



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  $\mu$  A 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

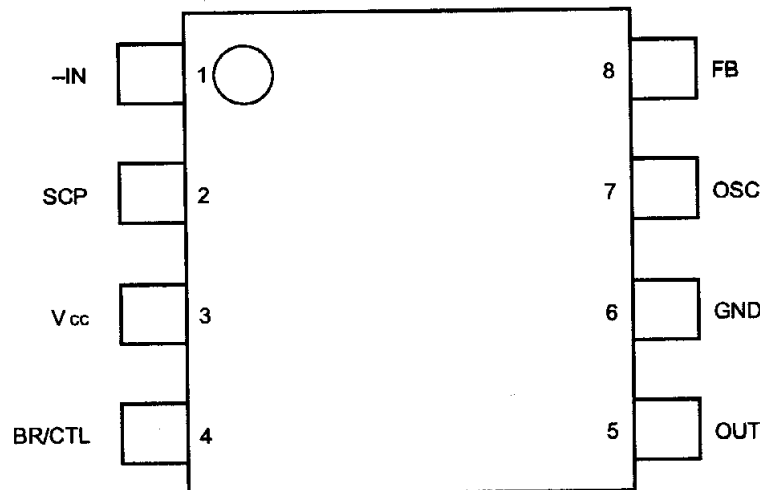


SOP-8



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, $T_a \leq +25^{\circ}C$	-	570	mW
		SOP-8, $T_a \leq +25^{\circ}C$	-	430	
		SSOP-8, $T_a \leq +25^{\circ}C$	-	580	
Operating temperature	$T_{OP}$	-	-30	+85	$^{\circ}C$
Storage temperature	$T_{STG}$		-55	+125	$^{\circ}C$

\* : 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	-	$\mu F$
Phase compensation capacitance	$C_P$	-	0.1	-	$\mu F$
Output current setting resistance	$R_B$	150	390	5000	$\Omega$
Timing resistance	$R_T$	1.0	3.0	10.0	$k\Omega$
Timing capacitance	$C_T$	100	270	10000	pF
Oscillation frequency	$f_{OSC}$	10	500	1000	kHz
Operating temperature	$T_{OP}$	-30	+25	+85	$^{\circ}C$

**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.



# MB3800 Switching Regulator Controller

Preliminary

## 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	V
Soft start	Charging Current	$I_{CS}$	$V_{SCP}=0V$	-1.5	-1.0	-0.7	$\mu A$
	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	$\mu A$
	Threshold Voltage	$V_{IPC}$	-	0.7	0.8	0.9	V
Sawtooth wave oscillator (OSC)	Oscillation frequency	$f_{OSC}$	$R_T=3.0K\Omega$ $C_T=270pF$	400	500	600	KHz
	Frequency input Stability	$f_{dV}$	$V_{CC}=2V$ to 15V	-	2	10	%
	Frequency variation with temperature	$f_{dT}$	$T_a=-30^\circ C \sim +85^\circ C$	-	5	-	%
Error amplifier	Input Threshold Voltage	$V_T$	$V_{FB}=450mV$				
	$V_T$ Input stability	$V_{TdV}$	$V_{CC}=2V \sim 15V$	480	500	520	mV
	$V_T$ variation with temperature	$V_{TdT}$	$T_a=-30^\circ C \sim +85^\circ C$	-	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	$I_{OM}^+$	-	-	-40	-24	$\mu A$
$I_{OM}^-$		$V_{FB}=0.45V$	24	40	-	$\mu A$	
Idle period adjustment section	Maximum duty cycle	$t_{DUTY}$	$R_T=3.0K\Omega$ $C_T=270pF, V_{FB}=0.8V$	65	75	85	%
Output section	Output voltage	$V_{OH1}$	$R_B=390\Omega, I_o=-15mA$	1.0	1.2	-	V
		$V_{OH2}$	$R_B=750\Omega,$ $V_{CC}=-15mA, I_o=-10mA$	0.8	1.0	-	V
		$V_{OL1}$	$R_B=390\Omega, I_o=15mA$	-	0.1	0.2	V
		$V_{OL2}$	$R_B=750\Omega,$ $V_{CC}=-15mA, I_o=10mA$	-	0.1	0.2	V
	Output source current	$I_O^+$	$R_B=390\Omega, V_o=0.9V$	-	-30	-20	mA
	Output sink current	$I_O^-$	$R_B=390\Omega, V_o=0.3V$	30	60	-	mA
	Pull down resistance	$R_o$	-	20	30	40	$k\Omega$



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Output current setting section/ Control section	Pin voltage	$V_{BR}$	$R_B=390\Omega$	0.2	0.3	0.4	V
	Input off condition	$I_{OFF}$	-	-20	-	0	$\mu A$
	Input on condition	$I_{ON}$		-	-	-45	$\mu A$
	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	$\mu A$
	Average supply current	$I_{CC}$	$R_B=390\Omega$	-	5.5	9.3	mA