PRODUCT TESTING GUIDE

DESIGN QUALIFICATION TESTING

All Samtec series undergo Design Qualification Testing (DQT). This includes Normal Force, Thermal Aging, Mating/Unmating/Durability, IR/DWV, Current Carrying Capacity (CCC), and Mechanical Shock/Random Vibration/LLCR and Event Detection.

EXTENDED LIFE PRODUCT™

E.L.P.™ certified products are tested to additional, rigorous standards which evaluate contact resistance in simulated storage and field conditions.

Products are exposed to 10-year Mixed Flowing Gas, where sulfur dioxide, chlorine, hydrogen sulfide and nitrogen dioxide flow around parts for 14 days, and achieve high mating cycles (250 to 2,500). Certain plating and/or contact options apply.

For additional details, including a list of qualifying products and test results, visit samtec.com/ELP or contact the Customer Engineering Support Group at ASG@samtec.com.

SEVERE ENVIRONMENT TESTING

Severe Environment Testing (SET) is a Samtec initiative to test products beyond typical industry standards and specifications to ensure they are more than suitable for rugged/harsh environment industries, including military, space, automotive, industrial and other extreme applications. Visit samtec.com/SET or contact set@samtec.com for more information and current available test results.

Additional Testing Includes:

- VITA 47.1 Module Insertions
- VITA 47.3 Humidity
- VITA 47.1 Operating Shock Class OS2
- VITA 47.1 Vibration Class VS3
- Exceeds VITA 47.1 Temperature Cycling Class C4
- Exceeds VITA 47.1 Non-Operating Temperature Class C4
- VITA 47.1 Electrostatic Discharge Resistance
- Exceeds VITA 47.1 Altitude for DWV

NASA:

SET products are approved for Class D missions that require high-reliability, quick-turn and cost-effective solutions for LEO satellites, SmallSats, CubeSats and other space exploration applications.

Samtec also utilizes NASA outgassing data to determine if certain products meet NASA’s ASTM E595-77/84/90 test requirements. Visit outgassing.nasa.gov for data.
# PRODUCT TESTING QUICK REFERENCE GUIDE

<table>
<thead>
<tr>
<th>TEST</th>
<th>DESIGN QUALIFICATION TESTING (DQT)</th>
<th>EXTENDED LIFE PRODUCT™ (E.L.P.™)</th>
<th>SEVERE ENVIRONMENT TESTING (SET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Tight</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Normal Force</td>
<td>✓</td>
<td>✓*</td>
<td>✓*</td>
</tr>
<tr>
<td>Thermal Aging</td>
<td>✓</td>
<td>✓*</td>
<td>✓*</td>
</tr>
<tr>
<td>Mating / Unmating / Durability (240 Hrs)</td>
<td>✓ (90-98% Relative Humidity, 100 Cycles)</td>
<td>✓* (90-98% Relative Humidity, 100 Cycles)</td>
<td>✓ (100% Relative Humidity, 250 Cycles)</td>
</tr>
<tr>
<td>IR / DWV</td>
<td>✓</td>
<td>✓*</td>
<td>✓ (At Altitude of 70,000 Feet)</td>
</tr>
<tr>
<td>CCC</td>
<td>✓</td>
<td>✓*</td>
<td>✓*</td>
</tr>
<tr>
<td>Mechanical Shock / Random Vibration / LLCR</td>
<td>✓ (100 G Peak, 6 ms, Half Sine &amp; 7.56gRMS Avg, 2 hr / Axis)</td>
<td>✓* (100 G Peak, 6 ms, Half Sine &amp; 7.56gRMS Avg, 2 hr / Axis)</td>
<td>✓ (40 G Peak, 11 ms, Half Sine &amp; 12gRMS, 5 - 2,000 Hz, 1 hr / Axis)</td>
</tr>
<tr>
<td>Mechanical Shock / Random Vibration / Nanosecond Event Detection</td>
<td>✓ (100 G Peak, 6 ms, Half Sine &amp; 7.56gRMS Avg, 2 hr / Axis)</td>
<td>✓* (100 G Peak, 6 ms, Half Sine &amp; 7.56gRMS Avg, 2 hr / Axis)</td>
<td>✓ (40 G Peak, 11 ms, Half Sine &amp; 12gRMS, 5 - 2,000 Hz, 1 hr / Axis)</td>
</tr>
<tr>
<td>Temperature Cycling (500 Cycles)</td>
<td>N/A</td>
<td>N/A</td>
<td>✓</td>
</tr>
<tr>
<td>Non-Operating Class Temperature</td>
<td>N/A</td>
<td>N/A</td>
<td>✓</td>
</tr>
<tr>
<td>Electrostatic Discharge (ESD)</td>
<td>N/A</td>
<td>N/A</td>
<td>✓</td>
</tr>
<tr>
<td>10 Year MFG (Mixed Flowing Gas)</td>
<td>N/A</td>
<td>✓</td>
<td>N/A</td>
</tr>
<tr>
<td>Mating Cycles (250 to 2,500)</td>
<td>N/A</td>
<td>✓</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- **Gas Tight**: Measures LLCR change after mated product is exposed in nitric acid for 1 hour. This test verifies there is enough normal force between contacts that a gas tight seal is created at the interface.
- **Normal Force**: Measures the contact gap compared to the print before taking normal force measurements; contact gaps are measured after thermal aging.
- **Thermal Aging**: Measures the change in LLCR and mating/unmating force after products have been thermally exposed.
- **Mating / Unmating / Durability**: Measures the change in LLCR and mating/unmating after products have been cycled and exposed to various environmental conditions.
- **Insulation Resistance / Dielectric Withstanding Voltage (IR/DWV)**: Determines the testing voltage and then ensures environmental exposure will not cause the product to fail at the test voltage.
- **Current Carrying Capacity (CCC)**: Establishes the maximum CCC versus ambient temperature.
- **Mechanical Shock / Random Vibration / LLCR**: Measures the product’s ability to withstand a series of mechanical shocks and random vibration. LLCR is a before and after check for damage.
- **Mechanical Shock / Random Vibration / Nanosecond Event Detection**: Measures the product’s ability to withstand a series of mechanical shocks and vibrations. Event detection monitors continuity during testing.
- **Temperature Cycling**: Evaluates the product’s reliability through thermal fatigue by cycling through two temperature extremes (-65 °C to 125 °C, 30 minute dwell time at each extreme).
- **Non-Operating Class Temperature**: Determines the temperature range at which the product operates at peak levels (-55 °C to 105 °C at 100 cycles, and -65 °C to 125 °C at 100 cycles; 200 total cycles).
- **Electrostatic Discharge (ESD)**: Measures the level of electrostatic voltage the product can withstand (exposure to 5k, 10k and 15k Volts, repeated 10 times).
- **10-Year Mixed Flowing Gas (MFG)**: Measures the change in LLCR after the product has been cycled and exposed to various environmental conditions.
- **Mating Cycles**: Measures the maximum number of mating/unmating cycles the product can withstand while maintaining the maximum resistance & pull force.
- **DWV at Altitude**: Measures the peak voltage that a product can withstand before dielectric breakdown at high altitudes (70,000 feet).

*Completed as part of initial Design Qualification Testing (DQT). All series undergo DQT. Extended Life Product™ testing and Severe Environment Testing are performed in addition to DQT. Please visit samtec.com for details.*

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