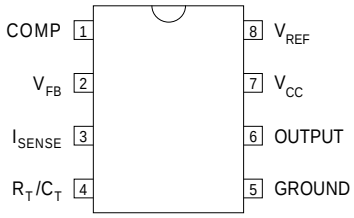
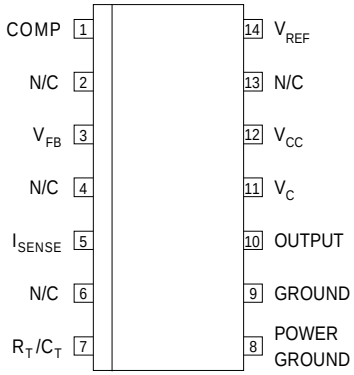
IP1844A SERIES
IP1845A SERIES

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 ±1% reference voltage tolerance**
- **Accurate oscillator discharge current**
- **Guaranteed ±10% frequency tolerance**
- **Low start–up current (<500 μA)**
- **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
IP1844A	✔				-55 to +125°C
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

Note:

To order, add the package identifier to the part number.

eg. IP1844AD–14
IP3845AJ

ABSOLUTE MAXIMUM RATINGS (T_{case} = 25°C unless otherwise stated)

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

Semelab plc. Telephone (01455) 556565. Telex: 341927. Fax (01455) 552612.

IP1844A SERIES
IP1845A SERIES

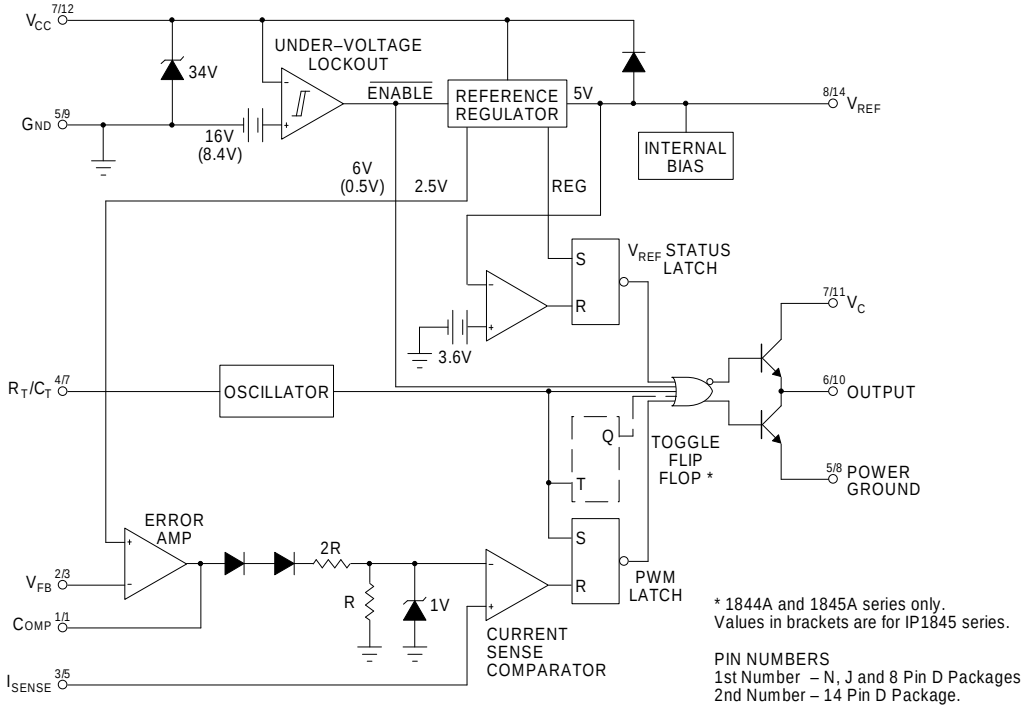
DESCRIPTION

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]		≤ 30V
I_O	Output Current		0 to ±200mA
	Analog Inputs (pins 2 and 3)		–0.3V to 3V
	Error Amp Output Sink Current		0 to 2mA
	Operating Ambient Temperature Range	IP1844A , IP1845A	–55 to 125°C
		IP2844A , IP2845A	–25 to 85°C
		IP3844A , IP3845A	0 to 70°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

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. 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.

   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_{PIN2} = 0V

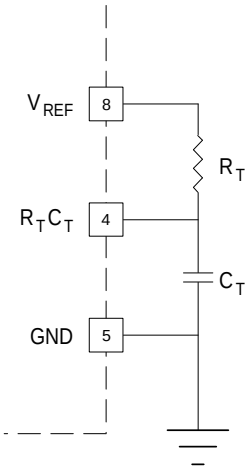
3. Gain defined as:

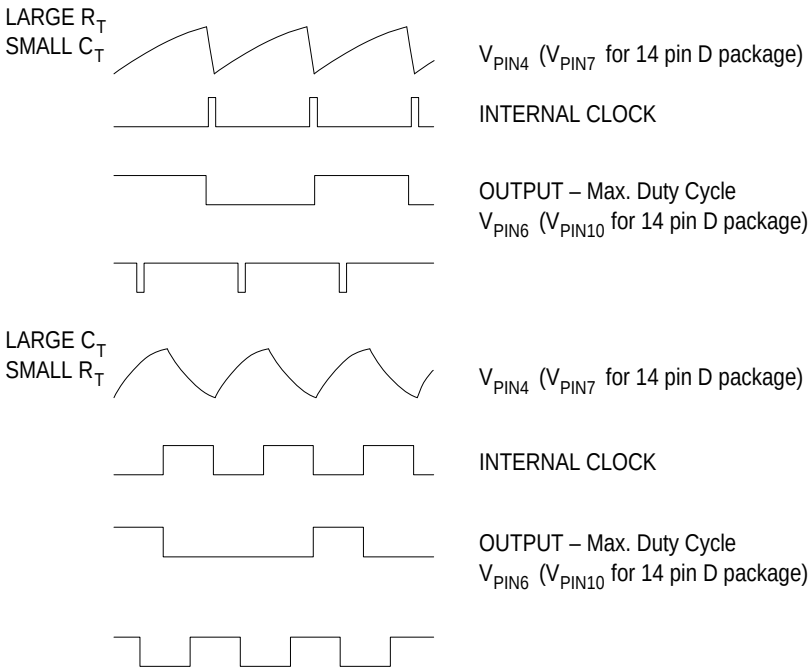
$$A = \frac{\Delta V_{PIN1}}{\Delta V_{PIN3}}$$

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

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:

$$t_c \approx 0.55\ R_TC_T$$

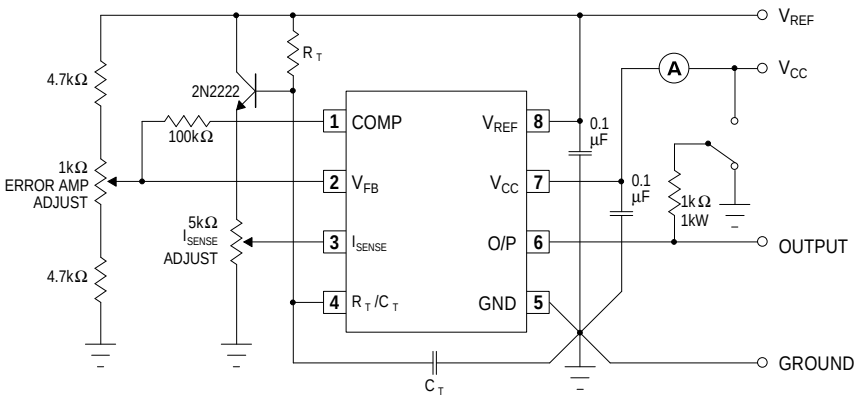
$$t_d \approx R_TC_T\ \ell n\ \left(\frac{.0063\ R_T - 2.3}{.0063\ - 4}\right)$$

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

For $R_T > 5k\Omega$,

$$\text{Resultant frequency}\quad f \approx \frac{1.8}{(R_TC_T)}$$

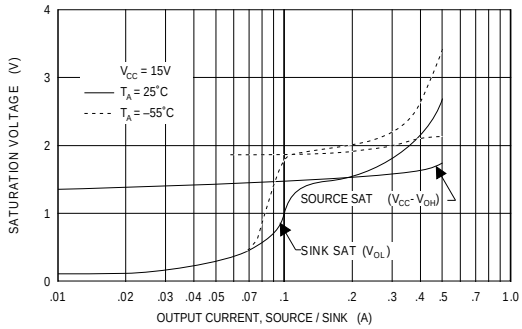
Open–Loop Laboratory Test Fixture



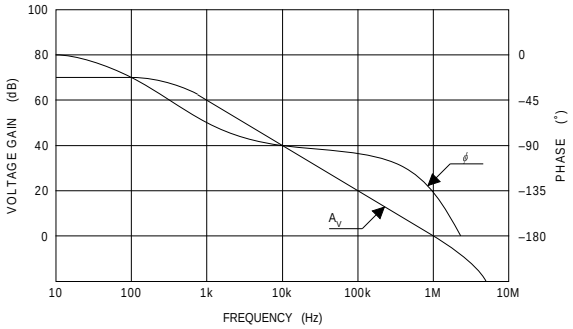
High peak current associated with capacitive loads necessitate careful grounding techniques. Timing and bypass capacitors should be connected close to pin 5 in a single point ground. The transistor and 5K potentiometer are used to sample the oscillator wave form and apply an adjustable ramp to pin 3.

TYPICAL PERFORMANCE CHARACTERISTICS

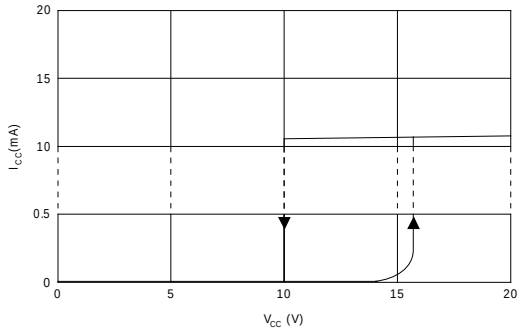
OUTPUT SATURATION CHARACTERISTICS



ERROR AMPLIFIER OPEN-LOOP FREQUENCY RESPONSE



UNDER VOLTAGE LOCKOUT 1844A SERIES



UNDER VOLTAGE LOCKOUT 1845A SERIES

