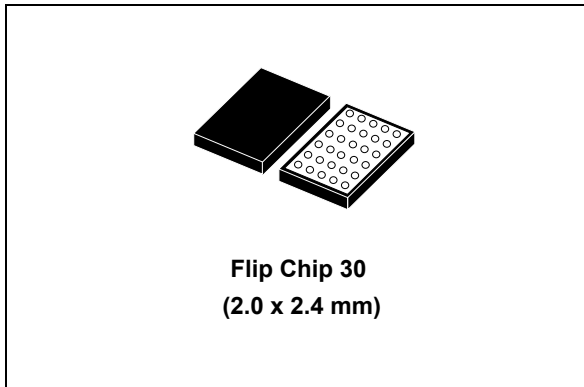


## Low voltage high bandwidth quad DPDT switch

Datasheet - production data



### Features

- Ultralow power dissipation
  - $I_{CC} = 1 \mu\text{A}$  (max.) at  $T_A = 85^\circ\text{C}$
- Low “ON” resistance
  - $R_{ON} = 5.4 \Omega$  ( $T_A = 25^\circ\text{C}$ ) at  $V_{CC} = 4.3 \text{ V}$
  - $R_{ON} = 6.6 \Omega$  ( $T_A = 25^\circ\text{C}$ ) at  $V_{CC} = 3.0 \text{ V}$
- Wide operating voltage range
  - $V_{CC}$  (OPR.) = 1.65 V to 4.3 V
- 4.3 V tolerant and 1.8 V compatible threshold on digital control input at  $V_{CC} = 2.3 \text{ V}$  to 3.0 V
- 4 select pins controlling 2 switches each
- Typical bandwidth (-3 dB) at 800 MHz on all channels
- USB (2.0) high speed (480 Mbps) signal switching compliant
- Integrated fail safe function
- Latch-up performance exceeds 100 mA per JESD 78, Class II
- ESD performance exceeds JESD22 2000-V human body model (A114-A)

### Applications

- Mobile phones

### Description

The STG3820 device is a high-speed CMOS low voltage quad analog DPDT (dual pole dual throw) switch or 2:1 multiplexer/demultiplexer switch fabricated in silicon gate C<sup>2</sup>MOS technology. It is designed to operate from 1.65 V to 4.3 V, making this device ideal for portable applications.

The SELm-n input is provided to control the switches. The switches nS1 and mS1 are ON (connected to common ports Dn and Dm respectively) when the SELm-n input is held high and OFF (high impedance state exists between the two ports) when the SELm-n is held low. The switches nS2 and mS2 are ON (connected to common port Dn and Dm respectively) when the SELm-n input is held low and OFF (high impedance state exists between the two ports) when the SELm-n is held high.

The STG3820 device has an integrated fail safe function to withstand overvoltage condition when the device is powered off. Additional key features are fast switching speed, break-before-make-delay time and ultralow power consumption. All inputs and outputs are equipped with protection circuits against static discharge, giving them ESD immunity and transient excess voltage.

**Table 1. Device summary**

| Order code | Package                        | Packing       |
|------------|--------------------------------|---------------|
| STG3820BJR | Flip Chip 30<br>(2.0 x 2.4 mm) | Tape and reel |

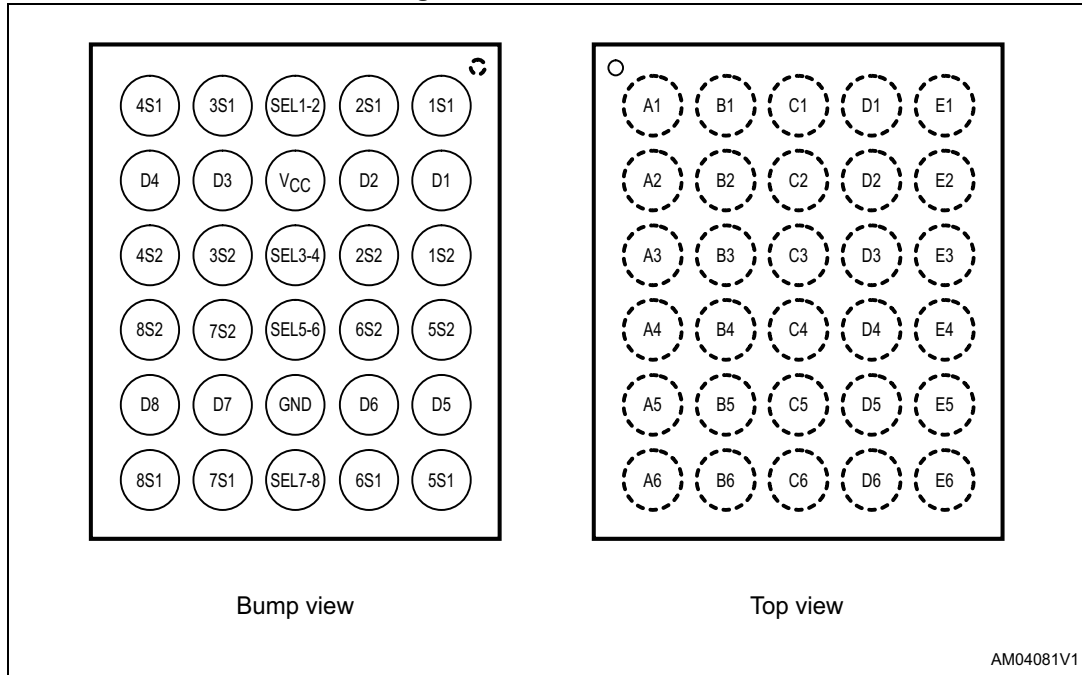
# Contents

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# 1 Pin settings

## 1.1 Pin connection

Figure 1. Pin connection



AM04081V1

## 1.2 Pin description

Table 2. Pin assignment

| Pin number | Symbol | Name and function                |
|------------|--------|----------------------------------|
| A1         | 1S1    | Independent channel for switch 1 |
| A2         | D1     | Common channel for switch 1      |
| A3         | 1S2    | Independent channel for switch 1 |
| A4         | 5S2    | Independent channel for switch 5 |
| A5         | D5     | Common channel for switch 5      |
| A6         | 5S1    | Independent channel for switch 5 |
| B1         | 2S1    | Independent channel for switch 2 |
| B2         | D2     | Common channel for switch 2      |
| B3         | 2S2    | Independent channel for switch 2 |
| B4         | 6S2    | Independent channel for switch 6 |
| B5         | D6     | Common channel for switch 6      |
| B6         | 6S1    | Independent channel for switch 6 |

Table 2. Pin assignment (continued)

| Pin number | Symbol | Name and function                |
|------------|--------|----------------------------------|
| C1         | SEL1-2 | Switch 1-2 selection control     |
| C2         | VCC    | Positive supply voltage          |
| C3         | SEL3-4 | Switch 3-4 selection control     |
| C4         | SEL5-6 | Switch 5-6 selection control     |
| C5         | GND    | Ground (0 V)                     |
| C6         | SEL7-8 | Switch 7-8 selection control     |
| D1         | 3S1    | Independent channel for switch 3 |
| D2         | D3     | Common channel for switch 3      |
| D3         | 3S2    | Independent channel for switch 3 |
| D4         | 7S2    | Independent channel for switch 7 |
| D5         | D7     | Common channel for switch 7      |
| D6         | 7S1    | Independent channel for switch 7 |
| E1         | 4S1    | Independent channel for switch 4 |
| E2         | D4     | Common channel for switch 4      |
| E3         | 4S2    | Independent channel for switch 4 |
| E4         | 8S2    | Independent channel for switch 8 |
| E5         | D8     | Common channel for switch 8      |
| E6         | 8S1    | Independent channel for switch 8 |

## 2 Logic diagram

Figure 2. Logic equivalent circuit

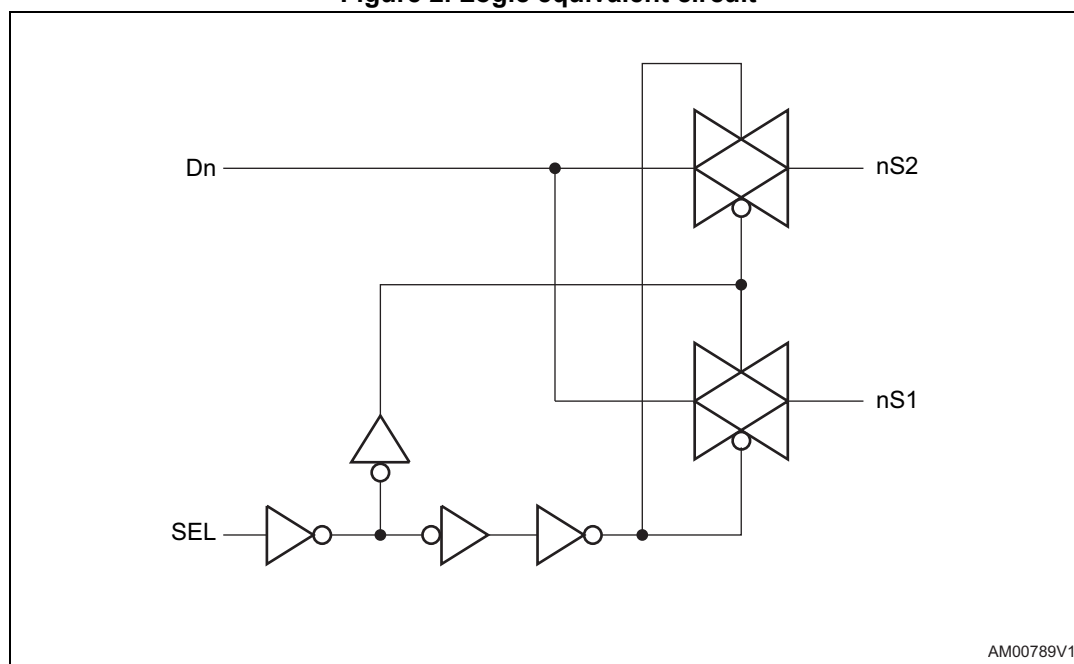


Table 3. Truth table

| SEL | Switch nS1         | Switch nS2         |
|-----|--------------------|--------------------|
| H   | ON                 | OFF <sup>(1)</sup> |
| L   | OFF <sup>(1)</sup> | ON                 |

1. High impedance.

### 3 Maximum ratings

Stressing the device above the rating listed in [Table 4: Absolute maximum ratings](#) 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 [Table 5: Recommended operating conditions](#) of this specification is not implied. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.

**Table 4. Absolute maximum ratings**

| Symbol                | Parameter  | Value                  | Unit |
|-----------------------|--|------------------------|------|
| $V_{CC}$              | Supply voltage   | -0.5 to 6.0            | V    |
| $V_I$                 | DC input voltage   | -0.5 to $V_{CC} + 0.5$ | V    |
| $V_{IC}$              | DC control input voltage                                 | -0.5 to 5.5            | V    |
| $V_O$                 | DC output voltage  | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IKC}$             | DC input diode current on control pin ( $V_{SEL} < 0$ V) | -50                    | mA   |
| $I_{IK}$              | DC input diode current ( $V_{SEL} < 0$ V)                | $\pm 50$               | mA   |
| $I_{OK}$              | DC output diode current                                  | $\pm 20$               | mA   |
| $I_O$                 | DC output current  | $\pm 128$              | mA   |
| $I_{OP}$              | DC output current peak (pulse at 1 ms, 10% duty cycle)   | $\pm 300$              | mA   |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or ground current                            | $\pm 100$              | mA   |
| $P_D$                 | Power dissipation at $T_A = 70$ °C                       | 1120                   | mW   |
| $T_{stg}$             | Storage temperature                                      | -65 to +150            | °C   |
| $T_L$                 | Lead temperature (10 sec.)                               | 300                    | °C   |

### Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol   | Parameter                              | Value                   | Unit    |      |
|----------|--|-------------------------|---------|------|
| $V_{CC}$ | Supply voltage                         | 1.65 to 4.3             | V       |      |
| $V_I$    | Input voltage                          | 0 to $V_{CC}$           | V       |      |
| $V_{IC}$ | Control input voltage                  | 0 to 4.3                | V       |      |
| $V_O$    | Output voltage                         | 0 to $V_{CC}$           | V       |      |
| $T_{op}$ | Operating temperature                  | -40 to 85               | °C      |      |
| dt/dv    | Input rise and fall time control input | $V_L = 1.65$ V to 2.7 V | 0 to 20 | ns/V |
|          |  | $V_L = 3.0$ V to 4.3 V  | 0 to 10 |      |

## 4 Electrical characteristics

Table 6. DC specifications

| Symbol            | Parameter   | V <sub>CC</sub> (V) | Test conditions  | Value                  |      |      |                 |      | Unit |
|-------------------|---|---------------------|--|------------------------|------|------|-----------------|------|------|
|                   |   |                     |  | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C    |      |      |
|                   |   |                     |  | Min.                   | Typ. | Max. | Min.            | Max. |      |
| V <sub>IH</sub>   | High level input voltage                            | 1.65 – 1.95         |  | 0.65                   | –    | –    | 0.65            | –    | V    |
|                   |   | 2.3 – 2.5           |  | V <sub>CC</sub>        | –    | –    | V <sub>CC</sub> | –    |      |
|                   |   | 2.7 – 3.0           |  | 1.2                    | –    | –    | 1.2             | –    |      |
|                   |   | 3.3 – 3.6           |  | 1.3                    | –    | –    | 1.3             | –    |      |
|                   |   | 4.3                 |  | 1.4                    | –    | –    | 1.4             | –    |      |
| V <sub>IL</sub>   | Low level input voltage                             | 1.65 – 1.95         |  | –                      | –    | 0.25 | –               | 0.25 | V    |
|                   |   | 2.3 – 2.5           |  | –                      | –    | 0.25 | –               | 0.25 |      |
|                   |   | 2.7 – 3.0           |  | –                      | –    | 0.25 | –               | 0.25 |      |
|                   |   | 3.3 – 3.6           |  | –                      | –    | 0.30 | –               | 0.30 |      |
|                   |   | 4.3                 |  | –                      | –    | 0.40 | –               | 0.40 |      |
| R <sub>PEAK</sub> | Switch ON peak resistance                           | 1.8                 | V <sub>S</sub> = 0 V to V <sub>CC</sub><br>I <sub>S</sub> = 8 mA | –                      | 17.0 | 19.6 | –               | –    | Ω    |
|                   |   | 2.7                 |  | –                      | 7.5  | 8.7  | –               | –    |      |
|                   |   | 3.0                 |  | –                      | 6.6  | 7.6  | –               | –    |      |
|                   |   | 3.7                 |  | –                      | 5.8  | 6.7  | –               | –    |      |
|                   |   | 4.3                 |  | –                      | 5.4  | 6.2  | –               | –    |      |
| R <sub>ON</sub>   | Switch ON resistance                                | 3.0                 | V <sub>S</sub> = 3 V<br>I <sub>S</sub> = 8 mA                    | –                      | 5.1  | 5.8  | –               | –    | Ω    |
|                   |   | 3.0                 | V <sub>S</sub> = 0.4 V<br>I <sub>S</sub> = 8 mA                  | –                      | 6.3  | 7.3  | –               | –    |      |
| ΔR <sub>ON</sub>  | ON resistance match between channels <sup>(1)</sup> | 1.8                 | V <sub>S</sub> at R <sub>ON</sub> MAX<br>I <sub>S</sub> = 8 mA   | –                      | –    | –    | –               | –    | Ω    |
|                   |   | 2.7                 |  | –                      | –    | –    | –               | –    |      |
|                   |   | 3.0                 |  | –                      | 0.3  | –    | –               | –    |      |
|                   |   | 3.7                 |  | –                      | –    | –    | –               | –    |      |
|                   |   | 4.3                 |  | –                      | –    | –    | –               | –    |      |

Table 6. DC specifications (continued)

| Symbol            | Parameter   | V <sub>CC</sub> (V) | Test conditions  | Value                  |      |      |              |      | Unit |
|-------------------|---|---------------------|--|------------------------|------|------|--------------|------|------|
|                   |   |                     |  | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                   |   |                     |  | Min.                   | Typ. | Max. | Min.         | Max. |      |
| R <sub>FLAT</sub> | ON resistance flatness <sup>(2)</sup>                           | 1.8                 | V <sub>S</sub> = 0 V to 0.4 V<br>I <sub>S</sub> = 8 mA           | –                      | 4.5  | –    | –            | –    | Ω    |
|                   |   | 1.8                 | V <sub>S</sub> = 0 V to V <sub>CC</sub><br>I <sub>S</sub> = 8 mA | –                      | 9.5  | –    | –            | –    |      |
|                   |   | 2.7                 |  | –                      | 2.2  | –    | –            | –    |      |
|                   |   | 3.0                 |  | –                      | 1.8  | –    | –            | –    |      |
|                   |   | 3.7                 |  | –                      | 1.6  | –    | –            | –    |      |
|                   |   | 4.3                 |  | –                      | 1.6  | –    | –            | –    |      |
| I <sub>OFF</sub>  | OFF state leakage current (Sn), (D)                             | 4.3                 | V <sub>S</sub> = 0.3 or 4 V                                      | -20                    | –    | 20   | -100         | 100  | nA   |
| I <sub>IN</sub>   | Input leakage current   | 0 to 4.3            | V <sub>SEL</sub> = 0 to 4.3 V                                    | -0.2                   | –    | 0.2  | -1.0         | 1.0  | μA   |
| I <sub>CC</sub>   | Quiescent supply current  | 1.65 to 4.3         | V <sub>SEL</sub> = V <sub>CC</sub> or GND                        | -0.2                   | –    | 0.2  | -1.0         | 1.0  | μA   |
| I <sub>CCLV</sub> | Quiescent supply current for low voltage driving <sup>(3)</sup> | 4.3                 | V <sub>SEL</sub> = 1.65 V  | –                      | ±37  | ±50  | –            | ±100 | μA   |
|                   |   |                     | V <sub>SEL</sub> = 1.80 V  | –                      | ±33  | ±40  | –            | ±50  |      |
|                   |   |                     | V <sub>SEL</sub> = 2.60 V  | –                      | ±11  | ±20  | –            | ±30  |      |

1. ΔR<sub>ON</sub> = max. |mSN - nSN|, where m = 1 to 8 and n = 1 to 8, N = 1, 2.
2. Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges.
3. Measurement is for one SEL pin.



Table 7. AC electrical characteristics ( $C_L = 35 \text{ pF}$ ,  $R_L = 50 \text{ }\Omega$ ,  $t_r = t_f \leq 5 \text{ ns}$ )

| Symbol                | Parameter                    | $V_{CC}$ (V) | Test conditions   | Value                             |      |      |   |      | Unit |
|-----------------------|------------------------------|--------------|---|-----------------------------------|------|------|---|------|------|
|                       |                              |              |   | $T_A = 25 \text{ }^\circ\text{C}$ |      |      | $-40 \text{ to } 85 \text{ }^\circ\text{C}$ |      |      |
|                       |                              |              |   | Min.                              | Typ. | Max. | Min.  | Max. |      |
| $t_{PLH}$ , $t_{PHL}$ | Propagation delay            | 1.65 - 1.95  |   | –                                 | 0.21 | –    | –   | –    | ns   |
|                       |                              | 2.3 - 2.7    |   | –                                 | 0.15 | –    | –   |      |      |
|                       |                              | 3.0 - 3.3    |   | –                                 | 0.14 | –    | –   |      |      |
|                       |                              | 3.6 - 4.3    |   | –                                 | 0.13 | –    | –   |      |      |
| $t_{ON}$              | Turn-on time                 | 1.65 - 1.95  | $V_S = 0.8 \text{ V}$   | –                                 | 36   | –    | –   | –    | ns   |
|                       |                              | 2.3 - 2.7    | $V_S = 1.5 \text{ V}$   | –                                 | 20   | 23   | –   | 26   |      |
|                       |                              | 3.0 - 3.3    |   | –                                 | 15   | 17   | –   | 20   |      |
|                       |                              | 3.6 - 4.3    |   | –                                 | 13   | 15   | –   | 17   |      |
| $t_{OFF}$             | Turn-off time                | 1.65 - 1.95  | $V_S = 0.8 \text{ V}$   | –                                 | 29   | –    | –   | –    | ns   |
|                       |                              | 2.3 - 2.7    | $V_S = 1.5 \text{ V}$   | –                                 | 19   | 22   | –   | 25   |      |
|                       |                              | 3.0 - 3.3    |   | –                                 | 14   | 16   | –   | 18   |      |
|                       |                              | 3.6 - 4.3    |   | –                                 | 11   | 13   | –   | 14   |      |
| $t_D$                 | Break-before-make time delay | 1.65 - 1.95  | $C_L = 35 \text{ pF}$<br>$R_L = 50 \text{ }\Omega$<br>$V_S = 1.5 \text{ V}$       | –                                 | 10   | –    | –   | –    | ns   |
|                       |                              | 2.3 - 2.7    |   | –                                 | 7    | –    | –   |      |      |
|                       |                              | 3.0 - 3.3    |   | –                                 | 6    | –    | –   |      |      |
|                       |                              | 3.6 - 4.3    |   | –                                 | 4    | –    | –   |      |      |
| Q                     | Charge injection             | 1.65         | $C_L = 100 \text{ pF}$<br>$V_{GEN} = 0 \text{ V}$<br>$R_{GEN} = 0 \text{ }\Omega$ | –                                 | 3.9  | –    | –   | –    | pC   |
|                       |                              | 2.3          |   | –                                 | 4.8  | –    | –   |      |      |
|                       |                              | 3.0          |   | –                                 | 5.2  | –    | –   |      |      |
|                       |                              | 4.3          |   | –                                 | 6.4  | –    | –   |      |      |

Table 8. AC electrical characteristics ( $C_L = 5 \text{ pF}$ ,  $R_L = 50 \text{ } \Omega$ ,  $T_A = 25 \text{ } ^\circ\text{C}$ )

| Symbol   | Parameter                     | $V_{CC}$ (V) | Test conditions   | Value                              |      |      |  |      | Unit |
|----------|-------------------------------|--------------|---|------------------------------------|------|------|--|------|------|
|          |                               |              |   | $T_A = 25 \text{ } ^\circ\text{C}$ |      |      | $-40 \text{ to } 85 \text{ } ^\circ\text{C}$ |      |      |
|          |                               |              |   | Min.                               | Typ. | Max. | Min.   | Max. |      |
| OIRR     | OFF isolation <sup>(1)</sup>  | 1.65 – 4.3   | $V_S = 1 \text{ V}_{RMS}$ ,<br>$f = 1 \text{ MHz}$<br>signal = 0 dBm  | –                                  | -78  | –    | –  | –    | dB   |
|          |                               |              | $V_S = 1 \text{ V}_{RMS}$ ,<br>$f = 10 \text{ MHz}$<br>signal = 0 dBm | –                                  | -57  | –    | –  | –    |      |
| Xtalk    | Crosstalk                     | 1.65 – 4.3   | $V_S = 1 \text{ V}_{RMS}$ ,<br>$f = 1 \text{ MHz}$<br>signal = 0 dBm  | –                                  | -78  | –    | –  | –    | dB   |
|          |                               |              | $V_S = 1 \text{ V}_{RMS}$ ,<br>$f = 10 \text{ MHz}$<br>signal = 0 dBm | –                                  | -58  | –    | –  | –    |      |
| BW       | -3dB bandwidth                | 3.0 – 4.3    | $R_L = 50 \text{ } \Omega$<br>signal = 0 dBm                          | –                                  | 800  | –    | –  | –    | MHz  |
| $C_{IN}$ | Control pin input capacitance |              | $V_{CC} = 0 \text{ V}$  | –                                  | 2    | –    | –  | –    | pF   |
| $C_{Sn}$ | Sn port capacitance           | 3.3          | F = 240 MHz,<br>switch is enabled                                     | –                                  | 6    | –    | –  | –    | pF   |
|          |                               |              | F = 240 MHz,<br>switch is disabled                                    | –                                  | 2    | –    | –  | –    |      |
| $C_D$    | D port capacitance            | 3.3          | F = 240 MHz   | –                                  | 8    | –    | –  | –    | pF   |

1. Off isolation =  $20 \text{ Log}_{10} (V_D/V_S)$ ,  $V_D$  = output,  $V_S$  = input to off switch.

Table 9. USB related AC electrical characteristics

| Symbol             | Parameter                                      | V <sub>CC</sub> (V) | Test conditions  | Value                  |      |      |              |      | Unit |
|--------------------|--|---------------------|--|------------------------|------|------|--------------|------|------|
|                    |  |                     |  | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                    |  |                     |  | Min.                   | Typ. | Max. | Min.         | Max. |      |
| t <sub>SK(0)</sub> | Channel-to-channel skew                        | 3.0 - 3.6           | C <sub>L</sub> = 10 pF   | –                      | 26   | –    | –            | –    | ps   |
| t <sub>SK(P)</sub> | Skew of opposite transition of the same output | 3.0 - 3.6           | C <sub>L</sub> = 10 pF   | –                      | 60   | –    | –            | –    | ps   |
| T <sub>J</sub>     | Total jitter                                   | 3.0 - 3.6           | R <sub>L</sub> = 50 Ω<br>C <sub>L</sub> = 10 pF<br>t <sub>R</sub> = t <sub>F</sub> = 750 ps<br>at 480 Mbps | –                      | 130  | –    | –            | –    | ps   |

# 5 Test circuits

Figure 3. On-resistance

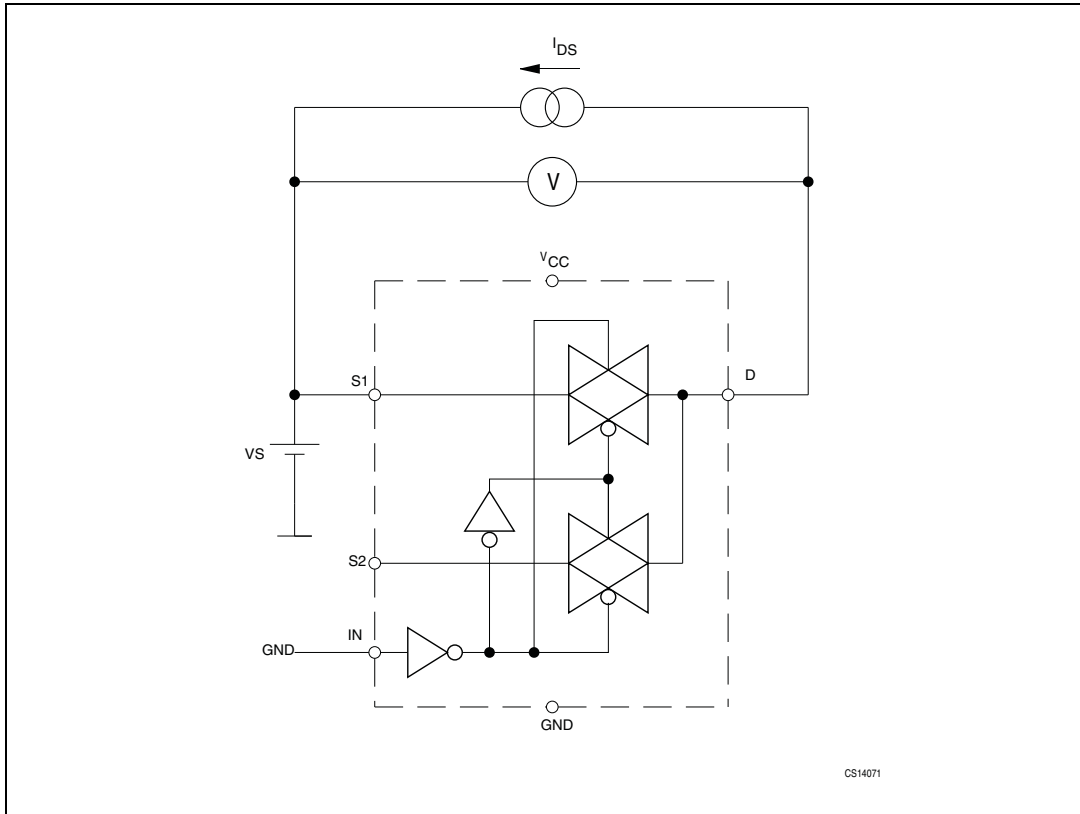


Figure 4. Bandwidth

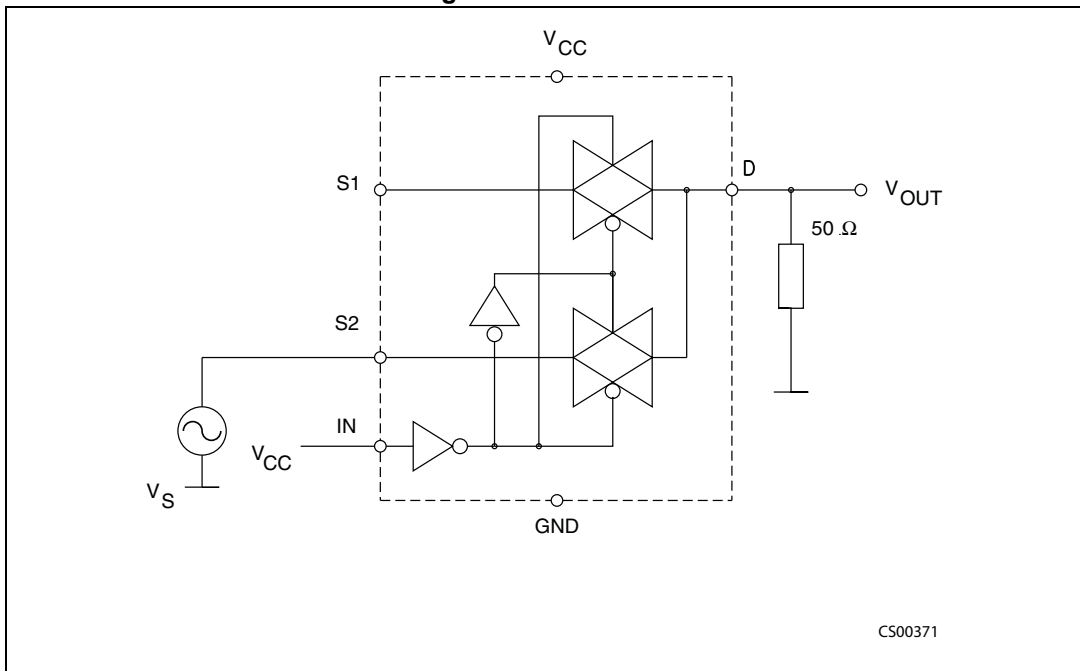


Figure 5. Off leakage

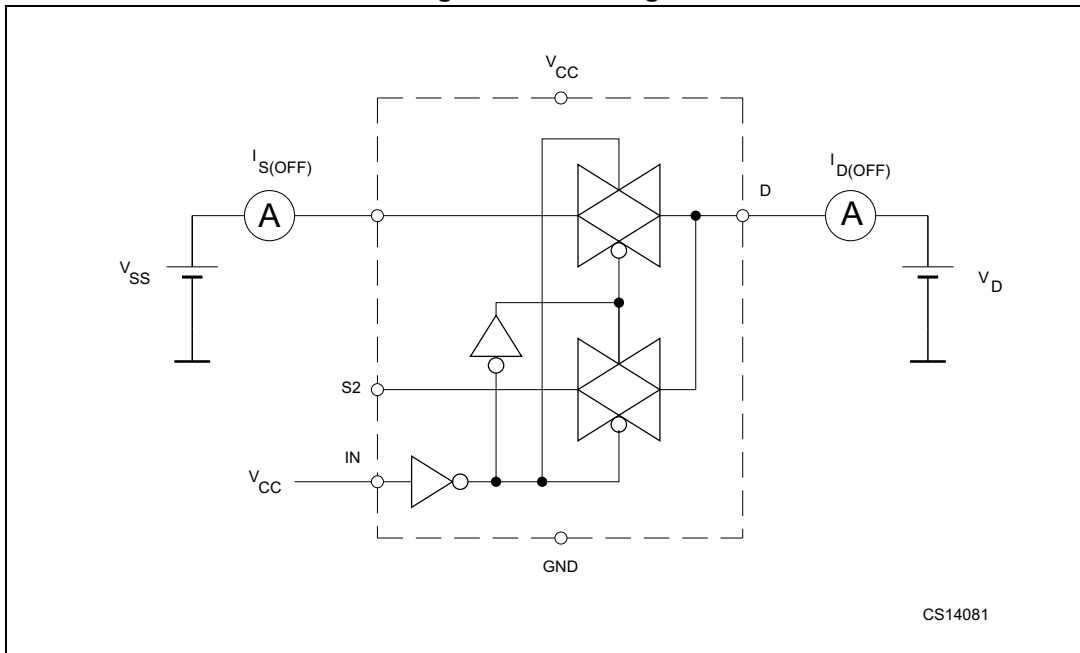


Figure 6. Channel to channel crosstalk

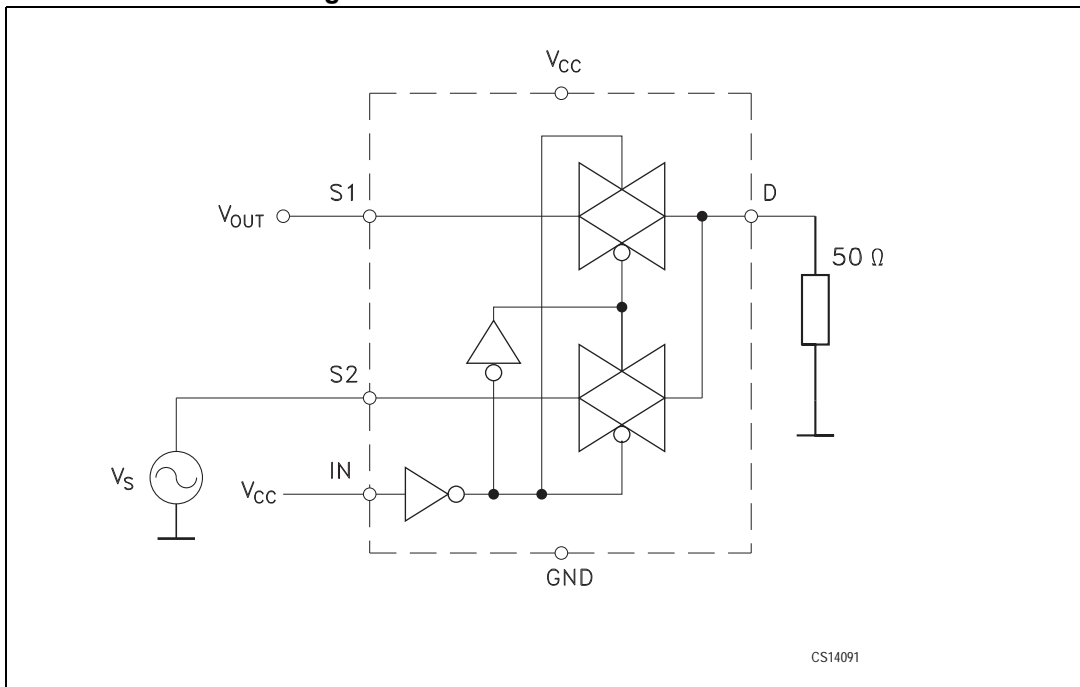
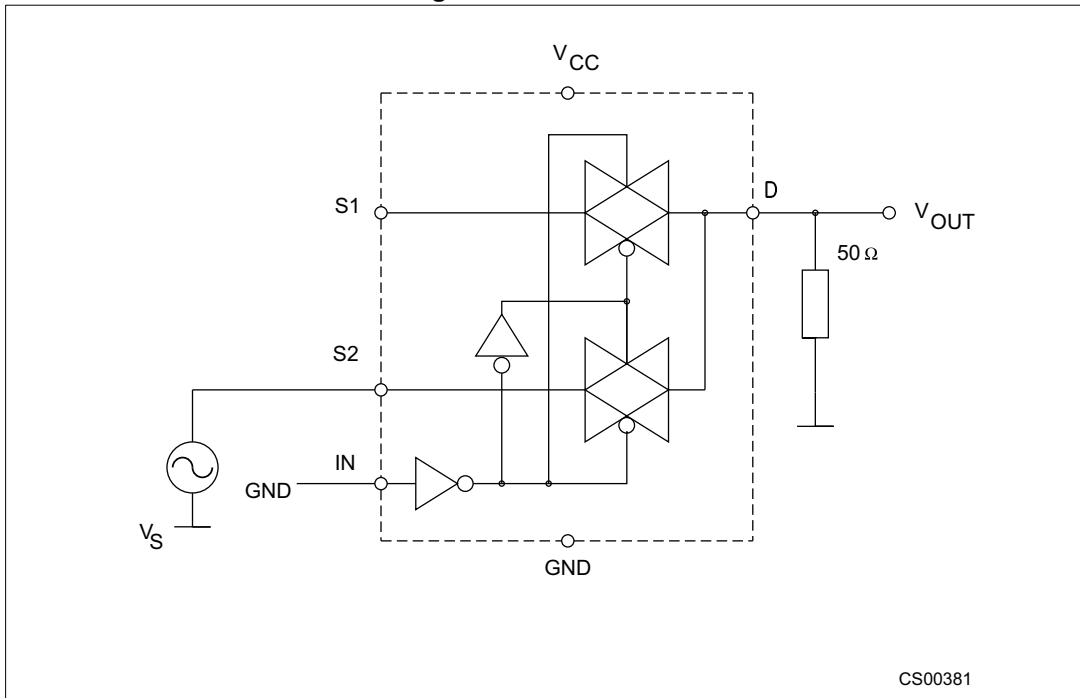
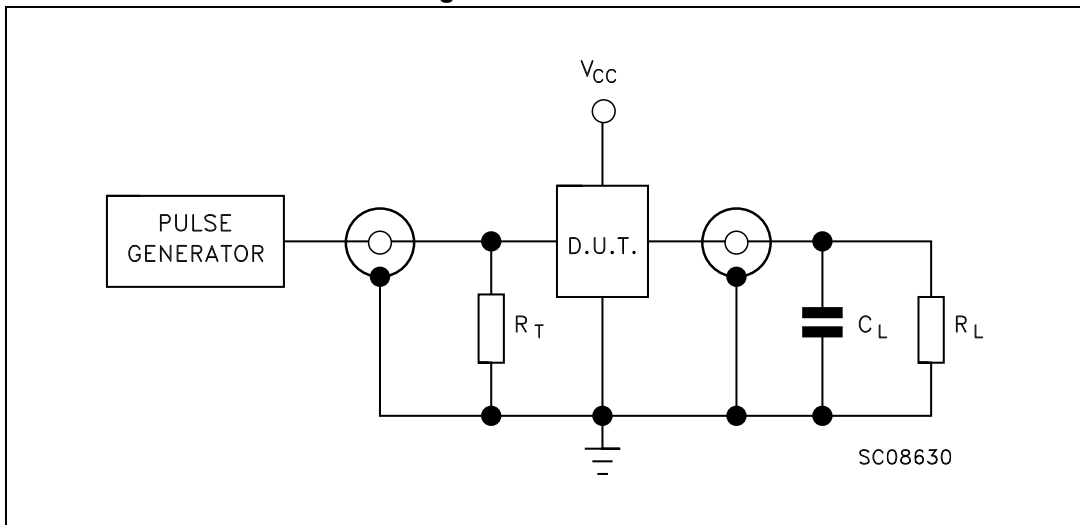


Figure 7. Off isolation



CS00381

Figure 8. Test circuit



SC08630

Note:  $C_L = 5/35\text{ pF}$  or equivalent: (includes jig capacitance).  
 $R_L = 50\ \Omega$  or equivalent.  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\ \Omega$ ).

Figure 9. Break-before-make time delay

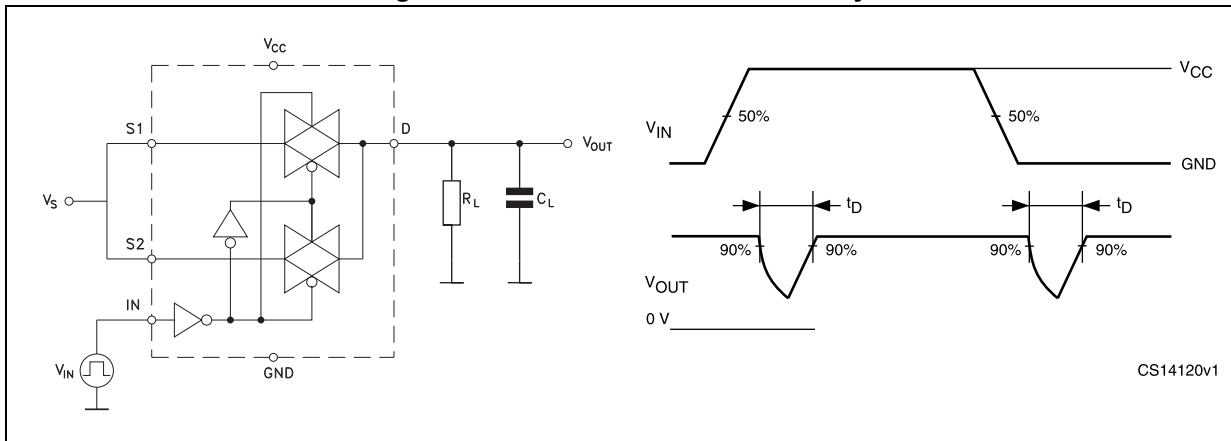


Figure 10. Switching time and charge injection ( $V_{GEN} = 0\text{ V}$ ,  $R_{GEN} = 0\ \Omega$ ,  $R_L = 1\text{ M}\Omega$ ,  $C_L = 100\text{ pF}$ )

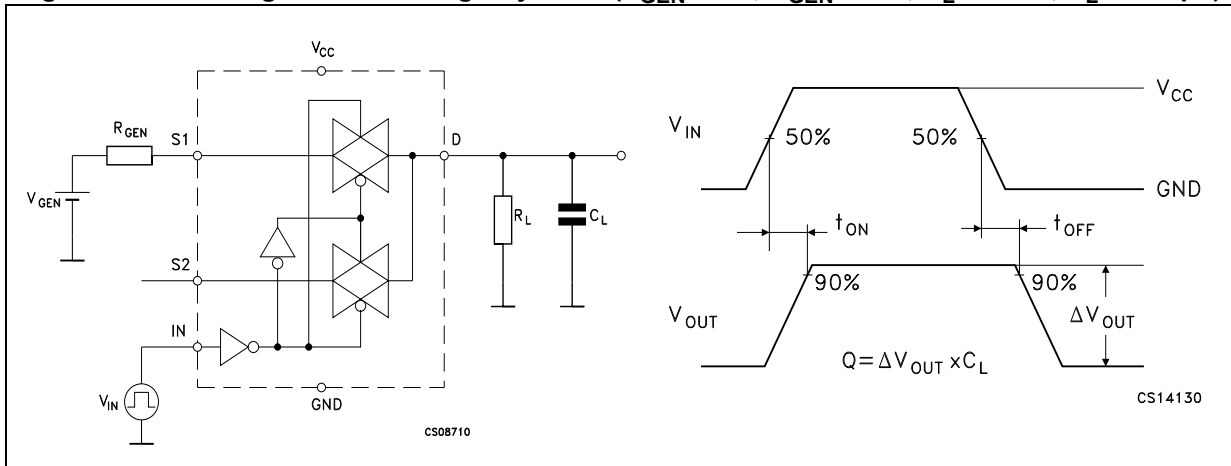
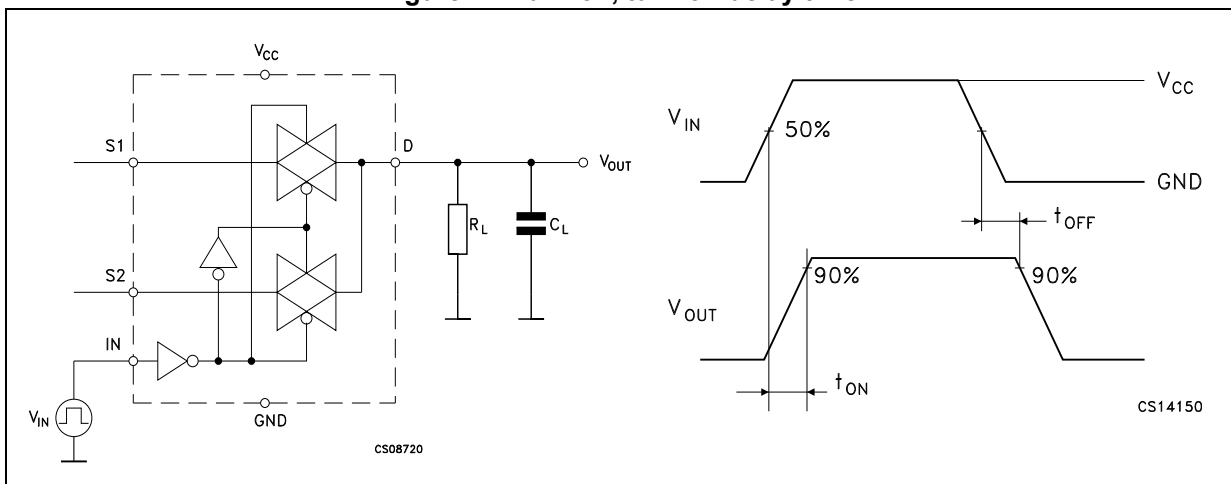


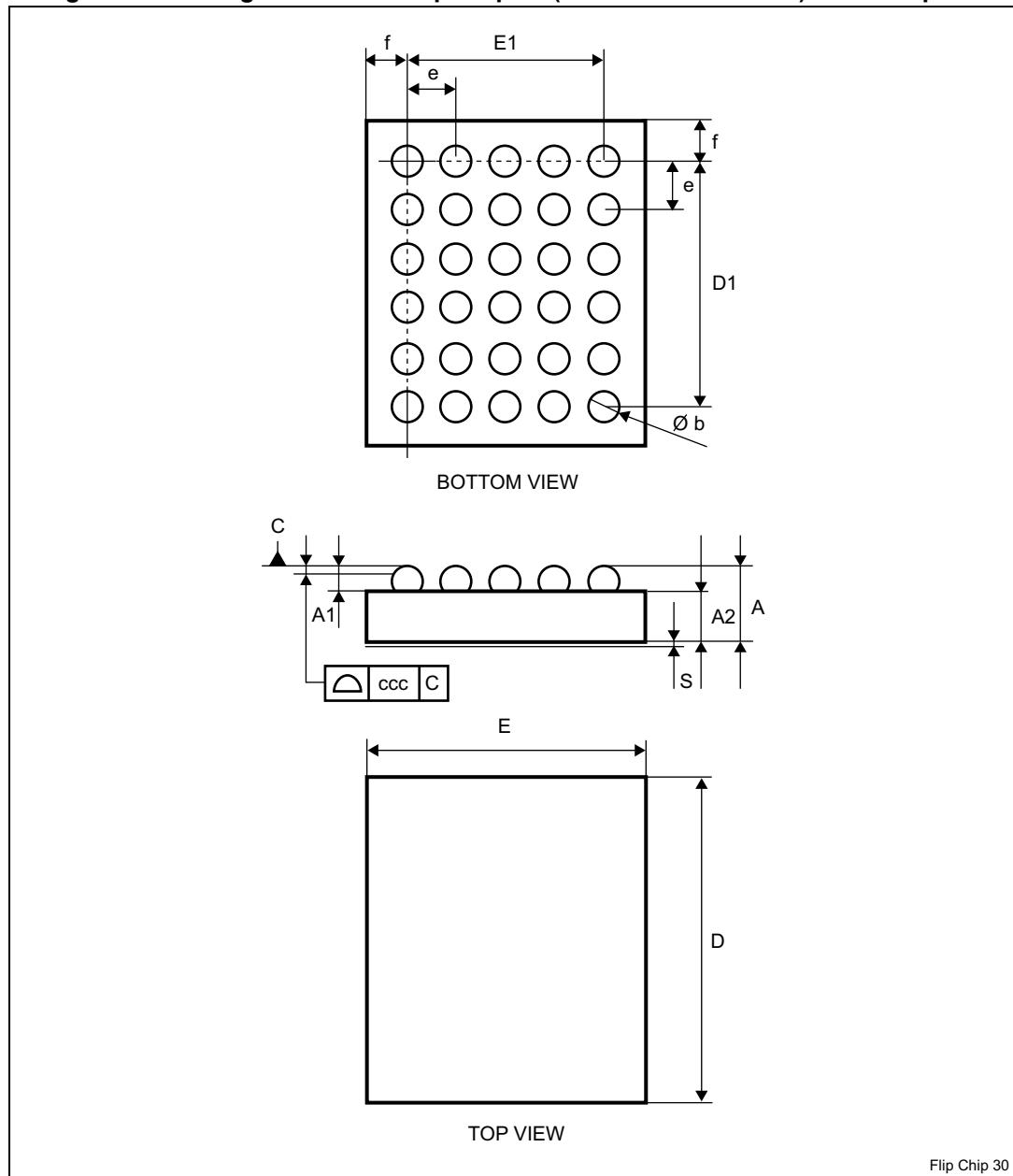
Figure 11. Turn-on, turn-off delay time



## 6 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

**Figure 12. Package outline for Flip Chip 30 (2.0 x 2.4 x 0.625 mm) - 0.4 mm pitch**



Flip Chip 30



**Table 10. Mechanical data for Flip Chip 30 (2.0 x 2.4 x 0.625 mm) - 0.4 mm pitch**

| Symbol | Dimensions (mm) |       |       |
|--------|-----------------|-------|-------|
|        | Min.            | Typ.  | Max.  |
| A      | 0.565           | 0.625 | 0.685 |
| A1     | 0.17            | 0.205 | 0.24  |
| A2     | 0.355           | 0.375 | 0.395 |
| b      | 0.215           | 0.255 | 0.295 |
| D      | 2.1             | 2.4   | 2.43  |
| D1     | –               | 2.0   | –     |
| E      | 1.97            | 2.0   | 2.03  |
| E1     | –               | 1.6   | –     |
| e      | 0.36            | 0.4   | 0.44  |
| f      | 0.19            | 0.2   | 0.21  |
| ccc    | –               | 0.05  | –     |
| \$     | 0.040           | 0.045 | 0.05  |

**Figure 13. Footprint recommendations for Flip Chip 30 (2.0 x 2.4 x 0.625 mm) - 0.4 mm pitch**

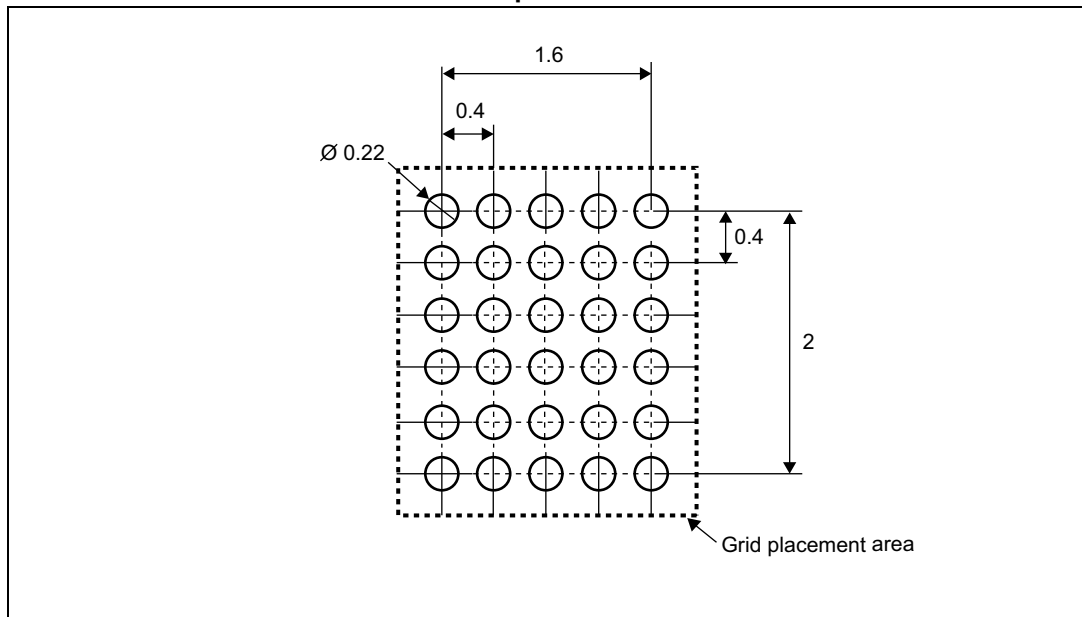


Figure 14. Tape information for Flip Chip 30 (2.0 x 2.4 x 0.625 mm) - 0.4 mm pitch

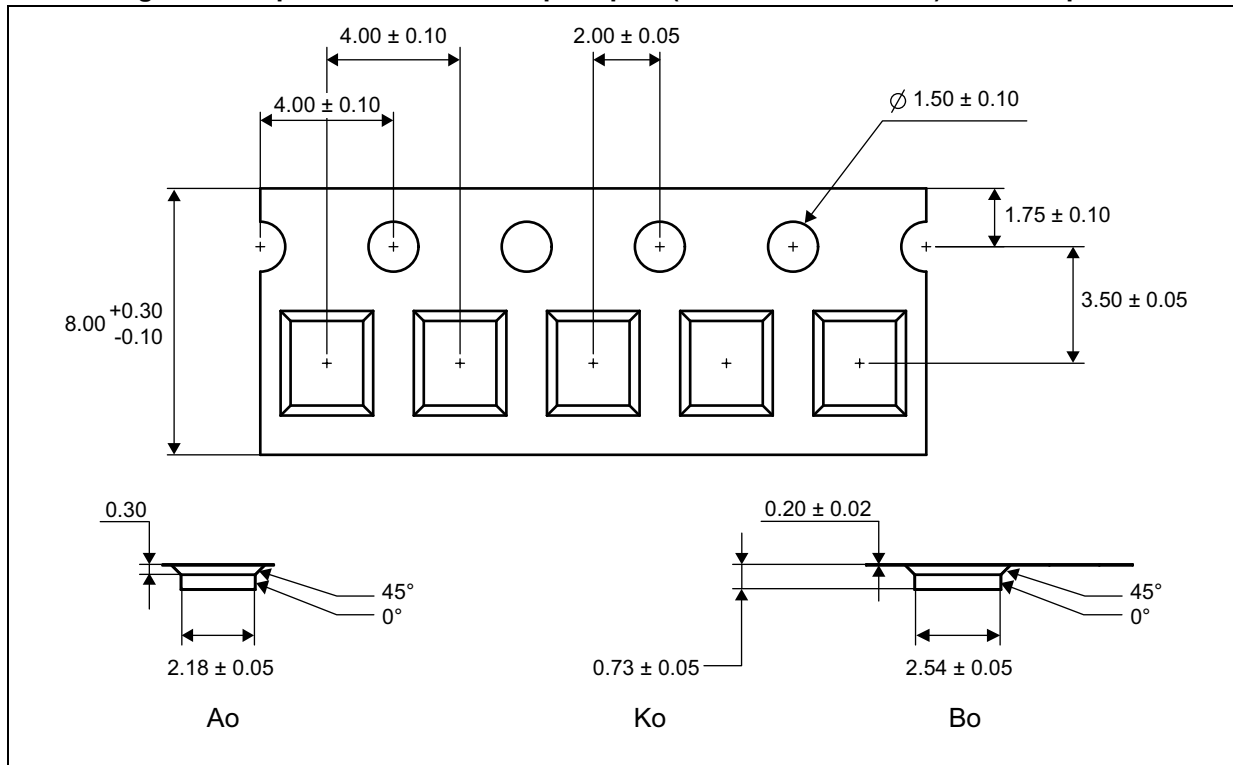
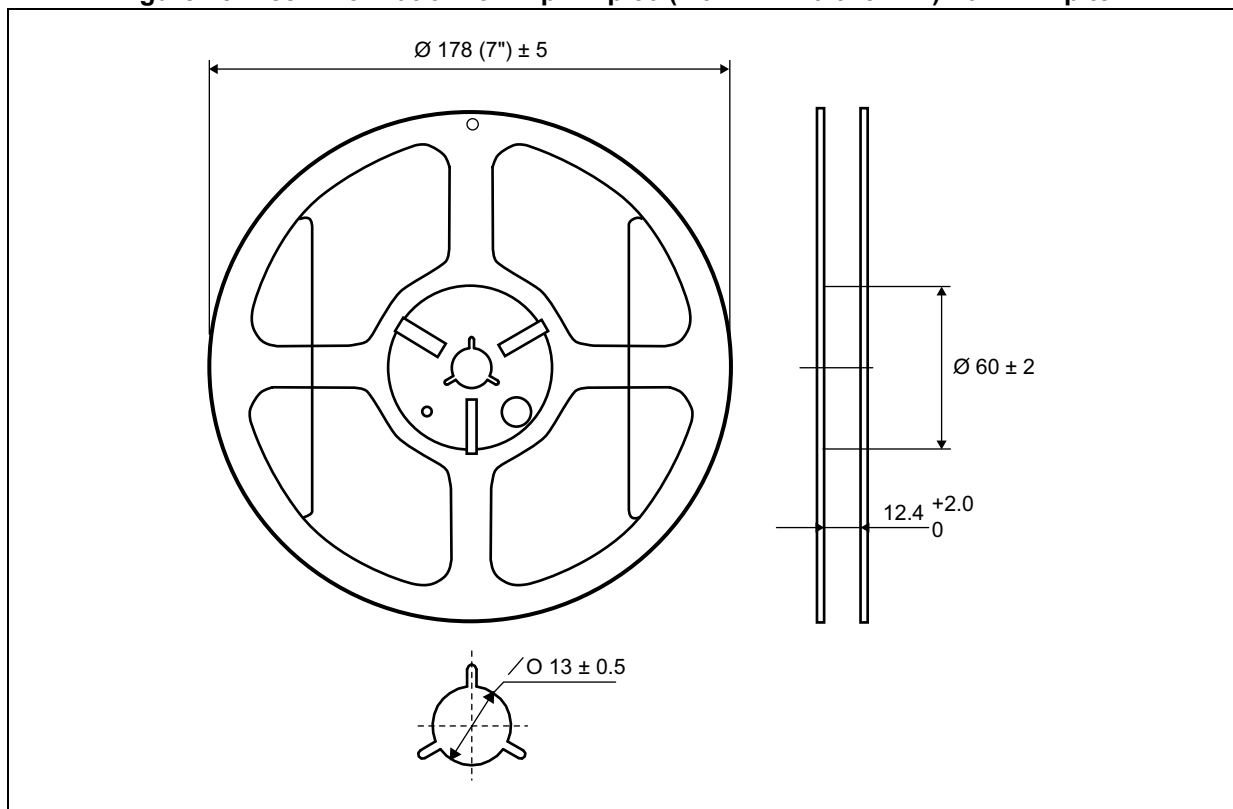


Figure 15. Reel information for Flip Chip 30 (2.0 x 2.4 x 0.625 mm) - 0.4 mm pitch



## 7 Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 18-Dec-2009 | 1        | Initial release.   |
| 19-Jan-2011 | 2        | Document reformatted, added <a href="#">Contents</a> , updated <a href="#">Figure 12</a> and <a href="#">Figure 13</a> , corrected typo in <a href="#">Features</a> , <a href="#">Table 1</a> , <a href="#">Section 1: Pin settings</a> , <a href="#">Table 2</a> , <a href="#">Table 7</a> , <a href="#">Table 8</a> , notes below <a href="#">Figure 8</a> , title of <a href="#">Figure 11</a> , <a href="#">Figure 12</a> , <a href="#">Table 10</a> , and <a href="#">Figure 13</a> , corrected name of "Table 11" to <a href="#">Figure 13</a> . |
| 23-Apr-2013 | 3        | Moved <a href="#">Description</a> to page 1.<br>Redrawn <a href="#">Figure 1</a> .<br>Updated <a href="#">Section 3</a> (added/updated cross-references, updated $V_{CC}$ value in <a href="#">Table 4</a> ).<br>Redrawn <a href="#">Figure 12</a> to <a href="#">Figure 15</a> .<br>Updated <a href="#">Figure 12</a> (removed superfluous reference to note).<br>Updated title of <a href="#">Figure 14</a> and <a href="#">Figure 15</a> (added "Flip Chip 30 (2.0 x 2.4 x 0.625 mm) - 0.4 mm pitch").<br>Minor corrections throughout document.    |
| 06-Aug-2013 | 4        | Updated <a href="#">Table 8 on page 10</a> (replaced $C_{ON}$ and $C_{OFF}$ symbol by $C_{sn}$ and $C_D$ symbol).  |

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