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SEMICONDUCTOR

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MSTLV61220DBVR

Product specification

GENERAL DESCRIPTION

The MSTLV61220DBVR is a high efficiency, current mode, synchronous boost converter which could opera te fromsingle or dual-cell Alkaline battery such as the input voltage below 0.9V. The converter output volta ge can be adjusted to 5.5V by an external resistor div ider. In light load, the MSTLV61220DBVR enters into the power-save mode to maintain high efficiency.

The MSTLV61220DBVR provides true output disconnect and this allows VOUT to go to zero volt during shutdown without drawing any current from the input source.

The MSTLV61220DBVR integrated a 0.5Ω N-channel MOSFET switch and 0.6Ω P-channel synchronous rect ifier. No external Schottky diode is required The devic e is available in SOT-23-6 package.

FEATURES

- Input Voltage Range:0.9V to 5.5V
- 1.2MHz Fixed Switching Frequency
- Adjustable Output Voltage up to 5.5V
- Accurate Reference Voltage 0.5V
- Integrated 0.5Ω NMOS and 0.6Ω PMOS
- Internal 1.2A Switch Current Limit
- Load Disconnect During Shutdown
- Thermal Shutdown Protection
- Available in SOT23-6 Package
- RoHS Compliant and Halogen Free

APPLICATIONS

- Single or Dual cell Alkaline
- 1 Cell Li-Ion or Li-Primary
- Personal Medical Products
- Handheld Instrument

Reference News

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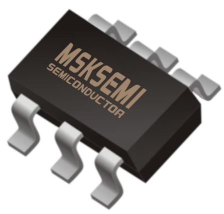
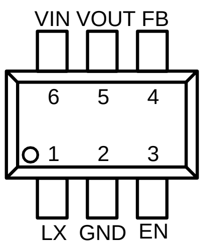
<tr><th>SOT-23-6</th><th>Pin Configuration</th><th>MARKING</th></tr>
<tr><td>
</td><td>
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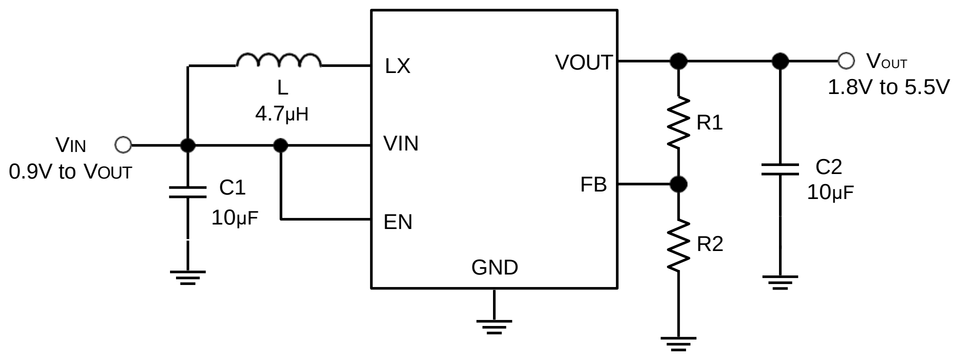
Pin Description

Pin No.	Pin Name	Pin Description
1	LX	Inductor node. Connect an inductor from power input to LX pin.
2	GND	Ground pin.
3	EN	Enable pin.
4	FB	Feedback Input. The reference voltage is 0.5V.
5	VOUT	Output Supply pin.
6	VIN	Input Supply pin.

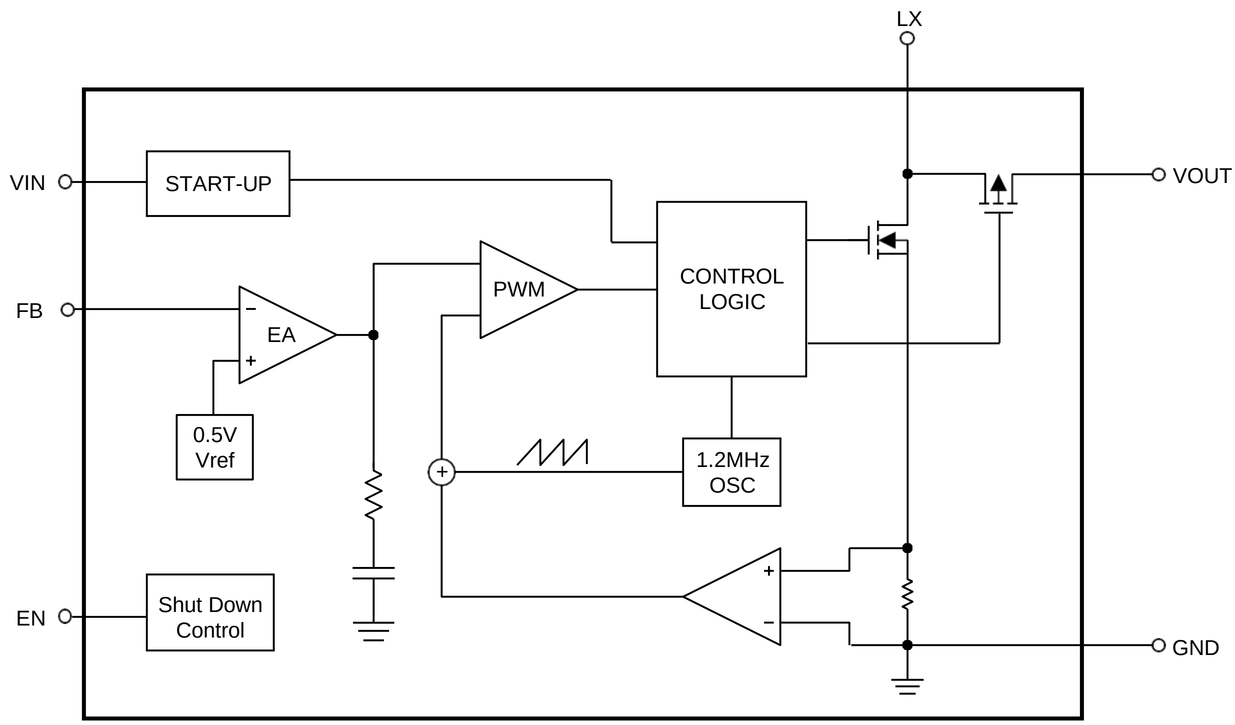
ORDERINFORMATION

P/N	PKG	QTY
MSTLV61220DBVR	SOT-23-6	3000

Typical Application Circuit



Functional Block Diagram



Absolute Maximum Ratings (Note 1)

VIN, EN, FB, VOUT −0.3V to 5.5V
LX −0.3V to 6.0V
Power Dissipation, PD @ T_A = 25°C
SOT23-6 0.4W
Package Thermal Resistance
SOT23-6, θ_{JA} 250°C/W
Lead Temperature (Soldering, 10 sec.) - 260°C
Junction Temperature 150°C
Storage Temperature Range −55°C to 150°C
ESD Susceptibility
HBM (Human Body Model) 2kV
CDM (Charged Device Model) 200V

Recommended Operating Conditions

VIN 0.9V to 5.5V
Junction Temperature Range −40°C to 85°C

Electrical Characteristics

VIN = EN = 5V, T_A=25°C, unless otherwise noted.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Start-up Voltage	V_{ST}	V_{OUT}=3.3V, R_{LOAD}=3.3kΩ		0.9		**V**
VIN UVLO	V_{UVLO}	V_{IN} decreasing		0.7		**V**
Output Voltage Range	V_{OUT}		1.8		5.5	**V**
Output Over Voltage	V_{OVP}			6.0		**V**
VIN Shutdown Current	I_{SHDN}	EN=0V		0.2		**μA**
VIN Quiescent Current	I_{Q1}	V_{IN}=V_{EN}=1.2V, V_{FB}=0.6V		0.5	0.9	**μA**
VOUT Quiescent Current	I_{Q2}	V_{OUT}=3.3V		5.5		**μA**
Feedback Reference Voltage	V_{FB}		490	500	510	**mV**
FB input current	I_{FB}				0.1	**μA**
Switch NMOS Ron	R_{ONN}			500		**mΩ**
Rectifier PMOS Ron	R_{ONP}			600		**mΩ**
Switch Frequency	fsw			1.2		**MHz**
Switch Current Limit	I_{LMT}			1.2		**A**
Enable High Voltage	V_{ENH}	VIN<1.5V	0.8*V_{IN}			**V**
Enable Low Voltage	V_{ENH}	VIN<1.5V			0.2*V_{IN}	**V**
Enable High Voltage	V_{ENL}	1.5<VIN<5.5V	1.2			**V**
Enable Low Voltage	V_{ENL}	1.5<VIN<5.5V			0.4	**V**
Enable Input Current	I_{EN}			1		**μA**
Thermal Shutdown Threshold	T_{SD}			150		**℃**
Thermal Shutdown Hysteresis	ΔT_{SD}			20		**℃**

Note 1. Stresses beyond those listed “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

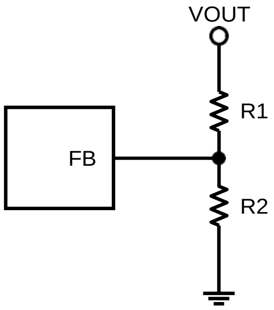
Application Information

Setting the Output Voltage

The output voltage is divided by a resistor divider, R1 and R2 to the FB pin. The internal reference V_{REF} is 0.5V (Typical). The output voltage is given by:

$$V_{OUT} = V_{REF} \times (1+\frac{R1}{R2})$$

Selecting large resistance values for both R1 and R2 to minimize the power consumption. R2 is recommended to be 100kΩ.



Input capacitor C_{IN}

To minimize the potential noise problem, place a typical X5R or better grade ceramic capacitor close to the VIN and GND pins, minimize the loop area formed by C_{IN}, and VIN/GND pins. In this case a 10uF or larger low ESR ceramic is recommended.

Output capacitor C_{OUT}

The output capacitor is selected to handle the output ripple noise requirements. Both steady state ripple and transient requirements must be taken into consideration when selecting this capacitor. For the best performance, it is recommended to use X5R or better grade ceramic capacitor and a 10uF or larger low ESR ceramic.

Inductor Selection

A boost converter normally requires two main passive components for storing energy during the conversion. A boost inductor is required and a storage capacitor at the output. To select the boost inductor, it is recommended to keep the possible peak inductor current below the current limit threshold of the power switch in the chosen configuration.

The second parameter for choosing the inductor is the desired current ripple in the inductor. Normally, it is advisable to work with a ripple of less than 20% of the average inductor current. A smaller ripple reduces the magnetic hysteresis losses in the inductor, as well as output voltage ripple and EMI. But in the same way, regulation time at load changes rises. In addition, a larger inductor increases the total system cost. With those parameters, the value of the inductor is given by:

$$L = \frac{V_{IN} \times (V_{OUT} - V_{IN})}{\Delta I_L \times f \times V_{OUT}}$$

Parameter f is the switching frequency and ΔI_L is the ripple current in the inductor, i.e, 20% x I_L. With this calculated value and currents, it is possible to choose a suitable inductor. Care must be taken that load transients and losses in the circuit can lead to higher currents. Also, the losses in the inductor caused by magnetic hysteresis losses and copper losses are a major parameter for total circuit efficiency.

Layout Consideration

As for all switching power supplies, the layout is an important step in the design, especially at high-peak currents and high switching frequencies. If the layout is not carefully done, the regulator could show stability problems as well as EMI problems. Therefore, use wide and short traces for the main current path and for the power ground tracks. The input capacitor, output capacitor, and the inductor should be placed as close as possible to the IC. Use a common ground node for power ground and a different one for control ground to minimize the effects of ground noise. Connect these ground nodes at any place close to the ground pin of the IC.

The feedback divider should be placed as close as possible to the ground pin of the IC. To lay out the control ground, it is recommended to use short traces as well, separated from the power ground traces. This avoiCHX ground shift problems, which can occur due to superimposition of power ground current and control ground current.

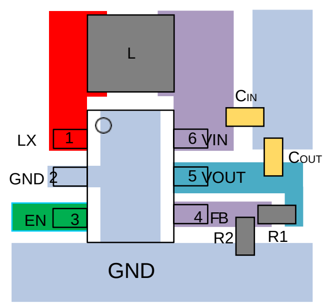
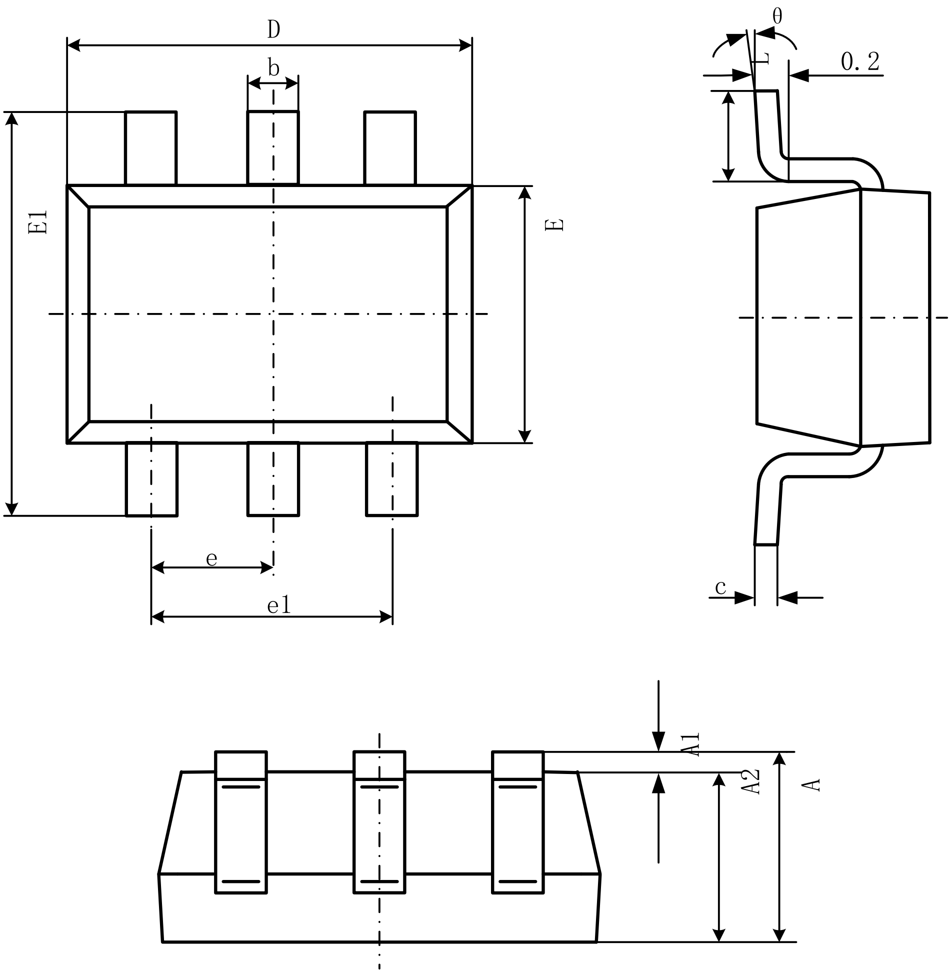


Figure Layout Example

Outline Dimension

SOT23-6 Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
Z	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(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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