

# UTC UC3844/45 LINEAR INTEGRATED CIRCUIT

## HIGH PERFORMANCE CURRENT MODE CONTROLLERS

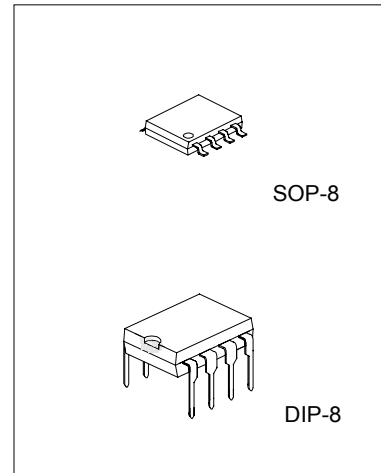
### DESCRIPTION

The UTC UC3844 and UTC UC3845 are high performance fixed frequency current mode controllers. They are specifically designed for Off-Line and dc-to-dc converter applications offering the designer a cost effective solution with minimal external components.

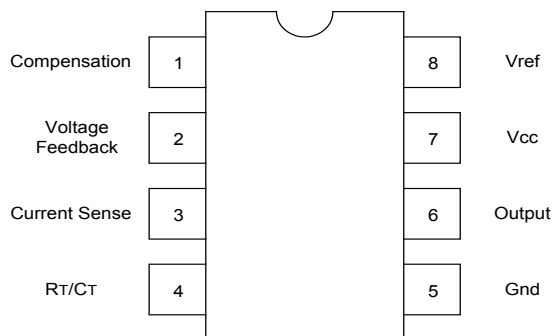
The UTC UC3844 has UVLO thresholds of 16V(on) and 10V(off), ideally suited for off-line converters. The UTC UC3845 is tailored for lower voltage applications having UVLO thresholds of 8.5V(on) and 7.6V(off).

### FEATURES

- \*Current Mode Operation to 500 kHz Output Switching Frequency
- \*Output Deadtime Adjustable from 50% to 70%
- \*Automatic Feed Forward Compensation
- \*Latching PWM for Cycle-By-Cycle Current Limiting
- \*Internally Trimmed Reference with Under voltage Lockout
- \*High Current Totem Pole Output
- \*Input Undervoltage Lockout with Hysteresis
- \*Low Startup and Operating Current



### PIN CONFIGURATION

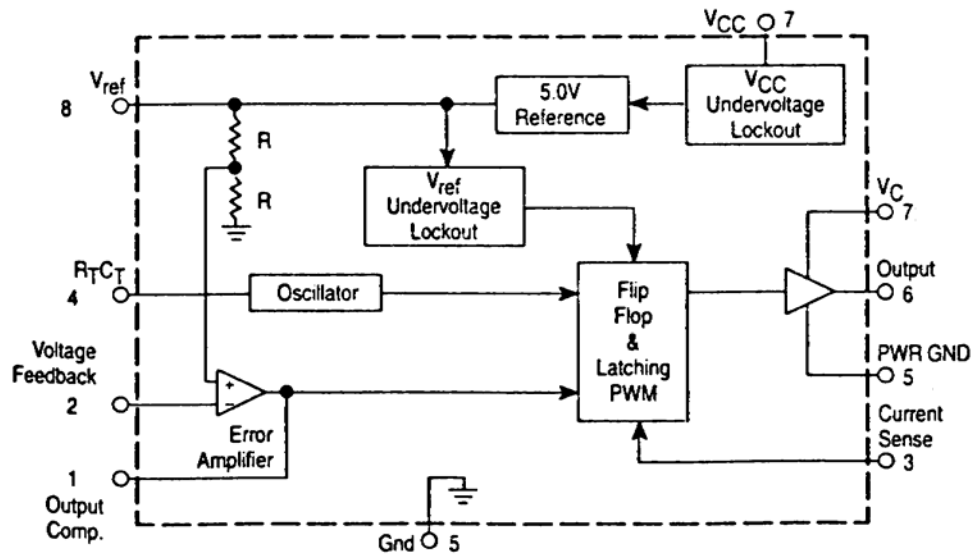


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## PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	Compensation	This pin is Error amplifier output and is made available for loop compensation.
2	Voltage Feedback	This is the inverting input of the Error Amplifier. It is normally connected to the switching power supply output through a resistor divider.
3	Current Sense	A voltage proportional to inductor current is connected to this input. The PWM uses this information to terminate the output switch conduction.
4	$R_T/C_T$	The Oscillator frequency and maximum output duty cycle are programmed by connecting resistor $R_T$ to $V_{ref}$ and capacitor $C_T$ to ground. Operation to 1.0 MHz is possible.
5	Gnd	This pin is combined control circuitry and power ground.
6	Output	This output directly drives the gate of a power MOSFET. Peak currents up to 1.0A are sourced and sunk by this pin. The output switches at one-half the oscillator frequency.
7	Vcc	This pin is the positive supply of the control IC.
8	Vref	This is the reference output. It provides charging current for capacitor $C_T$ though resistor $R_T$ .

## BLOCK DIAGRAM



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## ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	VALUE	UNIT
Total Power Supply and Zener Current	(I <sub>cc</sub> +I <sub>z</sub> )	30	mA
Output Current, Source or Sink (Note 1)	I <sub>o</sub>	1.0	A
Output Energy (Capacitive Load per cycle)	W	5.0	μJ
Current Sense and Voltage feedback Inputs	V <sub>in</sub>	-0.3 ~ +5.5	V
Error Amp Output Sink Current	I <sub>o</sub>	10	mA
Power Dissipation and thermal Characteristics			
SOP-8			
Maximum Power Dissipation @ TA=25°C	P <sub>D</sub>	862	mW
Thermal Resistance Junction-to-Air	R <sub>θJA</sub>	145	°C/W
DIP-8			
Maximum Power Dissipation @ TA=25°C	P <sub>D</sub>	1250	mW
Thermal Resistance Junction-to-Air	R <sub>θJA</sub>	100	°C/W
Operating Junction Temperature	T <sub>j</sub>	+150	°C
Operating Ambient Temperature	T <sub>A</sub>	0 ~ 70	°C
Storage Temperature Range	T <sub>stg</sub>	-65 ~ +150	°C

## ELECTRICAL CHARACTERISTICS (Ta=25°C)

(V<sub>cc</sub>=15V, [Note 2], R<sub>T</sub>=10k, C<sub>T</sub>=3.3nF, T<sub>A</sub>=T<sub>low</sub> to Thigh [Note 3], unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
<b>REFERENCE SECTION</b>						
Reference Output Voltage	V <sub>ref</sub>	I <sub>o</sub> =1.0mA, T <sub>j</sub> =25°C	4.9	5.0	5.1	V
Line Regulation	Reg <sub>line</sub>	V <sub>cc</sub> =12V to 25V	-	2.0	20	mV
Load Regulation	Reg <sub>load</sub>	I <sub>o</sub> =1.0mA to 20mA	-	3.0	25	mV
Temperature Stability	T <sub>s</sub>		-	0.2	-	mV/°C
Total Output Variation over Line, Load, Temperature	V <sub>ref</sub>		4.82		5.18	V
Output Noise Voltage	V <sub>n</sub>	f=10Hz to kHz, T <sub>j</sub> =25°C	-	50	-	μV
Long Term Stability	S	T <sub>A</sub> =125°C for 1000 Hours	-	5.0	-	mV
Output Short Circuit Current	I <sub>sc</sub>		-30	-85	-180	mA
<b>OSCILLATOR SECTION</b>						
Frequency	f <sub>osc</sub>	T <sub>j</sub> =25°C T <sub>A</sub> =T <sub>low</sub> to Thigh	47 46	52	57 60	kHz
Frequency Change with Voltage	Δf <sub>osc</sub> /ΔV	V <sub>cc</sub> =12V to 25V	-	0.2	1.0	%
Frequency Change with Temperature	Δf <sub>osc</sub> /ΔT	T <sub>A</sub> =T <sub>low</sub> to Thigh	-	5.0	-	%
Oscillator Voltage Swing	V <sub>osc</sub>		-	1.6	-	V
Discharge Current	I <sub>dischg</sub>	V <sub>osc</sub> =2.0V, T <sub>j</sub> =25°C	-	10.8	-	mA
<b>ERROR AMPLIFIER SECTION</b>						
Voltage Feedback Input	V <sub>FB</sub>	V <sub>o</sub> =2.5V	2.42	2.50	2.58	V
Input Bias Current	I <sub>IB</sub>	V <sub>FB</sub> =2.7V	-	-0.1	-2.0	μA
Open Loop Voltage Gain	AVOL	V <sub>o</sub> =2.0V to 4.0V	65	90	-	dB
Unity Gain Bandwidth	BW	T <sub>j</sub> =25°C	0.7	1.0	-	MHz
Power Supply Rejection Ratio	PSRR	V <sub>cc</sub> =12V to 25V	60	70	-	dB
Output Current						mA
Sink	I <sub>sink</sub>	V <sub>o</sub> =1.1V, V <sub>FB</sub> =2.7V	2.0	12	-	
Source	I <sub>source</sub>	V <sub>o</sub> =5.0V, V <sub>FB</sub> =2.3V	-0.5	-1.0	-	

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage Swing						V
High State	VOH	RL=15k to ground, VFB=2.3V	5.0	6.2	-	
Low State	VOL	RL=15k to Vref, VFB=2.7V	-	0.8	1.1	
<b>CURRENT SENSE SECTION</b>						
Current Sense Input Voltage Gain (Note 4 & 5)	Av		2.85	3.0	3.15	V/V
Maximum Current Sense Input Threshold (Note 4)	Vth		0.9	1.0	1.1	V
Power Supply Rejection Ratio	PSRR	Vcc=12V to 25V (Note4)	-	70	-	dB
Input Bias Current	IIB		-	-2.0	-10	μA
Propagation Delay	tPLH(IN/OUT)		-	150	300	ns
<b>OUTPUT SECTION</b>						
Output Voltage						V
Low State	VOL	Isink=20mA	-	0.1	0.4	
		Isink=200mA	-	1.6	2.2	
High State	VOH	Isink=20mA	13	13.5	-	
		Isink=200mA	12	13.4	-	
Output Voltage with UVLO Activated	VOL(UVLO)	Vcc=6.0V, Isink=1.0mA	-	0.1	1.1	V
Output Voltage Rise Time	tr	CL=1.0nF, Tj=25°C	-	50	150	ns
Output Voltage Fall Time	tf	CL=1.0nF, Tj=25°C	-	50	150	ns
<b>UNDERVOLTAGE LOCKOUT SECTION</b>						
Startup Threshold	Vth					V
UC3844			14.5	16.0	17.5	
UC3845			7.8	8.4	9.0	
Minimum Operating Voltage After Turn-On	Vcc(min)					V
UC3844			8.5	10.0	11.5	
UC3845			7.0	7.6	8.2	
<b>PWM SECTION</b>						
Duty Cycle						%
Maximum	DCmax		47	48	50	
Minimum	DCmin		-	-	0	
<b>TOTAL DEVICE</b>						
Power Supply Current (Note 2)	Icc	Vcc=6.5V for UC3845 Vcc=14V for UC3844	- -	0.5 12	1.0 17	mA
Power Supply Zener Voltage	Vz	Icc=25mA	30	36	-	V

- NOTE: 1. Maximum Package power dissipation limits must be observed.  
2. Adjust Vcc above the startup threshold before setting to 15V.  
3. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient as possible. Tlow=0°C and Thigh=+70°C  
4. This parameter is measured at the latch trip point with VFB=0V.  
5. Comparator gain is defined as: 
$$A_v = \frac{\Delta V \text{ Output Compensation}}{\Delta V \text{ Current Sense Input}}$$

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Figure 1. Timing Resistor versus Oscillator Frequency

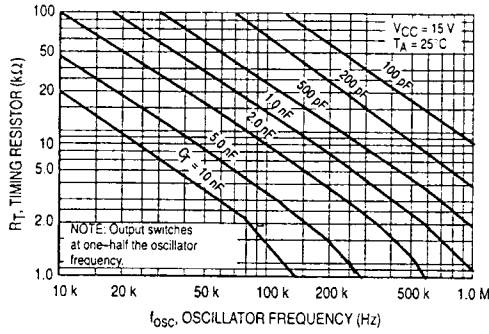


Figure 2. Output Deadtime versus Oscillator Frequency

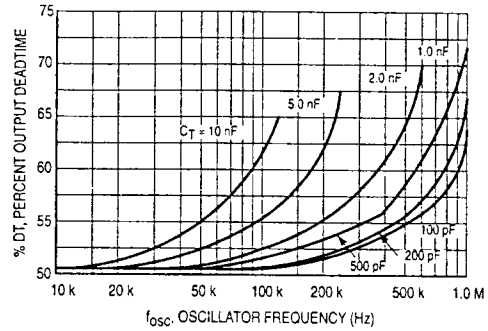


Figure 3. Error Amp Open Loop Gain and Phase versus Frequency

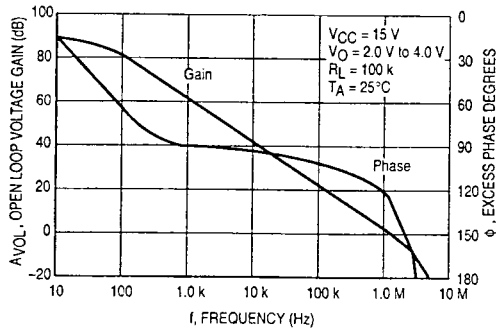


Figure 4. Current Sense Input Threshold versus Error Amp Output Voltage

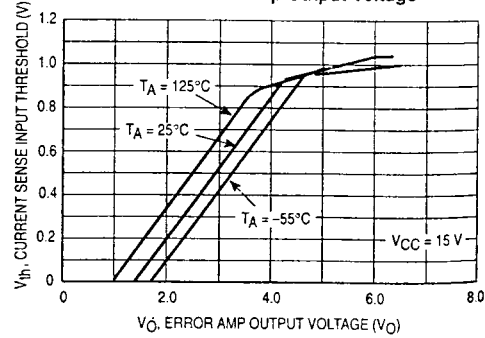


Figure 5. Reference Voltage Change versus Source Current

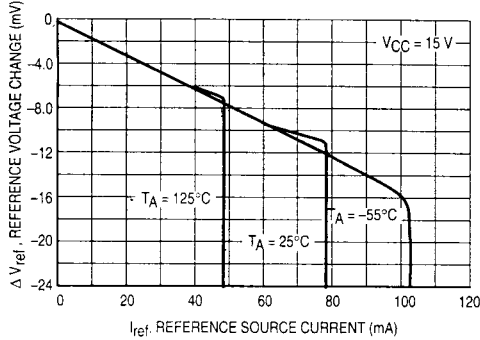
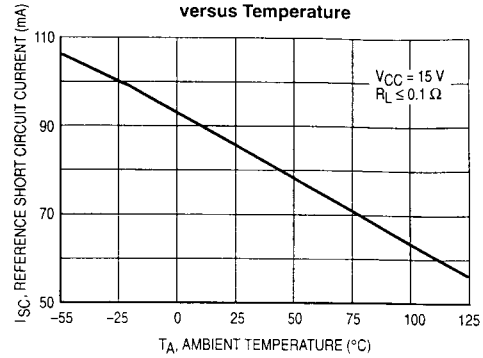


Figure 6. Reference Short Circuit Current versus Temperature



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Figure 7. Output Saturation Voltage versus Load Current

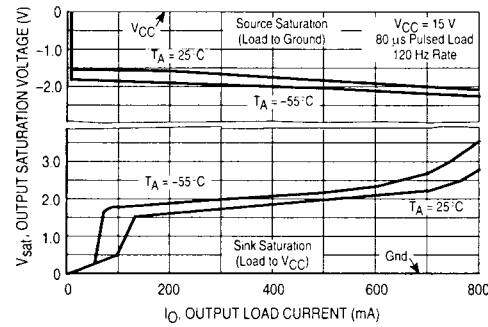


Figure 8. Supply Current versus Supply Voltage

