



12 W (PSR) NWK LD9162K

By : Jason Liao

Date : 2020/01/10

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1. Specification

Item	Min.	Typ.		Max.	Test Result
Input Voltage (V_{AC})	90	115	230	264	—
Input Frequency (Hz)	47 / 60	60	50	63 / 50	—
Output Voltage (V)	12				—
Output Current (A)	1				—
Efficiency	CoC Tier 2				Pass
Standby Power (mW)	< 75				Pass
Output Voltage Accuracy (%)	< ± 5 (11.4 ~ 12.6 V)				Pass
Over Current Protection (%)	< 135				Pass
Ripple & Noise Voltage (mV)	< 150				Pass
Dynamic Load (%)	< ± 5 % of V _{OUT} (20 ↔ 80 % Load)		< ± 10 % of V _{OUT} (10 ↔ 90 % Load)		Pass
Turn-on Delay Time (S)	< 3				Pass
Hold-up Time (mS)	> 10 @ Typical AC Input				Pass
Rise Time (mS)	< 40				Pass
Overshoot (%)	< 10				Pass
EMI	Conduction under 6dB				Pass

2. Outline

Top View



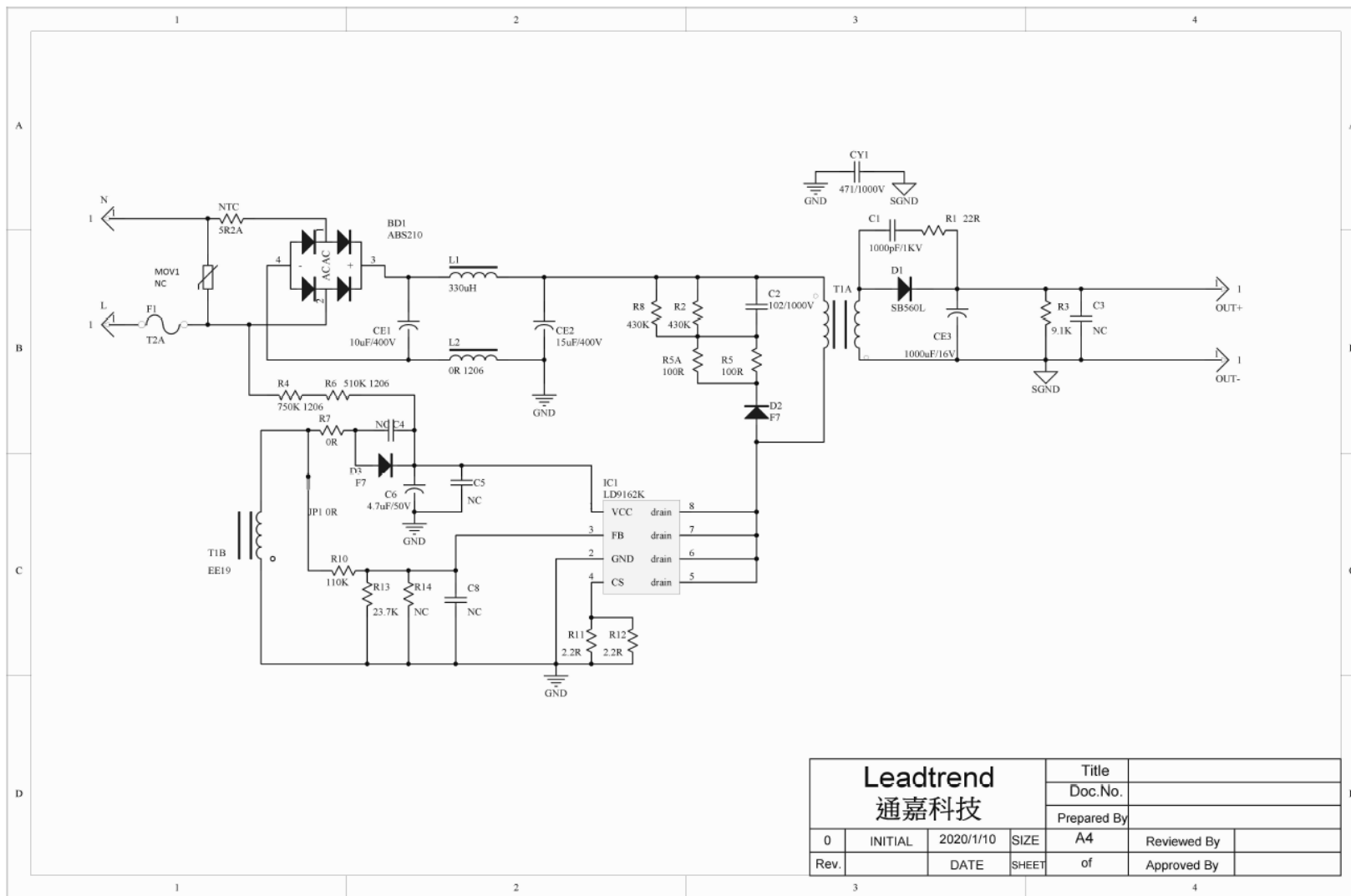
28.5 mm

Bottom View



54 mm

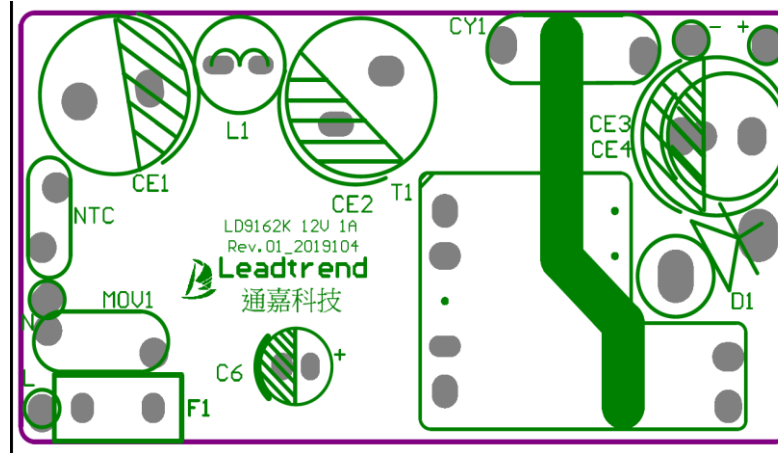
3. Schematic



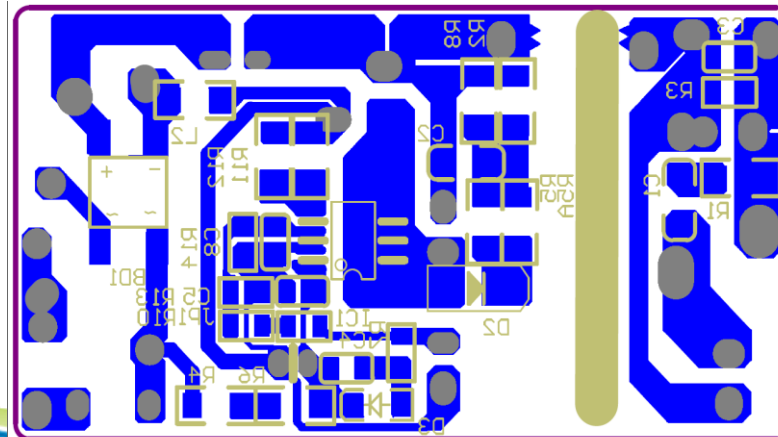
Leadtrend 通嘉科技				Title		
				Doc.No.		
				Prepared By		
0	INITIAL	2020/1/10	SIZE	A4	Reviewed By	
Rev.		DATE	SHEET	of	Approved By	

4. PCB Layout

Top Side



Bottom Side



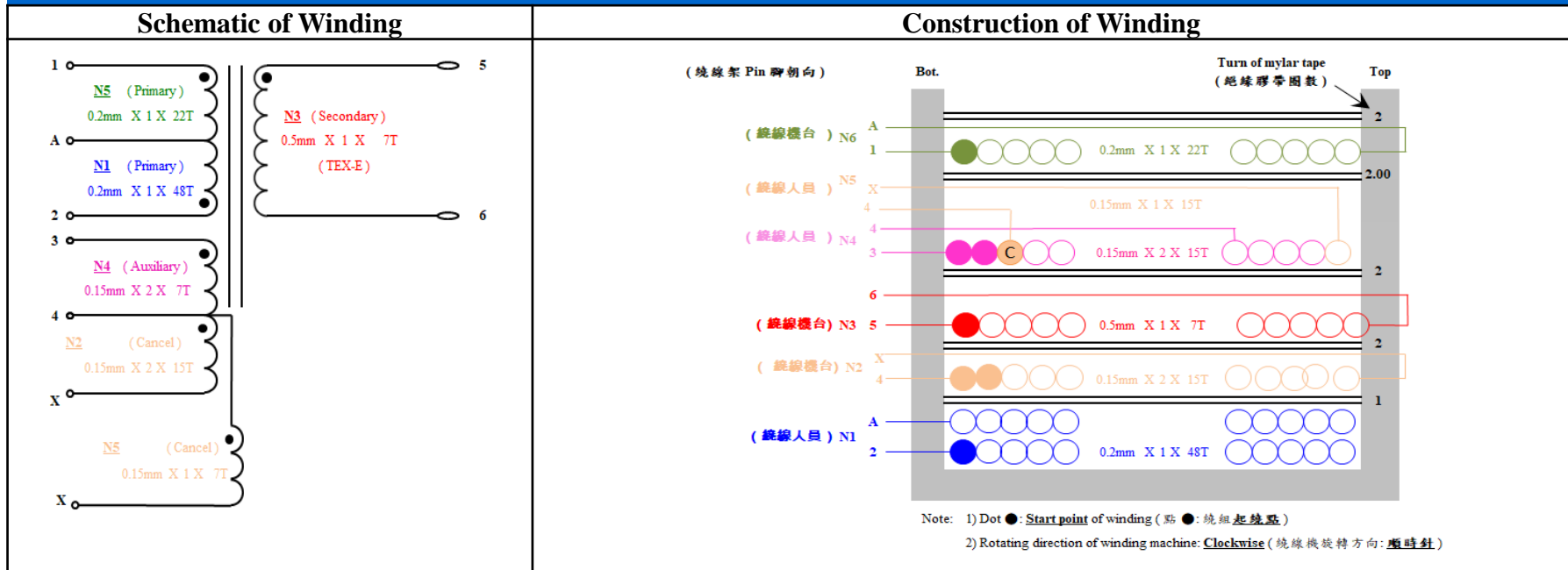
5. Bill of Materials

Designator	Footprint	Quantity	Value
BD1	ASB210	1	2A/1000V
EC1	E-CAP	1	10uF/400V
EC2	E-CAP	1	15uF/400V
C6	E-CAP	1	4.7uF/50V
C2,C1	C1206	2	102/1KV
EC3	E-CAP	1	1000uF/16V
D1	D0-201	1	10A / 60V
NTC	SCR052	1	2A/5R
L1	DR CORE	1	330uH
CY1	CY7.5	1	470pF
D3,D2	SOD-123	2	FR107
T1	AE-40	1	70:7:7 , L=1350uH
U1	SOT-8	1	LD9162K

5. Bill of Materials

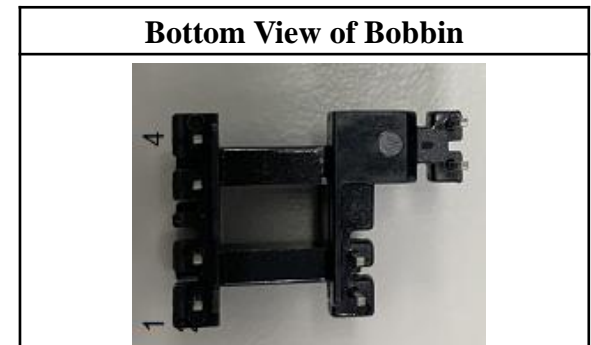
Designator	Footprint	Quantity	Value
F1	FUSF	1	T2A/250V
R5,R5A	R1206	2	100R
R2,R8	R1206	2	430K
R11, R12	R1206	2	2R2
R13	R0805	1	23.7K
R10	R0805	1	110K
R4	R1206	1	750K
R6	R1206	1	510K
JP1,R7	R0805	2	0R
R3	R0805	1	9.1K
R1	R1206	1	22R
L2	R1206	1	0R

6. Transformer Design



Winding No.	Pin No.		Winding Types	Number of Turns		Remarks	
	Start	Finish		Winding	Tape		
N1	2	A	0.2 mm X 1	48	2	N _P	Pin 朝人員順繞
N2	4	X	0.15 mm X 2	15	2	Cancel	Pin 朝機台逆繞
N3	5	6	0.5 mm X 1	7	2	N _S	Pin 朝機台逆繞
N4	3	4	0.15 mm X 2	7	2	N _A	Pin 朝人員順繞
N5	4	X	0.15 mm X 1	7	2	Cancel	Pin 朝人員順繞
N6	1	A	0.2 mm X 1	22	2	N _P	Pin 朝機台逆繞
Foil	5		5 mm X 10 mm X 1 mil	—	—	Core 底部貼銅下正 Pin 5	

Bobbin Shape	Core Material	A _e (mm ²)	L _p (μH)
	KP44A	40	1350± 5 % @ 75 kHz / 1 V



7. Efficiency

Input Voltage	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz
Output Current	100 %, 75 %, 50 %, 25 % of Full Load	
Measured Point of Output Voltage	End of Cable (24AWG / 1.5 M)	
Duration of Burn-in	30 Minutes	
Requirement	CoC Tier 2	

V_{IN,AC} (V / Hz)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	P_{IN} (W)	η (%)	η_{AV,4-Points} (%)	Requirement (%)
115 / 60	12.1	0.51	3.04	3.61	84.13	84.77	> 83.26
	12.05	1.00	6.12	7.16	85.49		
	11.99	1.50	8.97	10.54	85.09		
	11.94	2.00	11.94	14.15	84.35		
230 / 50	12.08	0.51	3.03	3.64	83.30	84.77	> 83.26
	12.03	1.00	6.11	7.18	85.11		
	11.98	1.50	8.96	10.47	85.59		
	11.91	2.00	11.91	14.00	85.07		

8. No Load Power Consumption

Input Voltage	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz
Output Current	0 A	
Requirement	< 75 mW (CoC Tier 2)	

V_{IN,AC} (V / Hz)	P_{IN} (mW)	Requirement (mW)
115 / 60	33	< 75
230 / 50	53	

9. Line / Load Regulation

Input Voltage	90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Output Current	No Load & Full Load			
Measured Point of Output Voltage	End of Cable 1.5M 24awg			
Requirement	< ± 5 %			

V_{IN,AC} (V / Hz)	V_{OUT} (V)		Requirement (V)
	0 A	1 A	
90 / 47	12.5	11.94	11.4 ~ 12.6
115 / 60	12.5	11.92	
230 / 50	12.49	11.90	
264 / 63	12.48	11.89	

10. Over Current Protection

Input Voltage		90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Requirement	Protection Mode	Auto Recovery			
	OCP Trigger Point	< 135 % of Full Load			

V _{IN,AC} (V / Hz)	I _{OUT,OCP} (A)	Protection Mode	Requirement
			OCP Trigger Point (A)
90 / 47	1.18	Auto Recovery	< 1.35A
115 / 60	1.18	Auto Recovery	
230 / 50	1.17	Auto Recovery	
264 / 63	1.18	Auto Recovery	

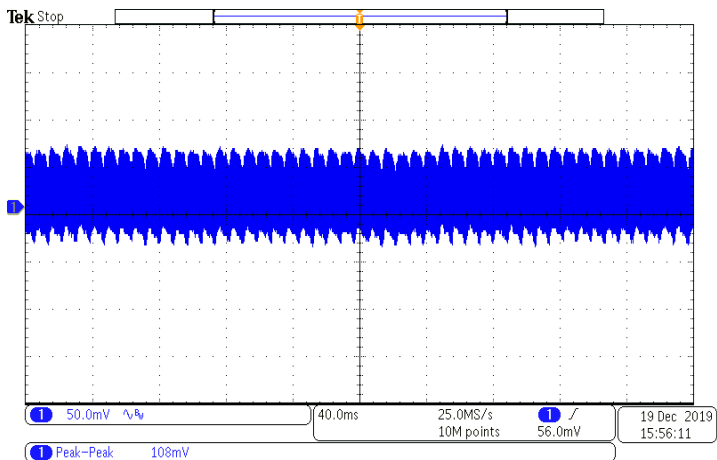
11. Ripple & Noise Voltage

Input Voltage	90 V _{AC} / 60 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 50 Hz
Output Current	Full Load			
Measured Point of Output Voltage	End of Cable			
Bandwidth	20 MHz (with 10 μF E-cap & 0.1 μF MLCC)			
Requirement	< 150 m V			

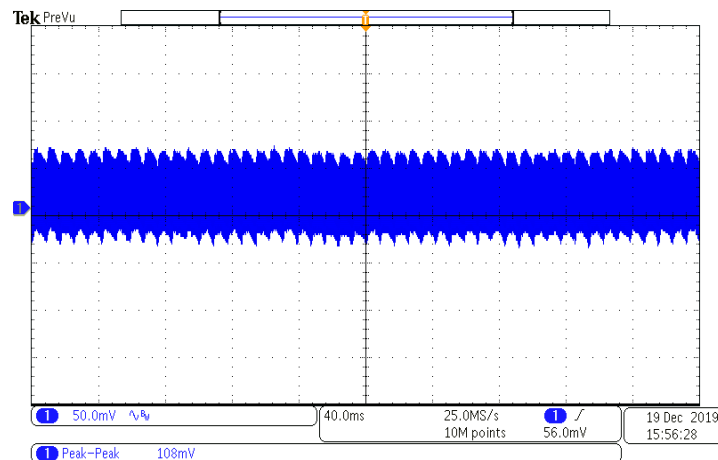
V_{IN,AC} (V / Hz)	V_{OUT,PK-PK} (mV)	Requirement (mV)
	1 A	
90 / 60	108	< 150
115 / 60	108	
230 / 50	104	
264 / 50	106	

12 V / 1 A

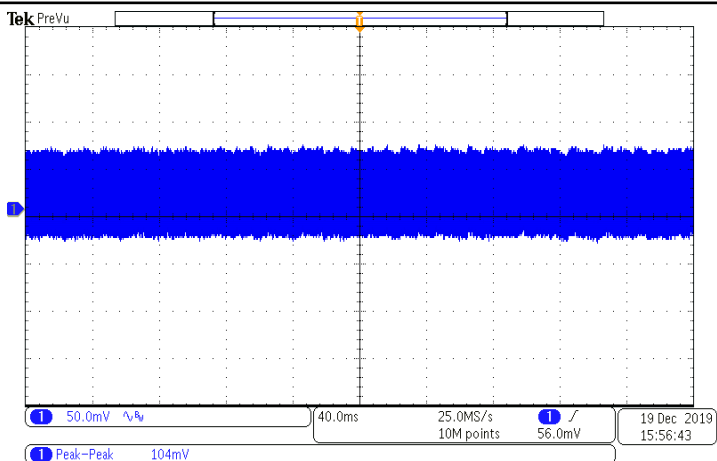
90 V_{AC} / 60 Hz



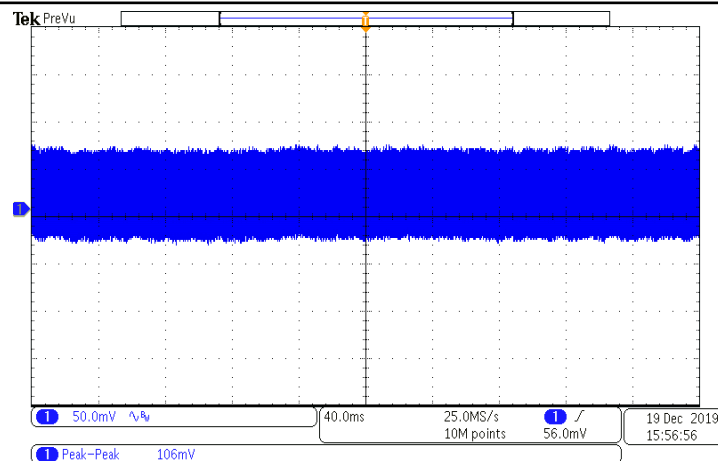
115 V_{AC} / 60 Hz



230 V_{AC} / 50 Hz



264 V_{AC} / 50 Hz



12. Dynamic Load

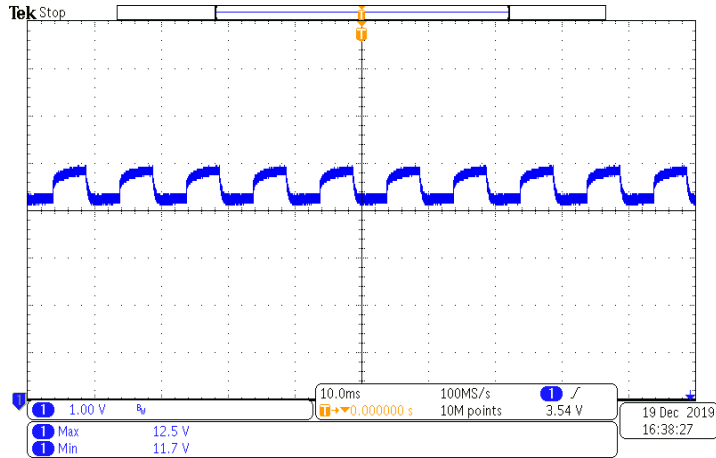
Input Voltage	90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Output Current	20 ↔ 80 % of Full Load (0.4 ↔ 2.6 A)			
	10 ↔ 90 % of Full Load (0.2 ↔ 1.8 A)			
Frequency of Load	100 Hz (5 mS High / 5 mS Low)			
Slew Rate of Load	2.5 A / μS			
Measured Point of Output Voltage	End of Cable			
Requirement	< ± 5 % of V _{OUT} (20 ↔ 80 % Load)		< ± 10 % of V _{OUT} (10 ↔ 90 % Load)	

Load (%)	V _{IN,AC} (V / Hz)	V _{OUT} (V)		Requirement (V)
		Min.	Max.	
20 ↔ 80	90 / 47	11.7	12.5	11.4 ~ 12.6
	115 / 60	11.6	12.5	
	230 / 50	11.6	12.5	
	264 / 63	11.6	12.5	
10 ↔ 90	90 / 47	11.5	12.6	10.8~ 13.2
	115 / 60	11.5	12.6	
	230 / 50	11.5	12.5	
	264 / 63	11.5	12.5	

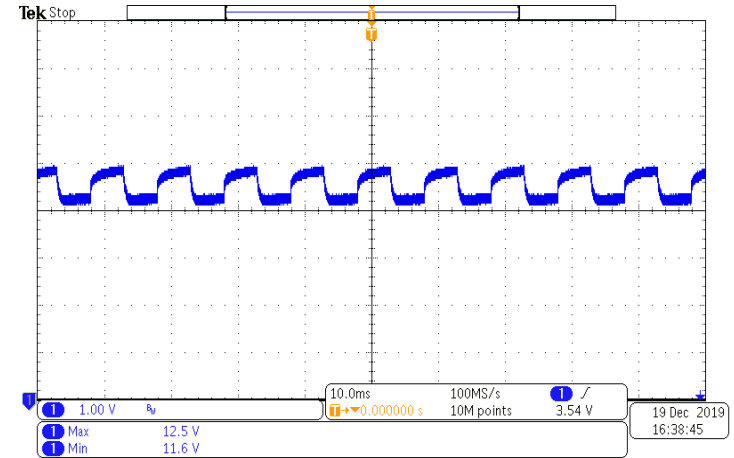
12. Dynamic Load (Cont.)

Load: 20 ↔ 80 %

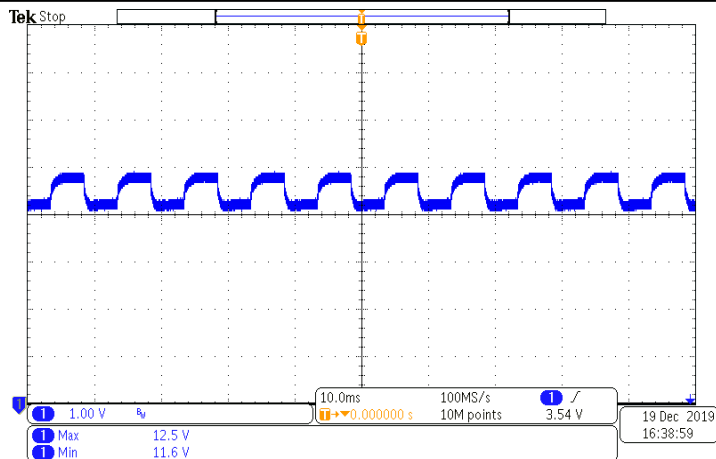
90 V_{AC} / 47 Hz



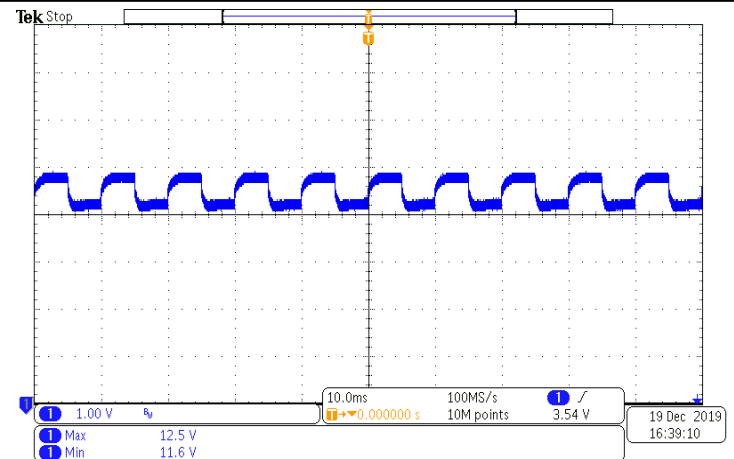
115 V_{AC} / 60 Hz



230 V_{AC} / 50 Hz



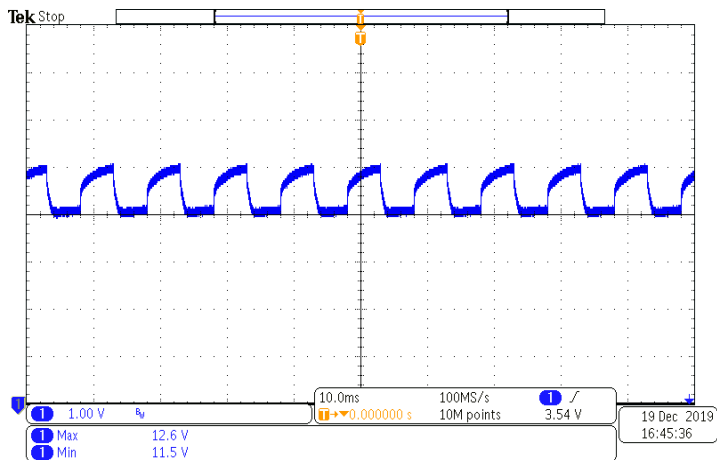
264 V_{AC} / 63 Hz



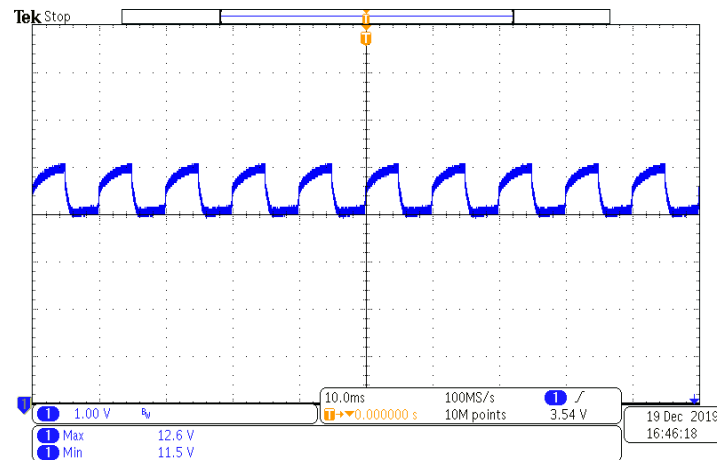
12. Dynamic Load (Cont.)

Load: 10 ↔ 90 %

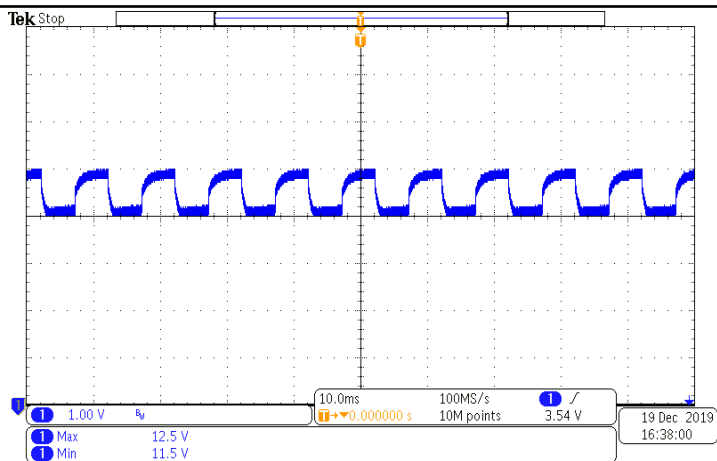
90 V_{AC} / 47 Hz



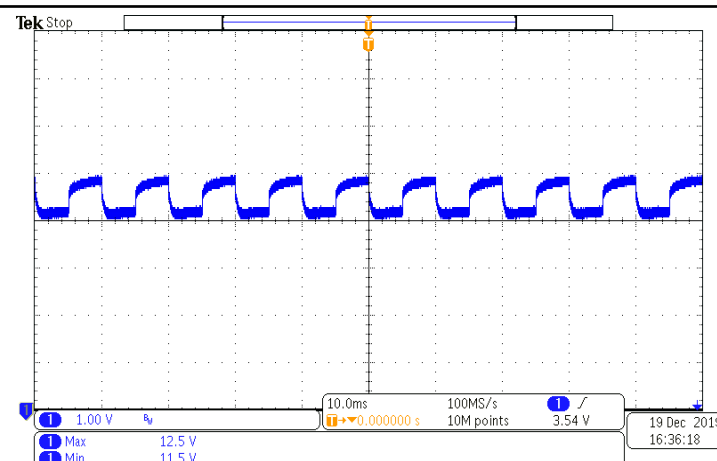
115 V_{AC} / 60 Hz



230 V_{AC} / 50 Hz



264 V_{AC} / 63 Hz



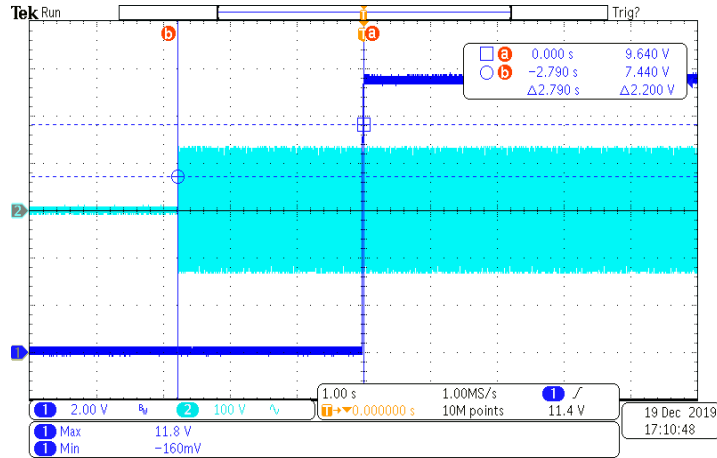
13. Turn-on Delay Time

Input Voltage	90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Output Current	Full Load			
Measured Point of Output Voltage	End of Cable			
Requirement	< 3 S			

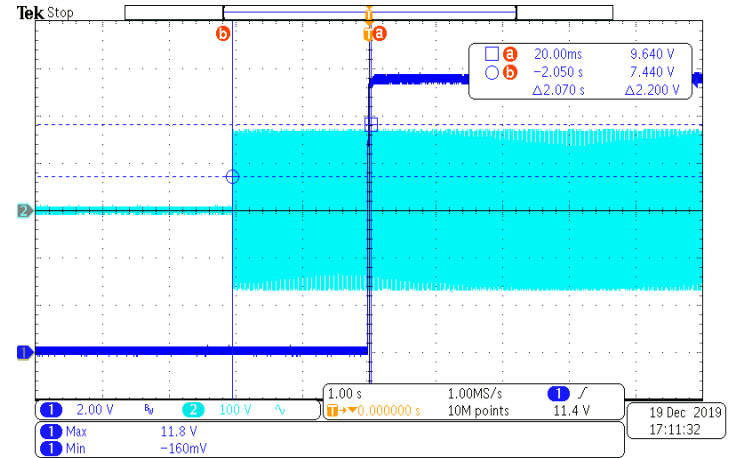
V_{IN,AC} (V / Hz)	T_{ON} (S)	Requirement (S)
90 / 47	2.79	< 3
115 / 60	2.07	
230 / 50	0.96	
264 / 63	0.81	

13. Turn-on Delay Time (Cont.)

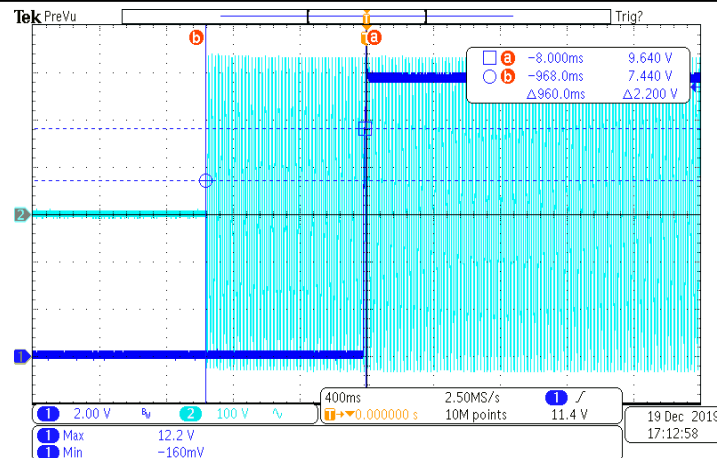
90 V_{AC} / 47 Hz



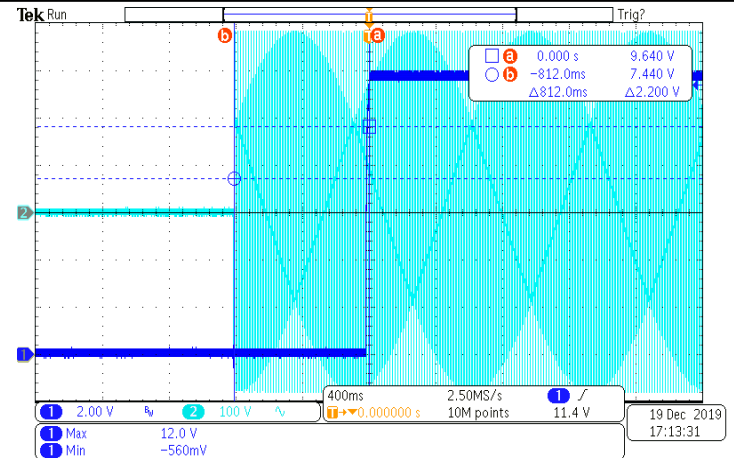
115 V_{AC} / 60 Hz



230 V_{AC} / 50 Hz



264 V_{AC} / 63 Hz



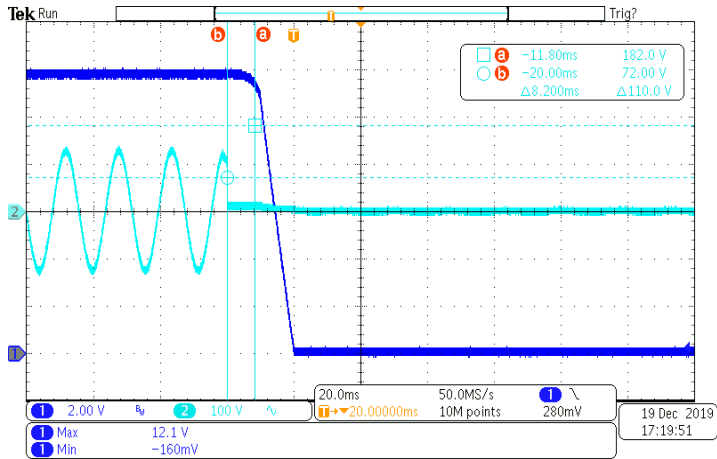
14. Hold-up Time

Input Voltage	90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Output Current	Full Load			
Measured Point of Output Voltage	End of Cable			
Angle of AC Off	0°			
Requirement	> 10 mS @ Typical AC Input			

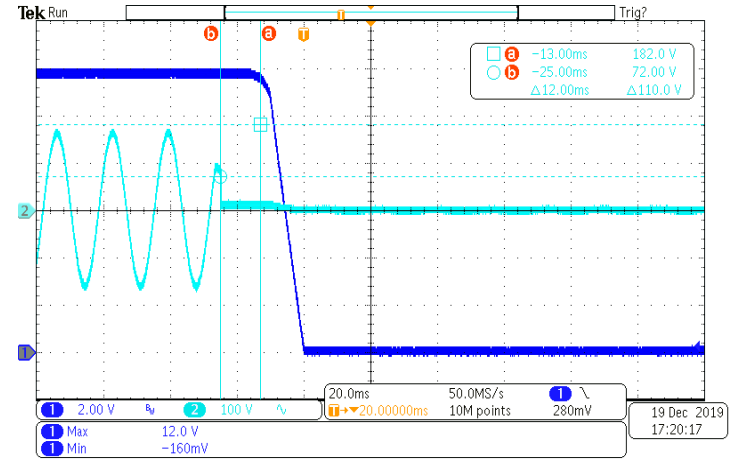
V_{IN,AC} (V / Hz)	T_{HOLD-UP} (mS)	Requirement (mS)
90 / 47	8.2	
115 / 60	12.0	> 10
230 / 50	82.4	> 10
264 / 63	114	

14. Hold-up Time (Cont.)

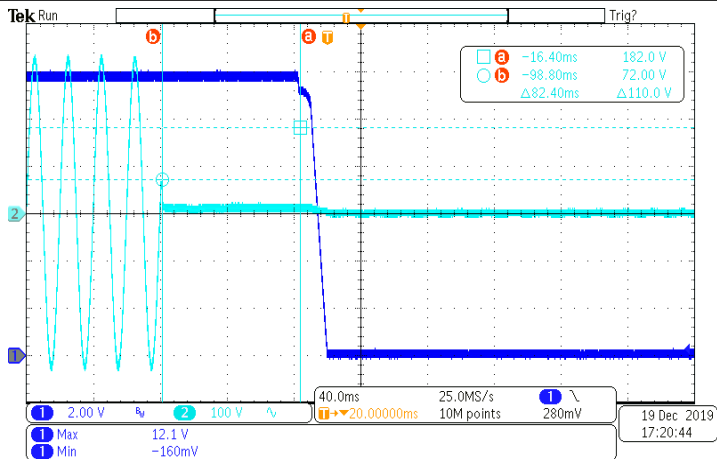
90 V_{AC} / 47 Hz



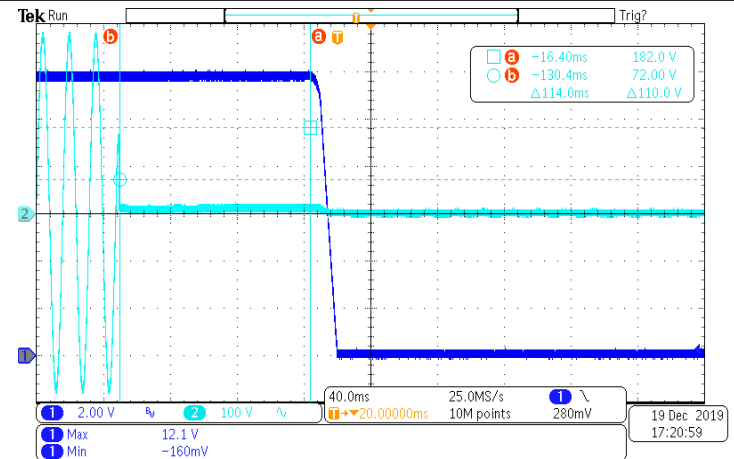
115 V_{AC} / 60 Hz



230 V_{AC} / 50 Hz



264 V_{AC} / 63 Hz



15. Rise Time & Overshoot

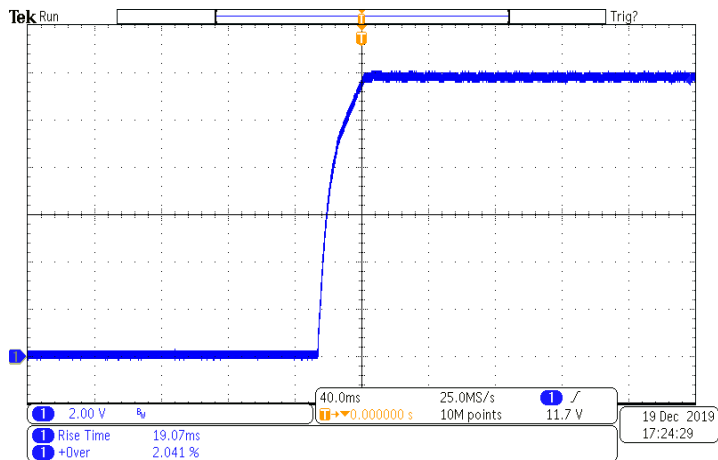
Input Voltage		90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Output Current		Full Load			
Measured Point of Output Voltage		End of Cable			
Requirement	Rise Time	< 40 mS			
	Overshoot	< 10 %			

V_{IN,AC} (V / Hz)	T_{RISE} (mS)	Requirement (mS)
90 / 47	19.07	< 40
115 / 60	15.92	
230 / 50	14.99	
264 / 63	14.15	

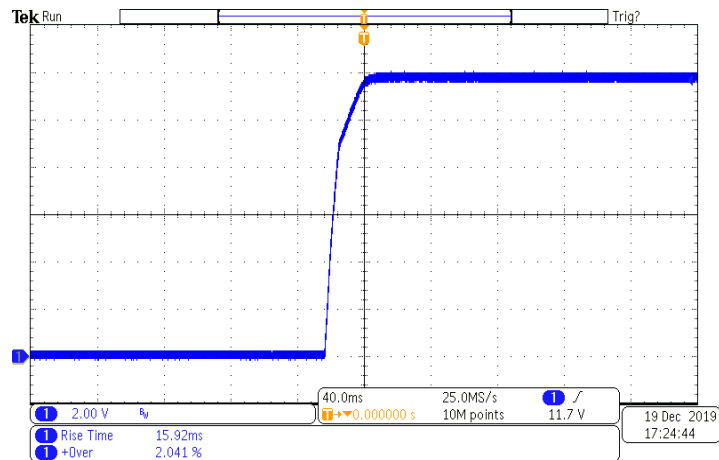
V_{IN,AC} (V / Hz)	Overshoot (%)	Requirement (%)
90 / 47	2.041	< 10
115 / 60	2.041	
230 / 50	2.041	
264 / 63	2.041	

15. Rise Time & Overshoot (Cont.)

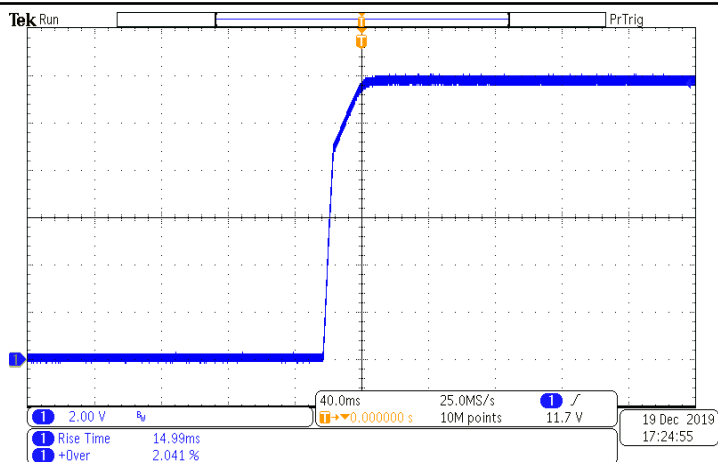
90 V_{AC} / 47 Hz



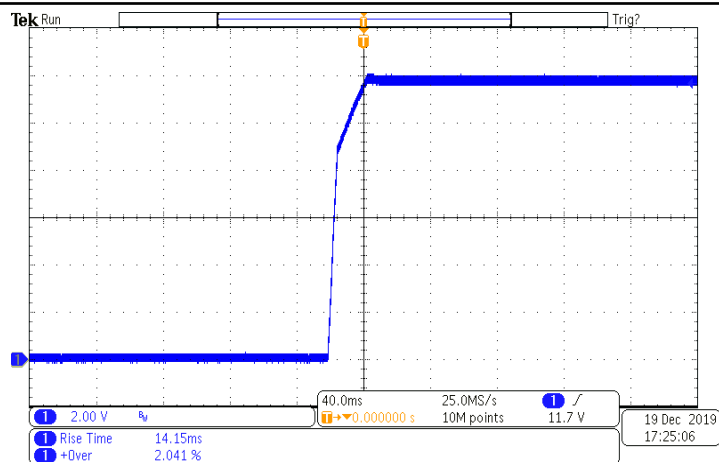
115 V_{AC} / 60 Hz



230 V_{AC} / 50 Hz



264 V_{AC} / 63 Hz



16. Supply Voltage of IC

Input Voltage	90 V _{AC} / 47 Hz	115 V _{AC} / 60 Hz	230 V _{AC} / 50 Hz	264 V _{AC} / 63 Hz
Output Current	No Load & Full Load			
Requirement	> V _{CC_OFF}			

V _{IN,AC} (V / Hz)	V _{CC,U1} (V)					Requirement (V)
	0 A		1 A		1A Turn-on Drop	
	Min.	Max.	Min.	Max.	Min.	
90 / 47	10.5	11.7	12.6	13.9	11.4	7.5 ~ 26.5
115 / 60	10.3	12.1	12.5	14.1	11.3	
230 / 50	10.3	12.1	12.7	14.5	11.3	
264 / 63	10.3	12.1	12.7	14.5	11.8	

17. Stress on Switching Parts

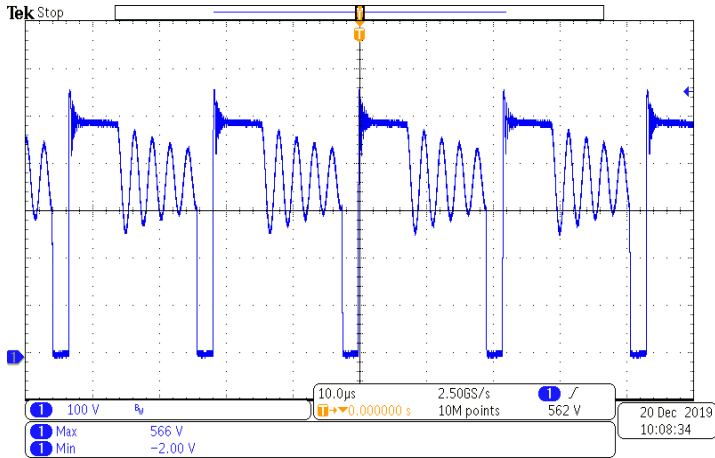
Input Voltage	264 V _{AC} / 63 Hz
Output Current	Full Load
Requirement	U1 < 90 % De-rating , D3 < 95 % De-rating

Location	Part No.	Condition	V _{DS} (V)	Requirement (V)
U1	LD9175GN	Normal	566	< 585 (650 * 0.9)
		Turn-on	566	
		Short Circuit	552	

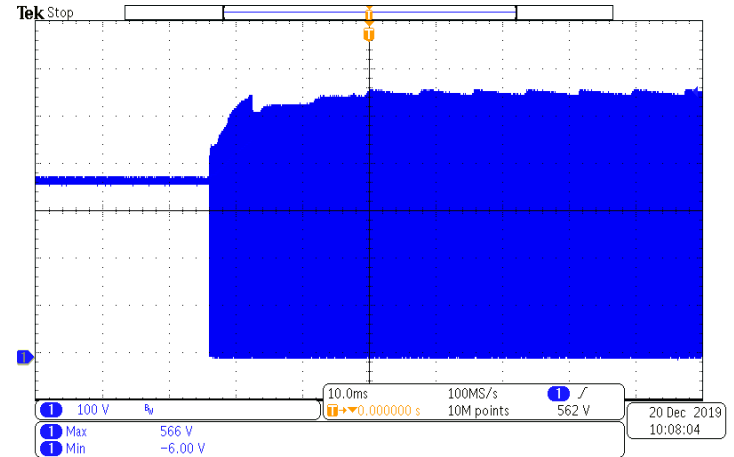
Location	Part No.	Condition	V _{RRM} (V)	Requirement (V)
D3	5A / 100V	Normal	54.6	< 57 (60* 0.95)
		Turn-on	55.0	
		Short Circuit	55.0	

17. Stress on Switching Parts (Cont.)

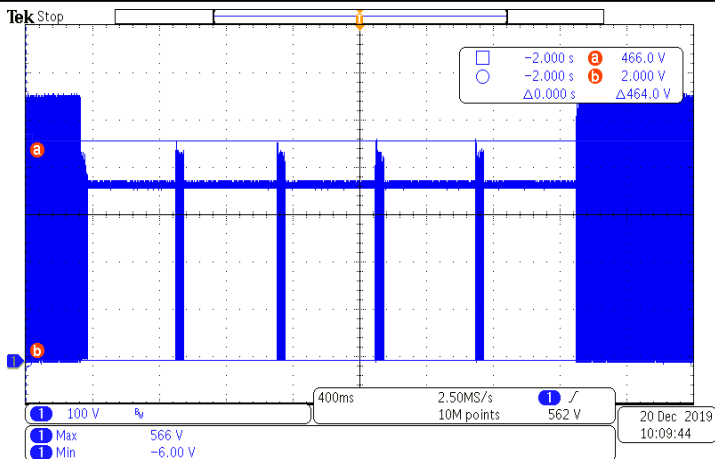
IC1_Normal



IC1_Turn-on

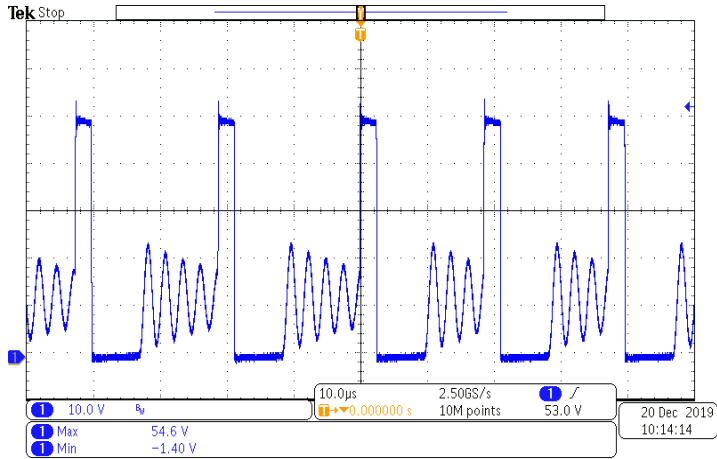


IC1_Short

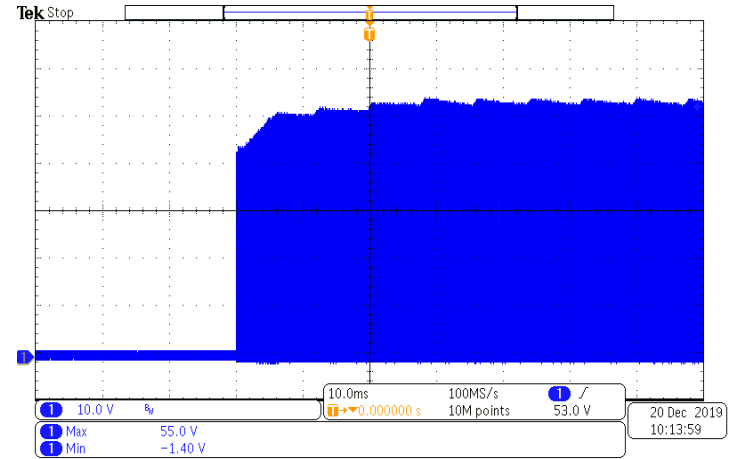


17. Stress on Switching Parts (Cont.)

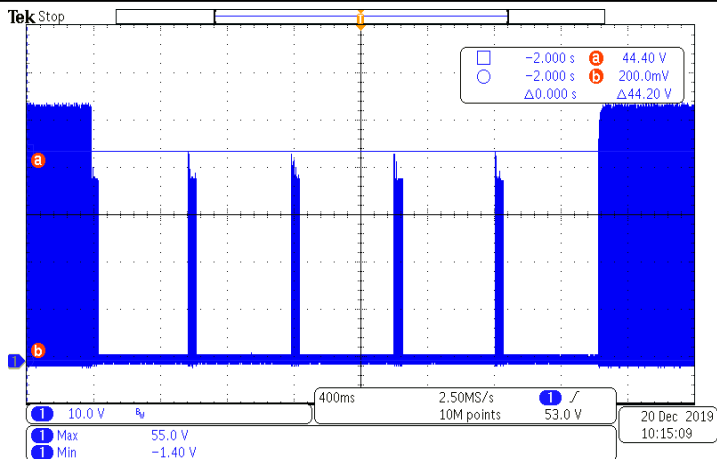
D1_Normal



D1_Turn-on



D1_Short Circuit



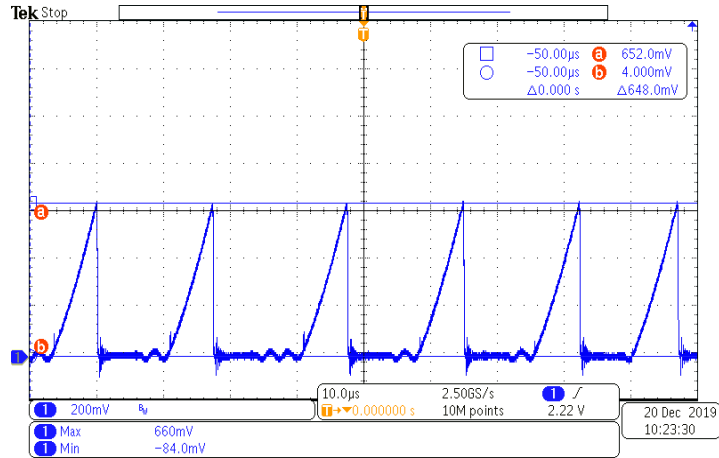
18. Flux Density of Transformer

Input Voltage	90 V _{AC} / 60 Hz	264 V _{AC} / 50 Hz
Output Current	Full Load & Maximum Power & Turn-on & Short Circuit	
Requirement	< 4,200	

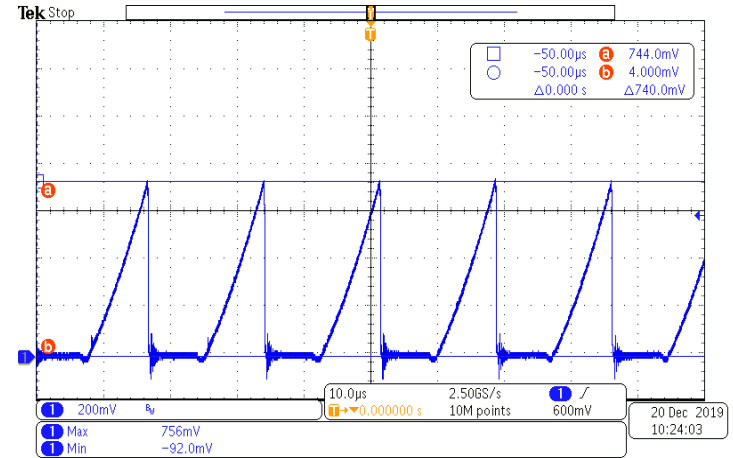
V_{IN,AC} (V / Hz)	I_{OUT} (A)	V_{CS,MAX} (V)	I_{PR1,MAX} (A)	B_{MAX} (G)	Requirement (G)
90 / 60	1	0.648	0.589	3050	< 4,200
	1.18	0.740	0.672	3469	
	1 A Turn-on	0.768	0.698	3614	
	Short Circuit	0.768	0.698	3614	
264 / 50	1	0.700	0.636	3295	
	2.32	0.712	0.647	3350	
	1 A Turn-on	0.784	0.712	3687	
	Short Circuit	0.784	0.712	3687	

18. Flux Density of Transformer (Cont.)

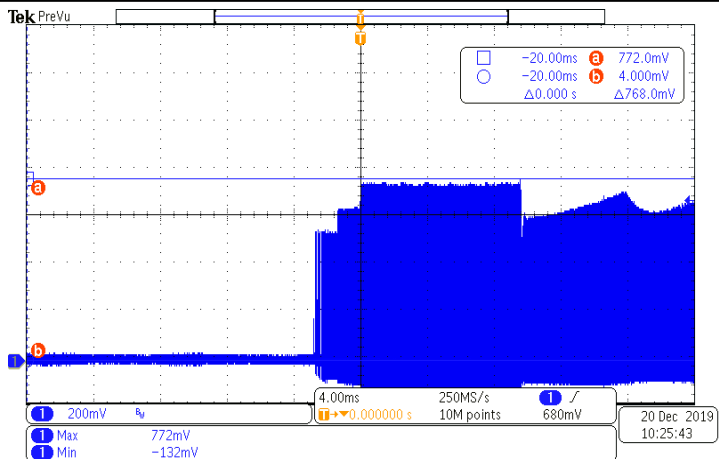
90 V_{AC} / 60 Hz_1 A



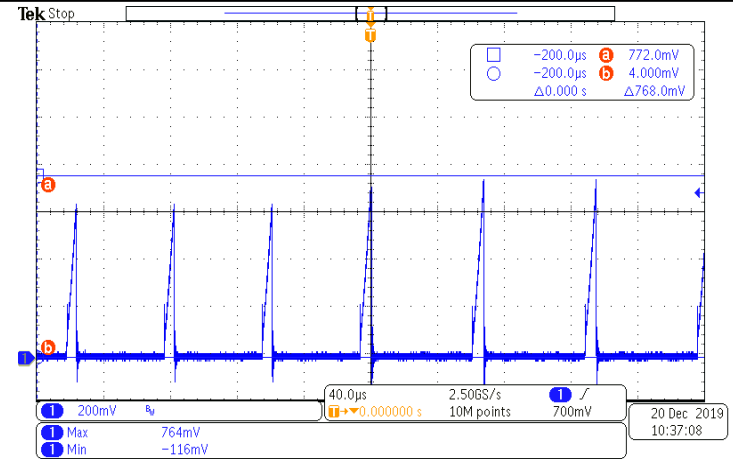
90 V_{AC} / 60 Hz_1.18 A



90 V_{AC} / 60 Hz_1A Turn-on

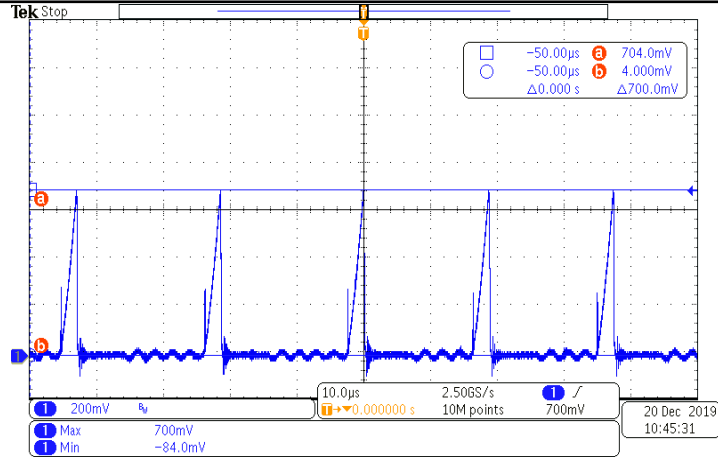


90 V_{AC} / 60 Hz_Short Circuit

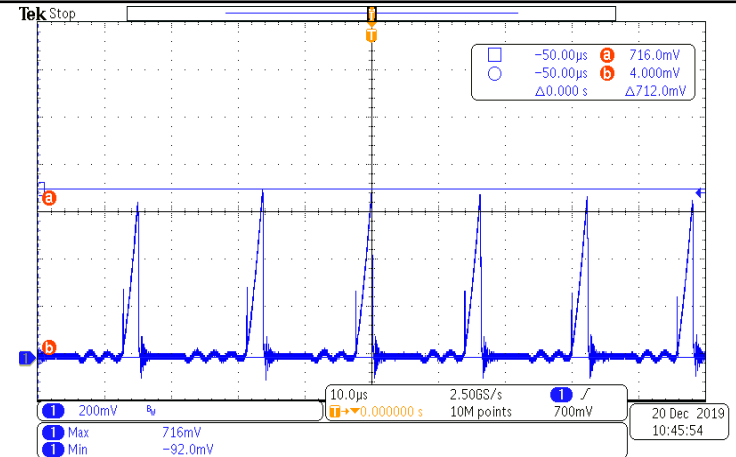


18. Flux Density of Transformer (Cont.)

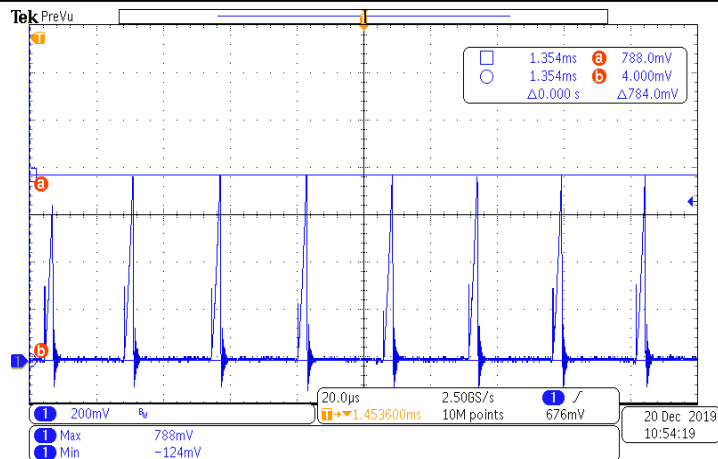
264 V_{AC} / 50 Hz_1 A



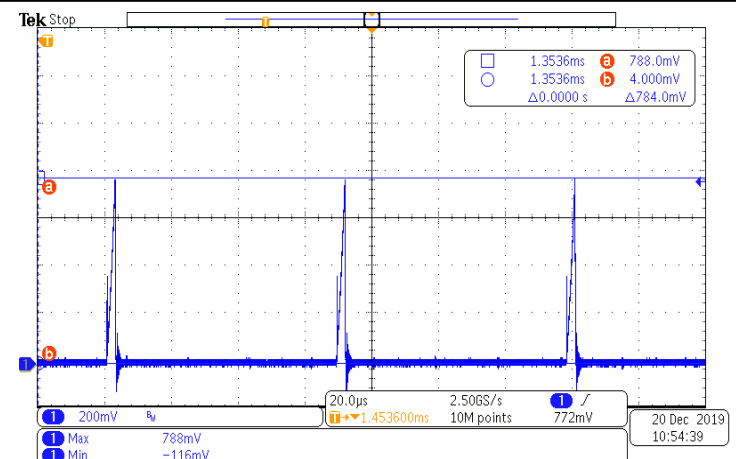
264 V_{AC} / 50 Hz_1.18 A



264 V_{AC} / 50 Hz_1 A Turn-on



264 V_{AC} / 50 Hz_Short Circuit



Conduction:

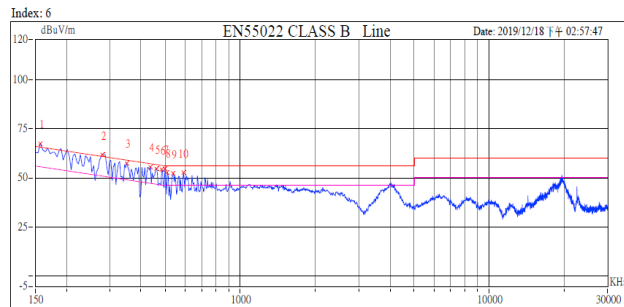
110 V_{AC} / 60 Hz / Line



Customer Name: 12V1A

Project No.:
 Engineer Name:

Model Name:
 Test Mode:



	Freq(KHz)	Peak Amptd(dBuV)	QP Amptd(dBuV)	Avg Amptd(dBuV)	QP Limit(dBuV)	Avg Limit(dBuV)	Margin(dB)	Factor(dB)
1	157.4148	67.53	56.21	31.21	65.79	55.79	-9.58	10.38
2	279.7595	61.94	47.76	25.46	62.29	52.29	-14.53	10.39
3	350.2004	57.64	44.13	24.45	60.28	50.28	-16.15	10.41
4	435.4709	55.75	42.61	34.52	57.84	47.84	-13.33	10.41
5	461.4228	54.84	39.93	30.28	57.10	47.10	-16.82	10.40
6	483.6673	54.06	42.11	34.69	56.47	46.47	-11.78	10.40
7	498.4970	54.62	38.01	30.76	56.04	46.04	-15.28	10.40
8	509.6192	52.83	36.93	29.51	56.00	46.00	-16.49	10.40
9	539.2786	52.42	37.72	31.13	56.00	46.00	-14.87	10.40
10	591.1824	52.59	40.43	32.25	56.00	46.00	-13.75	10.41

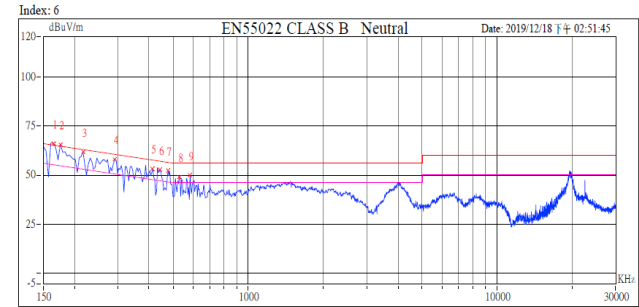
110 V_{AC} / 60 Hz / Neutral



Customer Name: 12V 1A

Project No.:
 Engineer Name:

Model Name:
 Test Mode:



	Freq(KHz)	Peak Amptd(dBuV)	QP Amptd(dBuV)	Avg Amptd(dBuV)	QP Limit(dBuV)	Avg Limit(dBuV)	Margin(dB)	Factor(dB)
1	164.8297	66.11	56.70	32.90	65.58	55.58	-8.88	10.41
2	175.9519	65.59	54.67	30.92	65.26	55.26	-10.58	10.40
3	216.7335	61.85	50.42	27.64	64.09	54.09	-13.67	10.39
4	290.8818	57.92	44.02	24.42	61.97	51.97	-17.96	10.40
5	413.2265	53.18	45.55	24.50	58.48	48.48	-12.93	10.40
6	442.8858	52.69	41.87	29.92	57.63	47.63	-15.77	10.40
7	476.2525	52.34	43.82	28.11	56.68	46.68	-12.86	10.39
8	528.1563	49.01	42.38	24.25	56.00	46.00	-13.62	10.39
9	583.7675	50.02	40.98	26.06	56.00	46.00	-15.02	10.40

Conduction:

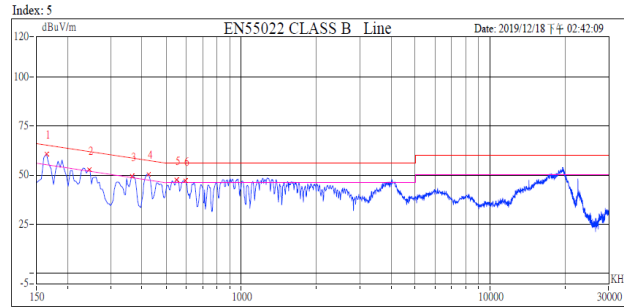
230 V_{AC} / 50 Hz / Line



Customer Name: 12V 1A

Project No.:
 Engineer Name:

Model Name:
 Test Mode:



	Freq(KHz)	Peak Amptd(dBuV)	QP Amptd(dBuV)	Avg Amptd(dBuV)	QP Limit(dBuV)	Avg Limit(dBuV)	Margin(dB)	Factor(dB)
1	164.8297	60.58	52.53	34.74	65.58	55.58	-13.04	10.37
2	246.3928	52.75	50.65	28.23	63.25	53.25	-12.60	10.38
3	365.0301	49.64	48.33	42.63	59.86	49.86	-7.23	10.41
4	424.3487	50.25	45.99	40.25	58.16	48.16	-7.91	10.41
5	550.4008	47.71	42.99	37.02	56.00	46.00	-8.98	10.40
6	598.5972	47.28	41.46	34.89	56.00	46.00	-11.11	10.41

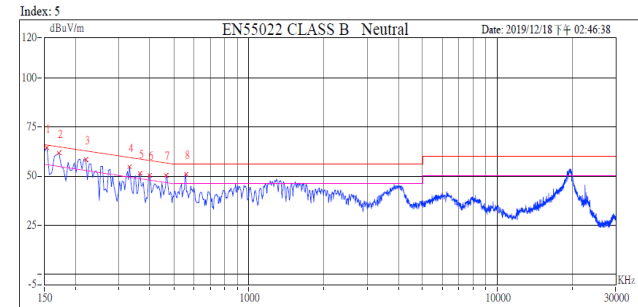
230 V_{AC} / 50 Hz / Neutral



Customer Name: 12V 1A

Project No.:
 Engineer Name:

Model Name:
 Test Mode:



	Freq(KHz)	Peak Amptd(dBuV)	QP Amptd(dBuV)	Avg Amptd(dBuV)	QP Limit(dBuV)	Avg Limit(dBuV)	Margin(dB)	Factor(dB)
1	153.7074	64.52	53.77	31.98	65.89	55.89	-12.13	10.42
2	172.2445	61.72	52.07	30.07	65.36	55.36	-13.30	10.41
3	220.4409	58.46	51.65	31.12	63.99	53.99	-12.34	10.39
4	331.6633	54.52	45.55	24.39	60.81	50.81	-15.26	10.40
5	365.0301	51.39	46.25	25.52	59.86	49.86	-13.61	10.40
6	398.3968	50.51	44.06	23.82	58.90	48.90	-14.84	10.40
7	465.1303	50.48	43.20	29.12	57.00	47.00	-13.79	10.39
8	557.8156	50.82	38.18	31.50	56.00	46.00	-14.50	10.39

The Best Company for AC-DC Mid & High Power Application Total Solution



THANK YOU

