CHANGE NOTIFICATION

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900

February 21, 2017

Dear Sir/Madam: PCN#022117

Subject: Notification of Change to LT3791, LT3791-1 Datasheet

Please be advised that Linear Technology Corporation has made a minor change to the LT3791, LT3791-1 product datasheet to facilitate improvement in our manufacturing yield. The changes are shown on the attached pages of the marked up datasheet. There was no change in form, fit, function, quality or reliability of the product. The product shipped after April 21, 2017 will be tested to the new limits.

Should you have any concerns, please contact me before April 21, 2017, at which time we will consider this change to be approved. Should you have any questions or concerns please contact your local Linear Technology Sales person or you may contact me at 408-432-1900 ext. 2077, or by e-mail at JASON.HU@LINEAR.COM.

Sincerely,

Jason Hu
Quality Assurance Engineer

LT3791

60V 4-Switch Synchronous Buck-Boost LED Driver Controller

FEATURES

- **4-Switch Single Inductor Architecture Allows V_{IN} Above, Below or Equal to V_{OUT}**
- **Synchronous Switching: Up to 98.5% Efficiency**
- **Wide V_{IN} Range: 4.7V to 60V**
- **Wide V_{OUT} Range: 0V to 60V (52V LED)**
- **±6% LED Current Accuracy: 0V ≤ V_{LED} < 52V**
- True Color PWM™ and Analog Dimming
- LED and Input Current Regulation with Current Monitor Outputs
- No Top MOSFET Refresh in Buck or Boost
- V_{OUT} Disconnected From V_{IN} During Shutdown
- Open or Shorted LED Fault Protection
- Capable of 100W or Greater per IC
- 38-Lead TSSOP with Exposed Pad

APPLICATIONS

- Automotive Head Lamps/Running Lamps
- General Purpose Lighting

DESCRIPTION

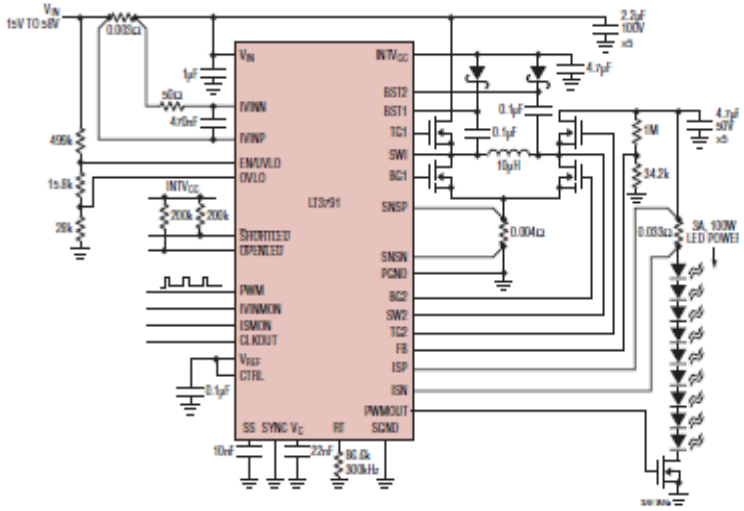
The LT®3791 is a synchronous 4-switch buck-boost LED driver controller. The controller can regulate LED current up to 52V of LED string with input voltages above, below, or equal to the output voltage. The constant-frequency, forced-continuous current mode architecture allows its frequency to be adjusted or synchronized from 200kHz to 700kHz. No top MOSFET refresh switching cycle is needed in buck or boost operation. With 60V input, 60V output capability and seamless transitions between operating regions, the LT3791 is ideal for LED driver applications in automotive, industrial, and even battery-powered systems.

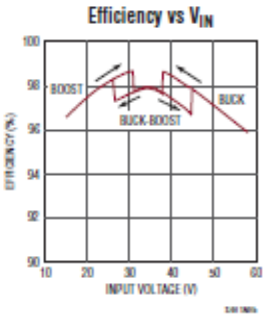
~~The LT3791 provides input current monitor, LED current monitor, and open or shorted LED fault condition, during which the LT3791 either restarts or latches off.~~

For New designs we recommend the LT8391 : 60V Synchronous 4-Switch Buck-Boost LED controller

TYPICAL APPLICATION

98.5% Efficient 100W (33.3V 3A) Buck-Boost LED Driver





ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating junction temperature range, otherwise specifications are at T_A = 25°C (Note 2). V_{IN} = 12V, $V_{EN/UVLO}$ = 12V unless otherwise noted.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Logic Inputs						
EN/UVLO Falling Threshold		●	1.16	1.2	1.24	V
EN/UVLO Rising Hysteresis				15		mV
EN/UVLO Input Low Voltage	I_{VIN} Drops Below 1µA				0.3	V
EN/UVLO Pin Bias Current Low	$V_{EN/UVLO}$ = 1V		2	3	4	µA
EN/UVLO Pin Bias Current High	$V_{EN/UVLO}$ = 1.6V			10	100	nA
CTRL Input Bias Current	V_{CTRL} = 1V			20	50	nA
CTRL Latch-Off Threshold				175		mV
OVLO Rising Shutdown Voltage		●	2.85	3	3.15	V
OVLO Falling Hysteresis				75		mV
Regulation						
V_{REF} Voltage		●	1.96	2.00	2.04	V
V_{REF} Line Regulation	4.7V < V_{IN} < 60V			0.002	0.04	%/V
$V_{(ISP-ISN)}$ Threshold	V_{CTRL} = 2V	 ●	97.5 94	100 100	102.5 106	mV mV
	V_{CTRL} = 1100mV	 ●	87 84	90 90	93 96	mV mV
	V_{CTRL} = 700mV	 ●	47.5 46	50 50	52.5 54	mV mV
	V_{CTRL} = 300mV	 ●	6.5 5	10 10	13.5 15	mV mV
ISP Bias Current				110		µA
ISN Bias Current				20		µA
LED Current Sense Common Mode Range			0		60	V
LED Current Sense Amplifier g_m				890		µS
ISMON Monitor Voltage	$V_{(ISP-ISN)}$ = 100mV	●	0.96	1	1.04	V
Input Current Sense Threshold $V_{(IVINP-IVINN)}$	3V ≤ V_{IVINP} ≤ 60V	●	46.5	50	54	mV
IVINP Bias Current				90		µA
IVINN Bias Current				20		µA
Input Current Sense Common Mode Range			3		60	V
Input Current Sense Amplifier g_m				2.12		mS
IVINMON Monitor Voltage	$V_{(IVINP-IVINN)}$ = 50mV	●	0.96	1	1.04	V
FB Regulation Voltage		 ●	1.194 1.176	1.2 1.2	1.206 1.220	V V
FB Line Regulation	4.7V < V_{IN} < 60V			0.002	0.025	%/V
FB Amplifier g_m				565		µS
FB Pin Input Bias Current	FB in Regulation			100	~~150~~ 200	nA
V_C Standby Input Bias Current	PWM = 0V		–20		20	nA
$V_{SENSE(MAX)}$ ($V_{SNSP-SNSN}$)	Boost Buck	● ●	42 –56	51 –47.5	60 –39	mV mV
Fault						
SS Pull-Up Current	V_{SS} = 0V			14		µA
SS Discharge Current				1.4		µA
FB Overvoltage Rising Threshold			1.22	1.25		V
Open LED Rising Threshold (V_{FB})	$V_{(ISP-ISN)}$ = 0V	●	1.127	1.15	1.173	V

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating junction temperature range, otherwise specifications are at T_A = 25°C (Note 2). V_{IN} = 12V, $V_{EN/UVLO}$ = 12V unless otherwise noted.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Open LED Falling Threshold (V_{FB})		●	1.078	1.1	1.122	V
Open LED Falling Threshold ($V_{(ISP-ISN)}$)	V_{FB} = 1.2V		5	10	15	mV
Short LED Falling Threshold (V_{FB})			380	400	450	mV
OPENLED Pin Output Impedance				1.1	2.0	kΩ
SHORTLED Pin Output Impedance				1.1	2.0	kΩ
SS Latch-Off Threshold				1.75		V
SS Reset Threshold				0.2		V
Oscillator						
Switching Frequency	R_T = 147k R_T = 59.0k R_T = 29.1k		190 380 665	200 400 700	210 420 735	kHz kHz kHz
SYNC Frequency			200		700	kHz
SYNC Pin Resistance to GND				90		kΩ
SYNC Threshold Voltage			0.3		1.5	V
Internal V_{CC} Regulator						
$INTV_{CC}$ Regulation Voltage			4.8	5	5.2	V
Dropout (V_{IN} – $INTV_{CC}$)	I_{INTVCC} = –10mA, V_{IN} = 5V			240	350	mV
$INTV_{CC}$ Undervoltage Lockout			3.1	3.5	3.9	V
$INTV_{CC}$ Current Limit	V_{INTVCC} = 4V			67		mA
PWM						
PWM Threshold Voltage			0.3		1.5	V
PWM Pin Resistance to GND				90		kΩ
PWMOUT Pull-Up Resistance				10	20	Ω
PWMOUT Pull-Down Resistance				5	10	Ω
NMOS Drivers						
TG1, TG2 Gate Driver On-Resistance Gate Pull-Up Gate Pull-Down	V_{BST} – V_{SW} = 5V			 2.6 1.7		 Ω Ω
BG1, BG2 Gate Driver On-Resistance Gate Pull-Up Gate Pull-Down	V_{INTVCC} = 5V			 3 1.2		 Ω Ω
TG Off to BG On Delay	C_L = 3300pF			60		ns
BG Off to TG On Delay	C_L = 3300pF			60		ns
TG1, TG2, $t_{OFF(MIN)}$	R_T = 59.0k			240	~~300~~ 320	ns

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The LT3791E is guaranteed to meet performance from 0°C to 125°C junction temperature. Specification over the -40°C to 125°C operating junction temperature range are assured by design, characterization and correlation with statistical process controls. The LT3791I is guaranteed to meet performance specifications over the –40°C to 125°C operating junction temperature range. The LT3791H is guaranteed to meet performance specifications over the –40°C to 150°C operating junction temperature range. The LT3791MP is guaranteed to meet performance specifications over the –55°C to 150°C operating junction temperature range. High junction temperatures degrade operating lifetimes. Operating lifetime is derated for junction temperatures greater than 125°C.

Note 3: The LT3791 includes overtemperature protection that is intended to protect the device during momentary overload conditions. Junction temperature will exceed the maximum operating junction temperature when overtemperature protection is active. Continuous operation above the specified absolute maximum operating junction temperature may impair device reliability.

LT3791-1

60V 4-Switch Synchronous Buck-Boost Controller

FEATURES

- **4-Switch Single Inductor Architecture Allows V_{IN} Above, Below or Equal to V_{OUT}**
- **Synchronous Switching: Up to 98.5% Efficiency**
- **Wide V_{IN} Range: 4.7V to 60V**
- **2% Output Voltage Accuracy: 1.2V ≤ V_{OUT} < 60V**
- **6% Output Current Accuracy: 0V ≤ V_{OUT} < 60V**
- Input and Output Current Regulation with Current Monitor Outputs
- No Top FET Refresh in Buck or Boost
- V_{OUT} Disconnected from V_{IN} During Shutdown
- C/10 Charge Termination and Output Shorted Flags
- Capable of 100W or greater per IC
- 38-Lead TSSOP with Exposed Pad

APPLICATIONS

- Automotive, Telecom, Industrial Systems
- High Power Battery-Powered System

DESCRIPTION

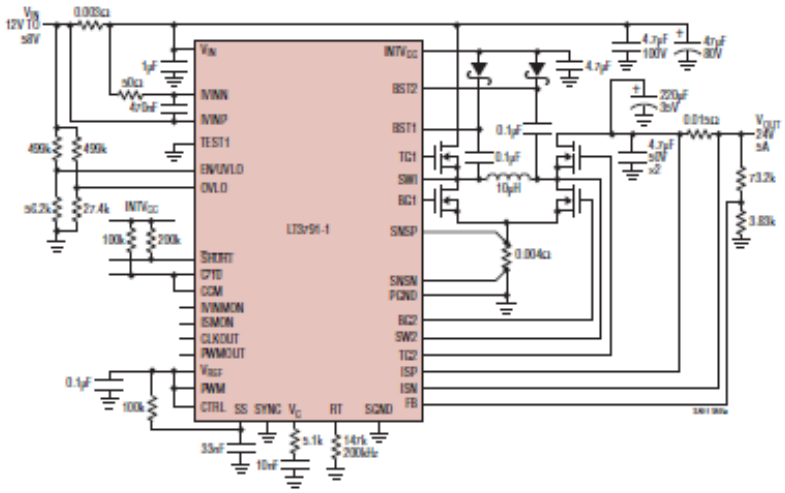
The LT®3791-1 is a synchronous 4-switch buck-boost voltage/current regulator controller. The controller can regulate output voltage, output current, or input current with input voltages above, below, or equal to the output voltage. The constant-frequency, current mode architecture allows its frequency to be adjusted or synchronized from 200kHz to 700kHz. No top FET refresh switching cycle is needed in buck or boost operation. With 60V input, 60V output capability and seamless transitions between operating regions, the LT3791-1 is ideal for voltage regulator, battery/super-capacitor charger applications in automotive, industrial, telecom, and even battery-powered systems.

~~The LT3791-1 provides input current monitor, output current monitor, and various status flags, such as C/10 charge termination and shorted output flag.~~

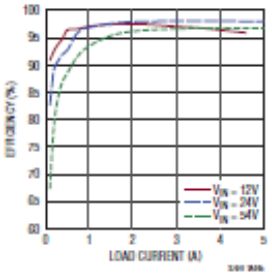
For New designs we recommend the LT8391 : 60V Synchronous 4-Switch Buck-Boost LED controller

TYPICAL APPLICATION

120W (24V 5A) Buck-Boost Voltage Regulator



Efficiency vs Load Current



ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating junction temperature range, otherwise specifications are at T_A = 25°C (Note 2). V_{IN} = 12V, $V_{EN/UVLO}$ = 12V unless otherwise noted.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Logic Inputs						
EN/UVLO Falling Threshold		●	1.16	1.2	1.24	V
EN/UVLO Rising Hysteresis				15		mV
EN/UVLO Input Low Voltage	I_{VIN} Drops Below 1µA				0.3	V
EN/UVLO Pin Bias Current Low	$V_{EN/UVLO}$ = 1V		2	3	4	µA
EN/UVLO Pin Bias Current High	$V_{EN/UVLO}$ = 1.6V			10	100	nA
CCM Threshold Voltage			0.3		1.5	V
CTRL Input Bias Current	V_{CTRL} = 1V			20	50	nA
CTRL Latch-Off Threshold				175		mV
OVLO Rising Shutdown Voltage		●	2.85	3	3.15	V
OVLO Falling Hysteresis				75		mV
Regulation						
V_{REF} Voltage		●	1.96	2.00	2.04	V
V_{REF} Line Regulation	4.7V < V_{IN} < 60V			0.002	0.04	%/V
$V_{(ISP-ISN)}$ Threshold	V_{CTRL} = 2V	 ●	97.5 94	100 100	102.5 106	mV mV
	V_{CTRL} = 1100mV	 ●	87 84	90 90	93 96	mV mV
	V_{CTRL} = 700mV	 ●	47.5 46	50 50	52.5 54	mV mV
	V_{CTRL} = 300mV	 ●	6.5 5	10 10	13.5 15	mV mV
ISP Bias Current				110		µA
ISN Bias Current				20		µA
Output Current Sense Common Mode Range			0		60	V
Output Current Sense Amplifier g_m				890		µS
ISMON Monitor Voltage	$V_{(ISP-ISN)}$ = 100mV	●	0.96	1	1.04	V
Input Current Sense Threshold $V_{(IVINP-IVINN)}$	3V ≤ V_{IVINP} ≤ 60V	●	46.5	50	54	mV
IVINP Bias Current				90		µA
IVINN Bias Current				20		µA
Input Current Sense Common Mode Range			3		60	V
Input Current Sense Amplifier g_m				2.12		mS
IVINMON Monitor Voltage	$V_{(IVINP-IVINN)}$ = 50mV	●	0.96	1	1.04	V
FB Regulation Voltage		 ●	1.194 1.176	1.2 1.2	1.206 1.220	V V
FB Line Regulation	4.7V < V_{IN} < 60V			0.002	0.025	%/V
FB Amplifier g_m				565		µS
FB Pin Input Bias Current	FB in Regulation			100	~~150~~ 200	nA
V_C Standby Input Bias Current	PWM = 0V		–20		20	nA
$V_{SENSE(MAX)}$ ($V_{SNSP-SNSN}$)	Boost Buck	● ●	42 –56	51 –47.5	60 –39	mV mV
Fault						
SS Pull-Up Current	V_{SS} = 0V			14		µA
SS Discharge Current				1.4		µA

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating junction temperature range, otherwise specifications are at T_A = 25°C (Note 2). V_{IN} = 12V, $V_{EN/UVLO}$ = 12V unless otherwise noted.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
$\overline{CTO}$ Rising Threshold (V_{FB})	$V_{(ISP-ISN)}$ = 0V	●	1.127	1.15	1.173	V
$\overline{CTO}$ Falling Threshold (V_{FB})		●	1.078	1.1	1.122	V
$\overline{CTO}$ Falling Threshold ($V_{(ISP-ISN)}$)	V_{FB} = 1.2V		5	10	15	mV
$\overline{SHORT}$ Falling Threshold (V_{FB})			380	400	450	mV
$\overline{CTO}$ Pin Output Impedance				1.1	2.0	kΩ
$\overline{SHORT}$ Pin Output Impedance				1.1	2.0	kΩ
SS Latch-Off Threshold				1.75		V
SS Reset Threshold				0.2		V
Oscillator						
Switching Frequency	R_T = 147k R_T = 59.0k R_T = 29.1k		190 380 665	200 400 700	210 420 735	kHz kHz kHz
SYNC Frequency			200		700	kHz
SYNC Pin Resistance to GND				90		kΩ
SYNC Threshold Voltage			0.3		1.5	V
Internal V_{CC} Regulator						
$INTV_{CC}$ Regulation Voltage			4.8	5	5.2	V
Dropout (V_{IN} – $INTV_{CC}$)	I_{INTVCC} = –10mA, V_{IN} = 5V			240	350	mV
$INTV_{CC}$ Undervoltage Lockout			3.1	3.5	3.9	V
$INTV_{CC}$ Current Limit	V_{INTVCC} = 4V			67		mA
PWM						
PWM Threshold Voltage			0.3		1.5	V
PWM Pin Resistance to GND				90		kΩ
PWMOUT Pull-Up Resistance				10	20	Ω
PWMOUT Pull-Down Resistance				5	10	Ω
NMOS Drivers						
TG1, TG2 Gate Driver On-Resistance Gate Pull-Up Gate Pull-Down	V_{BST} – V_{SW} = 5V			 2.6 1.7		 Ω Ω
BG1, BG2 Gate Driver On-Resistance Gate Pull-Up Gate Pull-Down	V_{INTVCC} = 5V			 3 1.2		 Ω Ω
TG Off to BG On Delay	C_L = 3300pF			60		ns
BG Off to TG On Delay	C_L = 3300pF			60		ns
TG1, TG2, $t_{OFF(MIN)}$	R_T = 59.0k			240	~~300~~ 320	ns

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The LT3791E-1 is guaranteed to meet performance from 0°C to 125°C junction temperature. Specification over the -40°C to 125°C operating junction temperature range are assured by design, characterization and correlation with statistical process controls. The LT3791I-1 is guaranteed to meet performance specifications over the –40°C to 125°C operating junction temperature range. The LT3791H-1 is guaranteed to meet performance specifications over the –40°C to 150°C operating junction temperature range. The LT3791MP-1 is guaranteed to meet performance specifications over the –55°C to 150°C operating junction temperature range. High junction temperatures degrade operating lifetimes. Operating lifetime is derated for junction temperatures greater than 125°C.

Note 3: The LT3791-1 includes overtemperature protection that is intended to protect the device during momentary overload conditions. Junction temperature will exceed the maximum operating junction temperature when overtemperature protection is active. Continuous operation above the specified absolute maximum operating junction temperature may impair device reliability.