



200 W PFC LD7593(8pin) & LD7932RG

By : Jess Lu

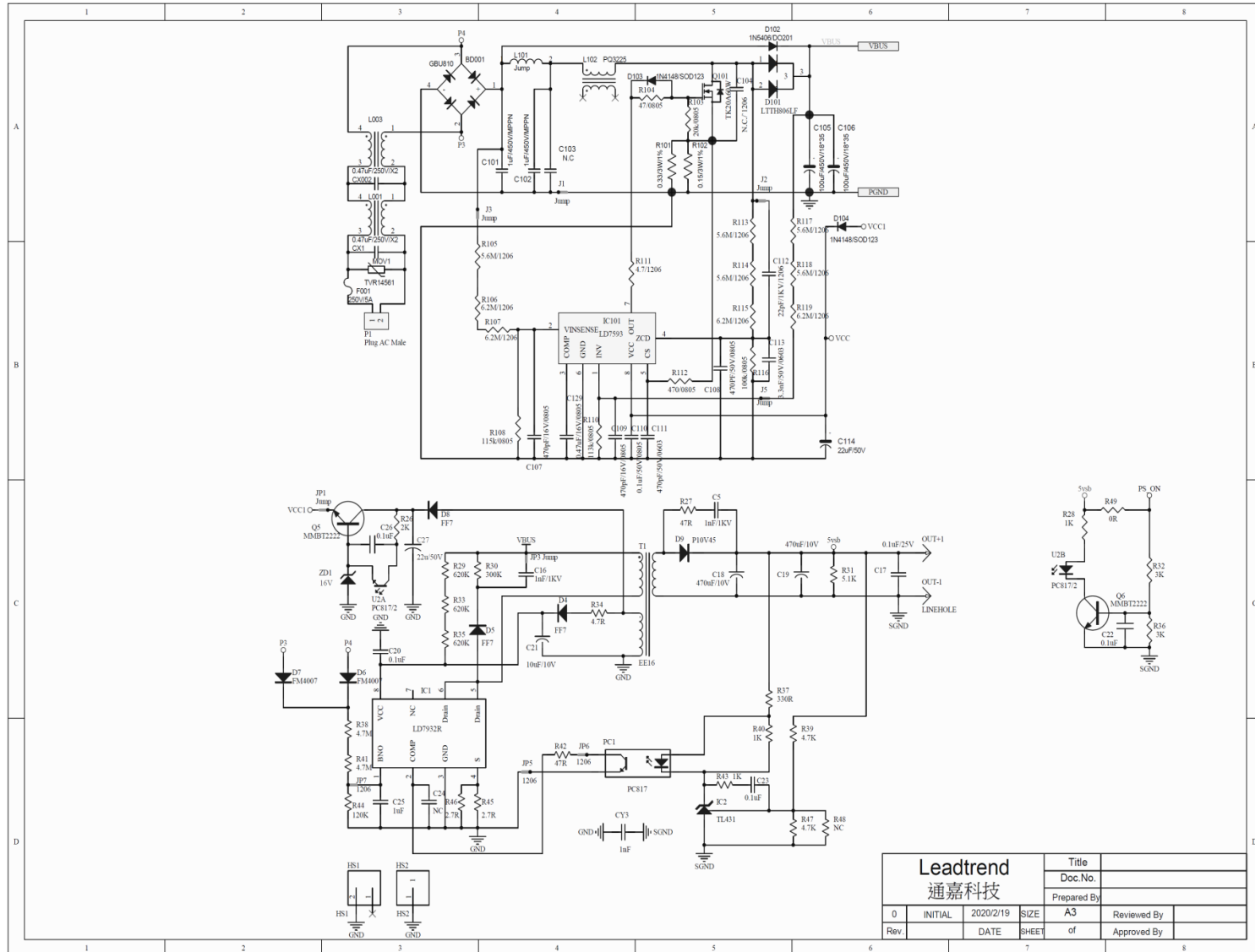
Date : 2020/02/18

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1. Specification

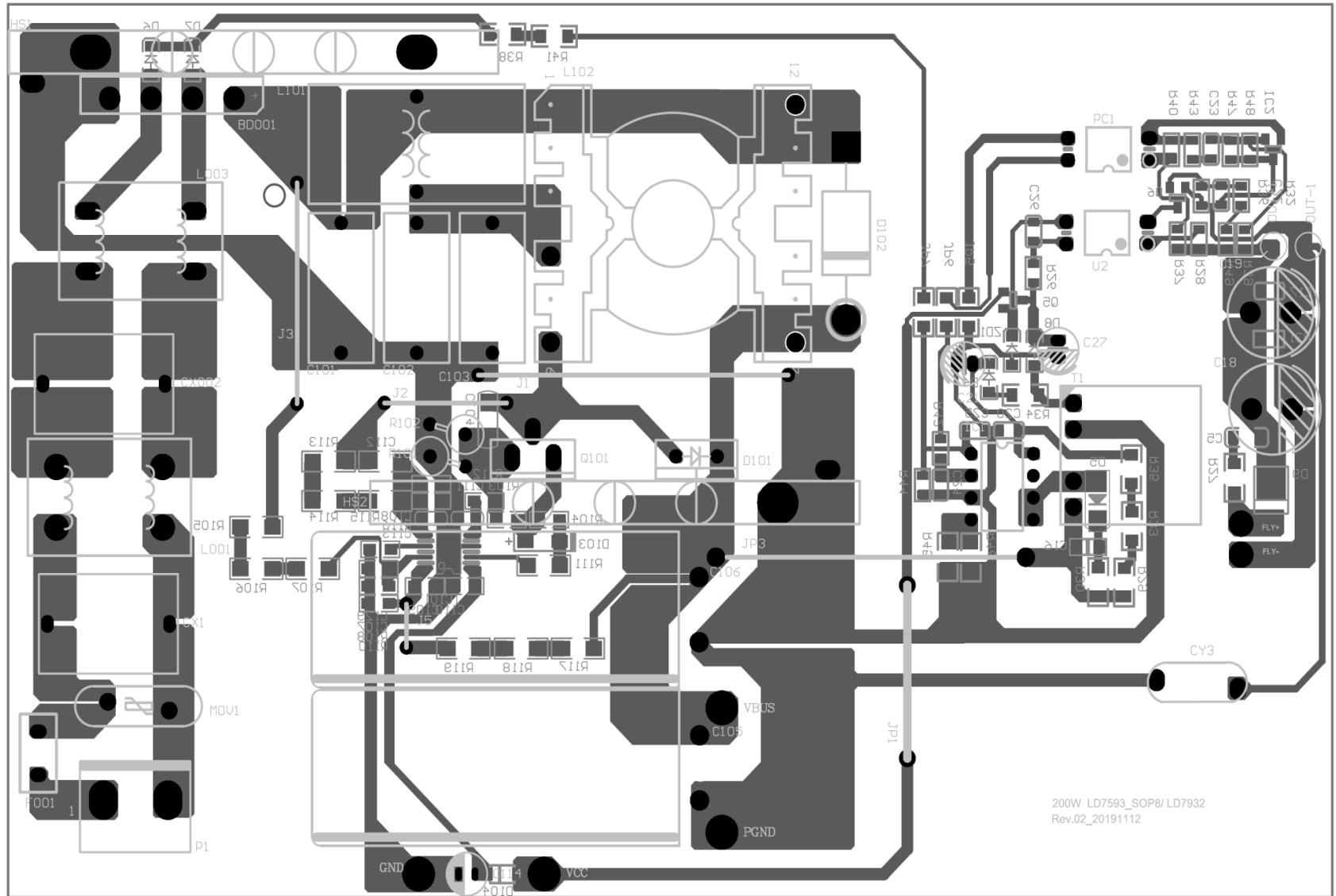
Item	Min.	Typ.		Max.	Test Result
Input Voltage (V_{AC})	90	115	230	264	—
Input Frequency (Hz)	47	60	50	63	—
Output Voltage & Current (V / A)	390V/0.5A				—
Efficiency	>90%				Pass
Power Factor	>0.9			>0.8	Pass
Stress	<90%				Pass
Regulation	385V~410V				Pass

2. Schematic



Leadtrend 通嘉科技		Title	
		Doc.No.	
Prepared By		Reviewed By	
0	INITIAL	2020/2/19	SIZE A3
Rev.	DATE	SHEET of	Approved By

3. PCB Layout



4. Bill of Materials

Location	Description	Q'ty
R110	SMD RES 0805 113K 1%	1
R111	SMD RES 1206 4.7R 5%	1
R104	SMD RES 0805 47R 5%	1
R101, R102	0.2Ω DIP-3W MOF 1%	2
R112	SMD RES 0805 470R 5%	1
R103	SMD RES 0805 20K 5%	1
R116	SMD RES 0805 100K 1%	1
R105,R113,R114,R117,R118	SMD RES 1206 5.6M 1%	5
R106,R107,R115,R119	SMD RES 1206 6.2M 1%	4
R108	SMD RES 0805 115K 1%	1
R26	SMD RES 0805 2K 5%	1
R27	SMD RES 1206 47R 5%	1
R28,R40,R43	SMD RES 0805 1K 5%	3
R29,R33,R35	SMD RES 1206 620K 5%	3
R30	SMD RES 1206 300K 5%	1
R31	SMD RES 0805 5.1K 5%	1
R32,R36	SMD RES 0805 3K 5%	2
R34	SMD RES 1206 4.7R 5%	1
R37	SMD RES 0805 330R 5%	1
R38,R41	SMD RES 1206 4.7M 1%	2
R39,R47	SMD RES 0805 4.7K 5%	2
R42	SMD RES 0805 47R 5%	1
R44	SMD RES 0805 120K 1%	1
R45,R46	SMD RES 1206 2.7R 1%	2
R49	SMD RES 0805 0R 5%	1
JP5,JP6,JP7	SMD RES 1206 0R 5%	3
CY3	Y1 CAP CD 102 250V P:10mm	1
C101,C102	105/450V/MPP/18*7.5*15mm	2
C129	SMD CC 0805 474 50V X7R 10%	1
C5,C16	SMD CC 1206 102 1000V X7R 10%	2
C107,C108,C109	SMD CC 0805 471 50V NP0 5%	3
C111	SMD CC 0603 471 50V NP0 5%	1

Location	Description	Q'ty
C113	SMD CC 0603 332 50V NP0 5%	1
C112	SMD CC 1206 22pF 1KV NP0 5%	1
C105,C106	E CAP NCC KXG 100uF/450V/18*35	2
C114,C27	E CAP 22uF 50V 20% 5*11	2
C17,C20,C22,C23,C26,C110	SMD CC 0805 104 50V X7R 10%	6
C18,C19	E CAP LTEC LZG 470uF 25V SC 8*20	2
C21	E CAP 10uF 50V 5*11	1
C25	SMD CC 0805 105 50V X7R 10%	1
CX1,CX002	DIP X2 CAP HQX 0.47uF(474) ±10% 275V P:15mm(17*16*10.3mm)	2
BD001	HY GBU 810	1
D103	1N4148 / SOD-123	1
D101	LTTH806LF / TO-220	1
D102	1N5406 / DO201	1
D4,D5,D8	FF7 / SOD-123	3
D6,D7	FM4007 / SOD-123	2
D9	PFC P10V45	1
IC1	LD7932R / DIP-8	1
IC2	SMD IC LA431OCRPA SOT-23-3L	1
Q101	TOSHIBA TK20A60W / TO-220	1
Q5,Q6	MMBT2222A / SOT-23	2
ZD1	BZT52-B16 16V / SOD-123	1
U1	LD7593(8pin) / SO-8	1
PC1,U2	DIP IC EL817C (CTR 200-400)	2
MOV1	TVR14N561K	1
T1	EE-16加寬 / AE 38 / 65:4:15 / 1800 uH	1
L001,L003	Core A10	2
L102	PQ3225 / 0.1*85*30T L= 170uH	1
F001	DIP FUSE 5A 250V 2010 Time Lag 8.5*8.5*4mm 方型塑膠外殼	1
PCB	162 x 103 x 2 mm / FR-4 / 2 oz	1
HS1	散熱片 / 80*25*5mm	1
HS2	散熱片 / 60*25*5mm	1

4. Bill of Materials (Cont.)

Location	Description	Q'ty
CON1	Pitch = 3.96 mm (3 PIN Cut pin2)	1
L101	JUMP / 7.5mm / 1 Φ	1
JP1	JUMP / 20mm / 1 Φ	1
J1,JP3	JUMP / 38mm / 1 Φ	2
J2	JUMP / 15mm / 1 Φ	1
J3	JUMP / 20mm / 1 Φ	1
J5	JUMP / 5mm / 1 Φ	1

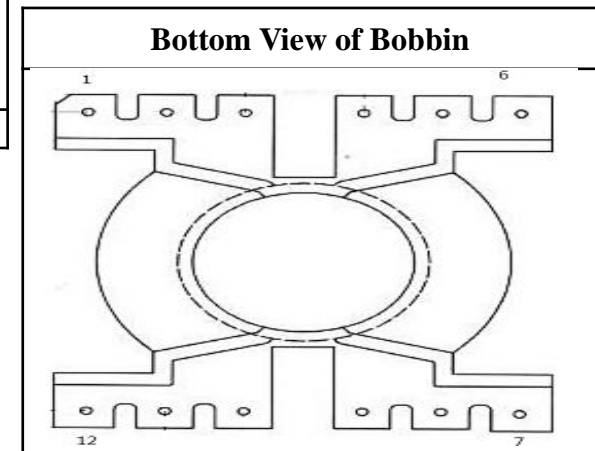
5. Transformer Design

L102

Schematic of Winding	Construction of Winding
<p style="text-align: center;">N1 0.1mm X 85 X 30T</p>	<p style="text-align: center;">bobbin pin 腳對繞線人員 ↓ 繞線人員</p> <p style="text-align: center;">Bottom Turn of mylar tape ↘ Top</p> <p style="text-align: center;">6 6 3</p> <p style="text-align: center;">N1 4 0.1mm X 85 X 30T</p> <p style="text-align: center;">Note: 1) Dot ●: Start point of winding 2) Rotating direction of winding machine: Clockwise 3) Bobbin 頂部對繞線機</p>

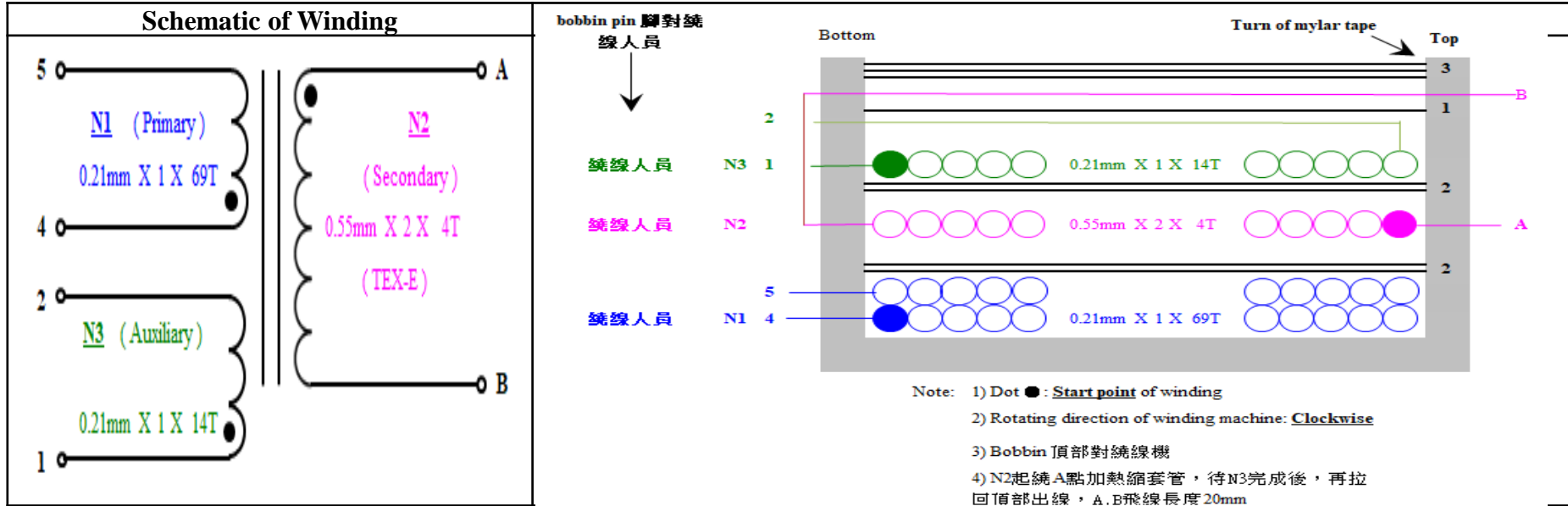
Winding No.	Pin No.		Winding Types	Number of Turns		Remarks	
	Start	Finis h		Winding	Tape		
N1	4	6	0.1 mm X 85	30	3	N1	Pin 朝人順繞

Bobbin Shape	Core Material	A_e (mm ²)	L_p (μH)
PQ3225	PC44	149	170 ± 5 % @ 65 kHz / 1 V



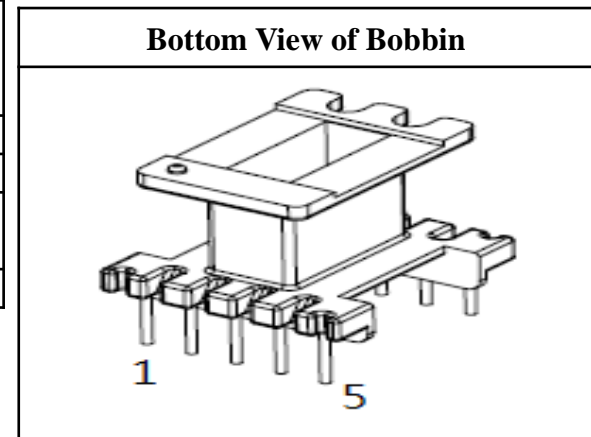
5. Transformer Design (Cont.)

T1



Winding No.	Pin No.		Winding Types	Number of Turns		Remarks	
	Start	Finish		Winding	Tape		
N1	4	5	0.21 mm X 1	69	2	N_p	Pin 朝人順繞
N2	A	B	0.55 mm X 2	4	2	N_s	Pin 朝人順繞
N3	1	2	0.21 mm X 1	14	1	N_A	Pin 朝人順繞(疏繞)

二次側線由頂部凹槽出線，起繞A點加熱縮套管



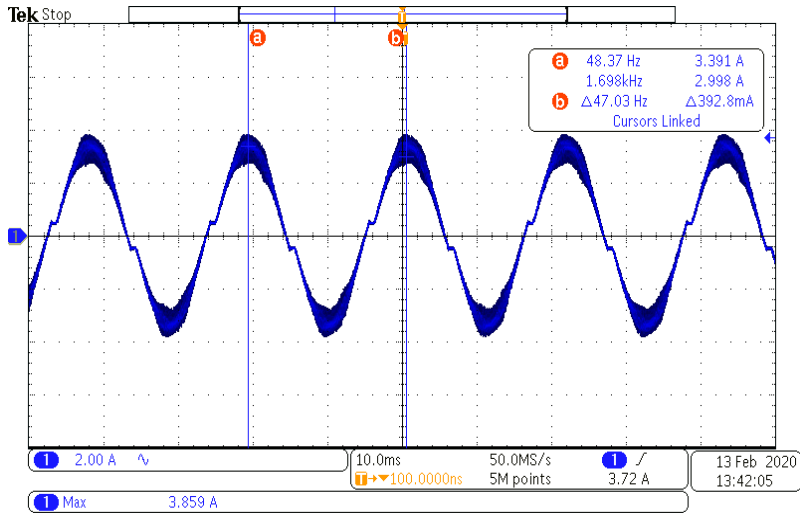
Bobbin Shape	Core Material	A_e (mm ²)	L_p (μH)
EE-16W	PC44	38	1800 ± 5 % @ 65 kHz / 1 V

6. Efficiency & Power Factor

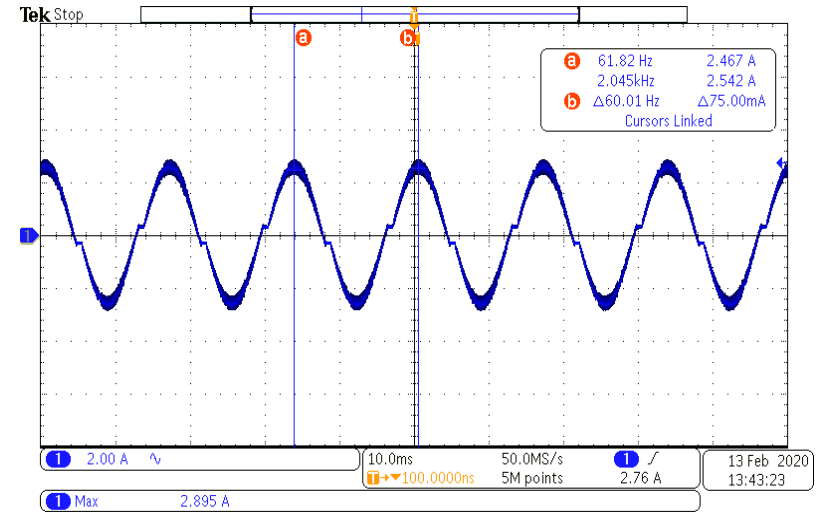
Input Voltage	90 V _{AC} / 47 Hz 115 V _{AC} / 60 Hz 230 V _{AC} / 50 Hz 264 V _{AC} / 63 Hz
Output Current	25% / 100% Load
Measured Point of Output Voltage	End of PCB

Voltage (V)	25% load		100% load	
	Efficiency (%)	Power Factor	Efficiency (%)	Power Factor
90	95.27	0.969	94.71	0.994
115	95.79	0.956	96.30	0.993
230	97.06	0.648	97.96	0.948
264	97.64	0.662	98.25	0.868

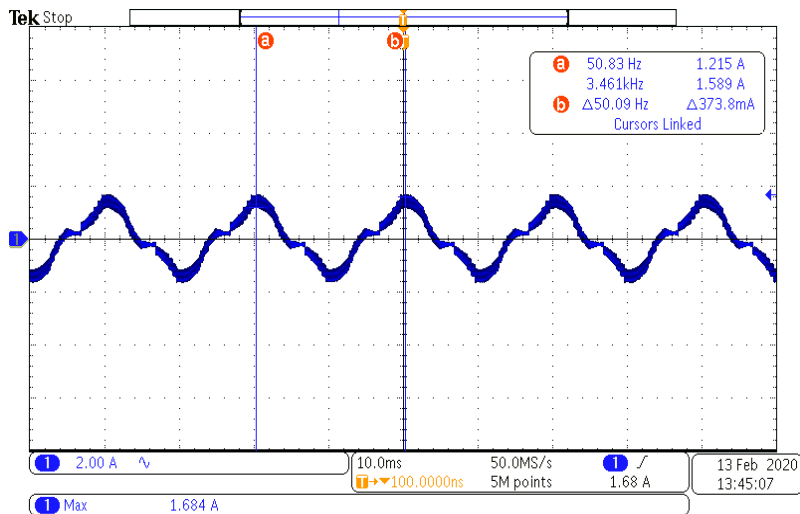
7. Key Waveform



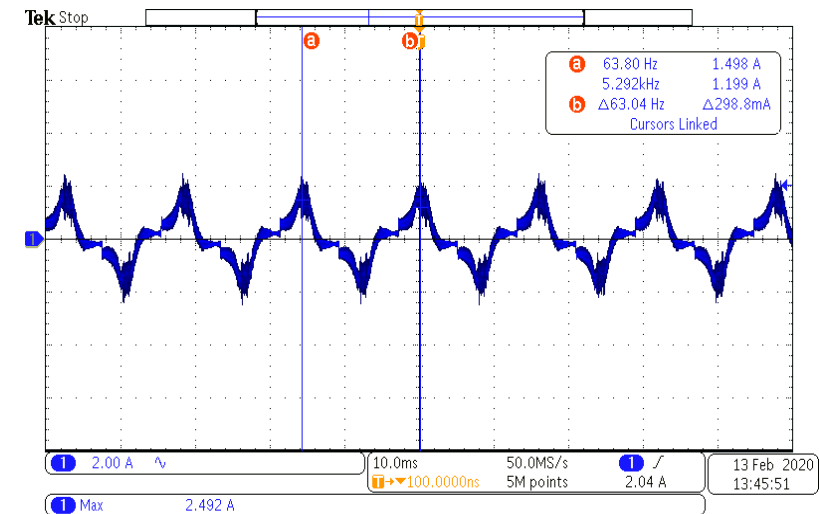
90Vac full load AC Current Waveform



115Vac full load AC Current Waveform

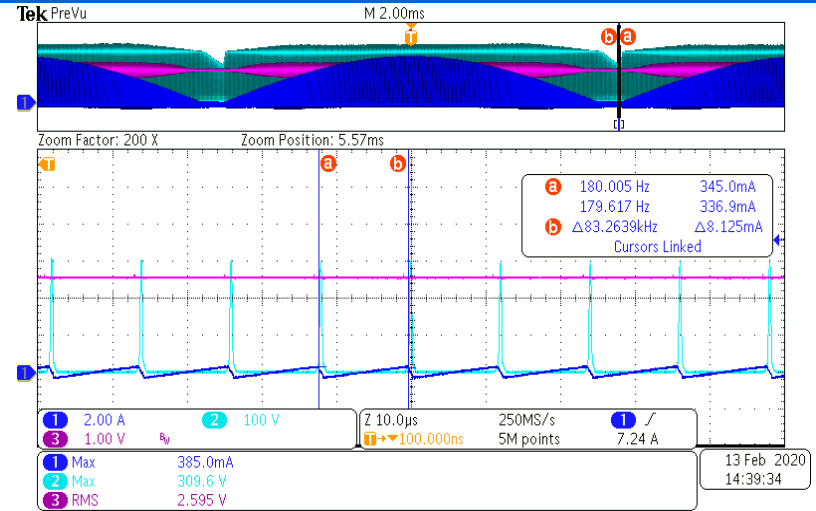
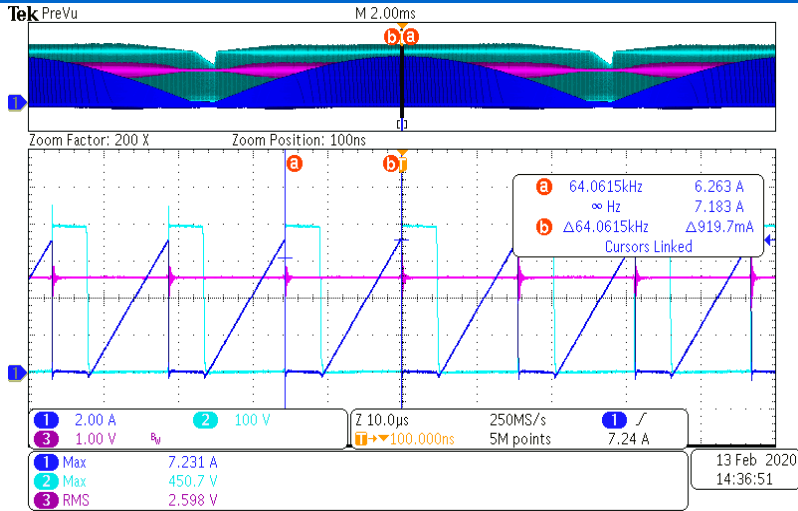


230Vac full load AC Current Waveform

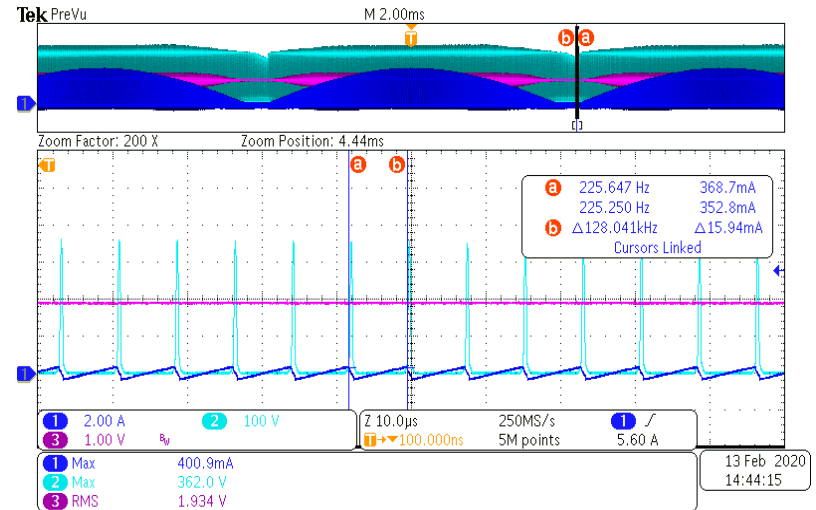
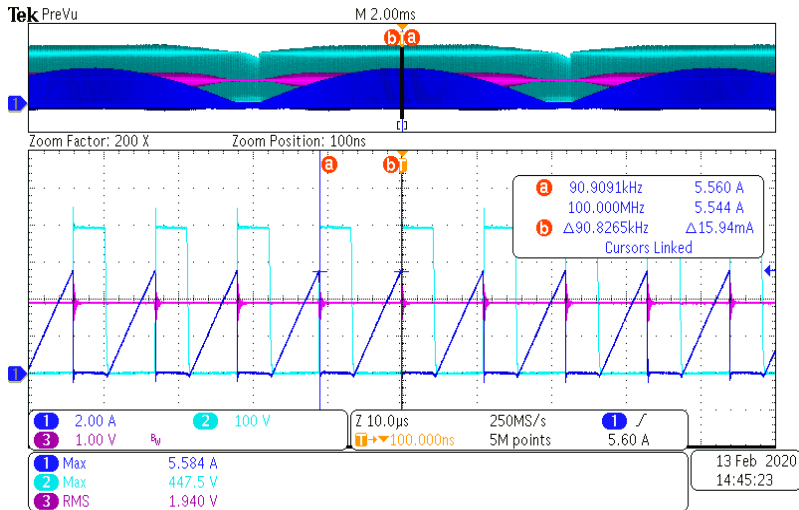


264Vac full load AC Current Waveform

7. Key Waveform (Cont.)

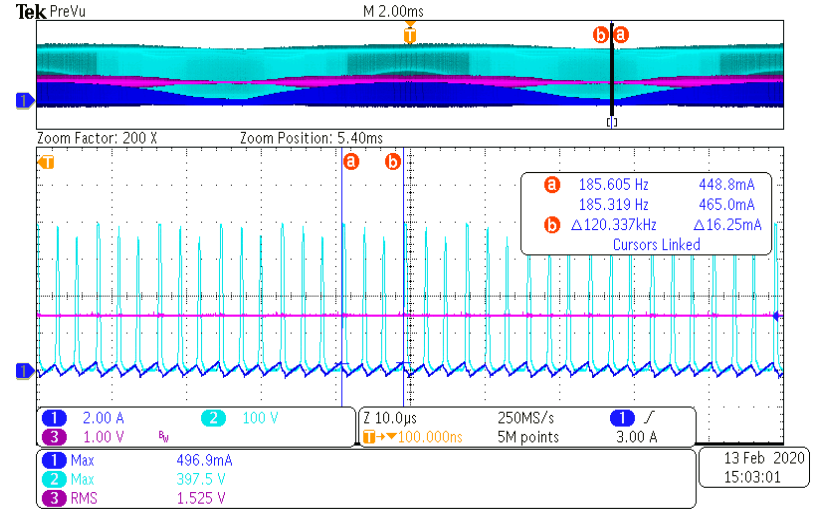
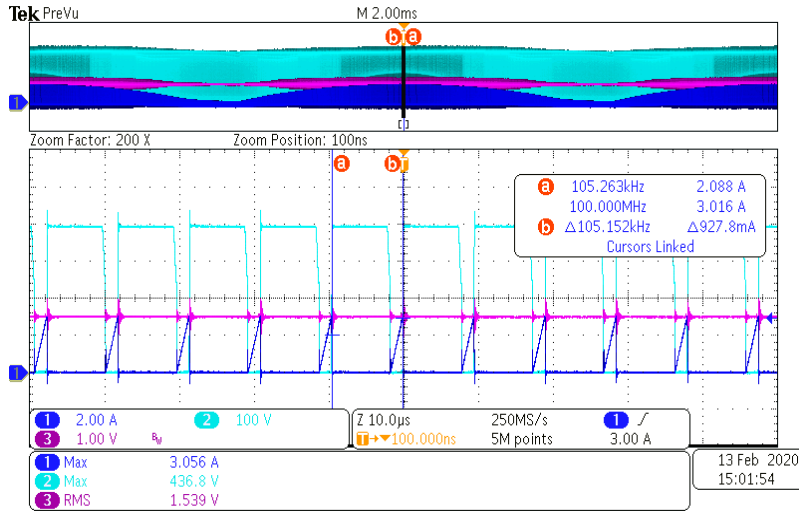


90Vac 390V/0.5A , CH1 I_{DS} . CH2 V_{DS} . CH3 Comp

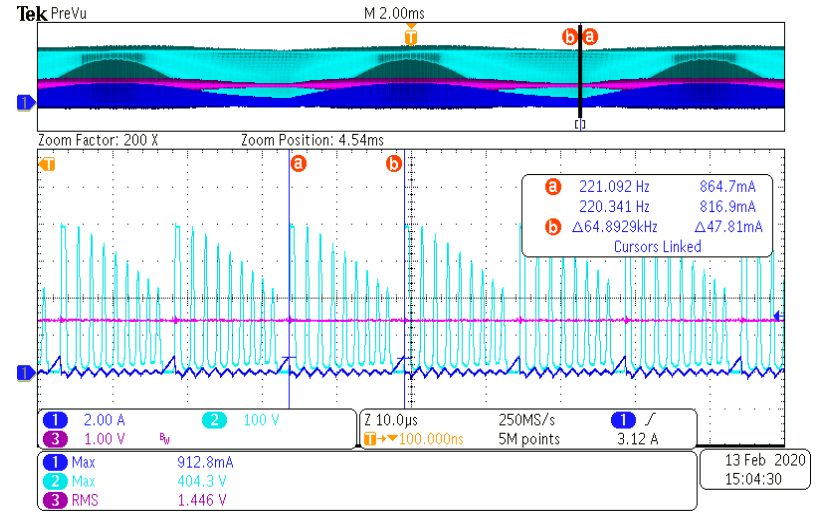
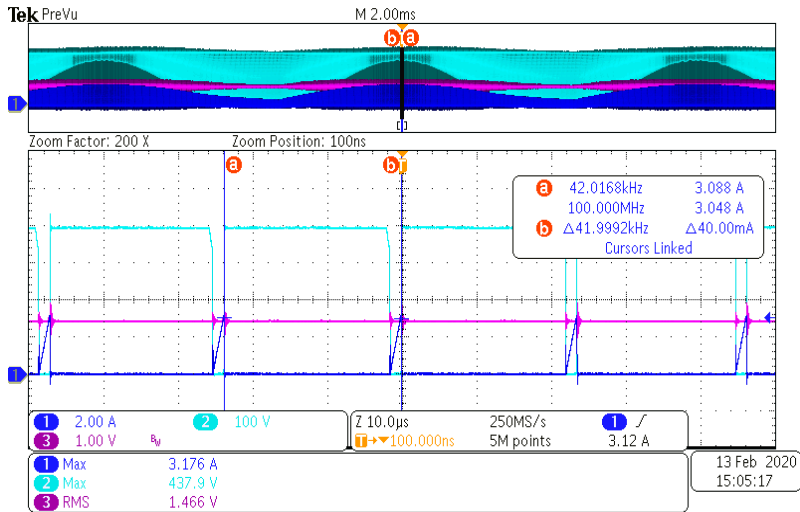


115Vac 390V/0.5A , CH1 I_{DS} . CH2 V_{DS} . CH3 Comp

7. Key Waveform (Cont.)

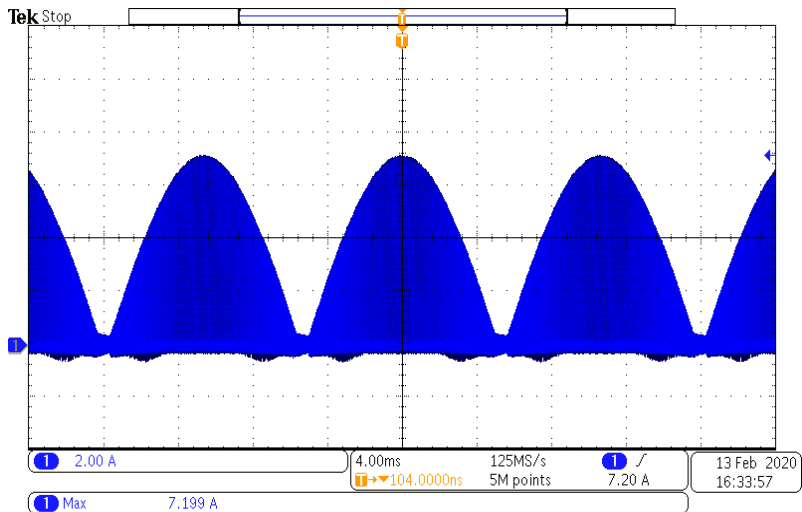


230Vac 390V/0.5A , CH1 I_{DS} . CH2 V_{DS} . CH3 Comp

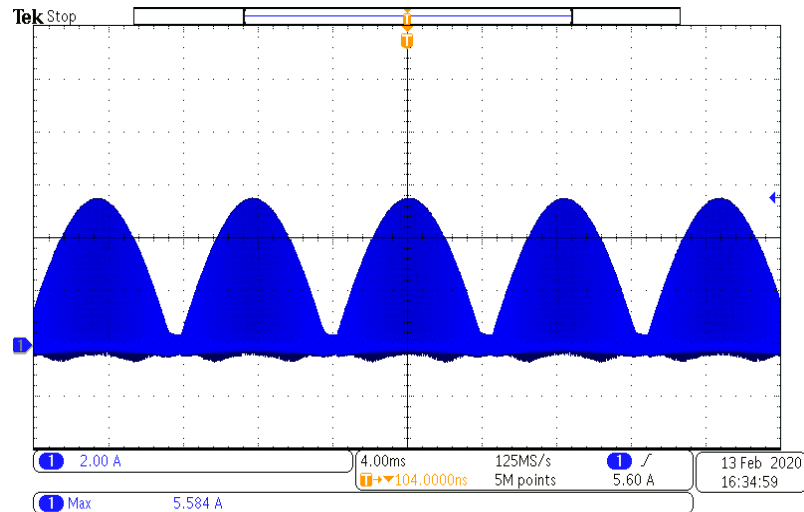


264Vac 390V/0.5A , CH1 I_{DS} . CH2 V_{DS} . CH3 Comp

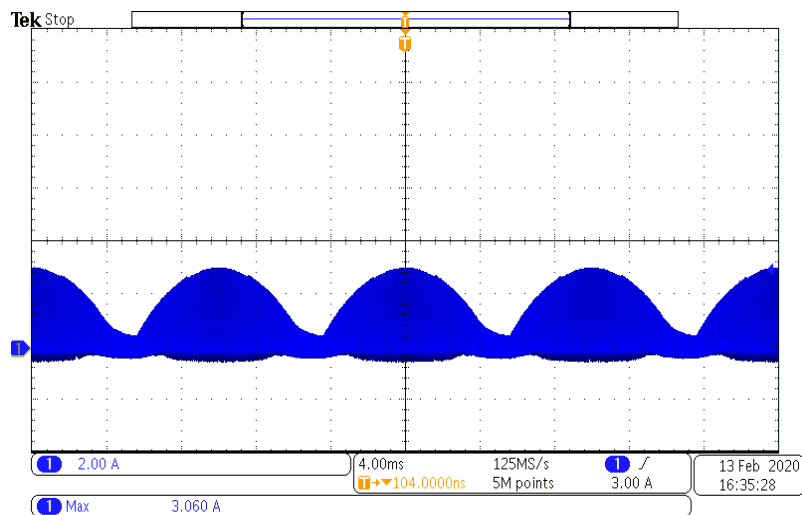
7. Key Waveform (Cont.)



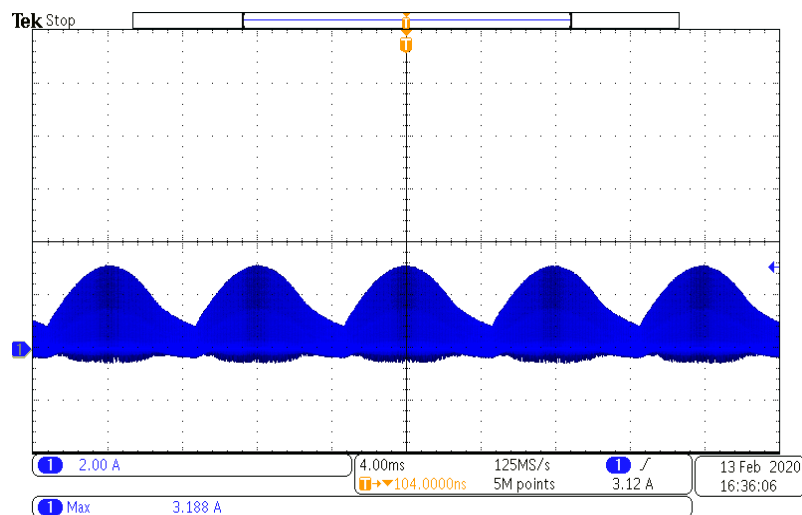
90Vac PFC Current Waveform



115Vac PFC Current Waveform



230Vac PFC Current Waveform



264Vac PFC Current Waveform

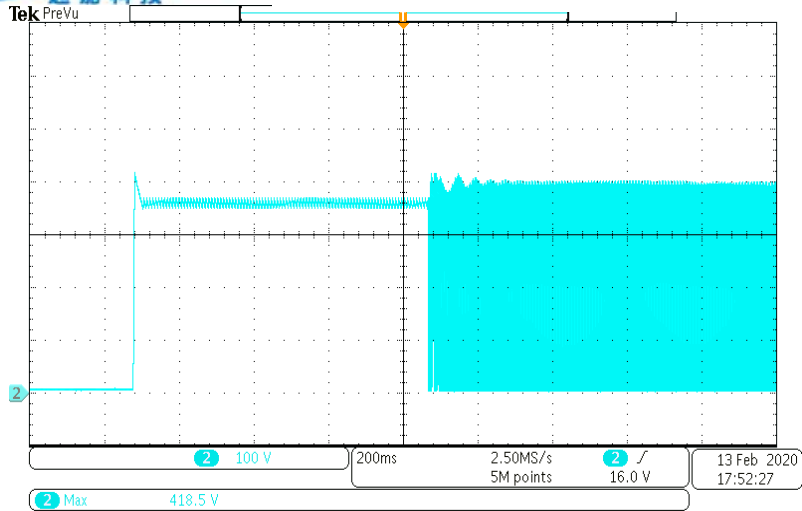
8. Stress on Switching Parts

Input Voltage	264 V _{AC} / 63 Hz
Output Current	Full Load
Requirement	<90 %

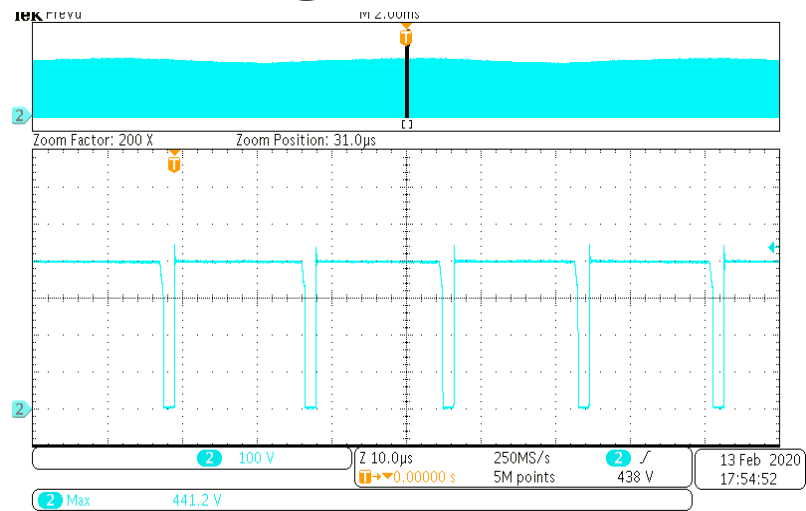
Turn on (264/63Hz)				
NO.	Location	Voltage (V)	Measurement (V)	Derating (%)
1	Q1	600	418.5	69.75
2	D1	600	420.8	70.13

Normal (264/63Hz)				
NO.	Location	Voltage (V)	Measurement V	Derating (%)
			V	%
1	Q1	600	441.2	73.53
2	D1	600	420	70

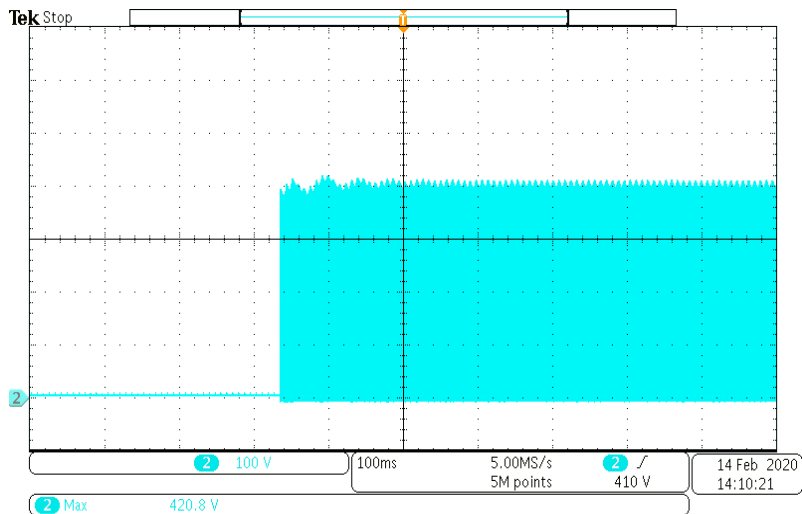
8. Stress on Switching



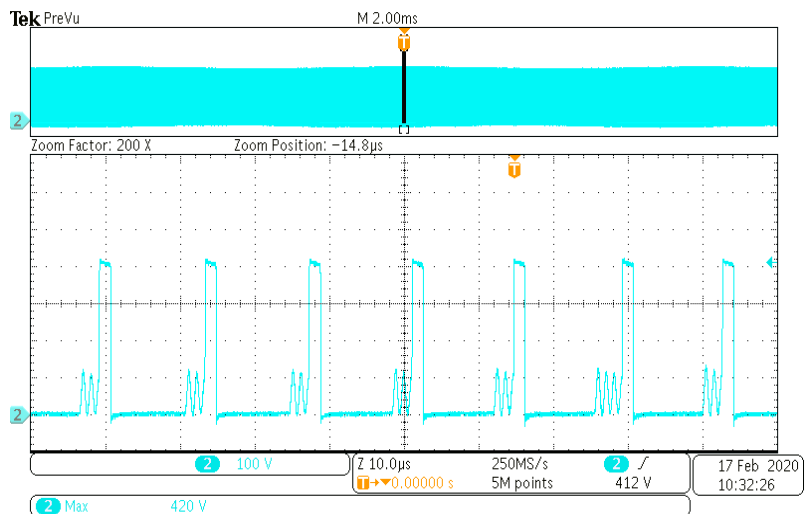
264Vac Q1 Vds turn on



264Vac Q1 Vds normal



264Vac D1 Vrrm turn on



264Vac D1 Vrrm normal

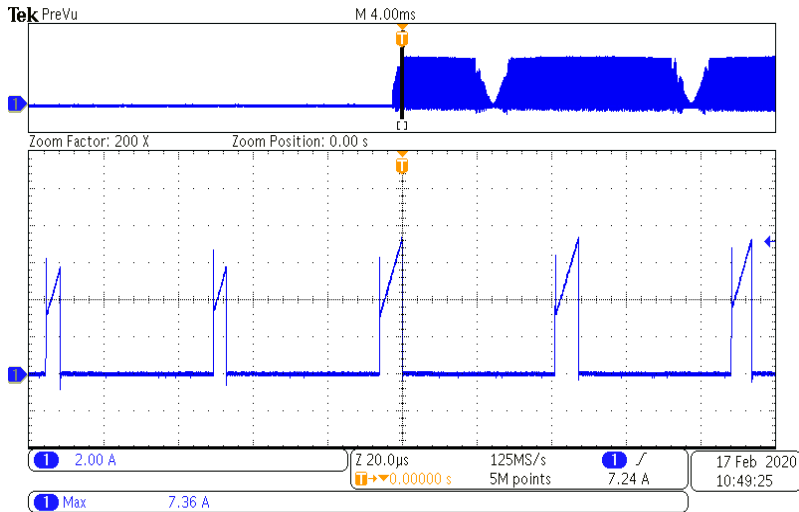
9. Mosfet Id Current

Input Voltage	90 V _{AC} / 47 Hz
Output Current	Full Load
Requirement	<90 %

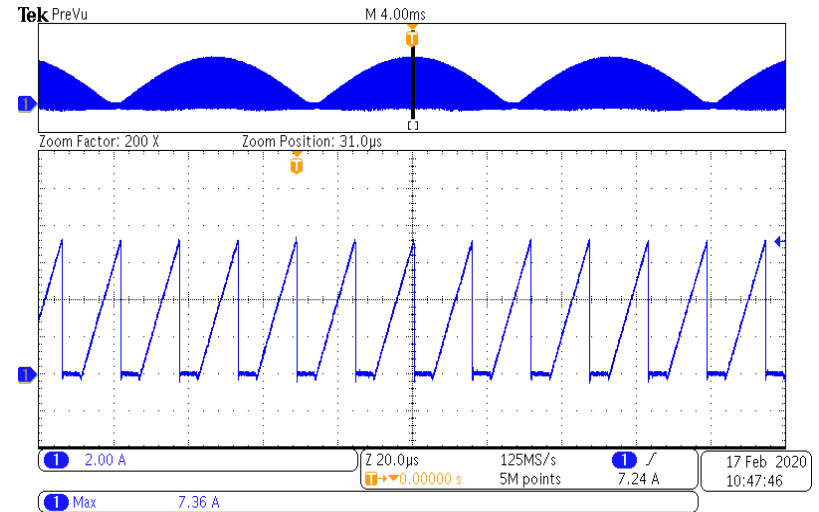
Turn on (90V/47Hz)				
NO.	Location	Current (A)	Measurement (A)	Derating (%)
1	Q1	20	7.36	36.8

Normal (90V/47Hz)				
NO.	Location	Current (A)	Measurement (A)	Derating (%)
1	Q1	20	7.36	36.8

9. Mosfet Id Current



90Vac Q1 Ids turn on



90Vac Q1 Ids normal

$$\Delta B_{max} = \frac{170\mu H \times 7.36 A \times 10^8}{30ts \times 1.49cm^2} = 2799 gauss$$

10. 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			
Requirement	385~410			

(V / Hz)	(V)		Requirement (V)
	No Load	Full Load	
90 / 47	397	395	385~410
115 / 60	398	395	
230 / 50	400	395	
264 / 63	402	395	

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



THANK YOU

