

## GT74LVC1T45

### Single-bit Dual-Supply Bus Transceiver with Voltage Translation

| 1 Features                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2 Application                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- Control inputs <math>V_{IH}/V_{IL}</math> levels are referenced to <math>V_{CCA}</math></li> <li>- Vcc isolation Feature – if either Vcc input is at GND, all are in the high-impedance state</li> <li>- Fully configurable dual-rail design allows each port to operate over the full 1.65V to 5.5V power supply range</li> <li>- Recommended temperature range: <math>-40^{\circ}\text{C}</math> to <math>+125^{\circ}\text{C}</math></li> <li>- Max data rates<br/>420 Mbps (3.3-V to 5-V Translation)<br/>210 Mbps (Translate to 3.3V)<br/>140 Mbps (Translate to 2.5V)<br/>75 Mbps (Translate to 1.8V)</li> </ul> | <ul style="list-style-type: none"> <li>- Personal Electronic</li> <li>- Industrial</li> <li>- Enterprise</li> <li>- Telecom</li> </ul> |

| 3 Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Circuit Diagram |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <p>This single-bit noninverting bus transceiver uses two separate power-supply rails. The GT74LVC1T45 is optimized to operate with <math>V_{CCA}</math> and <math>V_{CCB}</math> set at 1.65V to 5.5 V. The A port is designed to track <math>V_{CCA}</math>. <math>V_{CCA}</math> accepts any supply voltage from 1.65V to 5.5 V. The B port is designed to track <math>V_{CCB}</math>. <math>V_{CCB}</math> accepts any supply voltage from 1.65V to 5.5V. This allows for universal low-voltage bidirectional translation between any of the 1.8 V, 2.5 V, 3.3 V, and 5.5V voltage nodes. The logic levels of the direction-control (DIR) input activate either the B-port outputs or the A-port outputs. The device transmits data from the A bus to the B bus when the B-port outputs are activated, and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports is always active and have a logic HIGH or LOW level applied to prevent excess <math>I_{CC}</math> and <math>I_{CCZ}</math>. The GT74LVC1T45 is designed so that the control pin (DIR) is supplied by <math>V_{CCA}</math>.</p> |                 |

## 4 Revision History

| Revision   | Date         | Note                                                       |
|------------|--------------|------------------------------------------------------------|
| Rev. A1. 0 | 2023. 10. 21 | Original Version                                           |
| Rev. A1. 1 | 2023. 11. 02 | 1.Updated Package Qty<br>2.Added Tape and Reel Information |
| Rev. A1. 2 | 2023. 12. 26 | 1. Added Marking<br>2.Added MSL                            |
| Rev. A1. 3 | 2024. 01. 26 | Updated Part Name                                          |
| Rev. A1. 4 | 2024. 12. 13 | Updated Marking and Package Qty                            |

The latest datasheet version should be checked on the GTIC official website, as the company does not actively inform customers about updates to the datasheet.

## 5 Device Summary, Pin and Packages

**Table.5-1. Device Summary<sup>(1)</sup>**

| Serial Name | Part Name     | Package | Body Size (Nom)      | Marking <sup>(2)</sup> | MSL <sup>(3)</sup> | Package Qty        |
|-------------|---------------|---------|----------------------|------------------------|--------------------|--------------------|
| GT74LVC1T45 | GT74LVC1T45S6 | SOT23-6 | 3.00mmx2.80mmx1.15mm | 1T45<br>XXXX           | 3                  | Tape and Reel,3000 |
| GT74LVC1T45 | GT74LVC1T45C6 | SC70-6  | 2.10mmx2.30mmx1.00mm | 1T45<br>XXXX           | 3                  | Tape and Reel,3000 |

(1)For all available packages, please contact product sales.

(2)There may be additional marking, which relates to the lot trace code information (data code and Vendor code), the logo or the environmental category on the device.

(3)MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

(4)"XXXXX" in Marking will be appeared as the batch code.

## 5 Device Summary, Pin and Packages(Continued)

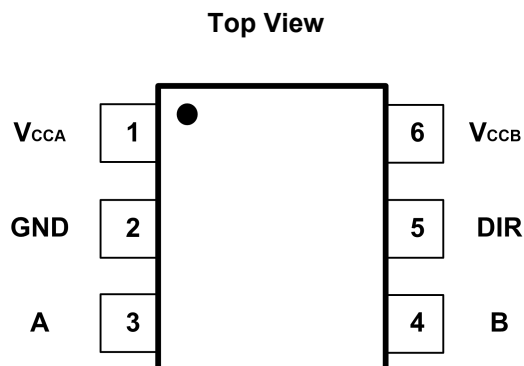


Fig.5-1. GT74LVC1T45: S6 (SOT23-6) Package  
GT74LVC1T45: C6 (SC70-6) Package

Table.5-2. Pin Definition

| PIN  |       | I/O | Description                                            |
|------|-------|-----|--------------------------------------------------------|
| Name | S6 C6 |     |                                                        |
| VCCA | 1     | -   | System-1 supply voltage (1.65V to 5.5 V)               |
| GND  | 2     | -   | Device GND                                             |
| A    | 3     | I/O | Output level depends on VCC1 voltage.                  |
| B    | 4     | I/O | Input threshold value depends on VCC2 voltage.         |
| DIR  | 5     | I   | GND (low level) determines B-port to A-port direction. |
| VCCB | 6     | -   | SYSTEM-2 supply voltage (1.65V to 5.5 V)               |

\* All unused input pins cannot be suspended and suggested to connect to GND.

## 6 Voltage, Temperature, ESD and Thermal Ratings

### 6.1 Absolute Maximum Ratings<sup>(1)</sup>

| Parameters                                          |                                                                                               |                    | Min  | Max        | Unit |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------|------|------------|------|
| Supply voltage range, VCCA, VCCB                    |                                                                                               |                    | −0.5 | 6.5        | V    |
| VI                                                  | Input voltage range <sup>(2)</sup>                                                            | I/O ports (A port) | −0.5 | 6.5        | V    |
|                                                     |                                                                                               | I/O ports (B port) | −0.5 | 6.5        |      |
|                                                     |                                                                                               | Control inputs     | −0.5 | 6.5        |      |
| VO                                                  | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>   | A port             | −0.5 | 6.5        | V    |
|                                                     |                                                                                               | B port             | −0.5 | 6.5        |      |
| VO                                                  | Voltage range applied to any output in the high or low state <sup>(2)</sup><br><sup>(3)</sup> | A port             | −0.5 | VCCA + 0.5 | V    |
|                                                     |                                                                                               | B port             | −0.5 | VCCB + 0.5 |      |
| IIK                                                 | Input clamp current                                                                           | VI < 0             |      | −50        | mA   |
| IOK                                                 | Output clamp current                                                                          | VO < 0             |      | −50        | mA   |
| IO                                                  | Continuous output current                                                                     |                    |      | ±50        | mA   |
| Continuous current through each VCCA, VCCB, and GND |                                                                                               |                    |      | ±100       | mA   |

(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 output positive-voltage rating may be exceeded up to 6.5V maximum if the output current rating is observed.

### 6.2 ESD Ratings<sup>(1) (2)</sup>

| ESD    |                         |                           | Value | Unit |
|--------|-------------------------|---------------------------|-------|------|
| V(ESD) | Electrostatic discharge | Human-Body Model (HBM)    | 8 K   | V    |
|        |                         | Charged-Device Model(CDM) | 2 K   | V    |

(1)JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2)JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

## 6 Voltage, Temperature, ESD and Thermal Ratings(Continued)

### 6.3 Recommended Operating Conditions<sup>(1) (2) (3) (4)</sup>

|                               |                                |                                        | Vcci           | Vcco           | Min         | Max         | Unit |
|-------------------------------|--------------------------------|----------------------------------------|----------------|----------------|-------------|-------------|------|
| VCCA                          | Supply Voltage                 |                                        |                |                | 1.65        | 5.5         | V    |
| VCCB                          |                                |                                        |                |                | 1.65        | 5.5         |      |
| VIH                           | High-level Input Voltage       | Data Inputs                            | 1.65V to 1.95V |                | VCCI × 0.65 |             | V    |
|                               |                                |                                        | 2.3V to 2.7V   |                | 1.7         |             |      |
|                               |                                |                                        | 3V to 3.6V     |                | 2           |             |      |
|                               |                                |                                        | 4.5V to 5.5V   |                | VCCI × 0.7  |             |      |
| VIL                           | Low-level Input Voltage        | Data Inputs                            | 1.65V to 1.95V |                |             | VCCI × 0.35 | V    |
|                               |                                |                                        | 2.3V to 2.7V   |                |             | 0.7         |      |
|                               |                                |                                        | 3V to 3.6V     |                |             | 0.8         |      |
|                               |                                |                                        | 4.5V to 5.5V   |                |             | VCCI × 0.3  |      |
| VIH                           | High-level Input Voltage       | Control Inputs<br>(referenced to VCCA) | 1.65V to 1.95V |                | VCCA × 0.65 |             | V    |
|                               |                                |                                        | 2.3V to 2.7V   |                | 1.7         |             |      |
|                               |                                |                                        | 3V to 3.6V     |                | 2           |             |      |
|                               |                                |                                        | 4.5V to 5.5V   |                | VCCA × 0.7  |             |      |
| VIL                           | Low-level Input Voltage        | Control Inputs<br>(referenced to VCCA) | 1.65V to 1.95V |                |             | VCCI × 0.35 | V    |
|                               |                                |                                        | 2.3V to 2.7V   |                |             | 0.7         |      |
|                               |                                |                                        | 3V to 3.6V     |                |             | 0.8         |      |
|                               |                                |                                        | 4.5V to 5.5V   |                |             | VCCI × 0.3  |      |
| VI                            | Input Voltage                  | Control Inputs                         |                |                | 0           | 5.5         | V    |
| VI/O                          | Input/Output voltage           | Active State                           |                |                | 0           | VCCO        | V    |
|                               |                                | 3-State                                |                |                | 0           | 5.5         | V    |
| IOH High-Level Output Current |                                |                                        |                | 1.65V to 1.95V |             | −4          | mA   |
|                               |                                |                                        |                | 2.3V to 2.7V   |             | −8          |      |
|                               |                                |                                        |                | 3V to 3.6V     |             | −24         |      |
|                               |                                |                                        |                | 4.5V to 5.5V   |             | −32         |      |
| IOL Low-Level Output Current  |                                |                                        |                | 1.65V to 1.95V |             | 4           | mA   |
|                               |                                |                                        |                | 2.3V to 2.7V   |             | 8           |      |
|                               |                                |                                        |                | 3V to 3.6V     |             | 24          |      |
|                               |                                |                                        |                | 4.5V to 5.5V   |             | 32          |      |
| Δt/Δv                         | Input Transition rise or fall  | Data Inputs                            | 1.65V to 1.95V |                |             | 20          | ns/V |
|                               |                                |                                        | 2.3V to 2.7V   |                |             | 20          |      |
|                               |                                |                                        | 3V to 3.6V     |                |             | 10          |      |
|                               |                                |                                        | 4.5V to 5.5V   |                |             | 5           |      |
| TA                            | Operating Free-Air Temperature |                                        |                |                | −40         | +125        | °C   |

(1)V<sub>CCI</sub> is the V<sub>CC</sub> associated with the data input port.

(2)V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port .

(3)For V<sub>CCI</sub> Values not specified in the data sheet, V<sub>IH</sub> min=V<sub>CCI</sub> × 0.7V, V<sub>IL</sub> max=V<sub>CCI</sub> × 0.3V .

(4)For V<sub>CCA</sub> Values not specified in the data sheet, V<sub>IH</sub> min=V<sub>CCA</sub> × 0.7V, V<sub>IL</sub> max=V<sub>CCA</sub> × 0.3V.

## 7 Electrical Specifications

### 7.1 Electrical Characteristics<sup>(1) (2)</sup>

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

| Parameter   |                | Test Conditions                                      | VCCA          | VCCB          | Min      | Typ | Max  | Unit |
|-------------|----------------|------------------------------------------------------|---------------|---------------|----------|-----|------|------|
| VOH         |                | IOH=−100 μA,(VI=VIH)                                 | 1.65V to 4.5V | 1.65V to 4.5V | VCCO−0.1 |     |      | V    |
|             |                | IOH=−4 mA,(VI=VIH)                                   | 1.65V         | 1.65V         | 1.2      |     |      |      |
|             |                | IOH=−8 mA,(VI=VIH)                                   | 2.3V          | 2.3V          | 1.9      |     |      |      |
|             |                | IOH=−24 mA,(VI=VIH)                                  | 3V            | 3V            | 2.4      |     |      |      |
|             |                | IOH=−32 mA,(VI=VIH)                                  | 4.5V          | 4.5V          | 3.8      |     |      |      |
| VOL         |                | IOL=100 μA,(VI=VIH)                                  | 1.65V to 4.5V | 1.65V to 4.5V |          |     | 0.1  | V    |
|             |                | IOL=4 mA,(VI=VIH)                                    | 1.65V         | 1.65V         |          |     | 0.45 |      |
|             |                | IOL=8 mA,(VI=VIH)                                    | 2.3V          | 2.3V          |          |     | 0.3  |      |
|             |                | IOL=24 mA,(VI=VIH)                                   | 3V            | 3V            |          |     | 0.55 |      |
|             |                | IOL=32 mA,(VI=VIH)                                   | 4.5V          | 4.5V          |          |     | 0.55 |      |
| II          | DIR            | VI=VCCA or GND                                       | 1.65V to 5.5V | 1.65V to 5.5V |          |     | ±2   | μA   |
| Ioff        | A or B Port    | VI or VO=0 to 5.5V                                   | 0V            | 0 to 5.5V     |          |     | ±2   | μA   |
|             |                |                                                      | 0 to 5.5V     | 0V            |          |     | ±2   |      |
| IOZ         | A or B Port    | Vo=VCCO or GND, OEB=VIH                              | 1.65V to 5.5V | 1.65V to 5.5V |          |     | ±2   | μA   |
| ICCA        |                | VI=VCCI or GND,Io=0                                  | 1.65V to 5.5V | 1.65V to 5.5V |          |     | 15   | μA   |
|             |                |                                                      | 5V            | 0V            |          |     | 15   |      |
|             |                |                                                      | 0V            | 5V            |          |     | −2   |      |
| ICCB        |                | VI=VCCI or GND,Io=0                                  | 1.65V to 5.5V | 1.65V to 5.5V |          |     | 15   | μA   |
|             |                |                                                      | 5V            | 0V            |          |     | −2   |      |
|             |                |                                                      | 0V            | 5V            |          |     | 15   |      |
| ICCA + ICCB |                | VI=VCCI or GND,Io=0                                  | 1.65V to 5.5V | 1.65V to 5.5V |          |     | 25   | μA   |
| ΔICCA       | A Port         | One A Port at VCCA−0.6V, DIR at VCCA , B Port=Open   | 3V to 5.5V    | 3V to 5.5V    |          |     | 50   | μA   |
|             | DIR            | DIR at VCCA−0.6V, B Port=Open, A Port at VCCA or GND |               |               |          |     | 50   |      |
| ΔICCB       | B Port         | One B Port at VCCB−0.6V, DIR at GND, A Port=Open     | 3V to 5.5V    | 3V to 5.5V    |          |     | 50   | μA   |
| Ci          | Control Inputs | VI=VCCA or GND                                       | 3.3V          | 3.3V          |          | 4   | 5    | pF   |
| Cio         | A or B Port    | VO=VCCA/B or GND                                     | 3.3V          | 3.3V          |          | 8.5 | 10   | pF   |

(1)V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.

(2)V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.

## 7 Electrical Specifications(Continued)

### 7.2 Switching Characteristics, $V_{CCA}=1.8V\pm0.15V$

over recommended operating free-air temperature range,  $V_{CCA}=1.8V\pm0.15V$  (unless otherwise noted)

| Parameter | From<br>(Input) | To<br>(Output) | $V_{CCB}=1.8V\pm0.15V$ |      | $V_{CCB}=2.5V\pm0.2V$ |      | $V_{CCB}=3.3V\pm0.3V$ |      | $V_{CCB}=5V\pm0.5V$ |      | Unit |
|-----------|-----------------|----------------|------------------------|------|-----------------------|------|-----------------------|------|---------------------|------|------|
|           |                 |                | Min                    | Max  | Min                   | Max  | Min                   | Max  | Min                 | Max  |      |
| TPLH      | A               | B              | 7.4                    | 10.3 | 5.3                   | 5.8  | 5.0                   | 5.4  | 4.9                 | 5.1  | ns   |
| TPHL      |                 |                |                        |      |                       |      |                       |      |                     |      |      |
| TPLH      | B               | A              | 7.4                    | 10.4 | 5.6                   | 7.7  | 5.2                   | 7.2  | 4.8                 | 6.9  | ns   |
| TPHL      |                 |                |                        |      |                       |      |                       |      |                     |      |      |
| TPHZ      | OEB             | A              | 11.0                   | 11.8 | 8.3                   | 12.0 | 7.6                   | 12.3 | 6.6                 | 12.7 | ns   |
| TPLZ      |                 |                |                        |      |                       |      |                       |      |                     |      |      |
| TPHZ      | OEB             | B              | 10.5                   | 12.3 | 9.9                   | 10.5 | 9.9                   | 10.6 | 10.6                | 11.3 | ns   |
| TPLZ      |                 |                |                        |      |                       |      |                       |      |                     |      |      |
| TPZH      | OEB             | A              | 11.5                   | 14.6 | 11.4                  | 14.0 | 11.3                  | 14.0 | 11.8                | 15.8 | ns   |
| TPZL      |                 |                |                        |      |                       |      |                       |      |                     |      |      |
| TPZH      | OEB             | B              | 14.4                   | 17.9 | 9.8                   | 11.5 | 9.0                   | 10.9 | 9.3                 | 11.3 | ns   |
| TPZL      |                 |                |                        |      |                       |      |                       |      |                     |      |      |

### 7.3 Switching Characteristics, $V_{CCA}=2.5V\pm0.2V$

over recommended operating free-air temperature range,  $V_{CCA}=2.5V\pm0.2V$  (unless otherwise noted)

| Parameter | From<br>(Input) | To<br>(Output) | $V_{CCB}=1.8V\pm0.15V$ |      | $V_{CCB}=2.5V\pm0.2V$ |     | $V_{CCB}=3.3V\pm0.3V$ |     | $V_{CCB}=5V\pm0.5V$ |     | Unit |
|-----------|-----------------|----------------|------------------------|------|-----------------------|-----|-----------------------|-----|---------------------|-----|------|
|           |                 |                | Min                    | Max  | Min                   | Max | Min                   | Max | Min                 | Max |      |
| TPLH      | A               | B              | 5.7                    | 7.5  | 2.9                   | 3.9 | 2.5                   | 3.3 | 2.3                 | 2.9 | ns   |
| TPHL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPLH      | B               | A              | 5.3                    | 6.1  | 2.9                   | 3.9 | 2.4                   | 3.5 | 1.9                 | 3.2 | ns   |
| TPHL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPHZ      | OEB             | A              | 5.5                    | 6.9  | 5.4                   | 6.8 | 3.2                   | 6.7 | 2.8                 | 6.6 | ns   |
| TPLZ      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPHZ      | OEB             | B              | 7.6                    | 9.1  | 5.0                   | 7.5 | 4.1                   | 7.2 | 5.2                 | 7.2 | ns   |
| TPLZ      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPZH      | OEB             | A              | 4.6                    | 10.8 | 4.7                   | 6.4 | 4.7                   | 6.5 | 5.0                 | 7.0 | ns   |
| TPZL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPZH      | OEB             | B              | 11.6                   | 13.4 | 5.6                   | 7.3 | 4.6                   | 6.1 | 4.0                 | 5.2 | ns   |
| TPZL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |

## 7 Electrical Specifications(Continued)

### 7.4 Switching Characteristics, $V_{CCA}=3.3V\pm0.3V$

over recommended operating free-air temperature range,  $V_{CCA}=3.3V\pm0.3V$  (unless otherwise noted)

| Parameter | From<br>(Input) | To<br>(Output) | $V_{CCB}=1.8V\pm0.15V$ |      | $V_{CCB}=2.5V\pm0.2V$ |     | $V_{CCB}=3.3V\pm0.3V$ |     | $V_{CCB}=5V\pm0.5V$ |     | Unit |
|-----------|-----------------|----------------|------------------------|------|-----------------------|-----|-----------------------|-----|---------------------|-----|------|
|           |                 |                | Min                    | Max  | Min                   | Max | Min                   | Max | Min                 | Max |      |
| TPLH      | A               | B              | 5.2                    | 7.0  | 2.4                   | 3.5 | 2.0                   | 2.9 | 1.8                 | 2.5 | ns   |
| TPHL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPLH      | B               | A              | 5.3                    | 6.1  | 2.9                   | 3.9 | 2.4                   | 3.5 | 1.9                 | 3.2 | ns   |
| TPHL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPHZ      | OEB             | A              | 4.3                    | 5.8  | 4.4                   | 5.9 | 4.3                   | 5.5 | 2.1                 | 4.8 | ns   |
| TPLZ      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPHZ      | OEB             | B              | 6.0                    | 8.8  | 4.7                   | 6.8 | 3.2                   | 6.3 | 3.3                 | 5.9 | ns   |
| TPLZ      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPZH      | OEB             | A              | 3.3                    | 10.0 | 3.4                   | 6.0 | 3.4                   | 4.8 | 3.4                 | 5.4 | ns   |
| TPZL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPZH      | OEB             | B              | 11.2                   | 13.0 | 5.0                   | 6.8 | 3.9                   | 5.5 | 3.3                 | 4.6 | ns   |
| TPZL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |

### 7.5 Switching Characteristics, $V_{CCA}=5V\pm0.5V$

over recommended operating free-air temperature range,  $V_{CCA}=5V\pm0.5V$  (unless otherwise noted)

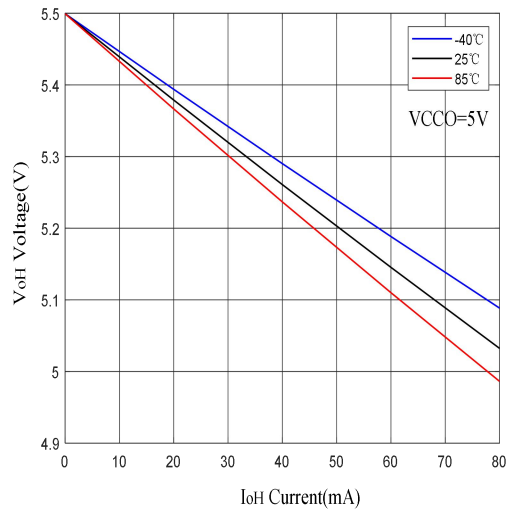
| Parameter | From<br>(Input) | To<br>(Output) | $V_{CCB}=1.8V\pm0.15V$ |      | $V_{CCB}=2.5V\pm0.2V$ |     | $V_{CCB}=3.3V\pm0.3V$ |     | $V_{CCB}=5V\pm0.5V$ |     | Unit |
|-----------|-----------------|----------------|------------------------|------|-----------------------|-----|-----------------------|-----|---------------------|-----|------|
|           |                 |                | Min                    | Max  | Min                   | Max | Min                   | Max | Min                 | Max |      |
| TPLH      | A               | B              | 4.9                    | 6.7  | 1.9                   | 3.3 | 1.6                   | 2.7 | 1.4                 | 2.3 | ns   |
| TPHL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPLH      | B               | A              | 5.2                    | 5.7  | 2.3                   | 3.0 | 1.8                   | 2.6 | 1.3                 | 2.3 | ns   |
| TPHL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPHZ      | OEB             | A              | 3.3                    | 4.3  | 3.1                   | 3.8 | 3.3                   | 4.5 | 2.6                 | 3.7 | ns   |
| TPLZ      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPHZ      | OEB             | B              | 3.3                    | 9.5  | 3.8                   | 4.9 | 3.3                   | 4.3 | 1.7                 | 3.8 | ns   |
| TPLZ      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPZH      | OEB             | A              | 2.6                    | 9.6  | 2.6                   | 7.2 | 2.6                   | 4.8 | 2.6                 | 3.9 | ns   |
| TPZL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |
| TPZH      | OEB             | B              | 10.6                   | 12.3 | 5.3                   | 6.7 | 3.7                   | 5.4 | 3.5                 | 4.2 | ns   |
| TPZL      |                 |                |                        |      |                       |     |                       |     |                     |     |      |

### 7.6 Operating Characteristics

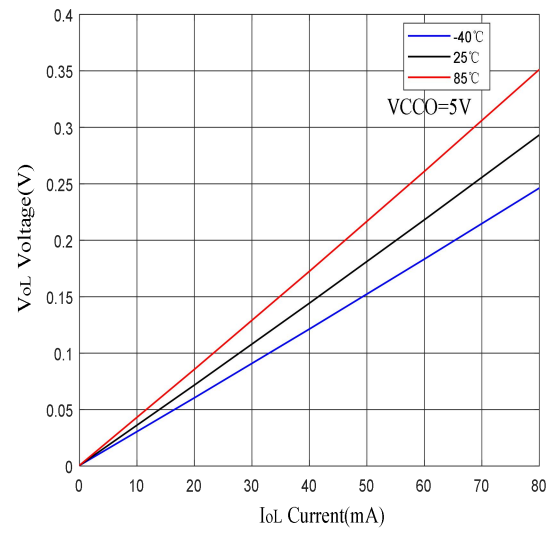
$T_A=25^{\circ}C$

| Parameter |                             | Test Conditions                  | VCCA=<br>VCCB=1.8V | VCCA=<br>VCCB=2.5V | VCCA=<br>VCCB=3.3V | VCCA=<br>VCCB=5V | Unit |
|-----------|-----------------------------|----------------------------------|--------------------|--------------------|--------------------|------------------|------|
|           |                             |                                  | Typ                | Typ                | Typ                | Typ              |      |
| CpdA      | A-port Input, B-port Output | CL=0,<br>f=10 MHz,<br>tr=tf=1 ns | 2.4                | 2.6                | 2.9                | 3.7              | pF   |
|           | B-port Input, A-port Output |                                  | 16.7               | 17.3               | 17.9               | 22.6             |      |
| CpdB      | A-port Input, B-port Output |                                  | 16.4               | 17.1               | 17.8               | 22.5             |      |
|           | B-port Input, A-port Output |                                  | 2.4                | 2.6                | 2.9                | 3.9              |      |

## 8 Typical Characteristics

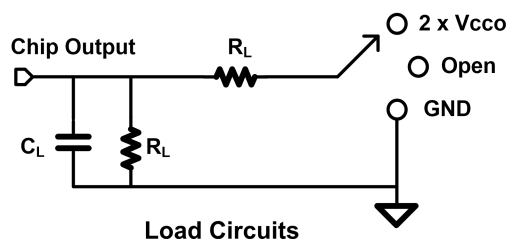


**Fig.8-1. Voltage Vs Current**



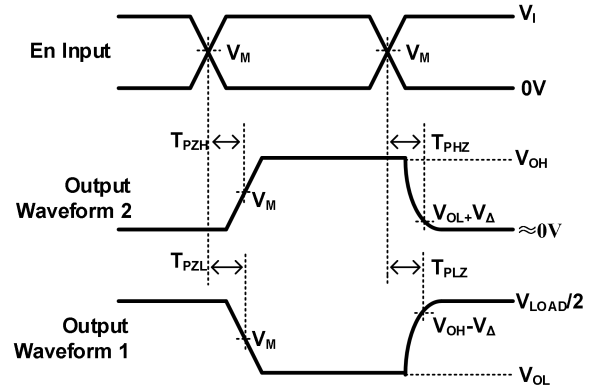
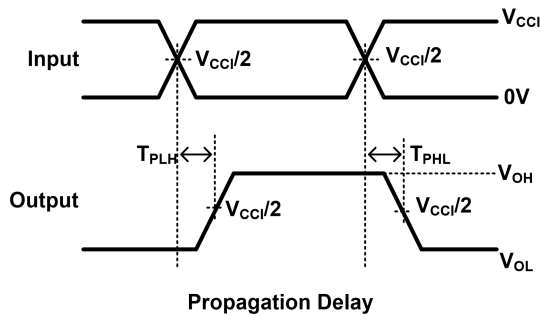
**Fig.8-2. Voltage Vs Current**

## 9 Parameter Measurement Information



| Parameter                                                     | V <sub>CCO</sub> | R <sub>L</sub> | C <sub>L</sub> | S1                   | VTP   |
|---------------------------------------------------------------|------------------|----------------|----------------|----------------------|-------|
| T <sub>pd</sub> Propagation delay time                        | 1.8V-5.5V        | 2 kΩ           | 15 pF          | Open                 | N/A   |
| T <sub>PLZ</sub> , T <sub>PZL</sub> Enable time, disable time | 1.8V ± 0.15V     | 2 kΩ           | 15 pF          | 2 X V <sub>CCO</sub> | 0.15V |
|                                                               | 2.5V ± 0.2V      | 2 kΩ           | 15 pF          | 2 X V <sub>CCO</sub> | 0.15V |
|                                                               | 3.3V ± 0.3V      | 2 kΩ           | 15 pF          | 2 X V <sub>CCO</sub> | 0.3V  |
|                                                               | 5V ± 0.5V        | 2 kΩ           | 15 pF          | 2 X V <sub>CCO</sub> | 0.3V  |
| T <sub>PHZ</sub> , T <sub>PZH</sub> Enable time, disable time | 1.8V ± 0.15V     | 2 kΩ           | 15 pF          | GND                  | 0.15V |
|                                                               | 2.5V ± 0.2V      | 2 kΩ           | 15 pF          | GND                  | 0.15V |
|                                                               | 3.3V ± 0.3V      | 2 kΩ           | 15 pF          | GND                  | 0.3V  |
|                                                               | 5V ± 0.5V        | 2 kΩ           | 15 pF          | GND                  | 0.3V  |

## 9 Parameter Measurement Information(Continued)



**Enable and Disable Times  
Low-And High-Level Enabling**

**Notes:**

- A.CL 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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $dv/dt \geq 1 \text{ V/ns}$ .
- D.The outputs are measured one at a time, with one transition per measurement.
- E.TPLZ and TPHZ are the same as  $t_{dis}$ .
- F.TPZL and TPZH are the same as  $t_{en}$ .
- G.TPLH and TPHL are the same as  $t_{pd}$ .
- H.VCCI is the VCC associated with the input port.
- I.VCCO is the VCC associated with the output port.
- J.All parameters and waveforms are not applicable to all devices.

## 10 Detailed Description

The GT74LVC1T45 is a single-bit, dual supply non-inverting voltage level translation. Pin A and direction control pin are support by VCCA and pin B is support by VCCB. The A port is able to accept I/O voltages ranging from 1.65V to 5.5 V, while the B port can accept I/O voltages from 1.65V to 5.5 V. The high on DIR allows data transmission from A to B and a low on DIR allows data transmission from B to A. This device is fully specified for partial-power-down applications using I<sub>off</sub>. The I<sub>off</sub> circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The VCC isolation feature ensures that if either VCC input is at GND, all outputs are in the high-impedance state.

The GT74LVC1T45 is a voltage level translator that can operate from 1.65V to 5.5V (VCCA) and 1.65V to 5.5V (VCCB). The signal translation between 1.65V and 5.5V requires direction control. When DIR is high, data transmission is from A to B. When DIR is low, data transmission is from B to A.

**Table.10-1. Function Table**

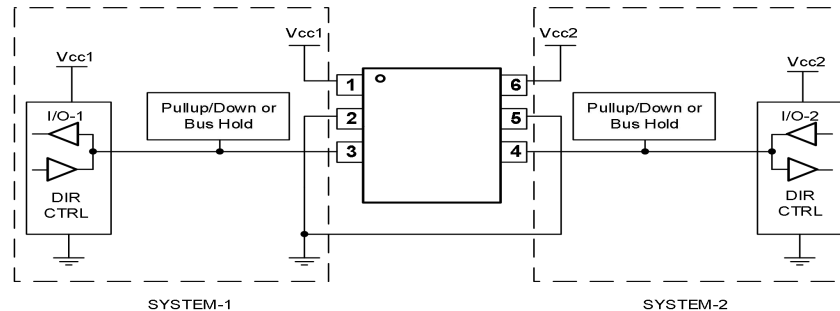
| Control input | Operation |
|---------------|-----------|
| DIR           |           |
| L             | B TO A    |
| H             | A TO B    |

## 11 Application Note

The GT74LVC1T45 device can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The maximum output current can be up to 32 mA when device is powered by 5 V.

### 11.1 Typical Application

Fig.11-1 shows the GT74LVC1T45 being used in a bidirectional logic level-shifting application. Because the GT74LVC1T45 does not have an output-enable (OE) pin, the system designer should take precautions to avoid bus contention between SYSTEM-1 and SYSTEM-2 when changing directions.



**Fig.11-1. Typical application circuit**

### 11.2 Enable Times

$TPZH \text{ (DIR to A)} = TPLZ \text{ (DIR to B)} + TPLH \text{ (B to A)}$

$TPZL \text{ (DIR to A)} = TPHZ \text{ (DIR to B)} + TPHL \text{ (B to A)}$

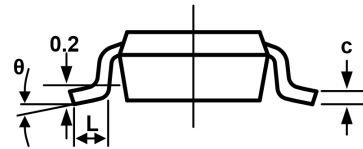
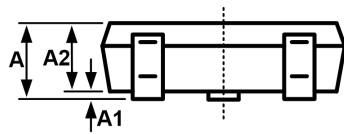
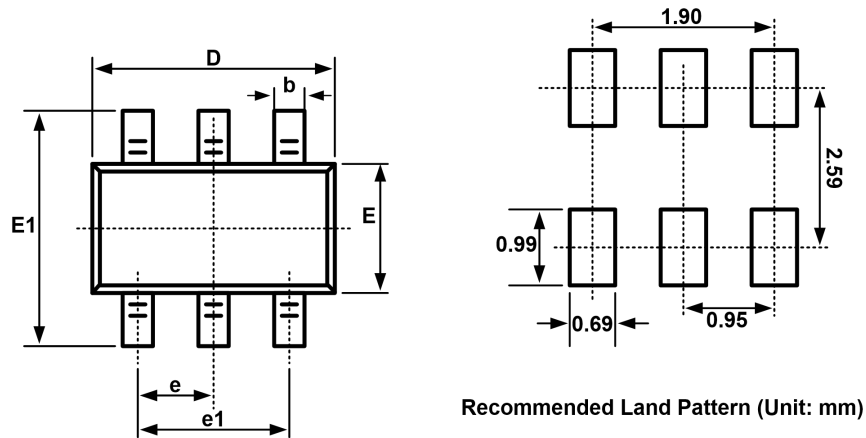
$TPZH \text{ (DIR to B)} = TPLZ \text{ (DIR to A)} + TPLH \text{ (A to B)}$

$TPZL \text{ (DIR to B)} = TPHZ \text{ (DIR to A)} + TPHL \text{ (A to B)}$

In a bidirectional application, these enable times provide the maximum delay from the time the DIR bit is switched until an output is expected. For example, if the GT74LVC1T45 initially is transmitting from A to B, then the DIR bit is switched; the B port of the device must be disabled before presenting it with an input. After the B port has been disabled, an input signal applied to it appears on the corresponding A port after the specified propagation delay.

## 12 Package Outline Dimension

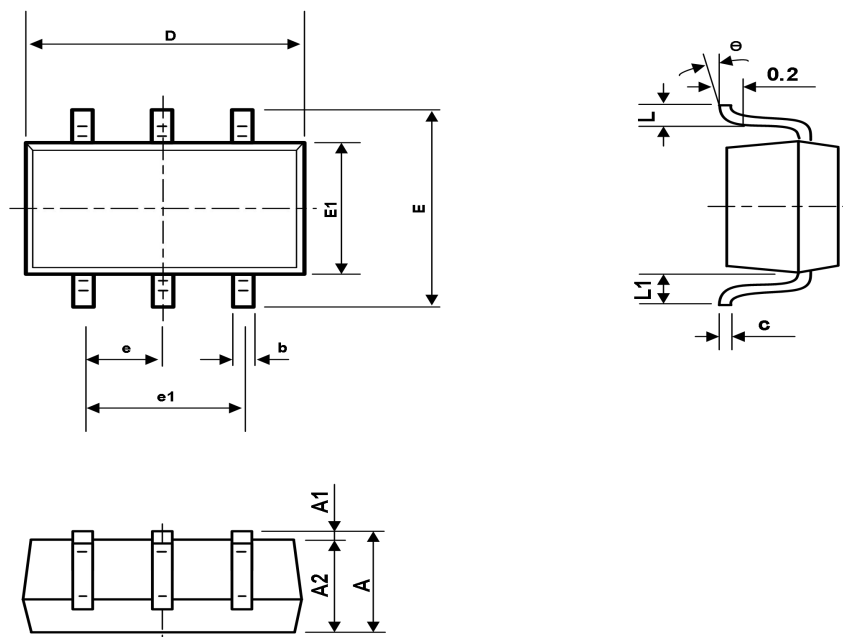
SOT23-6



| 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       | 1.800                     | 2.000 | 0.071                | 0.079 |
| L        | 0.300                     | 0.600 | 0.012                | 0.024 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |

# 12 Package Outline Dimension(Continued)

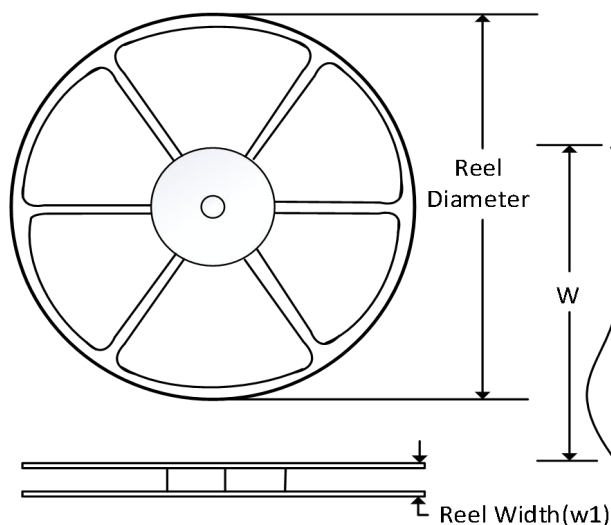
SC70-6



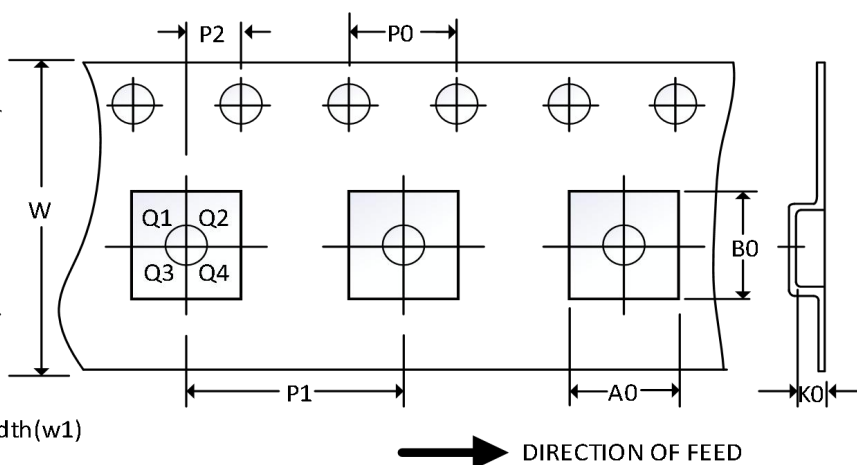
| Symbol | Dimension In Millimeters |       | Dimensions In Inches |       |
|--------|--------------------------|-------|----------------------|-------|
|        | Min                      | Max   | Min                  | Max   |
| A      | 0.900                    | 1.100 | 0.035                | 0.043 |
| 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      | 0.110                    | 0.175 | 0.004                | 0.007 |
| D      | 2.000                    | 2.200 | 0.079                | 0.087 |
| E      | 2.150                    | 2.450 | 0.085                | 0.096 |
| E1     | 1.150                    | 1.350 | 0.045                | 0.053 |
| e      | 0.650TYP                 |       | 0.026TYP             |       |
| e1     | 1.200                    | 1.400 | 0.047                | 0.055 |
| L      | 0.260                    | 0.460 | 0.010                | 0.018 |
| L1     | 0.525REF                 |       | 0.021REF             |       |
| θ      | 0°                       | 8°    | 0°                   | 8°    |

# 13 Tape and Reel Information

Reel Dimensions



Reel Dimensions



Note: The picture is only for reference. Please make the object as the standard.

## Key Parameter List of Tape and Reel

| Package Type | Reel Diameter | Reel Width (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|-----------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOT23-6      | 7"            | 9.5             | 3.17    | 3.23    | 1.37    | 4       | 4       | 2       | 8      | Q3            |
| SC70-6       | 7"            | 9.5             | 2.4     | 2.5     | 1.2     | 4       | 4       | 2       | 8      | Q3            |

Note:

(1)All dimensions are nominal.

(2)Plastic or metal protrusions of 0.15mm maximum per side are not included.