■ Material survey

Main application area	Frequency range	Specific application	Material	B max (mT)	Available core shapes
Broadband transformers, Line Filter, ISDN transformers, Digital data transformers (xDSL), Current-compensated interference, Suppression Chokes	0.1~1.0㎒	Line Filter, Current-compensated chokes	HM2A	430	Toroid, ESQ, USQ, UU, EE
			HM3A	430	
		Pulse transformers Line Filter impedance matching transformers	HM5A	410	Toroid, UU, EER, RM, EE
			HM6A	400	
			BM30	525	
Power Transformers for LCD, LED Transformers for DC/DC Converter, Transformers for General puprose	up to 200㎑	High voltage transformers, Power conversion Low loss	PM7	480	E, EER, ETD, UTV, EFD, EQ, Toroid, EP, RM, UU,
			PM12	520	
			PM15	530	
			PM16	530	
			BM20	560	
High frequency power conversion, General purpose transformer	up to 400㎑	Transformers for forward and push - pul converters	FM4	490	EFD, EPC, EER, RM low profile, Planar
	0.5~2.0 ㎒	Transformers for DC-DC converters, particularly resonance converters	FM10	526	

Material grade table

* High Permeability Material

Parameter	Symbol	Unit	Condition	HM2A	HM3A	HM5A	HM6A
Initial permeability	μ_i	–	25℃, ≤10㎑, ≤1mT	5500 ±25%	7000 ±25%	10000 ±30%	12000 ±30%
Flux density near saturation	B_s	mT	H=1200(A/m), 25℃, f=10㎑	430	430	410	400
Corecive field strengthen	H_c	A/m	25℃, f=10㎑	6	6	3	3
Remanence	B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	65	85	80	90
Curie temperature	T_c	℃	–	>140	>135	>125	>120
Relative loss factor	$\tan\delta/\mu_i$	10^{-6}	f=10㎑	<5	<3	<6	<13
Relative temperature factor	α_F	10^{-6} /℃	20℃～60℃	0.2 ～0.7	-0.1 ～0.0	-0.15 ～1.0	-0.01~ -0.02
Specific resistivity	ρ	Ω·m	–	1	0.5	0.13	0.1
Density	d	kg/㎥	–	4900	4900	4900	5000
material properties page							

Value measured on 30-20-8 mm non ground reference toroid which are not subjected to external stress.
For special shape or application, please refer to individual core specification.
Products generally comply with the material specification. However, deviations may due to shape, size and grinding operations etc.
Due to technical enhancement, data subject to change without notice.

Material grade table

* Power Material

Parameter	Symbol	Unit	Condition	PM7	PM12	PM15	PM16
Initial permeability	μ_i	-	25℃, ≤10㎑, ≤ 1mT	2400 ± 25%	3200 ± 25%	2500± 25%	3400± 25%
Flux density near saturation	B_s	mT	H=1200(A/m),25℃, f=10㎑	480	520	530	530
			H=1200(A/m),100℃, f=10㎑	390	420	420	420
Coercive field strength	H_c	A/m	25℃, f=10㎑	13	14	12	6 (1㎑)
			100℃, f=10㎑	10	10	10	14 (1㎑)
Remanence	B_{rms}	mT	H=1200(A/m),25℃, f=10㎑	140	140	140	83 (1㎑)
Curie temperature	T_c	℃	-	>210	>210	> 240	> 230
Cutoff frequency	f_c	㎒	25℃	1.5	1.5	1.8	1.7
Power loss	P_L	mW/㎤	100㎑ / 200mT, 25℃	700	315	550	305
			100㎑ / 200mT, 80℃	-	290	-	250
			100㎑ / 200mT, 100℃	410	-	250	-
			100㎑ / 200mT, 110℃	-	-	-	-
Specific resistivity	ρ	Ω·m	-	7	7	7	7
Density	d	㎏/m³	-	4800	4900	4900	4900
material properties page							

Value measured on 30-20-8 mm non ground reference toroid which are not subjected to external stress.
For special shape or application, please refer to individual core specification.
Products generally comply with the material specification. However, deviations may due to shape, size and grinding operations etc.
Due to technical enhancement, data subject to change without notice.

Material grade table

* High Frequency Power Material

Parameter	Symbol	Unit	Condition	FM4	FM10
Initial permeability	μ_i	-	25℃, ≤10㎑, ≤ 1mT	2000±25%	1300±25%
Flux density near saturation	B_s	mT	H=1200(A/m),25℃, f=10㎑	490	525
			H=1200(A/m),100℃, f=10㎑	370	430
Coercive field strength	H_c	A/m	25℃, f=10㎑	15	12
			100℃, f=10㎑		
Curie temperature	T_c	℃	-	>210	>290
Cutoff frequency	f_c	㎒	25℃	2.0	3.0
Power loss	P_L	mW/㎤	400㎑ / 50mT, 25℃	140	-
			400㎑ / 50mT, 100℃	110	
			500㎑ / 50mT, 25℃	-	-
			500㎑ / 50mT, 100℃	-	-
			1㎒ / 50mT, 25℃	-	331
			1㎒ / 50mT, 100℃	-	152
Specific resistivity	ρ	Ω·m	-	7	12
Density	d	㎏/m³	-	4570	4800
material properties page					

Value measured on 30-20-8 mm non ground reference toroid which are not subjected to external stress.
For special shape or application, please refer to individual core specification.
Products generally comply with the material specification. However, deviations may due to shape, size and grinding operations etc.
Due to technical enhancement, data subject to change without notice.

Material grade table

* High B Material

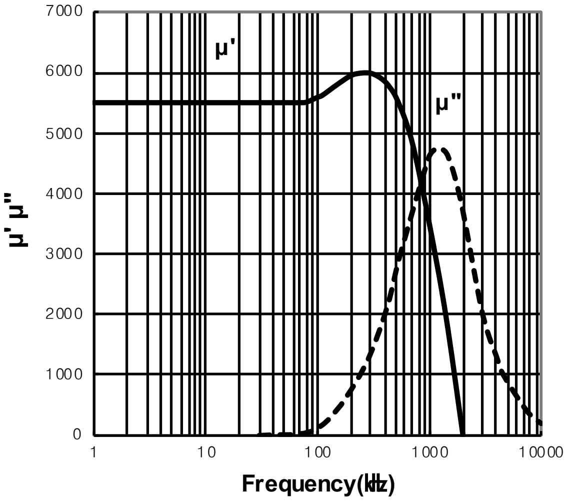
Parameter	Symbol	Unit	Condition	BM30	BM20
Initial permeability	μ_i	–	25℃, ≤10㎑, ≤1mT	3500 ±25%	2000 ±25%
Flux density near saturation	B_s	mT	H=1200(A/m), 25℃, f=10㎑	525	560
			H=1200(A/m), 100℃, f=10㎑	420	470
Corecive field strengthen	H_c	A/m	25℃, f=10㎑	12	16
			100℃, f=10㎑	10	10
Remanence	B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	100	120
Curie temperature	T_c	℃	–	> 240	> 310
Power loss	P_L	mW/㎤	100㎑/200mT , 25℃	410	680
			100㎑/200mT , 100℃	850	380
Specific resistivity	ρ	Ω·m	–	8	7
Density	d	kg/㎥	–	4850	4900
material properties page					

Value measured on 30-20-8 mm non ground reference toroid which are not subjected to external stress.
For special shape or application, please refer to individual core specification.
Products generally comply with the material specification. However, deviations may due to shape, size and grinding operations etc.
Due to technical enhancement, data subject to change without notice.

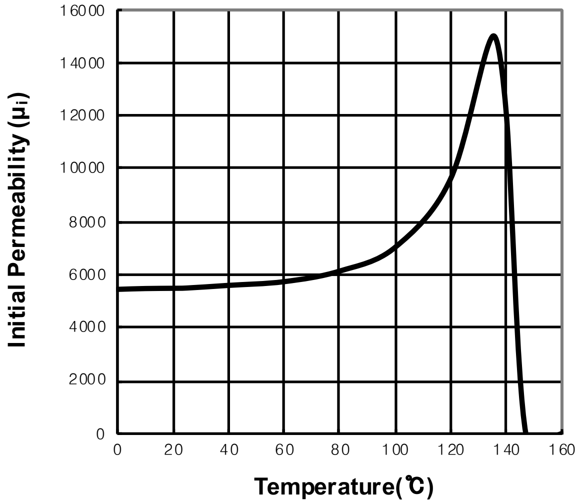
HM2A MATERIAL

◈ Material Property

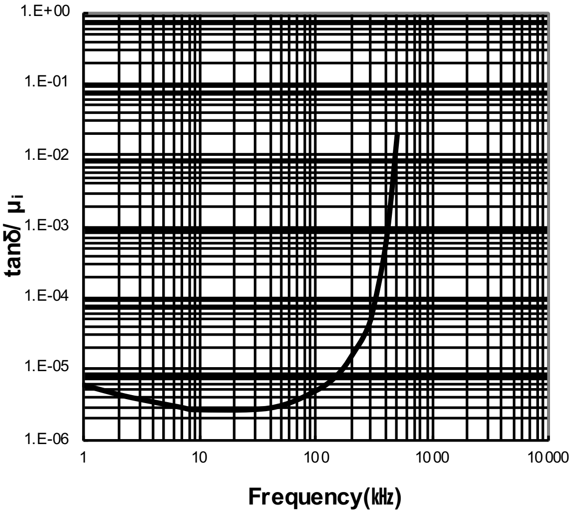
Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤1mT	5500±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	430
H_c	A/m	25℃, f=10㎑	6
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	65
T_c	℃	-	>140
$\tan\delta/\mu_i$	10^{-6}	f=10㎑	<5
α_F	10^{-6} /℃	20℃～60℃	0.2~0.7
ρ	Ω·m	-	1
d	kg/㎥	-	4900



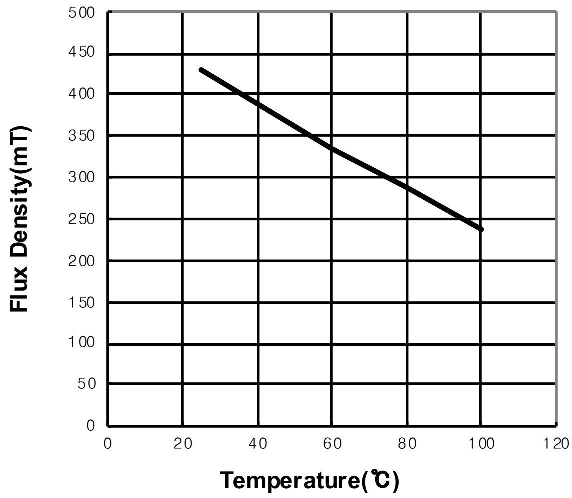
PERMEABILITY(μ_i)
vs. FREQUENCY



PERMEABILITY(μ_i)
vs. TEMPERATURE



RELATIVE LOSS FACTOR(tanδ/μ_i)
vs. FREQUENCY



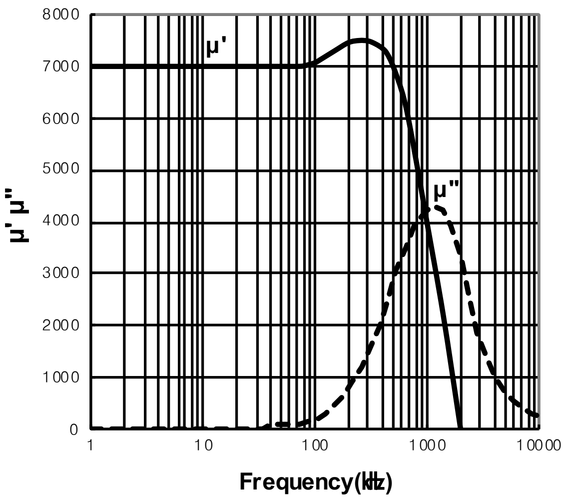
FLUX DENSITY(B_s) at 1200 A/m
vs. TEMPERATURE

HM3A MATERIAL

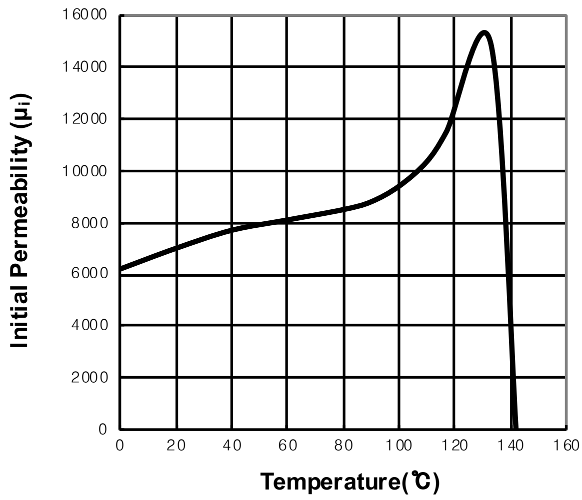
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤1mT	7000±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	430
H_c	A/m	25℃, f=10㎑	6
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	85
T_c	℃	-	>135
$\tan\delta/\mu_i$	10^{-6}	f=10㎑	<3
α_F	10^{-6} / ℃	20℃~60℃	-0.1~0.0
ρ	Ω·m	-	0.5
d	kg/㎥	-	4900

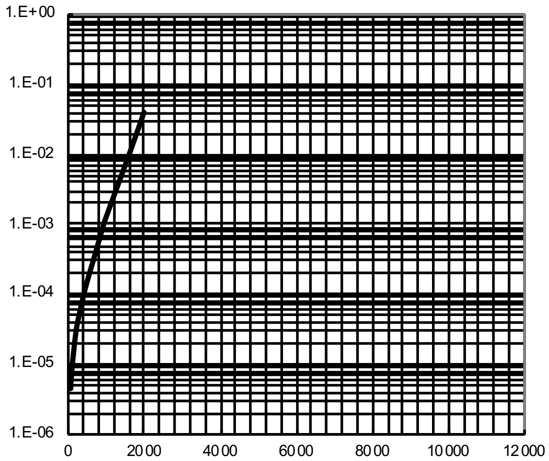
PERMEABILITY(μ_i) vs. FREQUENCY



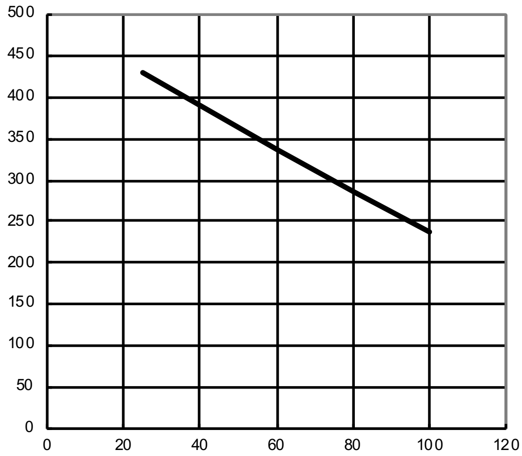
PERMEABILITY(μ_i) vs. TEMPERATURE



RELATIVE LOSS FACTOR($\tan\delta/\mu_i$) vs. FREQUENCY



FLUX DENSITY(B_s) at 1200 A/m vs. TEMPERATURE

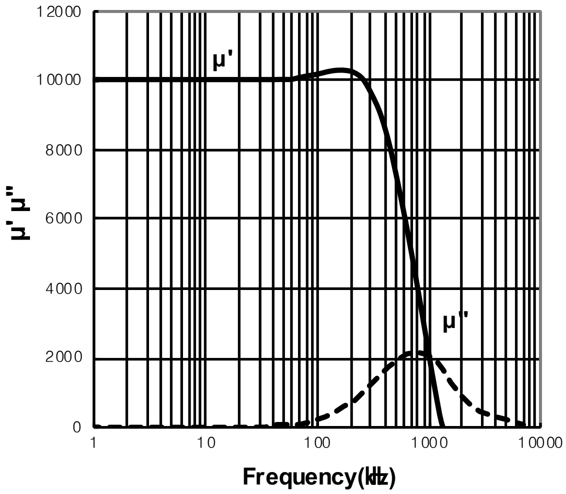


HM5A MATERIAL

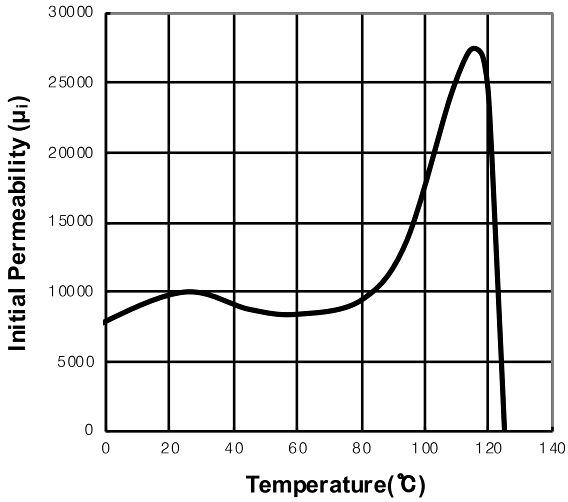
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤1mT	10000±30%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	410
H_c	A/m	25℃, f=10㎑	3
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	80
T_c	℃	-	>125
$\tan\delta/\mu_i$	10^{-6}	f=10㎑	<6.0
α_F	10^{-6} /℃	20℃~60℃	-0.15~1.0
ρ	Ω·m	-	0.13
d	kg/㎥	-	4900

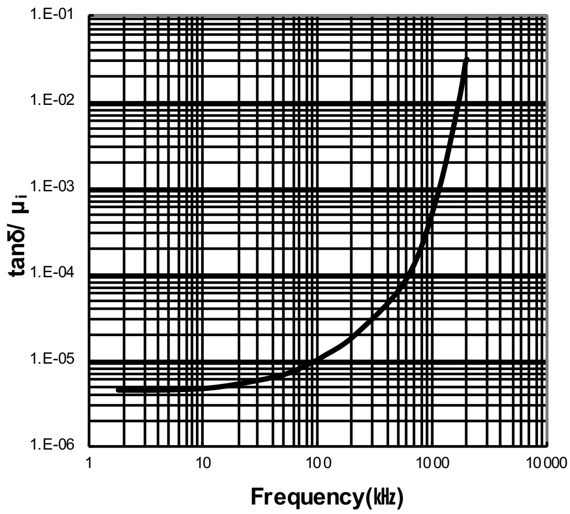
PERMEABILITY(μ_i)
vs. FREQUENCY



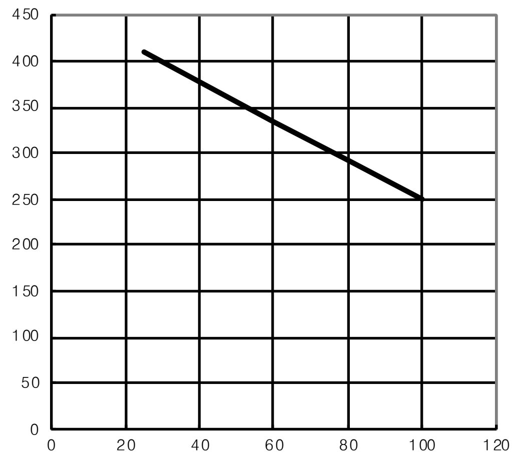
PERMEABILITY(μ_i)
vs. TEMPERATURE



RELATIVE LOSS FACTOR($\tan\delta/\mu_i$)
vs. FREQUENCY



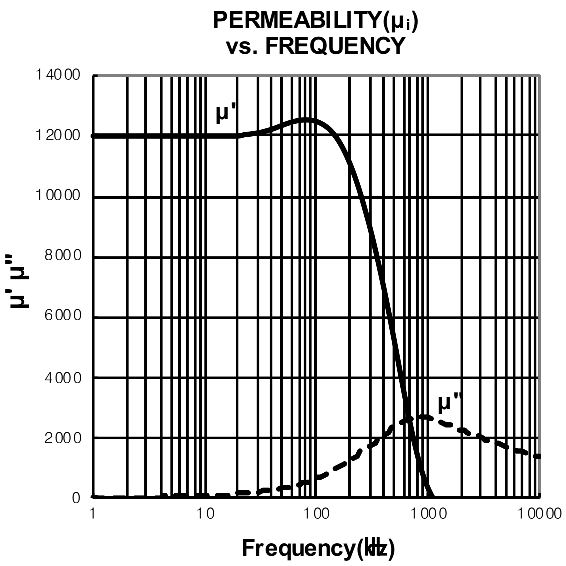
FLUX DENSITY(B_s) at 1200 A/m
vs. TEMPERATURE

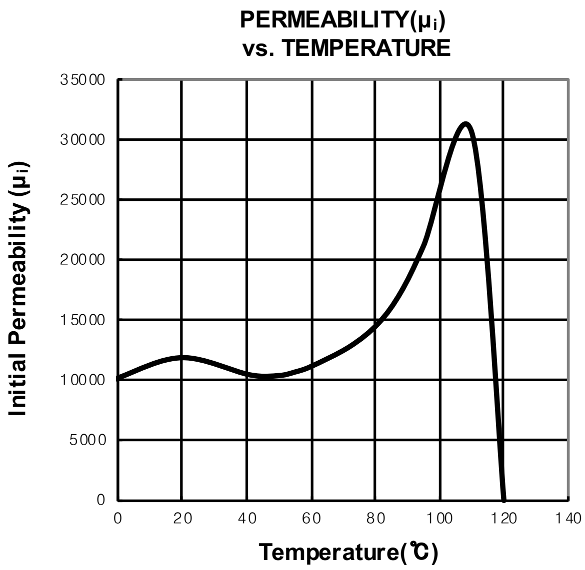


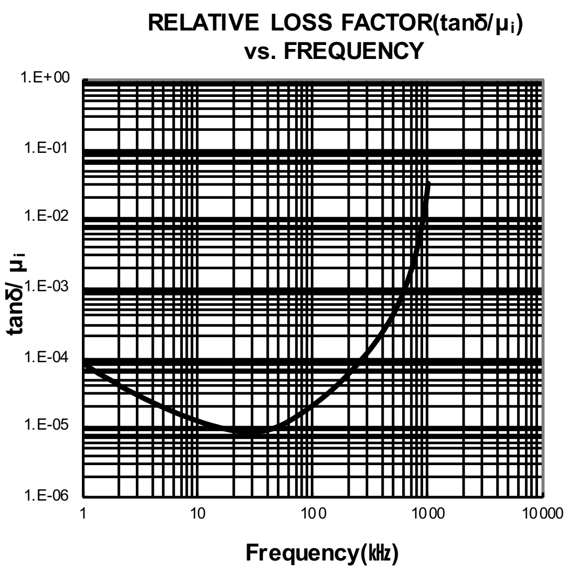
HM6A MATERIAL

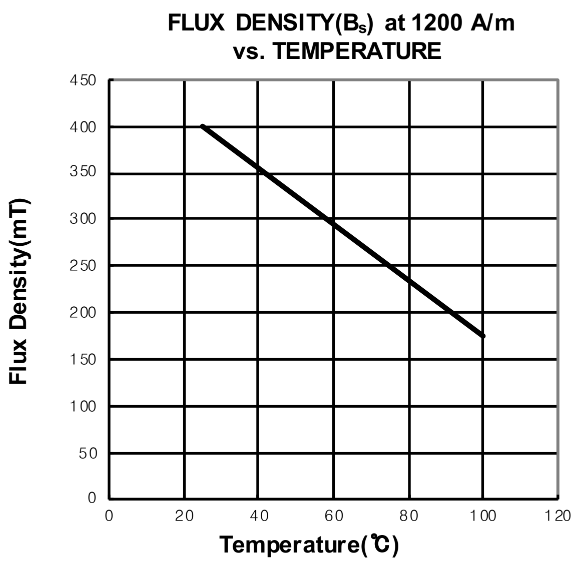
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤1mT	12000±30%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	400
H_c	A/m	25℃, f=10㎑	3
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	90
T_c	℃	-	>120
$\tan\delta/\mu_i$	10^{-6}	f=10㎑	< 13
α_F	10^{-6} /℃	20℃～60℃	-0.01~-0.02
ρ	Ω·m	-	0.1
d	kg/㎥	-	5000







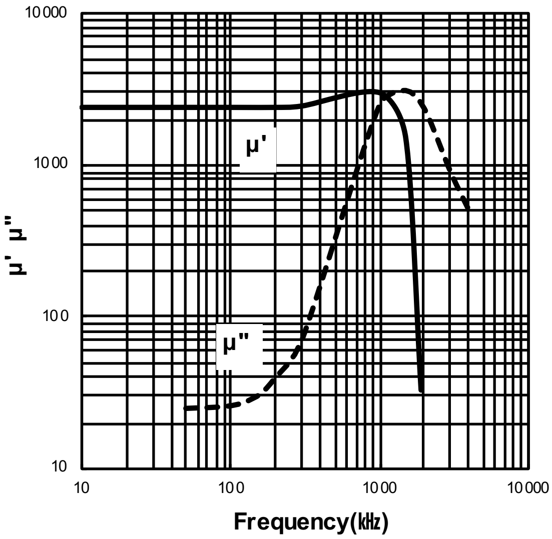


PM7　MATERIAL

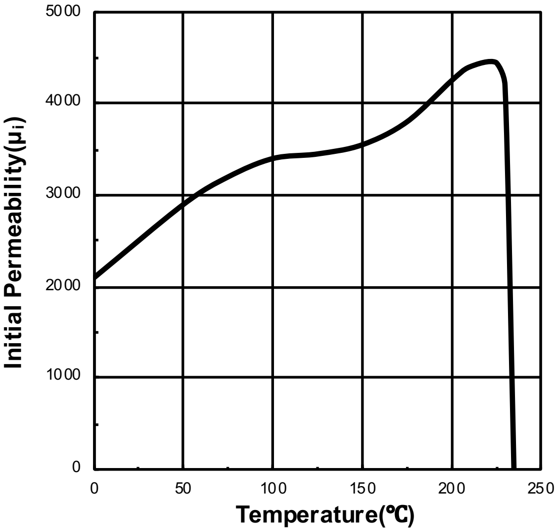
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤ 1mT	2400±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	480
		H=1200(A/m), 100℃, f=10㎑	390
H_c	A/m	25℃, f=10㎑	13
		100℃, f=10㎑	10
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	140
T_c	℃	-	>210
f_c	㎒	25℃	1.5
P_L	mW/㎤	100㎑ / 200mT, 25℃	700
		100㎑ / 200mT, 100℃	410
ρ	Ω·m	-	7
d	㎏/m³	-	4800

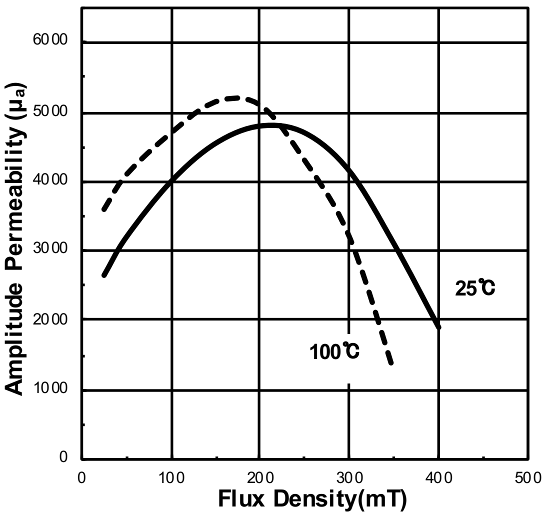
PERMEABILITY (μ_i)
vs. FREQUENCY



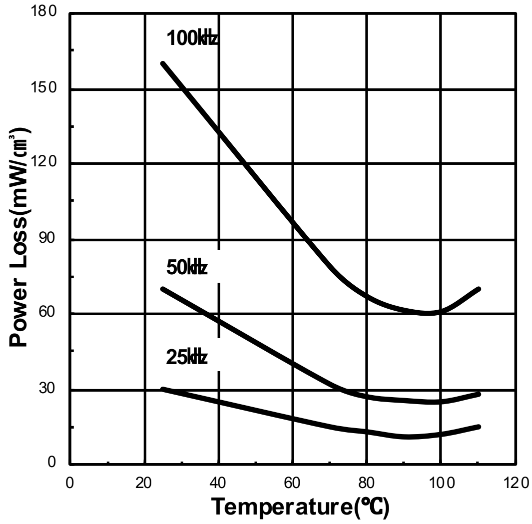
PERMEABILITY (μ_i)
vs. TEMPERATURE



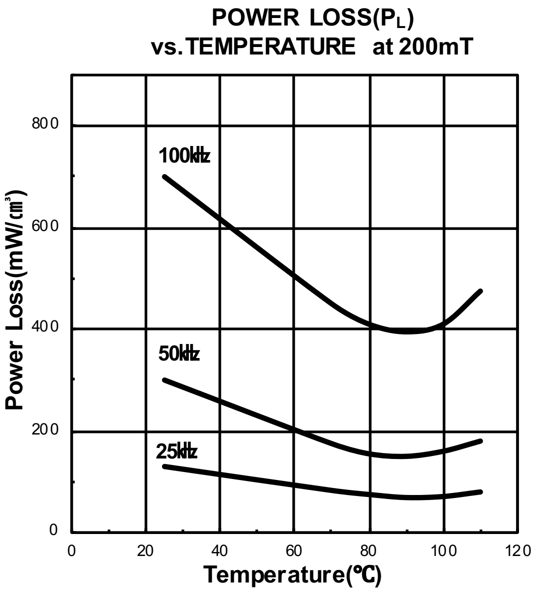
PERMEABILITY (μ_a)
vs. FLUX DENSITY(B)

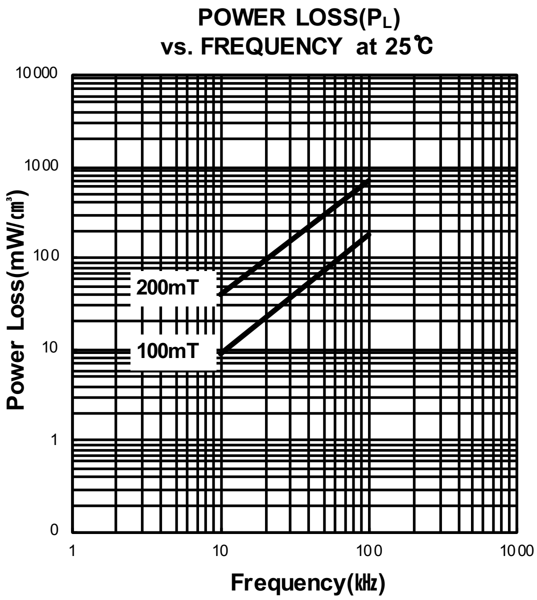


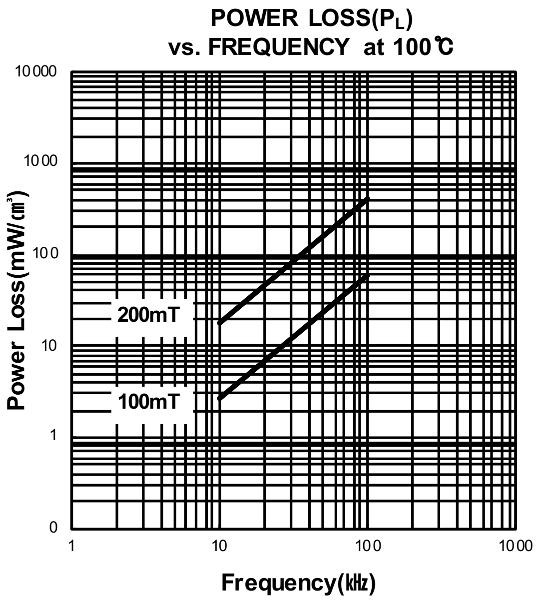
POWER LOSS(P_L)
vs. TEMPERATURE at 100mT

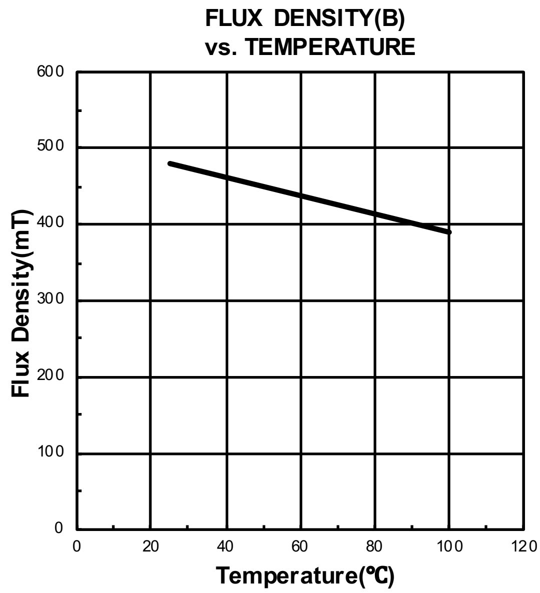


PM7 MATERIAL





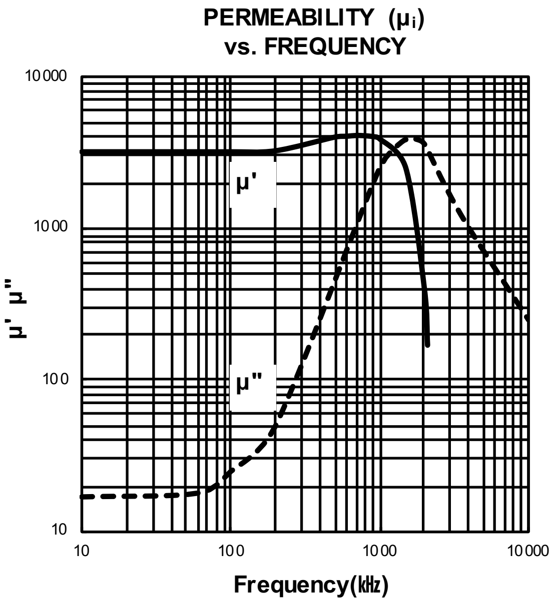


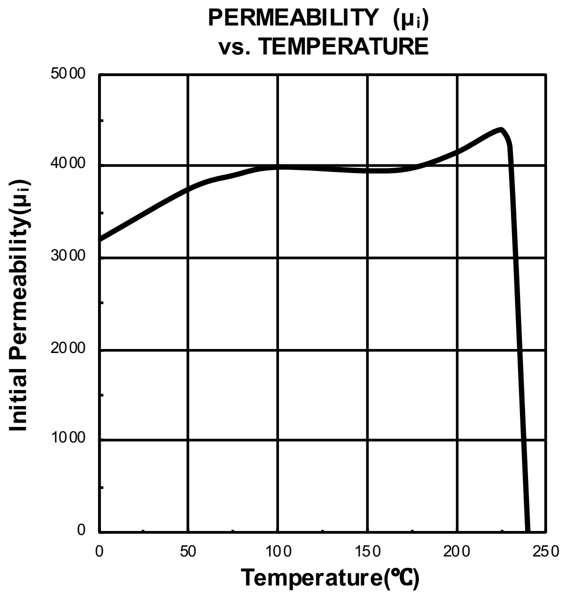


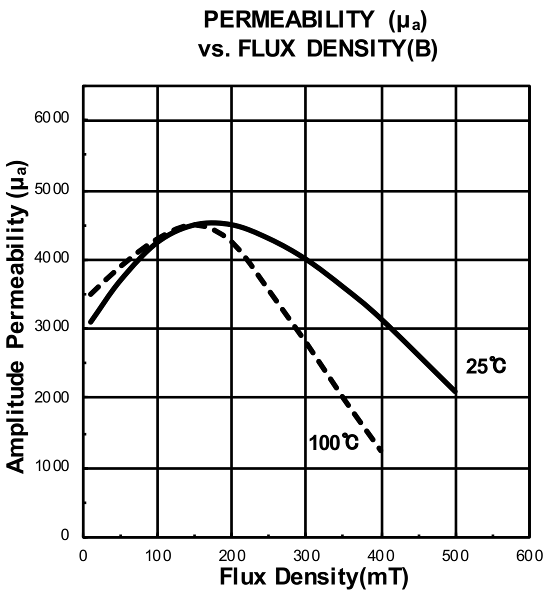
PM12 MATERIAL

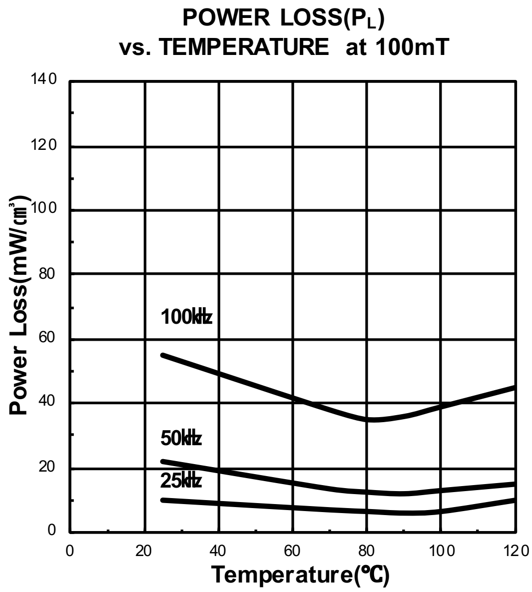
◈ Material Property

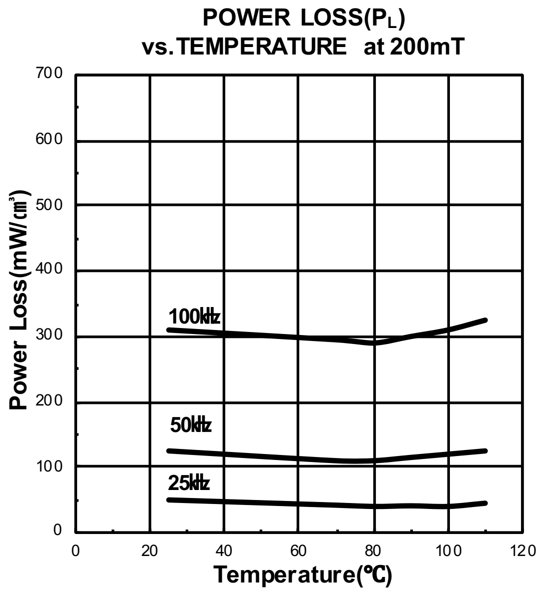
Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤ 1mT	3200±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	520
		H=1200(A/m), 100℃, f=10㎑	420
H_c	A/m	25℃, f=10㎑	14
		100℃, f=10㎑	10
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	140
T_c	℃	-	>210
f_c	㎒	25℃	1.5
P_L	mW/㎤	100㎑ / 200mT, 25℃	315
		100㎑ / 200mT, 100℃	290
ρ	Ω·m	-	7
d	㎏/m³	-	4900

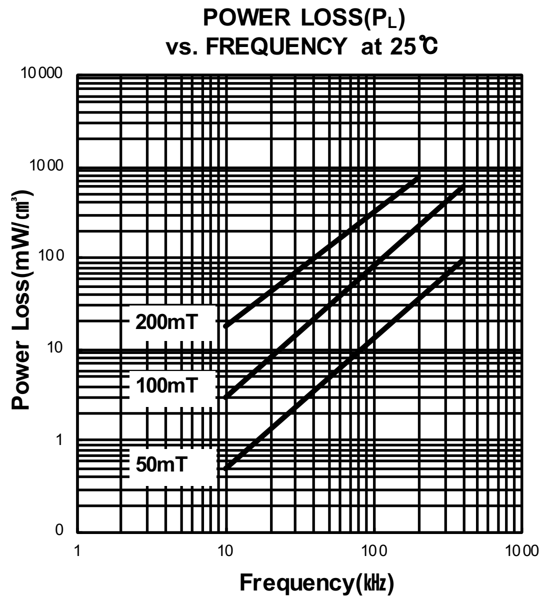


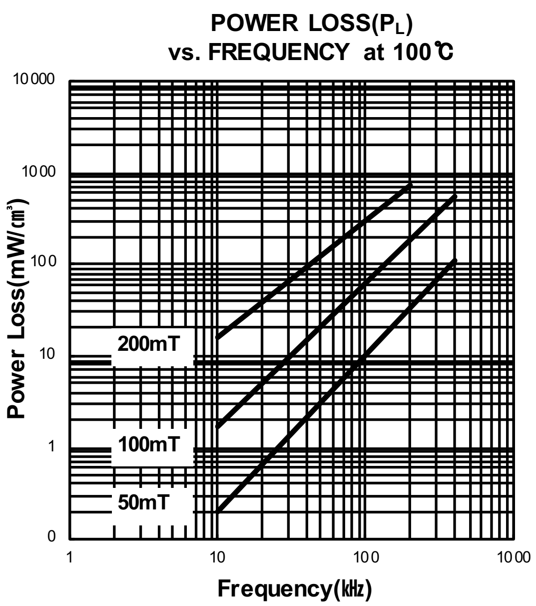


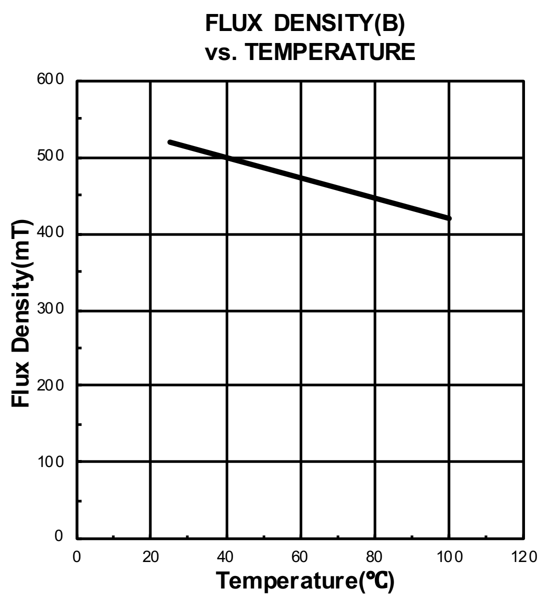





POWER LOSS(PL)
vs.TEMPERATURE at 200mT
Power Loss(mW/㎤)
700
600
500
400
300
200
100
0
100㎑
50㎑
25㎑
0
20
40
60
80
100
120
Temperature(℃)


POWER LOSS(PL)
vs. FREQUENCY at 25℃
Power Loss(mW/㎤)
10000
1000
100
10
1
0
200mT
100mT
50mT
1
10
100
1000
Frequency(㎑)

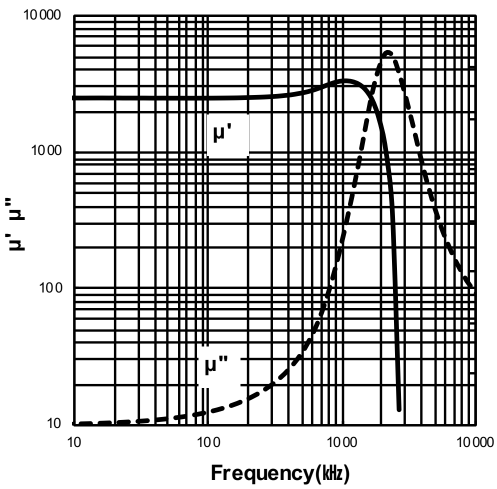

POWER LOSS(PL)
vs. FREQUENCY at 100℃
Power Loss(mW/㎤)
10000
1000
100
10
1
0
200mT
100mT
50mT
1
10
100
1000
Frequency(㎑)


FLUX DENSITY(B)
vs. TEMPERATURE
Flux Density(mT)
600
500
400
300
200
100
0
0
20
40
60
80
100
120
Temperature(℃)

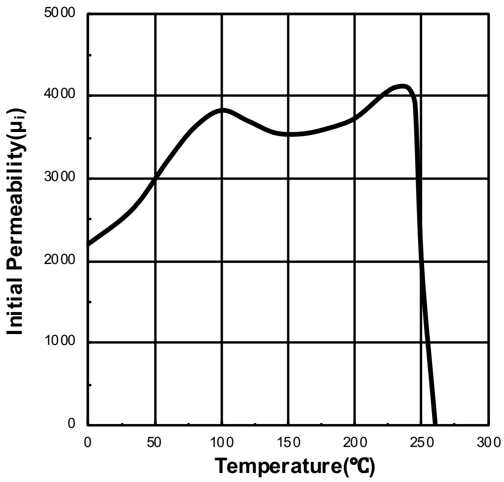
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤ 1mT	2500±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	530
		H=1200(A/m), 100℃, f=10㎑	420
H_c	A/m	25℃, f=10㎑	12
		100℃, f=10㎑	10
B_{rms}	mT	H=1200(A/m), 25℃, f=10㎑	140
T_c	℃	-	> 240
f_c	㎒	25℃	1.8
P_L	mW/㎤	100㎑ / 200mT, 25℃	550
		100㎑ / 200mT, 100℃	250
ρ	Ω·m	-	7
d	㎏/m³	-	4900

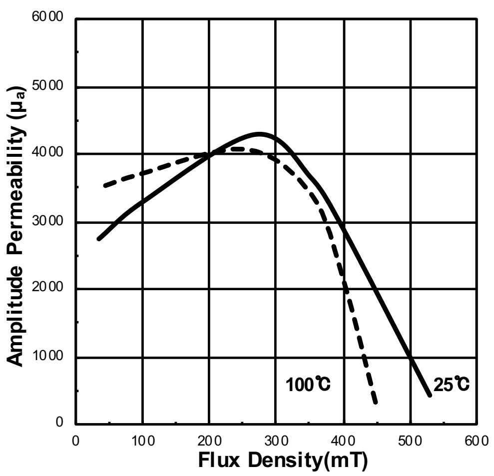
PERMEABILITY (μ_i) vs. FREQUENCY



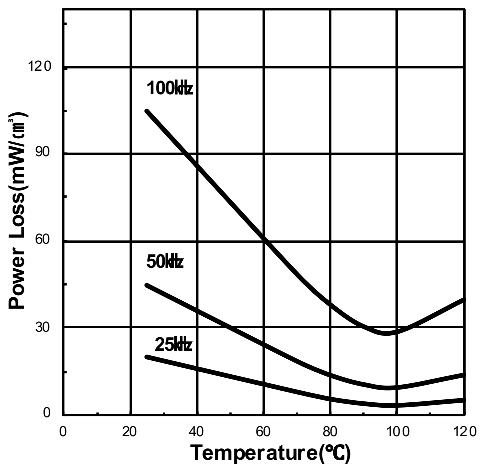
PERMEABILITY (μ_i) vs. TEMPERATURE

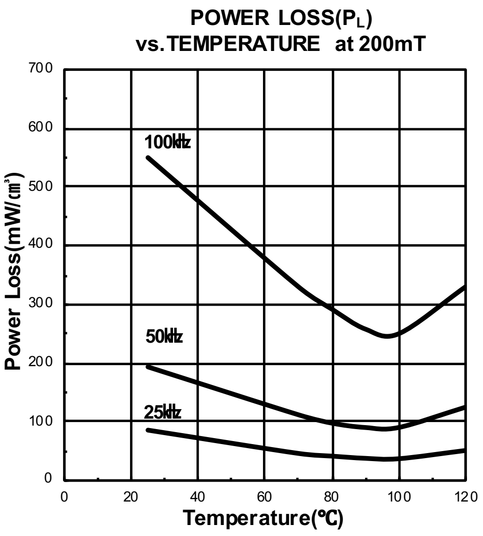


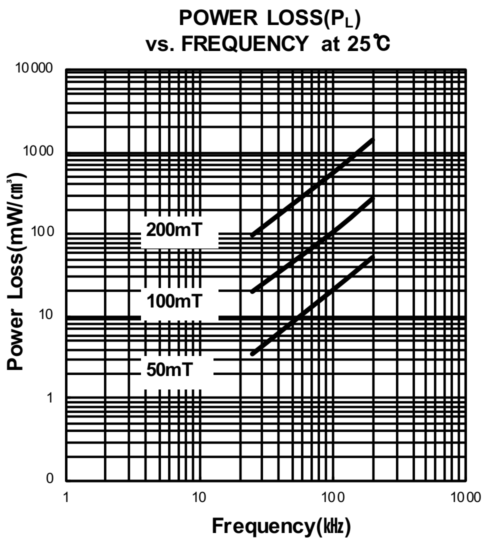
PERMEABILITY (μ_a) vs. FLUX DENSITY(B)

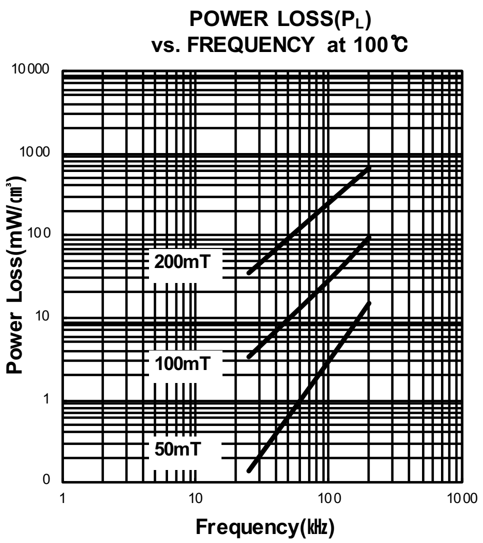


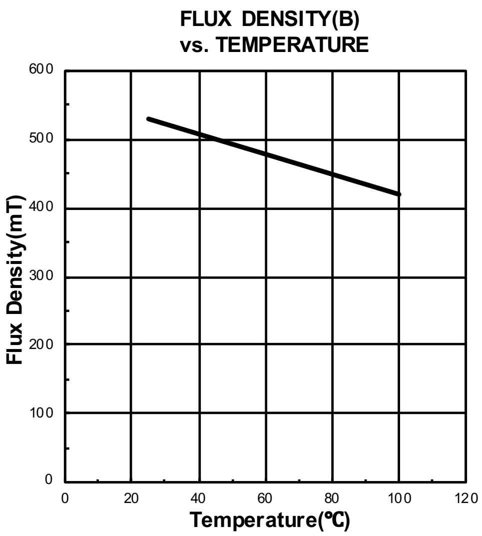
POWER LOSS(P_L) vs. TEMPERATURE at 100mT




POWER LOSS(PL)
vs.TEMPERATURE at 200mT
Power Loss(mW/㎤)
Temperature(℃)
100㎑
50㎑
25㎑
0
100
200
300
400
500
600
700
0
20
40
60
80
100
120


POWER LOSS(PL)
vs. FREQUENCY at 25℃
Power Loss(mW/㎤)
Frequency(㎑)
200mT
100mT
50mT
10000
1000
100
10
1
0
1
10
100
1000


POWER LOSS(PL)
vs. FREQUENCY at 100℃
Power Loss(mW/㎤)
Frequency(㎑)
200mT
100mT
50mT
10000
1000
100
10
1
0
1
10
100
1000

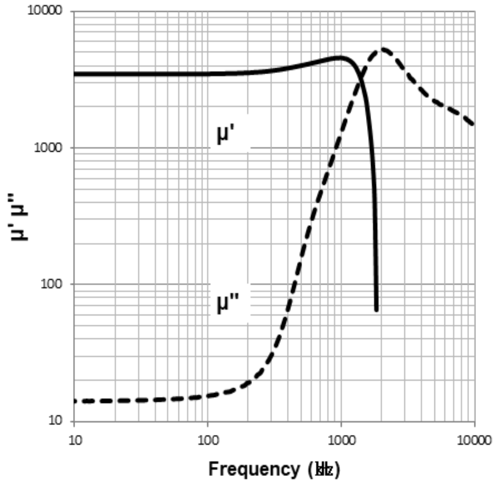

FLUX DENSITY(B)
vs. TEMPERATURE
Flux Density(mT)
Temperature(℃)
0
100
200
300
400
500
600
0
20
40
60
80
100
120

PM16 MATERIAL

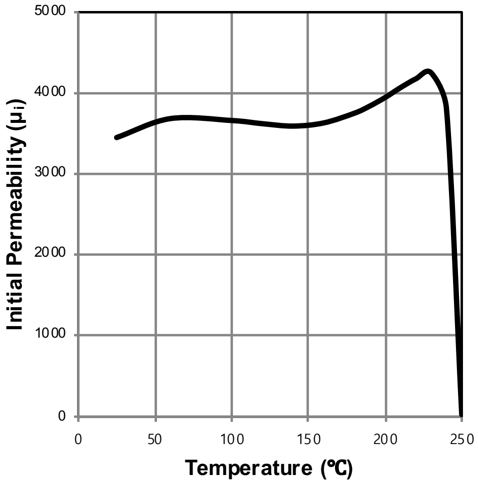
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤1kHz, ≤1mT	3400±25%
B_s	mT	H=1200(A/m), 25℃, f=1kHz	530
		H=1200(A/m), 100℃, f=1kHz	420
H_c	A/m	25℃, f=1kHz	6
		100℃, f=1kHz	14
B_{rms}	mT	H=1200(A/m), 25℃, f=1kHz	83
T_c	℃	-	>230
f_c	㎒	25℃	1.7
P_L	mW/㎤	100kHz/200mT, 25℃	305
		100kHz/200mT, 80℃	250
ρ	Ω·m	-	7
d	㎏/m³	-	4900

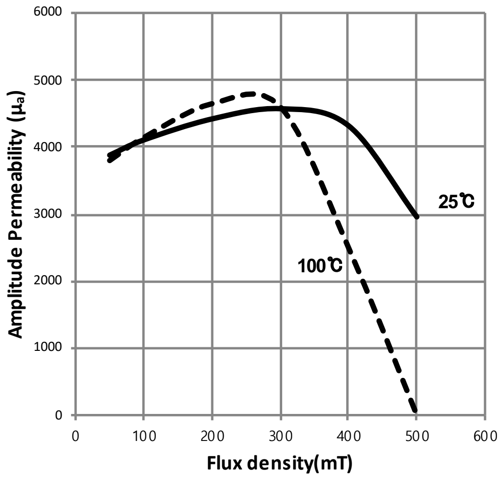
PERMEABILITY (μ_i)
vs. FREQUENCY



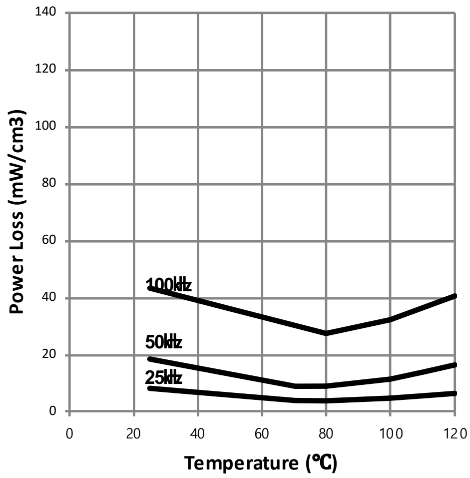
PERMEABILITY (μ_i)
vs. TEMPERATURE



PERMEABILITY (μa)
vs. FLUX DENSITY(B)

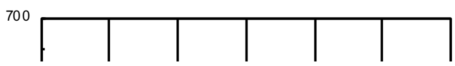


POWER LOSS(P_L)
vs. TEMPERATURE at 100mT

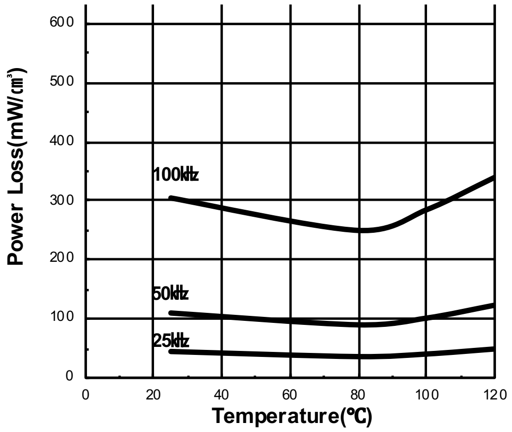


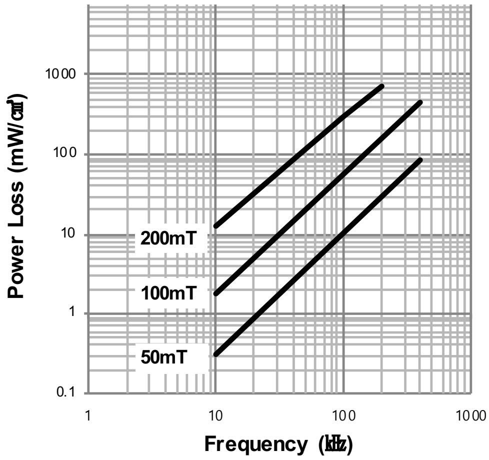
PM16 MATERIAL

POWER LOSS(P_L)
vs.TEMPERATURE at 200mT

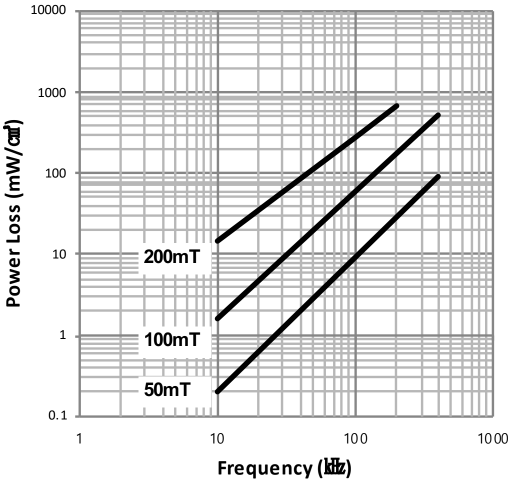


POWER LOSS(P_L)
vs. FREQUENCY at 25℃

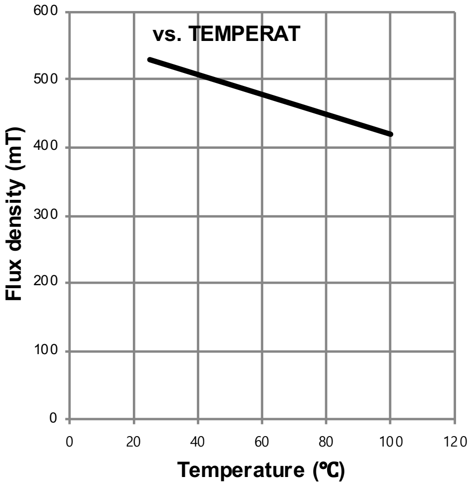




POWER LOSS(P_L)
vs. FREQUENCY at 100℃



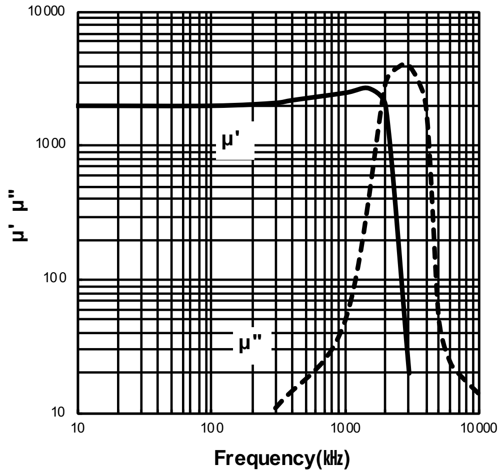
FLUX DENSITY(B)



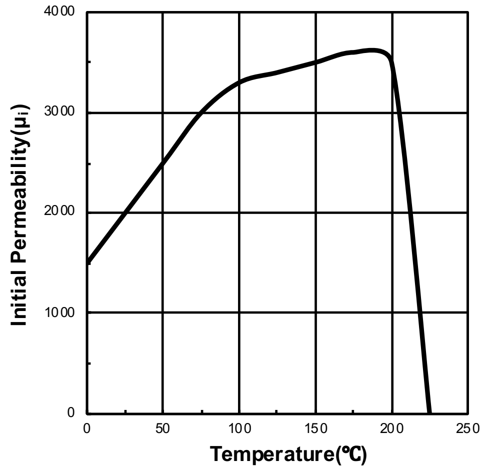
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤ 1mT	2000±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	490
		H=1200(A/m), 100℃, f=10㎑	370
H_c	A/m	25℃, f=10㎑	15
		100℃, f=10㎑	9
T_c	℃	-	>210
f_c	㎒	25℃	2
P_L	mW/㎤	400㎑ / 50mT, 25℃	140
		400㎑ / 50mT, 100℃	110
ρ	Ω·m	-	7
d	㎏/m³	-	4570

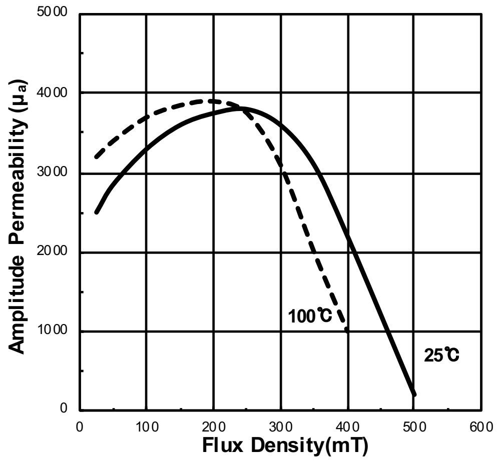
PERMEABILITY (μ_i) vs. FREQUENCY



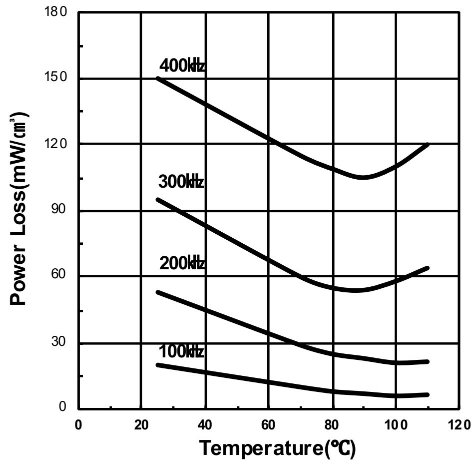
PERMEABILITY (μ_i) vs. TEMPERATURE



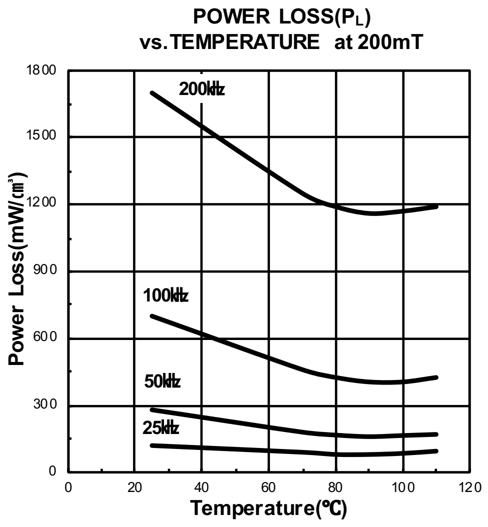
PERMEABILITY (μ_a) vs. FLUX DENSITY(B)

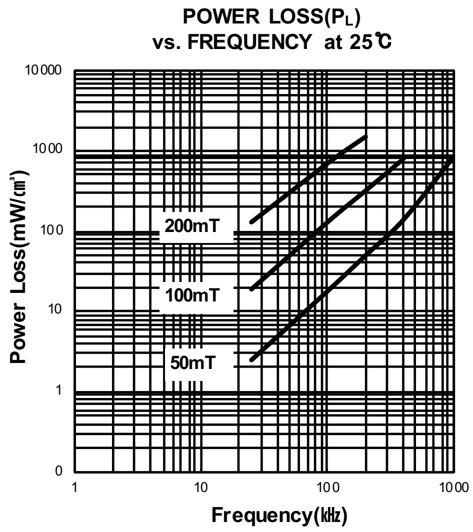


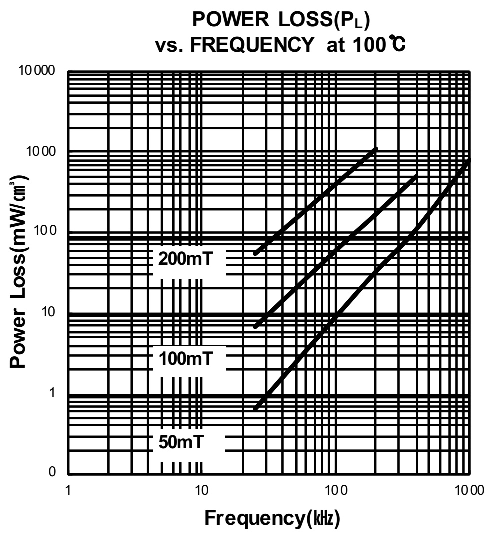
POWER LOSS(P_L) vs. TEMPERATURE at 50mT

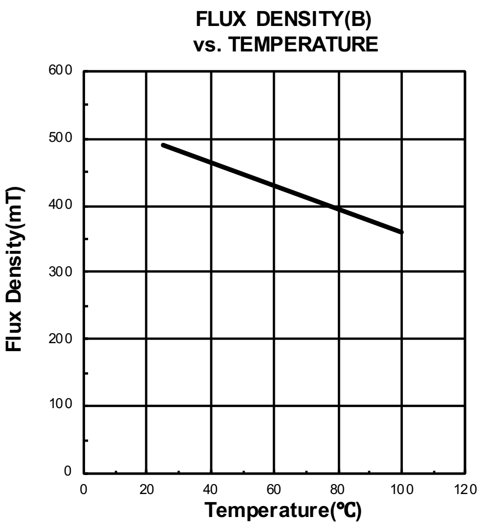


FM4 MATERIAL


POWER LOSS(PL)
vs.TEMPERATURE at 200mT
200㎑
100㎑
50㎑
25㎑
Power Loss(mW/㎤)
Temperature(℃)
0
300
600
900
1200
1500
1800
0
20
40
60
80
100
120


POWER LOSS(PL)
vs. FREQUENCY at 25℃
200mT
100mT
50mT
Power Loss(mW/㎤)
Frequency(㎑)
0
1
10
100
1000
10000
1
10
100
1000


POWER LOSS(PL)
vs. FREQUENCY at 100℃
200mT
100mT
50mT
Power Loss(mW/㎤)
Frequency(㎑)
0
1
10
100
1000
10000
1
10
100
1000

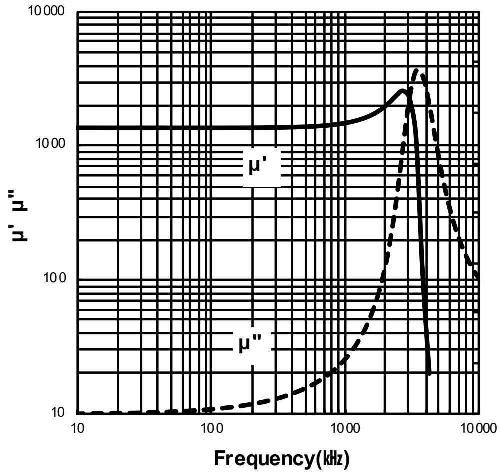

FLUX DENSITY(B)
vs. TEMPERATURE
Flux Density(mT)
Temperature(℃)
0
100
200
300
400
500
600
0
20
40
60
80
100
120

FM10 MATERIAL

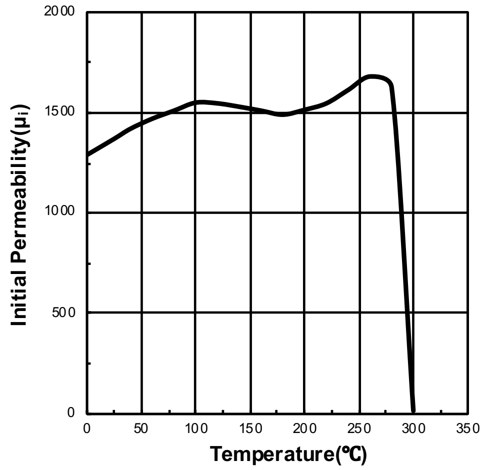
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤ 1mT	1300±25%
B_s	mT	H=1200(A/m), 25℃, f=10㎑	525
		H=1200(A/m), 100℃, f=10㎑	430
H_c	A/m	25℃, f=10㎑	12
		100℃, f=10㎑	-
T_c	℃	-	>290
f_c	㎒	25℃	3
P_L	mW/㎤	1000㎑ / 50mT, 25℃	330
		1000㎑ / 50mT, 100℃	150
ρ	Ω·m	-	12
d	㎏/m³	-	4800

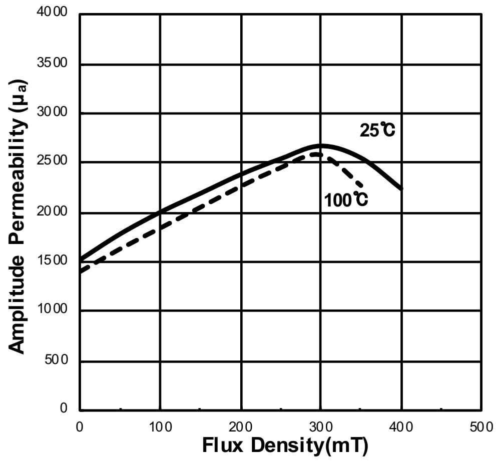
PERMEABILITY (μ_i) vs. FREQUENCY



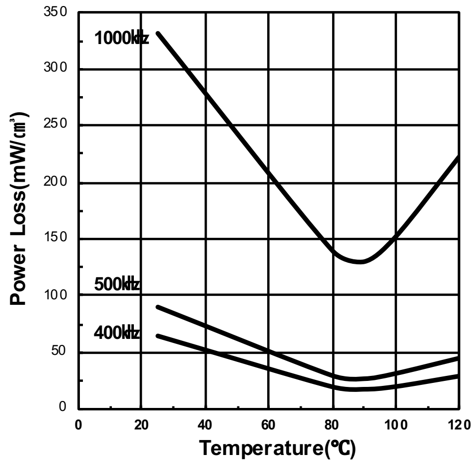
PERMEABILITY (μ_i) vs. TEMPERATURE



PERMEABILITY (μ_a) vs. FLUX DENSITY(B)

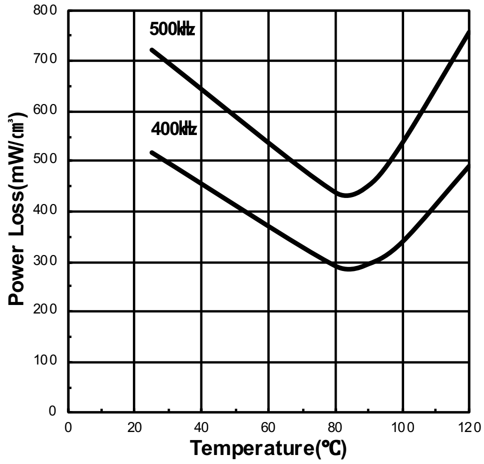


POWER LOSS(P_L) vs. TEMPERATURE at 50mT

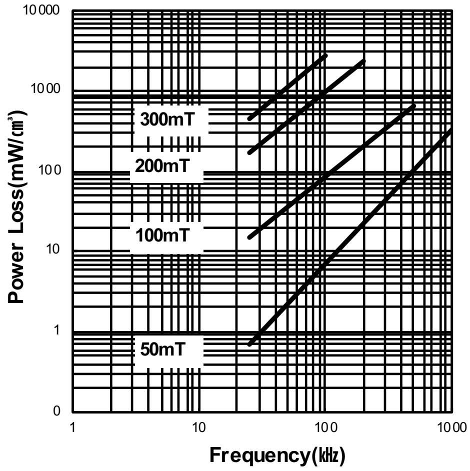


FM10 MATERIAL

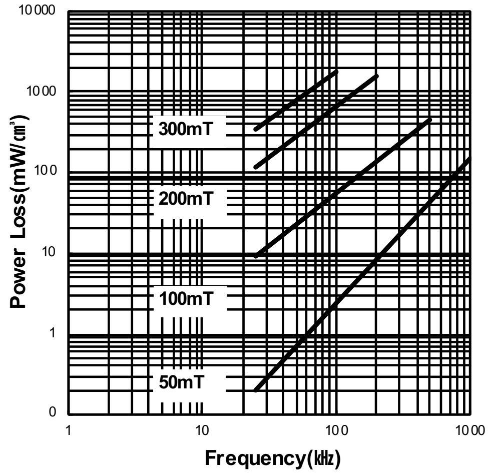
POWER LOSS(P_L)
vs.TEMPERATURE at 100mT



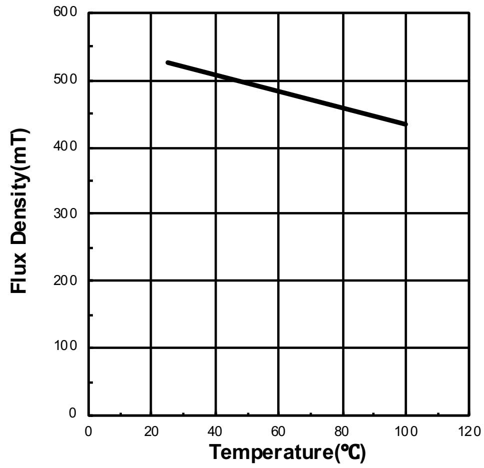
POWER LOSS(P_L)
vs. FREQUENCY at 25℃



POWER LOSS(P_L)
vs. FREQUENCY at 80℃



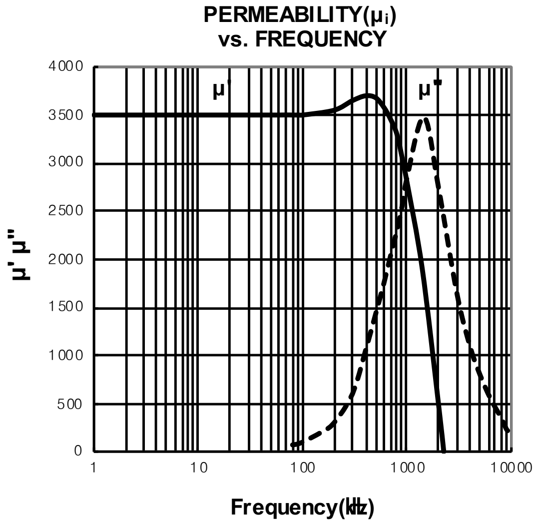
FLUX DENSITY(B)
vs. TEMPERATURE

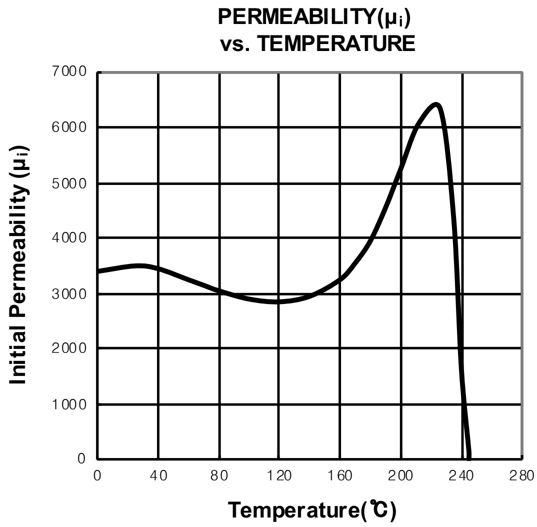


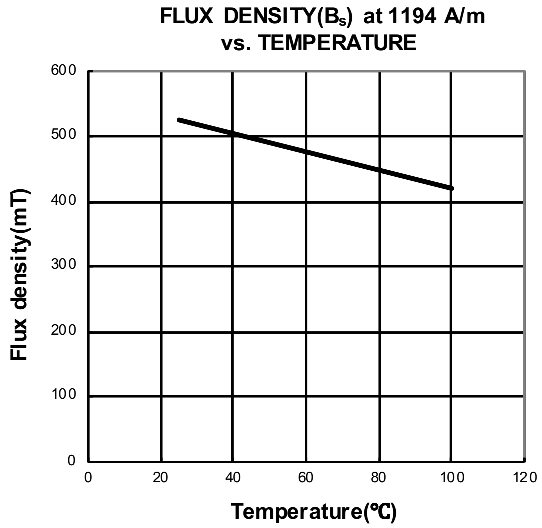
BM30 MATERIAL

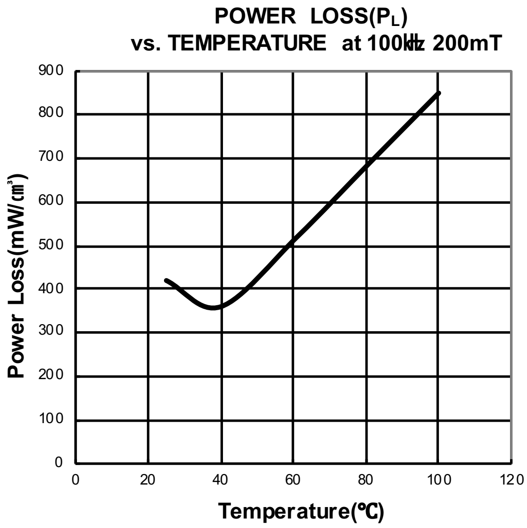
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤1mT	3500±25%
B_s	mT	H=1194(A/m), 25℃, f=10㎑	525
		H=1194(A/m), 100℃, f=10㎑	420
H_c	A/m	25℃, f=10㎑	12
		100℃, f=10㎑	10
B_{rms}	mT	H=1194(A/m), 25℃, f=10㎑	100
T_c	℃	-	> 240
P_L	mW/㎤	100㎑ / 200mT , 25℃	410
		100㎑ / 200mT , 100℃	850
ρ	Ω·m	-	8
d	kg/㎥	-	4850







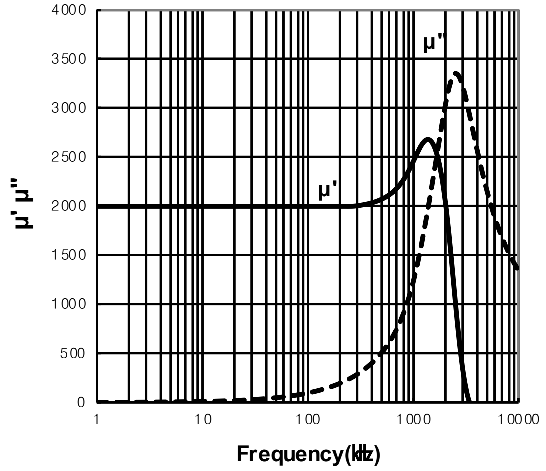


BM20 MATERIAL

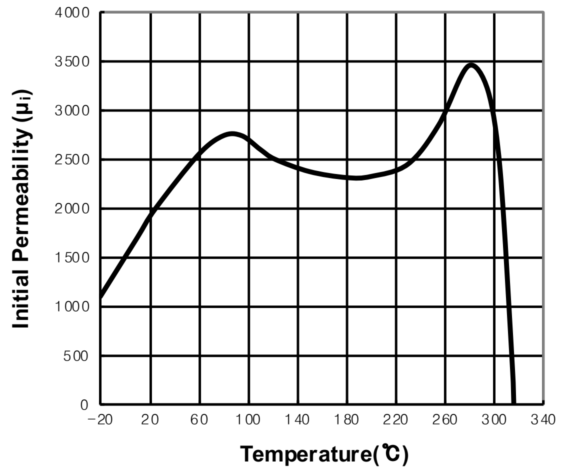
◈ Material Property

Symbol	Unit	Condition	Value
μ_i	-	25℃, ≤10㎑, ≤1mT	2000±25%
B_s	mT	H=1194(A/m), 25℃, f=10㎑	560
		H=1194(A/m), 100℃, f=10㎑	470
H_c	A/m	25℃, f=10㎑	16
		100℃, f=10㎑	10
B_{rms}	mT	H=1194(A/m), 25℃, f=10㎑	120
T_c	℃	-	> 310
P_L	mW/㎤	100㎑ / 200mT , 25℃	680
		100㎑ / 200mT , 100℃	380
ρ	Ω·m	-	7
d	kg/㎥	-	4900

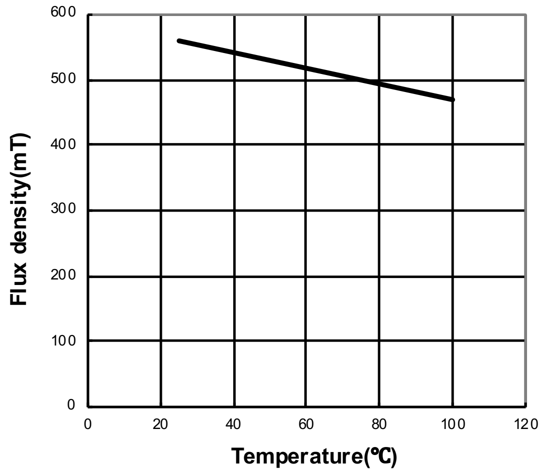
PERMEABILITY(μ_i)
vs. FREQUENCY



PERMEABILITY(μ_i)
vs. TEMPERATURE



FLUX DENSITY(B_s) at 1194 A/m
vs. TEMPERATURE



POWER LOSS(P_L)
vs. TEMPERATURE at 100㎑ 200mT