

# MNR60\*\* 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

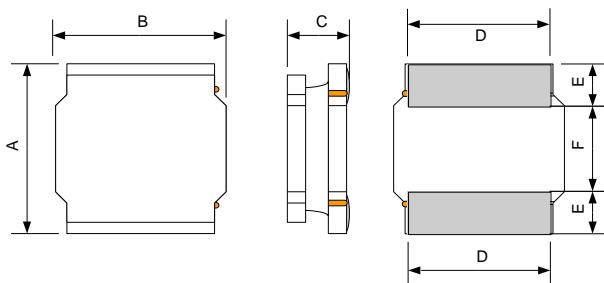
### Explanation of Part Number

MNR 6020 T1R0 M T

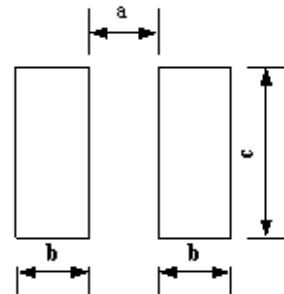
1 2 3 4 5 6

- ◆ 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.
MNR6020	6.0±0.3	6.0±0.3	2.0 Max.	4.9±0.3	1.55±0.3	2.9±0.3	2.8	1.7	5.7
MNR6028	6.0±0.3	6.0±0.3	2.8 Max.	4.9±0.3	1.55±0.3	2.9±0.3	2.8	1.7	5.7
MNR6045	6.0±0.3	6.0±0.3	4.5 Max.	4.9±0.3	1.55±0.3	2.9±0.3	2.8	1.7	5.7

## Electrical Characteristics List

### MNR6020 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	
MNR6020TR50NT	0.50±30%	0.018	0.014	120	4.50	6.00	4.00	5.00
MNR6020TR68NT	0.68±30%	0.022	0.017	115	6.55	7.80	3.80	4.80
MNR6020TR82NT	0.82±30%	0.022	0.017	110	5.30	6.30	3.80	4.80
MNR6020T1R0MT	1.0±20%	0.026	0.020	100	4.15	5.00	3.50	4.40
MNR6020T1R2MT	1.2±20%	0.029	0.022	88	5.90	7.00	3.20	4.00
MNR6020T1R5MT	1.5±20%	0.029	0.022	79	4.25	5.10	3.20	4.00
MNR6020T1R8MT	1.8±20%	0.036	0.028	68	4.85	5.80	2.75	3.50
MNR6020T2R0MT	2.0±20%	0.046	0.035	65	4.10	4.90	2.60	3.30
MNR6020T2R2MT	2.2±20%	0.036	0.028	61	3.75	4.50	2.75	3.50
MNR6020T2R7MT	2.7±20%	0.046	0.035	56	3.90	4.60	2.60	3.30
MNR6020T3R3MT	3.3±20%	0.046	0.035	51	3.15	3.70	2.60	3.30
MNR6020T3R9MT	3.9±20%	0.064	0.049	45	3.25	3.90	2.10	2.60
MNR6020T4R3MT	4.3±20%	0.064	0.049	44	2.70	3.20	2.10	2.60
MNR6020T4R7MT	4.7±20%	0.075	0.058	41	3.00	3.60	2.00	2.50
MNR6020T5R6MT	5.6±20%	0.075	0.058	36	2.40	2.90	1.90	2.40
MNR6020T6R2MT	6.2±20%	0.103	0.079	31	2.30	2.70	1.80	2.30
MNR6020T6R8MT	6.8±20%	0.103	0.079	31	2.20	2.60	1.80	2.30
MNR6020T8R2MT	8.2±20%	0.137	0.105	27	2.10	2.50	1.40	1.80
MNR6020T100MT	10±20%	0.137	0.105	27	1.75	2.10	1.40	1.80
MNR6020T120MT	12±20%	0.156	0.120	25	1.45	1.70	1.30	1.60
MNR6020T150MT	15±20%	0.189	0.145	21	1.20	1.40	1.20	1.50
MNR6020T180MT	18±20%	0.234	0.180	18	1.20	1.40	1.08	1.40
MNR6020T220MT	22±20%	0.265	0.204	16	1.05	1.20	1.00	1.30
MNR6020T330MT	33±20%	0.390	0.30	11	0.95	1.10	0.84	1.05
MNR6020T470MT	47±20%	0.559	0.430	10	0.70	0.90	0.80	0.90
MNR6020T331MT	330±20%	3.419	2.630	3	0.27	0.33	0.33	0.39

### MNR6028Series

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	
MNR6028TR82NT	0.82±30%	0.016	0.012	97	6.50	9.00	5.20	6.00
MNR6028T1R0MT	1.0±20%	0.013	0.010	70	5.75	7.00	5.20	5.70
MNR6028T1R2MT	1.2±20%	0.017	0.013	69	6.40	7.50	4.58	5.00
MNR6028T1R5MT	1.5±20%	0.017	0.013	65	6.00	6.60	4.58	5.00
MNR6028T2R2MT	2.2±20%	0.026	0.020	48	5.10	5.60	3.75	4.10
MNR6028T2R7MT	2.7±20%	0.026	0.020	48	3.80	4.10	3.75	4.10
MNR6028T3R3MT	3.3±20%	0.033	0.025	41	4.15	4.50	3.48	3.80
MNR6028T4R7MT	4.7±20%	0.039	0.030	35	3.00	3.30	3.08	3.40

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	
MNR6028T5R1MT	5.1±20%	0.056	0.043	32	3.20	3.50	2.60	2.80
MNR6028T6R2MT	6.2±20%	0.061	0.047	30	3.05	3.30	2.40	2.60
MNR6028T6R8MT	6.8±20%	0.061	0.047	27	2.60	3.00	2.40	2.60
MNR6028T8R2MT	8.2±20%	0.072	0.055	24	2.30	2.50	2.25	2.50
MNR6028T9R1MT	9.1±20%	0.096	0.074	24	2.55	2.80	2.15	2.40
MNR6028T100MT	10±20%	0.094	0.072	23	2.04	2.50	1.95	2.40
MNR6028T120MT	12±20%	0.104	0.080	18	1.80	2.00	1.85	2.00
MNR6028T150MT	15±20%	0.163	0.125	18	1.75	1.90	1.45	1.60
MNR6028T180MT	18±20%	0.156	0.120	15	1.52	1.80	1.45	1.60
MNR6028T220MT	22±20%	0.182	0.140	14	1.45	1.80	1.40	1.60
MNR6028T270MT	27±20%	0.202	0.155	13	1.50	1.60	1.32	1.40
MNR6028T330MT	33±20%	0.241	0.185	12	1.35	1.50	1.22	1.30
MNR6028T360MT	36±20%	0.280	0.215	11	1.25	1.40	1.13	1.20
MNR6028T390MT	39±20%	0.293	0.225	11	1.25	1.40	1.10	1.20
MNR6028T470MT	47±20%	0.410	0.315	9.5	1.15	1.30	1.06	1.10
MNR6028T560MT	56±20%	0.449	0.345	8.2	1.05	1.20	0.89	1.00
MNR6028T680MT	68±20%	0.468	0.360	7.7	0.80	0.95	0.86	0.95
MNR6028T750MT	75±20%	0.533	0.410	7.7	0.90	0.99	0.81	0.90
MNR6028T820MT	82±20%	0.650	0.50	7.7	0.80	0.88	0.70	0.77
MNR6028T101MT	100±20%	0.650	0.50	7.1	0.65	0.71	0.70	0.77
MNR6028T471MT	470±20%	2.808	2.160	2.8	0.30	0.33	0.40	0.45

### MNR6045Series

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	
MNR6045TR47NT	0.47±30%	0.008	0.006	155	15.00	16.50	6.50	6.60
MNR6045TR56NT	0.56±30%	0.008	0.006	142	14.00	15.00	6.50	6.60
MNR6045TR68NT	0.68±30%	0.008	0.006	99	11.00	12.00	5.70	6.50
MNR6045TR82NT	0.82±30%	0.010	0.008	140	10.35	11.00	5.90	6.50
MNR6045T1R0MT	1.0±20%	0.014	0.011	100	9.85	10.00	5.14	5.60
MNR6045T1R2MT	1.2±20%	0.013	0.010	100	8.35	9.10	5.40	5.90
MNR6045T1R3MT	1.3±20%	0.013	0.010	100	8.35	9.10	5.40	5.90
MNR6045T1R5MT	1.5±20%	0.016	0.012	65	8.80	9.70	4.95	5.40
MNR6045T1R8MT	1.8±20%	0.016	0.012	74	7.60	8.40	4.95	5.40
MNR6045T2R2MT	2.2±20%	0.018	0.014	52	6.75	7.40	4.60	5.00
MNR6045T2R3MT	2.3±20%	0.027	0.021	60	6.00	6.60	3.50	3.80
MNR6045T2R7MT	2.7±20%	0.020	0.015	38	5.75	6.30	4.30	4.70
MNR6045T3R0MT	3.0±20%	0.026	0.020	35	5.60	6.20	3.80	4.20
MNR6045T3R3MT	3.3±20%	0.027	0.021	32	5.90	6.20	3.70	4.00
MNR6045T3R6MT	3.6±20%	0.027	0.021	28	5.25	5.70	3.70	4.00
MNR6045T4R3MT	4.3±20%	0.030	0.023	23	4.45	4.90	3.50	3.80
MNR6045T4R5MT	4.5±20%	0.034	0.026	24	4.97	5.50	3.30	3.60
MNR6045T4R7MT	4.7±20%	0.034	0.026	24	4.97	5.50	3.30	3.60

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	
MNR6045T5R1MT	5.1±20%	0.034	0.026	23	4.40	4.80	3.30	3.60
MNR6045T5R6MT	5.6±20%	0.038	0.029	23	4.15	4.60	3.15	3.40
MNR6045T6R2MT	6.2±20%	0.040	0.031	26	4.43	4.80	3.00	3.30
MNR6045T6R3MT	6.3±20%	0.040	0.031	26	4.43	4.70	3.00	3.30
MNR6045T6R8MT	6.8±20%	0.040	0.031	20	3.90	4.30	3.00	3.30
MNR6045T7R5MT	7.5±20%	0.044	0.034	18	3.50	3.80	2.90	3.20
MNR6045T8R2MT	8.2±20%	0.056	0.043	21	3.90	4.30	2.60	2.80
MNR6045T9R1MT	9.1±20%	0.056	0.043	17	3.35	3.70	2.60	2.80
MNR6045T100MT	10±20%	0.062	0.048	15	3.20	3.50	2.45	2.70
MNR6045T120MT	12±20%	0.075	0.058	13	2.80	3.00	2.20	2.40
MNR6045T150MT	15±20%	0.088	0.068	12	2.50	2.70	2.05	2.20
MNR6045T180MT	18±20%	0.105	0.081	10	2.20	2.40	1.85	2.00
MNR6045T220MT	22±20%	0.116	0.089	10	2.05	2.20	1.80	2.00
MNR6045T270MT	27±20%	0.133	0.102	9.2	1.90	2.10	1.65	1.80
MNR6045T300MT	30±20%	0.172	0.132	7.8	1.70	1.80	1.50	1.60
MNR6045T330MT	33±20%	0.178	0.137	7.8	1.65	1.80	1.45	1.60
MNR6045T360MT	36±20%	0.225	0.173	7.8	1.62	1.80	1.40	1.50
MNR6045T390MT	39±20%	0.234	0.180	7.8	1.50	1.60	1.25	1.40
MNR6045T430MT	43±20%	0.260	0.20	7.7	1.63	1.80	1.20	1.30
MNR6045T470MT	47±20%	0.260	0.20	6.4	1.40	1.50	1.20	1.30
MNR6045T510MT	51±20%	0.269	0.207	6.4	1.35	1.50	1.15	1.20
MNR6045T560MT	56±20%	0.287	0.221	6.4	1.30	1.40	1.10	1.20
MNR6045T620MT	62±20%	0.306	0.235	6.4	1.25	1.40	1.10	1.20
MNR6045T680MT	68±20%	0.376	0.289	6.4	1.20	1.30	1.00	1.10
MNR6045T750MT	75±20%	0.397	0.305	5	1.15	1.20	0.95	1.00
MNR6045T820MT	82±20%	0.443	0.341	4.9	1.05	1.10	0.90	0.99
MNR6045T910MT	91±20%	0.467	0.359	4.9	1.00	1.10	0.85	0.94
MNR6045T101MT	100±20%	0.563	0.433	4.2	0.95	1.00	0.80	0.88
MNR6045T121MT	120±20%	0.629	0.484	4.2	0.85	0.94	0.77	0.85
MNR6045T151MT	150±20%	0.754	0.580	4.2	0.80	0.88	0.70	0.77
MNR6045T221MT	220±20%	1.084	0.834	3.5	0.70	0.77	0.59	0.65
MNR6045T331MT	330±20%	1.651	1.270	2.8	0.57	0.63	0.57	0.63
MNR6045T471MT	470±20%	2.340	1.80	2.0	0.500	0.560	0.420	0.480
MNR6045T681MT	680±20%	3.250	2.50	1.7	0.420	0.460	0.330	0.380

※1: All test data is referenced to 20°C ambient;

※2: Rated current: Isat or Irms, whichever is smaller;

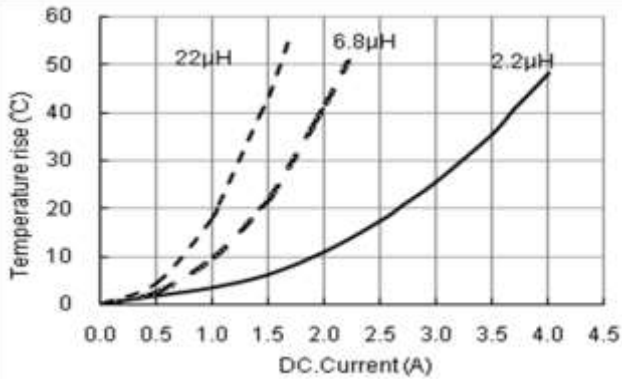
※\*3: Isat: DC current at which the inductance drops approximate 30% from its value without current;

※\*4: Irms: DC current that causes the temperature rise ( $\Delta T = 40^\circ\text{C}$ ) from 20°C ambient.

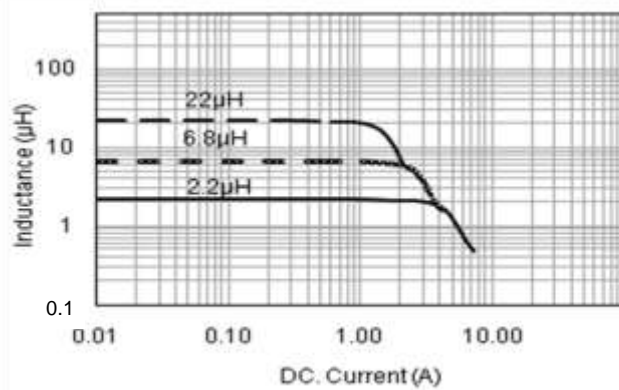
## TYPICAL ELECTRICAL CHARACTERISTICS

### MNR6020 Series

Temperature vs. DC Current Characteristics

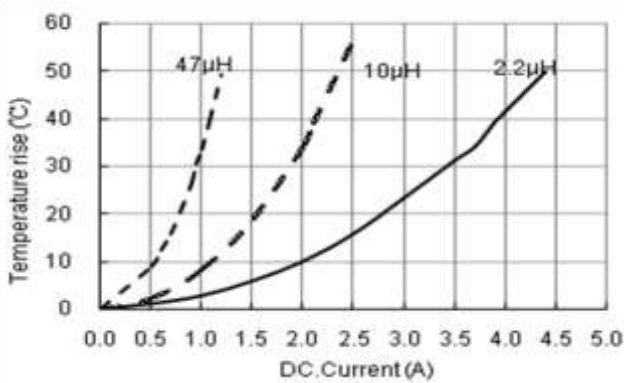


Inductance vs. DC Current Characteristics

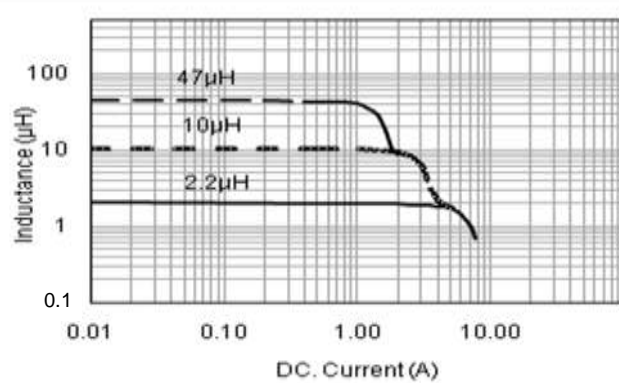


### MNR6028 Series

Temperature vs. DC Current Characteristics

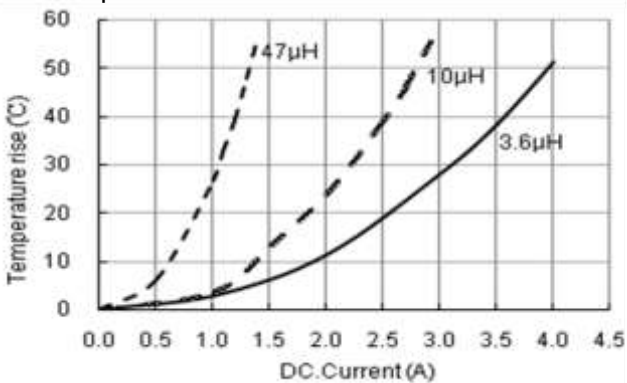


Inductance vs. DC Current Characteristics

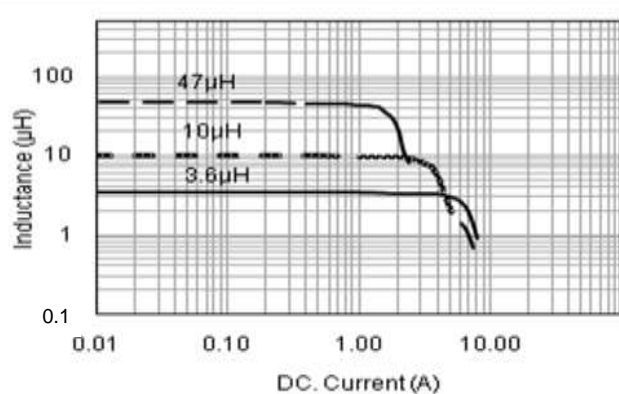


### MNR6045 Series

Temperature vs. DC Current Characteristics



Inductance vs. DC Current Characteristics



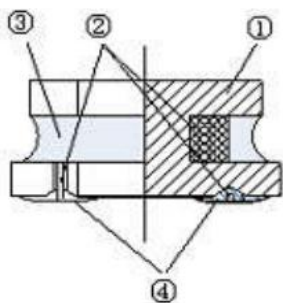
## Reliability Test

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	
MNR6020	16	6.4	6.4	2.2	1.5	8	330	100	13	2500
MNR6028	16	6.4	6.4	3.1	1.5	8	330	100	13	2000
MNR6045	16	6.4	6.4	4.75	1.5	8	330	100	13	1500

**Re-flowing Profile:**




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[HCF1305-3R3-R](#) [1206CS-151XG](#) [RCH664NP-4R7M](#) [RCP1317NP-391L](#) [DH2280-4R7M](#) [DS1608C-106](#) [B10TJ](#) [B82498B3101J000](#) [ELJ-](#)  
[RE27NJF2](#) [1812CS-153XJ](#) [1812CS-183XJ](#) [1812CS-223XJ](#) [1812LS-104XJ](#) [1812LS-105XJ](#) [1812LS-124XJ](#) [1812LS-154XJ](#) [1812LS-223XJ](#)  
[1812LS-224XJ](#) [1812LS-563XJ](#) [1812LS-683XJ](#) [1812LS-824XJ](#) [NIN-FB101JTR110F](#) [NIN-FB471JTR62F](#) [NIN-FC1R5JTR220F](#) [NIN-](#)  
[HCR15JTRF](#) [NIN-HCR33JTRF](#) [NIN-HDR22JTRF](#) [NIN-HDR82JTRF](#) [NIN-HK2N7STRF](#) [NIN-PA150KTR370F](#) [NIN-PB100KTR550F](#)