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

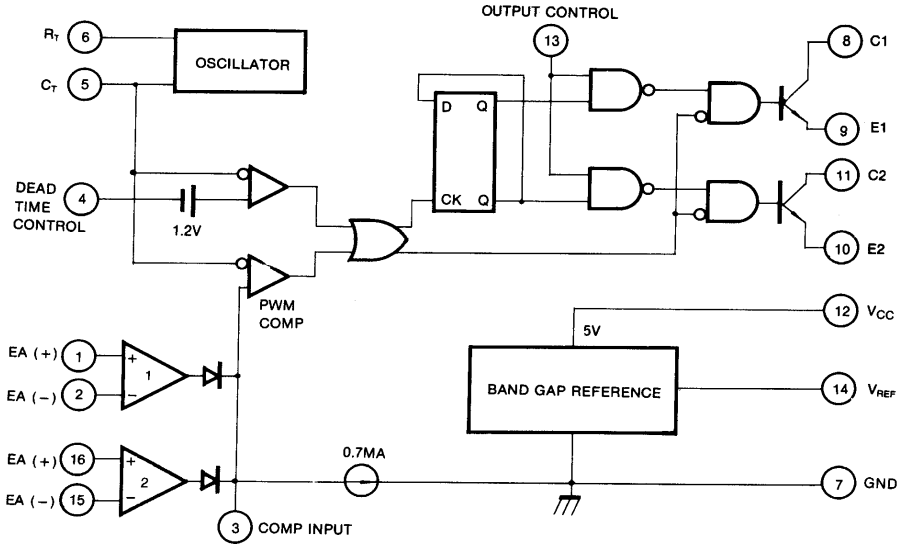
Description

The KA7500C is used for the control circuit of the pulse width 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 1 KHz to 300 KHz. The precision of voltage reference(Vref) is improved up to ±1% with trimming. This provides a better output voltage regulation. The operating temperature range is -25°C ~ +85°C

16-DIP

16-SOP

Internal Block Diagram



Rev. 5.0

Absolute Maximum Ratings

Parameter	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°C)	P_D	1 (KA7500C) 0.9 (KA7500CD)	W
Operating Temperature Range	T_{OPR}	-25 ~ +85	°C
Storage Temperature Range	T_{STG}	-65 ~ + 150	°C

Recommended Operationg Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power Supply Voltage	V_{CC}	7.0	15	40	V
Collector Output Voltage	V_{C1},V_{C2}	-	30	40	V
Collector Output Current (Each transistor)	I_{C1},I_{C2}	-	-	200	mA
Amplifier Input Voltage	V_{IN}	0.3	-	V_{CC}-2.0	V
Current Into Feedback Terminal	I_{fb}	-	-	0.3	mA
Reference Output Current	I_{ref}	-	-	10	mA
Timing Resistor	R_T	1.8	30	500	KΩ
Timing Capacitor	C_T	0.0047	0.001	10	uF
Oscillator Frequency	f_{osc}	1.0	40	200	kHz
PWM Input Voltage (Pins 3, 4, 13)	-	0.3	-	5.3	V

Electrical Characteristics

(V_{CC} = 20V, f = 10KHz, T_A = -25°C to + 85°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
REFERENCE SECTION						
Reference Output Voltage	V_{REF}	I_{REF} = 1mA, T_A=25°C(Note1)	4.95	5.0	5.05	V
		I_{REF} = 1mA	4.9	5.0	5.1	
Line Regulation	R_{Line}	V_{CC} = 7V to 40V	-	2.0	25	mV
Load Regulation	R_{LOAD}	I_{REF} = 1mA to 10mA	-	1.0	15	mV
Short-Circuit Output Current	I_{SC}	V_{REF} = 0V	10	35	50	mA
OSCILLATOR SECTION						
Oscillation Frequency	f_{osc}	C_T = 0.001μF, R_T = 30KΩ	-	40	-	KHz
		C_T = 0.001μF, R_T = 12KΩ,T_A=25°C	9.2	10	10.8	
		C_T = 0.001μF, R_T = 30KΩ, T_A=T_{low} to T_{high}	9.0	-	12	
Frequency Change with Temperature	Δf/ΔT	C_T = 0.01μF, R_T = 12KΩ	-	-	2	%
DEAD TIME CONTROL SECTION						
Input Bias Current	I_{BIAS}	V_{CC} = 15V, 0V≤V_4≤5.25V	-	-2.0	-10	μA
Maximum Duty Cycle	$D_{(MAX)}$	V_{CC} = 15V, V_4 = 0V O.C Pin = V_{REF}	45	-	-	%
Input Threshold Voltage	V_{ITH}	Zero Duty Cycle	-	3.0	3.3	V
		Max. Duty Cycle	0	-	-	
ERROR AMP SECTION						
Input Offset Voltage	V_{IO}	V_3 = 2.5V	-	2.0	10	mV
Input Offset Current	I_{IO}	V_3 = 2.5V	-	25	250	mA
Input Bias Current	I_{BIAS}	V_3 = 2.5V	-	0.2	1.0	μA
Common Mode Input Voltage	V_{CM}	7V ≤ V_{CC} ≤ 40V	-0.3	-	V_{CC}	V
Open-Loop Voltage Gain	G_{VO}	0.5V ≤ V_3 ≤3 .5V	70	95	-	dB
Unit-Gain Bandwidth	BW	-	-	650	-	KHz
PWM COMPARATOR SECTION						
Input Threshold Voltage	V_{ITH}	Zero Duty Cycle	-	4	4.5	V
Input Sink Current	I_{SINK}	V_3=0.7V	-0.3	-0.7	-	mA
OUTPUT SECTION						
Output Saturation Voltage Common Emitter	$V_{CE(SAT)}$	V_E = 0V, I_C = 200mA	-	1.1	1.3	V

Electrical Characteristics

(V_{CC} = 20V, f = 10KHz, T_A = -25°C to + 85°C, unless otherwise specified)

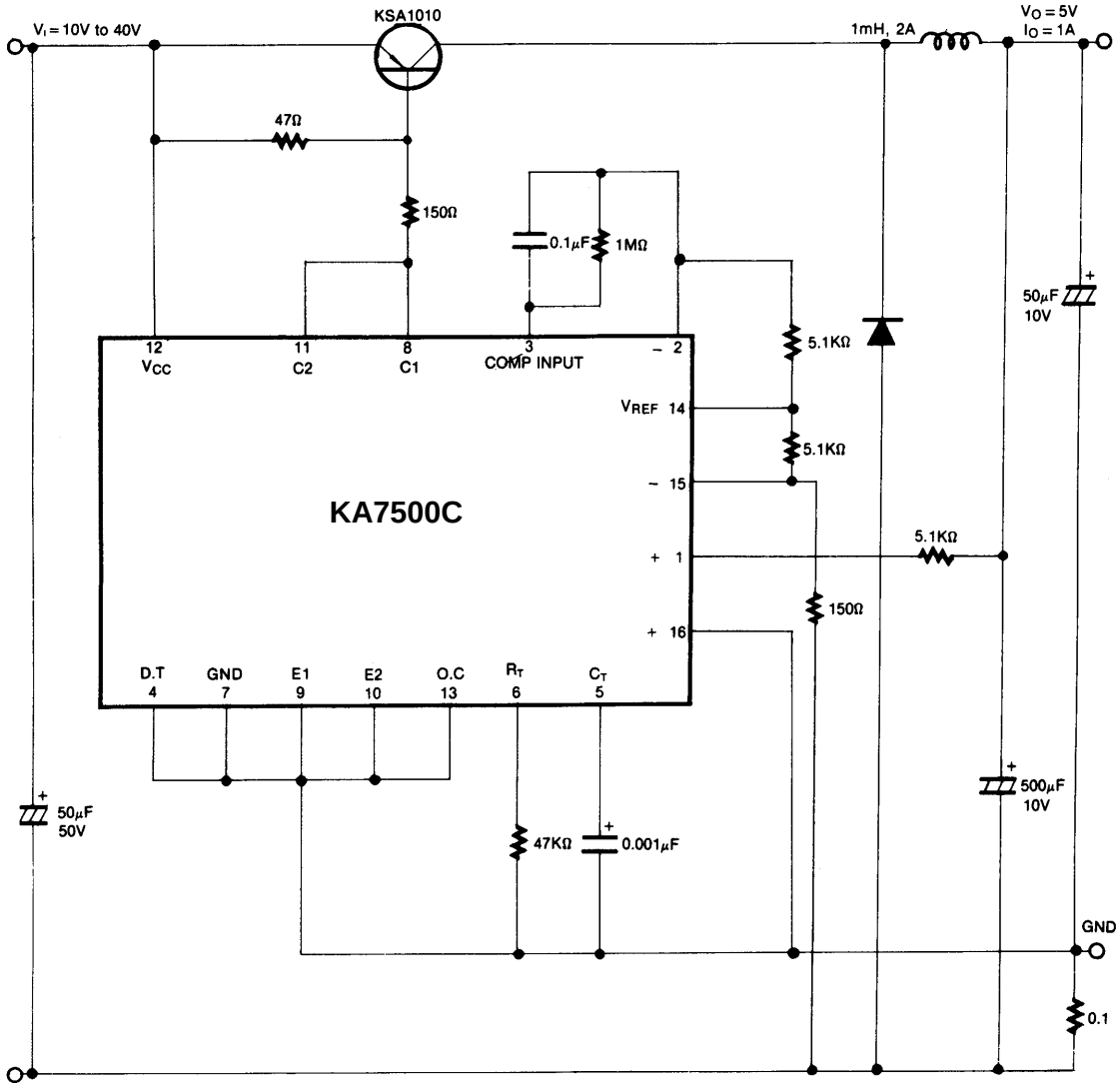
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Emitter-Follower	$V_{CC(SAT)}$	V_C = 15V, I_E = -200mA	-	1.5	2.5	V
Collector Off-State Current	$I_{C(OFF)}$	V_{CC} = 40V, V_{CE} = 40V	-	2	100	µA
Emitter Off-State Current	$I_{E(OFF)}$	V_{CC} = V_C = 40V, V_E = 0V	-	-	-100	
TOTAL DEVICE						
Supply Current	I_{CC}	Pin 6 = V_{REF}, V_{CC} = 15V	-	6	10	mA
OUTPUT SWITCHING CHARACTERISTIC						
Rise Time Common Emitter, Common Collector	t_R	-	-	100	200	ns
Fall Time Common Emitter, Common Collector	t_F	-	-	25	100	ns

Note :

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

Typical Application

Pulse Width Modulated Step-down Converter

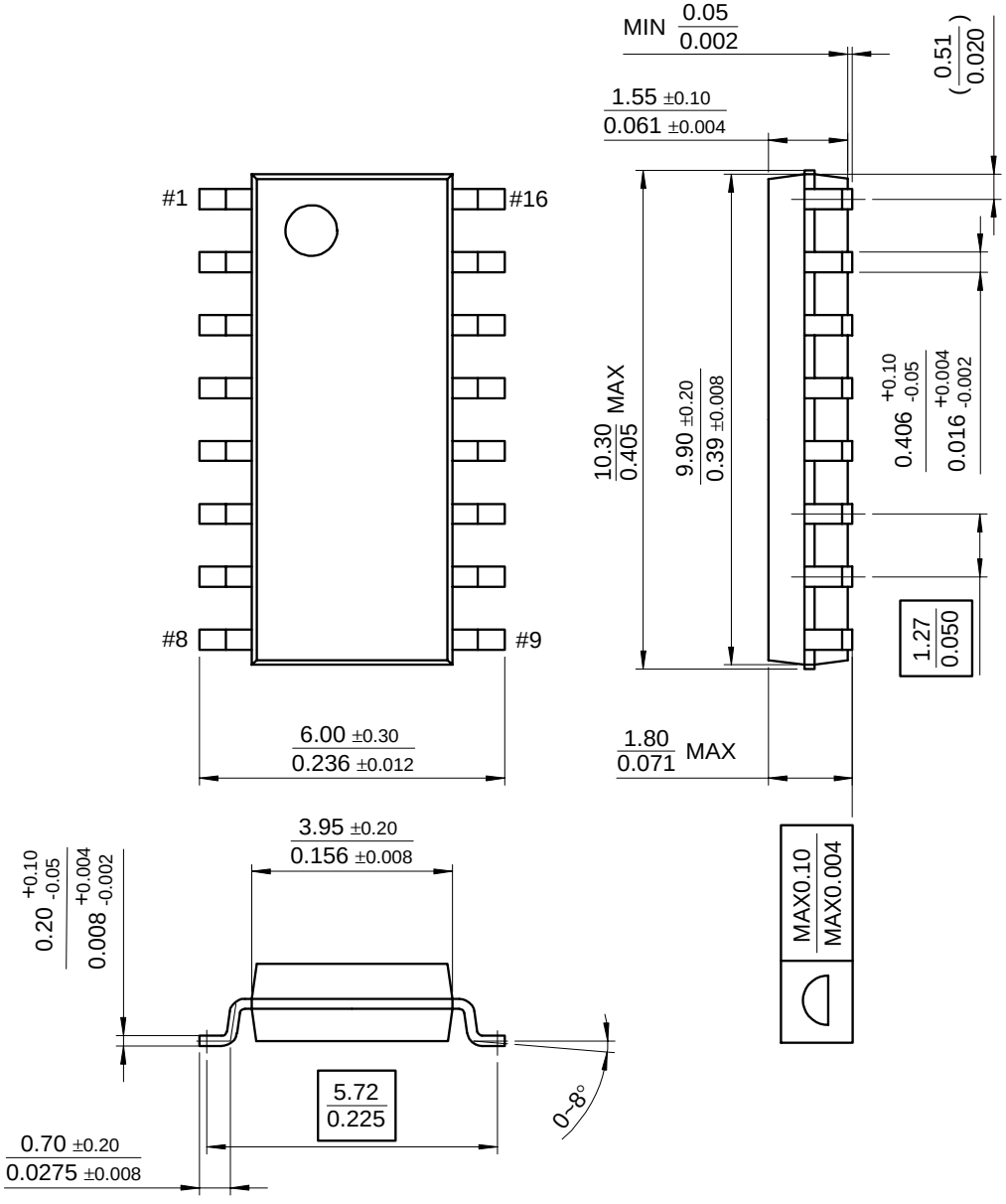


Mechanical Dimensions

Package

Dimensions in millimeters

16-SOP

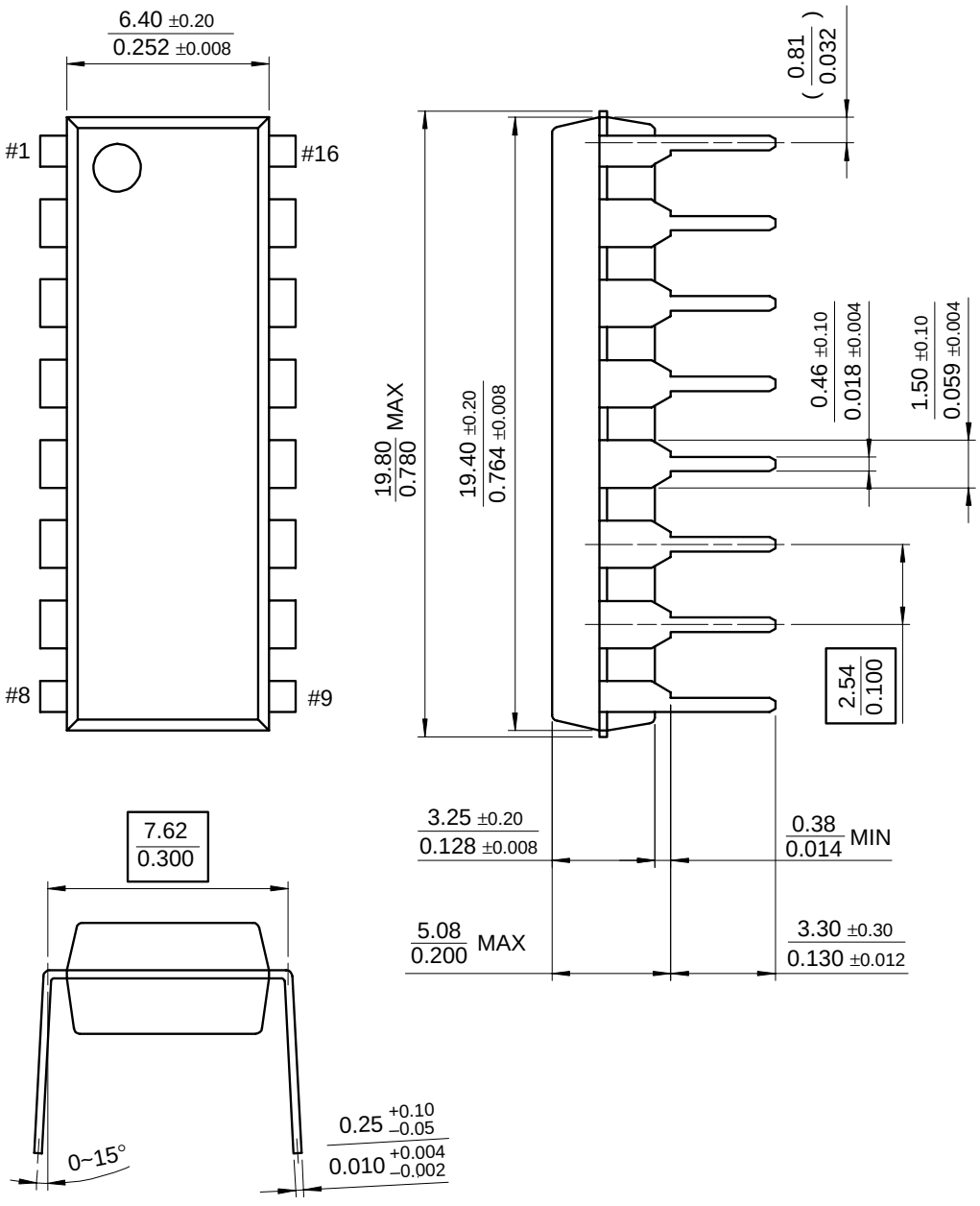


Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

16-DIP



Ordering Information

Product Number	Package	Operating Temperature
KA7500C	16-DIP	-25 ~ + 85°C
KA7500CD	16-SOP	

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