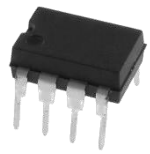
CURRENT MODE PWM CONTROLLER

DESCRIPTION

The UC284x and UC384x are fixed frequency current mode PWM controller. They are specially designed for OFF Line and DC to DC converter applications with a minimal external components. Internally implemented circuits include a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and a high current totem pole output ideally suited for driving a power MOSFET. Protection circuitry includes built under voltage lockout and current limiting.
The UC2842/44, UC3842/44 have UVLO thresholds of 16 V (on) and 10 V (off). The corresponding thresholds for the UC2843/45, UC3843/45 are 8.4V (on) and 7.6V (off).
The UC2842/43, UC3842/43 can operate within 100% duty cycle.
The UC2844/45, UC3844/45 can operate within 50% duty cycle.
The UC2842/44/44/45 is characterized for operation from TA = -40℃ to 85℃.
The UC3842/43/44/45 is characterized for operation from TA = 0℃ to 70℃.



DIP8

SOP8

FEATURES

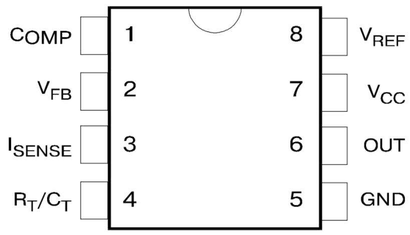
- Low Start-Up and Operating Current
- High Current Totem Pole Output
- Under voltage Lockout With Hysteresis
- Operating Frequency Up To 500KHz

ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
UC2842N	DIP8	UC2842	TUBE	2000/box
UC2843N	DIP8	UC2843	TUBE	2000/box
UC2844N	DIP8	UC2844	TUBE	2000/box
UC2845N	DIP8	UC2845	TUBE	2000/box
UC2842M/TR	SOP8	UC2842	REEL	2500/reel
UC2843M/TR	SOP8	UC2843	REEL	2500/reel
UC2844M/TR	SOP8	UC2844	REEL	2500/reel
UC2845M/TR	SOP8	UC2845	REEL	2500/reel
UC3842N	DIP8	UC3842	TUBE	2000/box
UC3843N	DIP8	UC3843	TUBE	2000/box
UC3844N	DIP8	UC3844	TUBE	2000/box
UC3845N	DIP8	UC3845	TUBE	2000/box
UC3842M/TR	SOP8	UC3842	REEL	2500/reel
UC3843M/TR	SOP8	UC3843	REEL	2500/reel
UC3844M/TR	SOP8	UC3844	REEL	2500/reel
UC3845M/TR	SOP8	UC3845	REEL	2500/reel

Pin CONNECTION

DIP8/SOP8

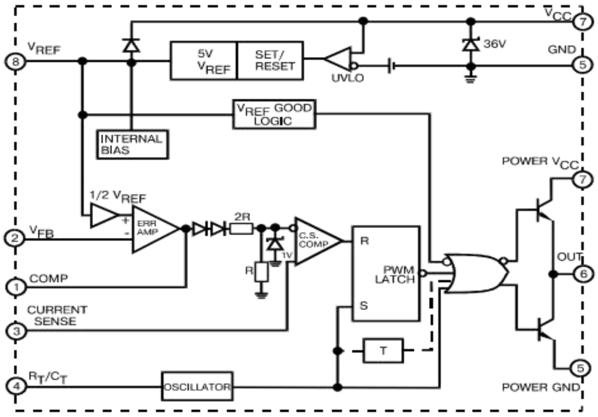


PIN FUNCTION

N	FUNCTION	DESCRIPTION
1	COMP	This pin is the Error Amplifier output and is made for loop compensation.
2	VFB	This is the inverting input of the Error Amplifier. It is normally connected to the switching power supply output through a resistor divider.
3	ISENSE	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	GROUND	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	VCC	This pin is the positive supply of the integrated circuit.
8	Vref	This is the reference output. It provides charging current for capacitor C_T through resistor R_T .

BLOCK DIAGRAM

(toggle flip flop used only in UC2844/45, UC3844/45)



Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit
Supply Voltage (low impedance source)	VCC	30	V
Output Current	I_O	1	A
Input Voltage (Analog Inputs pins 2,3)	V_I	0.3 to 5.5	V
Error Amp Output Sink Current	ISINK (E.A)	10	mA
Power Dissipation (T_A=25⁰C)	P_O	1	W
Storage Temperature Range	Tstg	-65 to150	℃
Lead Temperature (soldering 5 sec.)	T_L	260	℃

Electrical characteristics (*VCC=15V, RT=10k , CT=3.3nF, TA=0°C to +70°C, unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Reference Section						
Reference Output Voltage	VREF	T_J = 25°C, I_{REF} = 1 mA	4.9	5.0	5.1	V
Line Regulation	ΔVREF	12V ≤ V_{CC} ≤ 25 V		6.0	20	mV
Load Regulation	ΔVREF	1 mA ≤ I_{REF} ≤ 20mA		6.0	25	
Short Circuit Output Current	ISC	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} ≤ 25 V		0.05	1.0	%
Oscillator Amplitude	V(OSC)	(peak to peak)		1.6		V
Error Amplifier Section						
Input Bias Current	IBIAS	V_{FB}=3V		-0.1	-2	μA
Input Voltage	VI(E.A)	V_{pin1} = 2.5V	2.42	2.5	2.58	V
Open Loop Voltage Gain	AVOL	2V ≤ V_0 ≤ 4V	65	90		dB
Unity Gain Bandwidth	UGBW	T_j=25°C, Note 3	0.5	0.6		MHz
Power Supply Rejection Ratio	PSRR	12V ≤ V_{CC} ≤ 25 V	60	70		dB
Output Sink Current	ISINK	V_{pin2} = 2.7V, V_{pin1} = 1.1V	2	7		mA
Output Source Current	ISOURCE	V_{pin2} = 2.3V, V_{pin1} = 5V	-0.5	-1.0		mA
High Output Voltage	VOH	V_{pin2} = 2.3V, R_L = 15KΩ to GND	5.0	6.0		V
Low Output Voltage	VOL	V_{pin2} = 2.7V, R_L = 15KΩ to PIN 8		0.8	1.1	
Current Sense Section						
Gain	G_V	(Note 1 & 2)	2.85	3.0	3.15	V/V
Maximum Input Signal	VI(MAX)	V_{pin1} = 5V (Note1)	0.9	1.0	1.1	V
Supply Voltage Rejection	SVR	12V ≤ V_{CC} ≤ 25 V (Note 1)		70		dB
Input Bias Current	IBIAS	V_{pin3} = 3V		-3.0	-10	μA
Output Section						
Low Output Voltage	VOL	I_{SINK} = 20 mA		0.08	0.4	V
		I_{SINK} = 200 mA		1.4	2.2	
High Output Voltage	VOH	I_{SINK} = 20 mA	13	13.5		
		I_{SINK} = 200 mA	12	13.0		
Rise Time	t_R	T_J = 25°C, C_L = 1nF (Note 3)		45	150	nS
Fall Time	t_F	T_J = 25°C, C_L = 1nF (Note 3)		35	150	
Undervoltage Lockout Section						
Start Theshold	VTH(ST)	UC2842/44,UC3842/44	14.5	16.0	17.5	V
		UC2843/45,UC3843/45	7.8	8.4	9.0	
Min. Operating Voltage (After Turn On)	VOPR(min)	UC2842/44,UC3842/44	8.5	10	11.5	V
		UC2843/45,UC3843/45	7.0	7.6	8.2	
PWM Section						
Max. Duty Cycle	D(MAX)	UC2842/43,UC3842/43	95	97	100	%
		UC2844/45,UC3844/45	47	48	50	
Min. Duty Cycle	D(MAX)				0	
Total Standby Current						
Start Up Current	IST	UC3842/43/44/45		0.17	0.3	mA
Operating Supply Current	ICC (OPR)	Vpin3 = Vpin2 = 0V		13	17	
Zener Voltage	V_Z	I_{CC}=25 mA	30	38		V

* Adjust VCC above the start threshold before setting it to 15V.

Note 1: Parameter measured at trip point of latch with Vpin2=0.

Note 2: Gain defined as A=ΔVpin1/ΔVpin3 ; 0 ≤ Vpin3 ≤ 0.8V.

Note 3: These parameters, although guaranteed, are not 100% tested in production.

APPLICATION INFORMATION

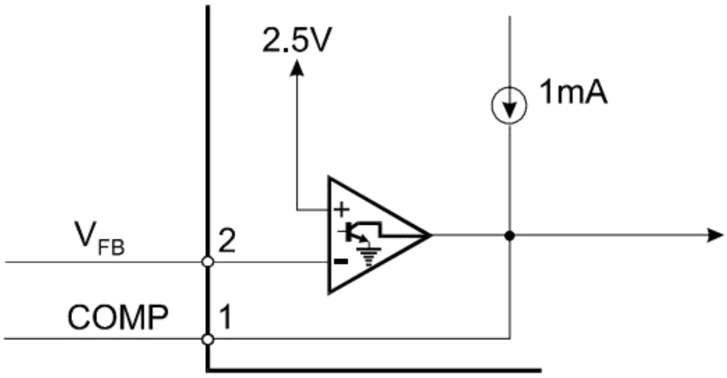


Figure 1. Error Amp Configuration

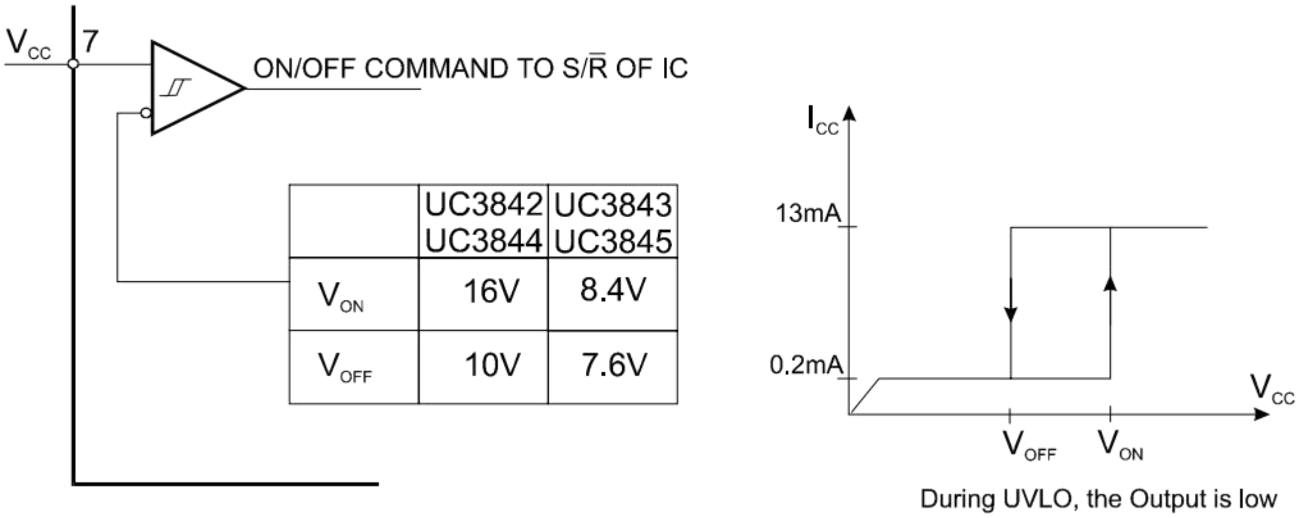


Figure 2. Under voltage Lockout

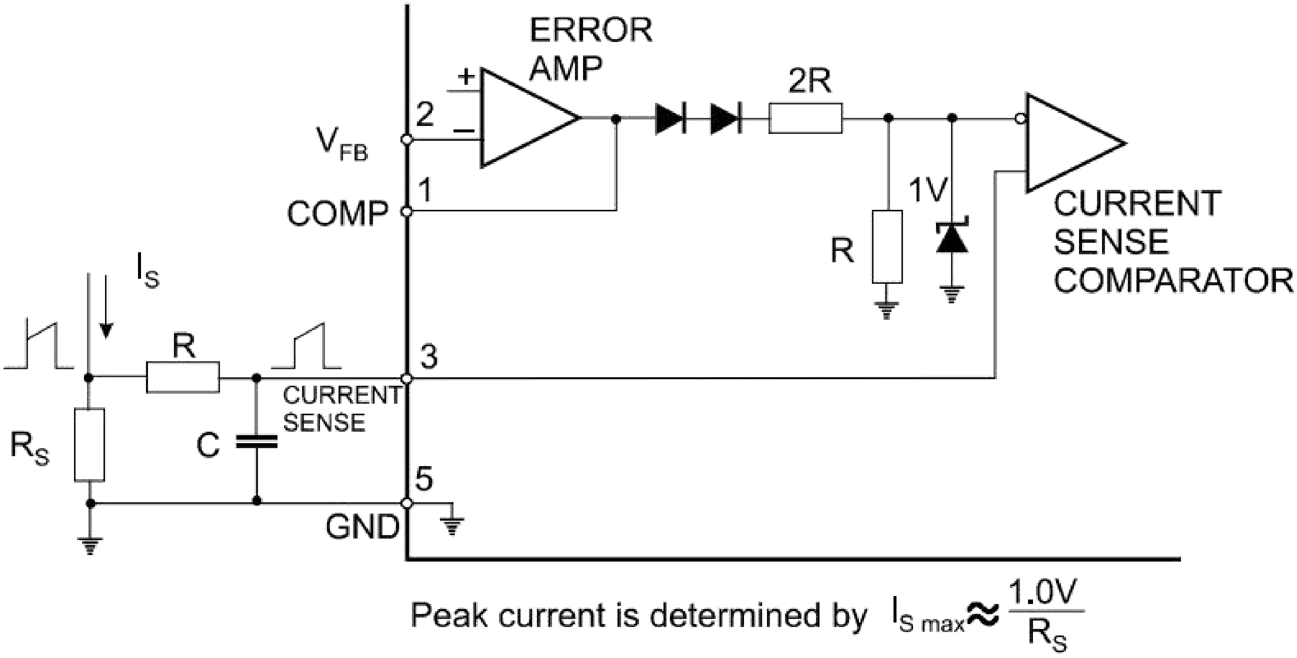


Figure 3. Current Sense Circuit

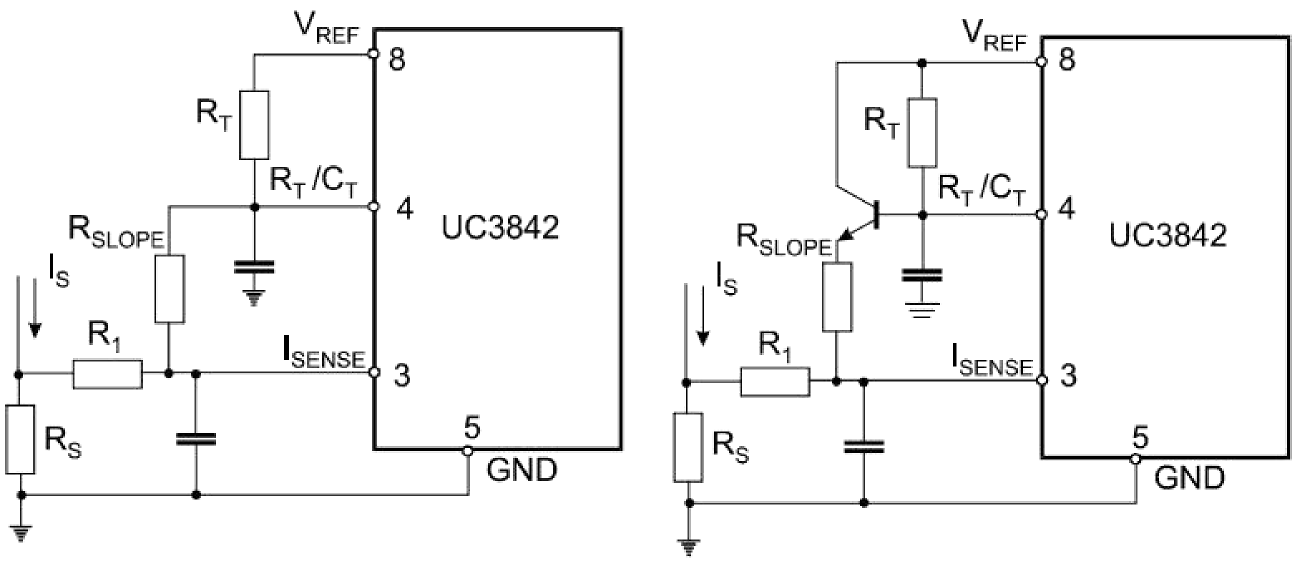
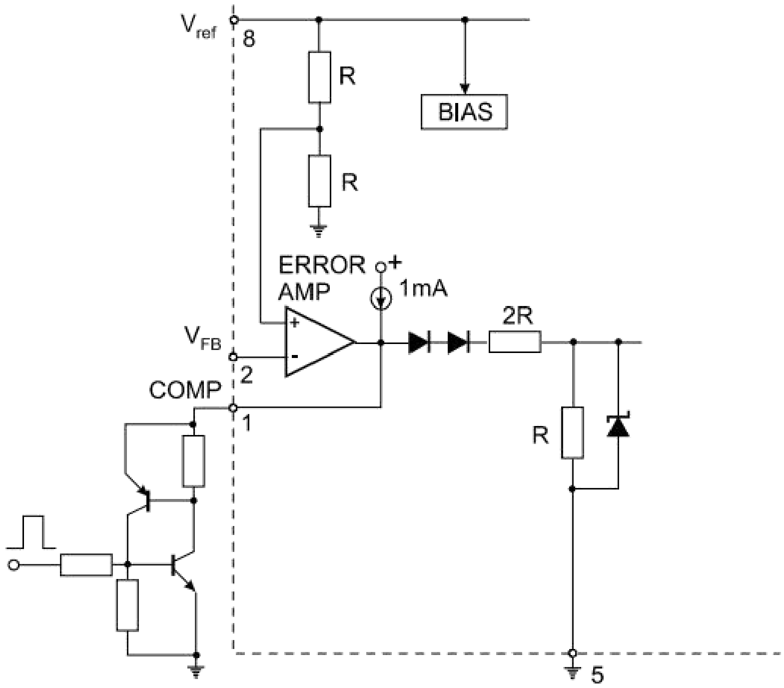
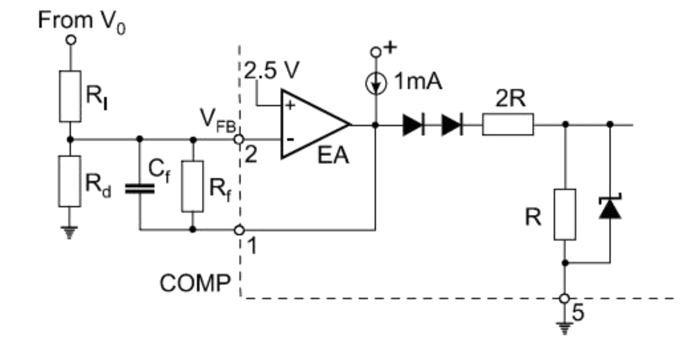


Figure 4. Slope Compensation Techniques

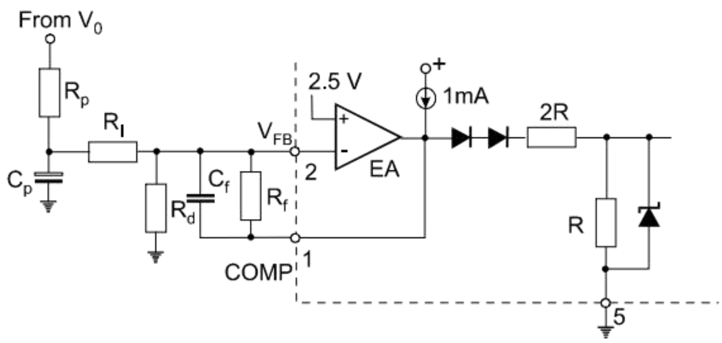


SCR must be selected for a holding current of less than 0.5mA.
The simple two transistor circuit can be used in place of the SCR as shown.

Figure 5. Latched Shutdown



Error Amp compensation circuit for stabilizing any current-mode topology except for boost and flyback converters operating with continuous inductor current.



Error Amp compensation circuit for stabilizing current-mode boost and flyback topologies operating with continuous inductor current.

Figure 6. Error Amplifier Compensation

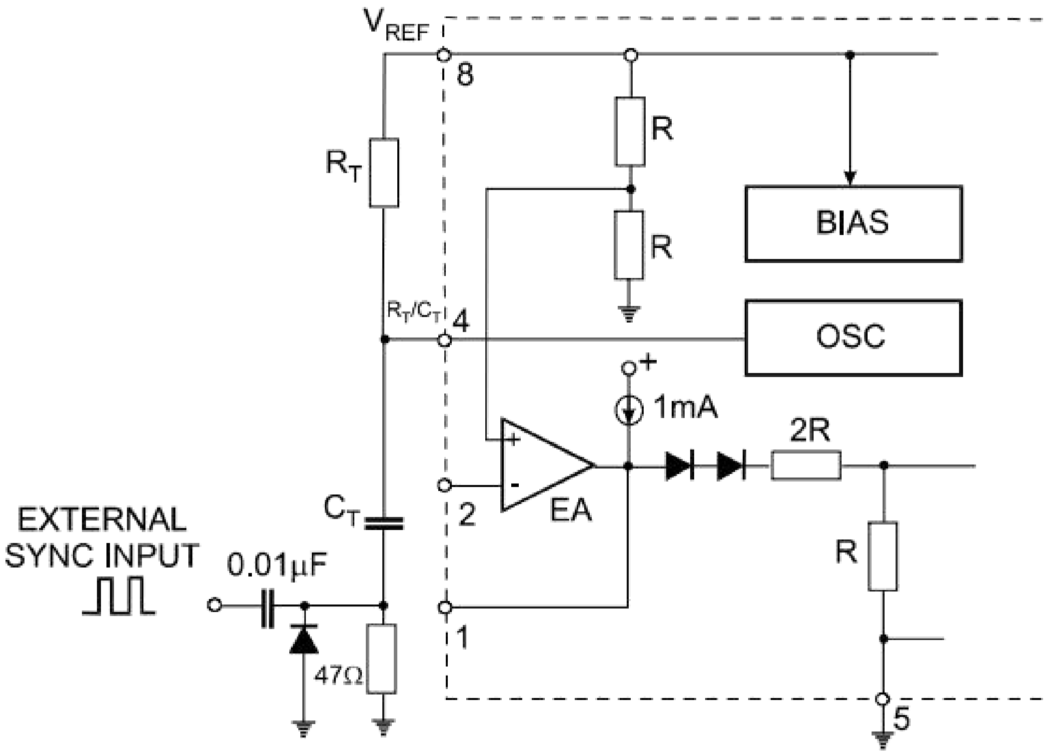


Figure 7. External Clock Synchronization

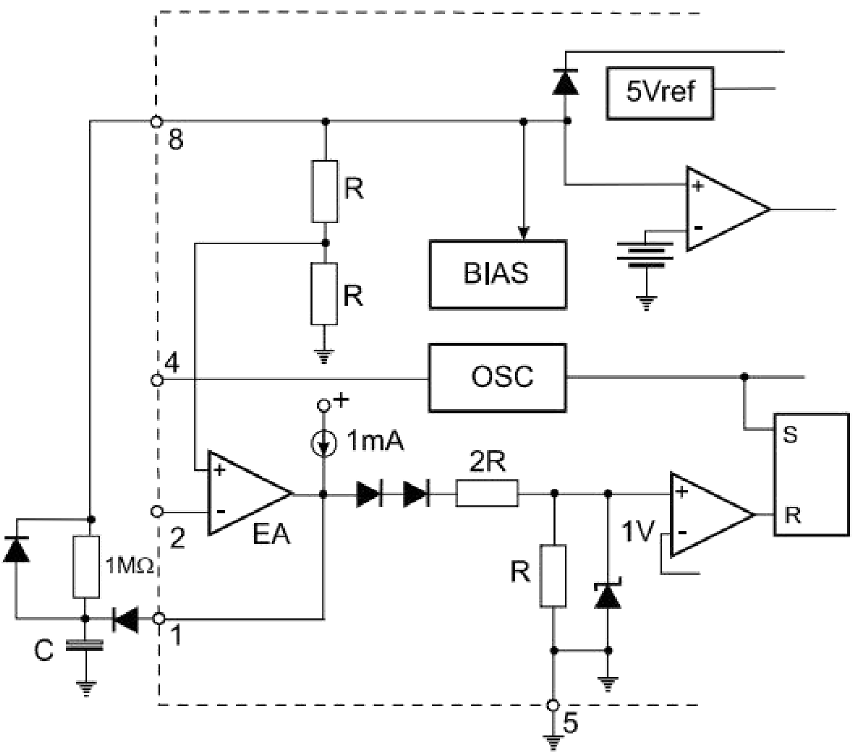


Figure 8. Soft-Start Circuit

TYPICAL PERFORMANCE CHARACTERISTICS

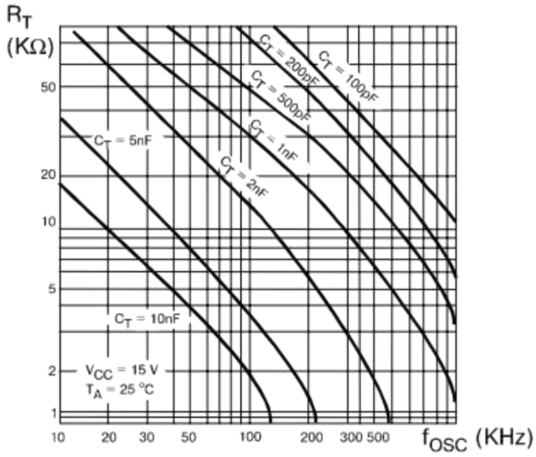


Figure 1. Timing Resistor vs. Oscillator Frequency

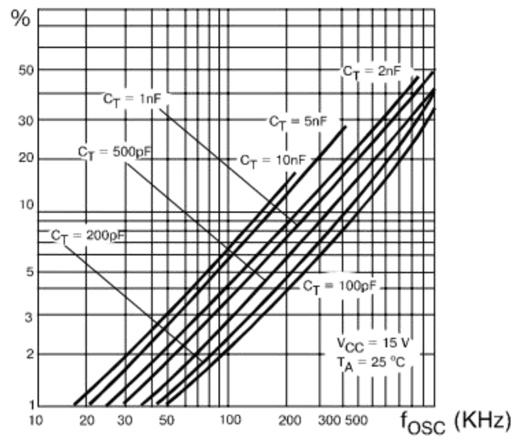


Figure 2. Output Dead-Time vs. Oscillator Frequency

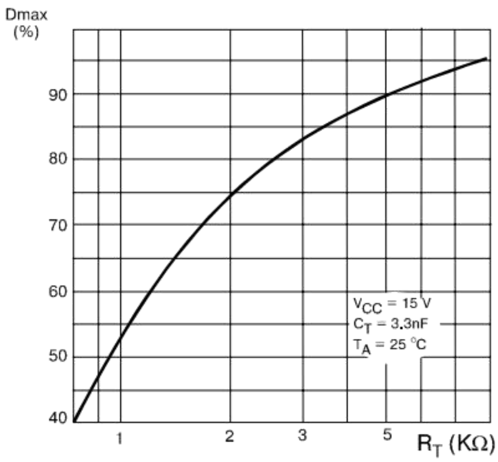


Figure 3. Maximum Output Duty Cycle vs.Timing Resistor (UC3842/43)

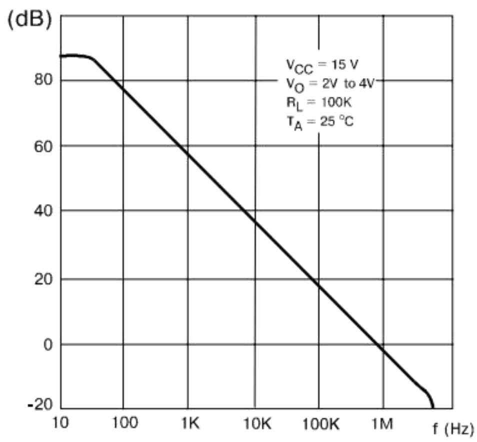


Figure 4. Error Amp Open-Loop Gain vs. Frequency

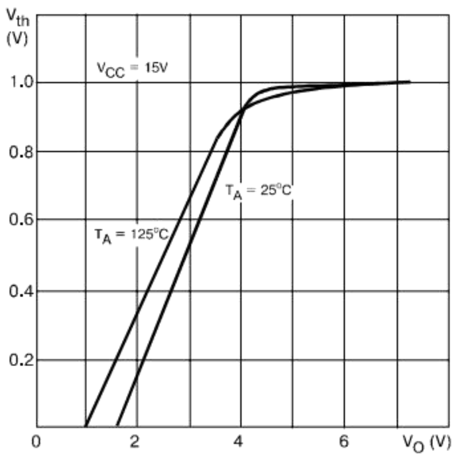


Figure 5. Current Sense Input Threshold vs. Error Amp Output Voltage

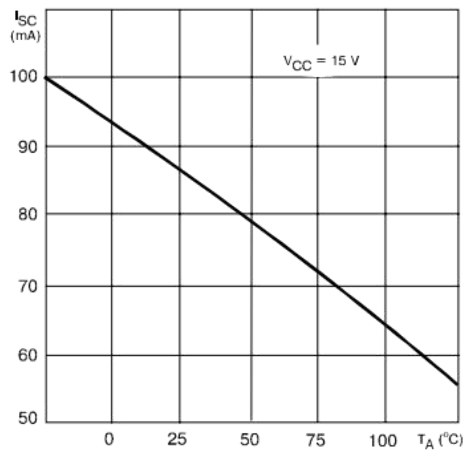


Figure 6. Reference Short Circuit Current vs. Temperature

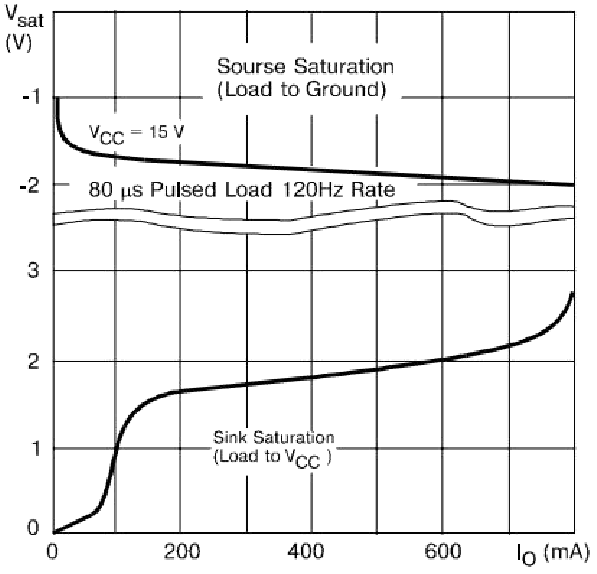


Figure 7. Output Saturation Voltage vs. Load Current
TA = 25°C

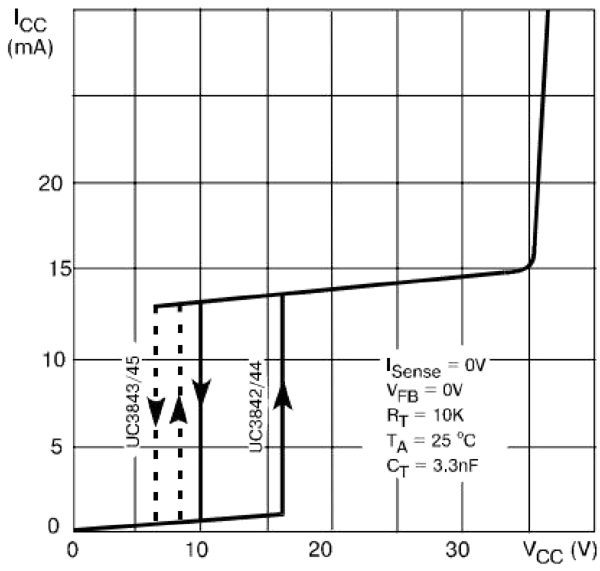


Figure 8. Supply Current vs. Supply Voltage

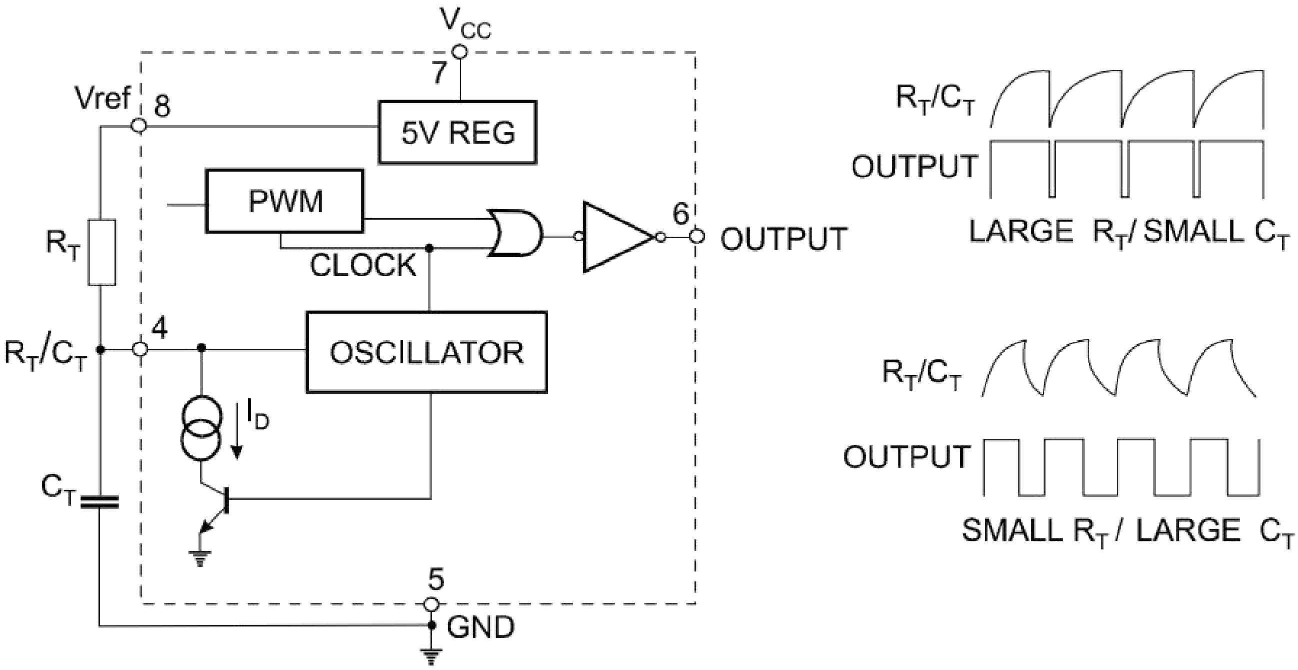
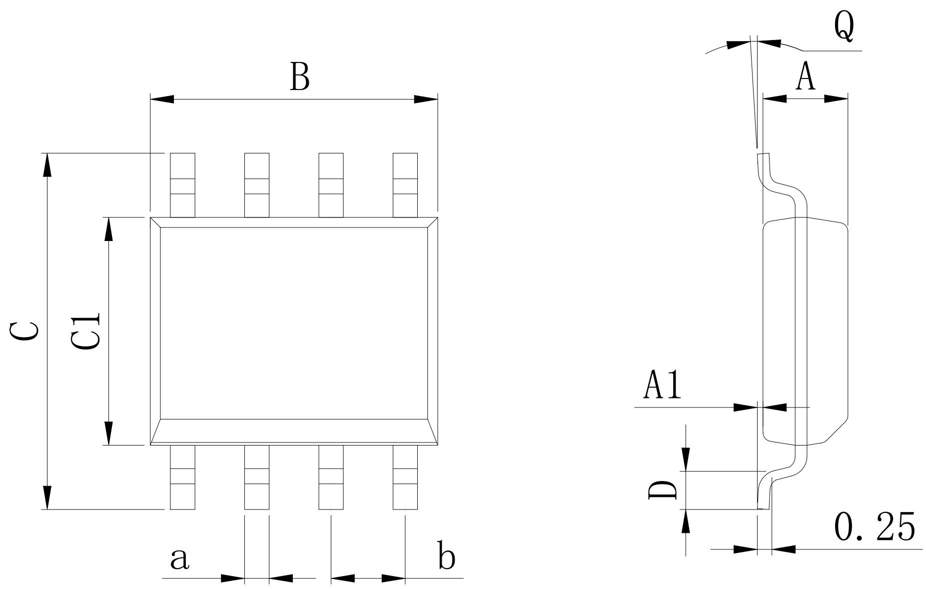


Figure 9. Oscillator and Output Waveforms

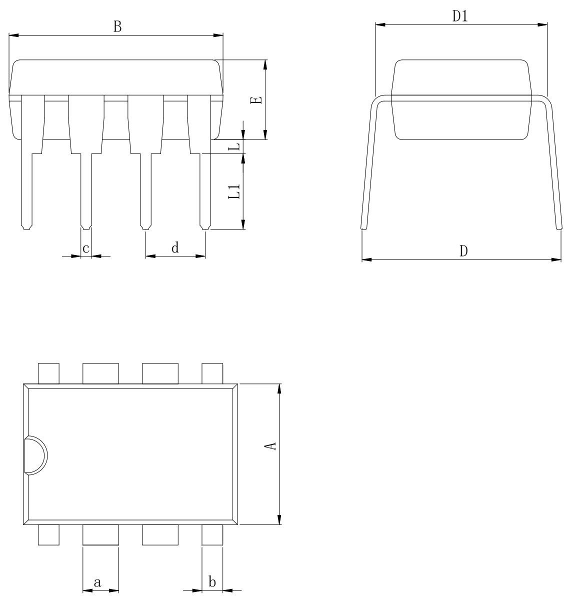
Physical Dimensions

SOP8



Dimensions In Millimeters(SOP8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

DIP8



Dimensions In Millimeters(DIP8)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.40	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	9.00	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

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