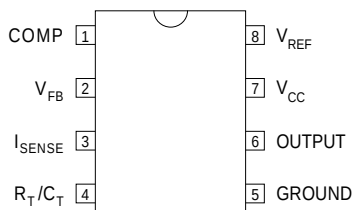


TOP VIEW

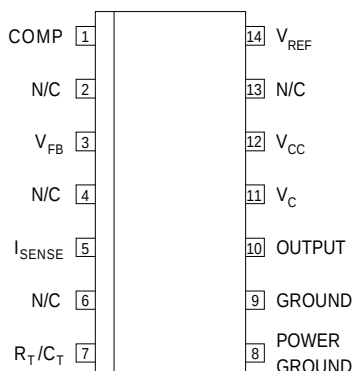


J Package – 8 Pin Ceramic DIP

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
- Accurate oscillator discharge current
- 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 IP and UC1844/5 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:
IP1844A	✓				-55 to +125°C	To order, add the package identifier to the part number. eg. IP1844AD-14 IP3845AJ
IP2844A	✓	✓	✓	✓	-25 to +85°C	
IP3844A	✓	✓	✓	✓	0 to +70°C	
IP1845A	✓				-55 to +125°C	
IP2845A	✓	✓	✓	✓	-25 to +85°C	
IP3845A	✓	✓	✓	✓	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 μJ
	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

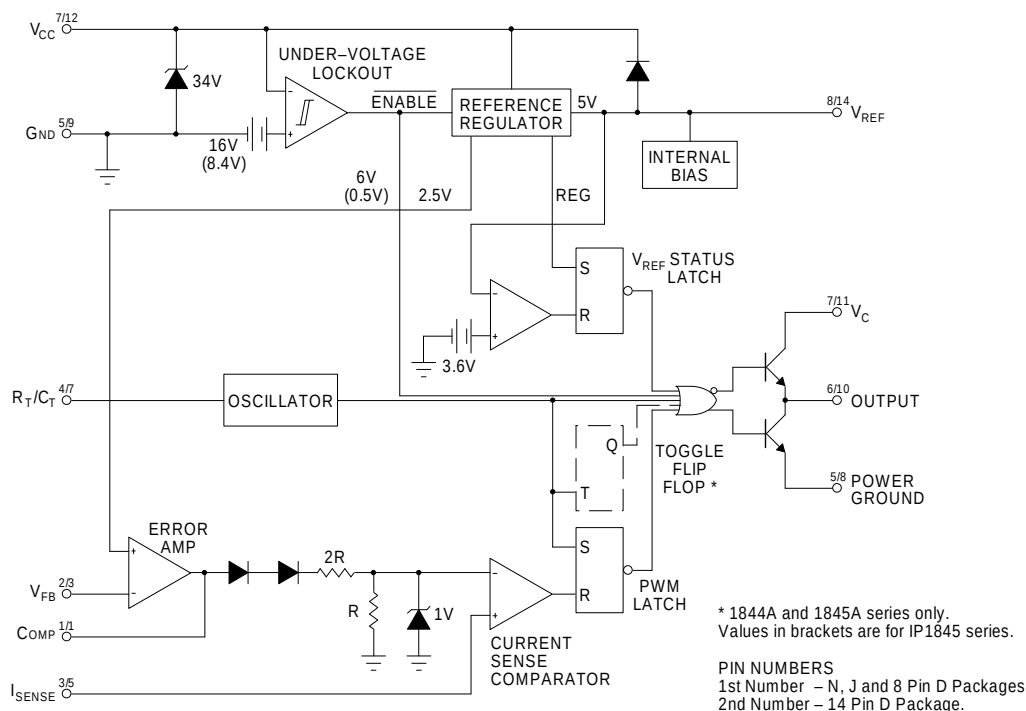
DESCRIPTION

The IP1844A/IP1845A 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 the IP1844A and IP1845A series of devices have a toggle flip-flop which blanks the output on every second clock pulse, thereby ensuring that the duty cycle never exceeds 50%. For applications requiring more flexible control, all devices feature an on-chip trimmed oscillator discharge current, allowing accurate control to maximum-duty-cycle by selection of timing components. This can be beneficial even when using the IP1844A or IP1845A series, as it allows optimum safety margins to be designed into the application.

Although pin compatible with the standard IP1844/5 parts these devices offer improved performance in several areas. They also offer tighter specification and improved performance over the IP and UC1844/5 series, whilst retaining complete compatibility.

BLOCK DIAGRAM



RECOMMENDED OPERATING CONDITIONS

V_{CC}	Supply Voltage ¹	$\leq 30V$
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 ¹	IP1844A , IP1845A IP2844A , IP2845A			IP3844A IP3845A			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
REFERENCE SECTION								
Output Voltage	I _O = 1mA T _J = 25°C	4.95	5.00	5.05	4.90	5.00	5.10	V
Input Regulation	V _{CC} = 12V to 25V		6	20		6	20	mV
Output Regulation	I _O = 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 _J = 25°C		50			50		μV
Long Term Stability	T _J = 125°C @ 1000Hrs		5	25		5	25	mV
Output Short Circuit Current	V _{REF} = 0	30	80	160	30	80	160	mA
OSCILLATOR SECTION								
Frequency	T _J = 25°C (Note 2)	47	52	57	47	52	57	kHz
Voltage Stability	V _{CC} = 12V to 25V		0.2	1		0.2	1	%
Temperature Stability	ΔT _A = Min to Max		5			5		%
Amplitude	V _{PIN4} Peak to Peak		1.7			1.7		V
Discharge Current	T _J = 25°C	7.8	8.3	8.8	7.8	8.3	8.8	mA
	ΔT _A = Min to Max	7		9	7		9	
ERROR AMP SECTION								
Input Voltage	V _{PIN1} = 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 _O = 2V to 4V	65	90		65	90		dB
Unity Gain Bandwidth		0.7	1		0.7	1		MHz
Supply Voltage Rejection	V _{CC} = 12V to 25V	60	70		60	70		dB
Output Sink Current	V _{PIN2} = 2.7V V _{PIN1} = 1.1V	2	6		2	6		mA
Output Source Current	V _{PIN2} = 2.3V V _{PIN1} = 5V	−0.5	−0.8		−0.5	−0.8		
V _{OUT} High	V _{PIN2} = 2.3V R _L = 15kΩ	5	6		5	6		V
V _{OUT} Low	V _{PIN2} = 2.7V R _L = 15kΩ		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.
- Output frequency is half the oscillator frequency.

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 ¹		IP1844A , IP1845A IP2844A , IP2845A			IP3844A IP3845A			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 _{PIN1} = 5V (Note 2)		0.9	1	1.1	0.9	1	1.1	V
Supply Voltage Rejection	V _C = 12V to 25V		60	70		60	70		dB
Input Bias Current				−2	−10		−2	−10	μA
Delay to Output				150	300		150	300	ns
OUTPUT SECTION									
Output Low Level	I _{SINK} = 20mA			0.1	0.4		0.1	0.4	V
	I _{SINK} = 200mA			1.5	2.2		1.5	2.2	
Output High Level	I _{SOURCE} = 20mA		13	13.5		13	13.5		V
	I _{SOURCE} = 200mA		12	13.5		12	13.5		
Rise Time	C _L = 1nF			50	150		50	150	ns
Fall Time	C _L = 1nF			50	150		50	150	
UVLO Saturation	V _{CC} = 6V I _L = 1mA			0.7	1.1		0.7	1.1	V
UNDER-VOLTAGE LOCKOUT SECTION									
Upper Threshold (V _{CC})	IP1844A Series		15	16	17	14.5	16	17.5	V
	IP1845A Series		7.8	8.4	9	7.8	8.4	9	
Lower Threshold (V _{CC})	IP1844A Series		9	10	11	8.5	10	11.5	V
	IP1845A 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 _{PIN2} = 0V	IP1844A Series		11	15		11	15	mA
	V _{PIN3} = 0V	IP1845A Series		14	17		14	17	
V _{CC} Zener Voltage	I _{CC} = 25mA		30	34	40	30	34	40	V
PWM SECTION									
Maximum Duty Cycle			47	48	50	46	48	50	%
Minimum Duty Cycle					0			0	

NOTES

1. Test Conditions unless otherwise stated:

V_{CC} = 15V*, R_T = 10kΩ, C_T = 3.3nF, f = 52kHz.

*Adjust V_{CC} above start threshold before setting at required level.

2. Parameter measured at trip point of latch with

V_{PIN2} = 0V

3. Gain defined as:

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

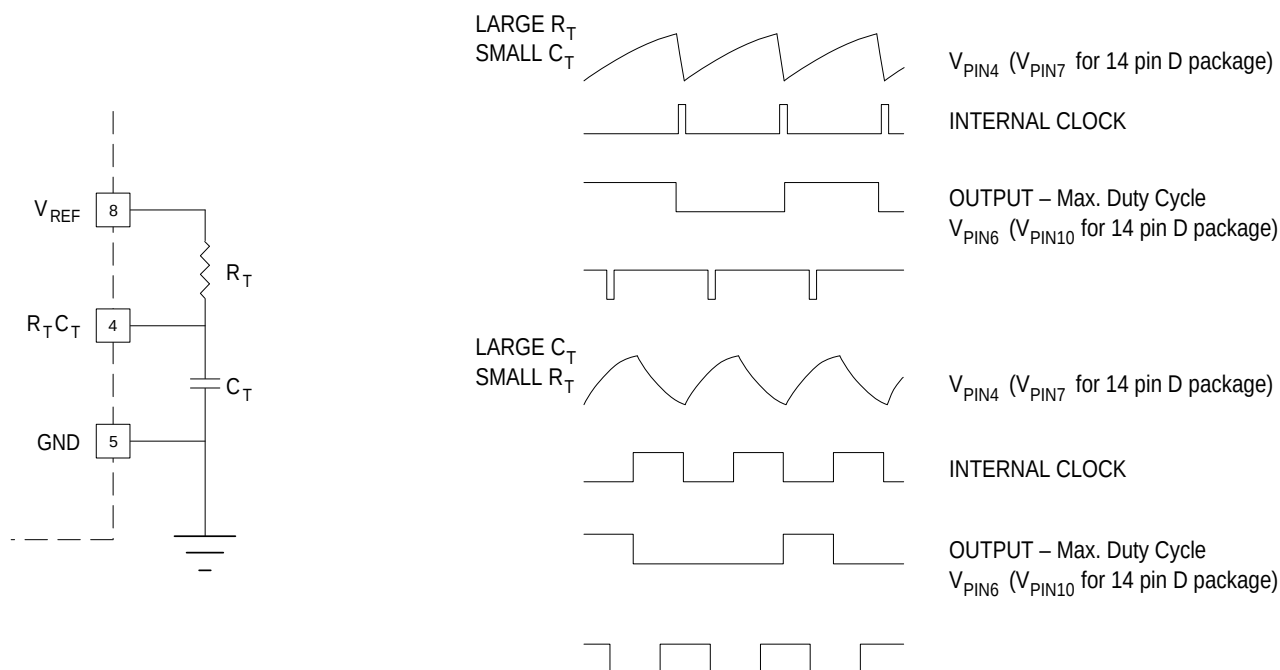
$$0 \leq V_{PIN3} \leq 0.8$$

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:

$$t_c \approx 0.55 R_T C_T$$

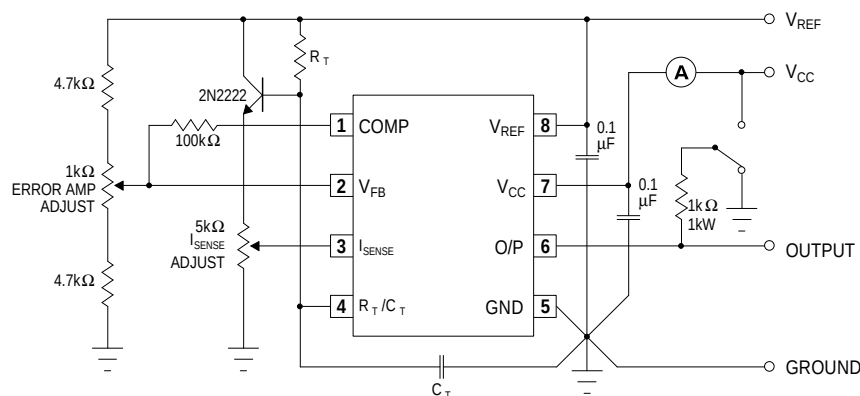
$$t_d \approx R_T C_T \ln \left(\frac{.0063 R_T - 2.3}{.0063 - 4} \right)$$

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

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

