Global Mixed-mode Technology Inc.

G684/G685

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

Applications

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

General Description

The G684/G685 are microprocessor (µP) supervisory circuits used to monitor the power supplies in µP 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_{CC} supply voltage declines below a preset threshold, with hysteresis after V_{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_{CC}. The G684L have an active-low $\overline{\text{RESET}}$ output, while the G684H 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 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

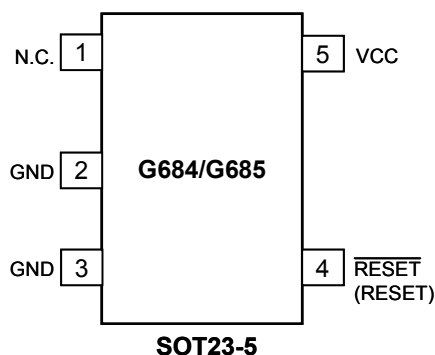| ORDER NUMBER	TEMP. RANGE	PACKAGE
G684H(L)xxxT1U	-40°C ~ +105°C	SOT23-5
G685LxxxT1U	-40°C ~ +105°C	SOT23-5

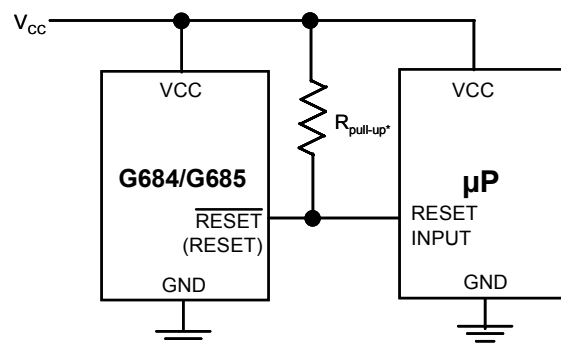Note: T1 : SOT23-5

U : Tape & Reel

* xxx specifies the threshold voltage.

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

Pin Configuration

SOT23-5

( )is for G684H

Typical Application Circuit

*G685 ONLY

Absolute Maximum Ratings

Terminal Voltage (with respect to GND)
V_{CC}………………………….…….………-0.3V to +6.0V
Delay Capacitor Pin Voltage, V_{CD}…..-0.3 to (V_{CC} +0.3V)
$\overline{RESET}$, 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, RESET, $\overline{RESET}$ ......….............20mA

Continuous Power Dissipation (T_A = +70°C)
5-Pin SOT23-5 (derate 2.17mW/°C above +70°C).174mW
Operating Temperature Range …...…....-40°C to +105°C
Storage Temperature Range..………......-65°C to +150°C
Lead Temperature (soldering, 10s)..……..……...+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 = -40°C to +105°C, unless otherwise noted. Typical values are at T_A = +25°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_{CC} Range		T_A = 0°C +70°C	0.8	---	5.5	V
		T_A = -40°C +105°C	1	---	5.5	
Supply Current (SOT23-5)	I_{CC}	V_{CC}<5.5V, G68_ _463/438/400/330_	---	16.5	25	μA
		V_{CC}<3.6V, G68_ _308/293/263_	---	13.9	27	
Reset Threshold	V_{TH-}	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 Hysterisis	V_{HYS}		3.6	5.3	7	%
Reset Threshold Tempco			---	70	---	ppm/°C
Reset Time Delay		V_{CC} from 0V to 5V	---	2	---	ms
$\overline{RESET}$ Output Current Low (push-pull active low, and open-drain active-low, G684L and G685L)	I_{OL}	V_{CC} = 2.5V, $V_{\overline{RESET}}$ = 0.5V	8	---	---	mA
$\overline{RESET}$ Output Current High (push-pull active low, G684L)	I_{OH}	V_{CC} = 5V, $V_{\overline{RESET}}$ = 4.5V, G684L463/438/400/330	4.5	---	---	mA
		V_{CC} = 3.3V, $V_{\overline{RESET}}$ = 2.8V, G684L308/293	3	---	---	
		V_{CC} = 3V, $V_{\overline{RESET}}$ = 2.5V, G684L263	2	---	---	
RESET Output Current Low (push-pull active high, G684H)	I_{OL}	V_{CC} = 5V, V_{RESET} = 0.5V, G684H463/438/400/330	16	---	---	mA
		V_{CC} = 3.3V, V_{RESET} = 0.5V, G684H308/293	12	---	---	
		V_{CC} = 3V, V_{RESET} = 0.5V, G684H263	10	---	---	
RESET Output Current High (push-pull active high, G684H)	I_{OH}	V_{CC} = 2.5V, V_{RESET} = 2V	2	---	---	mA
$\overline{RESET}$ Open-Drain Output Leakage Current (G685L)		V_{CC} > V_{TH}, $\overline{RESET}$ deasserted	---	---	1	μA

Note 1: Production testing done at T_A = +25°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 RESET	684Lx
G684H438T1U	4.38	Push-Pull RESET	684Kx
G684H400T1U	4.00	Push-Pull RESET	684Jx
G684H330T1U	3.30	Push-Pull RESET	684Nx
G684H308T1U	3.08	Push-Pull RESET	684Ix
G684H293T1U	2.93	Push-Pull RESET	684Hx
G684H263T1U	2.63	Push-Pull 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°C to +105°C, unless otherwise noted. Typical values are at T_A = +25°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.)

Supply Current vs. V_{CC}

Supply Curremt vs. Temperature (No Load)
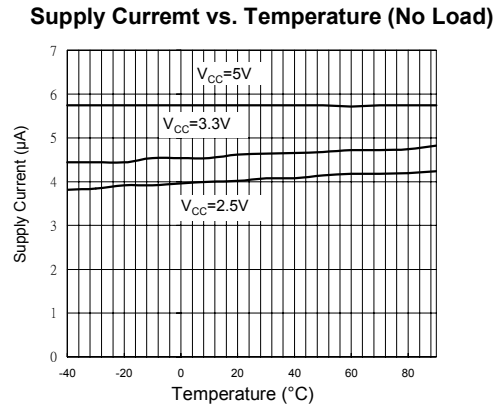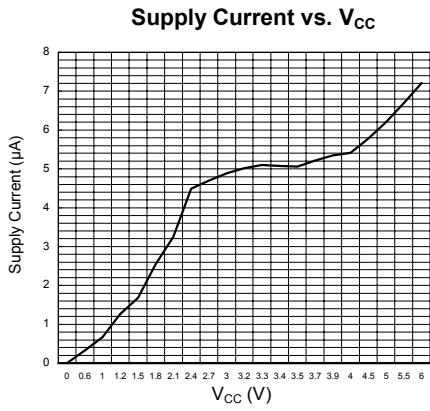
Normalized Reset Threshold vs. Temperature
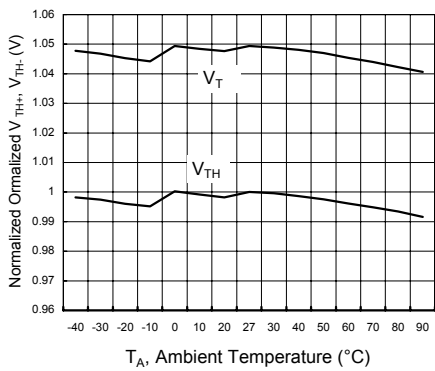
Functional Diagram

() is for G684H
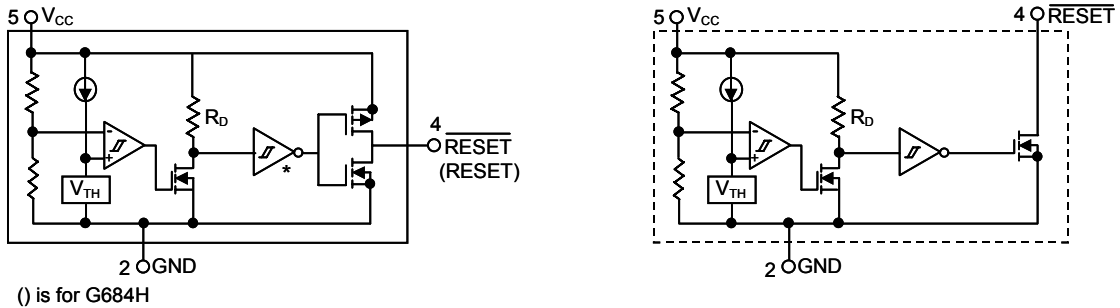
Figure 1

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 (µP's) reset input starts the µP 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 µP and other circuitry is inoperative with VCC below 0.8V. However, in applications where $\overline{\text{RESET}}$ ust 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.

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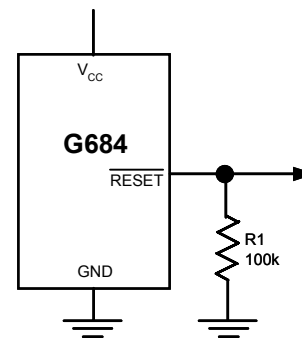

Figure2. $\overline{\text{RESET}}$ Valid to V_{CC} = Ground Circuit

Interfacing to µPs with Bidirectional Reset Pins

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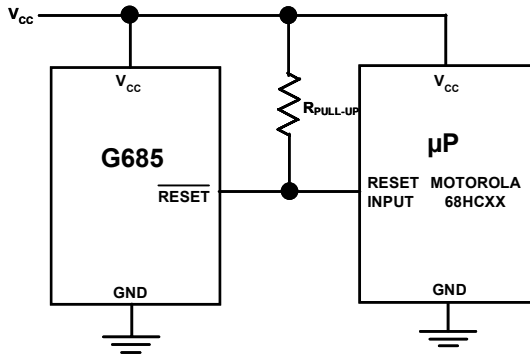

Figure 3. Interfacing to µPs with Bidirectional Reset I/O

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 VCC decays toward 0. The voltage where this occurs depends on the pull-up resistor value and the voltage to which it is connected.
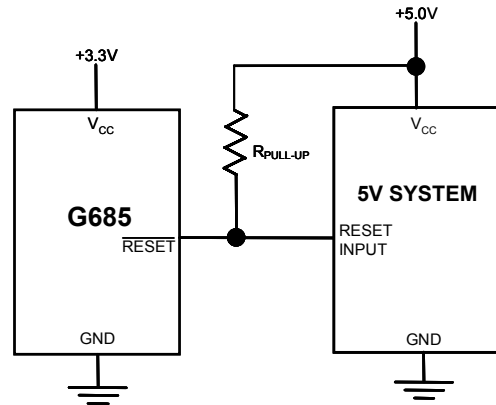

**Figure 4. G685L Open-Drain $\overline{\text{RESET}}$ Output Allows Use with Multiple Supplies**

Benefits of Highly Accurate Reset Threshold

Most 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.

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.
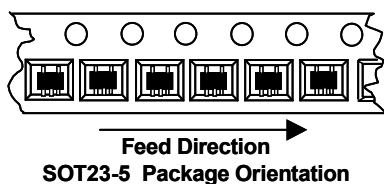
Package Information
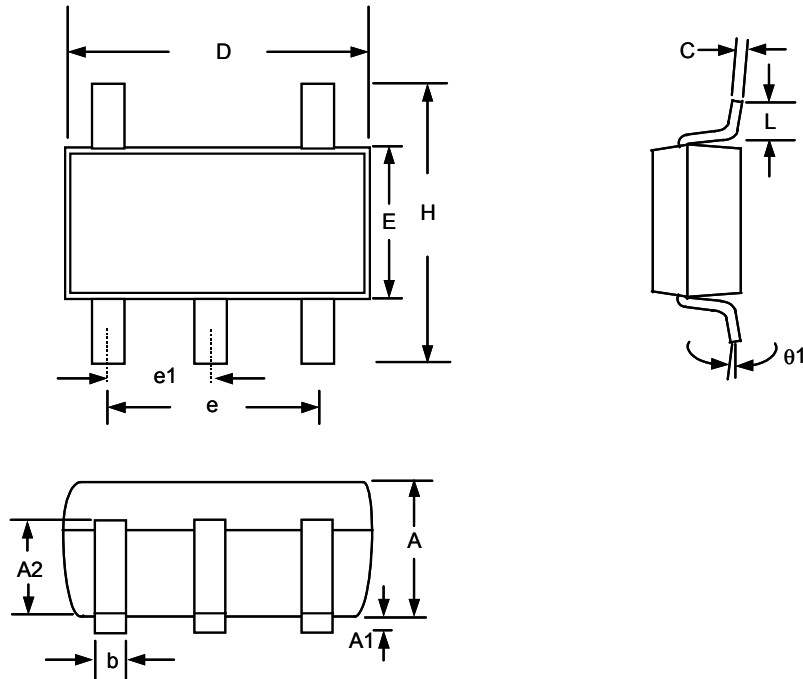
Note:

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance ±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	------	-----
$\theta 1$	1º	5º	9º

Taping Specification

Feed Direction
SOT23-5 Package Orientation

Ver: 1.2
Jun 03, 2004

TEL: 886-3-5788833
http://www.gmt.com.tw