



Microprocessor Reset IC

Features

- Precision Monitoring of +3V, +3.3V, and +5V Power-Supply Voltages
- Fully Specified Over Temperature
- Available in Three Output Configurations
 - Push-Pull $\overline{\text{RESET}}$ Output (G690L)
 - Push-Pull RESET Output (G690H)
 - Open-Drain $\overline{\text{RESET}}$ Output (G691L)
- 140ms min Power-On Reset Pulse Width
- 10 μ A Supply Current
- Guaranteed Reset Valid to $V_{CC} = +1V$
- Power Supply Transient Immunity
- No External Components
- 3-Pin SOT-23 Packages

Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical μ P and μ C Power Monitoring
- Portable / Battery-Powered Equipment
- Automotive

General Description

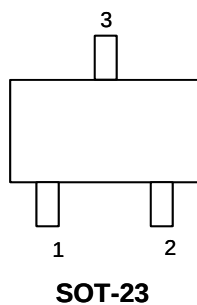
The G690/G691 are microprocessor (μ P) supervisory circuits used to monitor the power supplies in μ P and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V- powered circuits.

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 140ms after V_{CC} has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available.

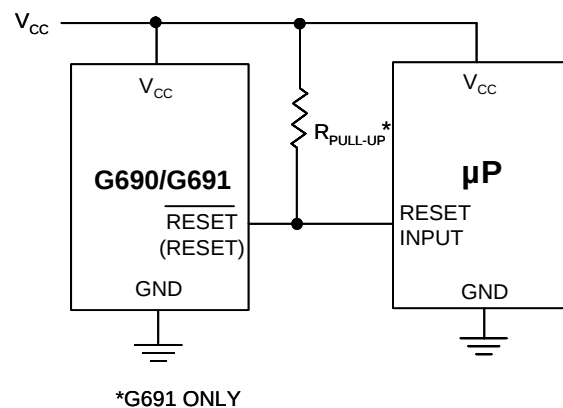
The G691L has an open-drain output stage, while the G690 have push-pull outputs. The G691L's open-drain $\overline{\text{RESET}}$ output requires a pull-up resistor that can be connected to a voltage higher than V_{CC} . The G690L have an active-low $\overline{\text{RESET}}$ output, while the G690H has an active-high 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 G690/G691 ideal for use in portable equipment. The G690/G691 are available in 3-pin SOT-23 packages.

Pin Configuration

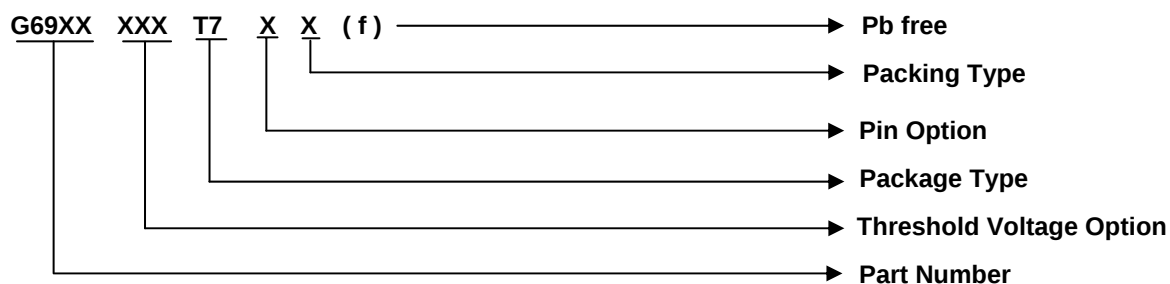


Typical Application Circuit



**Ordering Information**

ORDER NUMBER	ORDER NUMBER (Pb free)	TEMP. RANGE	OUTPUT TYPE	PACKAGE
G690LxxxT7xU	G690LxxxT7xUf	-40°C ~ +105°C	Push-Pull Active Low	SOT-23
G690HxxxT7xU	G690HxxxT7xUf	-40°C ~ +105°C	Push-Pull Active High	SOT-23
G691LxxxT7xU	G691LxxxT7xUf	-40°C ~ +105°C	Open-Drain	SOT-23

Order Number Identification**Part Number**

G690L : Push-Pull Active Low Output
 G690H : Push-Pull Active High Output
 G691L : Open-Drain Output

Threshold Voltage Option

* xxx specifies the threshold voltage.
 e.g. 263 denotes the 2.63V threshold voltage.

Package Type

T7 : SOT-23

Packing Type

U: Tape & Reel

Pin Option

1	2	3
1 : $\overline{\text{RESET}}$	GND	V_{CC}
2 : $\overline{\text{RESET}}$	V_{CC}	GND
3 : GND	$\overline{\text{RESET}}$	V_{CC}
4 : GND	V_{CC}	$\overline{\text{RESET}}$
5 : V_{CC}	GND	$\overline{\text{RESET}}$
6 : V_{CC}	$\overline{\text{RESET}}$	GND

*RESET for G690H

**Selector Guide**

ORDER NUMBER	ORDER NUMBER (Pb free)	RESET THRESHOLD (V)	OUTPUT TYPE	TOP MARK
				SOT-23
G691L463T71U	G691L463T71Uf	4.63	Open-Drain	689Fx
G691L438T71U	G691L438T71Uf	4.38	Open-Drain	689Ex
G691L400T71U	G691L400T71Uf	4.00	Open-Drain	689Dx
G691L308T71U	G691L308T71Uf	3.08	Open-Drain	689Cx
G691L293T71U	G691L293T71Uf	2.93	Open-Drain	689Bx
G691L263T71U	G691L263T71Uf	2.63	Open-Drain	689Ax
G690H463T71U	G690H463T71Uf	4.63	Push-Pull RESET	688Lx
G690H438T71U	G690H438T71Uf	4.38	Push-Pull RESET	688Kx
G690H400T71U	G690H400T71Uf	4.00	Push-Pull RESET	688Jx
G690H308T71U	G690H308T71Uf	3.08	Push-Pull RESET	688Ix
G690H293T71U	G690H293T71Uf	2.93	Push-Pull RESET	688Hx
G690H263T71U	G690H263T71Uf	2.63	Push-Pull RESET	688Gx
G690L463T71U	G690L463T71Uf	4.63	Push-Pull	688Fx
G690L438T71U	G690L438T71Uf	4.38	Push-Pull	688Ex
G690L400T71U	G690L400T71Uf	4.00	Push-Pull	688Dx
G690L308T71U	G690L308T71Uf	3.08	Push-Pull	688Cx
G690L293T71U	G690L293T71Uf	2.93	Push-Pull	688Bx
G690L263T71U	G690L263T71Uf	2.63	Push-Pull	688Ax

Note: T7: SOT-23

Not all product options are ready for mass production, please contact factory for availability.

Selector Guide

ORDER NUMBER	ORDER NUMBER (Pb free)	RESET THRESHOLD (V)	OUTPUT TYPE	TOP MARK
				SOT-23
G691L463T72U	G691L463T72Uf	4.63	Open-Drain	687Fx
G691L438T72U	G691L438T72Uf	4.38	Open-Drain	687Ex
G691L400T72U	G691L400T72Uf	4.00	Open-Drain	687Dx
G691L308T72U	G691L308T72Uf	3.08	Open-Drain	687Cx
G691L293T72U	G691L293T72Uf	2.93	Open-Drain	687Bx
G691L263T72U	G691L263T72Uf	2.63	Open-Drain	687Ax
G690H463T72U	G690H463T72Uf	4.63	Push-Pull RESET	686Lx
G690H438T72U	G690H438T72Uf	4.38	Push-Pull RESET	686Kx
G690H400T72U	G690H400T72Uf	4.00	Push-Pull RESET	686Jx
G690H308T72U	G690H308T72Uf	3.08	Push-Pull RESET	686Ix
G690H293T72U	G690H293T72Uf	2.93	Push-Pull RESET	686Hx
G690H263T72U	G690H263T72Uf	2.63	Push-Pull RESET	686Gx
G690L463T72U	G690L463T72Uf	4.63	Push-Pull	686Fx
G690L438T72U	G690L438T72Uf	4.38	Push-Pull	686Ex
G690L400T72U	G690L400T72Uf	4.00	Push-Pull	686Dx
G690L308T72U	G690L308T72Uf	3.08	Push-Pull	686Cx
G690L293T72U	G690L293T72Uf	2.93	Push-Pull	686Bx
G690L263T72U	G690L263T72Uf	2.63	Push-Pull	686Ax

Note: T7: SOT-23

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**Selector Guide**

ORDER NUMBER	ORDER NUMBER (Pb free)	RESET THRESHOLD (V)	OUTPUT TYPE	TOP MARK
				SOT-23
G691L463T73U	G691L463T73Uf	4.63	Open-Drain	691Fx
G691L438T73U	G691L438T73Uf	4.38	Open-Drain	691Ex
G691L400T73U	G691L400T73Uf	4.00	Open-Drain	691Dx
G691L308T73U	G691L308T73Uf	3.08	Open-Drain	691Cx
G691L293T73U	G691L293T73Uf	2.93	Open-Drain	691Bx
G691L263T73U	G691L263T73Uf	2.63	Open-Drain	691Ax
G690H463T73U	G690H463T73Uf	4.63	Push-Pull RESET	690Lx
G690H438T73U	G690H438T73Uf	4.38	Push-Pull RESET	690Kx
G690H400T73U	G690H400T73Uf	4.00	Push-Pull RESET	690Jx
G690H308T73U	G690H308T73Uf	3.08	Push-Pull RESET	690Ix
G690H293T73U	G690H293T73Uf	2.93	Push-Pull RESET	690Hx
G690H263T73U	G690H263T73Uf	2.63	Push-Pull RESET	690Gx
G690L463T73U	G690L463T73Uf	4.63	Push-Pull	690Fx
G690L438T73U	G690L438T73Uf	4.38	Push-Pull	690Ex
G690L400T73U	G690L400T73Uf	4.00	Push-Pull	690Dx
G690L308T73U	G690L308T73Uf	3.08	Push-Pull	690Cx
G690L293T73U	G690L293T73Uf	2.93	Push-Pull	690Bx
G690L263T73U	G690L263T73Uf	2.63	Push-Pull	690Ax

Note: T7: SOT-23

Not all product options are ready for mass production, please contact factory for availability.

**Absolute Maximum Ratings**

Terminal Voltage (with respect to GND)

 V_{CC} -0.3V to 6.0VRESET, $\overline{\text{RESET}}$ (push-pull) -0.3V to ($V_{CC} + 0.3V$) $\overline{\text{RESET}}$ (open drain) -0.3V to 6.0VInput Current, V_{CC} 20mAOutput Current, RESET, $\overline{\text{RESET}}$ 20mA

Operating Temperature Range -40°C to 105°C

Storage Temperature Range -65°C to 150°C

Reflow Temperature (soldering, 10sec) 260°C

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, $T_A = 25^\circ\text{C}$, unless otherwise noted. Typical values are at $T_A = 25^\circ\text{C}$, $V_{CC} = 5V$ for 463/438/400 versions, $V_{CC} = 3.3V$ for 308/293 versions, and $V_{CC} = 3V$ for 263 version.) (Note 1)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
V_{CC} Range			1.0	---	5.5	V
Supply Current (SOT-23)	I_{CC}	$V_{CC} < 5.5V$, G69_463/438/400	---	22	30	μA
		$V_{CC} < 3.6V$, G69_308/293/263	---	10	23	
Reset Threshold	V_{TH}	G69_463	4.56	4.63	4.70	V
		G69_438	4.31	4.38	4.45	
		G69_400	3.93	4.00	4.06	
		G69_308	3.03	3.08	3.12	
		G69_293	2.88	2.93	2.97	
		G69_263	2.59	2.63	2.67	
Reset Threshold Tempco			---	40	---	ppm/ $^\circ\text{C}$
V_{CC} to Reset Delay (Note 2)		$V_{CC} = V_{TH}$ to ($V_{TH} - 100\text{mV}$)	---	7	---	μs
Reset Active Timeout Period		$V_{CC} = V_{TH}$ max, G69_463/438/400	280	---	640	ms
		$V_{CC} = V_{TH}$ max, G69_308/293/263	150	---	550	
RESET Output Current Low (push-pull active low, and open-drain active-low, G690L and G691L)	I_{OL}	$V_{CC} = 2.5V$, $V_{\overline{\text{RESET}}} = 0.5V$	8	---	---	mA
RESET Output Current High (push-pull active low, G690L)	I_{OH}	$V_{CC} = 5V$, $V_{\overline{\text{RESET}}} = 4.5V$, G690L463/438/400	4.5	---	---	mA
		$V_{CC} = 3.3V$, $V_{\overline{\text{RESET}}} = 2.8V$, G690L308/293	3	---	---	
		$V_{CC} = 3V$, $V_{\overline{\text{RESET}}} = 2.5V$, G690L263	2	---	---	
RESET Output Current Low (push-pull active high, G690H)	I_{OL}	$V_{CC} = 5V$, $V_{\overline{\text{RESET}}} = 0.5V$, G690H463/438/400	16	---	---	mA
		$V_{CC} = 3.3V$, $V_{\overline{\text{RESET}}} = 0.5V$, G690H308/293	12	---	---	
		$V_{CC} = 3V$, $V_{\overline{\text{RESET}}} = 0.5V$, G690H263	10	---	---	
RESET Output Current High (push-pull active high, G690H)	I_{OH}	$V_{CC} = 2.5V$, $V_{\overline{\text{RESET}}} = 2V$	2	---	---	mA
RESET Open-Drain Output Leakage Current (G691L)		$V_{CC} > V_{TH}$, $\overline{\text{RESET}}$ deasserted	---	---	1	μA

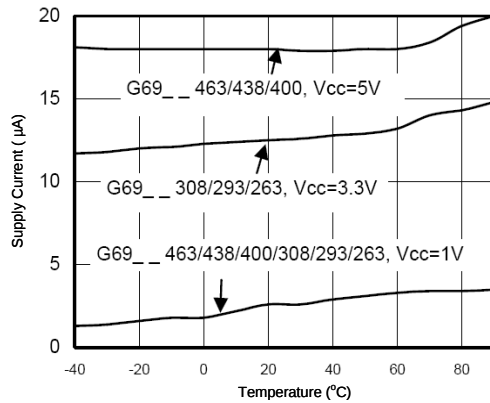
Note 1: Production testing done at $T_A = +25^\circ\text{C}$; limits over temperature guaranteed by design.

Note 2: $\overline{\text{RESET}}$ output is for G690L/G691L; While RESET output is for G690H.

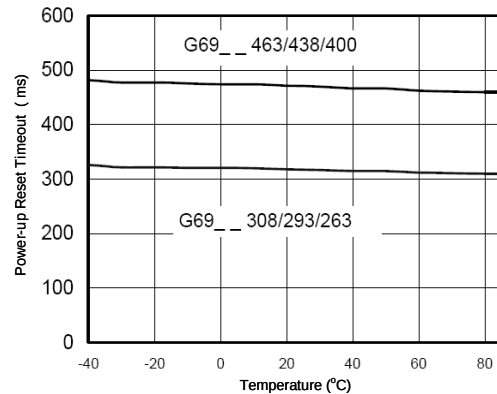
Typical Operating Characteristics

(V_{CC} = full range, $T_A = 25^\circ\text{C}$, unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$, $V_{CC} = 5\text{V}$ for 463/438/400 versions, $V_{CC} = 3.3\text{V}$ for 308/293 versions, and $V_{CC} = 3\text{V}$ for 263 version.)

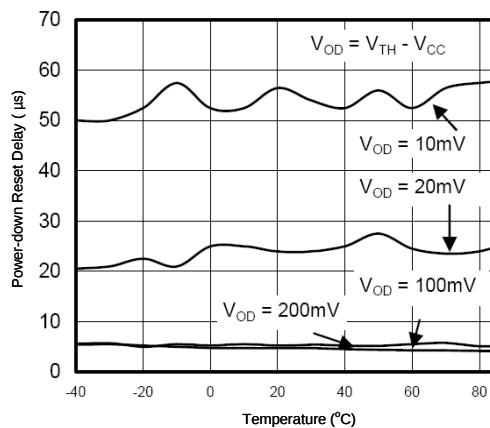
**Supply Current vs. Temperature
(No Load)**



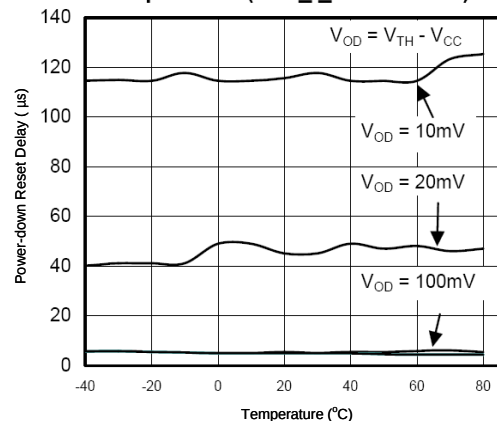
**Power-up Reset Timeout
vs. Temperature**



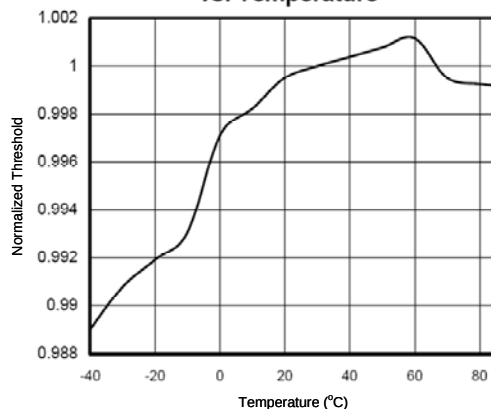
**Power-down Reset Delay vs.
Temperature (G69__ 308/293/263)**



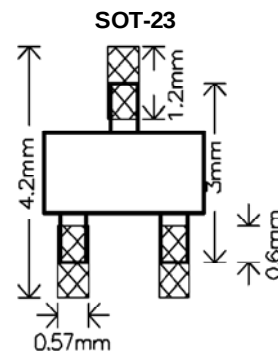
**Power-down Reset Delay vs.
Temperature (G68__ 463/438/400)**



**Normalized Reset Threshold
vs. Temperature**



Recommended Minimum Footprint



Pin Description

PIN	NAME	FUNCTION
1	GND	Ground
2	(G691L/G690L)	RESET Output remains low while V_{CC} is below the reset threshold, and for at least 140ms after V_{CC} rises above the reset threshold.
	RESET (G690H)	RESET Output remains high while V_{CC} is below the reset threshold, and for at least 140ms after V_{CC} rises above the reset threshold.
3	V_{CC}	Supply Voltage (+5V, +3.3V, +3.0V)

Detailed Description

A microprocessor's (μP 's) reset input starts the μP in a known state. The G691L/G690L/G690H 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 140ms after V_{CC} has risen above the reset threshold. The G691L uses an open-drain output, and the G690L/G690H have a push-pull output stage. Connect a pull-up resistor on the G691L's RESET output to any supply between 0 and 5.5V.

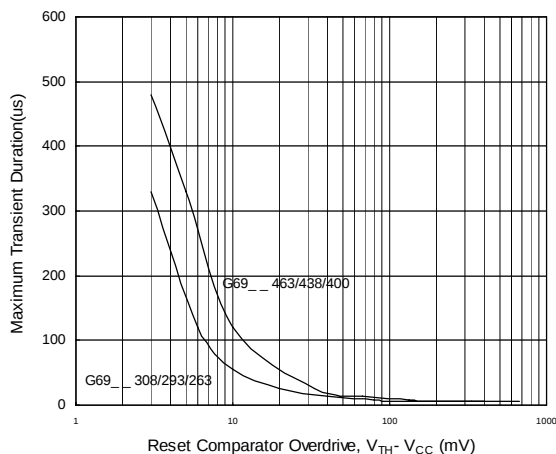


Figure 1. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

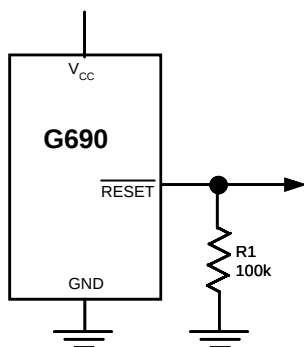


Figure 2. RESET Valid to V_{CC} = Ground Circuit

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 G691L/G690H/G690L are relatively immune to short-duration negative-going V_{CC} transients (glitches).

Figure 1 shows typical transient duration vs. reset comparator overdrive, for which the G691L/G690H/G690L 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. Typically, for the G69_463 and G69_438, a V_{CC} transient that goes 100mV below the reset threshold and lasts 7 μs or less will not cause a reset pulse. A 0.1 μF 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 G690 RESET output no longer sinks current—it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to RESET can drift to undetermined voltages. This presents no problem in most applications since most μP and other circuitry is inoperative with V_{CC} below 1V. However, in applications where RESET must be valid down to 0V, adding a pull-down resistor to RESET causes any stray leakage currents to flow to ground, holding RESET low (Figure 2). R1's value is not critical; 100k Ω is large enough not to load RESET and small enough to pull RESET to ground.

A 100k Ω pull-up resistor to V_{CC} is also recommended for the G691L if RESET is required to remain valid for $V_{CC} < 1V$.

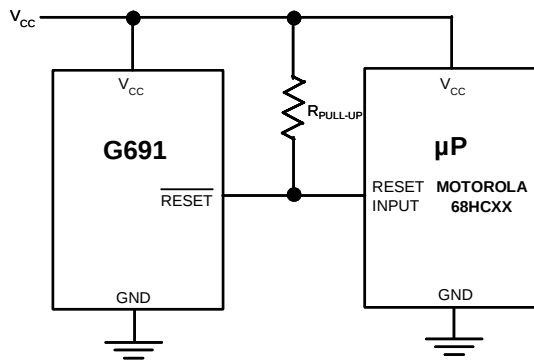


Figure 3. Interfacing to μ Ps with Bidirectional Reset I/O

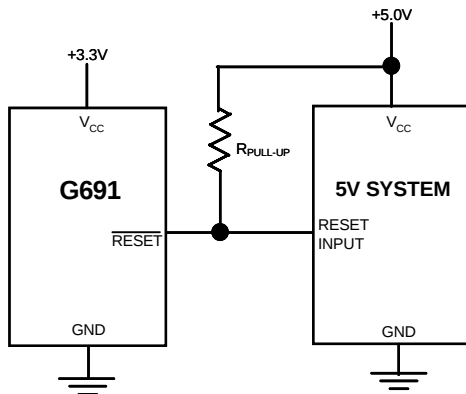


Figure 4. G691L Open-Drain $\overline{\text{RESET}}$ Output Allows Use with Multiple Supplies

Interfacing to μ Ps with Bidirectional Reset Pins

Since the $\overline{\text{RESET}}$ output on the G691L is open drain, this device interfaces easily with μ Ps that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the μ P supervisor's $\overline{\text{RESET}}$ output directly to the microcontroller's (μ C's) $\overline{\text{RESET}}$ pin with a single pull-up resistor allows either device to assert reset (Figure 3).

G691L Open-Drain $\overline{\text{RESET}}$ Output Allows Use with Multiple Supplies

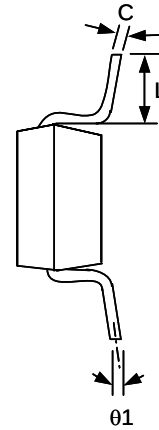
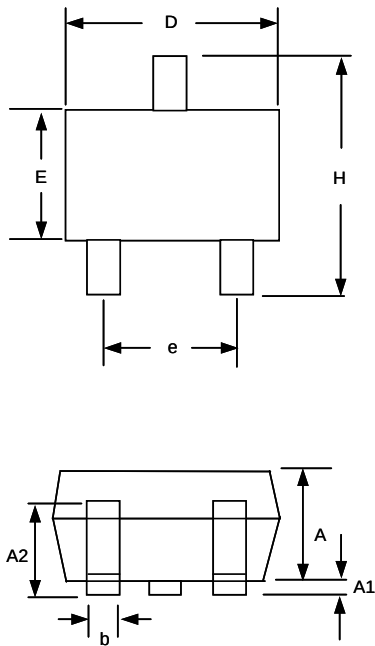
Generally, the pull-up connected to the G691L will connect to the supply voltage that is being monitored at the IC's V_{CC} pin. However, some systems may use the open-drain output to level-shift from the monitored supply to reset circuitry powered by some other supply (Figure 4). Note that as the G691L's V_{CC} decreases below 1V, so does the IC's ability to sink current at $\overline{\text{RESET}}$. Also, with any pull-up, $\overline{\text{RESET}}$ will be pulled high as V_{CC} decays toward 0. The voltage where this occurs depends on the pull-up resistor value and the voltage to which it is connected.

Benefits of Highly Accurate Reset Threshold

Most μ P 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.

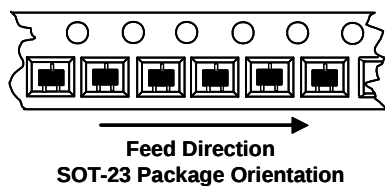
When using ICs rated at only the nominal supply $\pm 5\%$, this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted.

The G69_463/G69_308 use highly accurate circuitry to ensure that reset is asserted close to the 5% limit, and long before the supply has declined to 10% below nominal.

**Package Information****SOT-23 (T7) Package****Note:**

- 1.Package body sizes exclude mold flash protrusions or gate burrs
- 2.Tolerance ± 0.1000 mm (4mil) unless otherwise specified
- 3.Coplanarity: 0.1000mm
- 4.Dimension L is measured in gage plane

SYMBOL	DIMENSIONS IN MILLIMETER		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	-----	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
e	-----	1.90(TYP)	-----
H	2.60	2.80	3.00
L	0.37	-----	-----
$\theta 1$	1°	5°	9°

Taping Specification

PACKAGE	Q'TY/REEL
SOT-23	3,000 ea

GMT Inc. does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and GMT Inc. reserves the right at any time without notice to change said circuitry and specifications.

Ver: 2.0

Aug 07, 2006

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