

LT3641: Dual Monolithic Buck Regulator with Power-On Reset and Watchdog Timer

DESCRIPTION

Demonstration circuit 1727A is a dual monolithic buck regulator with power-on reset and watchdog timer featuring the LT3641. The board operates from inputs up to 42V and withstands transients up to 55V. The outputs are 5V, 1A and 1.8V, 0.8A. At light loads, both regulators operate in low ripple Burst Mode® to maintain high efficiency and low output ripple. Users can populate R13 on the EN/UVLO pin and R14 on EN2 to provide a programmable under voltage lockout for both outputs respectively. Both channels have cycle-by-cycle current limit, providing protection against shorted outputs.

The power-on reset and watchdog timer periods are independently adjustable using external capacitors. Tight accuracy specifications and glitch immunity ensure reliable operation of the circuit. Watchdog can be enabled or disabled by JP1.

The circuit can be synchronized to an external clock connected to the SYNC terminal. If the SYNC function is used, the R_T resistor (R9) should be chosen to set the LT3641 internal switching frequency at least 20% below the lowest synchronization input frequency.

The LT3641 data sheet gives complete descriptions of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for working on or modifying the demo circuit 1727A.

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

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PERFORMANCE SUMMARY (T_A = 25°C)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{IN}	Input Supply Range	V _{OUT1} = 5V, I _{OUT1} = 1A V _{OUT2} = 1.8V, I _{OUT2} = 0.8A	7		42	V
V _{OUT1}	Output Voltage 1	V _{IN} = 12V, I _{OUT1} = 0.8A	4.92	5.07	5.22	V
V _{OUT2}	Output Voltage 2	V _{IN} = 12V, I _{OUT2} = 1A	1.746	1.8	1.854	V
I _{OUT1}	Output Current 1		0		1	A
I _{OUT2}	Output Current 2		0		0.8	A
I _Q	No Load Quiescent Current	V _{IN} = 12V, V _{OUT1} = 5V, V _{OUT2} = 1.8V, No Load		0.37		mA
f _{SW}	Switching Frequency		1.75	2	2.35	MHz
t _{WDU}	Watchdog Upper Boundary Period	C7 = 1500pF		55.5		ms
t _{WDL}	Watchdog Lower Boundary Period	C7 = 1500pF		3.5		ms
t _{RST}	Programmed Reset Period	C8 = 1500pF		55.5		ms

QUICK START PROCEDURE

Demonstration circuit 1727A is easy to set up to evaluate the performance of the LT3641. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

1. Place Jumper JP1 in the following position:

OFF: Watchdog Disabled

ON: Watchdog Enabled

2. With power off, connect the input power supply to V_{IN} and GND.
3. With power off, connect loads from V_{OUT1} to GND and V_{OUT2} to GND.
4. Turn on the power at the input.

Note: Make sure that the input voltage does not exceed 42V.

5. Check for the proper output voltages:

$$V_{OUT1} = 5V, V_{OUT2} = 1.8V$$

Note: If there is no output, temporarily disconnect the load to make sure that the load is not set too high or is shorted.

6. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.
7. To test the watchdog timer, place jumper JP1 in the ON position. Connect a clock input to the $\overline{WDI}$ terminal. Observe the output at the $\overline{WDO}$ terminal while the clock parameters are adjusted.
8. To test Power-On Reset, observe output at the RESET terminals: $\overline{RST1}$ and $\overline{RST2}$.

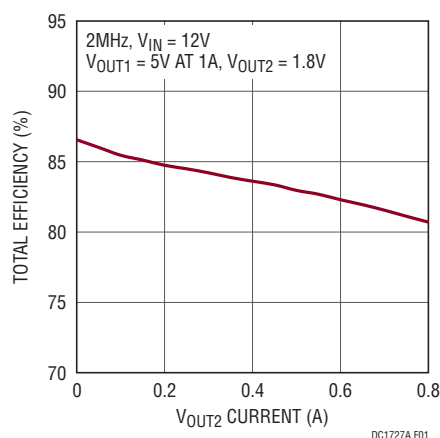


Figure 1. Total Efficiency vs V_{OUT2} Current

QUICK START PROCEDURE

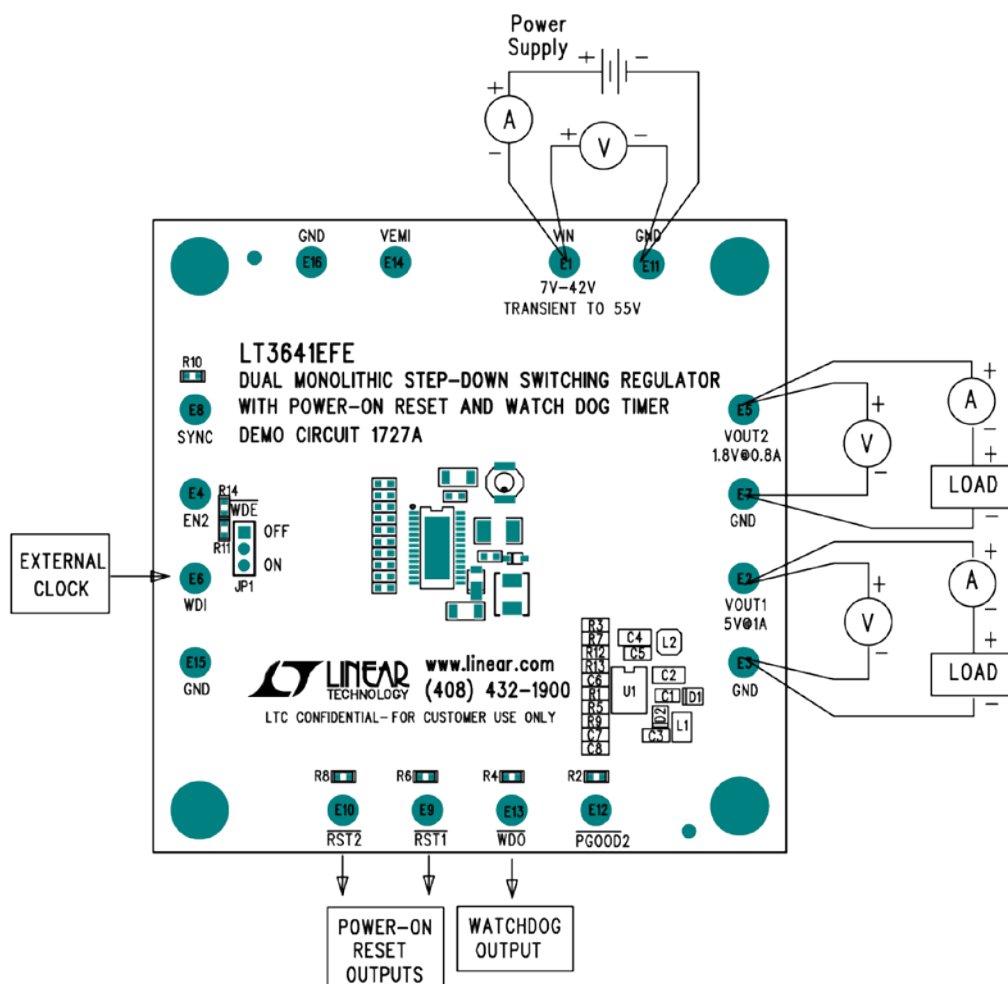


Figure 2. DC1727A Proper Measurement Equipment Setup

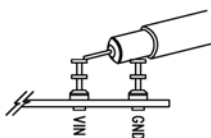
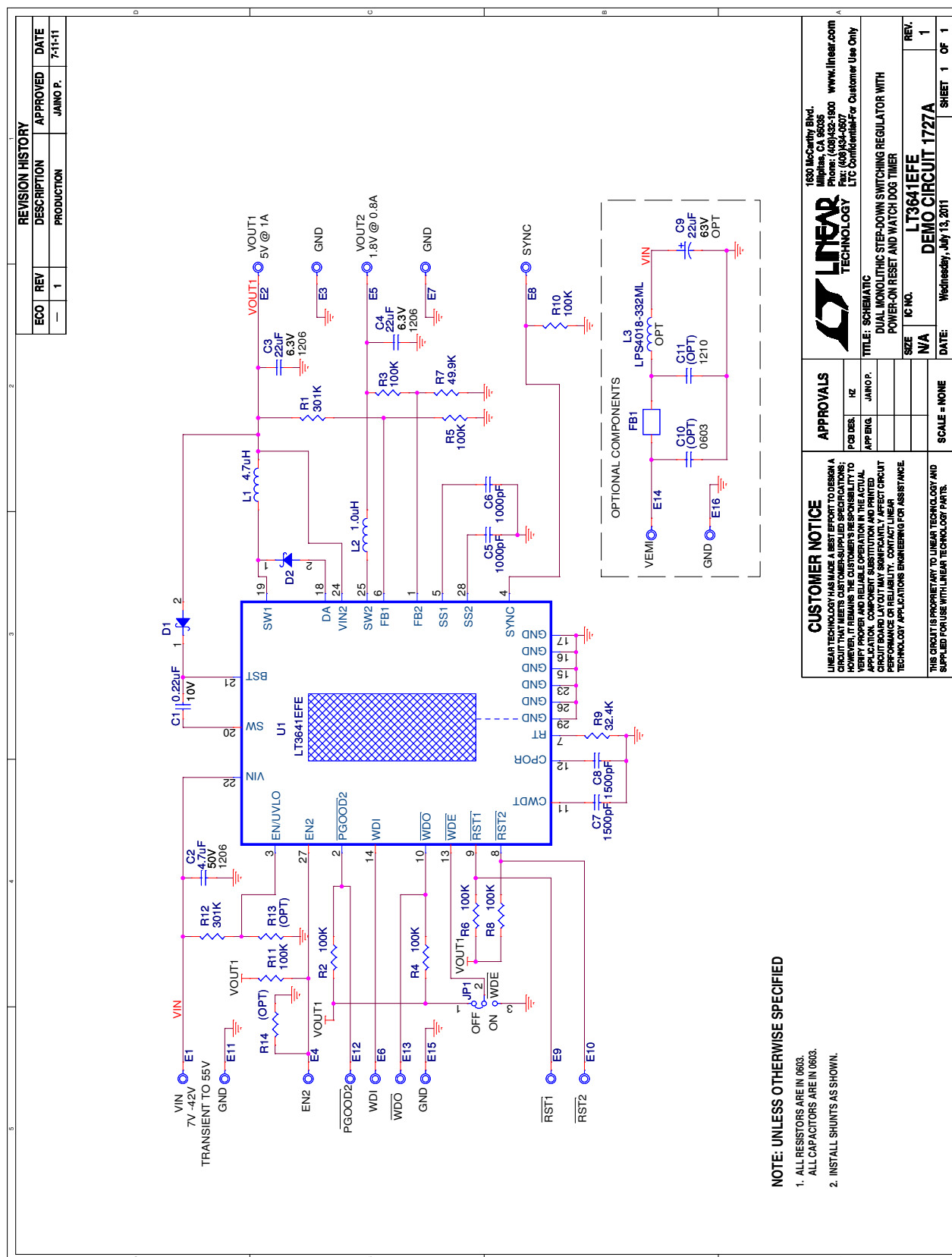


Figure 3. Measuring Input or Output Ripple

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PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	Capacitor, X7R, 0.22 μ F, 10V, 10%, 0603	Murata, GRM188R71A224KA01D
2	1	C2	Capacitor, X7R, 4.7 μ F, 50V, 10%, 1206	Murata, GRM31CR71H475KA12L
3	2	C3, C4	Capacitor, X7R, 22 μ F, 6.3V, 20%, 1206	AVX, 12066C226MAT2A
4	2	C5, C6	Capacitor, X7R, 1000pF, 25V, 10%, 0603	AVX, 06033C102KAT2A
5	2	C7, C8	Capacitor, COG, 1500pF, 25V, 5%, 0603	Murata, GRM1885C1E152JA
6	1	D1	Diode, Schottky, Diode, SOD323	Central Semiconductor, CMDD6263
7	1	D2	Diode, Schottky, PowerDI123	DIODES/ZETEX, DFLS260-7
8	1	L1	Inductor, 4.7 μ H	Cooper Bussmann, MPI4040R3-4R7-R
9	1	L2	Inductor, 1.0 μ H	Cooper Bussmann, SD3812-1R0-R
10	2	R1, R12	Resistor, Chip, 301k, 1%, 0603	Vishay, CRCW0603301KFKED
11	3	R3, R5, R11	Resistor, Chip, 100k, 1%, 0603	Panasonic, ERJ3EKF1003V
12	1	R7	Resistor, Chip, 49.9k, 1%, 0603	Vishay, CRCW060349K9FKEA
13	1	R9	Resistor, Chip, 32.4k, 1%, 0603	Vishay, CRCW060332K4FKED
14	1	U1	IC, LT3641EFE#PBF, TSSOP (4.4mm)	Linear Technology, LT3641EFE#PBF
Additional Demo Board Circuit Components				
1	1	C9	Capacitor, Aluminum SMT, 22 μ F, 63V	Suncom, 63CE22BS
2	0	C10 (Optional)	Capacitor, 0603	
3	0	C11 (Optional)	Capacitor, 1210	
4	0	FB1 (Optional)	Ferrite Bead, Chip, 1206	
5	0	L3 (Optional)	Inductor, SMT Power Inductor	
6	5	R2, R4, R6, R8, R10	Resistor, Chip, 100k, 1%, 0603	Vishay, CRCW0603100KFKEA
7	0	R13, R14 (Optional)	Resistor, 0603	
Hardware: For Demo Board Only				
1	16	E1-E16	Testpoint, Turret, .095"	Mill-Max, 2501-2-00-80-00-00-07-0
2	1	JP1	2mm Single Row Header, 3-Pin	Samtec, TMM-103-02-L-S
3	1	JP1	Shunt, 2mm	Samtec, 2SN-BK-G
4	4	MTGS	Stand-Off, Nylon 0.5" Tall	Würth, 702935000 (Snap On)



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