

## FR-4 Multilayer Low Tg PCB Material

Recommended Drill Series: 100, 150, 430, 460, 480, 560, 580

Drill Size	Diameter (inch)	Feed (inch/min)	Speed (k-rpm)	Retract (inch/min)	Z-Axis Offset (inches)	Max Hits	Chipload (mm/rev)	SFM
0.10mm	0.0040	44	160	200	-0.011	500	0.28	167
0.13mm	0.0050	50	160	300	-0.011	600	0.31	209
0.15mm	0.0059	56	160	300	-0.011	600	0.35	247
#96	0.0063	62	160	400	-0.011	600	0.39	264
#95	0.0067	69	160	400	-0.012	600	0.43	281
#94	0.0071	75	160	500	-0.012	600	0.47	297
#93	0.0075	80	160	500	-0.012	600	0.50	314
#92	0.0079	85	160	500	-0.012	800	0.53	331
#91	0.0083	91	160	600	-0.012	800	0.57	347
#90	0.0087	96	160	600	-0.012	800	0.60	364
#89	0.0091	101	160	700	-0.012	800	0.63	381
#88	0.0095	107	160	700	-0.012	800	0.67	398
0.25mm	0.0098	112	160	800	-0.012	1000	0.70	410
#87	0.0100	115	160	800	-0.012	1000	0.72	419
#86	0.0105	120	160	800	-0.012	1000	0.75	440
#85	0.0110	126	160	900	-0.013	1000	0.79	461
#84	0.0115	130	160	900	-0.013	1000	0.81	481
0.30mm	0.0118	132	160	1000	-0.013	1200	0.83	494
#83	0.0120	134	160	1000	-0.013	1200	0.84	502
#82	0.0125	136	160	1000	-0.013	1200	0.85	523
#81	0.0130	138	160	1000	-0.013	1200	0.86	544
#80	0.0135	140	156	1000	-0.013	1500	0.90	550
0.35mm	0.0138	140	152	1000	-0.013	1500	0.92	550
#79	0.0145	140	145	1000	-0.013	1500	0.97	550
1/64	0.0156	144	135	1000	-0.014	1500	1.07	550
0.40mm	0.0158	146	133	1000	-0.014	1500	1.10	550
#78	0.0160	148	131	1000	-0.014	1500	1.13	550
0.45mm	0.0177	150	119	1000	-0.014	1500	1.26	550
#77	0.0180	152	117	1000	-0.014	1500	1.30	550
0.50mm	0.0197	154	107	1000	-0.015	1500	1.44	550
#76	0.0200	155	105	1000	-0.015	1500	1.48	550
#75	0.0210	156	100	1000	-0.015	1500	1.56	550
0.55mm	0.0217	158	97	1000	-0.015	1500	1.63	550
#74	0.0225	160	93	1000	-0.015	1500	1.72	550
0.60mm	0.0236	162	89	1000	-0.016	1500	1.82	550
#73	0.0240	162	88	1000	-0.016	1500	1.84	550
#72	0.0250	163	84	1000	-0.016	1500	1.94	550
0.65mm	0.0256	164	82	1000	-0.016	1500	2.00	550
#71	0.0260	165	81	1000	-0.016	1500	2.04	550
0.70mm	0.0276	166	76	1000	-0.016	1500	2.18	550
#70	0.0280	166	75	1000	-0.017	1500	2.21	550
#69	0.0292	166	72	1000	-0.017	1500	2.31	550
0.75mm	0.0295	166	71	1000	-0.017	1500	2.34	550
#68	0.0310	166	68	1000	-0.017	1500	2.44	550
1/32	0.0312	166	67	1000	-0.017	1500	2.48	550
0.80mm	0.0315	166	67	1000	-0.017	1500	2.48	550
#67	0.0320	166	66	1000	-0.017	1500	2.52	550
#66	0.0330	164	64	1000	-0.018	1500	2.56	550
0.85mm	0.0335	163	63	1000	-0.018	1500	2.59	550
#65	0.0350	160	60	1000	-0.018	1500	2.67	550
0.90mm	0.0354	160	59	1000	-0.018	1500	2.71	550
#64	0.0360	159	58	1000	-0.018	1500	2.74	550
#63	0.0370	158	57	1000	-0.019	1500	2.77	550
0.95mm	0.0374	158	56	1000	-0.019	1500	2.82	550
#62	0.0380	156	55	1000	-0.019	1500	2.84	550
#61	0.0390	155	54	1000	-0.019	1500	2.87	550
1.00mm	0.0394	155	53	1000	-0.019	1500	2.92	550
#60	0.0400	154	53	1000	-0.019	1500	2.91	550
#59	0.0410	153	51	1000	-0.020	1500	3.00	550
1.05mm	0.0413	153	51	1000	-0.020	1500	3.00	550
#58	0.0420	150	50	1000	-0.020	1500	3.00	550
#57	0.0430	147	49	1000	-0.020	1500	3.00	550
1.10mm	0.0433	147	49	1000	-0.020	1500	3.00	550
1.15mm	0.0453	138	46	1000	-0.021	1500	3.00	550

Note: This information is based on 160K RPM Spindle Capability. Please use maximum spindle speed if listed RPM is unattainable

(U.S.) 1.888.848.9266

(International) 001.714.428.3655

Visit us online at [KyoceraPrecisionTools.com](http://KyoceraPrecisionTools.com)

Drill Size	Diameter (inch)	Feed (inch/min)	Speed (k-rpm)	Retract (inch/min)	Z-Axis Offset (inches)	Max Hits	Chipload (mm/rev)	SFM
#56	0.0465	135	45	1000	-0.021	1500	3.00	550
3/64	0.0469	135	45	1000	-0.021	1500	3.00	550
1.20mm	0.0472	135	45	1000	-0.021	1500	3.00	550
1.25mm	0.0492	129	43	1000	-0.021	1500	3.00	550
1.30mm	0.0512	123	41	1000	-0.022	1500	3.00	550
#55	0.0520	120	40	1000	-0.022	1500	3.00	550
1.35mm	0.0531	120	40	1000	-0.022	1500	3.00	550
#54	0.0550	114	38	1000	-0.023	1500	3.00	550
1.40mm	0.0551	114	38	1000	-0.023	1500	3.00	550
1.45mm	0.0571	111	37	1000	-0.023	1500	3.00	550
1.50mm	0.0591	108	36	1000	-0.024	1500	3.00	550
#53	0.0595	105	35	1000	-0.024	1500	3.00	550
1.55mm	0.0610	102	34	1000	-0.024	1500	3.00	550
1/16	0.0625	102	34	1000	-0.025	1500	3.00	550
1.60mm	0.0630	99	33	1000	-0.025	1500	3.00	550
#52	0.0635	99	33	1000	-0.025	1500	3.00	550
1.65mm	0.0650	96	32	1000	-0.025	1500	3.00	550
1.70mm	0.0669	93	31	1000	-0.026	1500	3.00	550
#51	0.0670	93	31	1000	-0.026	1500	3.00	550
1.75mm	0.0689	93	31	1000	-0.026	1500	3.00	550
#50	0.0700	90	30	1000	-0.026	1500	3.00	550
1.80mm	0.0709	90	30	1000	-0.027	1500	3.00	550
1.85mm	0.0728	87	29	1000	-0.027	1500	3.00	550
#49	0.0730	87	29	1000	-0.027	1500	3.00	550
1.90mm	0.0748	84	28	1000	-0.027	1500	3.00	550
#48	0.0760	84	28	1000	-0.028	1500	3.00	550
1.95mm	0.0768	81	27	1000	-0.028	1500	3.00	550
5/64	0.0781	81	27	1000	-0.028	1500	3.00	550
#47	0.0785	81	27	1000	-0.028	1500	3.00	550
2.00mm	0.0787	81	27	1000	-0.028	1500	3.00	550
2.05mm	0.0807	78	26	1000	-0.029	1500	3.00	550
#46	0.0810	78	26	1000	-0.029	1500	3.00	550
#45	0.0820	78	26	1000	-0.029	1500	3.00	550
2.10mm	0.0827	75	25	1000	-0.029	1500	3.00	550
2.15mm	0.0846	75	25	1000	-0.030	1500	3.00	550
#44	0.0860	72	24	1000	-0.030	1500	3.00	550
2.20mm	0.0866	72	24	1000	-0.030	1500	3.00	550
2.25mm	0.0886	72	24	1000	-0.031	1500	3.00	550
#43	0.0890	72	24	1000	-0.031	1500	3.00	550
2.30mm	0.0906	69	23	1000	-0.031	1500	3.00	550
2.35mm	0.0925	69	23	1000	-0.032	1500	3.00	550
#42	0.0935	66	22	1000	-0.032	1500	3.00	550
3/32	0.0938	66	22	1000	-0.032	1500	3.00	550
2.40mm	0.0945	66	22	1000	-0.032	1500	3.00	550
#41	0.0960	66	22	1000	-0.032	1500	3.00	550
2.45mm	0.0965	66	22	1000	-0.033	1500	3.00	550
#40	0.0980	63	21	1000	-0.033	1500	3.00	550
2.50mm	0.0984	63	21	1000	-0.033	1500	3.00	550
#39	0.0995	63	21	1000	-0.033	1500	3.00	550
2.55mm	0.1004	63	21	1000	-0.033	1500	3.00	550
#38	0.1015	63	21	1000	-0.034	1500	3.00	550
2.60mm	0.1024	63	21	1000	-0.034	1500	3.00	550
#37	0.1040	60	20	1000	-0.034	1200	3.00	550
2.65mm	0.1043	60	20	1000	-0.034	1200	3.00	550
2.70mm	0.1063	60	20	1000	-0.035	1200	3.00	550
#36	0.1065	60	20	1000	-0.035	1200	3.00	557
2.75mm	0.1083	60	20	1000	-0.035	1200	3.00	567
7/64	0.1094	60	20	1000	-0.036	1200	3.00	573
#35	0.1100	60	20	1000	-0.036	1200	3.00	576
2.80mm	0.1102	60	20	1000	-0.036	1200	3.00	577
#34	0.1110	60	20	1000	-0.036	1200	3.00	581
2.85mm	0.1122	60	20	1000	-0.036	1200	3.00	587
#33	0.1130	60	20	1000	-0.036	1200	3.00	591
2.90mm	0.1142	60	20	1000	-0.037	1200	3.00	598
#32	0.1160	60	20	1000	-0.037	1200	3.00	607
2.95mm	0.1161	60	20	1000	-0.037	1200	3.00	608
3.00mm	0.1181	60	20	1000	-0.038	1200	3.00	618
#31	0.1200	60	20	1000	-0.038	1200	3.00	628
3.05mm	0.1201	60	20	1000	-0.038	1200	3.00	629
3.10mm	0.1220	60	20	1000	-0.038	1200	3.00	638
3.15mm	0.1240	60	20	1000	-0.039	1200	3.00	649
1/8	0.1250	60	20	1000	-0.039	1200	3.00	654

Note: This information is based on 160K RPM Spindle Capability. Please use maximum spindle speed if listed RPM is unattainable

(U.S.) 1.888.848.9266

(International) 001.714.428.3655

Visit us online at [KyoceraPrecisionTools.com](http://KyoceraPrecisionTools.com)



Drill Size	Diameter (inch)	Feed (inch/min)	Speed (k-rpm)	Retract (inch/min)	Z-Axis Offset (inches)	Max Hits	Chipload (mm/rev)	SFM
3.20mm	0.1260	40	20	1000	-0.018	1000	2.00	659
3.25mm	0.1280	40	20	1000	-0.018	1000	2.00	670
#30	0.1285	40	20	1000	-0.019	1000	2.00	672
3.30mm	0.1299	40	20	1000	-0.019	1000	2.00	680
3.35mm	0.1319	40	20	1000	-0.019	1000	2.00	690
3.40mm	0.1339	40	20	1000	-0.019	1000	2.00	701
3.45mm	0.1358	40	20	1000	-0.019	1000	2.00	711
#29	0.1360	40	20	1000	-0.019	1000	2.00	712
3.50mm	0.1378	35	20	1000	-0.019	1000	1.75	721
3.55mm	0.1398	35	20	1000	-0.019	1000	1.75	732
#28	0.1405	35	20	1000	-0.019	1000	1.75	735
9/64	0.1406	35	20	1000	-0.019	800	1.75	736
3.60mm	0.1417	35	20	1000	-0.019	800	1.75	742
3.65mm	0.1437	35	20	1000	-0.020	800	1.75	752
#27	0.1440	35	20	1000	-0.020	800	1.75	754
3.70mm	0.1457	35	20	1000	-0.020	800	1.75	762
#26	0.1470	35	20	1000	-0.020	800	1.75	769
3.75mm	0.1476	35	20	1000	-0.020	800	1.75	772
#25	0.1495	35	20	1000	-0.020	800	1.75	782
3.80mm	0.1496	35	20	1000	-0.020	800	1.75	783
3.85mm	0.1516	35	20	1000	-0.020	800	1.75	793
#24	0.1520	35	20	1000	-0.020	600	1.75	795
3.90mm	0.1535	35	20	1000	-0.020	600	1.75	803
#23	0.1540	35	20	1000	-0.020	600	1.75	806
3.95	0.1555	30	20	1000	-0.020	600	1.50	814
5/32	0.1562	30	20	1000	-0.020	600	1.50	817
#22	0.1570	30	20	1000	-0.020	600	1.50	822
4.00mm	0.1575	30	20	1000	-0.020	600	1.50	824
#21	0.1590	30	20	1000	-0.021	600	1.50	832
4.05mm	0.1594	30	20	1000	-0.021	600	1.50	834
#20	0.1610	30	20	1000	-0.021	600	1.50	843
4.10mm	0.1614	30	20	1000	-0.021	600	1.50	845
4.15mm	0.1634	30	20	1000	-0.021	600	1.50	855
4.20mm	0.1654	30	20	1000	-0.021	600	1.50	866
#19	0.1660	30	20	1000	-0.021	600	1.50	869
4.25mm	0.1673	30	20	1000	-0.021	600	1.50	876
4.30mm	0.1693	30	20	1000	-0.021	600	1.50	886
#18	0.1695	30	20	1000	-0.021	600	1.50	887
4.35mm	0.1713	30	20	1000	-0.021	600	1.50	896
11/64	0.1719	30	20	1000	-0.021	600	1.50	900
#17	0.1730	30	20	1000	-0.021	500	1.50	905
4.40mm	0.1732	30	20	1000	-0.021	500	1.50	906
4.45mm	0.1752	30	20	1000	-0.022	500	1.50	917
#16	0.1770	30	20	1000	-0.022	500	1.50	926
4.50mm	0.1772	30	20	1000	-0.022	500	1.50	927
4.55mm	0.1792	30	20	1000	-0.022	500	1.50	938
#15	0.1800	30	20	1000	-0.022	500	1.50	942
4.60mm	0.1811	30	20	1000	-0.022	500	1.50	948
#14	0.1820	30	20	1000	-0.022	500	1.50	952
4.65mm	0.1831	30	20	1000	-0.022	500	1.50	958
#13	0.1850	30	20	1000	-0.022	500	1.50	968
4.70mm	0.1850	30	20	1000	-0.022	500	1.50	968
4.75mm	0.1870	30	20	1000	-0.022	500	1.50	979
3/16	0.1875	30	20	1000	-0.022	500	1.50	981
4.80mm	0.1890	30	20	1000	-0.023	500	1.50	989
#12	0.1890	30	20	1000	-0.023	500	1.50	989
4.85mm	0.1909	30	20	1000	-0.023	500	1.50	999
#11	0.1910	30	20	1000	-0.023	500	1.50	1000
4.90mm	0.1929	30	20	1000	-0.023	500	1.50	1010
#10	0.1935	30	20	1000	-0.023	500	1.50	1013
4.95mm	0.1949	30	20	1000	-0.023	500	1.50	1020
#9	0.1960	30	20	1000	-0.023	400	1.50	1026
5.00mm	0.1968	30	20	1000	-0.023	400	1.50	1030
5.05mm	0.1988	30	20	1000	-0.023	400	1.50	1040
#8	0.1990	30	20	1000	-0.023	400	1.50	1041
5.10mm	0.2008	25	20	1000	-0.023	400	1.25	1051
#7	0.2010	25	20	1000	-0.023	400	1.25	1052
5.15mm	0.2028	25	20	1000	-0.023	400	1.25	1061
13/64	0.2031	25	20	1000	-0.023	400	1.25	1063
#6	0.2040	25	20	1000	-0.024	400	1.25	1068
5.20mm	0.2047	25	20	1000	-0.024	400	1.25	1071
#5	0.2055	25	20	1000	-0.024	400	1.25	1075

Note: This information is based on 160K RPM Spindle Capability. Please use maximum spindle speed if listed RPM is unattainable

(U.S.) 1.888.848.9266

(International) 001.714.428.3655

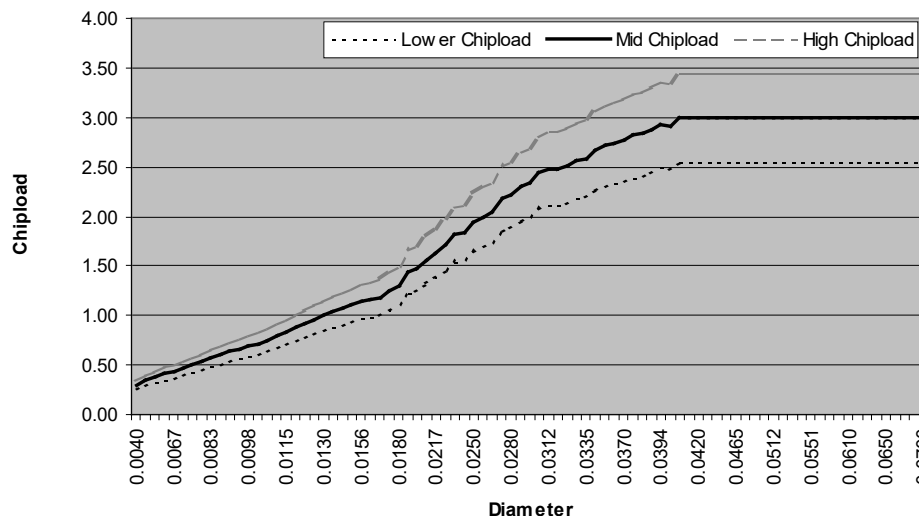
Visit us online at [KyoceraPrecisionTools.com](http://KyoceraPrecisionTools.com)

Drill Size	Diameter (inch)	Feed (inch/min)	Speed (k-rpm)	Retract (inch/min)	Z-Axis Offset (inches)	Max Hits	Chipload (mm/rev)	SFM
5.25mm	0.2067	25	20	1000	-0.024	400	1.25	1082
5.30mm	0.2087	25	20	1000	-0.024	400	1.25	1092
#4	0.2090	25	20	1000	-0.024	400	1.25	1094
5.35mm	0.2106	25	20	1000	-0.024	400	1.25	1102
5.40mm	0.2126	25	20	1000	-0.024	400	1.25	1113
#3	0.2130	25	20	1000	-0.024	400	1.25	1115
5.45mm	0.2146	25	20	1000	-0.024	400	1.25	1123
5.50mm	0.2165	25	20	1000	-0.024	400	1.25	1133
5.55mm	0.2185	25	20	1000	-0.024	400	1.25	1143
7/32	0.2188	25	20	1000	-0.024	400	1.25	1145
5.60mm	0.2205	25	20	1000	-0.025	400	1.25	1154
#2	0.2210	25	20	1000	-0.025	400	1.25	1157
5.65mm	0.2224	25	20	1000	-0.025	400	1.25	1164
5.70mm	0.2244	25	20	1000	-0.025	400	1.25	1174
5.75mm	0.2264	25	20	1000	-0.025	400	1.25	1185
#1	0.2280	25	20	1000	-0.025	400	1.25	1193
5.80mm	0.2283	25	20	1000	-0.025	400	1.25	1195
5.85mm	0.2302	25	20	1000	-0.025	400	1.25	1205
5.90mm	0.2323	25	20	1000	-0.025	400	1.25	1216
A	0.2340	25	20	1000	-0.025	400	1.25	1225
5.95mm	0.2343	25	20	1000	-0.026	400	1.25	1226
15/64	0.2344	25	20	1000	-0.026	400	1.25	1227
6.00mm	0.2362	25	20	1000	-0.026	400	1.25	1236
B	0.2380	25	20	1000	-0.026	400	1.25	1246
6.05mm	0.2382	25	20	1000	-0.026	400	1.25	1247
6.10mm	0.2402	25	20	1000	-0.026	400	1.25	1257
C	0.2420	25	20	1000	-0.026	400	1.25	1266
6.15mm	0.2421	25	20	1000	-0.026	400	1.25	1267
6.20mm	0.2441	25	20	1000	-0.026	400	1.25	1277
D	0.2460	25	20	1000	-0.026	400	1.25	1287
6.25mm	0.2461	25	20	1000	-0.026	400	1.25	1288
6.30mm	0.2480	25	20	1000	-0.026	400	1.25	1298
6.35mm	0.2500	25	20	1000	-0.027	400	1.25	1308
6.40mm	0.2520	25	20	1000	-0.027	400	1.25	1319
6.50mm	0.2559	25	20	1000	-0.027	400	1.25	1339
F	0.2570	25	20	1000	-0.027	400	1.25	1345
6.60mm	0.2598	25	20	1000	-0.027	400	1.25	1360

In some cases, there may be an opportunity to increase the chipload based on the application's robustness. Variables such as machine technology and condition, stack support materials, and Kyocera design selection may allow the increased throughput with higher chiploads. Multiply the recommended chipload by 1.15 to reach the higher chipload.

If the application is not as robust due to heavy glass, high copper content, tight annular ring requirements, or similar, multiply the recommended chipload by 0.85.

Chiploads for FR-4 Multilayer Low Tg



Note: This information is based on 160K RPM Spindle Capability. Please use maximum spindle speed if listed RPM is unattainable