

Linear Products

Product Specification

DESCRIPTION

The UC1842 family of control ICs provides in an 8-Pin mini-DIP the necessary features to implement off-line, fixed-frequency current-mode control schemes with a minimal external parts count. This technique results in improved line regulation, enhanced load response characteristics, and a simpler, easier to design control loop. Topological advantages include inherent pulse-by-pulse current limiting.

Protection circuitry includes built-in undervoltage lock-out and current limiting. Other features include fully-latched operation, a 1% trimmed bandgap reference, and start-up current less than 1mA.

These devices feature a totem-pole output designed to source and sink high peak current from a capacitive load, such as the gate of a power MOSFET. Consistent with N-channel power devices, the output is low in the OFF-state.

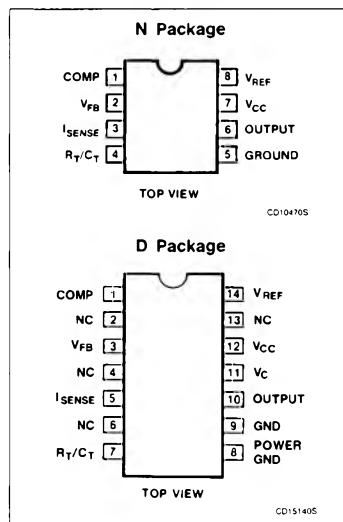
FEATURES

- Low start-up current ($\leq 1\text{mA}$)
- Automatic feed-forward compensation
- Pulse-by-pulse current limiting
- Enhanced load response characteristics
- Undervoltage lock-out with hysteresis
- Double pulse suppression
- High current totem-pole output
- Internally-trimmed bandgap reference
- 400kHz operation, guaranteed min

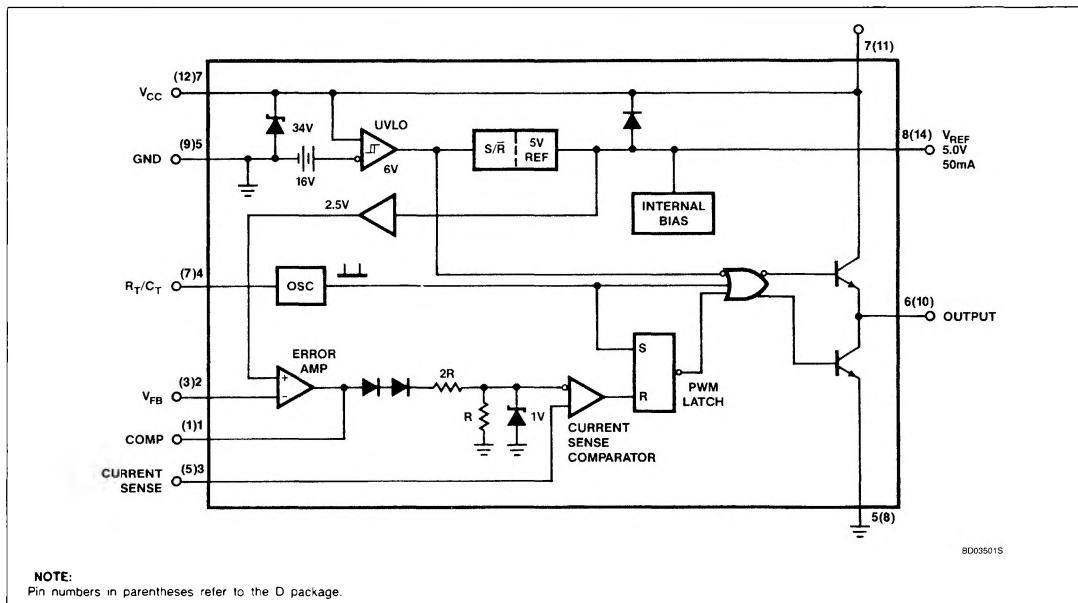
APPLICATIONS

- Off-line switched mode power supplies
- DC-to-DC converters

PIN CONFIGURATIONS



BLOCK DIAGRAM



Current-Mode PWM Controller

UC1842, UC2842, UC3842

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
8-Pin Plastic DIP	0 to +70°C	UC3842N
14-Pin Plastic SO	0 to +70°C	UC3842D
8-Pin Plastic DIP	-40 to +85°C	UC2842N
14-Pin Plastic SO	-40 to +85°C	UC2842D
8-Pin Plastic DIP	-55 to +125°C	UC1842N

ABSOLUTE MAXIMUM RATINGS¹

SYMBOL	PARAMETER	RATING	UNIT
V _{CC}	Supply voltage (I _{CC} < 30mA)		Self-Limiting
V _{CC}	Supply voltage (low impedance source)	30	V
I _{OUT}	Output current ^{2, 3}	± 1	A
	Output energy (capacitive load)	5	μJ
	Analog inputs (Pin 2, Pin 3)	-0.3 to 6.3	V
	Error amp output sink current	10	mA
P _D	Power dissipation at T _A ≤ 70°C (derate 12.5mW/°C for T _A > 70°C) ²	1	W
T _{STG}	Storage temperature range	-65°C to +150	°C
T _{SOLD}	Lead temperature (soldering, 10sec max)	300	°C

NOTES:

1. All voltages are with respect to Pin 5; all currents are positive into the specified terminal.
2. See section in application note on "Power Dissipation Calculation".
3. This parameter is guaranteed, but not 100% tested in production.

Current-Mode PWM Controller

UC1842, UC2842, UC3842

DC AND AC ELECTRICAL CHARACTERISTICS (Unless otherwise stated, these specifications apply for
 $-55 \leq T_J \leq 125^\circ\text{C}$ for UC1842/43; $-25 \leq T_J \leq 85^\circ\text{C}$ for UC2842/43;
 $0 \leq T_J \leq 70^\circ\text{C}$ for UC3842/43; $V_{CC} = 15^4$; $R_T = 10\text{k}\Omega$; $C_T = 3.3\text{nF}$.)

SYMBOL	PARAMETER	TEST CONDITIONS	UC1842 UC2842			UC3842			UNIT
			Min	Typ	Max	Min	Typ	Max	
Reference section									
V_{OUT}	Output voltage	$T_J = 25^\circ\text{C}$, $I_O = 1\text{mA}$	4.95	5.00	5.05	4.90	5.00	5.10	V
	Line regulation	$12 \leq V_{IN} \leq 25\text{V}$		6	20		6	20	mV
	Load regulation	$1 \leq I_O \leq 20\text{mA}$		6	25		6	25	mV
	Temp. stability ¹			0.2	0.4		0.2	0.4	mV/ $^\circ\text{C}$
	Total output variation ¹	Line, load, temp.	4.90		5.10	4.82		5.18	V
V_{NOISE}	Output noise voltage ¹	$10\text{Hz} \leq f \leq 10\text{kHz}$, $T_J = 25^\circ\text{C}$		50			50		μV
	Long-term stability ¹	$T_J = 125^\circ\text{C}$, 1000 Hrs.		5	25		5	25	mV
	Output short-circuit	$T_J = 25^\circ\text{C}$	-30	-100	-130	-30	-100	-130	mA
	Output short-circuit	$-55 < T_J \leq 0^\circ\text{C}$	-30	-100	-180	-30	-100	-180	mA
Oscillator section									
	Initial accuracy	$T_J = 25^\circ\text{C}$	47	52	57	47	52	57	kHz
	Voltage stability	$12 \leq V_{CC} \leq 25\text{V}$		0.2	1		0.2	1	%
	Temp. stability ¹	$T_{MIN} \leq T_J \leq T_{MAX}$		5			5		%
	Amplitude	$V_{PIN 4}$ peak-to-peak		1.7			1.7		V
Error amp section									
	Input voltage	V Pin 1 = 2.5V	2.45	2.50	2.55	2.42	2.50	2.58	V
I_{BIAS}	Input bias current			-0.3	-1		-0.3	-2	μA
A_{VOL}		$2 \leq V_O \leq 4\text{V}$	65	90		65	90		dB
	Unity gain bandwidth ¹	$T_J = 25^\circ\text{C}$	0.7	1		0.7	1		MHz
	Unity gain bandwidth	$T_{MIN} < T_J < T_{MAX}$	0.5			0.5			MHz
PSRR	Power supply rejection ratio	$12 \leq V_{CC} \leq 25\text{V}$	60	70		60	70		dB
I_{SINK}	Output sink current	$V_{PIN 2} = 2.7\text{V}$, $V_{PIN 1} = 1.1\text{V}$	2	6		2	6		mA
I_{SOURCE}	Output source current	$V_{PIN 2} = 2.3\text{V}$, $V_{PIN 1} = 5\text{V}$	-0.5	-0.8		-0.5	-0.8		mA
	V_{OUT} High	$V_{PIN 2} = 2.3\text{V}$, $R_L = 15\text{k}$ to ground	5	6		5	6		V
	V_{OUT} Low	$V_{PIN 2} = 2.7\text{V}$, $R_L = 15\text{k}$ to Pin 8		0.7	1.1		0.7	1.1	V
Current sense section									
	Gain ^{2, 3}		2.85	3	3.15	2.85	3	3.15	V/V
	Maximum input signal ²	$V_{PIN 1} = 5\text{V}$	0.9	1	1.1	0.9	1	1.1	V
PSRR	Power supply rejection ratio ²	$12 \leq V_{CC} \leq 25\text{V}$		70			70		dB
I_{BIAS}	Input bias current			-2	-10		-2	-10	μA
	Delay to output ¹			150	300		150	300	ns

Current-Mode PWM Controller

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DC AND AC ELECTRICAL CHARACTERISTICS (Continued) (Unless otherwise stated, these specifications apply for $-55 \leq T_J \leq 125^\circ\text{C}$ for UC1842/43; $-25 \leq T_J \leq 85^\circ\text{C}$ for UC2842/43; $0 \leq T_J \leq 70^\circ\text{C}$ for UC3842/43; $V_{CC} = 15\text{V}^4$; $R_T = 10\text{k}\Omega$; $C_T = 3.3\text{nF}$.)

SYMBOL	PARAMETER	TEST CONDITIONS	UC1842/43 UC2842/43			UC3842/43			UNIT
			Min	Typ	Max	Min	Typ	Max	
Output section									
I _{OL}	Output Low-Level	I _{SINK} = 20mA		0.1	0.4		0.1	0.4	V
		I _{SINK} = 200mA		1.5	2.2		1.5	2.2	V
I _{OH}	Output High-Level	I _{SOURCE} = 20mA	13	13.5		13	13.5		V
		I _{SOURCE} = 200mA	12	13.5		12	13.5		V
t _R	Rise time	C _L = 1nF		50	150		50	150	ns
t _F	Fall time	C _L = 1nF		50	150		50	150	ns
Undervoltage lockout section									
	Start threshold	X842	15	16	17	14.5	16	17.5	V
		X843	7.8	8.4	9.0	7.8	8.4	9.0	V
	Min. operating voltage after turn on	X842	9	10	11	8.5	10	11.5	V
		X843	7.0	7.6	8.2	7.0	7.6	8.2	V
PWM section									
	Maximum duty cycle	X842/43	93	97	100	93	97	100	%
	Minimum duty cycle				0			0	%
Total standby current									
	Start-up current			0.5	1		0.5	1	mA
I _{CC}	Operating supply current	V _{PIN 2} = V _{PIN 3} = 0V		11	17		11	17	mA
	V _{CC} zener voltage	I _{CC} = 25mA		34			34		V
Maximum operating frequency section									
	Maximum operating frequency for all functions operating cycle-by-cycle		400			400			kHz

NOTES:

1. These parameters, although guaranteed, are not 100% tested in production.

2. Parameter measured at trip point of latch with V_{PIN 2} = 0.

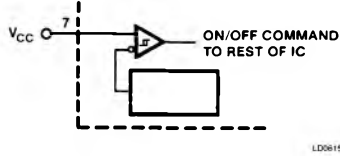
3. Gain defined as:

$$A = \frac{\Delta V_{PIN 1}}{\Delta V_{PIN 3}}; 0 \leq V_{PIN 3} \leq 0.8\text{V}.$$

Current-Mode PWM Controller

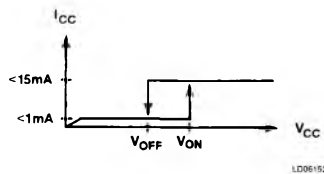
UC1842, UC2842, UC3842

UNDERVOLTAGE LOCKOUT



LD06152S

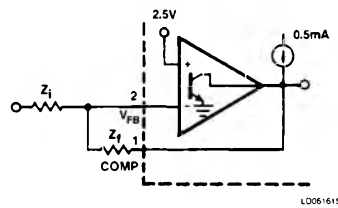
	UC1842
V_{ON}	16V
V_{OFF}	10V



LD06153S

NOTE:
During Undervoltage Lock-Out, the output driver is biased to a high impedance state. Pin 6 should be shunted to ground with a bleeder resistor to prevent activating the power switch with output leakage current.

ERROR AMP CONFIGURATION



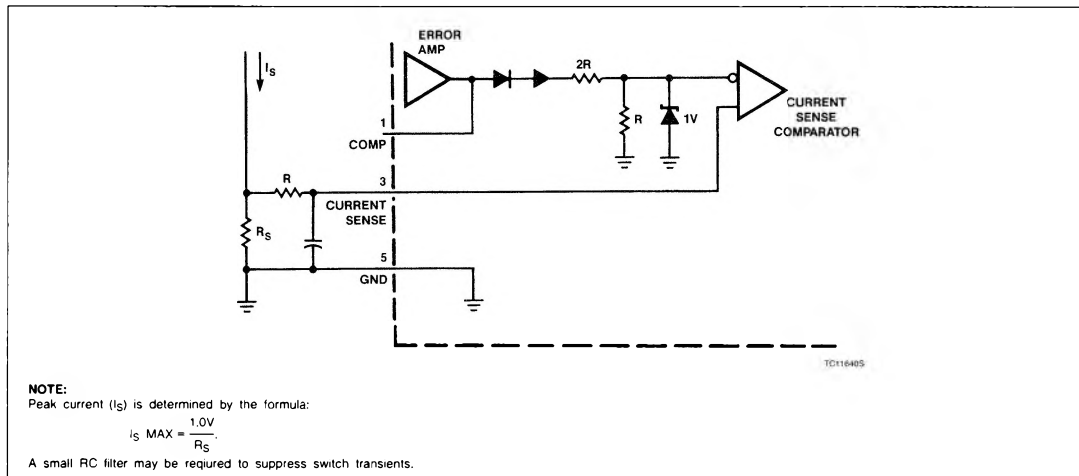
LD06161S

NOTE:
Error AMP can source or sink up to 0.5mA.

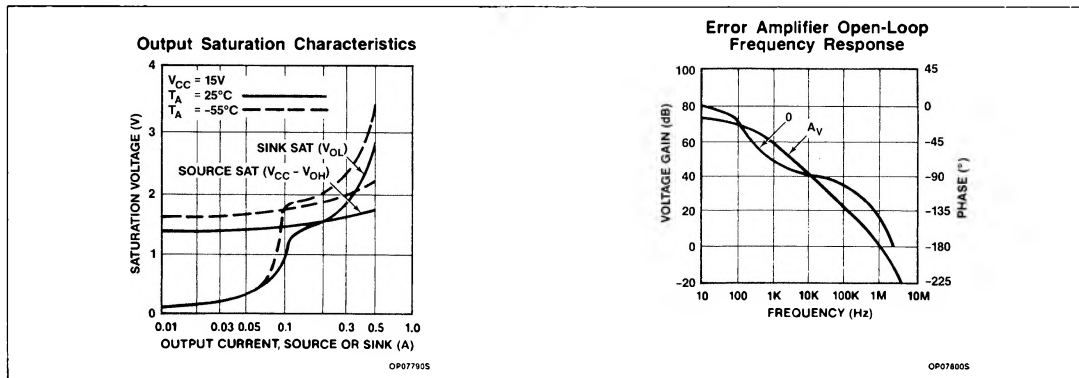
Current-Mode PWM Controller

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CURRENT SENSE CIRCUIT



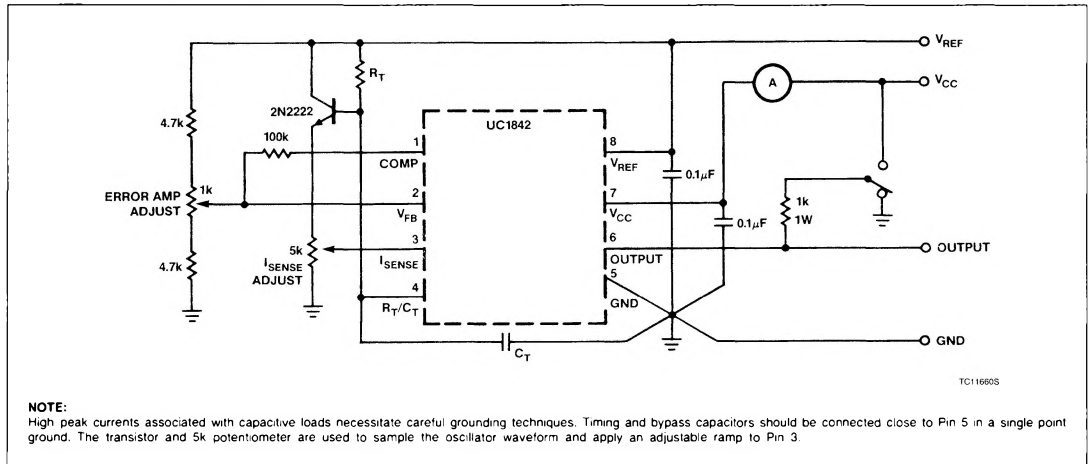
TYPICAL PERFORMANCE CHARACTERISTICS



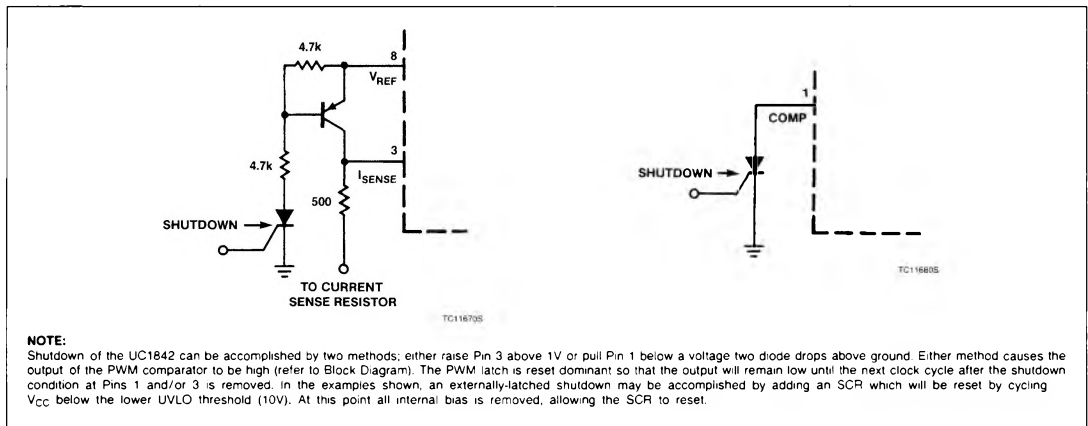
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OPEN-LOOP LABORATORY TEST FIXTURE



SHUTDOWN TECHNIQUES



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SYNCHRONIZATION AND MAXIMUM DUTY CYCLE CLAMP

