

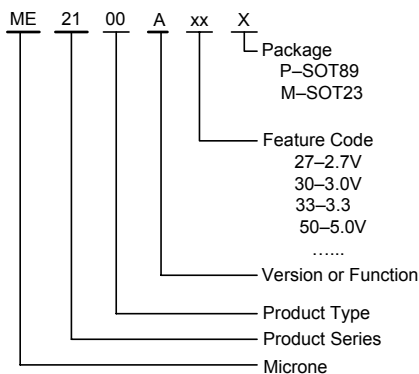
ME2100 Series Step-up DC-DC Converter

ME2100 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 100KHz(Typ.). A low ripple, high efficiency step-up DC/DC converter can be constructed of ME2100Xxx with only three external components. Also available is a CE(chip enable) function that reduce power dissipation During shut-down mode. ME2100Xxx is suitable for use with battery-powered instruments with low noise and low supply current.

Features

- Low input current: 6 μ A(Type);
- 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: $\pm 2.5\%$;
- Output Current: if $V_{in}=3.0V$ and $V_{out}=3.3V$, then $I_{out}=300mA$;
- Low start voltage: $\leq 0.9V$ (at $I_{out}=1mA$);
- Maximum oscillator frequency: 100KHz(Typ.);
- High Efficiency: 85%(Type);
- PACKAGE: SOT23, SOT89.

Selection Guide

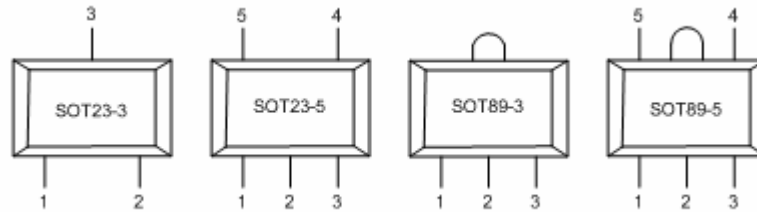


Applications

- 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
ME2100Axx	M3	SOT23-3	Build_in Transistor	No	Lx
	P	SOT89-3			
ME2100Bxx	M3	SOT23-3	External Transistor	No	Ext
	P	SOT89-3			
ME2100Cxx	M5	SOT23-5	Build_in Transistor	Yes	Lx+CE
	P	SOT89-5			
ME2100Dxx	M5	SOT23-5	External Transistor	Yes	Ext+CE
	P	SOT89-5			
ME2100F	M5	SOT23-5	External Transistor	No	FB

Pin Configuration



Pin Assignment

ME2100Axx

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

ME2100Bxx

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

ME2100Cxx

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

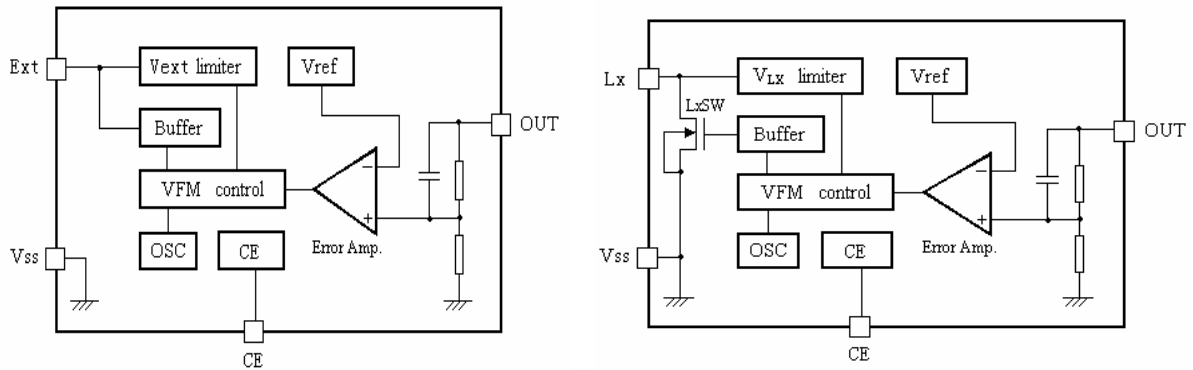
ME2100Dxx

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

ME2100F

PIN Number		PIN NAME	FUNCTION
SOT23-5			
1		FB	Feedback
2		Vdd	internal power supply
3		NC	NC
4		Vss	Ground
5		EXT	External switch transistor drive

Block Diagram



Absolute Maximum Ratings

PARAMETER	SYMBOL	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~V _{out} +0.3	V	
CE Pin voltage	V _{CE}	-0.3~V _{out} +0.3	V	
Lx Pin current	I _{LX}	600	mA	
EXT Pin current	I _{EXT}	±30	mA	
V _{dd} input voltage	V _{dd}	6.5	V	
Continuous Total Power Dissipation	SOT23	P _d	300	mW
	SOT89	P _d	500	mW
Operating Ambient Temperature	T _{Opr}	-25~+85	°C	
Storage Temperature	T _{stg}	-40~+125	°C	
Soldering temperature and time	T _{solder}	260°C, 10s		

Electrical Characteristics

Measuring conditions: Unless otherwise specified, $V_{IN}=V_{out} \times 0.6$, $V_{SS}=0V$, $I_{OUT}=10mA$, $T_{opt}=25^{\circ}C$.

ME2100A33/C33 $V_{out}=3.3V, F_{osc}=100kHz$

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OUT}	Output Voltage		3.218	3.300	3.382	V
V_{IN}	Maximum Input Voltage				6.5	V
V_{start}	Oscillation Start-up Voltage	$I_{OUT}=1mA$, $V_{IN}: 0 \rightarrow 2V$		0.8	0.9	V
V_{hold}	Oscillation Hold Voltage	$I_{OUT}=1mA$, $V_{IN}: 2 \rightarrow 0V$		0.27		V
I_{DD1}	Supply Current 1	No external component $V_{out}=V_{out} \times 0.95$,		35		μA
I_{DD2}	Supply Current 2	$V_{out}=V_{out}+0.5V$		5		μA
I_{LX}	Lx Switching Current	$V_{LX}=0.4V$, $V_{out}=V_{out} \times 0.95$		180		mA
I_{LXleak}	Lx Leakage Current	$V_{out}=V_{LX}=6V$			0.5	μA
F_{osc}	Oscillation Frequency	$V_{out}=\text{set } V_{out} \times 0.95$		100		kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side		78		%
EFFI	Efficiency			85		%

ME2100A50/C50 $V_{out}=5.0V, F_{osc}=100kHz$

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OUT}	Output Voltage		4.875	5.000	5.125	V
V_{IN}	Maximum Input Voltage				6.5	V
V_{start}	Oscillation Start-up Voltage	$I_{OUT}=1mA$, $V_{IN}: 0 \rightarrow 2V$		0.8	0.9	V
V_{hold}	Oscillation Hold Voltage	$I_{OUT}=1mA$, $V_{IN}: 2 \rightarrow 0V$		0.32		V
I_{DD1}	Supply Current 1	No external component $V_{out}=V_{out} \times 0.95$,		60		μA
I_{DD2}	Supply Current 2	$V_{out}=V_{out}+0.5V$		6		μA
I_{LX}	Lx Switching Current	$V_{LX}=0.4V$, $V_{out}=V_{out} \times 0.95$		210		mA
I_{LXleak}	Lx Leakage Current	$V_{out}=V_{LX}=6V$			0.5	μA
F_{osc}	Oscillation Frequency	$V_{out}=\text{set } V_{out} \times 0.95$		100		kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side		78		%
EFFI	Efficiency			85		%

ME2100B33/D33 Vout=3.3V,Fosc=100kHz

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{OUT}	Output Voltage		3.218	3.300	3.382	V
V _{IN}	Maximum Input Voltage				6.5	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		0.27		V
I _{DD1}	Supply Current 1	No external component Vout=Vout*0.95,		28		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		280		mA
I _{LXleak}	Lx Leakage Current	Vout=V _{LX} =6V			0.5	μA
F _{osc}	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V _{LX} "L")side		78		%
EFFI	Efficiency			85		%

ME2100B50/D50 Vout=5.0V,Fosc=100kHz

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{OUT}	Output Voltage		4.875	5.000	5.125	V
V _{IN}	Maximum Input Voltage				6.5	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		0.32		V
I _{DD1}	Supply Current 1	No external component Vout=Vout*0.95,		50		μA
I _{DD2}	Supply Current 2	Vout=Vout+0.5V		5.8		μA
I _{LX}	Lx Switching Current	V _{LX} =0.4V, Vout=Vout*0.95		300		mA
I _{LXleak}	Lx Leakage Current	Vout=V _{LX} =6V			0.5	μA
F _{osc}	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V _{LX} "L")side		78		%
EFFI	Efficiency			85		%

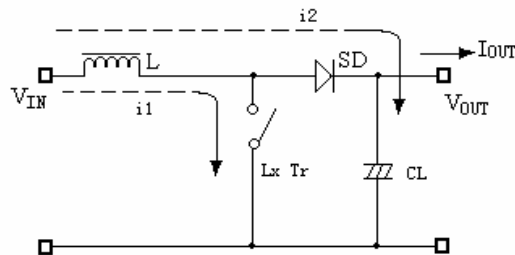
ME2100F Vout=3.0V,Fosc=100kHz

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{OUT}	Output Voltage		2.925	3.000	3.075	V
V _{FB}	Feedback Voltage		1.219	1.25	1.281	V
V _{IN}	Maximum Input Voltage				6.5	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		0.27		V
I _{DD1}	Supply Current 1	No external component Vout=Vout*0.95		31		μA
I _{DD2}	Supply Current 2	Vout=Vout+0.5V		5		μA
I _{LX}	Lx Switching Current	V _{LX} =0.4V, Vout=Vout*0.95		280		mA
I _{LXleak}	Lx Leakage Current	Vout=V _{LX} =6V			0.5	μA
F _{osc}	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V _{LX} “L”)side		78		%
EFFI	Efficiency			86		%

- Note: 1、Diode use Schottky diode such as IN5817 or IN5819 (forward voltage drop:0.2V)
 2、Inductor: 47 μ H (r<0.5 Ω)
 3、Capacitor: Tantalum type 47 μ F

Operation

ME2100 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

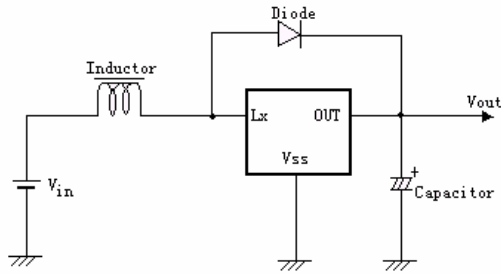
Peripheral components should be selected carefully because they are greatly affect the performances of ME2100:

- Use capacitor with a capacity of 10 μ F 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.

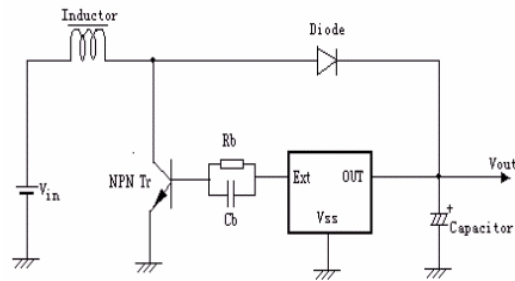
Notes:

- 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.
- 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.

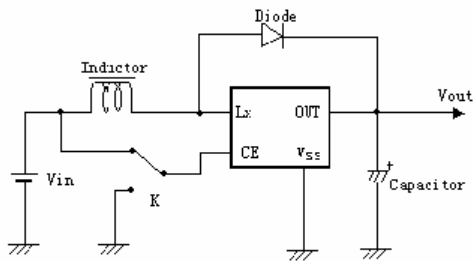
Typical Applications



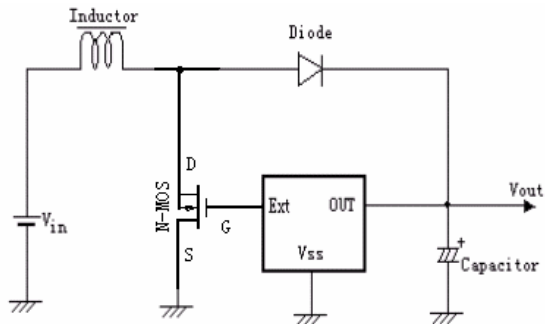
For use Build_in Transistor



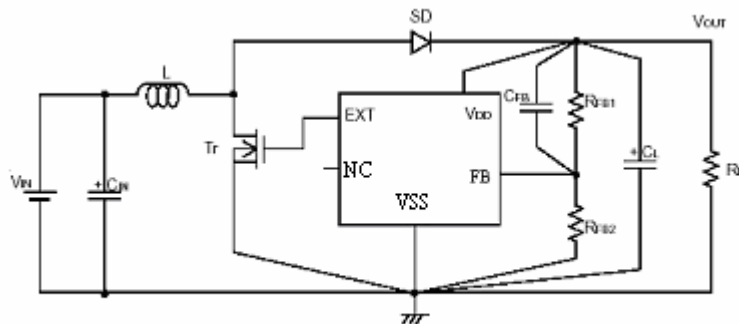
For use External Transistor



For use Chip Enable(CE)



For use external transistor(N_MOS)



For use FB&EXT

Components: Inductor: 47uH(Sumida)

Capacitor: 47uF/16V(Tantalume type)

NMOS: AAT9460、XP151、XP161

Base Capacitor(Cb): 2200pF

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

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

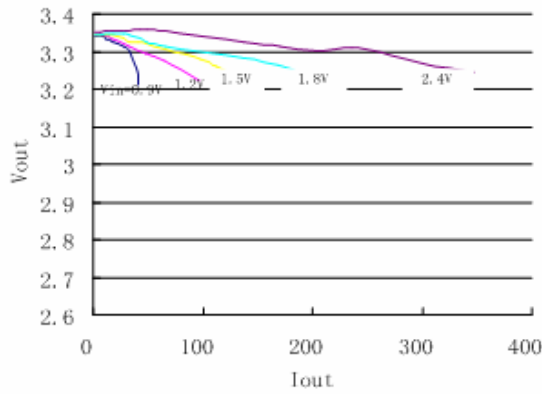
C_{FB} :Set up that $F_{zfb} = 1 / (2 \times \pi \times C_{FB} \times R_{FB1})$ is within the Adjustments necessary in respect of L, C_L .

Diode: IN5817、IN5819

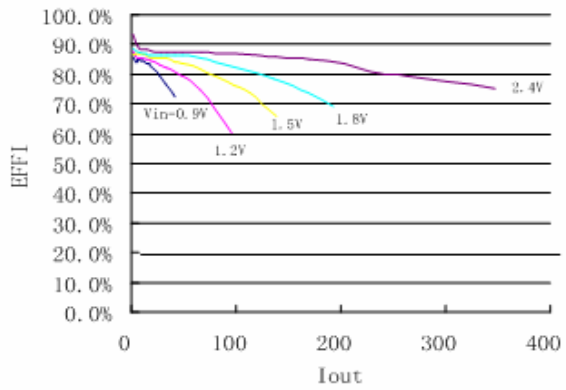
Transistor: 2SD1628G、2SD3279

Base Resistor(R_b): 1K Ω

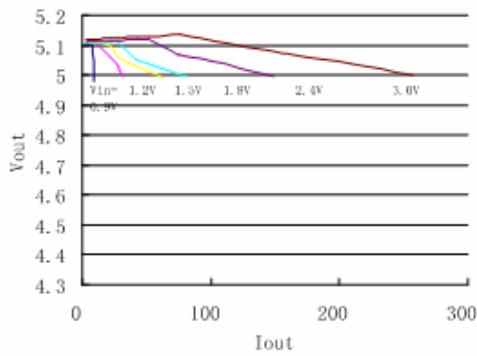
Type Characteristics



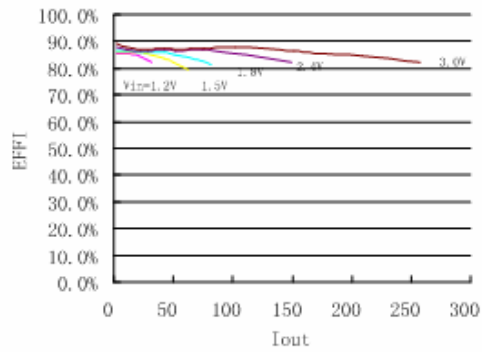
ME2100A33Iout - Vout



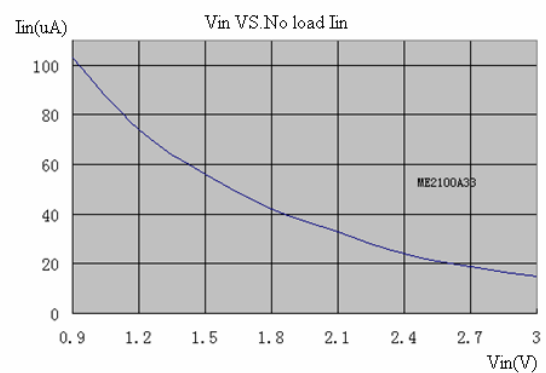
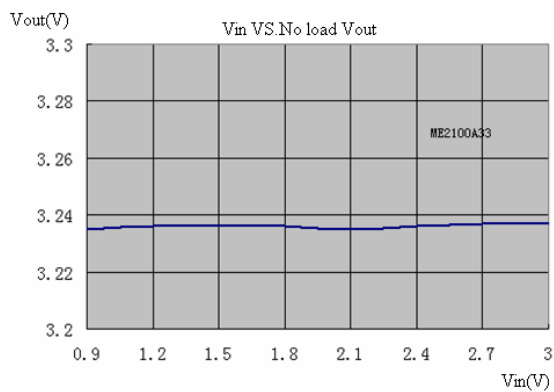
ME2100A33Iout - Efficiency



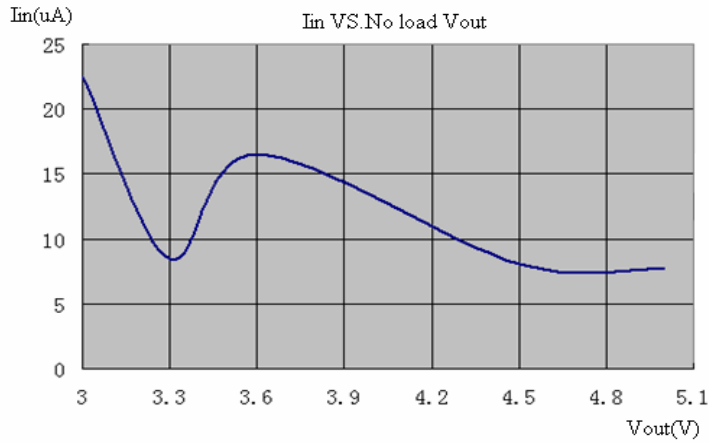
ME2100A50Iout - Vout



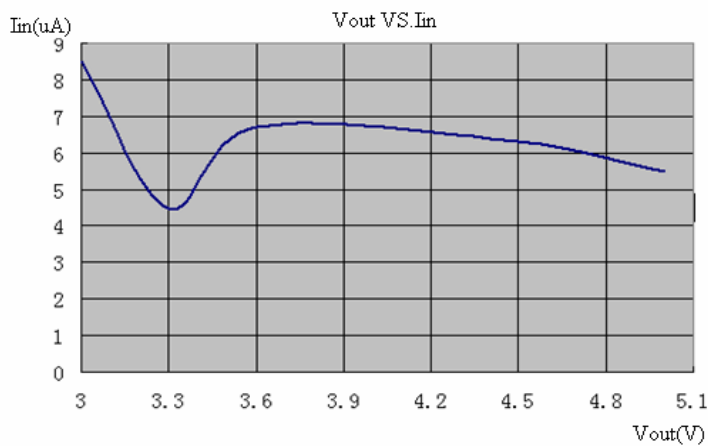
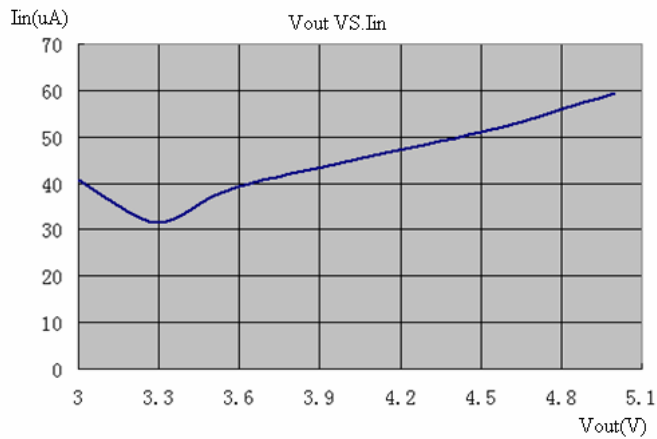
ME2100A50Iout - Efficiency



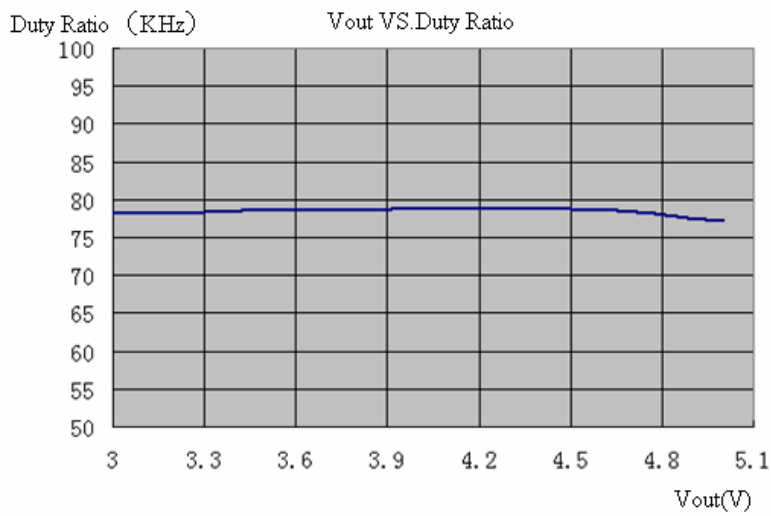
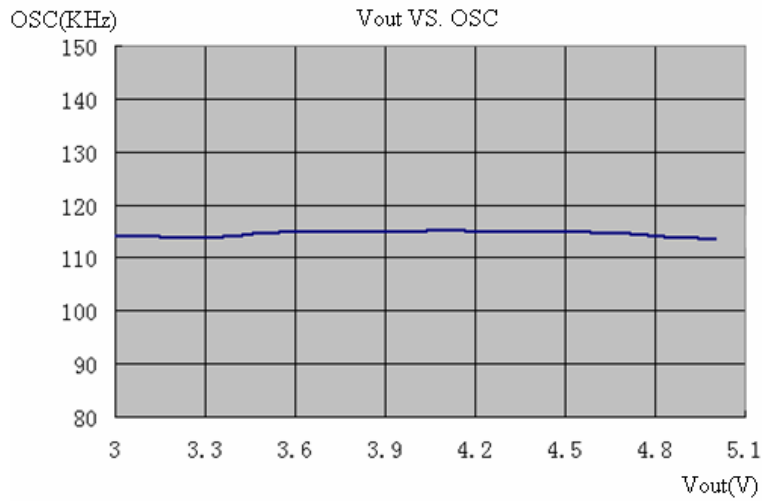
$L=47\mu\text{H}$, $C_{\text{out}}=47\mu\text{F}$, $V_{\text{OUT}}=100\mu\text{F}$, SD: 1N5817/5819



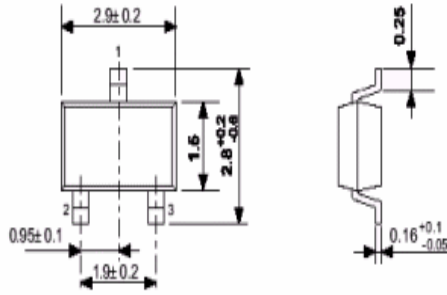
$V_{\text{DD}}=V_{\text{OUT}}*0.95$



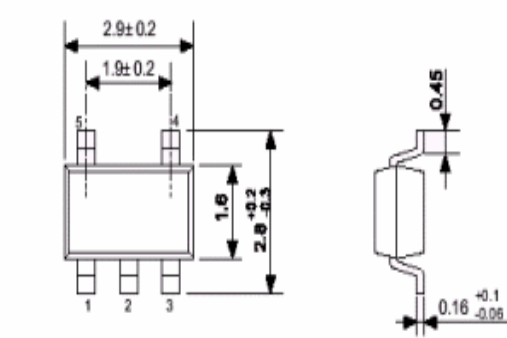
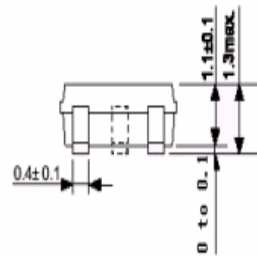
$$VDD = VOUT + 0.5$$



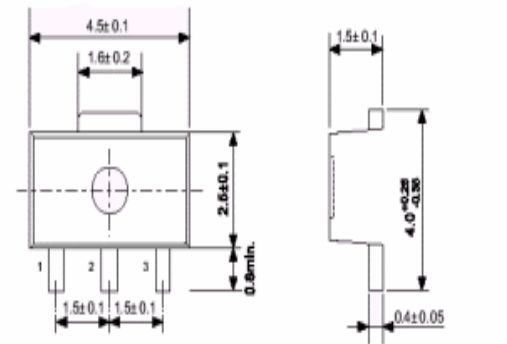
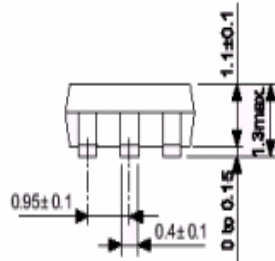
Package Diomensions



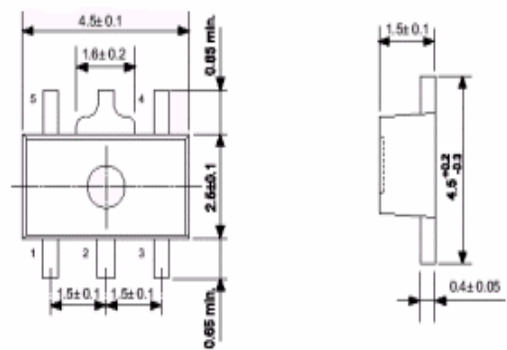
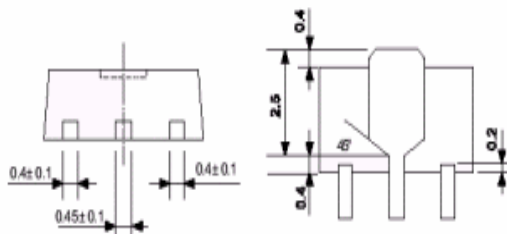
SOT23-3



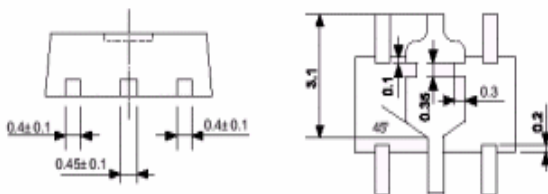
SOT23-5



SOT89-3



SOT89-5



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