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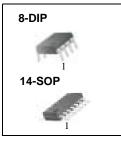
KA3842B/KA3843B/KA3844B/ KA3845B SMPS Controller

Features

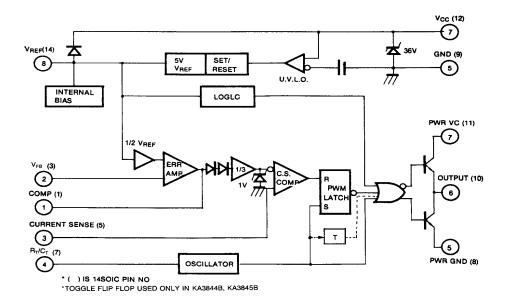
- Low Start up Current
- Maximum Duty Clamp
- UVLO With Hysteresis
- Operating Frequency up to 500KHz

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 for driving a power MOSFET. The KA3842B and KA3844B have UVLO thresholds of 16V (on) and 10V (off). The KA3842B and KA3845B are 8.5V (on) and 7.9V (off). The KA3842B and KA3844B and KA3844B and KA3845B can operate within 100% duty cycle. The KA3844B and KA3845B can operate with 50% duty cycle.



Internal Block Diagram



Absolute Maximum Ratings

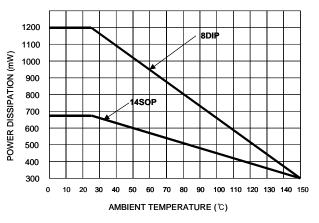
Parameter	Symbol	Value	Unit
Supply Voltage	Vcc	30	V
Output Current	IO	±1	A
Analog Inputs (Pin 2.3)	V(ANA)	-0.3 to 6.3	V
Error Amp Output Sink Current	ISINK (E.A)	10	mA
Power Dissipation at TA≤25°C (8DIP)	PD(Note1,2)	1200	mW
Power Dissipation at T _A ≤25°C (14SOP)	P _D (Note1,2)	680	mW
Storage Temperature Range	TSTG	-65 ~ +150	°C
Lead Temperature (Soldering, 10sec)	TLEAD	+300	°C

Note:

1. Board Thickness 1.6mm, Board Dimension 76.2mm ×114.3mm, (Reference EIA / JSED51-3, 51-7)

2. Do not exceeed PD and SOA (Safe Operation Area)

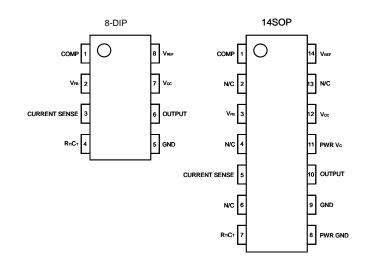
Power Dissipation Curve



Thermal Data

Characteristic	Symbol	8-DIP	14-SOP	Unit
Thermal Resistance Junction-ambient	Rthj-amb(MAX)	100	180	°C/W

Pin Array



Electrical Characteristics

(V_{CC}=15V, R_T=10K Ω , C_T=3.3nF, T_A= 0°C to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
REFERENCE SECTION						
Reference Output Voltage	VREF	$T_J = 25^{\circ}C$, IREF = 1mA	4.90	5.00	5.10	V
Line Regulation	ΔV_{REF}	12V≤V _{CC} ≤25V	-	6	20	mV
Load Regulation	$\Delta VREF$	1mA≤IREF≤20mA	-	6	25	mV
Short Circuit Output Current	Isc	$T_A = 25^{\circ}C$	-	-100	-180	mA
OSCILLATOR SECTION						
Oscillation Frequency	f	TJ = 25°C	47	52	57	KHz
Frequency Change with Voltage	$\Delta f/\Delta VCC$	12V≤V _{CC} ≤25V	-	0.05	1	%
Oscillator Amplitude	Vosc	-	-	1.6	-	VP-P
ERROR AMPLIFIER SECTION						
Input Bias Current	IBIAS	-	-	-0.1	-2	μΑ
Input Voltage	VI(E>A)	Vpin1 = 2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	Gvo	2V≤ Vo ≤4V (Note3)	65	90	-	dB
Power Supply Rejection Ratio	PSRR	12V≤ V _{CC} ≤25V (Note3)	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	Vон	$V_{pin2} = 2.3V, R_L = 15K\Omega$ to GND	5	6	-	V
Low Output Voltage	Vol	V_{pin2} = 2.7V, R_L = 15K Ω 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≤ V _{CC} ≤25V (Note1,3)	-	70	-	dB
Input Bias Current	IBIAS	-	-	-3	-10	μΑ
OUTPUT SECTION						
Low Output Voltage	Vol	ISINK = 20mA	-	0.08	0.4	V
		ISINK = 200mA	-	1.4	2.2	V
High Output Voltage	Vон	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		KA3842B/KA3844B	8.5	10.0	11.5	V
(After Turn On)	VOPR(MIN)	KA3843B/KA3845B	7.0	7.6	8.2	V
						·

Electrical Characteristics (Continued)

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

Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
PWM SECTION				•		
Max. Duty Cycle	D(Max)	KA3842B/KA3843B	95	97	100	%
Max. Duty Cycle	D(MAX)	KA3844B/KA3845B	47	48	50	%
Min. Duty Cycle	D(MIN)	-	-	-	0	%
TOTAL STANDBY CURRENT						
Start-Up Current	IST	-	-	0.45	1	mA
Operating Supply Current	ICC(OPR)	Vpin3=Vpin2=ON	-	14	17	mA
Zener Voltage	Vz	ICC = 25mA	30	38	-	V

Adjust VCC above the start threshould before setting at 15V

Note:

- 1. Parameter measured at trip point of latch
- 2. Gain defined as:

$$A = \frac{\Delta V_{pin1}}{\Delta V_{pin3}} \quad , 0 \le V pin3 \le 0.8 V$$

3. These parameters, although guaranteed, are not 100 tested in production.

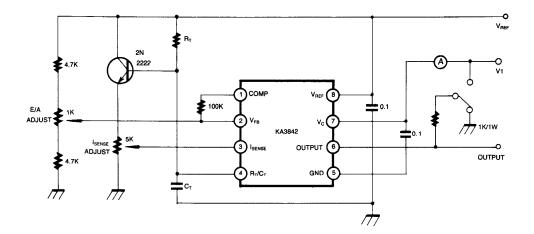


Figure 1. Open Loop Test Circuit

High peak currents associated with capacitive loads necessitate careful grounding techniques Timing and bypass capacitors should be connected close to pin 5 in a single point ground. The transistor and $5K\Omega$ potentiometer are used to sample the oscillator waveform and apply an adjustable ramp to pin 3.

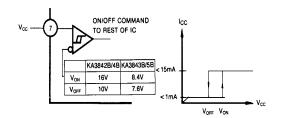
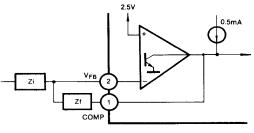


Figure 2. Under Voltage Lockout

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.



Error amp can source or sink up to 0.5mA

Figure 3. Error Amp Configuration

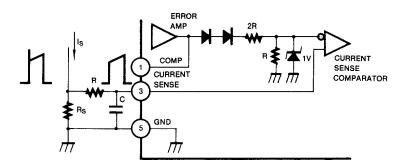


Figure 4. Current Sense Circuit

Peak current (I_S) is determined by the formula:

$$I_{S}(MAX) = \frac{1.0V}{R_{S}}$$

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

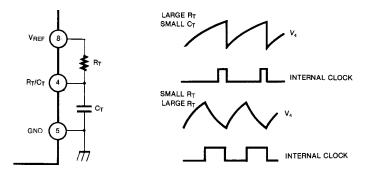


Figure 5. Oscillator Waveforms and Maximum Duty Cycle

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:

$$t_{c} = 0.55 \text{ R}_{T} \text{ C}_{T}$$
$$t_{D} = \text{ R}_{T} \text{ C}_{T} \text{ I}_{n} \left(\frac{0.0063 \text{ R}_{T} - 2.7}{0.0063 \text{ R}_{T} - 4} \right)$$

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

ForRT > 5K
$$\Omega$$
,f= $\frac{1.8}{R_TC_T}$

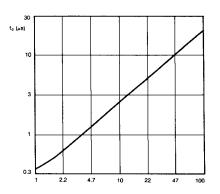


Figure 6. Oscillator Dead Time & Frequency

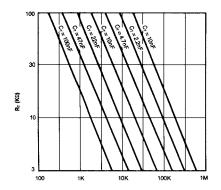


Figure 7. Timing Resistance vs Frequency

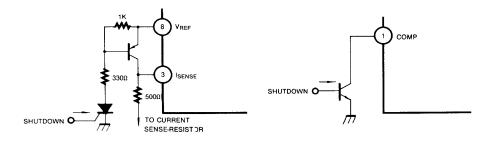


Figure 8. Shutdown Techniques

⁽Deadtime vs $C_T RT > 5k\Omega$)

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 SOR which will be reset by cycling VCC below the lower UVLO threshold. At this point the reference turns off, allowing the SCR to reset.

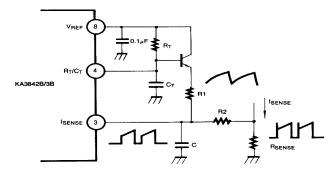
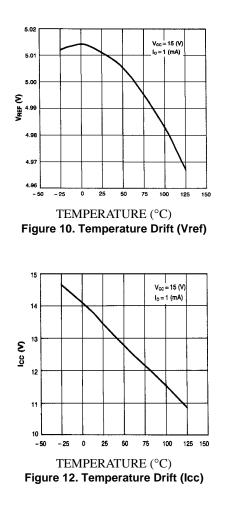


Figure 9. Slope Compensation

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_T, forms a filter with R2 to suppress the leading edge switch spikes.



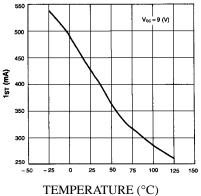
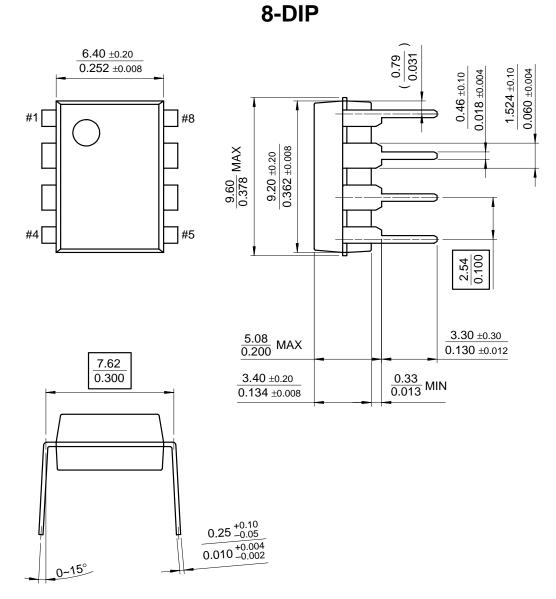


Figure 11. Temperature Drift (Ist)

Mechanical Dimensions

Package

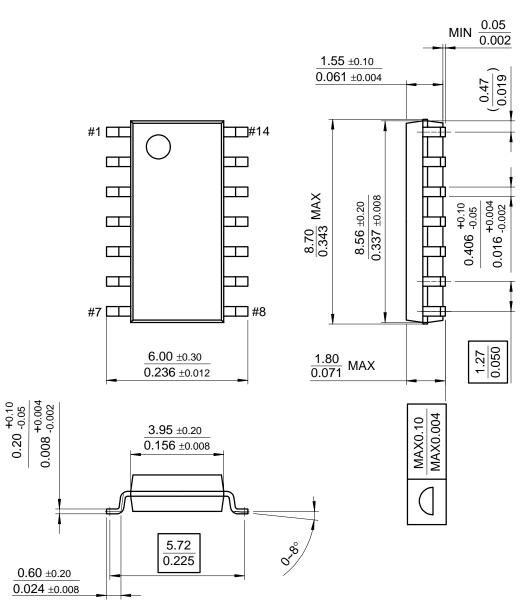
Dimensions in millimeters



Dimensions in millimeters

Mechanical Dimensions (Continued)

Package



14-SOP

Ordering Information

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

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