



Maxim > Products > [Supervisors, Voltage Monitors, Sequencers] [Military/Aerospace]

## MAX690, MAX691, MAX692, MAX693, MAX694, MAX695

Microprocessor Supervisory Circuits

**Industry-Standard, Full-Function  $\mu$ P Supervisor**

Key Specifications: Battery Backup Circuits										
Part Number	Reset Threshold Range (V)	Active-Low Reset Output	Active-High Reset Output	Max. $I_{CC}$ ( $\mu$ A)	Features	RoHS Available	Industry Qualified	Package	Operating Temp. Range ( $^{\circ}$ C)	
MAX690			-		<ul style="list-style-type: none"> <li>Adjustable Reset Input</li> <li>Power Fail Comparator                             <ul style="list-style-type: none"> <li>Watchdog</li> </ul> </li> </ul>			Ceramic DIP/8 FPCK/10 LCC/20 PDIP/8		
MAX691			Push-Pull		<ul style="list-style-type: none"> <li>Adjustable Reset Input                             <ul style="list-style-type: none"> <li>Battery On</li> </ul> </li> <li>Chip Enable Gate                             <ul style="list-style-type: none"> <li>Low Line</li> </ul> </li> <li>Power Fail Comparator                             <ul style="list-style-type: none"> <li>Watchdog</li> </ul> </li> </ul>			Ceramic DIP/16 LCC/20 PDIP/16 SOIC/16		

MAX692	3.3 to 5.5	Push-Pull	-	5000	<ul style="list-style-type: none"> <li>Adjustable Reset Input</li> <li>Power Fail Comparator               <ul style="list-style-type: none"> <li>Watchdog</li> </ul> </li> </ul>	Yes	MIL-STD-883B	Ceramic DIP/8 PDIP/8	-55 to +125 -40 to +85 0 to +70	
MAX693			Push-Pull		<ul style="list-style-type: none"> <li>Adjustable Reset Input               <ul style="list-style-type: none"> <li>Battery On</li> </ul> </li> <li>Chip Enable Gate               <ul style="list-style-type: none"> <li>Low Line</li> </ul> </li> <li>Power Fail Comparator               <ul style="list-style-type: none"> <li>Watchdog</li> </ul> </li> </ul>			Ceramic DIP/16 LCC/20 PDIP/16 SOIC/16		
MAX694			-		<ul style="list-style-type: none"> <li>Adjustable Reset Input</li> <li>Power Fail Comparator               <ul style="list-style-type: none"> <li>Watchdog</li> </ul> </li> </ul>			Ceramic DIP/8 LCC/20 PDIP/8		
MAX695			Push-Pull		<ul style="list-style-type: none"> <li>Adjustable Reset Input               <ul style="list-style-type: none"> <li>Battery On</li> </ul> </li> <li>Chip Enable Gate               <ul style="list-style-type: none"> <li>Low Line</li> </ul> </li> <li>Power Fail Comparator               <ul style="list-style-type: none"> <li>Watchdog</li> </ul> </li> </ul>			Ceramic DIP/16 PDIP/16 SOIC/16		
<a href="#">See All Battery Backup Circuits (86)</a>										

**Notes:**

\*\*This pricing is BUDGETARY, for comparing similar parts. Prices are in U.S. dollars and subject to change. Quantity pricing may vary substantially and international prices may differ due to local duties, taxes, fees, and exchange rates. For volume-specific prices and delivery, please see the [price and availability page](#) or contact an authorized distributor.

**Application Notes**

Application Note 23:  $\mu$ P-Supervisor Chip Controls Programmable Filter - MAX690  
 Application Note 42: Large Capacitor Replaces Backup Battery - MAX690

**Evaluation Kits**

none

**Design Guides**

Microprocessor Supervisory (PDF)

## Reliability Reports

Show FIT data for:  
Reliability Report: [MAX690xxxA.pdf](#) [MAX691xxE.pdf](#)

Request Reliability Report for:  
Underwriters Laboratories (UL®) Recognized

## Software/Models

none

## Ordering Information

Notes:

1. Other options and links for purchasing parts are listed at:
2. [Didn't Find What You Need?](#) Ask our applications engineers. Expert assistance in finding parts, usually within one business day.
3. Part number suffixes: T or T&R = tape and reel; + = RoHS/lead-free; # = RoHS/lead-exempt. More: See [Full Data Sheet](#) or [Part Naming Conventions](#).
4. \* Some packages have variations, listed on the drawing. "PkgCode/Variation" tells which variation the product uses. Note that "+", "#", "-" in the part number suffix describes RoHS status. Package drawings may show a different suffix character.

### Devices: 1-78 of 78

MAX690	Free Sample	Buy	Package: TYPE PINS FOOTPRINT DRAWING CODE/VAR *	Temp	RoHS/Lead-Free? Materials Analysis
MAX690EJA			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX690MJA/883B			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX690MJA			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX690C/D					See data sheet

MAX690MFB/883B			FPCK; 10 pin; Dwg: <a href="#">21-0010</a> (PDF) Use pkgcode/variation: F10-3*	-55°C to +125°C	See data sheet
MAX690MLP/883B			LCC; 20 pin; Dwg: <a href="#">21-0658</a> (PDF) Use pkgcode/variation: L20-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX690CPA			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8-2*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX690CPA+			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8+2*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX690EPA			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8-2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX690EPA+			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8+2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
<b>MAX691</b>	<b>Free Sample</b>	<b>Buy</b>	<b>Package:</b> TYPE PINS FOOTPRINT DRAWING CODE/VAR *	<b>Temp</b>	<b>RoHS/Lead-Free? Materials Analysis</b>
MAX691EJE			Ceramic DIP; 16 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J16-3*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691MJE/883B			Ceramic DIP; 16 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J16-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691MJE			Ceramic DIP; 16 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J16-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691C/D					See data sheet
MAX691MLP/883B			LCC; 20 pin; Dwg: <a href="#">21-0658</a> (PDF) Use pkgcode/variation: L20-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691CPE+			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16+1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX691CPE			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16-1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>

MAX691EPE			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16-1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691EPE+			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX691CWE+T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX691CWE+			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX691CWE-T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691CWE			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691EWE+T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX691EWE-T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691EWE			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX691EWE+			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
<b>MAX692</b>	<b>Free Sample</b>	<b>Buy</b>	<b>Package:</b> TYPE PINS FOOTPRINT DRAWING CODE/VAR *	<b>Temp</b>	<b>RoHS/Lead-Free? Materials Analysis</b>
MAX692EJA			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX692MJA/883B			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX692MJA			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>

MAX693EPE			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16-1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX693EPE+			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX693CWE+T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX693CWE+			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX693CWE			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX693CWE-T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX693EWE+T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX693EWE+			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX693EWE-T			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX693EWE			SOIC; 16 pin; Dwg: <a href="#">21-0042</a> (PDF) Use pkgcode/variation: W16-1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
<b>MAX694</b>	<b>Free Sample</b>	<b>Buy</b>	<b>Package:</b> TYPE PINS FOOTPRINT DRAWING CODE/VAR *	<b>Temp</b>	<b>RoHS/Lead-Free? Materials Analysis</b>
MAX694EJA			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX694MJA			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX694MJA/883B			Ceramic DIP; 8 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>

MAX694C/D					See data sheet
MAX694MLP/883B			LCC; 20 pin; Dwg: <a href="#">21-0658</a> (PDF) Use pkgcode/variation: L20-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX694CPA+			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8+2*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX694CPA			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8-2*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX694EPA			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8-2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX694EPA+			PDIP; 8 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P8+2*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
<b>MAX695</b>	<b>Free Sample</b>	<b>Buy</b>	<b>Package:</b> TYPE PINS FOOTPRINT DRAWING CODE/VAR *	<b>Temp</b>	<b>RoHS/Lead-Free? Materials Analysis</b>
MAX695C/D					See data sheet
MAX695EJE			Ceramic DIP; 16 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J16-3*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX695MJE/883B			Ceramic DIP; 16 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J16-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX695MJE			Ceramic DIP; 16 pin; Dwg: <a href="#">21-0045</a> (PDF) Use pkgcode/variation: J16-3*	-55°C to +125°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX695CPE			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16-1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">No Materials Analysis</a>
MAX695CPE+			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16+1*	0°C to +70°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>
MAX695EPE+			PDIP; 16 pin; Dwg: <a href="#">21-0043</a> (PDF) Use pkgcode/variation: P16+1*	-40°C to +85°C	RoHS/Lead-Free: <a href="#">Lead Free Materials Analysis</a>

# MAXIM Microprocessor Supervisory Circuits

MAX690/91/92/93/94/95

## General Description

The MAX690 Family of supervisory circuits reduce the complexity and number of components required for power supply monitoring and battery control functions in microprocessor systems. These include  $\mu$ P reset and backup-battery switchover, watchdog timer, CMOS RAM write protection, and power-failure warning. The MAX690 Family significantly improves system reliability and accuracy compared to that obtainable with separate ICs or discrete components.

The MAX690, MAX692 and MAX694 are supplied in 8-pin packages and provide four functions:

- 1) A Reset output during power-up, power-down and brownout conditions.
- 2) Battery backup switching for CMOS RAM, CMOS microprocessor or other low power logic.
- 3) A Reset pulse if the optional watchdog timer has not been toggled within a specified time.
- 4) A 1.3V threshold detector for power fail warning, low battery detection, or to monitor a power supply other than +5V.

The MAX691, MAX693 and MAX695 are supplied in 16-pin packages and perform all MAX690/692/694 functions, plus:

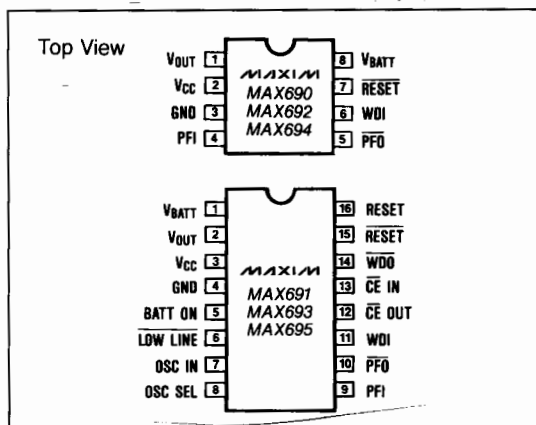
- 1) Write protection of CMOS RAM or EEPROM.
- 2) Adjustable reset and watchdog timeout periods.
- 3) Separate outputs for indicating a watchdog timeout, backup-battery switchover, and low  $V_{CC}$ .

## Applications

Computers  
Controllers  
Intelligent Instruments  
Automotive Systems  
Critical  $\mu$ P Power Monitoring

Ordering information continued on last page.

## Pin Configuration



## Features

- ◆ Precision Voltage Monitor  
4.65V in MAX690, MAX691, MAX694 and MAX695  
4.40V in MAX692 and MAX693
- ◆ Power OK/Reset Time Delay – 50, 200ms, or adjustable
- ◆ Watchdog Timer – 100ms, 1.6 sec, or adjustable
- ◆ Minimum Component Count
- ◆ 1 $\mu$ A Standby Current
- ◆ Battery Backup Power Switching
- ◆ Onboard Gating of Chip Enable Signals
- ◆ Voltage Monitor for Power Fail or Low Battery Warning

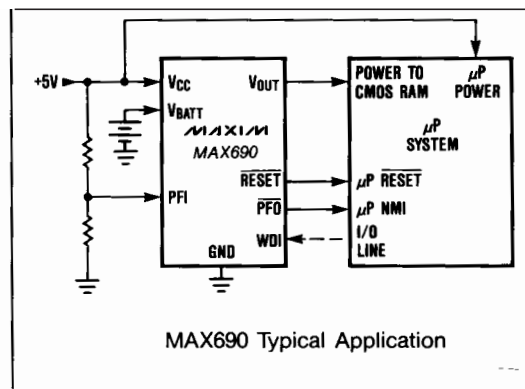
## Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX690CPA	0°C to +70°C	8 Lead Plastic DIP
MAX690C/D	0°C to +70°C	Dice*
MAX690EPA	-40°C to +85°C	8 Lead Plastic DIP
MAX690EJA	-40°C to +85°C	8 Lead Cerdip
MAX690MJA	-55°C to +125°C	8 Lead Cerdip
MAX691CPE	0°C to +70°C	16 Lead Plastic DIP
MAX691CWE	0°C to +70°C	16 Lead Wide SO
MAX691C/D	0°C to +70°C	Dice*
MAX691EPE	-40°C to +85°C	16 Lead Plastic DIP
MAX691EWE	-40°C to +85°C	16 Lead Wide SO
MAX691EJE	-40°C to +85°C	16 Lead Cerdip
MAX691MJE	-55°C to +125°C	16 Lead Cerdip

\*Contact factory for dice specifications.

Devices in PDIP and SO packages are available in both leaded and lead-free packaging. Specify lead free by adding the + symbol at the end of the part number when ordering. Lead free not available for Cerdip package.

## Typical Operating Circuit



MAXIM

Maxim Integrated Products 1



# Microprocessor Supervisory Circuits

## ABSOLUTE MAXIMUM RATINGS

Terminal Voltage (with respect to GND)	
V <sub>CC</sub> .....	-0.3V to 6.0V
V <sub>BATT</sub> .....	-0.3V to 6.0V
All Other Inputs (Note 1) ..	-0.3V to (V <sub>OUT</sub> + 0.5V)
Input Current	
V <sub>CC</sub> .....	200mA
V <sub>BATT</sub> .....	50mA
GND .....	20mA
Output Current	
V <sub>OUT</sub> .....	short circuit protected
All Other Outputs .....	20mA
Rate-of-Rise, V <sub>BATT</sub> , V <sub>CC</sub> .....	100V/μs
Operating Temperature Range	
C suffix .....	0°C to +70°C
E suffix .....	-40°C to +85°C
M suffix .....	-55°C to +125°C

Power Dissipation	
8-Pin Plastic DIP (Derate 5mW/°C above +70°C) .....	400mW
8-Pin CERDIP (Derate 8mW/°C above +85°C) .....	500mW
16-Pin Plastic DIP (Derate 7mW/°C above +70°C) .....	600mW
16-Pin Small Outline (Derate 7mW/°C above +70°C) .....	600mW
16-Pin CERDIP (Derate 10mW/°C above +85°C) .....	600mW
Storage Temperature Range .....	-65°C to +160°C
Lead Temperature (Soldering, 10s) .....	300°C

Stresses above 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 above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = full operating range, V<sub>BATT</sub> = 2.8V, T<sub>A</sub> = 25°C, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>BATTERY BACKUP SWITCHING</b>					
Operating Voltage Range MAX690, MAX691, MAX694, MAX695 V <sub>CC</sub> MAX690, MAX691, MAX694, MAX695 V <sub>BATT</sub> MAX692, MAX693 V <sub>CC</sub> MAX692, MAX693 V <sub>BATT</sub>		4.75 2.0 4.5 2.0		5.5 4.25 5.5 4.0	V
V <sub>OUT</sub> Output Voltage	I <sub>OUT</sub> = 1mA I <sub>OUT</sub> = 50mA	V <sub>CC</sub> -0.3 V <sub>CC</sub> -0.5	V <sub>CC</sub> -0.1 V <sub>CC</sub> -0.25		V
V <sub>OUT</sub> in Battery Backup Mode	I <sub>OUT</sub> = 250μA, V <sub>CC</sub> < V <sub>BATT</sub> - 0.2V	V <sub>BATT</sub> - 0.1	V <sub>BATT</sub> - 0.02		V
Supply Current (excludes I <sub>OUT</sub> )	I <sub>OUT</sub> = 1mA I <sub>OUT</sub> = 50mA		2 3.5	5 10	mA
Supply Current in Battery Backup Mode	V <sub>CC</sub> = 0V, V <sub>BATT</sub> = 2.8V		0.6	1	μA
Battery Standby Current (+ = Discharge, - = Charge)	5.5V > V <sub>CC</sub> > V <sub>BATT</sub> + 1V T <sub>A</sub> = 25°C T <sub>A</sub> = Full Operating Range	-0.1 -1.0		+0.02 +0.02	μA
Battery Switchover Threshold V <sub>CC</sub> - V <sub>BATT</sub>	Power Up Power Down		70 50		mV
Battery Switchover Hysteresis			20		mV
BATT ON Output Voltage	I <sub>SINK</sub> = 3.2mA			0.4	V
BATT ON Output Short Circuit Current	BATT ON = V <sub>OUT</sub> = 4.5V Sink Current BATT ON = 0V Source Current	0.5	25 1	25	mA μA
<b>RESET AND WATCHDOG TIMER</b>					
Reset Voltage Threshold	T <sub>A</sub> = Full Operating Range MAX690, MAX691, MAX694, MAX695 MAX692, MAX693	4.5 4.25	4.65 4.4	4.75 4.5	V V

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

# Microprocessor Supervisory Circuits

**MAX690/91/92/93/94/95**

## ELECTRICAL CHARACTERISTICS (continued)

( $V_{CC}$  = full operating range,  $V_{BATT} = 2.8V$ ,  $T_A = 25^\circ C$ , unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Reset Threshold Hysteresis			40		mV
Reset Timeout Delay (MAX690/91/92/93)	Figure 6. OSC SEL HIGH, $V_{CC} = 5V$	35	50	70	ms
Reset Timeout Delay (MAX694/95)	Figure 6. OSC SEL HIGH, $V_{CC} = 5V$	140	200	280	ms
Watchdog Timeout Period, Internal Oscillator	Long Period, $V_{CC} = 5V$	1.0	1.6	2.25	sec
	Short Period, $V_{CC} = 5V$	70	100	140	ms
Watchdog Timeout Period, External Clock	Long Period	3840		4097	Clock Cycles
	Short Period	768		1025	Clock Cycles
Minimum WDI Input Pulse Width	$V_{IL} = 0.4$ , $V_{IH} = 0.8V_{CC}$	200			ns
RESET and LOW LINE Output Voltage	$I_{SINK} = 1.6mA$ , $V_{CC} = 4.25V$ $I_{SOURCE} = 1\mu A$ , $V_{CC} = 5V$	3.5		0.4	V
RESET and WDO Output Voltage	$I_{SINK} = 1.6mA$ $I_{SOURCE} = 1\mu A$ , $V_{CC} = 5V$	3.5		0.4	V
Output Short Circuit Current	RESET, RESET, WDO, LOW LINE	1	3	25	$\mu A$
WDI Input Threshold	$V_{CC} = 5V$ (Note 2)	Logic Low		0.8	V
		Logic High	3.5		
WDI Input current	WDI = $V_{OUT}$ WDI = 0V	-50	-15	50	$\mu A$
<b>POWER FAIL DETECTOR</b>					
PFI Input Threshold	$V_{CC} = +5V$ , $T_A = Full$	1.2	1.3	1.4	V
PFI Input Current			$\pm 0.01$	$\pm 25$	nA
PFO Output Voltage	$I_{SINK} = 3.2mA$ $I_{SOURCE} = 1\mu A$	3.5		0.4	V
PFO Short Circuit Source Current	PFI = $V_{IH}$ , PFO = 0V	1	3	25	$\mu A$
<b>CHIP ENABLE GATING</b>					
CE IN Thresholds	$V_{IL}$ $V_{IH}$	3.0		0.8	V
CE IN Pullup Current			3		$\mu A$
CE OUT Output Voltage	$I_{SINK} = 3.2mA$ $I_{SOURCE} = 3.0mA$ $I_{SOURCE} = 1\mu A$ , $V_{CC} = 0V$	$V_{OUT} - 1.5$ $V_{OUT} - 0.05$		0.4	V
CE Propagation Delay	$V_{CC} = 5V$		50	200	ns
<b>OSCILLATOR</b>					
OSC IN Input Current			$\pm 2$		$\mu A$
OSC SEL Input Pullup Current			5		$\mu A$
OSC IN Frequency Range	OSC SEL = 0V	0		250	kHz
OSC IN Frequency with External Capacitor	OSC SEL = 0V $C_{OSC} = 47pF$		4		kHz

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

**Note 2:** WDI is guaranteed to be in the mid-level (inactive) state if WDI is floating and  $V_{CC}$  is in the operating voltage range. WDI is internally biased to 38% of  $V_{CC}$  with an impedance of approximately 125 kilohms.

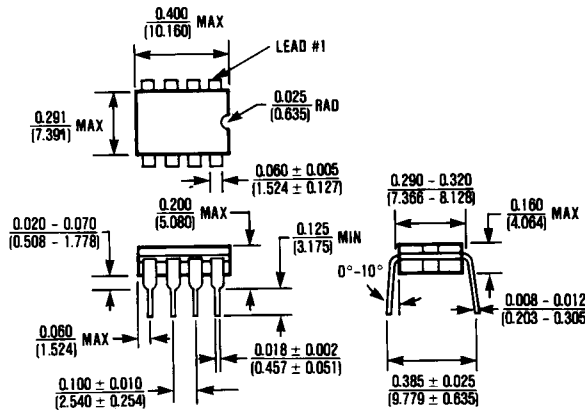
## Microprocessor Supervisory Circuits

**Table 2. Input and Output Status In Battery Backup Mode**

$V_{BATT}$ , $V_{OUT}$	$V_{BATT}$ is connected to $V_{OUT}$ via internal MOSFET.
RESET	Logic low
RESET	Logic high. The open circuit output voltage is equal to $V_{OUT}$ .
LOW LINE	Logic low
BATT ON	Logic high
WDI	WDI is internally disconnected from its internal pullup and does not source or sink current as long as its input voltage is between GND and $V_{OUT}$ . The input voltage does not affect supply current.
WDO	Logic high
PFI	The Power Fail Comparator is turned off and the Power Fail Input voltage has no effect on the Power Fail Output.
PFO	Logic low
CE IN	CE IN is internally disconnected from its internal pullup and does not source or sink current as long as its input voltage is between GND and $V_{OUT}$ . The input voltage does not affect supply current.
CE OUT	Logic high
OSC IN	OSC IN is ignored.
OSC SEL	OSC SEL is ignored.
$V_{CC}$	Approximately 12 $\mu$ A is drawn from the $V_{BATT}$ input when $V_{CC}$ is between $V_{BATT} + 100\text{mV}$ and $V_{BATT} - 700\text{mV}$ . The supply current is 1 $\mu$ A maximum when $V_{CC}$ is less than $V_{BATT} - 700\text{mV}$ .

### Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)



### 8 Lead CERDIP (JA)

$$\theta_{JA} = 125^{\circ}\text{C/W}$$

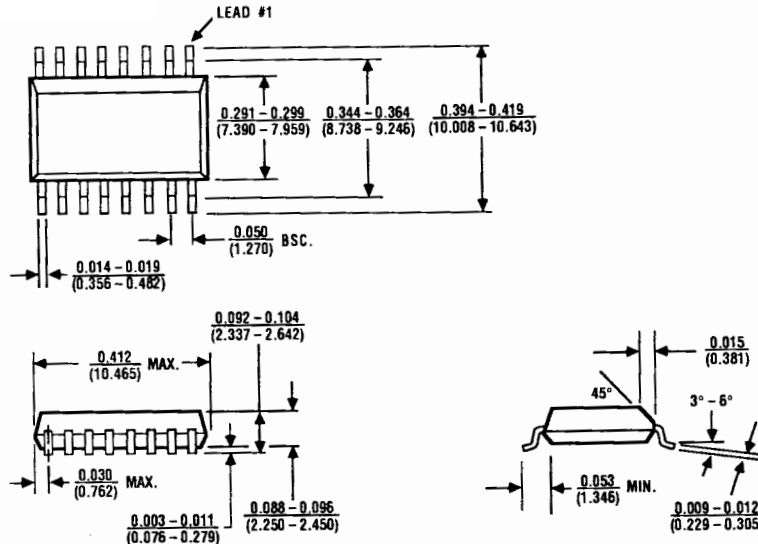
$$\theta_{JC} = 55^{\circ}\text{C/W}$$

# Microprocessor Supervisory Circuits

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information

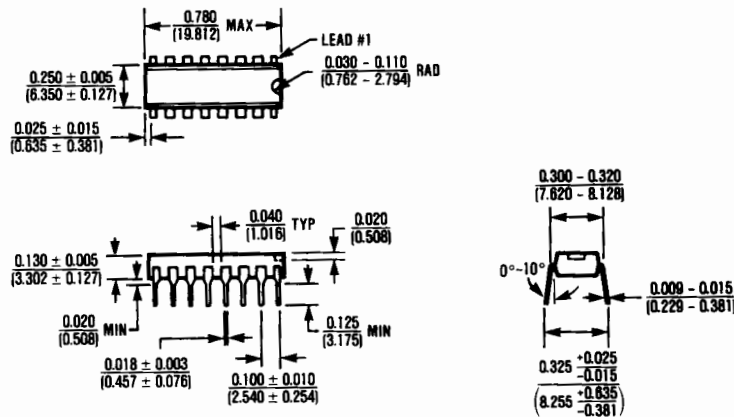
MAX690/91/92/93/94/95



### 16 Lead Small Outline, Wide (WE)

$$\theta_{JA} = 105^{\circ}\text{C/W}$$

$$\theta_{JC} = 60^{\circ}\text{C/W}$$



### 16 Lead Plastic DIP (PE)

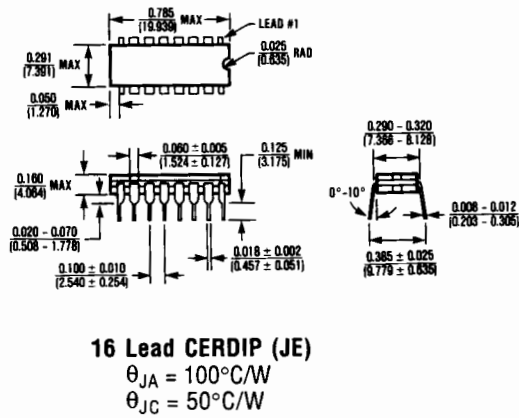
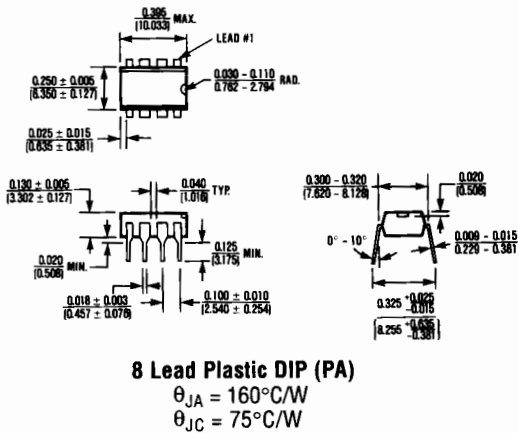
$$\theta_{JA} = 135^{\circ}\text{C/W}$$

$$\theta_{JC} = 65^{\circ}\text{C/W}$$

# Microprocessor Supervisory Circuits

## Package Information (continued)

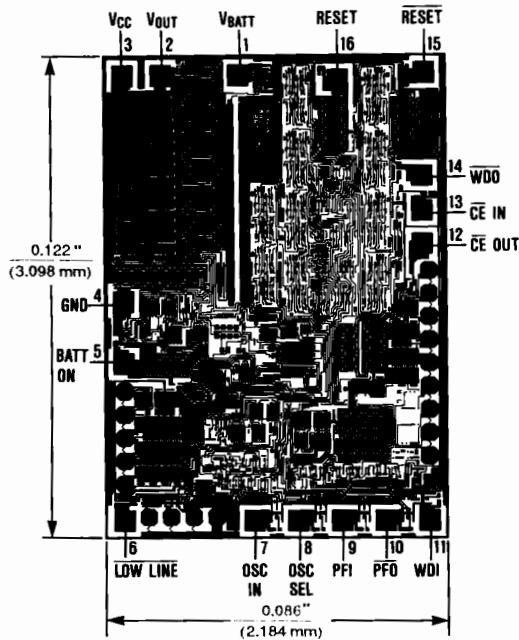
(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information



## Ordering Information (continued)

PART	TEMP. RANGE	PIN-PACKAGE
MAX692C/D	0°C to +70°C	Dice
MAX692CPA	0°C to +70°C	8 Lead Plastic DIP
MAX692EPA	-40°C to +85°C	8 Lead Plastic DIP
MAX692EJA	-40°C to +85°C	8 Lead CERDIP
MAX692MJA	-55°C to +125°C	8 Lead CERDIP
MAX693C/D	0°C to +70°C	Dice
MAX693CPE	0°C to +70°C	16 Lead Plastic DIP
MAX693CWE	0°C to +70°C	16 Lead Wide SO
MAX693EPE	-40°C to +85°C	16 Lead Plastic DIP
MAX693EJE	-40°C to +85°C	16 Lead CERDIP
MAX693EWE	-40°C to +85°C	16 Lead Wide SO
MAX693MJE	-55°C to +125°C	16 Lead CERDIP
MAX694C/D	0°C to +70°C	Dice
MAX694CPA	0°C to +70°C	8 Lead Plastic DIP
MAX694EPA	-40°C to +85°C	8 Lead Plastic DIP
MAX694EJA	-40°C to +85°C	8 Lead CERDIP
MAX694MJA	-55°C to +125°C	8 Lead CERDIP
MAX695C/D	0°C to +70°C	Dice
MAX695CPE	0°C to +70°C	16 Lead Plastic DIP
MAX695CWE	0°C to +70°C	16 Lead Wide SO
MAX695EPE	-40°C to +85°C	16 Lead Plastic DIP
MAX695EJE	-40°C to +85°C	16 Lead CERDIP
MAX695EWE	-40°C to +85°C	16 Lead Wide SO
MAX695MJE	-55°C to +125°C	16 Lead CERDIP

## Chip Topography



Devices in PDIP and SO packages are available in both leaded and lead-free packaging. Specify lead free by adding the + symbol at the end of the part number when ordering. Lead free not available for CERDIP package.

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