



# Bay Linear

Inspire the Linear Power

## BiCMOS Current Mode PWM Controller

## B38C42/43/44/45

### Advance Information

### Description

The Bay Linear B38C42/43/44/45 are fixed frequency and high performance current-mode PWM controller in BiCMOS. They are pin compatible with all bipolar 384X's controllers are similar to the MIC38C4X family. These devices are designed for DC-to-DC converter applications and feature a trimmed oscillator discharge current and bandgap reference.

The benefit of the BiCMOS process provides significant performance improvement compared to Bipolar 384X devices. At 15V<sub>IN</sub> the start-up current is reduced to 50µA (typ.) from 0.17 mA with an operating current reduced to 4mA (typ.) from 14mA. Also, quicker output rise and fall times drive larger MOSFET 's and rail-to-rail output capability improves efficiency, especially lower supply voltages.

Major differences between members of these series are the UVLO thresholds. Typical UVLO thresholds of 14.5V (on) and 9V (off) for the B38C42 and B38C44 devices make them ideally suited to off-line applications. The corresponding typical thresholds for the B38C43 and B3845 devcies are 8.4V (on) and 7.6V (off).

The B39C4X devices are available in 8 pin DIP and SOIC.

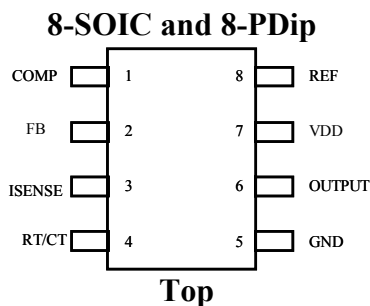
### Features

- Low-Power BiCMOS Process
- Ultra Low Start-Up Current of 50µA (typ.)
- Very Lower Operating Current (4mA)
- Current Mode Operation ≥ 500KHz
- CMOS outputs with Rail to Rail outputs
- Under Voltage Lockout with Hysteresis
- 5V Trimmed Bandgap Reference
- Trimmed Oscillator Discharged Current
- Low Cross-Conduction Currents
- Available in 8 pin SOIC and 8PDip
- Similar to MIC38C42/43/44/45
- Pin to Pin compatible with UC3842X Family

### Applications

- Switched and Current Mode Power Supplies
- Off-line Power Supply
- Step-Up (Buck), Step-Down (Boost) Regulator
- Flyback, Isolated Regulators
- Synchronous FET converters
- Forward Converters

### Pin Connection



### Ordering Information

Devices	Package	Temp.
B38C42M	SO-8	-40°C to +85°C
B38C42P	8-DIP	-40°C to +85°C
B38C43M	SO-8	-40°C to +85°C
B38C43P	8-DIP	-40°C to +85°C
B38C44M	SO-8	-40°C to +85°C
B38C44P	8-DIP	-40°C to +85°C
B38C45M	SO-8	-40°C to +85°C
B38C45P	8-DIP	-40°C to +85°C

## Absolute Maximum Rating

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{DD}$	20	V
Switch Supply Voltage	$V_D$	20	V
Output Current	$I_{OUT}$	1A	A
Zener Current	$V_{DD}$	30	mA
Current Sense Voltage	$V_{ISENSE}$	-0.3 to 5.5	V
Feedback Voltage	$V_{FB}$	-0.3 to 5.5	V
Power Dissipation	$P_D$	1	W
Storage Temperature Range	T	-65 to 150	°C
Lead Temperature (Soldering 10 Sec.)	$T_L$	300	°C

## Electrical Characteristics

$V_{DD} = 15V$  (Note 4),  $R_T = 11k$ ,  $C_T = 3.3nF$ ,  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , unless otherwise specified

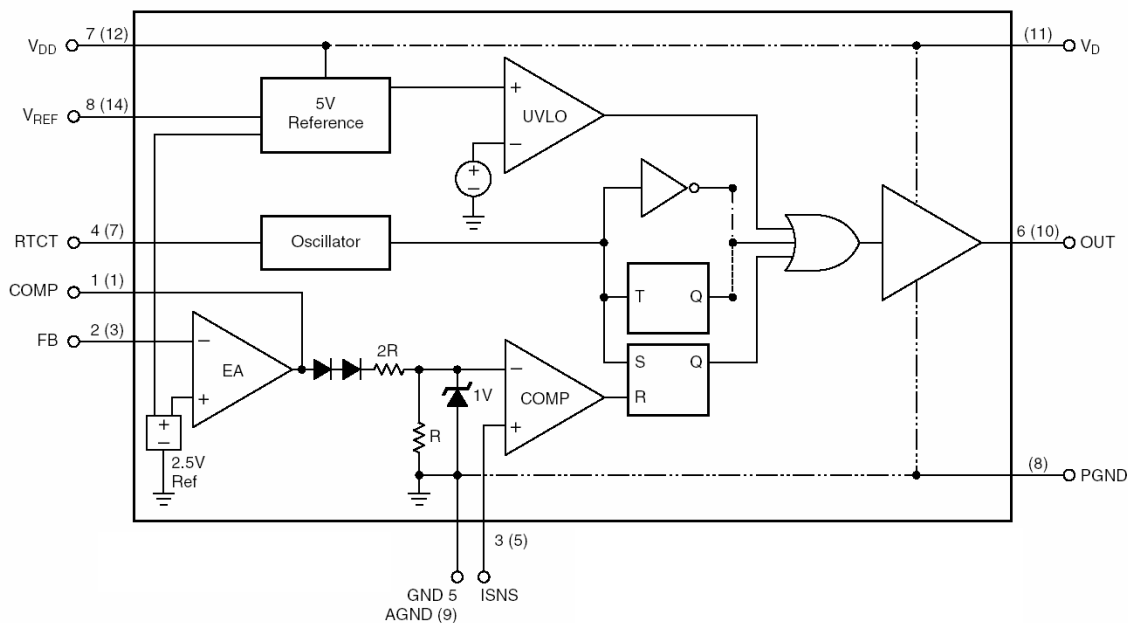
Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
<b>REFERENCE SECTION</b>						
Reference Voltage	$V_{REF}$	$T_J = 25^{\circ}C$ , $I_{REF} = 1mA$	4.90	5.00	5.10	V
Line Regulation	$REG_{(LINE)}$	$12V \leq V_{DD} \leq 18V$ , $I_O = 5\mu A$	-	2	20	mV
Load Regulation	$REG_{(LOAD)}$	$1mA \leq I_{REF} \leq 20mA$	-	1	25	
Short Circuit Output Current	$I_{SC}$	$T = 25^{\circ}C$	-30	-80	-180	mA
<b>OSCILLATOR SECTION</b>						
Oscillator Frequency	f	$T = 25^{\circ}C$	47	52	57	KHz
Frequency Change with Voltage	$\Delta f/\Delta V_{CC}$	$12V \leq V_{CC} \leq 25V$	-	0.05	1	%
Oscillator Amplitude	$V_{OSC}$		-	1.6	2.3	$V_{P-P}$
<b>ERROR AMPLIFIER SECTION</b>						
Input Bias Current	$I_{BIAS}$		-1	-0.1	1	$\mu A$
Input Voltage	$V_{I(E>A)}$	$V_1 = 2.5V$	2.42	2.50	2.58	V
Open Loop Voltage Gain	$G_{VO}$	$2V \leq V_O \leq 4V$	65	90	-	dB
Power Supply Rejection Ratio	PSRR	$12V \leq V_{CC} \leq 25V$	60	70	-	dB
Output Sink Current	$I_{SINK}$	$V_2 = 2.7V$ , $V_1 = 1.1V$	2	6	-	mA
Output Source Current	$I_{SOURCE}$	$V_2 = 2.3$ , $V_1 = 5V$	-0.5	-1.0	-	mA
High Output Voltage	$V_{OH}$	$V_2 = 2.3$ , $R_L = 15\Omega$ to GND	5	6	-	V
Low Output Voltage	$V_{OL}$	$V_2 = 2.7$ , $R_L = 15\Omega$ to pin 8	-	0.8	1.1	V
<b>OUTPUT SECTION</b>						
Low Output Voltage	$V_{OL}$	$I_{SINK} = 20mA$	-	0.08	0.4	V
		$I_{SINK} = 200mA$	-	1.4	2.2	
High Output Voltage	$V_{OH}$	$S_{source} = 20mA$	13	13.5	-	V
		$S_{source} = 200mA$	12	13.0	-	
Rise Time	$t_R$	$T_J = 25^{\circ}C$ , $C_L = 1nF$ (note3)	-	40	70	ns
Fall Time	$t_F$	$T_J = 25^{\circ}C$ , $C_L = 1nF$ (note3)	-	30	50	ns

**Note:** Output Switch tests are performed under pulsed conditions to minimize power dissipation

## Electrical Characteristics

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

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
<b>CURRENT SENSE SECTION</b>						
Gain	$G_V$	(Note 1 & 2)	2.85	3	3.15	V/V
Maximum input Signal	$V_{I(MAX)}$	$V_1 = 5V$ (Note 1)	0.9	1	1.1	V
Power Supply Rejection Ratio	PSRR	$12V \leq V_{CC} \leq 25V$		70	-	dB
Input Bias Current	$I_{BIAS}$			-3	-10	$\mu A$
<b>UNDER-VOLTAGE LOCKOUT SECTION</b>						
Start Threshold	$V_{TH(ST)}$	B3842/B3844	14.5	16	17.5	V
		B3843/B3845	7.8	8.4	9	
Min-Operating Voltage (after Turn On)	$V_{OPR(MIN)}$	B3842/B3844	8.5	10	11.5	V
		B3843/B3845	7.0	7.6	8.2	
<b>PWM SECTION</b>						
Max Duty Cycle	D(MAX)	B3842/B3844	95	97	100	%
		B3843/B3845	47	48	50	
Min Duty Cycle	D (MIN)		-	-	0	%
<b>TOTAL STANDBY CURRENT</b>						
Start-Up Current	$I_{ST}$	B3842A/43A/44A/45A	-	100	120	$\mu A$
		B3842B/43B/44B/45B		100	120	
Operating Supply Current	$I_{CC(OPR)}$	$V_3 = V_2 = ON$	-	14	17	mA
Zener Voltage	$V_Z$	$I_{CC}$	30	38	-	V
Start-Up Current	$I_{ST}$	B3842A/43A/44A/45A	-	0.17	0.3	mA
<b>PACKAGE THERMAL RESISTANCE</b>						
8-SOIC	$\theta_{JA}$				170	$^\circ C/W$
8-PDip	$\theta_{JA}$				125	$^\circ C/W$



## Startup & Operating Voltage Selection Guide

Duty Cycle	UVLO Thresholds	
	Star-Up at 8.4V Operating Min= 7.6V	Star-Up at 14.5V Operating Min= 9.0V
0% to 96%	B38C43	B38C42
0% to 50%	B38C45	B38C44

## Pin Descriptions

Pin No.#	Name	Function
1	COMP	Output of error amplifier & input to PWM comparator
2	FB	Inverting input of error amplifier
3	ISNS	Current sense comparator input. It is internally limited to 1V
4	RT/CT	Oscillator RC timing component connection. Resistor RT is connected to V <sub>REF</sub> and capacitor CT is connected to ground. Different values of RT and CT determine the maximum duty cycle..
5	GND/PGND	Combined power and analog ground
6	OUT	High-power, totem-pole driver output. OUT pin is actively held LOW when V <sub>CC</sub> is below the UVLO threshold.
7	V <sub>DD</sub>	Supply voltage input
8	V <sub>REF</sub>	5Volt reference voltage output

## Application Notes:

The Bay Linear B38C4X devices are compatible with generic 384x PWM devices. The following discussion highlights the differences and advantages of the Bay C design.

### Start- up Current

Bay Linear BiCMOS process allows for substantial reduction in the start- up current. Typical start- up current is 95 μ A, with a maximum limit of 120 μ A. Low start- up current allows high resistance, lower-wattage, start- up resistors to supply controller start- up power.

### Output Driver

The B38C4x CMOS output stage drives external power MOSFETs to the full supply voltage. Low ON-resistance and high peak current drive combine to give greater than 1000pF gate capacitance drive capability. Rise and fall time requirements may dictate the appropriate value of output capacitance. Within the restrictions of output capacity and controller power dissipation, switching frequencies

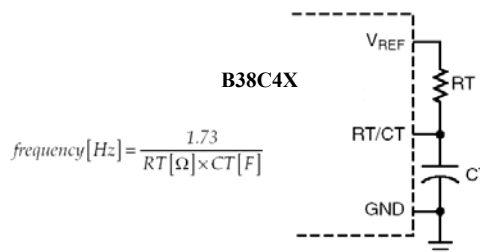
can exceed 1MHz.

The CMOS output stage “ break- before- make” action is guaranteed by design and insures that no cross- conduction current will flow. This minimizes heat dissipation, increases efficiency and enhances reliability.

### Oscillator Operation

Two external components, RT and CT, set the switching frequency.

With V<sub>CC</sub> = 14V, RT = 10k and CT = 3.3nF, nominal switching frequency is 50kHz.



**Advance Information-** These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

**Preliminary Information-** These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

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