**Single Buffer**

###### General Description

The ET74LVC1G16 provides a low-power, low-voltage single buffer.

The input can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

This device is fully specified for partial power-down applications using IOFF. The IOFF circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

###### Features

* Designed for 1.65V to 5.5V VCC Operation
* 5 V Tolerant Inputs for Interfacing with 5 V Logic
* High Noise Immunity
* ±24 mA Output Drive (VCC = 3.0 V)
* CMOS Low Power Consumption
* Latch-up Performance Exceeds 100 mA
* Direct Interface with TTL levels
* Inputs Accept Voltages up to 5 V
* Complies with JEDEC Standard:

-- JESD8-7 (1.65 V to 1.95V)

-- JESD8-5 (2.3 V to 2.7 V)

-- JESD8-B/JESD36 (2.7 V to 3.6 V)

* ESD Protection Exceeds JESD 22

-- 2000V Human-Body Model (A114) Pass

-- 1000V Charged-Device Model (C101) Pass

###### Device Information

|  |  |  |
| --- | --- | --- |
| **Part No.** | **Package** | **Size** |
| ET74LVC1G16 | SC70-5 | 1.3mm×2.1mm |

###### Pin Configuration

|  |
| --- |
| SC70-5  Figure1. Top View |

###### Pin Function

**SOP8 / TSSOP8**

|  |  |  |
| --- | --- | --- |
| **Pin No.** | **Function** | **Function** |
| 1 | n.c. | Not Connected |
| 2 | A | Data Input |
| 3 | GND | Ground |
| 4 | Y | Data Output |
| 5 | VCC | Supply Voltage |

###### Block Diagram

|  |
| --- |
| Figure2. Logic Symbol |

###### Functional Description

**Function Table**

|  |  |
| --- | --- |
| **Input A** | **Output Y** |
| L | L |
| H | H |

###### Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)**(1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameter** | **Condition** | **Min** | **Max** | **Unit** |
| VCC | Supply Voltage Range |  | -0.5 | +6.5 | V |
| VI | Input Voltage **(2)** |  | -0.5 | +6.5 | V |
| VO | Output Voltage **(2)(3)** |  | -0.5 | VCC+0.5 | V |
| IIK | Input Clamp Current | VI < 0V | -50 |  | mA |
| IOK | Output Clamp Current | VO >VCC or VO < 0V |  | ±50 | mA |
| IO | VO=0V to VCC | VO = 0V to VCC |  | ±50 | mA |
| ICC | Supply Current |  |  | 100 | mA |
| IGND | Ground Current |  | -100 |  | mA |
| TSTG | Storage Temperature Range |  | -65 | +150 | °C |
| PD | Total Power Dissipation |  |  | 250 | mW |
| V(ESD) | Human Body Model (EIA/JESD22−A114) | | 2000 |  | V |
| Charged Device Model (JESD22−C101) | | 1000 |  |
| ILU | Latch-up Current (EIA/JESD78) | | ±100 |  | mA |

***Note1:*** 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.

***Note2:*** The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

***Note3:*** The value of VCC is provided in the Recommended Operating Conditions table.

###### Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted) **(4)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameter** | | **Min** | **Max** | **Unit** |
| VCC | Supply Voltage | | 1.65 | 5.5 | V |
| VI | Input Voltage | | 0 | 5.5 | V |
| VO | Output Voltage | | 0 | VCC | V |
| TA | Operating Ambient Temperature | | -40 | 125 | °C |
| Δt/ΔV | Input Transition  Rise and Fall Rate | VCC = 1.65 V to 2.7 V |  | 20 | ns/V |
| VCC = 2.7 V to 5.5 V |  | 10 | ns/V |

***Note4:*** All unused inputs of the device must be held at VCC or GND to ensure proper device operation.

###### Electrical Characteristics

Over recommended operating free-air temperature range (unless otherwise noted)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameter** | **Condition** | **VCC (V)** | **−40°C to 85°C** | | | **−40°C to 125°C** | | **Unit** |
| **Min** | **TYP(5)** | **Max** | **Min** | **Max** |
| VIH | High Level Input Voltage |  | 1.65 to 1.95 | 0.65  VCC |  |  | 0.65  VCC |  | V |
| 2.3 to 2.7 | 1.7 |  |  | 1.7 |  |
| 2.7 to 3.6 | 2.0 |  |  | 2.0 |  |
| 4.5 to 5.5 | 0.7  VCC |  |  | 0.7  VCC |  |
| VIL | Low Level Input Voltage |  | 1.65 to 1.95 |  |  | 0.35  VCC |  | 0.35  VCC | V |
| 2.3 to 2.7 |  |  | 0.7 |  | 0.7 |
| 2.7 to 3.6 |  |  | 0.8 |  | 0.8 |
| 4.5 to 5.5 |  |  | 0.3  VCC |  | 0.3  VCC |
| VOH | High−Level Output Voltage | IOH = −100uA | 1.65 to 5.5 | VCC – 0.1 |  |  | VCC – 0.1 |  | V |
| IOH = −4mA | 1.65 | 1.2 | 1.54 |  | 0.95 |  |
| IOH = −8mA | 2.3 | 1.9 | 2.15 |  | 1.7 |  |
| IOH = −12mA | 2.7 | 2.2 | 2.5 |  | 1.9 |  |
| IOH = −24mA | 3.0 | 2.3 | 2.62 |  | 2.0 |  |
| IOH = −32mA | 4.5 | 3.8 | 4.11 |  | 3.4 |  |
| VOL | Low−Level Output Voltage | IOH = 100uA | 1.65 to 5.5 |  |  | 0.10 |  | 0.10 | V |
| IOH = 4mA | 1.65 |  | 0.07 | 0.45 |  | 0.70 |
| IOH = 8mA | 2.3 |  | 0.12 | 0.30 |  | 0.45 |
| IOH = 12mA | 2.7 |  | 0.17 | 0.40 |  | 0.60 |
| IOH = 24mA | 3.0 |  | 0.33 | 0.55 |  | 0.80 |
| IOH = 32mA | 4.5 |  | 0.39 | 0.55 |  | 0.80 |
| II | Input Leakage Current | VI = 5.5 V or GND | 0 to 5.5 |  | ±0.1 | ±5 |  | ±100 | μA |
| IOFF | Power-off Leakage Current | VO or VI = 5.5 V | 0 |  | ±0.1 | ±10 |  | ±200 | μA |
| ICC | Quiescent Supply Current | VI = 5.5 V or GND,IO = 0A | 1.65 to 5.5 |  | 0.1 | 10 |  | 200 | μA |
| ∆ICC | Additional Supply Current | VI = VCC - 0.6 V, IO=0A | 2.3 to 5.5 |  | 5 | 500 |  | 5000 | μA |

***Notes5:*** All typical values are at VCC = 3.3 V, TA = 25°C.

###### AC Electrical Characteristics

Over recommended operating free-air temperature range, CL = 30 pF or 50 pF (unless otherwise noted)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Conditions** | **VCC (V)** | **-40°C≤TA≤85°C** | | | **-40°C≤TA≤125°C** | | **Unit** |
| **Min** | **Typ(6)** | **Max** | **Min** | **Max** |
| tPD**(7)** | Propagation Delay | See Fig.4 | 1.65 to 1.95 | 1.0 | 4 | 8.6 | 1.0 | 11.0 | ns |
| 2.3 to 2.7 | 0.5 | 2.6 | 4.4 | 0.5 | 5.6 | ns |
| 2.7 | 0.5 | 2.3 | 4.5 | 0.5 | 5.6 | ns |
| 3.0 to 3.6 | 0.5 | 2.0 | 4.1 | 0.5 | 5.2 | ns |
| 4.5 to 5.5 | 0.5 | 1.6 | 3.2 | 0.5 | 4.1 | ns |

***Note6:*** Typical values are measure at VCC = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively, TA = 25°C.

***Note7:*** tpd is the same as tPLH and tPHL.

###### Capacitance Characteristics

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Conditions** | **VCC (V)** | **-40°C≤TA≤85°C** | | | **Unit** |
| **Min** | **Typ** | **Max** |
| CPD **(8)** | Power Dissipation Capacitance | VI=GND to VCC | 3.3 |  | 15 |  | pF |
| CI | Input Capacitance | VI = GND to VCC | 3.3 |  | 4 |  | pF |

***Note8:*** CPD is used to determine the dynamic power dissipation (PD in μW).

PD = CPD × VCC 2 × fi × N + Σ(CL × VCC 2 × fo) where:

fi = input frequency in MHz;

fo = output frequency in MHz;

CL = output load capacitance in pF;

VCC = supply voltage in V;

N = number of inputs switching;

Σ(CL × VCC 2 × fo) = sum of outputs.

**AC Testing Circuit**

|  |
| --- |
| Figure 3. Test circuit for measuring switching times  Definitions test circuit:  RL = Load resistance;  CL = Load capacitance including jig and probe capacitance;  RT = Termination resistance should be equal to output impedance ZO of the pulse generator;  VEXT = External voltage for measuring switching times. |

Table 1.Measurement Points and Test Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **VCC** | **Input** | | | **Output** | **Load** | | **VEXT** |
| **VI** | **tr/tf** | **VM** | **VM** | **CL** | **RL** | **tPLH tPHL** |
| 1.65 V to 5.5V | VCC | ≤ 6 ns | 0.5 × VCC | 0.5 × VCC | 30 pF | 1 kΩ | open |
| 2.3V to 2.7V | VCC | ≤ 6 ns | 0.5 × VCC | 0.5 × VCC | 30 pF | 500 Ω | open |
| 2.7V | 2.7V | ≤ 6 ns | 1.5V | 1.5V | 50 pF | 500 Ω | open |
| 3.0V to 3.6V | 2.7V | ≤ 6 ns | 1.5V | 1.5V | 50 pF | 500 Ω | open |
| 4.5V to 5.5V | VCC | ≤ 6 ns | 0.5 × VCC | 0.5 × VCC | 50 pF | 500 Ω | open |

**AC Testing Waveform**

|  |
| --- |
| Figure4. Load Circuit and Voltage Waveforms |

###### Package Dimension

**SC70-5**

|  |
| --- |
| Unit: mm |

###### Revision History and Checking Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Version** | **Date** | **Revision Item** | **Modifier** | **Function & Spec Checking** | **Package & Tape**  **Checking** |
| 0.0 | 2024.7.4 | Preliminary Version | Maruijie | Luhao | Liujiaying |