EVX2002-Y-00D

65W, Type-C PD Adapter Evaluation Board

DESCRIPTION

The EVX2002-Y-00D is an evaluation board designed for the MPX2002, a 65W Type-C PD adapter. The board is designed in a very small form factor with a high power density. Its electrical specifications are well-suited for cellphone and computer power adapters. The board provides very low no-load power consumption (<30mW), and its high overall efficiency meets DOE Level VI and CoC Tier2.

The MPX2002 is an all-in-one flyback controller solution. It integrates a primary driving circuit, secondary controller, synchronous rectification driver, and safety-compliant feedback in one chip. The device offers the benefits of both primary-side regulation (PSR) and secondary-side regulation (SSR).

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

The MPX2002 adopts novel quasi-resonant mode switching when it runs in discontinuous conduction mode (DCM). Due to this feature, the power supply has improved efficiency. At very light loads, the controller enters burst mode to achieve very low standby power consumption. The MPX2002 offers frequency jittering to help dissipate the energy generated by conducted noise.

The EVX2002-Y-00D evaluation board provides a reference design for a universal offline isolated power supply with a 20V/3.25A, 15V/3A, 12V/3A, 9V/3A, or 5V/3A output. This datasheet 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 performance testing.

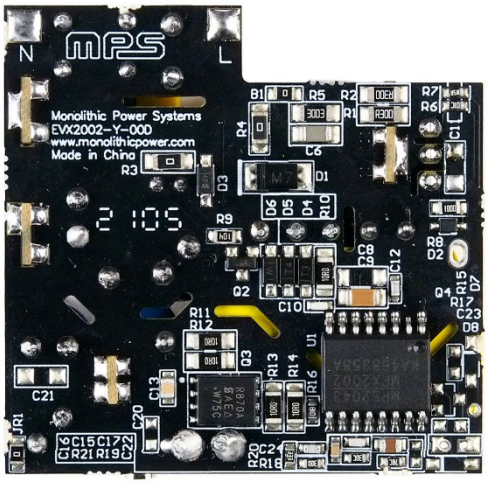
PERFORMANCE SUMMARY

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input AC voltage (V_{IN})		$90V_{AC}$ to $264V_{AC}$
Input AC frequency		47Hz to 63Hz
Output voltage (V_{OUT}) / output current (I_{OUT})	65W PD	20V/3.25A, 15V/3A, 12V/3A, 9V/3A, 5V/3A
Maximum efficiency	High-line input, V_{OUT} = 20V, I_{OUT} = 3.25A	92%
No-load power consumption	V_{IN} = $264V_{AC}$	<30mW

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVALUATION BOARD



LxWxH (46mmx45mmx23mm)

Board Number	MPS IC Number
EVX2002-Y-00D-Cypress	MPX2002
EVX2002-Y-00D-Weltrend	MPX2002

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

QUICK START GUIDE

1. Preset the AC input voltage to be between $90V_{AC}$ and $264V_{AC}$.
2. Turn the AC power supply off.
3. Connect the load to the Type-C connector.
4. Connect the power supply's line and neutral terminals to the AC input.
5. Turn the power supply on. The board should start up automatically.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVALUATION BOARD SCHEMATICS

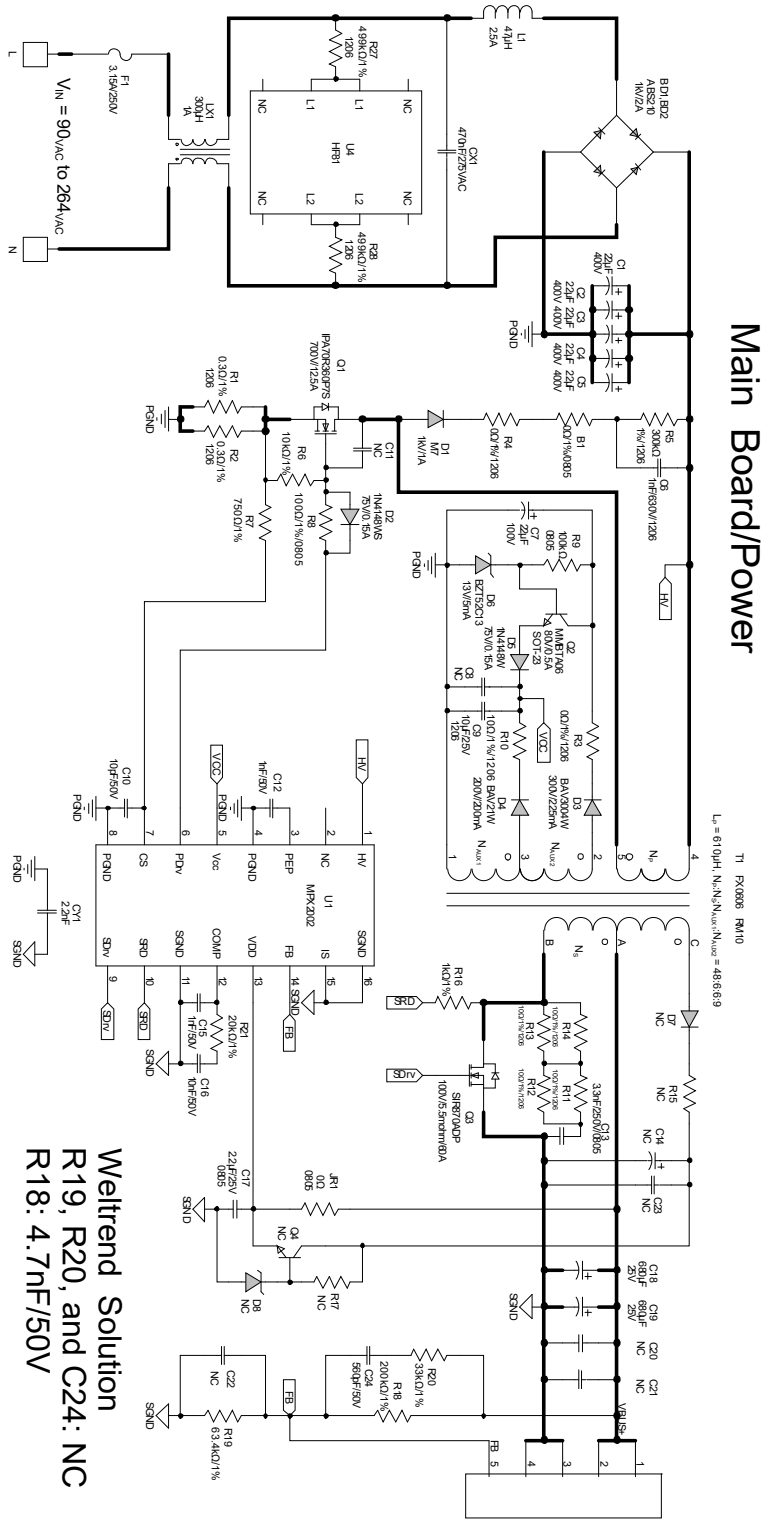


Figure 1: Main Board Power

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVALUATION BOARD SCHEMATICS *(continued)*

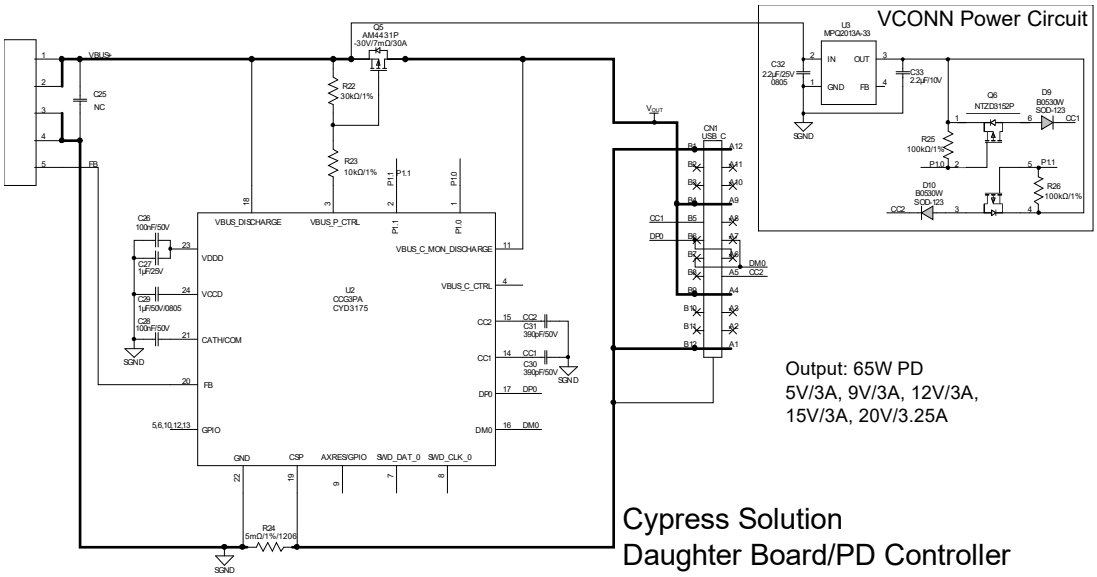


Figure 2: Daughter Board/PD Controller (Cypress Solution)

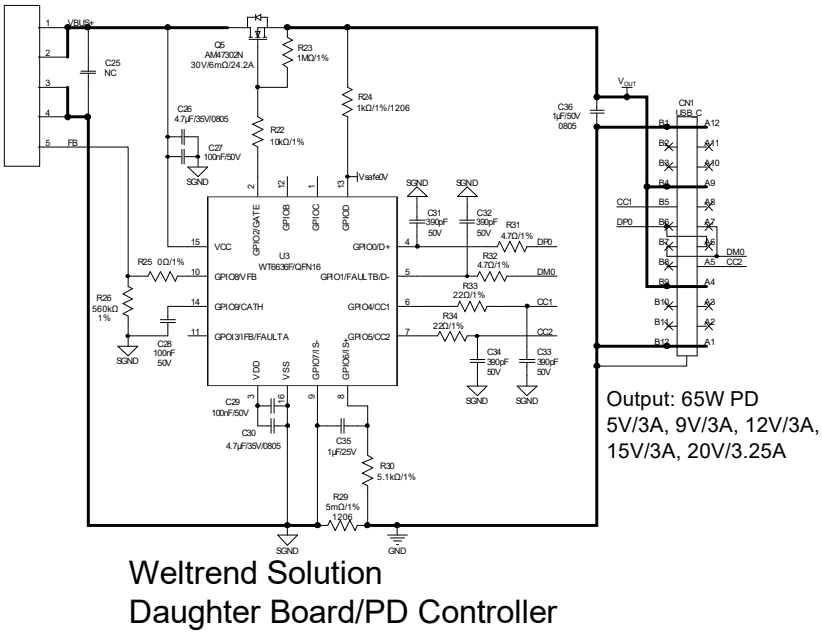


Figure 3: Daughter Board/PD Controller (Weltrend Solution)

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVX2002-Y-00D BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
Main Board/Power Stage: Cypress Solution						
2	BD1, BD2	ABS210	Diode, 1000V, 2A	SOPA-4	Diodes	ABS210-13
2	B1, JR1	0Ω	Film resistor, 1%	0805	Yageo	RC0805FR-070RL
5	C1, C2, C3, C4, C5	22µF/400V	Electrolytic capacitor, 400V	DIP	Aishi	ERK2GM220F16OT
1	C6	1nF/630V	Ceramic capacitor, 630V, U2J	1206	Murata	GRM31A7U2J102JW31D
1	C7	22µF/100V	Electrolytic capacitor, 100V	DIP	Aishi	ERJ1KM220E12OT
0	C8, C11, C14, C20, C21, C22, C23	NC				
1	C9	10µF/25V	Ceramic capacitor, 25V, X7R	1206	Murata	GRM31CR71E106KA12
1	C10	10pF/50V	Ceramic capacitor, 50V, NP0	0603	Wurth	885012006051
2	C12, C15	1nF/50V	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H102JA01D
1	C13	3.3nF/250V	Ceramic capacitor, 250V, X7R	0805	Yageo	CC0805KRX7RYBB332
1	C16	10nF/50V	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H103KA01D
1	C17	2.2µF/50V	Ceramic capacitor, 50V, X7R	0805	TDK	C2012X7R1H225K
2	C18, C19	680µF/25V	Solid capacitor, 25V, 8x16mm	DIP	Zhongyuan	RT681M25F160
1	C24	560pF/50V	Ceramic capacitor, 50V, C0G	0603	TDK	C1608C0G1H561K
1	CX1	470nF/ $275V_{AC}$	X2 capacitor, 275VAC, 10%	DIP	Huajia	275V470nF 12*13*8
1	CY1	2.2nF	Y-capacitor, 250V, 20%	DIP	Hongke	JYK09F222ML72N
1	D1	1000V	Diode, 1000V, 1A	SMA	MIC	M7
1	D2	75V	Diode, 75V, 0.15A	SOD-323	Diodes	1N4148WS
1	D3	300V	Diode, 300V, 225mA	SOD-123	Diodes	BAV3004W-7-F
1	D4	200V	Diode, 200V, 0.2A	SOD-123	Diodes	BAV21W
1	D5	75V	Diode, 75V, 0.15A	SOD-123	Diodes	1N4148W
1	D6	13V	Zener diode, 13V, 5mA	SOD-123	Diodes	BZT52C13
0	D7, D8	NC				

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVX2002-Y-00D BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	F1	250V	Fuse, 250V, 3.15A	DIP	COOPER Bussman	SS-5-3.15A
1	L1	47µH	Inductor, 2.5A	DIP	Wurth	744772470
1	LX1	300µH	Common choke, 300µH, 1A	DIP	Emei	TP4U300-00
1	Q1	700V	N-channel MOSFET, 700V, 0.36Ω/10V	PG-TO 220 FullPAK	Infineon	IPA70R360P7SXKSA 1
1	Q2	80V	NPN transistor, 80V, 0.5A	SOT-23	On Semiconductors	MMBTA06
1	Q3	100V	N-channel MOSFET, 100V, 5.5mΩ, 80nC, 60A	PowerPAK® SO-8	Vishay	SiR870ADP-T1-GE3
0	Q4	NC				
2	R1, R2	300mΩ	Film resistor, 1%, 1/4W	1206	Yageo	RL1206FR-070R3L
2	R3, R4	0Ω	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-070RL
1	R5	300kΩ	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-07300KL
1	R6	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R7	750Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07750RL
1	R8	100Ω	Film resistor, 1%	0805	Yageo	RC0805FR-07100RL
1	R9	100kΩ	Film resistor, 5%	0805	Yageo	RC0805JR-07100KL
5	R10, R11, R12, R13, R14	10Ω	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-0710RL
0	R15, R17	NC				
1	R16	1kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071KL
1	R18	200kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07200KL
1	R19	63.4kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0763K4L
1	R20	33kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0733KL
1	R21	20kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0720KL
2	R27, R28	499kΩ	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-07499KL
1	T1	0.61mH	RM10, L_P = 0.61mH, N_P:N_S:N_{AUX1}:N_{AUX2} = 48:6:6:9	RM10	ZYD	FX0606
1	U1	MPX2002	All-in-one controller	SOICW-16	MPS	MPX2002GY-Z
1	U4	HF81	X-capacitor bleeder	SOIC-8	MPS	HF81GS-Z

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVX2002-Y-00D BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
Main Board/Power Stage: Weltrend Solution						
2	BD1, BD2	ABS210	Diode, 1000V, 2A	SOPA-4	Diodes	ABS210-13
2	B1, JR1	0Ω	Film resistor, 1%	0805	Yageo	RC0805FR-070RL
5	C1, C2, C3, C4, C5	22µF/400V	Electrolytic capacitor, 400V	DIP	Aishi	ERK2GM220F16OT
1	C6	1nF/630V	Ceramic capacitor, 630V, U2J	1206	Murata	GRM31A7U2J102JW31D
1	C7	22µF/100V	Electrolytic capacitor, 100V	DIP	Aishi	ERJ1KM220E12OT
0	C8, C11, C14, C20, C21, C22, C23	NC				
1	C9	10µF/25V	Ceramic capacitor, 25V, X7R	1206	Murata	GRM31CR71E106KA12
1	C10	10pF/50V	Ceramic capacitor, 50V, NP0	0603	Wurth	885012006051
2	C12, C15	1nF/50V	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H102JA01D
1	C13	3.3nF/250V	Ceramic capacitor, 250V, X7R	0805	Yageo	CC0805KRX7RYBB332
1	C16	10nF/50V	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H103KA01D
1	C17	2.2µF/50V	Ceramic capacitor, 50V, X7R	0805	TDK	C2012X7R1H225K
2	C18, C19	680µF/25V	Solid capacitor, 25V, 8x16mm	DIP	Zhongyuan	RT681M25F160
1	C24	NC				
1	CX1	470nF/ $275V_{AC}$	X2 capacitor, 275VAC, 10%	DIP	Huajia	275V470nF 12*13*8
1	CY1	2.2nF	Y-capacitor, 250V, 20%	DIP	Hongke	JYK09F222ML72N
1	D1	1000V	Diode, 1000V, 1A	SMA	MIC	M7
1	D2	75V	Diode, 75V, 0.15A	SOD-323	Diodes	1N4148WS
1	D3	300V	Diode, 300V, 225mA	SOD-123	Diodes	BAV3004W-7-F
1	D4	200V	Diode, 200V, 0.2A	SOD-123	Diodes	BAV21W
1	D5	75V	Diode, 75V, 0.15A	SOD-123	Diodes	1N4148W
1	D6	13V	Zener diode, 13V, 5mA	SOD-123	Diodes	BZT52C13
0	D7, D8	NC				

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVX2002-Y-00D BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	F1	250V	Fuse, 250V, 3.15A	DIP	COOPER Bussman	SS-5-3.15A
1	L1	47µH	Inductor, 2.5A	DIP	Wurth	744772470
1	LX1	300µH	Common choke, 300µH, 1A	DIP	Emei	TP4U300-00
1	Q1	700V	N-channel MOSFET, 700V, 0.36Ω/10V	PG-TO 220 FullPAK	Infineon	IPA70R360P7SXKSA 1
1	Q2	80V	NPN transistor, 80V, 0.5A	SOT-23	On Semiconductors	MMBTA06
1	Q3	100V	N-channel MOSFET, 100V, 5.5mΩ, 80nC, 60A	PowerPAK® SO-8	Vishay	SiR870ADP-T1-GE3
0	Q4	NC				
2	R1, R2	300mΩ	Film resistor, 1%, 1/4W	1206	Yageo	RL1206FR-070R3L
2	R3, R4	0Ω	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-070RL
1	R5	300kΩ	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-07300KL
1	R6	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R7	750Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07750RL
1	R8	100Ω	Film resistor, 1%	0805	Yageo	RC0805FR-07100RL
1	R9	100kΩ	Film resistor, 5%	0805	Yageo	RC0805JR-07100KL
5	R10, R11, R12, R13, R14	10Ω	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-0710RL
0	R15, R17	NC				
1	R16	1kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071KL
1	R18	4.7nF/50V	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206087
1	R19	NC				
1	R20	NC				
1	R21	20kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0720KL
2	R27, R28	499kΩ	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-07499KL
1	T1	0.61mH	RM10, L_P = 0.61mH, N_P:N_S:N_{AUX1}:N_{AUX2} = 48:6:6:9	RM10	ZYD	FX0606
1	U1	MPX2002	All-in-one controller	SOICW-16	MPS	MPX2002GY-Z
1	U4	HF81	X-capacitor bleeder	SOIC-8	MPS	HF81GS-Z

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVX2002-Y-00D BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
Daughter Board/PD Controller Stage: Cypress Solution						
0	C25	NC				
2	C26, C28	100nF/50V	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206095
1	C27	1μF/25V	Ceramic capacitor, 25V, X7R	0603	Murata	GCM188R71E105KA64D
1	C29	1μF/50V	Ceramic capacitor, 50V, X7R	0805	Wurth	885012207103
2	C30, C31	390pF/50V	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H391JA01D
1	C32	2.2μF/25V	Ceramic capacitor, 25V, X7R	0805	Wurth	885012207079
1	C33	2.2μF/10V	Ceramic capacitor, 10V, X7R	0603	Murata	GRM188R71A225KE15D
2	D9, D10	30V	Schottky diode, 30V, 0.5A	SOD-123	Diodes	B0530W
1	Q5	-30V	P-channel MOSFET, -30V, 7mΩ	SOP-8	Analog Power	AM4431P-T1-PF
1	Q6	-20V	Dual P-channel MOSFET, -20V, -0.43A	SOT-563-6	On Semiconductors	NTZD3152PT1G
1	R22	30kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0730KL
1	R23	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R24	5mΩ	Film resistor, 1%, 1/4W	1206	Yageo	PA1206FRF070R005L
2	R25, R26	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	U2	30V	USB PD controller, CCG3PA	QFN-24	Cypress	CYPD3175
1	CN1	USB_C	16-pin SMT, Type-C connecter	DIP	Jinxing	JX-93579102
1	U3	MPQ2013A-33	3.3V LDO	TSOT23-4	MPS	MPQ2013AGJE-33-AEC1C672-Z

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVX2002-Y-00D BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
Daughter Board/PD Controller Stage: Weltrend Solution						
0	C25	NC				
2	C26, C30	4.7µF/ 35V	Ceramic capacitor, 35V, X7R	0805	TDK	C2012X7R1V475K
3	C27, C28, C29	100nF/ 50V	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206095
4	C31, C32, C33, C34	390pF/ 50V	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H391J A01D
1	C35	1µF/ 25V	Ceramic capacitor, 50V, X7R	0603	Murata	GCM188R71E105 KA64D
1	C36	1µF/ 50V	Ceramic capacitor, 50V, X7R	0805	Wurth	885012207103
1	Q5	30V	N-channel MOSFET, 30V, 24.2A, 6mΩ	DFN3x3-8L	Analog Power	AM7302N
1	R22	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R23	1MΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071ML
1	R24	1kΩ	Film resistor, 1%, 1/4W	1206	Yageo	RC1206FR-071KL
1	R25	0Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	R26	560kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07560KL
1	R29	5mΩ	Film resistor, 1%, 1/4W	1206	Yageo	PA1206FRF070R005L
1	R30	5.1kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-075K1L
2	R31, R32	4.7Ω	Film resistor, 1%	0603	Yageo	RC0603FR-074R7L
2	R33, R34	22Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0722RL
1	U3	30V	USB PD controller	QFN-16 (5mm x 5mm)	Weltrend	WT6636F
1	CN1	16-pin	16-pin SMT, Type-C connecter	DIP	Jinxing	JX-93579102

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. Note that V_{OUT} is tested with a 10cm cable, and the V_{OUT} probe includes a 44µF electrolytic capacitor and 100nF ceramic capacitor.

Table 1: Efficiency (V_{OUT} = 5V)

V_{OUT} = 5V							CoC Tier 2 Requirement
V_{IN} (V_{AC}/Hz)	Load	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff. (%)	
115/60	100%	16.543	4.90	3.000	14.700	88.86%	
	75%	12.417	4.94	2.250	11.115	89.51%	
	50%	8.3046	4.98	1.500	7.470	89.95%	
	25%	4.2281	5.01	0.750	3.758	88.87%	
	Average Efficiency (%)					89.30%	81.84%
	10%	1.9197	5.03	0.300	1.509	78.61%	72.48%
230/50	100%	16.776	4.90	3.000	14.700	87.63%	
	75%	12.671	4.94	2.250	11.115	87.72%	
	50%	8.5578	4.98	1.500	7.470	87.29%	
	25%	4.8656	5.01	0.750	3.758	77.23%	
	Average Efficiency (%)					84.96%	81.84%
	10%	1.9921	5.03	0.300	1.509	75.75%	72.48%

Table 2: Efficiency (V_{OUT} = 9V)

V_{OUT} = 9V							CoC Tier 2 Requirement
V_{IN} (V_{AC}/Hz)	Load	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff. (%)	
115/60	100%	29.597	8.93	3.004	26.826	90.64%	
	75%	22.175	8.96	2.250	20.160	90.91%	
	50%	14.802	9.00	1.500	13.500	91.20%	
	25%	7.5117	9.03	0.750	6.773	90.16%	
	Average Efficiency (%)					90.73%	87.30%
	10%	3.2475	9.05	0.300	2.715	83.60%	77.30%
230/50	100%	29.734	8.92	3.004	26.796	90.12%	
	75%	22.280	8.95	2.250	20.138	90.38%	
	50%	15.056	9.00	1.500	13.500	89.67%	
	25%	7.7701	9.03	0.750	6.773	87.16%	
	Average Efficiency (%)					89.33%	87.30%
	10%	3.3888	9.05	0.300	2.715	80.12%	77.30%

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

Table 3: Efficiency (V_{OUT} = 12V)

V_{OUT} = 12V							CoC Tier 2 Requirement
V_{IN} (V_{AC}/Hz)	Load	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff. (%)	
115/60	100%	39.404	11.92	3.004	35.808	90.87%	
	75%	29.513	11.95	2.249	26.876	91.06%	
	50%	19.724	11.99	1.500	17.985	91.18%	
	25%	9.9972	12.02	0.750	9.015	90.18%	
	Average Efficiency (%)					90.82%	88.30%
	10%	4.1549	12.05	0.300	3.615	87.01%	78.30%
230/50	100%	39.347	11.91	3.003	35.766	90.90%	
	75%	29.421	11.94	2.249	26.853	91.27%	
	50%	19.831	11.99	1.500	17.985	90.69%	
	25%	10.239	12.02	0.750	9.015	88.05%	
	Average Efficiency (%)					90.23%	88.30%
	10%	4.3793	12.05	0.300	3.615	82.55%	78.30%

Table 4: Efficiency (V_{OUT} = 15V)

V_{OUT} = 15V							CoC Tier 2 Requirement
V_{IN} (V_{AC}/Hz)	Load	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff. (%)	
115/60	100%	49.086	14.95	3.003	44.895	91.46%	
	75%	36.931	14.99	2.248	33.698	91.24%	
	50%	24.775	15.03	1.505	22.620	91.30%	
	25%	12.543	15.07	0.750	11.303	90.11%	
	Average Efficiency (%)					91.03%	88.85%
	10%	5.2966	15.09	0.300	4.527	85.47%	78.85%
230/50	100%	48.999	14.92	3.003	44.805	91.44%	
	75%	36.749	14.96	2.249	33.645	91.55%	
	50%	25.021	15.01	1.505	22.590	90.28%	
	25%	12.720	15.05	0.750	11.288	88.74%	
	Average Efficiency (%)					90.50%	88.85%
	10%	5.3680	15.08	0.300	4.524	84.28%	78.85%

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

Table 5: Efficiency (V_{OUT} = 20V)

V_{OUT} = 20V							CoC Tier 2 Requirement
V_{IN} (V_{AC}/Hz)	Load	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff. (%)	
115/60	100%	71.429	20.02	3.251	65.085	91.12%	
	75%	53.412	20.05	2.442	48.962	91.67%	
	50%	35.740	20.10	1.623	32.622	91.28%	
	25%	18.062	20.13	0.812	16.346	90.50%	
	Average Efficiency (%)					91.14%	89%
	10%	7.5703	20.15	0.325	6.549	86.51%	79%
230/50	100%	70.350	19.95	3.251	64.857	92.19%	
	75%	53.077	19.99	2.442	48.816	91.97%	
	50%	35.570	20.05	1.624	32.561	91.54%	
	25%	18.263	20.11	0.812	16.329	89.41%	
	Average Efficiency (%)					91.28%	89%
	10%	7.7966	20.13	0.325	6.542	83.91%	79%

Table 6: Efficiency (V_{OUT} = 20V)

V_{OUT} = 20V (Full Load)						
V_{IN} (V_{AC}/Hz)	Load	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff. (%)
90/60	100%	72.535	20.01	3.251	65.053	89.68%
115/60	100%	71.429	20.02	3.251	65.085	91.12%
230/50	100%	70.350	19.95	3.251	64.857	92.19%
264/50	100%	70.315	19.90	3.251	64.695	92.01%

Table 7: No-Load Consumption

No Load Consumption				
V_{IN} (V_{AC})	90	115	230	264
P_{IN} (mW)	11.49	13.39	24.31	26.43

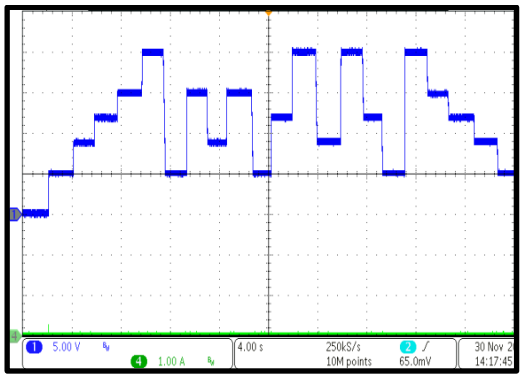
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

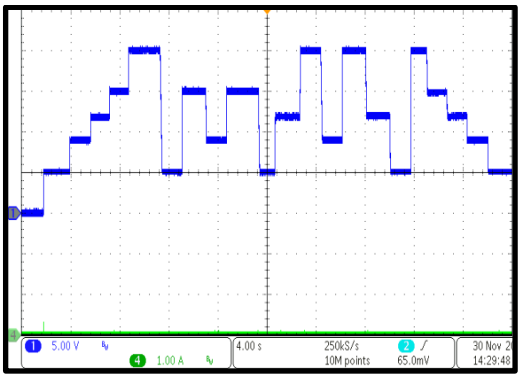
Output Voltage Transient Response
V_{IN} = 115V_{AC}/60Hz, I_{OUT} = 0A

CH1: V_{OUT}
CH4: I_{OUT}



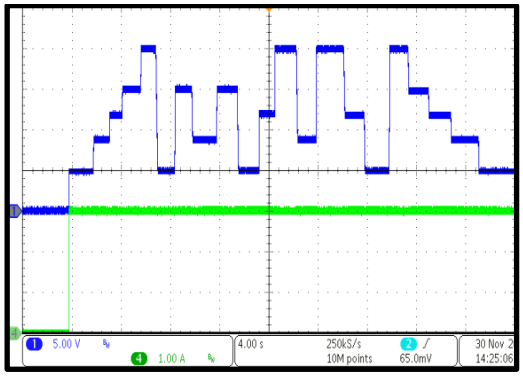
Output Voltage Transient Response
V_{IN} = 230V_{AC}/50Hz, I_{OUT} = 0A

CH1: V_{OUT}
CH4: I_{OUT}



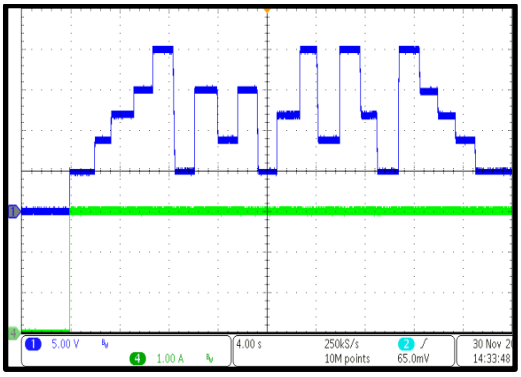
Output Voltage Transient Response
V_{IN} = 115V_{AC}/60Hz, I_{OUT} = 3A

CH1: V_{OUT}
CH4: I_{OUT}



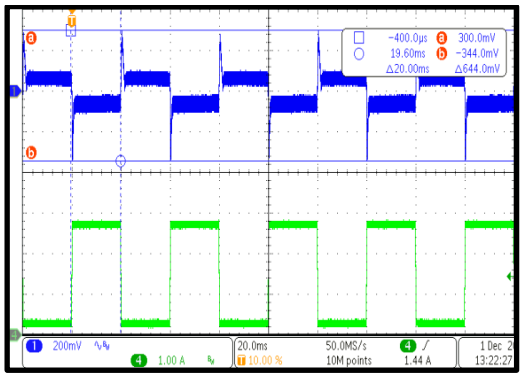
Output Voltage Transient Response
V_{IN} = 230V_{AC}/50Hz, I_{OUT} = 3A

CH1: V_{OUT}
CH4: I_{OUT}



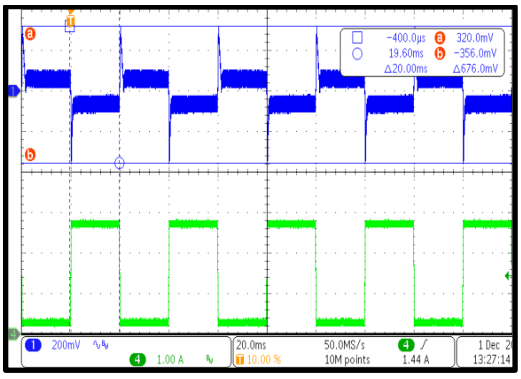
Load Transient Response
V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, V_{PP} = 644mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}
CH4: I_{OUT}



Load Transient Response
V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, V_{PP} = 676mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}
CH4: I_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

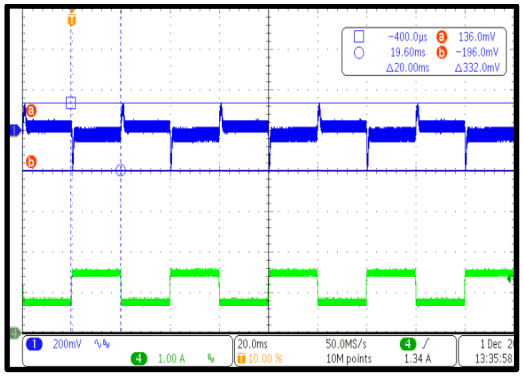
Performance waveforms are tested on the evaluation board.

Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, V_{PP} = 332mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

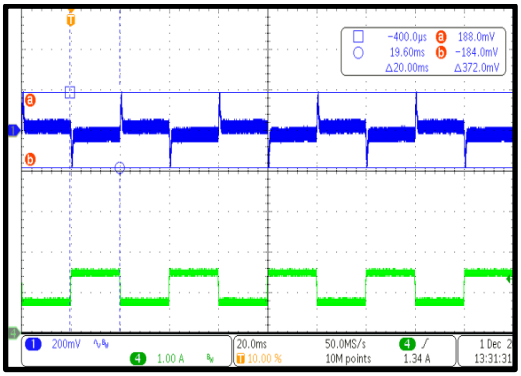


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, V_{PP} = 372mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

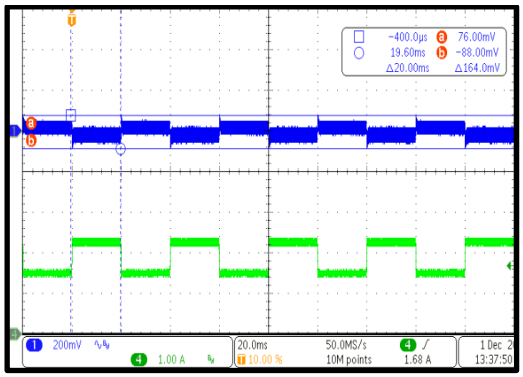


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, V_{PP} = 164mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

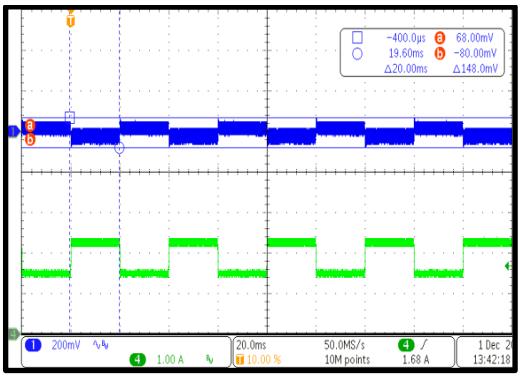


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, V_{PP} = 148mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

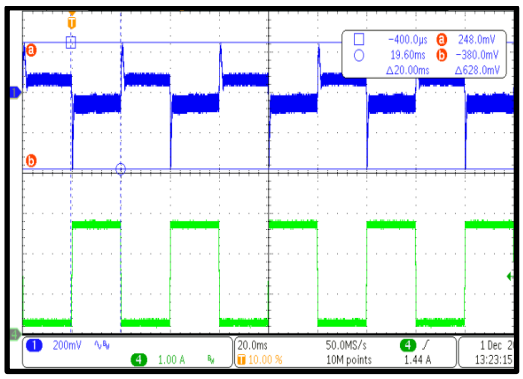


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, V_{PP} = 628mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

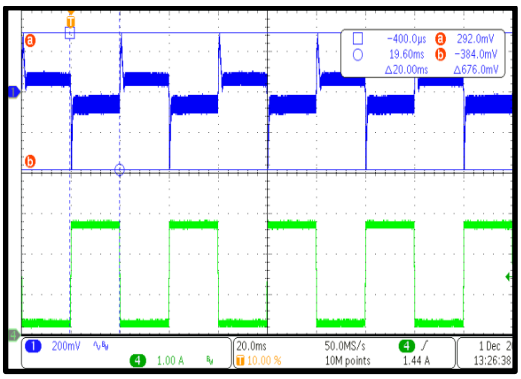


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, V_{PP} = 676mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

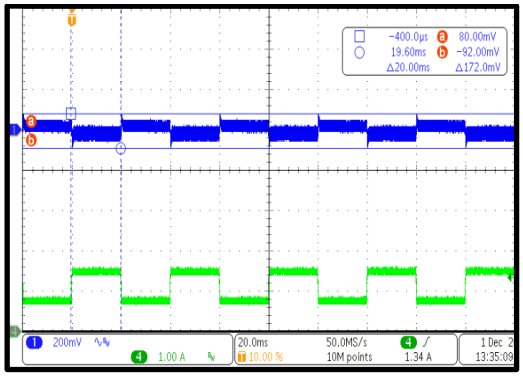
Performance waveforms are tested on the evaluation board.

Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, V_{PP} = 172mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

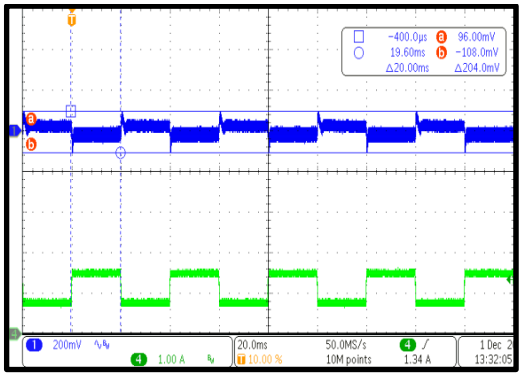


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, V_{PP} = 204mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

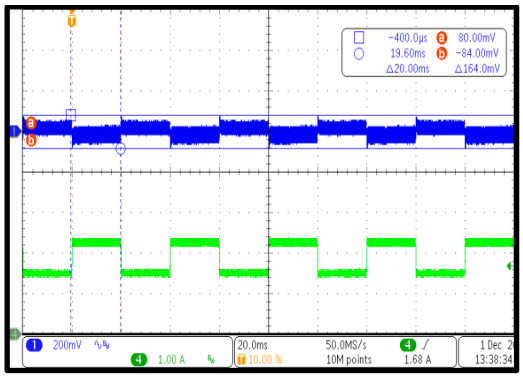


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, V_{PP} = 164mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

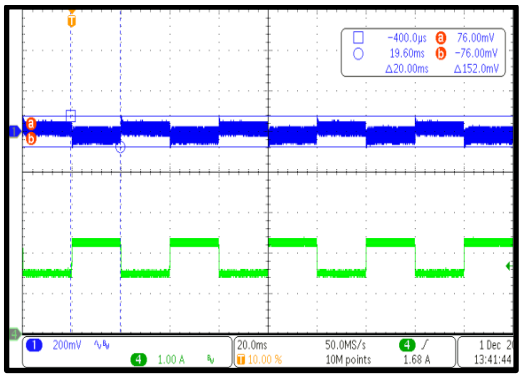


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, V_{PP} = 152mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

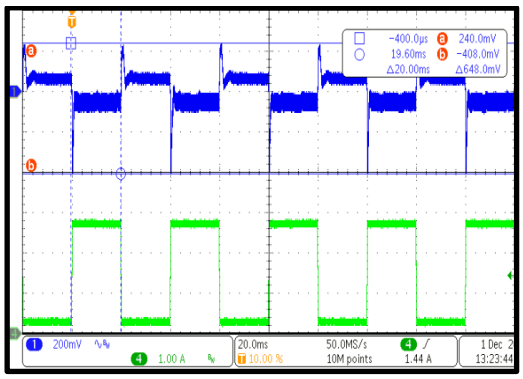


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, V_{PP} = 648mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

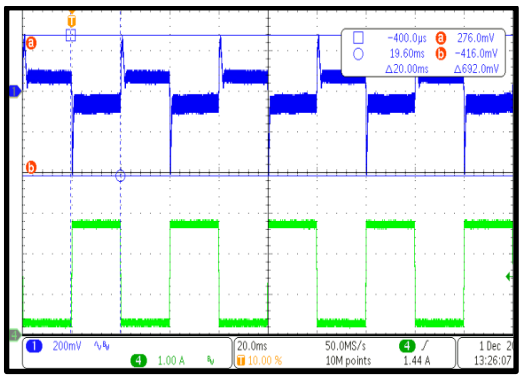


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, V_{PP} = 692mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

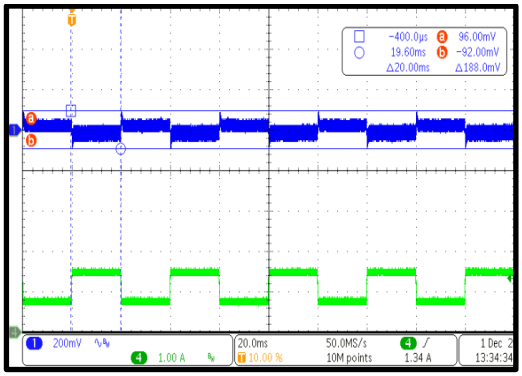
Performance waveforms are tested on the evaluation board.

Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, V_{PP} = 188mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

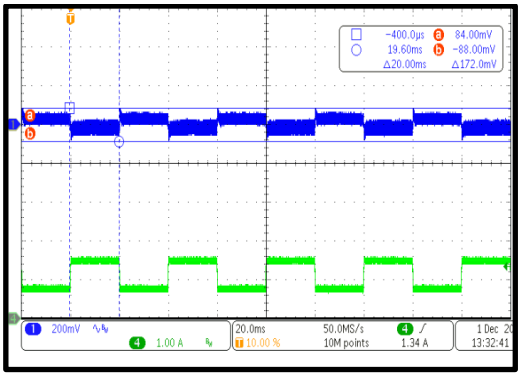


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, V_{PP} = 172mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

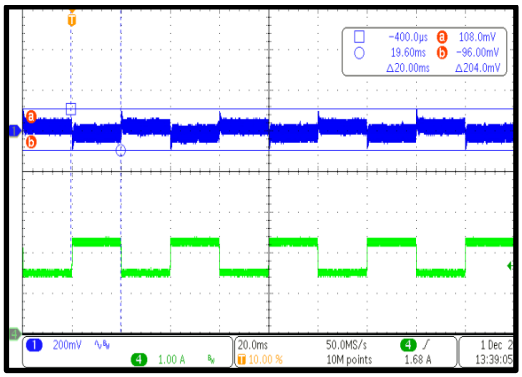


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, V_{PP} = 204mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

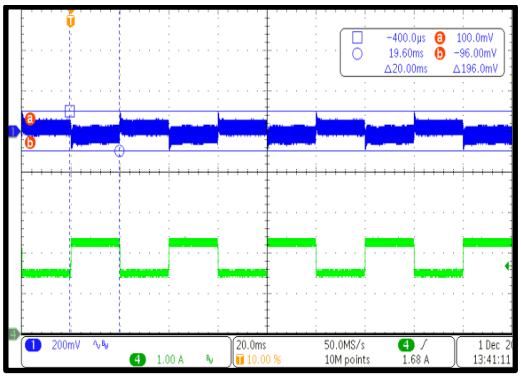


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, V_{PP} = 196mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

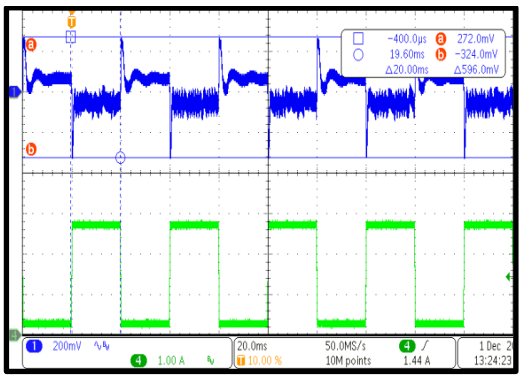


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, V_{PP} = 596mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

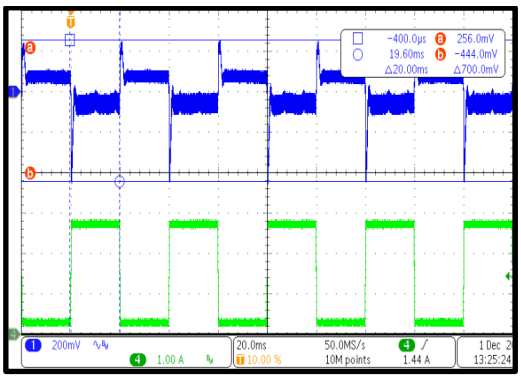


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, V_{PP} = 700mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

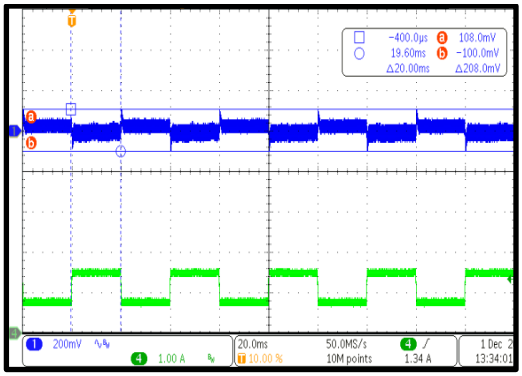
Performance waveforms are tested on the evaluation board.

Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, V_{PP} = 208mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

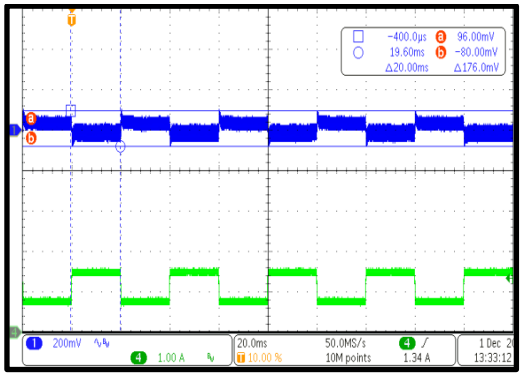


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, V_{PP} = 176mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

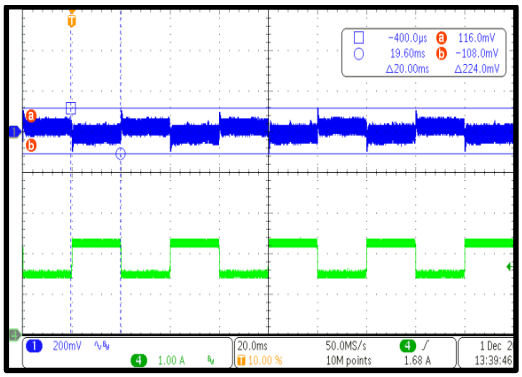


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, V_{PP} = 224mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

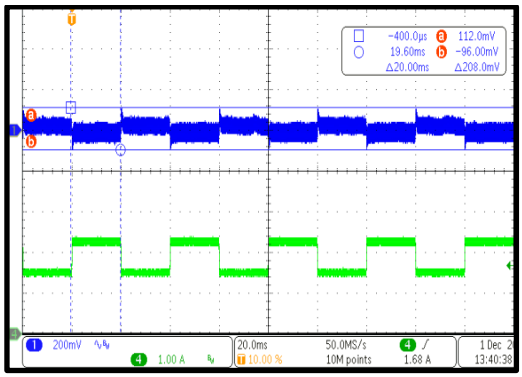


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, V_{PP} = 208mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

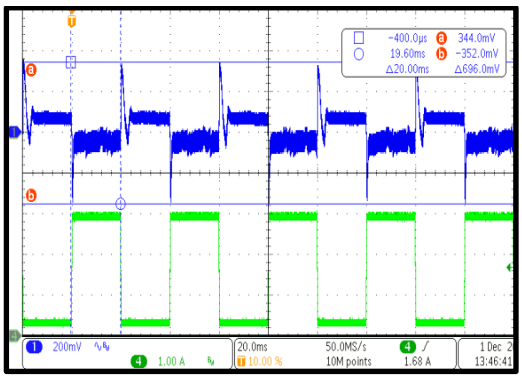


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, V_{PP} = 696mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

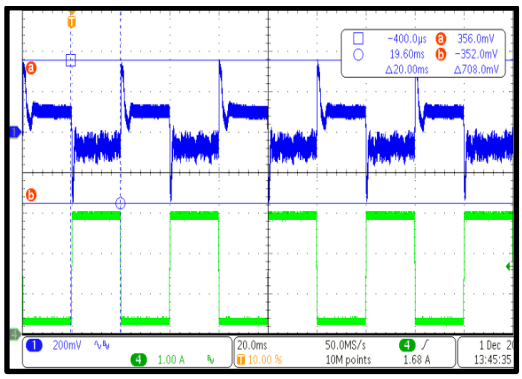


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, V_{PP} = 708mV,
Load: 10% to 90%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

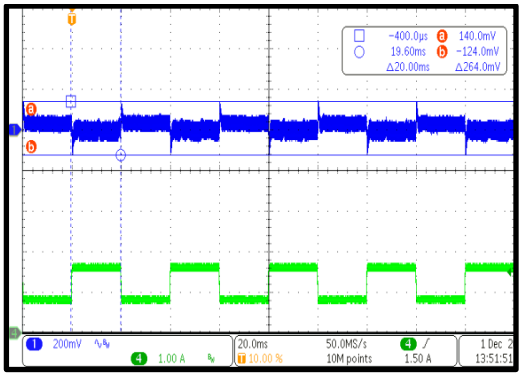
Performance waveforms are tested on the evaluation board.

Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, V_{PP} = 264mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

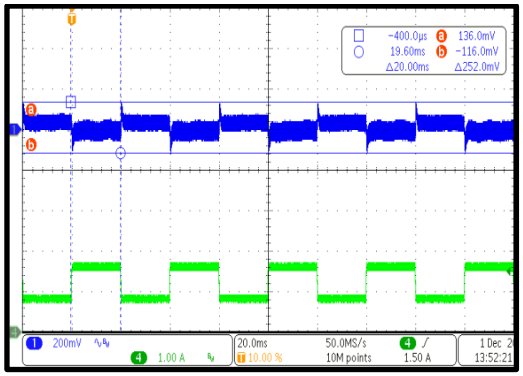


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, V_{PP} = 252mV,
Load: 25% to 50%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

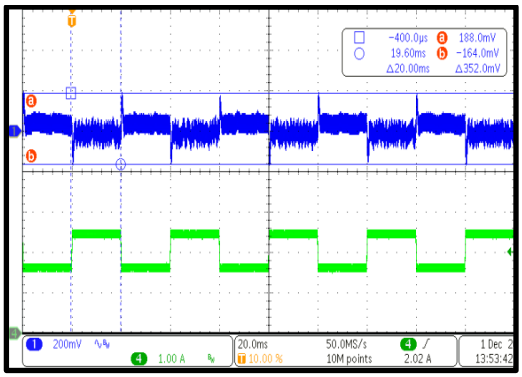


Load Transient Response

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, V_{PP} = 352mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

CH4: I_{OUT}

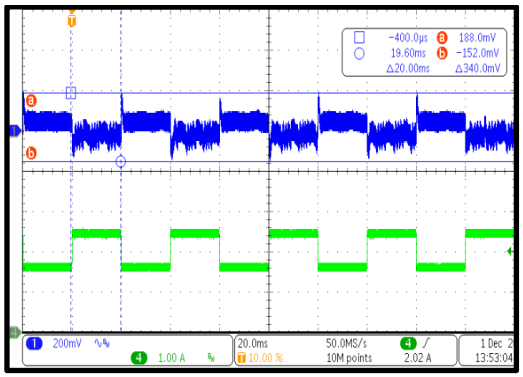


Load Transient Response

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, V_{PP} = 340mV,
Load: 50% to 75%, 20ms, 150mA/µs

CH1: V_{OUT}

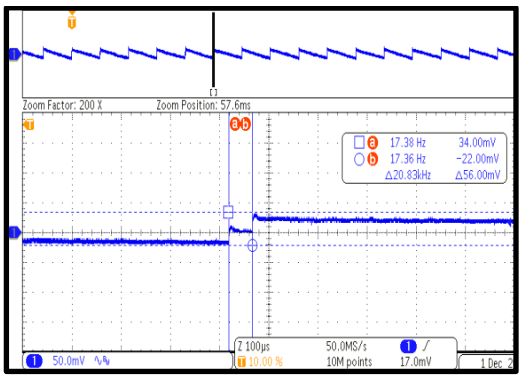
CH4: I_{OUT}



Output Voltage Ripple

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 0A, V_{PP} = 56mV

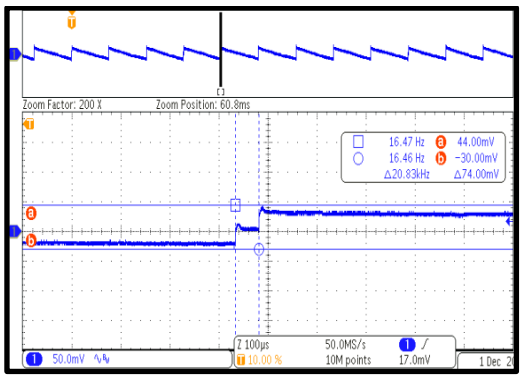
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 0A, V_{PP} = 74mV

CH1: V_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

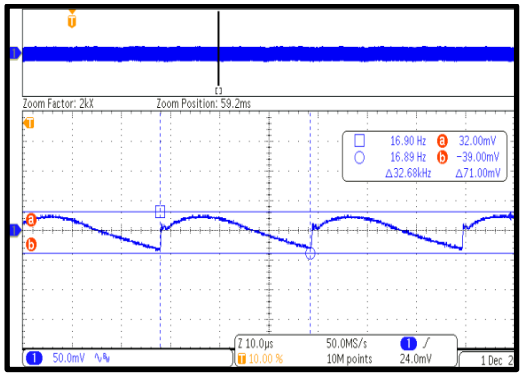
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

Output Voltage Ripple

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 3A, V_{PP} = 71mV

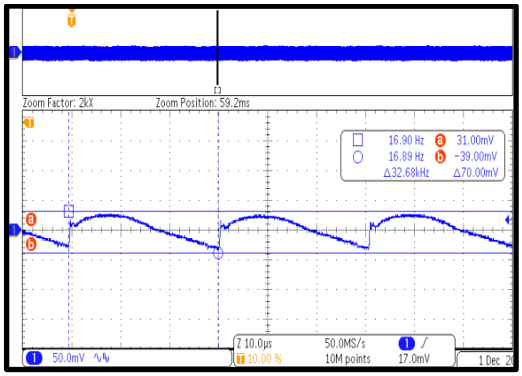
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, V_{PP} = 70mV

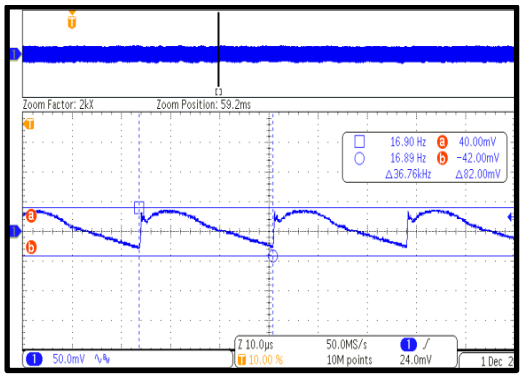
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, I_{OUT} = 3A, V_{PP} = 82mV

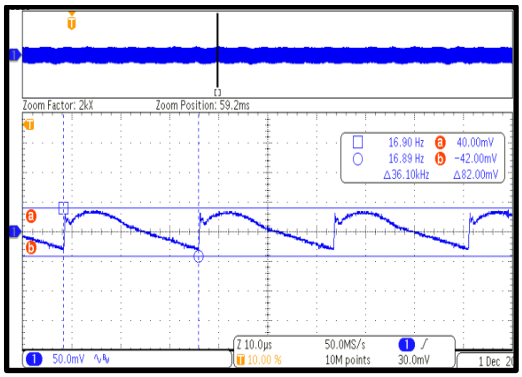
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A, V_{PP} = 82mV

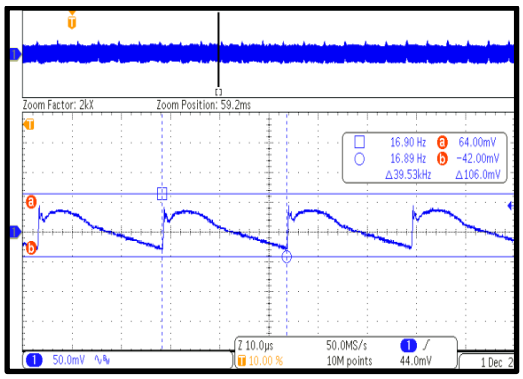
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, I_{OUT} = 3A, V_{PP} = 106mV

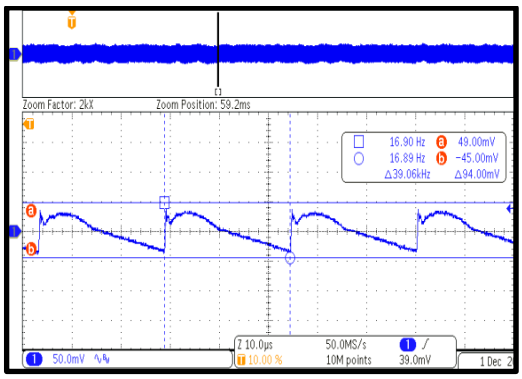
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A, V_{PP} = 94mV

CH1: V_{OUT}



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

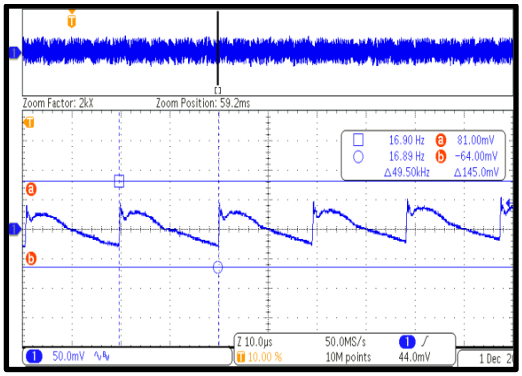
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

Output Voltage Ripple

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, I_{OUT} = 3A, V_{PP} = 145mV

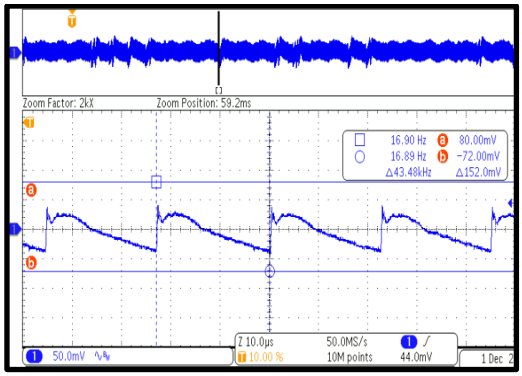
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A, V_{PP} = 152mV

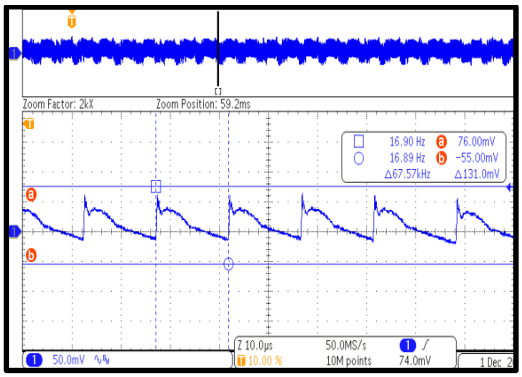
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, V_{PP} = 131mV

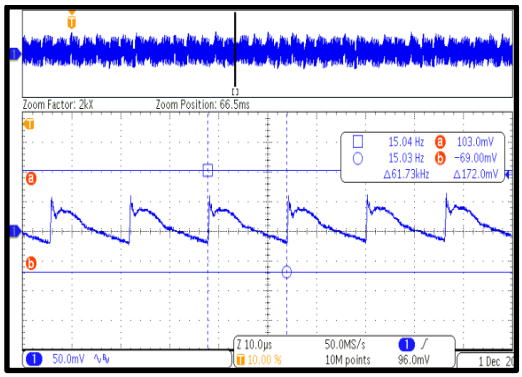
CH1: V_{OUT}



Output Voltage Ripple

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, V_{PP} = 172mV

CH1: V_{OUT}



Steady State

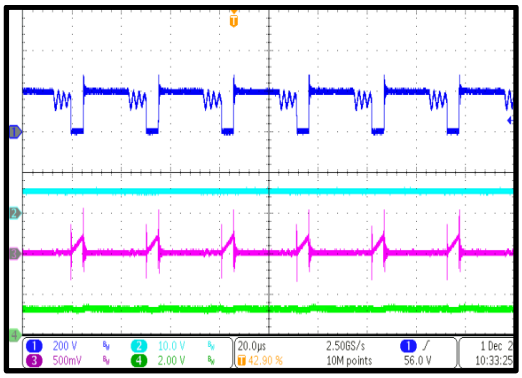
V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 3A

CH1: V_{DS_PRI}

CH2: V_{OUT}

CH3: V_{CS}

CH4: V_{COMP}



Steady State

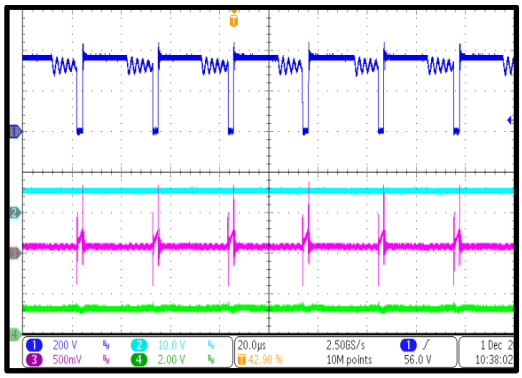
V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A

CH1: V_{DS_PRI}

CH2: V_{OUT}

CH3: V_{CS}

CH4: V_{COMP}



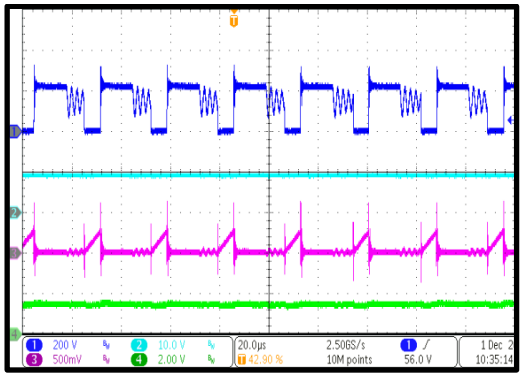
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

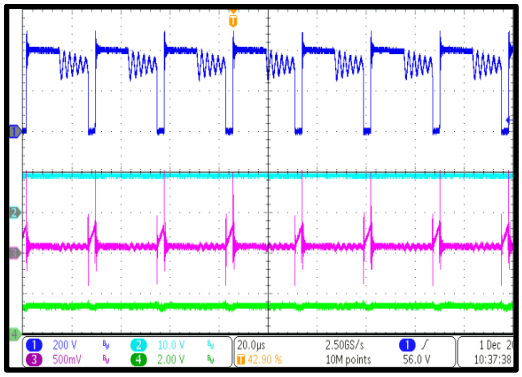
Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, I_{OUT} = 3A



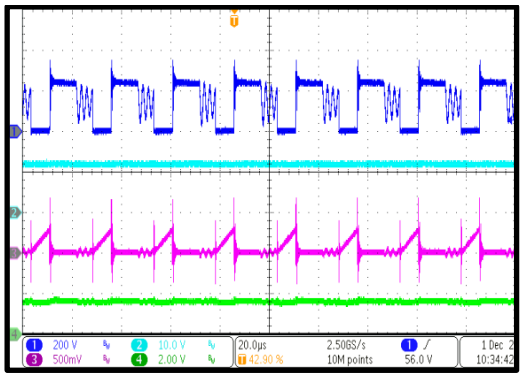
Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A



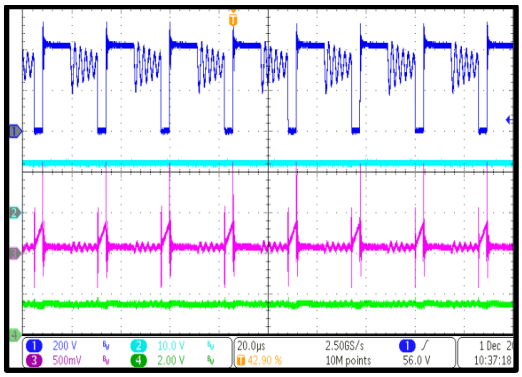
Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, I_{OUT} = 3A



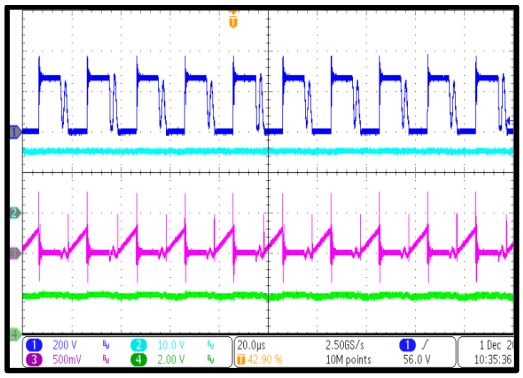
Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A



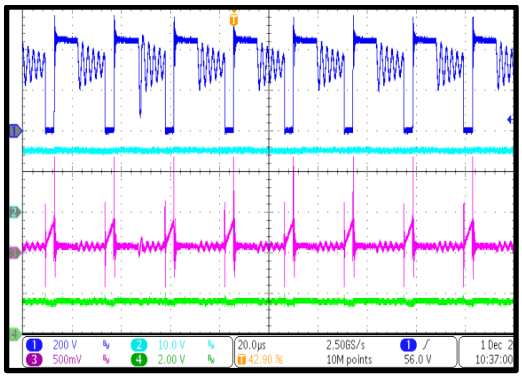
Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, I_{OUT} = 3A



Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A



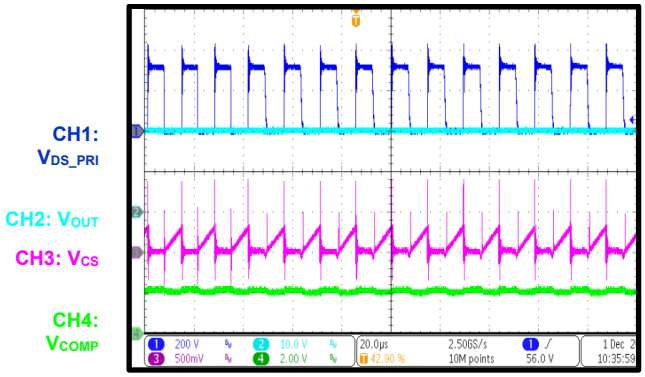
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

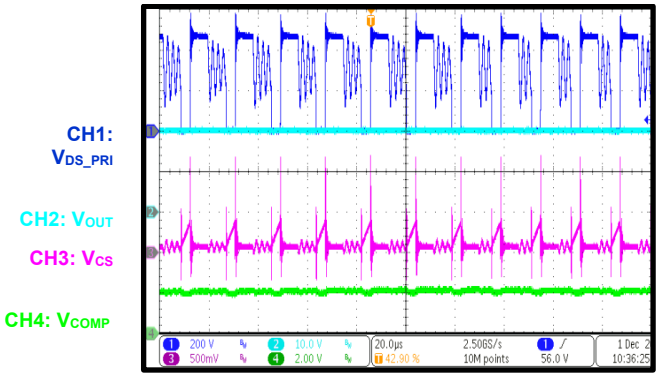
Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A



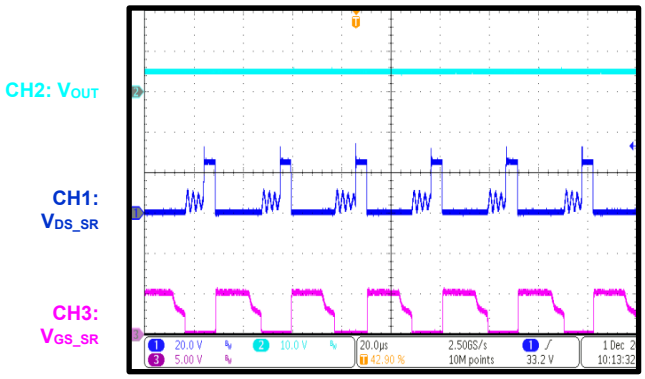
Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A



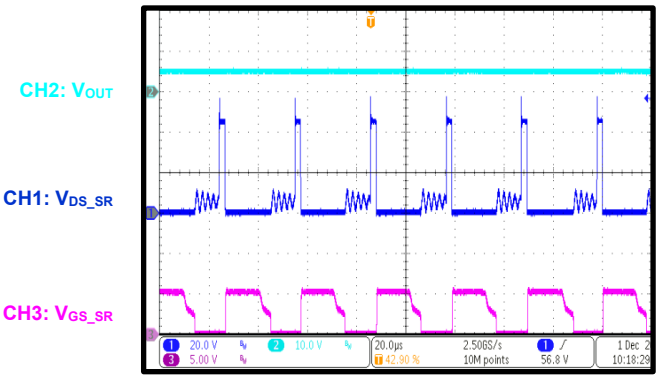
SR Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 3A



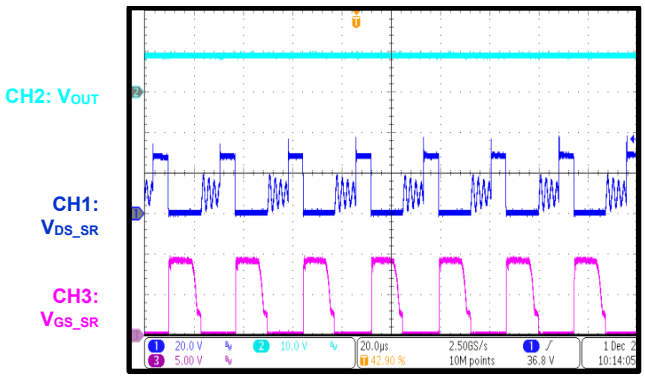
SR Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A



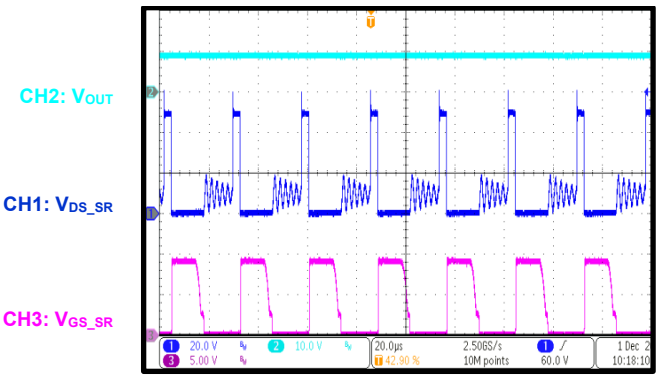
SR Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, I_{OUT} = 3A



SR Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A



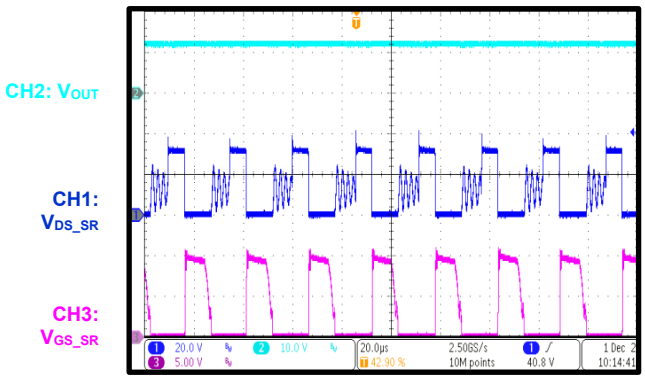
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

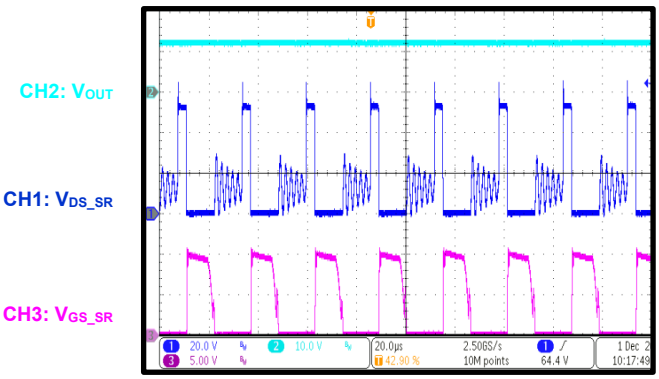
SR Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, I_{OUT} = 3A



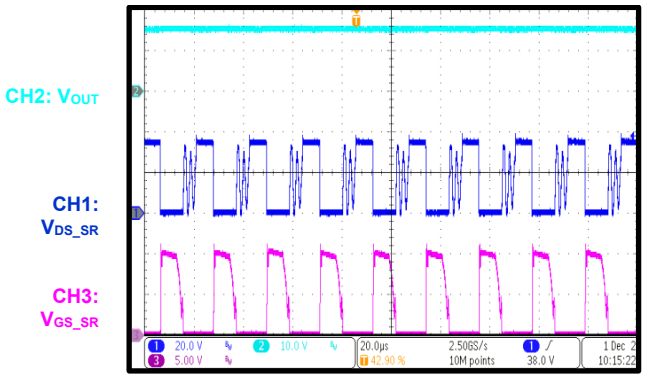
SR Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A



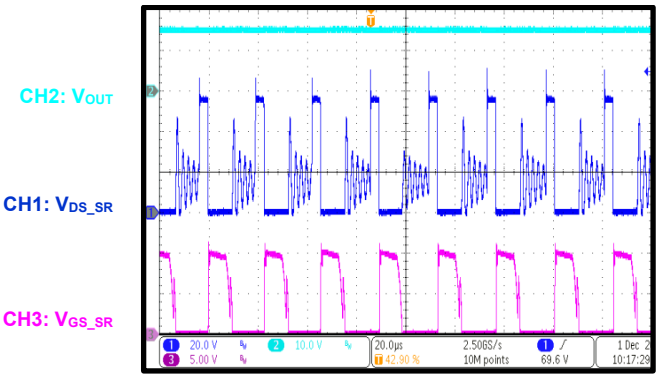
SR Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, I_{OUT} = 3A



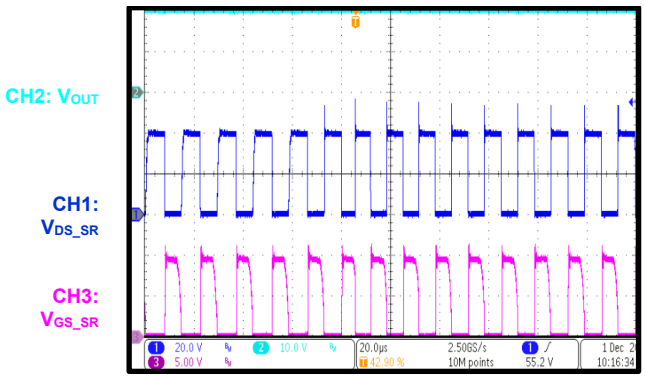
SR Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A



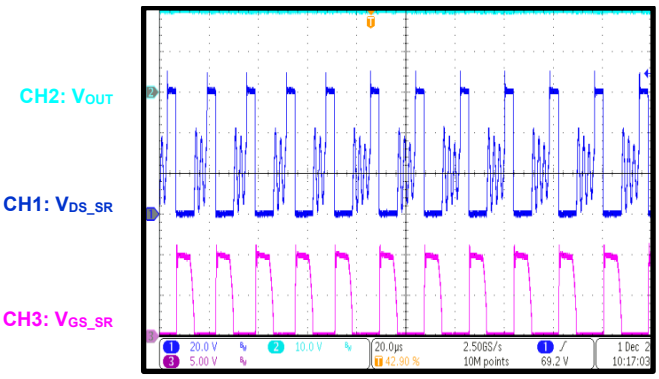
SR Steady State

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A



SR Steady State

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

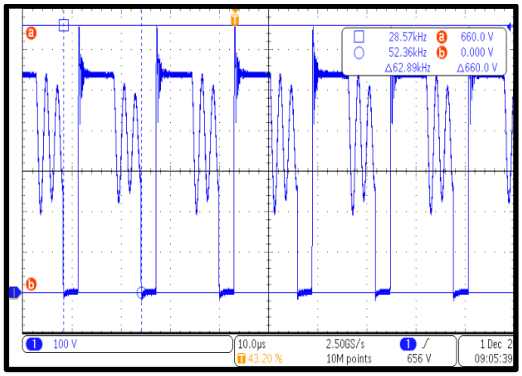
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

Primary MOSFET Stress

V_{IN} = 264V_{AC}, V_{OUT} = 20V, I_{OUT} = 3.25A, V_{MAX} = 660V

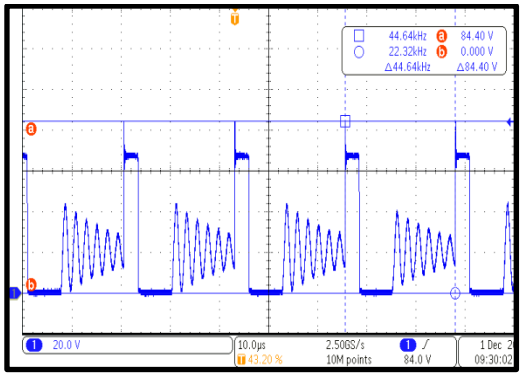
CH1: V_{DS_PRI}



Secondary MOSFET Stress

V_{IN} = 264V_{AC}, V_{OUT} = 20V, I_{OUT} = 2.23A, V_{MAX} = 84.4V

CH1: V_{DS_SR}



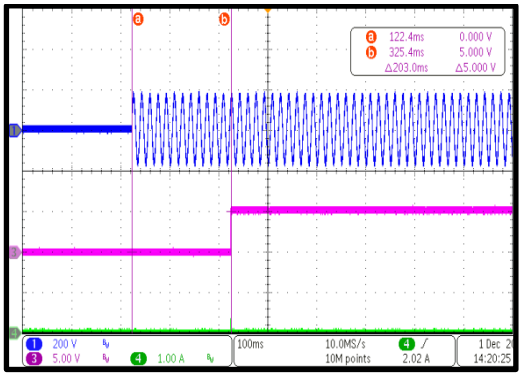
AC Input Start-Up

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 0A, t_{RISE} = 203ms

CH1: V_{IN}

CH3: V_{OUT}

CH4: I_{OUT}



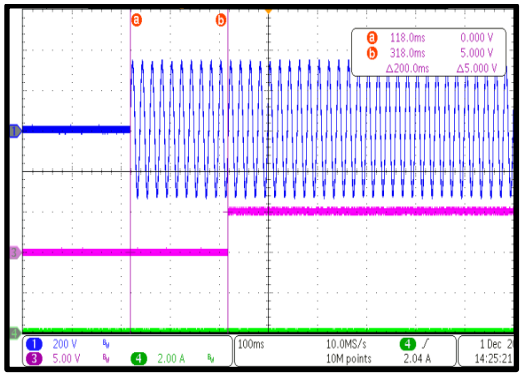
AC Input Start-Up

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 0A, t_{RISE} = 200ms

CH1: V_{IN}

CH3: V_{OUT}

CH4: I_{OUT}



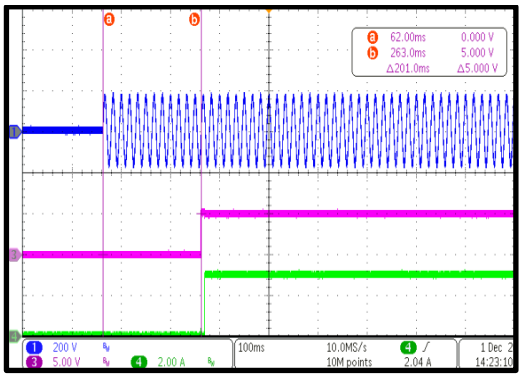
AC Input Start-Up

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 3A, t_{RISE} = 201ms

CH1: V_{IN}

CH3: V_{OUT}

CH4: I_{OUT}



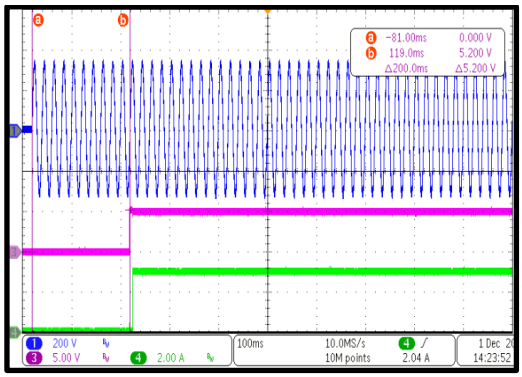
AC Input Start-Up

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, t_{RISE} = 200ms

CH1: V_{IN}

CH3: V_{OUT}

CH4: I_{OUT}



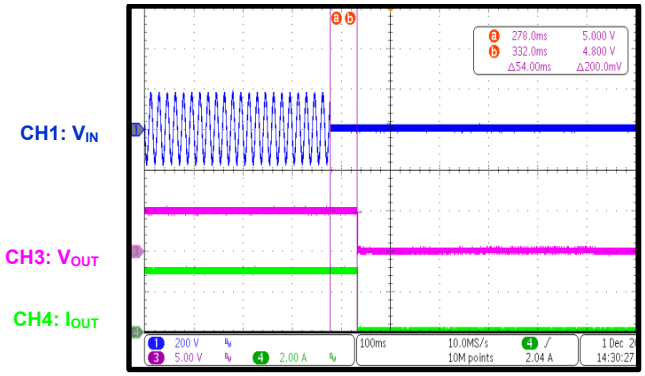
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

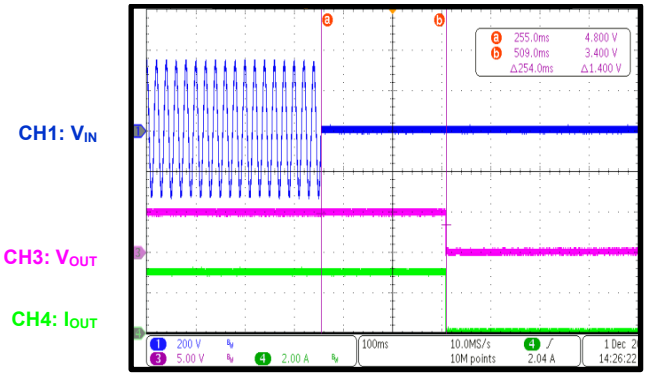
AC Input Shutdown

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OUT} = 3A, t_{HOLD} = 54ms



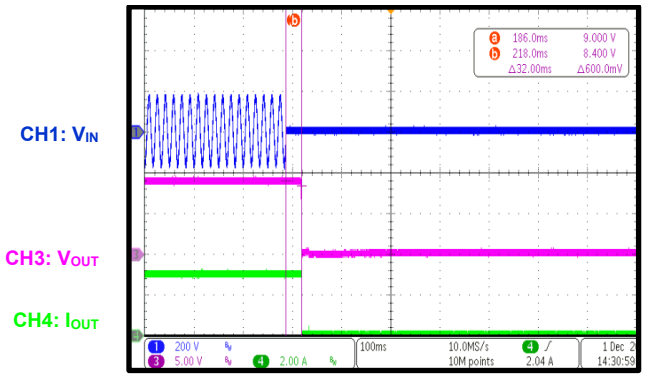
AC Input Shutdown

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, t_{HOLD} = 254ms



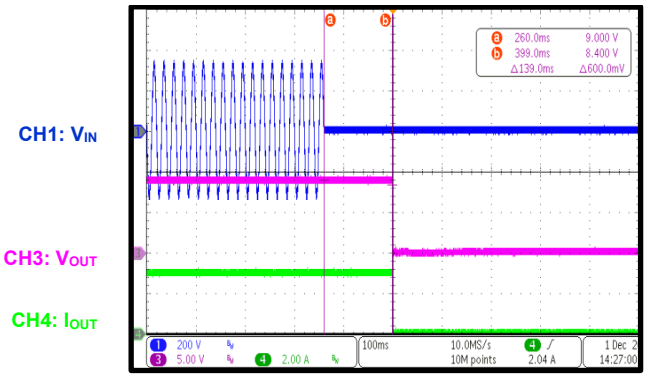
AC Input Shutdown

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, I_{OUT} = 3A, t_{HOLD} = 32ms



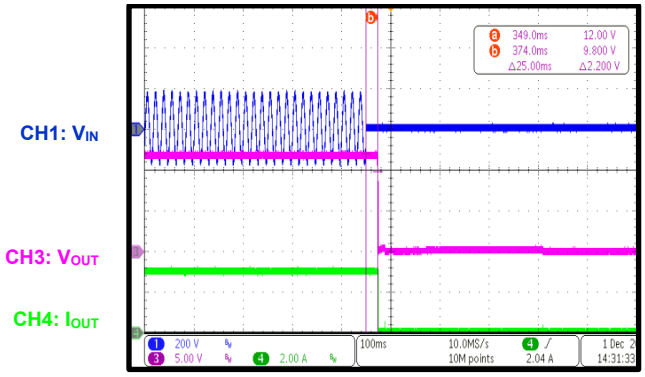
AC Input Shutdown

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A, t_{HOLD} = 139ms



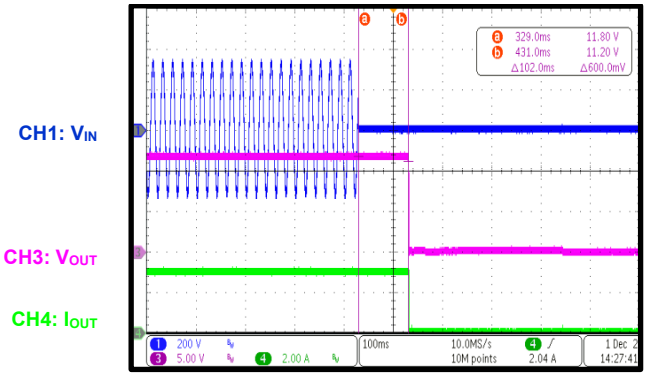
AC Input Shutdown

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, I_{OUT} = 3A, t_{HOLD} = 25ms



AC Input Shutdown

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A, t_{HOLD} = 102ms



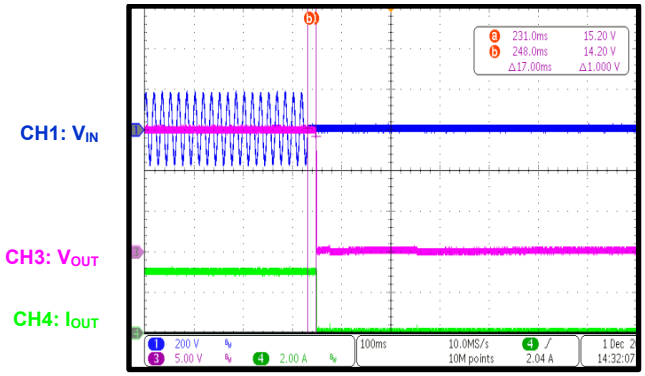
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

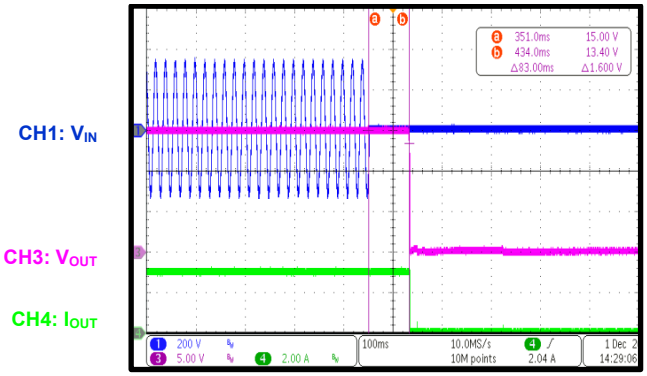
AC Input Shutdown

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, I_{OUT} = 3A, t_{HOLD} = 17ms



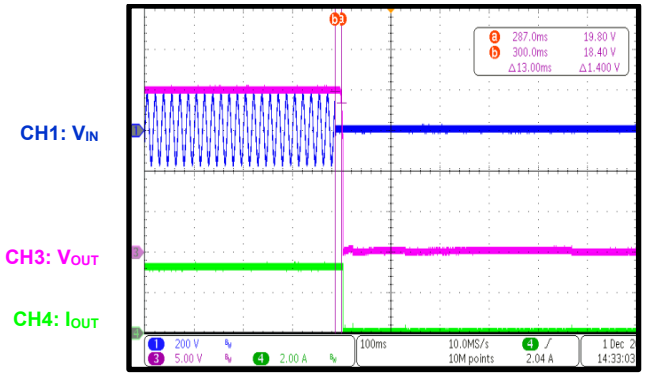
AC Input Shutdown

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A, t_{HOLD} = 83ms



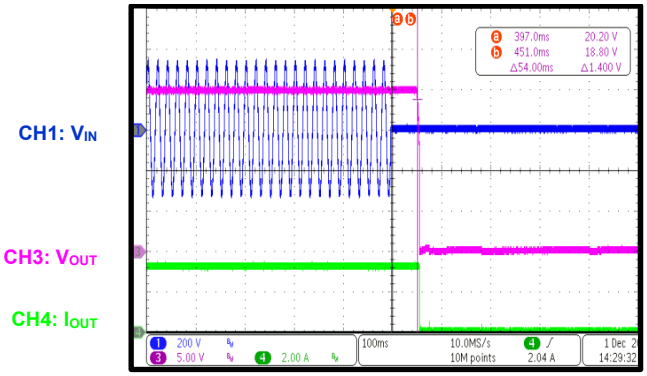
AC Input Shutdown

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, t_{HOLD} = 13ms



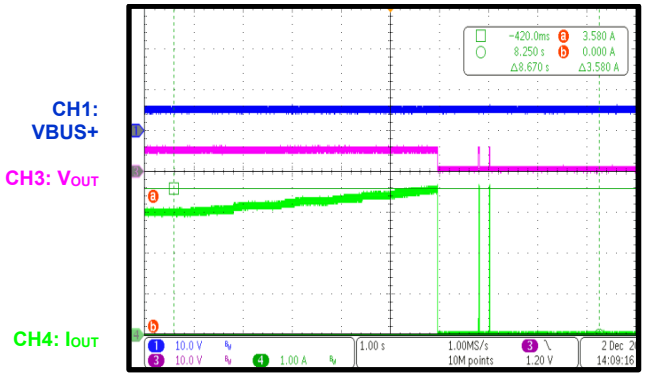
AC Input Shutdown

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, t_{HOLD} = 54ms



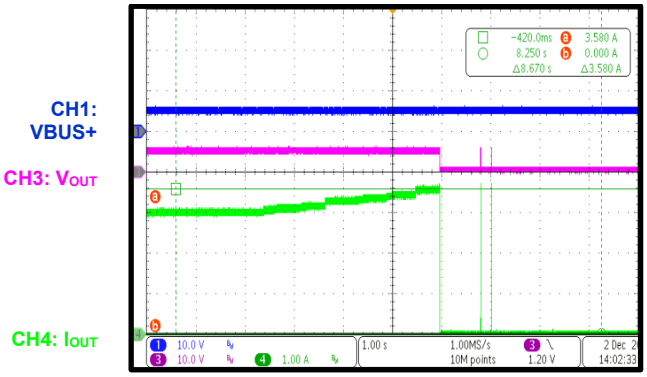
Output OCP

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 5V, I_{OCP} = 3.58A



Output OCP

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OCP} = 3.58A



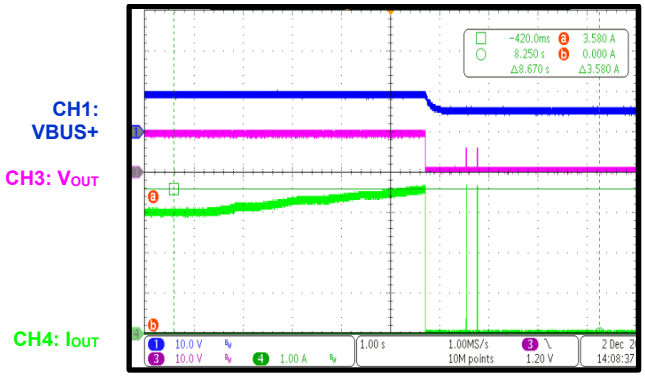
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

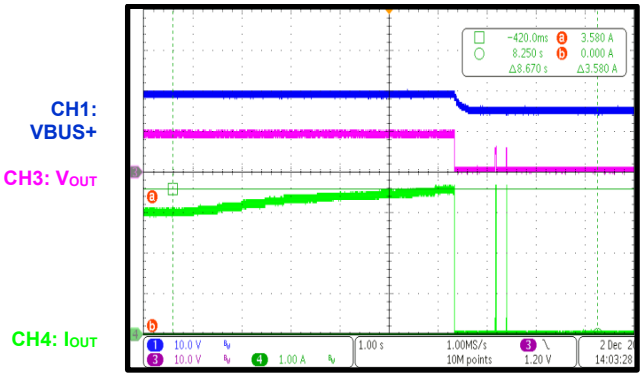
Output OCP

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 9V, I_{OCP} = 3.58A



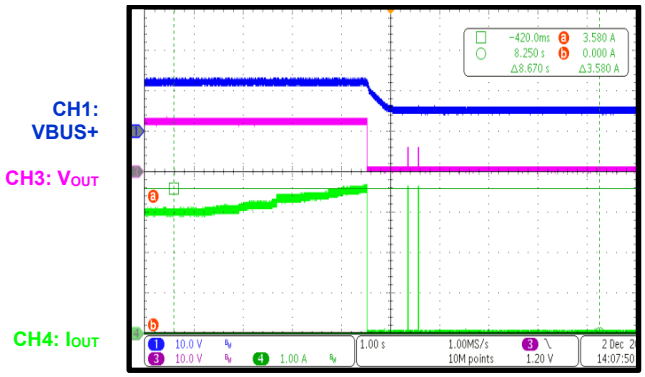
Output OCP

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OCP} = 3.58A



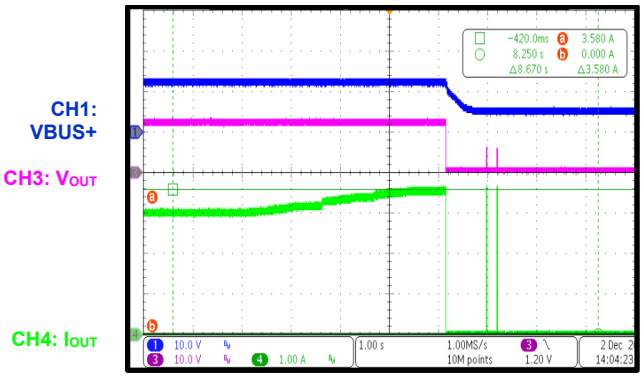
Output OCP

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 12V, I_{OCP} = 3.58A



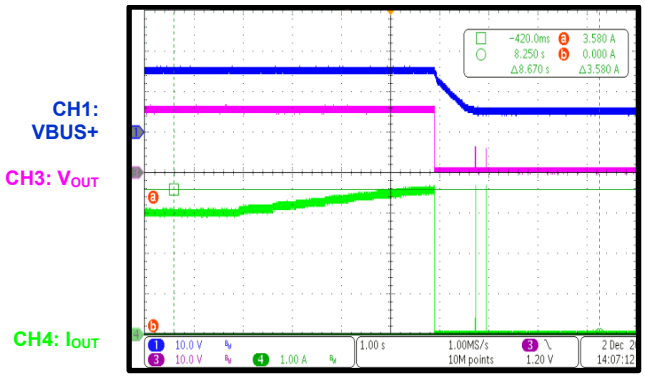
Output OCP

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OCP} = 3.58A



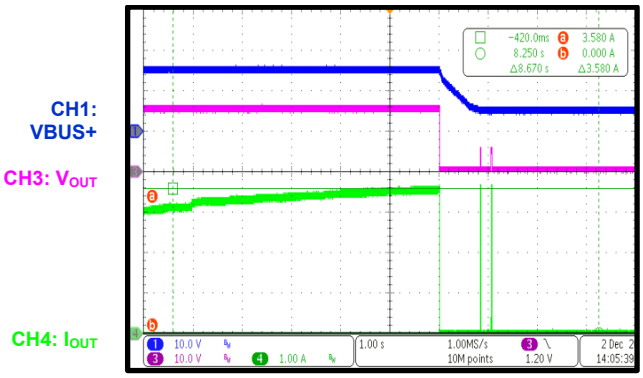
Output OCP

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 15V, I_{OCP} = 3.58A



Output OCP

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OCP} = 3.58A



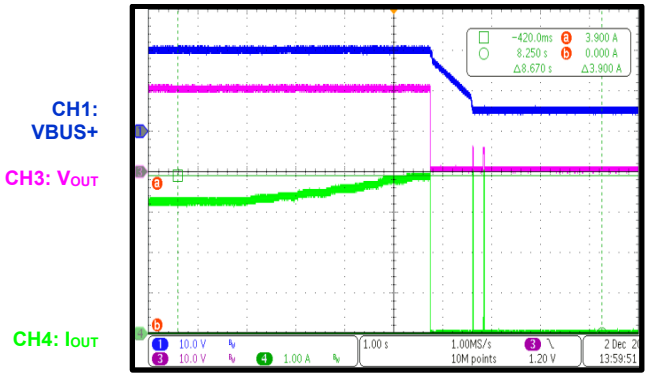
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

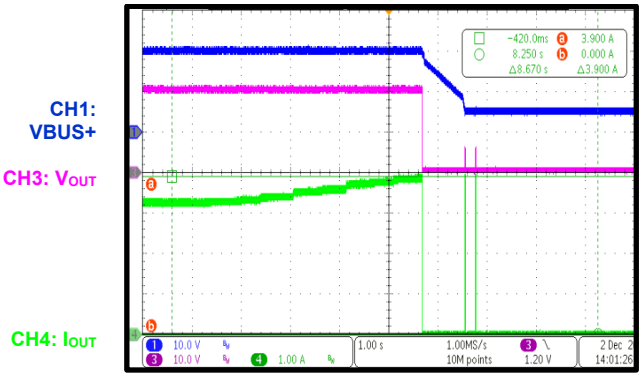
Output OCP

V_{IN} = 115V_{AC}/60Hz, V_{OUT} = 20V, I_{OCP} = 3.9A



Output OCP

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OCP} = 3.9A



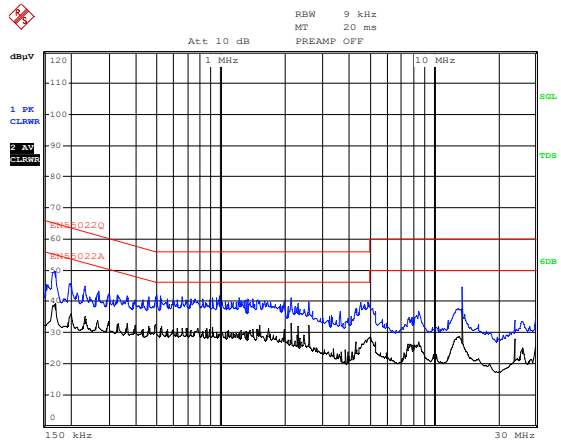
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

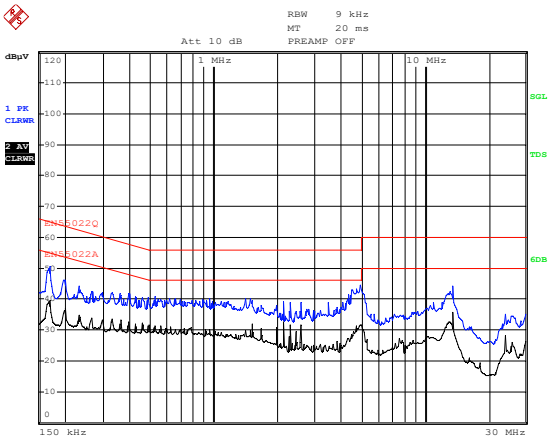
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, line L



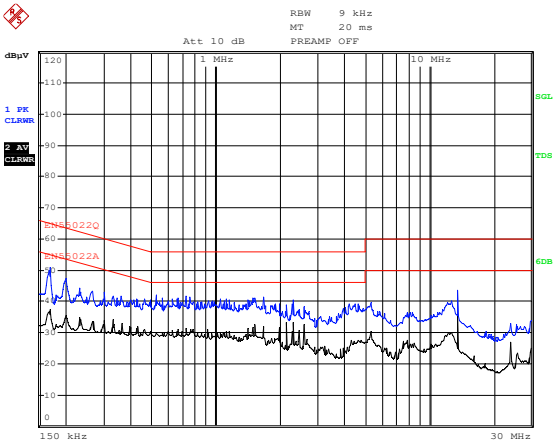
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, line N



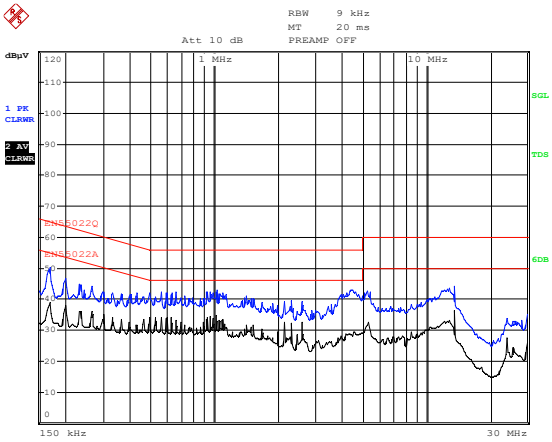
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, line L



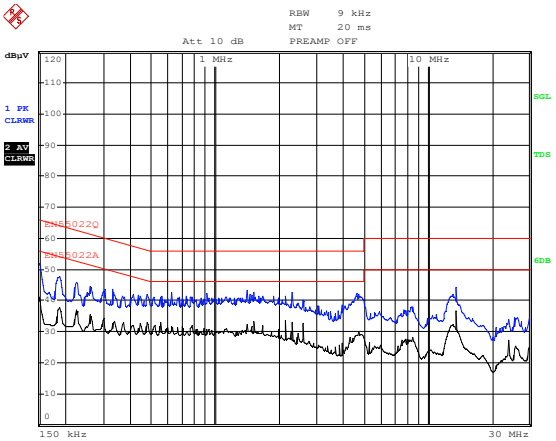
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 5V, I_{OUT} = 3A, line N



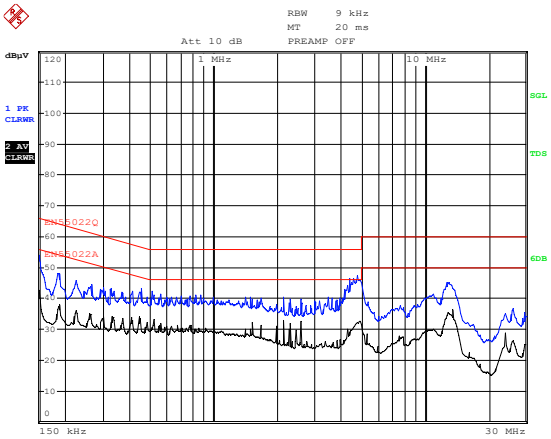
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A, line L



Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A, line N



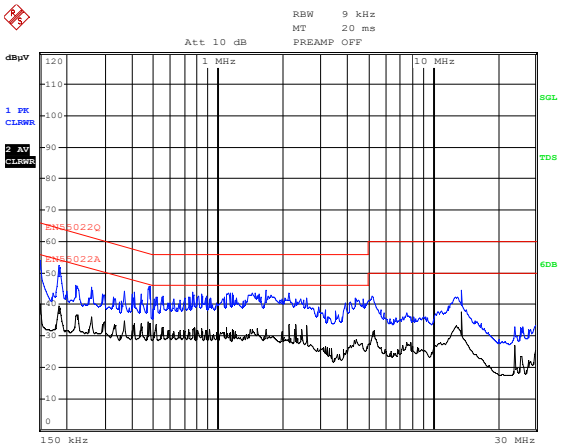
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

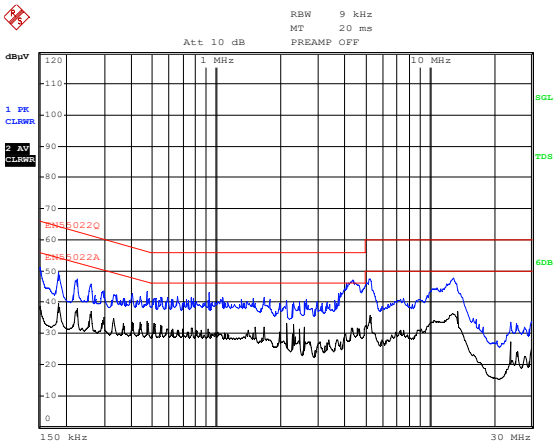
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A, line L



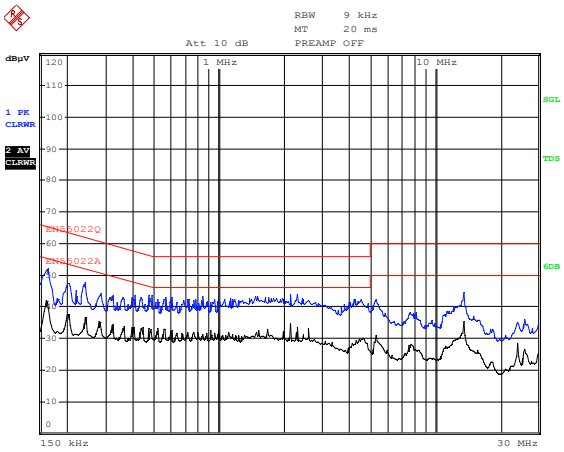
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 9V, I_{OUT} = 3A, line N



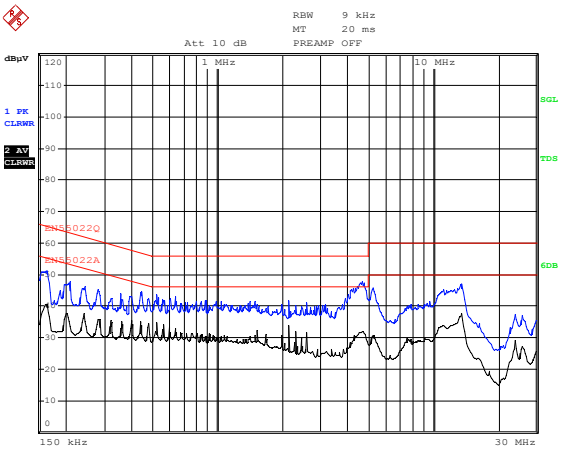
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A, line L



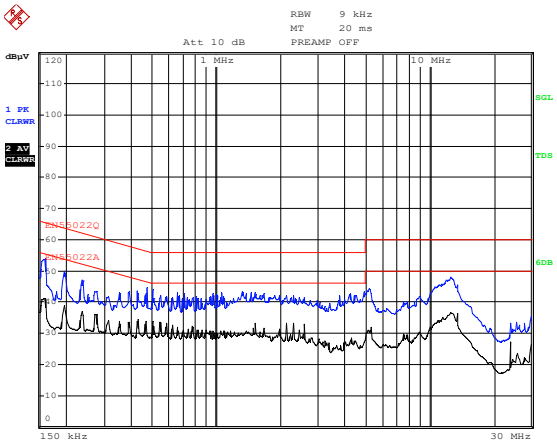
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A, line N



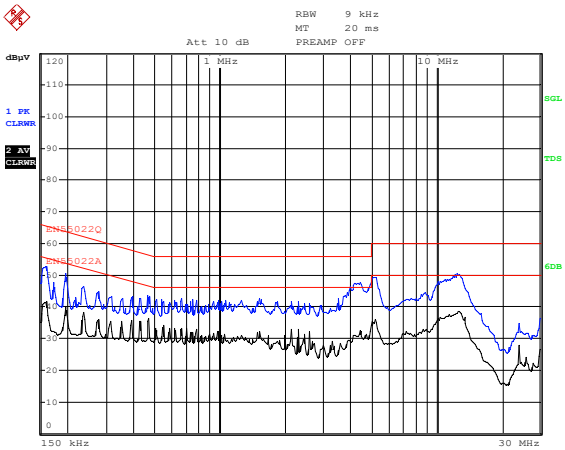
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A, line L



Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 12V, I_{OUT} = 3A, line N



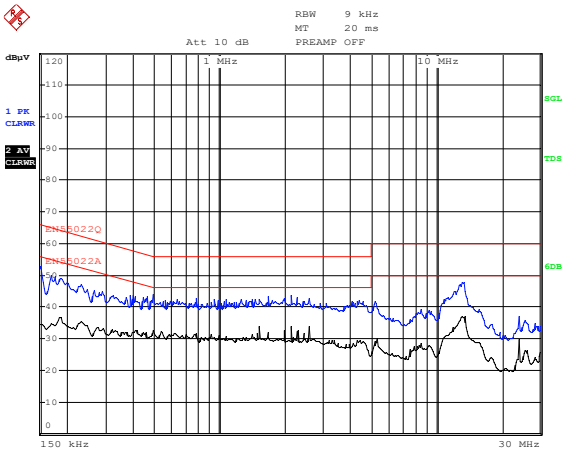
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

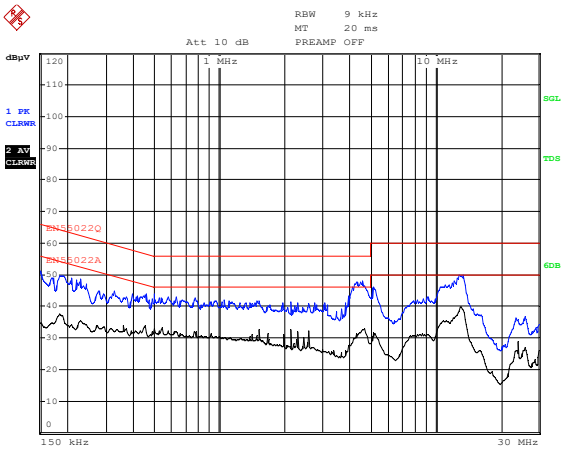
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A, line L



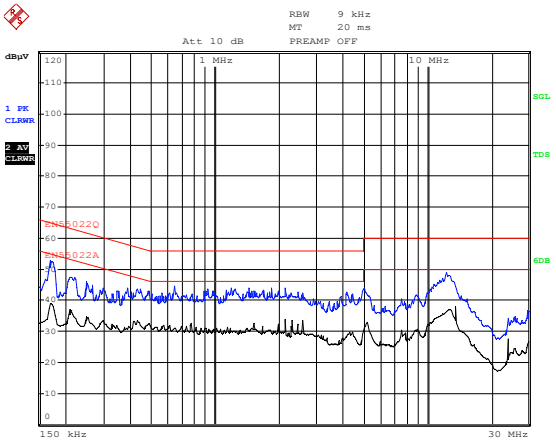
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A, line N



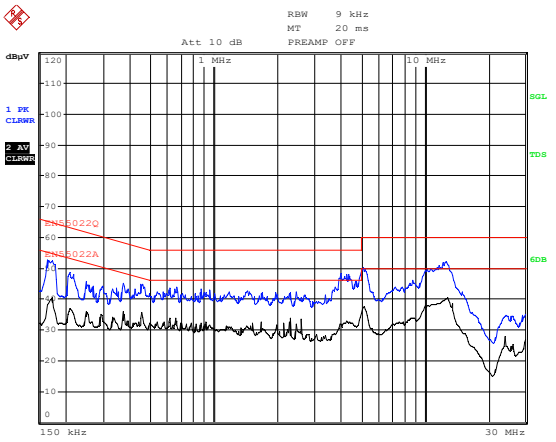
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A, line L



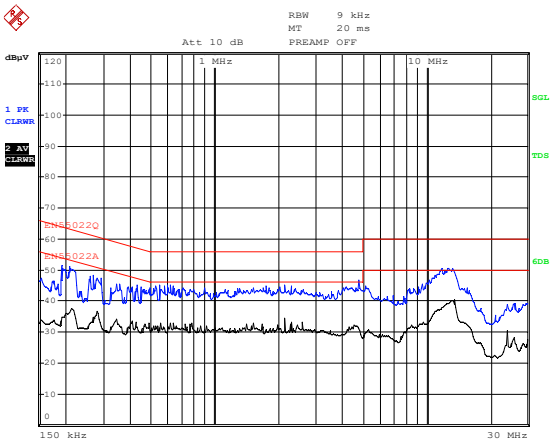
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 15V, I_{OUT} = 3A, line N



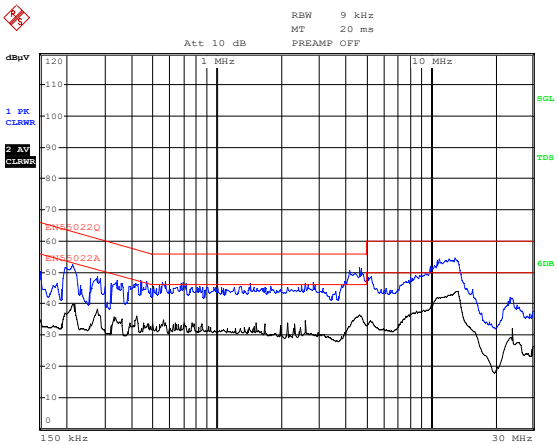
Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, line L



Conducted EMI

V_{IN} = 115V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, line N



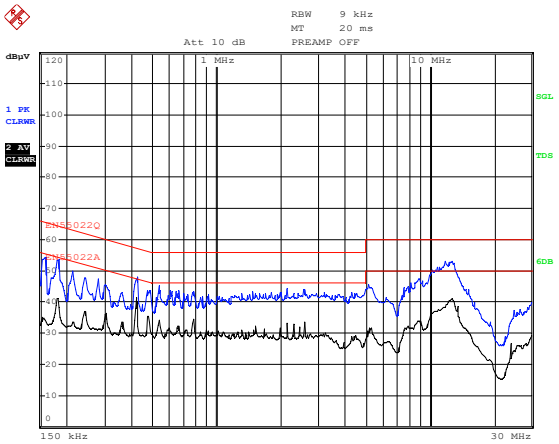
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

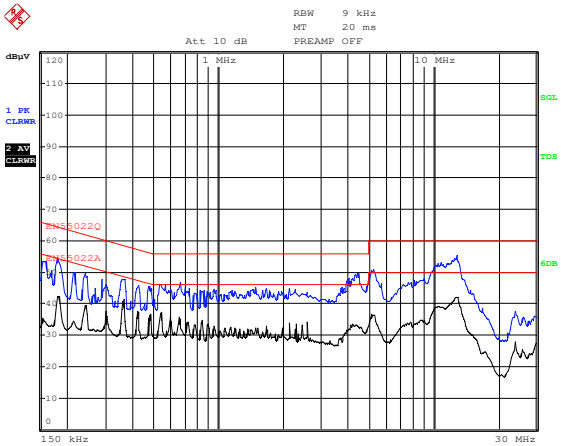
Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, line L



Conducted EMI

V_{IN} = 230V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A, line N



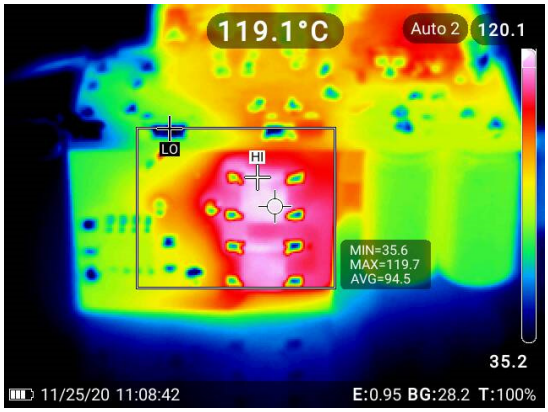
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

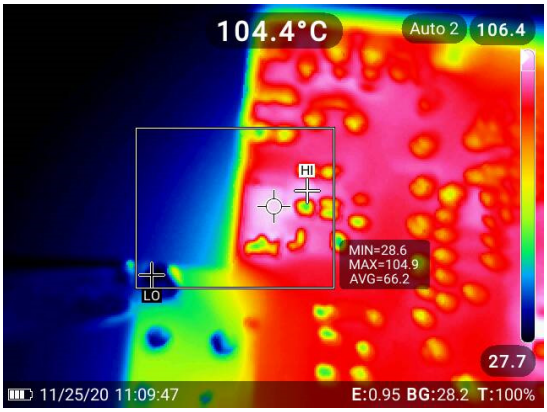
Thermal Measurements

V_{IN} = 90V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
BD1: 119.7°C



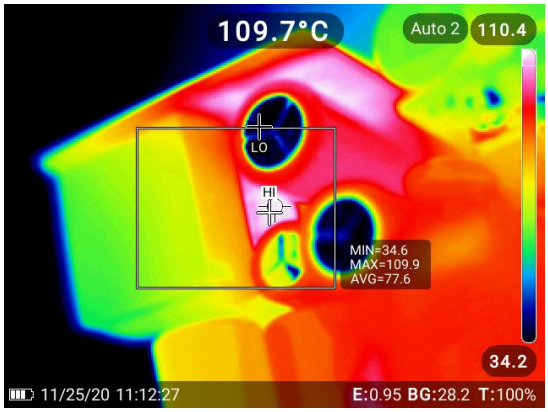
Thermal Measurements

V_{IN} = 90V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
D1: 104.9°C



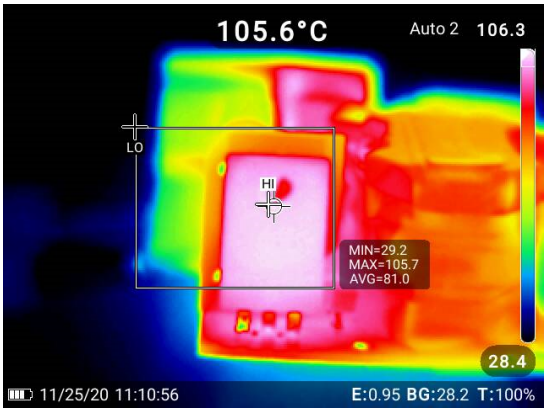
Thermal Measurements

V_{IN} = 90V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
L1: 109.9°C



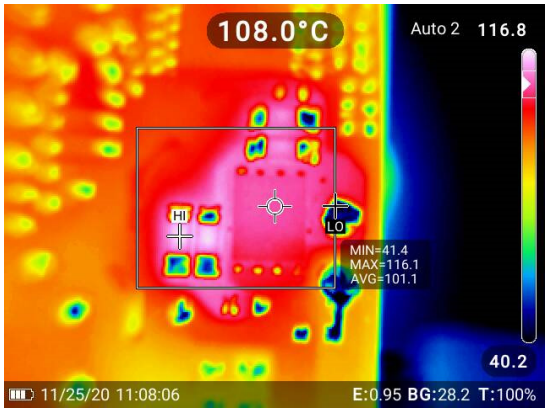
Thermal Measurements

V_{IN} = 90V_{AC}/60Hz, V_{OUT} = 20V, I_O = 3.25A,
Q1: 105.7°C



Thermal Measurements

V_{IN} = 90V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
Q3: 108°C



Thermal Measurements

V_{IN} = 90V_{AC}/60Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
T1: 104.2°C

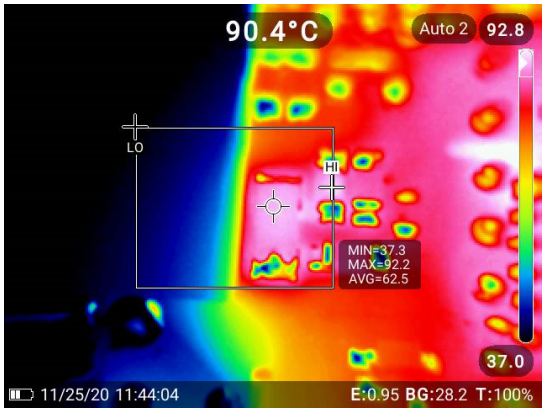
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

Thermal Measurements

V_{IN} = 264V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
D1: 90.4°C

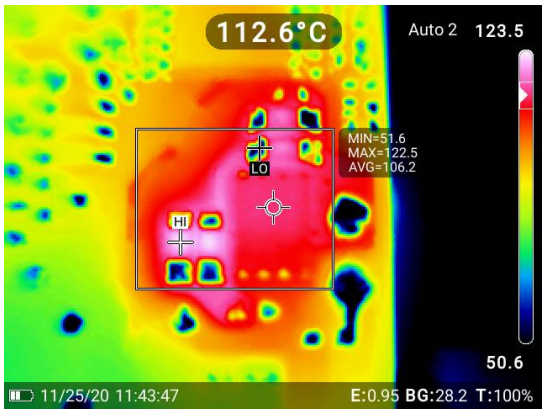


Thermal Measurements

V_{IN} = 264V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
Q1: 82.7°C

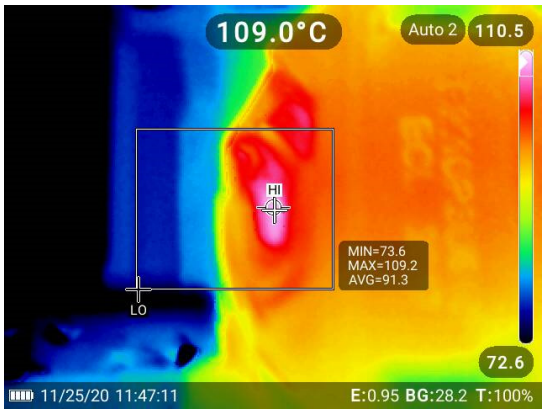
Thermal Measurements

V_{IN} = 264V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
Q3: 112.6°C



Thermal Measurements

V_{IN} = 264V_{AC}/50Hz, V_{OUT} = 20V, I_{OUT} = 3.25A,
T1: 109.2°C



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

PCB LAYOUT

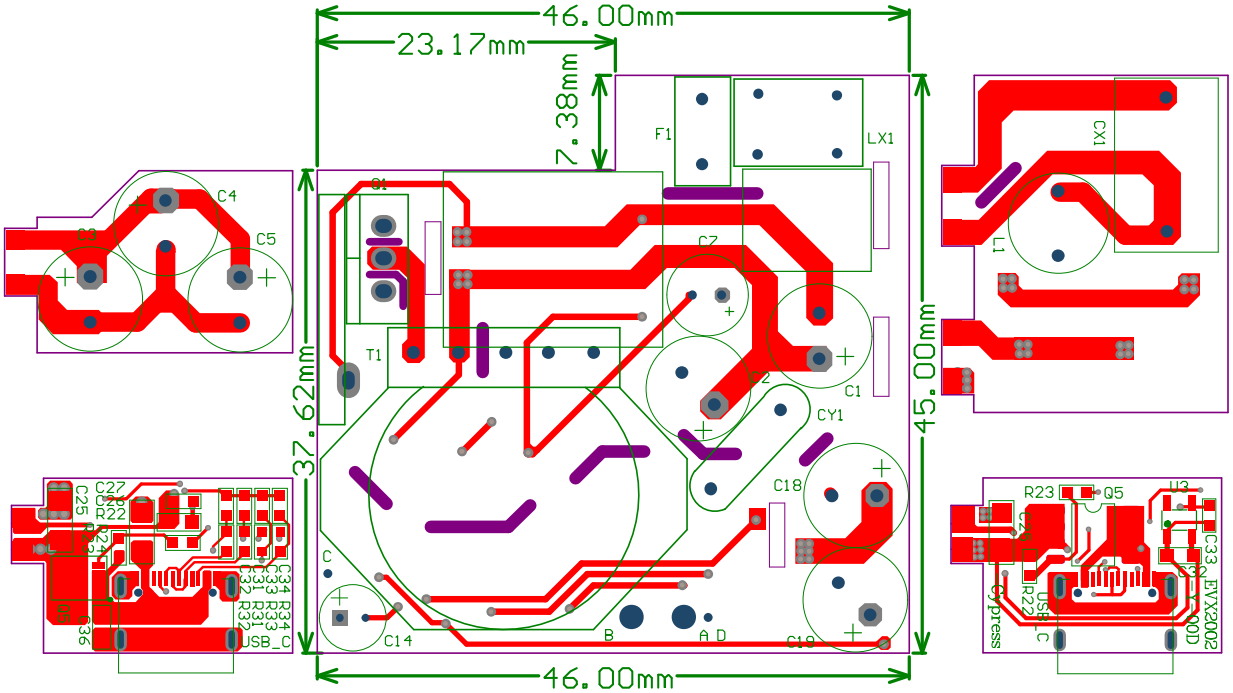


Figure 4: Top Layer

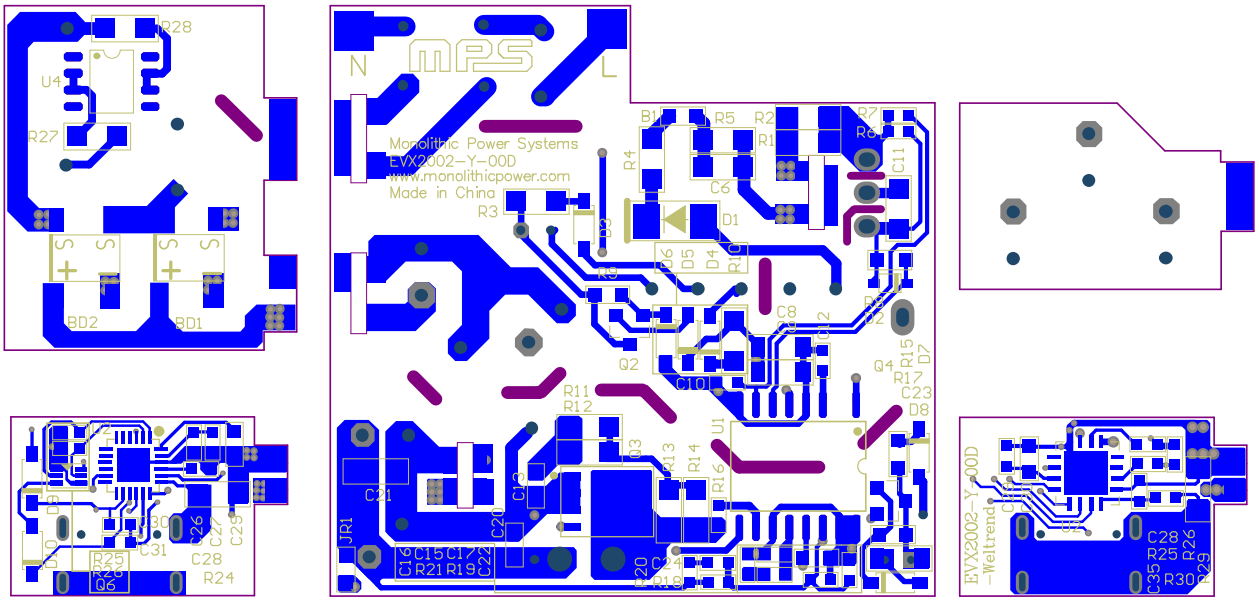


Figure 5: Bottom Layer

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

APPENDIX: FLYBACK TRANSFORMER T1 SPECIFICATION

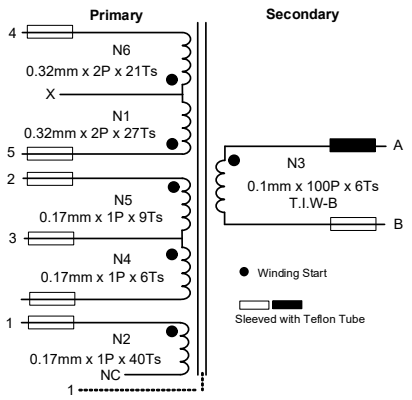


Figure 6: Electrical Diagram

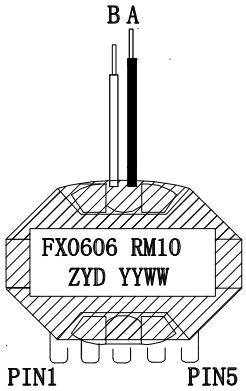


Figure 7: Pin Definition of Bobbin (View from Top)

Figure 8: Winding Diagram

Table 8: Electrical Characteristic

Parameter	Condition	Value
Primary Inductance	L_P (4-5)	610µH ±10%
Leakage Inductance	L_{LK} (4-5)	10µH max
Core	-	RM10 (5 + 0-pin)
Bobbin	-	RM10 (5 + 0-pin)
Core Material	-	PN95
Turn Ratio	N1:N3:N4:N5:N6	27:6:6:9:21

Table 9: Winding Specification

Tape Turns	Winding No.	Start to End	Wire Diameter (φ)	Turns	Winding	Tube
	N1	5 to X	0.32mm x 2P	27Ts	2 full layers	Yes
2Ts						
	N2	1 to NC	0.17mm x 1P	40Ts	1 full layer	Yes
2Ts						
	N3	A to B	0.1mm x 100P (T.I.W-B)	6Ts	1 full layer	Yes
2Ts						
	N4	3 to 1	0.17mm x 1P	6Ts	1 layer spread	Yes
2Ts						
	N5	2 to 3	0.17mm x 1P	9Ts	1 layer spread	Yes
2Ts						
	N6	X to 4	0.32mm x 2P	21Ts	First layer 1 full layer, second layer spread	Yes
3Ts						
	Connect the core to GND (pin 1) via 1.1Ts copper. The core center column is fixed with epoxy resin (3300HL).					

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	2/18/2022	Initial Release	-

Notice: The information in this document is subject to change without notice. Please contact MPS for current specifications. Users should warrant and guarantee that third-party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2022 MPS. All Rights Reserved.