EVX2001-Y-00D
65W Type-C PD Adapter

DESCRIPTION

The EVX2001-Y-00D is an evaluation board for a 65W Type-C PD adapter. It's a secondary low-side solution. The board is designed in a very small form factor with a very high power density. Its electrical specifications are suitable for the typical cell phone and computer power adapter. Particular benefits for the board includes the very low no-load power consumption (<30mW) and the very high overall efficiency which meet DOE Level VI and CoC Tier2.

The MPX2001 is an all-in-one flyback controller solution. It integrates a primary driving circuit, secondary controller, and synchronous rectification driver all in one chip, maintaining the benefits of both primary-side regulation (PSR) and secondary-side regulation (SSR).

No feedback circuit is needed, a synchronous rectifier (SR) can be matched perfectly with the driving signal of the primary-side MOSFET. With this feature, SR can operate safely in continuous conduction mode (CCM), which helps increase overall efficiency and provides the design with more flexibility.

At light loads, the controller freezes the peak current and reduces its switching frequency down to 20kHz to offer excellent light-load efficiency. At very light loads, the controller enters burst mode to achieve very low standby power consumption. The MPX2001 offers frequency jittering to help dissipate energy generated by conducted noise.

The EVX2001-Y-00D evaluation board provides a reference design for a universal offline isolated power supply with a 20V/3.25A, 15V/3A, 9V/3A, 5V/3A output. This EVDS contains the complete specification of the power supply, a detailed circuit diagram, the entire bill of materials required to build the power supply, a drawing of the transformers, and test data of the most important performance.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value
Input AC Voltage	V_{IN}	90VAC to 264VAC
Output SPEC	V_O/I_O	20VDC/3.25A 15VDC/3A 9VDC/3A 5VDC/3A

FEATURES

- High Power Density
- Meets DOE Level VI and CoC Tier2
- Maximum Efficiency up to 92%
- No Load Power Consumption Less than 30mW
- Meet EN55022 Class B Standard
- Meet IEC61000-3-2 Class D Standard
- Internal High-Voltage Current Source
- VCC Under-Voltage Lockout with Hysteresis (UVLO)
- Brown-In /-Out Protection on HV
- Output Short-Circuit Protection
- Output Over-Current Protection
- Output Over-Voltage Protection

High Voltage

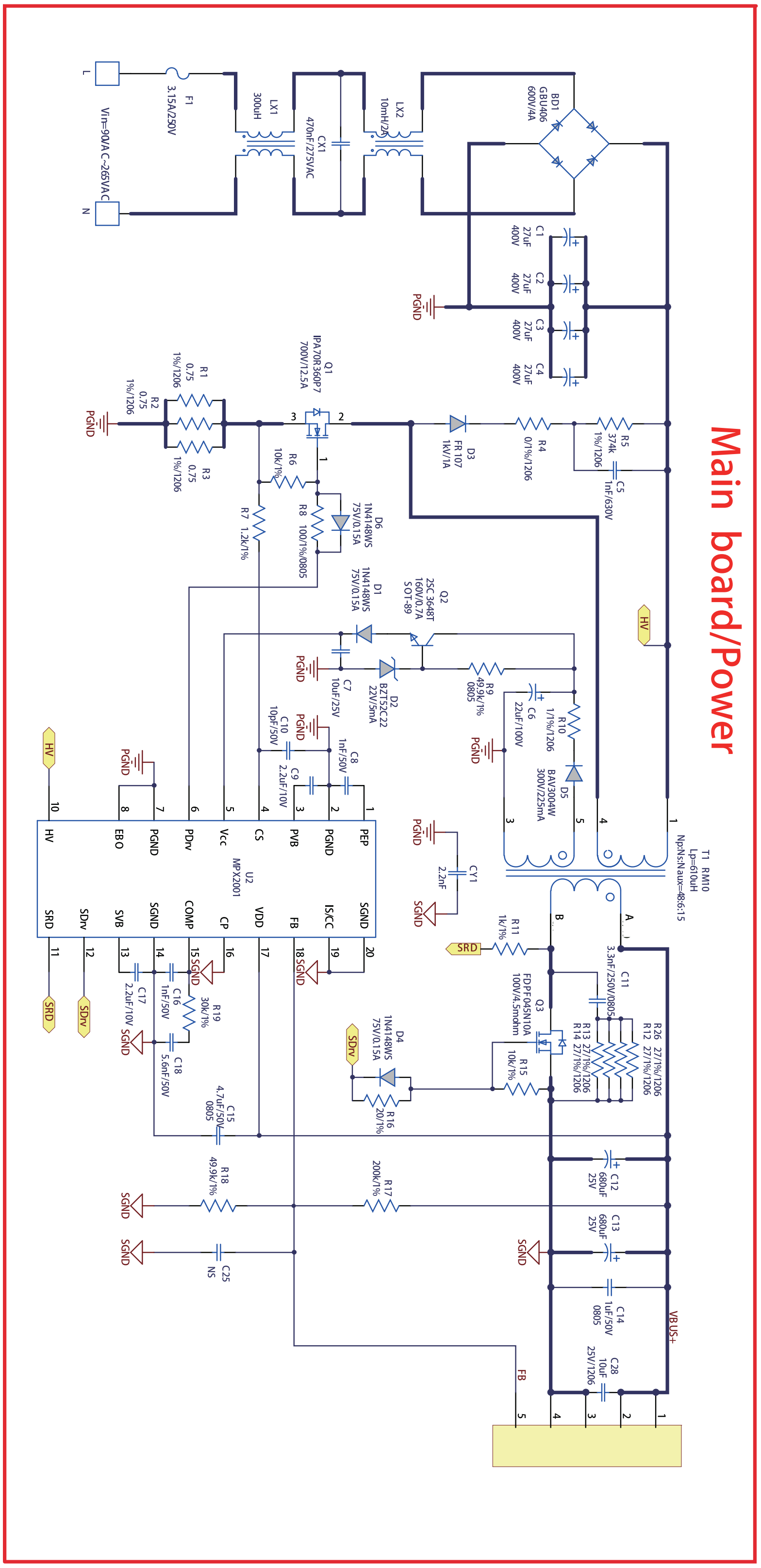
Warning: Although this board is designed to satisfy safety requirements, the engineering prototype has not been agency approved. Therefore, all testing should be performed using an isolation transformer to provide AC input to the prototype board.

EVALUATION BOARD

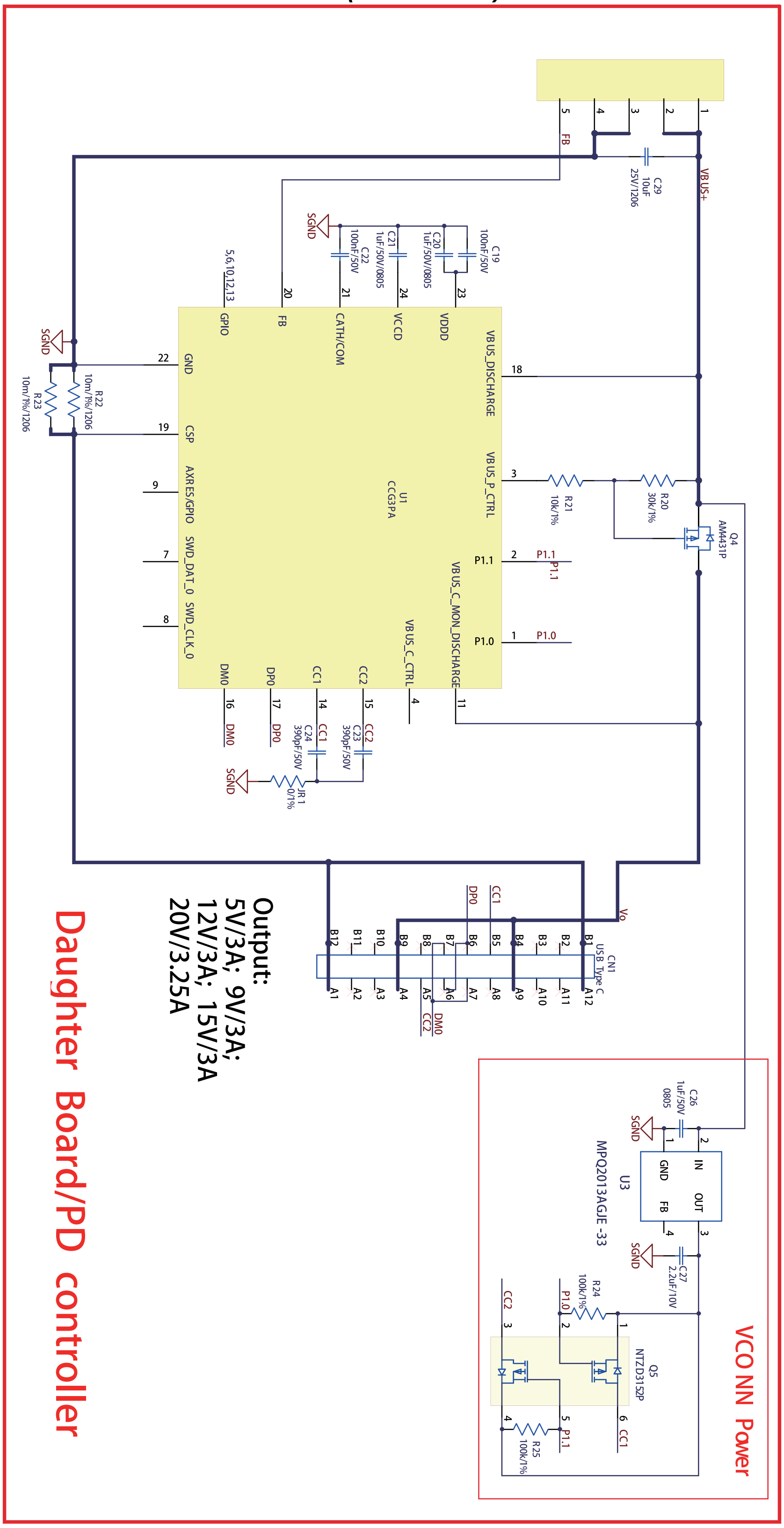
(L x W x H) (56mm x57mm x 23mm)

Board Number	MPS IC Number
EVX2001-Y-00D	MPX2001

EVALUATION BOARD SCHEMATIC



EVALUATION BOARD SCHEMATIC *(continued)*



PRINTED CIRCUIT BOARD LAYOUT

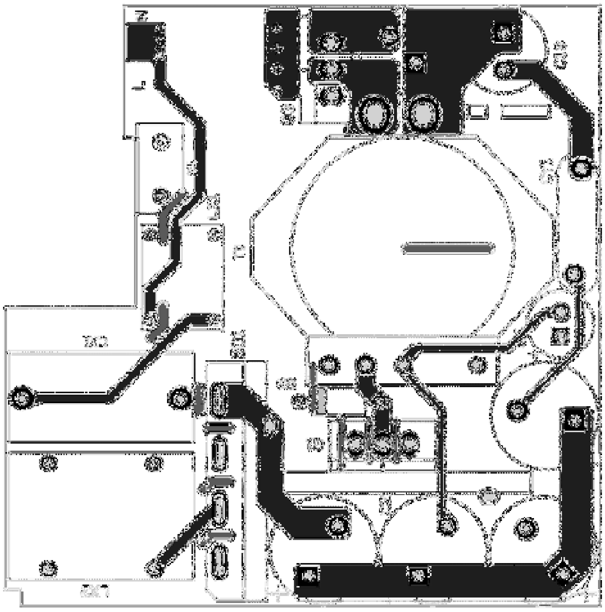


Figure 1: Top Layer – Main Power Board

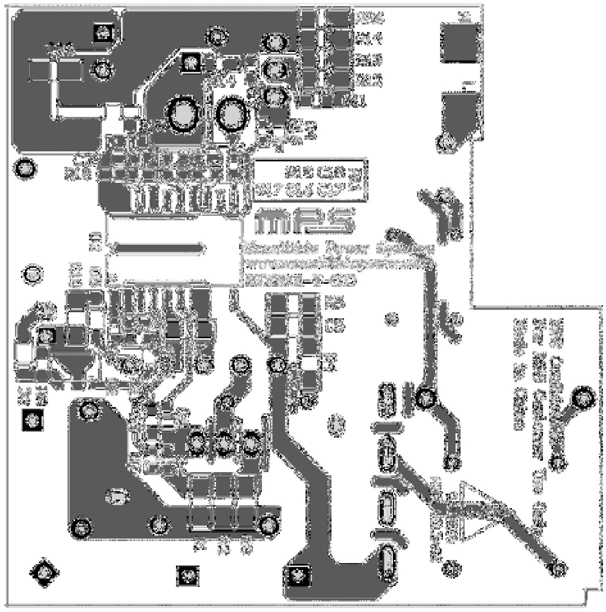


Figure 2: Bottom Layer – Main Power Board

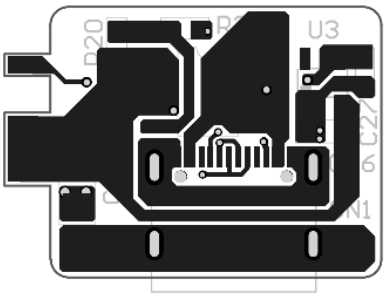


Figure 3: Top Layer – Daughter Board

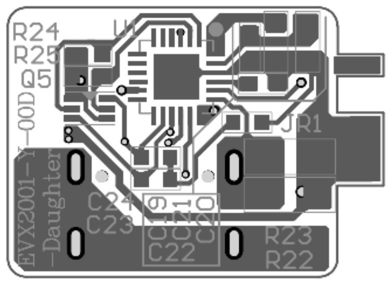


Figure 4: Bottom Layer – Daughter Board

BILL OF MATERIALS

RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
BD1	GBU406	Diode;600V;4A	DIP	Diodes	GBU406
C1,C2 C3,C4	27µF/400V	Electrolytic Capacitor; 400V	DIP	Aishi	HS 400V 27uF10*18
C5	1nF/630V	Ceramic Capacitor; 630V;U2J	1206	muRata	GRM31A7U2J102JW31D
C6	22µF/100V	Electrolytic Capacitor; 100V	DIP	Aishi	ERJ1KM222E120T
C7,C28 C29	10µF	Ceramic Capacitor; 25V;X7R	1206	muRata	GRM31CR71E106KA12
C8,C16	1nF/50V	Ceramic Capacitor; 50V;C0G	0603	muRata	GRM1885C1H102JA01D
C9,C17 C27	2.2µF/10V	Ceramic Capacitor; 10V;X7R	0603	muRata	GRM188R71A225KE15D
C10	10pF/50V	Ceramic Capacitor; 50V;C0G	0603	muRata	GRM1885C1H100JA01
C11	3.3nF/250V	Ceramic Capacitor; 250V;X7R	0805	Yageo	CC0805KRX7RYBB332
C12,C13	680µF/25V	Solid Capacitor;25V; 8*15mm	DIP	Shengyang Elec	SS687M025F1500
C14,C20 C21,C26	1µF/50V	Ceramic Capacitor; 50V;X7R	0805	Wurth	885012207103
C15	4.7µF/50V	Ceramic Capacitor; 50V;X7S	0805	muRata	GRM21BC71H475KE11L
C18	5.6nF/50V	Ceramic Capacity; 50V;X7R	0603	muRata	GRM188R71H562KA01D
C19,C22	100nF/50V	Ceramic Capacitor; 50V;X7R	0603	muRata	GCJ188R71H104KA12D
C23,C24	390pF/50V	Ceramic Capacitor; 50V;C0G	0603	TDK	C1608COG1H391J
C25	NS				
CX1	470nF/ 275VAC	Capacitor;275VAC; 10%	DIP	Carli	PX474K3ID42L270D9R
CY1	2.2nF	Capacitor;4kV;20%	DIP	Hongke	JNK12E222MY02N
D1,D4 D6	1N4148WS	Diode;75V;0.15A	SOD323	Diodes	1N4148WS
D2	BTZ52C22	Zener Diode;22V; 5mA	SOD123	Diodes	BTZ52C22
D3	FR107	Diode;1kV;1A	DO-41	MIC	FR107
D5	BAV3004W	Diode;300V;225mA	SOD123	Diodes	BAV3004W-7-F
F1	SS-5-3.15A	Fuse;250V;3.15A	DIP	COOPER Bussman	SS-5-3.15A
LX1	300µH	Common Choke; 300µH;1A	DIP	Emei	TP4U300-00
LX2	10mH	Common Choke; 10mH;2A	DIP	Emei	TP4M10-01
Q1	IPA70R360P7S	N-Mosfet; 700V;0.36ohm/10V	TO220	Fairchild	IPA70R360P7S
Q2	2SC3648	Transistor;160V;0.7A	SOT89	ON	2SC3648
Q3	FDPF045N10A	N-Mosfet; 100V;4.5mΩ	TO220	Vishay	FDPF045N10A

BILL OF MATERIALS *(continued)*

RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
Q4	AM4431P	P-Channel Mosfet; -30V;7mohm	SO8	Analog Power	AM4431P
Q5	NTZD3152P	Dual P-Channel Mosfet	SOT563-6	ON Semi	NTZD3152P
R1,R2 R3	0.75Ω	Film Resistor;1%;1/4W	1206	Royalohm	1206 F50LT5F
R4	0Ω	Film Resistor;1%;1/4W	1206	Yageo	RC1206FR-070R
R5	374kΩ	Film Resistor;1%;1/4W	1206	Yageo	RC1206FR-07374KL
R6,R15 R21	10kΩ	Film Resistor;1%	0603	Yageo	RC0603FR-0710KL
R7	1.2kΩ	Film Resistor;1%	0603	Yageo	RC0603FR-071K2L
R8	100Ω	Film Resistor;5%	0805		CR05T05NJ100R
R9	49.9kΩ	Film Resistor;1%	0805	Yageo	RC0805FR-0749K9L
R10	1Ω	Film Resistor;1%;1/4W	1206	Yageo	RC1206FR-071RL
R11	1kΩ	Film Resistor;1%	0603	Ralec	RF0603-1K
R12,R13 R14,R26	27Ω	Film Resistor;1%;1/4W	1206	Yageo	RC1206FR-0727RL
R16	20Ω	Film Resistor;1%	0603	Yageo	RC0603FR-0720RL
R17	200kΩ	Film Resistor;1%	0603	Yageo	RC0603FR-07200KL
R18	49.9kΩ	Film Resistor;1%	0603	Yageo	RC0603FR-0749K9L
R19,R20	30kΩ	Film Resistor;1%	0603	Yageo	RC0603FR-0730KL
R22,R23	10mΩ	Film Resistor;1%;1/4W	1206	Yageo	RC1206FR-07R01L
R24,R25	100kΩ	Film Resistor;1%	0603	Yageo	RC0603FR-07100KL
JR1	0Ω	Film Resistor;1%	0603	Yageo	RC0603FR-070RL
T1	0.61mH	RM10, Lp=0.61mH Np:Ns:Naux=48:6:15	RM10	Emei	FX0534
U1	CYPD3175	USB PD Controller, CCG3PA	QFN24	Cypress	CYPD3175
U2	MPX2001	All-in-one Controller	SOICW-20	MPS	MPX2001GY
U3	MPQ2013A	3.3V LDO	TSOT23-4	MPS	MPQ2013AGJE-33-C672-Z
CN1	Connect	Type-C Connector	DIP	Yalian	93551001
HS1		Heat sink			
HS2		Heat sink			

EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

1. Efficiency

V_O=5V						
V_{IN}(VAC)	Load	P_{IN}(W)	V_O(V)	I_O(A)	P_O(W)	Effi(%)
120	100%	16.241	4.93	2.998	14.780	91.01%
	75%	12.214	4.94	2.253	11.130	91.12%
	50%	8.1878	4.96	1.498	7.430	90.75%
	25%	4.1819	4.97	0.754	3.747	89.61%
	Average Effi(%)					90.62%
	10%	1.8046	4.98	0.301	1.499	83.06%
230	100%	16.450	4.93	2.997	14.775	89.82%
	75%	12.454	4.94	2.253	11.130	89.37%
	50%	8.3776	4.96	1.498	7.430	88.69%
	25%	4.3904	4.97	0.754	3.747	85.35%
	Average Effi(%)					88.31%
	10%	1.9605	4.98	0.301	1.499	76.46%

V_O=9V						
V_{IN}(VAC)	Load	P_{IN}(W)	V_O(V)	I_O(A)	P_O(W)	Effi(%)
120	100%	29.279	9.02	2.996	27.024	92.30%
	75%	22.004	9.03	2.252	20.336	92.42%
	50%	14.716	9.05	1.497	13.548	92.06%
	25%	7.4839	9.07	0.753	6.830	91.26%
	Average Effi(%)					92.01%
	10%	3.1424	9.08	0.300	2.724	86.69%
230	100%	29.450	9.01	2.997	27.003	91.69%
	75%	22.126	9.03	2.252	20.336	91.91%
	50%	14.939	9.05	1.497	13.548	90.69%
	25%	7.7514	9.07	0.754	6.839	88.23%
	Average Effi(%)					90.63%
	10%	3.2758	9.08	0.301	2.733	83.43%

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

1. Efficiency

V_O=15V						
V_{IN}(VAC)	Load	P_{IN}(W)	V_O(V)	I_O(A)	P_O(W)	Effi(%)
120	100%	48.940	15.02	3.006	45.150	92.26%
	75%	36.602	15.04	2.250	33.840	92.45%
	50%	24.473	15.06	1.496	22.530	92.06%
	25%	12.503	15.09	0.752	11.348	90.76%
	Average Effi(%)					91.88%
	10%	5.2045	15.11	0.300	4.533	87.10%
230	100%	48.728	15.00	3.006	45.090	92.53%
	75%	36.653	15.03	2.250	33.818	92.26%
	50%	24.545	15.05	1.496	22.515	91.73%
	25%	12.734	15.08	0.752	11.340	89.05%
	Average Effi(%)					91.40%
	10%	5.4338	15.10	0.300	4.530	83.37%

V_O=20V						
V_{IN}(VAC)	Load	P_{IN}(W)	V_O(V)	I_O(A)	P_O(W)	Effi(%)
120	100%	70.612	20.03	3.253	65.158	92.28%
	75%	52.973	20.06	2.444	49.027	92.55%
	50%	35.381	20.10	1.625	32.663	92.32%
	25%	18.274	20.14	0.817	16.454	90.04%
	Average Effi(%)					91.80%
	10%	7.6575	20.15	0.321	6.468	84.47%
230	100%	70.491	20.01	3.253	65.093	92.34%
	75%	52.922	20.05	2.444	49.002	92.59%
	50%	35.346	20.10	1.625	32.663	92.41%
	25%	18.276	20.13	0.817	16.446	89.99%
	Average Effi(%)					91.83%
	10%	7.6523	20.16	0.321	6.471	84.57%

2. No-Load Consumption

V_{IN}(VAC)	90	120	230	264
P_{IN}(mW)	9.85	12.03	24.85	26.96

EVB TEST RESULTS *(continued)*

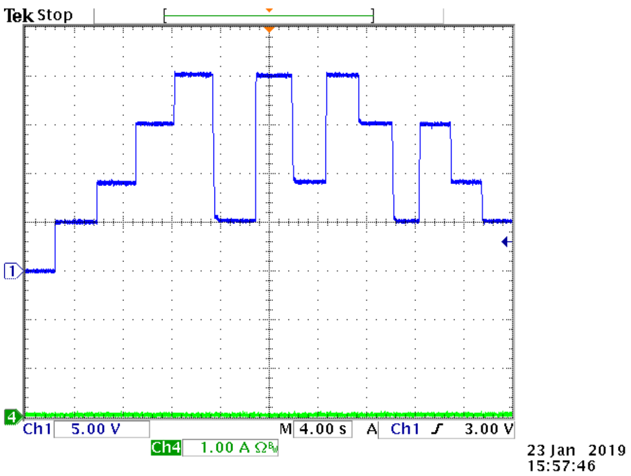
Performance waveforms are tested on the evaluation board.

3. Transient

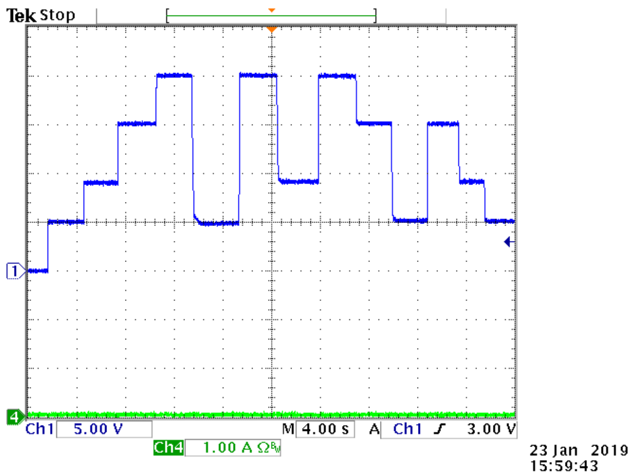
3.1 Output Voltage Transient

CH1: V_O; CH4: I_O

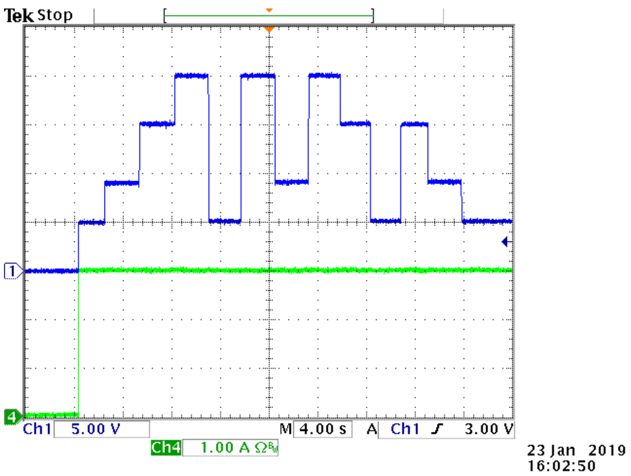
V_{IN}=120VAC, I_O=0A



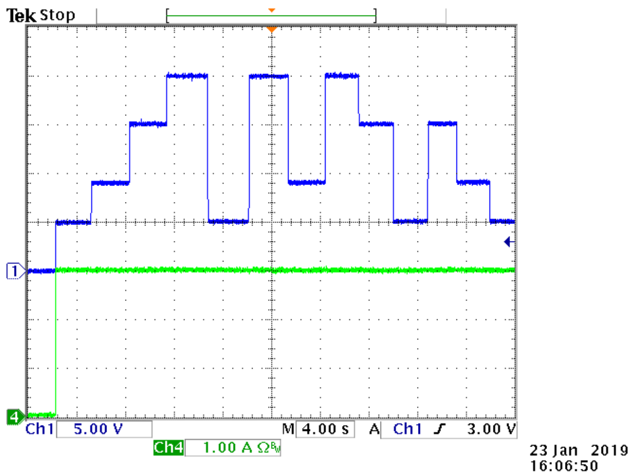
V_{IN}=230VAC, I_O=0A



V_{IN}=120VAC, I_O=3A



V_{IN}=230VAC, I_O=3A



EVB TEST RESULTS *(continued)*

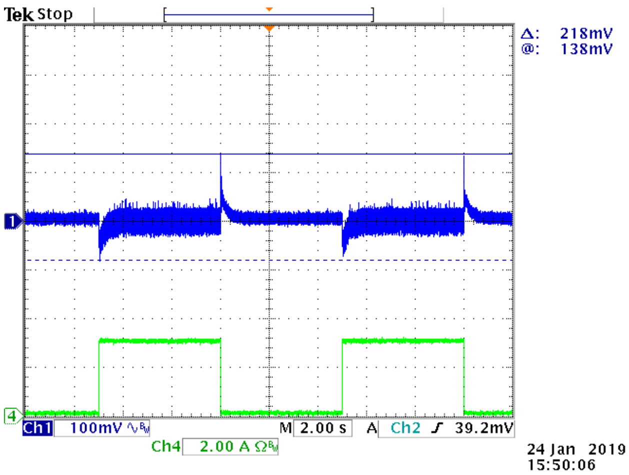
Performance waveforms are tested on the evaluation board.

3.2 Load Transient

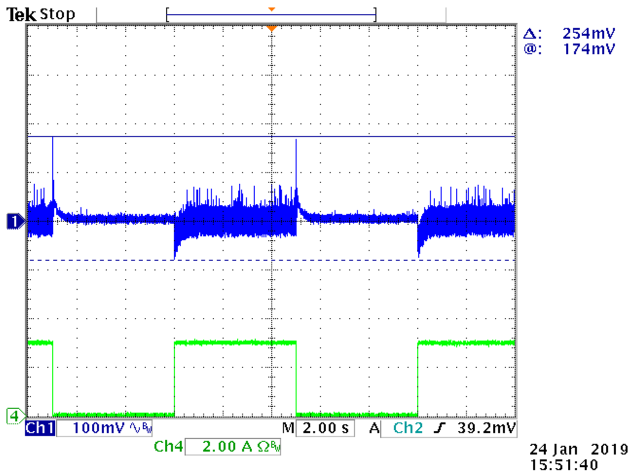
Transient between no load and full load.

CH1: V_O; CH4: I_O

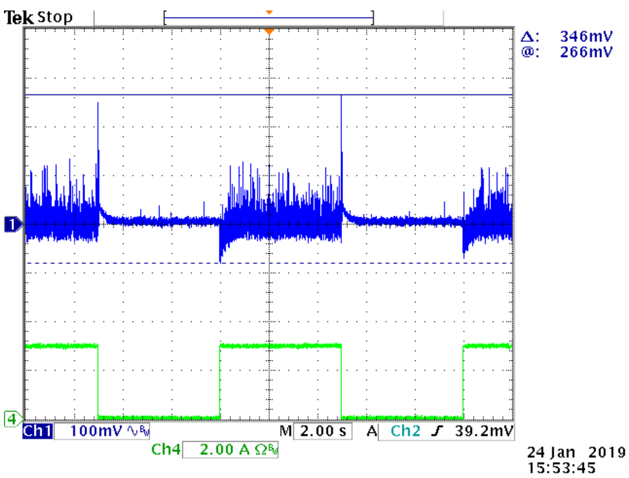
V_{IN}=120VAC, V_O=5V



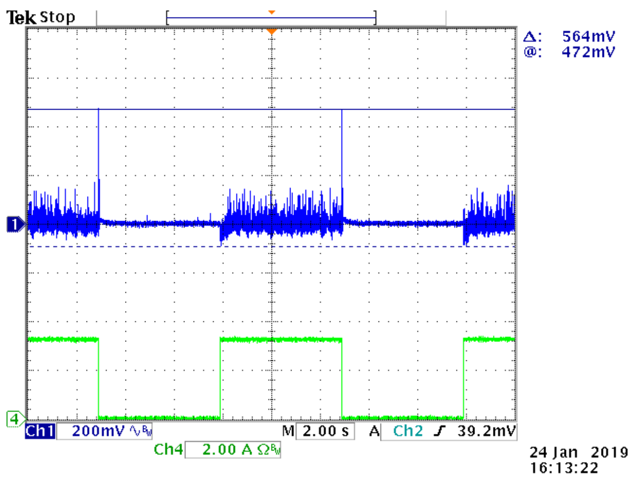
V_{IN}=120VAC, V_O=9V



V_{IN}=120VAC, V_O=15V



V_{IN}=120VAC, V_O=20V



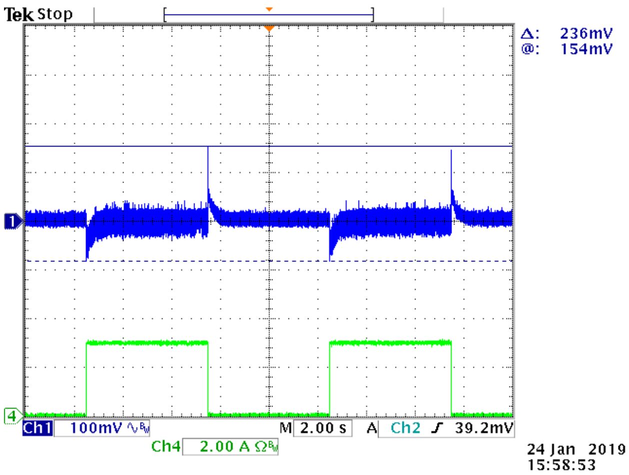
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

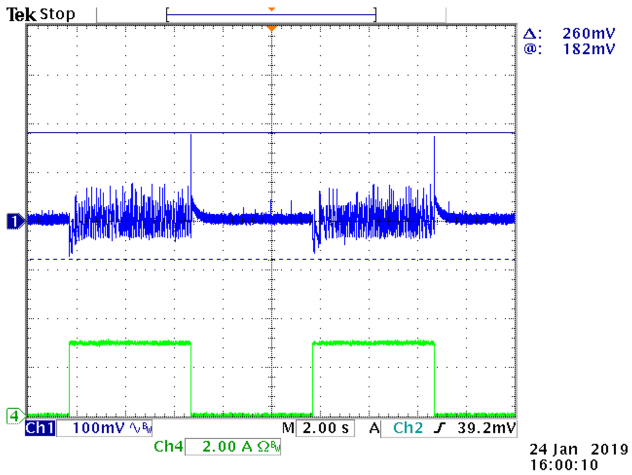
3.2 Load Transient

CH1: V_O; CH4: I_O

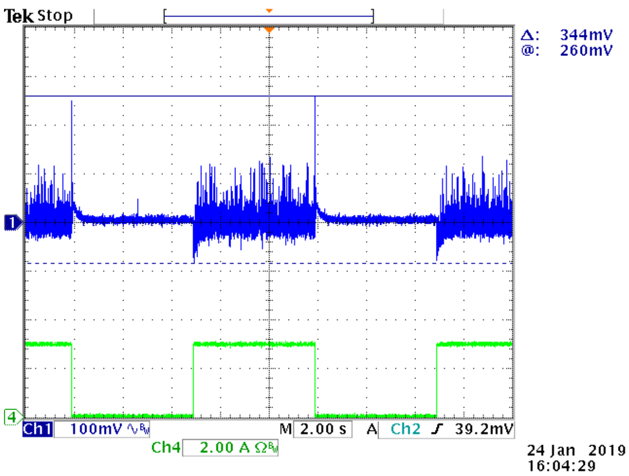
V_{IN}=230VAC, V_O=5V



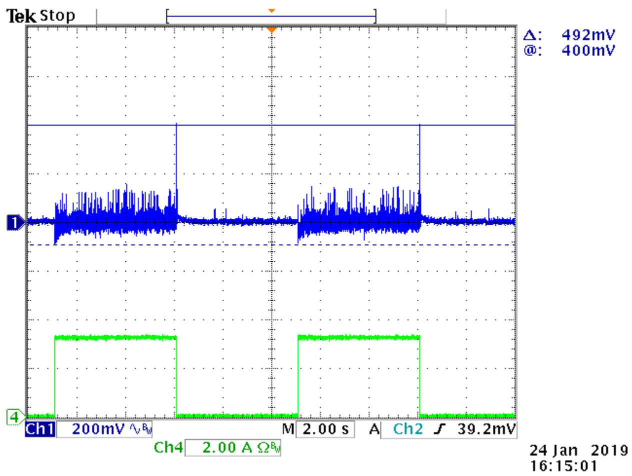
V_{IN}=230VAC, V_O=9V



V_{IN}=230VAC, V_O=15V



V_{IN}=230VAC, V_O=20V



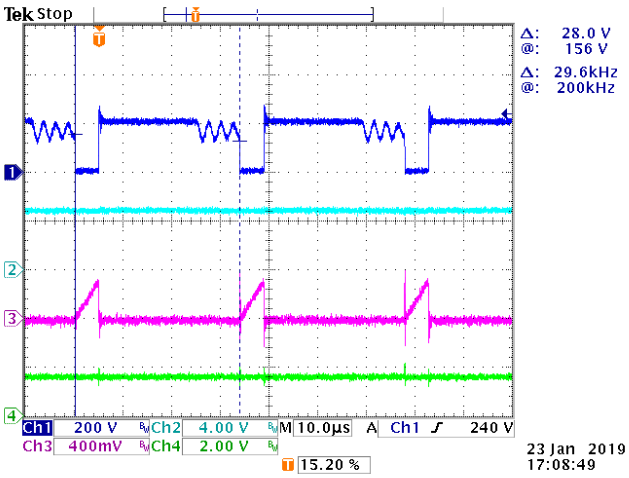
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

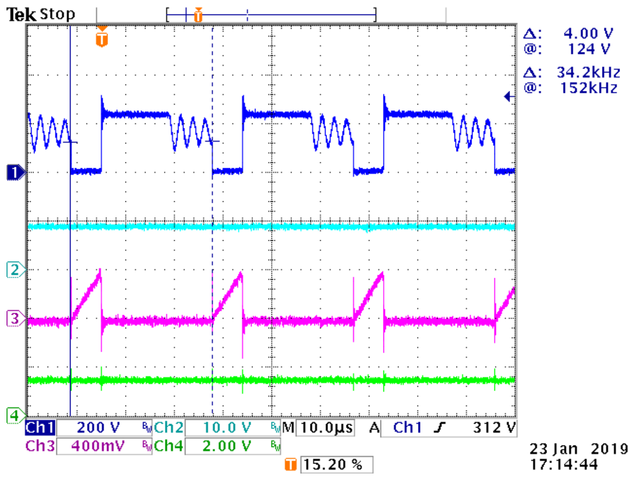
4. Steady State

CH1: VDS_Pri; CH2: V_O; CH3: VCS; CH4: VCOMP

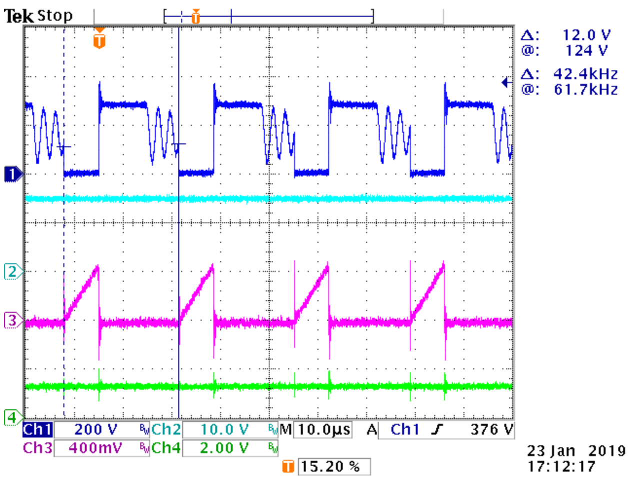
V_{IN}=120VAC, V_O=5V, I_O=3A



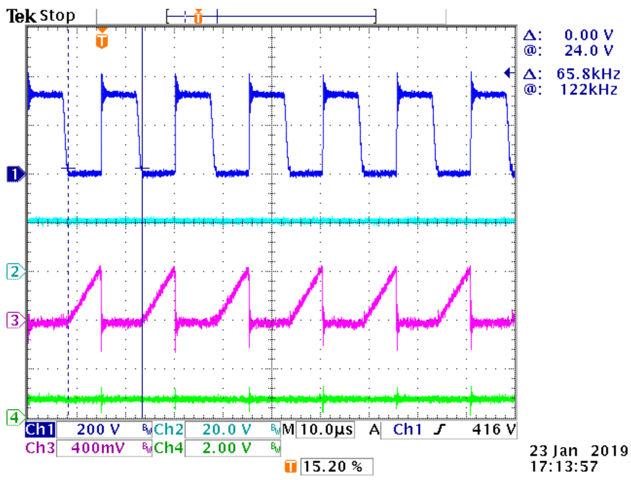
V_{IN}=120VAC, V_O=9V, I_O=3A



V_{IN}=120VAC, V_O=15V, I_O=3A



V_{IN}=120VAC, V_O=20V, I_O=3.25A



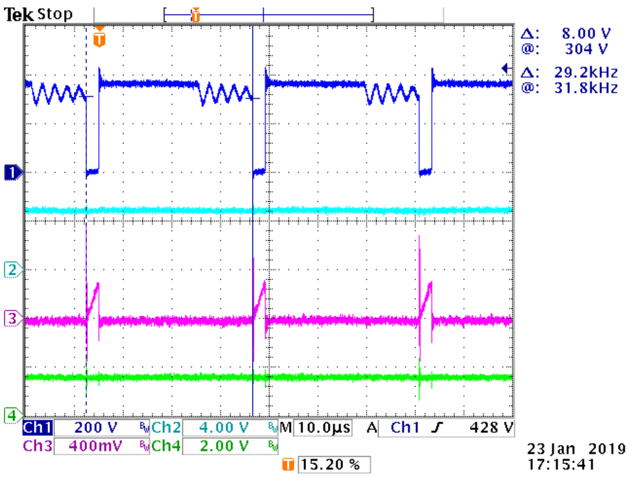
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

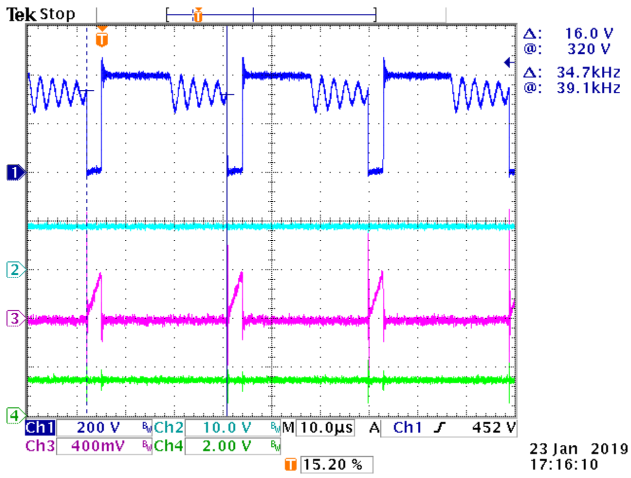
4. Steady State

CH1: VDS_Pri; CH2: V_O; CH3: VCS; CH4: VCOMP

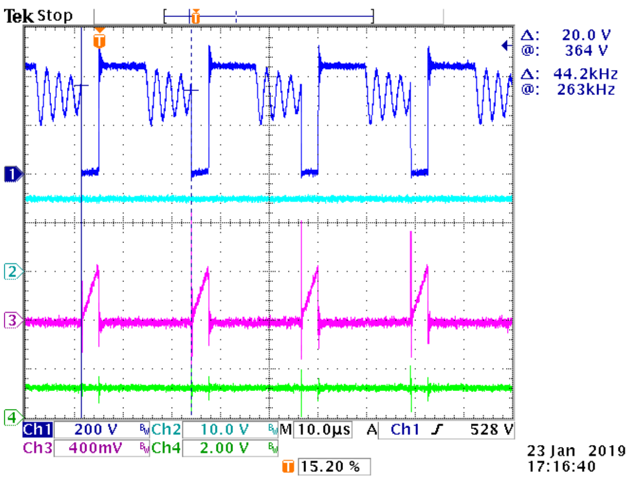
V_{IN}=230VAC, V_O=5V, I_O=3A



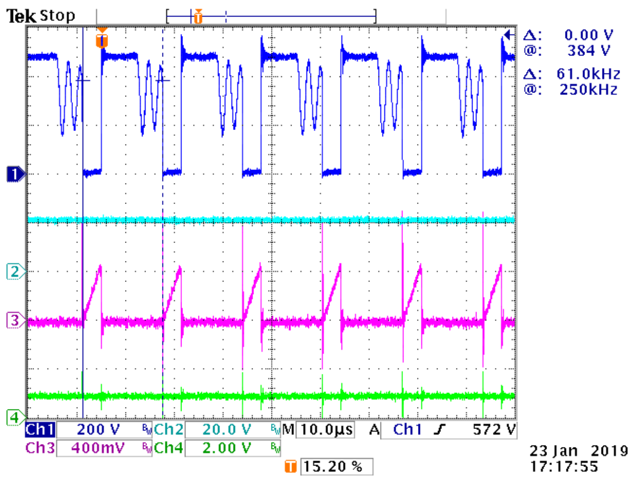
V_{IN}=230VAC, V_O=9V, I_O=3A



V_{IN}=230VAC, V_O=15V, I_O=3A



V_{IN}=230VAC, V_O=20V, I_O=3.25A



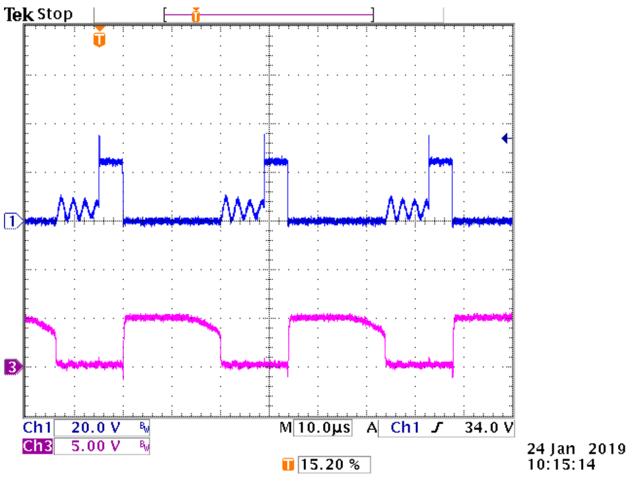
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

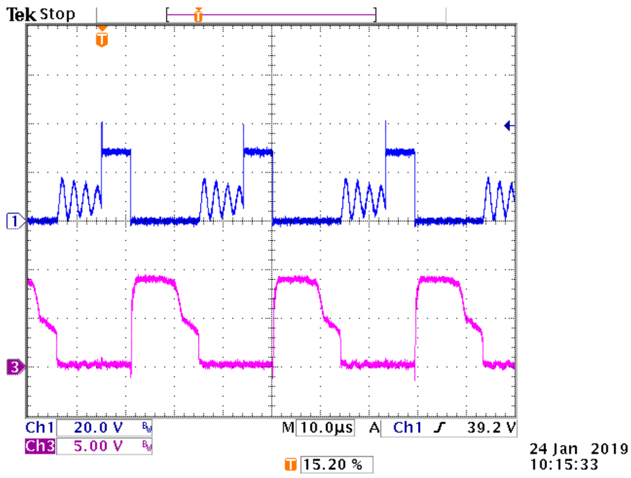
5. SR Steady State

CH1: VDS_SR; CH3: VGS_SR

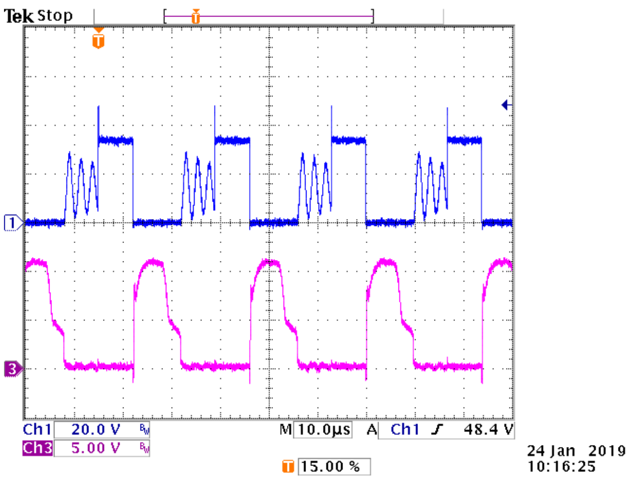
V_{IN}=120VAC, V_O=5V, I_O=3A



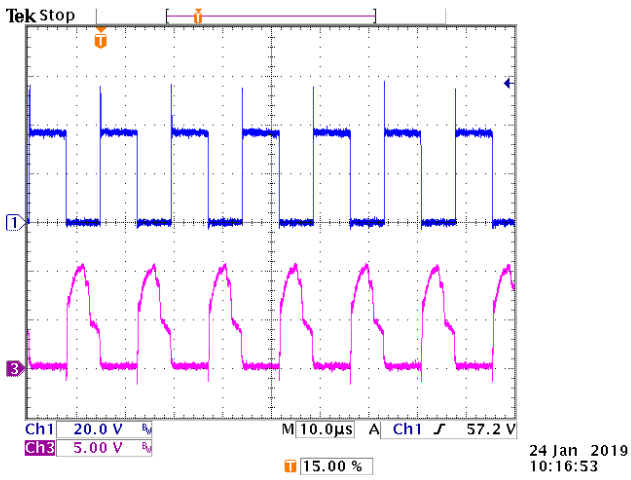
V_{IN}=120VAC, V_O=9V, I_O=3A



V_{IN}=120VAC, V_O=15V, I_O=3A



V_{IN}=120VAC, V_O=20V, I_O=3.25A



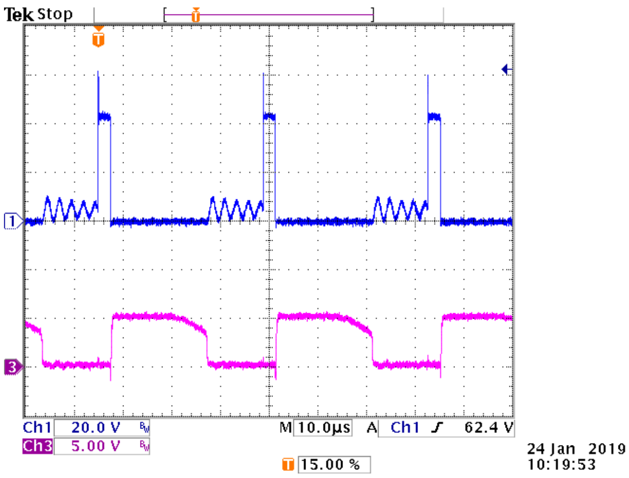
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

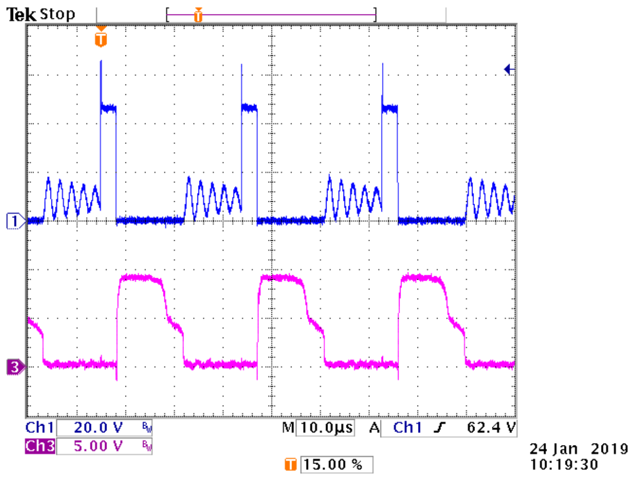
5. SR Steady State

CH1: VDS_SR; CH3: VGS_SR

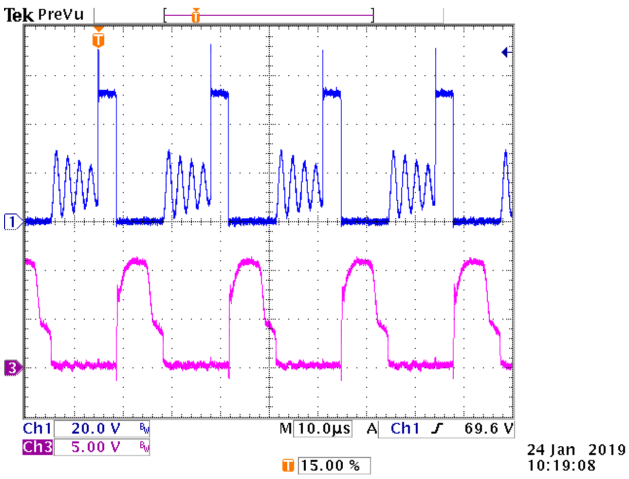
V_{IN}=230VAC, V_O=5V, I_O=3A



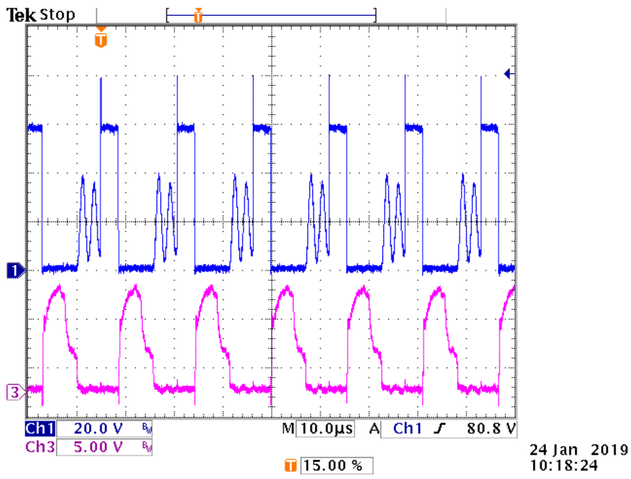
V_{IN}=230VAC, V_O=9V, I_O=3A



V_{IN}=230VAC, V_O=15V, I_O=3A



V_{IN}=230VAC, V_O=20V, I_O=3.25A



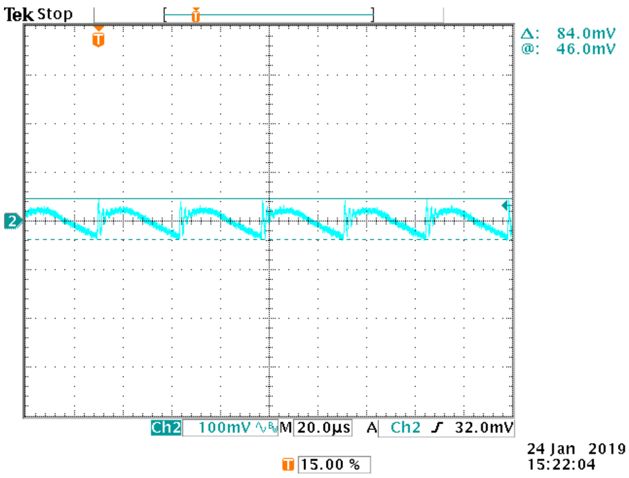
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

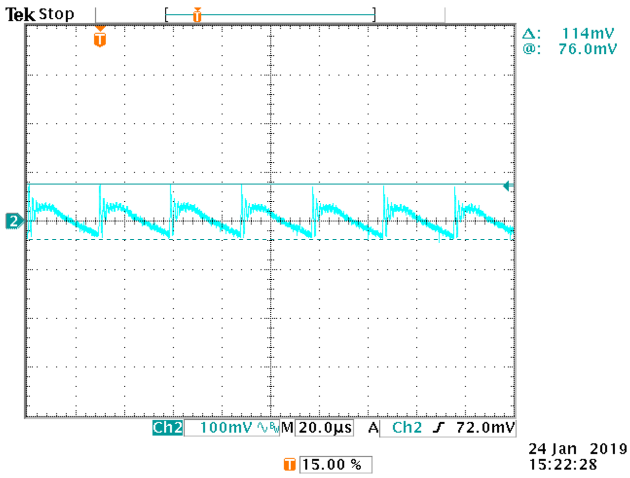
6. Output Voltage Ripple

CH2: V_O

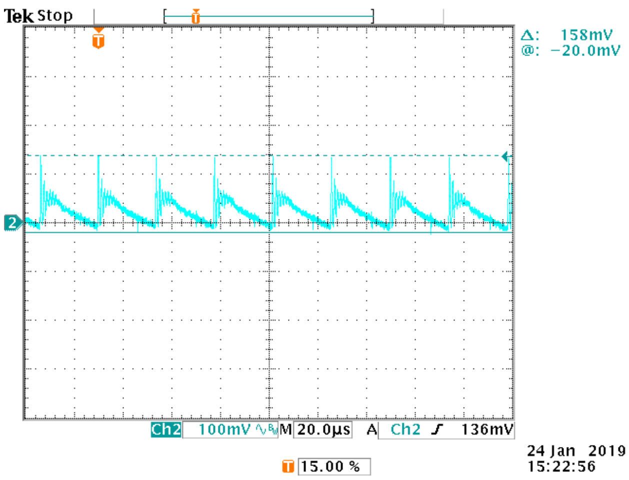
V_{IN}=120VAC, V_O=5V, I_O=3A



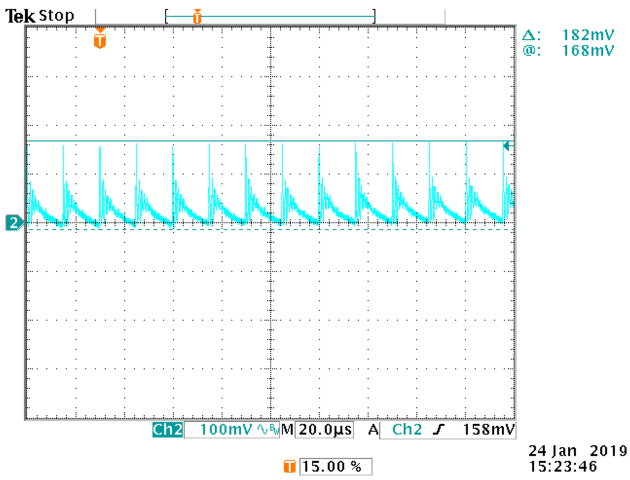
V_{IN}=120VAC, V_O=9V, I_O=3A



V_{IN}=120VAC, V_O=15V, I_O=3A



V_{IN}=120VAC, V_O=20V, I_O=3.25A



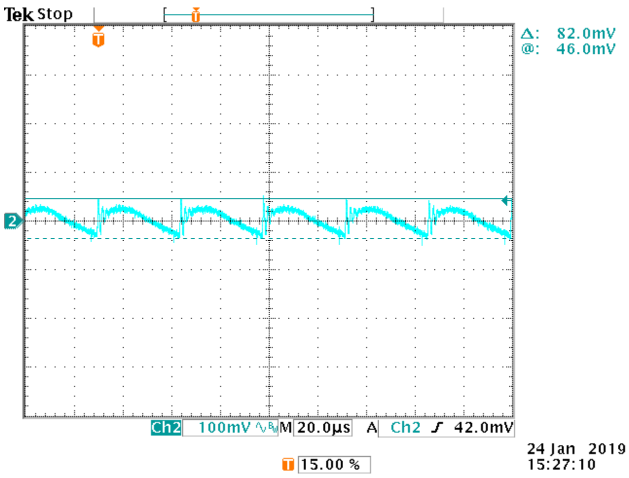
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

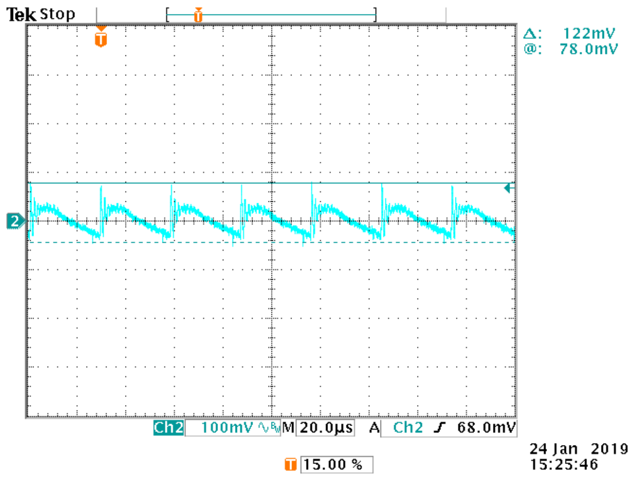
6. Output Voltage Ripple

CH2: V_O

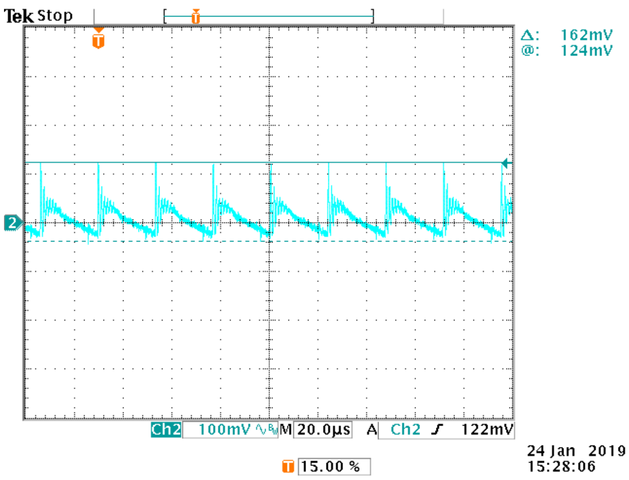
V_{IN}=230VAC, V_O=5V, I_O=3A



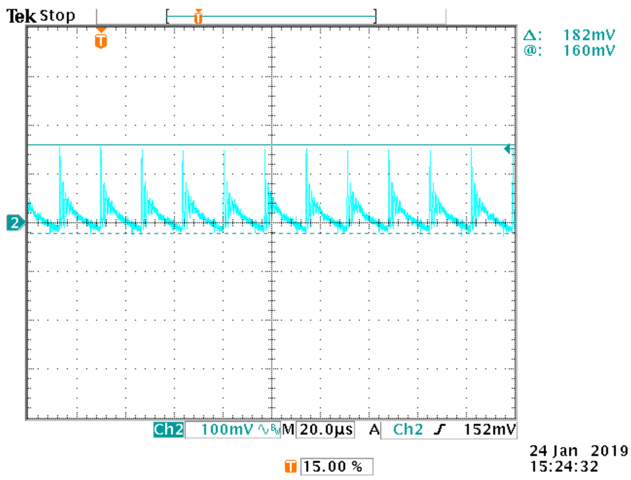
V_{IN}=230VAC, V_O=9V, I_O=3A



V_{IN}=230VAC, V_O=15V, I_O=3A



V_{IN}=230VAC, V_O=20V, I_O=3.25A



EVB TEST RESULTS *(continued)*

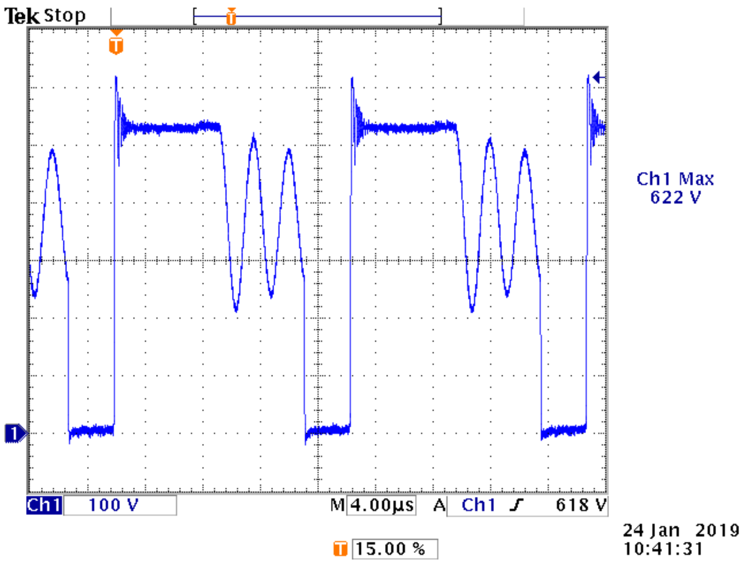
Performance waveforms are tested on the evaluation board.

7. FET Stress

7.1 Primary FET

CH1: VDS_Pri

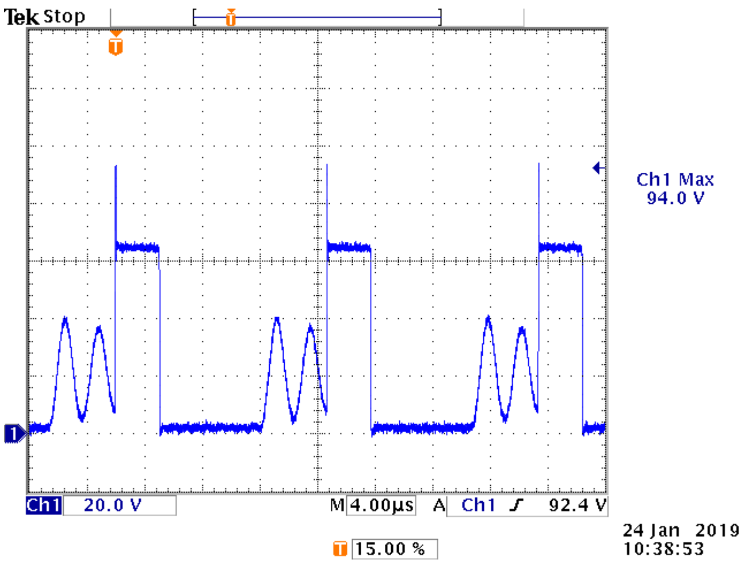
V_{IN}=264VAC, V_O=20V, I_O=3.25A



7.2 Secondary SR FET

CH1: VDS_SR

V_{IN}=264VAC, V_O=20V, I_O=3.25A



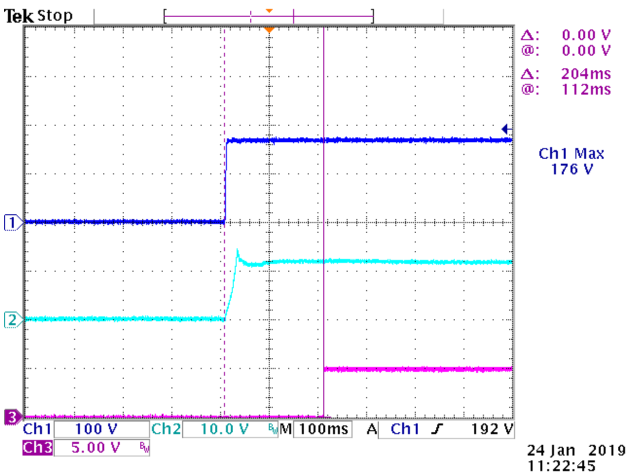
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

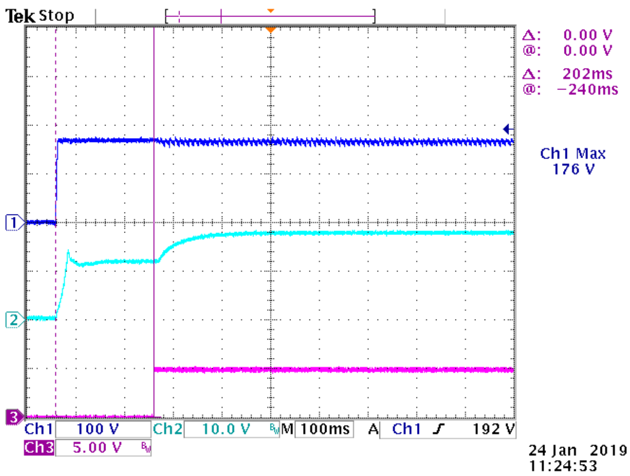
8. Start-Up

CH1: V_{HV}; CH2: VCC; CH3: V_O

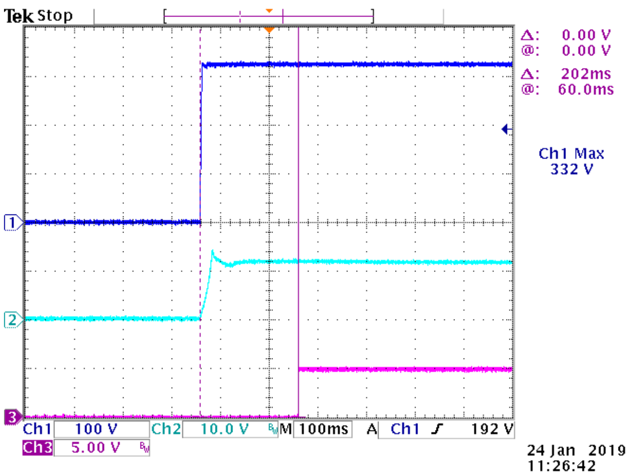
V_{IN}=120VAC, V_O=5V, I_O=0A



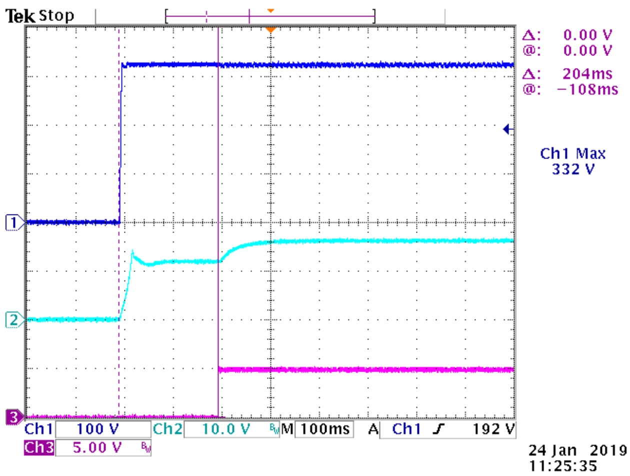
V_{IN}=120VAC, V_O=5V, I_O=3A



V_{IN}=230VAC, V_O=5V, I_O=0A



V_{IN}=230VAC, V_O=5V, I_O=3A



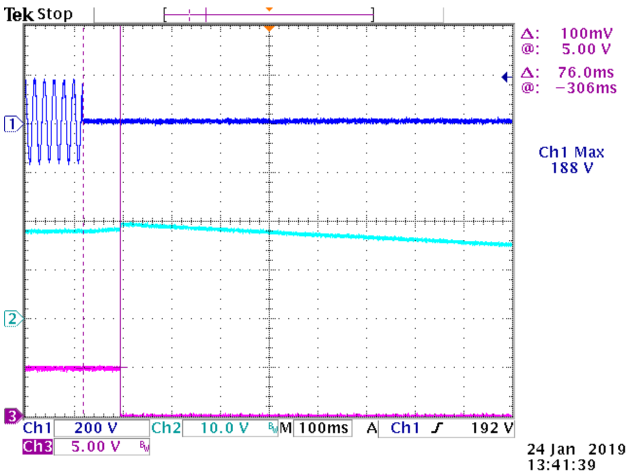
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

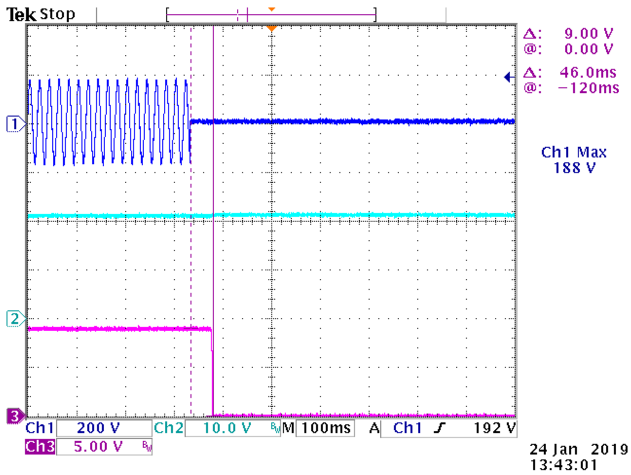
9. AC Input Shutdown

CH1: V_{IN}; CH2: VCC; CH3: V_O

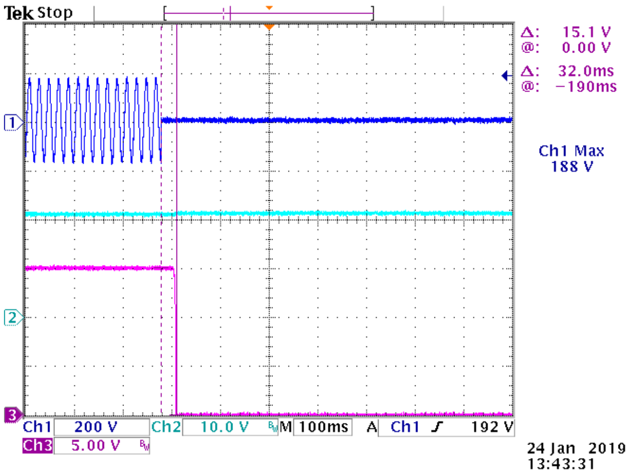
V_{IN}=120VAC, V_O=5V, I_O=3A



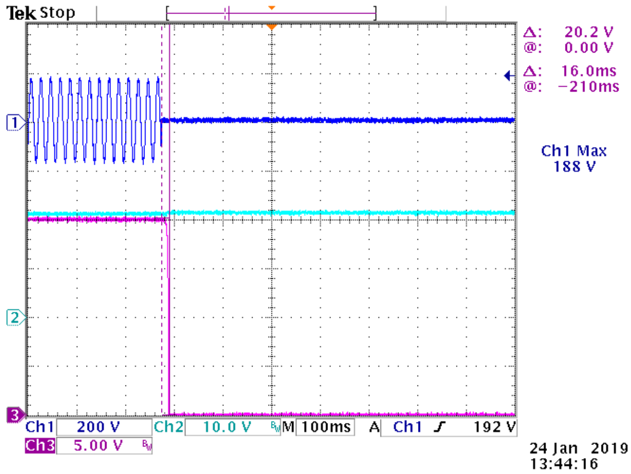
V_{IN}=120VAC, V_O=9V, I_O=3A



V_{IN}=120VAC, V_O=15V, I_O=3A



V_{IN}=120VAC, V_O=20V, I_O=3.25A



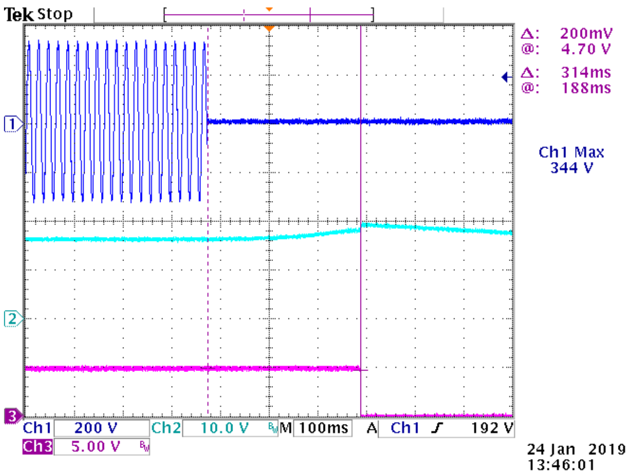
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

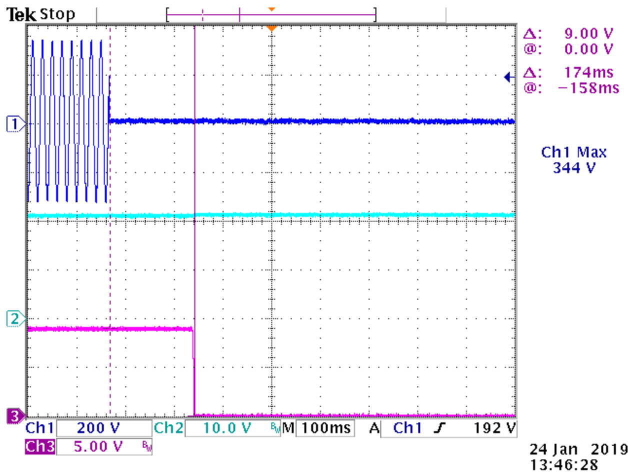
9. AC Input Shutdown

CH1: V_{IN}; CH2: VCC; CH3: V_O

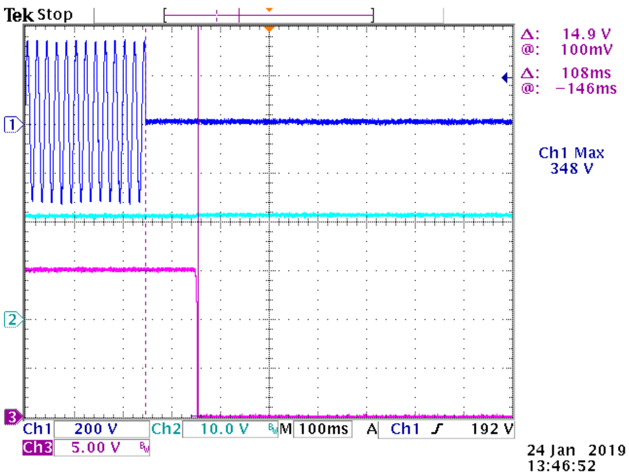
V_{IN}=230VAC, V_O=5V, I_O=3A



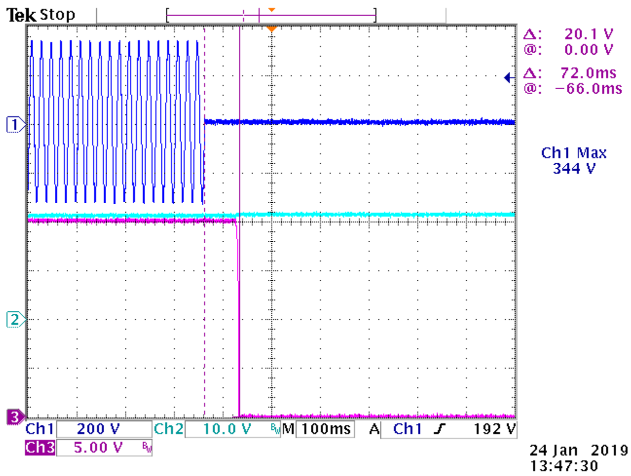
V_{IN}=230VAC, V_O=9V, I_O=3A



V_{IN}=230VAC, V_O=15V, I_O=3A



V_{IN}=230VAC, V_O=20V, I_O=3.25A



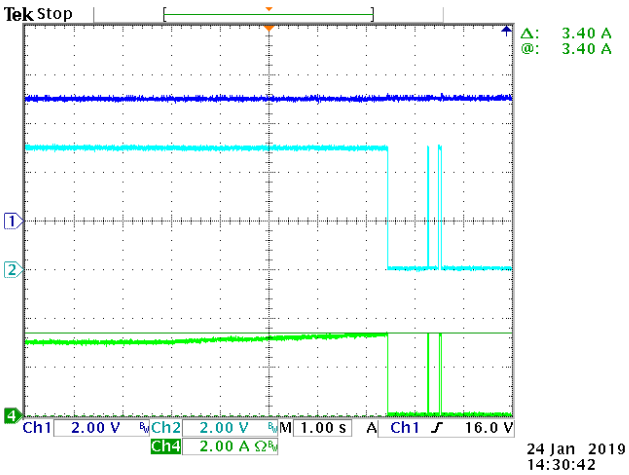
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

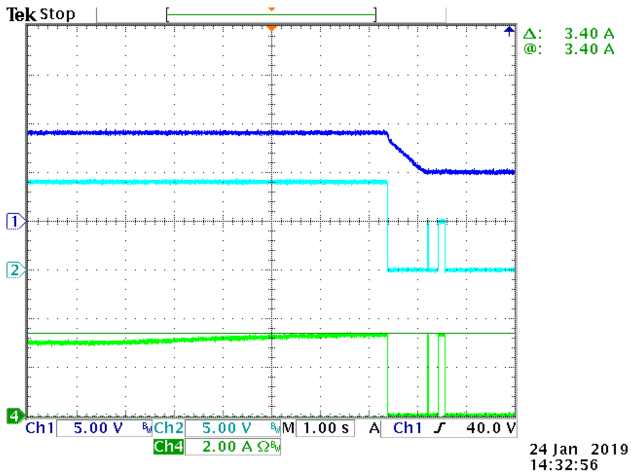
10. Output Over-Current Protection

CH1: VBUS+; CH2: V_O; CH4: I_O

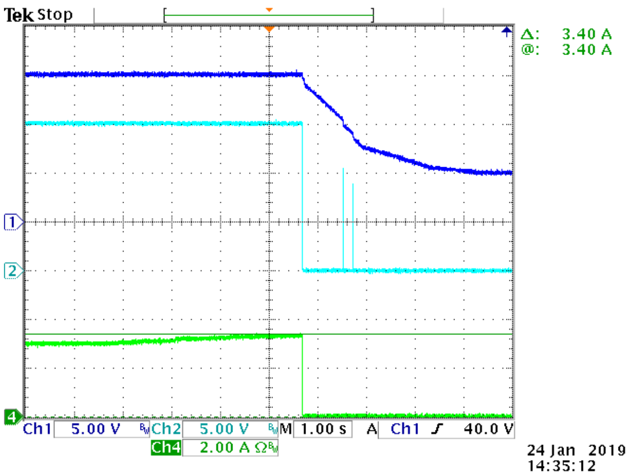
V_{IN}=120VAC, V_O=5V



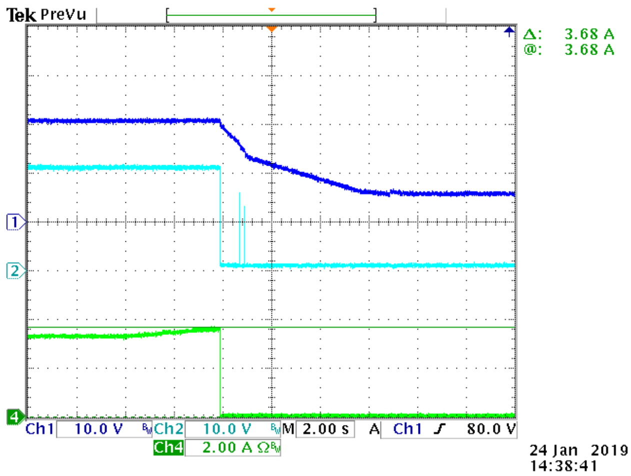
V_{IN}=120VAC, V_O=9V



V_{IN}=120VAC, V_O=15V



V_{IN}=120VAC, V_O=20V



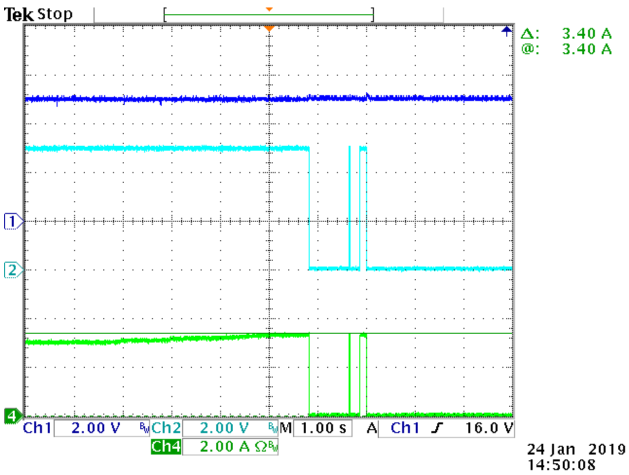
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

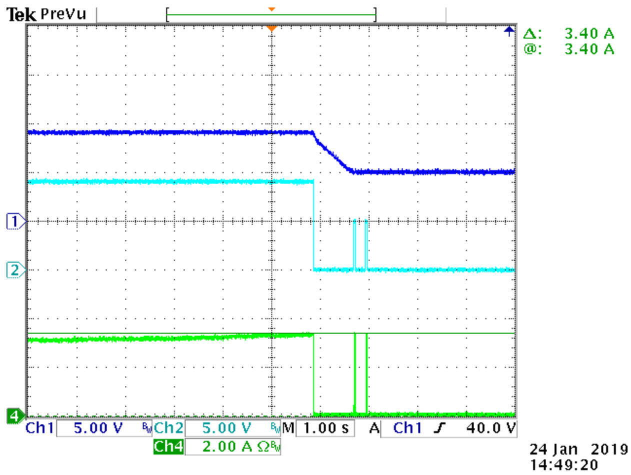
10. Output Over-Current Protection

CH1: VBUS+; CH2: V_O; CH4: I_O

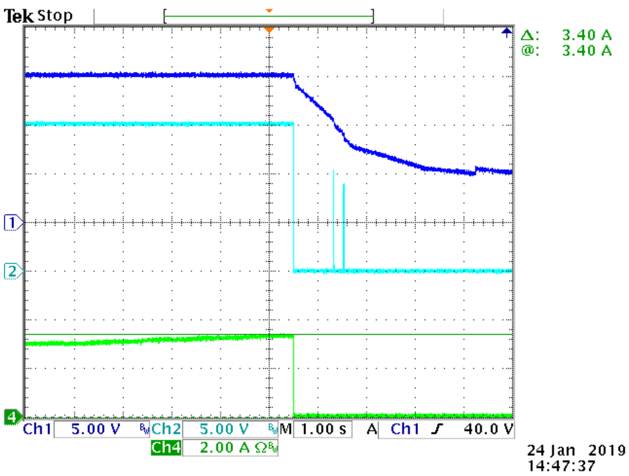
V_{IN}=230VAC, V_O=5V



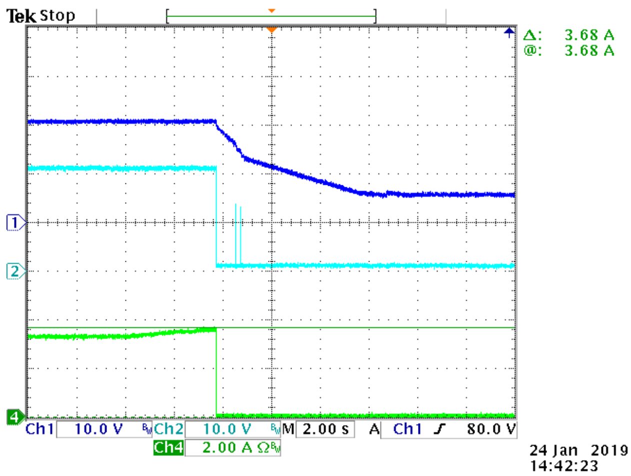
V_{IN}=230VAC, V_O=9V



V_{IN}=230VAC, V_O=15V



V_{IN}=230VAC, V_O=20V

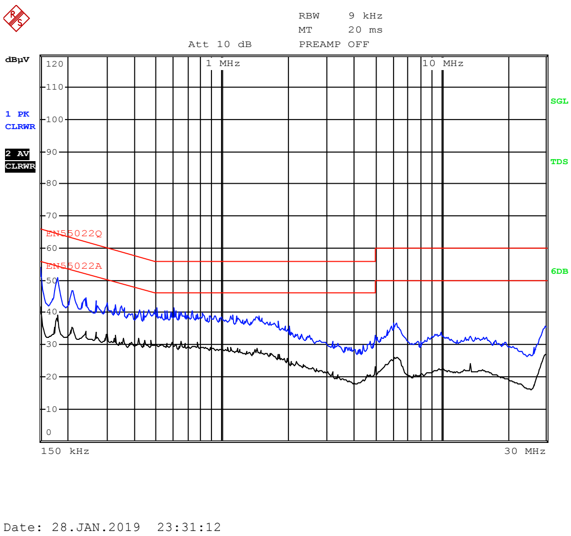


EVB TEST RESULTS *(continued)*

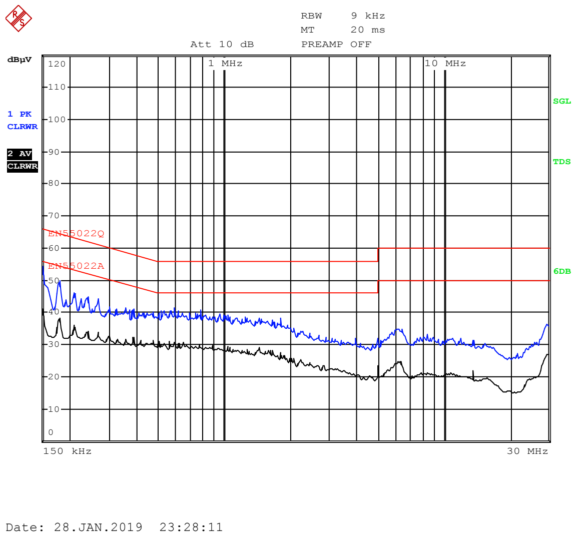
Performance waveforms are tested on the evaluation board.

11. Conductive EMI

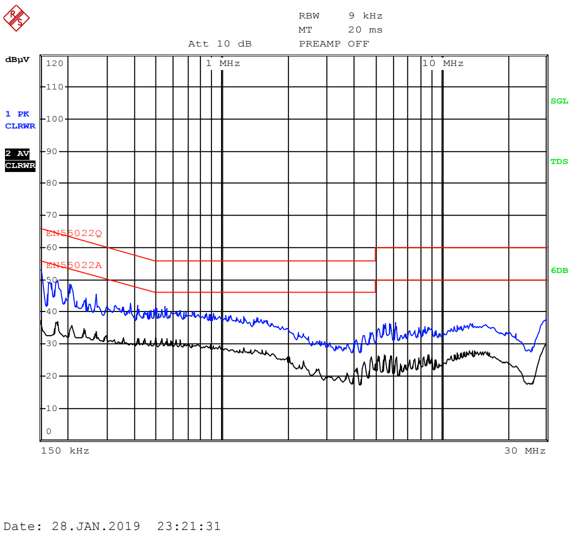
V_{IN}=120VAC, V_O=5V, I_O=3A, based on line L



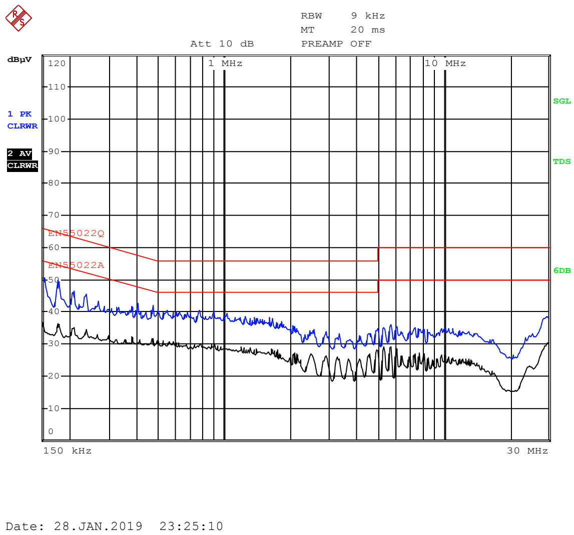
V_{IN}=120VAC, V_O=5V, I_O=3A, based on line N



V_{IN}=230VAC, V_O=5V, I_O=3A, based on line L



V_{IN}=230VAC, V_O=5V, I_O=3A, based on line N

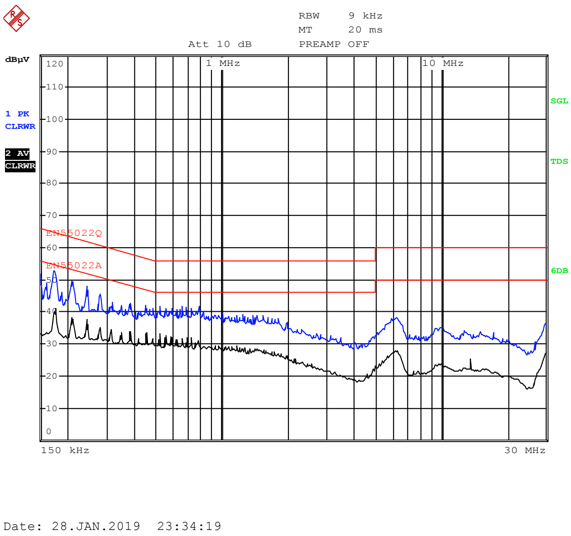


EVB TEST RESULTS *(continued)*

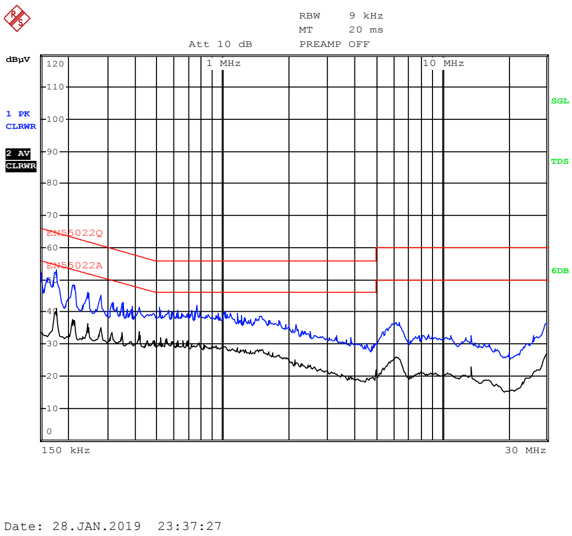
Performance waveforms are tested on the evaluation board.

11. Conductive EMI

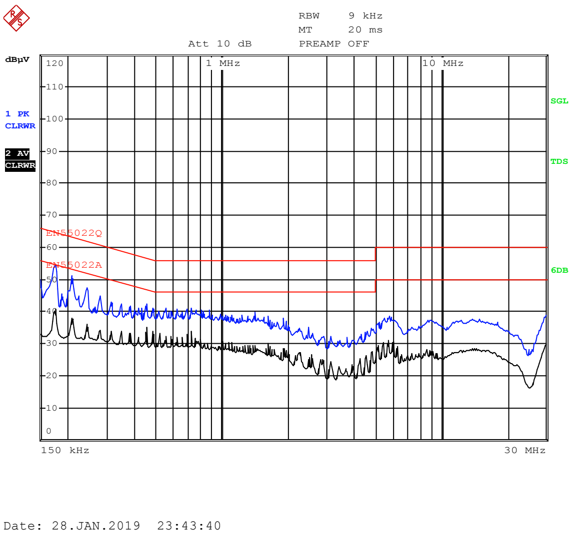
V_{IN}=120VAC, V_O=9V, I_O=3A, based on line L



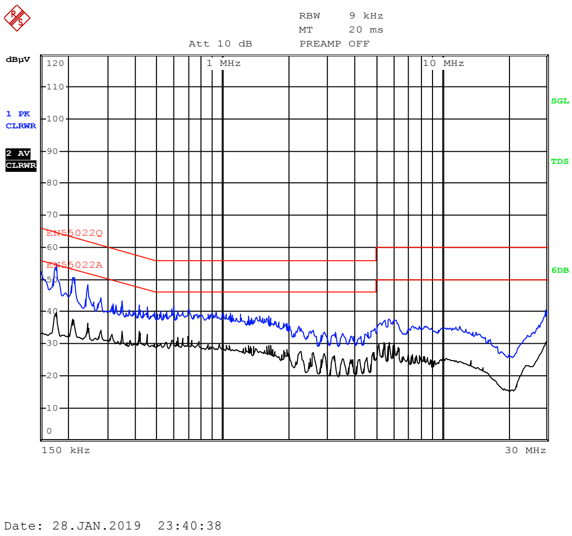
V_{IN}=120VAC, V_O=9V, I_O=3A, based on line N



V_{IN}=230VAC, V_O=9V, I_O=3A, based on line L



V_{IN}=230VAC, V_O=9V, I_O=3A, based on line N

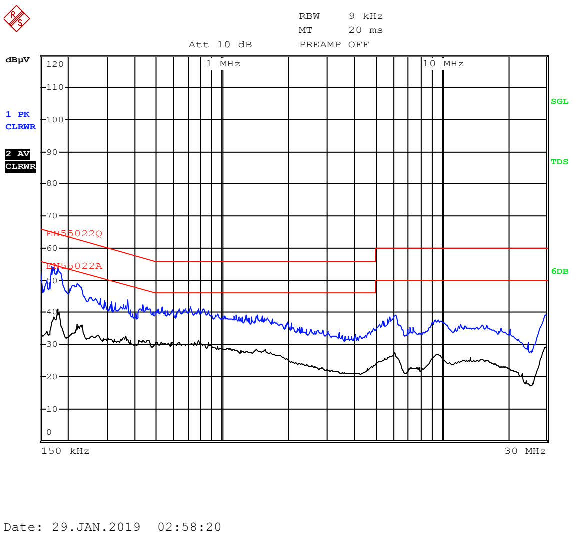


EVB TEST RESULTS *(continued)*

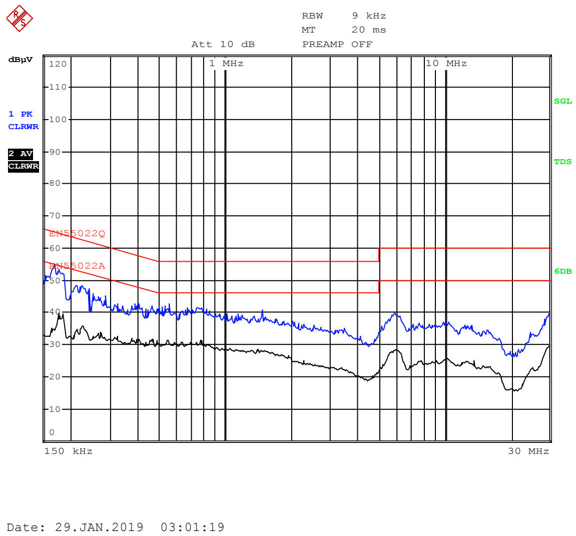
Performance waveforms are tested on the evaluation board.

11. Conductive EMI

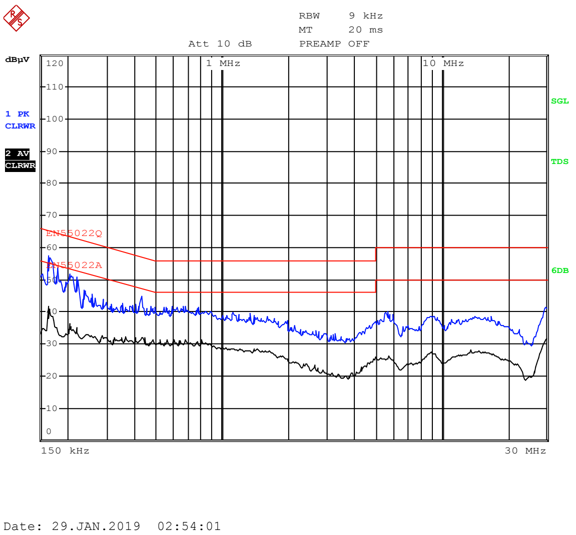
V_{IN}=120VAC, V_O=15V, I_O=3A, based on line L



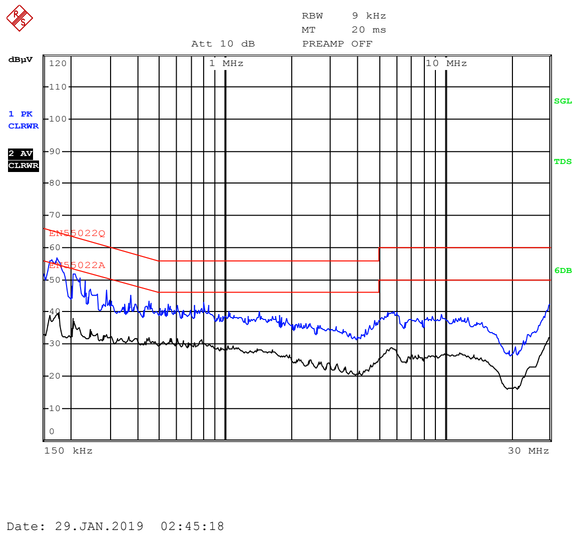
V_{IN}=120VAC, V_O=15V, I_O=3A, based on line N



V_{IN}=230VAC, V_O=15V, I_O=3A, based on line L



V_{IN}=230VAC, V_O=15V, I_O=3A, based on line N

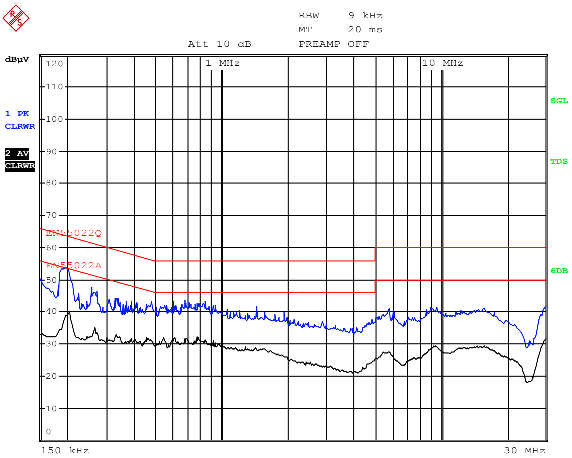


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

11. Conductive EMI

V_{IN}=120VAC, V_O=20V, I_O=3.25A, based on line L



Date: 29.JAN.2019 03:04:46

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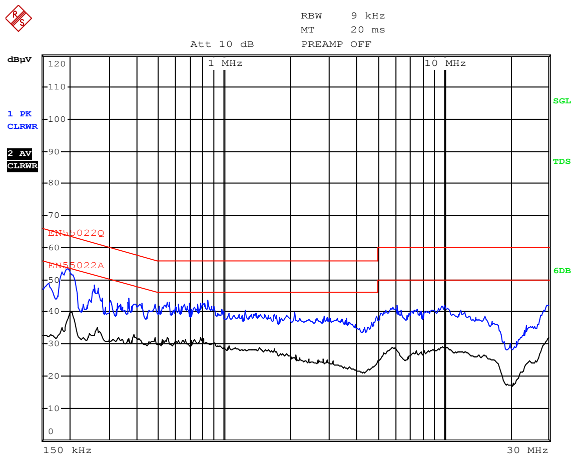

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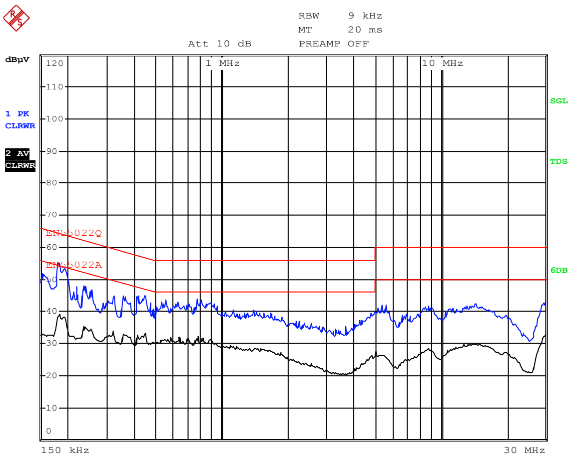
V_{IN}=230VAC, V_O=20V, I_O=3.25A, based on line L



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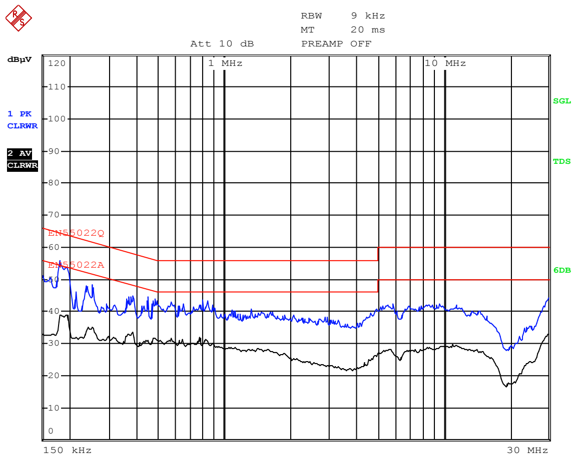
V_{IN}=230VAC, V_O=20V, I_O=3.25A, based on line N



Date: 29.JAN.2019 03:10:31

QUICK START GUIDE

1. Preset the AC input voltage between 90VAC and 264VAC.
2. Turn off the AC power supply.
3. Connect the load to the Type-C connector.
4. Connect the line and neutral terminals of the power supply to the AC input.
5. Turn the power supply on. The board will startup automatically.

CONTACT INFORMATION

To request this evaluation board, please refer to your local sales office, which can be found at: http://www.monolithicpower.com/Company/Contact-Us

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Inclusion of MPS products in critical applications is understood to be fully at the risk of the customer. Questions concerning potential risk applications should be directed to MPS.

MPS semiconductors are typically used in power supplies in which high voltages are present during operation. High voltage safety precautions should be observed in design and operation to minimize the chance of injury.

APPENDIX: FLYBACK TRANSFORMER T1 SPECIFICATION

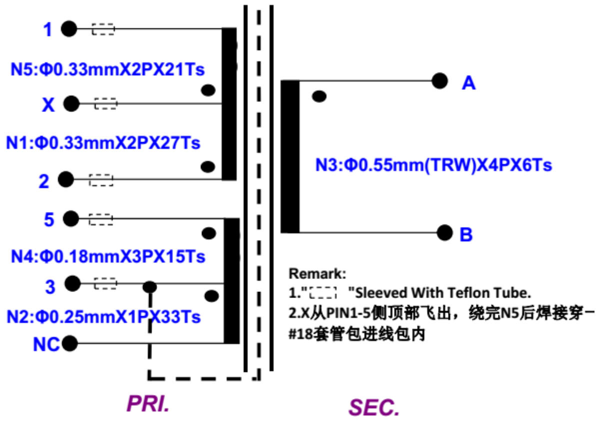

Figure 5: Electrical Diagram

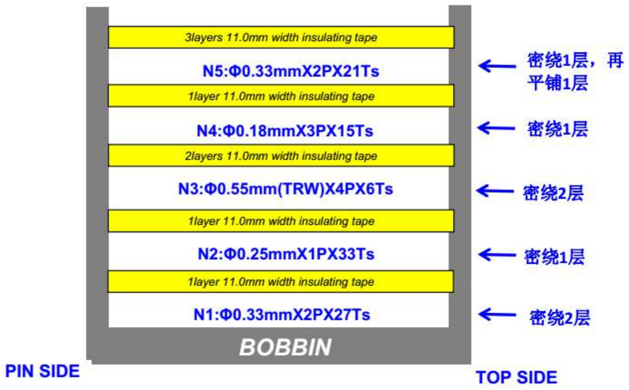

Figure 6: Winding Diagram

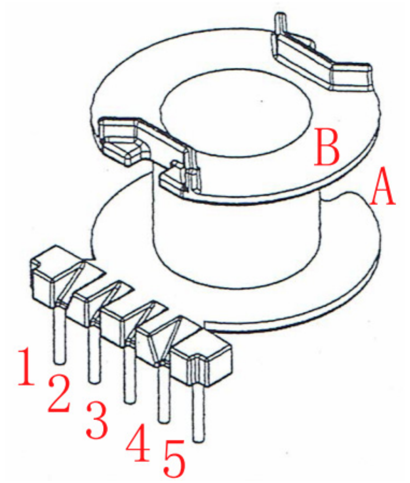

Figure 7: Pin Definition of Bobbin

(View from Bottom)

Table 1: Electrical Characteristic

Parameter	Condition	Value
Primary Inductance	Lp(2-1)	610μH±10%
Leakage Inductance	Llk(2-1)	10μH max
Core		RM10(5+0pin)
Bobbin		RM10(5+0pin)
Core Material		PC40
Turn Ratio	N1:N3:N4:N5	27:6:15:21

Table 2: Winding Specification

Tape Turns (T)	Winding No.	Start&End	Wire Diameter(φ)	Turns(T)	Winding	Tube
	N1	2→ X	0.33mm*2	27	2 full layers	Yes
1						
	N2	3 → NC	0.25mm*1	33	1 full layer	Yes
1						
	N3	A → B	0.55mm*4 (T.I.W)	6	2 full layers	Yes
2						
	N4	5→ 3	0.18mm*3	15	1 full layers	Yes
1						
	N5	X→ 1	0.33mm*2	21	1st layer 1 full layer 2nd layer spread	Yes
3						
	Connect the core to GND(pin3) via 3Ts tinned wire.					

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