# Single Power Supply 2-Input Positive AND Gate CMOS Logic Level Shifter

## Description

The FLG74LV1T08 is a single 2-input AND gate with reduced input thresholds to support voltage translation applications.

## Features

- Single-supply voltage translator at 5.0V, 3.3V, 2.5V, and 1.8V VCC
- Operating range of 1.8V to 5.5V
- Up translation:
  - 1.2V to 1.8V at 1.8V $V_{CC}$
  - 1.5V to 2.5V at 2.5V $V_{CC}$
  - 1.8V to 3.3V at 3.3V $V_{CC}$
  - 3.3V to 5.0V at 5.0V $V_{CC}$
- Down translation:
  - 3.3V to 1.8V at 1.8V $V_{CC}$
  - 3.3V to 2.5V at 2.5V $V_{CC}$
  - 5.0V to 3.3V at 3.3V $V_{CC}$
- Output drive:
  - 8mA output drive at 5V
  - 7mA output drive at 3.3V
  - 3mA output drive at 1.8V
- Characterized up to 50MHz at 3.3V $V_{CC}$
- 5V tolerance on input pins －40℃ to +125℃ operating
- Supports standard logic pinouts

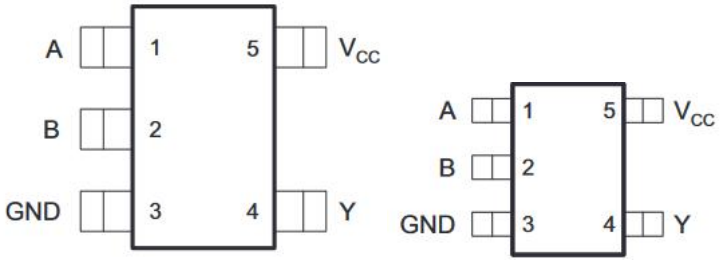
## Applications

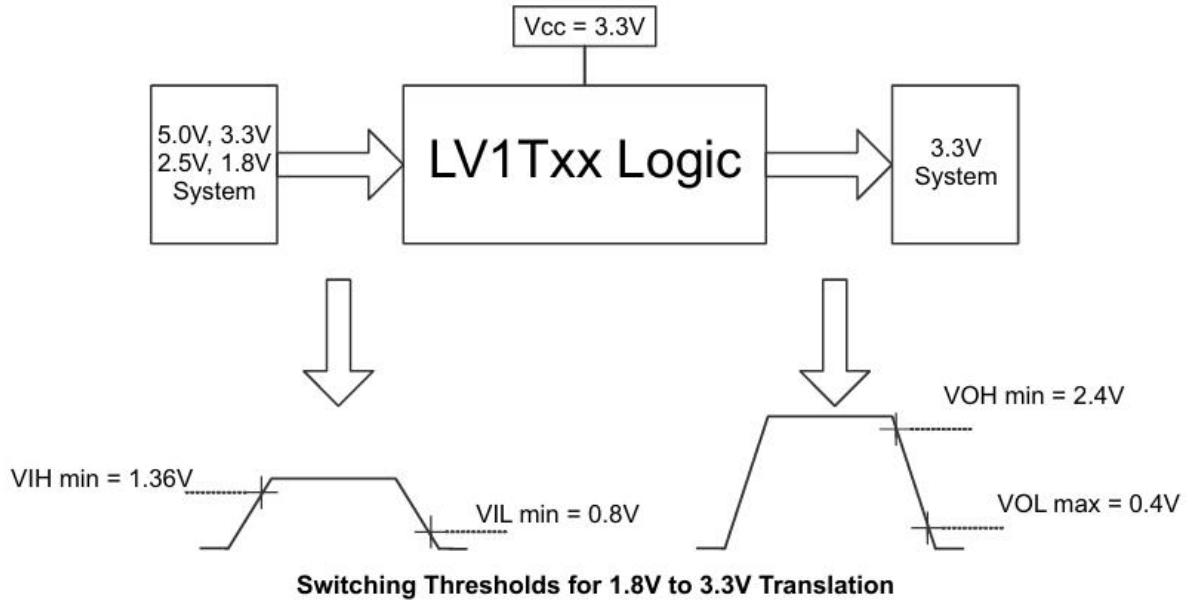
- Telecom
- Portable applications
- Servers
- PC and notebooks

## Order information

| Mode | Package | Ordering Number | Packing Option |
|---|---|---|---|
| FLG74LV1T08 | SOT-23-5 | FLG74LV1T08YSOT235G/TR | Tape and Reel,3000 |
| | SC70 | FLG74LV1T08YSC70G/TR | Tape and Reel,3000 |

## Pin Configuration




**Switching Thresholds for 1.8V to 3.3V Translation**

## Pin Assignment

| Pin Name | Pin No. | Pin Function |
|---|---|---|
| A | 1 | Input |
| B | 2 | Input |
| GND | 3 | Ground |
| Y | 4 | Output |
| VCC | 5 | Power Pin |

## Absolute Maximum Ratings (Note1)

- $V_{CC}$ ---------- -0. 5V to + 7.0V
- $V_I$ ---------- - 0. 5V t o + 7.0V
- $V_O$ (Voltage range applied to any output in the high-impedance or power-off state) ---------- - 0. 5V to + 4. 6V
- $V_O$(Voltage range applied to any output in the high or slow state )---------- -0.5V to $V_{CC}$+0.5V
- Input clamp current ---------- -20mA
- Output clamp current ---------- ±20mA
- Continuous output current ---------- ±25mA
- Storage Temperature ---------- -65℃ to 150℃

## Recommended Operating Conditions

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | Operating | 1.6 | | 5.5 | V |
| Input voltage | $V_I$ | | 0 | | 5.5 | V |
| Output voltage | $V_O$ | | 0 | | $V_{CC}$ | V |
| High- level output current | $I_{OH}$ | $V_{CC}$ = 1.8V | | | -3 | mA |
| | | $V_{CC}$ = 2.5V | | | -5 | |
| | | $V_{CC}$ = 3.3V | | | -7 | |
| | | $V_{CC}$ = 5.0V | | | -8 | |
| Low- level output current | $I_{OL}$ | $V_{CC}$ = 1.8V | | | 3 | mA |
| | | $V_{CC}$ = 2.5V | | | 5 | |
| | | $V_{CC}$ = 3.3V | | | 7 | |
| | | $V_{CC}$ = 5.0V | | | 8 | |
| Input transition rise or fall rate | △T/△V | $V_{CC}$ = 1.8V | | | 20 | ns/V |
| | | $V_{CC}$ = 3.3V to 2.5V | | | 20 | |
| | | $V_{CC}$ = 5.0V | | | 20 | |
| Operating temperature | $T_A$ | | -40 | | 125 | ℃ |

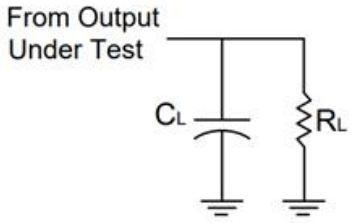
## Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| High- level input voltage | $V_{IH}$ | $V_{CC}$ = 1.65~1.8V | 0.94 | | | |
| | | $V_{CC}$ = 2.0V | 1.02 | | | |
| | | $V_{CC}$ = 2.25~2.5V | 1.135 | | | |
| | | $V_{CC}$ = 2.75V | 1.21 | | | |
| | | $V_{CC}$ = 3~3.3V | 1.35 | | | |
| | | $V_{CC}$ = 3.6V | 1.47 | | | |
| | | $V_{CC}$ = 4.5V~5.0V | 2.02 | | | |
| | | $V_{CC}$ = 5.5V | 2.1 | | | |
| Low- level input voltage | $V_{IL}$ | $V_{CC}$ = 1.65~2.0V | | | 0.58 | V |
| | | $V_{CC}$ = 2.25~2.75V | | | 0.75 | |
| | | $V_{CC}$ = 3~3.6V | | | 0.8 | |
| | | $V_{CC}$ = 4.5V~5.5V | | | 0.8 | |
| High- level output voltage | $V_{OH}$ | $V_{CC}$ = 1.65~5.5V, $I_{OH}$= -20uA | $V_{CC}$-0.1 | | | V |
| | | $V_{CC}$ = 1.65V, $I_{OH}$= -2mA | 1.28 | | | |
| | | $V_{CC}$ = 1.8V, $I_{OH}$= -2mA | 1.5 | | | |
| | | $V_{CC}$ = 2.3V, $I_{OH}$= -2.3mA | 2.0 | | | |
| | | $V_{CC}$ = 2.3V, $I_{OH}$= -3mA | 2.0 | | | |
| | | $V_{CC}$ = 2.5V, $I_{OH}$= -3mA | 2.25 | | | |
| | | $V_{CC}$ = 3.0V, $I_{OH}$= -3mA | 2.78 | | | |
| | | $V_{CC}$ = 3.0V, $I_{OH}$= -5.5mA | 2.6 | | | |
| | | $V_{CC}$ = 3.3V, $I_{OH}$= -5.5mA | 2.9 | | | |
| | | $V_{CC}$ = 4.5V, $I_{OH}$= -4mA | 4.2 | | | |
| | | $V_{CC}$ = 4.5V, $I_{OH}$= -8mA | 4.1 | | | |
| | | $V_{CC}$ = 5.0V, $I_{OH}$= -8mA | 4.6 | | | |
| Low- level output voltage | $V_{OL}$ | $V_{CC}$ = 1.65~5.5V, $I_{OL}$= 20uA | | | 0.1 | V |
| | | $V_{CC}$ = 1.65V, $I_{OL}$= 1.9mA | | | 0.2 | |
| | | $V_{CC}$ = 2.3V, $I_{OL}$= 2.3mA | | | 0.1 | |
| | | $V_{CC}$ = 2.3V, $I_{OL}$= 3mA | | | 0.15 | |
| | | $V_{CC}$ = 3V, $I_{OL}$= 3mA | | | 0.1 | |
| | | $V_{CC}$ = 3V, $I_{OL}$= 5.5mA | | | 0.2 | |
| | | $V_{CC}$ = 4.5V, $I_{OL}$= 4mA | | | 0.15 | |
| | | $V_{CC}$ = 4.5V, $I_{OL}$= 8mA | | | 0.3 | |
| Input leakage current | $I_I$ | $V_{IN}$= Vcc or GND, $V_{CC}$ = 0~5.5V | | | 0.12 | uA |
| Supply current | $I_{CC}$ | $V_{IN}$= $V_{CC}$ or GND, $I_{OUT}$=0, $V_{CC}$=1.8~5.0V | | | 1 | uA |
| Additional supply current per input pin | $\triangle I_{CC}$ | $V_{CC}$=5.5V, one input at 0.3V or 3.4 V,other input at $V_{CC}$ or GND, $I_{OUT}$=0 | | | 1.35 | mA |
| | | $V_{CC}$=1.8V, one input at 0.3V or 1.1 V,other input at $V_{CC}$ or GND, $I_{OUT}$=0 | | | 10 | uA |

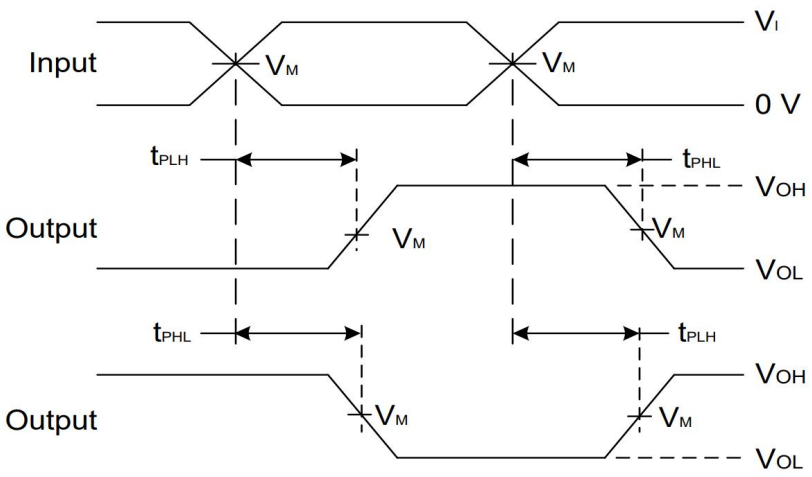
## Switching Characteristics

| Parameter | Symbol | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Propagation delay from input(A) to output(Y) | $T_{PD}$ | $V_{CC}$ = 5.0V | $C_L$=15pF $R_L$=1MΩ | | 4 | 5 | ns |
| | | $V_{CC}$ = 3.3V | | | 4.8 | 5 | |
| | | $V_{CC}$ = 2.5V | | | 6 | 6.5 | |
| | | $V_{CC}$ = 1.8V | | | 10.5 | 11 | |

## Parameter Measurement Information




| $V_{CC}$ | INPUTS | | $V_M$ | $C_L$ | $R_L$ |
|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | |
| 1.8V ± 0.15V | $V_{CC}$ | ≦2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| 2.5V ± 0.2V | $V_{CC}$ | ≦2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| 3.3V ± 0.3V | 3V | ≦2.5ns | 1.5V | 15pF | 1MΩ |
| 5V ± 0.5V | $V_{CC}$ | ≦2.5ns | $V_{CC}/2$ | 15pF | 1MΩ |




Voltage Waveform Propagation Delay Times

Inverting and Non Inverting Outputs

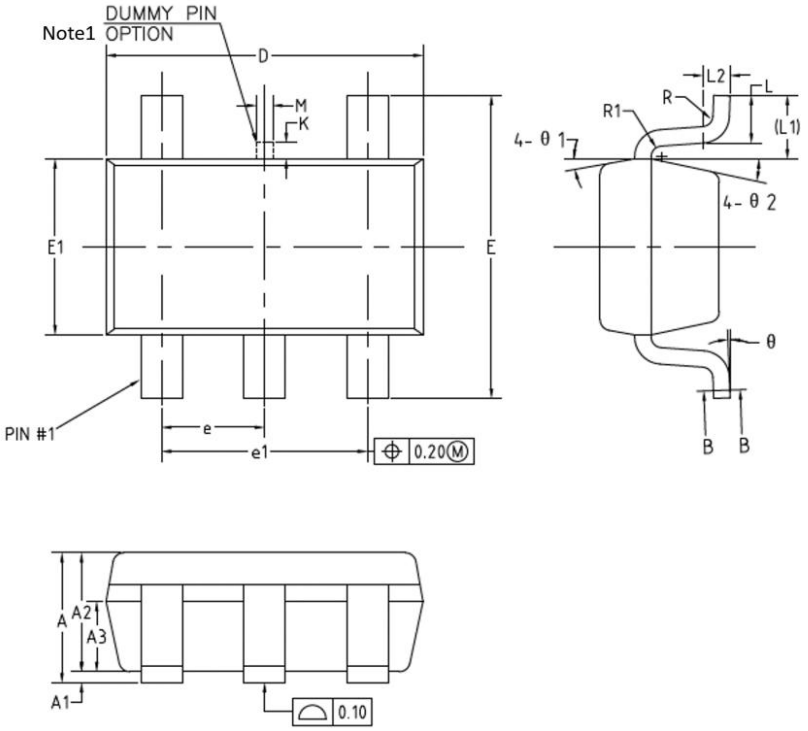
Notes: A. $C_L$ includes probe and jig capacitance

B. All pulses and supplied at pulse repetition rate ≦ 10MHz

C. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{PD}$

## Package Information

(1) Package Type: SOT23-5

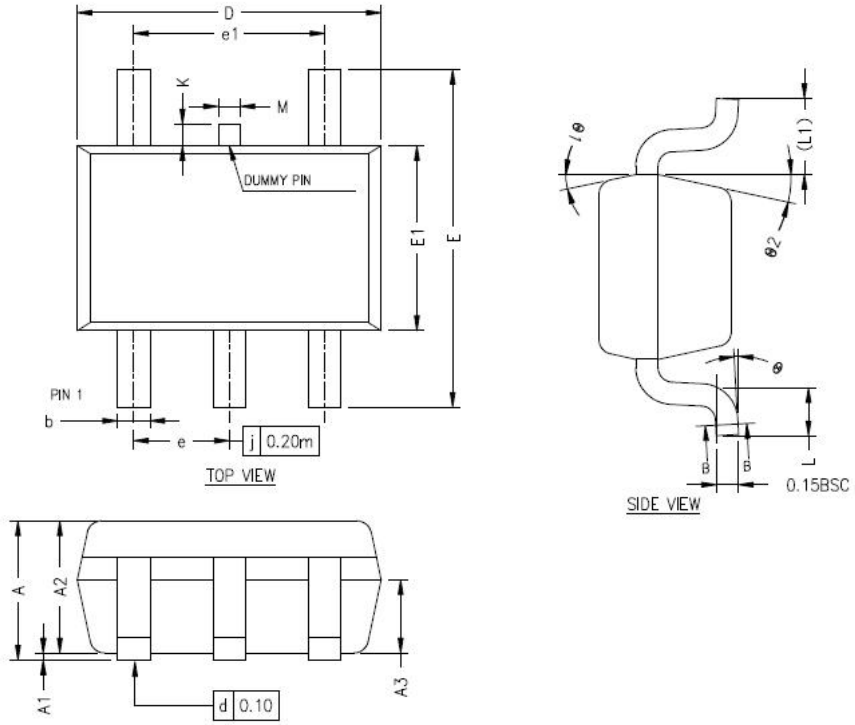



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|
| | A | – | – | 1.25 |
| | A1 | 0 | – | 0.15 |
| | A2 | 1.00 | 1.10 | 1.20 |
| | A3 | 0.60 | 0.65 | 0.70 |
| 4 | b | 0.34 | – | 0.45 |
| 4 | b1 | 0.34 | 0.38 | 0.41 |
| 4 | c | 0.12 | – | 0.20 |
| 4 | c1 | 0.12 | 0.15 | 0.16 |
| | D | 2.826 | 2.926 | 3.026 |
| | E | 2.60 | 2.80 | 3.00 |
| 3 | E1 | 1.526 | 1.626 | 1.700 |
| | e | 0.90 | 0.95 | 1.00 |
| | e1 | 1.80 | 1.90 | 2.00 |
| 2 | K | 0 | – | 0.20 |
| | L | 0.30 | 0.40 | 0.60 |
| | L1 | | 0.59REF | |
| | L2 | | 0.25BSC | |
| 2 | M | 0.10 | 0.15 | 0.20 |
| | R | 0.05 | – | 0.20 |
| | R1 | 0.05 | – | 0.20 |
| | θ | 0° | – | 8° |
| | θ 1 | 8° | 10° | 12° |
| | θ 2 | 10° | 12° | 14° |

Notes: 1. Dummy pin may differ or may not be present.

(2) Package Type: SC70




COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

| | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|
| | A | 0.80 | – | 1.10 |
| | A1 | 0 | – | 0.10 |
| | A2 | 0.80 | 0.90 | 1.00 |
| | A3 | 0.40 | 0.50 | 0.60 |
| | b | 0.17 | – | 0.30 |
| | b1 | 0.17 | 0.22 | 0.25 |
| 3 | c | 0.12 | – | 0.20 |
| 3 | c1 | 0.12 | 0.15 | 0.16 |
| | D | 2.02 | 2.07 | 2.12 |
| | E | 2.20 | 2.30 | 2.40 |
| | E1 | 1.21 | 1.26 | 1.31 |
| | e | 0.60 | 0.65 | 0.70 |
| | e1 | 1.20 | 1.30 | 1.40 |
| | L | 0.26 | 0.33 | 0.46 |
| | L1 | | 0.52REF | |
| 2 | M | 0.10 | 0.15 | 0.20 |
| 2 | K | 0 | – | 0.20 |
| | θ | 0° | – | 8° |
| | θ1 | 10° | 12° | 14° |
| | θ2 | 10° | 12° | 14° |

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