

## FR-4 Multilayer High 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	34	160	200	-0.011	500	0.21	167
0.13mm	0.0050	40	160	300	-0.011	600	0.25	209
0.15mm	0.0059	48	160	300	-0.011	600	0.30	247
#96	0.0063	52	160	400	-0.011	600	0.33	264
#95	0.0067	58	160	400	-0.012	600	0.36	281
#94	0.0071	62	160	500	-0.012	600	0.39	297
#93	0.0075	68	160	500	-0.012	600	0.43	314
#92	0.0079	75	160	500	-0.012	800	0.47	331
#91	0.0083	80	160	600	-0.012	800	0.50	347
#90	0.0087	84	160	600	-0.012	800	0.53	364
#89	0.0091	88	160	700	-0.012	800	0.55	381
#88	0.0095	92	160	700	-0.012	800	0.58	398
0.25mm	0.0098	94	160	800	-0.012	1000	0.59	410
#87	0.0100	95	160	800	-0.012	1000	0.59	419
#86	0.0105	98	160	800	-0.012	1000	0.61	440
#85	0.0110	100	156	900	-0.013	1000	0.64	450
#84	0.0115	104	150	900	-0.013	1000	0.69	450
0.30mm	0.0118	106	146	1000	-0.013	1200	0.73	450
#83	0.0120	108	143	1000	-0.013	1200	0.76	450
#82	0.0125	112	138	1000	-0.013	1200	0.81	450
#81	0.0130	115	132	1000	-0.013	1200	0.87	450
#80	0.0135	118	127	1000	-0.013	1500	0.93	450
0.35mm	0.0138	118	125	1000	-0.013	1500	0.94	450
#79	0.0145	119	119	1000	-0.013	1500	1.00	450
1/64	0.0156	120	110	1000	-0.014	1500	1.09	450
0.40mm	0.0158	120	109	1000	-0.014	1500	1.10	450
#78	0.0160	122	107	1000	-0.014	1500	1.14	450
0.45mm	0.0177	123	97	1000	-0.014	1500	1.27	450
#77	0.0180	124	96	1000	-0.014	1500	1.29	450
0.50mm	0.0197	125	87	1000	-0.015	1500	1.44	450
#76	0.0200	126	86	1000	-0.015	1500	1.47	450
#75	0.0210	126	82	1000	-0.015	1500	1.54	450
0.55mm	0.0217	126	79	1000	-0.015	1500	1.59	450
#74	0.0225	125	76	1000	-0.015	1500	1.64	450
0.60mm	0.0236	124	73	1000	-0.016	1500	1.70	450
#73	0.0240	124	72	1000	-0.016	1500	1.72	450
#72	0.0250	123	69	1000	-0.016	1200	1.78	450
0.65mm	0.0256	122	67	1000	-0.016	1200	1.82	450
#71	0.0260	122	66	1000	-0.016	1200	1.85	450
0.70mm	0.0276	120	62	1000	-0.016	1200	1.94	450
#70	0.0280	120	61	1000	-0.017	1200	1.97	450
#69	0.0292	119	59	1000	-0.017	1200	2.02	450
0.75mm	0.0295	119	58	1000	-0.017	1200	2.05	450
#68	0.0310	116	55	1000	-0.017	1500	2.11	450
1/32	0.0312	116	55	1000	-0.017	1500	2.11	450
0.80mm	0.0315	115	55	1000	-0.017	1500	2.09	450
#67	0.0320	114	54	1000	-0.017	1500	2.11	450
#66	0.0330	113	52	1000	-0.018	1500	2.17	450
0.85mm	0.0335	113	51	1000	-0.018	1500	2.22	450
#65	0.0350	112	49	1000	-0.018	1500	2.29	450
0.90mm	0.0354	112	49	1000	-0.018	1500	2.29	450
#64	0.0360	112	48	1000	-0.018	1500	2.33	450
#63	0.0370	111	46	1000	-0.019	1500	2.41	450
0.95mm	0.0374	111	46	1000	-0.019	1500	2.41	450
#62	0.0380	110	45	1000	-0.019	1500	2.44	450
#61	0.0390	109	44	1000	-0.019	1500	2.48	450
1.00mm	0.0394	109	44	1000	-0.019	1500	2.48	450
#60	0.0400	107	43	1000	-0.019	1500	2.49	450
#59	0.0410	105	42	1000	-0.020	1500	2.50	450
1.05mm	0.0413	105	42	1000	-0.020	1500	2.50	450
#58	0.0420	103	41	1000	-0.020	1500	2.50	450
#57	0.0430	100	40	1000	-0.020	1500	2.50	450
1.10mm	0.0433	100	40	1000	-0.020	1500	2.50	450
1.15mm	0.0453	95	38	1000	-0.021	1500	2.50	450

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

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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	93	37	1000	-0.021	1500	2.50	450
3/64	0.0469	93	37	1000	-0.021	1500	2.50	450
1.20mm	0.0472	90	36	1000	-0.021	1500	2.50	450
1.25mm	0.0492	88	35	1000	-0.021	1500	2.50	450
1.30mm	0.0512	85	34	1000	-0.022	1500	2.50	450
#55	0.0520	83	33	1000	-0.022	1500	2.50	450
1.35mm	0.0531	80	32	1000	-0.022	1200	2.50	450
#54	0.0550	78	31	1000	-0.023	1200	2.50	450
1.40mm	0.0551	78	31	1000	-0.023	1200	2.50	450
1.45mm	0.0571	75	30	1000	-0.023	1200	2.50	450
1.50mm	0.0591	73	29	1000	-0.024	1200	2.50	450
#53	0.0595	73	29	1000	-0.024	1200	2.50	450
1.55mm	0.0610	70	28	1000	-0.024	1200	2.50	450
1/16	0.0625	70	28	1000	-0.025	1200	2.50	450
1.60mm	0.0630	68	27	1000	-0.025	1200	2.50	450
#52	0.0635	68	27	1000	-0.025	1200	2.50	450
1.65mm	0.0650	65	26	1000	-0.025	1200	2.50	450
1.70mm	0.0669	65	26	1000	-0.026	1200	2.50	450
#51	0.0670	65	26	1000	-0.026	1200	2.50	450
1.75mm	0.0689	63	25	1000	-0.026	1200	2.50	450
#50	0.0700	63	25	1000	-0.026	1200	2.50	450
1.80mm	0.0709	60	24	1000	-0.027	1200	2.50	450
1.85mm	0.0728	60	24	1000	-0.027	1200	2.50	450
#49	0.0730	60	24	1000	-0.027	1200	2.50	450
1.90mm	0.0748	58	23	1000	-0.027	1200	2.50	450
#48	0.0760	58	23	1000	-0.028	1200	2.50	450
1.95mm	0.0768	55	22	1000	-0.028	1200	2.50	450
5/64	0.0781	55	22	1000	-0.028	1200	2.50	450
#47	0.0785	55	22	1000	-0.028	1200	2.50	450
2.00mm	0.0787	55	22	1000	-0.028	1200	2.50	450
2.05mm	0.0807	53	21	1000	-0.029	1000	2.50	450
#46	0.0810	53	21	1000	-0.029	1000	2.50	450
#45	0.0820	53	21	1000	-0.029	1000	2.50	450
2.10mm	0.0827	53	21	1000	-0.029	1000	2.50	450
2.15mm	0.0846	50	20	1000	-0.030	1000	2.50	450
#44	0.0860	50	20	1000	-0.030	1000	2.50	450
2.20mm	0.0866	50	20	1000	-0.030	1000	2.50	453
2.25mm	0.0886	50	20	1000	-0.031	1000	2.50	464
#43	0.0890	50	20	1000	-0.031	1000	2.50	466
2.30mm	0.0906	50	20	1000	-0.031	1000	2.50	474
2.35mm	0.0925	50	20	1000	-0.032	1000	2.50	484
#42	0.0935	50	20	1000	-0.032	1000	2.50	489
3/32	0.0938	50	20	1000	-0.032	1000	2.50	491
2.40mm	0.0945	50	20	1000	-0.032	1000	2.50	495
#41	0.0960	50	20	1000	-0.032	1000	2.50	502
2.45mm	0.0965	50	20	1000	-0.033	1000	2.50	505
#40	0.0980	50	20	1000	-0.033	1000	2.50	513
2.50mm	0.0984	50	20	1000	-0.033	1000	2.50	515
#39	0.0995	50	20	1000	-0.033	1000	2.50	521
2.55mm	0.1004	50	20	1000	-0.033	1000	2.50	525
#38	0.1015	50	20	1000	-0.034	1000	2.50	531
2.60mm	0.1024	50	20	1000	-0.034	1000	2.50	536
#37	0.1040	50	20	1000	-0.034	800	2.50	544
2.65mm	0.1043	50	20	1000	-0.034	800	2.50	546
2.70mm	0.1063	50	20	1000	-0.035	800	2.50	556
#36	0.1065	50	20	1000	-0.035	800	2.50	557
2.75mm	0.1083	50	20	1000	-0.035	800	2.50	567
7/64	0.1094	50	20	1000	-0.036	800	2.50	573
#35	0.1100	50	20	1000	-0.036	800	2.50	576
2.80mm	0.1102	50	20	1000	-0.036	800	2.50	577
#34	0.1110	50	20	1000	-0.036	800	2.50	581
2.85mm	0.1122	50	20	1000	-0.036	800	2.50	587
#33	0.1130	50	20	1000	-0.036	800	2.50	591
2.90mm	0.1142	50	20	1000	-0.037	800	2.50	598
#32	0.1160	50	20	1000	-0.037	800	2.50	607
2.95mm	0.1161	50	20	1000	-0.037	800	2.50	608
3.00mm	0.1181	50	20	1000	-0.038	800	2.50	618
#31	0.1200	50	20	1000	-0.038	800	2.50	628
3.05mm	0.1201	50	20	1000	-0.038	800	2.50	629
3.10mm	0.1220	50	20	1000	-0.038	800	2.50	638
3.15mm	0.1240	50	20	1000	-0.039	800	2.50	649
1/8	0.1250	50	20	1000	-0.039	800	2.50	654

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

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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	500	2.00	659
3.25mm	0.1280	40	20	1000	-0.018	500	2.00	670
#30	0.1285	40	20	1000	-0.019	500	2.00	672
3.30mm	0.1299	40	20	1000	-0.019	500	2.00	680
3.35mm	0.1319	40	20	1000	-0.019	500	2.00	690
3.40mm	0.1339	40	20	1000	-0.019	500	2.00	701
3.45mm	0.1358	40	20	1000	-0.019	500	2.00	711
#29	0.1360	40	20	1000	-0.019	500	2.00	712
3.50mm	0.1378	35	20	1000	-0.019	500	1.75	721
3.55mm	0.1398	35	20	1000	-0.019	500	1.75	732
#28	0.1405	35	20	1000	-0.019	500	1.75	735
9/64	0.1406	35	20	1000	-0.019	500	1.75	736
3.60mm	0.1417	35	20	1000	-0.019	500	1.75	742
3.65mm	0.1437	35	20	1000	-0.020	500	1.75	752
#27	0.1440	35	20	1000	-0.020	500	1.75	754
3.70mm	0.1457	35	20	1000	-0.020	500	1.75	762
#26	0.1470	35	20	1000	-0.020	500	1.75	769
3.75mm	0.1476	35	20	1000	-0.020	500	1.75	772
#25	0.1495	35	20	1000	-0.020	500	1.75	782
3.80mm	0.1496	35	20	1000	-0.020	400	1.75	783
3.85mm	0.1516	35	20	1000	-0.020	400	1.75	793
#24	0.1520	35	20	1000	-0.020	400	1.75	795
3.90mm	0.1535	35	20	1000	-0.020	400	1.75	803
#23	0.1540	35	20	1000	-0.020	400	1.75	806
3.95	0.1555	30	20	1000	-0.020	400	1.50	814
5/32	0.1562	30	20	1000	-0.020	400	1.50	817
#22	0.1570	30	20	1000	-0.020	400	1.50	822
4.00mm	0.1575	30	20	1000	-0.020	400	1.50	824
#21	0.1590	30	20	1000	-0.021	400	1.50	832
4.05mm	0.1594	30	20	1000	-0.021	400	1.50	834
#20	0.1610	30	20	1000	-0.021	400	1.50	843
4.10mm	0.1614	30	20	1000	-0.021	400	1.50	845
4.15mm	0.1634	30	20	1000	-0.021	400	1.50	855
4.20mm	0.1654	30	20	1000	-0.021	400	1.50	866
#19	0.1660	30	20	1000	-0.021	400	1.50	869
4.25mm	0.1673	30	20	1000	-0.021	400	1.50	876
4.30mm	0.1693	30	20	1000	-0.021	400	1.50	886
#18	0.1695	30	20	1000	-0.021	400	1.50	887
4.35mm	0.1713	30	20	1000	-0.021	400	1.50	896
11/64	0.1719	30	20	1000	-0.021	400	1.50	900
#17	0.1730	30	20	1000	-0.021	400	1.50	905
4.40mm	0.1732	30	20	1000	-0.021	400	1.50	906
4.45mm	0.1752	30	20	1000	-0.022	400	1.50	917
#16	0.1770	30	20	1000	-0.022	400	1.50	926
4.50mm	0.1772	30	20	1000	-0.022	400	1.50	927
4.55mm	0.1792	30	20	1000	-0.022	400	1.50	938
#15	0.1800	30	20	1000	-0.022	400	1.50	942
4.60mm	0.1811	30	20	1000	-0.022	400	1.50	948
#14	0.1820	30	20	1000	-0.022	400	1.50	952
4.65mm	0.1831	30	20	1000	-0.022	400	1.50	958
#13	0.1850	30	20	1000	-0.022	400	1.50	968
4.70mm	0.1850	30	20	1000	-0.022	400	1.50	968
4.75mm	0.1870	30	20	1000	-0.022	400	1.50	979
3/16	0.1875	30	20	1000	-0.022	400	1.50	981
4.80mm	0.1890	30	20	1000	-0.023	300	1.50	989
#12	0.1890	30	20	1000	-0.023	300	1.50	989
4.85mm	0.1909	30	20	1000	-0.023	300	1.50	999
#11	0.1910	30	20	1000	-0.023	300	1.50	1000
4.90mm	0.1929	30	20	1000	-0.023	300	1.50	1010
#10	0.1935	30	20	1000	-0.023	300	1.50	1013
4.95mm	0.1949	30	20	1000	-0.023	300	1.50	1020
#9	0.1960	30	20	1000	-0.023	300	1.50	1026
5.00mm	0.1968	30	20	1000	-0.023	300	1.50	1030
5.05mm	0.1988	30	20	1000	-0.023	300	1.50	1040
#8	0.1990	30	20	1000	-0.023	300	1.50	1041
5.10mm	0.2008	25	20	1000	-0.023	300	1.25	1051
#7	0.2010	25	20	1000	-0.023	300	1.25	1052
5.15mm	0.2028	25	20	1000	-0.023	300	1.25	1061
13/64	0.2031	25	20	1000	-0.023	300	1.25	1063
#6	0.2040	25	20	1000	-0.024	300	1.25	1068
5.20mm	0.2047	25	20	1000	-0.024	300	1.25	1071
#5	0.2055	25	20	1000	-0.024	300	1.25	1075

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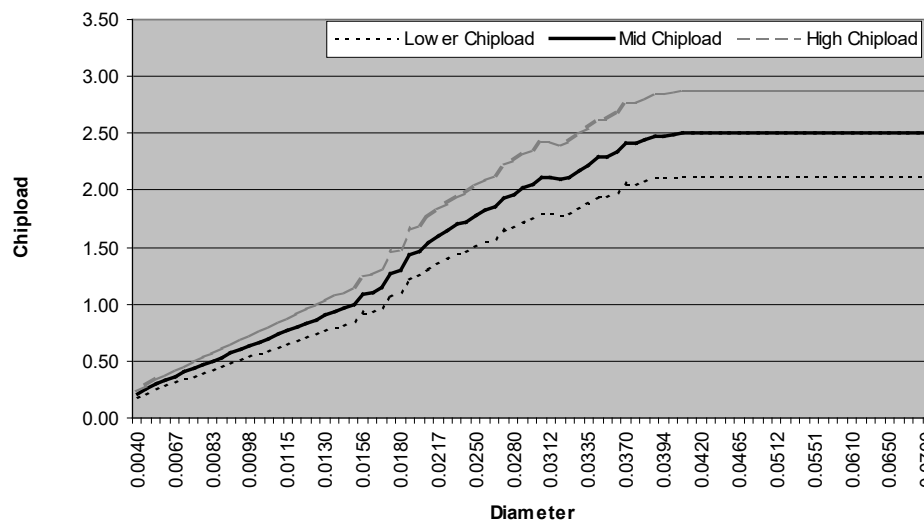
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Drill Size	Diameter (inch)	Feed (inch/min)	Speed (k-rpm)	Retract (inch/min)	Z-Axis Offset (inches)	Max Hits	Chipload (mm/rev)	SFM
5.25mm	0.2067	25	20	1000	-0.024	300	1.25	1082
5.30mm	0.2087	25	20	1000	-0.024	300	1.25	1092
#4	0.2090	25	20	1000	-0.024	300	1.25	1094
5.35mm	0.2106	25	20	1000	-0.024	200	1.25	1102
5.40mm	0.2126	25	20	1000	-0.024	200	1.25	1113
#3	0.2130	25	20	1000	-0.024	200	1.25	1115
5.45mm	0.2146	25	20	1000	-0.024	200	1.25	1123
5.50mm	0.2165	25	20	1000	-0.024	200	1.25	1133
5.55mm	0.2185	25	20	1000	-0.024	200	1.25	1143
7/32	0.2188	25	20	1000	-0.024	200	1.25	1145
5.60mm	0.2205	25	20	1000	-0.025	200	1.25	1154
#2	0.2210	25	20	1000	-0.025	200	1.25	1157
5.65mm	0.2224	25	20	1000	-0.025	200	1.25	1164
5.70mm	0.2244	25	20	1000	-0.025	200	1.25	1174
5.75mm	0.2264	25	20	1000	-0.025	200	1.25	1185
#1	0.2280	25	20	1000	-0.025	200	1.25	1193
5.80mm	0.2283	25	20	1000	-0.025	200	1.25	1195
5.85mm	0.2302	25	20	1000	-0.025	200	1.25	1205
5.90mm	0.2323	25	20	1000	-0.025	200	1.25	1216
A	0.2340	25	20	1000	-0.025	200	1.25	1225
5.95mm	0.2343	25	20	1000	-0.026	200	1.25	1226
15/64	0.2344	25	20	1000	-0.026	200	1.25	1227
6.00mm	0.2362	25	20	1000	-0.026	200	1.25	1236
B	0.2380	25	20	1000	-0.026	200	1.25	1246
6.05mm	0.2382	25	20	1000	-0.026	200	1.25	1247
6.10mm	0.2402	25	20	1000	-0.026	200	1.25	1257
C	0.2420	25	20	1000	-0.026	200	1.25	1266
6.15mm	0.2421	25	20	1000	-0.026	200	1.25	1267
6.20mm	0.2441	25	20	1000	-0.026	200	1.25	1277
D	0.2460	25	20	1000	-0.026	200	1.25	1287
6.25mm	0.2461	25	20	1000	-0.026	200	1.25	1288
6.30mm	0.2480	25	20	1000	-0.026	200	1.25	1298
6.35mm	0.2500	25	20	1000	-0.027	200	1.25	1308
6.40mm	0.2520	25	20	1000	-0.027	200	1.25	1319
6.50mm	0.2559	25	20	1000	-0.027	200	1.25	1339
F	0.2570	25	20	1000	-0.027	200	1.25	1345
6.60mm	0.2598	25	20	1000	-0.027	200	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 High Tg



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