Contents

Core Locator & Unit Pack Quantity

MPP

P/N	PAGE	QTY
55015	4-4	10000
55016	4-4	10000
55017	4-4	10000
55018	4-4	10000
55020	4-4	10000
55021	4-4	10000
55022	4-4	10000
55023	4-4	10000
55025	4-8	10000
55026	4-8	10000
55027	4-8	10000
55028	4-8	10000
55030	4-8	10000
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55032	4-8	10000
55033	4-8	10000
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55047	4-13	5000
55048	4-13	5000
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55051	4-13	5000
55052	4-13	5000
55053	4-13	5000
55059	4-17	1000
55071	4-20	250
55076	4-22	220
55083	4-23	180
55084	4-25	120
55086	4-25	120
55087	4-25	120
55089	4-25	120
55090	4-25	120
55091	4-25	120
55092	4-25	120
55104	4-28	90
55106	4-28	90
55107	4-28	90
55109	4-28	90
55110	4-28	90
55111	4-28	90
55112	4-28	90
55115	4-14	2000
55116	4-14	2000
55117	4-14	2000
55118	4-14	2000
55120	4-14	2000
55121	4-14	2000
55122	4-14	2000
55123	4-14	2000
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55127	4-12	6000
55128	4-12	6000
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55133	4-12	6000
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55137	4-1	7500
55138	4-1	7500
55140	4-1	7500
55145	4-2	7500
55147	4-2	7500
55148	4-2	7500
55150	4-2	7500
55175	4-3	5000
55177	4-3	5000
55178	4-3	5000
55180	4-3	5000
55181	4-3	5000
55190	4-27	80
55191	4-27	80
55192	4-27	80
55195	4-27	80
55197	4-27	80
55199	4-27	80
55201	4-16	1600
55202	4-16	1600
55203	4-16	1600
55204	4-16	1600
55206	4-16	1600
55208	4-16	1600
55209	4-16	1600
55235	4-5	10000
55236	4-5	10000
55237	4-5	10000
55238	4-5	10000
55240	4-5	10000
55241	4-5	10000
55242	4-5	10000
55243	4-5	10000
55249	4-23	180
55250	4-23	180
55251	4-23	180
55252	4-23	180
55254	4-23	180
55256	4-23	180
55257	4-23	180
55265	4-6	10000
55266	4-6	10000
55267	4-6	10000
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55270	4-6	10000
55271	4-6	10000
55272	4-6	10000
55273	4-6	10000
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55280	4-9	8000
55281	4-9	8000
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55283	4-9	8000
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55286	4-10	8000
55287	4-10	8000
55288	4-10	8000
55290	4-10	8000
55291	4-10	8000
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55310	4-17	1000
55312	4-17	1000
55313	4-17	1000
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55320	4-22	220
55321	4-22	220
55322	4-22	220
55324	4-22	220
55326	4-22	220
55327	4-22	220
55345	4-18	480
55347	4-18	480
55348	4-18	480
55350	4-18	480
55351	4-18	480
55352	4-18	480
55353	4-18	480
55375	4-15	2000
55377	4-15	2000
55378	4-15	2000
55380	4-15	2000
55381	4-15	2000
55382	4-15	2000
55383	4-15	2000
55405	4-7	10000
55407	4-7	10000
55408	4-7	10000
55410	4-7	10000
55411	4-7	10000
55412	4-7	10000
55413	4-7	10000
55433	4-24	105
55435	4-24	105
55436	4-24	105
55438	4-24	105
55439	4-24	105
55440	4-24	105
55441	4-24	105
55543	4-20	250
55544	4-20	250
55545	4-20	250
55546	4-20	250
55548	4-20	250
55550	4-20	250
55551	4-20	250
55580	4-21	300
55581	4-21	300
55582	4-21	300
55583	4-21	300
55585	4-21	300
55586	4-21	300
55587	4-21	300
55588	4-21	300
55710	4-26	90
55712	4-26	90
55713	4-26	90
55715	4-26	90
55716	4-26	90
55717	4-26	90
55718	4-26	90
55848	4-16	1600
55866	4-29	45
55867	4-29	45
55868	4-29	45
55869	4-29	45
55894	4-19	400
55906	4-30	40
55907	4-30	40
55908	4-30	40
55909	4-30	40
55925	4-19	400
55926	4-19	400
55927	4-19	400
55928	4-19	400
55930	4-19	400
55932	4-19	400
55933	4-19	400

Core Locator & Unit Pack Quantity

High Flux

P/N	PAGE	QTY
58018	4-4	10000
58020	4-4	10000
58021	4-4	10000
58022	4-4	10000
58023	4-4	10000
58028	4-8	10000
58030	4-8	10000
58031	4-8	10000
58032	4-8	10000
58033	4-8	10000
58038	4-11	8000
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58042	4-11	8000
58043	4-11	8000
58048	4-13	5000
58050	4-13	5000
58051	4-13	5000
58052	4-13	5000
58053	4-13	5000
58059	4-17	1000
58071	4-20	250
58076	4-22	220
58083	4-23	180
58089	4-25	120
58090	4-25	120
58091	4-25	120
58092	4-25	120
58109	4-28	90
58110	4-28	90
58111	4-28	90
58112	4-28	90
58118	4-14	2000
58120	4-14	2000
58121	4-14	2000
58122	4-14	2000
58123	4-14	2000
58128	4-12	6000
58130	4-12	6000
58131	4-12	6000
58132	4-12	6000
58133	4-12	6000
58190	4-27	80
58191	4-27	80
58192	4-27	80
58195	4-27	80
58204	4-16	1600
58206	4-16	1600
58208	4-16	1600
58209	4-16	1600
58238	4-5	10000
58240	4-5	10000
58241	4-5	10000
58242	4-5	10000
58243	4-5	10000
58252	4-23	180
58254	4-23	180
58256	4-23	180
58257	4-23	180
58268	4-6	10000
58270	4-6	10000
58271	4-6	10000
58272	4-6	10000
58273	4-6	10000
58278	4-9	8000
58280	4-9	8000
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58282	4-9	8000
58283	4-9	8000
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58290	4-10	8000
58291	4-10	8000
58292	4-10	8000
58293	4-10	8000
58308	4-17	1000
58310	4-17	1000
58312	4-17	1000
58313	4-17	1000
58322	4-22	220
58324	4-22	220
58326	4-22	220
58327	4-22	220
58349	4-18	480
58350	4-18	480
58351	4-18	480
58352	4-18	480
58353	4-18	480
58378	4-15	2000
58380	4-15	2000
58381	4-15	2000
58382	4-15	2000
58383	4-15	2000
58408	4-7	10000
58410	4-7	10000
58411	4-7	10000
58412	4-7	10000
58413	4-7	10000
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58439	4-24	105
58440	4-24	105
58441	4-24	105
58546	4-20	250
58548	4-20	250
58550	4-20	250
58551	4-20	250
58583	4-21	300
58585	4-21	300
58586	4-21	300
58587	4-21	300
58588	4-21	300
58715	4-26	90
58716	4-26	90
58717	4-26	90
58718	4-26	90
58848	4-16	1600
58866	4-29	45
58867	4-29	45
58868	4-29	45
58869	4-29	45
58894	4-19	400
58906	4-30	40
58907	4-30	40
58908	4-30	40
58909	4-30	40
58928	4-19	400
58930	4-19	400
58932	4-19	400
58933	4-19	400

Core Locator & Unit Pack Quantity

Kool Mμ®

P/N	PAGE	QTY
77020	4-4	10000
77021	4-4	10000
77030	4-8	10000
77031	4-8	10000
77040	4-11	8000
77041	4-11	8000
77050	4-13	5000
77051	4-13	5000
77054	4-13	5000
77055	4-13	5000
77059	4-17	1000
77071	4-20	250
77076	4-22	220
77083	4-23	180
77089	4-25	120
77090	4-25	120
77091	4-25	120
77093	4-25	120
77094	4-25	120
77109	4-28	90
77110	4-28	90
77111	4-28	90
77120	4-14	2000
77121	4-14	2000
77130	4-12	6000
77131	4-12	6000
77140	4-1	7500
77141	4-1	7500
77150	4-2	7500
77151	4-2	7500
77154	4-2	7500
77155	4-2	7500
77180	4-3	5000
77181	4-3	5000
77184	4-3	5000
77185	4-3	5000
77191	4-27	80
77192	4-27	80
77193	4-27	80
77194	4-27	80
77195	4-27	80
77206	4-16	1600

P/N	PAGE	QTY
77210	4-16	1600
77211	4-16	1600
77213	4-28	90
77214	4-28	90
77224	4-14	2000
77225	4-14	2000
77240	4-5	10000
77241	4-5	10000
77244	4-5	10000
77245	4-5	10000
77254	4-23	180
77256	4-23	180
77258	4-23	180
77259	4-23	180
77270	4-6	10000
77271	4-6	10000
77280	4-9	8000
77281	4-9	8000
77290	4-10	8000
77291	4-10	8000
77294	4-10	8000
77295	4-10	8000
77310	4-17	1000
77312	4-17	1000
77314	4-17	1000
77315	4-17	1000
77324	4-22	220
77326	4-22	220
77328	4-22	220
77329	4-22	220
77334	4-12	6000
77335	4-12	6000
77350	4-18	480
77351	4-18	480
77352	4-18	480
77354	4-18	480
77355	4-18	480
77380	4-15	2000
77381	4-15	2000
77384	4-15	2000
77385	4-15	2000
77410	4-7	10000

P/N	PAGE	QTY
77411	4-7	10000
77414	4-7	10000
77415	4-7	10000
77438	4-24	105
77439	4-24	105
77440	4-24	105
77442	4-24	105
77443	4-24	105
77444	4-1	7500
77445	4-1	7500
77548	4-20	250
77550	4-20	250
77552	4-20	250
77553	4-20	250
77585	4-21	300
77586	4-21	300
77587	4-21	300
77589	4-21	300
77590	4-21	300
77715	4-26	90
77716	4-26	90
77717	4-26	90
77719	4-26	90
77720	4-26	90
77824	4-4	10000
77825	4-4	10000
77834	4-8	10000
77835	4-8	10000
77844	4-11	8000
77845	4-11	8000
77848	4-16	1600
77868	4-29	45
77874	4-6	10000
77875	4-6	10000
77884	4-6	10000
77885	4-6	10000
77894	4-19	400
77908	4-30	40
77930	4-19	400
77932	4-19	400
77934	4-19	400
77935	4-19	400

Core Locator & Unit Pack Quantity

XFLUX™

P/N	PAGE	QTY
78051	4-13	5000
78059	4-17	1000
78071	4-20	250
78076	4-22	220
78083	4-23	180
78090	4-25	120

P/N	PAGE	QTY
78110	4-28	90
78121	4-14	2000
78192	4-27	80
78351	4-18	480
78381	4-21	2000
78439	4-24	105

P/N	PAGE	QTY
78586	4-21	300
78716	4-26	90
78848	4-16	1600
78867	4-29	45
78894	4-19	400
78907	4-30	40

Powder Core Locator by O.D.

O.D.	I.D.	HT.	MPP	High Flux	Kool Mμ	XFlux
3.56	1.78	1.52	55140	-	77141	-
			55139	-	77444	-
			55138	-	77445	-
140 SIZE PAGE 4-1			55134	-	77140	-
			55137	-	-	-
			55135	-	-	-
3.94	2.24	2.54	55150	-	77151	-
			55149	-	77155	-
			55148	-	77154	-
150 SIZE PAGE 4-2			55144	-	77150	-
			55147	-	-	-
			55145	-	-	-
4.65	2.36	2.54	55181	-	77181	-
			55180	-	77185	-
			55179	-	77184	-
180 SIZE PAGE 4-3			55178	-	77180	-
			55174	-	-	-
			55177	-	-	-
			55175	-	-	-
6.35	2.79	2.79	55023	58023	77021	-
			55022	58022	77825	-
			55021	58021	77824	-
			55020	58020	77020	-
020 SIZE PAGE 4-4			55019	58019	-	-
			55018	58018	-	-
			55014	-	-	-
			55017	-	-	-
			55015	-	-	-
			55016	-	-	-
6.6	2.67	2.54	55243	58243	77241	-
			55242	58242	77245	-
			55241	58241	77244	-
			55240	58240	77240	-
240 SIZE PAGE 4-5			55239	58239	-	-
			55238	58238	-	-
			55234	-	-	-
			55237	-	-	-
			55235	-	-	-
			55236	-	-	-
6.6	2.67	4.78	55273	58273	77271	-
			55272	58272	77875	-
			55271	58271	77874	-
			55270	58270	77270	-
270 SIZE PAGE 4-6			55269	58269	-	-
			55268	58268	-	-
			55264	-	-	-
			55267	-	-	-
			55265	-	-	-
			55266	-	-	-
6.86	3.96	5.08	55413	58413	77411	-
			55412	58412	77415	-
			55411	58411	77414	-
			55410	58410	77410	-
410 SIZE PAGE 4-7			55409	58409	-	-
			55408	58408	-	-
			55404	-	-	-
			55407	-	-	-
			55405	-	-	-
7.87	3.96	3.18	55033	58033	77031	-
			55032	58032	77035	-
			55031	58031	77034	-
			55030	58030	77030	-
030 SIZE PAGE 4-8			55029	58029	-	-
			55028	58028	-	-
			55024	58024	-	-
			55027	-	-	-
			55026	-	-	-
			55025	-	-	-

O.D.	I.D.	HT.	MPP	High Flux	Kool Mμ	XFlux
9.65	4.78	3.18	55283	58283	77281	-
			55282	58282	77885	-
			55281	58281	77884	-
			55280	58280	77280	-
280 SIZE PAGE 4-9			55279	58279	-	-
			55278	55278	-	-
			55274	-	-	-
			55277	-	-	-
			55276	-	-	-
			55275	-	-	-
9.65	4.78	3.96	55293	58293	77291	-
			55292	58292	77295	-
			55291	58291	77294	-
			55290	58290	77290	-
290 SIZE PAGE 4-10			55289	58289	-	-
			55288	55288	-	-
			55284		-	-
			55287	-	-	-
			55285	-	-	-
			55286	-	-	-
10.2	5.08	3.96	55043	58043	77041	
			55042	58042	77845	-
			55041	58041	77844	-
			55040	58040	77040	-
040 SIZE PAGE 4-11			55039	58039	-	-
			55038	58038	-	-
			55034		-	-
			55037	-	-	-
			55035	-	-	-
			55036	-	-	-
11.2	6.35	3.96	55133	58133	77131	
			55132	58132	77335	-
			55131	58131	77334	-
			55130	58130	77130	-
130 SIZE PAGE 4-12			55129	58129	-	-
			55128	58128	-	-
			55124		-	-
			55127	-	-	-
			55125	-	-	-
12.7	7.62	4.75	55053	58053	77051	78051
			55052	58052	77055	-
			55051	58051	77054	-
			55050	58050	77050	-
050 SIZE PAGE 4-13			55049	58049	-	-
			55048	58048	-	-
			55044		-	-
			55047	-	-	-
			55045	-	-	-
			55046	-	-	-
16.5	10.2	6.35	55123	58123	77121	78121
			55122	58122	77225	-
			55121	58121	77224	-
			55120	58120	77120	-
050 SIZE PAGE 4-14			55119	58119	-	-
			55118	58118	-	-
			55114		-	-
			55117	-	-	-
			55115	-	-	-
			55116	-	-	-
17.3	9.65	6.35	55383	58383	77381	78381
			55382	58382	77385	-
			55381	58381	77384	-
			55380	58380	77380	-
380 SIZE PAGE 4-15			55379	58379	-	-
			55378	58378	-	-
			55374	-	-	-
			55377	-	-	-
			55375	-	-	-

Powder Core Locator by O.D.

O.D.	I.D.	HT.	MPP	High Flux	Kool Mμ	XFlux
20.3	12.7	6.35	55209	58209	77847	78848
			55208	58208	77848	-
			55848	58848	77211	-
			55206	58206	77210	-
206 SIZE PAGE 4-16			55205	58205	77206	-
			55204	58204	-	-
			55200	-	-	-
			55203	-	-	-
			55201	-	-	-
			55202	-	-	-
22.9	14.0	7.62	55313	58313	77312	78059
			55312	58312	77316	-
			55059	58059	77059	-
			55310	58310	77315	-
310 SIZE PAGE 4-17			55309	58309	77314	-
			55308	58308	77310	-
			55304	-	-	-
			55307	-	-	-
			55305	-	-	-
			55306	-	-	-
23.6	14.4	8.89	55353	58353	77352	78351
			55352	58352	77356	-
			55351	58351	77351	-
			55350	58350	77355	-
350 SIZE PAGE 4-18			55349	58349	77354	-
			55348	58348	77350	-
			55344	-	-	-
			55347	-	-	-
			55345	-	-	-
26.9	14.7	11.2	55933	58933	77932	78894
			55932	58932	77936	-
			55894	58894	77894	-
			55930	58930	77935	-
			55929	58929	77934	-
930 SIZE PAGE 4-19			55928	58928	77930	-
			55924	-	-	-
			55927	-	-	-
			55925	-	-	-
			55926	-	-	-
33.0	19.9	10.7	55551	58551	77550	78071
			55550	58550	77555	-
			55071	58071	77071	-
			55548	58548	77553	-
			55547	58547	77552	-
548 SIZE PAGE 4-20			55546	58546	77548	-
			55542	-	-	-
			55545	-	-	-
			55543	-	-	-
			55544	-	-	-
34.3	23.4	8.89	55588	58588	77587	78586
			55587	58587	77591	-
			55586	58586	77586	-
			55585	58585	77590	-
			55584	58584	77589	-
585 SIZE PAGE 4-21			55583	58583	77585	-
			55579	-	-	-
			55582	-	-	-
			55580	-	-	-
			55581	-	-	-
35.8	22.4	10.5	55327	58327	77326	78076
			55326	58326	77330	-
			55076	58076	77076	-
			55324	58324	77329	-
			55323	58323	77328	-
324 SIZE PAGE 4-22			55322	58322	77324	-
			55318	-	-	-
			55321	-	-	-
			55319	-	-	-
			55320	-	-	-

O.D.	I.D.	HT.	MPP	High Flux	Kool Mμ	XFlux
39.9	24.1	14.5	55257	58257	77256	78083
			55256	58256	77260	-
			55083	58083	77083	-
			55254	58254	77259	-
			55253	58253	77258	-
254 SIZE PAGE 4-23			55252	58252	77254	-
			55248	-	-	-
			55251	-	-	-
			55249	-	-	-
			55250	-	-	-
46.7	24.1	18.0	55441	58441	77440	78439
			55440	58440	77431	-
			55439	58439	77439	-
			55438	58438	77443	-
			55437	58437	77442	-
438 SIZE PAGE 4-24			55436	-	77438	-
			55432	-	-	-
			55435	-	-	-
			55433	-	-	-
46.7	28.7	15.2	55092	58092	77091	78090
			55091	58091	77095	-
			55090	58090	77090	-
			55089	58089	77094	-
			55088	-	77093	-
089 SIZE PAGE 4-25			55087	-	77089	-
			55082	-	-	-
			55086	-	-	-
			55084	-	-	-
50.8	31.8	13.5	55718	58718	77717	78716
			55717	58717	77721	-
			55716	58716	77716	-
			55715	58715	77720	-
			55714	58714	77719	-
715 SIZE PAGE 4-26			55713	-	-	-
			55709	-	-	-
			55712	-	-	-
			55710	-	-	-
57.2	26.4	15.2	55190	58190	77191	78192
			55191	58191	77189	-
			55192	58192	77192	-
			55195	58195	77193	-
			55196	-	77194	-
195 SIZE PAGE 4-27			55197	-	77195	-
			55198	-	-	-
			55199	-	-	-
57.2	35.6	14.0	55112	58112	77111	78110
			55111	58111	77212	-
			55110	58110	77110	-
			55109	58109	77214	-
			55108	-	77213	-
109 SIZE PAGE 4-28			55107	-	77109	-
			55103	-	-	-
			55106	-	-	-
			55104	-	-	-
77.8	49.2	12.7	55869	58869	77868	78867
			55868	58568	77872	-
866 SIZE PAGE 4-29			55867	58867	77867	-
			55866	58866	-	-
77.8	49.2	15.9	55909	58909	77908	78907
			55908	58908	77912	-
906 SIZE PAGE 4-30			55907	58907	77907	-
			55906	58906	-	-

Notes

Introduction

Magnetics Molypermalloy Powder (MPP) cores are distributed air gap toroidal cores made from a 79% nickel, 17% iron, and 4% molybdenum alloy powder for the lowest core losses of any powder core material.

MPP cores possess many outstanding magnetic characteristics, such as high resistivity, low hysteresis and eddy current losses, excellent inductance stability after high DC magnetization or under high DC bias conditions and minimal inductance shift up to 2,000 gausses under AC conditions.

Magnetics High Flux powder cores are distributed air gap toroidal cores made from a 50% nickel - 50% iron alloy powder for the highest available biasing capability of any powder core material.

High Flux cores have certain advantages that make them quite useful for applications involving high power, high DC bias, or high AC bias at high power frequencies. High Flux cores have a saturation flux density of 15,000 gauss, as compared to 7,500 gauss for standard MPP cores or 4,500 gauss for ferrites. The core loss of High Flux powder cores is significantly lower than that of powdered iron cores. It is possible that High Flux cores will offer a reduction in core size over powdered iron cores in most applications.

Magnetics Kool Mμ® powder cores are distributed air gap cores made from a ferrous alloy powder for low losses at elevated frequencies. The near zero magnetostriction alloy makes Kool Mμ ideal for eliminating audible frequency noise in filter inductors.

In high frequency applications, core losses of powdered iron, for instance, can be a major factor in contributing to undesirable temperature rises. Hence, Kool Mμ cores are ideal because their losses are significantly less, resulting in lower temperature rises. It is possible that Kool Mμ cores will offer a reduction in core size over powdered iron cores in a similar application.

Extremely large Kool Mu toroids and racetrack cores are offered in sizes ≥101.6 mm (4.00 inches). These large shapes are ideal for high current inductors. MPP and High Flux versions are also available.

Kool Mμ E Cores have a distributed air gap which makes them ideally suited for switching regulator inductors, flyback transformers, and power factor correction (PFC) inductors. The 10,500 gauss saturation level of Kool Mμ provides a higher energy storage capability than can be obtained with gapped ferrite E cores, resulting in smaller core size. Kool Mμ E cores are competitively priced against gapped ferrite E cores and their distributed air gap eliminates gap loss problems associated with ferrites. Kool Mμ E cores have significantly lower losses and substantially better thermal properties when compared to powdered iron E cores.

Magnetics XFLux™ distributed air gap cores are made from 6.5% silicon iron powder. A true high temperature material, with no thermal aging, XFLUX offers lower losses than powder iron cores and superior DC Bias performance. The soft saturation of XFLUX material offers an advantage over ferrite cores. XFLUX cores are ideal for low and medium frequency chokes where inductance at peak is critical.

MPP THINZ™, or Molypermalloy Powder washer cores, are distributed air gapped toroidal cores made from an 81% nickel, 17% iron, and 2% molybdenum alloy powder having the highest permeability of any powder core material and significantly higher saturation flux density compared to discrete gapped ferrite. THINZ™ offer an extremely low height self shielded power inductor core allowing finished inductor heights in the 1.5 mm to 2 mm range. Excellent temperature stability, superior inductance under DC bias, and low core losses highlight this product line's outstanding magnetic properties.

Applications

Magnetics powder cores are primarily used in power inductor applications, specifically in switch-mode power supply (SMPS) output filters, also known as DC Inductors. Other power applications include differential inductors, boost inductors, buck inductors, and flyback transformers.

While all four materials are used in these applications, each has its own advantage. For the lowest loss inductor, MPP material should be used since it has the lowest core loss. For the smallest core size in a dc bias dominated design, High Flux material should be used since it has the highest flux capacity. For reasonably low losses and reasonably high saturation at a low cost, Kool Mμ® should be used since it has the lowest material costs. XFLUX™ has the highest saturation.

Other specialty applications, such as High Q low level filters, load coils, and temperature stabilized inductors can use MPP material.

	MPP	High Flux	Kool Mμ	XFLUX
Permeability	14-550	14-160	26-125	60
Core Loss	Lowest	Moderate	Low	Moderate
Perm vs. DC Bias	Better	Best	Good	Best
Saturation (Bsat)	7.5 Kilogauss	15 Kilogauss	10.5 Kilogauss	16 Kilogauss
Nickel Content	80%	50%	0%	0%
Relative Cost	High	Medium	Low	Low

Core Indentification

All Magnetics Powder cores have unique part numbers that provide important information about the characteristics of the cores. A description of each type of part number is provided below.

TOROIDS

C055206A2

- Catalog Number (designates size and permeability)
- Material Code . . . . . 55 = MPP, 58 = High Flux, 77 = Kool Mμ, 78 = XFlux
- Grading Code . . . . . C0 = Graded into 2% inductance bands, 00 = Not graded

Core Finish Code	Voltage Breakdown	Material Availability	O.D. Size Availability	Permeability Availability
A2	500 volts	MPP, High Flux	All	All
A5	1000 volts	MPP, High Flux	6.35 - 57.2 mm	60μ - 200μ
A7	500 volts	Kool Mμ, XFlux	All	All
A9	4000 volts	MPP, High Flux	6.35 - 57.2 mm	60μ - 200μ
AY	300 volts	All	3.56 - 16.5 mm	14μ - 300μ
D4	500 volts	MPP	6.35 - 57.2 mm	60μ - 200μ
L6	500 volts	MPP	6.35 - 57.2 mm	60μ - 200μ
M4	500 volts	MPP	6.35 - 57.2 mm	60μ - 200μ
W4	500 volts	MPP	6.35 - 57.2 mm	60μ - 200μ

Powder Core Toroid Stamping Summary

Size (O.D. mm)	6-digit Shop Order Number	2-digit MaterialCode	3-digit Catalog Number	2-digit Core Finish Code	Inductance Code	Example
6.35 - 6.86	✔		✔		✔	123456 020 +6
7.87 - 12.7	✔		✔	✔	✔	123456 050A2 +6
> 12.7	✔	✔	✔	✔	✔	123456 55120A2 +6

- Inductance Code is only stamped on MPP toroids with C0 Grading Code
- Cores with O.D. less than 6.35 mm are not stamped

E CORES and THINZ

00K5528E060

- Permeability Code . . . . . Permeability, e.g. 060 for 60μ
- Shape Code . . . . . E = E Core, T = Toroid
- Size Code . . . . . First two digits equal approximate length or O.D. in mm / Last two digits equal approximate height or I.D. in mm
- Material Code . . . . . M = MPP, H = High Flux, K = Kool Mμ
- Grading Code . . . . . 00 = Not graded

LARGE E CORES and SEGMENTS

00K130LE026

- Permeability Code . . . . Permeability, e.g. 026 for 26μ
- Shape Code . . . . . LE = Large E Core, TC = Toroid, RT = Race Track, IS = I Segment, AR = Arc Segment
- Size Code
- Material Code . . . . . M = MPP, H = High Flux, K = Kool Mμ, X = XFlux
- Grading Code . . . . . 00 = Not graded

- Full part number and shop order number are stamped on all shapes

Core Finish

Magnetics powder cores are coated with a special finish that provides a tough, wax tight, moisture and chemical resistant barrier having excellent dielectric properties.

Each material has a unique color coating:

Material	Color	Core Finish Codes
MPP	Gray	A2, A5, A9, D4 M4, W4, L6
High Flux	Khaki	A2, A5, A9
Kool Mμ	Black	A7
XFlux	Brown	A7

The finish is tested for voltage breakdown by inserting the core between two weighted wire mesh pads. Force is adjusted to produce a uniform pressure of 10 psi, simulating winding pressure. The test condition to guarantee the minimum breakdown voltage (500 volts rms from wire to core) is a 60 Hz voltage equal to 2.5 times the minimum (or 1250 volts rms wire to wire). Higher minimum voltage breakdown finishes can be provided upon request for cores with greater than 5 mm O.D. There is no voltage breakdown guarantee on cores with less than 5 mm O.D.

Cores as large as 16.5 mm (0.650") O.D. can be coated with parylene to minimize the constriction of the inside diameter dimensions. The parylene coating has a minimum breakdown voltage guarantee of 300 volts rms from wire to core (tested at 750 volts rms wire to wire at 60 Hz). All finished dimensions in this catalog are for the color coating. When choosing a parylene coated core, the maximum O.D. and HT. are reduced by 0.18 mm (0.007"), and the minimum I.D. may be increased by 0.18 mm (0.007"). Use core finish code AY for parylene coating.

The maximum steady-state operating temperature for the coating is 200°C. The maximum steady-state operating temperature for the parylene coating is 130°C, but can be used as high as 200°C for short periods, such as during infrared solder reflow. High temperature operation of the cores does not affect the magnetic properties.

Core Inductance Tolerance/Grading

Magnetics powder cores are precision manufactured to an inductance tolerance of ±8%*, using standards obtained from Kelsall Permeameter Cup measurements and a precision series inductance bridge.

MPP cores with outside diameters greater than 5 mm are graded into 2% inductance bands as a standard practice at no additional charge. Cores with outside diameters less than 5 mm are graded into 5% bands and are manufactured to an inductance tolerance of ±7.5%. Grading into 1% bands is available on certain sizes by special request. Core grading minimizes winding adjustments, and thus reduces coil costs. When 1% bands are required, the wound cores must be processed for inductance stability (see Page 1-7).

Graded Magnetics MPP and High Flux cores are also available with tolerances less than the standard ±8%. Please contact Magnetics for special pricing.

GRADE Stamped on Core O.D.	INDUCTANCE % Deviation from Nominal		TURNS % Deviation from Nominal	
	From	To	From	To
+8	+8	+7	-4.0	-3.5
+6	+7	+5	-3.5	-2.5
+4	+5	+3	-2.5	-1.5
+2	+3	+1	-0.5	+0.5
+0	+1	-1	-0.5	+0.5
-2	-1	-3	+0.5	+1.5
-4	-3	-5	+1.5	+2.5
-6	-5	-7	+2.5	+3.5
-8	-7	-8	+3.5	+4.0

14μ and 26μ cores are not graded.
* Kool Mμ cores with outside diameters less than 12 mm have wider tolerances.

Inductance versus Turns

Magnetics inductance standards are measured in a Kelsall Permeameter Cup. Actual wound inductance measured outside a Kelsall Cup is greater than the calculated value due to leakage flux and flux developed by the current in the winding. The difference depends on many variables — core size, permeability, core finish thickness, wire size, and number of turns, in addition to the way in which the windings are put on the core. This difference is negligible for permeabilities above 125 and turns greater than 500. However, the lower the permeability and/or number of turns, the more pronounced this deviation becomes.

The following table is presented as a guide to the differences that may be experienced with various numbers of turns on a 1-inch O.D. 125μ core:

Number of Turns	Actual Inductance
1000	+0.0%
500	+0.5%
300	+1.0%
100	+3.0%
50	+5.0%
25	+8.5%

The following formula can be used to approximate the leakage flux to add to the expected inductance. This formula was developed from historical data of cores tested at Magnetics. Be aware that this will only give an approximation based on evenly spaced windings. You may expect as much as a ±50% deviation from this result.

$$L_{LK} = \frac{292\ N^{1.065} A_e}{l_e \times 10^5}$$

where:
- L_{LK} = leakage inductance (mH)
- N = number of turns
- A_e = core cross section (cm^2)
- l_e = core magnetic path length (cm)

A_L and Inductance Considerations

The inductance of a wound core can be calculated from the core geometry by using the following equation:

$$L = \frac{.4\pi\ \mu N^2 A_e}{l_e \times 10^8}$$

where:
- L = inductance (Henries)
- μ = core permeability
- N = number of turns
- A_e = core cross section (cm^2)
- l_e = core magnetic path length (cm)

The inductance for a given number of turns is related to the nominal inductance (as listed in the catalog nH/T^2 turns) by the following:

$$L_n = \frac{A_L N^2}{10^6}$$

where:
- L_N = inductance for N turns (mH)
- A_L = nominal inductance (nH/T^2)

MPP Temperature and Linear Stabilization

Magnetics MPP cores are provided in three basic temperature stabilizations; Standard, Controlled, and Linear. Typical and guaranteed inductance limits for these temperature stabilizations are illustrated on the following pages.

Standard cores are offered with three different finishes (A2, A5, or A9). Controlled and Linear cores are offered with a D4, M4, W4 and L6 finish, respectively. See page 1-3 for size and permeability availability.

The inductance of MPP cores is affected by temperature changes, which cause variations in the amount of distributed air gap (insulating material). The expansion characteristics of powdered metal, insulating material, and core finish all contribute to the inductance change arising from temperature changes.

The temperature coefficient of inductance can be controlled by the addition of a small percentage of special compensating alloys, which have curie points within the temperature range being controlled. When each curie point is exceeded, these particles become non-magnetic and act as additional air gaps; thus the change in inductance is minimized over a predetermined temperature range. MPP cores can thus be utilized in precision circuits requiring extremely high inductance stability over wide temperature ranges.

Magnetics standard cores (A2, A5, A9 Stabilization) offer the expected temperature performance shown on page 3-12. If guaranteed temperature performance is necessary, Controlled or Linear cores are recommended.

Magnetics MPP cores are offered in three controlled stabilizations, D4, W4, and M4 to provide high levels of inductance stability over temperature per the chart listed below. Stabilization is effective only to initial permeability or when cores are driven at low induction (<100 gauss).

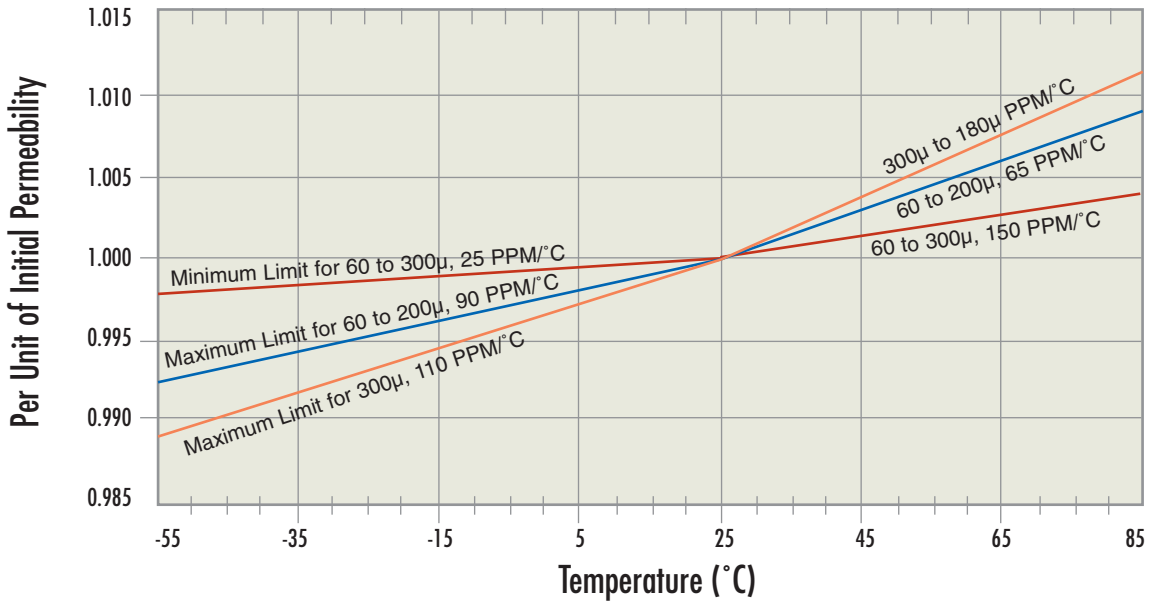
MPP cores are also offered with linear temperature characteristics, L6. Linear cores provide a temperature coefficient, from -55°C to +85°C, which can be matched with a 100ppm polystyrene capacitor to yield extremely stable tuned circuits. Temperature coefficient values are referenced to 25°C.

The temperature stability of MPP cores can be affected by external factors such as moisture, winding stresses and potting compounds. These effects can be minimized by using suitable stability procedures during the coil fabrication process. Please see Inductor Stabilization Procedure on page 1-7.

Part No. Suffix	Stabilization Type	Inductance Stability Limits	Stabilized Temperature Range	Guaranteed Minimum Breakdown
D4	Controlled	± 0.1%	0˚C to +55˚C +32˚F to +130˚F	500 volts
W4	Controlled	± .25%	-55˚C to +85˚C -67˚F to +185˚F	500 volts
M4	Controlled	± .25%	-65˚C to +125˚C -85˚F to +257˚F	500 volts
L6	Linear	See page 1-7	-55˚C to +85˚C -67˚F to +185˚F	500 volts

M4 cores meet the W4 limits and may be substituted in place of W4. Stabilized only available in 60-200 perm in O.D.s from 6.35 mm (0.25") - 57.2 mm (2.25").

MPP Linear Cores Guaranteed Limits



MPP Inductor Stabilization Procedure

Magnetics MPP cores possess excellent inductance/time stability. Under typical shelf life conditions the inductance of an unpotted core will shift less than 0.5%.

If maximum stability is desired, the following precautions and procedures will remove winding stresses and core moisture and provide inductance stabilities better than 0.05%.

1. Wind cores to the approximate specified inductance (slightly over the desired value).
2. Cool wound cores to -60°C. Maintain at temperature for 20 minutes to help relieve winding stresses caused by high winding tension, large wire, or many turns.
3. Heat cores slowly (<2°C/minute) to 115°C. Maintain at temperature for 20 minutes.
4. Steps 2 and 3 should be repeated twice.
5. Bake at 115°C for 16 hours.
6. Cool to room temperature and adjust turns to obtain specified inductance.
7. Cores must be kept dry until potted or hermetically sealed.
8. If the cores are to be potted, they should be covered first with a cushioning material, such as silicone rubber. This material minimizes the possibility of the potting compound stressing the core and changing the inductance value.
9. Potting compounds should be chosen with care, as even semi-flexible resins can cause core stresses and reduce stability. Selection should be based on minimum shrinkage and minimum moisture absorption.

Winding Considerations

Winding Factors

Magnetics core winding factors can vary from 20% to 60%, a typical value in many applications being 40%.

Magnetics has chosen to normalize winding data by basing R_{dc}, ohm/mh, and winding-turn-length on unity winding factor. This approach provides the coil designer with a means of calculating realistic design parameters for his choice of winding factor.

Please note that unity values are theoretical values, not attainable in practice. The highest winding factor possible, even with hand winding, is 65% - 75%, due to the spacing between the turns of wire.

Winding Turn Length

Winding turn lengths have been computed, using empirical relationships, for five winding factors. This permits an estimate of the actual length/turn for any winding factor.

Wound Coil Dimensions

Wound coil dimensions are listed for unity winding factor, as these are the largest dimensions necessary for packaging the wound coil. These dimensions are attainable, as a 70% winding factor (no residual hole) yields the same overall coil dimensions as a 100% (unity) winding factor (no interstices). Coil dimensions for coils wound to 40% winding factor can be estimated as follows:

$$O.D._{40\%} = .5\,(O.D._{core} + O.D._{unity})$$

where : $O.D._{core}$ = core O.D. after finish

$O.D._{unity}$ = wound coil O.D.

$$HT._{40\%} = .45\,(HT._{core} + HT._{unity})$$

where : $HT._{core}$ = core O.D. after finish

$HT._{unity}$ = wound coil O.D.

Temperature Rise Calculations

Temperature rise in a wound core depends on (1) wire resistance and current through the coil (P_{cu}, copper losses), and (2) core excitation (P_{fe}, core losses). Total power loss, defined as $P_{fe} + P_{cu}$ (milliwatts), is in the form of heat and is dissipated from exposed surfaces of a wound core.

The heat dissipated depends on the total exposed surface of the wound unit. Temperature rise cannot be predicted precisely, but can be approximated by the following formula:

$$\text{Temperature Rise (°C)} = \left[\frac{\text{Total Power Loss (milliwatts)}}{\text{Surface Area (cm}^2\text{)}}\right]^{.833}$$

In this catalog, surface area is presented in two ways:

1. Unwound core (after insulation is added)
2. Wound core, assuming 40% winding factor

Nominal DC Resistance

Nominal DC Resistance, in ohms/millihenry, is useful in calculating DC winding resistance (R_{dc}) for any value of inductance. The value of nominal DC Resistance is essentially independent of wire size and the number of turns of wire. The value of Nominal DC Resistance for any given winding factor can be computed as follows:

$$\Omega/mH_{wf} = \frac{\Omega\, mH_u}{wf} \times \frac{K_{wf}}{K_u}$$

where :

Ω mH	=	Ω/mH for chosen winding factor
Ω mH	=	Ω unity value, listed for each core size
wf	=	chosen winding factor
K_{wf}	=	length/turn for chosen wf*
K_u	=	length/turn for unity (100%) wf*

*see "Winding Turn Length" on core size pages

The value of R_{dc} for any given winding factor can be computed as follows:

$$R_{dcwf} = R_{dcu} \times wf \times \frac{K_{wf}}{K_u}$$

where :

R_{dcwf}	=	R_{dc} for chosen winding factor
R_{dcu}	=	unity value, listed for each size (ohms)
wf	=	chosen winding factor
K_{wf}	=	length/turn for chosen wf*
K_u	=	length/turn for unity (100%) wf*

Sample Calculation

Using a 55930 core, we can calculate the value of R_{dc} for 50 mH and 40% winding factors as follows, using parameter values listed on page 4-19:

$$\Omega\, mH_{40\%} = \frac{\Omega\, mH_u}{wf} \times \frac{K_{40\%}}{Ku} = \frac{.0524}{.40} \times \frac{.1344}{.1714} = .103\,\Omega/mH$$

The value of ohms/mH yields a value of R_{dc} at 50 mH, of 5.1 ohms (50mH x .103)

The value R_{dc} for the 55930 core can also be obtained by noting the unity values for No. 28 wire (i.e. 1400 turns and 15.67 ohms) can be converted to 40% winding factor values as follows:

$$N_{40\%} = N_{unity} \times wf$$
$$= 1400 \times .40$$
$$= 560 \text{ turns}$$

$$R_{dc40\%} = R_{dcu} \times wf \times \frac{K_{40\%}}{K_u}$$
$$= 15.67 \times .40 \times \frac{.1344}{.1714}$$
$$= 4.9 \text{ ohms}$$