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 $15V_{IN}$ 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

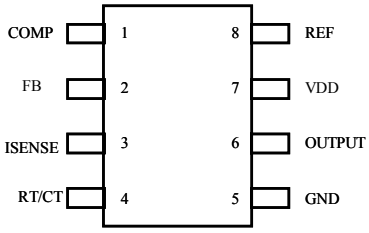
- **Low-Power BiCMOS Process**
- **Ultra Low Start-Up Current of 50µA (typ.)**
- **Very Lower Operating Current (4mA)**
- **Current Mode Operation ≥ 500KHz**
- **CMOS outputs with Rail to Rail outputs**
- **Under Voltage Lockout with Hysteresis**
- **5V Trimmed Bandgap Reference**
- **Trimmed Oscillator 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

8-SOIC and 8-PDip



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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°C to +85°C, unless otherwise specified

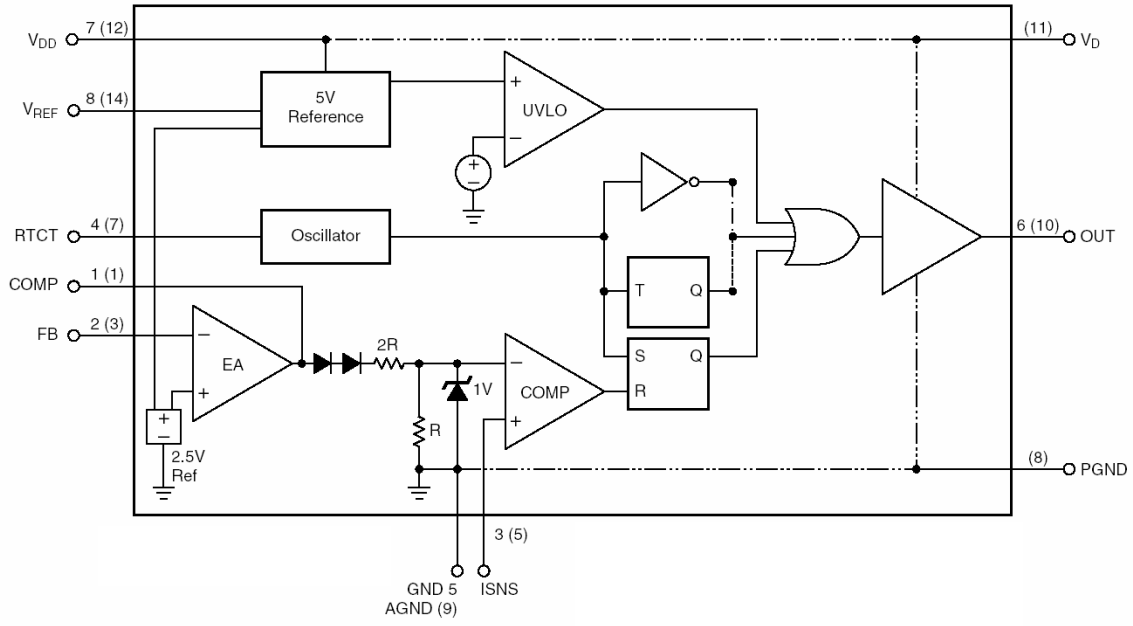
Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
REFERENCE SECTION						
Reference Voltage	V_{REF}	T_J = 25 °C. I_{REF} = 1mA	4.90	5.00	5.10	V
Line Regulation	$REG_{(LINE)}$	12V≤V_{DD}≤18V, I_O = 5µA	-	2	20	mV
Load Regulation	$REG_{(LOAD)}$	1mA≤I_{REF}≤20mA	-	1	25	
Short Circuit Output Current	I_{SC}	T= 25 °C	-30	-80	-180	mA
OSCILLATOR SECTION						
Oscillator Frequency	f	T= 25 °C	47	52	57	KHz
Frequency Change with Voltage	$\Delta f/\Delta V_{CC}$	12V≤V_{CC}≤25V	-	0.05	1	%
Oscillator Amplitude	V_{OSC}		-	1.6	2.3	V_{P-P}
ERROR AMPLIFIER SECTION						
Input Bias Current	I_{BIAS}		-1	-0.1	1	µA
Input Voltage	$V_{I(E>A)}$	V_I =2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	G_{VO}	2V≤V_O≤4V	65	90	-	dB
Power Supply Rejection Ratio	PSRR	12V≤V_{CC}≤25V	60	70	-	dB
Output Sink Current	I_{SINK}	V_2 =2.7V, V_I =1.1V	2	6	-	mA
Output Source Current	I_{SOURCE}	V_2=2.3, V_I=5V	-0.5	-1.0	-	mA
High Output Voltage	V_{OH}	V_2=2.3, R_L= 15Ω to GND	5	6	-	V
Low Output Voltage	V_{OL}	V_2=2.7, R_L= 15Ω to pin 8	-	0.8	1.1	V
OUTPUT SECTION						
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_{ource} = 20mA	13	13.5	-	V
		S_{ource} = 200mA	12	13.0	-	
Rise Time	t_R	T_J = 25 °C, C_L=1nF (note3)	-	40	70	ns
Fall Time	t_F	T_J = 25 °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 = 10Ω, C_T = 3.3nF, T_A=0 °C to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
CURRENT SENSE SECTION						
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≤V_{CC}≤25V		70	-	dB
Input Bias Current	I_{BIAS}			-3	-10	µA
UNDER-VOLTAGE LOCKOUT SECTION						
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	
PWM SECTION						
Max Duty Cycle	D(MAX)	B3842/B3844	95	97	100	%
		B3843/B3845	47	48	50	
Min Duty Cycle	D (MIN)		-	-	0	%
TOTAL STANDBY CURRENT						
Start-Up Current	I_{ST}	B3842A/43A/44A/45A	-	100	120	µA
		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
PACKAGE THERMAL RESISTANCE						
8-SOIC	θ_{JA}				170	°C/W
8-PDip	θ_{JA}				125	°C/W



Startup & Operating Voltage Selection Guide

	UVLO Thresholds	
Duty Cycle	**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	Oscilator RC timing component connection. Resistor RT is connected to V_{REF} and capacitro CT is conencted to ground. Different values of RT and CT determine the maximum duty cycle..
5	GND/PGND	Combined pwoer and analog ground
6	OUT	High-power, toten-pole driver output. OUT pin is activly held LOW when V_{CC} is below the UVLO threshold.
7	V_{DD}	Suply votlage input
8	V_{REF}	5Volt reerence votlage 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

Bau 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.

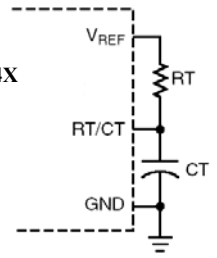
The CMOS output stage " break- before- make" action is guaranteed by design and insures that no cross- conduction current will flow. This minimizes heat dissipation, increases efficiency and enhances reliability.

Oscilator Operation

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

With VCC = 14V, RT = 10k and CT = 3.3nF, nominal switching frequency is 50kHz.

$$frequency[Hz] = \frac{1.73}{RT[\Omega] \times CT[F]}$$



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.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including " Typical" for each customer application.

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