

## **Step-up PFM DC/DC Converter**

### ❖ GENERAL DESCRIPTION

The AX5110 is a Pulse Frequency Modulation (PFM) DC/DC converter. It is Low quiescent current 30uA and shutdown current less 1uA. The AX5110 feature a wide input voltage. The operating voltage is ranged from 1.2V to 12V. It also feature low quiescent current, switching current limiting, low temperature coefficient.

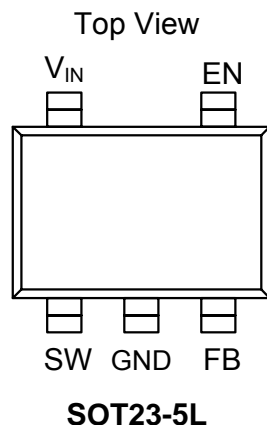
Smaller package size and fewer tiny external components are required in the application to save space and lower cost. AX5110 is available in SOT23-5L package.

### ❖ FEATURES

- Input voltage: 1.2V to 12V
- Low Quiescent Current: 17uA(typ.)
- Low Saturation Voltage : 200mV typical at 300mA
- 350mA typical switching current limiting
- High output voltage : up to 34V
- Low Profile SOT23-5 **Pb-Free** Packaging

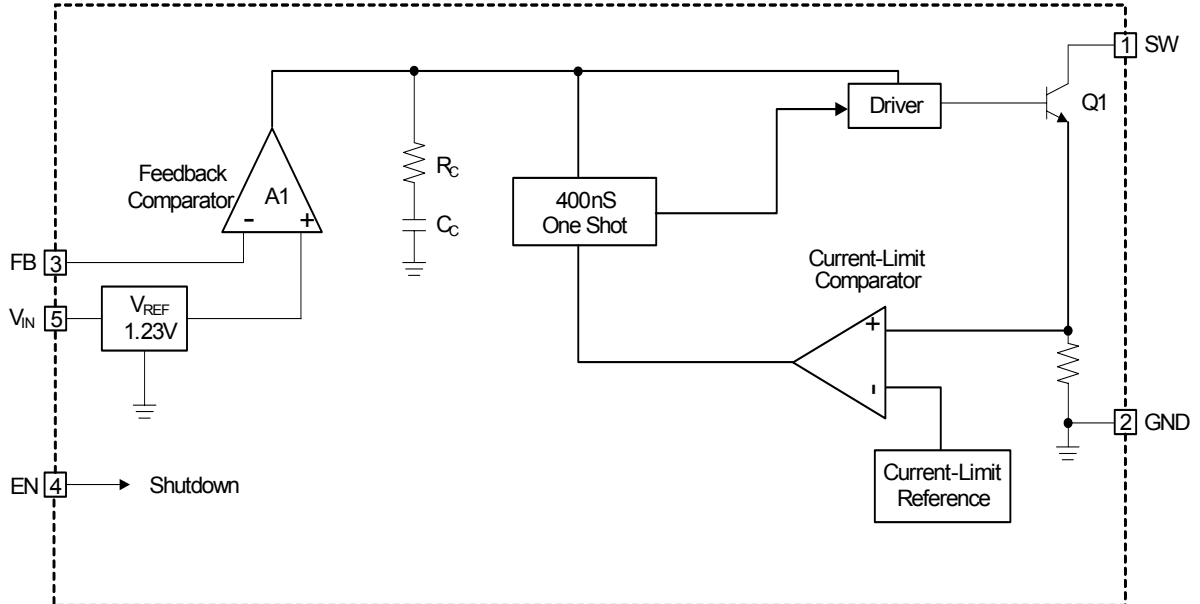
### ❖ PIN ASSIGNMENT

The package type: SOT23-5L; the pin assignment is given by:



Name	Description
V <sub>IN</sub>	IC power supply pin
SW	Switch pin. Connect external inductor & diode here.
FB	Feedback pin
EN	Shutdown pin H : normal operation L : operation stopped
GND	Ground Pin

❖ Block Diagram



❖ ORDER/MARKING INFORMATION

Order Information	Top Marking
<p><b>AX5110 X X</b></p> <p>Package Type      Packing                      B: SOT-23-5L      A : Taping</p>	<p><b>B1XX</b> → WW : 01~26(A~Z)                      27~52(<math>\bar{A}</math>~<math>\bar{Z}</math>)                      Year : 6 = 2006                      A = 2010                      Part number : AX5110</p>

❖ **Absolute Maximum Ratings** (at Ta=25°C)

Characteristics	Symbol	Rating	Unit
V <sub>IN</sub> Pin Voltage	V <sub>IN</sub>	15	V
SW Voltage	V <sub>SW</sub>	36	V
Feedback Pin Voltage	V <sub>FB</sub>	V <sub>IN</sub>	V
EN Pin Voltage	V <sub>EN</sub>	15	V
Maximum Junction Temperature	T <sub>J</sub>	150	V
Storage Temperature Range	T <sub>STG</sub>	-40 to +150	°C
Operating Junction Temperature Range	T <sub>J</sub>	-40 to +125	°C
Power Dissipation	PD	( T <sub>J</sub> -T <sub>A</sub> ) / θ <sub>JA</sub>	mW
Thermal Resistance from Junction to case	θ <sub>JC</sub>	110	°C/W
Thermal Resistance from Junction to ambient	θ <sub>JA</sub>	250	°C/W

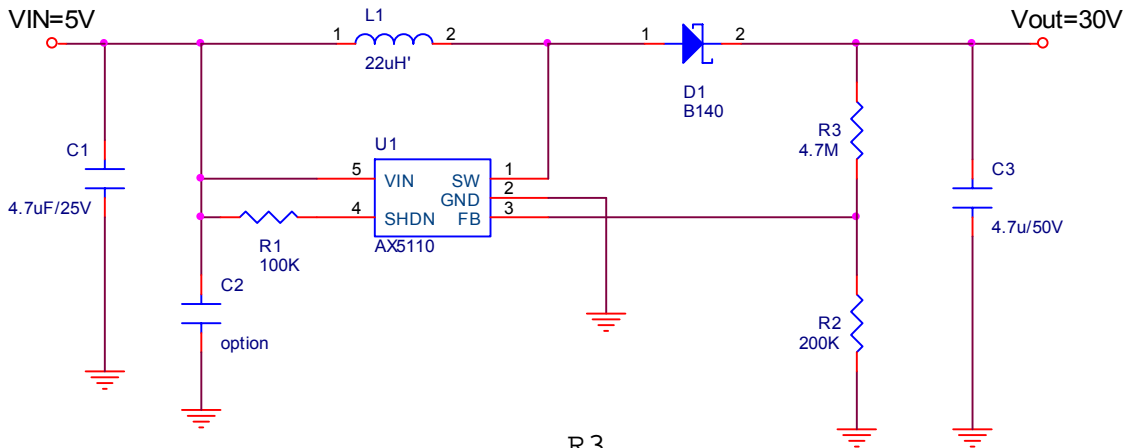
Note : θ<sub>JA</sub> is measured with the PCB copper area of approximately 1 in<sup>2</sup>(Multi-layer) that need connect to GND pin of the AX5110.

❖ **Electrical Characteristics** (V<sub>IN</sub> = 5V, V<sub>OUT</sub>=12V, Ta=25°C, unless otherwise specified)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage	V <sub>IN</sub>		1.2	-	12	V
Quiescent Current	I <sub>CCO</sub>	V <sub>FB</sub> =1.5V ,Not Switching	-	17	30	uA
Shutdown Current	I <sub>SD</sub>	V <sub>EN</sub> =0V	-	-	1	uA
Feedback Voltage	V <sub>FB</sub>		1.205	1.23	1.255	V
Feedback Bias Current	I <sub>FB</sub>	V <sub>FB</sub> =1.23V	-	30	80	nA
Line Regulation	V <sub>Line</sub>	1.2V<V <sub>IN</sub> <12V, Load=10mA	-	0.05	0.1	%/V
Switching Saturation Voltage	V <sub>CESAT</sub>	I <sub>SW</sub> =300mA	-	200	300	mV
Switch Current Limit	I <sub>SW</sub>		300	350	400	mA
Switch Leakage Current	I <sub>LEAK</sub>	Switch-off, V <sub>SW</sub> =5V	-	0.01	5	uA
EN Pin Logic input threshold voltage	V <sub>ENH</sub>	High (regulator ON)	0.9	-	-	V
	V <sub>ENL</sub>	Low (regulator OFF)	-	-	0.25	
EN Pin Input Current	I <sub>EN</sub>	V <sub>EN</sub> =1.2V	-	2	3	uA
		V <sub>EN</sub> =5V	-	8	12	uA

❖ Application Circuit

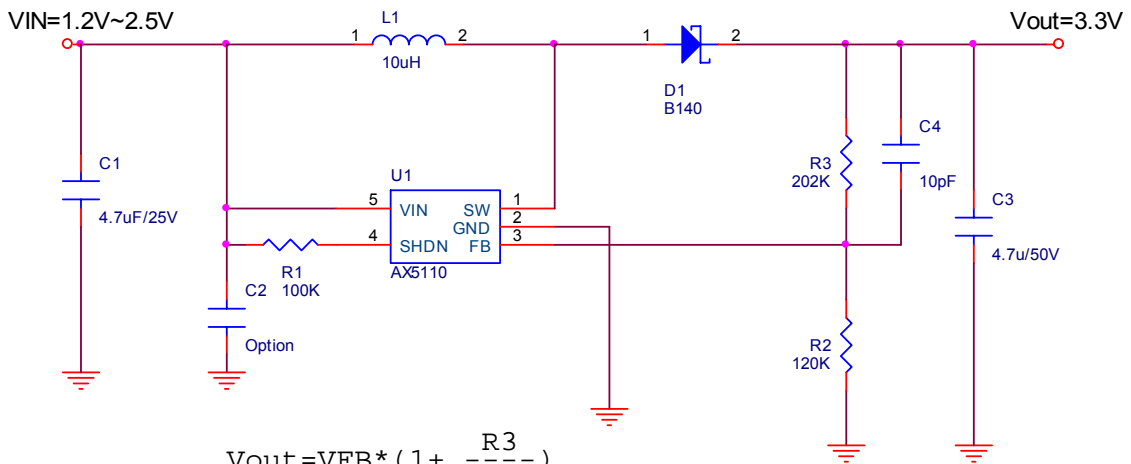
1. VCC=5V/ VOUT=30V for LCD.OLED Bias Supply



$$V_{out} = V_{FB} * (1 + \frac{R3}{R2})$$

VFB=1.23V, R2 suggest 100K~300K

2. VCC=1.2~2.5V/ VOUT=3.3V for 1 or 2 cells to 3.3V boost converter



$$V_{out} = V_{FB} * (1 + \frac{R3}{R2})$$

VFB=1.23V, R2 Suggest 100K~300K

## ❖ Application Information

### Capacitor Selection

The small size of ceramic capacitors makes them ideal for AX5110 applications. X5R and X7R types are recommended because they retain their capacitance over wider voltage and temperature ranges than other types such as Y5V or Z5U. A 4.7 $\mu$ F input capacitor and a 4.7 $\mu$ F output capacitor are sufficient for most AX5110 applications.

### Inductor Selection

A 10 $\mu$ H inductor is recommended for most AX5110 applications. Although small size and high efficiency are major concerns, the inductor should have low core losses and low DCR (copper wire resistance).

### Diode Selection

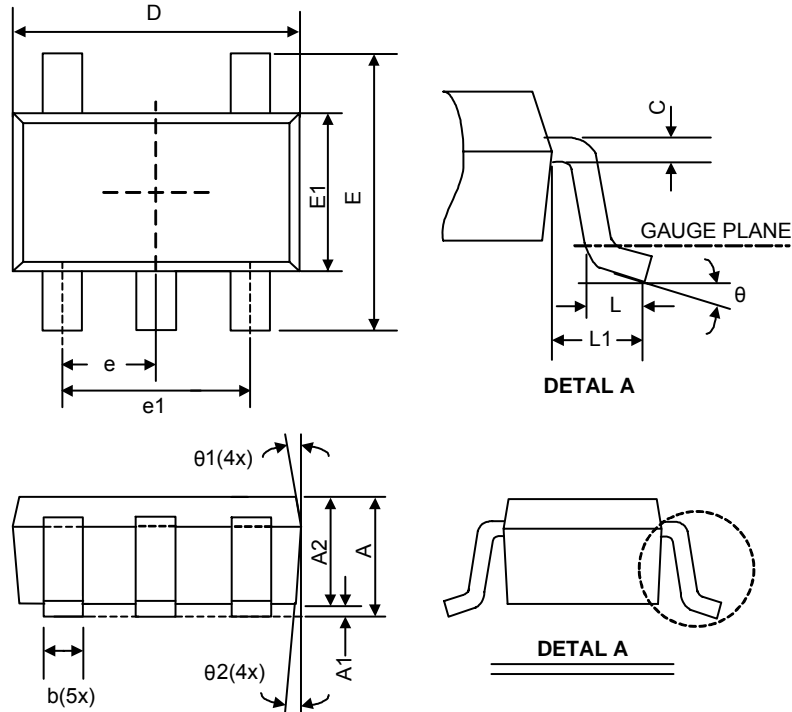
Schottky diodes with higher current ratings usually have lower forward voltage drop, larger diode capacitance and fast reverse recovery, it is the ideal choices for AX5110 applications. The forward voltage drop of a Schottky diode represents the conduction losses in the system, while the diode capacitance ( $C_T$  or  $C_D$ ) represents the switching losses. For diode selection, both forward voltage drop and diode capacitance need to be considered.

### PCB layout guide

When laying out the PC board, the following suggestions should be taken to ensure proper operation of the AX5110. These items are also illustrated graphically in below.

1. The power traces, including the GND trace, the SW trace and the  $V_{CC}$  trace should be kept short, direct and wide to allow large current flow. Put enough multiply-layer pads when they need to change the trace layer.
2. Connect the input capacitor C1 to the  $V_{CC}$  pin as closely as possible to get good power filter effect.
3. Do not trace signal line under inductor.

❖ Package Outlines



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.05	-	1.35	0.041	-	0.053
A1	0.05	-	0.15	0.002	-	0.006
A2	1.00	1.10	1.20	0.039	0.043	0.047
b	0.30	-	0.50	0.012	-	0.020
C	0.08	-	0.22	0.003	-	0.009
D	2.80	2.90	3.00	0.110	0.114	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
E	2.60	2.80	3.00	0.102	0.110	0.118
L	0.30	-	0.60	0.012	-	0.024
L1	0.50	0.60	0.70	0.020	0.024	0.028
e1	1.80	1.90	2.00	0.071	0.075	0.079
e	0.85	0.95	1.05	0.033	0.037	0.041
theta	0°	4°	8°	0°	4°	8°
theta1	5°	10°	15°	5°	10°	15°
theta2	5°	10°	15°	5°	10°	15°