



DESCRIPTION

The AP8345 is a fixed-frequency, current-mode PWM controller designed for off-line and DC-DC converter applications with minimal external components. It integrates a precision-trimmed oscillator for accurate duty-cycle control, a temperature-compensated reference, a high-gain error amplifier, a current-sense comparator, and a high-current totem-pole output stage optimized for driving an external power MOSFET. Built-in protection features include undervoltage lockout (UVLO) and cycle-by-cycle current limiting. The AP8345 features lower UVLO thresholds of 8.4V (turn-on) and 7.6V (turn-off), making it suitable for low-input-voltage applications.

The AP8345 supports operation within 50% duty cycle. It is characterized for operation from $T_A=0^{\circ}\text{C}$ to 75°C .

The AP8345 is available in SOP8 and DIP8 Packages.

ORDERING INFORMATION

Package Type	Part Number	
SOP8 SPQ: 2,500pcs/Reel	M8	AP8345M8R
		AP8345M8VR
DIP8 SPQ: 2,000pcs/Box	P8	AP8345P8U
		AP8345P8VU
Note	R: Tape & Reel	
	U: Tube	
	V: Halogen free Package	
AiT provides all RoHS products		

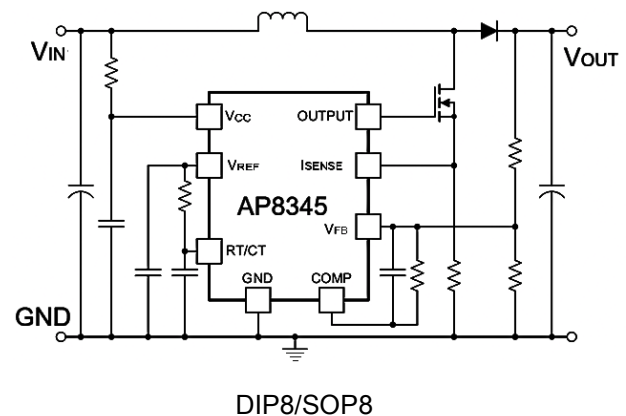
FEATURES

- Low Start-Up and Operating Current
- High Current Totem Pole Output
- Under voltage Lockout with Hysteresis
- Operating Frequency Up To 500KHz
- Available in SOP8 and DIP8 Packages

APPLICATIONS

- Switching Regulators of any polarity
- Transformer-coupled DC-DC converters

TYPICAL APPLICATION



**PIN DESCRIPTION**

AP8345 SOP8 SOP8, M8 Top View		AP8345 DIP8 DIP8, P8 Top View	
PIN#	Symbol	Function	
1	COMP	This pin is the Error Amplifier output and is made for loop compensation.	
2	V _{FB}	This is the inverting input of the Error Amplifier. It is normally connected to the switching power supply output through a resistor divider.	
3	I _{SENSE}	A voltage proportional to inductor current is connected to this input. The PWM uses this information to terminate the output switch conduction.	
4	R _T /C _T	The oscillator frequency and maximum Output duty cycle are programmed by connecting resistor R _T to V _{REF} and capacitor C _T to ground.	
5	GND	This pin is the combined control circuitry and power ground.	
6	OUTPUT	This output directly drives the gate of a power MOSFET. Peak currents up to 1A are sourced and sink by this pin.	
7	V _{CC}	This pin is the positive supply of the integrated circuit.	
8	V _{REF}	This is the reference output. It provides charging current for capacitor C _T through resistor R _T .	



ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise specified.

V _{CC} , Supply Power (Low Impedance Source)	30V
I _O , Output Current	1A
V _I , Input Voltage (Analog Inputs Pins 2,3)	0.3V ~ 5.5V
I _{SINK} (E.A), Error Amp Output Sink Current	10mA
P _O , Power Dissipation (T _A =25°C)	1W
T _{STG} , Storage Temperature Range	-65°C ~ +150°C
T _L , Lead Temperature (Soldering, 10 seconds)	245°C

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

V_{CC}=15V, R_T=10k, C_T=3.3nF, T_A=0°C ~+70°C, unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reference Section						
Reference Output Voltage	V _{REF}	T _J =25°C, I _{REF} =1 mA	4.90	5	5.10	V
Line Regulation	ΔV _{REF}	12V≤V _{CC} ≤25V	-	6	20	mV
Load Regulation	ΔV _{REF}	1 mA≤I _{REF} ≤20mA	-	6	25	mV
Short Circuit Output Current	I _{SC}	T _A =25°C	-	-100	-180	mA
Oscillator Section						
Oscillation Frequency	f	T _J =25°C	47	52	57	KHz
Frequency Change with Voltage	Δf/ΔV _{CC}	12V≤V _{CC} ≤25V	-	0.05	1	%
Oscillator Amplitude	V _{OSC}	(peak to peak)	-	1.60	-	V _{P-P}
Error Amplifier Section						
Input Bias Current	I _{BIAS}	V _{rB} =3V	-	-0.10	-2	μA
Input Voltage	V _I (E>A)	V _{pin1} =2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	VOL	2V≤V _o ≤4V	65	90	-	dB
Unity Gain Bandwidth	UGBW	T _j =25°C ⁽³⁾	0.50	0.60	-	MHz
Power Supply Rejection Ratio	PSRR	12V≤V _{CC} ≤25 V	60	70	-	dB
Output Sink Current	I _{SINK}	V _{pin2} =2.7V, V _{pin1} =1.1V	2	7	-	mA
Output Source Current	I _{SOURCE}	V _{pin2} =2.3V, V _{pin1} =5V	-0.50	-1	-	mA
High Output Voltage	V _{OH}	V _{pin2} =2.3V, R _L =15KΩ to GND	5	6	-	V
Low Output Voltage	V _{OL}	V _{pin2} =2.7V, R _L =15KΩ to PIN 8	-	0.80	1.10	V



Current Sense Section						
Gain	G _V	(1) (2)	2.85	3	3.15	V/V
Maximum Input Signal	V _{I(MAX)}	V _{pin1} =5V ⁽¹⁾	0.90	1	1.10	V
Supply Voltage Rejection	PSRR	12V≤V _{cc} ≤25V ⁽¹⁾	-	70	-	dB
Input Bias Current	IBIAS	V _{pin3} =3V	-	-3	-10	μA
Output Section						
Low Output Voltage	VOL	I _{SINK} =20 mA	-	0.08	0.40	V
		I _{SINK} =200 mA	-	1.40	2.20	
High Output Voltage	VOH	I _{SOURCE} =20 mA	13	13.50	-	
		I _{SOURCE} =200 mA	12	13	-	
Rise Time	tr	T _J =25°C, CL=1nF ⁽³⁾	-	45	150	nS
Fall Time	tf	T _J =25°C, CL=1nF ⁽³⁾	-	35	150	
Undervoltage Lockout Section						
Start Threshold	V _{TH(ST)}		7.80	8.40	9	V
Min. Operating Voltage (After Turn On)	V _{OPR (min)}		7	7.60	8.20	V
PWM Section						
Max. Duty Cycle	D(MAX)		47	48	50	%
Min. Duty Cycle	D(MAX)	-	-	-	0	%
Total Standby Current						
Start Up Current Operating	I _{ST}		-	0.17	0.30	mA
Supply Current	I _{CC(OPR)}	V _{pin3} =V _{pin2} =ON	-	13	17	mA
Zener Voltage	V _Z	I _{cc} =25 mA	30	38	-	V

(1) Parameter measured at trip point of latch with $V_{pin2}=0$.

(2) Gain defined as $A = \Delta V_{pin1} / \Delta V_{pin3}$; $0 \leq V_{pin3} \leq 0.8V$.

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



TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1. Timing Resistor vs. Oscillator Frequency

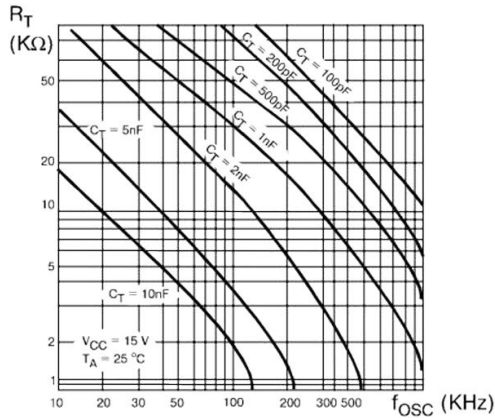


Fig 2. Output Dead-Time vs. Oscillator Frequency

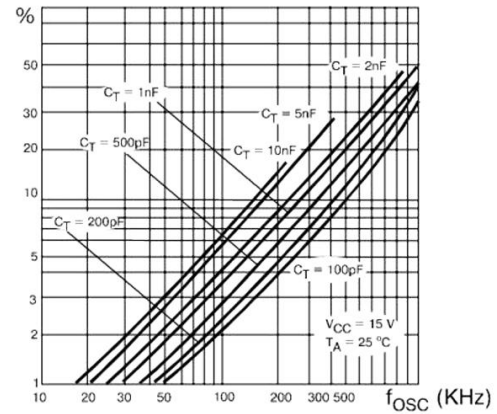


Fig.3. Maximum Output Duty Cycle vs. Timing Resistor

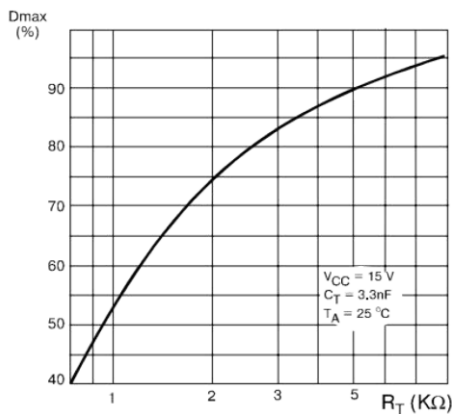


Fig 4. Error Amp Open-Loop Gain vs. Frequency

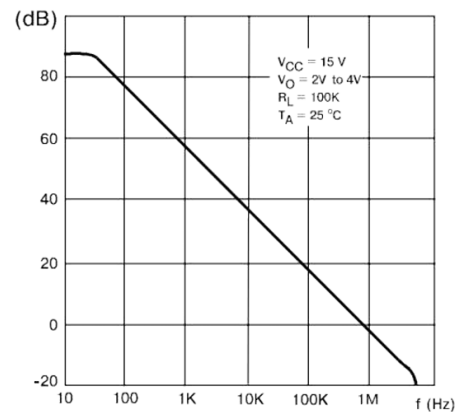


Fig 5. Current Sense Input Threshold vs. Error Amp Output Voltage

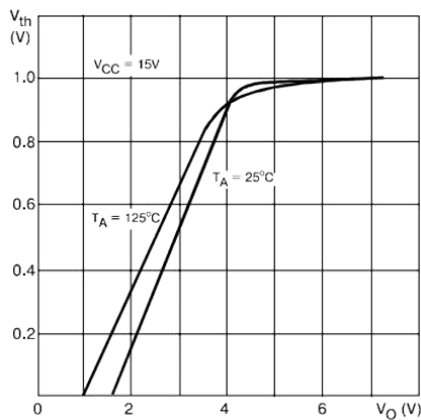


Fig 6. Reference Short Circuit Current vs. Temperature

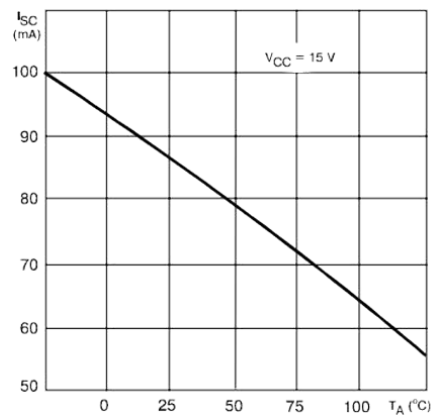




Fig 7. Output Saturation Voltage vs. Load Current

$T_A = 25^\circ\text{C}$

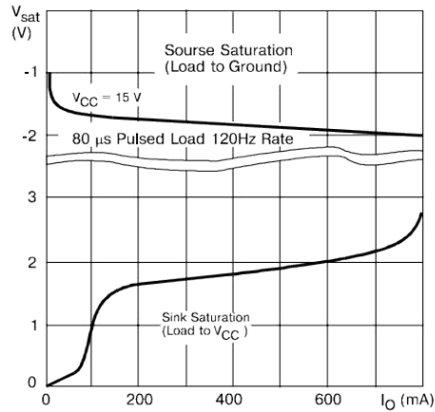


Fig 8. Supply Current vs. Supply Voltage

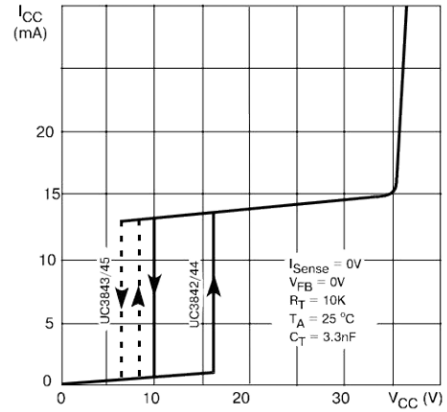
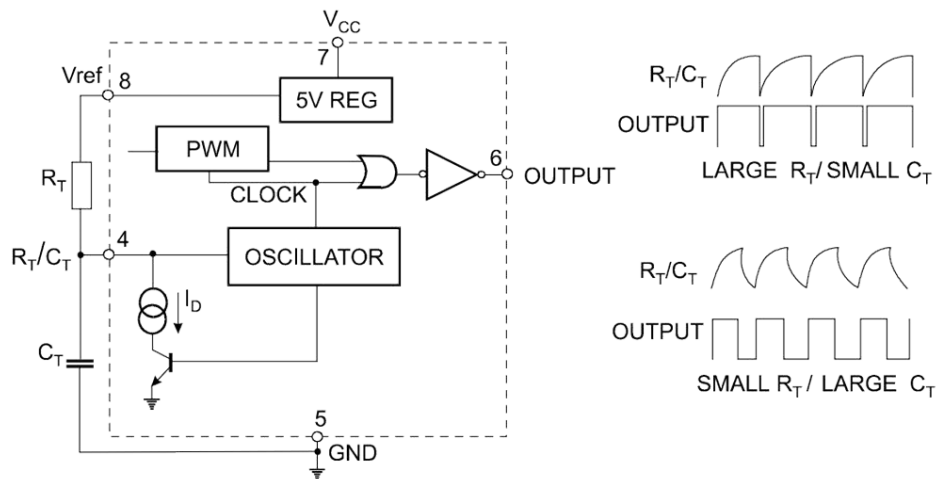


Fig 9. Oscillator and Output Waveforms





APPLICATION INFORMATION

Fig 10. Error Amp Configuration

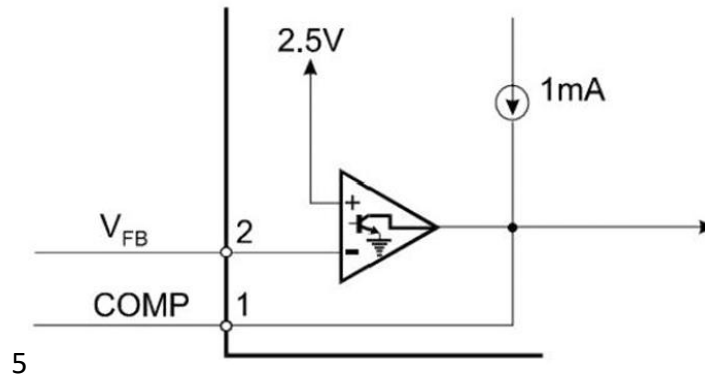


Fig 11. Under voltage Lockout

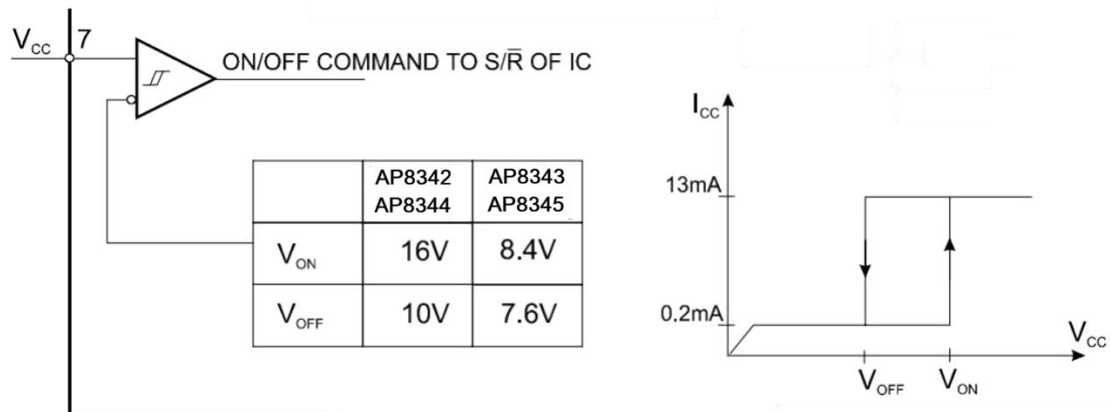


Fig 12. Current Sense Circuit

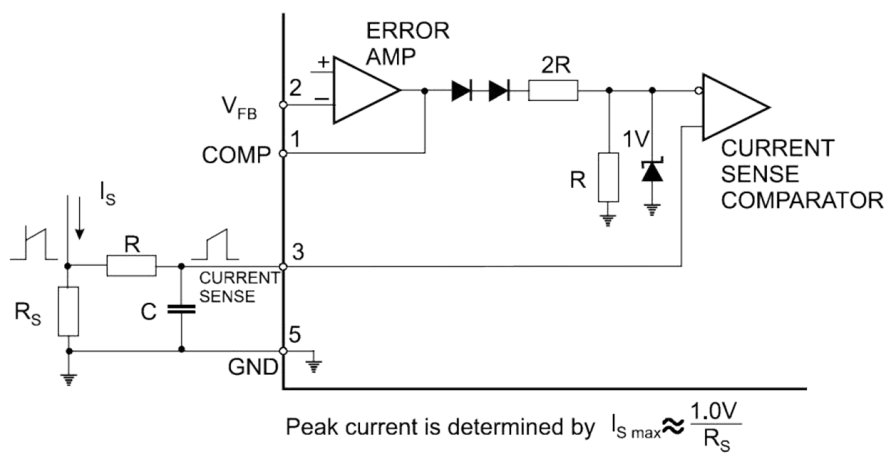




Fig 13. Slope Compensation Techniques

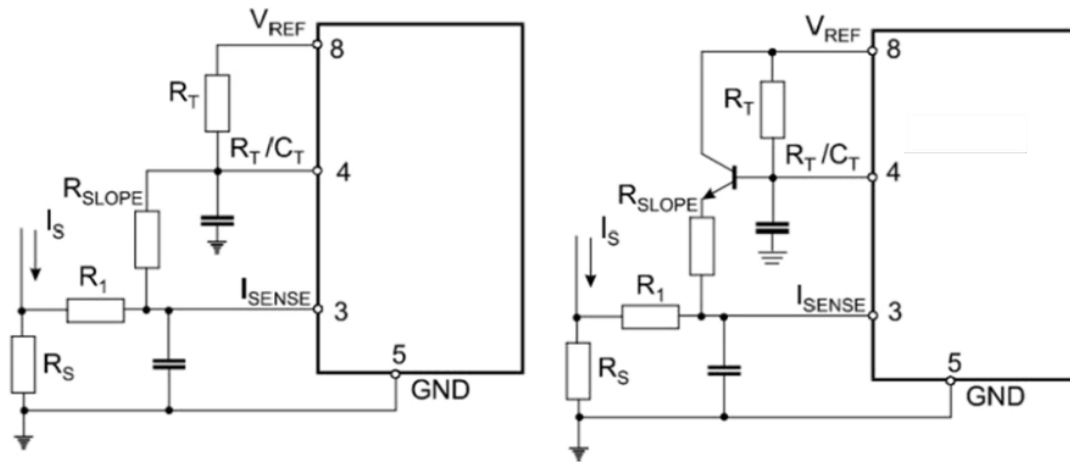


Fig 14. Latched Shutdown

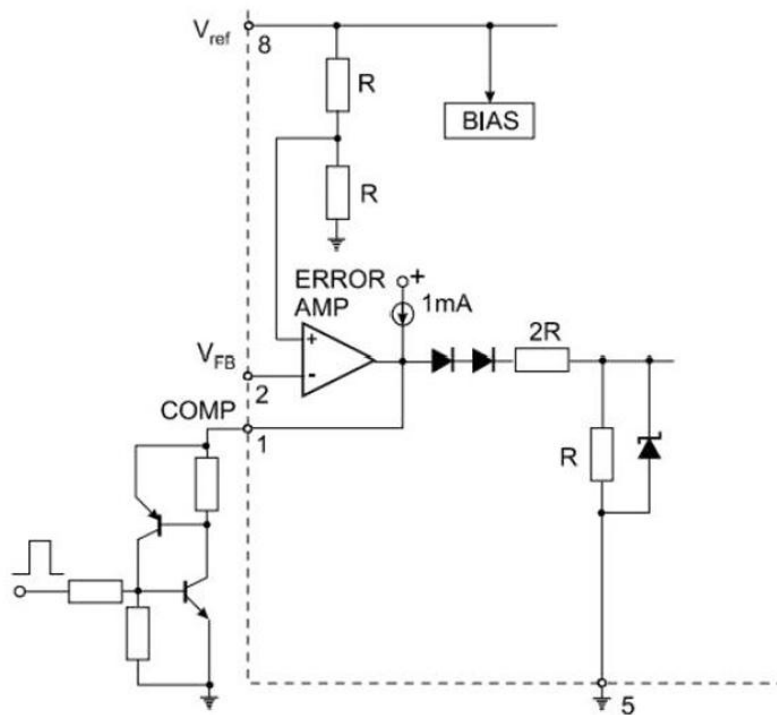




Fig 15. Error Amplifier Compensation

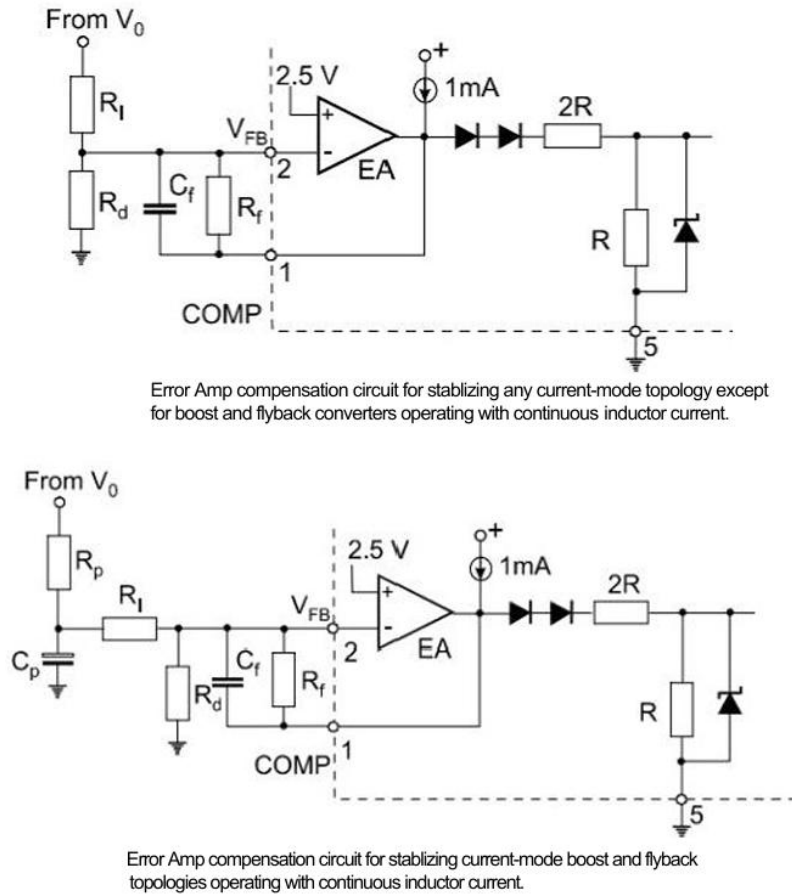


Fig 16. External Clock Synchronization

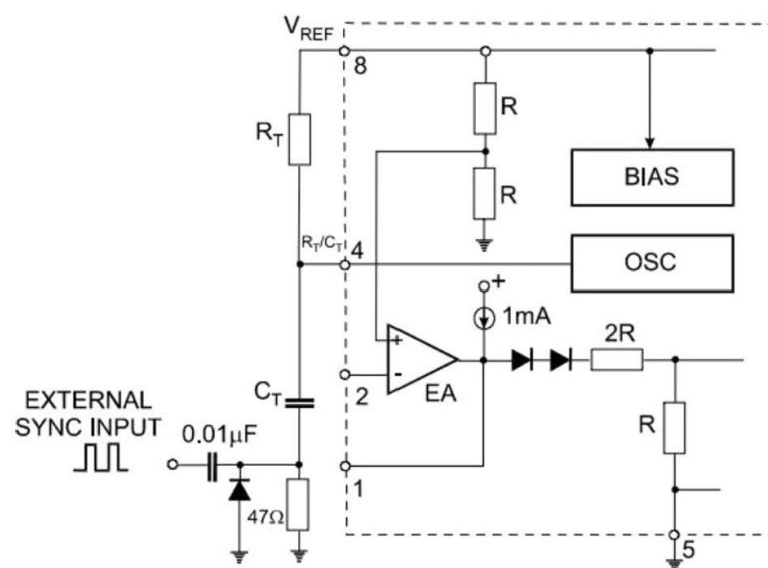
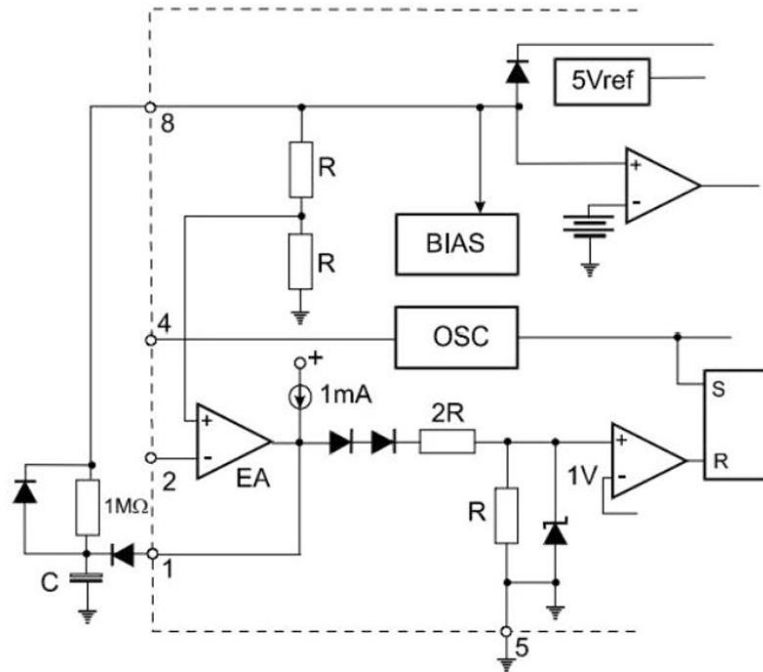


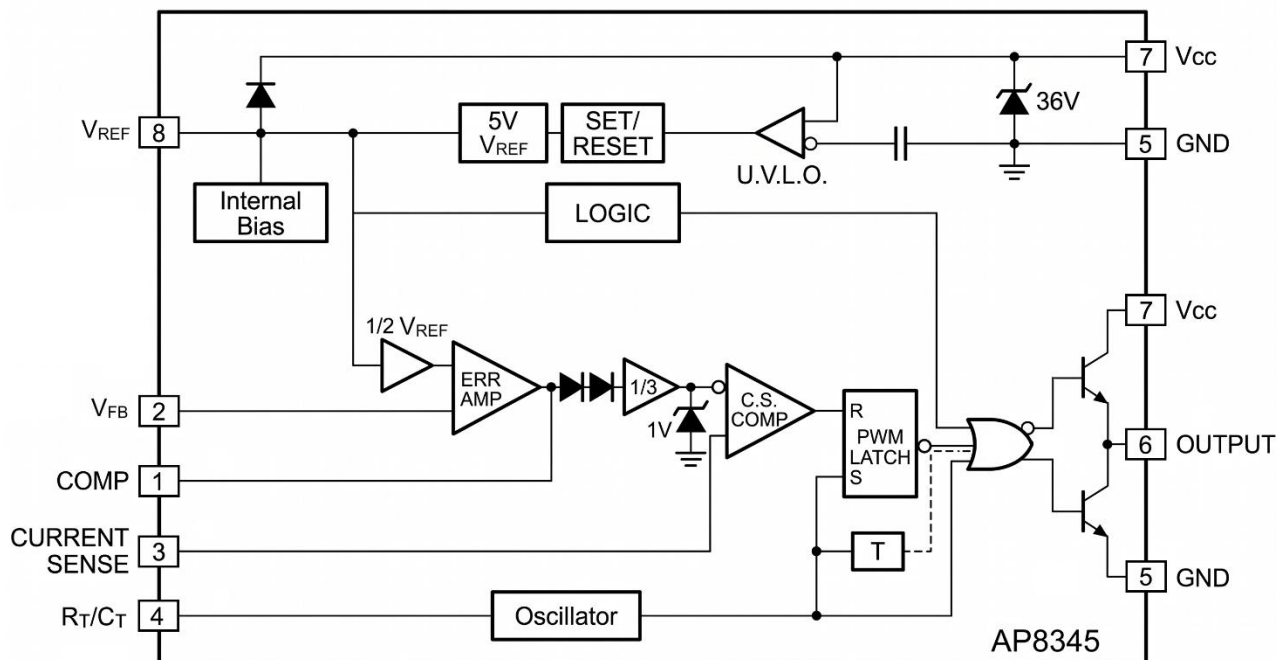


Fig 17. Soft-Start Circuit





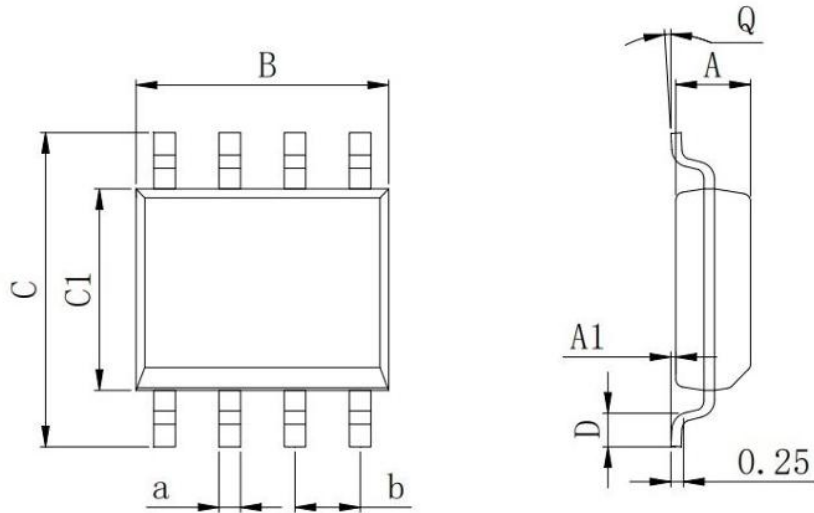
BLOCK DIAGRAM





PACKAGE INFORMATION

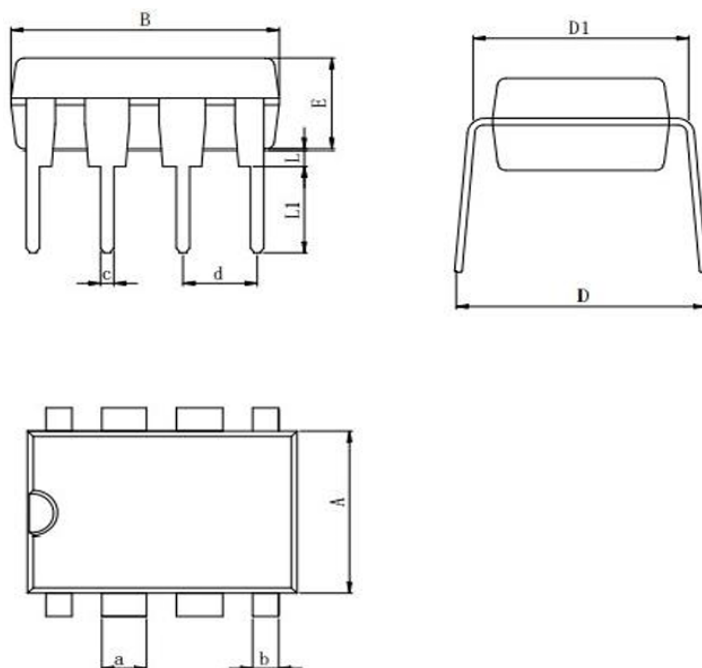
Dimension in SOP8 (Unit: mm)



Symbol	Min.	Max.
A	1.350	1.550
A1	0.050	0.200
a	0.350	0.450
B	4.900	5.100
b	1.270 BSC.	
C	5.800	6.200
C1	3.800	4.000
D	0.400	0.800
Q	0°	8°



Dimension in DIP8 (Unit: mm)



Symbol	Min.	Max.
A	6.100	6.680
a	1.500	1.550
B	9.000	9.500
b	0.850	0.900
c	0.400	0.500
D	8.100	10.900
D1	7.420	7.820
d	2.540 BSC.	
E	3.100	3.550
L	0.500	0.700
L1	3.000	3.600



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