

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.

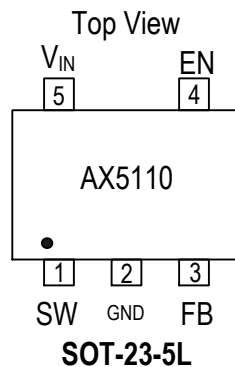
Smaller package size and fewer tiny external components are required in the application to save space and lower cost. AX5110 is available in SOT-23-5L package.

❖ 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 SOT-23-5 Pb-Free Packaging

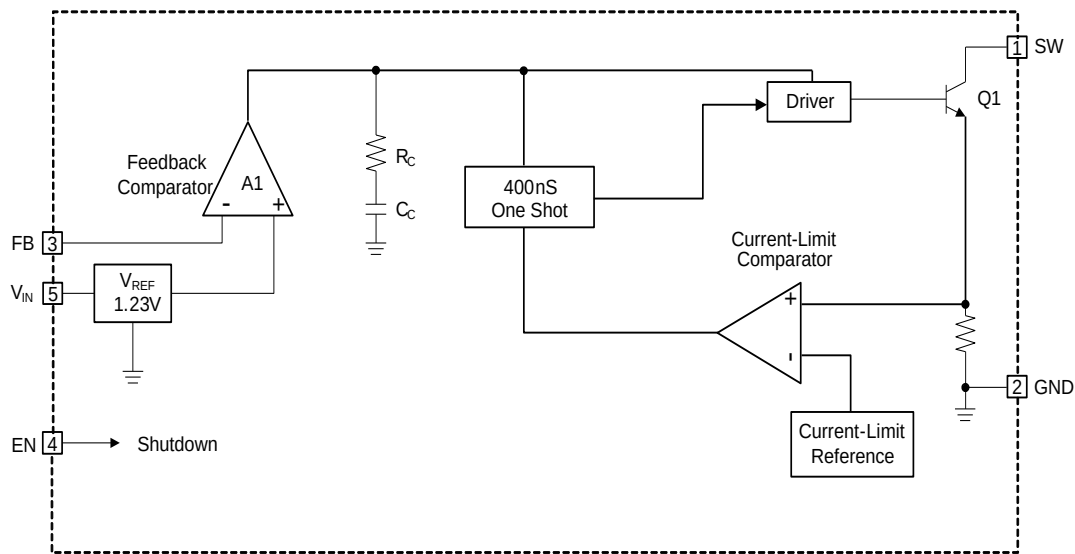
❖ PIN ASSIGNMENT

The package type: SOT-23-5L; the pin assignment is given by:



Name	Description
SW	Switch pin. Connect external inductor and diode here.
GND	Ground Pin
FB	Feedback pin
EN	Shutdown pin H : normal operation L : operation stopped
V _{IN}	IC power supply pin

❖ BLOCK DIAGRAM



❖ ORDER/MARKING INFORMATION

Order Information	Top Marking
AX5110 X X Package Type B: SOT-23-5L Packing A : Taping	B1 Y W X AX5110 ID code:internal WW:01~26 (A~Z) 27~52 (a~z) Year: A=2010 1=2011

❖ ABSOLUTE MAXIMUM RATINGS (at $T_A=25^{\circ}\text{C}$)

Characteristics	Symbol	Rating	Unit
V_{IN} Pin Voltage	V_{IN}	15	V
SW Voltage	V_{SW}	36	V
Feedback Pin Voltage	V_{FB}	V_{IN}	V
EN Pin Voltage	V_{EN}	15	V
Maximum Junction Temperature	T_J	150	V
Storage Temperature Range	T_{STG}	-40 to +150	$^{\circ}\text{C}$
Operating Temperature Range	T_{OPR}	-40 to +125	$^{\circ}\text{C}$
Power Dissipation	PD	$(T_J - T_A) / \theta_{JA}$	mW
Thermal Resistance from Junction to case	θ_{JC}	110	$^{\circ}\text{C/W}$
Thermal Resistance from Junction to ambient	θ_{JA}	250	$^{\circ}\text{C/W}$

Note: θ_{JA} is measured with the PCB copper area of approximately 1 in²(Multi-layer) that need connect to GND pin of the AX5110.

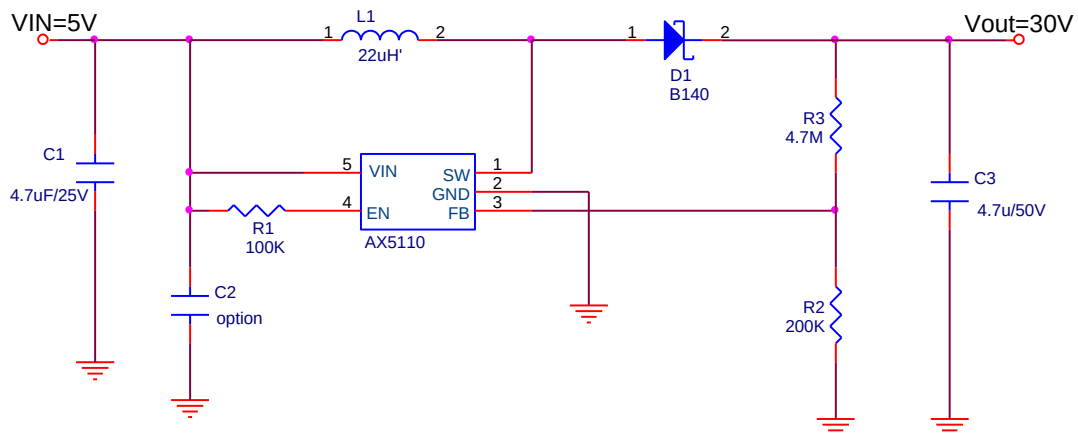
❖ ELECTRICAL CHARACTERISTICS

($V_{IN} = 5V$, $V_{OUT}=12V$, $T_A=25^{\circ}C$, unless otherwise specified)

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

❖ APPLICATION CIRCUIT

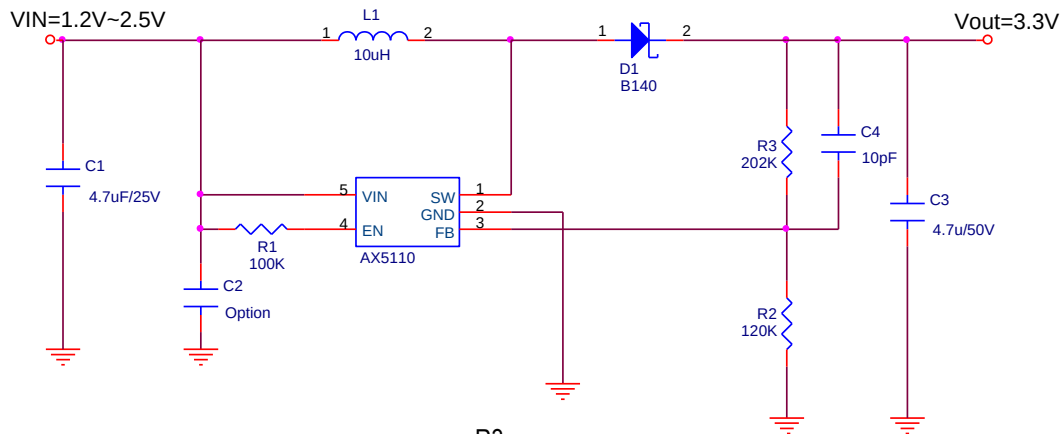
1. VCC=5V/ VOUT=30V for LCD.OLED Bias Supply



$$V_{out} = V_{FB} \left(1 + \frac{R_3}{R_2} \right)$$

$V_{FB}=1.23V$, R_2 suggest 100K~300K

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



$$V_{out} = V_{FB} \left(1 + \frac{R_3}{R_2} \right)$$

$$V_{FB} = 1.23V, R_2 \text{ Suggest } 100K \sim 300K$$

❖ 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 4.7μF input capacitor and a 4.7μF output capacitor are sufficient for most AX5110 applications.

Inductor Selection

A 10μH 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

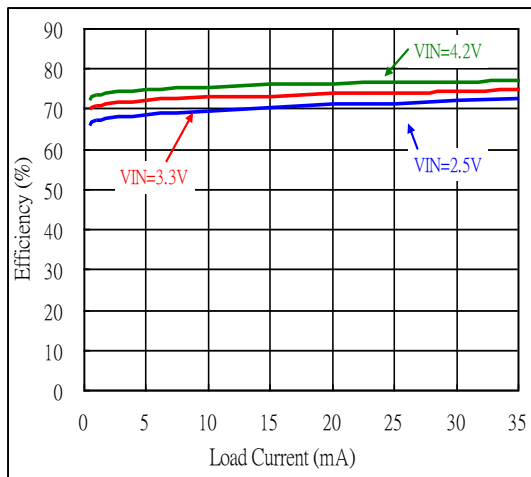
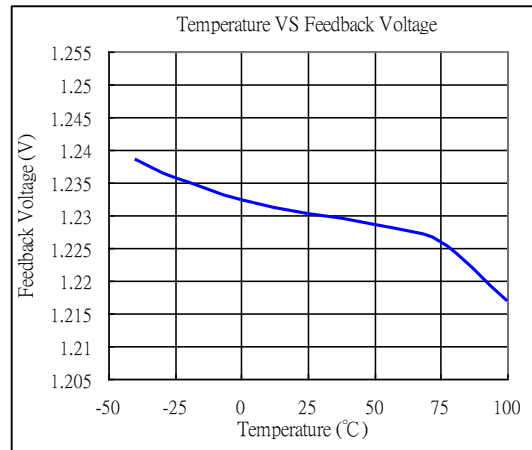
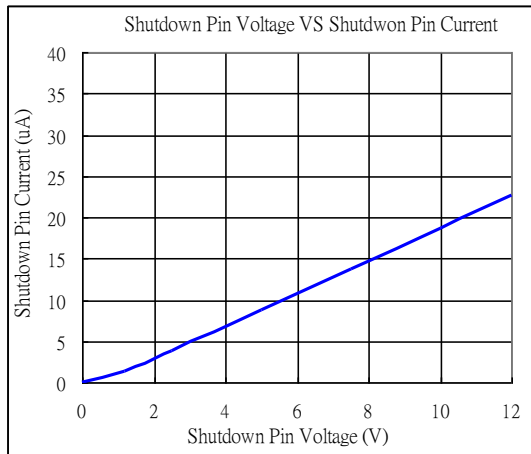
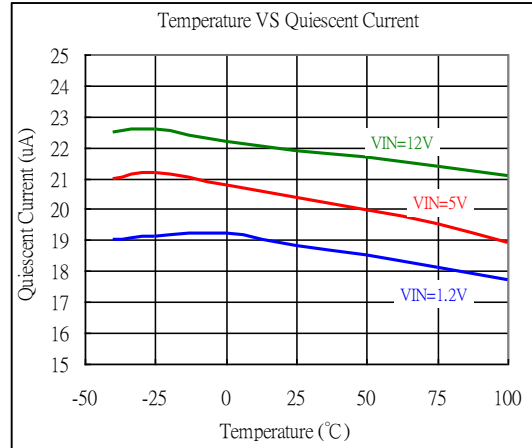
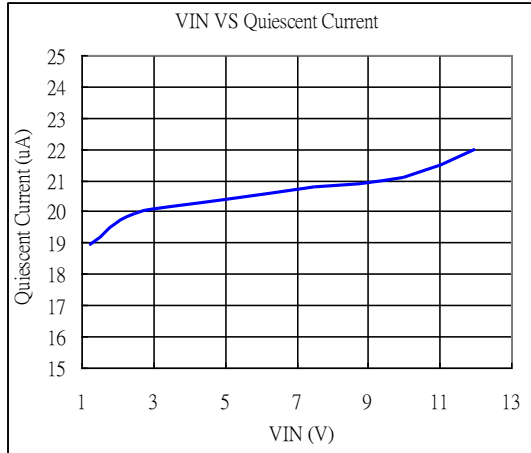
Schottky diodes with higher current ratings usually have lower forward voltage drop, larger diode capacitance and fast reverse recovery, it is the ideal choices for AX5110 applications. The forward voltage drop of a Schottky diode represents the conduction losses in the system, while the diode capacitance (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

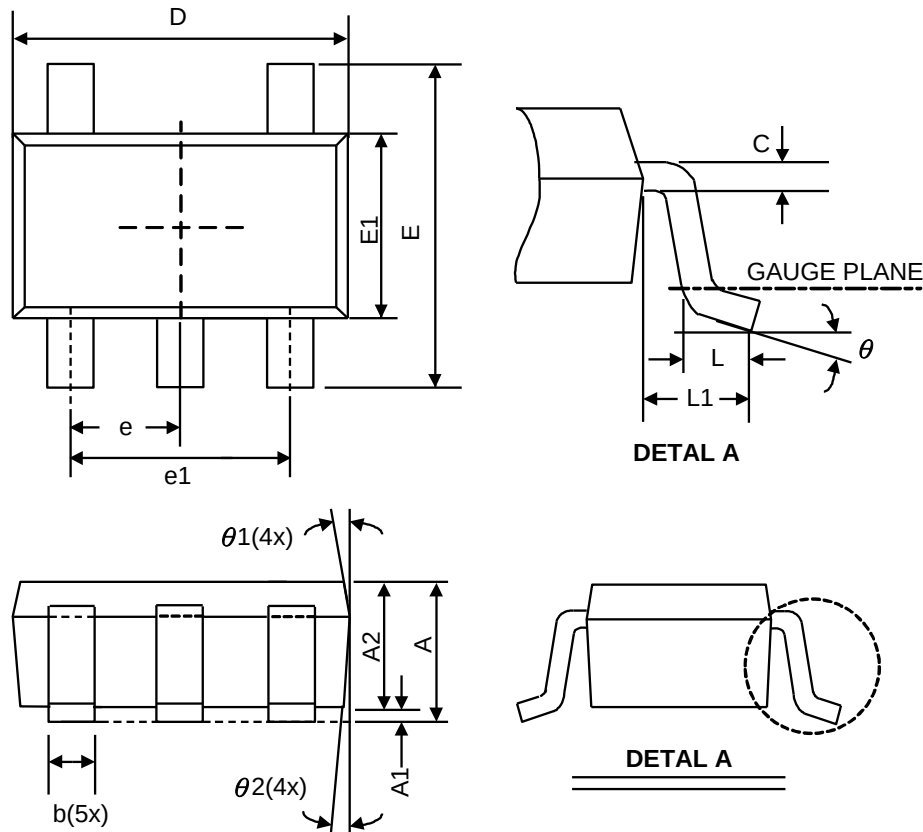
When laying out the PC board, the following suggestions should be taken to ensure proper operation of the AX5110. These items are also illustrated graphically in below.

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.

❖ TYPICAL CHARACTERISTICS



❖ PACKAGE OUTLINES



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.45	-	-	0.057
A1	0.00	0.08	0.15	0	0.003	0.006
A2	0.90	1.10	1.30	0.035	0.043	0.051
b	0.30	0.40	0.50	0.012	0.016	0.020
C	0.08	0.15	0.22	0.003	0.006	0.009
D	2.70	2.90	3.10	0.106	0.114	0.122
E1	1.40	1.60	1.80	0.055	0.063	0.071
E	2.60	2.80	3.00	0.102	0.110	0.118
L	0.30	0.45	0.60	0.012	0.018	0.024
L1	0.50	0.60	0.70	0.020	0.024	0.028
e1	1.9 BSC			0.075 BSC		
e	0.95 BSC			0.037 BSC		
θ	0°	4°	8°	0°	4°	8°
θ 1	5°	10°	15°	5°	10°	15°
θ 2	5°	10°	15°	5°	10°	15°

JEDEC outline: MO-178 AA