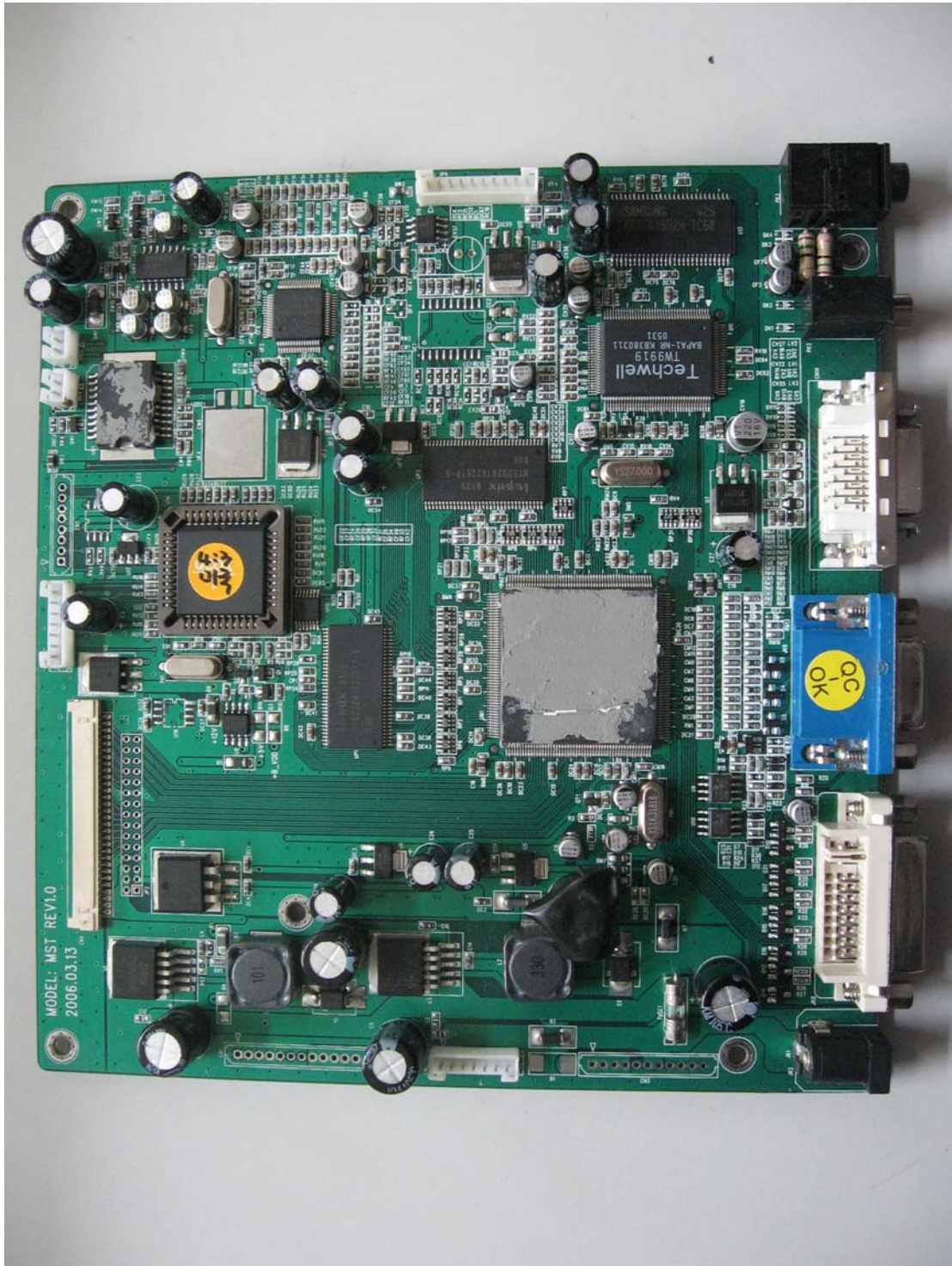
Side View



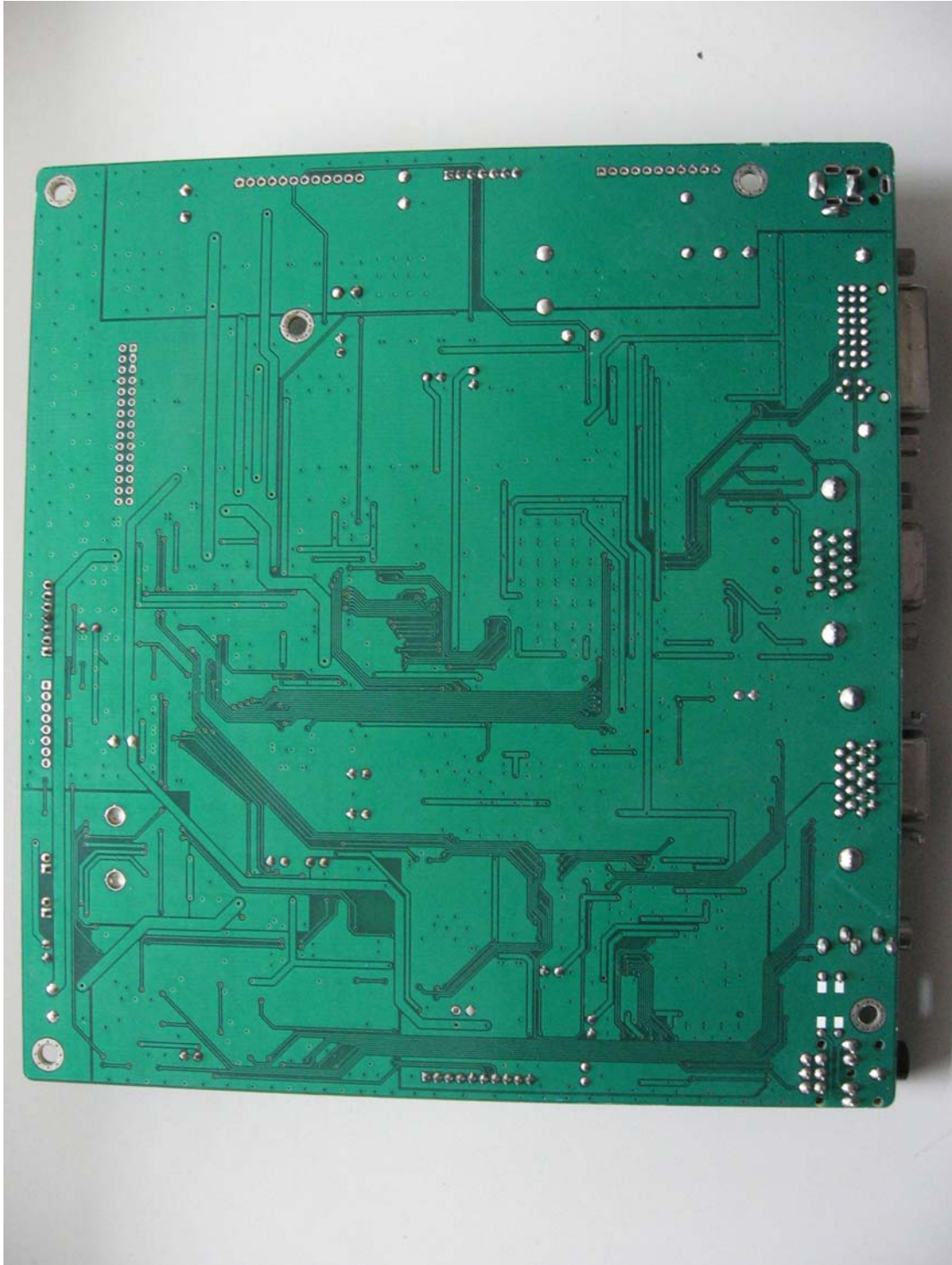
Inside View



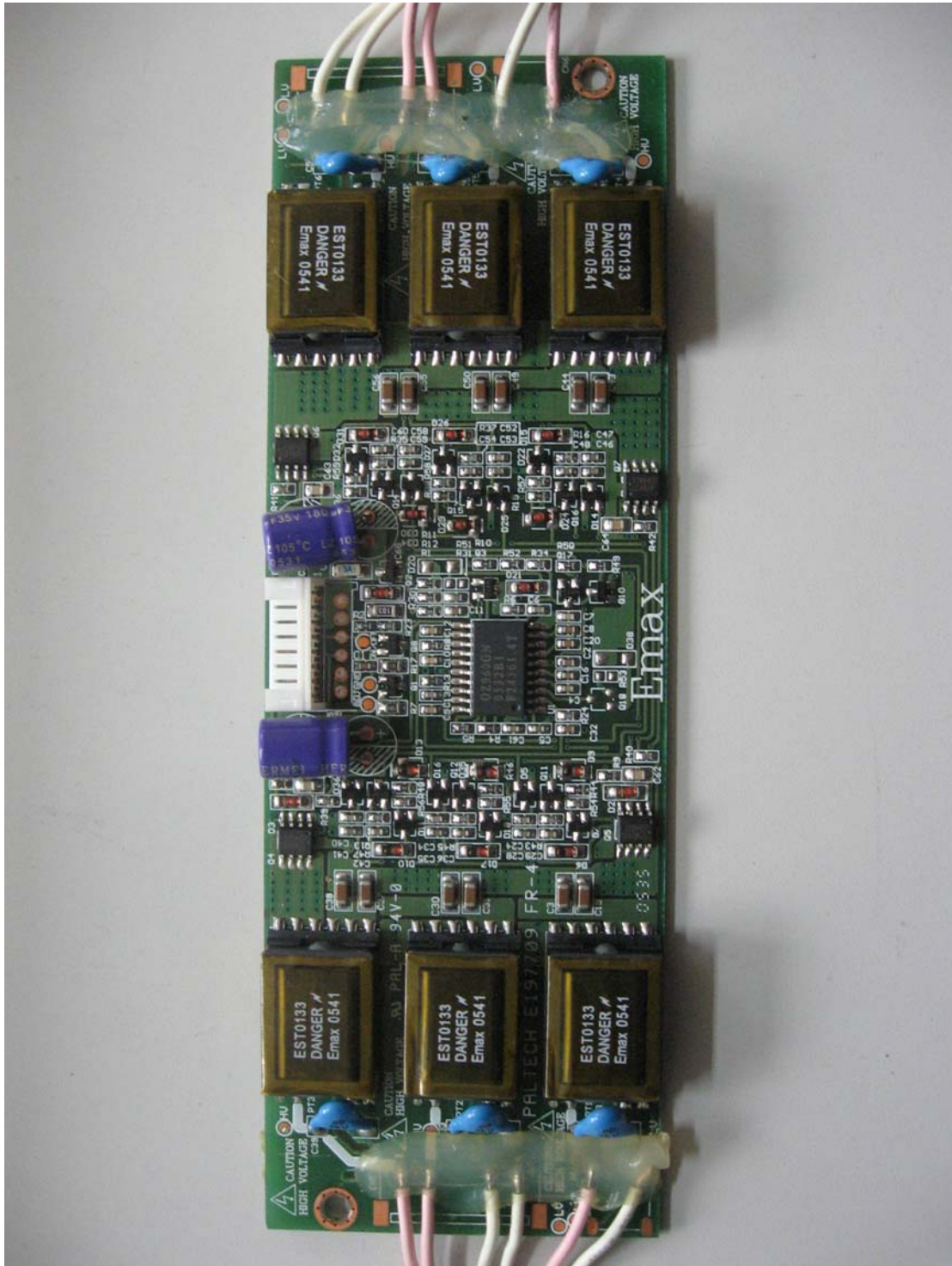
Board I Front



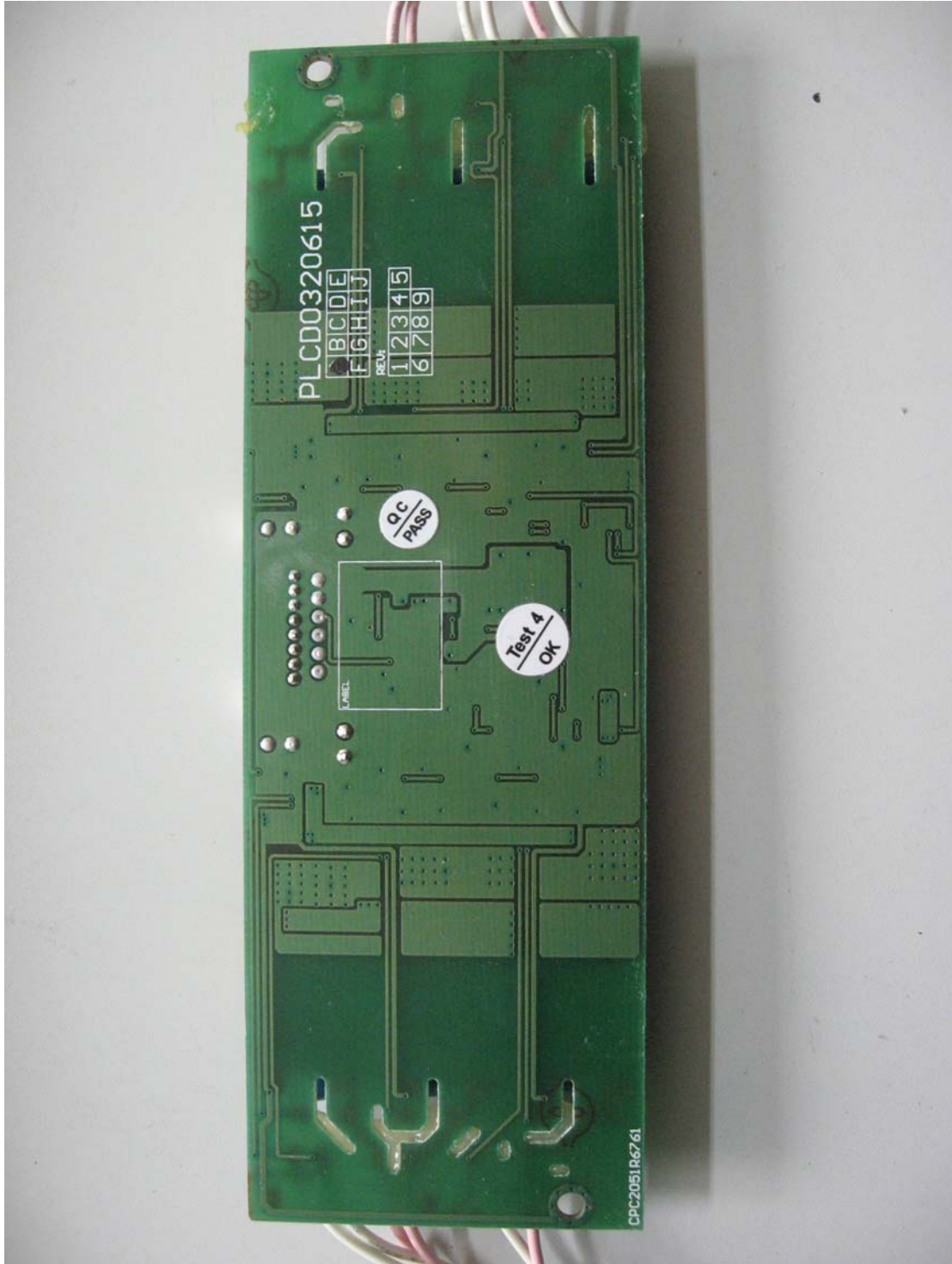
Board I Rear



Board II Front



Board II Rear



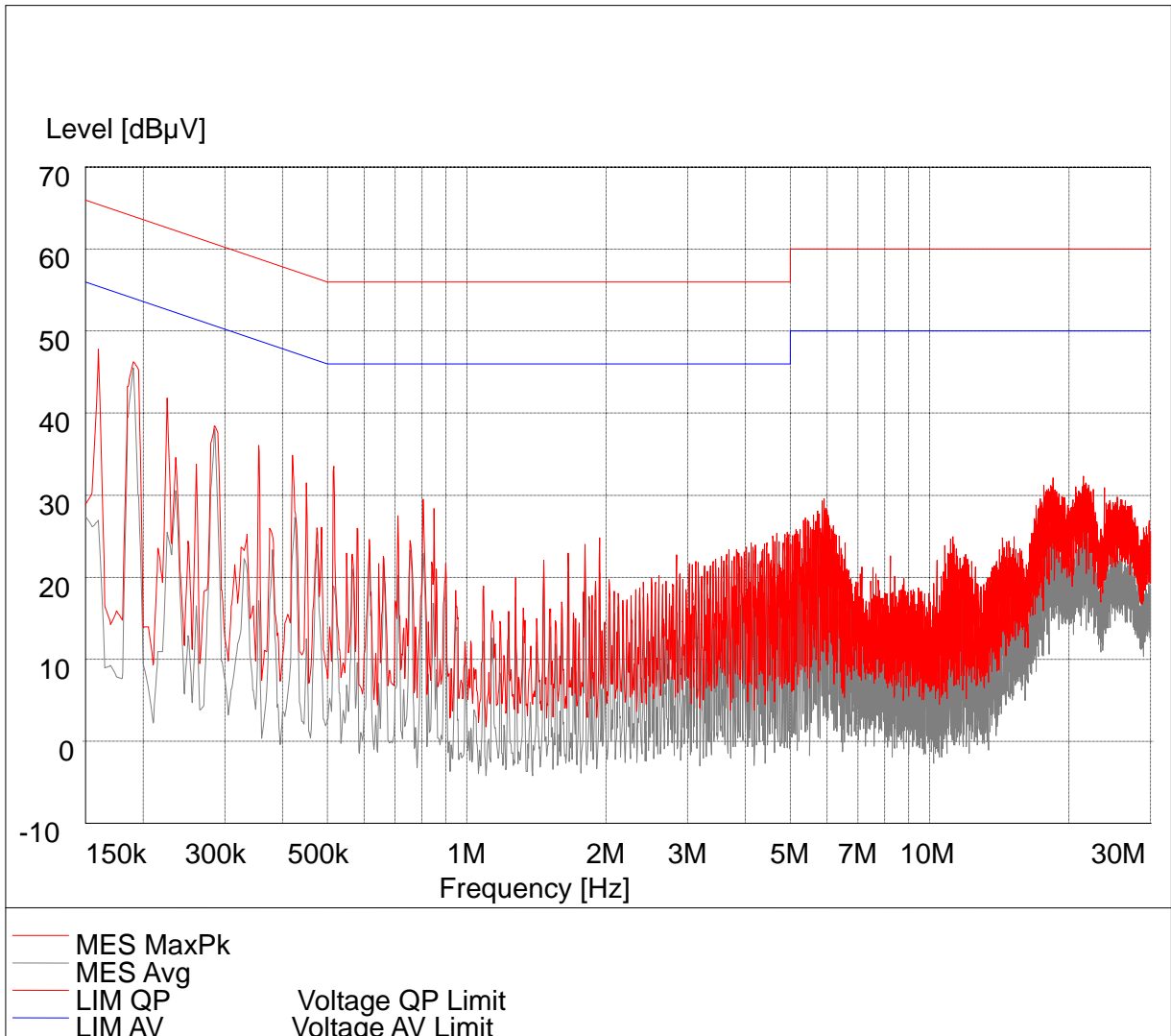
6.4 Data sheet of Conducted Emission

Standard Engineering Co., Ltd.
Conducted Emission Measurement

EUT: XG20ST
Manufacturer: DOOSOL SYSTEM Co.,Ltd.
Operating Condition: D-Sub Mode
Test Site: Shield Room
Operator: SM Kim
Test Specification: Conducted Emission Fcc Part 15 Subpart B / Class B
Comment: Phase N

SCAN TABLE: "ZFCCCEB"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	1.0 ms	9 kHz	ESH3-Z2

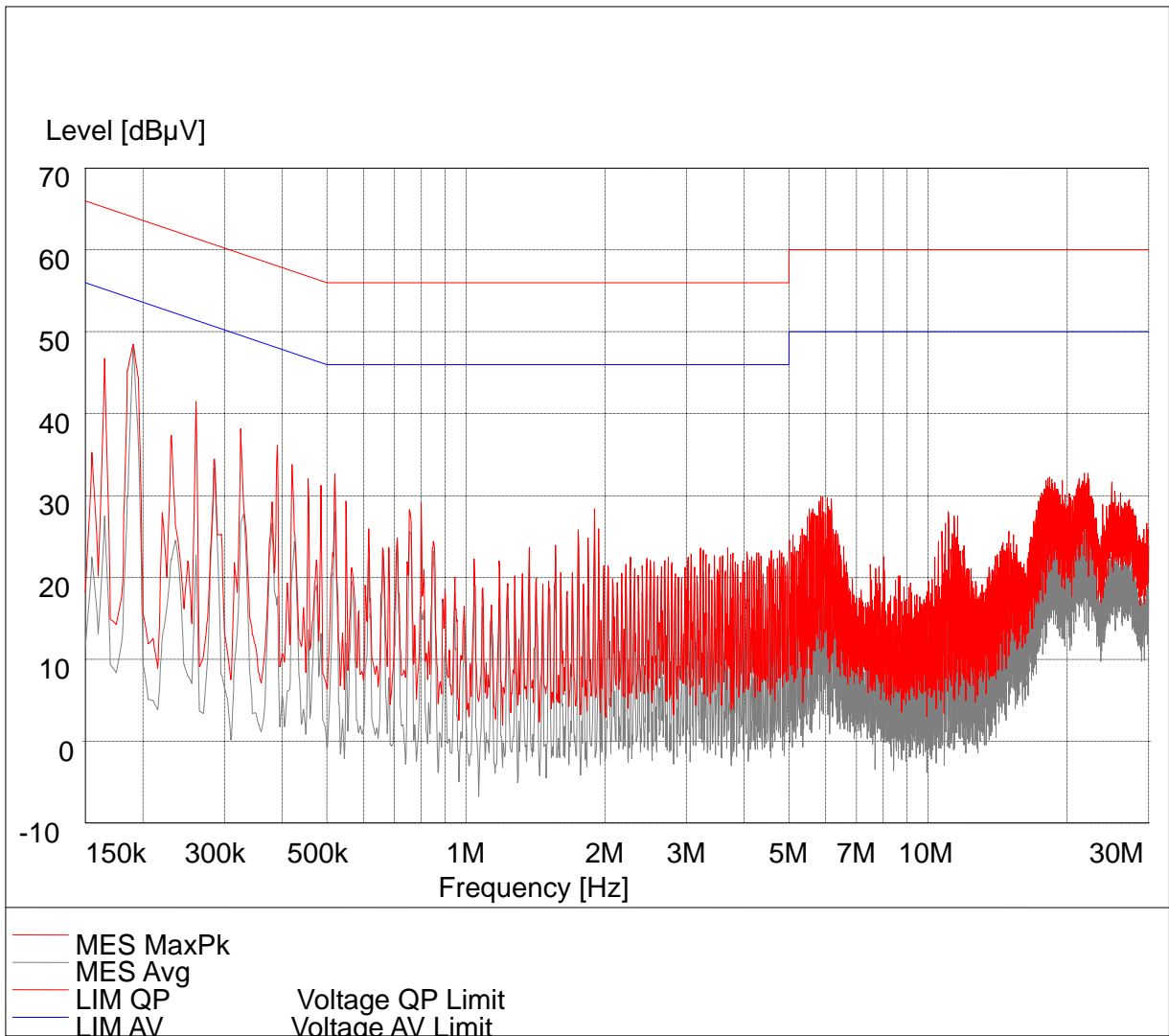


Standard Engineering Co., Ltd.
Conducted Emission Measurement

EUT: XG20ST
 Manufacturer: DOOSOL SYSTEM Co.,Ltd.
 Operating Condition: D-Sub Mode
 Test Site: Shield Room
 Operator: SM Kim
 Test Specification: Conducted Emission Fcc Part 15 Subpart B / Class B
 Comment: Phase L

SCAN TABLE: "ZFCCCEB"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	1.0 ms	9 kHz	ESH3-Z2

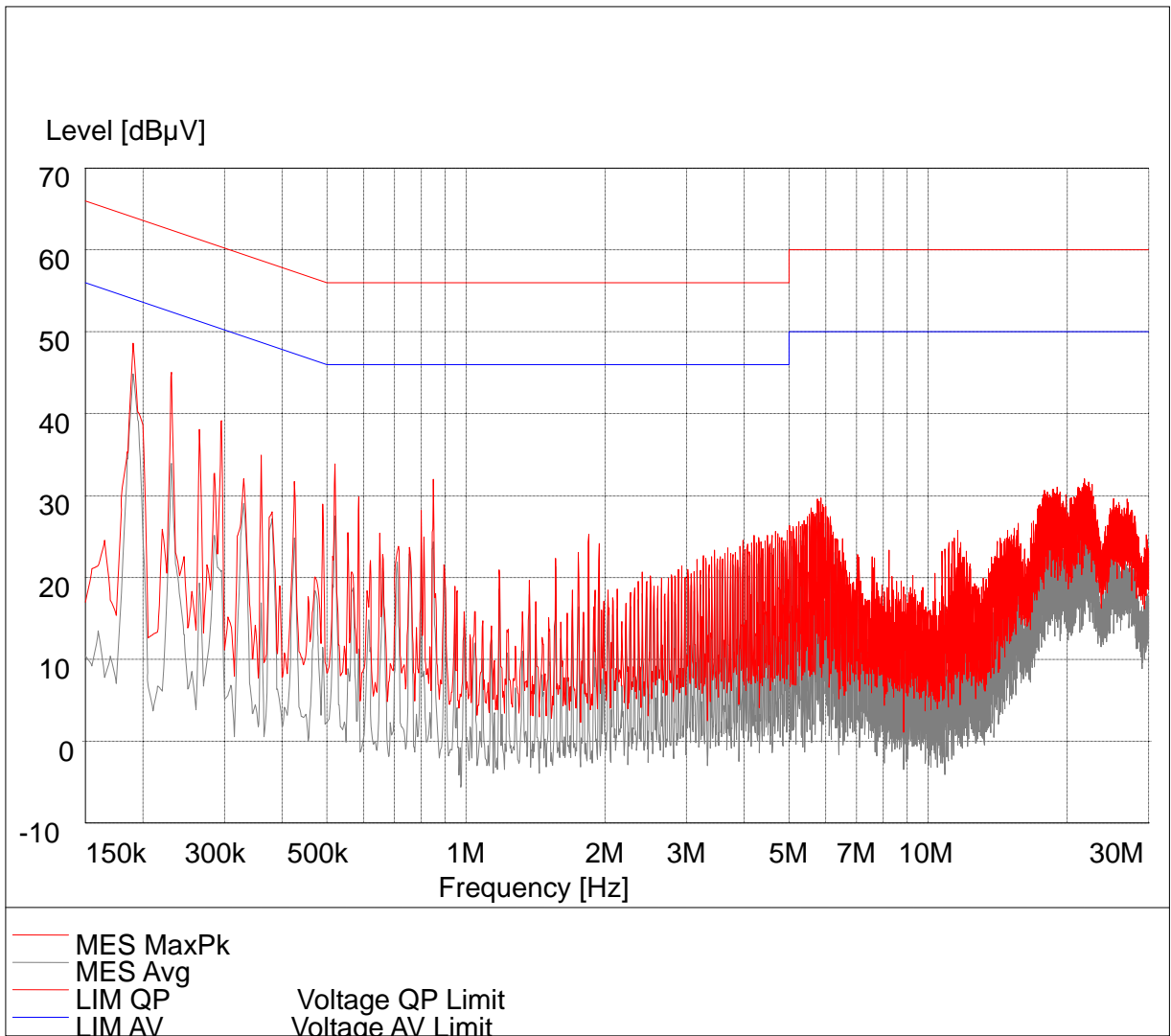


Standard Engineering Co., Ltd.
Conducted Emission Measurement

EUT: XG20ST
 Manufacturer: DOOSOL SYSTEM Co.,Ltd.
 Operating Condition: DVI Mode
 Test Site: Shield Room
 Operator: SM Kim
 Test Specification: Conducted Emission Fcc Part 15 Subpart B / Class B
 Comment: Phase N

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150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	1.0 ms	9 kHz	ESH3-Z2

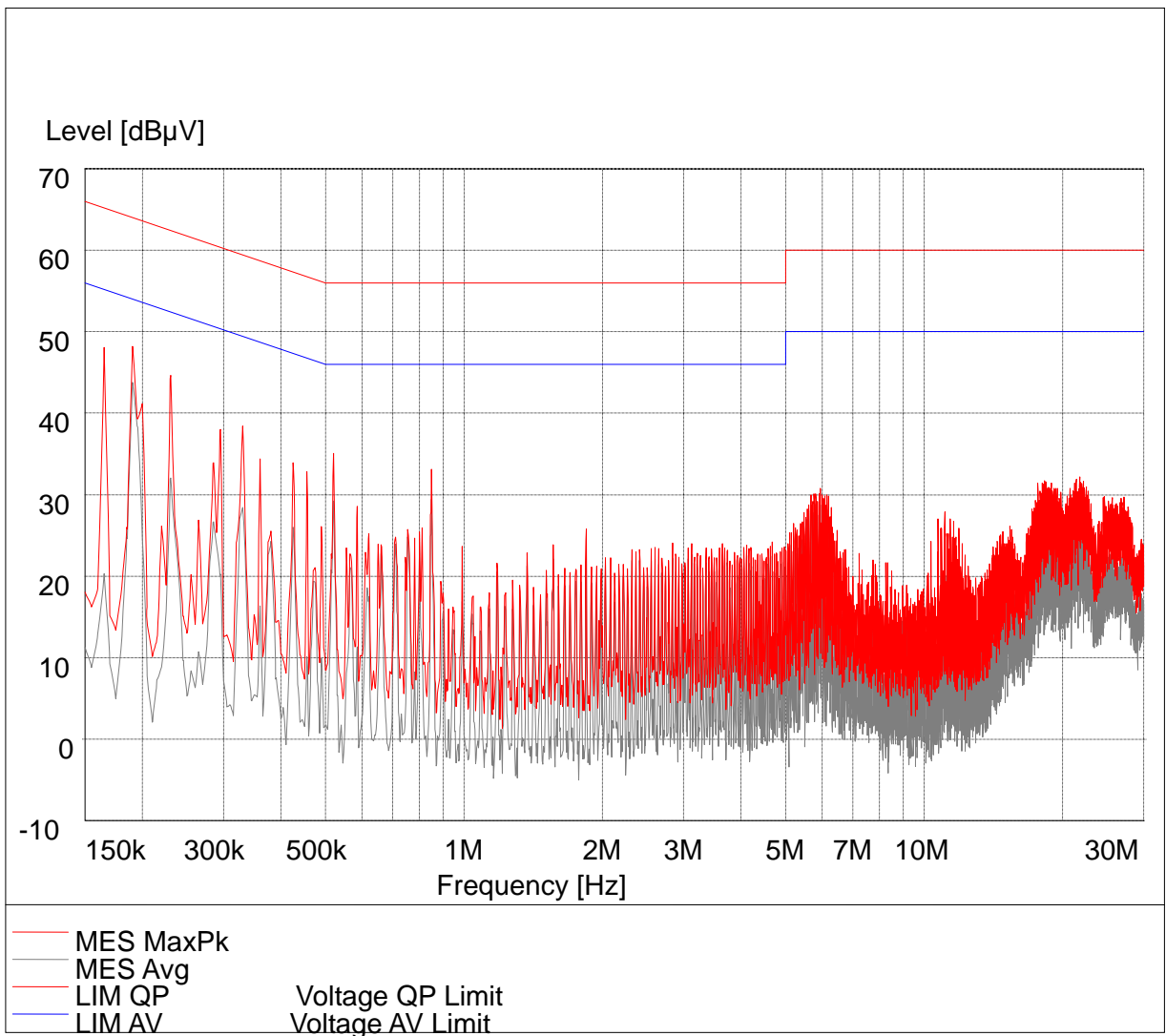


Standard Engineering Co., Ltd.
Conducted Emission Measurement

EUT: XG20ST
 Manufacturer: DOOSOL SYSTEM Co.,Ltd.
 Operating Condition: DVI Mode
 Test Site: Shield Room
 Operator: SM Kim
 Test Specification: Conducted Emission Fcc Part 15 Subpart B / Class B
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SCAN TABLE: "ZFCCCEB"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	1.0 ms	9 kHz	ESH3-Z2





6.5 Block Diagram/Circuit

Attached

6.6 User's Manual

Attached

