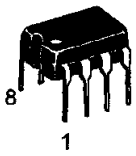
MB3800 Switching Regulator Controller

Preliminary

The MB3800 is a single-channel switching regulator control IC for low voltage applications incorporating a soft start function and short circuit detection function. The device has a low minimum operating voltage of 1.8 V and is ideal for the power supply of battery-operated electronic equipment.

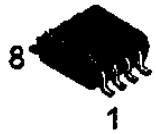
FEATURES

- Wide supply voltage operating range: 1.8 to 15 V
- Low current consumption: Typically 5.5 mA in operation, 1 μA or less in stand-by
- High speed operation is possible: Maximum 1 MHz
- The error amplifier gain is set inside the IC, so peripheral components are minimized.
- Incorporates a soft start circuit.
- Incorporates a timer-latch type short circuit detection circuit .
- Totem-pole type output with adjustable on/off current (for NPN transistors)
- Incorporates a stand-by function.
- Three types of packages (SOP-8 or SSOP-8)



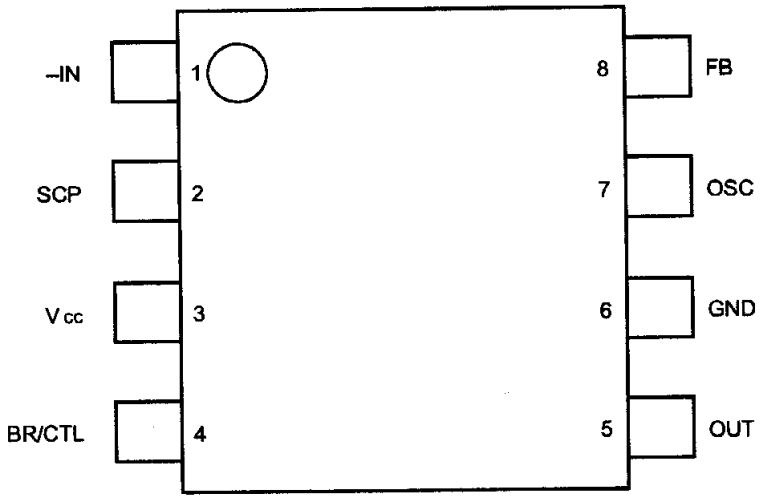
DIP-8

SOP-8



SSOP-8

(TOP VIEW)



Pin No	Symbol	I/O	Description
1	-IN	I	Error amplifier inverting input pin
2	SCP	-	Soft start and SCP setting capacitor connection pin
3	VCC	-	Power Supply Pin
4	BR/CTL	I	Output current setting and control pin
5	OUT	O	Totem-pole type output pin
6	GND	-	GND Pin
7	OSC	-	Capacitor and resistor connection pin for setting the oscillation frequency
8	FB	O	Error amplifier output pin

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rated Value		Unit
			Min	Max	
Power supply voltage	V_{CC}	-	-	16	V
Output source current	I_O^+	-	-	-50	mA
Output sink current	I_O^-	-	-	50	mA
Allowable dissipation	P_D	DIP-8, Ta≦+25℃	-	570	mW
		SOP-8,Ta≦+25℃	-	430	
		SSOP-8, Ta≦+25℃	-	580	
Operating temperature	T_{OP}	-	-30	+85	℃
Storage temperature	T_{STG}		-55	+125	℃

* : When mounted on a 10 cm square double-sided epoxy board

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Values			Unit
		Min	Typ	Max	
Power supply voltage	V_{CC}	1.8	-	15	V
Error amplifier input voltage	V_I	-0.2	-	1.0	V
BR/CTL pin input voltage	V_{BR}	-0.2	-	V_{CC}	V
Output Source Current	I_O^+	-40	-	-	mA
Output sink current	I_O^-	-	-	40	mA
SCP pin capacitance	C_{PE}	-	0.1	-	μF
Phase compensation capacitance	C_P	-	0.1	-	μF
Output current setting resistance	R_B	150	390	5000	Ω
Timing resistance	R_T	1.0	3.0	10.0	kΩ
Timing capacitance	C_T	100	270	10000	pF
Oscillation frequency	f_{OSC}	10	500	1000	kHz
Operating temperature	T_{OP}	-30	+25	+85	℃

WARNING: Recommended operating conditions are normal operating ranges for the semiconductor device. All the device's electrical characteristics are warranted when operated within these ranges.
Always use semiconductor devices within the recommended operating conditions. Operation outside these ranges may adversely affect reliability and could result in device failure.

ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Condition	Value			Unit
				Min	Typ	Max	
Circuit to prevent malfunction at low input voltage (U.V.L.O.)	Reset Voltage	V_R	-	-	-	0.9	V
	Threshold Voltage	V_{TH}		1.1	1.3	1.5	
Soft start	Charging Current	I_{CS}	V_{SCP}=0V	-1.5	-1.0	-0.7	μA
	Voltage at soft start completion	V_{tS}	-	0.7	0.8	0.9	V
Short circuit detection (S.C.R)	Charging current	I_{CPC}	V_{SCP}=0V	-1.5	-1.0	-0.7	μA
	Threshold Voltage	V_{tPC}	-	0.7	0.8	0.9	V
Sawtooth wave oscillator (OSC)	Oscillation frequency	f_{OSC}	R_T=3.0KΩ C_T=270pF	400	500	600	KHz
	Frequency input Stability	f_{dV}	V_{CC}=2V to 15V	-	2	10	%
	Frequency variation with temperature	f_{dT}	Ta=-30℃~+85℃	-	5	-	%
Error amplifier	Input Threshold Voltage	V_T	V_{FB}=450mV				
	V_T Input stability	V_{TdV}	V_{CC}=2V ~15V	480	500	520	mV
	V_T variation with temperature	V_{TdT}	Ta=-30℃~+85℃	-	5	20	mV
	Input bias current	I_B	V_{IN}=0V	-	1	-	%
	Voltage Gain	A_V	-	70	100	145	V/V
	Frequency bandwidth	BW	A_V=0dB	-	6	-	MHz
	Maximum output voltage range	V_{OM}^+	-	0.78	0.87	-	V
		V_{OM}^-		-	0.05	0.2	V
	Output source current	I_{OM}^+	V_{FB}=0.45V	-	-40	-24	μA
	Output sink current	I_{OM}^-		24	40	-	μA
Idle period adjustment section	Maximum duty cycle	t_{DUTY}	R_T=3.0KΩ C_T=270pF,V_{FB}=0.8V	65	75	85	%
Output section	Output voltage	V_{OH1}	R_B=390Ω,I_O=-15mA	1.0	1.2	-	V
		V_{OH2}	R_B=750Ω, V_{CC}=-15mA,I_O=-10mA	0.8	1.0	-	V
		V_{OL1}	R_B=390Ω,I_O=15mA	-	0.1	0.2	V
		V_{OL2}	R_B=750Ω, V_{CC}=-15mA,I_O=10mA	-	0.1	0.2	V
	Output source current	IO^+	R_B=390Ω,V_O=0.9V	-	-30	-20	mA
	Output sink current	IO^-	R_B=390Ω,V_O=0.3V	30	60	-	mA
	Pull down resistance	R_O	-	20	30	40	kΩ

Output current setting section/ Control section	Pin voltage	V_{BR}	R_B=390Ω	0.2	0.3	0.4	V
	Input off condition	I_{OFF}	-	-20	-	0	μA
	Input on condition	I_{ON}		-	-	-45	μA
	Pin current range	I_{BR}		-1.8	-	-0.1	mA
Entire device	Stand-by current	I_{CCS}	BR/CTL pin open or V_{CC}	-	-	1	μA
	Average supply current	I_{CC}	R_B=390Ω	-	5.5	9.3	mA