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[Fairchild Semiconductor](#)  
[KA7500B](#)

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# KA7500B

## SMPS Controller

### Features

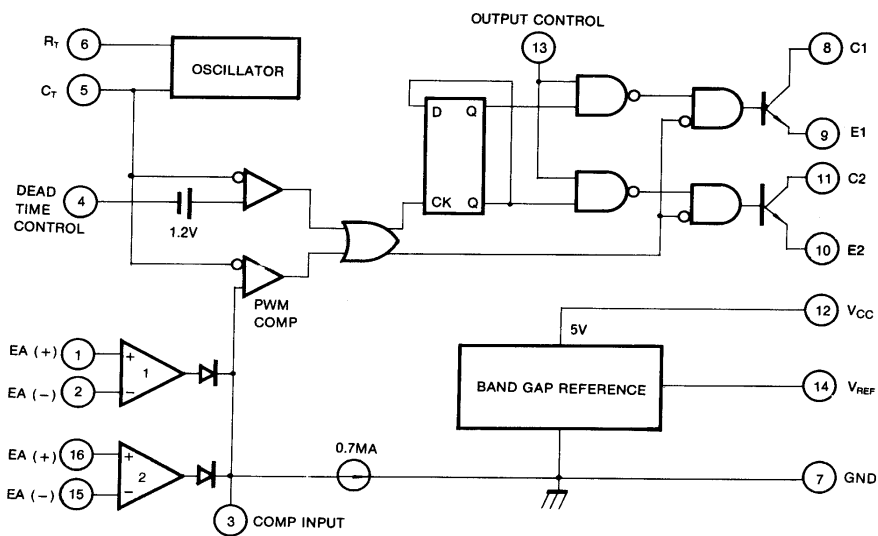
- Internal Regulator Provides a Stable 5V Reference Supply Trimmed to 5%
- Uncommitted Output TR for 200mA Sink or Source Current
- Output Control For Push-Pull or Single Ended Operation
- Variable Duty Cycle By Dead Time Control (Pin 4) Complete PWM Control Circuit
- On-Chip Oscillator With Master or Slave Operation
- Internal Circuit Prohibits Double Pulse at Either Output

### Description

The KA7500B is used for the control circuit of the PWM switching regulator. The KA7500B consists of 5V reference voltage circuit, two error amplifiers, a flip flop, an output control circuit, a PWM comparator, a dead time comparator and an oscillator. This device can be operated in the switching frequency of 1kHz to 300kHz.



### Internal Block Diagram



KA7500B

**Absolute Maximum Ratings**

| Parameter                                 | Symbol           | Value                         | Unit |
|---|------------------|-------------------------------|------|
| Supply Voltage                            | V <sub>CC</sub>  | 42                            | V    |
| Collector Supply Voltage                  | V <sub>C</sub>   | 42                            | V    |
| Output Current                            | I <sub>O</sub>   | 250                           | mA   |
| Amplifier Input Voltage                   | V <sub>IN</sub>  | V <sub>CC</sub> +0.3          | V    |
| Power Dissipation (T <sub>A</sub> = 25°C) | P <sub>D</sub>   | 1 (KA7500B)<br>0.9 (KA7500BD) | W    |
| Operating Temperature Range               | T <sub>OPR</sub> | 0 ~ +70                       | °C   |
| Storage Temperature Range                 | T <sub>STG</sub> | -65 ~ +150                    | °C   |

## Electrical Characteristics

(V<sub>CC</sub> = 20V, f = 10kHz, T<sub>A</sub> = 0°C to +70°C, unless otherwise specified)

| Parameter                                   | Symbol                | Conditions   | Min. | Typ. | Max.            | Unit |
|---|-----------------------|--|------|------|-----------------|------|
| <b>REFERENCE SECTION</b>                    |                       |  |      |      |                 |      |
| Reference Output Voltage                    | V <sub>REF</sub>      | I <sub>REF</sub> = 1mA   | 4.75 | 5.0  | 5.25            | V    |
| Line Regulation                             | ΔV <sub>REF</sub>     | V <sub>CC</sub> = 7V to 40V  | -    | 2.0  | 25              | mV   |
| Temperature Coefficient of V <sub>REF</sub> | ΔV <sub>REF</sub> /ΔT | T <sub>A</sub> = 0°C to 70°C   | -    | 0.01 | 0.03            | %/°C |
| Load Regulation                             | ΔV <sub>REF</sub>     | I <sub>REF</sub> = 1mA to 10mA   | -    | 1.0  | 15              | mV   |
| Short-Circuit Output Current                | I <sub>SC</sub>       | V <sub>REF</sub> = 0V  | 10   | 35   | 50              | mA   |
| <b>OSCILLATOR SECTION</b>                   |                       |  |      |      |                 |      |
| Oscillation Frequency                       | f                     | C <sub>T</sub> = 0.01μF, R <sub>T</sub> = 12kΩ                           | -    | 10   | -               | kHz  |
| Frequency Change with Temperature           | Δf/ΔT                 | C <sub>T</sub> = 0.01μF, R <sub>T</sub> = 12kΩ                           | -    | -    | 2               | %    |
| <b>DEAD TIME CONTROL SECTION</b>            |                       |  |      |      |                 |      |
| Input Bias Current                          | I <sub>BIAS</sub>     | V <sub>CC</sub> = 15V, 0V ≤ V <sub>4</sub> ≤ 5.25V                       | -    | -2.0 | -10             | μA   |
| Maximum Duty Cycle                          | D(MAX)                | V <sub>CC</sub> = 15V, V <sub>4</sub> = 0V<br>O.C Pin = V <sub>REF</sub> | 45   | -    | -               | %    |
| Input Threshold Voltage                     | V <sub>I</sub> TH     | Zero Duty Cycle  | -    | 3.0  | 3.3             | V    |
|   |                       | Max. Duty Cycle  | 0    | -    | -               |      |
| <b>ERROR AMP SECTION</b>                    |                       |  |      |      |                 |      |
| Input Offset Voltage                        | V <sub>IO</sub>       | V <sub>3</sub> = 2.5V  | -    | 2.0  | 10              | mV   |
| Input Offset Current                        | I <sub>IO</sub>       | V <sub>3</sub> = 2.5V  | -    | 25   | 250             | mA   |
| Input Bias Current                          | I <sub>BIAS</sub>     | V <sub>3</sub> = 2.5V  | -    | 0.2  | 1.0             | μA   |
| Common Mode Input Voltage                   | V <sub>CM</sub>       | 7V ≤ V <sub>CC</sub> ≤ 40V   | -0.3 | -    | V <sub>CC</sub> | V    |
| Open-Loop Voltage Gain                      | G <sub>VO</sub>       | 0.5V ≤ V <sub>3</sub> ≤ 3.5V   | 70   | 95   | -               | dB   |
| Unit-Gain Bandwidth (Note1)                 | BW                    | -  | -    | 650  | -               | kHz  |
| <b>PWM COMPARATOR SECTION</b>               |                       |  |      |      |                 |      |
| Input Threshold Voltage                     | V <sub>I</sub> TH     | Zero Duty Cycle  | -    | 4    | 4.5             | V    |
| Input Sink Current                          | I <sub>SINK</sub>     | V <sub>3</sub> = 0.7V  | -0.3 | -0.7 | -               | mV   |
| <b>OUTPUT SECTION</b>                       |                       |  |      |      |                 |      |
| Output Saturation Voltage<br>Common Emitter | V <sub>CE(SAT)</sub>  | V <sub>E</sub> = 0, I <sub>C</sub> = 200mA                               | -    | 1.1  | 1.3             | V    |
| Common Collector                            | V <sub>CC(SAT)</sub>  | V <sub>C</sub> = 15V, I <sub>E</sub> = -200mA                            | -    | 1.5  | 2.5             |      |
| Collector Off-State Current                 | I <sub>C(OFF)</sub>   | V <sub>CC</sub> = 40V, V <sub>CE</sub> = 40V                             | -    | 2    | 100             | μA   |
| Emitter Off-State Current                   | I <sub>E(OFF)</sub>   | V <sub>CC</sub> = V <sub>C</sub> = 40V, V <sub>E</sub> = 0               | -    | -    | -100            |      |
| <b>TOTAL DEVICE</b>                         |                       |  |      |      |                 |      |
| Supply Current                              | I <sub>CC</sub>       | Pin 6 = V <sub>REF</sub> , V <sub>CC</sub> = 15V                         | -    | 6    | 10              | mA   |
| <b>OUTPUT SWITCHING CHARACTERISTICS</b>     |                       |  |      |      |                 |      |
| Rise Time                                   | t <sub>R</sub>        | -  | -    | -    | -               | ns   |
| Common Emitter                              | -                     | -  | -    | 100  | 200             |      |
| Common Collector                            | -                     | -  | -    | 100  | 200             | ns   |
| Fall Time                                   | t <sub>F</sub>        | -  | -    | -    | -               |      |
| Common Emitter                              | -                     | -  | -    | 25   | 100             | ns   |
| Common Collector                            | -                     | -  | -    | 40   | 100             |      |

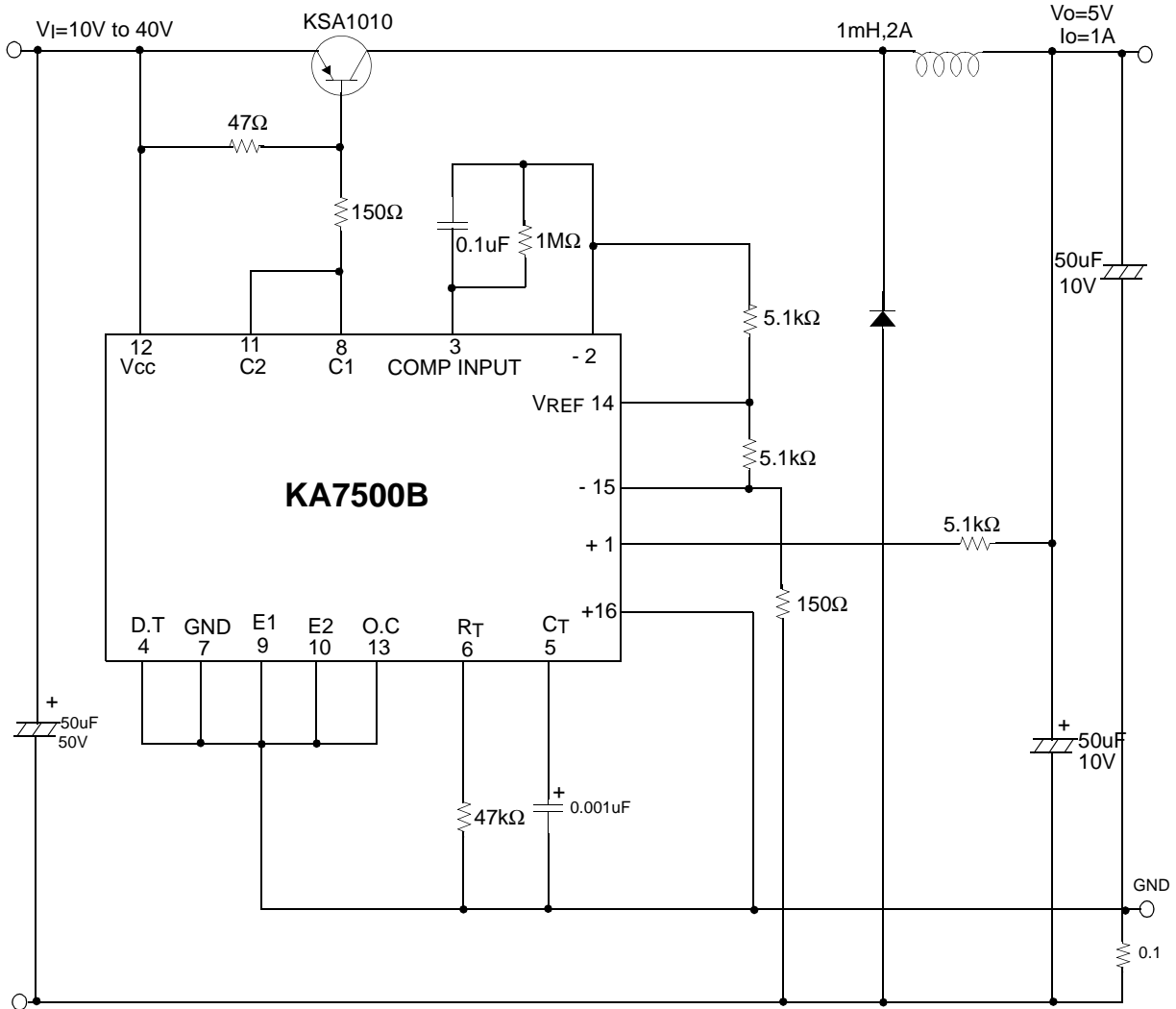
**Note:**

1. This parameter, although guaranteed, is not 100% tested in production.

KA7500B

## Typical Application

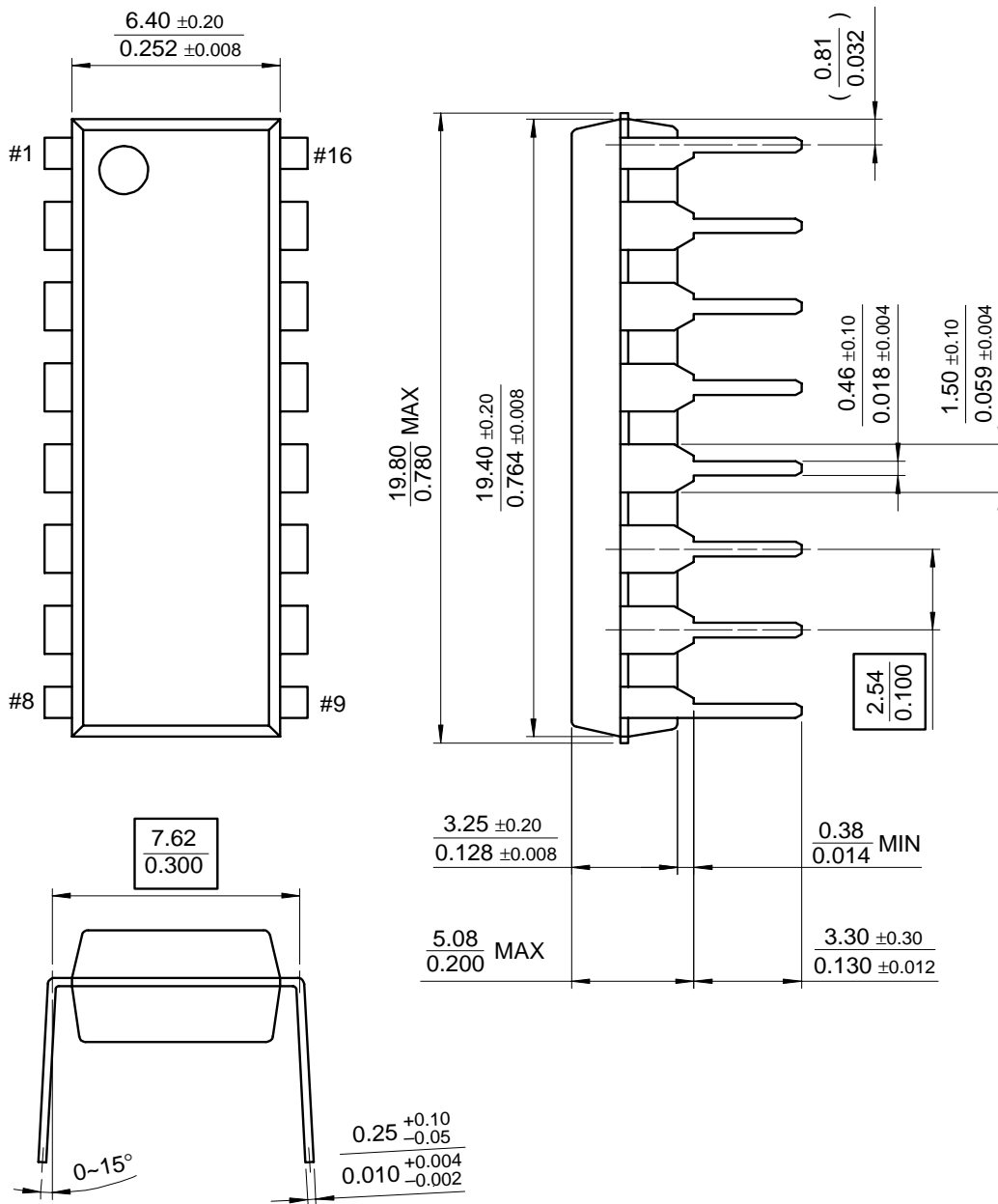
### Pulse Width Modulated Step-down Converter



## Mechanical Dimensions

### Package

### 16-DIP

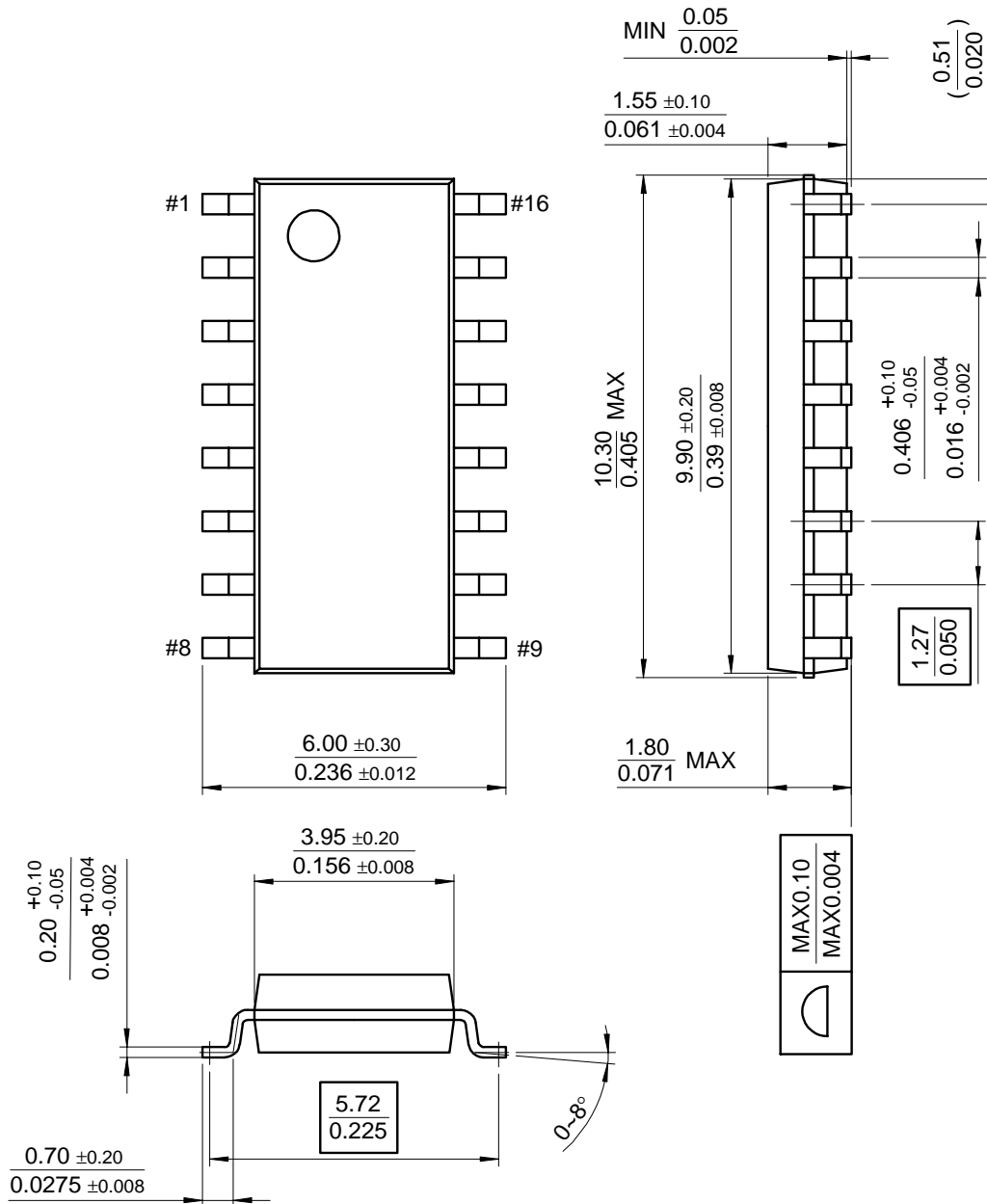


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**Mechanical Dimensions** (Continued)

Package

**16-SOP**



## Ordering Information

| Product Number | Package | Operating Temperature |
|----------------|---------|-----------------------|
| KA7500B        | 16-DIP  | 0 ~ +70°C             |
| KA7500BD       | 16-SOP  |                       |



## KA7500B

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