ME301　DC-DC Converter

Introduction

ME301 is a VFM Step-up DC/DC converter IC with ultra-low supply current by CMOS process. It consists of an oscillator, a VFM control circuit, a Lx switch driver transistor, a reference voltage unit, an error amplifier, resistors for voltage detection, and an Lx switch protection circuit. A low ripple, high efficiency step-up DC/DC converter can be constructed of ME301 with only three external components. It is compatible with RH301B.ME301 is suitable for use with battery-powered instruments with low noise and ultra low supply current.

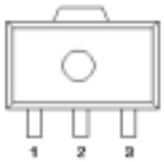
Applications

- ✧ Power source for battery-powered equipment.
- ✧ Power source for cameras, camcorders, VRCs, PDAs, and hand-held communication equipment.
- ✧ Power source for appliances which require higher cell voltage than that of batteries used in the appliances.

Features

- ✧ Small number of external components: only an inductor, a diode and a capacitor
- ✧ Ultra low input current: TYP. 6μA(at no load, 1.5V input)
- ✧ High output voltage accuracy: ±2.5%
- ✧ Low ripple and low noise
- ✧ Low start-up voltage: MAX. 0.9V（with 1mA input ）
- ✧ High efficiency: TYP. 80%
- ✧ Small Package: SOT-89

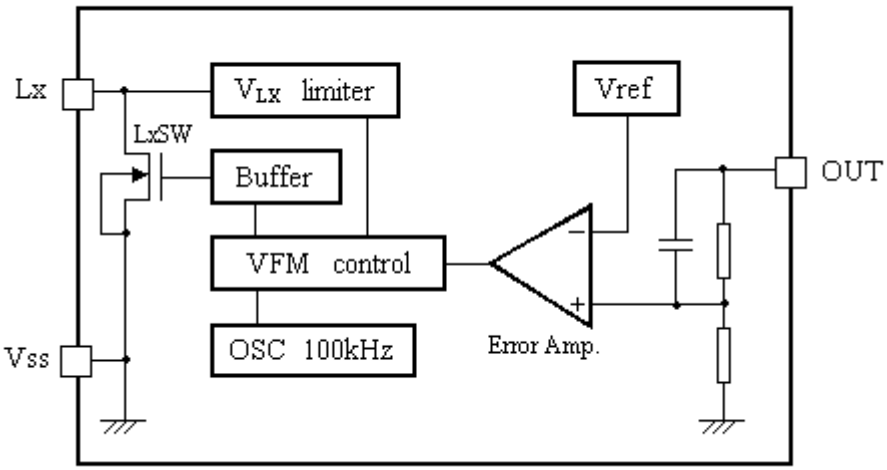
Pin Configuration



Pin Description

Pin No.	Symbol	Description
1	Vss	Ground Pin
2	OUT	Step-up Output Pin, Power Supply
3	Lx	Switching Pin

Block Diagram

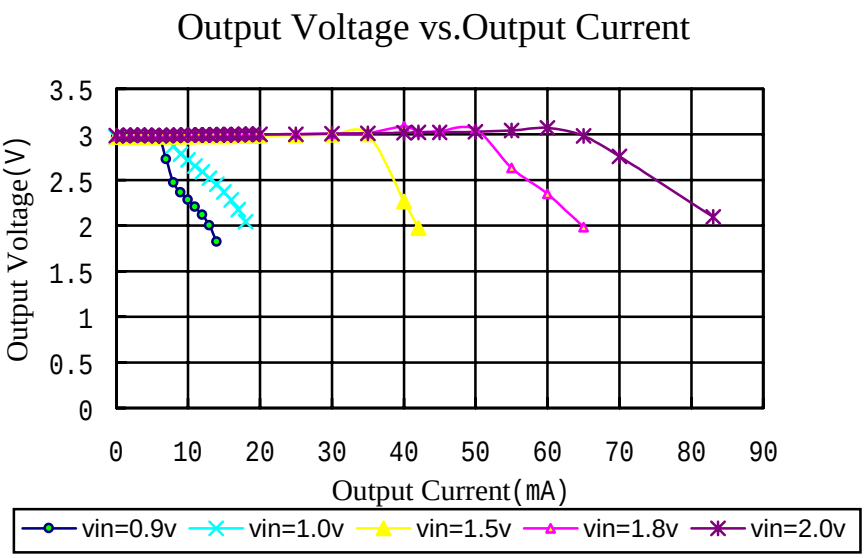


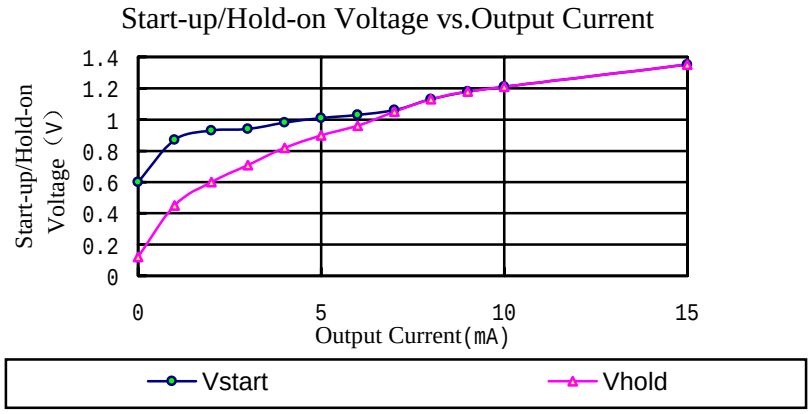
Electrical Characteristic

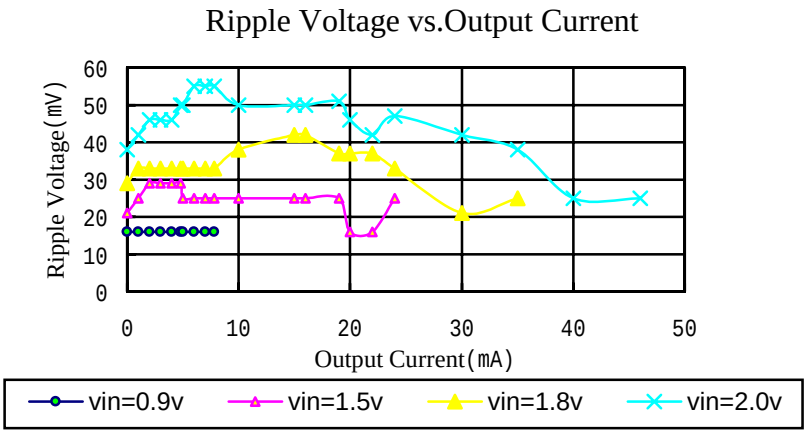
Unless otherwise provided, V_{IN}=1.8V，V_{SS}=0V，I_{OUT}=10mA，T_{opt}=25℃。 Test circuit is at page.

Symbol	Item	Conditions	Value			Unit
			MIN.	TYP	MAX	
V_{OUT}	Output Voltage		2.925	3.000	3.075	V
V_{IN}	Input Voltage				8	V
V_{start}	Start-up Voltage	I_{OUT}=1mA，V_{IN}：0→2V		0.8	0.9	V
V_{hold}	Hold-on Voltage	I_{OUT}=1mA，V_{IN}：2→0V	0.7			V
I_{IN1}	Input Current 1	At no load		8	12	μA
I_{IN2}	Input Current 2	$V_{IN\_}$=3.5V		6		μA
I_{LX}	Lx Switching Current	V_{LX}=0.4V, V_{IN}=2.85V	40			mA
I_{LXleak}	Lx Leakage Current	V_{IN}=3.5V V_{LX}=6V			0.5	μA
F_{osc}	Oscillator Frequency			180		kHz
Maxdty	Oscillator Duty Cycle	on(V_{LX} “L”)side		75		%
η	Efficiency			80		%

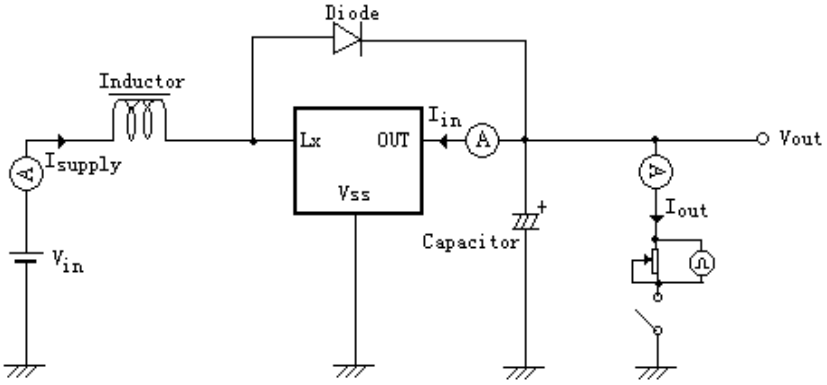
Typical Characteristics：







Test Circuit



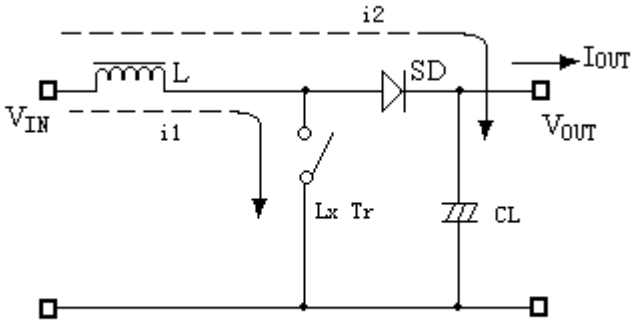
Inductor：47μH；

Diode：Schottky Type(forward voltage drop:0.2V)；

Capacitor：Aluminium type，47μF。

Operation

ME301 step-up DC/DC converter charges energy in the inductor when Lx Transistor is on, and discharges the energy with the addition of the energy from input power source thereto, so that a higher output voltage than the input voltage is obtained. Following is the operation diagram.



Selection of Peripheral Components and Application Notes

Peripheral components should be selected carefully because they are greatly affect the performances of ME301：

✧ Use capacitor with a capacity of 10μF or more (too small capacity will lead to high output ripple), and with good frequency characteristics (it is better to use Tantalum type). Besides, it is recommended the use of a capacitor with an allowable voltage which is at least three times the output set voltage. This is because there may be the case where a spike-shaped high voltage is

generated by the inductor when Lx transistor is turned OFF.

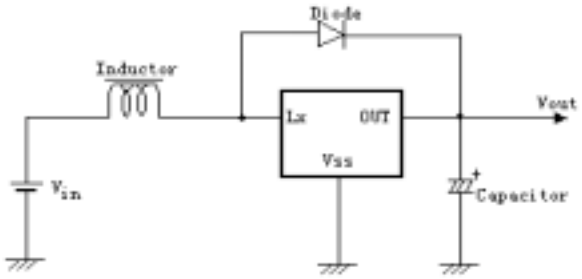
- ✧ Choose such an inductor that has sufficiently small d.c. resistance and large allowable current, and hardly reaches magnetic saturation. When the inductance value of the inductor is small, there may be the case where ILX exceeds the absolute maximum ratings at the maximum load.
- ✧ Use a diode of a Schottky type with high switching speed.

Notes：

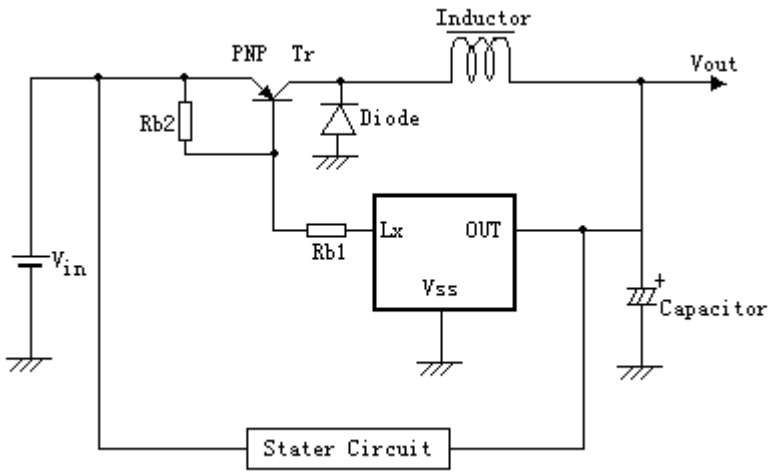
- ✧ Set external components as close as possible to the IC and minimize the connection between the components and the IC. In particular, when an external component is connected to OUT Pin, make minimum connection with the capacitor. A 0.1μ ceramic capacitor is suggested to be parallelly connected to OUT Pin and Vss Pin.
- ✧ Make Vss pin sufficient grounding, otherwise, the zero level within IC will varied with the switching current. This may result in unstable operation of IC.

Typical Applications

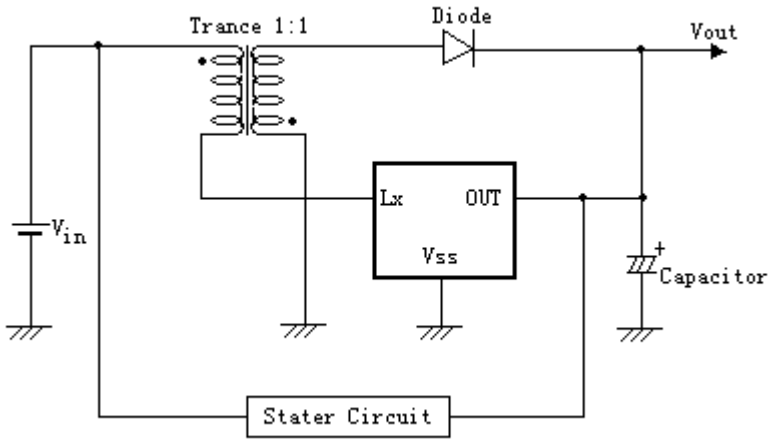
Typical Step-up Circuit: The following circuit is the basic circuit to make input voltage less than 3.0v to 3v output voltage.



Step-down Circuit ：



Step-up/Step-down Circuit：



Note: The starter circuit is necessary for all above circuits.