

# KA7500C SMPS Controller

### Features

- Internal Regulator Provides a Stable 5V Reference Supply Trimmed to ±1% Accuracy
- 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

# Description

The KA7500C is used for the control circuit of the pulsewidth modulation switching regulator. The KA7500C 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 1kHz to 300kHz. The precision of voltage reference ( $V_{REF}$ ) is improved up to ±1% with trimming. This provides a better output voltage regulation. The operating temperature range is -25°C ~ +85°C.



# **Ordering Information**

Part Number	Operating Temperature Range	Eco Status	Package	Packing Method	
KA7500C			16-Lead Dual Inline Package (DIP)	Tube	
KA7500CD	-25 to +85°C	RoHS	16-Lead Small Outline Package (SOP)	Tube	
KA7500CDTF			To-Lead Small Outline Fackage (SOF)	Tape and Reel	

Ø For Fairchild's definition of Eco Status, please visit: <u>http://www.fairchildsemi.com/company/green/rohs\_green.html</u>

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## **Absolute Maximum Ratings**

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Paramet	ter	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage			42	V
Vc	Collector Supply Voltage			42	V
I <sub>O</sub>	Output Current			250	mA
V <sub>IN</sub>	Amplifier Input Voltage			V <sub>CC</sub> + 0.3	V
Pp	Power Dissipation	KA7500C		1	W
FD		KA7500CD		0.9	vv
T <sub>OPR</sub>	Operation Temperature Range		-25	+85	°C
T <sub>STG</sub>	Storage Temperature Rang		-65	+150	°C
TJ	Junction Temperature			+125	°C

# **Recommended Operating Conditions**

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Symbol Parameter		Тур.	Max.	Unit
Vcc	V <sub>CC</sub> Power Supply Voltage		15	40	V
$V_{C1}, V_{C2}$	V <sub>C2</sub> Collector Supply Voltage		30	40	V
I <sub>C1</sub> , I <sub>C2</sub> Collector Output Current (Each Transition)				200	mA
V <sub>IN</sub>	V <sub>IN</sub> Amplifier Input Voltage			V <sub>CC</sub> - 2.0	V
I <sub>FB</sub>	I <sub>FB</sub> Current Into Feedback Terminal			0.3	mA
I <sub>REF</sub> Reference Output Terminal				10	mA
RT	Timing Resistor	1.8	30.0	500.0	KΩ
CT	Timing Capacitor	0.0047	0.0010	10.0000	μA
fosc Oscillator Frequency		1	40	200	kHz
V <sub>IN_PWM</sub>	PWM Input Voltage (Pins 3, 4, and 13)	0.3		5.3	V

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Symbol	Parameter	Conditions	Min.	Тур.	Max.	Units	
Reference	Section		•	1	n		
V <sub>REF</sub>	Reference Output Voltage	$I_{REF}$ =1mA, $T_A$ =25°C <sup>(1)</sup>	4.95	5.00	5.05	v	
		I <sub>REF</sub> =1mA	4.90	5.00	5.10		
RLINE	Line Regulation	V <sub>CC</sub> =7V to 40V		2	25	mV	
RLOAD	Load Regulation	I <sub>REF</sub> =1mA to 10mA		1	15	mV	
I <sub>SC</sub>	Short-Circuit Output Current	V <sub>REF</sub> =0V	10	35	50	mA	
Oscillation	Frequency	1		1		1	
		$C_T$ =0.001µF, $R_T$ =30K $\Omega$		40.0		kHz	
fosc	Oscillation Frequency	C <sub>T</sub> =0.01μF, R <sub>T</sub> =12KΩ, T <sub>A</sub> =25°C	9.2	10.0	10.8		
		$C_T$ =0.01µF, $R_T$ =12K $\Omega$ , $T_A$ = $T_{LOW}$ to $T_{HIGH}$	9.0		12.0		
$\Delta f/\Delta t$	Frequency Change with Temperature	$C_T$ =0.01µF, $R_T$ =12K $\Omega$			2	%	
Dead-Tim	e Control Section						
I <sub>BIAS</sub>	Input Bias Current	$V_{CC}$ =15V, 0V $\le$ V <sub>4</sub> $\le$ 5.25V		-2	-10	μA	
D <sub>(MAX)</sub>	Maximum Duty Cycle	V <sub>CC</sub> =15V, V <sub>4</sub> =0V, OC Pin=V <sub>REF</sub>	45			%	
M		Zero Duty Cycle		3.0	3.3	v	
VITH	Input Threshold Voltage	Maximum Duty Cycle	0				
Error Amp	lifier Section		•		•		
VIO	Input Offset Voltage	V <sub>3</sub> =2.5V		2	10	mV	
l <sub>io</sub>	Input Offset Current	V <sub>3</sub> =2.5V		25	250	mA	
I <sub>BIAS</sub>	Input Bias Current	V <sub>3</sub> =2.5V		0.2	1.0	μA	
V <sub>CIM</sub>	Common Mode Input Voltage	$7V \le V_{CC} \le 40V$	-0.3		V <sub>CC</sub>	V	
Gvo	Open-Loop Voltage Gain	$0.5V \le V_3 \le 3.5V$	70	95		dB	
Bw	Unit-Gain Bandwidth			650		kHz	
PWM Com	parator Section	1		6		1	
VITH	Input Threshold Voltage	Zero Duty Cycle	1.17	4.0	4.5	V	
ISINK	Input Sink Current	V <sub>3</sub> =0.7V	-0.3	-0.7		mA	
Output Sec	tion		20	•		•	
V <sub>CE(SAT)</sub>	Output Saturation Voltage Common Emitter	V <sub>E</sub> =0V, I <sub>C</sub> =200mA		1.0	1.3	v	
V <sub>CC(SAT)</sub>	Emitter-Follower	V <sub>C</sub> =15V, I <sub>E</sub> =-200mA		1.5	2.5	Ň	
I <sub>C(OFF)</sub>	Collector Off-State Current	V <sub>CC</sub> =40V, V <sub>CE</sub> =40V		2	100		
I <sub>E(OFF)</sub>	Emitter Off-State Current	V <sub>CC</sub> =V <sub>C</sub> =40V, V <sub>E</sub> =40V			-100	μA	
Total Devic	ce and the second se						
Icc	Supply Current	Pin6=V <sub>REF</sub> , V <sub>CC</sub> =15V		6	10	mA	
	itching Characteristics						
t <sub>R</sub>	Rise Time, Common Emitter, Common Collector			100	200		
t⊧	Fall Time, Common Emitter,			25	100	ns	

### Note:

1. This is guaranteed where the marking code of the package surface is over 027.

**Electrical Characteristics** 







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### PRODUCT STATUS DEFINITIONS

Definition	of Terms	
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Datasheet Identification Product Status		Definition			
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.			
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