# Single Non-inverting Buffer with 3-state Output

## General Description

The ETQ74LVC1G126 is a high performance single noninverting buffer operating from a 1.65V to 5.5V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

## Features

- Designed for 1.65V to 5.5V VCC Operation
- Over-voltage Tolerant Inputs
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- These Devices are Pb−Free and are RoHS Compliant
- 3−State OE Input is Active−High
- MSL1
- Automotive AEC-Q100 Grade 1 Qualified
  - -- Ambient temperature range of -40°C to +125°C
  - -- ESD HBM 4KV PASS
  - -- ESD CDM 1KV PASS

## Device Information

| Part No. | Package | Size |
|---|---|---|
| ETQ74LVC1G126 | SC70-5 | 2.07mm×2.30mm |

## Applications

- Fully compliant with standards for automotive applications
- Combine normal power signals from multiple power rails

## Pin Configuration

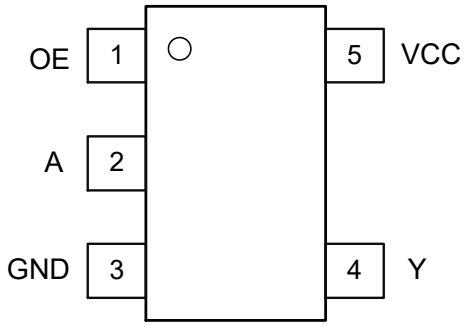



Figure1. Top View

## Pin Function

| Pin No. | Name | Description |
|---|---|---|
| 1 | OE | Control Pin,High Active |
| 2 | A | Input A |
| 3 | GND | Ground |
| 4 | Y | Output Y |
| 5 | VCC | Power Supply |

## Block Diagram

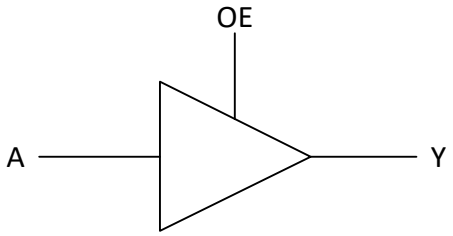



Figure2. Logic Symbol

## Functional Description

### Function Table

| Input | | Output |
|---|---|---|
| **OE** | **A** | **Y** |
| H | L | L |
| H | H | H |
| L | X | Z |

## Absolute Maximum Ratings

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage | | −0.5 to 7.0 | V |
| $V_I$ | DC Input Voltage | | −0.5 ≤$V_I$ ≤+7.0 | V |
| $V_O$ | DC Output Voltage Output in Higher or Low State (1) | | −0.5 to $V_{CC}$ + 0.5 | V |
| $I_{IK}$ | DC Input Diode Current $V_I$ < GND | | −50 | mA |
| $I_{OK}$ | DC Output Diode Current $V_O$ < GND, $V_O$ > $V_{CC}$ | | ±50 | mA |
| $I_O$ | DC Output Sink Current | | ±50 | mA |
| $I_{CC}$ | DC Supply Current per Supply Pin | | ±100 | mA |
| $I_{GND}$ | DC Ground Current per Supply Pin | | ±100 | mA |
| $T_{STG}$ | Storage Temperature Range | | −65 to 150 | °C |
| $T_L$ | Lead Temperature, 1 mm from Case for 10 Seconds | | 260 | °C |
| $T_J$ | Junction Temperature Under Bias | | 150 | °C |
| $\theta_{JA}$ | Thermal Resistance | SC70-5 | 300 | °C /W |
| $P_D$ | Power Dissipation in Still Air at 85°C | | 215 | mW |
| $V_{ESD}$ | ESD Classification | Human Body Model (2) | ±4000 | V |
| | | Charged Device Model (3) | ±1000 | |
| $I_{LU}$ | Latchup Current Above $V_{CC}$ and GND at 125°C (4) | | ±100 | mA |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

***Notes:***

**1**. IO absolute maximum rating must be observed.

**2**. HBM tested per AEC-Q100-002(EIA/JESD22-A114);

**3**. CDM tested per AEC-Q100-011(EIA/JESD22-C101);

**4**. Latch up Current Maximum Rating tested per AEC-Q100-004(EIA/JESD78E).

## Recommended Operating Conditions

| Symbol | Parameter | | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage Operating | | 1.65 | 5.5 | V |
| | Date Retention Voltage Operating | | 1.5 | 5.5 | |
| $V_{IN}$ | DC Input Voltage | | 0 | 5.5 | V |
| $V_{OUT}$ | DC Output Voltage (High or Low State) | | 0 | 5.5 | V |
| $T_A$ | Operating Temperature Range | | -40 | 125 | °C |
| $t_r$,$t_f$ | Input Rise and Fall Time | $V_{CC}$ = 2.5 V ± 0.2 V | 0 | 20 | ns/V |
| | | $V_{CC}$ = 3.0 V ± 0.3 V | 0 | 10 | |
| | | $V_{CC}$ = 5.0 V ± 0.5 V | 0 | 5 | |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied.

## Electrical Characteristics

### DC Electrical Characteristics

| Symbol | Parameter | Condition | $V_{CC}$(V) | $T_A$ = 25 °C | | | −40°C ≤$T_A$≤125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $V_{IH}$ | High−Level Input Voltage | | 1.65to1.95<br>2.3 to 5.5 | 0.75Vcc<br>0.7Vcc | | | 0.75Vcc<br>0.7Vcc | | V |
| $V_{IL}$ | Low−Level Input Voltage | | 1.65to1.95<br>2.3 to 5.5 | | | 0.25Vcc<br>0.3Vcc | | 0.25Vcc<br>0.3Vcc | V |
| $V_{OH}$ | High−Level Output Voltage<br>$V_{IN}$ = $V_{IL}$ | $I_{OH}$= −100uA | 1.65to5.5 | Vcc−0.1 | Vcc | | Vcc−0.1 | | V |
| | | $I_{OH}$ =−3mA | 1.65 | 1.29 | 1.52 | | 1.29 | | |
| | | $I_{OH}$ =−8mA | 2.3 | 1.9 | 2.1 | | 1.9 | | |
| | | $I_{OH}$=−12mA | 2.7 | 2.2 | 2.4 | | 2.2 | | |
| | | $I_{OH}$=−16mA | 3.0 | 2.4 | 2.7 | | 2.4 | | |
| | | $I_{OH}$=−24mA | 3.0 | 2.3 | 2.5 | | 2.3 | | |
| | | $I_{OH}$ =-32mA | 4.5 | 3.8 | 4.0 | | 3.8 | | |
| $V_{OL}$ | Low−Level Output Voltage<br>$V_{IN}$ = $V_{IH}$ | $I_{OH}$ =100uA | 1.65to5.5 | | 0.0 | 0.1 | | 0.1 | V |
| | | $I_{OL}$ =3mA | 1.65 | | 0.08 | 0.24 | | 0.24 | |
| | | $I_{OL}$ =8mA | 2.3 | | 0.20 | 0.3 | | 0.3 | |
| | | $I_{OL}$ =12mA | 2.7 | | 0.22 | 0.4 | | 0.4 | |
| | | $I_{OL}$ =16mA | 3.0 | | 0.28 | 0.4 | | 0.4 | |
| | | $I_{OL}$ =24mA | 3.0 | | 0.38 | 0.55 | | 0.55 | |
| | | $I_{OL}$ =32mA | 4.5 | | 0.42 | 0.55 | | 0.55 | |
| $I_{IN}$ | Input Leakage Current | $V_{IN}$ = 5.5V or GND | 0 to 5.5 | | ±0.1 | | | ±1.0 | uA |
| $I_{OFF}$ | Power Off Leakage Current | $V_{IN}$ = 5.5V or $V_{OUT}$ =5.5V | 0 | | | 1 | | 10 | uA |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$ = 5.5V or GND | 5.5 | | | | | 10 | uA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## AC Electrical Characteristics

$t_r = t_f = 2.5ns$

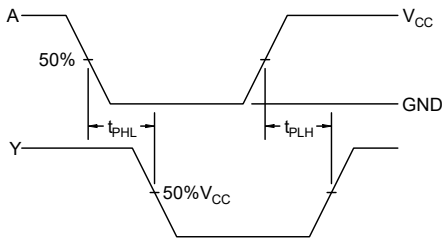
| Symbol | Parameter | Condition | $V_{CC}$(V) | $T_A$ = 25 °C | | | −40°C ≤$T_A$≤125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $t_{PD}$ | Propagation Delay (Figure3 and 4) | $R_L$= 1MΩ $C_L$= 15pF | 1.65 | 2.0 | 10.1 | 12.9 | 2.0 | 13.9 | ns |
| | | | 1.8 | 2.0 | 9.1 | 11.6 | 2.0 | 12.4 | |
| | | | 2.5 | 0.2 | 6.0 | 7.7 | 0.8 | 8.2 | |
| | | $R_L$= 1MΩ $C_L$= 15pF | 3.3 | 0.8 | 5.0 | 6.5 | 0.5 | 7.0 | |
| | | $R_L$= 500Ω $C_L$= 50pF | | 1.2 | 5.6 | 7.1 | 1.5 | 7.6 | |
| | | $R_L$= 1MΩ $C_L$= 15pF | 5.0 | 0.5 | 4.4 | 5.6 | 0.5 | 6.1 | |
| | | $R_L$= 500Ω $C_L$= 50pF | | 0.8 | 4.8 | 6.1 | 0.8 | 6.6 | |
| $t_{PZL}$, $t_{PZH}$ | Output Enable Time (Figure5 and 6) | $R_L$ = 500Ω $C_L$ = 50pF | 1.65 | 2.0 | 12.9 | 15.8 | 2.0 | 16.8 | ns |
| | | | 1.8 | 2.0 | 10.8 | 13.2 | 2.0 | 14.1 | |
| | | | 2.5 | 1.5 | 7.2 | 8.8 | 1.5 | 9.4 | |
| | | | 3.3 | 1.5 | 5.8 | 7.1 | 1.5 | 7.6 | |
| | | | 5.0 | 0.8 | 4.5 | 5.5 | 0.8 | 5.9 | |
| $t_{PLZ}$, $t_{PHZ}$ | Output Disable Time (Figure5 and 6) | $R_L$ = 500Ω $C_L$ = 50pF | 1.65 | 2.0 | 11.5 | 14.1 | 2.0 | 15.1 | ns |
| | | | 1.8 | 2.0 | 9.8 | 12.0 | 2.0 | 12.8 | |
| | | | 2.5 | 1.5 | 7.7 | 9.5 | 1.5 | 10.1 | |
| | | | 3.3 | 1.0 | 7.2 | 8.8 | 1.0 | 9.4 | |
| | | | 5.0 | 0.5 | 5.4 | 6.8 | 0.5 | 7.3 | |

## Capacitance Characteristics

| Symbol | Parameter | Condition | Typ | Unit |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{CC}$= 5.5 V,$V_I$ = 0 V or $V_{CC}$ | >2.5 | pF |
| $C_{PD}$ | Power Dissipation Capacitance [(5)] | 10MHz,$V_{CC}$ = 3.3 V, $V_I$ = 0 V or $V_{CC}$ | 4 | pF |
| | | 10MHz,$V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 4 | |

***Note5***. $C_{PD}$ is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)}=C_{PD}\times V_{CC}\times fin+I_{CC}\times C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D=C_{PD}\times V_{CC}^2\times fin+I_{CC}\times V_{CC}\times Fig$.

## AC Test Circuit

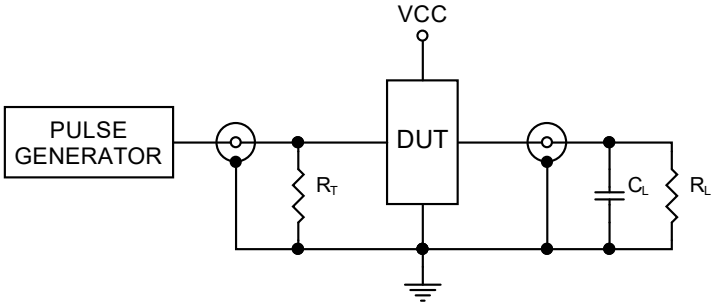



PROPAGATION DELAYS:

tR=tF=2.5ns, 10% to 90%; f=1MHZ;

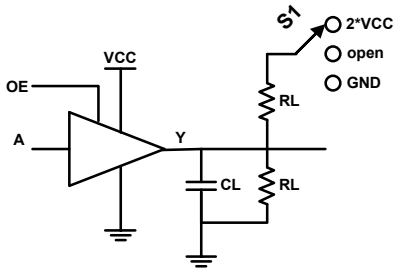
tW=500ns

Figure 3. Switch Waveform




$R_T$=50Ω(typ)

Figure 4. Test Circuit




| Test | Swith |
|---|---|
| tPD | Open |
| tPZL tPLZ | 2*VCC |
| tPZH tPHZ | GND |

Figure 5. Output Enable/Disable Time Test Circuit

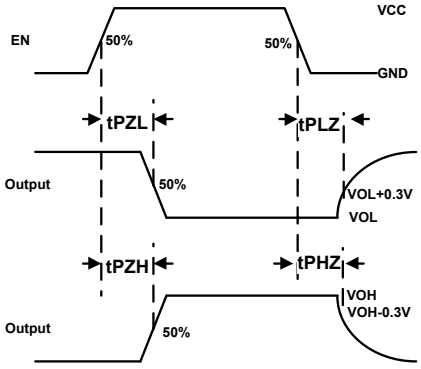
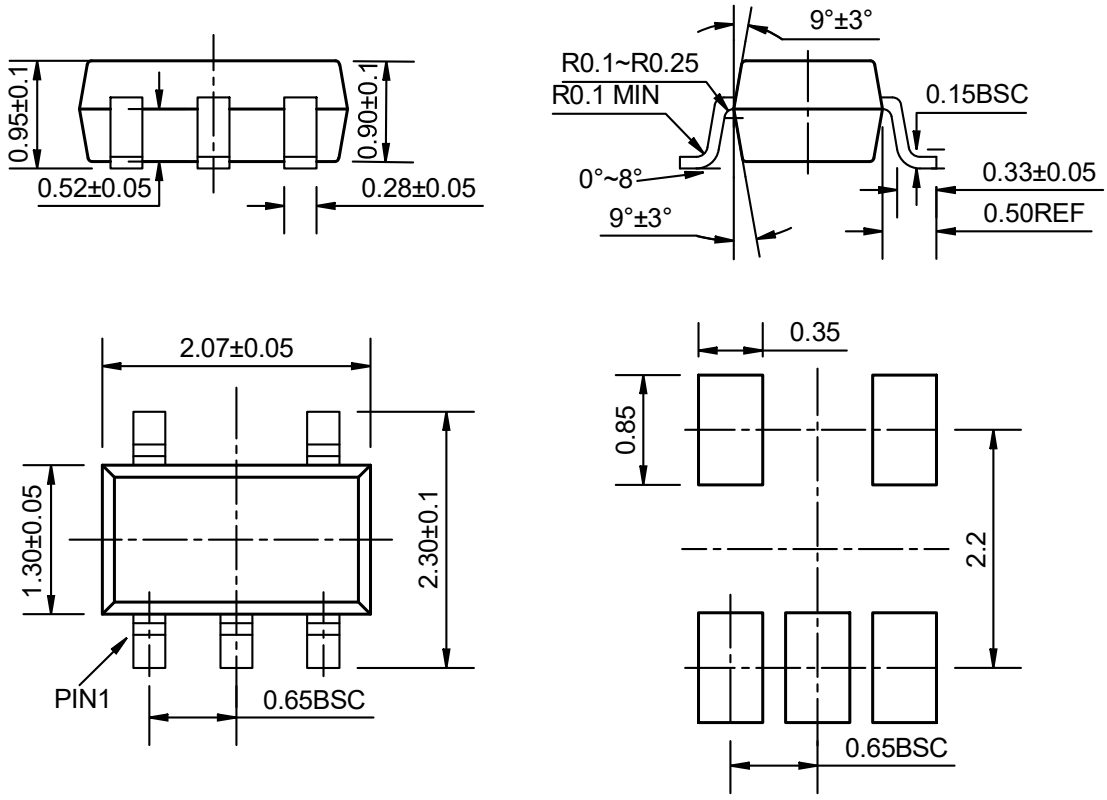



Figure 6. Output Enable/Disable Waveform

## Package Dimension

SC70-5




**Recommended Land Pattern**

Unit: mm

## Revision History and Checking Table

| Version | Date | Revision Item | Modifier | Function & Spec Checking | Package & Tape Checking |
|---|---|---|---|---|---|
| 1.0 | 2017-10-23 | Original Version | Ma Yong jian | Ma Yong jian | Liu Jia Ying |
| 1.1 | 2023-03-06 | Update Typeset<br>ETQ version | Shibo | Shibo | Shibo |