

# ST1284

# Parallel port single termination network with ±15 kV ESD protection

Datasheet - production data



### Features

- One device for parallel port termination
- Compliant with IEEE1284 standard
- EMI / RFI noise filtering
- Highly integrated solution in a 28 pin QSOP package
- One single device provides the proper termination for 8 data lines, 1 strobe line, 4 control lines and 4 status lines
- In system ESD protection of ±15 kV (air discharge) as per IEC 61000-4-2 level 4
- ECOPACK<sup>®</sup>2 compliant component

#### Complies with the following standards

- IEC 61000-4-2, level 4
  - ±15 kV (air discharge)
  - ±8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: class 3
  - ±25 kV (human body model)

## Applications

ECP/EPP parallel port termination on:

- Desktops
- Notebooks
- Workstations
- Servers
- PC peripherals
- Set top box

## Description

The ST1284-01A8 is a highly integrated termination for enhanced high speed parallel ports. The integrated termination complies to the IEEE1284 standard recommendations and government EMC compatibility requirements. It is built around two basic cells. The first one (cell 1) provides line termination, EMI filtering and ESD protection for the strobe and data lines while the second one (cell 2) provides EMI filtering and ESD protection for the control and status lines.

In addition, ST1284-01A8 provides extra protection against ESD. When tested according to IEC 61000-4-2, they withstand  $\pm 8$  kV contact discharges and  $\pm 15$  kV air discharges, thereby providing to the system the necessary robustness to meet up to level 4 of IEC 61000-4-2, without the need for additional ESD protection components.

May 2017

DocID6976 Rev 6

This is information on a product in full production.

$1 \qquad \qquad$
$ \begin{array}{c} 3 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4$
$5 \qquad \qquad$
$ \begin{array}{c} \mathbf{b} \\ \mathbf{c} \\ \mathbf$
$10$ $\frac{1}{2}$
$13 \xrightarrow{\downarrow \downarrow} \underset{c \downarrow \downarrow \downarrow}{\mathbb{R}^{S}} \underset{c \downarrow \downarrow \downarrow}{\mathbb{R}^{S}} \xrightarrow{\downarrow V_{c}} 16$ $14 \xrightarrow{\downarrow c \downarrow \downarrow \downarrow} \underset{c \downarrow \downarrow \downarrow}{\mathbb{R}^{S}} 15$

	R1	R2	RS	С
Code 01	4.7 kΩ	4.7 kΩ	33 Ω	180 pF
Tolerance	±10 %	±10 %	±10 %	±20 %



# 1 Characteristics

Table 1: Absolute maximum ratings (T<sub>amb</sub> = 25 °C)

Symbol	Р	Value	Unit	
		MIL STD 883E - method 3015-7	±25	
V <sub>pp</sub>	V <sub>pp</sub> Peak pulse voltage	IEC61000-4-2 contact discharge	±9	kV
	IEC61000-4-2 air discharge	±16		
Vcc	Supply voltage	5.5	V	
Pr	Power rating per resistor		100	mW
PP	Package power rating		1	Ω
T <sub>stg</sub>	Storage junction temperature range		-55 to +150	
Tj	Maximum operating junction temperature		125	°C
Top	Operating temperature range		-40 to +125	

#### Table 2: Electrical characteristics (T<sub>amb</sub> = 25 °C)

Symbol	Parameter	Test condition	Min.	Тур.	Max.	Unit
I <sub>R</sub>	Leakage current	$V_{CC} = 5.0 V$			10	μA
V <sub>BR</sub>	Breakdown voltage	I <sub>R</sub> = 1 mA	6			V
VF	Forward voltage drop	I <sub>F</sub> = 50 mA		0.9		V



## 1.1 Basic cell configurations

The ST1284-01A8 is built around the two basic cells described below which integrate the recommended IEEE1284 network and the ESD protection compatible with IEC 61000-4-2 level 4.





4/12



## 2 Application information

The functional diagram here above presents a IEEE1284-A connector pinout and shows how to connect the ST1284-01A8 in order to correctly terminate and filter the 17 signal lines. The IEEE1284-A connector is the PC standard for the host connection.

Control and status lines (from 10 to 17) only require a pull-up resistor ( $R_p$ ) and a filter capacitor (C).

The data lines (from 2 to 9) and the STROBE (pin 1) also require a termination series resistor ( $R_s$ ) in addition to the pull-up resistor and a filter capacitor. The V<sub>CC</sub> is connected to pin 20 and the ground to pin 22.

The ST1284-01A8 can be used with all 3 types of connectors defined in the IEEE1284 standard:

- IEEE1284-A is a 25 dB connector which is the PC standard for the host connection.
- IEEE1284-B is a 36 pin, 0.085 inch center line connector used on the peripheral device.
- IEEE1284-C is a new 36 pin, 0.050 inch center line connector which can be used for both host and peripherals.

## 3 Technical information

#### 3.1 Frequency behavior of data and strobe signals



## 3.2 ESD protection

In addition to the termination requirements and EMC compatibility, computing devices are required to be tested for ESD susceptibility. This test, already in place in Europe, is described as per IEC 61000-4-2 standard. This test requires that a device tolerates ESD events and remains operational without user intervention.

The ST1284-01A8 is particularly optimized to perform ESD protection. ESD protection is based on the use of device which clamps at:

 $V_{ouput} = V_{BR} + R_d \times I_{PP}$ 

This protection function is split in 2 stages. As shown in *Figure* 7, the ESD strikes are clamped by the first stage  $S_1$  and then its remaining overvoltage is applied to the second stage through the resistor R. Such a configuration makes the voltage very low at the output.





To have a good approximation of the remaining voltages at both  $V_{\text{in}}$  and  $V_{\text{out}}$  stages, we give the typical dynamic resistance value  $R_{\text{d}}$ .

Taking into account these hypothesis  $R_t > R_d$ ,  $R_g > R_d$  and  $R_{load} > R_d$ , gives these formulas:

$$V_{input} = \frac{R_g \times V_{BR} + R_d \times V_{PP}}{R_g}$$

$$V_{output} = \frac{R_t \times V_{BR} + R_d \times V_{input}}{R_t}$$

The results of the calculation done for  $V_{PP}$  = 8 kV,  $R_g$  = 330  $\Omega$  (IEC 61000-4-2 standard),  $V_{BR}$  = 7 V (typ.) and  $R_d$  = 1  $\Omega$  (typ.) give:

- V<sub>input</sub> = 31.2 V
- V<sub>output</sub> = 7.95 V

This confirms the very low remaining voltage across the device to be protected. It is also important to note that in this approximation the parasitic inductance effect was not taken into account. This could be few tenths of volts during few ns at the input side. This parasitic effect is not present at the output side due to the low current involved after the resistance R.

The measurements in *Figure 9* clearly show the high efficiency of the ESD protection:

- no influence of the parasitic inductances on Vout stage
- V<sub>output</sub> clamping voltage very close to V<sub>BR</sub> (positive strike) and -V<sub>F</sub> (negative strike)



#### Technical information





8/12



## 4 Package information

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

### 4.1 QSOP28 package information



#### Table 3: QSOP28 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
А	1.55		1.75	0.061		0.069
a1	0.10		0.25	0.004		0.010
b	0.20		0.30	0.008		0.012
b1	0.18		0.25	0.007		0.010
D	9.80		9.98	0.386		0.393
Е	3.80		3.98	0.15		0.157
е		0.64			0.025	
F	5.79		6.20	0.228		0.244
L	0.40		0.90	0.016		0.035
S		8° max.			8° max.	



9/12





#### **Table 4: Mechanical specifications**

Lead plating	Tin-lead		
Lead plating thickness	7 μm min. 25 μm max.		
Lead material	Copper Alloy		
Lead coplanarity	0.102 mm (0.004")		
Body material	Molded epoxy		
Resin	Meets UL94V-0 standard		



# 5 Ordering information

Table 5: Ordering information					
Order code	Marking	Package	Weight	Base qty.	Delivery mode
ST1284-01A8	ST1284 01	000000	0.147 a	48	Tube
ST1284-01A8RL	511284-01	QSOP28	0.147 g	2500	Tape and reel

# 6 Revision history

Table 6:	Document	revision	history
----------	----------	----------	---------

Date	Revision	Changes
Oct-2003	2B	Last release.
12-Mar-2010	3	Updated table in Figure 1 and Figure 10.
11-May-2012	4	Updated Table 3.
09-Jul-2014	5	Corrected typographical error in Table 2.
05-May-2017	6	Updated Table 1: "Absolute maximum ratings (Tamb = $25 \text{ °C}$ )". Minor text changes to improve readability.



#### **IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2017 STMicroelectronics - All rights reserved

