

## Surface Mount EMI Filters Three Terminal Chips

### Features

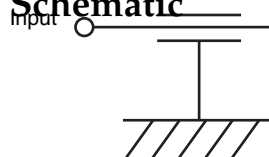
- Excellent performance in high current applications
- Non-polar, surface mountable
- Superior filtering characteristics
- Superb ability to withstand transient voltages and surge
- Offers exceptional solderability and resistance to solder heat
- Available in 0603, 0805, 1205 and 1806 body size
- Two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



### Typical Electrical Characteristics

|                                      |  |                     |                                  |
|--------------------------------------|--|---------------------|----------------------------------|
| <i>Capacitance Range</i> .....       |  | COG (NPO)           | 22 pF to 470 pF                  |
|                                      |  | X7R                 | 470 pF to 47,000 pF              |
|                                      |  | YV5                 | 220,000 pF                       |
|                                      |  | X5R                 | 100,000 pF                       |
| <i>Capacitance Tolerance</i> .....   |  | COG (NPO)           | +50/-20%                         |
|                                      |  | X7R                 | +50/-20%                         |
|                                      |  | Y5V                 | +80/-20%                         |
|                                      |  | X5R                 | +/- 20%                          |
| <i>Temperature Coefficient</i> ..... |  | COG (NPO)           | 0 $\pm$ 30 ppm/°C, -55 to +125°C |
|                                      |  | X7R                 | +/-15%, -55 to +125°C            |
|                                      |  | Y5V                 | -25 to +85°C                     |
|                                      |  | X5R                 | -55 to +85°C                     |
| <i>Insulation Resistance</i> .....   |  | .. up to 100,000 pF | 10000 Megohms                    |
|                                      |  | 47,000 pF           | 5000 Megohms                     |
| <i>DC Resistance</i> .....           |  | 0.4 Amp or less     | 0.3 ohm max.                     |
|                                      |  | 1 Amp               | 0.08 ohm max.                    |
|                                      |  | 2 Amp               | 0.04 ohm max.                    |
| <i>Rated Voltage</i> .....           |  | up to 100 VDC       |                                  |
| <i>Rated Current</i> .....           |  | up to 2 Amps        |                                  |

## Surface Mount EMI Filters Three Terminal Chips

### Selection Guide

| Part Number                              | Body Size   | Capacitance (in picofarad) | Capacitance Tolerance | Temp. Charact. | Rated Voltage (Volts DC) | Rated Current (Amps DC) | IR (Megohms Min.) | DC Resistance (ohm Max.) | Operating Temp.   |
|------------------------------------------|-------------|----------------------------|-----------------------|----------------|--------------------------|-------------------------|-------------------|--------------------------|-------------------|
| SF0603C220SBNB-*                         | 0603        | 22                         | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603C470SBNB-*                         | 0603        | 47                         | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603C101SBNB-*                         | 0603        | 100                        | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603C221SBNB-*                         | 0603        | 220                        | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603X471SBNB-*                         | 0603        | 470                        | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603X102SBNB-*                         | 0603        | 1,000                      | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603X222SBNB-*                         | 0603        | 2,200                      | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0603X223SANC-*                         | 0603        | 22,000                     | +50/-20%              | X7R            | 25                       | 0.5                     | 10,000            | 0.15                     | -55/+125°C        |
| <b>SF0603R104MAND-*</b>                  | <b>0603</b> | <b>100,000</b>             | <b>+/- 20%</b>        | <b>X5R</b>     | <b>25</b>                | <b>1.0</b>              | <b>10,000</b>     | <b>0.08</b>              | <b>-55/+85°C</b>  |
| SF0805C220SBNC-*                         | 0805        | 22                         | +50/-20%              | COG            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0805C470SBNC-*                         | 0805        | 47                         | +50/-20%              | COG            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0805C101SBNC-*                         | 0805        | 100                        | +50/-20%              | COG            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0805C221SBNC-*                         | 0805        | 220                        | +50/-20%              | COG            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0805X471SBNC-*                         | 0805        | 470                        | +50/-20%              | X7R            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0805X102SBNC-*                         | 0805        | 1,000                      | +50/-20%              | X7R            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| SF0805X222SBNC-*                         | 0805        | 2,200                      | +50/-20%              | X7R            | 50                       | 0.4                     | 10,000            | 0.3                      | -55/+125°C        |
| <b>SF0805X223SBND-*</b>                  | <b>0805</b> | <b>22,000</b>              | <b>+50/-20%</b>       | <b>X7R</b>     | <b>50</b>                | <b>1.0</b>              | <b>10,000</b>     | <b>0.08</b>              | <b>-55/+125°C</b> |
| SF1205C220SBNB-*                         | 1205        | 22                         | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205C470SBNB-*                         | 1205        | 47                         | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205C101SBNB-*                         | 1205        | 100                        | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205C221SBNB-*                         | 1205        | 220                        | +50/-20%              | COG            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205X471SBNB-*                         | 1205        | 470                        | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205X102SBNB-*                         | 1205        | 1,000                      | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205X222SBNB-*                         | 1205        | 2,200                      | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1205X223SBNB-*                         | 1205        | 22,000                     | +50/-20%              | X7R            | 50                       | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| <b>SF1205X473SBND-*</b>                  | <b>1205</b> | <b>47,000</b>              | <b>+50/-20%</b>       | <b>X7R</b>     | <b>50</b>                | <b>1.0</b>              | <b>5,000</b>      | <b>0.08</b>              | <b>-55/+125°C</b> |
| SF1806C220SDNB-*                         | 1806        | 22                         | +50/-20%              | COG            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806C470SDNB-*                         | 1806        | 47                         | +50/-20%              | COG            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806C101SDNB-*                         | 1806        | 100                        | +50/-20%              | COG            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806C221SDNB-*                         | 1806        | 220                        | +50/-20%              | COG            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806C471SDNB-*                         | 1806        | 470                        | +50/-20%              | COG            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806X102SDNB-*                         | 1806        | 1,000                      | +50/-20%              | X7R            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806X222SDNB-*                         | 1806        | 2,200                      | +50/-20%              | X7R            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806X103SDNB-*                         | 1806        | 10,000                     | +50/-20%              | X7R            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| SF1806X223SDNB-*                         | 1806        | 22,000                     | +50/-20%              | X7R            | 100                      | 0.3                     | 10,000            | 0.3                      | -55/+125°C        |
| <b>2 AMP FILTER<br/>SF1806Y224ZBNE-*</b> | <b>1806</b> | <b>220,000</b>             | <b>+80/-20%</b>       | <b>Y5V †</b>   | <b>50</b>                | <b>2.0</b>              | <b>1,000</b>      | <b>0.04</b>              | <b>-25/+85°C</b>  |

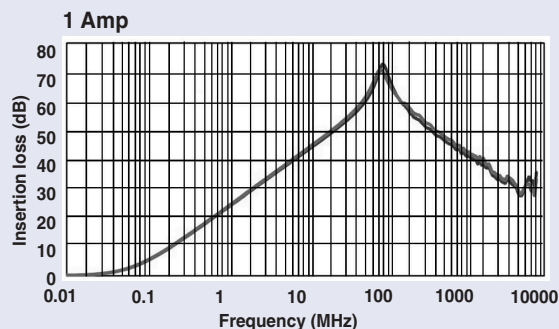
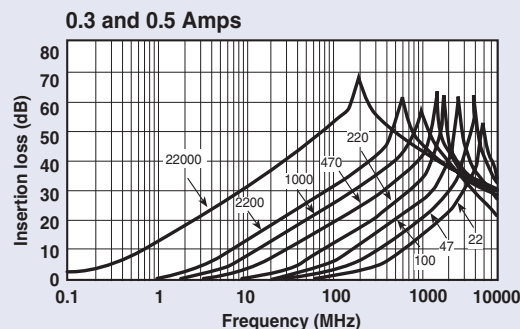
Bold Letter = High Current Applications  
† = Temperature Characteristic is +30/-80%

\* = Denotes Packaging Style. Replace with T for Tape and Reel or B for Bulk

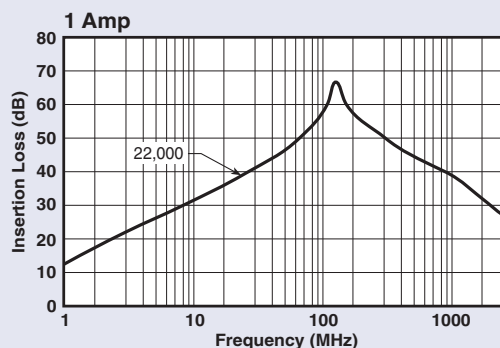
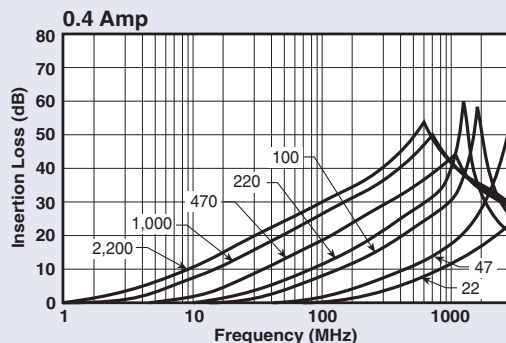
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### Insertion Loss (Per MIL-STD-220)

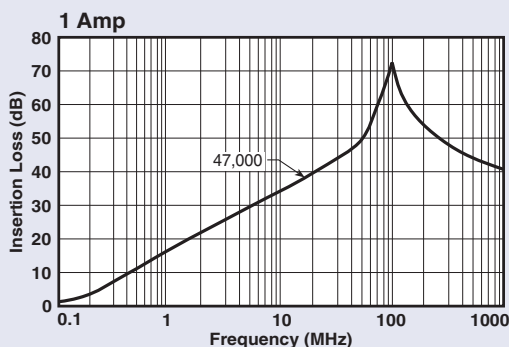
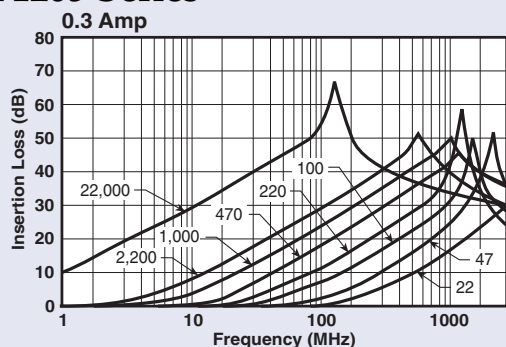
#### SF0603 Series



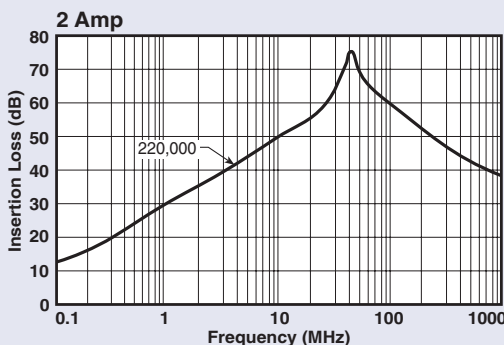
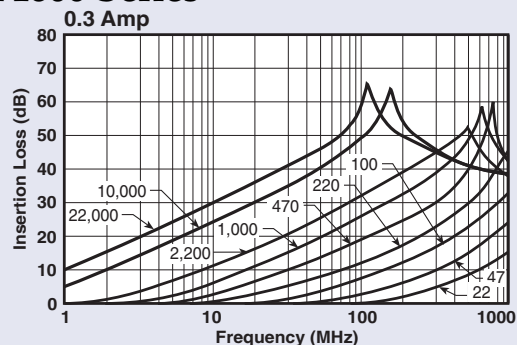
#### SF0805 Series



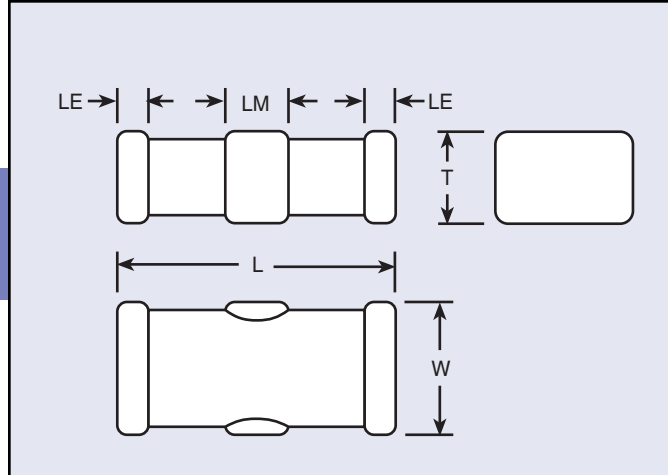
#### SF1205 Series



#### SF1806 Series



## Surface Mount EMI Filters Three Terminal Chips



### Mechanical Dimensions

Dimensions in inches (mm)

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

### Ordering Information

**Example: SF0805C221SBNCT**

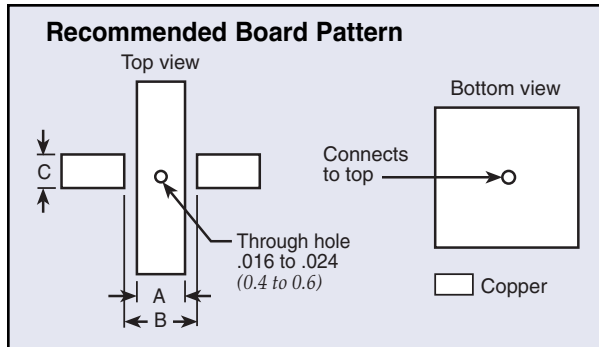
This part number represents a three terminal chip with a body size of 0805 with a COG (NPO) dielectric. The capacitance is 220 pF with a capacitance tolerance of +50%/-20%. Voltage rating is 50 Volts DC. It has nickel barrier, solder plated terminations and a current rating of 0.4 Amp, (400 milliamps).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

| SF    | 0805                         | C                                        | 221                                                                            | S                                             | B                           | N                                   | C                                                                                        | T                           |
|-------|------------------------------|------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------|-------------------------------------|------------------------------------------------------------------------------------------|-----------------------------|
| Style | Size                         | Ceramic                                  | Capacitance Code                                                               | Capacitance Tolerance                         | Rated Voltage (Vdc)         | Termination                         | Current Rating                                                                           | Packaging                   |
| SF    | 0603<br>0805<br>1205<br>1806 | C - COG<br>X - X7R<br>Y - Y5V<br>R - X5R | First two numbers are significant, the third number refers to number of zeroes | S - +50%/-20%<br>Z - +80%/-20%<br>M - +/- 20% | A - 25<br>B - 50<br>D - 100 | N - Ni Barrier,<br>Solder<br>Plated | B - 0.3 A<br>C - 0.4 A<br>D - 1 A<br>E - 2 A<br>F - 3 A<br>G - 4 A<br>H - 5 A<br>I - 6 A | T - Tape & Reel<br>B - Bulk |

# Surface Mount EMI Filters Three Terminal Chips Soldering Specifications

## Soldering Instructions

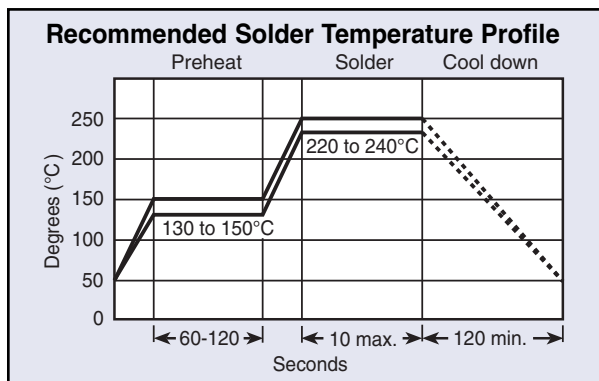
### Reflow Soldering



Board Pattern Dimensions in inches (mm)

| Body Style/Size | Dimension      |                |                |
|-----------------|----------------|----------------|----------------|
|                 | A              | B              | C              |
| SF0603          | 0.020<br>(0.5) | 0.047<br>(1.2) | 0.031<br>(0.8) |
| SF0805          | 0.024<br>(0.6) | 0.059<br>(1.5) | 0.039<br>(1.0) |
| SF1205          | 0.051<br>(1.3) | 0.091<br>(2.3) | 0.047<br>(1.2) |
| SF1806          | 0.079<br>(2.0) | 0.138<br>(3.5) | 0.051<br>(1.3) |

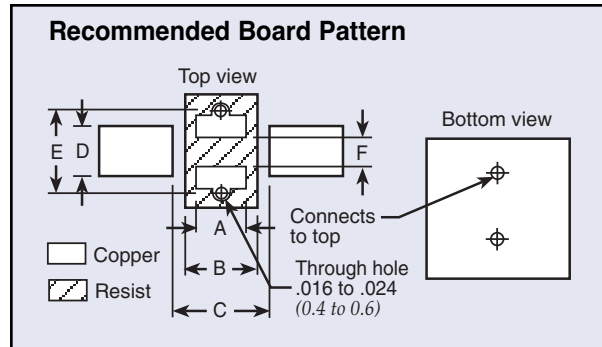
### Reflow Soldering



## 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.

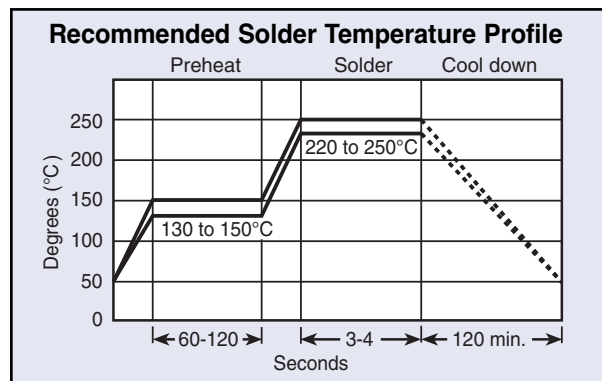
### Flow Soldering



Board Pattern Dimensions in inches (mm)

| Body Style/Size | Dimension      |                |                |                |                |                |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                 | A              | B              | C              | D              | E              | F              |
| SF0603          | 0.020<br>(0.5) | 0.031<br>(0.8) | 0.047<br>(1.2) | 0.031<br>(0.8) | 0.071<br>(1.8) | 0.016<br>(0.4) |
| SF0805          | 0.024<br>(0.6) | 0.031<br>(0.8) | 0.059<br>(1.5) | 0.039<br>(1.0) | 0.087<br>(2.2) | 0.024<br>(0.6) |
| SF1205          | 0.051<br>(1.3) | 0.059<br>(1.5) | 0.091<br>(2.3) | 0.047<br>(1.2) | 0.118<br>(3.0) | 0.024<br>(0.6) |
| SF1806          | 0.059<br>(1.5) | 0.079<br>(1.5) | 0.138<br>(3.5) | 0.051<br>(1.3) | 0.118<br>(3.0) | 0.024<br>(0.6) |

### Flow Soldering



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:

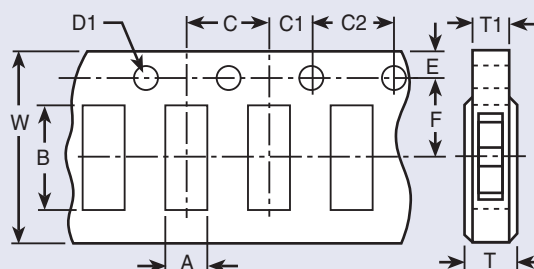
Frequency: Not to exceed 28kHz  
Output Power: Not to exceed 20W/liter  
Cleaning Time: 5 minutes max

## Surface Mount EMI Filters Three Terminal Chips Soldering Specifications

### Package Quantities

| Body Style/Size | Tape and Reel    |
|-----------------|------------------|
| SF0603          | 4,000 units/reel |
| SF0805          | 4,000 units/reel |
| SF1205          | 4,000 units/reel |
| SF1806          | 2,000 units/reel |

### Package Information Paper Tape Dimensions SF0805 and SF1205 Bodies



Dimensions in inches (mm)

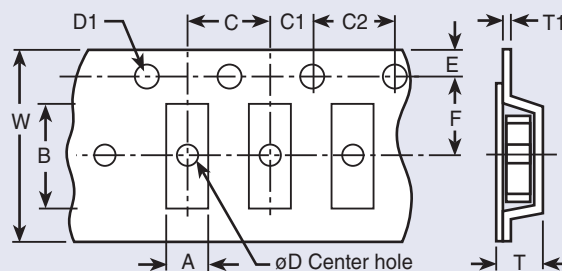
| Body Style/Size | Chip Cavity                        |                                   | Tape                              |                                    |                                    | Holes                             |                                   |                                   | Hole Diameter                         |  | Thickness        |                        |
|-----------------|------------------------------------|-----------------------------------|-----------------------------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---------------------------------------|--|------------------|------------------------|
|                 | Length A                           | Width B                           | Width W                           | Center to End F                    | Indexing to End E                  | Center to Center C                | Indexing to Center C1             | Indexing to Indexing C2           | Indexing D1                           |  | Overall T (Max.) | Carrier Tape T1 (Max.) |
| SF0603          | 0.039<br>+/-0.00?<br>(1.0 +/-0.?)  | 0.075<br>+/-0.00?<br>(1.9 +/-0.?) | 0.315<br>+/-0.012<br>(8.0 +/-0.3) | 0.138<br>+/-0.002<br>(3.5 +/-0.05) | 0.069<br>+/-0.004<br>(1.75 +/-0.1) | 0.157<br>+/-0.004<br>(4.0 +/-0.1) | 0.079<br>+/-0.004<br>(2.0 +/-0.1) | 0.157<br>+/-0.008<br>(4.0 +/-0.1) | 0.059<br>+0.004/-0<br>(1.5 +/-0.1/-0) |  | 0.043<br>(1.1)   | 0.039<br>(1.0)         |
| SF0805          | 0.064<br>+/-0.008<br>(1.62 +/-0.2) | 0.091<br>+/-0.008<br>(2.3 +/-0.2) | 0.315<br>+/-0.012<br>(8.0 +/-0.3) | 0.138<br>+/-0.002<br>(3.5 +/-0.05) | 0.069<br>+/-0.004<br>(1.75 +/-0.1) | 0.157<br>+/-0.004<br>(4.0 +/-0.1) | 0.079<br>+/-0.004<br>(2.0 +/-0.1) | 0.157<br>+/-0.008<br>(4.0 +/-0.1) | 0.059<br>+0.004/-0<br>(1.5 +/-0.1/-0) |  | 0.043<br>(1.1)   | 0.039<br>(1.0)         |
| SF1205          | 0.067<br>+/-0.008<br>(1.70 +/-0.2) | 0.138<br>+/-0.008<br>(3.5 +/-0.2) | 0.315<br>+/-0.012<br>(8.0 +/-0.3) | 0.138<br>+/-0.002<br>(3.5 +/-0.05) | 0.069<br>+/-0.004<br>(1.75 +/-0.1) | 0.157<br>+/-0.004<br>(4.0 +/-0.1) | 0.079<br>+/-0.004<br>(2.0 +/-0.1) | 0.157<br>+/-0.008<br>(4.0 +/-0.1) | 0.059<br>+0.004/-0<br>(1.5 +/-0.1/-0) |  | 0.043<br>(1.1)   | 0.039<br>(1.0)         |

### Plastic Reel Dimensions

Dimensions in inches (mm)

| Body Style/Size | Diameter (Max.) | Width (Max.) |
|-----------------|-----------------|--------------|
| SF0603          | 7.00 (180)      | 0.46 (11.5)  |
| SF0805          | 7.00 (180)      | 0.46 (11.5)  |
| SF1205          | 7.00 (180)      | 0.46 (11.5)  |
| SF1806          | 7.00 (180)      | 0.61 (11.5)  |

### Package Information Tape and Reel Specification Plastic Carrier Tape Dimensions SF1806 Body



Dimensions in inches (mm)

| Body Style/Size | Chip Cavity                        |                                    | Tape                               |                                    |                                    | Holes                             |                                   |                                   | Hole Diameter   |                                       | Thickness        |                |
|-----------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------|---------------------------------------|------------------|----------------|
|                 | Length A                           | Width B                            | Width W                            | Center to End F                    | Indexing to End E                  | Center to Center C                | Indexing to Center C1             | Indexing to Indexing C2           | Center D (Min.) | Indexing D1                           | Overall T (Max.) | Tape T1 (Max.) |
| SF1806          | 0.071<br>+/-0.008<br>(1.80 +/-0.2) | 0.185<br>+/-0.008<br>(4.70 +/-0.2) | 0.472<br>+/-0.008<br>(12.0 +/-0.2) | 0.217<br>+/-0.002<br>(5.5 +/-0.05) | 0.069<br>+/-0.004<br>(1.75 +/-0.1) | 0.157<br>+/-0.004<br>(4.0 +/-0.1) | 0.079<br>+/-0.004<br>(2.0 +/-0.1) | 0.157<br>+/-0.008<br>(4.0 +/-0.1) | 0.059<br>(1.5)  | 0.059<br>+0.004/-0<br>(1.5 +/-0.1/-0) | 0.098<br>(2.5)   | 0.024<br>(0.6) |