

## KA3882/3/4/5

## SMPS CONTROLLER

### CURRENT MODE PWM CONTROLLER

The KA3882/3/4/5 are fixed PWM controller for Off-Line and DC to DC converter applications. The internal circuits include UVLO, low start up current circuit, temperature compensated reference, high gain error amplifier, current sensing comparator, and high current totempole output for driving a POWER MOSFET. Also KA3882/3/4/5 provide low start up current below 0.3mA and short shutdown delay time typ. 100ns.

The KA3882 and KA3884 have UVLO threshold of 1.6V(on) and 10V(off).

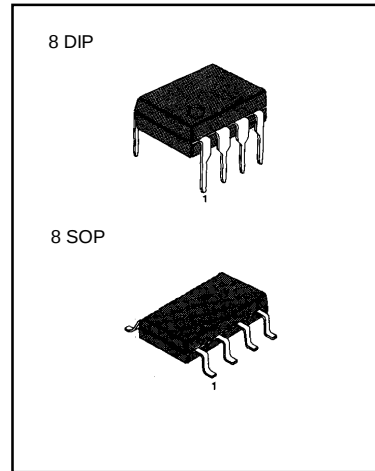
The KA3883 and KA3885 are 8.4V(on) and 7.6V(off).

The KA3882 and KA3883 can operate within 100% duty cycle.

The KA3884 and KA3885 within 50% by using T Flip-Flop.

### FEATURES

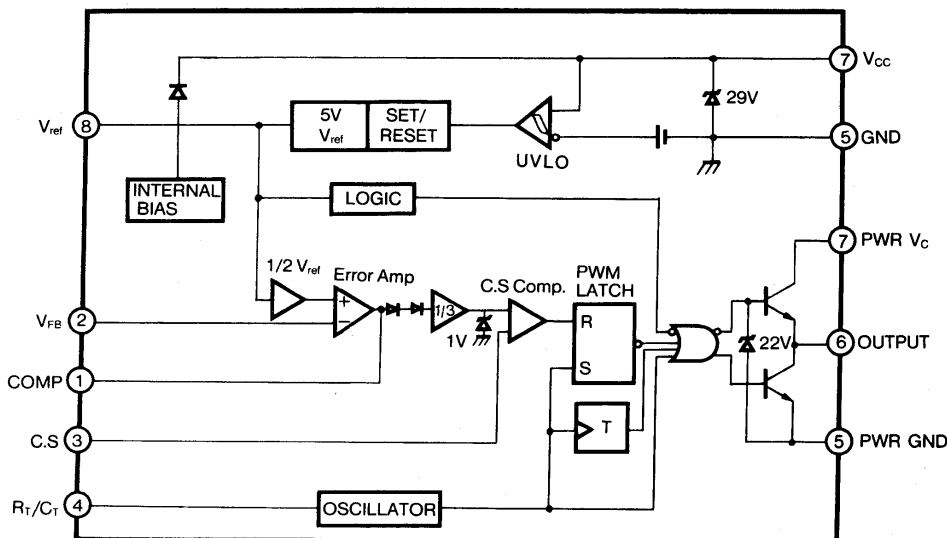
- Low Start Current 0.2mA (typ)
- Operating Range Up To 500KHz
- Cycle by Cycle Current Limiting
- Under Voltage Lock Out With Hysteresis
- Short Shutdown Delay Time: typ.100ns
- High Current Totempole Output
- Output Swing Limiting: 22V



### ORDERING INFORMATION

| Device  | Package | Operating Temperature |
|---------|---------|-----------------------|
| KA388X  | 8 DIP   | 0 ~ + 85°C            |
| KA388XD | 8 SOP   | 0 ~ + 85°C            |

### BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Characteristic                 | Symbol         | Value        | Unit |
|--------------------------------|----------------|--------------|------|
| Supply Voltage                 | $V_{CC}$       | 30           | V    |
| Output Current                 | $I_O$          | + 1          | A    |
| Analog Inputs (pin 2, 3)       | $V_{I(ANA)}$   | - 0.3 to 6.3 | V    |
| Error Amp. Output Sink Current | $I_{SINK(EA)}$ | 10           | mA   |
| Power Dissipation              | $P_D$          | 1            | W    |

## ELECTRICAL CHARACTERISTICS

( $V_{CC} = 15V$ ,  $R_T = 10K\Omega$ ,  $C_T = 3.3nF$ ,  $T_A = 0^\circ C$  to  $+85^\circ C$ , Unless otherwise specified)

| Characteristic               | Symbol           | Test Conditions                        | Min  | Typ   | Max   | Unit |
|------------------------------|------------------|----------------------------------------|------|-------|-------|------|
| <b>REFERENCE SECTION</b>     |                  |                                        |      |       |       |      |
| Output Voltage               | $V_{REF}$        | $T_J = 25^\circ C$ , $I_O = 1mA$       | 4.9  | 5.0   | 5.1   | V    |
| Line Regulation              | $\Delta V_{REF}$ | $V_{CC} = 12V$ to $25V$                | -    | 6     | 20    | mV   |
| Load Regulation              | $\Delta V_{REF}$ | $I_O = 1mA$ to $20mA$                  | -    | 6     | 25    | mV   |
| Output Short Circuit         | $I_{SC}$         | $T_A = 25^\circ C$                     | -    | - 100 | - 180 | mA   |
| <b>OSILLATOR SECTION</b>     |                  |                                        |      |       |       |      |
| Initial Accuracy             | $F_{OSC}$        | $T_J = 25^\circ C$                     | 47   | 52    | 57    | KHz  |
| Voltage Stability            | $ST_V$           | $V_{CC} = 12V$ to $25V$                | -    | 0.2   | 1     | %    |
| Amplitude                    | $V_{OSC}$        | $V_{PIN4}$ , Peak to Peak              | -    | 1.7   | -     | V    |
| Discharge Current            | $I_{DISCHG}$     | $T_J = 25^\circ C$ , $Pin4 = 2V$       | 7.8  | 8.3   | 8.8   | mA   |
| <b>CURRENT SENSE SECTION</b> |                  |                                        |      |       |       |      |
| Gain                         | $G_V$            | (NOTE 2, 3)                            | 2.85 | 3     | 3.15  | V/V  |
| Maximum Input Signal         | $V_{I(MAX)}$     | $V_{PIN1} = 5V$ (NOTE 2)               | 0.9  | 1.0   | 1.1   | V    |
| PSRR                         | PSRR             | $V_{CC} = 12V$ to $25V$<br>(NOTE 1, 2) | -    | 70    | -     | dB   |
| Input Bias Current           | $I_{BIAS}$       | -                                      | -    | - 2   | -10   | uA   |
| Delay to Output              | $T_D$            | $V_{PIN3} = 0V$ to $2V$ (NOTE1)        | -    | 100   | 200   | ns   |

**ELECTRICAL CHARACTERISTICS(Continued)**(V<sub>CC</sub> = 15V, R<sub>T</sub> = 10K $\Omega$ , C<sub>T</sub> = 3.3nF, T<sub>A</sub> = 0 $^{\circ}$ C to + 85 $^{\circ}$ C, Unless otherwise specified)

| Characteristic                             | Symbol              | Test Conditions                                        | Min  | Typ  | Max  | Unit    |
|--------------------------------------------|---------------------|--------------------------------------------------------|------|------|------|---------|
| <b>ERROR AMPLIFIER SECTION</b>             |                     |                                                        |      |      |      |         |
| Input Voltage                              | V <sub>I</sub>      | T <sub>PIN1</sub> = 2.5V                               | 2.42 | 2.50 | 2.58 | V       |
| Input Bias Current                         | I <sub>BIAS</sub>   | -                                                      | -    | -0.3 | - 2  | $\mu$ A |
| Open Loop Gain                             | G <sub>VO</sub>     | V <sub>O</sub> = 2V to 4V<br>(NOTE 1)                  | 65   | 90   | -    | dB      |
| Unity Gain Bandwidth                       | GBW                 | T <sub>J</sub> = 25 $^{\circ}$ C<br>(NOTE 1)           | 0.7  | 1    | -    | MHz     |
| PSRR                                       | PSRR                | V <sub>CC</sub> = 12V to 25V<br>(NOTE 1)               | 60   | 70   | -    | dB      |
| Output Sink Current                        | I <sub>SINK</sub>   | V <sub>PIN2</sub> = 2.7V<br>V <sub>PIN1</sub> = 1.1V   | 2    | 6    | -    | mA      |
| Output Source Current                      | I <sub>SOURCE</sub> | V <sub>PIN2</sub> = 2.3V<br>V <sub>PIN1</sub> = 5.0V   | -0.5 | -0.8 | -    | mA      |
| Output High Voltage                        | V <sub>OH</sub>     | V <sub>PIN2</sub> = 2.3V<br>R1 = 15K $\Omega$ to GND   | 5    | 6    | -    | V       |
| Output Low Voltage                         | V <sub>OL</sub>     | V <sub>PIN2</sub> = 2.7V<br>R1 = 15K $\Omega$ to Pin8  | -    | 0.8  | 1.1  | V       |
| <b>OUTPUT SECTION</b>                      |                     |                                                        |      |      |      |         |
| Output Low Level                           | V <sub>OL</sub>     | I <sub>SINK</sub> = 20mA                               | -    | 0.1  | 0.4  | V       |
|                                            |                     | I <sub>SINK</sub> = 200mA                              | -    | 1.5  | 2.2  | V       |
| Output High Level                          | V <sub>OH</sub>     | I <sub>SOURCE</sub> = 20mA                             | 13   | 13.5 | -    | V       |
|                                            |                     | I <sub>SOURCE</sub> = 200mA                            | 12   | 13.5 | -    | V       |
| Rise Time                                  | t <sub>R</sub>      | T <sub>J</sub> = 25 $^{\circ}$ C, C1 = 1nF<br>(NOTE 1) | -    | 40   | 100  | ns      |
| Fall Time                                  | t <sub>F</sub>      | T <sub>J</sub> = 25 $^{\circ}$ C, C1 = 1nF<br>(NOTE 1) | -    | 40   | 100  | ns      |
| Output Voltage Swing Limit                 | V <sub>OLIM</sub>   | V <sub>CC</sub> = 27V, C1 = 1nF                        | -    | 22   | -    | V       |
| <b>UNDER VOLTAGE LOCKOUT SECTION</b>       |                     |                                                        |      |      |      |         |
| Start Threshold                            | V <sub>TH</sub>     | KA3882/4                                               | 15   | 16   | 17   | V       |
|                                            |                     | KA3883/5                                               | 7.8  | 8.4  | 9.0  | V       |
| Min.Operating Voltage<br>( After turn on ) | V <sub>TL</sub>     | KA3882/4                                               | 9    | 10   | 11   | V       |
|                                            |                     | KA3883/5                                               | 7.0  | 7.6  | 8.2  | V       |

**ELECTRICAL CHARACTERISTICS(Continued)**(V<sub>CC</sub> = 15V, R<sub>T</sub> = 10K $\Omega$ , C<sub>T</sub> = 3.3nF, T<sub>A</sub> = 0°C to +85°C, unless otherwise specified)

| Characteristic                | Symbol           | Test Conditions                            | Min | Typ | Max | Unit |
|-------------------------------|------------------|--------------------------------------------|-----|-----|-----|------|
| <b>PWM SECTION</b>            |                  |                                            |     |     |     |      |
| Maximum Duty Cycle            | D <sub>MAX</sub> | KA3882/3                                   | 94  | 96  | 100 | %    |
|                               |                  | KA3884/5                                   | 47  | 48  | 50  | %    |
| Minimum Duty Cycle            | D <sub>MIN</sub> | -                                          | -   | -   | 0   | %    |
| <b>TOTAL STANDBY CURRENT</b>  |                  |                                            |     |     |     |      |
| Start-Up Current              | I <sub>ST</sub>  | -                                          | -   | 0.2 | 0.4 | mA   |
| Operating Supply Current      | I <sub>CC</sub>  | V <sub>PIN2</sub> = V <sub>PIN3</sub> = 0V | -   | 11  | 17  | mA   |
| V <sub>CC</sub> Zener Voltage | V <sub>Z</sub>   | I <sub>CC</sub> = 25mA                     | -   | 29  | -   | V    |

\* Adjust V<sub>CC</sub> above the start threshold before setting at 15V

NOTE 1. These parameters, although guaranteed, are not 100% tested in production.

2. Parameter measured at trip point of latch with V<sub>2</sub> = 0V.3. Gain defined as:  $G_V = \Delta V_{PIN1} / \Delta V_{PIN3}$  (V<sub>PIN3</sub> = 0 to 0.8V)

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| FACT™                | QS™                     |      |
| FACT Quiet Series™   | Quiet Series™           |      |
| FAST®                | SuperSOT™-3             |      |
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