



Step-Up DC-DC Converter

General Description

The KB2301 Series are PFM step-up DC-DC converters with very low ripple noise due to the high operation frequency. The maximum operation frequency is 400KHz.

Only three components are required to realize the conversion from the battery voltage to a selected output voltage.

A driver pin (EXT) is provided for driving external power transistor to extend the output current capability where large current is required.

Enable pin (EN) is also provided so that the circuit can be powered down.

Ordering Information

KB2301 **X** **X** **X** **X**

Package Type:

- T: SOT-23-3
- F: SOT-23-5
- E: SOT-89

Output Voltage:

- 20: 2.0V
- 21: 2.1V
- ...
- 49: 4.9V
- 50: 5.0V

External switch

- E: use external switch
- L: use internal switch

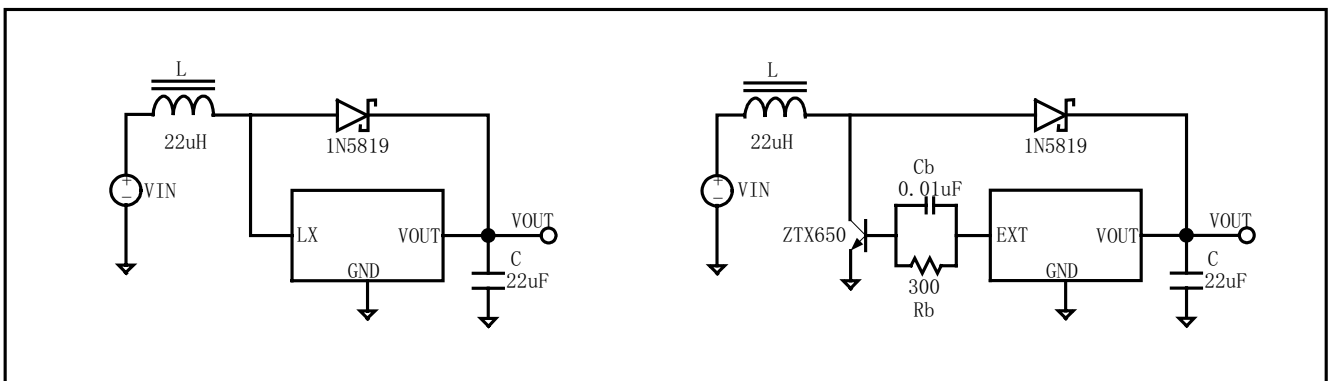
Features

- 400KHz Maximum Operation Frequency
- 2.0V to 5.0V Output Voltage With 0.1V Step
- Low Start-up Voltage: 0.8V at 1mA
- $\pm 2\%$ Output Voltage Accuracy
- Up to 88% Efficiency
- Output current: 300mA at 2.5V input, 3.3V output
- Low Ripple and Low Noise
- Output Current Extendable by External Switch

Applications

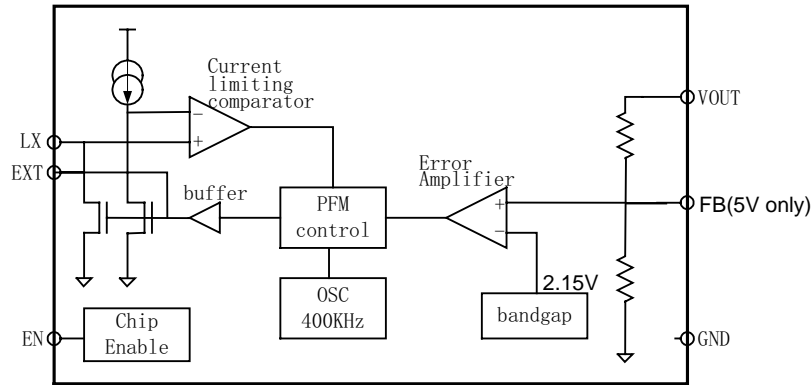
- Power source for applications where a higher voltage than the battery voltage is required
- One to three cell battery devices
- Power source for cameras, camcorders, VCRs, PDAs, pagers and hand held communication instrument

Typical Applications



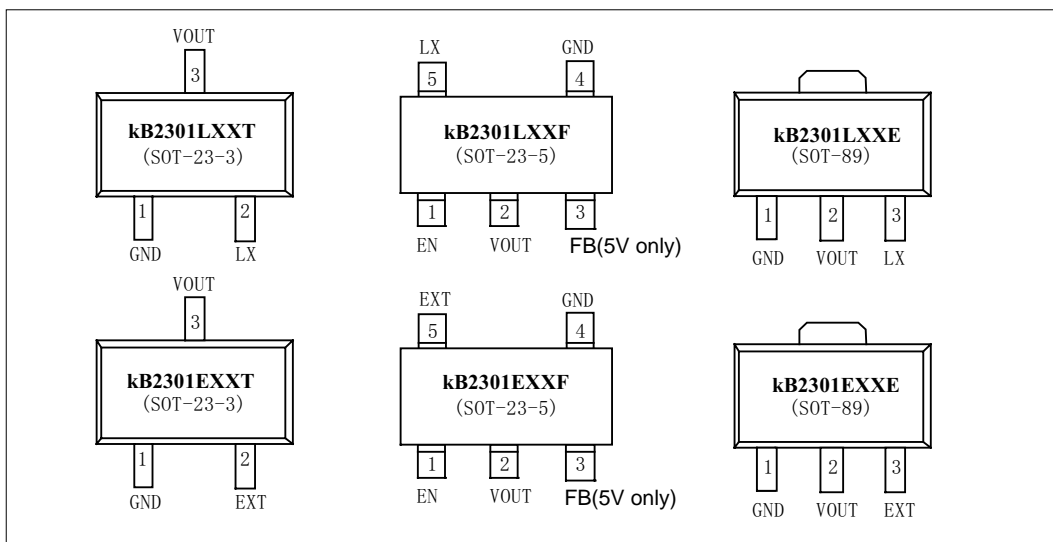


Block Diagram



Pin Assignment

| Pin Name | Part Marking and Package Type | | | | | | Description |
|----------|-------------------------------|----------------------|--------------------|----------------------|----------------------|--------------------|---------------------------------------|
| | KB2301 LXXT SOT-23-3 | KB2301 LXXF SOT-23-5 | KB2301 LXXE SOT-89 | KB2301 EXXT SOT-23-3 | KB2301 EXXF SOT-23-5 | KB2301 EXXE SOT-89 | |
| LX | 2 | 5 | 3 | - | - | - | Switching pin |
| EXT | - | - | - | 2 | 5 | 3 | Buffer output for external transistor |
| VOUT | 3 | 2 | 2 | 3 | 2 | 2 | Output voltage |
| EN | - | 1 | - | - | 1 | - | Chip enable (active high) |
| GND | 1 | 4 | 1 | 1 | 4 | 1 | Ground |
| FB | - | 3 | - | - | 3 | - | 5V only |





Absolute Maximum Ratings

| Type | Symbol | Description | Value | Unit |
|-------------------|-----------|--|---------------|------|
| Voltage | Vmax | Maximum voltage on VOUT and VLX pins | 8 | V |
| | Vmin-max | Voltage range on EXT and EN pins | -0.3-VOUT+0.3 | V |
| Current | ILXmax | Maximum current on LX pin | 1000 | mA |
| | IEXTmax | Maximum current on EXT pin | 100 | mA |
| Power dissipation | Psot-23-3 | Maximum Power dissipation for SOT-23-3 package | 0.25 | W |
| | Psot-23-5 | Maximum Power dissipation for SOT-23-5 package | 0.25 | W |
| | Psot-89 | Maximum Power dissipation for SOT-89 package | 0.5 | W |
| Thermal | Tmin-max | Operation temperature range | -20-85 | °C |
| | Tstorage | Storage temperature range | -40-165 | °C |
| ESD | VESD | ESD voltage for human body mode | 2000 | V |

Electronic Characteristics

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|--------------------------------|------------------|---------------------------------------|-----|-----|------|------|
| Output voltage accuracy | ΔV_{OUT} | | -2 | | 2 | % |
| Maximum input voltage | $V_{IN_{MAX}}$ | | 0.7 | | VOUT | V |
| Start-up voltage | V_{START} | ILOAD=1mA, VIN:0→2V | | | 0.85 | V |
| Hold-on voltage | V_{HOLD} | ILOAD=1mA, VIN:2→0V | 0.6 | | | V |
| Maximum oscillation frequency | F_{MAX} | | 350 | 400 | 450 | KHz |
| Oscillator duty cycle | DC_{OSC} | | 75 | 80 | 85 | % |
| Efficiency | η | | | 85 | 88 | % |
| Current limit | I_{LIMIT} | | 600 | 800 | 1000 | mA |
| Input current at no load | IIN0 | VIN=1.8V VOUT=3.0V | | 20 | | uA |
| | | VIN=1.8V VOUT=5.0V | | | | uA |
| VOUT pin current at switch off | IOUT0 | Drive VOUT pin with voltage VOUT+0.5V | | 6 | 8 | uA |
| Input standby current | IINQ | No load, EN="low" | | | 1 | uA |

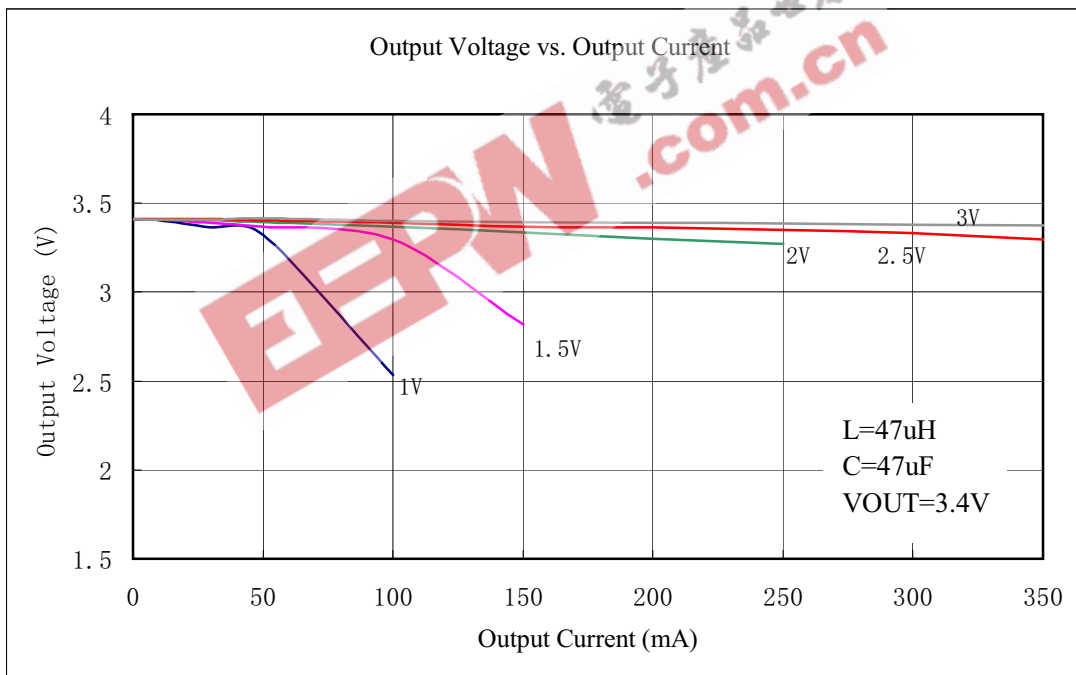
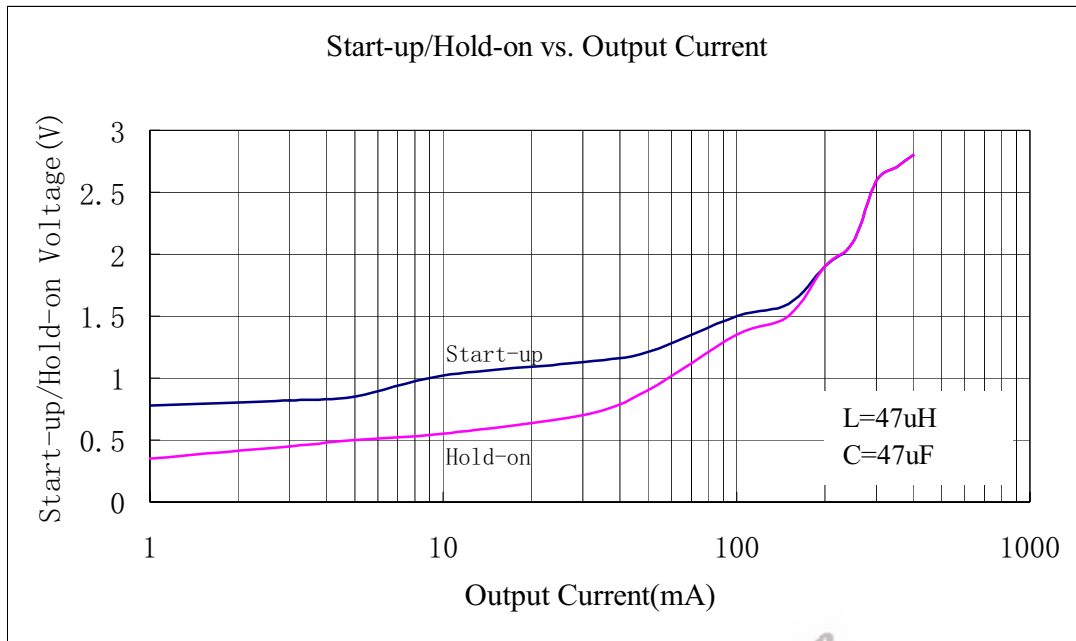


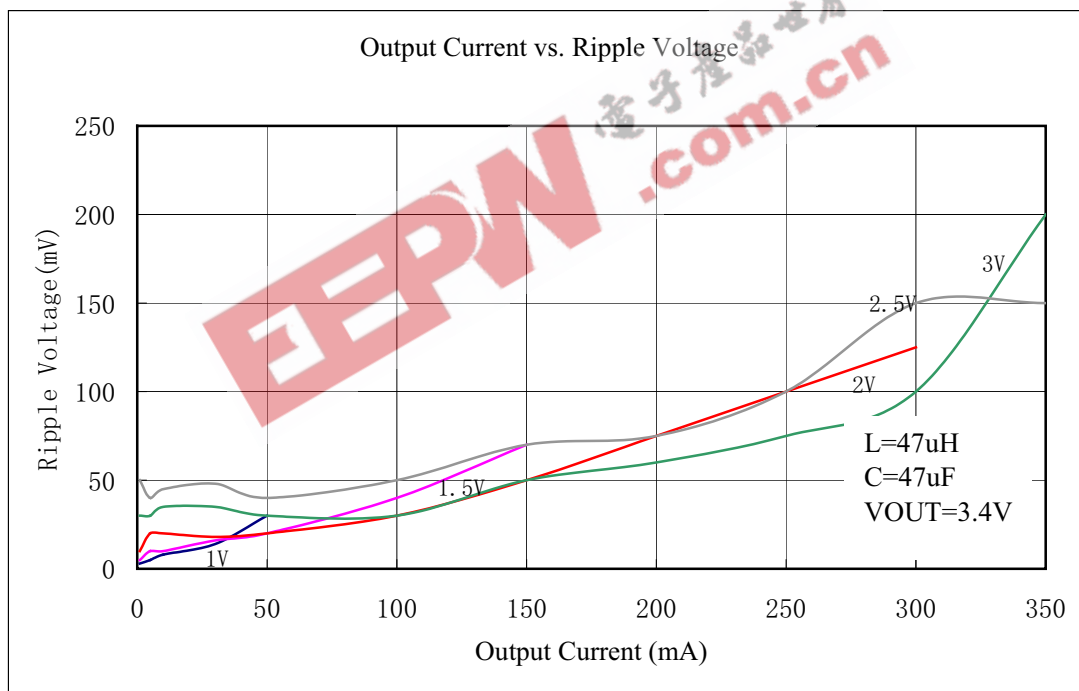
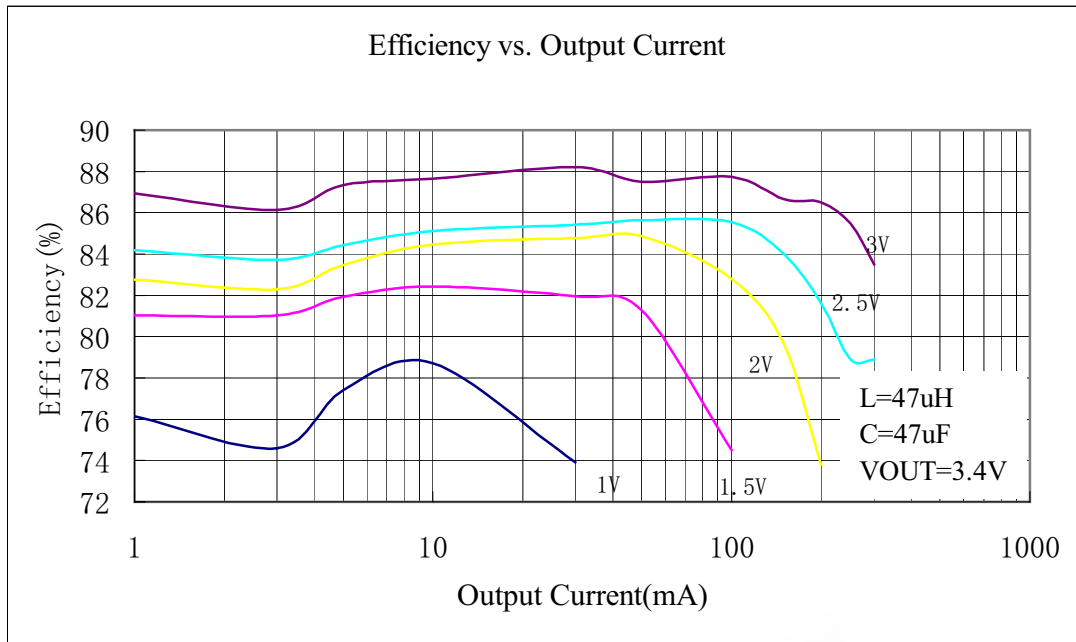
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|-------------------------|--|--|-----------|--|-----|----|
| EN “High” voltage level | | | 0.4*VOOUT | | | V |
| EN “low” level | | | | | 0.2 | V |
| EN “high” input current | | | | | 0.1 | uA |
| EN “low” input current | | | -0.1 | | | uA |
| EXT output current | | | -5 | | 5 | mA |

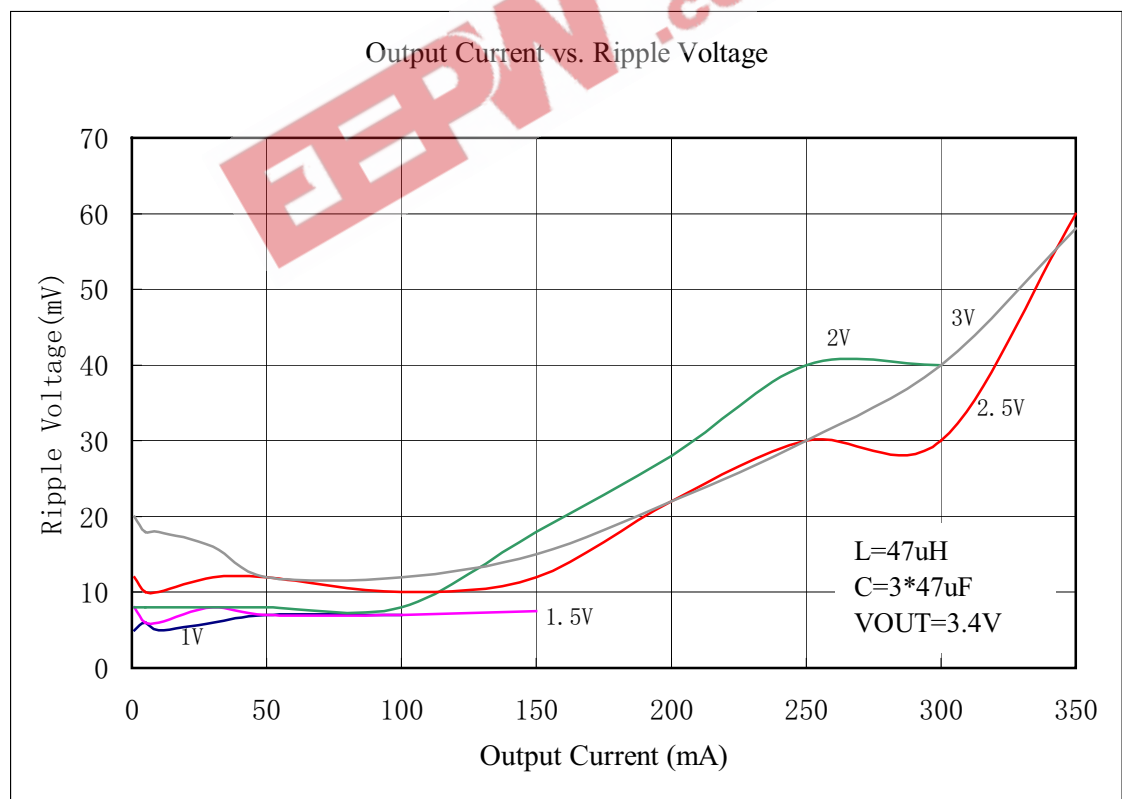
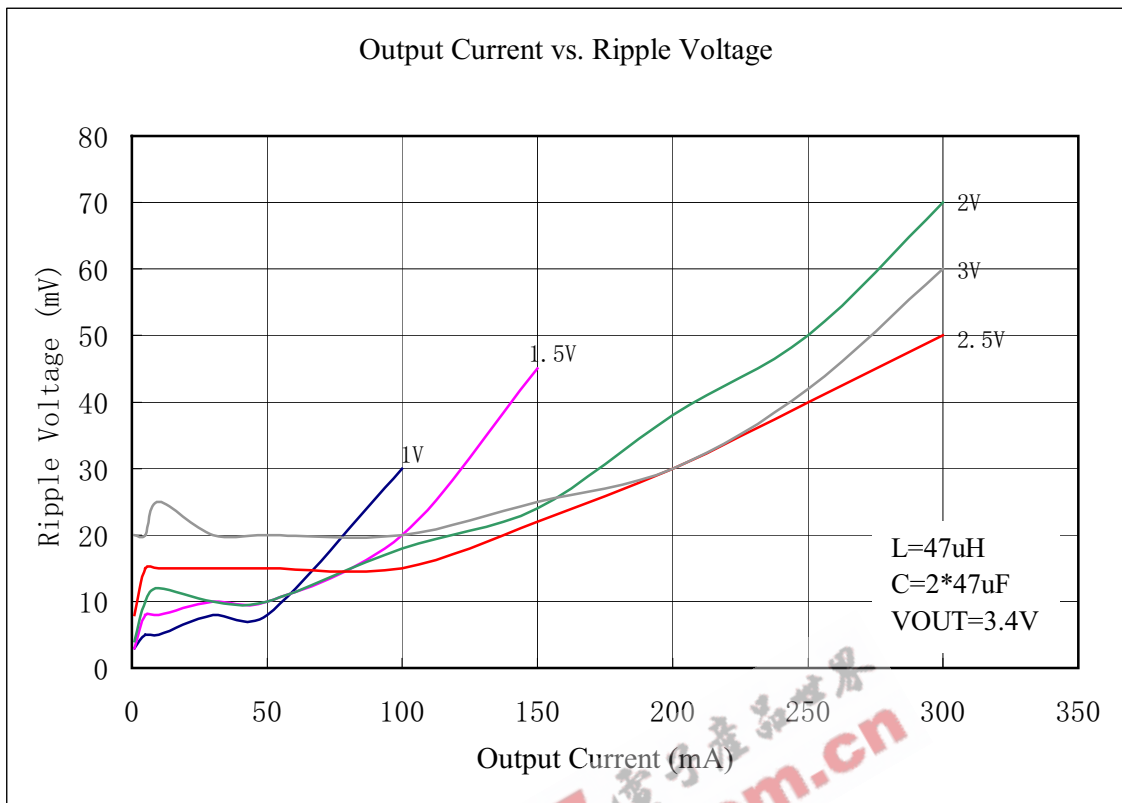
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Typical Characteristics (Using Internal Switch Transistor)



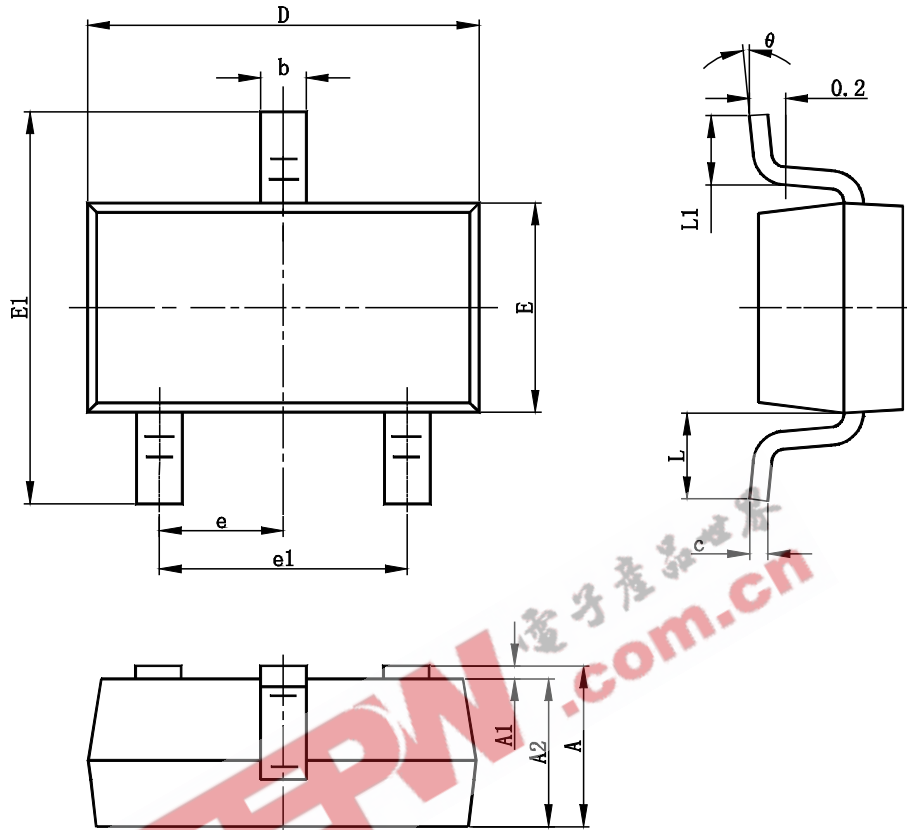






Package Information

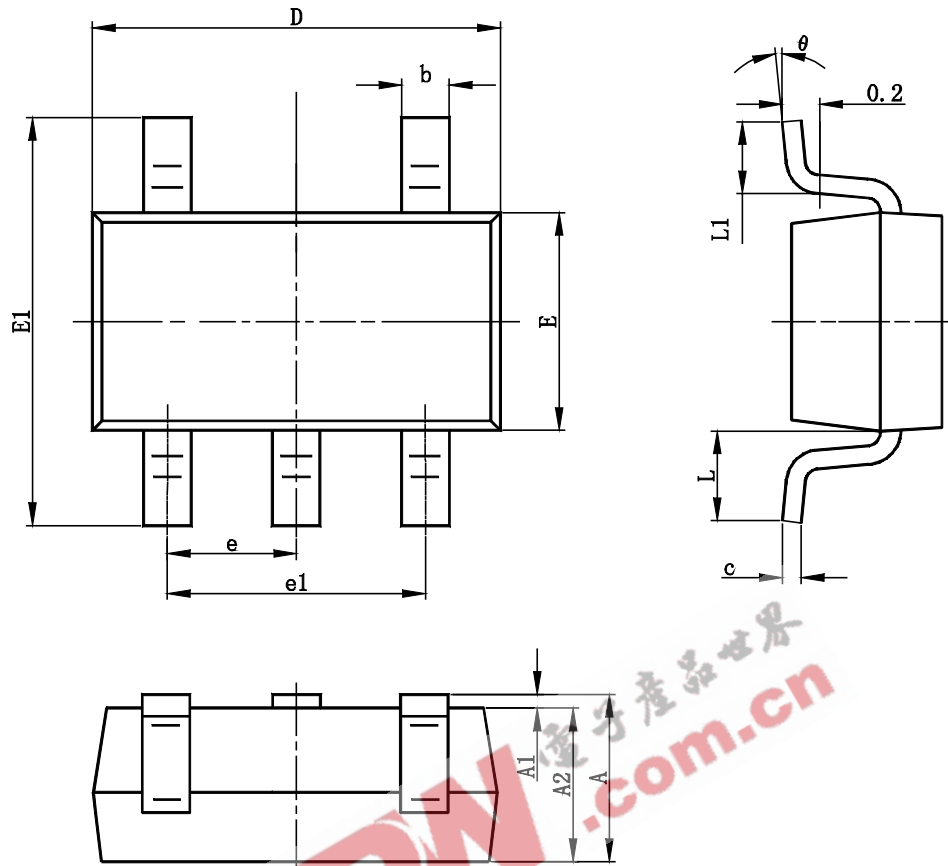
SOT-23-3L PACKAGE OUTLINE DIMENSIONS



| 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 | 0.400 | 0.012 | 0.016 |
| 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 | 0.950TYP | | 0.037TYP | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.700REF | | 0.028REF | |
| L1 | 0.300 | 0.600 | 0.012 | 0.024 |
| ? | 08 | 0 | 8 | |



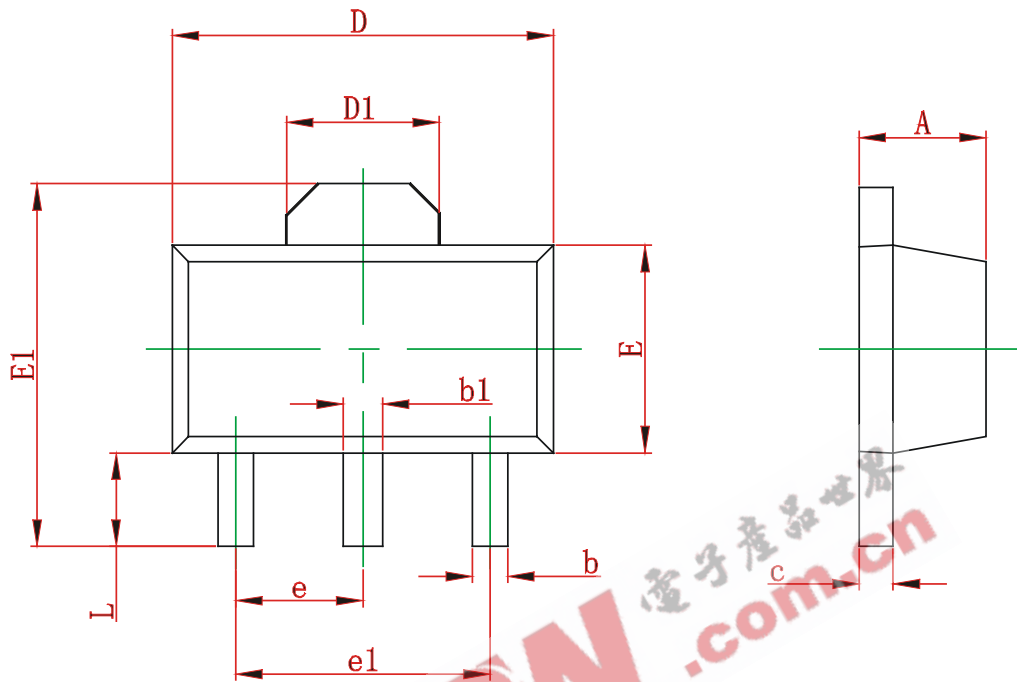
SOT-23-5L PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeter | | 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 | 0.400 | 0.012 | 0.016 |
| 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 | 0.950TYP | | 0.037TYP | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.700REF | | 0.028REF | |
| L1 | 0.300 | 0.600 | 0.012 | 0.024 |
| ? | 08 | 0 | 8 | |



SOT-89-3L PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeter | | Dimensions In Inches | |
|--------|--------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.400 | 1.600 | 0.055 | 0.063 |
| b | 0.320 | 0.520 | 0.013 | 0.197 |
| 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 | | 0.060TYP | |
| e1 | 3.000 TYP | | 0.118TYP | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |