

# KA7500B

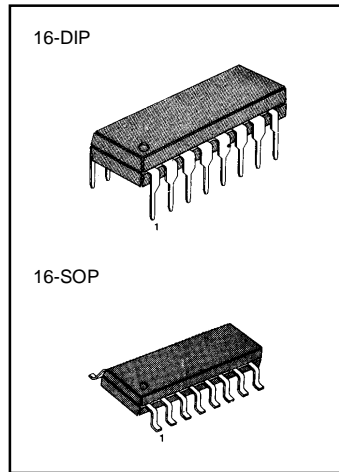
# SMPS CONTROLLER

## VOLTAGE-MODE PWM CONTROLLER

The KA7500B is used for the control circuit of the pulse width modulation switching regulator. The KA7500B consists of 5V reference voltage circuit, two error amplifiers, 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 1 KHz to 300 KHz.

### FEATURES

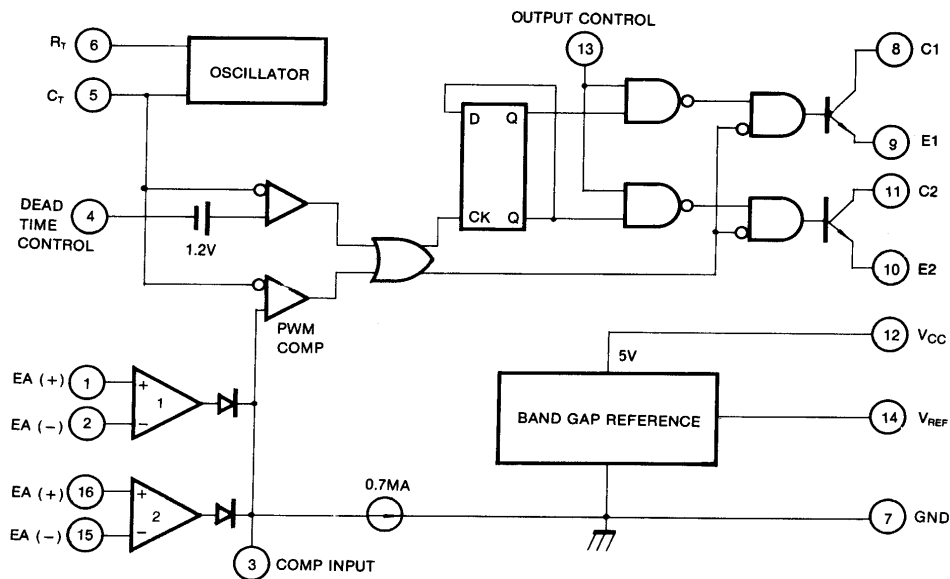
- Internal regulator provides a stable 5V reference supply trimmed to 1 %
- Uncommitted output TR for 200mA sink or source current
- Output control for push-pull or single-ended operation
- Variable duty cycle by dead time control (pin 4)
- Complete PWM control circuit
- On-chip oscillator with master or slave operation
- Internal circuit prohibits double pulse at either output



### ORDERING INFORMATION

Device	Package	Operating Temperature
KA7500B	16 DIP	0 ~ +70 °C
KA7500BD	16 SOP	0 ~ +70 °C

### BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	42	V
Collector Supply Voltage	$V_C$	42	V
Output Current	$I_o$	250	mA
Amplifier Input Voltage	$V_{IN}$	$V_{CC} + 0.3$	V
Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_D$	1 (KA7500B) 0.9 (KA7500BD)	W
Operating Temperature Range	$T_{OPR}$	0 ~ +70	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-65 ~ +150	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = 20V, f = 10KHz, T<sub>A</sub> = 0 $^\circ\text{C}$  to +70 $^\circ\text{C}$ , unless otherwise specified)

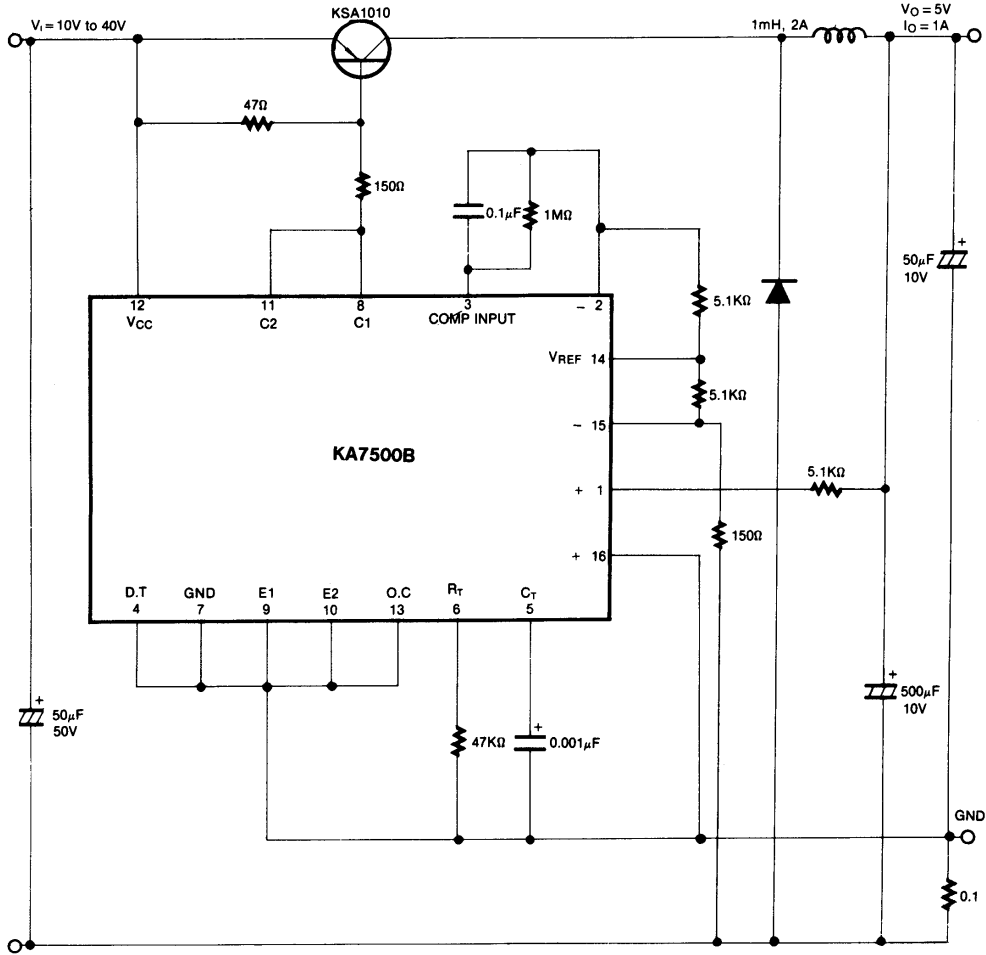
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>REFERENCE SECTION</b>						
Reference Output Voltage	$V_{REF}$	$I_{REF} = 1\text{mA}$	4.75	5.0	5.25	V
Line Regulation	$\Delta V_{REF}$	$V_{CC} = 7\text{V to } 40\text{V}$		2.0	25	mV
Temperature Coefficient of $V_{REF}$	$\Delta V_{REF}/\Delta T$	$T_A = 0^\circ\text{C to } 70^\circ\text{C}$		0.01	0.03	%/ $^\circ\text{C}$
Load Regulation	$\Delta V_{REF}$	$I_{REF} = 1\text{mA to } 10\text{mA}$		1.0	15	mV
Short-Circuit Output Current	$I_{SC}$	$V_{REF} = 0$	10	35	50	mA
<b>OSCILLATOR SECTION</b>						
Oscillation Frequency	f	$C_T = 0.01\mu\text{F}$ , $R_T = 12\text{K}\Omega$		10		KHz
Frequency Change with Temperature	$\Delta f/\Delta T$	$C_T = 0.01\mu\text{F}$ , $R_T = 12\text{K}\Omega$			2	%
<b>DEAD TIME CONTROL SECTION</b>						
Input Bias Current	$I_{BIAS}$	$V_{CC} = 15\text{V}$ , $0\text{V} < V_4 < 5.25\text{V}$		-2.0	-10	$\mu\text{A}$
Maximum Duty Cycle	$D_{(MAX)}$	$V_{CC} = 15\text{V}$ , $V_4 = 0\text{V}$ $O.C \text{ Pin} = V_{REF}$	45			%
Input Threshold Voltage	$V_{ITH}$	Zero Duty Cycle		3.0	3.3	V
		Max. Duty Cycle	0			
<b>ERROR AMP SECTION</b>						
Input Offset Voltage	$V_{IO}$	$V_3 = 2.5\text{V}$		2.0	10	mV
Input Offset Current	$I_{IO}$	$V_3 = 2.5\text{V}$		25	250	mA
Input Bias Current	$I_{BIAS}$	$V_3 = 2.5\text{V}$		0.2	1.0	$\mu\text{A}$
Common Mode Input Voltage	$V_{CM}$	$7\text{V} < V_{CC} < 40\text{V}$	-0.3		$V_{CC}$	V
Open-Loop Voltage Gain	$G_{VO}$	$0.5\text{V} < V_3 < 3.5\text{V}$	70	95		dB
Unit-Gain Bandwidth	BW			650		KHz

**ELECTRICAL CHARACTERISTICS**(V<sub>CC</sub> = 20V, f = 10KHz, T<sub>A</sub> = 0 °C to + 70 °C, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>PWM COMPARATOR SECTION</b>						
Input Threshold Voltage	V <sub>ITH</sub>	Zero Duty Cycle		4	4.5	V
Input Sink Current	I <sub>SINK</sub>	V <sub>3</sub> =0.7V	-0.3	-0.7		mV
<b>OUTPUT SECTION</b>						
Output Saturation Voltage Common Emitter	V <sub>CE(SAT)</sub>	V <sub>E</sub> = 0, I <sub>C</sub> = 200mA		1.1	1.3	V
Common Collector	V <sub>CC(SAT)</sub>	V <sub>C</sub> = 15V, I <sub>E</sub> = -200mA		1.5	2.5	
Collector Off-State Current	I <sub>C(OFF)</sub>	V <sub>CC</sub> = 40V, V <sub>CE</sub> = 40V		2	100	μA
Emitter Off-State Current	I <sub>E(OFF)</sub>	V <sub>CC</sub> = V <sub>C</sub> = 40V, V <sub>E</sub> = 0			-100	
<b>TOTAL DEVICE</b>						
Supply Current	I <sub>CC</sub>	Pin 6 = V <sub>REF</sub> , V <sub>CC</sub> = 15V		6	10	mA
<b>OUTPUT SWITCHING CHARACTERISTIC</b>						
Rise Time	t <sub>R</sub>					
Common Emitter				100	200	nS
Common Collector				100	200	
Fall Time	t <sub>F</sub>					
Common Emitter				25	100	nS
Common Collector				40	100	

TYPICAL APPLICATION

PLUSE WIDTH MODULATED STEP-DOWN CONVERTER



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