

LTM8042, LTM8042-1 1A, 350mA μ Module LED Driver

DESCRIPTION

Demonstration circuits 1511A-A and 1511A-B feature the LTM[®]8042 and the LTM8042-1, which are respectively complete 1A and 350mA μ Module LED drivers. The demonstration circuits are assembled as boost topologies, accepting an input voltage from 3V to 30V and supporting an output up to 32V (see Table 1). The default switching frequency is 600kHz for DC1511A-A and 950kHz for DC1511A-B, but can be adjusted by changing the value of R_T .

DC1511A is easily configured to support other features, including PWM dimming, analog dimming, buck-boost mode and buck mode (step-down). DC1511A includes a

P-channel MOSFET that is necessary for PWM dimming. The R_{ADJ} pin/terminal voltage controls the output current. Voltage is either applied directly to the terminal or set by a divider that includes resistor R_{ADJ} and the LTM8042's internal 2V reference and divider resistor. Open LED over-voltage protection is also included. Consult the LTM8042/LTM8042-1 datasheet for further information on how to properly use or modify the circuit.

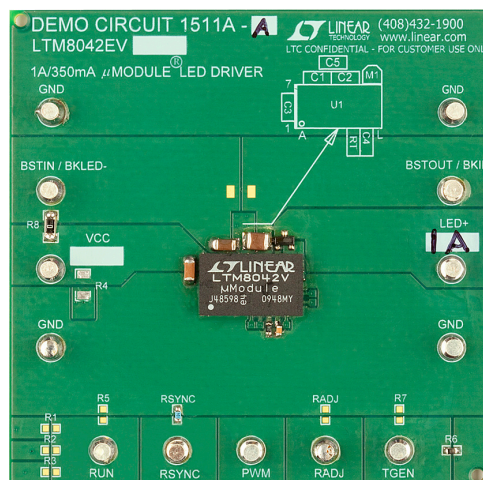
Design files for this circuit board are available at <http://www.linear.com/demo>

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PERFORMANCE SUMMARY Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range, V_{IN} (BSTIN)		3V to 30V (See Table 1)
I_{LED}	DC1511A-A (LTM8042) DC1511A-B (LTM8042-1) Current Derating May Be Necessary Under Certain V_{IN} , V_{OUT} , Frequency and Thermal Conditions	1A 350mA
Switching Frequency	$R_T = 30.1\text{k}$ (DC1511A-A) $R_T = 16.9\text{k}$ (DC1511A-B)	600kHz 950kHz
Maximum Output Voltage (Open LED Voltage)		36V
Efficiency	$V_{IN} = 12\text{V}$, $V_{LED} = 16.7\text{V}$, $I_{LED} = 1\text{A}$ $V_{IN} = 12\text{V}$, $V_{LED} = 24.8\text{V}$, $I_{LED} = 350\text{mA}$	91.5% (See Figure 2) 89% (See Figure 3)

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit 1511A is easy to set up to evaluate the performance of the LTM8042EV/LTM8042EV-1. Refer to Figure 1 for the proper measurement equipment set-up and follow the procedure below for a boost (step-up) topology.

1. Connect a string of LEDs with forward voltage 32V or less, but greater than the input voltage, to the LED⁺ (LED anode) and GND (LED cathode) terminals on the PCB, as shown in Figure 1.
2. With the power off, connect the input power supply to the BSTIN/BKLED⁻ and GND terminals within the ranges specified in Table 1. Preset the DC input voltage within the recommended input voltage range for the appropriate forward voltage of the LED string.

Table 1. Input Range for Proper Operation (Refer to the LTM8042/LTM8042-1 Datasheet)

DC1511A-A LTM8042		DC1511A-B LTM8042-1	
INPUT VOLTAGE (BSTIN/BKLED ⁻ TO GND)	LED STRING VOLTAGE (LED ⁺ TO GND)	INPUT VOLTAGE (BSTIN/BKLED ⁻ TO GND)	LED STRING VOLTAGE (LED ⁺ TO GND)
5V to 5.8V	6V to 9V	3.2V to 7V	8V to 12V
6.4V to 7.7V	8V to 12V	4.1V to 10V	12V to 16V
8.6V to 11.3V	12V to 16V	4.8V to 12.3V	15V to 21V
11.3V to 13.8V	15V to 21V	5.8V to 15V	18V to 24V
13.4V to 16.5V	18V to 24V	8.5V to 20.8V	24V to 32V
20.5V to 22.5V	24V to 32V		

3. Connect the PWM terminal. If PWM is not used, connect PWM to a 5V source or to the input voltage. PWM must be pulled high or the LEDs will remain off.
4. Turn the input power supply on.
5. Observe the LED string running at the programmed LED current.
6. For PWM dimming, connect a PWM 100Hz or higher frequency signal to the PWM terminal.
7. Observe the reduction of brightness in the LED string by varying the duty cycle of the PWM signal.

To use the DC1511A in a buck-boost mode topology, make the following modifications to the procedure.

1. At step 1, connect the cathode of the LED string to the BSTIN/BKLED⁻ terminal. The LED forward voltage may be greater than the input voltage for buck-boost mode.
2. At step 2, refer to the datasheet buck-boost mode applications information table. Preset the DC input voltage within the recommended input voltage range for the appropriate forward voltage and current of the LED string.

To use the DC1511A in a buck mode (step-down) topology, make the following modifications to the procedure.

1. Remove the 0Ω jumper at location R8 and instead install the jumper at location R4. This shorts the V_{CC}, TGEN and RUN pins/terminals to BSTOUT/BKIN instead of BSTIN/BKLED⁻.
2. At step 1, connect the cathode of the LED string to the BSTIN/BKLED⁻ terminal. The LED forward voltage must be less than the input voltage for buck mode.
3. At step 2, connect the input power supply to BSTOUT/BKIN and GND. Refer to the datasheet buck mode applications information table. Preset the DC input voltage within the recommended input voltage range for the appropriate forward voltage and current of the LED string.

QUICK START PROCEDURE

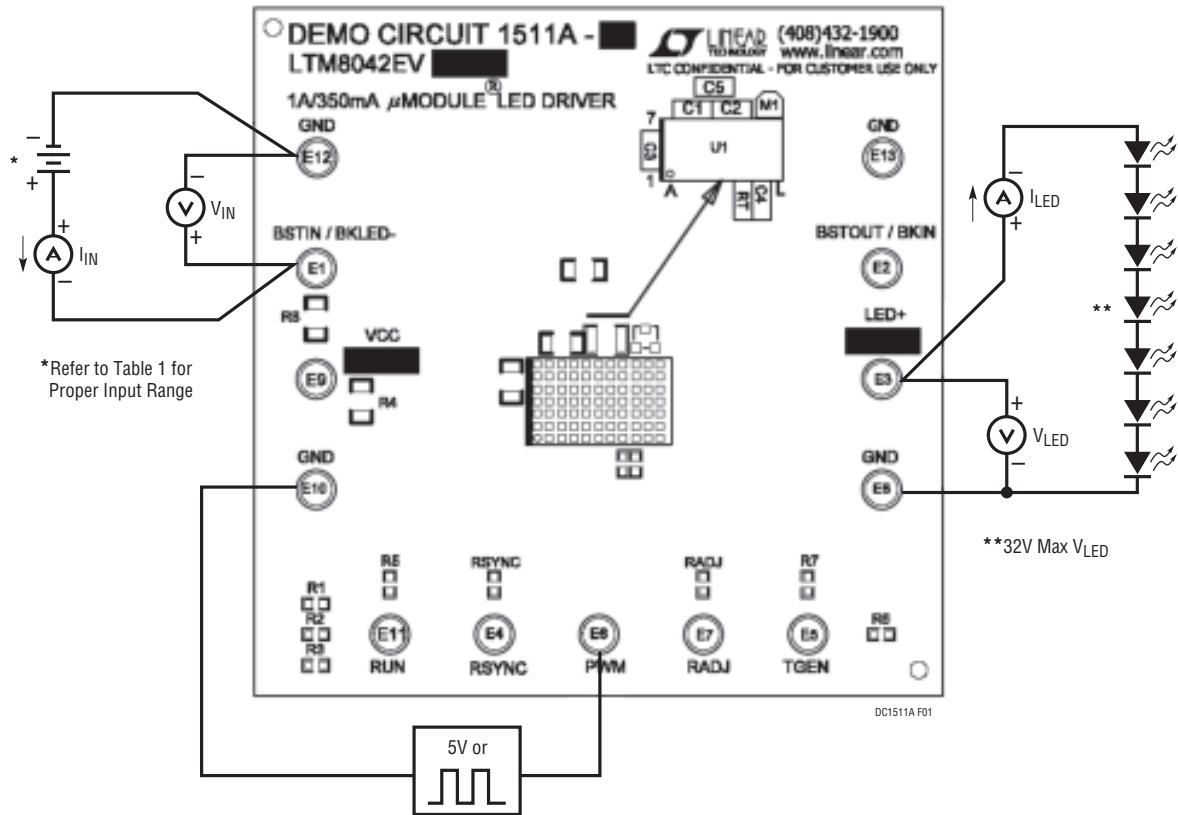


Figure 1. Proper Measurement Equipment Set-Up (Boost Topology)

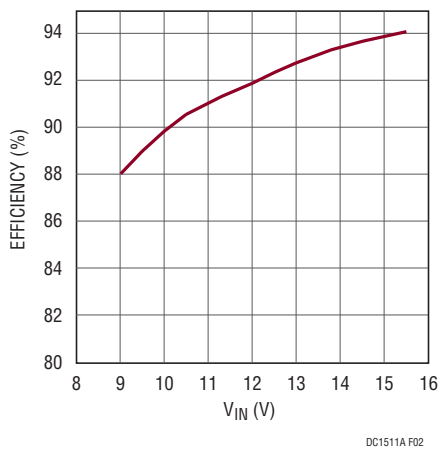


Figure 2. DC1511A-A Efficiency vs V_{IN} Boost Operation, 16.7V at 1A LED String

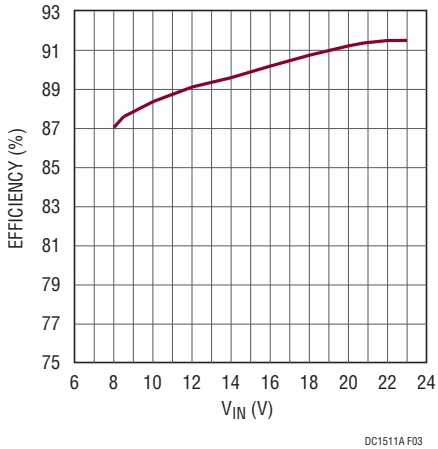


Figure 3. DC1511A-B Efficiency vs V_{IN} Boost Operation, 24.8V at 350mA LED String

DEMO MANUAL DC1511A

PARTS LIST

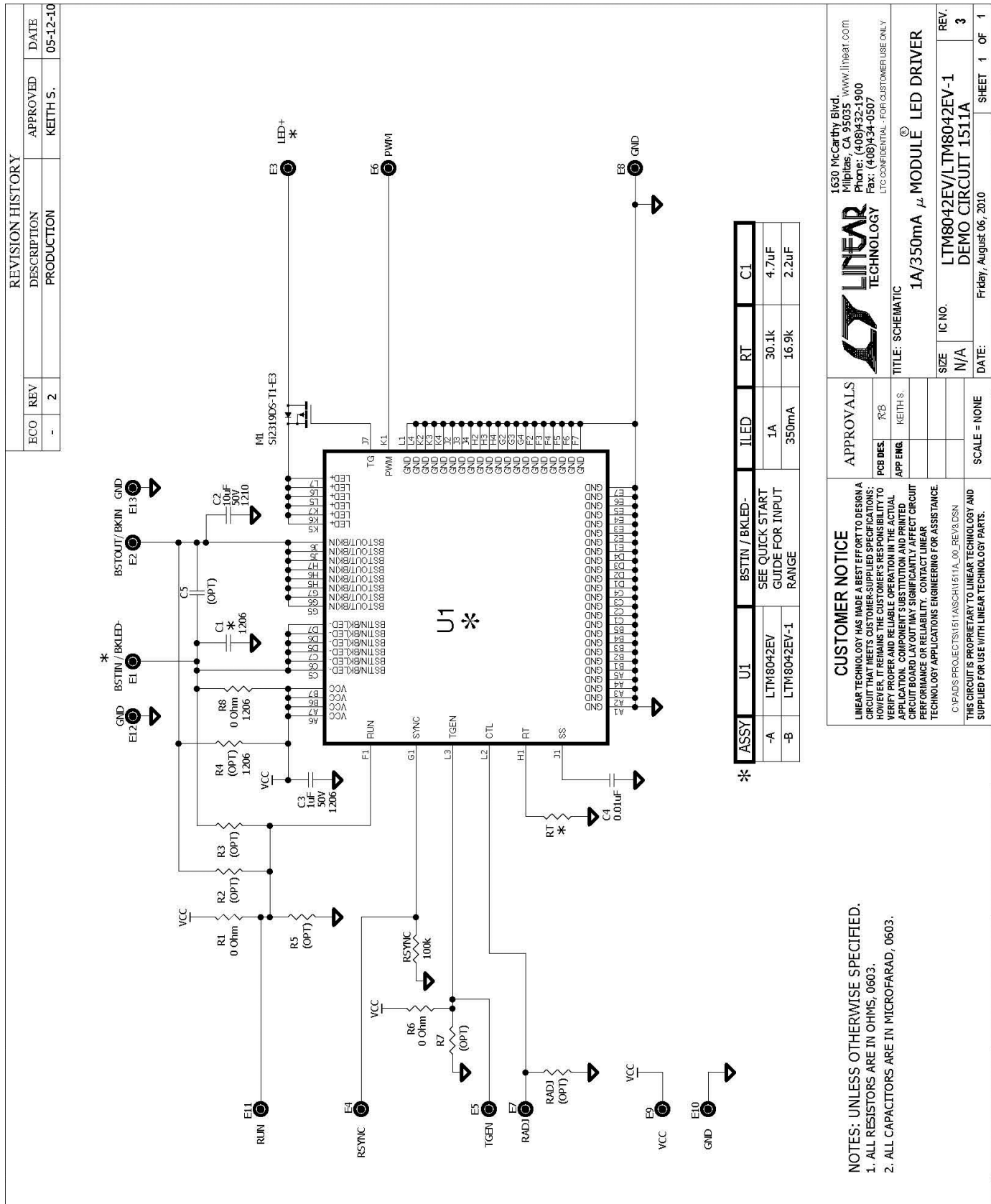
LTM8042EV

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	Cap., X5R, 4.7 μ F, 50V, 20%, 1206	Taiyo Yuden UMK316BJ475ML-T
2	1	C2	Cap., X5R, 10 μ F, 50V, 20%, 1210	Taiyo Yuden UMK325BJ106MM-T
3	1	C4	Cap., X7R, 0.01 μ F, 25V, 10%, 0603	AVX 06033C103KAT2A
4	1	RT	Res., Chip, 30.1k, 0.06W, 1%, 0603	NIC NRC06F3012TRF
5	1	U1	I.C., LED Driver, LGA (77), 15mm $\times$ 9mm $\times$ 4.32mm	Linear Technology Corporation LTM8042EV
Additional Demo Board Circuit Components				
1	1	C3	Cap., X5R, 1 μ F, 50V, 20%, 1206	TDK C3216X5R1H105M
2	0	C5 (OPT)	Cap., 1206	
3	0	R _{ADJ} , R2, R3, R5, R7 (OPT)	Res., 0603	
4	1	R _{SYNC}	Res., Chip, 100k, 0.06W, 5%, 0603	NIC NRC06J104TRF
5	2	R1, R6	Res./Jumper, Chip, 0 Ω , 1/16W, 1A, 0603	Vishay CRCW06030000Z0EA
6	0	R4 (OPT)	Res., 1206	
7	1	R8	Res./Jumper, Chip, 0 Ω , 1/4W, 1A, 1206	Vishay CRCW12060000Z0EA
8	1	M1	P-Channel MOSFET, 40V, SOT-23	Vishay Si2319DS-T1-E3 #PBF
Hardware, for Demo Board Only				
1	13	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13	Turret, Testpoint 0.094"	Mill-Max 2501-2-00-80-00-00-07-0

LTM8042EV-1

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	Cap., X5R, 2.2 μ F, 50V, 20%, 1206	Taiyo Yuden UMK316BJ225MD-T
2	1	C2	Cap., X5R, 10 μ F, 50V, 20%, 1210	Taiyo Yuden UMK325BJ106MM-T
3	1	C4	Cap., X7R, 0.01 μ F, 25V, 10%, 0603	AVX 06033C103KAT2A
4	1	RT	Res., Chip, 16.9k, 0.06W, 1%, 0603	Vishay CRCW060316K9FKEA
5	1	U1	I.C., LED Driver, LGA (77), 15mm $\times$ 9mm $\times$ 4.32mm	Linear Technology Corporation LTM8042EV-1
Additional Demo Board Circuit Components				
1	1	C3	Cap., X5R, 1 μ F, 50V, 20%, 1206	TDK C3216X5R1H105M
2	0	C5 (OPT)	Cap., 1206	
3	0	R _{ADJ} , R2, R3, R5, R7 (OPT)	Res., 0603	
4	1	R _{SYNC}	Res., Chip, 100k, 0.06W, 5%, 0603	NIC NRC06J104TRF
5	2	R1, R6	Res./Jumper, Chip, 0 Ω , 1/16W, 1A, 0603	Vishay CRCW06030000Z0EA
6	0	R4 (OPT)	Res., 1206	
7	0	R8	Res./Jumper, Chip, 0 Ω , 1/4W, 1A, 1206	Vishay CRCW12060000Z0EA
8	1	M1	P-Channel MOSFET, 40V, SOT-23	Vishay Si2319DS-T1-E3 #PBF
Hardware, for Demo Board Only				
1	13	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13	Turret, Testpoint, 0.094"	Mill-Max 2501-2-00-80-00-00-07-0

SCHEMATIC DIAGRAM



DEMO MANUAL DC1511A

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