

Demo Board Test Report for LD7513

--- 5W (5V, 1A) 30mW Charger

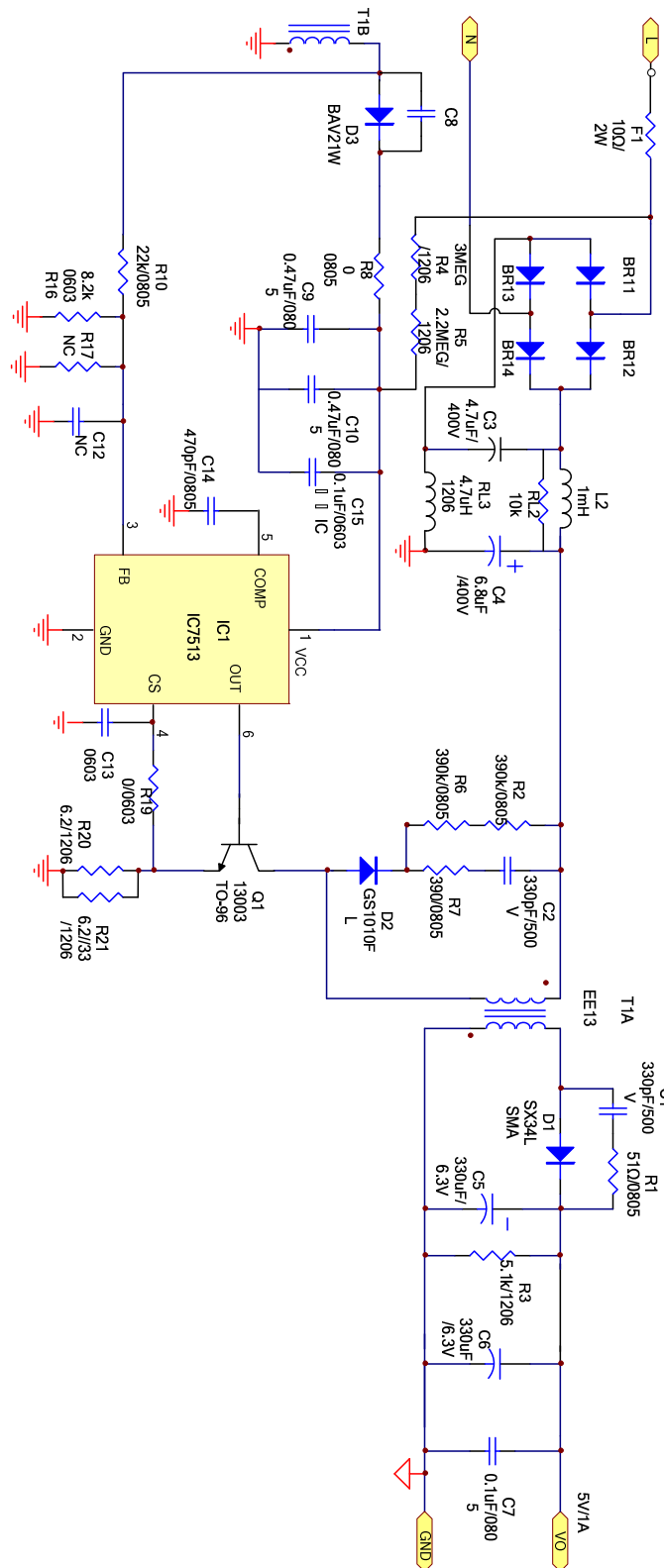
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I. SCHEMATIC



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1. Input Voltage & Frequency

The unit shall be capable of operating as a universal AC input power supply accepting AC inputs. The power supply shall operate between the following voltages (from 100V to 264V). The supply will be designed to operate for a Table 1.

	Minimum	Normal	Maximum
Input Voltage	90Vac	115Vac	264Vac
Frequency	47HZ	60HZ	63HZ

Table 1.

2. Output Loads

The line and load regulation for each of the outputs are shown in Table. 2.

Parameter	Output Voltage			Output Current	
	Minimum	Typical	Maximum	Minimum	Maximum
+5V	4.75V	5V	5.25V	0A	1A
Line Regulation	-5%	/	+5%	/	1A
Load Regulation	-5%	/	+5%	0A	1A

Table 2

3. Green Mode Power Consumption

The no-load input power of power supply shall remain less than 30mW (AC input \leq 230Vac).

Test Condition:

Input: 90Vac/115Vac/230Vac/264Vac (60Hz)

Output: No Load

Ambient Temperature: 25°C (Burn in 30 minutes)

Test Result: PASS

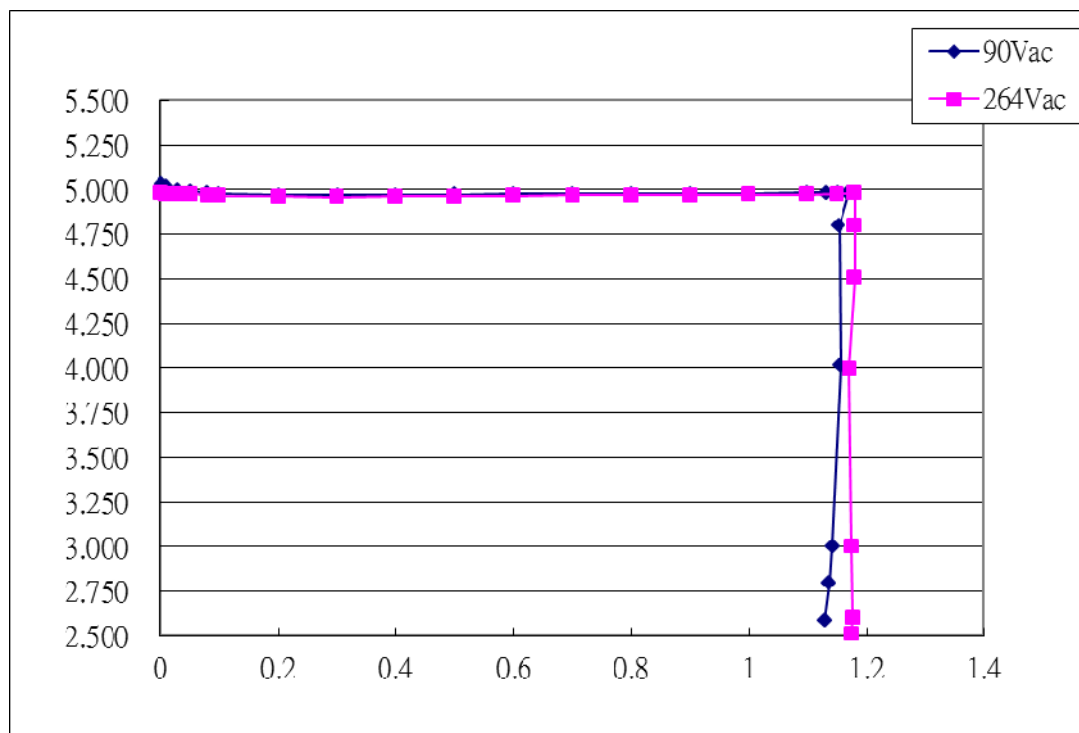
V _{in} (Vac)	P _{out} (W)	P _{in} (mW)
90	No Load	20
115	No Load	21
230	No Load	25
264	No Load	29

Table 3.

4. Load and Line Regulation
Test Conditions:
Input: 100Vac/115Vac/230Vac/264Vac(60Hz)
Ambient Temperature: 25°C

Output voltage is monitored at end of PCB

Table 4. Vo(CV mode) vs. Io(mA)



5. Efficiency Test

The efficiency of power supply shall be measured throughout its specified operating input range and at output maximum load conditions. It should meet Energy Star V2.0 Efficiency Level V.

Test Condition:

Input: 90Vac/115Vac/230Vac/264Vac(60Hz)

Output: 25%、50%、75%、100% of Max Load(1A)

Ambient Temperature: 25°C

Vac (V _{rms})	Pin (W)	Po (W)	Vo (V)	Io (A)	Eff. (%)	Avg. Eff. (%)
115	6.271	4.975	4.98	1.000	79.33	79.36
	4.673	3.728	4.97	0.750	79.78	
	3.110	2.480	4.97	0.500	79.74	
	1.578	1.240	4.96	0.250	78.58	
230	6.270	4.978	4.977	1.000	79.39	78.31
	4.709	3.727	4.972	0.750	79.15	
	3.173	2.485	4.964	0.500	78.32	
	1.622	1.239	4.954	0.250	76.39	

Table 5.

6. Output Dynamic Response

Test Condition:

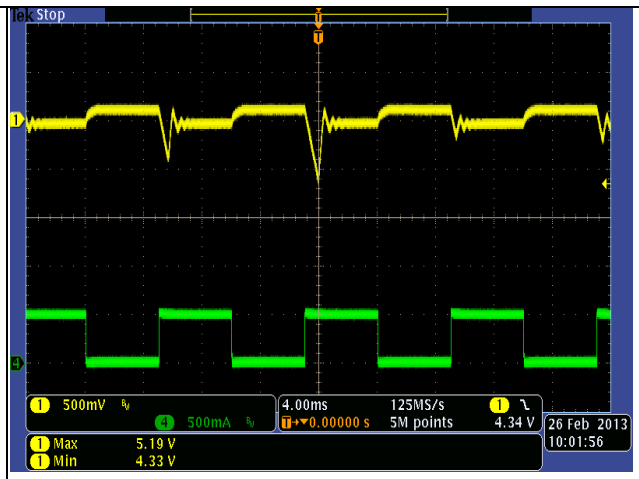
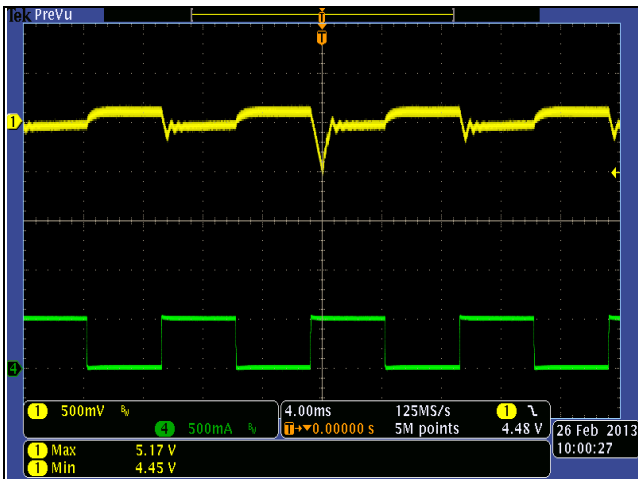
Input: 90Vac/264Vac

Otput: 0 to 0.5A, 0.5 to 1A, Frequency: 100Hz, Duty: 50%, Slew Rate: 0.1A/us

Ambient Temperature: 25°C

Input	Output Dynamic	Reading	
		V _H	V _L
90Vac	0→0.5A	5.17	4.45
264Vac	0→0.5A	5.19	4.33
90Vac	0.5→1A	5.10	4.86
264Vac	0.5→1A	5.10	4.87
SPEC	Max/Min	5.25	4.20

Table 6



Output Load Dynamic Response

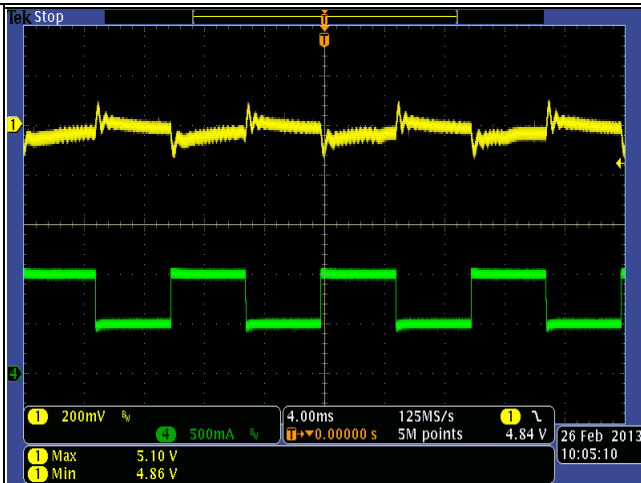
Fig.1

Output Load Dynamic Response

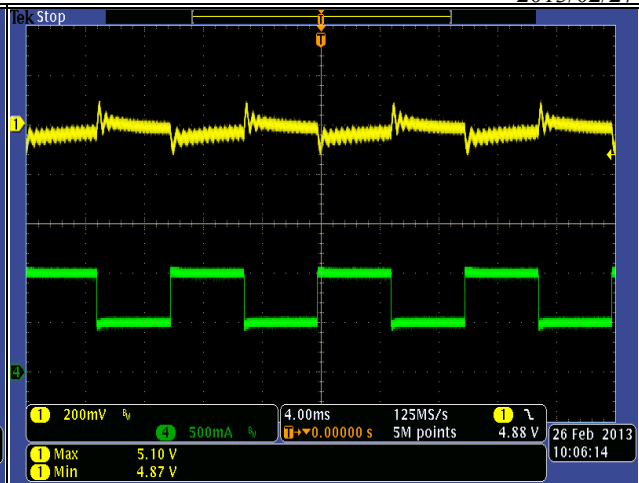
Fig.2

Vin: 90Vac
 O/P : +5V= 0A→0.5A
 CH1: V_O (DC Offset 5V)
 CH4: I_O
 Reading: +5V_{Max}= 5.17V
 +5V_{Min}= 4.45V

Vin: 264Vac
 O/P : +5V= 0A→0.5A
 CH1: V_O (DC Offset 5V)
 CH4: I_O
 Reading: +5V_{Max}= 5.19V
 +5V_{Min}= 4.33V


Fig.3

Output Load Dynamic Response
 Vin: 90Vac
 O/P : +5V= 0.5A→1A
 CH1: V_O (DC Offset 5V)
 CH4: I_O
 Reading: +5V_{Max}= 5.10V
 +5V_{Min}= 4.86V


Fig.4

Output Load Dynamic Response
 Vin: 264Vac
 O/P : +5V= 0.5A→1A
 CH1: V_O (DC Offset 5V)
 CH4: I_O
 Reading: +5V_{Max}= 5.10V
 +5V_{Min}= 4.87V

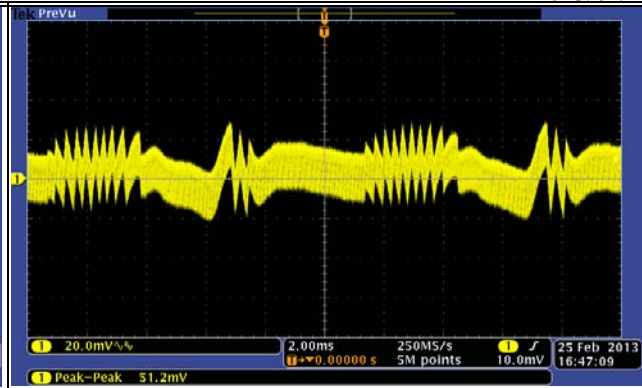
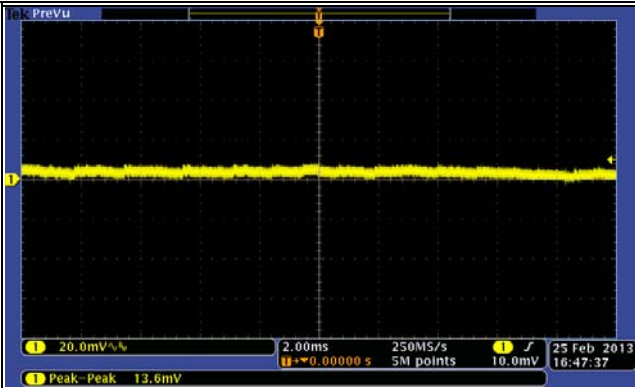
7. Peak to Peak Output Ripple

This refers to the peak-to-peak residual AC that remains on the DC power line after passing through all the filtering processes conducted within the power supply. It shall be measured across output terminals using a single ended measurement with an oscilloscope (bandwidth limited to 20 MHz) and a high persistence display. Readings shall be made through the range of minimum to maximum load current and **within 100mV**.

Test Conditions:**Input: 90Vac/264Vac(60Hz)****Output: +5V=0A/1A****Ambient Temperature : 25°C**Test Result: **PASS**

Input	Output Load	Vout Voltage (VAC)
		Vripple(mV)
90Vac	0A	13.60
	1A	51.20
264Vac	0A	10.40
	1A	46.40
SPEC	Max	100mV

Table 7


Output Ripple/Noise Test
Fig.5

Vin: 90Vac

O/P: +5V=0A

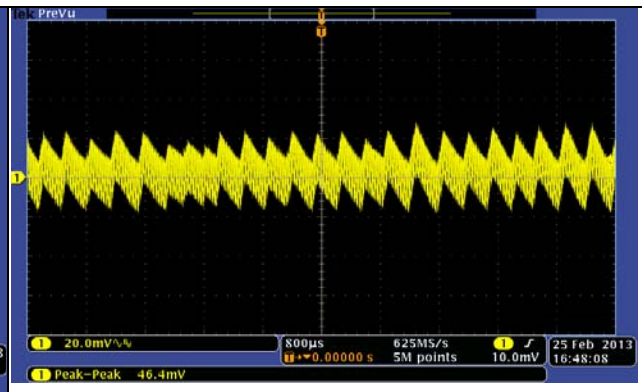
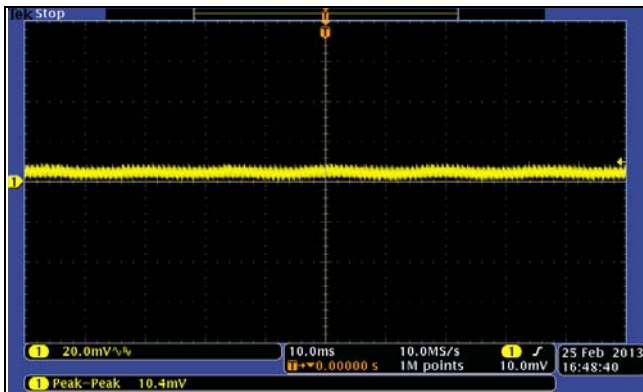
 CH1: V_{P-P+5V}

 Reading: **13.6mV(AC)**
Output Noise Test
Fig.6

Vin: 90Vac

O/P: +5V=1A

 CH1: V_{P-P+5V}

 Reading: **51.2mV(AC)**

Output Ripple/Noise Test
Fig.7

Vin: 264Vac

O/P: +5V=0A

 CH1: V_{P-P+5V}

 Reading: **10.4mV(AC)**
Output Noise Test
Fig.8

Vin: 264Vac

O/P: +5V=1A

 CH1: V_{P-P+5V}

 Reading: **46.4mV(AC)**

8. Turn On Delay Time

Turn on delay time will be less than 3 seconds at full load. Turn on delay time is measured as the delay between input voltage being applied at 0° phase angle and when the outputs arrive within 10% of their operating value. Turn on delay time is measured using an input voltage of 90VAC(rms) and input frequency of 47Hz.

Test Conditions:

Input: 90Vac/47Hz

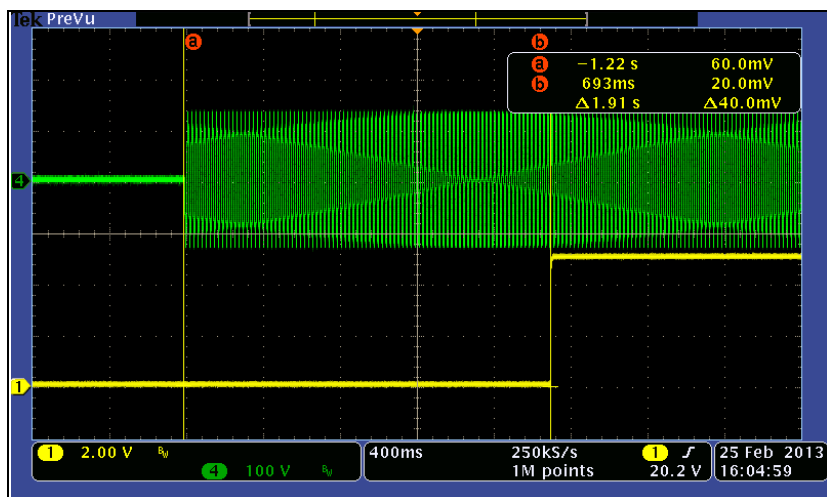
Output: Electrical Load CR mode (5Ω)

Ambient Temperature : 25°C

Test Result: PASS

Input	T _{turn on delay}
90Vac	1.910s

Table 8.



Turn on Time Test
 Vin: 90Vac/47Hz
 O/P: 5V/5Ω
 CH1: V_{O_+5v}
 CH4: AC Input Voltage
 Reading: **1.91s**

Fig.9

9. Output Short Protection

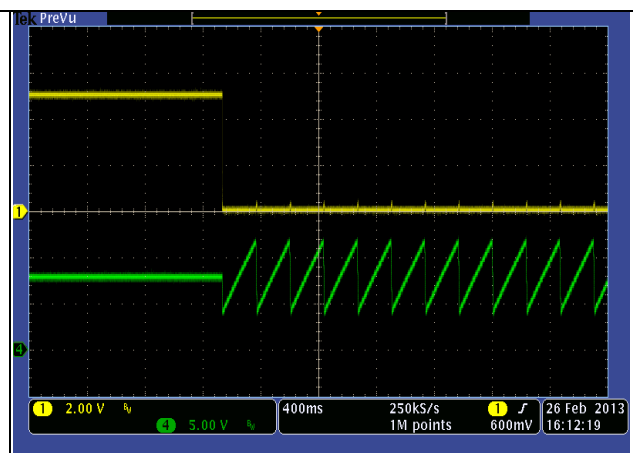
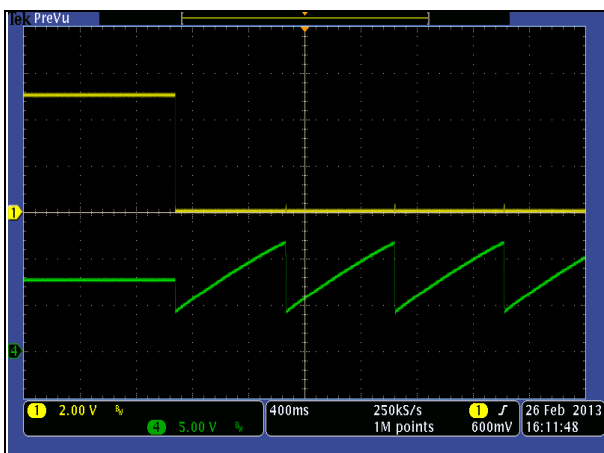
The supply shall be designed with appropriate output short circuit protection. This protection shall be activated in the event of a short or long-term condition happened. The primary shall limit the total power without inflicting any damage to any internal supply components and shall be reversible pending removal of the cause of the condition and without any user intervention.

Test Condition:

Input: 90Vac/264Vac (60Hz)

Ambient Temperature: 25°C

Test Result: PASS



Output Short Protection
 Vin: 90Vac
 O/P : +5V=0A→Short
 CH1: V_O CH4: V_{cc} Fig.10

Output Short Protection
 Vin: 264Vac
 O/P : +5V=0A→Short
 CH1: V_O CH4: V_{cc} Fig.11

10. Power Component Stress Voltage
Test Condition:

- Set the output loads at full load and ambient 25 °C.
- The PSU test on everyone voltage and frequency.

Check:

- Under Steady state the derating shall be below **100%**.
- Under Transient state the derating shall be below **100%**.
- Input line bulk capacitors limits are **100%** (continuous).

Result:
Input Voltage: 90Vac/264Vac

Output Power: Electrical Load CR mode (5Ω)

No.	Location	Max. Rating(V)	Steady State(90V)	
			Measurement	Derating(%)
			V	V
1	Q1	700	329	47.00%
2	D1	40	13.2	33.00%

Table 9-1.

No.	Location	Max. Rating(V)	Steady State(264V)	
			Measurement	Derating(%)
			V	V
1	Q1	700	578	82.57%
2	D1	40	27	67.50%

Table 9-2.

No.	Location	Max. Rating(V)	Transient State(90V)	
			Measurement	Derating(%)
			V	V
1	Q1	700	360	51.43%
2	D1	40	13	32.50%

Table 9-3.

No.	Location	Max. Rating(V)	Transient State(264V)	
			Measurement	Derating(%)
			V	V
1	Q1	700	590	84.29%
2	D1	40	28	70.00%

Table 9-4.

11. Thermal Test
Test Condition:

- Set the output loads at full load and ambient **25°C**.
- The PSU test on everyone voltage and frequency.
- Born-In 0.5 hours

Result:

No.	Location	Max. Rating(°C.)	90V/60Hz(°C.)	264/60Hz(°C.)	Derating(%)	
					90V/60Hz	264/60Hz
1	BD1	150	41	33	27.33%	22.00%
2	F1	125	45	34	36.00%	27.20%
3	D1	150	61	62	40.67%	41.33%
4	Q1 Body	150	47	59	31.33%	39.33%
5	T1	125	52	54	41.60%	43.20%
6	L2	125	44	36	35.20%	28.80%
7	D2	150	50	52	33.33%	34.67%
8	IC1	125	41	38	32.80%	30.40%

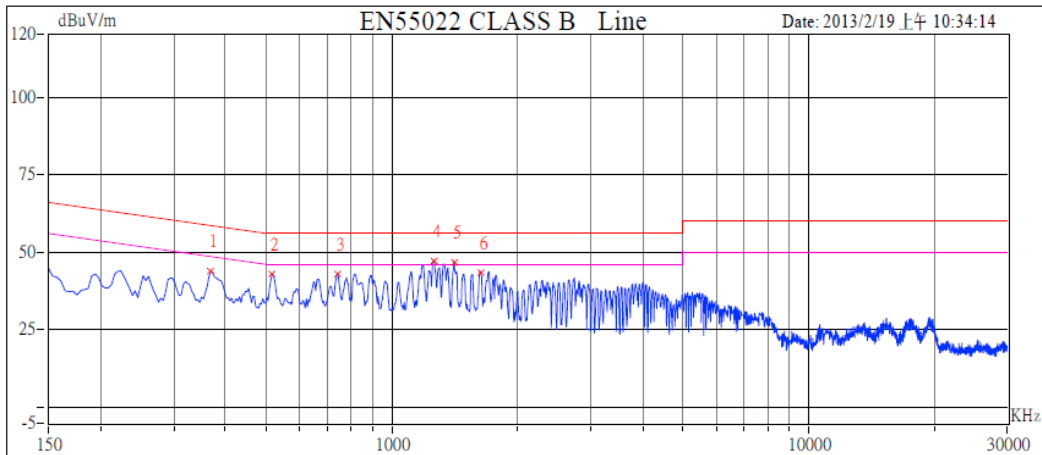
Table 10. Key Parts for Thermal Test

12. EMI
Test Condition:

The power supply should comply with FCC part15,EN 55022 and CISPR22 meeting Class B for conducted emissions with a 3dB margin. Tested unit should be connected to a pure resistor load (rated loding). The test condition shall be followed as: 220VAC(L and N)

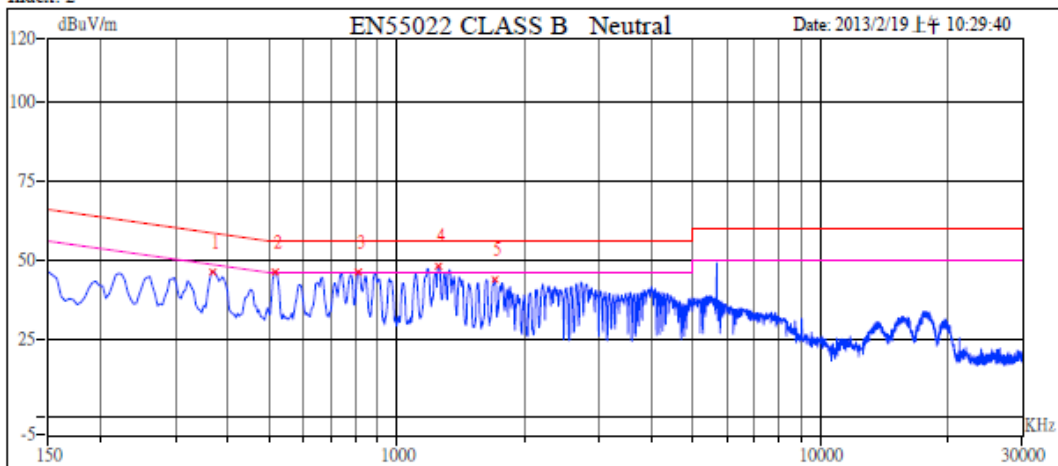
Test Result: PASS

Index: 2



	Freq(KHz)	Peak Amptd(dBuV)	QP Amptd(dBuV)	Avg Amptd(dBuV)	QP Limit(dBuV)	Avg Limit(dBuV)	Margin(dB)	Factor(dB)
1	368.7375	43.67	40.35	33.95	59.75	49.75	-15.80	9.86
2	517.0341	42.77	40.33	36.17	56.00	46.00	-9.83	9.86
3	743.1864	43.12	39.32	34.01	56.00	46.00	-11.99	9.87
4	1262.2244	47.16	43.53	38.07	56.00	46.00	-7.93	9.87
5	1414.2285	46.69	41.78	36.59	56.00	46.00	-9.41	9.87
6	1632.9659	43.57	39.55	34.27	56.00	46.00	-11.73	9.87

Index: 2



	Freq(KHz)	Peak Amptd(dBuV)	QP Amptd(dBuV)	Avg Amptd(dBuV)	QP Limit(dBuV)	Avg Limit(dBuV)	Margin(dB)	Factor(dB)
1	368.7375	46.44	43.63	36.35	59.75	49.75	-13.40	9.92
2	517.0341	46.30	44.20	39.15	56.00	46.00	-6.85	9.92
3	809.9198	46.19	43.81	37.08	56.00	46.00	-8.92	9.93
4	1254.8096	48.04	44.52	38.67	56.00	46.00	-7.33	9.93
5	1703.4068	43.79	40.29	35.68	56.00	46.00	-10.32	9.92

V. Transformer Specification:

1. Core : EE13
2. Bobbin : 10 PIN 立式
3. Inductance(Pin 1 - Pin 2) : 2200uH±5%
4. Np/Ns/Nvcc : 124/07/10

10	Tape 3M#1350 1Ts		
9	0.15mm*3 10Ts PIN4 → PIN5	VCC	NVCC
8	Tape 3M#1350 2Ts		
7	0.3 mm *2 (三層絕緣線) 7Ts F2(白) → F1(黑)	1 Layers 反方向繞	Ns
6	Tape 3M#1350 3Ts		
5	Copper PIN5	1 Layers shielding	
4	Tape 3M#1350 1Ts		
3	0.15mm*1 124Ts PIN2 → PIN1	3 Layers 需繞滿 1,2,3layer 中加一個 Tape 1~2 層頭尾相連	Np
2	Tape 3M#1350 1Ts		
1	Copper PIN5	1 Layers shielding	
Bobbin			

