PFM Step-up DC/DC Converter, BPD108 Series

General Description

BPD108 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 2.0-9.0V and maximum frequency is 180KHz(TYP.). A low ripple, high efficiency step-up DC/DC converter can be constructed of BPD108Xxx with only three external components. Also available is a CE(chip enable) function that reduce power dissipation During shut-down mode. BPD108Xxx 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~9.0V
- Output voltage range：2.0V~9.0V(step 0.1V)
- Output voltage accuracy：±2.5%
- Output Current：If V_{IN}=3.0V and V_{OUT}=5.0V,then I_{OUT}=400mA
- Low start voltage：≤0.9V(at I_{OUT} =1mA)
- Maximum oscillator frequency：180KHz(TYP.)
- High Efficiency：85%(TYP.)
- Package：SOT23、SOT89、TO92

Selection Guide

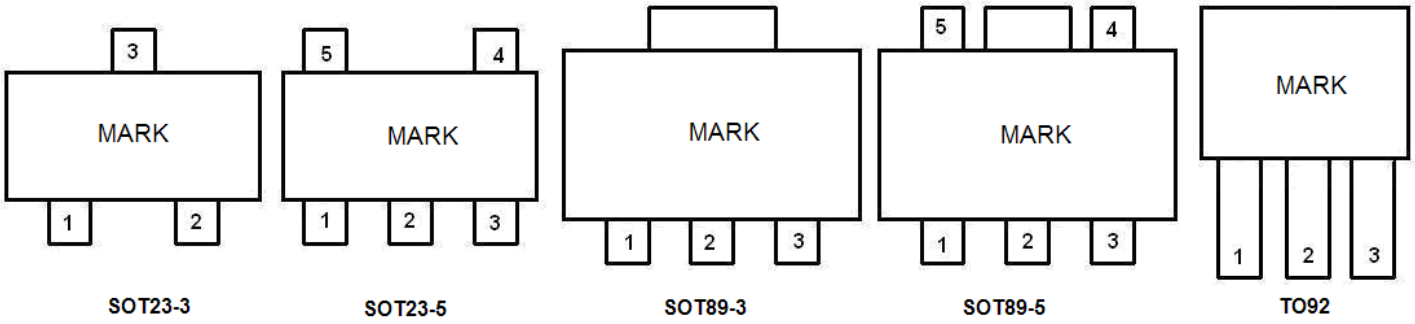
BP D108 X XX X X

- Environment mark
- Package：
  e.g.：P-SOT89
  M-SOT23
- Output Voltage
  e.g.：27-2.7V
  30-3.0V
  33-3.3V
  50-5.0V
  .....
- Version or Function
- Product Type
- Product Series
- Better Power

Typical Application

- 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

Pin Configuration



Pin Assignment

TYPE	POSTFIX	PACKAGE	SWITCHING TRANSISTOR	CE FUNCTION	FEATURES
BPD108Axx	M3	SOT23-3	Build in Transistor	No	Lx
	P	SOT89-3			
	T1	TO92			
BPD108Bxx	M3	SOT23-3	External Transistor	No	Ext
	P	SOT89-3			
BPD108Cxx	M5	SOT23-5	Build in Transistor	Yes	Lx CE
	P	SOT89-5			
BPD108Dxx	M5	SOT23-5	External Transistor	Yes	Ext CE
	P	SOT89-5			
BPD108F	M5	SOT23-5	External Transistor	Yes	Ext

BPD108AXX

PIN Number			Pin Name	Function
SOT23-3	SOT89-3	TO92		
1	1	1	Vss	Ground
3	2	3	Vout	Output voltage monitor, IC internal power supply
2	3	2	Lx	Switch

BPD108BXX

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

BPD108CXX

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

BPD108DXX

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

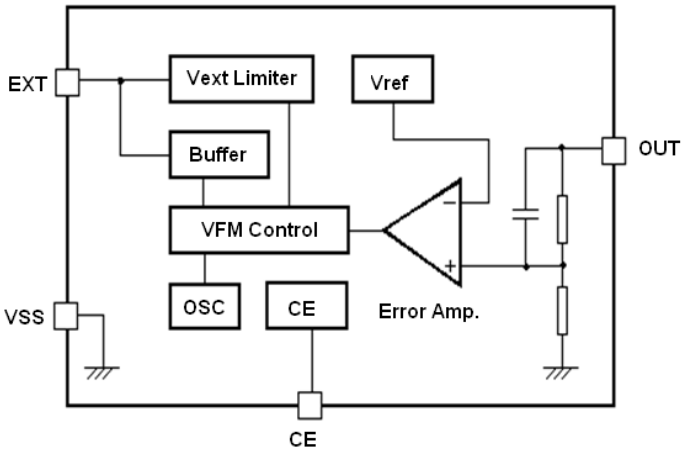
BPD108F

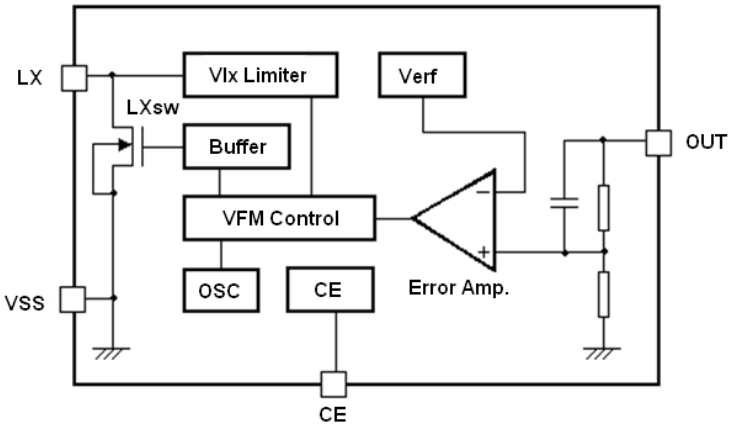
PIN Number	Pin Name	Function
SOT23-5		
1	FB	Feed Back
2	Vdd	Output voltage monitor, IC internal power supply
3	NC	NC
4	Vss	Ground
5	EXT	External switch transistor drive

Absolute Maximum Ratings

PARAMETER		SYMBAL	RATINGS	UNITS
V_{IN} Input Voltage		V_{IN}	9.0	V
Lx Pin voltage		V_{LX}	9.0	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}	1000	mA
EXT Pin current		I_{EXT}	±30	mA
Vdd input voltage		V_{dd}	9.0	V
Continuous Total Power Dissipation	SOT23	Pd	300	mW
	SOT89	Pd	500	mW
	TO92	Pd	500	mW
Operating Ambient Temperature		T_{Opr}	-25~+85	℃
Storage Temperature		T_{stg}	-40~+125	℃
Soldering temperature and time		T_{solder}	260℃, 10s	

Block Diagram





Electrical Characteristics

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

BPD108Axx/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		%

BPD108Bxx/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		%

BPD108F 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		%

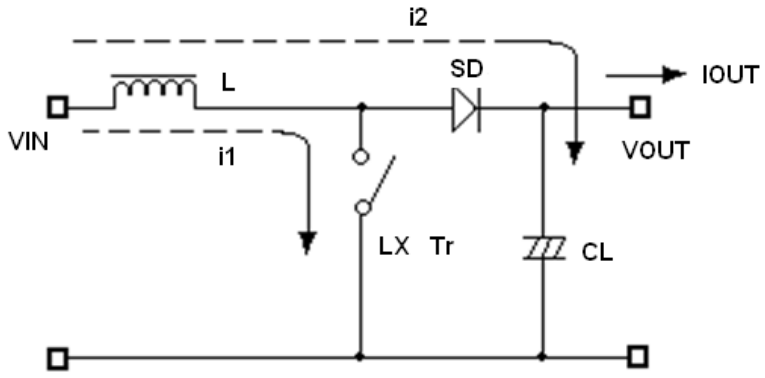
Note：1、Diode use Schottky diode such as IN5817 or IN5819 (forward voltage drop:0.2V)

2、Inductor：33μH（r<0.5Ω）

3、Capacitor：Tantalum type 100μF

Operation Description

BPD108 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.

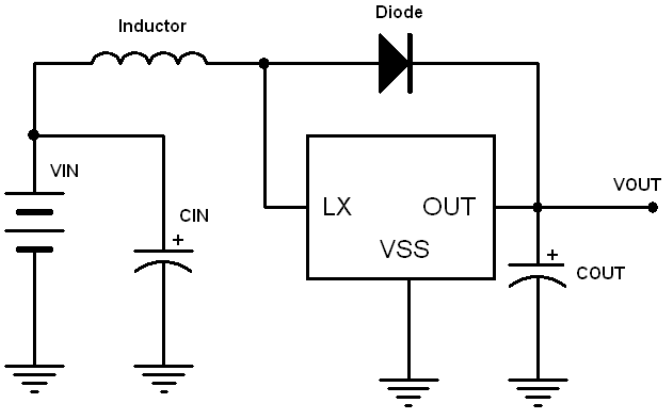


Switching DC/DC Step up Converter operating process

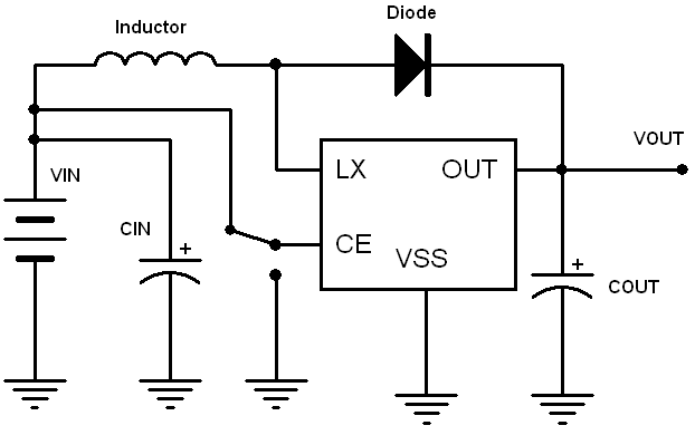
Selection of Peripheral Components and Application Notes

- 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
- Peripheral components should be selected carefully because they are greatly affect the performances of BPD108：
  - ✧ 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.
- PCB Layout：
  - ✧ 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 VOUT 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.

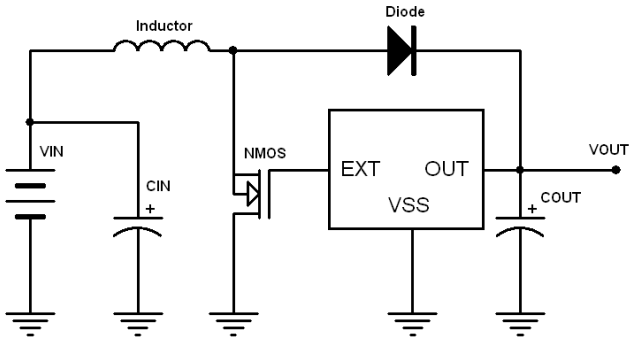
Typical Applications



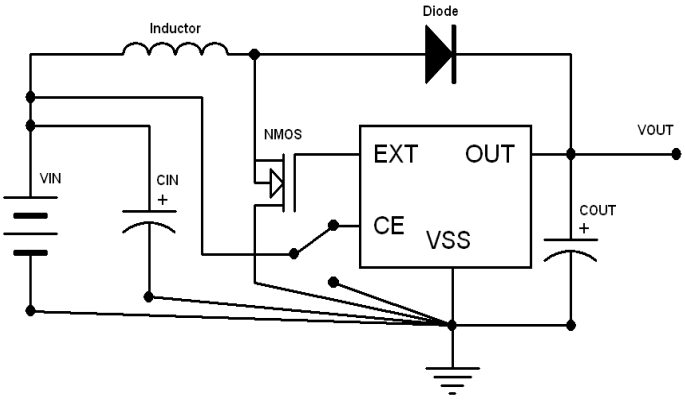
For use build in transistor



For use chip enable



For use external transistor



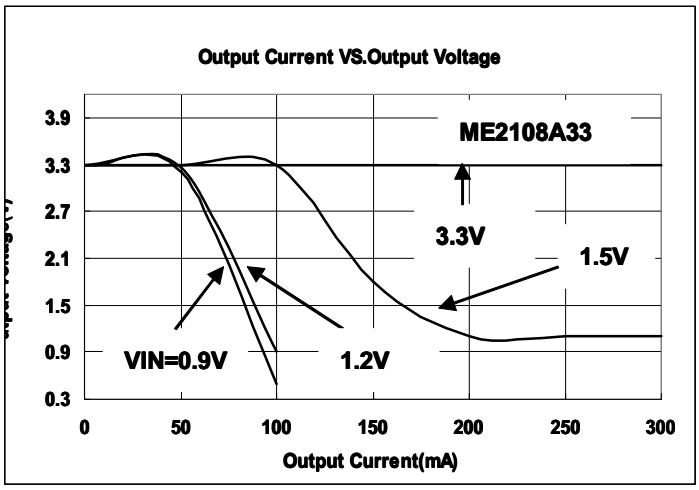
For use external transistor&chip enable

Components：

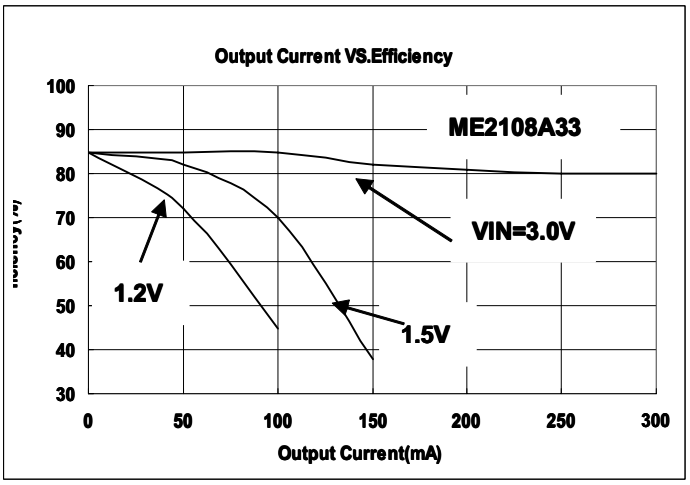
- Inductor：33uH(Sumida)
- Diode：IN5817、IN5819
- Capacitor：47uF/16V(Tantalum Capacitor)
- Transistor：2SD1628G、2SD3279
- NMOS：2302、AAT9460、XP151、XP161

Type Characteristics

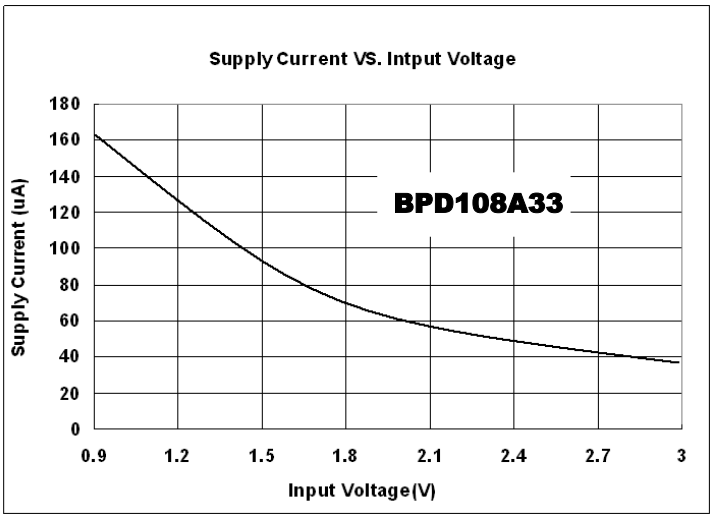
（1）Output CurrentVS.Output Voltage（**Ta = 25 °C**）



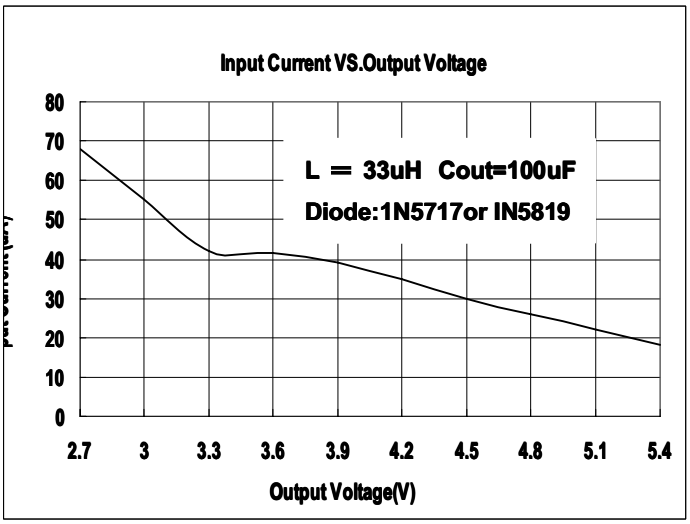
（2）Output Current VS. Efficiency（**Ta = 25 °C**）



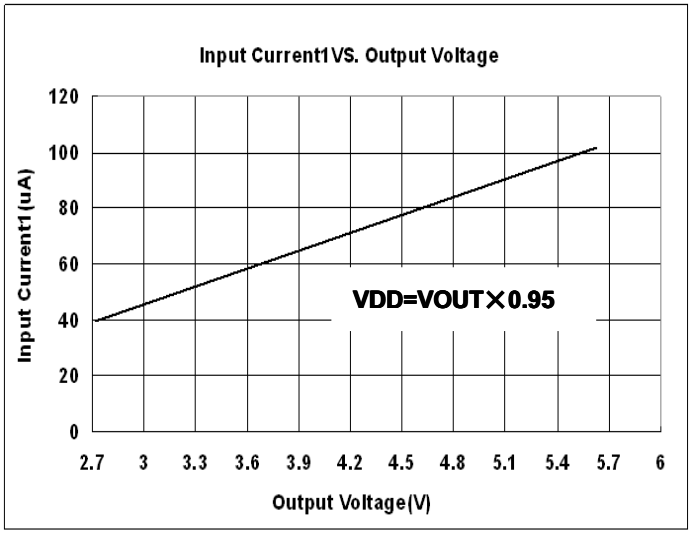
（3）Supply Current VS. Input Voltage（**Ta = 25 °C**）

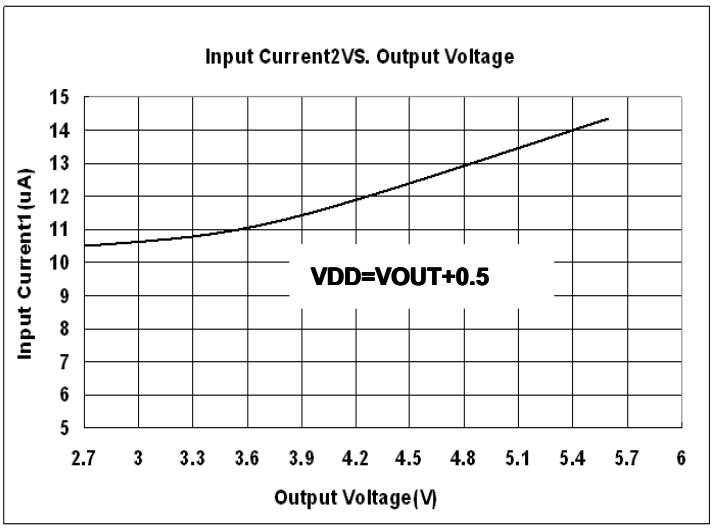


（4）Input Current VS. Output Voltage（**Ta = 25 °C**）

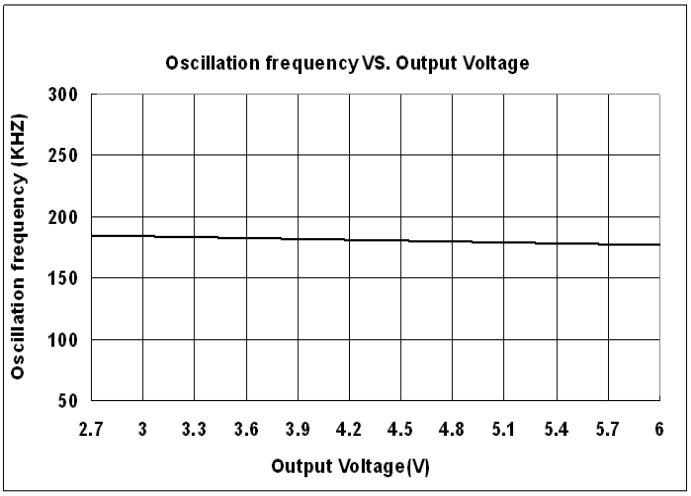


（5）Input Current1VS. Output Voltage（**Ta = 25 °C**）（6）Input Current2VS. Output Voltage（**Ta = 25 °C**）

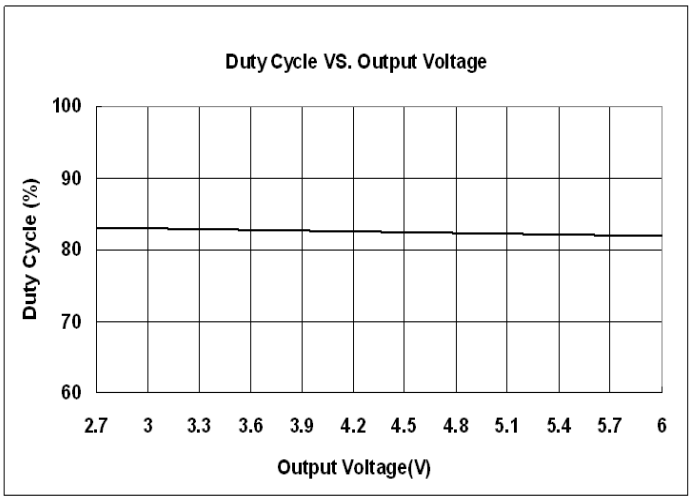




（7）Oscillation frequency VS. Output Voltage

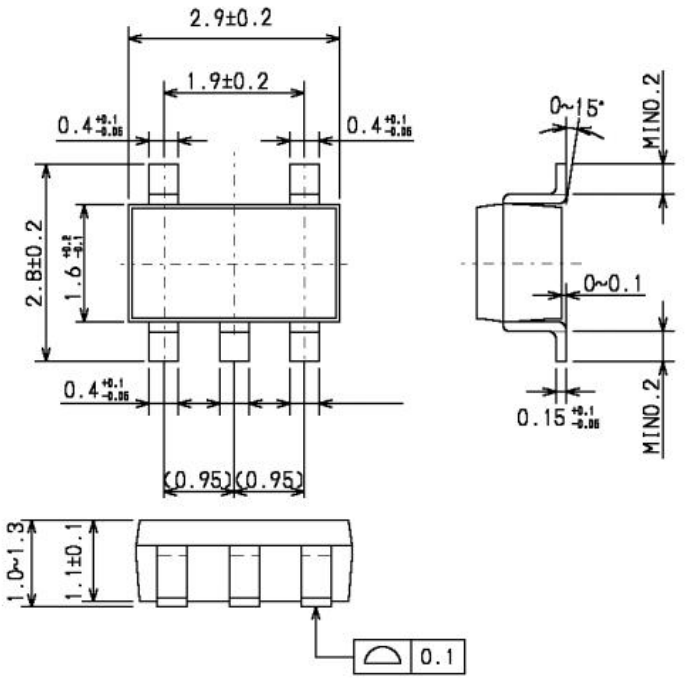


（8）Duty Cycle VS. Output Voltage（**Ta = 25 °C**）

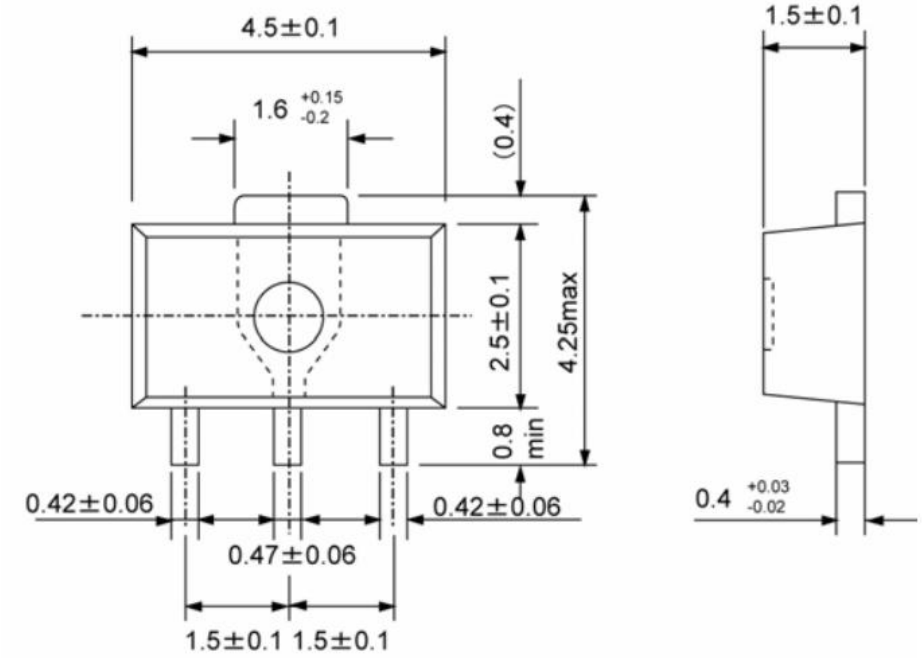


Packaging Information:

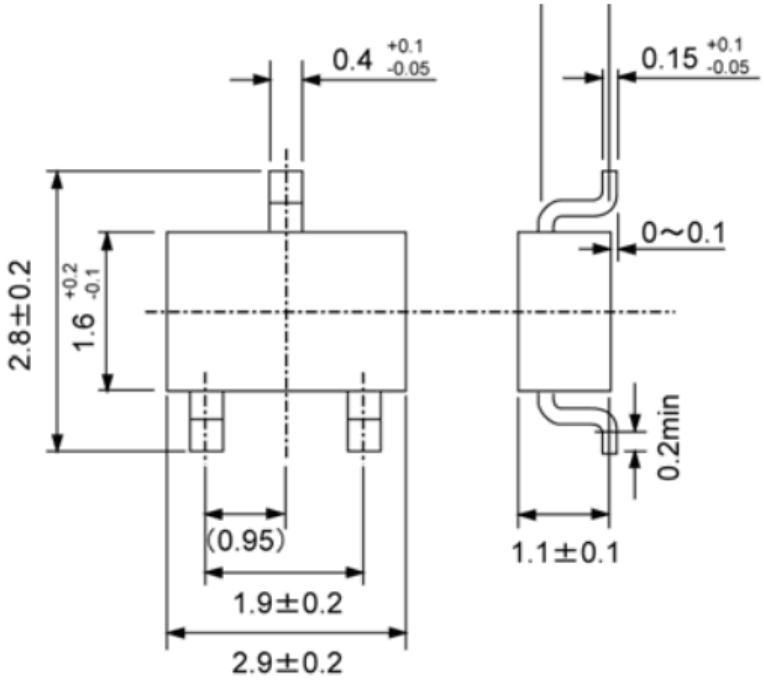
● SOT23-5



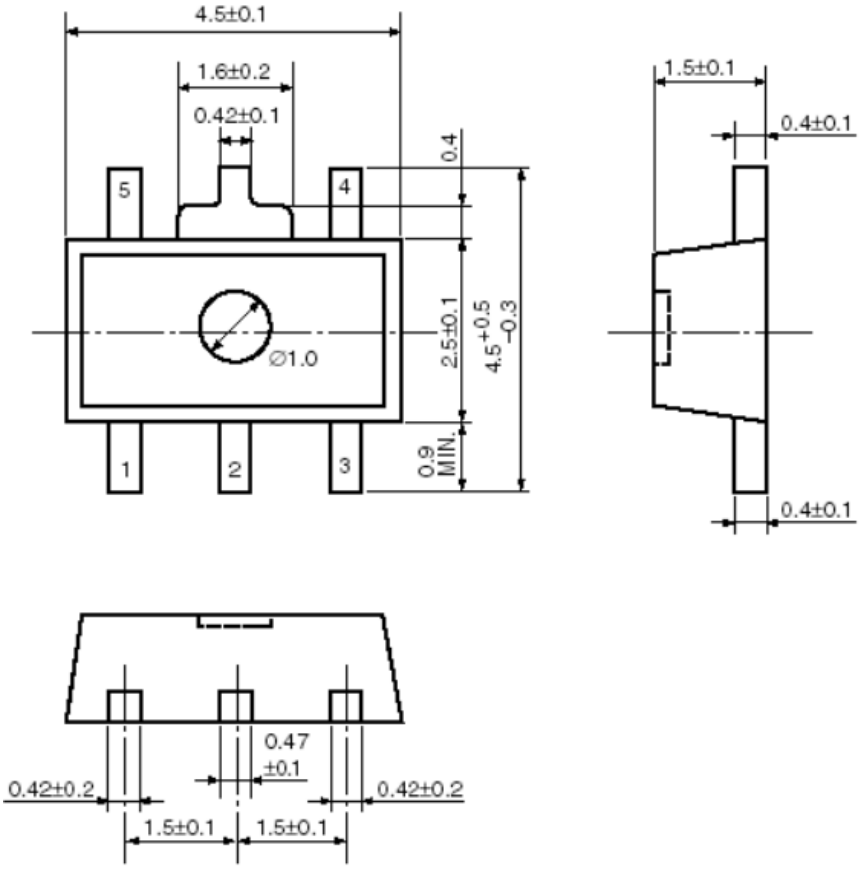
● SOT89-3



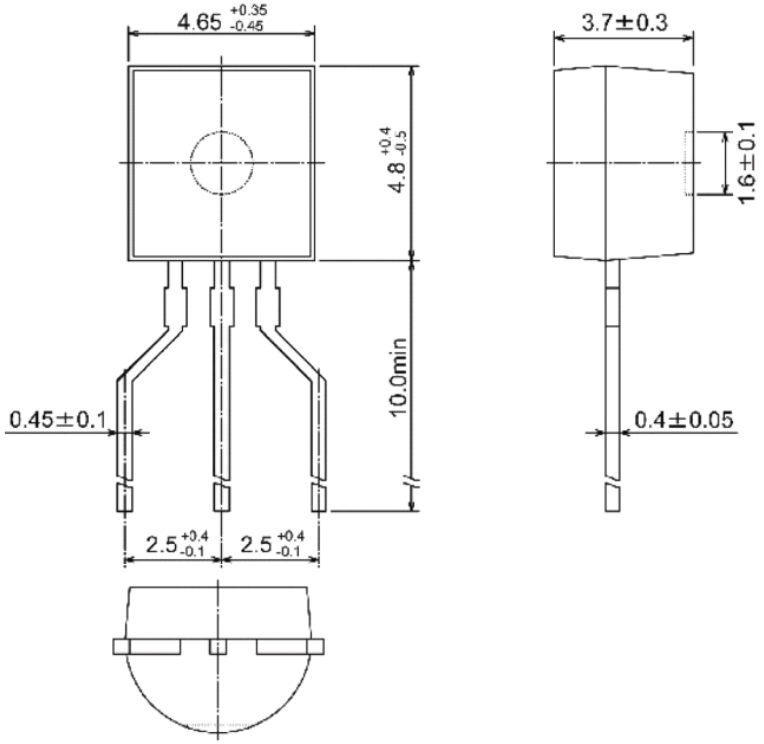
● SOT23-3



● SOT89-5



● TO92


4.65 +0.35 -0.45
3.7±0.3
4.8 +0.4 -0.5
1.6±0.1
10.0min
0.45±0.1
0.4±0.05
2.5 +0.4 -0.1
2.5 +0.4 -0.1