

# KA3525A

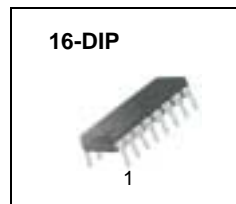
## SMPS Controller

### Features

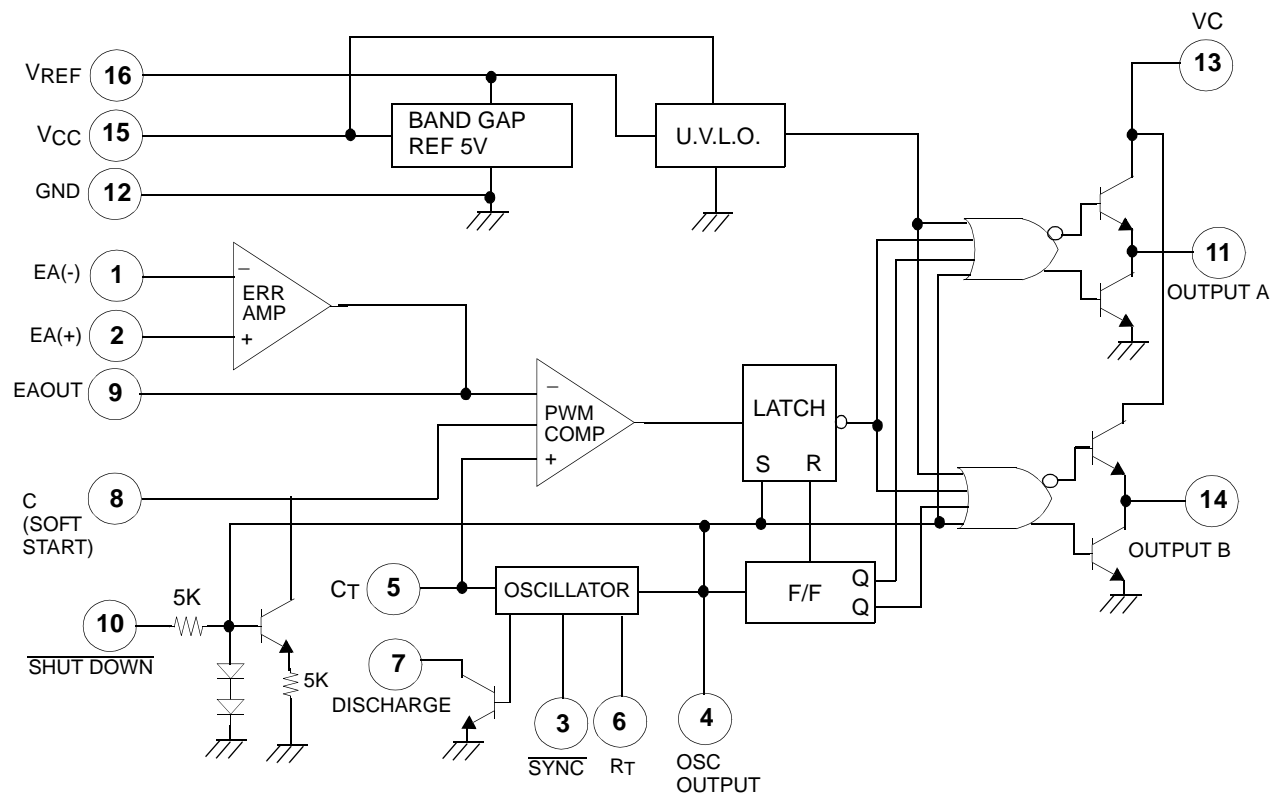
- 5V ±1% Reference
- Oscillator Sync Terminal
- Internal Soft Start
- Deadtime Control
- Under Voltage Lockout

### Description

The KA3525A is a monolithic integrated circuit that includes all of the control circuits necessary for a pulse width modulating regulator. There are a voltage reference, an error amplifier, a pulse width modulator, an oscillator, an under voltage lockout, a soft start circuit, and the output driver in the chip.



### Internal Block Diagram



## Absolute Maximum Ratings

| Parameter                                 | Symbol                | Value      | Unit |
|---|-----------------------|------------|------|
| Supply Voltage                            | V <sub>CC</sub>       | 40         | V    |
| Collector Supply Voltage                  | V <sub>C</sub>        | 40         | V    |
| Output Current, Sink or Source            | I <sub>O</sub>        | 500        | mA   |
| Reference Output Current                  | I <sub>REF</sub>      | 50         | mA   |
| Oscillator Charging Current               | I <sub>CHG(OSC)</sub> | 5          | mA   |
| Power Dissipation (T <sub>A</sub> = 25°C) | P <sub>D</sub>        | 1000       | mW   |
| Operating Temperature                     | T <sub>OPR</sub>      | 0 ~ +70    | °C   |
| Storage Temperature                       | T <sub>STG</sub>      | -65 ~ +150 | °C   |
| Lead Temperature (Soldering, 10sec)       | T <sub>LEAD</sub>     | +300       | °C   |

## Electrical Characteristics

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

| Parameter                      | Symbol                 | Conditions                                     | Min. | Typ. | Max. | Unit |
|--------------------------------|------------------------|--|------|------|------|------|
| <b>REFERENCE SECTION</b>       |                        |  |      |      |      |      |
| Reference Output Voltage       | V <sub>REF</sub>       | T <sub>J</sub> = 25°C                          | 5.0  | 5.1  | 5.2  | V    |
| Line Regulation                | ΔV <sub>REF</sub>      | V <sub>CC</sub> = 8 to 35V                     | -    | 9    | 20   | mV   |
| Load Regulation                | ΔV <sub>REF</sub>      | I <sub>REF</sub> = 0 to 20mA                   | -    | 20   | 50   | mV   |
| Short Circuit Output Current   | I <sub>SC</sub>        | V <sub>REF</sub> = 0, T <sub>J</sub> = 25°C    | -    | 80   | 100  | mA   |
| Total Output Variation (Note1) | ΔV <sub>REF</sub>      | Line, Load and Temperature                     | 4.95 | -    | 5.25 | V    |
| Temperature Stability (Note1)  | ST <sub>T</sub>        | -  | -    | 20   | 50   | mV   |
| Long Term Stability (Note1)    | ST                     | T <sub>J</sub> = 125°C, 1KHS                   | -    | 20   | 50   | mV   |
| <b>OSCILLATOR SECTION</b>      |                        |  |      |      |      |      |
| Initial Accuracy (Note1, 2)    | ACCUR                  | T <sub>J</sub> = 25°C                          | -    | ±3   | ±6   | %    |
| Frequency Change With Voltage  | Δf/ΔV <sub>CC</sub>    | V <sub>CC</sub> = 8 to 35V (Note1, 2)          | -    | ±0.8 | ±2   | %    |
| Maximum Frequency              | f(MAX)                 | R <sub>T</sub> = 2kΩ, C <sub>T</sub> = 470pF   | 400  | 430  | -    | kHz  |
| Minimum Frequency              | f(MIN)                 | R <sub>T</sub> = 200kΩ, C <sub>T</sub> = 0.1μF | -    | 60   | 120  | Hz   |
| Clock Amplitude (Note1, 2)     | V(CLK)                 | -  | 3    | 4    | -    | V    |
| Clock Width (Note1, 2)         | t <sub>W</sub> (CLK)   | T <sub>J</sub> = 25°C                          | 0.3  | 0.6  | 1    | μs   |
| Sync Threshold                 | V <sub>TH</sub> (SYNC) | -  | 1.2  | 2    | 2.8  | V    |
| Sync Input Current             | I <sub>I</sub> (SYNC)  | Sync = 3.5V                                    | -    | 1.3  | 2.5  | mA   |

**Electrical Characteristics** (Continued)

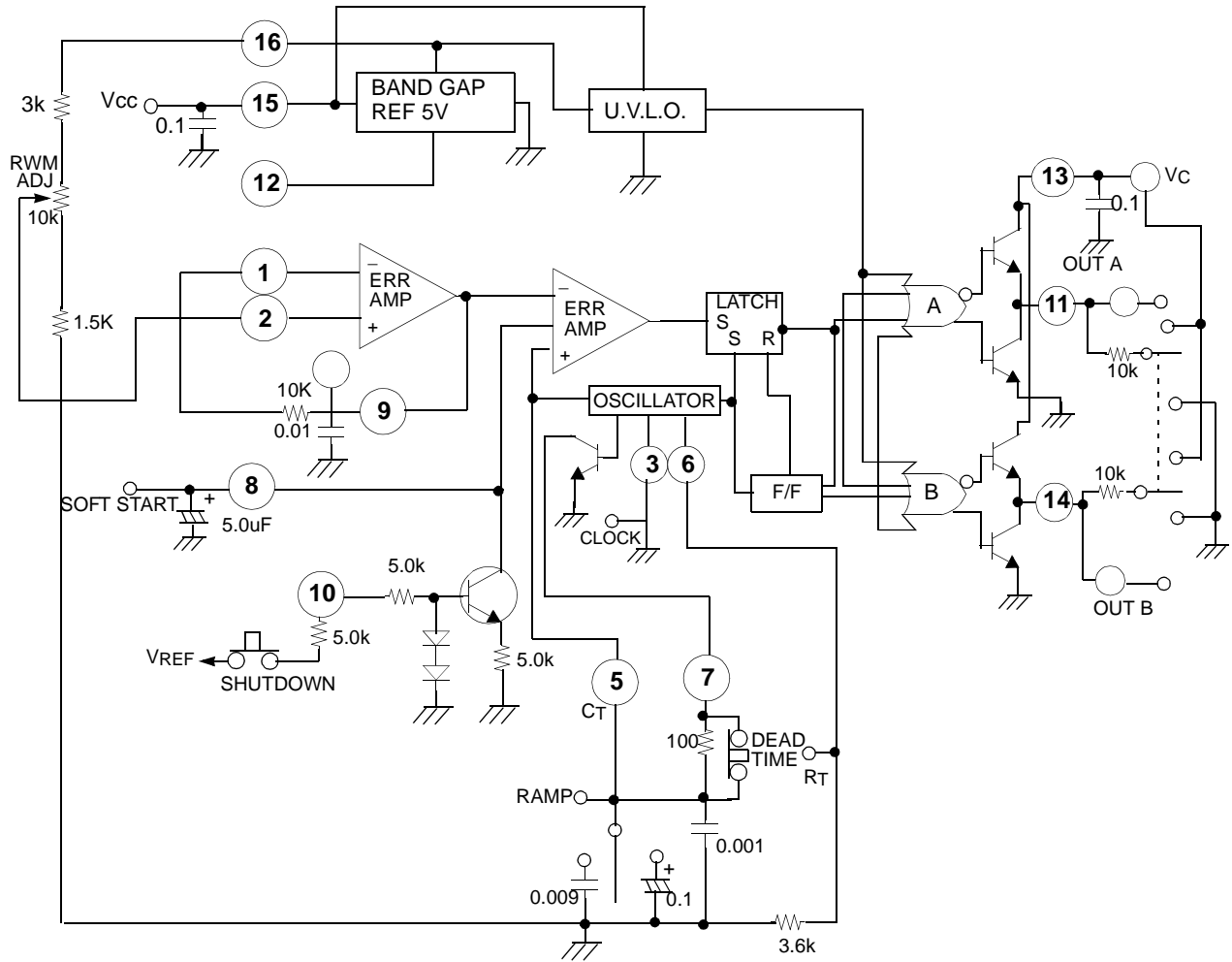
(VCC = 20V, TA = 0 to +70°C, unless otherwise specified)

| Parameter  | Symbol              | Conditions                                  | Min. | Typ. | Max. | Unit |
|--|---------------------|---|------|------|------|------|
| <b>ERROR AMPLIFIER SECTION (V<sub>CM</sub> = 5.1V)</b> |                     |   |      |      |      |      |
| Input Offset Voltage                                   | V <sub>IO</sub>     | -   | -    | 1.5  | 10   | mV   |
| Input Bias Current                                     | I <sub>BIAS</sub>   | -   | -    | 1    | 10   | μA   |
| Input Offset Current                                   | I <sub>IO</sub>     | -   | -    | 0.1  | 1    | μA   |
| Open Loop Voltage Gain                                 | G <sub>VO</sub>     | R <sub>L</sub> ≥ 10MΩ                       | 60   | 80   | -    | dB   |
| Common Mode Rejection Ratio                            | CMRR                | V <sub>CM</sub> = 1.5 to 5.2V               | 60   | 90   | -    | dB   |
| Power Supply Rejection Ratio                           | PSRR                | V <sub>CC</sub> = 8 to 3.5V                 | 50   | 60   | -    | dB   |
| <b>PWM COMPARATOR SECTION</b>                          |                     |   |      |      |      |      |
| Minimum Duty Cycle                                     | D(MIN)              | -   | -    | -    | 0    | %    |
| Maximum Duty Cycle                                     | D(MAX)              | -   | 45   | 49   | -    | %    |
| Input Threshold Voltage (Note2)                        | V <sub>TH1</sub>    | Zero Duty Cycle                             | 0.7  | 0.9  | -    | V    |
| Input Threshold Voltage (Note2)                        | V <sub>TH2</sub>    | Max Duty Cycle                              | -    | 3.2  | 3.6  | V    |
| <b>SOFT-START SECTION</b>                              |                     |   |      |      |      |      |
| Soft Start Current                                     | I <sub>SOFT</sub>   | V <sub>SD</sub> = 0V, V <sub>SS</sub> = 0V  | 25   | 51   | 80   | μA   |
| Soft Start Low Level Voltage                           | V <sub>SL</sub>     | V <sub>SD</sub> = 25V                       | -    | 0.3  | 0.7  | V    |
| Shutdown Threshold Voltage                             | V <sub>TH(SD)</sub> | -   | 0.9  | 1.3  | 1.7  | V    |
| Shutdown Input Current                                 | I <sub>N(SD)</sub>  | V <sub>SD</sub> = 2.5V                      | -    | 0.3  | 1    | mA   |
| <b>OUTPUT SECTION</b>                                  |                     |   |      |      |      |      |
| Low Output Voltage I                                   | V <sub>OL I</sub>   | I <sub>SINK</sub> = 20mA                    | -    | 0.1  | 0.4  | V    |
| Low Output Voltage II                                  | V <sub>OL II</sub>  | I <sub>SINK</sub> = 100mA                   | -    | 0.05 | 2    | V    |
| High Output Voltage I                                  | V <sub>CH I</sub>   | I <sub>SOURCE</sub> = 20mA                  | 18   | 19   | -    | V    |
| High Output Voltage II                                 | V <sub>CH II</sub>  | I <sub>SOURCE</sub> = 100mA                 | 17   | 18   | -    | V    |
| Under Voltage Lockout                                  | V <sub>UV</sub>     | V <sub>8</sub> and V <sub>9</sub> = High    | 6    | 7    | 8    | V    |
| Collector Leakage Current                              | I <sub>LKG</sub>    | V <sub>CC</sub> = 35V                       | -    | 80   | 200  | μA   |
| Rise Time (Note1)                                      | t <sub>R</sub>      | C <sub>L</sub> = 1μF, T <sub>J</sub> = 25°C | -    | 80   | 600  | ns   |
| Fall Time (Note1)                                      | t <sub>F</sub>      | C <sub>L</sub> = 1μF, T <sub>J</sub> = 25°C | -    | 70   | 300  | ns   |
| <b>STANDBY CURRENT</b>                                 |                     |   |      |      |      |      |
| Supply Current   | I <sub>CC</sub>     | V <sub>CC</sub> = 35V                       | -    | 12   | 20   | mA   |

**Note :**

1. These parameters, although guaranteed over the recommended operating conditions, are not 100% tested in production
2. Tested at f<sub>OSC</sub>=40kHz (R<sub>T</sub>=3.6K, C<sub>T</sub>=0.01μF, R<sub>I</sub> = 0Ω)

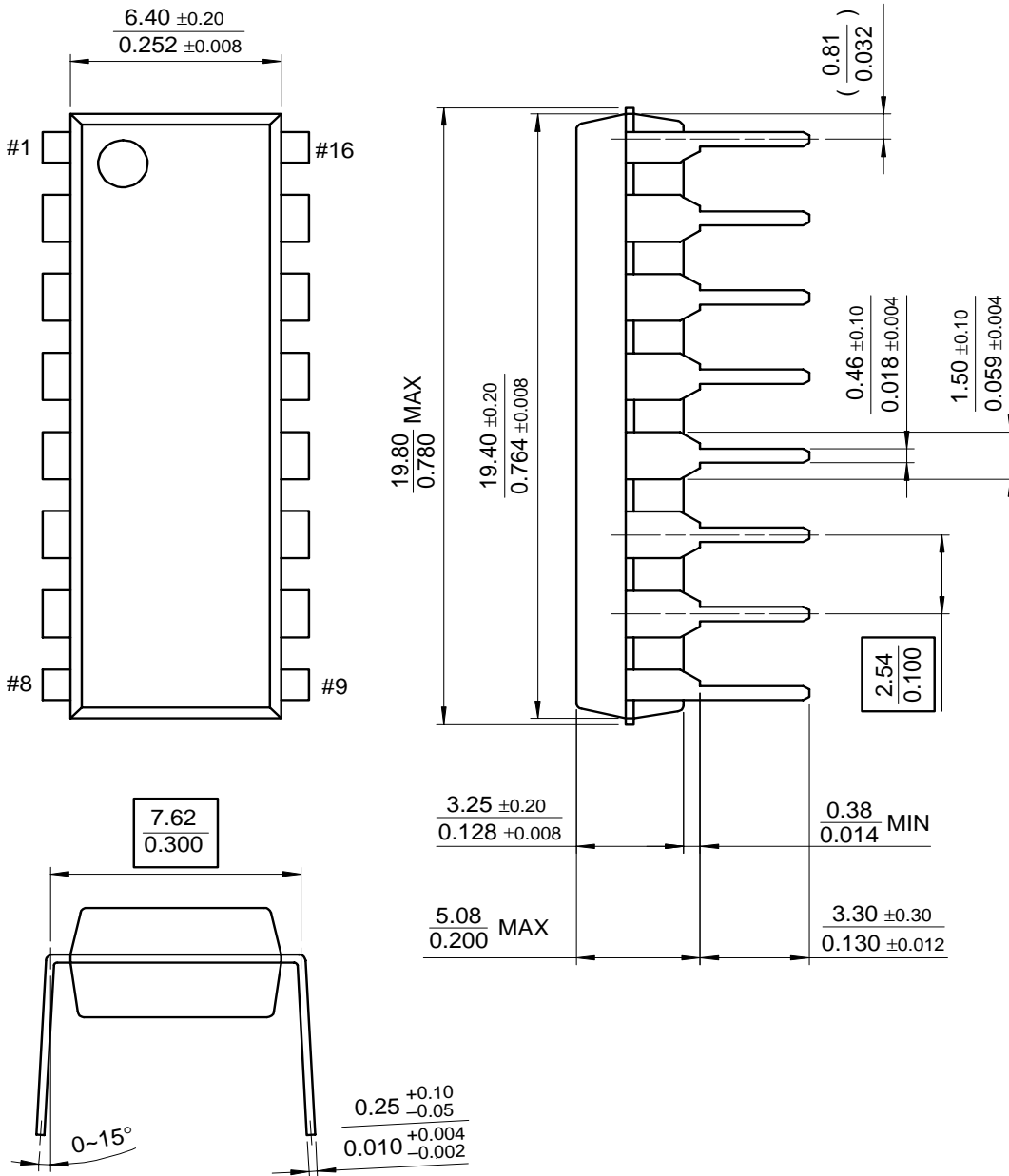
# Test Circuit



# Mechanical Dimensions

## Package

### 16-DIP



## Ordering Information

| Product Number | Package | Operating Temperature |
|----------------|---------|-----------------------|
| KA3525A        | 16-DIP  | 0 ~ +70°C             |

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