

## General Description

The KB3301 is a small, high efficiency, and low voltage step-up DC/DC converter with an Adaptive Current Mode PWM control loop, includes an error amplifier, ramp generator, comparator, switch pass element and driver in which providing a stable and high efficient operation over a wide range of load currents. It operates in stable waveforms without external compensation.

The low start-up input voltage below 0.8V makes KB3301 suitable for 1 to 4 battery cells applications of providing up to 300mA output current. The 500KHz high switching rate minimized the size of external components. Besides, the 14 $\mu$ A low quiescent current together with high efficiency maintains long battery lifetime.

The KB3301 is available in small package SOT-26 and SOT89-5

## Features

- ◆ 90% Efficiency
- ◆ High Supply Capability to Deliver 5.0V 500mA with input 3.6V-4.2V
- ◆ 14 $\mu$ A Quiescent (switch-off) Supply Current
- ◆ 500KHz Fixed Switching Frequency
- ◆ Zero Shutdown Mode Supply Current
- ◆ Providing Flexibility for Using Internal and External Power Switches
- ◆ 1.0V Low Start-up Input Voltage
- ◆ Small SOT-26 & SOT89-5 Package

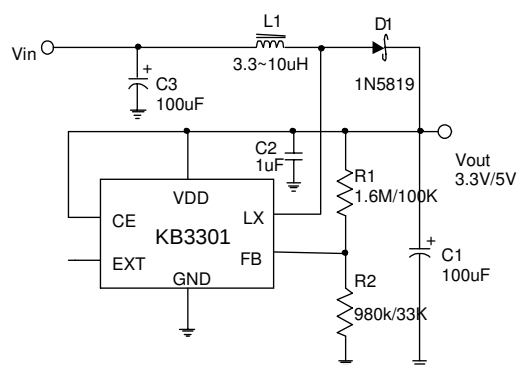
### Ordering Information

| Item     | Package  | Shipping          |
|----------|----------|-------------------|
| KB3301MR | SOT-26   | 3000pcs/Reel&Tape |
| KB3301PR | SOT-89-5 | 3000pcs/Reel&Tape |

## Applications

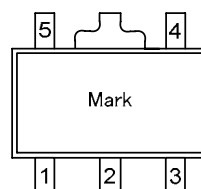
- ◆ LCD Panel
- ◆ DSC
- ◆ MP3
- ◆ Wireless Equipment
- ◆ Portable Instrument
- ◆ PDA

## Typical Application Circuit

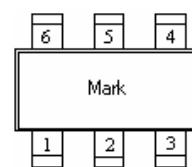


Note: Vin=3.6~4.2V, Vout=5.0V 500mA ( USB host application )

### Package Information



SOT89-5

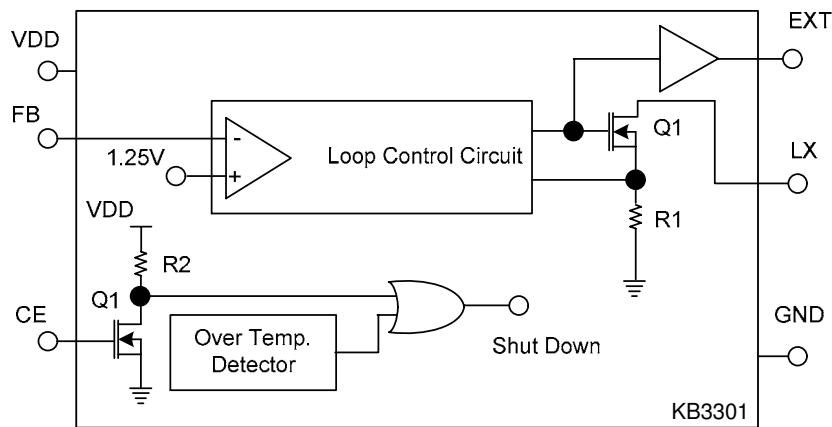


SOT-26

### Pin Configurations

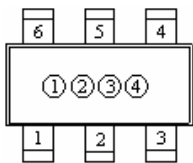
| SOT-26 | SOT-89-5 | Pin Name | Pin Function         |
|--------|----------|----------|----------------------|
| 1      | 1        | CE       | Chip enable          |
| 2      |          | EXT      | Output               |
| 3      | 5        | GND      | Ground               |
| 4      | 4        | LX       | Switching            |
| 5      | 2        | VDD      | Input                |
| 6      | 3        | FB       | Feedback input 1.25V |

Function Block Diagram

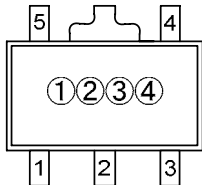


Marking Information

|    | Symbol | Description             |
|----|--------|-------------------------|
| ①  | 1      | Step-up DC-DC Converter |
| ②  | 3      | KB3301                  |
| ③④ | 01     | Control Code            |

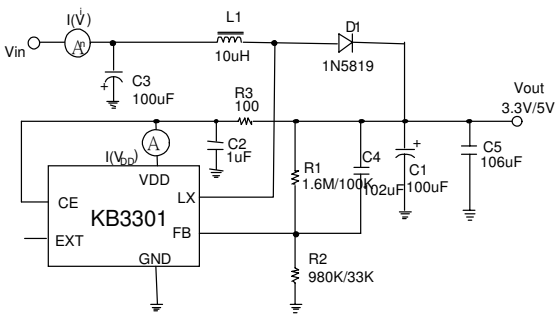


SOT-26



SOT-89-5

Test Circuit



## ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| Parameter                      |          | Symbol           | Ratings               | Unit |
|--------------------------------|----------|------------------|-----------------------|------|
| Supply Voltage                 |          | V <sub>in</sub>  | - 0.3V ~ 7V           | V    |
| LX Pin Switch Voltage          |          | V <sub>LX</sub>  | - 0.3 ~ (VDD + 0.8V)  | V    |
| Other I/O Pin Voltages         |          | V <sub>ss</sub>  | - 0.3V ~ (VDD + 0.3V) | V    |
| Lx Pin Switch Current          |          | I <sub>LX</sub>  | 2.5                   | A    |
| EXT Pin Driver Current         |          | I <sub>EXT</sub> | 200                   | mA   |
| Package Thermal Resistance     | SOT-26   | Pd               | 145                   | °C/W |
|                                | SOT-89-5 |                  | 45                    | °C/W |
| Operating Junction Temperature |          | T <sub>j</sub>   | 125                   | °C   |
| Storage Temperature Range      |          | T <sub>stg</sub> | - 65 ~ +150           | °C   |

## ELECTRICAL CHARACTERISTICS

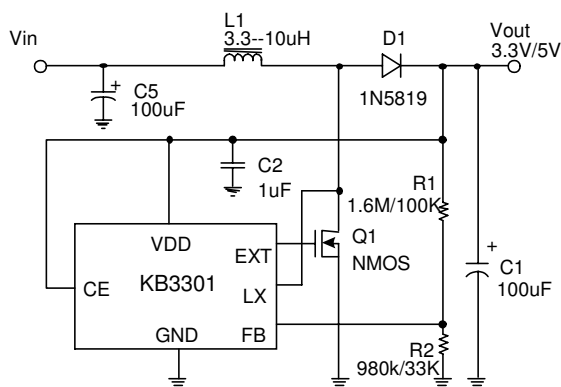
(V<sub>in</sub> = 1.5V, VDD = 3.3V, I = 0, Ta = 25°C, unless otherwise spec)

| Parameter                             | Symbol                  | Test Conditions                                    | Min   | Typ  | Max   | Units  |
|---------------------------------------|-------------------------|----------------------------------------------------|-------|------|-------|--------|
| Start-UP Voltage                      | V <sub>ST</sub>         | I <sub>L</sub> = 1mA                               | --    | 0.80 | 0.85  | V      |
| Operating VDD Range                   | V <sub>DD</sub>         | VDD pin voltage                                    | 2     | --   | 6.5   | V      |
| No Load Current I (V <sub>IN</sub> )  | I <sub>NO LOAD</sub>    | V <sub>IN</sub> = 1.5V, V <sub>OUT</sub> = 3.3V    | --    | 75   | --    | μA     |
| Switch-off Current I (VDD)            | I <sub>SWITCH OFF</sub> | V <sub>IN</sub> = 6V                               | --    | 14   | --    | μA     |
| Shutdown Current I (V <sub>IN</sub> ) | I <sub>OFF</sub>        | CE Pin = 0V, V <sub>IN</sub> = 4.5V                | --    | 0.01 | 1     | μA     |
| Feedback Reference Voltage            | V <sub>REF</sub>        | Close Loop, VDD = 3.3V                             | 1.225 | 1.25 | 1.275 | V      |
| Switching Frequency                   | F <sub>S</sub>          | VDD = 3.3V                                         | --    | 500  | --    | KHz    |
| Maximum Duty                          | D <sub>MAX</sub>        | VDD = 3.3V                                         | --    | 95   | --    | %      |
| LX ON Resistance                      |                         | VDD = 3.3V                                         | --    | 0.3  | --    | Ω      |
| Current Limit Setting                 | I <sub>LIMIT</sub>      | VDD = 3.3V                                         | --    | 2    | --    | A      |
| EXT ON Resistance to VDD              |                         | VDD = 3.3V                                         | --    | 5    | --    | Ω      |
| EXT ON Resistance to GND              |                         | VDD = 3.3V                                         | --    | 5    | --    | Ω      |
| Line Regulation                       | ΔV <sub>LINE</sub>      | V <sub>IN</sub> = 1.5 ~ 2.5V, I <sub>L</sub> = 1mA | --    | 10   | --    | mV/V   |
| Load Regulation                       | ΔV <sub>LOAD</sub>      | V <sub>IN</sub> = 2.5V, I <sub>L</sub> = 1 ~ 100mA | --    | 0.25 | --    | mV/mA  |
| CE Pin Trip Level                     |                         | VDD = 3.3V                                         | 0.4   | 0.8  | 1.2   | V      |
| Temperature Stability for Vout        | T <sub>S</sub>          |                                                    | --    | 50   | --    | ppm/°C |
| Thermal Shutdown                      | T <sub>SD</sub>         |                                                    | --    | 165  | --    | °C     |
| Thermal Shutdown Hysteresis           | ΔT <sub>SD</sub>        |                                                    | --    | 10   | --    | °C     |

\* Note: The CE pin shall be tied to VDD pin and inhibit to act the ON/OFF state whenever the VDD pin voltage may reach to 5.5V or above.

## Applications

### ● High Current Application



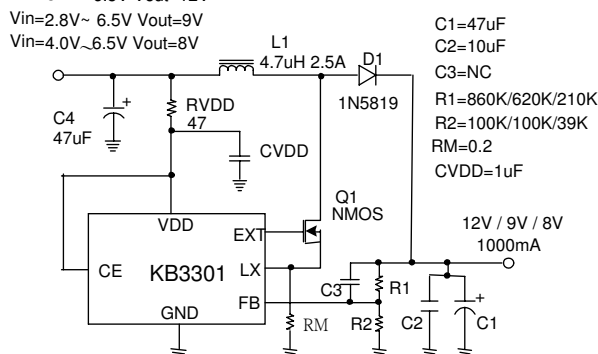
### ● High Voltage Application

Vin=3.1V~6.5V Vout=12V

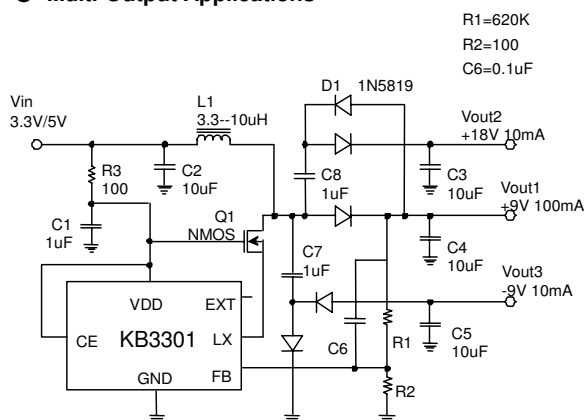
Vin=2.8V~6.5V Vout=9V

Vin=4.0V~6.5V Vout=8V

NMOS= XP161A1355PR FDN337N



### ● Multi-Output Applications



## Application Note

### ● Output Voltage Setting

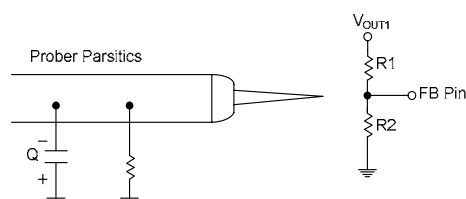
Referring to application circuits, the output voltage of the switching regulator ( $V_{OUT}$ ) can be set

$$V_{OUT1} = \left(1 + \frac{R1}{R2}\right) \times 1.25V \quad \dots A$$

### ● Feedback Loop Design

Referring to application circuits, The selection of R1 and R2 based on the trade-off between quiescent current consumption and interference immunity is stated below:

- ◆ Follow Equation A
- ◆ Higher R reduces the quiescent current (Path current  $\approx 1.25V/R2$ ), however resistors beyond 5M $\Omega$  are not recommended.
- ◆ Lower R gives better noise immunity, and is less sensitive to interference, layout parasitics, FB node leakage, and improper probing to FB pins.

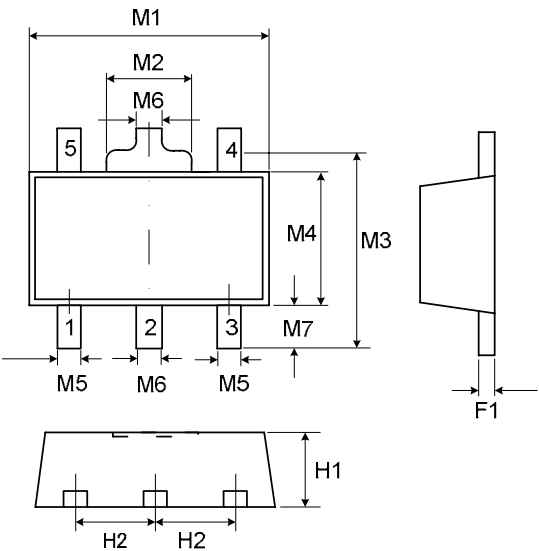


- ◆ A proper value of feed forward capacitor parallel with R1 can improve the noise immunity of the feedback loops, especially in an improper layout. An empirical suggestion is around 0~33pF for feedback resistors of M $\Omega$ , and 10nF~0.1 $\mu$ F for feedback resistors of tens to hundreds K $\Omega$ .

For applications without standby or suspend modes, lower values of R1 and R2 are preferred. For applications concerning the current consumption in standby or suspend modes, the higher values of R1 and R2 are feedback needed. Such "high impedance loops" are sensitive to any interference, which require careful layout and avoid any interference, e.g. probing to FB pin.

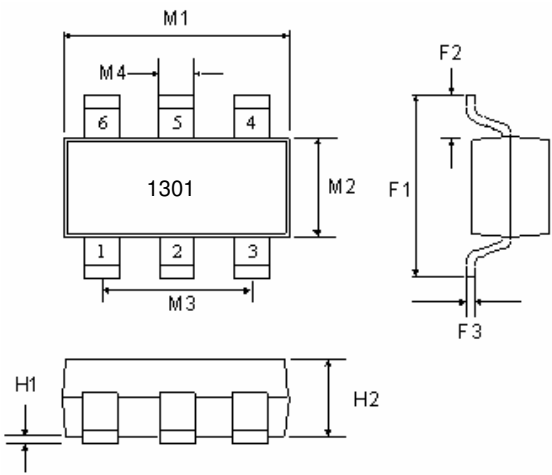
PACAGE DESCRIPTION

● SOT-89-5



| Units: mm |       |       |
|-----------|-------|-------|
| Symbol    | Min   | Max   |
| A         | 1.400 | 1.600 |
| b         | 0.360 | 0.520 |
| B         | 2.400 | 2.600 |
| b1        | 0.406 | 0.533 |
| C         | --    | 4.250 |
| C1        | 0.800 | --    |
| D         | 4.400 | 4.600 |
| D1        | --    | 1.700 |
| e         | 1.400 | 1.600 |
| H         | 0.380 | 0.430 |

● SOT-26



| Units: mm |       |       |
|-----------|-------|-------|
| Symbol    | Min   | Max   |
| A         | 0.889 | 1.295 |
| A1        | --    | 0.152 |
| B         | 1.397 | 1.803 |
| b         | 0.356 | 0.559 |
| C         | 2.591 | 2.997 |
| D         | 2.692 | 3.099 |
| e         | 0.838 | 1.041 |
| H         | 0.102 | 0.254 |
| L         | 0.356 | 0.610 |