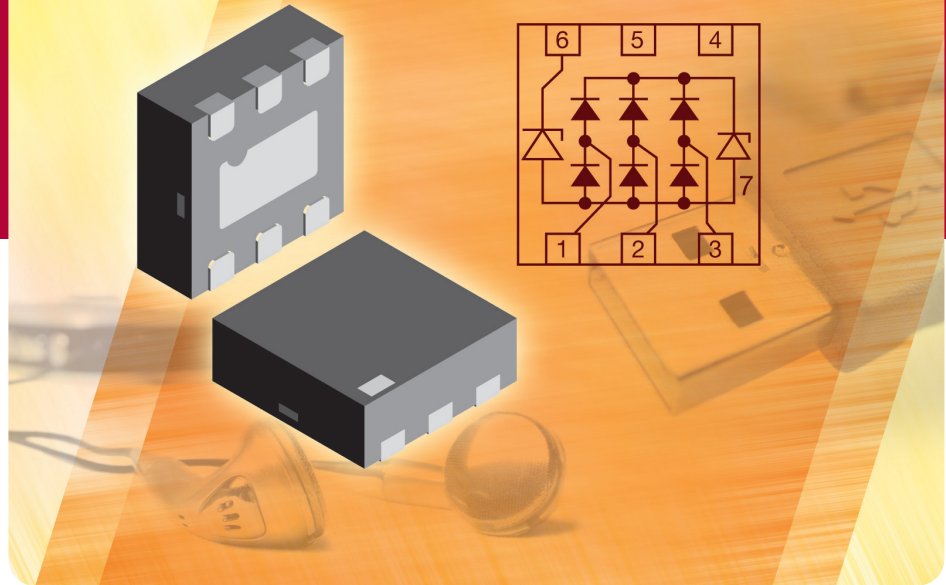




DIODES

VBUS053CZ-HAF

USB-OTG ESD Protection



VBUS053CZ-HAF

New USB-OTG ESD Protection Bus Port Array for $V_{BUS} = 28\text{ V}$

KEY BENEFITS

- Low load capacitance: $C_D = 0.8\text{ pF}$
- 3-line USB ESD protection with 5 V working range
- 1-line V_{BUS} protection with 28 V working range
- Small LLP package with low package height: $< 0.6\text{ mm}$
- Green molding compound

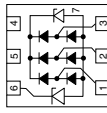
APPLICATIONS

- ESD protection in high-speed data applications for OTG application during battery charging via USB port
 - Portable gaming devices
 - MP3 players
 - Mobile phones

New USB-OTG ESD Protection Bus Port Array for VBUS = 28 V

FEATURES

- Ultra compact LLP75-7L package
- Low package height < 0.6 mm
- 3-line USB ESD-protection with max. working range = 5.5 V
- V_{BUS}-protection with 28 V working range
- Low leakage current
- Low load capacitance C₀ = 0.7 pF
- ESD-protection to IEC 61000-4-2 ± 15 kV contact discharge ± 15 kV air discharge
- Surge current acc. IEC 61000-4-5 I_{pp} > 3 A
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



MARKING (example only)



Dot = pin 1 marking
 XX = date code
 YY = type code (see table below)

ORDERING INFORMATION		
DEVICE NAME	ORDERING CODE	MINIMUM ORDER QUANTITY
VBUS053CZ-HAF	VBUS053CZ-HAF-G-08	15 000

PACKAGE DATA			
DEVICE NAME	PACKAGE TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING
VBUS053CZ-HAF	LLP75-7L	UA	UL 94 V-0

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	TEST CONDITIONS	UNIT
Data line D+, ID, Pin 1, 2 and 3 to ground (pin 7)		
Peak pulse current	acc. IEC 61000-4-5; t _p = 8/20 μs; single shot	I _{PPM}
Peak pulse power	acc. IEC 61000-4-5; t _p = 8/20 μs; single shot	P _{PP}
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}
	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}
V _{BUS} : Pin 6 to ground (pin 7)		
Peak pulse current	acc. IEC 61000-4-5; t _p = 8/20 μs; single shot	I _{PPM}
Peak pulse power	acc. IEC 61000-4-5; t _p = 8/20 μs; single shot	P _{PP}
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}
	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}
Operating temperature	Junction temperature	T _J
Storage temperature		T _{STG}

** Please see document "Vishay Material Category Policy": www.vishay.com/doc299502

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For technical questions, contact ESDprotection@vishay.com

ELECTRICAL CHARACTERISTICS VBUS053CZ-HAF All inputs (pin 1, 2, and 3) to ground (pin 7)						
PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of line which can be protected	N _{lines}	-	-	3	lines
Reverse working voltage	at I _R = 0.1 μA	V _{RWM}	5.5	-	-	V
Reverse current	at V _R = V _{RWM} = 3.3 V; T = 65 °C	I _R	-	-	0.085	μA
	at V _R = V _{RWM} = 5.5 V	I _R	-	-	0.1	μA
Forward voltage	at I _F = 15 mA	V _F	0.7	-	-	V
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	6.5	-	10	V
Reverse clamping voltage	at I _{pp} = 1 A; acc. IEC 61000-4-5	V _C	-	10	12	V
	at I _{pp} = 3 A; acc. IEC 61000-4-5	V _C	-	15	18	V
Forward clamping voltage	at I _F = 3 A; acc. IEC 61000-4-5	V _F	-	3.4	4.1	V
Line capacitance	Test pin at V _R = 0 V;	C ₀	-	0.7	1	pF
	any other I/O pin at V _R = 3.3 V; f = 1 MHz					
Line symmetry	Difference of the line capacitance	dC ₀	-	-	0.1	pF
Line to line capacitance	Among pins 1, 2 and 3	C ₀	-	0.35	0.5	pF

Note

- Ratings at 25 °C, ambient temperature unless otherwise specified

ELECTRICAL CHARACTERISTICS VBUS053CZ-HAF V _{BUS} (pin 6) to ground (pin 7)						
PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of line which can be protected	N _{lines}	-	-	1	lines
Reverse working voltage	at I _R = 100 nA	V _{RWM}	28	-	-	V
Reverse current	at V _R = V _{RWM} = 28 V	I _R	-	-	100	nA
Forward voltage	at I _F = 10 mA	V _F	0.6	0.75	0.9	V
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	32	-	40	V
Reverse clamping voltage	at I _{pp} = 1 A; acc. IEC 61000-4-5; T = 25 °C	V _C	-	37	45	V
	at I _{pp} = 3 A; acc. IEC 61000-4-5; T = 25 °C	V _C	-	42	52	V
Forward clamping voltage	at I _F = 3 A; acc. IEC 61000-4-5	V _F	-	-	2.2	V
Line capacitance	at V _R = 0 V; f = 1 MHz	C ₀	-	31	40	pF

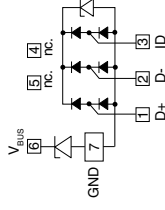
Note

- Ratings at 25 °C, ambient temperature unless otherwise specified

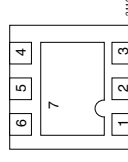
APPLICATION NOTE

The VBUS053CZ-HAF is intended as an ESD-protection and transient voltage suppressor for one USB-OTG port.

The LLP75-7L package contains two separate dies which are mounted on a common ground plane (pin 7). The high-speed data lines D+, D- and ID, are connected to pins 1, 2, and 3. As long as the signal voltage on the data lines is between the ground- and the 5 V working range, the low capacitance PN-diodes offer a very high isolation to ground and to the other data lines. But as soon as any transient signal like an ESD-signal, exceeds this working range of 5 V in either the positive or negative direction, one of the PN-diodes gets into the forward mode and clamps the transient either to ground or to the avalanche break through level. An extra avalanche diode (separate die) clamps the supply line voltage (V_{BUS} at pin 6) above the 28 V working range to ground (pin 7). Due to the "two die construction" the V_{BUS} line has a very high isolation to the data lines. In case of a destructive transient signal, i.e. coming from a charger, the data lines will not be influenced.



(pinning top view)



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