EVAL-RHM4900-AZ

RHM4900

Quad, 40V_{IN}, 3A Silent Switcher µModule Regulator

General Description

The EVAL-RHM4900-AZ evaluation board features the *RHM4900*, a quad output, high-performance, step-down Silent Switcher® power µModule® regulator in a thermally-enhanced 16mm × 11.9mm × 3.32mm, ball-grid array (BGA) package. The EVAL-RHM4900-AZ has a wide operating input voltage range of 5.4V to 40V. The output rails are configured for 5V, 3.3V, 1.5V, and 1.2V. They are resistor programmable from 0.8V to 8V. Each output can provide up to 3A, and phases can also be paralleled together to satisfy higher rail current requirements.

The RHM4900 is a complete multi-output, DC-to-DC, point-of-load (POL) regulator in a compact form factor, requiring only a few input and output capacitors and resistors to set the output voltages and operating frequency. Output voltage tracking is made available by the TRSS pins for supply rail sequencing. External clock synchronization is available through the SYNC pins.

The CLKOUT pins provide for the optional synchronization of additional phases. For reduced noise, spread-spectrum operation is available through the SYNC pin programming. The RHM4900 data sheet must be read in conjunction with this user guide for working on or modifying the EVAL-RHM4900-AZ.

Features and Benefits

- Optional Circuitry for Parallel Operation
- Input EMI Filter (VEMI)

EVAL-RHM4900-AZ Files

FILE	DESCRIPTION
EVAL-RHM4900-AZ	Evaluation board design files.

Ordering Information appears at end of this user guide.

Evaluation Board Photo

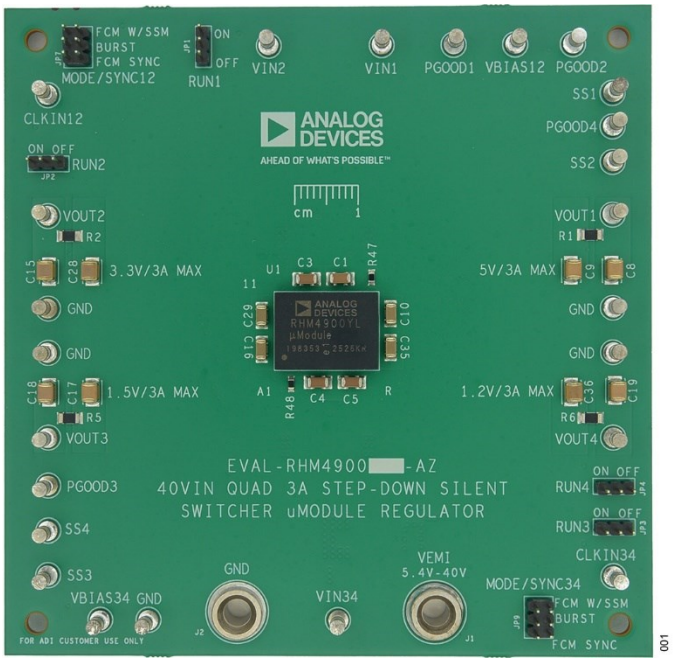

Figure 1. EVAL-RHM4900-AZ Evaluation Board (Part Marking is Either Ink Mark or Laser Mark)

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Performance Summary

Specifications are at T_A = 25°C.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input voltage range		5.4		40	V
Output voltage V_{OUT}	V_{OUT1} V_{OUT2} V_{OUT3} V_{OUT4}		5 3.3 1.5 1.2		V V V V
Maximum continuous output current per phase	Derating is necessary for certain operating conditions. Refer to the RHM4900 data sheet for more details.		3		A
Default operating frequency	V_{OUT1}, V_{OUT2}, (R_T = 28kΩ) V_{OUT3}, V_{OUT4}, (R_T = 100kΩ)		1.2 400		MHz kHz
Efficiency	V_{IN} = 12V V_{OUT} = 5V/3A V_{OUT} = 3.3V/3A V_{OUT} = 1.5V/3A V_{OUT} = 1.2V/3A		See *Figure 3a* 93 91 84 82		 % % % %

Quick Start

Required Equipment

- Power supply
- At least one electronic load.
- At least two digital multimeters (DMMs).

Procedure

The EVAL-RHM4900-AZ evaluation board provides an easy way to evaluate the performance of the RHM4900. See *Figure 2* for test setup connections and use the following procedure.

1. With power off, place the jumpers in the following positions.

JP1	JP2	JP3	JP4	JP7	JP9
RUN1	RUN2	RUN3	RUN4	MODE/SYNC12	MODE/SYNC34
ON	ON	ON	ON	Forced continuous mode (FCM), SYNC	FCM, SYNC

2. Before connecting the input supply, loads, and meters, preset the input voltage supply to be between 5.4V to 40V. Preset the load currents to 0A.

3. With power off, connect the loads, input voltage supply, and meters, as shown in *Figure 2*.

4. Turn on the input power supply. The output voltage meters for each phase should display the programmed output voltage ±2%.

5. Once the proper output voltages are established, adjust the load currents for each phase within the 0A to 3A range. Observe each output's load regulation, efficiency, and other performances. Output voltage ripples for each output should be measured across the furthest output capacitor with a BNC cable and oscilloscope.

6. To observe increased light load efficiency, place the MODE/SYNC pin jumpers (JP7, JP9) in the BURST position. For spread-spectrum operation, place the jumpers in the FCM W/SSM position.

7. To synchronize the VOUT1 and VOUT2 rails to an external clock, connect a clock to CLKIN12 (E19) with MODE/SYNC12 (JP7) set to FCM, SYNC, and to synchronize VOUT3 and VOUT4 to an external clock, connect a clock to CLKIN34 (E20) with MODE/SYNC34 (JP9) set to FCM, SYNC. Set the clock voltage to 50% duty cycle with the clock low-level below 0.8V and clock high-level above 1.5V. Do not exceed 6V on these pins.

8. Optional: An input EMI filter is included on the evaluation board. To include this filter, connect the input supply positive terminal to VEMI. To exclude the input EMI filter, connect the input positive supply to VIN1, VIN2, or VIN34. The VIN1 is the input for the VOUT1 rail, VIN2 is the input for the VOUT2 rail, and VIN34 is the input for the VOUT3 and VOUT4 rails.

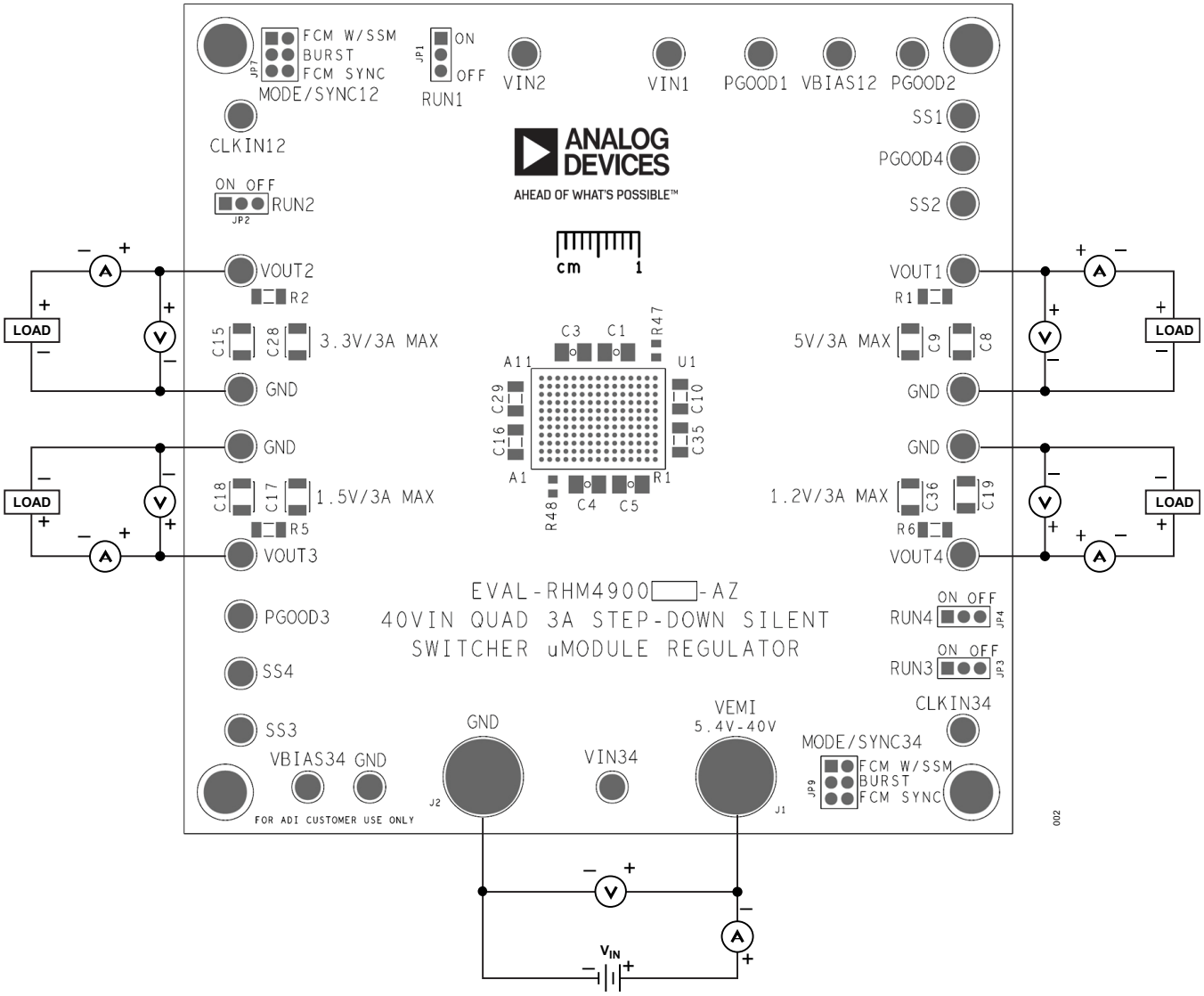
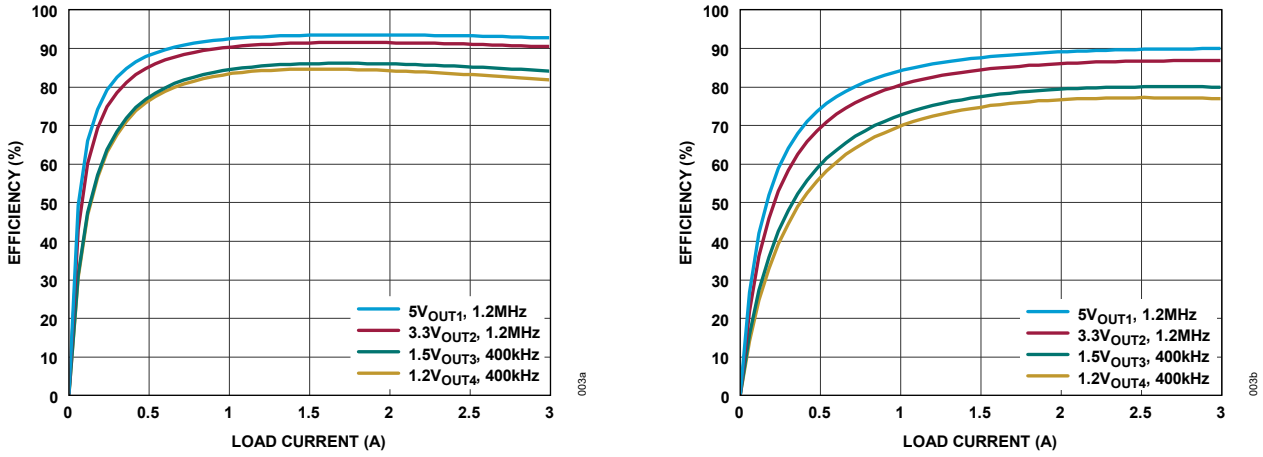


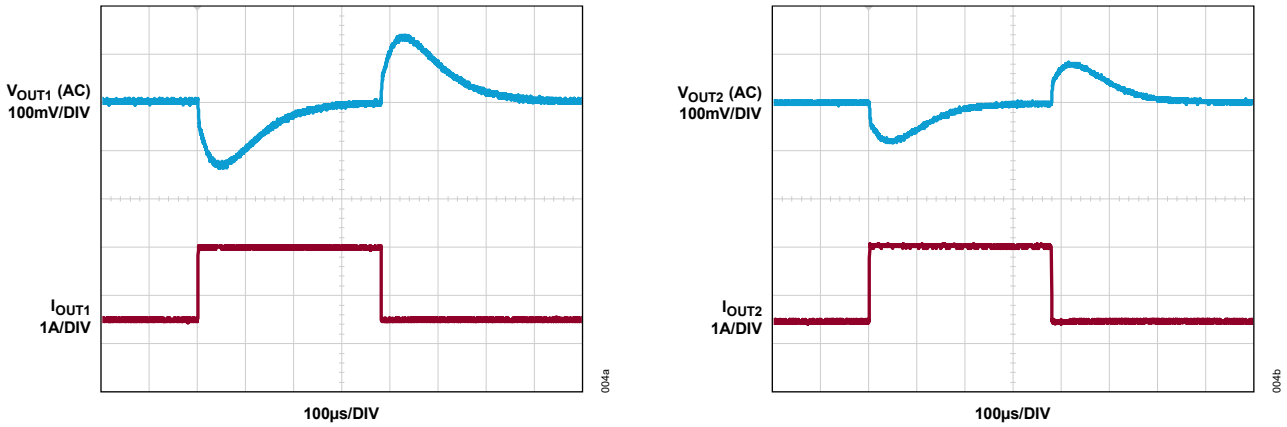
Figure 2. Test Setup of EVAL-RHM4900-AZ

Typical Performance Characteristics



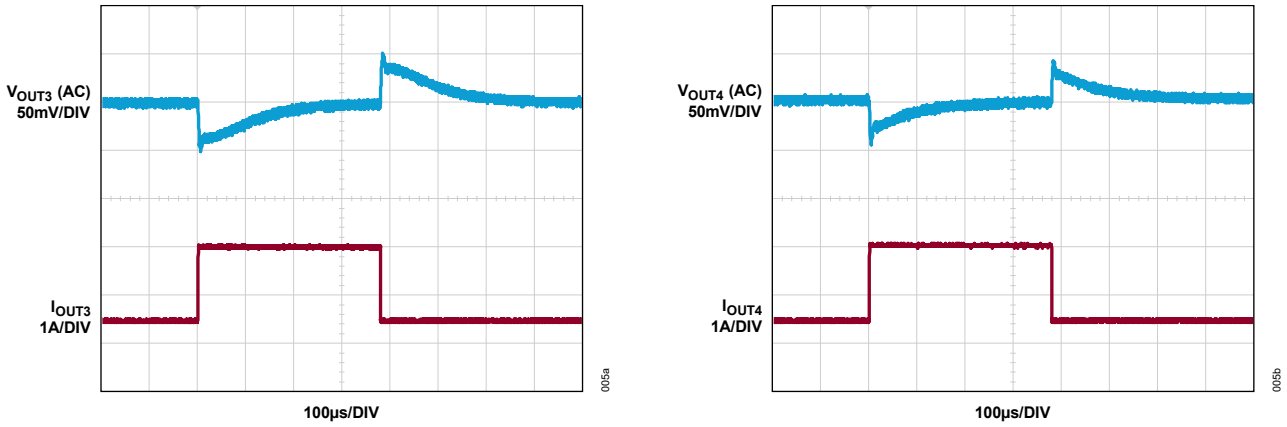
(a) $12V_{IN}$ (b) $24V_{IN}$

Figure 3. Efficiency in Forced Continuous Mode (FCM)



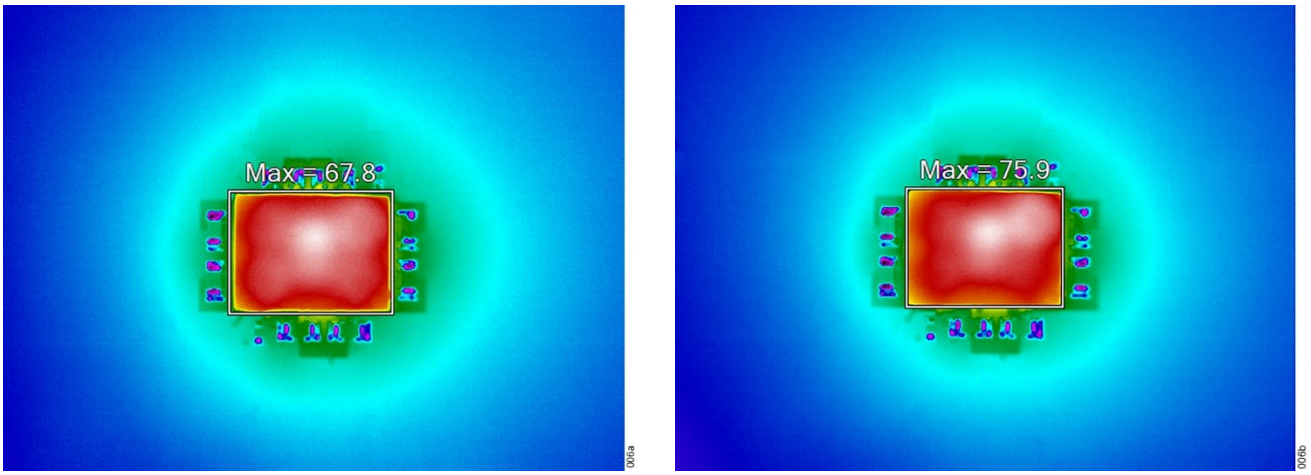
(a) V_{OUT1} = 5V (b) V_{OUT2} = 3.3V

Figure 4. $12V_{IN}$ Measured Transient Responses at 1.5A to 3A Load Step



(a) V_{OUT3} = 1.5V **(b) V_{OUT4} = 1.2V**

Figure 5. $12V_{IN}$ Measured Load Transient Responses at 1.5A to 3A Load Step

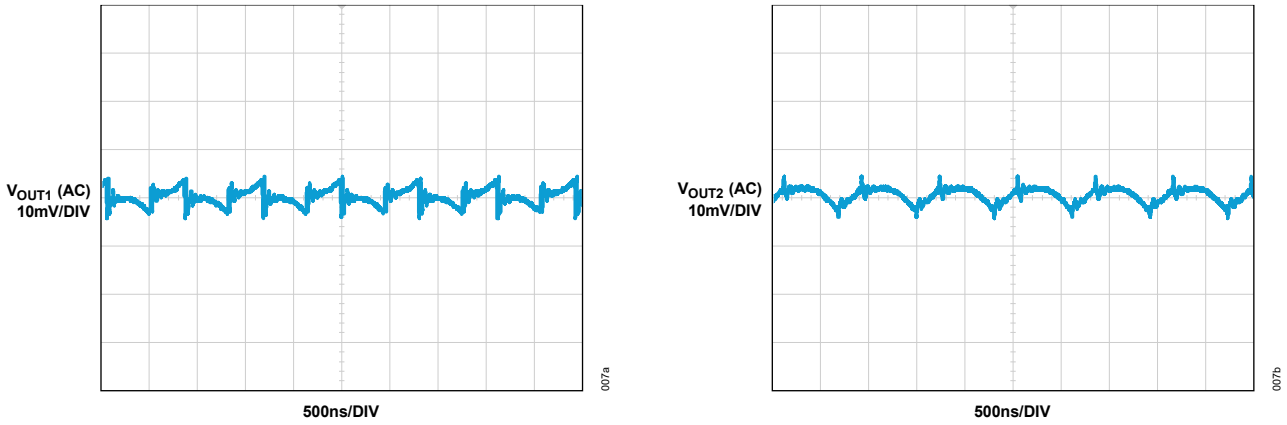


(a) V_{IN} = 12V **(b) V_{IN} = 24V**

V_{IN} (V)	AIRFLOW	HEATSINK	AMBIENT (°C)
12	Natural convection	None	25

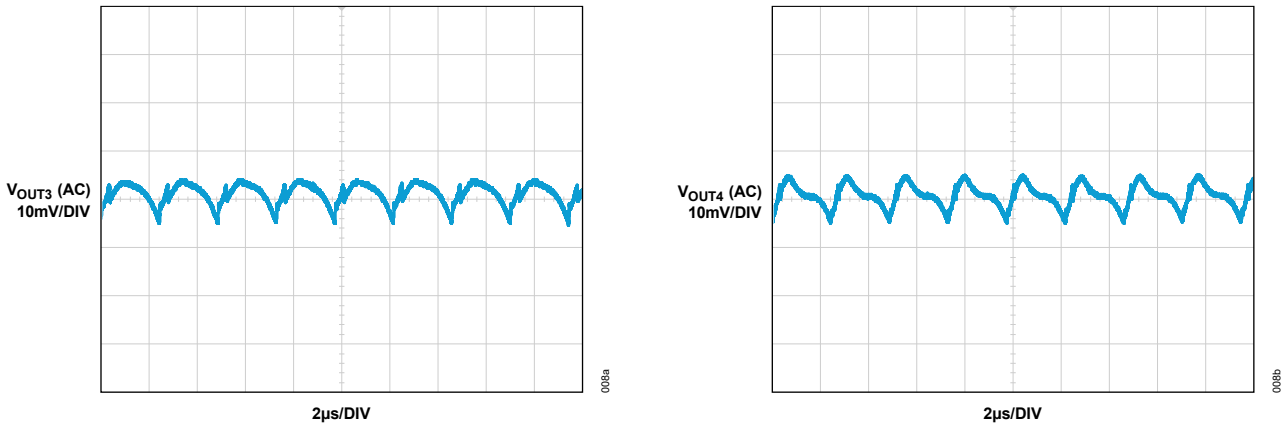
V_{IN} (V)	AIRFLOW	HEATSINK	AMBIENT (°C)
24	Natural convection	None	25

Figure 6. Measured Thermal Captures with 3A Load on Each Output



(a) V_{OUT1} = 5V (b) V_{OUT2} = 3.3V

Figure 7. 12V_{IN} Measured Output Ripple at 3A Load



(a) V_{OUT3} = 1.5V (b) V_{OUT4} = 1.2V

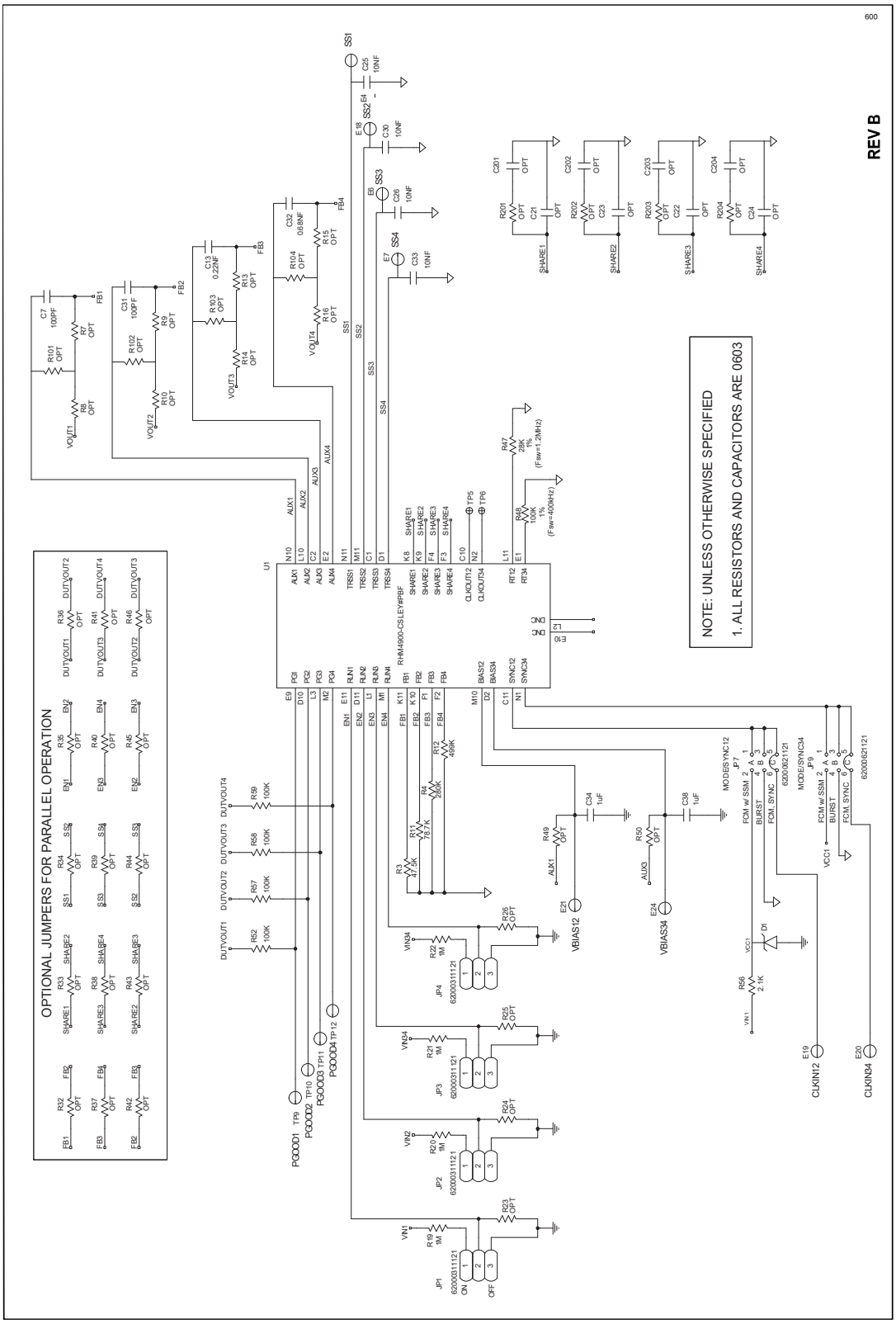
Figure 8. 12V_{IN} Measured Output Ripple at 3A Load

EVAL-RHM4900-AZ Evaluation Board Bill of Materials

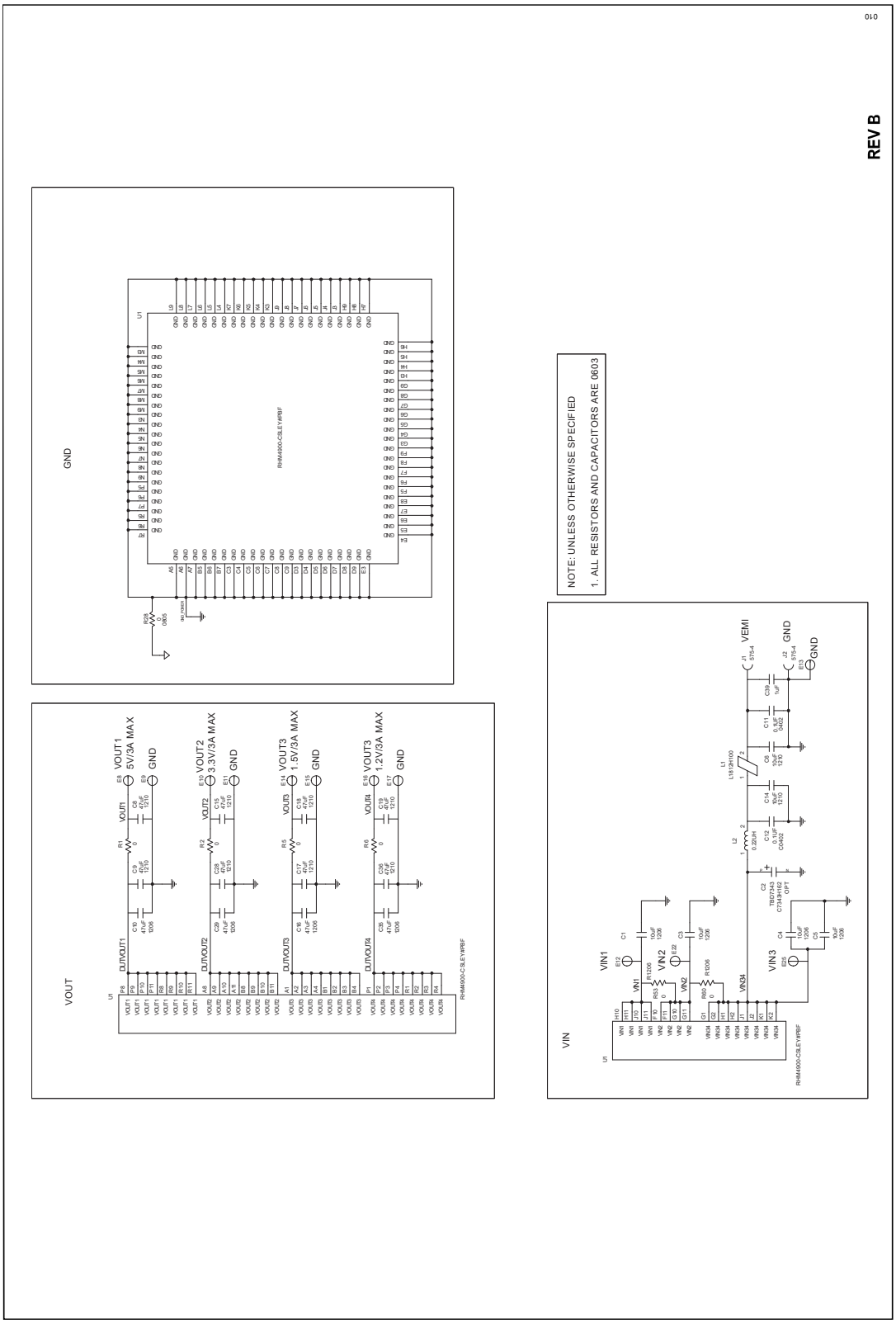
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
REQUIRED CIRCUIT COMPONENTS				
1	4	C1, C3 to C5	CAP., CER, 10µF, 50V, 10%, X5R, 1206	TDK, C3216X5R1H106K160AB
2	4	C10, C16, C29, C35	CAP., CER, 47µF, 6.3V, 20%, X5R, 1206	MURATA, GRM31CR60J476ME19L
3	2	C11, C12	CAP., CER, 0.1µF, 50V, 10%, X7R, 0402, AEC-Q200	MURATA, GCM155R71H104KE02D
4	1	C13	CAP., CER, 0.22nF, 25V, 10%, X7R, 0603	AVX CORPORATION, 06033C221KAT2A
5	2	C6, C14	CAP., CER, 10µF, 50V, 10%, X7R, 1210	MURATA, GRM32ER71H106KA12L
6	8	C8, C9, C15, C17 to C19, C28, C36	CAP., CER, 47µF, 6.3V, 10%, X7R, 1210, AEC-Q200	MURATA, GCM32ER70J476KE19L
7	4	C25, C26, C30, C33	CAP., CER, 10nF, 16V, 10%, X5R, 0603	AVX CORPORATION, 0603YD103KAT2A
8	2	C7, C31	CAP., CER, 100pF, 16V, X7R, 10%, 0603	YAGEO, CC0603KRX7R7BB101
9	1	C32	CAP., CER, 0.68nF, 25V, 5%, C0G, 0603	AVX CORPORATION, 06033A681JAT2A
10	3	C34, C38, C39	CAP., CER, 1µF, 50V, 10%, X5R, 0603, AEC-Q200	MURATA, GRT188R61H105KE13D
11	1	D1	DIO., ZENER, 3.9V, 0.2W, SOD-323	DIODES INC., BZT52C3V9S-7-F
12	1	L1	IND., FERRITE BEAD, 100Ω AT 100MHz, 25%, 8A, 0.006Ω, 1812, AEC-Q200	WURTH ELEKTRONIK, 74279226101
13	1	L2	IND., POWER SHIELDED, 0.22µH, 30%, 9.5A, 0.0073Ω, 1616	WURTH ELEKTRONIK, 744373240022
14	4	R1, R2, R5, R6	RES., SMD, 0Ω, 1%, 1/4W, 1206	VISHAY, WSL120600000ZEA9
15	1	R11	RES., SMD, 78.7kΩ, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ-3EKF7872V
16	1	R12	RES., SMD, 499kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603499KFKEA
17	4	R19 to R22	RES., SMD, 1MΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031M00FKEA
18	1	R28	RES., SMD, 0Ω, JUMPER, 1/8W, 0805, AEC-Q200	VISHAY, CRCW08050000Z0EA
19	1	R3	RES., SMD, 47.5kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060347K5FKEA
20	1	R4	RES., SMD, 280kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603280KFKEA
21	1	R47	RES., SMD, 28kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW060328K0FKEA
22	5	R48, R52, R57 to R59	RES., SMD, 100kΩ, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603100KFKEA
23	2	R53, R60	RES., SMD, 0Ω, 5%, 1/4W, 1206, AEC-Q200	VISHAY, CRCW12060000Z0EA
24	1	R56	RES., SMD, 2.1kΩ, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ-3EKF2101V

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
25	1	U1	IC-ADI, QUAD 40V_{IN}, 3A STEP-DOWN Silent Switcher µModule REGULATOR, BGA-165	ADI, RHM4900IY-CSL#PBF
OPTIONAL CIRCUIT COMPONENTS				
1	0	C2	CAP., OPTION, 7343	
2	0	C21-C24, C201-C204	CAP., OPTION, 0603	
3	0	R7 to R10, R13 to R16, R23 to R26, R32 to R35, R37 to R40, R42 to R45, R49, R50, R101 to R104, R201 to R204	RES., OPTION, 0603	
4	0	R36, R41, R46	RES., OPTION, 2512	
Hardware: For Demo Board Only				
1	24	E4, E6 to E22, E24, E25, TP9 to TP12	CONN-PCB, TEST POINT, TURRET, 0.094-INCH, MTG. HOLE	MILL-MAX, 2501-2-00-80-00-00-07-0
2	2	J1, J2	CONN-PCB, BANANA JACK, FEMALE, NON-INSULATED, THT, SWAGE, 0.218-INCH LENGTH	KEYSTONE ELECTRONICS, 575-4
3	4	JP1 to JP4	CONN-PCB, 3-POS, MALE, HDR, SINGLE ROW, 2mm PITCH, 2.70mm	WURTH ELEKTRONIK, 62000311121
4	2	JP7, JP9	CONN-PCB, 6-POS, MALE, HDR, DUAL ROW, 2mm PITCH, 2.70mm	WURTH ELEKTRONIK, 62000621121
5	4	MH1 to MH4	STANDOFF, SELF-RETAINING SPACER, 12.7mm LENGTH	WURTH ELEKTRONIK, 702931000
6	6	XJP1 to XJP4, XJP7, XJP9	SHUNT, FEMALE, 2-POS, 2mm	WURTH ELEKTRONIK, 60800213421

EVAL-RHM4900-AZ Evaluation Board Schematic



EVAL-RHM4900-AZ Evaluation Board Schematic (Continued)



Ordering Information

PART	TYPE
EVAL-RHM4900-AZ	Evaluation board featuring the RHM4900, a quad output, high-performance, step-down Silent Switcher® power µModule regulator for CSL applications.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
Rev. 0	07/26	Initial release.	—

Notes