

UC3854A and UC3854B Advanced Power Factor Correction Control ICs (DN-44)

Bill Andreycak

System Power MAN

1 Description

The UC3854A and UC3854B power factor correction (PFC) control devices are advanced versions of the industry standard UC3854. The new devices are pin-for-pin compatible with the original version and feature numerous improvements. The UC3854A device can be used in most existing UC3854 PFC designs with no modifications to the printed circuit board. New PFC preregulator designs and upgrades of existing ones can realize enhanced performance and a reduced parts count with minimal design effort.

2 Specification Differences

Table 1. Specification Differences

PARAMETER	UC3854	UC3854A	UC3854B
Supply current, off	2.0 mA max	400 μ A max	400 μ A max
Supply voltage V_{CC}	35 V max	22 V max	22 V max
V_{CC} turn-on threshold	16 V typ	16 V typ	10.5 V typ
V_{CC} UVLO hysteresis	6.0 V typ	6.0 V typ	0.5 V typ
Current amplifier bandwidth	1 MHz typ	5 MHz typ	5 MHz typ
Current amplifier offset	4 mV, -4 mV max	0 mV, -4 mV max	0 mV, -4 mV max
MULTOUT voltage (high)	2.5 V typ.	5.0 V typ.	5.0 V typ.
Multiplier gain tolerance	not specified	-0.9 to -1.1	-0.9 to -1.1
ENABLE propagation delay	not specified	300 ns typ	300 ns typ

Table 2. Other Improvements and Changes - Non-Specified

PARAMETER	UC3854	UC3854A	UC3854B
V_{SENSE} input	7.5 V	3.0 V	3.0 V
IAC voltage	6.0 V typ	0.5 V typ	0.5 V typ
Voltage Amplifier clamp	none	internal	internal
Current Amplifier clamp	none	internal	internal
V_{REF} good circuitry	none	internal	internal

3 Application Information

Converting an existing PFC design from the UC3854 to use the UC3854A or UC3854B device eliminates four components from the control circuit.

These are:

- One diode used to clamp the voltage amplifier output.
- A zener diode used to clamp the current amplifier output.
- One resistor to offset the bias current from the 6-V amplitude of the I_{AC} node.
- One resistor from V_{CC} to the current amplifier input to accommodate the worst case 4-mV offset voltage.

The output voltage divider feedback resistor value from V_{SENSE} to ground must be lowered to accommodate the change in the amplifier's reference voltage from 7.5 V to 3.0 V. In most applications, existing production printed circuit boards do not have to be modified to take advantage of the newer devices. Locations used for the four components can remain on the boards but do not need to be populated. For further application information consult TI's Application Note U-134 and Design Note DN-39D, or contact a Field Applications Engineer.

4 UC3854A Evaluation Board List of Materials

Table 3. List of Materials

REFERENCE DESIGNATOR	DESCRIPTION
C1	Capacitor, 0.47 μ F / 300 VAC "X" type
C2	Capacitor, electrolytic, 450 μ F / 450 VDC
C3	Capacitor, 270 pF / 16 VDC
C4	Capacitor, ceramic, 1 μ F / 16 VDC
C6	Capacitor, ceramic, 0.047 μ F / 16 VDC
C7	Capacitor, ceramic, 0.47 μ F / 16 VDC
C9	Capacitor, electrolytic, 100 μ F / 35 VDC
C10	Capacitor, ceramic, 0.01 μ F / 35 VDC
C11	Capacitor, ceramic, 1 μ F / 16 VDC
C12	Capacitor, poly, 0.1 μ F / 63 VDC
C13	Capacitor, ceramic, 62 pF / 16 VDC
C15	Capacitor, ceramic, 620 pF / 16 VDC
C16	Capacitor, ceramic, 1 μ F / 35 VDC
C*	Capacitor, add a 0.47 μ F / 300 VAC "X" cap between TP "C" and TP "F"
D1	Bridge rectifier, 600 V / 6 A
D2	Rrectifier, 600 V / 8 A very fast, trr35 ns
D4	Schottky, 20 V / 3 A , 1N5820
D6	Bridge rectifier, 40 V / 1 A
F1	Fuse, 6 A / 300 VAC
J1	Jumper wire, AWG #22
L1	Inductor, 1 mH (see Application Note U-134)
Q1	Channel MOSFET, 500 V, 0.25 OHM N / APT5025
R1	Resistor, 0.25 Ω , 5 WATT NON-INDUCTIVE
R2	Resistor, 3.9 k Ω , 1/2 W
R3	Resistor, 3.9 k Ω , 1/2 W
R4	Resistor, 1.6 k Ω , 1/2 W
R5	Resistor, 10 k Ω , 1/2 W
R6	Resistor, 24 k Ω , 1/2 W
R7	Resistor, 240 k Ω , 1/2 W

Table 3. List of Materials (continued)

REFERENCE DESIGNATOR	DESCRIPTION
R8	Resistor, 1 M, 1/2
R9	Resistor, 91 k Ω , 1/2 W
R10	Resistor, 20 k Ω , 1/2 W
R12	Resistor, 27 k Ω , 1/2 W
R13	Resistor, 75 k Ω , 1/2 W
R14	Resistor, 15 k Ω , 1/2 W
R15	Resistor, jumper wire, AWG #22
R16	Resistor, 20 Ω , 1/2 W
R17	Resistor, 1.15 M, 1/2 W, 1% tolerance
R18	Resistor, 9.1 k Ω , 1/2 W, 1% tolerance
R19	Resistor, jumper wire, AWG #22
R22	Resistor, 120 k Ω , 2 W
R23	Resistor, 910 k Ω , 1/2 W
R24	Resistor, user determined by auxiliary supply winding
TH1	Thermistor, N.T.C., 6 A / 500 V rating
U1	UC3854A PFC control device
NOT USED: C5, C8, C14, D3, D5, Q2, Q3, R11, R20, R21, R23, R26	

UC3854A Evaluation Board List of Materials

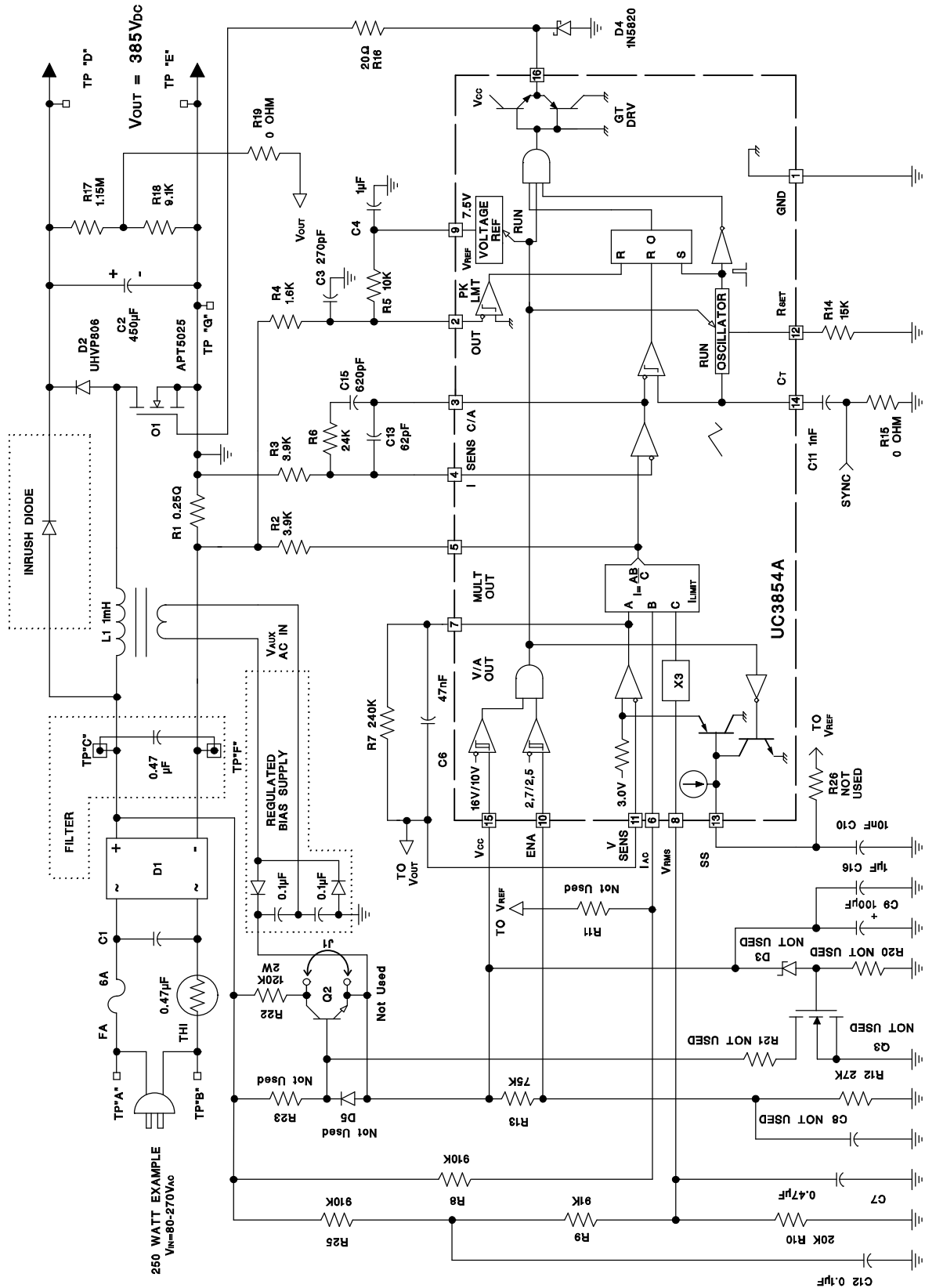


Figure 1. UC3854A Evaluation PC Board Schematic 250-W Power Factor Correction Application

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