

1. 初始磁导率 μ_i

初始磁导率是磁性材料的磁导率(B/H)在磁化曲线始端的极限值, 即

$$\mu_i = \frac{1}{\mu_0} \lim_{H \rightarrow 0} \frac{B}{H}$$

式中 μ_0 为真空磁导($4\pi \times 10^{-7}$ H/m)
 H 为磁场强度(A/m)
 B 为磁通密度(T)

2. 有效磁导率 μ_e

在闭合磁路中, 如果漏磁可忽略, 可以用有效磁导率来表征磁芯的性能。

$$\mu_e = \frac{L}{\mu_0 N^2} \cdot \frac{l_e}{A_e}$$

式中 L 为装有磁芯的线圈的电感量(H)
 N 为线圈匝数
 Le 为有效磁路长度(m)
 Ae 为有效截面积(m²)

3. 饱和磁通密度Bs(T)

磁化到饱和状态的磁通密度。见图1

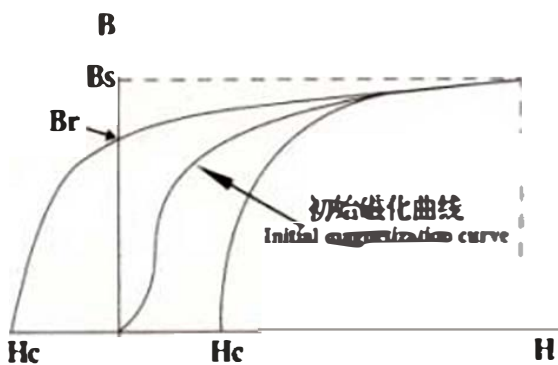


图1 Fig.1

4. 剩磁磁通密度Br(T)

从饱和状态去除磁场后, 剩余的磁通密度。见图1

1. Initial permeability, μ_i

The initial permeability μ_i is the limit value at the initial magnetization curve's origin point and is given by the following formula:

$$\mu_i = \frac{1}{\mu_0} \lim_{H \rightarrow 0} \frac{B}{H}$$

Where μ_0 : Permeability of vacuum ($4\pi \times 10^{-7}$ H/m)
 H: Magnetic field strength(A/m)
 B: Magnetic flux density(T)

2. Effective permeability, μ_e

This is usually defined as the permeability of a core forming a closed circuit where leakage flux is negligibly small

$$\mu_e = \frac{L}{\mu_0 N^2} \cdot \frac{l_e}{A_e}$$

Where L: self-inductance of core with coil(H)
 N: number of turns
 Le: effective magnetic path length(m)
 Ae: effective cross sectional area(m²)

3. Saturation magnetic flux density, Bs(T)

The magnetic flux density at a magnetic field where H is up to an approximate saturation magnetic field value. (Fig.1)

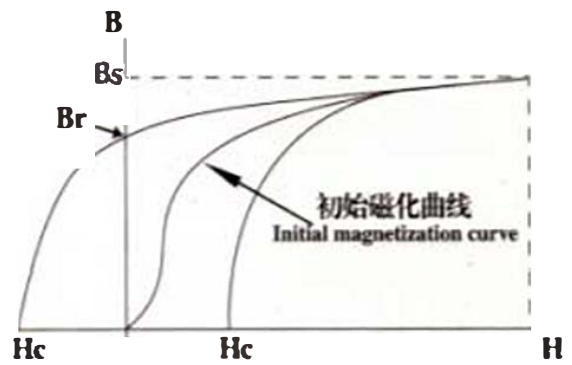


图1 Fig.1

4. Residual magnetic flux density, Br

The value of flux density retained by the core when the magnetic field is reduced from the state of the effective saturation magnetic flux density to zero. (Fig.1)

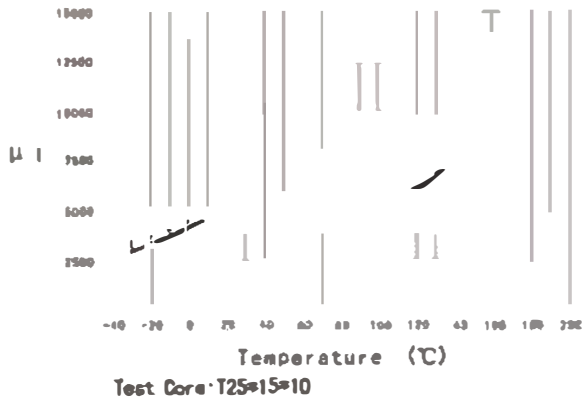


MnZn 高磁导率铁氧体磁芯材质特性
MnZn High μ Ferrite Materials

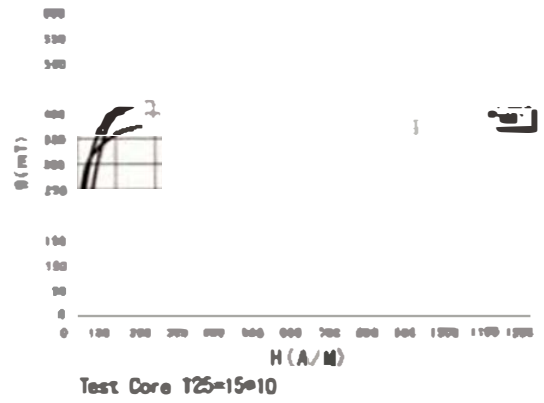
特性 Characteristics	符号 symbol	单位 Unit	F5K $\pm 30\%$	F7K $\pm 30\%$	F10K $\pm 30\%$	F12K $\pm 30\%$	F15K $\pm 30\%$
初始磁导率 μ_i Initial Permeability	μ_i	10KHz	5500	7000	10000	12000	15000
		100KHz	5500	7000	95000		
		500KHz	4500 (min)	5000 (min)			
比损耗因素 Relative loss Factor	$\tan \delta / \mu$	$\times 10^{-6}$	<15 100KHz	<7 10KHz	<7 10KHz	<8 10KHz	<10 10KHz
比温度系数 Relative temperature coefficient	$\alpha_{\mu r}$	$\times 10^{-4} / ^\circ\text{C}$	0~1.5 (20~60 $^\circ\text{C}$)	0~1.5 (-30~20 $^\circ\text{C}$) 0~2 (-20~55 $^\circ\text{C}$)	-0.5~1.5 (-30~20 $^\circ\text{C}$) -0.5~1.5 (20~70 $^\circ\text{C}$)	-0.5~1.5 (0~70 $^\circ\text{C}$)	-1.0~1.5 (0~70 $^\circ\text{C}$)
饱和磁通密度 Saturation Magnetic	B_s	Mt					
		25 $^\circ\text{C}$	420	400	400	380	360
剩磁(H=1194A/m) Remanence	B_r	mT	150	90	90	150	140
矫顽力(H=1194A/m) Coercive Force	H_c	A/m	8	10.4	7.2	5	4
减落因素 Disaccommodation Factor	D_r	$\times 10^{-6}$	<3	<3	<2	<2	<2
居里温度 Curie Temperature	T_c	$^\circ\text{C}$	≥ 150	≥ 130	≥ 125	≥ 120	≥ 110
电阻率 Resistivity	ρ	$\Omega \cdot \text{m}$	0.3	0.3	0.15	0.15	0.15
密度d(G/cm ³) Density	d	Kg/m ³	4.8	4.9	4.9	4.9	4.9

注: MnZn 高磁导率铁氧体材料是具有较高的起始磁导率 μ_i 和较低的损耗因子 $\tan \delta / \mu_i$, 用于制造变频变压器、扼流圈电感、抗电磁干扰共模线圈、差模线圈等所需的各类磁芯。F7K、F10K材质具有良好频率特性和高频阻抗, 特别适用于EMC和抗EMC领域。F10K、F12K、F15K材料还具有宽温、低减落、高稳定性特性, 用于网络通信系统ADSL技术, 可大大提高传输速度和传输距离, 减少信号的谐波失真THD。

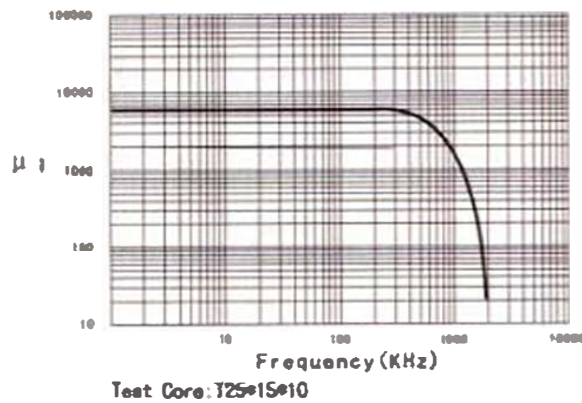
Initial Permeability Temperature
初始磁导率的温度特性



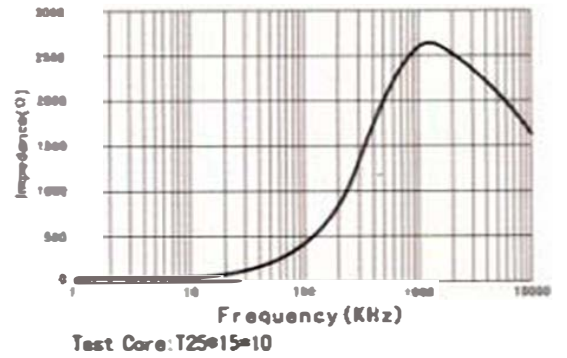
Saturation Flux Density Magnetic Field
磁饱和和磁通密度



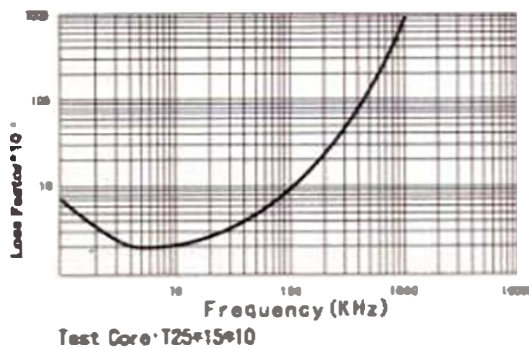
Initial Permeability Frequency
初始磁导率的频率特性



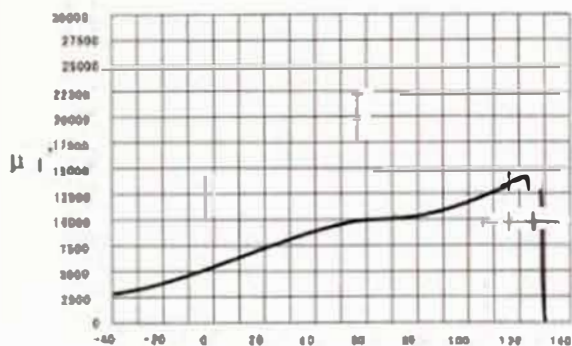
Impedance Frequency
阻抗频率



Loss Factor Frequency
损失系数的频率

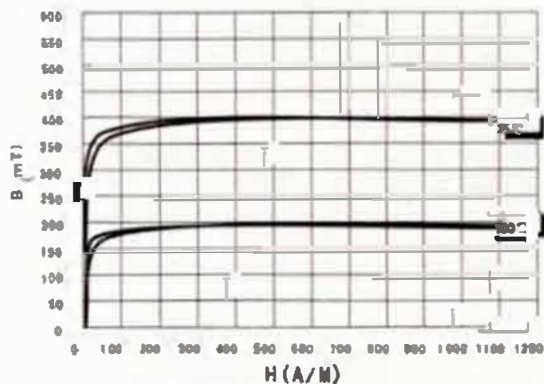


Initial Permeability Temperature
初始磁导率的温度特性



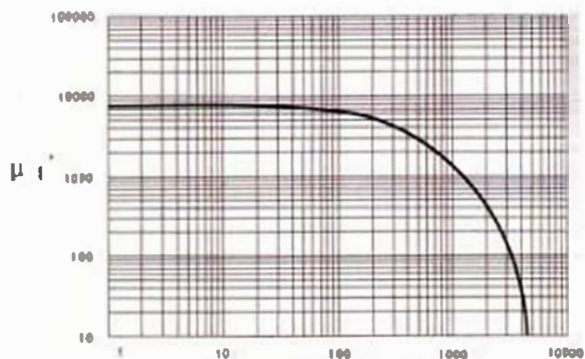
Temperature (°C)
Test Core: T25*15*10

Saturation Flux Density Magnetic Field
磁场饱和和磁通密度



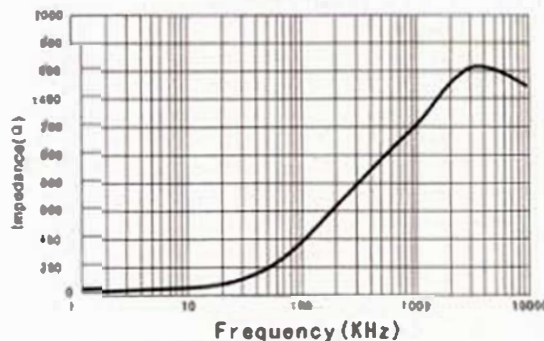
Test Core: T25*15*10

Initial Permeability Frequency
初始磁导率的频率特性



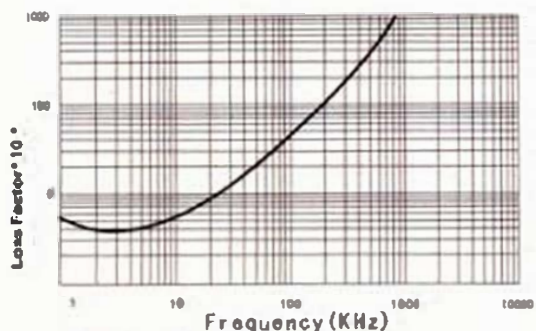
Test Core: T25*15*10

Impedance Frequency
阻抗频率



Test Core: T25*15*10

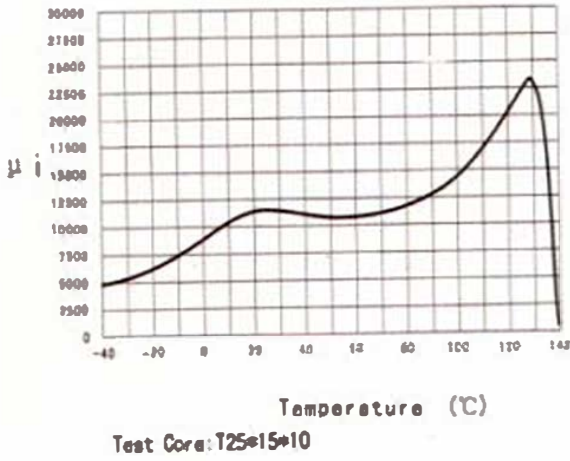
Loss Factor Frequency
损失系数的频率



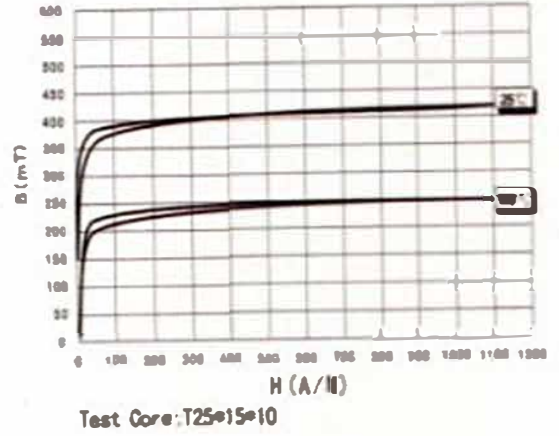
Test Core: T25*15*10



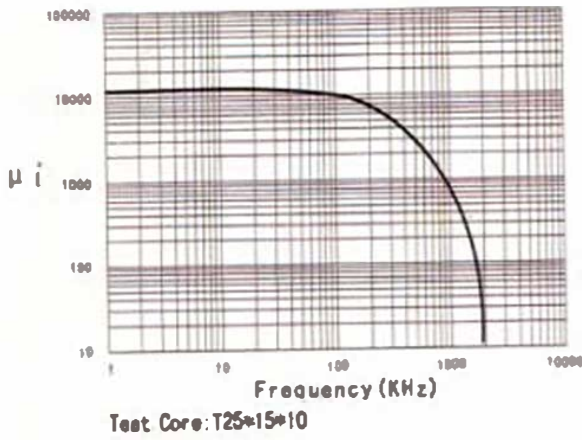
Initial Permeability Temperature
初始磁導率的溫度特性



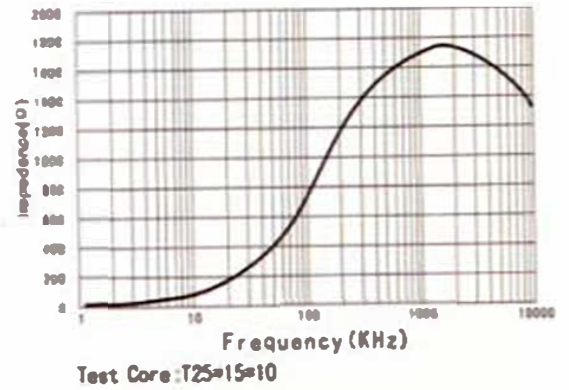
Saturation Flux Density Magnetic Field
磁場飽和磁通密度



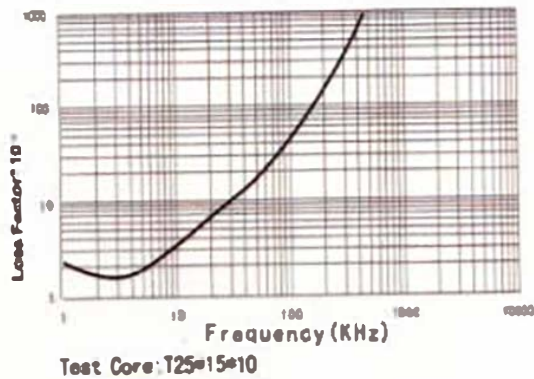
Initial Permeability Frequency
初始磁導率的頻率特性



Impedance Frequency
阻抗頻率



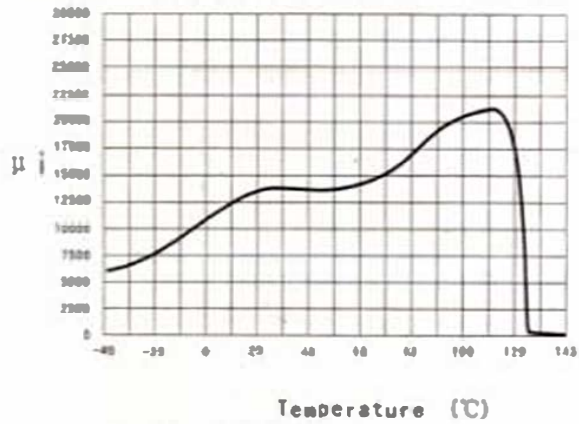
Loss Factor Frequency
損失系數的頻率



F12K 材料特性 MATERIAL CHARACTERISTICS

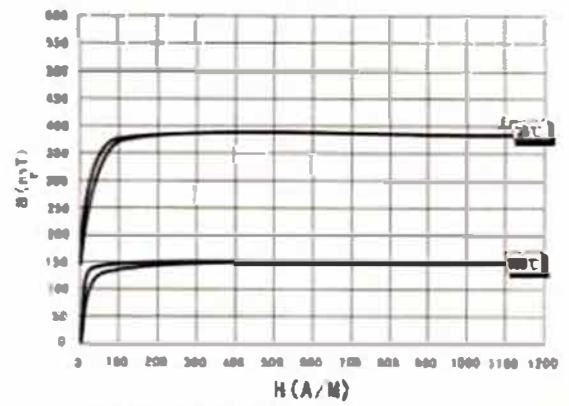


Initial Permeability Temperature
初始磁导率的温度特性



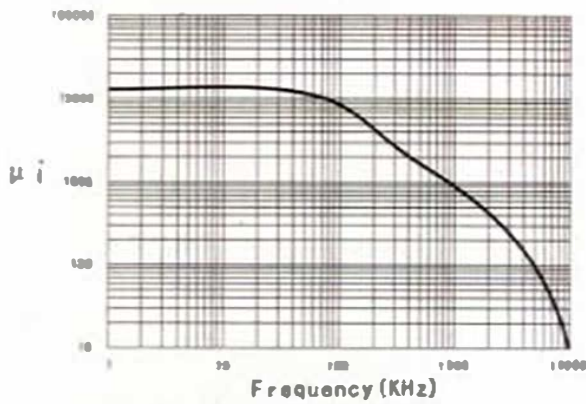
Test Core: T25*15*10

Saturation Flux Density Magnetic Field
磁场饱和和磁通密度



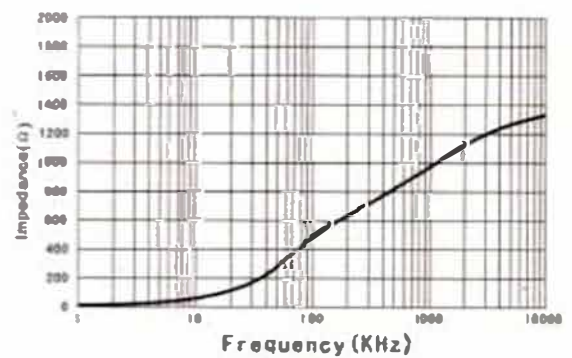
Test Core: T25*15*10

Initial Permeability Frequency
初始磁导率的频率特性



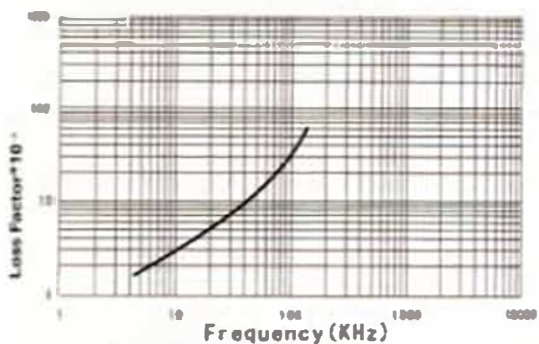
Test Core: T25*15*10

Impedance Frequency
阻抗频率



Test Core: T25*15*10

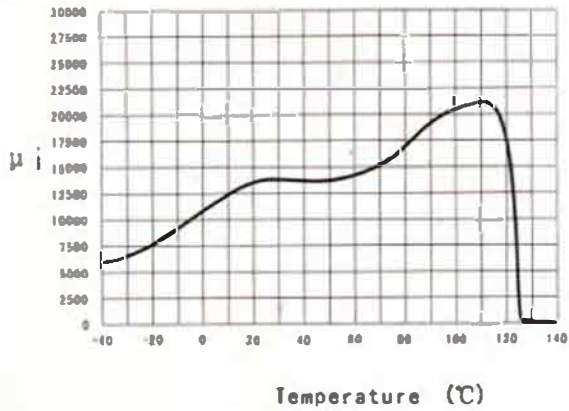
Loss Factor Frequency
损耗系数的频率



Test Core: T25*15*10

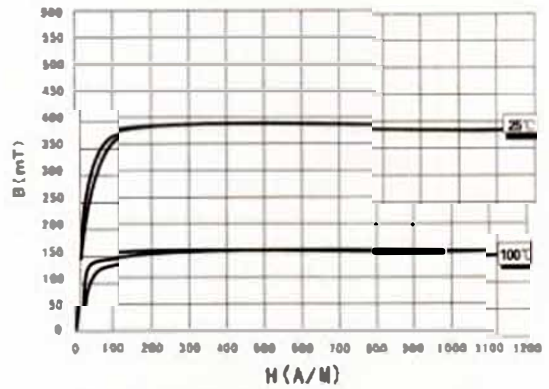
F15K 材料特性 MATERIAL CHARACTERISTICS

Initial Permeability Temperature
初始磁導率的溫度特性



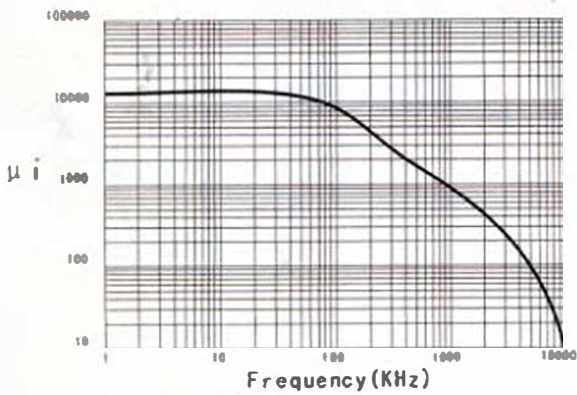
Test Core: T25*15*10

Saturation Flux Density Magnetic Field
磁場飽和磁通密度



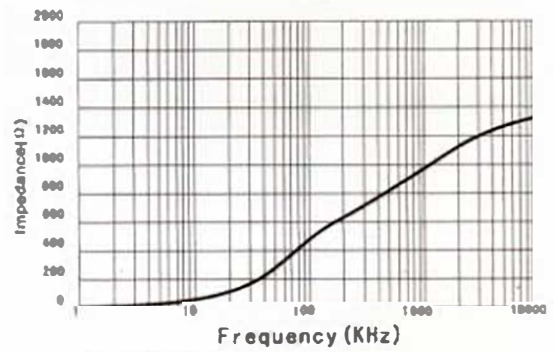
Test Core: T25*15*10

Initial Permeability Frequency
初始磁導率的頻率特性



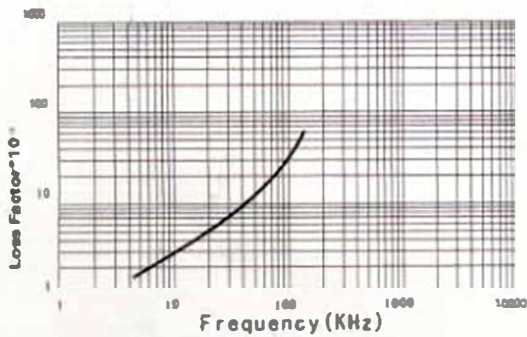
Test Core: T25*15*10

Impedance Frequency
阻抗頻率



Test Core: T25*15*10

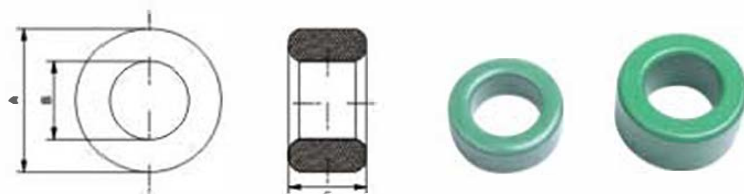
Loss Factor Frequency
損失系數的頻率



Test Core: T25*15*10



T 型 T CORES



T Cores Dimensions 尺寸

型号 Type	尺寸 T Cores Dimensions				电气特性 Electrical Characteristics				
	A mm	B mm	C mm	WT (g/set)	AL (nH/n ² ±30%)				
					F5K	F7K	F10K	F12K	F15K
T6*3*2	6.0±0.3	3.0±0.2	2.0±0.2	0.21	1450	2200	2600	3200	4000
T6*3*3	6.0±0.3	3.0±0.2	2.0±0.2	0.32	2200	2800	4000	5000	6100
T8*4*2	8.0±0.3	4.0±0.3	2.0±0.3	0.33	1330	1870	2670	3200	3750
T8*4*3	8.0±0.3	4.0±0.3	3.0±0.3	0.60	2080	2900	4150	4980	6220
T8*4*4	8.0±0.3	4.0±0.3	4.0±0.3	0.76	2650	3700	5300	6400	8000
T8*5*3	8.0±0.3	5.0±0.3	2.0±0.3	0.51	1410	1974	2820	3384	4230
T9*5*3	9.0±0.3	5.0±0.3	3.0±0.3	0.63	1720	2400	3428	4114	5142
T9*5*4	9.0±0.3	5.0±0.3	4.0±0.3	0.85	2110	2950	3660	4392	5490
T9*5*5	9.0±0.3	5.0±0.3	5.0±0.3	1.05	2940	4110	5870	7050	8810
T10*5*5	10.0±0.3	5.0±0.3	5.0±0.3	1.05	3300	4650	6650	8000	10000
T10*6*4	10.0±0.3	6.0±0.3	4.0±0.3	0.99	2000	2800	4000	4800	6000
T10*6*5	10.0±0.3	6.0±0.3	5.0±0.3	1.21	2500	3500	5000	6000	7500
T12*6*4	12.0±0.3	6.0±0.3	4.0±0.3	1.8	2665	3732	5332	6398	7997
T12*6*6	12.0±0.3	6.0±0.3	6.0±0.3	2.5	3500	5020	6610	7950	10500
T12.7*7.9*5	12.7±0.4	7.9±0.3	5.0±0.3	1.8	2310	3240	4630	5550	6945
T12.7*7.9*6.35	12.7±0.4	7.9±0.3	6.35±0.3	2.4	3250	4460	5500	6600	8250
T14*8*4	14.0±0.4	8.0±0.3	4.0±0.3	1.9	2200	3000	3937	4724	5906
T14*8*6	14.0±0.4	8.0±0.3	7.0±0.3	3.00	3350	4700	6714	8056	10075
T14*8*7	14.0±0.4	8.0±0.3	7.0±0.3	3.50	3800	5348	7640	9168	11462
T14*9*5	14.0±0.4	9.0±0.3	5.0±0.3	2.17	2210	3090	4420	5300	6630
T16*9*5	16.0±0.4	9.0±0.3	5.0±0.3	3.35	2600	3650	5210	6250	7800
T16*9*7	16.0±0.4	9.0±0.3	7.0±0.3	4.56	3280	4692	6560	7872	9852
T16*9*8	16.0±0.4	9.0±0.3	8.0±0.3	4.94	4080	5710	8160	9560	10240
T16*12*8	16.0±0.4	9.0±0.3	5.0±0.3	3.45	2286	3200	4570	5485	6866
T18*10*5	18.0±0.4	10.0±0.3	5.0±0.3	4.20	3120	4367	6237	7480	9108
T18*10*7	18.0±0.4	10.0±0.3	7.0±0.3	5.70	4110	5760	8230	9870	12340
T18*10*8	18.0±0.4	10.0±0.3	8.0±0.3	6.80	4700	6580	9400	11280	14100
T18*10*10	18.0±0.4	10.0±0.3	10.0±0.3	8.40	5880	8230	11750	14100	17620
T18*12*6	18.0±0.4	12.0±0.3	6.0±0.3	4.50	2450	3402	4860	5832	7287
T18*12*8	18.0±0.4	12.0±0.3	8.0±0.3	5.50	3250	4536	6481	7777	9718
T20*10*7	20.0±0.4	10.0±0.3	7.0±0.3	7.70	4668	6530	9337	11204	14108
T20*10*10	20.0±0.4	10.0±0.3	7.0±0.3	11.5	6920	9688	13840	16608	20913
T20*12*8	20.0±0.4	12.0±0.3	8.0±0.3	7.8	4000	5720	8170	9790	12240
T20*12*10	20.0±0.4	12.0±0.3	10.0±0.3	9.8	5000	7150	10200	12240	15300
T22*14*8	22.0±0.5	14.0±0.4	8.0±0.4	8.72	3620	5060	7230	8670	10840
T22*14*10	22.0±0.5	14.0±0.4	10.0±0.4	11.0	4520	6330	9040	10840	13560
T25*15*7	25.0±0.5	15.0±0.4	7.0±0.4	10.1	3580	5012	7174	8605	13560

注: AL值测试条件: 1KHZ/0.25V 100TS 25°C±3°C



T 型 CORES



T Cores Dimensions 尺寸

型号Type	尺寸Tcores Dimensions				电气特性Electrical Characteristics				
	A	B	C	WT	AL (nH/n ² ±30%)				
	mm	mm	mm	(g/sec)	F5K	F7K	F10K	F12K	F15K
T25*15*8	25.0±0.5	15.0±0.4	8.0±0.4	12.1	4520	4520	4520	4520	4520
T25*15*10	25.0±0.5	15.0±0.4	10.0±0.4	13.1	5110	7150	10220	12260	15330
T25*15*12	25.0±0.5	15.0±0.4	12.0±0.4	18.7	6130	8580	12260	14710	18390
T25*15*13	25.0±0.5	15.0±0.4	13.0±0.4	20.3	6640	9300	12920	15670	1990
T25*15*15	25.0±0.5	15.0±0.4	13.0±0.4	23.5	7660	10730	15330	18390	22930
T28*19*12	28.0±0.5	19.0±0.4	12.0±0.4	21.40	4590	6430	9180	11010	13770
T28*19*15	28.0±0.5	19.0±0.4	15.0±0.4	28.00	6350	8862	12660	15192	19940
T31*19*8	31.0±0.8	19.0±0.7	8.0±0.6	17.80	3920	5480	7830	9690	11740
T31*19*13	31.0±0.8	19.0±0.7	13.0±0.6	29.40	6360	8910	12730	14080	17610
T31*19*15	31.0±0.8	19.0±0.7	15.0±0.6	31.00	7200	10080	14400	17280	21600
T35*25*8	35.0±0.8	25.0±0.7	8.0±0.6	20.2	2690	3766	5380	6156	8081
T36*19*8	36.0±0.8	19.0±0.7	8.0±0.6	17.8	3920	5480	7830	9390	11740
T36*19*13	36.0±0.8	19.0±0.7	13.0±0.6	29.4	6360	8910	12730	14080	17610
T36*19*15	36.0±0.8	19.0±0.7	13.0±0.6	34.0	7200	10080	14400	17280	21600
T36*23*10	36.0±0.8	23.0±0.7	10.0±0.6	29.2	4480	6272	8960	10752	13458
T36*23*13	36.0±0.8	23.0±0.7	13.0±0.6	38.5	5922	8150	11642	13970	17485
T36*23*15	36.0±0.8	23.0±0.7	15.0±0.6	45.0	6130	9000	12880	14500	19200
T37*22*15	37.0±0.8	22.0±0.7	15.0±0.6	51.8	7790	10900	15500	18600	23250
T38*19*13	38.0±0.8	19.0±0.7	13.0±0.6	54.0	6240	8730	11640	14430	19250
T38*22*14	38.0±0.8	22.0±0.7	14.0±0.6	51.8	7640	10696	15280	18260	22870
T38*22*15	38.0±0.8	22.0±0.7	15.0±0.6	55.5	8200	11480	16400	19710	24550
T47*27*10	47.0±1.0	27.0±0.8	15.0±0.8	56.2	5550	7771	11086	12170	15050
T47*27*15	47.0±1.0	27.0±0.8	15.0±0.8	56.2	9090	12606	17977	19730	24400
T50*30*20	50.0±1.5	30.0±1.0	20.0±0.8	125.0	10220	14300	20500	24520	30700
T50*31*19	50.0±1.5	31.0±1.0	19.0±0.8	116.0	9100	12730	18250	21820	27320
T56*25*20	56.0±1.5	25.0±1.0	20.0±0.8	197.0	16690	21490	30790	36830	46110
T60*40*20	60.0±1.5	40.0±1.0	20.0±0.8	154.0	8100	10430	14950	17880	30700
T60*40*25	60.0±1.5	40.0±1.0	25.0±0.8	194.0	10120	13030	18670	22330	27960
T63*38*15	63.0±1.5	38.0±1.0	15.0±0.8	141.0	7980	10280	14730	17620	22060
T63*38*20	63.0±1.5	38.0±1.0	20.0±0.8	186.0	10120	13040	18680	22340	27970
T63*38*25	63.0±1.5	38.0±1.0	25.0±0.8	238.0	13640	17700	25250	30200	37810
T65*38*20	65.0±1.5	38.0±1.0	20.0±0.8	195.0	10750	15050	21470	25680	32150
T68*44*13.5	68.0±1.5	44.0±1.0	13.5±0.8	135.0	5875	3120	4450	5230	6660
T68*44*15.0	68.0±1.5	44.0±1.0	15.0±0.8	148.0	6540	9160	13090	15650	19590

注: AL值测试条件: 1KHZ/0.25V 100TS 25°C±3°C