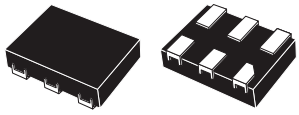
ST1G3236

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

Features

- High speed: t_{PD} = 4.0ns (Max.) at T_A = 85°C
- Low power dissipation:
  $I_{CCA} = I_{CCB}$ = 5µA(Max.) at T_A = 85°C
- Balanced propagation delays:
  $t_{PLH} \cong t_{PHL}$
- Power-down protection on inputs and outputs
- 26Ω series resistor on A-side outputs
- Operating voltage range:
  - V_{CCA}(Opr) = 1.2V to 3.6V
  - V_{CCB}(Opr) = 1.2V to V_{CCA}
- Latch-up performance exceeds 100mA per JESD 78, Class II
- ESD performance exceeds JESD22
  - 2000-V Human-body model (A114-A)



DFN6L

Description

The ST1G3236 is a dual supply low voltage CMOS 1-bit bus Transceiver fabricated with sub-micron silicon gate and five-layer metal wiring C2MOS technology. Designed for use as an interface between a 3.3V bus and a 2.5V or 1.2V bus in mixed supply systems of 3.3V/1.2V, 3.3V/2.5V and 2.5V/1.8V, the ST1G3236 achieves high speed operation while maintaining low power dissipation. V_{CCA} and V_{CCB} can be powered from 1.2V to 3.6V respectively. The DIR pin is designed to track V_{CCB}.

The device is intended for two-way asynchronous communication between data buses and the direction of data transmission is determined by DIR inputs.

All inputs are equipped with protection circuits against static discharge, giving them 2kV ESD immunity and transient excess voltage.

Table 1. Device summary

Order code	Package	Packaging
ST1G3236DTR	DFN6L (1.2x1mm)	Tape and Reel

Contents

1 Device summary

1.1 Pin settings

Figure 1. Logic diagram

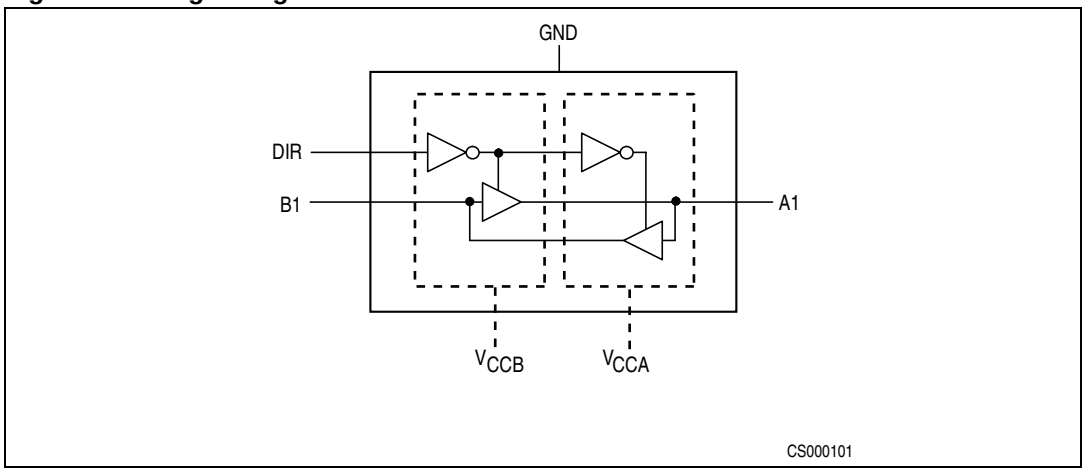
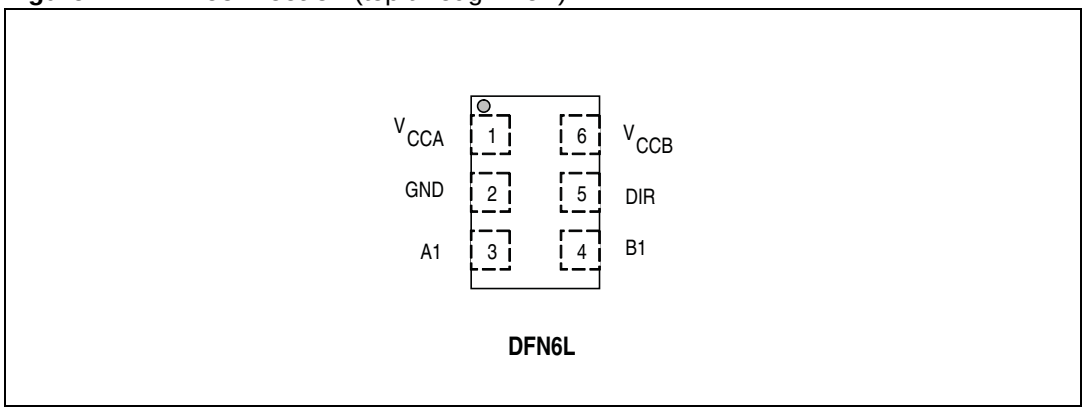


Figure 2. Pin connection (top through view)



1.2 Pin description

Table 1. Pin description

Pin N°	Symbol	Name and function
1	V_{CCA}	Positive supply voltage
2	GND	Ground (0V)
3	A1	Data Inputs/Outputs
4	B1	Data Inputs/Outputs
5	DIR	Directional controls
6	V_{CCB}	Positive supply voltage

2 Pin connection

Figure 3. Input and output equivalent circuit

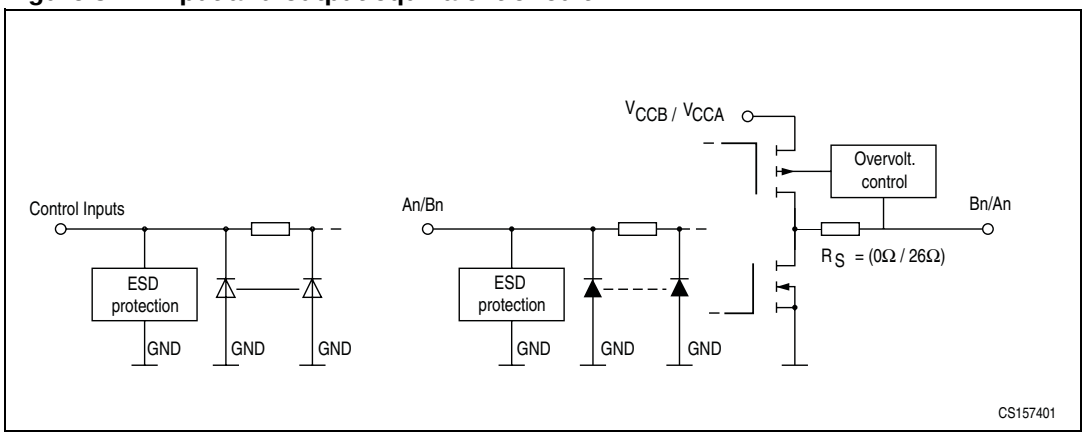


Table 2. Truth table

Dir input	Function	
	Bus A	Bus B
L	Output	Input
H	Input	Output

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_I	DC input voltage	-0.5 to +4.6	V
$V_{I/OA}$	DC output voltage	-0.5 to V_{CCA} + 0.5	V
$V_{I/OB}$	DC output voltage	-0.5 to V_{CCB} + 0.5	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_{OB}	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 4. Recommended operating conditions

Symbol	Parameter	Value	Unit
V_{CCA}	Supply voltage	1.2 to 3.6	V
V_{CCB}(1)	Supply voltage	1.2 to V_{CCA}	V

Table 4. Recommended operating conditions

Symbol	Parameter		Value	Unit
V_I	Input voltage (DIR)		0 to V_{CCB}	V
$V_{I/OA}$	I/O voltage		0 to V_{CCA}	V
$V_{I/OB}$	I/O voltage		0 to V_{CCB}	V
T_{op}	Operating temperature		-40 to 85	°C
dt/dv(2)	Input Rise and Fall Time	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} = 1.2 to 1.95V	0 to 100	ns/V

1. V_{CCB} must be lower than V_{CCA}
2. V_{IN} from 0.8V to 2.0V at V_{CC} = 3.0V

4 Electrical characteristics

Table 5. DC specification for V_{CCA}

Symbol	Parameter	Test condition			Value				Unit
		V_{CCB} (V)	V_{CCA} (V)		T_A = 25 °C		-40 to 85 °C		
					Min	Max	Min	Max	
V_{IHA}	High level input voltage (A1)	1.2 to V_{CCA}	1.2 to 1.95		0.65 V_{CCA}		0.65 V_{CCA}		V
			1.95 to 2.7		1.6		1.6		
			2.7 to 3.6		2		2		
V_{ILA}	Low level input voltage (A1)	1.2 to V_{CCA}	1.2 to 1.95			0.35V_{CCA}		0.35 V_{CCA}	V
			1.95 to 2.7			0.7		0.8	
			2.7 to 3.6			0.8		0.8	
V_{OHA}	High level output voltage	1.2 to V_{CCA}	1.2 to 3.6V	I_O=-100µA	V_{CCA}- 0.2		V_{CCA}- 0.2		V
			3.0	I_O=-10mA	2.5		2.5		
			2.3	I_O=-6mA	1.8		1.8		
			1.65	I_O=-4mA	1.25		1.25		
			1.4	I_O=-2mA	1.1		1.1		
			1.2	I_O=-1mA	0.95		0.95		
V_{OLA}	Low level output voltage	1.2 to V_{CCA}	1.2 to 3.6V	I_O=-100µA		0.2		0.2	V
			3.0	I_O=-10mA		0.55		0.55	
			2.3	I_O=-6mA		0.40		0.40	
			1.65	I_O=-4mA		0.40		0.40	
			1.4	I_O=-2mA		0.30		0.30	
			1.2	I_O=-1mA		0.25		0.25	
I_{IA}	Input leakage current	2.7	3.3	V_I =V_{CCA} or GND		±0.5		±5	µA
		1.4	2.7	V_{IA} =3.6V or GND		±0.5		±5	µA

Table 5. DC specification for V_{CCA} (continued)

Symbol	Parameter	Test condition			Value				Unit
		V_{CCB} (V)	V_{CCA} (V)		T_A = 25 °C		-40 to 85 °C		
					Min	Max	Min	Max	
I_{OFF}	Power OFF leakage current	0	0	V_{IA}=GND to 3.6V V_{IB}=GND to 3.6V DIR=GND to 3.6V		±1.0		±10	µA
I_{CCtA}	Quiescent supply current	1.2V	1.2 to 3.6V	V_{IA}=V_{CCA} or GND V_{IB}=V_{CCB} or GND DIR =A to B		0.5		5	µA
		1.2 to 3.6V	3.6						
ΔI_{CCtA}	Maximum quiescent supply current/input	2.7V	3.3V	V_{IA} =V_{CCA} to 0.6V V_{IB} =V_{CCB} or GND				0.75	µA
		1.8	3.3						
		1.8	2.7						

Table 6. DC specification for V_{CCB}

Symbol	Parameter	Test condition			Value				Unit
		V_{CCB} (V)	V_{CCA} (V)		T_A = 25 °C		-40 to 85 °C		
					Min	Max	Min	Max	
V_{IHB}	High level input voltage (A1)	1.2	V_{CCB} to 3.6V		0.65 V_{CCB}		0.65 V_{CCB}		V
		1.8			1.2		1.2		
		2.5			1.6		1.6		
		3.3			2		2		
V_{ILB}	Low level input voltage (B1, DIR)	1.2	V_{CCB} to 3.6V			0.35 V_{CCB}		0.35 V_{CCB}	V
		1.8				0.6		0.6	
		2.5				0.7		0.7	
		3.3				1.0		1.0	

Table 6. DC specification for V_{CCB} (continued)

Symbol	Parameter	Test condition			Value				Unit
		V_{CCB} (V)	V_{CCA} (V)		T_A = 25 °C		-40 to 85 °C		
					Min	Max	Min	Max	
V_{OHB}	High level output voltage	1.2 to 3.6V	V_{CCB} to 3.6V	I_O=-100µA		V_{CCB}-0.2		V_{CCB}-0.2	V
		3.0		I_O=-10mA		2.5		2.5	
		2.3		I_O=-6mA		1.8		1.8	
		1.65		I_O=-4mA		1.25		1.25	
		1.4		I_O=-2mA		1.1		1.1	
		1.2		I_O=-1mA		0.95		0.95	
V_{OLB}	Low level output voltage	1.2 to 3.6V	V_{CCB} to 3.6V	I_O=-100µA		0.2		0.2	V
		3.0		I_O=-10mA		0.55		0.55	
		2.3		I_O=-6mA		0.40		0.40	
		1.65		I_O=-4mA		0.40		0.40	
		1.4		I_O=-2mA		0.30		0.30	
		1.2		I_O=-1mA		0.25		0.25	
I_{IB}	Input leakage current	2.7	3.3	V_{IB} =V_{CC} or GND		±0.5		±5	µA
		1.4	2.7	V_{IB} =3.6V or GND		±0.5		±5	µA
I_{CCtB}	Quiescent supply current	1.2 to V_{CCA}	1.2 to 3.6	V_{IA}=V_{CCA} or GND V_{IB}=V_{CCB} or GND DIR =B to A		0.5		5	µA
ΔI_{CCtB}	Maximum quiescent supply current/input (B1, DIR)	2.7	3.3	V_{IB} =V_{CCB} to 0.6V	-	-	-	0.75	µA
		1.8	3.3		-	-	-		
		1.8	2.7	V_{IA} =V_{CCB} or GND	-	-	-		

Table 7. AC electrical characteristics

Symbol	Parameter	Test condition			Value			Unit
		V_{CCB} (V)	V_{CCA} (V)		-40 to 85 °C			
					Min	Typ	Max	
t_{PLH} t_{PHL}	Propagation delay time An to Bn	1.8 ±0.15	2.5 ±0.2	C_L = 30 pF R_L = 500Ω	1.0		4	ns
		1.8 ±0.15	3.3 ±0.3		1.0		3.5	
		2.5 ±0.2	3.3 ±0.3		1.0		2.8	
		1.8 ±0.15	2.5 ±0.2	C_L = 10 pF	1.0		3.8	
		1.8 ±0.15	3.3 ±0.3		1.0		3.4	
		2.5 ±0.2	3.3 ±0.3		1.0		2.7	
t_{PLH} t_{PHL}	Propagation delay time Bn to An	1.8 ±0.15	2.5 ±0.2	C_L = 30 pF R_L = 500 Ω	1.0		4.5	ns
		1.8 ±0.15	3.3 ±0.3		1.0		4	
		2.5 ±0.2	3.3 ±0.3		1.0		3	
		1.8 ±0.15	2.5 ±0.2	C_L = 10 pF	1.0		4.5	
		1.8 ±0.15	3.3 ±0.3		1.0		4	
		2.5 ±0.2	3.3 ±0.3		1.0		3	
t_{PZL} t_{PZH}	Output enable time DIR to An	1.8 ±0.15	2.5 ±0.2	C_L = 30 pF R_L = 500Ω		6		ns
		1.8 ±0.15	3.3 ±0.3			6		
		2.5 ±0.2	3.3 ±0.3			6		
t_{PZL} t_{PZH}	Output enable time DIR to Bn	1.8 ±0.15	2.5 ±0.2	C_L = 30 pF R_L = 500Ω		6		ns
		1.8 ±0.15	3.3 ±0.3			6		
		2.5 ±0.2	3.3 ±0.3			6		

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			6				pF
$C_{I/O}$	I/O capacitance	2.5	3.3			6				pF
C_{PD}	Power dissipation capacitance	2.5	3.3	f = 10MHz		29				pF
		1.8	3.3			29				pF

Note: 1 C_{PD} 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. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$ (per circuit)

5 Test circuit

Figure 4. Test circuit

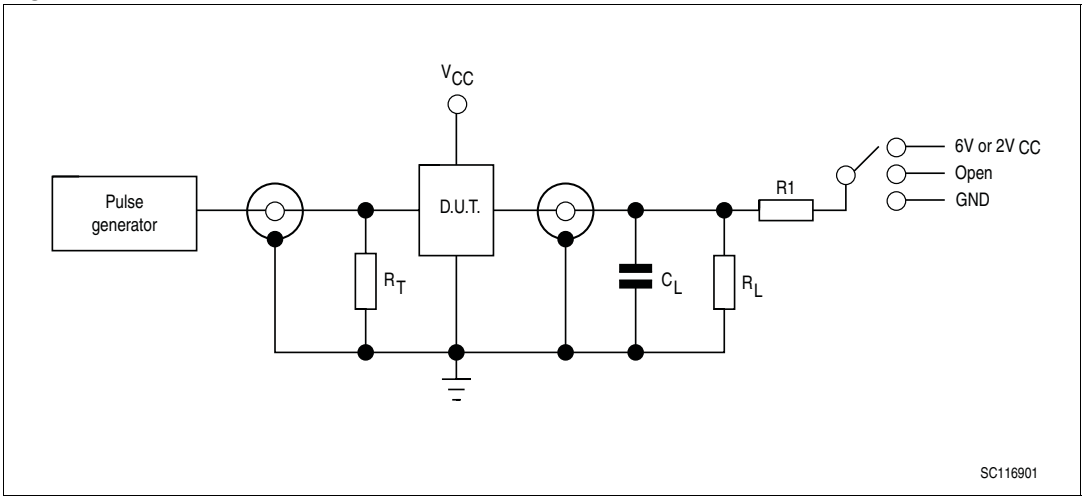


Table 9. Test circuit

Test		Switch
t_{PLH}, t_{PHL}	CL =30pF ; RL =500Ω	Open

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

6 Waveforms

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

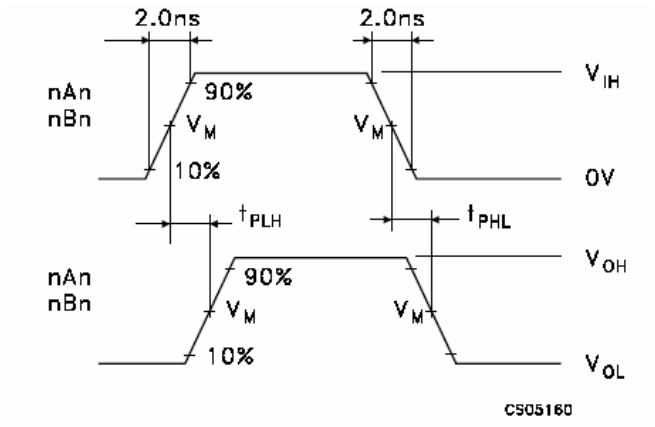
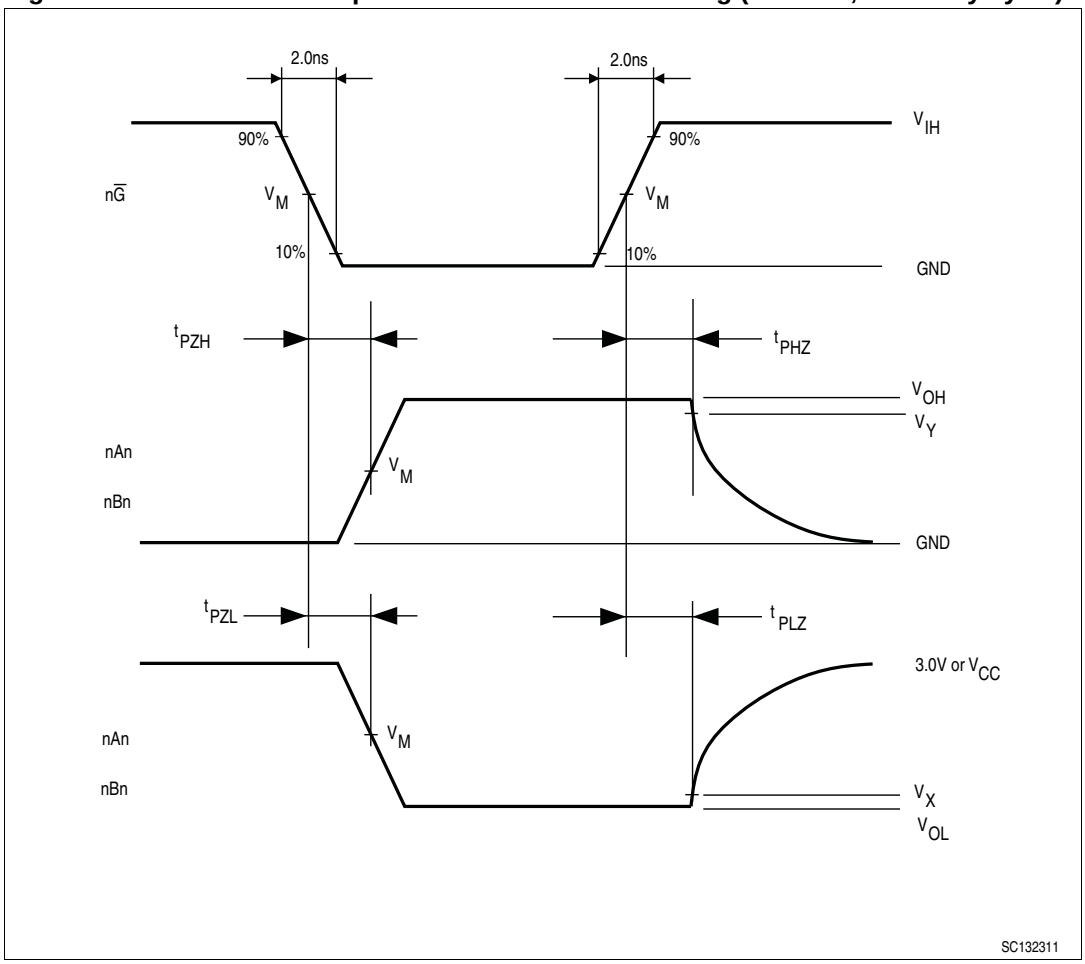


Table 10. Waveform symbol value

Symbol	V_{CC}		
	3.0 to 3.6V	2.3 to 2.7V	1.65 to 1.95V
V_{IH}	V_{CC}	V_{CC}	V_{CC}
V_M	1.5V	$V_{CC}/2$	$V_{CC}/2$
V_X	V_{OL} +0.3V	V_{OL} +0.15V	V_{OL} +0.15V
V_Y	V_{OH} -0.3V	V_{OH} -0.15V	V_{OH} -0.15V

Figure 6. Waveform - Output Enable and Disable timing (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 7. DFN6 (1.2x1mm) package outline

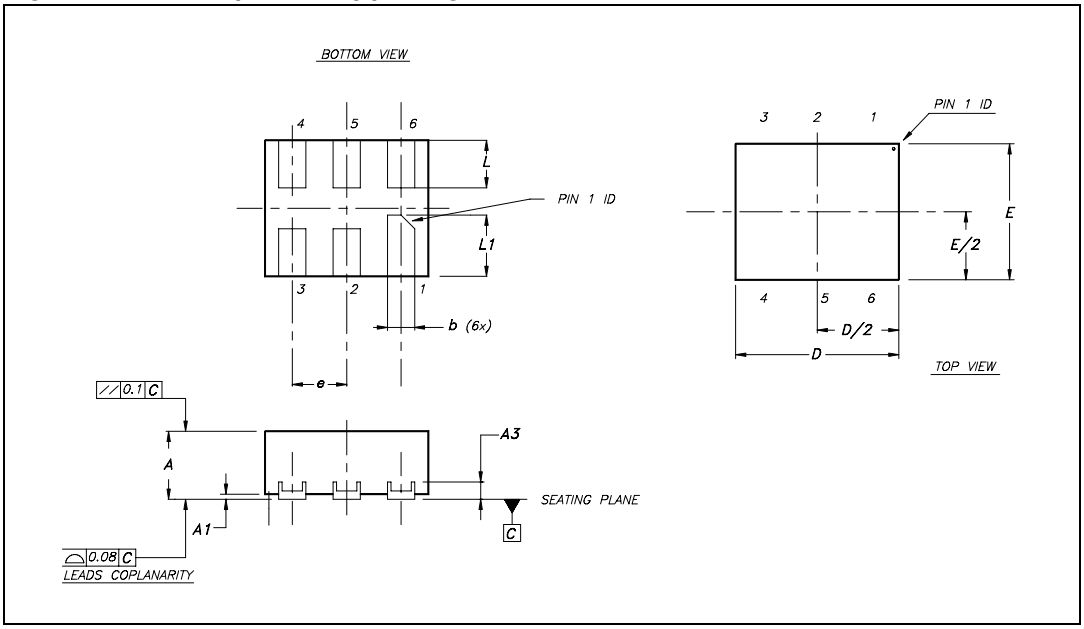


Table 11. DFN6L (1.2x1mm) mechanical data

Symbol	millimeters		
	Min	Typ	Max
A	0.45	0.50	0.55
A1	0	0.02	0.05
A3		0.127	
b	0.15	0.20	0.25
D	1.15	1.20	1.25
E	0.95	1	1.05
e		0.40	
L	0.30	0.35	0.40
L1	0.40	0.45	0.50

Figure 8. Recommended footprint

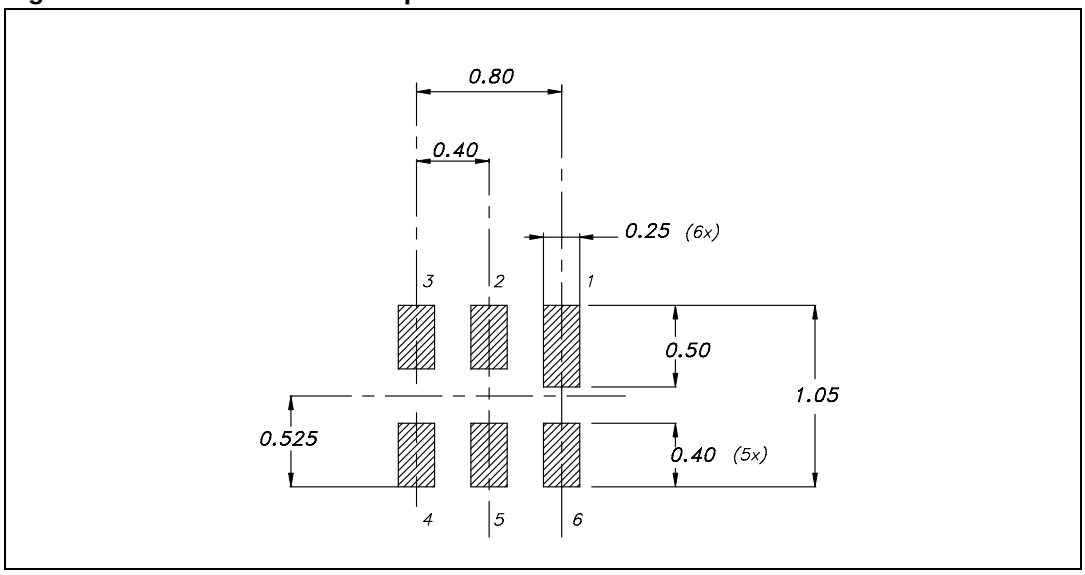


Figure 9. Tape and reel information

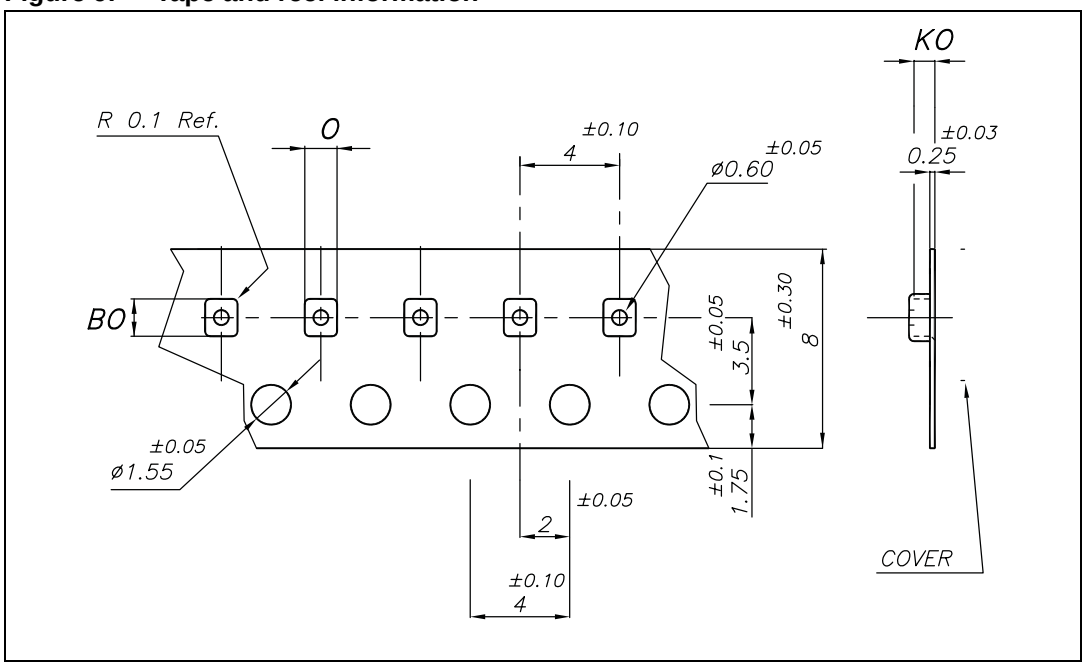


Figure 10. Reel for carrier tape information

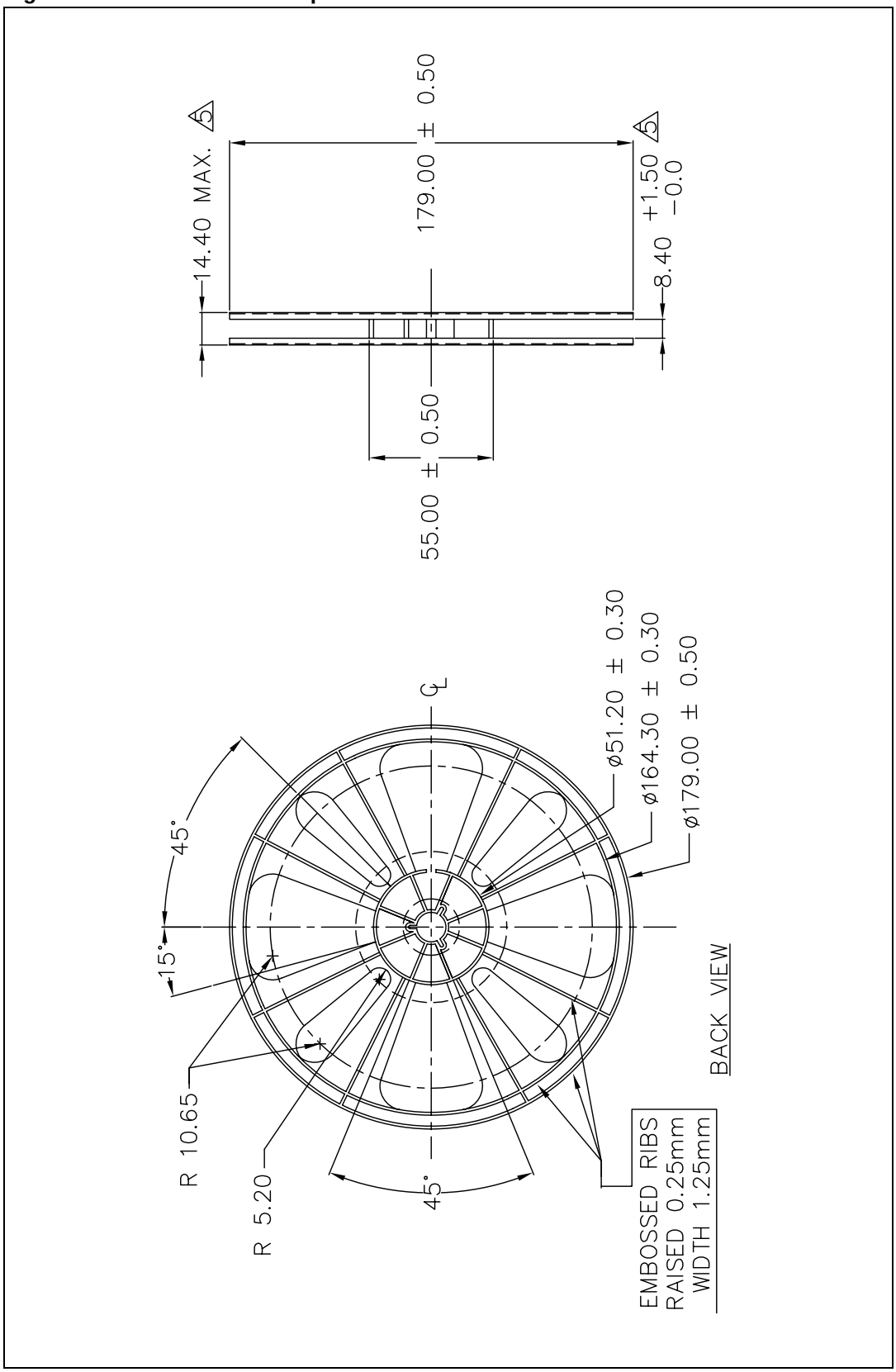
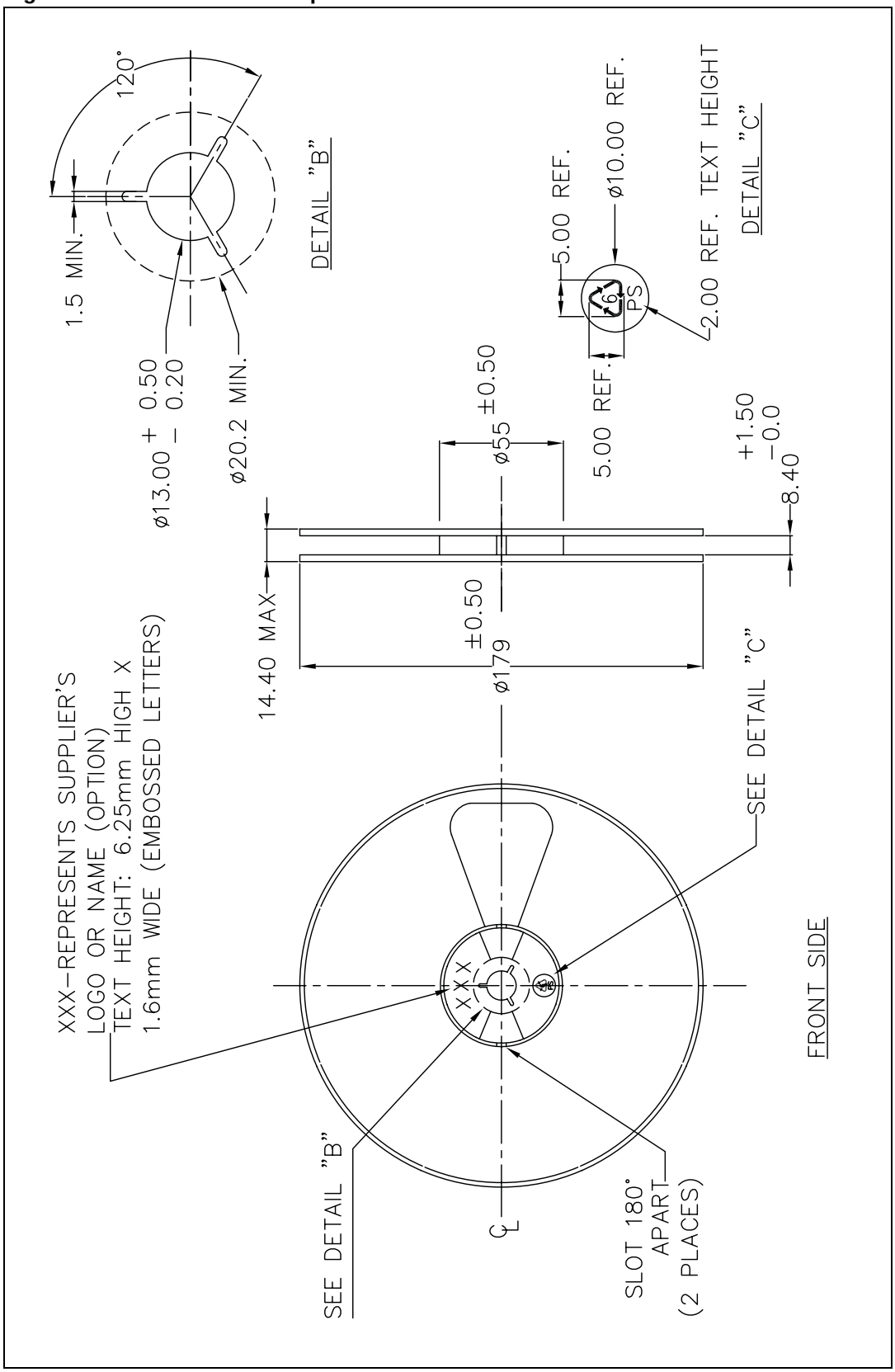


Figure 11. Reel for carrier tape information



8 Revision history

Table 12. Revision history

Date	Revision	Changes
25-July-2007	1	First release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com