



DESCRIPTION

The A7332 is a monolithic step-down DC/DC converter featuring low EMI performance and the ability to deliver up to 3A output current without an external power transistor, reducing overall solution size and BOM cost.

The device supports 100% duty-cycle operation for low-dropout applications. An internal soft-start function reduces inrush current at startup, making it suitable for battery-powered portable systems.

Protection features include cycle-by-cycle peak current limiting, short-circuit protection, thermal shutdown, and under-voltage lockout (UVLO).

The A7332 is available in PSOP8 package.

ORDERING INFORMATION

Package Type	Part Number	
PSOP8 SPQ: 2,500pcs/Reel	MP8	A7332MP8R
		A7332MP8VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

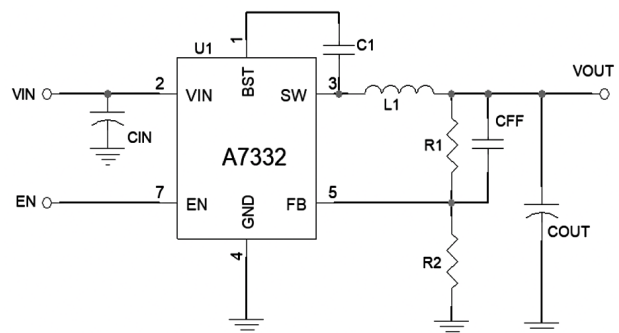
FEATURES

- Low $R_{DS(ON)}$ Integrated Power MOSFET (150m Ω / 95m Ω)
- Wide Input Voltage Range: 4.2V to 30V
- Adjustable Output Voltage from 0.925V to V_{IN}
- Up to 100% Duty Cycle Operation
- 600kHz Typical Switching Frequency
- Internal Power-Save Mode (Automatic PFM / PWM Switching)
- Constant On-Time (COT) Control Architecture
- Low EMI Signature
- Internal Soft-Start Function
- Cycle-by-Cycle Over-Current Protection (OCP)
- Short-Circuit Protection (SCP)
- Thermal Shutdown Protection (TSD)
- Under-Voltage Lockout (UVLO)
- Available in PSOP8 Package

APPLICATION

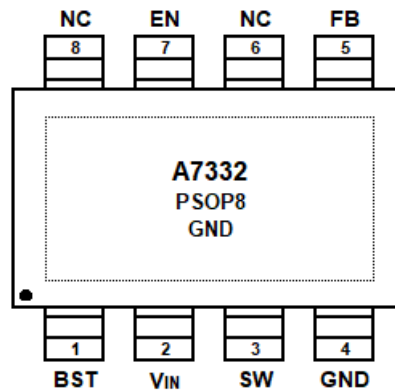
- LCD Display, TV
- STB (Set-Top-Box)
- Distributed Power System
- Networking, XDSL Modem

TYPICAL APPLICATION





PIN DESCRIPTION



Pin #	Symbol	Function
1	BST	A capacitor connected between the BST and SW pins is required to generate the floating supply for the high-side gate driver.
2	V _{IN}	Power input. Bypass with a 10uF~22uF ceramic capacitor to GND.
3	SW	Connection point for the internal power MOSFETs and the inductor. Connect the output filter inductor between the SW pin and the output node.
4	GND	Ground.
5	FB	Feedback input for the internal control loop. Connect this pin to the center tap of an external resistor divider from the output voltage to GND to set the output voltage.
6	NC	No connection
7	EN	Device enables logic input. A logic high enables the device, while a logic low disables it and places it into shutdown mode. Leaving this pin floating will enable the A7332.
8	NC	No connection
9	GND	EPAD pin and connect to Ground.



ABSOLUTE MAXIMUM RATINGS

V _{IN} , Supply Voltage	-0.3V ~ 36V
V _{SW} , Switch Node Voltage	-0.3V to (V _{IN} +0.5V)
V _{BST} , Boost Voltage	V _{SW} +5V
V _{EN} , Enable Voltage	-0.3V ~ 36V
V _{FB} , Feedback	-0.3V ~ 6.5V
T _J , Junction Operating Temperature Range	-40°C ~ +150°C
Storage Temperature Range	-65°C ~ +150°C
Lead Temperature (Soldering, 10s)	270°C
R _{θJA} Junction-to-ambient thermal resistance	48.4 °C/W
R _{θJC} Junction-to-case (top) thermal resistance	52.5 °C/W

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 WORK CONDITIONS

Parameter	Conditions	Min	Typ	Max	Unit
Supply Voltage V _{IN}		4.5	-	30	V
Ambient Operating Temperature		-40	-	85	°C
T _J , Operating Junction Temperature		-40		125	°C
Output Current		0		3	A



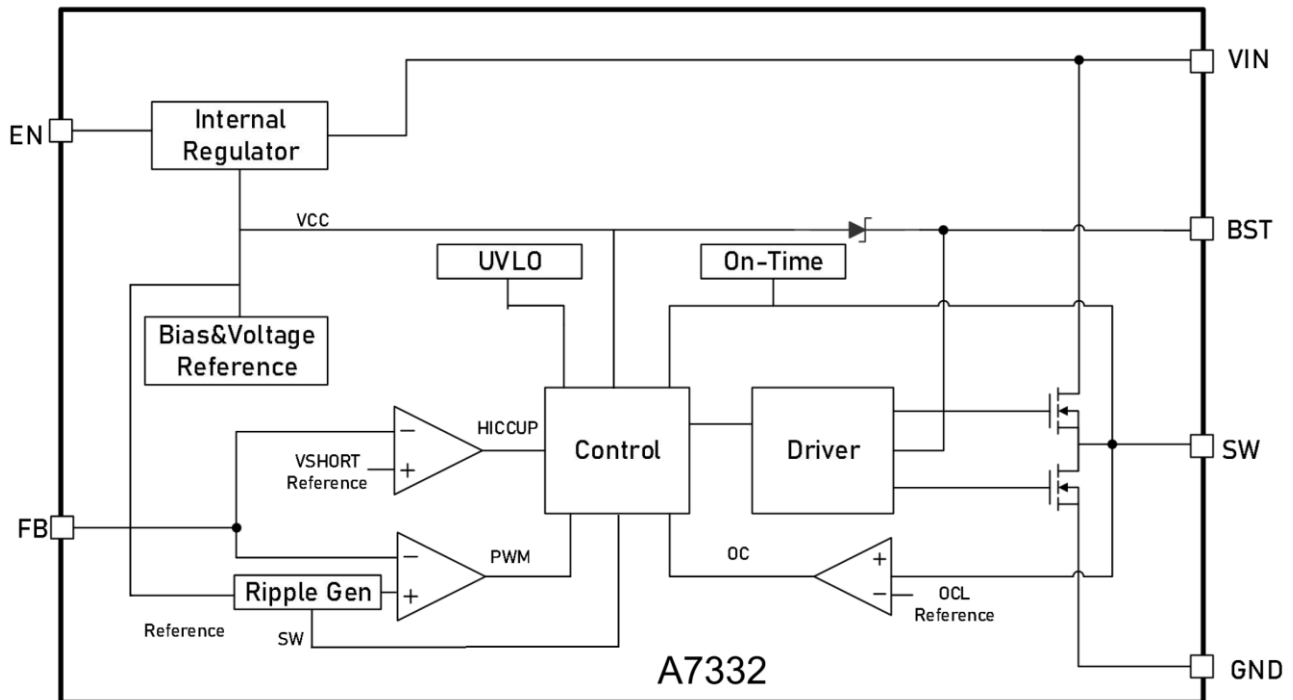
ELECTRICAL CHARACTERISTICS

$V_{IN}=12V$, $T_A=25^{\circ}C$, unless otherwise stated

Parameter	Conditions	Min	Typ	Max	Unit
V_{IN} , Input Voltage Range		4.0	-	30	V
UVLO Threshold Voltage Lockout		-	3.5	-	V
UVLO Voltage lockout Hysteresis		-	360	-	mV
I_{OFF} , Shutdown Current	$V_{EN}=0V$ or $V_{EN}=GND$	-	3	-	μA
I_Q , Non-Switching Quiescent Current	$V_{EN}=5V$ or $V_{EN}=GND$	-	330	-	μA
V_{BF} , Regulated Feedback Voltage	$4.0V \leq V_{IN} \leq 30V$	905	925	945	mV
$R_{(HSD)}$ High-side Switch On Resistance	$I_{SW}=1000mA$	-	120	-	m Ω
$R_{(LSD)}$ Low-side Switch On Resistance	$I_{SW}=1000mA$	-	60	-	m Ω
$I_{(LIM_HS)}$ FET Current Limit	FB=90%	-	4.4	-	A
F_{SW} , Oscillation Frequency		500	600	900	kHz
$V_{(EN_H)}$ EN Input Voltage "H"	0 to V_{IN}	1.2	-	-	V
$V_{(EN_L)}$ EN Input Voltage "L"	V_{IN} to 0	-	-	0.4	V
Enable Threshold Hysteresis			120		mV
Thermal Shutdown		-	160	-	$^{\circ}C$
Thermal Shutdown Hysteresis			30		$^{\circ}C$
Soft Start			2.4		ms



BLOCK DIAGRAM





DETAILED INFORMATION

The A7332 is a high-output-current monolithic switch-mode step-down DC/DC converter designed to provide up to 3A of output current from an input voltage range of 4V to 30V. The device operates at a fixed switching frequency of 600kHz and employs a slope-compensated current-mode control architecture for stable operation and fast transient response.

The shutdown function can be controlled by a logic-level signal, allowing the device to enter a low-power standby mode. Internal compensation is integrated to provide excellent line and load regulation while minimizing the need for external compensation components.

To enhance system reliability, the A7332 includes thermal shutdown and current-limit protection. Thermal shutdown prevents damage caused by excessive junction temperature, while current limiting protects the internal power switch from overcurrent conditions. When the current-limit condition occurs and the feedback voltage (V_{FB}) drops below 0.925V, the switching frequency is reduced to improve short-circuit protection and reduce power dissipation.

APPLICATION INFORMATION

The A7332 is a 4V to 30V wide input, 3A monolithic step-down DC/DC converter operating at a fixed 600kHz switching frequency. The device requires only three external power components (C_{IN} , C_{OUT} , and $L1$), simplifying system design. The output voltage can be programmed via an external feedback network from 0.925V to V_{IN} .

$$V_{OUT} = 0.925 \times (R1 + R2) / R2$$

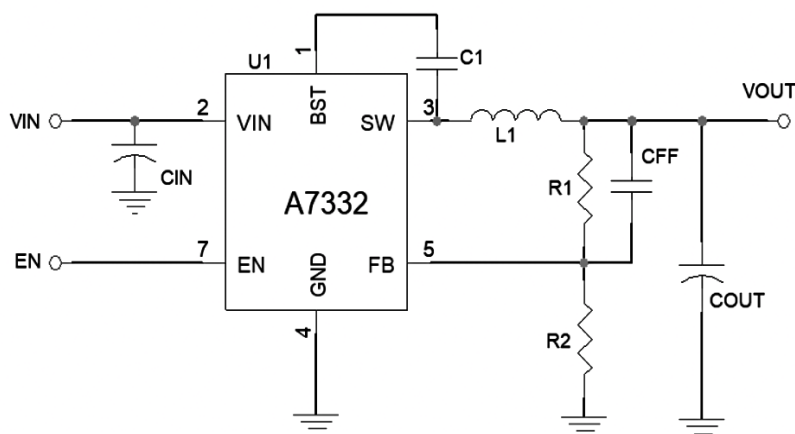




Table 1: Recommend Component Values

V _{OUT} (V)	L1 (μH)	C1 (μF)	C _{IN} (μF)	C _{OUT} (μF)	CFF (pF)	R1 (KΩ)	R2 (KΩ)
1.5	1.0-4.7	0.1	22	22	10-100	5.1	8.2
3.3	1.5-6.8	0.1	22	22	10-100	10	3.9
5	2.2-8.0	0.1	22	22	10-100	33	7.5
12	6.8-15	0.1	22	22	10-100	12	1

Inductor L1 value recommended (For reference only) and the CFF is optional

- A. Input :30V/ Output 1.5V /3A: L1 is 3.0μH : **PIA6045-3R0M**
- B. Input :30V/ Output 3.3V /3A: L1 is 5.6μH : **PIA8065-5R6M**
- C. Input :30V/ Output 5.0V /3A: L1 is 7.8μH : **PIA8065-7R8M**
- D. Input :30V/ Output 12 V /3A: L1 is 15μH : **WSL06040-150M**

Note: If the input voltage, output voltage, or load current is changed, the inductor value should be recalculated to ensure proper converter operation and optimal performance.

POWER SUPPLY RECOMMEND

The A7332 is designed to operate from an input voltage range of 4V to 30V. The input supply should be well regulated and have adequate current capability. If the input source is located several inches away from the device, additional bulk input capacitance may be required in addition to the local ceramic bypass capacitor to minimize input voltage transients and supply impedance. A 47μF electrolytic capacitor is typically sufficient for most applications.

Output Capacitor

The output capacitor (C_{OUT}) is critical for achieving a stable and low-ripple output voltage. Improper selection may result in abnormal system operation and excessive current ripple.

The equivalent series resistance (ESR) of the output capacitor must be within an appropriate range to ensure loop stability and proper feedback operation.

During the switching transition of the power MOSFET from ON to OFF, the feedback voltage (V_{FB}) may exhibit a slight increase. To maintain a stable feedback voltage and ensure proper charge transfer, a certain ESR and inductor current are required. Therefore, a feedforward capacitor (C_{FF}) is necessary.

Taking V_{OUT} = 5V as an example, when the feedforward capacitor is 0.1 μF, the recommended ESR range for the output capacitor is 100 mΩ to 250 mΩ.

It is recommended to use tantalum or aluminum electrolytic capacitors, optionally in parallel with a small ceramic capacitor (C_{FF}) to improve high-frequency performance.



If the output capacitor and its ESR cannot be adjusted, a feedforward capacitor can be connected in parallel with R1 to set the desired frequency response. The feedforward capacitor also helps reduce output voltage ripple.

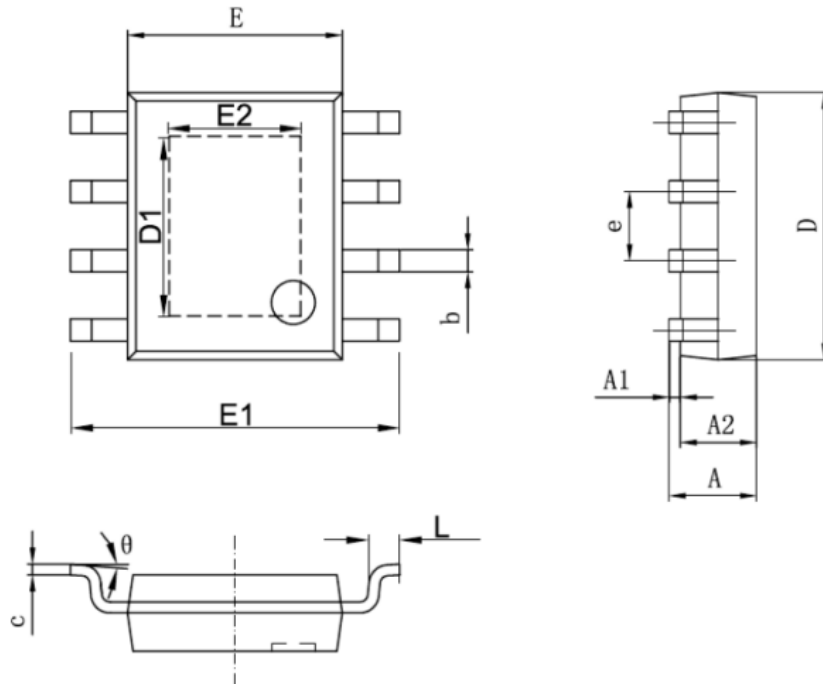
PCB LAYOUT GUIDELINES

- VIN and GND traces should be as wide as possible to reduce impedance and improve thermal dissipation.
- Input and output capacitors should be placed as close to the device as possible to minimize trace inductance and impedance.
- Provide adequate vias for both input and output capacitors to ensure solid grounding and current flow.
- Keep the SW (switching) trace as short and wide as possible to minimize radiated EMI.
- Avoid routing switching current beneath the IC to reduce potential noise and ground bounce.
- Use a dedicated VOUT trace to connect to the upper feedback resistor for accurate regulation.
- Implement a Kelvin connection from the feedback path to the GND pin for precise voltage sensing.
- Keep the voltage feedback loop away from high voltage switching traces, and shield it with a ground plane if possible.
- Minimize the trace area of the VFB node to reduce susceptibility to noise coupling.
- The GND trace between the output capacitor and the IC's GND pin should be as wide as possible to reduce voltage drop and ensure solid grounding.



PACKAGE INFORMATION

Dimension in PSOP8 (Unit: mm)



Symbol	Min	Max
A	1.350	1.700
A1	0.000	0.120
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
D1	3.202	3.402
E	3.800	4.000
E1	5.800	6.200
E2	2.313	2.513
e	1.270(BSC)	
L	0.400	1.270
θ	0°	8°



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