

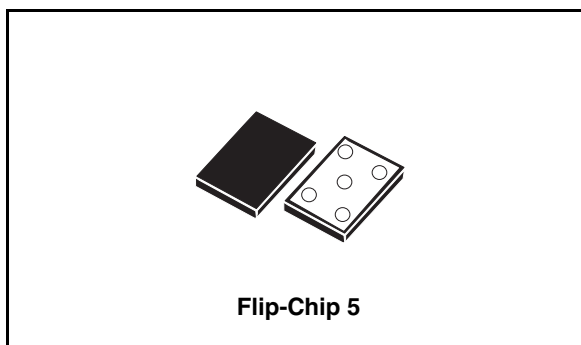


## ST1G3234

### 1-bit dual supply bus buffer level translator with A-side series resistor

#### Features

- High speed:  $t_{PD} = 4.4\text{ns}$  (Max.) at  $T_A = 85^\circ\text{C}$   
 $V_{CCB} = 1.65\text{V}$ ;  $V_{CCA} = 3.0\text{V}$
- Low power dissipation:  
 $I_{CCA} = I_{CCB} = 5\mu\text{A}$  (Max.) at  $T_A = 85^\circ\text{C}$
- Symmetrical output impedance:  
 $I_{OHA} = I_{OLA} = 10\text{mA}$  Min at  
 $V_{CCA} = 2.75\text{V}$ ;  $V_{CCB} = 1.4\text{V}$  to  $3.6\text{V}$   
 $I_{OHA} = I_{OLA} = 6\text{mA}$  Min at  
 $V_{CCA} = 2.3\text{V}$ ;  $V_{CCB} = 1.4\text{V}$  to  $3.6\text{V}$
- Balanced propagation delays:  
 $t_{PLH} \cong t_{PHL}$
- Power down protection on inputs and outputs
- $26\Omega$  series resistor on A-side outputs
  - Operating voltage range:  
 $V_{CCA}(\text{Opr}) = 1.4\text{V}$  to  $3.6\text{V}$  (1.2V data retent)  
 $V_{CCB}(\text{Opr}) = 1.4\text{V}$  to  $3.6\text{V}$  (1.2V data retent)
- Max data rates:  
380Mbps (1.8V to 3.3V translation)  
260Mbps (<1.8V to 3.3V translation)  
260Mbps (translate to 2.5V)  
210Mbps (translate to 1.5V)
- Latch-up performance exceeds 500mA (JESD 17)
- ESD performance:  
HBM > 2000V (MIL STD 883 method 3015);  
MM > 200V
- RoHS compliant for Flip-Chip package



#### Description

The ST1G3234 is a dual supply low voltage CMOS 1-Bit bus buffer level translator fabricated with sub-micron silicon gate and five-layer metal wiring C<sup>2</sup>MOS technology. Designed for use as an interface between a 3.3V bus and a 2.5V or 1.8V bus in a mixed 3.3V/1.8V, 3.3V/2.5V, 1.8V/1.4V and 2.5V/1.8V supply systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

This IC is intended for one-way asynchronous communication between data buses. The input and output power down protections disable the device when both power supply are down, so that the buses are effectively isolated.

The input tolerant buffers allow to translate  $V_{CCB}$  compatible signals and greater signals than  $V_{CCB}$  up/down to  $V_{CCA}$ .

All inputs are equipped with protection circuits against static discharge, giving them ESD immunity and transient excess voltage.

#### Order codes

| Part number | Package     | Comments            |
|-------------|-------------|---------------------|
| ST1G3234BJR | Flip-Chip 5 | 4000 parts per reel |

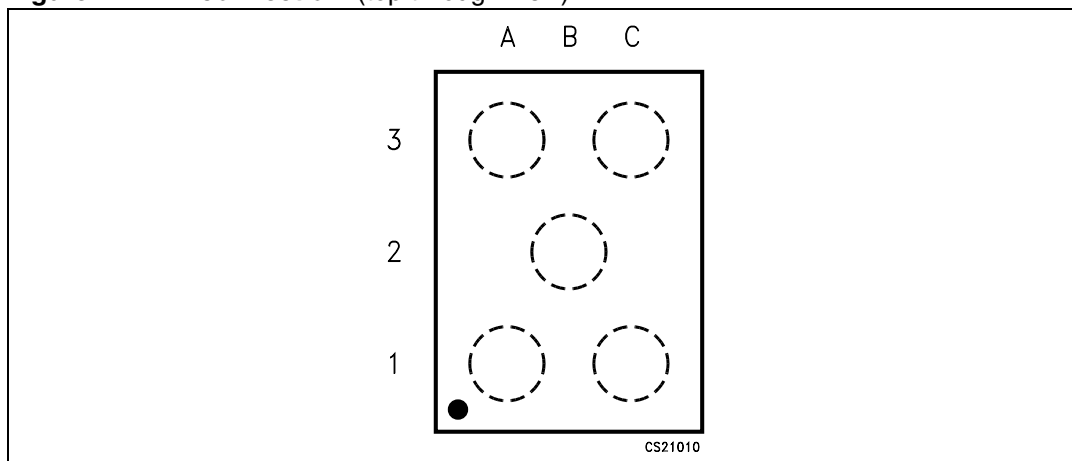
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# 1 Pin settings

## 1.1 Pin connection

Figure 1. Pin connection (top through view)



## 1.2 Pin description

Table 1. Pin description

| Pin N° | Symbol    | Name and function                 |
|--------|-----------|-----------------------------------|
| A1     | A1        | Data output ( $V_{CCA}$ referred) |
| C1     | B1        | Data input ( $V_{CCB}$ referred)  |
| B2     | GND       | Ground (0V)                       |
| A3     | $V_{CCA}$ | Positive supply voltage           |
| C3     | $V_{CCB}$ | Positive supply voltage           |

## 2 Device summary

Figure 2. Input equivalent circuit

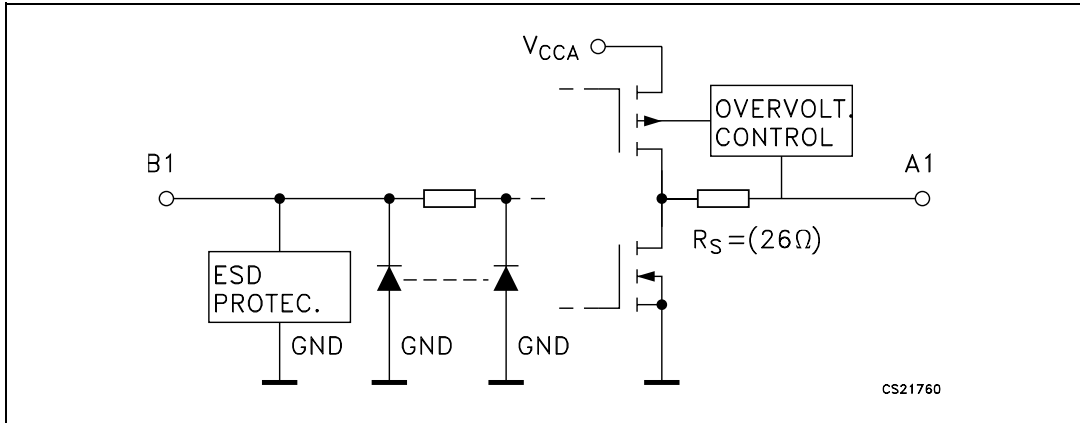


Figure 3. Logic diagram

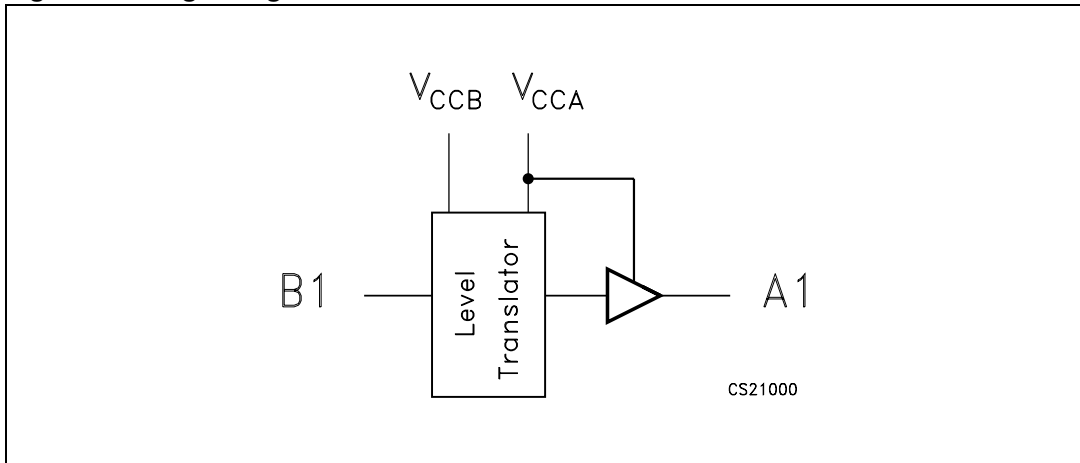


Table 2. Truth table

| Inputs B1 (V <sub>CCB</sub> Referred) | Outputs A1 (V <sub>CCA</sub> Referred) |
|---------------------------------------|--|
| L                                     | L                                      |
| H                                     | H                                      |

### 3 Maximum rating

Stressing the device above the rating listed in the “Absolute Maximum Ratings” table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the Operating sections of this specification is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics SURE Program and other relevant quality documents.

**Table 3. Absolute maximum ratings**

| Symbol    | Parameter  | Value                   | Unit |
|-----------|--|-------------------------|------|
| $V_{CCA}$ | Output supply voltage  | -0.5 to +4.6            | V    |
| $V_{CCB}$ | Input supply voltage   | -0.5 to + 4.6           | V    |
| $V_{OA}$  | DC output voltage<br>(power down mode: $V_{CCA}=V_{CCB}=Gnd$ ) | -0.5 to +4.6            | V    |
| $V_{IB}$  | DC input voltage<br>(power down mode: $V_{CCA}=V_{CCB}=Gnd$ )  | -0.5 to +4.6            | V    |
| $V_{OA}$  | DC output voltage  | -0.5 to $V_{CCA} + 0.5$ | V    |
| $V_{IB}$  | DC input voltage   | -0.5 to + 4.6           | V    |
| $I_{IK}$  | DC input diode current   | -20                     | mA   |
| $I_{OK}$  | DC output diode current  | -50                     | mA   |
| $I_{OA}$  | DC output current  | $\pm 50$                | mA   |
| $I_{CCA}$ | DC $V_{CCA}$ or ground current                                 | $\pm 100$               | mA   |
| $I_{CCB}$ | DC $V_{CCB}$ or ground current                                 | $\pm 100$               | mA   |
| $P_d$     | Power dissipation  | 200                     | mW   |
| $T_{stg}$ | Storage temperature  | -65 to +150             | °C   |
| $T_L$     | Lead temperature (10 sec)                                      | 260                     | °C   |

### 3.1 Recommended operating conditions

**Table 4. Recommended operating conditions**

| Symbol    | Parameter                               | Value                      | Unit     |      |
|-----------|---|----------------------------|----------|------|
| $V_{CCA}$ | Supply voltage                          | 1.4 to 3.6                 | V        |      |
| $V_{CCB}$ | Supply voltage                          | 1.4 to 3.6                 | V        |      |
| $V_{IB}$  | Input voltage (B1)                      | 0 to $V_{CCB}$             | V        |      |
| $V_{OA}$  | Output voltage (A1)                     | 0 to $V_{CCA}$             | V        |      |
| $T_{op}$  | Operating temperature                   | -40 to 85                  | °C       |      |
| dt/dv     | Input Rise and Fall Time <sup>(1)</sup> | $V_{CCB} = 3.0$ to $3.6V$  | 0 to 10  | ns/V |
|           |   | $V_{CCB} = 2.3$ to $2.7V$  | 0 to 20  | ns/V |
|           |   | $V_{CCB} = 1.4$ to $1.95V$ | 0 to 100 | ns/V |

1. VI from 0.8V to 2.0V at  $V_{CC} = 3.0V$

## 4 Electrical characteristics

Table 5. DC specification

| Symbol            | Parameter                 | Test condition                         |  |  | Value                  |                      |                      |                      | Unit |
|-------------------|---------------------------|--|--|--|------------------------|----------------------|----------------------|----------------------|------|
|                   |                           | V <sub>CCB</sub><br>(V) <sup>(1)</sup> | V <sub>CCA</sub><br>(V) <sup>(1)</sup> |  | T <sub>A</sub> = 25 °C |                      | -40 to 85 °C         |                      |      |
|                   |                           |  |  |  | Min                    | Max                  | Min                  | Max                  |      |
| V <sub>IHB</sub>  | High level input voltage  | 1.4                                    | 1.4 to 3.6V                            |  | 0.65V <sub>CCB</sub>   |                      | 0.65V <sub>CCB</sub> |                      | V    |
|                   |                           | 1.8                                    |  | 0.65V <sub>CCB</sub>   |                        | 0.65V <sub>CCB</sub> |                      |                      |      |
|                   |                           | 2.5                                    |  | 1.6  |                        | 1.6                  |                      |                      |      |
|                   |                           | 3.3                                    |  | 2.0  |                        | 2.0                  |                      |                      |      |
| V <sub>ILB</sub>  | Low level input voltage   | 1.4                                    | 1.4 to 3.6V                            |  |                        | 0.35V <sub>CCB</sub> |                      | 0.35V <sub>CCB</sub> | V    |
|                   |                           | 1.8                                    |  |  | 0.35V <sub>CCB</sub>   |                      | 0.35V <sub>CCB</sub> |                      |      |
|                   |                           | 2.5                                    |  |  | 0.7                    |                      | 0.7                  |                      |      |
|                   |                           | 3.3                                    |  |  | 0.8                    |                      | 0.8                  |                      |      |
| V <sub>OHA</sub>  | High level output voltage | 1.4 to 3.6V                            | 1.4                                    | I <sub>O</sub> =-100μA                                       | 1.2                    |                      | 1.2                  |                      | V    |
|                   |                           |  | 2.75                                   | I <sub>O</sub> =-10mA  | 2.2                    |                      | 2.2                  |                      |      |
|                   |                           |  | 2.3                                    | I <sub>O</sub> =-6mA   | 1.8                    |                      | 1.8                  |                      |      |
|                   |                           |  | 1.65                                   | I <sub>O</sub> =-2mA   | 1.4                    |                      | 1.4                  |                      |      |
|                   |                           |  | 1.4                                    | I <sub>O</sub> =-1mA   | 1.1                    |                      | 1.1                  |                      |      |
| V <sub>OLA</sub>  | Low level output voltage  | 1.4 to 3.6V                            | 1.4                                    | I <sub>O</sub> =100μA  |                        | 0.20                 |                      | 0.20                 | V    |
|                   |                           |  | 2.75                                   | I <sub>O</sub> =1mA  |                        | 0.40                 |                      | 0.40                 |      |
|                   |                           |  | 2.75                                   | I <sub>O</sub> =10mA   |                        | 0.55                 |                      | 0.55                 |      |
|                   |                           |  | 2.3                                    | I <sub>O</sub> =6mA  |                        | 0.40                 |                      | 0.40                 |      |
|                   |                           |  | 1.65                                   | I <sub>O</sub> =2mA  |                        | 0.25                 |                      | 0.25                 |      |
|                   |                           |  | 1.4                                    | I <sub>O</sub> =1mA  |                        | 0.20                 |                      | 0.20                 |      |
| I <sub>IB</sub>   | Input leakage current     | 2.7                                    | 3.6                                    | V <sub>IB</sub> = V <sub>CCB</sub> or GND                    |                        | ±0.5                 |                      | ±5                   | μA   |
|                   |                           | 1.4                                    | 2.7                                    | V <sub>IB</sub> = 3.6V or GND                                |                        | ±0.5                 |                      | ±5                   | μA   |
| I <sub>OFF</sub>  | Power OFF leakage current | 0                                      | 0                                      | V <sub>IB</sub> =GND to 3.6V<br>V <sub>OA</sub> =GND to 3.6V |                        | ±1.0                 |                      | ±10                  | μA   |
| I <sub>CCtB</sub> | Quiescent supply current  | 1.4 to 3.6V                            | 1.4 to 3.6V                            | V <sub>IB</sub> = V <sub>CCB</sub> or GND                    |                        | 0.5                  |                      | 5                    | μA   |
| I <sub>CCtA</sub> | Quiescent supply current  | 1.4 to 3.6V                            | 1.4 to 3.6V                            | V <sub>IB</sub> = V <sub>CCB</sub> or GND                    |                        | 0.5                  |                      | 5                    | μA   |

1. V<sub>CC</sub> range = 3.3 ± 0.3; 2.5 ± 0.2V; 1.8 ± 0.15V

Table 6. AC electrical characteristics

| Symbol                            | Parameter                       | Test condition          |                         |  | Value        |     | Unit |
|-----------------------------------|---------------------------------|-------------------------|-------------------------|--|--------------|-----|------|
|                                   |                                 | V <sub>CCB</sub><br>(V) | V <sub>CCA</sub><br>(V) |  | -40 to 85 °C |     |      |
|                                   |                                 |                         |                         |  | Min          | Max |      |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation delay time B1 to A1 | 2.3 to 3.6              | 1.4                     | C <sub>L</sub> = 10 pF                           | 2.0          | 5.0 | ns   |
|                                   |                                 | 1.4 to 1.95             | 1.4                     |  | 2.0          | 5.0 |      |
|                                   |                                 | 2.3 to 3.6              | 1.65 to 1.95            |  | 2.0          | 4.5 |      |
|                                   |                                 | 1.4 to 1.95             | 1.65 to 1.95            |  | 2.0          | 4.8 |      |
|                                   |                                 | 1.4 to 1.95             | 2.3 to 2.7              |  | 2.0          | 3.5 |      |
|                                   |                                 | 1.4 to 1.95             | 3.0 to 3.6              |  | 2.0          | 3.5 |      |
|                                   |                                 | 2.3 to 2.7              | 3.0 to 3.6              |  | 1.0          | 3.0 |      |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation delay time B1 to A1 | 2.3 to 3.6              | 1.4                     | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500 Ω | 2.0          | 5.5 | ns   |
|                                   |                                 | 1.4 to 1.95             | 1.4                     |  | 2.0          | 5.5 |      |
|                                   |                                 | 2.3 to 3.6              | 1.65 to 1.95            |  | 2.0          | 5.0 |      |
|                                   |                                 | 1.4 to 1.95             | 1.65 to 1.95            |  | 2.0          | 5.2 |      |
|                                   |                                 | 1.4 to 1.95             | 2.3 to 2.7              |  | 2.0          | 4.0 |      |
|                                   |                                 | 1.4 to 1.95             | 3.0 to 3.6              |  | 2.0          | 4.0 |      |
|                                   |                                 | 2.3 to 2.7              | 3.0 to 3.6              |  | 1.0          | 3.5 |      |

Table 7. Capacitance characteristics

| Symbol           | Parameter                     | Test condition          |                         |           | Value                  |     |     |              |     | Unit |    |
|------------------|-------------------------------|-------------------------|-------------------------|-----------|------------------------|-----|-----|--------------|-----|------|----|
|                  |                               | V <sub>CCB</sub><br>(V) | V <sub>CCA</sub><br>(V) |           | T <sub>A</sub> = 25 °C |     |     | -40 to 85 °C |     |      |    |
|                  |                               |                         |                         |           | Min                    | Typ | Max | Min          | Max |      |    |
| C <sub>INB</sub> | Input capacitance             | open                    | open                    |           |                        | 5   |     |              |     |      | pF |
| C <sub>O</sub>   | Output capacitance            | 2.5                     | 3.3                     |           |                        | 6   |     |              |     |      | pF |
| C <sub>PD</sub>  | Power dissipation capacitance | 2.5                     | 3.3                     | f = 10MHz |                        | 27  |     |              |     |      | pF |
|                  |                               | 1.8                     | 3.3                     |           |                        | 27  |     |              |     |      |    |
|                  |                               | 1.4                     | 2.5                     |           |                        | 23  |     |              |     |      |    |
|                  |                               | 1.4                     | 1.8                     |           |                        | 20  |     |              |     |      |    |
|                  |                               | 3.3                     | 1.8                     |           |                        | 27  |     |              |     |      |    |

Note: 1 C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average current can be obtained by the following equation. I<sub>CC(opr)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>IN</sub> + I<sub>CC</sub>/4 (per circuit)



## 5 Test circuit

Figure 4. Test circuit

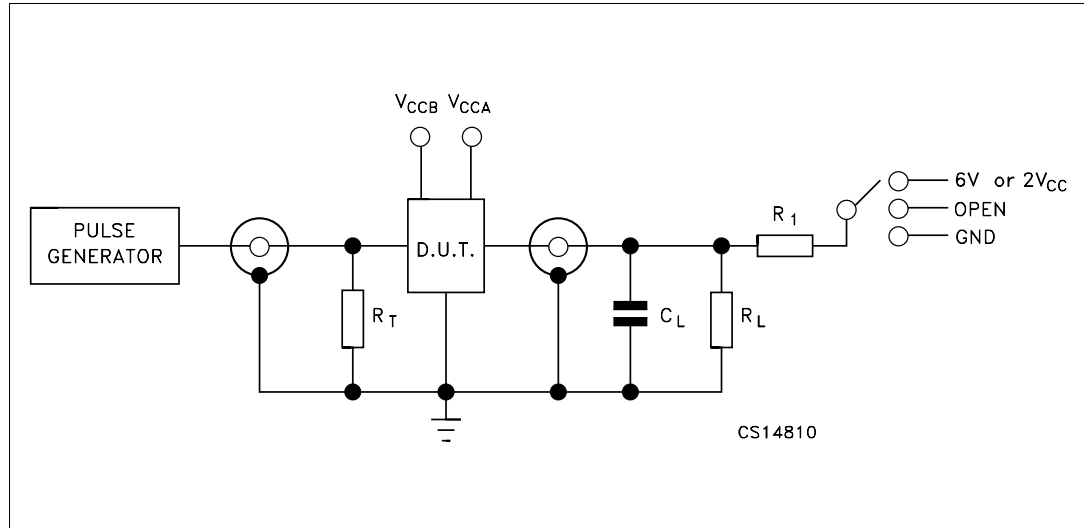


Table 8. Test circuit

| Test                  | Switch |
|-----------------------|--------|
| $t_{PLH}$ , $t_{PHL}$ | Open   |

$C_L = 10/30pF$  or equivalent (includes jig and probe capacitance)

$R_L = R_1 = 500\Omega$  or equivalent

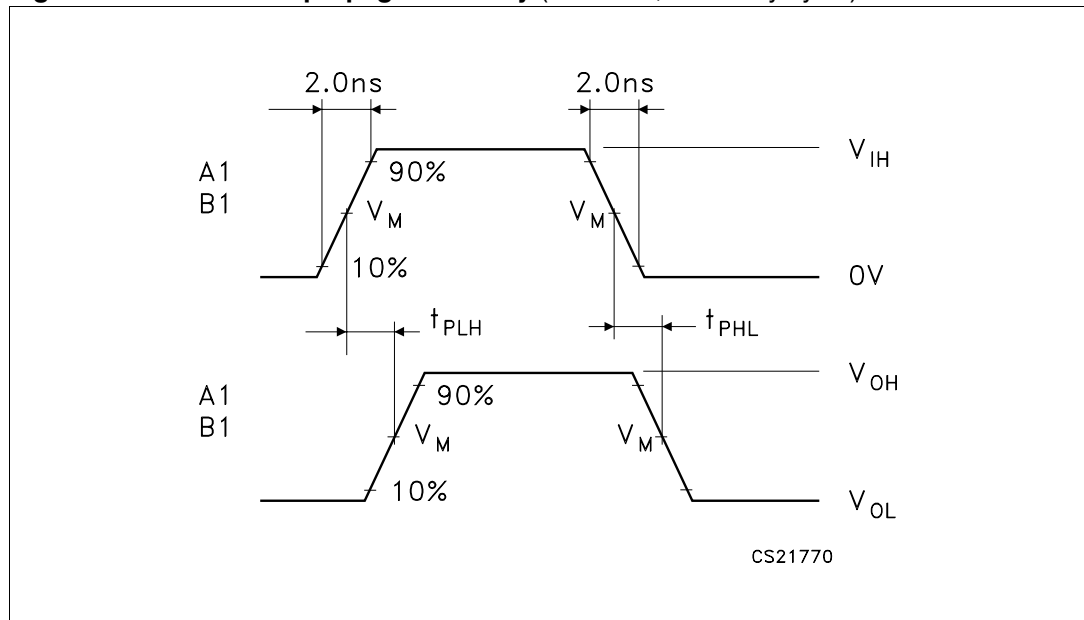
$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

# 6 Waveforms

**Table 9. Waveform symbol value**

| Symbol          | V <sub>CC</sub>        |                         |                         |
|-----------------|------------------------|-------------------------|-------------------------|
|                 | 3.0 to 3.6V            | 2.3 to 2.7V             | 1.65 to 1.95V           |
| V <sub>IH</sub> | V <sub>CC</sub>        | V <sub>CC</sub>         | V <sub>CC</sub>         |
| V <sub>M</sub>  | 1.5V                   | V <sub>CC</sub> /2      | V <sub>CC</sub> /2      |
| V <sub>X</sub>  | V <sub>OL</sub> + 0.3V | V <sub>OL</sub> + 0.15V | V <sub>OL</sub> + 0.15V |
| V <sub>Y</sub>  | V <sub>OL</sub> - 0.3V | V <sub>OL</sub> - 0.15V | V <sub>OL</sub> - 0.15V |

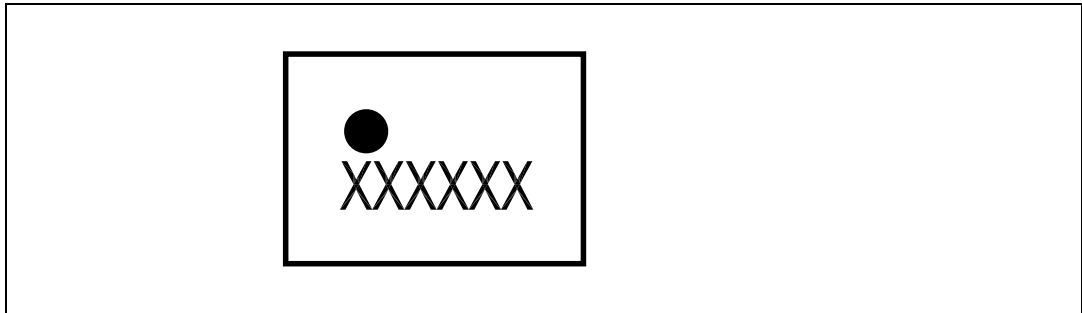
**Figure 5. Waveform - propagation delay (f = 1MHz; 50% duty cycle)**



## 7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

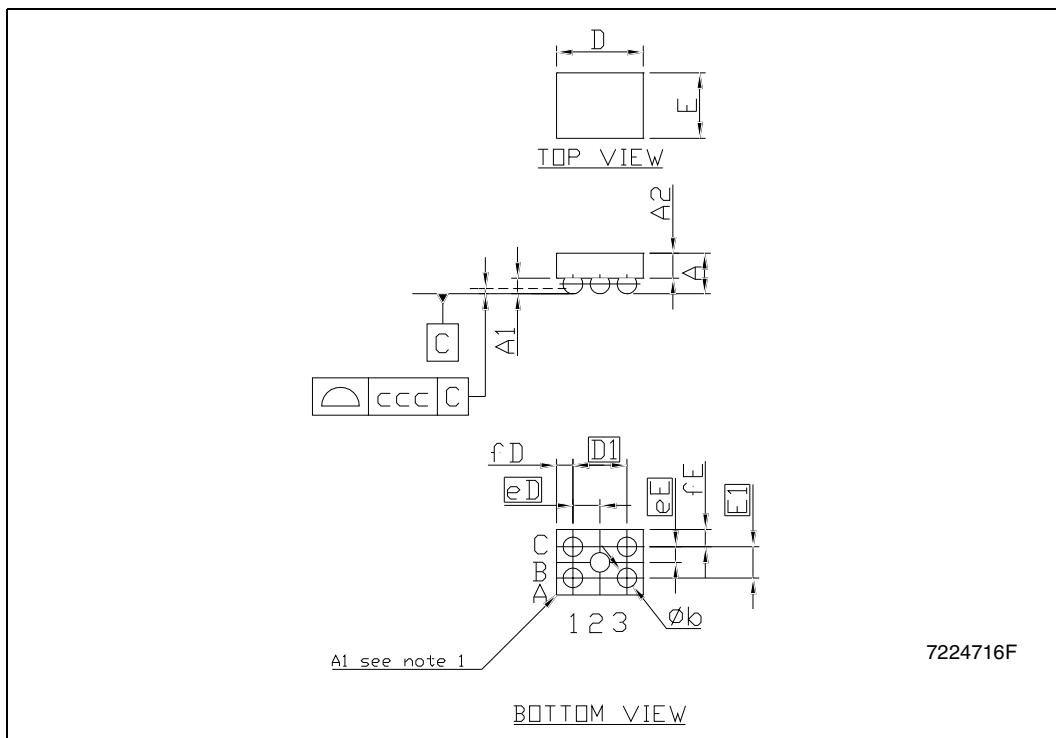
**Figure 6. Marking**



*Note:* X = Marking Area; Marking Code 9537

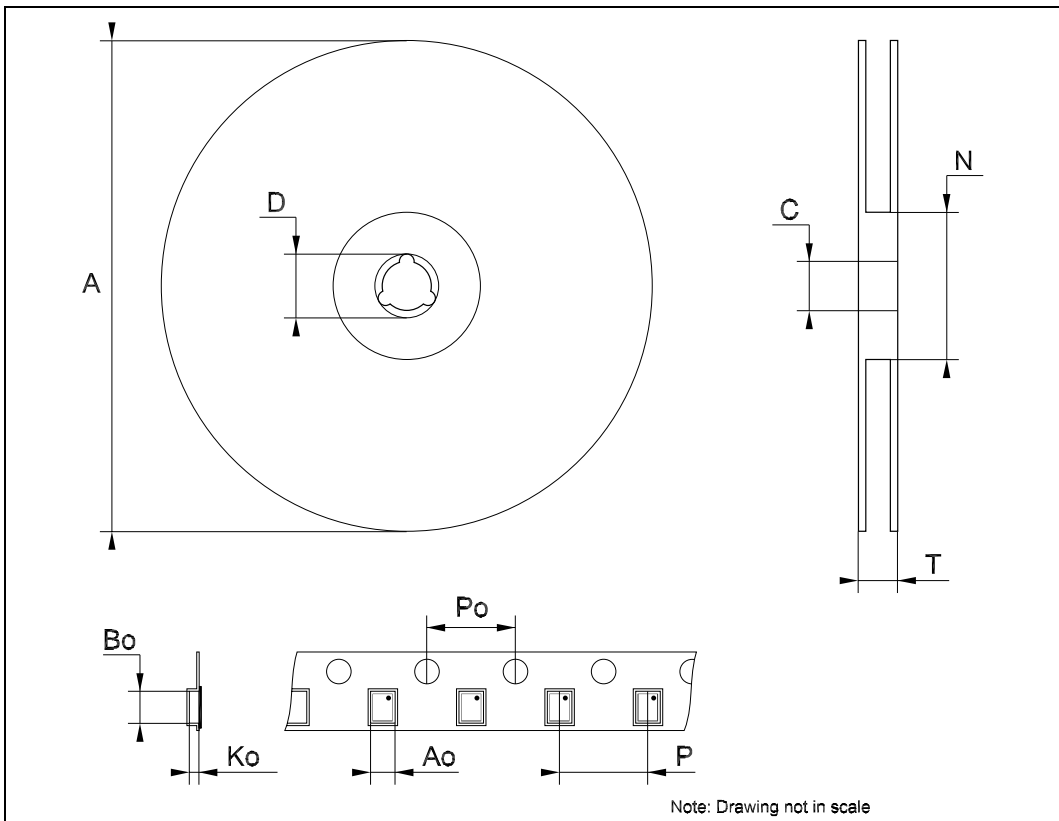
**Flip-Chip 5 MECHANICAL DATA**

| DIM. | mm.   |       |       | mils |      |      |
|------|-------|-------|-------|------|------|------|
|      | MIN.  | TYP   | MAX.  | MIN. | TYP. | MAX. |
| A    | 0.585 | 0.65  | 0.715 | 23.0 | 25.6 | 28.1 |
| A1   | 0.21  | 0.25  | 0.29  | 8.3  | 9.8  | 11.4 |
| a2   |       | 0.40  |       |      | 15.7 |      |
| b    | 0.265 | 0.315 | 0.365 | 10.4 | 12.4 | 14.4 |
| D    | 1.31  | 1.36  | 1.41  | 51.6 | 53.5 | 55.5 |
| D1   |       | 0.866 |       |      | 34.1 |      |
| E    | 0.97  | 1.02  | 1.07  | 38.2 | 40.2 | 42.1 |
| E1   |       | 0.5   |       |      | 19.7 |      |
| eD   | 0.383 | 0.433 | 0.483 | 15.1 | 17.0 | 19.0 |
| eE   | 0.20  | 0.25  | 0.30  | 7.9  | 9.8  | 11.8 |
| fD   |       | 0.247 |       |      | 9.7  |      |
| fE   |       | 0.260 |       |      | 10.2 |      |
| ccc  |       | 0.080 |       |      | 3.1  |      |



**Tape & Reel Flip-Chip 5 MECHANICAL DATA**

| DIM. | mm.  |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      |      | 178  |       |       | 6.926 |
| C    | 12.8 |      | 13.2 | 0.504 |       | 0.519 |
| D    | 20.2 |      |      | 0.795 |       |       |
| N    | 49   | 50   | 51   | 1.929 | 1.969 | 2.008 |
| T    |      |      | 12.4 |       |       | 0.488 |
| Ao   | 1.60 | 1.65 | 1.70 | 0.063 | 0.065 | 0.067 |
| Bo   | 1.27 | 1.32 | 1.37 | 0.050 | 0.052 | 0.054 |
| Ko   | 0.76 | 0.81 | 0.86 | 0.030 | 0.032 | 0.034 |
| Po   | 3.9  | 4    | 4.1  | 0.153 | 0.157 | 0.161 |
| P    | 3.9  | 4    | 4.1  | 0.153 | 0.157 | 0.161 |



## 8 Revision history

Table 10. Revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 14-Oct-2004 | 1        | First release.  |
| 20-Dec-2004 | 2        | Revision on <a href="#">Table 3</a> .   |
| 11-Feb-2005 | 3        | Add Tape & Reel, Figures 2, 3, 5, 6, <a href="#">Table 3, 5, 7</a> and Mechanical Data has been modified. |
| 30-Mar-2005 | 4        | Add features ==> Max data rates.  |
| 09-May-2005 | 5        | <a href="#">Table 7</a> and <a href="#">Table 8</a> have been updated.                                    |
| 16-Aug-2006 | 6        | New template, updated test condition $V_{OHA}$ <a href="#">Table 5</a>                                    |

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