LTM8083
$3V_{IN}$ to $36V_{IN}$, $12V_{OUT}$ at 1.5A* Buck-Boost µModule Regulator

DESCRIPTION

Demonstration circuit 2859A is a step-up/-down DC/DC converter with a 3V to 36V input voltage range and a 12V output capable of 1.5A* from 12 to $36V_{IN}$, 0.8A at $6V_{IN}$, and 0.25A at $3V_{IN}$, featuring the LTM®8083.

Key Features of This Board Include:

- SYNC Input for External Synchronization
- CTRL Input for Adjusting Current Limit Threshold

The LTM8083 data sheet gives complete description of the device, including operation and application information. The data sheet must be read in conjunction with this demo manual prior to working on or modifying DC2859A.

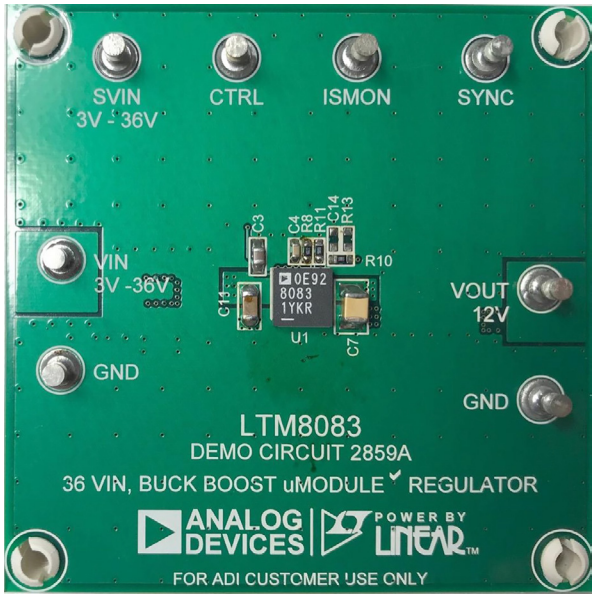
Design files for this circuit board are available.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		3		36	V
f_{SW}	Switching Frequency			1		MHz
V_{OUT}	Output Voltage			12.0		V
I_{OUT}	Maximum Output Current	V_{IN} = 12V to 36V	1.5			A
I_{OUT}	Maximum Output Current	V_{IN} = 6V	0.8			A
V_{OUT} (AC)	Output Ripple (Across C23/C30)	V_{IN} = 12V, I_{OUT} = 1.5A		40		mV_{P-P}
η	Efficiency	V_{IN} = 12V, I_{OUT} =1A		91.6		%

BOARD PHOTO



QUICK START PROCEDURE

Demo circuit 2859A is an easy way to evaluate the performance of the LTM8083. Refer to Figure 1 for proper measurement equipment setup, and follow the procedure below.

1. With power off, connect the input power supply "+" to V_{IN} and "–" to GND. Connect the load from V_{OUT} to GND.
2. Set voltage of the DC power supply at 6V. Turn on the power at the input.

   Note. Make sure that the input voltage does not exceed 36V.
3. Check for the proper output voltage between V_{OUT} and GND (V_{OUT} = 12V).

   Note. If there is no output, or output voltage value is out of the spec, temporarily disconnect the load to make sure that the load is not set too high.

   Note. The circuit features frequency foldback to protect the power switches during a fault or output current overload.
4. Once the proper output voltage at each channel is established, adjust the load within the operating range and measure the output voltage regulation, ripple voltage, efficiency and other parameters.

   Note. When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the V_{IN} and GND terminals, V_{OUT}^+ and GND terminals. See Figure 2 for proper scope probe technique.

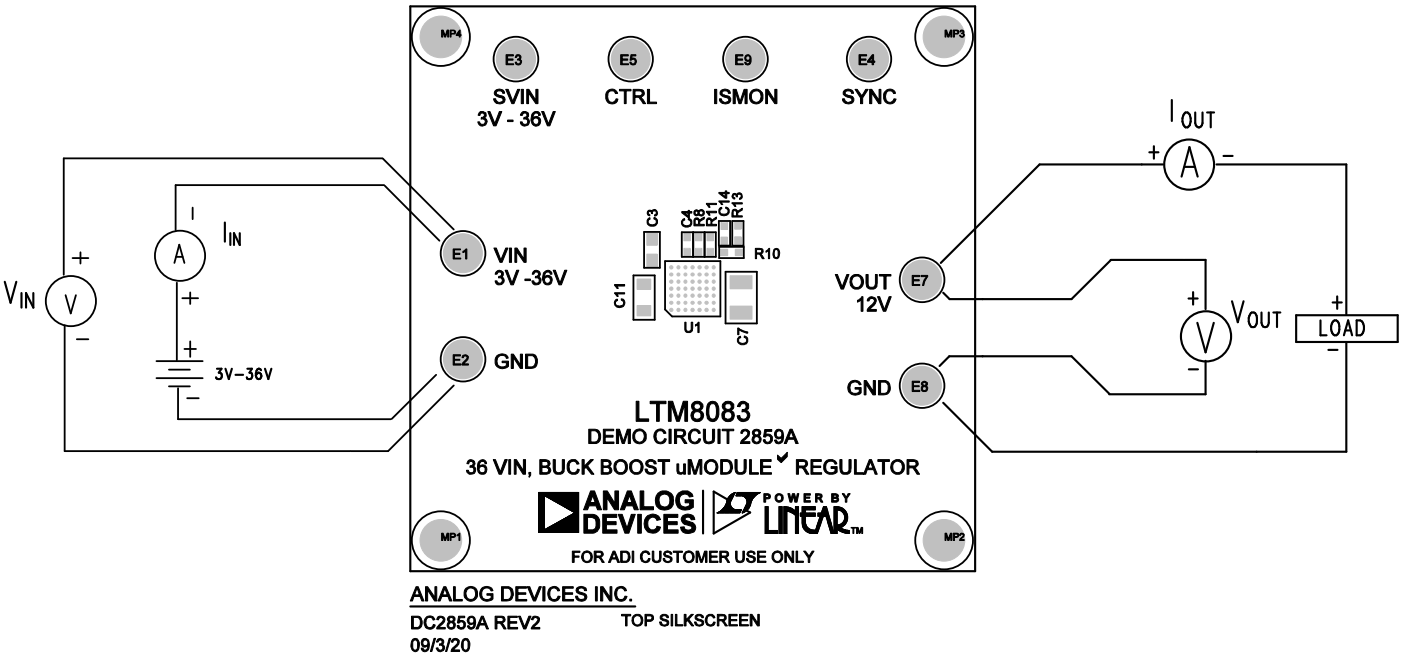


Figure 1. DC2859A Proper Equipment Setup

QUICK START PROCEDURE

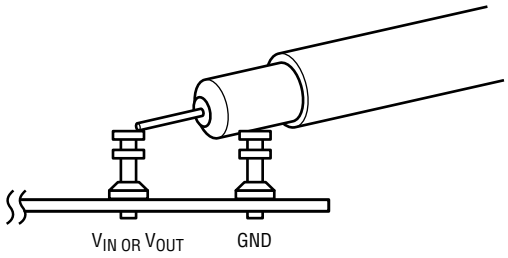


Figure 2. Measuring Input or Output Ripple

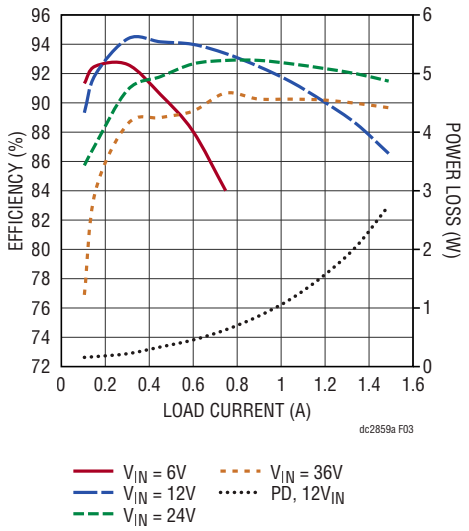


Figure 3. DC2859A Efficiency vs Load Current (12V without EMI Filter, T_A = 25°C)

QUICK START PROCEDURE

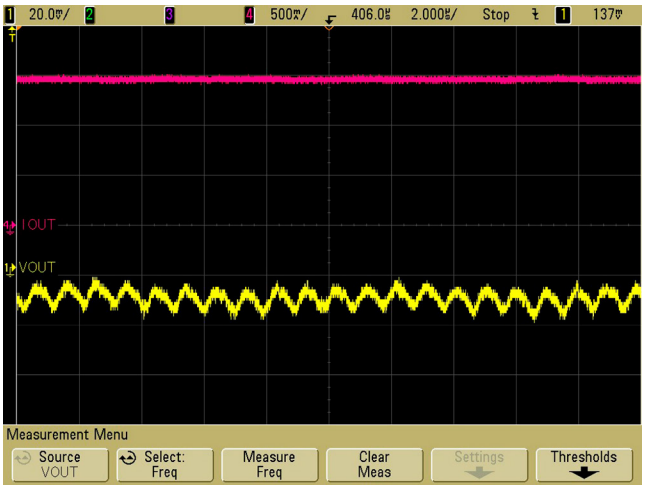


Figure 4. DC2859A Ripple ($12V_{IN}$, I_{OUT} = 1.5A)

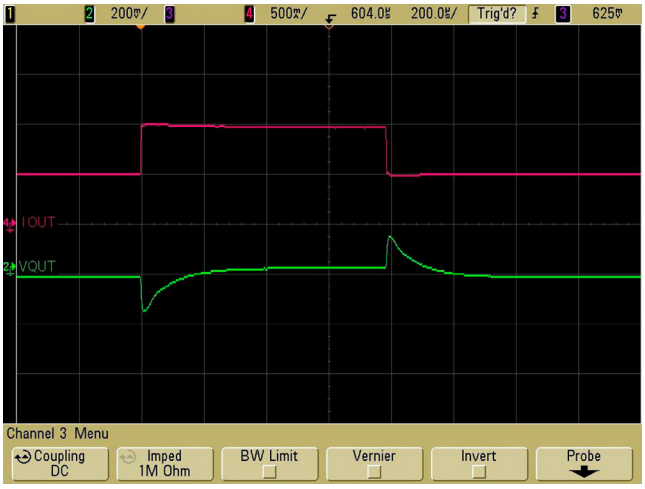


Figure 5. DC2859A Transient Response ($12V_{IN}$, I_{OUT} = 0.5A to 1A)

QUICK START PROCEDURE

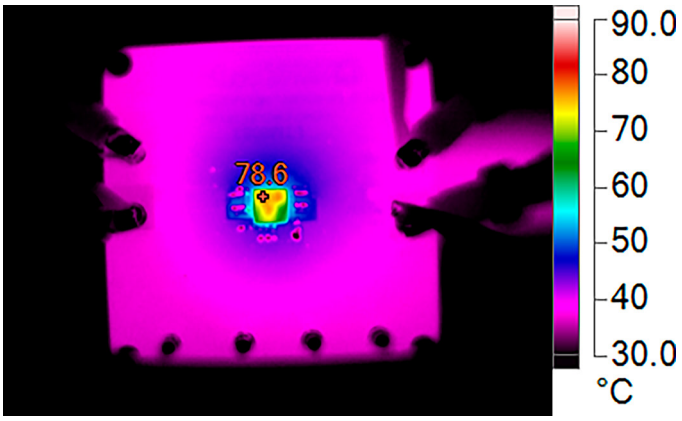


Figure 6. DC2859A Thermal Performance ($6V_{IN}$, I_{OUT1} = 0.8A, T_A = 25°C)

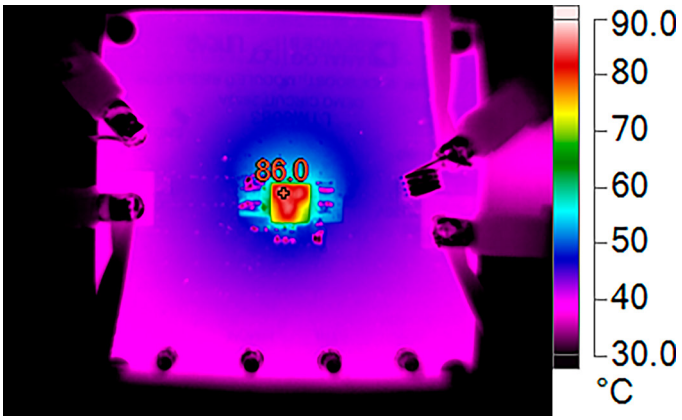


Figure 7. DC2859A Thermal Performance ($12V_{IN}$, I_{OUT1} = 1.45A, T_A = 25°C)

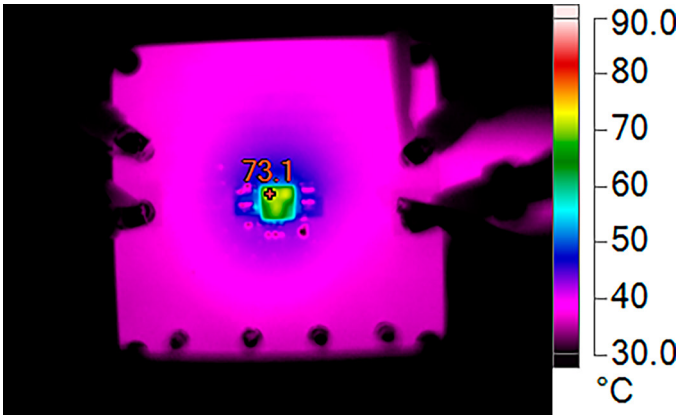


Figure 8. DC2859A Thermal Performance ($36V_{IN}$, I_{OUT1} = 1.5A, T_A = 25°C)

QUICK START PROCEDURE

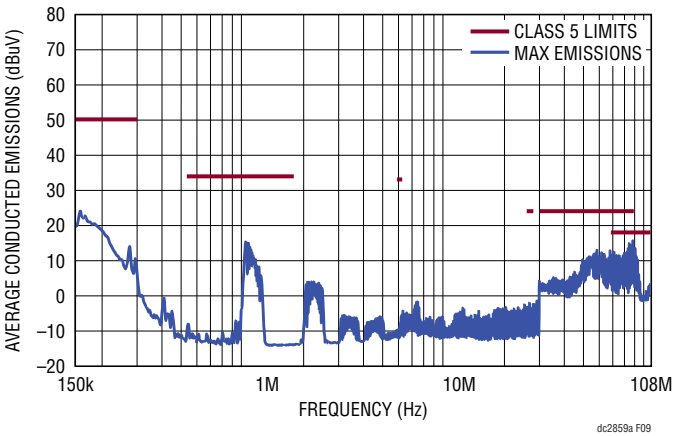


Figure 9. Conducted Emissions Scan of the LTM8083. Producing $12V_{OUT}$ at 1.5A, from $12V_{IN}$. DC2859A Hardware. f_{SW} = 1MHz. Measured in a 10m Chamber. Peak Detect Method.

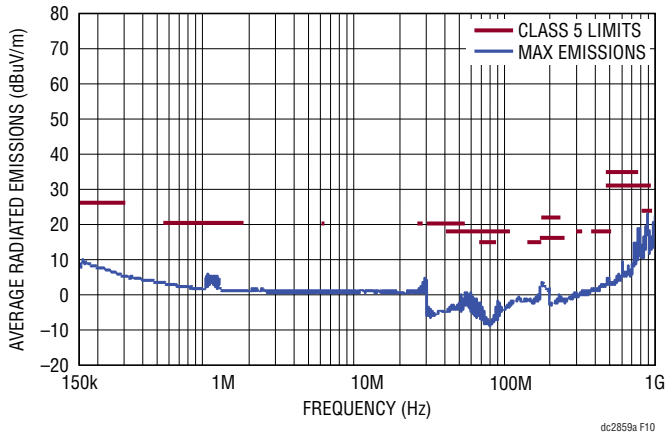
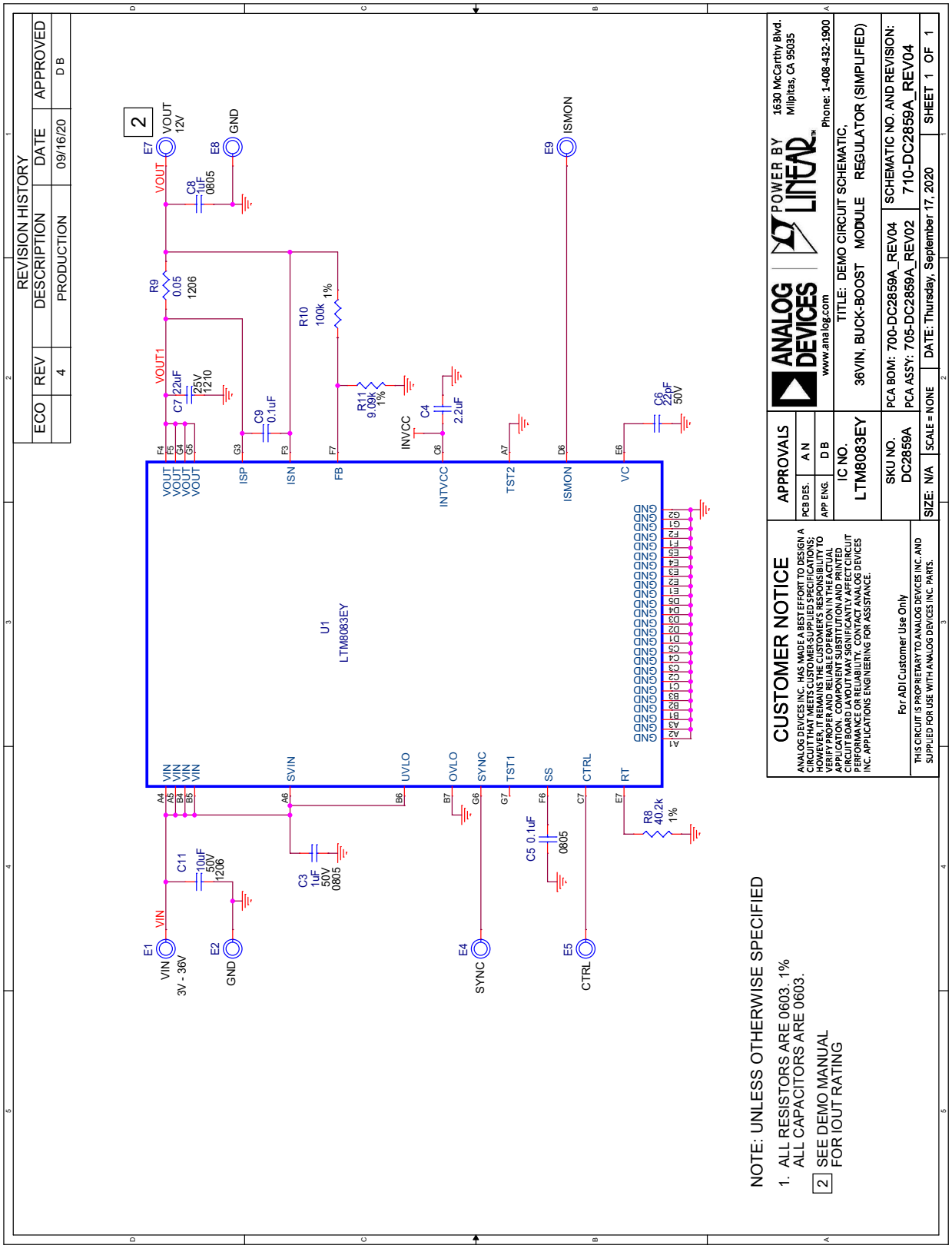


Figure 10. Radiated Emissions Scan of the LTM8083. Producing $12V_{OUT}$ at 1.5A, from $12V_{IN}$. DC2859A Hardware. f_{SW} = 1MHz. Measured in a 10m Chamber. Peak Detect Method

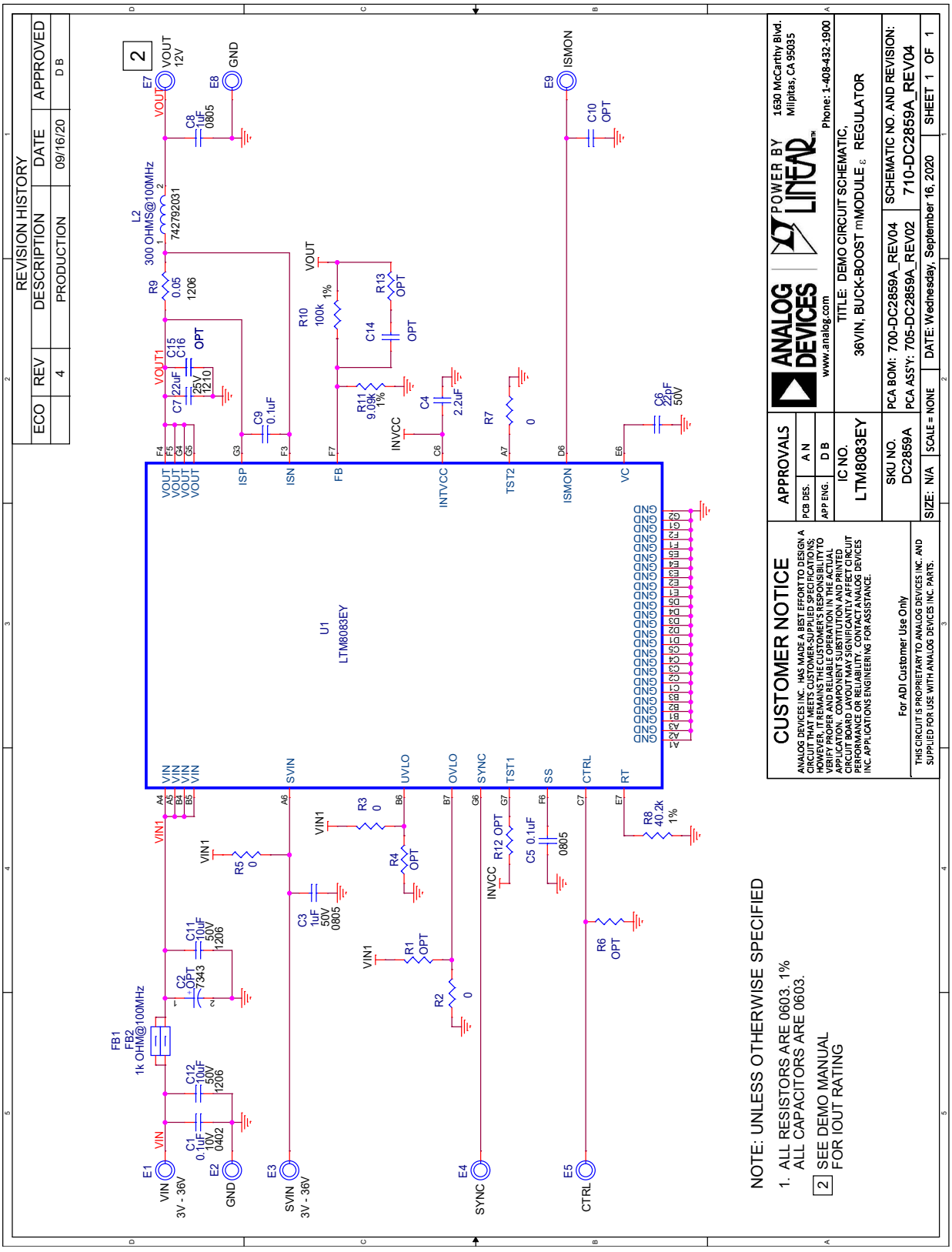
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., 0.1µF, X5R, 10V, 10%, 0402	KEMET, C0402C104K8PAC7867
2	1	C3	CAP., 1µF, X7R, 50V, 10%, 0805	AVX, 08055C105KAT2A
3	1	C4	CAP., 2.2µF, X5R, 25V, 10%, 0603	MURATA, GRM188R61E225KA12D
4	1	C5	CAP., 0.1µF, X7R, 50V, 10%, 0805	AVX, 08055C104KAT2A
5	1	C6	CAP., 22pF, C0G, 50V, 5%, 0603	AVX, 06035A220JAT2A
6	1	C7	CAP., 22µF, X5R, 25V, 10%, 1210	KEMET, C1210C226K3PACTU
7	1	C8	CAP., 1µF, X7R, 25V, 10%, 0805	AVX, 08053C105KAT2A
8	1	C9	CAP., 0.1µF, X7R, 25V, 10%, 0603	AVX, 06033C104KAT2A
9	2	C11, C12	CAP., 10µF, X7R, 50V, 10%,1206	SAMSUNG, CL31B106KBHNNNE
10	2	FB1, FB2	IND.,1k AT 100MHz, FERRITE BEAD, 25%, 1.5A, 150mΩ, 0805	TDK, MPZ2012S102AT000
11	1	L2	IND., 300Ω AT 100MHz, FERRITE BEAD, 25%, 0805	WURTH ELEKTRONIK, 742792031
12	1	R8	RES., 40.2k, 1%, 1/10W, 0603, AEC-Q200	NIC, NRC06F4022TRF
13	1	R9	RES., 0.05Ω, 1%, 1/4W, 1206, SENSE	VISHAY, WSL1206R0500FEA
14	1	R10	RES., 100k, 1%, 1/10W, 0603	STACKPOLE ELECTRONICS, INC., RMCF0603FG100K
15	1	R11	RES., AEC-Q200, 9.09k, 1%, 1/10W, 0603	VISHAY, CRCW06039K09FKEA
16	1	U1	IC, 36V_{IN} 1.25A BUCK-BOOST µModule® REGULATOR, BGA-49	ANALOG DEVICES, LTM8083EY#PBF
Additional Demo Board Circuit Components				
1	0	C2	CAP., OPTION, 7343	
2	0	C10	CAP., OPTION, 0603	
3	0	C14–C16	CAP., OPTION, 1210	
4	0	R1, R4, R6, R12, R13	RES., OPTION, 0603	
5	4	R2, R3, R5, R7	RES.,0Ω,1/10W,0603	VISHAY, CRCW06030000Z0EA
Hardware				
1	8	E1–E5, E7–E9	TEST POINT, TURRET, 0.094", MTG. HOLE	MILL-MAX, 2501-2-00-80-00-00-07-0
2	4	MP1–MP4	STANDOFF, NYLON, SNAP-ON, 0.375"	KEYSTONE, 8832

SIMPLIFIED SCHEMATIC (WITHOUT EMI FILTER)



FULL SCHEMATIC



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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