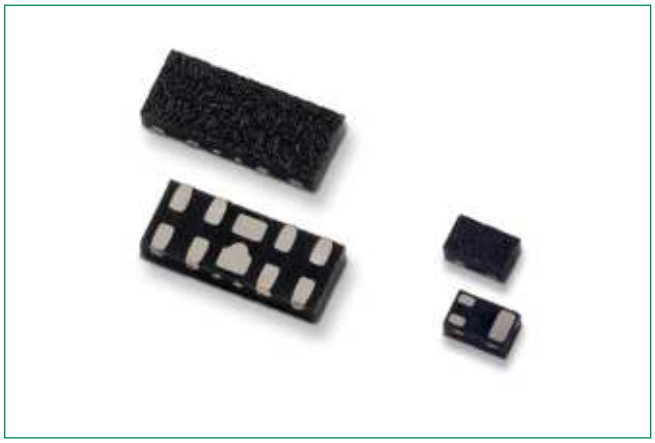
Ultra Low Capacitance
Diode Arrays Series

HF RoHS Pb ELV



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

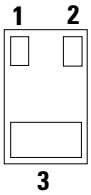
- 0.20 pF TYP capacitance
- ESD, IEC 61000-4-2, ±20kV contact, ±20kV air
- Low clamping voltage of 9.2V @ IPP=2.0A (tP=8/20µs)
- Low profile DFN array packages
- Facilitates excellent signal integrity
- ELV Compliant
- Halogen free, Lead free and RoHS compliant
- AEC-Q101 qualified

Applications

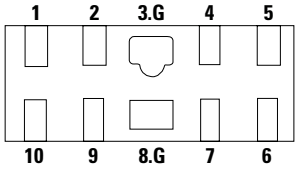
- USB 3.1, 3.0, 2.0
- HDMI 2.0, 1.4a, 1.3
- DisplayPort(TM)
- V-by-One®)
- Thunderbolt (Light Peak)
- LVDS interfaces
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Applications requiring high ESD performance in small packages

Pinout

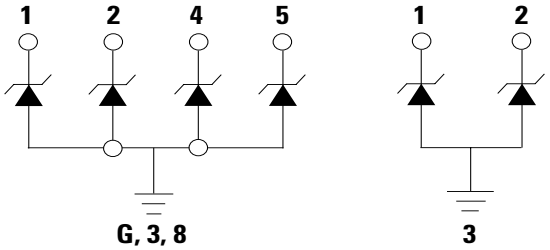
0402 DFN array



1004 DFN array



Functional Block Diagram



1004 DFN array

0402 DFN array

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Ultra Low Capacitance
Diode Arrays Series

Absolute Maximum Ratings

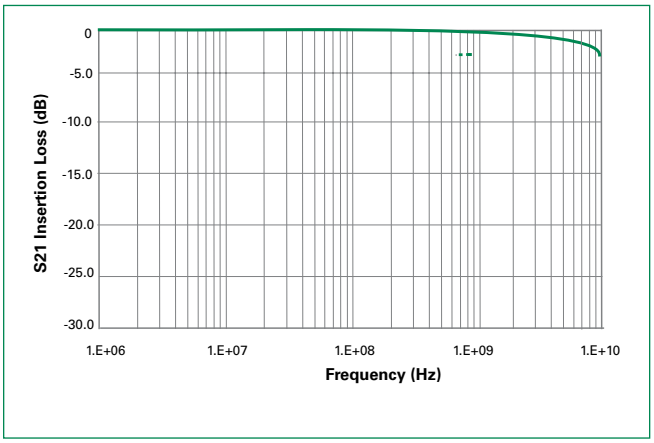
Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20µs)	2.0	A
T_{OP}	Operating Temperature	-40 to 125	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

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.

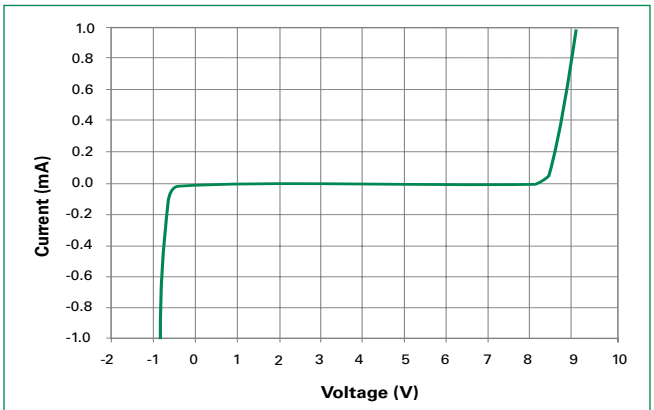
Electrical Characteristics - (T_{OP}=25°C)

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=8/20µs			2.0	A
ESD Withstand Voltage	IEC 61000-4-2 (Contact)	±20			kV
	IEC 61000-4-2 (Air)	±20			

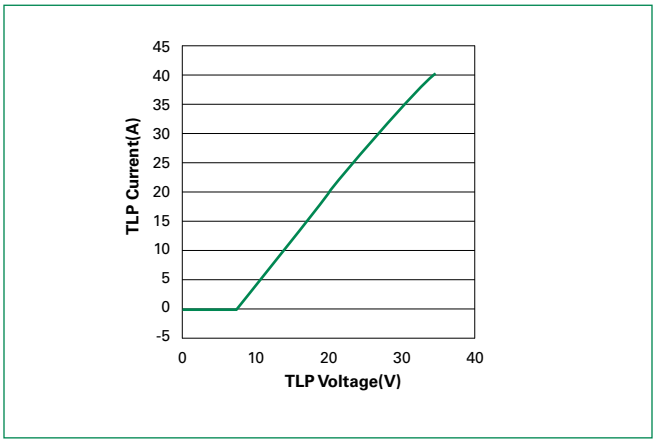
Insertion Loss Diagram



Device IV Curve



TLP

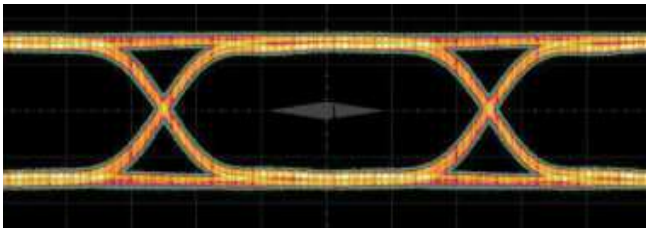


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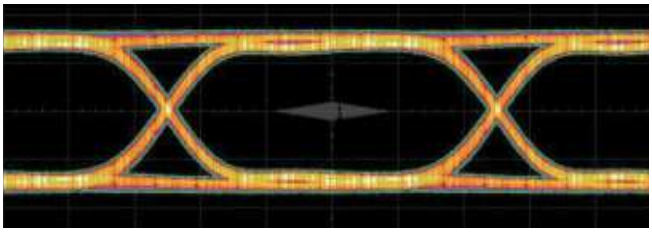
Ultra Low Capacitance
Diode Arrays Series

USB3.0 Eye Diagram

5.0 Gb/s, 1000mV differential, CPO Compliant Test Pattern



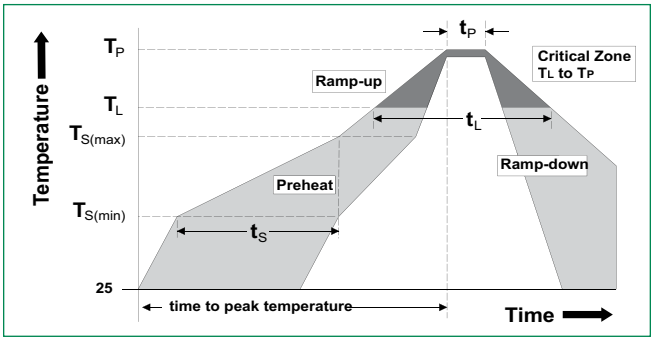
Without Component



With Component

Soldering Parameters

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



Part Numbering System

SP xxxx **U** – **ULC** – **02** **X** **T** **G**

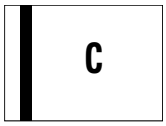
- **TVS Diode Arrays** (SPA® Diodes)
- Size: 1004, 0402
- **Directional**: U: Unidirectional
- Ultra LC
- Number of Channels: 02
- **Package**: U: 1004 DFN, E: 0402 DFN
- T= Tape & Reel
- G= Green

Product Characteristics of 0402 DFN Package

Lead Plating	Pre-Plated Frame
Lead Material	Copper Alloy
Lead Coplanarity	0.004 inches(0.102mm)
Substrate material	Silicon
Body Material	Molded Epoxy
Flammability	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



0402



1004

Notes :
For markings see Ordering Information table below

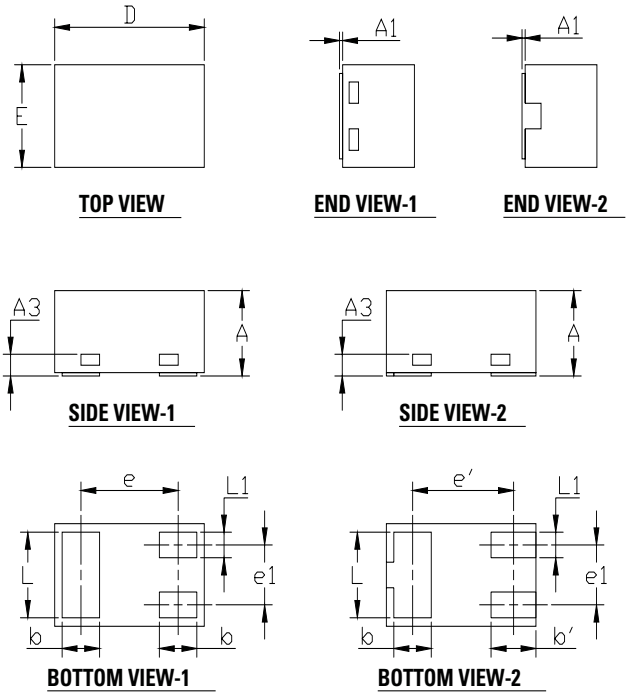
Ordering Information

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

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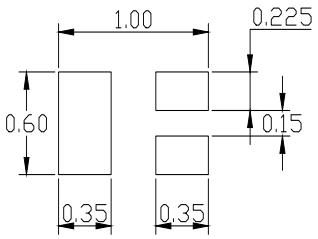
Ultra Low Capacitance
Diode Arrays Series

Package Dimensions — 0402 DFN Array

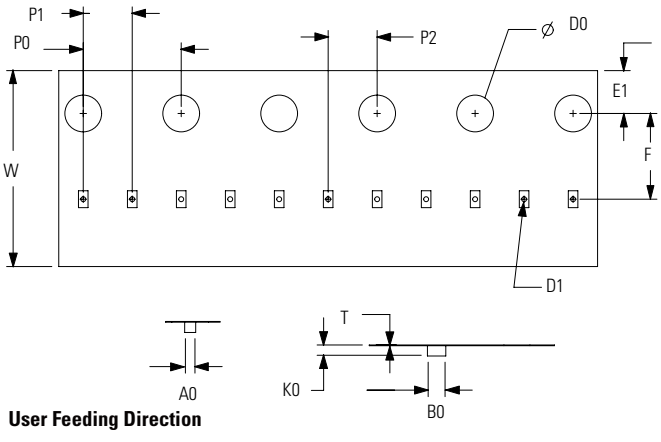


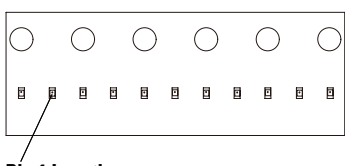
Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.33	-	0.55	0.013	0.015	0.022
A1	0	-	0.05	0	-	0.002
A3		0.13REF			0.005REF	
b	0.20	0.25	0.30	0.008	0.010	0.012
b'	0.20	0.30	0.40	0.008	0.012	0.016
D	0.95	1.00	1.05	0.037	0.039	0.041
E	0.55	0.60	0.65	0.022	0.024	0.026
e		0.65BSC			0.026BSC	
e'		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



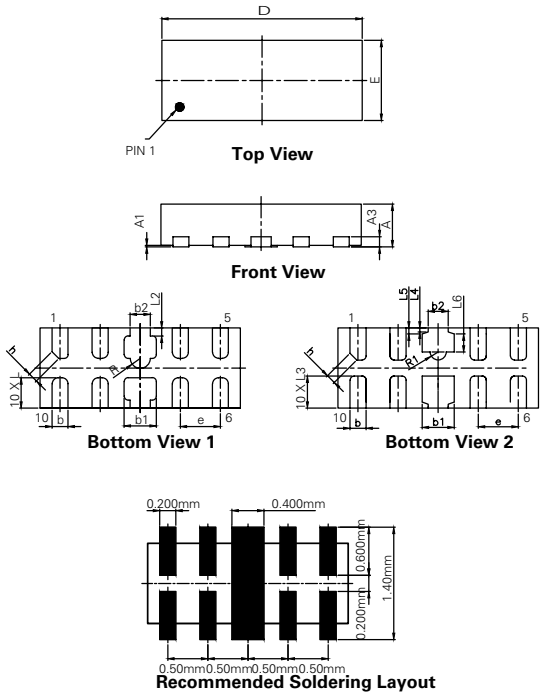


Symbol	Millimeters
A0	0.70+/-0.05
B0	1.15+/-0.05
D0	ø 1.50+/-0.10
D1	ø 0.40 +/-0.10
E1	1.75+/-0.10
F	3.50+/-0.10
K0	0.55+/-0.05
P0	4.00+/-0.10
P1	2.00+/-0.10
P2	2.00+/-0.05
W	8.00+0.30/-0.10
T	0.20+/-0.05

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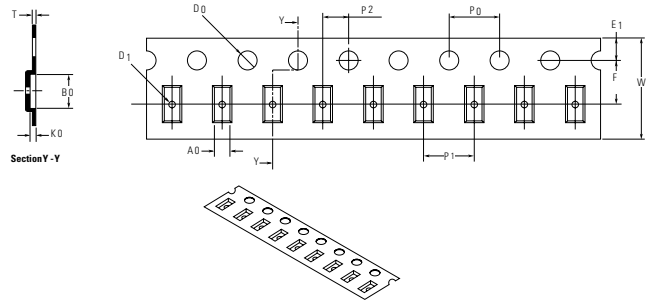
Ultra Low Capacitance
Diode Arrays Series

Package Dimensions — 1004 DFN Array

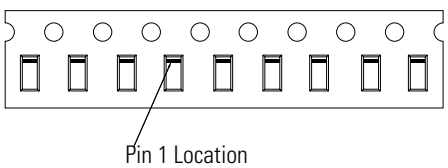


Symbol	Millimeters	
	Min	Max
A	0.40	0.60
A1	0.00	0.05
A3	0.120	0.175
b	0.15	0.25
b1	0.35	0.45
b2	0.20	0.30
D	2.40	2.60
E	0.90	1.10
L	0.28	0.48
L1	0.00	0.15
L2	0.05	0.15
L3	0.35	0.45
L4	0.050 REF	
L5	0.075 REF	
L6	0.225 REF	
e	0.500 BASIC	
h	0.6	0.16

Embossed Carrier Tape & Reel Specification — 1004 DFN Array



T User Feeding Direction



Max Pin 1 Location

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

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