surface mount
EMI filters

SPECTRUM CONTROL INC.
Signal & Power Integrity Group
In 1968, Spectrum Control was founded as a solutions-oriented company designing and manufacturing products to suppress or eliminate electromagnetic interference (EMI). In the years that followed we adapted our core EMI filter technology into a complete line of capacitors, discrete filters, filtered arrays, filtered connectors, power filters, gaskets and shielding, microwave filters and power management products. Today, Spectrum Control offers the most experienced team of EMI engineering specialists and most extensive line of EMI filter products and packaged filter solutions.

Spectrum products are used in virtually all industries worldwide, including telecommunications, medical, government, military, aerospace, computer and industrial controls. In addition, we’ve secured preferred supplier status with many of the leading electronics OEMs around the world.

With many years of experience in the design and manufacture of filters, Spectrum Control has a unique perspective on EMI and its control. We are now extending our filter expertise to the board level with our introduction of a complete line of surface mount EMI filters. Our family of surface mount inductors, low pass filters, high frequency filters and power filters is designed to offer high performance EMI filtering with a minimal PCB footprint.

Spectrum Control surface mount EMI filters are ideal for a wide range of PCB applications, including automotive electronics, digital A/V equipment, computers, peripherals, telecommunications, switching power supplies and high current buss lines.

ISO 9001 CERTIFIED

www.specemc.com
Spectrum Control’s expertise

Spectrum Control is unique in providing an integrated approach to EMC problem solving by offering customer consulting, diagnostic testing, design and manufacturing services. As a fully integrated manufacturer, we are able to respond to short lead times and develop cost-effective solutions to satisfy your performance and budgetary needs.

test
- Spectrum Control’s Test Facility provides a total solution for your compliance issues
- In-house anechoic chamber and shielding room
- NARTE certified engineering staff
- Tests available for:
  - European emission and immunity regulations (CE Mark)
  - FCC Part 15
  - MIL standard testing

design
- In-house EMI and power conditioning specialists
- Comprehensive computer modeling
- Designs are “in-house” compliance verified
- Custom assemblies:
  - Incorporate EMI filtering, circuit breaker protection, transient suppression, voltage cut-off, power factor correction, harmonic suppression, remote sensing and other options to meet your specific requirements
  - Plug-and-play designs
  - Reduce your time to market
  - Lower your inventory needs

manufacture
- Flexible factories
- Custom designs
- Spectrum Control, Inc. ISO 9001 certified
- Schedule sharing programs available
- Vertically integrated supplier
## Surface Mount EMI Filter Selection Guide

### Surface Mounted Low Pass Filters

<table>
<thead>
<tr>
<th>Applications</th>
<th>Features / Benefits</th>
<th>Performance Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellular telephones and base stations, telecommunication equipment, computer and peripheral equipment, digital AV equipment such as TV, VCR and DVD</td>
<td>Easy installation</td>
<td>Capacitance: From 22 to 220,000 pF</td>
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<tr>
<td></td>
<td>Nickel barrier with solder coated termination offers excellent solderability</td>
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<td></td>
<td>Design flexibility</td>
<td>Max. current range: 0.3 to 2 Amps</td>
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<td>Available in EIA (EIAJ) sizes 0603 (1608), 0805 (2012), 1206 (3216), 1806 (4516)</td>
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<td>Nickel barrier with solder coated termination offers excellent solderability</td>
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<td>Design flexibility</td>
<td>Max. current range: 0.3 Amps</td>
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<tr>
<td></td>
<td>Common ground across four lines in one chip controls cross talk</td>
<td>Temperature range: -55°C to +125°C</td>
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<tr>
<td></td>
<td>Easy installation</td>
<td>Capacitance: From 47 to 1,000 pF</td>
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<tr>
<td></td>
<td>Superior solderability and heat resistance due to multilayer electrode structure</td>
<td>Rated voltage: 100 VDC</td>
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<td>Design flexibility</td>
<td>Rated current: 10 Amps</td>
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<tr>
<td></td>
<td>Simple structure and high withstanding voltage</td>
<td>Temperature range: -55°C to +125°C</td>
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<td></td>
<td>Performance</td>
<td>Circuit: Feed thru</td>
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<tr>
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<td>Self-resonant frequency extends to the microwave band</td>
<td>Performance: Excellent performance in GHz applications</td>
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<tr>
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<td>Extreme elimination of residual inductance</td>
<td>Performance: Eliminates thru-hole filters thus eliminating costly RFI bulkheads</td>
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<td>Easy installation</td>
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<td>Power amplifiers, power supplies, temperature and current motor controls, high current lines and driver circuits</td>
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<td>Tape and reel packaging along with bulk packaging</td>
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<td>Performance</td>
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</table>

### Applications

- SF SERIES: Three Terminal Chip
- LC/LZ SERIES: LC Type Chips
- SA SERIES: Mini Surface Mount Filters
- MSM SERIES: Square Surface Mount Filters
- SSM SERIES: Square Surface Mount Filters

### Performance Characteristics

- Capacitance
  - SF SERIES: From 22 to 220,000 pF
- LC/LZ SERIES: From 22 to 22,000 pF
- SA SERIES: From 22 to 22,000 pF
- MSM SERIES: From 47 to 1,000 pF
- SSM SERIES: From 47 to 1,000 pF

- Rated voltage
  - SF SERIES: 50 to 100 VDC
  - LC/LZ SERIES: 25 VDC
  - SA SERIES: 25 VDC
  - MSM SERIES: 50 VDC
  - SSM SERIES: 50 VDC

- Max. current range
  - SF SERIES: 0.3 to 2 Amps
  - LC/LZ SERIES: 100 mA
  - SA SERIES: 0.3 Amps
  - MSM SERIES: 10 Amps
  - SSM SERIES: 10 Amps

- Temperature range
  - SF SERIES: -55°C to +125°C
  - LC/LZ SERIES: -40°C to +85°C
  - SA SERIES: -55°C to +125°C
  - MSM SERIES: -55°C to +125°C
  - SSM SERIES: -55°C to +125°C

### Web Resources

- SF SERIES: [www.specemc.com/sf](http://www.specemc.com/sf)
- LC/LZ SERIES: [www.specemc.com/lc](http://www.specemc.com/lc)
- SA SERIES: [www.specemc.com/sa](http://www.specemc.com/sa)
- MSM SERIES: [www.specemc.com/msm](http://www.specemc.com/msm)
- SSM SERIES: [www.specemc.com/ssm](http://www.specemc.com/ssm)
### Surface Mount EMI Filter Selection Guide

#### Applications

<table>
<thead>
<tr>
<th>RSM SERIES</th>
<th>PSM SERIES</th>
<th>HIGH FREQ.</th>
<th>POWER EMI FILTERS</th>
</tr>
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<tbody>
<tr>
<td>Round Surface Mount Filters</td>
<td>Power Surface Mount Filters</td>
<td>High Frequency PCB Filters</td>
<td>Mini Surface Mount Power Filters</td>
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<td>Power amplifiers, power supplies, temperature and motor controls, high current buss lines and driver circuits</td>
<td>Power amplifiers, power supplies, temperature and motor controls, high current buss lines and driver circuits</td>
<td>Low power digital circuits, FCC and VDE compliant equipment</td>
<td>Electrical measurement equipment, automotive electronics, industrial electronic equipment, switching power supplies, switching power supplies, cellular base stations, computer and peripheral equipment, digital equipment, monitor and display units</td>
</tr>
</tbody>
</table>

#### Features/Benefits

- **Easy installation**
  - Universal part orientation increase application speed to the PCB
  - Square mechanical geometry enhances soldering to a PCB
  - Encapsulated for environmental protection
  - Mounts directly to PCB without bracket or plate
  - Built-in standoffs permit cleaning and coating under the filter
  - Mounts on PCB to begin filtering at the source of the problem
  - Provides EMI filtering to protect low power digital circuits - helps meet FCC and VDE specifications

- **Performance**
  - Excellent performance in GHz applications
  - High temperature construction
  - High surge capabilities

- **Design flexibility**
  - Compact footprint for densely populated PCBs
  - Tape and reel packaging along with bulk packaging
  - Mounts on PCB to begin filtering at the source of the problem
  - High insertion loss over wide frequency spectrum while handling higher currents

- **Capacitance**
  - From 1,500 to 4,000 pF
  - From 68 to 10,000 pF
  - From 800 pF
  - Up to 75 dB

- **Rated voltage**
  - 100 VDC
  - 50 VDC
  - Rated voltage 50 VDC
  - Rated voltage up to 75 dB

- **Rated current**
  - 5 to 10 Amps
  - 10 or 20 Amps
  - Rated current 10 Amps
  - Temperature range -25°C to +105°C

- **Temperature range**
  - -55°C to +125°C
  - -25°C to +85°C
  - -25°C to +105°C

- **Circuit**
  - Pi
  - Pi & Feed Thru
  - Feed Thru

#### Performance Characteristics

- **Insertion loss**
  - Up to 75 dB

- **Voltage ratings**
  - From DC to 250VAC, 60Hz
  - From 100KHz to 30MHz

- **Current ratings**
  - UP to 16 Amps
  - Up to 16 Amps

- **Leakage current range**
  - 5uA to 0.5mA
  - 5uA to 0.5mA

- **Pages**
  - Pages 49-50
  - Pages 51-52
  - Page 53
  - Page 54
  - Page 55-58

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**SPECTRUM CONTROL INC.**
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**SPECTRUM CONTROL GmbH**
- Hansastrasse 6 • 91126 Schwabach, Germany • Phone: (49)-9122-795-0 • Fax: (49)-9122-795-58
Spectrum Control has the EMC expertise and in-house filter solutions you need to meet worldwide EMC standards.

Our EMC testing services offer you a flexible resource to assist in product development by identifying and correcting EMI susceptibility and/or emission problems. Spectrum Control has a fully equipped EMC test laboratory and experienced engineering staff ready to solve demanding EMC challenges. For a modest daily fee we can test your equipment, determine state of compliance, and work with you in developing a viable solution. It is not uncommon for clients to leave our lab with a prototype in hand.

**EMC Lab Highlights**
- NARTE Certified Staff
- Semi-anechoic chamber
- Computer controlled instrumentation
- Graphical data presentation in multiple formats
- Fiber optic video monitoring system

**Testing Capabilities**

**MILITARY**
- MIL-STD-461 A/B/C/D/E
- MIL-STD-1399

**AUTOMOTIVE**
- CISPR 25 Test Methods

**COMMERCIAL**
- FCC-Part 15
- RTCA/DO-160 A/B/C/D
- GR-1089-CORE

**INTERNATIONAL**
- EN55011/CISPR 11
- EN55014/CISPR 14
- EN55022/CISPR 22
- EN61000-4-2 Electrostatic Discharge
- EN61000-4-3 Radiated RF Immunity
- EN61000-4-4 Electrical Fast Transient
- EN61000-4-5 Surge
- EN61000-4-6 Conducted RF Immunity
Surface Mount EMI Filters
Three Terminal Chips

Features
- Excellent performance in high current applications
- Non-polar, surface mountable
- Superior filtering characteristics
- Superb ability to withstand transient voltages and surge
- Offers exceptional solderability and resistance to solder heat
- Available in 0603, 0805, 1205 and 1806 body size
- Two amp current rating available
- Available lead free/RoHS Compliant

Applications
- Cellular telephones and base stations
- Telecommunication equipment
- Industrial electronic interface or programmable controllers
- Electronic automotive equipment
- Computer and peripheral equipment

Circuit Schematic

Input ———— Output

Typical Electrical Characteristics

Capacitance
- Range: COG (NPO) 22 pF to 470 pF
  - X7R 470 pF to 47,000 pF
  - Y5V 100,000 pF and 220,000 pF

Capacitance Tolerance
- COG (NPO) +50/-20%
- X7R +50/-20%
- Y5V +80/-20%

Temperature Coefficient
- COG (NPO) 0 ±/30 ppm/°C, -55 to +125°C
  - X7R +/-15%, -55 to +125°C
  - Y5V -25 to +85°C

Insulation Resistance
- up to 22,000 pF 10,000 MΩ
  - 47,000 pF 5,000 MΩ

DC Resistance
- 0.4 Amp or less 0.3 Ohm max.
  - 1 Amp 0.08 Ohm max.
  - 2 Amp 0.04 Ohm max.

Rated Voltage
- up to 100 VDC

Rated Current
- up to 2 Amps
Surface Mount EMI Filters
Three Terminal Chips

Insertion Loss (Per MIL-STD-220)

**SF0603 Series**
- 0.3 and 0.5 Amps
- 1 Amp

**SF0805 Series**
- 0.4 Amp
- 1 Amp

**SF1205 Series**
- 0.3 Amp
- 1 Amp

**SF1806 Series**
- 0.3 Amp
- 2 Amp
## Selection Guide

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<td>22</td>
<td>+50/-20%</td>
<td>COG</td>
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<td>+50/-20%</td>
<td>COG</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td>SF1806C221SDNB-*</td>
<td>1806</td>
<td>220</td>
<td>+50/-20%</td>
<td>COG</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td>SF1806C471SDNB-*</td>
<td>1806</td>
<td>470</td>
<td>+50/-20%</td>
<td>COG</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td>SF1806X102SDNB-*</td>
<td>1806</td>
<td>1,000</td>
<td>+50/-20%</td>
<td>X7R</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td>SF1806X222SDNB-*</td>
<td>1806</td>
<td>2,200</td>
<td>+50/-20%</td>
<td>X7R</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td>SF1806X103SDNB-*</td>
<td>1806</td>
<td>1,000</td>
<td>+50/-20%</td>
<td>X7R</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td>SF1806X223SDNB-*</td>
<td>1806</td>
<td>22,000</td>
<td>+50/-20%</td>
<td>X7R</td>
<td>100</td>
<td>0.3</td>
<td>10,000</td>
<td>0.3</td>
<td>-55/+125°C</td>
</tr>
<tr>
<td><strong>2 AMP FILTER</strong> SF1806Y224ZBNE-*</td>
<td>1806</td>
<td>220,000</td>
<td>+80/-20%</td>
<td>Y5V†</td>
<td>50</td>
<td>2.0</td>
<td>1,000</td>
<td>0.04</td>
<td>-25/+85°C</td>
</tr>
</tbody>
</table>

Bold Letter = High Current Applications
† = Temperature Characteristic is +30/-80%
** = Denotes Packaging Style. Replace with T for Tape and Reel or B for Bulk
Surface Mount EMI Filters
Three Terminal Chips

Mechanical Dimensions

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Body Length (L)</th>
<th>Body Width (W)</th>
<th>Body Thickness (T)</th>
<th>End Terminal Length (LE)</th>
<th>Middle Terminal Length (LM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF0603</td>
<td>0.063 +/-0.006 (1.60 +/-0.15)</td>
<td>0.031 +/-0.006 (0.80 +/-0.15)</td>
<td>0.023 +/-0.006 (0.6 +/-0.15)</td>
<td>0.008 +/-0.006 (0.2 +/-0.15)</td>
<td>0.020 +/-0.006 (0.5 +/-0.15)</td>
</tr>
<tr>
<td>SF0805</td>
<td>0.079 +/-0.008 (2.0 +/-0.2)</td>
<td>0.049 +/-0.008 (1.25 +/-0.2)</td>
<td>0.032 +/-0.008 (0.8 +/-0.2)</td>
<td>0.012 +/-0.008 (0.3 +/-0.2)</td>
<td>0.024 +/-0.008 (0.6 +/-0.2)</td>
</tr>
<tr>
<td>SF1205</td>
<td>0.126 +/-0.008 (3.2 +/-0.2)</td>
<td>0.049 +/-0.008 (1.25 +/-0.2)</td>
<td>0.028 +/-0.008 (0.7 +/-0.2)</td>
<td>0.016 +/-0.012 (0.4 +/-0.3)</td>
<td>0.043 +/-0.012 (1.1 +/-0.3)</td>
</tr>
<tr>
<td>SF1806</td>
<td>0.177 +/-0.012 (4.5 +/-0.3)</td>
<td>0.063 +/-0.012 (1.6 +/-0.3)</td>
<td>0.039 +/-0.012 (1.0 +/-0.3)</td>
<td>0.020 +/-0.012 (0.5 +/-0.3)</td>
<td>0.055 +/-0.012 (1.4 +/-0.3)</td>
</tr>
</tbody>
</table>

Ordering Information

Example: SF0805C221SBNCT

This part number represents a three terminal chip with a body size of 0805 with a COG (NPO) dielectric. The capacitance is 220 pF with a capacitance tolerance of +50%/-20%. Voltage rating is 50 Volts DC. It has nickel barrier, solder plated terminations and a current rating of 0.4 Amp, (400 milliamps). The parts are taped and reeled.
Soldering Instructions

Reflow Soldering

**Recommended Board Pattern**

![Board Pattern Dimensions in inches (mm)]

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF0603</td>
<td>A: 0.020</td>
</tr>
<tr>
<td></td>
<td>B: 0.047</td>
</tr>
<tr>
<td></td>
<td>C: 0.031</td>
</tr>
<tr>
<td>SF0805</td>
<td>A: 0.024</td>
</tr>
<tr>
<td></td>
<td>B: 0.059</td>
</tr>
<tr>
<td></td>
<td>C: 0.039</td>
</tr>
<tr>
<td>SF1205</td>
<td>A: 0.051</td>
</tr>
<tr>
<td></td>
<td>B: 0.091</td>
</tr>
<tr>
<td></td>
<td>C: 0.047</td>
</tr>
<tr>
<td>SF1806</td>
<td>A: 0.079</td>
</tr>
<tr>
<td></td>
<td>B: 0.138</td>
</tr>
<tr>
<td></td>
<td>C: 0.051</td>
</tr>
</tbody>
</table>

**Flow Soldering**

**Recommended Board Pattern**

![Board Pattern Dimensions in inches (mm)]

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF0603</td>
<td>A: 0.020</td>
</tr>
<tr>
<td></td>
<td>B: 0.031</td>
</tr>
<tr>
<td></td>
<td>C: 0.047</td>
</tr>
<tr>
<td>SF0805</td>
<td>A: 0.024</td>
</tr>
<tr>
<td></td>
<td>B: 0.031</td>
</tr>
<tr>
<td></td>
<td>C: 0.059</td>
</tr>
<tr>
<td>SF1205</td>
<td>A: 0.051</td>
</tr>
<tr>
<td></td>
<td>B: 0.059</td>
</tr>
<tr>
<td></td>
<td>C: 0.091</td>
</tr>
<tr>
<td>SF1806</td>
<td>A: 0.059</td>
</tr>
<tr>
<td></td>
<td>B: 0.079</td>
</tr>
<tr>
<td></td>
<td>C: 0.138</td>
</tr>
</tbody>
</table>

**Flow Soldering**

**Recommended Solder Temperature Profile**

![Soldering Temperature Profile](image)

**Reflow Soldering**

**Recommended Solder Temperature Profile**

![Soldering Temperature Profile](image)

**General Soldering Notes**

1. High soldering temperatures and long soldering times can cause leaching of the termination and adversely affect adhesion. These conditions can also decrease capacitance value. Use the above recommended solder temperature cycle.

2. Due to the mechanical characteristic of ceramic composition, aggressive thermal shock will degrade performance. Preheat the assembly before soldering using the above solder temperature profile as a guide.

3. Use mild flux (less than 0.2% by weight of Chlorine), preferable rosin based. If water soluble, wash thoroughly to assure all residue is removed from the underside of components.

4. Ultrasonic Cleaning

   When using an ultrasonic cleaning method, the following range is recommended:
   - Frequency: Not to exceed 28KHz
   - Output Power: Not to exceed 20W/liter
   - Cleaning Time: 5 minutes max
Package Information

Surface Mount EMI Filters
Three Terminal Chips
Packaging Specifications

Package Quantities

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Tape and Reel</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF0603</td>
<td>4,000 units/reel</td>
</tr>
<tr>
<td>SF0805</td>
<td>4,000 units/reel</td>
</tr>
<tr>
<td>SF1205</td>
<td>4,000 units/reel</td>
</tr>
<tr>
<td>SF1806</td>
<td>2,000 units/reel</td>
</tr>
</tbody>
</table>

Plastic Reel Dimensions

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Diameter (Max.)</th>
<th>Width (Max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF0603</td>
<td>7.00 (180)</td>
<td>0.46 (11.5)</td>
</tr>
<tr>
<td>SF0805</td>
<td>7.00 (180)</td>
<td>0.46 (11.5)</td>
</tr>
<tr>
<td>SF1205</td>
<td>7.00 (180)</td>
<td>0.46 (11.5)</td>
</tr>
<tr>
<td>SF1806</td>
<td>7.00 (180)</td>
<td>0.61 (15.5)</td>
</tr>
</tbody>
</table>

Dimensions in inches (mm)
Surface Mount EMI Filters
LC & LZ Type Chips

LC Features
- High efficiency EMI surface mount filter
- Ideally suited for high frequency signal lines
- Steep insertion loss (IL) characteristics
- Available in 0603, 0805 and 1206 body sizes

LC Typical Electrical Characteristics
Cut-off
Frequency Ranges . . . . . . . . . . . 10 MHz to 220 MHz ± 20%
Rated Voltage . . . . . . . . . . . . . . 25 Volt
Rated Current . . . . . . . . . . . . . . 100 mA
IR . . . . . . . . . . . . . . . . . . . . . . 10 MΩ min.
Operating
Temperature Range . . . . . . . . -40°C to +85°C

LZ Features
- Monolithic construction of dielectric and ferrite materials
- Band stop filter with a choice of rejected frequency band
- Little delay and distortion from original signal wave
- Available in the 0402 and 0603 body sizes

LZ Typical Electrical Characteristics
Center
Frequency Ranges . . . . . . . . . . . 10 MHz to 2,000 MHz ± 20%
Rated Current . . . . . . . . . . . . . . 50 mA and 100 mA
Rejected Bandwidth . . . . . . . . 0.5 dec. to 1.5 dec.
Operating
Temperature Range . . . . . . . . -25°C to +85°C

LC/LZ Applications
- Telecommunication equipment, fax, modem, and ADSL
- Computer and peripheral equipment
- Digital AV equipment, such as TV, VCR and DVD
- Digital circuit equipment noise countermeasure
## Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Body Size</th>
<th>Cut-off Frequency (MHz)</th>
<th>Cut-off Frequency Tolerance</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
<th>I.R. (Min.)</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC0603M223MANA-*</td>
<td>0603</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC0603M473MANA-*</td>
<td>0603</td>
<td>47</td>
<td>± 20%</td>
<td>25 V</td>
<td>100 mA</td>
<td>10 Ω</td>
<td>-40°C – +85°C</td>
</tr>
<tr>
<td>LC0603M104MANA-*</td>
<td>0603</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC0805M103MANA-*</td>
<td>0805</td>
<td>10</td>
<td>± 20%</td>
<td>25 V</td>
<td>100 mA</td>
<td>10 Ω</td>
<td>-40°C – +85°C</td>
</tr>
<tr>
<td>LC0805M223MANA-*</td>
<td>0805</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC0805M473MANA-*</td>
<td>0805</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC0805M104MANA-*</td>
<td>0805</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC0805M224MANA-*</td>
<td>0805</td>
<td>220</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC1206M103MANA-*</td>
<td>1206</td>
<td>10</td>
<td>± 20%</td>
<td>25 V</td>
<td>100 mA</td>
<td>10 Ω</td>
<td>-40°C – +85°C</td>
</tr>
<tr>
<td>LC1206M223MANA-*</td>
<td>1206</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC1206M473MANA-*</td>
<td>1206</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC1206M104MANA-*</td>
<td>1206</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Denotes packaging style, replace with T for tape and reel or B for bulk

## Ordering Information

**Example: LC1206M223MANAT**

This part number represents an LC EMI filter chip with a body size of 1206. The cut-off frequency is 22 MHz with a tolerance of ± 20%, voltage rating is 25 Volts DC. It has nickel barrier, solder plated termination and a current rating of 0.1 Amp (100 milliamps). The parts are taped and reeled.

<table>
<thead>
<tr>
<th>LC</th>
<th>1206</th>
<th>M223</th>
<th>M</th>
<th>A</th>
<th>N</th>
<th>A</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
<td>Size</td>
<td>Cut-off Frequency</td>
<td>Cut-off Tolerance</td>
<td>Rated Voltage</td>
<td>Termination</td>
<td>Rated Current</td>
<td>Packaging</td>
</tr>
<tr>
<td>LC</td>
<td>0603</td>
<td>M223 = 22 MHz</td>
<td>± 20%</td>
<td>25 VDC</td>
<td>Ni Barrier, Solder Plated</td>
<td>0.1 A (100 mA)</td>
<td>Tape and Reel</td>
</tr>
<tr>
<td></td>
<td>0805</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B = Bulk</td>
</tr>
<tr>
<td></td>
<td>1206</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Surface Mount EMI Filters

## LC & LZ Type Chips

### Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Body Size</th>
<th>Cut-off Frequency (MHz)</th>
<th>Cut-off Frequency Tolerance</th>
<th>Rejected Bandwidth (dec.)</th>
<th>Max. Insertion Loss</th>
<th>Rated Current</th>
<th>Operating Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZ0402Z824MBNB-*</td>
<td>0402</td>
<td>820</td>
<td>± 20%</td>
<td>0.75</td>
<td>≥ 10 dB</td>
<td>50 mA</td>
<td>-25°C – +85°C</td>
</tr>
<tr>
<td>LZ0402B105MBNB-*</td>
<td>0603</td>
<td>1,000</td>
<td>± 20%</td>
<td>1.0</td>
<td>≥ 15 dB</td>
<td>100 mA</td>
<td></td>
</tr>
<tr>
<td>LZ0402Y155MBNB-*</td>
<td>0603</td>
<td>1,500</td>
<td>± 20%</td>
<td>1.25</td>
<td>≥ 20 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LZ0402Y205MBNB-*</td>
<td>0603</td>
<td>2,000</td>
<td>± 20%</td>
<td>1.25</td>
<td>≥ 20 dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Denotes packaging style, replace with T for tape and reel or B for bulk

### LZ0402 Style

**Insertion loss (Reference)**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Insertion Loss (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td>100</td>
<td>0.5</td>
</tr>
<tr>
<td>1G</td>
<td>0.5</td>
</tr>
<tr>
<td>10G</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### LZ0603 Style

**Insertion loss (Reference)**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Insertion Loss (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10M</td>
<td>0.5</td>
</tr>
<tr>
<td>100M</td>
<td>0.5</td>
</tr>
<tr>
<td>1G</td>
<td>0.5</td>
</tr>
<tr>
<td>10G</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Ordering Information

Example: **LZ0402B824MBNBT**

<table>
<thead>
<tr>
<th>LZ</th>
<th>0402</th>
<th>B</th>
<th>824</th>
<th>M</th>
<th>B</th>
<th>N</th>
<th>A</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZ</td>
<td>0402</td>
<td>B</td>
<td>Rejected Bandwidth</td>
<td>Center Frequency Tolerance</td>
<td>Max. Insertion Loss</td>
<td>Termination</td>
<td>Rated Current</td>
<td>Packaging</td>
</tr>
<tr>
<td></td>
<td>0603</td>
<td></td>
<td>Center Frequency 820 MHz</td>
<td>± 20%</td>
<td>10 dB</td>
<td>Ni</td>
<td>0.1 A</td>
<td>Tape and Reel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LZ</th>
<th>0603</th>
<th>B</th>
<th>824</th>
<th>M</th>
<th>B</th>
<th>N</th>
<th>A</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZ</td>
<td>0603</td>
<td>B</td>
<td>Rejected Bandwidth</td>
<td>Center Frequency Tolerance</td>
<td>Max. Insertion Loss</td>
<td>Termination</td>
<td>Rated Current</td>
<td>Packaging</td>
</tr>
<tr>
<td></td>
<td>0603</td>
<td></td>
<td>Center Frequency 1000 MHz</td>
<td>± 20%</td>
<td>15 dB</td>
<td>Ni</td>
<td>0.5 A</td>
<td>Bulk</td>
</tr>
</tbody>
</table>

SPECTRUM CONTROL INC. • 8031 Avonia Rd. • Fairview, PA 16415 • Phone: 814-474-2207 • Fax: 814-474-2208 • Web site: www.specemc.com
SPECTRUM CONTROL GmbH • Hansastrasse 6 • 91126 Schwabach, Germany • Phone: (49)-9122-795-0 • Fax: (49)-9122-795-58
Surface Mount EMI Filters
LC & LZ Type Chips

Circuit Schematic

LC 0603

LC 0805 & 1206

LZ 0402 & 0603

Mechanical Dimensions

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Body Length (L)</th>
<th>Body Width (W)</th>
<th>Body Thickness (T)</th>
<th>End Terminal Length (LE)</th>
<th>Middle Terminal Length (LM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZ0402</td>
<td>0.039±0.002</td>
<td>0.020±0.002</td>
<td>0.020±0.002</td>
<td>0.016±0.004</td>
<td></td>
</tr>
<tr>
<td>LZ0603</td>
<td>0.063±0.008</td>
<td>0.031±0.008</td>
<td>0.031±0.008</td>
<td>0.012±0.008</td>
<td></td>
</tr>
<tr>
<td>LC0603</td>
<td>0.063±0.004</td>
<td>0.031±0.004</td>
<td>0.024±0.004</td>
<td>0.010±0.008</td>
<td>0.016±0.008</td>
</tr>
<tr>
<td>LC0805</td>
<td>0.079±0.007</td>
<td>0.049±0.004</td>
<td>0.031±0.008</td>
<td>0.012±0.010</td>
<td>0.024±0.012</td>
</tr>
<tr>
<td>LC1206</td>
<td>0.126±0.008</td>
<td>0.063±0.008</td>
<td>0.039±0.008</td>
<td>0.016±0.012</td>
<td>0.043±0.012</td>
</tr>
</tbody>
</table>

Package Quantities

<table>
<thead>
<tr>
<th>Body Style/Size</th>
<th>Tape and Reel</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZ0402</td>
<td>10,000 units/reel</td>
</tr>
<tr>
<td>LZ0603</td>
<td>4,000 units/reel</td>
</tr>
<tr>
<td>LC0603</td>
<td>4,000 units/reel</td>
</tr>
<tr>
<td>LC0805</td>
<td>4,000 units/reel</td>
</tr>
<tr>
<td>LC1206</td>
<td>2,000 units/reel</td>
</tr>
</tbody>
</table>
**Features**

- The filter’s structure minimizes residual inductance with a high self resonant frequency, ensuring large insertion loss in a wide band.
- The common ground electrode built into the chip ensures complete grounding of all lines at the ground on both ends. The filter is designed to control cross talk.
- An optimum constant can be selected from the capacity range of 22-22,000 pF to best suit the frequency.
- Solder plated nickel barrier terminations offer good solderability and resistance to soldering heat.
- Available lead free/RoHs Compliant

**Applications**

- Noise reduction for DC lines on computers
- Computer peripheral equipment
- Digital TV & VTR
- Cellular telephones
- Automotive electronics

**Typical Electrical Characteristics**

- Rated Voltage ............... 25 VDC to 50 VDC
- Rated Current ............... 0.3 Amps
- IR ......................... 10,000 MΩ Min.
- DC Resistance ............... 0.3 Ω Max.
- Temperature Range ....... -55°C to +125°C
- Capacitance Range ......... 22 pF to 22,000 pF
- Capacitance Tolerance .... ±20%

**Specifications**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rated Voltage (@ 50/60Hz)</th>
<th>Rated Current</th>
<th>Temperature Characteristic</th>
<th>IR</th>
<th>DC Resistance</th>
<th>Operating Temp</th>
<th>Capacitance (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA1206C220</td>
<td>50 VDC</td>
<td>0.3A DC</td>
<td>C</td>
<td>C</td>
<td>10,000 MΩ min.</td>
<td>-55/+125°C</td>
<td>22</td>
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<tr>
<td>SA1206C470</td>
<td></td>
<td></td>
<td>C</td>
<td>C</td>
<td></td>
<td></td>
<td>47</td>
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<tr>
<td>SA1206C101</td>
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<td></td>
<td>C</td>
<td>C</td>
<td></td>
<td></td>
<td>100</td>
</tr>
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<td>SA1206C221</td>
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<td></td>
<td>C</td>
<td>C</td>
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<td>220</td>
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<td>SA1206U471</td>
<td></td>
<td></td>
<td>U</td>
<td>U</td>
<td></td>
<td></td>
<td>470</td>
</tr>
<tr>
<td>SA1206R102</td>
<td></td>
<td></td>
<td>R</td>
<td>R</td>
<td>0.3Ω max.</td>
<td></td>
<td>1,000</td>
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<tr>
<td>SA1206R222</td>
<td></td>
<td></td>
<td>R</td>
<td>R</td>
<td></td>
<td></td>
<td>2,200</td>
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<tr>
<td>SA1206R223</td>
<td>25 VDC</td>
<td></td>
<td>R</td>
<td>R</td>
<td></td>
<td></td>
<td>22,000</td>
</tr>
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</table>

**Circuit Schematic**

**Insertion Loss**

**Dimensions**

Dimensions in inches (mm)
Surface Mount Filter Arrays
SA Series

Ordering Information

<table>
<thead>
<tr>
<th>SA</th>
<th>1206</th>
<th>C</th>
<th>220</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
<td>Size</td>
<td>Temperature Characteristics</td>
<td>Capacitance</td>
</tr>
<tr>
<td>SA Series</td>
<td>1206</td>
<td>C +/- 30 ppm/˚C, R +/- 15%, U -750 +/- 120 ppm/˚C</td>
<td>M = ± 20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M</th>
<th>B</th>
<th>N</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacitance tolerance</td>
<td>Rated Voltage (Vdc)</td>
<td>Termination</td>
<td>Packaging</td>
</tr>
<tr>
<td>M = ± 20%</td>
<td>A = 25</td>
<td>N = Ni Barrier Solder Plated</td>
<td>T - Tape and reel 4,000 pcs/reel</td>
</tr>
<tr>
<td></td>
<td>B = 50</td>
<td></td>
<td>B - Bulk pack 1,000 pcs/bag</td>
</tr>
</tbody>
</table>

SA Tape and Reel Packaging

Recommended Board Pattern

Dimensions in inches (mm)

SA Series Filter Arrays
**Surface Mount Low Pass Filters**

**MSM, SSM, RSM & PSM Series**

**MSM - Miniature Surface Mount Chip Capacitors**

The MSM series filters feature high temperature construction and have current ratings up to 10 Amps. The filter chips will hardly allow residual inductance and the self-resonant frequency extends to the microwave band. Applications include telecommunication equipment, computer and peripheral equipment and digital AV equipment, medical equipment, DC power supply lines.

- Miniature footprint help in dense circuit configuration
- Rated at 10 Amps
- Packaged in tape and reel or bulk form
- Operating temperature ranges of -25˚C to +85˚C and -55˚C to +125˚C
- Available lead free/RoHs Compliant

**SSM - Square Surface Mount Filters**

The SSM series filters feature high temperature construction and have current ratings up to 10 Amps. The filter chip series are non-polar and surface mountable with excellent performance characteristics and come in a Pi circuit configuration. Applications include telecommunication equipment, computer and peripheral equipment, digital AV equipment, power amplifiers, power supplies and high current bus lines.

- Square mechanical geometry enhances SMT soldering
- Rated to 10 Amps
- Packaged in tape and reel or bulk form
- Operating temperature range of –55˚C to +125˚C
- Available lead free/RoHs Compliant

**RSM - Round Surface Mount Filters**

The RSM series filters feature high temperature construction and have current ratings up to 10 Amps. The filter chip series are non-polar and surface mountable with excellent performance characteristics and come in a Pi circuit configuration. Applications include telecommunication equipment, computer and peripheral equipment, digital AV equipment, power amplifiers, power supplies and high current bus lines.

- Round mechanical geometry enhances SMT soldering
- Rated to 10 Amps
- Packaged in tape and reel or bulk form
- Operating temperature range of –55˚C to +125˚C
- Available lead free/RoHs Compliant

**PSM - Power Surface Mount Filters**

The PSM series filters feature high temperature construction and have current ratings up to 20 Amps. This filter series is non-polar and surface mountable with excellent performance characteristics and come in either a Feed-thru or Pi circuit configuration. Applications include telecommunication equipment, computer and peripheral equipment, digital AV equipment, power amplifiers, power supplies and high current bus lines.

- Provides time and costs saving compared to thru-hole filters
- Rated to 20 Amps
- Packaged in tape and reel or bulk form
- Operating temperature range of –55˚C to +125˚C
- Available lead free/RoHs Compliant
Surface Mount Low Pass Filters
MSM Series

MSM

Working Voltage ............ 50 VDC
Test Voltage ............... 150 VDC
Current Rating ............ 10 Amps max.
Insulation Resistance ...... 1.0 MΩ
Terminations .............. Ni-BARRIER
Soldering Conditions ...... Max. 250°C-5 sec.

MSM Ordering Information

<table>
<thead>
<tr>
<th>MSM</th>
<th>4</th>
<th>T</th>
<th>Capacitance</th>
<th>Current Rating</th>
<th>Packaging</th>
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<tbody>
<tr>
<td>470M</td>
<td>10</td>
<td>T</td>
<td>47 pF</td>
<td>10 Amps</td>
<td>Tape and Reel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T</td>
<td>150 pF</td>
<td></td>
<td>2,000 pcs/reel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R</td>
<td>270 pF</td>
<td></td>
<td>1,000 pcs/reel</td>
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</tbody>
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Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Temperature Characteristics</th>
<th>Capacitance</th>
<th>Capacitance Tolerance</th>
<th>Current Rating</th>
<th>Rated Rating</th>
<th>Temperature Range</th>
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<tbody>
<tr>
<td>MSM4T470M10</td>
<td>T</td>
<td>47 pF</td>
<td>+50/-20%</td>
<td>10A</td>
<td>50 VDC</td>
<td>-55/+125°C</td>
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<tr>
<td>MSM4R151M10</td>
<td>R</td>
<td>150 pF</td>
<td></td>
<td></td>
<td></td>
<td>-55/+125°C</td>
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<tr>
<td>MSM4R271M10</td>
<td>R</td>
<td>270 pF</td>
<td></td>
<td></td>
<td></td>
<td>-55/+125°C</td>
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<tr>
<td>MSM4V102M10</td>
<td>V</td>
<td>1000 pF</td>
<td></td>
<td></td>
<td></td>
<td>-25/+85°C</td>
</tr>
</tbody>
</table>

MSM Recommended Board Pattern

Dimensions in inches (mm)

MSM Tape and Reel Packaging

Dimensions in inches (mm)
Surface Mount Low Pass Filters
SSM & RSM Series

SSM

Working Voltage .......... 100 VDC
Test Voltage .......... 250 VDC
Current .......... Max. 10 Amps
Insulation ............ Min. 10^4 MΩ
Terminations .......... Silver Plated
Soldering Conditions .......... Max. 250°C -5 sec.
Marking .......... None
Packaging .......... Bulk or Tape and Reel

Note: Insertion loss shown for the following SSM values* only:
101Z
501P
202P

*Additional IL charts available by request.

RSM

Working Voltage .......... 100 VDC
Test Voltage .......... 250 VDC
Current .......... Max. 10 Amps
Insulation ............ Min. 10^4 MΩ
Terminations .......... Silver Ni-Tin plated
Soldering Conditions .......... Max. 250°C -5 sec.
Marking .......... None
Packaging .......... Bulk or Tape and Reel

Note: Insertion loss shown for the following RSM values only:
152P
402Z

* Capacitance values for insertion loss curves are displayed left to right in the order shown.

Dimensions in inches (mm)
### SSM & RSM Ordering Information

**Example:** SSM1-101Z-05T

<table>
<thead>
<tr>
<th>SSM</th>
<th>1</th>
<th>-</th>
<th>101Z</th>
<th>-</th>
<th>05</th>
<th>T</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
<td>Circuit Configuration</td>
<td>Capacitance</td>
<td>Current Rating</td>
<td>Packaging</td>
<td>Tape and Reel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSM (Square)</td>
<td>1 - Pi</td>
<td>100 pF</td>
<td>05 - 5 Amps</td>
<td>T - Tape and reel packaging</td>
<td>1 - 1,000 pieces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSM (Round)</td>
<td></td>
<td>500 pF</td>
<td>10 - 10 Amps</td>
<td>B - Bulk packaging</td>
<td>6 - 6,000 pieces</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Value</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>101Z</td>
<td>100 pF</td>
<td>+80/-20%</td>
</tr>
<tr>
<td>501P</td>
<td>500 pF</td>
<td>+100/-0%</td>
</tr>
<tr>
<td>152P</td>
<td>1500 pF</td>
<td>+100/-0%</td>
</tr>
<tr>
<td>202P</td>
<td>2000 pF</td>
<td>+100/-0%</td>
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<tr>
<td>402E</td>
<td>4000 pF</td>
<td>±25</td>
</tr>
<tr>
<td>402Z</td>
<td>4000 pF</td>
<td>+80/-20%</td>
</tr>
</tbody>
</table>

† Also available through Spectrum Control’s authorized distributors.
€ Also available through Spectrum Control’s authorized European distributors/agents.
†† SSM1-152P-05-T1

---

### SSM/RSM Tape and Reel Packaging

- Dimensions in inches (mm)

![Diagram of SSM/RSM Tape and Reel Packaging](image)

### SSM Recommended Board Pattern

- Dimensions in inches (mm)

![Diagram of SSM Recommended Board Pattern](image)
Surface Mount Low Pass Filters  
PSM Series

**PSM**

- **Feed-thru**: Input — Output — Ground
- **Pi**: Input — Ground — Output

Voltage Rating *.......................... 200 VDC @ -55°C to +125°C  
* DWV ..................................... 700 VDC

Current Rating .......................... 20 Amps (Feed-thru) max.  
* ......................................... 10 Amps (Pi) max.

Insulation Resistance .................. 1.0 GΩ @ 25°C

Dissipation Factor ....................... 4.0% maximum

D.C.R. ................................ Max. .0005Ω, typ. .0002Ω

* AC rating available - consult factory.

**Dimensions in inches (mm):**

- .120 (3.00) Sq. (both ends)
- .070 (1.75) (4x both ends)
- .025 (0.63) Ref.
- .25 (6.00)
- .315 (8.00)

Tolerances: ± .010 (.254)

**PSM**

- Voltage Rating: 200 VDC @ -55°C to +125°C  
- DWV: 700 VDC

Current Rating: 20 Amps (Feed-thru) max.

Insulation Resistance: 1.0 GΩ @ 25°C

Dissipation Factor: 4.0% maximum

D.C.R.: Max. .0005Ω, typ. .0002Ω

* AC rating available - consult factory.

**Spectrum Control GmbH**

- Hansastrasse 6  
- 91126 Schwabach, Germany  
- Phone: (49)-9122-795-0  
- Fax: (49)-9122-795-58

**Spectrum Control Inc.**

- 8031 Avonia Rd.  
- Fairview, PA 16415  
- Phone: 814-474-2207  
- Fax: 814-474-2208  
- Web site: www.specemc.com

---

**Feed-thru Insertion Loss**

Typical SMT Applications

**Shielded or Partition Applications**

* Capacitance values for insertion loss curves are displayed left to right in the order shown.

**Pi Insertion Loss**

Typical SMT Applications

* See note

- 0.01 µF  
- 4000 pf  
- 2500 pf  
- 1500 pf  
- 1000 pf  
- 820 pf  
- 470 pf  
- 130 pf  
- 100 pf  
- 68 pf  

* See note

- 0.01 µF  
- 4000 pf  
- 2500 pf  
- 1500 pf  
- 1000 pf  
- 820 pf  
- 470 pf  
- 130 pf  
- 100 pf  
- 68 pf  

* Capacitance values for insertion loss curves are displayed left to right in the order shown.
Soldering recommendations supplied upon request
- Reflow temperature limit is 250°C
- Unit weight is approximately 0.4 grams
- Tape and reel packaging available for automated assembly

**Available in Feed-thru circuit only.

### Technical Notes

<table>
<thead>
<tr>
<th>Code</th>
<th>Value*</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>680M</td>
<td>68 pF</td>
<td>±20%</td>
</tr>
<tr>
<td>101M</td>
<td>100 pF</td>
<td>±20%</td>
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<tr>
<td>131P</td>
<td>130 pF</td>
<td>+100/-0%</td>
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<tr>
<td>471P</td>
<td>470 pF</td>
<td>+100/-0%</td>
</tr>
<tr>
<td>821M</td>
<td>820 pF</td>
<td>±20%</td>
</tr>
<tr>
<td>102M</td>
<td>1000 pF</td>
<td>±20%</td>
</tr>
<tr>
<td>152M</td>
<td>1500 pF</td>
<td>±20%</td>
</tr>
<tr>
<td>252P</td>
<td>2500 pF</td>
<td>+100/-0%</td>
</tr>
<tr>
<td>402Z</td>
<td>4000 pF</td>
<td>+80/20%</td>
</tr>
<tr>
<td>103Z**</td>
<td>.01 µF</td>
<td>+80/-20%</td>
</tr>
</tbody>
</table>

* Other capacitance values available as special order.

### PSM Recommended Board Pattern

- X = 0.350" minimum for 1 oz. copper (0.036 mm thickness)
- X = 0.200" minimum for 2 oz. copper (0.071 mm thickness)
- For low current (10 Amp or less)
  - X = 0.130" minimum for 1 oz. copper (0.036 mm thickness for 10 Amp and 0.5 oz. copper - 0.018 mm thickness for 5 Amp or less)

Dimensions in inches (mm)
The economical High Frequency PCB Filter offers electrical characteristics which allow many devices to meet most government and industry specifications for EMI control, while providing good electrostatic discharge protection.

A lossy ferrite filter with a center ground lead is terminated within the filter's thermoset epoxy body.

The High Frequency PCB Filter offers savings three ways. First is the low cost of the filter assembly. Second is the economy of installation. Three silver plated leads are inserted into holes in a printed circuit board which has a ground path circuit, for conventional flows-soldering with other components. No special mounting plate or brackets are needed and when the holes are placed as recommended in a .062 (1.57mm) thick board, no lead trimming is required. Elimination of hand soldering provides opportunities for improved quality in addition to applied-cost benefits.

A third savings results from placing a filter at the source of an EMI problem, potentially eliminating the need for additional filtering at other points in the circuit.

Features
- Provides EMI filtering to protect low power digital circuits - helps equipment meet FCC and VDE specifications
- Mounts directly to printed circuit board with no bracket or plate for lower applied costs - can be flow soldered with other components
- Encapsulated for environmental protection
- Mounts on PCB to begin filtering at the source of the problem
- Built-in standoffs permit cleaning or coating under the filter

Schematic

Typical Electrical Characteristics
Current .................. Max. 10A DC; 0.3A RF
Operating Voltage ........ Max. 50 VDC, -25°C +85°C
Capacitance ............... 800 pF min.
Dissipation Factor .......... 0.1 Max.
Dielectric
Withstanding Voltage ...... 125 VDC for 5 seconds
Insulation Resistance ...... Min. 100 MΩ at 100 VDC for 2 minutes and 25°C
Direct Current
Resistance ............... 0.002 Ohms Max.
Minimum No-Load
Insertion Loss ............. Per MIL-STD-220 at 25°C; PCB mounted, 50 Ohm strip line
3dB @ 8 MHz
10dB @ 25 MHz
15dB @ 50 MHz
20dB @ 100 MHz-1GHz

Preformed to Recommended Mounting Configuration
Part Number 842448-2

Recommended PCB Hole Layout

Standard Configuration
Part Number 842448-1
Mini Surface Mount Power Filters
MSP Series

Features
- Designed for 7A DC power lines
- Offers high insertion loss in a wide frequency band by combining feed through capacitors, multilayer ceramic capacitors and ferrite bead inductors with high self resonance frequency.
- Compact EMI package with plus and minus lines

Applications
- Electronic measuring instruments
- Industrial equipment
- Automotive electronics
- Switching power supplies
- DC-DC converters

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
<th>Max. DCR</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSP</td>
<td>50VDC</td>
<td>7A</td>
<td>5 MΩ</td>
<td>-25°C ~ +105°C</td>
</tr>
</tbody>
</table>

Circuit Schematic

Insertion Loss

Dimensions

Dimensions in inches (mm)
Miniature PCB Power Filters
MPC Series

61-MPC Series
Rugged construction design enables parts to perform in industrial environments. The 61-MPC series is ideally suited for products that must conform to FCC part 15 regulations. Agency approvals: UL recognized, CSA certified, TUV approved (tested and found to be in accordance with VDE 0565 Part 30. Applications include;

- Personal computers and peripherals
- Measuring instruments
- Home appliances and vacuum cleaners
- Monitor and display units
- Switching power supplies
- Available lead free/RoHs Compliant

11-MPC Series
Power filters are available in PCB mount, bolt-in, fast-on tab or solder lug. The 11-MPC series is ideally suited for products that have been limited board space and require a low cost alternative. Available in both metal and plastic cases. Applications include;

- Personal computers and peripherals
- Digital equipment
- Measuring instruments and medical equipment
- TV & VCR monitors and display units
- Available lead free/RoHs Compliant

MPC-010/-015 Series
The compact design of the MPC-010 and -015 series power filters integrates a feed thru capacitor, multilayer ceramic capacitor and ferrite bead inductors. This series is ideally suited for dense PCBs and where both positive and negative lines have reduce EMI in one housing. Applications include;

- DC power lines on industrial equipment
- Measuring instruments
- Home appliances and vacuum cleaners
- Monitor and display units
- Switching power supplies
- Available lead free/RoHs Compliant

Circuit Diagrams

Circuit 1

Circuit 2

Circuit 3

Circuit 4

Circuit 5
## Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated Voltage (50/60Hz)</th>
<th>Rated Current</th>
<th>Leakage Current (Max.)</th>
<th>Inductance (L1)</th>
<th>Temperature Rise (Max.)</th>
<th>Circuit Diagram</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>61-MPC-010-1-11</td>
<td>250VAC</td>
<td>1A</td>
<td>0.1mA</td>
<td>11mH</td>
<td>40°C</td>
<td>1</td>
<td>A</td>
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<tr>
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<td>250VAC</td>
<td>1.6A</td>
<td></td>
<td>6mH</td>
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<td></td>
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<tr>
<td>61-MPC-025-1-11</td>
<td>250VAC</td>
<td>2.5A</td>
<td></td>
<td>2.4mH</td>
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<tr>
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<td>250VAC</td>
<td>3.6A</td>
<td></td>
<td>1.2mH</td>
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<td></td>
<td></td>
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<tr>
<td>11-MPC-001-2-B</td>
<td>120/250VAC</td>
<td>1A</td>
<td>5uA</td>
<td></td>
<td>30°C</td>
<td>2</td>
<td>C</td>
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<tr>
<td>11-MPC-001-5-A</td>
<td>120/250VAC</td>
<td>1A</td>
<td>5uA</td>
<td></td>
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<tr>
<td>11-MPC-001-5-B</td>
<td>120/250VAC</td>
<td>2A</td>
<td>0.5mA</td>
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<td>11-MPC-002-5-B</td>
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<td></td>
<td></td>
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Note: Test voltage: 1500VAC one minute, line to ground. Insulation resistance: 300 MΩ min. at 500VDC. Voltage drop: 1V max. at rated current. Weight: 17.5g

### Figures

- **Figure A**
- **Figure B**
- **Figure C**
- **Figure D**
- **Figure E**
- **Figure F**
- **Figure G**

Dimensions in inches (mm)
Miniature PCB Power Filters
MPC Series

61-MPC Series

Common Mode

Temperature Characteristics

Normal Mode

Y Cap
2 X 3300pF
Miniature PCB Power Filters

MPC Series

11-MPC Series

Common Mode

Normal Mode

MPC-010 & 015 Series
### Ceramic Inductors
- CIN-0402-XXXXX .................................. 27
- CIN-0603-XXXXX .................................. 28
- CIN-0805-XXXXX .................................. 28

### Ferrite Chip Beads
- FCB-0402-XXXXX .................................. 9
- FCB-0603-XXXXX .................................. 9
- FCB-0805-XXXXX .................................. 10
- FCB-1206-XXXXX .................................. 10
- FCB-1806-XXXXX .................................. 10
- FCB-1812-XXXXX .................................. 10

### Ferrite Inductors
- FIN-0603-XXXXX .................................. 23
- FIN-0805-XXXXX .................................. 24
- FIN-1206-XXXXX .................................. 24

### Ferrite Power Beads
- FPB-0603-XXXXX .................................. 17
- FPB-0805-XXXXX .................................. 17
- FPB-1206-XXXXX .................................. 17
- FPB-1806-XXXXX .................................. 17
- FPB-1812-XXXXX .................................. 17

### LC Type Series
- LZ-0402-XXXXX .................................. 43
- LZ-0603-XXXXX .................................. 43
- LC-0603-XXXXX .................................. 42
- LC-0805-XXXXX .................................. 42
- LC-1206-XXXXX .................................. 42

### Mini PCB Power Filters
- 61-MPC-XXXXX .................................. 56
- 11-MPC-XXXXX .................................. 56
- MPC-010-050-XXXXX .............................. 56
- MPC-010-250-XXXXX .............................. 56
- MPC-015-050-XXXXX .............................. 56

### Mini Surface Mount Filters
- MSM-4-XXXX-XXXX .................................. 48

### Mini Surface Mount Power Filters
- MSPXXXX-XXXX .................................. 54

### Round Surface Mount Filters
- RSM1-XXXX-XXXX .................................. 49

### Power Surface Mount Filters
- PSMX-XXXX-XXXX .................................. 51

### SM Filter Arrays
- SA-1206-XXXX-XXXX .................................. 45

### Square Surface Mount Filters
- SSM1-XXXX-XXXX .................................. 49

### Three Terminal Chip
- SF-0603-XXXXXXXXX .............................. 37
- SF-0805-XXXXXXXXX .............................. 37
- SF-1205-XXXXXXXXX .............................. 37
- SF-1806-XXXXXXXXX .............................. 37
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