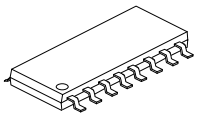
ENHANCED HIGH POWER FACTOR PREREGULATOR



SOP-16

■ DESCRIPTION

The UTC **UC3854** provide all the functions necessary for active power factor corrected preregulators. The controller achieves near unity power factor by shaping the AC input line current waveform to correspond to that of AC input line voltage. Average current mode control maintains stable, low distortion sinusoidal line current without the need for slope compensation, unlike peak current mode control.

Designed in UTC's Bipolar process, the UTC **UC3854** offers new features such as wide bandwidth, low offset Current Amplifier, a faster responding and improved accuracy enable comparator, a V_{REF} "good" comparator, UVLO threshold options (16/10V for offline, 10.5/10V for startup from an auxiliary 12V regulator), lower startup supply current, and an enhanced multiply/divide circuit. New features like the improved amplifier current sinking capability, amplifier output clamps, and low offset VAC pin reduce the external component count while improving performance. Improved common mode input range of the Multiplier output/Current Amp input allow the designer greater flexibility in choosing a method for current sensing. Unlike its predecessor, the maximum multiplier output current is now clamped to a maximum of 2 * I_{AC} at all times.

A 1% 7.5V reference, fixed frequency oscillator, PWM, Voltage Amplifier with softstart, line voltage feedforward (V_{RMS} squarer), input supply voltage clamp, and over current comparator round out the list of features.

■ FEATURES

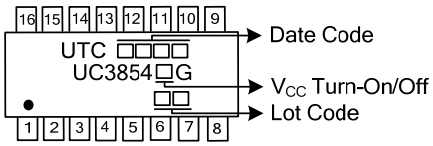
* Controls Boost Preregulator to Near Unity Power Factor
* Limits Line Distortion
* World-Wide Line Operation
* Accurate Power Limiting
* Fixed Frequency Average Current Mode Control
* High Bandwidth (5MHz), Low Offset Current Amplifier
* Integrated Current and Voltage Amp Output Clamps
* Multiplier Improvements: Linearity, 500mV VAC Offset (eliminates external resistor), 0-5V Multout Common Mode Range
* VREF "GOOD" Comparator
* Faster and Improved Accuracy ENABLE Comparator
* 300uA Startup Supply Current

■ ORDERING INFORMATION

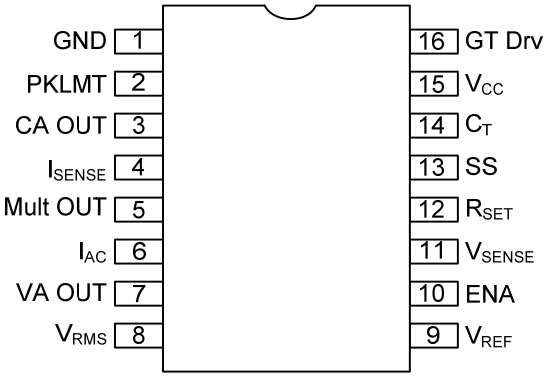
Ordering Number	Package	Packing
UC3854xG-S16-R	SOP-16	Tape Reel

UC3854xG-S16-R (1) Packing Type (2) Package Type (3) Green Package (4) V_{CC} Turn-On/Off	(1) R: Tape Reel (2) S16: SOP-16 (3) G: Halogen Free and Lead Free (4) refer to ELECTRICAL CHARACTERISTICS

■ MARKING



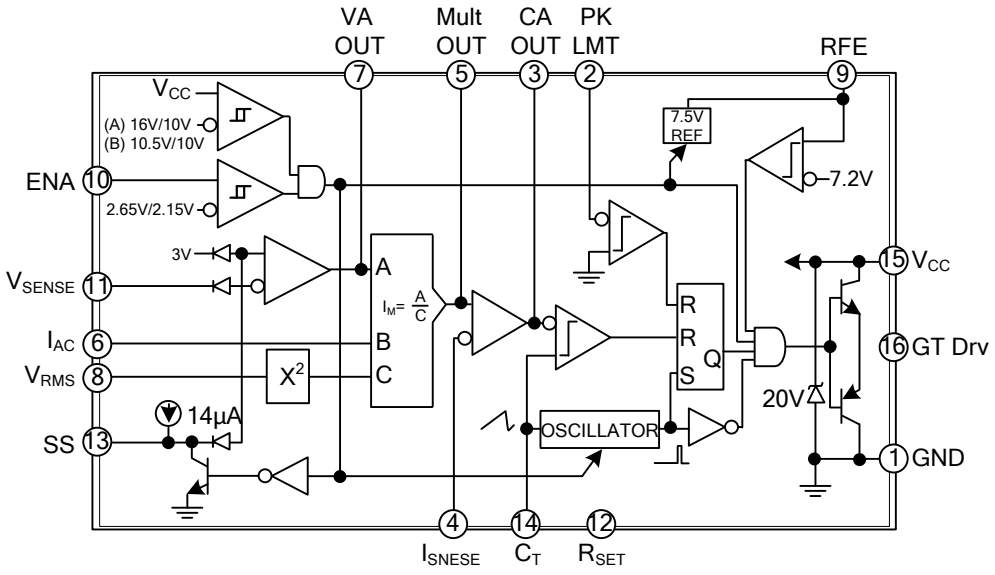
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	GND	Ground. All voltage are measured with respect to GND .
2	PKLMT	Peak Limit. The threshold for PKLMT is 0V.
3	CA OUT	Current Error Amplifier Output.
4	I_{SNESE}	Current Sense Minus. The negative input to the current amplifier.
5	Mult OUT	Multiplier/Divider Output. Multiplier output and non-inverting input connected together
6	I_{AC}	Analog Input AC Current.
7	VA OUT	Voltage Error Amplifier Output.
8	V_{RMS}	RMS Line Voltage.
9	V_{REF}	Voltage Reference Output.
10	ENA	Enable. A logic input, set “H” active.
11	VSNESE	Voltage Error Amplifier Inverting Input.
12	R_{SET}	Oscillator Charging Current.
13	SS	Soft Start.
14	C_T	Oscillator Timing Capacitor.
15	V_{CC}	Positive supply voltage.
16	GT Drv	Gate Driver.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	22	V
GT Drv Current	Continuous	I_{OUT}	0.5	A
	50% Duty Cycle		1.5	A
Input Voltage	VSENSE, VRMS	V_{IN}	11	V
	ISENSE, Mult Out		11	V
	PKLMT		5	V
	R_{SET}, I_{AC} PKLMT, ENA		10	mA
Power Dissipation		P_D	1	W
Storage Temperature		T_{STG}	-65~+150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. All voltages with respect to Gnd (Pin 1)
3. All currents are positive into the specified terminal

■ ELECTRICAL CHARACTERISTICS

Unless otherwise stated, V_{CC}=18V, R_T=8.2k, C_T=1.5nF, PKLMT=1V, V_{RMS}=1.5V, I_{AC}=100uA, I=0V, CA Out=3.5V, VA Out=5V, V_{SENSE}=3V, 0°C <T_A<70°C, T_A=T_J.

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Overall							
Supply Current, Off	$I_{CC(On)}$	CAO, VAO = 0V, V_{CC}= UVLO - 0.3V			250	400	uA
Supply Current, On	$I_{CC(Off)}$				12	18	mA
V_{CC} Turn-On Threshold	$V_{CC(On)}$	UC3854A			16	17.5	V
		UC3854B			10.5	11.2	V
V_{CC} Turn-OFF Threshold	$V_{CC(Off)}$	UC3854A/B		9	10		V
V_{CC} Clamp	$V_{CC(Clamp)}$	I(V_{CC}) = I_{CC}(on) + 5mA		18	20	22	V
Voltage Amplifier							
Input Voltage	V_{SENSE}			2.9	3.0	3.1	V
V_{SENSE} Bias Current	I_{VSENSE}			-500	-25	500	nA
Open Loop Gain	A_{VA}	V_{OUT}= 2 ~ 5V		70	100		dB
V_{OUT} High	V_{HV}	I_{LOAD}= -500uA			6		V
V_{OUT} Low	V_{LV}	I_{LOAD}= 500uA			0.3	0.5	V
Output Short Circuit Current	I_{SCV}	V_{OUT}= 0V			1.5	3.5	mA
Gain Bandwidth Product	GB_V	Fin = 100kHz, 10mV p-p, (Note 1)			1		mHz
Current amplifier							
Input Offset Voltage	I_{OFFC}	V_{CM}= 0V	T_A=+25°C	-4		0	mV
			Overtemp	-5.5		0	mV
Input Bias Current(sense)	I_{CSENSE}	V_{CM}= 0V		-500		500	nA
Open Loop Gain	A_{CA}	V_{CM}= 0V, V_{OUT}= 2 ~ 6V		80	110		dB
V_{OUT} High	V_{HC}	I_{LOAD}= -500uA			8		V
VOUT Low	V_{LC}	I_{LOAD}= 500uA			0.3	0.5	V
Output Short Circuit Current	I_{SCC}	V_{OUT}= 0V			1.5	3.5	mA
Common Mode Range	V_{CMC}			-0.3		5	V
Gain Bandwidth Product	GB_C	Fin = 100kHz, 10mV p-p, (Note 1)		3	5		mHz
Reference							
Output Voltage	V_{REF}	I_{REF} = 0mA, T_A= 25°C		7.4	7.5	7.6	V
		I_{REF}= 0mA		7.35	7.5	7.65	V
Load Regulation	$\triangle V_{LOAD}$	I_{REF}= 1 ~ 10mA		0	8	20	mV
Line Regulation	$\triangle V_{LINE}$	V_{CC}=12 ~ 18V		0	14	25	mV
Short Circuit Current	I_{SCR}	V_{REF}= 0V		25	35	60	mA

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Oscillator						
Initial Accuracy	f_0	T_A= 25°C	85	100	115	kHz
Voltage Stability	$\triangle f_{VCC}$	V_{CC}=12 ~ 18V		1		%
Total Variation	f_T	Line, Temp	80		120	kHz
Ramp Amplitude (p-p)	V_{PP}		4.9		5.9	V
Ramp Valley Voltage	V_{VAL}		0.8		1.3	V
Enable/Softstart /Current Limit						
Enable Threshold	V_{ENA}		2.35	2.55	2.8	V
Enable Hysteresis	V_{HYS}	V_{FAULT}= 2.5V		500	600	mV
Enable Input Bias Current	I_{ENA}	V_{ENABLE}= 0V		-2	-5	uA
Propagation Delay to Disable	T_{ENA}	Enable Overdrive= -100mV (Note 1)		300		ns
SS Charge Current	I_{SS}	$V_{SOFTSTART}$= 2.5V	10	14	24	
PKLMT Offset Voltage	V_{OFFP}		-15		15	mV
PKLMT Input Current	I_{PK}	V_{PKLMT}= -0.1V	-200	-100		uA
PKLMT Propagation Delay	T_{PK}	(Note 1)		150		ns
Multiplier						
Output Current - I_{AC} Limited	I_{LIM}	I_{AC}=100mA, V_{RMS}= 1V, R_{SET}= 10k	-220	-200	-170	uA
Output Current - Zero	I_{ZERO}	I_{AC}=0uA, R_{SET}= 10k	-2.0	-0.2	2.0	uA
Output Current - Power Limited	I_{PLIM}	V_{RMS}= 1.5V, Va = 6V	-230	-200	-170	uA
Output Current	I_{MULT}	V_{RMS}= 1.5V, Va= 2V		-22		uA
		$_{VRMS}$= 1.5V, Va= 5V		-156		uA
		V_{RMS}= 5V, Va= 2V		-2		uA
		V_{RMS}= 5V, Va= 5V		-14		uA
Gain Constant	K	(Note 2) V_{RMS}= 1.5V, T_J= 25°C, Va = 6V	-1.1	-1.0	-0.9	A/A
Gate Driver						
Output High Voltage	V_{HG}	I_{OUT}= -200mA, V_{CC}=15V	12	12.8		v
Output Low Voltage Output Low (UVLO)	V_{LG}	I_{OUT}= 200mA		1	2.2	V
		I_{OUT}= 10mA		300	500	mV
		I_{OUT}= 50mA, V_{CC}=0V		0.9	1.5	V
Output Rise / Fall Time	T_{RF}	C_{LOAD}= 1nF (Note 1)		35		ns
Output Peak Current	I_{PEAK}	C_{LOAD}= 10nF (Note 1)		1.0		A

Notes: 1. Guaranteed by design, not 100% tested in production

2. Gain constant (K)= $\frac{I_{AC} * (Va - 1.5V)}{V_{RMS}^2 * I_{MO}}$