



# Low-Voltage Manual Reset & Watchdog Supervisory Circuits in 4-Lead SC70

Preliminary Technical Data

ADM8611/ADM8616/ADM8617/ADM8618

## FEATURES

- Precision 1.8V to 5V Power Supply Monitoring
- 9 Reset Threshold Options:
  - 1.58V to 4.63V
- 140ms (Min) Reset Timeout
- Manual Reset Input (ADM8611)
- Watchdog Timer (ADM8616–ADM8618)
- Reset Output Stages
  - Push-Pull Active-Low
  - Open-Drain Active-Low
  - Push-Pull Active-High
- Low Power Consumption (3 $\mu$ A)
- Guaranteed Reset Output valid to  $V_{CC}=1V$
- Power Supply Glitch Immunity
- Specified Over -40°C to +85°C Temperature Range
- 4-Lead SC70 Package

## APPLICATIONS

- Microprocessor Systems
- Computers
- Controllers
- Intelligent Instruments
- Portable Equipment

## GENERAL DESCRIPTION

The ADM8611/ADM8616/ADM8617/ADM8618 are supervisory circuits which monitor power supply voltage levels and code execution integrity in microprocessor-based systems. A power-on-reset signal is generated when the supply voltage rises to a preset threshold level. The ADM8611's debounced manual reset input can be used to initiate a reset by means of an external push-button or logic signal. The ADM8616–ADM8618 have an on-chip watchdog timer which can reset the microprocessor if it fails to strobe within a preset timeout period.

## FUNCTIONAL BLOCK DIAGRAMS

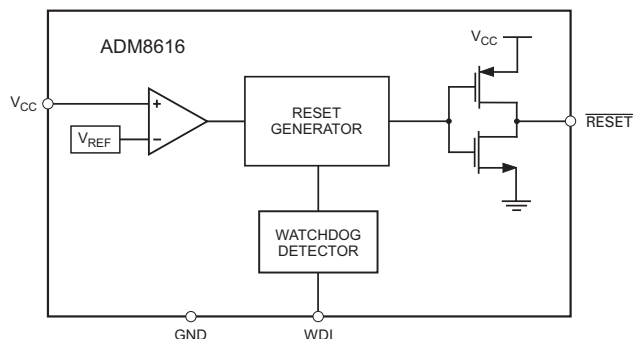


Figure 1.

Each part is available in a choice of the following 9 reset threshold options: 1.58V, 1.67V, 2.19V, 2.32V, 2.63V, 2.93V, 3.08V, 4.38V and 4.63V. The reset timeout periods are 20ms (min) and 140ms (min) for the ADM8611 and ADM8616–ADM8618, respectively. The watchdog timeout period is 1.6s (typ). The parts differ in terms of reset output configuration, as indicated in table 1.

The ADM8611/ADM8616/ADM8617/ADM8618 are available in 4-lead SC70 packages and typically consume only 3 $\mu$ A, making them suitable for use in low power portable applications.

Table 1. Selection Table

| Part No. | Manual Reset | Watchdog | Output Stage |           |
|----------|--------------|----------|--------------|-----------|
|          |              |          | RESET        | RESET     |
| ADM8611  | Yes          | -        | Push-Pull    |           |
| ADM8616  | -            | Yes      | Push-Pull    |           |
| ADM8617  | -            | Yes      | Open-Drain   |           |
| ADM8618  | -            | Yes      |              | Push-Pull |

## Rev. PrB

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective companies.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.  
Tel: 781.329.4700  
Fax: 781.326.8703  
www.analog.com  
© 2004 Analog Devices, Inc. All rights reserved.

## ADM8611/ADM8616/ADM8617/ADM8618—SPECIFICATIONS

Table 2.  $V_{CC}$ =Full Operating Range,  $T_A=T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted

| Parameter                                    | Min                                            | Typ       | Max                      | Units              | Test Conditions/Comments                                                                                                                              |
|----------------------------------------------|------------------------------------------------|-----------|--------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUPPLY                                       |                                                |           |                          |                    |                                                                                                                                                       |
| $V_{CC}$ Operating Voltage Range             | 1                                              |           | 5.5                      | V                  |                                                                                                                                                       |
| Supply Current                               |                                                | 10<br>5   | 20<br>12                 | $\mu A$<br>$\mu A$ | $V_{CC}=5.5V$<br>$V_{CC}=3.6V$                                                                                                                        |
| RESET THRESHOLD VOLTAGE                      |                                                |           |                          |                    |                                                                                                                                                       |
| ADM861_L                                     | 4.50                                           | 4.63      | 4.75                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_M                                     | 4.25                                           | 4.38      | 4.50                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_T                                     | 3.00                                           | 3.08      | 3.15                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_S                                     | 2.85                                           | 2.93      | 3.00                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_R                                     | 2.55                                           | 2.63      | 2.70                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_Z                                     | 2.25                                           | 2.32      | 2.38                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_Y                                     | 2.12                                           | 2.19      | 2.25                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_W                                     | 1.62                                           | 1.67      | 1.71                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| ADM861_V                                     | 1.52                                           | 1.58      | 1.62                     | V                  | $T_A=-40^{\circ}C$ to $+85^{\circ}C$                                                                                                                  |
| RESET THRESHOLD TEMPERATURE COEFFICIENT      |                                                | 40        |                          | ppm/ $^{\circ}C$   |                                                                                                                                                       |
| RESET THRESHOLD HYSTERESIS                   |                                                | 3         |                          | mV                 |                                                                                                                                                       |
| RESET TIMEOUT PERIOD                         | 20<br>140                                      | 30<br>200 | 40<br>280                | ms<br>ms           | ADM8611<br>ADM8616–ADM8618                                                                                                                            |
| $V_{CC}$ TO RESET DELAY                      |                                                | 40        |                          | $\mu s$            | $V_{CC}$ falling at 1mV/ $\mu s$                                                                                                                      |
| PUSH-PULL OUTPUT (ADM8611, ADM8616, ADM8618) |                                                |           |                          |                    |                                                                                                                                                       |
| $\overline{RESET}$ Output Voltage            | 0.8x $V_{CC}$<br>$V_{CC}-1.5$                  | 5         | 0.3                      | V                  | $V_{CC}>=1.0V$ , $I_{SINK}=50\mu A$                                                                                                                   |
|                                              |                                                |           | 0.3                      | V                  | $V_{CC}>=1.2V$ , $I_{SINK}=100\mu A$                                                                                                                  |
|                                              |                                                |           | 0.3                      | V                  | $V_{CC}>=2.7V$ , $I_{SINK}=1.2mA$                                                                                                                     |
|                                              |                                                |           | 0.4                      | V                  | $V_{CC}>=4.5V$ , $I_{SINK}=3.2mA$                                                                                                                     |
|                                              |                                                |           |                          | V                  | $V_{CC}>=2.7V$ , $I_{SOURCE}=500\mu A$                                                                                                                |
|                                              |                                                |           |                          | V                  | $V_{CC}>=4.5V$ , $I_{SOURCE}=800\mu A$                                                                                                                |
| $\overline{RESET}$ Rise Time                 |                                                |           | 25                       | ns                 | From 10% to 90% $V_{CC}$ , $C_L=5pF$ , $V_{CC}=3.3V$                                                                                                  |
| RESET Output Voltage                         |                                                |           | 0.3<br>0.4               | V<br>V             | $V_{CC}>=2.7V$ , $I_{SINK}=1.2mA$<br>$V_{CC}>=4.5V$ , $I_{SINK}=3.2mA$                                                                                |
|                                              | 0.8x $V_{CC}$<br>0.8x $V_{CC}$<br>$V_{CC}-1.5$ |           |                          | V<br>V             | $V_{CC}>=1.8V$ , $I_{SOURCE}=150\mu A$<br>$V_{CC}>=2.7V$ , $I_{SOURCE}=500\mu A$<br>$V_{CC}>=4.5V$ , $I_{SOURCE}=800\mu A$                            |
| OPEN-DRAIN OUTPUT (ADM8617)                  |                                                |           |                          |                    |                                                                                                                                                       |
| $\overline{RESET}$ Output Voltage            |                                                |           | 0.3<br>0.3<br>0.3<br>0.4 | V<br>V<br>V<br>V   | $V_{CC}>=1.0V$ , $I_{SINK}=50\mu A$<br>$V_{CC}>=1.2V$ , $I_{SINK}=100\mu A$<br>$V_{CC}>=2.7V$ , $I_{SINK}=1.2mA$<br>$V_{CC}>=4.5V$ , $I_{SINK}=3.2mA$ |
| Open-Drain Reset Output Leakage Current      |                                                |           | 1                        | $\mu A$            |                                                                                                                                                       |

| Parameter                                  | Min                 | Typ  | Max                 | Units | Test Conditions/Comments                                                      |
|--------------------------------------------|---------------------|------|---------------------|-------|-------------------------------------------------------------------------------|
| MANUAL RESET INPUT (ADM8611)               |                     |      |                     |       |                                                                               |
| $\overline{\text{MR}}$ Input Threshold     |                     |      | 0.3xV <sub>CC</sub> | V     |                                                                               |
| $\overline{\text{MR}}$ Input Pulse Width   | 0.7xV <sub>CC</sub> |      |                     | V     |                                                                               |
| $\overline{\text{MR}}$ Glitch Rejection    | 1                   | 100  |                     | μs    |                                                                               |
| $\overline{\text{MR}}$ Pull-up Resistance  | 25                  | 50   | 75                  | ns    |                                                                               |
| $\overline{\text{MR}}$ to Reset Delay      |                     | 200  |                     | kΩ    |                                                                               |
|                                            |                     |      |                     | ns    |                                                                               |
| WATCHDOG INPUT (ADM8616, ADM8617, ADM8618) |                     |      |                     |       |                                                                               |
| Watchdog Timeout Period                    | 4.3                 | 6.3  | 9.3                 | ms    | ADM86__W                                                                      |
|                                            | 71                  | 102  | 153                 | ms    | ADM86__X                                                                      |
|                                            | 1.12                | 1.6  | 2.4                 | s     | ADM86__Y                                                                      |
|                                            | 17.9                | 25.6 | 38.4                | s     | ADM86__Z                                                                      |
| WDI Pulse Width                            | 50                  |      |                     | ns    | V <sub>IL</sub> =0.3xV <sub>CC</sub> , V <sub>IH</sub> =0.7xV <sub>CC</sub> , |
| WDI Input Threshold                        | 0.3xV <sub>CC</sub> |      | 0.7xV <sub>CC</sub> | V     |                                                                               |
| WDI Input Current                          |                     | 120  | 160                 | μA    | V <sub>WDI</sub> = V <sub>CC</sub> , time average                             |
|                                            | -20                 | -15  |                     | μA    | V <sub>WDI</sub> =0, time average                                             |

## ABSOLUTE MAXIMUM RATINGS

Table 3. T<sub>A</sub> = 25°C unless otherwise noted.

| Parameter                                          | Rating          |
|----------------------------------------------------|-----------------|
| V <sub>CC</sub>                                    | -0.3V to +6V    |
| RESET/RESET                                        | -0.3V to +6V    |
| Output Current (RESET, $\overline{\text{RESET}}$ ) | 20mA            |
| Operating Temperature Range                        | -40°C to +85°C  |
| Storage Temperature Range                          | -65°C to +150°C |
| θ <sub>JA</sub> Thermal Impedance, SC70            | 146°C/W         |
| Lead Temperature                                   |                 |
| Soldering (10 sec)                                 | 300°C           |
| Vapour Phase (60 sec)                              | 215°C           |
| Infrared (15 sec)                                  | 220°C           |

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and 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.

## PIN CONFIGURATIONS AND FUNCTIONAL DESCRIPTIONS

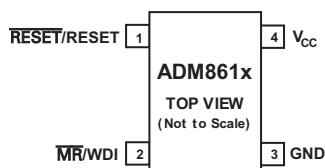


Table 4. Pin Functional Descriptions

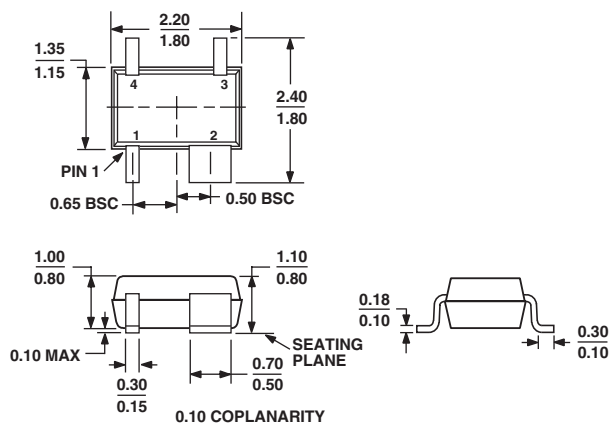
| Pin No. | Name                          | Description                                                                                                                                                                                                                                                           |
|---------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | RESET (ADM8616/ADM8617)       | Active-Low Reset Output, which is asserted whenever $V_{CC}$ is below the reset.threshold, $V_{TH}$ . Push-Pull Output Stage for ADM8616. Open-Drain Output Stage for ADM8617.                                                                                        |
|         | RESET (ADM8618)               | Active-High, Push-Pull Reset Output.                                                                                                                                                                                                                                  |
| 2       | MR (ADM8611)                  | Manual Reset Input. This is an active-low input which, when forced low for at least 1 $\mu$ s, generates a reset. Features a 52k $\Omega$ internal pull-up.                                                                                                           |
|         | WDI (ADM8616/ADM8617/ADM8618) | Watchdog Input. Generates a reset if the logic level on the pin remains low or high for the duration of the watchdog timeout. The timer is cleared if a logic transition occurs on this pin or if a reset is generated. Leave floating to disable the watchdog timer. |
| 3       | GND                           | Ground                                                                                                                                                                                                                                                                |
| 4       | $V_{CC}$                      | Power Supply Voltage being Monitored.                                                                                                                                                                                                                                 |

## ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



## OUTLINE DIMENSIONS



PACKAGE OUTLINE CORRESPONDS IN FULL TO EIAJ SC82  
EXCEPT FOR WIDTH OF PIN-2 AS SHOWN

Figure 2. 4-Lead Plastic Surface Mount Package [SC70]

(KS-4)

Dimensions shown in millimeters

## ORDERING GUIDE (ADM8611/ADM8616)

| Model <sup>1</sup> | Reset Threshold (V) | Temperature Range | Quantity | Package Type | Branding |
|--------------------|---------------------|-------------------|----------|--------------|----------|
| ADM8611LABKS-RL    | 4.63                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611LABKS-RL7   | 4.63                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611MABKS-RL    | 4.38                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611MABKS-RL7   | 4.38                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611TABKS-RL    | 3.08                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611TABKS-RL7   | 3.08                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611SABKS-RL    | 2.93                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611SABKS-RL7   | 2.93                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611RABKS-RL    | 2.63                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611RABKS-RL7   | 2.63                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611ZABKS-RL    | 2.32                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611ZABKS-RL7   | 2.32                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611YABKS-RL    | 2.19                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611YABKS-RL7   | 2.19                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611WABKS-RL    | 1.67                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611WABKS-RL7   | 1.67                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8611VABKS-RL    | 1.58                | -40°C to +85°C    | 10k      | SC70-4       | N0F      |
| ADM8611VABKS-RL7   | 1.58                | -40°C to +85°C    | 3k       | SC70-4       | N0F      |
| ADM8616LAKS-RL     | 4.63                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616LAKS-RL7    | 4.63                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616MAKS-RL     | 4.38                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616MAKS-RL7    | 4.38                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616TAKS-RL     | 3.08                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616TAKS-RL7    | 3.08                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616SAKS-RL     | 2.93                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616SAKS-RL7    | 2.93                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616RAKS-RL     | 2.63                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616RAKS-RL7    | 2.63                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616ZAKS-RL     | 2.32                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616ZAKS-RL7    | 2.32                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616YAKS-RL     | 2.19                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616YAKS-RL7    | 2.19                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616WAKS-RL     | 1.67                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616WAKS-RL7    | 1.67                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |
| ADM8616VAKS-RL     | 1.58                | -40°C to +85°C    | 10k      | SC70-4       | N0G      |
| ADM8616VAKS-RL7    | 1.58                | -40°C to +85°C    | 3k       | SC70-4       | N0G      |

## ORDERING GUIDE (ADM8617/ADM8618)

| Model             | Reset Threshold (V) | Temperature Range | Quantity | Package Type | Branding |
|-------------------|---------------------|-------------------|----------|--------------|----------|
| ADM8617LACYKS-RL  | 4.63                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617LACYKS-RL7 | 4.63                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617MACYKS-RL  | 4.38                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617MACYKS-RL7 | 4.38                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617TACYKS-RL  | 3.08                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617TACYKS-RL7 | 3.08                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617SACYKS-RL  | 2.93                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617SACYKS-RL7 | 2.93                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617RACYKS-RL  | 2.63                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617RACYKS-RL7 | 2.63                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617ZACYKS-RL  | 2.32                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617ZACYKS-RL7 | 2.32                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617YACYKS-RL  | 2.19                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617YACYKS-RL7 | 2.19                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617WACYKS-RL  | 1.67                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617WACYKS-RL7 | 1.67                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8617VACYKS-RL  | 1.58                | -40°C to +85°C    | 10k      | SC70-4       | N0H      |
| ADM8617VACYKS-RL7 | 1.58                | -40°C to +85°C    | 3k       | SC70-4       | N0H      |
| ADM8618LACYKS-RL  | 4.63                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618LACYKS-RL7 | 4.63                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618MACYKS-RL  | 4.38                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618MACYKS-RL7 | 4.38                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618TACYKS-RL  | 3.08                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618TACYKS-RL7 | 3.08                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618SACYKS-RL  | 2.93                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618SACYKS-RL7 | 2.93                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618RACYKS-RL  | 2.63                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618RACYKS-RL7 | 2.63                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618ZACYKS-RL  | 2.32                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618ZACYKS-RL7 | 2.32                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618YACYKS-RL  | 2.19                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618YACYKS-RL7 | 2.19                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618WACYKS-RL  | 1.67                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618WACYKS-RL7 | 1.67                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |
| ADM8618VACYKS-RL  | 1.58                | -40°C to +85°C    | 10k      | SC70-4       | N0J      |
| ADM8618VACYKS-RL7 | 1.58                | -40°C to +85°C    | 3k       | SC70-4       | N0J      |

<sup>1</sup> Entries in bold type are standard models. Contact factory for availability of non-standard models.