4-Pin µP Voltage Monitors with Manual Reset Input

Features

- **Precision Monitoring of +3V, +3.3V, and +5V Power-Supply Voltages**
- **Fully Specified Over Temperature**
- **Push-Pull Active-low $\overline{\text{RESET}}$ Output**
- **220ms Min Power-On Reset Pulse Width**
- **10µA Supply Current**
- **Guaranteed Reset Valid to V_{CC} = +1V**
- **Power Supply Transient Immunity**
- **No External Components**
- **Manual Reset Input**
- **SOT-143 Package**
- **2% Threshold Accuracy**

Applications

- **Computers**
- **Controllers**
- **Intelligent Instruments**
- **Critical µP and µC Power Monitoring**
- **Portable / Battery-Powered Equipment**
- **Automotive**

General Description

The G632 are microprocessor (µP) supervisory circuits used to monitor the power supplies in µP and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V- powered circuits. The G632 also provides a debounced manual reset input.

These circuits perform a single function: they assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold, keeping it asserted for at least 220ms after V_{CC} has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available.

The G632 have a push-pull and active-low $\overline{\text{RESET}}$ output. The reset comparator is designed to ignore fast transients on V_{CC}, and the outputs are guaranteed to be in the correct logic state for V_{CC} down to 1V.

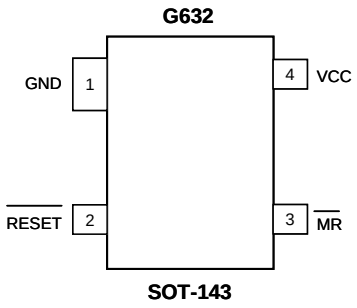
Low supply current makes the G632 ideal for use in portable equipment. The G632 are available in a SOT-143 packages.

Ordering Information

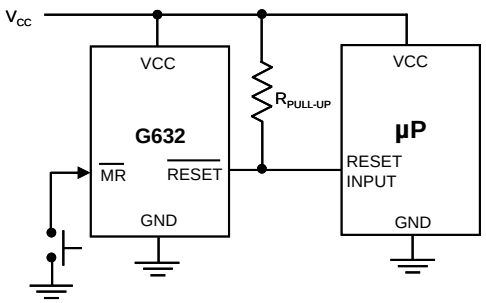
ORDER NUMBER	MARKING	RESET THRESHOLD(V)	TEMP. RANGE	OUTPUT TYPE	PACKAGE (Green)
G632L293TC1U	632Ax	2.93	-40°C ~ +105°C	Push-Pull	SOT-143

Note: TC: SOT-143
1: Bonding Code
U: Tape & Reel

Pin Configuration



Typical Application Circuit



ICC may increased at high T_A, Therefore, can not connect Resistors to VCC to prevent Icc abnormal behavior at high T_A.

Absolute Maximum Ratings

Terminal Voltage (with respect to GND)
V_{CC}. . . . . .-0.3V to 6.0V
$\overline{RESET}$ (push-pull) . . . . . .-0.3V to (V_{CC} + 0.3V)
$\overline{RESET}$ (open drain) . . . . . -0.3V to 6.0V
Input Current, V_{CC}. 20mA
Output Current, $\overline{RESET}$ 20mA
Junction Temperature (T_J) . . . . . 150°C
Thermal Resistance Junction to Ambient, (θ_{JA})
SOT-143 . . . . . 430°C/W

Continuous Power Dissipation (T_A = 25°C)
SOT-143 . . . . . 290mW
Thermal Resistance Junction to Case, (θ_{JC})
SOT-143 . . . . . 180°C/W
Operating Temperature Range. . . . . .-40°C to 105°C
Storage Temperature Range. . . . . -65°C to +150°C
Reflow Temperature (soldering, 10s) . . . . . .260°C
ESD Rating (Human Body Model) 2KV

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

Electrical Characteristics

(V_{CC} = full range, -40°C to +105°C, unless otherwise noted. Typical values are at T_A = 25°C, V_{CC}= 3.3V. (Note 1)

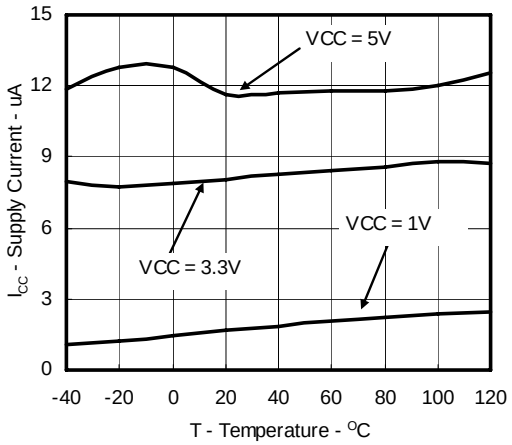
PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
V_{CC} Range		T_A =-40°C +105°C	1	---	5.5	V
Supply Current	I_{CC}		---	10	18	µA
Reset Threshold	V_{TH}		2.87	2.92	2.96	V
V_{CC} to Reset Delay		V_{CC} = V_{TH} to (V_{TH} – 100mV)	---	18	---	µs
Reset Active Timeout Period	T_{DLY}	V_{CC} = V_{TH} max,	220	---	360	ms
$\overline{MR}$ Minima Pulse Width	t_{MR}		---	10	---	µs
$\overline{MR}$ Glitch Immunity (Note 2)			---	100	---	ns
$\overline{MR}$ to Reset Propagation Delay	t_{MD}		---	0.5	---	µs
$\overline{MR}$ Input Threshold	V_{IH}	V_{CC} > $V_{TH(max)}$	0.6V_{CC}	0.7V_{CC}	---	V
	V_{IL}		---	0.2V_{CC}	0.3V_{CC}	
$\overline{MR}$ Pull-up Resistance			10	21	30	KΩ
$\overline{RESET}$ Output Current Low	I_{OL}	V_{CC} = 2.5V, $V_{\overline{RESET}}$ = 0.5V	8	---	---	mA

Note 1: Production testing done at T_A = +25°C; limits over temperature guaranteed by design.
Note 2: "Glitches" of 100ns or less typically will not generate a reset pulse.

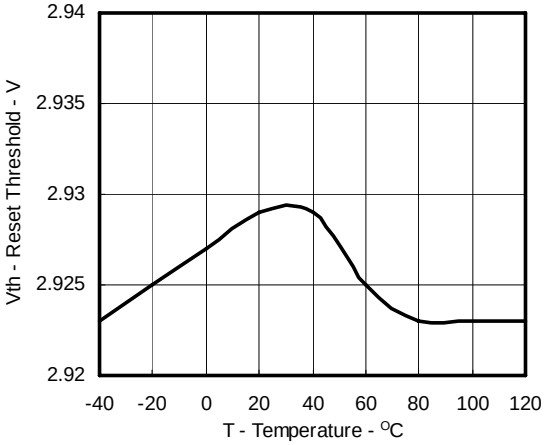
Typical Operating Characteristics

(V_{CC} = full range, T_A = -40°C to +120°C, unless otherwise noted. Typical values are at T_A = +25°C, V_{CC} = 3.3V

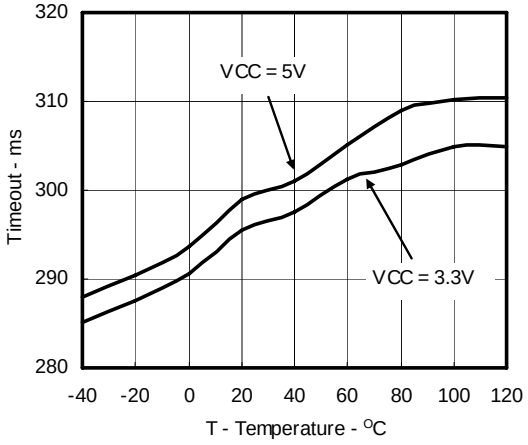
Supply Current V.S Temperature (No Load)



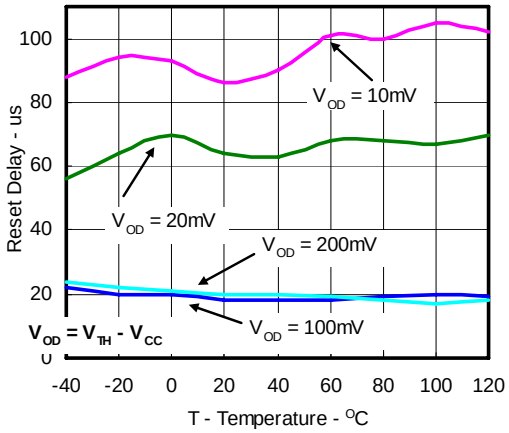
Reset Threshold V.S Temperature



Power-up Reset Timeout V.S Temperature

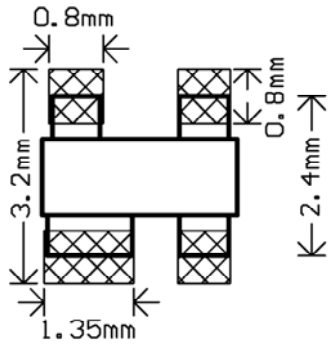


Power-down Reset Delay V.S Temperature

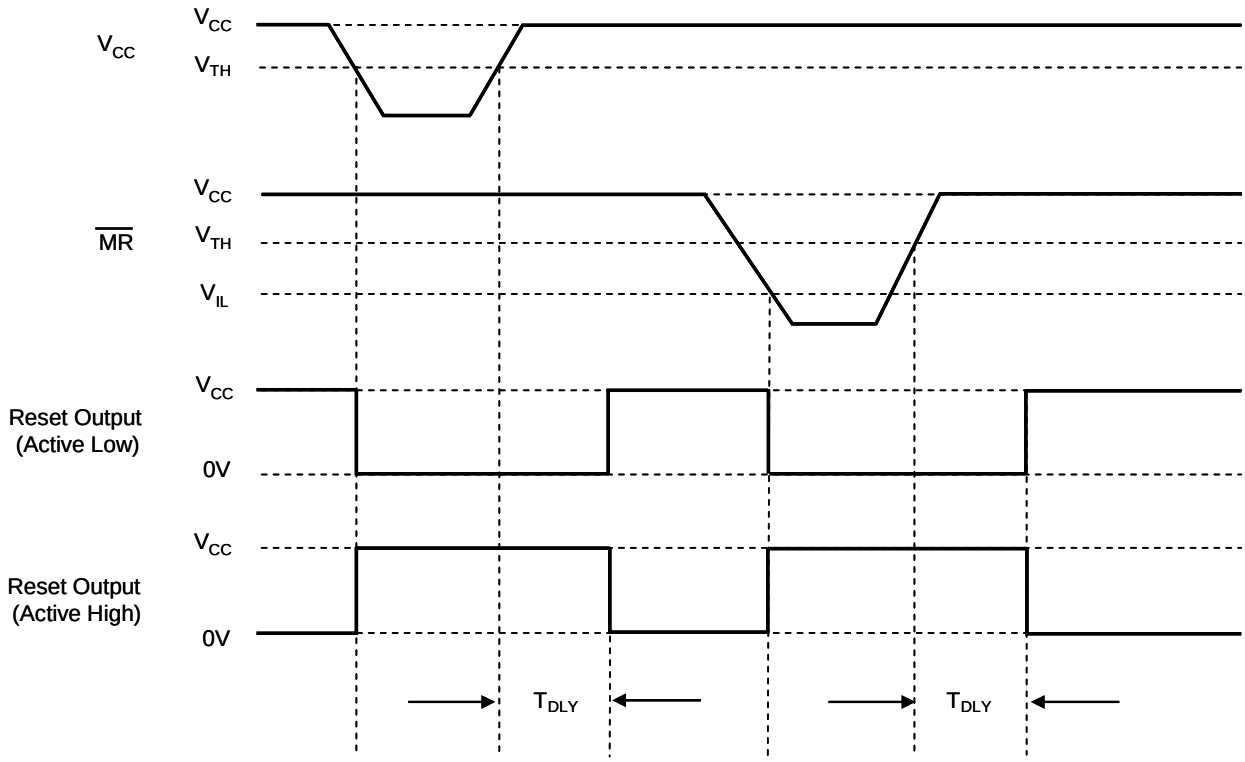


Minimum Footprint PCB Layout Section

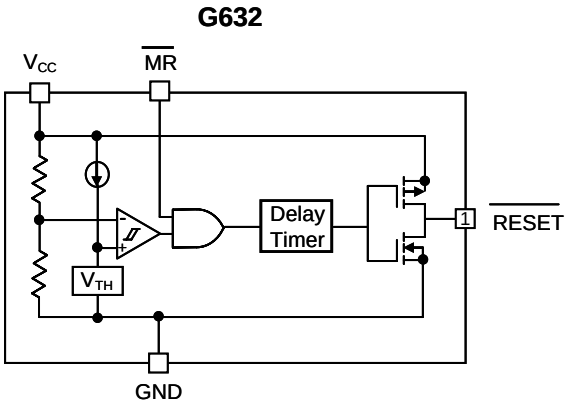
SOT-143



Timing Diagram



Functional Diagram



Pin Description

PIN	NAME	FUNCTION
1	GND	Ground
2	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ Output remains low while V_{CC} is below the reset threshold, and for at least 220ms after V_{CC} rises above the reset threshold.
3	$\overline{\text{MR}}$	Manual Reset Input. A logic low on $\overline{\text{MR}}$ asserts reset. Reset remains asserted as long as $\overline{\text{MR}}$ is low and for at least 230ms after $\overline{\text{MR}}$ returns high, This active-low input has an internal 20kΩ pull- up resistor. It can be driven from a TTL or CMOS-logic line, or shorted to ground with a switch. Leave open if unused.
4	VCC	Supply Voltage (+5V, +3.3V, +3.0V)
	NC	No Connection.

Detailed Description

A microprocessor's (µP's) reset input starts the µP in a known state. The G632 assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold, keeping it asserted for at least 220ms after V_{CC} has risen above the reset threshold. The G632 have a push-pull and active-low output stage.

The manual reset input ($\overline{\text{MR}}$) can also initiate a reset. See the Manual Reset Input Section.

Manual Reset Input

Many µP-based products require manual reset capability, allowing the operator, a test technician, or external logic circuitry to initiate a reset. A logic low on $\overline{\text{MR}}$ asserts reset. Reset remains asserted while $\overline{\text{MR}}$ is low, and for the Reset Active Timeout Period (t_{RP}) after $\overline{\text{MR}}$ returns high. This input has an internal 20kΩ pull-up resistor, so it can be left open if it is not used. $\overline{\text{MR}}$ can be driven with TTL or CMOS-logic levels, or with open-drain / collector outputs. Connect a normally open momentary switch from $\overline{\text{MR}}$ to GND to create a manual-reset function; external debounce circuitry is not required. If $\overline{\text{MR}}$ is driven from long cables or if the device is used in a noisy environment, connecting a 0.1µF capacitor from $\overline{\text{MR}}$ to ground provides additional noise immunity.

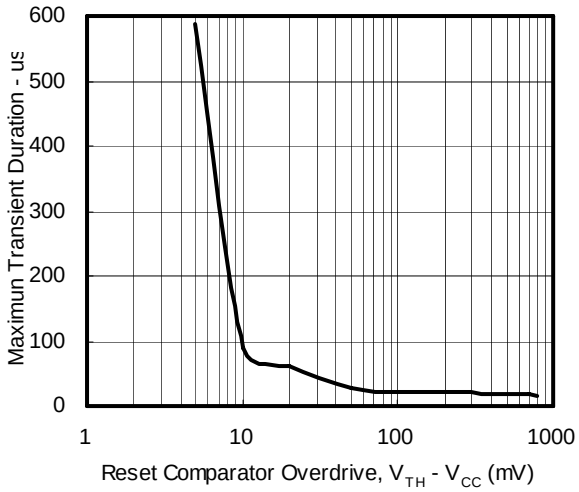


Figure1. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive

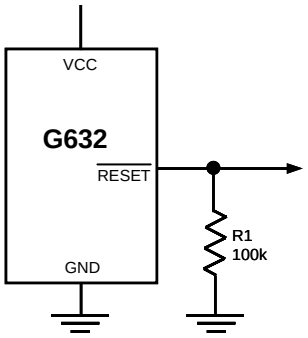


Figure2. $\overline{\text{RESET}}$ Valid to V_{CC} = Ground Circuit

Applications Information

Negative-Going V_{CC} Transients

In addition to issuing a reset to the µP during power-up, power-down, and brownout conditions, the G632 is relatively immune to short-duration negative-going V_{CC} transients (glitches).

Figure1 shows typical transient duration vs. reset comparator overdrive, for which the G632 do not generate a reset pulse. The graph was generated using a negative-going pulse applied to V_{CC}, starting 0.5V above the actual reset threshold and ending below it by the magnitude indicated (reset comparator overdrive). The graph indicates the maximum pulse width a negative-going V_{CC} transient can have without causing a reset pulse. As the magnitude of the transient increases (goes farther below the reset threshold), the maximum allowable pulse width decreases. A 0.1µF bypass capacitor mounted as close as possible to the V_{CC} pin provides additional transient immunity.

Ensuring a Valid Reset Output Down to V_{CC} = 0

When V_{CC} falls below 1V, the G632 $\overline{\text{RESET}}$ output no longer sinks current — it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to $\overline{\text{RESET}}$ can drift to undetermined voltages. This presents no problem in most applications since most µP and other circuitry is inoperative with VCC below 1V. However, in applications where $\overline{\text{RESET}}$ must be valid down to 0V, adding a pull-down resistor to $\overline{\text{RESET}}$ causes any stray leakage currents to flow to ground, holding $\overline{\text{RESET}}$ low (Figure 2). R1's value is not critical; 100kΩ is large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground.

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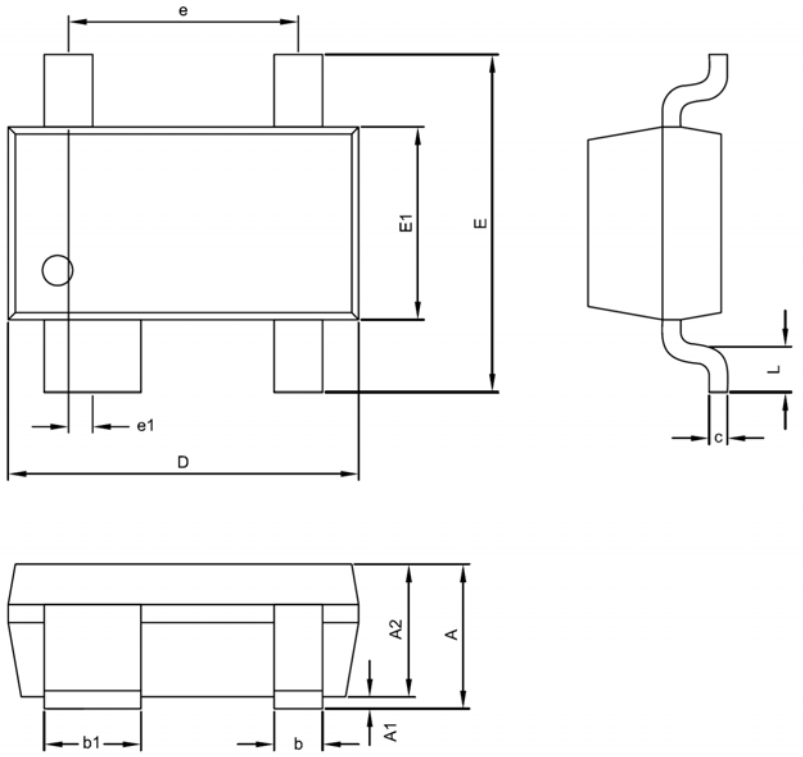
Benefits of Highly Accurate Reset Threshold

Most µP supervisor ICs have reset threshold voltages between 5% and 10% below the value of nominal supply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal.

When using ICs rated at only the nominal supply ±5%, this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted.

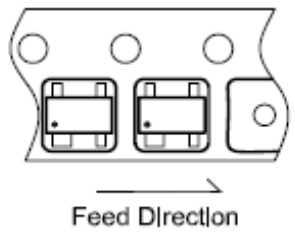
Package Information



SOT-143 (TC) Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.95	1.10	1.20	0.037	0.043	0.047
A1	0.00	---	0.15	0.000	---	0.006
A2	0.90	1.00	1.10	0.035	0.039	0.043
D	2.80	2.90	3.05	0.110	0.114	0.120
E	2.30	2.40	2.50	0.091	0.094	0.098
E1	1.20	1.30	1.40	0.047	0.051	0.055
c	0.10	0.15	0.18	0.004	0.006	0.007
b	0.35	0.40	0.50	0.014	0.016	0.020
b1	0.75	0.80	0.90	0.030	0.031	0.035
e	1.92 BSC			0.076 BSC		
e1	0.20 BSC			0.008 BSC		
L	0.30	0.55	0.60	0.012	0.022	0.024

Taping Specification



PACKAGE	Q'TY/REEL
SOT-143	3,000 ea