



DEMO BOARD TEST REPORT

100W Isolated Two-Stage Dimmable LED Driver with KP2801A+KP1315+KP1402

FEATURES

- Input and Output Isolation
- Efficiency >89% @ 230Vac 30~54Vo&1.8A
- High PF >0.95 & Low THD <10%
- Harmonics Meets IEC61000-3-2 Class C
- Dimming Range 7%-100%
- 0-10V/PWM/Resistor Multiple Dimming
- No Flicker with Low Output Ripple
- Excellent Line Regulation and Load Regulation
- Low Standby Power <500mW

APPLICATIONS

- Street Lamp
- Tunnel Lamp
- High Bay Light

INTRODUCTION

The DEMO board is a high performance isolated two stage dimmable LED driver. The 1st stage is a Boost PFC with High PF @ Low THD with controller KP2801A; the 2nd stage is a high efficiency dimmable Flyback converter with controller KP1315. The output current is controlled by a 0-10V/PWM/Resistor multiple dimming signal converter KP1402.

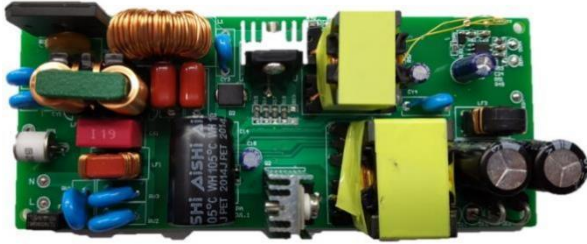
This DEMO board is designed with excellent dimming linearity and 7% minimum dimming brightness, which supports dimming off mode for low standby power. And the Demo Board is typically designed for the 100W application which support output voltage from 30V to 54V.

DEMO BOARD SEPCIFICATION

Description	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	Vin	198	220-240	264	Vac	50Hz
Output Voltage	Vout	30		54	Vdc	
Output Current	Iout		1.8		A	
Total Output Power	Pout		97.2		W	
Dimming Range	Dim	7		100	%	
Power Factor	PF	>0.95				198Vac-264Vac @ 54V&1.8A
Total Harmonic Distortion	THD	<10			%	198Vac-264Vac @ 54V&1.8A
System Average Efficiency	η	>89			%	198Vac-264Vac @ 30-54V&1.8A
Open Load Protection	Vo			60	V	
Standby Power	Pstandby			0.5	W	198Vac-264Vac @ Dim off
Startup Time	Tst			0.5	s	Tested at 198/264Vac
EMI Margin		6			dB	EN55015
Surge Test		6			kV	Differential Mode / Common Mode @ 230Vac/50Hz

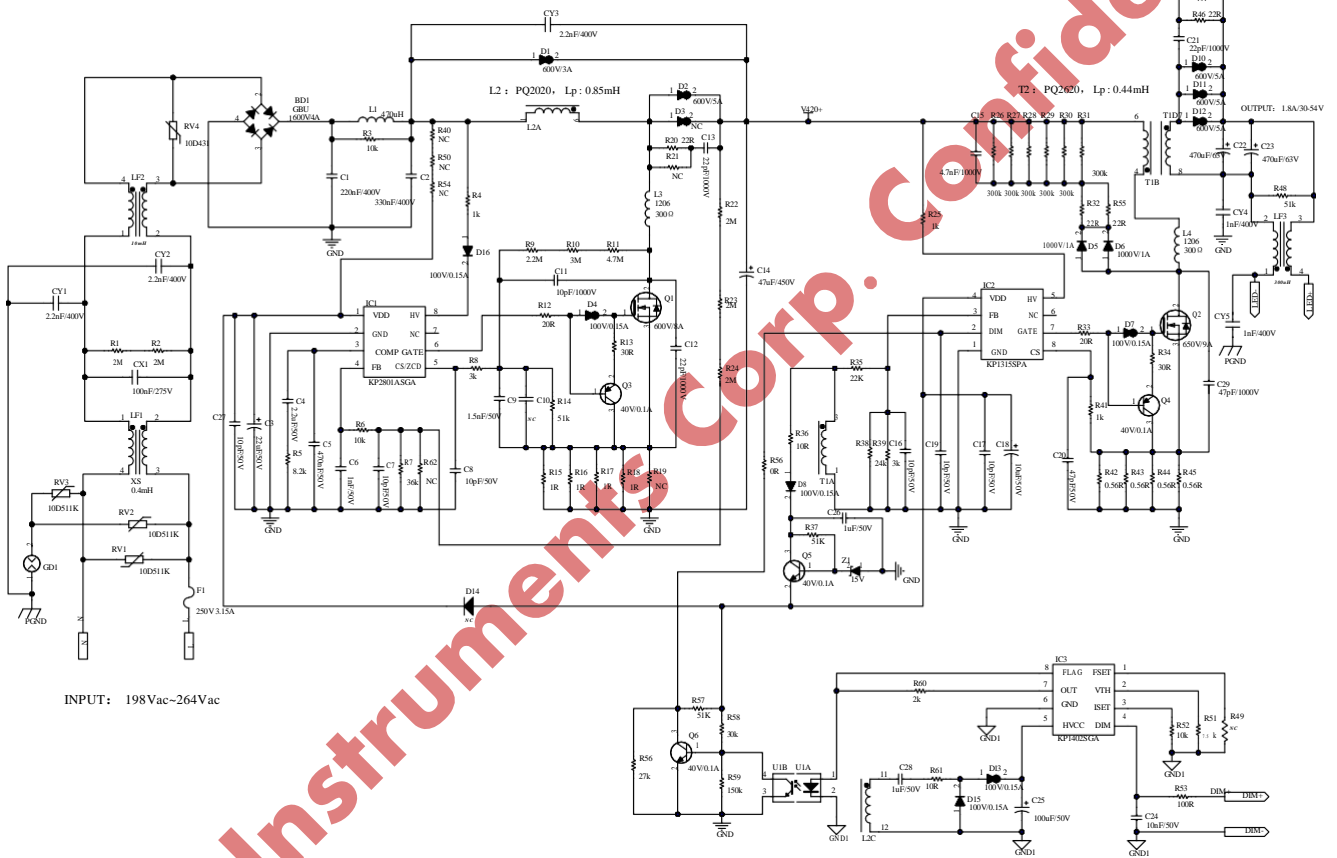
Note: The table above shows the minimum acceptable performance of the design. Actual performance is listed in the results section.

Demo Board of KP2801A+KP1315+KP1402_D02_REV1.1



Board Size (in mm): L x W x H=140 x 58 x30

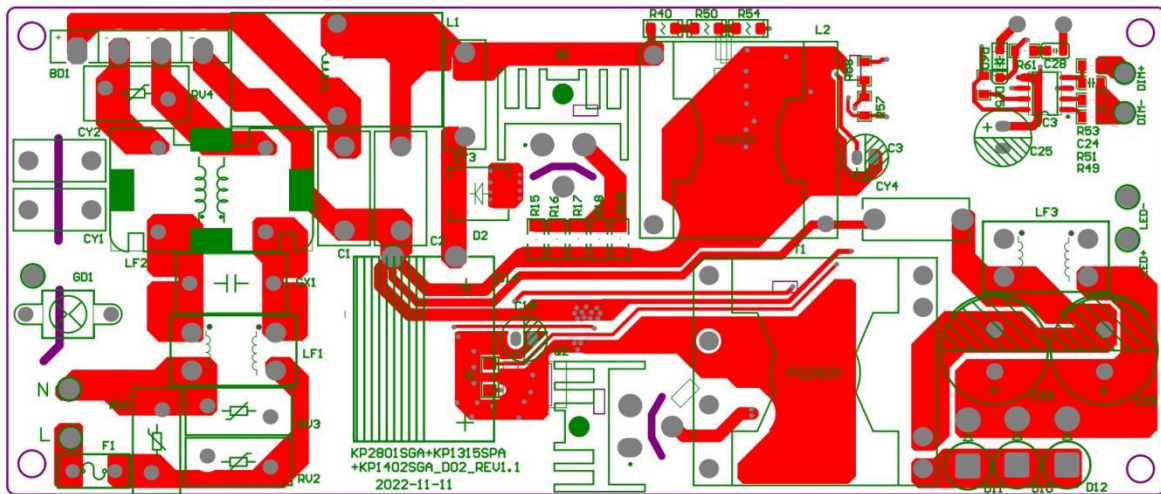
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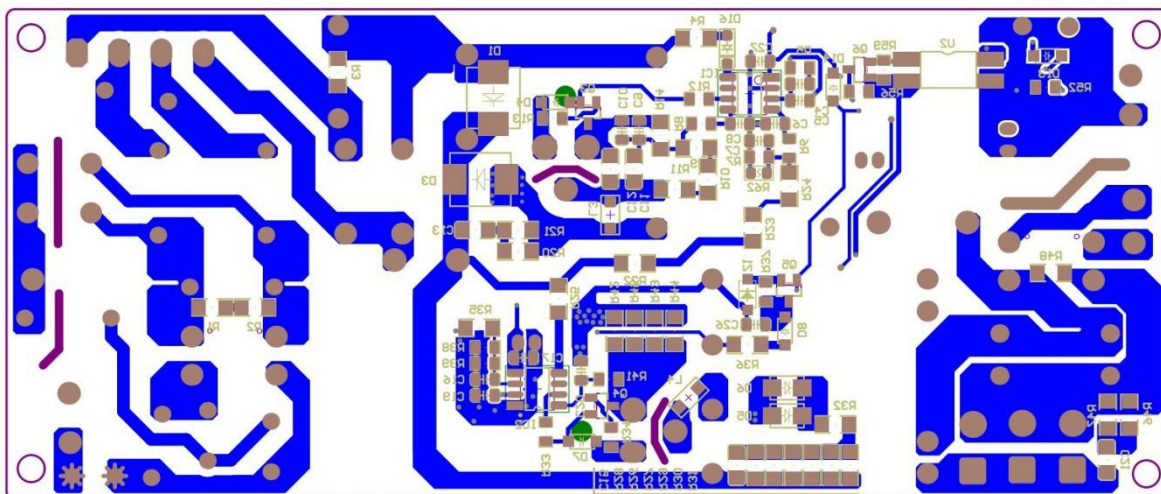
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Printed Circuit Board Layout

Top Layer



Bottom Layer





**100W Isolated Two-Stage Dimmable LED Driver with
KP2801A+KP1315+KP1402**

Bill of Material

No.	Designator	Value	Description	Package	Manufacturer	Part Number
1	BD1	600V/4A	BRD 4A 600V 1V	GBU	MDD	GBU406
2	C1	220nF/400V	CBB 400Vdc 12*6*12.5 P10	TH	STE	B22G224JN1B012 0125060EOZ
3	C2	330nF/400V	CBB 400Vdc 12*7*16 P10	TH	STE	B22G334JN1B012 0160070EOZ
4	C3	22µF/50V	Electrolytic Cap 50V 5*12 P2.0	TH	AISHI	ERS1HM220D12 OT
5	C4	2.2µF/50V	Ceramic Cap 50V ±10% X7R	0805	YAGEO	CC0805KKX7R9B B225
6	C5	470nF/50V	Ceramic Cap 50V ±10% X7R	0805	WE	885012207102
7	C6	1nF/50V	Ceramic Cap 50V ±5% NPO	0805	WE	885012007063
8	C7, C8, C16, C17, C19, C27	10pF/50V	Ceramic Cap 50V ±5% NPO	0805	WE	885012007051
9	C9	1.5nF/50V	Ceramic Cap 50V ±5% NPO	0805	WE	885012007064
10	C10	NC	NC	NC	NC	NC
11	C11	10pF/1000V	Ceramic Cap 1000V ±5% NPO	1206	YAGEO	CC1206JKNPOCB N100
12	C12, C13, C21	22pF/1000V	Ceramic Cap 1000V ±5% NPO	1206	WE	885342008008
13	C14	47µF/450V	Electrolytic Cap 450V 16*25 P7.5	TH	AISHI	EGM2WM470L25 OT
14	C15	4.7nF/1000V	Ceramic Cap 1000V ±10% X7R	1206	WE	885342208020
15	C18	10µF/50V	Electrolytic Cap 50V 5*11 P2.0	TH	AISHI	EW1HM100D11 OT
16	C20	47pF/50V	Ceramic Cap 50V ±5% NPO	0805	WE	885012007055
17	C22, C23	470µF/63V	Electrolytic Cap 63V 12.5*20 P5.0	TH	AISHI	EW1JM471W20 OT
18	C24	10nF/50V	Ceramic Cap 50V ±10% X7R	0805	WE	885012207092
19	C25	100µF/50V	Electrolytic Cap 50V 8*12 P3.5	TH	AISHI	ERS1HM101F120 T
20	C26, C28	1µF/50V	Ceramic Cap 50V ±10% X7R	0805	WE	885012207103
21	C29	47pF/1000V	Ceramic Cap 1000V ±5% NPO	1206	YAGEO	CC1206JKNPOCB N470
22	CX1	100nF/275V	X2 Capacitor 275Vac 13*7*13 P10	TH	WE	890324023023CS
23	CY1, CY2, CY3	2.2nF/400V	Y1 Capacitor 400Vac ±10% T5 P10	TH	STE	Q09F1D222MN0B 0SON0
24	CY4, CY5	1nF/400V	Y1 Capacitor 400Vac ±10% T5 P10	TH	STE	Q07F1D102MN0B 0SON0
25	D1	600V/3A	DIO FRD 3A 600V 35nS 1.68V	SMB	MDD	ES3JB
26	D2, D10, D11, D12	600V/5A	DIO FRD 5A 600V 35nS 1.68V	SMC	MDD	ES5JC
27	D3, D14	NC	NC	NC	NC	NC
28	D4, D7, D8, D13, D15, D16	100V/0.15A	DIO FRD 0.15A 100V 1.25V	SOD-123	World	1N4148W- SOD123
29	D5, D6	1000V/1A	DIO FRD 1A 1000V 1.1V	DO- 214AC (SMA)	MDD	M7
30	F1	250V 5A	Fuse 250V 5A	TH	CONQUER	MST5A250V
31	GD1	2RL2000L	Gas Discharge Tube,2000V,5.5mm*6.0mm	TH	BrightKing	2RL2000L-5
32	IC1	KP2801ASG A	High Performance QR Boost PFC Constant Voltage Controller	SOP-8	KIWI	KP2801ASGA
33	IC2	P1315SPA	PWM/0-10V Dimming High Efficiency QR Mode PSR CC LED Controller	SOP-8	KIWI	KP1315SPA



100W Isolated Two-Stage Dimmable LED Driver with KP2801A+KP1315+KP1402

34	IC3	KP1402SGA	Dimming Signal Converter Compatible with 0~10V,10-0V, Resistor, and PWM Dimming	SOP-8	KIWI	KP1402SGA
35	L1	0.47mH	Inductor Isat 1.6A Rdc 0.11Ω 14*25	TH	WE	7447071
36	L2	0.85mH	PQ2020, L=0.85mH, Np=0.1mm*20P*90Ts, Na=0.2mm*5Ts	PQ2020	Rongyao	PQ2020
37	L3, L4	300Ω	Bead Core 300Ω ± 25% 100MHz 3A	1206	WE	742792121
38	LF1, LF3	0.4mH	COMMON INDUCTOR Isat 4.5A Rdc 22mΩ 15*7.5*16	XS	WE	7448014501
39	LF2	10mH	COMMON INDUCTOR Isat 5A Rdc 50mΩ 24*14.5*25	MPQ	PuLuoDe	PDSQAT1918-103MLB
40	Q1	600V/8A	MOSFET 600V 8A 720mohm	TO-220F	sisemi	SIF8N60F
41	Q2	650V/9A	MOSFET 650V 9A 1700mohm	TO-220AB	Analog Power	AM9N65P
42	Q3, Q4	40V/0.1A	Transistor -40V -0.1A PNP	SOT23	LGE	MMBT3906LT1
43	Q5, Q6	40V/0.1A	Transistor 40V 0.1A NPN	SOT23	LGE	MMBT3904 1AM
44	R1, R2, R22, R23, R24	2M	Chip Resistor ±1% 1/4W	1206	FH	RS-06L2004FT
45	R3	10k	Chip Resistor ±1% 1/4W	1206	FH	RS-06K1002FT
46	R4, R25	1k	Chip Resistor ±1% 1/4W	1206	FH	RS-06K1001FT
47	R5	8.2k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K8201FT
48	R6, R52	10k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K1002FT
49	R7	36k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K3602FT
50	R8, R39	3k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K3001FT
51	R9	2.2M	Chip Resistor ±1% 1/4W	1206	FH	RS-06L3004FT
52	R10	3M	Chip Resistor ±1% 1/4W	1206	FH	RS-06L3004FT
53	R11	4.7M	Chip Resistor ±1% 1/4W	1206	FH	RS-06L4704FT
54	R12, R33	20R	Chip Resistor ±1% 1/8W	0805	FH	RS-05K20R0FT
55	R13, R34	30R	Chip Resistor ±1% 1/8W	0805	FH	RS-05K30R0FT
56	R14, R48	51k	Chip Resistor ±1% 1/4W	1206	FH	RS-06K5102FT
57	R15, R16, R17, R18	1R	Chip Resistor ±1% 1/4W	1206	FH	RS-06L1R00FT
58	R19, R21, R40, R47, R49, R50, R54	NC				
59	R20, R32, R46, R55	22R	Chip Resistor ±1% 1/4W	1206	FH	RS-06K22R0FT
60	R26, R27, R28, R29, R30, R31	300k	Chip Resistor ±1% 1/4W	1206	FH	RS-06K3003FT
61	R35	22K	Chip Resistor ±1% 1/4W	1206	FH	RS-06K2202FT
62	R36	10R	Chip Resistor ±1% 1/4W	1206	FH	RS-06K10R0FT
63	R37, R57	51K	Chip Resistor ±1% 1/8W	0805	FH	RS-05K5102FT
64	R38	24k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K2402FT
65	R41	1k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K1001FT
66	R42, R43, R44, R45	0.56R	Chip Resistor ±1% 1/4W	1206	RALEC	RTT06R560FTP
67	R51	7.5k	Chip Resistor ±1% 1/8W	0805	FH	RS-05K7501FT
68	R53	100R	Chip Resistor ±1% 1/8W	0805	FH	RS-05K1000FT



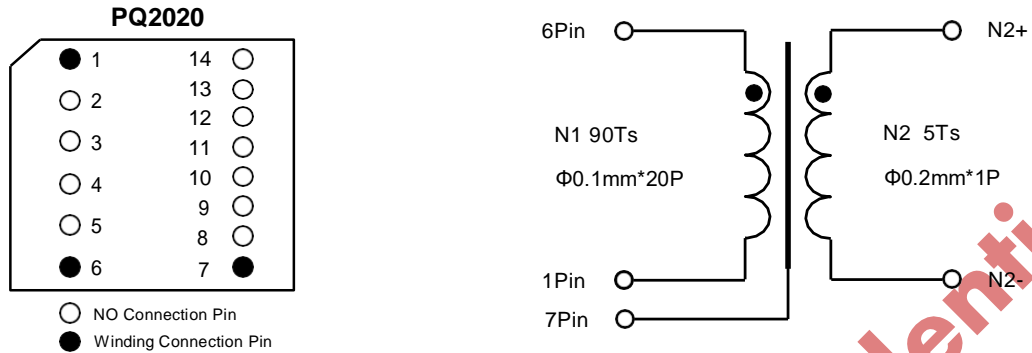
**100W Isolated Two-Stage Dimmable LED Driver with
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69	R56	0R	Chip Resistor $\pm 1\%$ 1/4W	1206	FH	RS-06000FT
70	R56	27k	Chip Resistor $\pm 1\%$ 1/8W	0805	FH	RS-05K2702FT
71	R58	30k	Chip Resistor $\pm 1\%$ 1/8W	0805	FH	RS-05K3002FT
72	R59	150k	Chip Resistor $\pm 1\%$ 1/8W	0805	FH	RS-05K1503FT
73	R60	2k	Chip Resistor $\pm 1\%$ 1/8W	0805	FH	RS-05K2001FT
74	R61	10R	Chip Resistor $\pm 1\%$ 1/8W	0805	FH	RS-05K10R0FT
75	R62	NC	Chip Resistor $\pm 1\%$ 1/8W	0805	FH	RS-05K3602FT
76	RV1, RV2, RV3	10D511K	VARISTOR 320VAC 69J 1250A	TH	STE	STE10D511K1EQ 0FSTOR0
77	RV4	10D431	VARISTOR 275VAC 80J 3500A	TH	WE	820412711
78	T1	0.44mH	PQ2620, Lp=0.44mH, Np=0.4mm*1P*40Ts, Ns=0.1mm*35P*22Ts, Na=0.2mm*1P*8Ts	PQ2620	Rongyao	PQ2620
79	U1	EL817	PHOTO TR 50mA 200%-400%	SMD-4	EVERLIGHT	EL817(A)-F
80	Z1	15V	Diode Zener 15V 2% 200mW	SOD-323	PANJIT	BZT52-B15S

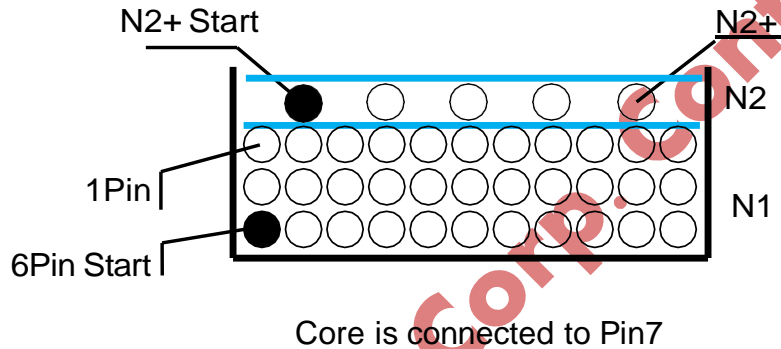
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Inductor Manufacture Guide---L2

1. Electrical Diagram



2. Winding Diagram



3. Winding Order

Number	Winding	Layer	Start	End	Wire Size	Turns	Note
1	N1	Primary	6	1	0.1mm*20P	90T	0.1mmΦ*20P 2UEW, Litz
2	N2	Auxiliary	N2+	N2-	0.2mm*1P	5T	0.2Φ*5, TIW-B

4. Electrical Specification

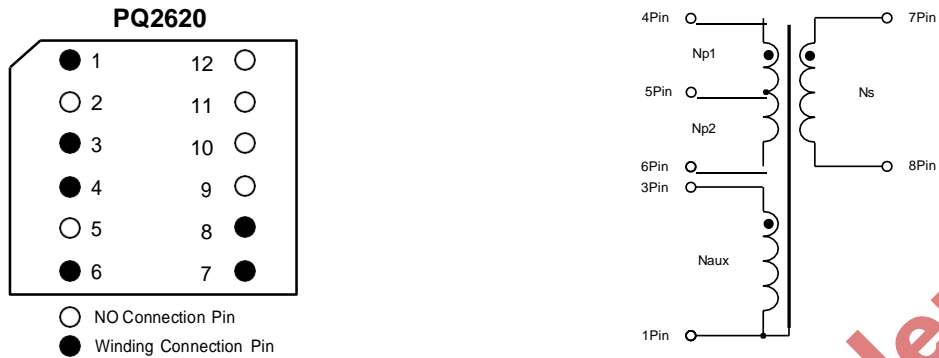
Items	Test Condition	Test Pin	Specification
Primary Inductance	Measured at 40kHz, 1.0 VRMS	Pins 6 - 1, all other windings open	0.85mH±5%
DC Resistance	Measured at 40kHz, 1.0 VRMS	Pins 6 - 1	1Ω Max
HI-POT HV Test	Primary to Auxiliary, 3750Vac	Pins 1, 6 - N2+, N2-	<5mA, 1Min

5. Inductor BOM

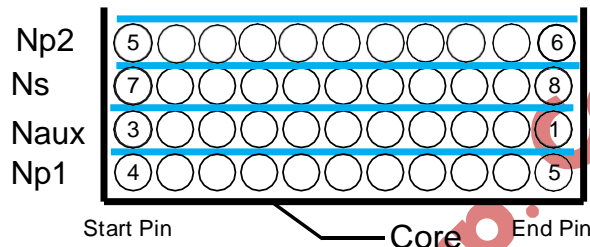
Items	Description
1	Core: PQ2020, PC44 or equivalent, AE=62mm ²
2	Bobbin: PQ2020, 6+8 Pin
3	Wire: Φ0.1mm*20P, 2UEW, Class B
4	Triple Insulation Wire: Φ0.2mm, TIW-B
5	Tape: 10mm(W)×0.06mm (TH)

Inductor Manufacture Guide---T1

6. Electrical Diagram



7. Winding Diagram



8. Winding Order

Number	Winding	Layer	Start	End	Wire Size	Turns	Note
1	Np1	Primary1	4	5	0.4mm	20T	0.4Φ*20, TIW-B
2	Naux	Auxiliary	3	1	0.2mm	8T	0.2Φ*8, TIW-B
3	Ns	Secondary	7	8	0.1mm*40P	22T	0.1mmΦ*40P 2UEW, Litz
4	Np2	Primary2	5	6	0.4mm	20T	0.4Φ*20, TIW-B

9. Electrical Specification

Items	Test Condition	Test Pin	Specification
Primary Inductance	Measured at 40kHz, 1.0 VRMS	Pins 4 - 6, all other windings open	0.44mH±5%
Primary Leakage Inductance	Measured at 40kHz, 1.0 VRMS	Pins 4 - 6, all other windings shorted	10μH Max
DC Resistance	Measured at 40kHz, 1.0 VRMS	Pins 4 - 6	0.5Ω Max
HI-POT Test	Primary to Secondary, 3750Vac	Pins4, 6 - 7, 8	<5mA, 1Min

10. Inductor BOM

Items	Description
1	Core: PQ2620, PC44 or equivalent, AE=119mm ²
2	Bobbin: PQ2620, 6+6 Pin
3	Wire: Φ0.1mm*40P, 2UEW, Class B
4	Triple Insulation Wire: Φ0.4mm, TIW-B; Φ0.2mm, TIW-B
5	Tape: 10mm(W)×0.06mm(TH)

Test Result

1. Steady State Characteristics

1.1 Efficiency, PF and THD

Test Conditions: Input: 230Vac; Output: 30~54V&1.8A.

Standard: Eff>89%, PF>0.95, THD<10% @230Vac, 30~54V&1.8A;

Result: Pass

Vo(V)	Vin(V)	F(Hz)	PF	THD	Pin(W)	Vo(V)	Io(A)	Eff(%)
30V	198	50	0.990	8.9%	64.173	31.049	1.844	89.20%
	210	50	0.988	9.0%	64.137	31.047	1.845	89.29%
	220	50	0.986	9.3%	64.101	31.046	1.845	89.37%
	230	50	0.984	9.5%	64.094	31.046	1.846	89.40%
	240	50	0.981	10%	64.093	31.046	1.846	89.42%
	250	50	0.978	11.3%	64.076	31.047	1.846	89.43%
	260	50	0.975	12.3%	64.066	31.048	1.845	89.44%
	264	50	0.973	12.6%	64.044	31.049	1.845	89.44%
36V	198	50	0.992	7.6%	75.105	37.045	1.828	90.17%
	210	50	0.991	8.1%	75.023	37.045	1.828	90.25%
	220	50	0.989	8.1%	74.950	37.044	1.827	90.30%
	230	50	0.988	8.4%	74.904	37.045	1.826	90.33%
	240	50	0.986	9.1%	74.864	37.044	1.826	90.35%
	250	50	0.983	9.7%	74.832	37.045	1.825	90.36%
	260	50	0.981	10.5%	74.815	37.046	1.825	90.37%
	264	50	0.979	10.9%	74.789	37.045	1.825	90.38%
42V	198	50	0.994	6.4%	86.300	43.045	1.819	90.71%
	210	50	0.992	7.1%	86.216	43.045	1.819	90.80%
	220	50	0.992	7.0%	86.167	43.046	1.819	90.85%
	230	50	0.990	7.4%	86.113	43.046	1.819	90.90%
	240	50	0.989	7.9%	86.067	43.046	1.819	90.95%
	250	50	0.987	8.5%	86.044	43.046	1.818	90.96%
	260	50	0.985	9.1%	86.025	43.046	1.818	90.99%
	264	50	0.984	9.4%	86.013	43.047	1.818	91.00%

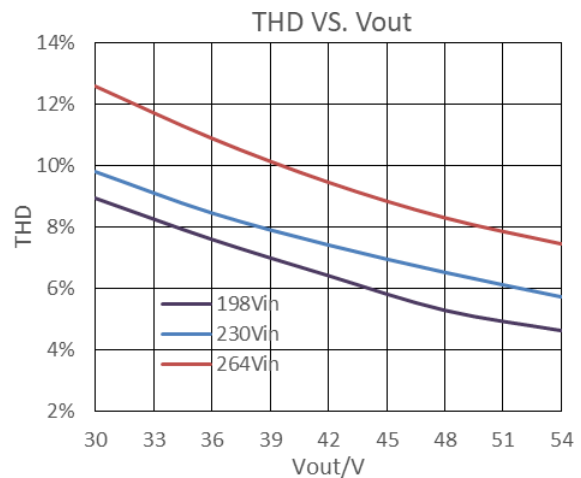
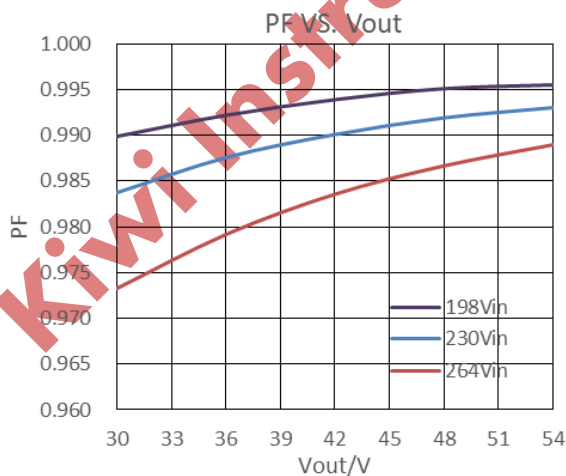
48V	198	50	0.995	5.3%	97.807	49.045	1.816	91.04%
	210	50	0.994	6.0%	97.688	49.045	1.815	91.14%
	220	50	0.993	6.1%	97.612	49.044	1.815	91.21%
	230	50	0.992	6.5%	97.555	49.044	1.815	91.26%
	240	50	0.990	6.9%	97.497	49.045	1.815	91.32%
	250	50	0.989	7.5%	97.451	49.045	1.815	91.35%
	260	50	0.987	8.0%	97.414	49.045	1.815	91.39%
	264	50	0.987	8.3%	97.386	49.044	1.815	91.41%
54V	198	50	0.996	4.6%	109.313	55.045	1.812	91.24%
	210	50	0.995	4.9%	109.153	55.045	1.812	91.36%
	220	50	0.994	5.3%	109.045	55.043	1.811	91.44%
	230	50	0.993	5.7%	108.938	55.041	1.811	91.50%
	240	50	0.992	6.1%	108.864	55.041	1.811	91.57%
	250	50	0.991	6.6%	108.794	55.039	1.811	91.62%
	260	50	0.990	7.2%	108.748	55.039	1.811	91.66%
	264	50	0.989	7.4%	108.714	55.037	1.811	91.67%

1.2 PF, THD VS. Vout

Test Conditions: Input: 198-264Vac; Output: 30-54V&1.8A.

Standard: PF>0.95, THD<10% @ 230Vac, 30-54V&1.8A.

Result: Pass



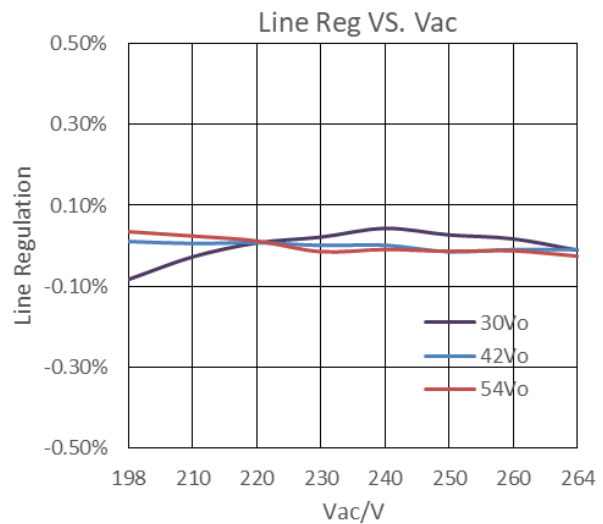
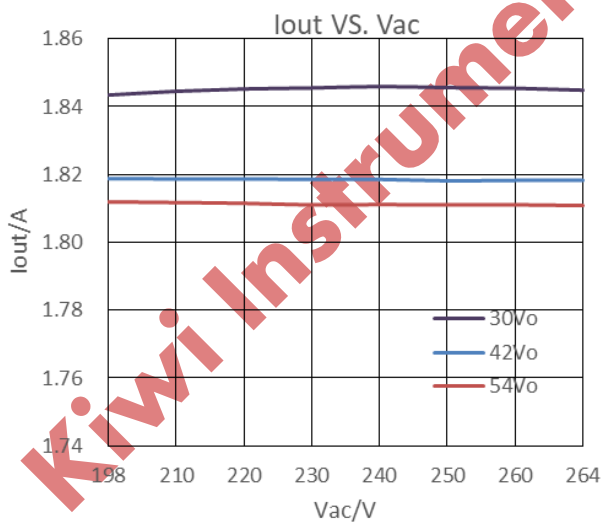
1.3 Line Regulation

Test Conditions: Input: 198-264Vac; Output: 30-54V&1.8A.

Standard: Line Regulation <1%

Result: Pass

Vin(V)	Io(A)								
	Vo=30V	Vo=33V	Vo=36V	Vo=39V	Vo=42V	Vo=45V	Vo=48V	Vo=51V	Vo=54V
198	1.844	1.842	1.828	1.822	1.819	1.817	1.816	1.815	1.812
210	1.845	1.841	1.828	1.822	1.819	1.817	1.815	1.814	1.812
220	1.845	1.840	1.827	1.822	1.819	1.817	1.815	1.815	1.811
230	1.846	1.838	1.826	1.821	1.819	1.817	1.815	1.814	1.811
240	1.846	1.837	1.826	1.821	1.819	1.817	1.815	1.814	1.811
250	1.846	1.837	1.825	1.821	1.818	1.817	1.815	1.814	1.811
260	1.845	1.834	1.825	1.821	1.818	1.817	1.815	1.814	1.811
264	1.845	1.834	1.825	1.821	1.818	1.817	1.815	1.814	1.811
Max	1.846	1.842	1.828	1.822	1.819	1.817	1.816	1.815	1.812
Ave	1.845	1.838	1.826	1.822	1.818	1.817	1.815	1.814	1.811
Min	1.844	1.834	1.825	1.821	1.818	1.817	1.815	1.814	1.811
Line Reg	0.13%	0.48%	0.18%	0.09%	0.03%	0.03%	0.03%	0.05%	0.06%



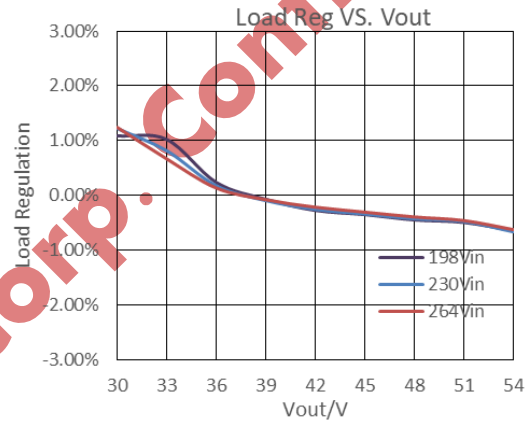
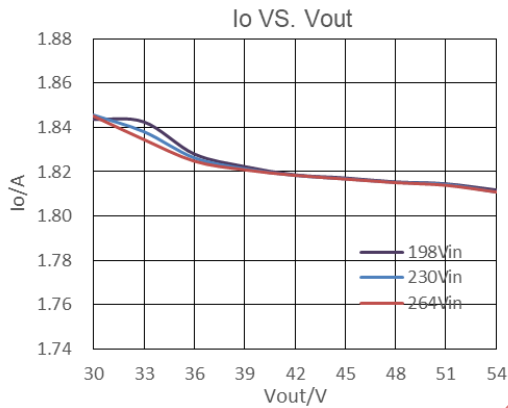
1.4 Load Regulation

Test Conditions: Input: 198-264Vac; Output: 30-54V&1.8A.

Standard: Load Regulation < 2%

Result: Pass

Vin(V)	Io(A)									Load Reg
	Vo= 30V	Vo= 33V	Vo= 36V	Vo= 39V	Vo= 42V	Vo= 45V	Vo= 48V	Vo= 51V	Vo= 54V	
198	1.844	1.842	1.828	1.822	1.819	1.817	1.816	1.815	1.812	1.74%
210	1.845	1.841	1.828	1.822	1.819	1.817	1.815	1.814	1.812	1.81%
220	1.845	1.840	1.827	1.822	1.819	1.817	1.815	1.815	1.811	1.85%
230	1.846	1.838	1.826	1.821	1.819	1.817	1.815	1.814	1.811	1.90%
240	1.846	1.837	1.826	1.821	1.819	1.817	1.815	1.814	1.811	1.91%
250	1.846	1.837	1.825	1.821	1.818	1.817	1.815	1.814	1.811	1.90%
260	1.845	1.834	1.825	1.821	1.818	1.817	1.815	1.814	1.811	1.89%
264	1.845	1.834	1.825	1.821	1.818	1.817	1.815	1.814	1.811	1.87%



1.5 Harmonic Current

Test Conditions: Input: 230Vac; Output: 54V&1.8A /30V&0.8A.

Standard: IEC61000-3-2 Class C

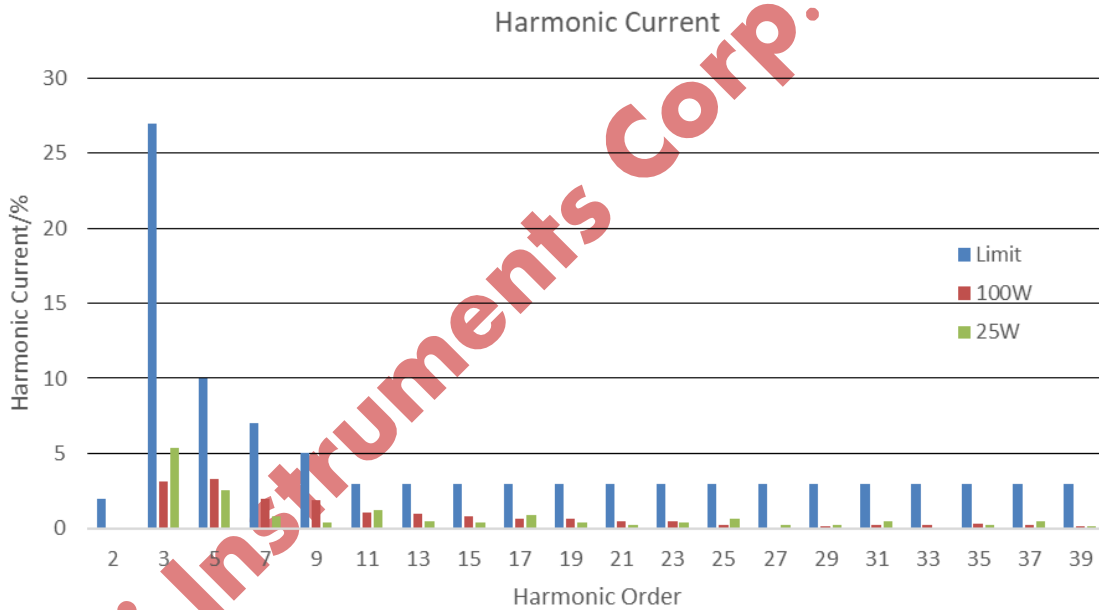
Result: Pass

Harmonic Current Limit Value and Actual Value @ 54V&1.8A

Harmonic NO.	Limit (%)	Actual Value(%)	Pass Fail	Harmonic NO.	Limit (%)	Actual Value(%)	Pass Fail
2	2	0	Pass	3	27	3.1	Pass
5	10	3.3	Pass	7	7	1.95	Pass
9	5	1.85	Pass	11	3	1.09	Pass
13	3	1.01	Pass	15	3	0.83	Pass
17	3	0.65	Pass	19	3	0.65	Pass
21	3	0.47	Pass	23	3	0.44	Pass
25	3	0.2	Pass	27	3	0.06	Pass
29	3	0.13	Pass	31	3	0.24	Pass
33	3	0.27	Pass	35	3	0.28	Pass
37	3	0.21	Pass	39	3	0.16	Pass

Harmonic Current Limit Value and Actual Value @30V&0.8A

Harmonic NO.	Limit (%)	Actual Value(%)	Pass Fail	Harmonic NO.	Limit (%)	Actual Value(%)	Pass Fail
2	2	0.03	Pass	3	27	5.38	Pass
5	10	2.52	Pass	7	7	0.8	Pass
9	5	0.4	Pass	11	3	1.22	Pass
13	3	0.45	Pass	15	3	0.37	Pass
17	3	0.9	Pass	19	3	0.37	Pass
21	3	0.21	Pass	23	3	0.37	Pass
25	3	0.62	Pass	27	3	0.27	Pass
29	3	0.26	Pass	31	3	0.45	Pass
33	3	0.05	Pass	35	3	0.21	Pass
37	3	0.45	Pass	39	3	0.16	Pass



1.6 Output Current Ripple

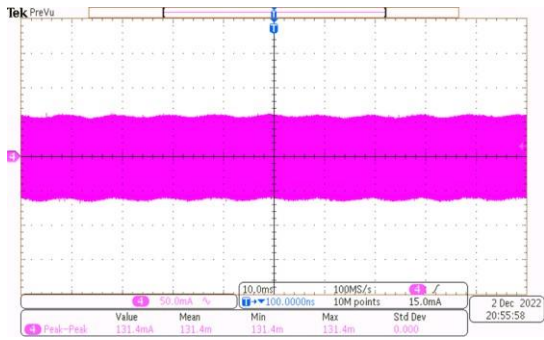
Test Conditions: Input: 198-264Vac; Output: 30-54V&1.8A.

Standard: Pk-pk Ripple < 20%

Result: Pass

Waveforms:

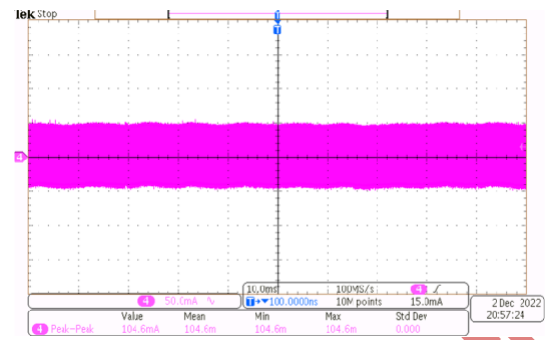
Test Condition: 230Vac/50Hz Input, 30V&1.8A Output



(CH4: Io)

Comments: Ipeak-peak=131.4mA

Test Condition: 230Vac/50Hz Input, 54V&1.8A Output



(CH4: Io)

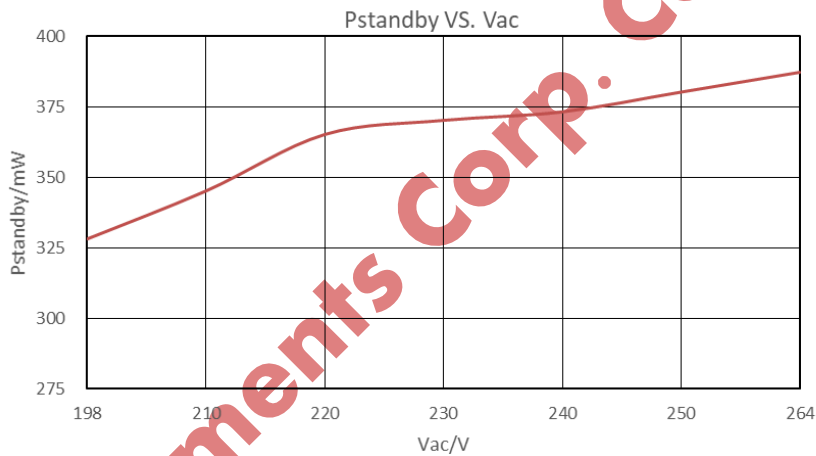
Comments: Ipeak-peak=104.6mA

1.7 Standby Power

Test Conditions: Input: 198-264Vac; Output: Dim OFF.

Standard: $P_{Standby} < 0.5W$

Result: Pass

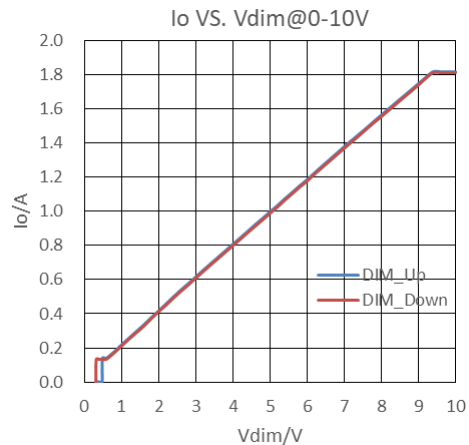
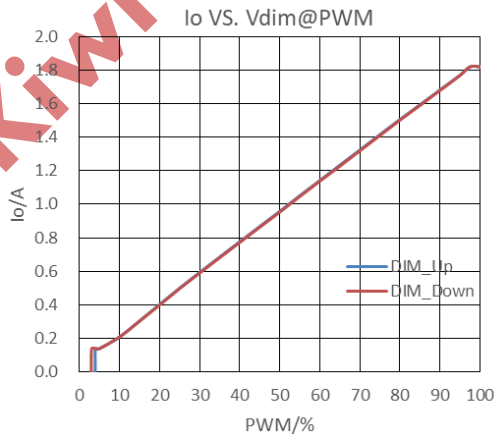


1.8 Dimming Curve

Test Conditions: Input: 220Vac; Output: 54V&1.8A; PWM/0-10V

Standard: High linearity of dimming curve

Result: Pass



2 Dynamic Characteristics

2.1 Start-up Characteristics

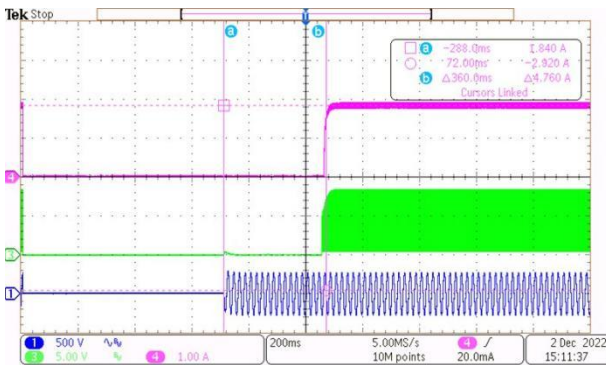
Test Conditions: Input: 198/230/264Vac; Output: 30~54V&1.8A~0.15A.

Standard: Start up time <500ms, and no flicker and no overshoot

Result: Pass

Waveforms:

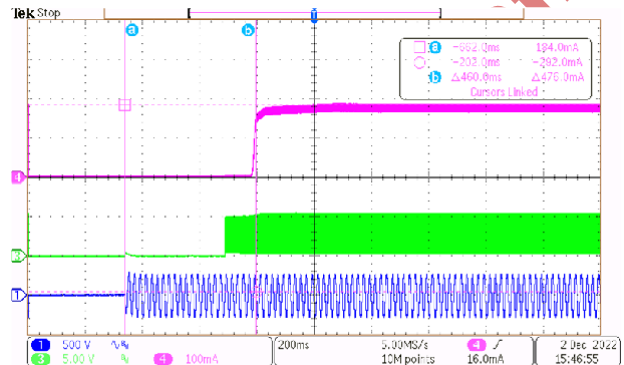
Test Condition: 198Vac/50Hz Input, 30V&1.8A Output



(CH1: Vin; CH3: Flyback_Gate; CH4: Io)

Comments: Current rise time 360ms, No flicker and no overshoot

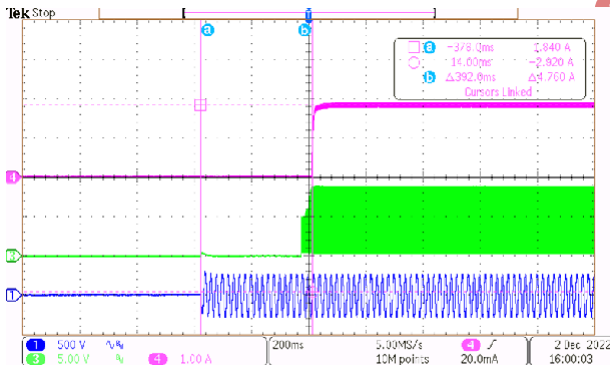
Test Condition: 198Vac/50Hz Input, 30V&0.15A Output



(CH1: Vin; CH3: Flyback_Gate; CH4: Io)

Comments: Current rise time 460ms, No flicker and no overshoot

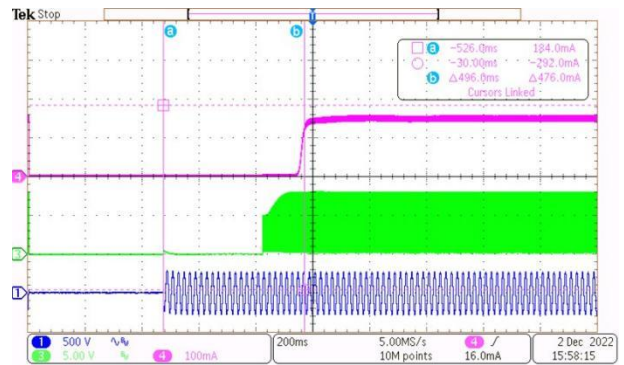
Test Condition: 198Vac/50Hz Input, 54V&1.8A Output



(CH1: Vin; CH3: Flyback_Gate; CH4: Io)

Comments: Current rise time 392ms, No flicker and no overshoot

Test Condition: 198Vac/50Hz Input, 54V&0.15A Output



(CH1: Vin; CH3: Flyback_Gate; CH4: Io)

Comments: Current rise time 496ms, No flicker and no overshoot

2.2 Power off Characteristics

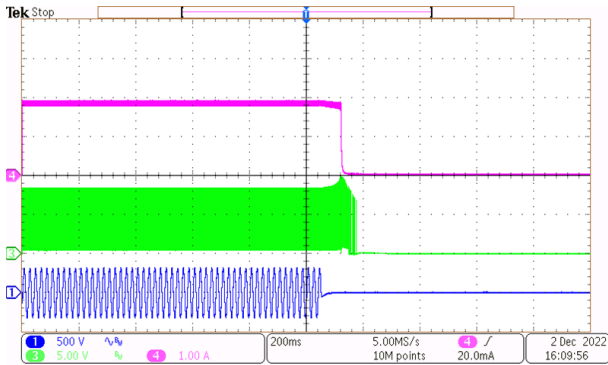
Test Conditions: Input: 230Vac; Output: 30/54V&1.8A.

Standard: No flicker and no overshoot

Result: Pass

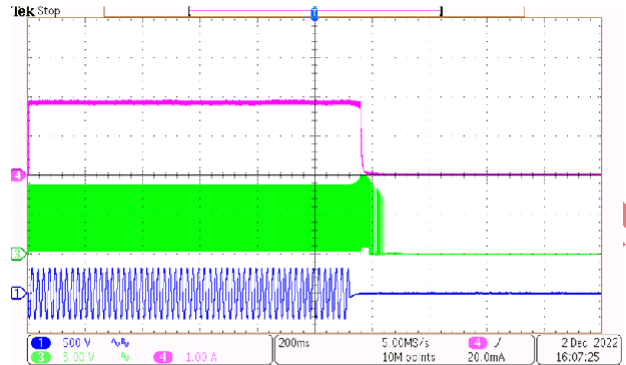
Waveforms:

Test Condition: 230Vac/50Hz Input, 30V&1.8A Output



(CH1: Vin; CH3: Flyback_Gate; CH4: Io)
Comments: OK, No flicker and no overshoot

Test Condition: 230Vac/50Hz Input, 54V&1.8A Output



(CH1: Vin; CH3: Flyback_Gate; CH4: Io)
Comments: OK, No flicker and no overshoot

2.3 Dim on/off Characteristics

Test Conditions: Input: 198Vac; Output: 30/54V&1.8A.

Standard: No flicker and no overshoot

Result: Pass

Waveforms:

Test Condition: 198Vac/50Hz Input, 30V&1.8A Output

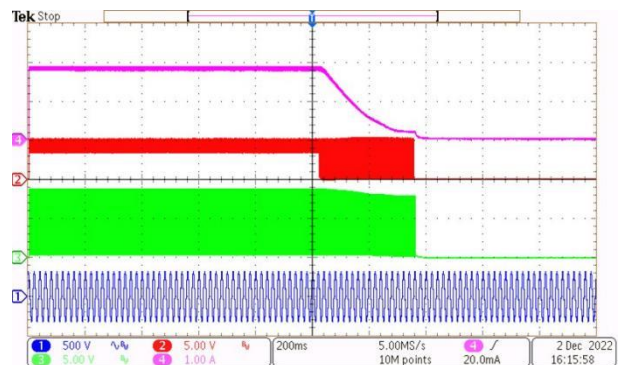
Test Condition: 198Vac/50Hz Input, 30V&1.8A Output

(CH1: Vin; CH2: DIM; CH3: Flyback_Gate; CH4: Io)
Comments: OK, No flicker and no overshoot

Test Condition: 198Vac/50Hz Input, 54V&1.8A Output

(CH1: Vin; CH2: DIM; CH3: Flyback_Gate; CH4: Io)
Comments: OK, No flicker and no overshoot

Test Condition: 198Vac/50Hz Input, 54V&1.8A Output



(CH1: Vin; CH2: DIM; CH3: Flyback_Gate; CH4: Io)
Comments: OK, No flicker and no overshoot

(CH1: Vin; CH2: DIM; CH3: Flyback_Gate; CH4: Io)
Comments: OK, No flicker and no overshoot

2.4 Dynamic Dimming

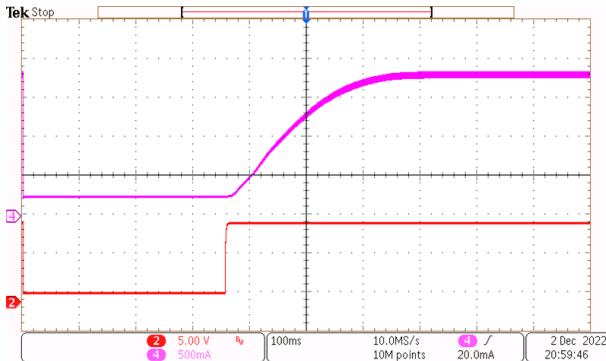
Test Conditions: Input: 198Vac; Output: 30/54V&1.8A.

Standard: No flicker and no overshoot

Result: Pass

Waveforms:

Test Condition: 230Vac/50Hz Input, 54V&1.8A Output
DIM 1V jump to 10V



(CH2: DIM; CH4: Io)

Comments: OK, No flicker and no overshoot

Test Condition: 230Vac/50Hz Input, 54V&1.8A Output
DIM 10V jump to 1V



(CH2: DIM; CH4: Io)

Comments: OK, No flicker and no overshoot

3 Reliability Testing

3.1 Output Short Protection

Test Conditions: Input: 230Vac; Output: 54V&1.8A.

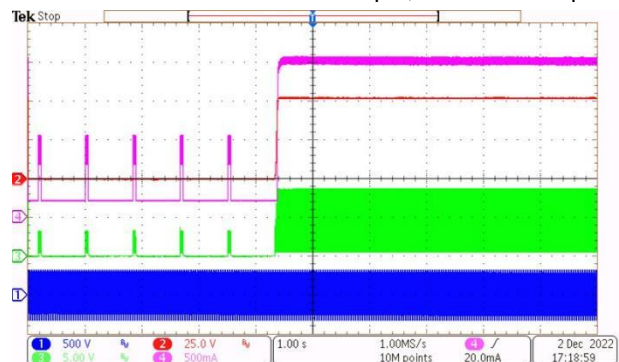
Standard: Output is auto recovery and no component damaged.

Result: Pass

Waveforms:

Test Condition: 230Vac/50Hz Input, 54V&1.8A Output

Test Condition: 230Vac/50Hz Input, 54V&1.8A Output



(CH1: Vin; CH2: Vo; CH3: Flyback_Gate; CH4: Io)

Comments: Protect function is OK

(CH1: Vin; CH2: Vo; CH3: Flyback_Gate; CH4: Io)

Comments: Auto recovery function is OK

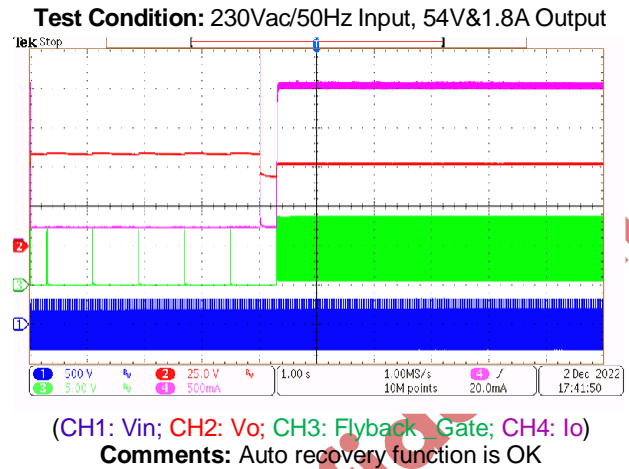
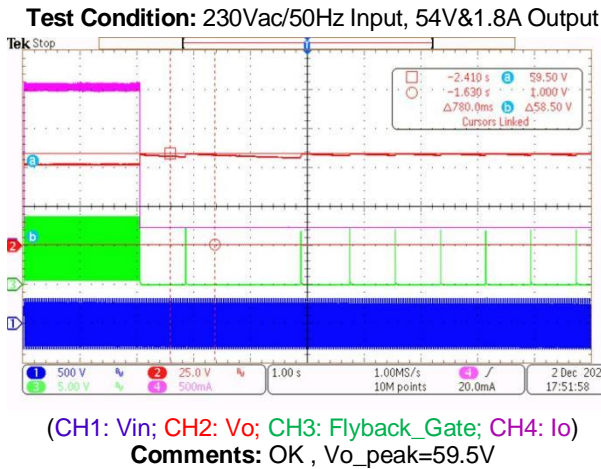
3.2 Open Load Protection

Test Conditions: Input: 230Vac; Output: 54V&1.8A.

Standard: Output is auto recovery and no component damaged.

Result: Pass

Waveforms:



3.3 Maximum Stress of Boost MOSFET

Test Conditions: Input: 198/264Vac; Output: 54V&1.8A.

Standard: $V_{DS_peak} < 90\% \cdot V_{dsmax}$

Result: Pass

Waveforms:

Test Condition: 198Vac/50Hz Input, 54V&1.8A Output

Test Condition: 264Vac/50Hz Input, 54V&1.8A Output

(CH1: PFC_DS; CH3:PFC_Gate)
Comments: OK VDS_peak=460V

(CH1: PFC_DS; CH3:PFC_Gate)
Comments: OK VDS_peak=452.5V

3.4 Maximum Stress of Flyback MOSFET

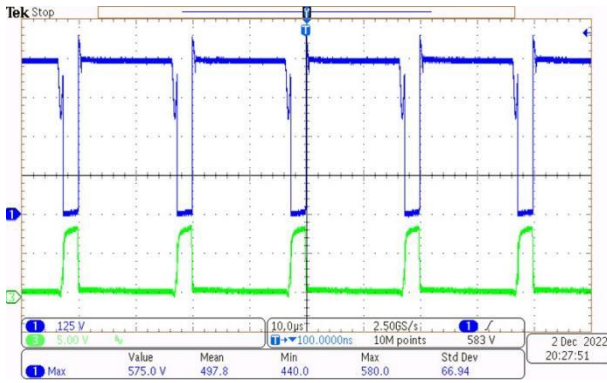
Test Conditions: Input: 198/264Vac; Output: 54V&1.8A.

Standard: $V_{DS_peak} < 90\% \cdot V_{dsmax}$

Result: Pass

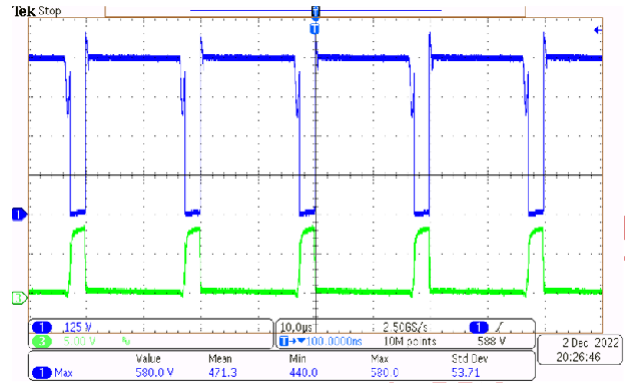
Waveforms:

Test Condition: 198Vac/50Hz Input, 54V&1.8A Output



(CH1: Buck_GS; CH2: DS; CH4: Iout)
Comments: OK VDS_peak=580V

Test Condition: 264Vac/50Hz Input, 54V&1.8A Output



(CH1: Buck_GS; CH2: DS; CH4: Iout)
Comments: OK VDS_peak=580V

3.5 Maximum Stress of Flyback Output Diode

Test Conditions: Input: Input: 198/264Vac; Output: 54V&1.8A.

Standard: VD_peak < 90% *VDmax

Result: Pass

Waveforms:

Test Condition: 198Vac/50Hz Input, 54V&1.8A Output

Test Condition: 264Vac/50Hz Input, 54V&1.8A Output

(CH1: Buck_GS; CH3: VD; CH4: Iout)
Comments: OK VDS_peak=440V

(CH1: Buck_GS; CH3: VD; CH4: Iout)
Comments: OK VDS_peak=440V

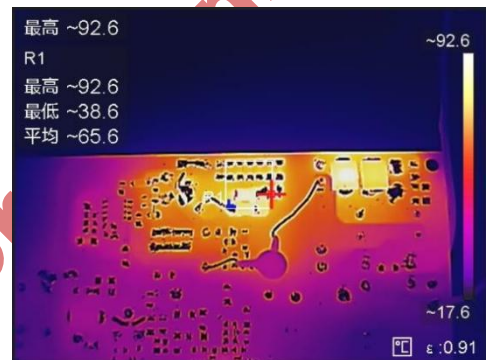
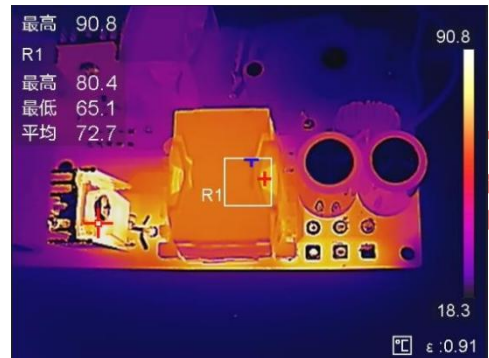
3.6 Thermal Test

Test Conditions: Input: 230Vac; Output: 54V&1.8A. Burn-in 0.5Hour @ confined container and steady environment with no airflow, Ta is the temperature inside the cardboard box.

Standard: Final product will be cased and potted, the open frame thermal test data is only for reference.

Result: Pass

230Vac/50Hz, Ta=25°C



3.7 EMC Test

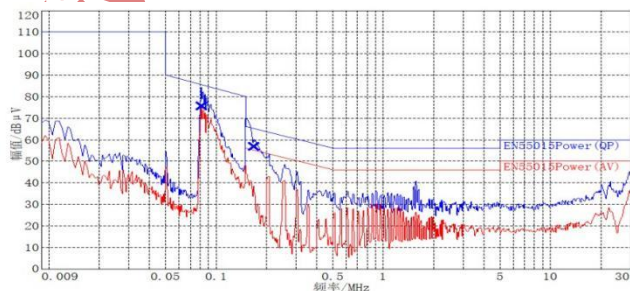
Test Conditions: Input: 230Vac; Output: 54V&1.8A.

Standard:

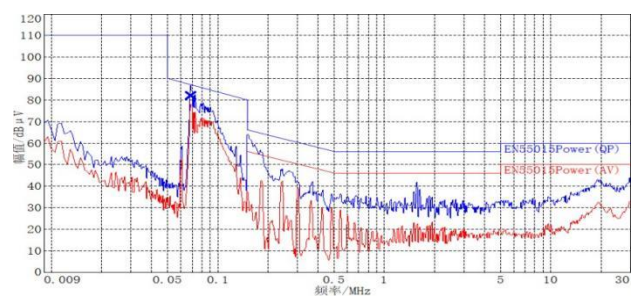
Standard	EN55015
Content	CE/CDN
Requirement	>6dB Margin

Result: CE test Pass; CDN test no Pass

Test Condition: Vin=230Vac/50Hz, CE

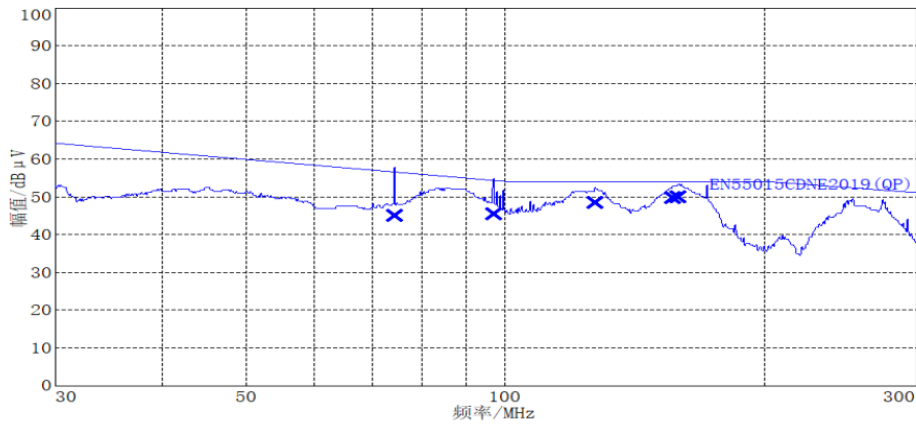


CE EMI---LINE



CE EMI---NEUTRAL

Test Condition: CDN



Conduction CDN—230Vac/60Hz

3.8 Surge Test

Test Conditions: Input: 220Vac; Output: 54V&1.8A.

Standard: >6000V

Result: Pass

Input Voltage (Vac)	Surge Level (V)	Injection Location	Injection Phase (°)	Test Result (Pass/Fail)
220Vac/50Hz	+6000	L to N	0	Pass
	+6000	L to N	90	Pass
	+6000	L to N	180	Pass
	+6000	L to N	270	Pass
	-6000	L to N	0	Pass
	-6000	L to N	90	Pass
	-6000	L to N	180	Pass
220Vac/50Hz	+6000	L to PE	0	Pass
	+6000	L to PE	90	Pass
	+6000	L to PE	180	Pass
	+6000	L to PE	270	Pass
	+6000	N to PE	0	Pass
	+6000	N to PE	90	Pass
	+6000	N to PE	180	Pass
	+6000	N to PE	270	Pass
	+6000	L&N to PE	0	Pass
	+6000	L&N to PE	90	Pass
	+6000	L&N to PE	180	Pass
	+6000	L&N to PE	270	Pass



- A: Normal performance within limits specified by the manufacturer, requestor or purchaser;
- B: Temporary loss of function or degradation of performance, which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operation intervention;
- C: Temporary loss of function or degradation of performance, the correction of which requires operator intervention;
- D: Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

Test Result: A (A/B/C/D)

Test Setup Guide

1. Connect the “LED+” and “LED-” terminal to the positive and negative end of the load.
2. Set the AC Power Source between 198Vac and 264Vac.
3. Connect the AC Power Source terminal to the “L” and “N” terminals on the Demo Board.

Turn on the AC Power Source to make system startup; and Turn off the AC Power Source to make system shutdown.

Kiwi Instruments Corp. Confidential



Revision History

DATE	REV	DESCRIPTION
2022/12/04	1.1	First Release

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