

### FEATURES

- Pin-compatible with MAX1232 and Dallas DS1232
- Adjustable precision voltage monitor with 4.5 V and 4.75 V options
- Adjustable strobe monitor with 150 ms, 600 ms, or 1.2 sec options
- No external components
- Specified from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### APPLICATIONS

- Microprocessor systems
- Portable equipment
- Computers
- Controllers
- Intelligent instruments
- Automotive systems

### GENERAL DESCRIPTION

The ADM1232 is pin-compatible with the MAX1232, DS1232LP, and DS1232. The Analog Devices, Inc., ADM1232 is a microprocessor monitoring circuit that can monitor the following:

- Microprocessor supply voltage
- Whether a microprocessor has locked up
- External interrupts

The ADM1232 is available in four packages: an 8-lead MSOP (RM-8), an 8-lead PDIP (N-8), a 16-lead wide SOIC (RW-16), and an 8-lead narrow SOIC (R-8).



Figure 1.

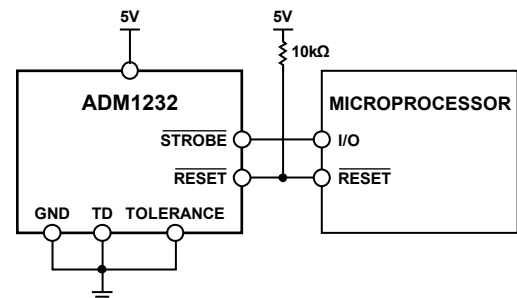


Figure 2. Typical Supply Monitoring Application

#### Rev. C

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## REVISION HISTORY

### 12/08—Rev. B to Rev. C

|  |           |
|--|-----------|
| Updated Format .....                   | Universal |
| Changes to Table 2 .....               | 4         |
| Added Thermal Resistance Section ..... | 4         |
| Updated Outline Dimensions .....       | 7         |
| Changes to Ordering Guide .....        | 9         |

### 12/97—Rev. A to Rev. B

|   |   |
|---|---|
| Changes to Specifications Section ..... | 2 |
|---|---|

### x/97—Rev. 0 to Rev. A

|   |   |
|---|---|
| Changes to Specifications Section ..... | 2 |
|---|---|

### 7/97—Revision 0: Initial Version

## SPECIFICATIONS

$V_{CC}$  = full operating range,  $T_A = T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted.

Table 1.

| Parameter                                     | Min            | Typ            | Max            | Unit | Test Conditions/Comments  |
|---|----------------|----------------|----------------|------|---|
| TEMPERATURE                                   | -40            |                | +85            | °C   | $T_A = T_{MIN}$ to $T_{MAX}$ .  |
| POWER SUPPLY                                  |                |                |                |      |   |
| Voltage                                       | 4.5            | 5.0            | 5.5            | V    |   |
| Current                                       |                | 20             | 50             | μA   | $V_{IL}, V_{IH}$ = CMOS levels.   |
|   |                | 200            | 500            | μA   | $V_{IL}, V_{IH}$ = TTL levels.  |
| STROBE AND PB RESET INPUTS                    |                |                |                |      |   |
| Input High Level                              | 2.0            |                | $V_{CC} + 0.3$ | V    |   |
| Input Low Level                               | -0.3           |                | +0.8           | V    |   |
| INPUT LEAKAGE CURRENT<br>(STROBE, TOLERANCE)  | -1.0           |                | +1.0           | μA   |   |
| TD  |                | 1.6            |                | μA   |   |
| OUTPUT CURRENT                                |                |                |                |      |   |
| RESET   | 8              | 10             |                | mA   | $V_{CC}$ is at 4.5 V to 5.5 V.  |
| RESET/RESET                                   | -8             | -12            |                | mA   | $V_{CC}$ is at 4.5 V to 5.5 V.  |
| OUTPUT VOLTAGE                                |                |                |                |      |   |
| RESET/RESET                                   | $V_{CC} - 0.5$ | $V_{CC} - 0.1$ |                | V    | When sourcing less than 500 μA, RESET remains within 0.5 V of $V_{CC}$ on power-down until $V_{CC}$ drops below 2.0 V. When sinking less than 500 μA, RESET remains within 0.5 V of GND on power-down until $V_{CC}$ drops below 2.0 V. |
| RESET/RESET High Level                        |                |                | 0.4            | V    |   |
| RESET/RESET Low Level                         | 2.4            |                |                | V    |   |
| 1 V OPERATION                                 |                |                |                |      |   |
| RESET Output Voltage                          |                | $V_{CC} - 0.1$ |                | V    | When sourcing less than 50 μA.  |
| RESET Output Voltage                          |                | 0.1            |                | V    | When sinking less than 50 μA.   |
| $V_{CC}$ TRIP POINT                           |                |                |                |      |   |
| 5%  | 4.5            | 4.62           | 4.74           | V    | TOLERANCE = GND.  |
| 10%   | 4.25           | 4.37           | 4.49           | V    | TOLERANCE = $V_{CC}$ .  |
| CAPACITANCE                                   |                |                |                |      |   |
| Input (STROBE, TOLERANCE)                     |                |                | 5              | pF   | $T_A = 25^\circ\text{C}$ .  |
| Output (RESET, RESET)                         |                |                | 7              | pF   | $T_A = 25^\circ\text{C}$ .  |
| PB RESET                                      |                |                |                |      |   |
| Time  | 20             |                |                | ms   | RESET must be held low for a minimum of 20 ms to guarantee a reset.   |
| Delay   | 1              | 4              | 20             | ms   |   |
| RESET ACTIVE TIME                             | 250            | 610            | 1000           | ms   |   |
| STROBE  |                |                |                |      |   |
| Pulse Width                                   | 70             |                |                | ns   |   |
| Timeout Period                                | 62.5           | 150            | 250            | ms   | TD = 0 V.   |
|   | 250            | 600            | 1000           | ms   | TD = floating.  |
|   | 500            | 1200           | 2000           | ms   | TD = $V_{CC}$ .   |
| $V_{CC}$                                      |                |                |                |      |   |
| Fall Time                                     | 10             |                |                | μs   | Guaranteed by design.   |
| Rise Time                                     | 0              |                |                | μs   | Guaranteed by design.   |
| $V_{CC}$ FAIL DETECT TO RESET<br>OUTPUT DELAY |                |                |                |      | RESET and RESET are logically correct.  |
|   |                |                | 50             | μs   | After $V_{CC}$ falls below the set tolerance voltage (see Figure 9).  |
|   | 250            | 610            | 1000           | ms   | After $V_{CC}$ rises above the set tolerance voltage.   |

## ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$  unless otherwise noted.

**Table 2.**

| Parameter                            | Rating                                    |
|--------------------------------------|---|
| $V_{CC}$                             | 5.5 V                                     |
| Logic Inputs                         | $-0.3\text{ V to }V_{CC} + 0.3\text{ V}$  |
| Storage Temperature Range            | $-65^\circ\text{C to }+150^\circ\text{C}$ |
| Lead Temperature (Soldering, 10 sec) | $300^\circ\text{C}$                       |
| Vapor Phase (60 sec)                 | $215^\circ\text{C}$                       |
| Infrared (15 sec)                    | $220^\circ\text{C}$                       |
| Power Dissipation                    |   |
| N-8 <sup>1</sup>                     | 1000 mW                                   |
| RW-16, RM-8 <sup>2</sup>             | 900 mW                                    |
| R-8 <sup>2</sup>                     | 900 $\mu\text{W}$                         |

<sup>1</sup> Derate by 13.5 mW/ $^\circ\text{C}$  above  $25^\circ\text{C}$ .

<sup>2</sup> Derate by 12 mW/ $^\circ\text{C}$  above  $25^\circ\text{C}$ .

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## THERMAL RESISTANCE

$\theta_{JA}$  is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

**Table 3. Thermal Resistance**

| Package Type           | $\theta_{JA}$ | Unit               |
|------------------------|---------------|--------------------|
| 8-Lead PDIP (N-8)      | 100           | $^\circ\text{C/W}$ |
| 16-Lead SOIC_W (RW-16) | 73            | $^\circ\text{C/W}$ |
| 8-Lead MSOP (RM-8)     | 206           | $^\circ\text{C/W}$ |
| 8-Lead SOIC_N (R-8)    | 153           | $^\circ\text{C/W}$ |

## ESD CAUTION



**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

## PIN CONFIGURATIONS AND FUNCTION DESCRIPTIONS



Figure 3. RW-16 Pin Configuration

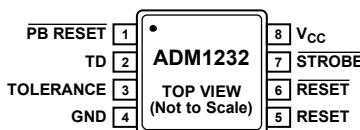


Figure 4. RM-8 Pin Configuration

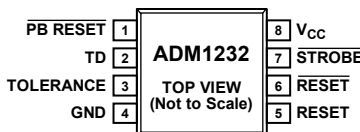


Figure 5. N-8 and R-8 Pin Configuration

Table 4. Pin Function Descriptions

| Pin No.                    |                | Mnemonic                     | Description   |
|----------------------------|----------------|------------------------------|---|
| RW-16                      | N-8, R-8, RM-8 |                              |   |
| 1, 3, 5, 7, 10, 12, 14, 16 |                | NC                           | No Connection.  |
| 2                          | 1              | $\overline{\text{PB RESET}}$ | Push-Button Reset Input. This debounced input ignores pulses of less than 1 ms and is guaranteed to respond to pulses greater than 20 ms.   |
| 4                          | 2              | TD                           | Time Delay Set. This input allows the user to select the maximum amount of time that the ADM1232 allows the $\overline{\text{STROBE}}$ input to remain inactive—that is, $\overline{\text{STROBE}}$ is not receiving any high-to-low transitions—without forcing the ADM1232 to generate a RESET pulse. See the Specifications section, Figure 8, and the $\overline{\text{STROBE}}$ Timeout Selection section. |
| 6                          | 3              | TOLERANCE                    | Tolerance Input. This input determines how much the supply voltage is allowed to decrease (as a percentage) before a RESET is asserted. Connect this pin to $V_{CC}$ for 10% and to GND for 5%.   |
| 8                          | 4              | GND                          | 0 V Ground Reference for All Signals.   |
| 9                          | 5              | RESET                        | Active High Logic Output. This pin is asserted when any of the following events occurs: $V_{CC}$ decreases below the amount specified by the TOLERANCE input; when $\overline{\text{PB RESET}}$ is forced low; if there are no high-to-low transitions within the limits set by TD at $\overline{\text{STROBE}}$ ; and during power-up.   |
| 11                         | 6              | $\overline{\text{RESET}}$    | Inverse of RESET. This pin has an open-drain output.  |
| 13                         | 7              | $\overline{\text{STROBE}}$   | The $\overline{\text{STROBE}}$ input is used to monitor the activity of a microprocessor. If there are no high-to-low transitions within the time specified by TD, a reset is asserted.   |
| 15                         | 8              | $V_{CC}$                     | Power Supply Input, 5 V.  |

## CIRCUIT INFORMATION

### PB RESET

The  $\overline{\text{PB RESET}}$  input makes it possible to manually reset a system using either a standard push-button switch or a logic low input. An internal debounce circuit provides glitch immunity when used with a switch, reducing the effects of glitches on the line. The debounce circuit is guaranteed to cause the ADM1232 to assert a reset if  $\overline{\text{PB RESET}}$  is brought low for more than 20 ms and is guaranteed to ignore low inputs of less than 1 ms.



Figure 6. Typical Push-Button Reset Application



Figure 7.  $\overline{\text{PB RESET}}$

### STROBE TIMEOUT SELECTION

$T_D$  (time delay) set is used to set the strobe timeout period. The strobe timeout period is the maximum time between high-to-low transitions that  $\overline{\text{STROBE}}$  accepts before a reset is asserted (see Figure 8). The strobe timeout settings are listed in Table 5.

Table 5. Strobe Timeout Settings

| Condition               | Min  | Typ  | Max  | Unit |
|-------------------------|------|------|------|------|
| $T_D = 0\text{ V}$      | 62.5 | 150  | 250  | ms   |
| $T_D = \text{Floating}$ | 250  | 600  | 1000 | ms   |
| $T_D = V_{CC}$          | 500  | 1200 | 2000 | ms   |



Figure 8.  $\overline{\text{STROBE}}$  Parameters



Figure 9. Reset Output Delay

### TOLERANCE

The TOLERANCE input is used to determine the level at which  $V_{CC}$  can vary below 5 V without the ADM1232 asserting a reset. Connecting TOLERANCE to GND selects a  $-5\%$  tolerance level and causes the ADM1232 to generate a reset if  $V_{CC}$  falls below 4.75 V. If TOLERANCE is connected to  $V_{CC}$ , a  $-10\%$  tolerance level is selected, which causes the ADM1232 to generate a reset if  $V_{CC}$  falls below 4.5 V. See the parameters for the  $V_{CC}$  trip point in the Specifications section for more information.

### RESET AND $\overline{\text{RESET}}$ OUTPUTS

$\overline{\text{RESET}}$  is capable of sourcing and sinking current, whereas  $\text{RESET}$  is an open-drain MOSFET that sinks current only. Therefore, it is necessary to pull this output high.

# OUTLINE DIMENSIONS

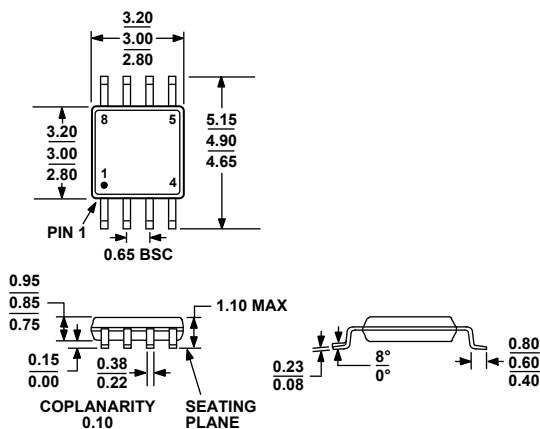


COMPLIANT TO JEDEC STANDARDS MS-013-AA  
 CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS  
 (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR  
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 10. 16-Lead Standard Small Outline Package [SOIC\_W]  
 Wide Body  
 (RW-16)

Dimensions shown in millimeters and (inches)

032707-B



COMPLIANT TO JEDEC STANDARDS MO-187-AA

Figure 11. 8-Lead Mini Small Outline Package [MSOP]  
 (RM-8)

Dimensions shown in millimeters



COMPLIANT TO JEDEC STANDARDS MS-001  
 CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETER DIMENSIONS  
 (IN PARENTHESES) ARE ROUNDED-OFF INCH EQUIVALENTS FOR  
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.  
 CORNER LEADS MAY BE CONFIGURED AS WHOLE OR HALF LEADS.

Figure 12. 8-Lead Plastic Dual In-Line Package [PDIP]  
 Narrow Body  
 (N-8)

Dimensions shown in inches and (millimeters)

0770606-A



COMPLIANT TO JEDEC STANDARDS MS-012-AA  
 CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS  
 (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR  
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 13. 8-Lead Standard Small Outline Package [SOIC\_N]  
 Narrow Body  
 (R-8)

Dimensions shown in millimeters and (inches)

012407-A



**ORDERING GUIDE**

| Model                          | Temperature Range | Package Description  | Package Options | Branding |
|--------------------------------|-------------------|--|-----------------|----------|
| ADM1232ARM                     | -40°C to +85°C    | 8-Lead Mini Small Outline Package [MSOP]                   | RM-8            | M2A      |
| ADM1232ARM-REEL                | -40°C to +85°C    | 8-Lead Mini Small Outline Package [MSOP]                   | RM-8            | M2A      |
| ADM1232ARM-REEL7               | -40°C to +85°C    | 8-Lead Mini Small Outline Package [MSOP]                   | RM-8            | M2A      |
| ADM1232ARMZ <sup>1</sup>       | -40°C to +85°C    | 8-Lead Mini Small Outline Package [MSOP]                   | RM-8            | M4W      |
| ADM1232ARMZ-REEL <sup>1</sup>  | -40°C to +85°C    | 8-Lead Mini Small Outline Package [MSOP]                   | RM-8            | M4W      |
| ADM1232ARMZ-REEL7 <sup>1</sup> | -40°C to +85°C    | 8-Lead Mini Small Outline Package [MSOP]                   | RM-8            | M4W      |
| ADM1232AN                      | -40°C to +85°C    | 8-Lead Plastic Dual In-Line Package [PDIP]                 | N-8             |          |
| ADM1232ANZ <sup>1</sup>        | -40°C to +85°C    | 8-Lead Plastic Dual In-Line Package [PDIP]                 | N-8             |          |
| ADM1232ARW                     | -40°C to +85°C    | 16-Lead Standard Small Outline Package [SOIC_W], Wide Body | RW-16           |          |
| ADM1232ARW-REEL                | -40°C to +85°C    | 16-Lead Standard Small Outline Package [SOIC_W], Wide Body | RW-16           |          |
| ADM1232ARW-REEL7               | -40°C to +85°C    | 16-Lead Standard Small Outline Package [SOIC_W], Wide Body | RW-16           |          |
| ADM1232ARWZ <sup>1</sup>       | -40°C to +85°C    | 16-Lead Standard Small Outline Package [SOIC_W], Wide Body | RW-16           |          |
| ADM1232ARWZ-REEL <sup>1</sup>  | -40°C to +85°C    | 16-Lead Standard Small Outline Package [SOIC_W], Wide Body | RW-16           |          |
| ADM1232ARWZ-REEL7 <sup>1</sup> | -40°C to +85°C    | 16-Lead Standard Small Outline Package [SOIC_W], Wide Body | RW-16           |          |
| ADM1232ARN                     | -40°C to +85°C    | 8-Lead Standard Small Outline Package [SOIC_N]             | R-8             |          |
| ADM1232ARN-REEL                | -40°C to +85°C    | 8-Lead Standard Small Outline Package [SOIC_N]             | R-8             |          |
| ADM1232ARN-REEL7               | -40°C to +85°C    | 8-Lead Standard Small Outline Package [SOIC_N]             | R-8             |          |
| ADM1232ARNZ <sup>1</sup>       | -40°C to +85°C    | 8-Lead Standard Small Outline Package [SOIC_N]             | R-8             |          |
| ADM1232ARNZ-REEL <sup>1</sup>  | -40°C to +85°C    | 8-Lead Standard Small Outline Package [SOIC_N]             | R-8             |          |
| ADM1232ARNZ-REEL7 <sup>1</sup> | -40°C to +85°C    | 8-Lead Standard Small Outline Package [SOIC_N]             | R-8             |          |

<sup>1</sup> Z = RoHS Compliant Part.

**ADM1232**

**NOTES**

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