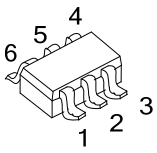
4-CHANNEL ESD SOLUTION FOR USB-HS/USB OTG/USB CHARGER INTERFACE



SOT-26
(SC-59-6)

■ 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
  – Â±10-kV IEC 61000-4-2 Contact Discharge
  – Â±10-kV IEC 61000-4-2 Air-Gap Discharge
* 3 Amps Peak Pulse Current (8/20μs 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

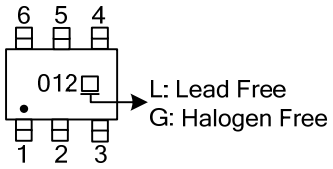
■ ORDERING INFORMATION

Ordering Number		Package Packing	
Lead Free	Halogen Free		
USB4S012L-AG6-R USB4S0	12G-AG6-R	SOT-26	Tape Reel

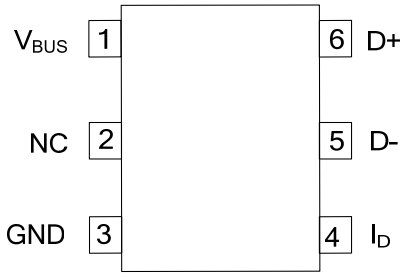
USB4S012L-AG6-R
(1)Packing Type
(2)Package Type
(3)Halogen Free

(1) R: Tape Reel
(2) AG6 : SOT-26
(3) L: Lead Free, G: Halogen Free

■ MARKING INFORMATION

PACKAGE	MARKING
SOT-26	

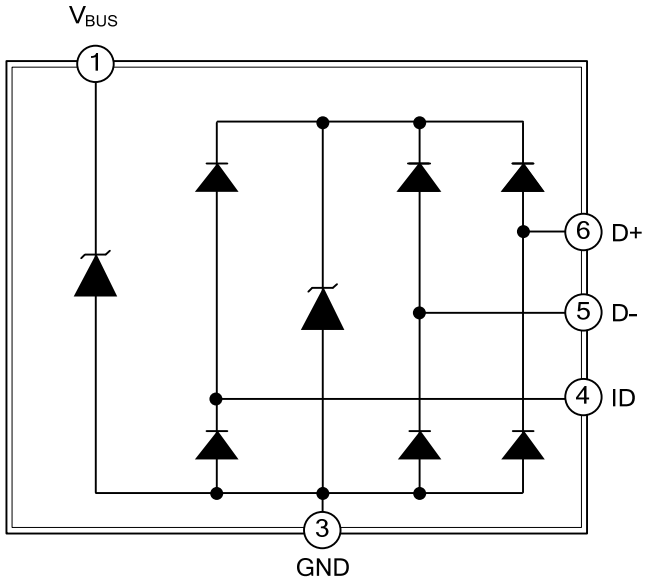
■ PIN CONFIGURATION



■ 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 dioded 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