



LC2326

24V 2A Synchronous PFM/PWM Buck Converter

DESCRIPTION

The LC2326 is a high efficiency current-mode synchronous, 24V/2A buck converter. Its input voltage ranges from 4V to 24V and it provides an adjustable regulated output voltage from 0.8V to 8V while delivering up to 2A of output current.

The internal synchronous switches increase efficiency and eliminate the need for an external Schottky diode. The switching frequency is set to 410 KHz. And the LC2326 will automatically switch between PFM and PWM mode based on the load current, thus to enhance the converter efficiency at light load.

LC2326 consists of many protection blocks such as UVLO, input voltage over voltage protection to stand much higher input voltage spike, thermal protection and output short circuit protection.

The LC2326 is available in the TSOT23-8 package.

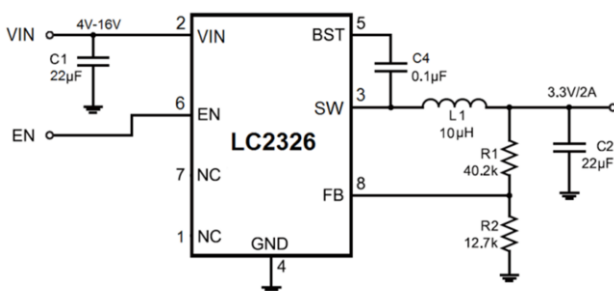
FEATURES

- Adjustable Output Voltage, $V_{fb}=0.8V$
- 150mΩ/70mΩ Low $R_{ds(on)}$ Internal Power MOSFETs
- Proprietary Switching Loss Reduction Technique
- Maximum output current is 2A
- Range of operation input voltage: Max 24V
- High Efficiency, up to 95%
- Internal Soft Start
- OCP Protection
- OVP Protection: 25V
- Thermal Shutdown
- Available in TSOT23-8 Package

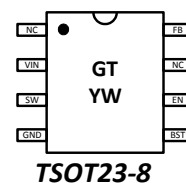
APPLICATIONS

- Notebook Systems and I/O Power
- Digital Set Top Boxes
- Flat Panel Television and Monitors
- Distributed Power Systems

TYPICAL APPLICATION



PIN OUT & MARKING



GT: Product Code
 YW: Date code

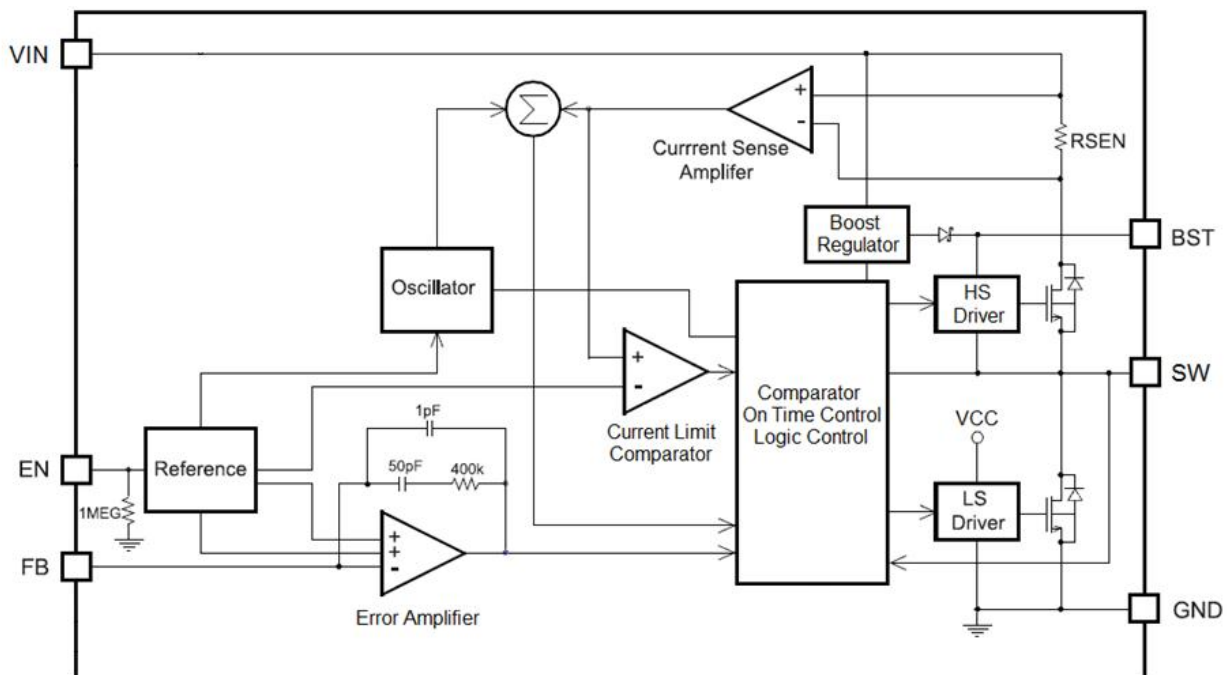
ORDERING INFORMATION

Part No.	Package	Tape & Reel
LC2326CB8TR	TSOT-23-8	3000/Reel

PINOUT DESCRIPTION

PIN #	NAME	DESCRIPTION
1	NC	No connection
2	VIN	Power input, the input capacitor should be placed as close to VIN and GND pin as possible
3	SW	Power switching node to connect inductor
4	GND	Ground
5	BST	High side power transistor gate drive boost input
6	EN	Enable input. Setting it to high level or connecting to Vin via a resistor may turn on the chip, while setting it to ground level will turn off the chip.
7	NC	No connection
8	FB	Feedback input

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

Parameter		Value
Max Input Voltage		24V
Max Operating Junction Temperature(Tj)		125°C
Ambient Temperature(Ta)		-20°C – 85°C
Package Thermal Resistance (θ_{jc})	TSOT23-8	100°C / W
Storage Temperature(Ts)		-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.

RECOMMENDED WORK CONDITIONS

Parameter	Value
Input Voltage Range	Max. 24V
Operating Junction Temperature(Tj)	-20°C – 85°C

ELECTRICAL CHARACTERISTICS

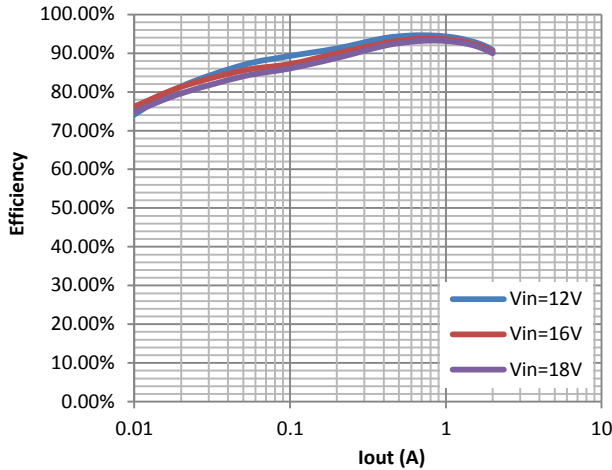
(VIN=12V, TA=25°C)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIN	Input Voltage Range		4		24	V
Vref	Feedback Voltage	Vin=12V, Ven=5V	0.784	0.8	0.816	V
I _{fb}	Feedback Leakage current			0.1	0.4	uA
I _q	Quiescent Current	Active, V _{fb} =1V, No Switching		0.7	1	mA
		Shutdown, Vin=8V		6	10	uA
LnReg	Line Regulation	Vin=5V to 12V		0.1		%/V
LdReg	Load Regulation	I _{out} =0.1 to 2A		0.02		%/A
F _{soc}	Switching Frequency	V _{en} =2V, Vin=12V		410		KHz
R _{dsonP}	PMOS R _{dson}			150		mohm
R _{dsonN}	NMOS R _{dson}			70		mohm
I _{limit}	Peak Current Limit			2.5		A
V _{enh}	EN High Threshold			1.5		V
V _{enl}	EN Low Threshold			1.4		V
V _{ovp}	Input Over-Voltage Protection	V _{en} =2V		25		V
TSD	Over Temperature Protection			150		°C

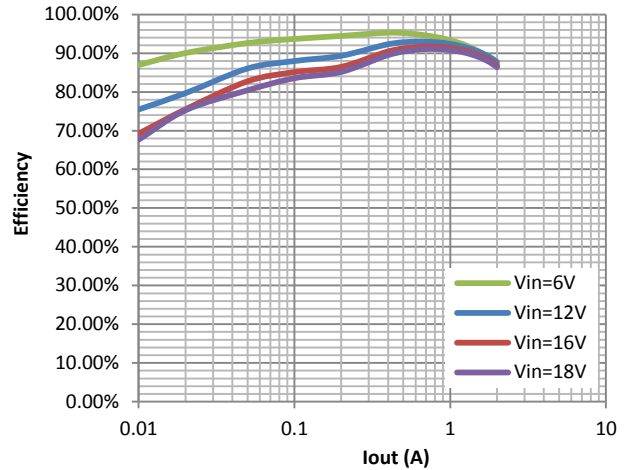
TYPICAL PERFORMANCE CHARACTERISTICS

($T_A=25^\circ\text{C}$, unless otherwise stated)

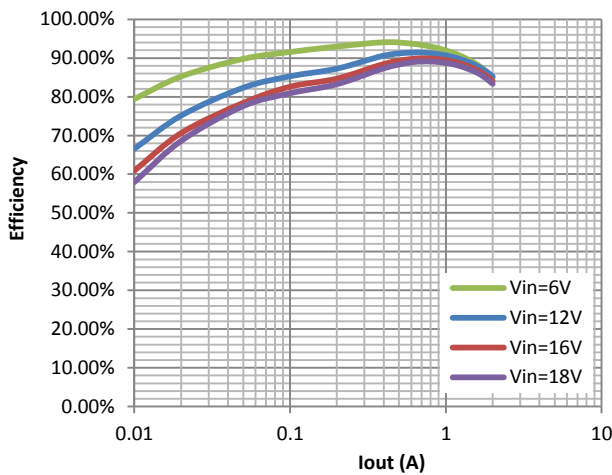
Efficiency (Vout=5.0V)



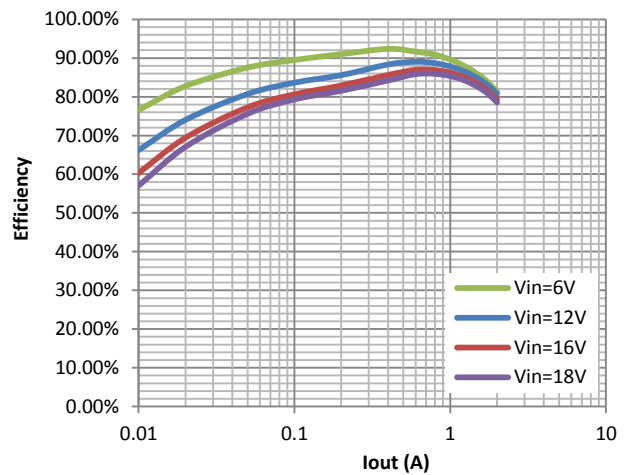
Efficiency (Vout=3.3V)



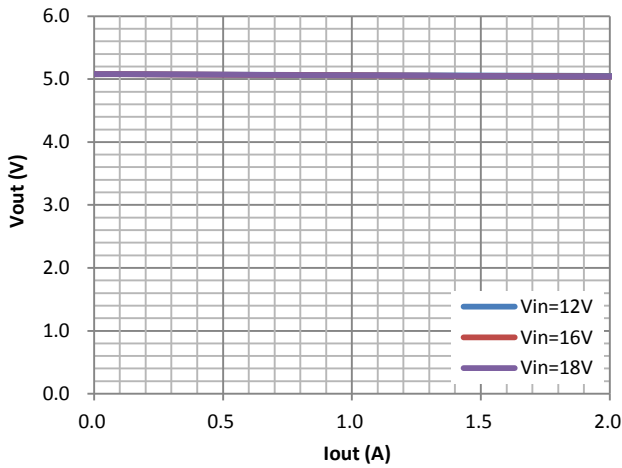
Efficiency (Vout=2.5V)



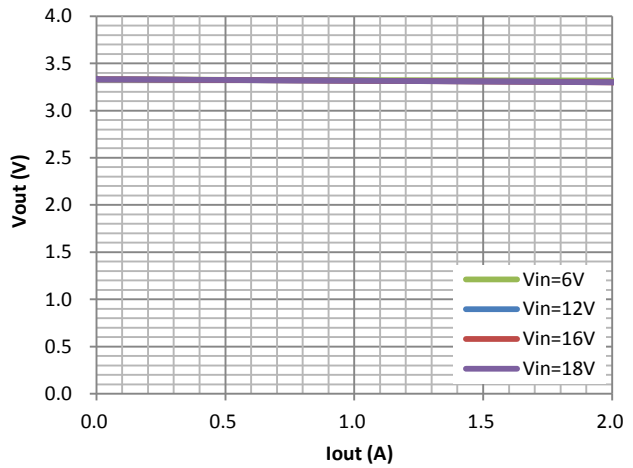
Efficiency (Vout=1.8V)



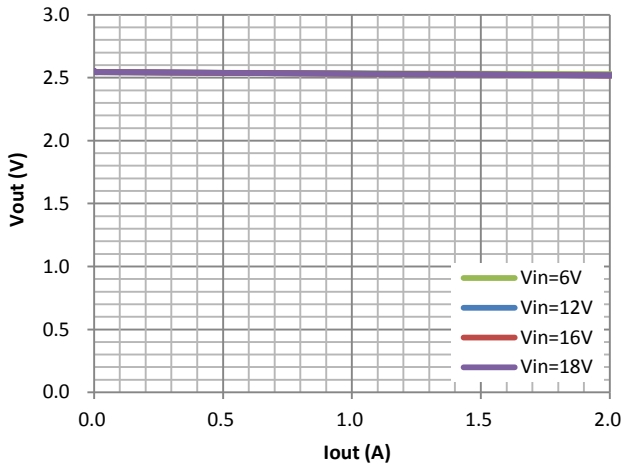
Vout VS. Iout (Vout=5.0V)



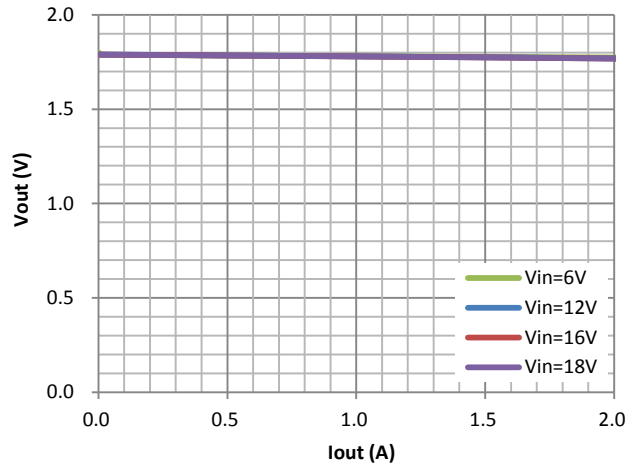
Vout VS. Iout (Vout=3.3V)



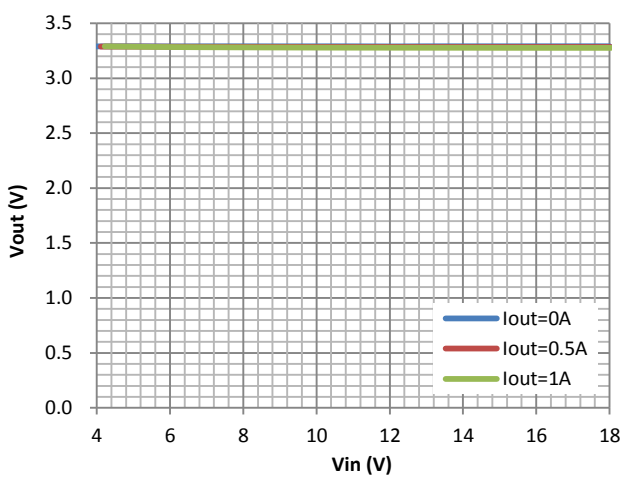
Vout VS. Iout (Vout=2.5V)



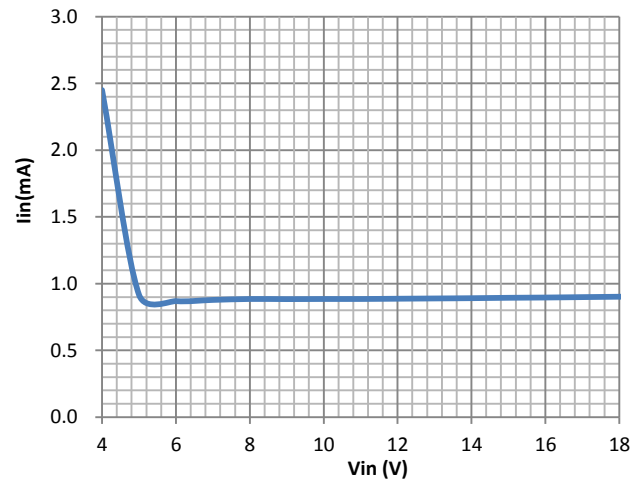
Vout VS. Iout (Vout=1.8V)



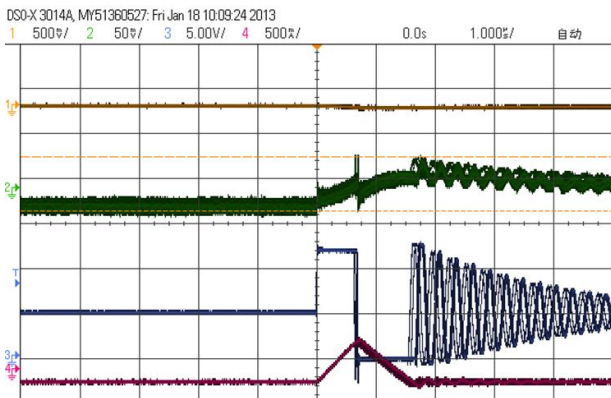
Vout VS. Vin



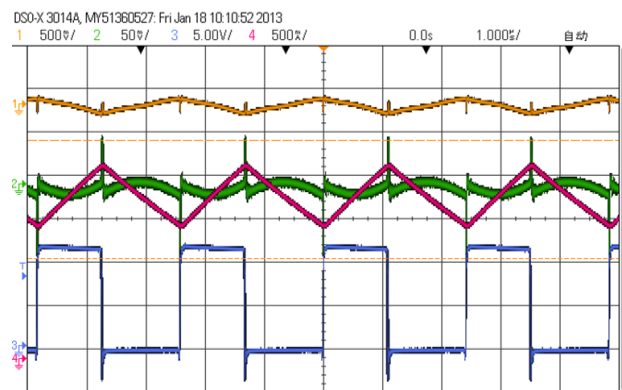
Zero Load Operating Current VS. Vin



Switching waveform Vin=12V, Iout=0A
Ch1—VIN, Ch2—VOUT, Ch3—SW, CH4—IL



Switching waveform Vin=12V, Iout=2A
Ch1—VIN, Ch2—VOUT, Ch3—SW, CH4—IL



FUNCTIONAL DESCRIPTIONS

Loop Operation

The LC2326 is a wide input range, high-efficiency, DC-to-DC step-down switching regulator, capable of delivering up to 2A of output current, integrated with a 70mΩ synchronous MOSFET, eliminating the need for external diode. It uses a PWM current-mode control scheme. An error amplifier integrates error between the FB signal and the internal reference voltage. The output of the integrator is then compared to the sum of a current-sense signal and the slope compensation ramp. This operation generates a PWM signal that modulates the duty cycle of the power MOSFETs to achieve regulation for output voltage.

Current Limit

There is a cycle-by-cycle current limit on the high-side MOSFET of 2.5A (typ). When the current flowing out of SW exceeds this limit, the high-side MOSFET turns off and the synchronous rectifier turns on. Unlike the traditional method of current limiting by limiting the voltage at the compensation pin, which usually has large variation due to duty cycle variance, this type of peak current limiting scheme provides a relatively more accurate limit for output current, thereby lowering the requirements for system design.

Light Load Operation

Traditionally, a fixed current mode constant frequency PWM DC-DC regulator always switches even when the output load is small. When energy is shuffling back and forth through the power MOSFETs, power is lost due to the finite RDS(ON)s of the MOSFETs and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. LC2326 employs a proprietary control scheme that improves efficiency in this situation by enabling the device into a power save mode during light load, thereby extending the range of high efficiency operation.

Soft Start and UVLO

LC2326 has an internal soft-start circuitry to reduce supply inrush current during startup conditions. When the device exits under-voltage lockout (UVLO), shutdown mode, or restarts following a thermal-overload event, the I soft-start circuitry slowly ramps up current available at SW. If VIN drops below 3.75V, the UVLO circuit inhibits switching. Once VIN rises above 3.9V, the UVLO clears, and the soft-start sequence activates.

THERMAL CONSIDERATION

LC2326 is high efficiency Buck converter, which means it consumes very few power when converting the high voltage to low voltage. However, when output power is very large, like 5V/2A, the output power is as high as 10W, a heat dissipation path is strongly recommended to be routed on PCB. LC2326 is in TSOT23-8 package. The heat is conducted out via Pin 4 (GND), so the heat dissipation route on PCB should be connected to the Pin 4 of the chip.

PACKAGE OUTLINE

Package	TSOT23-8	Devices per reel	3000	Unit	mm
Package specification:					
Symbol	Dimensions In Millimeters		Dimensions In Inches		
	Min	Max	Min	Max	
A	---	0.900	---	0.035	
A1	0.000	0.100	0.000	0.004	
A2	0.700	0.800	0.028	0.031	
b	0.300	0.500	0.012	0.020	
c	0.080	0.200	0.003	0.008	
D	2.820	3.020	0.111	0.119	
E1	1.600	1.700	0.063	0.067	
E	2.650	2.950	0.104	0.116	
e	0.65 (BSC)		0.026(BSC)		
e1	1.90 (BSC)		0.075(BSC)		
L	0.300	0.600	0.012	0.024	
θ	0°	8°	0°	8°	