16V, 2A Synchronous Buck Converter

General Description

The HM2259 devices are synchronous step-down converters optimized for small solution size and high efficiency. The devices integrate switches capable of delivering an output current up to 2A. The devices are based on an adaptive on time with current mode control scheme. Typical operating frequency is 520 KHz at medium to heavy loads. The devices are optimized to achieve very low output voltage ripple even with small external components and feature an excellent load transient response. The low impedance internal MOSFET supports high efficiency operation with wide input voltage range from 4.5V to 16V. Power sequencing is possible by configuring the Enable pin. Other features like over current protection and over temperature protection are built-in. The HM2259 devices are available in a SOT-23 6-pin package.

Ordering Information

Part Number	Package	Body Size
HM2259	SOT-23 6	

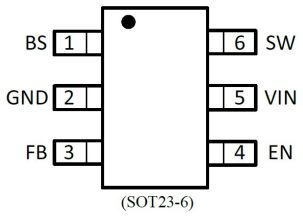
Features

- 4.5V to 16V Input Voltage Range
- 520KHz Typical Switching Frequency
- Output Current up to 2A (Max)
- Adaptive On Time Current Control
- 400μA Operating Quiescent Current
- Up to 93% Efficiency
- Over Current Protection
- Excellent Transient Load Response
- Internal Soft Startup of 300μs (Typ.)
- Thermal Shutdown Protection

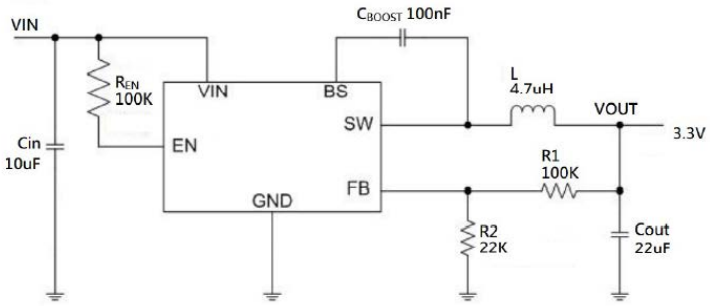
Applications

- Portable TV
- LCD/OLED Monitors and TV
- DSL Modems
- IP CAM
- CCTV
- Set Top Boxes (STB)
- Networking

Pin Configuration



Typical Application Circuit

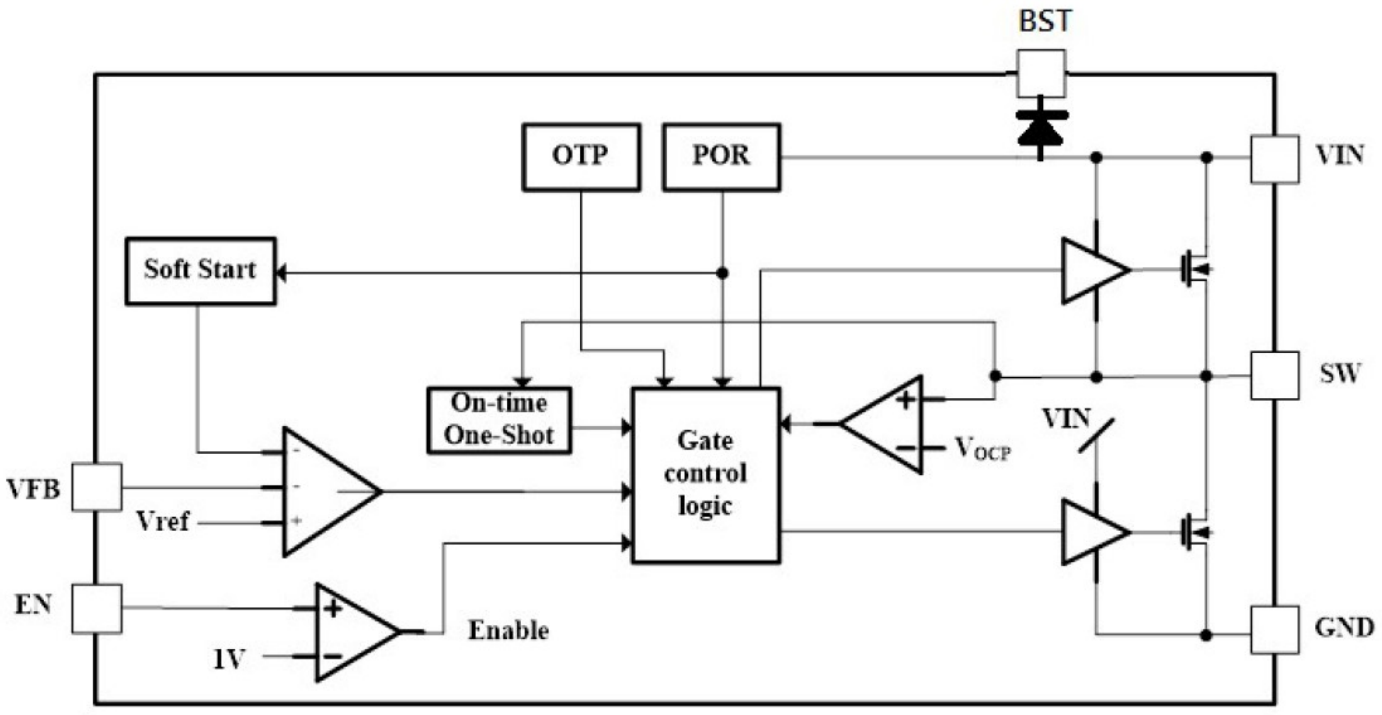


VOUT	R1	R2
5.0V	100K	13.6K
3.3V	100K	22K
2.5V	68K	21.5K
1.8V	43.2K	21.5K
1.5V	33K	22K
1.2V	22K	22K
1.0V	15K	22K

Pin Assignment

Pin Name	Pin No.	Pin Function
BS	1	Boot-Strap Pin. Supply high side gate driver. Connect a 22nF~100nF ceramic capacitor between the BS and LX pins.
GND	2	Ground
FB	3	Feedback pin for the internal control loop. Connect this pin to the external feedback divider.
EN	4	Device enable logic input. Logic HIGH enables the device. Logic LOW disables the device and turns it into shutdown. Do not leave floating.
VIN	5	Power supply voltage input.
SW	6	Feedback pin for the internal control loop. Connect this pin to the external feedback divider

Function Block Diagram



Absolute Maximum Ratings (Note1)

- VIN---------- -0.3V to +20V
- LX, EN---------- -0.3V to VIN+0.3V
- FB, BS-SW ---------- -0.3V to +5V
- Junction Temperature---------- 125°C
- Lead Temperature (Soldering, 10 sec.)---------- 300°C
- Storage Temperature ---------- –65°C to 150°C

Recommended Operating Conditions

- VIN ---------- +4.5V to +16V
- Junction Temperature ---------- -40°C to 125°C

Electrical Characteristics

V_{IN}=12V, V_{OUT} = 1.2V, L = 2.2uH, C_{OUT} = 10uF, T_J=25℃, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Input voltage	V_{IN}		4.5		16	V
Quiescent current	I_Q	I_{OUT} = 0A, no switching	--	400	--	uA
Under voltage lock out	V_{UVLO}	V_{IN} rising	--	4.3	4.5	V
Under voltage lock out hysteresis	V_{UVLO_HY}	V_{IN} falling	--	0.15	--	V
EN high level voltage	V_{ENH}		1.5	--	--	V
EN low level voltage	V_{ENL}		--	--	0.4	V
Shutdown current	I_{SD}	EN=LOW	--	5	10	uA
Output voltage	V_{OUT}		0.6	--	D_{MAX}*V_{IN}	V
Feedback voltage	V_{FB}		0.588	0.6	0.612	V
FB pin current	I_{FB}	V_{FB} = V_{IN}	-50		50	nA
High-side switch resistance	R_{DSONH}	V_{BS-LX} = 4.8V	--	120	--	mΩ
Low-side switch resistance	R_{DSONL}	V_{IN} = 5V	--	100	--	mΩ
High-side switch peak current limit	I_{LIM_H}		2.4			A
Switching frequency	f_{SW}		--	520	--	KHz
Minimum ON-time	t_{ONMIN}		--	50	--	nS
Minimum OFF-time	t_{OFFMIN}		--	100	--	nS
Soft Start time	t_{SS}			300		uS
Thermal shutdown threshold	T_{SDN}		--	150	--	°C
Thermal Shutdown Hysteresis	T_{SDNHY}		--	30	--	°C

Typical Characteristics

V_{IN}=12V, V_{OUT} = 3.3V, L = 4.7uH, C_{OUT} = 22uF, T_J=25℃, unless otherwise specified

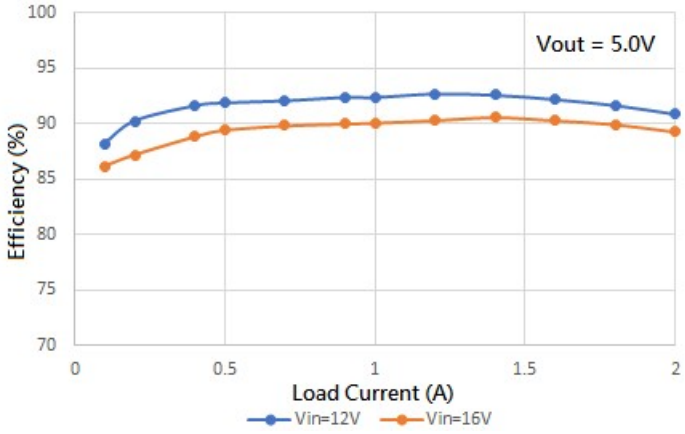


Fig 1 Efficiency vs Load

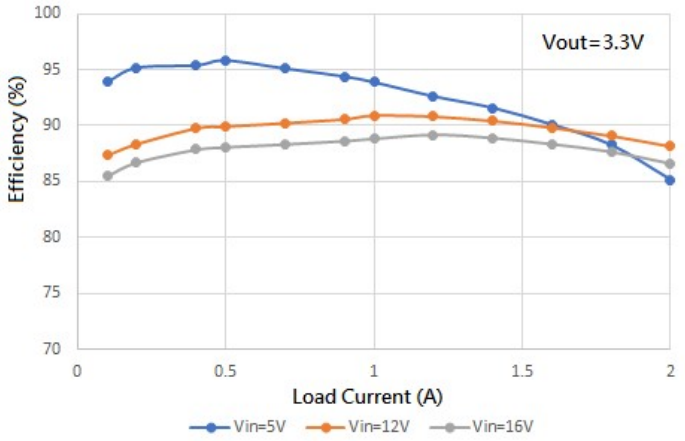


Fig 2 Efficiency vs Load

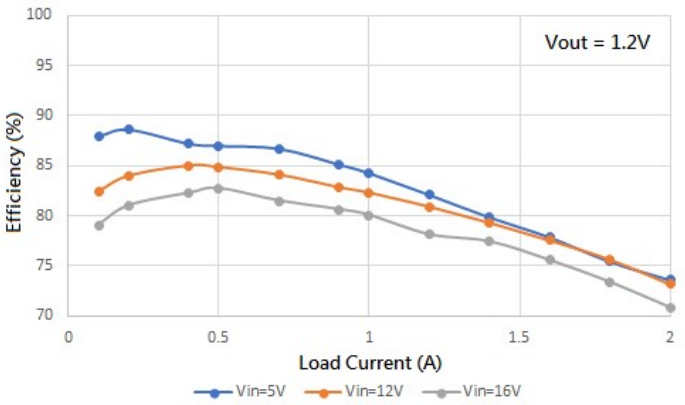


Fig 3 Efficiency vs Load

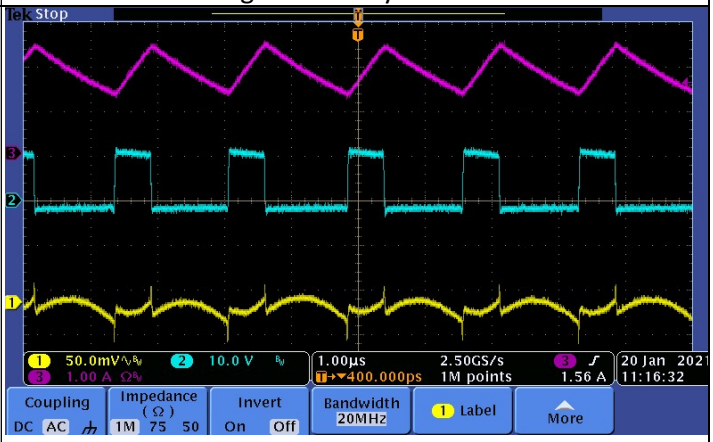


Fig 4 Output Ripple (Vin=12V, Vout=3.3V, I_{LOAD}=2A)

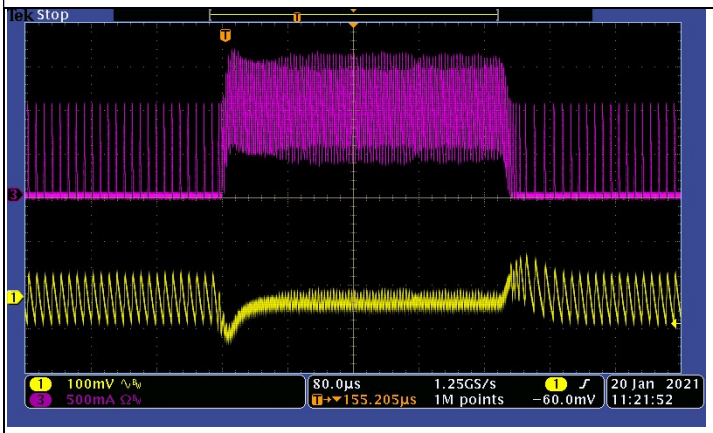


Fig 5 Load Transient (Vin=12V, Vout=3.3V, I_{LOAD}=0.1-1A)

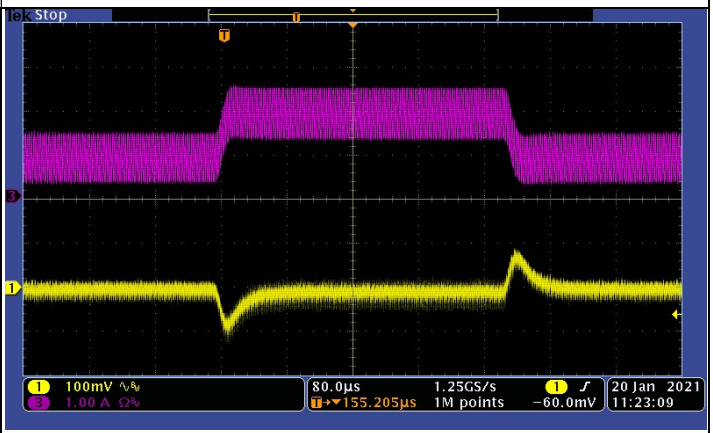


Fig 6 Load Transient (Vin=12V, Vout=3.3V, I_{LOAD}=1-2A)

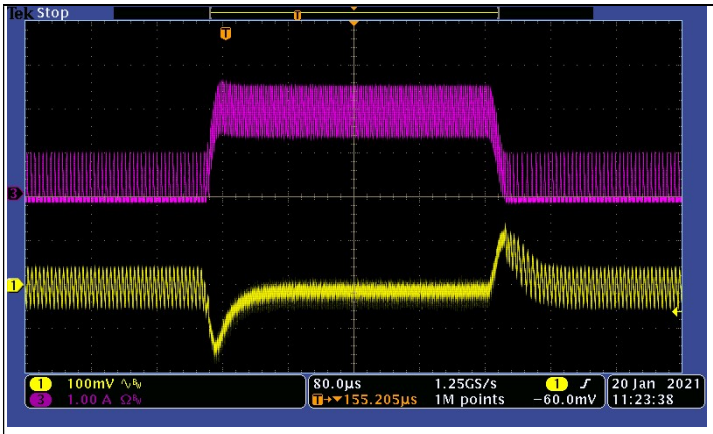


Fig 7 Load Transient (Vin=12V, Vout=3.3V, I_{LOAD}=0.2-2A)

Fig 8 Enable Start up (Vin=12V, Vout=3.3V, I_{LOAD}=2A)

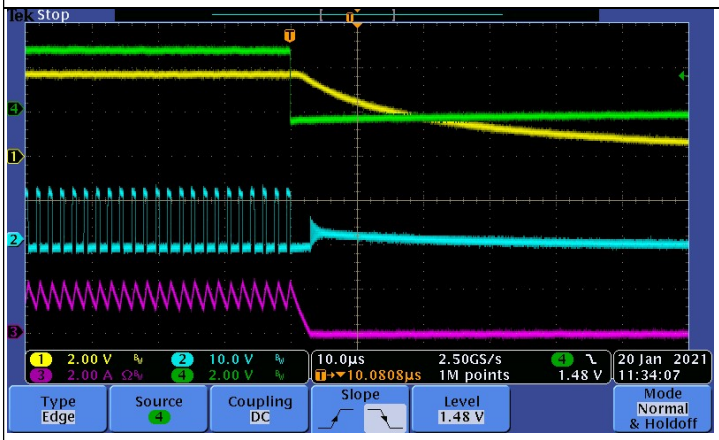


Fig 9 Shutdown (Vin=12V, Vout=3.3V, I_{LOAD}=2A)

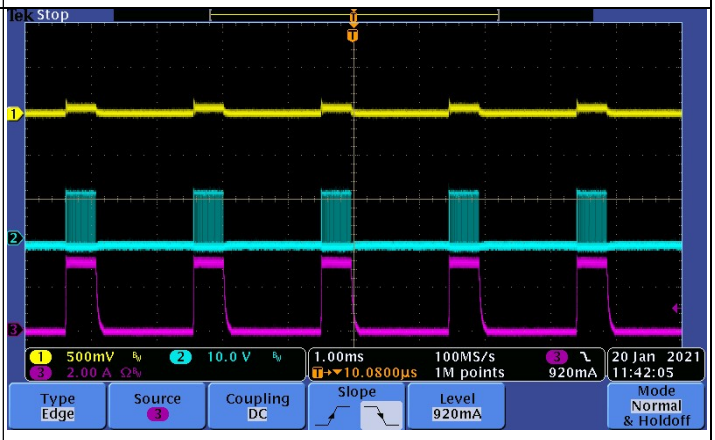


Fig 10 Vout Short Circuit (Vin=12V, Vout=3.3V)

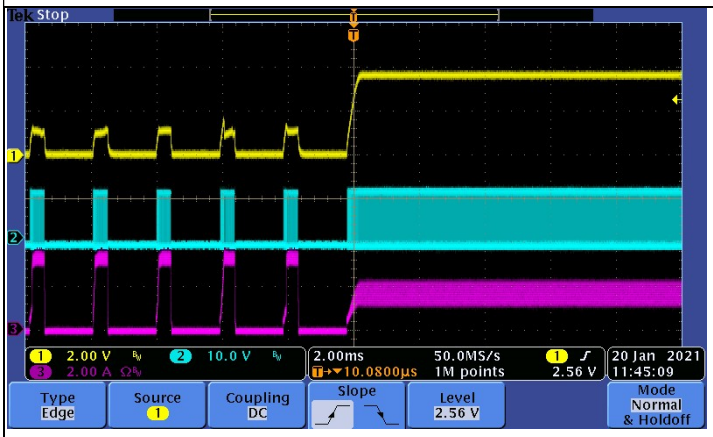


Fig 11 Short then Release (Vin=12V, Vout=3.3V, I_{LOAD}=2A)

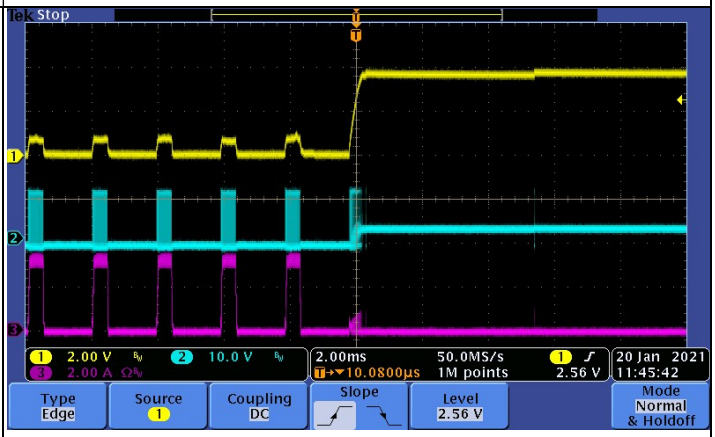


Fig 11 Short then Release (Vin=12V, Vout=3.3V, I_{LOAD}=0A)