



LC2770

40V Synchronous Constant Current LED Driver

DESCRIPTION

LC2770 is a 40V synchronous constant current buck LED driver, with 55mΩ High-Side and 20mΩ Low-Side MOSFETs integrated, minimal external component requirement and high efficiency, ideal for car lamp applications.

Adjustable Output Current up to 3.5A with ±3% accuracy. R_{ISEN} resistor is used to set the output current.

No external compensation component needed. 135kHz switching frequency with jitter function improves EMI performance.

Internal thermal regulation prevents the chip from overheating without shutting down the output.

Input under voltage lock-out protection disable the chip when input voltage lower than 7V.

FEATURES

- Build in power MOSFETs
- Adjustable output current, $I_{FB}=150mV$
- Constant current accuracy: ±3%
- No external compensation needed
- Internal thermal regulation
- Under voltage lock-out
- Minimum external components
- Available in SOP8 package

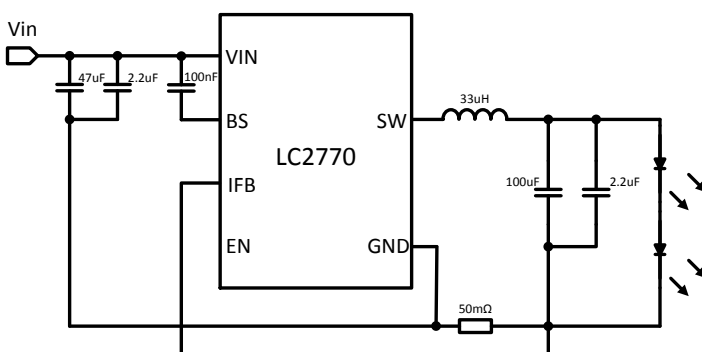
APPLICATIONS

- LED lamp for automobile

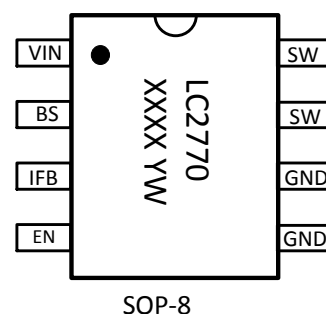
ORDERING INFORMATION

PART No.	PACKAGE	Tape&Reel
LC2770CD8TR	SOP-8	4000/Reel
		2500/Reel

TYPICAL APPLICATION



PIN OUT & MARKING



LC2770: Product Code
 XXXX: Lot No.
 YW: Date code (Year & Week)

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	VIN	Power supply input. Place a 2.2 μ F ceramic capacitor between VIN and GND as close as possible
2	BS	Power to the internal high-side MOSFET gate driver. Connect a 100nF capacitor from BS to VIN
3	IFB	Feedback pin
4	EN	Enable input. Setting it to high level 5V or NO connection, when setting it to ground level will turn off the chip.
5, 6	GND	Ground
7, 8	SW	Power switching output connect to external inductor

ABSOLUTE MAXIMUM RATING

Parameter	Value
VIN to GND	-0.3 to 42V
SW to GND	-0.3 to 42V
EN, I _{FB} to GND	-0.3 to 6V
Max operating junction temperature(T _J)	150°C
Ambient temperature(T _A)	-40°C – 105°C
Package thermal resistance (θ_{JC})	SOP-8 45°C / W
Storage temperature(T _S)	-40°C – 150°C
Lead temperature & time	260°C, 10S
ESD (HBM)	>2000V

Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

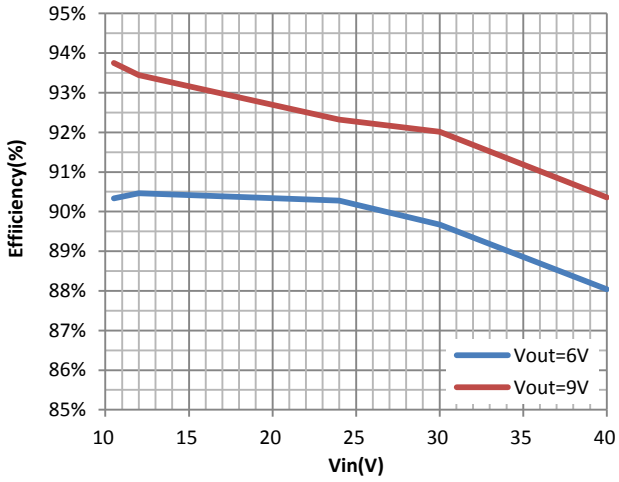
ELECTRICAL CHARACTERISTICS

(Vin=12V, T_A=25°C, unless otherwise stated)

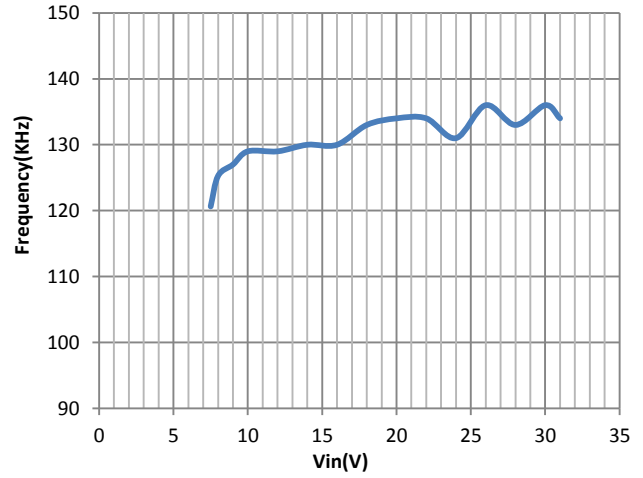
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIN	Input voltage		7	-	40	V
V _{UVLO}	UVLO voltage			7		V
	UVLO hysteresis			1		V
I _{SB}	Standby current			1.6	4	mA
F _{SW}	Switching frequency			135		KHz
I _{FB}	Reference voltage of constant current		145.5	150	154.5	mV
D _{MAX}	Maximum duty cycle			100		%
	Minimum on-time			250		ns
High side	R _{DS(ON)} of power MOS	I _{OUT} =1A	-	55	75-	m Ω
Low side		I _{OUT} =1A	-	17	22-	m Ω
T _{SD}	Thermal shutdown temp		-	150	-	°C

TYPICAL PERFORMANCE CHARACTERISTICS

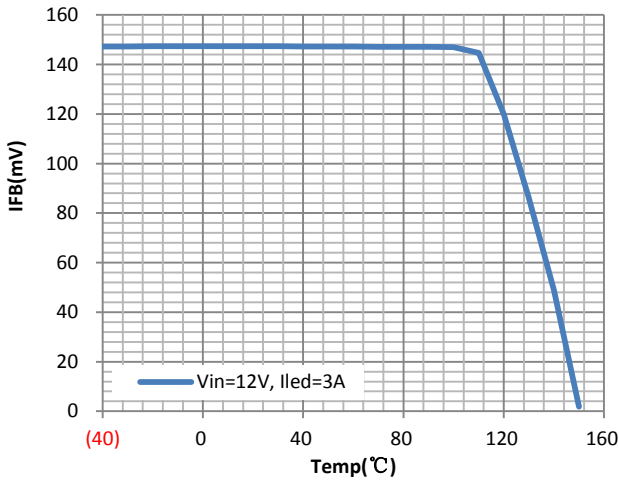
Efficiency vs. Vin



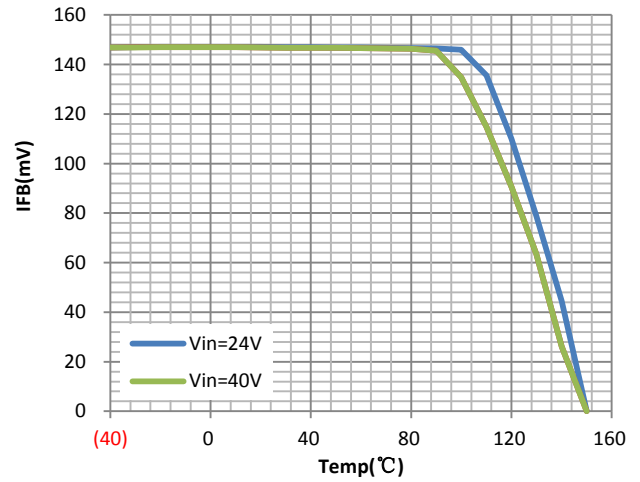
Switch Frequency vs. Input Voltage



Temperature vs. I_{FB}



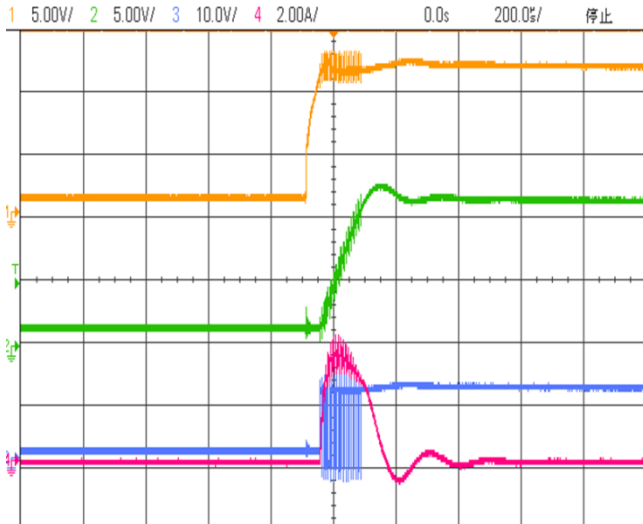
Temperature vs. I_{FB}



Power On

Vin=12V, No load

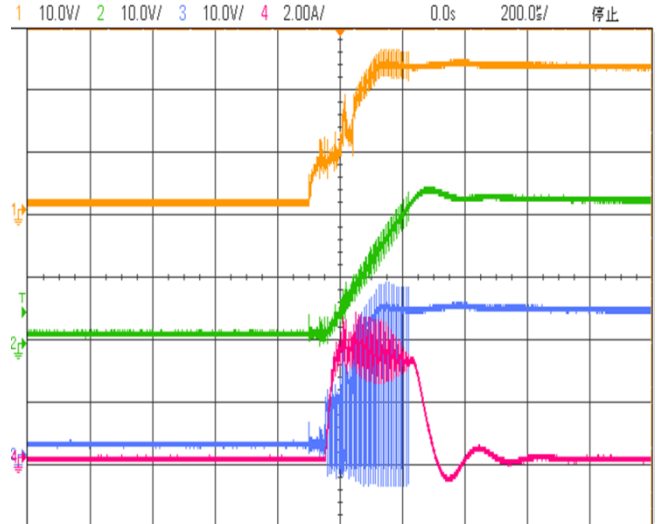
(CH1=Vin, CH2=Vout, CH3=SW, CH4=I_{sw})



Power On

Vin=24V, No load

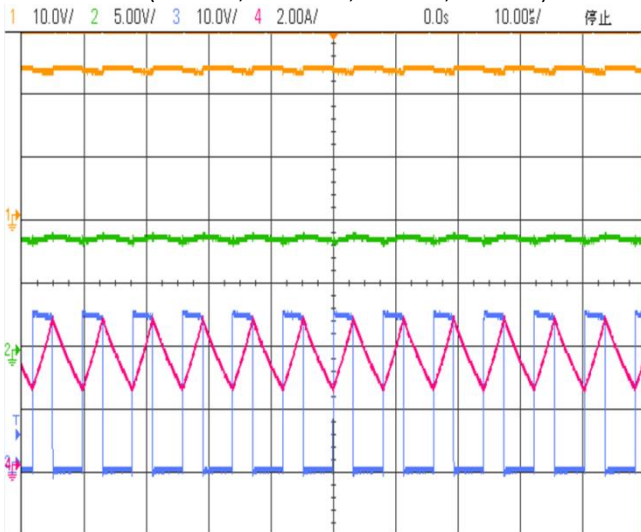
(CH1=Vin, CH2=Vout, CH3=SW, CH4=I_{sw})



Output Voltage Ripple

Vin=12V, Vout=9V, I_{LED}=3.5A

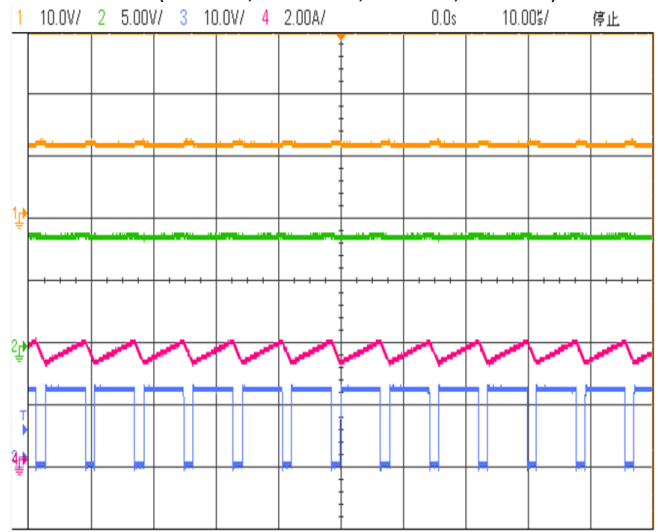
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



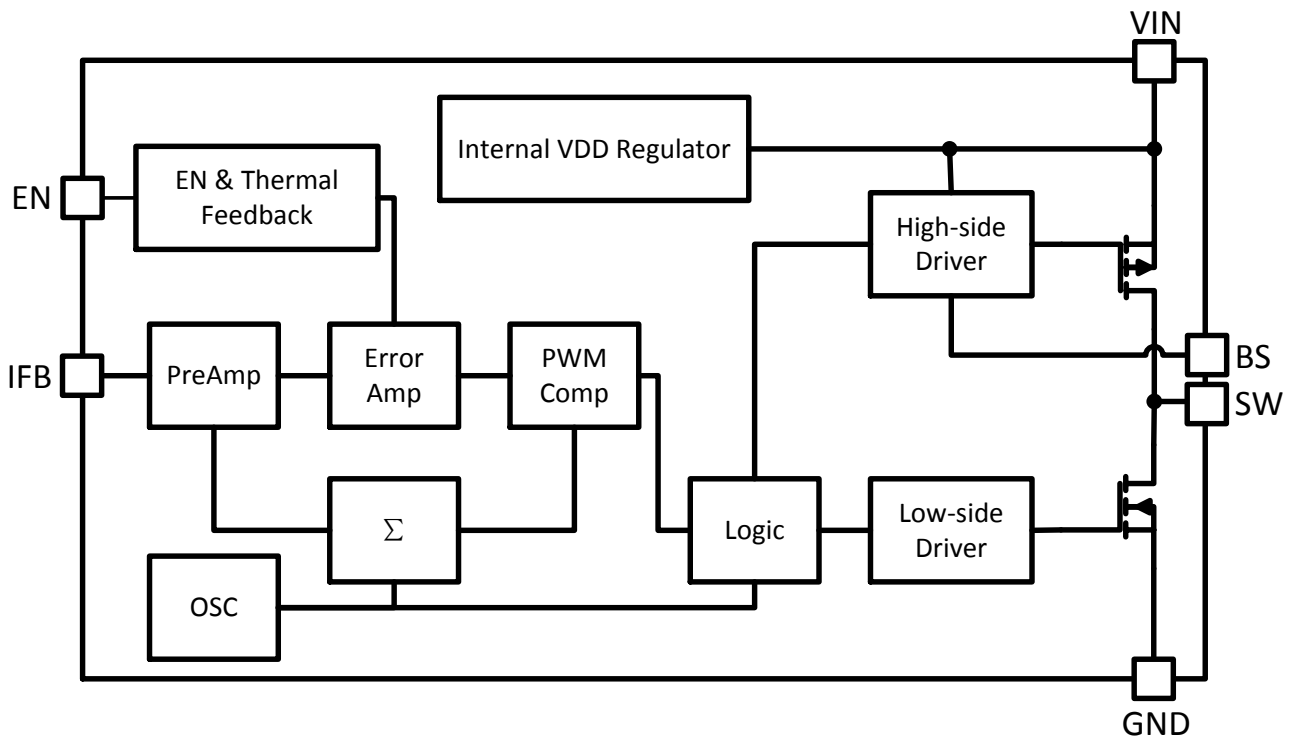
Output Voltage Ripple

Vin=24V, Vout=9V, I_{LED}=3.5A

(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



BLOCK DIAGRAM



DETAILED DESCRIPTION

Input under voltage protection

LC2770 provides an input voltage up to 40V and operates from an input voltage range of 7V to 40V. If VIN drops below 6V, the UVLO circuit inhibits switching. Once VIN rises above 7V, the UVLO clears, and the chip activates.

Constant current output

LC2770 presets the IFB voltage to 150mV. An internal compensated loop will provide enough gain and stability to ensure this voltage under the right conditions. When the internal loop works normally, the external output capacitor must be parallel to the LED load.

The Output Current can be set by an external resistor using the following equation:

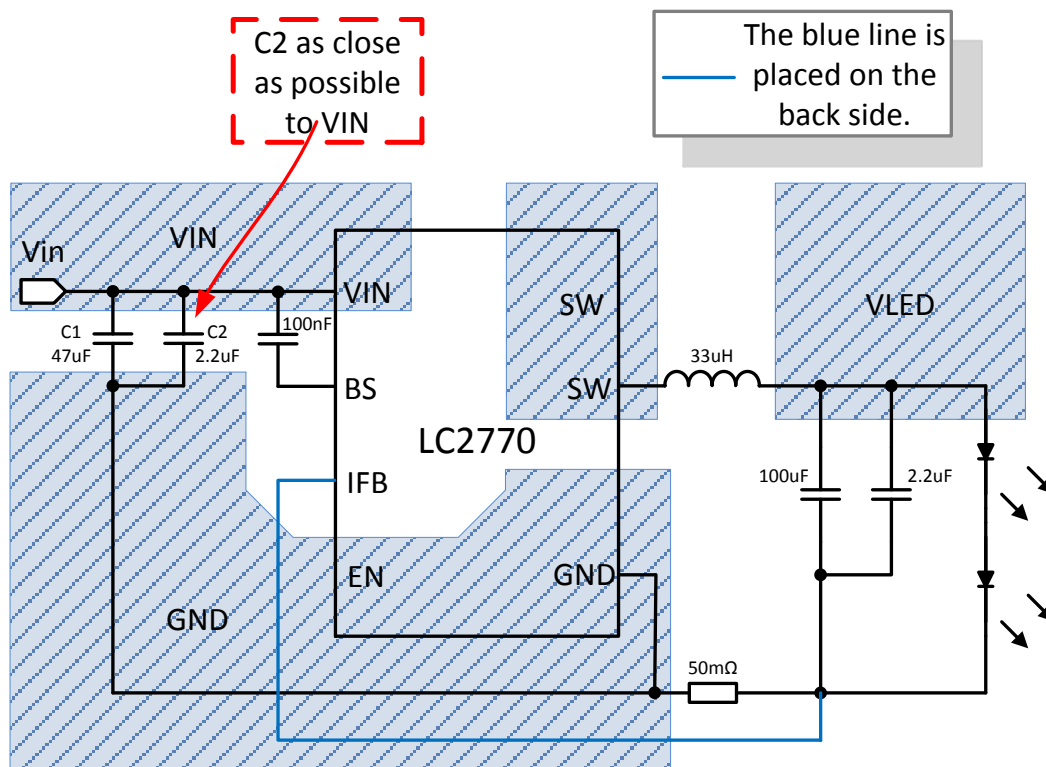
$$I_{OUT} = \frac{150mV}{R_{ISEN}}$$

Note that this equation only stands when the junction temperature is lower than the threshold value of thermal regulation, for which please read the following section.

Thermal regulation

The junction temperature of the IC is monitored internally. If the junction temperature exceeds the threshold value (typically 140°C), the converter reduces the voltage of IFB according to the temperature rise, thus to reduce the output current accordingly (i.e. when the junction temperature reaches to 145°C, the current will be drop to 75% of the original current; when reaches to 150°C, the current will be 50%). For a 30% current drop will cause a 51% heat drop generated by MOSFETS' RDS(ON) due to $P=I^2R$, and since the DC power loss makes the most contribution to heat generation, normally, this method can stabilize the temperature at between 140°C and 150°C without turning off the output when the power dissipation condition is insufficient (i.e. when the ventilation fan stops). But if external temperature continues to rise, the chip will completely shut down. This is non-latch protection. Once the junction temperature drops, the IFB voltage will rise again and the chip will resume to work.

LAYOUT GUIDE



PACKAGE OUTLINE

