



Integrated Microprocessor Supervisory Module with Lithium Backup Battery

MAX1691

General Description

The MAX1691 reduces the complexity and number of components required for power-supply monitoring and battery control functions in microprocessor (μ P) systems. The MAX1691 features switchover to internal backup battery, write protection of CMOS RAM or EEPROM, and watchdog function.

The internal +3V 125mAh lithium battery connects to the μ P supervisory circuit through external pin strapping, minimizing battery drain during shipping.

The MAX1691 is shipped in special nonconductive material. **Note: Storing the MAX1691 in conductive foam will discharge the internal battery.**

Features

- ◆ Internal 3V, 125mAh Lithium Battery
- ◆ 200ms Power OK/Reset Time Delay
- ◆ 1 μ A Standby Current, 35 μ A Operating Current
- ◆ On-Board Gating of Chip-Enable Signals, 10ns Max Delay
- ◆ Voltage Monitor for Power-Fail or Low-Battery Warning
- ◆ 16-Pin, 0.6" Plastic DIP Module

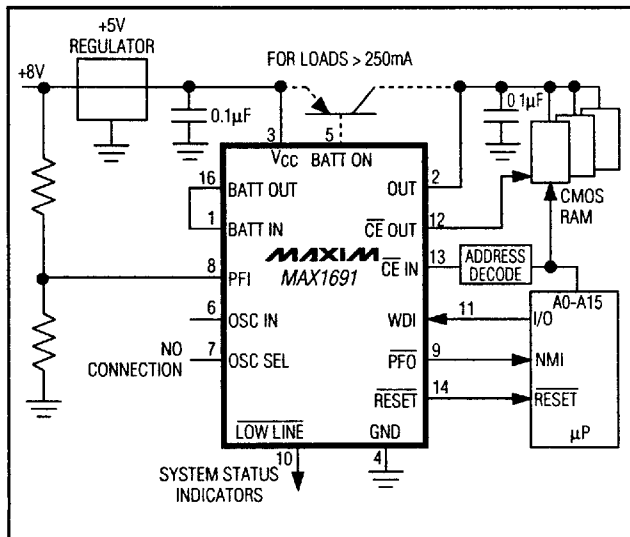
Applications

- Computers
- Controllers
- Intelligent Instruments
- Automotive Systems
- Critical μ P Power Monitoring

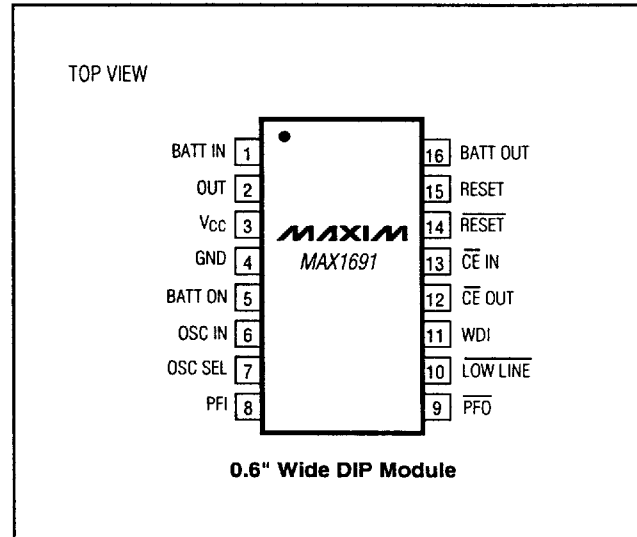
Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX1691CHE	0°C to +70°C	16 Plastic 0.6" Wide DIP Module

Typical Operating Circuit



Pin Configuration



Call toll free 1-800-998-8800 for free samples or literature.

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ABSOLUTE MAXIMUM RATINGS

Terminal Voltage (with respect to GND)

V _{CC}	-0.3V to +6V
All Other Inputs (Note 1)	-0.3V to (V _{OUT} + 0.3V)
Input Current	
BATT OUT	0mA to -25mA
V _{CC} Peak	1.0A
V _{CC} Continuous	250mA
BATT IN Peak	250mA
BATT IN Continuous	25mA
GND	±25mA
All Other Outputs	±25mA

Continuous Power Dissipation

Plastic DIP Module (derate 8.70mW/°C)	696mW
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	-40°C to +85°C
Lead Temperature (soldering, 10sec)	+260°C

Note 1: The input voltage limits on PFI and WDI may be exceeded if the current into these pins is less than 10mA.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{CC} = 4.75V to 5.5V, V_{BATT IN} = +2.8V applied externally, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Operating Voltage Range, V _{CC}			0	5.0	5.5	V
V _{OUT}	V _{CC} = 4.5V	I _{OUT} = 25mA	V _{CC} - 0.05	V _{CC} - 0.02		V
		I _{OUT} = 250mA	V _{CC} - 0.3	V _{CC} - 0.2		
V _{CC} to OUT On Resistance	V _{CC} = 4.5V			0.8	1.2	Ω
V _{OUT} in Battery-Backup Mode	V _{CC} < V _{BATT IN} , I _{OUT} = 100μA		V _{BATT IN} - 0.25			V
Supply Current in Normal Operating Mode (Excludes I _{OUT})	V _{CC} > V _{BATT IN}			35	100	μA
Supply Current in Battery-Backup Mode (Excludes I _{OUT}) (Note 2)	V _{CC} > V _{BATT IN} - 1.2V	T _A = +25°C		0.04	1	μA
		T _A = T _{MIN} to T _{MAX}			5	
V _{BATT IN} Standby Current (Note 3)	V _{BATT IN} + 0.2V ≤ V _{CC}	T _A = +25°C	-0.1		0.02	μA
		T _A = T _{MIN} to T _{MAX}	-1.0		0.02	
Battery-Switchover Threshold	Power-up		V _{BATT IN} + 0.03			V
	Power-down		V _{BATT IN} - 0.03			
Battery-Switchover Hysteresis				60		mV
BATT ON Output Low Voltage	I _{SINK} = 3.2mA				0.4	V
BATT ON Output Short-Circuit Current	Sink current			60		mA
	Source current		1	15	100	μA
Battery Capacity (Note 1)				125		mAh
Internal Battery Voltage (Note 1)				2.9		V
RESET AND WATCHDOG TIMER						
Reset Threshold Voltage			4.50	4.65	4.75	V
Reset Threshold Hysteresis				15		mV
V _{CC} to $\overline{\text{RESET}}$ Delay	Power-down			100		μs
$\overline{\text{LOW LINE}}$ to $\overline{\text{RESET}}$ Delay				330		ns
Reset Active Timeout Period, Internal Oscillator	Power-up		140	200	280	ms

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ELECTRICAL CHARACTERISTICS (continued)

(VCC = 4.75V to 5.5V, VBATT IN = +2.8V applied externally, TA = TMIN to TMAX, unless otherwise noted. Typical values are at +25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Reset Active Timeout Period, External Clock	Power-up		2048		Clock Cycles
Watchdog Timeout Period, Internal Oscillator	Long period	1.00	1.60	2.25	sec
	Short period	70	100	140	ms
Watchdog Timeout Period, External Clock	Long period		4096		Clock Cycles
	Short period		1024		Clock Cycles
Minimum Watchdog Input Pulse Width	VIL = 0.8V, (VIH = 0.75) (VCC)	100			ns
RESET Output Voltage	ISINK = 50μA, VCC = 1V, VBATT IN = 0V, VCC falling		0.004	0.300	V
	ISINK = 3.2mA, VCC = 4.25V		0.1	0.4	
	ISOURCE = 1.6mA, VCC = 5V	3.5			
RESET Output Short-Circuit Current	Output sink current		60		mA
	Output source current		7	20	
RESET Output Voltage Low (Note 4)	ISINK = 3.2mA		0.1	0.4	V
RESET Output Short-Circuit Current (Note 4)	Output sink current		60		mA
LOW LINE Output Voltage	ISINK = 3.2mA, VCC = 4.25V			0.4	V
	ISOURCE = 1μA, VCC = 5V	3.5			
LOW LINE Output Short-Circuit Current	Output sink current		60		mA
	Output source current	1	15	100	
WDI Threshold Voltage (Note 5)	VIH	0.75 x VCC			V
	VIL			0.8	
WDI Input Current	WDI = 0V	-50	-10		μA
	WDI = VOUT		20	50	
POWER-FAIL COMPARATOR					
PFI Input Threshold	VCC = 5V	1.20	1.25	1.30	V
PFI Leakage Current			±0.01	±25	nA
PFO Output Voltage	ISINK = 3.2mA			0.4	V
	ISOURCE = 1μA, VCC = 5V	3.5			
PFO Output Short-Circuit Current	Output sink current		60		mA
	Output source current	1	15	100	
PFI to PFO Delay	VIN = -20mV, VOD = 15mV		2		μs
	VIN = 20mV, VOD = 15mV		70		
CHIP-ENABLE GATING					
CE IN Leakage Current	Disabled mode		±0.005	±1	μA
CE IN to CE OUT Resistance (Note 6)	Enabled mode		75	150	Ω
CE OUT Short-Circuit Current (Reset Active)	Disabled mode, CE OUT = 0V	0.10	0.75	2.00	mA
CE IN to CE OUT Propagation Delay (Note 7)	50Ω source impedance driver, CLOAD = 50pF		6	10	ns
CE OUT Output Voltage High (Reset Active)	VCC = 5V, IOUT = -100μA	3.5			V
	VCC = 0V, VBATT IN = 2.8V, IOUT = 1μA	2.7			
RESET to CE OUT Delay	Power-down		15		μs

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ELECTRICAL CHARACTERISTICS (continued)

($V_{CC} = 4.75V$ to $5.5V$, $V_{BATT IN} = +2.8V$ applied externally, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $25^\circ C$.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INTERNAL OSCILLATOR					
OSC IN Leakage Current	OSC SEL = 0V		0.10	±5	μA
OSC IN Input Pull-Up Current	OSC SEL = V_{OUT} or floating, OSC IN = 0V		10	100	μA
OSC SEL Input Pull-Up Current	OSC SEL = 0V		10	100	μA
OSC IN Frequency Range	OSC SEL = 0V		50		kHz
OSC IN Frequency with External Capacitor	OSC SEL = 0V, $C_{OSC} = 47pF$		100		kHz

Note 1: See *Typical Operating Characteristics*.

Note 2: The supply current drawn from the battery excluding I_{OUT} typically goes to $18\mu A$ when $(V_{BATT IN} - 1V) < V_{CC} < V_{BATT IN}$. In most applications, this is a brief period as V_{CC} falls through this region.

Note 3: '+' = battery-discharging current, '-' = battery-charging current.

Note 4: RESET is an open-drain output and sinks current only.

Note 5: WDI is internally connected to a voltage divider between V_{OUT} and GND. If unconnected, WDI is driven to 1.6V (typ), disabling the watchdog function.

Note 6: The chip-enable resistance is tested with $V_{CC} = 4.75V$. $V_{CE IN} = V_{CE OUT} = V_{CC}/2$.

Note 7: The chip-enable propagation delay is measured from the 50% point at $\overline{CE IN}$ to the 50% point at $\overline{CE OUT}$.

Typical Operating Characteristics

($V_{BATT IN} = 2.8V$ externally applied, $V_{CC} = 5.0V$, $T_A = +25^\circ C$, unless otherwise noted).

