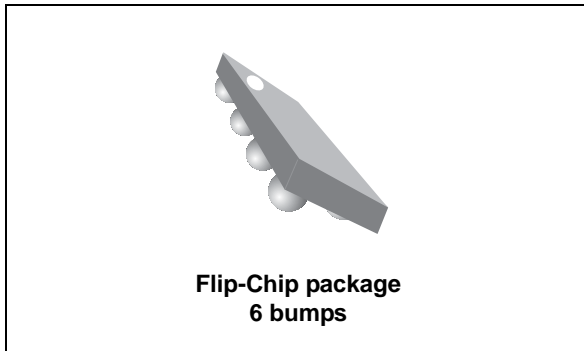


## 4-line ESD protection for high speed lines

Datasheet - production data



### Description

The HSP061-4F4 is a 4-channel ESD array with a rail to rail architecture designed specifically for the protection of high speed differential lines.

The ultra-low variation of the capacitance ensures very low influence on signal-skew.

The device is available in a Flip-Chip package with a 300  $\mu\text{m}$  pitch, which minimizes the PCB area.

### Features

- Flow-through routing to keep signal integrity
- Ultralarge bandwidth: 13 GHz
- Ultralow capacitance: 0.5 pF
- Low leakage current: 70 nA at 25 °C
- Extended operating junction temperature range: -40 °C to 125 °C
- Small package size: 0.72 mm<sup>2</sup>
- Very thin package: 0.380 mm typical
- RoHS compliant

### Complies with following standards

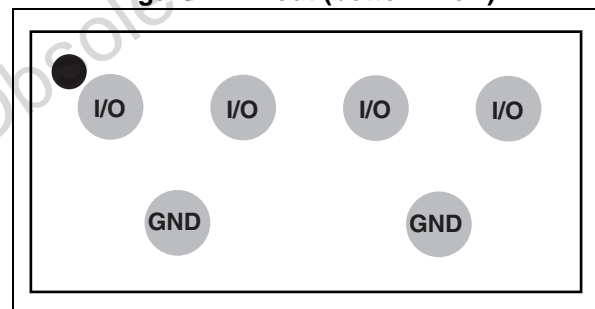
- IEC 61000-4-2 level 4:
  - 8 kV (contact discharge)
  - 15 kV (air discharge)

### Applications

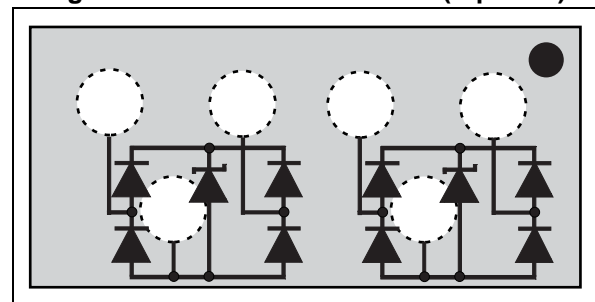
The HSP061-4F4 is designed to protect against electrostatic discharge on sub micron technology circuits driving:

- HDMI 1.3 and 1.4
- Digital Video Interface
- Display Port
- USB 3.0
- Serial ATA

**Figure 1. Pinout (bottom view)**



**Figure 2. Functional schematic (top view)**



# 1 Characteristics

**Table 1. Absolute maximum ratings  $T_{amb} = 25\text{ }^{\circ}\text{C}$**

| Symbol    | Parameter   | Value                           | Unit               |    |
|-----------|---|---------------------------------|--------------------|----|
| $V_{PP}$  | Peak pulse voltage                                  | IEC 61000-4-2 contact discharge | 8                  | kV |
|           |   | IEC 61000-4-2 air discharge     | 15                 |    |
| $I_{pp}$  | Repetitive peak pulse current (8/20 $\mu\text{s}$ ) | 3.5                             | A                  |    |
| $T_j$     | Operating junction temperature range                | -40 to +125                     | $^{\circ}\text{C}$ |    |
| $T_{stg}$ | Storage temperature range                           | -65 to +150                     | $^{\circ}\text{C}$ |    |
| $T_L$     | Maximum lead temperature for soldering during 10 s  | 260                             | $^{\circ}\text{C}$ |    |

**Table 2. Electrical characteristics  $T_{amb} = 25\text{ }^{\circ}\text{C}$**

| Symbol                 | Parameter                                      | Test conditions   | Min. | Typ. | Max. | Unit     |
|------------------------|--|---|------|------|------|----------|
| $V_{BR}$               | Breakdown voltage                              | $I_R = 1\text{ mA}$   | 6    |      |      | V        |
| $I_{RM}$               | Leakage current                                | $V_{RM} = 3\text{ V}$   |      |      | 70   | nA       |
| $V_{CL}$               | Clamping voltage                               | IEC 61000-4-2, +8 kV contact ( $I_{PP} = 30\text{ A}$ ), measured at 30 ns                        |      | 18   |      | V        |
| $C_{I/O - GND}$        | Capacitance (input/output to ground)           | $V_{I/O} = 0\text{ V}$ ,<br>$F = 200\text{ MHz to }3000\text{ MHz}$ ,<br>$V_{OSC} = 30\text{ mV}$ |      | 0.5  | 0.55 | pF       |
| $\Delta C_{I/O - GND}$ | Capacitance variation (input/output to ground) | $V_{I/O} = 0\text{ V}$ ,<br>$F = 200\text{ MHz to }3000\text{ MHz}$ ,<br>$V_{OSC} = 30\text{ mV}$ |      | 0.03 | 0.05 | pF       |
| $f_C$                  | Cut-off frequency                              | -3dB  |      | 13   |      | GHz      |
| $Z_{Diff}$             | Differential impedance                         | $t_r = 200\text{ ps (10 - 90\%)}^{(1)}$<br>$Z_{0\text{ Diff}} = 100\text{ }\Omega$                | 85   | 100  | 115  | $\Omega$ |

1. HDMI specification conditions. This information can be provided for other applications. Please contact your local ST office.

Figure 3. Leakage current versus junction temperature (typical values)

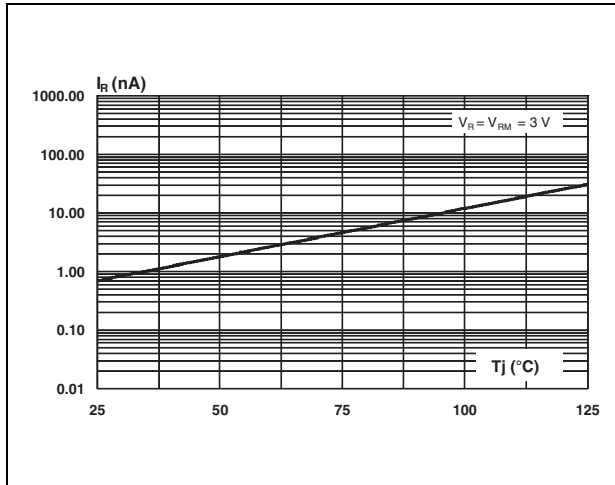


Figure 4. Attenuation versus frequency

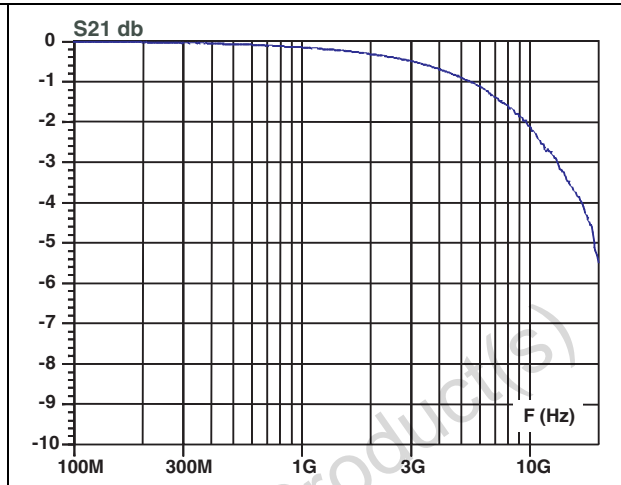


Figure 5. Differential impedance ( $Z_{diff}$ )<sup>(1)</sup>

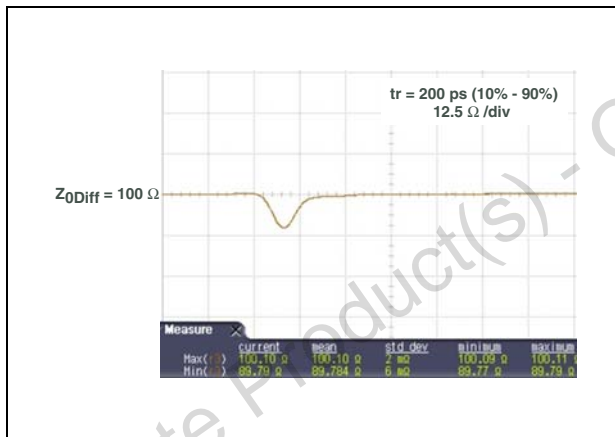
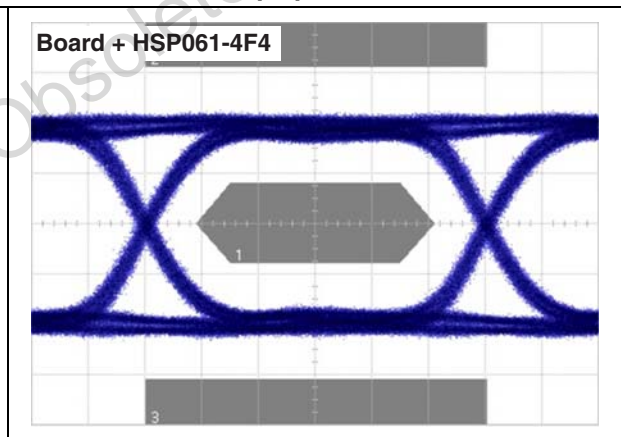


Figure 6. Eye diagram - HDMI mask at 3.35 Gbps per channel<sup>(1)</sup>



1. HDMI specification conditions. This information can be provided for other applications. Please contact your local ST office.

Figure 7. ESD response to IEC 61000-4-2 (+8 kV contact discharge)

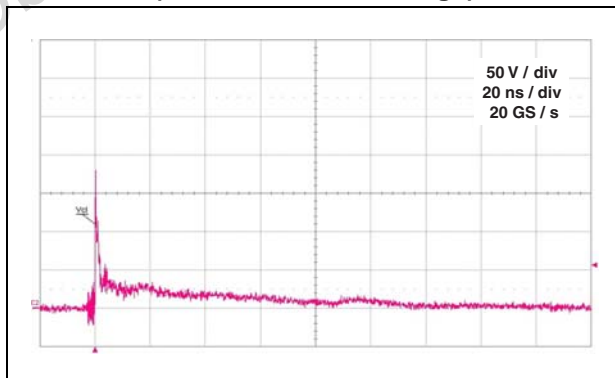
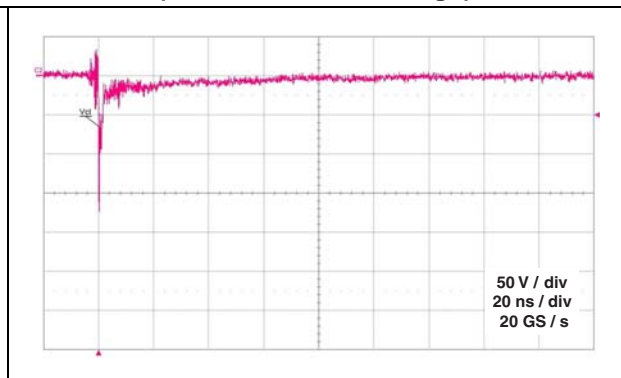


Figure 8. ESD response to IEC 61000-4-2 (-8 kV contact discharge)



## 2 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](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 9. Flip Chip dimensions

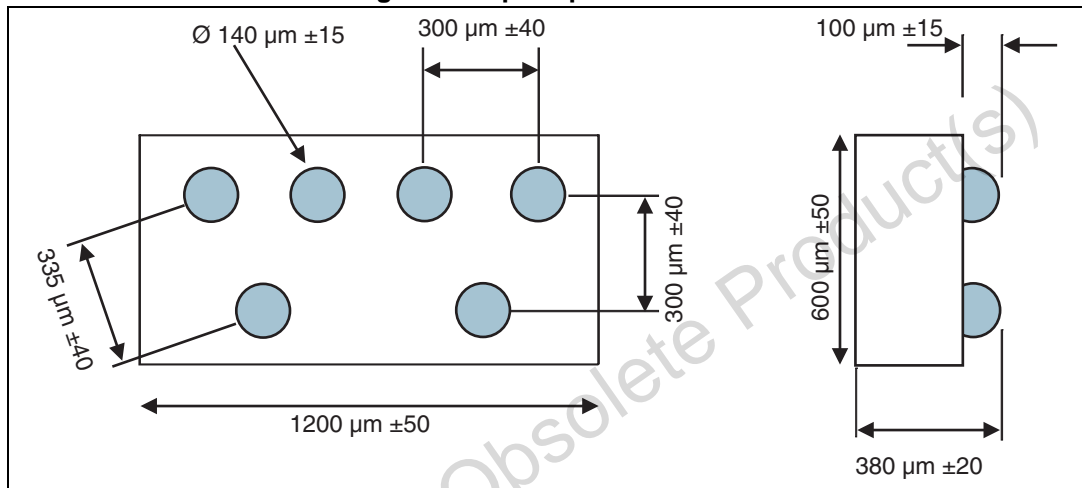


Figure 10. Footprint recommendations (dimensions in mm)

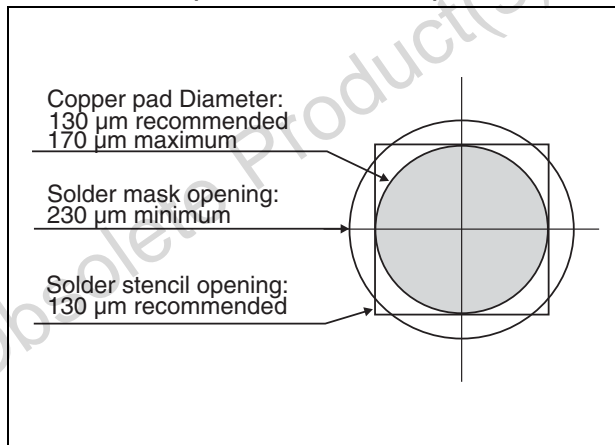


Figure 11. Marking

Dot,  
xx = marking  
z = manufacturing  
location  
yww = datecode  
y = year,  
ww = week

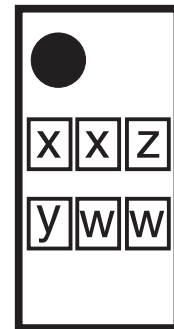
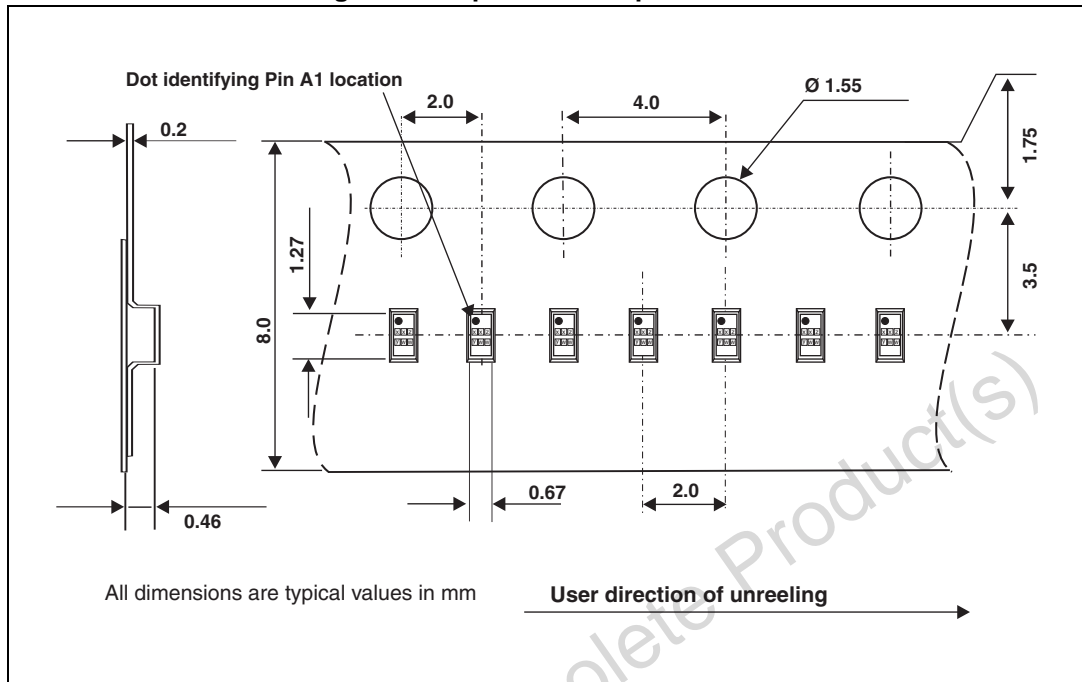


Figure 12. Tape and reel specification



Obsolete Product(s) - Obsolete Product(s)

### 3 Ordering information

Figure 13. Ordering information scheme

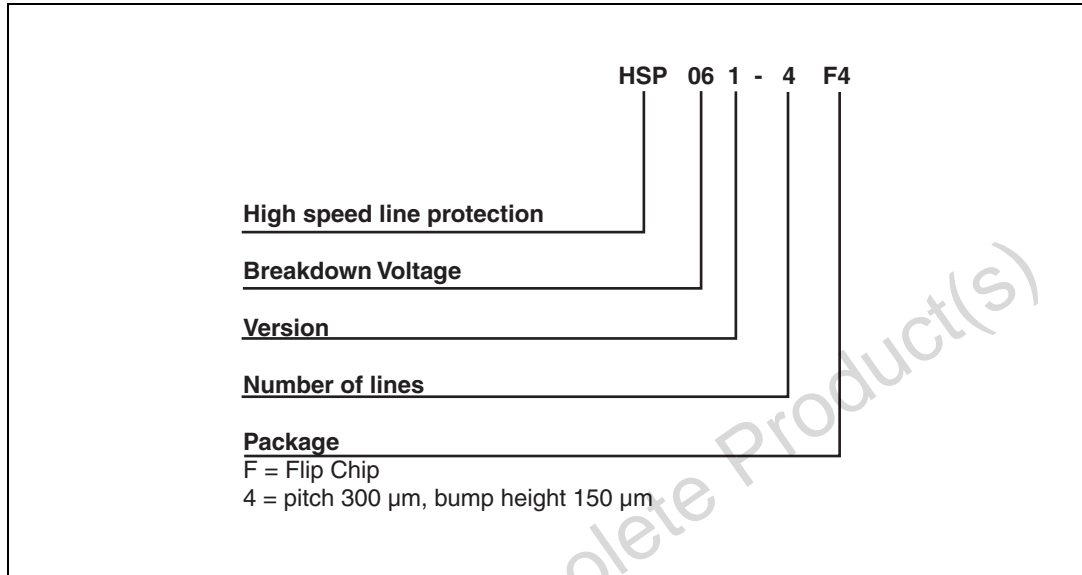


Table 3. Ordering information

| Order code | Marking | Package   | Weight | Base qty | Delivery mode      |
|------------|---------|-----------|--------|----------|--------------------|
| HSP061-4F4 | EW      | Flip Chip | 0.5 mg | 1000     | Tape and reel (7") |

### 4 Revision history

Table 4. Document revision history

| Date        | Revision | Changes  |
|-------------|----------|--|
| 08-Sep-2011 | 1        | Initial release.   |
| 31-Oct-2013 | 2        | Added package thickness information in <a href="#">Features</a> and <a href="#">Figure 9</a> . |

**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.**

**ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER'S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR "AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL" INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.**

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.

© 2013 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

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

[www.st.com](http://www.st.com)

