



**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

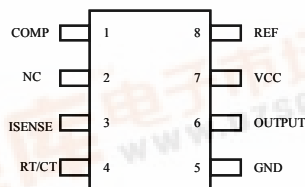
### Applications

- 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	$I_O$	$\pm 1$	A
Analog Input (pin 2,3)	$V_{(ANA)}$	-0.3 to 6.3	V
Error Amp Output Sink Current	$I_{SINK(EA)}$	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**

( $V_{CC} = 15V$ ;  $R_T = 10\Omega$ ,  $C_T = 3.3nF$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$ , unless otherwise specified)

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

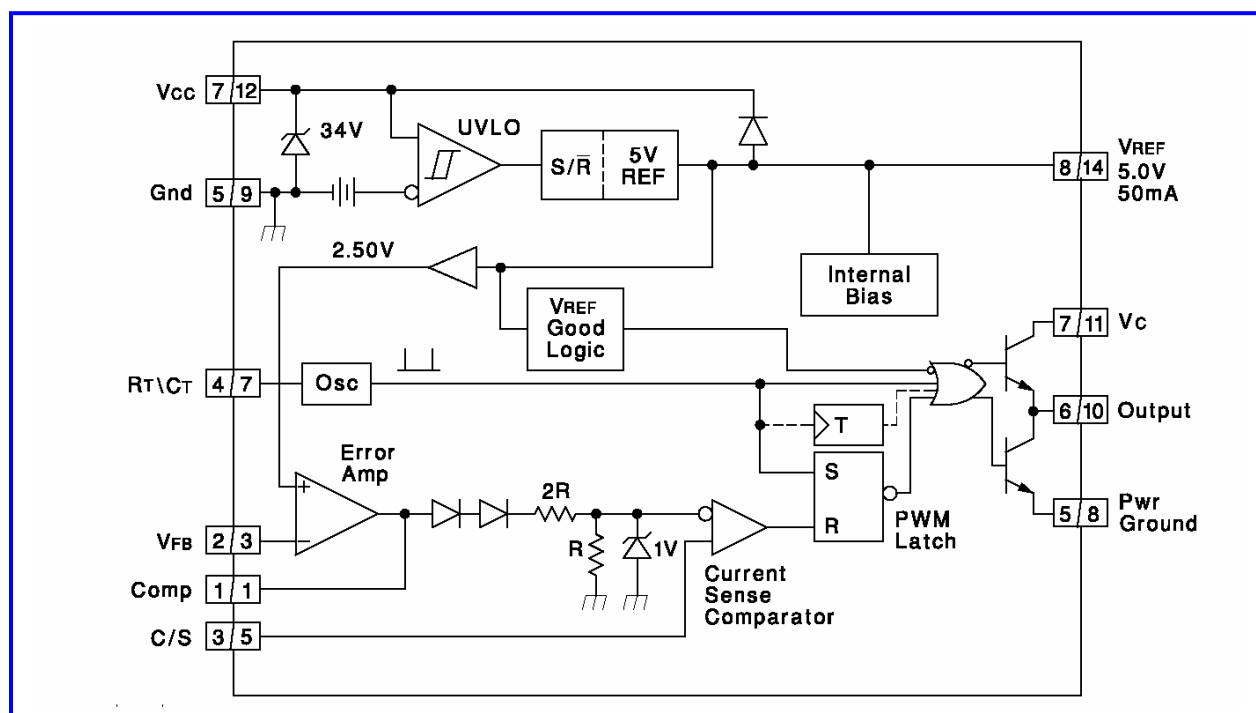
**Note:** Output Switch tests are performed under pulsed conditions to minimize power dissipation

## Electrical Characteristics

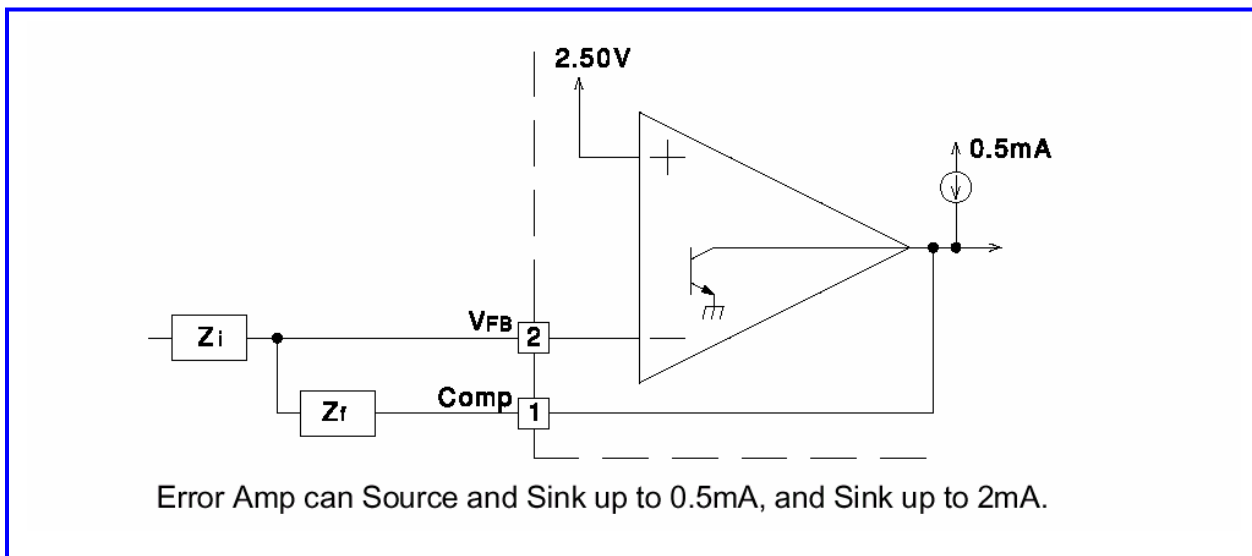
( $V_{CC} = 15V$ ;  $R_T = 10\Omega$ ,  $C_T = 3.3nF$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$ , unless otherwise specified)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
CURRENT SENSE SECTION						
Gain	G <sub>V</sub>	(Note 1 & 2)	2.85	3	3.15	V/V
Maximum input Signal	V <sub>I(MAX)</sub>	V <sub>I</sub> = 5V (Note 1)	0.9	1	1.1	V
Power Supply Rejection Ratio	PSRR	12V≤V <sub>CC</sub> ≤25V		70	-	dB
Input Bias Current	I <sub>BIAS</sub>			-3	-10	μA
UNDER-VOLTAGE LOCKOUT SECTION						
Start Threshold	V <sub>TH(ST)</sub>	B3842/B3844	14.5	16	17.5	V
		B3843/B3845	7.8	8.4	9	
Min-Operating Voltage (after Turn On)	V <sub>OPR(MIN)</sub>	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 <sub>ST</sub>	B3842A/43A/44A/45A	-	0.17	0.3	mA
		B3842A1/43A1/44A1/45A1		0.45	1	
Operating Supply Current	I <sub>CC(OPR)</sub>	V <sub>3</sub> =V <sub>2</sub> =ON	-	14	17	mA
Zener Voltage	V <sub>Z</sub>	I <sub>CC</sub>	30	38	-	V

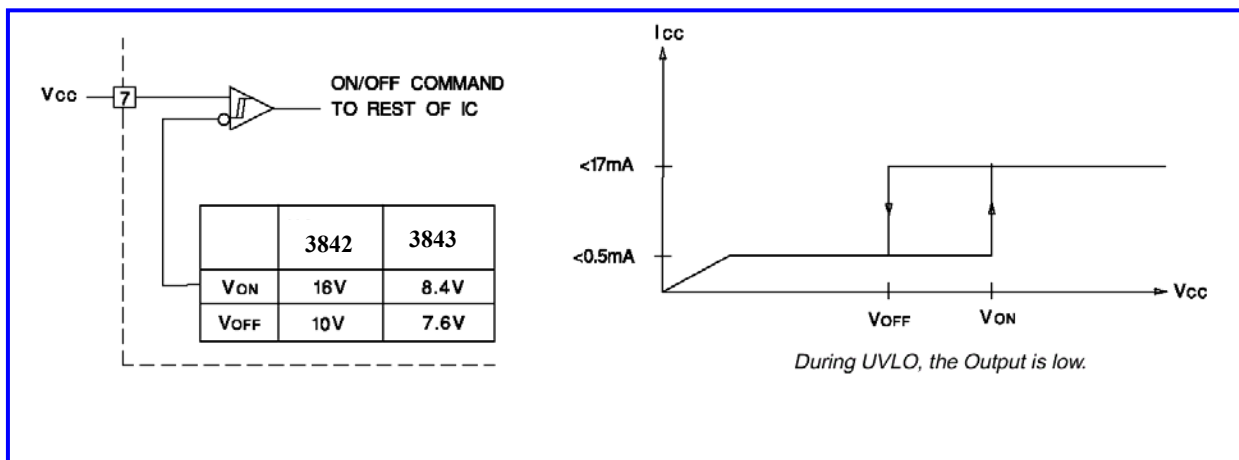
## Block Diagram



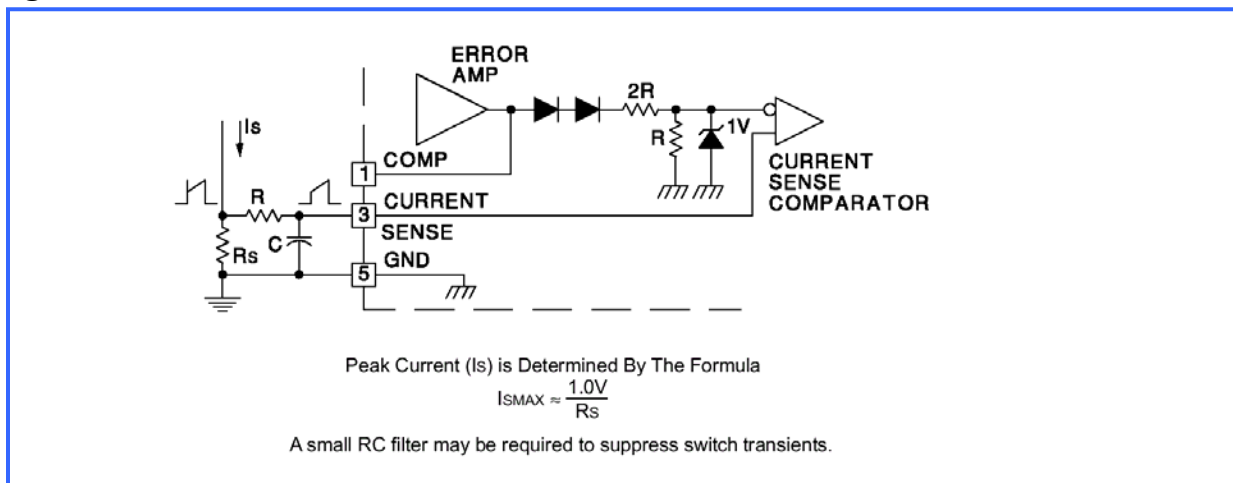
**Figure 1: Error Amp Configuration**



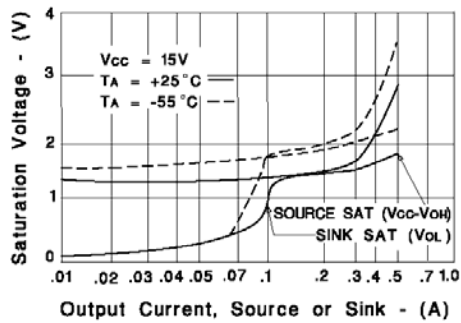
**Figure 2: Under-Voltage Lockout**



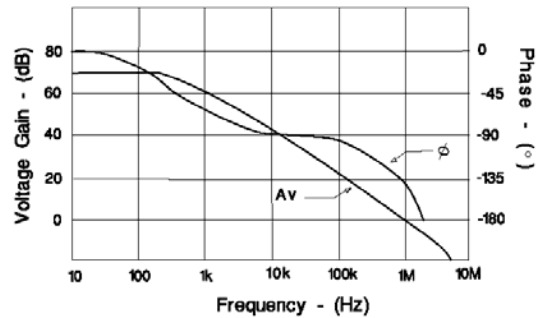
**Figure 3: Current Sense Circuit**



## Output Saturation Characteristics

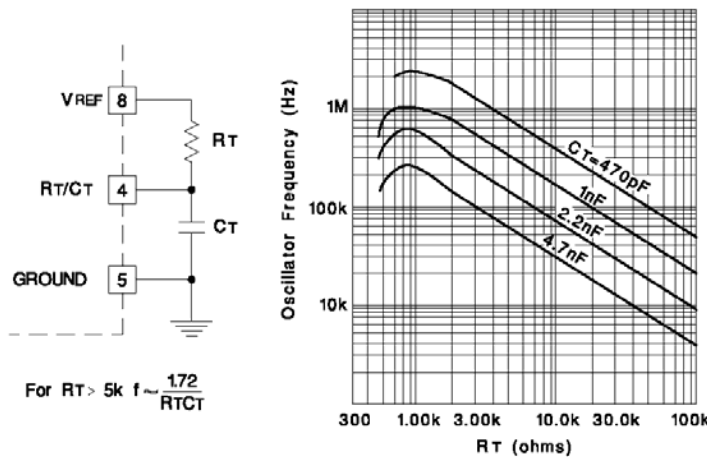


## Error Amplifier Open-Loop Frequency Response

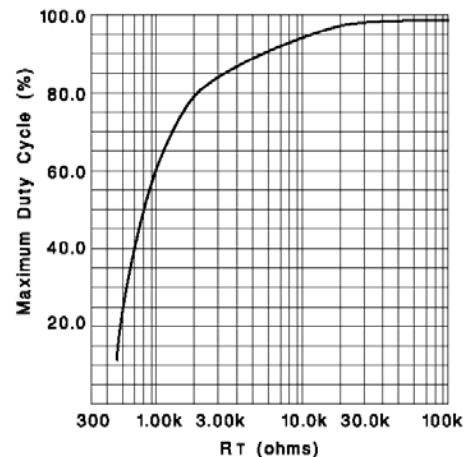


## Oscillator Section

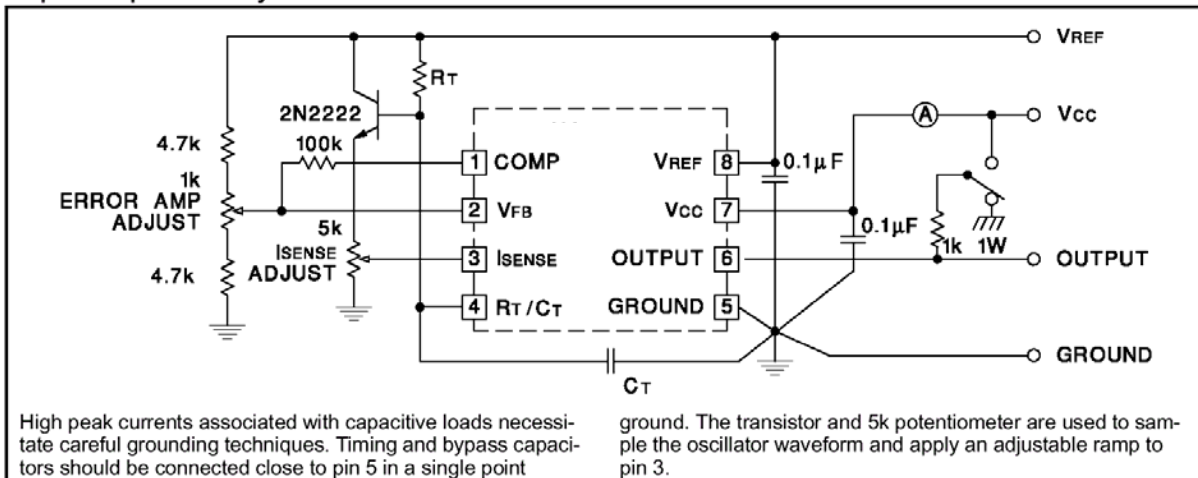
### Oscillator Frequency vs Timing Resistance

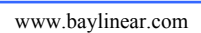


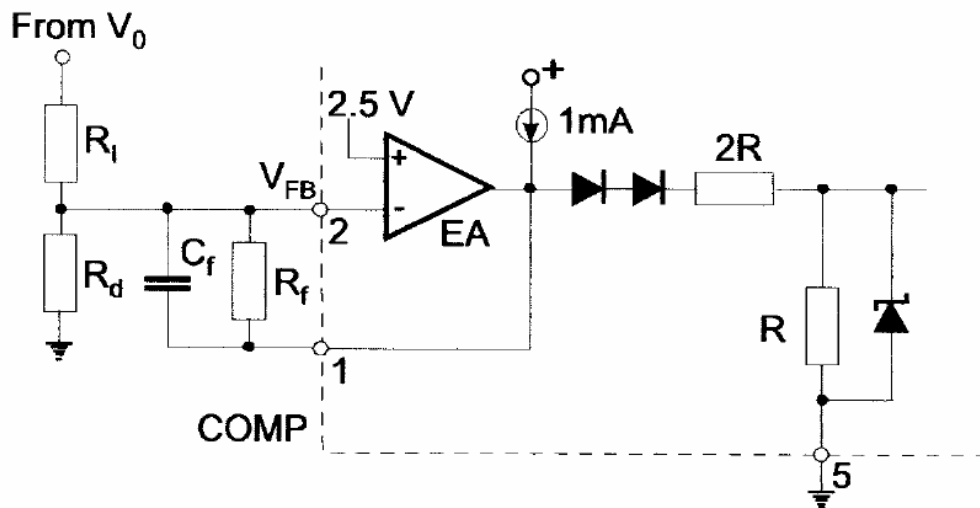
### Maximum Duty Cycle vs Timing Resistor



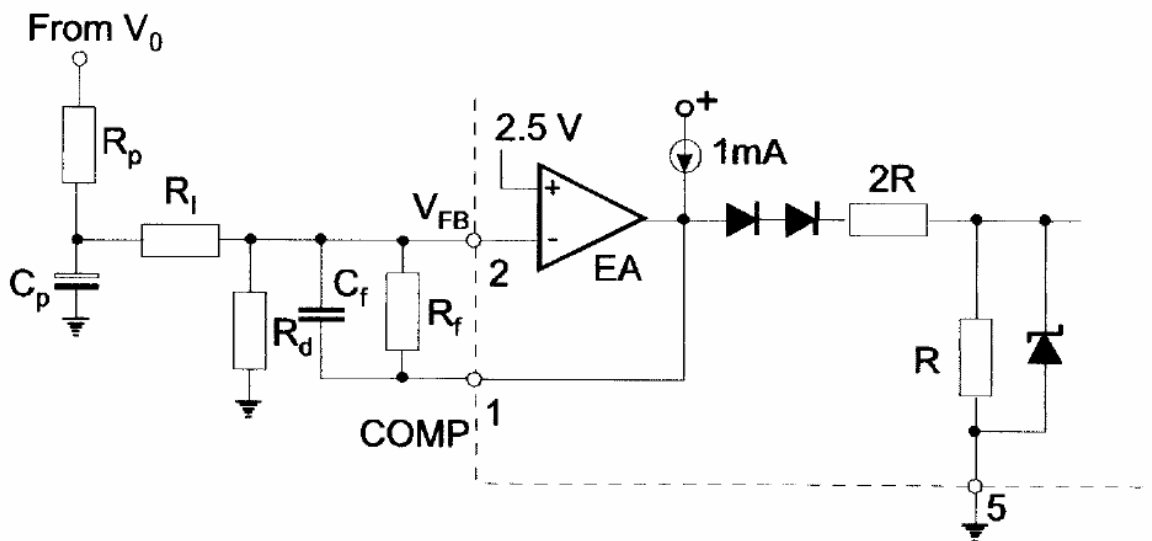
## Open-Loop Laboratory Test Fixture





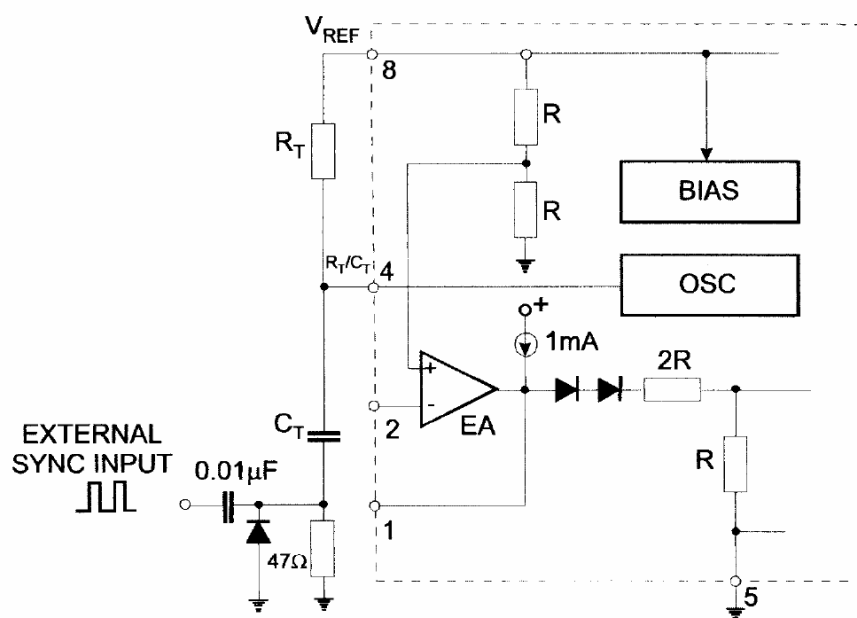


Error Amp compensation circuit for stabilizing any current-mode topology except for boost and flyback converters operating with continuous inductor current.

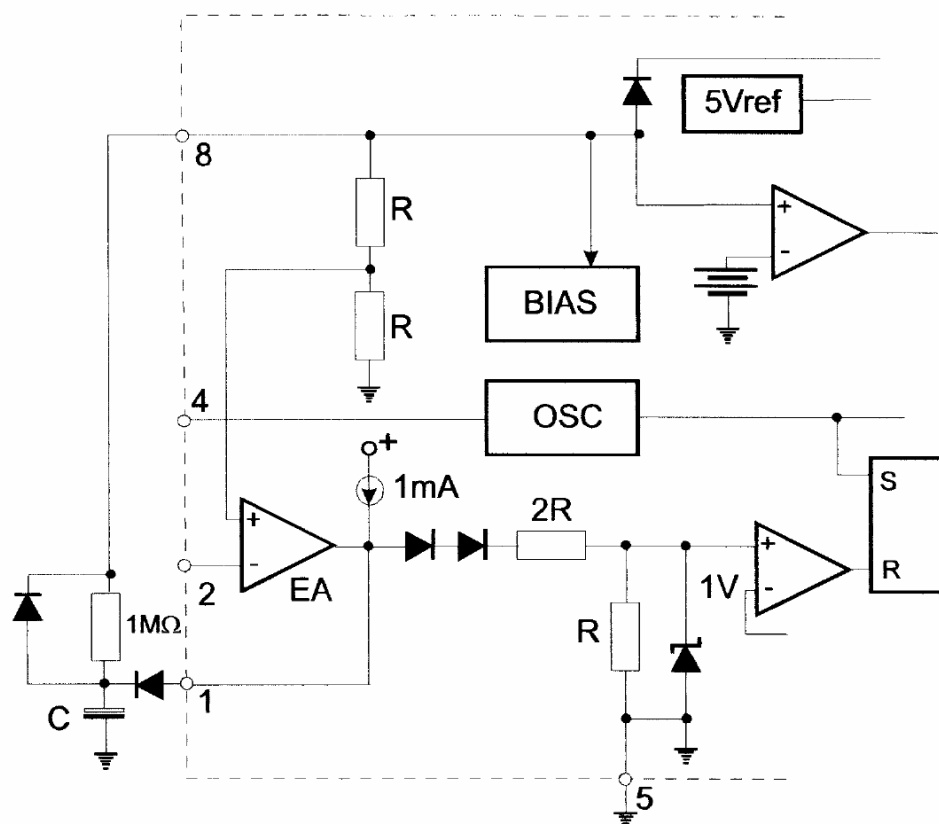


Error Amp compensation circuit for stabilizing current-mode boost and flyback topologies operating with continuous inductor current.

Figure 6. Error Amplifier Compensation



**Figure 7. External Clock Synchronization**



**Figure 8. Soft-Start Circuit**

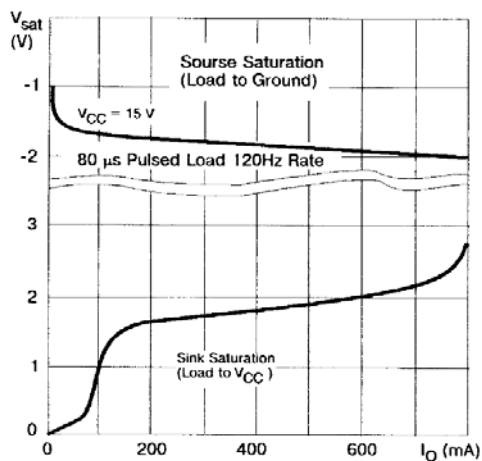


Figure 7. Output Saturation Voltage vs. Load Current  
 $T_A = 25^\circ\text{C}$

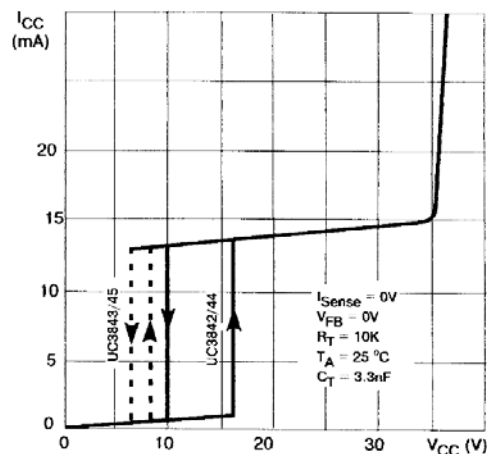


Figure 8. Supply Current vs. Supply Voltage

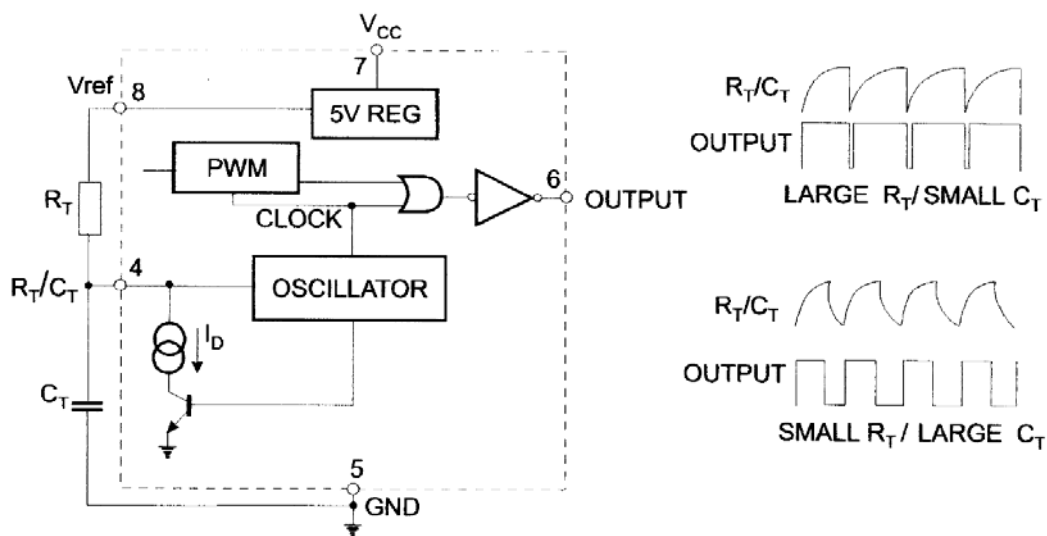


Figure 9. Oscillator and Output Waveforms

**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.

---

## **LIFE SUPPORT AND NUCLEAR POLICY**

---

Bay Linear products are not authorized for and should not be used within life support systems which are intended for surgical implants into the body to support or sustain life, in aircraft, space equipment, submarine, or nuclear facility applications without the specific written consent of Bay Linear President.

---