DESCRIPTION

The A7320A is a high efficiency current-mode synchronous, 18V/2A buck converter. Its input voltage ranges from 4.5V to 18V and it provides an adjustable regulated output voltage from 0.923V to 15V 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 340KHz. And the A7320A will automatically switch between PFM and PWM mode based on the load current, thus to enhance the converter efficiency at light load.

A7320A consists of many protection block such as UVLO, input voltage over voltage protection to stand much higher input voltage spike, thermal protection and output short circuit protection.

The A7320A is available in SOP8 and PSOP8 packages.

ORDERING INFORMATION

Package Type	Part Number	
SOP8	M8	A7320AM8R
		A7320AM8VR
PSOP8	MP8	A7320AMP8R
		A7320AMP8VR
Note	R: Tape & Reel V: Halogen free Package	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

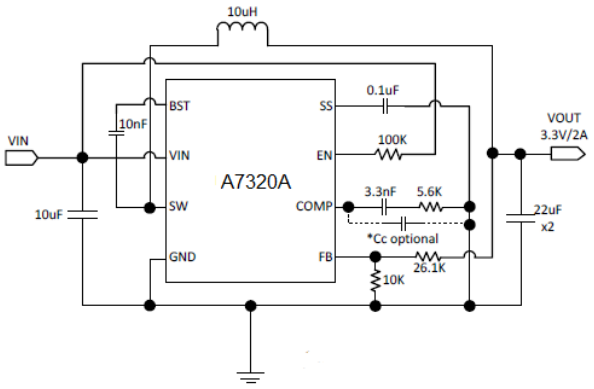
FEATURES

- Adjustable Output Voltage, V_{FB}=0.923V
- Maximum output current is 2A
- Range of operation input voltage: Max 18V
- Withstand input voltage spike >30V
- Standby current: 1mA (typ.)
- Operating current at zero load: 1.2mA (typ.)
- Line regulation: 0.1%/V (typ.)
- Load regulation: 10mV (typ.)
- High efficiency, up to 95%
- Environment Temperature: -20°C ~ 85°C
- Available in SOP8 and PSOP8 Packages

APPLICATION

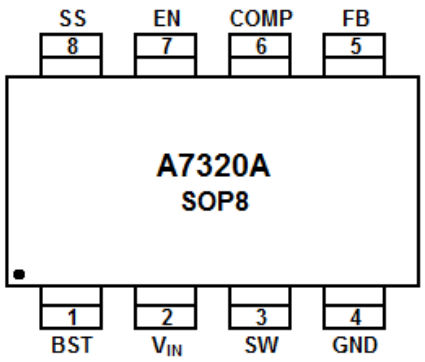
- Set-top-box
- Consumer Electronic Device for automobile
- LCD Monitor and LCD TV
- Portable DVD
- ADSL Modem, WLAN router
- Other 12V or double cell Li-ion battery powered device

TYPICAL APPLICATION

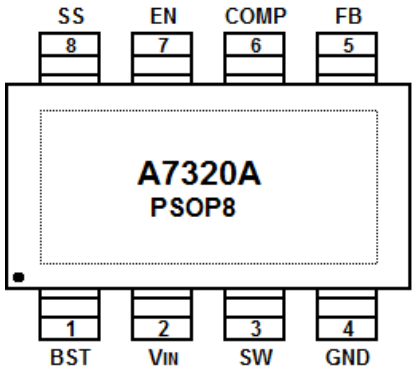


* When V_{IN} is as low as 5V, C_C is recommended to be 100pf, but not needed when Vin larger than 5V.

PIN DESCRIPTION



Top View



Top View

Pin #		Symbol	Function
SOP8	PSOP8		
1	1	BST	High side power transistor gate drive boost input
2	2	V_{IN}	Power input, the input capacitor should be placed as close to V_{IN} and GND pin as possible
3	3	SW	Power switching node to connect inductor
4	4	GND	Ground.
5	5	FB	Feedback input with reference voltage set to 0.923
6	6	COMP	Compensation node. A serial RC connected to this pin is required to maintain the Buck converter control loop stable.
7	7	EN	Enable input. Setting it to high level or connecting to V_{IN} via a resistor may turn on the chip, while setting it to ground level will turn off the chip.
8	8	SS	Soft-start node. Connecting a 0.1uF capacitor to ground make the Buck converter output rise smoothly.

ABSOLUTE MAXIMUM RATINGS

Max Input Voltage		30V
T_J, Max Operating Junction Temperature		125°C
T_A, Ambient Temperature		-20°C ~ 85°C
θ_{JC}, Package Thermal Resistance	SOP8	45°C/W
	PSOP8	10°C/W
T_S, Storage Temperature		-40°C ~ 150°C
Lead Temperature & Time		260°C,10S
ESD (HBM)		>2000V

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range	Max. 18V
T_J, Operating Junction Temperature	-20°C ~ 125°C

ELECTRICAL CHARACTERISTICS

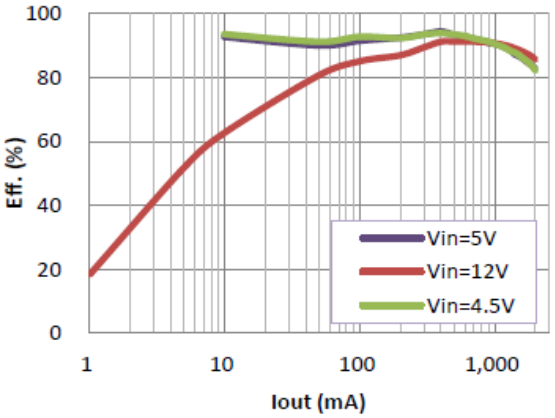
V_{IN}=12V, T_A=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	V_{DD}		4.5		18	V
Feedback Voltage	V_{REF}	V_{IN}=12V, V_{EN}=5V	0.900	0.923	0.946	V
Feedback Leakage current	I_{FB}			0.1	0.4	uA
Quiescent Current	I_Q	Active, V_{FB}=1V, No Switching		1.1	1.5	mA
		Shutdown, V_{IN}=8V		6	10	uA
Line Regulation	LnReg	V_{IN}=5V to 12V		0.1		%/V
Load Regulation	LdReg	I_{OUT}=0.1 to 2A		0.02		%/A
Switching Frequency	F_{SOC}	V_{EN}=2V, V_{IN}=12V		340		KHz
PMOS Rdson	RdsonP			130		mohm
NMOS Rdson	RdsonN			110		mohm
Peak Current Limit	Ilimit			2.5		A
EN High Threshold	V_{ENH}		1	1.5	2	V
EN Low Threshold	V_{ENL}				0.5	V
Input Over-Voltage Protection	V_{OVP}	V_{EN}=2V	18			V
Over Temperature Protection	TSD			160		°C

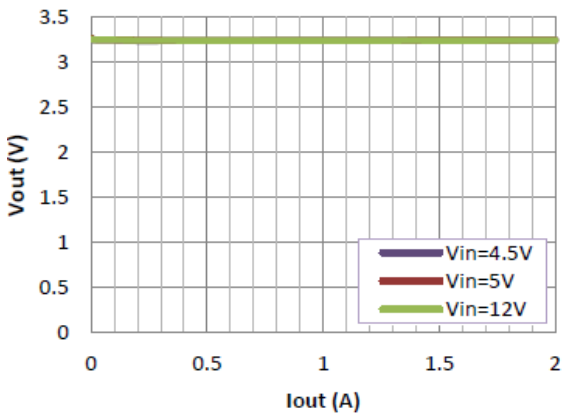
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN}=12V, V_{OUT}=3.3V, L=10uH, C_{IN}=10uF, C_{OUT}=22uF, T_A=25°C, unless otherwise stated

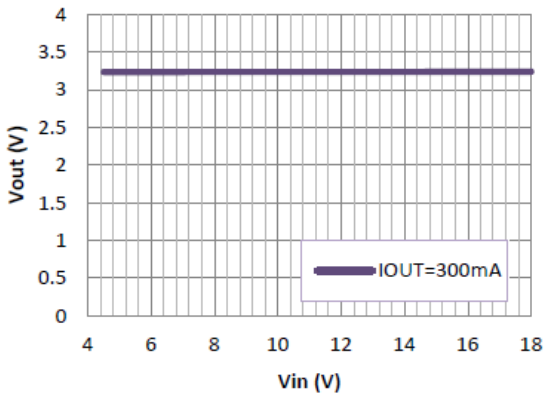
1. Efficiency (V_{OUT}=3.3V)



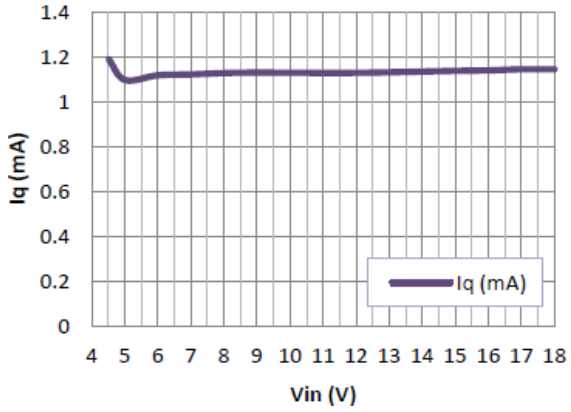
2. V_{OUT} Vs. I_{OUT}



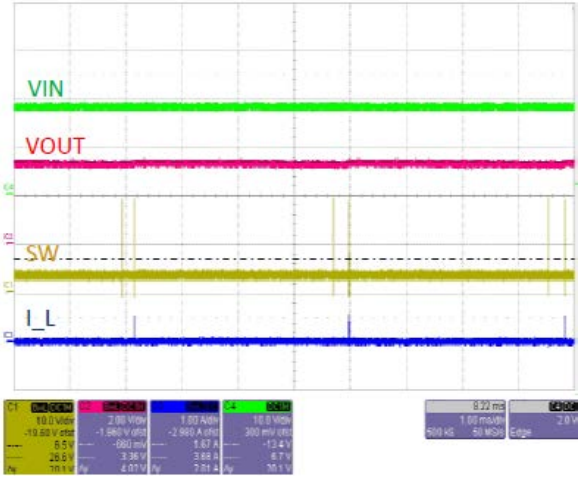
3. V_{OUT} Vs. V_{IN}



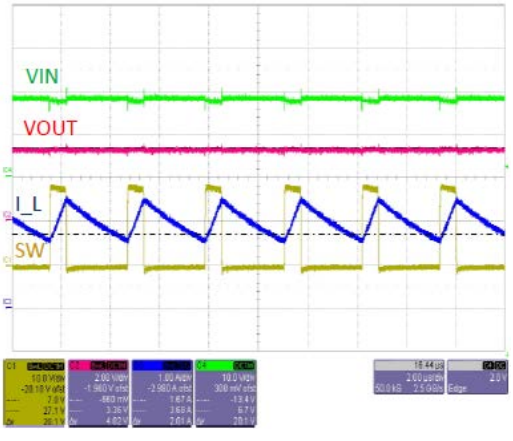
4. Zero Load Operating Current Vs. V_{IN}



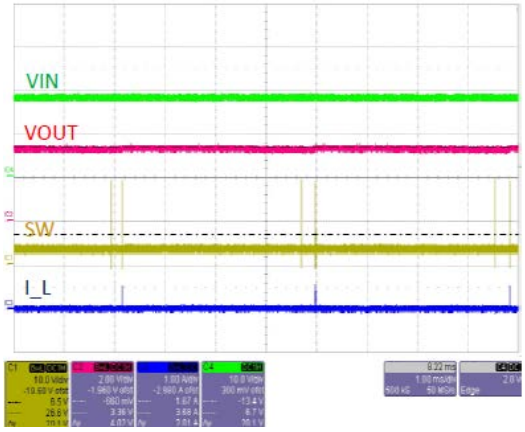
5. Switching waveform V_{IN}=18V, I_{OUT}=0



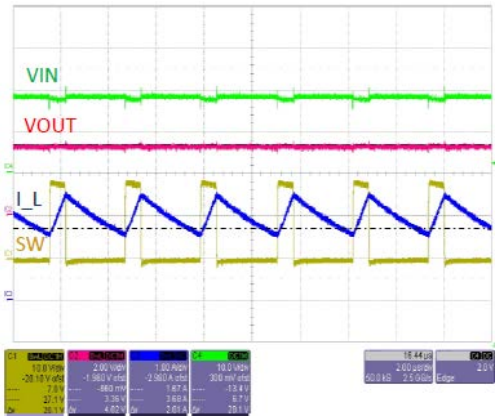
6. Switching waveform V_{IN}=18V, I_{OUT}=2A



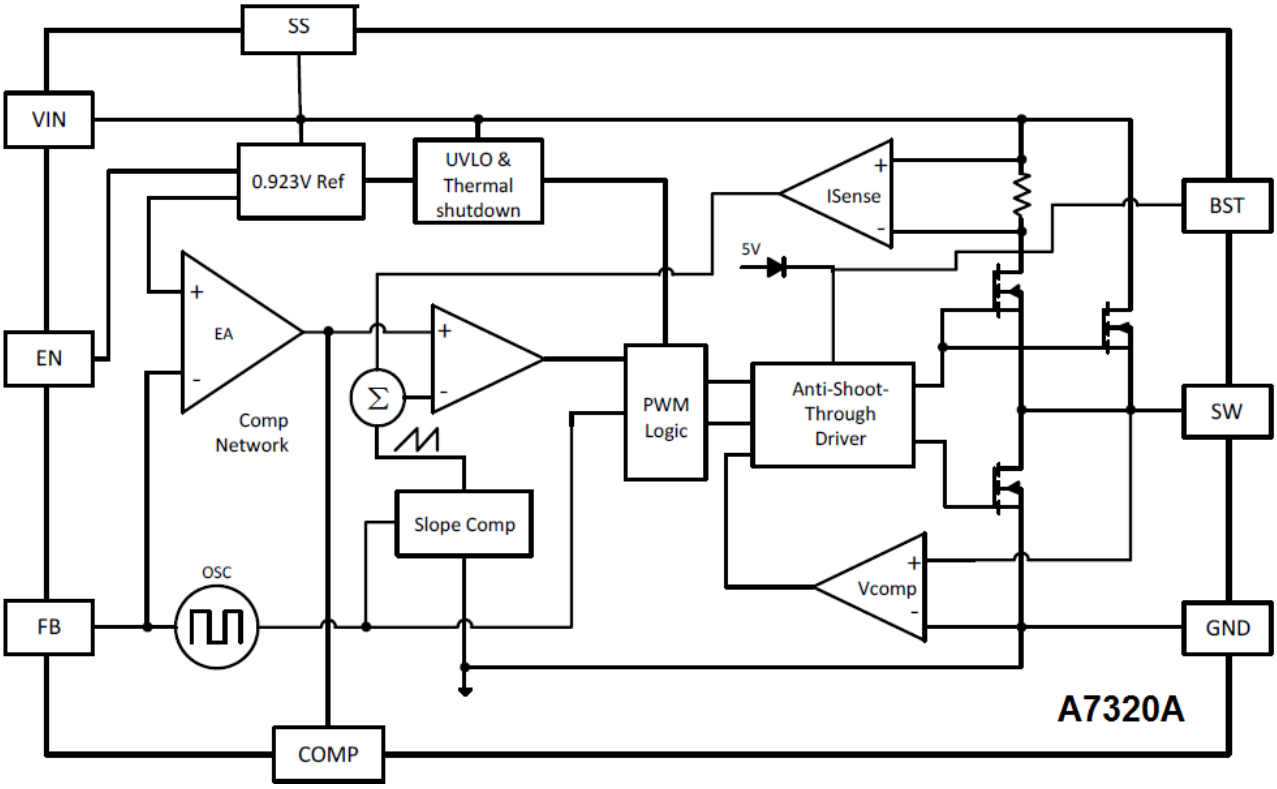
7. Switching waveform V_{IN}=5V, I_{OUT}=0



8. Switching waveform V_{IN}=5V, I_{OUT}=2A



BLOCK DIAGRAM



DETAILED INFORMATION

Functional Descriptions

Loop Operation

The A7320A 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 110mΩ 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 3A(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 RDSONs of the MOSFETs and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. A7320A 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.

Faster Transient Response

Normally, people use 3.3nF and 5.6Kohm RC for compensation to keep the loop stable. However, if one needs to have faster load transient response, 3.3nF and 8.5Kohm is recommended.

Component Selection

When setting up the A7320A for different output voltage, please use following recommended component value for the best performance.

V_{OUT} (V)	C_{OUT} (µF)	L (µH)
8	22x2	22
5	22x2	15
3.3	22x2	10
2.5	22x2	6.8
1.8	22x2	4.7
1.2	22x2	3.3

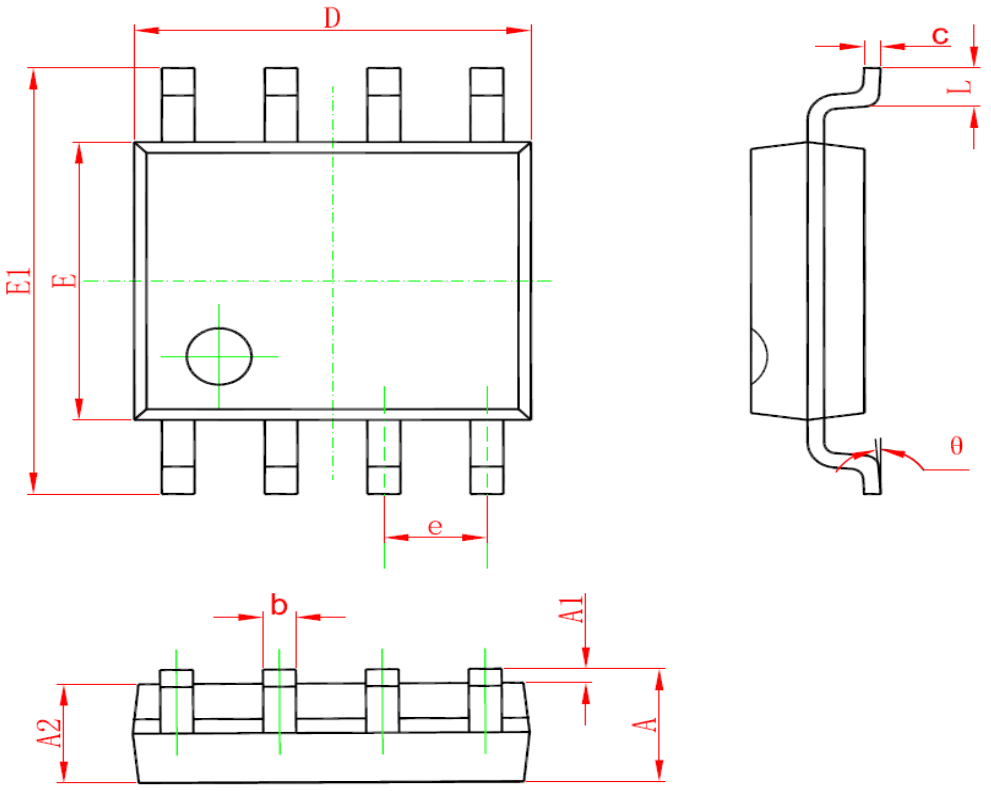
Thermal Consideration

A7320A 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. A7320A has two different SOP8 package. For the normal SOP8, 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. If PSOP8 is selected, the heat dissipation copper area should be exposed and connected to the exposed pad underneath the chip body.

When output power is larger than 10W, the PSOP8 package is recommended.

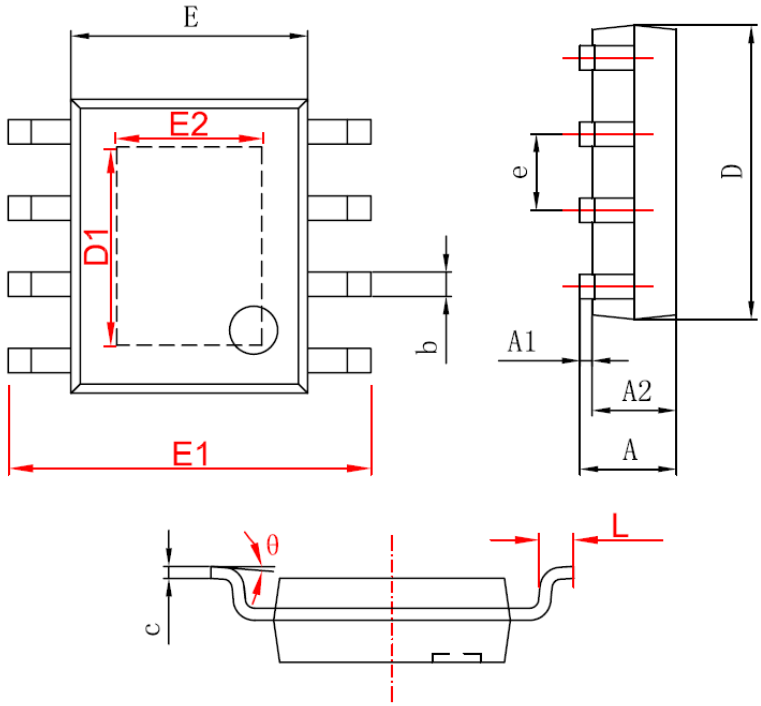
PACKAGE INFORMATION

Dimension in SOP8 (Unit: mm)



Symbol	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.250	1.650
b	0.380	0.510
c	0.170	0.250
D	4.800	5.000
E	3.800	4.000
E1	5.800	6.200
e	1.270(BSC)	
L	0.450	0.800
θ	0°	8°

Dimension in PSOP8 Package (Unit: mm)



Symbol	Min	Max
A	1.350	1.750
A1	0.000	0.150
A2	1.250	1.650
b	0.380	0.510
c	0.170	0.250
D	4.800	5.000
D1	3.100	3.500
E	3.800	4.000
E1	5.800	6.200
E2	2.200	2.600
e	1.270(BSC)	
L	0.450	0.800
θ	0°	8°

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