Ver 02

MExx1C Series DC-DC Converter

MExx1C Series is a VFM Step-up DC/DC converter IC with ultra-low supply current by CMOS process. High frequency noise that occurs during switching is reduced by using advanced circuit designed, output voltage is programmable in 0.1V steps between 2.0~7.0V. A low ripple, high efficiency step-up DC/DC converter for MExx1C can be constructed of with only three external components. Also available is a CE(chip enable) function that reduce power dissipation During shut-down mode., and an independent Vdd pin function (separated power supply and voltage detect pins) for fly-back circuits. MExx1Cx is suitable for use with battery-powered instruments with low noise and ultra low supply current; Ext function can use for large output circuit.

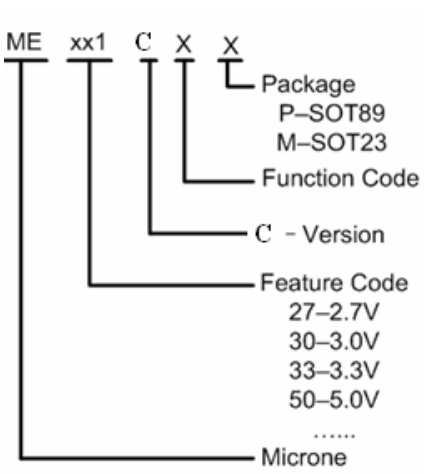
Features

- Ultra low ripple and noise；
- Low input current：6μA(Type)；
- Operating voltage range：0.9V~6.5V；
- Output voltage range：2.0V~7.0V(step 0.1V)；
- Output voltage accuracy：±2.5%；
- Output Current：if Vin=3.0V and Vout=3.3V，then Iout=250mA；
- Low start voltage：≤0.9V(at Iout=1mA)；
- Maximum oscillator frequency： 100KHz(Typ.)；
- High Efficiency：85%(Type)；
- PACKAGE：SOT23，SOT89。

Applications

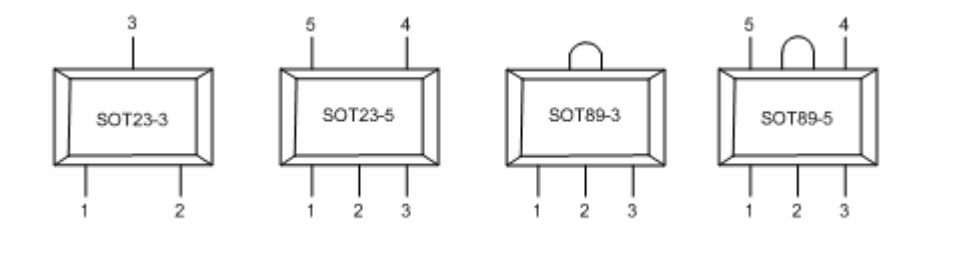
- Power source for battery-powered equipment；
- Power source for wireless mouse, wireless keyboard, toys, cameras, camcorders, VCRs, PDAs, and hand-held communication equipment ；
- Power source for appliances which require higher cell voltage than that of batteries used in the appliances。

Selection Guide



TYPE	POSTFIX	PACKAGE	SWITCHING TRANSISTOR	CE FUNCTION	FEATURES
MExx1C	M	SOT23-3	Build-in Transistor	No	Lx
	P	SOT89-3			
MExx1C1	M	SOT23-3	External Transistor	No	Ext
	P	SOT89-3			
MExx1C2	M	SOT23-5	Build-in Transistor	Yes	Lx+CE
	P	SOT89-5			
MExx1C3	M	SOT23-5	External Transistor	Yes	Ext+CE
	P	SOT89-5			

Pin Configuration



Pin Assignment

MExx1C

PIN Number		PIN NAME	FUNCTION
SOT23-3	SOT89-3		
1	1	Vss	Ground
3	2	Vout	Output voltage monitor, IC internal power supply
2	3	Lx	Switch

MExx1C1

PIN Number		PIN NAME	FUNCTION
SOT23-3	SOT89-3		
1	1	Vss	Ground
3	2	Vout	Output voltage monitor, IC internal power supply
2	3	Ext	External switch transistor drive

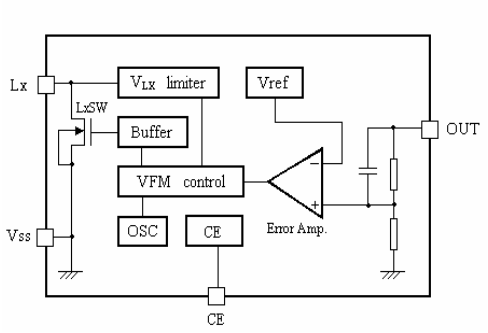
MExx1C2

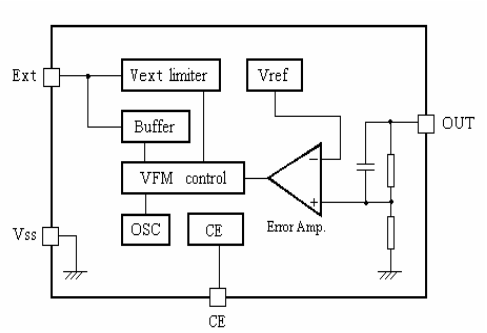
PIN Number		PIN NAME	FUNCTION
SOT23-5	SOT89-5		
4	5	Vss	Ground
2	2	Vout	Output voltage monitor, IC internal power supply
5	4	Lx	Switch
1	3	CE	Chip enable
3	1	NC	NC

MExx1C3

PIN Number		PIN NAME	FUNCTION
SOT23-5	SOT89-5		
4	5	Vss	Ground
2	2	Vout	Output voltage monitor, IC internal power supply
5	4	Ext	External switch transistor drive
1	3	CE	Chip enable
3	1	NC	NC

Block Diagram





Absolute Maximum Ratings

PARAMETER		SYMBAL	RATINGS	UNITS
V_{IN} Input Voltage		V_{IN}	6.5	V
Lx Pin voltage		V_{LX}	6.5	V
EXT Pin voltage		V_{EXT}	-0.3~Vout+0.3	V
CE Pin voltage		V_{CE}	-0.3~Vout+0.3	V
Lx Pin current		I_{LX}	600	mA
EXT Pin current		I_{EXT}	±30	mA
Vdd input voltage		V_{dd}	6.5	V
Continuous Total Power Dissipation	SOT23	Pd	300	mW
	SOT89	Pd	500	mW
Operating Ambient Temperature		T_{Opr}	-25~+85	℃
Storage Temperature		T_{stg}	-40~+125	℃
Soldering temperature and time		T_{solder}	260℃, 10s	

Electrical Characteristics

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OUT}	Output Voltage		Vout* 0.975	Vout	Vout* 1.025	V
V_{IN}	Maximum Input Voltage				6.5	V
Iin	No-load Input Current	Iout=0mA		4.6	9.3	uA
V_{start}	Oscillation Start-up Voltage	I_{OUT}=1mA， V_{IN}：0→2V		0.8	0.9	V
V_{hold}	Oscillation Hold Voltage	I_{OUT}=1mA， V_{IN}：2→0V	0.7			V
I_{DD1}	Supply Current 1	No external component Vout=Vout*0.95,		8	12	μA
I_{DD2}	Supply Current 2	Vout=Vout+0.5V		6		μA
I_{LX}	Lx Switching Current	V_{LX}=0.4V, Vout=Vout*0.95		100	160	mA
I_{Lxleak}	Lx Leakage Current	Vout=V_{LX}=6V			0.5	μA
R_{EXTH}	EXT"High" On Resistance	Same as I_{DD1}. VEXT=Vout-0.4V,		140	210	Ω
R_{EXTL}	EXT"Low" On Resistance	Same as I_{DD1}.. VEXT=0.4V,		140	210	Ω
V_{CEH}	CE"High" Voltage	Vout=Vce=set Vout*0.95	0.9			V
V_{CEL}	CE"Low" Voltage	Vout=Vce=set Vout*0.95			0.3	V
I_{CEH}	CE"High" Current	Vout=6.0V, Vce=6.0V	-0.5	0	0.5	uA
I_{CEL}	CE"low" Current	Vout=6.0V, Vce=0.0V	-0.5	0	0.5	uA
F_{osc}	Oscillation Frequency			100	150	kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side		75		%
EFFI	Efficiency			85		%

Measuring conditions：Unless otherwise specified , V_{IN}=Vout*0.6，V_{SS}=0V，I_{OUT}=10mA，T_{opt}=25℃。

Note：1、Diode use Schottky diode such as IN5817 or IN5819 (forward voltage drop:0.2V)

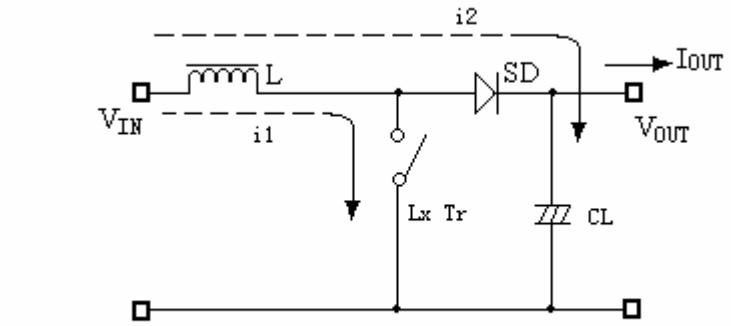
2、Inductor：47μH（r<0.5Ω）

3、Capacitor：Tantalum type 47μF

Operation

MExx1C 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.

Switching DC/DC Step-up Converter operating process



Selection of Peripheral Components and Application Notes

Peripheral components should be selected carefully because they are greatly affect the performances of MExx1C：

• 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.

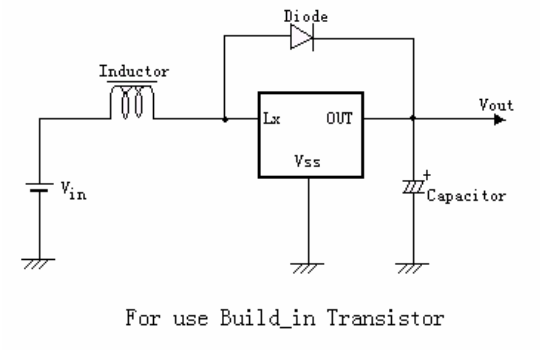
• Use a diode of a Schottky type with high switching speed.

Notes：

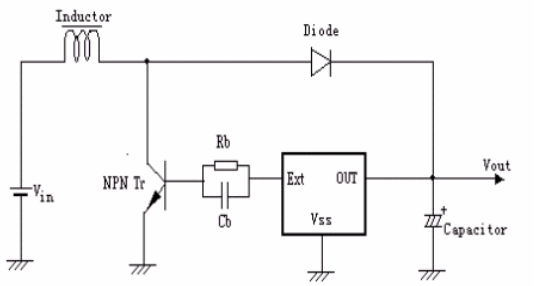
• Set external components as close as possible to the IC and minimize the connection between the components and the IC. In particular, when an external component is connected to V_{OUT} Pin, make minimum connection with the capacitor. A 0.1μF ceramic capacitor is suggested to be parallelly connected to V_{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.

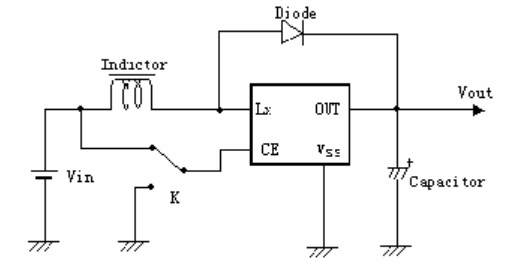
Typical Applications



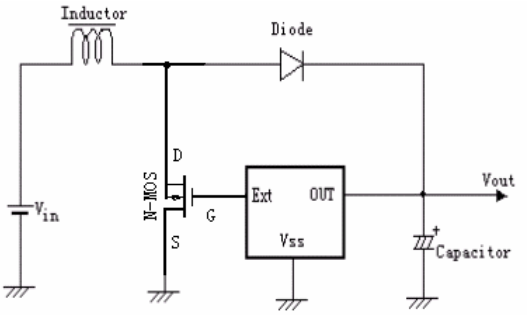
For use Build_in Transistor



For use External Transistor



For use Chip Enable(CE)



For use external transistor(N_MOS)

Components： Inductor：47uH(Sumida) Diode：IN5817、IN5819

Capacitor：47uF/16V(Tantalume type) Transistor：2SD1628G、2SD3279

NMOS：AAT9460、XP151、XP161 Base Resistor(Rb)：1KΩ

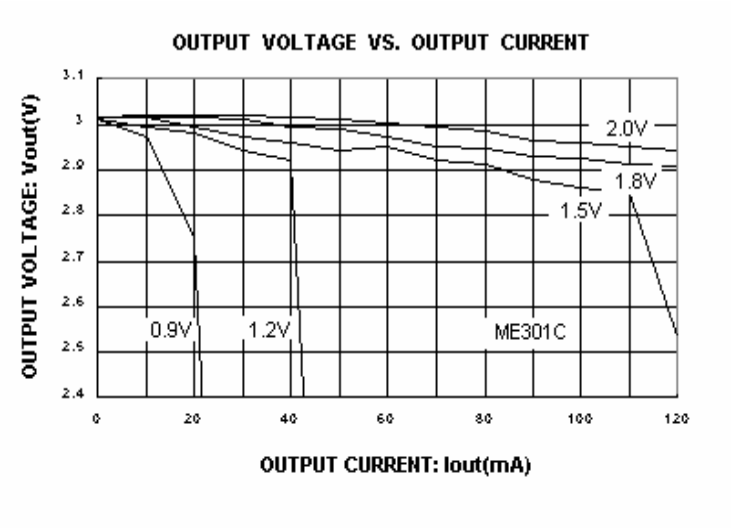
Base Capacitor(Cb)：2200pF

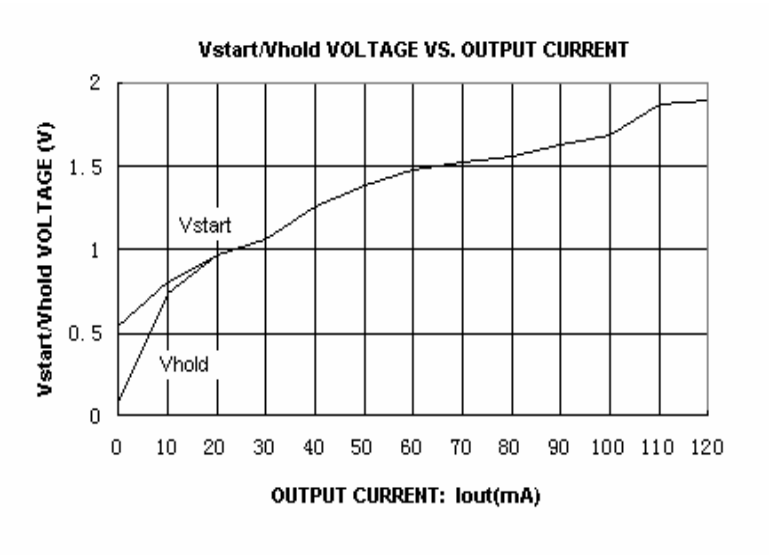
R_{FB} :Set up so that R_{FB1}/R_{FB2}=Vout-1(Vout=set-up output voltage),

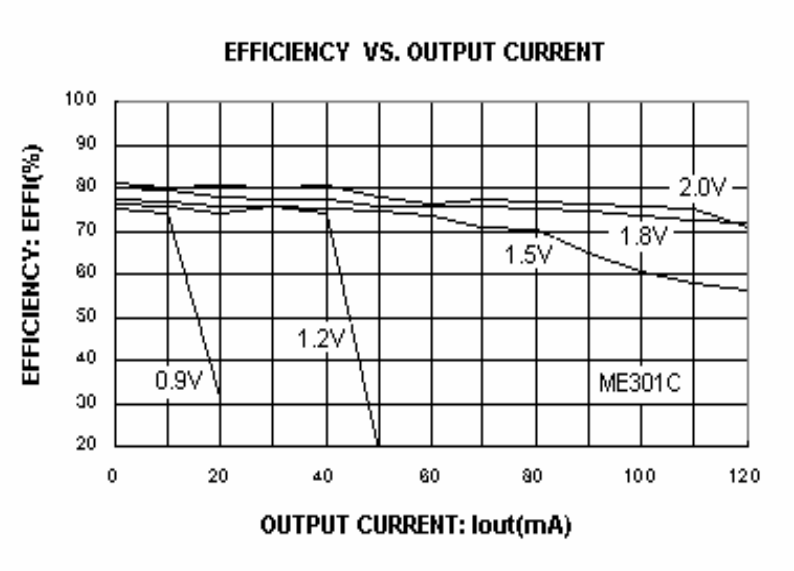
Please use with $R_{FB1}+R_{FB2} \leqslant 2M\Omega$;

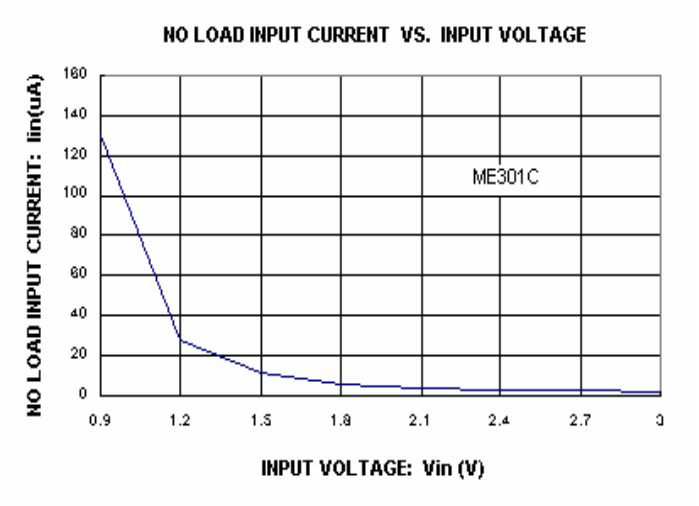
C_{FB}:Set up that $Fzfb=1/(2\times\pi\times C_{FB}\times R_{FB1})$ is within the Adjustments necessary in respect of L,C_L.

Type Characteristics:

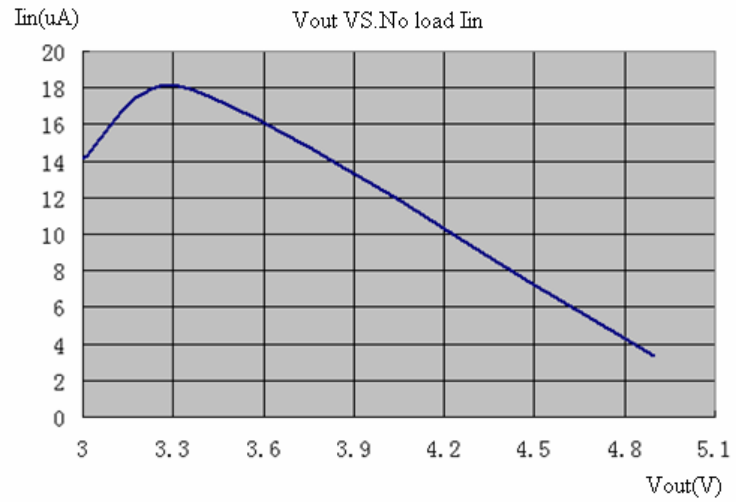




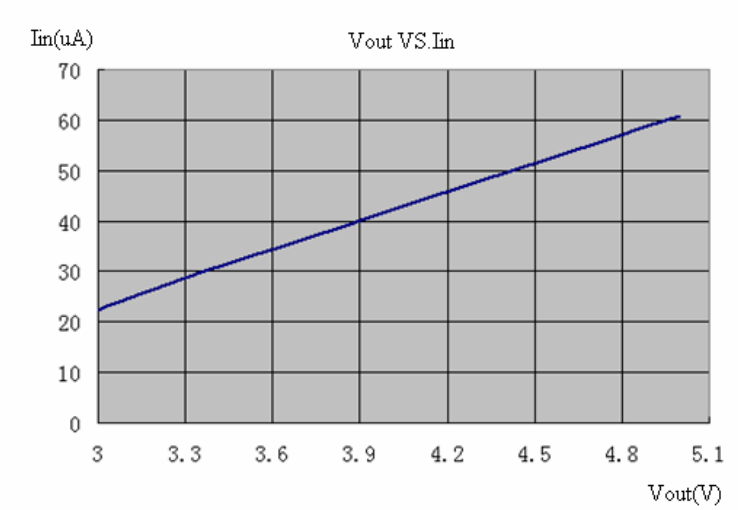




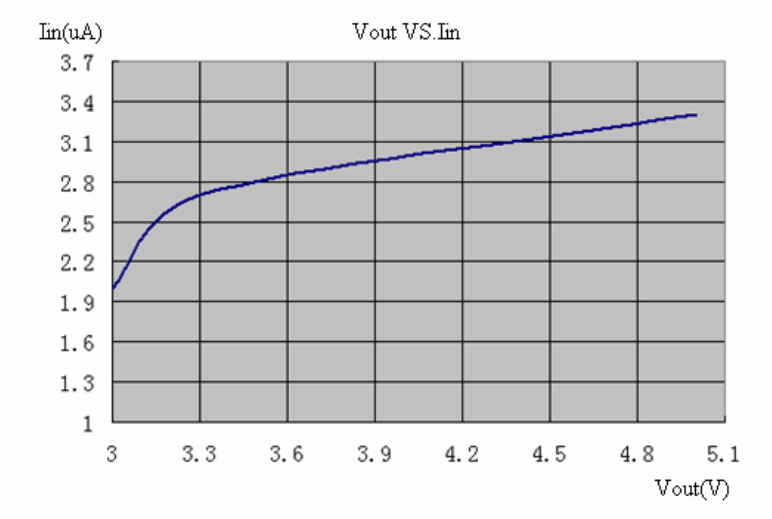
L＝47uH，Cout＝47uF，SD：1N5717/5819，$V_{IN}=V_{OUT}*0.6$

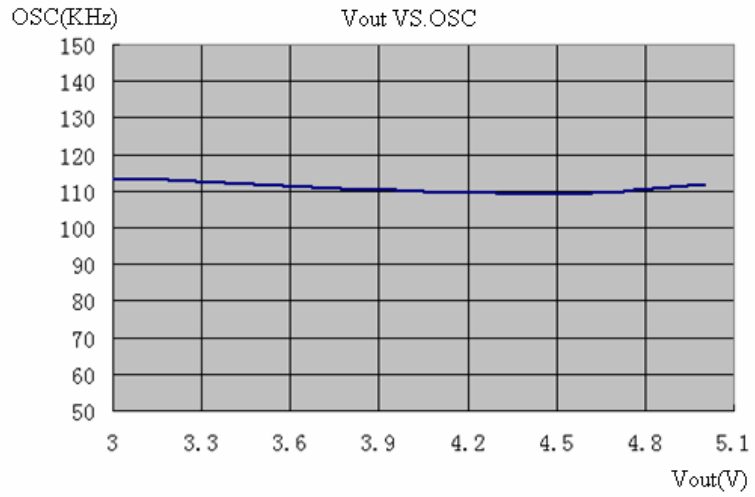


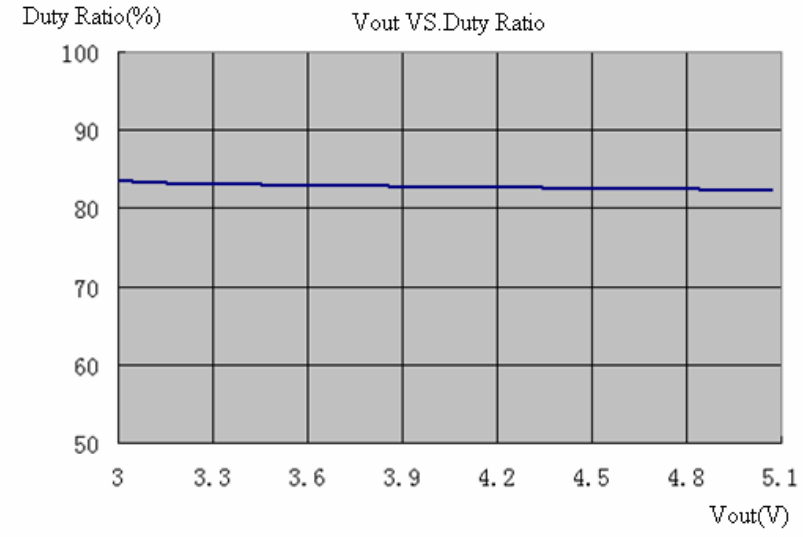
$V_{DD}=V_{OUT}*0.95$



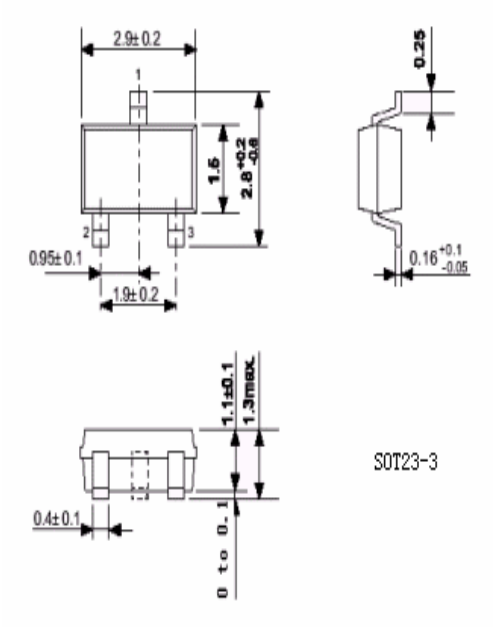
$V_{DD}=V_{OUT}+0.5$

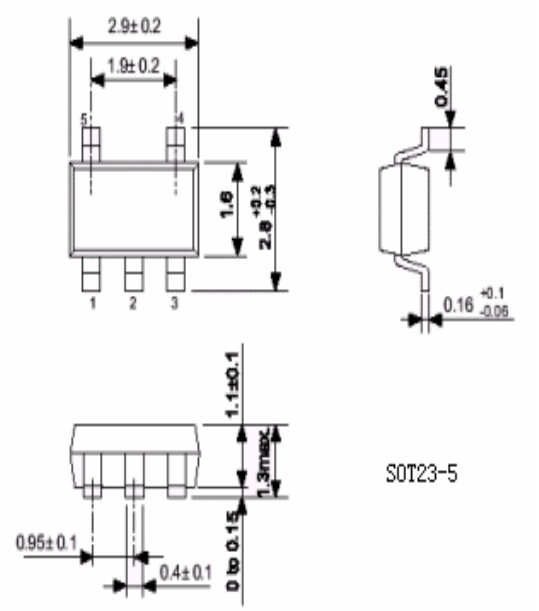

Iin(uA)
Vout VS.Iin
3.7
3.4
3.1
2.8
2.5
2.2
1.9
1.6
1.3
1
3
3.3
3.6
3.9
4.2
4.5
4.8
5.1
Vout(V)

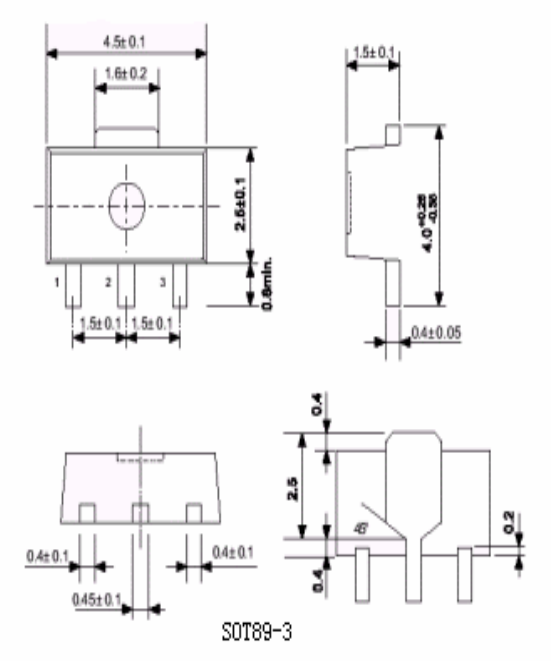

OSC(KHz)
Vout VS.OSC
150
140
130
120
110
100
90
80
70
60
50
3
3.3
3.6
3.9
4.2
4.5
4.8
5.1
Vout(V)

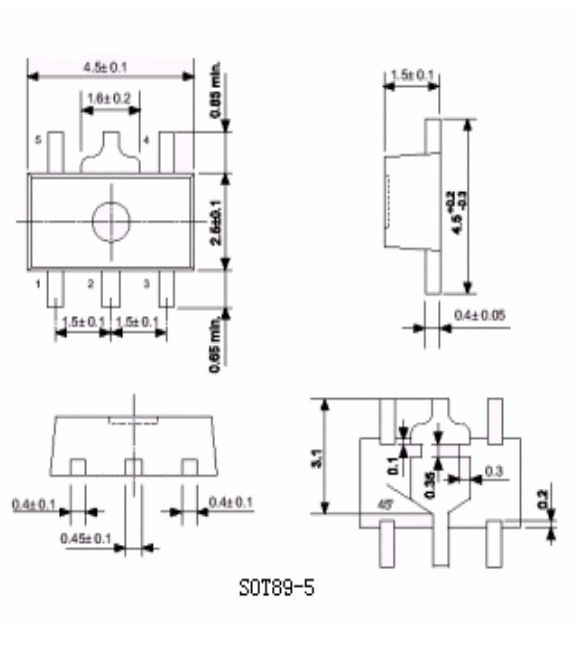

Duty Ratio(%)
Vout VS.Duty Ratio
100
90
80
70
60
50
3
3.3
3.6
3.9
4.2
4.5
4.8
5.1
Vout(V)

Package Diomensions









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