# DC/DC Step up Converter ME2108 Series

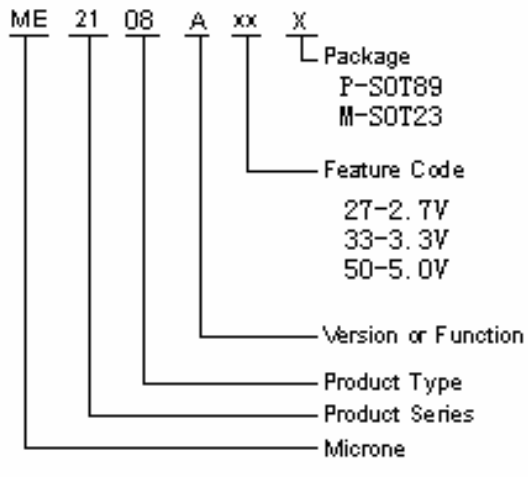
## General Description：

**ME2108 Series** is a PFM Step-up DC/DC converter IC with 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 and maximum frequency is 180KHz(Typ.). A low ripple, high efficiency step-up DC/DC converter can be constructed of ME2108Xxx with only three external components. Also available is a CE(chip enable) function that reduce power dissipation During shut-down mode. ME2108Xxx is suitable for use with battery-powered instruments with low noise and low supply current.

## Features：

- Low ripple and low noise
- 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=5.0V，then Iout=400mA
- Low start voltage：≤0.9V(at Iout=1mA)；
- Maximum oscillator frequency：180KHz(Typ.)
- High Efficiency：85%(Type)
- PACKAGE：SOT23，SOT89

## Selection Guide：

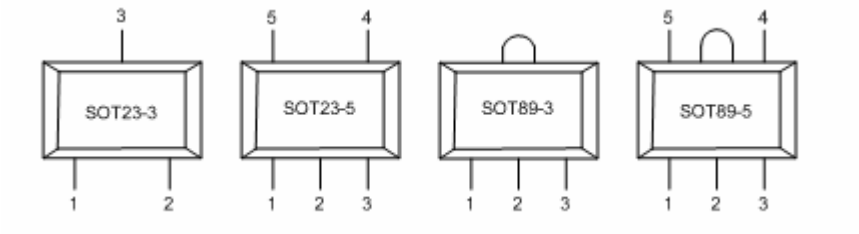



## Applications：

- 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

| TYPE | POSTFIX | PACKAGE | SWITCHING TRANSISTOR | CE FUNCTION | FEATURES |
|---|---|---|---|---|---|
| ME2108Axx | M3 | SOT23-3 | Build in Transistor | No | Lx |
| | P | SOT89-3 | | | |
| ME2108Bxx | M3 | SOT23-3 | External Transistor | No | Ext |
| | P | SOT89-3 | | | |
| ME2108Cxx | M5 | SOT23-5 | Build in Transistor | Yes | Lx CE |
| | P | SOT89-5 | | | |
| ME2108Dxx | M5 | SOT23-5 | External Transistor | Yes | Ext CE |
| | P | SOT89-5 | | | |
| ME2108Dxx | M5 | SOT23-5 | External Transistor | Yes | Ext |

## Pin Configuration：




## Pin Assignment：

**ME2108Axx**

| 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 |

**ME2108Bxx**

| 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 |

**ME2108Cxx**

| 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 |

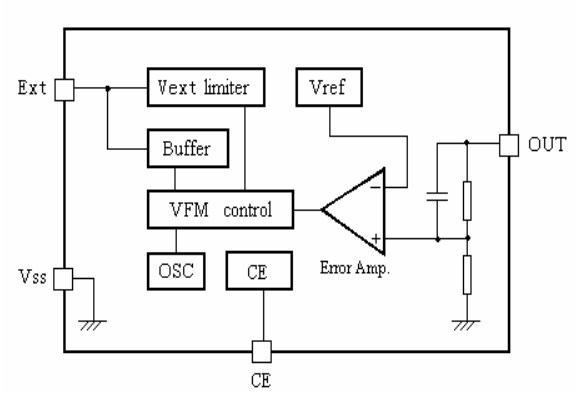
**ME2108Dxx**

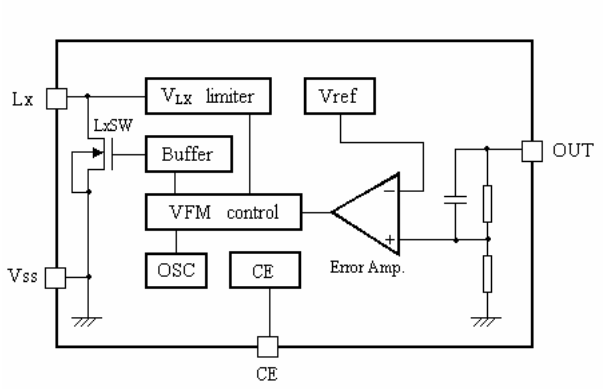
| PIN Number | | PIN NAME | FUNCTION |
|---|---|---|---|
| SOT23-5 | SOT89-5 | | |
| 4 | 5 | Vss | Ground |
| 2 | 2 | Vout | Output voltage monitor, IC internal power supply |
| 5 | 4 | Ext | External switch transistor drive |
| 1 | 3 | CE | Chip enable |
| 3 | 1 | NC | NC |

**ME2108Fxx**

| PIN Number | PIN NAME | FUNCTION |
|---|---|---|
| SOT23-5 | | |
| 1 | FB | Feed Back |
| 2 | Vdd | Output voltage monitor, IC internal power supply |
| 3 | NC | NC |
| 4 | Vss | Ground |
| 5 | EXT | External switch transistor drive |

## 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：

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

**ME2108Axx/Cxx** Fosc=180kHz

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | | Vout*0.975 | Vout | Vout*1.025 | V |
| $V_{start}$ | 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 | | 0.45 | | V |
| $I_{DD1}$ | Supply Current 1 | No external component Vout=Vout*0.95, | | 50 | | μA |
| $I_{DD2}$ | Supply Current 2 | Vout=Vout+0.5V | | 9 | | μA |
| $I_{LX}$ | Lx Switching Current | $V_{LX}$=0.4V, Vout=Vout*0.95 | | 360 | | mA |
| $I_{LXleak}$ | Lx Leakage Current | Vout=$V_{LX}$=6V | | | 0.5 | μA |
| $F_{osc}$ | Oscillation Frequency | Vout=set Vout*0.95 | | 180 | | kHz |
| Maxdty | Duty Ratio | on($V_{LX}$"L")side | | 84 | | % |
| EFFI | Efficiency | | | 85 | | % |

**ME2108Bxx/Dxx** Fosc=180kHz

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | | Vout*0.975 | Vout | Vout*1.025 | V |
| $V_{start}$ | 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 | | 0.45 | | V |
| $I_{DD1}$ | Supply Current 1 | No external component Vout=Vout*0.95, | | 80 | | μA |
| $I_{DD2}$ | Supply Current 2 | Vout=Vout+0.5V | | 12 | | μA |
| $I_{LX}$ | Lx Switching Current | $V_{LX}$=0.4V, Vout=Vout*0.95 | | 360 | | mA |
| $I_{LXleak}$ | Lx Leakage Current | Vout=$V_{LX}$=6V | | | 0.5 | μA |
| $F_{osc}$ | Oscillation Frequency | Vout=set Vout*0.95 | | 180 | | kHz |
| Maxdty | Duty Ratio | on($V_{LX}$"L")side | | 84 | | % |
| EFFI | Efficiency | | | 85 | | % |

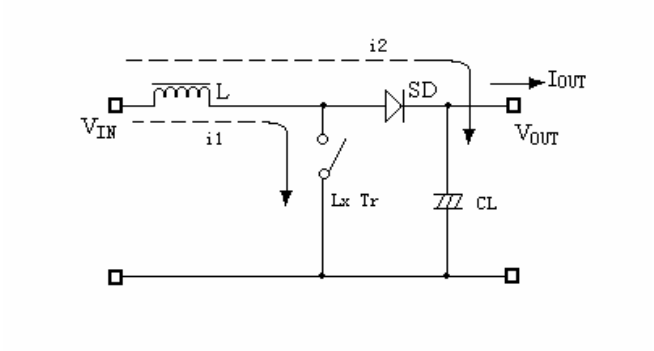
**ME2108F** VFB=3.3V , Fosc=180kHz

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $V_{FB}$ | Output Feedback Voltage | | 3.22 | 3.3 | 3.38 | V |
| $V_{start}$ | 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 | | 0.45 | | V |
| $I_{DD1}$ | Supply Current 1 | No external component Vout=Vout*0.95, | | 80 | | μA |
| $I_{DD2}$ | Supply Current 2 | Vout=Vout+0.5V | | 10 | | μA |
| $I_{LX}$ | Lx Switching Current | $V_{LX}$=0.4V, Vout=Vout*0.95 | | 360 | | mA |
| $I_{LXleak}$ | Lx Leakage Current | Vout=$V_{LX}$=6V | | | 0.5 | μA |
| $F_{osc}$ | Oscillation Frequency | Vout=set Vout*0.95 | | 180 | | kHz |
| Maxdty | Duty Ratio | on($V_{LX}$"L")side | | 84 | | % |
| EFFI | Efficiency | | | 85 | | % |

Note: 1、Diode use Schottky diode such as IN5817 or IN5819 (forward voltage drop:0.2V)
2、Inductor: 33μH (r<0.5Ω)
3、Capacitor: Tantalum type 100μF

## Operation:

ME2108 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

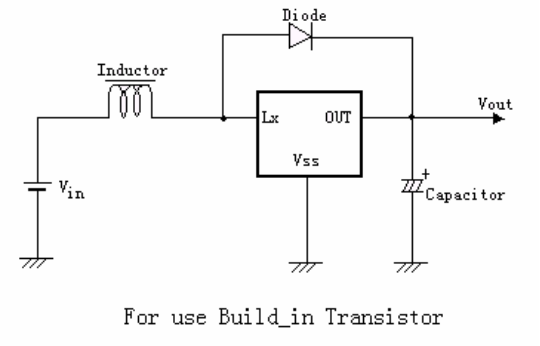
Peripheral components should be selected carefully because they are greatly affect the performances of ME2108：

- 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 $I_{LX}$ exceeds the absolute maximum ratings at the maximum load.
- Use a diode of a Schottky type with high switching speed.

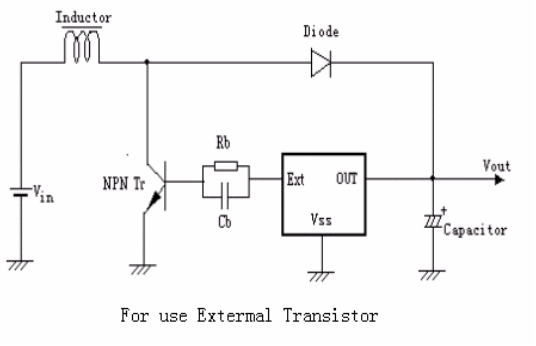
**PCBLAYOUT：**

- 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.
- 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.

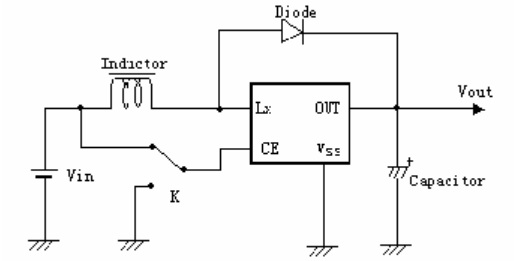
## Typical Applications：



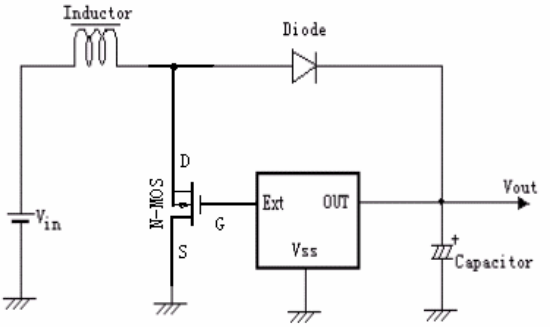

For use Build_in Transistor




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(Tantalum type) Transistor：2SD1628G、2SD3279

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

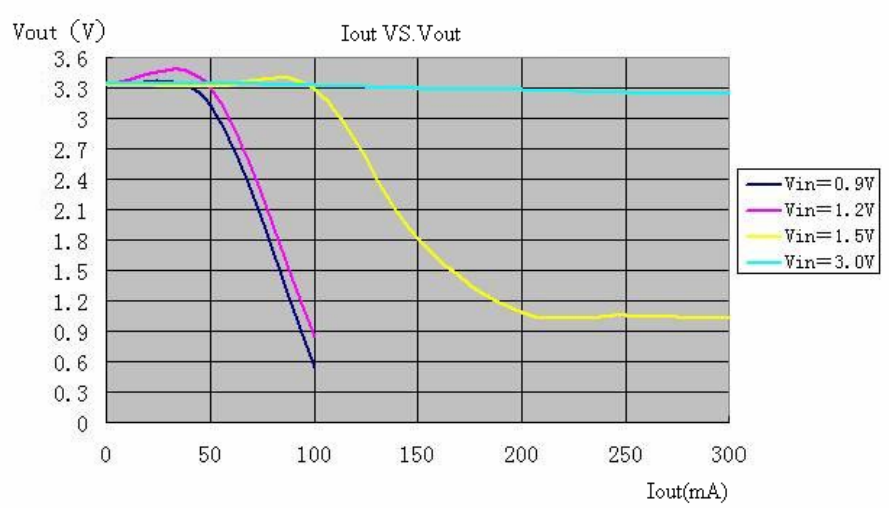
Base Capacitor(Cb)：2200pF

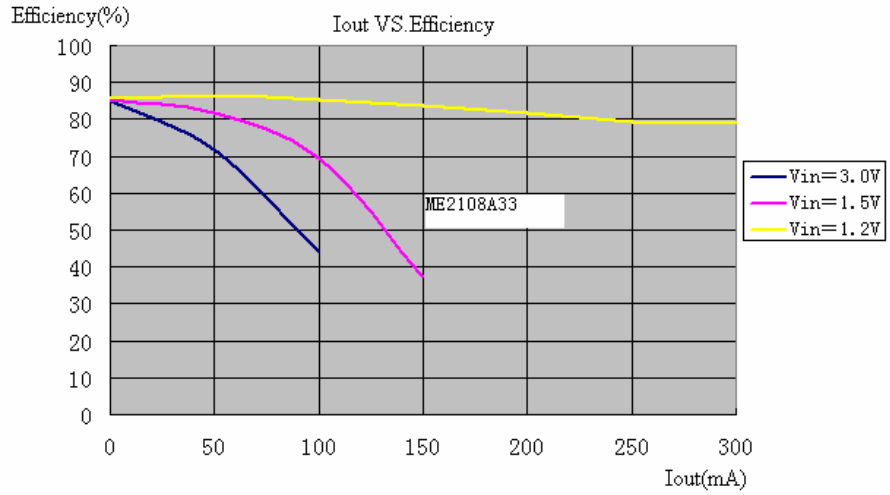
$R_{FB}$ :Set up so that $R_{FB1}$ /$R_{FB2}$=Vout / $V_{FB}$-1(Vout=set-up output voltage),

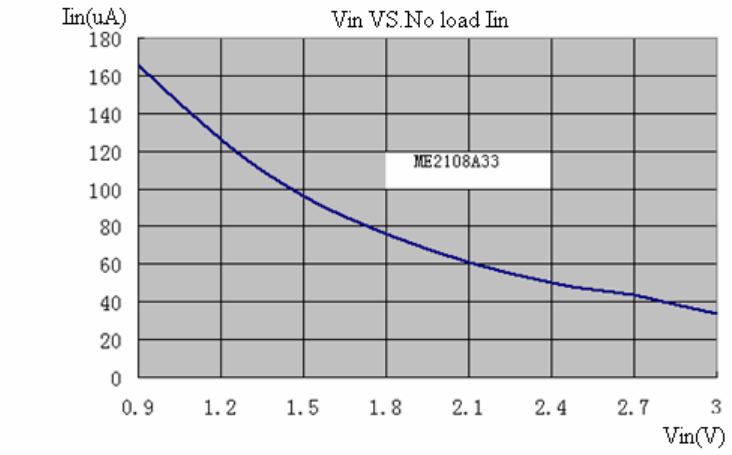
Please use with $R_{FB1}+R_{FB2}\leq 2M\Omega$;

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

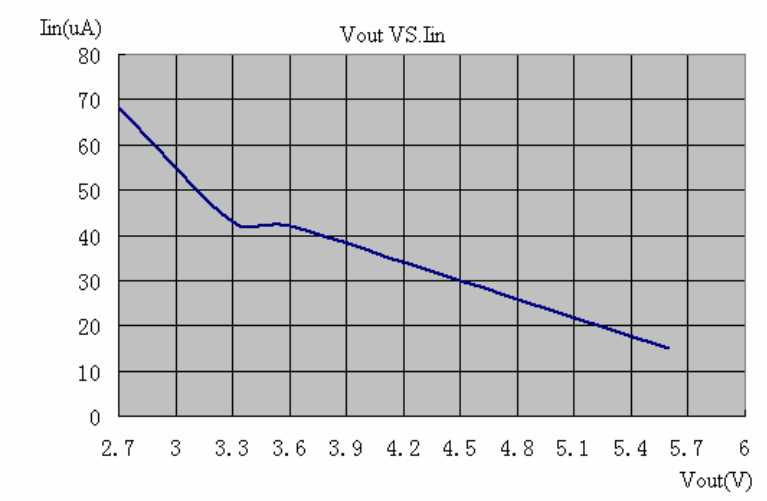
## Type Characteristics



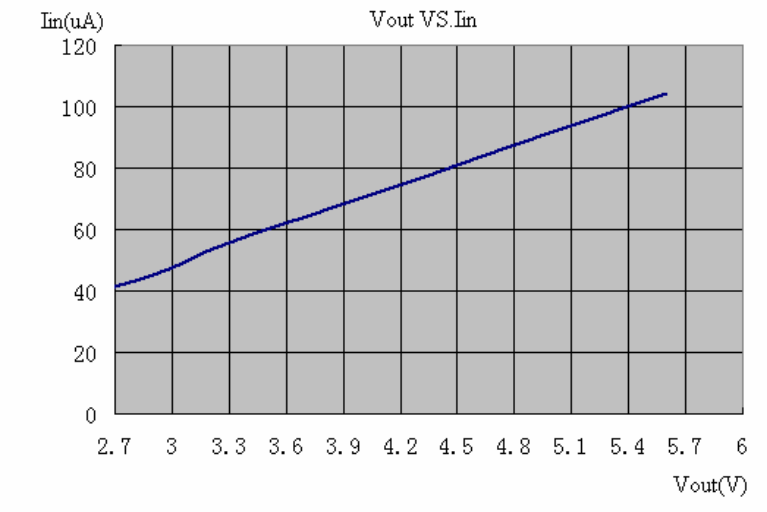



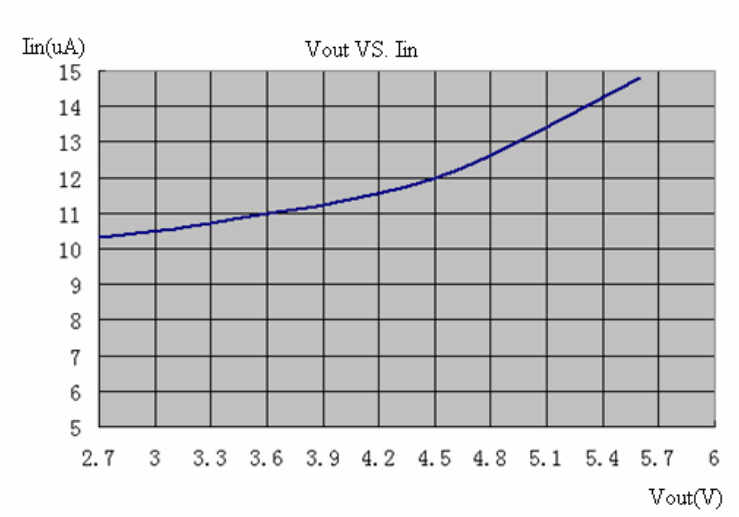
**L＝47uH，Cout＝47uF，Vout=100uF，SD：1N5717/5819**

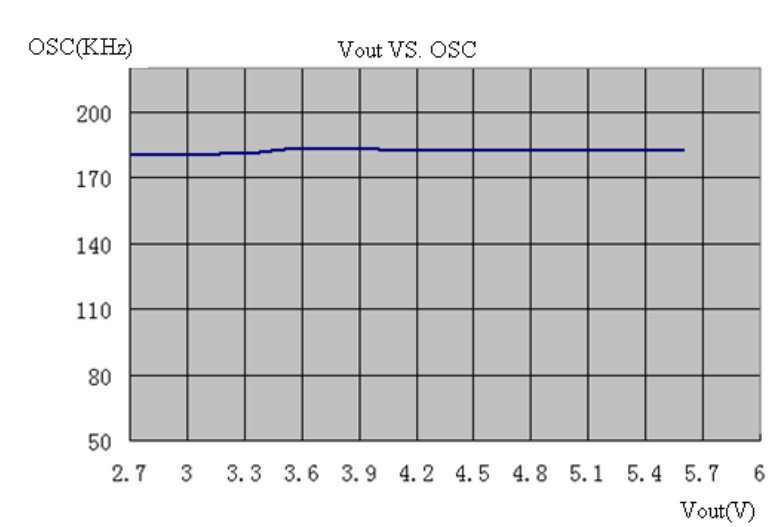


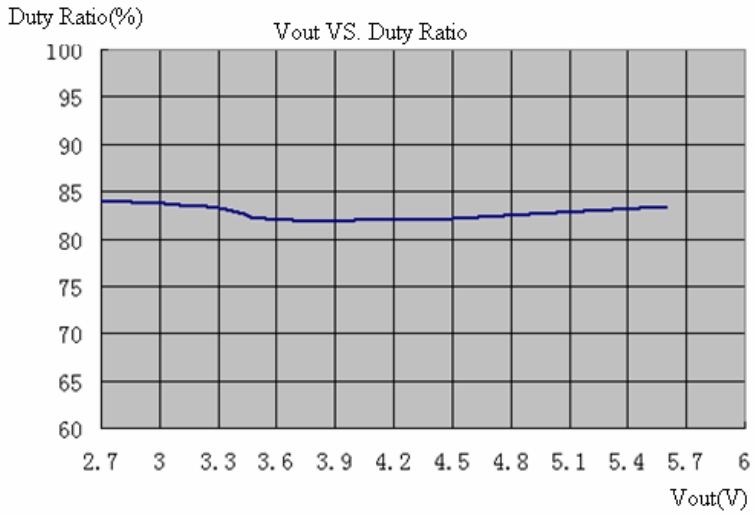

**$V_{DD}$=$V_{OUT}$*0.95**



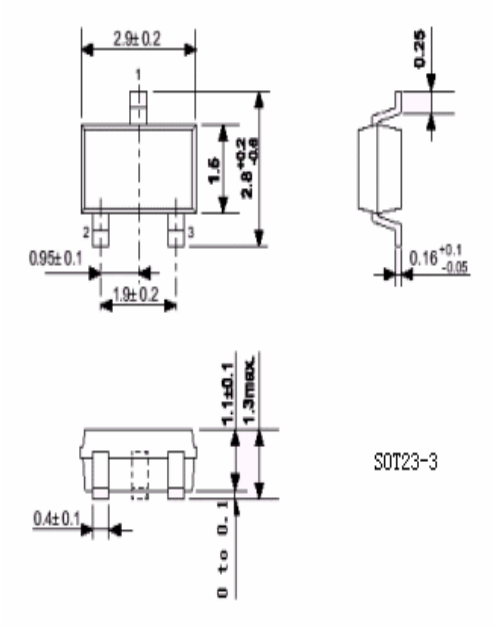
$V_{DD}=V_{OUT}+0.5$

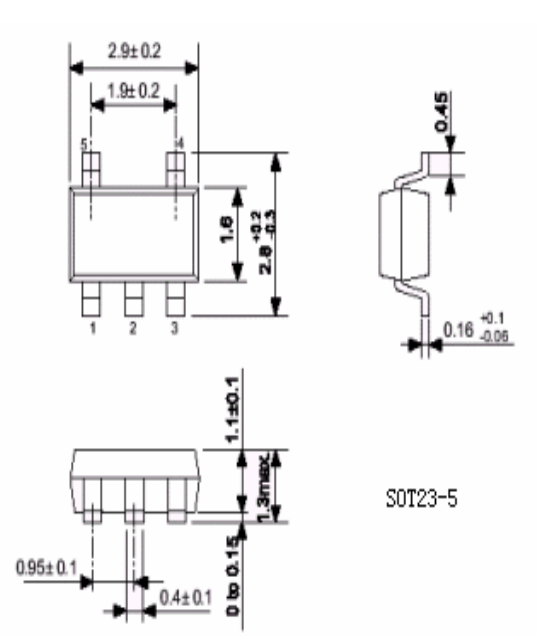

Iin(uA)
Vout VS. Iin
15
14
13
12
11
10
9
8
7
6
5
2.7 3 3.3 3.6 3.9 4.2 4.5 4.8 5.1 5.4 5.7 6
Vout(V)

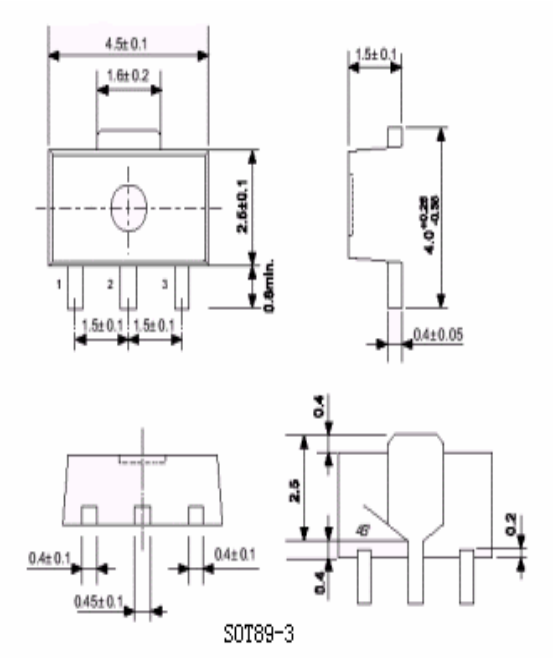

OSC(KHz)
Vout VS. OSC
200
170
140
110
80
50
2.7 3 3.3 3.6 3.9 4.2 4.5 4.8 5.1 5.4 5.7 6
Vout(V)

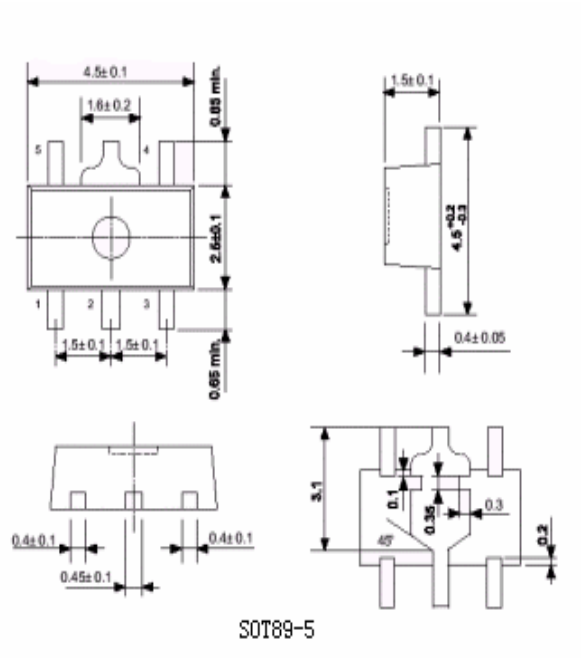

Duty Ratio(%)
Vout VS. Duty Ratio
100
95
90
85
80
75
70
65
60
2.7 3 3.3 3.6 3.9 4.2 4.5 4.8 5.1 5.4 5.7 6
Vout(V)

## Package Dimensions：



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