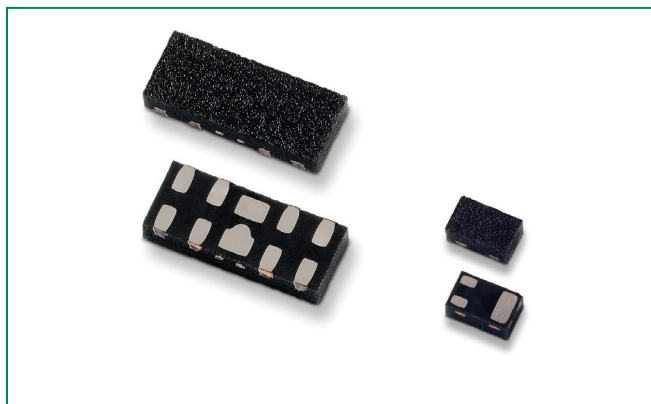


Ultra Low Capacitance Diode Arrays Series

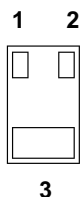


Description

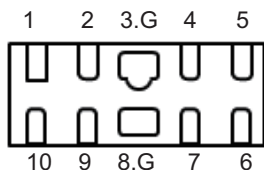
The Ultra Low Capacitance Diode Arrays Series provides signal integrity-preserving unidirectional ESD protection for the world's most challenging high speed serial interfaces. Compelling packaging options including the standard 2.5mmx1.0mm layout and the SOD883, trace layout complexity, saves significant PCB space. Providing in excess of 20kV contact ESD protection (IEC61000-4-2) while maintaining extremely low leakage and dynamic resistance, offered in the industry's most progressive and soon to be popular footprints, the series sets higher standards for signal integrity and usability.

Pinout

0402 DFN array



1004 DFN array
ACE-Q101 qualified)



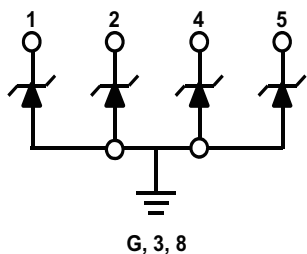
Features

- 0.20pF TYP capacitance
- ESD, IEC61000-4-2, $\pm 20\text{kV}$ contact, $\pm 20\text{kV}$ air
- Low clamping voltage of 9.2V @ $I_{PP}=2.0\text{A}$ ($t_p=8/20\mu\text{s}$)
- Low profile DFN array packages
- Facilitates excellent signal integrity
- ELV Compliant
- Halogen free, Lead free and RoHS compliant

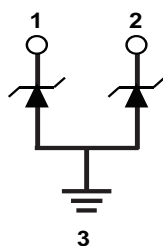
Applications

- 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

Functional Block Diagram



1004 DFN array



0402 DFN array

TVS Diode Arrays (SPA® Diodes)

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	-30 to 85	°C
T_{STOR}	Storage Temperature	-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.

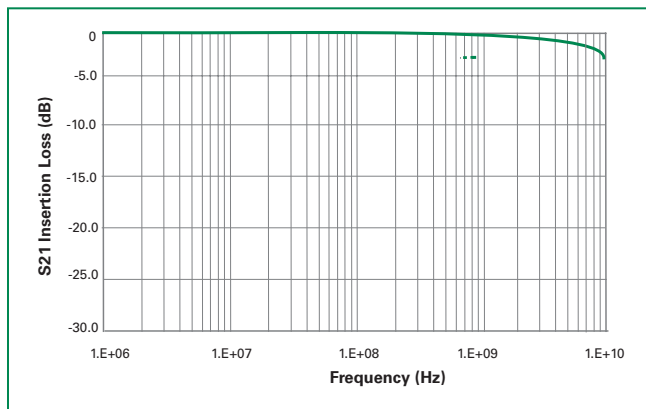
Thermal Information

Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

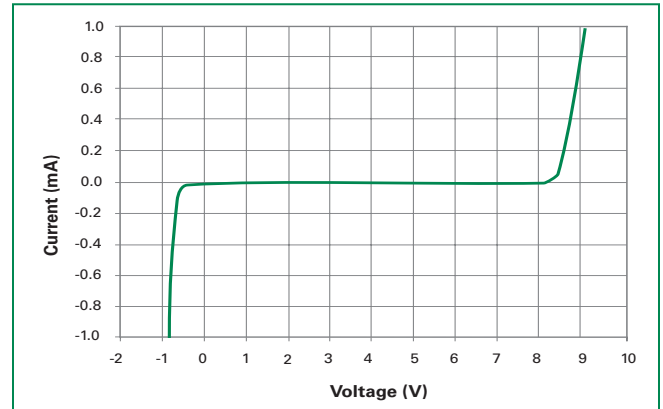
Electrical Characteristics - ($T_{OP}=25^{\circ}C$)

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	IEC61000-4-2 (Contact)	± 20			kV
	IEC61000-4-2 (Air)	± 20			

Insertion Loss Diagram

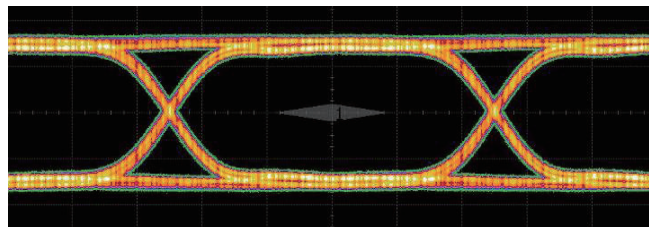


Device IV Curve

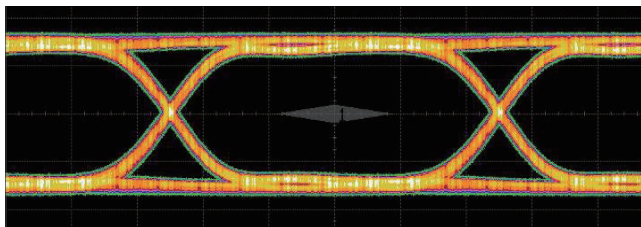


USB3.0 Eye Diagram

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



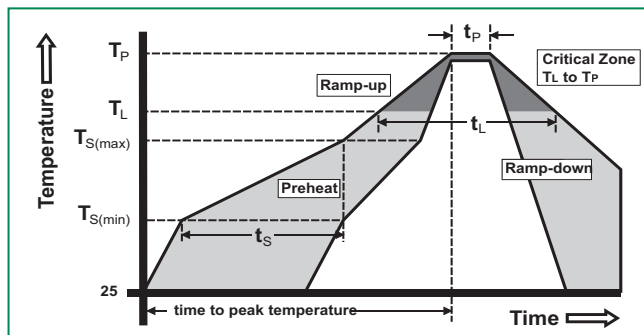
Without Device



With Device

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 – 180 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)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_p)		8 minutes Max.
Do not exceed		260°C

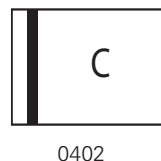


Product Characteristics of 0402 DFN Package

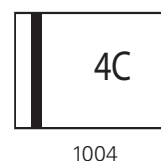
Lead Plating	Pre-Plated Frame
Lead Material	Copper Alloy
Lead Coplanarity	0.004 inches(0.102mm)
Substrate material	Silicon
Body Material	Molded Epoxy
Flammability	UL 94 V-0

- Notes :
1. All dimensions are in millimeters
 2. Dimensions include solder plating.
 3. Dimensions are exclusive of mold flash & metal burr.
 4. Bto 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

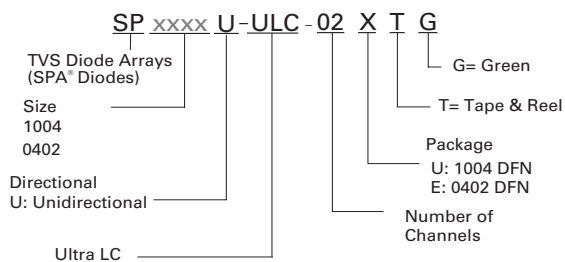


0402



1004

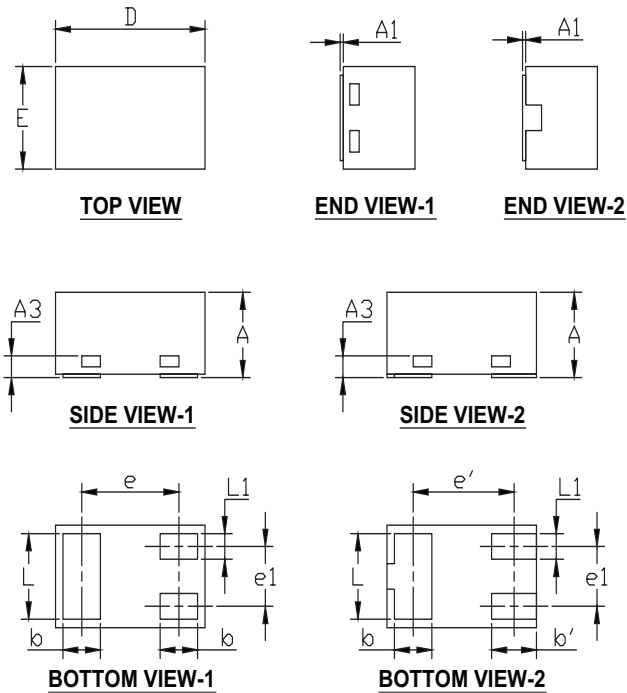
Part Numbering System



Ordering Information

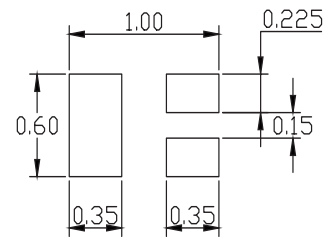
Part Number	Package	Marking	Reel Quantity
SP0402U-ULC-02ETG	0402 DFN Array	I C	10000
SP1004U-ULC-04UTG	1004 DFN Array	I 4C	3000

Package Dimensions — 0402 DFN Array

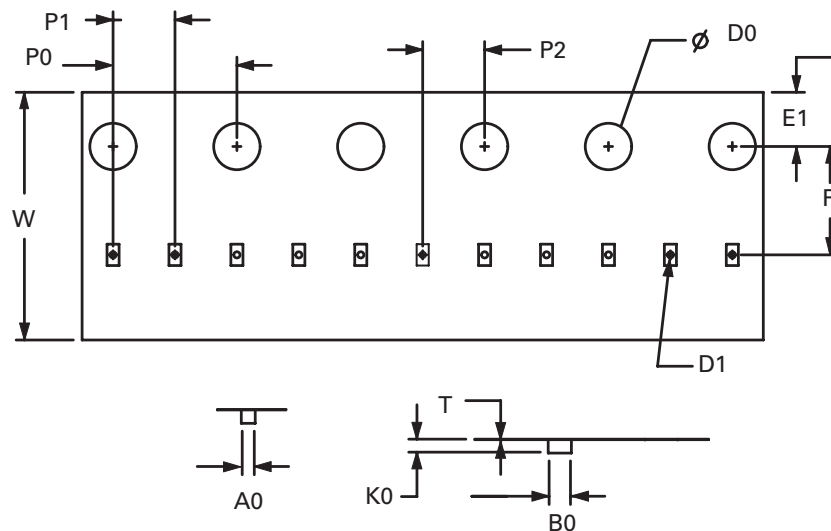


Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.33	-	0.55	0.013	0.015	0.022
A1	0	-	0.05	0	-	0.002
A3	0.13REF			0.005REF		
b	0.20	0.25	0.30	0.008	0.010	0.012
b'	0.20	0.30	0.40	0.008	0.012	0.016
D	0.95	1.00	1.05	0.037	0.039	0.041
E	0.55	0.60	0.65	0.022	0.024	0.026
e	0.65BSC			0.026BSC		
e'	0.675BSC			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

SOLDERING PATTERN

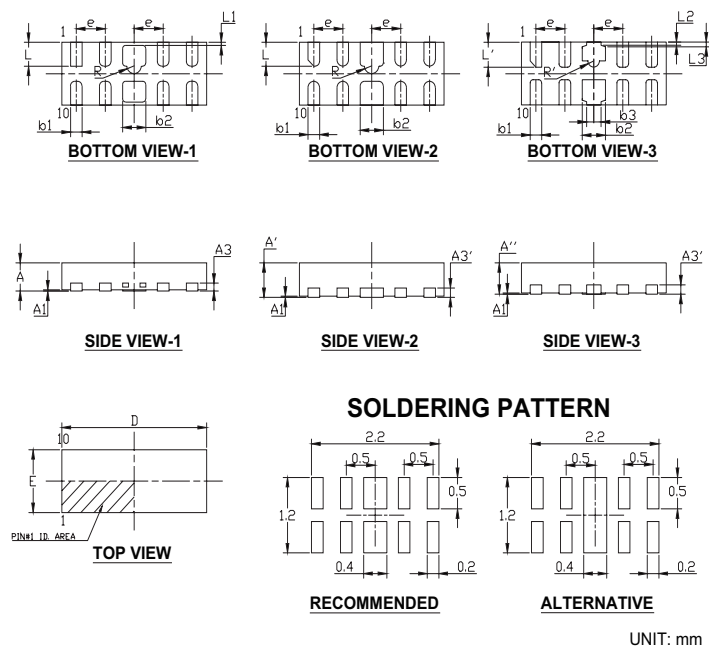


Embossed Carrier Tape & Reel Specification — 0402 DFN Array



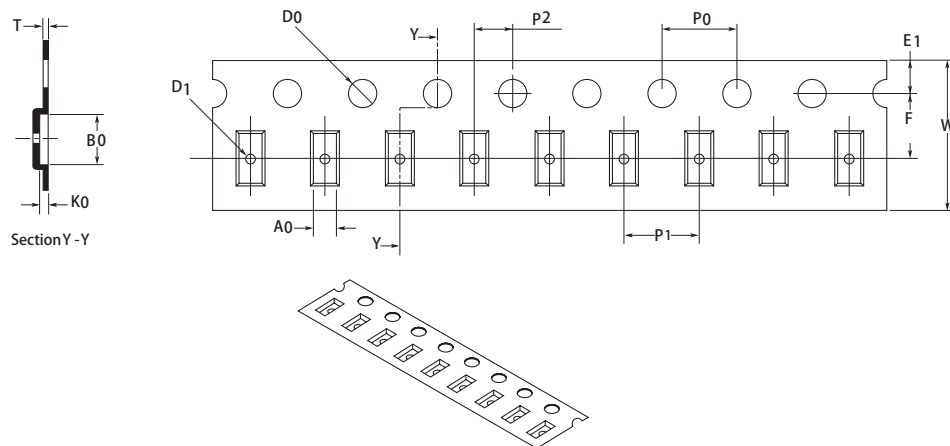
Symbol	Millimeters
A0	0.70+/-0.05
B0	1.15+/-0.05
D0	ø 1.50+/-0.10
D1	ø 0.40 +/-0.10
E1	1.75+/-0.10
F	3.50+/-0.10
K0	0.55+/-0.05
P0	4.00+/-0.10
P1	2.00+/-0.10
P2	2.00+/-0.05
W	8.00+0.30/-0.10
T	0.20+/-0.05

Package Dimensions — 1004 DFN Array



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.33	0.43	0.013	0.017
A'	0.50	0.60	0.020	0.024
A''	0.45	0.55	0.018	0.022
A1	0.00	0.05	0.000	0.002
A3	0.127 ref.		0.005 ref.	
A3'	0.15 ref.		0.006 ref.	
b1	0.15	0.25	0.006	0.010
b2	0.35	0.45	0.014	0.018
b3	0.20	0.30	0.008	0.012
D	2.40	2.60	0.094	0.102
E	0.90	1.10	0.035	0.043
e	0.50 BSC		0.020 BSC	
L	0.28	0.48	0.011	0.019
L'	0.35	0.45	0.014	0.018
L1	0.00	0.15	0	
L2	0.05 REF		0.002 REF	
L3	0.075 REF		0.003 REF	
R	0.125 REF		0.005 REF	
R'	0.05	0.15	0.002	0.006

Embossed Carrier Tape & Reel Specification — 1004 DFN Array



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	0.46 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