TMX LT02

SAW Filter datasheet

1.4 x 1.1 mm, SMD

Table of Contents

Features ........................................................................................................................................................................ 1
Maximum Ratings ........................................................................................................................................................ 1
Frequency and Electrical Characteristics (Reference temperature @ 25°C) ................................................................. 1
Model Outline, Pin Connection and Marking ................................................................................................................. 2
Test Circuit.................................................................................................................................................................... 3
Frequency Characteristics ............................................................................................................................................ 3
Recommended Reflow Soldering Profile ......................................................................................................................... 4
ESD Protection .............................................................................................................................................................. 5
Tape and Reel Specifications ........................................................................................................................................ 6
Reliability Test............................................................................................................................................................... 7
Features

Features
- 915 MHz center frequency
- Ceramic package for Surface Mounted Technology
- Low Loss: 2.7 dB typical value within PassBand Width 902 to 928 MHz
- No matching network required for operation at 50 Ω
- Unbalanced to unbalanced operation

Applications
- Remote control - RF
- Wireless applications:
  - Home appliances
  - Security systems
  - Smart metering

Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature range (T_{stgr})</td>
<td>-40</td>
<td></td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>Operating temperature range (T_{a})</td>
<td>-40</td>
<td></td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>DC voltage between any Terminals (V_{DC})</td>
<td>5</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Maximum input power handling (at 25°C during 50,000)</td>
<td>20</td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>Maximum pulse input power (4s max with 1 pulse every 30 mn max)</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Frequency and Electrical Characteristics (Reference temperature @ 25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center frequency (f_c)</td>
<td>915.0</td>
<td></td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td>Bandwidth (BW, passband width)</td>
<td>26.00</td>
<td></td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td>Maximum Insertion loss (IL, 902 – 928 MHz)</td>
<td>2.7</td>
<td>3.2</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Amplitude ripple (902 – 928 MHz)</td>
<td>0.9</td>
<td>1.8</td>
<td></td>
<td>dB</td>
</tr>
</tbody>
</table>

Absolute Attenuation

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 10.00 to 845.00 MHz</td>
<td>39</td>
<td>42</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>From 845.00 to 880.00 MHz</td>
<td>35</td>
<td>38</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>From 947.00 to 970.00 MHz</td>
<td>13</td>
<td>30</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>From 970.00 to 1020.00 MHz</td>
<td>33</td>
<td>45</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>From 1020.00 to 1200.00 MHz</td>
<td>35</td>
<td>45</td>
<td></td>
<td>dB</td>
</tr>
</tbody>
</table>

Input impedance\(^2\) (Single ended)      | 50   |      |      | Ω    |
Output impedance\(^2\) (Single ended)     | 50   |      |      | Ω    |

1 Typical values are nominal performances at room temperature
2 No external matching is required
Model Outline, Pin Connection and Marking

### Marking

<table>
<thead>
<tr>
<th>Line 1</th>
<th>L2</th>
<th>RakonXpress designation (TMX LT02)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 2</td>
<td>DC</td>
<td>= Identify black dot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC = Date code (See the tables below)</td>
</tr>
</tbody>
</table>

#### Pin Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input unbalanced</td>
</tr>
<tr>
<td>4</td>
<td>Output unbalanced</td>
</tr>
<tr>
<td>2, 3, 5</td>
<td>To Be Grounded</td>
</tr>
</tbody>
</table>

### Date Codes

**Date code (1st digit)**

- 2020 & 2024: n, p, q, r, s, t, u, v, w, x, y, z
- 2023 & 2027: a, b, c, d, e, f, g, h, i, j, k, m

**Date code (2nd digit)**

<table>
<thead>
<tr>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>9th</th>
<th>10th</th>
<th>11th</th>
<th>12th</th>
<th>13th</th>
<th>14th</th>
<th>15th</th>
</tr>
</thead>
<tbody>
<tr>
<td>16th</td>
<td>17th</td>
<td>18th</td>
<td>19th</td>
<td>20th</td>
<td>21st</td>
<td>22nd</td>
<td>23rd</td>
<td>24th</td>
<td>25th</td>
<td>26th</td>
<td>27th</td>
<td>28th</td>
<td>29th</td>
<td>30th</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
<td>P</td>
<td>Q</td>
</tr>
<tr>
<td>R</td>
<td>S</td>
<td>T</td>
<td>U</td>
<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td>a</td>
<td>b</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>g</td>
</tr>
</tbody>
</table>

**Unit: mm**

- TOP VIEW: 1.4 ± 0.05
- FRONT VIEW: 0.7 max
- BOTTOM VIEW: 0.25 ± 0.03 (x5)
Test Circuit

50 Ω / 50 Ω Configuration

Input
Single, 50 Ω

1

SAW Filter

2, 3, 5

GND

4

Output
Single, 50 Ω

Frequency Characteristics

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Graphs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical S21 response</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td>S11</td>
<td><img src="image" alt="Graph" /></td>
</tr>
</tbody>
</table>
Recommended Reflow Soldering Profile

**Temperature**

- **Pre-Heating**: 150°C to 200°C for 60~120 sec
- **Ramp Up**: ≤ 3°C/sec
- **Reflow**: 217°C for 60~150 sec
- **Ramp Down**: ≤ 6°C/sec
- **Peak Temperature**: 260°C ± 5°C

**Time**

- **25°C to Peak**: 480 sec Max.

**NOTE:**

- The components shall remain within the electrical specifications after it soldered on the 1mm thickness PCB board and dipped in the solder at 260 ± 5°C during 10 ± 1 seconds.
- The components shall remain within the electrical specifications after it soldered by electric iron, solder at 350 ± 10 °C during 3~4 seconds. Recovery time: 2 ± 0.5 hour.
- Ultrasonic cleaning may cause deterioration and destruction of the component. Please avoid ultrasonic cleaning.
- Only leads of components may be soldered. Please avoid soldering another part of the component.
ESD Protection

This product is electrostatic sensitive device. When you install or measure it, you should be careful not to add antistatic electricity or high voltage. Please be advised that you had better check anti surge voltage.

To reduce the probability of damages caused by ESD, the following matching topologies should be applied.

ESD matching should be added to the filter port, where electrostatic discharge is expected. It predominantly appears at the antenna input of RF receivers. Therefore “ESD matching” should be designed to short circuit or block the ESD pulse.

Depending on the input impedance of the SAW filter and the source impedance, the needed component values have to be determined from case to case.

In cases where ESD is minor, the following simplified “ESD matching” topologies can be used:

Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements.
### Tape and Reel Specifications

**TAPE DETAILS:**

```
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Code</th>
<th>Dimension</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of component hole</td>
<td>A</td>
<td>1.4 max</td>
<td></td>
</tr>
<tr>
<td>Width of component hole</td>
<td>B</td>
<td>1.7 max</td>
<td></td>
</tr>
<tr>
<td>Diameter of component hole</td>
<td>D₀</td>
<td>Φ 1.5</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Diameter of feed hole</td>
<td>D₁</td>
<td>Φ 0.5</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Pitch of sprocket hole</td>
<td>P₀</td>
<td>4.0</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Length from hole center to component center</td>
<td>P₁</td>
<td>4.0</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Length from Pocket hole center to sprocket hole center</td>
<td>P₂</td>
<td>2.0</td>
<td>± 0.05</td>
</tr>
<tr>
<td>Width of carrier tape</td>
<td>W</td>
<td>8</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Width of adhesive tape</td>
<td>F</td>
<td>3.5</td>
<td>± 0.05</td>
</tr>
<tr>
<td>Gap of hold down tape and carrier tape</td>
<td>E</td>
<td>1.75</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Thickness of Ebossed tape sheet</td>
<td>t₁</td>
<td>0.25 max</td>
<td></td>
</tr>
<tr>
<td>Thickness of Ebossed tape</td>
<td>t₂</td>
<td>1.0 max</td>
<td></td>
</tr>
</tbody>
</table>
```

**REEL DETAILS:**

```
\[
\begin{align*}
\text{Diameter of sprocket hole} & \equiv \Phi 1.5 & \pm 0.1 \\
\text{Diameter of feed hole} & \equiv \Phi 0.5 & \pm 0.1 \\
\text{Pitch of sprocket hole} & \equiv 4.0 & \pm 0.1 \\
\text{Length from hole center to component center} & \equiv 4.0 & \pm 0.1 \\
\text{Length from Pocket hole center to sprocket hole center} & \equiv 2.0 & \pm 0.05 \\
\text{Width of carrier tape} & \equiv 8 & \pm 0.1 \\
\text{Width of adhesive tape} & \equiv 3.5 & \pm 0.05 \\
\text{Gap of hold down tape and carrier tape} & \equiv 1.75 & \pm 0.1 \\
\text{Thickness of Ebossed tape sheet} & \equiv 0.25 \text{ max} \\
\text{Thickness of Ebossed tape} & \equiv 1.0 \text{ max} \\
\end{align*}
\]
```

**NOTE:**
- Unit: mm
- Standard Packing Quantity (SPQ) is 4000 pieces/reel
- Each reel is inside an anti-static bag
### Reliability Test

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test condition / Description</th>
</tr>
</thead>
</table>
| **Mechanical shock** | a) Drops: 3 times on concrete floor  
                             (b) Height: 1.0 m |
| **Vibration resistance** | (a) Frequency of vibration: 10~55 Hz  
                                          Amplitude: 1.5 mm  
                             (c) Directions: X, Y and Z  
                             (d) Duration: 2 hours |
| **Moisture resistance** | (a) Condition: 40 ±2°C, 93+2 -3% RH  
                                      (b) Duration: 96 hours  
                             (c) Wait 4 hours before measurement |
| **Climatic sequence** | (a) +70°C for 16 hours  
                                 (b) +55°C for 24 hours, 90~9 5% RH  
                                 (c) -25°C for 2 hours  
                                 (d) +40°C for 24 hours, 90~95 % RH  
                                 (e) Wait 4 hours before measurement |
| **High temperature exposure** | (a) Temperature: 85°C  
                                      (b) Duration: 250 hours  
                             (c) Wait 4 hours before measurement |
| **Temperature cycling** | (a) +85°C for 30 minutes  
                                     -40°C for 30 minutes repeated 120 times  
                             (b) Wait 4 hours before measurement |

**Note**

As a result of the particularity of inner structure of SAW products, the components can easily be breakdown by electrostatic shock; so it’s mandatory to pay attention to ESD protect during the tests.