## Description

The µClamp™ series of TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD. It is designed to replace multilayer varistors (MLVs) in portable applications such as cell phones, notebook computers, and other portable electronics. It features large cross-sectional area junctions for conducting high transient currents. TVS diodes offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

The µClamp™0508T is in a 8-pin, RoHS/WEEE compliant, SLP1713P8T package. It measures 1.7 x 1.3 mm with a nominal height of only 0.4mm. The leads are spaced at a pitch of 0.4mm and are finished with lead-free NiPdAu. Each device features eight TVS diodes with an operating voltage of 5 volts and a maximum loading capacitance of only 10pF.

They may be used to meet the ESD immunity requirements of IEC 61000-4-2, Level 4 (±15kV air, ±8kV contact discharge). The combination of small size and high ESD surge capability makes them ideal for use in portable applications such as cellular phones, digital cameras, and notebook computers.

## Features

- Transient protection for data lines to
  **IEC 61000-4-2 (ESD) ±15kV (air), ±8kV (contact)**
  **IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)**
  **Cable Discharge Event (CDE)**
- Ultra-small package
- Protects eight data lines
- Low clamping voltage
- Working voltage: 5V
- Low capacitance (10pF)
- Solid-state silicon-avalanche technology

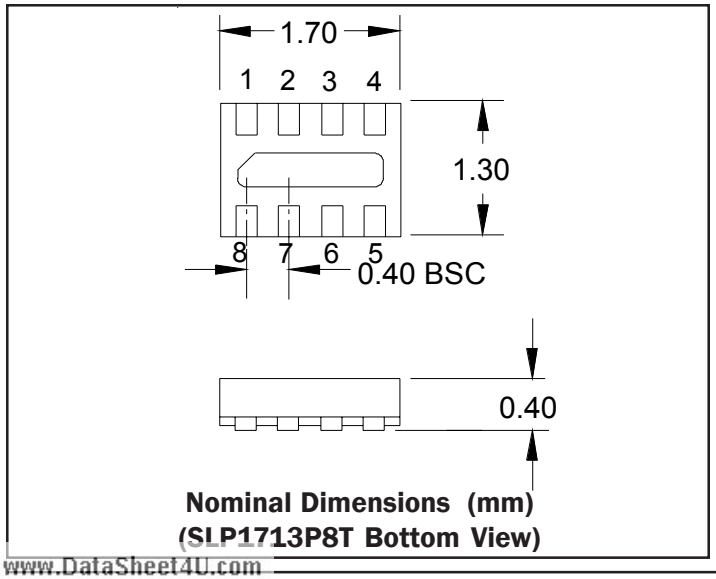
## Mechanical Characteristics

- SLP1713P8T package
- RoHS/WEEE Compliant
- Nominal Dimensions: 1.7 x 1.3 x 0.4 mm
- Lead Finish: NiPdAu
- Molding compound flammability rating: UL 94V-0
- Marking : Marking code
- Packaging : Tape and Reel

## Applications

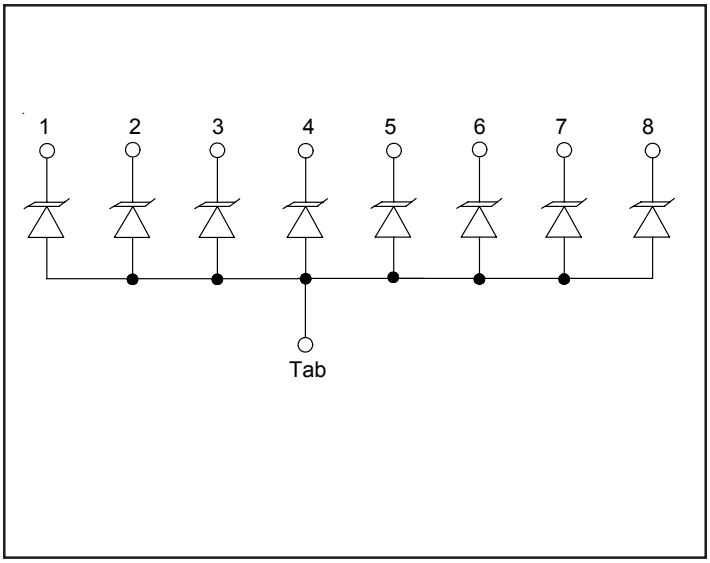
- Cellular Handsets & Accessories
- Notebooks & Handhelds
- Micro SD Ports
- MMC & HS-MMC Ports
- Portable Instrumentation
- Digital Cameras
- Peripherals

## Dimensions




**Nominal Dimensions (mm)**
**(SLP1713P8T Bottom View)**

## Schematic



## Absolute Maximum Rating

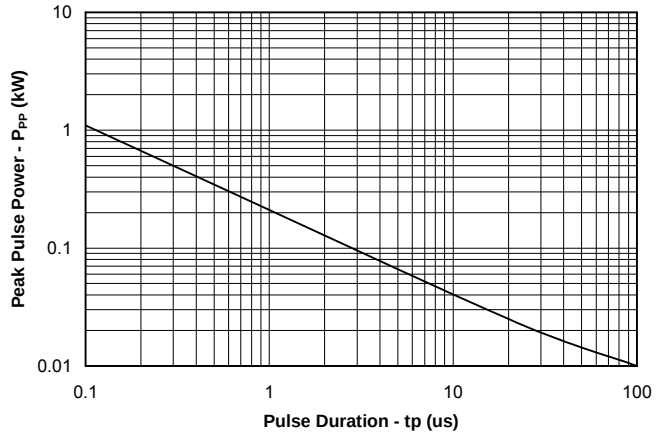
| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power (tp = 8/20µs) | $P_{pk}$ | 25 | Watts |
| Maximum Peak Pulse Current (tp = 8/20µs) | $I_{pp}$ | 2 | Amps |
| ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | $V_{ESD}$ | +/- 20<br>+/- 15 | kV |
| Operating Temperature | $T_J$ | -55 to +125 | °C |
| Storage Temperature | $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (T=25°C)

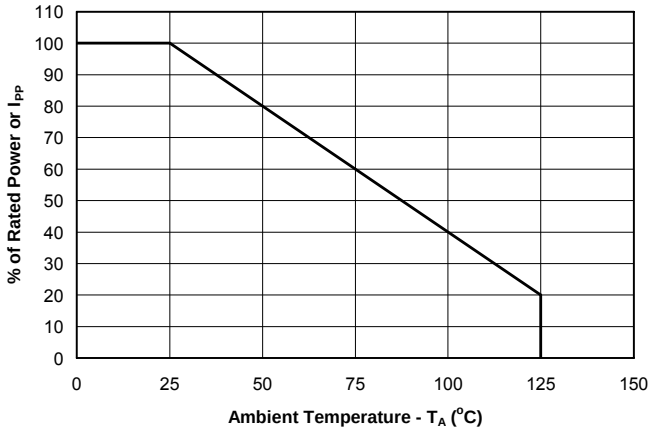
| Parameter | Symbol | Conditions | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|---|
| Reverse Stand-Off Voltage | $V_{RWM}$ | | | | 5 | V |
| Reverse Breakdown Voltage | $V_{BR}$ | $I_t$ = 1mA | 6 | | | V |
| Reverse Leakage Current | $I_R$ | $V_{RWM}$ = 5V, T=25°C | | | 0.25 | µA |
| Forward Voltage | $V_F$ | $I_F$ = 10mA | | 1 | 1.2 | V |
| Clamping Voltage | $V_C$ | $I_{PP}$ = 2A, $t_p$ = 8/20µs | | | 12.5 | V |
| Junction Capacitance | $C_j$ | $V_R$ = 0V, f = 1MHz | | | 10 | pF |
| Junction Capacitance | $C_j$ | $V_R$ = 3.3V, f = 1MHz | | 4.5 | | pF |

## Typical Characteristics

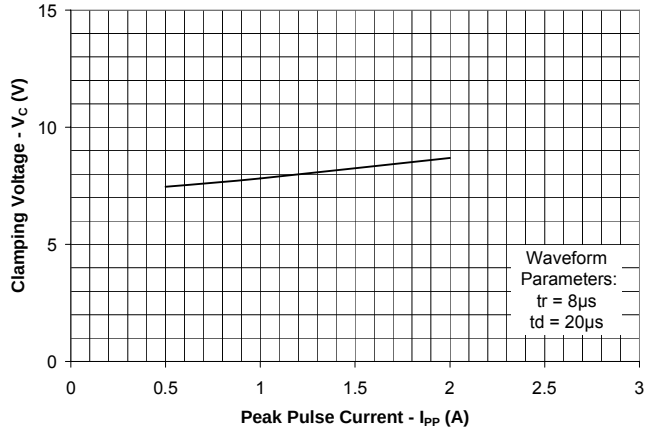
### Non-Repetitive Peak Pulse Power vs. Pulse Time



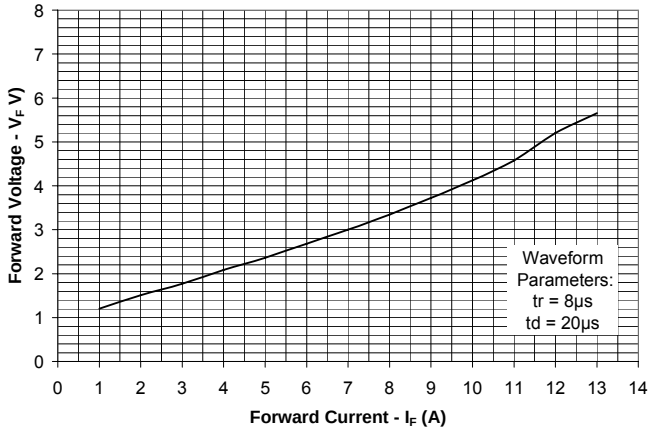

### Power Derating Curve



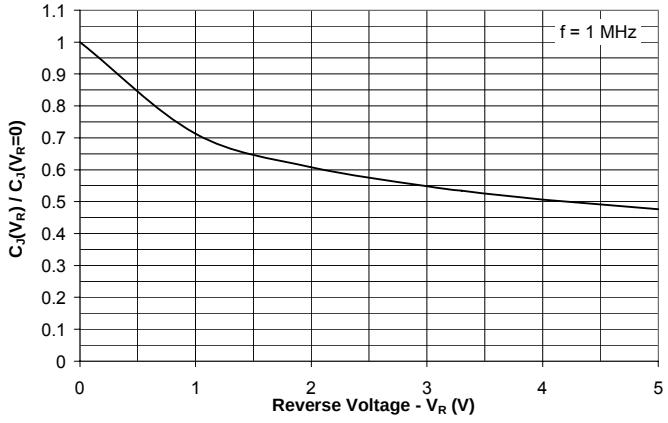

### Clamping Voltage vs. Peak Pulse Current



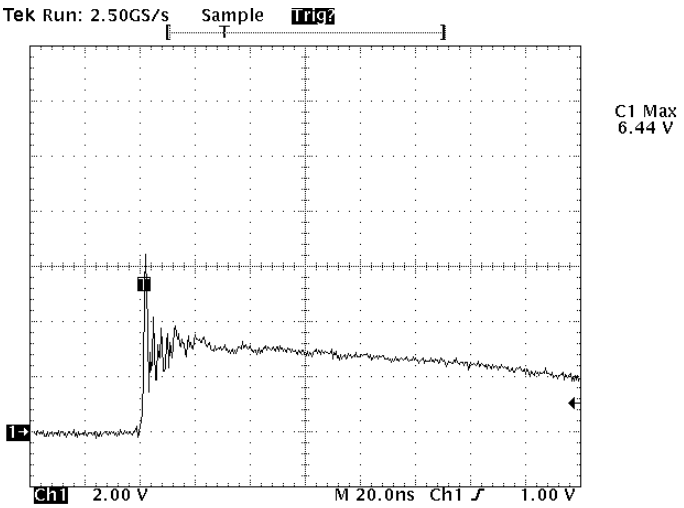

### Forward Voltage vs. Forward Current




### Junction Capacitance vs. Reverse Voltage



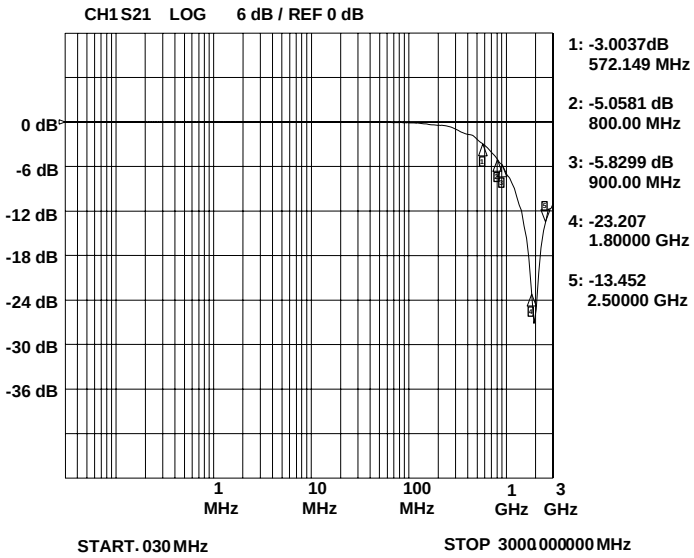

### ESD Clamping
### (8kV Contact per IEC 61000-4-2)



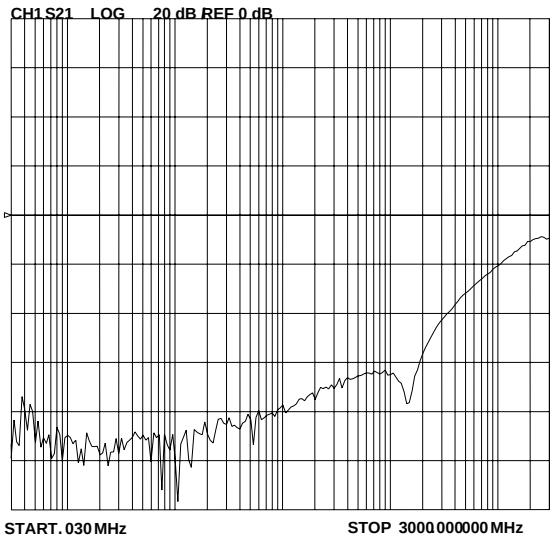

Note: Data is taken with a 10x attenuator

## Typical Characteristics

### Insertion Loss S21




### Analog Crosstalk



## Applications Information

### Device Connection Options

This device is designed to protect eight data lines. The device is unidirectional and may be used on lines where the signal polarity is above ground.

### Ground Connection Recommendation

Parasitic inductance present in the board layout will affect the filtering and ESD performance of the device. Ground loop inductance can be reduced by using multiple vias to make the connection to the ground plane. Figure 2 shows the recommended device layout. The ground pad vias have a diameter of 0.008 inches (0.20 mm) while the two external vias have a diameter of 0.010 inches (0.250mm). The internal vias are spacedapproximately evenly from the center of the pad. The designer may choose to use more vias with a smaller diameter (such as 0.005 inches or 0.125mm) since changing the diameter of the via will result in little change in inductance.

### Circuit Board Layout Recommendations for Suppression of ESD.

Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- Place the TVS near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the TVS and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.
- Never run critical signals near board edges.
- Use ground planes whenever possible.

**Figure 1 - Circuit Diagram (Eight Each)**

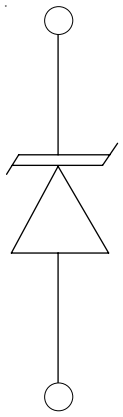
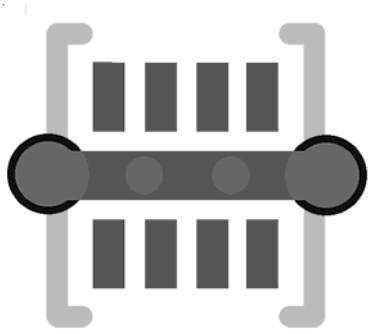
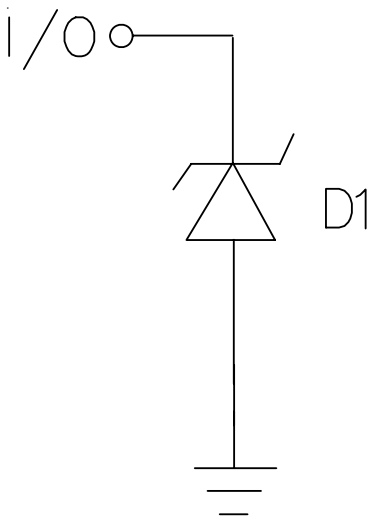


**Figure 2 - Recommended Layout using Ground Vias**



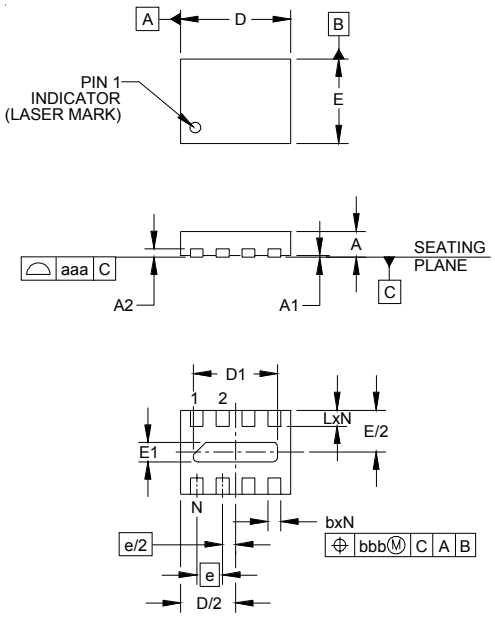
## Applications Information - Spice Model




**uClamp0508T Spice Model**

| uClamp0508T Spice Parameters | | |
|---|---|---|
| **Parameter** | **Unit** | **D1 (TVS)** |
| IS | Amp | 2.05e-15 |
| BV | Volt | 7.0 |
| VJ | Volt | 0.80 |
| RS | Ohm | 0.75 |
| IBV | Amp | 1.0E-3 |
| CJO | Farad | 9e-12 |
| TT | sec | 2.541E-9 |
| M | -- | 0.25 |
| N | -- | 1.1 |
| EG | eV | 1.11 |

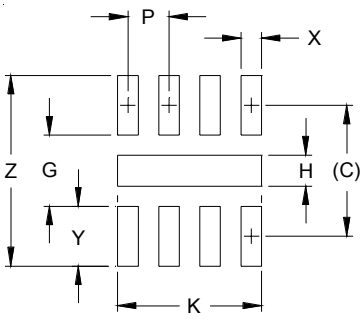
## Outline Drawing - SLP1713P8T




| DIM | INCHES | | | MILLIMETERS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | .015 | .016 | .017 | 0.37 | 0.40 | 0.43 |
| A1 | .000 | .001 | .002 | 0.00 | 0.02 | 0.05 |
| A2 | | (.005) | | | (0.13) | |
| b | .006 | .008 | .010 | 0.15 | 0.20 | 0.25 |
| D | .065 | .067 | .070 | 1.65 | 1.70 | 1.78 |
| D1 | .047 | .051 | .055 | 1.20 | 1.30 | 1.40 |
| E | .049 | .051 | .054 | 1.25 | 1.30 | 1.38 |
| E1 | .008 | .012 | .016 | 0.20 | 0.30 | 0.40 |
| e | | .016 BSC | | | 0.40 BSC | |
| L | .008 | .010 | .012 | 0.20 | 0.25 | 0.30 |
| N | | 8 | | | 8 | |
| aaa | | .003 | | | 0.08 | |
| bbb | | .004 | | | 0.10 | |

NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

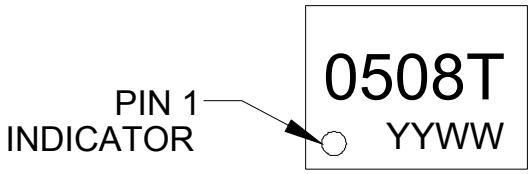
## Land Pattern - SLP1713P8T




| DIM | INCHES | MILLIMETERS |
|---|---|---|
| C | (.050) | (1.27) |
| G | .027 | 0.69 |
| H | .012 | 0.30 |
| K | .055 | 1.40 |
| P | .016 | 0.40 |
| X | .008 | 0.20 |
| Y | .023 | 0.58 |
| Z | .073 | 1.85 |

NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.
3. THERMAL VIAS IN THE LAND PATTERN OF THE EXPOSED PAD SHALL BE CONNECTED TO A SYSTEM GROUND PLANE. FAILURE TO DO SO MAY COMPROMISE THE THERMAL AND/OR FUNCTIONAL PERFORMANCE OF THE DEVICE.

## Marking Code



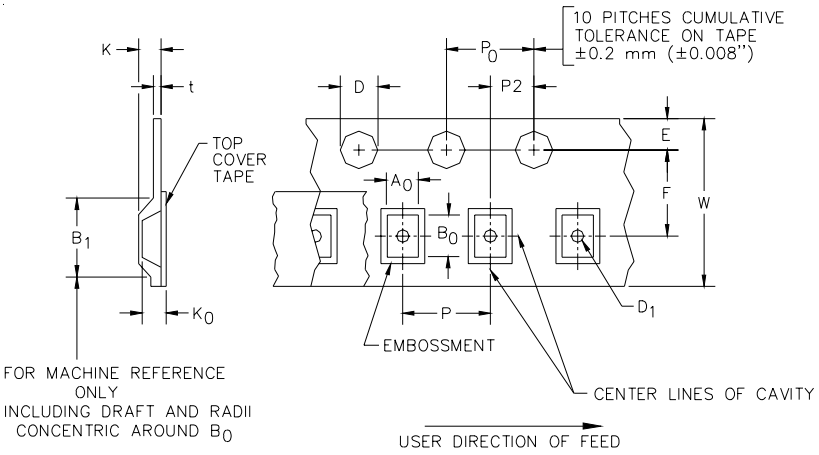

Note: YYWW = Date Code

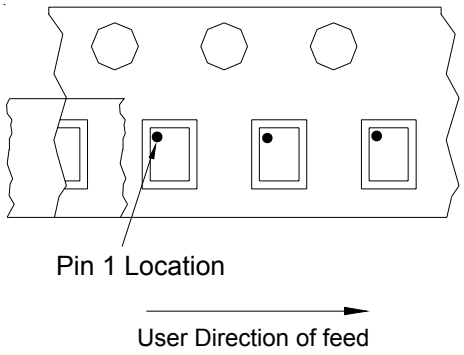
## Ordering Information

| Part Number | Working Voltage | Qty per Reel | Reel Size |
|---|---|---|---|
| uClamp0508T.TCT | 5V | 3,000 | 7 Inch |

Notes:
1) This is a lead-free, RoHS/WEEE compliant product
MicroClamp, uClamp and µClamp are marks of Semtech Corporation

## Tape and Reel Specification




**Device Orientation in Tape**

| A0 | B0 | K0 |
|---|---|---|
| 1.51 +/-0.10 mm | 1.91 +/-0.10 mm | 0.66 +/-0.10 mm |

| Tape Width | B, (Max) | D | D1 | E | F | K (MAX) | P | P0 | P2 | T(MAX) | W |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 mm | 4.2 mm (.165) | 1.5 + 0.1 mm - 0.0 mm (0.59 +.005 - .000) | 0.8 mm ±0.05 (.031) | 1.750±.10 mm (.069±.004) | 3.5±0.05 mm (.138±.002) | 2.4 mm (.094) | 4.0±0.1 mm (.157±.00-4) | 4.0±0.1 mm (.157±.00-4) | 2.0±0.05m-m (.079±.002) | 0.4 mm (.016) | 8.0 mm + 0.3 mm - 0.1 mm (.312±.012) |

## Contact Information

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