



# Microprocessor Supervisory Circuits

MAX696-MAX697/883B

## 1.0 SCOPE

**1.1** This specification covers the detail requirements for two complex supervisory circuits used in power-supply monitoring and battery control functions for microprocessor systems. These circuits are processed in accordance with MIL-STD-883 and are fully compliant to paragraph 1.2.1.

It is highly recommended that this data sheet be used as a baseline for new military or aerospace source control drawings.

For typical applications and operating characteristics, consult Maxim's data books.

## 1.2 Part Numbers

Device	Part Number
-1	MAX696MX/883B
-2	MAX697MX/883B

## 1.3 Package

(X)	Package	Description
JE	J-16	16-Pin Ceramic Dual-In-Line Package (CERDIP)

**Note:** See *Package Information* section for package drawing and dimensions.

## 1.4 Absolute Maximum Ratings

(Terminal voltage with respect to GND,  $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

MAX696	$V_{CC}$	-0.3V to +6.0V
	$V_{BATT}$	-0.3V to +6.0V
MAX697	$V_{CC}$	+0.3V
	GND	-0.3V
All Other Inputs		(Note 1) -0.3V to ( $V_{OUT} + 0.5V$ )
Input Current		
	$V_{CC}$	200mA
	$V_{BATT}$	50mA
	GND	20mA
Output Current		
	$V_{OUT}$	Short-Circuit Protected
	All Other Outputs	20mA
	Rate-of-Rise, $V_{BATT}$ , $V_{CC}$	100V/ $\mu\text{s}$
Power Dissipation ( $T_j = +150^\circ\text{C}$ )		
	up to $+70^\circ\text{C}$	800mW
	derate above $+70^\circ\text{C}$	10.00mW/ $^\circ\text{C}$
Operating Temperature Range		$-55^\circ\text{C}$ to $+125^\circ\text{C}$
Storage Temperature Range		$-65^\circ\text{C}$ to $+160^\circ\text{C}$
Lead Temperature (soldering, 10 sec)		$+300^\circ\text{C}$

**Note 1:** The input voltage limits on PFI and WDI may be exceeded if the input current is limited to less than 10mA.



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

# Microprocessor Supervisory Circuits

- 1.5 Thermal Resistance**     $\Theta_{JC} = 50^{\circ}\text{C/W}$  for JE-16  
                                        $\Theta_{JA} = 100^{\circ}\text{C/W}$  for JE-16

## 2.0 REQUIREMENTS

- 2.1** Electrical performance characteristics are specified in Table 1 and apply over the full ambient operating temperature range, unless otherwise specified.

**TABLE 1. ELECTRICAL PERFORMANCE CHARACTERISTICS (Note 2)**

CHARACTERISTICS	SYMBOL	CONDITIONS	DEVICE TYPES	GROUP A SUB-GROUPS	LIMITS		UNITS
					MIN	MAX	
Operating Voltage Range	$V_{\text{RANGE}}$	$V_{\text{CC}}$	-1	1, 2, 3	3.2	5.5	V
		$V_{\text{BATT}}$	-2		3.0	5.5	
Supply Current			-1			2.0	
<b>BATTERY-BACKUP SWITCHING</b>							
Output Voltage	$V_{\text{OUT}}$	$I_{\text{OUT}} = 1\text{mA}$	-1	1, 2, 3	$V_{\text{CC}}-0.3$		V
		$I_{\text{OUT}} = 50\text{mA}$			$V_{\text{CC}}-0.5$		
$V_{\text{OUT}}$ In Battery-Backup Mode	$\text{BATT}_{\text{OUT}}$	$I_{\text{OUT}} = 250\mu\text{A}$ , $V_{\text{CC}} < V_{\text{BATT}}-0.2\text{V}$	-1	1, 2, 3	$V_{\text{BATT}}-0.1$		V
Supply Current (excludes $I_{\text{OUT}}$ )	$I_{\text{CC}}$	$I_{\text{OUT}} = 1\text{mA}$	-1	1	4	mA	
				2, 3	7		
		$I_{\text{OUT}} = 50\text{mA}$		1	7		
				2, 3	10		
Supply Current in Battery-Backup Mode	$I_{\text{BATT}}$	$V_{\text{CC}} = 0\text{V}$ , $V_{\text{BATT}} = 2.8\text{V}$	-1	1	1	$\mu\text{A}$	
				2, 3	10	$\mu\text{A}$	
Battery Standby Leakage Current	$\text{BATT}_{\text{Lkg}}$	$5.5\text{V} > V_{\text{CC}} > V_{\text{BATT}} + 1\text{V}$	-1	1	-0.1	0.02	$\mu\text{A}$
				2, 3	-1.0	0.02	$\mu\text{A}$
Battery Switchover Threshold $V_{\text{CC}}-V_{\text{BATT}}$	$\text{BATT}_{\text{SWTH}}$	Power-up or power-down	-1	1, 2, 3	-200	200	mV
BATT On Output Voltage	$\text{BATT}_{\text{ONOUT}}$	$I_{\text{SINK}} = 1.6\text{mA}$	-1	1, 2, 3		0.4	V
BATT On Output Short-Circuit Current	$\text{BATT}_{\text{ONIOS}}$	$\text{BATT ON} = V_{\text{OUT}}$	-1	1, 2, 3		60	mA
		$\text{BATT ON} = 0\text{V}$ , $V_{\text{CC}} = 0\text{V}$			0.5	25	$\mu\text{A}$

# Microprocessor Supervisory Circuits

MAX696-MAX697/883B

5

**TABLE 1. ELECTRICAL PERFORMANCE CHARACTERISTICS (Note 2) (continued)**

CHARACTERISTICS	SYMBOL	CONDITIONS	DEVICE TYPES	GROUP A SUB-GROUPS	LIMITS		UNITS	
					MIN	MAX		
<b>RESET AND WATCHDOG TIMING</b>								
Low-Line Threshold	LL <sub>IN</sub>	V <sub>CC</sub> = 5V, 3V	All	1, 2, 3	1.25	1.35	V	
Reset Timeout Delay	R <sub>DEL</sub>	OSC SEL HIGH, V <sub>CC</sub> = 5V	All	9	35	70	ms	
				10, 11	31	78		
Watchdog Timeout Period, Internal Oscillator	WD <sub>INT</sub>	Long period, V <sub>CC</sub> = 5V	All	9	1.00	2.25	sec	
				10, 11	0.90	2.42		
		Short period, V <sub>CC</sub> = 5V	All	9	70	140	ms	
				10, 11	62	154		
Watchdog Timeout Period, External Clock	WD <sub>EXT</sub>	Long period	All	9, 10, 11	3840	4097	Clock cycles	
		Short period			768	1025		
Minimum WDI Input Pulse Width	WDI <sub>PW</sub>	V <sub>IL</sub> = 0.4V, V <sub>IH</sub> = 4.0V, V <sub>CC</sub> = 5V	All	9	200		ns	
				10, 11	300			
RESET Output Voltage	R <sub>VOH</sub>	I <sub>SOURCE</sub> = 1μA, V <sub>CC</sub> = 5V	All	1, 2, 3	3.5		V	
	R <sub>VOL</sub>	I <sub>SINK</sub> = 1.6mA			0.4			
			I <sub>SINK</sub> = 400μA, V <sub>CC</sub> = 0V	-1	0.4			
LOW LINE Output Voltage	LL <sub>VOH</sub>	I <sub>SOURCE</sub> = 1μA, V <sub>CC</sub> = 5V	All	1, 2, 3	3.5		V	
	LL <sub>VOL</sub>	I <sub>SINK</sub> = 800μA			0.4			
RESET Output Voltage	R <sub>VOH</sub>	I <sub>SOURCE</sub> = 1μA, V <sub>CC</sub> = 5V	All	1, 2, 3	3.5		V	
	R <sub>VOL</sub>	I <sub>SINK</sub> = 1.6mA			0.4			
WDO Output Voltage	WDO <sub>VOH</sub>	I <sub>SOURCE</sub> = 1μA, V <sub>CC</sub> = 5V	All	1, 2, 3	3.5		V	
	WDO <sub>VOL</sub>	I <sub>SINK</sub> = 800μA		2, 3	0.4			
Output Short-Circuit Current	I <sub>OS</sub>	RESET, RESET, WDO, LOWLINE	All	1, 2, 3	1	25	μA	
WDI Input Threshold Logic Low	WDI <sub>VIL</sub>	V <sub>CC</sub> = 5V (Note 3)	All	1	0.8		V	
				2, 3	0.4			
WDI Input Threshold Logic High	WDI <sub>VIH</sub>	V <sub>CC</sub> = 5V (Note 3)	All	1	3.5		V	
				2, 3	3.8			
WDI Input Current	WDI <sub>IN</sub>	MAX696	All	1	50		μA	
					WDI = V <sub>OUT</sub>	80		
						WDI = 0V		-50
					WDI = 0V			-80
		MAX697		WDI = V <sub>CC</sub>	1	50		
						2, 3		80
					1			-50
						2, 3		-80

# Microprocessor Supervisory Circuits

MAX696-MAX697/883B

**TABLE 1. ELECTRICAL PERFORMANCE CHARACTERISTICS (Note 2) (continued)**

CHARACTERISTICS	SYMBOL	CONDITIONS	DEVICE TYPES	GROUP A SUB-GROUPS	LIMITS		UNITS
					MIN	MAX	
<b>POWER-FAIL DETECTOR</b>							
PFI Input Threshold	PF <sub>MIN</sub>	V <sub>CC</sub> = 3V, 5V	All	1, 2, 3	1.2	1.4	V
PFI-LL <sub>IN</sub> Threshold Difference	PFI-LL <sub>IN</sub>	V <sub>CC</sub> = 3V, 5V	All	1	-50	50	mV
PFI Input Current	PF <sub>IIN</sub>		All	1, 2, 3	-25	25	nA
LL <sub>IN</sub> Input Current	LL <sub>IN1</sub>		-1	1, 2, 3	-500	25	nA
			-2		-25	25	
P $\overline{F}$ O Output Voltage	P $\overline{F}$ O <sub>VOH</sub>	I <sub>SOURCE</sub> = 1 $\mu$ A, V <sub>CC</sub> = 5V	All	1, 2, 3	3.5		V
	P $\overline{F}$ O <sub>VOL</sub>	I <sub>SINK</sub> = 1.6mA			0.4		
P $\overline{F}$ O Short-Circuit Source Current	P $\overline{F}$ O <sub>IOS</sub>	PFI = V <sub>IH</sub> , P $\overline{F}$ O = 0V	All	1, 2, 3	1	25	$\mu$ A
<b>CHIP-ENABLE GATING (MAX697)</b>							
$\overline{C}$ E IN Threshold Logic Low	$\overline{C}$ E <sub>IN VIL</sub>		-2	1	0.8		V
				2, 3	0.4		
$\overline{C}$ E IN Threshold Logic High	$\overline{C}$ E <sub>VIH</sub>		-2	1	3.0		V
				2, 3	3.5		
$\overline{C}$ E IN Pull-Up Current	$\overline{C}$ E <sub>INPI</sub>		-2	1, 2, 3	1	25	$\mu$ A
$\overline{C}$ E OUT Output Voltage	$\overline{C}$ E <sub>VOH</sub>	I <sub>SOURCE</sub> = 800 $\mu$ A	-2	1	V <sub>OUT-0.5</sub>		V
		I <sub>SOURCE</sub> = 1 $\mu$ A			V <sub>OUT-0.05</sub>		
	$\overline{C}$ E <sub>VOL</sub>	I <sub>SINK</sub> = 1.6mA	1, 2, 3	0.4			
$\overline{C}$ E Propagation Delay	t <sub>PDCE</sub>	V <sub>CC</sub> = 5V	-2	9	150		ns
				10, 11	250		
<b>OSCILLATOR</b>							
OSC IN Input Current	OSC <sub>IN</sub>		All	1, 2, 3	25		$\mu$ A
OSC SEL Input Pull-Up Current	OSCSEL <sub>IN</sub>	V <sub>CC</sub> = 5V	All	1, 2, 3	1	25	$\mu$ A
OSC IN Frequency Range	OSCIN <sub>FRQ</sub>	OSC SEL = 0V, V <sub>CC</sub> = 5V	All	9, 10, 11	0	250	kHz
OSC IN Frequency (Note 4)	OSCIN	OSC SEL = 0V, C <sub>Osc</sub> = 47pF	All	9	4	kHz	

**Note 2:** V<sub>CC</sub> = full operating range, V<sub>BATT</sub> = 2.8V, T<sub>A</sub> = +25°C, unless otherwise noted.

**Note 3:** WDI is guaranteed to be in the mid-level (inactive) state if WDI is floating and V<sub>CC</sub> is in the operating voltage range. WDI is internally biased to 38% of V<sub>CC</sub> with an impedance of approximately 125k $\Omega$ .

**Note 4:** Design characteristics typical, but not tested.

# Microprocessor Supervisory Circuits

MAX696-MAX697/883B

## 3.0 QUALITY ASSURANCE

- 3.1** Sampling and inspection procedures shall be in accordance with MIL-M-38510 and, to the extent specified, with MIL-STD-883.
- 3.2** Screening shall be in accordance with Method 5004 of MIL-STD-883. Burn-in test (Method 1015):
- (1) Test condition A, B, C, or D.
  - (2)  $T_A = +125^{\circ}\text{C}$ , minimum.
  - (3) Interim and final electrical test requirements shall be as specified in Table 2.
- 3.3** Quality conformance inspection shall be in accordance with Method 5005 of MIL-STD-883 including Groups A, B, C, and D inspection.  
Group A inspection:
- (1) Tests as specified in Table 2.
  - (2) Selected subgroups in Table 1, Method 5005 of MIL-STD-883 shall be omitted.
- 3.4** Groups C and D inspections:
- a. End-point electrical parameters shall be specified in Table 1.
  - b. Steady-state life test (Method 1005 of MIL-STD-883):
    - (1) Test condition A, B, C, or D.
    - (2)  $T_A = +125^{\circ}\text{C}$ , minimum.
    - (3) Test duration, 1000 hours, except as permitted by Method 1005 of MIL-STD-883.

**TABLE 2. ELECTRICAL TEST REQUIREMENTS**

MIL-STD-883 Test Requirements	Subgroups (per Method 5005, Table 1)
Interim Electrical Parameters (Method 5004)	1
Final Electrical Parameters (Method 5004)	1,* 2, 3, 9, 10,** 11**
Group A Test Requirements (Method 5005)	1, 2, 3, 9, 10,** 11**
Groups C and D End-Point Electrical Parameters (Method 5005)	1

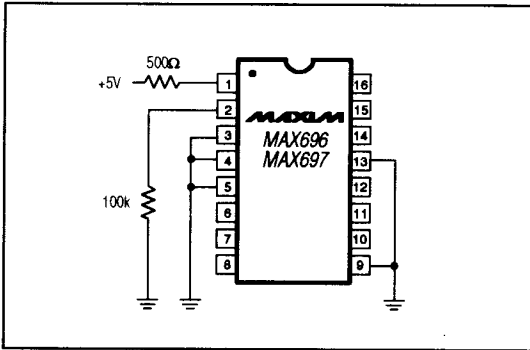
\* PDA applies to Subgroup 1 only.

\*\* Subgroups 10 and 11, if not tested, shall be guaranteed to the limits in Table 1.

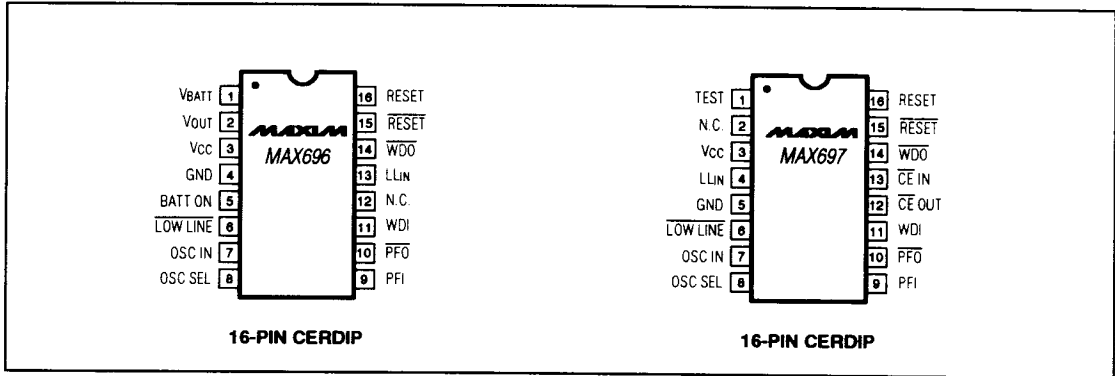
5

# Microprocessor Supervisory Circuits

## 4.0 Life Test/Burn-In Circuit

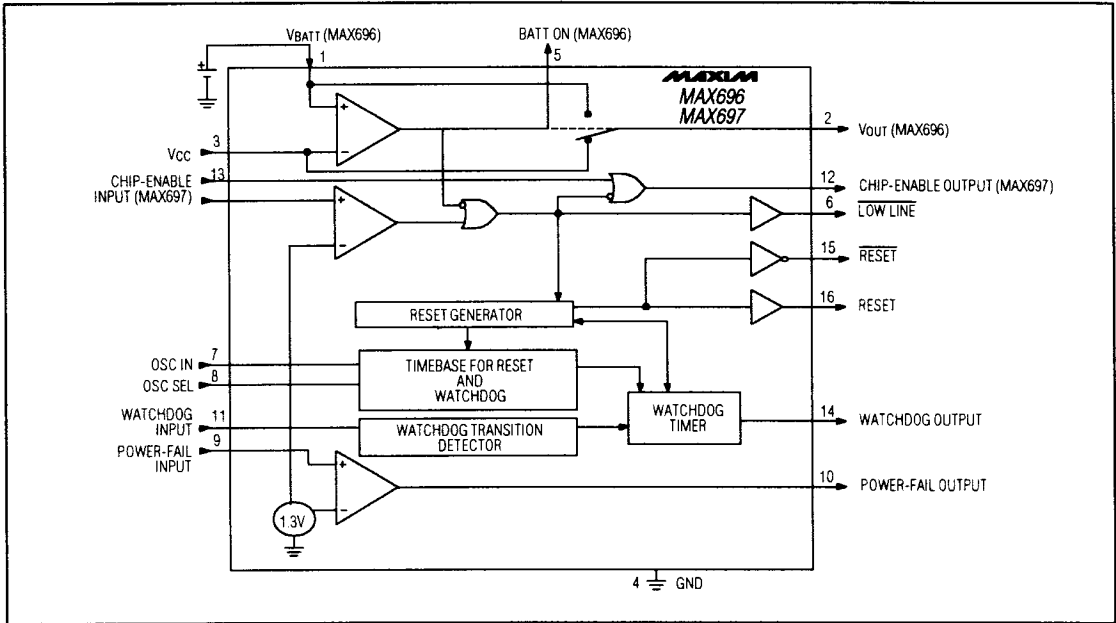


## 4.1 Pin Configurations



# Microprocessor Supervisory Circuits

## 4.2 Functional Diagram



MAX696-MAX697/883B

5