



PFM Step-up DC/DC Converter

● Features

- Minimal Number of External Components
(Only an Inductor, a Diode, and a Capacitor)
- Ultra Low Input Current (5 μ A at Switch Off)
- $\pm 2\%$ High Output Voltage Accuracy
- Low Ripple and Low Noise
- Low Start-up Voltage, 0.85V at 1mA
- 85% Efficiency with Low Cost Inductor
- SOT-89 , SOT-23-3L Small Packages

● Applications

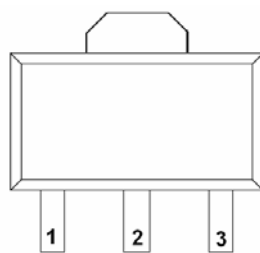
- Power source for battery-powered equipment
- Power source for cameras, camcorders, VCRs, PDAs, pagers, electronic data banks, and hand-held communication equipment
- Power source for applications, which require higher voltage than that of batteries used in the appliances

● General Description

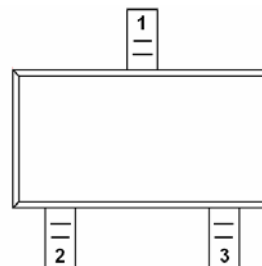
The FS1501 Series are PFM Step-up DC/DC IC with ultra low supply current by CMOS process and suitable for use with battery-powered instruments.

The FS1501 IC consists of an oscillator, a PFM control circuit, a driver transistor (LX switch), a reference voltage unit, an error amplifier, resistors for voltage detection, and a LX switch protection circuit. A low ripple and high efficiency step-up DC/DC converter can be constructed of this FS1501 IC with only three external components.

● Pin Configurations



SOT89-3L



SOT23

● Pin Description

| Pin Port | SOT89-3L (A) | SOT89-3L (B) | SOT-23 (A) | SOT23 (B) |
|----------|--------------|--------------|------------|-----------|
| ① | GND | GND | GND | VOUT |
| ② | VOUT | VOUT | LX | GND |
| ③ | LX | EXT | VOUT | EXT |

| | |
|-------------|-------------------|
| Gnd | Ground |
| Vout | Output |
| Lx | Pin for Switching |
| Ext | External |



● Ordering Information

FS1501-①②③④⑤

| Designator | Symbol | Description |
|------------|--------------------------|--|
| ①② | Output Detection Voltage |18=1.8V, 25=2.5V, 30=3.0V 33=3.3V%0.1V step) |
| ③ | Pin Description | A: SOT89-3L (A) ; SOT23-3L (A) |
| | | B: SOT89-3L (B) ; SOT23-3L (B) |
| ④⑤ | Package Type: | SI: SOT23、SM:SOT89-3L |

● Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Units |
|-----------------------------------|------------------|-------------|-------|
| Output Voltage | V _{OUT} | -0.3 to +10 | V |
| LX Pin Voltage | V _{LX} | -0.3 to +10 | V |
| EN Pin Voltage | EN | -0.3 to +10 | V |
| LX Pin Output Current | I _{LX} | 1 | A |
| Power Dissipation, PD @ TA = 25°C | SOT-89 | 500 | mW |
| | SOT23-3L | 250 | |
| Operating Temperature Range | Topr | -40 to 85 | °C |
| Storage Temperature Range | Tstg | -40 to 125 | °C |

● Electrical Characteristics @ (T_A=25°C, unless otherwise specified)

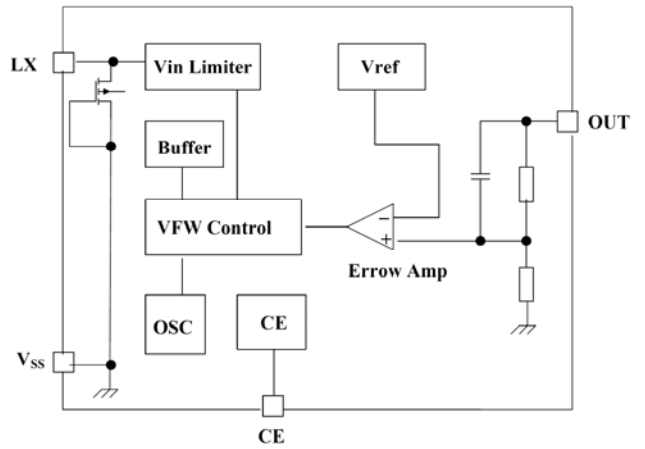
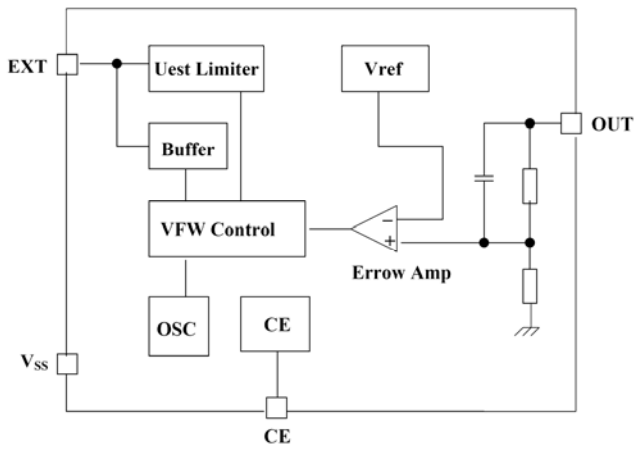
| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|-------------------------|------------------------------|--|------|------|-----|-------|
| Output Voltage Accuracy | ΔV _{OUT} | | -2 | -- | +2 | % |
| Input Voltage | V _{IN} | | -- | -- | 10 | V |
| Start-up Voltage | V _{ST} | I _{OUT} = 1mA, V _{IN} : 0 → 2V | -- | 0.85 | 1.0 | V |
| Hold-on Voltage | V _{HO} | I _{OUT} = 1mA, V _{IN} : 2 → 0V | 0.7 | -- | -- | V |
| Efficiency | | | -- | 75 | 85 | % |
| Input Current 1 | V _{OUT} ≤ 3.5V | To be measured at V _{IN} at no load | -- | 30 | 40 | μA |
| | 3.5V < V _{OUT} ≤ 5V | | -- | 50 | 60 | |
| Input Current 2 | V _{OUT} ≤ 3.5V | To be measured at V _{OUT} in switch off condition | -- | 5 | 8 | μA |
| | 3.5V < V _{OUT} ≤ 5V | | -- | 6 | 10 | |
| LX Switch_ ing Current | I _{SWITCHING} | V _{LX} = 0.4V | 100 | 200 | -- | mA |
| EN "H" Level | V _{SH} | V _{IN} = V _{OUT} × 0.9 | 0.75 | -- | -- | V |
| EN "L" Level | V _{SL} | V _{IN} = V _{OUT} × 0.9 | -- | -- | 0.3 | V |
| EN "H" Input Current | I _{SH} | EN = 10 | -- | -- | 0.1 | μA |
| EN "L" Input Current | I _{SL} | EN = 0V | -0.5 | -- | 0.1 | μA |
| Maximum Oscillator | F _{MAX} | | -- | 100 | -- | KHz |
| Oscillator Duty Cycle | D _{OSC} | On (V _{LX} "L") side | 65 | 75 | 85 | % |

NOTE:

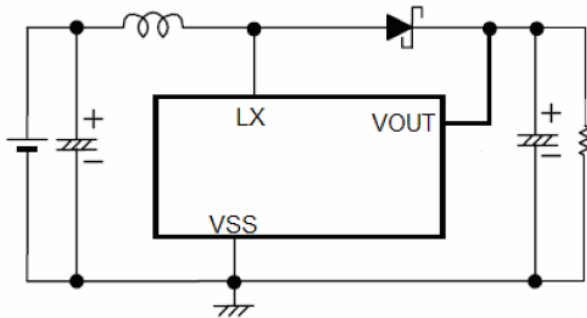
1. V_{OUT(T)} = Specified output Voltage.
2. Unless otherwise provided, V_{IN} = 1.8V, V_{SS} = 0V, I_{OUT} = 10mA, TOPT = 25°C
3. Unless otherwise provided, V_{IN} = 3V, V_{SS} = 0V, I_{OUT} = 10mA, TOPT = 25°C



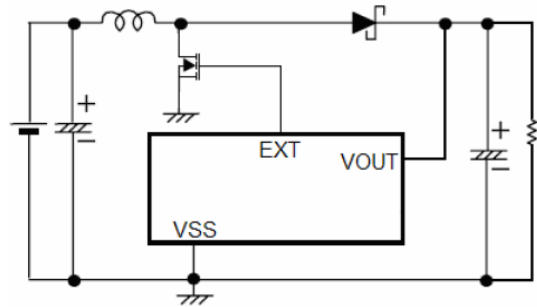
● Typical Block Diagram



● Typical Application Circuit



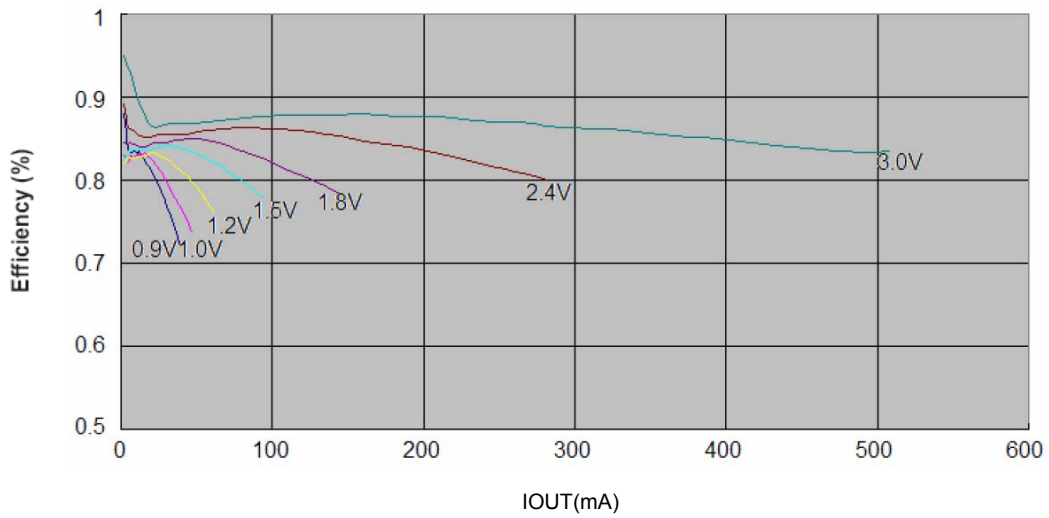
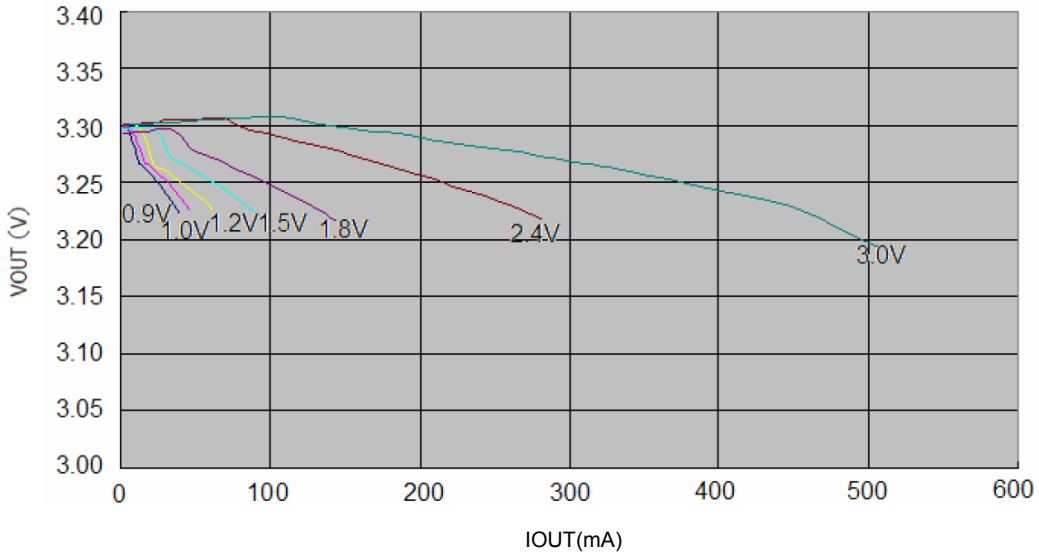
APPLICATION NO.1



APPLICATION NO.2



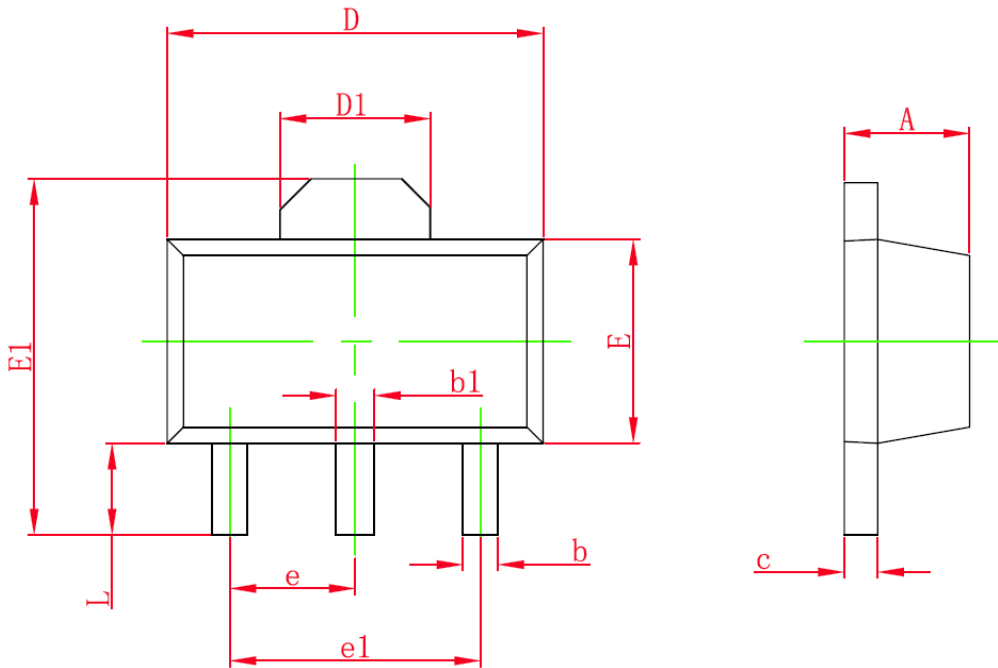
- Typical Performance Characteristics
(For $V_{out} = 3.3V$)





- Package Information

SOT-89-3L PACKAGE OUTLINE DIMENSIONS

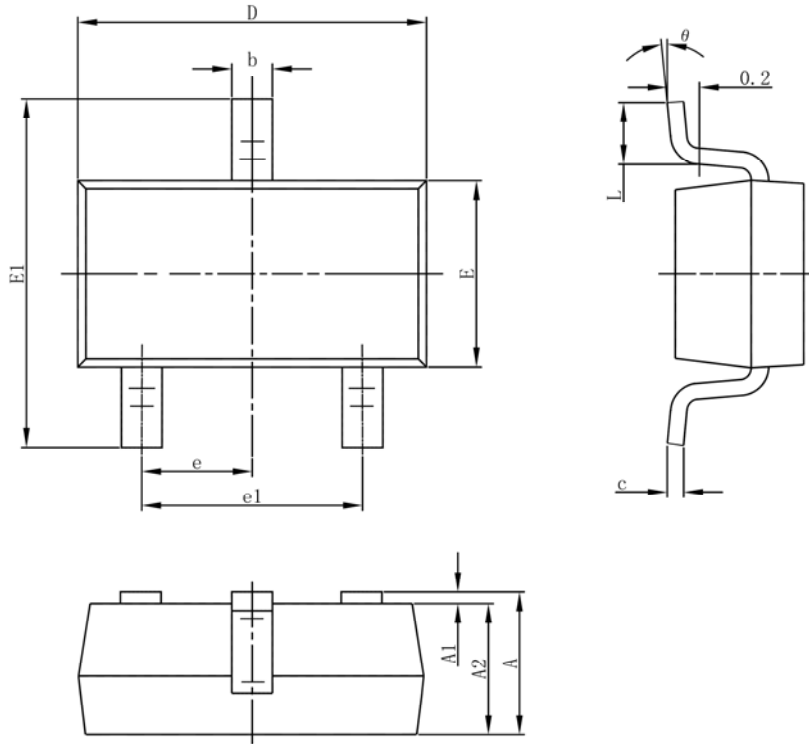


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.400 | 1.600 | 0.055 | 0.063 |
| b | 0.320 | 0.520 | 0.013 | 0.020 |
| b1 | 0.400 | 0.580 | 0.016 | 0.023 |
| c | 0.350 | 0.440 | 0.014 | 0.017 |
| D | 4.400 | 4.600 | 0.173 | 0.181 |
| D1 | 1.550 REF. | | 0.061 REF. | |
| E | 2.300 | 2.600 | 0.091 | 0.102 |
| E1 | 3.940 | 4.250 | 0.155 | 0.167 |
| e | 1.500 TYP. | | 0.060 TYP. | |
| e1 | 3.000 TYP. | | 0.118 TYP. | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |



● Package Information

SOT-23-3L PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |
| UNIT:mm | | | | |