Appendix I

Datasheet of BAP 72 – 02

BAP70-02

Silicon PIN diode

Rev. 8 — 11 December 2018 Product data sheet

1 Product profile

1.1 General description

Planar PIN diode in a SOD523 ultra small SMD plastic package.

1.2 Features and benefits

- High voltage; current controlled RF resistor for attenuators
- Low diode capacitance
- Very low series inductance
- AEC-Q101 qualified

1.3 Applications

- RF attenuators
- (SAT) TV
- Car radio

2 Pinning information

Table 1. Discrete pinning

Pin	Description	Simplified outline	Symbol
1	cathode		 sym006
2	anode		

3 Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BAP70-02	-	plastic surface-mounted package; 2 leads	SOD523

4 Marking

Table 3. Marking

Type number	Marking code
BAP70-02	K8[1]

[1] The marking bar indicates the cathode (see simplified outline graphic in Table 1)

5 Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_R	reverse voltage	continuous voltage	-	50	V
I_F	forward current	continuous current	-	100	mA
P_{tot}	total power dissipation	$T_{sp} \leq 90$ °C	-	415	mW
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		−65	+150	°C

6 Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j\text{-}sp)}$	thermal resistance from junction to solder point		145	K/W

7 Characteristics

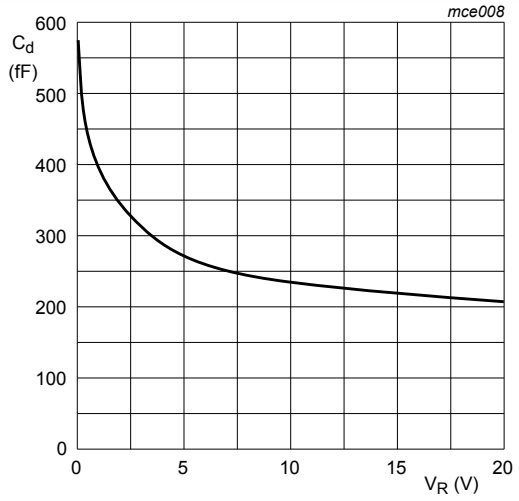
Table 6. Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_F	forward voltage	I_F = 50 mA	-	0.9	1.1	V
I_R	reverse current	V_R = 50 V	-	-	100	nA
C_d	diode capacitance	f = 1 MHz (see Figure 1)				
		V_R = 0 V	-	570	-	fF
		V_R = 1 V	-	400	-	fF
		V_R = 5 V	-	270	-	fF
		V_R = 20 V	-	200	250	fF

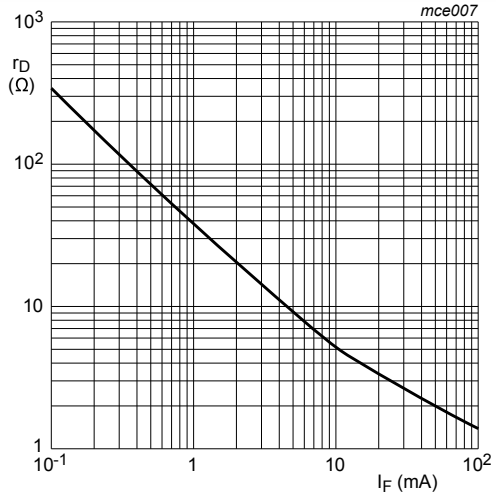
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
r_D	diode forward resistance	f = 100 MHz (see Figure 2)				
		I_F = 0.5 mA	-	77	100	Ω
		I_F = 1 mA	-	40	50	Ω
		I_F = 10 mA	-	5.4	7	Ω
		I_F = 100 mA	-	1.4	1.9	Ω
τ_L	charge carrier life time	when switched from I_F = 10 mA to I_R = 6 mA; R_L = 100 Ω; measured at I_R = 3 mA	-	1.25	-	µs
L_S	series inductance	I_F = 100 mA; f = 100 MHz	-	0.6	-	nH

8 Graphical data



f = 1 MHz; T_j = 25 °C.

Figure 1. Diode capacitance as a function of reverse voltage (typical values)

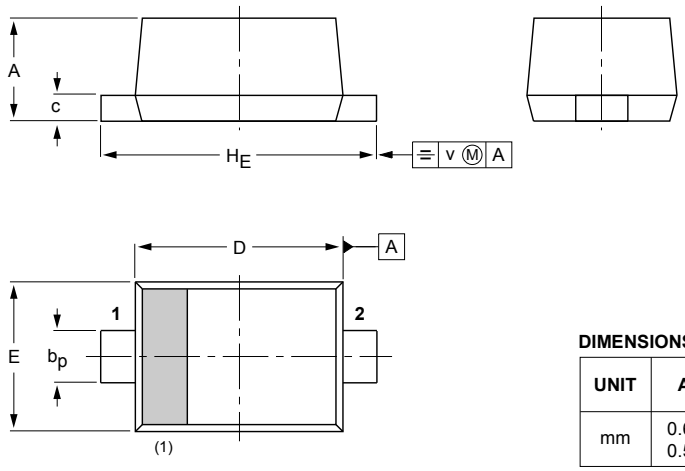


f = 100 MHz; T_j = 25 °C.

Figure 2. Diode forward resistance as a function of forward current (typical values)

9 Package outline

Plastic surface-mounted package; 2 leads **SOD523**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	c	D	E	H_E	v
mm	0.65 0.58	0.34 0.26	0.17 0.11	1.25 1.15	0.85 0.75	1.65 1.55	0.1

Note

1. The marking bar indicates the cathode.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOD523			SC-79			~~02-12-13~~ 06-03-16

Figure 3. Package outline SOD523

10 Abbreviations

Table 7. Abbreviations

Acronym	Description
PIN	P-type, Intrinsic, N-type
SMD	Surface-Mounted Device
RF	Radio Frequency

11 Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAP70-02 v.8	20181211	Product data sheet	-	BAP70-02 v.7
Modifications:	• Section 1.2 "Features and benefits" has been updated. • The "Legal information" pages have been updated.			
BAP70-02 v.7	20140416	Product data sheet	-	BAP70-02 v.6
BAP70-02 v.6	20140211	Product data sheet	-	BAP70-02_N v.5
BAP70-02_N v.5	20080102	Product data sheet	-	BAP70-02_N v.4
BAP70-02_N v.4	20070322	Product data sheet	-	BAP70-02 v.3
BAP70-02 v.3 (9397 750 10093)	20020806	Product data sheet	-	BAP70-02_N v.2
BAP70-02_N v.2 (9397 750 10079)	20020702	Preliminary data sheet	-	BAP70-02_N v.1
BAP70-02_N v.1 (9397 750 09578)	20020402	Preliminary data sheet	-	-

12 Legal information

12.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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Contents

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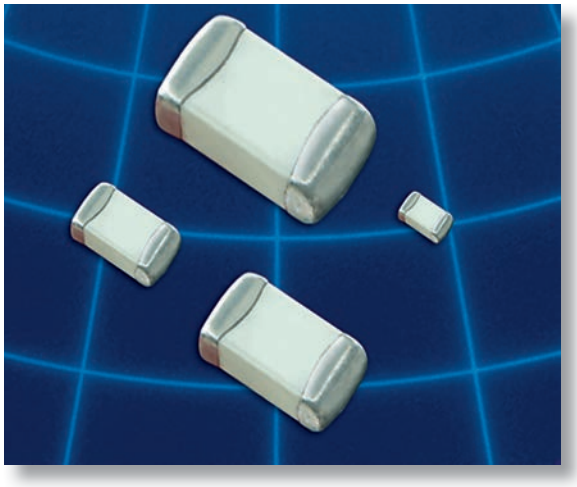
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 11 December 2018
Document identifier: BAP70-02

Appendix II

Datasheet of 0603 Capacitor

MULTI-LAYER HIGH-Q CAPACITORS



These lines of multilayer capacitors have been developed for High-Q and microwave applications.

• The **S-Series** (R07S, R14S, R15S) capacitors give an ultra-high Q performance, and exhibit NP0 temperature characteristics.

• The **L-Series** (R05L) capacitors give mid-high Q performance, and exhibit NP0 temperature characteristics.

• The **E-Series** (S42E, S48E, S58E) capacitors give excellent high-Q performance from HF to Microwave frequencies. Typical uses are high voltage, high current applications. They are offered in chip (Ni barrier or Non-Magnetic Pt.-Ag) or in Non-Magnetic leaded form.

• RoHS compliance is standard for all unleaded parts (see termination options box).

• Automotive versions (AEC-Q200) of R05L, R07S, R14S, R15S, and S42E series are available on request

HOW TO ORDER

252	S48	E	470	K	V	4	E	-AEC

WVDC[2]
250 = 25 V
500 = 50V
201 = 200 V
251 = 250 V
501 = 500 V
102 = 1000 V
152 = 1500 V
252 = 2500 V
362 = 3600 V
722 = 7200 V

CASE SIZE
R05 (0201)
R07 (0402)
R14 (0603)
R15 (0805)
S42 (1111)
S48 (2525)
S58 (3838)

CAPACITANCE (pF)
1st two digits are significant; third digit denotes number of zeros, R = decimal.
100 = 10 pF
101 = 100 pF

DIELECTRIC
S = Ultra High Q NPO
L = High Q NPO
E = Ultra High Q NPO, High Voltage, High Power
G = Fully Oriented, Ultra High-Q NPO

TOLERANCE
< 10pF
A = ± 0.05 pF
B = ± 0.10 pF
C = ± 0.25 pF
D = ± 0.50 pF

≥ 10pF
F = ±1 %
G = ±2%
J = ±5%
K = ± 10%

For tolerance availability, see chart.

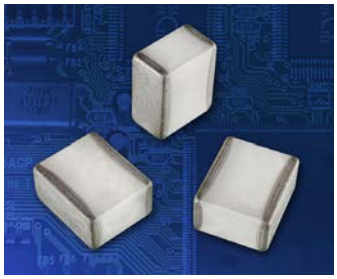
TERMINATION
Nickel Barrier
V = Ni/Sn (Green)
T = Ni/SnPb
G = Ni/Au (Green)
Non-Mag[1]
U = Cu/Sn (Green)
C = Cu/SnPb
Leaded (All Non-Mag)[1]
1 = Microstrip
2 = Axial Ribbon
3 = Axial Wire
4 = Radial Ribbon
5 = Radial Wire

MARKING
3 = Cap Code & Tolerance
4 = No Marking
6 = EIA Code
(Marking option is only available on 0805 and larger case sizes)

PACKAGING
S = Bulk
W = Waffle Pack
0201 - 0603
Y = Paper 5" Reel
T = Paper 7" Reel
R[1] = Paper 13" Reel
J[1] = Paper 5" Reel - Horizontally Oriented Electrodes
N[1] = Paper 5" Reel - Vertically Oriented Electrodes
L[1] = Paper 7" Reel - Horizontally Oriented Electrodes
V[1] = Paper 7" Reel - Vertically Oriented Electrodes
0805 - 3838
Z = Embossed 5" Reel
E = Embossed 7" Reel
U[1] = Embossed 13" Reel
M[1] = Embossed 5" Reel - Horizontally Oriented Electrodes
Q[1] = Embossed 5" Reel - Vertically Oriented Electrodes
G[1] = Embossed 7" Reel - Horizontally Oriented Electrodes
P[1] = Embossed 7" Reel - Vertically Oriented Electrodes
Tape specifications conform to EIA RS481

QUALIFICATION
AEC-Q200 qualification [3] (optional)

Part Number written:
252S48E470KV4E



[1] - Not available for all MLCC - Call factory for info.
[2] - WVDC - Working Voltage DC.
[3] -Qualification required for automotive application, Not available for all series - Call factory for info.

LOW ESR / HIGH-Q CAPACITOR SELECTION CHART

Cap. Value \ EIA Size			RF Power Applications										
			0201 (R05)		0402	0603	0805	0805	1111		2525	3838	
			NPO (R05L)	NPO (R05G)	(R07S)	(R14S)	(R15S)	(R15L)	(S42E)		(S48E)	(S58E)	
Capacitance pF	Code												
0.1	0R1												
0.2	0R2		25/50 V	25 V	50/250 V	250 V			500V	1500V			
0.3	0R3		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V			
0.4	0R4		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V			
0.5	0R5		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V		
0.6	0R6		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
0.7	0R7		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
0.8	0R8		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
0.9	0R9		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.0	1R0		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.1	1R1		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.2	1R2	A	25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.3	1R3		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.4	1R4	B	25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.5	1R5		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.6	1R6		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.7	1R7	C	25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.8	1R8		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
1.9	1R9	D	25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
2.0	2R0		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
2.1	2R1		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
2.2	2R2		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
2.4	2R4		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
2.7	2R7		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
3.0	3R0		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
3.3	3R3		25/50 V	25 V	50/250 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
3.6	3R6		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
3.9	3R9		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
4.3	4R3		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
4.7	4R7		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
5.1	5R1		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
5.6	5R6	A**	25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
6.2	6R2	B	25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
6.8	6R8		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
7.5	7R5	C	25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
8.2	8R2		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
9.1	9R1	D	25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
10	100		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
11	110		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
12	120		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
13	130	F	25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
15	150		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
16	160	G	25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
18	180		25/50 V	25 V	50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
20	200	J	25/50 V		50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
22	220		25/50 V		50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
24	240	K	25/50 V		50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
27	270		25/50 V		50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
30	300		25/50 V		50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V
33	330		25/50 V		50/200 V	250 V	250 V		500V	1500V	3600V	3600V	7200V

Consult factory for Non-Standard values.
****A tolerance only available for R07S (0402) and R14S(0603) caps**

Low ESR / High-Q Capacitor Selection Chart

Cap. Value \ EIA Size			0201 (R05)		0402	RF Power Applications							
			NPO (R05L)	NP0 (R05G)	(R07S)	0603 (R14S)	0805 (R15S)	0805 (R15L)	1111 (S42E)		2525 (S48E)	3838 (S58E)	
Capacitance pF	Code	Tolerance											
36	360	F G J K	25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
39	390		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
43	430		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
47	470		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
51	510		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
56	560		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
62	620		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
68	680		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
75	750		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
82	820		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
91	910		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
100	101		25/50 V			250 V	250 V		500V	1500V	3600V	3600V	7200V
110	111						250 V		300V	1500V	2500V	3600V	7200V
120	121						250 V		300V	1000V	2500V	3600V	7200V
130	131						250 V		300V	1000V	2500V	3600V	7200V
150	151						250 V		300V	1000V	2500V	3600V	7200V
160	161						250 V		300V	1000V	2500V	3600V	7200V
180	181						250 V		300V	1000V	2500V	3600V	7200V
200	201						250 V		300V	1000V	2500V	3600V	
220	221						250 V		200V	1000V	2500V	3600V	
240	241							500V	200V	600V	2500V	3600V	
270	271							500V	200V	600V	2500V	3600V	
300	301							500V	200V	600V	1500V	3600V	
330	331							500V	200V	600V	1500V	3600V	
360	361							500V	200V	600V	1500V	3600V	
390	391							500V	200V	500V	1500V	3600V	
430	431	G J K						500V	200V	500V	1500V	2500V	
470	471							500V	200V	500V	1500V	2500V	
510	511							100V	200V	500V	1000V	2500V	
560	561							100V	200V	500V	1000V	2500V	
620	621							100V	200V	500V	1000V	2500V	
680	681							50V	200V		1000V	2500V	
750	751							50V	200V		1000V	2500V	
820	821							50V	200V		1000V	2500V	
910	911							50V	200V		1000V	1000V	
1000	102							50V	200V		1000V	1000V	
1200	122							50V			1000V	1000V	
1500	152							50V			500V	1000V	
1800	182							50V			500V	1000V	
2200	222							50V			300V	1000V	
2700	272										300V	500V	
3300	332											500V	
3900	392											500V	
4700	472											500V	
5100	512											500V	
10000	103												

Consult factory for Non-Standard values.

Dielectric Characteristics — *NPO*

TEMPERATURE COEFFICIENT:	0 ± 30ppm /°C, -55 to 150°C
QUALITY FACTOR / DF:	Q >1,000 @ 1KHz (C>1,000pF), Typical 10,000 (C<1,000 pF)
INSULATION RESISTANCE:	>100 GΩ @ 25°C,WVDC[1]; 125°C IR is 10% of 25°C rating
DIELECTRIC STRENGTH:	500 V ≤ 2.5 X WVDC[1] Min., 25°C, 50 mA max 1000 V ≤ 1.5 X WVDC[1] Min., 25°C, 50 mA max > 1500 = 1 X WVDC[1] Min., 25°C, 50 mA max
TEST PARAMETERS::	1MHz ±50kHz, 1.0±0.2 VRMS, 25°C

AVAILABLE CAPACITANCE:

Size 0201:	0.2 - 100 pF	Size 1111:	0.2 - 1000 pF
Size 0402:	0.2 - 33 pF	Size 2525:	1.0 - 2700 pF
Size 0603:	0.2 - 100 pF	Size 3838:	1.0 - 5100 pF
Size 0805:	0.3 - 220 pF		

Mechanical & Environmental Characteristics

	SPECIFICATION	TEST PARAMETERS
SOLDERABILITY:	Solder coverage ≥ 90% of metalized areas No termination degradation	Preheat chip to 120°-150°C for 60 sec., dip terminals in rosin flux then dip in Sn62 solder @ 240°±5°C for 5±1 sec
RESISTANCE TO SOLDERING HEAT:	No mechanical damage Capacitance change: ±2.5% or 0.25pF Q>500 I.R. >10 G Ohms DWV[2]: 2.5 x WVDC[1]	Preheat device to 80°-100°C for 60 sec. followed by 150°-180°C for 60 sec. Dip in 260°±5°C solder for 10±1 sec. Measure after 24±2 hour cooling period
TERMINAL ADHESION:	Termination should not pull off. Ceramic should remain undamaged.	Linear pull force[3] exerted on axial leads soldered to each terminal.
PCB DEFLECTION:	No mechanical damage. Capacitance change: 5% or 0.5pF whichever is greater.	Glass epoxy PCB: 2 mm deflection
LIFE TEST:	MIL-STD-202, Method 108I No mechanical damage Capacitance change: ±3.0% or 0.3 pF Q>500 I.R. >1 G Ohms DWV[2]: 2.5 x WVDC[1]	Applied voltage: 200% of WVDC[1] for capacitors rated at 500 volts DC or less. 100% of WVDC[1] for capacitors rated at 1250 volts DC or less. Temperature: 125°±3°C Test time: 1000+48-0 hours
THERMAL CYCLE:	No mechanical damage. Capacitance change: ±2.5% or 0.25pF Q>2000 I.R. >10 G Ohms DWV[2]: 2.5 x WVDC[1]	5 cycles of: 30±3 minutes @ -55°+0/-3°C, 2-3 min. @ 25°C, 30±3 min. @ +125°+3/-0°C, 2-3 min. @ 25°C Measure after 24±2 hour cooling period
HUMIDITY, STEADY STATE:	No mechanical damage. Capacitance change: ±5.0% or 0.50pF max. Q>300 I.R. ≥ 1 G-Ohm DWV[2]: 2.5 x WVDC[1]	Relative humidity: 90-95% Temperature: 40°±2°C Test time: 500 +12/-0 Hours Measure after 24±2 hour cooling period
HUMIDITY, LOW VOLTAGE:	No mechanical damage. Capacitance change: ±5.0% or 0.50pF max. Q>300 I.R. = 1 G-Ohm min. DWV[2]: 2.5 x WVDC[1]	Applied voltage: 1.5 VDC, 50 mA max. Relative humidity: 85±2% Temperature: 40°±2°C Test time: 240 +12/-0 Hours Measure after 24±2 hour cooling period
VIBRATION:	No mechanical damage. Capacitance change: ±2.5% or 0.25pF Q>1000 I.R. ≥ 10 G-Ohm DWV[2]: 2.5 x WVDC[1]	Cycle performed for 2 hours in each of three perpendicular directions Frequency range 10Hz to 55 Hz to 10 Hz traversed in 1 minute. Harmonic motion amplitude: 1.5mm

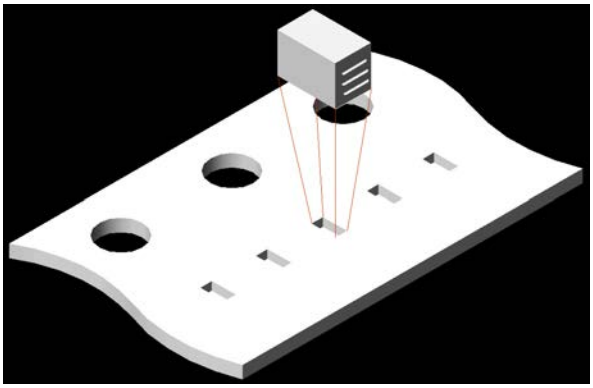
[1] - WVDC - Working Voltage DC.
[2] - DWV - Dielectric Withstanding Voltage.
[3] - 0402 ≥ 2.0lbs, 0603 ≥ 4.0lbs (min).
[4] - Whichever is less.
AEC-Q200: Qualification required for automotive application - Not available for all series - Call factory for info.

Mechanical Characteristics

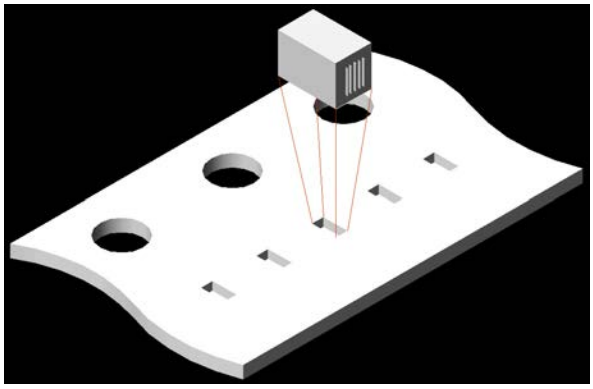
Size	Units	Length	Width	Thickness	End Band
EIA 0201	In	.024 ±.001	.012 ±.001	.012 ±.001	.008 Max.
Metric (0603)	mm	(0.60 ±0.03)	(0.30 ±0.03)	(0.30 ±0.03)	(0.20 Max.)
EIA 0402	In	.040 ±.004	.020 ±.004	.020 ±.004	.010 ±.006
Metric (1005)	mm	(1.02 ±0.1)	(0.51 ±0.1)	(0.51 ±0.1)	(0.25 ±.15)
EIA 0603	In	.062 ±.006	.032 ±.006	.030 +.005/-.003	.014 ±.006
Metric (1608)	mm	(1.57 ±0.15)	(0.81 ±0.15)	(0.76 +.13-.08)	(0.35 ±.15)
EIA 0805	In	.080 ±.008	.050 ±.008	.040 ±.006	.020 ±.010
Metric (2012)	mm	(2.03 ±0.20)	(1.27 ±0.20)	(1.02 ±.15)	(0.50 ±.25)

Horizontal and Verticle Oriented Capacitors

Horizontal Electrode Orientation



Vertical Electrode Orientation



Applications & Features

Size:	EIA 0201, 0805, 1111
Performance:	SRF's up to 20 GHz, Ultra High Q, Tight tolerance, Ultralow ESR
Termination:	Ni/Au, Ni/Sn, Ni/SnPb
Applications:	High Frequency Wireless Communications, Portable Wireless Products, Battery Powered Products

RoHS Compliant

Benifits of using Oriented Capacitors

- Consistent Orientation - Improved repeatability of production circuits.
- Consistent Orientation - More consistent filter performance.
- Vertical Orientation - The elimination of parallel frequencies.
- Vertical Orinetation - Lower inductance for a given capacitor.
- Horizontal Orientation - Lower coupling between adjacent capacitors.

E-Series Terminations and Leads

CHIP DIMENSIONS

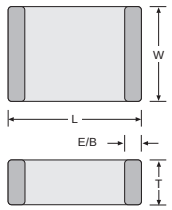
Termination	Size	Units	L	Tol	W	Tol	T	E / B	Tol
V,T U,C	S42E	In	0.110	+.020 -.010	0.110	+/- .015	0.102 Max.	0.015 Typ.	+/- 0.008
		mm	2.79	+0.51 -0.25	2.79	+/- 0.38	2.59 Max.	0.38 Typ.	+/- 0.20
	S48E	In	0.230	+.025 -.010	0.250	+/- .015	0.150 Max.	0.025 Typ.	
		mm	5.84	+0.63 -0.25	6.35	+/- 0.38	3.81 Max.	0.63 Typ.	
	S58E	In	0.380	+.015 -.010	0.380	+/- .010	0.170 Max.	0.025 Typ.	
		mm	9.65	+0.38 -0.25	9.65	+/- 0.25	4.32 Max.	0.63 Typ.	

For all E-Series Models:

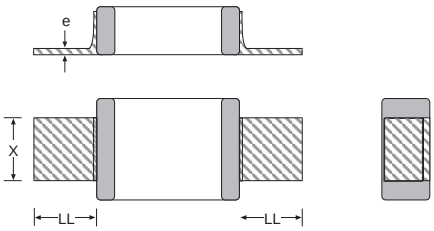
OPERATING TEMP. :	-55 to +125°C
INSULATION RESISTANCE:	>10G Ω @ 25°C
TEMPERATURE COEFFICIENT:	0 ± 30ppm /°C, -55 to 125°C
DISSIPATION FACTOR (TYP.):	< 0.05% @ 1 MHz

Drawings not to scale

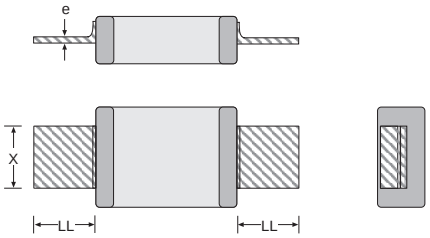
Unleaded Termination Codes “V” (Ni/Sn), “T” (Ni/SnPb), “U” (Cu/Sn non-mag), “C” (Cu/SnPb non-mag)



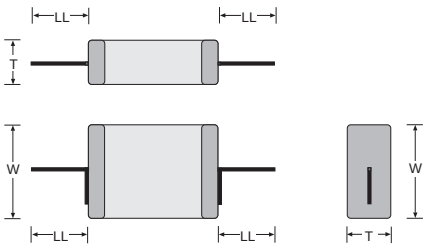
Microstrip Ribbon Leads (Non-Magnetic), Termination Code “1”



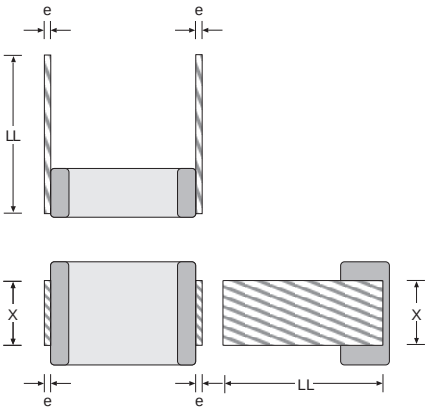
Axial Ribbon Leads (Non-Magnetic), Termination Code “2”



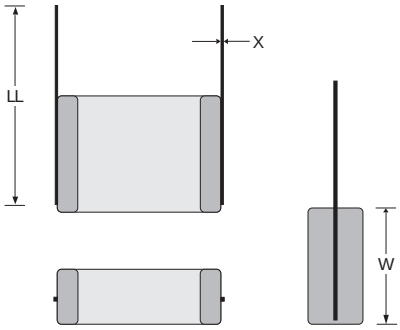
Axial Wire Leads (Non-Magnetic), Termination Code “3”



Radial Ribbon Leads (Non-Magnetic), Termination Code “4”



Radial Wire Leads (Non-Magnetic), Termination Code “5”

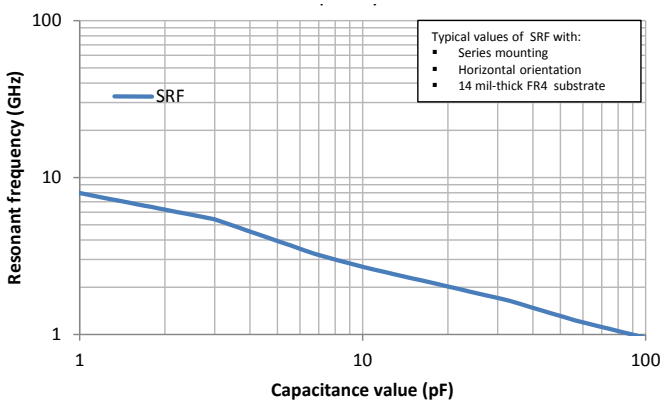


Lead	Size	LL(min)	X	Tol	e	e-Tol
1	S42E	0.25	0.093	+/-0.005	0.004	+/- 0.002
		6.40	2.36	+/- 0.13	0.102	+/- 0.051
	S48E	0.394	0.217	+/- 0.02	0.009	- 0.0019/+ 0.0031
		10.0	5.5	+/- 0.50	0.220	- 0.050/+ 0.080
	S58E	0.748	0.35	+/- 0.02	0.010	- 0.0019/+ 0.0039
		19.00	8.90	+/- 0.50	0.250	- 0.050/+ 0.100
2	S42E	0.25	0.093	+/-0.005	0.004	+/- 0.002
		6.40	2.36	+/- 0.13	0.102	+/- 0.051
	S48E	0.394	0.217	+/- 0.02	0.009	- 0.0019/+ 0.0031
		10.00	5.50	+/- 0.50	0.220	- 0.050/+ 0.080
	S58E	0.748	0.35	+/- 0.02	0.010	- 0.0019/+ 0.0039
		19.00	8.90	+/- 0.50	0.25	- 0.050/+ 0.100
3	S42E	0.25	0.020in (0.511) diameter wire			
		6.40				
	S48E	0.394				
		10.00				
	S58E	0.748				
		19.00				

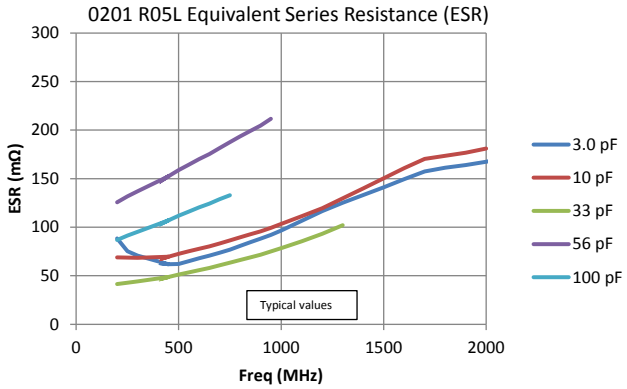
Lead	Size	LL(min)	X	Tol	e	e-Tol
4	S42E	0.352	0.093	+/-0.005	0.004	+/- 0.002
		8.90	2.36	+/- 0.13	0.102	+/- 0.051
	S48E	0.501	0.217	+/- 0.02	0.009	- 0.0019/+ 0.0031
		12.70	5.50	+/- 0.50	0.220	- 0.050/+ 0.080
	S58E	0.886	0.35	+/- 0.02	0.010	- 0.0019/+ 0.0039
		22.50	8.90	+/- 0.50	0.25	- 0.050/+ 0.100
5	S42E	0.25	0.020in (0.511) diameter wire			
		6.40				
	S48E	0.394				
		10.00				
	S58E	0.748				
		19.00				

RF Characteristics - 0201 R05L Series *More data at: https://jtisoft.johansontechnology.com*

Resonant Frequency : 0201/R05L

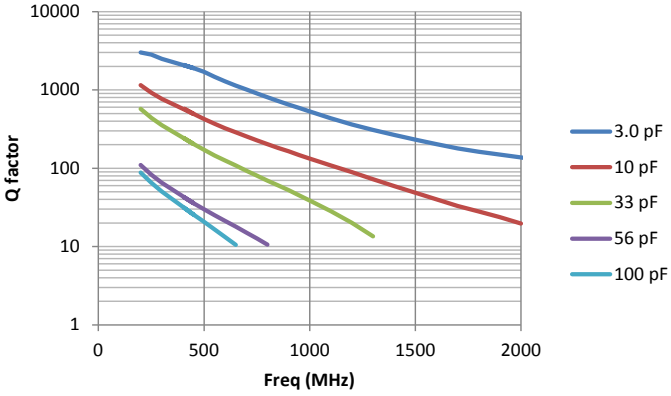


0201 R05L Equivalent Series Resistance (ESR)

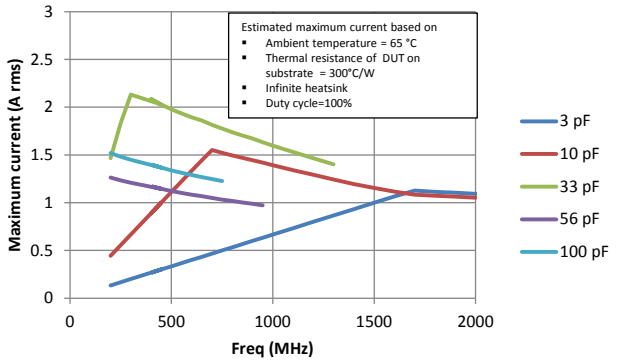


The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

0201 R05L Q factor

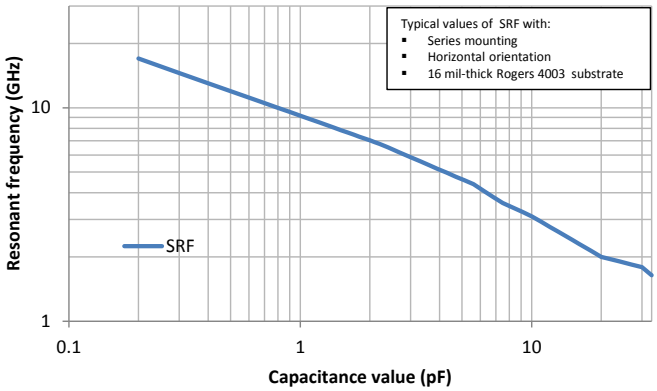


0201 R05L Max Current

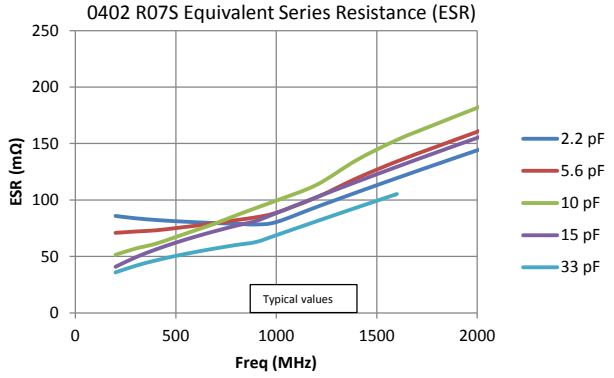


RF Characteristics - 0402 R07S Series *More data at: https://jtisoft.johansontechnology.com*

0402 R07S Series Resonant frequency

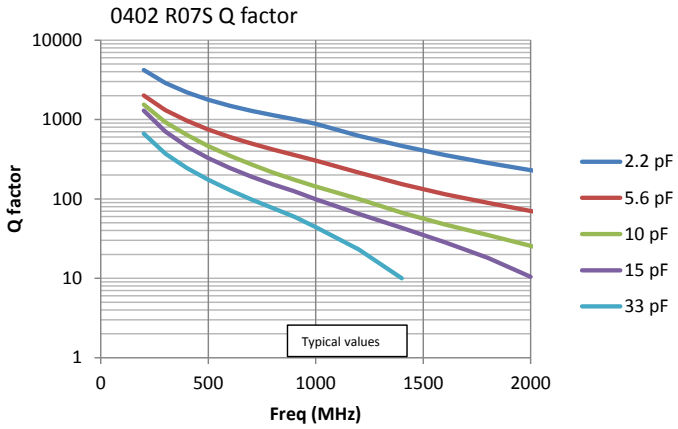


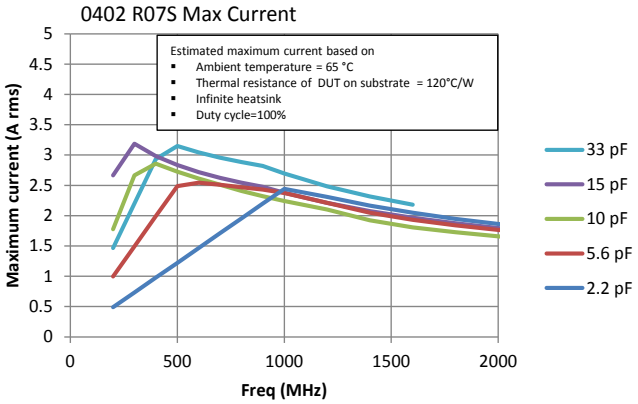
0402 R07S Equivalent Series Resistance (ESR)



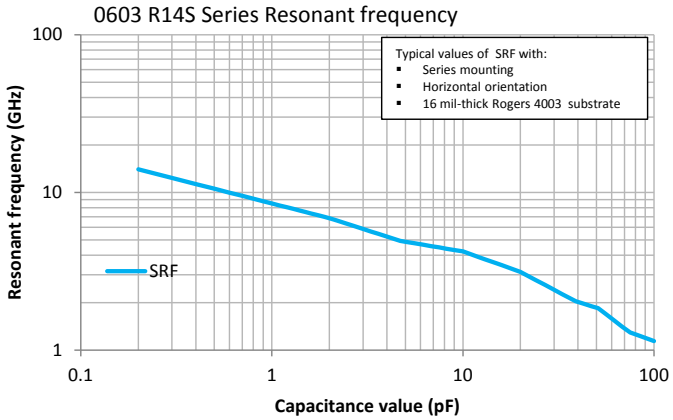
The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

RF Characteristics 0402 R07S Series *More data at: https://jtisoft.johansontechnology.com*

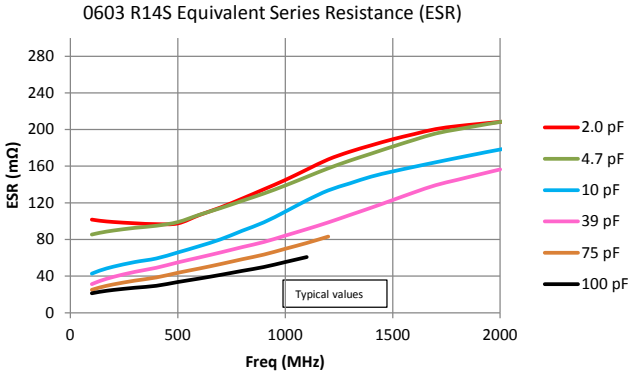


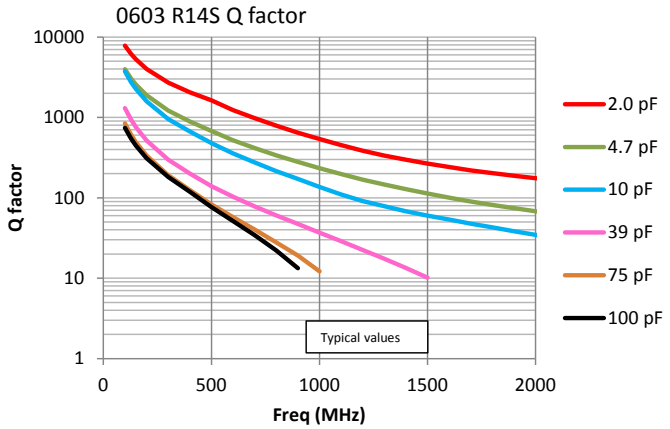


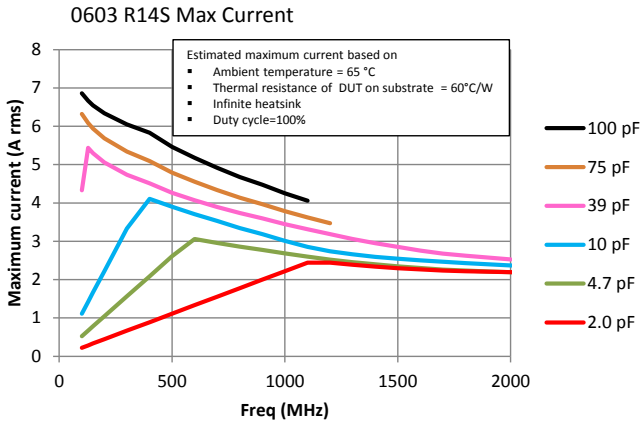
RF Characteristics 0603 R14S Series *More data at: https://jtisoft.johansontechnology.com*

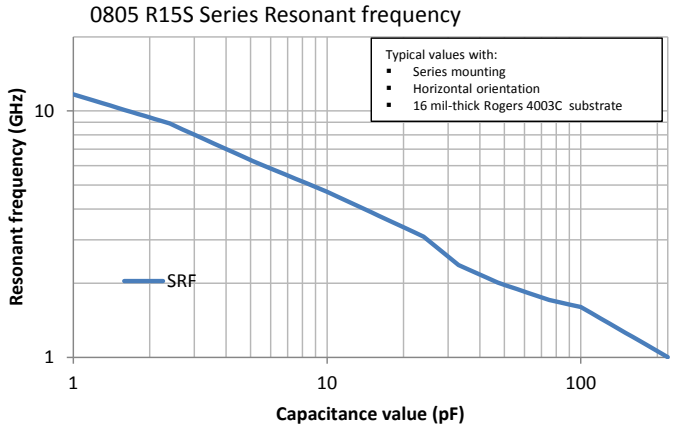


The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

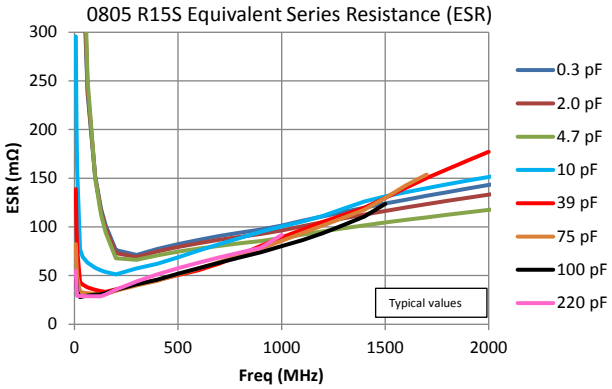


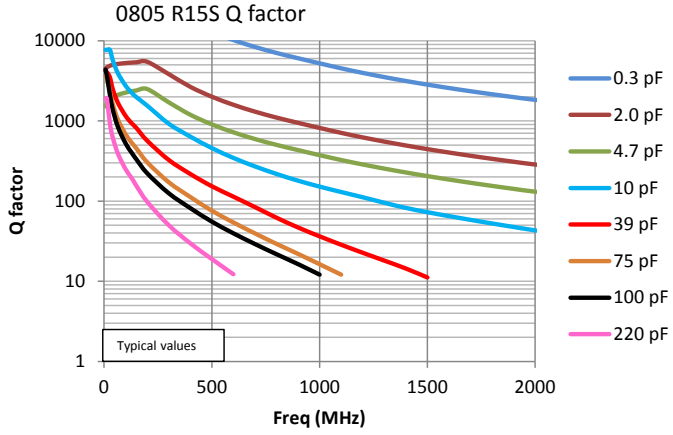


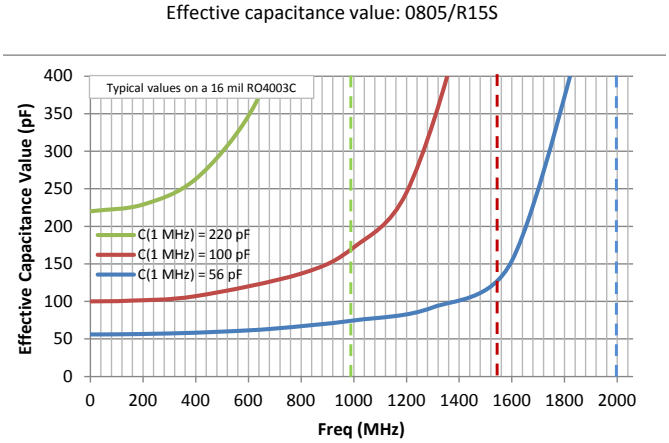


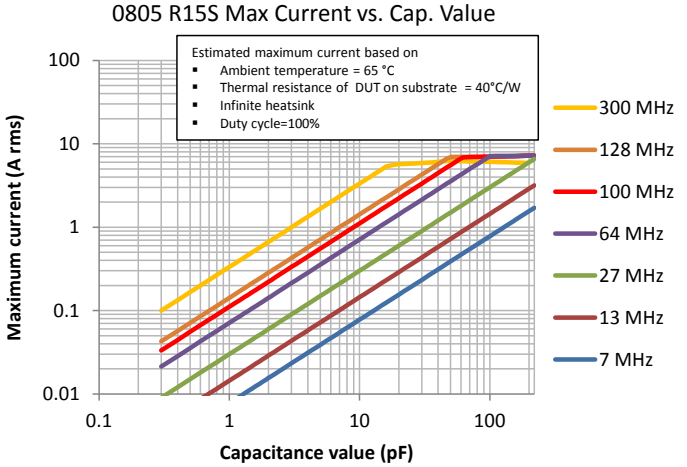


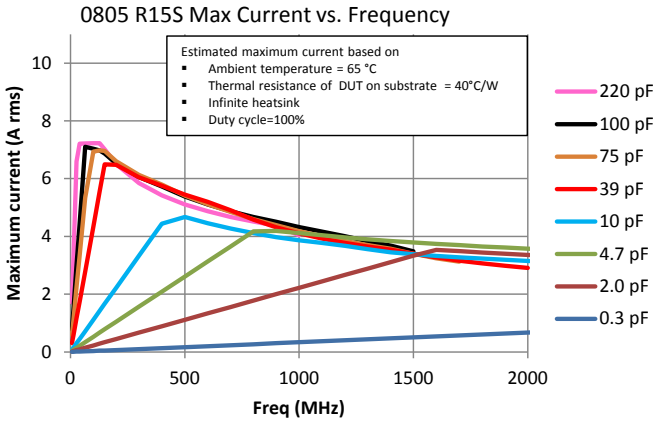
The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

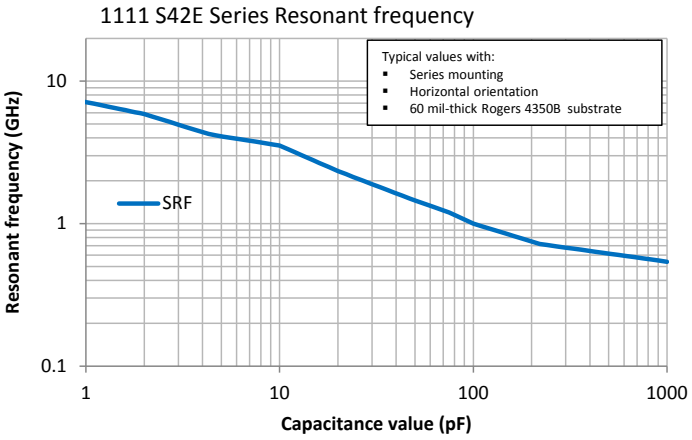




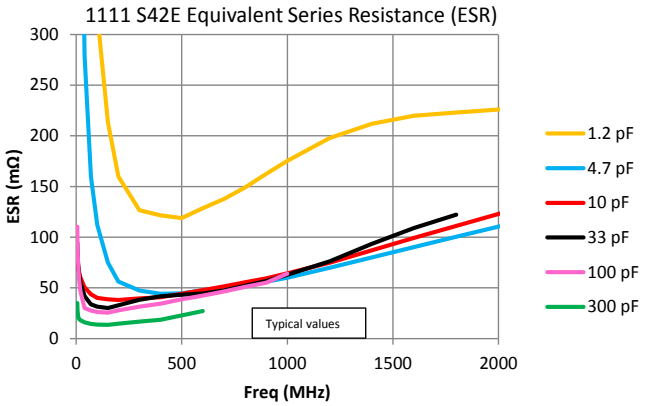


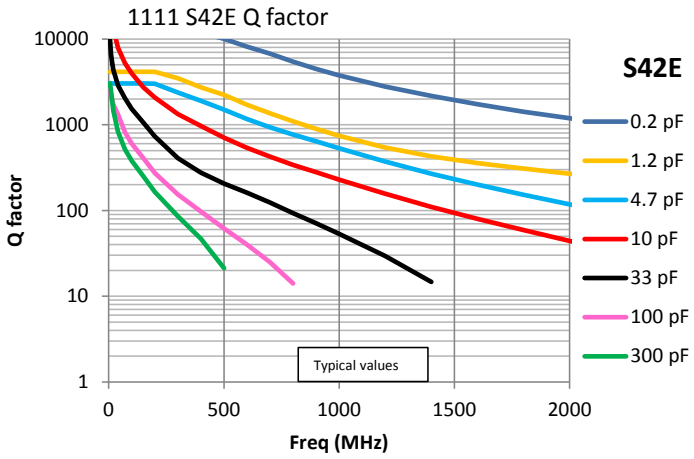


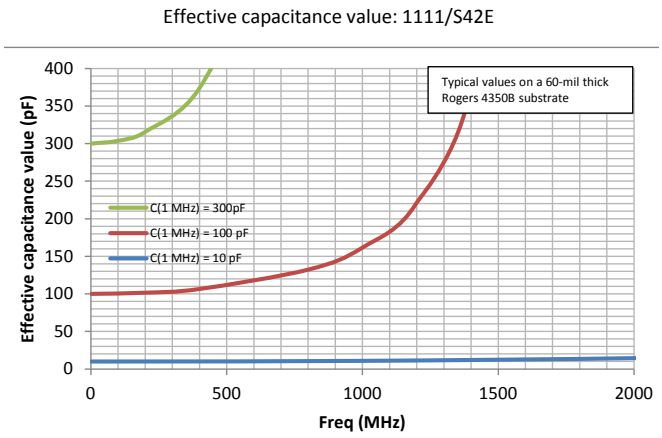


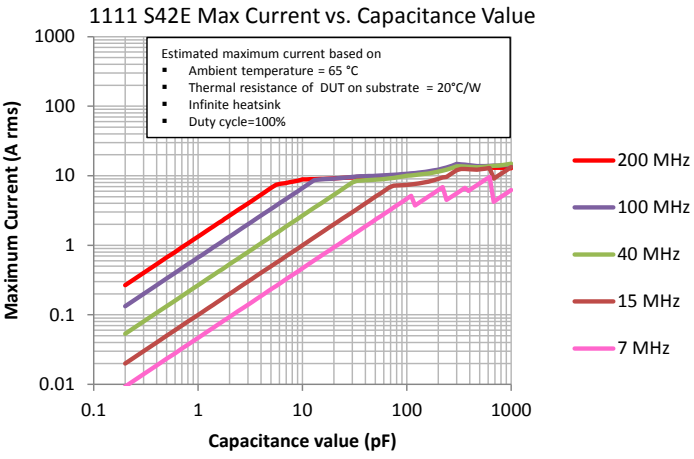


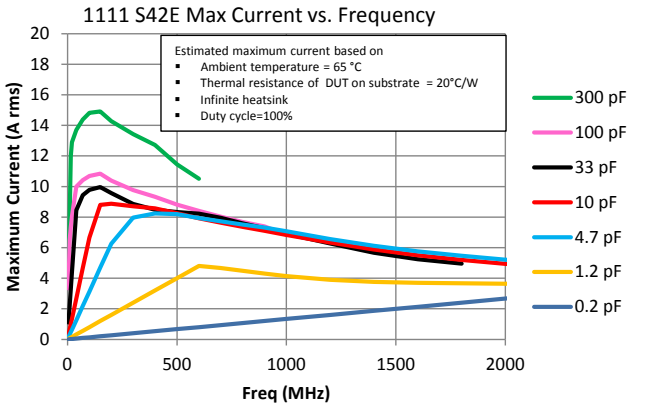
The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

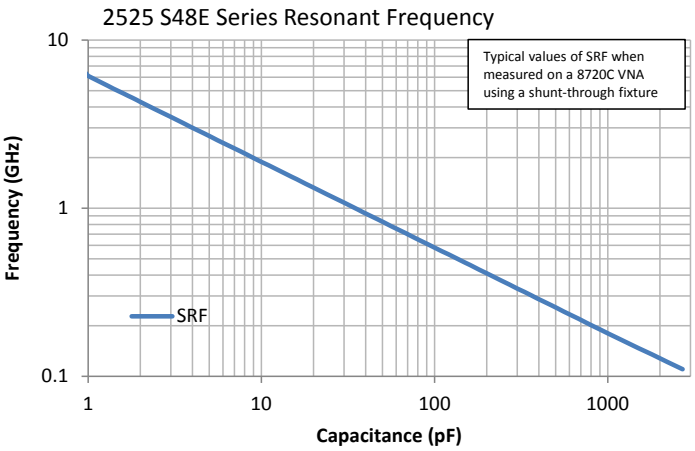




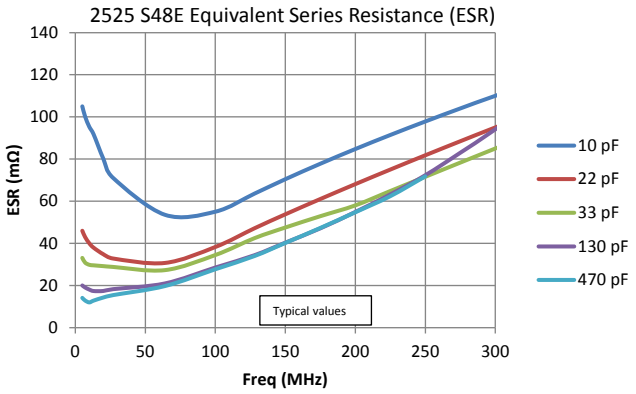


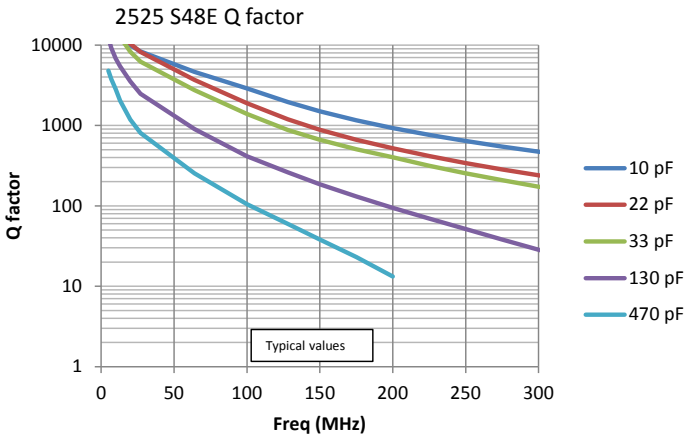


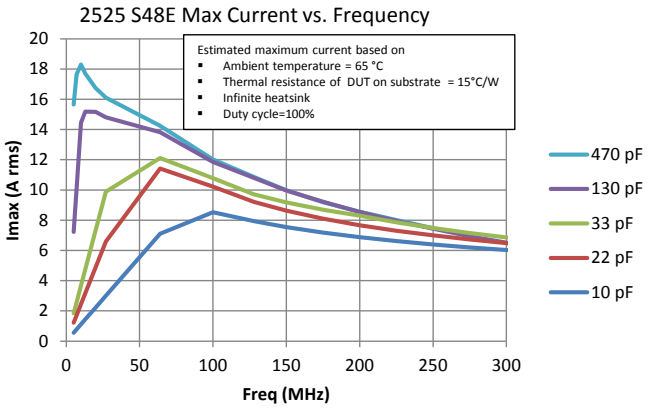


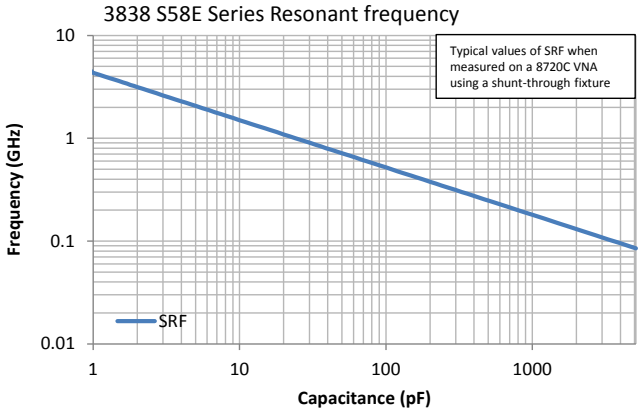


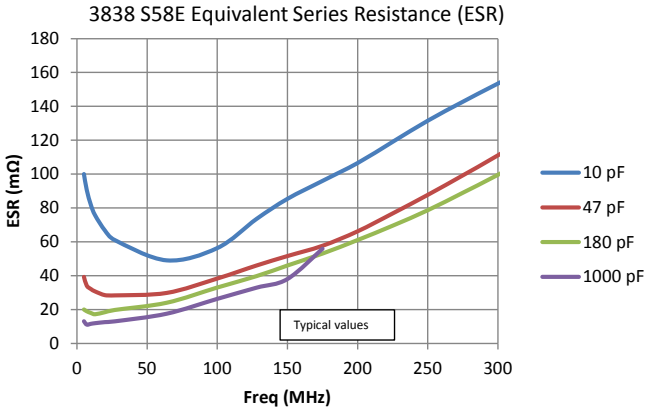
The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.



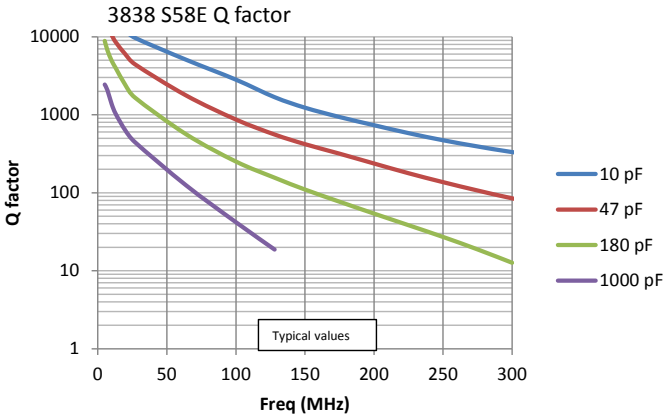


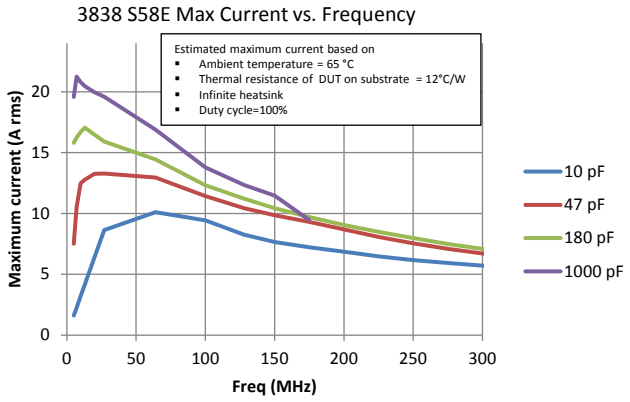






The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.





Appendix III

Datasheet of 0402 Inductor

Thick Film Chip Resistors

RoHS Compliant

Description:

The resistors are constructed in a high grade ceramic body (aluminum oxide). Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the substrate. The composition of the paste is adjusted to give the approximate resistance required and the value is trimmed to within tolerance by laser cutting of this resistive layer.

The resistive layer is covered with a protective coat. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a Tin (lead free) alloy.

Features:

- High reliability and stability
- Reduced size of final equipment
- Lower assembly costs
- Higher component and equipment reliability

Application:

- Consumer electrical equipment
- EDP, Computer application
- Telecom application

Quick Reference Data

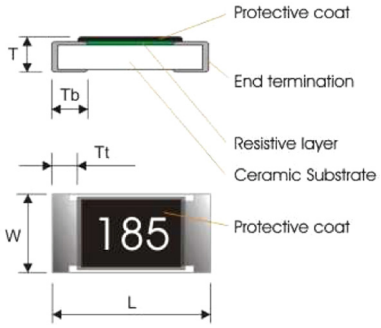
Item	General Specification			
Series No.	MCWR12	MCWR08	MCWR06	MCWR04
Size code	1206(3216)	0805(2012)	0603(1608)	0402(1005)
Resistance Range	1Ω to10MΩ 1% tolerance			
Resistance Tolerance	1% E96/E24			
TCR (ppm/°C) 10MΩ ≥R >10 R≤10Ω	≤ ± 100 -200 to +400			
Max. dissipation @ T_{amb}=70°C	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	150V	75V	50V
Max. Overload Voltage (DC or RMS)	400V	300V	150V	100V
Climatic category	55/155/56			

Note :

1. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by
   RCWV = $\sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.
2. The resistance of Jumper is defined <0.05Ω.

	MCWR12	MCWR08	MCWR06	MCWR04
L	3.1 ± 0.1	2 ± 0.1	1.6 ± 0.1	1 ± 0.05
W	1.6 ± 0.1	1.25 ± 0.1	0.8 ± 0.1	0.50 ± 0.05
T	0.6 ± 0.15	0.5 ± 0.15	0.45 ± 0.15	0.35 ± 0.05
Tb	0.45 ± 0.2	0.4 ± 0.2	0.3 ± 0.15	0.25 ± 0.1
Tt	0.5 ± 0.2	0.4 ± 0.2	0.3 ± 0.1	0.2 ± 0.1

Dimensions : Millimetres



Functional Description:

Product characterization

Standard values of nominal resistance is E96 series for resistors with a tolerance of ±1%.

Derating

The power that the resistor can dissipate depends on the operating temperature; see Fig.2

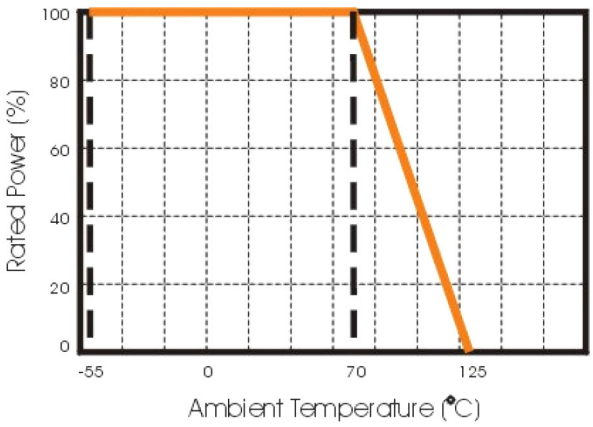


Figure 2 Maximum dissipation in percentage of rated power as a function of the ambient temperature for MCWR12, MCWR08, MCWR06, MCWR04

Mounting

Due to their rectangular shapes and small tolerances, Surface Mountable Resistors are suitable for handling by automatic placement systems.

Chip placement can be on ceramic substrates and printed-circuit boards (PCBs).

Electrical connection to the circuit is by individual soldering condition.

The end terminations guarantee a reliable contact.

Soldering Condition:

The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260°C for 10 seconds. Therefore, it is possible to mount Surface Mount Resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs).

Surface Mount Resistors are tested for solderability at 235°C during 2 seconds. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in Fig 3.

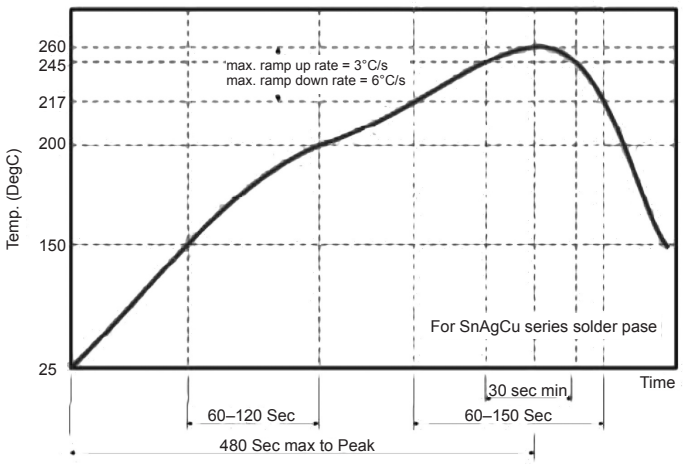


Fig 3. Infrared soldering profile for Chip Resistors

Catalogue Numbers:

The resistors have a catalogue number starting with

MCWR12	X	472_	J	T	L
Size code MCWR12 : 1206 MCWR08 : 0805 MCWR06 : 0603 MCWR04: 0402	**Type code** **X** : ±1%, 10Ω to 1MΩ **W** : ±1%, < 10Ω; >1MΩ	**Resistance code** ±5%, E24: 2 significant digits followed by no. of zeros and a blank 4.7Ω =4R7_ 10Ω =100_ 220Ω =221_ Jumper =000_ ("_" means a blank) ±1%, E24+E96: 3 significant digits followed by no. of zeros 102Ω =1020 37.4KΩ =3742	**Tolerance** F : ±1% P : Jumper	**Packaging code** T : 7" Reeled taping Q : 10" Reeled taping G : 13" Reeled taping H : 13" reel 50Kpcs only for 0402 B : Bulk D : 7" reel 20Kpcs only for 0402 A : 7" reel 15Kpcs only for 0402	**Termination code** L = Sn base (lead free)

MCWR12, MCWR08, MCWR06:

1. Reeled tape packaging : 8mm width paper taping 5,000pcs per 7" reel, 10kpcs per 10" reel, 20kpcs per 13" reel.
2. Bulk packaging : 5,000pcs per poly-bag

MCWR04:

1. Reeled tape packaging : 8mm width paper taping 10,000pcs per 7" reel, 20,000pcs per 10" reel. 70,000pcs per 13" reel.
2. Bulk packaging : 10,000pcs per poly-bag

Test and Requirements:

Essentially all tests are carried out according to the schedule of IEC publication 115-8, category LCT/UCT/56 (rated temperature range : Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days). The testing also meets the requirements specified by EIA, EIAJ and JIS.

The tests are carried out in accordance with IEC publication 68, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions according to IEC 60068-1, subclause 5.3. Unless otherwise specified, the following value supplied :

Temperature: 15°C to 35°C.

Relative humidity: 45% to 75%.

Air pressure: 86kPa to 106 kPa (860 mbar to 1060 mbar).

All soldering tests are performed with midly activated flux.

Test	Procedure / Test Method	Requirement	
		Resistor	0Ω
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	- DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/°C) t_1 : 20°C+5°C/-1 °C; t_2 : -55°C or +155°C R_1 : Resistance at reference temperature (20°C +5°C / -1 °C) R_2 : Resistance at test temperature (-55°C or +155°C)	Within the specified tolerance Refer to "QUICK REFERENCE DATA"	<50mΩ
Resistance to soldering heat(R.S.H) JISC5201-1:1998 Clause 4.18	Un-mounted chips completely immersed for 10 ±1second in a SAC solder bath at 260°C ±5°C	±1%: ΔR/Rmax. ±(0.5%+0.05Ω) no visible damage	<50mΩ
Solderability JISC5201-1: 1998 Clause 4.17	Un-mounted chips completely immersed for 10 ±1second in a SAC solder bath at 235°C ±5°C	95% coverage min., good tinning and no visible damage	
Temperature cycling JISC5201-1: 1998 Clause 4.19	30 minutes at -55°C ±3°C, 2-3 minutes at 20°C +5°C -1°C, 30 minutes at +155°C ±3°C, 2-3 minutes at 20°C +5°C -1°C, total 5 continuous cycles	±1%: ΔR/Rmax. ±(0.5%+0.05Ω) No visible damage	<50mΩ
High Temperature Exposure MIL-STD-202 method 108	1,000 +48/-0 hours; without load in a temperature chamber controlled 155 ±3° C	±1%:ΔR/ Rmax.±(1%+0.1Ω) No visible damage	<50mΩ
Bending strength JISC5201-1: 1998 Clause 4.33	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 3mm for 10sec, 5mm for MCWR04	±1%:ΔR/ Rmax.±(1%+0.05Ω) No visual damaged	<50mΩ
Adhesion JISC5201-1: 1998 Clause 4.32	Pressurizing force: 5N, Test time: 10 ±1sec.	No remarkable damage or removal of the terminations	
Short Time Overload (STOL) JISC5201-1: 1998 Clause 4.13	2.5 times RCWV or max. overload voltage, for 5seconds	±1%: ΔR/R max. ±(1%+0.05Ω) No visible damage	<50mΩ

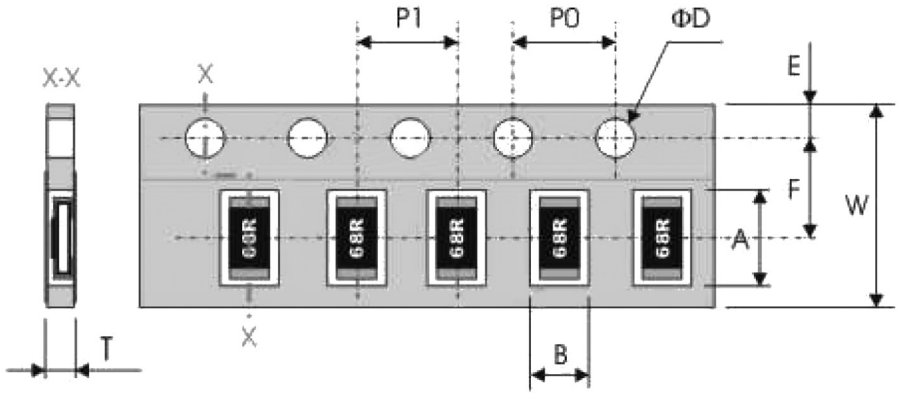
Test	Procedure / Test Method	Requirement	
		Resistor	0Ω
Load life in Humidity JISC5201-1: 1998 Clause 4.24	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at 40°C± 2°C and 90 to 95% relative humidity, 1.5hours on and 0.5 hours off	±1%: ΔR/R max. ±(1%+0.1Ω) No visible damage	<50mΩ
Load life (endurance) JISC5201-1: 1998 Clause 4.25	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 70±2ºC, 1.5 hours on and 0.5 hours off	±1%: ΔR/R max. ±(1%+0.1Ω) No visible damage	<50mΩ
Insulation Resistance JISC5201-1: 1998 Clause 4.6	Apply the maximum overload voltage (DC) for 1minute	R≧10GΩ	
Dielectric Withstand Voltage JISC5201-1: 1998 Clause 4.7	Apply the maximum overload voltage (AC) for 1 minute	No breakdown or flashover	

Test Condition For Jumper (0 Ω)

Item	MCWR12	MCWR08	MCWR06	MCWR04
Power Rating At 70°C	1/4W	1/8W	1/10W	1/16W
Resistance	MAX. 50mΩ			
Rated Current	2A	1.5A	1A	1A
Peak Current	5A	3.5A	3A	2A
Operating Temperature	-55°C to +155° C			

Packaging:

Paper Tape specifications

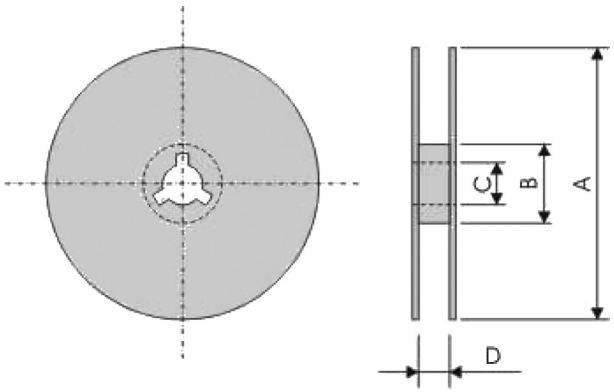


Dimensions : Millimetres

Series No.	A	B	W	F	E
MCWR12	3.6 ±0.2	2 ±0.2	8 ±0.3	3.5 ±0.2	1.75 ±0.1
MCWR08	2.4 ±0.2	1.65 ±0.2			
MCWR06	1.9 ±0.2	1.1 ±0.2			
MCWR04	1.2 ±0.1	0.7 ±0.1			

Series No.	P1	P0	D	T
MCWR12/WR08	4 ±0.1	4 ±0.1	Φ1.5 $^{+0.1}_{-0.0}$	Max. 1
MCWR06				0.65 ±0.05
MCWR04	2 ±0.1			0.4 ±0.05

7" Reel dimensions:



Symbol	A	B	C	D
7" reel	Φ178 ±2	Φ60 ±1	13 ±0.2	9 ±0.5
10" reel	Φ254 ±2	Φ100 ±1	13 ±0.2	9 ±0.5
13" reel	Φ330 ±2	Φ100 ±1	13 ±0.2	9 ±0.5