

KA3842B/KA3843B/KA3844B/ KA3845B

SMPS Controller

Features

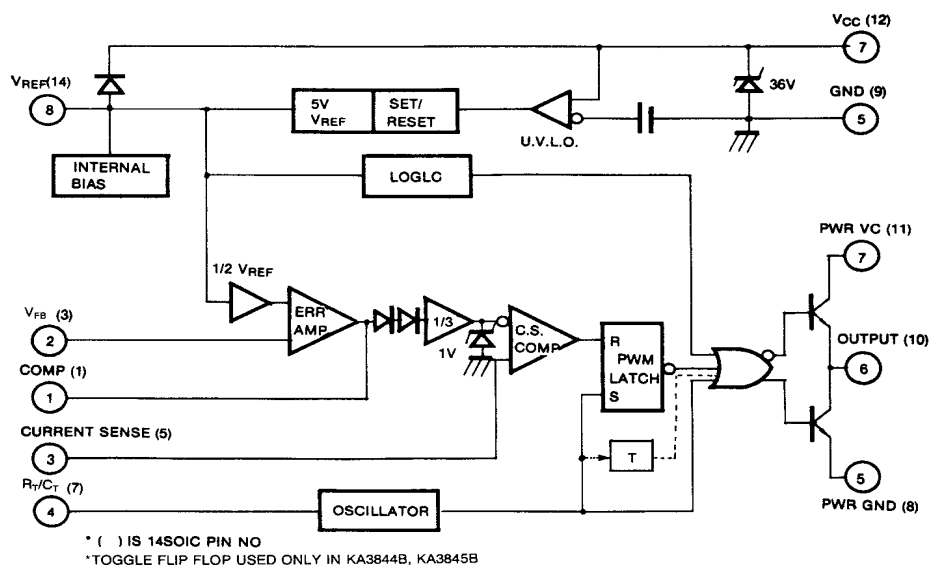
- Low Start Up Current
- Maximum Duty Clamp
- UVLO With Hysteresis
- Operating Frequency Up To 500KHz

Description

The KA3842B/KA3843B/KA3844B/KA3845B are fixed frequency current-mode PWM controller. They are specially designed for Off - Line and DC-to-DC converter applications with minimum external components. These integrated circuits feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and a high current totempole output. Ideally suited for driving a power MOSFET. Protection circuitry includes built in under voltage lockout and current limiting. The KA3842B and KA3844B have UVLO thresholds of 16V (on) and 10V (off). The KA3843B and KA3845B are 8.5V (on) and 7.9V (off). The KA3842B and KA3843B can operate within 100% duty cycle. The KA3844B and KA3845B can operate with 50% duty cycle.

8-DIP**14-SOP**

Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage	V _{CC}	30	V
Output Current	I _O	±1	A
Analog Inputs (Pin 2,3)	V _(ANA)	-0.3 to 6.3	V
Error Amp Output Sink Current	I _{SINK} (E.A.)	10	mA
Power Dissipation (T _A = 25°C)	P _D	1	W

Electrical Characteristics

(VCC=15V, RT=10KΩ, CT=3.3nF, TA= 0°C to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
REFERENCE SECTION						
Reference Output Voltage	VREF	TJ = 25°C, IREF = 1mA	4.90	5.00	5.10	V
Line Regulation	ΔVREF	12V ≤ VCC ≤ 25V	-	6	20	mV
Load Regulation	ΔVREF	1mA ≤ IREF ≤ 20mA	-	6	25	mV
Short Circuit Output Current	ISC	TA = 25°C	-	-100	-180	mA
OSCILLATOR SECTION						
Oscillation Frequency	f	TJ = 25°C	47	52	57	KHz
Frequency Change with Voltage	Δf/ΔVCC	12V ≤ VCC ≤ 25V	-	0.05	1	%
Oscillator Amplitude	VOSC	-	-	1.6	-	VP-P
ERROR AMPLIFIER SECTION						
Input Bias Current	IBIAS	-	-	-0.1	-2	μA
Input Voltage	VI(E>A)	Vpin1 = 2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	GVO	2V ≤ VO ≤ 4V	65	90	-	dB
Power Supply Rejection Ratio	PSRR	12V ≤ VCC ≤ 25V	60	70	-	dB
Output Sink Current	ISINK	Vpin2 = 2.7V, Vpin1 = 1.1V	2	7	-	mA
Output Source Current	ISOURCE	Vpin2 = 2.3V, Vpin1 = 5V	-0.6	-1.0	-	mA
High Output Voltage	VOH	Vpin2 = 2.3V, RL = 15KΩ to GND	5	6	-	V
Low Output Voltage	VOL	Vpin2 = 2.7V, RL = 15KΩ to Pin 8	-	0.8	1.1	V
CURRENT SENSE SECTION						
Gain	GV	(Note 1 & 2)	2.85	3	3.15	V/V
Maximum Input Signal	VI(MAX)	Vpin1 = 5V (Note 1)	0.9	1	1.1	V
Power Supply Rejection Ratio	PSRR	12V ≤ VCC ≤ 25V (Note 1)	-	70	-	dB
Input Bias Current	IBIAS	-	-	-3	-10	μA
OUTPUT SECTION						
Low Output Voltage	VOL	ISINK = 20mA	-	0.08	0.4	V
		ISINK = 200mA	-	1.4	2.2	V
High Output Voltage	VOH	ISOURCE = 20mA	13	13.5	-	V
		ISOURCE = 200mA	12	13.0	-	V
Rise Time	tR	TJ = 25°C, CL = 1nF (Note 3)	-	45	150	ns
Fall Time	tF	TJ = 25°C, CL = 1nF (Note 3)	-	35	150	ns
UNDER-VOLTAGE LOCKOUT SECTION						
Start Threshold	VTH(ST)	KA3842B/KA3844B	14.5	16.0	17.5	V
		KA3843B/KA3845B	7.8	8.4	9.0	V
Min. Operating Voltage (After Turn On)	VOPR(MIN)	KA3842B/KA3844B	8.5	10.0	11.5	V
		KA3843B/KA3845B	7.0	7.6	8.2	V

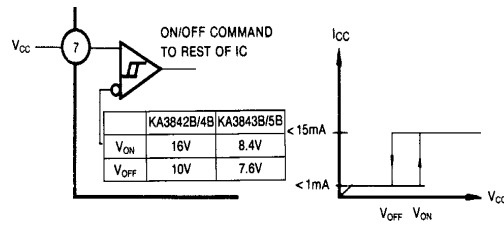


Figure 2. Under Voltage Lockout

During Under-Voltage Lock-Out, the output driver is biased to a high impedance state. Pin 6 should be shunted to ground with a bleeder resistor to prevent activating the power switch with output leakage current.

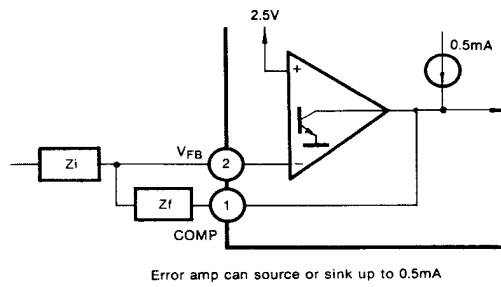


Figure 3. Error Amp Configuration

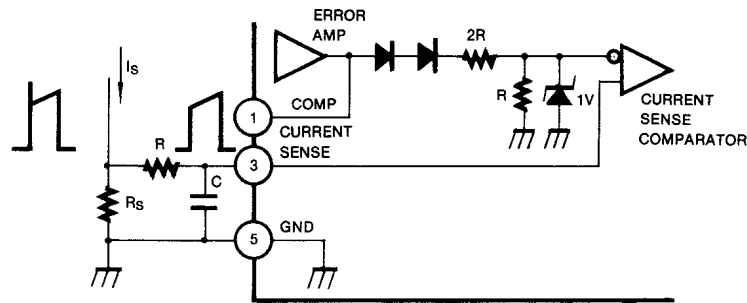


Figure 4. Current Sense Circuit

Peak current (I_S) is determined by the formula:

$$I_S(\text{MAX}) = \frac{1.0V}{R_S}$$

A small RC filter may be required to suppress switch transients.

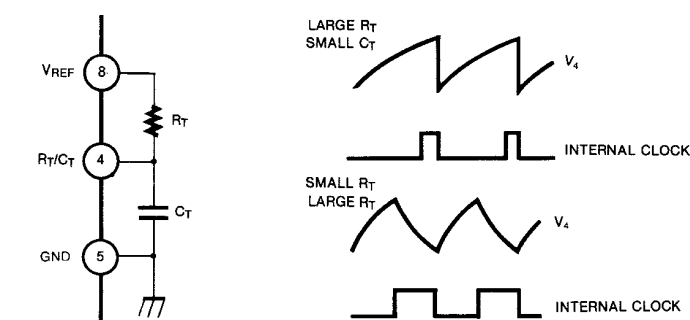


Figure 5. Oscillator Waveforms and Maximum Duty Cycle

Oscillator timing capacitor, C_T , is charged by V_{REF} through R_T , and discharged by an internal current source. During the discharge time, the internal clock signal blanks the output to the low state. Selection of R_T and C_T therefore determines both oscillator frequency and maximum duty cycle. Charge and discharge times are determined by the formulas:

$$t_c = 0.55 R_T C_T$$

$$t_D = R_T C_T I_n \left(\frac{0.0063 R_T - 2.7}{0.0063 R_T - 4} \right)$$

Frequency, then, is: $f = (t_c + t_D)^{-1}$

$$\text{For } R_T > 5K\Omega, f = \frac{1.8}{R_T C_T}$$

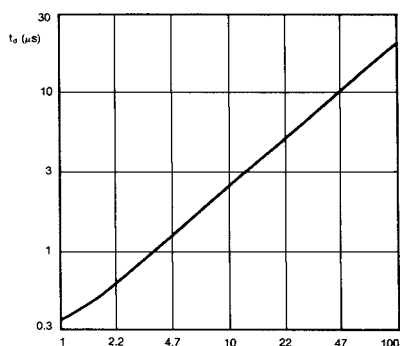


Figure 6. Oscillator Dead Time & Frequency
(Deadtime vs C_T $R_T > 5k\Omega$)

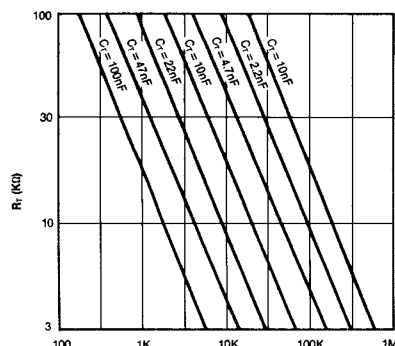


Figure 7. Timing Resistance vs Frequency

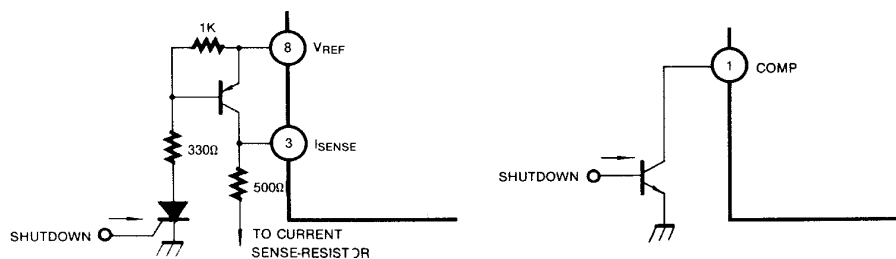


Figure 8. Shutdown Techniques

Shutdown of the KA3842B can be accomplished by two methods; either raise pin 3 above 1V or pull pin 1 below a voltage two diode drops above ground. Either method causes the output of the PWM comparator to be high (refer to block diagram). The PWM latch is reset dominant so that the output will remain low until the next clock cycle after the shutdown condition at pins 1 and/or 3 is removed. In one example, an externally latched shutdown may be accomplished by adding an SCR which will be reset by cycling V_{oc} below the lower UVLO threshold. At this point the reference turns off, allowing the SCR to reset.

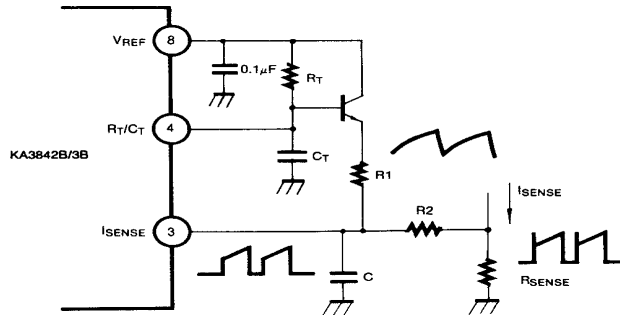


Figure 9. Slope Compensation

A fraction of the oscillator ramp can be resistively summed with the current sense signal to provide slope compensation for converters requiring duty cycles over 50%. Note that capacitor, C, forms a filter with R2 to suppress the leading edge switch spikes.

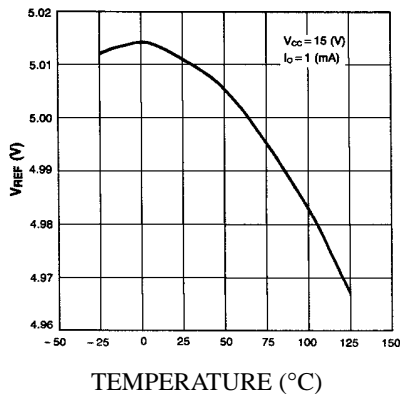


Figure 10. TEMPERATURE DRIFT (Vref)

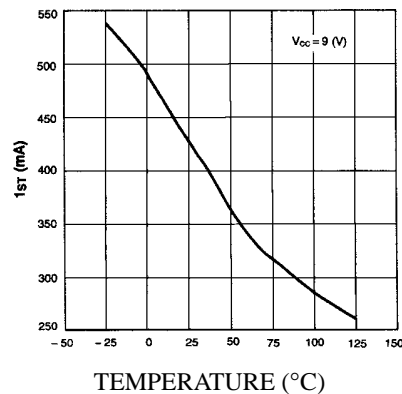


Figure 11. TEMPERATURE DRIFT (Ist)

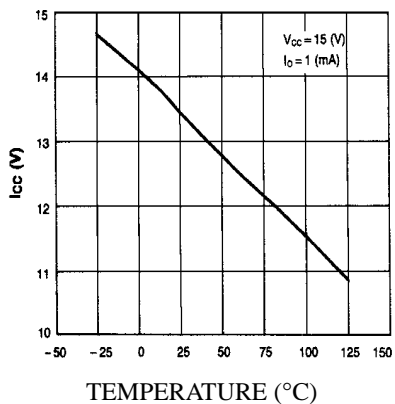
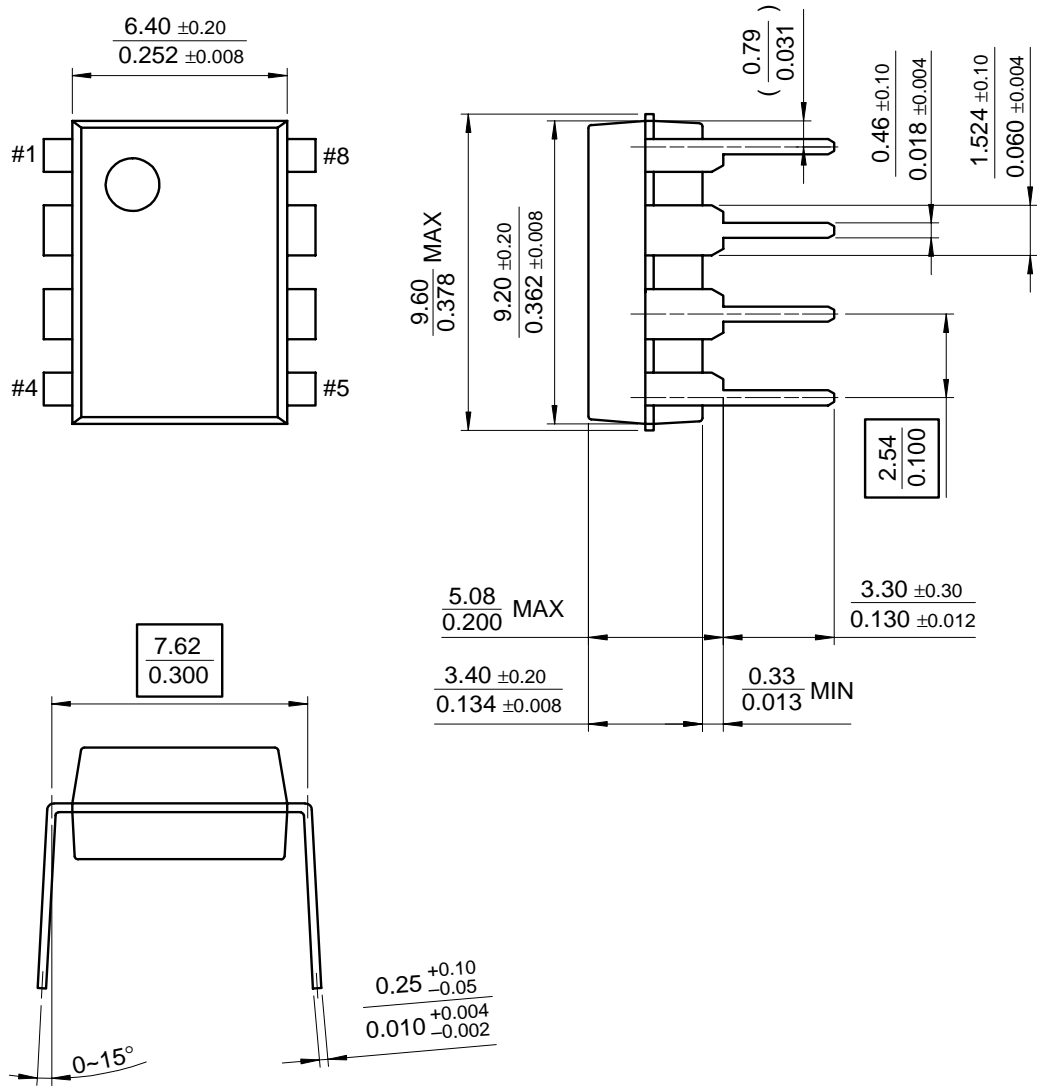


Figure 12. TEMPERATURE DRIFT (Icc)

Mechanical Dimensions

Package

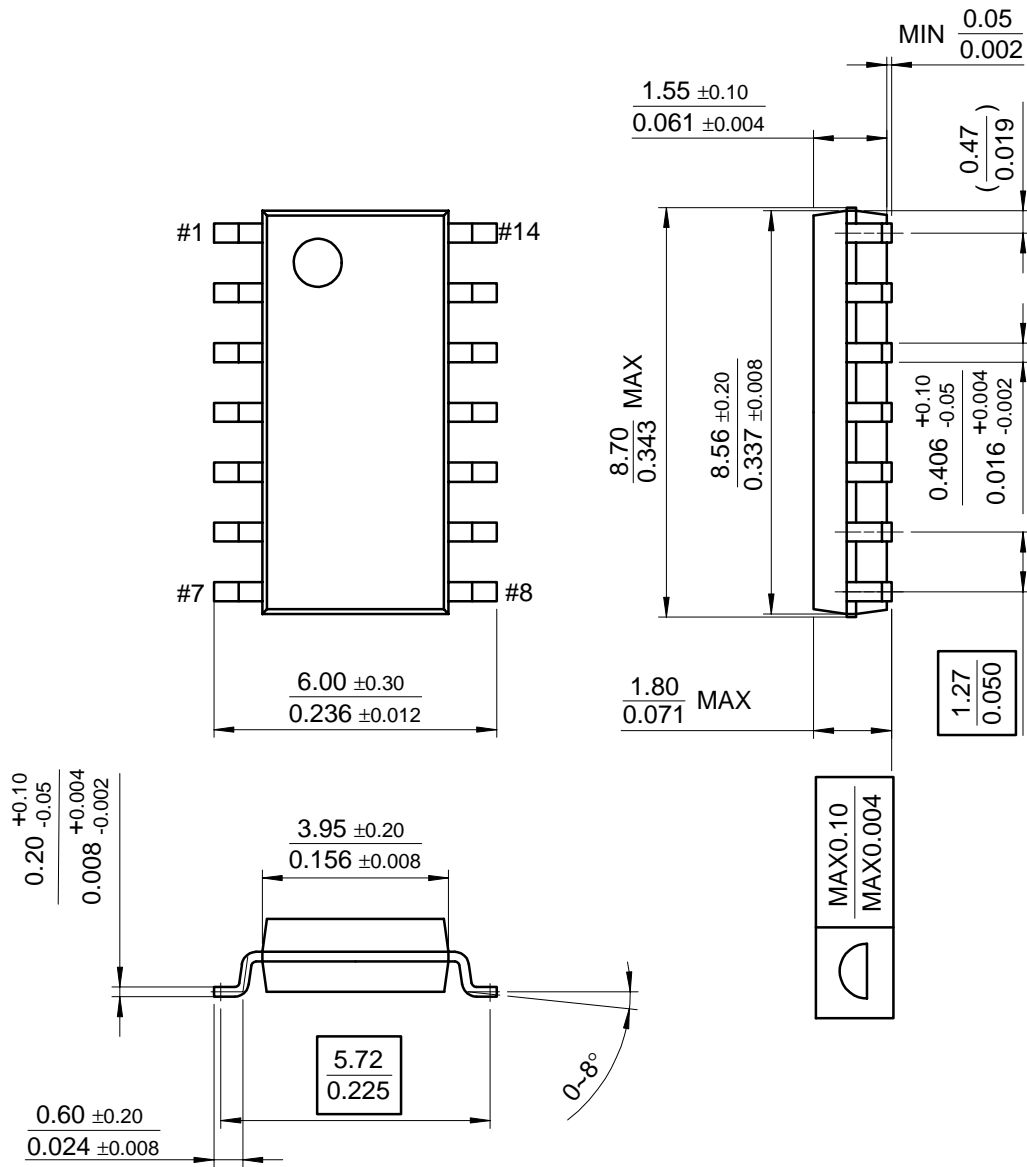
8-DIP



Mechanical Dimensions (Continued)

Package

14-SOP



Ordering Information

Product Number	Package	Operating Temperature
KA3842B	8-DIP	0 ~ + 70°C
KA3843B		
KA3844B		
KA3845B		
KA3842BD		
KA3843BD	14-SOP	
KA3844BD		
KA3845BD		

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