X2Y Balanced Line EMI Chip
Reliability and Performance Data

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**Introduction**

The X2Y Balanced Line EMI Chip is a 3 terminal device with a revolutionary internal design, offering simultaneous line-to-line and line-to-ground filtering, using a single chip. The novel electrode structure provides a much reduced inductance when compared to conventional capacitors, which enhances the high frequency filtering performance.

Capable of replacing two or more conventional devices, typical applications include the suppression of EMI in DC motors for automotive products, eg window lifters, mirror motors, seat adjustment etc.

X2Y components are available in case sizes of 0805 up to 2220, capacitance values from 10pF to 1.2uF.

**Specifications**

- **Dielectric:** X7R or C0G/ NP0
- **Capacitance Measurement:** At 1000hr point
- **Typical Capacitance Matching:** Better than 5%
- **Temperature Rating:** -55°C to 125°C
- **Dielectric Withstand Voltage:** 2.5 x Rated Volts for 5 secs. Charging current limited to 50mA max.
- **Insulation Resistance:** 100GOhms or 1000S (whichever is the less).
- **Termination Material:** Nickel Barrier.

**Component Diagrams**
Technical Benefits

- Simultaneous line-to-line and line-to-ground filtering in one device.
- Replaces chokes, inductors, and capacitors with an SMT single chip solution.
- Reduces 2 or more components with one device.
- Matched capacitance line-to-ground on both lines.
- Low inductance due to cancellation effect.
- Differential and common mode attenuation.
- Effects of temperature and voltage variation eliminated.

Applications

- Balanced lines.
- Twisted pairs.
- EMI suppression on DC motors.
- Sensor/ transducer applications.
- Wireless communications.
- Audio.

Reliability Information

Load Test

Samples taken during the development process and from production batches have been subjected to a standard load test. Load test information and results:

- Number of capacitors tested: 10270
- Product group analysed: All X2Y products sample tested.
- Testing location: Syfer Reliability Test Department.
- Endurance test conditions: Up to 1000 hours with 1.5x Rated Voltage applied at 125°C.
- Results: 6 failures in 10,215,360 component test hours.
The load test results have then been used to calculate FIT (Failure In Time) rates by applying voltage and temperature acceleration factors. For details regarding the FIT rate calculation method including acceleration factors then refer to Syfer application note reference AN0004.

**X2Y FIT Rates**

![Graph showing X2Y Failure Rate Data](image)

**FIT Rate Reliability Conversion Factors**

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FITS</td>
<td>MTBF (Years)</td>
<td>(10^9) (FITS \times 8760)</td>
</tr>
<tr>
<td>FITS</td>
<td>Failure Rate Per Hour</td>
<td>FITS (10^9)</td>
</tr>
<tr>
<td>FITS</td>
<td>ppm (1 year)</td>
<td>FITS (10^9) \times 8760 x 1,000,000</td>
</tr>
</tbody>
</table>

FITS = Failures in \(10^9\) Hours  
MTBF = Mean Time Between Failure
Humidity Tests
Samples taken during the development process and from production batches have been subjected to a standard humidity test. Humidity test information and results:
- Number of capacitors tested: 719
- Product group analysed: All X2Y products sample tested.
- Testing location: Syfer Reliability Test Department.
- Endurance test conditions: Up to 1000 hours with 85°C/85%RH with 1.5Vdc or 5Vdc applied.
- Results: 0 failures in 552,600 component test hours.

Performance Information
Capacitance vs. Time
Typical COG performance:
Typical X7R performance:

![Typical X7R Capacitance vs Time Graph](chart1)

IR vs. Temperature

Typical COG performance:
Greater than 100GOhms or 1000S over the operating temperature range.

Typical X7R performance:

![IR vs Temperature Graph](chart2)
DF vs. Temperature

Typical maximum COG performance:

![Graph showing Dissipation Factor vs Temperature for COG.](image)

Typical X7R performance:

![Graph showing Dissipation Factor vs Temperature for X7R.](image)
Rated Voltage vs. Temperature

Typical COG performance:

![COG Performance Graph](image1)

Typical X7R performance:

![X7R Performance Graph](image2)
Temperature Coefficient

Typical COG performance:

![Temperature Coefficient COG](chart)

Typical X7R performance:

![Typical Temperature Coefficient X7R](chart)
**Voltage Coefficient**

Typical COG performance:

![COG Voltage Coefficient Graph](image)

Typical X7R performance (50DCV Rated):

![X7R Voltage Coefficient Graph](image)