ML63 Series DC-DC Converter

❖ *Application*

- *Power Source of Portable Products*
- *Palmtops*
- *Portable Cameras and Video Recorders*
- *Wireless mouse and keyboard*

❖ *Features*

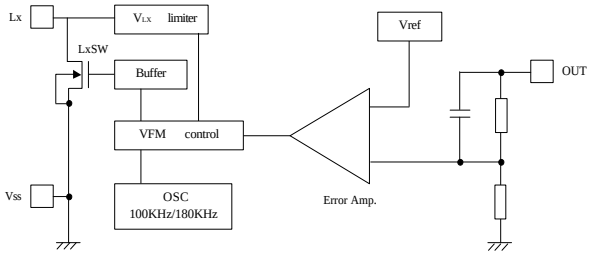
- Small number of external components: inductor, diode and capacitor.
- Ultra low input current : Typical 0.6uA (at no load, 1.5V input)
- Oscillator : 100 kHz, 180 kHz (± 15%)
- Low ripple and noise
- Low startup voltage : Max 0.9V (with 1mA input)
- High Efficiency: Typical 80%
- Package Available:
  SOT- 89 (500mW) & TO - 92 (300mW)

❖ *General Description*

The ML63 is a group of 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 for voltage detection and an Lx switch protection circuit. It is suitable for use with battery-powered instruments with low noise and ultra low supply current.

❖ *Block Diagram*



❖ *Absolute Maximum Ratings*

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	8	V
Output Current		I_{OUT}	500	mA
Output Voltage		V_{OUT}	V_{SS}-0.3 ~V_{IN}+0.3	V
Continuous Total Power Dissipation	SOT-89	P_d	500	mW
	TO-92		300	
Operating Ambient Temperature		T_{opr}	-30 ~ +80	°C
Storage Temperature		T_{stg}	-40 ~ +125	°C

❖ *Electrical Characteristics*

VIN = 1.6V, IOUT = 10mA, Ta = 25°C, unless otherwise provided.

ML63271 / ML63271A VOUT=2.7V

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}		2.633	2.700	2.767	V
Startup Voltage	V_{START}	I_{OUT}=1mA		0.8	0.9	V
Hold-on Voltage	V_{HOLD}	I_{OUT}=1mA	0.7			V
Oscillator Frequency	F_{OSC}	TYPE = ML63271A	85	100	115	KHz
		TYPE = ML63271	153	180	207	KHz
Input Current 1	I_{IN1}	At no load		8	12	uA
Input Current 2	I_{IN2}	V_{IN} = 3.2V		6		uA
Lx Switching Current	I_{LX}	V_{LX}=0.4V, V_{IN}=2.55V	40			mA
Lx Leakage Current	I_{LXLEAK}	V_{IN}=3.5V, V_{LX}=6.0V			0.5	uA
Oscillator Duty Cycle	MAXDTY	Measuring Lx Waveform		75		%
Efficiency	EFF			80		%
Input Voltage	V_{IN}				8	V

VIN = 1.8V, IOUT = 10mA, Ta = 25°C, unless otherwise provided.

ML63301 / ML63301A VOUT=3.0V

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}		2.925	3.000	3.075	V
Startup Voltage	V_{START}	I_{OUT}=1mA		0.8	0.9	V
Hold-on Voltage	V_{HOLD}	I_{OUT}=1mA	0.7			V
Oscillator Frequency	F_{OSC}	TYPE = ML63301A	85	100	115	KHz
		TYPE = ML63301	153	180	207	KHz
Input Current 1	I_{IN1}	At no load		8	12	uA
Input Current 2	I_{IN2}	V_{IN} = 3.5V		6		uA
Lx Switching Current	I_{LX}	V_{LX}=0.4V, V_{IN}=2.85V	40			mA
Lx Leakage Current	I_{LXLEAK}	V_{IN}=3.5V, V_{LX}=6.0V			0.5	uA
Oscillator Duty Cycle	MAXDTY	Measuring Lx Waveform		75		%
Efficiency	EFF			80		%
Input Voltage	V_{IN}				8	V

VIN = 1.8V, IOUT = 10mA, Ta = 25°C, unless otherwise provided.

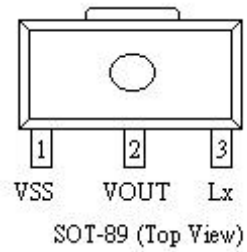
ML63501 VOUT=5.0V

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_{OUT}		4.925	5.000	5.075	V
Startup Voltage	V_{START}	I_{OUT}=1mA		0.8	0.9	V
Hold-on Voltage	V_{HOLD}	I_{OUT}=1mA	0.7			V
Oscillator Frequency	F_{OSC}		85	100	115	KHz
Input Current 1	I_{IN1}	At no load		8	12	uA
Input Current 2	I_{IN2}	V_{IN} = 3.5V		6		uA
Lx Switching Current	I_{LX}	V_{LX}=0.4V, V_{IN}=2.85V	40			mA
Lx Leakage Current	I_{LXLEAK}	V_{IN}=3.5V, V_{LX}=6.0V			0.5	uA
Oscillator Duty Cycle	MAXDTY	Measuring Lx Waveform		75		%
Efficiency	EFF			80		%
Input Voltage	V_{IN}				8	V

❖ *Pin Configuration*

SOT-89 :

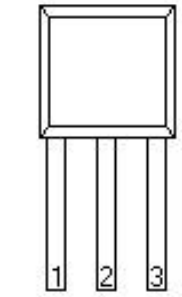
Pin Number	*Pin Name*	*Description*
1	*VSS*	*Ground*
2	*VOUT*	*Voltage Output/Internal power supply*
3	*Lx*	*Switch*



SOT-89 (Top View)

TO-92 :

Pin Number	*Pin Name*	*Description*
1	*VSS*	*Ground*
2	*VOUT*	*Voltage Output/Internal power supply*
3	*Lx*	*Switch*



TO92 (Front View)

❖ *Application Notes*

Note on Use

1. It is recommended to use capacitor with a capacity of 10uF or more for good frequency characteristics, otherwise it will lead to high output ripple. Tantalum type capacitor is recommended. As there may be the case where a spike-shaped high voltage is generated by the inductor when Lx transistor is turned off, the operating voltage of capacitor should be at least three times of the output set voltage so as to avoid over-voltage damage.

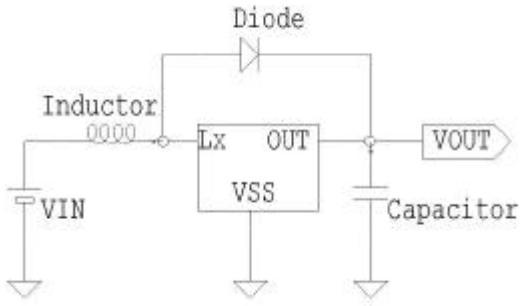
2. It is recommended to use inductor has sufficiently small d.c. resistance, large allowable current and hardly reaches magnetic saturation. When the inductance of inductor is small, there may be the case that the inductor current exceeds the absolute maximum ratings at the maximum load condition.

3. It is recommended to place external components as close as possible to the DC/CD converter so as to minimize the interconnection parasitic between components and DC/DC converter, especially for the capacitor connected to VOUT pin. It is recommended to place 0.1uF ceramic capacitor between VOUT pin and VSS pin.

4. It is recommended to provide sufficient grounding for VSS pin. This will help to stable the zero level within DC/DC converter induced by the switching current level variation during operation. And the insufficient grounding may result in unstable operation of DC/DC converter.

Typical Application Circuit

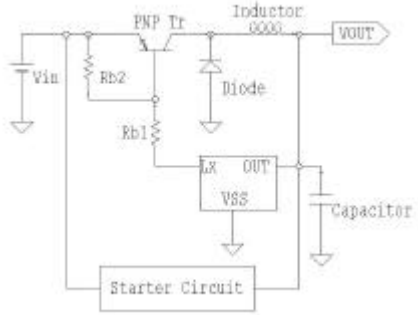
1. Step-up Circuit



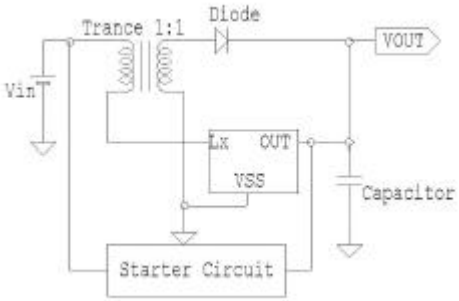
Typical Value:

Inductor: 270uH
Capacitor: Aluminium type, 4.7uF.
Diode: Schottky Diode with forward voltage drop of 0.2V or less

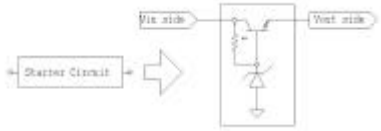
2. Step-down Circuit



3. Step-up/Step-down Circuit

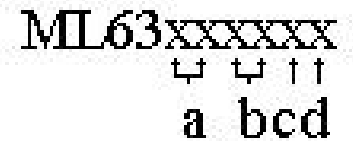


Note : The starter circuit is necessary for above circuits.



❖ *Ordering Information*

Designator	Description
a	**Output Voltage** eg. 27=2.7V 30=3.0V 50=5.0V
b	**Oscillator Frequency** 1 = 180KHz 1A = 100KHz
c	**Package Type** P = SOT-89 T = TO-92
d	**Device Orientation** R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92)



❖ *History of Revision*

REV	DESCRIPTION	DATE
	First Official Specification	23/10/02

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