

Step-up DC/DC Converter —Backlight Driver

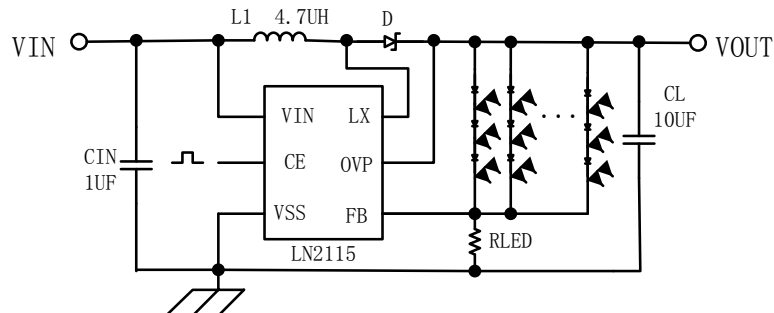
General Description

The LN2115 Series is a fixed frequency, constant current step-up DC/DC converter ideal for driving LEDs used in backlighting applications on cellular phones, PDAs and digital cameras etc. Output voltage of up to 28V can be derived, and from a 3.6V input four white Led's cab be driven in series or alternatively, using a 3.0V input, a network of six LEDs may be driven. Luminance of the LED's is controlled by changing the duty cycle of a PWM signal applied to the CE pin.

Applications

- For White LED Drivers
- Mobil phones, PHS
- PDAs
- Digital still cameras

Typical Application Circuit



Caution: The value of the resistance named R_{LED} : $R_{LED} = V_{FB} / I_{LED}$; V_{FB} is the voltage of the FB pin;
 I_{LED} is the current of LED.

Ordering Information

LN2115 ①②③④⑤⑥-⑦

Item	Symbol	Function
①	B	Denotes Lx Overvoltage Limit: Yes Denotes Oscillation Frequency:1.5MHZ
②③④	025	Denotes FB Voltage:0.25V
⑤	M	Denotes Package Type : SOT-23-6L
⑥	R	Embossed Tape :Standard Feed
	L	Embossed Tape :Reverse Feed
⑦	G	Green epoxy molding compound

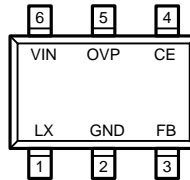
Features

- Input voltage range 2.5V—6V
- Output voltage range up to 28V
- Oscillation frequency 1.5MHz±20%
- Efficiency 88%(When driving 3 white LEDs in series $V_{IN}=3.6V$ $I_{LED}=20mA$)
- Control PWM control
- Stand-by Current $ISTB=1.0\mu A(MAX)$
- Load capacitor 10uF,ceramic
- LX limit Current 1000mA

Package

- SOT23-6L

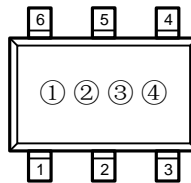
■ Functional Pin Description



SOT-23-6L
(TOP VIEW)

Pin Number	Pin Name	Function
1	LX	SWITCH
2	VSS	Ground
3	FB	Voltage Feedback
4	CE	Chip Enable
5	OVP	Over voltage protect
6	VIN	Power Input

■ Marking Rule



SOT-23-6L
(TOP VIEW)

- ① Represents the product name

Symbol	Part Number
Z	LN2115****M*

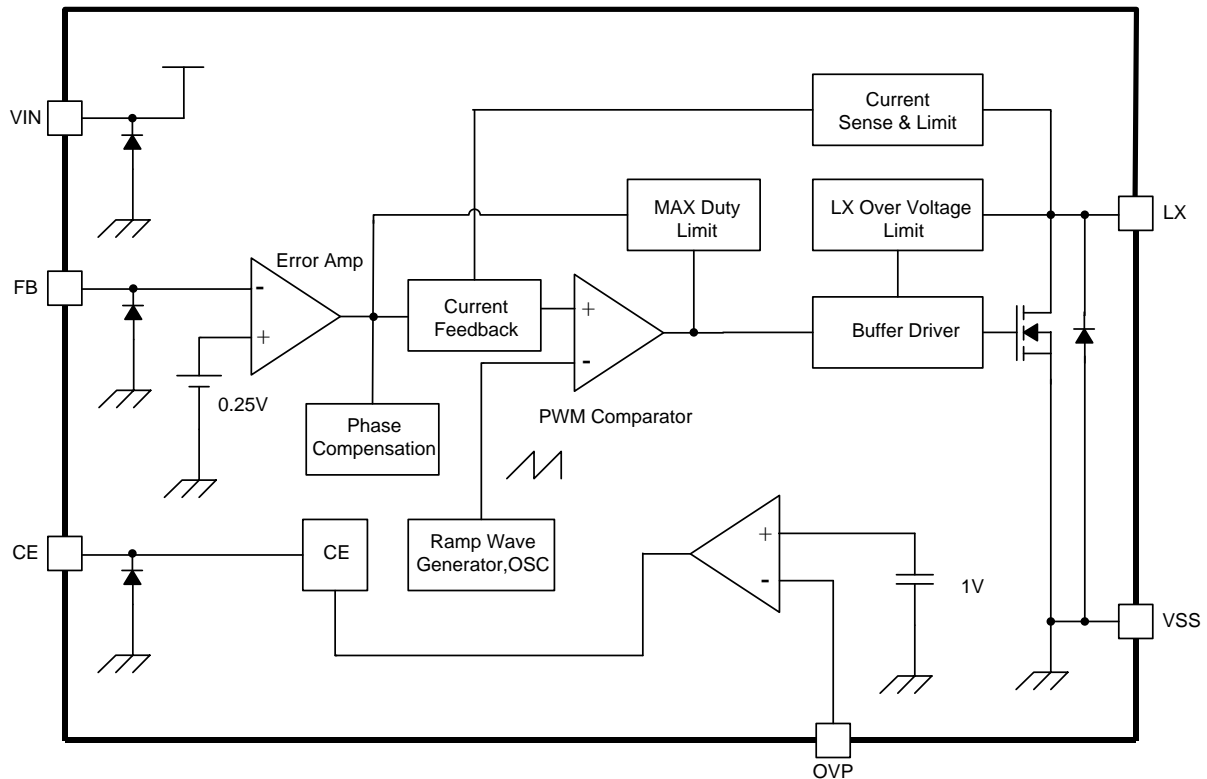
- ② ③ Represents the voltage of FB pin and the type of regulator

Symbol	V _{FB}
L5	0.25V±0.01V

- ③ Represents the assembly lot no

0~9, A~Z, Reverts 0~9, A~Z repeated (G,I,J,O,Q,W expected)

Note: the dots around the marking are represents the product quality tracking infromations.

■ Function Block Diagram

■ Absolute Maximum Ratings

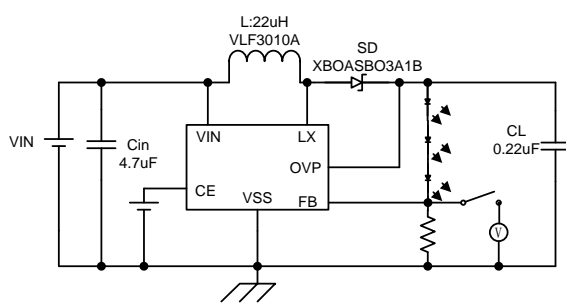
Item	Symbol	Absolute maximum ratings	Unit	
VIN Pin Voltage	V_{IN}	$V_{SS}-0.3 \sim V_{SS}+7$	V	
OUT Pin Voltage	V_{OUT}	$V_{SS}-0.3 \sim V_{SS}+29$		
LX Pin Voltage	V_{LX}	$V_{SS}-0.3 \sim V_{SS}+29$		
FB Pin Voltage	V_{FB}	$V_{SS}-0.3 \sim V_{SS}+7$	V	
CE Pin Voltage	V_{CE}	$V_{SS}-0.3 \sim V_{SS}+7$	V	
OVP Pin Voltage	V_{OVP}	$V_{SS}-0.3 \sim V_{SS}+29$		
LX Pin Current	I_{LX}	1000	mA	
Power Dissipation	PD	SOT23-6L	250	mW
Operating Temperature range	T_{opr}		$-40 \sim +85$	°C
Storage Temperature range	T_{stg}		$-55 \sim +125$	

■ Electrical Characteristics

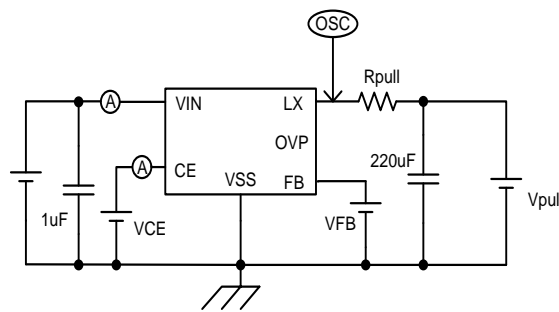
(Ta=25°C, unless otherwise noted)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Circuits
FB Control Voltage	V _{FB}	-	0.24	0.25	0.26	V	1
Operating Voltage range	V _{IN}	-	2.5	-	6		
Stand-by Current	ISTB	V _{CE} =0V, V _{LX} =5V	-	-	1	μA	3
Supply Current 1	IDD1	-	-	550	-	μA	2
Supply Current 2	IDD2	V _{IN} =V _{LX} , V _{FB} =0.4V	-	65	-		
Oscillation Frequency	FOSC	-	1.2	1.5	1.8	MHz	2
Maximum Duty Cycle	MAXDTY	V _{CONT} =0.4V	86	92	98	%	2
Efficiency	EFFI	V _{IN} =3.6V; R _{LED} =20Ω	-	88	-	%	1
Current Limit	I _{LIM}	V _{IN} =3.6	-	800	-	mA	4
OVP Overvoltage Limit	OVPL	-	20	22.5	25	V	2
LX On Resistance	-	V _{IN} =3.6V, V _{LX} =0.4V	-	2.0	-	Ω	2
LX Leak Current	I _{LXL}	-	-	0	1	μA	3
CE 'H' Voltage	V _{CEH}	-	0.65	-	-	V	2
CE 'L' Voltage	V _{CEL}	-	-	-	0.2	V	2
CE 'H' Current	I _{CEH}	V _{IN} =V _{LX} , V _{FB} =0.4V	-	-	0.1	μA	3
CE 'L' Current	I _{CEL}	V _{CE} =0V, V _{LX} =5V	-	-	-0.1	μA	3
FB 'H' Current	I _{CEH}	V _{IN} =V _{LX} , V _{FB} =0.4V	-	-	0.1	μA	3
FB 'L' Current	I _{CEL}	V _{CE} =0V, V _{LX} =5V	-	-	-0.1	μA	3

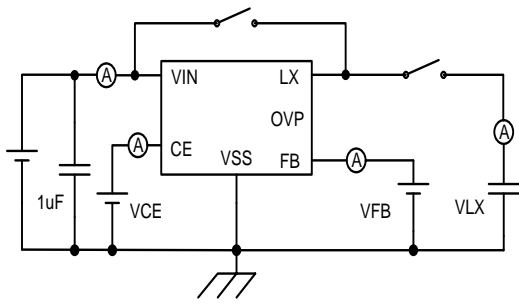
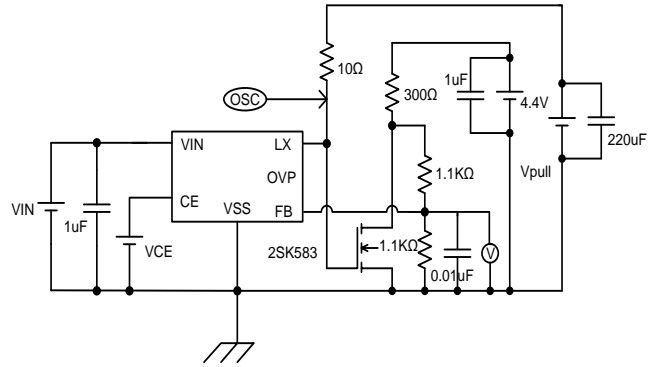
■ Test Circuits



Circuit 1

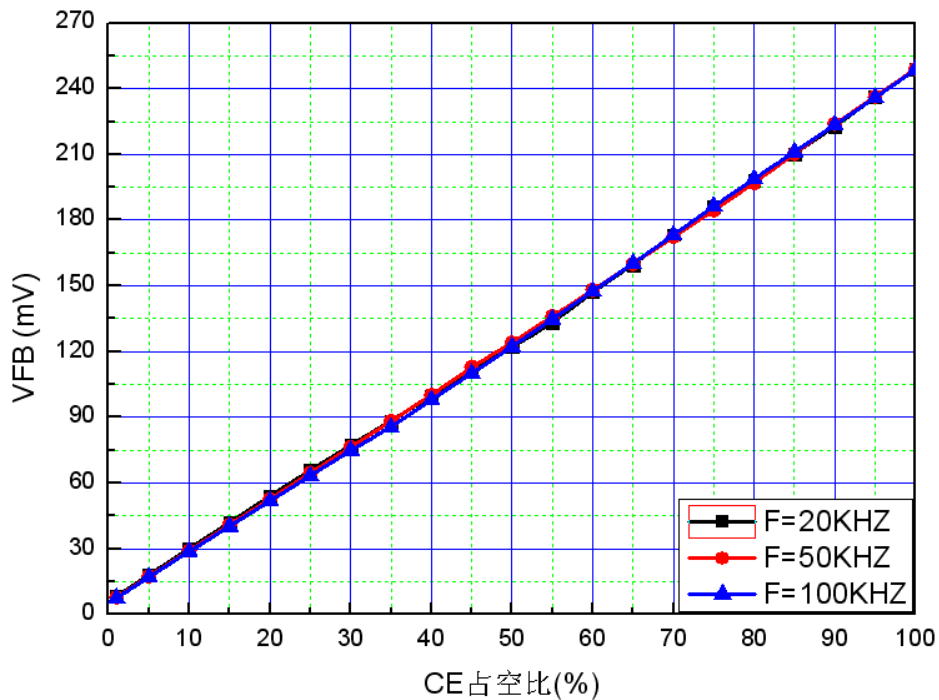


Circuit 2


Circuit 3

Circuit 4

Caution: The value of the resistance named R_{LED} : $R_{LED} = V_{FB} / I_{LED}$; V_{FB} is the voltage of the FB pin; I_{LED} is the current of LED and equal to 20mA usually.

■ Typical Performance Characteristics

PWM duty vs LED CURRENT


■ Application information

● LED Current Setting

The voltage provided by boost circuit can ensure that the FB voltage is equal to the internal reference voltage. Therefore, when R_{LED} is connected to FB and GND, the current of V_{OUT} flowing through LED and R_{LED} flowing to GND can be set by R_{LED} . The current calculation formula is as follows:

$$I_{LED} = 0.25/R_{LED}$$

● Dimming control

PWM Model Connecting CE Feet Adjustment Mode

For brightness, when the CE pin is connected to a high level, a typical 0.25V reference voltage is provided inside the chip to maximize the brightness. However, a PWM signal can also be connected to the CE foot to adjust the reference voltage by adjusting the duty cycle of the PWM signal. The relationship between duty cycle and the reference voltage is calculated according to the following formula:

$$V_{FB} = \text{Duty} \times 250\text{mV}$$

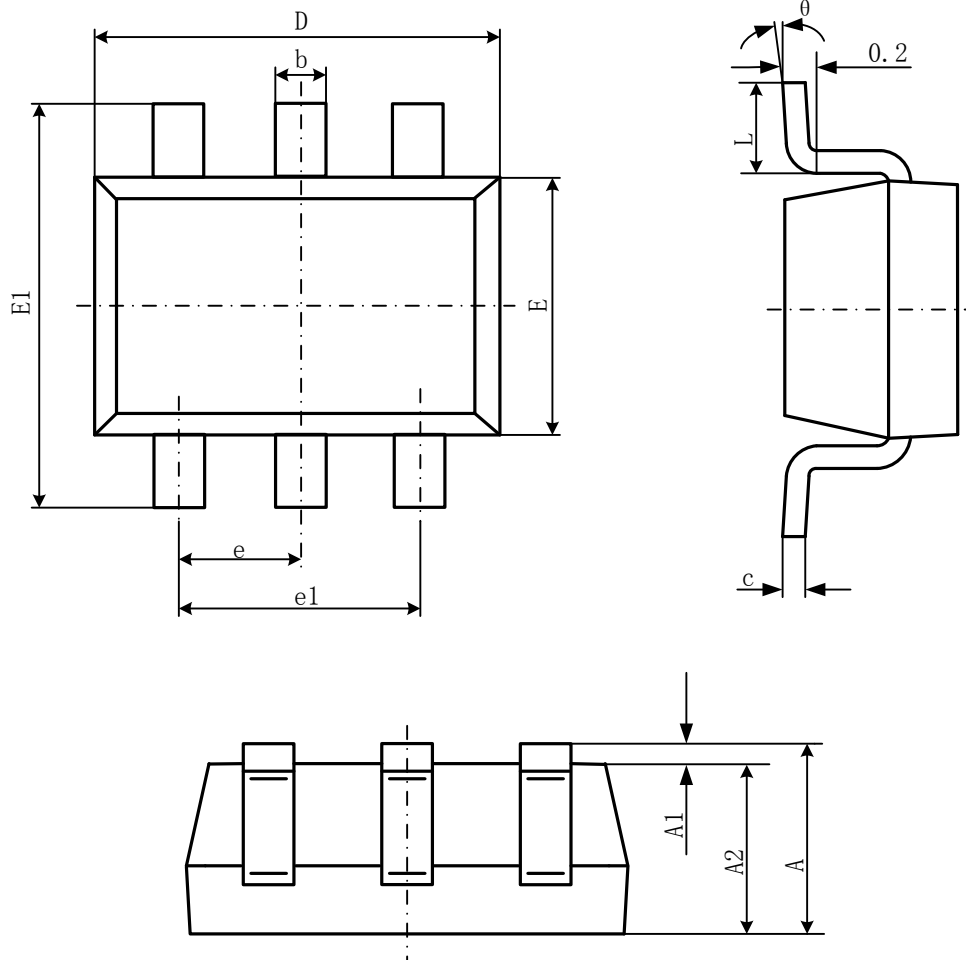
Duty is duty cycle, 250mV is internal benchmark, and the maximum dimming frequency can be up to 100KHZ.

● Capacitance

The input capacitor is 1uF, and the output capacitor is more than 10uF. Otherwise, the output capacitor may be unstable, and the input and output capacitors should be close to the chip end.

Package Information

- SOT23-6L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
Z	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°