HDMI05-CL02F3

5-line IPAD™, HDMI™ control line ESD protection

Features

- Low line capacitance: 12 pF max.
- High efficiency in ESD protection
- Lead-free package
- Very thin package
- High reliability offered by monolithic integration
- High reduction of parasitic elements through integration and wafer level packaging

Complies with the standards:

- IEC 61000-4-2 Level 4
  - ± 15 kV (air discharge)
  - ± 8 kV (contact discharge)
- IEC 61000-4-2 Level 1
  - ± 2 kV (air discharge)
  - ± 2 kV (contact discharge)

Application

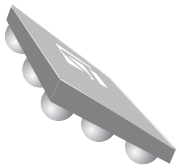
Where ESD protection for HDMI control lines (CEC, HPD, SCL and SDA) is required:

- Mobile phones and communication systems
- Portable multimedia players
- Camcorder, digital still cameras

Description

The HDMI05-CL02F3 chip is a low capacitance ESD protection for HDMI control pins. It also integrates pull-up resistor for I²C bus and pull-down resistor for hot plug detect and pull-up resistor for CEC line.

The ESD protection circuitry prevents damage to the protected device when subjected to ESD surges up to 15 kV.



Flip Chip
9 bumps

Figure 1. Pin configuration (bump side)

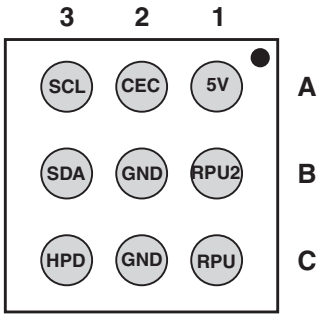
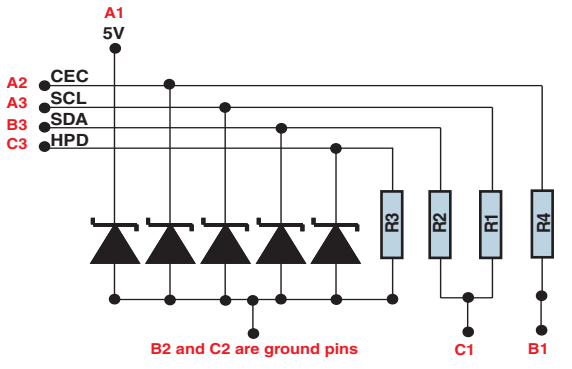


Figure 2. Schematic



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1 Characteristics

Table 1. Absolute maximum ratings (T_{amb} = 25 °C)

Symbol	Parameter	Value	Unit
V_{PP}	External pins (A1, A2, A3, B3 and C3): ESD IEC 61000-4-2, level 4 - air discharge ESD IEC 61000-4-2, level 4 - contact discharge Internal pins (B1, C1): ESD IEC 61000-4-2, level 1 - air discharge ESD IEC 61000-4-2, level 1 - contact discharge	 15 8 2 2	kV
Pd	Line resistance power dissipation at 70 °C	60	mW
T_{op}	Operating temperature range	-30 to + 85	°C
T_{stg}	Storage temperature range	-55 to + 150	°C

Figure 3. Electrical characteristics (definitions)

Symbol		Parameter
V_{BR}	=	Breakdown voltage
I_{RM}	=	Leakage current @ V_{RM}
V_{RM}	=	Stand-off voltage
V_{CL}	=	Clamping voltage
R_d	=	Dynamic impedance
I_{PP}	=	Peak pulse current
I_R	=	Breakdown current
αT	=	Voltage temperature coefficient
V_F	=	Forward voltage drop
C_{line}	=	Line capacitance
$R_{I/O}$	=	Series resistance between Input

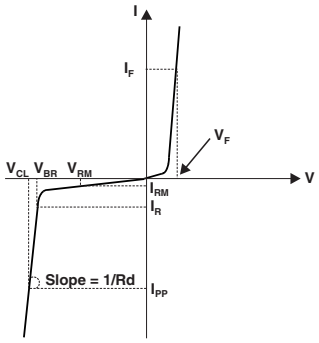


Table 2. Electrical characteristics (T_{amb} = 25 °C)

Symbol	Test condition	Min.	Typ.	Max.	Unit
V_{BR}	I_R = 1 mA	6		20	V
I_{RM}	V_{RM} = 3 V per line		50	200	nA
R_1, R_2		1575	1750	1925	Ω
R_3		80	100	120	kΩ
R_4		22	27	32	kΩ
C_{line}	V_{line} = 0 V, V_{osc} = 30 mV, F = 1 MHz CEC to GND with R_{PU2} not connected SCL and SDA to GND with R_{PU} not connected (measured under zero light conditions)		14 24	17 29	pF
C_{line}(1)	V_{line} = 0 V, V_{osc} = 30 mV, F = 1 MHz CEC, SCL and SDA to GND with R_{PU} and R_{PU2} grounded (measured under zero light conditions)		10	12	pF

1. This is the line capacitance seen by the data signals in the application conditions

Figure 4. S21(dB) versus frequency

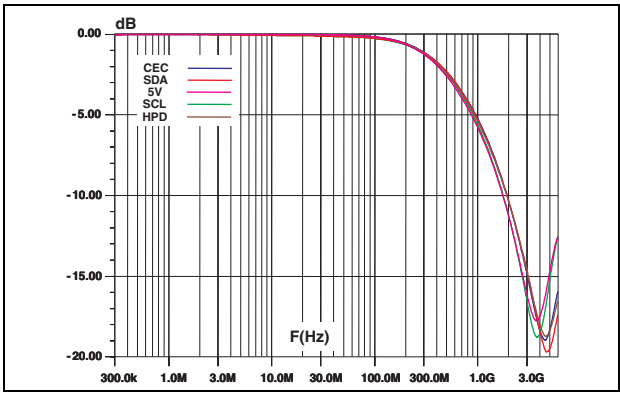


Figure 5. Analog crosstalk measurements

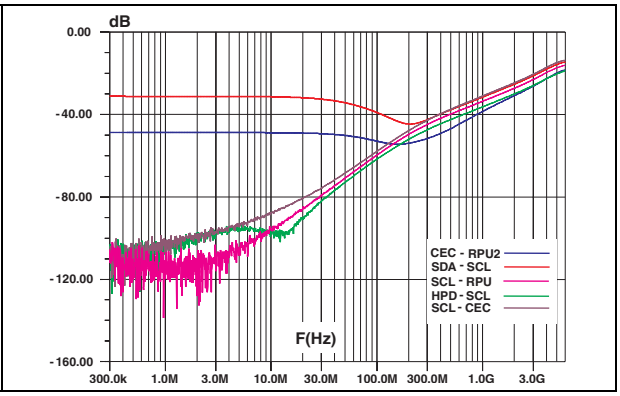


Figure 6. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on CEC line

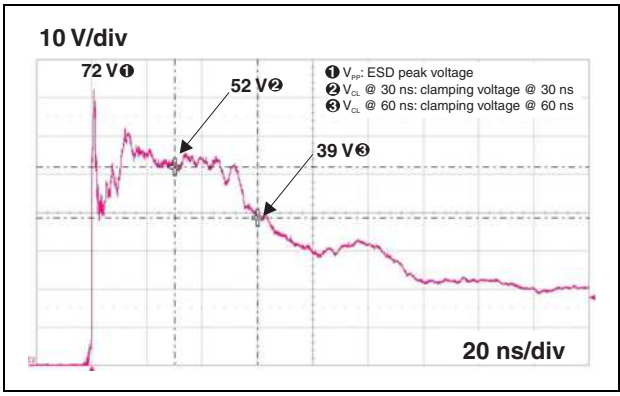


Figure 7. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on CEC line

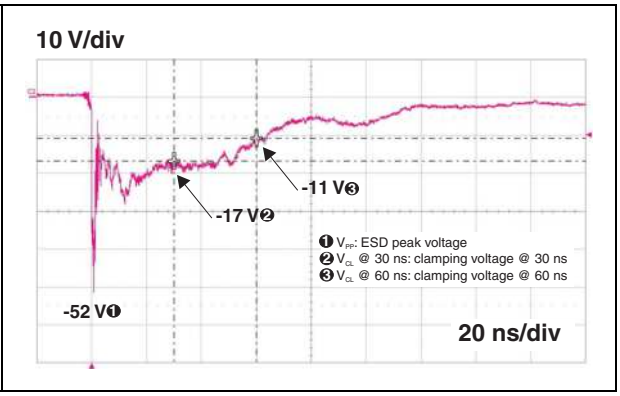


Figure 8. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on SCL line

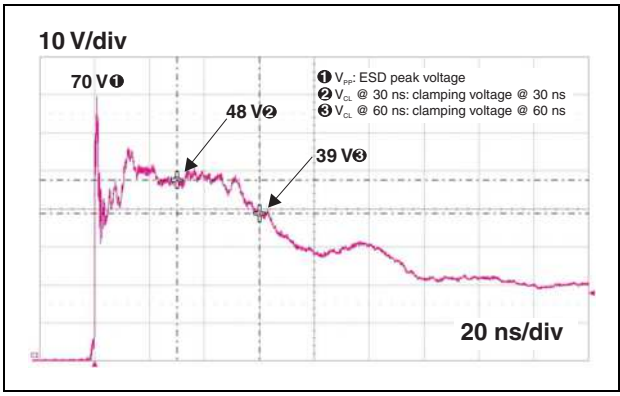


Figure 9. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on SCL line

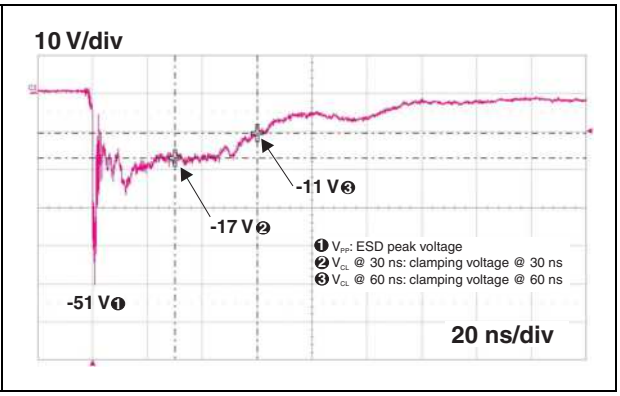


Figure 10. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on SDA line

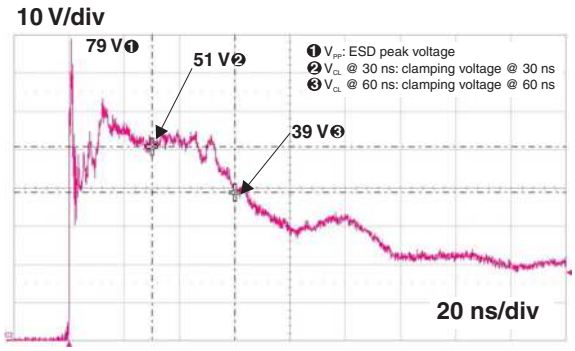


Figure 11. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on SDA line

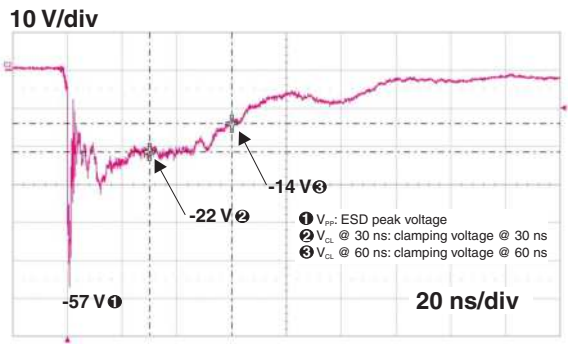


Figure 12. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on HPD line

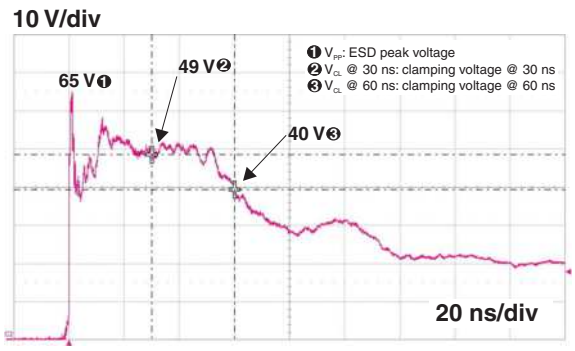


Figure 13. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on HPD line

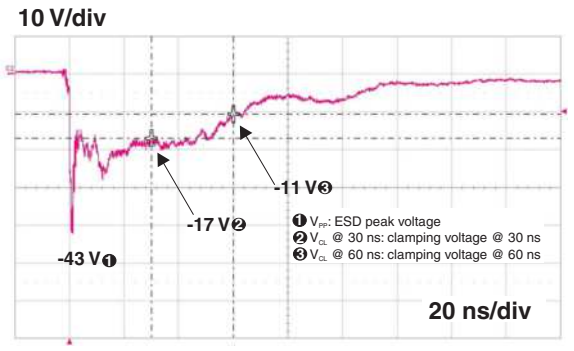


Figure 14. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on 5 V line

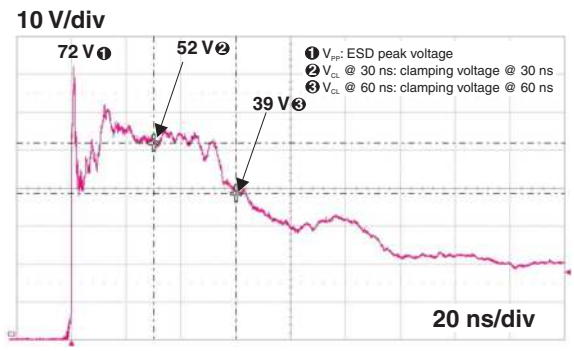
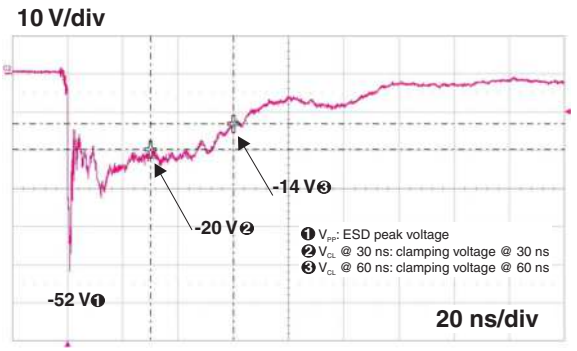
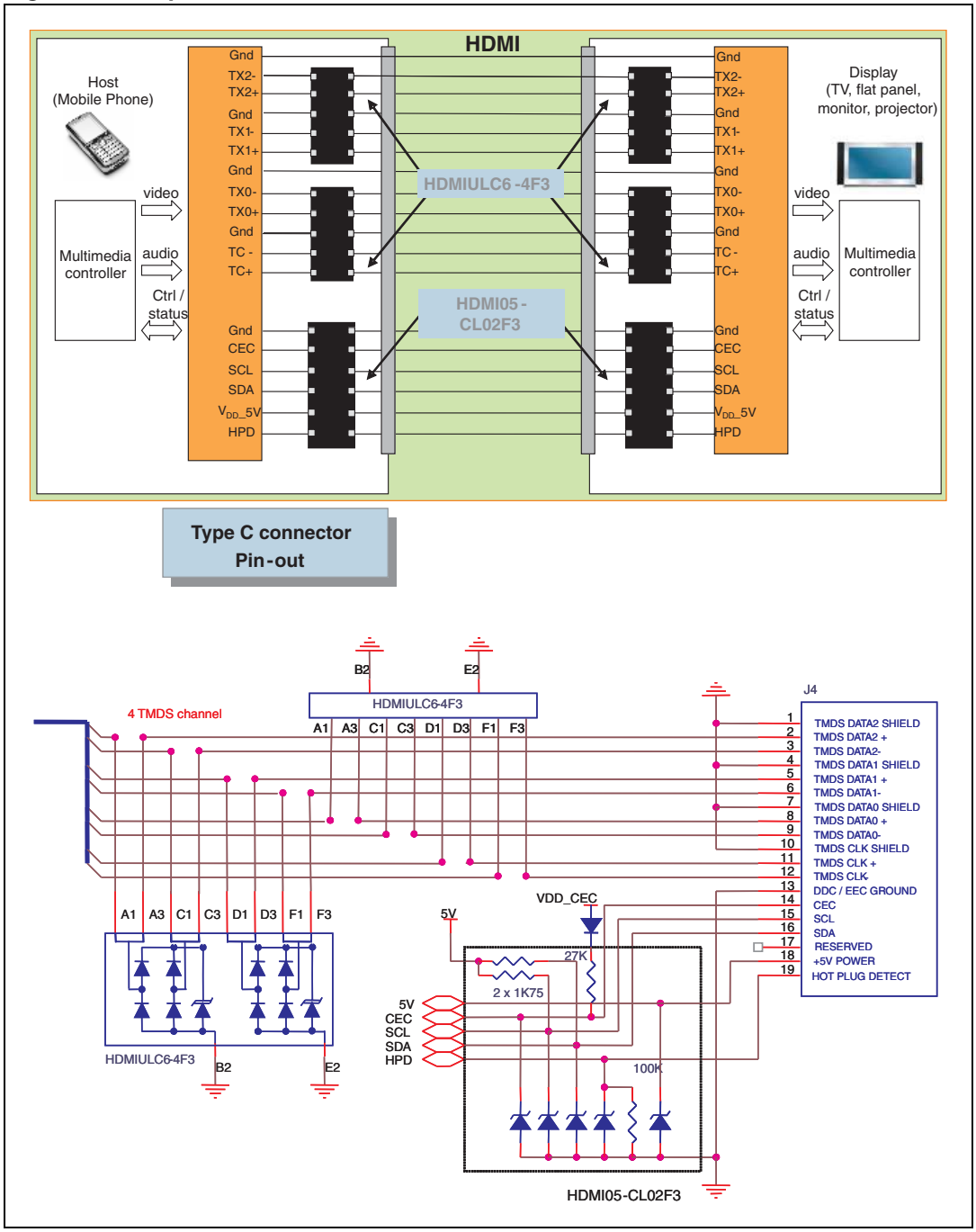


Figure 15. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on 5 V line



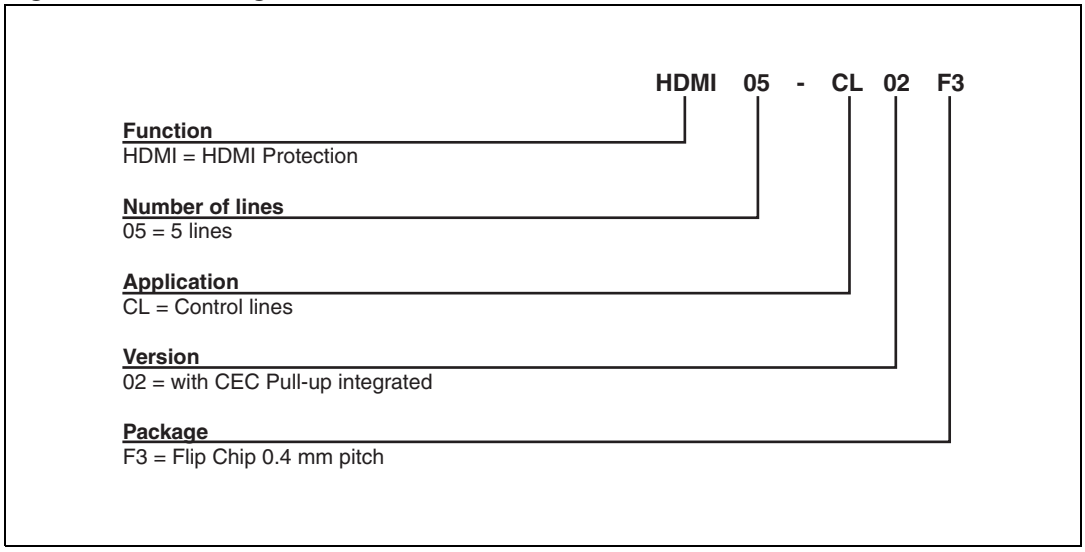
2 Typical application schematic

Figure 16. Implementation with HDMI



3 Ordering information scheme

Figure 17. Ordering information scheme



4 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. ECOPACK® is an ST trademark.

Figure 18. Flip Chip dimensions

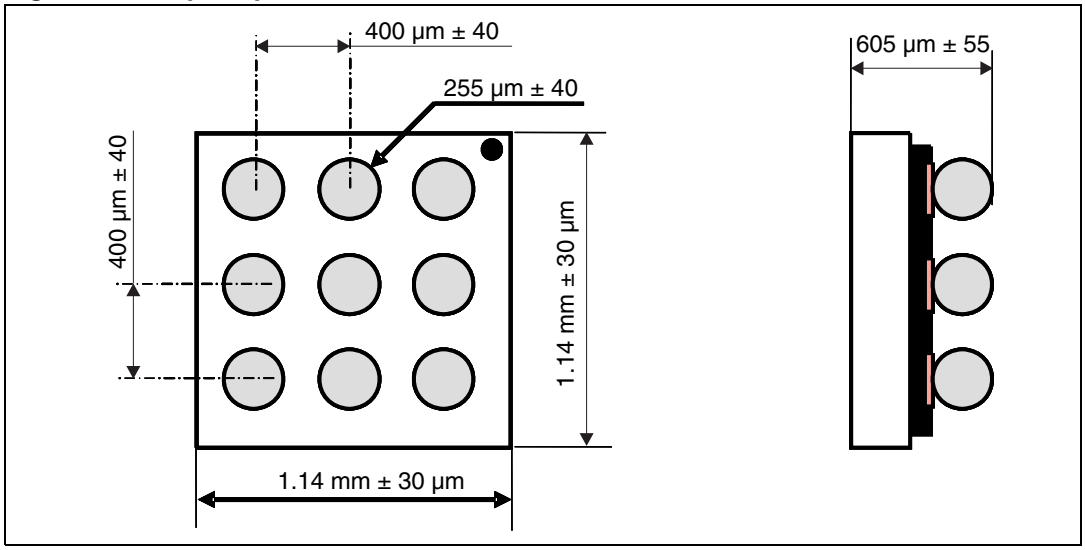


Figure 19. Footprint

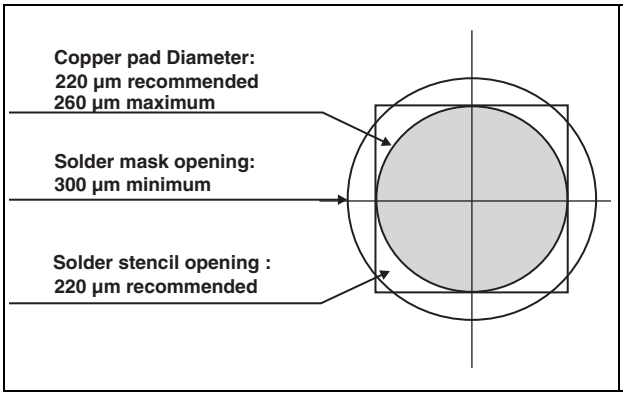


Figure 20. Marking

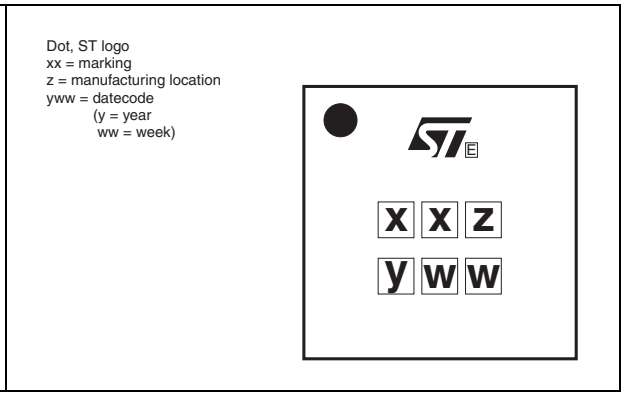
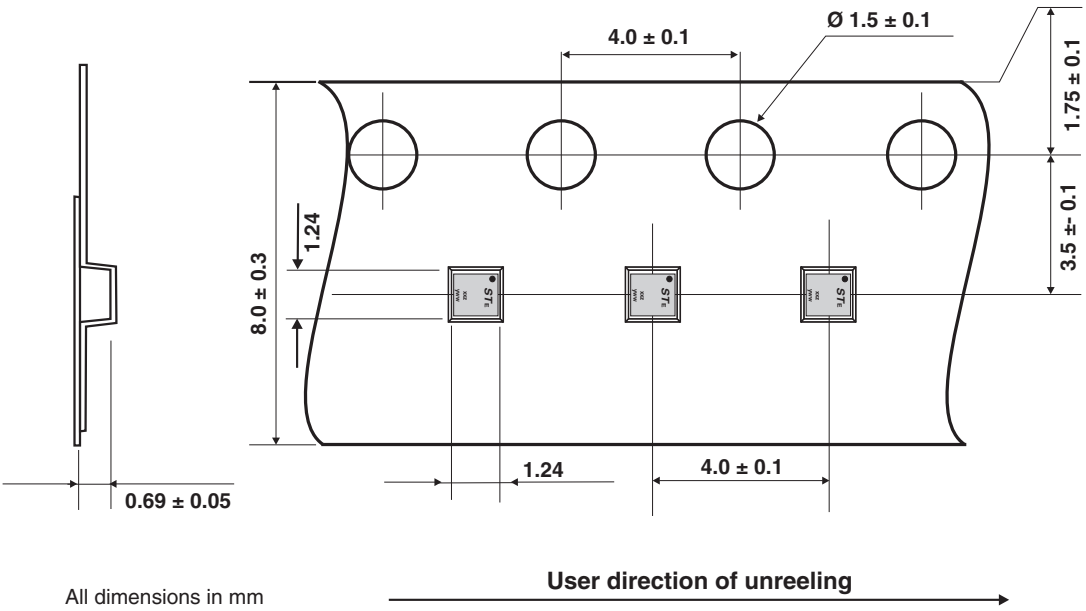


Figure 21. Flip Chip tape and reel specification



5 Ordering information

Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
HDMI05-CL02F3	JG	Flip Chip	1.76 mg	5000	Tape and reel (7”)

6 Revision history

Table 4. Document revision history

Date	Revision	Changes
24-Mar-2009	1	First issue.
07-Apr-2010	2	Updated *Figure 18.*

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