



BiCMOS 1A Current-Mode PWM Controllers

MIC38HC4x-1 is available in 14-pin plastic DIP and SOIC packages. 8-pin devices feature small size, while 14-pin devices separate the analog and power connections for improved performance and power dissipation.

- Fast 20ns output rise and 15ns output fall times
- -40°C to $+85^{\circ}\text{C}$ temperature range exceeds UC284x specifications
- High-performance, low-power BiCMOS Process
- Ultralow start-up current ($50\mu\text{A}$ typical)
- Low operating current (4mA typical)
- High output drive (1A peak current, HC version)
- CMOS outputs with rail-to-rail swing
- Current-mode operation up to 500kHz
- Trimmed 5V bandgap reference
- Pin-for-pin compatible with UC3842/3843/3844/3845(A)
- Trimmed oscillator discharge current
- UVLO with hysteresis
- Low cross-conduction currents

- Current-mode, off-line, switched-mode power supplies
- Current-mode, dc-to-dc converters.
- Step-down “buck” regulators
- Step-up “boost” regulators
- Flyback, isolated regulators
- Forward converters
- Synchronous FET converters

‡ MIC38HC44, MIC38HC45 (50% max. duty cycle) versions only

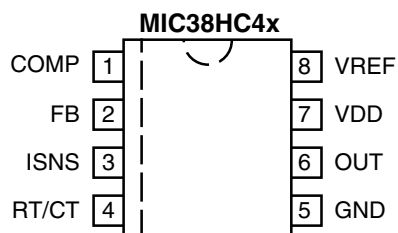
Ordering Information

Part Number	Temperature Range	Package
MIC38HC42BN	−40°C to +85°C	8-pin Plastic DIP
MIC38HC43BN	−40°C to +85°C	8-pin Plastic DIP
MIC38HC44BN	−40°C to +85°C	8-pin Plastic DIP
MIC38HC45BN	−40°C to +85°C	8-pin Plastic DIP
MIC38HC42-1BN	−40°C to +85°C	14-pin Plastic DIP
MIC38HC43-1BN	−40°C to +85°C	14-pin Plastic DIP
MIC38HC44-1BN	−40°C to +85°C	14-pin Plastic DIP
MIC38HC45-1BN	−40°C to +85°C	14-pin Plastic DIP
MIC38HC42BM	−40°C to +85°C	8-pin SOIC
MIC38HC43BM	−40°C to +85°C	8-pin SOIC
MIC38HC44BM	−40°C to +85°C	8-pin SOIC
MIC38HC45BM	−40°C to +85°C	8-pin SOIC
MIC38HC42-1BM	−40°C to +85°C	14-pin SOIC
MIC38HC43-1BM	−40°C to +85°C	14-pin SOIC
MIC38HC44-1BM	−40°C to +85°C	14-pin SOIC
MIC38HC45-1BM	−40°C to +85°C	14-pin SOIC

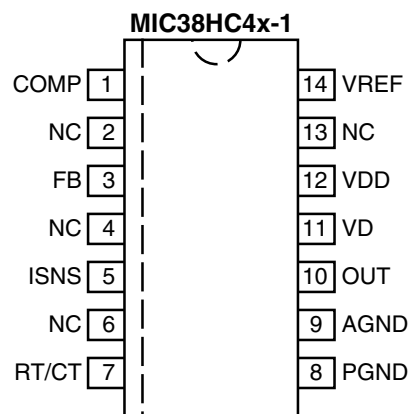
Selection Guide

	UVLO Thresholds	
Duty Cycle	Startup 8.4V Minimum Operating 7.6V	Startup 14.5V Minimum Operating 9V
0% to 96%	MIC38HC43	MIC38HC42
0% to 50%	MIC38HC45	MIC38HC44

Pin Configuration



8-Pin DIP (N)
8-Lead SOIC (M)



14-Pin DIP (-1BN)
14-Lead SOIC (-1BM)

Pin Description

Pin Number N, M, MM	Pin Number -1BN, -1BM	Pin Name	Pin Function
1	1	COMP	Compensation: Connect external compensation network to modify the error amplifier output.
	2	NC	Not internally connected.
2	3	FB	Feedback (Input): Error amplifier input. Feedback is 2.5V at desired output voltage.
	4	NC	Not internally connected.
3	5	ISNS	Current Sense (Input): Current sense comparator input. Connect to current sensing resistor or current transformer.
	6	NC	Not internally connected.
4	7	RT/CT	Timing Resistor/Timing Capacitor: Connect external RC network to select switching frequency.
5		GND	Ground: Combined analog and power ground.
	8	PGND	Power Ground: N-channel driver transistor ground.
	9	AGND	Analog Ground: Controller circuitry ground.
6	10	OUT	Power Output: Totem-pole output.
	11	VD	Power Supply (Input): P-channel driver transistor supply input. Return to power ground (PGND).
7	12	VDD	Analog Supply (Input): Controller circuitry supply input. Return to analog ground (AGND).
	13	NC	Not internally connected.
8	14	VREF	5V Reference (Output): Connect external RC network.

Absolute Maximum Ratings

Zener Current (V_{DD}) 30mA

Operation at $\geq 18V$ may require special precautions (Note 6).

Supply Voltage (V_{DD}), **Note 6** 20V

Switch Supply Voltage (V_D) 20V

Current Sense Voltage (V_{ISNS}) -0.3V to 5.5V

Feedback Voltage (V_{FB}) -0.3V to 5.5V

Output Current, 38HC42/3/4/5 (I_{OUT}) 1A

Operating Junction Temperature (T_J) 150°C

Package Thermal Resistance

8-Pin Plastic DIP (θ_{JA}) 125°C/W

8-Pin MM8™ (θ_{JA}) 250°C/W

8-Pin SOIC (θ_{JA}) 170°C/W

14-Pin Plastic DIP (θ_{JA}) 90°C/W

14-Pin SOIC (θ_{JA}) 145°C/W

Storage Temperature (T_A) -65°C to +150°C

Electrical Characteristics

$V_{DD} = 15V$, **Note 4**; $R_T = 9.09k\Omega$; $C_T = 3.3nF$; $-40^\circ C \leq T_A \leq 85^\circ C$; unless noted

Parameter	Test Conditions	Min	Typ	Max	Units
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Reference Section

Output Voltage	$T_A = 25^\circ C$, $I_O = 1mA$	4.90	5.00	5.10	V
Line Regulation	$12V \leq V_{DD} \leq 18V$, $I_O = 5\mu A$, Note 6		2	20	mV
Load Regulation	$1 \leq I_O \leq 20mA$		1	25	mV
Temp. Stability	Note 1		0.2		mV/°C
Total Output Variation	Line, Load, Temp., Note 1	4.82		5.18	V
Output Noise Voltage	$10Hz \leq f \leq 10kHz$, $T_A = 25^\circ C$, Note 1		50		μV
Long Term Stability	$T_A = 125^\circ C$, 1000 hrs., Note 1		5	25	mV
Output Short Circuit		-30	-80	-180	mA

Oscillator Section

Initial Accuracy	$T_A = 25^\circ C$, Note 5	49	52	55	kHz
Voltage Stability	$12 \leq V_{DD} \leq 18V$, Note 6		0.2	1.0	%
Temp. Stability	$T_{MIN} \leq T_A \leq T_{MAX}$, Note 1		0.04		%/°C
Clock Ramp	$T_A = 25^\circ C$, $V_{RT/CT} = 2V$	7.7	8.4	9.0	mA
Reset Current	$T_A = T_{MIN}$ to T_{MAX}	7.2	8.4	9.5	mA
Amplitude	$V_{RT/CT}$ peak to peak		1.9		Vp-p

Error Amp Section

Input Voltage	$V_{COMP} = 2.5V$	2.42	2.50	2.58	V
Input Bias Current	$V_{FB} = 5.0V$		-0.1	-2	μA
A_{VOL}	$2 \leq V_O \leq 4V$	65	90		dB
Unity Gain Bandwidth	Note 1	0.7	1.0		MHz
PSRR	$12 \leq V_{DD} \leq 18V$	60			dB
Output Sink Current	$V_{FB} = 2.7V$, $V_{COMP} = 1.1V$	2	14		mA
Output Source Current	$V_{FB} = 2.3V$, $V_{COMP} = 5V$	-0.5	-1		mA
V_{OUT} High	$V_{FB} = 2.3V$, $R_L = 15k$ to ground	5	6.8		V
V_{OUT} Low	$V_{FB} = 2.7V$, $R_L = 15k$ to V_{REF}		0.1	1.1	V

Parameter	Test Conditions	Min	Typ	Max	Units
Current Sense					
Gain	Notes 2, 3	2.85	3.0	3.15	V/V
Maximum Threshold	$V_{COMP} = 5V$, Note 2	0.9	1	1.1	V
PSRR	$12 \leq V_{DD} \leq 18V$, Note 2		70		dB
Input Bias Current			-0.1	-2	μA
Delay to Output			120	250	ns
Output					
$R_{DS(ON)}$ 'HC' High	$I_{SOURCE} = 200mA$		10		Ω
$R_{DS(ON)}$ 'HC' Low	$I_{SINK} = 200mA$		5.5		Ω
Rise Time	$T_A = 25^\circ C$, $C_L = 1nF$		20	50	ns
Fall Time	$T_A = 25^\circ C$, $C_L = 1nF$		15	40	ns
Undervoltage Lockout					
Start Threshold	MIC38HC42/4	13.5	14.5	15.5	V
	MIC38HC43/5	7.8	8.4	9.0	V
Minimum Operating Voltage	MIC38HC42/4	8	9	10	V
	MIC38HC43/5	7.0	7.6	8.2	V
Pulse Width Modulator					
Maximum Duty Cycle	MIC38HC42/3	94	96		%
	MIC38HC44/5	46	50		%
Minimum Duty Cycle				0	%
Total Standby Current					
Start-Up Current	$V_{DD} = 13V$, 38HC42/44		50	200	μA
	$V_{DD} = 7.5V$, 38HC43/45				
Operating Supply Current	$V_{FB} = V_{ISNS} = 0V$		4.0	6.0	mA
Zener Voltage (V_{DD})	$I_{DD} = 25mA$, Note 6	30	37		V

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

Note 2: Parameter measured at trip point of latch with $V_{EA} = 0$.

Note 3: Gain defined as:

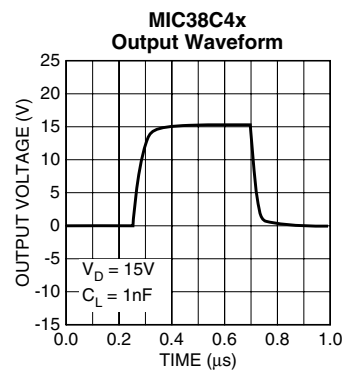
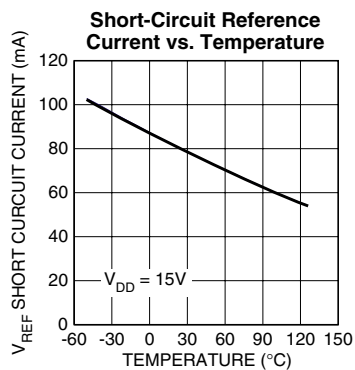
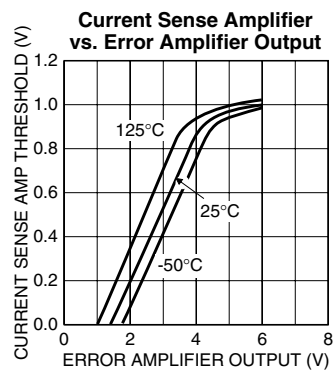
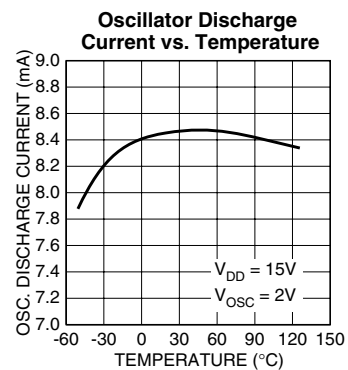
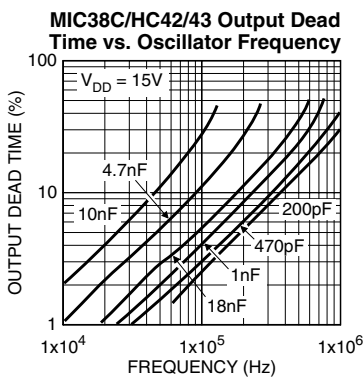
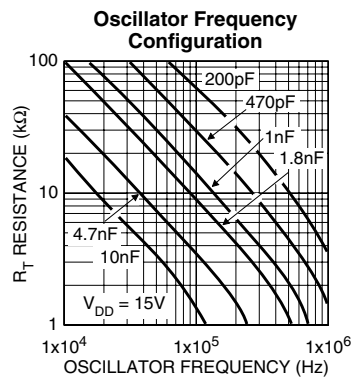
$$A = \frac{\Delta V_{PIN1}}{V_{TH}(I_{SNS})}; 0 \leq V_{TH}(I_{SNS}) \leq 0.8V$$

Note 4: Adjust V_{DD} above the start threshold before setting at 15V.

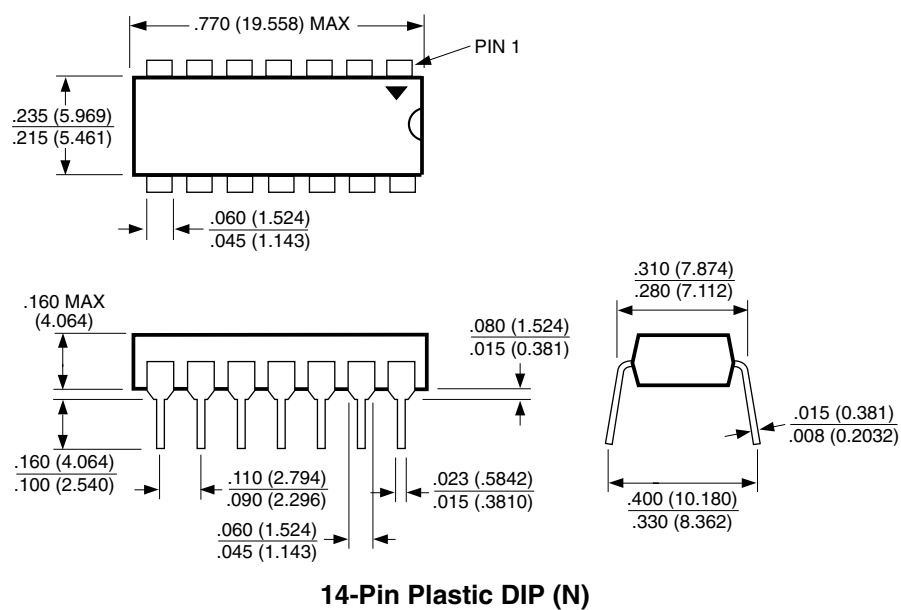
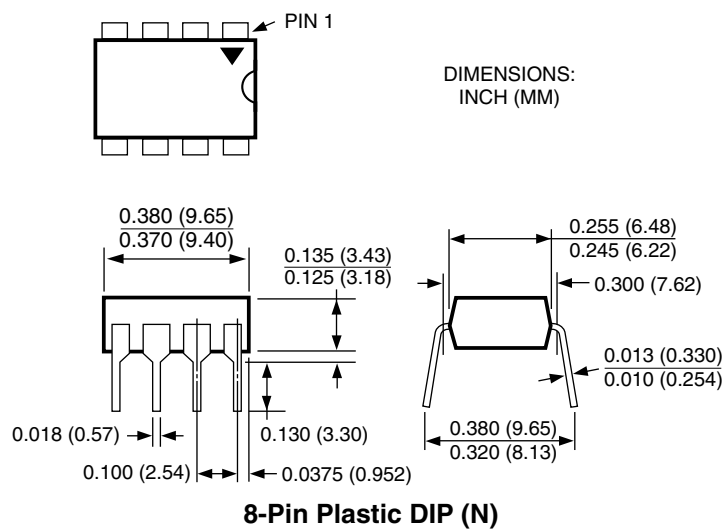
Note 5: Output frequency equals oscillator frequency for the MIC38HC42 and MIC38HC43. Output frequency for the MIC38HC44, and MIC38HC45 equals one half the oscillator frequency.

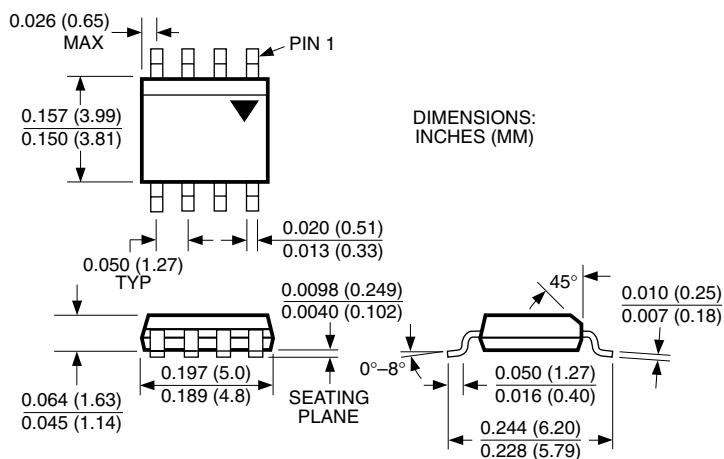
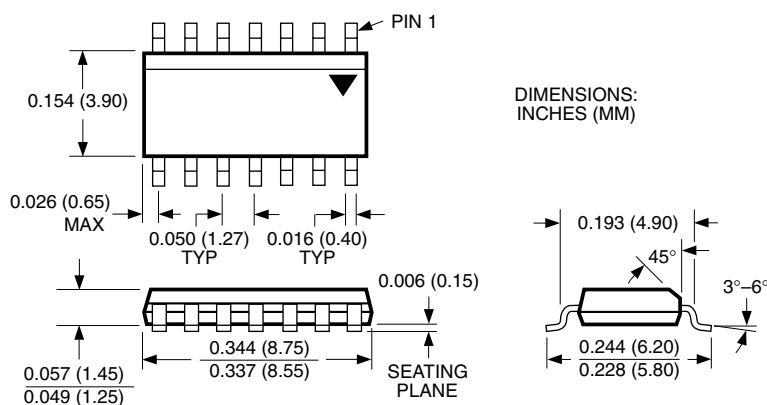
Note 6: On 8-pin version, 20V is maximum input on pin 7, as this is also the supply pin for the output stage. On 14-pin version, 40V is maximum for pin 12 and 20V maximum for pin 11.

Typical Characteristics



Package Information



**8-Pin SOIC (M)****14-Pin SOIC (M)**

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