

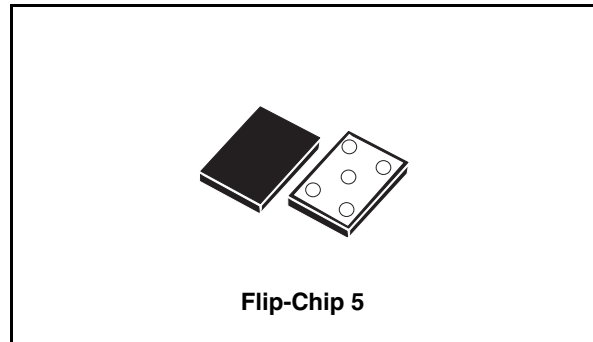


ST1G3234B

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

Features

- High speed: $t_{PD} = 4.0$ ns (max.) at $T_A = 85$ °C
 $V_{CCB} = 1.65$ V; $V_{CCA} = 3.0$ V
- Low power dissipation:
 $I_{CCA} = I_{CCB} = 5$ μ A (max.) at $T_A = 85$ °C
- Symmetrical output impedance:
 $I_{OHA} = I_{OLA} = 10$ mA min at
 $V_{CCA} = 2.75$ V; $V_{CCB} = 1.4$ to 3.6 V
 $I_{OHA} = I_{OLA} = 6$ mA min. at
 $V_{CCA} = 2.3$ V; $V_{CCB} = 1.4$ to 3.6 V
- Balanced propagation delays:
 $t_{PLH} \cong t_{PHL}$
- Power-down protection on inputs and outputs
- 26 Ω series resistor on A-side outputs
- Operating voltage range:
 - V_{CCA} (opr.) = 1.4 to 3.6 V
 - V_{CCB} (opr.) = 1.4 to 3.6 V
- Allows partial power-down when $V_{CCA} = 0$,
device consumes very low quiescent current
- Max data rates:
 - 380 Mbps (1.8 to 3.3 V translation)
 - 260 Mbps (<1.8 to 3.3 V translation)
 - 260 Mbps (translates to 2.5 V)
 - 210 Mbps (translates to 1.5 V)
- Latch-up performance exceeds 500 mA
(JESD 17)
- ESD performance:
HBM > 2000 V (MIL STD 883 method 3015);
MM > 200 V
- RoHS compliant to Flip-Chip package



Description

The ST1G3234B is a dual supply low voltage CMOS 1-bit bus buffer level translator fabricated with sub-micron silicon gate and five-layer metal wiring C²MOS technology. Designed for use as an interface between a 3.3 V bus and a 2.5 V or 1.8 V bus in a mixed 3.3 V/ 1.8 V, 3.3 V/ 2.5 V, 1.8 V/ 1.4 V and 2.5 V/ 1.8 V supply systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The ST1G3234B 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.

The ST1G3234B is $V_{CCA} = 0$ V tolerant, achieving very low current consumption when the V_{CCA} is grounded.

Table 1. Device summary

| Order code | Package | Comments |
|--------------|-------------|---------------------|
| ST1G3234BBJR | Flip-Chip 5 | 4000 parts per reel |

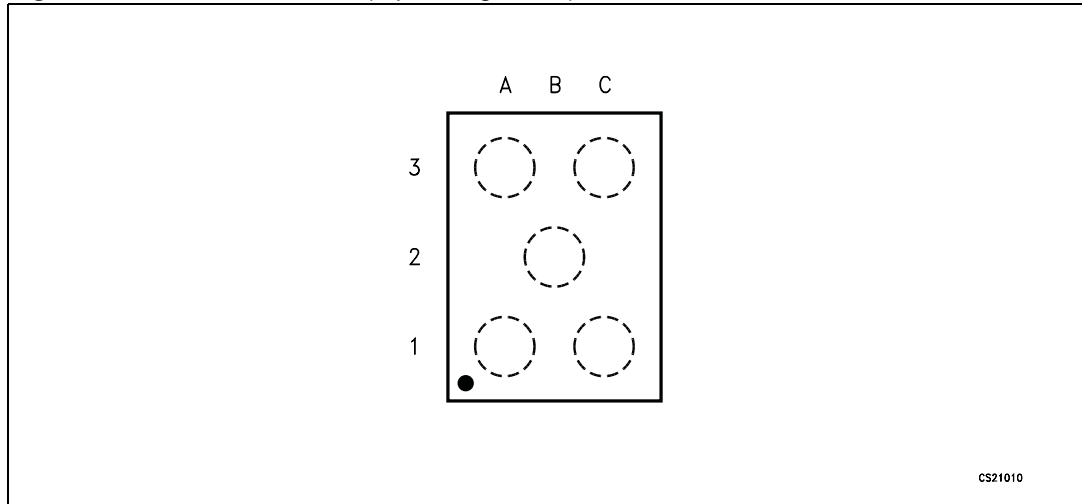
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1 Pin settings

1.1 Pin connection

Figure 1. Pin connection (top through view)



1.2 Pin description

Table 2. Pin description

| Pin number | 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

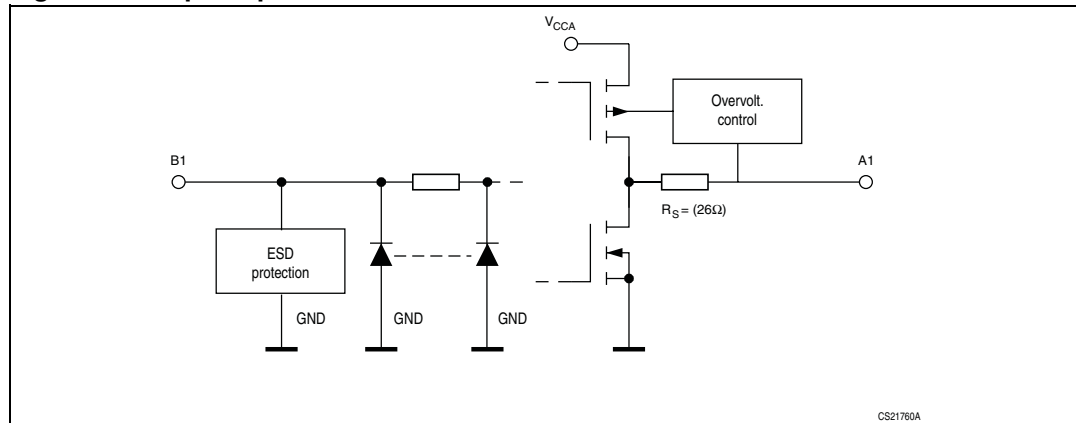


Figure 3. Logic diagram

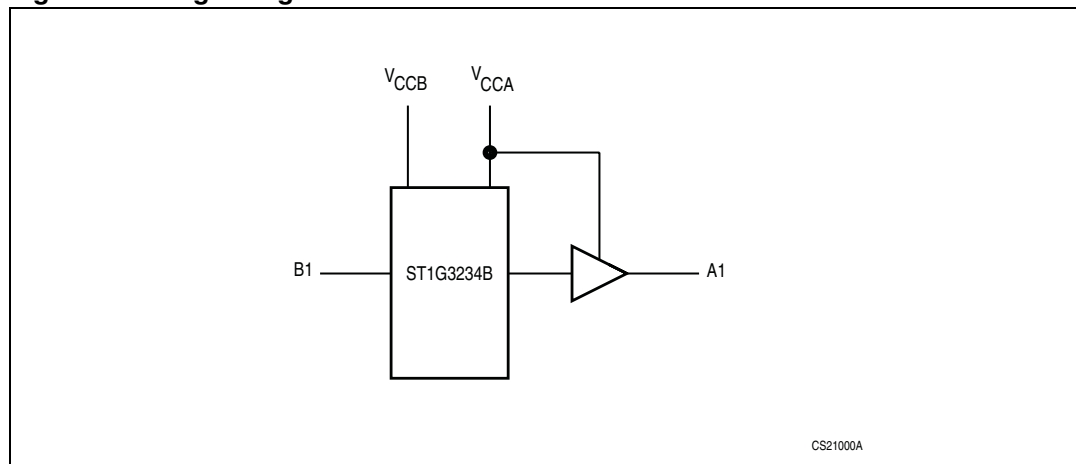


Table 3. Truth table

| Inputs B1 (V_{CCB} referred) | Outputs A1 (V_{CCA} 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 4. 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 (power down mode: $V_{CCA}=V_{CCB}=Gnd$) | -0.5 to +4.6 | V |
| V_{IB} | DC input voltage (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 | ± 50 | mA |
| I_{CCA} | DC V_{CCA} or ground current | ± 100 | mA |
| I_{CCB} | DC V_{CCB} or ground current | ± 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 5. 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 | $V_{CCB} = 3.0$ to 3.6 V | 0 to 10 | ns/V |
| | | $V_{CCB} = 2.3$ to 2.7 V | 0 to 20 | ns/V |
| | | $V_{CCB} = 1.2$ to 1.95 V | 0 to 100 | ns/V |

4 Electrical characteristics

Table 6. DC specification

| Symbol | Parameter | Test condition | | | Value | | | | Unit |
|-----------|---------------------------|---------------------------------|---------------------------------|--|----------------------|----------------|----------------|----------------|---------------|
| | | V_{CCB} (V) ⁽¹⁾ | V_{CCA} (V) ⁽¹⁾ | | $T_A = 25\text{ °C}$ | | -40 to 85 °C | | |
| | | | | | Min | Max | Min | Max | |
| V_{IHB} | High level input voltage | 1.4 | 1.4 to 3.6 | | 0.65 V_{CCB} | | 0.65 V_{CCB} | | V |
| | | 1.8 | | 0.65 V_{CCB} | | 0.65 V_{CCB} | | | |
| | | 2.5 | | 1.6 | | 1.6 | | | |
| | | 3.3 | | 2.0 | | 2.0 | | | |
| V_{ILB} | Low level input voltage | 1.4 | 1.4 to 3.6 | | | 0.35 V_{CCB} | | 0.35 V_{CCB} | V |
| | | 1.8 | | | 0.35 V_{CCB} | | 0.35 V_{CCB} | | |
| | | 2.5 | | | 0.7 | | 0.7 | | |
| | | 3.3 | | | 0.8 | | 0.8 | | |
| V_{OHA} | High level output voltage | 1.4 to 3.6 | 1.4 | $I_O = -100\ \mu\text{A}$ | 1.2 | | 1.2 | | V |
| | | | 2.75 | $I_O = -10\ \text{mA}$ | 2.2 | | 2.2 | | |
| | | | 2.3 | $I_O = -6\ \text{mA}$ | 1.8 | | 1.8 | | |
| | | | 1.65 | $I_O = -2\ \text{mA}$ | 1.4 | | 1.4 | | |
| | | | 1.4 | $I_O = -1\ \text{mA}$ | 1.1 | | 1.1 | | |
| V_{OLA} | Low level output voltage | 1.4 to 3.6 | 1.4 | $I_O = -100\ \mu\text{A}$ | | 0.20 | | 0.20 | V |
| | | | 2.75 | $I_O = 1\ \text{mA}$ | | 0.40 | | 0.40 | |
| | | | 2.75 | $I_O = 10\ \text{mA}$ | | 0.55 | | 0.55 | |
| | | | 2.3 | $I_O = 6\ \text{mA}$ | | 0.40 | | 0.40 | |
| | | | 1.65 | $I_O = 2\ \text{mA}$ | | 0.25 | | 0.25 | |
| | | | 1.4 | $I_O = 1\ \text{mA}$ | | 0.20 | | 0.20 | |
| I_{IB} | Input leakage current | 2.7 | 3.6 | $V_{IB} = V_{CCB}$ or GND | | ± 0.5 | | ± 5 | μA |
| | | 1.4 | 2.7 | $V_{IB} = 3.6\ \text{V}$ or GND | | ± 0.5 | | ± 5 | μA |
| I_{OFF} | Power OFF leakage current | 0 | 0 | $V_{IB} = \text{GND to } 3.6\ \text{V}$ $V_{OA} = \text{GND to } 3.6\ \text{V}$ | | ± 1.0 | | ± 10 | μA |

Table 6. DC specification (continued)

| Symbol | Parameter | Test condition | | | Value | | | | Unit |
|------------------|--------------------------|--|--|--|------------------------|-----|--------------|-----|------|
| | | V _{CCB} (V) ⁽¹⁾ | V _{CCA} (V) ⁽¹⁾ | V _{IB} = V _{CCB} or GND | T _A = 25 °C | | -40 to 85 °C | | |
| | | | | | Min | Max | Min | Max | |
| I _{CCB} | Quiescent supply current | 1.4 to 3.6 | 1.4 to 3.6 | V _{IB} = V _{CCB} or GND | 0.5 | | 5 | μA | |
| | | 1.4 to 3.6 | 0 | | | | | | |
| I _{CCA} | Quiescent supply current | 1.4 to 3.6 | 1.4 to 3.6 | V _{IB} = V _{CCB} or GND | 0.5 | | 5 | μA | |

1. V_{CC} range = 1.8 ± 0.15 V; 2.5 ± 0.2 V; 3.3 ± 0.3 V

Table 7. AC electrical characteristics

| Symbol | Parameter | Test condition | | | Value | | Unit |
|-----------------------------------|---------------------------------|-------------------------|-------------------------|--|--------------|-----|------|
| | | V _{CCB} (V) | V _{CCA} (V) | C _L | -40 to 85 °C | | |
| | | | | | Min | Max | |
| t _{PLH} t _{PHL} | Propagation delay time B1 to A1 | 2.3 to 3.6 | 1.4 | C _L = 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 _{PLH} t _{PHL} | Propagation delay time B1 to A1 | 2.3 to 3.6 | 1.4 | C _L = 30 pF R _L = 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 8. Capacitance characteristics

| Symbol | Parameter | Test condition | | | Value | | | | | Unit |
|------------------|-------------------------------|-------------------------|-------------------------|------------|------------------------|-----|-----|--------------|-----|------|
| | | V _{CCB} (V) | V _{CCA} (V) | | T _A = 25 °C | | | -40 to 85 °C | | |
| | | | | | Min | Typ | Max | Min | Max | |
| C _{INB} | Input capacitance | open | open | | | 5 | | | | pF |
| C _O | Output capacitance | 2.5 | 3.3 | | | 6 | | | | pF |
| C _{PD} | Power dissipation capacitance | 2.5 | 3.3 | f = 10 MHz | | 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_{PD} is defined as the value of the device'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: $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$ (per circuit)

5 Test circuit

Figure 4. Test circuit

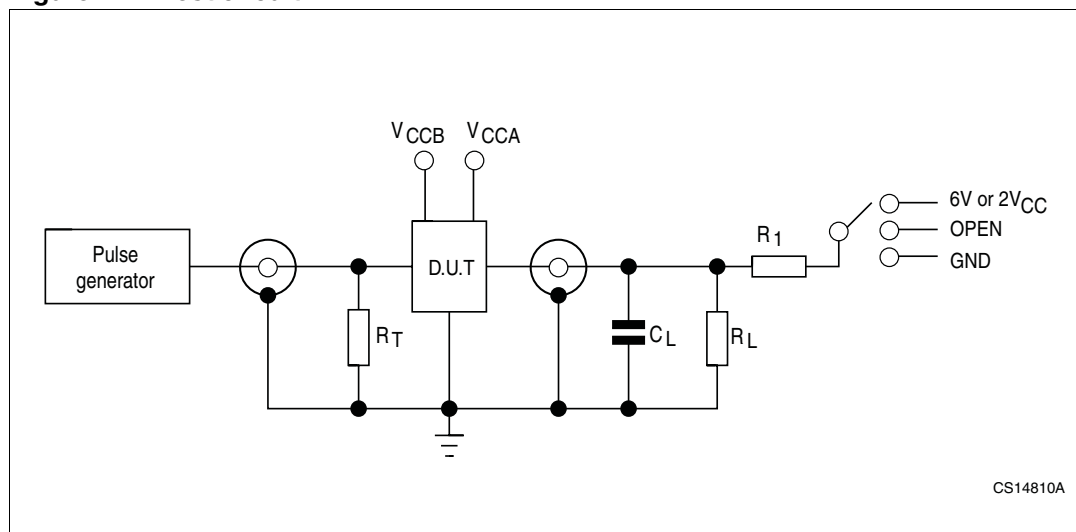


Table 9. Test circuit

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

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

$R_L = R_1 = 500 \Omega$ or equivalent

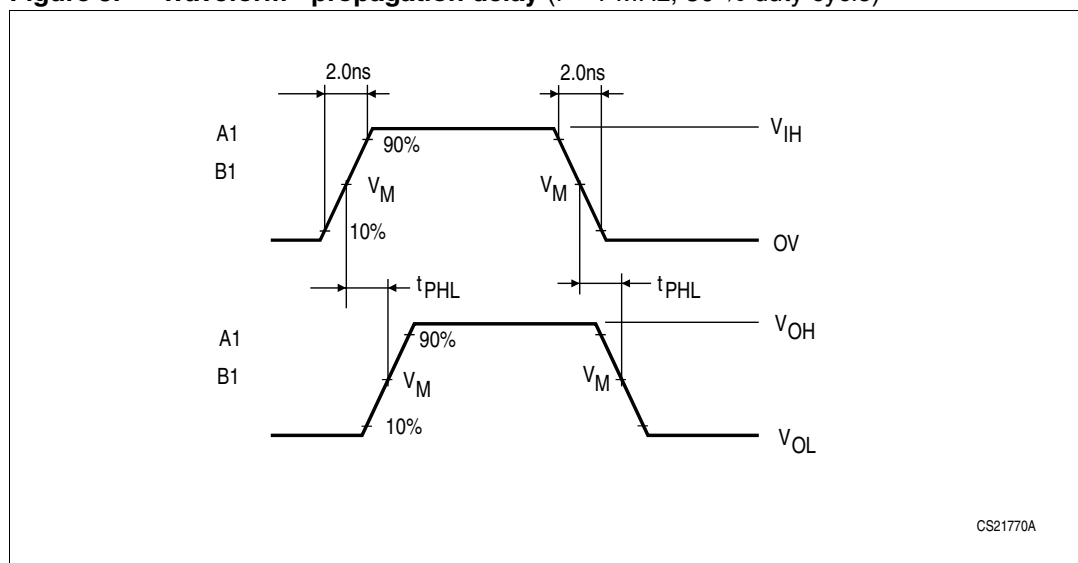
$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

6 Waveforms

Table 10. Waveform symbol value

| Symbol | V _{CC} | | |
|-----------------|-----------------|--------------------|--------------------|
| | 3.0 to 3.6 V | 2.3 to 2.7 V | 1.65 to 1.95 V |
| V _{IH} | V _{CC} | V _{CC} | V _{CC} |
| V _M | 1.5 V | V _{CC} /2 | V _{CC} /2 |

Figure 5. Waveform - propagation delay (f = 1 MHz; 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.

Figure 6. Marking

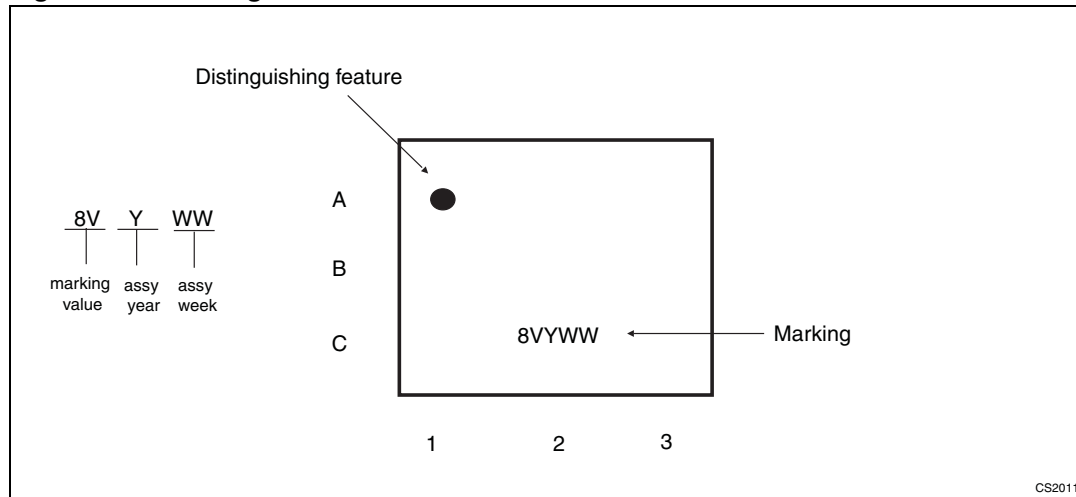


Figure 7. Flip-Chip 5 package outline

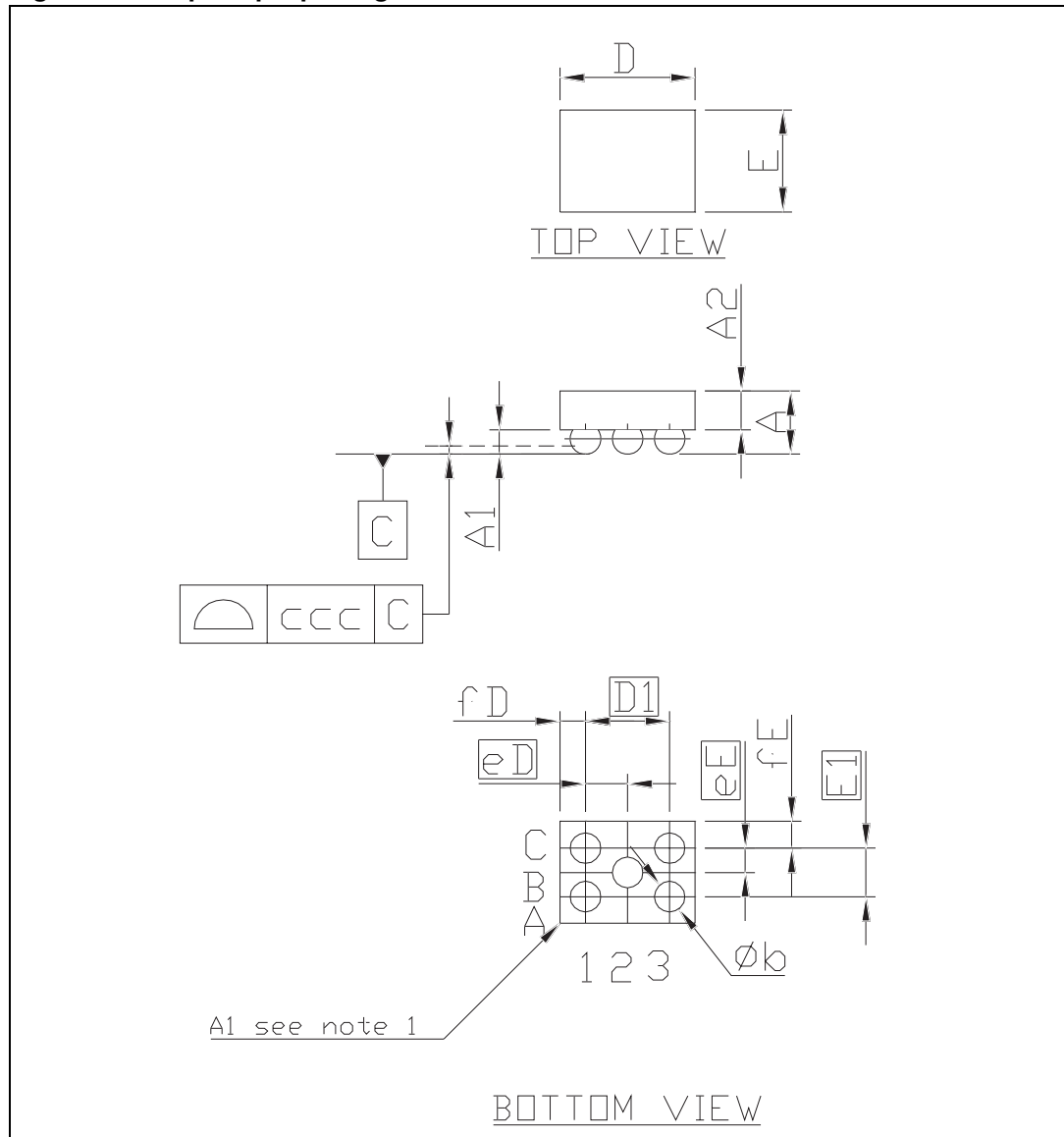
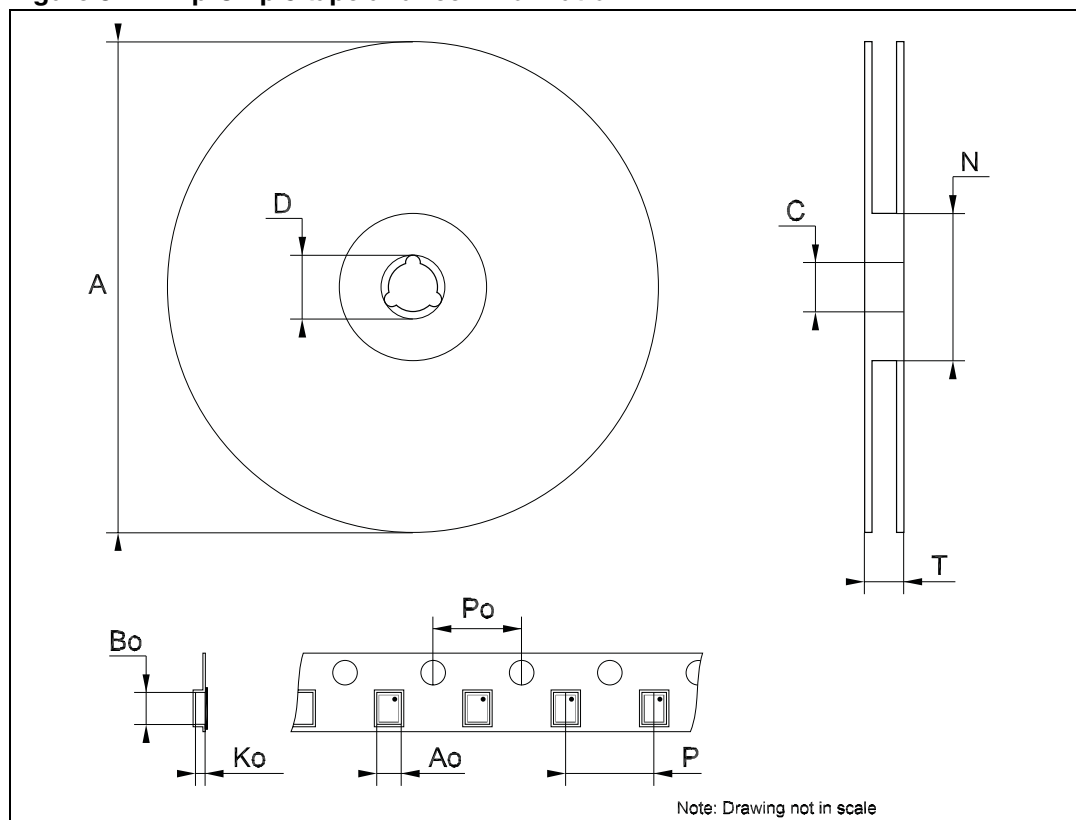


Table 11. Flip-Chip 5 mechanical data

| Symbol | millimeters | | | mils | | |
|--------|-------------|-------|-------|------|------|------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.585 | 0.65 | 0.714 | 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 | | 9.866 | | | 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 | |

Figure 8. Flip-Chip 5 tape and reel information



1. Drawing not to scale.

Table 12. Flip-Chip 5 tape and reel mechanical data

| Symbol | millimeters | | | inches | | |
|--------|-------------|------|------|--------|-------|-------|
| | 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 13. Document revision history

| Date | Revision | Changes |
|------------|----------|--|
| 1-Aug-2007 | 1 | Initial release. |
| 3-Dec-2007 | 2 | Changed t_{PD} value from 4.4 ns to 4.0 ns, removed footnote in Table 5: Recommended operating conditions on page 6 , updated V_{OLA} value at $V_{CCA} = 1.4$ V, changed symbol names for quiescent supply current and minor text changes in Table 6: DC specification on page 7 , removed V_X and V_Y waveforms data in Table 10: Waveform symbol value on page 11 , replaced Figure 6: Marking on page 12 and enlarged Figure 7: Flip-Chip 5 package outline on page 13 to improve readability. |

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