Features

- Low capacitance: 0.35pF typical (I/O to GND)
- Very high peak pulse power at Vbus (2500W)
- Up to 3 data lines and one power line protects
- Complies with following standards:
  – IEC 61000-4-2 (ESD) immunity test
  Air discharge: ±30kV (Vbus) / 16kV (data lines)
  Contact discharge: ±30kV (Vbus) / 10kV (data lines)
  – IEC61000-4-4 (EFT) 40A (5/50ns)
  – IEC61000-4-4 (Lightning) 100A (Vbus, 8/20μs) / 4A (data lines, 8/20μs)
- RoHS Compliant

Description

The ESD0541LT is a low capacitance TVS array,utilizing leading monolithic silicon technology to provide fast response time and low ESD clamping voltage, making this device an ideal solution for protecting voltage sensitive high-speed data lines.The ESD0541LT complies with the IEC 61000-4-2 (ESD) standard with ±15kV air and ±8kV contact discharge. It is assembled into a 6-pin DFN2018-6 lead-free package. The leads are finished with NiPdAu. Each device will protect up to four high-speed lines. The combination of small size, low capacitance, and high surge capability makes them ideal for use in applications such as USB ports.

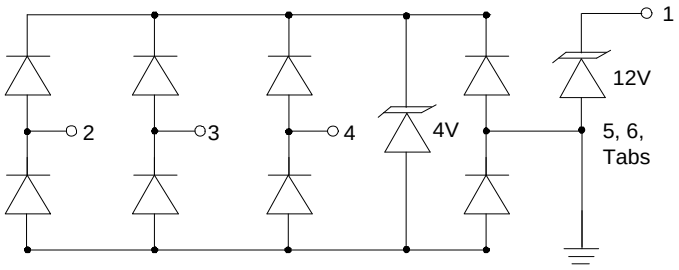
Mechanical Characteristics

- Package: DFN2018-6
- Lead Finish: NiPdAu
- Case Material: “Green” Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections: See Diagram

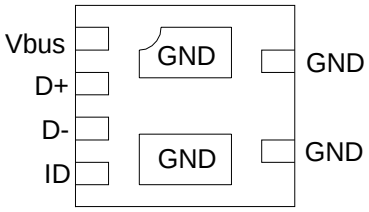
Applications

- USB 2.0
- USB OTG
- μUSB

Dimensions and Pin Configuration



Circuit Diagram



Pin Schematic

Part Number Code

E	S	D	0	5	1	1	L	1
1	2	3	4	5	6	7	8	9

Product Type	
ESD	TSK Electrostatic suppressor ESD Type

Reverse Working Voltage（V）	
3V3	3.3V
05	5V
16	16V

Line	
1	1-Line
2	2-Line
3	3-Line

directional	
0	Bi
1	Uni

Capacitance Type	
L	Low
X	Normal

Size	
1	0201
2	0402
3	DFN0603
4	DFN1006

★ Code 4 to 9 is optional

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
DP, DM, USB ID (Pins 2, 3, 4)			
Peak Pulse Power (8/20μs)	Ppk	60	W
Peak Pulse Current (8/20μs)	IPP	4	A
ESD per IEC 61000−4−2 (Air) ESD per IEC 61000−4−2 (Contact)	VESD	±16 ±10	kV
Operating Temperature Range	TJ	−55 to +125	°C
Storage Temperature Range	Tstg	−55 to +150	°C
Vbus (Pin 1)			
Peak Pulse Power (8/20μs)	Ppk	2500	W
Peak Pulse Current (8/20μs)	IPP	100	A
ESD per IEC 61000−4−2 (Air) ESD per IEC 61000−4−2 (Contact)	VESD	±30 ±30	kV
Operating Temperature Range	TJ	−55 to +125	°C
Storage Temperature Range	Tstg	−55 to +150	°C

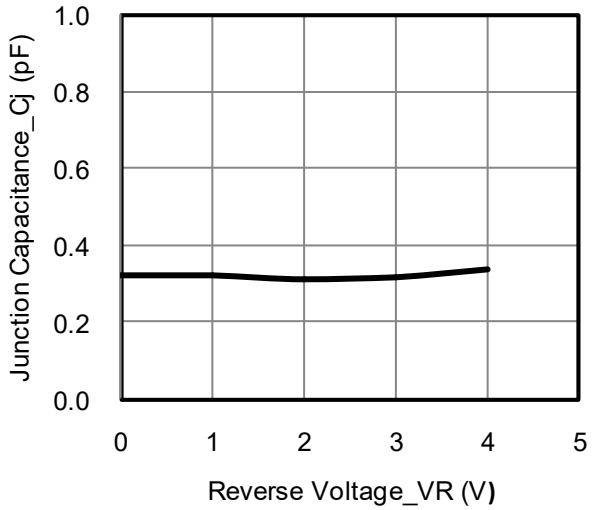
Electrical Characteristics (T_A=25°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
DP, DM, USB ID (Pins 2, 3, 4)						
Reverse Working Voltage	VRWM			4	V	Any I/O to ground
Breakdown Voltage	VBR	4.5			V	IT = 1mA, any I/O to ground
Reverse Leakage Current	I_R			0.1	μA	VRWM = 4V, any I/O to ground
Clamping Voltage	VC			10.5	V	IPP = 1A (8 x 20μs pulse), any I/O pin to ground
Clamping Voltage	VC			15.0	V	IPP = 4A (8 x 20μs pulse), any I/O pin to ground
Junction Capacitance	CJ		0.35	0.5	pF	VR = 0V, f = 1MHz, any I/O pin to ground

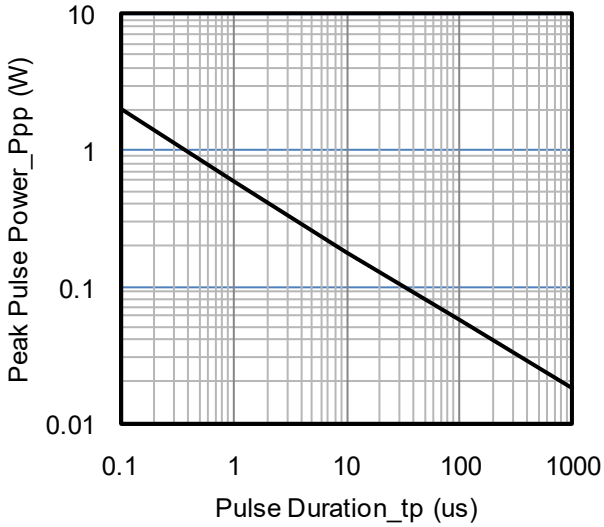
Note: I/O Pins are 2, 3, 4

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Vbus TVS (Pin 1)						
Reverse Working Voltage	V_{RWM}			12	V	Pin 1 to ground
Breakdown Voltage	V_{BR}	12.5	13.3	16.5	V	I_T = 1mA, pin 1 to ground
Reverse Leakage Current	I_R			0.2	μA	V_{RWM} = 12V, pin 1 to ground
Forward Voltage	V_F	0.6	0.7	1.0	V	I_F = 10mA, ground to pin 1
Clamping Voltage	V_C			18	V	I_{PP} = 30A (8 x 20μs pulse), pin 6 to ground
Clamping Voltage	V_C			25	V	I_{PP} = 100A (8 x 20μs pulse), pin 6 to ground
Junction Capacitance	C_J			1000	pF	VR = 0V, f = 1MHz, pin 6 to ground

Typical Performance Characteristics (TA=25°C unless otherwise Specified)

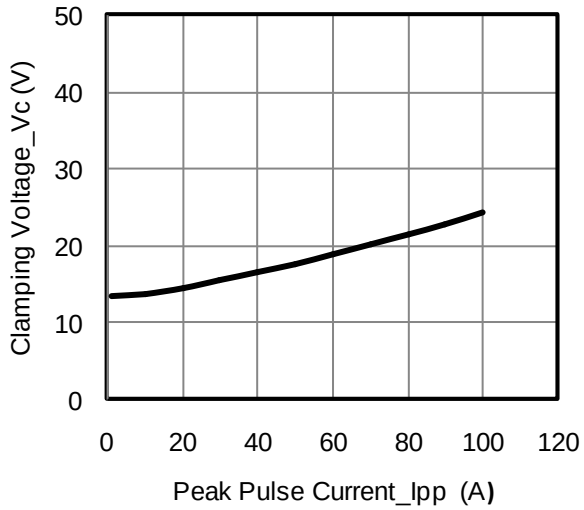


Junction Capacitance vs. Reverse Voltage (Pins 2, 3, 4)

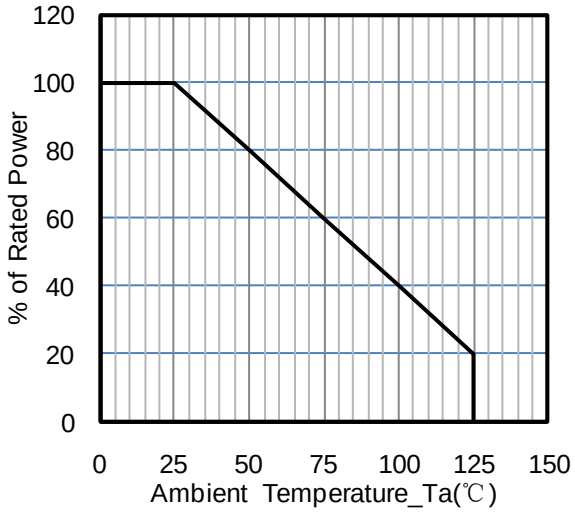


Peak Pulse Power vs. Pulse Time

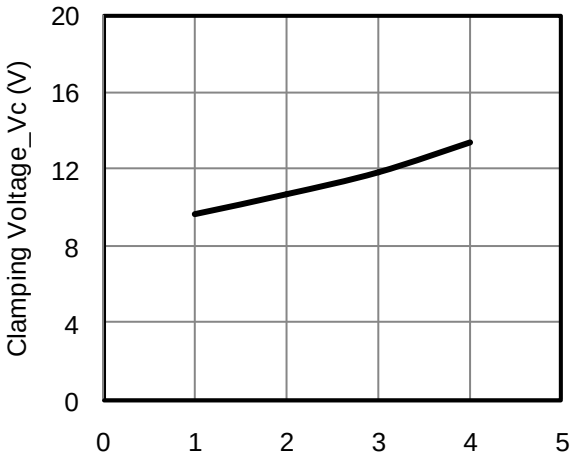
Typical Performance Characteristics (TA=25°C unless otherwise Specified)



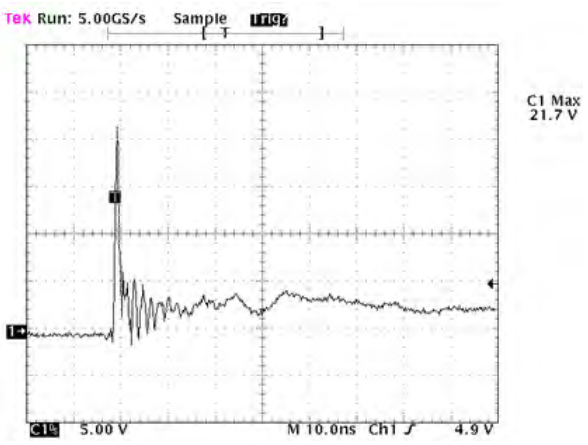
Clamping Voltage vs. Peak Pulse Current (Vbus)



Power Derating Curve

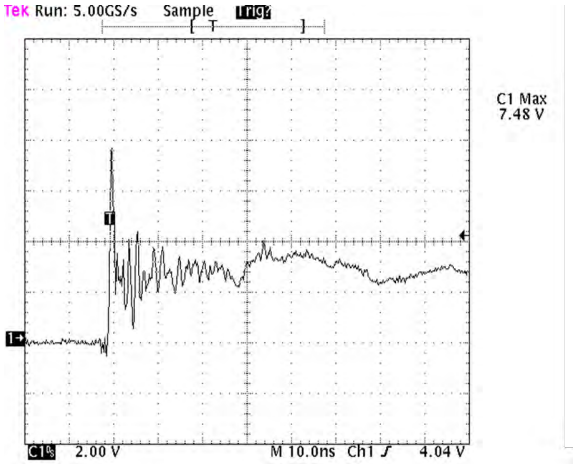


Clamping Voltage vs. Peak Pulse Current (Pins 2, 3, 4)



ESD Clamping Voltage

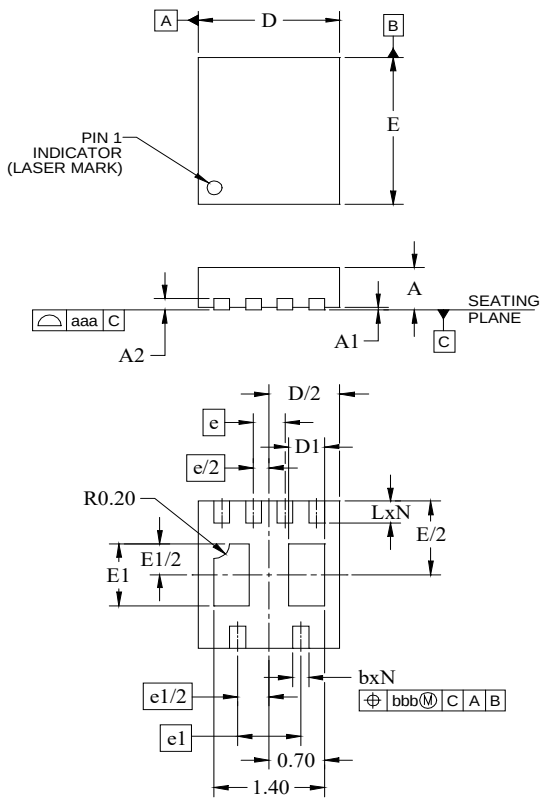
8 kV Contact per IEC61000−4−2 (Pins 2, 3, 4)



ESD Clamping Voltage

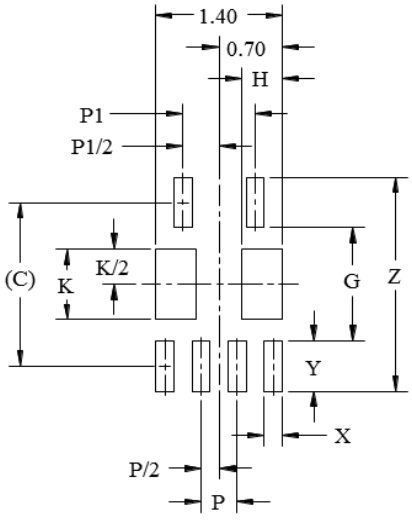
8 kV Contact per IEC61000−4−2 (Vbus)

DFN2018 6 Package Outline Drawing



DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.50	0.575	0.65
A1	0.00	0.03	0.05
A2		(0.127)	
b	0.15	0.20	0.25
D	1.70	1.80	1.90
E	1.90	2.00	2.10
D1	0.30	0.45	0.55
E1	0.69	0.84	0.94
e	0.40 BSC		
e1	0.80 BSC		
L	0.25	0.30	0.35
N	6		
aaa	0.08		
bbb	0.10		

Suggested Land Pattern



DIMENSIONS	
DIM	MILLIMETERS
C	(1.95)
G	1.35
H	0.45
K	0.84
P	0.40
P1	0.80
X	0.20
Y	0.60
Z	2.55

Ordering Information

Part Number	Packaging	Reel Size
ESD0541LT	3000/Tape & Reel	7 inch