

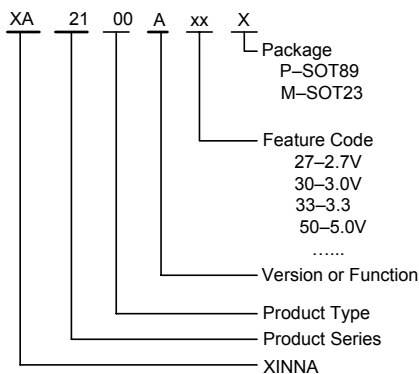
## XA2100 Series Step-up DC-DC Converter

**XA2100 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 XA2100Xxx with only three external components. Also available is a CE(chip enable) function that reduce power dissipation During shut-down mode. XA2100Xxx is suitable for use with battery-powered instruments with low noise and low supply current.

### Features

- Low input current: 6 $\mu$ 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 Vin=3.0V and Vout=3.3V, then Iout=300mA;
- Low start voltage:  $\leq$ 0.9V(at Iout=1mA);
- Maximum oscillator frequency: 100KHz(Typ.);
- High Efficiency: 85%(Type);
- PACKAGE : SOT23-3 , SOT23-5 , SOT89-3 , SOT89-5

### Selection Guide

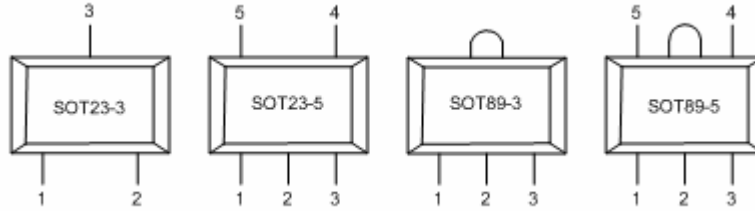


### Applications

- 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
XA2100Axx	M3	SOT23-3	Build_in Transistor	No	Lx
	P	SOT89-3			
XA2100Bxx	M3	SOT23-3	External Transistor	No	Ext
	P	SOT89-3			
XA2100Cxx	M5	SOT23-5	Build_in Transistor	Yes	Lx+CE
	P5	SOT89-5			
XA2100Dxx	M5	SOT23-5	External Transistor	Yes	Ext+CE
	P5	SOT89-5			
XA2100F	M5	SOT23-5	External Transistor	No	FB

## Pin Configuration



## Pin Assignment

### XA2100Axx

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

### XA2100Bxx

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

### XA2100Cxx

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

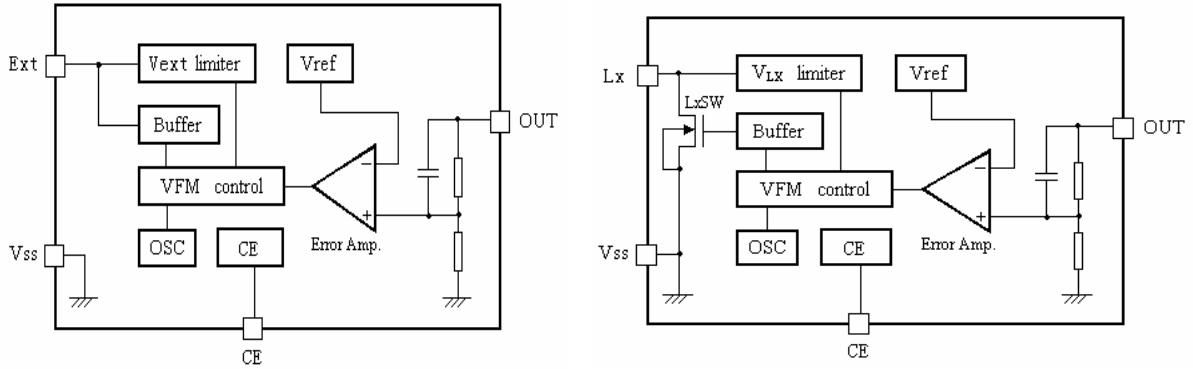
### XA2100Dxx

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

### XA2100F

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 <sub>IN</sub> Input Voltage	V <sub>IN</sub>	6.5	V	
Lx Pin voltage	V <sub>LX</sub>	6.5	V	
EXT Pin voltage	V <sub>EXT</sub>	-0.3~V <sub>out</sub> +0.3	V	
CE Pin voltage	V <sub>CE</sub>	-0.3~V <sub>out</sub> +0.3	V	
Lx Pin current	I <sub>LX</sub>	600	mA	
EXT Pin current	I <sub>EXT</sub>	±30	mA	
V <sub>dd</sub> input voltage	V <sub>dd</sub>	6.5	V	
Continuous Total Power Dissipation	SOT23	P <sub>d</sub>	300	mW
	SOT89	P <sub>d</sub>	500	mW
Operating Ambient Temperature	T <sub>Opr</sub>	-25~+85	°C	
Storage Temperature	T <sub>stg</sub>	-40~+125	°C	
Soldering temperature and time	T <sub>solder</sub>	260°C, 10s		

## Electrical Characteristics

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

**XA2100A33/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		$\mu A$
$I_{DD2}$	Supply Current 2	$V_{out}=V_{out}+0.5V$		5		$\mu A$
$I_{LX}$	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	$\mu A$
$F_{osc}$	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		%

**XA2100A50/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		$\mu A$
$I_{DD2}$	Supply Current 2	$V_{out}=V_{out}+0.5V$		6		$\mu A$
$I_{LX}$	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	$\mu A$
$F_{osc}$	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		%

## XA2100B33/D33 Vout=3.3V,Fosc=100kHz

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V <sub>OUT</sub>	Output Voltage		3.218	3.300	3.382	V
V <sub>IN</sub>	Maximum Input Voltage				6.5	V
V <sub>start</sub>	Oscillation Start-up Voltage	I <sub>OUT</sub> =1mA, V <sub>IN</sub> : 0→2V		0.8	0.9	V
V <sub>hold</sub>	Oscillation Hold Voltage	I <sub>OUT</sub> =1mA, V <sub>IN</sub> : 2→0V		0.27		V
I <sub>DD1</sub>	Supply Current 1	No external component Vout=Vout*0.95,		28		μA
I <sub>DD2</sub>	Supply Current 2	Vout=Vout+0.5V		6		μA
I <sub>LX</sub>	Lx Switching Current	V <sub>LX</sub> =0.4V, Vout=Vout*0.95		280		mA
I <sub>LXleak</sub>	Lx Leakage Current	Vout=V <sub>LX</sub> =6V			0.5	μA
F <sub>osc</sub>	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V <sub>LX</sub> "L" )side		78		%
EFFI	Efficiency			85		%

## XA2100B50/D50 Vout=5.0V,Fosc=100kHz

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V <sub>OUT</sub>	Output Voltage		4.875	5.000	5.125	V
V <sub>IN</sub>	Maximum Input Voltage				6.5	V
V <sub>start</sub>	Oscillation Start-up Voltage	I <sub>OUT</sub> =1mA, V <sub>IN</sub> : 0→2V		0.8	0.9	V
V <sub>hold</sub>	Oscillation Hold Voltage	I <sub>OUT</sub> =1mA, V <sub>IN</sub> : 2→0V		0.32		V
I <sub>DD1</sub>	Supply Current 1	No external component Vout=Vout*0.95,		50		μA
I <sub>DD2</sub>	Supply Current 2	Vout=Vout+0.5V		5.8		μA
I <sub>LX</sub>	Lx Switching Current	V <sub>LX</sub> =0.4V, Vout=Vout*0.95		300		mA
I <sub>LXleak</sub>	Lx Leakage Current	Vout=V <sub>LX</sub> =6V			0.5	μA
F <sub>osc</sub>	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V <sub>LX</sub> "L" )side		78		%
EFFI	Efficiency			85		%

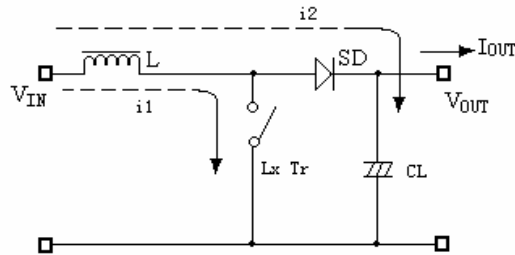
**XA2100F**  $V_{out}=3.0V, F_{osc}=100kHz$

SYMB-OL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$V_{OUT}$	Output Voltage		2.925	3.000	3.075	V
VFB	Feedback Voltage		1.219	1.25	1.281	V
$V_{IN}$	Maximum Input Voltage				6.5	V
$V_{start}$	Oscillation Start-up Voltage	$I_{OUT}=1mA,$ $V_{IN}: 0 \rightarrow 2V$		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 $V_{out}=V_{out} \times 0.95$		31		$\mu A$
$I_{DD2}$	Supply Current 2	$V_{out}=V_{out}+0.5V$		5		$\mu A$
$I_{LX}$	Lx Switching Current	$V_{LX}=0.4V,$ $V_{out}=V_{out} \times 0.95$		280		mA
$I_{LXleak}$	Lx Leakage Current	$V_{out}=V_{LX}=6V$			0.5	$\mu A$
$F_{osc}$	Oscillation Frequency	$V_{out}=set V_{out} \times 0.95$		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:  $47 \mu H$  ( $r < 0.5 \Omega$ )  
 3、Capacitor: Tantalum type  $47 \mu F$

## Operation

XA2100 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

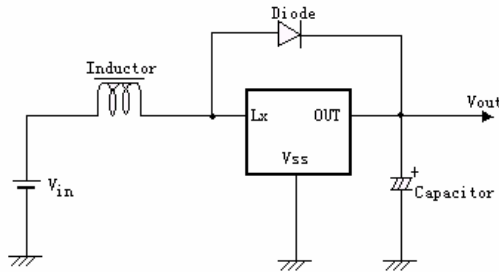
Peripheral components should be selected carefully because they are greatly affect the performances of XA2100 :

- Use capacitor with a capacity of 10  $\mu$  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.

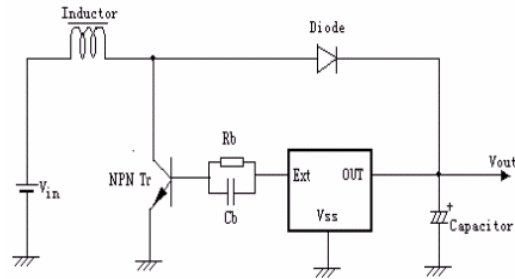
### Notes:

- 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.

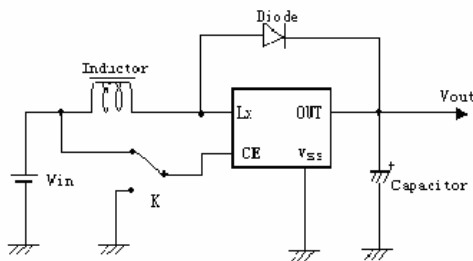
## Typical Applications



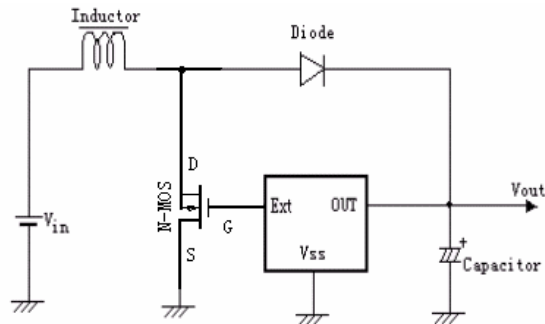
For use Build\_in Transistor



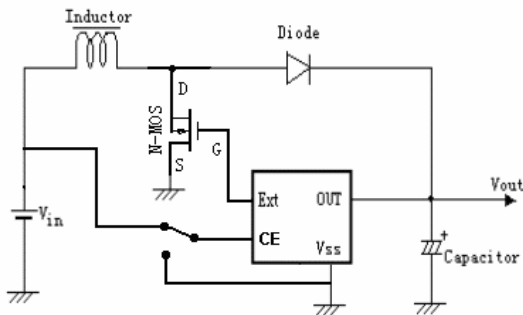
For use External Transistor



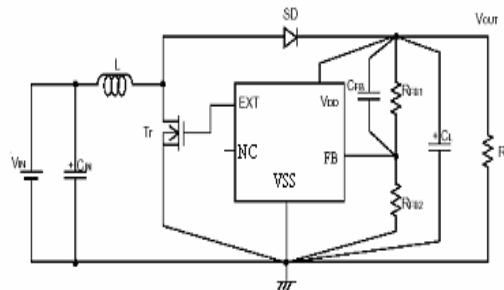
For use Chip Enable(CE)



For use external transistor(N\_MOS)



For use external transistor & Enable



For use FB & external

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<sub>L</sub>.

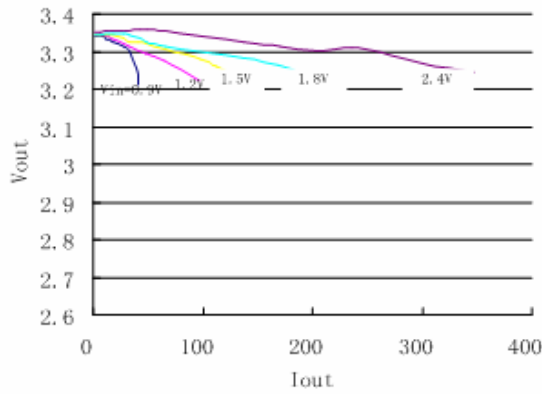
Diode: IN5817、IN5819

Transistor: 2SD1628G、2SD3279

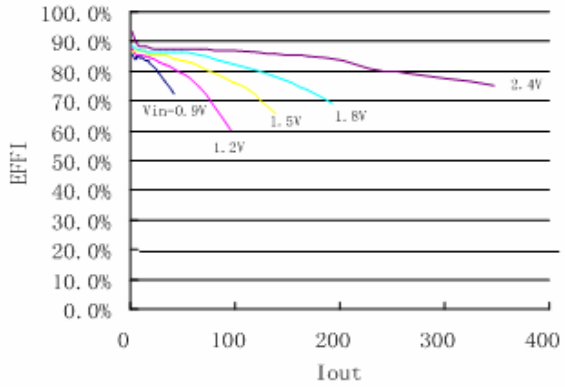
Base Resistor(Rb): 1K  $\Omega$



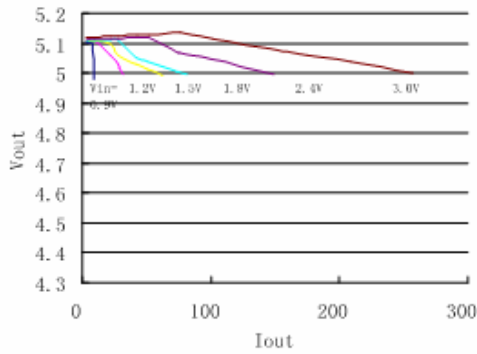
## Type Characteristics



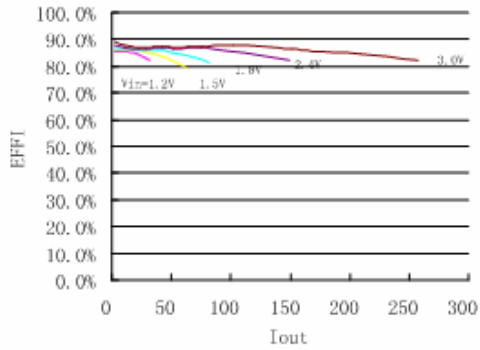
XA2100 A33 Iout - Vout



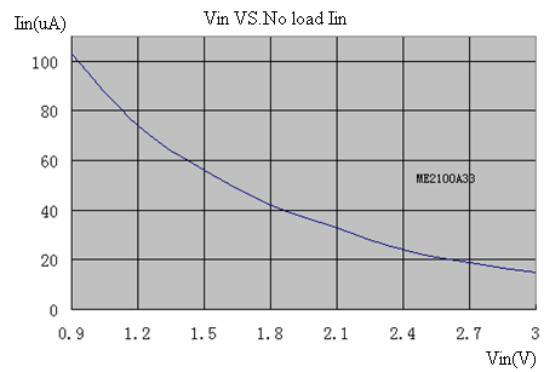
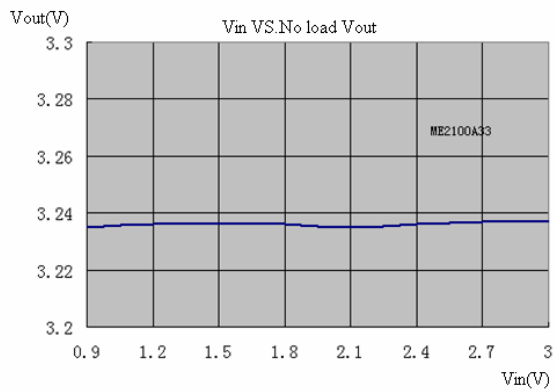
XA2100 A33 Iout - Efficiency



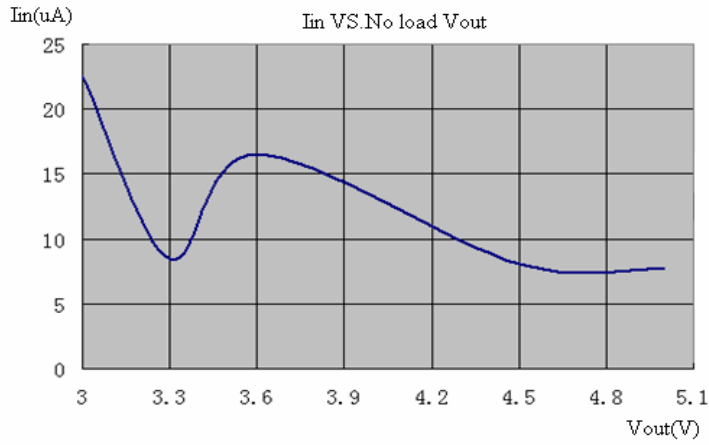
XA2100 A50 Iout - Vout



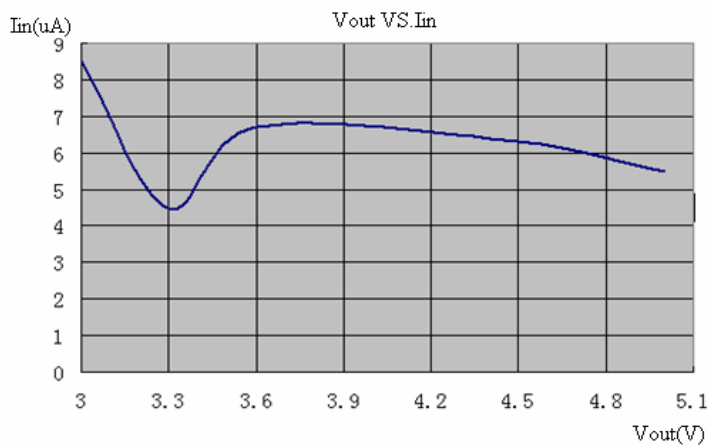
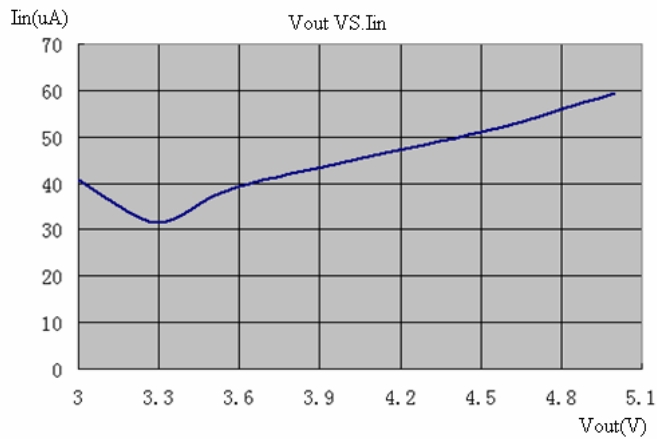
XA2100 A50 Iout - Efficiency



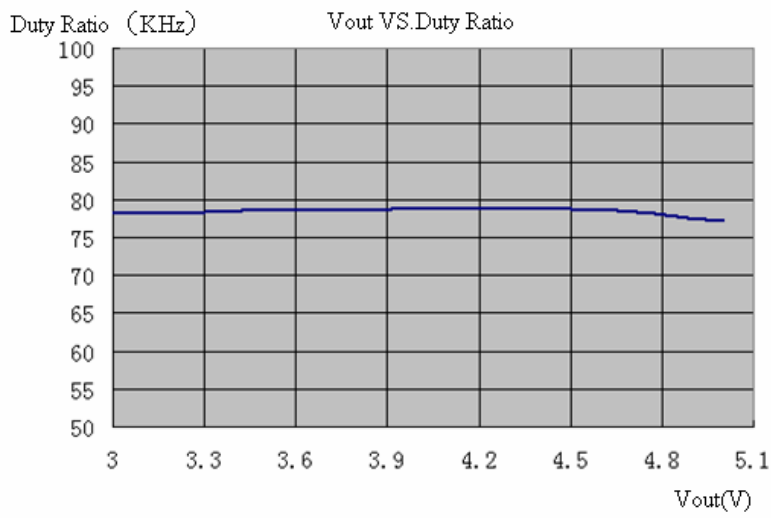
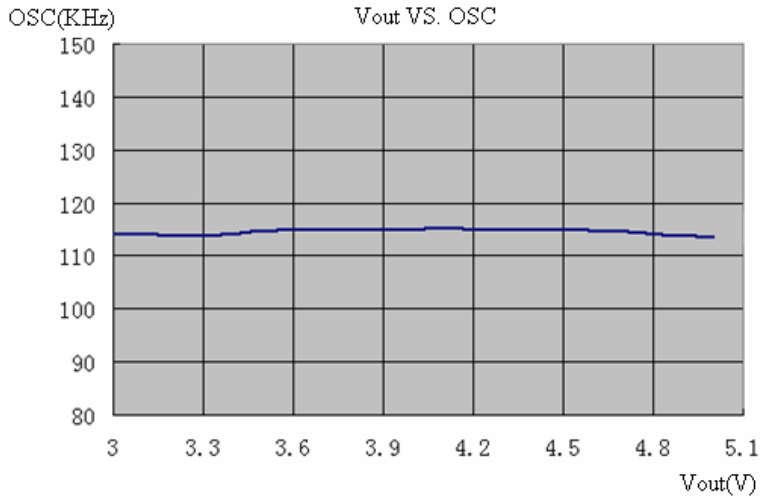
**L=47uH, Cout=47uF, V<sub>OUT</sub>=100uF, SD: 1N5817/5819**



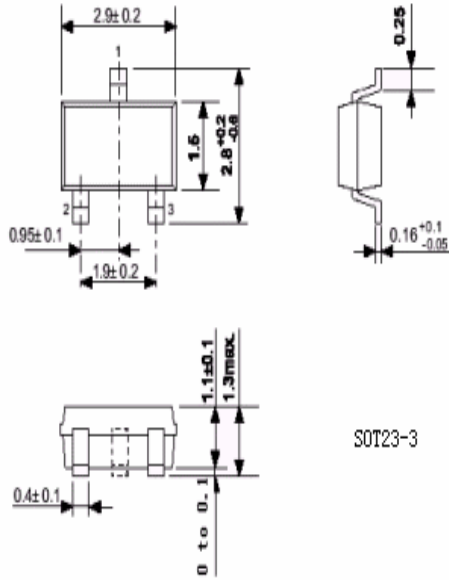
**VDD=VOUT\*0.95**



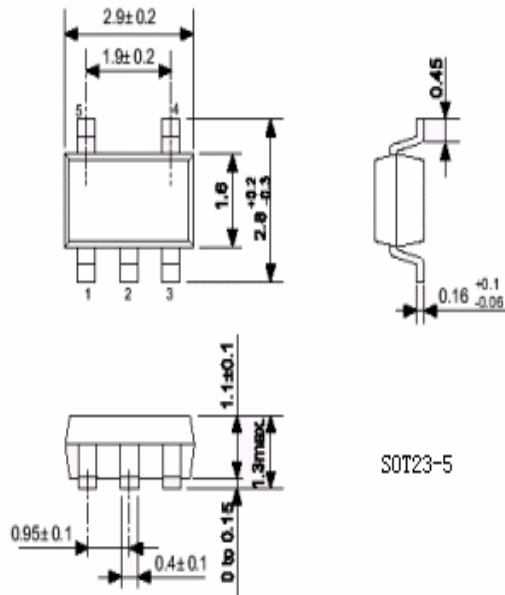
**VDD=VOUT+0.5**



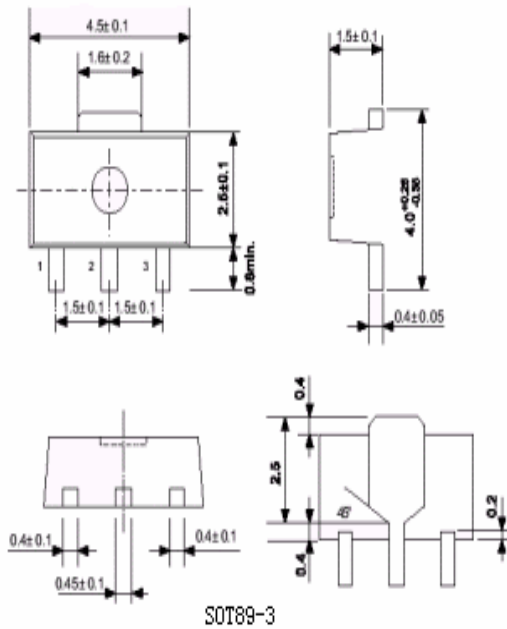
Package Diomensions



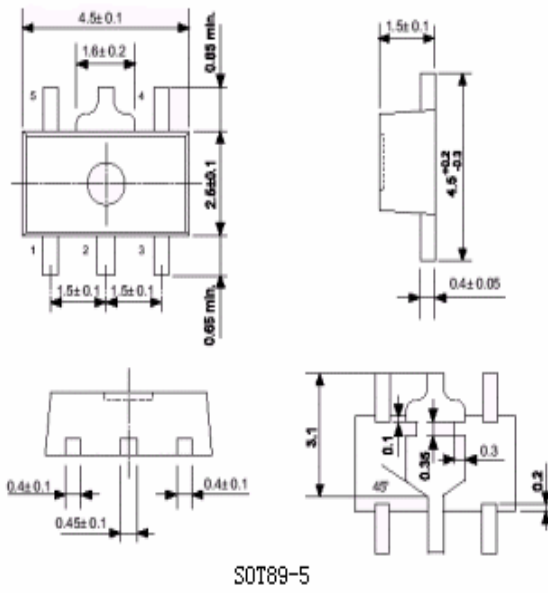
SOT23-3



SOT23-5



SOT89-3



SOT89-5