

## SMP1255PUTG TVS Arrays

### Description

The SMP1255P integrates 3 channels of ultra-low capacitance steering diodes and a low voltage TVS diode to provide maximum protection of the USB data and ID pins against ESD per the IEC61000-4-2 standard. An additional 12V TVS diode is included to provide lightning surge protection for the USB VBUS pin up to 100A ( $t_P=8/20\mu s$ ) per the IEC61000-4-5 standard. The SMP1255P provides superior protection for current intensive applications such as fast charging peripherals.

The SMP1255P comes in a space saving 2.0x1.8mm  $\mu$ DFN package with a typical height of 0.55mm making it an ideal solution for smart phones, tablets, and other portable electronics.

### Features

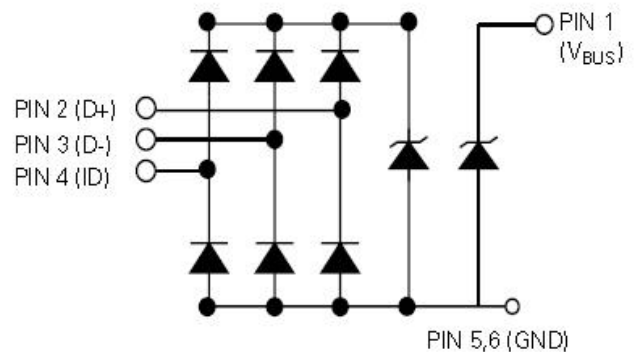
For USB Voltage Bus Pin ( $V_{BUS}$ )

- IEC 61000-4-2 (ESD)  $\pm 30kV$  (air),  $\pm 30kV$  (contact)
- IEC 61000-4-5 (lightning) 100A (8/20  $\mu s$ )
- IEC 61000-4-4 (EFT) 80A (5/50ns)
- Protection for VBUS operating up to 12V
- Benchmark setting protection
- High current handling capability for fast charging applications

For USB Data Pin (D+, D-, ID)

- IEC 61000-4-2 (ESD)  $\pm 15kV$  (air),  $\pm 12kV$  (contact)
- IEC 61000-4-5 (lightning) 4A (8/20  $\mu s$ )
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- 0.5pF capacitance
- Low clamping voltage and dynamic resistance (0.3  $\Omega$ )

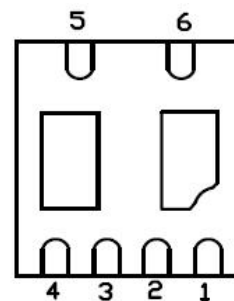
### Functional Block Diagram



### Applications

- USB 2.0
- USB OTG
- $\mu$ USB
- Protection for the VBUS circuit on USB2.0
- Fast Charging

### Pinout



**Ordering Information**

Device	Package	Packaging Options	P0/P1	Packaging Specifications	Min. Order Qty.
SMP1255PUTG	μDFN-6	Tape & Reel - 8mm tape/7" reel	2mm/4mm	EIA RS-481	3000

For information on tape and reel specifications, including part orientation and tape sizes, please refer to our tape and reel packaging specification.

**Absolute Maximum Ratings @T<sub>A</sub>=25°C unless otherwise specified**

Parameter	Symbol	Value	Units
Peak Current (tp=8/20μs)	I <sub>PP</sub> (Pin1)	100	A
Peak Current (tp=8/20μs)	I <sub>PP</sub> (Pin2-4)	4	A
Operating Temperature	T <sub>OP</sub>	-40 to + 125	°C
Storage Temperature	T <sub>STOR</sub>	-55 to + 150	°C

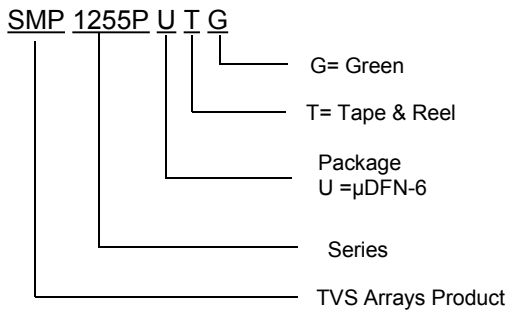
CAUTION: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**Electrical Characteristics (T<sub>OP</sub>=25°C)**

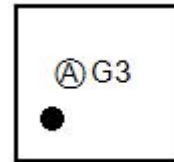
Characteristics	Symbol	Condition	Min.	Typ.	Max.	Units
USB V <sub>BUS</sub> (Pin 1)						
Reverse Stand-Off Voltage	V <sub>RWM</sub>	Pin 1 to GND	-	-	12	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>T</sub> =1mA, Pin 1 to GND	13	13.5	16.5	V
Reverse Leakage Current	I <sub>LEAK</sub>	V <sub>R</sub> =12V, Pin 1 to GND	-	-	0.1	μA
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =10mA, GND to Pin 1	0.6	0.7	1.0	V
Clamping Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> = 30A, tp=8/20μs, Fwd	-	16.5	18	V
		I <sub>PP</sub> = 100A, tp=8/20μs, Fwd	-	19.5	25	V
ESD With stand Voltage <sup>1</sup>	V <sub>ESD</sub>	IEC61000-4-2 (Contact)	±30	-	-	kV
		IEC61000-4-2 (Air)	±30	-	-	kV
Diode Capacitance <sup>1</sup>	C <sub>D</sub>	Reverse Bias=0V, f=1 MHz	-	1300	2500	pF
USB D+, D-, ID (Pin 2, 3, 4)						
Reverse Stand-Off Voltage	V <sub>RWM</sub>	Pin 2, 3 and 4 to GND	-	-	4	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>T</sub> =2μA, Pin 2, 3 and 4 to GND	4.5	6.0	7.5	V
Reverse Leakage Current	I <sub>LEAK</sub>	V <sub>R</sub> =2V, Pin 2, 3 and 4 to GND	-	-	0.02	μA
		V <sub>R</sub> =4V, Pin 2, 3 and 4 to GND	-	-	0.1	
Clamping Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> = 1A, tp=8/20μs, Fwd	-	6.6	8.0	V
		I <sub>PP</sub> = 2A, tp=8/20μs, Fwd	-	7.0	8.5	V
Dynamic Resistance	R <sub>DYN</sub>	TLP, tp=100ns, Pin 2, 3 and 4 to GND <sup>2</sup>	-	0.3	-	Ω
ESD With stand Voltage <sup>1</sup>	V <sub>ESD</sub>	IEC61000-4-2 (Contact)	±12	-	-	kV
		IEC61000-4-2 (Air)	±15	-	-	kV
Diode Capacitance <sup>1</sup>	C <sub>I/O-GND</sub>	Reverse Bias=0V, f=1 MHz	-	0.5	0.6	pF

Note: 1. Parameter is guaranteed by design and/or device characterization.  
2. Transmission Line Pulse (TLP) Test Setting: tp=100ns, tr=0.2ns I<sub>TLP</sub> and V<sub>TLP</sub> averaging window: start t<sub>1</sub>=70ns to t<sub>2</sub>=90ns

**Part Name Information**



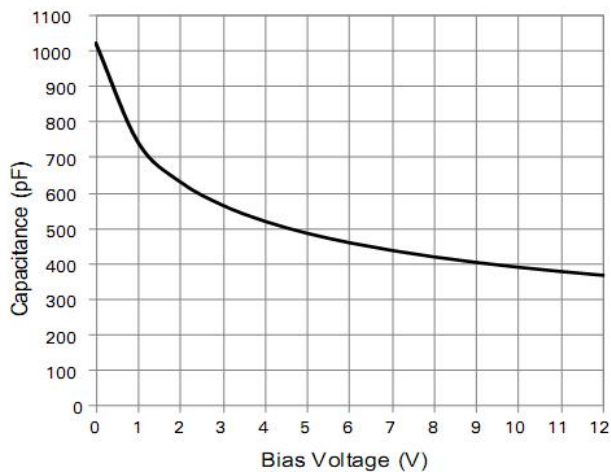
**Marking Diagram**



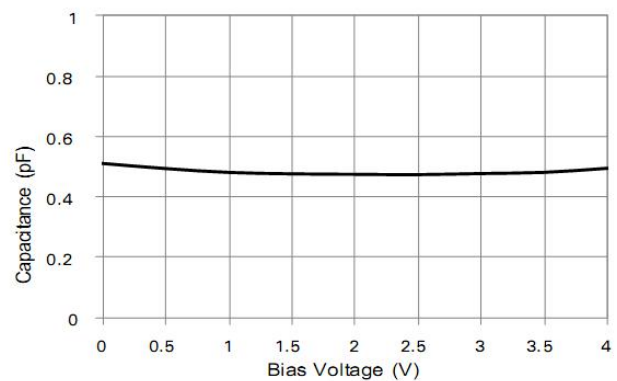
Where  $\text{\textcircled{A}}$  G3 is SMP1255PUTQ  
 $\text{\textcircled{A}}$  = Product Series SMP1255P  
 G3 = Assembly Site

**Ratings and Characteristics Curves**

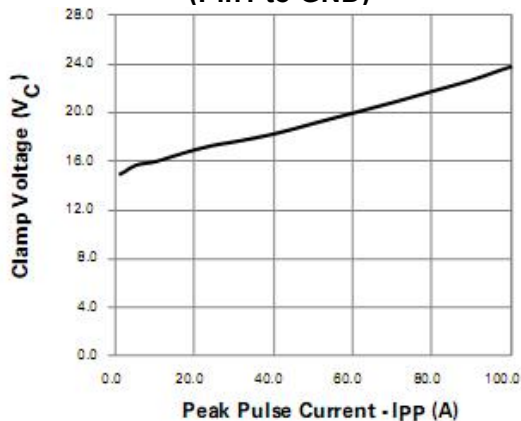
**Capacitance vs. Reverse Bias (Pin1 to GND)**



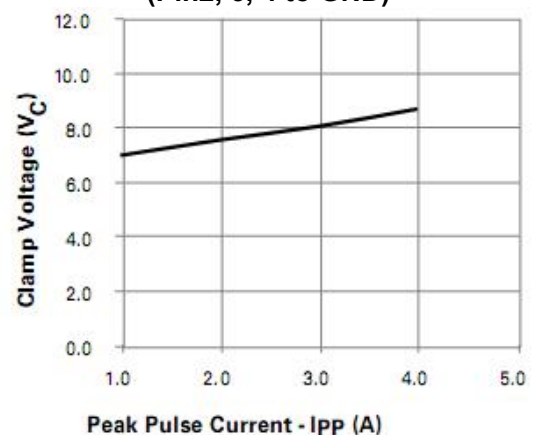
**Capacitance vs. Reverse Bias (Pin2, 3, 4 to GND)**

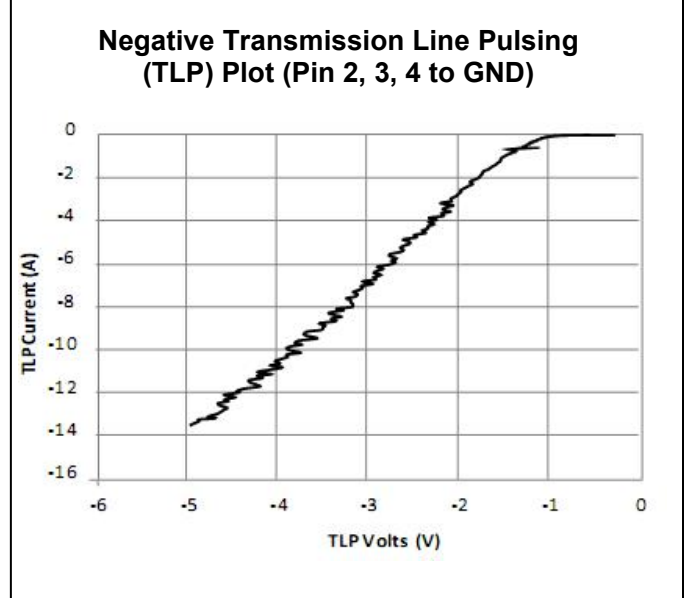
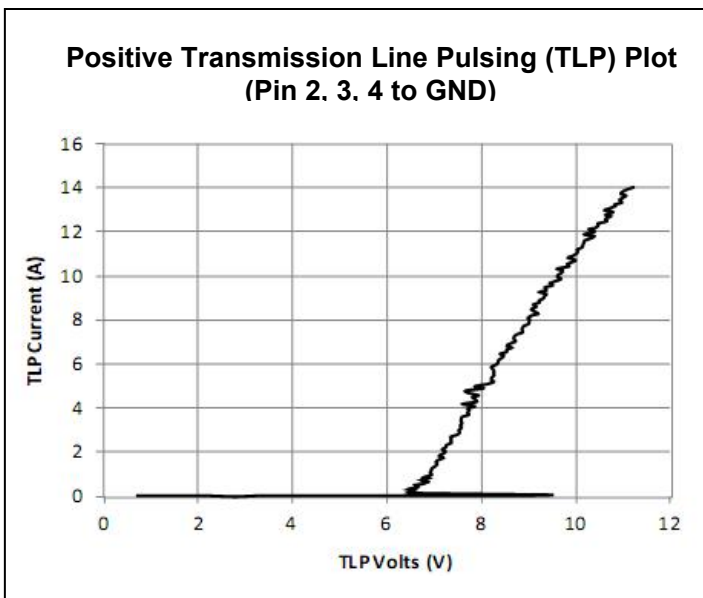
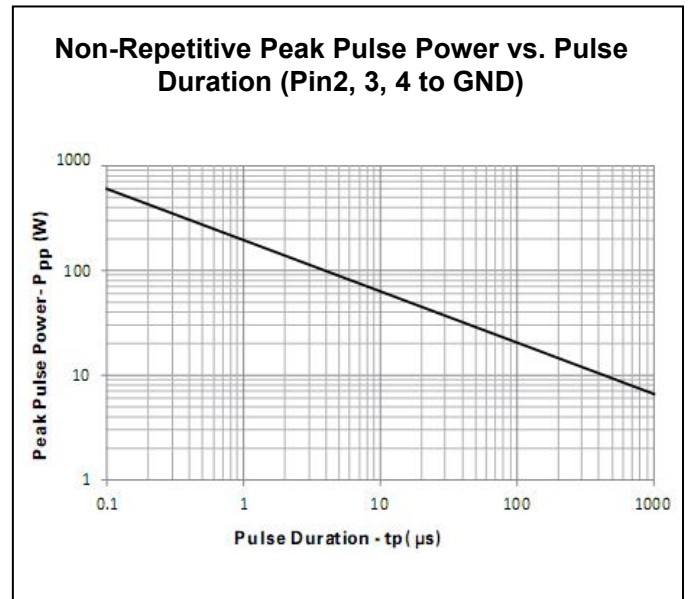
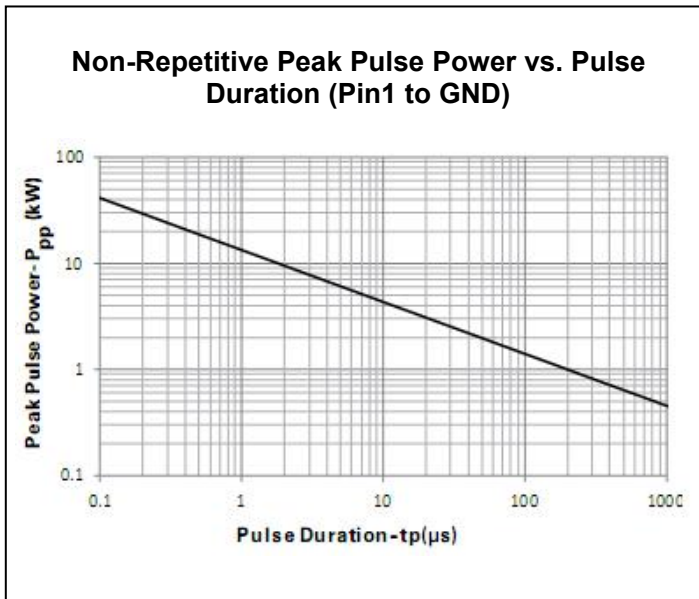


**Clamping Voltage vs. Peak Pulse Current (Pin1 to GND)**

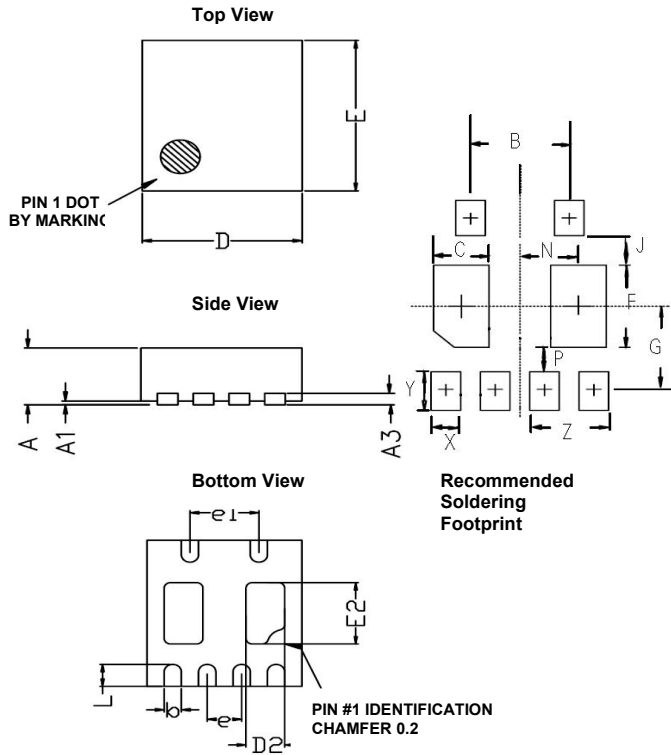


**Clamping Voltage vs. Peak Pulse Current (Pin2, 3, 4 to GND)**



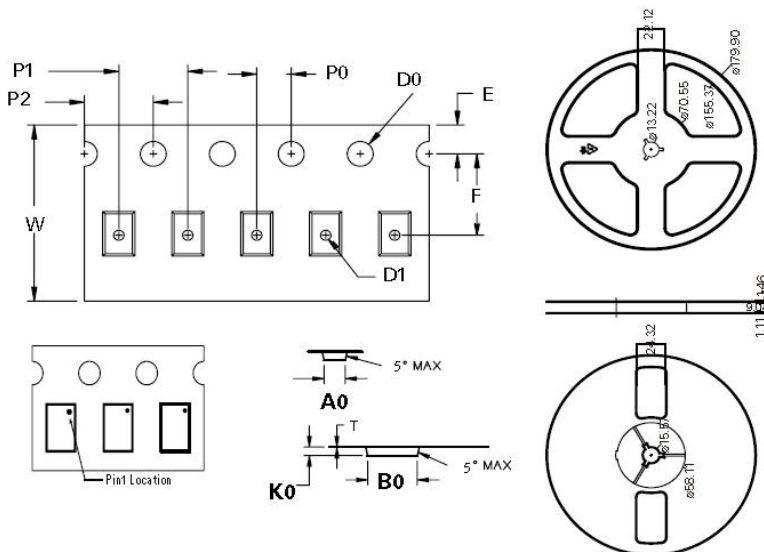


**Mechanical Dimensions  $\mu$ DFN-6**



$\mu$ DFN-6(1.8×2.0×0.55mm)						
JEDEC MO-229						
Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
<b>A</b>	0.50	0.55	0.60	0.020	0.022	0.024
<b>A1</b>	0.00	-	0.05	0.000	-	0.002
<b>A3</b>	0.15Ref			0.006Ref		
<b>D</b>	1.75	1.80	1.85	0.069	0.071	0.073
<b>E</b>	1.95	2.00	2.05	0.077	0.079	0.081
<b>b</b>	0.15	0.20	0.25	0.006	0.008	0.010
<b>L</b>	0.20	0.30	0.40	0.008	0.012	0.016
<b>D2</b>	0.35	0.45	0.55	0.014	0.018	0.022
<b>E2</b>	0.74	0.84	0.94	0.029	0.033	0.037
<b>e</b>	0.40 BSC			0.016 BSC		
<b>e1</b>	0.80 BSC			0.031 BSC		
<b>B</b>	0.80 BSC			0.031 BSC		
<b>C</b>	0.35	0.45	0.55	0.014	0.018	0.022
<b>F</b>	0.81	0.84	0.87	0.032	0.033	0.034
<b>G</b>	0.82	0.85	0.88	0.032	0.033	0.034
<b>J</b>	0.24	0.25	0.26	0.010	0.010	0.010
<b>N</b>	0.47	0.48	0.49	0.018	0.019	0.020
<b>P</b>	0.24	0.25	0.26	0.010	0.010	0.010
<b>X</b>	0.23	0.24	0.25	0.009	0.009	0.009
<b>Y</b>	0.35	0.36	0.37	0.014	0.014	0.014
<b>Z</b>	0.62	0.64	0.66	0.024	0.025	0.026

**Embossed Carrier Tape & Reel Specification — $\mu$ DFN-6**



Symbol	Millimeters
<b>A0</b>	1.95+/-0.05
<b>B0</b>	2.30+/-0.05
<b>D0</b>	1.50+0.10
<b>D1</b>	$\Phi$ 0.60+0.05
<b>E</b>	1.75+/-0.10
<b>F</b>	3.50+/-0.05
<b>K0</b>	0.75+/-0.05
<b>P0</b>	2.00+/-0.05
<b>P1</b>	4.00+/-0.10
<b>P2</b>	4.00+/-0.10
<b>T</b>	0.25+/-0.02
<b>W</b>	8.00+0.30/-0.10



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