

Micropower, Step-Up/Step-Down Switching Regulator Adjustable and Fixed 5 V, 12 V

ADP1110

FEATURES

Operates at Supply Voltages from 1.0 V to 30 V Step-Up or Step-Down Mode
Minimal External Components Required
Low Battery Detector
User-Adjustable Current Limiting
Fixed or Adjustable Output Voltage Versions
8-Pin Plastic DIP or SO-8 Package

APPLICATIONS

Cellular Telephones

Single-Cell to 5 V Converters
Laptop and Palmtop Computers

Pagers Cameras

Battery Backup Supplies Portable Instruments

Laser Diode Drivers
Hand-Held Inventory Computers

GENERAL DESCRIPTION

The ADP1110 is part of a family of step-up/step-down switching regulators that operate from an input voltage supply of as little as 1.0 V. This very low input voltage allows the ADP1110 to be used in applications that use a single cell as the primary power source.

The ADP1110 can be configured to operate in either step-up or step-down mode, but for input voltages greater than 3 V, the ADP1111 would be a more effective solution.

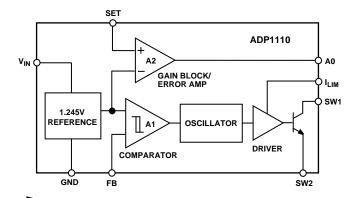
An auxiliary gain amplifier can serve as a low battery detector as well as a linear regulator.

The quiescent current of 300 µA makes the ADP1110 useful in remote or battery powered applications.

The 70 kHz frequency operation also allows for the use of surface mount external capacitors and inductors.

Battery protection circuitry limits the effect of reverse current to safe levels at reverse voltages up to 1.6 V.

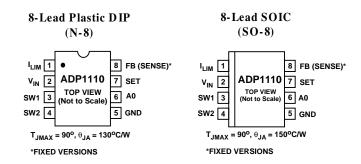
FUNCTIONAL BLOCK DIAGRAM



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Model	Voltage	Description	Option
ADP1110AN	ADJ	PDIP /	N-87
ADP1110AR	ADJ	/ s / oic / /	50-8
ADP1110AN-5	5 V	DIP /	N-8
ADP1110AR-5	5 V	SOIC	SO-8
ADP1110AN-12	12 V	PDIP	N-8
ADP1110AR-12	12 V	SOIC	SO-8

^{*}For outline information see Package Information section.

PIN CONFIGURATIONS



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ADP1110—SPECIFICATIONS (@ T_A = +25°C, V_{IN} = 1.5 V, unless otherwise noted)

Parameter	Conditions ¹	$\mathbf{v_s}$	Min	ADP1110 Typ	Max	Units
			WIIII		WIAX	
QUIESCENT CURRENT*	Switch Off	I _Q		300		μΑ
INPUT VOLTAGE*	Step-Up Mode	V_{IN}	1.15 1.0		12.6 12.6	V
	Step-Down Mode		110		30	v
COMPARATOR TRIP POINT VOLTAGE*	ADP1110 ¹		210	220	230	mV
OUTPUT SENSE VOLTAGE*	ADP1110-5 ²	V_{OUT}	4.75	5.00	5.25	V
	ADP1110-12 ²		11.4	12.00	12.6	V
COMPARATOR HYSTERESIS*	ADP1110			4	8	mV
OUTPUT HYSTERESIS*	ADP1110-5			90	180	mV
	ADP1110-12			200	400	mV
SCILLATOR AREQUENCY		f_{OSC}	52	70	90	kH z
pury cycle*//	Full Load (V _{FB} < V _{REF})	DC	62	69	78	%
SWITCH-ON TIME*		t _{ON}	7.5	10	12.5	μs
FEEDBACK PIN BIAS CUPRENT	$ADP1110 V_{FB} = 0V$	I_{FB}		70	150	nA
SET PIN BIAS CURRENT*	$V_{\text{SET}} = V_{\text{REF}}$	I_{SET}		100	300	nA
A0 OUTPUT LOW*	I _{AO} = 300 µA V _{SET} 150 mV	V _{AO}		J (1.15	0.4	V
REFERENCE LINE REGULATION*	$1.0 \text{ V} \le V_{IN} \le 1.5 \text{ V}$ $1.5 \text{ V} \le V_{IN} \le 12 \text{ V}$	PL		0.35	$\left/\begin{array}{c} 1.0 \\ 0.1 \end{array}\right/$	%/V
SWITCH SATURATION VOLTAGE* STEP-UP MODE	$V_{IN} = 1.5 \text{ V}, I_{SW} = 400 \text{ mA}$	V _{CESAT}		300	400 (mV mV
312. 31 11322	$V_{IN} = 1.5 \text{ V}, I_{SW} = 500 \text{ mA}$			400	550	m V
7	$V_{IN} = 5 \text{ V}, I_{SW} = 1 \text{ A}$			700	750 1000	mV mV
A2 ERROR AMP GAIN*	$R_{L} = 100 \text{ k}\Omega^{3}$	A _V	1000	5000		V/V
REVERSE BATTERY CURRENT	(Note 4)	I_{REV}		750		mA
CURRENT LIMIT CURRENT LIMIT TEMPERATURE COEFFICIENT	$220~\Omega$ Between I_{LIM} and V_{IN}			400 -0.3		mA %/°C
SWITCH-OFF LEAKAGE CURRENT	Measured at SW1 Pin	I_{LEAK}		1	10	μА
MAXIMUM EXCURSION BELOW GND	$I_{SW1} \le 10 \mu A$, Switch Off	V_{SW2}		-400	-350	mV
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NOTES

Specifications subject to change without notice.

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^{*}Denotes the specifications that apply over the full operating temperature range.

¹This specification guarantees that both the high and low trip point of the comparator fall within the 210 mV to 230 mV range.

²This specification guarantees that the output voltage of the fixed versions will always fall within the specified range. The waveform at the sense pin will exhibit a sawtooth shape due to the comparator hysteresis.

 $^{^3100~}k\Omega$ resistor connected between a 5 V source and the A0 pin.

⁴The ADP1110 is guaranteed to withstand continuous application of +1.6 V applied to the GND and SW2 pins while V_{IN}, I_{LIM}, and SW1 pins are grounded.