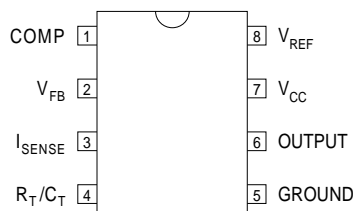


**TOP VIEW**



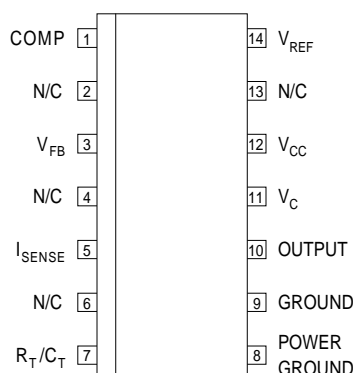
**CURRENT MODE  
REGULATING  
PULSE WIDTH  
MODULATORS**

**J Package – 8 Pin Ceramic DIP**

**N Package – 8 Pin Plastic DIP**

**D-8 Package – 8 Pin Plastic (150) SOIC**

**TOP VIEW**



**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 UC1842 and UC1843 series for improved operation
- 500kHz operation

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

**Order Information**

Part Number	J-Pack 8 Pin	N-Pack 8 Pin	D-8 8 Pin	D-14 14 Pin	Temp. Range	Note:
IP1842	✓				-55 to +125°C	To order, add the package identifier to the part number. eg. IP1842J IP3843D-14
IP2842	✓	✓	✓	✓	-25 to +85°C	
IP3842	✓	✓	✓	✓	0 to +70°C	
IP1843	✓				-55 to +125°C	
IP2843	✓	✓	✓	✓	-25 to +85°C	
IP3843	✓	✓	✓	✓	0 to +70°C	

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

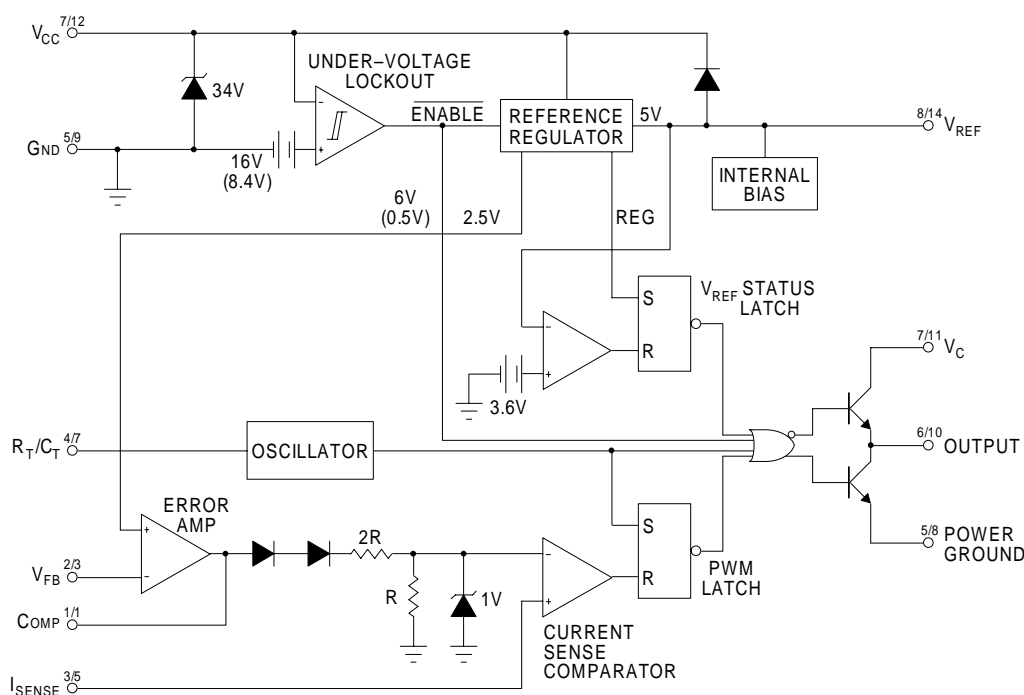
$V_{CC}$	Supply Voltage	(low impedance source) ( $I_{CC} < 30mA$ )	+30V Self limiting
$I_O$	Output Current		$\pm 1A$
	Output Energy	(capacitive load)	5 $\mu J$
	Analog Inputs	(pins 2 and 3)	-0.3V to + $V_{CC}$
	Error Amp Output Sink Current		10mA
$P_D$	Power Dissipation	$T_{amb} = 25^\circ C$	1W
	Derate @ $T_{amb} > 50^\circ C$		10mW/ $^\circ C$
$P_D$	Power Dissipation	$T_{case} = 25^\circ C$	2W
	Derate @ $T_{case} > 25^\circ C$		24mW/ $^\circ C$
$T_{STG}$	Storage Temperature Range		-65 to 150°C
$T_L$	Lead Temperature	(soldering, 10 seconds)	+300°C

## DESCRIPTION

The IP1842 and IP1843 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.

Although pin compatible with the UC1842 and 1843 series, SEMELAB has incorporated several improvements in the IP1842 and IP1843 series allowing tighter and more complete specification of electrical performance.

## BLOCK DIAGRAM



Values in brackets are for IP1843 series.

PIN NUMBERS  
1st Number – N, J and 8 Pin D Packages  
2nd Number – 14 Pin D Package.

## RECOMMENDED OPERATING CONDITIONS

$V_{CC}$	Supply Voltage <sup>1</sup>	$\leq 30V$
$I_O$	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	$-55$ to $125^{\circ}C$
		$-25$ to $85^{\circ}C$
		0 to $70^{\circ}C$

### Notes:

1. Lower limit set by under voltage lockout specification.

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

Parameter	Test Conditions	IP1842/IP1843 IP2842/IP2843			IP3842 IP3843			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
REFERENCE SECTION								
Output Voltage	I <sub>O</sub> = 1mA                      T <sub>J</sub> = 25°C	4.95	5.00	5.05	4.90	5.00	5.10	V
Input Regulation	V <sub>CC</sub> = 12V to 25V		6	20		6	20	mV
Output Regulation	I <sub>O</sub> = 1mA to 20mA		6	25		6	25	
Temperature Stability			0.2	0.4		0.2	0.4	mV/°C
Total Output Variation	Line, Load, Temp	4.90		5.10	4.82		5.18	V
Output Noise Voltage	f = 10Hz to 10kHz      T <sub>J</sub> = 25°C		50			50		μV
Long Term Stability	T <sub>J</sub> = 125°C @ 1000Hrs		5	25		5	25	mV
Output Short Circuit Current	V <sub>REF</sub> = 0	30	80	160	30	80	160	mA
OSCILLATOR SECTION								
Frequency	T <sub>J</sub> = 25°C	47	52	57	47	52	57	kHz
Voltage stability	V <sub>CC</sub> = 12V to 25V		0.2	1		0.2	1	%
Temperature Stability	ΔT <sub>A</sub> = Min to Max		5			5		%
Amplitude	V <sub>PIN4</sub> Peak to Peak		1.7			1.7		V
Discharge Current	T <sub>J</sub> = 25°C		8.3			8.3		mA
	ΔT <sub>A</sub> = Min to Max		8			8		%
ERROR AMP SECTION								
Input Voltage	V <sub>PIN1</sub> = 2.5V	2.45	2.50	2.55	2.42	2.50	2.58	V
Input Bias Current			−0.3	−1		−0.3	−2	μA
Open Loop Voltage Gain	V <sub>O</sub> = 2V to 4V	65	90		65	90		dB
Unity Gain Bandwidth		0.7	1		0.7	1		MHz
Supply Voltage Rejection	V <sub>CC</sub> = 12V to 25V	60	70		60	70		dB
Output Sink Current	V <sub>PIN2</sub> = 2.7V                      V <sub>PIN1</sub> = 1.1V	2	6		2	6		mA
Output Source Current	V <sub>PIN2</sub> = 2.3V                      V <sub>PIN1</sub> = 4.6V	−0.5	−0.8		−0.5	−0.8		
V <sub>OUT</sub> High	V <sub>PIN2</sub> = 2.3V                      R <sub>L</sub> = 15kΩ	4.6	4.8		4.6	4.8		V
V <sub>OUT</sub> Low	V <sub>PIN2</sub> = 2.7V                      R <sub>L</sub> = 15kΩ		0.7	1.1		0.7	1.1	

### NOTES

1. 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		IP1842/IP1843 IP2842/IP2843			IP3842 IP3843			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
CURRENT SENSE SECTION									
Gain	See Notes 2,3		2.85	3	3.15	2.85	3	3.15	V/V
Maximum Input Signal	V <sub>PIN1</sub> = 4.6V (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				200	400		200	400	ns
OUTPUT SECTION									
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      T <sub>J</sub> = 25°C			50	150		50	150	ns
Fall Time	C <sub>L</sub> = 1nF      T <sub>J</sub> = 25°C			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
UNDER-VOLTAGE LOCKOUT SECTION									
Upper Threshold (V <sub>CC</sub> )	1842 Series		15	16	17	14.5	16	17.5	V
	1843 Series		7.8	8.4	9	7.8	8.4	9	
Lower Threshold (V <sub>CC</sub> )	1842 Series		9	10	11	8.5	10	11.5	V
	1843 Series		7	7.6	8.2	7	7.6	8.2	
TOTAL STANDBY CURRENT									
Start-up Current				0.3	0.5		0.3	0.5	mA
Operating Supply Current	V <sub>PIN2</sub> = 0V	1842 Series		11	15		11	15	mA
	V <sub>PIN3</sub> = 0V	1843 Series		14	17		14	17	
V <sub>CC</sub> Zener Voltage	I <sub>CC</sub> = 25mA		30	34	40	30	34	40	V

### NOTES

- Test Conditions unless otherwise stated:  
 $V_{CC} = 15V^*$ ,  $R_T = 10k\Omega$ ,  $C_T = 3.3nF$ ,  $f = 52kHz$ .  
 $^*$ Adjust  $V_{CC}$  above start threshold before setting at required level.
- Parameter measured at trip point of latch with  
 $V_{PIN2} = 0V$
- Gain defined as:

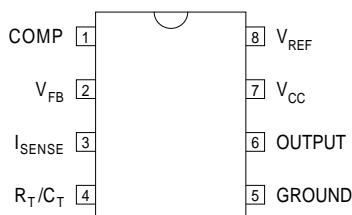
$$A = \frac{\Delta V_{PIN1}}{\Delta V_{PIN3}}$$

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

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

## 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:

$$t_c \approx 0.55 R_T C_T$$

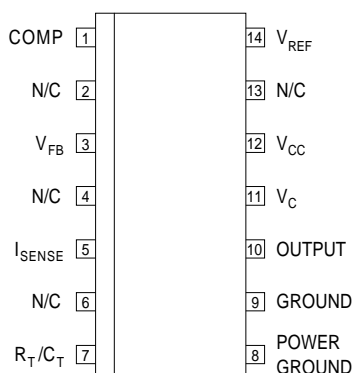
$$t_d \approx R_T C_T \ln \left( \frac{.0063 R_T - 2.3}{.0063 - 4} \right)$$

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

For  $R_T > 5k\Omega$ ,

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

### 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 waveform and apply an adjustable ramp to pin 3.

## TYPICAL PERFORMANCE CHARACTERISTICS

