Voltage Mode PWM Controller **SDC7500**

General Description

The SDC7500 is a voltage mode pulse width modulation switching regulator control circuit designed primarily for power supply control.

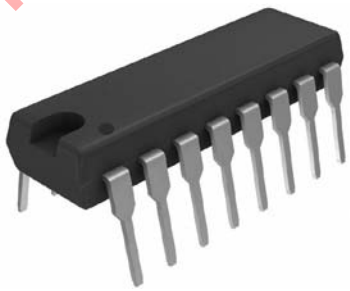
The SDC7500 consists of a reference voltage circuit, two error amplifiers, an on-chip adjustable oscillator, a dead-time control (DTC) comparator, a pulse-steering control flip-flop, and an output control circuit. The precision of voltage reference (V_{REF}) is ±1% through trimming and this provides a better output voltage regulation. The SDC7500 provides for push-pull or single-ended output operation, which can be selected through the output control.

Features

- Complete PWM power control circuitry
- Uncommitted outputs for 200mA sink or source current
- Output control for single ended or push pull operation
- Internal regulator provides a stable 5V reference supply with 5% tolerance
- Adjustable dead-time control
- Package: DIP-16

Applications

- PC power supply
- DC-DC convertor



DIP-16

Figure 1. Package Type

Pin Configuration

Package: DIP-16

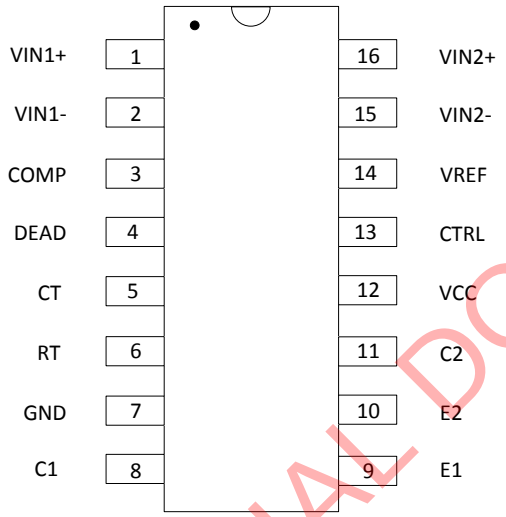


Figure 2. Pin Configuration

Pin Number	Pin Name	Function
1	VIN1+	Amplifier positive input
2	VIN1-	Amplifier negative input
3	COMP	Compensation pin
4	DEAD	Dead time control
5	CT	Oscillate capacitor pin, external timing capacitor
6	RT	Oscillate resistor pin, external timing resistor
7	GND	Ground
8	C1	Output transistor collector
9	E1	Output transistor emitter
10	E2	Output transistor emitter
11	C2	Output transistor collector
12	VCC	Power supply pin
13	CTRL	Output control pin
14	VREF	Reference pin
15	VIN1-	Amplifier negative input
16	VIN2+	Amplifier positive input

Table 1. Pin Configuration

Functional Block Diagram

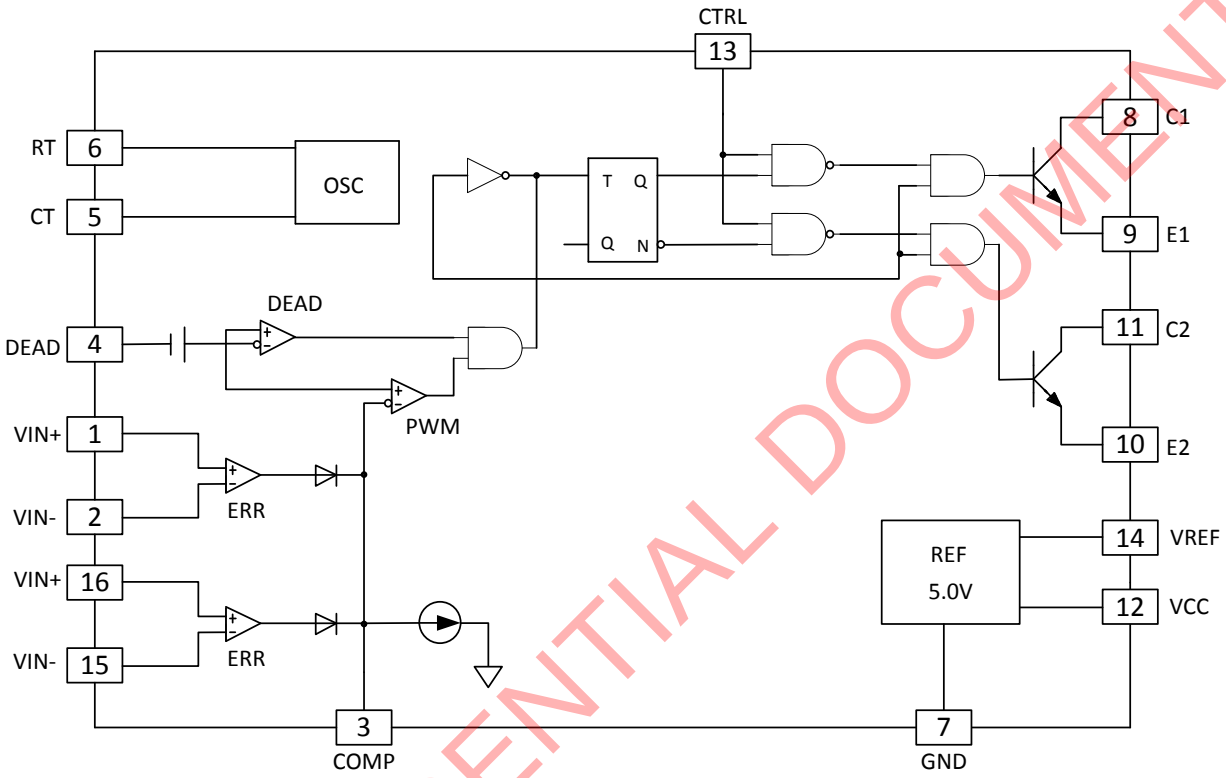
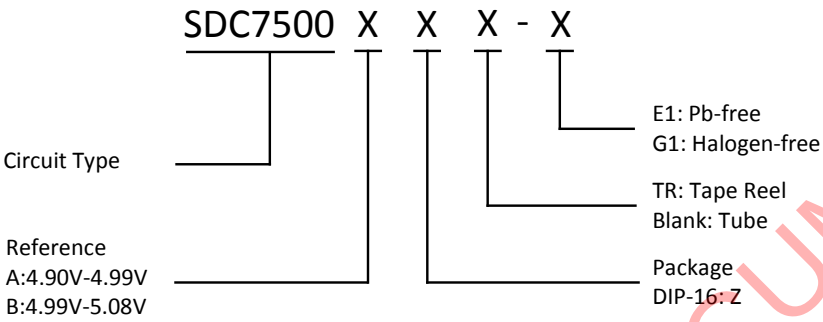


Figure 3. Functional Block Diagram

Ordering Information



Package	Temperature	Part Number		Marking ID		Packing Type
		Pb-free	Halogen-free	Pb-free	Halogen-free	
DIP-16	-40℃~85℃	SDC7500AZ -E1	SDC7500AZ -G1	SDC7500	SDC7500G	Tube
		SDC7500BZ -E1	SDC7500BZ -G1	SDC7500	SDC7500G	Tube

Absolute Maximum Ratings (NOTE: Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device.)

Parameter	Symbol	Value	Unit
Power supply voltage VCC	V_{CC}	42	V
Amplifier input voltage	V_{IN}	0.3	V
Collector output voltage	V_{OUT}	42	V
Collector output current	I_{CO}	200	mA
Total dissipation power	P_D	1000	mW
Operating Junction Temperature	T_J	-40~150	°C
Storage temperature	T_{STG}	-65~150	°C
Latch-up test per JEDEC 78	-	200	mA
ESD, HBM model per Mil-Std-883, Method 3015	HBM	2000	V
ESD, MM model per JEDEC EIA/JESD22-A115	MM	200	V

Table 2. Absolute Maximum Ratings

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Power supply voltage VCC	V_{CC}	10	36	V
Frequency	f_{osc}	1.0	200	kHz
Operating temperature	T_{OPR}	-40	85	°C

Table 3. Recommended Operating Conditions

Electrical Characteristics (Ta=25°C, VCC=15.0V, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Section						
Output voltage(SDC7500A)	V_{REF}	I_{REF}=1mA	4.90	-	4.99	V
Output voltage(SDC7500B)			4.99	-	5.08	V
Input regulation	V_{Delta_VV}	V_{CC}=7V~40V	-	2	25	mV
Output regulation	V_{Delta_VL}	I_{REF}=1mA~10mA	-	1	15	mV
Short-circuit output current	I_{SC}	V_{REF}=0V, Ta=25°C	-	55	-	mA
Output voltage change with temperature	Delta_VT	Ta=-25°C~85°C	-	0.2	1	%
PWM Section						
Input threshold voltage	V_{TH}	DUTY=0	-	4	4.5	V
Input sink current	I_{SINK}	V_{COMP}=0.7V	0.3	0.7	-	mA
Oscillator Section						
Frequency	f_{OSC}	CT=1nf, RT=12kΩ	23	29	34	kHz
Standard deviation of frequency	Delta	ALL Value of CT RT Ta constant	-	10	-	%
Frequency change with temperature	Delta_FT	Ta=-25°C~85°C	-	-	12	%
Frequency change with voltage	Delta_FV	V_{CC}=7V~40V	-	0.1	-	%
Amplifier Section						
Input offset voltage	V_{OFFSET}	$V_{O(PIN3)}$=2.5V	-	2	10	mV
Input offset current	I_{OFFSET}	$V_{O(PIN3)}$=2.5V	-	25	250	nA
Input bias current	I_{BIAS}	$V_{O(PIN3)}$=2.5V	-	0.2	1	uA
Output sink current	I_{SINK}	V_{COMP}=0.5V	0.3	0.7	-	mA
Output source current	I_{SOURSE}	V_{COMP}=3.5V	-2	-	-	mA
Common-mode input voltage range	V_{IN}	V_{CC}=7V~40V	-0.3~V_{CC}			V
Open-loop voltage amplification	G_V	V_O=0.5V~3.5V	70	95	-	dB
Unity-gain bandwidth	f_{BAND}	-	-	800	-	kHz
Common-mode rejection ratio	R_{REJ}	V_{CC}=40V	65	80	-	dB
Dead Time Control Section						
Input bias	I_{BIAS}	V_I=0V~5.25V	-	-2	-10	uA
Maximum duty cycle	G_V	$V_{I(PIN4)}$=0	45	-	-	%
Input threshold voltage	V_{TH}	DUTY=0	-	2.7	3.3	V
Input threshold voltage	V_{TH}	DUTY=MAX	0	-	-	V

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Power Current Section							
Standby supply current		I_{CC1}	V_{CC}=15V	-	6	10	mA
Standby supply current		I_{CC}	V_{CC}=40V	-	9	15	mA
Average supply current		I_{AV}	V_{PIN4}=2V	-	7.5	-	mA
Output Section							
Collector off-state current		I_C	V_{CE}=40V V_{CC}=40V	-	2	100	uA
Emitter off-state current		I_E	V_{CC}=V_C=40V V_E=0	-	-	-100	uA
Collector-emitter saturation voltage	Common-emitter	V_{SAT}	V_E=0, I_C=100mA	-	1.0	1.3	V
	Emitter-follower	V_{SAT}	V_C=15V, I_E=-100mA	-	1.5	2.5	V
Output control input current		I_{IN}	V_i=V_{REF}	-	-	3.5	mA
Switching Characteristics							
Output voltage rise time		t_r	Common-emitter configuration	-	100	200	ns
Output voltage fall time		t_f		-	25	100	ns
Output voltage rise time		t_r	Emitter-follower configuration	-	100	200	ns
Output voltage fall time		t_f		-	40	100	ns

Table 4. Electrical Characteristics

Typical Performance Characteristics

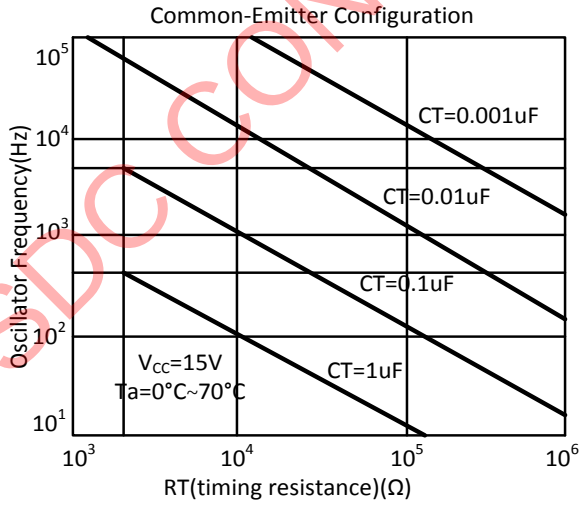


Figure 4. Oscillator frequency and frequency variation vs. Timing resistance

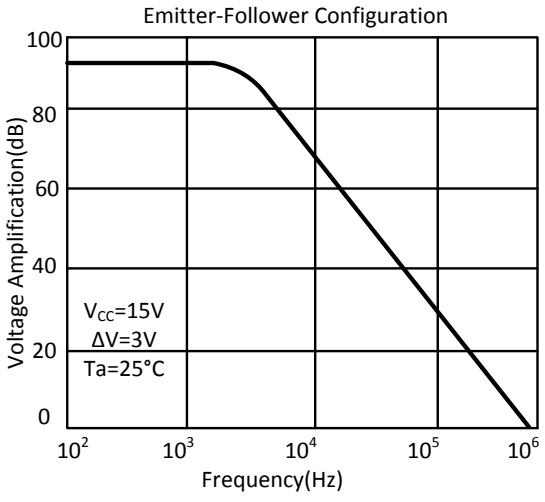


Figure 5. Amplifier voltage amplification

Typical Application

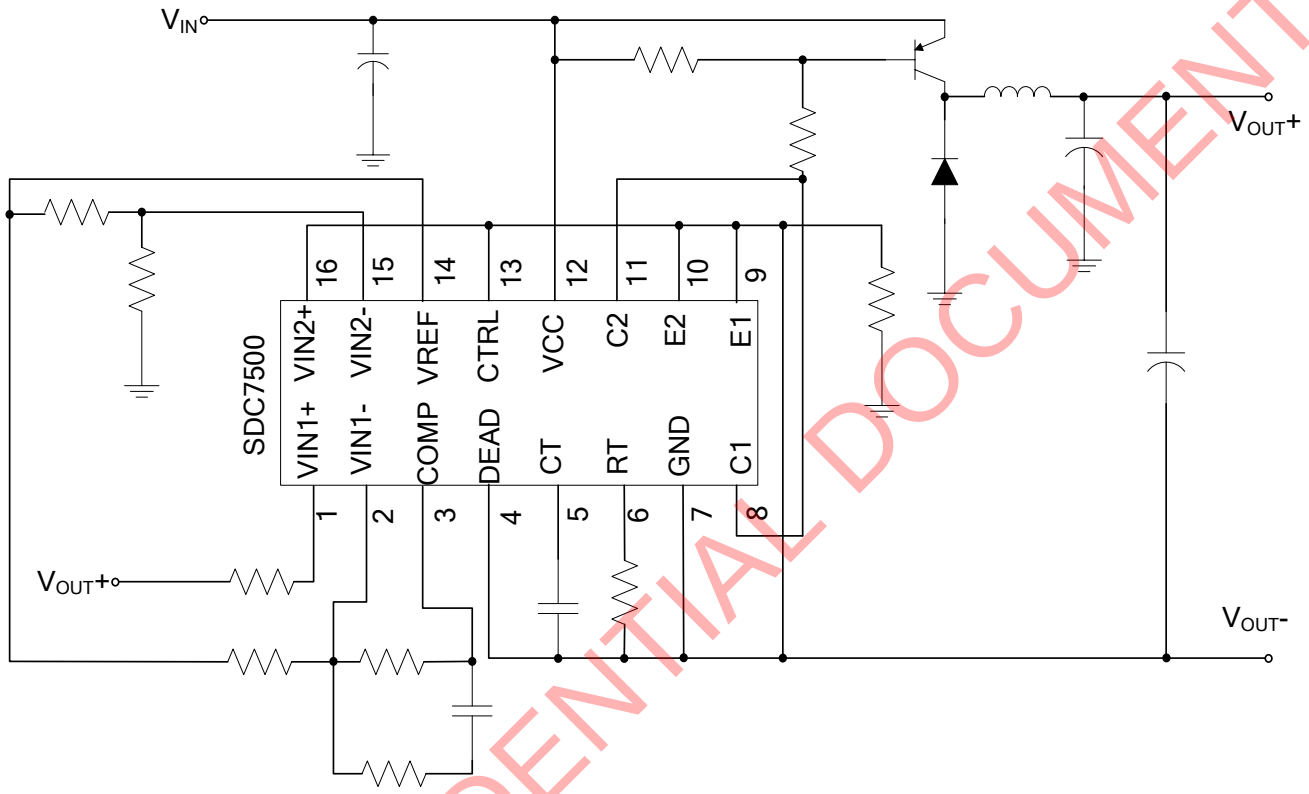
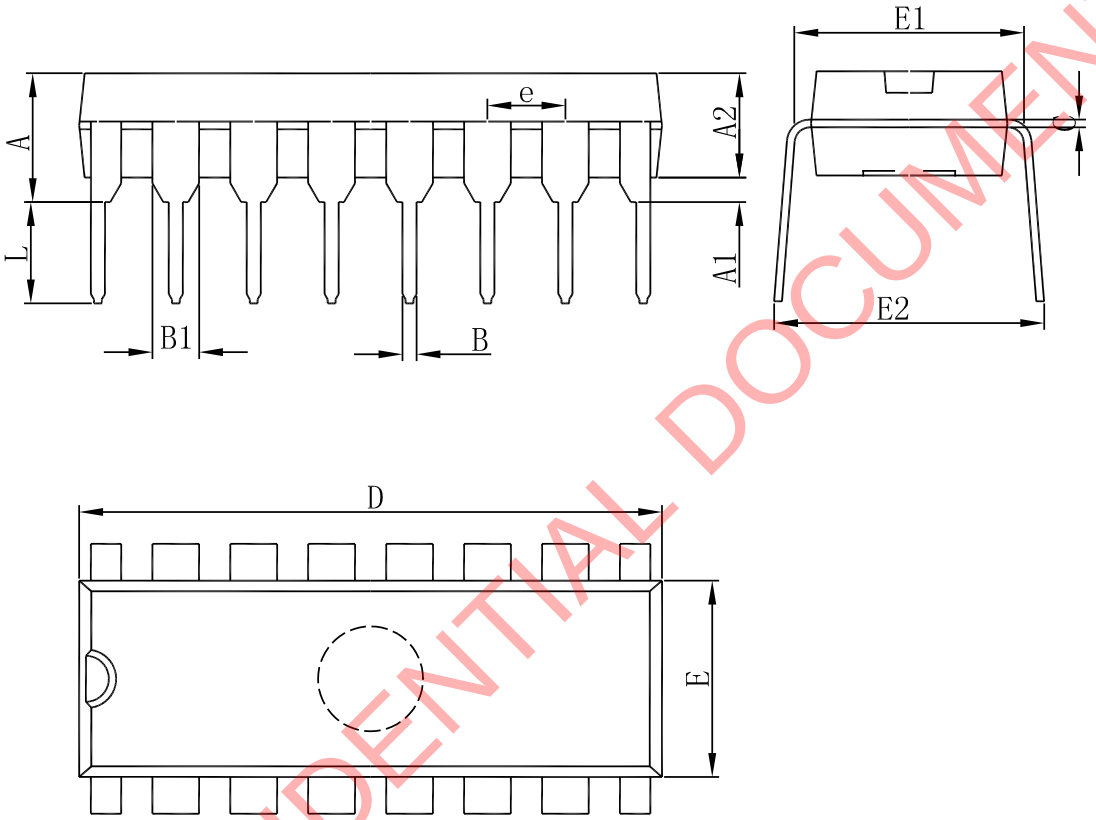


Figure 6. Typical Application

Package Dimension

DIP-16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510	-	0.020	-
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

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