

Multi Layer Ferrite Inductors

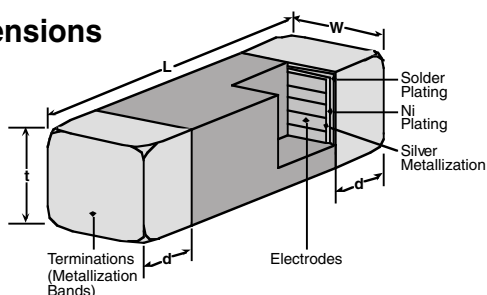
Type MCL

ISO 9001:2000
TS-16949

1. General

- Monolithic structure for closed magnetic path eliminates crosstalk and provides high reliability in a wide range of temperature and humidity ranges
- Standard EIA packages: 1J, 2A, 2B
- Nickel barrier with solder overcoat for excellent solderability
- Magnetically shielded

2. 2.1 Dimensions



Size Code	L	W	t	d
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.014±.006 (0.36±0.15)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.035±.008 (0.9±0.2)	.02±.01 (0.51±0.25)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.043±.008 (1.1±0.2)	.02±.01 (0.51±0.25)

3. Ordering and Specifying Information*

MCL	1J	H	T	TE	R10	J
Type	Size	Material	Termination Material	Packaging	Nominal Inductance	Tolerance
	1J 2A 2B	Permeability Code: H J	T: Sn (Other termination styles available, contact factory for options)	TD: 7" Paper Tape (1J - 4,000 pcs/reel; 2A - 0.047μH - 2.2μH = 4,000 pcs/reel) TE: 7" Embossed Plastic (2A - 2.7μH - 10μH = 3,000 pcs/reel; 2B - 3,000 pcs/reel)	047 = .047μH R10 = .100μH	K: ±10% M: ±20%

* Please note: KSE's part numbers do not contain any spaces or hyphens.

4. Standard Applications

Part Designation	Inductance L (μH)	Minimum Q	L.Q. Test Frequency (MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range	
MCL1JHTTD047M	0.047	10	50	260	0.30	50	-55°C to +125°C	
MCL1JHTTD068M	0.068			250				
MCL1JHTTD082M	0.082			245				
MCL1JHTTDR10*	0.10	15	25	240	0.50			
MCL1JHTTDR12*	0.12			205				
MCL1JHTTDR15*	0.15			180	0.60			
MCL1JHTTDR18*	0.18							
MCL1JHTTDR22*	0.22			150	0.80			
MCL1JHTTDR27*	0.27			136				

* Add tolerance character (K, M) - Other tolerances available upon request

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4. Standard Applications (continued)

Part Designation	Inductance L (μH)	Minimum Q	L.Q. Test Frequency (MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range
MCL1JHTTDR33*	0.33	15	25	125	0.85	35	-55°C to +125°C
MCL1JHTTDR39*	0.39			110	1.00		
MCL1JHTTDR47*	0.47			105	1.35		
MCL1JHTTDR56*	0.56			95	1.55		
MCL1JHTTDR68*	0.68			90	1.70		
MCL1JHTTDR82*	0.82			85	2.10		
MCL1JJTTD1R0*	1.0	35	10	75	0.60	25	
MCL1JJTTD1R2*	1.2			65	0.80		
MCL1JJTTD1R5*	1.5			60			
MCL1JJTTD1R8*	1.8			55	0.95		
MCL1JJTTD2R2*	2.2			50	1.15	15	
MCL1JJTTD2R7*	2.7			45	1.35		
MCL1JJTTD3R3*	3.3		40	1.55			
MCL1JJTTD3R9*	3.9		35	1.70			
MCL1JJTTD4R7*	4.7		33	2.10			
MCL1JJTTD5R6*	5.6		4	22	1.55	5	
MCL1JJTTD6R8*	6.8			20	1.70		
MCL1JJTTD8R2*	8.2			18	2.10		
MCL1JJTTD100*	10	17		1.85			
MCL1JJTTD120*	12	30	2	15	2.10	3	
MCL2AHTTD047M	0.047	15	50	320	0.20	300	
MCL2AHTTD068M	0.068			280			
MCL2AHTTD082M	0.082			255			
MCL2AHTTDR10*	0.10	20	25	235	0.30	250	
MCL2AHTTDR12*	0.12			220			
MCL2AHTTDR15*	0.15			200	0.40		
MCL2AHTTDR18*	0.18			185			
MCL2AHTTDR22*	0.22			170	0.50		
MCL2AHTTDR27*	0.27			150			
MCL2AHTTDR33*	0.33			145	0.55		
MCL2AHTTDR39*	0.39	25		135	0.65	200	
MCL2AHTTDR47*	0.47			125			
MCL2AHTTDR56*	0.56			115	0.75	150	
MCL2AHTTDR68*	0.68			105	0.80		
MCL2AHTTDR82*	0.82			100	1.00		
MCL2AJTTD1R0*	1.0		45	10	75	0.40	50
MCL2AJTTD1R2*	1.2	65			0.50		
MCL2AJTTD1R5*	1.5	60					
MCL2AJTTD1R8*	1.8	55			0.60		
MCL2AJTTD2R2*	2.2	50			0.65	30	
MCL2AJTTE2R7*	2.7	45			0.75		
MCL2AJTTE3R3*	3.3	41			0.80		
MCL2AJTTE3R9*	3.9	38			0.90		
MCL2AJTTE4R7*	4.7	35			1.00		

* Add tolerance character (K, M) - Other tolerances available upon request

4. Standard Applications (continued)

Part Designation	Inductance L (μH)	Minimum Q	L.Q. Test Frequency (MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range	
MCL2AJTTE5R6*	5.6	50	4	32	0.90	15	-55°C to +125°C	
MCL2AJTTE6R8*	6.8			29	1.00			
MCL2AJTTE8R2*	8.2			26	1.10			
MCL2AJTTE100*	10		2	24	1.15			
MCL2BHTTE047M	0.047	20	50	320	0.15	300	-55°C to +125°C	
MCL2BHTTE068M	0.068			280	0.25	250		
MCL2BHTTER10*	0.10		25	235				0.30
MCL2BHTTER12*	0.12			220				
MCL2BHTTER15*	0.15			200				
MCL2BHTTER18*	0.18			185	0.40			
MCL2BHTTER22*	0.22			170				
MCL2BHTTER27*	0.27			150	0.50			
MCL2BHTTER33*	0.33			145	0.60			
MCL2BHTTER39*	0.39			25	135	0.50		200
MCL2BHTTER47*	0.47				125	0.60		
MCL2BHTTER56*	0.56	115			0.70	150		
MCL2BHTTER68*	0.68	105			0.80			
MCL2BHTTER82*	0.82	100			0.90			
MCL2BJTTE1R0*	1.0	45	10	75	0.40	100		-55°C to +125°C
MCL2BJTTE1R2*	1.2			65	0.50	50		
MCL2BJTTE1R5*	1.5			60				
MCL2BJTTE1R8*	1.8			55				
MCL2BJTTE2R2*	2.2			50	0.60			
MCL2BJTTE2R7*	2.7			45				
MCL2BJTTE3R3*	3.3			41	0.70			
MCL2BJTTE3R9*	3.9			38	0.80			
MCL2BJTTE4R7*	4.7			35	0.85			
MCL2BJTTE5R6*	5.6	50	4	32	0.90	25		
MCL2BJTTE6R8*	6.8			29				
MCL2BJTTE8R2*	8.2			26				
MCL2BJTTE100*	10		2	24	1.00	15		
MCL2BJTTE120*	12			22	1.05			
MCL2BJTTE150*	15	30	1	19	0.70	5		
MCL2BJTTE180*	18			18				
MCL2BJTTE220*	22			16	0.90			
MCL2BJTTE270*	27			14				
MCL2BJTTE330*	33		0.4	13	1.05			

* Add tolerance character (K, M) - Other tolerances available upon request

5. Characteristics

Item	Requirement	Conditions												
Operating Temperature	-25°C ~ +85°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 Inductance: Relative to value before test $\pm 20\%$. 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 $\pm 10^\circ\text{C}$ Preheat Time: 60 sec Solder Temp: 260°C $\pm 5^\circ\text{C}$ 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 $\pm 5^\circ\text{C}$ 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 $\pm 5^\circ\text{C}$ 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 Inductance: Relative to value before test $\pm 10\%$.	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.	<table> <tr> <th>Type</th><th>W(kgf)</th><th>Time</th></tr> <tr> <td>1J (0603)</td><td>0.5</td><td>30 sec ± 2 sec</td></tr> <tr> <td>2A (0805)</td><td>1.0</td><td>30 sec ± 2 sec</td></tr> <tr> <td>2B (1206)</td><td>1.5</td><td>30 sec ± 2 sec</td></tr> </table>	Type	W(kgf)	Time	1J (0603)	0.5	30 sec ± 2 sec	2A (0805)	1.0	30 sec ± 2 sec	2B (1206)	1.5	30 sec ± 2 sec
Type	W(kgf)	Time												
1J (0603)	0.5	30 sec ± 2 sec												
2A (0805)	1.0	30 sec ± 2 sec												
2B (1206)	1.5	30 sec ± 2 sec												
Terminal Strength (push test)	Appearance: There shall be no evidence of mechanical degradations to terminals or body.	<table> <tr> <th>Type</th><th>W(kgf)</th><th>Time</th></tr> <tr> <td>1J (0603)</td><td>1.4</td><td>60 sec</td></tr> <tr> <td>2A (0805)</td><td>1.8</td><td>60 sec</td></tr> <tr> <td>2B (1206)</td><td>2.3</td><td>60 sec</td></tr> </table>	Type	W(kgf)	Time	1J (0603)	1.4	60 sec	2A (0805)	1.8	60 sec	2B (1206)	2.3	60 sec
Type	W(kgf)	Time												
1J (0603)	1.4	60 sec												
2A (0805)	1.8	60 sec												
2B (1206)	2.3	60 sec												
Bending Strength	Appearance: There shall be no physical or mechanical damage Inductance: Relative to initial value before test $\pm 10\%$	Board: 90x40x1.6mm Bend: 1mm Time: 5 sec												

5. Characteristics (continued)

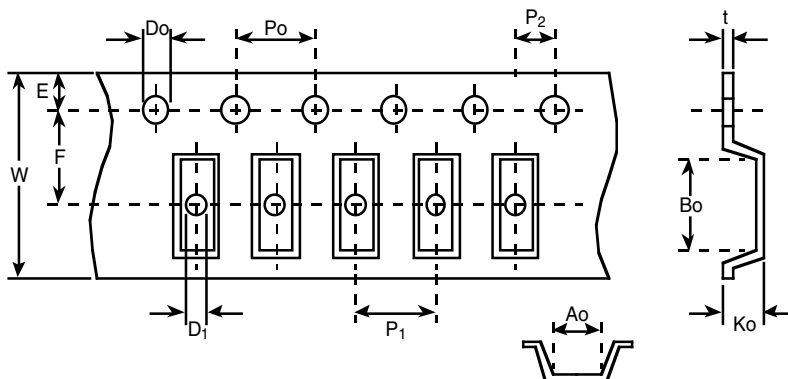
Item	Requirement	Conditions																		
Mechanical Shock	Appearance: There shall be no physical or mechanical damage Inductance: Relative to initial value before test $\pm 10\%$	Force: 50G Time: 11 msec There shall be 3 shocks in each of 6 directions (18 shocks total).																		
Vibration	Inductance: Relative to initial value $\pm 10\%$	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: 1.5mm 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. Inductance: Relative to initial value $\pm 20\%$. 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.	<table border="1"> <thead> <tr> <th>Step</th><th>Temperature</th><th>Time</th></tr> </thead> <tbody> <tr> <td>1-start</td><td>$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$</td><td>_____</td></tr> <tr> <td>2-hold</td><td>$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$</td><td>30 min ± 5 min</td></tr> <tr> <td>3-transfer</td><td>_____</td><td>0.5 min max.</td></tr> <tr> <td>4-hold</td><td>$+105^{\circ}\text{C} \pm 2^{\circ}\text{C}$</td><td>30 min ± 5 min</td></tr> <tr> <td>5-transfer</td><td>_____</td><td>0.5 min max.</td></tr> </tbody> </table> Steps 1 thru 5 constitute one complete cycle and the test shall consist of a total of 500 cycles.	Step	Temperature	Time	1-start	$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$	_____	2-hold	$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 min ± 5 min	3-transfer	_____	0.5 min max.	4-hold	$+105^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 min ± 5 min	5-transfer	_____	0.5 min max.
Step	Temperature	Time																		
1-start	$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$	_____																		
2-hold	$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 min ± 5 min																		
3-transfer	_____	0.5 min max.																		
4-hold	$+105^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 min ± 5 min																		
5-transfer	_____	0.5 min max.																		
Load Humidity	Appearance: There shall be no physical or mechanical damage Inductance: Relative to initial value $\pm 15\%$ Measurements shall be taken at 0 hours, 250 hours, 500 hours and 1,000 hours and shall meet the conditions stated above.	Temperature: $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ Relative Humidity: 85% Time: 1,000 hours total Apply: 100% rated current																		
Life Test	Appearance: There shall be no physical or mechanical damage Inductance: Relative to initial value $\pm 15\%$ Measurements shall be taken at 0 hours, 250 hours, 500 hours and 1,000 hours and shall meet the conditions stated above.	Temperature: $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ Time: 1,000 hours total Apply: 100% rated current																		

6. Packaging Specifications

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

7. Dimensions - inches (mm)

Tape	Ao	Bo	Ko
1J	0.043±0.002 (1.1±0.1)	0.075±0.002 (1.9±0.1)	0.043±0.002 (1.1±0.1)
2A	0.063±0.002 (1.6±0.1)	0.093±0.002 (2.4±0.1)	0.046±0.002 (1.2±0.1)
2B	0.071±0.002 (1.8±0.1)	0.138±0.002 (3.5±0.1)	0.048±0.002 (1.2±0.1)



Tape	E	F	W	P ₁	P _o	P ₂	Do	D ₁	t
1J 2A 2B	0.069±0.004 (1.75±0.10)	0.138±0.002 (3.50±0.05)	0.318±0.002 (8.1±0.1)	0.157±0.004 (4.0±0.1)	0.157±0.004 (4.0±0.1)	0.079±0.002 (2.00±0.05)	0.059±0.004 (1.5±0.1/-0.0)	0.039 min. (1.0 min.)	0.009±0.001 (0.23±0.02)

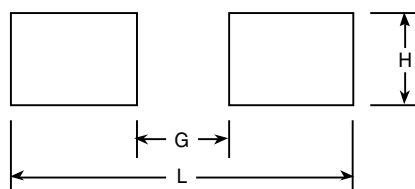
8. Chip Quantities Per Reel

Chip Size	Parts on 7 inch (178mm) Reel
1J	4,000
2A	* 2,000/4,000
2B	3,000

* MCL0805: 2.7μH ~ 12μH = 2K
0.047μH ~ 2.2μH = 4K

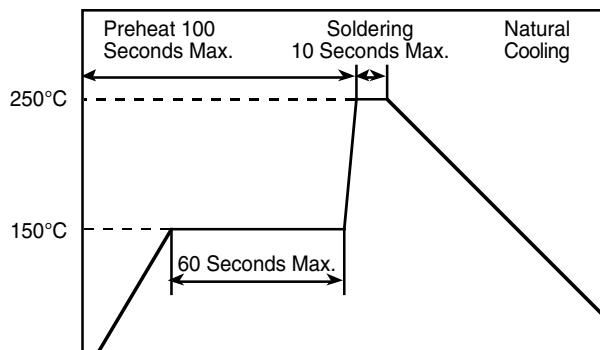
9. Recommended PC Board Land Patterns - inches (mm)

Chip Size	L	G	H
1J	0.102 (2.6)	0.022 (0.55)	0.037 (0.94)
2A	0.118 (3.0)	0.026 (0.66)	0.057 (1.45)
2B	0.173 (4.4)	0.059 (1.5)	0.071 (1.8)



10. Recommended Temperature Profiles for Soldering

Recommended Temperature Profile
for Wave Soldering



Recommended Temperature Profile
for Reflow Soldering

