18V, 2A, 600KHz Synchronous Buck Converter

EA8252

Datasheet

General Description

The EA8252 is a 2A buck regulator, designed to operate from 4.5V to 18V input voltage range. Built-in low $R_{DS(ON)}$ high/low side Power-MOSFETS not only reduce external components and has up to 95% efficiency, ideal for 2A output current applications. The EA8252 is designed to take into account the light load mode operation. At output loading 10mA condition, the efficiency up to 81%. The EA8252 has complete protection functions, including cycle-by-cycle current limit, short circuit protection, OVP, OTP and UVLO protection. The internal compensation design not only allows users to more simplified application, and can reduce the cost of external components. The EA8252 is available in the SOP-8 and SOP-8 (with EP) packages and has a good cooling effect and easy to use.

Features

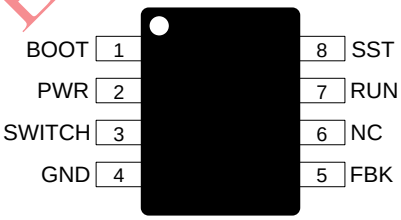
- Built-in Low $R_{DS(ON)}$ Power-MOSFETS
- Efficiency Up to 95%
- Light Load Efficiency Up to 81%
- 4.5V to 18V Input Voltage Range
- Output Adjustable Down to 0.765V
- 2A Continuous Load Current
- Fixed 600KHz Switching Frequency
- Internal Compensation
- Cycle-by-Cycle Current Limit
- Auto Recovery Hiccup Mode Short Circuit Protection
- Output Over Voltage Protection
- Input UVLO Protection
- Auto Recovery OTP Protection
- External Adjustable Soft-Start Function
- Available in SOP-8 and SOP-8 (with EP) Package

Applications

- Distributed Power Systems
- Netcom Products
- LCD TVs and Flat TVs
- Notebooks

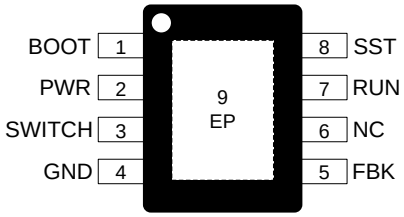
Pin Configurations

(TOP VIEW)



SOP-8

(TOP VIEW)



SOP-8 (with EP)

Pin Description

Pin Name	Function Description	Pin No.
BOOT	The power input of the internal high side N-MOSFET gate driver. Connect a 33nF ceramic capacitor from BOOT pin to SWITCH pin.	1
PWR	The EA8252 power input pin. Recommended to use two 10uF MLCC capacitors between PWR pin and GND pin. It can also use electrolytic capacitors, but need to add a 0.1uF ceramic capacitor as close to the PWR pin as possible to avoid noise interference.	2
SWITCH	Internal MOSFET switching output. Connect SWITCH pin with a low pass filter circuit to obtain a stable DC output voltage.	3
GND	Ground pin.	4
FBK	Feedback input. Connect FBK pin and GND pin with voltage dividing resistors to set the output voltage.	5
NC	No Connect.	6
RUN	The device turns on/turns off control input. The EA8252 on/off state can be controlled by RUN pin voltage level. Connect RUN pin to PWR pin with a 150KΩ pull up resistor for automatic startup.	7
SST	Soft-Start input. Connect SST pin and GND pin by a ceramic capacitor. It can be used to set the soft-start time.	8
EP	Exposed Pad. Make sure that the EP has good soldering with the GND plane of the PCB surface to achieve the desired cooling effect.	9

Function Block Diagram

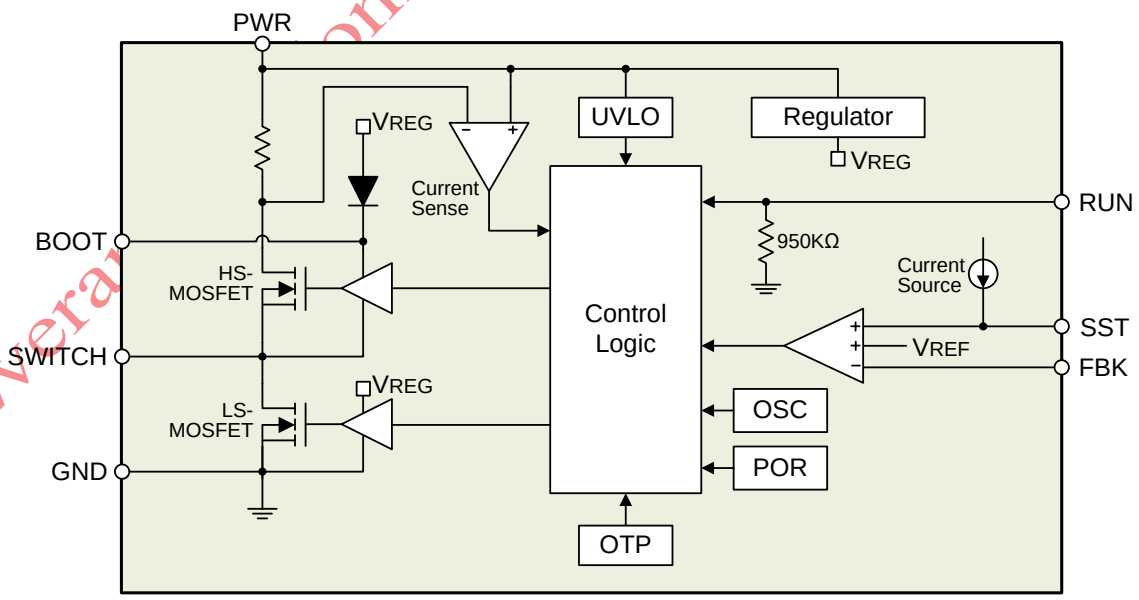


Figure 1. EA8252 internal function block diagram

Absolute Maximum Ratings

Parameter	Value
Input Voltage (V_{PWR})	-0.3V to +20V
RUN Pin Input Voltage (V_{RUN})	-0.3V to +20V
BOOT Pin Voltage (V_{BOOT})	V_{SWITCH}-0.3V to V_{SWITCH}+6.3V
SWITCH Pin Voltage (V_{SWITCH})	-1V to +20V
FBK, SST Pins Voltage (V_{FBK}, V_{SST})	-0.3V to +6.3V
Ambient Temperature operating Range (T_A)	-40°C to +85°C
Maximum Junction Temperature (T_{Jmax})	+150°C
Lead Temperature (Soldering, 10 sec)	+260°C
Storage Temperature Range (T_S)	-65°C to +150°C

Note (1): Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. Exposure to "Absolute Maximum Ratings" conditions for extended periods may affect device reliability and lifetime.

Package Thermal Characteristics

Parameter	Value
SOP-8 Thermal Resistance (θ_{JC})	45°C/W
SOP-8 Thermal Resistance (θ_{JA})	107°C/W
SOP-8 Power Dissipation at T_A=25°C (P_{Dmax})	1.17W
SOP-8 (with EP) Thermal Resistance (θ_{JC})	14°C/W
SOP-8 (with EP) Thermal Resistance (θ_{JA})	65°C/W
SOP-8 (with EP) Power Dissipation at T_A=25°C (P_{Dmax})	1.92W

Note (1): P_{Dmax} is calculated according to the formula: $P_{DMAX}=(T_{JMAX}-T_A)/\theta_{JA}$.

Recommended Operating Conditions

Parameter	Value
Input Voltage (V_{PWR})	+4.5V to +18V
RUN Pin Input Voltage (V_{RUN})	-0.3V to +18V
Output Voltage (V_{OUT})	+0.765V to +15V
Junction Temperature Range (T_J)	-40°C to +125°C

Electrical Characteristics

V_{PWR}=12V, T_A=25°C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage	V_{PWR}		4.5		18	V
Shutdown Supply Current	I_{SD}	V_{RUN} = 0V		0.1	1	uA
Quiescent Current	I_Q	V_{RUN} = 2V, V_{FBK} = 105% V_{REF}, I_{LOAD} = 0A		700		uA
UVLO Threshold	V_{UVLO}	V_{PWR} Rising	3.8	4.2	4.5	V
UVLO Hysteresis	$V_{UV-HYST}$			300		mV
Output Load Current	I_{LOAD}				2	A
Reference Voltage	V_{REF}	4. 5V ≤ V_{PWR} ≤ 18V	0.749	0.765	0.781	V
Switching Frequency	F_{SW}		500	600	700	KHz
Short Frequency	F_{SHORT}	V_{OUT} = 0V		200		KHz
High Side MOSFET On-Resistance	$R_{DS(ON)-HM}$			120		mΩ
Low Side MOSFET On-Resistance	$R_{DS(ON)-LM}$			100		mΩ
High Side MOSFET Current Limit	I_{LIM-HM}		2.5	4		A
High Side MOSFET Leakage Current	$I_{LEAK-HM}$	V_{RUN} = 0V, V_{SWITCH} = 0V		1	10	uA
RUN Pin Input Low Voltage	V_{RUN-L}				0.4	V
RUN Pin Input High Voltage	V_{RUN-H}		2			V
RUN Pin Pull-Low Resistance	R_{RUN}			950		KΩ
Maximum Duty Cycle	D_{MAX}	V_{FBK} = 0.6V		88		%
High Side MOSFET Minimum On Time	T_{ONMIN}			100		ns
SST Pin Charge Current	I_{SST}	V_{SST} = 0V		5.5		uA
Thermal Shutdown Threshold	T_{OTP}			160		°C
Thermal Shutdown Hysteresis	T_{HYST}			50		°C

Note (1): MOSFET on-resistance specifications are guaranteed by correlation to wafer level measurements.
(2): Thermal shutdown specifications are guaranteed by correlation to the design and characteristics analysis.

Application Circuit Diagram

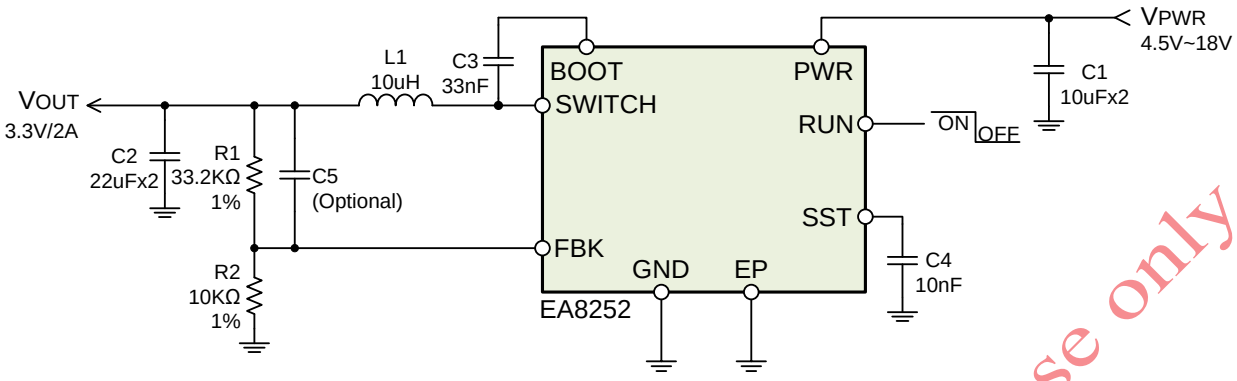


Figure 2. Typical application circuit diagram

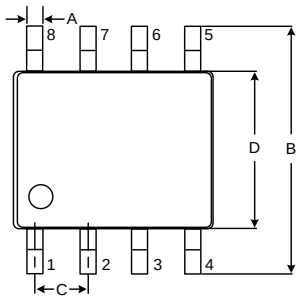
Ordering Information

Part Number	Package Type	Packing Information
EA8252O8R	SOP-8	Tape & Reel / 2500
EA8252P8R	SOP-8(with EP)	Tape & Reel / 2500

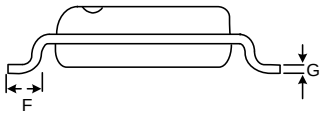
Note (1): “O8”: SOP-8 package type code.
(2): “P8”: SOP-8(with EP) package type code.
(3): “R”: Tape & Reel.

Package Information

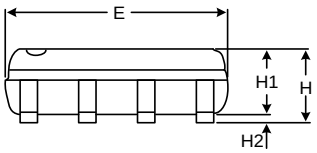
SOP-8 Package



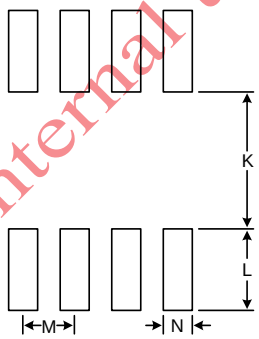
Top View



Front View



Side View



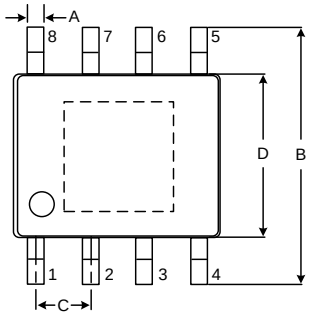
Recommended Layout Pattern

Unit: mm

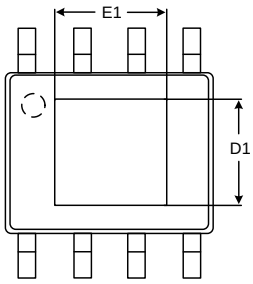
Symbol	Dimension Min	Dimension Max	Symbol	Dimension Typ
A	0.32	0.52	K	3.00
B	5.79	6.20	L	2.00
C	1.19	1.35	M	1.27
D	3.79	4.00	N	0.72
E	4.81	5.01		
F	0.41	1.27		
G	0.17	0.25		
H	1.26	1.71		
H1	1.26	1.56		
H2	0.00	0.15		

Package Information

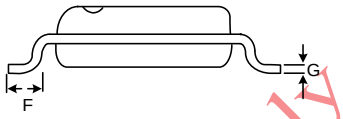
SOP-8(with EP) Package



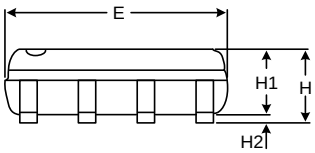
Top View



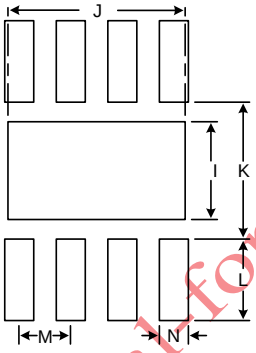
Bottom View



Front View



Side View



Recommended Layout Pattern

Unit: mm

Symbol	Dimension		Symbol	Dimension
	Min	Max		Typ
A	0.32	0.52	I	1.60
B	5.79	6.20	J	5.50
D	3.79	4.00	K	3.00
D1	2.16	2.42	L	2.00
E	4.81	5.01	M	1.27
E1	3.05	3.51	N	0.72
C	1.19	1.35		
F	0.41	1.27		
G	0.17	0.25		
H	1.26	1.71		
H1	1.26	1.56		
H2	0.00	0.15		