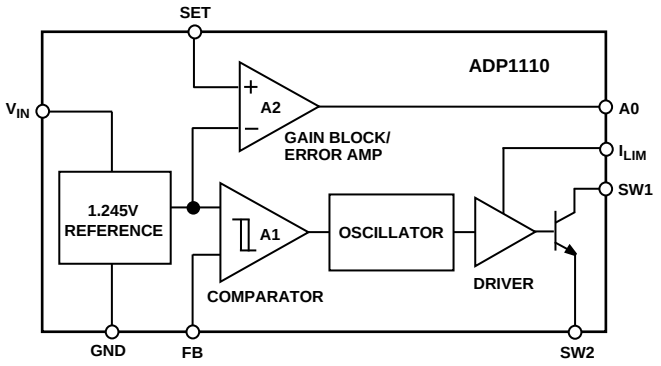
Micropower, Step-Up/Step-Down Switching Regulator Adjustable and Fixed 5 V, 12 V

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

FUNCTIONAL BLOCK DIAGRAM



ORDERING GUIDE

Model	Output Voltage	Package Description	Package Option*
ADP1110AN	ADJ	PDIP	N-8
ADP1110AR	ADJ	SOIC	SO-8
ADP1110AN-5	5 V	PDIP	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.

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.

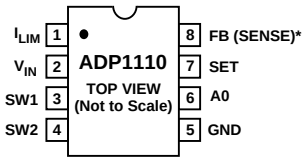
The quiescent current of 300 μA makes the ADP1110 useful in remote or battery powered applications.

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.

PIN CONFIGURATIONS

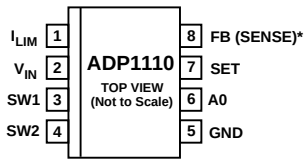
8-Lead Plastic DIP (N-8)



T_{JMAX} = 90°, θ_{JA} = 130°C/W

*FIXED VERSIONS

8-Lead SOIC (SO-8)



T_{JMAX} = 90°, θ_{JA} = 150°C/W

*FIXED VERSIONS

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

Parameter	Conditions[1]	V_S	ADP1110 Min	ADP1110 Typ	ADP1110 Max	Units
QUIESCENT CURRENT*	Switch Off	I_Q		300		µA
INPUT VOLTAGE*	Step-Up Mode	V_{IN}	1.15		12.6	V
			1.0		12.6	V
	Step-Down Mode				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
OSCILLATOR FREQUENCY*		f_{OSC}	52	70	90	kHz
DUTY 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 CURRENT*	ADP1110 V_{FB} = 0 V	I_{FB}		70	150	nA
SET PIN BIAS CURRENT*	$V_{SET} = V_{REF}$	I_{SET}		100	300	nA
A0 OUTPUT LOW*	I_{AO} = 300 µA	V_{AO}		0.15	0.4	V
	V_{SET} = 150 mV					
REFERENCE LINE REGULATION*	1.0 V ≤ V_{IN} ≤ 1.5 V			0.35	1.0	%/V
	1.5 V ≤ V_{IN} ≤ 12 V			0.05	0.1	%/V
SWITCH SATURATION VOLTAGE* STEP-UP MODE	V_{IN} = 1.5 V, I_{SW} = 400 mA	V_{CESAT}		300	400	mV
					600	mV
	V_{IN} = 1.5 V, I_{SW} = 500 mA			400	550	mV
					750	mV
	V_{IN} = 5 V, I_{SW} = 1 A			700	1000	mV
A2 ERROR AMP GAIN*	R_L = 100 kΩ[3]	A_V	1000	5000		V/V
REVERSE BATTERY CURRENT	(Note 4)	I_{REV}		750		mA
CURRENT LIMIT	220 Ω Between I_{LIM} and			400		mA
CURRENT LIMIT TEMPERATURE COEFFICIENT	V_{IN}			–0.3		%/°C
SWITCH-OFF LEAKAGE CURRENT	Measured at SW1 Pin	I_{LEAK}		1	10	µA
MAXIMUM EXCURSION BELOW GND	I_{SW1} ≤ 10 µA, Switch Off	V_{SW2}		–400	–350	mV

NOTES

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

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

[2]This 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 saw-tooth shape due to the comparator hysteresis.

[3]100 kΩ resistor connected between a 5 V source and the A0 pin.

[4]The 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.

Specifications subject to change without notice.