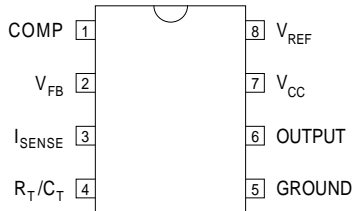
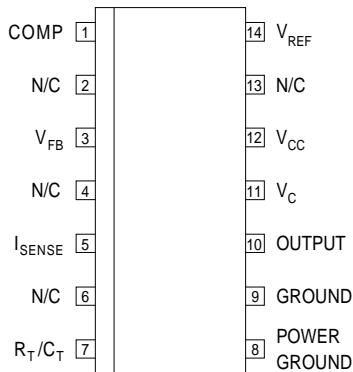


**TOP VIEW**



**J Package – 8 Pin Ceramic DIP**  
**N Package – 8 Pin Plastic DIP**  
**D-8 Package – 8 Pin Plastic (150) SOIC**

**TOP VIEW**



**D-14 Package – 14 Pin Plastic (150) SOIC**

**CURRENT MODE  
REGULATING  
PULSE WIDTH  
MODULATORS**

**FEATURES**

- Guaranteed  $\pm 1\%$  reference voltage tolerance
- Guaranteed  $\pm 10\%$  frequency tolerance
- Low start-up current ( $< 500 \mu A$ )
- Under voltage lockout with hysteresis
- Output state completely defined for all supply and input conditions
- Interchangeable with UC1844 and UC1845 series for improved operation
- 500kHz Oscillator operation  
250kHz Output operation

**Order Information**

Part Number	J-Pack 8 Pin	N-Pack 8 Pin	D-8 8 Pin	D-14 14 Pin	Temp. Range	Note:
IP1844	✓		✓		-55 to +125°C	To order, add the package identifier to the part number.
IP2844	✓	✓	✓	✓	-25 to +85°C	
IP3844	✓	✓	✓	✓	0 to +70°C	
IP1845	✓		✓		-55 to +125°C	eg. IP1844D-14 IP3845J
IP2845	✓	✓	✓	✓	-25 to +85°C	
IP3845	✓	✓	✓	✓	0 to +70°C	

**ABSOLUTE MAXIMUM RATINGS** ( $T_{case} = 25^\circ C$  unless otherwise stated)

$V_{CC}$	Supply Voltage	(low impedance source) ( $I_{CC} < 30mA$ )		+30V Self limiting
$I_O$	Output Current			$\pm 1A$
	Output Energy	(capacitive load)		5 $\mu J$
	Analog Inputs	(pins 2 and 3)		-0.3V to $+V_{CC}$
	Error Amp Output Sink Current			10mA
$P_D$	Power Dissipation	$T_{amb} = 25^\circ C$	J, N Packages	1W
	Derate @ $T_{amb} > 50^\circ C$			10mW/ $^\circ C$
$P_D$	Power Dissipation	$T_{case} = 25^\circ C$	D Package	725mW
	Derate @ $T_{amb} > 50^\circ C$			7.25mW/ $^\circ C$
$P_D$	Power Dissipation	$T_{case} = 25^\circ C$	J, N Packages	2W
	Derate @ $T_{case} > 25^\circ C$			16mW/ $^\circ C$
$T_{STG}$	Storage Temperature Range			-65 to 150°C
$T_L$	Lead Temperature	(soldering, 10 seconds)		+300°C

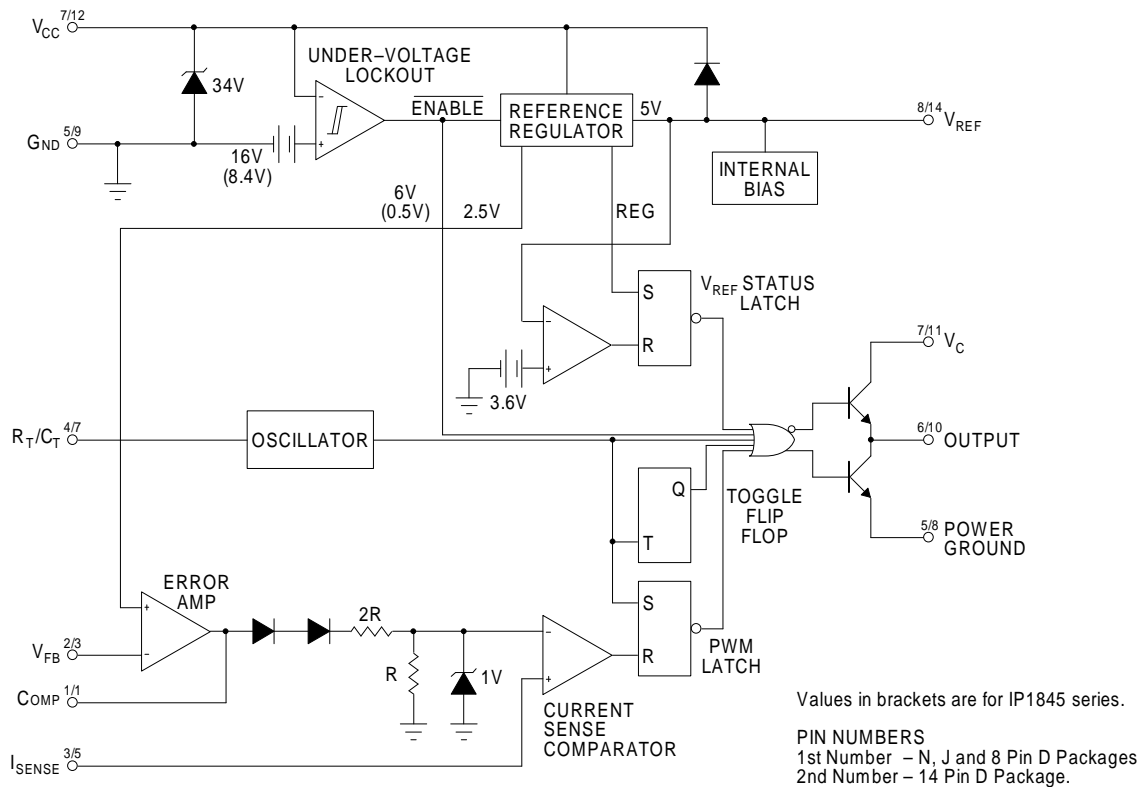
**DESCRIPTION**

The IP1844 and IP1845 series of switching regulator control circuits contain all the functions necessary to implement off-line, current mode switching regulators, using a minimum number of external parts.

Functions included are voltage reference, error amplifier, current sense comparator, oscillator, totem-pole output driver and under-voltage lockout circuitry. In addition there is a toggle flip-flop which blanks the output on every second clock pulse, thereby ensuring that the duty cycle never exceeds 50%.

Although pin compatible with the UC1844 and UC1845 series, SEMELAB has incorporated several improvements in the IP1844 and IP1845 series allowing tighter and more complete specification of electrical performance .

**BLOCK DIAGRAM**



**RECOMMENDED OPERATING CONDITIONS**

$V_{CC}$	Supply Voltage	$\leq 30V$
$I_o$	Output Current	0 to $\pm 200mA$
	Analog Inputs (pins 2 and 3)	-0.3V to 3V
	Error Amp Output Sink Current	0 to 2mA
	Operating Ambient Temperature Range	IP1844 , IP1845 IP2844 , IP2845 IP3844 , IP3845
		-55 to 125°C -25 to 85°C 0 to 70°C

**ELECTRICAL CHARACTERISTICS** (Over Full Operating Temperature Range unless otherwise stated)

Parameter	Test Conditions	IP1844/IP1845 IP2844/IP2845			IP3844 IP3845			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
<b>REFERENCE SECTION</b>								
Output Voltage	$I_O = 1\text{mA}$ $T_J = 25^\circ\text{C}$	4.95	5.00	5.05	4.90	5.00	5.10	V
Input Regulation	$V_{CC} = 12\text{V to } 25\text{V}$		6	20		6	20	mV
Output Regulation	$I_O = 1\text{mA to } 20\text{mA}$		6	25		6	25	
Temperature Stability			0.2	0.4		0.2	0.4	$\frac{\text{mV}}{^\circ\text{C}}$
Total Output Variation	Line, Load, Temp	4.90		5.10	4.82		5.18	V
Output Noise Voltage	$f = 10\text{Hz to } 10\text{kHz}$ $T_J = 25^\circ\text{C}$		50			50		$\mu\text{V}$
Long Term Stability	$T_J = 125^\circ\text{C @ } 1000\text{Hrs}$		5	25		5	25	mV
Output Short Circuit Current	$V_{REF} = 0$	30	80	160	30	80	160	mA
<b>OSCILLATOR SECTION</b>								
Frequency	$T_J = 25^\circ\text{C}$	47	52	57	47	52	57	kHz
Voltage stability	$V_{CC} = 12\text{V to } 25\text{V}$		0.2	1		0.2	1	%
Temperature Stability	$\Delta T_A = \text{Min to Max}$		5			5		%
Amplitude	$V_{PIN4}$ Peak to Peak		1.7			1.7		V
Discharge Current	$T_J = 25^\circ\text{C}$		8.3			8.3		mA
	$\Delta T_A = \text{Min to Max}$		8			8		%
<b>ERROR AMP SECTION</b>								
Input Voltage	$V_{PIN1} = 2.5\text{V}$	2.45	2.50	2.55	2.42	2.50	2.58	V
Input Bias Current			-0.3	-1		-0.3	-2	$\mu\text{A}$
Open Loop Voltage Gain	$V_O = 2\text{V to } 4\text{V}$	65	90		65	90		dB
Unity Gain Bandwidth		0.7	1		0.7	1		MHz
Supply Voltage Rejection	$V_{CC} = 12\text{V to } 25\text{V}$	60	70		60	70		dB
Output Sink Current	$V_{PIN2} = 2.7\text{V}$ $V_{PIN1} = 1.1\text{V}$	2	6		2	6		mA
Output Source Current	$V_{PIN2} = 2.3\text{V}$ $V_{PIN1} = 5.0\text{V}$	-0.5	-0.8		-0.5	-0.8		
$V_{OUT}$ High	$V_{PIN2} = 2.3\text{V}$ $R_L = 15\text{k}\Omega$	5.0	6.0		5.0	6.0		V
$V_{OUT}$ Low	$V_{PIN2} = 2.7\text{V}$ $R_L = 15\text{k}\Omega$		0.7	1.1		0.7	1.1	

**NOTES**

- Test Conditions unless otherwise stated:  
 $V_{CC} = 15\text{V}^*$ ,  $R_T = 10\text{k}\Omega$ ,  $C_T = 3.3\text{nF}$ ,  $f = 52\text{kHz}$ .  
\*Adjust  $V_{CC}$  above start threshold before setting at required level.

All specifications apply over the full operating temperature range unless otherwise stated. (See Ordering Information for further details).

**ELECTRICAL CHARACTERISTICS** (Over Full Operating Temperature Range unless otherwise stated)

Parameter	Test Conditions	IP1844/IP1845 IP2844/IP2845			IP3844 IP3845			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
<b>CURRENT SENSE SECTION</b>								
Gain	See Notes 2,3	2.85	3	3.15	2.85	3	3.15	V/V
Maximum Input Signal	V <sub>PIN1</sub> = 5.0V (Note 2)	0.9	1	1.1	0.9	1	1.1	V
Supply Voltage Rejection	V <sub>C</sub> = 12V to 25V	60	70		60	70		dB
Input Bias Current			-2	-10		-2	-10	μA
Delay to Output			150	300		150	300	ns
<b>OUTPUT SECTION</b>								
Output Low Level	I <sub>SINK</sub> = 20mA		0.1	0.4		0.1	0.4	V
	I <sub>SINK</sub> = 200mA		1.5	2.2		1.5	2.2	
Output High Level	I <sub>SOURCE</sub> = 20mA	13	13.5		13	13.5		V
	I <sub>SOURCE</sub> = 200mA	12	13.5		12	13.5		
Rise Time	C <sub>L</sub> = 1nF		50	150		50	150	ns
Fall Time	C <sub>L</sub> = 1nF		50	150		50	150	
UVLO Saturation	V <sub>CC</sub> = 6V I <sub>L</sub> = 1mA		0.7	1.1		0.7	1.1	V
<b>UNDER-VOLTAGE LOCKOUT SECTION</b>								
Upper Threshold (V <sub>CC</sub> )	1844 Series	15	16	17	14.5	16	17.5	V
	1845 Series	7.8	8.4	9	7.8	8.4	9	
Lower Threshold (V <sub>CC</sub> )	1844 Series	9	10	11	8.5	10	11.5	V
	1845 Series	7	7.6	8.2	7	7.6	8.2	
<b>TOTAL STANDBY CURRENT</b>								
Start-up Current			0.3	0.5		0.3	0.5	mA
Operating Supply Current	V <sub>PIN2</sub> = 0V	1844 Series	11	15		11	15	mA
	V <sub>PIN3</sub> = 0V	1845 Series	14	17		14	17	
V <sub>CC</sub> Zener Voltage	I <sub>CC</sub> = 25mA	30	34	40	30	34	40	V
<b>PWM SECTION</b>								
Maximum Duty Cycle		47	48	50	46	48	50	%
Minimum Duty Cycle				0			0	

**NOTES**

1. Test Conditions unless otherwise stated:

V<sub>CC</sub> = 15V\*, R<sub>T</sub> = 10kΩ, C<sub>T</sub> = 3.3nF, f = 52kHz.

\*Adjust V<sub>CC</sub> above start threshold before setting at required level.

All specifications apply over the full operating temperature range unless otherwise stated.

(See Ordering Information for further details).

2. Parameter measured at trip point of latch with

V<sub>PIN2</sub> = 0V

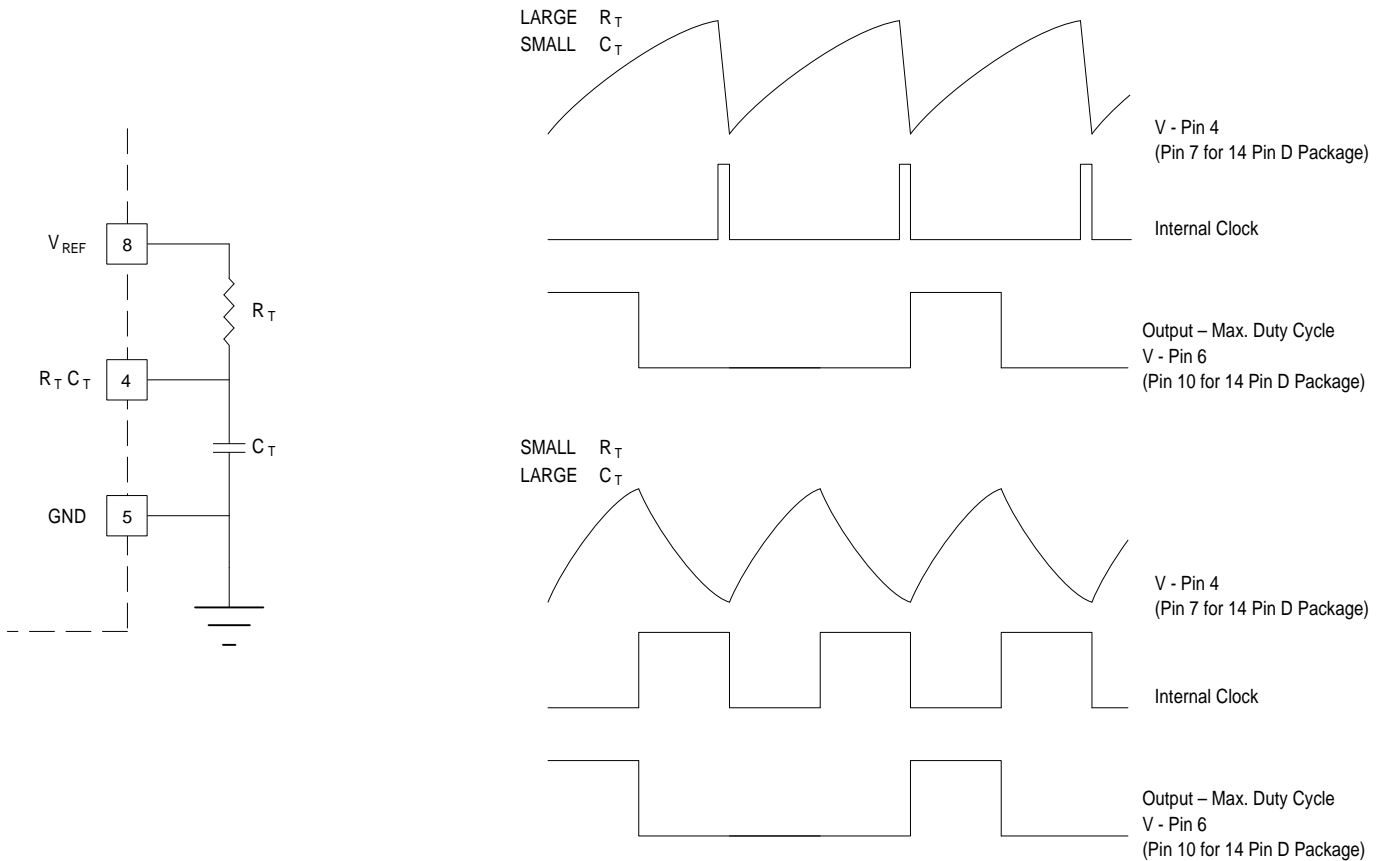
3. Gain defined as:

$$A = \frac{\Delta V_{PIN1}}{\Delta V_{PIN3}}$$

$$0 \leq V_{PIN3} \leq 0.8$$

**APPLICATIONS INFORMATION**

**Oscillator Waveforms and Maximum Duty Cycle**



Oscillator timing capacitor  $C_T$  is charged by  $V_{REF}$  through  $R_T$  and discharged by an internal current source. During the discharge time, the internal clock signal blanks the output to the low state. Selection of  $R_T$  and  $C_T$  therefore determines both oscillator frequency and maximum duty cycle.

Charge and discharge times are determined by the formulae:

$$t_c \approx 0.55 R_T C_T$$

For  $R_T > 5k\Omega$ ,

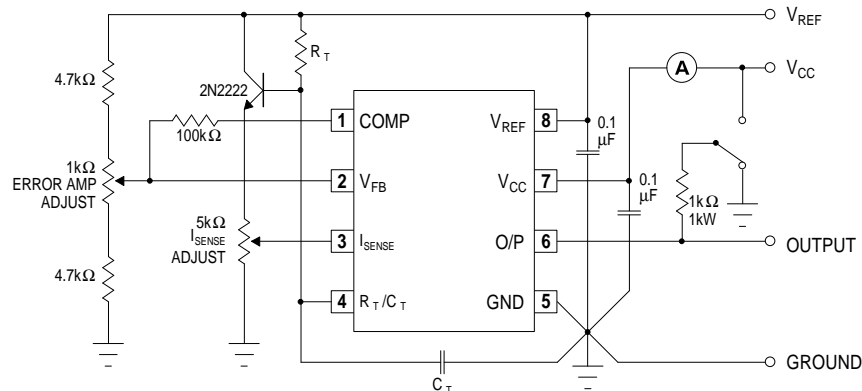
$$t_d \approx R_T C_T \ln \left( \frac{.0063 R_T - 2.3}{.0063 - 4} \right)$$

$$\text{Resultant frequency } f \approx \frac{1.8}{(R_T C_T)}$$

$$\text{Resultant frequency } f = \frac{1}{(t_c + t_d)}$$

**APPLICATIONS INFORMATION**

**Open-Loop Laboratory Test Fixture**



High peak current 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 wave form and apply an adjustable ramp to pin 3.

**TYPICAL PERFORMANCE CHARACTERISTICS**

