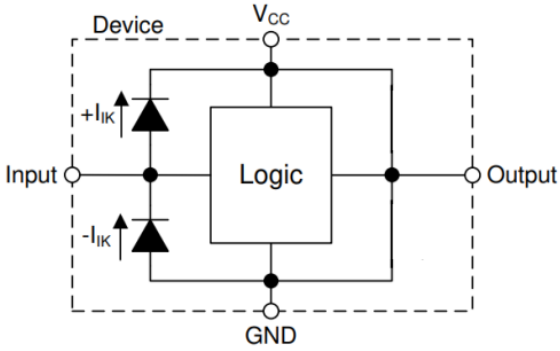
# GS1G125

## Single Bus Buffer Gate With 3-State Output

## FEATURES

- Operating Voltage Range:1.65V to 5.5V
- Low Power Consumption:1μA (Max)
- Operating Temperature Range: -40°C to +125°C
- Inputs Accept Voltage to 5.5V
- Output Drive: ±24mA at $V_{CC}$=3.0V
- Micro Size Packages: SOT23-5, SC70-5
- Positive-negative input clamp diode




## APPLICATIONS

- AV Receiver
- Cable Modem Termination Systems
- Digital Picture Frame (DPF)
- High-Speed Data Acquisition and Generation
- Motor Controls: High-Voltage
- Personal Navigation Device (GPS)
- Portable Media Player
- Video Communication Systems

## DESCRIPTION

The single buffer is designed for 1.65V to 5.5V $V_{CC}$ operation. The GS1G125 device is single line driver with 3-state output. The output is disabled when the output-enable ($\overline{OE}$) input is high.

This device is fully specified for partial-power-down applications using $I_{off}$. The $I_{off}$ circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to $V_{CC}$ through a pullup resistor, the minimum value of the resistor is determined by the current-sinking capability of the driver.

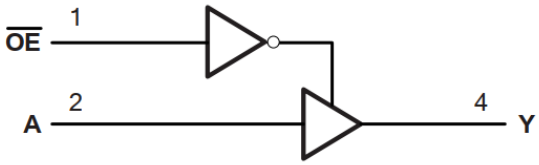
The GS1G125 is available in Green SOT23-5 and SC70-5 packages. It operates over an ambient temperature range of -40°C to +125°C.

### FUNCTION TABLE

| INPUTS | | OUTPUT |
|---|---|---|
| ($\overline{OE}$) | A | Y |
| L | H | H |
| L | L | L |
| H | X | Z |

H=HIGH Logic Level
L =LOW Logic Level
X=Don't Care
Z=High-impedance OFF-state

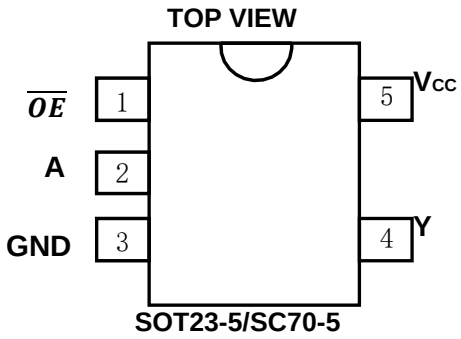
### Simplified Schematic




## PACKAGE/ORDERING INFORMATION

| PRODUCT | ORDER NUMBER | PACKAGE DESCRIPITION | PACKAGE OPTION | MARKING INFORMATION |
|---|---|---|---|---|
| GS1G125 | GS1G125-TR | SOT23-5 | Tape and Reel,3000 | 1G125 |
| | GS1G125-CR | SC70-5 | Tape and Reel,3000 | 1G125 |

## PIN CONFIGURATIONS




## PIN DESCRIPTION

| PIN<br>SOT23-5/SC70-5 | NAME | I/O TYPE | FUNCTION |
|---|---|---|---|
| 1 | $\overline{OE}$ | I | $\overline{OE}$ Enable/Input |
| 2 | A | I | Input |
| 3 | GND | - | Ground |
| 4 | Y | O | Output |
| 5 | $V_{CC}$ | - | Power pin |

# Specifications

## Absolute Maximum Ratings (1)

over operating free-air temperature range (unless otherwise noted) (1)(2)

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage range | | -0.5 | 6.5 | V |
| $V_I$ | Input voltage range (2) | | -0.5 | $V_{CC}$+0.5 | V |
| Vo | Voltage range applied to any output in the high-impedance or power-off state(2) | | -0.5 | 6.5 | V |
| Vo | Voltage range applied to any output in the high or low state (2)(3) | | -0.5 | $V_{CC}$+0.5 | V |
| $I_{IK}$ | Input clamp current | $V_I$<0 | | -50 | mA |
| $I_{OK}$ | Output clamp current | $V_O$<0 | | -50 | mA |
| $I_O$ | Continuous output current | | | ±50 | mA |
| | Continuous current through $V_{CC}$ or GND | | | ±100 | mA |
| $T_J$ | Junction temperature | | -65 | 150 | °C |
| $T_{stg}$ | Storage temperature | | -65 | 150 | °C |

(1) 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 under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The value of $V_{CC}$ is provided in the Recommended Operating Conditions table.

### ESD Ratings:

| PARAMETER | SYMBOL | | MAX | UNIT |
|---|---|---|---|---|
| Electrostatic discharge | $I_{ESD}$ | Latch up current | 350 | mA |
| | $V_{ESD}$ | Human-body model（HBM） | ±5500 | V |
| | | Charge device model（CDM） | ±2000 | |

## Thermal Information:

| THERMAL METRIC | | GS1G125 | | UNIT |
|---|---|---|---|---|
| | | SOT23-5 | SC70-5 | |
| $R_{\Theta JA}$ | Junction-to-ambient thermal resistance | 223.8 | 214.7 | °C/W |
| $R_{\Theta JC(top)}$ | Junction-to-case(top) thermal resistance | 134.8 | 126.1 | °C/W |
| $R_{\Theta JB}$ | Junction-to-board thermal resistance | 82.9 | 59.0 | °C/W |
| $\Psi_{JT}$ | Junction-to-top characterization parameter | 11.8 | 31.4 | °C/W |
| $\Psi_{JB}$ | Junction-to-board characterization parameter | 84.9 | 56.4 | °C/W |
| $R_{\Theta JC(bot)}$ | Junction-to-case(bottom) thermal resistance | N/A | N/A | °C/W |

## ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (TYP values are at $T_A$ = +25°C, unless otherwise noted.) (1)

### Recommended Operating Conditions

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | MAX | UNITS |
|---|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | Operating | 1.65 | 5.5 | V |
| | | Data retention only | 1.5 | 5.5 | |
| High-level input voltage | $V_{IH}$ | $V_{CC}$=1.65V to 1.95V | 0.5x$V_{CC}$ | | V |
| | | $V_{CC}$=2.3V to 2.7V | 1.1 | | |
| | | $V_{CC}$=3V to 3.6V | 1.3 | | |
| | | $V_{CC}$=4.5V to 5.5V | 0.4x$V_{CC}$ | | |
| Low-level input voltage | $V_{IL}$ | $V_{CC}$=1.65V to 1.95V | | 0.3x$V_{CC}$ | V |
| | | $V_{CC}$=2.3V to 2.7V | | 0.55 | |
| | | $V_{CC}$=3V to 3.6V | | 0.75 | |
| | | $V_{CC}$=4.5V to 5.5V | | 0.2x$V_{CC}$ | |
| Input voltage | $V_I$ | | 0 | 5.5 | V |
| Output voltage | $V_O$ | | 0 | $V_{CC}$ | V |
| Input transition rise or fall | $t_r$, $t_f$ | $V_{CC}$=1.8V± 0.15V,2.5V ± 0.2V | | 20 | ns/V |
| | | $V_{CC}$=3.3V± 0.3V | | 10 | |
| | | $V_{CC}$=5V± 0.5V | | 5 | |
| Operating temperature | $T_A$ | | -40 | +125 | °C |

### DC Characteristics

| PARAMETER | | TEST CONDITIONS | Vcc | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|
| $V_{OH}$ | | $I_{OH}$ = –100μA | 1.65V to 5.5V | Full | $V_{CC}$-0.1 | | | V |
| | | $I_{OH}$ = –4mA | 1.65V | | 1.2 | | | |
| | | $I_{OH}$ = –8mA | 2.3V | | 1.7 | | | |
| | | $I_{OH}$ = –16mA | 3V | | 2.2 | | | |
| | | $I_{OH}$ = –24mA | | | 2.1 | | | |
| | | $I_{OH}$ = –32mA | 4.5V | | 3.3 | | | |
| $V_{OL}$ | | $I_{OL}$ = 100μA | 1.65V to 5.5V | Full | | | 0.1 | V |
| | | $I_{OL}$ = 4mA | 1.65V | | | | 0.15 | |
| | | $I_{OL}$ = 8mA | 2.3V | | | | 0.25 | |
| | | $I_{OL}$ = 16mA | 3V | | | | 0.4 | |
| | | $I_{OL}$ = 24mA | | | | | 0.55 | |
| | | $I_{OL}$ = 32mA | 4.5V | | | | 0.55 | |
| $I_I$ | A or B inputs | $V_I$=5.5V or GND | 5.5V | | ±0.1 | ±1 | ±1 | μA |
| | | | | | | ±5 | ±5 | |
| $I_{off}$ | | $V_O$=5.5V | 0 | +25 C | | ±0.1 | ±1 | μA |
| | | | | Full | | | ±10 | |
| $I_{CC}$ | | $V_I$=$V_{CC}$ or GND, $I_O$=0 | 1.65V to 5.5V | +25 C | | 0.1 | 1 | μA |
| | | | | Full | | | 10 | |
| $\Delta I_{CC}$ | | One input at $V_{CC}$-0.6V, Other inputs at $V_{CC}$ or GND | 3V to 5.5V | Full | | | 500 | μA |

## Switching Characteristics, $C_L$=15pF

over recommended operating free-air temperature range (-40°C to 125°C, unless otherwise noted.) (1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$=1.8V±0.15V | $V_{CC}$=2.5V±0.2V | $V_{CC}$=3.3V±0.3V | $V_{CC}$=5V±0.5V | UNIT |
|---|---|---|---|---|---|---|---|
| | | | TYP | TYP | TYP | TYP | |
| $t_{pd}$ | A | Y | 6.3 | 4.3 | 3.5 | 2.6 | ns |

## Switching Characteristics, $C_L$=30pF or 50pF

over recommended operating free-air temperature range (-40°C to 125°C, unless otherwise noted.) (1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$=1.8V±0.15V | $V_{CC}$=2.5V±0.2V | $V_{CC}$=3.3V±0.3V | $V_{CC}$=5V±0.5V | UNIT |
|---|---|---|---|---|---|---|---|
| | | | TYP | TYP | TYP | TYP | |
| $t_{pd}$ | A | Y | 10 | 7.7 | 6.8 | 6 | ns |
| $t_{en}$ | $\overline{OE}$ | Y | 9.8 | 7.4 | 6.6 | 5.8 | ns |
| $t_{dis}$ | $\overline{OE}$ | Y | 5.9 | 4.5 | 3.6 | 3 | ns |

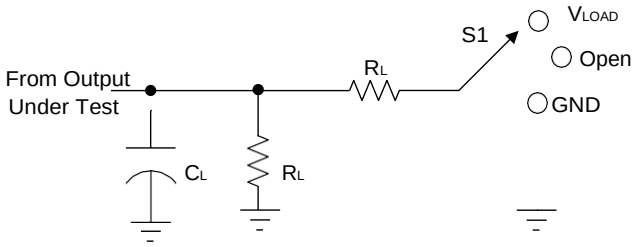
## Operating Characteristics

$T_A$=25°C

| PARAMETER | | | TEST CONDITIONS | $V_{CC}$=1.8V | $V_{CC}$=2.5V | $V_{CC}$=3.3V | $V_{CC}$=5V | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | TYP | TYP | TYP | TYP | |
| $C_{pd}$ | Power dissipation capacitance | Output enabled | f=10MHz | 18 | 18 | 19 | 21 | pF |
| | | Output disabled | | 2 | 2 | 2 | 4 | |

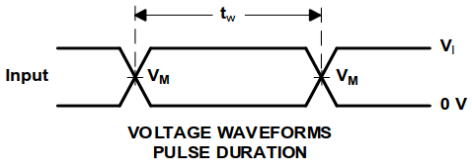
(1) All unused inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation.

## Parameter Measurement Information

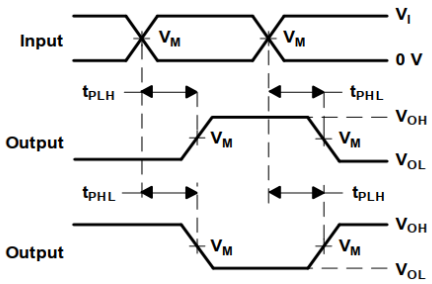



| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND |

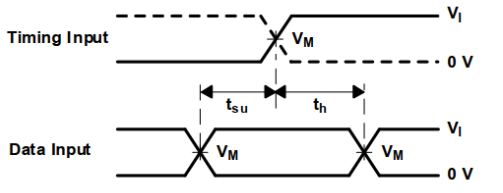
| $V_{CC}$ | INPUTS | | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | | $V_\Delta$ |
|---|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | | | | |
| 1.8V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 2 x $V_{CC}$ | 15pF | 1MΩ | 1kΩ | 0.15V |
| 2.5V±0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 2 x $V_{CC}$ | 15pF | 1MΩ | 500Ω | 0.15V |
| 3.3V±0.3V | 3V | ≤2.5ns | 1.5V | 6V | 15pF | 1MΩ | 500Ω | 0.3V |
| 5V±0.5V | $V_{CC}$ | ≤2.5ns | $V_{CC}/2$ | 2 x $V_{CC}$ | 15pF | 1MΩ | 500Ω | 0.3V |



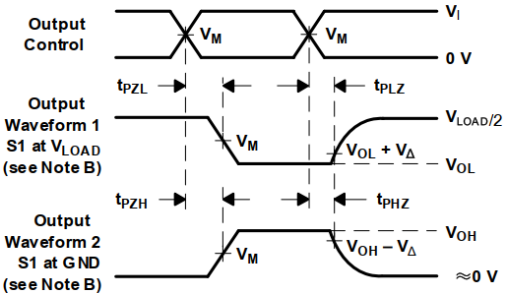

VOLTAGE WAVEFORMS
PULSE DURATION




VOLTAGE WAVEFORMS PROPAGATION DELAY
TIMES INVERTION AND NONINVERTING OUTPUTS




VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



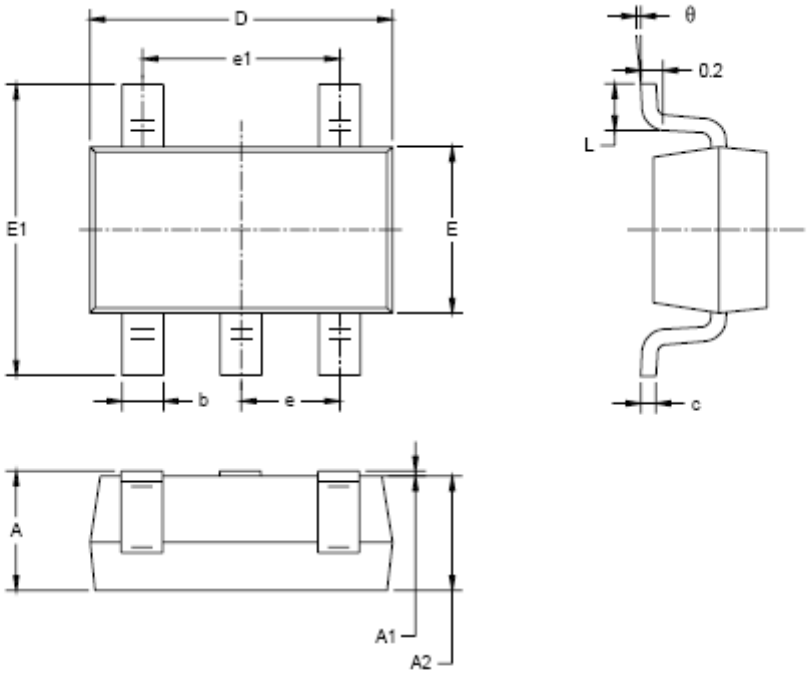

VOLTAGE WAVEFORMS ENABLE AND DISABLE
TIMES LOW-AND HIGH-LEVEL ENABLING

**Figure 1. Load Circuit and Voltage Waveforms**

**Notes:** A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR≤10 MHz, $Z_O$ = 50Ω .
D. The outputs are measured one at a time, with one transition per measurement.
E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
F. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.
G. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.
H. All parameters and waveforms are not applicable to all devices.

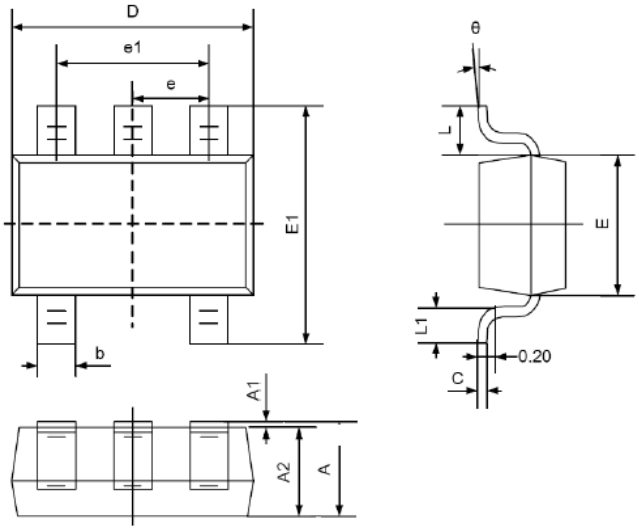
## PACKAGE OUTLINE DIMENSIONS

**SOT23-5**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950 BSC | | 0.037 BSC | |
| e1 | 1.900 BSC | | 0.075 BSC | |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

**SC70-5**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.000 | 0.035 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| C | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 1.150 | 1.350 | 0.045 | 0.053 |
| E1 | 2.150 | 2.450 | 0.085 | 0.096 |
| e | 0.650TYP | | 0.026TYP | |
| e1 | 1.200 | 1.400 | 0.047 | 0.055 |
| L | 0.525REF | | 0.021REF | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| θ | 0° | 8° | 0° | 8° |