UC3842B, UC3843B, UC2842B, UC2843B

High Performance Current Mode Controllers

The UC3842B, UC3843B series are high performance fixed frequency current mode controllers. They are specifically designed for Off−Line and DC−DC converter applications offering the designer a cost−effective solution with minimal external components. These integrated circuits feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and a high current totem pole output ideally suited for driving a power MOSFET.

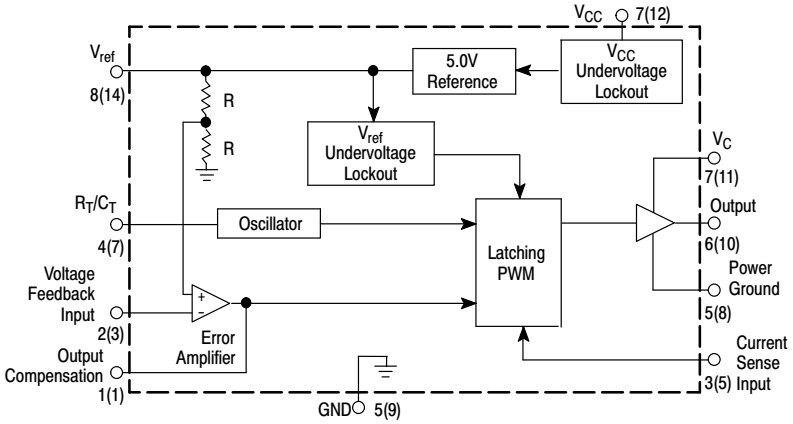
Also included are protective features consisting of input and reference undervoltage lockouts each with hysteresis, cycle−by−cycle current limiting, programmable output deadtime, and a latch for single pulse metering.

These devices are available in an 8−pin dual−in−line and surface mount (SOIC−8) plastic package as well as the 14−pin plastic surface mount (SOIC−14). The SOIC−14 package has separate power and ground pins for the totem pole output stage.

The UCX842B has UVLO thresholds of 16 V (on) and 10 V (off), ideally suited for off−line converters. The UCX843B is tailored for lower voltage applications having UVLO thresholds of 8.5 V (on) and 7.6 V (off).

Features

- Trimmed Oscillator for Precise Frequency Control
- Oscillator Frequency Guaranteed at 250 kHz
- Current Mode Operation to 500 kHz
- Automatic Feed Forward Compensation
- Latching PWM for Cycle−By−Cycle Current Limiting
- Internally Trimmed Reference with Undervoltage Lockout
- High Current Totem Pole Output
- Undervoltage Lockout with Hysteresis
- Low Startup and Operating Current
- Pb−Free Packages are Available



Pin numbers in parenthesis are for the D suffix SOIC−14 package.

Figure 1. Simplified Block Diagram

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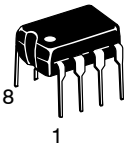
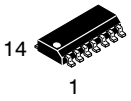


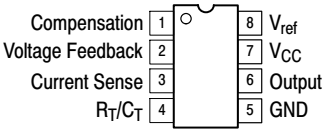
PDIP−8
N SUFFIX
CASE 626



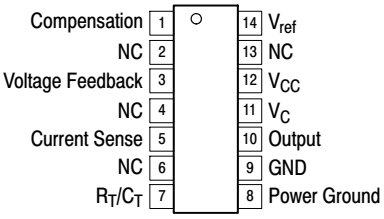
SOIC−14
D SUFFIX
CASE 751A

SOIC−8
D1 SUFFIX
CASE 751

PIN CONNECTIONS



(Top View)



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 16 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 18 of this data sheet.

Publication Order Number:
UC3842B/D

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Bias and Driver Voltages (Zero Series Impedance, see also Total Device spec)	V_{CC}, V_C	30	V
Total Power Supply and Zener Current	$(I_{CC} + I_Z)$	30	mA
Output Current, Source or Sink	I_O	1.0	A
Output Energy (Capacitive Load per Cycle)	W	5.0	μJ
Current Sense and Voltage Feedback Inputs	V_{in}	– 0.3 to + 5.5	V
Error Amp Output Sink Current	I_O	10	mA
Power Dissipation and Thermal Characteristics			
D Suffix, Plastic Package, SOIC−14 Case 751A			
Maximum Power Dissipation @ T_A = 25°C	P_D	862	mW
Thermal Resistance, Junction−to−Air	$R_{\theta JA}$	145	°C/W
D1 Suffix, Plastic Package, SOIC−8 Case 751			
Maximum Power Dissipation @ T_A = 25°C	P_D	702	mW
Thermal Resistance, Junction−to−Air	$R_{\theta JA}$	178	°C/W
N Suffix, Plastic Package, Case 626			
Maximum Power Dissipation @ T_A = 25°C	P_D	1.25	W
Thermal Resistance, Junction−to−Air	$R_{\theta JA}$	100	°C/W
Operating Junction Temperature	T_J	+150	°C
Operating Ambient Temperature	T_A		°C
UC3842B, UC3843B		0 to 70	
UC2842B, UC2843B		– 25 to + 85	
UC3842BV, UC3843BV		−40 to +105	
Storage Temperature Range	T_{stg}	– 65 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. This device series contains ESD protection and exceeds the following tests:
   Human Body Model 4000 V per JEDEC Standard JESD22-A114B
   Machine Model Method 200 V per JEDEC Standard JESD22-A115-A
2. This device contains latch-up protection and exceeds 100 mA per JEDEC Standard JESD78

ELECTRICAL CHARACTERISTICS (V_{CC} = 15 V [Note 3], R_T = 10 k, C_T = 3.3 nF. For typical values T_A = 25°C, for min/max values T_A is the operating ambient temperature range that applies [Note 4], unless otherwise noted.)

Characteristics	Symbol	UC284XB			UC384XB, XBV			Unit
		Min	Typ	Max	Min	Typ	Max	
REFERENCE SECTION								
Reference Output Voltage (I_O = 1.0 mA, T_J = 25°C)	V_{ref}	4.95	5.0	5.05	4.9	5.0	5.1	V
Line Regulation (V_{CC} = 12 V to 25 V)	Reg_{line}	–	2.0	20	–	2.0	20	mV
Load Regulation (I_O = 1.0 mA to 20 mA)	Reg_{load}	–	3.0	25	–	3.0	25	mV
Temperature Stability	T_S	–	0.2	–	–	0.2	–	mV/°C
Total Output Variation over Line, Load, and Temperature	V_{ref}	4.9	–	5.1	4.82	–	5.18	V
Output Noise Voltage (f = 10 Hz to 10 kHz, T_J = 25°C)	V_n	–	50	–	–	50	–	μV
Long Term Stability (T_A = 125°C for 1000 Hours)	S	–	5.0	–	–	5.0	–	mV
Output Short Circuit Current	I_{SC}	– 30	– 85	–180	– 30	– 85	–180	mA
OSCILLATOR SECTION								
Frequency T_J = 25°C T_A = T_{low} to T_{high} T_J = 25°C (R_T = 6.2 k, C_T = 1.0 nF)	f_{OSC}	 49 48 225	 52 – 250	 55 56 275	 49 48 225	 52 – 250	 55 56 275	kHz
Frequency Change with Voltage (V_{CC} = 12 V to 25 V)	$\Delta f_{OSC}/\Delta V$	–	0.2	1.0	–	0.2	1.0	%
Frequency Change with Temperature, T_A = T_{low} to T_{high}	$\Delta f_{OSC}/\Delta T$	–	1.0	–	–	0.5	–	%
Oscillator Voltage Swing (Peak–to–Peak)	V_{OSC}	–	1.6	–	–	1.6	–	V
Discharge Current (V_{OSC} = 2.0 V) T_J = 25°C, T_A = T_{low} to T_{high} UC284XB, UC384XB UC384XBV	I_{dischg}	 7.8 7.5 –	 8.3 – –	 8.8 8.8 –	 7.8 7.6 7.2	 8.3 – –	 8.8 8.8 8.8	mA
ERROR AMPLIFIER SECTION								
Voltage Feedback Input (V_O = 2.5 V)	V_{FB}	2.45	2.5	2.55	2.42	2.5	2.58	V
Input Bias Current (V_{FB} = 5.0 V)	I_{IB}	–	– 0.1	–1.0	–	– 0.1	– 2.0	μA
Open Loop Voltage Gain (V_O = 2.0 V to 4.0 V)	A_{VOL}	65	90	–	65	90	–	dB
Unity Gain Bandwidth (T_J = 25°C)	BW	0.7	1.0	–	0.7	1.0	–	MHz
Power Supply Rejection Ratio (V_{CC} = 12 V to 25 V)	PSRR	60	70	–	60	70	–	dB
Output Current Sink (V_O = 1.1 V, V_{FB} = 2.7 V) Source (V_O = 5.0 V, V_{FB} = 2.3 V)	 I_{Sink} I_{Source}	 2.0 – 0.5	 12 –1.0	 – –	 2.0 – 0.5	 12 –1.0	 – –	mA
Output Voltage Swing High State (R_L = 15 k to ground, V_{FB} = 2.3 V) Low State (R_L = 15 k to V_{ref}, V_{FB} = 2.7 V) UC284XB, UC384XB UC384XBV	 V_{OH} V_{OL}	 5.0 – –	 6.2 0.8 –	 – 1.1 –	 5.0 – –	 6.2 0.8 0.8	 – 1.1 1.2	V
CURRENT SENSE SECTION								
Current Sense Input Voltage Gain (Notes 5 and 6) UC284XB, UC384XB UC384XBV	A_V	 2.85 –	 3.0 –	 3.15 –	 2.85 2.85	 3.0 3.0	 3.15 3.25	V/V
Maximum Current Sense Input Threshold (Note 5) UC284XB, UC384XB UC384XBV	V_{th}	 0.9 –	 1.0 –	 1.1 –	 0.9 0.85	 1.0 1.0	 1.1 1.1	V
Power Supply Rejection Ratio (V_{CC} = 12 V to 25 V, Note 5)	PSRR	–	70	–	–	70	–	dB
Input Bias Current	I_{IB}	–	– 2.0	–10	–	– 2.0	–10	μA
Propagation Delay (Current Sense Input to Output)	$t_{PLH(In/Out)}$	–	150	300	–	150	300	ns

3. Adjust V_{CC} above the Startup threshold before setting to 15 V.
4. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient as possible.
   T_{low} = 0°C for UC3842B, UC3843B; –25°C for UC2842B, UC2843B; –40°C for UC3842BV, UC3843BV
   T_{high} = +70°C for UC3842B, UC3843B; +85°C for UC2842B, UC2843B; +105°C for UC3842BV, UC3843BV
5. This parameter is measured at the latch trip point with V_{FB} = 0 V.
6. Comparator gain is defined as: $A_V \frac{\Delta V \text{ Output Compensation}}{\Delta V \text{ Current Sense Input}}$

ELECTRICAL CHARACTERISTICS (V_{CC} = 15 V [Note 7], R_T = 10 k, C_T = 3.3 nF. For typical values T_A = 25°C, for min/max values T_A is the operating ambient temperature range that applies [Note 8], unless otherwise noted.)

Characteristics		Symbol	UC284XB Min	UC284XB Typ	UC284XB Max	UC384XB, XBV Min	UC384XB, XBV Typ	UC384XB, XBV Max	Unit
OUTPUT SECTION									
Output Voltage									V
Low State (I_{Sink} = 20 mA)		V_{OL}	–	0.1	0.4	–	0.1	0.4	
(I_{Sink} = 200 mA)	UC284XB, UC384XB		–	1.6	2.2	–	1.6	2.2	
	UC384XBV		–	–	–	–	1.6	2.3	
High State (I_{Source} = 20 mA)	UC284XB, UC384XB	V_{OH}	13	13.5	–	13	13.5	–	
	UC384XBV		–	–	–	12.9	13.5	–	
(I_{Source} = 200 mA)			12	13.4	–	12	13.4	–	
Output Voltage with UVLO Activated (V_{CC} = 6.0 V, I_{Sink} = 1.0 mA)		$V_{OL(UVLO)}$	–	0.1	1.1	–	0.1	1.1	V
Output Voltage Rise Time (C_L = 1.0 nF, T_J = 25°C)		t_r	–	50	150	–	50	150	ns
Output Voltage Fall Time (C_L = 1.0 nF, T_J = 25°C)		t_f	–	50	150	–	50	150	ns
UNDERVOLTAGE LOCKOUT SECTION									
Startup Threshold (V_{CC})		V_{th}							V
	UCX842B, BV		15	16	17	14.5	16	17.5	
	UCX843B, BV		7.8	8.4	9.0	7.8	8.4	9.0	
Minimum Operating Voltage After Turn−On (V_{CC})		$V_{CC(min)}$							V
	UCX842B, BV		9.0	10	11	8.5	10	11.5	
	UCX843B, BV		7.0	7.6	8.2	7.0	7.6	8.2	
PWM SECTION									
Duty Cycle									%
Maximum	UC284XB, UC384XB	$DC_{(max)}$	94	96	–	94	96	–	
	UC384XBV		–	–	–	93	96	–	
Minimum		$DC_{(min)}$	–	–	0	–	–	0	
TOTAL DEVICE									
Power Supply Current		I_{CC} + I_C							mA
Startup (V_{CC} = 6.5 V for UCX843B, V_{CC} 14 V for UCX842B, BV)			–	0.3	0.5	–	0.3	0.5	
(Note 7)			–	12	17	–	12	17	
Power Supply Zener Voltage (I_{CC} = 25 mA)		V_Z	30	36	–	30	36	–	V

7. Adjust V_{CC} above the Startup threshold before setting to 15 V.
8. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient as possible.
   T_{low} = 0°C for UC3842B, UC3843B; −25°C for UC2842B, UC2843B; −40°C for UC3842BV, UC3843BV
   T_{high} = +70°C for UC3842B, UC3843B; +85°C for UC2842B, UC2843B; +105°C for UC3842BV, UC3843BV

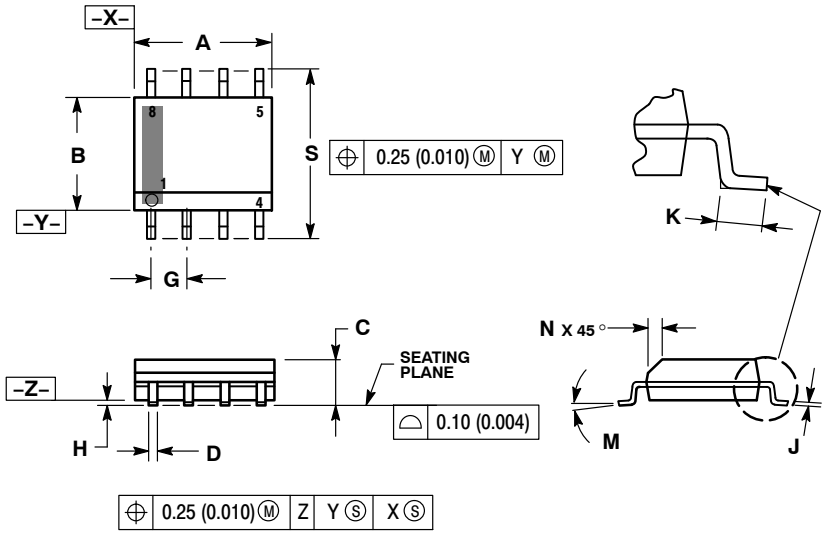
ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping†
UC3843BD	T_A = 0° to +70°C	SOIC−14	55 Units/Rail
UC3843BDG		SOIC−14 (Pb−Free)	55 Units/Rail
UC3843BDR2		SOIC−14	2500 Tape & Reel
UC3843BDR2G		SOIC−14 (Pb−Free)	2500 Tape & Reel
UC3843BD1		SOIC−8	98 Units/Rail
UC3843BD1G		SOIC−8 (Pb−Free)	98 Units/Rail
UC3843BD1R2		SOIC−8	2500 Tape & Reel
UC3843BD1R2G		SOIC−8 (Pb−Free)	
UC3843BDR2		SOIC−14	
UC3843BDR2G		SOIC−14 (Pb−Free)	
UC3843BN		PDIP−8	1000 Units/Rail
UC3843BNG		PDIP−8 (Pb−Free)	1000 Units/Rail
UC3843BVD	T_A = −40° to +105°C	SOIC−14	55 Units/Rail
UC3843BVDG		SOIC−14 (Pb−Free)	55 Units/Rail
UC3843BVDR2		SOIC−14	2500 Tape & Reel
UC3843BVDR2G		SOIC−14 (Pb−Free)	2500 Tape & Reel
UC3843BVD1		SOIC−8	98 Units/Rail
UC3843BVD1G		SOIC−8 (Pb−Free)	98 Units/Rail
UC3843BVD1R2		SOIC−8	2500 Tape & Reel
UC3843BVD1R2G		SOIC−8 (Pb−Free)	2500 Tape & Reel
UC3843BVN		PDIP−8	1000 Units/Rail
UC3843BVNG		PDIP−8 (Pb−Free)	1000 Units/Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

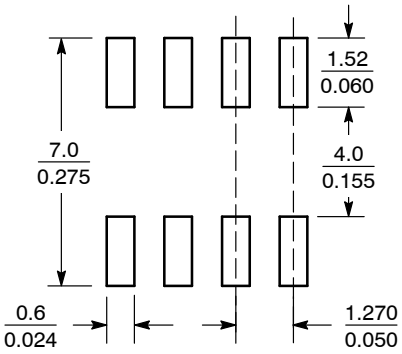
SOIC−8
D1 SUFFIX
CASE 751−07
ISSUE AJ



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOLDERING FOOTPRINT*



SCALE 6:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.