LTM8024
40V, Dual 3A Step-Down µModule Regulator

DESCRIPTION

Demonstration circuit 1868A is a dual step-down DC/DC switching converter featuring the LTM®8024 µModule regulator. The demo board is designed to deliver dual 5V/3A and 3.3V/3A outputs from a 7V to 40V input. The Silent Switcher® architecture minimizes EMI while achieving high efficiency at frequencies up to 3MHz. The modes of operation (Burst Mode or Discontinuous Mode/SYNC) are jumper selectable. Burst Mode operation improves efficiency at light loads.

The LTM8024 is a fixed frequency PWM regulator with current mode control scheme. The switching frequency is set by an appropriate resistor (R11) from the RT pin to ground. The RUN pins (EN1/EN2 terminals) can be used to set the LTM8024 in micro power shutdown mode. The power good output of each channel (PG1 or PG2 terminal) will be low when that channel's output voltage is outside of the ±7.5% regulation window.

The LTM8024 data sheet gives a complete description of the operation and application information. The data sheet must be read in conjunction with this demo manual.

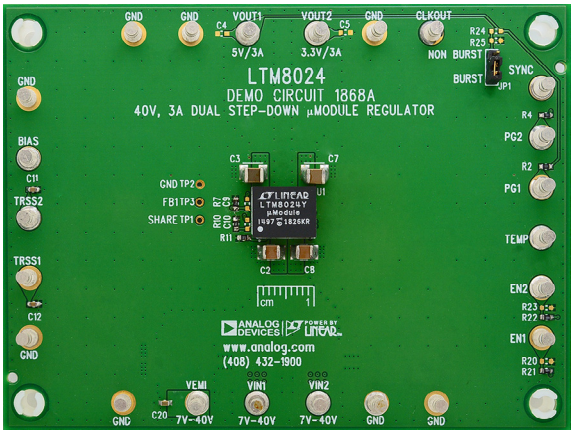
Design files for this circuit board are available.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITION	VALUE
Input Voltage Range		7V to 40V
Output Voltage, V_{OUT1}	V_{IN} = 7V to 40V, I_{OUT1} = 0A to 3A	5V ± 3%
Output Voltage, V_{OUT2}	V_{IN} = 7V to 40V, I_{OUT2} = 0A to 3A	3.3V ± 3%
Maximum Output Current, I_{OUT1}	V_{IN} = 7V to 40V, V_{OUT1} = 5V	3A
Maximum Output Current, I_{OUT2}	V_{IN} = 7V to 40V, V_{OUT2} = 3.3V	3A
Typical Switching Frequency		1MHz
Typical Efficiency, V_{OUT1} (5V)	V_{IN} = 12V, I_{OUT1} = 3A	93.2%
Typical Efficiency, V_{OUT2} (3.3V)	V_{IN} = 12V, I_{OUT2} = 3A	91.3%

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit 1868A is easy to set up to evaluate the performance of the LTM8024. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to V_{IN1} (7V – 40V) and GND (input return).
2. Connect the 5V output load between V_{OUT1} and GND (Initial load: no load); and connect the 3.3V output load between V_{OUT2} and GND (Initial load: no load).
3. Connect the DVMs to the input and outputs.
4. Turn on the input power supply and check for the proper output voltages. V_{OUT1} should be 5V ± 3%; V_{OUT2} should be 3.3V ± 3%.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, efficiency and other parameters.

NOTE: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 2 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (–) terminals of an output capacitor. The probe's ground ring needs to touch the (–) lead and the probe tip needs to touch the (+) lead.

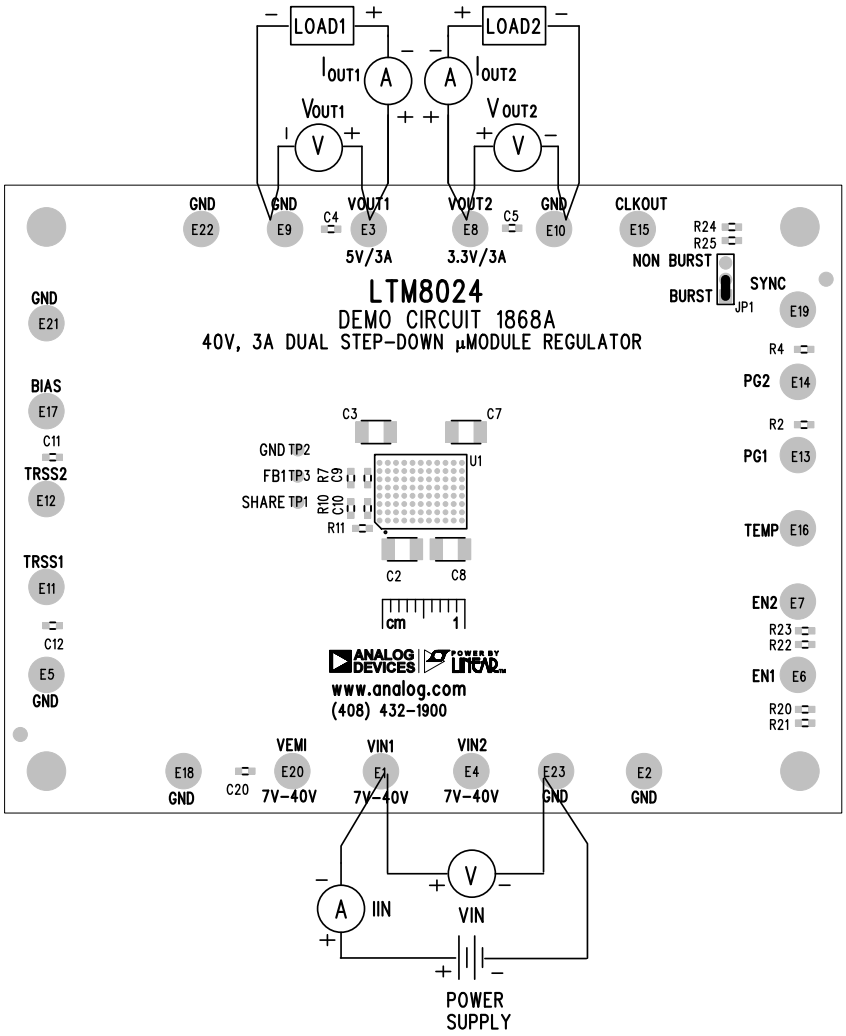


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

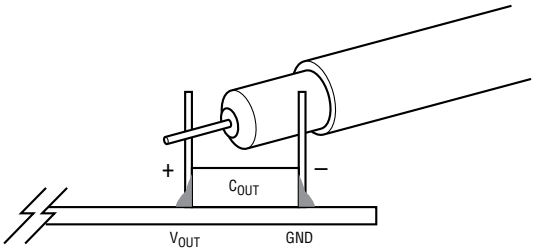


Figure 2. Measuring Output Voltage Ripple

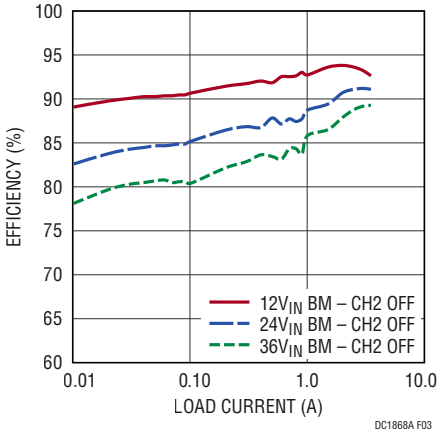


Figure 3. 5V Efficiency vs Load Current (Burst Mode Operation, 1MHz, Channel 2 Off)

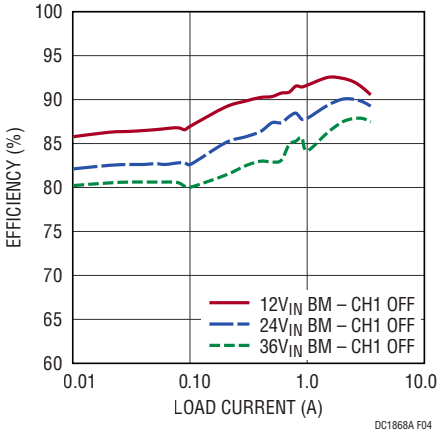


Figure 4. 3.3V Efficiency vs Load Current (Burst Mode Operation, 1MHz, Channel 1 Off)

QUICK START PROCEDURE

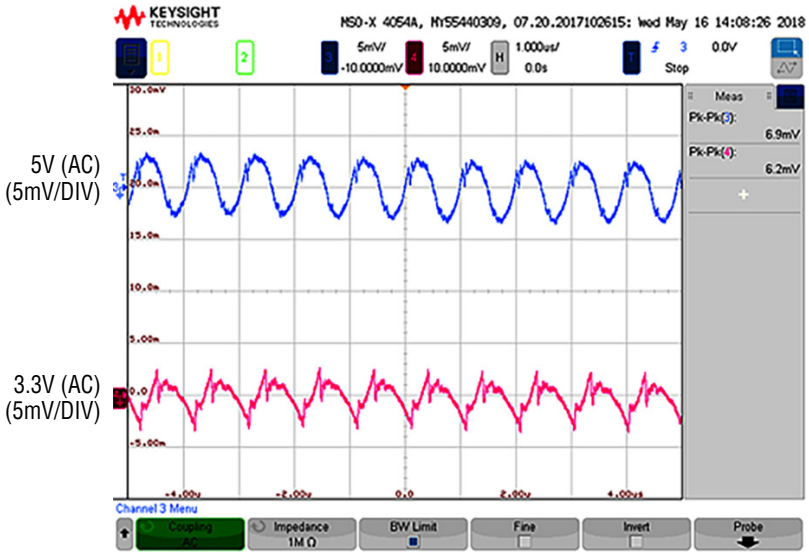
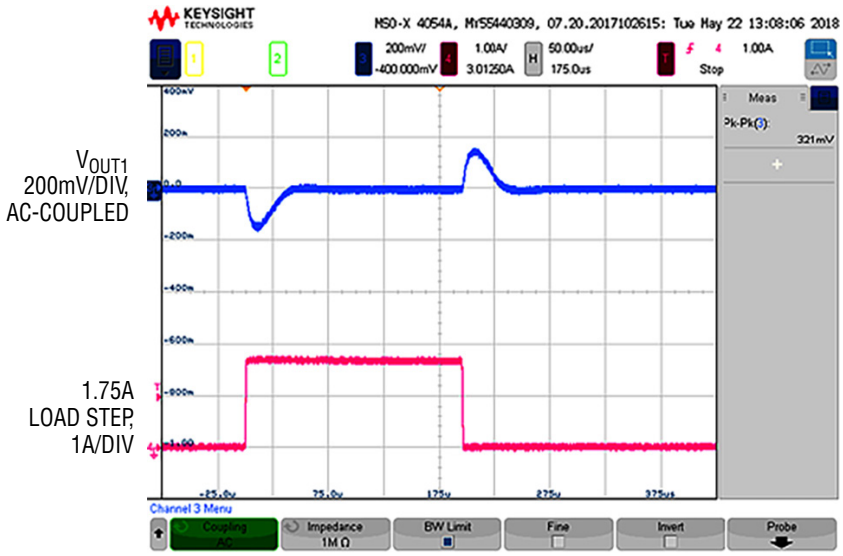


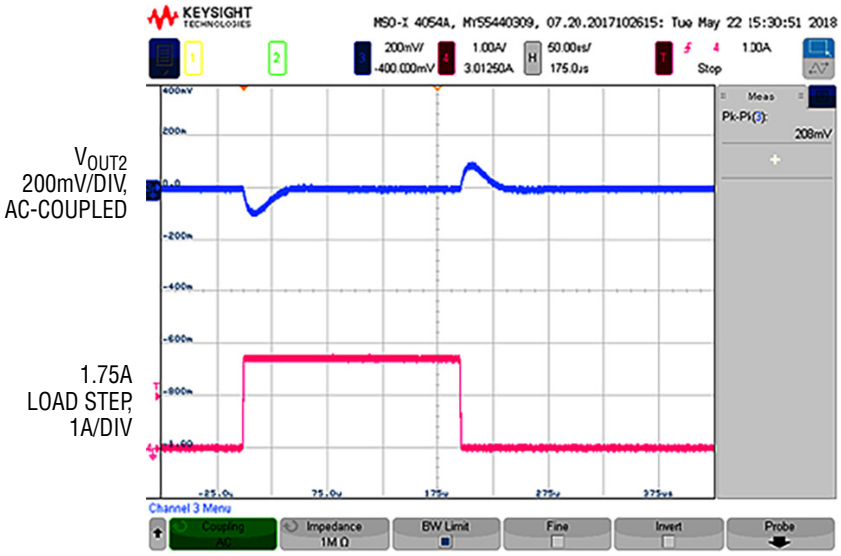
Figure 5. Output Voltage Ripples ($12V_{IN}$, 3.5A Load on Each Output, Discontinuous Mode)



(TOTAL I_{OUT1} 1.75A TO/FROM 3.5A)

Figure 6. Load Step Transient Test (V_{IN} = 12V, V_{OUT1} = 5V)

QUICK START PROCEDURE



(TOTAL I_{OUT2} 1.75A TO/FROM 3.5A)

Figure 7. Load Step Transient Test (V_{IN} = 12V, V_{OUT2} = 3.3V)

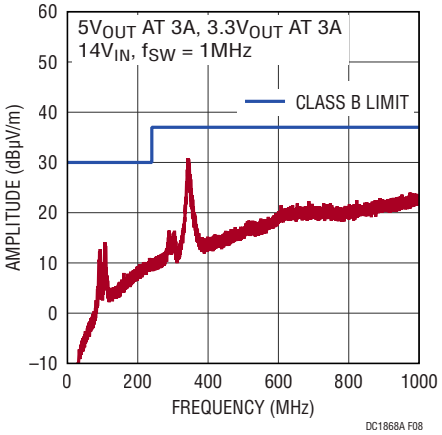
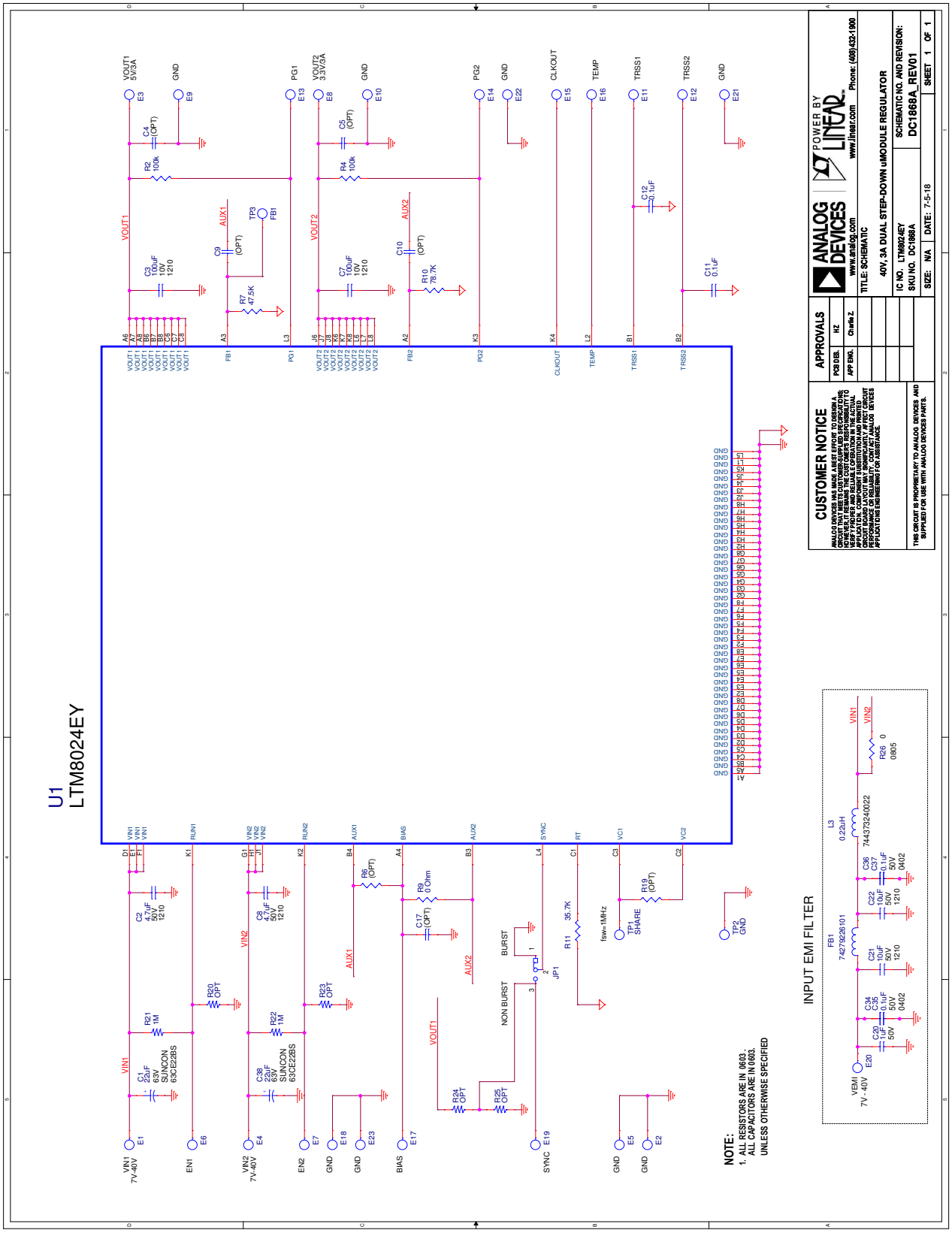


Figure 8. CISPR22 Class B Emissions DC1868A Demo Board Spread Spectrum On, No EMI Filter, (C20 = 0.1µF, L1, FB1 Short), (C21, C22, C34-C37 Open)

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C38	CAP., 22µF, ALUM, 63V	SUN ELECT., 63CE22BS
2	2	C2, C8	CAP., 4.7µF, X5R, 50V, 20%, 1210	TAIYO YUDEN, UMK325BJ475MM-T
3	2	C3, C7	CAP., 100µF, X5R,10V, 20%, 1210	TAIYO YUDEN, LMK325BJ107MM-T
4	2	C11, C12	CAP., 0.1µF, X7R, 16V, 10%, 0603	MURATA, GRM188R71C104KA01D
5	1	C20	CAP., 1µF, X5R, 50V, 10%, 0603	MURATA, GRM188R61H105KAALD
6	2	C21, C22	CAP., 10µF, X7R, 50V, 10% 1210	MURATA, GRM32ER71H106KA12L
7	4	C34, C35, C36, C37	CAP., 0.1µF, X7R, 50V, 10%, 0402	MURATA, GCM155R71H104KE02D
8	1	FB1	FERRITE BEAD	WURTH ELEKTRONIK, 74279226101
9	1	L3	INDUCTOR, 0.22µH	WURTH ELEKTRONIK, 744373240022
10	2	R2, R4	RES., CHIP, 100k, 0.1W ,1%, 0603	VISHAY, CRCW0603100KFKEA
11	1	R7	RES., CHIP, 47.5k, 0.1W,1%, 0603	VISHAY, CRCW060347K5FKEA
12	1	R9	RES/JUMPER, CHIP, 0Ω, 0.1W, 0603	VISHAY, CRCW06030000Z0EA
13	1	R10	RES., CHIP, 78.7k, 0.1W, 1%, 0603	VISHAY, CRCW060378K7FKEA
14	1	R11	RES., CHIP, 35.7k, 0.1W, 1%, 0603	VISHAY, CRCW060335K7FKEA
15	2	R21, R22	RES., CHIP, 1M, 0.1W, 1%, 0603	VISHAY, CRCW06031M00FKEA
16	1	R26	RES/JUMPER, CHIP, 0Ω, 0.1W, 0805	VISHAY, CRCW08050000Z0EA
17	1	U1	I.C., DUAL 40V_{IN}, 3A µModule REG	ANALOG DEVICES, LTM8024EY #PBF
Additional Demo Board Circuit Components				
1	0	C4, C5, C9, C10, C17 (OPT)	CAP., OPT, 0603	
2	0	R6, R19, R23, R20, R24, R25 (OPT)	RES., OPT, 0603	
Hardware for Demo Board Only				
1	23	E1–E23	TEST POINT, TURRET, .094" PBF	MILL MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	HEADERS, 3 PINS, 2mm CTRS.	SAMTEC, TMM-103-02-L-S
3	1	XJP1	SHUNT, 2mm CTRS.	SAMTEC, 2SN-BK-G
4	4	MH1–MH4	STANDOFF, NYLON, 0.25"	KEYSTONE, 8831 (SNAP ON)
5	1		FAB, PRINTED CIRCUIT BOARD	ANALOG DEVICES, DEMO CIRCUIT 1868A
6	2		STENCILS FOR BOTH SIDES	ANALOG DEVICES, STENCIL DC1868A

SCHEMATIC DIAGRAM



ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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