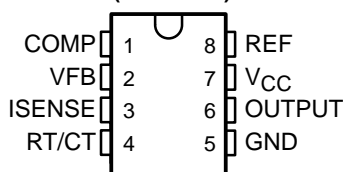- **Optimized for Off-Line and dc-to-dc Converters**
- **Low Start-Up Current (<1 mA)**
- **Automatic Feed-Forward Compensation**
- **Pulse-by-Pulse Current Limiting**
- **Enhanced Load-Response Characteristics**
- **Undervoltage Lockout With Hysteresis**
- **Double Pulse Suppression**
- **High-Current Totem-Pole Output**
- **Internally Trimmed Bandgap Reference**
- **500-kHz Operation**
- **Error Amplifier With Low Output Resistance**
- **Designed to Be Interchangable With Unitrode UC2842 and UC3842 Series**

**D PACKAGE**
**(TOP VIEW)**

| | | | | |
|---|---|---|---|---|
| COMP | 1 | | 14 | REF |
| NC | 2 | | 13 | NC |
| VFB | 3 | | 12 | $V_{CC}$ |
| NC | 4 | | 11 | VC |
| ISENSE | 5 | | 10 | OUTPUT |
| NC | 6 | | 9 | GND |
| RT/CT | 7 | | 8 | POWER GROUND |
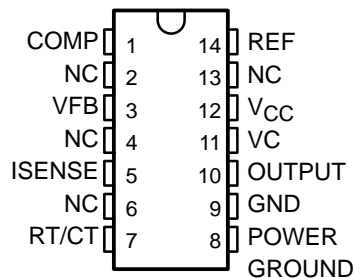
NC – No internal connection

**P PACKAGE**
**(TOP VIEW)**

| | | | | |
|---|---|---|---|---|
| COMP | 1 | | 8 | REF |
| VFB | 2 | | 7 | $V_{CC}$ |
| ISENSE | 3 | | 6 | OUTPUT |
| RT/CT | 4 | | 5 | GND |

**description**

The UC2842 and UC3842 series of control integrated circuits provide the features that are necessary to implement off-line or dc-to-dc fixed-frequency current-mode control schemes with a minimum number of external components. Some of the internally implemented circuits are an undervoltage lockout (UVLO) featuring a start-up current of less than 1 mA and a precision reference trimmed for accuracy at the error amplifier input. Other internal circuits include logic to ensure latched operation, a pulse-width modulation (PWM) comparator (which also provides current-limit control), and a totem-pole output stage designed to source or sink high-peak current. The output stage, suitable for driving N-channel MOSFETs, is low when it is in the off state.

The primary difference between the UC2842-series devices and the UC3842-series devices is the ambient operating temperature range. The UC2842-series devices operate between −40°C and 85°C; the UC3842-series devices operate between 0°C and 70°C. Major differences between members of these series are the UVLO thresholds and maximum duty cycle ranges. Typical UVLO thresholds of 16 V (on) and 10 V (off) on the UCx842 and UCx844 devices make them ideally suited to off-line applications. The corresponding typical thresholds for the UCx843 and UCx845 devices are 8.4 V (on) and 7.6 V (off). The UCx842 and UCx843 devices can operate to duty cycles approaching 100%. A duty cycle range of 0 to 50% is obtained by the UCx844 and UCx845 by the addition of an internal toggle flip-flop, which blanks the output off every other clock cycle.

**AVAILABLE OPTIONS**

| | PACKAGED DEVICES | | CHIP FORM (Y) |
|---|---|---|---|
| $T_A$ | SMALL OUTLINE (D) | PLASTIC DIP (P) | |
| 0°C to 70°C | UC3842D UC3843D UC3844D UC3845D | UC3842P UC3843P UC3844P UC3845P | UC3842Y UC3843Y UC3844Y UC3845Y |
| −40°C to 85°C | UC2842D UC2843D UC2844D UC2845D | UC2842P UC2843P UC2844P UC2845P | — — — — |

The DW package is available taped and reeled. Add the suffix R to the device type, (i.e., LT1054CDWR).

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### TEXAS INSTRUMENTS

# UC284x, UC384x, UC384xY
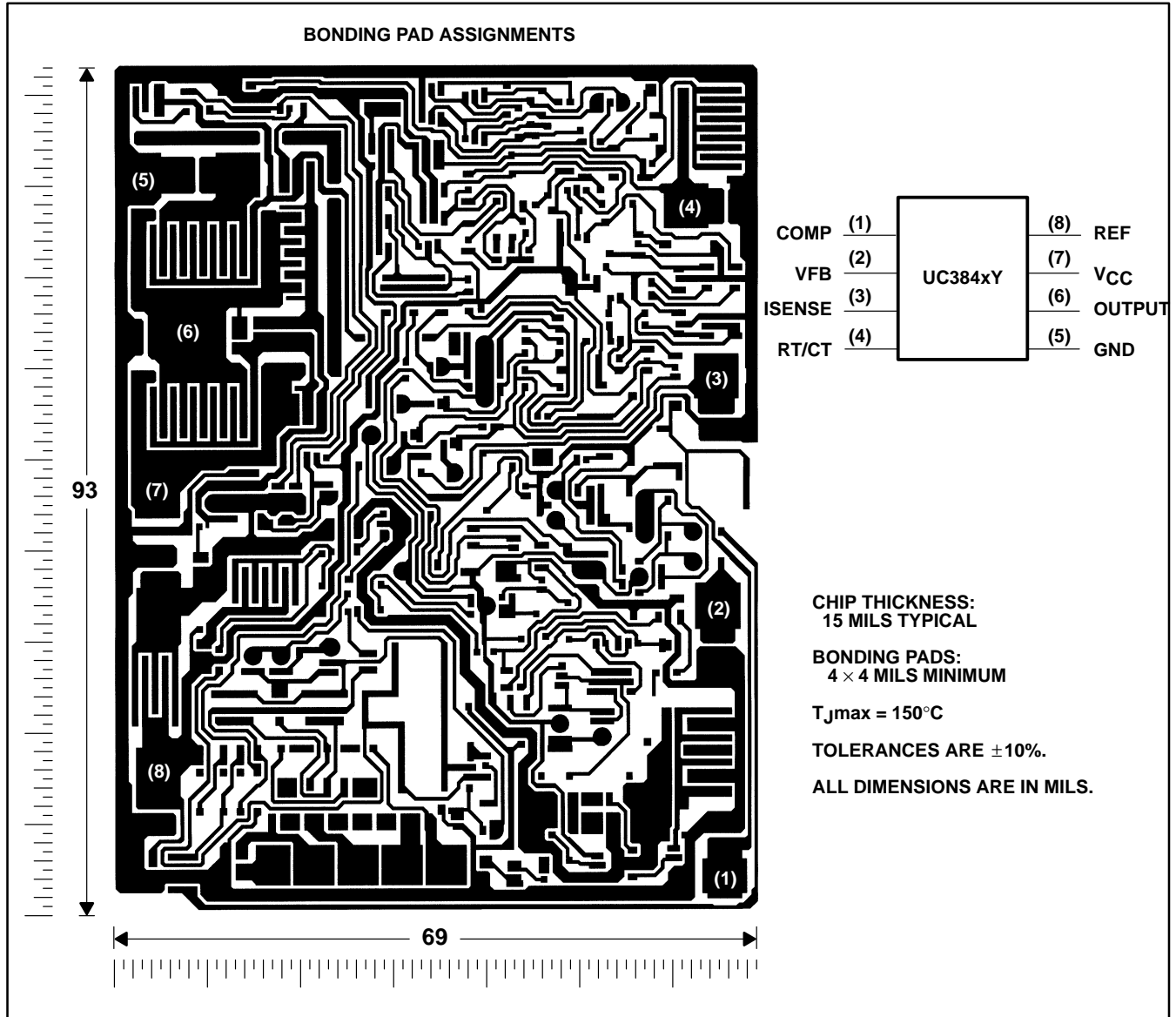# CURRENT-MODE PWM CONTROLLERS

## functional block diagram
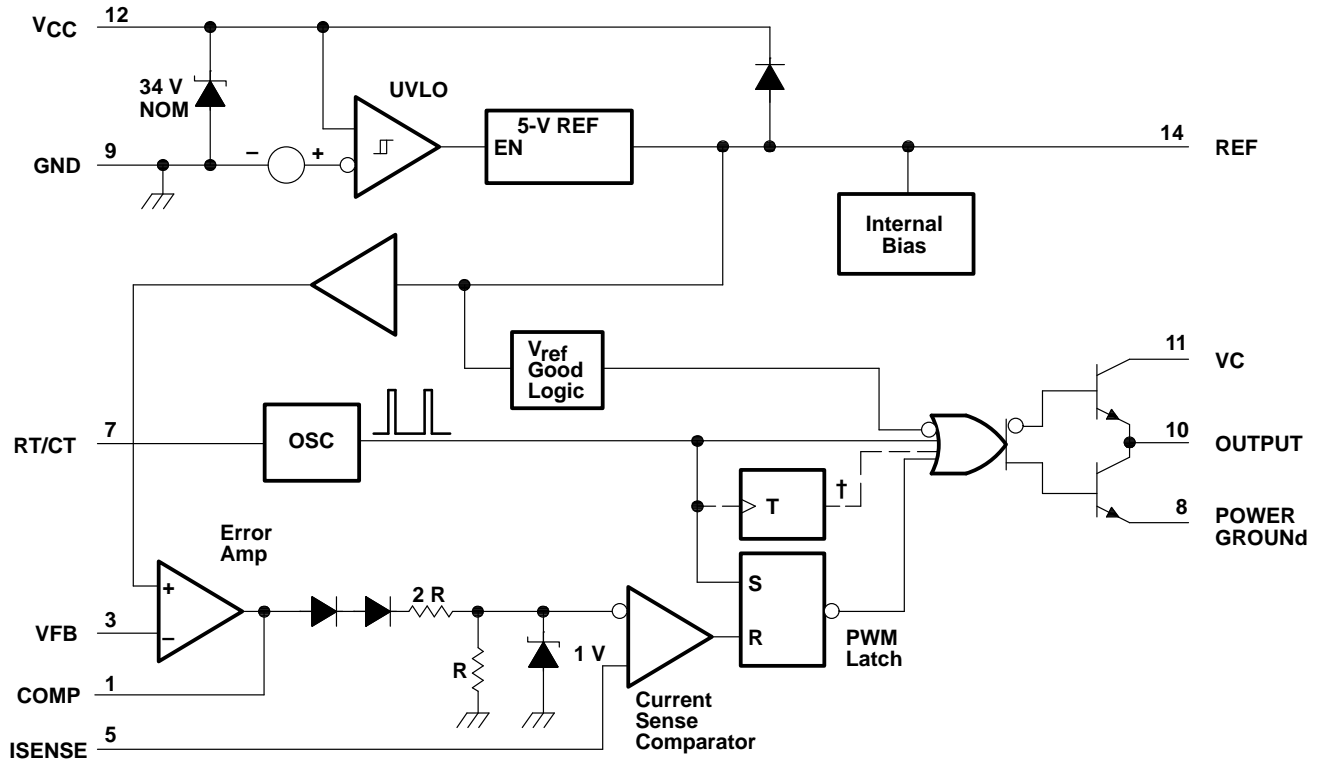


† The toggle flip-flop is present only in UC2844, UC2845, UC3844, and UC3845.

NOTE A:   Terminal numbers apply to the D package only.

TEXAS
INSTRUMENTS

## UC384xY chip information

This chip, when properly assembled, displays characteristics similar to the UC384x. Thermal compression or ultrasonic bonding may be used on the doped aluminum bonding pads. The chip may be mounted with conductive epoxy or a gold-silicon preform.

**BONDING PAD ASSIGNMENTS**

**93**

**69**

| | | |
|---|---|---|
| COMP (1) | UC384xY | (8) REF |
| VFB (2) | | (7) V$_{CC}$ |
| ISENSE (3) | | (6) OUTPUT |
| RT/CT (4) | | (5) GND |

**CHIP THICKNESS:**
  15 MILS TYPICAL

**BONDING PADS:**
  4 $\times$ 4 MILS MINIMUM

**T$_J$max = 150°C**

**TOLERANCES ARE ±10%.**

**ALL DIMENSIONS ARE IN MILS.**

# UC284x, UC384x, UC384xY
# CURRENT-MODE PWM CONTROLLERS

SLVS038B – JANUARY 1989 – REVISED AUGUST 1995

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

Supply voltage (see Note 1) ($I_{CC}$ < 30 mA) .......................................... Self Limiting
Analog input voltage range, $V_I$ (VFB and ISENSE terminals) .......................... − 0.3 V to 6.3 V
Output voltage, $V_O$ (OUTPUT terminal) ................................................. 35 V
Input voltage, $V_I$, (VC terminal, D package only) ...................................... 35 V
Supply current, $I_{CC}$ ....................................................................... 30 mA
Output current, $I_O$ ........................................................................ ±1 A
Error amplifier output sink current ......................................................... 10 mA
Continuous total power dissipation .................................... See Dissipation Rating Table
Output energy (capacitive load) ........................................................... 5 μJ
Operating free-air temperature range, $T_A$: UC284x ................................. − 40°C to 85°C
  UC384x .................................... 0°C to 70°C
Storage temperature range, $T_{stg}$ ................................................ − 65°C to 150°C
Lead temperature, 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.

NOTE 1: All voltages are with respect to the device GND terminal.

### DISSIPATION RATING TABLE

| PACKAGE | $T_A \leq 25°C$ POWER RATING | DERATE ABOVE $T_A = 25°C$ | $T_A = 70°C$ POWER RATING | $T_A = 85°C$ POWER RATING |
|---|---|---|---|---|
| D | 950 mW | 7.6 mW/°C | 608 mW | 494 mW |
| P | 1000 mW | 8.0 mW/°C | 640 mW | 520 mW |

## recommended operating conditions

| | UC284x | | | UC384x | | | UNIT |
|---|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| Supply voltage, $V_{CC}$ and $V_C$† | | | 30 | | | 30 | V |
| Input voltage, $V_I$, RT/CT | 0 | | 5.5 | 0 | | 5.5 | V |
| Input voltage, $V_I$, VFB and ISENSE | 0 | | 5.5 | 0 | | 5.5 | V |
| Output voltage, $V_O$, OUTPUT | 0 | | 30 | 0 | | 30 | V |
| Output voltage, $V_O$, POWER GROUND† | −0.1 | | 1 | −0.1 | | 1 | V |
| Supply current, externally limited, $I_{CC}$ | | | 25 | | | 25 | mA |
| Average output current, $I_O$ | | | 200 | | | 200 | mA |
| Reference output current, $I_{O(ref)}$ | | | −20 | | | −20 | mA |
| Timing capacitance, $C_T$ | | | | 1 | | | nF |
| Oscillator frequency, $f_{osc}$ | | 100 | 500 | | 100 | 500 | kHz |
| Operating free-air temperature, $T_A$ | −40 | | 85 | 0 | | 70 | °C |

† These recommended voltages for $V_C$ and POWER GROUND apply only to the D package.

**TEXAS INSTRUMENTS**

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## electrical characteristics, $V_{CC}$ = 15 V (see Note 2), $R_T$ = 10 k$\Omega$, $C_T$ = 3.3 nF, $T_A$ = full range (unless otherwise specified)

### reference section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Output voltage | $I_O$ = 1 mA, $T_J$ = 25°C | 4.95 | 5 | 5.05 | 4.9 | 5 | 5.1 | V |
| Line regulation | $V_{CC}$ = 12 V to 25 V | | 6 | 20 | | 6 | 20 | mV |
| Load regulation | $I_O$ = 1 mA to 20 mA | | 6 | 25 | | 6 | 25 | mV |
| Temperature coefficient of output voltage | | | 0.2 | 0.4 | | 0.2 | 0.4 | mV√°C |
| Output voltage with worst-case variation | $V_{CC}$ = 12 V to 25 V, $I_O$ = 1 mA to 20 mA | 4.9 | | 5.1 | 4.82 | | 5.18 | V |
| Output noise voltage | f = 10 Hz to 10 kHz, $T_J$ = 25°C | | 50 | | | 50 | | µV |
| Output voltage long-term drift | After 1000 h at $T_A$ = 25°C | | 5 | 25 | | 5 | 25 | mV |
| Short-circuit output current | | −30 | −100 | −180 | −30 | −100 | −180 | mA |

† All typical values are at $T_J$ = 25°C.
NOTE 2: Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### oscillator section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Oscillator frequency (see Note 3) | $T_J$ = 25°C | 47 | 52 | 57 | 47 | 52 | 57 | kHz |
| Frequency change with supply voltage | $V_{CC}$ = 12 V to 25 V | | 2 | 10 | | 2 | 10 | Hz/kHz |
| Frequency change with temperature | $T_A$ = $T_{MIN}$ to $T_{MAX}$ | | 50 | | | 50 | | Hz/kHz |
| Peak-to-peak amplitude at RT/CT | | | 1.7 | | | 1.7 | | V |

† All typical values are at $T_J$ = 25°C.
NOTES: 2. Adjust $V_{CC}$ above the start threshold before setting it to 15 V.
      3. Output frequency equals oscillator frequency for the UCx842 and UCx843. Output frequency is one-half oscillator frequency for the UCx844 and UCx845.

### error amplifier section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Feedback input voltage | COMP at 2.5 V | 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 amplification | $V_O$ = 2 V to 4 V | 65 | 90 | | 65 | 90 | | dB |
| Gain-bandwidth product | | 0.7 | 1 | | 0.7 | 1 | | MHz |
| Supply voltage rejection ratio | $V_{CC}$ = 12 V to 25 V | 60 | 70 | | 60 | 70 | | dB |
| Output sink current | VFB at 2.7 V, COMP at 1.1 V | 2 | 6 | | 2 | 6 | | mA |
| Output source current | VFB at 2.3 V, COMP at 5 V | −0.5 | −0.8 | | −0.5 | −0.8 | | mA |
| High-level output voltage | VFB at 2.3 V, $R_L$ = 15 k$\Omega$ to GND | 5 | 6 | | 5 | 6 | | V |
| Low-level output voltage | VFB at 2.7 V, $R_L$ = 15 k$\Omega$ to GND | | 0.7 | 1.1 | | 0.7 | 1.1 | V |

† All typical values are at $T_J$ = 25°C.
NOTE 2: Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

## TEXAS
## INSTRUMENTS

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**electrical characteristics, $V_{CC}$ = 15 V (see Note 2), $R_T$ = 10 k$\Omega$, $C_T$ = 3.3 nF, $T_A$ = full range (unless otherwise specified) (continued)**

### current sense section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Voltage amplification | See Notes 4 and 5 | 2.85 | 3 | 3.13 | 2.85 | 3 | 3.15 | V/V |
| Current sense comparator threshold | COMP at 5 V,          See Note 4 | 0.9 | 1 | 1.1 | 0.9 | 1 | 1.1 | V |
| Supply voltage rejection ratio | $V_{CC}$ = 12 V to 25 V,   See Note 4 | | 70 | | | 70 | | dB |
| Input bias current | | | −2 | −10 | | −2 | −10 | µA |
| Delay time to output | | | 150 | 300 | | 150 | 300 | ns |

† All typical values are at $T_J$ = 25°C.
NOTES:  2.  Adjust $V_{CC}$ above the start threshold before setting it to 15 V.
    4.   These parameters are measured at the trip point of the latch with VFB at 0 V.
    5.  Voltage amplification is measured between ISENSE and COMP with the input changing from 0 V to 0.8 V.

### output section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| High-level output voltage | $I_{OH}$ = −20 mA | 13 | 13.5 | | 13 | 13.5 | | V |
| | $I_{OH}$ = −200 mA | 12 | 13.5 | | 12 | 13.5 | | |
| Low-level output voltage | $I_{OL}$ = 20 mA | | 0.1 | 0.4 | | 0.1 | 0.4 | V |
| | $I_{OL}$ = 200 mA | | 1.5 | 2.2 | | 1.5 | 2.2 | |
| Rise time | $C_L$ = 1 nF,          $T_J$ = 25°C | | 50 | 150 | | 50 | 150 | ns |
| Fall time | $C_L$ = 1 nF,          $T_J$ = 25°C | | 50 | 150 | | 50 | 150 | ns |

† All typical values are at $T_J$ = 25°C.
NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### undervoltage lockout section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Start threshold voltage | UCx842,          UCx844 | 15 | 16 | 17 | 14.5 | 16 | 17.5 | V |
| | UCx843,          UCx845 | 7.8 | 8.4 | 9 | 7.8 | 8.4 | 9 | |
| Minimum operating voltage after start-up | UCx842,          UCx844 | 9 | 10 | 11 | 8.5 | 10 | 11.5 | V |
| | UCx843,          UCx845 | 7 | 7.6 | 8.2 | 7 | 7.6 | 8.2 | |

† All typical values are at $T_J$ = 25°C.
NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### pulse-width-modulator section

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Maximum duty cycle | UCx842,          UCx843 | 95% | 97% | 100% | 95% | 97% | 100% | |
| | UCx844,          UCx845 | 46% | 48% | 50% | 46% | 48% | 50% | |
| Minimum duty cycle | | | | 0 | | | 0 | |

† All typical values are at $T_J$ = 25°C.
NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### supply voltage

| PARAMETER | TEST CONDITIONS | UC284x MIN | UC284x TYP† | UC284x MAX | UC384x MIN | UC384x TYP† | UC384x MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Start-up current | | | 0.5 | 1 | | 0.5 | 1 | mA |
| Operating supply current | VFB and ISENSE at 0 V | | 11 | 17 | | 11 | 17 | mA |
| Limiting voltage | $I_{CC}$ = 25 mA | | 34 | | | 34 | | V |

† All typical values are at $T_J$ = 25°C.
NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

## TEXAS
## INSTRUMENTS

## electrical characteristics, $V_{CC} = 15$ V (see Note 2), $R_T = 10$ k$\Omega$, $C_T = 3.3$ nF, $T_J = 25°$C (unless otherwise specified)

### reference section

| PARAMETER | TEST CONDITIONS | UC384xY | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Output voltage | $I_O = 1$ mA | | 5 | | V |
| Line regulation | $V_{CC} = 12$ V to 25 V | | 6 | | mV |
| Load regulation | $I_O = 1$ mA to 20 mA | | 6 | | mV |
| Temperature coefficient of output voltage | | | 0.2 | | mV√°C |
| Output noise voltage | f = 10 Hz to 10 kHz | | 50 | | µV |
| Output voltage long-term drift | After 1000 h at $T_A = 25°$C | | 5 | | mV |
| Short-circuit output current | | | −100 | | mA |

NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### oscillator section

| PARAMETER | TEST CONDITIONS | UC384xY | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Oscillator frequency (see Note 3) | | | 52 | | kHz |
| Frequency change with supply voltage | $V_{CC} = 12$ V to 25 V | | 2 | | Hz/kHz |
| Frequency change with temperature | | | 5 | | Hz/kHz |
| Peak-to-peak amplitude at RT/CT | | | 1.7 | | V |

NOTES:   2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.
3.   Output frequency equals oscillator frequency for the UCx842 and UCx843. Output frequency is one-half oscillator frequency for the UCx844 and UCx845.

### error amplifier section

| PARAMETER | TEST CONDITIONS | UC384xY | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Feedback input voltage | COMP at 2.5 V | | 2.50 | | V |
| Input bias current | | | −0.3 | | µA |
| Open-loop voltage amplification | $V_O = 2$ V to 4 V | | 90 | | dB |
| Gain-bandwidth product | | | 1 | | MHz |
| Supply voltage rejection ratio | $V_{CC} = 12$ V to 25 V | | 70 | | dB |
| Output sink current | VFB at 2.7 V,          COMP at 1.1 V | | 6 | | mA |
| Output source current | VFB at 2.3 V,          COMP at 5 V | | −0.8 | | mA |
| High-level output voltage | VFB at 2.3 V,          $R_L = 15$ k$\Omega$ to GND | | 6 | | V |
| Low-level output voltage | VFB at 2.7 V,          $R_L = 15$ k$\Omega$ to GND | | 0.7 | | V |

NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### current sense section

| PARAMETER | TEST CONDITIONS | UC384xY | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Voltage amplification | See Notes 4 and 5 | | 3 | | V/V |
| Current sense comparator threshold | COMP at 5 V,          See Note 4 | | 1 | | V |
| Supply voltage rejection ratio | $V_{CC} = 12$ V to 25 V,   See Note 4 | | 70 | | dB |
| Input bias current | | | −2 | | µA |
| Delay time to output | | | 150 | | ns |

NOTES:   2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.
4.    These parameters are measured at the trip point of the latch with VFB at 0 V.
5.   Voltage amplification is measured between ISENSE and COMP with the input changing from 0 V to 0.8 V.

![Texas Instruments logo] **TEXAS INSTRUMENTS**

## electrical characteristics, $V_{CC}$ = 15 V (see Note 2), $R_T$ = 10 k$\Omega$, $C_T$ = 3.3 nF, $T_J$ = 25$°$C (unless otherwise specified) (continued)

### output section

| PARAMETER | TEST CONDITIONS | UC384xY | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| High-level output voltage | $I_{OH}$ = −20 mA | | 13.5 | | V |
| | $I_{OH}$ = −200 mA | | 13.5 | | |
| Low-level output voltage | $I_{OL}$ = 20 mA | | 0.1 | | V |
| | $I_{OL}$ = 200 mA | | 1.5 | | |
| Rise time | $C_L$ = 1 nF | | 50 | | ns |
| Fall time | $C_L$ = 1 nF | | 50 | | ns |

NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### undervoltage lockout section

| PARAMETER | TEST CONDITIONS | | UC384xY | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Start threshold voltage | UC3842Y, | UC3844Y | | 16 | | V |
| | UC3843Y, | UC3845Y | | 8.4 | | |
| Minimum operating voltage after start-up | UC3842Y, | UC3844Y | | 10 | | V |
| | UC3843Y, | UC3845Y | | 7.6 | | |

NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### pulse-width-modulator section

| PARAMETER | TEST CONDITIONS | | UC384xY | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Maximum duty cycle | UC3842Y, | UC3843Y | | 97% | | |
| | UC3844Y, | UC3845Y | | 48% | | |

NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.

### supply voltage

| PARAMETER | TEST CONDITIONS | UC384xY | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Start-up current | | | 0.5 | 1 | mA |
| Operating supply current | VFB and ISENSE at 0 V | | 11 | 17 | mA |
| Limiting voltage | $I_{CC}$ = 25 mA | | 34 | | V |

NOTE 2.   Adjust $V_{CC}$ above the start threshold before setting it to 15 V.
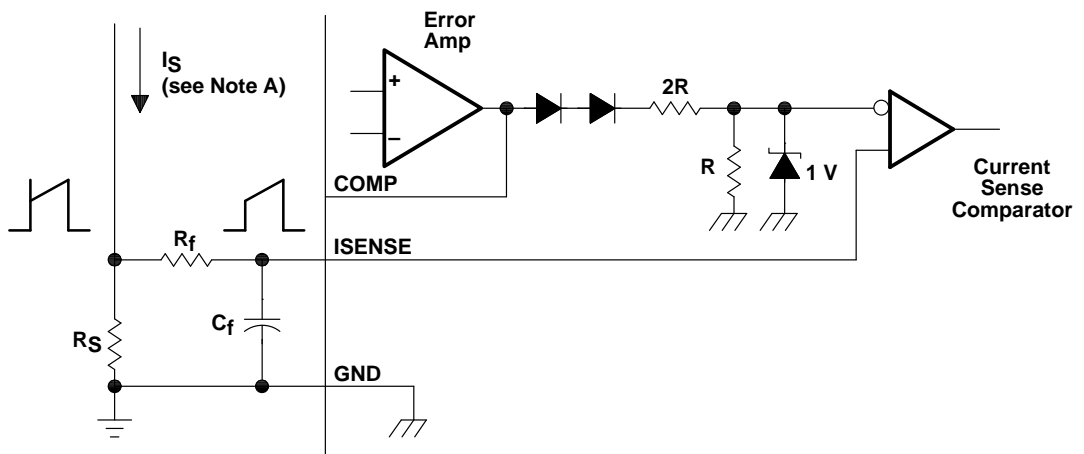
# TEXAS
# INSTRUMENTS

## APPLICATION INFORMATION
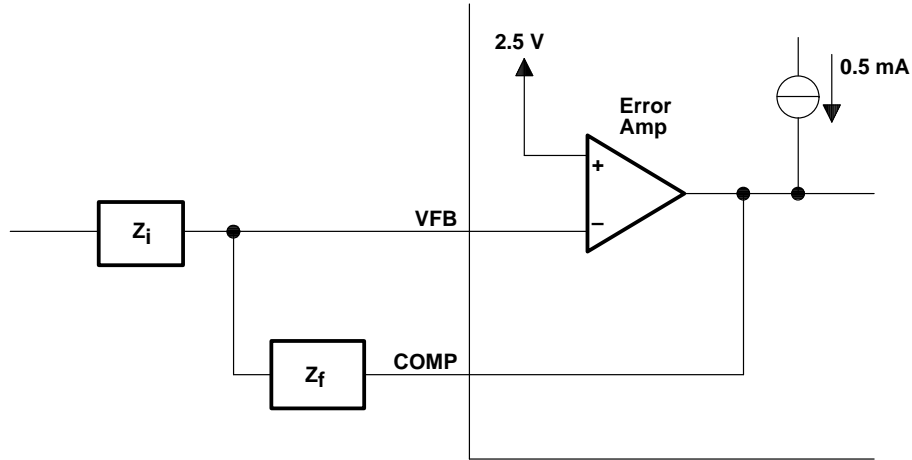


NOTE A.   Error amplifier can source or sink up to 0.5 mA.

**Figure 1. Error Amplifier Configuration**

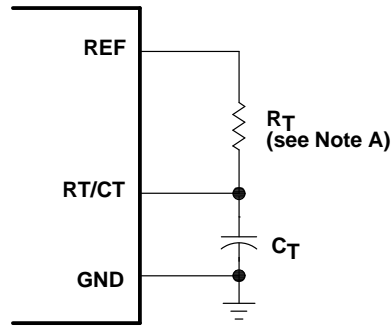

NOTE A: Peak current ($I_S$) is determined by the formula:

$$I_{S(max)} = \frac{1\ V}{R_S}$$

A small RC filter formed by resistor $R_f$ and capacitor $C_f$ may be required to suppress switch transients.

**Figure 2. Current Sense Circuit**

## APPLICATION INFORMATION



NOTE A: For $R_T > 5 \text{ K}\Omega$ $\quad f \approx \dfrac{1.72}{R_T C_T}$
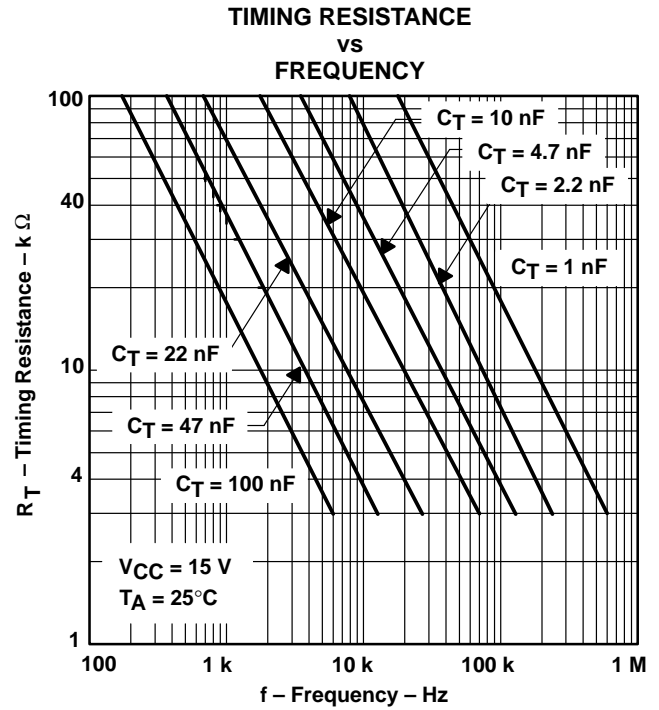
**Figure 3. Oscillator Section**



**DEAD TIME**
**vs**
**TIMING CAPACITANCE**

$V_{CC} = 15 \text{ V}$
$R_T \geq 5 \text{ k}\Omega$
$T_A = 25°C$

**Figure 4**



**TIMING RESISTANCE**
**vs**
**FREQUENCY**

$C_T = 10 \text{ nF}$
$C_T = 4.7 \text{ nF}$
$C_T = 2.2 \text{ nF}$
$C_T = 1 \text{ nF}$
$C_T = 22 \text{ nF}$
$C_T = 47 \text{ nF}$
$C_T = 100 \text{ nF}$
$V_{CC} = 15 \text{ V}$
$T_A = 25°C$

**Figure 5**
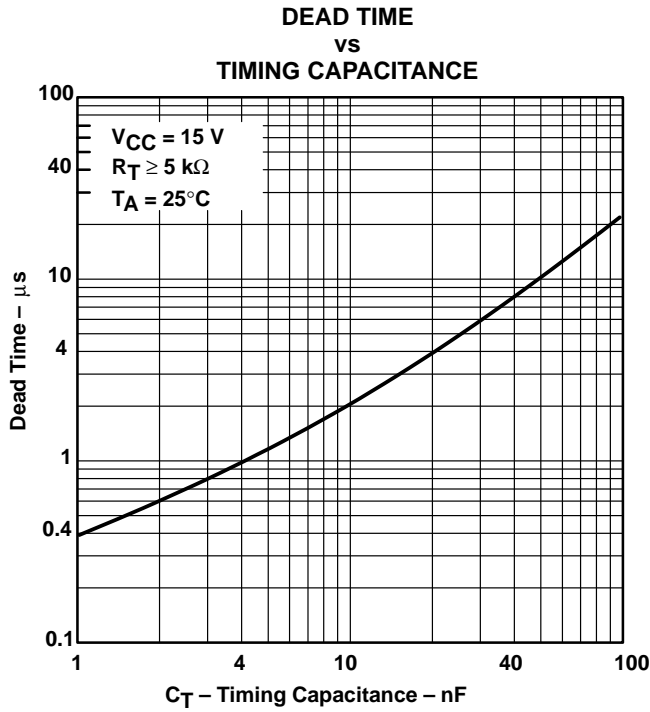
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## APPLICATION INFORMATION

### open-loop laboratory test fixture

In the open-loop laboratory test fixture shown in Figure 6, high-peak currents associated with loads necessitate careful grounding techniques. Timing and bypass capacitors should be connected close to the GND terminal in a single-point ground. The transistor and 5-kΩ potentiometer sample the oscillator waveform and apply an adjustable ramp to the ISENSE terminal.
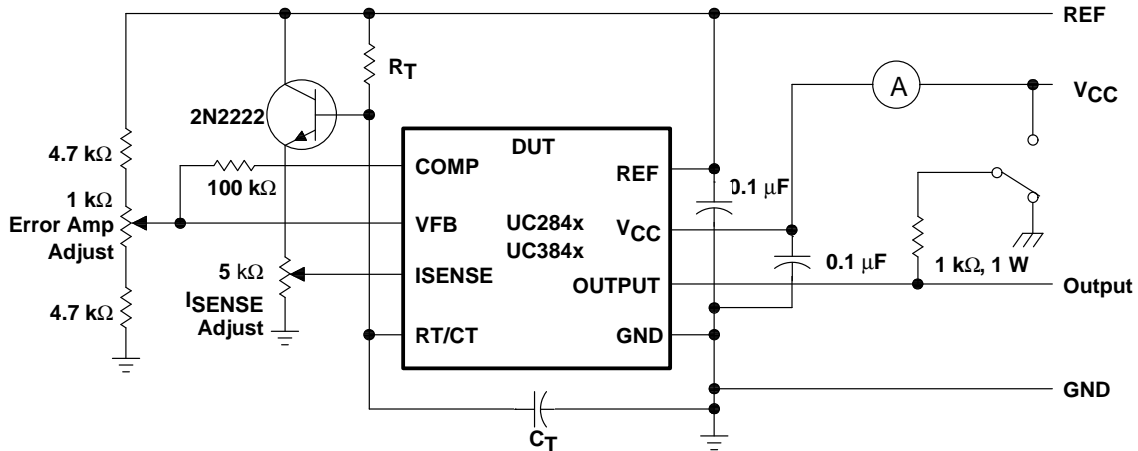
**Figure 6. Open-Loop Laboratory Test Fixture**

### shutdown technique

Shutdown of the PWM controller (see Figure 7) can be accomplished by two methods: either raise the voltage at ISENSE above 1 V or pull the COMP terminal below a voltage two diode drops above ground. Either method causes the output of the PWM comparator to be high (refer to block diagram). The PWM latch is reset dominant so that the output remains low until the next clock cycle after the shutdown condition at the COMP or ISENSE terminal is removed. In one example, an externally latched shutdown may be accomplished by adding an SCR that resets by cycling $V_{CC}$ below the lower UVLO threshold. At this point the reference turns off, allowing the SCR to reset.
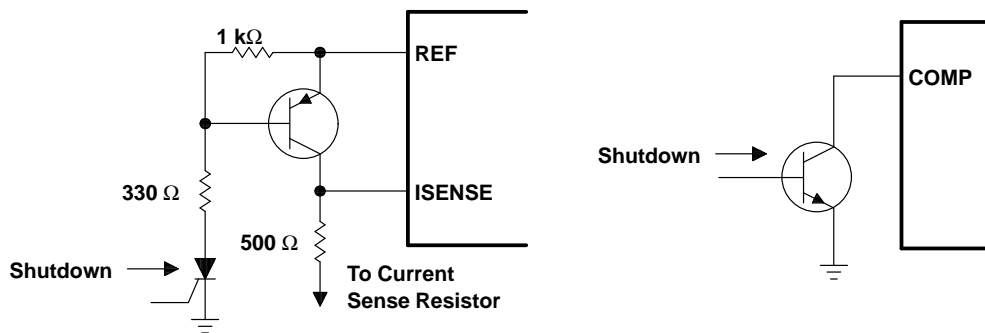
**Figure 7. Shutdown Techniques**

## APPLICATION INFORMATION

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% (see Figure 8). Note that capacitor C forms a filter with R2 to suppress the leading-edge switch spikes.
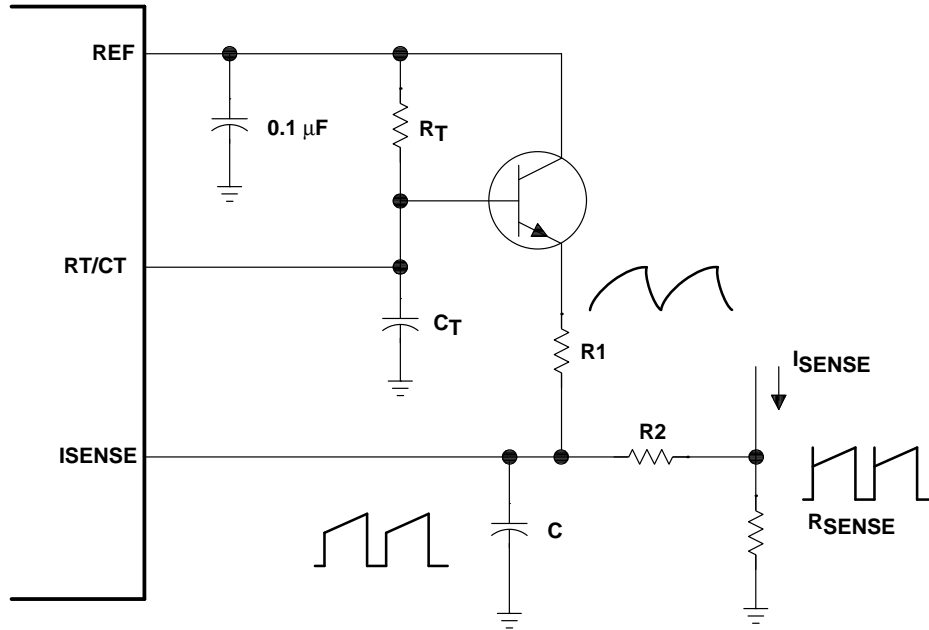


**Figure 8. Slope Compensation**

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