0.9V to 5.5V Input,450mA Output,Synchronous Step Up Voltage Converter

1 Features

- Wide input voltage Range: 0.9V~5.5V
- Wide Output Voltage Range: 1.8V~5.0V
- Up to 450mA Output Current
- 400KHz Typical Switching Frequency
- 7.5μA Low Quiescent Supply Current
- High Efficiency up to 93%
- No External Diode or FETs Needed
- Over Current Protection

2 Applications

- Cellular Phones
- LCD Bias Supplies
- Portable Applications
- Wireless Mouse/Keyboard

3 Order Information

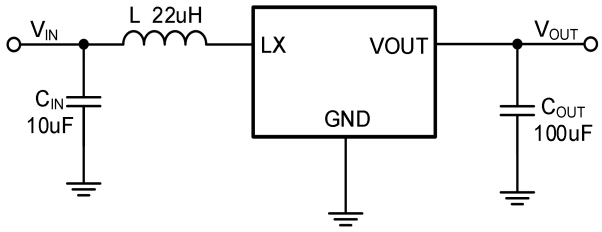
MX5701 A □□ □□

- Package Type
  A3 : SOT23-3
- Output Type
  33 : 3.3V
  50 : 5.0V
- Version number

4 Description

The MX5701 is a compact, PFM mode, and step-up DC-DC converter with low quiescent current, low-noise boost converters are intended for low-voltage systems that often need a locally generated high voltage. The internal synchronous rectifier reduces cost and PCB space by eliminating the need for an external Schottky diode. The duty cycle factor is automatically switched according to the load current.The start-up voltage is guaranteed below 1V.The APW7079 is suitable for portable battery-powered applications. Consuming low quiescent current and an optimized control scheme allows the device to operate at very high efficiency over the entire load current range.

Simplified Schematic

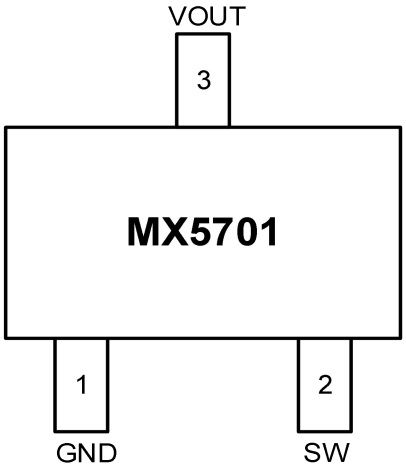


Device Information

ORDERABLE DEVICE	VOLTAGE	DEVICE MARKING (1)	PACKAGE TYPE	PACKAGE SIZE (mm)	PACKAGE QTY.(Reel&Tape)
MX5701A33A3	3.3V	KA33xyz	SOT23	2.9 x 1.6 x 1.1	3000
MX5701A50A3	5.0V	KA50xyz	SOT23	2.9 x 1.6 x 1.1	3000

(1) "KA" is package code,"33/50" is output voltage,"x" is year code ,"y" is month code, "z" is lot number code.
(2) This product currently has eleven voltage values: 3.3V,5.0V.
If you need other voltage values and package form, please contact our sales staff.

5 Pin Configuration and Functions



SOT23-3 Pin Configuration

PIN NO.	NAME	DESCRIPTION
1	GND	Ground pin.
2	SW	The switch pin of the converter. It is connected to the inductor.
3	VOUT	Boost converter output.

6 Specifications

5.1 Absolute Maximum Ratings

Over operating temperature range(25°C) (unless otherwise noted)(1)

ITEM		MIN	MAX	UNIT
Voltage (2)	SW	–0.3	6	V
	VOUT	–0.3	6	V
SW Pin Current Maximum			1000	mA
Operating junction temperature, T_J		–40	150	°C
Storage temperature, T_{stg}		–55	150	°C
Junction-to-ambient thermal resistance, $R_{\theta JA}$			230	°C/W
Power Dissipation (SOT23-3)			540	mW

(1) Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only and the device is not switching. Functional operation of the device at these or any other conditions beyond those indicated under recommended perating conditions is not implied. Exposure to absolute– maximum– rated conditions for extended periods may affect device reliability.
(2) All voltage values are with respect to network ground terminal .

5.2 Recommended Operating Conditions

ITEM	MIN	MAX	UNIT
Operating junction temperature (1)	-40	125	°C/W
Operating temperature range	-40	85	°C/W
Input voltage	0.9	5.5	V
Output voltage	1.8	5.0	V
Output current	0	450	mA

(1) All limits specified at room temperature (TA = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

5.3 Electrical Characteristics

L=22uH,C_{IN}=10uF,C_{OUT}=100uF, T_A=25°C, unless otherwise specified.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{START}	Start-Up Input Voltage	I_{load}=1mA, V_{IN} :0→2V; V_{OUT}=3.3V	0.7	0.9	1.1	V
		I_{load}=1mA, V_{IN} :0→2V; V_{OUT}=5.0V	0.7	1.0	1.1	V
V_{HOLD}	Operating Hold Voltage	I_{load}=1mA, V_{IN} :2→0V	0.5			V
V_{IN}	Input voltage range		0.9		5.5	V
V_{OUT}	Output voltage range	MX5701A33	3.234	3.3	3.366	V
		MX5701A50	4.9	5.0	5.1	V
ΔV_{OUT}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA; V_{IN}=2V		20	30	mV
I_Q(1)	Quiescent Current into OUT	V_{IN}=2V; V_{OUT}=V_{OUT}+0.5; V_{OUT}=3.3V		7.5	14.5	μA
		V_{IN}=3V; V_{OUT}=V_{OUT}+0.5; V_{OUT}=5.0V		10	16.5	μA
I_{IN0}	Input current without load	V_{IN}=2V; V_{OUT}=3.3V		10	15	μA
		V_{IN}=3V; V_{OUT}=5.0V		18	30	μA
EFFI(2)	Efficiency			93	95	%
D_{OSC}	Oscillator Maximum Duty Cycle	V_{IN}=2V; V_{OUT}=3.3V		74		%
		V_{IN}=3V; V_{OUT}=5.0V		78		%
I_{LIM}	FET current limit	V_{OUT}=3.3V	0.8	1	1.2	A
		V_{OUT}=5.0V	0.9	1.2	1.3	A
F_{sw}	Centre switching frequency			400		KHz

(1)Supply current is measured with an ammeter between the output and OUT pin. This current correlates directly with actual battery supply current, but is reduced in value according to the step-up ratio and efficiency.No Inductor Connected.
(2)EFFI={[(Output Voltage)×(Output Current)] / [(Input Voltage)×(Input Current)]}×100

6 Detailed Description

6.1 Overview

The MX5701 high efficiency synchronous boost converter. The devices feature fixed frequency, current mode PFM control for exceptional line and load regulation. Current limit PFM control is used for the control method to make it difficult for the output voltage ripple to increase even when the switching current is superimposed, so the product can be used within a wide voltage and current range. Further, because PFM control is used, it has excellent transient response high performance boost DC/DC converter.

6.2 Functional Block Diagram

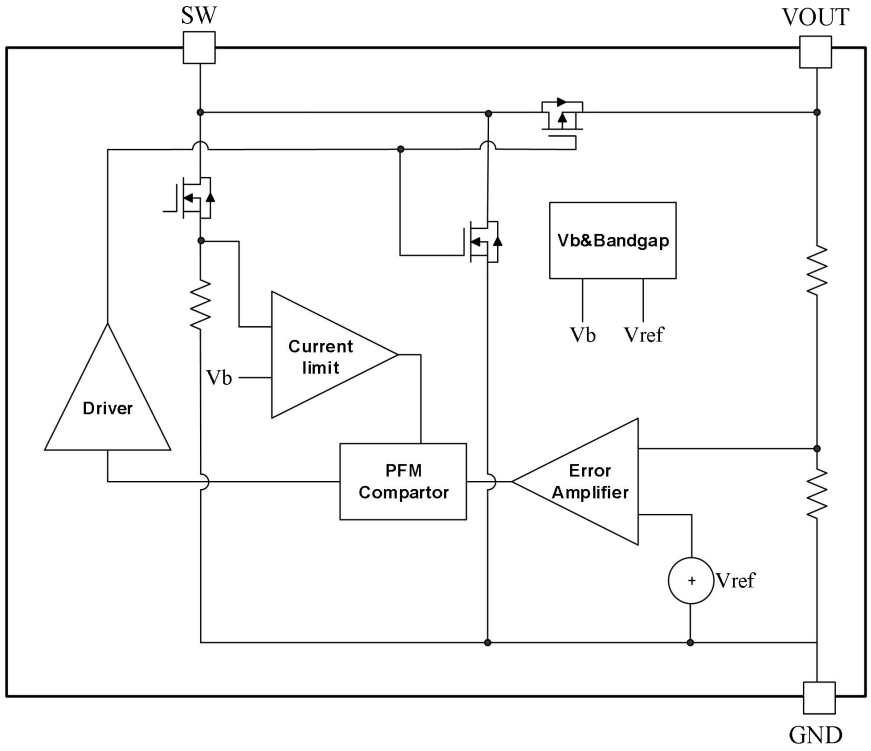


Figure 1. MX5701 Functional Block Diagram

7 Application information

7.1 Input Capacitor

10μF or greater X7R or X5R ceramic capacitor is selected to get good dynamic performance. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and reduce noise. However, when the power supply is far away from the DC-DC circuit, it is recommended to add more than 22uF filter capacitor near the input of DC-DC, which can reduce the output noise.

7.2 Output Capacitor

In order to reduce the ripple of the output, relatively large output capacitance values are required. However, if the output capacitance is too large, the reaction time of the system will be too slow and the cost will increase. Therefore, it is recommended to use a 47uF capacitor, or to reduce the output ripple, a relatively large output capacitance value is required. However, if the output capacitance is too large,

the reaction time of the system will be too slow and the cost will increase. So it is recommended to use a 47uF capacitor, or two 22uF capacitors in parallel. If a smaller ripple is required, a larger capacitance is required. If the load is small (around 10mA), a smaller capacitor can be used.

7.3 Boost Inductor Selection

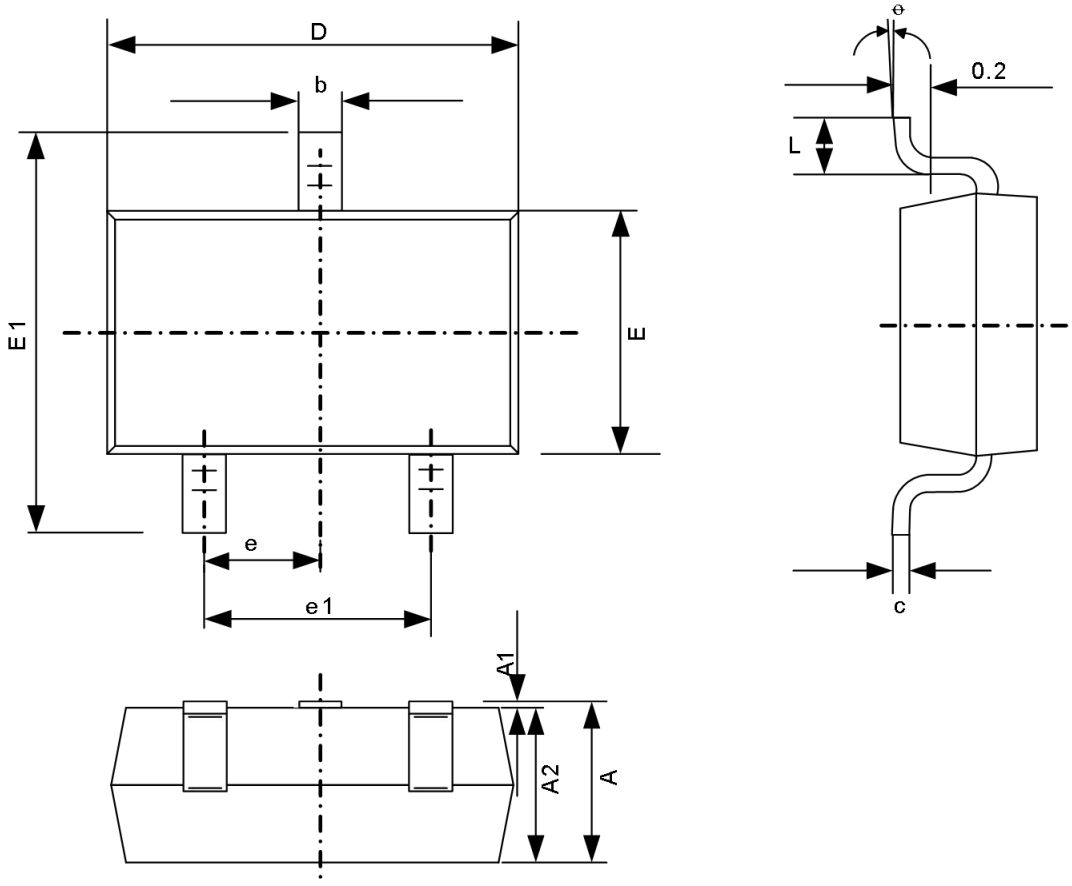
Small inductance will make the ripple current large and too large inductance will cause poor dynamic characteristics and the slow response. The proper inductance should be selected to ensure the loop stability. For these reasons, the recommended of inductor value for the application is 22μH.

7.4 Synchronous Rectification

The internal synchronous rectifier eliminates the need for an external Schottky diode, thus reducing cost and board space. While the inductor discharges, the P-channel MOSFET turns on and shunts the MOSFET body diode. As a result, the rectifier voltage drop is significantly reduced, improving efficiency without the addition of external components.

8 Package Outline

SOT23-3



Symbol	Dimensions In Millimetres		Dimensions In Inches	
	Min	Max	Min	Max
A	1. 050	1. 250	0. 041	0. 049
A1	0. 000	0. 100	0. 000	0. 004
A2	1. 050	1. 150	0. 041	0. 045
b	0. 300	0. 500	0. 012	0. 020
c	0. 100	0. 200	0. 004	0. 008
D	2. 820	3. 020	0. 111	0. 119
E	1. 500	1. 700	0. 059	0. 067
E1	2. 650	2. 950	0. 104	0. 116
e	0. 950 TYP		0. 037 TYP	
e1	1. 900 TYP		0. 075 TYP	
L	0. 250	0. 600	0. 010	0. 024
θ	0°	8°	0°	8°