



ESD Protection for high speed interface

Main applications

Where transient over-voltage protection in ESD sensitive equipment is required, such as:

- Computers
- Printers
- Communication systems
- Cell phone handsets and accessories
- Video equipment

Description

The **DSILC6-4xx** is a monolithic application specific discrete dedicated to ESD protection of high speed interfaces, such as USB 2.0, Ethernet, **display and camera serial interfaces** (LVDS).

The device is ideal for applications where both reduced printed circuit board space and power absorption capability are required.

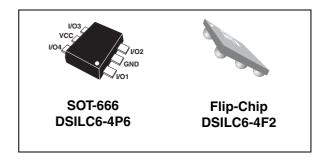
Features

Diode array topology

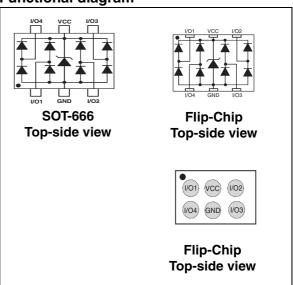
- 4 line protection
- 5 V V_{CC} protection
- Very low capacitance: 1 pF typ.
- Lead-free pacakge
- RoHS compliant

Benefits

- Very low capacitance between lines to GND for optimized data integrity
- Low PCB space consumption: 2.9 mm² max for SOT-666 and 1.5 mm² max for Flip-Chip
- Cut-off frequency > 2 GHz
- High reliability offered by monolithic integration
- MDDI, SMIA, MIPI specification compliant



Functional diagram



Order Code

Part Number	Marking
DSILC6-4P6	G
DSILC6-4F2	El

Complies with the following standards:

IEC 61000-4-2 level 4:

8 kV (contact discharge)

15 kV (air discharge)

MIL STD 883G-Method 3015-7: class 3B

Characteristics DSILC6-4xx

1 Characteristics

Table 1. Absolute ratings

Symbol	Parameter			Value	Unit	
V _{PP}	Peak pulse voltage	IEC 61000-4-2 contact disc IEC 61000-4-2 air discharg	8 15	kV		
ı	Poak pulso ourrent		SOT-666	5	Α	
IPР	I _{PP} Peak pulse current	I/O to GND Pulse waveform = 8/20 μs	Flip-Chip	7	A	
D	P _{PP} Peak pulse power		SOT-666	90	W	
ГРР			Flip-Chip	120	VV	
T _{stg}	Storage temperature range			-55 to +150	°C	
Tj	Maximum junction temperature			125	°C	
TL	Lead solder temperature (10 seconds duration)			260	°C	

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

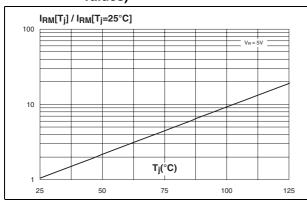
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Symbol	Parameter	- <u>'</u> † 1
V _{RM}	Reverse stand-off voltage	
I _{RM}	Leakage current	V _{BR} , y _F
V_{BR}	Breakdown voltage	V _{cl} \forall V _{RM}
V _F	Forward voltage	
V _{CL}	Clamping voltage	Slope = 1/Rd
I _{PP}	Peak pulse current	*

Symbol Parameter		Test Conditions			Value		
					Тур	Max	Unit
I _{RM}	Leakage current	V _{RM} = 5 V				0.5	μΑ
V _{BR}	Breakdown voltage between V _{BUS} and GND	I _R = 1 mA		6			V
V _F	Forward voltage	I _F = 10 mA				1	V
		V 0 V F 1 MH= V 20 mV	SOT-666		2	2.5	
Capacitance between I/O and GND	Capacitance between	$V_{I/O} = 0 \text{ V, F} = 1 \text{ MHz, V}_{OSC} = 30 \text{ mV}$	Flip-Chip		2.5	3	
	$V_{I/O} = 1.65 \text{ V}, V_{CC} = 4.3 \text{ V},$	SOT-666		1.5	1.8		
		$F = 1 \text{ MHz}, V_{OSC} = 400 \text{ mV}$	Flip-Chip		1.8	2.0	
		V = 0.V E = 1 MHz V = 20 mV	SOT-666		1.0	1.25	nE
C _{i/o-i/o} Capacitance between I/O	$V_{I/O} = 0 \text{ V, F} = 1 \text{ MHz, V}_{OSC} = 30 \text{ mV}$	Flip-Chip		1.25	1.5	pF	
	$V_{I/O} = 1.65 \text{ V}, V_{CC} = 4.3 \text{ V},$	SOT-666		0.75	0.9		
	F = 1 MHz, V _{OSC} = 400 mV Flip-Chip			0.9	1.20		
$\Delta C_{i/o\text{-GND}}$		V _{I/O} = 0 V, F = 1 MHz, V _{OSC} = 30 mV				0.06	
$\Delta C_{i/o-i/o}$		V _{I/O} = 0 V, F = 1 MHz, V _{OSC} = 30 mV				0.05	

DSILC6-4xx Characteristics

Figure 1. Relative variation of leakage current versus junction temperature - SOT-666 (typical values)

Figure 2. Relative variation of leakage current versus junction temperature Flip-Chip (typical values)



100 IRM[T_j] / IRM[T_j=25°C]

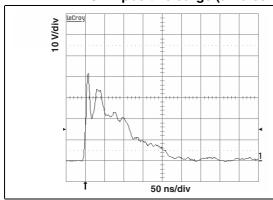
10 V_n=5V

T_j(°C)

25 50 75 100 125

Figure 3. Remaining voltage after
DSILC6-4P6 during ESD
15 kV positive surge (air discharge)

Figure 4. Remaining voltage after
DSILC6-4F2 during ESD
15 kV positive surge (air discharge)



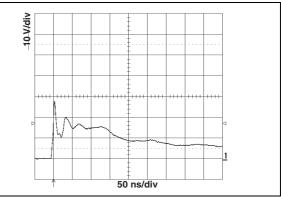
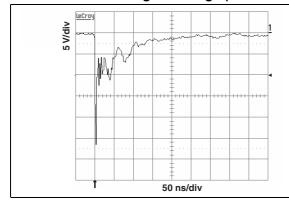
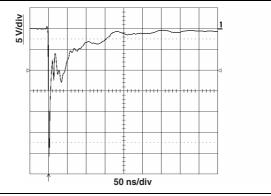


Figure 5. Remaining voltage after
DSILC6-4P6 during ESD
15 kV negative surge (air discharge)

Figure 6. Remaining voltage after
DSILC6-4F2 during ESD
15 kV negative surge (air discharge)

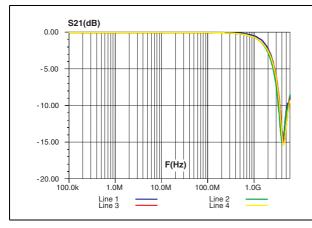




Characteristics DSILC6-4xx

Figure 7. Frequency responses of all lines DSILC6-4P6

Figure 8. Frequency response of all lines DSILC6-4F2



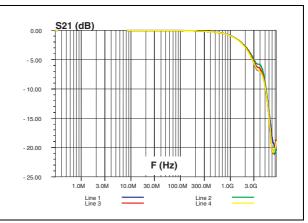
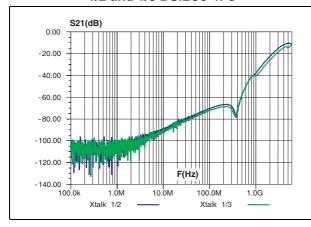
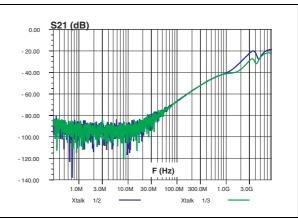


Figure 9. Crosstalk results for lines 1/2 and 1/3 DSILC6-4P6

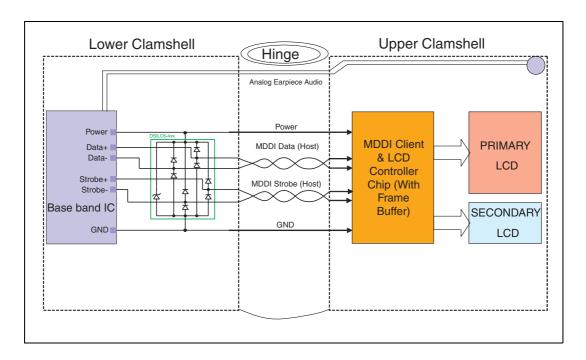
Figure 10. Crosstalk results for lines 1/2 and 1/3 DSILC6-4F2



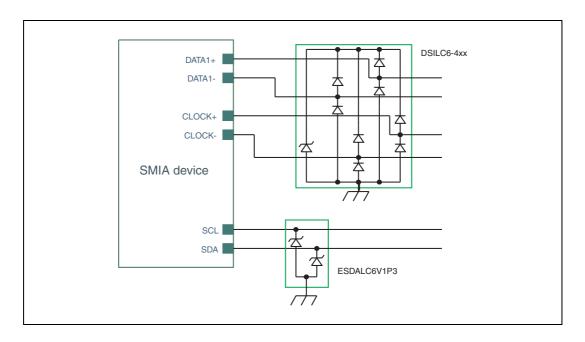


2 Application examples

2.1 MDDI

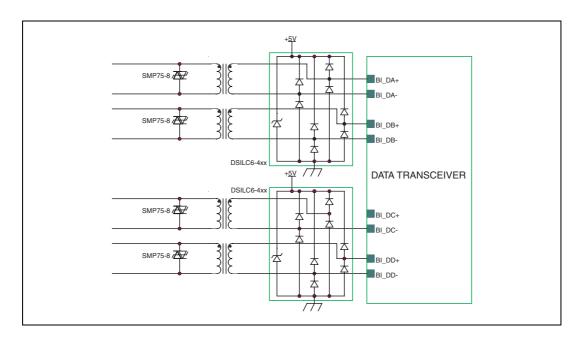


2.2 SMIA

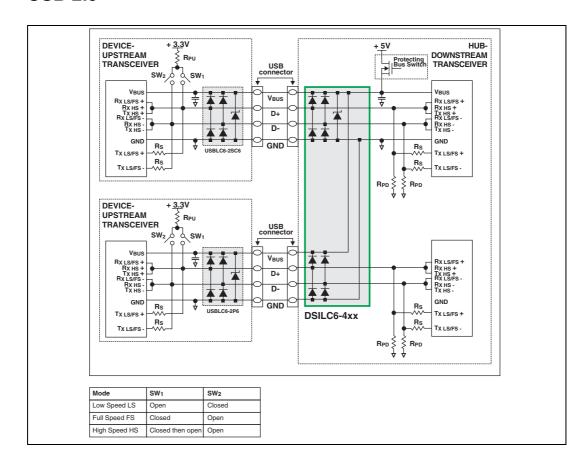


5/

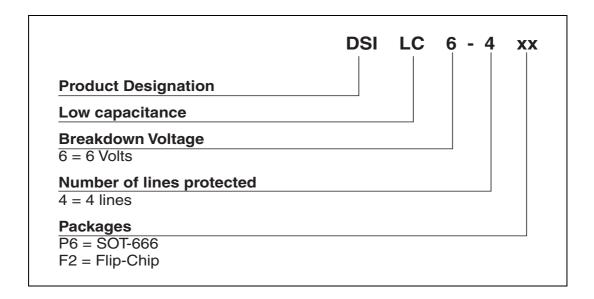
2.3 Ethernet 1 Gb



2.4 USB 2.0



3 Ordering information scheme

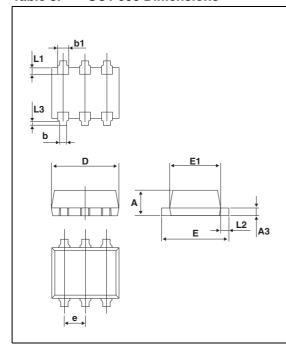


Package information DSILC6-4xx

4 Package information

Epoxy meets UL94, V0

Table 3. SOT-666 Dimensions

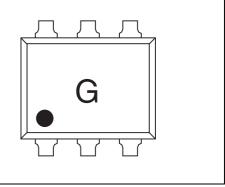


	Dimensions						
Ref.	Millimete		ers		Inches		
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	0.45		0.60	0.018		0.024	
А3	0.08		0.18	0.003		0.007	
b	0.17		0.34	0.007		0.013	
b1	0.19	0.27	0.34	0.007	0.011	0.013	
D	1.50		1.70	0.059		0.067	
Е	1.50		1.70	0.059		0.067	
E1	1.10		1.30	0.043		0.051	
е		0.50			0.020		
L1		0.19			0.007		
L2	0.10		0.30	0.004		0.012	
L3		0.10			0.004		

Figure 11. SOT-666 footprint

0.50

Figure 12. SOT-666 marking



DSILC6-4xx Package information

Figure 13. Flip-Chip Dimensions

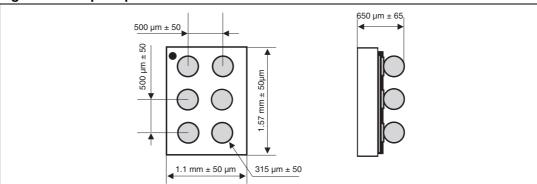


Figure 14. Flip-Chip footprint

Figure 15. Flip-Chip marking

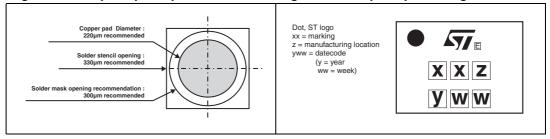
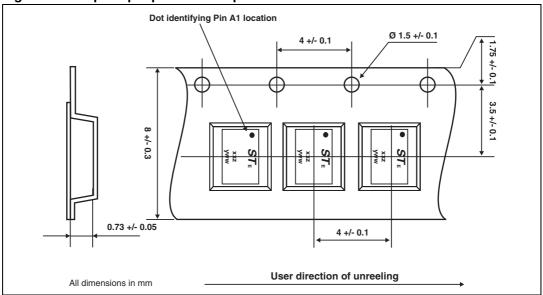


Figure 16. Flip-Chip tape and reel specifications



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 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.

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Ordering information DSILC6-4xx

5 Ordering information

Ordering code	Marking	Package	Weight	Base qty	Delivery mode
DSILC6-4P6	G	SOT-666	2.9 mg	3000	Tape and reel
DSILC6-4F2	El	Flip-Chip	2.22 mg	5000	Tape and reel

6 Revision history

Date	Revision	Description of Changes
10-Aug-2006	1	Initial release.
04-Jan-2007	2	Added Flip-Chip package. Added applications examples for SMIA, Ethernet 1 Gb, and USB. Updated Tj max to 150. Added V_{RM} line in Table 2. Modified MDDI example figure.
28-May-2007	3	Modified Functional diagram on page 1 to show Top side view instead of Bump side view of DSILC64F2. Removed V _{RM} line in Table 2. Added characteristic curves specific to each package for ESD, Frequency response and Crosstalk

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