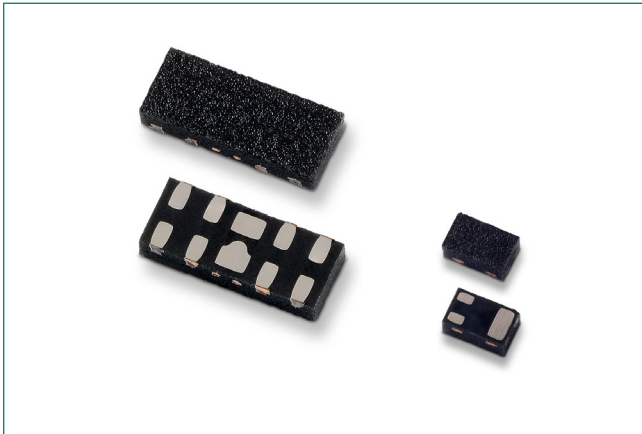
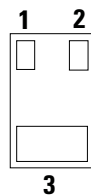


# Ultra Low Capacitance Diode Arrays Series

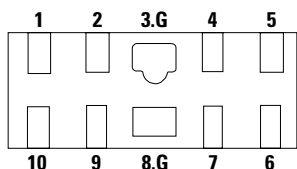


## Pinout

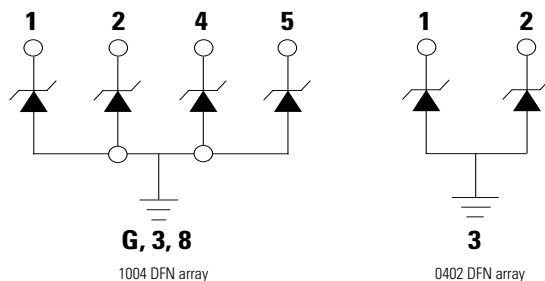
0402 DFN array



1004 DFN array



## Functional Block Diagram



## Description

This Ultra Low Capacitance Diode Arrays Series provides signal integrity-preserving unidirectional ESD protection for the world's most challenging high speed serial interfaces. The SOD 883 and the standard 2.4 mm x 1.0 mm packaging options provide significant PCB layout space savings and reduces trace layout complexity. This component provides both air and contact ESD protection (IEC 61000-4-2) of 20 kV while maintaining an extremely low leakage current and low dynamic resistance. Due to its low off-state capacitance, this series is compatible with high speed interfaces and thus maintains high bandwidth signal integrity.

## Features & Benefits

- 0.20 pF TYP capacitance
- ESD, IEC 61000-4-2,  $\pm 20$ kV contact,  $\pm 20$ kV air
- Low clamping voltage of 9.2V @ IPP=2.0A (tP=8/20 $\mu$ s)
- Low profile DFN array packages
- Facilitates excellent signal integrity
- ELV Compliant
- Halogen free, Lead free and RoHS compliant
- AEC-Q101 qualified

## Applications

- USB 3.1, 3.0, 2.0
- HDMI 2.0, 1.4a, 1.3
- DisplayPort(TM)
- V-by-One®
- Thunderbolt (Light Peak)
- LVDS interfaces
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Applications requiring high ESD performance in small packages

# Ultra Low Capacitance Diode Arrays Series

## Absolute Maximum Ratings

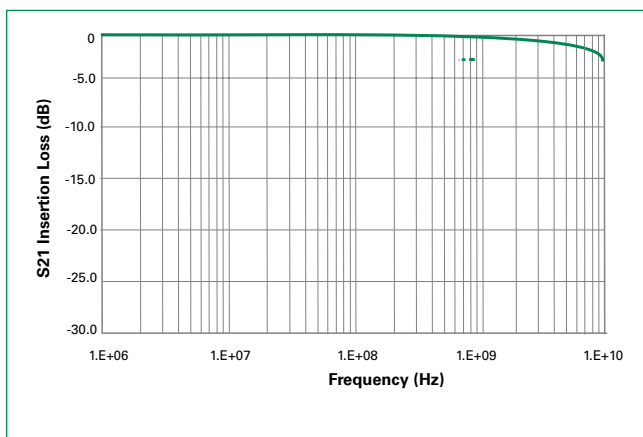
Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	2.0	A
$T_{OP}$	Operating Temperature	-40 to 125	°C
$T_{STOR}$	Storage Temperature	-55 to 150	°C

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

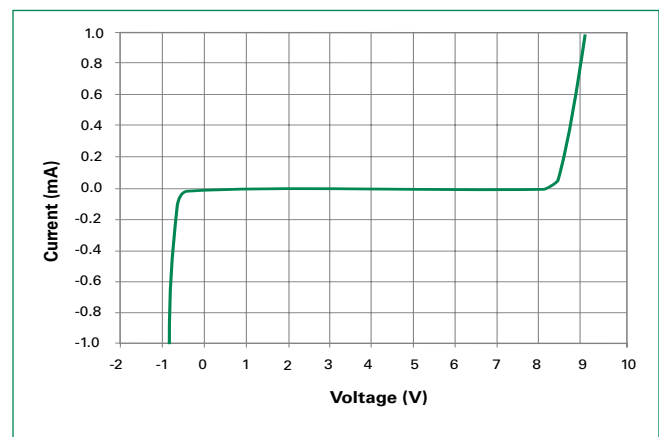
## Electrical Characteristics - ( $T_{OP}=25^\circ C$ )

Parameter	Test Conditions	Min	Typ	Max	Units
Input Capacitance	@ $V_R = 0V$ , $f = 3GHz$		0.20	0.22	pF
Breakdown Voltage	$V_{BR}$ @ $I_T=1mA$		9.00		V
Reverse Working Voltage				7.0	V
Reverse Leakage Current	$I_L$ @ $V_{RWM}=5.0V$		25	50	nA
Clamping Voltage	$V_{CL}$ @ $I_{PP}=2.0A$		9.20		V
Peak Pulse Current	$t_p=8/20\mu s$			2.0	A
ESD Withstand Voltage	IEC 61000-4-2 (Contact)	$\pm 20$			kV
	IEC 61000-4-2 (Air)	$\pm 20$			

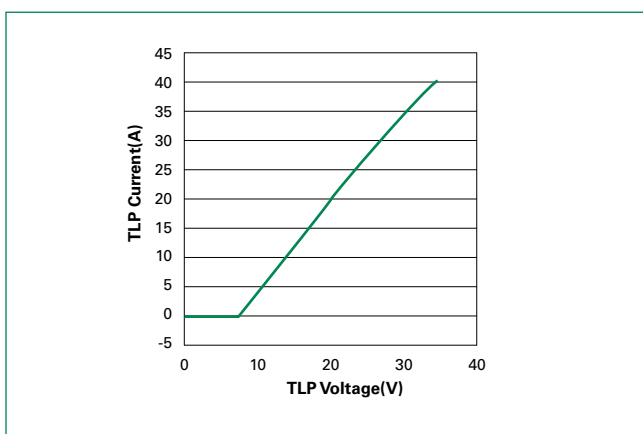
## Insertion Loss Diagram



## Device IV Curve

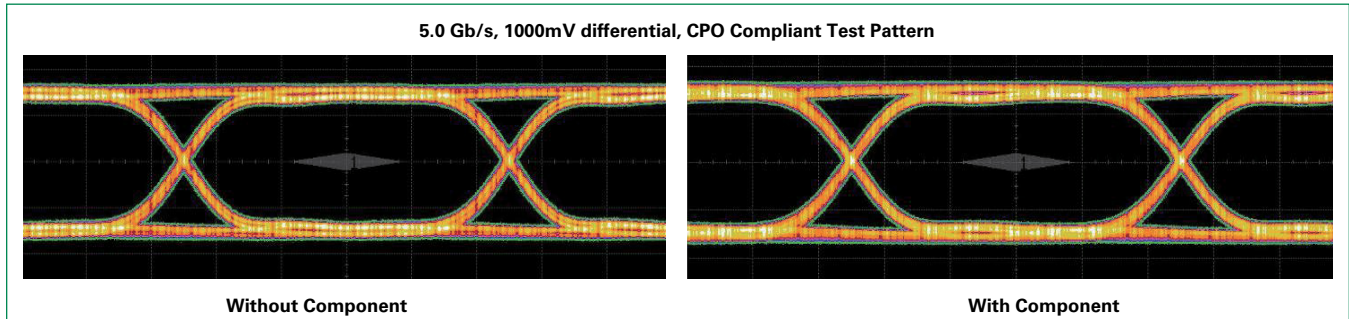


## TLP



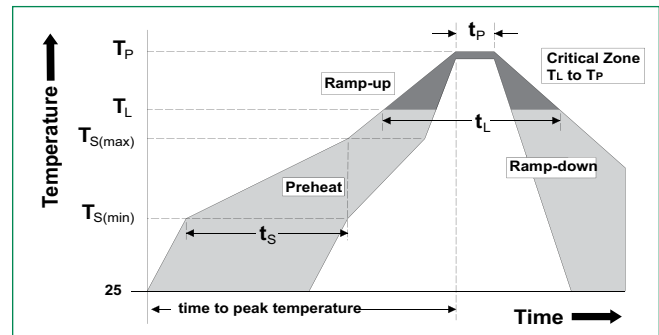
# Ultra Low Capacitance Diode Arrays Series

## USB3.0 Eye Diagram



## Soldering Parameters

<b>Reflow Condition</b>	Pb – Free assembly	
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_p$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b>	3°C/second max	
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>	3°C/second max	
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>	260 <sup>+0/-5</sup> °C	
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>	30 seconds	
<b>Ramp-down Rate</b>	6°C/second max	
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>	8 minutes Max.	
<b>Do not exceed</b>	260°C	



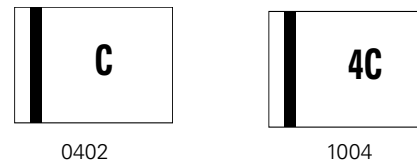
## Product Characteristics of 0402 DFN Package

<b>Lead Plating</b>	Pre-Plated Frame
<b>Lead Material</b>	Copper Alloy
<b>Lead Coplanarity</b>	0.004 inches(0.102mm)
<b>Substrate material</b>	Silicon
<b>Body Material</b>	Molded Epoxy
<b>Flammability</b>	UL Recognized epoxy meeting flammability rating V-0

### Notes :

1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.

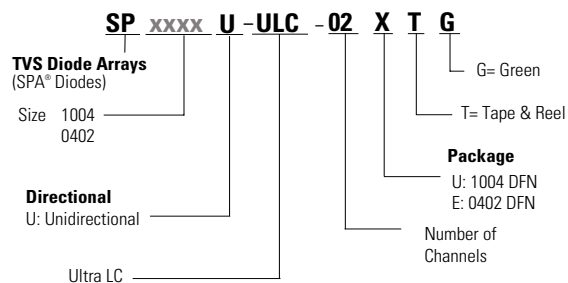
## Part Marking System



### Notes :

For markings see Ordering Information table below

## Part Numbering System

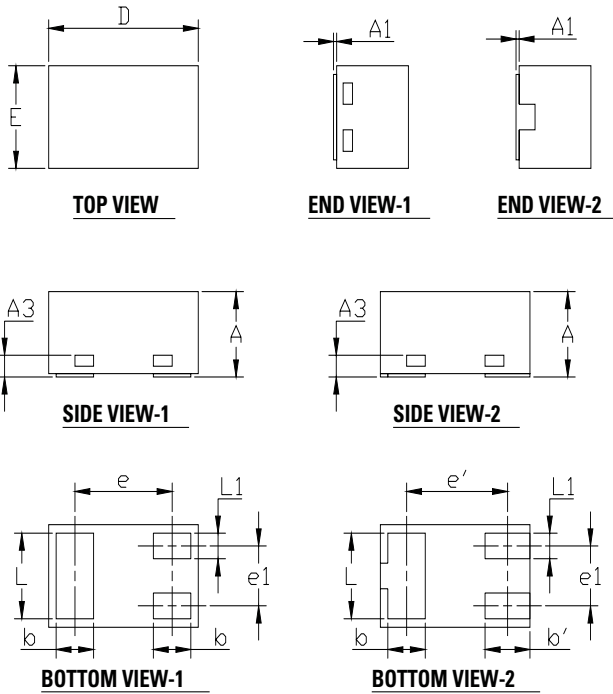


## Ordering Information

Part Number	Package	Reel Quantity
SP0402U-ULC-02ETG	0402 DFN Array	10000
SP1004U-ULC-04UTG	1004 DFN Array	3000

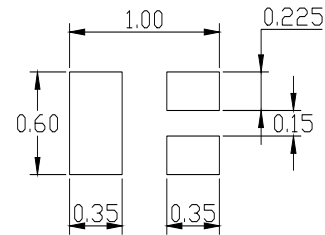
# Ultra Low Capacitance Diode Arrays Series

## Package Dimensions – 0402 DFN Array

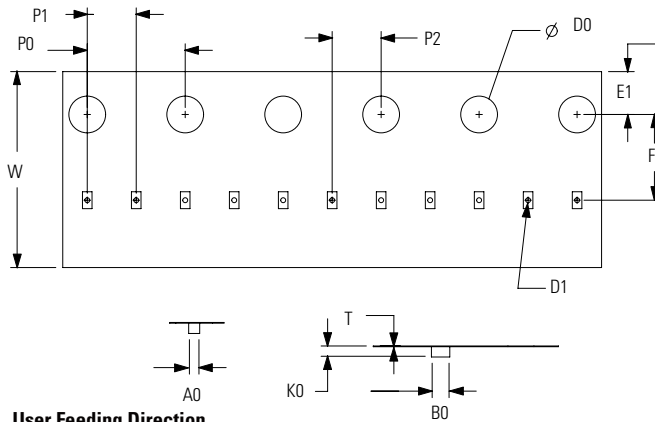


Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.33	-	0.55	0.013	0.015	0.022
A1	0	-	0.05	0	-	0.002
A3	0.13REF			0.005REF		
b	0.20	0.25	0.30	0.008	0.010	0.012
b'	0.20	0.30	0.40	0.008	0.012	0.016
D	0.95	1.00	1.05	0.037	0.039	0.041
E	0.55	0.60	0.65	0.022	0.024	0.026
e	0.65BSC			0.026BSC		
e'	0.675BSC			0.027BSC		
L	0.40	0.50	0.60	0.016	0.020	0.024
L1	0.10	0.15	0.20	0.004	0.006	0.008
e1	0.35BSC			0.014BSC		

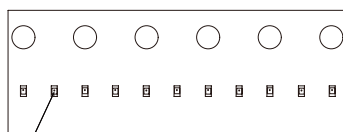
### SOLDERING PATTERN



## Embossed Carrier Tape & Reel Specification – 0402 DFN Array



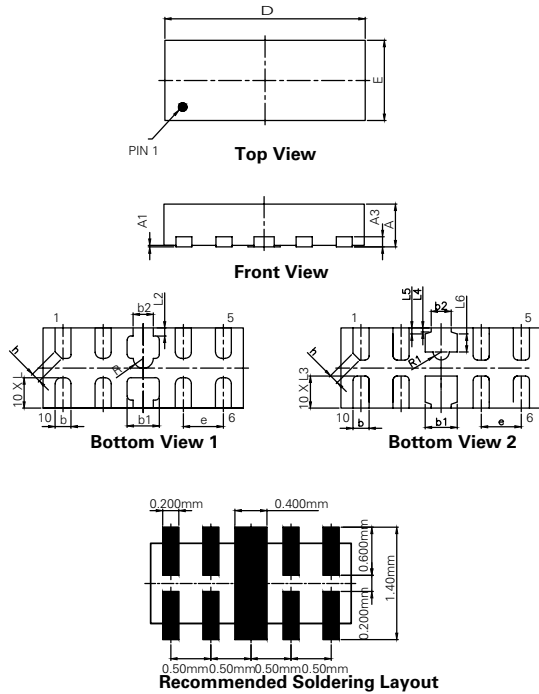
Symbol	Millimeters
A0	0.70+/-0.05
B0	1.15+/-0.05
D0	ø 1.50+/-0.10
D1	ø 0.40 +/-0.10
E1	1.75+/-0.10
F	3.50+/-0.10
K0	0.55+/-0.05
P0	4.00+/-0.10
P1	2.00+/-0.10
P2	2.00+/-0.05
W	8.00+0.30/-0.10
T	0.20+/-0.05



Pin 1 Location

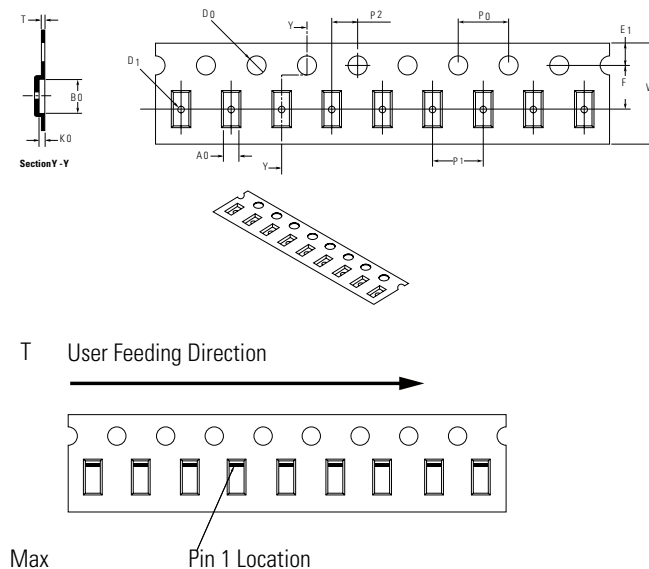
# Ultra Low Capacitance Diode Arrays Series

## Package Dimensions — 1004 DFN Array



Symbol	Millimeters	
	Min	Max
<b>A</b>	0.40	0.60
<b>A1</b>	0.00	0.05
<b>A3</b>	0.120	0.175
<b>b</b>	0.15	0.25
<b>b1</b>	0.35	0.45
<b>b2</b>	0.20	0.30
<b>D</b>	2.40	2.60
<b>E</b>	0.90	1.10
<b>L</b>	0.28	0.48
<b>L1</b>	0.00	0.15
<b>L2</b>	0.05	0.15
<b>L3</b>	0.35	0.45
<b>L4</b>	0.050 REF	
<b>L5</b>	0.075 REF	
<b>L6</b>	0.225 REF	
<b>e</b>	0.500 BASIC	
<b>h</b>	0.6	0.16

## Embossed Carrier Tape & Reel Specification — 1004 DFN Array



Symbol	Millimeters
<b>A0</b>	1.15 min/1.30 max
<b>B0</b>	2.70+/-0.05
<b>D0</b>	∅ 1.50 min/1.65 max
<b>D1</b>	∅ 0.50 min/1.05 max
<b>E1</b>	1.75+/-0.10
<b>F</b>	3.50+/-0.10
<b>K0</b>	0.65 min/0.75 max
<b>P0</b>	4.00+/-0.10
<b>P1</b>	4.00+/-0.10
<b>P2</b>	2.00+/-0.05
<b>W</b>	8.00+0.30/-0.10
<b>T</b>	0.17 min/0.30 max

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