

# MNR40\*\* Series

## Wire Wound SMD Power Inductors

### FEATURES

- Magnetic-resin shielded construction reduces buzz noise to ultra-low levels
- Metallization on ferrite core results in excellent shock resistance and damage-free durability
- Closed magnetic circuit design reduces leakage flux and Electro Magnetic Interference (EMI)
- 30% higher current rating than conventional inductors of equal size
- Takes up less PCB real estate and save more power
- Operate temperature range ....  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$  (Including self temp. rise)
- RoHS compliant



### APPLICATIONS

- Smart phone, smart TV, set top box, notebook
- Car navigation systems, telecomm base stations
- VR, AR
- LED lighting

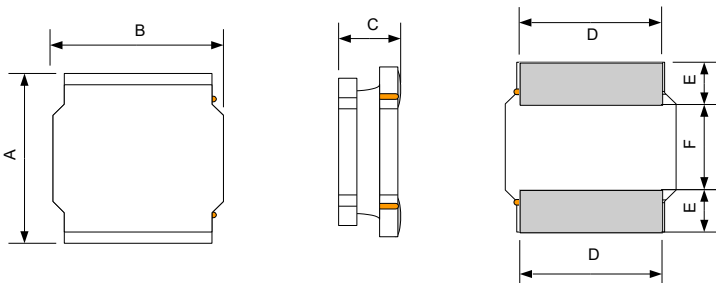
### Explanation of Part Number

MNR 4018 T1R0 M T

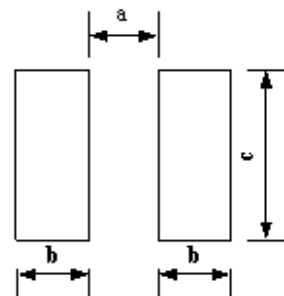
1 2 3 4 5 6

- ◆ 1:Product Series:Wire Wound SMD Power Inductors
- ◆ 2:Dimensions:
- ◆ 3: Feature Type:T Type
- ◆ 4: Initial inductance value: 1R0 = 1.0uH
- ◆ 5: Tolerance of Inductance:M:+/-20%, N:+/-30%
- ◆ 6:Packing:Tape Carrier Package

### Dimensions: [mm]



### Recommended Land Pattern



Unit: mm

Series	A	B	C	D	E	F	a Typ.	b Typ.	c Typ.
MNR4010	4.0±0.2	4.0±0.2	1.0 Max.	3.3±0.2	0.95±0.2	2.1±0.2	1.9	1.1	3.7
MNR4012	4.0±0.2	4.0±0.2	1.2 Max.	3.3±0.2	0.95±0.2	2.1±0.2	1.9	1.1	3.7
MNR4018	4.0±0.2	4.0±0.2	1.8 Max.	3.3±0.2	0.95±0.2	2.1±0.2	1.9	1.1	3.7
MNR4020	4.0±0.2	4.0±0.2	2.0 Max.	3.3±0.2	0.95±0.2	2.1±0.2	1.9	1.1	3.7
MNR4030	4.0±0.2	4.0±0.2	3.0 Max.	3.3±0.2	0.95±0.2	2.1±0.2	1.9	1.1	3.7

## Electrical Characteristics List

### MNR4010 Series

Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>3</sup>		Heat Rating Current <sup>4</sup>	
	@100kHz,1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	µH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4010T1R0NT	1.0±30%	0.067	0.056	104	2.00	2.30	1.90	2.40
MNR4010T1R5NT	1.5±30%	0.084	0.070	71	1.68	2.00	1.70	2.00
MNR4010T2R2MT	2.2±20%	0.102	0.085	52	1.20	1.50	1.50	2.00
MNR4010T3R3MT	3.3±20%	0.120	0.100	42	1.10	1.40	1.40	1.80
MNR4010T4R7MT	4.7±20%	0.168	0.140	30	0.95	1.10	1.20	1.50
MNR4010T6R8MT	6.8±20%	0.240	0.200	26	0.80	0.95	1.00	1.20
MNR4010T100MT	10±20%	0.360	0.300	19	0.62	0.75	0.75	1.00
MNR4010T150MT	15±20%	0.516	0.430	17	0.54	0.61	0.60	0.85
MNR4010T220MT	22±20%	0.684	0.570	11	0.45	0.52	0.50	0.75

### MNR4012 Series

Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>3</sup>		Heat Rating Current <sup>4</sup>	
	@100kHz,1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	µH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4012TR82NT	0.82±30%	0.065	0.050	150	3.02	3.30	1.65	2.50
MNR4012T1R0MT	1.0±20%	0.065	0.050	120	2.61	3.20	1.65	2.50
MNR4012T1R5MT	1.5±20%	0.085	0.065	90	2.10	2.70	1.46	2.20
MNR4012T1R8MT	1.8±20%	0.104	0.080	88	2.12	2.60	1.32	1.90
MNR4012T2R2MT	2.2±20%	0.104	0.080	74	1.76	2.30	1.32	1.90
MNR4012T2R7MT	2.7±20%	0.117	0.090	71	1.90	2.30	1.25	1.70
MNR4012T3R3MT	3.3±20%	0.143	0.110	60	1.72	2.10	1.12	1.60
MNR4012T3R6MT	3.6±20%	0.143	0.110	57	1.20	1.70	1.12	1.60
MNR4012T4R3MT	4.3±20%	0.182	0.140	54	1.58	1.70	1.00	1.50
MNR4012T4R7MT	4.7±20%	0.163	0.125	50	1.15	1.80	1.05	1.50
MNR4012T5R1MT	5.1±20%	0.201	0.155	50	1.55	1.60	0.95	1.50
MNR4012T5R6MT	5.6±20%	0.182	0.140	42	1.00	1.60	1.00	1.20
MNR4012T6R8MT	6.8±20%	0.257	0.198	40	0.85	1.40	0.84	1.20
MNR4012T100MT	10±20%	0.345	0.265	33	0.80	1.10	0.77	1.00
MNR4012T120MT	12±20%	0.377	0.290	32	0.66	1.00	0.70	0.95
MNR4012T150MT	15±20%	0.442	0.340	25	0.56	0.80	0.64	0.85
MNR4012T180MT	18±20%	0.611	0.470	23	0.55	0.75	0.55	0.80
MNR4012T220MT	22±20%	0.763	0.587	20	0.46	0.70	0.49	0.75
MNR4012T270MT	27±20%	0.936	0.720	18	0.50	0.70	0.45	0.60
MNR4012T330MT	33±20%	1.053	0.810	17	0.42	0.60	0.42	0.58
MNR4012T360MT	36±20%	1.170	0.90	14	0.40	0.50	0.40	0.56
MNR4012T390MT	39±20%	1.430	1.10	16	0.55	0.66	0.37	0.50
MNR4012T470MT	47±20%	1.430	1.10	12	0.35	0.50	0.37	0.50
MNR4012T560MT	56±20%	1.625	1.250	11	0.33	0.45	0.33	0.46
MNR4012T680MT	68±20%	2.535	1.950	11	0.38	0.45	0.27	0.45
MNR4012T820MT	82±20%	2.782	2.140	11	0.28	0.40	0.26	0.36
MNR4012T101MT	100±20%	2.873	2.210	9.4	0.25	0.30	0.25	0.35

## MNR4018 Series

Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>*3</sup>		Heat Rating Current <sup>*4</sup>	
	@100kHz,1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	μH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4018TR47NT	0.47±30%	0.018	0.014	155	4.30	5.20	4.00	4.50
MNR4018TR68NT	0.68±30%	0.026	0.020	128	4.90	5.60	3.30	3.80
MNR4018T1R0MT	1.0±20%	0.033	0.025	80	4.80	5.20	2.00	3.30
MNR4018T1R5MT	1.5±20%	0.039	0.030	65	3.35	4.00	1.80	3.20
MNR4018T1R8MT	1.8±20%	0.044	0.034	54	3.00	3.40	2.00	2.80
MNR4018T2R2MT	2.2±20%	0.059	0.045	52	2.70	3.20	1.65	2.60
MNR4018T3R3MT	3.3±20%	0.091	0.070	44	2.45	2.90	1.23	2.10
MNR4018T4R7MT	4.7±20%	0.117	0.090	34	1.70	2.20	1.20	1.80
MNR4018T6R8MT	6.8±20%	0.143	0.110	29	1.45	2.00	1.06	1.50
MNR4018T100MT	10±20%	0.234	0.180	24	1.30	1.60	0.84	1.20
MNR4018T150MT	15±20%	0.325	0.250	19	0.94	1.10	0.65	1.00
MNR4018T220MT	22±20%	0.468	0.360	16	0.80	0.88	0.59	0.85
MNR4018T330MT	33±20%	0.689	0.530	12	0.56	0.75	0.49	0.72
MNR4018T470MT	47±20%	0.845	0.650	10	0.57	0.70	0.42	0.65
MNR4018T680MT	68±20%	1.30	1.0	8.3	0.47	0.51	0.32	0.52
MNR4018T101MT	100±20%	2.275	1.750	6.5	0.40	0.44	0.25	0.41
MNR4018T151MT	150±20%	3.250	2.50	5.5	0.31	0.34	0.22	0.36
MNR4018T221MT	220±20%	5.20	4.0	4	0.27	0.30	0.17	0.27

## MNR4020 Series

Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>*3</sup>		Heat Rating Current <sup>*4</sup>	
	@100kHz,1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	μH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4020TR24MT	0.24±20%	0.014	0.011	283	10.5	12.5	4.50	5.20
MNR4020TR33NT	0.33±30%	0.016	0.013	223	7.50	8.50	3.30	4.90
MNR4020TR47NT	0.47±30%	0.029	0.022	160	7.00	7.50	3.30	3.70
MNR4020TR68NT	0.68±30%	0.036	0.028	120	6.40	6.60	2.80	3.30
MNR4020T1R0MT	1.0±20%	0.038	0.029	75	4.78	5.20	2.15	3.20
MNR4020T1R2MT	1.2±20%	0.038	0.029	72	5.10	5.60	2.15	3.20
MNR4020T1R5MT	1.5±20%	0.046	0.035	71	4.45	4.90	1.98	3.00
MNR4020T2R2MT	2.2±20%	0.052	0.040	49	3.40	3.70	1.85	2.80
MNR4020T3R3MT	3.3±20%	0.091	0.070	44	3.20	3.50	1.40	2.50
MNR4020T3R6MT	3.6±20%	0.072	0.055	49	2.80	3.00	1.54	2.50
MNR4020T4R7MT	4.7±20%	0.098	0.075	42	2.35	2.50	1.34	2.00
MNR4020T5R1MT	5.1±20%	0.111	0.085	42	2.30	2.50	1.27	1.80
MNR4020T5R6MT	5.6±20%	0.117	0.090	30	2.20	2.40	1.22	1.80
MNR4020T6R2MT	6.2±20%	0.150	0.115	36	2.15	2.30	1.08	1.60
MNR4020T6R8MT	6.8±20%	0.163	0.125	33	2.20	2.40	1.04	1.60
MNR4020T7R5MT	7.5±20%	0.150	0.115	30	1.85	2.00	1.08	1.50
MNR4020T8R2MT	8.2±20%	0.163	0.125	27	1.75	1.90	1.04	1.40
MNR4020T100MT	10±20%	0.215	0.165	26	1.60	1.70	0.90	1.20
MNR4020T120MT	12±20%	0.228	0.175	26	1.50	1.60	0.88	1.20
MNR4020T150MT	15±20%	0.299	0.230	24	1.35	1.50	0.77	1.10
MNR4020T220MT	22±20%	0.455	0.350	15	1.05	1.10	0.62	0.87
MNR4020T270MT	27±20%	0.709	0.545	14	1.02	1.10	0.50	0.70

Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>*3</sup>		Heat Rating Current <sup>*4</sup>	
	@100kHz,1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	μH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4020T330MT	33±20%	0.715	0.550	11	0.85	0.93	0.49	0.68
MNR4020T390MT	39±20%	0.845	0.650	11	0.82	0.90	0.46	0.64
MNR4020T430MT	43±20%	0.858	0.660	10	0.77	0.85	0.45	0.63
MNR4020T470MT	47±20%	0.923	0.710	10	0.74	0.81	0.44	0.61
MNR4020T510MT	51±20%	0.975	0.750	10	0.70	0.77	0.42	0.59
MNR4020T560MT	56±20%	1.040	0.80	10	0.66	0.72	0.41	0.57
MNR4020T620MT	62±20%	1.170	0.90	9.6	0.65	0.71	0.39	0.52
MNR4020T680MT	68±20%	1.380	1.060	7.7	0.61	0.67	0.36	0.50
MNR4020T750MT	75±20%	1.510	1.160	7.7	0.70	0.77	0.35	0.49
MNR4020T820MT	82±20%	1.520	1.170	7.2	0.50	0.55	0.34	0.47
MNR4020T101MT	100±20%	2.020	1.550	6.3	0.48	0.53	0.31	0.43

### MNR4030 Series

Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>*3</sup>		Heat Rating Current <sup>*4</sup>	
	@100kHz,1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	μH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4030TR68NT	0.68±30%	0.013	0.010	130	6.80	8.00	4.56	5.10
MNR4030TR91NT	0.91±30%	0.017	0.013	100	6.25	6.80	4.15	4.70
MNR4030T1R0MT	1.0±20%	0.018	0.014	70	5.26	5.70	4.15	4.70
MNR4030T1R2MT	1.2±20%	0.020	0.015	80	5.80	6.30	3.82	4.20
MNR4030T1R5MT	1.5±20%	0.026	0.020	62	4.84	5.30	3.34	3.60
MNR4030T1R8MT	1.8±20%	0.033	0.025	60	4.50	5.00	3.20	3.30
MNR4030T2R2MT	2.2±20%	0.039	0.030	52	4.90	5.80	2.95	3.20
MNR4030T3R3MT	3.3±20%	0.052	0.040	38	3.30	3.60	2.40	2.60
MNR4030T3R9MT	3.9±20%	0.074	0.057	32	3.00	3.30	2.10	2.30
MNR4030T4R3MT	4.3±20%	0.072	0.055	37	2.95	3.20	2.10	2.30
MNR4030T4R7MT	4.7±20%	0.078	0.060	31	2.90	3.20	2.00	2.30
MNR4030T5R6MT	5.6±20%	0.085	0.065	30	2.60	2.80	1.95	2.10
MNR4030T6R8MT	6.8±20%	0.117	0.090	24	2.75	3.00	1.60	1.70
MNR4030T7R5MT	7.5±20%	0.111	0.085	26	2.20	2.40	1.65	1.80
MNR4030T8R2MT	8.2±20%	0.117	0.090	26	2.10	2.30	1.60	1.70
MNR4030T100MT	10±20%	0.130	0.10	21	1.95	2.40	1.50	1.60
MNR4030T120MT	12±20%	0.176	0.135	18	1.70	1.80	1.30	1.40
MNR4030T150MT	15±20%	0.247	0.190	16	1.65	1.80	1.11	1.20
MNR4030T180MT	18±20%	0.260	0.20	10	1.40	1.50	1.10	1.20
MNR4030T220MT	22±20%	0.293	0.225	10	1.30	1.40	1.00	1.20
MNR4030T330MT	33±20%	0.429	0.330	10	1.10	1.20	0.84	0.92
MNR4030T360MT	36±20%	0.436	0.335	9.8	1.05	1.10	0.83	0.91
MNR4030T390MT	39±20%	0.566	0.435	10	1.03	1.10	0.73	0.80
MNR4030T470MT	47±20%	0.579	0.445	8.4	0.95	1.00	0.72	0.80
MNR4030T510MT	51±20%	0.611	0.470	8.4	0.90	1.13	0.70	0.80
MNR4030T560MT	56±20%	0.722	0.555	8.4	0.85	0.94	0.65	0.71
MNR4030T620MT	62±20%	0.760	0.585	7	0.80	0.99	0.63	0.70
MNR4030T680MT	68±20%	1.128	0.868	7	0.72	0.80	0.52	0.57

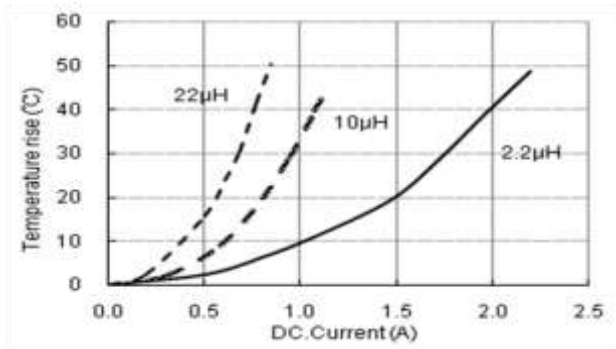
Part Number	Inductance	DC Resistance		Self-resonant Frequency	Saturation Current <sup>*3</sup>		Heat Rating Current <sup>*4</sup>	
	@100kHz, 1V	Max.	Typ.	Min.	Max.	Typ.	Max.	Typ.
Units	μH	Ω		MHz	A		A	
Symbol	L	DCR		S.R.F	Isat		Irms	
MNR4030T750MT	75±20%	1.326	1.020	6.3	0.70	0.88	0.48	0.53
MNR4030T820MT	82±20%	1.378	1.060	5.6	0.66	0.72	0.47	0.52
MNR4030T910MT	91±20%	1.430	1.10	5.6	0.65	0.71	0.46	0.50
MNR4030T101MT	100±20%	1.495	1.150	5.6	0.60	0.73	0.45	0.49
MNR4030T121MT	120±20%	1.755	1.350	5.4	0.55	0.60	0.42	0.46
MNR4030T151MT	150±20%	2.340	1.80	4	0.50	0.55	0.30	0.35
MNR4030T471MT	470±20%	9.360	7.20	2	0.30	0.35	0.20	0.23
MNR4030T501MT	500±20%	9.027	6.944	2	0.28	0.30	0.15	0.20
MNR4030T681MT	680±20%	9.854	7.580	1.2	0.19	0.20	0.14	0.18

- ※1: All test data is referenced to 20°C ambient;
- ※2: Rated current: Isat or Irms, whichever is smaller;
- ※\*3: Isat: DC current at which the inductance drops approximate 30% from its value without current;
- ※\*4: Irms: DC current that causes the temperature rise ( $\Delta T = 40^\circ\text{C}$ ) from 20°C ambient.

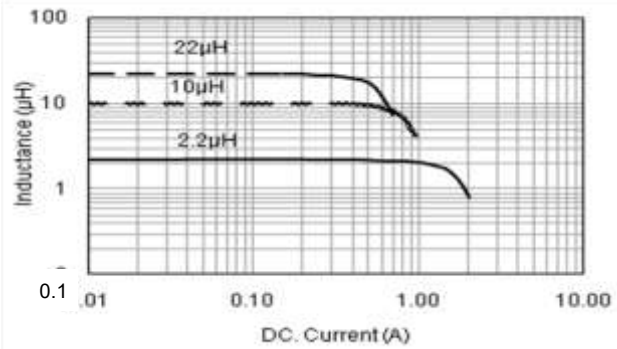
## TYPICAL ELECTRICAL CHARACTERISTICS

### MNR4010 Series

Temperature vs. DC Current Characteristics

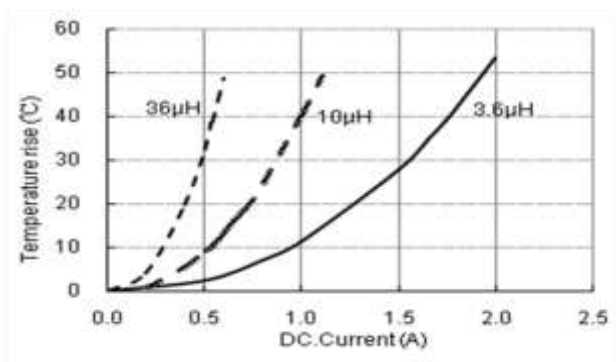


Inductance vs. DC Current Characteristic

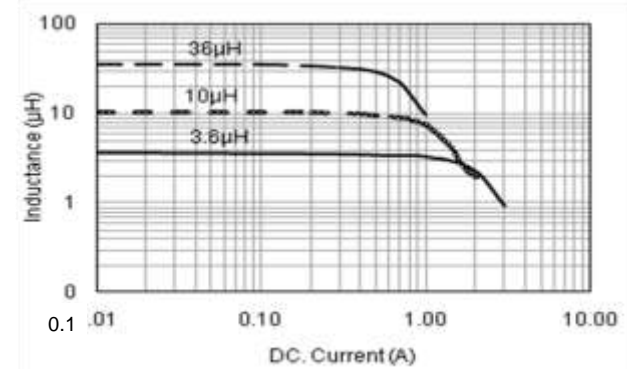


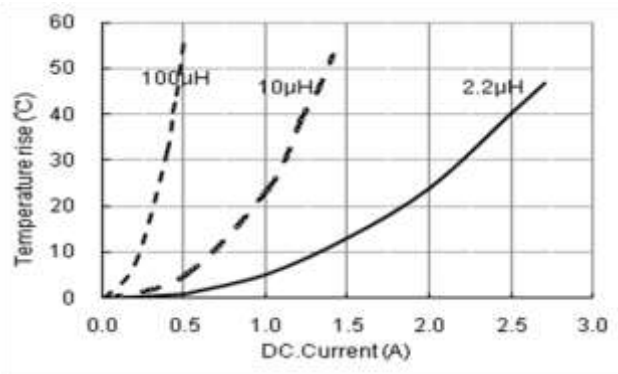
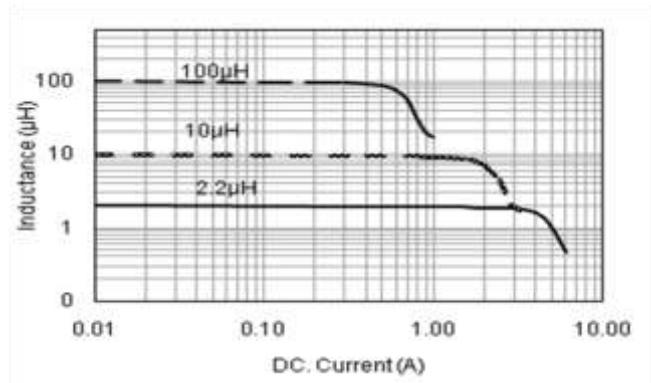
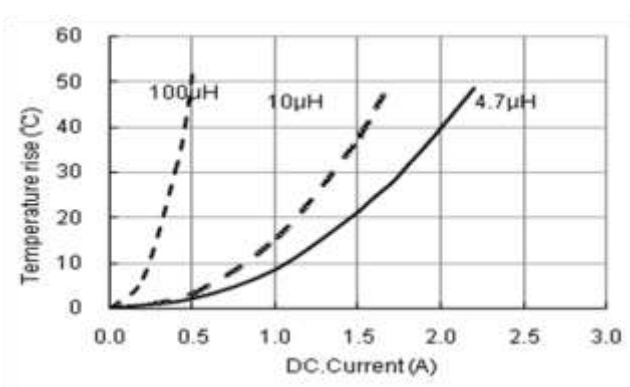
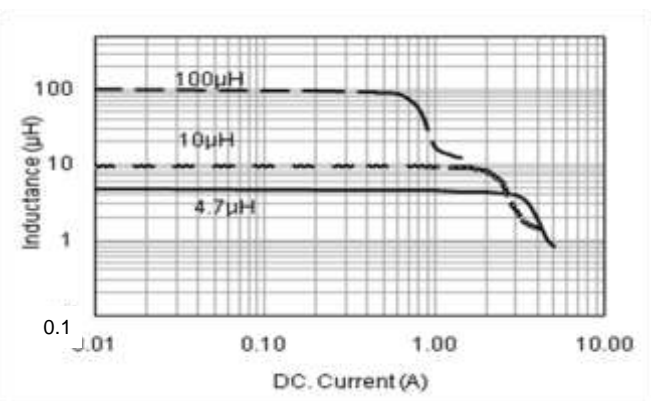
### MNR4012 Series

Temperature vs. DC Current Characteristics



Inductance vs. DC Current Characteristic



**MNR4020 Series**
**Temperature vs. DC Current Characteristics**

**Inductance vs. DC Current Characteristics**

**MNR4030 Series**
**Temperature vs. DC Current Characteristics**

**Inductance vs. DC Current Characteristics**


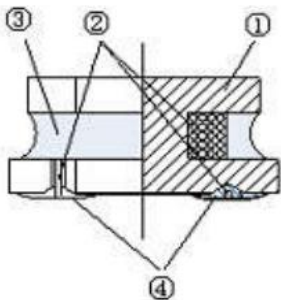
## Reliability Test

TEST ITEM	SPECIFICATION	TEST CONDITION
Withstanding voltage test	After test, inductors shall have no evidence of electrical and mechanical damage.	AC voltage of 100v and AC current of 1mA applied between inductor's terminal and core for 3 secs.
Resistance to soldering heat	1. Inductor shall have no evidence of electrical and mechanical damage. 2. Inductance shall not change more than $\pm 5\%$ . 3. Q shall not change more than 20%.	a. Temp: $260 \pm 5$ b. Time: $10 \pm 1.0$ se
Solderability test	The terminal shall be at least 95% covered with solder.	After fluxing, the terminal shall be dipped in a melted solder bath at $245 \pm 5^\circ\text{C}$ for $4 \pm 1.0$ secs.
High temperature & high humidity test	The anti-erosion quality of the surface and the specimen's inductance shall not change from the initial value within $\pm 10\%$	a. Test condition 1)Temp.: $85^\circ\text{C}$ , R.H.:85% 2)Time: $144 \pm 2$ hours b. Measurement method The experimental component should be put at normal condition for 2 hours then to measure again after test
Salt spray test		a. Test condition 1)Temp.: $35 \pm 2^\circ\text{C}$ 2)Time: $48 \pm 2$ hours 3)Salt solution PH:6.5~7.2 b. Measurement method The experimental component should be put at normal condition for 2 hours then to measure again after test
Vibration test	1. Inductance shall be within 10% of the initial value. 2. Appearance: no damage	a. Frequency: 10 to 55 b. Amplitude: 1.5 c. Direction and time X, Y and Z directions for 2 hours each.

TEST ITEM	SPECIFICATION	TEST CONDITION
Free fall test	No mechanical damage shall be noticed.	Drop 5 times on a concrete floor from 1m the height
Temperature Cycling test	1. Inductance shall be within 10% of the initial value 2. Appearance: No dama	a. Test conditi 1)Temp.: $-55^{\circ}\text{C}$ ,time: $30\pm 3\text{min}$ 2)Temp.: $+125^{\circ}\text{C}$ ,time: $30\pm 3\text{min}$ 3)Cycles times:12 cycles b. Measurement method The experimental component should be put at normal condition for 2 hours then to measure again after test
High Temperature resistance test		a. Test conditi 1)Applied rated current 2)Temp.: $85^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 3)Test time: $1000+24/-0\text{H}$ b. Measurement method The experimental component should be put at normal condition for 24 hours then to measure again after test.
Low temperature resistance test		a. Test conditi 1)Temp.: $-55^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 2)Test time: $1000+24/-0\text{H}$ b. Measurement method The experimental component should be put at normal condition for 24 hours then to measure again after test.

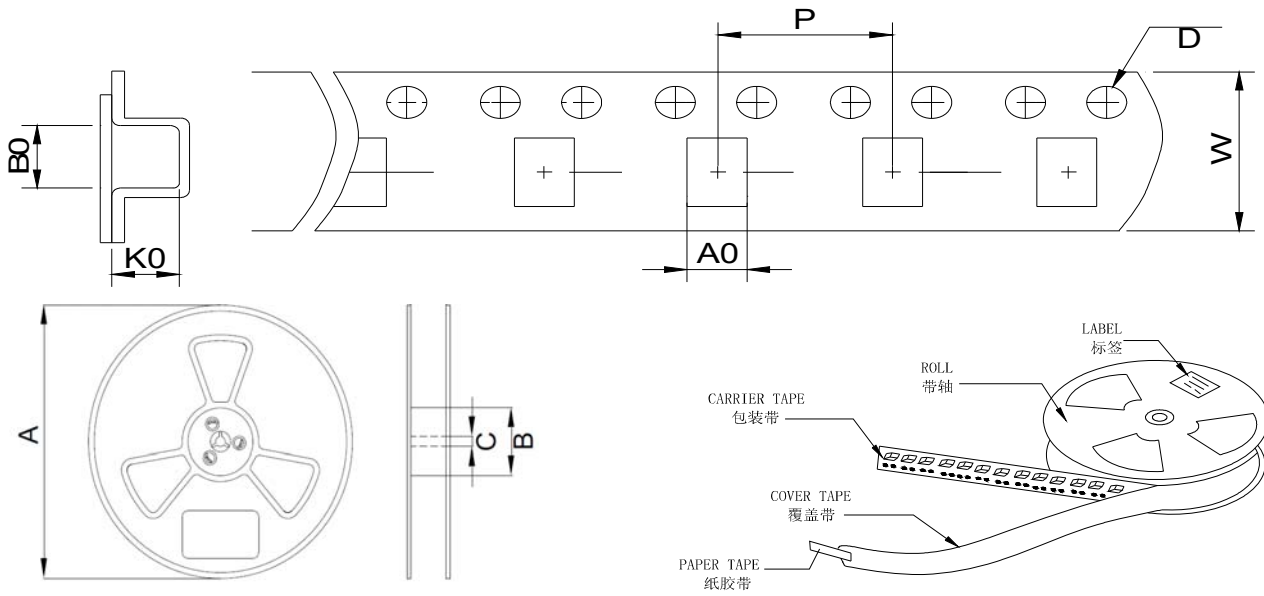
We have suggested the storage period of lead-free product should not over 6 months.

### Structure (The structure of product.)

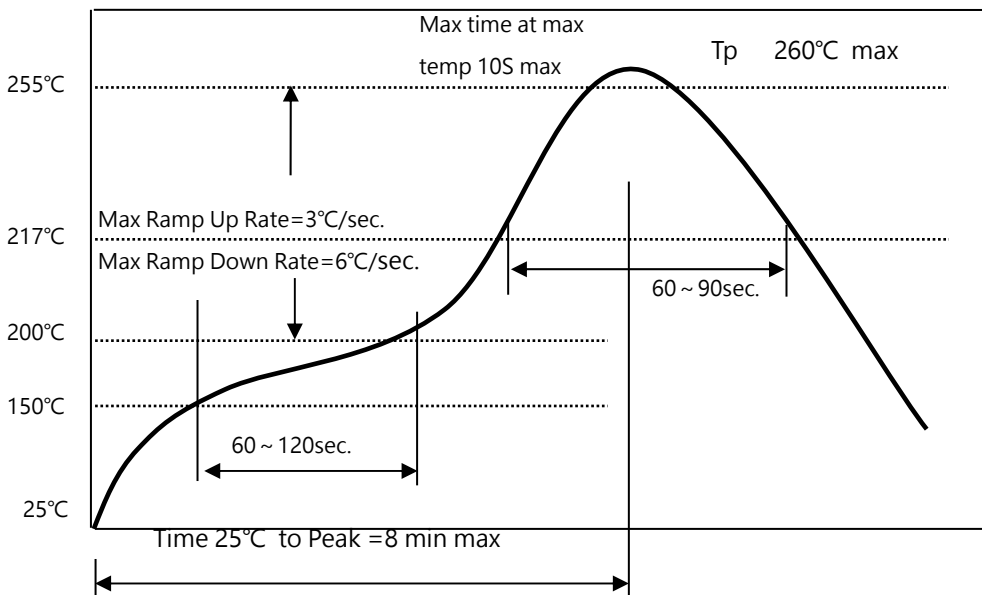


NO	Components	Material
①	Core	Ni-Zn Ferrite
②	Wire	Polyurethane system enameled copper wire
③	Magnetic Glue	Epoxy resin and magnetic powder
④	Plating	AgNiSn or FeNiCu + Sn Alloy



**PACKAGING SPECIFICATION :**


Type	Tape Dimension (mm)						Reel Dimension (mm)			Quantity (Pcs/Reel)
	W	A0	B0	K0	D	P	A	B	C	
MNR4010	12	4.3	4.3	1.4	1.5	8	330	100	13	4500
MNR4012	12	4.3	4.3	1.6	1.5	8	330	100	13	4500
MNR4018	12	4.3	4.3	2	1.5	8	330	100	13	3000
MNR4020	12	4.3	4.3	2.2	1.5	8	330	100	13	3000
MNR4030	12	4.3	4.3	3.2	1.5	8	330	100	13	2000

**Re-flowing Profile:**


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