Microprocessor Supervisory Circuit in 4-Lead SC70

ADM6711/ADM6713

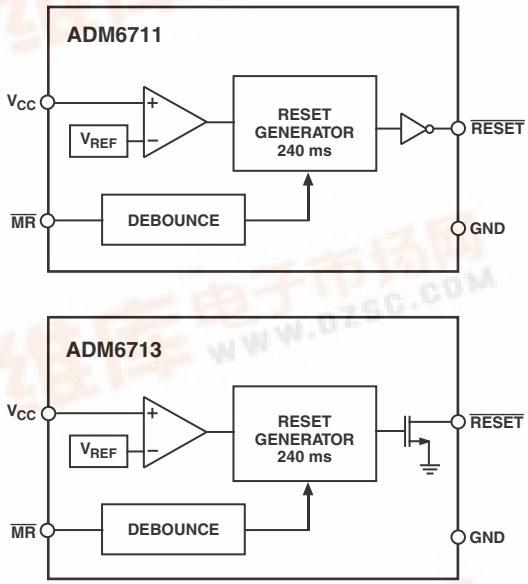
FEATURES

- Specified Over Temperature
- Low Power Consumption (12 μA)
- Precision Monitoring of 2.5 V, 3 V, 3.3 V, and 5 V Power Supply Voltages
- Reset Timeout Period of 140 ms (Min)
- Manual Reset Input
- Output Stages
  - Push-Pull $\overline{\text{RESET}}$ Output (ADM6711)
  - Open-Drain $\overline{\text{RESET}}$ Output (ADM6713)
- Reset Assertion Down to 1 V V_{CC}
- Power Supply Glitch Immunity
- 4-Lead SC70 Package

APPLICATIONS

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

FUNCTIONAL BLOCK DIAGRAMS



GENERAL DESCRIPTION

The ADM6711/ADM6713 are reset generator circuits suitable for use in microprocessor based systems. They provide a reset signal on power-up, power-down, and whenever the supply voltage falls below a preset threshold. In addition, both parts have a debounced manual reset input so that a reset signal can also be initiated with an external switch or logic signal.

With six different reset threshold options available ranging from 2.32 V to 4.63 V, the ADM6711/ADM6713 are suitable for monitoring 2.5 V, 3 V, 3.3 V, and 5 V supplies. A reset timeout of at least 140 ms occurs when V_{CC} rises above the threshold. This gives the supply voltage time to stabilize before the microprocessor starts up.

The ADM6711 has a push-pull output, so no additional external components are needed. The ADM6713's open-drain output requires an external pull-up resistor, which can be connected to a voltage higher than V_{CC}, if desired.

The parts are highly reliable with accurate voltage references and immunity to fast, negative-going transients on V_{CC}. Low current consumption and space-efficient 4-lead SC70 packaging make the ADM6711/ADM6713 ideal for use in low power portable applications.

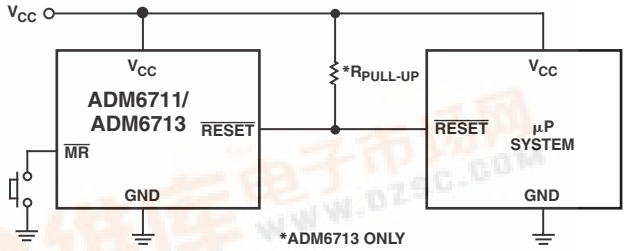


Figure 1. Typical Operating Circuit

REV. 0

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781/329-4700 www.analog.com
Fax: 781/326-8703

ADM6711/ADM6713–SPECIFICATIONS (V_{CC} = Full Operating Range; $T_A = T_{MIN}$ to T_{MAX}; V_{CC} Typ = 5 V for L/M, 3.3 V for T/S, 3 V for R, and 2.5 V for Z models; unless otherwise noted.)

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
SUPPLY					
V_{CC} Operating Voltage Range	1.0		5.5	V	T_A = 0°C to 70°C
	1.2		5.5	V	T_A = –40°C to +125°C
Supply Current		16	35	µA	V_{CC} < 5.5 V, ADM671_L/M, T_A = –40°C to +85°C
		12	30	µA	V_{CC} < 3.6 V, ADM671_R/S/T/Z, T_A = –40°C to +85°C
			60	µA	V_{CC} < 5.5 V, ADM671_L/M, T_A = 85°C to 125°C
			60	µA	V_{CC} < 3.6 V, ADM671_R/S/T/Z, T_A = 85°C to 125°C
RESET VOLTAGE THRESHOLD					
ADM671_L	4.56	4.63	4.70	V	T_A = 25°C
	4.50		4.75	V	T_A = –40°C to +85°C
	4.44		4.82	V	T_A = 85°C to 125°C
ADM671_M	4.31	4.38	4.45	V	T_A = 25°C
	4.25		4.50	V	T_A = –40°C to +85°C
	4.20		4.56	V	T_A = 85°C to 125°C
ADM671_T	3.04	3.08	3.11	V	T_A = 25°C
	3.00		3.15	V	T_A = –40°C to +85°C
	2.95		3.21	V	T_A = 85°C to 125°C
ADM671_S	2.89	2.93	2.96	V	T_A = 25°C
	2.85		3.00	V	T_A = –40°C to +85°C
	2.81		3.05	V	T_A = 85°C to 125°C
ADM671_R	2.59	2.63	2.66	V	T_A = 25°C
	2.55		2.70	V	T_A = –40°C to +85°C
	2.52		2.74	V	T_A = 85°C to 125°C
ADM671_Z	2.28	2.32	2.35	V	T_A = 25°C
	2.25		2.38	V	T_A = –40°C to +85°C
	2.22		2.42	V	T_A = 85°C to 125°C
RESET THRESHOLD TEMPERATURE COEFFICIENT		30		ppm/°C	
V_{CC} to $\overline{\text{RESET}}$ DELAY		20		µs	$V_{CC} = V_{TH}$ to (V_{TH} – 100 mV)
$\overline{\text{RESET}}$ ACTIVE TIMEOUT PERIOD	140	240	460	ms	T_A = –40°C to +85°C
	100		640	ms	T_A = 85°C to 125°C
$\overline{\text{RESET}}$ OUTPUT VOLTAGE					
Low (ADM6711/ADM6713)			0.3	V	$V_{CC} = V_{TH}$ min, I_{SINK} = 1.2 mA, ADM671_R/S/T/Z
			0.4	V	$V_{CC} = V_{TH}$ min, I_{SINK} = 3.2 mA, ADM671_L/M
			0.3	V	V_{CC} >1.0 V, I_{SINK} = 50 µA
High (ADM6711)	0.8 V_{CC}			V	$V_{CC} > V_{TH}$ max, I_{SOURCE} = 500 µA, ADM6711R/S/T/Z
	0.8 V_{CC}			V	$V_{CC} > V_{TH}$ max, I_{SOURCE} = 800 µA, ADM6711L/M
$\overline{\text{RESET}}$ OPEN-DRAIN OUTPUT LEAKAGE CURRENT			1	µA	$V_{CC} > V_{TH}$, $\overline{\text{RESET}}$ deasserted
MANUAL RESET ($\overline{\text{MR}}$)					
Input Threshold	0.3 V_{CC}			V	V_{IL}
			0.7 V_{CC}	V	V_{IH}
Pull-Up Resistance	10	20		kΩ	
Minimum Pulsewidth	1			µs	
Glitch Immunity		100		ns	
Reset Delay		200		ns	

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS*
(T_A = 25°C, unless otherwise noted.)

V_{CC} . . . . . –0.3 V to +6 V
$\overline{RESET}$ (Push-Pull) . . . . . –0.3 V to (V_{CC} + 0.3 V)
$\overline{RESET}$ (Open-Drain) . . . . . –0.3 V to +6 V
$\overline{MR}$ . . . . . –0.3 V to (V_{CC} + 0.3 V)
Input Current
V_{CC}, $\overline{MR}$ . . . . . 20 mA
Output Current
$\overline{RESET}$ . . . . . 20 mA
Rate of Rise, V_{CC} . . . . . 100 V/µs
θ_{JA} Thermal Impedance, SC70 . . . . . 146°C/W
Operating Temperature Range . . . . . –40°C to +125°C
Storage Temperature Range . . . . . –65°C to +150°C
Lead Temperature (Soldering, 10 sec) . . . . . 300°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 listed in the operational sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods of time may affect device reliability.

Table I. $\overline{RESET}$ Threshold Options

Model	$\overline{RESET}$ Threshold (V)
ADM671_L	4.63
ADM671_M	4.38
ADM671_T	3.08
ADM671_S	2.93
ADM671_R	2.63
ADM671_Z	2.32

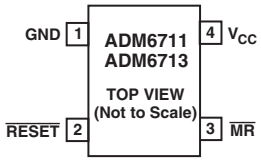
ORDERING GUIDE

Model	$\overline{RESET}$ Threshold (V)	Temperature Range	Branding	Quantity (k)
ADM6711LAKS-REEL	4.63	–40°C to +125°C	M0B	10
ADM6711LAKS-REEL-7	4.63	–40°C to +125°C	M0B	3
ADM6711MAKS-REEL	4.38	–40°C to +125°C	M0C	10
ADM6711MAKS-REEL-7	4.38	–40°C to +125°C	M0C	3
ADM6711TAKS-REEL	3.08	–40°C to +125°C	M0D	10
ADM6711TAKS-REEL-7	3.08	–40°C to +125°C	M0D	3
ADM6711SAKS-REEL	2.93	–40°C to +125°C	M0E	10
ADM6711SAKS-REEL-7	2.93	–40°C to +125°C	M0E	3
ADM6711RAKS-REEL	2.63	–40°C to +125°C	M0F	10
ADM6711RAKS-REEL-7	2.63	–40°C to +125°C	M0F	3
ADM6711ZAKS-REEL	2.32	–40°C to +125°C	M0G	10
ADM6711ZAKS-REEL-7	2.32	–40°C to +125°C	M0G	3
ADM6713LAKS-REEL	4.63	–40°C to +125°C	M0H	10
ADM6713LAKS-REEL-7	4.63	–40°C to +125°C	M0H	3
ADM6713MAKS-REEL	4.38	–40°C to +125°C	M0J	10
ADM6713MAKS-REEL-7	4.38	–40°C to +125°C	M0J	3
ADM6713TAKS-REEL	3.08	–40°C to +125°C	M0K	10
ADM6713TAKS-REEL-7	3.08	–40°C to +125°C	M0K	3
ADM6713SAKS-REEL	2.93	–40°C to +125°C	M0L	10
ADM6713SAKS-REEL-7	2.93	–40°C to +125°C	M0L	3
ADM6713RAKS-REEL	2.63	–40°C to +125°C	M0M	10
ADM6713RAKS-REEL-7	2.63	–40°C to +125°C	M0M	3
ADM6713ZAKS-REEL	2.32	–40°C to +125°C	M0N	10
ADM6713ZAKS-REEL-7	2.32	–40°C to +125°C	M0N	3

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 the ADM6711/ADM6713 feature 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.

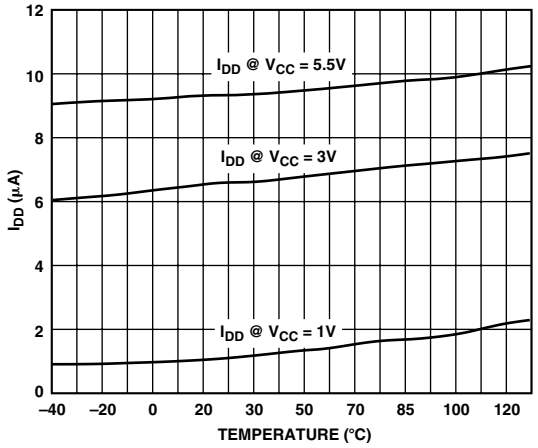
PIN CONFIGURATION



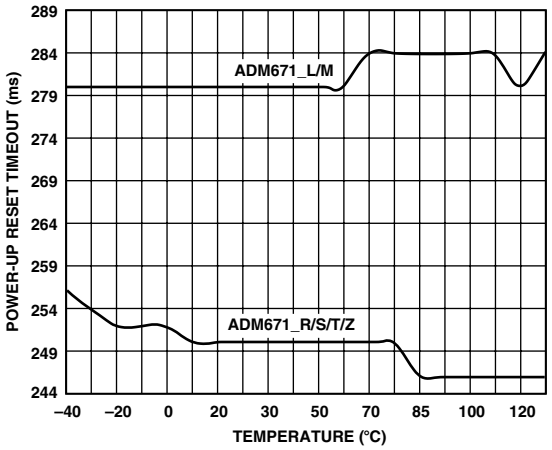
PIN FUNCTION DESCRIPTIONS

Pin No.	Mnemonic	Function
1	GND	Ground Reference for All Signals. 0 V.
2	$\overline{\text{RESET}}$	Active Low Logic Output. $\overline{\text{RESET}}$ remains low while V_{CC} is below the reset threshold and remains low for 240 ms (typ) after V_{CC} rises above the reset threshold.
3	$\overline{\text{MR}}$	Manual Reset. This active low debounced input will ignore input pulses of 100 ns (typ) and is guaranteed to accept input pulses of greater than 1 µs. Leave floating when not used.
4	V_{CC}	Supply Voltage Being Monitored.

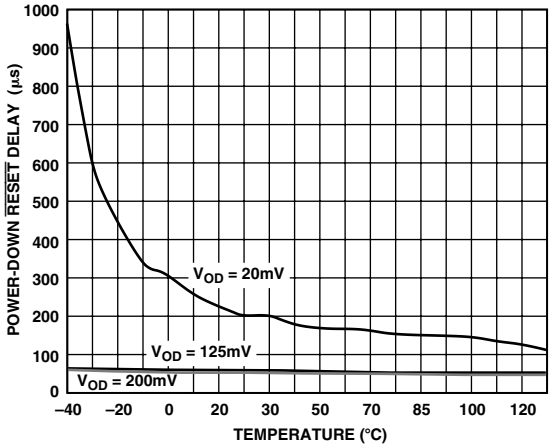
Typical Performance Characteristics–ADM6711/ADM6713



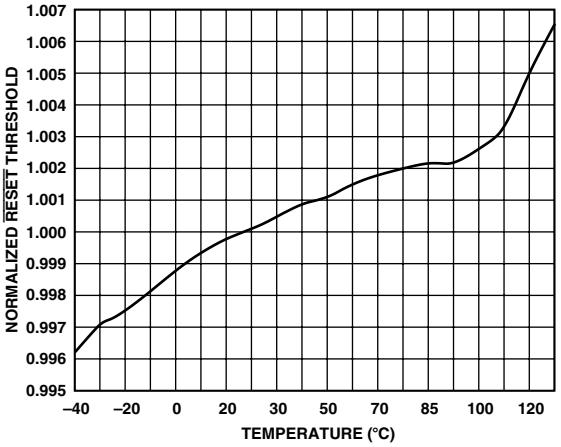
TPC 1. Supply Current vs. Temperature



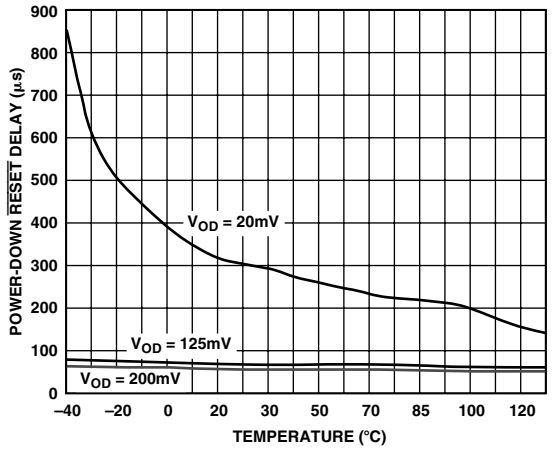
TPC 4. Power-Up Reset Timeout vs. Temperature



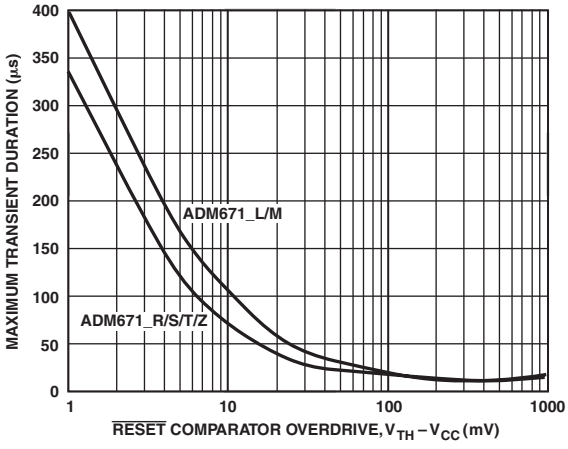
TPC 2. Power-Down $\overline{RESET}$ Delay vs. Temperature ADM671_R/S/T/Z



TPC 5. $\overline{RESET}$ Threshold Deviation vs. Temperature



TPC 3. Power-Down $\overline{RESET}$ Delay vs. Temperature ADM671_L/M



TPC 6. Maximum Transient Duration without Causing a $\overline{RESET}$ Pulse vs. $\overline{RESET}$ Comparator Overdrive

DETAILED DESCRIPTION

The ADM6711/ADM6713 are designed to protect the integrity of a system's operation by ensuring the proper operation of the system during power-up, power-down, and brownout conditions.

When the ADM6711/ADM6713 are powered up, the $\overline{\text{RESET}}$ output will remain low for a period equal to the typical reset active timeout period. This is designed to give the system time to power up correctly and for the power supply to stabilize before any devices are brought out of reset and allowed to begin executing instructions. Initializing a system in this way provides a more reliable startup for microprocessor systems.

MANUAL RESET INPUT

The ADM6711/ADM6713's manual reset ($\overline{\text{MR}}$) input allows the system operator to reset a system by means of an external manual switch. Alternatively, a logic signal from another digital circuit can be used to trigger a reset via the $\overline{\text{MR}}$ input.

The $\overline{\text{MR}}$ input will ignore negative-going pulses faster than 100 ns (typically) and is guaranteed to accept any negative-going input pulse of a duration greater than or equal to 1 µs. The $\overline{\text{RESET}}$ output will remain low while $\overline{\text{MR}}$ is held low and for 240 ms (typically) after $\overline{\text{MR}}$ returns high.

If $\overline{\text{MR}}$ is connected to long cables or is used in a noisy environment, then placing a 0.1 µF capacitor between the $\overline{\text{MR}}$ input and ground will help to remove any fast, negative-going transients.

POWER SUPPLY GLITCH IMMUNITY

The ADM6711/ADM6713 contain internal filtering circuitry that provides immunity to fast transient glitches on the power supply line. TPC 6 illustrates glitch immunity performance by showing the maximum transient duration without causing a reset pulse for glitches with amplitudes in the range of 1 mV to 1000 mV.

Glitch immunity makes the ADM6711/ADM6713 suitable for use in noisy environments. Mounting a 0.1 µF decoupling capacitor as close as possible to the V_{CC} pin improves glitch immunity further.

ADM6713 $\overline{\text{RESET}}$ OUTPUT LOGIC LEVELS

The ADM6713's open-drain $\overline{\text{RESET}}$ output is designed for use with an external pull-up resistor. This resistor can be tied to V_{CC} or any other reasonable voltage level, offering the flexibility to use the ADM6713 to drive a variety of different logic level circuitry.

ENSURING A VALID $\overline{\text{RESET}}$ OUTPUT DOWN TO V_{CC} = 0 V

When V_{CC} falls below 0.8 V, the ADM6711's $\overline{\text{RESET}}$ output no longer sinks current. Therefore, a high impedance CMOS logic input connected to $\overline{\text{RESET}}$ may drift to undetermined logic levels. To eliminate this problem, a pull-down resistor should be connected from $\overline{\text{RESET}}$ to ground. A 100 kΩ resistor is large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground.

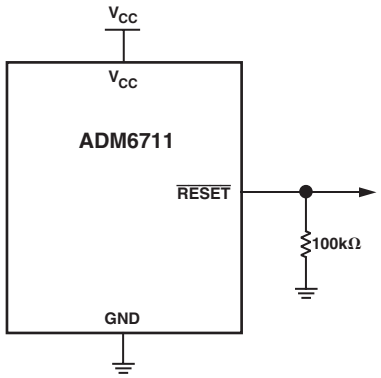
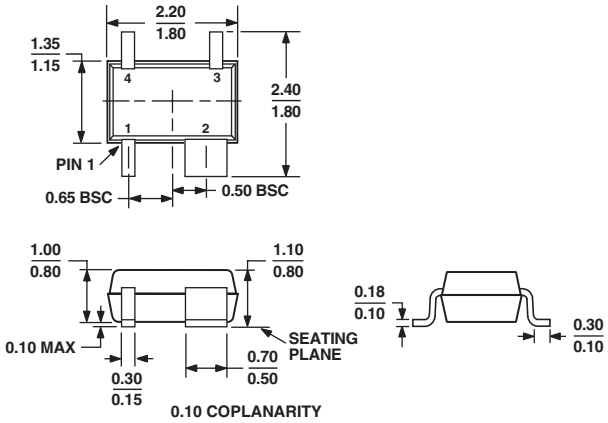


Figure 2. Ensuring a Valid $\overline{\text{RESET}}$ Output Down to V_{CC} = 0 V

OUTLINE DIMENSIONS

4-Lead Thin Shrink Small Outline Transistor Package [SC70]
(EIAJ SC82 body)
(KS-4)

Dimensions shown in millimeters



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

C03754–0–8/03(0)