

# DATA SHEET

## **Multilayer suppressors EMI-suppression products**

Supersedes data of February 2002

2004 Sep 01

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## EMI-suppression products

## Multilayer suppressors

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### MULTILAYER SUPPRESSORS

Multilayer suppressors are a powerful solution for EMI/RFI attenuation for electronic equipment. Supplied in seven standard sizes (0402, 0603, 0805, 1206, 1210, 1806 and 1812), they have impedances between 6 and 2 000  $\Omega$  at 100 MHz.

When installed in series with signal and/or power circuits, high frequency noise is suppressed. There is no need for ground termination, which makes these devices very suitable for circuits with difficult ground. Typical suppression frequencies range from 10 MHz to 1 000 MHz and rated currents are between 0.1 and 6 A.

Multilayer suppressors are specially designed to reduce noise in low impedance circuits while keeping the signal free from distortion. This is because at the interfering frequencies these components behave as a resistor. The high frequency noise is converted into heat rather than reflected to the source. This dissipation prevents ringing and parasitic oscillations.

These characteristics can be used for many different purposes:

- Absorption of generated noise.
- Filtering and wave-shape correction of digital signals from high speed clock oscillators.
- Prevention of high frequency interference entering circuit electronics.

### Features

- Monolithic structure for closed magnetic path and high reliability
- Standard EIA and EIAJ sizes: 0402, 0603, 0805, 1206, 1210, 1806 and 1812
- High impedance per volume which leads to effective high density circuits
- Suitable for wave and reflow soldering
- Plating material lead-free
- Wide range of impedance values
- Superior physical properties
- Available in standard EIA and EIAJ tape-and-reel
- Operating temperature -40°C to +125°C
- 100% sorting out on impedance

### Main applications areas for multilayer suppressors are:

- computer and peripheral equipment: mother board, notebook, CD-Rom, DVD-Rom, CD-RW, scanner, hard disc, VGA card, sound card, LCD monitor, printer, PC server thumb drive, PCMCIA card, graphic card, etc.
- network: LAN card, hub, switcher, router set top box, etc.
- telecom: cell phone, ADSL, wired modem, cable modem, ISDN, GPS satellite receiver, etc.
- consumer: walkman, walkdisc, digital still camera (DSC), sound system, HDTV, projector, DVD player, VCD player, tuner for TV, cable modem, etc.

To help designers in the trial and error process of finding the most suitable suppression component, we offer a sample box with a selection of products.

Ordering code: SAMPLEBOX12

## EMI-suppression products

## Multilayer suppressors

**TYPE NUMBER STRUCTURE**

Type numbers for these products consist of the following:

- Product type
- Size
- Impedance.

**Product type**

MLS: Multilayer Suppressor.

MLP: Multilayer Power Beads.

MLN: Multilayer Narrow Band.

**Size**

0402: 1.0 × 0.5 × 0.5 mm  
 0603: 1.6 × 0.8 × 0.8 mm  
 0805: 2.0 × 1.25 × 0.9 mm  
 1206: 3.2 × 1.6 × 1.1 mm  
 1210: 3.2 × 2.5 × 1.3 mm  
 1806: 4.5 × 1.6 × 1.6 mm  
 1812: 4.5 × 3.2 × 1.5 mm.

**Impedance value**

Expressed in ohms ( $\Omega$ )

First two digits are significant figures

Last digit is the number of zeros to follow.

**EXAMPLES**

600: 60  $\Omega$   
 101: 100  $\Omega$   
 121: 120  $\Omega$   
 151: 150  $\Omega$   
 301: 300  $\Omega$   
 102: 1000  $\Omega$

**Multilayer Suppressor MLS0603-4S7-600**

TYPE	SIZE	INTERNAL CODE	IMPEDANCE
MLS	0603	4S7	60

**Multilayer Power Bead MLP0603-121**

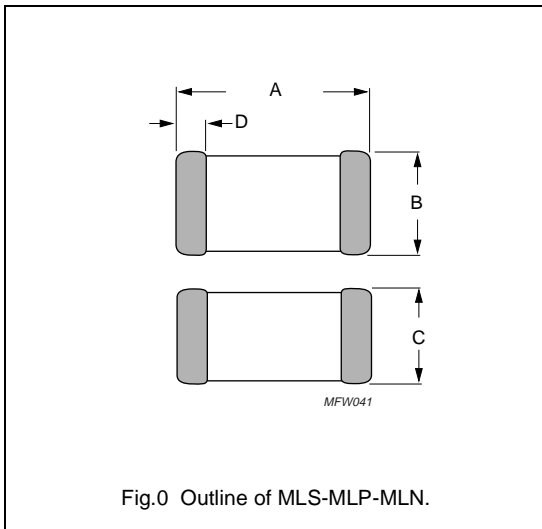
TYPE	SIZE	IMPEDANCE
MLP	0603	120

**Multilayer Narrow Band MLN0603-601**

TYPE	SIZE	IMPEDANCE
MLN	0603	600

Standard products are delivered taped on reel and have a tolerance on impedance of 25%.

**MULTILAYER SUPPRESSORS**



**Product dimensions of Multilayer Suppressors MLS - MLP - MLN**

SIZE	A	B	C	D	mass (mg)
0402	$1.0 \pm 0.15$	$0.5 \pm 0.15$	$0.5 \pm 0.15$	$0.25 \pm 0.15$	≈ 1
0603	$1.6 \pm 0.20$	$0.8 \pm 0.15$	$0.8 \pm 0.15$	$0.3 \pm 0.20$	≈ 5
0805	$2.0 \pm 0.20$	$1.25 \pm 0.20$	$0.9 \pm 0.20$	$0.5 \pm 0.30$	≈ 11
1206	$3.2 \pm 0.20$	$1.6 \pm 0.20$	$1.1 \pm 0.20$	$0.5 \pm 0.30$	≈ 28
1210	$3.2 \pm 0.20$	$2.5 \pm 0.20$	$1.3 \pm 0.20$	$0.5 \pm 0.30$	≈ 50
1806	$4.5 \pm 0.25$	$1.6 \pm 0.20$	$1.6 \pm 0.20$	$0.5 \pm 0.30$	≈ 55
1812	$4.5 \pm 0.25$	$3.2 \pm 0.20$	$1.5 \pm 0.20$	$0.5 \pm 0.30$	≈ 100

## EMI-suppression products

## Multilayer suppressors

## Product specifications Multilayer Suppressors MLS

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0402	6 $\pm$ 25%	0.05	500	MLS0402-4S4-060	<a href="#">des</a>
	10 $\pm$ 25%	0.05	500	MLS0402-4S4-100	<a href="#">des</a>
	40 $\pm$ 25%	0.3	300	MLS0402-4S4-400	<a href="#">des</a>
	80 $\pm$ 25%	0.4	200	MLS0402-4S4-800	<a href="#">des</a>
	120 $\pm$ 25%	0.5	200	MLS0402-4S4-121	<a href="#">des</a>
	240 $\pm$ 25%	0.5	200	MLS0402-4S4-241	<a href="#">des</a>
	480 $\pm$ 25%	0.8	100	MLS0402-4S4-481	<a href="#">des</a>
0603	11 $\pm$ 25%	0.05	500	MLS0603-4S4-110	<a href="#">des</a>
	19 $\pm$ 25%	0.08	500	MLS0603-4S4-190	<a href="#">des</a>
	30 $\pm$ 25%	0.1	400	MLS0603-4S7-300	<a href="#">des</a>
	40 $\pm$ 25%	0.1	400	MLS0603-4S7-400	<a href="#">des</a>
	60 $\pm$ 25%	0.1	300	MLS0603-4S7-600	<a href="#">des</a>
	80 $\pm$ 25%	0.15	300	MLS0603-4S7-800	<a href="#">des</a>
	100 $\pm$ 25%	0.25	300	MLS0603-4S7-101	<a href="#">des</a>
	120 $\pm$ 25%	0.25	300	MLS0603-4S7-121	<a href="#">des</a>
	150 $\pm$ 25%	0.3	200	MLS0603-4S7-151	<a href="#">des</a>
	220 $\pm$ 25%	0.3	200	MLS0603-4S7-221	<a href="#">des</a>
	300 $\pm$ 25%	0.4	200	MLS0603-4S7-301	<a href="#">des</a>
	450 $\pm$ 25%	0.5	200	MLS0603-4S7-451	<a href="#">des</a>
	600 $\pm$ 25%	0.5	200	MLS0603-4S7-601	<a href="#">des</a>
	750 $\pm$ 25%	0.7	200	MLS0603-4S7-751	<a href="#">des</a>
1000 $\pm$ 25%	0.7	200	MLS0603-4S7-102	<a href="#">des</a>	
1500 $\pm$ 25%	1	50	MLS0603-4S4-152	<a href="#">des</a>	
0805	7 $\pm$ 25%	0.1	600	MLS0805-4S4-070	<a href="#">des</a>
	9 $\pm$ 25%	0.1	600	MLS0805-4S4-090	<a href="#">des</a>
	11 $\pm$ 25%	0.1	600	MLS0805-4S4-110	<a href="#">des</a>
	17 $\pm$ 25%	0.1	600	MLS0805-4S4-170	<a href="#">des</a>
	30 $\pm$ 25%	0.1	600	MLS0805-4S4-300	<a href="#">des</a>
	60 $\pm$ 25%	0.15	500	MLS0805-4S4-600	<a href="#">des</a>
	70 $\pm$ 25%	0.15	500	MLS0805-4S7-700	<a href="#">des</a>
	80 $\pm$ 25%	0.15	500	MLS0805-4S7-800	<a href="#">des</a>
	120 $\pm$ 25%	0.25	300	MLS0805-4S7-121	<a href="#">des</a>
	150 $\pm$ 25%	0.25	300	MLS0805-4S7-151	<a href="#">des</a>
	220 $\pm$ 25%	0.3	300	MLS0805-4S7-221	<a href="#">des</a>
	300 $\pm$ 25%	0.3	300	MLS0805-4S7-301	<a href="#">des</a>
	400 $\pm$ 25%	0.3	300	MLS0805-4S7-401	<a href="#">des</a>
	500 $\pm$ 25%	0.4	300	MLS0805-4S7-501	<a href="#">des</a>
	600 $\pm$ 25%	0.4	300	MLS0805-4S7-601	<a href="#">des</a>
750 $\pm$ 25%	0.5	200	MLS0805-4S4-751	<a href="#">des</a>	

## EMI-suppression products

## Multilayer suppressors

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0805	1000 $\pm$ 25%	0.5	200	MLS0805-4S7-102	<a href="#">des</a>
	1500 <sup>(1)</sup> $\pm$ 25%	0.6	200	MLS0805-4S7-152	<a href="#">des</a>
	2000 $\pm$ 25%	0.8	100	MLS0805-4S4-202	<a href="#">des</a>
1206	19 $\pm$ 25%	0.05	600	MLS1206-4S4-190	<a href="#">des</a>
	26 $\pm$ 25%	0.05	600	MLS1206-4S4-260	<a href="#">des</a>
	30 $\pm$ 25%	0.05	600	MLS1206-4S4-300	<a href="#">des</a>
	50 $\pm$ 25%	0.1	500	MLS1206-4S4-500	<a href="#">des</a>
	60 $\pm$ 25%	0.1	500	MLS1206-4S4-600	<a href="#">des</a>
	70 $\pm$ 25%	0.1	500	MLS1206-4S4-700	<a href="#">des</a>
	90 $\pm$ 25%	0.15	500	MLS1206-4S4-900	<a href="#">des</a>
	120 $\pm$ 25%	0.15	500	MLS1206-4S4-121	<a href="#">des</a>
	150 $\pm$ 25%	0.15	500	MLS1206-4S4-151	<a href="#">des</a>
	200 $\pm$ 25%	0.2	400	MLS1206-4S4-201	<a href="#">des</a>
	400 $\pm$ 25%	0.2	400	MLS1206-4S4-401	<a href="#">des</a>
	500 $\pm$ 25%	0.2	400	MLS1206-4S4-501	<a href="#">des</a>
	600 $\pm$ 25%	0.3	400	MLS1206-4S4-601	<a href="#">des</a>
	1000 <sup>(1)</sup> $\pm$ 25%	0.4	200	MLS1206-4S7-102	<a href="#">des</a>
1200 <sup>(1)</sup> $\pm$ 25%	0.4	200	MLS1206-4S7-122	<a href="#">des</a>	
2000 <sup>(2)</sup> $\pm$ 25%	0.6	200	MLS1206-4S7-202	<a href="#">des</a>	
1210	32 $\pm$ 25%	0.2	500	MLS1210-4S4-320	<a href="#">des</a>
	60 $\pm$ 25%	0.2	500	MLS1210-4S4-600	<a href="#">des</a>
	90 $\pm$ 25%	0.2	500	MLS1210-4S4-900	<a href="#">des</a>
1806	50 $\pm$ 25%	0.2	600	MLS1806-4S4-500	<a href="#">des</a>
	60 $\pm$ 25%	0.2	600	MLS1806-4S4-600	<a href="#">des</a>
	80 $\pm$ 25%	0.2	600	MLS1806-4S4-800	<a href="#">des</a>
	100 $\pm$ 25%	0.3	500	MLS1806-4S4-101	<a href="#">des</a>
	150 $\pm$ 25%	0.3	500	MLS1806-4S4-151	<a href="#">des</a>
	170 $\pm$ 25%	0.3	500	MLS1806-4S4-171	<a href="#">des</a>
1812	70 $\pm$ 25%	0.3	500	MLS1812-4S4-700	<a href="#">des</a>
	120 $\pm$ 25%	0.3	500	MLS1812-4S4-121	<a href="#">des</a>

**Note**

1. at 50 MHz
2. at 30 MHz

- RDC: Resistance of component for DC current.
- Maximum rated current: measure of current capacity of the component. When the maximum rated current is applied, temperature rise shall not exceed 20°C.
- Standard tolerance on impedance is  $\pm 25\%$ .
- Other tolerances can be provided upon request.
- Operating temperature: -40°C to +125°C.

## EMI-suppression products

## Multilayer suppressors

## Product specifications Multilayer Power Beads MLP

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0603	11 $\pm$ 25%	0.02	4000	MLP0603-110	<a href="#">des</a>
	25 $\pm$ 25%	0.03	3000	MLP0603-250	<a href="#">des</a>
	40 $\pm$ 25%	0.035	3000	MLP0603-400	<a href="#">des</a>
	60 $\pm$ 25%	0.04	3000	MLP0603-600	<a href="#">des</a>
	120 $\pm$ 25%	0.07	1800	MLP0603-121	<a href="#">des</a>
	300 $\pm$ 25%	0.14	1500	MLP0603-301	<a href="#">des</a>
	500 $\pm$ 25%	0.18	1500	MLP0603-501	<a href="#">des</a>
	600 $\pm$ 25%	0.2	1000	MLP0603-601	<a href="#">des</a>
	1000 $\pm$ 25%	0.25	800	MLP0603-102	<a href="#">des</a>
0805	11 $\pm$ 25%	0.01	6000	MLP0805-110	<a href="#">des</a>
	17 $\pm$ 25%	0.02	5000	MLP0805-170	<a href="#">des</a>
	30 $\pm$ 25%	0.02	4000	MLP0805-300	<a href="#">des</a>
	60 $\pm$ 25%	0.03	3000	MLP0805-600	<a href="#">des</a>
	80 $\pm$ 25%	0.04	3000	MLP0805-800	<a href="#">des</a>
	120 $\pm$ 25%	0.04	3000	MLP0805-121	<a href="#">des</a>
	200 $\pm$ 25%	0.05	2500	MLP0805-201	<a href="#">des</a>
	300 $\pm$ 25%	0.08	2000	MLP0805-301	<a href="#">des</a>
	600 $\pm$ 25%	0.1	2000	MLP0805-601	<a href="#">des</a>
1000 $\pm$ 25%	0.12	1500	MLP0805-102	<a href="#">des</a>	
1206	19 $\pm$ 25%	0.015	7000	MLP1206-190	<a href="#">des</a>
	32 $\pm$ 25%	0.015	4000	MLP1206-320	<a href="#">des</a>
	50 $\pm$ 25%	0.02	4000	MLP1206-500	<a href="#">des</a>
	70 $\pm$ 25%	0.025	3000	MLP1206-700	<a href="#">des</a>
	80 $\pm$ 25%	0.025	3000	MLP1206-800	<a href="#">des</a>
	100 $\pm$ 25%	0.03	2500	MLP1206-101	<a href="#">des</a>
	300 $\pm$ 25%	0.06	2000	MLP1206-301	<a href="#">des</a>
	600 $\pm$ 25%	0.1	1800	MLP1206-601	<a href="#">des</a>
	1000 <sup>(1)</sup> $\pm$ 25%	0.15	1200	MLP1206-102	<a href="#">des</a>
	1200 <sup>(1)</sup> $\pm$ 25%	0.18	1000	MLP1206-122	<a href="#">des</a>
1500 <sup>(1)</sup> $\pm$ 25%	0.2	800	MLP1206-152	<a href="#">des</a>	
1210	60 $\pm$ 25%	0.025	4000	MLP1210-600	<a href="#">des</a>
	90 $\pm$ 25%	0.025	3000	MLP1210-900	<a href="#">des</a>
1806	50 $\pm$ 25%	0.02	6000	MLP1806-500	<a href="#">des</a>
	60 $\pm$ 25%	0.02	5000	MLP1806-600	<a href="#">des</a>
	80 $\pm$ 25%	0.025	4000	MLP1806-800	<a href="#">des</a>
	150 $\pm$ 25%	0.1	2000	MLP1806-151	<a href="#">des</a>
1812	70 $\pm$ 25%	0.03	6000	MLP1812-700	<a href="#">des</a>
	120 $\pm$ 25%	0.03	4000	MLP1812-121	<a href="#">des</a>

## EMI-suppression products

## Multilayer suppressors

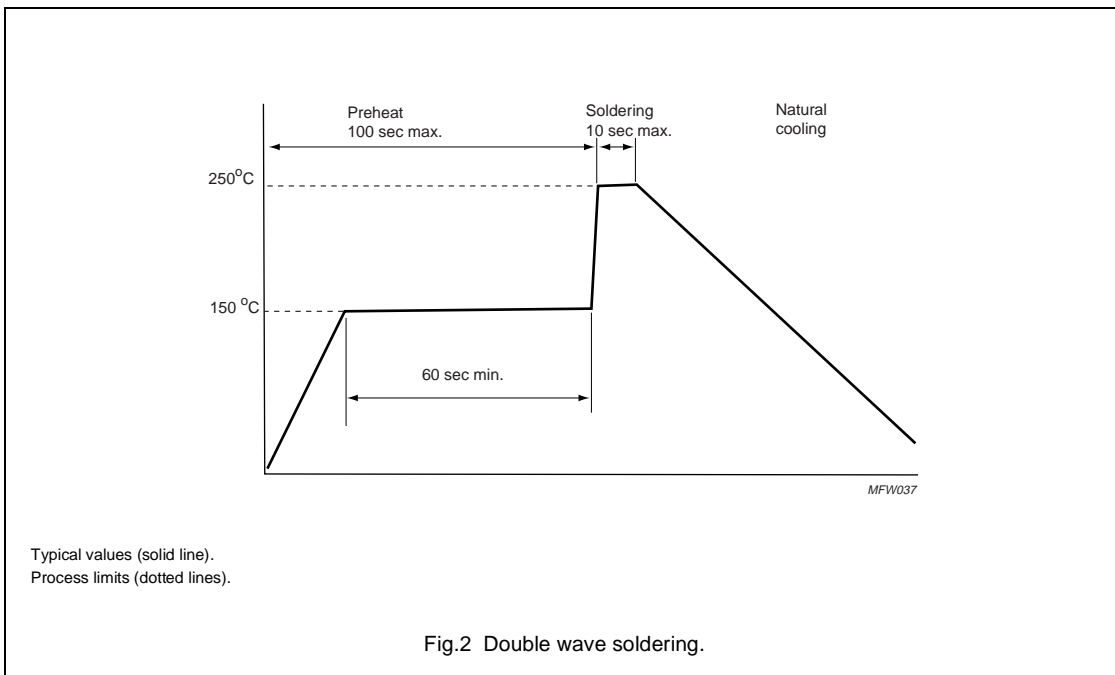
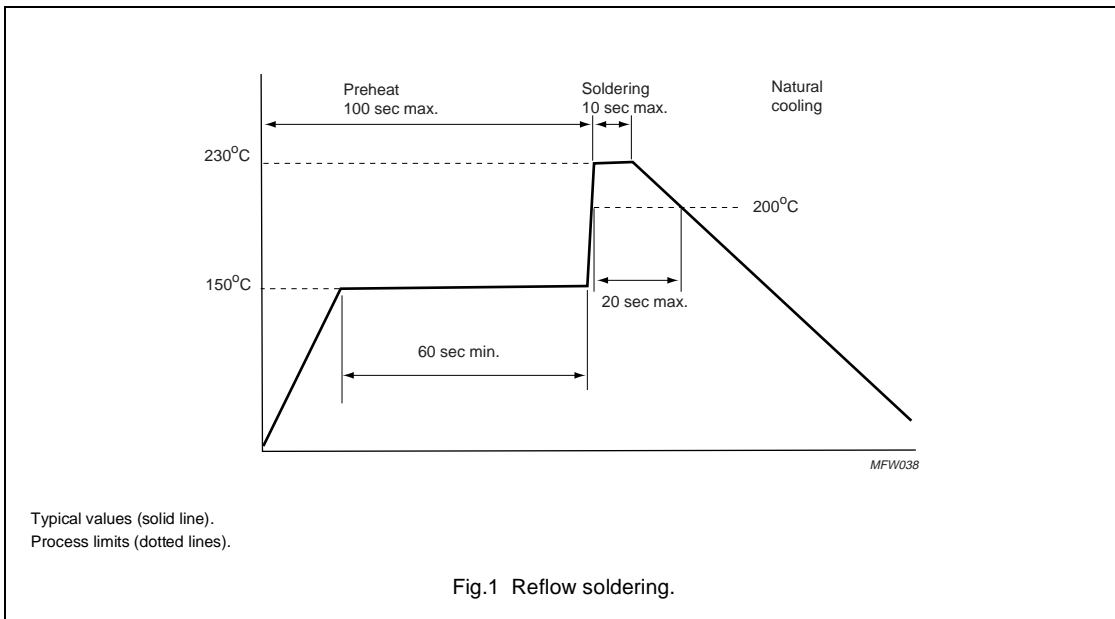
## Product specifications Multilayer Narrow Band MLN

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0603	6 $\pm$ 25%	0.05	500	MLN0603-060	<a href="#">des</a>
	10 $\pm$ 25%	0.07	400	MLN0603-100	<a href="#">des</a>
	40 $\pm$ 25%	0.30	300	MLN0603-400	<a href="#">des</a>
	80 $\pm$ 25%	0.50	300	MLN0603-800	<a href="#">des</a>
	120 $\pm$ 25%	0.40	300	MLN0603-121	<a href="#">des</a>
	240 $\pm$ 25%	0.60	200	MLN0603-241	<a href="#">des</a>
	300 $\pm$ 25%	0.60	200	MLN0603-301	<a href="#">des</a>
	480 $\pm$ 25%	0.70	150	MLN0603-481	<a href="#">des</a>
	600 $\pm$ 25%	0.60	100	MLN0603-601	<a href="#">des</a>
0805	6 $\pm$ 25%	0.07	800	MLN0805-060	<a href="#">des</a>
	11 $\pm$ 25%	0.10	700	MLN0805-110	<a href="#">des</a>
	26 $\pm$ 25%	0.20	600	MLN0805-260	<a href="#">des</a>
	32 $\pm$ 25%	0.20	600	MLN0805-320	<a href="#">des</a>
	60 $\pm$ 25%	0.30	500	MLN0805-600	<a href="#">des</a>
	75 $\pm$ 25%	0.30	500	MLN0805-750	<a href="#">des</a>
	90 $\pm$ 25%	0.30	500	MLN0805-900	<a href="#">des</a>
	120 $\pm$ 25%	0.40	400	MLN0805-121	<a href="#">des</a>
	150 $\pm$ 25%	0.40	400	MLN0805-151	<a href="#">des</a>
	170 $\pm$ 25%	0.50	400	MLN0805-171	<a href="#">des</a>
	220 $\pm$ 25%	0.50	300	MLN0805-221	<a href="#">des</a>
	300 $\pm$ 25%	0.50	300	MLN0805-301	<a href="#">des</a>
	400 $\pm$ 25%	0.60	300	MLN0805-401	<a href="#">des</a>
	500 $\pm$ 25%	0.70	200	MLN0805-501	<a href="#">des</a>
	600 $\pm$ 25%	0.50	200	MLN0805-601	<a href="#">des</a>
1000 $\pm$ 25%	1.0	100	MLN0805-102	<a href="#">des</a>	
1200 $\pm$ 25%	0.70	100	MLN0805-122	<a href="#">des</a>	
1500 $\pm$ 25%	0.70	100	MLN0805-152	<a href="#">des</a>	
1206	32 $\pm$ 25%	0.20	600	MLN1206-320	<a href="#">des</a>
	60 $\pm$ 25%	0.30	500	MLN1206-600	<a href="#">des</a>
	80 $\pm$ 25%	0.30	500	MLN1206-800	<a href="#">des</a>
	90 $\pm$ 25%	0.30	500	MLN1206-900	<a href="#">des</a>
	120 $\pm$ 25%	0.40	400	MLN1206-121	<a href="#">des</a>
	150 $\pm$ 25%	0.40	400	MLN1206-151	<a href="#">des</a>
	200 $\pm$ 25%	0.50	300	MLN1206-201	<a href="#">des</a>
	220 $\pm$ 25%	0.50	300	MLN1206-221	<a href="#">des</a>
	350 $\pm$ 25%	0.60	300	MLN1206-351	<a href="#">des</a>
	400 $\pm$ 25%	0.60	300	MLN1206-401	<a href="#">des</a>
	600 $\pm$ 25%	0.80	300	MLN1206-601	<a href="#">des</a>
	1200 $\pm$ 25%	1.00	200	MLN1206-122	<a href="#">des</a>

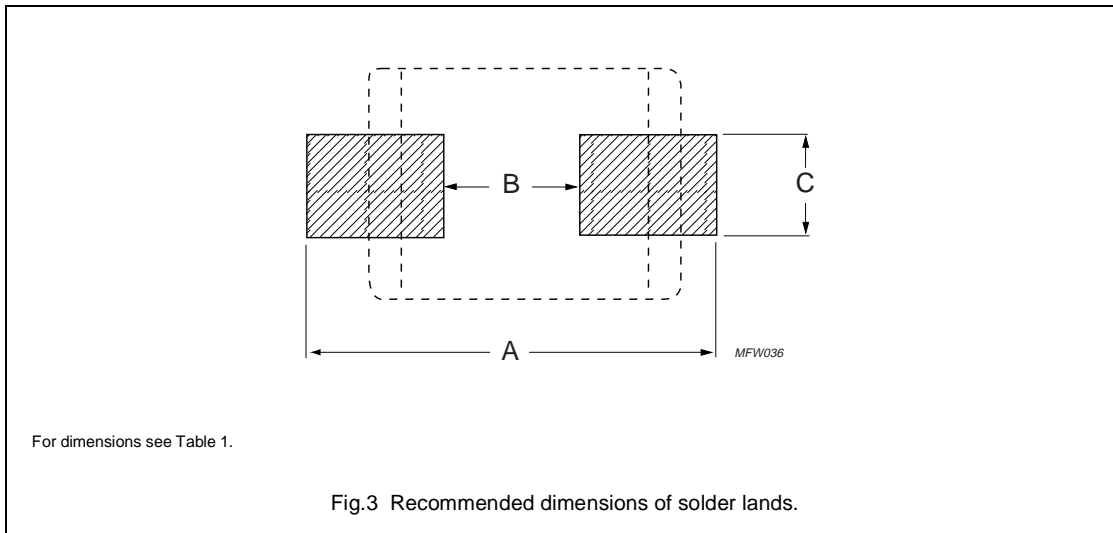


**MOUNTING**

**Soldering profiles**



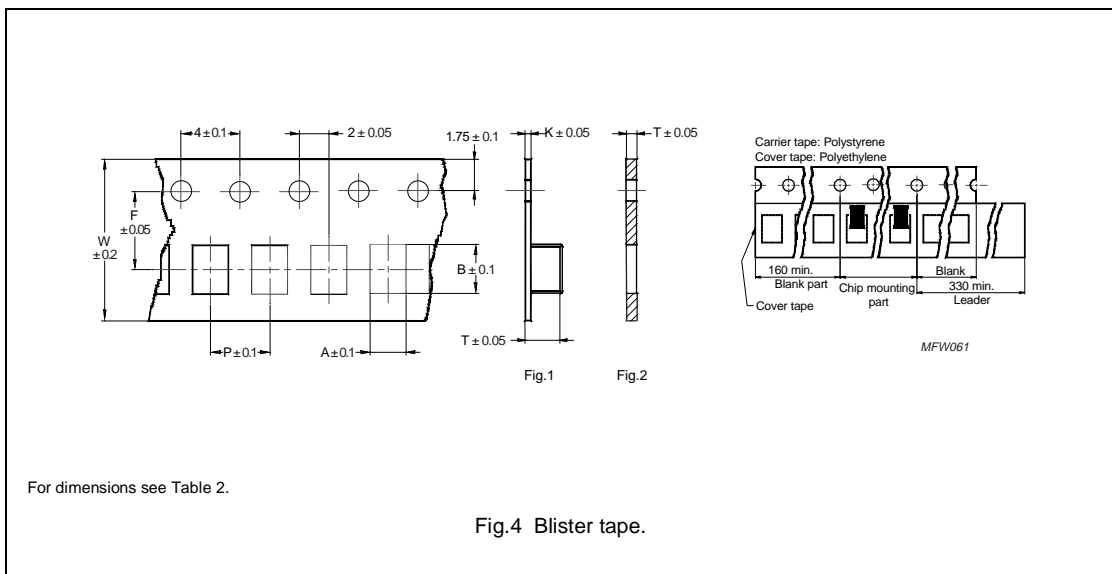
**Dimensions of solderlands**



**Table 1** Solder land dimensions for MLS, MLP and MLN types; see Fig.3

SIZE	FOOTPRINT DIMENSIONS (mm)		
	A	B	C
0402	1.2 – 1.4	0.4	0.4
0603	2.4 – 3.4	0.8	0.6
0805	3.0 – 4.0	1.2	1.0
1206	4.2 – 5.2	2.0	1.2
1210	5.5 – 6.5	2.0	1.8
1806	5.5 – 6.5	3.0	1.2
1812	5.5 – 6.5	3.0	2.4

**BLISTER TAPE AND REEL DIMENSIONS**



**Table 2** Dimensions of blister tape for relevant product size code; see Fig.4

DIMENSION	PRODUCT SIZE CODE						
	0402	0603	0805	1206	1210	1806	1812
A	0.65	0.975	1.54	1.94	2.80	1.94	3.64
B	1.15	1.8	2.32	3.54	3.42	4.94	4.94
T	0.7	1.05	1.15	1.29	1.64	1.90	1.80
W	8.0	8.0	8.0	8.0	8.0	12	12
P	2.0	4.0	4.0	4.0	4.0	4.0	8.0
F	3.5	3.5	3.5	3.5	3.5	5.5	5.5
K	-	-	0.2	0.2	0.2	0.3	0.3
Tape fig.	2	2	1	1	1	1	1

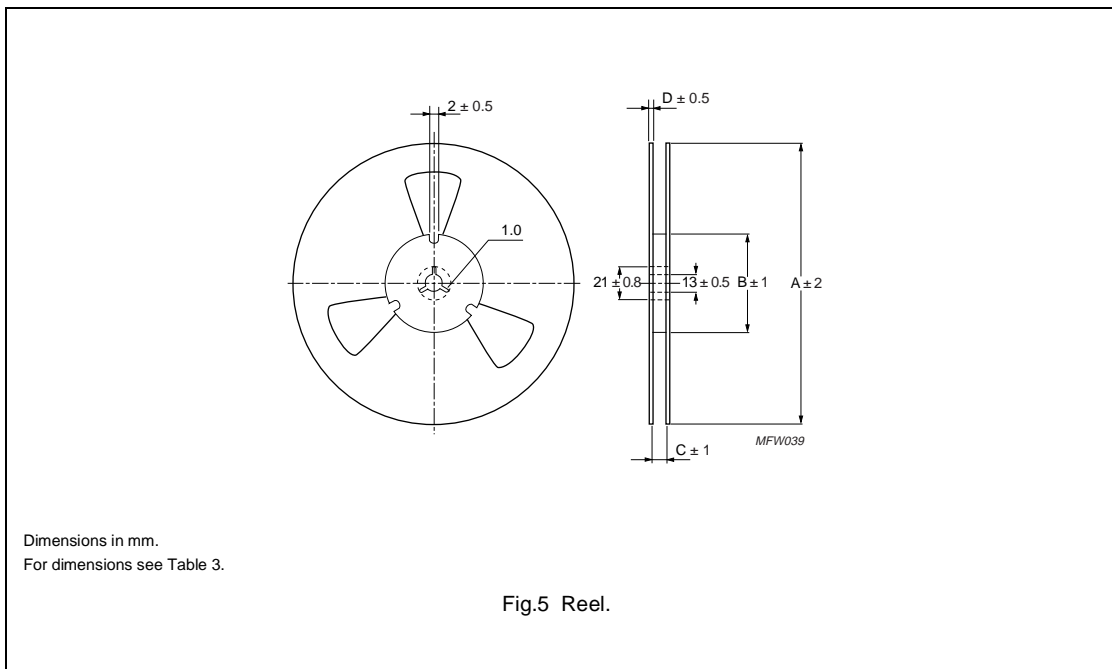
**MATERIAL BLISTER TAPE:**

- Sizes 0402 and 0603: paper
- Other sizes: Polystyrene

**MATERIAL COVER FILM:**

- Polyethylene

EMI-suppression products



**Table 3** Reel dimensions; see Fig.5

DIMENSION	PRODUCT SIZE CODE						
	0402	0603	0805	1206	1210	1806	1812
A	178	178	178	178	178	178	178
B	60	60	60	60	60	60	60
C	10	10	10	10	10	14	14
D	2	2	2	2	2	2	2

**Table 4** Packing quantities

	PRODUCT SIZE CODE						
	0402	0603	0805	1206	1210	1806	1812
<b>Pcs./reel</b>	10 000	4 000	4 000	3 000	2 500	2 000	1 000

## EMI-suppression products

## Multilayer suppressors




## DATA SHEET STATUS DEFINITIONS

DATA SHEET STATUS	PRODUCT STATUS	DEFINITIONS
Preliminary specification	Development	This data sheet contains preliminary data. Ferroxcube reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Ferroxcube reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

## DISCLAIMER

**Life support applications** — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Ferroxcube customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Ferroxcube for any damages resulting from such application.

## PRODUCT STATUS DEFINITIONS

STATUS	INDICATION	DEFINITION
<b>Prototype</b>		These are products that have been made as development samples for the purposes of technical evaluation only. The data for these types is provisional and is subject to change.
<b>Design-in</b>		These products are recommended for new designs.
<b>Preferred</b>		These products are recommended for use in current designs and are available via our sales channels.
<b>Support</b>		These products are <b>not</b> recommended for new designs and may not be available through all of our sales channels. Customers are advised to check for availability.