**Low-power Configurable Multiple Function Gate**

###### General Description

The ET74LVC1G58 is a configurable multiple function gate with Schmitt-trigger inputs. The device can be configured as any of the following logic functions AND, OR, NAND, NOR, XOR, inverter and buffer; using the 3-bit input. All inputs can be connected directly to VCC or GND. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

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

###### Features

* Wide Supply Voltage Range from 1.65 V to 5.5 V
* Over-voltage Tolerant Inputs to 5.5 V
* High Noise Immunity
* ±24 mA Output Drive (VCC = 3.0 V)
* CMOS Low Power Dissipation
* Direct Interface with TTL Levels
* IOFF Circuitry Provides Partial Power-down Mode Operation
* ESD Protection:

--HBM JESD22-A114 Exceeds 2000 V

--CDM JESD22-C101 Exceeds 1500 V

* Latch-up Performance Exceeds 200 mA
* Multiple Package Options
* Part Number and Package

|  |  |  |  |
| --- | --- | --- | --- |
| **Part No.** | **Package** | **Size** | **MSL** |
| ET74LVC1G58 | SC70-6 | 2.00 mm × 1.25 mm | Level 3 |
| ET74LVC1G58T | SOT23-6 | 2.90 mm × 2.75 mm | Level 3 |
| ET74LVC1G58Y | DFN6 | 1.45mm × 1.00 mm | Level 1 |
| ET74LVC1G58N | DFN6 | 1.00 mm × 1.00 mm | Level 1 |

###### Applications

* Active Noise Cancellation (ANC)
* Bar-code Scanners
* Blood Pressure Monitors
* CPAP Machines
* Cable Solutions
* Embedded PCs
* Field Transmitter: Temperature or Pressure Sensors
* HVAC: Heating, Ventilating and Air Conditioning
* TVs: High-Definition (HDTV), LCD and Digital
* Video Communications Systems

###### Pin Configuration

|  |
| --- |
| ET74LVC1G58 (SC70-6)  ET74LVC1G58T (SOT23-6) ET74LVC1G58Y (DFN6) ET74LVC1G58N (DFN6)  Fig1. Top View |

###### Pin Function

|  |  |  |
| --- | --- | --- |
| **Pin No.** | **Pin Name** | **Pin Function** |
| **ET74LVC1G58/T/Y/N** |
| 1 | B | Data Input |
| 2 | GND | Ground (0 V) |
| 3 | A | Data Input |
| 4 | Y | Data Output |
| 5 | VCC | Supply Voltage |
| 6 | C | Data Input |

###### Block Diagram

|  |
| --- |
| Fig 2. Logic Symbol |

###### Functional Description

**Function Table**

H = HIGH voltage level; L = LOW voltage level.

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

**Function Selection Table**

|  |  |
| --- | --- |
| **Logic function** | **Figure** |
| 2-input NAND | See Fig 3. |
| 2-input NAND with both Inputs Inverted | See Fig 6. |
| 2-input AND with Inverted Input | See Fig 4. and Fig 5. |
| 2-input NOR with Inverted Input | See Fig 4. and Fig 5. |
| 2-input OR | See Fig 6. |
| 2-input OR with both Inputs Inverted | See Fig 3. |
| 2-input XOR | See Fig 7. |
| Buffer | See Fig 8. |
| Inverter | See Fig 9. |
| Fig3. 2-input NAND gate or  2-input OR gate with both inputs inverted | Fig4. 2-input AND gate with input B inverted or  2-input NOR gate with inverted C input |
| Fig5. 2-input AND gate with input C inverted or  2-input NOR gate with inverted A input | Fig6. 2-input OR gate or  2-input NAND gate with both inputs inverted |
| Fig7. 2-input XOR gate | Fig8. Buffer |
| Fig 9. Inverter | |

**Absolute Maximum Ratings**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Conditions** | **Value** | **Unit** |
| VCC | DC Supply Voltage |  | -0.5 to 6.5 | V |
| IIK | Input Clamping Current |  | -50 | mA |
| VI | Input Voltage**(1)** | VI < 0 V | -0.5 to 6.5 | V |
| IOK | Output Clamping Current | VO > VCC or VO < 0 V | ±50 | mA |
| VO | Output Voltage**(1)** | VO > VCC or VO < 0 V | -0.5 to 6.5 | V |
| Power-down mode; VCC = 0 V | -0.5 to 6.5 | V |
| IO | Output Current | VO = 0 V to VCC | ±50 | mA |
| ICC | Supply Current |  | 100 | mA |
| IGND | Ground Current |  | -100 | mA |
| TJ | Max Junction Temperature |  | 150 | °C |
| TSTG | Storage Temperature Range |  | -65 to 150 | °C |
| VESD | HBM | Per JESD22-A114 | ±2000 | V |
| CDM | Per JESD22-C101 | ±1500 | V |
| ILU | Max Latch up Current | Per EIA/JESD78E | ±200 | mA |

###### Stresses exceeding those listed in this 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.

***Note1:***The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

###### Thermal Characteristics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symbol | Package | Ratings | Value | Unit |
| RθJA | SC70-6 | Thermal Characteristics, Thermal Resistance, Junction-to-Air | 270 | °C/W |
| SOT23-6 | 220 |
| DFN6(1.45×1.00) | 330 |
| DFN6(1.00×1.00) | 360 |
| PD | SC70-6 | Power Dissipation  in Still Air at 25°C | 460 | mW |
| SOT23-6 | 570 |
| DFN6(1.45×1.00) | 380 |
| DFN6(1.00×1.00) | 350 |

## Recommended Operating Conditions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Min** | **Max** | **Unit** |
| VCC | Supply Voltage Range | 1.65 | 5.5 | V |
| VI | Input Voltage | 0 | 5.5 | V |
| VO | Output Voltage | 0 | VCC | V |
| TA | Ambient Temperature | -40 | 125 | °C |

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

**Electrical Characteristics**

**Static Characteristics**

###### At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Conditions** | **VCC(V)** | **-40°C≤TA≤85°C** | | | **-40°C≤TA≤125°C** | | **Unit** |
| **Min** | **Typ(2)** | **Max** | **Min** | **Max** |
| VOL | LOW - Level Output Voltage | VI = VT+ or VT- |  |  |  |  |  |  |  |
| IO = 100μA | 1.65V to 5.5V |  |  | 0.1 |  | 0.1 | V |
| IO = 4mA | 1.65V |  |  | 0.45 |  | 0.7 | V |
| IO = 8mA | 2.3V |  |  | 0.3 |  | 0.45 | V |
| IO = 12mA | 2.7V |  |  | 0.4 |  | 0.6 | V |
| IO = 24mA | 3.0V |  |  | 0.55 |  | 0.8 | V |
| IO = 32mA | 4.5V |  |  | 0.55 |  | 0.8 | V |
| VOH | HIGH - Level Output Voltage | VI = VT+ or VT- |  |  |  |  |  |  |  |
| IO = -100μA | 1.65V to 5.5V | VCC - 0.1 |  |  | VCC  - 0.1 |  | V |
| IO = -4mA | 1.65V | 1.2 |  |  | 0.95 |  | V |
| IO = -8mA | 2.3V | 1.9 |  |  | 1.7 |  | V |
| IO = -12mA | 2.7V | 2.2 |  |  | 1.9 |  | V |
| IO = -24mA | 3.0V | 2.3 |  |  | 2.0 |  | V |
| IO = -32mA | 4.5V | 3.8 |  |  | 3.4 |  | V |
| II | Input Leakage Current | VI = 5.5V or GND | 0V to 5.5V |  | ±0.1 | ±1 |  | ±1 | μA |
| IOFF | Power-Off Leakage Current | VI or VO =5.5V | 0V |  | ±0.1 | ±2 |  | ±2 | μA |
| ICC | Supply Current | VI=5.5V or GND; IO = 0A | 1.65V to 5.5V |  | 0.1 | 4 |  | 4 | μA |
| ΔICC | Additional Supply Current | VI=VCC - 0.6V; IO = 0A | 2.3V to 5.5V |  | 5 | 500 |  | 500 | μA |
| CI | Input Capacitance | Input Capacitance |  |  | 2.5 |  |  |  | pF |

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.

***Note2:*** Typical values are measured at maximum VCC and TA = 25 °C.

###### Electrical Characteristics(Continued)

**Dynamic Characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig 10.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Conditions** | **VCC(V)** | **-40°C≤TA≤85°C** | | | **-40°C≤TA≤125°C** | | **Unit** |
| **Min** | **Typ(2)** | **Max** | **Min** | **Max** |
| TPD | Propagation Delay | A, B, C to Y;  See Fig.10 **(3)** | tPHL | | | | | | |
| 1.65 V to 1.95V | 2.0 | 10.0 | 15.0 | 2.0 | 18 | ns |
| 2.3V to 2.7V | 1.5 | 7.0 | 11.0 | 1.5 | 14.0 | ns |
| 2.7V | 1.5 | 6.7 | 10.5 | 1.5 | 13.0 | ns |
| 3.0V to 3.6V | 1.5 | 7.0 | 10.0 | 1.5 | 12.0 | ns |
| 4.5V to 5.5V | 1.5 | 5.5 | 9.5 | 1.5 | 11.0 | ns |
| tPLH | | | | | | |
| 1.65 V to 1.95V | 4.0 | 20.0 | 29.0 | 4.0 | 32.0 | ns |
| 2.3V to 2.7V | 3.0 | 17.6 | 25.0 | 3.0 | 28.0 | ns |
| 2.7V | 3.0 | 19.2 | 24.0 | 3.0 | 27.0 | ns |
| 3.0V to 3.6V | 3.0 | 15.5 | 23.0 | 3.0 | 26.0 | ns |
| 4.5V to 5.5V | 3.0 | 13.5 | 21.0 | 3.0 | 24.0 | ns |
| CPD | Power Dissipation Capacitance | VI= GND to VCC **(4)** | 3.3V |  | 20 |  |  |  | pF |

***Note3:*** Tpd is the same as TPLH and TPHL.

***Note4:*** 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.

**Test Circuit**

|  |
| --- |
| Measurement points are given in Table 1.  VOL and VOH are typical output voltage levels that occur with the output load.  Fig.10 Input A, B and C to output Y propagation delay times |

Table 1. Measurement Points

|  |  |  |  |
| --- | --- | --- | --- |
| **Supply Voltage** | **Input** | | **Output** |
| **VCC** | **VM** | **VI** | **VM** |
| 1.65 V to 1.95 V | 0.5 × VCC | VCC | 0.5 × VCC |
| 2.3 V to 2.7 V | 0.5 × VCC | VCC | 0.5 × VCC |
| 2.7 V | 1.5 V | 2.7 V | 1.5 V |
| 3.0 V to 3.6 V | 1.5 V | 2.7 V | 1.5 V |
| 4.5 V to 5.5 V | 0.5 × VCC | VCC | 0.5 × VCC |

|  |
| --- |
| Measurement points are given in Table 2.  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.  Fig.11 Test circuit for measuring switching times |

## Table 2. Test Data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Supply Voltage** | **Input** | | **Load** | | **VEXT** |
| **VCC** | **VI** | **tr = tf** | **CL** | **RL** | **tPLH , tPHL** |
| 1.65 V to 1.95 V | VCC | ≤ 5.0 ns | 30 pF | 1 kΩ | open |
| 2.3 V to 2.7 V | VCC | ≤ 5.0 ns | 30 pF | 500 Ω | open |
| 2.7 V | 2.7 V | ≤ 5.0 ns | 50 pF | 500 Ω | open |
| 3.0 V to 3.6 V | 2.7 V | ≤ 5.0 ns | 50 pF | 500 Ω | open |
| 4.5 V to 5.5 V | VCC | ≤ 5.0 ns | 50 pF | 500 Ω | open |

###### **Electrical Characteristics**(Continued)

## Transfer Characteristics

## At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Symbol** | **Parameters** | **Conditions** | **-40°C≤TA≤85°C** | | | **-40°C≤TA≤125°C** | | **Unit** |
| **Min** | **Typ(2)** | **Max** | **Min** | **Max** |
| VT+ | Positive-going  Threshold Voltage | See Fig. 12, Fig. 13,  Fig. 14 and Fig. 15 |  |  |  |  |  |  |
| VCC = 1.8V | 0.70 | 1.09 | 1.20 | 0.67 | 1.20 | V |
| VCC = 2.3V | 1.11 | 1.35 | 1.60 | 1.08 | 1.60 | V |
| VCC = 3.0V | 1.40 | 1.67 | 1.90 | 1.37 | 1.90 | V |
| VCC = 4.5V | 2.05 | 2.31 | 2.64 | 2.02 | 2.64 | V |
| VCC = 5.5V | 2.41 | 2.71 | 3.13 | 2.38 | 3.13 | V |
| VT- | Negative-going  Threshold Voltage | See Fig. 12, Fig. 13,  Fig. 14 and Fig. 15 |  |  |  |  |  |  |
| VCC = 1.8V | 0.30 | 0.61 | 0.70 | 0.30 | 0.73 | V |
| VCC = 2.3V | 0.58 | 0.84 | 1.00 | 0.58 | 1.03 | V |
| VCC = 3.0V | 0.80 | 1.08 | 1.30 | 0.80 | 1.33 | V |
| VCC = 4.5V | 1.21 | 1.55 | 1.90 | 1.21 | 1.93 | V |
| VCC = 5.5V | 1.45 | 1.85 | 2.29 | 1.45 | 2.32 | V |
| VH | Hysteresis Voltage | (VT+ - VT-) See Fig. 12,  Fig. 13, Fig. 14 and Fig. 15 |  |  |  |  |  |  |
| VCC = 1.8V | 0.30 | 0.47 | 0.62 | 0.23 | 0.62 | V |
| VCC = 2.3V | 0.40 | 0.51 | 0.80 | 0.34 | 0.80 | V |
| VCC = 3.0V | 0.50 | 0.58 | 0.90 | 0.34 | 0.90 | V |
| VCC = 4.5V | 0.51 | 0.76 | 1.10 | 0.45 | 1.10 | V |
| VCC = 5.5V | 0.61 | 0.86 | 1.20 | 0.55 | 1.20 | V |

**Wave-forms Transfer Characteristics**

|  |  |
| --- | --- |
| Fig. 12. Transfer characteristic | VT+ and VT- limits are at 70 % and 20 %  Fig. 13. Definition of VT+ , VT- and VH |
| Fig. 14. Transfer characteristic | VT+ and VT- limits are at 70 % and 20 %  Fig. 15. Definition of VT+ , VT- and VH |
| Fig 16. Typical ET74LVC1G58 transfer characteristic; VCC = 3.0 V | |

###### Application Circuits

|  |
| --- |
| This application shows the ET74LVC1G58 configured as an NOR gate with an inverted input. This particular configuration is helpful for dual sensor or switch applications where one of the inputs is normally closed or a logic high 1. Normally this application would require two external gates, but because the ET74LVC1G58 can be configured to meet this function the application can be implemented with a single chip solution.    Fig 19. Dual-Sensor Alarm Trigger **(5)** |

***Note5:*** This application circuit is for reference only.

###### Package Dimension

SC70-6 (2.00×1.25)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SOT23-6_I-模型  COMMON DIMENSIONS  (UNITS OF MEASURE=MILLIMETER)   |  |  |  |  | | --- | --- | --- | --- | | **SYMBOL** | **MIN** | **NOM** | **MAX** | | A | 0.80 | -- | 1.10 | | A1 | 0.00 | -- | 0.10 | | b | 0.15 | -- | 0.30 | | c | 0.08 | -- | 0.25 | | D**(6)** | 1.80 | -- | 2.20 | | e | -- | 0.65 | -- | | e1 | -- | 1.30 | -- | | E | 1.80 | -- | 2.40 | | E1**(6)** | 1.15 | -- | 1.35 | | L | 0.325 | -- | 0.525 | | L1 | 0.26 | -- | 0.46 |   ***Note6:*** . Plastic or metal protrusions of 0.2 mm maximum per side are not included. |

SOT23-6 (2.90×1.50)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SOT23-6_I-模型  COMMON DIMENSIONS  (UNITS OF MEASURE=MILLIMETER)   |  |  |  |  | | --- | --- | --- | --- | | **SYMBOL** | **MIN** | **NOM** | **MAX** | | A | 0.90 | -- | 1.10 | | A1 | 0.013 | -- | 0.10 | | b | 0.25 | -- | 0.40 | | c | 0.10 | -- | 0.26 | | D | 2.70 | -- | 3.10 | | e | -- | 0.95 | -- | | e1 | -- | 1.90 | -- | | E | 2.50 | -- | 3.00 | | E1 | 1.30 | -- | 1.70 | | L | 0.60 | -- | 0.65 | | L1 | 0.20 | -- | 0.60 | | Q | 0.23 | -- | 0.33 | |

DFN6(1.45×1.00)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DFN6(+L1)-模型  COMMON DIMENSIONS  (UNITS OF MEASURE=MILLIMETER)   |  |  |  |  | | --- | --- | --- | --- | | **SYMBOL** | **MIN** | **NOM** | **MAX** | | A | 0.450 | 0.500 | 0.550 | | A1 | 0.000 | 0.035 | 0.050 | | A3 | 0.152REF | | | | b | 0.150 | 0.20 | 0.250 | | D | 0.900 | 1.000 | 1.100 | | E | 1.350 | 1.450 | 1.550 | | e | 0.500BSC | | | | K | 0.300REF | | | | K1 | 0.250REF | | | | L | 0.300 | 0.350 | 0.400 | | L1 | 0.050REF | | | | L2 | 0.250 | 0.300 | 0.350 | |

DFN6(1.00×1.00)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DFN6-1X1-模型  COMMON DIMENSIONS  (UNITS OF MEASURE=MILLIMETER)   |  |  |  |  | | --- | --- | --- | --- | | **SYMBOL** | **MIN** | **NOM** | **MAX** | | A | 0.34 | 0.37 | 0.40 | | A1 | 0 | 0.02 | 0.05 | | A3 | 0.10REF | | | | b | 0.10 | 0.15 | 0.20 | | D | 0.95 | 1.00 | 1.05 | | E | 0.95 | 1.00 | 1.05 | | e | 0.30 | 0.35 | 0.40 | | H | 0.10REF | | | | K | 0.15 | -- | -- | | L | 0.35 | 0.40 | 0.45 | | L1 | 0.35 | 0.40 | 0.45 | | L2 | 0.075REF | | | |

###### Marking

|  |
| --- |
| DFN6(1.45×1.00) Package    57 = Part Number  X = Track Number |

###### Tape Information

DFN6 (1.45×1.00) Package

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|  |

###### Revision History and Checking Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Version** | **Date** | **Revision Item** | **Modifier** | **Function & Spec Checking** | **Package &**  **Tape Checking** |
| 0.0 | 2024-05-18 | Preliminary Version | Wangar | Tugz | Liujy |
| 0.1 | 2024-11-21 | Update HBM and Transfer Characteristics | Wangar | Tugz | Liujy |