## Features

- Transient protection for high-speed data lines
  IEC 61000-4-2 (ESD) ±25kV (Air)
  ±17kV
  (Contact) IEC 61000-4-4 (EFT) 40A (5 /50 ns) Cable Discharge Event (CDE)
- Package optimized for high-speed lines
- Ultra-small package (1.0mm×0.6mm×0.55mm)
- Protects one data, control or power line
- Low capacitance: 10pF (Typical)
- Low leakage current: 10nA @ $V_{RWM}$ (Typical)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge
- ROHS compliant

## Description

TT1211MBX is a low-capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 10pF only, TT 1211 MBX is designed to protect parasitic -sensitive systems against over -voltage and over -current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 (±15kV air, ±8kV contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5 / 50 ns), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

## Applications

- Serial ATA
- PCI Express
- Desktops, Servers and Notebooks
- Cellular Phones
- MDDI Ports
- Display Ports
- Digital Visual Interfaces (DVI)

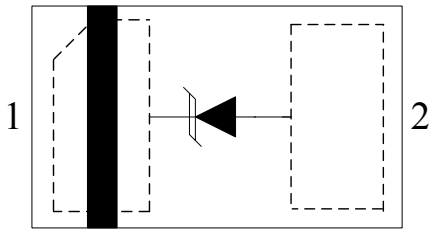
## Mechanical Characteristics

- DFN1006-2L package
- Flammability Rating: UL 94V-0
- Marking: Part number
- Packaging: Tape and Reel

## Circuit Diagram




## Pin Configuration



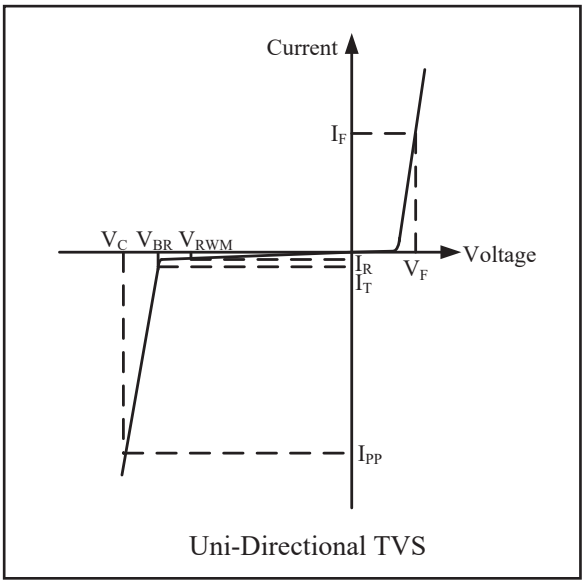

DFN1006-2L
(Top View)

## Absolute Maximum Rating

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{ESD}$ | ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | ±25<br>±17 | kV |
| $T_{OPT}$ | Operating Temperature | -55/+125 | °C |
| $T_{STG}$ | Storage Temperature | -55/+150 | °C |

## Electrical Characteristics (T = 25°C)

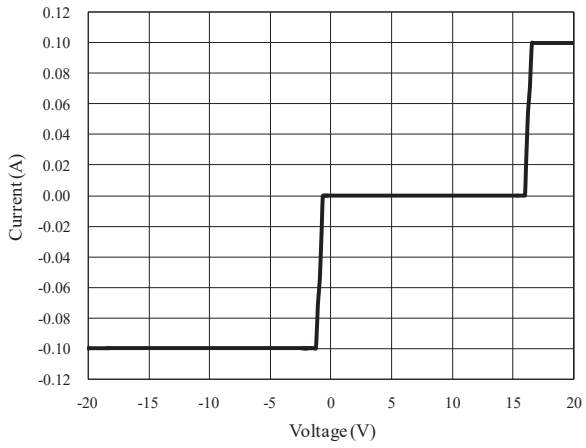
| Symbol | Parameter |
|---|---|
| $V_{RWM}$ | Nominal Reverse Working Voltage |
| $I_R$ | Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$ | Reverse Breakdown Voltage @ $I_T$ |
| $I_T$ | Test Current for Reverse Breakdown |
| $V_C$ | Clamping Voltage @ $I_{PP}$ |
| $I_{PP}$ | Maximum Peak Pulse Current |
| $C_{ESD}$ | Parasitic Capacitance |
| $V_R$ | Reverse Voltage |
| f | Small Signal Frequency |
| $I_F$ | Forward Current |
| $V_F$ | Forward Voltage @ $I_F$ |



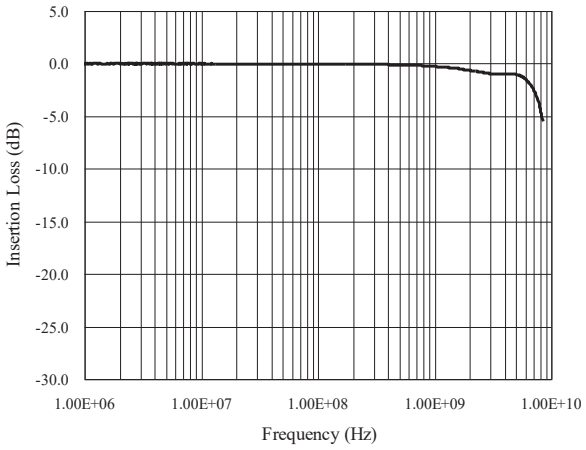
Uni-Directional TVS

| Symbol | Test Condition | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|
| $V_{RWM}$ | | | | 12.0 | V |
| $I_R$ | $V_{RWM}$ = 12V, T = 25°C<br>Between I/O and GND | | 0.01 | 0.1 | μA |
| $V_{BR}$ | $I_T$ = 1mA<br>Between I/O and GND | 13 | | | V |
| $V_F$ | $I_T$ = 1mA<br>Between GND and I/O | 0.7 | | 1.2 | V |
| $V_C$ | $I_{PP}$ = 1A, $t_p$ = 8/20μs<br>Between I/O and GND | | 18 | 20 | V |
| $C_{ESD}$ | $V_R$ = 0V, f = 1MHz<br>Between I/O and GND | | 10 | 15 | pF |

## Voltage Sweeping of I/O to GND

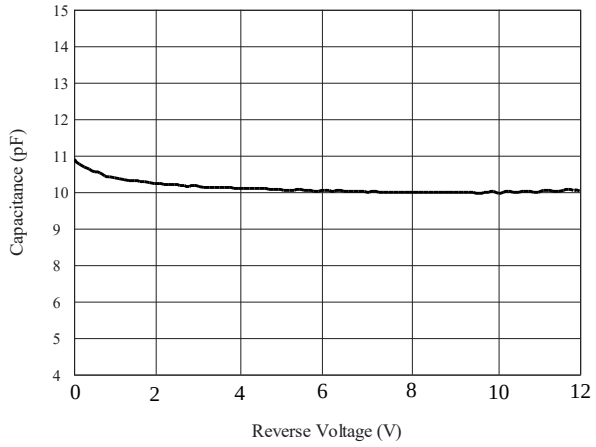



## Insertion Loss S21 of I/O to GND

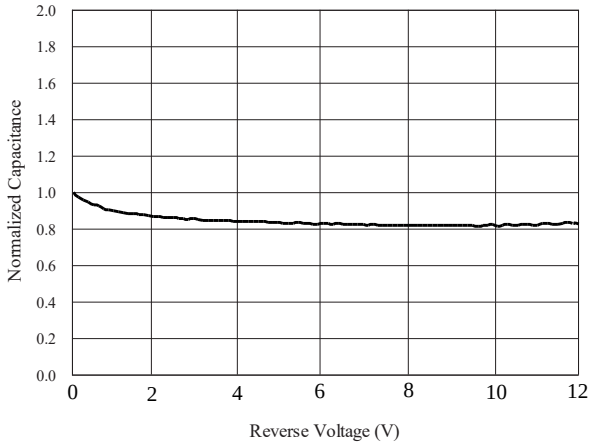



## Capacitance *vs.* Voltage of I/O to GND (f = 1MHz)

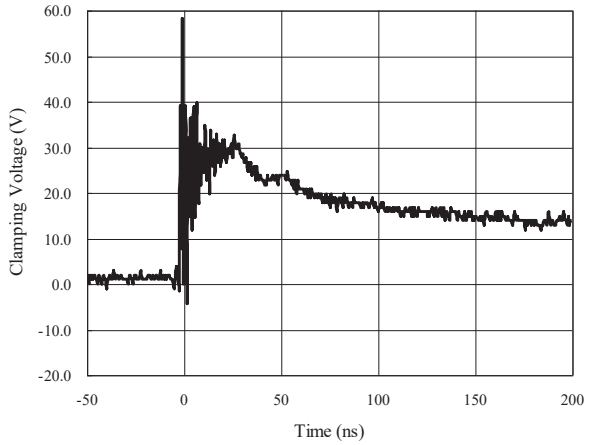
Capacitance *vs.* Reverse Voltage



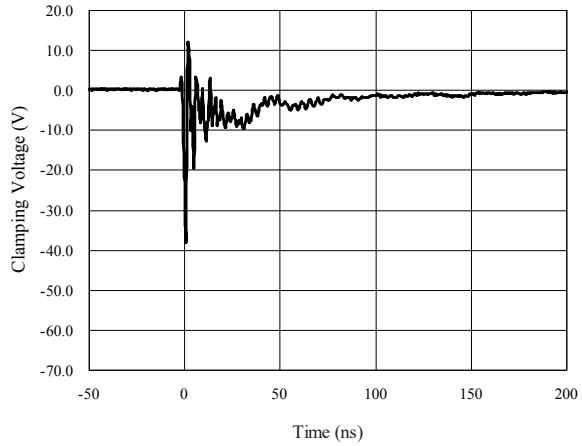

Normalized Capacitance *vs.* Reverse Voltage




## ESD Clamping of I/O to GND (+8kV Contact per IEC 61000-4-2)

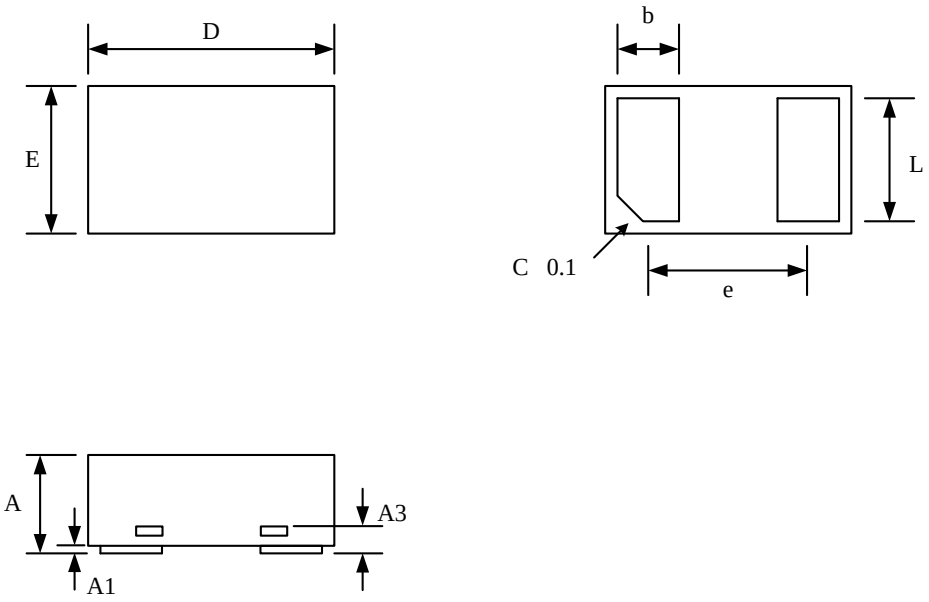



## ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)



## Package Outline

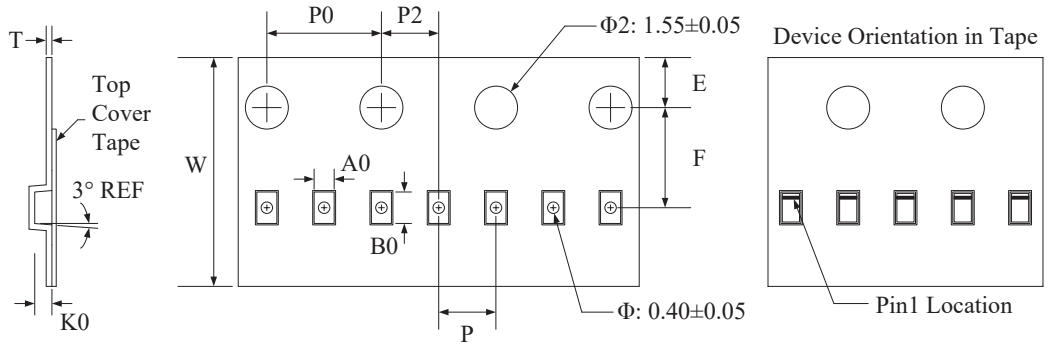
- DFN1006-2L package
- 2 leads, very small package
- MSL-1



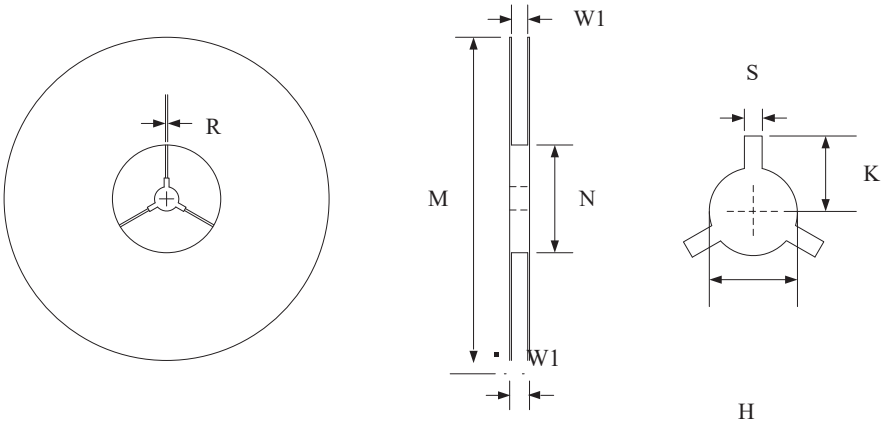

Package Dimensions (Controlling dimensions are in millimeters)

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Minimum | Maximum | Minimum | Maximum |
| A | 0.400 | 0.550 | 0.016 | 0.022 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.125 REF | | 0.005 REF | |
| D | 0.950 | 1.050 | 0.037 | 0.041 |
| E | 0.550 | 0.650 | 0.022 | 0.026 |
| b | 0.200 | 0.300 | 0.008 | 0.012 |
| e | 0.650 BSC | | 0.026 BSC | |
| L | 0.450 | 0.550 | 0.018 | 0.022 |

## Tape and Reel Specification




| Symbol | W | A0 | B0 | K0 | E | F | P | P0 | P2 | T |
|---|---|---|---|---|---|---|---|---|---|---|
| Dimensions (mm) | 8.00±0.1 | 0.7±0.05 | 1.15±0.05 | 0.55±0.05 | 1.75±0.1 | 3.5±0.05 | 2.0±0.1 | 4.0±0.1 | 2.0±0.05 | 0.2±0.05 |




| Symbol | Reel Size | M | N | W | W | H | S | K | R |
|---|---|---|---|---|---|---|---|---|---|
| Dimensions (mm) | Φ178 | 178.0±1.0 | 60.0±1.0 | 11.5±0.5 | 9.0±0.5 | 13.0±0.5 | 2.0±0.1 | 11.0±0.2 | 1.0±0.05 |

## Marking Codes




**Note:**

(1) "BM" is part number.

## Ordering Information

| Part Number | Working Voltage | Quantity Per Reel | Reel Size |
|---|---|---|---|
| TT1211MBX | 12V | 10,000 | 7 Inch |