Bay Linear

Inspire the Linear Power

Current Mode PWM Controller

B3842/43/44/45A&A1

Description

The Bay Linear B3842/43/44/45 are fixed frequency current-mode PWM controller. These devices are designed for Off-Line and DC-to-DC converter applications with minimum external components. The B3842 family Feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and a high current totempole output. Ideally suited for driving a power N-Channel MOSFET's. It is low when is on off stage. Protection circuitry includes built in under-voltage lockout and current limiting.

Major differences between members of these series are the UVLO thresholds and maximum duty-cycle ranges. Typical UVLO thresholds of 16V (on) and 10V (off) on the B3842 and B3844 devices make them ideally suited to off-line applications. These corresponding typical thresholds for the B3842 and B3845 devcies are 8.4V (on) and 7.6V (off). The B3842 and B3843 devcies can operate to duty cycles approaching 100%. A duty-Cycle range of 0 to 50% is obtained by the B3844 and B3845 by the addition of an internal toggle flip-flop, which blanks the output off every other clock cycle. It id available in 8 pin DIP and SOIC packages.

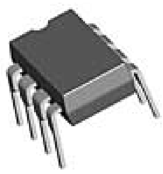
Features

- **Low Start-Up and Operating Current**
- **Maximum Duty Cycle**
- **Operating Frequency Up to 500KHz**
- **Under voltage Lockout with Hysteresis**
- **Available in 8 pin SOIC**
- **Similar to industry Standard UC3842**

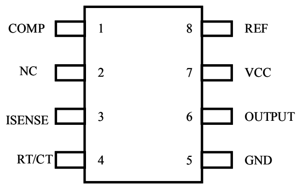
Applications

- **Switching Power Supply**
- **Monitor**

Pin Connection



8-Pin Surface Mount



Top View

Ordering Information

Devices	Package	Temp.
B384X(Z)M	SO-8	0 °C to 70 °C
B384X(Z)P	8-DIP	0 °C to 70 °C

Z=A ON Semi Z=A1 Fairchild & Samsung

Absolute Maximum Rating

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	30	V
Output Current	I_O	±1	A
Analog Input (pin 2,3)	$V_{(ANA)}$	-0.3 to 6.3	V
Error Amp Output Sink Current	$I_{SINK\ (E.A)}$	10	mA
Power Dissipation	P_D	1	W
Storage Temperature Range	T	-65 to 150	°C
Lead Temperature (Soldering 10 Sec.)	T_L	260	°C

Electrical Characteristics

(V_{CC} = 15V;R_T = 10Ω, C_T = 3.3nF, T_A=0 °C to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
REFERENCE SECTION						
Reference Voltage	V_{REF}	T_J = 25 °C. I_{REF}= 1mA	4.90	5.00	5.10	V
Line Regulation	$REG_{(line)}$	$12V \le V_{CC} \le 25V$	-	6	20	mA
Load Regulation	REG (LOAD)	$1mA \le I_{REF} \le 20mA$ T= 25 °C	-	6	25	
Short Circuit Output Current	I_{SC}	T= 25 °C	-	-100	-180	mA
OSCILLATOR SECTION						
Oscillator Frequency	f	T= 25 °C	47	52	57	KHz
Frequency Change with Voltage	$\Delta f/\Delta V_{CC}$	$12V \le V_{CC} \le 25V$	-	0.05	1	%
Oscillator Amplitude	V_{OSC}		-	1.6	-	V_{P-P}
ERROR AMPLIFIER SECTION						
Input Bias Current	I_{BIAS}		-	-0.1	-2	µA
Input Voltage	$V_{I(E>A)}$	V_1 =2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	G_{VO}	$2V \le V_O \le 4V$	65	90	-	dB
Power Supply Rejection Ratio	PSRR	$12V \le V_{CC} \le 25V$	60	70	-	dB
Output Sink Current	I_{SINK}	V_2 =2.7V, V_1 =1.1V	2	7	-	mA
Output Source Current	I_{SOURCE}	V_2=2.3, V_1=5V	-0.6	-1.0	-	mA
High Output Voltage	V_{OH}	V_2=2.3, R_L= 15Ω to GND	5	6	-	V
Low Output Voltage	V_{OL}	V_2=2.7, R_L= 15Ω to pin 8	-	0.8	1.1	V
OUTPUT SECTION						
Low Output Voltage	V_{OL}	I_{SINK} = 20mA I_{SINK} = 200mA	-	0.08 1.4	0.4 2.2	V
High Output Voltage	V_{OH}	S_{ource} = 20mA S_{ource} = 200mA	13 12	13.5 13.0	- -	V
Rise Time	t_R	T_J = 25 °C, C_L=1nF (note3)	-	45	150	ns
Fall Time	t_F	T_J = 25 °C, C_L=1nF (note3)	-	35	150	ns

Note: Output Switch tests are performed under pulsed conditions to minimize power dissipation

Electrical Characteristics

(V_{CC} = 15V;R_T = 10Ω, C_T = 3.3nF, T_A=0 °C to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
CURRENT SENSE SECTION						
Gain	G_V	(Note 1 & 2)	2.85	3	3.15	V/V
Maximum input Signal	$V_{I(MAX)}$	V_1 = 5V (Note 1)	0.9	1	1.1	V
Power Supply Rejection Ratio	PSRR	12V≤V_{CC}≤25V		70	-	dB
Input Bias Current	I_{BIAS}			-3	-10	μA
UNDER-VOLTAGE LOCKOUT SECTION						
Start Threshold	$V_{TH(ST)}$	B3842/B3844	14.5	16	17.5	V
		B3843/B3845	7.8	8.4	9	
Min-Operating Voltage (after Turn On)	$V_{OPR(MIN)}$	B3842/B3844	8.5	10	11.5	V
		B3843/B3845	7.0	7.6	8.2	
PWM SECTION						
Max Duty Cycle	D(MAX)	B3842/B3843	95	97	100	%
		B3844/B3845	47	48	50	
Min Duty Cycle	D (MIN)		-	-	0	%
TOTAL STANDBY CURRENT						
Start-Up Current	I_{ST}	B3842A/43A/44A/45A	-	0.17	0.3	mA
		B3842A1/43A1/44A1/45A1		0.45	1	
Operating Supply Current	$I_{CC(OPR)}$	V_3=V_2=ON	-	14	17	mA
Zener Voltage	V_Z	I_{CC}	30	38	-	V

Block Diagram

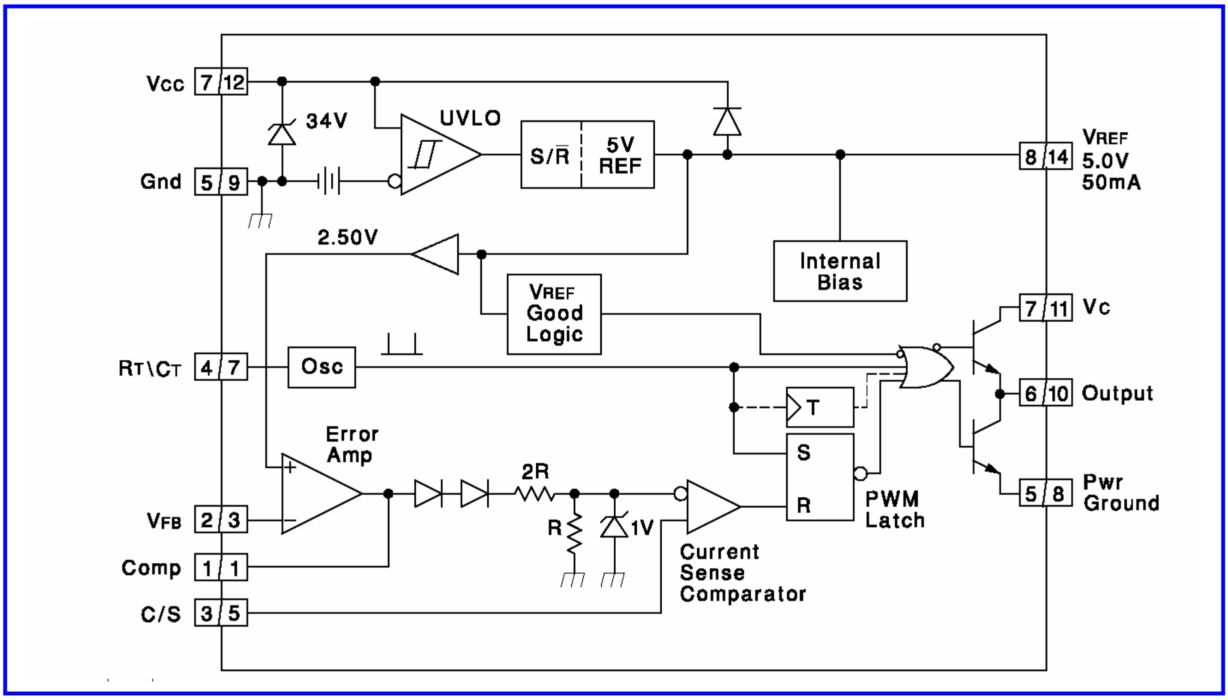
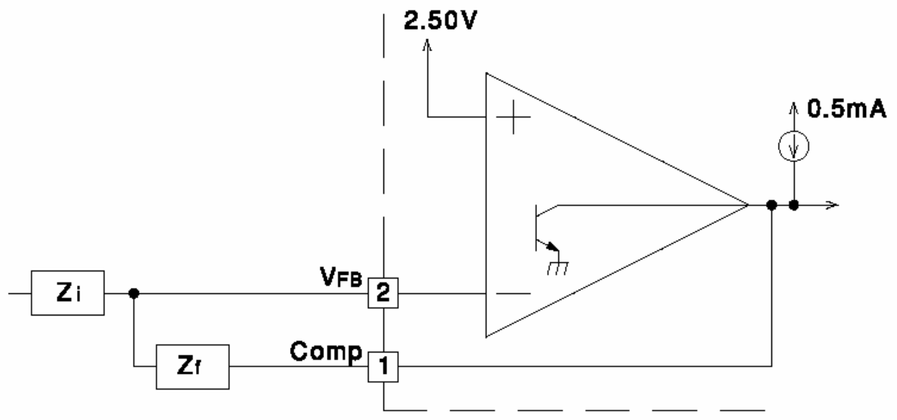
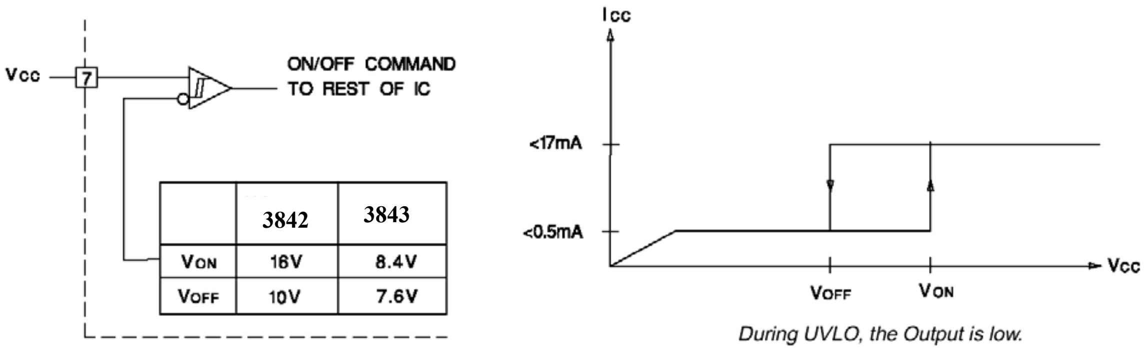


Figure 1: Error Amp Configuration



Error Amp can Source and Sink up to 0.5mA, and Sink up to 2mA.

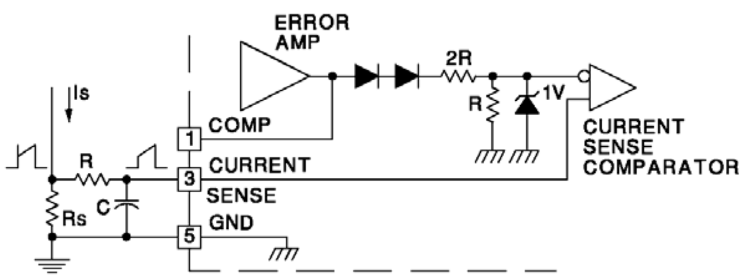
Figure 2: Under-Voltage Lockout



	3842	3843
V_{ON}	16V	8.4V
V_{OFF}	10V	7.6V

During UVLO, the Output is low.

Figure 3: Current Sense Circuit

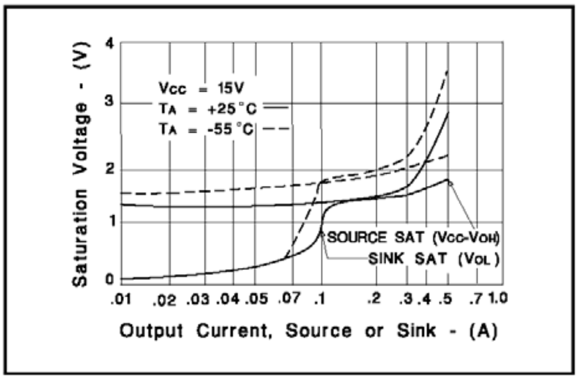


Peak Current (Is) is Determined By The Formula

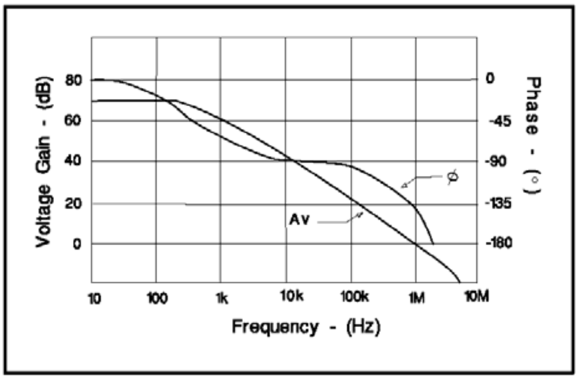
$$I_{SMAX} \approx \frac{1.0V}{R_S}$$

A small RC filter may be required to suppress switch transients.

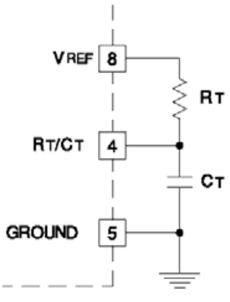
Output Saturation Characteristics



Error Amplifier Open-Loop Frequency Response

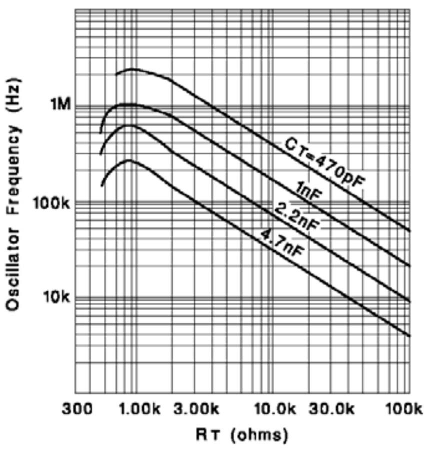


Oscillator Section

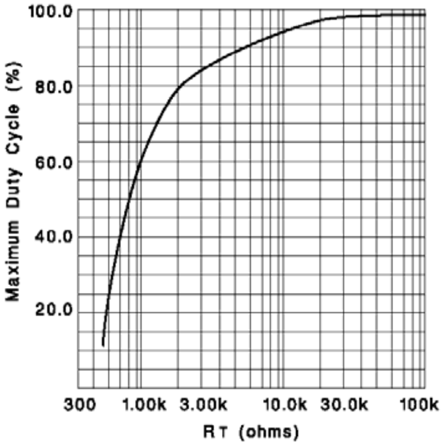


For RT > 5k $f \approx \frac{1.72}{R_T C_T}$

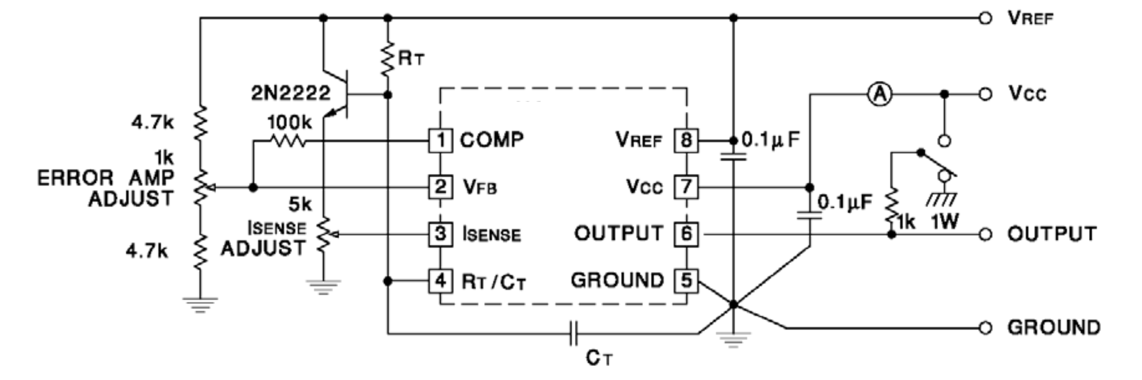
Oscillator Frequency vs Timing Resistance



Maximum Duty Cycle vs Timing Resistor



Open-Loop Laboratory Test Fixture



High peak currents associated with capacitive loads necessitate careful grounding techniques. Timing and bypass capacitors should be connected close to pin 5 in a single point ground. The transistor and 5k potentiometer are used to sample the oscillator waveform and apply an adjustable ramp to pin 3.

Figure 4: Slope Conpensation Techigues

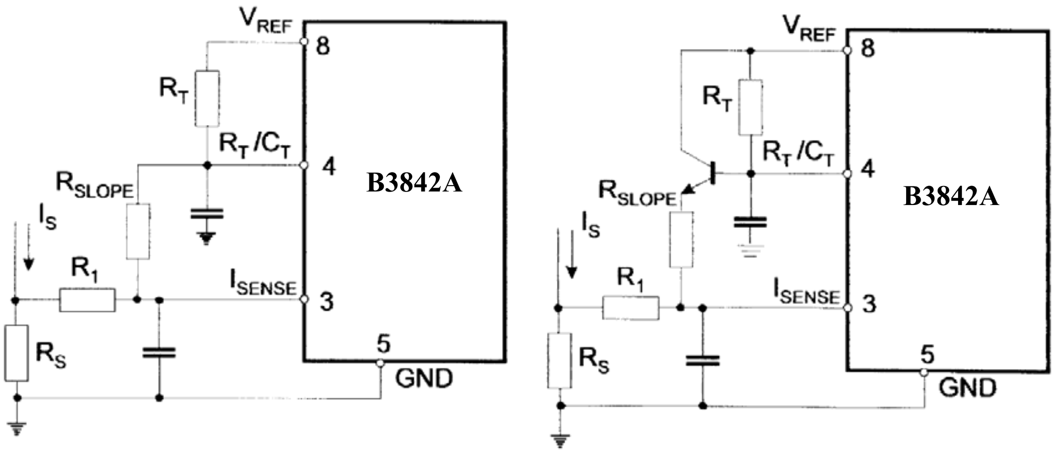
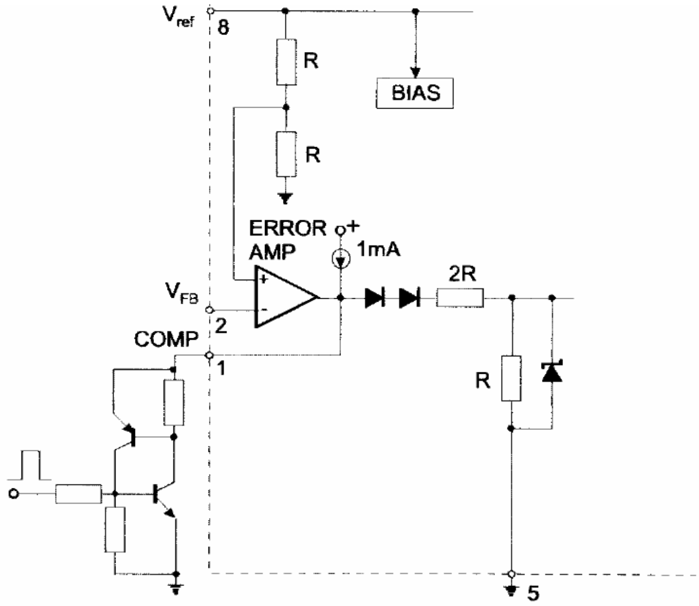
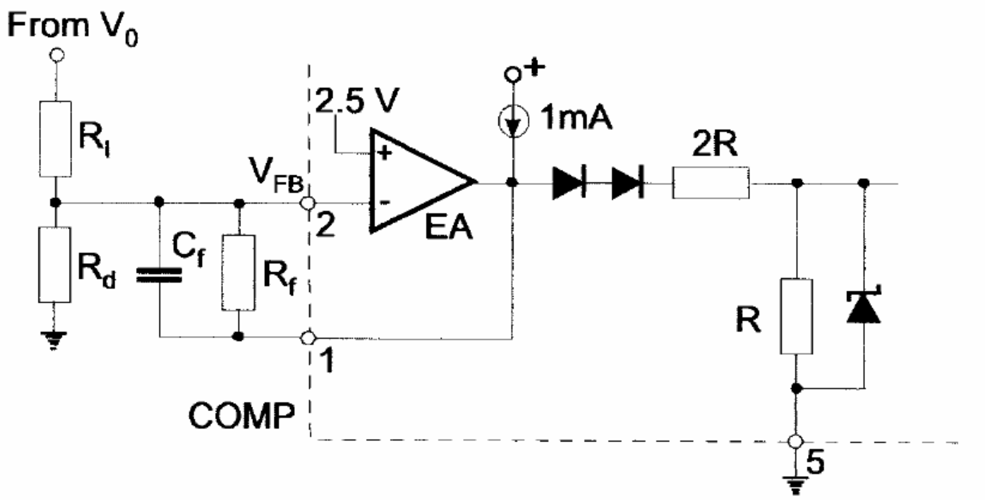


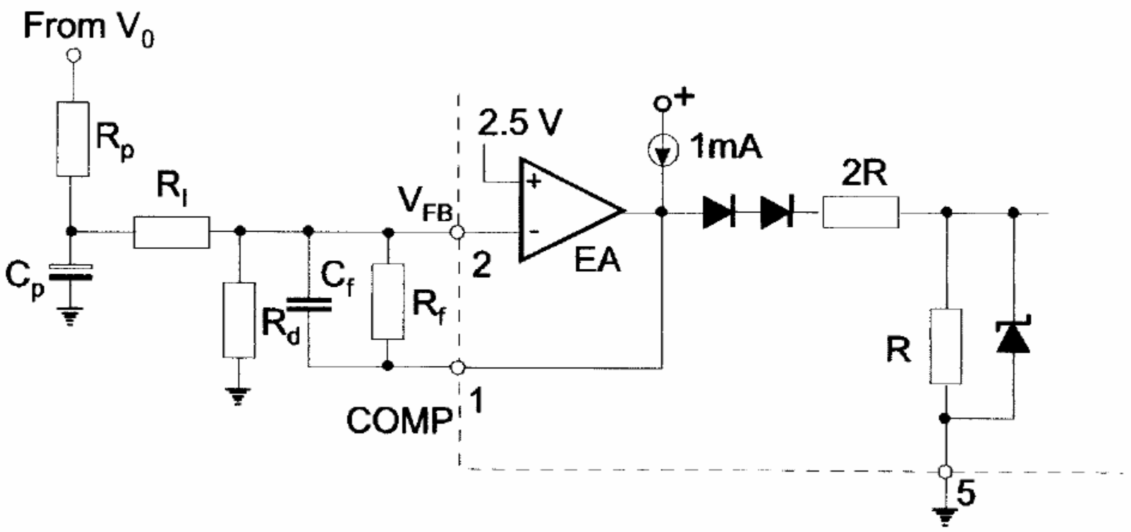
Figure 5:Latched Shutdown



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.



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

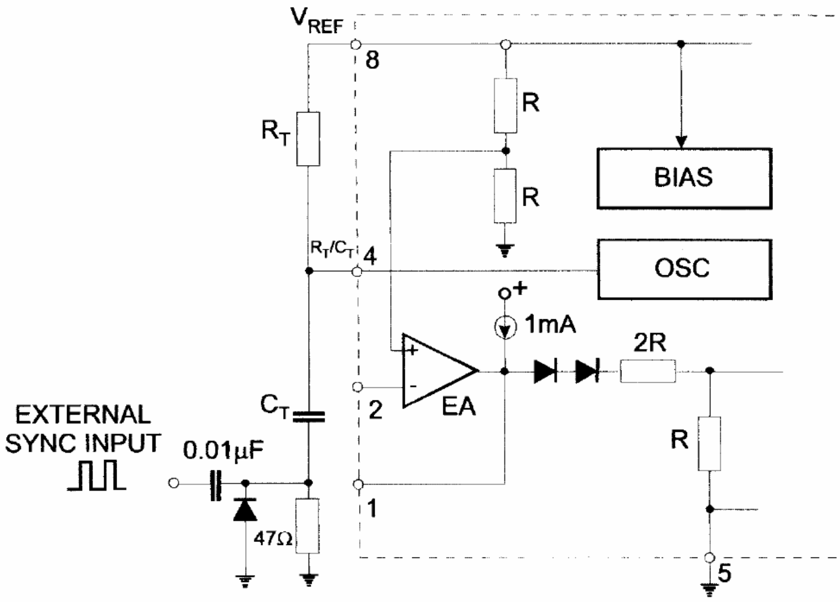


Figure 7. External Clock Synchronization

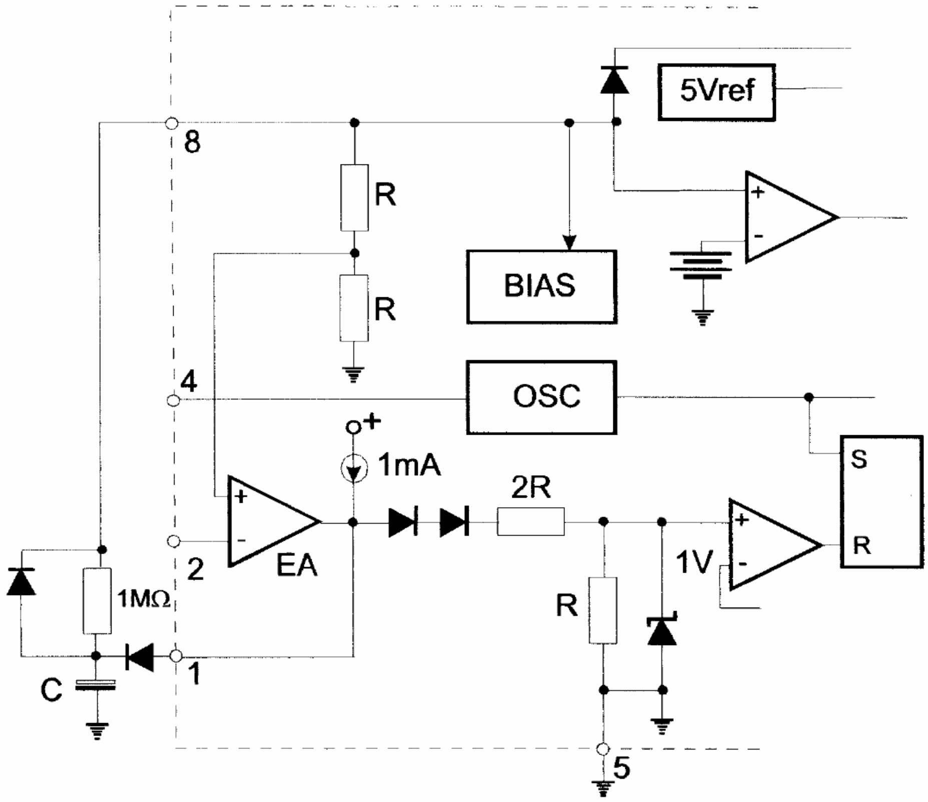


Figure 8. Soft-Start Circuit

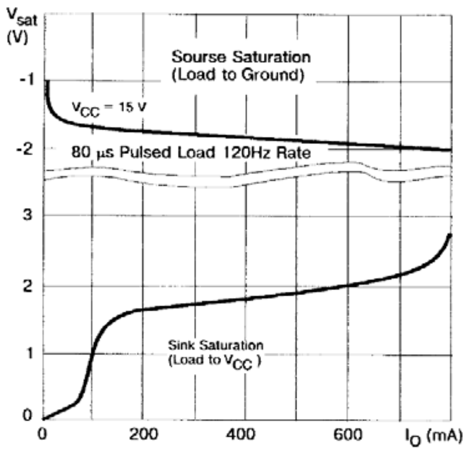


Figure 7. Output Saturation Voltage vs. Load Current
$T_A = 25°C$

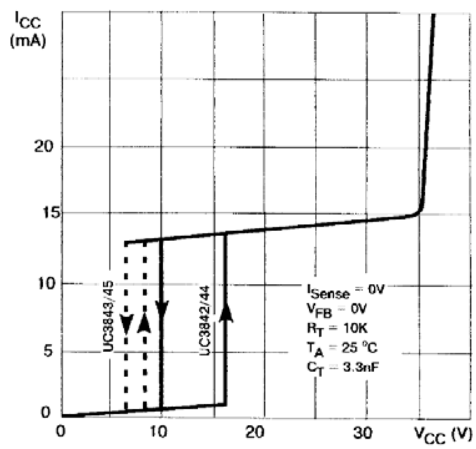


Figure 8. Supply Current vs. Supply Voltage

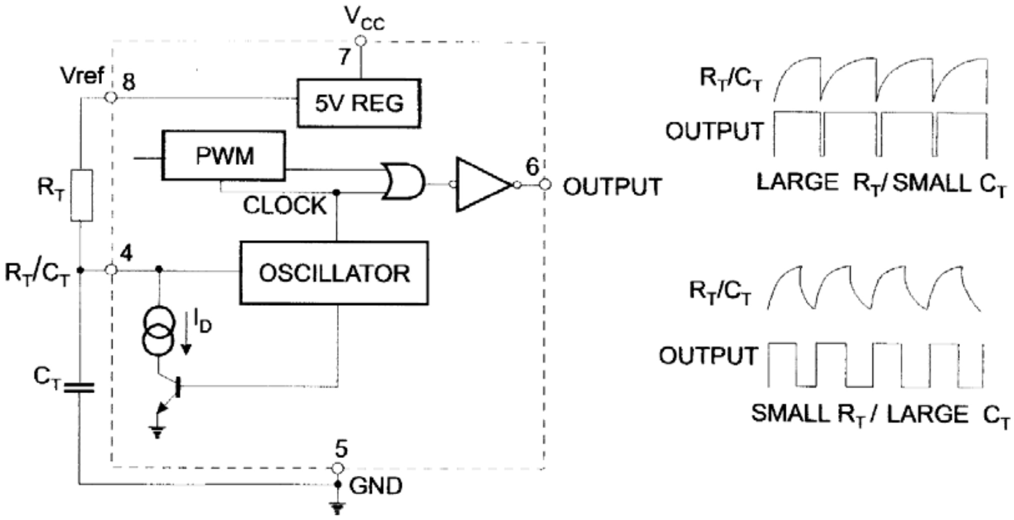


Figure 9. Oscillator and Output Waveforms

Advance Information- These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

Preliminary Information- These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including " Typical" for each customer application.

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