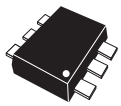
THE DATASHEET OF

USBULC6-2P6

USBULC6-2P6

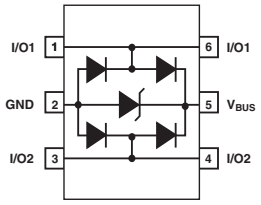
Ultra large bandwidth ESD protection

Datasheet - production data



SOT-666
USBULC6-2P6

Figure 1. Functional diagram



Features

- 2 data line 15 kV ESD protection (air and contact discharge)
- Protects 5 V V_{BUS} when applicable
- Ultra low capacitance
- Very low leakage current: 0.5 µA max.
- Fast response time compared with varistors
- SOT-666 package
- RoHS compliant

Benefits

- ESD protection of V_{BUS} when applicable
- High bandwidth to minimize impact on data signal quality
- Low PCB space occupation
- Low leakage current for longer operation of battery powered devices
- High reliability offered by monolithic integration

Complies with the following standards

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

Applications

- USB 2.0 ports including high speed USB ports
- Up to 480 Mb/s as well as full and low speed USB ports
- Ethernet port: 10/100/1000 Mb/s
- Video line protection
- Portable electronics

Description

The USBULC6-2P6 is a monolithic application specific device dedicated to ESD protection of high speed interfaces.

The ultra low line capacitance provides high bandwidth and secures a high level of signal integrity without compromising the protection of downstream sensitive chips against the most stringently characterized ESD strikes.

1 Characteristics

Table 1. Absolute ratings

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	IEC 61000-4-2 air discharge IEC 61000-4-2 contact discharge MIL STD883G-Method 3015-7	±15 ±15 ±25	kV
T_{stg}	Storage temperature range		-55 to +150	°C
T_j	Maximum junction temperature		+125	°C
T_L	Lead solder temperature (10 seconds duration)		260	°C

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

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
I_{RM}	Leakage current	V_{RM} = 5 V			0.5	µA
V_{BR}	Breakdown voltage between V_{BUS} and GND	I_R = 1 mA	6			V
V_{CL}	Clamping voltage	I_{PP} = 1 A, 8/20 µs Any I/O pin to GND			12	V
		I_{PP} = 5 A, 8/20 µs Any I/O pin to GND			17	V
$C_{i/o-GND}$	Capacitance between I/O and GND	V_R = 0 V, F = 1 MHz Any I/O pin to ground		1.0	1.2	pF
		V_R = 0 V, F = 240 MHz Any I/O pin to ground		0.7	0.85	
$\Delta C_{i/o-GND}$	Capacitance variation between I/O and GND	V_R = 0 V, F = 1 MHz Any I/O pin to ground		0.02		
$C_{i/o-i/o}$	Capacitance between I/O	V_R = 0 V, F = 1 MHz Ground not connected		0.47	0.55	
		V_R = 0 V, F = 240 MHz Ground not connected		0.45	0.55	

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

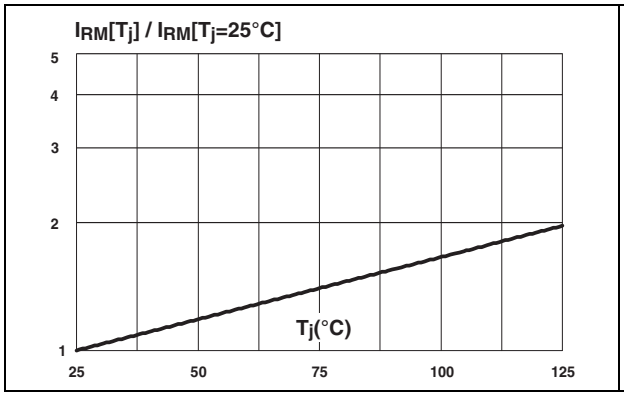


Figure 3. Typical frequency response

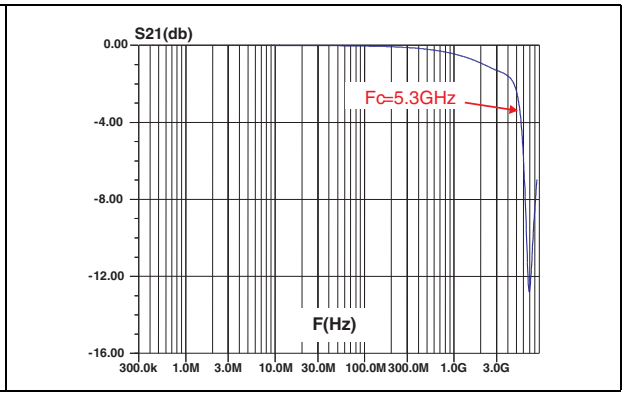


Figure 4. Crosstalk measurement

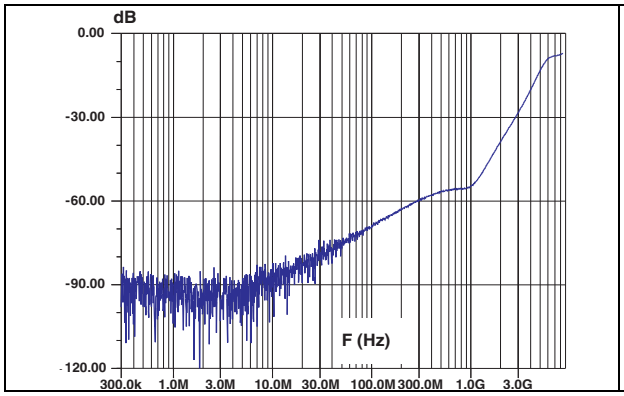


Figure 5. Line capacitance versus frequency (typical values)

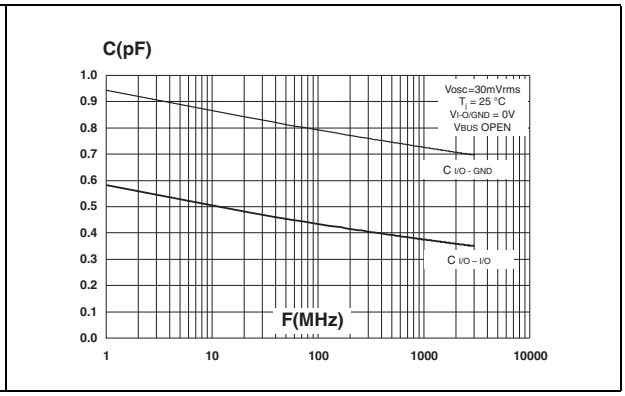


Figure 6. Remaining voltage on I/O1 after USBULC-2P6 during positive ESD surge (+15 kV air discharge)

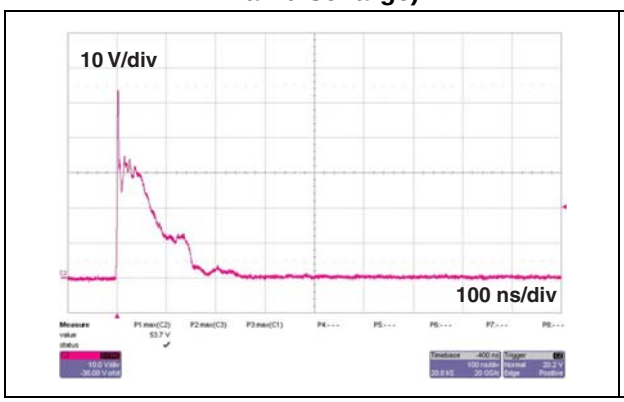


Figure 7. Remaining voltage on I/O2 after USBULC-2P6 during negative ESD surge (-15 kV air discharge)

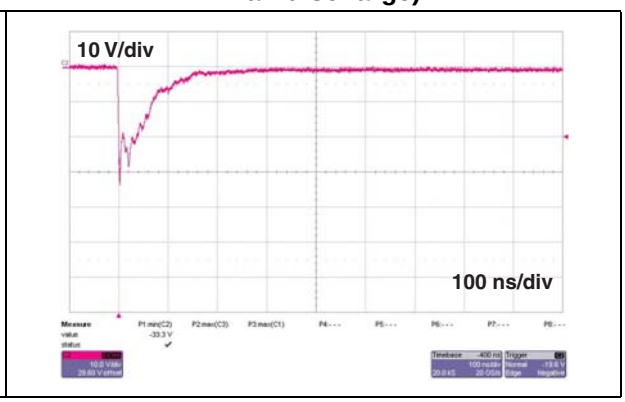


Figure 8. Remaining voltage on V_{BUS} after USBULC-2P6 during positive ESD surge (+15 kV air discharge)

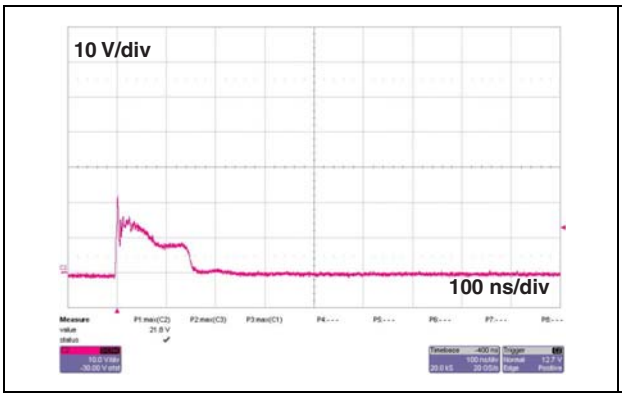


Figure 9. Remaining voltage on V_{BUS} after USBULC-2P6 during negative ESD surge (-15 kV air discharge)

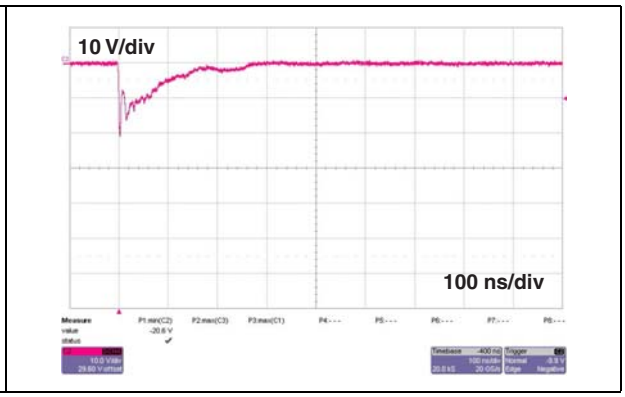


Figure 10. Eye diagram PCB only, 400 mV amplitude, F = 480 Mbps

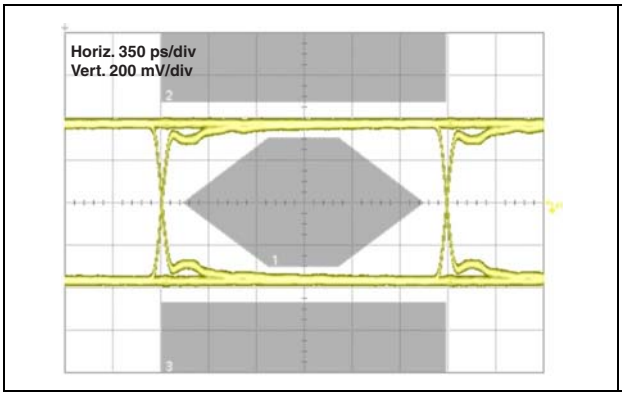


Figure 11. Eye diagram PCB + USBULC6-2P6, 400 mV amplitude, F = 480 Mbps

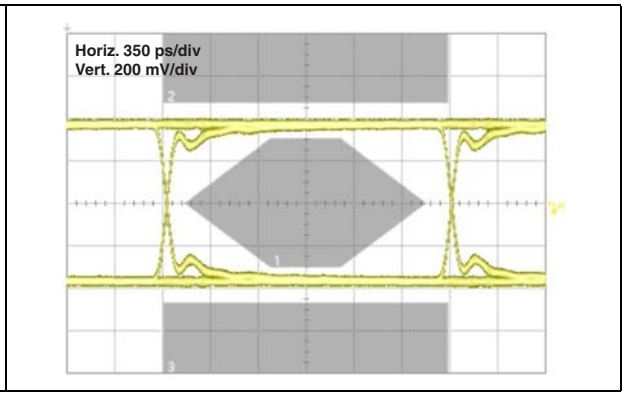
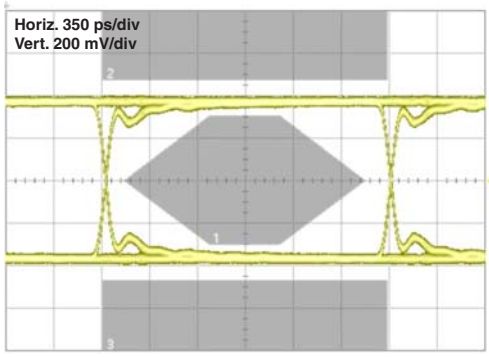
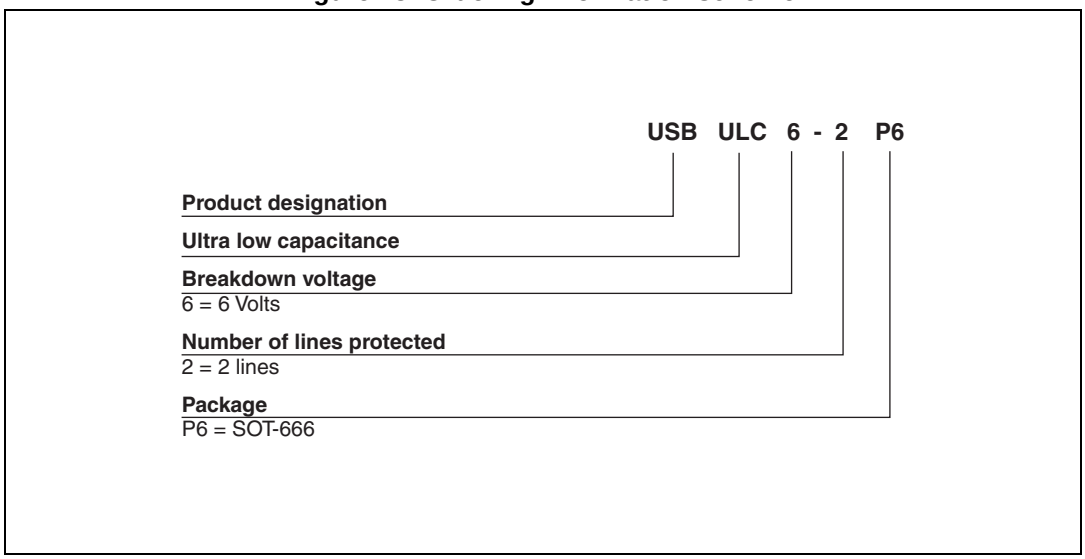


Figure 12. Eye diagram PCB + USBULC6-2P6, +5 V on V_{BUS}, decoupling capacitor 100 nF, 400 mV amplitude, F = 480 Mbps



2 Ordering information scheme

Figure 13. Ordering information scheme

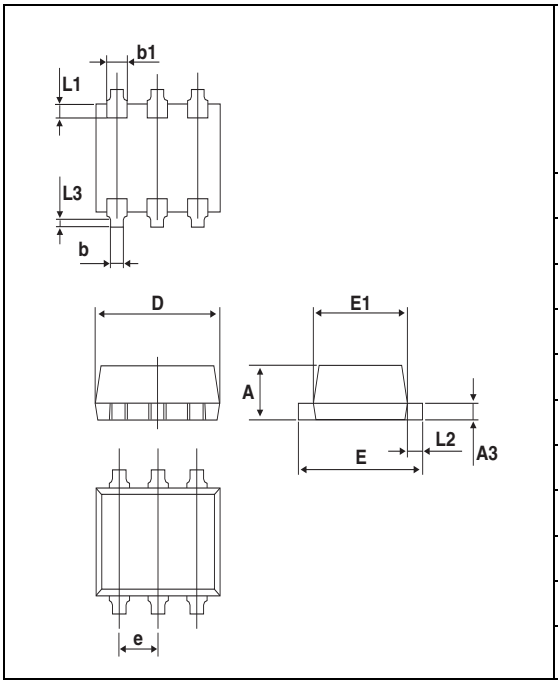


3 Package information

- Epoxy meets UL94, V0

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*.

Table 3. SOT-666 dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.45		0.60	0.018		0.024
A3	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
E	1.50		1.70	0.059		0.067
E1	1.10		1.30	0.043		0.051
e		0.50			0.020	
L1		0.19			0.007	
L2	0.10		0.30	0.004		0.012
L3		0.10			0.004	

Figure 14. SOT-666 footprint

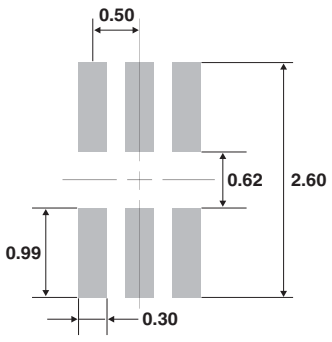
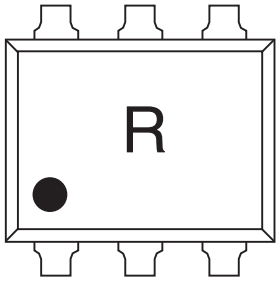


Figure 15. SOT-666 marking



4 Ordering information

Table 4. Ordering information

Ordering code	Marking	Package	Weight	Base qty	Delivery mode
USBULC6-2P6	R	SOT-666	2.9 mg	3000	Tape and reel

5 Revision history

Table 5. Document revision history

Date	Revision	Description of changes
31-Mar-2014	1	First issue.

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