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PROTERIAL

FINEMET®

Nanocrystalline Components

Products Guide

株式会社プロテリアル

Proterial, Ltd.

FINEMET®

飽和磁束密度と比透磁率が高く、コアロスが低い ナノ結晶 Fe（鉄）基軟磁性材料ファインメット®

FINEMET® Nanocrystalline Fe-based Soft Magnetic Material with High Saturation Flux Density, High Relative Permeability and Low Core Loss

ファインメット®とは ｜ What is FINEMET®

ファインメット® の素材は、Feを主成分にして、これにSi（シリコン）とB（ボロン）および微量のCu（銅）とNb（ニオブ）を添加した独自組成の高温融液を約100万℃／秒で急冷固化したアモルファス（非晶質）薄帯です。この素材を結晶化温度以上で熱処理し、結晶粒径をこれまで実現できなかった10nm（nm:ナノメータ、1nm=0.001μm=百万分の1mm）程度まで小さくしています。
結晶の微細化により磁気特性はアモルファスのときに比べて大幅に向上します。従来、結晶質磁性材料では、結晶組織が細かいほど軟磁気特性は悪くなるとされてきましたが、プロテリアルオリジナルのファインメット® が、この常識をくつがえしました。

The precursor of FINEMET® is amorphous ribbon (non-crystalline) obtained by rapid quenching at one million℃/second from the molten metal consisting of Fe, Si, B and small amounts of Cu and Nb. These crystallized alloys have grains which are extremely uniform and small, “about ten nanometers in size”. Amorphous metals which contain certain alloy elements show superior soft magnetic properties through crystallization. It was commonly known that the characteristics of soft magnetic materials are “larger crystal grains yield better soft magnetic properties”. Contrary to this common belief, soft magnetic material consisting of a small, “nano-order”, crystal grains have excellent soft magnetic properties.

特長 ｜ Features

1. 飽和磁束密度と透磁率の双方が高い
飽和磁束密度はFe（鉄）基アモルファスと同等で、かつ透磁率はCo（コバルト）基アモルファスと同等です。

2. コアロスが低い
コアロスはFe基アモルファスの1/5以下、かつCo基アモルファスと同等の値のため、省エネルギー化できます。

3. 磁歪が低い
磁歪が低いため、加工時の応力による特性の劣化が少なく、可聴周波成分が入力されたときの騒音も小さくできます。

4. 温度特性が良好で、かつ経時変化が少ない
透磁率の温度による変化はMn-Znフェライトよりも小さく、経時変化はCoアモルファスよりも小さくなっています。

5. 広帯域で特性が良好
透磁率とコアロスは、ともに広い周波数帯域において、Co基アモルファスと同等の特性を有しています。また、薄帯のため高抵抗であり、低コアロスとなっています。

6. B-H曲線の形状制御が可能
B-H曲線の形状・角形比は、熱処理によって高・中・低と制御できます。使用目的や、用途に合わせて選択が可能です。

1. Satisfy both high saturation magnetic flux density and high permeability
High saturation magnetic flux density comparable to Fe-based amorphous metal. High permeability comparable to Co-based amorphous metal.

2. Low core Loss
1/5th the core loss of Fe-based amorphous metal and approximately the same core loss as Co-based amorphous metal.

3. Low magnetostriction
Less affected by mechanical stress. Very low audio noise emission.

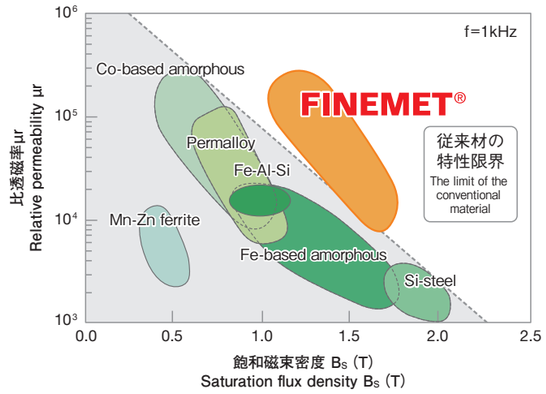
4. Excellent temperature characteristics and small aging effects
Permeability variation by temperature is smaller than Mn-Zn ferrite. Unlike Co-based amorphous metals, aging ettects are very small.

5. Excellent characteristics over wide frequency range
High permeability and low core loss over wide frequency range, which is equivalent to Co-based amorphous metal.

6. Flexibility to control magnetic properties “B-H curve shape”during annealing
Three types of B-H curve squareness, high, middle and low remanence ratio, corresponding to various applications.

従来材の特性を超えるファインメット®
Superior to Conventional Material

軟磁性材料の比透磁率と飽和磁束密度の関係
Relationship between relative permeability and saturation flux density of various soft magnetic materials



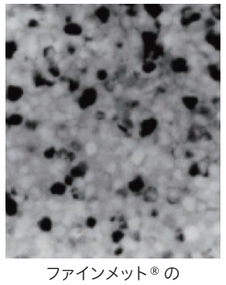
ファインメット®を構成する材料技術
Material Technology for FINEMET®

プロテリアルは、パーマロイ、アモルファス、そしてファインメット®などの金属軟磁性材料から、フェライトにいたる幅広い軟磁性材料について、組成分析から製造や加工、評価、回路設計まで豊富な技術を蓄積しています。また、薄帯を始めとする素材の質的・量的革新を進めると同時に、特長ある応用品を開発しています。そして、「素材に立脚した応用」と「応用に立脚した素材」の両面から、省エネ、小型軽量化、高機能化を追求します。

Proterial, Ltd. produces various types of soft magnetic materials, such as Permalloy, soft ferrite, amorphous metal, and FINEMET®, and we use these materials in our products' applications. We continually improve our material technology and develop new applications by taking advantage of the unique characteristics these materials provide. FINEMET® is a good example. It is our hope, FINEMET® will be the best solution for your application.

材料技術および応用技術 ｜ Technology

- 超急冷技術 Rapid quenching
- ナノ構造制御技術 Nano structure control
- 熱処理技術 Heat Treatment
- 評価技術 Measurement
- 磁気回路設計技術 Electromagnetic circuit designing
- 電気・電子回路設計技術 Electromagnetic and electro circuit designing



ファインメット® の
透過型電子顕微鏡写真
Picture of FINEMET® through a transmission electron microscope

INDEX

Common Mode Choke Cores
コモンモードチョークコア

ナノ結晶軟磁性材料「ファインメット®」を使用したコモンモードチョーク用コアに、高透磁率の「FT-3KM」材、「FT-3K50T」材を使用したシリーズと、磁気飽和しにくい「FT-3KL」材、「FT-8K50D」材を使用したシリーズをご用意しました。どちらも広い周波数帯域で高いインピーダンスが得られます。

In the product line of FINEMET® common mode choke cores, there are two types of cores made of (1) high permeability material "FT-3KM","FT-3K50T" and (2) high saturation-field material "FT-3KL","FT-8K50D". Both cores have high impedance in wide frequency range.

「FT-3KM」「FT-3K50T」材を使用したコアの特長 ｜ Features for cores made of "FT-3KM", "FT-3K50T"

高透磁率のFT-3KM、FT-3K50T材を使用したコアには、従来のMn-Znフェライトコアと比べて以下の特長があります。
The cores made of high permeability FT-3KM FT-3K50T have the following advantages over commonly used Mn-Zn ferrite cores:

1．インピーダンス透磁率が高く、約4倍のインピーダンスが得られます。
20℃、100kHzにおける複素透磁率の実数部μr'は2倍以上、虚数部μr"を含めたインピーダンス透磁率μrzは4倍以上に達します。このためノイズフィルタの小型軽量化に貢献します。

2．キュリー温度が高く、磁気特性が温度によって大きく変化しません。
比透磁率μr'の周波数特性が、温度に大きく依存しません。つまりコモンモードチョークを構成したときのインダクタンスとインピーダンスの周波数特性が温度によって大きく変化しません（図2、3）。

1. Four times higher impedance due to high impedance permeability.
The real part of complex permeability (μr') at 100kHz and 20℃ reaches more than twice as high as that of Mn-Zn ferrite cores. The impedance relative permeability (μrz) including imaginary part of complex permeability (μr") reaches more than four times as high as that of Mn-Zn ferrite cores.

2. Stable magnetic properties against temperature change.
Inductance and impedance of the common mode chokes are very stable against temperature change due to high Curie temperature. (Figure 2, 3).

Table 1. Comparison of magnetic and physical properties between FINEMET® and Mn-Zn ferrite

			FT-3KM	FT-3K50T	FT-3KL	FT-8K50D	Mn-Zn ferrite
Initial permeability ,μr' [100kHz]		20°C	17,000	31,000	17,000	5,000	5,300
		100°C	18,000	29,000	15,000	4,400	7,000
Impedance permeability ,μrz [100kHz]		20°C	26,900	40,000	18,500	5,000	5,300
		100°C	27,100	35,000	16,000	4,400	7,000
Saturation magnetic flux density, Bs*	(T)	20°C	1.23	1.23	1.23	1.32	0.44
		100°C	1.20	1.20	1.20	1.25	0.27
Residual magnetic flux density, Br*	(T)	20°C	0.62	0.05	0.06	0.01	0.10
		100°C	0.59	0.05	0.04	0.02	0.06
Coercive force, Hc*	(A/m)	20°C	2.5	0.6	0.6	2.1	8.0
		100°C	2.7	0.7	0.6	2.8	4.9
Curie temperature, Tc	(°C)		570	570	570	550	150
Saturation magnetostriction, λs	[×10^{-6}]		<1	<1	<1	<8	-1.1
Electrical resistivity, ρ	(μΩ・m)		1.2	1.2	1.2	1.2	1.0×10^{6}
Density	(kg/m^3)		7.3×10^3	7.3×10^3	7.3×10^3	7.4×10^3	4.85×10^3

* DC magnetic properties at 800A/m

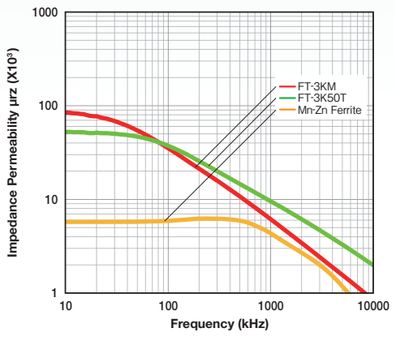


Figure 1. Frequency dependence of Impedance Permeability

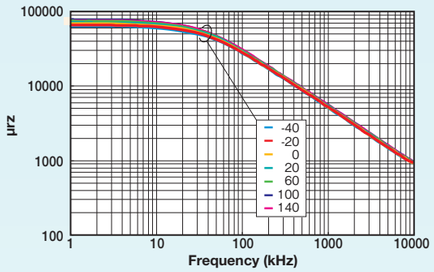


Figure 2. Temperature dependence of impedance permeability (μrz) for FINEMET® FT-3KM

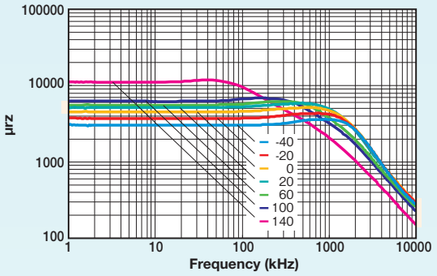


Figure 3. Temperature dependence of impedance permeability (μrz) for Mn-Zn ferrite

「FT-3KL」材、「FT-8K50D」材を使用したコアの特長 ｜ Features for cores made of "FT-3KL", "FT-8K50D"

高飽和磁界のFT-3KL,FT-8K50D材を使用したコアは高い磁界（電流）レベルでも磁気飽和しにくく、優れた直流重畳特性を有しております（図4,5）
The cores made of FT-3KL, FT-8K50D have excellent DC superposed characteristics due to its high saturation-field property in B-H curve(Figure 4,5)

Figure 4. DC-BH Curves

Figure 5. DC superposed characteristics of Relative Permeability, μ´

Figure 6. Frequency dependence of Impedance Permeability

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コモンモードチョークコア
Common Mode Choke Cores

FT-3KM K series
FT-3KM K シリーズ

FT-3KM Kシリーズコアは、信号ライン、DCパワーライン、単相ACパワーライン用のコモンモードチョーク用トロイダルコアです。
飽和磁歪定数（λs）の小さいFT-3KM材を使用することにより、可聴周波数成分が入力されても低騒音です。

FT-3KM K series cores made of FT-3KM material are for common mode chokes for signal lines, DC and single-phase AC power lines.
Low saturation magnetostriction (λs) contribute to low acoustic noise.

Table 2. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)							Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value ($\mu H/N^2$)	
		A ±0.7	B ±0.7	C ±0.5	D ±0.7	E REF.	F REF.	G REF.				10kHz MIN.	100kHz ±30%
F1AH0538	FT-3KM K1208A	13.0	7.1	6.0	10.7	2.6	–	1.8	7.7	30.3	2.9	18.2	5.8
F1AH0692	FT-3KM K1208C	13.5	12.5	6.8	15.5	3.0	–	1.5	13.3	31.7	4.5	24.0	8.8
F1AH0654	FT-3KM K1812A	20.2	8.1	10.3	13.1	3.5	–	2.5	11.3	47.1	5.8	14.7	5.3
F1AH0694	FT-3KM K2313D	25.2	15.1	11.5	20.7	4.0	–	2.8	43.9	57.3	23.0	41.6	15.3
F1AH0695	FT-3KM K2214B	24.2	10.6	12.0	16.2	4.0	–	2.8	22.2	56.5	13.0	22.2	8.1
F1AH0696	FT-3KM K2515D	27.2	15.6	13.0	21.2	3.5	–	2.8	46.3	62.8	26.0	41.6	15.3
F1AH0697	FT-3KM K2818E	30.4	18.0	15.8	24.0	3.5	1.5	3.0	55.5	72.3	37.0	43.4	15.9
F1AH0699	FT-3KM K3819D	40.4	15.5	16.8	23.5	4.0	2.0	4.0	87.9	89.5	68.0	55.5	20.4
F1AH0700	FT-3KM K3824G	40.6	23.0	21.4	31.0	4.0	2.0	4.0	105.0	97.4	87.0	61.0	24.4
F1AH0701	FT-3KM K5328E	56.4	19.0	24.6	29.0	5.5	2.0	5.0	127.5	114.7	155.0	62.5	25.0

- Ae: effective cross-section area,　Lm: mean magnetic path length

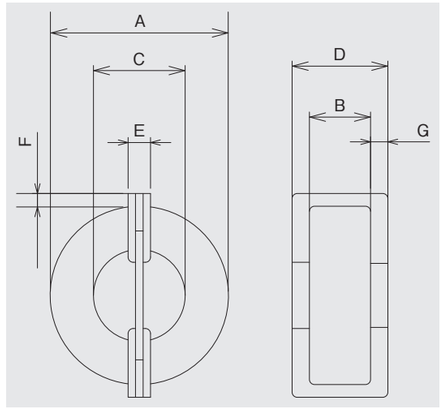

Figure 7. FT-3KM K series core

コモンモードチョークコア ｜ Common Mode Choke Cores
信号ライン用、DCパワーライン用、単相ACパワーライン用 ｜ For signal lines, DC and single-phase AC power lines

FT-3KL V series
FT-3KL V シリーズ

FT-3KL Vシリーズコアは、FT-3KL材を使用した信号ライン、DCパワーライン、単相ACパワーライン用のコモンモードチョーク用トロイダルコアです。
高インピーダンスと高飽和電流を両立し、小型・軽量でラジオノイズ対策に優れた効果を発揮します。
新設計のコア内部構造により、優れた耐振動性を有しています。

FT-3KL V series cores made of FT-3KL material are for common mode chokes for signal lines, DC and single-phase AC power lines.
Having both high impedance and high saturation-field property, these cores show high performance in reduction of radiation noise.
With new design of inner structure, these cores have high durability against vibration.

Table 3. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)							Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value ($\mu H/N^2$)	
		A ±0.7	B ±0.7	C ±0.5	D ±0.7	E REF.	F REF.	G REF.				10kHz MIN.	100kHz ±30%
F1AH0970	FT-3KL V1208C	13.5	12.5	6.8	15.5	3.0	–	1.5	13.7	31.9	4.5	8.7	9.1
F1AH0972	FT-3KL V2515D	27.2	15.6	13.0	21.2	3.5	–	2.8	47.3	63.3	26.0	15.1	16.0

- Ae: effective cross-section area,　Lm: mean magnetic path length

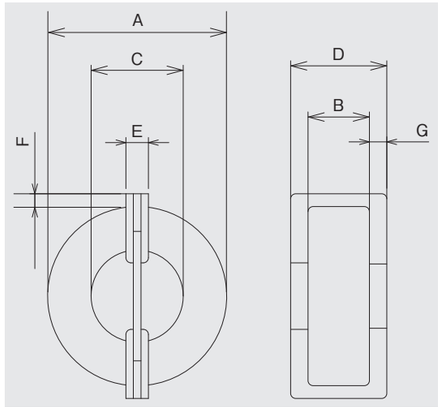

Figure 8. FT-3KL V series core

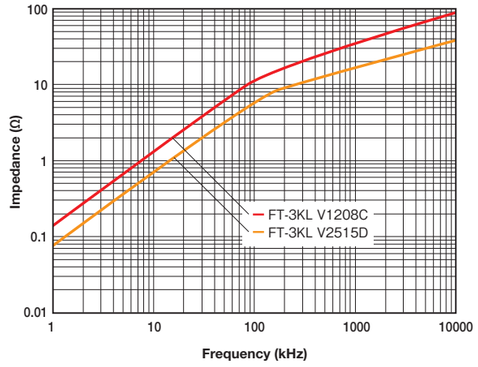

Figure 9. Frequency dependence of impedance for FT-3KL V series core

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For safety and proper usage, you are requested to approve our product specification or to transact the approval sheet for product specifications before ordering. This catalog and its contents are subject to change without notice.

コモンモードチョークコア
Common Mode Choke Cores

FT-3KM N series
FT-3KM N シリーズ

FT-3KM Nシリーズコアは、3相ACパワーライン用のコモンモードチョーク用トロイダルコアです。
飽和磁歪定数（λs）の小さいFT-3KM材を使用することにより、可聴周波数成分が入力されても低騒音です。

FT-3KM N series cores made of FT-3KM material are for common mode chokes for three-phase AC power lines.
Low saturation magnetostriction (λs) contribute to low acoustic noise.

Table 4. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)							Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value (μH/N^2)	
		A ±0.7	B ±0.7	C ±0.5	D ±0.7	E REF.	F REF.	G REF.				10kHz MIN.	100kHz ±30%
F1AH0702	FT-3KM N2515D	27.6	16.0	12.6	22.0	3.2	1.0	3.0	46.9	62.8	28	41.6	15.3
F1AH0703	FT-3KM N3320E	35.6	19.0	17.4	27.0	3.2	1.5	4.0	73.1	73.3	56	49.7	19.9
F1AH0704	FT-3KM N4225E	46.0	19.0	21.0	27.0	4.0	3.0	4.0	95.6	105.2	95	51.4	20.6
F1AH0705	FT-3KM N5034E	54.0	19.0	30.0	29.0	4.0	–	5.0	90.0	131.9	110	38.6	15.4
F1AH0706	FT-3KM N6442E	68.0	19.0	38.0	29.0	5.0	–	5.0	123.8	166.5	184	42.0	16.8
F1AH0708	FT-3KM N5434G	58.0	25.0	30.0	47.0	6.2	8.0	7.0	150.0	138.0	210	61.4	24.5

- Ae: effective cross-section area,　Lm: mean magnetic path length

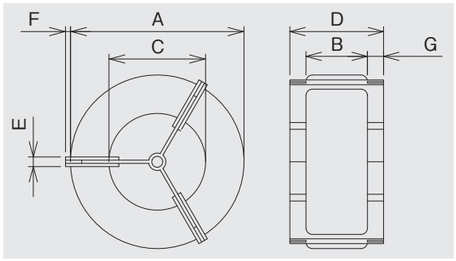


Figure 10. FT-3KM N series core except FT-3KM N5434G

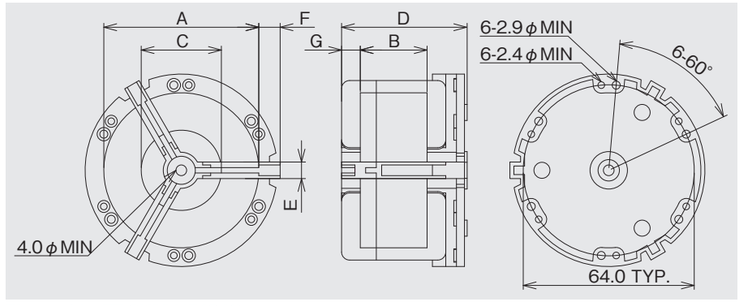
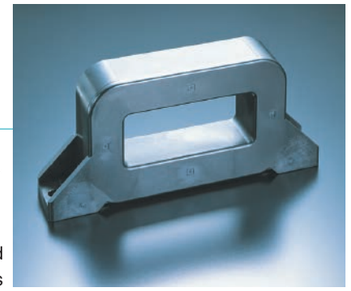


Figure 11. FT-3KM N5434G

FT-3KM S series
FT-3KM S シリーズ



FT-3KM Sシリーズはバスバー配線に適した低背コモンモードチョーク用コアです。
配電盤内に納めやすく、限られた実装スペースを有効に活用できます。
同一サイズのMn-Znフェライトコアに比べ、大幅な軽量化が可能です。

FT-3KM S series "square shaped" common mode choke cores are designed specifically for bus bar systems. Unlike toroidal cores, these square shaped cores allow utilizing space effectively in a switchboard.
In addition, these cores are far lighter weight compare to Mn-Zn ferrite cores with the same performance.

Table 5. Product code, part name and specifications

Product code	P/N	Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value (μH/N^2)	
					10kHz	100kHz
F1AH0545	FT-3KM S10085HB	112.5	290.1	410	21.9～ 51.2	6.5～12.1
F1AH0572	FT-3KM S11080HB	271.9	303.8	765	50.6～118.1	14.9～27.8

- Ae: effective cross-section area,　Lm: mean magnetic path length

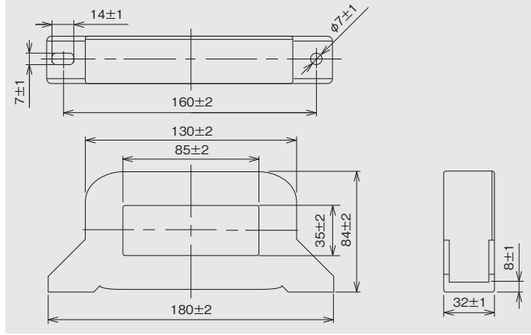


Figure 12. FT-3KM S series core

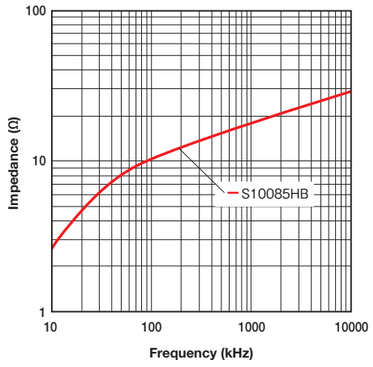


Figure 13. Frequency dependence of impedance for S10085HB

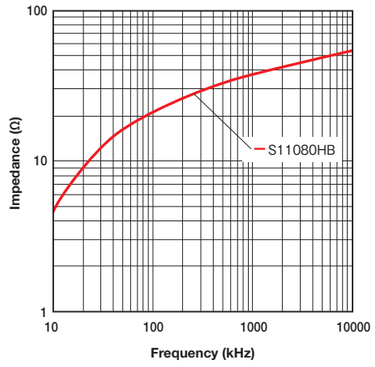


Figure 14. Frequency dependence of impedance for S11080HB

FT-3KM F series
FT-3KM F シリーズ

FT-3KM Fシリーズコアは、信号ライン、DCパワーライン、単相および3相ACパワーライン用のコモンモードチョーク用トロイダルコアです。

FT-3KM F series cores made of FT-3KM material are for common mode chokes for signal lines, DC and AC power lines.

Table 6. Product code, part name and specifications (Toroidal type: Figure 15)

Product code	P/N	Finished dimension(mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value (μH/N^2)	
		A	B	C				10kHz	100kHz
F1AH0047	FT-3KM F2515D	28.0±0.5	16.8±0.7	12.8±0.5	46.9	62.8	25	42.0～100.0	16.9±30%
F1AH0048	FT-3KM F3320E	35.8±0.5	17.5±0.7	17.3±0.5	73.1	83.3	49	49.7～120.0	19.9±30%
F1AH0049	FT-3KM F3724E	40.0±0.5	17.6±0.7	21.1±0.5	73.1	95.8	59	43.0～100.0	17.3±30%
F1AH0050	FT-3KM F4424G	46.5±0.6	22.8±0.6	21.5±0.5	142.5	106.8	123	75.4～180.0	30.2±30%
F1AH0896	FT-3KM F4535G	49.0±0.5	25.0±0.7	31.0±0.5	75.0	125.7	89	34.0～ 80.0	13.5±30%
F1AH0897	FT-3KM F4627H	50.0±0.7	28.2±1.0	23.4±0.5	178.1	114.7	168	89.2～210.0	35.1±30%
F1AH0898	FT-3KM F6045G	64.0±0.7	25.0±1.0	41.0±0.7	112.5	164.9	162	39.0～ 90.0	15.4±30%
F1AH0899	FT-3KM F7555G	79.0±0.7	25.0±0.7	51.0±0.7	150.0	204.2	267	42.0～100.0	16.6±30%
F1AH0900	FT-3KM F10080G	104.0±0.7	25.0±0.7	76.0±0.7	138.8	285.1	336	30.0～ 65.0	12.0±30%
F1AH0901	FT-3KM F140100	144.0±1.0	35.0±1.0	96.0±0.7	427.5	380.1	1335	63.0～150.0	24.8±30%
F1AH0024	FT-3KM F200160	204.0±1.0	35.0±1.0	156.0±1.0	427.5	568.6	1875	42.0～100.0	15.1+50% -30%

Table 7. Product code, part name and specifications (Base plate type: Figure 16, 17)

Product code	P/N	Finished dimension (mm)								
		A MAX.	B MAX.	C MAX.	D ±0.5	E ±0.3	F ±0.5	G ±0.5	H ±0.5	K MIN.
F1AH0026	FT-3KM F6045GB	95.0	26.0	78.0	80.0	12.5	72.0	50.0	7.0	39.5
F1AH0903	FT-3KM F7555GB	121.0	30.0	100.0	100.0	–	–	–	–	50.0
F1AH0904	FT-3KM F10080GB	161.0	32.0	122.0	140.0	–	–	–	–	75.0
F1AH0029	FT-3KM F11080GB	181.0	26.0	131.0	150.0	12.5	124.0	100.0	20.0	74.0
F1AH0905	FT-3KM F140100PB	181.0	42.0	162.0	160.0	–	–	–	–	95.0
F1AH0032	FT-3KM F200160PB	241.0	42.0	217.0	220.0	–	–	–	–	155.0

Product code	P/N	Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	Applied screw		AL value (μH/N^2)		Shape
					I	J	10kHz	100kHz	
F1AH0026	FT-3KM F6045GB	112.5	164.9	193	M4	M5	39.0～ 90.0	15.4±30%	Fig.17
F1AH0903	FT-3KM F7555GB	150.0	204.2	377	–	M6	42.0～100.0	16.6±30%	Fig.16
F1AH0904	FT-3KM F10080GB	138.8	285.1	516	–	M6	30.0～ 65.0	12.0±30%	Fig.16
F1AH0029	FT-3KM F11080GB	213.8	300.8	613	M5	M6	40.2～ 95.0	16.1±30%	Fig.17
F1AH0905	FT-3KM F140100PB	427.5	380.1	1595	–	M6	63.0～150.0	24.8±30%	Fig.16
F1AH0032	FT-3KM F200160PB	427.5	568.6	2235	–	M6	42.0～100.0	15.1+50% -30%	Fig.16

- Ae: effective cross-section area,　Lm: mean magnetic path length

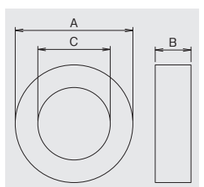


Figure 15. Toroidal type

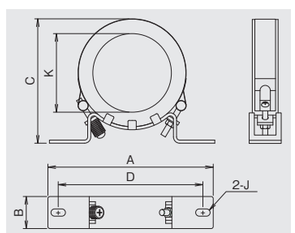


Figure 16. Base plate type
The core is fixed onto the zinc-electroplated SPCC base by using SUS 304 stainless steel band.

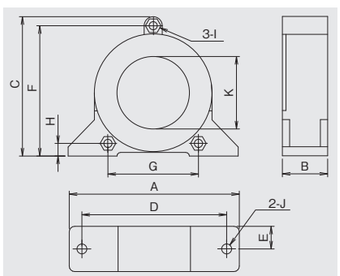


Figure 17. Base combined type

コモンモードチョークコア ｜ Common Mode Choke Cores
信号ライン用、DC/ACパワーライン用、零相リアクトル用 ｜ For signal lines, DC and AC power lines and Output filters

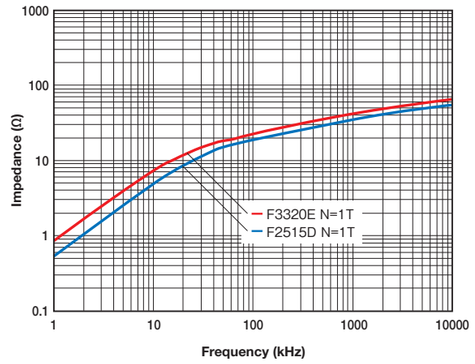


Figure 18. Frequency dependence of impedance for FT-3KM F2515D and F3320E

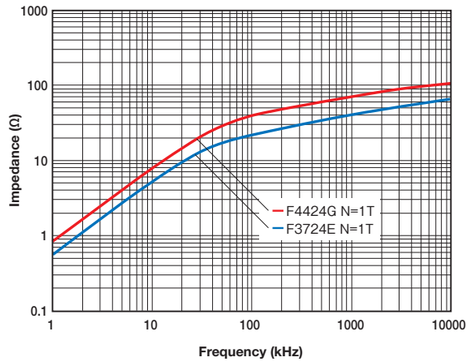


Figure 19. Frequency dependence of impedance for FT-3KM F3724E and F4424G

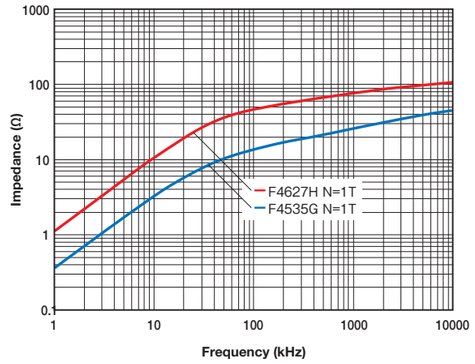


Figure 20. Frequency dependence of impedance for FT-3KM F4535G and F4627H

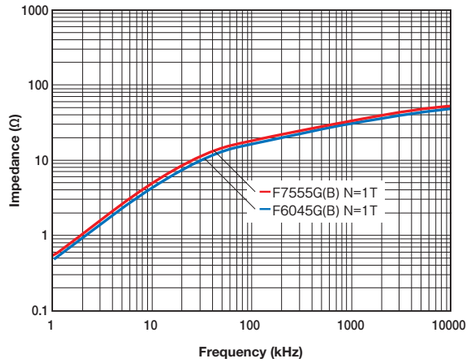


Figure 21. Frequency dependence of impedance for FT-3KM F6045G(B) and F7555G(B)

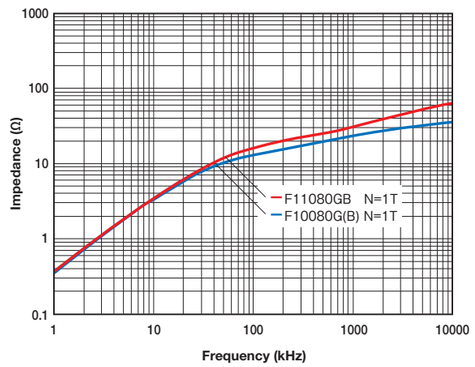


Figure 22. Frequency dependence of impedance for FT-3KM F10080G(B) and F11080GB

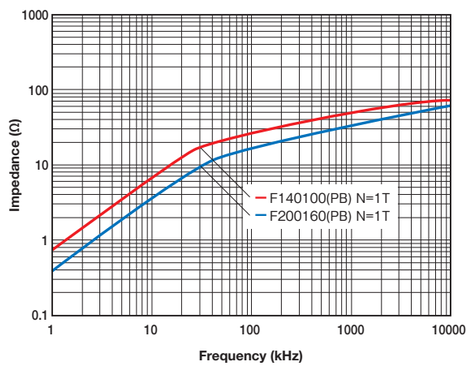


Figure 23. Frequency dependence of impedance for FT-3KM F14100(PB) and F220160(PB)

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コモンモードチョークコア
Common Mode Choke Cores

FT-3KL F series
FT-3KL F シリーズ

FT-3KL Fシリーズコアは、高飽和電流コモンモードチョークコアです。
高透磁率と高飽和電流を両立し、大きな電流ノイズでも優れたノイズ減衰特性を発揮します。

FT-3KL F series are common mode choke cores with high saturation-field property. Having both high permeability and high saturation-field property, these cores show significant noise reduction even under high common mode current.

Table 8. Product code, part name and specifications (Toroidal type: Figure 24)

Product code	P/N	Finished dimension (mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value (μH/N^2)	
		A	B	C				10kHz	100kHz
F1AH0680	FT-3KL F3320E	35.8±0.5	17.5±0.7	17.3±0.5	73.1	83.3	49	17.8～33.0	18.8±30%
F1AH0681	FT-3KL F3724E	40.0±0.5	17.6±0.7	21.1±0.5	73.1	95.8	59	15.4～28.7	16.3±30%
F1AH0682	FT-3KL F4535G	49.0±0.5	25.0±0.7	31.0±0.5	75.0	125.7	89	12.1～22.4	12.8±30%
F1AH0683	FT-3KL F6045G	64.0±0.7	25.0±1.0	41.0±0.7	107.3	166.0	162	13.1～24.3	13.8±30%
F1AH0684	FT-3KL F7555G	79.0±0.7	25.0±0.7	51.0±0.7	146.3	205.0	267	14.4～26.8	15.2±30%
F1AH0685	FT-3KL F10080G	104.0±0.7	25.0±0.7	76.0±0.7	138.3	285.1	336	9.8～18.3	10.4±30%
F1AH0686	FT-3KL F140100	144.0±1.0	35.0±1.0	96.0±0.7	427.5	380.1	1335	22.8～42.3	24.0±30%

Table 9. Product code, part name and specifications (Base plate type: Figure 25, 26)

Product code	P/N	Finished dimension (mm)								
		A MAX.	B MAX.	C MAX.	D ±0.5	E ±0.3	F ±0.5	G ±0.5	H ±0.5	K MIN.
F1AH0687	FT-3KL F6045GB	95.0	26.0	78.0	80.0	12.5	72.0	50.0	7.0	39.5
F1AH0688	FT-3KL F7555GB	121.0	30.0	100.0	100.0	–	–	–	–	50.0
F1AH0690	FT-3KL F11080GB	181.0	26.0	131.0	150.0	12.5	124.0	100.0	20.0	74.0
F1AH0691	FT-3KL F140100PB	181.0	42.0	162.0	160.0	–	–	–	–	95.0

Product code	P/N	Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	Applied screw		AL value (μH/N^2)		Shape
					I	J	10kHz	100kHz	
F1AH0687	FT-3KL F6045GB	107.3	166.0	193	M4	M5	13.1～24.3	13.8±30%	Fig.26
F1AH0688	FT-3KL F7555GB	146.3	205.0	377	–	M6	14.4～26.8	15.2±30%	Fig.25
F1AH0690	FT-3KL F11080GB	213.8	300.8	613	M5	M6	14.4～26.7	15.2±30%	Fig.26
F1AH0691	FT-3KL F140100PB	427.5	380.1	1595	–	M6	22.8～42.3	24.0±30%	Fig.25

- Ae: effective cross-section area, Lm: mean magnetic path length

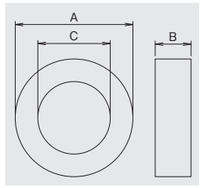

Figure 24. Toroidal type

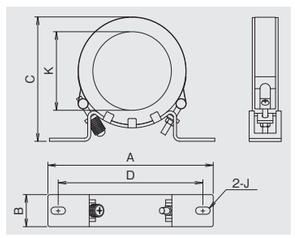

Figure 25. Base plate type
The core is fixed onto the zinc-electroplated SPCC base by using SUS 304 stainless steel band.

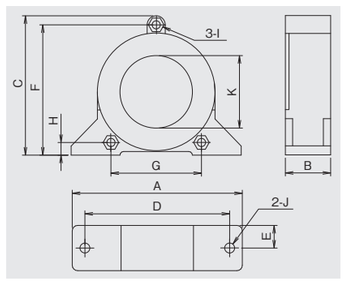

Figure 26. Base combined type

コモンモードチョークコア ｜ Common Mode Choke Cores
信号ライン用、DC/ACパワーライン用、零相リアクトル用 ｜ For signal lines, DC and AC power lines and Output filters

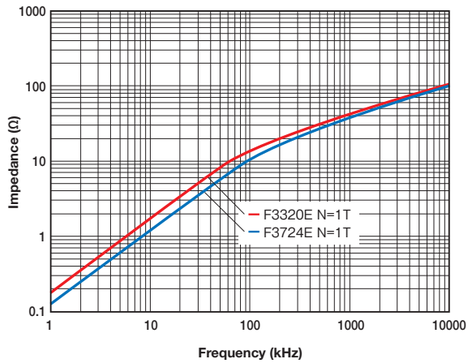

Figure 27. Frequency dependence of impedance for FT-3KL F3320E and F3724E

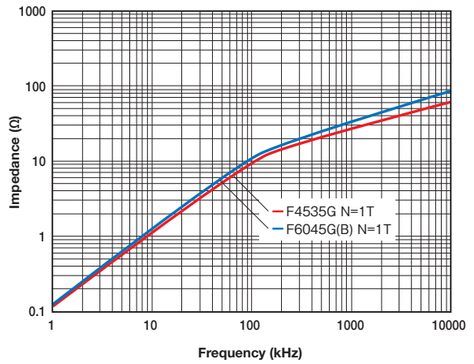

Figure 28. Frequency dependence of impedance for FT-3KL F4535G andF6045G(B)

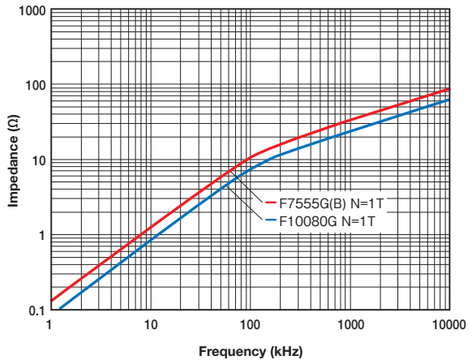

Figure 29. Frequency dependence of impedance for FT-3KL F7555G(B) andF10080G

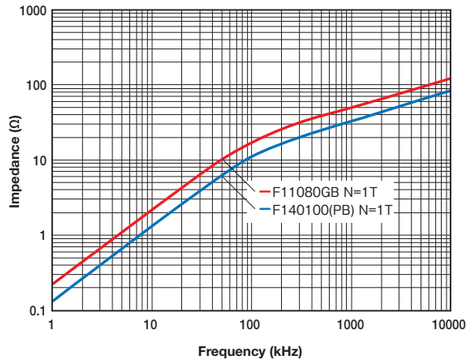

Figure 30. Frequency dependence of impedance for FT-3KL F11080GB andF140100(PB)

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For safety and proper usage, you are requested to approve our product specification or to transact the approval sheet for product specifications before ordering. This catalog and its contents are subject to change without notice.

FT-3K50T F series

FT-3K50T Fシリーズ

FT-3K50Tを適用したコモンモードチョークコア、Fシリーズです。
FT-3KMに比べMHz帯での特性を向上させることにより
特にAMラジオ帯域で効果を発揮します。

Common mode chock core, F series with FINEMET® FT-3K50T, with higher impedance at MHz band than that of FT-3KM, realizes effective noise reduction at AM radio band.

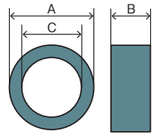
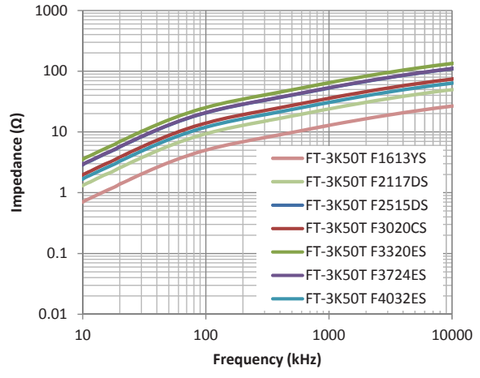


Table 10. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value (μH/N^2)	
		A MAX.	B MAX.	C MIN.				10kHz +50%,-30%	100kHz +/-30%
F1AH1157	FT-3K50T F1613YS	17.8	8.0	10.7	7.2	45.2	4	10.1	6.2
F1AH1181	FT-3K50T F2117DS	23.3	15.3	13.9	16.9	58.9	11	18.0	11.2
F1AH1182	FT-3K50T F2515DS	28.5	17.5	12.3	44.3	63.3	25	43.9	27.2
F1AH1183	FT-3K50T F3020CS	32.8	12.5	17.6	37.6	79.3	28	29.8	18.5
F1AH1107	FT-3K50T F3320ES	36.3	18.2	16.8	71.2	83.3	49	53.7	33.3
F1AH1108	FT-3K50T F3724ES	40.5	18.3	20.6	71.2	95.8	60	46.7	28.9
F1AH1184	FT-3K50T F4032ES	42.3	17.8	29.1	39.7	111.6	40	22.3	13.9
F1AH1185	FT-3K50T F4424GS	47.1	23.4	21.0	138.7	106.8	123	81.6	50.6
F1AH1109	FT-3K50T F4535GS	49.5	25.7	30.5	73.0	125.7	89	36.5	22.6
F1AH1186	FT-3K50T F4627HS	50.7	29.2	22.9	173.4	114.7	164	95.0	58.9
F1AH1187	FT-3K50T F5040GS	52.3	22.8	37.1	70.8	141.8	80	31.4	19.4
F1AH1110	FT-3K50T F6045GS	64.7	26.0	40.3	104.4	166.0	162	39.5	24.5
F1AH1111	FT-3K50T F7555GS	79.7	25.7	50.3	142.4	205.0	267	43.6	27.1
F1AH1112	FT-3K50T F10080GS	104.7	25.7	75.3	135.8	286.2	336	29.8	18.5
F1AH1113	FT-3K50T F140100PS	145.0	36.0	95.3	419.4	382.8	1,335	68.8	42.7

- Ae: effective cross-section area, Lm: mean magnetic path length



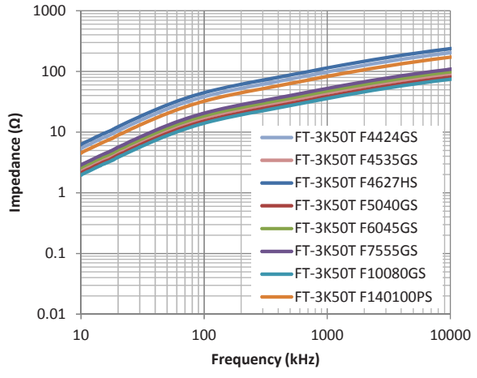


Figure 31. Impedance vs. Frequency

FT-8K50D F series

FT-8K50D Fシリーズ

FT-8K50Dを適用したコモンモードチョークコア、Fシリーズです。
高インピーダンスと、高飽和耐性を両立し大きな電流ノイズにも飽和しにくく、
ノイズを効果的に抑制することができます。

Common mode chock core, F series with FINEMET® FT-8K50D, realizes higher impedance at MHz band and high DC superposed characteristics effectively suppress larger commom mode current without magnetic saturation.

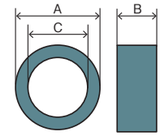


Table 11. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value (μH/N^2)	
		A Max.	B Max.	C Min.				10kHz +/-30%	100kHz +/-30%
F1AH1121	FT-8K50D F4535G	49.5	25.7	30.5	75.0	125.7	89	3.7	3.7
F1AH1122	FT-8K50D F6045G	64.7	26.0	40.3	107.3	166.0	157	4.1	4.0
F1AH1123	FT-8K50D F7555G	79.7	25.7	50.3	146.3	205.0	272	4.5	4.4
F1AH1124	FT-8K50D F10080G	104.7	25.7	75.3	139.5	286.2	336	3.1	3.0
F1AH1125	FT-8K50D F140100P	145.0	36.0	95.3	430.9	382.8	1,350	7.1	7.0
F1AH1126	FT-8K50D F200160P	205.0	36.0	155.3	427.5	568.6	1,930	4.7	4.7

- Ae: effective cross-section area, Lm: mean magnetic path length

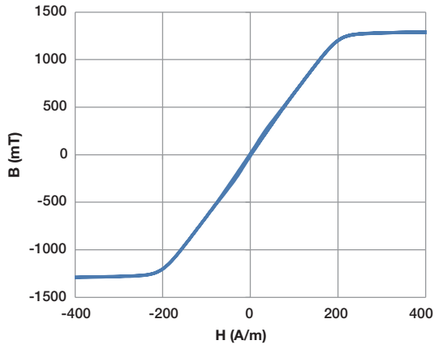


Figure 32. DC B-H

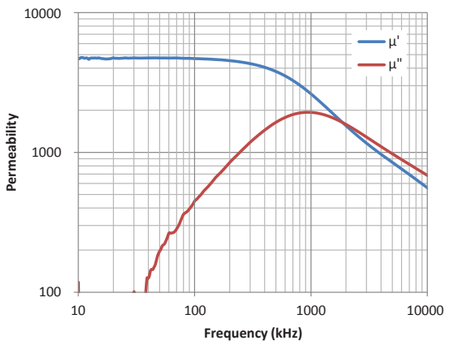


Figure 33. Permeability vs. Frequency

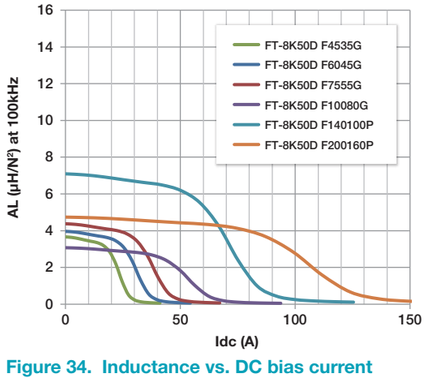


Figure 34. Inductance vs. DC bias current

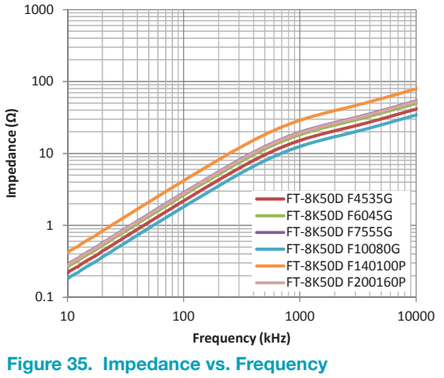


Figure 35. Impedance vs. Frequency

Common Mode Choke Coils
コモンモードチョークコイル

特長 | Features

「ファインメット®」コモンモードチョークコイルには、Mn-Znフェライトコアを用いた従来品に比べ、以下の特長があります。
1. コアの透磁率が高く、しかもQ値が低いため、広い周波数帯域でインピーダンスが高く、大きなノイズ抑制効果を発揮します。
   例えば、100kHzのインダクタンスが同一でも、インピーダンスは約2倍です。さらに、同一インダクタンスを得るのに必要な巻数が少ないため巻線間容量を小さくでき、MHz帯以上の高周波帯域で高いインピーダンスが得られます（図36）。
2. インピーダンスが温度により大きく変化しないため、広い温度範囲で安定したノイズ抑制効果が得られます（図37、38）。

FINEMET® common mode choke coil (CMC) has superior characteristics when compared with Mn-Zn ferrite chokes.
Those characteristics are as follows:
1. Having high permeability and low Q factor, FINEMET® CMC has higher impedance over a wide frequency range, which results in offering excellent noise suppression performance at wide frequency range.
   When FINEMET® and Mn-Zn ferrite chokes have same inductance at 100kHz, FINEMET® chokes show impedance two times higher than that of Mn-Zn ferrite chokes. Furthermore, since FINEMET® chokes require fewer windings to obtain the same inductance as Mn-Zn ferrite chokes, stray capacitance can be reduced and it allows high impedance at higher frequencies than 1 MHz (Figure 36).
2. Their frequency characteristics of impedance are not significantly affected by temperature change. As a result, it offers high noise suppression effect over a wide temperature range (Figure 37, 38).

適用 | Applications

エアコン、エレベータ、ポンプ、汎用インバータ、NCマシン、
レーザー加工機、ACサーボ、UPS、コンピュータ、周辺端末機器、
複写機、通信機器、各種ディスプレイ装置、放送機器、医療機器等

Air conditioner, elevator, liquid pump, inverters, NC machine, welding equipment, AC servo, UPS, personal computer, computer peripherals, copy machine, networking equipment, broadcast equipment, medical equipment, etc.

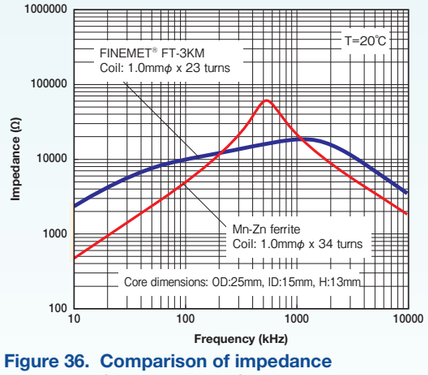


Figure 36. Comparison of impedance (8mH at 100kHz)

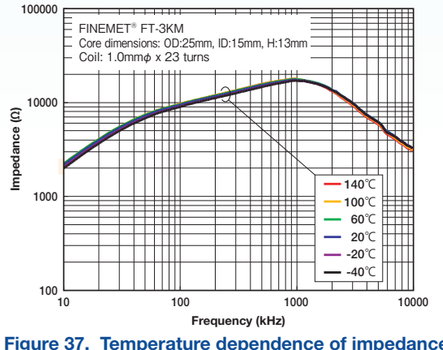


Figure 37. Temperature dependence of impedance for FINEMET® common mode chokes

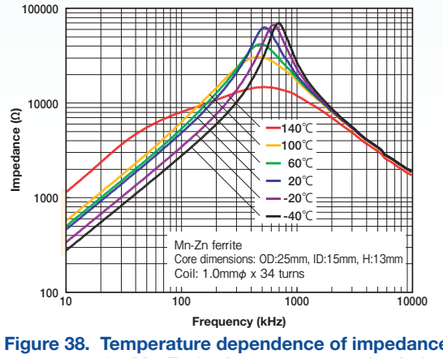


Figure 38. Temperature dependence of impedance for Mn-Zn ferrite common mode chokes

FM-C series
FM-Cシリーズ

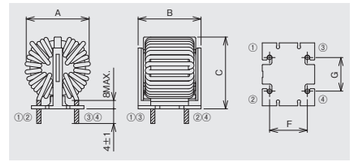
FT-3K50Tを適用したコモンモードチョークコイル、FM-Cシリーズです。
高周波領域のインピーダンス特性を向上させることにより、効果的にAMラジオ帯域でノイズを抑制します。

Common mode chock coil, FM-C series using FT-3K50T core, realizes higher impedance at MHz band and that contributes to effective noise reduction at AM radio band.

Table 12. Product code, part name and specifications

Product code	P/N	Rated current (A)	L (mH) 100kHz TYP.	Wire diameter (mm)	Finished dimension (mm)					DC resistance (mΩ) MAX.
					A MAX.	B MAX.	C MAX.	F REF.	G REF.	
F1AH1174	FM-C151V192BPF-50T	15	2.7	1.5	29	26	32	18	16	9.4
F1AH1176	FM-C153V162BPF-50T	15	2.3	2	37	32	37	18	16	5.1
F1AH1177	FM-C203V152BPF-50T	20	2.2	2	40	36	41	18	16	6.1
F1AH1178	FM-C253V132BPF-50T	25	1.9	2.4	40	36	41	18	16	3.6
F1AH1179	FM-C304V162BPF-50T	30	2.3	2.6	46	33	46	20	28	2.6
F1AH1180	FM-C405V142BPF-50T	40	2.0	3	57	43	60	18	34	2.3

Standard Specification
Rated voltage : AC250V or DC250V
Insulation voltage rating : AC2kV for 1min. Or AC2.4kV for 3sec.(line-line)
Insulation resistance : Over 100MΩ after applying DC500V for 1min.(line-line)
Insulation grade : Class B (130℃)
Operating temperature range : -40℃～+130℃ (including temperature rise of core)



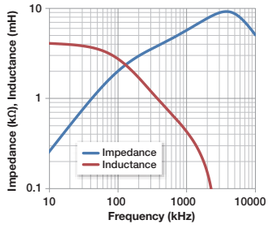


Figure 39. FM-C151V192BPF-50T

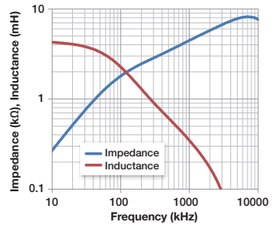


Figure 40. FM-C153V162BPF-50T

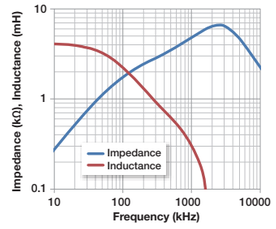


Figure 41. FM-C203V152PF-50T

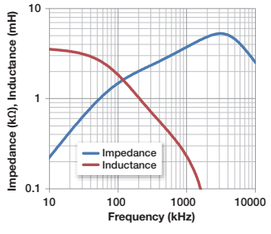


Figure 42. FM-C253V132BPF-50T

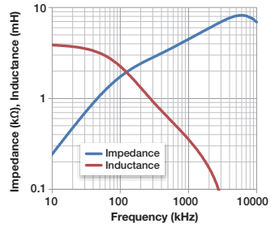


Figure 43. FM-C304V162BPF-50T

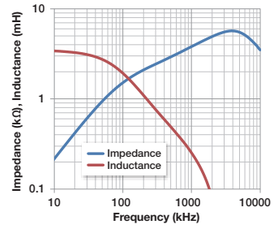


Figure 44. FM-C405V142BPF-50T

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For safety and proper usage, you are requested to approve our product specification or to transact the approval sheet for product specifications before ordering. This catalog and its contents are subject to change without notice.

FM-V series
FM-Vシリーズ

FT-3K50Tを適用したコモンモードチョークコイル、FM-Vシリーズです。
耐振動性を考慮したコア材の設計により、車載用途に適しています。

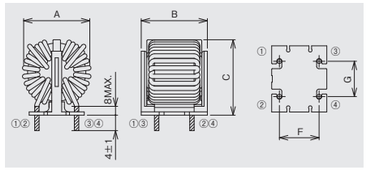
Common mode chock coil, FM-V series using FT-3K50T core with design for vibration, suits for automobile application.

Table 13. Product code, part name and specifications

Product code	P/N	Rated current (A)	L (mH) 100kHz TYP.	Wire diameter (mm)	Finished dimension (mm)					DC resistance (mΩ) MAX.
					A MAX.	B MAX.	C MAX.	F REF.	G REF.	
F1AH1189	FM-V163V202BPF-50T	16	2.8	2.0	38	27	38	18	22	6.5
F1AH1190	FM-V164V412BPF-50T	16	5.8	2.1	48	28	46	18	22	7.8

Standard Specification

Rated voltage	: AC400V or DC400V
Insulation voltage rating	: AC2kV for 1min. Or AC2.4kV for 3sec.(line-line)
Insulation resistance	: Over 100MΩ after applying DC500V for 1min.(line-line)
Insulation grade	: Class B (130℃)
Operating temperature range	: -40℃～+130℃ (including temperature rise of core)



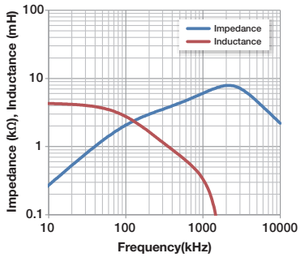


Figure 45.
FM-V163V202BPF-50T

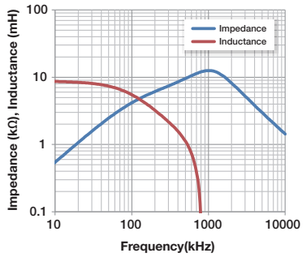


Figure 46.
FM-V164V412BPF-50T

FM-VL series
FM-VLシリーズ

FT-3KLを適用したコモンモードチョークコイル、FM-VLシリーズです。
耐振動性を考慮したコア材の設計により、車載用途に適しています。

Common mode chock coil, FM-VL series using FM-3KL core with design for vibration, suits for automobile application.

Table 14. Standard Specifications

Item	Specification
Rated voltage	AC250V or DC250V
Insulation voltage rating	AC1.5kV for 1min. or AC1.8kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Insulation grade	Class E (120°C)
Operating temperature range	-40°C – +120°C (including temperature rise of core)

Table 15. Product code, part name and specifications

Product code	P/N	Rated current (A)	|Z|(Ω) 100kHz MIN.	Wire diameter (mm)	Finished dimension (mm)				Weight (g) TYP.	DC resistance (mΩ) MAX.
					A MAX.	B MAX.	F REF.	G REF.		
F1AH0973	FM-VL12H980MYPF	12	98	1.2	18	19	10	15	9	4.0
F1AH0975	FM-VL25E211MYPF	25	207	2.2	37	25	18	28	48	2.4

- Lead-free solder is used for the winding coils.

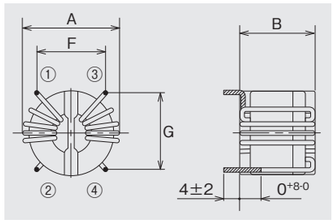


Figure 47. Single-phase VL coils

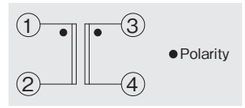


Figure 48. Circuit diagram

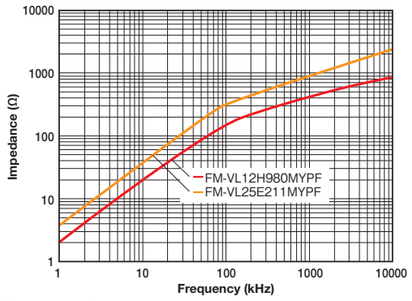


Figure 49. Frequency dependence of impedance for single-phase VL coils

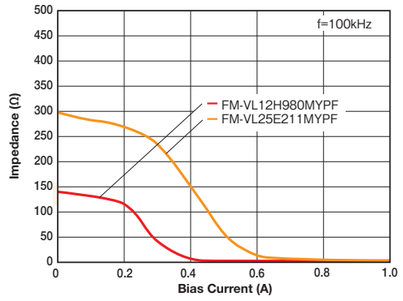
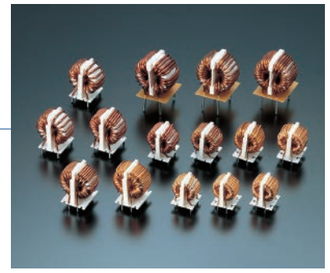


Figure 50. DC superposed charactaristics of impedance for single-phase VL coils

FM-A series
FM-Aシリーズ



単相FM-Aコイルでは、FMコイルの実績に基づいた新工法と新構造を採用することで大幅なコストダウンを図りました。

FM-A series single-phase common mode chokes are cost economical version of FM series that use a new manufacturing process and new structure.

Table 16. Standard Specifications

Item	Specification
Rated voltage	AC250V or DC250V
Insulation voltage rating	AC2kV for 1min. or AC2.4kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Insulation grade	Class B (130°C)
Operating temperature range	-40°C – +130°C (including temperature rise of core)

Table 17. Product code, part name and specifications

Product code	P/N	Rated current (A)	|Z|(kΩ) 100kHz MIN.	L(mH) 100kHz REF.	Wire diameter (mm)	Finished dimension (mm)					Weight (g) TYP.	DC resistance (mΩ) MAX.	Shape
						A MAX.	B MAX.	C MIN.	F REF.	G REF.			
F1AH0713	FM-A083V692PF	8	6.9	8.1	1.4	34	30.5	37	10	26	64	25	Fig.51
F1AH0714	FM-A103V402PF	10	4.0	4.7	1.6	36	30.5	37	10	26	63	15	Fig.51
F1AH0592	FM-A104V103PF	10	10.0	11.8	1.6	42	32	43	10	28	102	19	Fig.51
F1AH0872	FM-A153V332PF	15	3.3	3.9	1.7	38	33	37	18	16	70	12	Fig.51
F1AH0717	FM-A154V442PF	15	4.4	5.2	1.9	42	32	44	10	28	98	9	Fig.51
F1AH0873	FM-A154V722PF	15	7.2	8.5	1.7	42	32	44	10	28	102	14	Fig.51
F1AH0718	FM-A204V262PF	20	2.6	3.1	2.2	44	32	44	20	28	102	6	Fig.51
F1AH0599	FM-A205V852PF	20	8.5	10.0	2.2	52	43	60	18	34	202	12	Fig.51
F1AH0719	FM-A254V132PF	25	1.3	1.6	2.4	44	32	45	20	28	95	4	Fig.51
F1AH0722	FM-A255V242PF	25	2.4	2.9	2.6	52	43	55	18	34	163	5	Fig.51
F1AH0591	FM-A305V212PF	30	2.1	2.5	3.0	57	43	60	18	34	188	3	Fig.51
F1AH0874	FM-A054V173YPF	5	17.0	20.9	1.0	43	34	-	15	35	75	60	Fig.52
F1AH0723	FM-A083V692YPF	8	6.9	8.1	1.4	38	32	-	13	30	64	25	Fig.52
F1AH0875	FM-A083V942YPF	8	9.4	11.0	1.3	39	34	-	13	30	66	33	Fig.52
F1AH0876	FM-A084V173YPF	8	17.0	20.9	1.3	43	34	-	15	35	98	38	Fig.52
F1AH0724	FM-A103V402YPF	10	4.0	4.7	1.6	38	33	-	13	30	63	15	Fig.52
F1AH0726	FM-A104V103YPF	10	10.0	11.8	1.6	43	35	-	15	35	102	19	Fig.52
F1AH0877	FM-A153V332YPF	15	3.3	3.9	1.7	38	33	-	13	30	70	12	Fig.52
F1AH0878	FM-A154V722YPF	15	7.2	8.5	1.7	43	34	-	15	35	102	14	Fig.52

- Lead-free solder is used for the winding coils.

コモンモードチョークコイル ｜ Common Mode Choke Coils
DCパワーライン用、単相ACパワーライン用 ｜ For DC and single-phase AC power lines

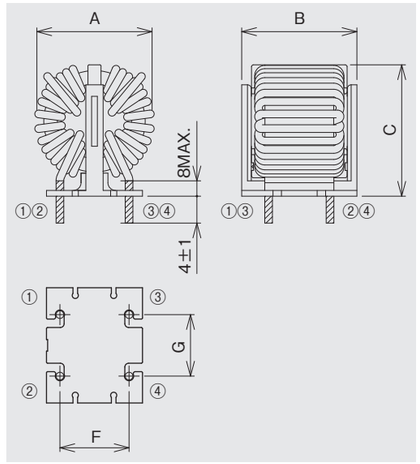


Figure 51. FM-A□□□V□□□PF

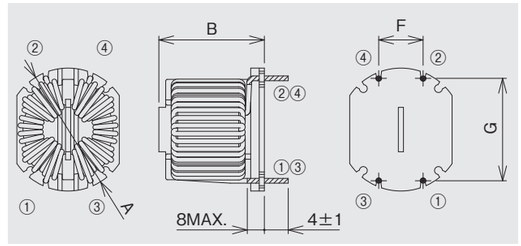


Figure 52. FM-A□□□V□□□YPF

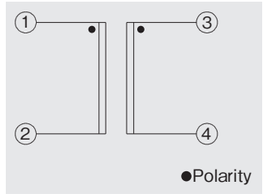


Figure 53. Circuit diagram

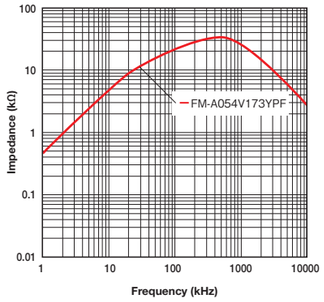


Figure 54.
Frequency dependence of impedance for single-phase FM-A coils with rated current 5A

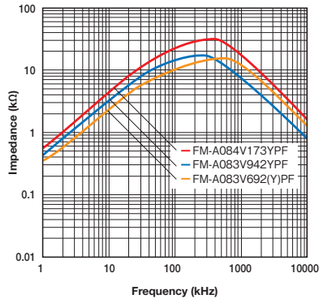


Figure 55.
Frequency dependence of impedance for single-phase FM-A coils with rated current 8A

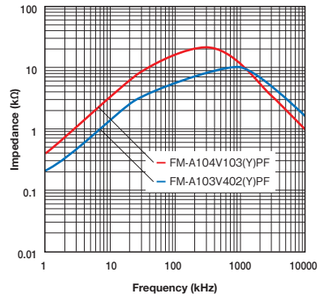


Figure 56.
Frequency dependence of impedance for single-phase FM-A coils with rated current 10A

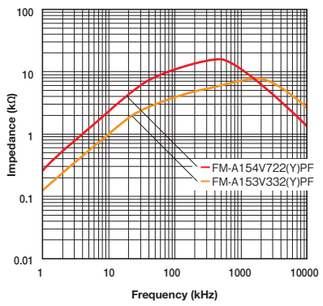


Figure 57.
Frequency dependence of impedance for single-phase FM-A coils with rated current 15A

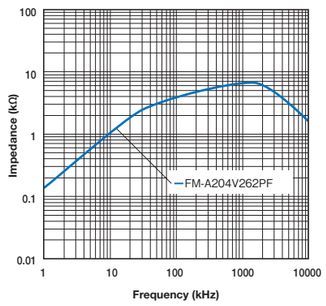


Figure 58.
Frequency dependence of impedance for single-phase FM-A coils with rated current 20A

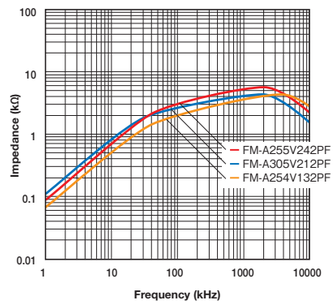


Figure 59.
Frequency dependence of impedance for single-phase FM-A coils with rated current 25A-30A

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FM series
FMシリーズ

単相FMコイルは、小型でノイズ減衰特性に優れたコモンモードチョークです。

FM series single-phase common mode chokes are compact in size and have excellent electromagnetic noise suppression properties.

Table 18. Standard Specifications

Item	Specification
Rated voltage	AC250V or DC250V
Insulation voltage rating	AC1.5kV for 1min. or AC1.8kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Insulation grade	Class E (120°C)
Operating temperature range	-40°C – +120°C (including temperature rise of core)

Table 19. Product code, part name and specifications

Product code	P/N	Rated current (A)	L (mH)		Wire diameter (mm)	Finished dimension (mm)				Weight (g) TYP.	DC resistance (mΩ) MAX.	Shape
			10kHz MIN.	100kHz MIN.		A MAX.	B MAX.	F REF.	G REF.			
F1AH0866	FM02W752MPF	2	31.0	5.0	0.4	16	12	5	11	4.2	135	Fig.60
F1AH0813	FM03C782MBPF	3	28.1	7.8	0.7	31	25	7	22	30	80	Fig.60
F1AH0814	FM03D382MBPF	3	15.0	3.8	0.8	29	25	7	17	24	40	Fig.60
F1AH0790	FM05E572MBPF	5	22.0	5.7	1.1	33	32	7	24	55	30	Fig.60
F1AH0815	FM05F852MBPF	5	39.1	8.5	1.1	37	32	7	28	66	40	Fig.60
F1AH0816	FM08E242MBPF	8	9.3	2.4	1.4	36	32	7	24	51	12	Fig.60
F1AH0817	FM10G752MBPF	10	29.3	7.5	1.4	50	32	7	25	107	20	Fig.60
F1AH0818	FM10I113MBPF	10	44.4	10.6	1.5	50	37	10	32	150	25	Fig.60
F1AH0819	FM15F162MBPF	15	6.2	1.6	1.9	42	34	7	28	120	6	Fig.60
F1AH0820	FM15G462MBPF	15	18.0	4.6	1.8	51	34	7	25	122	10	Fig.60
F1AH0821	FM15I682MBPF	15	26.9	6.8	1.9	53	39	10	32	168	12	Fig.60
F1AH0822	FM20G242MBPF	20	9.4	2.4	2.0	52	35	7	25	117	6	Fig.60
F1AH0823	FM20I382MBPF	20	13.7	3.8	2.1	54	42	10	32	162	7	Fig.60
F1AH0880	FM25G142MBPF	25	5.6	1.4	2.3	54	37	7	25	155	4	Fig.60
F1AH0825	FM25I292MBPF	25	10.3	2.9	2.3	55	43	10	32	166	5	Fig.60
F1AH0826	FM10G752MYBPF	10	29.3	7.5	1.4	55	34	27	37	108	20	Fig.61
F1AH0827	FM10I113MYBPF	10	44.4	10.6	1.5	55	40	27	37	151	25	Fig.61
F1AH0828	FM15G462MYBPF	15	18.0	4.6	1.8	55	37	27	37	123	10	Fig.61
F1AH0829	FM15I682MYBPF	15	26.9	6.8	1.9	55	42	27	37	171	12	Fig.61
F1AH0830	FM20G242MYBPF	20	9.4	2.4	2.0	55	38	27	37	118	6	Fig.61
F1AH0831	FM20I382MYBPF	20	13.7	3.8	2.1	55	45	27	37	162	7	Fig.61
F1AH0832	FM20S562MYBPF	20	22.5	5.6	2.4	71	41	40	50	295	9	Fig.61
F1AH0833	FM25G142MYBPF	25	5.6	1.4	2.3	55	40	27	37	156	4	Fig.61
F1AH0834	FM25I292MYBPF	25	10.3	2.9	2.3	55	46	27	37	167	5	Fig.61
F1AH0835	FM30S192MYBPF	30	7.5	1.9	2.0x2	73	42	40	50	273	4	Fig.61
F1AH0836	FM40S122MYBPF	40	5.0	1.2	1.9x3	73	42	40	50	253	2	Fig.61

- Lead-free solder is used for the winding coils.

コモンモードチョークコイル | Common Mode Choke Coils
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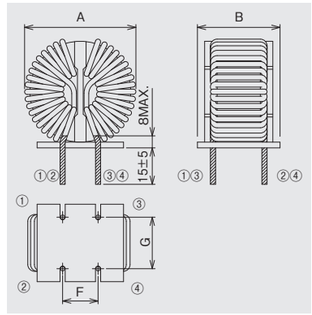

Figure 60. FM□□□□□□MBPF

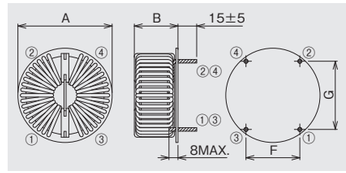

Figure 61. FM□□□□□□MYBPF

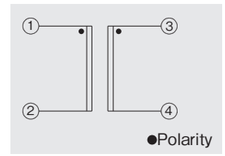

Figure 62. Circuit diagram

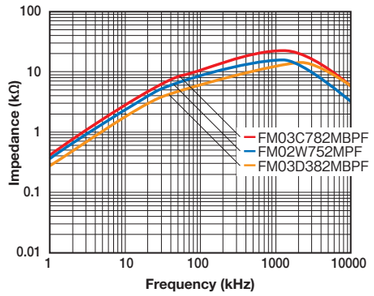

Figure 63. Frequency dependence of impedance for single-phase FM coils with rated current 2A-3A

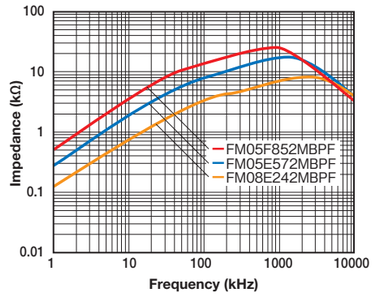

Figure 64. Frequency dependence of impedance for single-phase FM coils with rated current 5A-8A

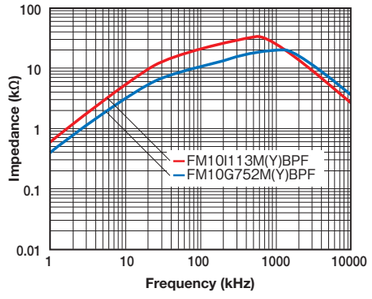

Figure 65. Frequency dependence of impedance for single-phase FM coils with rated current 10A

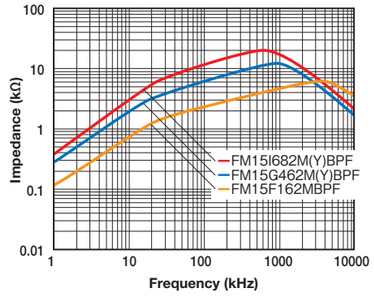

Figure 66. Frequency dependence of impedance for single-phase FM coils with rated current 15A

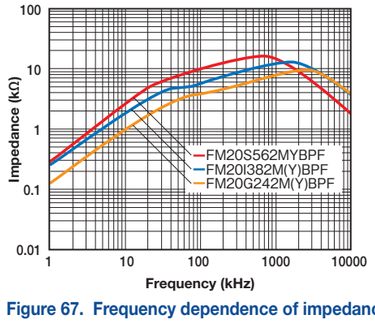

Figure 67. Frequency dependence of impedance for single-phase FM coils with rated current 20A

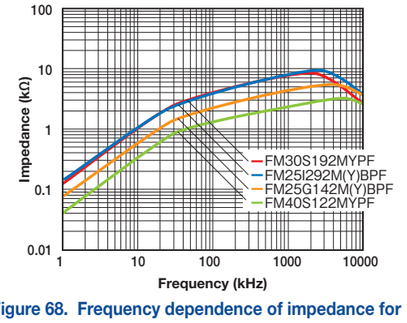

Figure 68. Frequency dependence of impedance for single-phase FM coils with rated current 25A-40A

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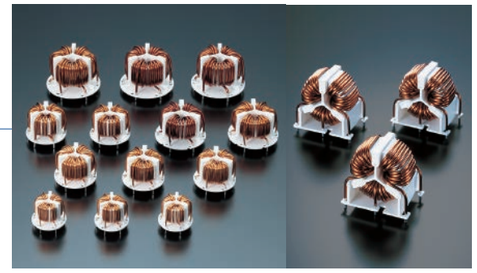
FM-A series
FM-Aシリーズ



3相FM-Aコイルでは、FMコイルの実績に基づいた新工法と新構造を採用することで大幅なコストダウンを図りました。

FM-A series three-phase common mode chokes are cost economical version of FM series that use a new manufacturing process and new structure.

Table 20. Standard Specifications

Item	Specification
Rated voltage	AC250V
Insulation voltage rating	AC2kV for 1min. or AC2.4kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Insulation grade	Class B (130°C)
Operating temperature range	-40°C – +130°C (including temperature rise of core)

Table 21. Product code, part name and specifications

Product code	P/N	Rated current (A)	|Z|(kΩ) 100kHz MIN.	L(mH) 100kHz REF.	Wire diameter (mm)	Finished dimension (mm)					Weight (g) TYP.	DC resistance (mΩ) MAX.	Shape
						A MAX.	B MAX.	C MAX.	F REF.	G REF.			
F1AH0737	FM-A051T502PF	5	5.0	5.9	0.9	35	28	-	30	15	40	36	Fig.69
F1AH0728	FM-A081T202PF	8	2.0	2.3	1.1	35	28	-	30	15	39	17	Fig.69
F1AH0893	FM-A152T232PF	15	2.3	2.7	1.7	45	35	-	40	20	99	8	Fig.69
F1AH0740	FM-A153T452PF	15	4.5	5.3	1.8	56	38	-	50	25	153	11	Fig.69
F1AH0741	FM-A204T442PF	20	4.4	5.3	2.2	63	46	-	56	28	236	9	Fig.69
F1AH0734	FM-A253T152PF	25	1.5	1.8	2.4	56	38	-	50	25	158	4	Fig.69
F1AH0736	FM-A304T212PF	30	2.1	2.4	2.6	63	47	-	56	28	232	5	Fig.69
F1AH0881	FM-A082T852VBPF	8	8.5	10.1	1.3	45	33	45	20	26	105	26	Fig.71
F1AH0882	FM-A102T602VBPF	10	6.0	7.1	1.5	45	33	45	20	26	111	17	Fig.71
F1AH0883	FM-A152T232VBPF	15	2.3	2.7	1.7	45	33	45	20	26	101	8	Fig.71

- Lead-free solder is used for the winding coils.

コモンモードチョークコイル | Common Mode Choke Coils
3相ACパワーライン用 | For three-phase AC power lines

コモンモードチョークコイル
Common Mode Choke Coils

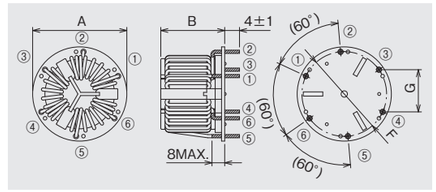


Figure 69. FM-A□□□T□□□PF

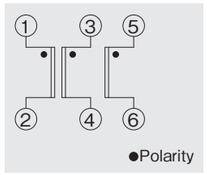


Figure 70. Circuit diagram

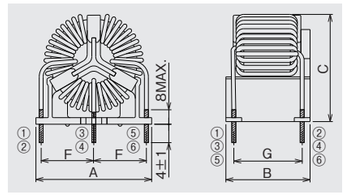


Figure 71. FM-A□□□T□□□VBPF

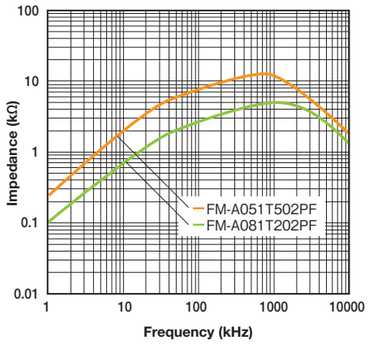


Figure 72. Frequency dependence of impedance for three-phase FM-A coils with rated current 5A-10A

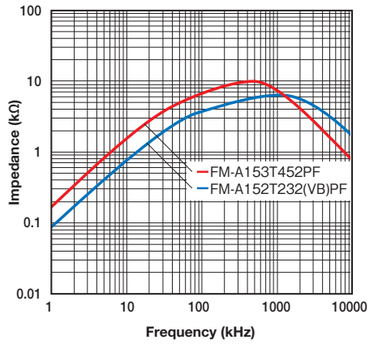


Figure 73. Frequency dependence of impedance for three-phase FM-A coils with rated current 15A

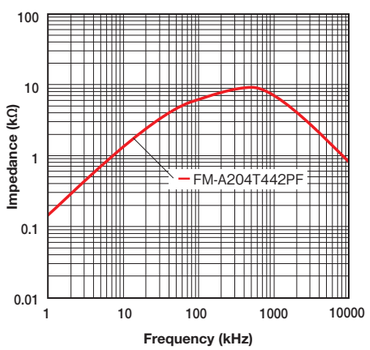


Figure 74. Frequency dependence of impedance for three-phase FM-A coils with rated current 20A

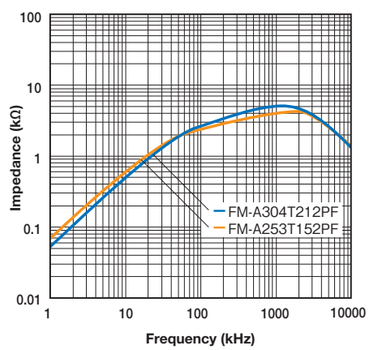


Figure 75. Frequency dependence of impedance for three-phase FM-A coils with rated current 25A-30A

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FM series
FMシリーズ

3相FMコイルは、小型でノイズ減衰特性に優れたコモンモードチョークです。

FM series three-phase common mode chokes are compact in size and have excellent electromagnetic noise suppression properties.

Table 22. Standard Specifications

Item	Specification
Rated voltage	AC250V
Insulation voltage rating	AC2kV for 1min. or AC2.4kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Insulation grade	Class E (120°C)
Operating temperature range	-40°C – +120°C (including temperature rise of core)

Table 23. Product code, part name and specifications

Product code	P/N	Rated current (A)	L (mH)		Wire diameter (mm)	Finished dimension (mm)				Weight (g) TYP.	DC resistance (mΩ) MAX.	Shape
			10kHz MIN.	100kHz MIN.		A MAX.	B MAX.	F REF.	G REF.			
F1AH0837	FM03R832MBPF	3	32.6	8.3	0.7	34	25	30	12	40	98	Fig.76
F1AH0838	FM05R302MBPF	5	12.0	3.0	0.9	34	25	30	12	47	32	Fig.76
F1AH0839	FM10J462MBPF	10	16.6	4.6	1.4	61	37	50	35	155	20	Fig.76
F1AH0840	FM15J322MBPF	15	11.5	3.2	1.8	61	37	50	35	180	10	Fig.76
F1AH0841	FM20J172MBPF	20	6.2	1.7	2.1	61	38	50	35	165	6	Fig.76
F1AH0842	FM20N242MBPF	20	8.6	2.4	2.3	66	39	60	40	241	6	Fig.76
F1AH0843	FM20O472MBPF	20	16.8	4.7	2.0	89	42	75	45	335	12	Fig.76
F1AH0844	FM25J112MBPF	25	4.1	1.1	2.3	63	37	50	35	174	4	Fig.76
F1AH0845	FM25O302MBPF	25	10.7	3.0	2.3	89	43	75	45	345	8	Fig.76
F1AH0846	FM30K252MBPF	30	8.8	2.5	2.5	74	49	64	32	375	6	Fig.77
F1AH0847	FM30O232MBPF	30	8.2	2.3	2.6	89	40	75	45	390	6	Fig.76
F1AH0848	FM40K142MBPF	40	5.0	1.4	2.7	78	49	64	32	345	4	Fig.77
F1AH0849	FM50K601MBPF	50	2.2	0.6	2.8	74	49	64	32	303	3	Fig.77

- Lead-free solder is used for the winding coils.

コモンモードチョークコイル | Common Mode Choke Coils
3相ACパワーライン用 | For three-phase AC power lines

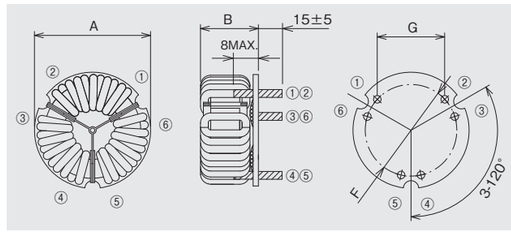

Figure 76. FM□□□□□□MBPF

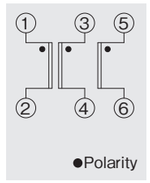

Figure 78. Circuit diagram

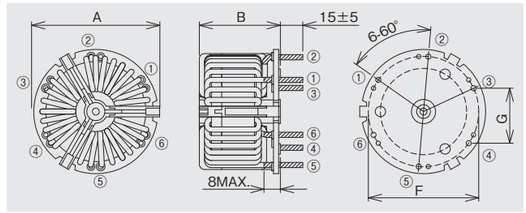

Figure 77. FM□□K□□□MBPF

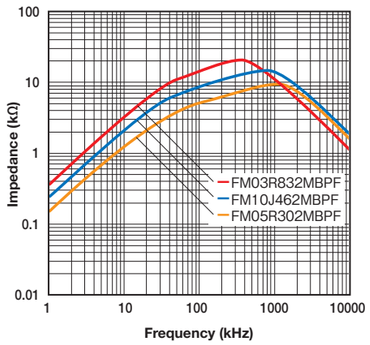

Figure 79. Frequency dependence of impedance for three-phase FM coils with rated current 3A-10A

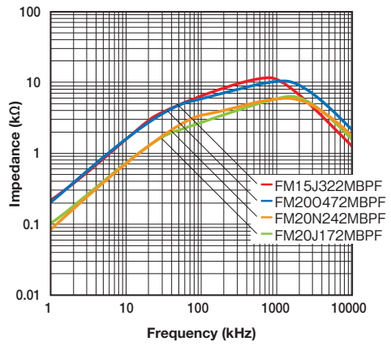

Figure 80. Frequency dependence of impedance for three-phase FM coils with rated current 15A-20A

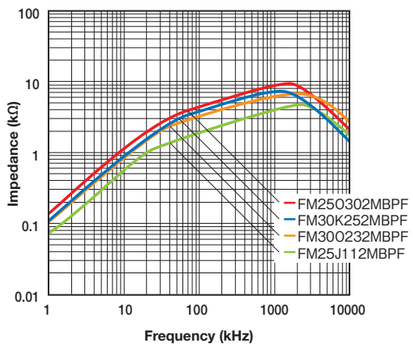

Figure 81. Frequency dependence of impedance for three-phase FM coils with rated current 25A-30A

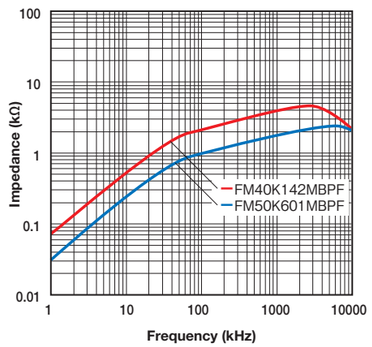

Figure 82. Frequency dependence of impedance for three-phase FM coils with rated current 40A-50A

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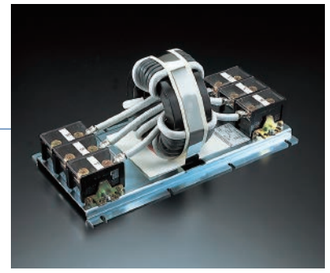
FN series
FN シリーズ



FNコイルは、「ファインメット®」FT-3KM Fシリーズコアを用いた、小型でノイズ減衰特性に優れた定格100A以上の大電流対応のコモンモードチョークです。

FN coils made with FT-3KM F series cores are compact three phase common modes chokes having excellent noise suppression properties for rated current over 100 Ampere.

Table 24. Standard Specifications

Item	Specification
Rated voltage	AC600V
Insulation voltage rating	AC2kV for 1min. or AC2.4kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Temperature rise (coil)	Refer to each specification
Operating temperature range	Coil : -30°C – +120°C (including temperature rise of core) Terminal: -30°C – +80°C (including temperature rise of core)

Table 25. Product code, part name and specifications

Product code	P/N	Rated current (A)	L (mH)		Finished dimension (mm)					Weight (kg) TYP.	DC resistance (mΩ) MAX.	Temp. rise (°C)
			10kHz REF.	100kHz ±30%	A ±1	B ±1	C MAX.	F REF.	H			
F1AH0033	FN100I102MB	100	4.5	1.2	320	160	150	24.5	M8	4	1.0	60
F1AH0039	FN100I202MB	100	9.0	2.3	350	160	150	24.5	M8	5	1.3	60
F1AH0034	FN150I102MB	150	4.5	1.2	320	160	150	27.0	M8	4	0.7	60
F1AH0040	FN150J202MB	150	13.0	3.2	400	210	200	45.0	M10	8	1.3	60
F1AH0041	FN200J202MB	200	10.0	2.4	400	210	200	45.0	M10	9	0.8	60
F1AH0036	FN300J102MB	300	5.0	1.2	450	210	200	45.0	M10	11	0.4	70
F1AH0042	FN300J202MB	300	10.0	2.5	520	210	200	45.0	M10	15	0.8	70
F1AH0679	FN600K152MB	600	5.0	1.5	650	300	270	63.0	M16	32	0.2	70

- These are lead-free products.

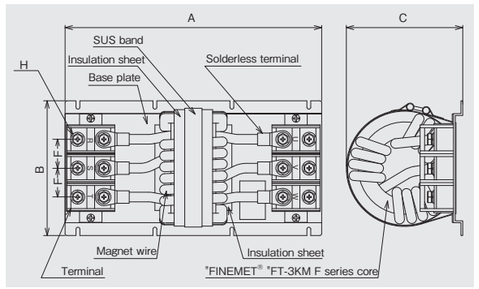


Figure 83. FN coil

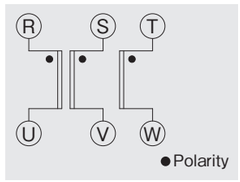


Figure 84. Circuit diagram

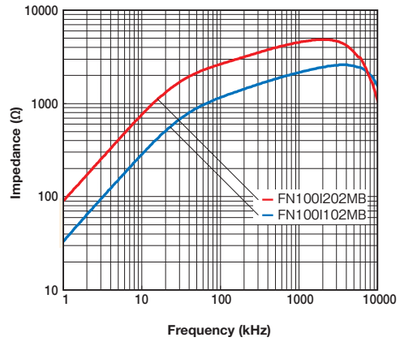


Figure 85. Frequency dependence of impedance for three-phase FN coils with rated current 100A

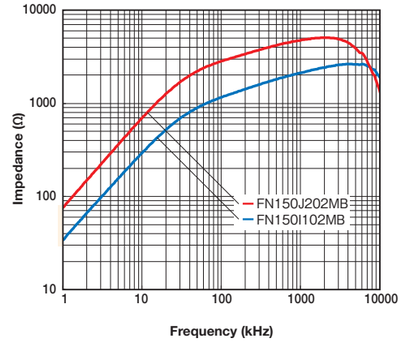


Figure 86. Frequency dependence of impedance for three-phase FN coils with rated current 150A

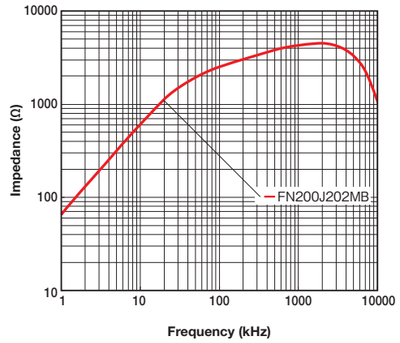


Figure 87. Frequency dependence of impedance for three-phase FN coils with rated current 200A

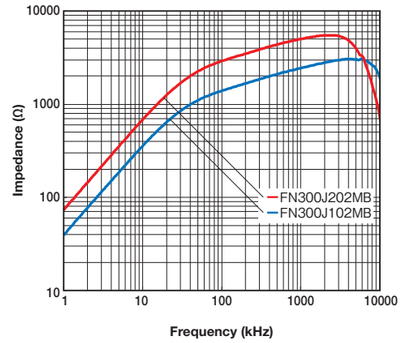


Figure 88. Frequency dependence of impedance for three-phase FN coils with rated current 300A

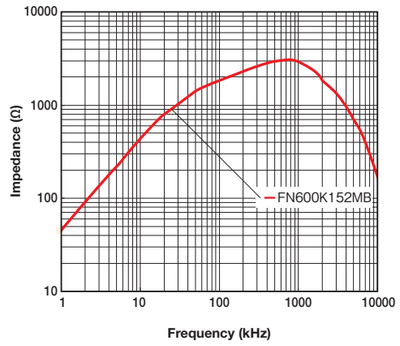


Figure 89. Frequency dependence of impedance for three-phase FN coils with rated current 600A

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FM-H series
FM-Hシリーズ

FM-Hコイルは、3相AC400V系ライン用の小型でノイズ減衰特性に優れたコモンモードチョークです。

FM-H coils are compact common mode chokes having excellent noise suppression properties for three-phase AC 400V power lines.

Table 26. Standard Specifications

Item	Specification
Rated voltage	AC415V
Insulation voltage rating	AC2kV for 1min. or AC2.4kV for 3 sec. (line-line)
Insulation resistance	Over 100MΩ after applying DC500V for 1min. (line-line)
Insulation grade	Class B (130°C)
Operating temperature range	-40°C – +130°C (including temperature rise of core)

Table 27. Product code, part name and specifications

Product code	P/N	Rated current (A)	L (mH)		Wire diameter (mm)	Finished dimension (mm)				Weight (g) TYP.	DC resistance (mΩ) MAX.
			10kHz MIN.	100kHz MIN.		A MAX.	B MAX.	F REF.	G REF.		
F1AH0884	FM-H15O672MBPF	15	24.1	6.7	1.8	85	52	75	40	370	17.0
F1AH0885	FM-H20O472MBPF	20	16.8	4.7	2.2					410	9.5
F1AH0886	FM-H25O302MBPF	25	10.7	3.0	2.4					410	6.5
F1AH0887	FM-H30O232MBPF	30	8.2	2.3	2.8					440	4.5

- Lead-free solder is used for the winding coils.

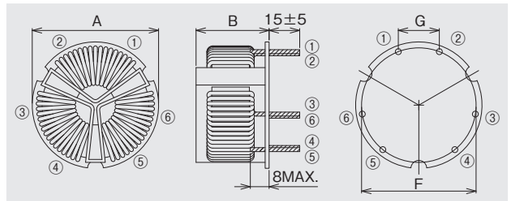

Figure 90. FM-H□□□□□□PF

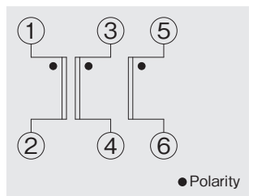

Figure 91. Circuit diagram

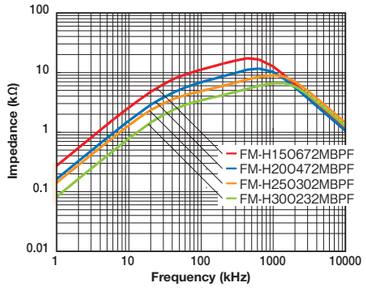

Figure 92. Frequency dependence of impedance

Medium Frequency Transformer Core
高周波トランス用コア

低損失で高飽和磁束密度を有するFINEMET®FT-3TL材をご用意しました。
SiCパワーデバイス等を用いた高周波駆動電源の高効率化、小型軽量化に貢献します。

FINEMET® FT-3TL has lower core loss and has high saturation flux density.
FT-3TL contributes small volume, light weight and high efficiency design of power supply.

特長 | Features

FT-3TLは従来のファインメット®材料及び従来の軟磁性材料より低損失であり高Bm駆動に適しています。
数kHz～数10kHzで駆動される高周波トランスの小型軽量化、高効率化に効果を発揮します。

FT-3TL is suitable for high Bm drive, because of lower core loss compare to other maerial include previous FINEMET® alloys.
FT-3TL contributes small volume, light weight and high efficiency design.

1. 低損失
ファインメットカットコア比
トロイダルコア 約1/7　角型コア 約1/5
アモルファスカットコア比
トロイダルコア 約1/30　角型コア 約1/25

2. 高飽和磁束密度
Mn-Znフェライト比約4倍
（Mn-Zn Ferrite 0.3T　FT-3TL　1.2T）

1. Lower Core Loss
Compare to conventional FNEMET® cut core.
Toroidal core has 1/7 smaller core loss Square core has 1/5 smaller core loss
Compare to Fe based amorphous cut core.
Toroidal core has 1/30 smaller core loss Square core has 1/25 smaller core los

2. High Saturation Flux Density
4 times more higher flux density compare to Mn-Zn Ferrite
(Mn-Zn Ferrite 0.3T FT-3TL 1.2T)

低コア損失
Low Core Loss

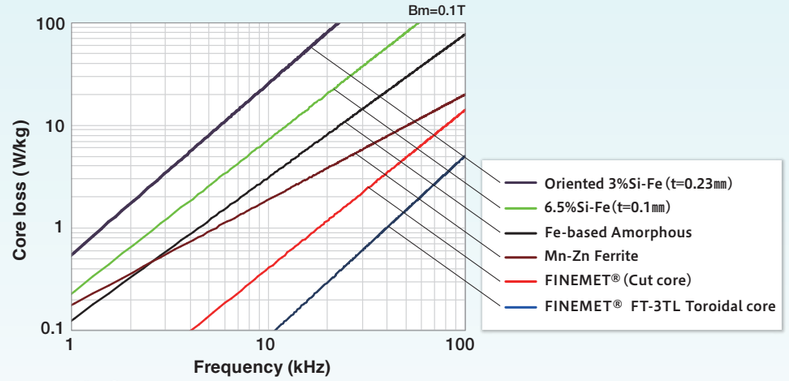

Figure 93. Core Loss vs. Frequency

高飽和磁束密度
High Satulation Flux Density

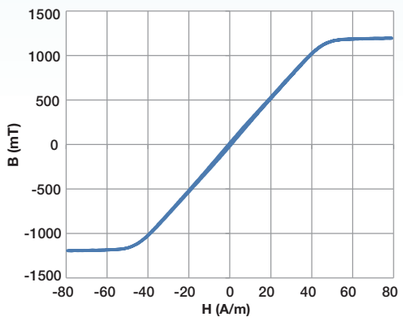

Figure 94. DC B-H

優れた周波数特性
Excellent Frequency Characteristic

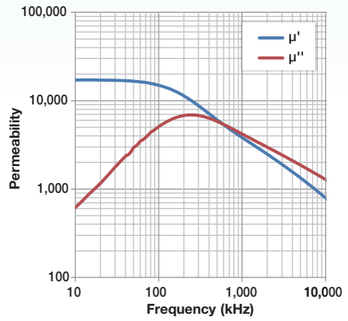

Figure 95. Permeability vs. Frequency

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FT-3TL F/RT series
FT-3TL F/RTシリーズ

FT-3TLを適用したパワートランス用コアです。
低損失、高飽和磁束密度によりシステムの高効率化、小型化に貢献します。

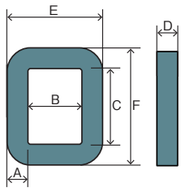
Cores for power transformer with FINEMET® FT-3TL,
with low core loss and high saturation flux density, realize effective power transforming.

トロイダルコア
Toroidal Cores

Table 28. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	AL value ($\mu H/N^2$)	Pc (W Max)
		A Max.	B Max.	C Min.				10kHz +/-30%	20kHz 0.1T
F1AH1165	FT-3TL F5040GS	52.3	22.8	37.1	70.8	141.8	80	14.4	0.03
F1AH1166	FT-3TL F6045GS	64.7	26.0	40.3	104.4	166.0	162	18.2	0.07
F1AH1167	FT-3TL F7555GS	79.7	25.7	50.3	142.4	205.0	267	20.1	0.11
F1AH1168	FT-3TL F10080GS	104.7	25.7	75.3	135.8	286.2	336	13.7	0.14
F1AH1169	FT-3TL F140100PS	145.0	36.0	95.3	419.4	382.8	1,335	31.7	0.56
F1AH1170	FT-3TL F200160PS	205.0	36.0	155.0	416.1	568.6	1,875	21.1	0.79

- Ae: effective cross-section area,　Lm: mean magnetic path length



角型コア
Square Cores

Table 29. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)					
		A TYP.	B TYP.	C TYP.	D TYP.	E TYP.	F TYP.
F1AH1171	FT-3TL RT50-78-138-30S	50	78	138	30	178	238
F1AH1172	FT-3TL RT40-130-305-30S	40	130	305	30	210	385
F1AH1173	FT-3TL RT50-150-330-50S	50	150	330	50	250	430

Product code	P/N	Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (kg) TYP.	AL value ($\mu H/N^2$)	Pc (W Max)
					10kHz +/-30%	20kHz 0.1T
F1AH1171	FT-3TL RT50-78-138-30S	1,125	575	4.7	56.5	2.8
F1AH1172	FT-3TL RT40-130-305-30S	900	987	6.5	26.3	3.8
F1AH1173	FT-3TL RT50-150-330-50S	1,875	1,108	15.2	48.9	8.9

- Ae: effective cross-section area,　Lm: mean magnetic path length

Surge Absorber Cores
サージアブソーバコア

特長 ｜ Features

「ファインメット®」ビーズ（FT-3AM材使用）、可飽和コア MPシリーズ（FT-3SH材使用）は、高パルス透磁率特性のサージアブソーバ用コアです。
ダイオードのリバースリカバリー電流（順方向電流が流れた後の逆方向電流）、スイッチング回路で発生する過渡的な電流サージやリンギングの抑制に効果を発揮します。
また、可飽和コア MPシリーズは、マグアンプ用可飽和コアに好適です。

1. Co基アモルファスの約2倍、Ni-Znフェライトの約3倍の飽和磁束密度を持ち、Co基アモルファスに匹敵するパルス透磁率および低コアロス特性のため、小型のコアでより高いレベルのサージ電流、サージ電圧を抑制することができます。
2. Co基アモルファスやNi-Znフェライトのキュリー温度が約200℃であるのに対し、「ファインメット®」のキュリー温度は570℃と高いため、温度特性が極めて安定です。
3. Co基アモルファスのような経時変化（透磁率の減少、角形比、保磁力およびコアロスの増加）がほとんどありません。
4. Co基アモルファスに比べて、低コストです。

FINEMET® beads made of FT-3AM material and MP series saturable cores made of FT-3SH material are suitable for surge absorber used for medium to large handling power.
Having high saturation flux density (Bs=1.23T) and low core loss (80Wkg at 100kHz, Bm=0.2T), MP series cores are also suitable for saturable cores in magamp circuit driven below 150kHz.
Features of FT-3AM and FT-3SH cores:

1. The saturation magnetic flux density is twice as high as that of Co-based amorphous metal and three times higher than that of Ni-Zn ferrite. The pulse permeability and the core loss are comparable to Co-based amorphous metal. As a result, small-size cores using FT-3AM/FT-3SH offer higher performance in suppression of surge current and voltage.
2. The temperature characteristics of FINEMET® are very stable due to its high Curie temperature, (570°C). (Curie temperature of Co-based amorphous metal and Ni-Zn ferrite is around 200°C.)
3. Unlike Co-based amorphous metal, which has relatively large aging effects (decrease of permeability and increase of coercivity and core loss over time), the aging effects of FINEMET® are very small.
4. Lower cost than Co-based amorphous.

Table 30. Comparison of magnetic and physical properties among FT-3AM and conventional materials.

			FT-3AM	FT-3SH	Co Based Amorphous	Ni-Zn ferrite
Saturation flux density, Bs*	(T)	20°C	1.23	1.23	0.60	0.38
		100°C	1.20	1.20	0.53	0.29
Squareness ratio, Br/Bs*		20°C	0.50	0.90	0.80	0.71
		100°C	0.48	0.88	0.78	0.60
Coercive force, Hc*	(A/m)	20°C	2.5	0.60	0.30	30
		100°C	–	–	0.29	20
Pulse permeability, μrp**			3,500	4,000	4,500	500
Core loss, Pcv**	(J/m^3)		7.5	6.5	6.0	7.0
Curie temperature, Tc	(°C)		570	570	210	200
Saturation magnetostriction, λs	[$\times 10^{-6}$]		<1	<1	≒0	-7.8
Electrical resisitivity, ρ	(μΩ・m)		1.2	1.2	1.3	1×10^{12}
Density, d	(kg/m^3)		7.3×10^3	7.3×10^3	7.7×10^3	5.2×10^3

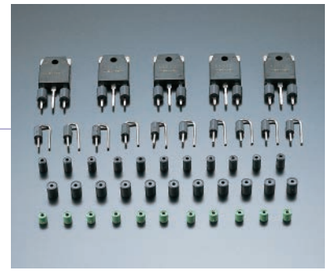
* DC magnetic properties at 800A/m
**Pulse width τ s=0.1μs　Operating magnetic flux density △B=0.2T

主な適用 ｜ Applications

スイッチング電源、インバータなどに用いられる高速ダイオードのリバースリカバリー電流や逆方向サージ電圧の抑制、パワーMOS-FETなど半導体スイッチング素子のターンオン時のサージ電流抑制、スイッチング回路で発生する過渡的な電流スパイクやリンギングの低減など。

1. Suppression of reverse recovery current and surge current from diode in switching mode power supplies or invertors.
2. Suppression of surge current at the moment of activation of switching diode, such as power MOS-FET.
3. Suppression of spike or ringing current generated in switching circuit.

FINEMET Beads
「ファインメット®」ビーズ



「ファインメット®」ビーズは、FT-3AM材を用いた小型のビーズコアで、ダイオードのリバース・リカバリー電流などの半導体スイッチング素子のスイッチング・サージを始めとする各種サージ電流・電圧の抑制が図れます。

FINEMET® Beads made of FT-3AM material are small size bead cores which show excellent performance in suppression of various kinds of surge current, such as surge from a switching diode.

Table 31. Product code, part name and specifications (toroidal core)

Product code	P/N	Finished dimension (mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	Weight (g) TYP.	2ϕs (μWb) MIN.		AL value ($\mu H/N^2$) 100kHz
		A	B	C				25°C	120°C	
F1AH0432	FT-3AM B3X	4.0 MAX.	5.0 MAX.	1.6 TYP.	1.13	7.85	0.10	2.2	2.0	2.0 MIN.
F1AH0433	FT-3AM B3AR	4.0 MAX.	7.0 MAX.	1.6 TYP.	1.88	7.85	0.16	3.6	3.4	3.3 MIN.
F1AH0434	FT-3AM B4AR	5.0 MAX.	7.0 MAX.	1.6 TYP.	3.75	9.42	0.34	7.3	6.9	5.5 MIN.

- Ae: effective cross-section area, Lm: mean magnetic path length

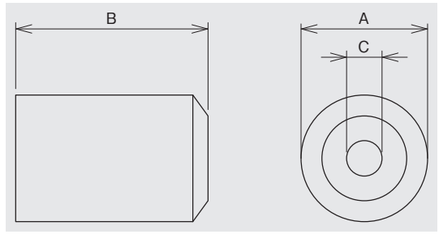


Figure 96. Toroidal core

Table 32. Product code, part name and specifications (lead wire core)

Product code	P/N	Fineshed dimension (mm)								Weight (g) TYP.
		A	B	C	D	E	F	G	H	
F1AH0675	FT-3AM B4ARL-PF	5.0 MAX.	7.0 REF.	15.0 REF.	3.0 MIN.	7.0 MAX.	5.0±1	1.0ϕ	2.0 MAX.	0.52
F1AH0676	FT-3AM B4ARLY-PF	5.0 MAX.	7.0 MAX.	3.0 MIN.	4.0±1	–	15.0±1	1.0ϕ	2.8 MAX.	0.56

- Ae, Lm, 2ϕs, AL value and core case are the same as FT-3AM B4AR.
- These are lead-free products.

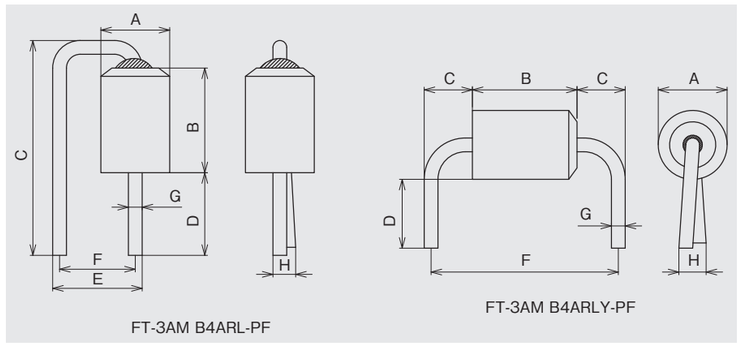
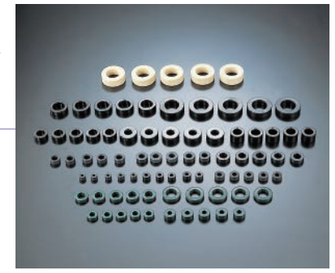


Figure 97. Lead wire core

Saturable Core MP series
可飽和コア MP シリーズ



「ファインメット®」可飽和コアMPシリーズ（FT-3SH材使用）は、中～大容量のサージアブソーバ（磁気スナバ）に好適です。
また、高飽和磁束密度（Bs＝1.23T）で、Co基アモルファス可飽和コアに準ずる低損失特性（80W/kg at 100kHz, Bm=0.2T）のため、150kHz程度以下の周波数で駆動するマグアンプの動作磁束密度を高く設定でき、コアの小型化が図れます。

FINEMET® saturable cores MP series (using FT-3SH material) are suitable for surge absorber for medium to large handling power.
Having high saturation flux density (Bs=1.23T) and low core loss (80W/kg at 100kHz, Bm=0.2T), MP series cores are also suitable for saturable cores in magamp circuit driven below 150kHz.

Table 33. Standard Specifications

Item	Specification
Operating temperature range	-20°C – +125°C (including temperature rise of core)

Table 34. Product code, part name and specifications

Product code	P/N	Finished dimension (mm)			Ae (mm^2) TYP.	Lm (mm) TYP.	2ϕs (μWb) MIN.	Weight (g) TYP.
		A TYP.	B TYP.	C TYP.				
F1AH0762	MP1006LF3T*	11.4	6.4	4.8	7.6	25.4	14.9	1.9
F1AH0763	MP1205LF3T	13.8	6.6	6.8	6.0	31.4	11.8	1.9
F1AH0812	MP1605VF3T*	16.7	6.6	8.3	10.0	39.3	19.6	3.7
F1AH0770	MP1903VF3T	21.2	5.1	11.0	8.6	50.0	16.9	4.3
F1AH0772	MP2303VF3T	24.9	5.1	14.9	8.5	61.9	16.7	5.3
F1AH0773	MP2705VF3T	29.5	6.7	14.8	21.6	68.9	42.5	10.0
F1AH0774	MP3210VF3T	35.0	11.5	19.9	40.7	85.8	80.0	27.0

- Ae: effective cross-section area, Lm: mean magnetic path length, 2ϕs: total magnetic flux(2×Bs×Ae)

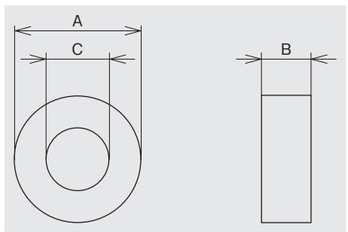


Figure 98. MP series core