**Description**

The SP5001 Series is a highly integrated Common Mode Filter (CMF) providing both ESD protection and EMI common mode noise filtering for systems using high speed differential serial interfaces, such as MIPI D-PHY or HDMI.

The SP5001 Series can protect and filter two differential line pairs in a small RoHS-compliant TDFN-10 package, with cost and space savings over discrete solutions.

**Features**

- Large differential bandwidth > 2.5 GHz
- High Common Mode Stop Band Attenuation:
  - > 25 dB at 700 MHz
  - > 30 dB at 800 MHz
- ±15kV ESD protection per channel (IEC 61000-4-2 Level 4, contact discharge and ±30kV air discharge)
- TDFN-10 2.50mm × 2.00mm × 0.75mm package with 0.50mm lead pitch
- RoHS-compliant, Lead-free packaging
- Moisture Sensitivity Level (MSL-1)

**Applications**

- HDMI/DVI Display in Mobile Phones
- MIPI D-PHY (CSI-2, DSI, etc) in Mobile Phones and Digital Still Cameras

**Pinout**

- **Pinout Diagram**
  - **In 1+**: Pin 1
  - **In 1-**: Pin 2
  - **GND**: Pin 3
  - **In 2+**: Pin 4
  - **In 2-**: Pin 5
  - **Out 1+**: Pin 6
  - **Out 1-**: Pin 7
  - **Out 2+**: Pin 8
  - **Out 2-**: Pin 9
  - **GND**: Pin 10

  **Note**: This drawing is not to scale.
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.

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDC</td>
<td>DC Current Per Line</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>PDC</td>
<td>DC Package Power Rating</td>
<td>0.5</td>
<td>W</td>
</tr>
<tr>
<td>TOP</td>
<td>Operating Temperature</td>
<td>-40 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>STOR</td>
<td>Storage Temperature</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

### Electrical Characteristics (TOP=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Resistance</td>
<td>RCH</td>
<td>Pins 1−10, 2−9, 4−7 and 5−6</td>
<td>8.0</td>
<td>Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Channel Capacitance</td>
<td>CTOTAL</td>
<td>VIO = 1.65VDC, Reverse Bias; f=1MHz, 30mVAC</td>
<td>0.8</td>
<td>1.3</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Reverse Standoff Voltage</td>
<td>VRWM</td>
<td>5.0</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>VR</td>
<td>I=1mA</td>
<td>6.0</td>
<td>8.0</td>
<td>10.0</td>
<td>V</td>
</tr>
<tr>
<td>Forward Voltage at I</td>
<td>VF</td>
<td>I=1mA</td>
<td>0.4</td>
<td>0.7</td>
<td>1.5</td>
<td>V</td>
</tr>
<tr>
<td>Reverse Leakage Current</td>
<td>ILEAK</td>
<td>VIO =3.3V</td>
<td>0.01</td>
<td>0.10</td>
<td>μA</td>
<td></td>
</tr>
<tr>
<td>Dynamic Resistance</td>
<td>Rdyn</td>
<td>Positive (tp=8/20μs)</td>
<td>1.3</td>
<td>Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative (tp=8/20μs)</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLP, tp=100ns, I/O to GND</td>
<td>0.36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD Withstand Voltage</td>
<td>VESD</td>
<td>IEC 61000-4-2 (Contact Discharge)</td>
<td>±15</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (Air Discharge)</td>
<td>±30</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Mode Cutoff Frequency</td>
<td>F3dB</td>
<td>ZSOURCE=50Ω, ZLOAD50Ω</td>
<td>2.5</td>
<td>GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Mode Stop Band Attenuation</td>
<td>Fα</td>
<td>f=800MHz</td>
<td>30</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. ESD zapping at I/O pins (1,2,4,5) with respect to GND.
2. Guaranteed by design.
3. Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

### Differential Mode Attenuation SDD21 vs. Frequency (Zdiff = 100Ω)

![Differential Mode Attenuation SDD21 vs. Frequency](image1)

### Common Mode Attenuation SCC21 vs. Frequency (Zcomm= 50Ω)

![Common Mode Attenuation SCC21 vs. Frequency](image2)
TVS Diode Array (SPA® Diodes)
Low Capacitance ESD Protection - SP5001 Series

Differential Return Loss SDD11 vs. Frequency (Zdiff = 100Ω)

Differential Return Loss SDD22 vs. Frequency (Zdiff = 100Ω)

Transmission Line Pulsing (TLP) Plot

Part Numbering System

Part Marking System

Soldering Parameters

Ordering Information

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Specifications are subject to change without notice.
Revised: 09/19/19
Package Dimensions – TDFN-10

Tape & Reel Specification – TDFN-10

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