

### FEATURES

- 26 Reset Threshold Options:**  
2.5V to 5V in 100mV Increments
- 4 Reset Timeout Options:**  
1ms, 20ms, 140ms and 1120ms (Min)
- 4 Watchdog Timeout Options:**  
6.3ms, 102ms, 1600ms and 25.6s (Typ)
- Manual Reset Input**
- Reset Output Stages**
  - Push-Pull Active-Low
  - Open-Drain Active-Low
  - Push-Pull Active-High
- Low Power Consumption (3µA)**
- Guaranteed Reset Output valid to V<sub>CC</sub>=1V**
- Power Supply Glitch Immunity**
- Specified Over Industrial Temperature Range**
- 5-Lead SOT-23 Package**

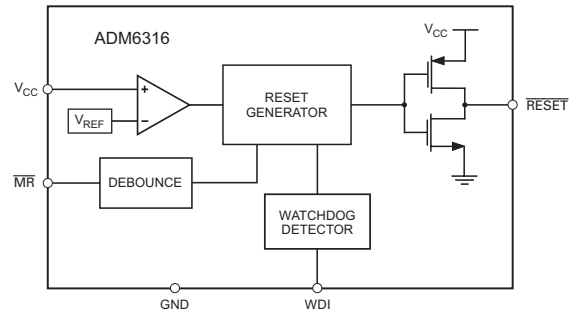
### APPLICATIONS

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

### GENERAL DESCRIPTION

The ADM6316-ADM6322 are supervisory circuits which monitor power supply voltage levels and code execution integrity in microprocessor-based systems. As well as providing power on reset signals, an on-chip watchdog timer can reset the microprocessor if it fails to strobe within a preset timeout period. A reset signal can also be asserted by means of an external push-button, through a manual reset input. The seven parts feature different combinations of watchdog input, manual reset input and output stage configuration, as shown in table 1.

### FUNCTIONAL BLOCK DIAGRAM



Each part is available in a choice of 26 reset threshold options ranging from 2.5V to 5V in 100mV increments. There are also 4 reset timeout options of 1ms, 20ms, 140ms and 1120ms (min) and 4 watchdog timeout options of 6.3ms, 102ms, 1600ms and 25.6s (typ).

The ADM6316-ADM6322 are available in 5-lead SOT-23 packages and typically consume only 3µA, making them suitable for use in low power portable applications.

Table 1. Selection Table

Part No.	Watchdog	Manual Reset	Output Stage	
			RESET	RESET
ADM6316	Yes	Yes	Push-Pull	-
ADM6317	Yes	Yes	-	Push-Pull
ADM6318	Yes	-	Push-Pull	Push-Pull
ADM6319	-	Yes	Push-Pull	Push-Pull
ADM6320	Yes	Yes	Open-Drain	-
ADM6321	Yes	-	Open-Drain	Push-Pull
ADM6322	-	Yes	Open-Drain	Push-Pull

### Rev. PrB

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## ADM6316-ADM6322—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	20	$\mu$ A	$V_{CC}=5.5V$
		5	12	$\mu$ A	$V_{CC}=3.6V$
RESET THRESHOLD VOLTAGE					
	$V_{TH}-1.5\%$	$V_{TH}$	$V_{TH}+1.5\%$	V	$T_A=+25^\circ C$
	$V_{TH}-2.5\%$	$V_{TH}$	$V_{TH}+2.5\%$	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					
ADM63__A	1	1.4	2	ms	
ADM63__B	20	28	40	ms	
ADM63__C	140	200	280	ms	
ADM63__D	1120	1600	2240	ms	
$V_{CC}$ TO RESET DELAY					
		40		$\mu$ s	$V_{CC}$ falling at 1mV/ $\mu$ s
PUSH-PULL OUTPUT (ADM6316, ADM6317, ADM6318, ADM6319, ADM6321, ADM6322)					
$\overline{RESET}$ Output Voltage			0.3	V	$V_{CC} \geq 1.0V$ , $I_{SINK}=50\mu A$
			0.3	V	$V_{CC} \geq 1.2V$ , $I_{SINK}=100\mu A$
			0.3	V	$V_{CC} \geq 2.7V$ , $I_{SINK}=1.2mA$
			0.4	V	$V_{CC} \geq 4.5V$ , $I_{SINK}=3.2mA$
	$0.8 \times V_{CC}$			V	$V_{CC} \geq 2.7V$ , $I_{SOURCE}=500\mu A$
	$V_{CC}-1.5$			V	$V_{CC} \geq 4.5V$ , $I_{SOURCE}=800\mu A$
$\overline{RESET}$ Rise Time		5	25	ns	From 10% to 90% $V_{CC}$ , $C_L=5pF$ , $V_{CC}=3.3V$
RESET Output Voltage			0.3	V	$V_{CC} \geq 2.7V$ , $I_{SINK}=1.2mA$
			0.4	V	$V_{CC} \geq 4.5V$ , $I_{SINK}=3.2mA$
	$0.8 \times V_{CC}$			V	$V_{CC} \geq 1.8V$ , $I_{SOURCE}=150\mu A$
	$0.8 \times V_{CC}$			V	$V_{CC} \geq 2.7V$ , $I_{SOURCE}=500\mu A$
	$V_{CC}-1.5$			V	$V_{CC} \geq 4.5V$ , $I_{SOURCE}=800\mu A$
OPEN-DRAIN OUTPUT (ADM6320, ADM6321, ADM6322)					
$\overline{RESET}$ Output Voltage			0.3	V	$V_{CC} \geq 1.0V$ , $I_{SINK}=50\mu A$
			0.3	V	$V_{CC} \geq 1.2V$ , $I_{SINK}=100\mu A$
			0.3	V	$V_{CC} \geq 2.7V$ , $I_{SINK}=1.2mA$
			0.4	V	$V_{CC} \geq 4.5V$ , $I_{SINK}=3.2mA$
Open-Drain Reset Output Leakage Current			1	$\mu$ A	
WATCHDOG INPUT (ADM6316, ADM6317, ADM6318, ADM6320, ADM6321)					
Watchdog Timeout Period	4.3	6.3	9.3	ms	ADM63__W
	71	102	153	ms	ADM63__X
	1.12	1.6	2.4	s	ADM63__Y
	17.9	25.6	38.4	s	ADM63__Z
WDI Pulse Width	50			ns	$V_{IL}=0.3 \times V_{CC}$ , $V_{IH}=0.7 \times V_{CC}$
WDI INPUT THRESHOLD					
WDI Input Threshold	$0.3 \times V_{CC}$			V	
			$0.7 \times V_{CC}$	V	
WDI INPUT CURRENT					
WDI Input Current		120	160	$\mu$ A	$V_{WDI}=V_{CC}$ , time average
	-20	-15		$\mu$ A	$V_{WDI}=0$ , time average

Parameter	Min	Typ	Max	Units	Test Conditions/Comments
MANUAL RESET INPUT (ADM6316, ADM6317, ADM6319, ADM6320, ADM6322)					
$\overline{\text{MR}}$ Input Threshold	0.8		2.0	V	$V_{\text{TH}} > 4.0\text{V}$
	$0.3 \times V_{\text{CC}}$			V	$V_{\text{TH}} > 4.0\text{V}$
			$0.7 \times V_{\text{CC}}$	V	$V_{\text{TH}} < 4.0\text{V}$
$\overline{\text{MR}}$ Input Pulse Width	1			$\mu\text{s}$	$V_{\text{TH}} < 4.0\text{V}$
$\overline{\text{MR}}$ Glitch Rejection		100		ns	
$\overline{\text{MR}}$ Pull-up Resistance	35	52	75	$\text{k}\Omega$	
$\overline{\text{MR}}$ to Reset Delay		230		ns	$V_{\text{CC}} = 5\text{V}$

## ABSOLUTE MAXIMUM RATINGS

Table 3.  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Parameter	Rating
$V_{\text{CC}}$	-0.3V to +6V
$\overline{\text{RESET}}$ (ADM6320, ADM6321, ADM6322)	-0.3V to +6V
Output Current ( $\overline{\text{RESET}}$ , $\overline{\text{RESET}}$ )	20mA
Operating Temperature Range	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temperature Range	$-65^\circ\text{C}$ to $+125^\circ\text{C}$
$\theta_{\text{JA}}$ Thermal Impedance, SOT-23	$270^\circ\text{C}/\text{W}$
Lead Temperature	
Soldering (10 sec)	$300^\circ\text{C}$
Vapour Phase (60 sec)	$215^\circ\text{C}$
Infrared (15 sec)	$220^\circ\text{C}$

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

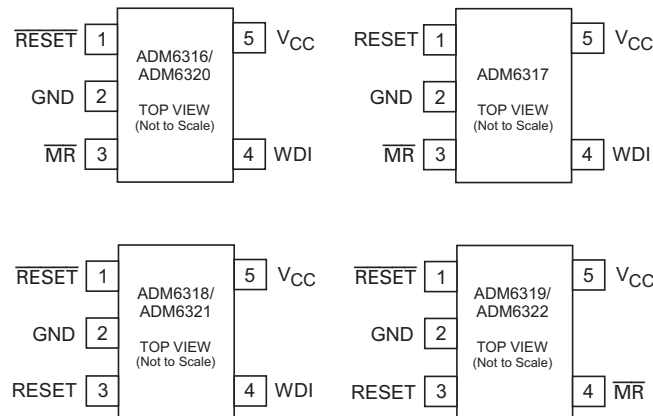


Table 4. Pin Functional Descriptions

Pin No.	Name	Description
1	RESET (ADM6316/18/19/20/21/22)	Active-Low Reset Output, which is asserted whenever $V_{CC}$ is below the reset threshold, $V_{TH}$ . Push-Pull Output Stage for ADM6316/18/19. Open-Drain Output Stage for ADM6320/21/22.
	RESET (ADM6317)	Active-High, Push-Pull Reset Output.
2	GND	Ground
3	MR (ADM6316/17/20)	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.
	RESET (ADM6318/19/21/22)	Active-High, Push-Pull Reset Output.
4	WDI (ADM6316/17/18/20/21)	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.
	MR (ADM6319/22)	Manual Reset Input.
5	$V_{CC}$	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.



### TYPICAL PERFORMANCE CHARACTERISTICS

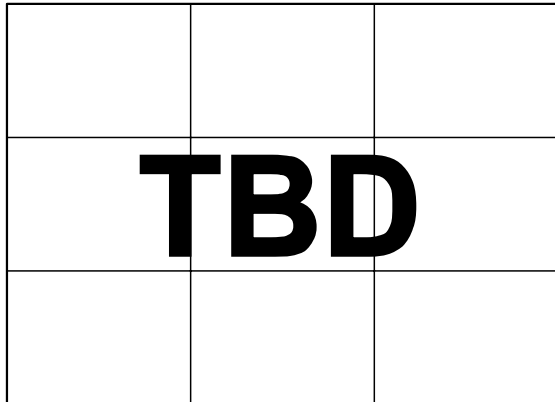


Figure 1. Supply Current vs. Temperature  
(ADM6316/ADM6317/ADM6318/ADM6320/ADM6321)

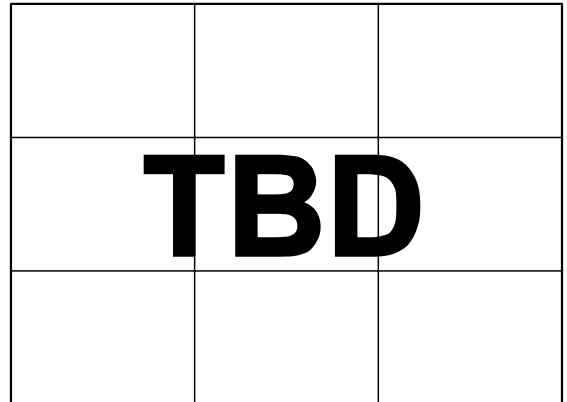


Figure 4. Normalized Reset Timeout Period vs. Temperature

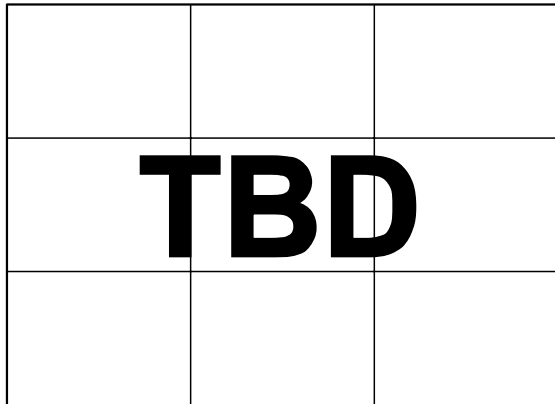


Figure 2. V<sub>CC</sub> Falling to Reset Propagation Delay vs. Temperature

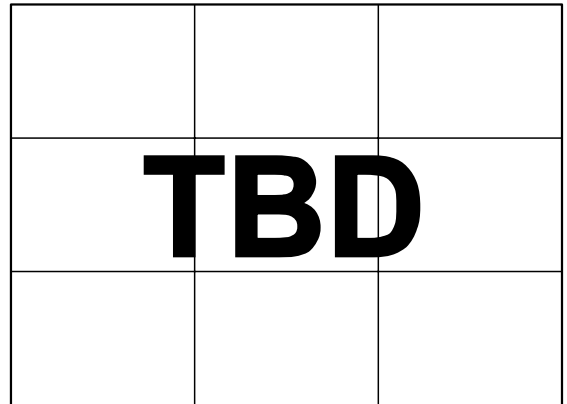


Figure 5. Normalized Watchdog Timeout Period vs. Temperature  
(ADM6316/ADM6317/ADM6318/ADM6320/ADM6321)

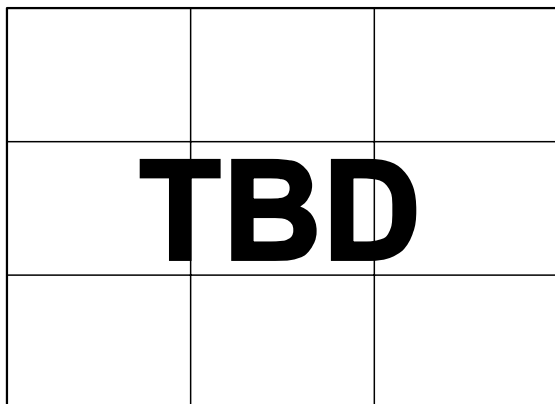


Figure 3. Manual Reset to Reset Propagation Delay vs. Temperature  
(ADM6316/ADM6317/ADM6319/ADM6320/ADM6322)

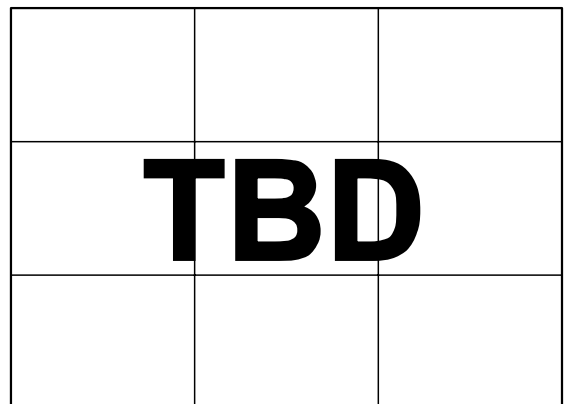


Figure 6. Maximum V<sub>CC</sub> Transient Duration vs. Reset Threshold Overdrive

Table 5. Reset Threshold Options

Part No.	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40°C to +85°C	
	Min	Typ	Max	Min	Max
ADM63__50	4.925	5.000	5.075	4.875	5.125
ADM63__49	4.827	4.900	4.974	4.778	5.023
ADM63__48	4.728	4.800	4.872	4.680	4.920
ADM63__47	4.630	4.700	4.771	4.583	4.818
ADM63__46	4.561	4.630	4.699	4.514	4.746
ADM63__45	4.433	4.500	4.568	4.388	4.613
ADM63__44	4.314	4.390	4.446	4.270	4.490
ADM63__43	4.236	4.300	4.365	4.193	4.408
ADM63__42	4.137	4.200	4.263	4.095	4.305
ADM63__41	4.039	4.100	4.162	3.998	4.203
ADM63__40	3.940	4.00	4.060	3.900	4.100
ADM63__39	3.842	3.900	3.959	3.803	3.998
ADM63__38	3.743	3.800	3.857	3.705	3.895
ADM63__37	3.645	3.700	3.756	3.608	3.793
ADM63__36	3.546	3.600	3.654	3.510	3.690
ADM63__35	3.448	3.500	3.553	3.413	3.588
ADM63__34	3.349	3.400	3.451	3.315	3.485
ADM63__33	3.251	3.300	3.350	3.218	3.383
ADM63__32	3.152	3.200	3.248	3.120	3.280
ADM63__31	3.034	3.080	3.126	3.003	3.157
ADM63__30	2.955	3.000	3.045	2.925	3.075
ADM63__29	2.886	2.930	2.974	2.857	3.000
ADM63__28	2.758	2.800	2.842	2.730	2.870
ADM63__27	2.660	2.700	2.741	2.633	2.768
ADM63__26	2.591	2.630	2.669	2.564	2.696
ADM63__25	2.463	2.500	2.538	2.438	2.563

Table 6. Reset Timeout Options

Suffix	Min	Typ	Max	Units
A	1	1.6	2	ms
B	20	30	40	ms
C	140	200	280	ms
D	1.12	1.60	2.24	s

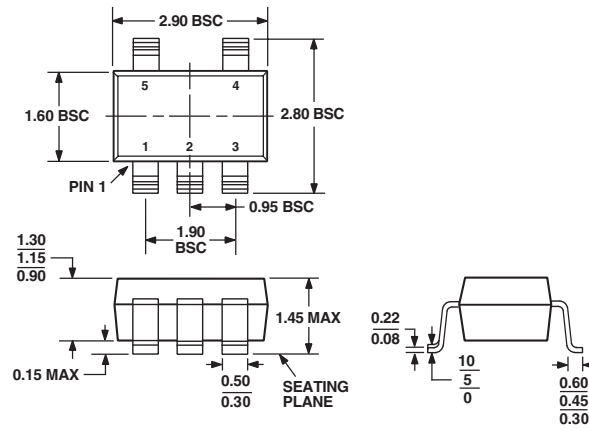
Table 7. Watchdog Timeout Options

Suffix	Min	Typ	Max	Units
W	4.3	6.3	9.3	ms
X	71	102	153	ms
Y	1.12	1.6	2.4	s
Z	17.9	25.6	38.4	s

Table 8. Standard Models

Model	Reset Threshold (V)	Minimum Reset Timeout (ms)	Typical Watchdog Timeout (s)
ADM6316LARJ29CY	2.93	140	1.6
ADM6316LARJ46CY	4.63	140	1.6
ADM6318LHARJ46CY	4.63	140	1.6
ADM6319LHARJ46C	4.63	140	1.6
ADM6320PARJ29CY	2.93	140	1.6
ADM6320PARJ46CY	4.63	140	1.6
ADM6321HPARJ46CY	4.63	140	1.6
ADM6322HPARJ46C	4.63	140	1.6

# OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MO-178AA

Figure 7. 5-Lead Small Outline Transistor Package [SOT-23]

(RJ-5)

Dimensions shown in millimeters

ORDERING GUIDE

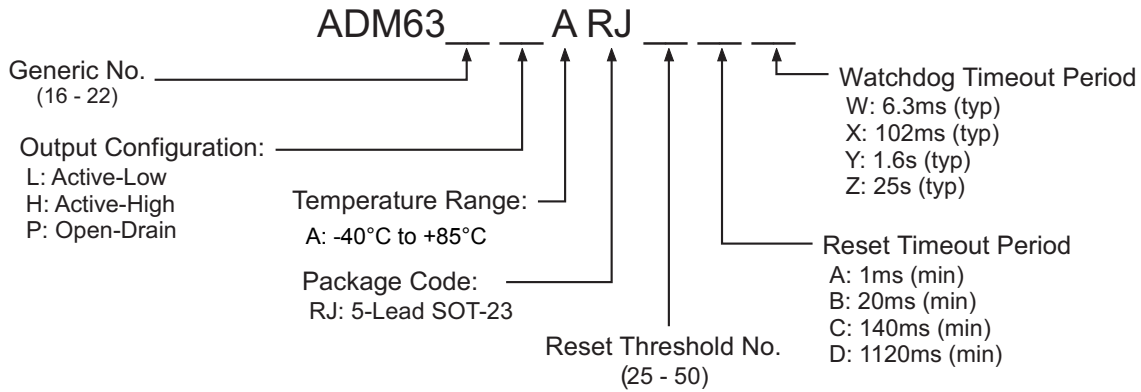


Figure 8. Ordering Code Structure

Model <sup>1</sup>	Temperature Range	Quantity	Package Type	Branding
ADM6316__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N00
ADM6316__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N00
ADM6317__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N01
ADM6317__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N01
ADM6318__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N02
ADM6318__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N02
ADM6319__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N03
ADM6319__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N03
ADM6320__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N04
ADM6320__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N04
ADM6321__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N05
ADM6321__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N05
ADM6322__ARJ____-RL	-40°C to +85°C	10k	SOT-23-5	N06
ADM6322__ARJ____-R7	-40°C to +85°C	3k	SOT-23-5	N06

<sup>1</sup> Contact factory for availability of non-standard models (See table 8 for list of standard models)