ME2101 Series Step-up DC-DC Converter

ME2101 Series is a PWM 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 2.0~5.0V and maximum frequency is 100KHz(Typ.). A low ripple, high efficiency step-up DC/DC converter can be constructed of ME2101AxxX 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.An inner soft-start circuit limits current surges from input power supply at start up and the reliability of the chip is improved. ME2101XxxX is suitable for use with battery-powered instruments with low noise and low supply current.

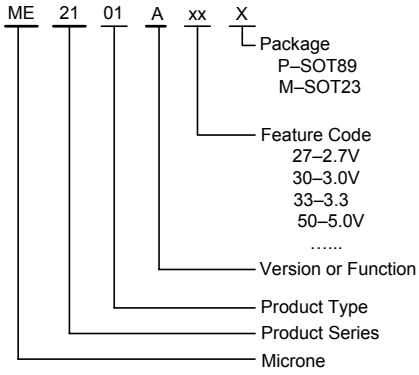
Features

- Small number of external components: only an inductor, a diode and a capacitor；
- Low ripple and low noise；
- Operating voltage range：0.9V~6.5V；
- Output voltage range：2.0V~5.0V(step 0.1V)；
- Output voltage accuracy：±2.5%；
- Output Current：if Vin=3.0V and Vout=3.3V，then Iout=350mA；
- Low start voltage：≤0.9V(at Iout=1mA)；
- Maximum oscillator frequency： 100KHz(Typ.)；
- High Efficiency：87%(Type)；
- Slow-Start Time ：15mS(Type)；
- PACKAGE：SOT-23，SOT-89.

Applications

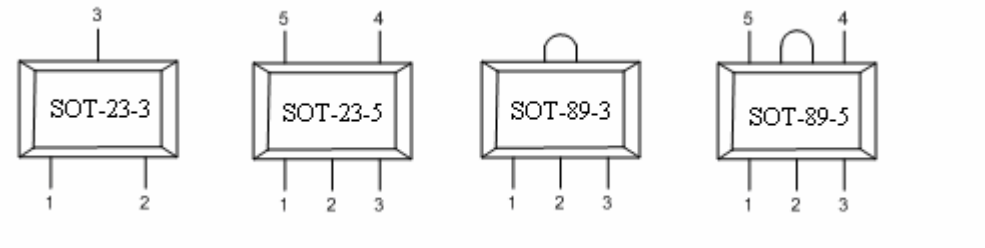
- Power source for battery-powered equipment；
- Power source for wireless mouse, wireless keyboard, toys, cameras, camcorders, VCRs, PDAs, and hand-held communication equipment；
- Power source for appliances which require higher cell voltage than that of batteries used in the appliances。

Selection Guide



TYPE	POSTFIX	PACKAGE	SWITCHING TRANSISTOR	CE FUNCTION	FEATURES
ME2101Axx	M	SOT-23-3	Build_in Transistor	No	Lx
	P	SOT-89-3			
ME2101Bxx	M	SOT-23-3	Extemal Transistor	No	Ext
	P	SOT-89-3			
ME2101Cxx	M	SOT-23-5	Build_in Transistor	Yes	Lx+CE
	P	SOT-89-5			
ME2101Dxx	M	SOT-23-5	Extemal Transistor	Yes	Ext+CE
	P	SOT-89-5			

Pin Configuration



Pin Assignment

ME2101Axx

PIN Number		PIN NAME	FUNCTION
SOT-23-3	SOT-89-3		
1	1	Vss	Ground
3	2	Vout	Output voltage monitor, IC internal power supply
2	3	Lx	Switch

ME2101Bxx

PIN Number		PIN NAME	FUNCTION
SOT-23-3	SOT-89-3		
1	1	Vss	Ground
3	2	Vout	Output voltage monitor, IC internal power supply
2	3	Ext	External switch transistor drive

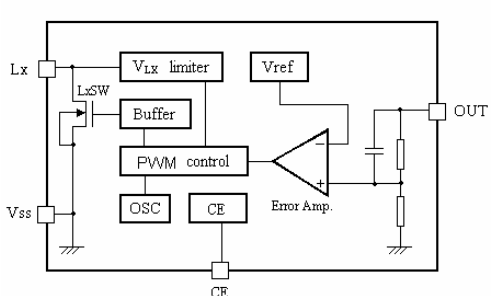
ME2101Cxx

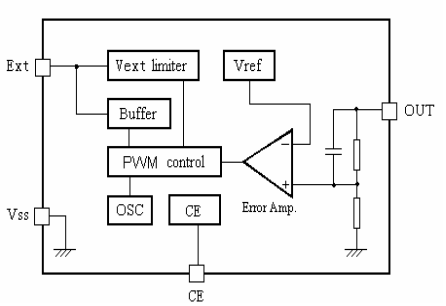
PIN Number		PIN NAME	FUNCTION
SOT-23-5	SOT-89-5		
4	5	Vss	Ground
2	2	Vout	Output voltage monitor, IC internal power supply
5	4	Lx	Switch
1	3	CE	Chip enable
3	1	NC	NC

ME2101Dxx

PIN Number		PIN NAME	FUNCTION
SOT-23-5	SOT-89-5		
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	SOT-23	Pd	300	mW
	SOT-89	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

ME2101A30 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_{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		0.24		V
I_{DD1}	Supply Current 1	No external component Vout=Vout*0.95,		30		μA
I_{DD2}	Supply Current 2	Vout=Vout+0.5V		11		μA
I_{LX}	Lx Switching Current	V_{LX}=0.4V, Vout=Vout*0.95		250		mA
I_{LXleak}	Lx Leakage Current	Vout=V_{LX}=6V			0.5	μA
I_{EXTH}	EXT"High" On Current	Same as I_{DD1}. VEXT=Vout-0.4V,		-6		mA
I_{EXTL}	EXT"Low" On Current	Same as I_{DD1}.. VEXT=0.4V,		14		mA
V_{CEH}	CE"High" Voltage	Vout=Vce=set Vout*0.95	0.70			V
V_{CEL}	CE"Low" Voltage	Vout=Vce=set Vout*0.95			0.20	V
I_{CEH}	CE"High" Current	Vout=6.0V, Vce=6.0V			0.25	uA
I_{CEL}	CE"low" Current	Vout=6.0V, Vce=0.0V			-0.25	uA
F_{osc}	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side	80	87	92	%
EFFI	Efficiency			87		%
Tss	Slow-Start Time		5	15	25	mS

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

Electrical Characteristics

ME2101A33 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		0.24		V
I_{DD1}	Supply Current 1	No external component Vout=Vout*0.95,		35		μA
I_{DD2}	Supply Current 2	Vout=Vout+0.5V		13		μA
I_{LX}	Lx Switching Current	V_{LX}=0.4V, Vout=Vout*0.95		260		mA
I_{LXleak}	Lx Leakage Current	Vout=V_{LX}=6V			0.5	μA
I_{EXTH}	EXT"High" On Current	Same as I_{DD1}. VEXT=Vout-0.4V,		-6		mA
I_{EXTL}	EXT"Low" On Current	Same as I_{DD1}.. VEXT=0.4V,		14		mA
V_{CEH}	CE"High" Voltage	Vout=Vce=set Vout*0.95	0.70			V
V_{CEL}	CE"Low" Voltage	Vout=Vce=set Vout*0.95			0.20	V
I_{CEH}	CE"High" Current	Vout=6.0V, Vce=6.0V			0.25	uA
I_{CEL}	CE"low" Current	Vout=6.0V, Vce=0.0V			-0.25	uA
F_{osc}	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side	80	87	92	%
EFFI	Efficiency			85		%
Tss	Slow-Start Time		5	15	25	mS

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

Electrical Characteristics

ME2101A50 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		0.24		V
I_{DD1}	Supply Current 1	No external component Vout=Vout*0.95,		70		μA
I_{DD2}	Supply Current 2	Vout=Vout+0.5V		26		μA
I_{LX}	Lx Switching Current	V_{LX}=0.4V, Vout=Vout*0.95		290		mA
I_{LXleak}	Lx Leakage Current	Vout=V_{LX}=6V			0.5	μA
I_{EXTH}	EXT"High" On Current	Same as I_{DD1}. VEXT=Vout-0.4V,		-5.72		mA
I_{EXTL}	EXT"Low" On Current	Same as I_{DD1}.. VEXT=0.4V,		13.25		mA
V_{CEH}	CE"High" Voltage	Vout=Vce=set Vout*0.95	0.70			V
V_{CEL}	CE"Low" Voltage	Vout=Vce=set Vout*0.95			0.20	V
I_{CEH}	CE"High" Current	Vout=6.0V, Vce=6.0V			0.25	uA
I_{CEL}	CE"low" Current	Vout=6.0V, Vce=0.0V			-0.25	uA
F_{osc}	Oscillation Frequency	Vout=set Vout*0.95		100		kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side	80	87	92	%
EFFI	Efficiency			85		%
Tss	Slow-Start Time		5	15	25	mS

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)

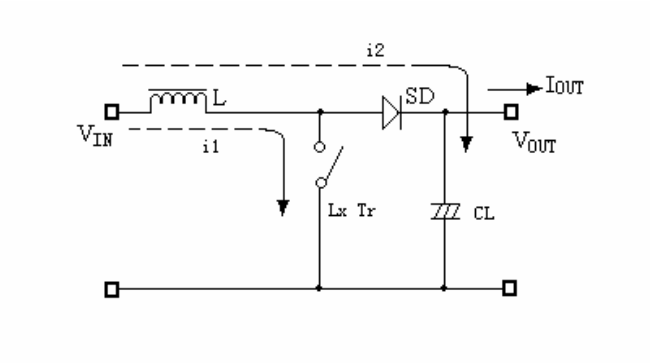
2、Inductor: 47μH (r<0.5Ω)

3、Capacitor: Tantalum type 47μF

Operation

ME2101 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 ME2101：

• 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.

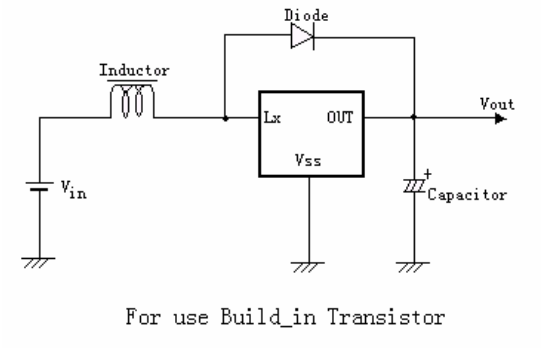
• Use a diode of a Schottky type with high switching speed.

Notes：

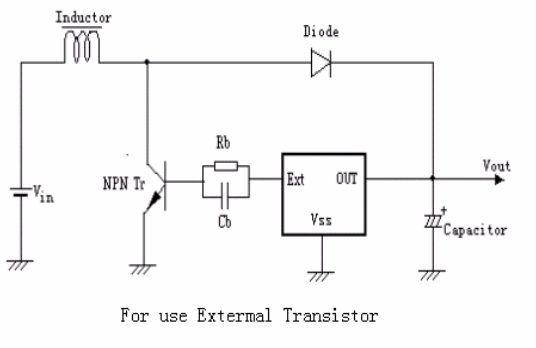
• Set external components as close as possible to the IC and minimize the connection between the components and the IC. In particular, when an external component is connected to V_{OUT} Pin, make minimum connection with the capacitor. A 0.1μF ceramic capacitor is suggested to be parallelly connected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

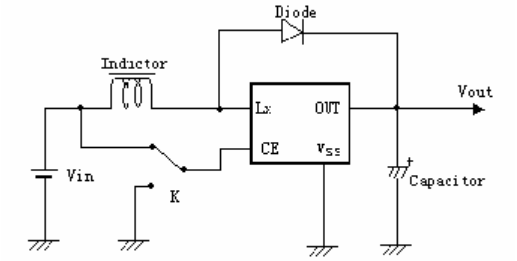
Typical Applications



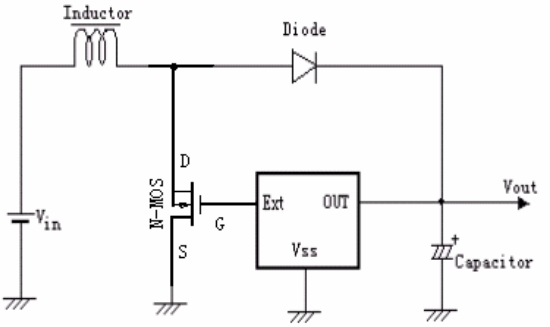
For use Build_in Transistor



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

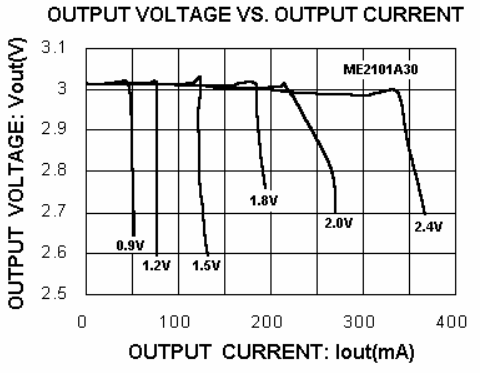
Base Capacitor(Cb)：2200pF

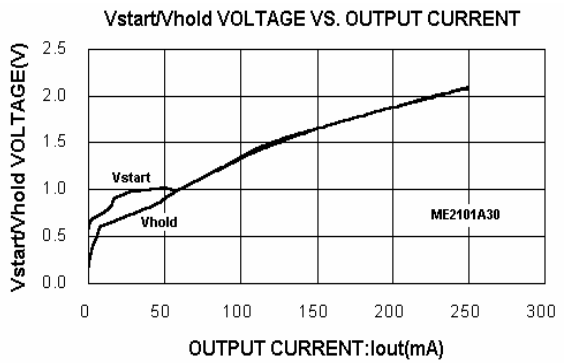
R_{FB} :Set up so that R_{FB1}/R_{FB2}=Vout-1(Vout=set-up output voltage),

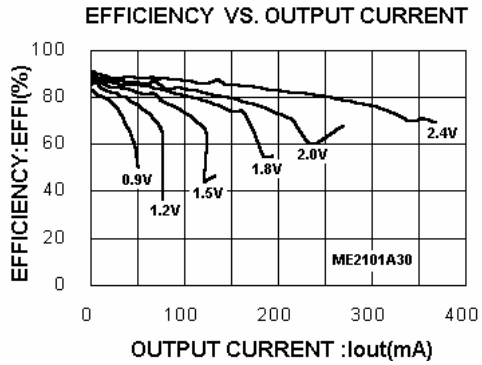
Please use with $R_{FB1}+R_{FB2} \leq 2M\Omega$;

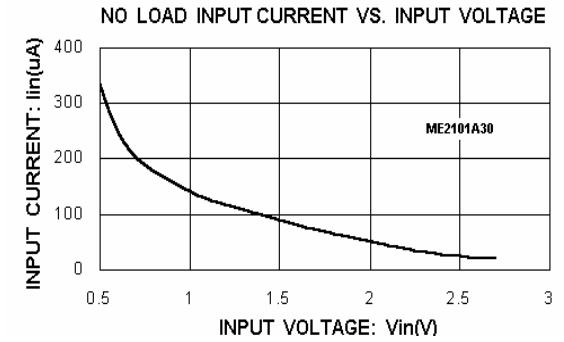
C_{FB}:Set up that Fzfb=1/(2×π×C_{FB}×R_{FB1}) is within the Adjustments necessary in respect of L,C_L.

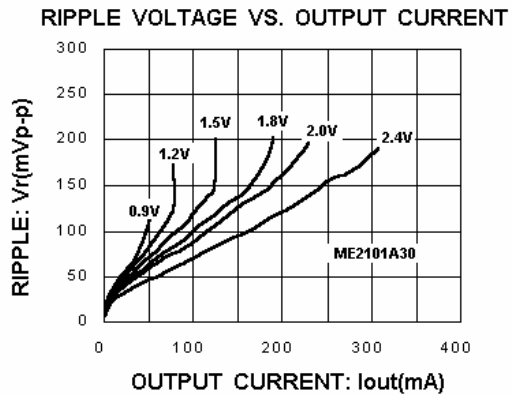
Type Characteristics



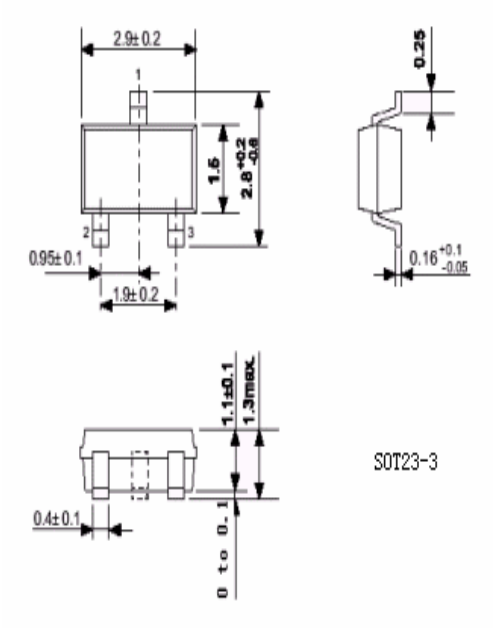


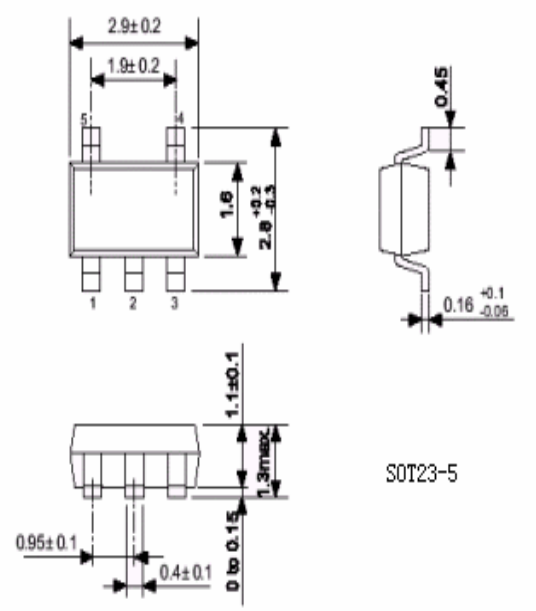


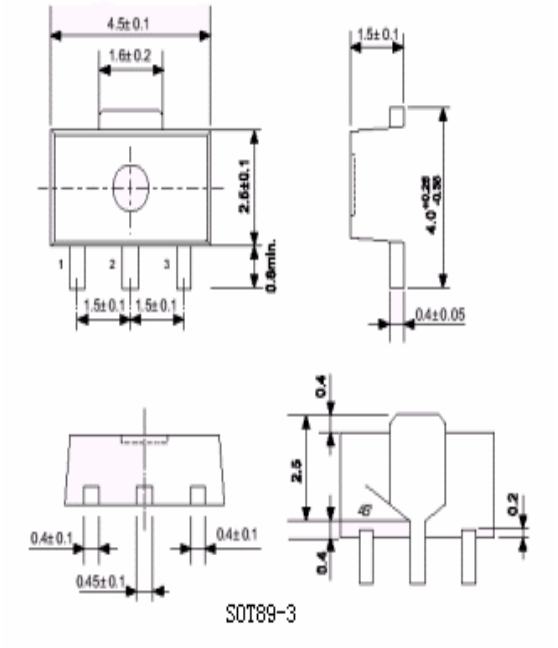


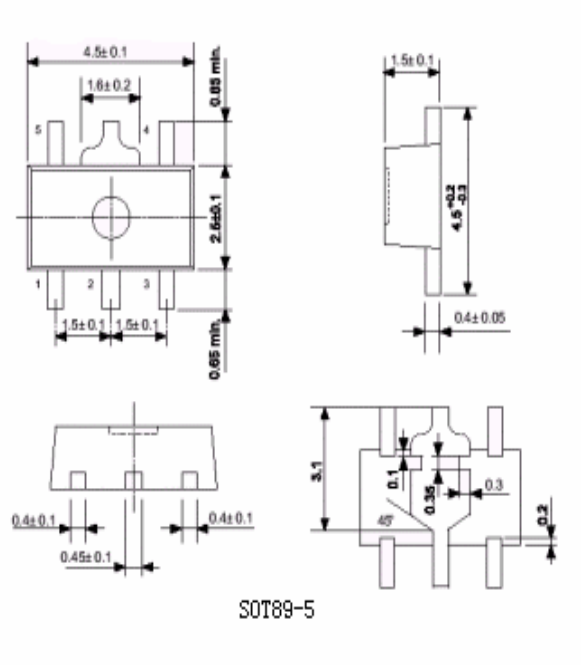


Package Diomensions









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