LT8711
Micropower Synchronous Sepic Converter

DESCRIPTION

Demonstration circuit 2234A is a synchronous sepic converter featuring the LT®8711 multitopology switching controller. The LT8711 is a current mode PWM DC/DC controller with a dual input LDO to optimize gate driver efficiency. Ultralow 15µA quiescent current in low noise Burst Mode® operation achieves high efficiency at very light loads and helps extend the run-time in battery powered applications when in standby mode. The LT8711 switching frequency can be programmed either via oscillator resistor or external clock over a 100kHz to 750kHz range.

The demo board regulates a 12V, 4A output from a 4.5V to 40V input source, and operates at 200kHz switching frequency. The rated maximum load current is 4A, while derating is necessary for certain input voltage and thermal conditions.

The SYNC pin on the demo board is grounded (JP1 at BURST position) by default for low ripple high efficiency Burst Mode operation at light load. To synchronize to an external clock, move JP1 to SYNC and apply the external clock to the SYNC turret. Force continuous conduction mode can be selected by moving JP1 shunt to FCM position.

The DC2234A can be modified from a SEPIC converter to other topologies. Synchronous BOOST and some other schematics are provided in the data sheet. Please consult the factory or LT8711 data sheet for details regarding how to customize the DC2234A or how to design different topologies for custom specifications.

The LT8711 includes many other features such as user configurable under voltage lockout, soft-start, input voltage feedforward regulation, and it is easily configured as synchronous buck, boost, SEPIC or nonsynchronous buck-boost converter.

The data sheet gives a complete description of the device, operation and application information. The data sheet must be read in conjunction with this demo manual for DC2234A. The LT8711 is assembled in a 20-lead plastic TSSOP package with a thermally enhanced ground pad. Proper board layout is essential for maximum thermal performance. See the Layout Considerations section in the data sheet.

Design files for this circuit board are available at http://www.linear.com/demo/DC2234A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Voltage Range		4.5		40	V
V_{OUT}	Output Voltage		11.6	12	12.4	V
I_{OUT}	Maximum Output Current	Derating is Necessary for Certain V_{IN} and Thermal Conditions	4			A
t_{SW}	Switching Frequency		185	200	215	kHz
EFF	Efficiency at DC	V_{IN} = 5V, I_{OUT} = 1A V_{IN} = 12V, I_{OUT} = 2A V_{IN} = 24V, I_{OUT} = 4A V_{IN} = 36V, I_{OUT} = 4A		91.9 92 91.4 90.2		% % % %

QUICK START PROCEDURE

DC2234A is easy to set up to evaluate the performance of the LT8711. Refer to Figure 3 for proper measurement equipment setup and follow the procedure below:

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. See Figure 4 for the proper scope technique.

1. Set an input power supply that is capable of 40V/12A. Then turn off the supply.
2. With power off, connect the supply to the input terminals V_{IN} and GND.
3. Turn on the power at the input.

   NOTE: Make sure that the input voltage never exceeds 40V.
4. Check for the proper output voltage of 12V. Turn off the power at the input.
5. Once the proper output voltage is established, connect a variable load capable of sinking 4A at 12V to the output terminals V_{OUT} and GND. Set the current for 0A.

a. If efficiency measurements are desired, an ammeter can be put in series with the output load in order to measure the DC2234A's output current.

b. A voltmeter can be placed across the output terminals in order to get an accurate output voltage measurement.

6. Turn on the power at the input.

   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
7. Once the proper output voltage is again established, adjust the load and/or input within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other desired parameters.
8. An external clock can be added to the SYNC terminal when SYNC function is used (JP1 on the SYNC position). Please ensure that the chosen RT sets the LT8711 switching frequency to equal or below the lowest SYNC frequency. See the data sheet section, Clock Synchronization.

QUICK START PROCEDURE

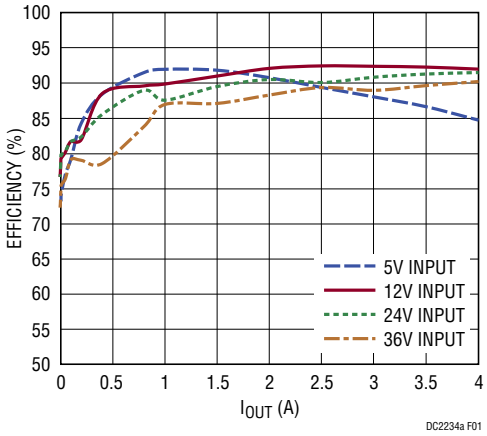


Figure 1. Efficiency vs Load Current at 200kHz Switching Frequency

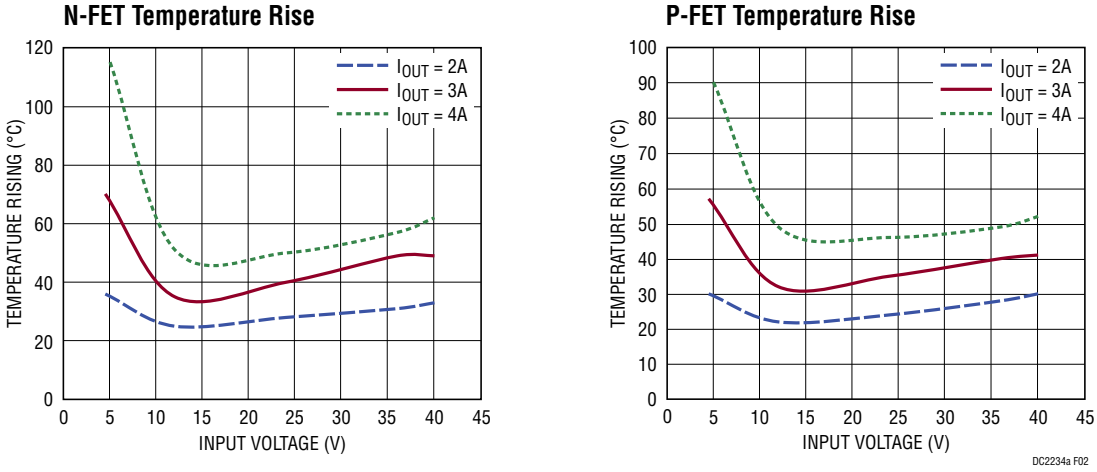


Figure 2. DC2234A Temperature Rising vs Input Voltage

QUICK START PROCEDURE

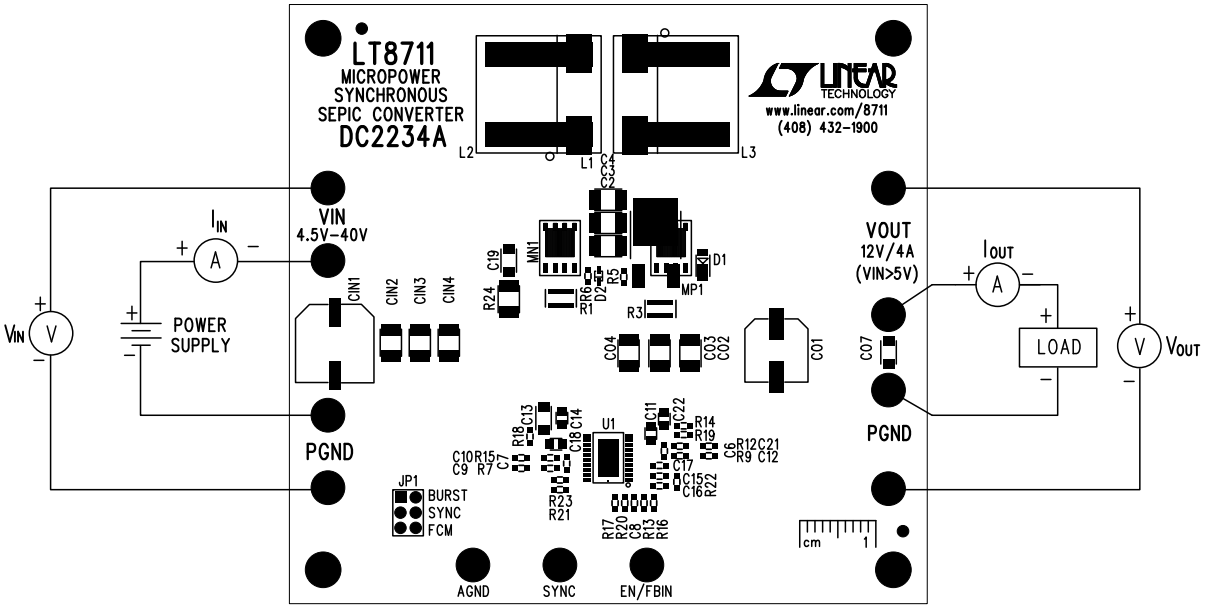


Figure 3. Proper Measurement Equipment Setup

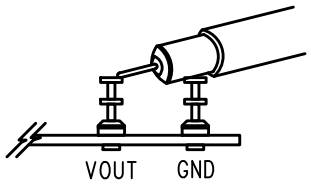


Figure 4. Measuring Output Ripple

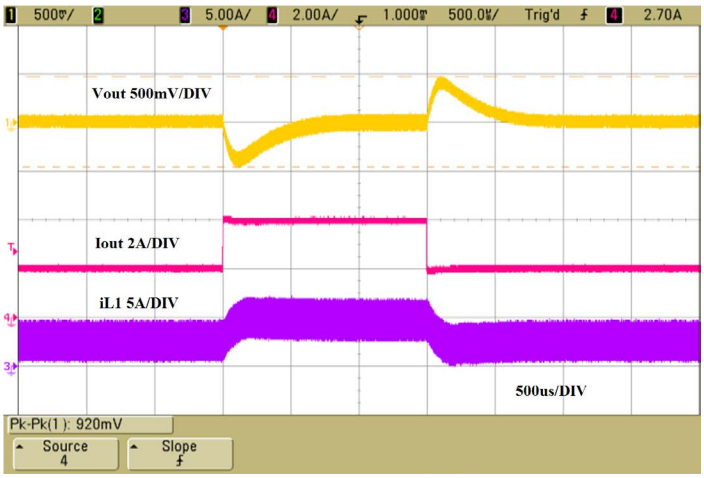


Figure 5. DC2234A 12V Input 2A to 4A Load Transient

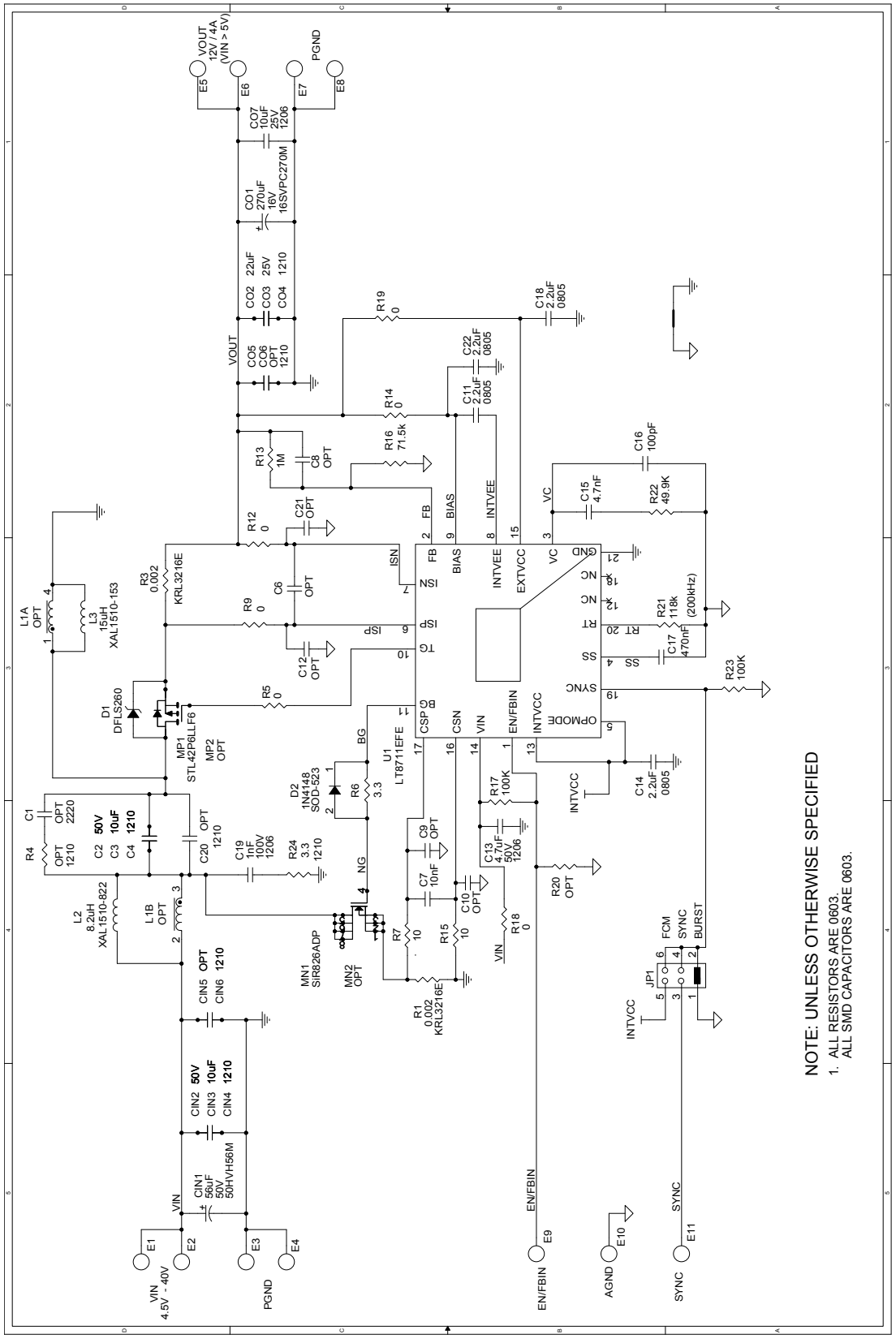
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	6	C2, C3, C4, CIN2, CIN3, CIN4	CAP, X7R, 10µF, 50V, 10% 1210	MURATA, GRM32ER71H106KA12L
2	1	CO1	ALUM, POLYMER, 270µF, 16V, 20%	PANASONIC, 16SVPC270M
3	3	CO2, CO3, CO4	CAP, X7R, 22µF, 25V, 10% 1210	MURATA, GRM32ER71E226KE15L
4	1	CO7	CAP, X7R, 10µF, 25V, 10% 1206	MURATA, GRM31CR71E106KA12L
5	1	C7	CAP, X7R, 10nF, 25V, 10% 0603	MURATA, GRM188R71E103KA01D
6	4	C11, C14, C18, C22	CAP, X7R, 2.2µF, 16V, 10% 0805	MURATA, GRM21BR71C225KA12L
7	1	C13	CAP, X7R, 4.7µF, 50V, 10% 1206	TDK, C3216X7R1H475K160AC
8	1	C15	CAP, X7R, 4.7nF, 25V, 10% 0603	MURATA, GRM188R71E472KA01D
9	1	C16	CAP, C0G, 100pF, 50V, 5% 0603	TDK, C1608C0G1H101J080AA
10	1	C17	CAP, X7R, 0.47µF 16V 10% 0603	MURATA, GRM188R71C474KA88D
11	1	C19	CAP, X7R, 1000pF, 100V, 10% 1206	MURATA, GRM319R72A102KA01D
12	1	D1	DIODE, 60V, 2A, POWERDI-123	DIODES INC, DFLS260-7
13	1	D2	DIODE, 80V, 125mA, SOD-523	DIODES INC, 1N4148WT-7
14	1	L2	IND, 8.2µH	COILCRAFT, XAL1510-822MEB
15	1	L3	IND, 15µH	COILCRAFT, XAL1510-153MEB
16	1	MN1	N-MOSFET, 80V, POWERPAK SO-8	VISHAY, SIR826ADP-T1-GE3
17	1	MP1	P-MOSFET, 60V, POWERFLAT 5x6	STMicroelectronics, STL42P6LLF6
18	2	R1, R3	RES, SENSE, 0.002Ω, 1.5W, 2%, KRL3216	SUSUMU, KRL3216E-C-R002-G-T5
19	6	R5, R9, R12, R14, R18, R19	RES, CHIP, 0Ω, 0.1W, 0603	NIC, NRC06ZOTRF
20	1	R6	RES, CHIP, 3.3Ω, 0.1W, 1%, 0603	VISHAY, CRCW06033R30FKEA
21	2	R7, R15	RES, CHIP, 10Ω, 0.1W, 1%, 0603	VISHAY, CRCW060310R0FKEA
22	1	R13	RES, CHIP, 1M, 0.1W, 1%, 0603	VISHAY, CRCW06031M00FKEA
23	1	R16	RES, CHIP, 71.5k, 0.1W, 1%, 0603	VISHAY, CRCW060371K5FKEA
24	2	R17,R23	RES, CHIP, 100k, 0.1W, 1%, 0603	NIC, NRC06F1003TRF
25	1	R21	RES, CHIP, 118k, 0.1W, 1%, 0603	NIC, NRC06F1183TRF
26	1	R22	RES, CHIP, 49.9k, 0.1W, 1%, 0603	VISHAY, CRCW060349K9FKEA
27	1	R24	RES, CHIP, 3.3Ω, 1/2W, 5%, 1210	VISHAY, CRCW12103R30JNEA
28	1	U1	IC, LT8711EFE 20-LEAD TSSOP	LINEAR TECH, LT8711EFE#PBF
Additional Demo Board Circuit Components				
1	1	CIN1	EP-CAP, 56µF, 50V, HVH SERIES	SUN ELECT, 50HVH56M
2	0	CIN5, CIN6, CO5, CO6, C20(OPT)	CAP, 1210	
3	0	C1 (OPT)	CAP, 2220	
4	0	C6, C8, C9, C10, C12, C21(OPT)	CAP, 0603	
5	0	L1 (OPT)	IND, 8.2µH	
6	0	MN2 (OPT)	N-MOSFET, POWERPAK SO-8	
7	0	MP2 (OPT)	P-MOSFET, POWERFLAT 5x6	
8	0	R4 (OPT)	RES, 1210	
9	0	R20 (OPT)	RES, 0603	

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Hardware: For Demo Board Only				
1	11	E1 TO E11	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	DOUBLE ROW HEADER 2 x 3 0.079"	WURTH ELEKTRONIK, 62000621121
3	1	XJP1	SHUNT, 0.079" CENTER	WURTH ELEKTRONIK, 60800213421
4	4	MH1 TO MH4	STAND-OFF, NYLON 0.50" TALL	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



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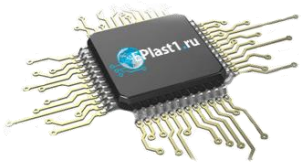

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