



## 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 (G684L)
  - Push-Pull  $\text{RESET}$  Output (G684H)
  - Open-Drain  $\overline{\text{RESET}}$  Output (G685L)
- 14 $\mu\text{A}$  Supply Current
- Guaranteed Reset Valid to  $V_{\text{CC}} = 0.8\text{V}$
- Power Supply Transient Immunity
- 5 pin SOT23-5 Packages
- 2% Threshold Accuracy

### Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical  $\mu\text{P}$  and  $\mu\text{C}$  Power Monitoring
- Portable / Battery-Powered Equipment
- Automotive

### General Description

The G684/G685 are microprocessor ( $\mu\text{P}$ ) supervisory circuits used to monitor the power supplies in  $\mu\text{P}$  and digital systems. They provide excellent circuit reliability and low cost 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  $V_{\text{CC}}$  supply voltage declines below a preset threshold, with hysteresis after  $V_{\text{CC}}$  has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available.

The G685 has an open-drain output stage, while the G684 have push-pull outputs. The G685L's open-drain  $\overline{\text{RESET}}$  output requires a pull-up resistor that can be connected to a voltage higher than  $V_{\text{CC}}$ . The G684L have an active-low  $\overline{\text{RESET}}$  output, while the G684H has an active-high  $\text{RESET}$  output. The reset comparator is designed to ignore fast transients on  $V_{\text{CC}}$ , and the outputs are guaranteed to be in the correct logic state for  $V_{\text{CC}}$  down to 0.8V.

Low supply current makes the G684/G685 ideal for use in portable equipment. The G684/G685 are available in 5-pin SOT23-5 packages.

### Ordering Information

ORDER NUMBER	TEMP. RANGE	PACKAGE
G684H(L)xxxT1U	-40°C ~ +105°C	SOT23-5
G685LxxxT1U	-40°C ~ +105°C	SOT23-5

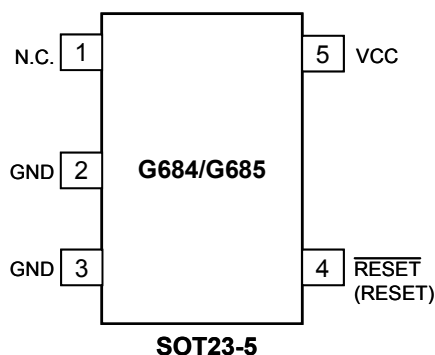
Note: T1 : SOT23-5

U : Tape & Reel

\* xxx specifies the threshold voltage.

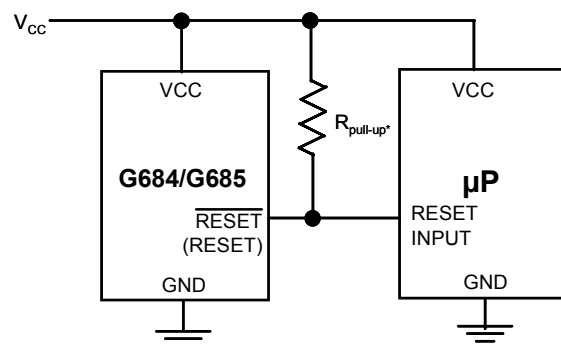
e.g. 263 denotes the 2.63V threshold voltage.

### Pin Configuration



(jis for G684H)

### Typical Application Circuit



\*G685 ONLY

**Absolute Maximum Ratings**

Terminal Voltage (with respect to GND)

 $V_{CC}$ .....-0.3V to +6.0VDelay Capacitor Pin Voltage,  $V_{CD}$ .....-0.3 to ( $V_{CC} + 0.3V$ )RESET,  $\overline{RESET}$  (push-pull).....-0.3V to ( $V_{CC} + 0.3V$ ) $\overline{RESET}$  (open drain).....-0.3V to +6.0VInput Current,  $V_{CC}$  .....20mAOutput Current, RESET,  $\overline{RESET}$  .....20mAContinuous Power Dissipation ( $T_A = +70^\circ C$ )5-Pin SOT23-5 (derate 2.17mW/ $^\circ C$  above  $+70^\circ C$ ).174mWOperating Temperature Range .....-40 $^\circ C$  to +105 $^\circ C$ Storage Temperature Range.....-65 $^\circ C$  to +150 $^\circ C$ Lead Temperature (soldering, 10s).....+260 $^\circ C$ 

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,  $T_A = -40^\circ C$  to  $+105^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ ,  $V_{CC} = 5V$  for 463/438/400/330 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 <sub>CC</sub> Range		T <sub>A</sub> = 0 $^\circ C$ +70 $^\circ C$	0.8	---	5.5	V
		T <sub>A</sub> = -40 $^\circ C$ +105 $^\circ C$	1	---	5.5	
Supply Current (SOT23-5)	I <sub>CC</sub>	V <sub>CC</sub> <5.5V, G68_ 463/438/400/330_	---	16.5	25	$\mu A$
		V <sub>CC</sub> <3.6V, G68_ 308/293/263_	---	13.9	27	
Reset Threshold	V <sub>TH</sub>	G69_ 463_	4.50	4.60	4.69	V
		G69_ 438_	4.23	4.32	4.40	
		G69_ 400_	3.88	3.96	4.04	
		G69_ 330_	3.25	3.30	3.37	
		G69_ 308_	3.04	3.10	3.16	
		G69_ 293_	2.86	2.91	2.96	
		G69_ 263_	2.59	2.64	2.69	
Reset Threshold Hysteresis	V <sub>HYS</sub>		3.6	5.3	7	%
Reset Threshold Tempco			---	70	---	ppm/ $^\circ C$
Reset Time Delay		V <sub>CC</sub> from 0V to 5V	---	2	---	ms
RESET Output Current Low (push-pull active low, and open-drain active-low, G684L and G685L)	I <sub>OL</sub>	V <sub>CC</sub> = 2.5V, V $\overline{RESET}$ = 0.5V	8	---	---	mA
RESET Output Current High (push-pull active low, G684L)	I <sub>OH</sub>	V <sub>CC</sub> = 5V, V $\overline{RESET}$ = 4.5V, G684L463/438/400/330	4.5	---	---	mA
		V <sub>CC</sub> = 3.3V, V $\overline{RESET}$ = 2.8V, G684L308/293	3	---	---	
		V <sub>CC</sub> = 3V, V $\overline{RESET}$ = 2.5V, G684L263	2	---	---	
RESET Output Current Low (push-pull active high, G684H)	I <sub>OL</sub>	V <sub>CC</sub> = 5V, V $\overline{RESET}$ = 0.5V, G684H463/438/400/330	16	---	---	mA
		V <sub>CC</sub> = 3.3V, V $\overline{RESET}$ = 0.5V, G684H308/293	12	---	---	
		V <sub>CC</sub> = 3V, V $\overline{RESET}$ = 0.5V, G684H263	10	---	---	
RESET Output Current High (push-pull active high, G684H)	I <sub>OH</sub>	V <sub>CC</sub> = 2.5V, V $\overline{RESET}$ = 2V	2	---	---	mA
RESET Open-Drain Output Leak- age Current (G685L)		V <sub>CC</sub> > V <sub>TH</sub> , $\overline{RESET}$ deasserted	---	---	1	$\mu A$

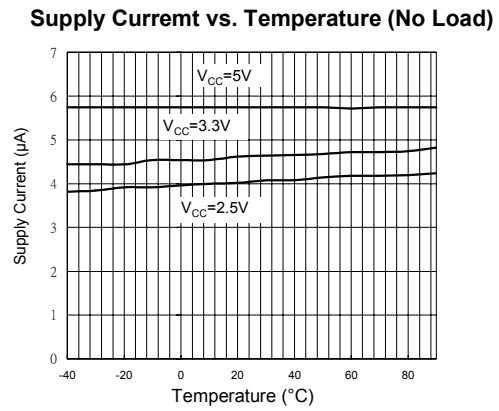
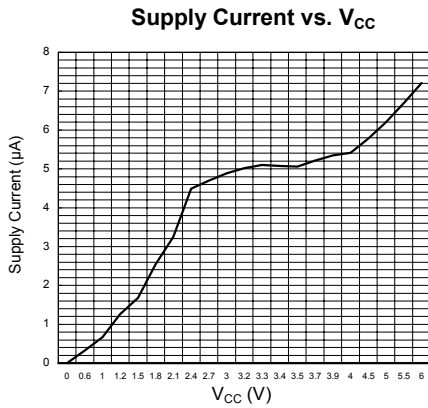
Note 1: Production testing done at  $T_A = +25^\circ C$ ; limits over temperature guaranteed by design.

**Selector Guide**

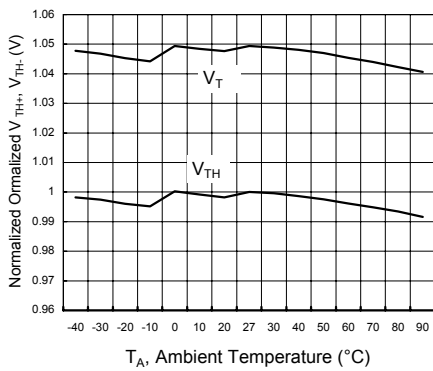
PART/SUFFIX	RESET THRESHOLD (V)	OUTPUT TYPE	TOP MARK
G685L463T1U	4.63	Open-Drain $\overline{\text{RESET}}$	685Gx
G685L438T1U	4.38	Open-Drain $\overline{\text{RESET}}$	685Fx
G685L400T1U	4.00	Open-Drain $\overline{\text{RESET}}$	685Ex
G685L330T1U	3.30	Open-Drain $\overline{\text{RESET}}$	685Dx
G685L308T1U	3.08	Open-Drain $\overline{\text{RESET}}$	685Cx
G685L293T1U	2.93	Open-Drain $\overline{\text{RESET}}$	685Bx
G685L263T1U	2.63	Open-Drain $\overline{\text{RESET}}$	685Ax
G684H463T1U	4.63	Push-Pull $\overline{\text{RESET}}$	684Lx
G684H438T1U	4.38	Push-Pull $\overline{\text{RESET}}$	684Kx
G684H400T1U	4.00	Push-Pull $\overline{\text{RESET}}$	684Jx
G684H330T1U	3.30	Push-Pull $\overline{\text{RESET}}$	684Nx
G684H308T1U	3.08	Push-Pull $\overline{\text{RESET}}$	684Ix
G684H293T1U	2.93	Push-Pull $\overline{\text{RESET}}$	684Hx
G684H263T1U	2.63	Push-Pull $\overline{\text{RESET}}$	684Gx
G684L463T1U	4.63	Push-Pull $\overline{\text{RESET}}$	684Fx
G684L438T1U	4.38	Push-Pull $\overline{\text{RESET}}$	684Ex
G684L400T1U	4.00	Push-Pull $\overline{\text{RESET}}$	684Dx
G684L330T1U	3.30	Push-Pull $\overline{\text{RESET}}$	684Mx
G684L308T1U	3.08	Push-Pull $\overline{\text{RESET}}$	684Cx
G684L293T1U	2.93	Push-Pull $\overline{\text{RESET}}$	684Bx
G684L263T1U	2.63	Push-Pull $\overline{\text{RESET}}$	684Ax

**Typical Operating Characteristics**

( $V_{CC}$  = full range,  $T_A$  =  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$ , unless otherwise noted. Typical values are at  $T_A$  =  $+25^{\circ}\text{C}$ ,  $V_{CC}$  = 5V for 463/438/400/330 versions,  $V_{CC}$  = 3.3V for 308/293 versions, and  $V_{CC}$  = 3V for 263 version.)



**Normalized Reset Threshold vs. Temperature**



**Functional Diagram**

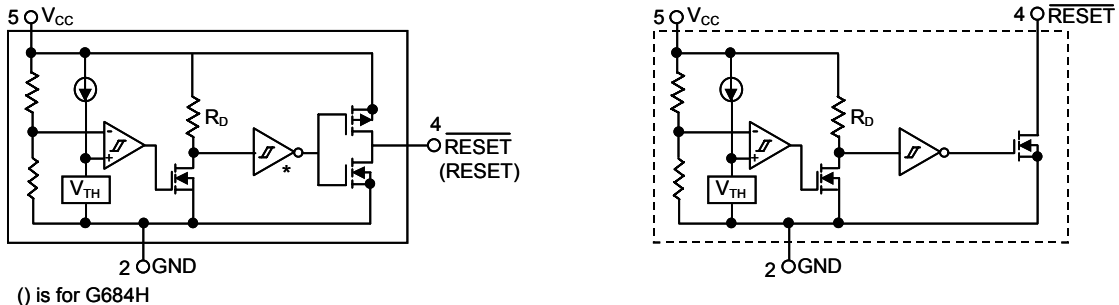


Figure 1

## Pin Description

PIN	NAME	FUNCTION
1	N.C.	No Connection.
2,3	GND	Ground
4	$\overline{\text{RESET}}$ (G684L/G685L)	$\overline{\text{RESET}}$ Output remains low while $V_{CC}$ is below the reset threshold, and for 2ms typical after $V_{CC}$ rises above the reset threshold.
	RESET (G684H)	RESET Output remains high while $V_{CC}$ is below the reset threshold, and for 2ms typical after $V_{CC}$ rises above the reset threshold.
5	$V_{CC}$	Supply Voltage (+5V, +3.3V, +3.0V)

## Detailed Description

A microprocessor's ( $\mu\text{P}$ 's) reset input starts the  $\mu\text{P}$  in a known state. The G685L/G684L/G684H 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 ( $V_{TH-}$ ),  $V_{CC}$  has risen above the high reset threshold  $V_{TH+}$  ( $V_{TH-} + V_{HYS}$ ). The G685L uses an open-drain output, and the G684L/G684H have a push-pull output stage. Connect a pull-up resistor on the G685L's  $\overline{\text{RESET}}$  output to any supply between 0 and 5.5V.

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

When  $V_{CC}$  falls below 0.8V, the G684  $\overline{\text{RESET}}$  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  $\mu\text{P}$  and other circuitry is inoperative with  $V_{CC}$  below 0.8V. 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; 100k $\Omega$  is large enough not to load  $\overline{\text{RESET}}$  and small enough to pull  $\overline{\text{RESET}}$  to ground.

A 100k $\Omega$  pull-up resistor to  $V_{CC}$  is also recommended for the G685L if  $\overline{\text{RESET}}$  is required to remain valid for  $V_{CC} < 0.8\text{V}$ .

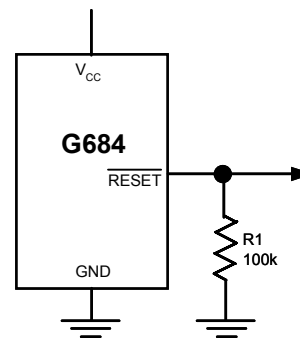
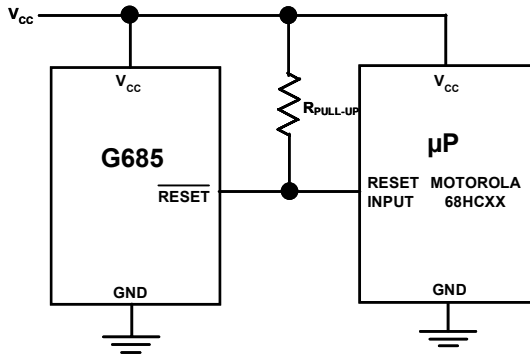


Figure2.  $\overline{\text{RESET}}$  Valid to  $V_{CC} = \text{Ground}$  Circuit

**Interfacing to  $\mu$ Ps with Bidirectional Reset Pins**

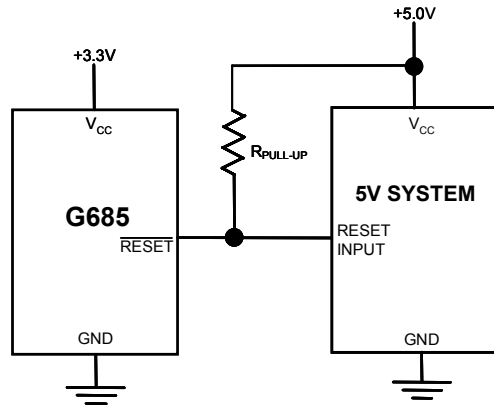
Since the  $\overline{\text{RESET}}$  output on the G685L is open drain, this device interfaces easily with  $\mu$ Ps that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the  $\mu$ P supervisor's  $\overline{\text{RESET}}$  output directly to the microcontroller's ( $\mu$ C's)  $\overline{\text{RESET}}$  pin with a single pull-up resistor allows either device to assert reset (Figure 3).



**Figure 3. Interfacing to  $\mu$ Ps with Bidirectional Reset I/O**

**G685L Open-Drain  $\overline{\text{RESET}}$  Output Allows Use with Multiple Supplies**

Generally, the pull-up connected to the G685L 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 G685L'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.



**Figure 4. G685L Open-Drain  $\overline{\text{RESET}}$  Output Allows Use with Multiple Supplies**

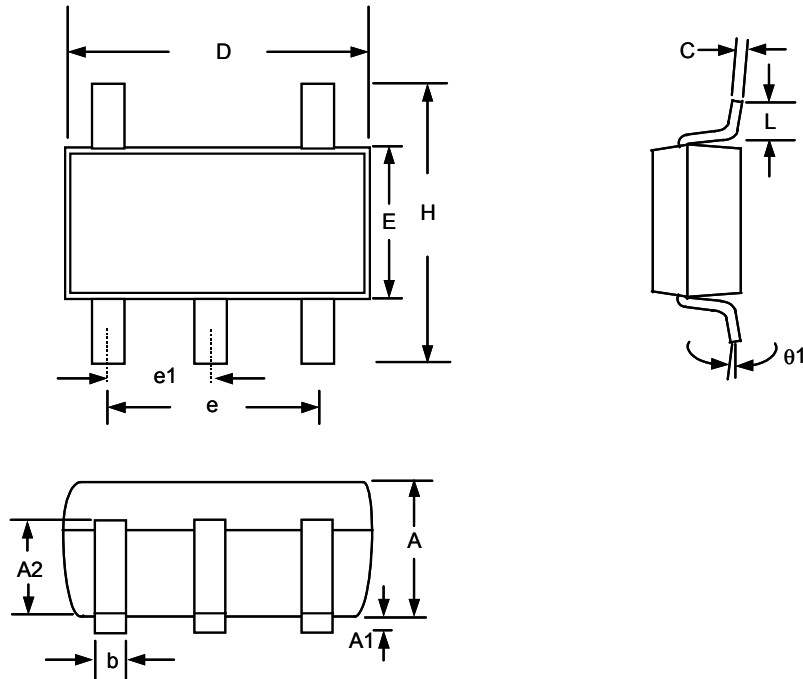
**Benefits of Highly Accurate Reset Threshold**

Most  $\mu$ 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 G68\_\_463/G68\_\_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

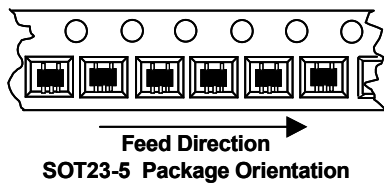


**Note:**

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

SYMBOLS	DIMENSIONS IN MILLIMETERS		
	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)	-----
e1	-----	0.95	-----
H	2.60	2.80	3.00
L	0.37	-----	-----
$\theta 1$	1°	5°	9°

## Taping Specification



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.