



Multilayer Ceramic Chip Inductors MHI_D Series, 0402 Size

Features:

- Monolithic structure with high reliability
- High quality ceramic material and unique manufacturing processes providing high Q at high frequencies and high self-resonant frequencies
- Superior termination bonding strength
- Nickel barrier with solder overlapped termination offering excellent solderability and solder leach resistance, suitable for both wave and reflow soldering processes
- Halogen free and RoHS compliant

Applications:

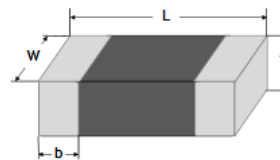
- High frequency equipment including cellular phones, pagers, radar detectors, computer communications, etc

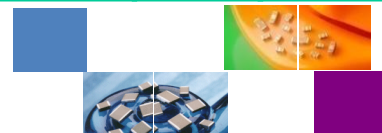
Ordering Code:

MHI	0402	D	10N	J	T
<u>Series Code</u>	<u>Size Code</u>	<u>Characteristic Code</u>	<u>Inductance Code</u>	<u>Tolerance Code</u>	<u>Package Code</u>
MHI: Multilayer ceramic chip inductor	inch (mm) 0402 (1005) 0603 (1608)		1N0 = 1nH 10N = 10nH R10 = 100nH	J = ±5% K = ±10% S = ±0.3nH	T = Tape & Reel

Shape and Dimensions:

Unit (mm)	0402 (1005)
Length (L)	1.00±0.10
Width (W)	0.50±0.10
Thickness (T)	0.50±0.10
Termination bandwidth (b)	0.25±0.10





General Electrical Characteristics:

✧ Operating temperature: -55 to +125°C (including self-temperature rise)

Part Number	Inductance (nH)	L, Q Test Frequency	Q Min.	SRF typ. (MHz)	RDC Max. (Ω)	IDC ¹ Max. (mA)	Tolerance
MHI0402D1N0_T	1.0	100MHz, 200mV	8	10,000	0.07	400	S
MHI0402D1N1_T	1.1	100MHz, 200mV	8	10,000	0.1	400	S
MHI0402D1N2_T	1.2	100MHz, 200mV	8	10,000	0.09	400	S
MHI0402D1N3_T	1.3	100MHz, 200mV	8	9,000	0.1	400	S
MHI0402D1N5_T	1.5	100MHz, 200mV	8	9,000	0.1	400	S
MHI0402D1N6_T	1.6	100MHz, 200mV	8	8,700	0.1	400	S
MHI0402D1N8_T	1.8	100MHz, 200mV	8	8,700	0.1	400	S
MHI0402D2N0_T	2.0	100MHz, 200mV	8	8,100	0.1	400	S
MHI0402D2N2_T	2.2	100MHz, 200mV	8	8,100	0.12	400	S
MHI0402D2N4_T	2.4	100MHz, 200mV	8	7,700	0.15	400	S
MHI0402D2N7_T	2.7	100MHz, 200mV	8	7,700	0.15	400	S
MHI0402D3N0_T	3.0	100MHz, 200mV	8	6,300	0.15	400	S
MHI0402D3N3_T	3.3	100MHz, 200mV	8	6,300	0.15	400	S, K
MHI0402D3N6_T	3.6	100MHz, 200mV	8	6,100	0.15	400	S, K
MHI0402D3N9_T	3.9	100MHz, 200mV	8	6,100	0.18	400	S, K
MHI0402D4N3_T	4.3	100MHz, 200mV	8	6,000	0.18	400	S, K
MHI0402D4N7_T	4.7	100MHz, 200mV	8	6,000	0.18	400	S, K
MHI0402D5N0_T	5	100MHz, 200mV	8	5,100	0.2	400	S, K
MHI0402D5N1_T	5.1	100MHz, 200mV	8	5,300	0.2	400	S, K
MHI0402D5N6_T	5.6	100MHz, 200mV	8	5,100	0.2	400	S, K
MHI0402D6N8_T	6.8	100MHz, 200mV	8	4,550	0.24	400	J, K
MHI0402D8N0_T	8	100MHz, 200mV	8	4,100	0.3	300	J, K
MHI0402D8N2_T	8.2	100MHz, 200mV	8	4,100	0.24	300	J, K
MHI0402D9N1_T	9.1	100MHz, 200mV	8	3,900	0.26	300	J, K
MHI0402D10N_T	10	100MHz, 200mV	8	3,900	0.26	300	J, K
MHI0402D12N_T	12	100MHz, 200mV	8	3,000	0.4	300	J, K
MHI0402D15N_T	15	100MHz, 200mV	8	2,800	0.5	300	J, K
MHI0402D18N_T	18	100MHz, 200mV	8	2,500	0.55	300	J, K
MHI0402D22N_T	22	100MHz, 200mV	8	2,200	0.7	300	J, K
MHI0402D24N_T	24	100MHz, 200mV	8	2,100	0.7	300	J, K
MHI0402D27N_T	27	100MHz, 200mV	8	2,000	0.8	300	J, K
MHI0402D33N_T	33	100MHz, 200mV	8	1,800	0.9	200	J, K
MHI0402D39N_T	39	100MHz, 200mV	8	1,600	1	150	J, K

¹IDC: Applied the current to coils, the inductance shall be less than 10% initial value.



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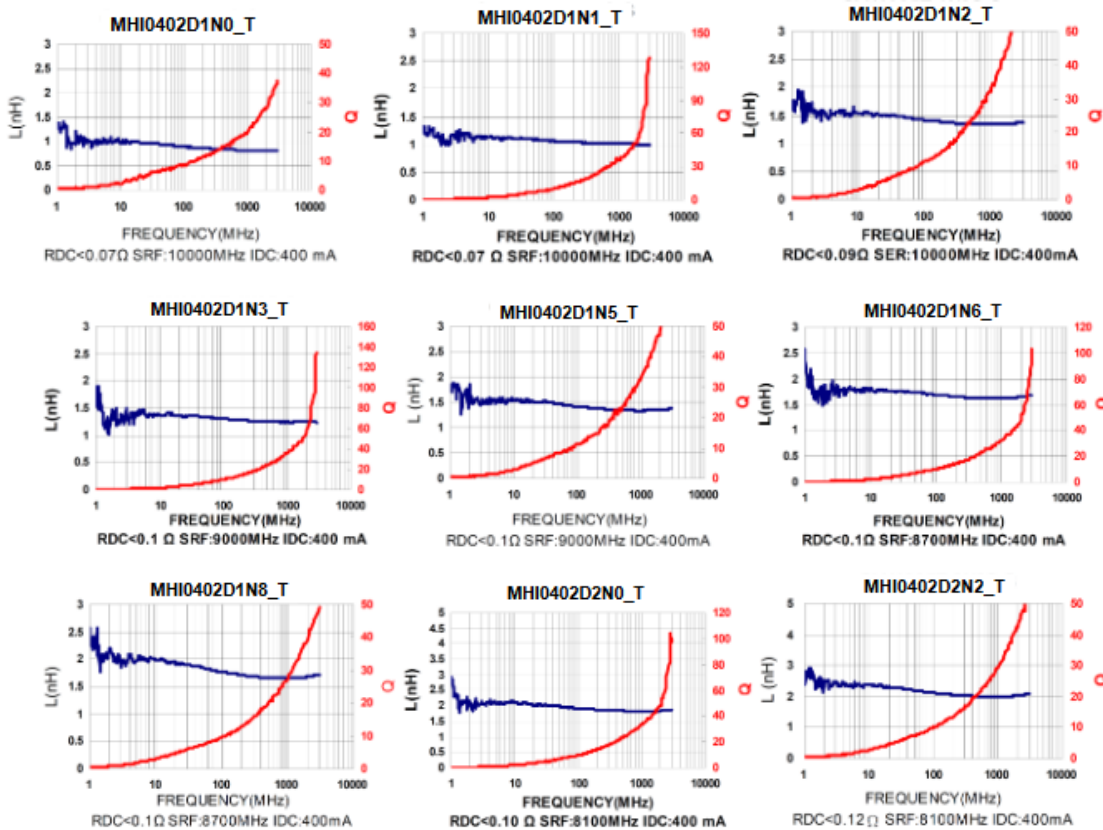
General Electrical Characteristics (Continue):

Part Number	Inductance (nH)	L, Q Test Frequency	Q Min.	SRF typ. (MHz)	RDC Max. (Ω)	IDC ¹ Max. (mA)	Tolerance
MHI0402D47N_T	47	100MHz, 200mV	8	1,400	1.2	150	J, K
MHI0402D56N_T	56	100MHz, 200mV	8	1,300	1.3	150	J, K
MHI0402D68N_T	68	100MHz, 200mV	8	1,100	1.5	100	J, K
MHI0402D75N_T	75	100MHz, 200mV	8	1,080	1.5	100	J, K
MHI0402D82N_T	82	100MHz, 200mV	8	1,000	1.6	100	J, K
MHI0402DR10_T	100	100MHz, 200mV	8	900	2	100	J, K
MHI0402DR12_T	120	100MHz, 200mV	8	800	2.2	100	J, K
MHI0402DR15_T	150	100MHz, 200mV	8	700	3.5	100	J, K
MHI0402DR18_T	180	100MHz, 200mV	8	600	3.8	100	J, K
MHI0402DR22_T	220	100MHz, 200mV	8	500	4.2	100	J, K
MHI0402DR27_T	270	100MHz, 200mV	8	500	4.8	100	J, K

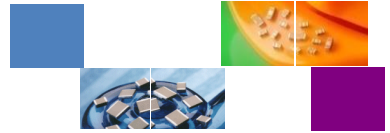
¹ IDC: Applied the current to coils, the inductance shall be less than 10% initial value.

High Frequency Characteristics:

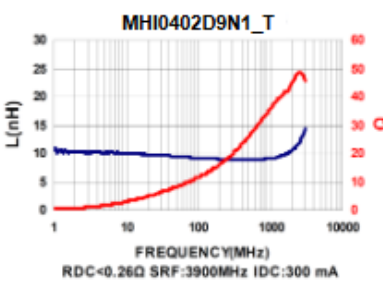
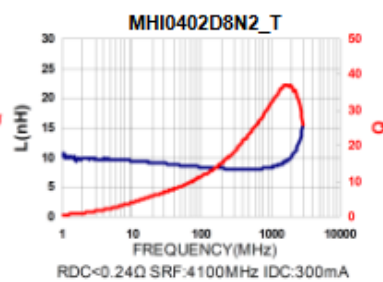
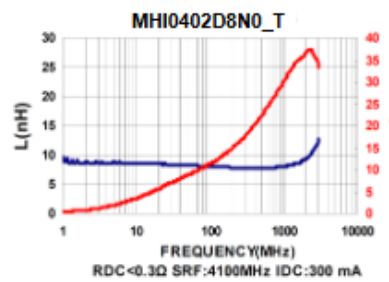
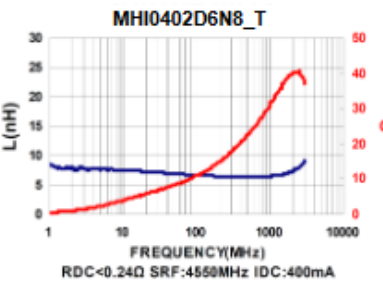
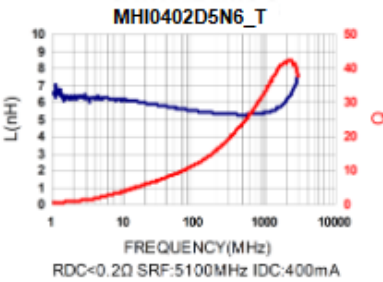
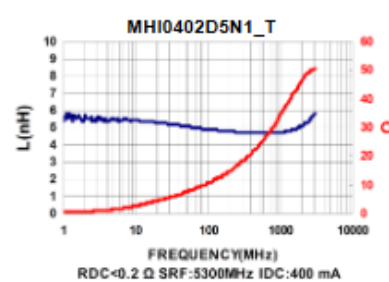
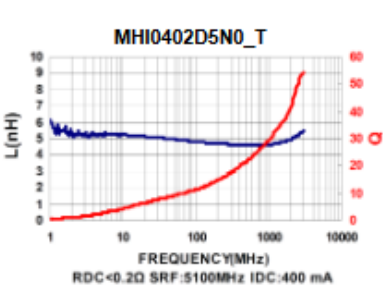
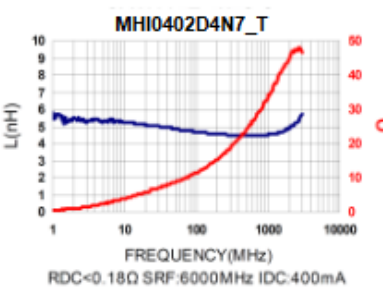
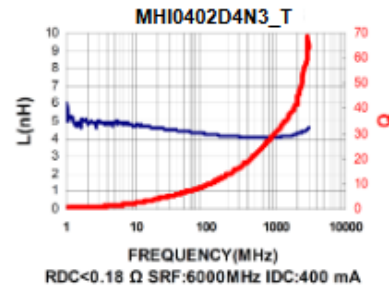
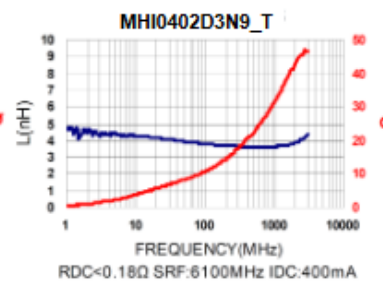
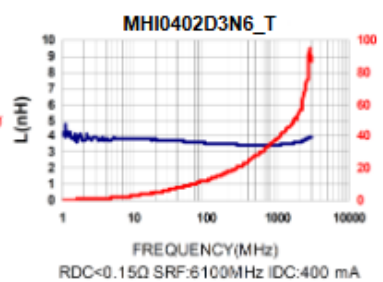
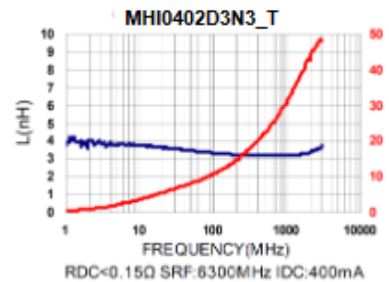
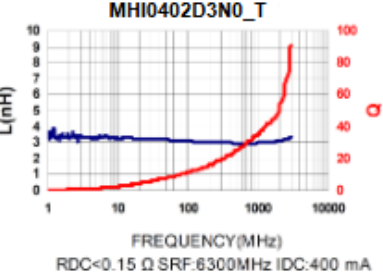
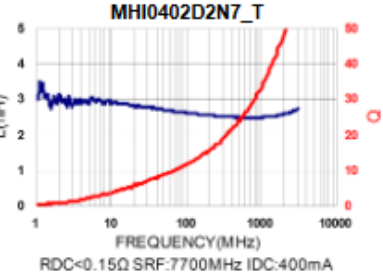
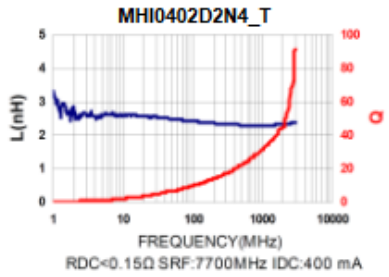
Test Instruments : Agilent E4991A Material/Impedance Analyzer



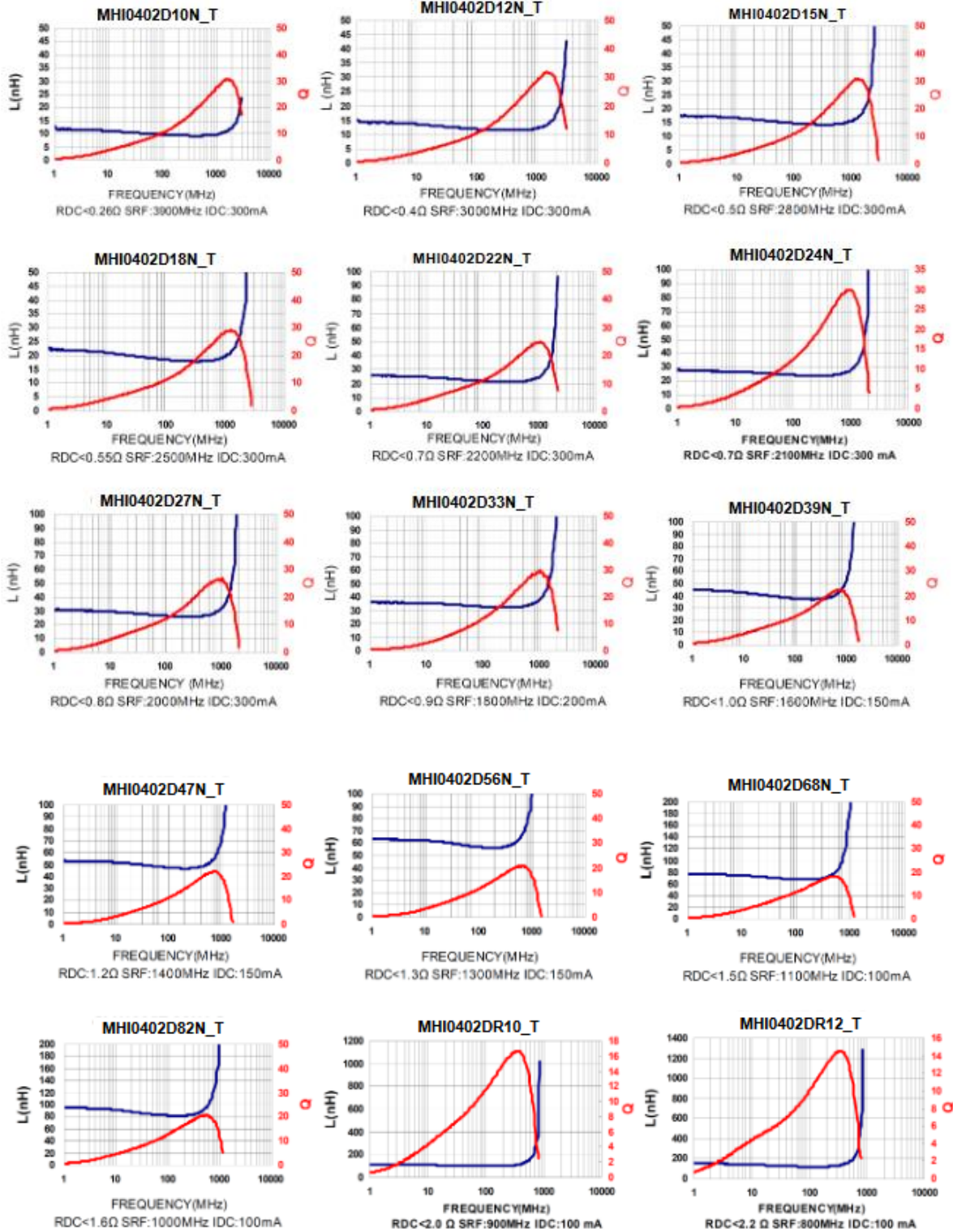
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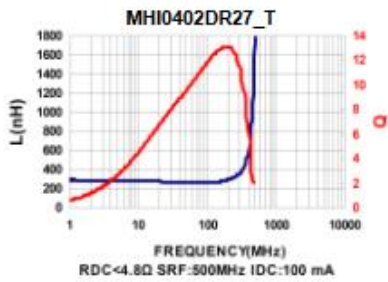
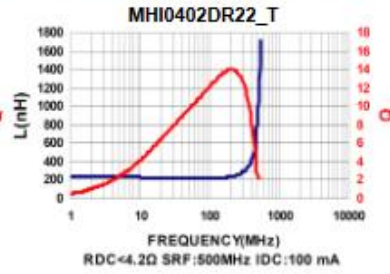
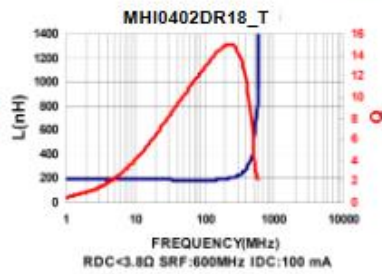
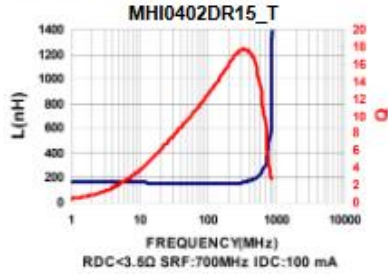
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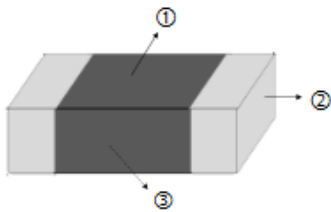
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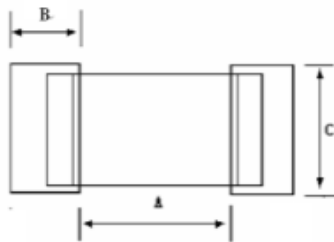


Construction and Materials:



Body ①	Al ₂ O ₃ /SiO ₂ base ceramic
Termination ②	Ag/Cu/Ni/Sn
Inner electrode ③	Ag

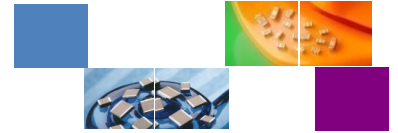
Recommended Foot Print Dimensions:



Size	A (mm)	B (mm)	C (mm)
0402	0.35~0.40	0.40~0.50	0.50~0.55
0603	0.70~0.80	0.55~0.60	0.80~0.90

Packaging:

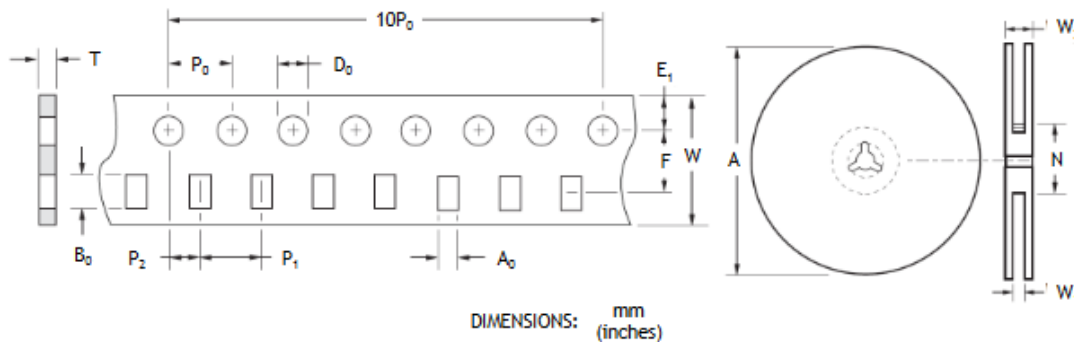
Chip Size	Parts on 7 inch (178mm) Reel
0402	10,000
0603	4,000



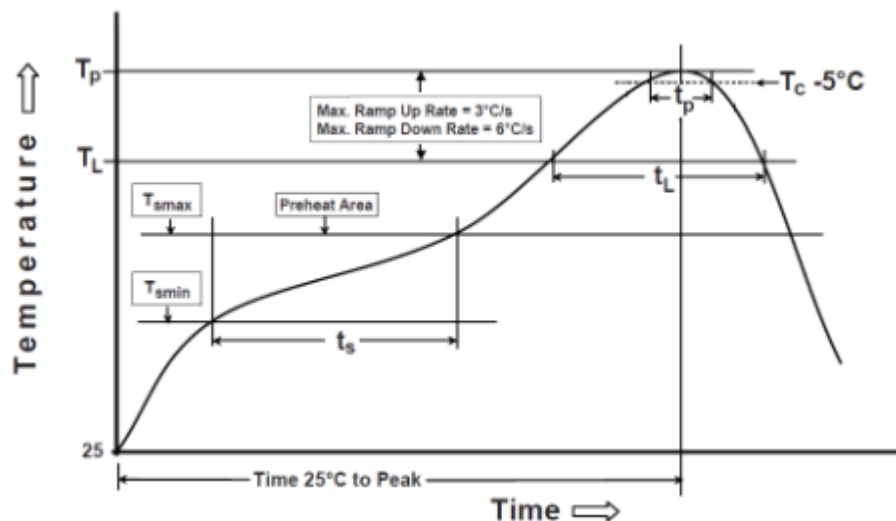
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Tape and Reel Specifications:

Dimensions (Tape)	MHI0402D Series	MHI0603D Series	Dimensions (Reel)	MHI0402D Series MHI0603D Series
W	8.0±0.1 (0.315±0.004)	8.0±0.1 (0.315±0.004)	A max.	178 (7.01)
P ₀	4.0±0.1 (0.157±0.004)	4.0±0.1 (0.157±0.004)	N min.	60 (2.362)
P ₁	4.0±0.05 (0.157±0.002)	4.0±0.05 (0.157±0.002)	W ₁	9.0 (0.354)
P ₂	2.0±0.05 (0.079±0.002)	2.0±0.05 (0.079±0.002)	W ₂	12 (0.472)
A ₀	0.62±0.1 (0.024±0.004)	1.0±0.1 (0.039±0.004)		
B ₀	1.12±0.1 (0.044±0.004)	1.8±0.1 (0.071±0.004)		
D ₀	1.55±0.1 (0.061±0.004)	1.55±0.1 (0.061±0.004)		
F	3.5±0.05 (0.138±0.002)	3.5±0.05 (0.138±0.002)		
E ₁	1.75±0.1 (0.069±0.004)	1.75±0.1 (0.069±0.004)		
T	0.60±0.05 (0.024±0.002)	0.95±0.05 (0.037±0.002)		
10P ₀	40.0±0.1 (1.575±0.004)	40.0±0.1 (1.575±0.004)		

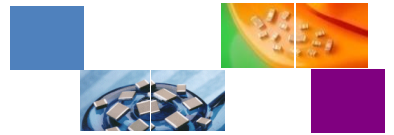


Recommended Reflow Soldering Profile:



Profile Feature	Pb-Free Assembly
Preheat/Soak	
Temperature Min (T_{smin})	150°C
Temperature Max(T_{smax})	200°C
Time(t_s) from (T_{smin} to T_{smax})	60~120 seconds
Ramp-uprate (T_L to T_p)	3°C/second max.
Liquidous temperature(T_L)	217°C
Time(t_L) maintained above T_L	60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (T_c)	30 seconds *
Ramp-down rate (T_p to T_L)	6°C/second max.
Time 25°C to peak temperature	8 minutes max.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

Do not use this product in any Automotive Power train or Safety equipment such as ECU, ABSsystems, or Battery Pack, Battery Management System, Battery Charger for Electric Vehicles and Plug-in Hybrid Vehicles. Only AEM products clearly described as "for Automotive Use" on ist catalog can be used for automobile applications such as Power train and Safety equipment.



**Multilayer Ceramic Chip Inductors
MHI_D Series, 0603 Size**

Features:

- Monolithic structure with high reliability
- High quality ceramic material and unique manufacturing processes providing high Q at high frequencies and high self-resonant frequencies
- Superior termination bonding strength
- Nickel barrier with solder overplated termination offering excellent solderability and solder leach resistance, suitable for both wave and reflow soldering processes
- Halogen free and RoHS compliant

Applications:

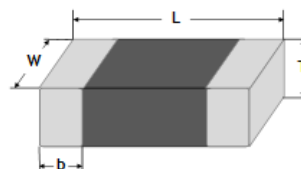
- High frequency equipment including cellular phones, pagers, radar detectors, computer communications, etc

Ordering Code:

MHI	0603	D	10N	J	T
<u>Series Code</u>	<u>Size Code</u> inch (mm)	<u>Characteristic Code</u>	<u>Inductance Code</u>	<u>Tolerance Code</u>	<u>Package Code</u>
MHI: Multilayer ceramic chip inductor	0402 (1005) 0603 (1608)		1N0 = 1nH 10N = 10nH R10 = 100nH	J = ±5% K = ±10% S = ±0.3nH	T = Tape & Reel

Shape and Dimensions:

Unit (mm)	0603 (1608)
Length (L)	1.6±0.15
Width (W)	0.8±0.15
Thickness (T)	0.8±0.15
Termination bandwidth (b)	0.3±0.20



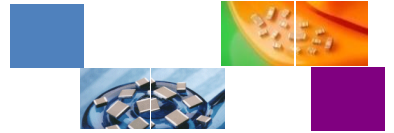


General Electrical Characteristics:

✧ Operating temperature: -55 to +125°C (including self-temperature rise)

Part Number	Inductance (nH)	L Test Frequency	Q Min. @ 100MHz	Q Typ. @ 800MHz	SRF typ. (MHz)	RDC Max. (Ω)	IDC ¹ Max. (mA)	Tolerance
MHI0603D1N0_T	1.0	100 MHz, 200 mV	8	30	10000	0.1	600	S
MHI0603D1N2_T	1.2	100 MHz, 200 mV	8	30	10000	0.1	600	S
MHI0603D1N5_T	1.5	100 MHz, 200 mV	8	30	8000	0.1	600	S
MHI0603D1N6_T	1.6	100 MHz, 200 mV	8	30	8000	0.1	600	S
MHI0603D 1N8_T	1.8	100 MHz, 200 mV	8	30	8000	0.1	600	S
MHI0603D2N2_T	2.2	100 MHz, 200 mV	8	40	7200	0.1	600	S
MHI0603D2N7_T	2.7	100 MHz, 200 mV	10	40	6200	0.1	600	S
MHI0603D3N0_T	3.0	100 MHz, 200 mV	10	40	5200	0.12	600	S
MHI0603D3N3_T	3.3	100 MHz, 200 mV	10	40	5200	0.12	600	S, K
MHI0603D3N6_T	3.6	100 MHz, 200 mV	10	40	5000	0.14	600	S
MHI0603D3N9_T	3.9	100 MHz, 200 mV	10	40	5000	0.14	600	S, K
MHI0603D4N3_T	4.3	100 MHz, 200 mV	10	40	4750	0.16	600	S, K
MHI0603D4N7_T	4.7	100 MHz, 200 mV	10	40	4750	0.16	600	S, K
MHI0603D5N1_T	5.1	100 MHz, 200 mV	10	40	4100	0.18	600	S, K
MHI0603D5N6_T	5.6	100 MHz, 200 mV	10	40	4100	0.18	600	S, K
MHI0603D6N2_T	6.2	100 MHz, 200 mV	10	40	3750	0.22	600	J, K
MHI0603D6N8_T	6.8	100 MHz, 200 mV	10	40	3750	0.22	600	J, K
MHI0603D7N5_T	7.5	100 MHz, 200 mV	10	40	3300	0.24	600	J, K
MHI0603D8N2_T	8.2	100 MHz, 200 mV	10	40	3300	0.24	600	J, K
MHI0603D10N_T	10	100 MHz, 200 mV	12	40	3000	0.26	600	J, K
MHI0603D12N_T	12	100 MHz, 200 mV	12	40	2600	0.28	600	J, K
MHI0603D15N_T	15	100 MHz, 200 mV	12	40	2500	0.32	600	J, K
MHI0603D16N_T	16	100 MHz, 200 mV	12	40	2400	0.35	600	J, K
MHI0603D18N_T	18	100 MHz, 200 mV	12	40	2400	0.35	600	J, K
MHI0603D22N_T	22	100 MHz, 200 mV	12	40	2000	0.4	500	J, K
MHI0603D27N_T	27	100 MHz, 200 mV	12	38	1900	0.45	500	J, K
MHI0603D33N_T	33	100 MHz, 200 mV	12	38	1600	0.55	400	J, K
MHI0603D39N_T	39	100 MHz, 200 mV	12	38	1400	0.6	400	J, K
MHI0603D47N_T	47	100 MHz, 200 mV	12	28	1300	0.7	400	J, K
MHI0603D56N_T	56	100 MHz, 200 mV	12	28	1100	0.75	400	J, K

¹IDC: Applied the current to coils, the inductance shall be less than 10% initial value.



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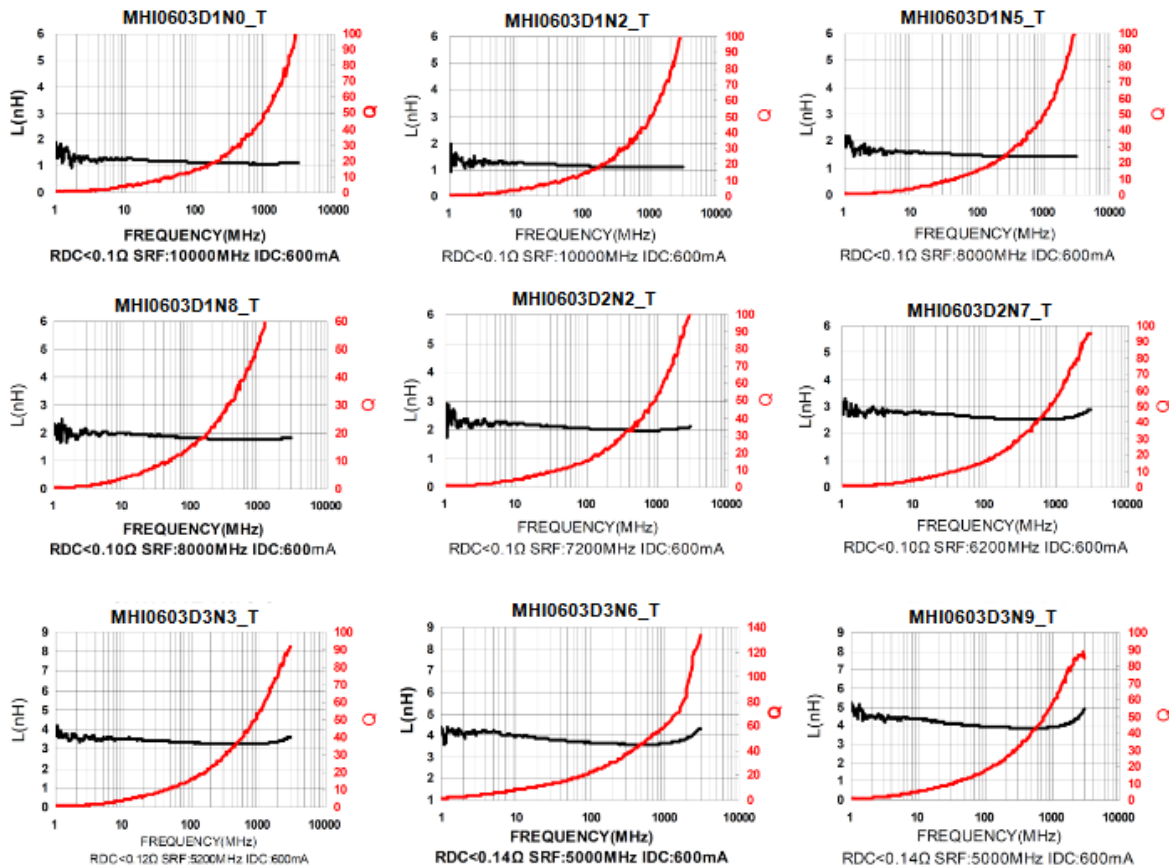
General Electrical Characteristics (Continue):

Part Number	Inductance (nH)	L Test Frequency	Q Min. @ 100MHz	Q Typ. @ 800MHz	SRF typ. (MHz)	RDC Max. (Ω)	IDC ¹ Max. (mA)	Tolerance
MHI0603D62N_T	62	100 MHz, 200 mV	12	22	1050	0.85	400	J, K
MHI0603D68N_T	68	100 MHz, 200 mV	12	22	1050	0.85	400	J, K
MHI0603D75N_T	75	100 MHz, 200 mV	12	20	900	1	300	J, K
MHI0603D82N_T	82	100 MHz, 200 mV	12	18	900	1	300	J, K
MHI0603DR10_T	100	100 MHz, 200 mV	12	13	770	1.2	300	J, K
MHI0603DR12_T	120	50 MHz, 200 mV	8	-	650	1.3	300	J, K
MHI0603DR15_T	150	50 MHz, 200 mV	8	-	550	1.7	250	J, K
MHI0603DR18_T	180	50 MHz, 200 mV	8	-	520	1.9	250	J, K
MHI0603DR22_T	220	50 MHz, 200 mV	8	-	500	2	250	J, K
MHI0603DR27_T	270	50 MHz, 200 mV	8	-	470	2.2	150	J, K
MHI0603DR33_T	330	50 MHz, 200 mV	8	-	320	2.8	100	J, K
MHI0603DR39_T	390	50 MHz, 200 mV	8	-	300	3	100	J, K

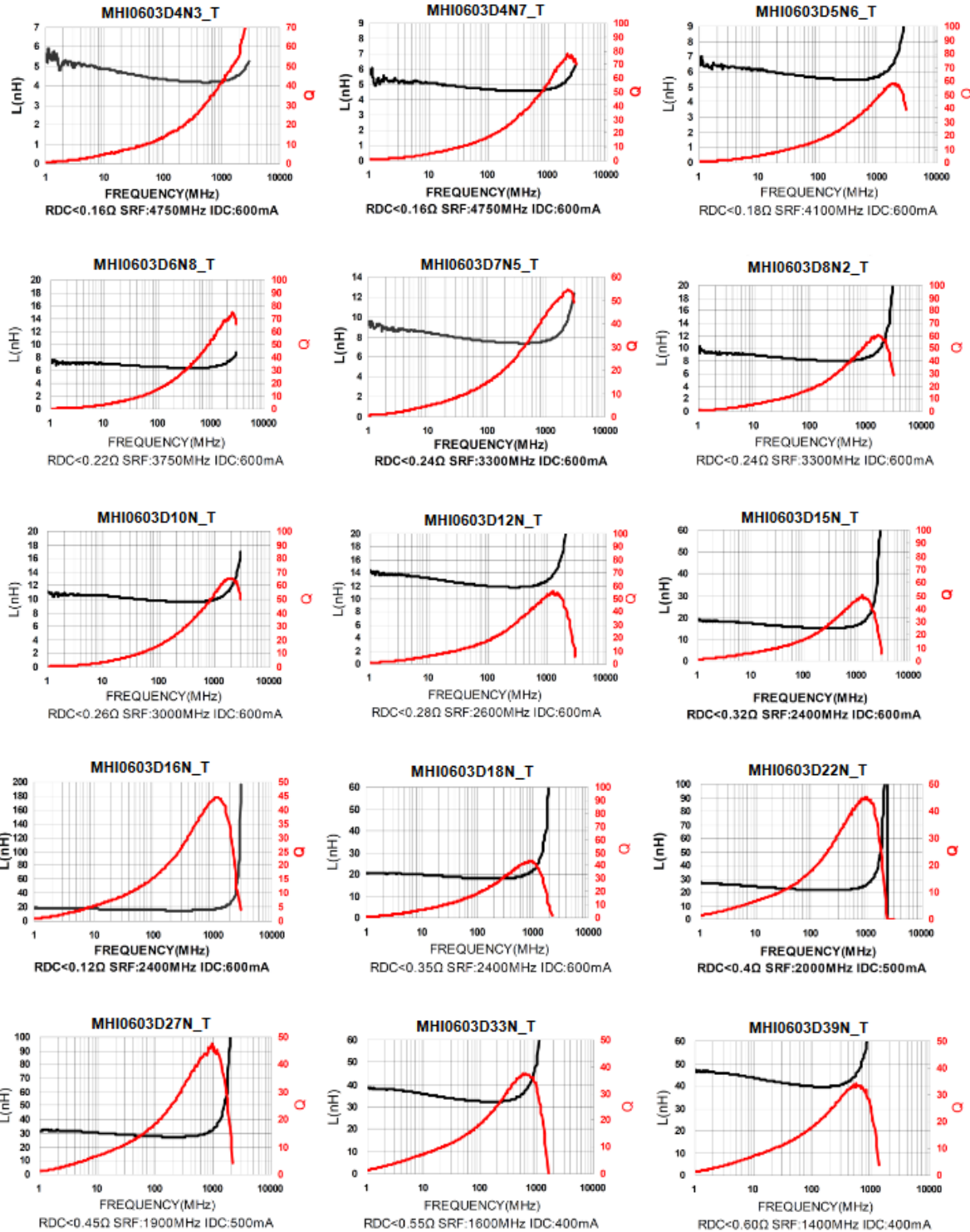
¹ IDC: Applied the current to coils, the inductance shall be less than 10% initial value.

High Frequency Characteristics:

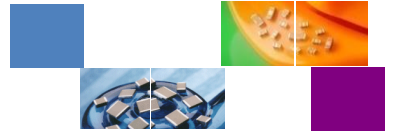
Test Instruments : Agilent E4991A Material/Impedance Analyzer



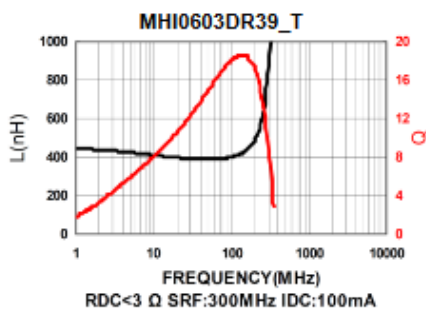
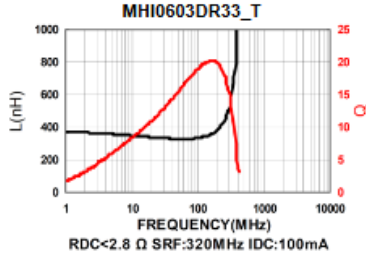
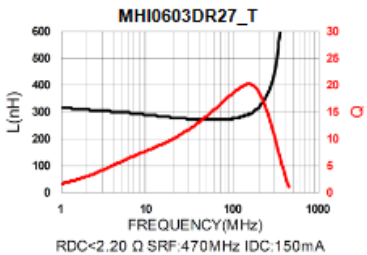
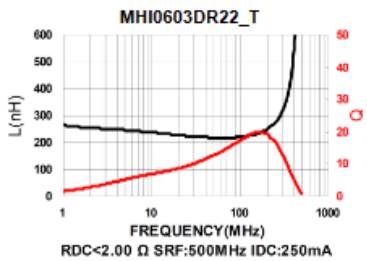
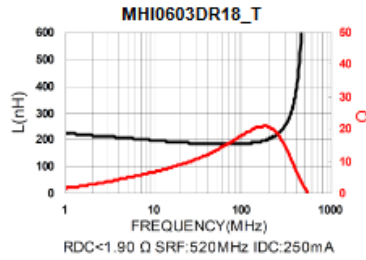
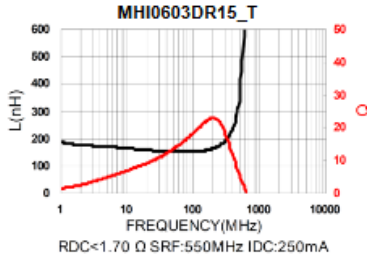
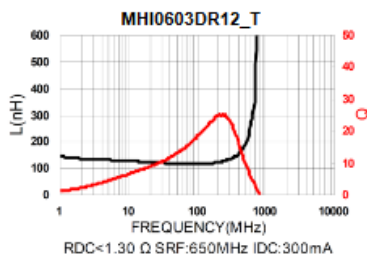
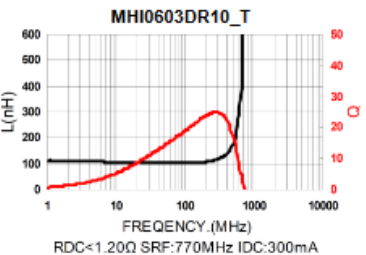
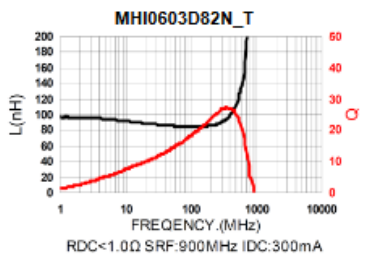
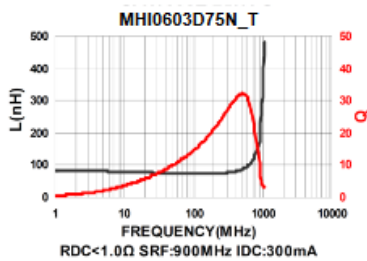
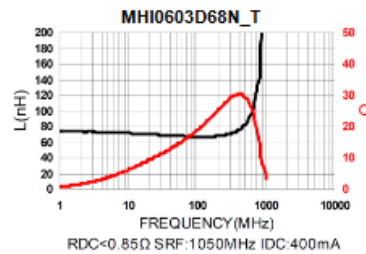
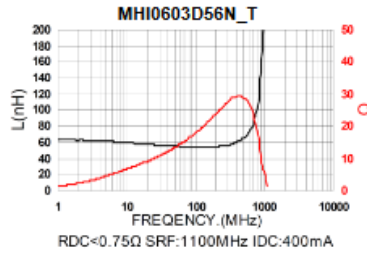
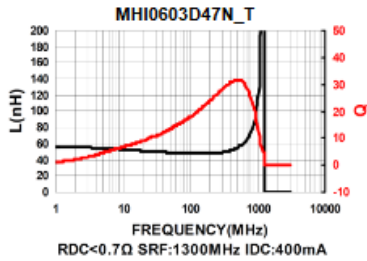
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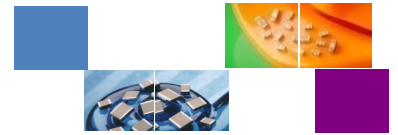
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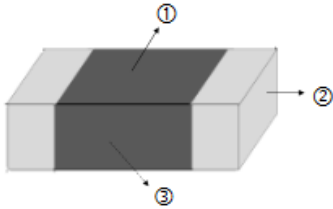


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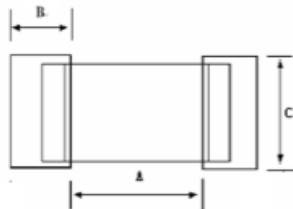
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Construction and Materials:



Body ①	Al ₂ O ₃ /SiO ₂ base ceramic
Termination ②	Ag/Cu/Ni/Sn
Inner electrode ③	Ag

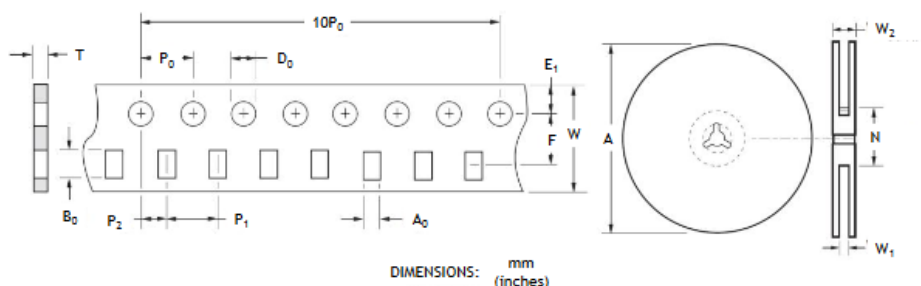
Recommended Foot Print Dimensions:



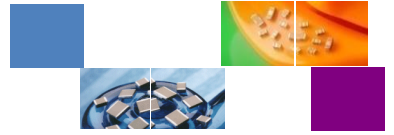
Size	A (mm)	B (mm)	C (mm)
0402	0.35~0.40	0.40~0.50	0.50~0.55
0603	0.70~0.80	0.55~0.60	0.80~0.90

Tape and Reel Specifications:

Dimensions (Tape)	MHI0402D Series	MHI0603D Series	Dimensions (Reel)	MHI0402D Series MHI0603D Series
W	8.0±0.1 (0.315±0.004)	8.0±0.1 (0.315±0.004)	A max.	178 (7.01)
P ₀	4.0±0.1 (0.157±0.004)	4.0±0.1 (0.157±0.004)	N min.	60 (2.362)
P ₁	4.0±0.05 (0.157±0.002)	4.0±0.05 (0.157±0.002)	W ₁	9.0 (0.354)
P ₂	2.0±0.05 (0.079±0.002)	2.0±0.05 (0.079±0.002)	W ₂	12 (0.472)
A ₀	0.62±0.1 (0.024±0.004)	1.0±0.1 (0.039±0.004)		
B ₀	1.12±0.1 (0.044±0.004)	1.8±0.1 (0.071±0.004)		
D ₀	1.55±0.1 (0.061±0.004)	1.55±0.1 (0.061±0.004)		
F	3.5±0.05 (0.138±0.002)	3.5±0.05 (0.138±0.002)		
E ₁	1.75±0.1 (0.069±0.004)	1.75±0.1 (0.069±0.004)		
T	0.60±0.05 (0.024±0.002)	0.95±0.05 (0.037±0.002)		
10P ₀	40.0±0.1 (1.575±0.004)	40.0±0.1 (1.575±0.004)		



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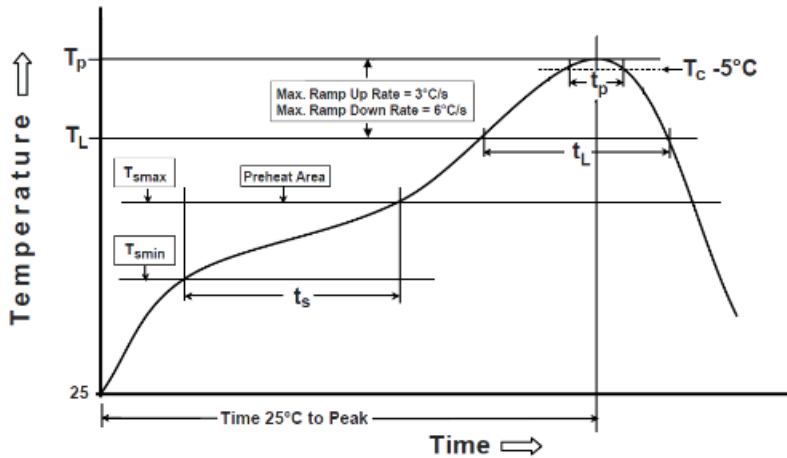


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Packaging:

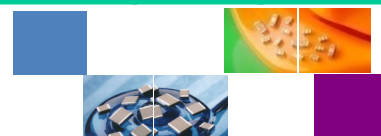
Chip Size	Parts on 7 inch (178mm) Reel
0402	10,000
0603	4,000

Recommended Reflow Soldering Profile:



Profile Feature	Pb-Free Assembly
Preheat/Soak	
Temperature Min (T_{smin})	150°C
Temperature Max (T_{smax})	200°C
Time (t_s) from (T_{smin} to T_{smax})	60~120 seconds
Ramp-up rate (T_L to T_p)	3°C/second max.
Liquidous temperature (T_L)	217°C
Time (t_L) maintained above T_L	60~150 seconds
Peak package body temperature (T_p)	260°C
Time (t_p)*within 5°C of the specified classification temperature (T_c)	30 seconds *
Ramp-down rate (T_p to T_L)	6°C/second max.
Time 25°C to peak temperature	8 minutes max.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

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