

PFC (Power Factor Correction) IC

Totem Pole PFC Controller Output 330 W 390 V

BM85060FV Reference Board

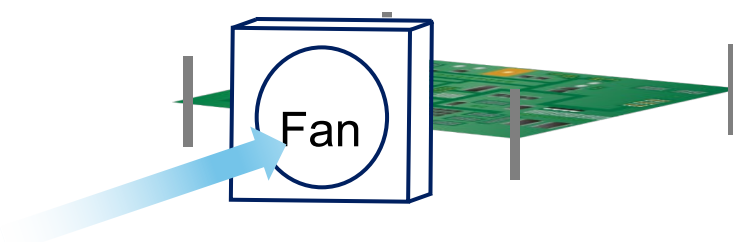
Electronics Characteristics

Not guarantee the characteristics, is representative value.

Unless otherwise noted; $V_{IN} = 230 \text{ Vac}$, $I_{OUT} = 0.85 \text{ A}$, $T_a = 25 \text{ }^{\circ}\text{C}$

Parameter		Min	Typ	Max	Units	Conditions
Input Voltage Range	V_{IN}	90	115/230	264	Vac	
Input Frequency	f_{LINE}	47	50/60	63	Hz	
Output Voltage	V_{OUT}	370	390	409.5	V	
Maximum Output Power	P_{OUT}	-	-	330	W	
Output Current Range ^(Note 1)	I_{OUT}	0.0	-	0.85	A	
Total Harmonic Distortion(THD)	THD	-	-	10	%	
PF(Power Factor)	PF	-	0.99	-	-	
Efficiency	η	-	97.0	-	%	AC115 V $I_{OUT} = 0.85 \text{ A}$
Output Ripple Voltage	V_R	-	10.8	20	Vpp	AC90 V $I_{OUT} = 0.85 \text{ A}$
Hold Time	T_{HOLD}	-	35	-	ms	$V_{OUT} \text{ min } 300 \text{ V}$
Operating Temperature Range	T_{OP}	-10	+25	+35	$^{\circ}\text{C}$	

(Note 1) Cool the component surface temperature with FAN, etc., if necessary, and the load application time so that the temperature does not exceed 105 $^{\circ}\text{C}$.



Operation Procedure

1. Equipment

1. AC power supply 90 to 264 Vac, over 400 W
2. Electronic load capacity 0.85 A which supports input voltage 500 V
3. Multi meter
4. Power meter

2. Connect Method

1. AC power supply presetting range 90 to 264 Vac, Output switch is OFF.
2. Electronic load setting under 0.85 A, Load switch is OFF.
3. The reference board connects to measuring equipment and power supplies as in Figure. 1.
4. AC power supply switch is ON.
(Only starts under light-load conditions.)
5. Check that output voltage is 390 V.
6. Electronic load switch is ON.
7. Operate with enough caution against electric shock because of non-isolated output voltage 390 V.

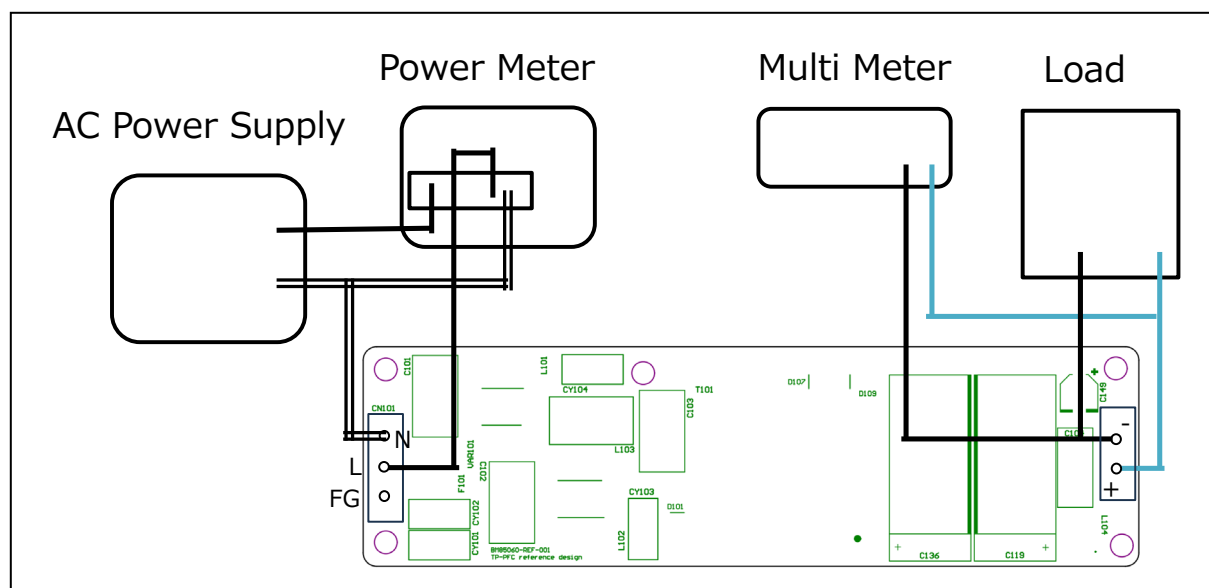
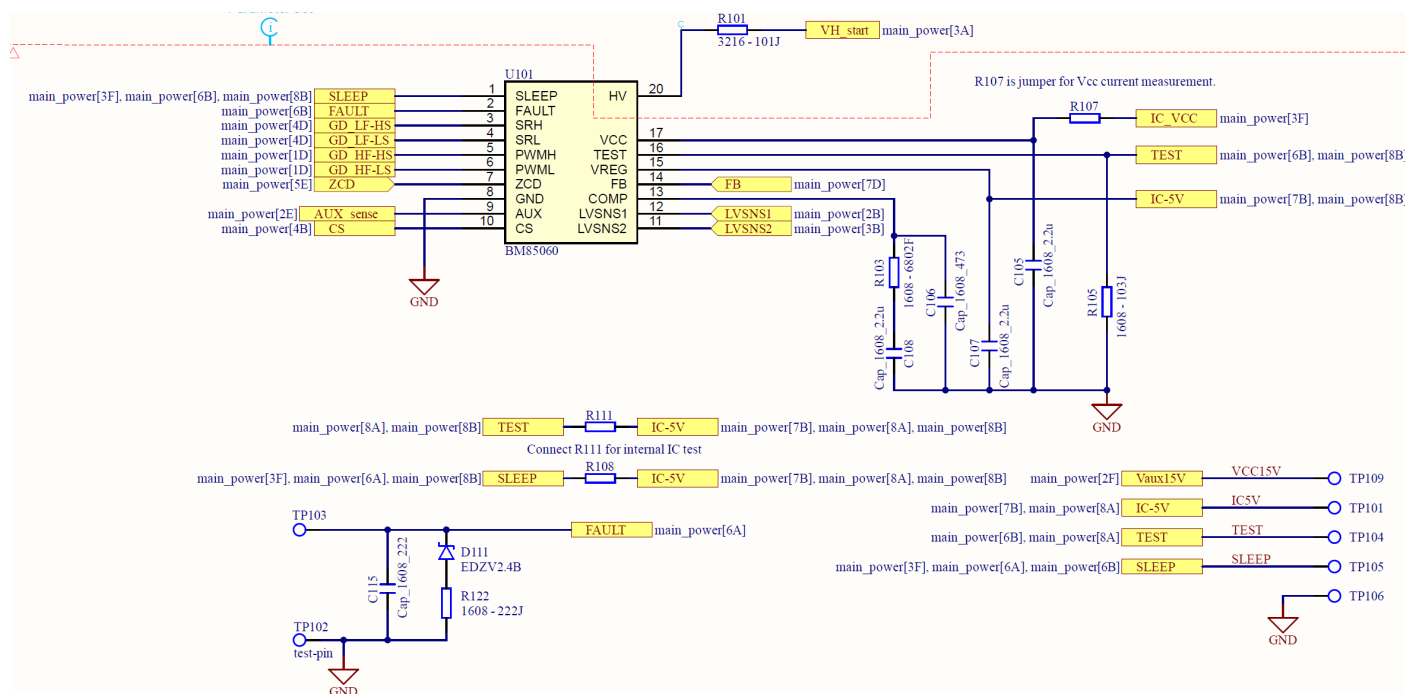
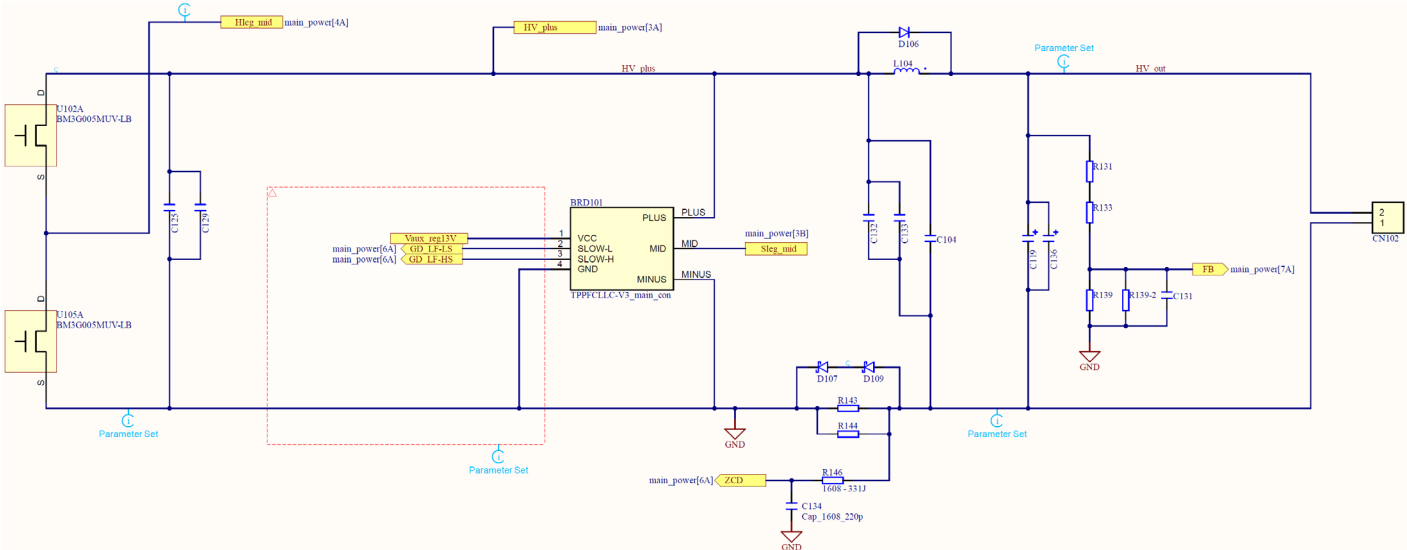
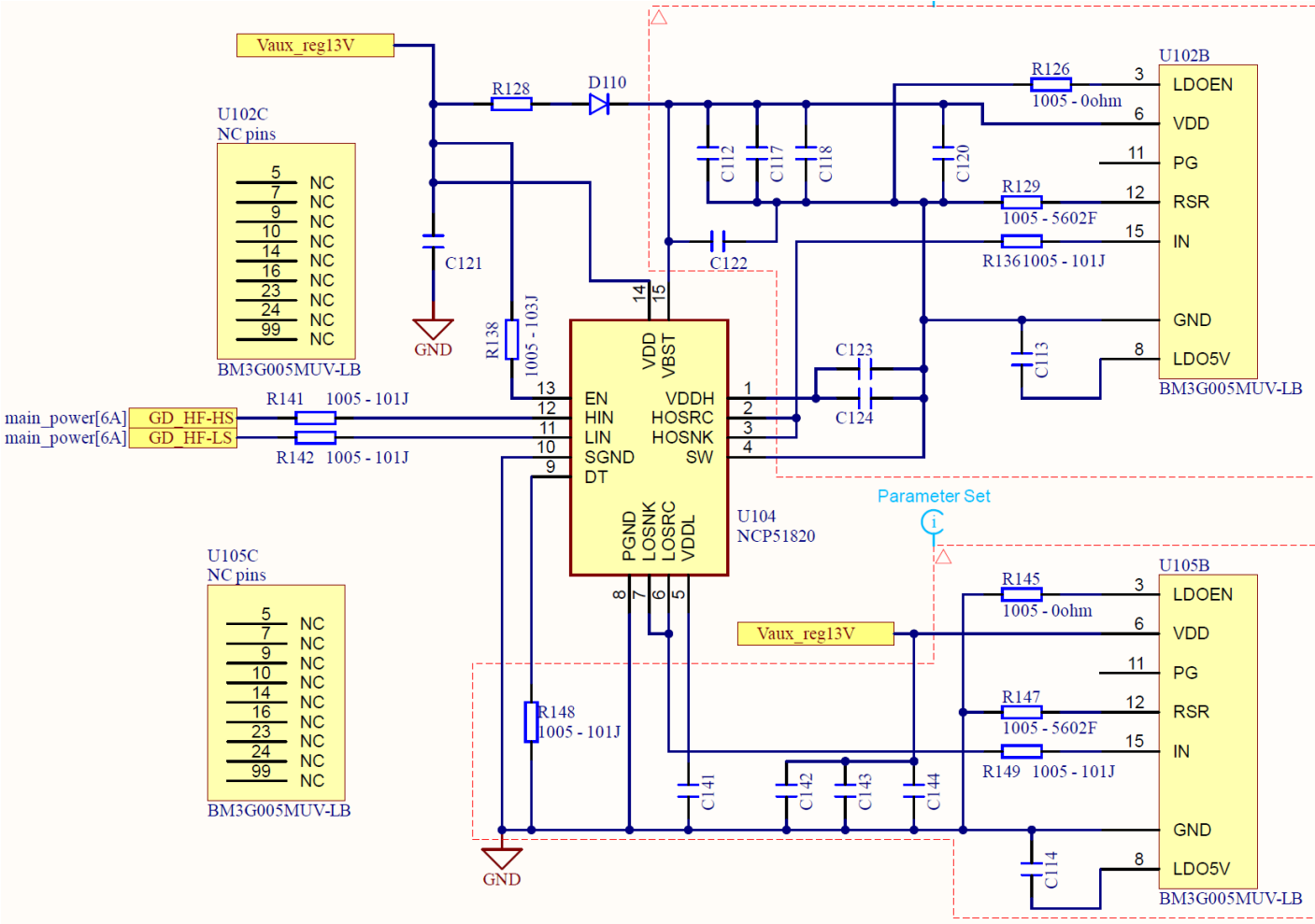


Figure 1. Connection Circuit

$$V_{IN} = 90 \text{ to } 264 \text{ Vac}, V_{OUT} = 390 \text{ V}$$




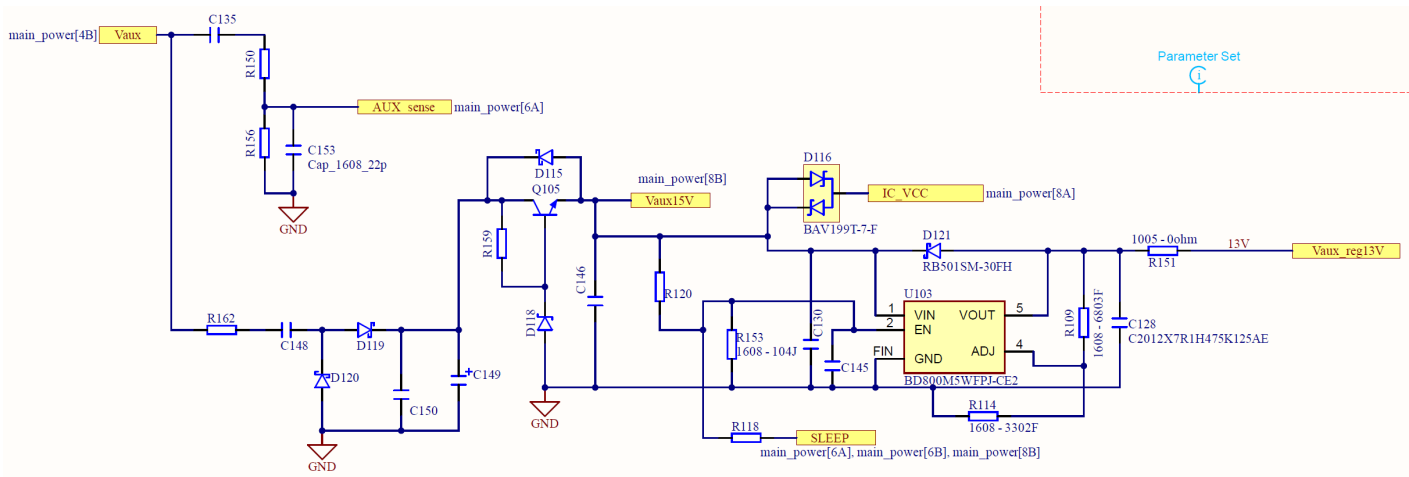


Figure 2. BM85060FV-EVK-001 Main board Schematics

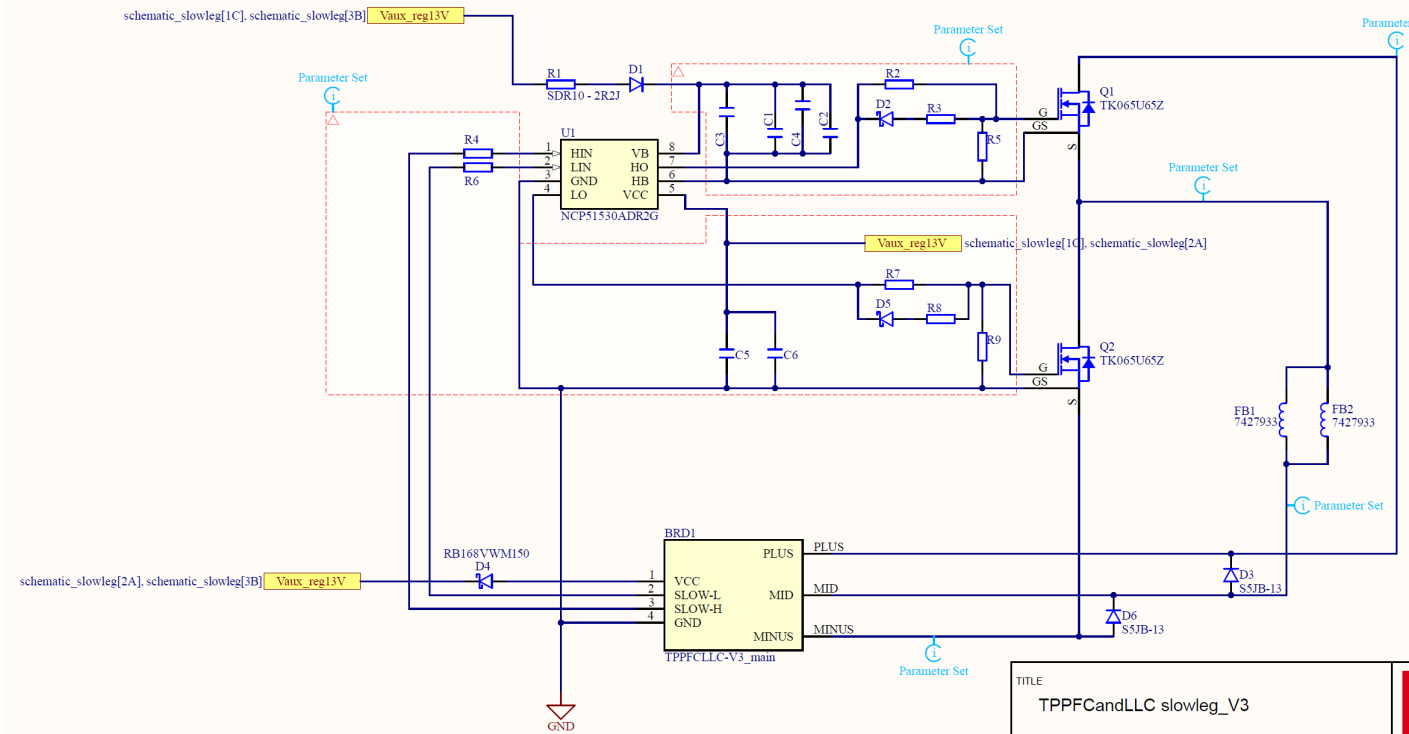


Figure 3. BM85060FV-EVB-001 Daughter board Schematics

Bill of Materials

Main Board

Item	Specification	Parts name	Manufacturer
CN101		1-178136-2	TE Connectivity
CN102		1-917337-2	TE Connectivity
Q105	NPN, 80V 1.5A	2SCR544PHZG	ROHM
C149	47uF,63V	63TLV47M8X10.5	RUBYCON
C119, C136	150uF,450V	EKXN451ELL151MM35S	CHEMICON
R126, R145, R151	0Ω	MCR01SMQPJ000	ROHM
R136, R141, R142, R148, R149	100Ω	MCR01SMQPJ101	ROHM
R138	10kΩ	MCR01SMQPJ103	ROHM
R129, R147	56kΩ	MCR01SMQPF5602	ROHM
R107	0Ω	MCR03SEQPJ000	ROHM
R121	100Ω	MCR03SEQPJ101	ROHM
R120	1kΩ	MCR03SEQPJ102	ROHM
R105, R123	10kΩ	MCR03SEQPF1002	ROHM
R153	100kΩ	MCR03SEQPJ104	ROHM
R122	2.2kΩ	MCR03SEQPJ222	ROHM
R146	330Ω	MCR03SEQPJ331	ROHM
R108, R159	4.7kΩ	MCR03SEQPJ472	ROHM
R117, R119	100kΩ	MCR03SEQPF1003	ROHM
R114	33kΩ	MCR03SEQPF3302	ROHM
R139, R139-2	100kΩ	MCR03SEQPF1003	ROHM
R103	68kΩ	MCR03SEQPF6802	ROHM
R109	680kΩ	MCR03SEQPF6803	ROHM
R111, R118	Non Mounted		
R102	0Ω	RCL06120000Z0EA	VISHAY
R101	100Ω	MCR18SEQPJ101	ROHM
FB101, FB102	39Ω@100MHz	7427933	Wurth elektronik
L103	90uH	7447013	Wurth elektronik
F101	4A,250Vac	40014000440	littelfuse
C101, C102, C103	820nF,275Vac	890324025047CS	Wurth elektronik
D116	0.15A,85V	BAV199T-7-F	Diodes
U103	LDO	BD800M5WFPJ-CE2	ROHM
U102, U105	GaN SIP 50mΩ	BM3G005MUV-LB	ROHM
U101	TPPFC	BM85060FV	ROHM
C128, C146	4.7uF,50V	C2012X7R1H475K125AE	TDK
C112, C117, C118, C150	10uF,50V	C3216X7R1H106K160AE	TDK
C113, C114, C120, C122, C123, C141, C144	0.1uF,50V	GRM155R71H104KE14D	MURATA
C130	0.1uF,50V	C1608X7R1H104K	TDK
C121, C124, C142, C143	1uF,25V	GRM188R71E105KA12D	MURATA
C105, C107, C108	2.2uF,25V	GRM188Z71E225KE43D	MURATA
C135, C145, C148	10nF,50V	C1608X7R1H103K	TDK
C153	22pF,50V	C1608C0G1H220J080AA	TDK
C111	470pF,100V	GRT1885C2A471JA02D	MURATA
C109, C110, C131, C134	220pF,50V	C1608C0G1H221J080AA	TDK
C115	2200pF,50V	GRM1885C1H222JA01D	Murata
C106	0.047uF,50V	C1608X7R1H473K080AE	TDK
C125, C129, C132, C133	0.047uF,630V	CGA5L1X7T2J473K160AE	TDK
CT101	1.33mH	CU8965-ALC	Coilcraft
CY101, CY102, CY103, CY104	1000pF,300Vac	DE1E3RA102MA4BP01F	MURATA
C104	1uF,450Vdc	ECW-FD2W105JB	Panasonic
D111	Zener Diode,2.4V	EDZV2.4B	ROHM
VAR101	275Vac,3.5kA,Φ10mm	ERZ-V10D431CS	Panasonic
R106, R110	Non Mounted		
R131, R133	3.9MΩ	KTR18E2PZF3904	ROHM
R115, R116	4.3MΩ	KTR18E2PZF4304	ROHM
R112, R113	5.6MΩ	KTR18E2PZF5604	ROHM
L101, L102	4mH@100kHz	LDFW005402Y66V0E	CHEMICON
L104	10uF	LPS6235-103MR	Coilcraft
R143, R144	220mΩ	MCR50LJQPFLR220	ROHM
U104	HB-GDIC	NCP51820	Onsemi
D115	SBD,1A,150V	RB168VAM150TR	ROHM
D119, D120	SBD,1A,150V	RB168VWM150	ROHM
D121	SBD,100mA,3V	RB501SM-30FH	ROHM
D103, D104, D105, D108, D110	FRD,800mA,700V	RFN1LAM7STF	ROHM
D107, D109	FRD,20A,200V	RFN2VWM2S	ROHM
D101, D102, D106	5A,600V	S5JB-13	Diodes
R150	10kΩ	SDR03 EZPJ 103	ROHM
R156	4.7kΩ	SDR03 EZPJ 472	ROHM
R104	2.2Ω	SDR10 EZPJ 2R2	ROHM
R128, R162	4.7Ω	SDR10 EZPJ 4R7	ROHM
TP101, TP102, TP103, TP104, TP105, TP106, TP109			
D118	Zener Diode,14.66V	udzv1e-1715b	ROHM
T101	12A, 80uH	ZF2920-AL	Coilcraft

Daughter Board

Item	Specification	Parts name	Monufacturer
C1, C2, C4, C6	10uF,35Vdc	C3216X7R1V106K160AE	TDK
C3, C5	1uF,25Vdc	GRM188R71E105KA12D	MURATA
D1	FRD,800mA,700V	RFN1LAM7STF	ROHM
D2, D5	SBD,530mA,60V	RBR1VWM60A	ROHM
D3, D6	5A,600V	S5JB-13	Diodes
D4	SBD,1A,150V	RB168VWM150	Rohm
Q1, Q2	65mΩ,650V	TK065U65Z,RQ	Toshiba
R1	2.2Ω	SDR10 EZPJ 2R2	ROHM
R2, R7	68Ω	SDR10 EZPJ 680	ROHM
R3, R8	6.8Ω	SDR10 EZPJ 6R8	ROHM
R4, R6	0Ω	MCR03SEQPJ000	ROHM
R5, R9	33kΩ	MCR03SEQPJ333	ROHM
U1	HB-GDIC	NCP51530ADR2G	Onsemi
FB1, FB2	FB, 14A, 23ohm@25MHz	7427933	Würth elektronik

Materials may be changed without notifying.

Size: 170 mm x 47 mm

Top view of the PCB layout for the 1000Y module. The layout shows various components including capacitors (C101, C102, C103, C104, C136, C119, C149), inductors (L101, L102, L103, L104), a transformer (T101), and other components (VAR101, F101, CY101, CY102, CY103, CY104, BRD101). The components are arranged on a rectangular PCB with a central area for the transformer and surrounding areas for other components. The layout is labeled with component names and values.

Figure 4. Main board (Top view)

Bottom view of the PCB showing component placement and labels. The components are labeled with their designations and values, including:

- U101, U102, U103, U104, U105
- Q105, Q106, Q107, Q108, Q109, Q110, Q111, Q112, Q113, Q114, Q115, Q116, Q117, Q118, Q119, Q120, Q121, Q122, Q123, Q124, Q125, Q126, Q127, Q128, Q129, Q130, Q131, Q132, Q133, Q134, Q135, Q136, Q137, Q138, Q139, Q140, Q141, Q142, Q143, Q144, Q145, Q146, Q147, Q148, Q149, Q150, Q151, Q152, Q153, Q154, Q155, Q156, Q157, Q158, Q159, Q160, Q161, Q162, Q163, Q164, Q165, Q166, Q167, Q168, Q169, Q170, Q171, Q172, Q173, Q174, Q175, Q176, Q177, Q178, Q179, Q180, Q181, Q182, Q183, Q184, Q185, Q186, Q187, Q188, Q189, Q190, Q191, Q192, Q193, Q194, Q195, Q196, Q197, Q198, Q199, Q200
- R101, R102, R103, R104, R105, R106, R107, R108, R109, R110, R111, R112, R113, R114, R115, R116, R117, R118, R119, R120, R121, R122, R123, R124, R125, R126, R127, R128, R129, R130, R131, R132, R133, R134, R135, R136, R137, R138, R139, R140, R141, R142, R143, R144, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155, R156, R157, R158, R159, R160, R161, R162, R163, R164, R165, R166, R167, R168, R169, R170, R171, R172, R173, R174, R175, R176, R177, R178, R179, R180, R181, R182, R183, R184, R185, R186, R187, R188, R189, R190, R191, R192, R193, R194, R195, R196, R197, R198, R199, R200
- C101, C102, C103, C104, C105, C106, C107, C108, C109, C110, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C130, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169, C170, C171, C172, C173, C174, C175, C176, C177, C178, C179, C180, C181, C182, C183, C184, C185, C186, C187, C188, C189, C190, C191, C192, C193, C194, C195, C196, C197, C198, C199, C200
- D106, D107, D108, D109, D110, D111, D112, D113, D114, D115, D116, D117, D118, D119, D120, D121, D122, D123, D124, D125, D126, D127, D128, D129, D130, D131, D132, D133, D134, D135, D136, D137, D138, D139, D140, D141, D142, D143, D144, D145, D146, D147, D148, D149, D150, D151, D152, D153, D154, D155, D156, D157, D158, D159, D160, D161, D162, D163, D164, D165, D166, D167, D168, D169, D170, D171, D172, D173, D174, D175, D176, D177, D178, D179, D180, D181, D182, D183, D184, D185, D186, D187, D188, D189, D190, D191, D192, D193, D194, D195, D196, D197, D198, D199, D200
- FB101, FB102
- ROHM SEMICONDUCTOR
- PCB101
- PCB102

Figure 5. Main board (Bottom view)

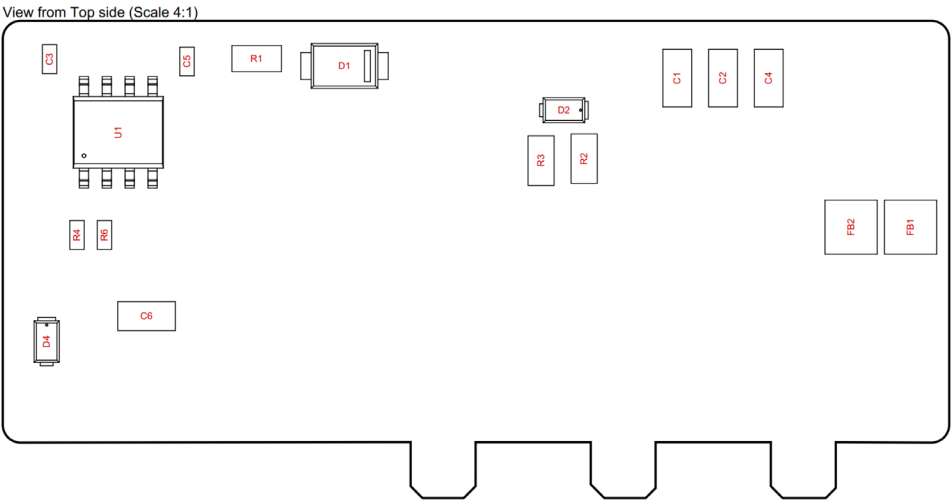


Figure 6. Sub board (Top view)

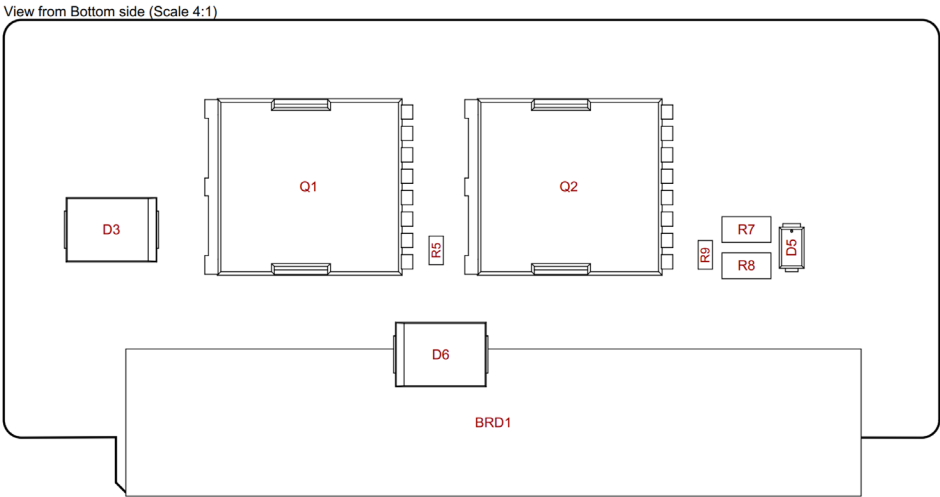


Figure 7. Sub board (Bottom view)

BM85060FV Overview

Feature

- Totem Pole PFC Topology
- Built-in 650V start-up circuit
- Critical Conduction Mode (CRM) Operation
- Support for Discontinuous Current Mode (DCM) at light loads, with a minimum frequency of 25 kHz at that time
- Burst Mode operation at very light loads
- Brownout detection
- X Capacitor Discharge
- Dynamic Response Enhancer

Key Specification

- Operating Power Supply Voltage Range 8.0 V to 36.0 V
- Frequency Range 25kHz~1MHz
- Quiescent Current 150uA
- Operating Temperature Range -40 °C to +105 °C

Package

SSOP-B20

W (Typ) x D (Typ) x H (Max)

6.5 mm x 6.4 mm x 1.25 mm

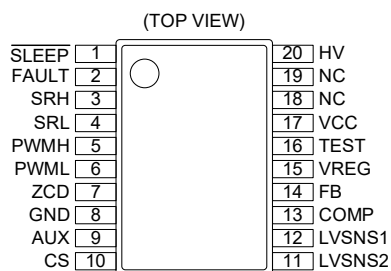


Figure 8. Block Diagram

Table 1. BM85060FV PIN description

Pin No.	Pin Name	Function
1	SLEEP	The pin is held high after VCC UVLO is released except SLEEP or burst mode condition. When burst mode condition is satisfied, this pin held low immediately.
2	FAULT	Dedicated fault trigger pin.
3	SRH	Control signal for high side slow leg device.
4	SRL	Control signal for low side slow leg device.
5	PWMH	PWM logic level output for control of high side fast leg switch.
6	PWML	PWM logic level output for control of low side fast leg switch.
7	ZCD	The pin senses the inductor downslope current and short-circuit current of half-bridge.
8	GND	Ground connection
9	AUX	The pin is used to monitor the switch node resonance on the auxiliary winding and enable valley turn-on during CrM.
10	CS	Connected to current sensing transformer. Current limit is based on the signal on this pin.
11	LVSNS2	Low voltage input for AC line voltage monitoring. LVSNS2 resistor divider should be connected to the neutral of the AC line voltage.
12	LVSNS1	Low voltage input for AC line voltage monitoring. LVSNS1 resistor divider should be connected to AC line side of the boost inductor.
13	COMP	Connection pin to the loop compensation network.
14	FB	This pin senses the PFC output voltage for loop regulation.
15	VREG	Internal regulator output. Capacitor must be connected.
16	TEST	Test pin. This pin must be connected to ground.
17	VCC	Bias supply input
18	NC	Not internally connected. Provision for clearance on the PCB to meet safety requirements.
19	NC	Not internally connected. Provision for clearance on the PCB to meet safety requirements.
20	HV	High voltage startup and X capacitor discharge function.

Performance Data

Load Regulation

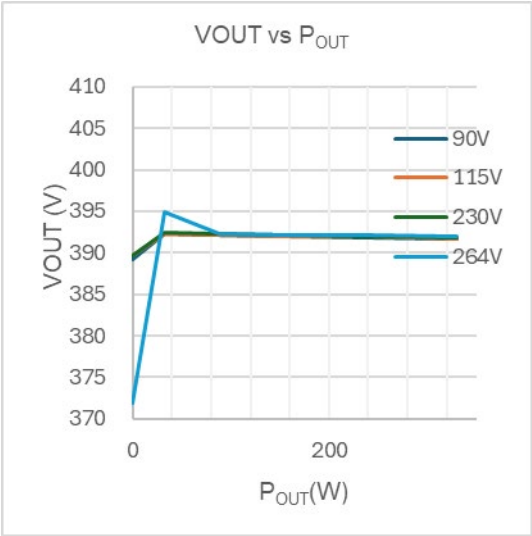


Figure 9. Load Regulation (V_{OUT} vs P_{OUT})

A large output ripple of approximately 50 V was observed at $V_{ac} = 264$ V and $I_{out} = 0.085$ A.

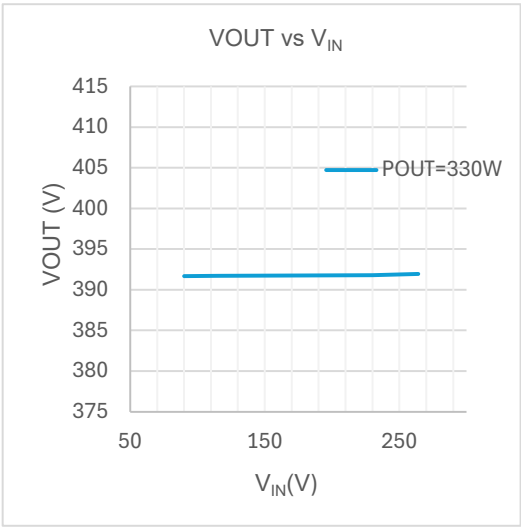


Figure 10. Line Regulation (V_{OUT} vs V_{IN})

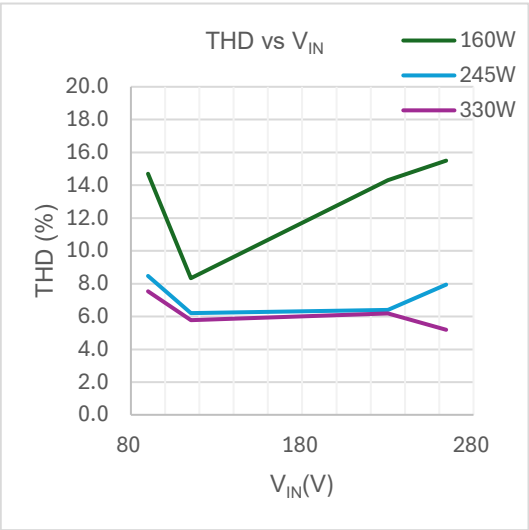


Figure 11. Total Harmonic Distortion (THD vs V_{IN})

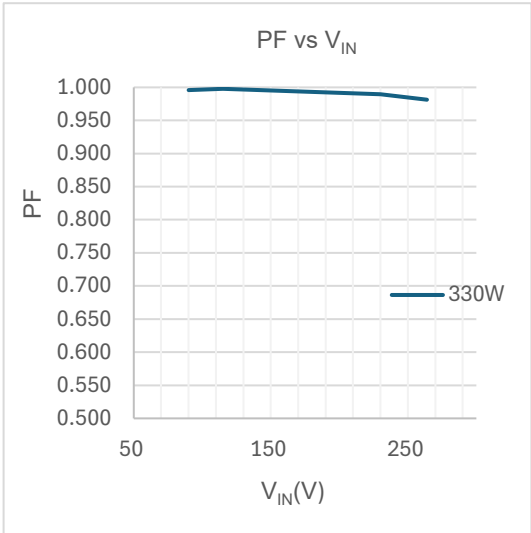


Figure 12. Power Factor (PF vs V_{IN})

Performance data – Continued

Efficiency

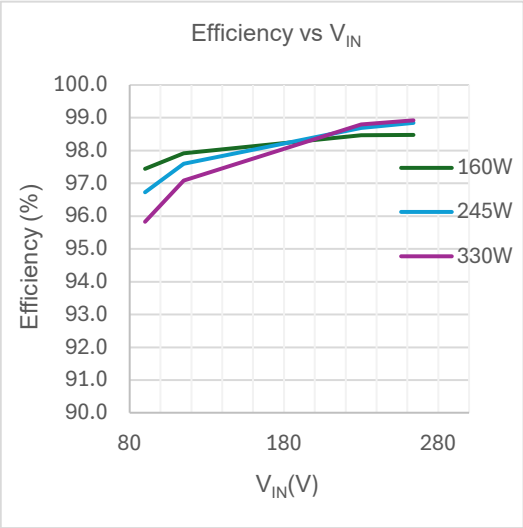


Figure 13. Efficiency (Efficiency vs VIN)

Harmonic Current

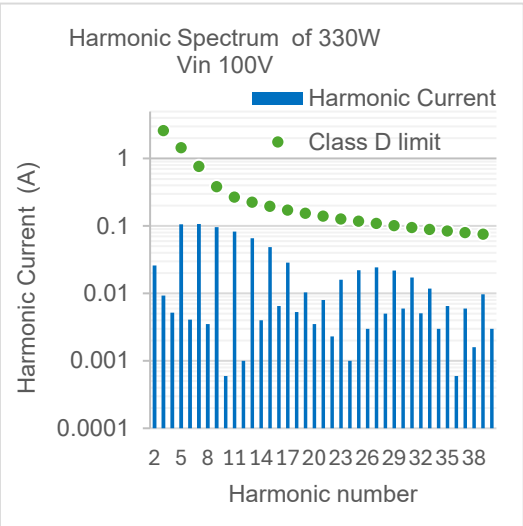


Figure 14. Harmonic Current VIN = 100 Vac

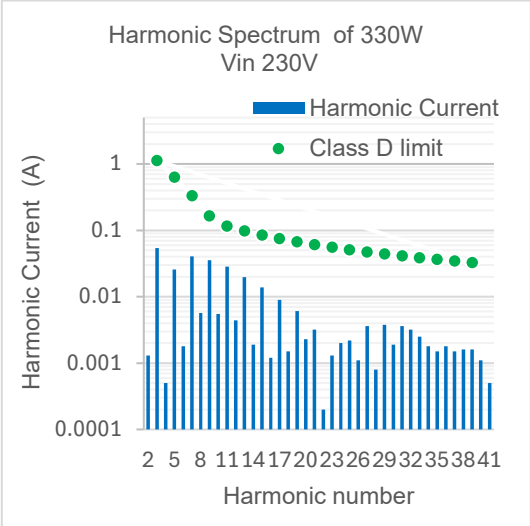


Figure 15. Harmonic Current VIN = 230 Vac

Performance Data – Continued

Input Current

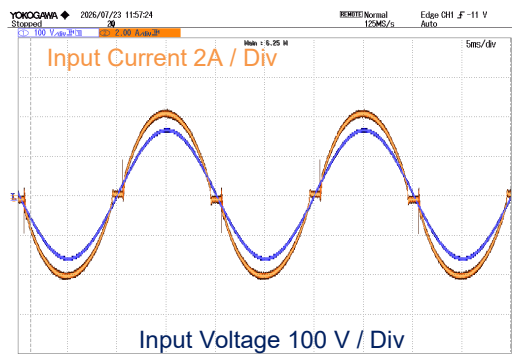


Figure 16. Input Current $V_{IN} = 115\text{ V}_{ac}$, $I_{OUT} = 0.85\text{ A}$

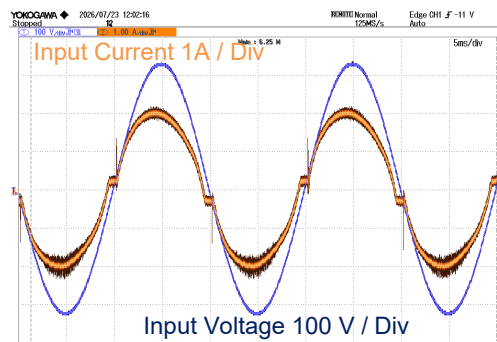


Figure 17. Input Current $V_{IN} = 230\text{ V}_{ac}$, $I_{OUT} = 0.85\text{ A}$

Performance Data – Continued

Hold time

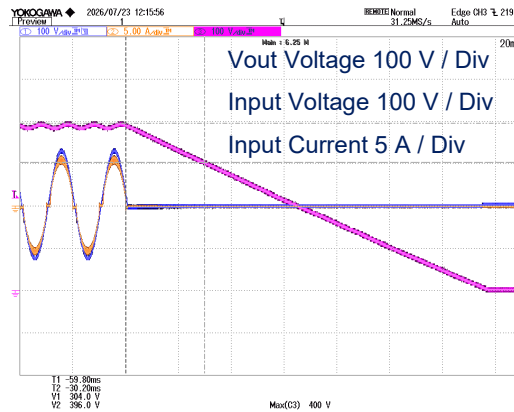


Figure 18. Hold time

Start Up Io = 0 A

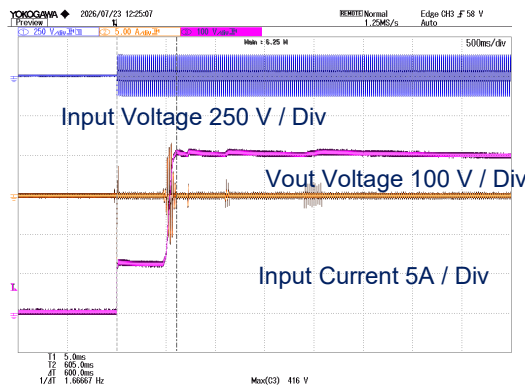


Figure 19. Start Up VIN = 90 Vac

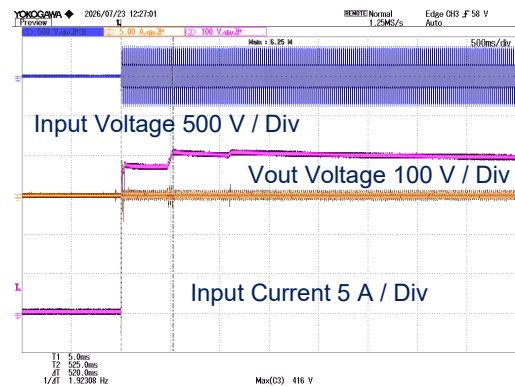


Figure 20. Start Up VIN = 264 Vac

Performance Data - Continued

Load Transient $I_o = 0.085\text{ A} \Leftrightarrow 0.85\text{ A}$

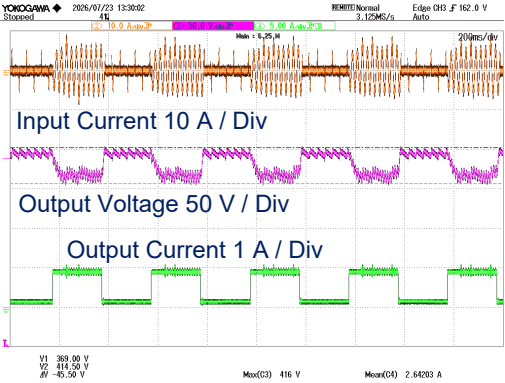


Figure 21. Load Transient $V_{IN} = 90\text{ V}_{AC}$

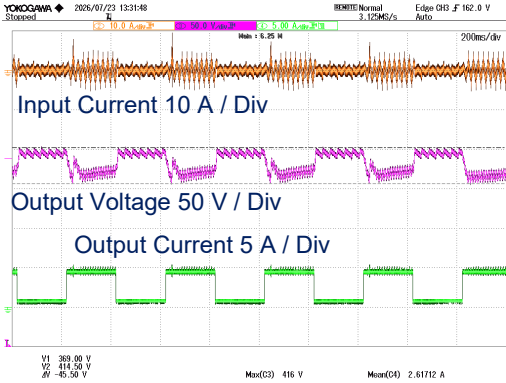


Figure 22. Load Transient $V_{IN} = 264\text{ V}_{AC}$

Output ripple $I_o = 0.85\text{ A}$

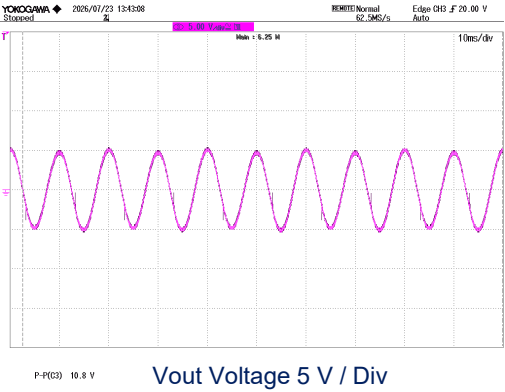


Figure 23. Output ripple $V_{IN} = 90\text{ V}_{AC}$

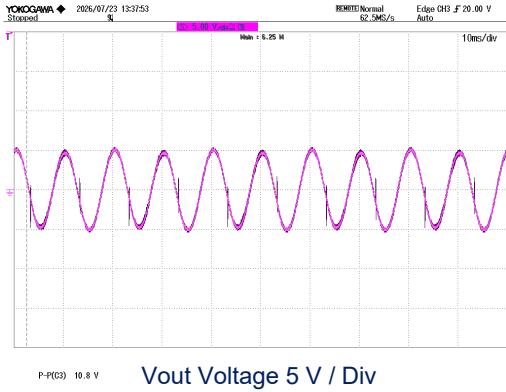


Figure 24. Output ripple $V_{IN} = 264\text{ V}_{AC}$

Performance Data - Continued

EMI

Conducted Emission: CISPR22 Pub 22 Class B

To reduce the influence of the Y-capacitor inside the electronic load, a commercial AC/DC power supply is connected to the EUT output.

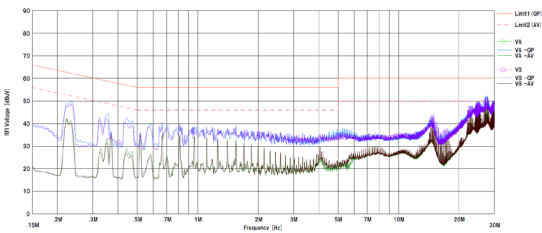


Figure 25. $V_{IN} = 115 V_{ac} / 60 \text{ Hz}$, $I_{OUT} = 0.85 \text{ A}$

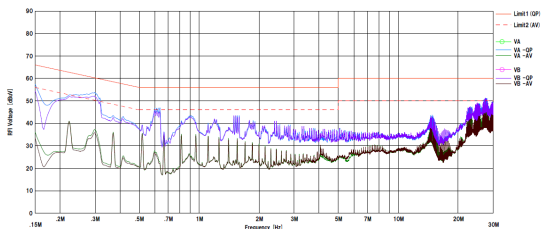


Figure 26. $V_{IN} = 230 V_{ac} / 60 \text{ Hz}$, $I_{OUT} = 0.85 \text{ A}$

Performance Data - Continued

Known Operating Characteristics

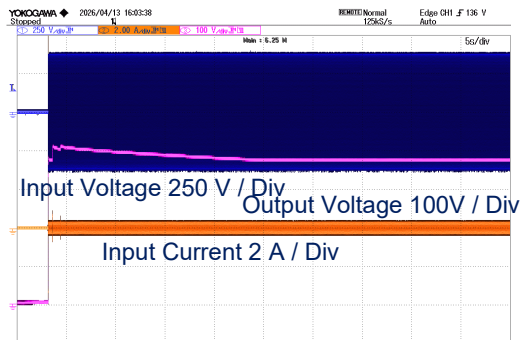


Figure 27. $V_{IN} = 264 \text{ V}_{ac} / 60 \text{ Hz}$, $I_{OUT} = 0 \text{ A}$

Revision History

Date	Rev.	Changes
1.Oct.2026	001	New Release

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