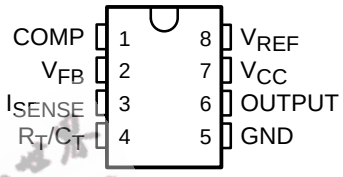
UC1842A-EP, UC1843A-EP, UC1844A-EP, UC1845A-EP
CURRENT-MODE PWM CONTROLLER

SGLS134B – SEPTEMBER 2002 – REVISED APRIL 2003

- **Controlled Baseline**
  - **One Assembly/Test Site, One Fabrication Site**
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree†**
- **Optimized for Off-line and DC to DC Converters**
- **Low Start Up Current (<0.5 mA)**
- **Trimmed Oscillator Discharge Current**
- **Automatic Feed Forward Compensation**
- **Pulse-by-Pulse Current Limiting**
- **Enhanced Load Response Characteristics**
- **Under-Voltage Lockout With Hysteresis**
- **Double Pulse Suppression**
- **High Current Totem Pole Output**
- **Internally Trimmed Bandgap Reference**
- **500 kHz Operation**
- **Low R_O Error Amp**

† Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

D PACKAGE
(TOP VIEW)



description

The UC1842A/3A/4A/5A family of control ICs is a pin for pin compatible improved version of the UC3842/3/4/5 family. Providing the necessary features to control current mode switched mode power supplies, this family has the following improved features. Start up current is guaranteed to be less than 0.5 mA. Oscillator discharge is trimmed to 8.3 mA. During under voltage lockout, the output stage can sink at least 10 mA at less than 1.2 V for V_{CC} over 5 V.

The difference between members of this family are shown in the table below.

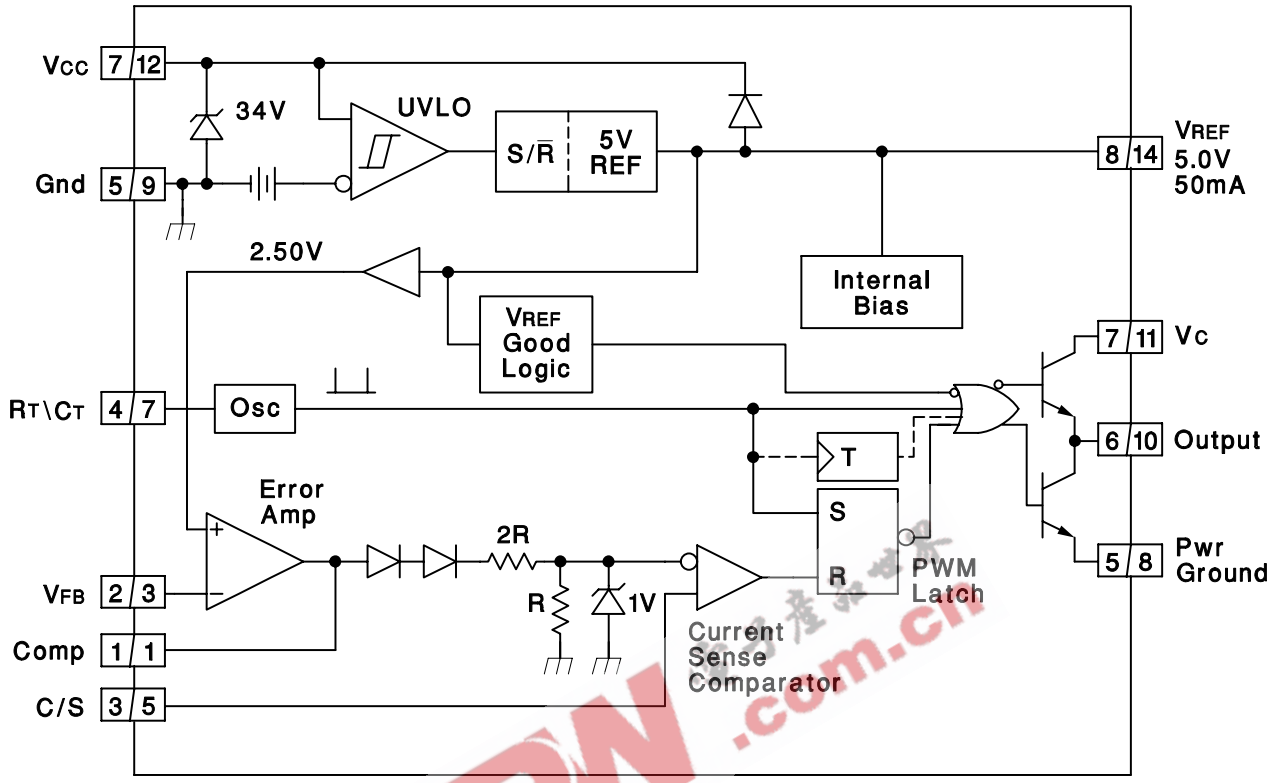
PART NUMBER	UVLO ON	UVLO OFF	MAXIMUM DUTY CYCLE
UC1842A	16 V	10 V	<100%
UC1843A	8.5 V	7.9 V	<100%
UC1844A	16 V	10 V	<50%
UC1845A	8.5 V	7.9 V	<50%

ORDERING INFORMATION‡

T_A	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	SOP – D	Tape and reel	UC1842AMDREP	1842AME
–55°C to 125°C	SOP – D	Tape and reel	UC1843AMDREP	1843AME
–55°C to 125°C	SOP – D	Tape and reel	UC1844AMDREP	1844AME
–55°C to 125°C	SOP – D	Tape and reel	UC1845AMDREP	1845AME

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

block diagram



NOTES: 1. A = DIL-8 Pin Number. B = SO-14 Pin Number.
2. Toggle flip flop used only in 1844A and 1845A.

Ordering Information

UC 184 4 A M D R EP

- EP — ENHANCED PLASTIC INDICATOR
- R — TAPE and REEL INDICATOR
- D — PACKAGE
  - D = Plastic SOIC
- M — MILITARY TEMPERATURE RANGE INDICATOR
- A — IMPROVED PERFORMANCE INDICATOR
- 4 — PRODUCT OPTION
  - 2 through 5

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†‡

V_{CC} voltage (low impedance source) . . . . . 30 V
V_{CC} voltage (I_{CC} mA) . . . . . self limiting
Output current, I_O . . . . . ±1 A
Output energy (capacitive load) . . . . . 5 µJ
Analog Inputs (pins 3, 5) . . . . . –0.3 V to 6.3 V
Error Amp Output Sink current . . . . . 10 mA
Power Dissipation at T_A < +25°C (D package) . . . . . 1 W
Package thermal impedance, θ_{JA} (see Note 1): D (8-pin) package . . . . . 97°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature soldering 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

‡ Unless otherwise indicated, voltages are reference to ground and currents are positive into and negative out of the specified terminals.

NOTE 1: Long term high–temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See http://www.ti.com/ep_quality for additional information on enhanced plastic packaging.

electrical characteristics, T_A = –55°C to 125°C for the UC184xAM-EP, V_{CC} = 15 V (see Note 1), R_T = 10 kΩ, C_T = 3.3 nF, and $T_A = T_J$ (unless otherwise stated)

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Reference Section						
Output voltage	T_J = 25°C, I_O = 1 mA		4.95	5.0	5.05	V
Line regulation voltage	V_{IN} = 12 V to 25 V			6	20	mV
Load regulation voltage	I_O = 1 mA to 20 mA			6	25	mV
Temperature stability	See Notes 2 and 3			0.2	0.4	mV/°C
Total output variation voltage	Line, Load, Temp.		4.9		5.1	V
Output noise voltage	f = 10 Hz to 10 kHz, See Note 2	T_J = 25°C		50		µV
Long term stability	1000 hours, See Note 2	T_A = 125°C		5	25	mV
Output short-circuit current			–30	–100	–180	mA
Oscillator Section						
Initial accuracy	See Note 4	T_J = 25°C	47	52	57	kHz
Voltage stability	V_{CC} = 12 V to 25 V			0.2	1	%
Temperature stability	T_A = MIN to MAX, See Note 2			5		%
Amplitude peak-to-peak	V pin 7, See Note 2			1.7		V
Discharge current	V pin 7 = 2 V, See Note 5	T_J = 25°C	7.8	8.3	8.8	mA
		T_J = Full range	7.5		8.8	

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PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Error Amplifier Section						
Input voltage	COMP = 2.5 V		2.45	2.5	2.55	V
Input bias current				–0.3	–1	µA
Open loop voltage gain (A_{VOL})	V_O = 2 V to 4 V		65	90		dB
Unity gain bandwidth	See Note 2	T_J = 25°C	0.7	1		MHz
PSRR	V_{CC} = 12 V to 25 V		60	70		dB
Output sink current	FB = 2.7 V, COMP = 1.1 V		2	6		mA
Output source current	FB = 2.3 V, COMP = 5 V		–0.5	–0.8		mA
V_{OUT} high	FB = 2.3 V, R_L = 15 kΩ to GND		5	6		V
V_{OUT} low	FB = 2.7 V, R_L = 15 kΩ to V_{REF}			0.7	1.1	V
Current Sense Section						
Gain	See Notes 6 and 7		2.85	3	3.15	V/V
Maximum input signal	COMP = 5 V, See Note 6		0.9	1	1.1	V
PSRR	V_{CC} = 12 V to 25 V, See Note 6			70		dB
Input bias current				–2	–10	µA
Delay to output	I_{SENSE} = 0 V to 2 V, See Note 2			150	300	ns
Output Section (OUT)						
Low-level output voltage	I_{OUT} = 20 mA			0.1	0.4	V
	I_{OUT} = 200 mA			15	2.2	
High-level output voltage	I_{OUT} = –20 mA		13	13.5		V
	I_{OUT} = –200 mA		12	13.5		
Rise time	C_L = 1 nF, See Note 2	T_J = 25°C		50	150	ns
Fall time	C_L = 1 nF, See Note 2	T_J = 25°C		50	150	ns
UVLO saturation	V_{CC} = 5 V, I_{OUT} = 10 mA			0.7	1.2	V
Undervoltage Lockout Section						
Start threshold		UC1842A, UC1844A	15	16	17	V
		UC1843A, UC1845A	7.8	8.4	9	
Minimum operation voltage after turn on		UC1842A, UC1844A	9	10	11	V
		UC1843A, UC1845A	7	7.6	8.2	

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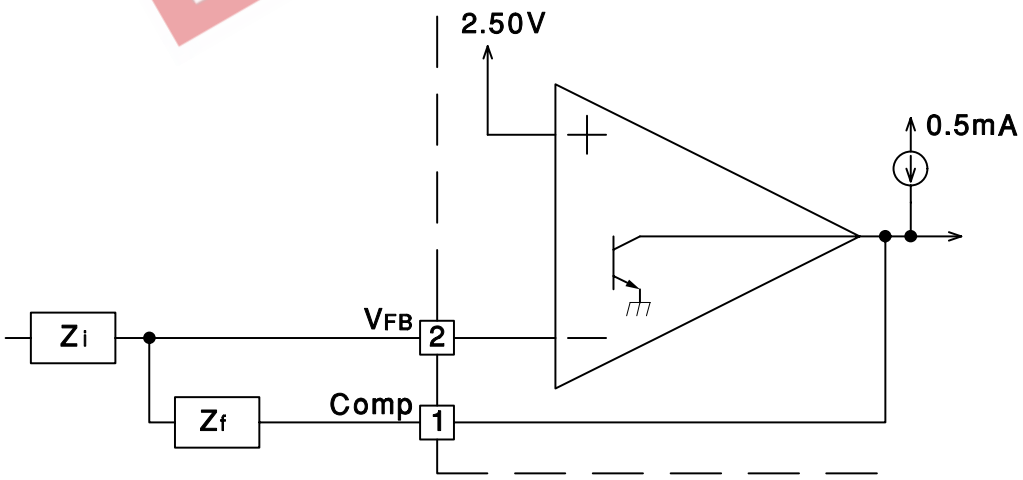
PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNITS
PWM Section						
Maximum duty cycle		UC1842A, UC1843A	94	96	100	%
		UC1844A, UC1845A	47	48	50	
Minimum duty cycle					0	%
Total Standby Current						
Start-up current				0.3	0.5	mA
Operating supply current	FB = 0 V, SENSE = 0 V			11	17	mA
V_{CC} internal zener voltage	I_{CC} = 25 mA		30	34		V

NOTES:
1. Adjust V_{CC} above the start threshold before setting at 15 V.
2. Not production tested.
3. Temperature stability, sometimes referred to as average temperature coefficient, is described by the equation:
$$\text{Temp Stability} = \frac{V_{REF}\,(\max) - V_{REF}\,(\min)}{T_J\,(\max) - T_J\,(\min)}$$
V_{REF} (max) and V_{REF} (min) are the maximum and minimum reference voltage measured over the appropriate temperature range. Note that the extremes in voltage do not necessarily occur at the extremes in temperature.
4. Output frequency equals oscillator frequency for the UC1842A and UC1843A. Output frequency is one half oscillator frequency for the UC1844A and UC1845A.
5. This parameter is measured with R_T = 10 kΩ to V_{REF}. This contributes approximately 300 µA of current to the measurement. The total current flowing into the $R_{T/C}$ pin will be approximately 300 µA higher than the measured value.
6. Parameter measured at trip point of latch with V_{FB} at 0 V.
7. Gain is defined by: $A = \frac{\Delta V_{COMP}}{\Delta V_{SENSE}}$; $0 \le V_{SENSE} \le 0.8$ V.

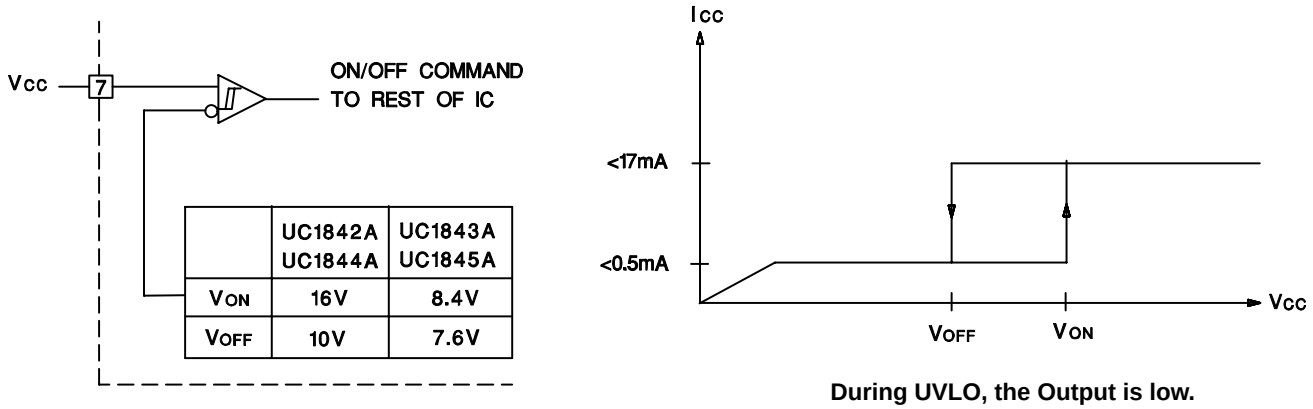
PARAMETER MEASUREMENT INFORMATION



Error Amp can source and sink up to 0.5 mA, and sink up to 2 mA.

Figure 1. Error Amp Configuration

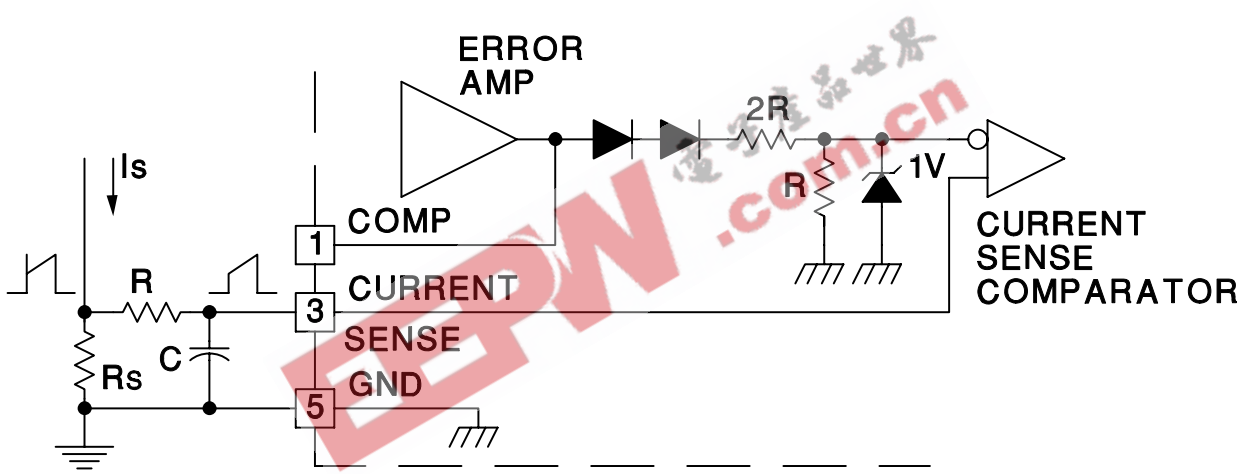
PARAMETER MEASUREMENT INFORMATION



	UC1842A UC1844A	UC1843A UC1845A
VON	16V	8.4V
VOFF	10V	7.6V

During UVLO, the Output is low.

Figure 2. Under Voltage Lockout



Peak Current (Is) is Determined By The Formula:

$$Ismax' \frac{1.0V}{RS}$$

A small RC filter may be required to supress switch transients.

Figure 3. Current Sense Circuit

PARAMETER MEASUREMENT INFORMATION

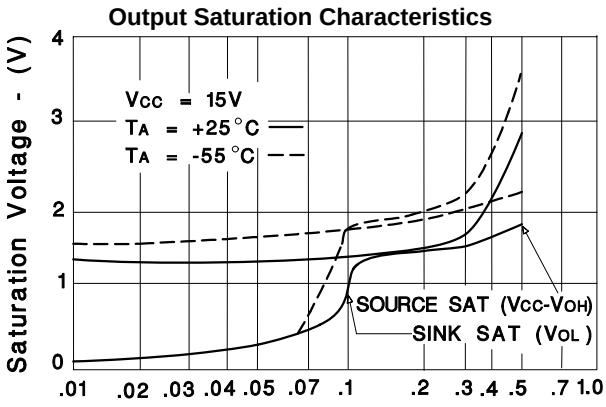


Figure 4

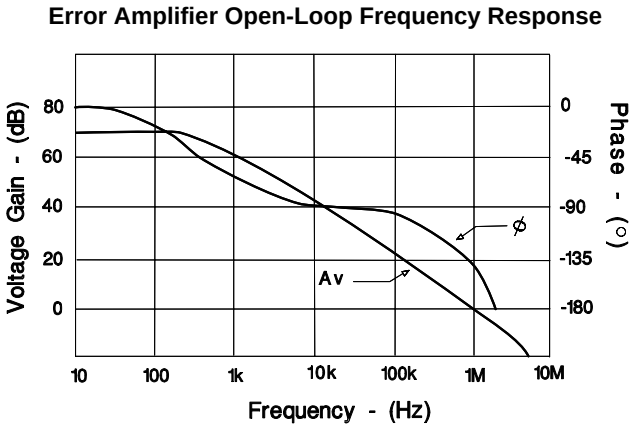


Figure 5

APPLICATION INFORMATION

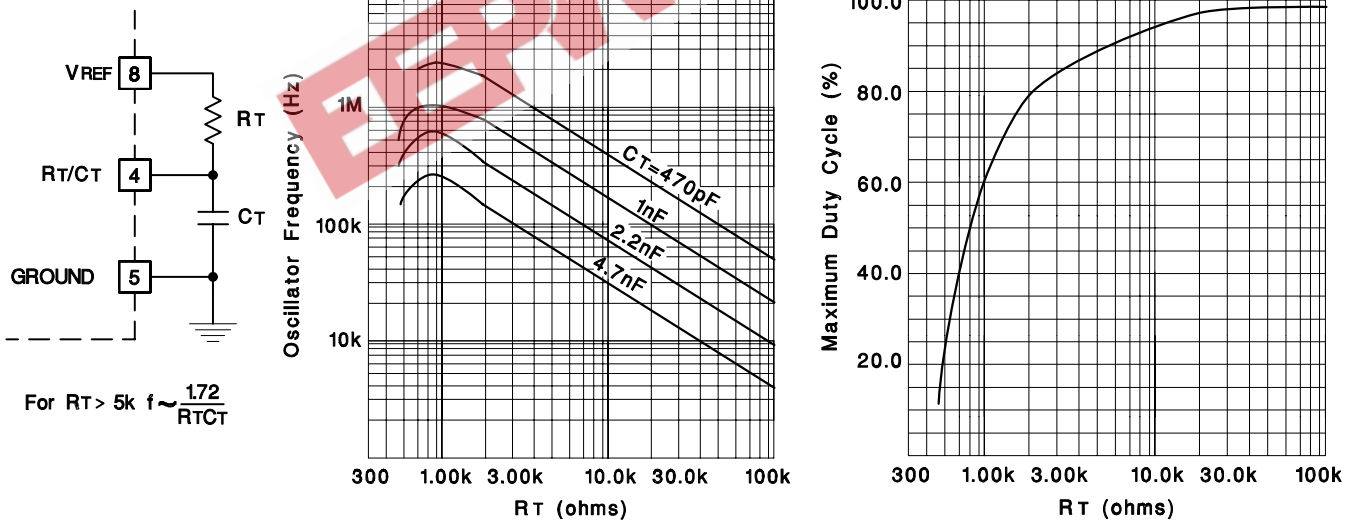
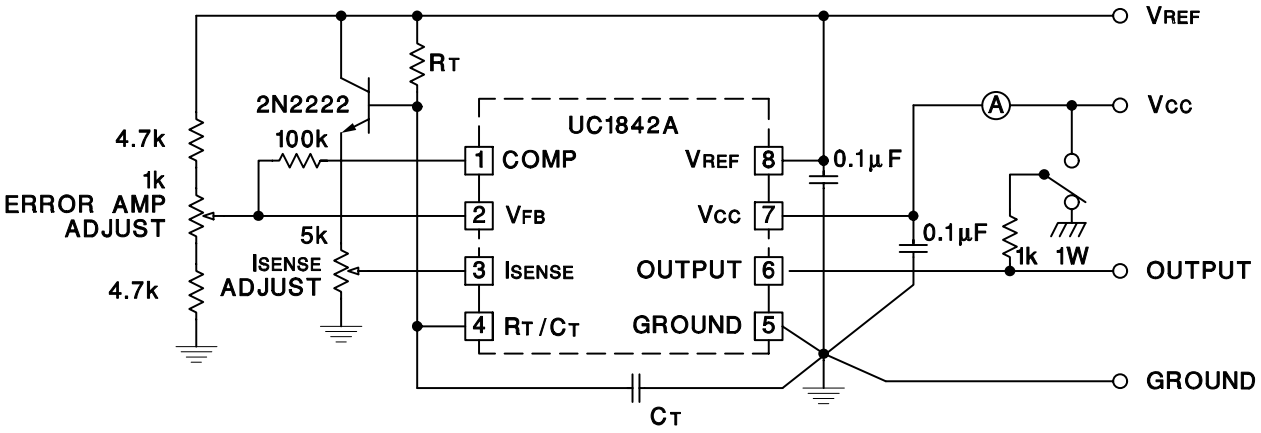


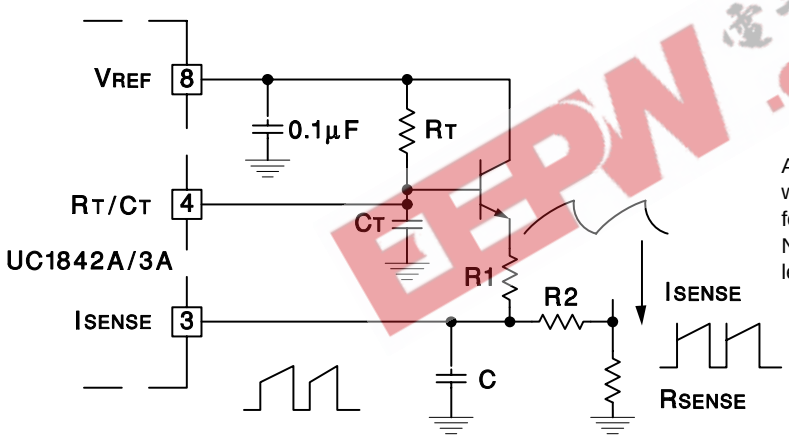
Figure 6. Oscillator

APPLICATION INFORMATION



High peak currents 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.

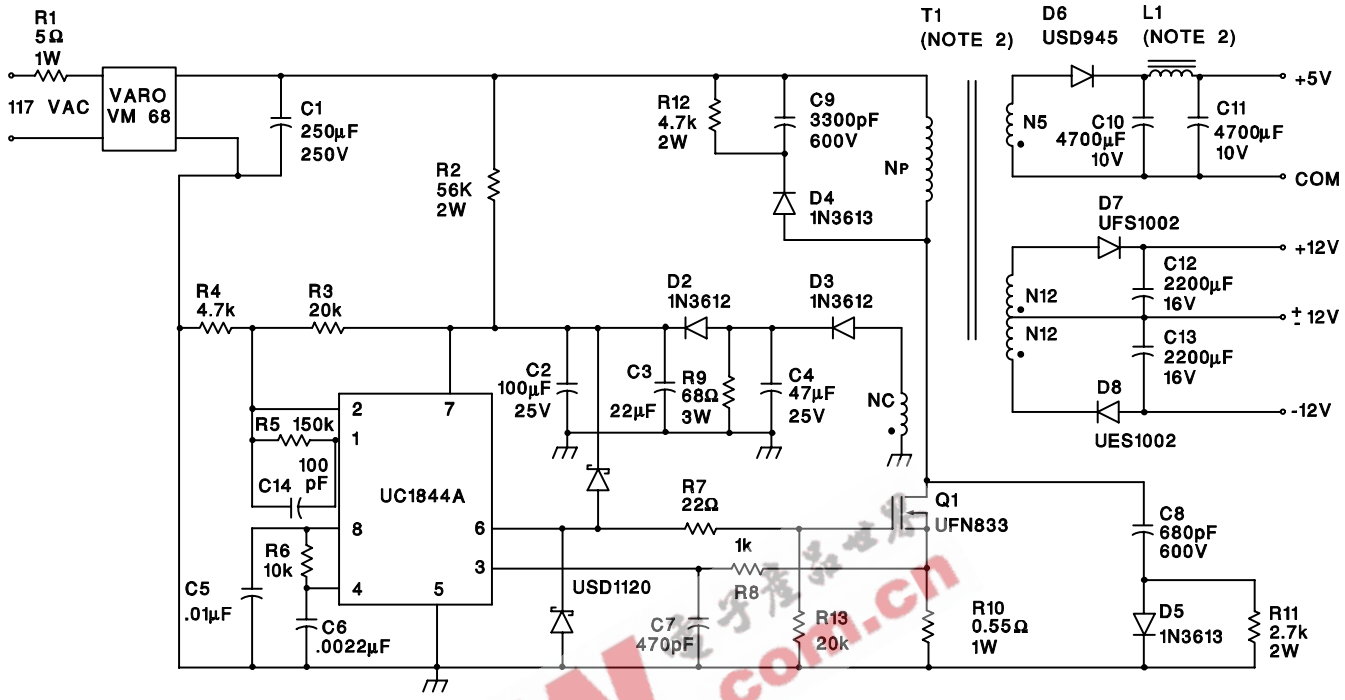
Figure 7. Open-Loop Laboratory Text Fixture



A fraction of the oscillator ramp can be resistively summed with the current sense signal to provide slope compensation for converters requiring duty cycles over 50%.
Note that capacitor, C, forms a filter with R2 to suppress the leading edge switch spikes.

Figure 8. Slope Compression

APPLICATION INFORMATION



Power Supply Specifications

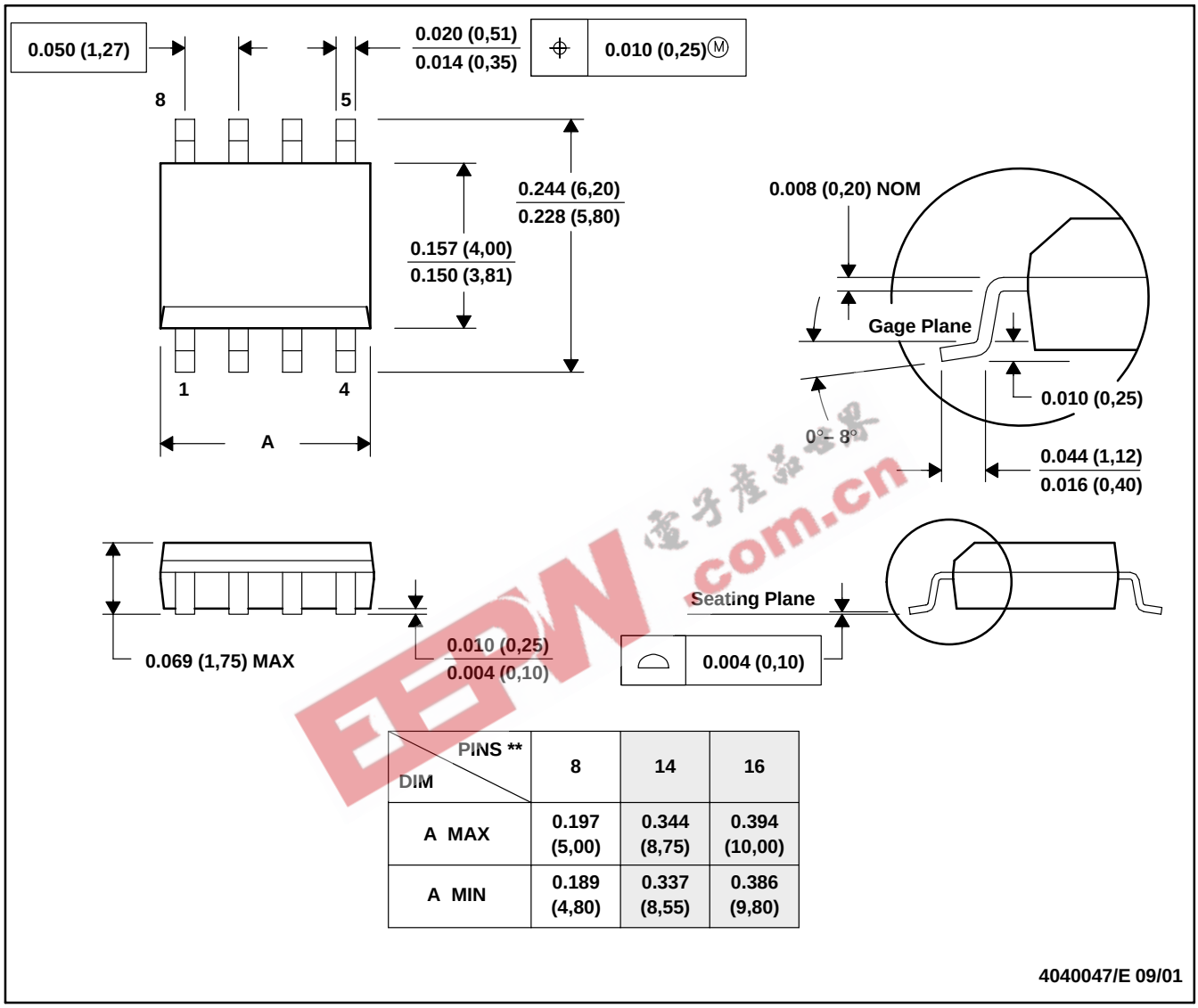
1. Input Voltage 95VAC to 130VAC (50Hz/60Hz)
2. Line Isolation 3750V
3. Switching Frequency 40 kHz
4. Efficiency, Full Load 70%
5. Output Voltage:
   A. +5V, ±5%; 1A to 4A Load
   B. +12V, ±3%; 0.1A to 0.3A Load Ripple voltage: 100 mV P-P Max
   C. –12V, ±3%; 0.1A to 0.3A Load Ripple voltage: 100 mV P-P Max

Figure 9. Off-Line Flyback Regulator

MECHANICAL DATA

D (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

8 PINS SHOWN



DIM \ PINS **	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
D. Falls within JEDEC MS-012

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