

# 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.

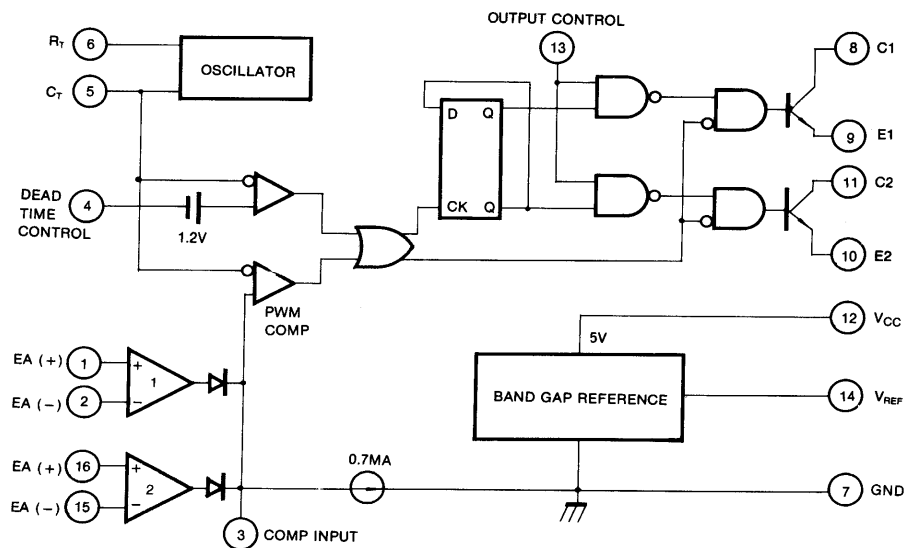
16-DIP



16-SOP



### Internal Block Diagram



## 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)

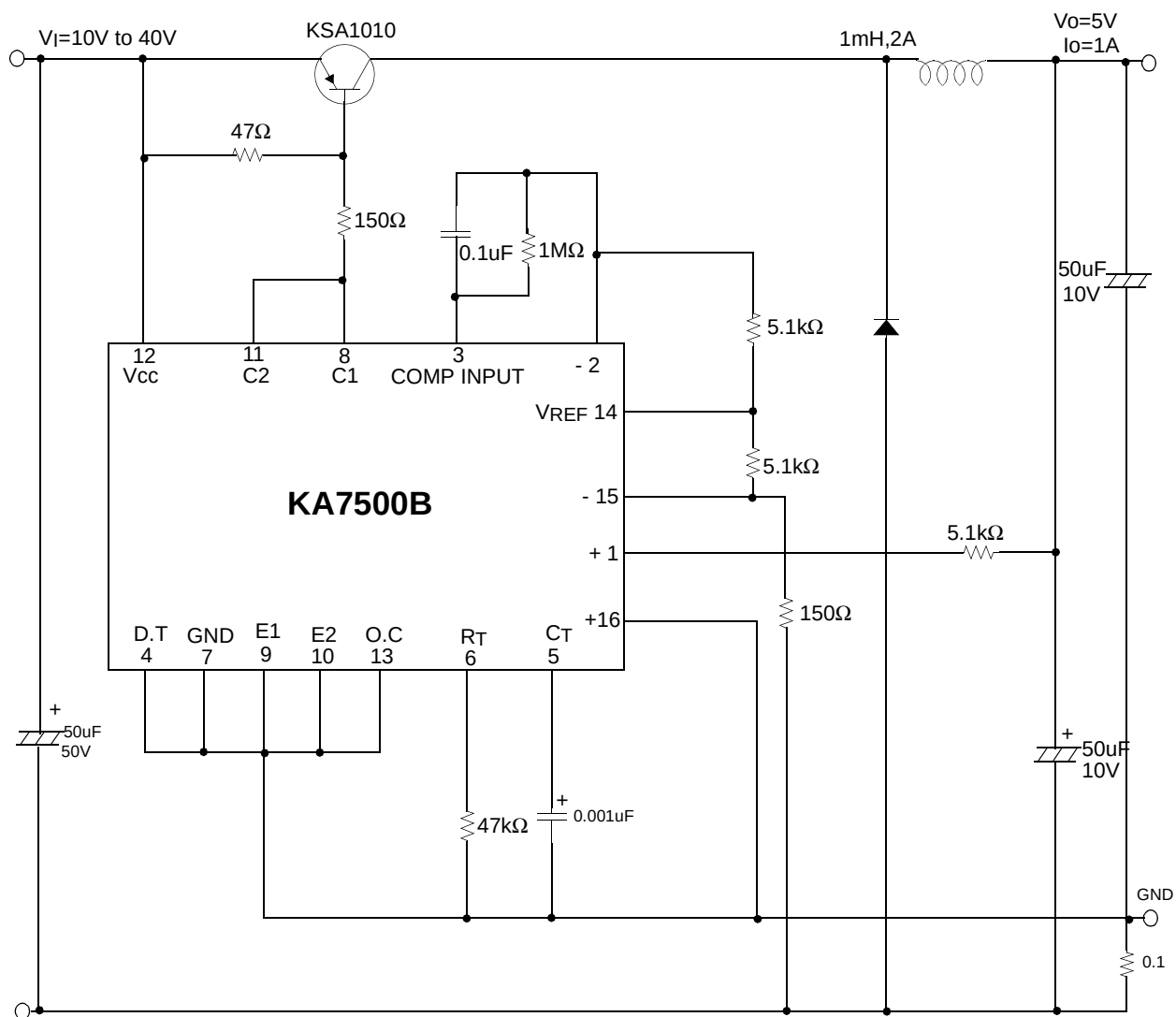
| Parameter                                   | Symbol   | Conditions                           | Min. | Typ. | Max. | Unit |
|---------------------------------------------|----------|--------------------------------------|------|------|------|------|
| REFERENCE SECTION                           |          |                                      |      |      |      |      |
| Reference Output Voltage                    | VREF     | IREF = 1mA                           | 4.75 | 5.0  | 5.25 | V    |
| Line Regulation                             | ΔVREF    | VCC = 7V to 40V                      | -    | 2.0  | 25   | mV   |
| Temperature Coefficient of VREF             | ΔVREF/ΔT | TA = 0°C to 70°C                     | -    | 0.01 | 0.03 | %/°C |
| Load Regulation                             | ΔVREF    | IREF = 1mA to 10mA                   | -    | 1.0  | 15   | mV   |
| Short-Circuit Output Current                | ISC      | VREF = 0V                            | 10   | 35   | 50   | mA   |
| OSCILLATOR SECTION                          |          |                                      |      |      |      |      |
| Oscillation Frequency                       | f        | CT = 0.01μF, RT = 12kΩ               | -    | 10   | -    | kHz  |
| Frequency Change with Temperature           | Δf/ΔT    | CT = 0.01μF, RT = 12kΩ               | -    | -    | 2    | %    |
| DEAD TIME CONTROL SECTION                   |          |                                      |      |      |      |      |
| Input Bias Current                          | IBIAS    | VCC = 15V, 0V≤V4≤5.25V               | -    | -2.0 | -10  | μA   |
| Maximum Duty Cycle                          | D(MAX)   | VCC = 15V, V4 = 0V<br>O.C Pin = VREF | 45   | -    | -    | %    |
| Input Threshold Voltage                     | VITH     | Zero Duty Cycle                      | -    | 3.0  | 3.3  | V    |
|                                             |          | Max. Duty Cycle                      | 0    | -    | -    |      |
| ERROR AMP SECTION                           |          |                                      |      |      |      |      |
| Input Offset Voltage                        | VIO      | V3 = 2.5V                            | -    | 2.0  | 10   | mV   |
| Input Offset Current                        | IIO      | V3 = 2.5V                            | -    | 25   | 250  | mA   |
| Input Bias Current                          | IBIAS    | V3 = 2.5V                            | -    | 0.2  | 1.0  | μA   |
| Common Mode Input Voltage                   | VCM      | 7V ≤ VCC ≤ 40V                       | -0.3 | -    | VCC  | V    |
| Open-Loop Voltage Gain                      | GVO      | 0.5V ≤ V3 ≤ 3.5V                     | 70   | 95   | -    | dB   |
| Unit-Gain Bandwidth (Note1)                 | BW       | -                                    | -    | 650  | -    | kHz  |
| PWM COMPARATOR SECTION                      |          |                                      |      |      |      |      |
| Input Threshold Voltage                     | VITH     | Zero Duty Cycle                      | -    | 4    | 4.5  | V    |
| Input Sink Current                          | ISINK    | V3=0.7V                              | -0.3 | -0.7 | -    | mV   |
| OUTPUT SECTION                              |          |                                      |      |      |      |      |
| Output Saturation Voltage<br>Common Emitter | VCE(SAT) | VE = 0, IC = 200mA                   | -    | 1.1  | 1.3  | V    |
| Common Collector                            | VCC(SAT) | VC = 15V, IE = -200mA                | -    | 1.5  | 2.5  |      |
| Collector Off-State Current                 | IC(OFF)  | VCC = 40V, VCE = 40V                 | -    | 2    | 100  | μA   |
| Emitter Off-State Current                   | IE(OFF)  | VCC = VC = 40V, VE = 0               | -    | -    | -100 |      |
| TOTAL DEVICE                                |          |                                      |      |      |      |      |
| Supply Current                              | ICC      | Pin 6 = VREF, VCC = 15V              | -    | 6    | 10   | mA   |
| OUTPUT SWITCHING CHARACTERISTICS            |          |                                      |      |      |      |      |
| Rise Time                                   | tR       | -                                    | -    | -    | -    | -    |
| Common Emitter                              | -        | -                                    | -    | 100  | 200  | ns   |
| Common Collector                            | -        | -                                    | -    | 100  | 200  |      |
| Fall Time                                   | tF       | -                                    | -    | -    | -    | -    |
| Common Emitter                              | -        | -                                    | -    | 25   | 100  | ns   |
| Common Collector                            | -        | -                                    | -    | 40   | 100  |      |

### Note:

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

## Typical Application

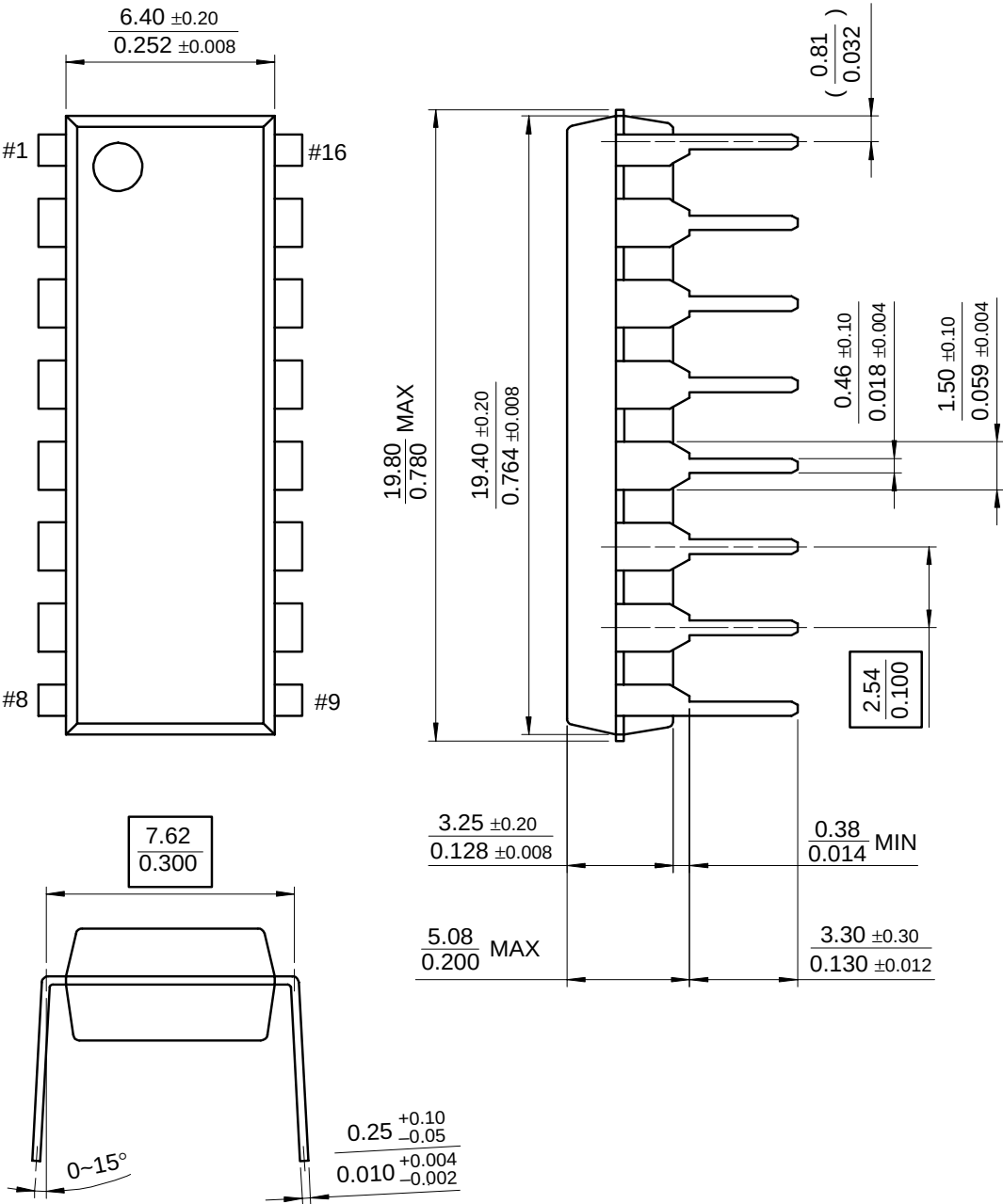
### Pulse Width Modulated Step-down Converter



# Mechanical Dimensions

## Package

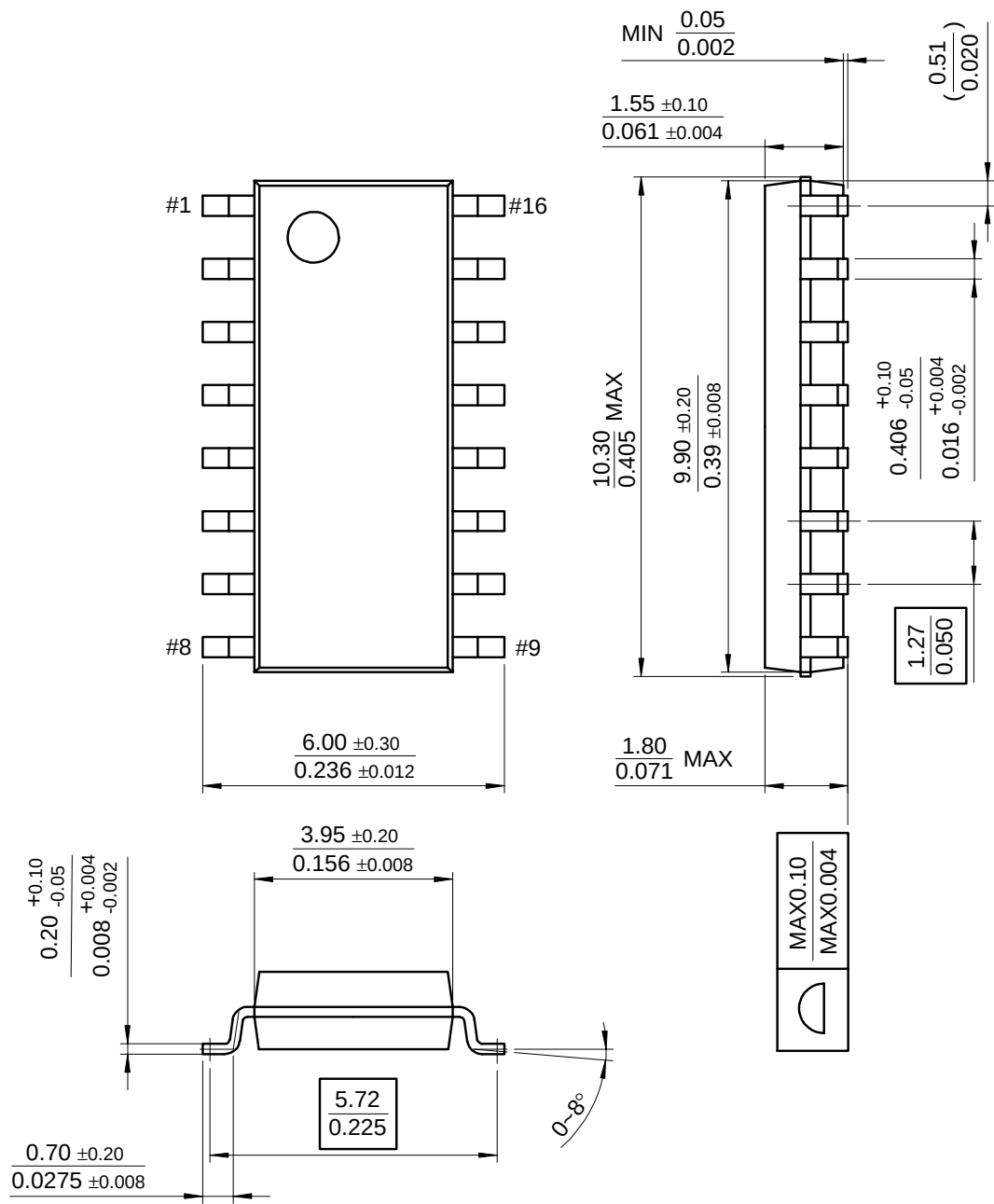
### 16-DIP



Mechanical Dimensions (Continued)

Package

16-SOP



## Ordering Information

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

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