



PFM Step-up DC/DC 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 ME2108 with only three external components. Also available is a CE(chip enable) function that reduce power dissipation During shut-down mode. ME2108 is suitable for use with battery-powered instruments with low noise and low supply current.

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

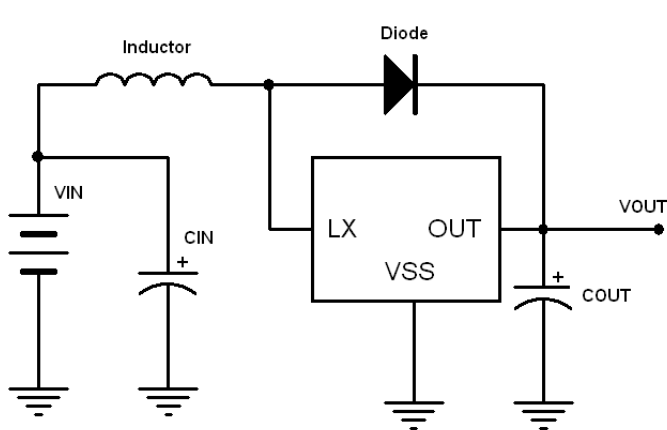
Features

- 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: $\pm 2.5\%$
- Output Current: If $V_{IN}=3.0V$ and $V_{OUT}=5.0V$, then $I_{OUT}=400mA$
- Low start voltage: $\leq 0.9V$ (at $I_{OUT}=1mA$)
- Maximum oscillator frequency: 180KHz(TYP.)
- High Efficiency: 85%(TYP.)

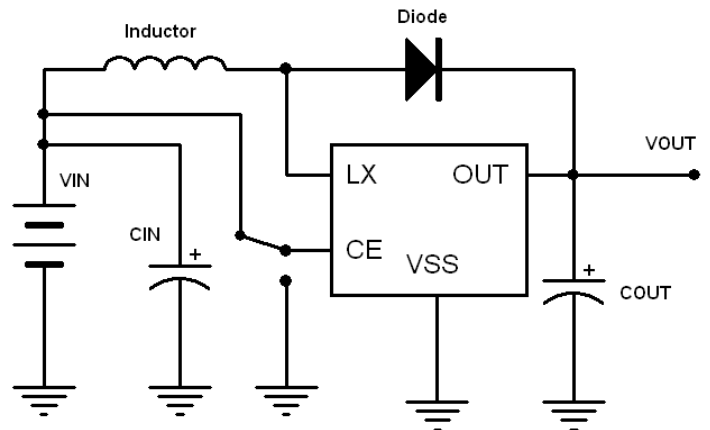
Package

- 3-pin: SOT23、SOT23-3、SOT89-3、TO92
- 5-pin: SOT23-5

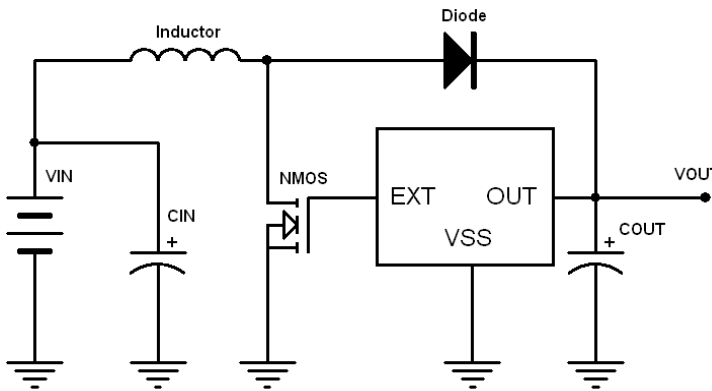
Typical Application Circuit



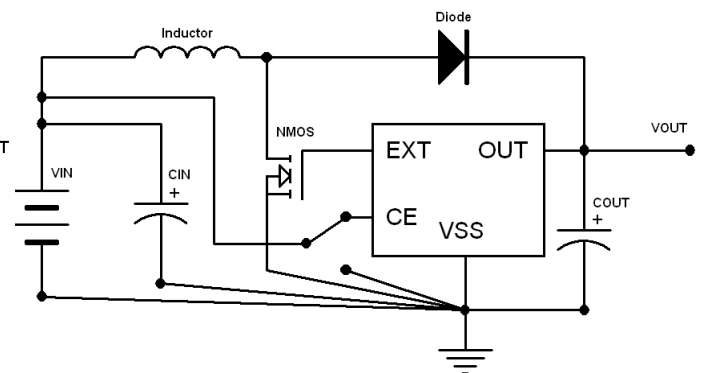
For use build in transistor



For use chip enable



For use external transistor

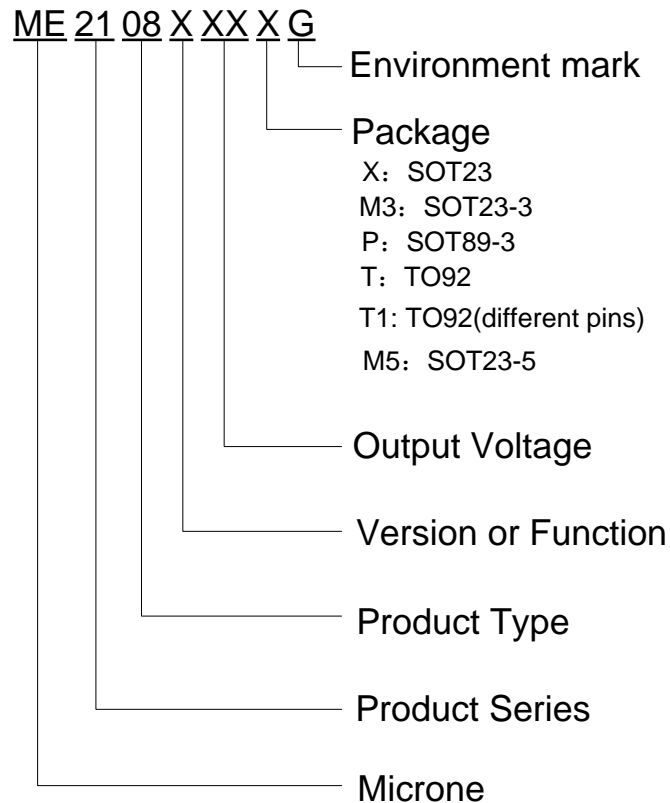


For use external transistor&chip enable

Components:

- Inductor: 33uH(Sumida)
- Diode: IN5817、IN5819
- Capacitor: 47uF/16V(Tantalum Capacitor)
- NMOS: MEM2302、AAT9460、XP151、XP161

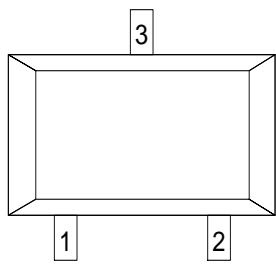
Selection Guide



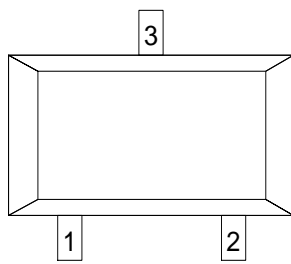
Product series	Switch Transistor	CE Function	Features	Voltage	Package
ME2108A27TG	Build in Transistor	No	Lx	2.7	TO-92
ME2108A28PG	Build in Transistor	No	Lx	2.8	SOT89-3
ME2108A30M3G	Build in Transistor	No	Lx	3.0	SOT23-3
ME2108A33T1G	Build in Transistor	No	Lx	3.3	TO-92(different pins)
ME2108B33M3G	External Transistor	No	Ext	3.3	SOT23-3
ME2108C36M5G	Build in Transistor	Yes	Lx	3.6	SOT23-5
ME2108D50M5G	External Transistor	Yes	Ext	5.0	SOT23-5
ME2108F33M5G	External Transistor	Yes	Ext	3.3	SOT23-5

NOTE: At present ,there are nine kinds of voltage value: 2.7V、2.8V、3.0V、3.3V、3.6V、4.0V、4.5V、5.0V、5.6V。 If you need other voltage and package, please contact our sales staff。

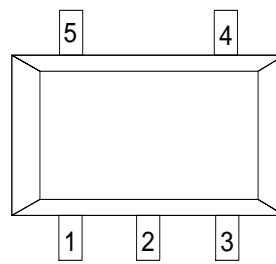
Pin Configuration



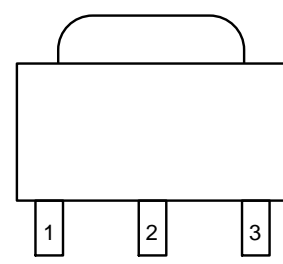
SOT23



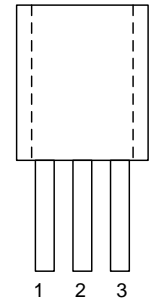
SOT23-3



SOT23-5



SOT89-3



TO-92

ME2108AXX

PIN Number				Pin Name	Function
SOT23/SOT23-3	SOT89-3	TO92	TO92(T1)		
1	1	1	1	Vss	Ground
3	2	2	3	Vout	Output voltage monitor, IC internal power supply
2	3	2	2	Lx	Switch

ME2108BXX

PIN Number			Pin Name	Function
SOT23	SOT23-3	SOT89-3		
1	1	1	Vss	Ground
3	3	2	Vout	Output voltage monitor, IC internal power supply
2	2	3	Ext	External switch transistor drive

ME2108CXX

PIN Number		Pin Name	Function
SOT23-5			
4		Vss	Ground
2		Vout	Output voltage monitor, IC internal power supply
5		Lx	Switch
1		CE	Chip enable
3		NC	NC

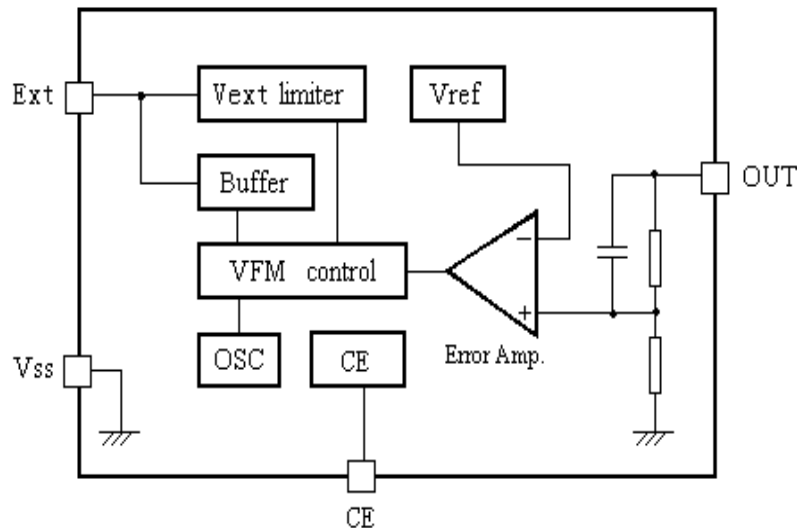
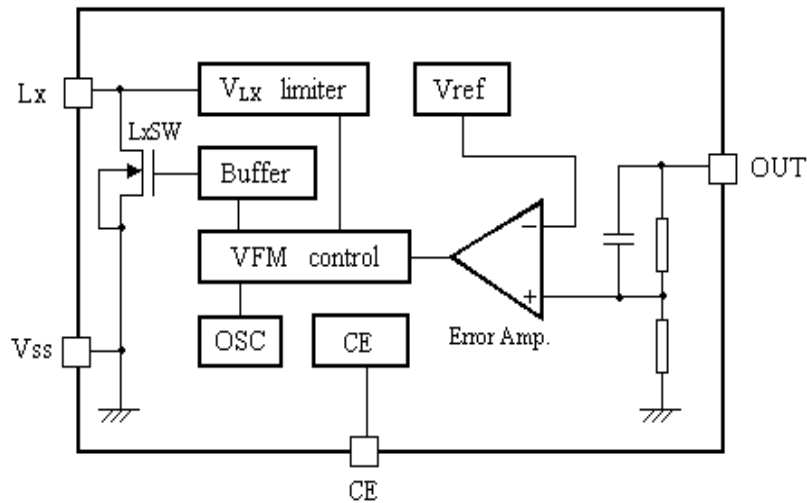
ME2108DXX/

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

ME2108FXX

PIN Number	Pin Name	Function
SOT23-5		
1	FB	Feed Back
2	Vdd	Input voltage pin
3	NC	NC
4	Vss	Ground
5	EXT	External switch transistor drive

Block Diagram



Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Vdd 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
Continuous Total Power Dissipation	SOT23	Pd	0.38	W
	SOT23-3		0.54	
	SOT23-5		0.6	
	SOT89-3		1.25	
	TO92		0.83	
Thermal resistance (Junction to air)	SOT23	θ_{JA}	328	°C/W
	SOT23-3		230	
	SOT23-5		210	
	SOT89-3		100	
	TO92		150	
Operating Ambient Temperature		T_{Opr}	-25~+85	°C
Maximum junction temperature		T_J	-40~+150	°C
Storage Temperature		T_{stg}	-55~+150	°C
Soldering temperature and time		T_{solder}	260°C, 10s	

Electrical Characteristics

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

ME2108Axx/Cxx $F_{osc}=180kHz$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{OUT}	Output Voltage		$V_{out} \times 0.975$	V_{out}	$V_{out} \times 1.025$	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	$I_{OUT}=1mA$, $V_{IN}: 2 \rightarrow 0V$		0.45		V
I_{DD1}	Supply Current 1	No external component $V_{out}=V_{out} \times 0.95$,		50		μA
I_{DD2}	Supply Current 2	$V_{out}=V_{out}+0.5V$		9		μA
I_{LX}	Lx Switching Current	$V_{LX}=0.4V$, $V_{out}=V_{out} \times 0.95$		360		mA
I_{LXleak}	Lx Leakage Current	$V_{out}=V_{LX}=6V$			0.5	μA
F_{osc}	Oscillation Frequency	$V_{out}=\text{set } V_{out} \times 0.95$		180		kHz
Maxdty	Duty Ratio	on(V_{LX} “L”)side		84		%
EFFI	Efficiency			85		%

ME2108Bxx/Dxx $F_{osc}=180kHz$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{OUT}	Output Voltage		$V_{out} \times 0.975$	V_{out}	$V_{out} \times 1.025$	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	$I_{OUT}=1mA$, $V_{IN}: 2 \rightarrow 0V$		0.45		V
I_{DD1}	Supply Current 1	No external component $V_{out}=V_{out} \times 0.95$,		80		μA
I_{DD2}	Supply Current 2	$V_{out}=V_{out}+0.5V$		12		μA
I_{LX}	Lx Switching Current	$V_{LX}=0.4V$, $V_{out}=V_{out} \times 0.95$		360		mA
I_{LXleak}	Lx Leakage Current	$V_{out}=V_{LX}=6V$			0.5	μA
F_{osc}	Oscillation Frequency	$V_{out}=\text{set } V_{out} \times 0.95$		180		kHz
Maxdty	Duty Ratio	on(V_{LX} “L”)side		84		%
EFFI	Efficiency			85		%

ME2108F33 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	$I_{OUT}=1mA$, $V_{IN}: 0 \rightarrow 2V$		0.8	0.9	V
V_{hold}	Oscillation Hold Voltage	$I_{OUT}=1mA$, $V_{IN}: 2 \rightarrow 0V$		0.45		V
I_{DD1}	Supply Current 1	No external component $V_{out}=V_{out} \times 0.95$,		80		μA
I_{DD2}	Supply Current 2	$V_{out}=V_{out}+0.5V$		10		μA
I_{LX}	Lx Switching Current	$V_{LX}=0.4V$, $V_{out}=V_{out} \times 0.95$		360		mA
I_{LXleak}	Lx Leakage Current	$V_{out}=V_{LX}=6V$			0.5	μA
F_{osc}	Oscillation Frequency	$V_{out}=\text{set } V_{out} \times 0.95$		180		kHz
Maxdty	Duty Ratio	on(V_{LX} "L")side		84		%
EFFI	Efficiency			85		%

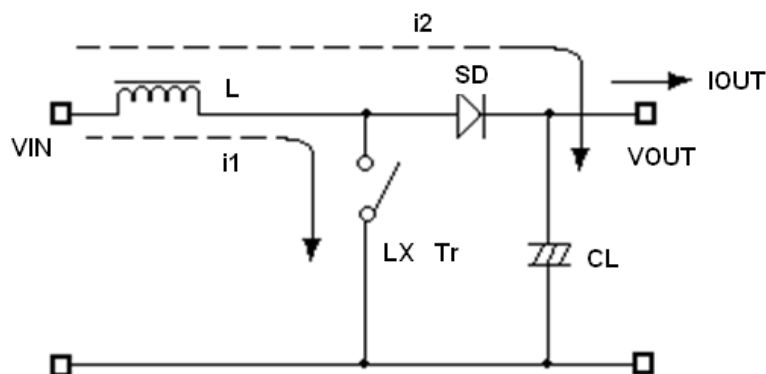
Note: 1、Diode use Schottky diode such as IN5817 or IN5819 (forward voltage drop:0.2V)

2、Inductor: 33 μ H ($r < 0.5\Omega$)

3、Capacitor: Tantalum type 100 μ F

Operation Description

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

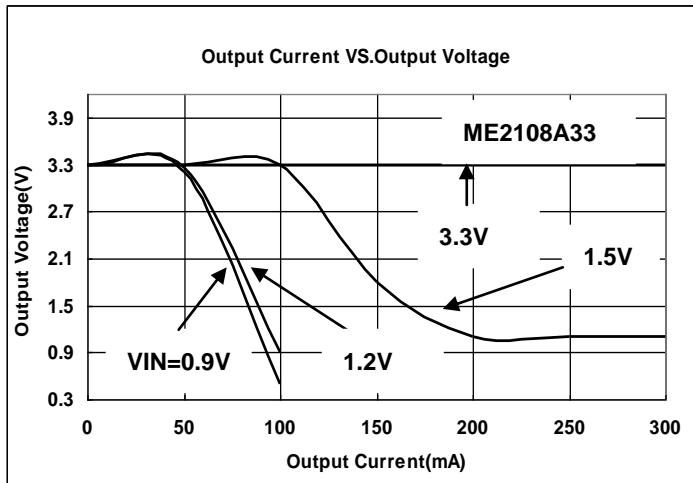
Selection of Peripheral Components and Application Notes

- Power source for battery-powered equipment

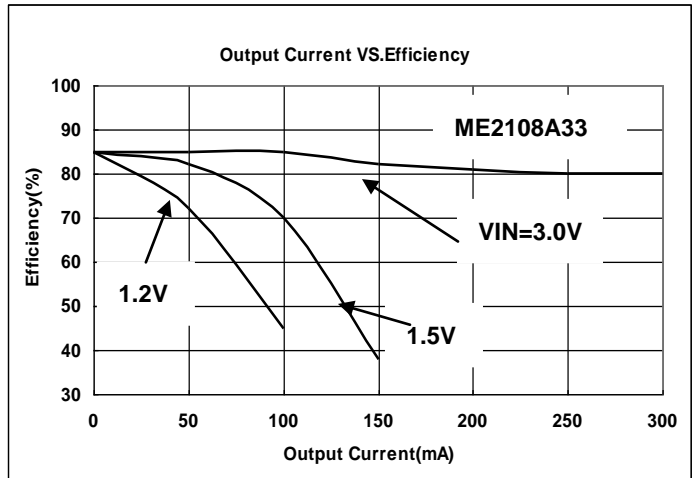
- Power source for wireless mouse, wireless keyboard, toys, cameras, camcorders, VCRs, PDAs, and hand-held communication equipment
- Power source for appliances which require higher cell voltage than that of batteries used in the appliances
- Peripheral components should be selected carefully because they are greatly affect the performances of ME2108:
 - ✧ 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 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.

Type Characteristics

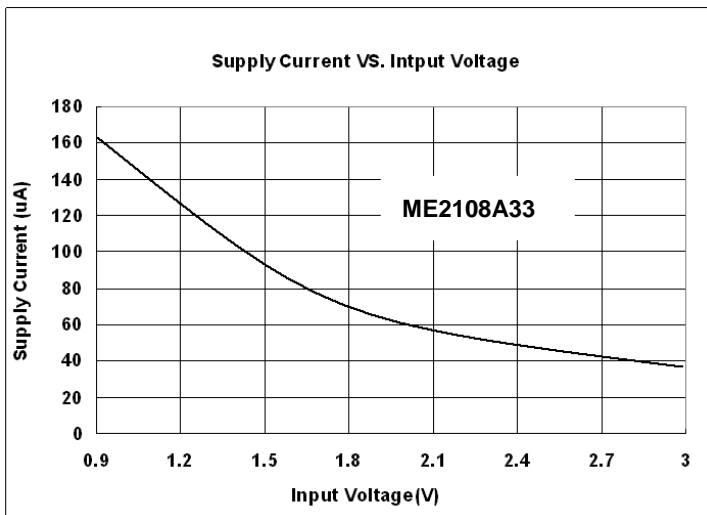
(1) Output Current VS. Output Voltage ($T_a = 25^\circ\text{C}$)



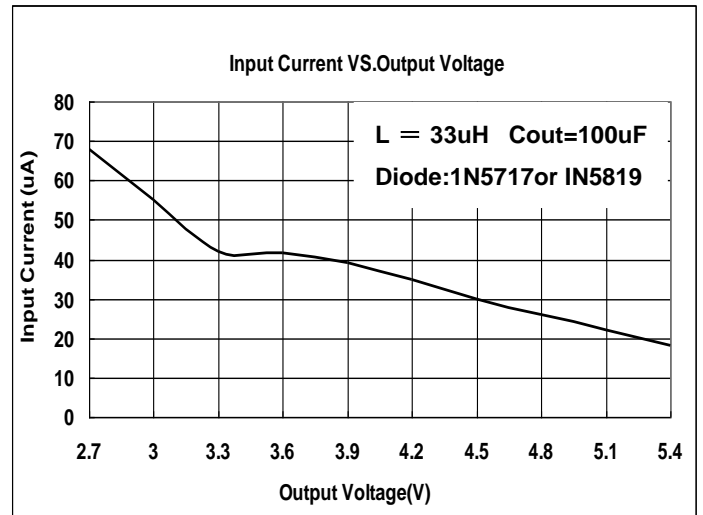
(2) Output Current VS. Efficiency ($T_a = 25^\circ\text{C}$)



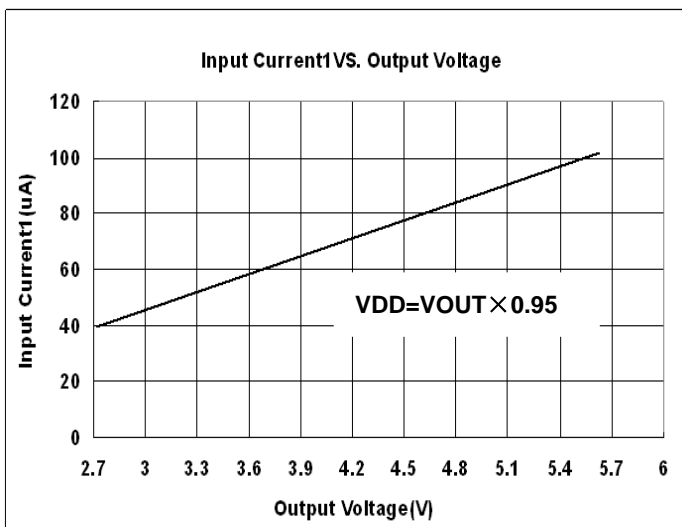
(3) Supply Current VS. Input Voltage ($T_a = 25^\circ\text{C}$)



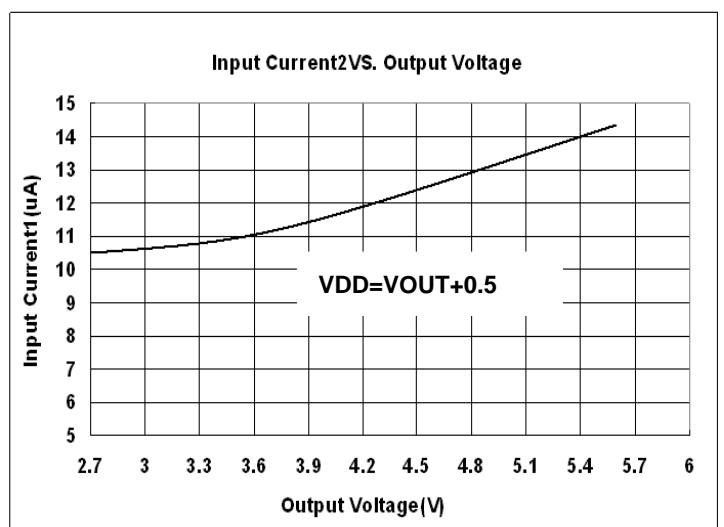
(4) Input Current VS. Output Voltage ($T_a = 25^\circ\text{C}$)



(5) Input Current1 VS. Output Voltage ($T_a = 25^\circ\text{C}$)

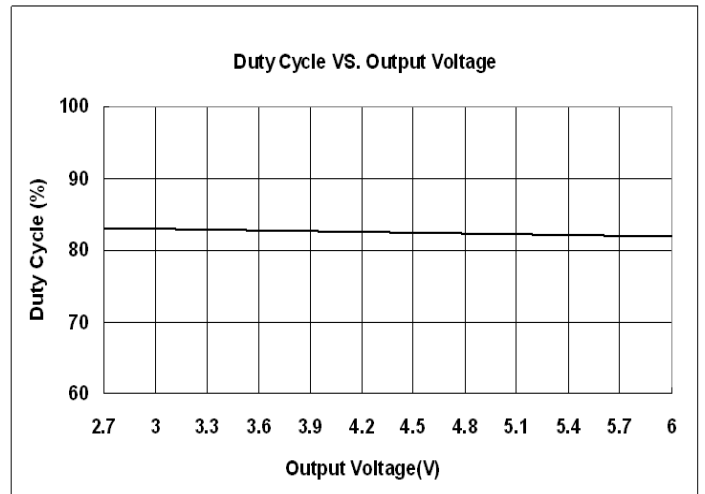
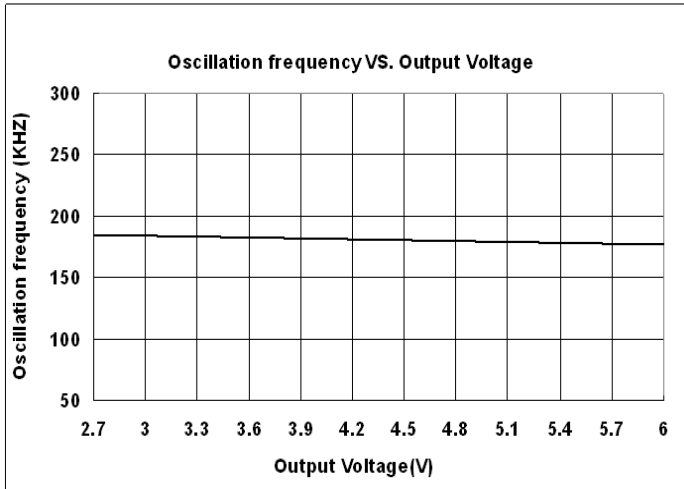


(6) Input Current2 VS. Output Voltage ($T_a = 25^\circ\text{C}$)



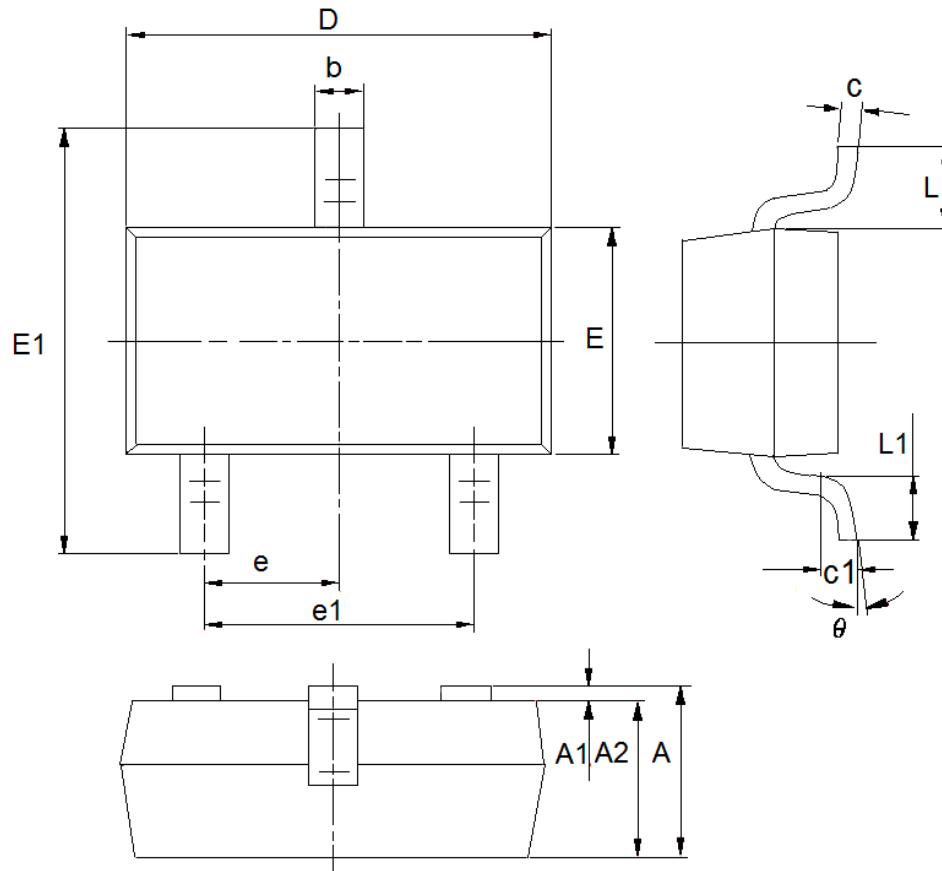
(7) Oscillation frequency VS. Output Voltage

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



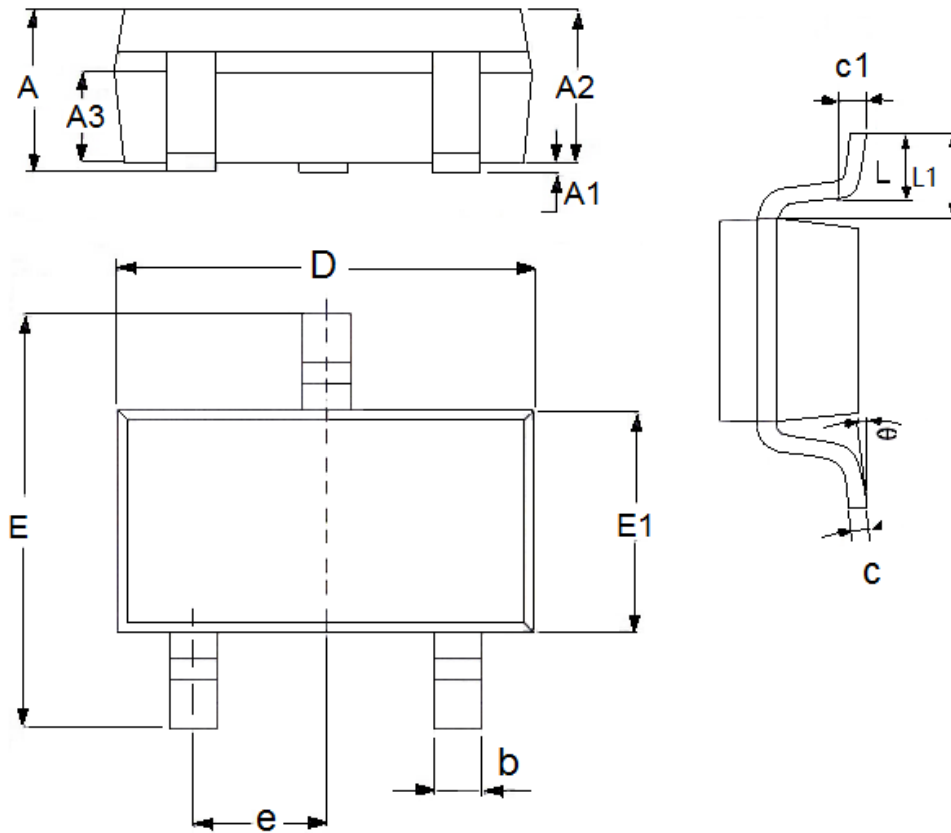
Packaging Information

- Packaging Type: SOT23



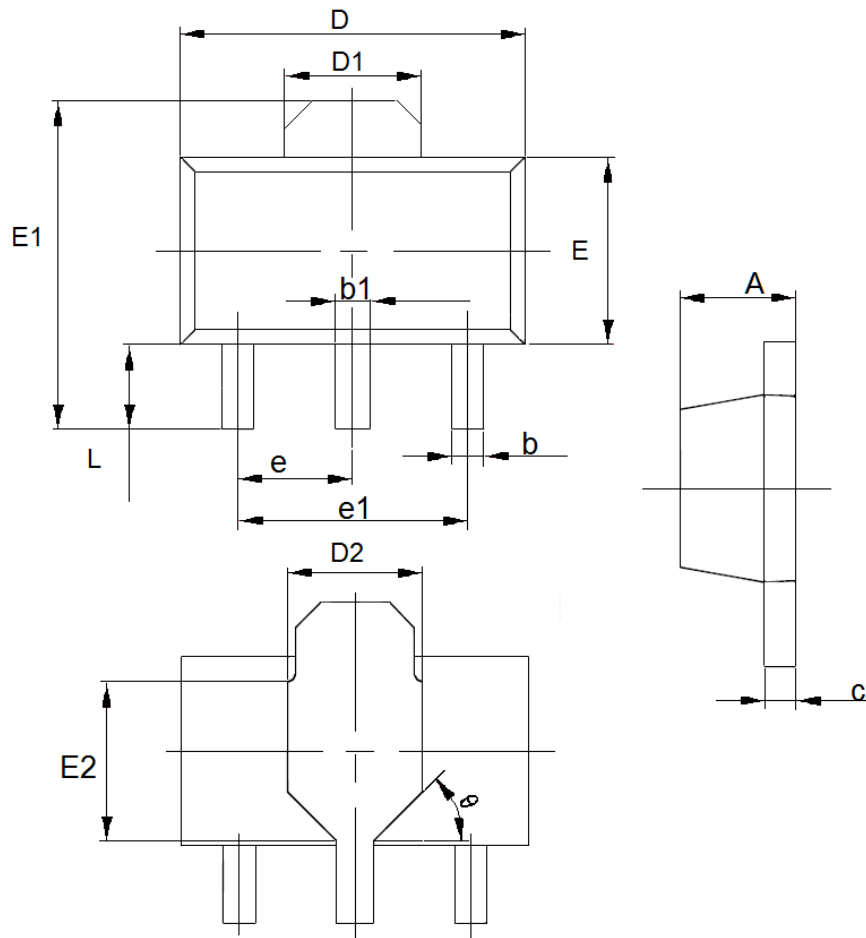
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.9	1.15	0.0354	0.0453
A1	0	0.14	0.0000	0.0055
A2	0.9	1.05	0.0354	0.0413
b	0.28	0.52	0.0110	0.0205
c	0.07	0.23	0.0028	0.0091
D	2.8	3.0	0.1102	0.1181
e1	1.8	2.0	0.0709	0.0787
E	1.2	1.4	0.0472	0.0551
E1	2.2	2.6	0.0866	0.1024
e	0.95(TYP)		0.0374(TYP)	
L	0.55(TYP)		0.0217(TYP)	
L1	0.25	0.55	0.0098	0.0217
theta	0	8°	0.0000	8°
c1	0.25(TYP)		0.0098(TYP)	

● Packaging Type: SOT23-3



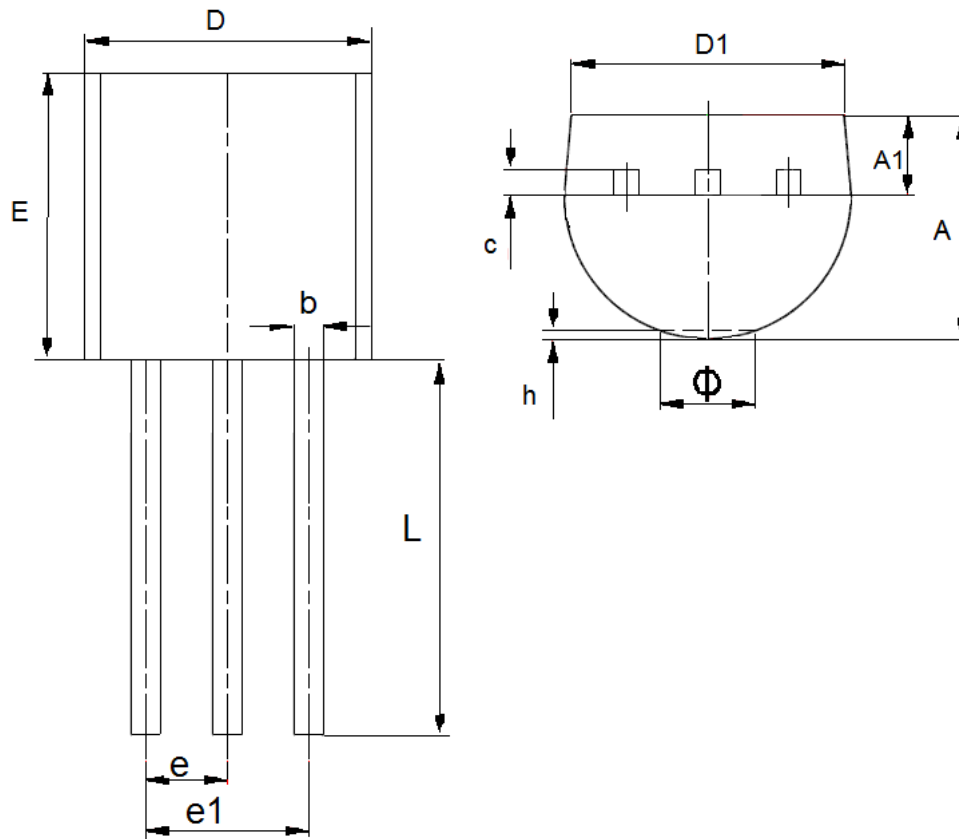
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.8	3.1	0.1102	0.1220
E	2.6	3.1	0.1023	0.1220
E1	1.5	1.8	0.0591	0.0709
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6	0.0098	0.0236
L1	0.59(TYP)		0.0232(TYP)	
θ	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

● Packaging Type: SOT89-3



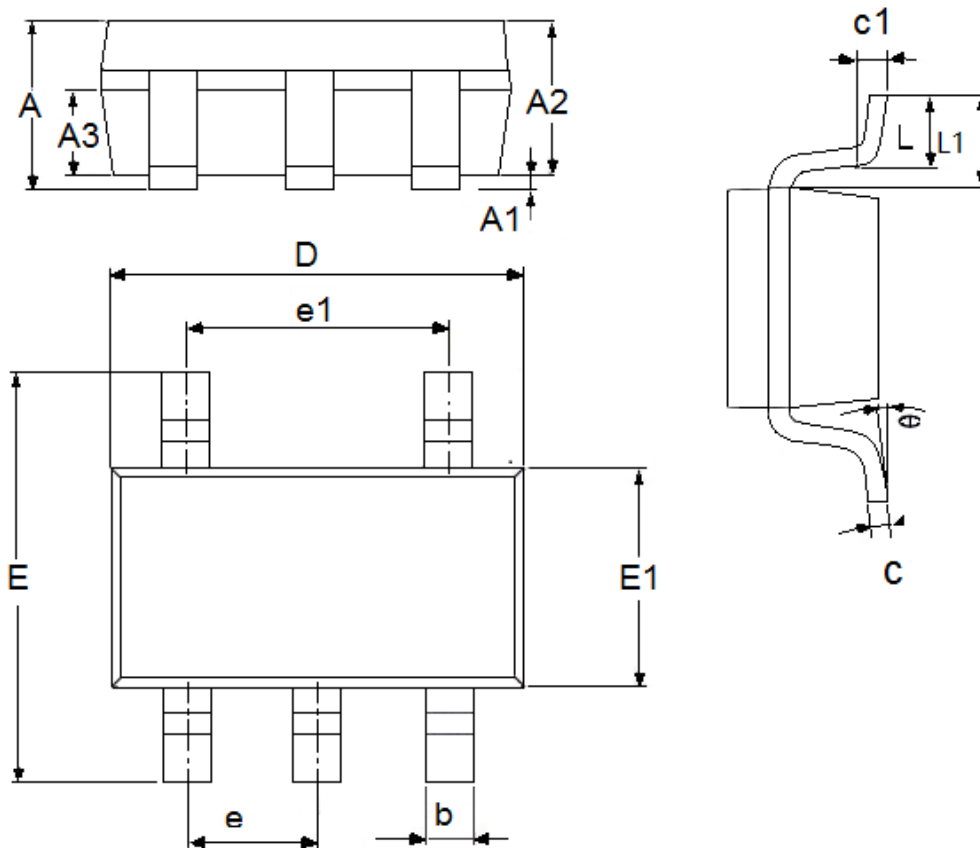
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.4	1.6	0.0551	0.0630
b	0.32	0.52	0.0126	0.0205
b1	0.4	0.58	0.0157	0.0228
c	0.35	0.45	0.0138	0.0177
D	4.4	4.6	0.1732	0.1811
D1	1.55(TYP)		0.061(TYP)	
D2	1.75(TYP)		0.0689(TYP)	
e1	3.0(TYP)		0.1181(TYP)	
E	2.3	2.6	0.0906	0.1023
E1	3.94	4.4	0.1551	0.1732
E2	1.9(TYP)		0.0748(TYP)	
e	1.5(TYP)		0.0591(TYP)	
L	0.8	1.2	0.0315	0.0472
θ	45°		45°	

- Packaging Type: TO92



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	3.3	3.7	0.1299	0.1457
A1	1.1	1.4	0.0433	0.0551
b	0.38	0.55	0.015	0.0217
c	0.36	0.51	0.0142	0.0201
D	4.3	4.7	0.1693	0.185
D1	3.43	—	0.135	—
E	4.3	4.7	0.1693	0.185
e	1.27TYP		0.05TYP	
e1	2.44	2.64	0.0961	0.1039
L	14.1	14.5	0.5551	0.5709
h	0	0.38	0	0.015
Φ	—	1.6	—	0.063

● Packaging Type: SOT23-5



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.23	0.0039	0.0091
D	2.82	3.05	0.1110	0.1201
e1	1.9(TYP)		0.0748(TYP)	
E	2.6	3.05	0.1024	0.1201
E1	1.5	1.75	0.0512	0.0689
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6	0.0098	0.0236
L1	0.59(TYP)		0.0232(TYP)	
theta	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

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