



24W/ 12V DC Switch Mode Power Supply

-DK125 DEMO BOARD DESIGN NOTE

Device	Application	Input Voltage	Output Power	Technology	I/O Isolation
12V2A-DK125 (DIP-8)	Adapter/SMPS	90-264V AC	24W	Hard switched flyback	Yes

Item	Output Specification	Test Condition
Rated Input Voltage	100V ac~ 240Vac	
Input Voltage Range	90V ac~ 264Vac	
Input Frequency Range	60 / 50Hz	
Average Efficiency	>85%	Measured at board end
Standby Power	<0.3W	90V ac~ 264Vac
Output Voltage	12V	90V ac~ 264Vac and 2A
Output Current	2A	90V ac~ 264Vac
Rated Output Power	24W	90V ac~ 264Vac
Ripple and Noise	<100mV	90V ac~ 264Vac, 1uF+0.1uF CAP @ E-Load

Circuit Description:

This design note describes a 24W universal AC input, isolated hard switched flyback converter for SMPS and adapter etc. It provides the complete circuit schematic details, layout, test data and BOM for 12V 2A power supply.

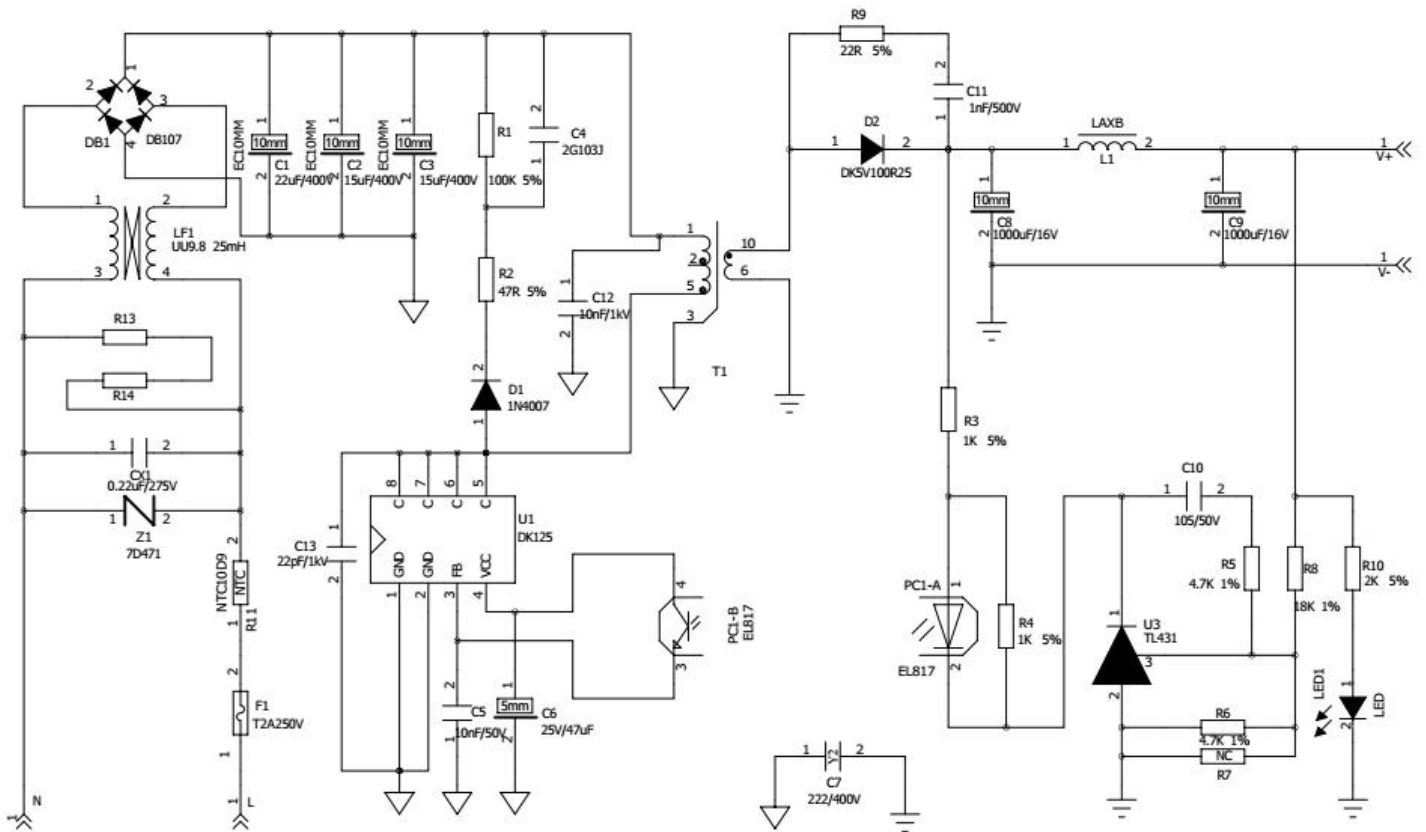
IC DK125 (DIP-8) used in this design.

1. Pi filter circuit formed by C8,C9 and L1
2. Snubber circuit formed by R1,R2,C4 and D1
3. Loop control formed by R4-R7, U3 and C10

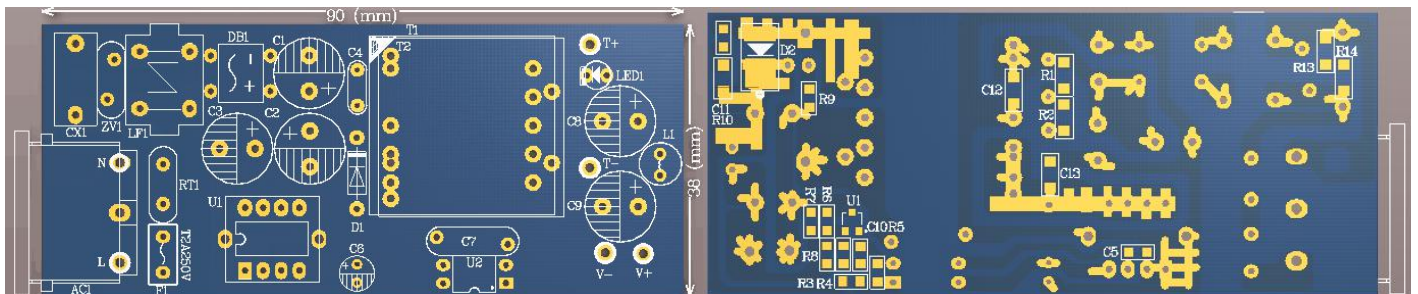
Main Features:

- Comply with Energy Star level V
- Over current / voltage / temperature, Output short circuit and Open circuit Protection

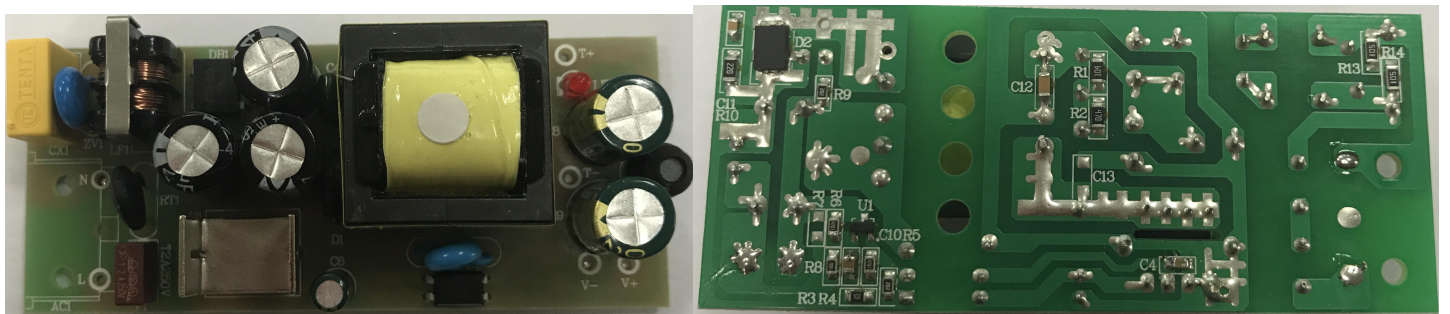
Circuit Schematic:



PCB Layout:



Demo board Photo:



BOM (Bill of Material):

NO.	Name	Specification	QTY	Position	Remark
1	PCB	single 94V0 90*38mm 1.6mm 10Z spray rosin	1		
2	SMD resister	1206 100K 5%	1	R1	
3	SMD resister	1206 47R 5%	1	R2	
4	SMD resister	0805 1K 5%	1	R3	
5	SMD resister	0805 2K 5%	2	R4, R9	
6	SMD resister	0805 4.7K 1%	2	R5, R6	
7	SMD resister	0805 18K 1%	1	R8	For CE
8	SMD resister	1206 22R 5%	1	R10	For CE
9	SMD resister	1206 1M 5%	2	R13, R14	FOR CE
10	Fuse	T2A250V VDE P=5mm	1	F1	
11	E capacitor	Φ 10*17mm 400V/22uF 105°C ±20%	1	C1	
12	E capacitor	Φ 10*17mm 400V/15uF 105°C ±20%	2	C2, C3	
13	Polyester capacitor	2G103J	1	C4	
14	SMD capacitor	0805 103 50V ±20%	1	C5	
15	E capacitor	Φ 5*12mm 25V/47uF 105°C ±20% low ESR	1	C6	
16	Y capacitor	Y1 222 400V pin=10mm ±20%	1	C7	
17	E capacitor	Φ 10*17mm 25V/1000uF 105°C ±20% LowESR	2	C8, C9	
18	SMD capacitor	0805 105 50V ±20%	1	C10	
19	SMD capacitor	0805 102 500V ±20%	1	C11	For CE
20	SMD capacitor	1206 103 1KV ±20%	1	C12	For CE
21	Rectifier bridge	DB107 DIP-4	1	DB1	
22	Diode	1N4007 DO-41	1	D1	
23	Synchronous rectifier IC	DK5V100R25 SM-7	1	D2	
24	X capacitor	0.22uF 275V p=10mm 20%	1	CX1	For CE
25	Common-mode inductor	UU9.8 25mH 0.25mm	1	LF1	For CE
26	I inductor	Φ 6*8mm 10uH 0.5mm	1	L1	For CE
27	Varistor	7D471	1	ZV1	For Lightning Protection
28	NTC	10D-9	1	RT1	For CE
29	LED	Φ 3 red long pin	1	LED1	
30	DK IC	DK125 DIP-8	1	U1	
31	Opto-coupler	EL817C DIP-4	1	U2	
32	Regulator IC	TL431 SOT-23	1	U3	
33	Heat sink	DIP-8 thick	1		
34	Silicone grease	Appropriate amount	1	For heat sink	
35	Transformer	EF25 vertical 5Pin+5Pin	1	T1	

Remark: it is designed as per CE requirement, if CE no need ,above remarked components could be deleted or changed

Transformer Data:

一、Circuit diagram:				Number	DK125-12V2A
				Version	V1
				Core	EF25 PC40
				Bobbin	EF25(5+5 horizontal)
				Made by	He
				Audited by	
				Authorized by	
				Date	2016.12.18
Pin 3, 5, 6, 8, 10 cut					

二、Transformer Winding Specification					
Winding	No. of turns	Diameter (mm)	Pile/No. of wire	Max.Current (mA)	Remark
N1 4-2	37	0.35	1		Share with N3
N2 9-7	11	0.45	2		3-layer isolated wire
N3 2-1	37	0.35	1		
Shielded layer	copper same width as the bobbin	1			P1&P2 double shield

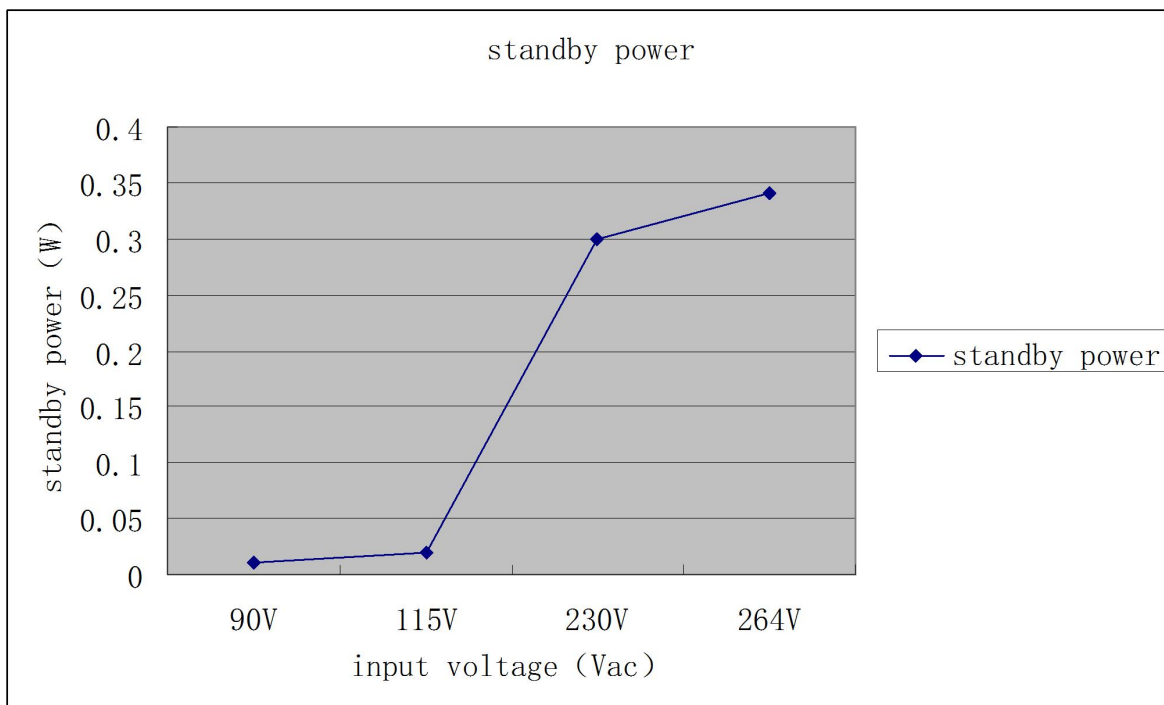
三、Electronic Specification				
Test item	Test point	Requirement	Testing Situation	Remark
Primary inductance	N1+N3	0.78-0.83mH	F=1KHz, U=0.3V	
Primary leakage inductance	N1+N3	< 76uH	F=1KHz, U=0.3V	Short Circuit point at pin7 & pin9

Remark: winding sequence: NI-P1-N2-P2-N3

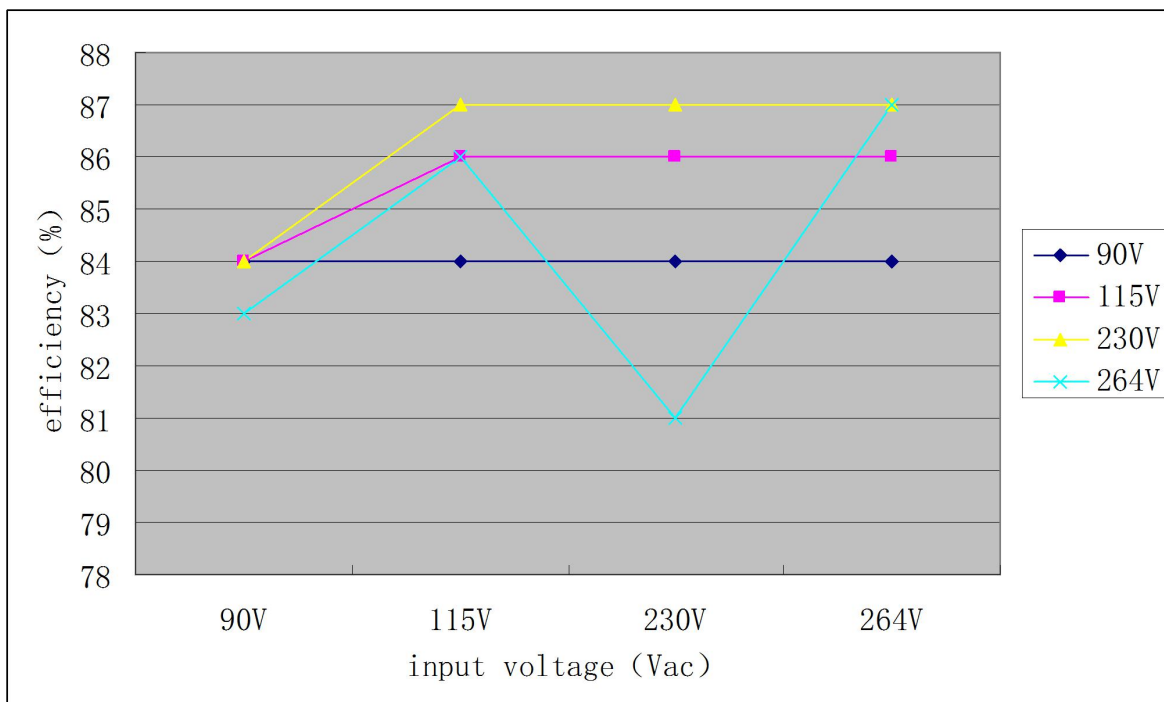
四、Safety				
Test item	Test point	Requirement	Testing Situation	Remark
withstand voltage	N1&N2	no breakdown	AC3500V/5mA/5S	
Primary point to Core	N1&core	no breakdown	AC1000V/5mA/5S	

五、Testing				
Standard GB2828-87 level II , AQL: Cr=0.01;Ma=0.65;Mi=1.5				

Standby Power at No Load:



Average Efficiency Between 25%, 50%, 75% and 100% Load:

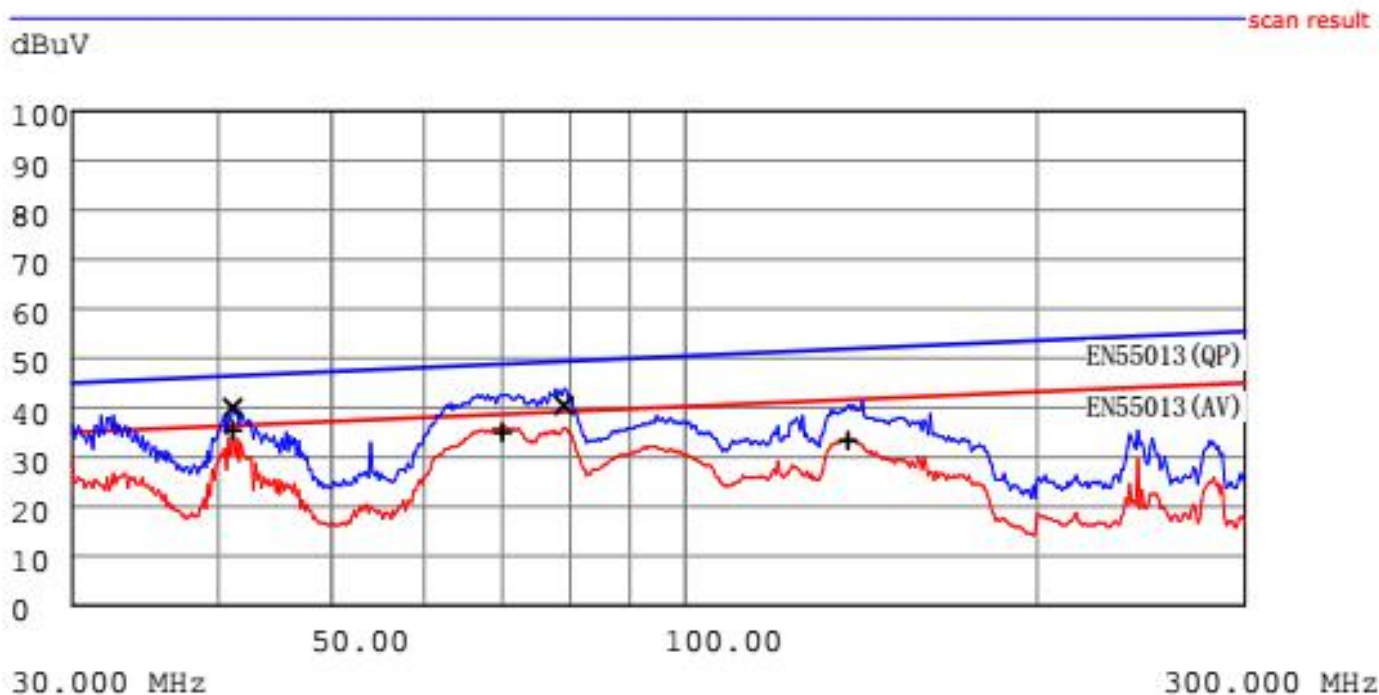


Radiated Emission TEST

EMI TEST REPORT

Organizat: 12V2A	Operator:	EUT:	parameter
Place:	Time: 2017/4/18/17:39	test equipmKH3932	
Detector: PK+AV	Test-time (r10 :	SN: 1332408	
Limit: EN55013	Transductor (PIPK / AV	JZ: 2,13,1518	
Remark: 12V2A 辐射			

Start (MHz)	End (MHz)	Step (MHz)	freq, step
30.000	100.000	0.100	
100.000	230.000	0.200	
230.000	300.000	0.200	



final test				
(QP)	freq (MHz)	lev (dBuV)	Lim (dBuV)	Δ (lev-Lim)
	41.210	39.6	45.4	-5.8
	79.060	40.3	46.8	-6.5
(AV)	freq (MHz)	lev (dBuV)	Lim (dBuV)	Δ (lev-Lim)
	41.210	35.1	35.4	-0.3
	70.050	34.8	36.5	-1.7
	137.940	33.2	39.0	-5.8

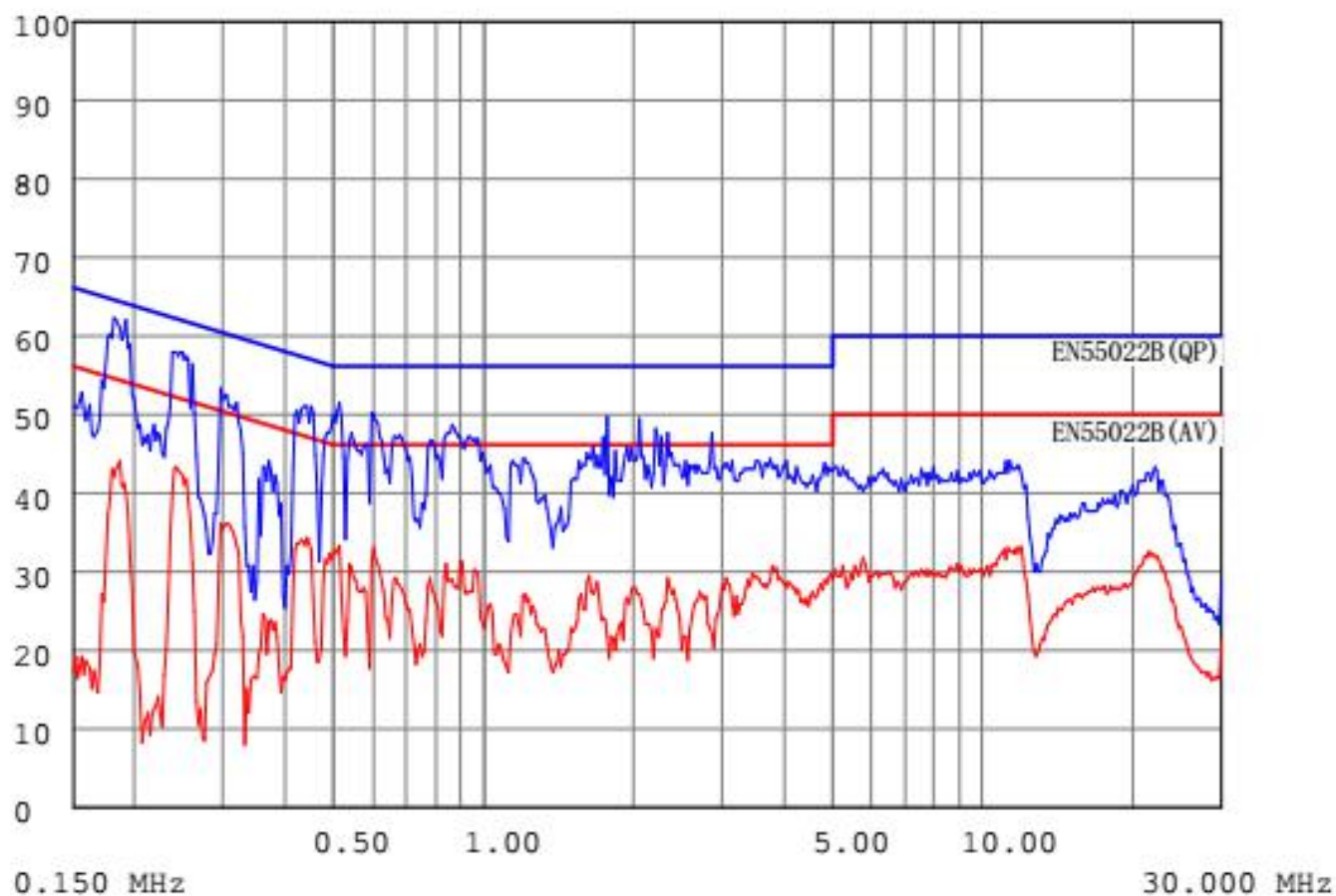
Conducted Emission TEST

EMI TEST REPORT

Organizat: 12V2A	Operator:	EUT:	parameter
Place:	Time: 2017/4/18/17:29	test equipm: KH3932	
Detector: PK+AV	Test-time (r10):	SN: 1332408	
Limit: EN55022B	Transductor (PIPK / AV	JZ: 2,13,1510	
Remark: 12V2A传导L			

Start (MHz)	End (MHz)	Step (MHz)	freq, step
0.150	2.000	0.002	
2.000	10.000	0.010	
10.000	30.000	0.025	

dBuV scan result

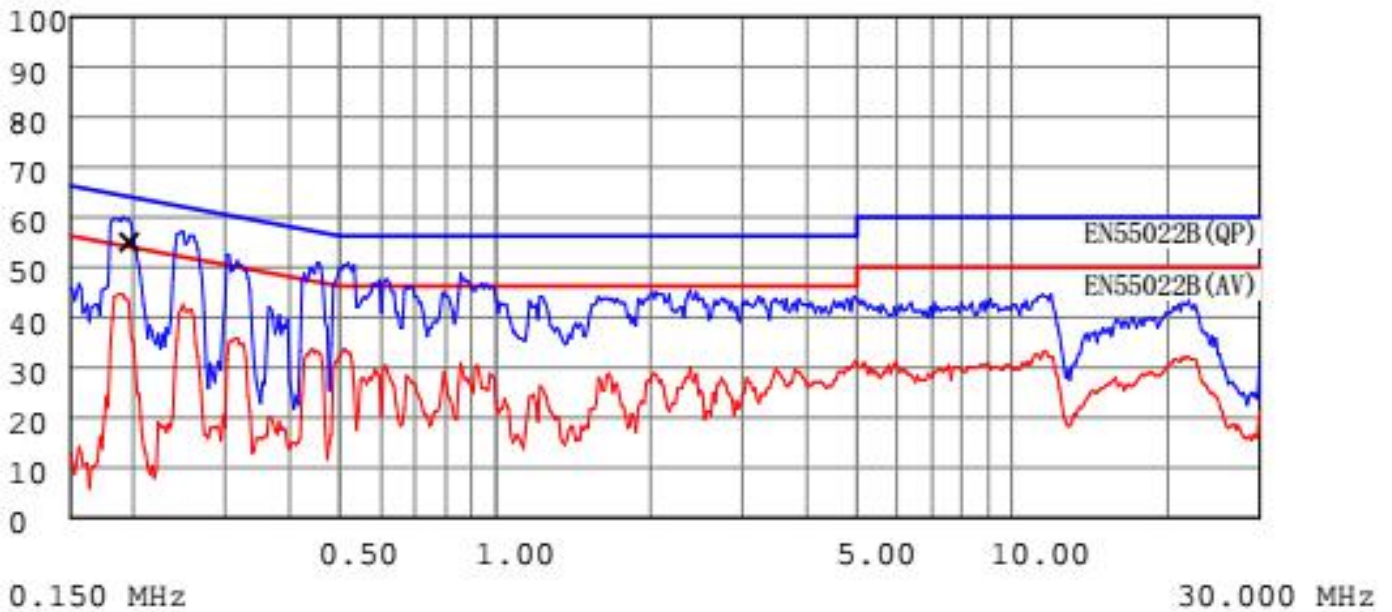


EMI TEST REPORT

Organizat: 12V2A	Operator:	EUT:
Place:	Time: 2017/4/18/17:32	Test equipm: KH3932
Detector: PK+AV	Test-time (r10):	SN: 1332408
Limit: EN55022B	Transductor (PIPK / AV	JZ: 2,14,817
Remark: 12V2A传导N		

Start (MHz)	End (MHz)	Step (MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

dBuV scan result



(QP)	freq (MHz)	lev (dBuV)	Lim (dBuV)	Δ (lev-Lim)
	0.196	55.0	64.7	-9.7

Notice:

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