APPLICATION NOTE

Reliability Performance for Standard Commercial Ferrite Isolators and Circulators

Introduction
The best-in-class performance of Skyworks ferrite isolators and circulators is achieved through a systematic approach that emphasizes quality and reliability from product development through volume production. Six Sigma tools and methodologies are used to build quality into our designs, to control manufacturing processes, and to drive continuous improvement.

The reliability of Skyworks isolator and circulator products is assured by completing extensive stress testing during the qualification stage of all new product designs.

This Application Note describes the Skyworks reliability test plan and predictive reliability calculations that help to maintain a high standard of reliability throughout the product life cycle.

All isolator and circulator products are compliant with the EU RoHS directive, 2002/95/EC.

Reliability Test Plan
A typical reliability test plan for standard isolators and circulators is diagrammed in Figure 1. This testing is aligned to IEC standards.

Additional customized test capabilities are also available and include:

- Mechanical shock
- Drop testing

- 85 °C/85% relative humidity
- Salt fog testing
- Wind-driven rain testing

Reliability Prediction
The reliability prediction calculations used the method described in Telcordia SR-332. Calculation parameters were:

- Operating temperature: −10 °C to +85 °C
- Environment: Ground benign, controlled
- Operation stress: 50%
- Method: Method I, Case 3

See Table 1 for a summary of the reliability predictions for various circulator and isolator platforms. Figures 2 and 3 illustrate the predictive Failure In Time (FIT) over temperature for typical isolators and circulators.

Reference Documents
Figure 1. Reliability Test Plan Flowchart

Table 1. Reliability Prediction Summary, Ambient Temperature

<table>
<thead>
<tr>
<th>Platform</th>
<th>Assembly</th>
<th>Junction</th>
<th>Terminator/Attenuator</th>
<th>Ground Benign, Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quantity</td>
<td>Type</td>
</tr>
<tr>
<td>Isolator</td>
<td>Machined (Housing)</td>
<td>Single 1</td>
<td>Termination</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Dual</td>
<td>1</td>
<td>Termination</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Stamped (Base plate and can)</td>
<td>Single 1</td>
<td>Attenuator</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Dual</td>
<td>2</td>
<td>Termination</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Cast (Base plate and connector)</td>
<td>Dual 2</td>
<td>Termination</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Machined (Housing)</td>
<td>Single 0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Stamped (Base plate and can)</td>
<td>Single 0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
|          | Robust (Lead) | Single 0 | N/A | N/A | N/A | 254 | 448
Figure 2. FIT Calculation for Typical Isolator (Dual and Single Junction)

Figure 3. FIT Calculation for Typical Circulator (Single Junction)