



USB4S012

Preliminary

TVS

4-CHANNEL ESD SOLUTION FOR USB-HS/USB OTG/USB CHARGER INTERFACE

DESCRIPTION

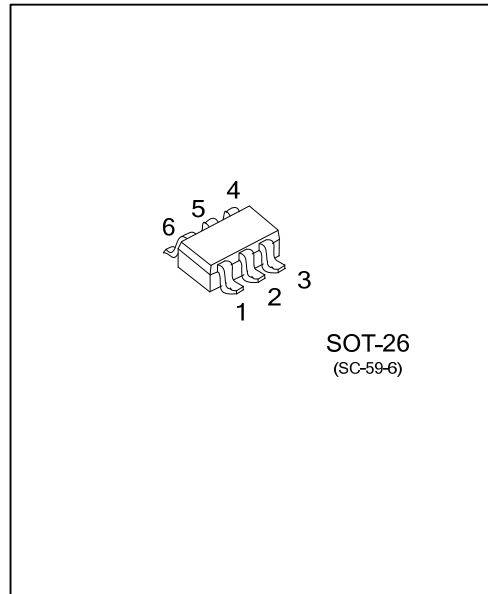
The UTC **USB4S012** is a four-channel electrostatic discharge (ESD) solution for USB charger or USB on-the-go (OTG) interface. In many cell phone applications, the USB connector is the de facto communication port for external communications like high-speed data transfer, audio signal, charging, car-kit, etc. In order to support different interfaces, the USB port needs to handle different voltage levels. For example, some chargers require the V_{BUS} port of the USB connector to handle in excess of the normal V_{BUS} voltage per USB specifications. The UTC **USB4S012** offers combinations of two different clamp voltages to match the voltage tolerances of the different signal interfaces using the common USB connector.

The UTC **USB4S012** conforms to IEC61000-4-2 (Level 4) ESD. The device is offered in space-saving packages with flow-through pin mapping.

FEATURES

- * Integrated ESD Clamps for D+, D-, VBUS, and ID Pins to Provide Single-Chip ESD Protection for USB High Speed, USB-OTG, and USB Charger Interface
- * IEC 61000-4-2 (Level 4) System Level ESD Compliance Measured at the D+, D-, and ID Pins
 - $\hat{A}\pm 10$ -kV IEC 61000-4-2 Contact Discharge
 - $\hat{A}\pm 10$ -kV IEC 61000-4-2 Air-Gap Discharge
- * 3 Amps Peak Pulse Current (8/20 μ s Pulse) for V_{BUS} and D+, D-, and ID Lines
- * Special Snap Back Technology Allows High-voltage Tolerance During Normal Operation while Reducing the Clamp Voltage during System Level ESD Stress

- * USB Signal Pins (D+, D-, ID)
 - 0.8-pF Line Capacitance
 - Tolerates 6V Signal
- * V_{BUS} Line (V_{BUS})
 - 11-pF Line Capacitance
 - Tolerates 20V Signal
- * Flow-Through Pin Mapping for the High-Speed Lines Ensures Zero Additional Skew Due to Board Layout While Placing the ESD Protection Chip Near the Connector
- * Supports Data Rates in Excess of 480Mbps
- * Industrial Temperature Range: -40°C~85°C



ORDERING INFORMATION

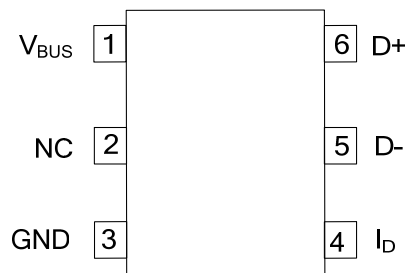
Ordering Number		Package	Packing
Lead Free	Halogen Free		
USB4S012L-AG6-R	USB4S012G-AG6-R	SOT-26	Tape Reel

<p>USB4S012L-AG6-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Halogen Free 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) AG6 : SOT-26 (3) L: Lead Free, G: Halogen Free
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MARKING INFORMATION

PACKAGE	MARKING
SOT-26	<p>012</p> <p>L: Lead Free G: Halogen Free</p>

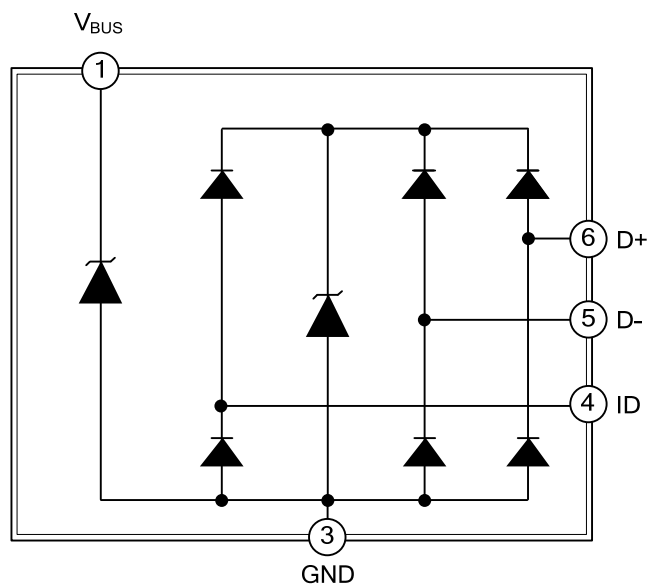
PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	V_{BUS}	ESD clamp for high-voltage tolerant VBUS line(s)
2	NC	Not internally connected
3	GND	Ground
4	ID	Provides ESD protection to the high-speed differential data lines
5	D-	Provides ESD protection to the high-speed differential data lines
6	D+	Provides ESD protection to the high-speed differential data lines

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING over operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT
V _{BUS} Voltage Tolerance	V _{BUS} pin	-0.3~20	V
IO Voltage Tolerance	D+, D-, I _D pins	-0.3~6	V
IEC 61000-4-2 Contact Discharge	D+, D-, ID	±10	kV
IEC 61000-4-2 Air-Gap Discharge	D+, D-, ID	±10	kV
IEC 61000-4-2 Contact Discharge	V _{BUS} pin	±10	kV
IEC 61000-4-2 Air-Gap Discharge	V _{BUS} pin	±9	kV
Peak pulse power (tp = 8/20 μs)	D+, D-, ID, V _{BUS} pins	60	W
Peak pulse current (tp = 8/20 μs)	D+, D-, ID, V _{BUS} pins	3	A
Storage Temperature Range	T _{STG}	-65~125	°C
Operating Free-Air Temperature Range	T _A	-40~85	°C

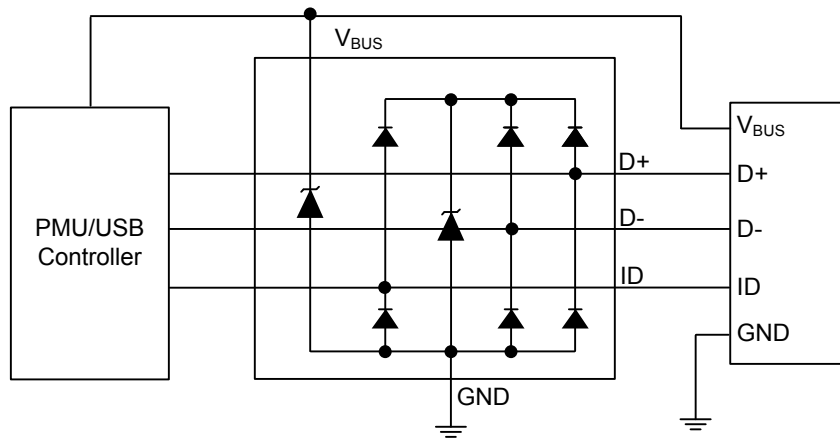
Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS

over operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V _{BUS} Operating Current	I _{VBUS}	V _{BUS} =5V	D+, D-, ID pins open			μA	
		V _{BUS} =19V			0.1		0.5
IO Port Current	I _{IO}	V _{IO} =2.5V, V _{BUS} =5V	D+, D-, ID pins		0.1	0.5	μA
Diode Forward Voltage	V _D	I _{IO} =8mA	D+, D-, ID pins (lower clamp diode)	0.6	0.8	0.95	V
V _{BUS} Pin Capacitance	C _{VBUS}	V _{BUS} =5V			11	15	pF
IO Capacitance	C _{IO}	V _{IO} =2.5V	D+, D-, ID pins (DRY package)		0.8	1	pF
Dynamic Resistance	R _{DYN}	I _{IO} =1.5A	D+, D-, ID, and V _{BUS} pins, including central clamp diode during positive ESD pulse		1.2		Ω
		I _{IO} =1A	D+, D-, ID, and V _{BUS} pins, including central clamp diode during negative ESD pulse		1		
Breakdown Voltage	V _{BR}	I _{IO} =1mA	D+, D-, ID pins	6	9		V
			V _{BUS} pin(s)	20	24		

■ TYPICAL APPLICATION CIRCUIT



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