Demo Board Test Report for LD5760

--- 65W (19V, 3.42A) Adapter

Tested by	Reviewed by	Approved by
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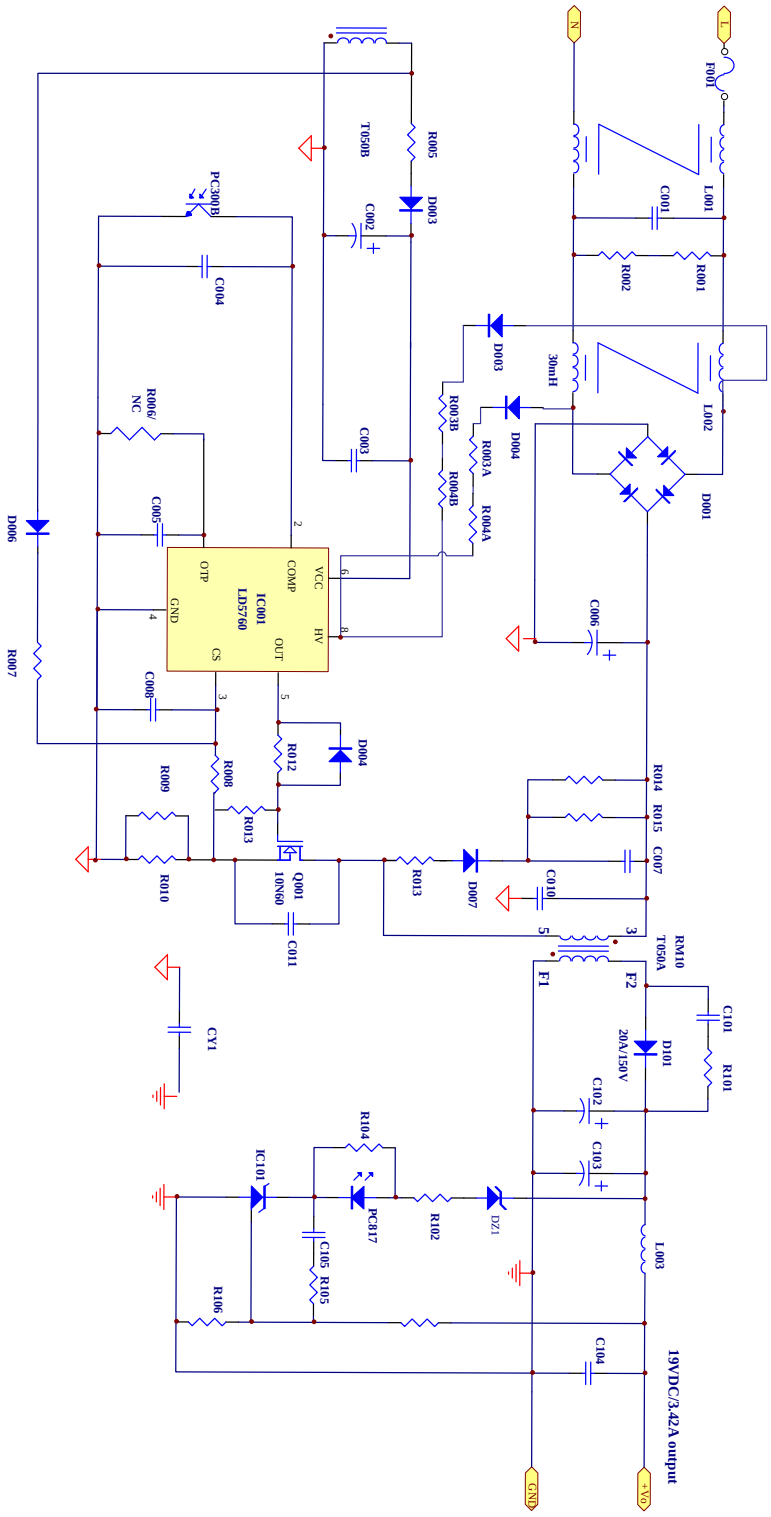
N
L
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R102
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L003
C105
R105
R106
C104
19VDC/3.42A output
GND
+Vo

Ⅱ. BOM

P/N	Component Value	Note
R001	NA	
R002	NA	
R003A	10KΩ, 1206	
R003B	0Ω, 1206	
R004A	10KΩ, 1206	
R004B	0Ω, 1206	
R005	1.2Ω, 1206	
R006	NC	
R007	120KΩ, 1206	
R008	820Ω, 0805	
R009	NA	
R010	024Ω	
RT1	NC	
R011	10Ω, 0805	
R012	51Ω, 0805	
R013	100KΩ, 1206	
R014	100KΩ, 1206	
R015	100KΩ, 1206	
R016	NA	
R017	NA	
R018	NA	
R019	NA	
R101	51Ω, 1206	
R102	750Ω, 0805	
R103	62KΩ, 0805	
R104	NA	
R105	1.3KΩ, 0805	
R106	9.1KΩ, 0805	
L001	LD design	
L002	LD design	
L003	LD design	

P/N	Component Value	Note
C001	0.33μF	X-cap
C002	33μF, 50V	
C003	0.1μF, 50V, 0805	
C004	NA	
C005	NA	
C006	120uF, 400V	
C007	2.2nF, 500V, 1206	
C008	220pF, 16V, 0805	
C009	2.2nF, 500V, 1206	
C010	NA	
C011	NA	
C101	330pF, 500V, 1206	
C102	680μF, 35V	
C103	680μF, 35V	
C104	0.1uF, 25V	
C105	0.1uF, 16V, 0805	
C106	NA	
CY1	470pF	Y-cap
D001	KBP406G	
D002	NA	
D003	1N4007	
D004	1N4007	
D005	1N4148	
D006	BAV103	
D007	1N4007	
D008	1N4007	
D101	SRF20200C	
ZD1	0Ω, 1206	
IC001	LD5760	SOP-7
IC101	KA431	Fairchild
PC300	LTV-817B	Lite-ON
Q001	10N60	Fairchild
F1	250V, 2A	
T050A	LD design	RM10

III. EXECUTIVE SUMMARY

Office	Taipei
Model Name	LD5760-DemoBoard#01
Version	01
IC	LD5760GS(D/C:114624A2)

TEST	Result	Comments
3. Green Mode Power Consumption	**PASS**	
4. Line Regulation	**PASS**	
. Load Regulation	**PASS**	
5. Output Dynamic Response	**PASS**	
6. Peak to Peak Output Ripple and Noise	**PASS**	
7. Turn On Delay Time	**PASS**	
8. Holdup Time	**PASS**	
9. Over Current Protection	**PASS**	
10. Over Voltage Protection	**PASS**	
11. Output Short Protection	**PASS**	
12. Efficiency Test	**PASS**	
13. Stress Voltage Test	**PASS**	

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 90V to 264V). The supply will be designed to operate for a Table 1.

	Minimum	Normal	Maximum
Input Voltage	90Vac	110Vac	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
+19V	17.1V	19V	20.9V	0A	3.42A
Line Regulation	-1%	/	+1%	/	3.42A
Load Regulation	-2%	/	+2%	0A	3.42A

Table 2

3. Green Mode Power Consumption

The input power of power supply shall remain **less than 300mW** under output at no load condition.

Test Condition:
Input: 90Vac/115Vac/230Vac/264Vac (60Hz)
Output: +19V
Ambient Temperature: 25℃
Burn-In 20mintues

Test Result: PASS

Vin(Vac)	Pout(W)	Pin(mW)
90	No Load	19.23
115	No Load	21
230	No Load	26
264	No Load	32

Table 3-1.

	90Vac	115Vac	230Vac	264Vac
Pout	Pin(W)	Pin(W)	Pin(W)	Pin(W)
100mW	0.13	0.13	0.138	0.145
200mW	0.233	0.232	0.24	0.252
250mW	0.300	0.3	0.306	0.312
500mW	0.568	0.566	0.604	0.614
1W	1.17	1.171	1.18	1.19

Table 3-2.

4. Total Regulation

Line regulation is defined to be the percent change in output voltage versus the nominal output voltage due to a change in AC input. The supply shall maintain the specified regulation throughout its specified operating range. Line regulation is measured at Min. Nominal and Max input voltages.

Load regulation is defined to be the percent change in output voltage versus the nominal output voltage due to a change in load. The supply shall maintain the specified regulation throughout its specified operating range. Load regulation to be measured at Min. and Max output voltages.

Test Conditions:
Input: 90Vac/264Vac(60Hz)
Output: +19V=0A/3.42A
Ambient Temperature : 25℃

AMB	Output	90Vac	264Vac
25 DEG.C	3.42A	19.2	19.2
	0A	18.9	18.95
Reading		-1.59%	-1.32%
SPEC		±2%	

Table 4

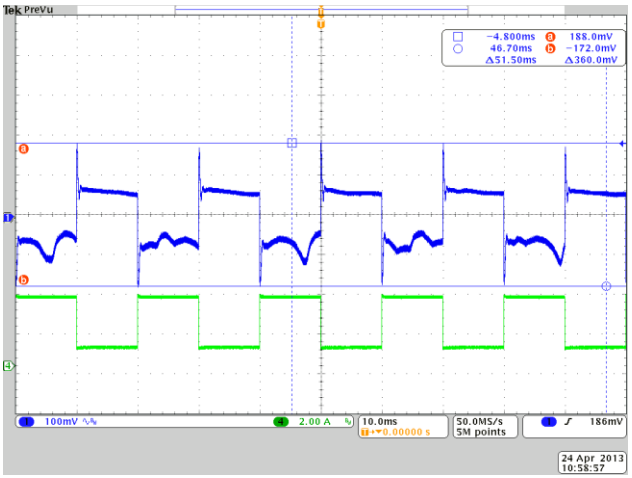
5. Output Dynamic Response

The dynamic of the output response refers to the change in output voltage to a step increase in the current of **25% to 100%** load shall maintain ±10% of specified regulation.

Test Condition:
Input: 90Vac/264Vac (60Hz)
Ambient Temperature: 25℃

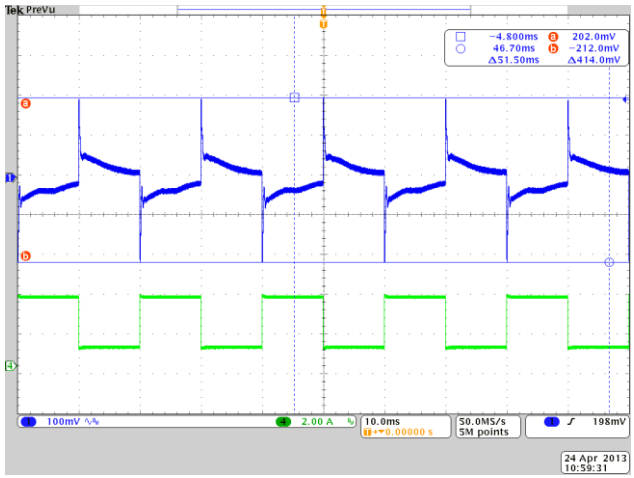
Input	Output Dynamic	Reading		Derating	
		V_H	V_L	V_H	V_L
90Vac	0.855→3.42A	188mV	-172mV	3.76%	3.44%
264Vac	0.855→3.42A	202mV	-212mV	4.04%	4.24%
Reading	Max	202mV	-212mV	4.04%	4.24%
Reading	Min	188mV	-172mV	3.76%	3.44%
SPEC	Max/Min	±0.5V		10%	

Table 5



Output Load Dynamic Response Fig.1
Vin: 90Vac
O/P : +19V= 0.855A→3.42A
CH1: V_{O+19V}

Reading: $+19V_{Max}$= **188mV(AC)**
$+19V_{Min}$= **-172mV(AC)**



Output Load Dynamic Response Fig.2
Vin: 264Vac
O/P : +19V= 0.855A→3.42A
CH1: V_{O+19V}

Reading: $+19V_{Max}$= **202mV(AC)**
$+19V_{Min}$= **-212mV(AC)**

6. Peak to Peak Output Ripple and Noise

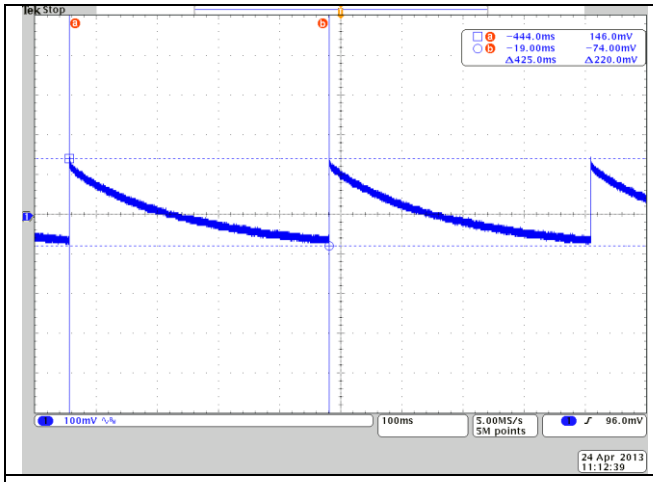
This refers to the peak-to-peak residual AC that remains on the DC power line after passing through all the filtering processes conducted within the power supply. The peak to peak output ripple and noise shall be considered to comprise of the complex envelope of the low frequency saw tooth voltage ripple and the high frequency switching noise. 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 300mV**.

Test Conditions:
Input: 90Vac/264Vac(60Hz)
Output: +19V=0A/3.42A
Ambient Temperature : 25℃

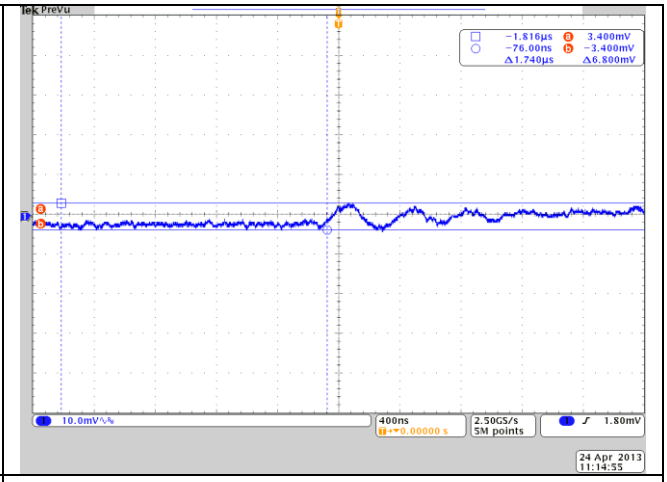
Test Result: PASS

Input	Output Load	Vout Voltage (VAC)	
		Vripple(mV)	Vnoise(mV)
90Vac	0A	200.0	6.8
	3.42A	101.0	85.0
264Vac	0A	208.0	4.6
	3.42A	24.2	13.4
Reading	Min	24.2	4.6
	Max	208.0	85.0
SPEC	Max	300mV	

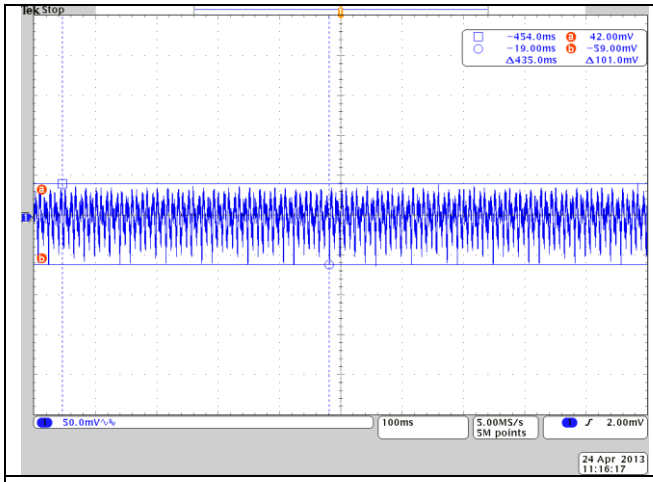
Table 6



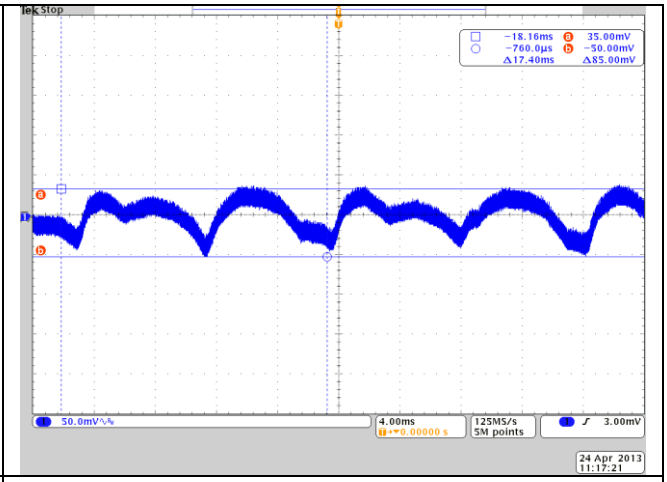
Output Ripple/Noise Test Fig.3
Vin: 90Vac
O/P: +19V=0A
CH1: $V_{P-P+19V}$
Reading: **220mV(AC)**



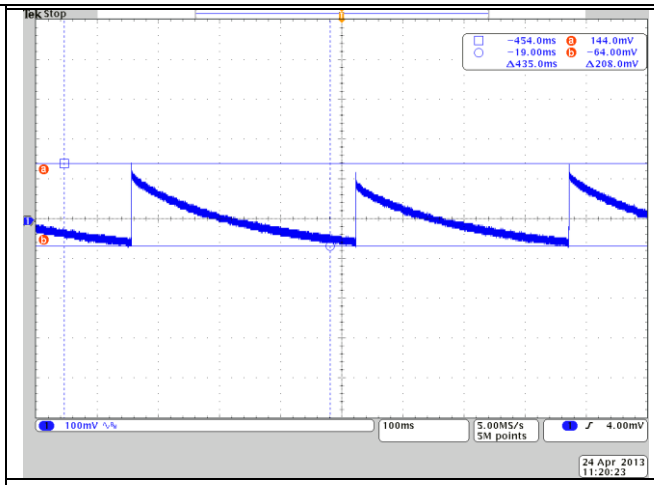
Output Noise Test Fig.4
Vin: 90Vac
O/P: +19V=0A
CH1: $V_{P-P+19V}$
Reading: **6.8mV(AC)**



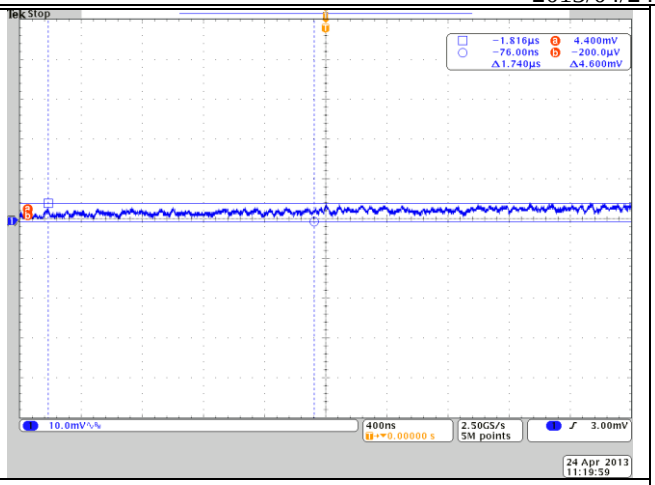
Output Ripple/Noise Test Fig.5
Vin: 90Vac
O/P: +19V=3.42A
CH1: $V_{P-P+19V}$
Reading: **101mV(AC)**



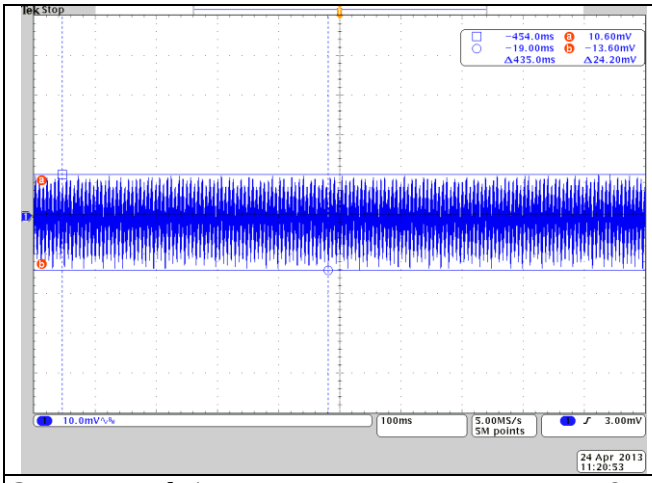
Output Noise Test Fig.6
Vin: 90Vac
O/P: +19V=3.42A
CH1: $V_{P-P+19V}$
Reading: **85mV(AC)**



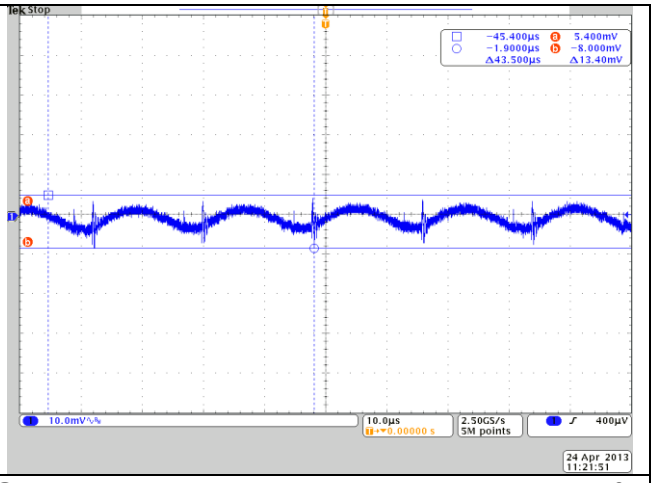
Output Ripple/Noise Test Fig.7
Vin: 264Vac
O/P: +19V=0A
CH1: $V_{P-P+19V}$
Reading: **208mV(AC)**



Output Noise Test Fig.8
Vin: 264Vac
O/P: +19V=0A
CH1: $V_{P-P+19V}$
Reading: **4.6mV(AC)**



Output Ripple/Noise Test Fig.9
Vin: 264Vac
O/P: +19V=3.42A
CH1: $V_{P-P+19V}$
Reading: **24.2mV(AC)**



Output Noise Test Fig.10
Vin: 264Vac
O/P: +19V=3.42A
CH1: $V_{P-P+19V\ V}$
Reading: **13.4mV(AC)**

7. Turn On Delay Time

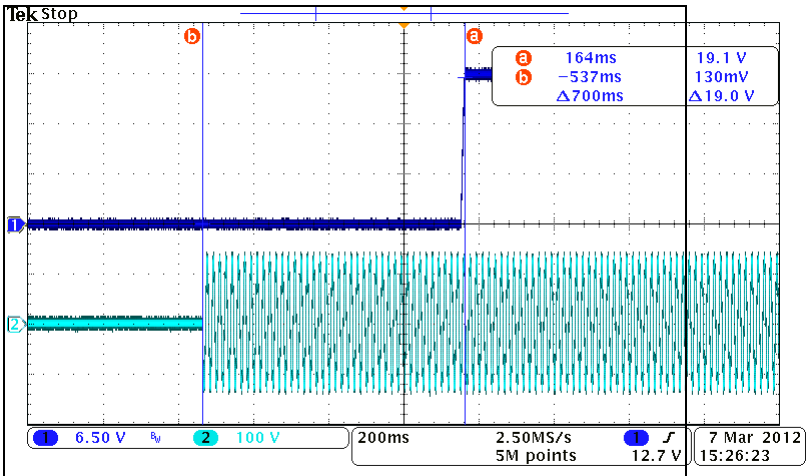
Turn on delay time will be **less than 3 seconds** at full load. Turn on delay time is measured as the delay between input voltage being applied at 0^o phase angle and when the outputs arrive within 10% of their operating value. Turn on delay time is measured using an input voltage of 90VAC(rms) and input frequency of 60Hz.

Test Conditions:
Input: 90Vac(60Hz)
Output: +19V=3.42A
Ambient Temperature : 25℃

Test Result: PASS

Input	$T_{turn\ on\ delay}$
90Vac	700ms

Table 7



Turn on Time Test Fig.11
Vin: 90Vac/60Hz
O/P: +19V=3.42A
CH1: V_{O+19V}
CH2: AC Input Voltage
Reading:**700ms**

8. Holdup Time

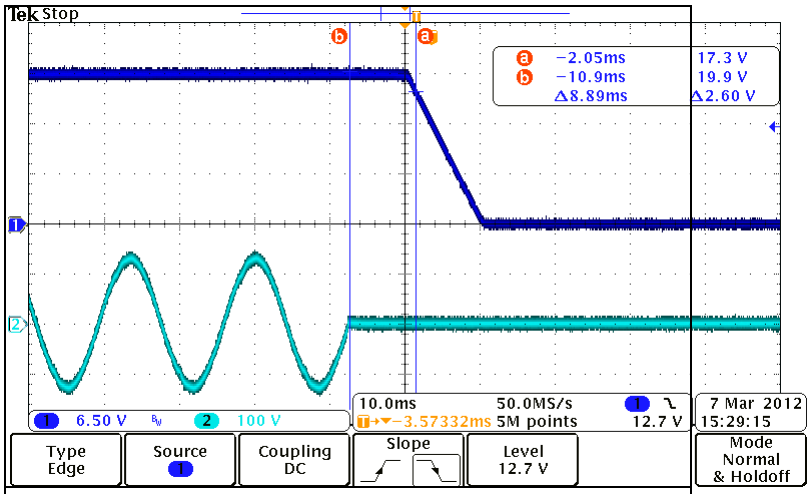
Holdup time refers to the time it takes for a loss of input voltage to propagate through the power supply and affect the output voltages. Holdup time spec must be met at 100Vac input line voltage and maintain minimum half AC cycle. Holdup time shall be measured by monitoring the output voltages and measuring the time it takes for the first affected output voltage to pass through the lower bound of the regulation threshold after input power to the converter is removed. The initial conditions of loading and input voltage are max load and minimum operational line input. The holdup time is measured by triggering an oscilloscope on the loss of input voltage while monitoring the conditions of the output voltages.

Test Conditions:
Input: 100Vac(50Hz)
Output: +19V=3.42A
Ambient Temperature : 25℃

Test Result: PASS

Input	$T_{hold\ on}$
100Vac	8.89ms

Table 8



Hold-up Time Test Fig.12
Vin: 100Vac/50HZ
O/P: Max Load
CH1: V_{O_+19V}
CH2: AC Input Voltage
Reading:**8,89ms**

9. Over Current Protection

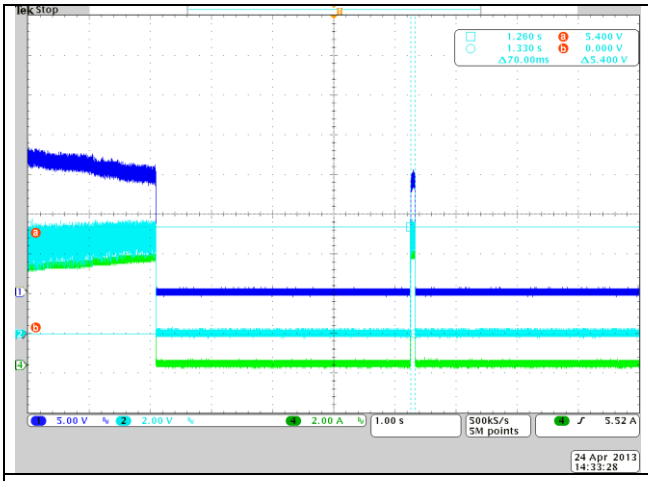
The supply shall be designed with appropriate output over current protection. This protection shall be activated in the event of a short or long-term condition during which one or more of the output current load increases such that the primary current exceeds a predetermined limit. The primary shall 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. This protection shall be activated **within 130% to 180%** of maximum load.

Test Condition:
Input: 90Vac/264Vac (60Hz)
Ambient Temperature: 25℃

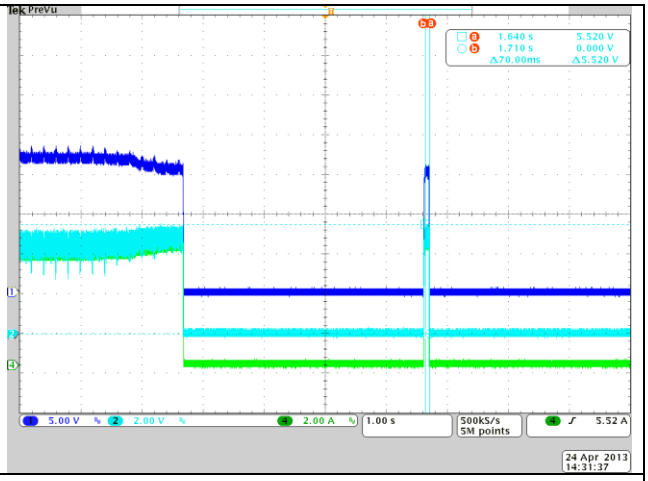
Test Result: PASS

Intput	OCP
90Vac	5.36A
264Vac	5.68A

Table 9



Over Current Protection Fig.13
Vin: 90Vac
O/P : +19V=Max→OCP
CH1: V_{O+19V}
CH2: COMP
CH4: I_{+19V}



Over Current Protection Fig.14
Vin: 264Vac
O/P : +19V=Max→OCP
CH1: V_{O+19V}
CH2: COMP
CH4: I_{+19V}

10. Over Voltage Protection

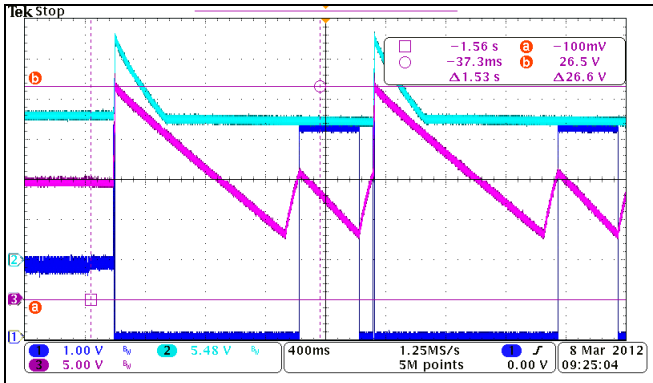
The supply shall be designed with appropriate output over voltage protection. This protection shall be activated in the event of a short or long-term condition during which one or more of the output open loop circuit happened. It shall limit the power supply without inflicting any damage to any internal supply components.

Test Condition:
Input: 90Vac/264Vac (60Hz)
Ambient Temperature: 25℃

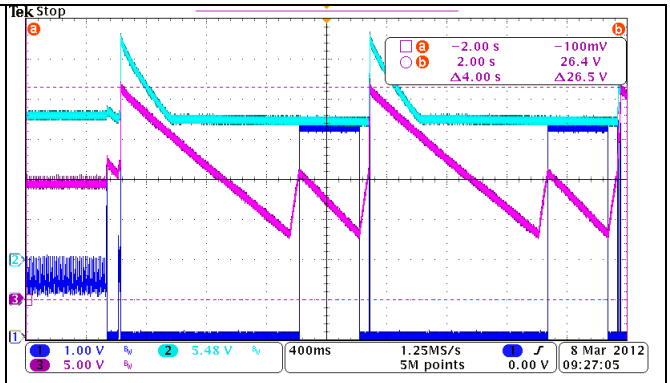
Test Result: PASS

	Primary-side	Second-side
Vin(Vac)	Vcc Voltage(V)	+19Vout(V)
Vac=90V	26.5	30.4
Vac=264V	26.4	30.2

Table 10



Over Voltage Protection Test Fig.15
Vin: 90Vac turn on
O/P: +19V=0A
CH1: Comp
CH2: V_{O+19V}
CH3: Vcc
Reading: Vcc=26.5V (OVP Protection)
V_{O+19V} =30.4V



Over Voltage Protection Test Fig.16
Vin: 264Vac turn on
O/P: +19V=0A
CH1: Comp
CH2: V_{O+19V}
CH3: Vcc
Reading: Vcc=26.4V (OVP Protection)
V_{O+19V} =30.2V

11.CS Pin Over Voltage Protection

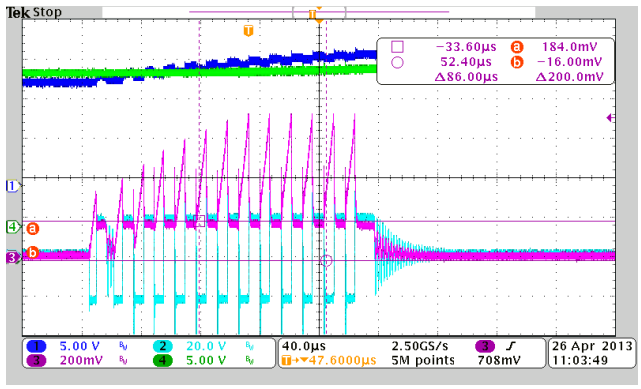
The supply shall be designed with appropriate output over voltage protection. This protection shall be activated in the event of a short or long-term condition during which one or more of the output open loop circuit happened. It shall limit the power supply without inflicting any damage to any internal supply components.

Test Condition:
Input: 90Vac/264Vac (60Hz)
Ambient Temperature: 25℃

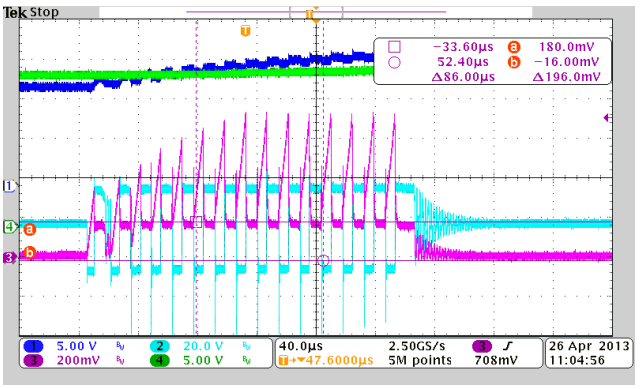
Test Result: PASS

	Primary-side
Vin(Vac)	Vcs Voltage(V)
Vac=90V	0.2
Vac=264V	0.196

Table 11



Over Voltage Protection Test Fig.17
Vin: 90Vac turn on
O/P: +19V=0A
CH1: Vcc
CH2: V_{AUX}
CH3: V_{CS}
CH4: V_{O+19V}
Reading: V_{CS}= 0.2V



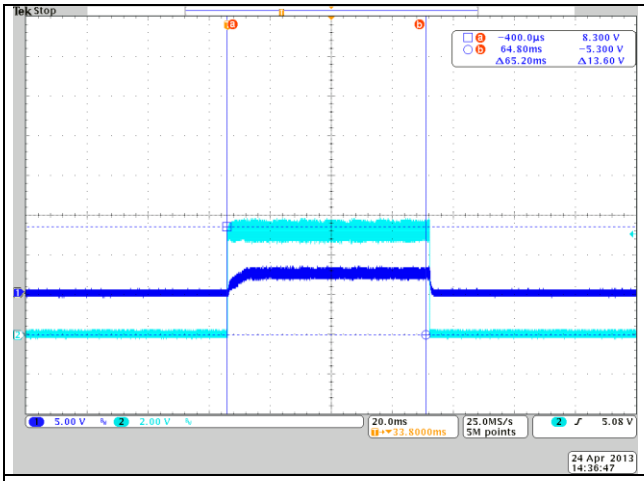
Over Voltage Protection Test Fig.18
Vin: 264Vac turn on
O/P: +19V=0A
CH1: Vcc
CH2: V_{AUX}
CH3: V_{CS}
CH4: V_{O+19V}
Reading: V_{CS}= 0.196V

12. Output Short Protection

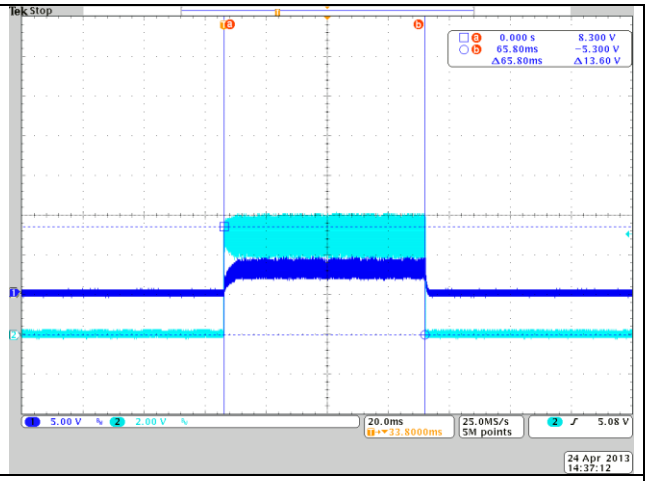
The supply shall be designed with appropriate output short circuit protection. This protection shall be activated in the event of a short or long-term condition happened. The primary shall limit the total power without inflicting any damage to any internal supply components and shall be reversible pending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

Test Condition:
Input: 90Vac/264Vac (60Hz)
Ambient Temperature: 25℃

Test Result: PASS



Output Short Protection Fig.19
Vin: 90Vac
O/P : +19V=0A→Short
CH1: V_{O+19V} CH2: COMP



Output Short Protection Fig.20
Vin: 264Vac
O/P : +19V=0A→Short
CH1: V_{O+19V} CH2: COMP

13. 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: 115Vac/230Vac (60Hz)

Output: 25%、50%、75%、100% of Max Load (3.42A)

Ambient Temperature: 25℃

	115V		230V	
Po	Pin	Eff(%)	Pin	Eff(%)
65.31	78.80	82.88%	77.50	84.27%
49.48	56.70	87.27%	55.60	88.99%
33.11	37.10	89.25%	36.50	90.71%
16.67	18.40	90.60%	18.20	91.59%
Result		87.50%		88.89%

Table 12

14. Power Component Stress Voltage

Test Condition:
- Set the output loads at full load and ambient 25 ℃.
- The PSU test on everyone voltage and frequency.

Check:
- Under Steady state the derating shall be below **95%.**
- Under Transient state the derating shall be below **95%**.
- Input line bulk capacitors limits are **100%** (continuous).

Result:
Input Voltage: 90Vac/264Vac (60Hz)
Output Power: Max Load/Short

No.	Location	Max. Rating(V)	Steady State(90V / 60HZ)	
			Measurement	Derating(%)
			V	V
1	Q001	600	308	51.33%
2	D101	200	73.6	36.80%

Table 13-1

No.	Location	Max. Rating(V)	Steady State(264V / 60HZ)	
			Measurement	Derating(%)
			V	V
1	Q001	600	568	94.67%
2	D101	200	110	55.00%

Table 13-2

No.	Location	Max. Rating(V)	Transient State(90V / 60HZ)	
			Measurement	Derating(%)
			V	V
1	Q001	600	312	52.00%
2	D101	200	88	44.00%

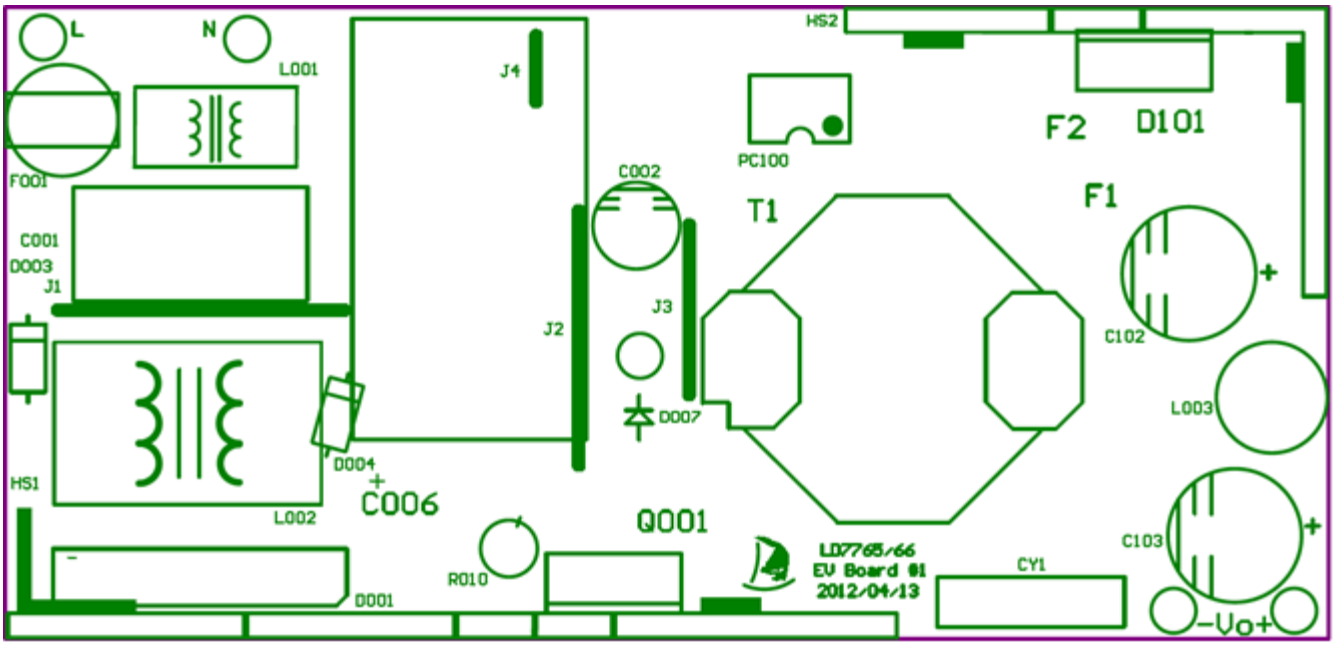
Table 14-1

No.	Location	Max. Rating(V)	Transient State(264V / 60HZ)	
			Measurement	Derating(%)
			V	V
1	Q001	600	592	98.67%
2	D101	200	148	74.00%

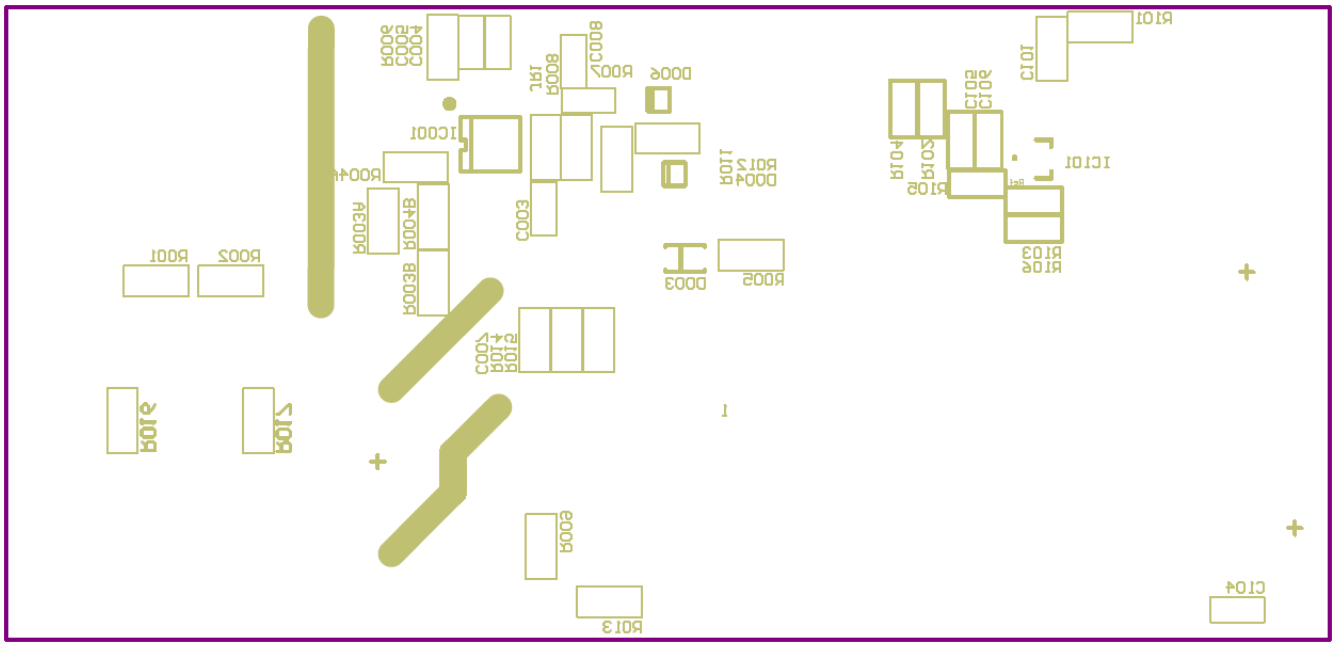
Table 14-2

Ⅳ. Gerber File:

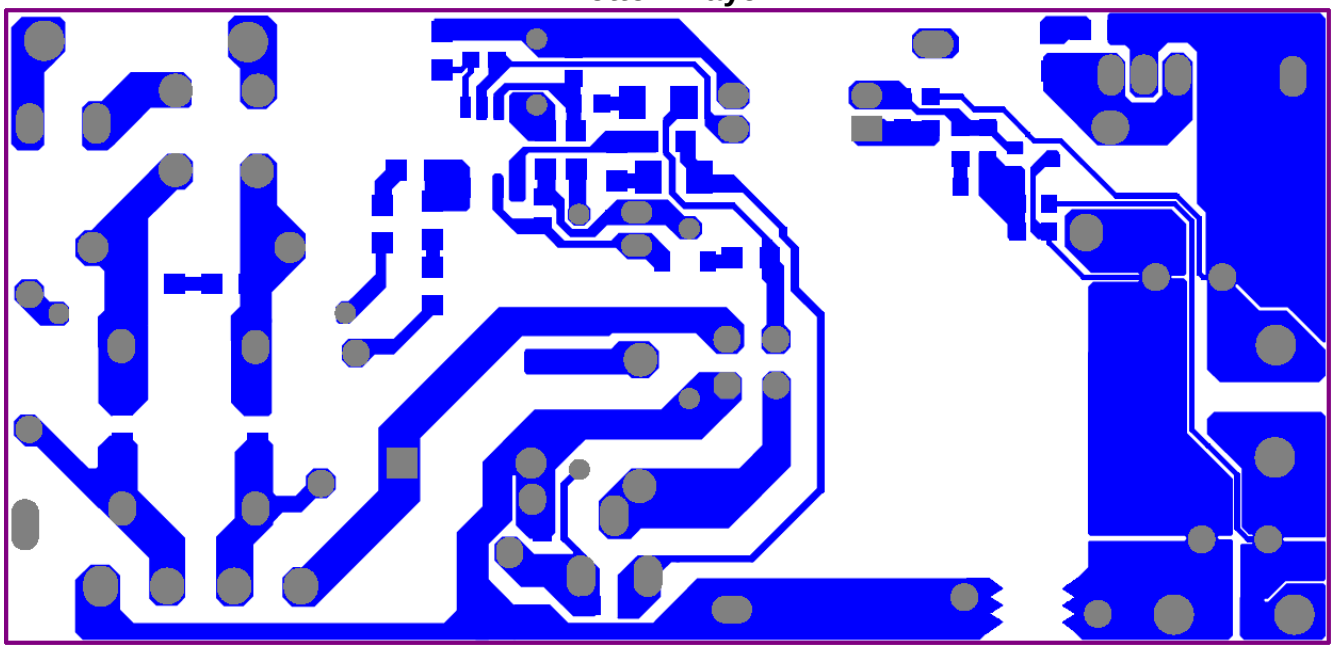
Silkscreen TOP



Silkscreen Bottom



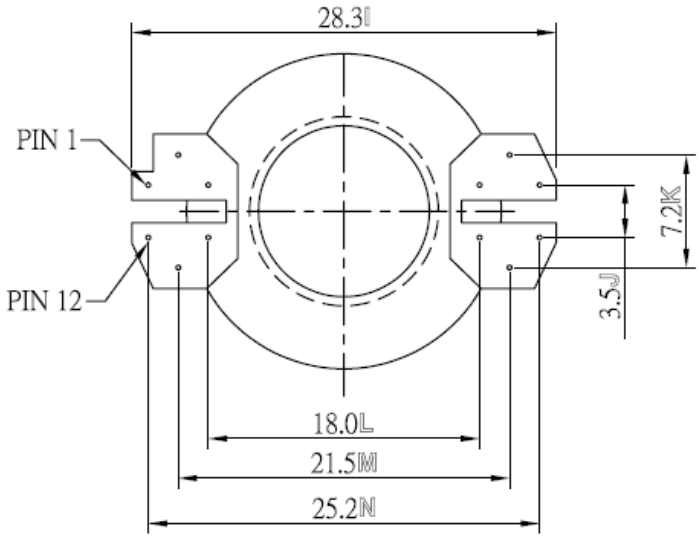
Bottom Layer

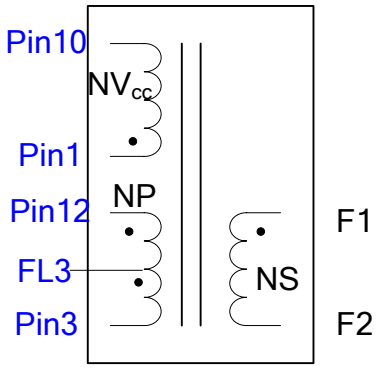


Soldermask Bottom

Ⅴ. Transformer Specification:

Core: RM10 PC44 or 3C94
Bobbin: RM10





1. 感量 , Pin12-3: 450uH±5% Gap:以實測電感作調整
2. Np/Ns/NVcc: 38/8/7
3. F1 and F2 出線 長 30mm 含 5mm 鍍錫
4. FL3,由 Bobbin 上方出線長 10mm 含 5mm 接在一起後鍍錫
5. F1 加黑色套管
6. HI-POT: 3000V_{AC}: Primary to Secondary

1	0.3*3 (2-UEW) 19Ts PIN12 –> FL3	2 Layers
2	3M#1350 1Ts	
3	銅箔 1Ts –>PIN1	
4	3M# 1350 1Ts	
5	0.65mm*2 (三層絕緣線) 8Ts F1(白) –>F2(黑)	2 Layers
6	3M# 1350 1Ts	
7	銅箔 1Ts –> PIN1	
8	3M# 1350 1Ts	
9	0.3*3 (2-UEW) 19Ts FL3–> PIN 3	2 Layers
10	3M# 1350 1Ts	
11	0.2mm*4(2-UEW) 7Ts PIN 1 –> PIN10	平均疏繞
12	3M# 1350 2Ts	
FINISHED		