KOA SPEER ELECTRONICS, INC.

RoHS COMPLIANT

spec sheet

SS-222 R12
AHA 12/06/06

Multilayer Ceramic Inductors

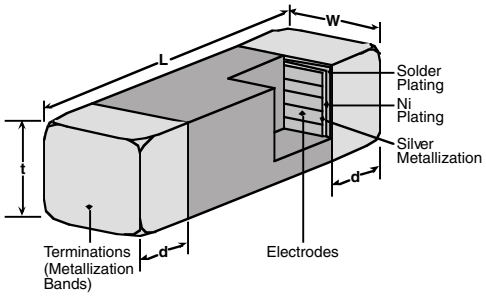
Type MHL

ISO 9001:2000 CERTIFIED
TS-16949 CERTIFIED

1. General

- Monolithic structure provides high reliability in a wide temperature and humidity range
- High quality ceramic material and unique manufacturing process provides high Q at high frequency
- Standard EIA packages: 1E, 1J
- Nickel barrier with solder overcoat for excellent solderability
- Marking: Brown body color with no marking (1E)
  White body color with with black stripe and no marking (1J)

2. Dimensions



Size Code	Dimensions inches (mm)			
	L	W	t	d
1E (0402)	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.01±.004 (0.25±0.1)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.012±.008 (0.30±0.2)

3. Type Designation

The type designation shall be in the following form:

MHL	1E	C	T	TE	3N9	S
Type	Size	Material	Termination Material	Packaging	Nominal Inductance	Tolerance
	1E 1J	Permeability Code: C T	T: Sn (Other termination styles available, contact factory for options)	TP: 7" paper tape 2mm pitch (1E only - 10,000 pcs/reel) TD: 7" paper tape (1J - 4,000 pcs/reel	3N9 = 3.9nH R10 = 100nH	S: ±0.3nH J: ±5%

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4. Standard Applications

	Part Designation	Inductance L (nH)	Inductance Tolerance	Q Minimum (100MHz)	Q Typical (100MHz)	Q Typical (800MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum ()	Allowable DC Current Maximum (mA)	Operating Temperature Range
	MHL1ECTTP1N0*	1.0	S: ±0.3nH	8	11	37	10000	0.12	300	-55°C to +125°C
	MHL1ECTTP1N2*	1.2				36				
	MHL1ECTTP1N5*	1.5					6000	0.13		
	MHL1ECTTP1N8*	1.8				34		0.14		
	MHL1ECTTP2N2*	2.2						0.16		
	MHL1ECTTP2N7*	2.7						0.17		
	MHL1ECTTP3N3*	3.3						0.19		
	MHL1ECTTP3N9*	3.9				32	4000	0.22		
	MHL1ECTTP4N7*	4.7						0.24		
	MHL1ECTTP5N6*	5.6						0.27		
	MHL1ECTTP6N8*	6.8	J: ±5%				3900	0.32		
	MHL1ECTTP8N2*	8.2					3500	0.37		
	MHL1ECTTP10N*	10				31	3200	0.42		
	MHL1ECTTP12N*	12					2600	0.50		
	MHL1ECTTP15N*	15				30	2300	0.55		
	MHL1ECTTP18N*	18					2000	0.65		
	MHL1ECTTP22N*	22					1600	0.8		
	MHL1ECTTP27N*	27				28	1400	0.9		
	MHL1ECTTP33N*	33				26	1200	1.0	200	
	MHL1ECTTP39N*	39				24	1100	1.2		
	MHL1ECTTP47N*	47				23	900	1.3		
	MHL1ECTTP56N*	56				21	750	1.4		
	MHL1ECTTP68N*	68			10	19			180	
	MHL1ECTTP82N*	82				16	600	1.6	150	
	MHL1ECTTPR10*	100				—			100	
NEW	**MHL1ECTTPR12***	120				—				
	MHL1JCTTD1N5*	1.5	S: ±0.3nH	8	14	46	6000	0.10	100	-55°C to +125°C
	MHL1JCTTD1N8*	1.8								
	MHL1JCTTD2N2*	2.2								
	MHL1JCTTD2N7*	2.7								
	MHL1JCTTD3N3*	3.3		10				0.13		
	MHL1JCTTD3N9*	3.9						0.15		
	MHL1JCTTD4N7*	4.7						0.20		
	MHL1JCTTD5N6*	5.6			15		4000	0.23	600	
	MHL1JCTTD6N8*	6.8	J: ±5%					0.20		
	MHL1JCTTD8N2*	8.2					5800	0.28		
	MHL1JCTTD10N*	10		12			3200	0.30		
	MHL1JCTTD12N*	12					2600	0.35		
	MHL1JCTTD15N*	15					2300	0.40		
	MHL1JCTTD18N*	18					2000	0.45		
	MHL1JCTTD22N*	22					1600	0.50		
	MHL1JCTTD27N*	27					1400	0.55		
	MHL1JTTTD27N*	27			18					
	MHL1JCTTD33N*	33			15		1200	0.60	500	

*Add tolerance character (S, J)

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4. Standard Applications (continued)

Part Designation	Inductance L (nH)	Inductance Tolerance	Q			Self Resonant Frequency Typical (MHz)	DC Resistance Maximum ()	Allowable DC Current Maximum (mA)	Operating Temperature Range
			Minimum (100MHz)	Typical (100MHz)	Typical (800MHz)				
MHL1JCTTD39N*	39	J: ±5%	12	15	46	1100	0.65	500	-55°C to +125°C
MHL1JTTTD39N*	39			17					
MHL1JCTTD47N*	47			15	39	900	0.70		
MHL1JCTTD56N*	56				37		0.75		
MHL1JCTTD68N*	68				36	700	0.80	400	
MHL1JCTTD82N*	82				29	600	0.85	300	
MHL1JCTTDR10*	100				16		0.90		
MHL1JCTTDR12*	120		8			500	1.0		
MHL1JCTTDR15*	150			13			1.2		
MHL1JCTTDR18*	180				—	400	1.3		
MHL1JCTTDR22*	220						1.5		

*Add tolerance character (S, J)

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5. Characteristics

Item	Requirement	Conditions
Operating Temperature	-55°C to +125°C	
Storage Temperature	40°C @ 70% Humidity	Sealed plastic bags with desiccant shall be used to reduce the potential of oxidation on the terminations during storage.
Resistance to Solder Heat	**Change in Impedance:** Relative to value before test ±20%. **Appearance:** There shall be no cracking **Solder Coverage:** More than 75% of the terminal electrode shall be covered with solder.	**Flux:** 5-10 sec dip **After Flux:** Air dry for 15 sec **Preheat:** 150°C ±10°C **Preheat Time:** 60 sec **Solder Temp:** 260°C ±5°C **Dip Time:** 10 ±1 sec
Solderability	**Solder Coverage:** More than 95% of the termination shall be covered with solder.	**Flux:** 5-10 sec dip **After Flux:** Air dry for 15 sec **Solder Temp:** 245°C ±5°C **Dip Time:** 5 ±0.5 sec
Leach Resistance	**Appearance:** There shall be no visible signs of physical or mechanical damage (i.e. no cracks) **Terminations:** Termination must not be leached away for more than 5%.	The bead shall be subjected to the following 5 steps for the period of time shown below. The 5 steps constitute one (1) rotation. 4 rotations shall be carried out. **1) Flux:** 5-10 sec **2) After Flux:** Air dry for 15 sec **3) Solder Temp:** 230°C ±5°C **4) Dip Time:** 5 ±0.5 sec **5) Cool:** Air cool for 60 seconds
Insulation Resistance	**Insulation Resistance:** Min 1G ohms	
Solvent Resistance	**Change in Impedance:** Relative to value before test ±10%.	Cleaning by: **Washer:** Ultrasonic washer (100W) **Solvent:** Isopropyl alcohol **Time:** 3 minutes
Terminal Strength (hanging test)	**Appearance:** The terminal electrode shall not break off, nor shall there be damage to the body.	**Type** / **W(kgf)** / **Time** 1E / — / N/A 1J / 0.5 / 30 sec ±2 sec
Terminal Strength (push test)	**Appearance:** There shall be no evidence of mechanical degradations to terminals or body.	**Type** / **W(kgf)** / **Time** 1E / — / N/A 1J / 1.4 / 60 sec
Bending Strength	**Appearance:** There shall be no physical or mechanical damage **Impedance:** Relative to initial value before test ±10%	**Board:** 90x40x1.6mm **Bend:** 1mm **Time:** 5 sec

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5. Characteristics (continued)

Item	Requirement	Conditions
Mechanical Shock	**Appearance:** There shall be no physical or mechanical damage **Impedance:** Relative to initial value before test ±10%	**Force:** 50G **Time:** 11 msec There shall be 3 shocks in each of 6 directions (18 shocks total).
Vibration	**Impedance:** Relative to initial value ±10%	Only endurance conditioning by sweeping shall be made. The entire frequency range from 10-2,000 Hz and return to 10 Hz in 20 minutes (this shall constitute one cycle). Amplitude: 15G The test shall have a 15G peak and shall be applied for a period of 4 hours (12 cycles) in each of 3 mutually perpendicular directions (a total of 36 cycles within a total of 12 hours).
Thermal Shock	**Appearance:** There shall be no physical or mechanical damage. **Impedance:** Relative to initial value ±20%. **DCR:** The DCR shall not exceed initial specified value. Testing of the parts will be made at 0 hours, 250 hours and 500 hours. Before testing the parts shall be allowed to cool to room temperature for 24 hours.	**Step / Temperature / Time** 1-start / -40°C ±2°C / ——— 2-hold / -40°C ±2°C / 30 min ±5 min 3-transfer / ——— / 0.5 min max. 4-hold / +105°C ±2°C / 30 min ±5 min 5-transfer / ——— / 0.5 min max. Steps 1 thru 5 constitute one complete cycle and the test shall consist of a total of 500 cycles.
Load Humidity	**Appearance:** There shall be no physical or mechanical damage **Impedance:** Relative to initial value ±15% Measurements shall be taken at 0 hours, 250 hours, 500 hours and 1,000 hours and shall meet the conditions stated above.	**Temperature:** 85°C ±2°C **Relative Humidity:** 85% **Time:** 1,000 hours total **Apply:** 100% rated current
Life Test	**Appearance:** There shall be no physical or mechanical damage **Impedance:** Relative to initial value ±15% Measurements shall be taken at 0 hours, 250 hours, 500 hours and 1,000 hours and shall meet the conditions stated above.	**Temperature:** 85°C ±2°C **Time:** 1,000 hours total **Apply:** 100% rated current

6. Packaging Specifications

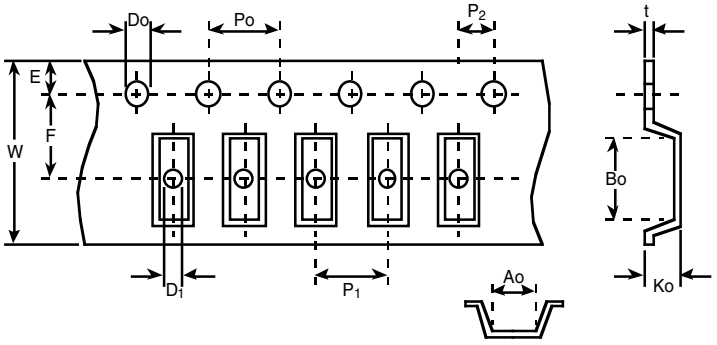
KOA's multilayer components are provided on tape-and-reel for use in pick-and-place machines. The reel size is 7 inch.

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7. Dimensions - inches (mm)

Tape	Ao	Bo	Ko
1E	.026±.004 (0.67±0.1)	.046±.004 (1.17±0.1)	.025±.004 (0.63±0.1)
1J	.045±.004 (1.15±0.1)	.073±.004 (1.85±0.1)	.043±.004 (1.1±0.1)



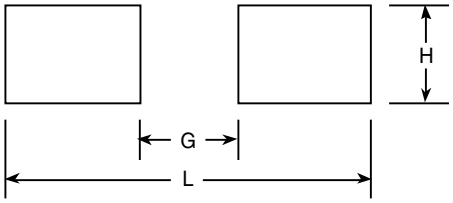
Tape	E	F	W	P_1	Po	P_2	Do	D_1	t
1E 1J	.069±.004 (1.75±0.10)	.138±.002 (3.5±.005)	.315±.008 (8.0±0.2)	.079±.009 (2.0±0.23)	.079±.004 (2.0±0.1)	.079±.002 (2.0±0.05)	.059±.004 (1.5+0.1/-0.0)	.039 min. (1.0 min.)	.009±.001 (0.23±0.02)

8. Chip Quantities Per Reel

Chip Size	Parts on 7 inch (178mm) Reel	Parts on 13 inch (330mm) Reel
0402 (1005)	10,000	———
0603 (1608)	4,000	4,000

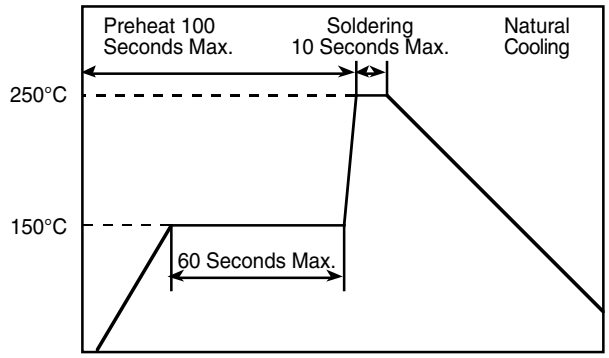
9. Recommended PC Board Land Patterns - inches (mm)

Chip Size	L	G	H
1E (0402)	.05 (1.3)	.015 (0.4)	.019 (0.5)
1J (0603)	.102 (2.6)	.023 (0.6)	.031 (0.8)

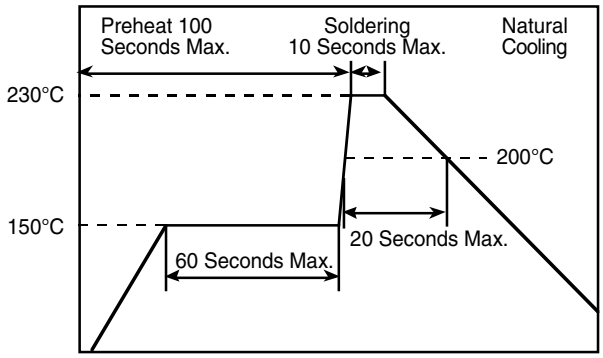


10. Recommended Temperature Profiles for Soldering

Recommended Temperature Profile for Wave Soldering



Recommended Temperature Profile for Reflow Soldering



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