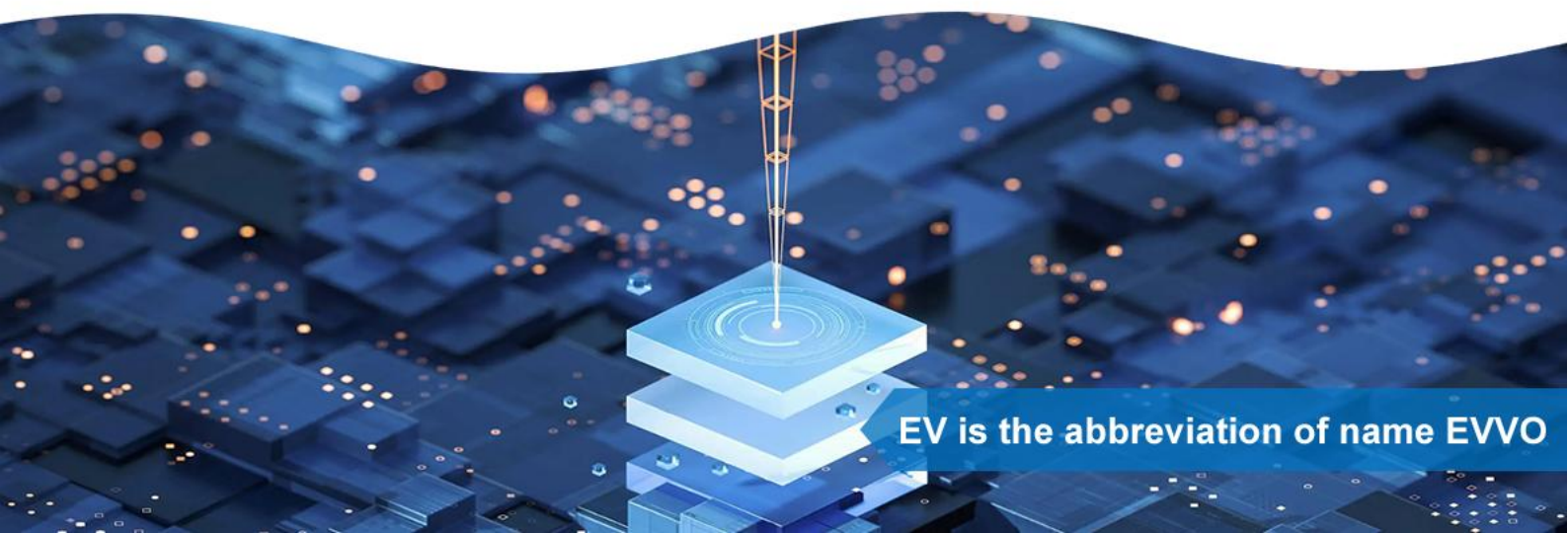
EVVOSEMI®

THINK CHANGE DO


# Product Specification

| | |
|---|---|
| Domestic Part Number | UC2842/43/44/45 |
| Overseas Part Number | UC2842/43/44/45 |
| Equivalent Part Number | UC2842/43/44/45 |



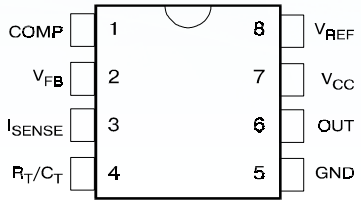
## Description

The 2842/43/44/45 are fixed frequency current mode PWM controller. They are specially designed for OFF−Line and DC to DC converter applications with a minimal external components. Internally implemented circuits include a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and a high current totempole output ideally suited for driving a power MOSFET. Protection circuitry includes built undervoltage lockout and current limiting. The 2842 and 2844 have UVLO thresholds of 16 V (on) and 10 V (off). The corresponding thresholds for the 2843/45 are 8.4V (on) and 7.6V (off). The 2842 and 2843 can operate within 100% duty cycle. The 2844 and 2845 can operate within 50% duty cycle.
The 284X has Start-Up Current 0.5mA (typ).

## Features

- Low Start-Up and Operating Current
- High Current Totem Pole Output
- Undervoltage Lockout With Hysteresis
- Operating Frequency Up To 500KHz

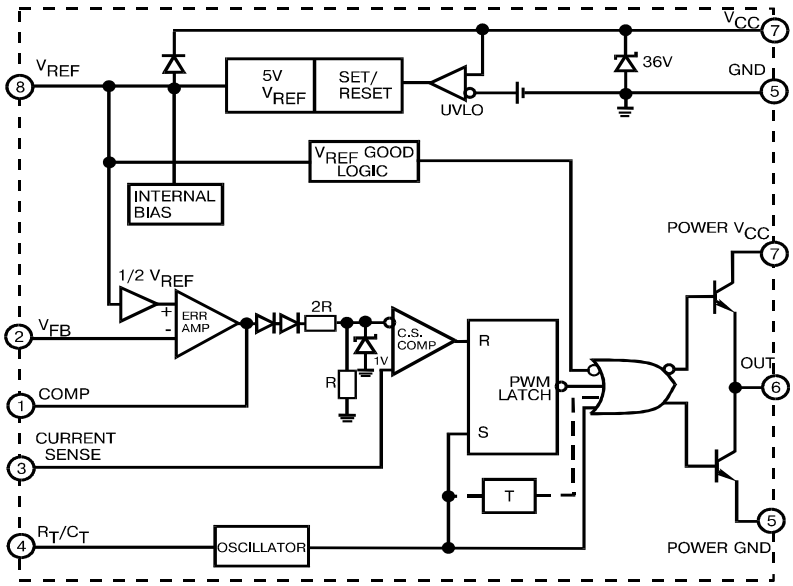
## Pin Connection




Top view

## Block diagram

(toggle flip flop used only in 2844, 2845)




## Absolute Maximum Ratings

| Symbol | Parameter | Maximum | Units |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage (low impedance source) | 30 | V |
| $I_O$ | Output Current | ±1 | A |
| $V_I$ | Input Voltage (Analog Inputs pins 2,3) | −0.3 to 5.5 | V |
| $I_{SINK\ (E.A)}$ | Error Amp Output Sink Current | 10 | mA |
| Po | Power Dissipation ($T_A$=25$^0$C) | 1 | W |
| Tstg | Storage Temperature Range | -65 to150 | $^o$C |
| $T_L$ | Lead Temperature (soldering 5 sec.) | 260 | $^o$C |
| $T_A$ | Operating Ambient Temperature | -25 to +85 | $^o$C |

## Electrical characteristics

(*$V_{CC}$=15V, $R_T$=10kΩ, $C_T$=3.3nF, $T_A$=$0^0$C to +$70^0$C, unless otherwise specified)

| Characteristics | Symbol | Test Conditions | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| **Reference Section** | | | | | | | |
| Reference Output Voltage | $V_{REF}$ | $T_J$ = 25°C, $I_{REF}$ = 1 mA | | 4.9 | 5.0 | 5.1 | V |
| Line Regulation | $\Delta V_{REF}$ | 12V ⩽ $V_{CC}$ ⩽ 25 V | | | 6.0 | 20 | mV |
| Load Regulation | $\Delta V_{REF}$ | 1 mA ⩽ $I_{REF}$ ⩽ 20mA | | | 6.0 | 25 | |
| Short Circuit Output Current | $I_{SC}$ | $T_A$ = 25°C | | | -100 | -180 | mA |
| **Oscillator Section** | | | | | | | |
| Oscillation Frequency | f | $T_J$ = 25°C | 284X | 47 | 50 | 57 | KHz |
| | | | 284X | 47 | 52 | 57 | |
| Frequency Change with Voltage | $\Delta f/\Delta V_{CC}$ | 12V ⩽ $V_{CC}$ ⩽ 25 V | | | 0.05 | 1.0 | % |
| Oscillator Amplitude | $V_{(OSC)}$ | (peak to peak) | | | 1.6 | | V |
| **Error Amplifier Section** | | | | | | | |
| Input Bias Current | $I_{BIAS}$ | $V_{FB}$=3V | | | -0.1 | -2 | µA |
| Input Voltage | $V_{I(E.A)}$ | $V_{pin1}$ = 2.5V | | 2.42 | 2.5 | 2.58 | V |
| Open Loop Voltage Gain | $A_{VOL}$ | 2V ⩽ $V_0$ ⩽ 4V | | 65 | 90 | | dB |
| Power Supply Rejection Ratio | PSRR | 12V ⩽ $V_{CC}$ ⩽ 25 V | | 60 | 70 | | |
| Output Sink Current | $I_{SINK}$ | $V_{pin2}$ = 2.7V, $V_{pin1}$ = 1.1V | | 2 | 7 | | mA |
| Output Source Current | $I_{SOURCE}$ | $V_{pin2}$ = 2.3V, $V_{pin1}$ = 5V | | -0.5 | -1.0 | | mA |
| High Output Voltage | $V_{OH}$ | $V_{pin2}$ = 2.3V, $R_L$ = 15KΩ to GND | | 5.0 | 6.0 | | V |
| Low Output Voltage | $V_{OL}$ | $V_{pin2}$ = 2.7V, $R_L$ = 15KΩ to PIN 8 | | | 0.8 | 1.1 | |
| **Current Sense Section** | | | | | | | |
| Gain | $G_V$ | (Note 1 & 2) | | 2.85 | 3.0 | 3.15 | V/V |
| Maximum Input Signal | $V_{I(MAX)}$ | $V_{pin1}$ = 5V (Note1) | | 0.9 | 1.0 | 1.1 | V |
| Supply Voltage Rejection | SVR | 12V ⩽ $V_{CC}$ ⩽ 25 V (Note 1) | | | 70 | | dB |
| Input Bias Current | $I_{BIAS}$ | $V_{pin3}$ = 3V | | | -3.0 | -10 | µA |
| **Output Section** | | | | | | | |
| Low Output Voltage | $V_{OL}$ | $I_{SINK}$ = 20 mA | | | 0.08 | 0.4 | V |
| | | $I_{SINK}$ = 200 mA | | | 1.4 | 2.2 | |
| High Output Voltage | $V_{OH}$ | $I_{SINK}$ = 20 mA | | 13 | 13.5 | | |
| | | $I_{SINK}$ = 200 mA | | 12 | 13.0 | | |
| Rise Time | $t_R$ | $T_J$ = 25°C, $C_L$ = 1nF (Note 3) | | | 45 | 150 | nS |
| Fall Time | $t_F$ | $T_J$ = 25°C, $C_L$ = 1nF (Note 3) | | | 35 | 150 | |
| **Undervoltage Lockout Section** | | | | | | | |
| Start Theshold | $V_{TH(ST)}$ | 2842/44 | | 14.5 | 16.0 | 17.5 | V |
| | | 2843/45 | | 7.8 | 8.4 | 9.0 | |
| Min. Operating Voltage (After Turn On) | $V_{OPR(min)}$ | 2842/44 | | 8.5 | 10 | 11.5 | V |
| | | 2843/45 | | 7.0 | 7.6 | 8.2 | |
| **PWM Section** | | | | | | | |
| Max. Duty Cycle | $D_{(MAX)}$ | 2842/43 | | 95 | 97 | 100 | % |
| | | 2844/45 | | 47 | 48 | 50 | |
| Min. Duty Cycle | $D_{(MAX)}$ | | | | | 0 | |
| **Total Standby Current** | | | | | | | |
| Start-Up Current | $I_{ST}$ | 284X | | | 0.05 | | mA |
| Operating Supply Current | $I_{CC\ (OPR)}$ | $V_{pin3}$ = $V_{pin2}$= 0V | | | 13 | 17 | |
| Zener Voltage | $V_Z$ | $I_{CC}$=25 mA | | 30 | 38 | | V |

* - Adjust $V_{CC}$ above the start threshold before setting it to 15V.
Note 1: Parameter measured at trip point of latch with $V_{pin2}$=0.
Note 2: Gain defined as A=$\Delta V_{pin1}/\Delta V_{pin3}$ ; 0 ≤ $V_{pin3}$ ≤ 0.8V.
Note 3: These parameters, although guaranteed, are not 100% tested in production.

## Pin functions

| N | Function | Description |
|---|---|---|
| 1 | COMP | This pin is the Error Amplifier output and is made for loop compensation. |
| 2 | $V_{FB}$ | This is the inverting input of the Error Amplifier. It is normally connected to the switching power supply output through a resistor divider. |
| 3 | $I_{SENSE}$ | 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. |
| 5 | GROUND | This pin is the combined control circuitry and power ground. |
| 6 | OUTPUT | This output directly drives the gate of a power MOSFET. Peak currents up to 1A are sourced and sink by this pin. |
| 7 | $V_{CC}$ | This pin is the positive supply of the integrated circuit. |
| 8 | $V_{ref}$ | This is the reference output. It provides charging current for capacitor $C_T$ through resistor $R_T$. |

## Application information

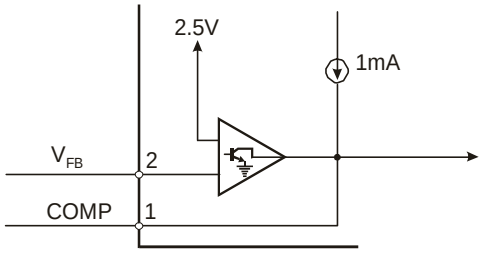



Figure 1. Error Amp Configuration

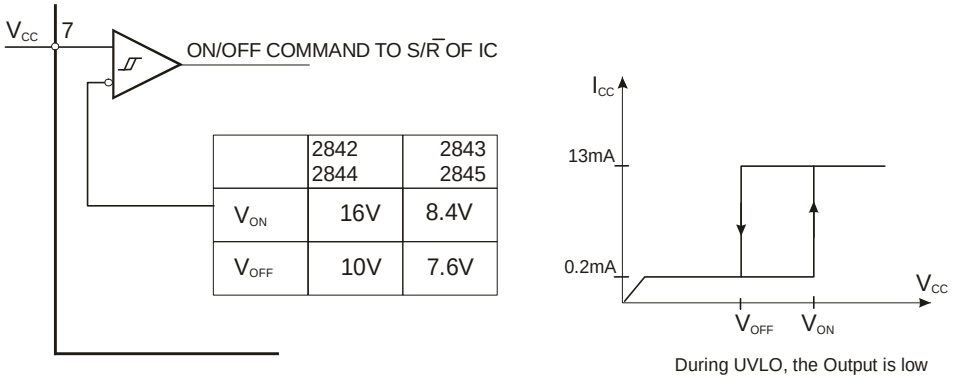



Figure 2. Undervoltage Lockout

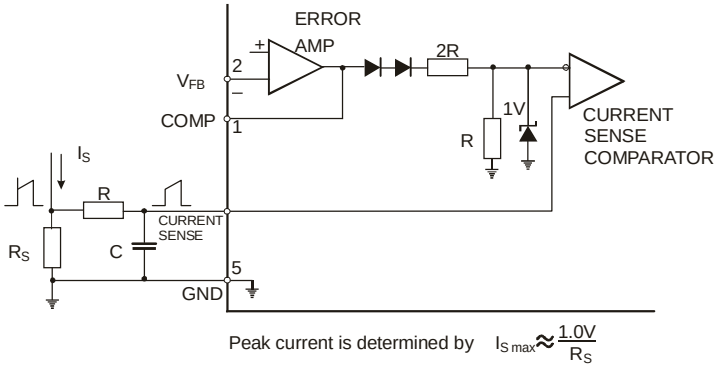



Figure 3. Current Sense Circuit

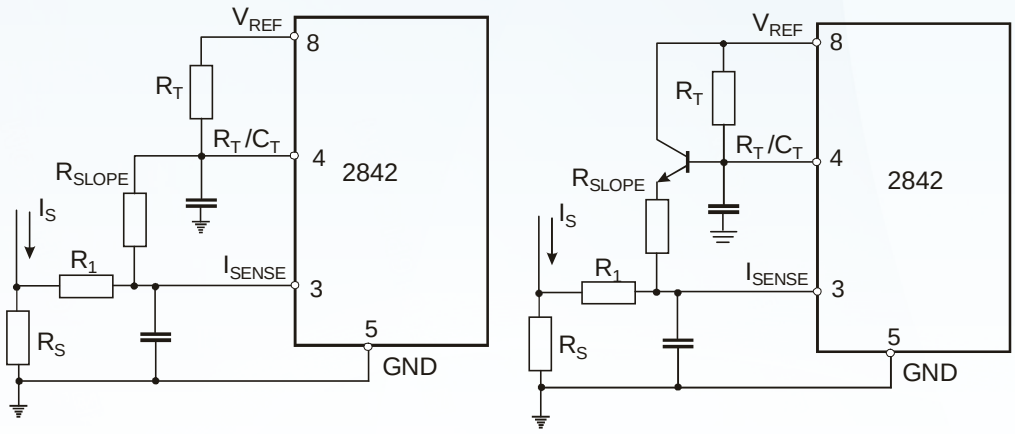
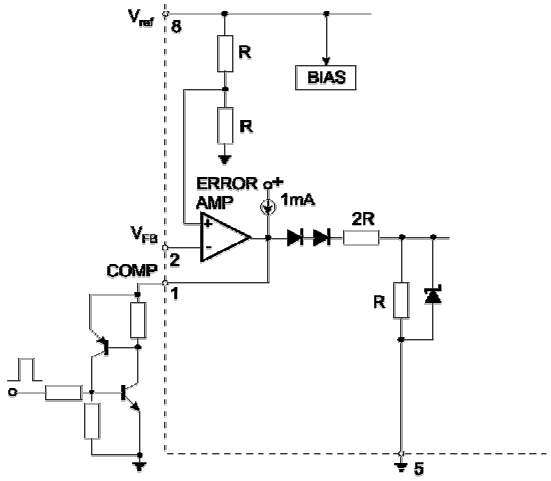
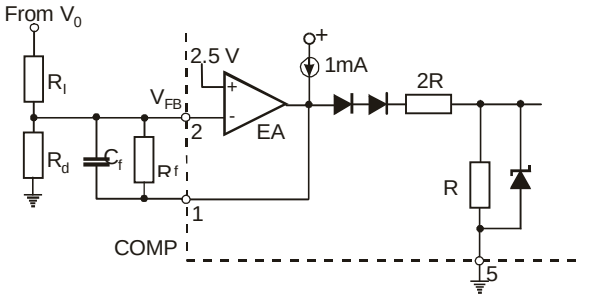



Figure 4. Slope Compensation Techniques

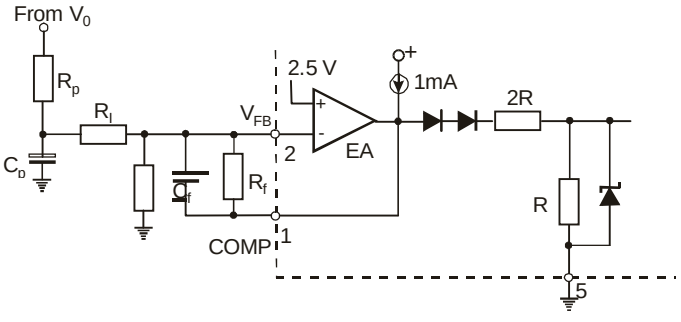



SCR must be selected for a holding current of less than 0.5mA.
The simple two transistor circuit can be used in place of the SCR as shown.

Figure 5. Latched Shutdown




Error Amp compensation circuit for stabilizing any current-mode topology except for boost and flyback converters operating with continuous inductor current.




Error Amp compensation circuit for stabilizing current-mode boost and flyback topologies operating with continuous inductor current.

Figure 6. Error Amplifier Compensation

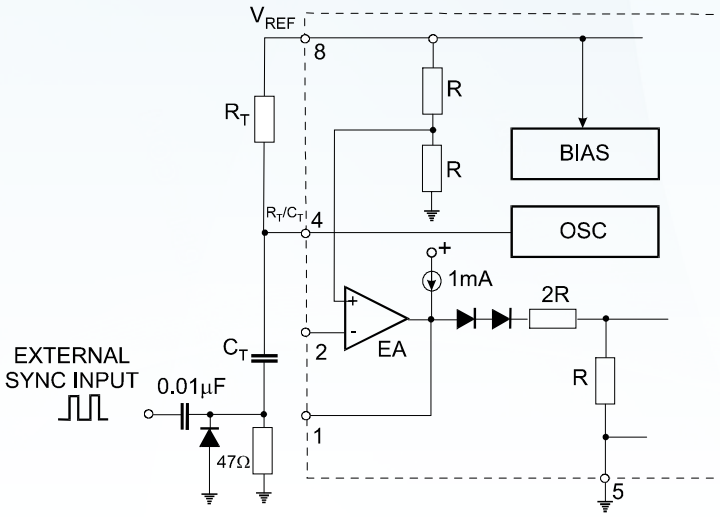



Figure 7. External Clock Synchronization

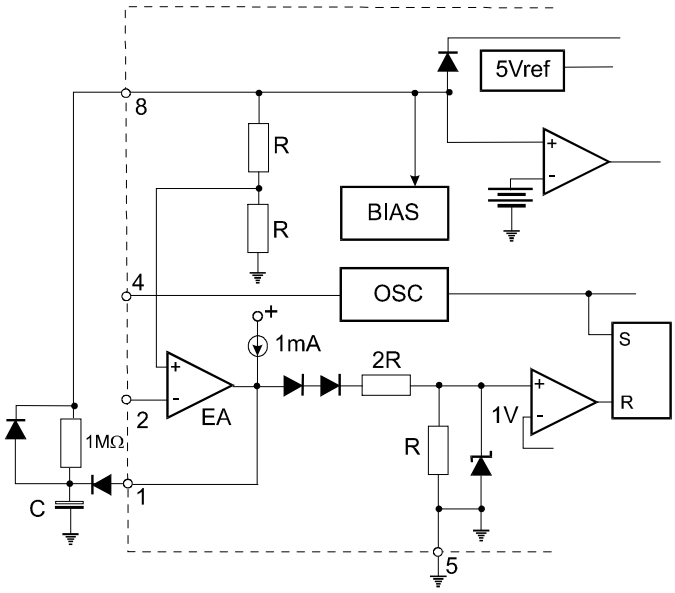



Figure 8. Soft-Start Circuit

## Typical Performance Characteristics

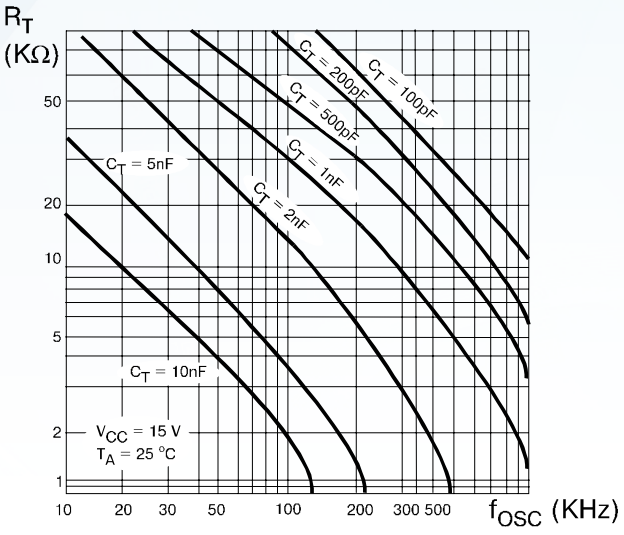



Figure 1. Timing Resistor vs. Oscillator Frequency

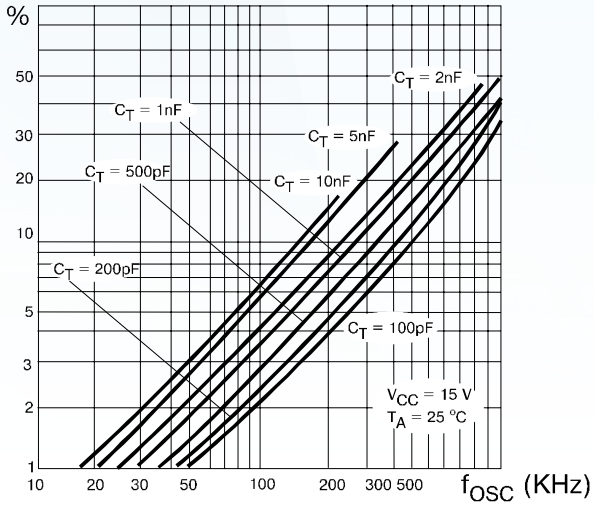



Figure 2. Output Dead-Time vs. Oscillator Frequency

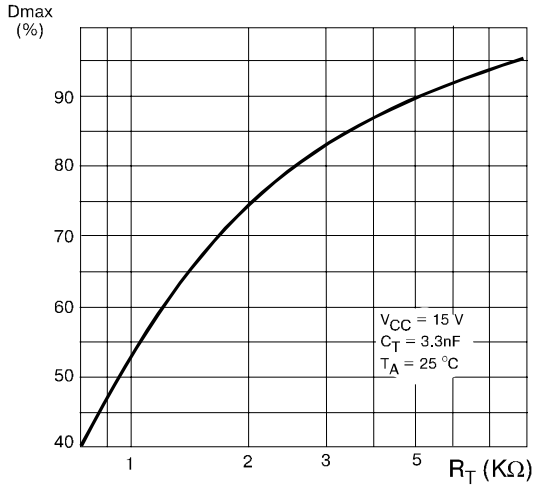



Figure 3. Maximum Output Duty Cycle vs. Timing Resistor (UC3842/43)

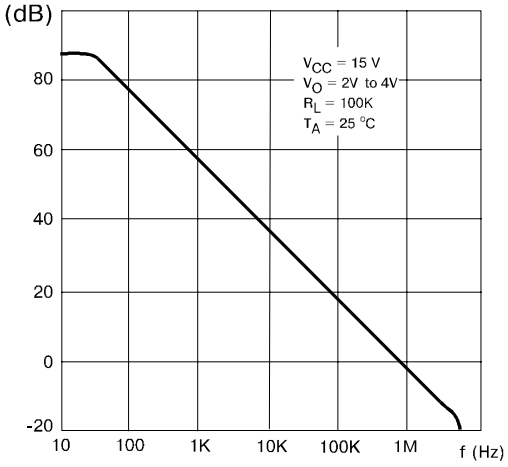



Figure 4. Error Amp Open-Loop Gain vs. Frequency

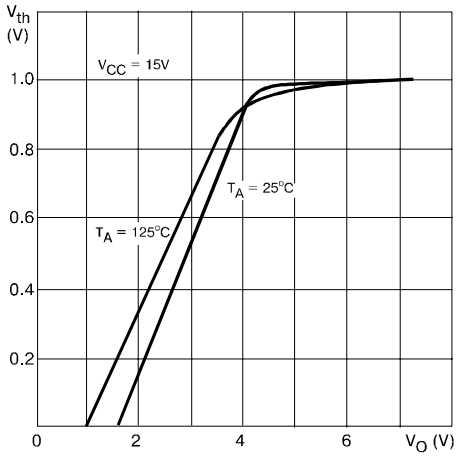



Figure 5. Current Sense Input Threshold vs. Error Amp Output Voltage

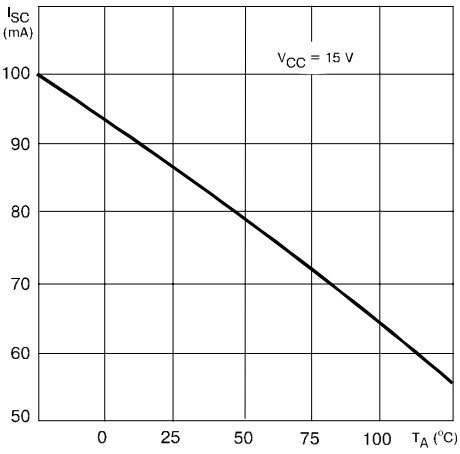



Figure 6. Reference Short Circuit Current vs. Temperature

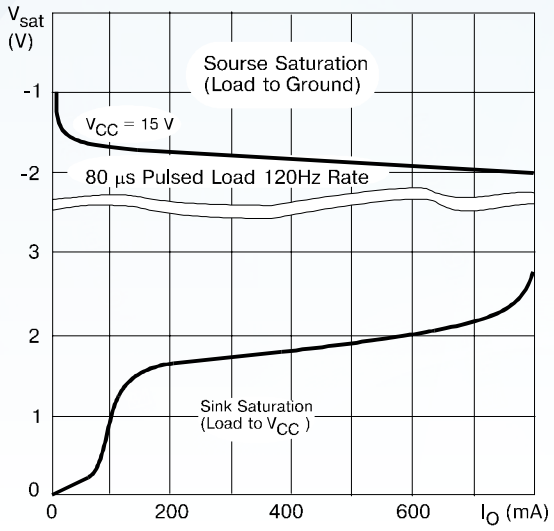



Figure 7. Output Saturation Voltage vs. Load Current
$T_A$ = 25°C

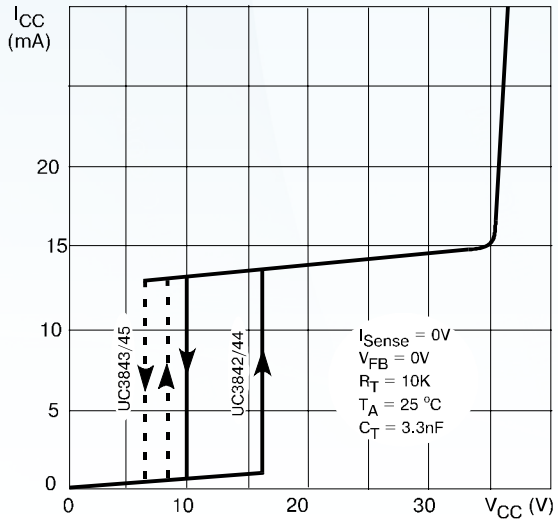



Figure 8. Supply Current vs. Supply Voltage

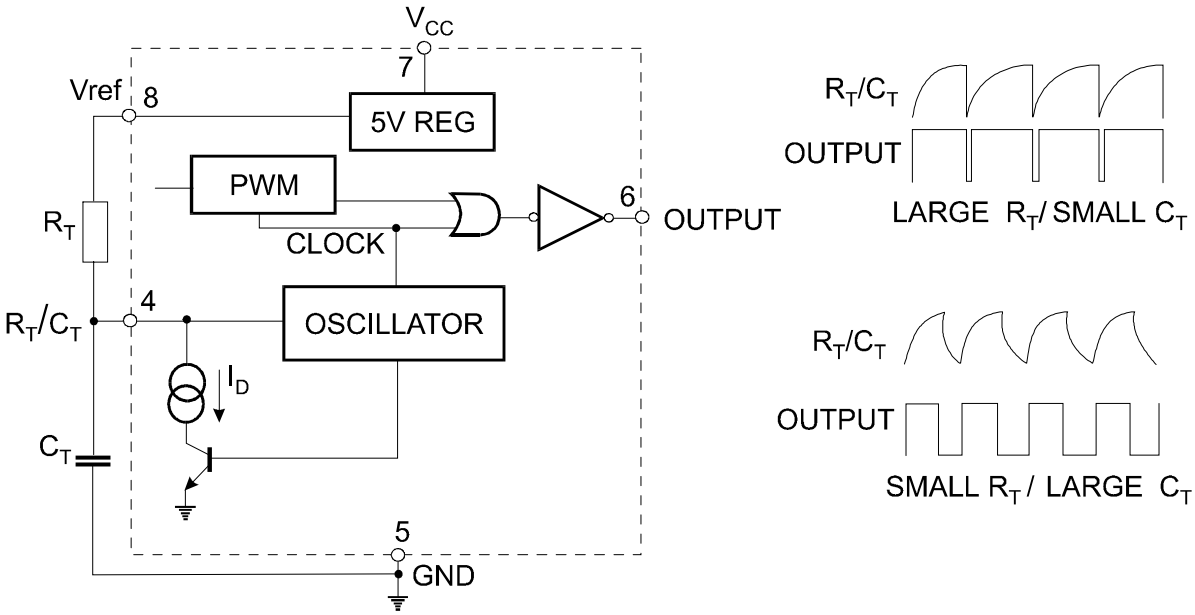



Figure 9. Oscillator and Output Waveforms

## Ordering information

| Order code | Package | Baseqty | Deliverymode |
|---|---|---|---|
| UC2842B | SOP-8 | 2500 | Tape and reel |
| UC2843B | SOP-8 | 2500 | Tape and reel |
| UC2844B | SOP-8 | 2500 | Tape and reel |
| UC2845B | SOP-8 | 2500 | Tape and reel |

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