PCB-RULER-ND: Metric Side Rev 1 (March 2016) 12 inch (~30.5cm)

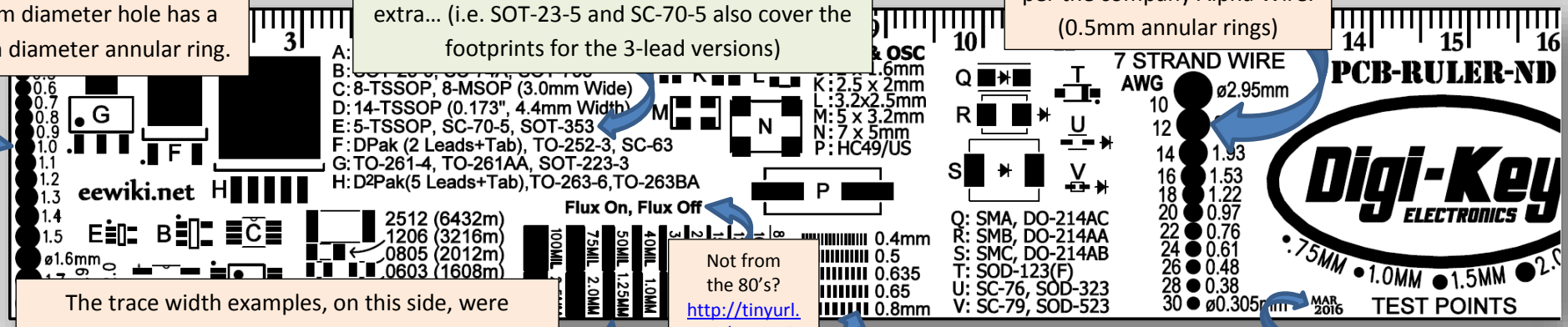
Our aim was to create a reliable and accurate PCB layout reference tool. We tried to include as many useful features as possible.

1.25" x 12" (31.75mm x 30.48cm) ◦ 0.062" Thick - 1oz Copper (~35µm) ◦ ENIG finish (Electroless Nickel Immersion Gold) ◦ Weight ~ 1.16oz/32.9gm

Hole examples with 0.5mm thick annular rings, so the 1mm diameter hole has a 2mm diameter annular ring.

Footprints of the eight most popular IC packages (used by our manufacturers) including a few extra… (i.e. SOT-23-5 and SC-70-5 also cover the footprints for the 3-lead versions)

Diameter of 7-strand wire per the company Alpha Wire. (0.5mm annular rings)



The trace width examples, on this side, were positioned on the edge so they could be placed over a PCB trace to estimate what width was used.

Not from the 80's? http://tinyurl.com/woworlr Always clean your boards.

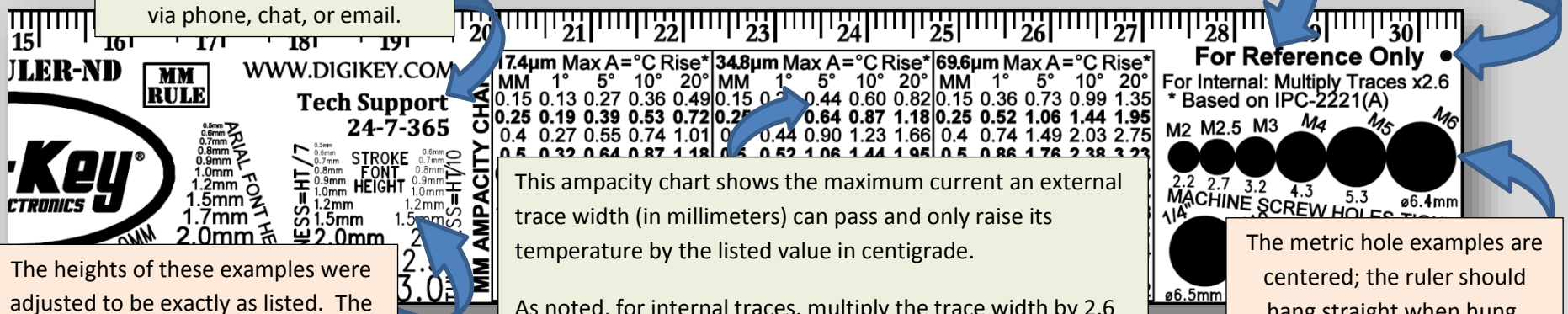
Pitch examples

Revision Date

A reminder that we offer support every hour of every day via phone, chat, or email.

The disclaimer; we aimed for perfect, but we have humans working here and there may be errors.

Fiducial



The heights of these examples were adjusted to be exactly as listed. The Stroke font thicknesses shown are calculated height/7 or /10, so 2mm/7 =0.286mm thick & 2/10=0.2mm.

This ampacity chart shows the maximum current an external trace width (in millimeters) can pass and only raise its temperature by the listed value in centigrade.

As noted, for internal traces, multiply the trace width by 2.6 to carry the same amount of current.

When calculating per IPC-2221(A), the copper thicknesses listed on the MIL side were used.

The metric hole examples are centered; the ruler should hang straight when hung. Annular rings = 0.6mm thick.

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PCB-RULER-ND: MIL Side Rev 1 (March 2016) 12 inch (~30.5cm)

A table showing the thickness conversion from oz of copper to mils and µm.

The link to the app note we used for this formula: MT-094

Same as above, in MILs

Transistor symbol references

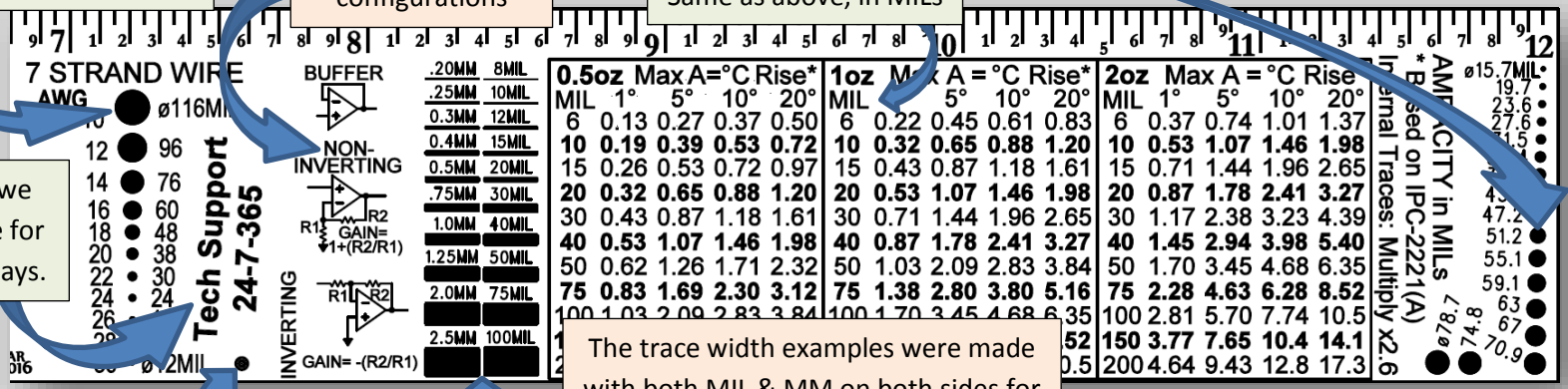
Many customers use these services daily, however others have no idea we could help them with these services. Some not listed are custom: fan connections, heatsinks, transformers, power supplies, die-cutting of adhesives & thermal interface materials.

A bit of geek humor. *

The hole examples on the MIL side were made without annular rings for contrast.

Common op-amp configurations

Same as above, in MILs



Again, we are here for you, always.

Fiducial with copper vs silk

The trace width examples were made with both MIL & MM on both sides for ease of comparison between the two.

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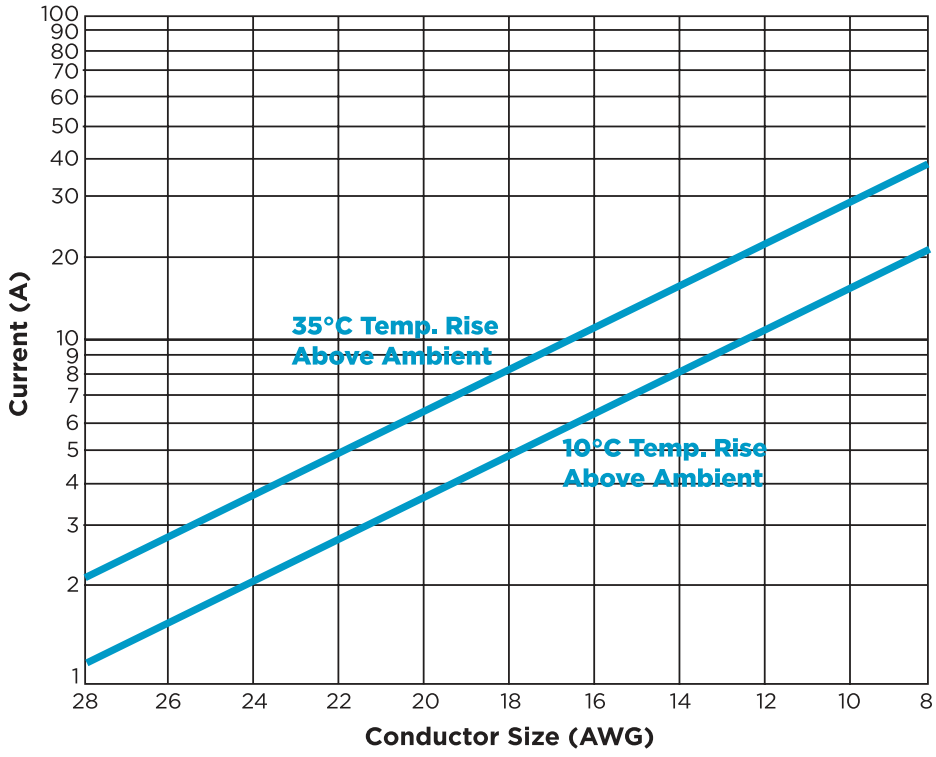
Current Ratings for Alpha Cables

The maximum continuous current rating for a cable is limited by conductor size, number of conductors contained within the cable, maximum temperature rating of the cable, and environmental conditions such as ambient temperature and air flow. To use the current capacity chart, first determine conductor size, temperature rating, and number of conductors from the applicable product description for the cable of interest.

Next, find the current value on the chart for the proper temperature rating and conductor size. To calculate the maximum current rating/conductor, multiply the chart value by the appropriate conductor factor.

The chart assumes cable is surrounded by still air at an ambient temperature of 25°C. Current values are in RMS amperes and are valid for copper conductors only. For conditions other than specified, contact Alpha Technical Support at 1-800-52-ALPHA.

Note: Current ratings are intended as general guidelines for low-power electronic communications and control applications. Current ratings for power applications generally are set by regulatory agencies such as UL, CSA, NEC, and others.



Current Ratings	
No. of Conductors*	**Factor**
1	1.6
2 to 3	1.0
4 to 5	0.8
6 to 15	0.7
16 to 30	0.5

*Do not count shields unless used as conductor.

AWG/Metric Conductor Table

		Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
AWG	Stranding	Inch	mm	CMA	mm²	Lb/ 1000 ft	kg/km	Ohms/ 1000 ft	Ohms/ km	Ohms/ 1000 ft	Ohms/ km
38	Solid	0.0040	0.102	16.0	0.008	0.048	0.071	648	2126	696	2283
38	7/46	0.0047	0.119	17.2	0.009	0.053	0.079	614	2014	659	2162
36	Solid	0.0050	0.127	25.0	0.013	0.076	0.113	415	1362	445	1460
36	7/44	0.0060	0.152	28.0	0.014	0.086	0.128	378	1240	406	1332
34	Solid	0.0063	0.160	39.7	0.020	0.120	0.179	261	856	280	919
34	7/42	0.0075	0.191	43.8	0.022	0.135	0.201	242	794	260	853
32	Solid	0.0080	0.203	64.0	0.032	0.194	0.289	162	531	174	571
32	7/40	0.0093	0.236	67.3	0.034	0.208	0.310	157	515	169	554
32	19/44	0.0100	0.254	76.0	0.039	0.235	0.350	139	456	149	489
30	Solid	0.0100	0.254	100	0.051	0.303	0.451	104	341	111	364
30	7/38	0.0120	0.305	112	0.057	0.346	0.515	94.5	310	101	331
30	19/42	0.0125	0.318	119	0.060	0.367	0.546	89.1	292	95.6	314
28	Solid	0.0126	0.320	159	0.081	0.481	0.716	65.2	214	69.3	227
28	7/36	0.0150	0.381	175	0.089	0.540	0.804	60.4	198	64.9	213
28	19/40	0.0155	0.394	183	0.093	0.564	0.839	57.9	190	62.2	204
27	7/35	0.017	0.432	220	0.111	0.679	1.01	48.1	158	51.7	170
26	Solid	0.0159	0.404	253	0.128	0.766	1.14	41.0	135	43.5	143
26	7/34	0.019	0.483	278	0.141	0.858	1.28	38.1	125	40.9	134
26	10/36	0.019	0.483	250	0.127	0.772	1.15	42.3	139	45.4	149
26	19/38	0.020	0.508	304	0.154	0.939	1.40	34.8	114	37.4	123
25	7/.0067	0.020	0.508	314	0.159	0.970	1.44	33.7	111	36.1	118
25	7/33	0.021	0.533	353	0.179	1.09	1.62	30.0	98.4	32.2	106
25	40/40	0.023	0.584	384	0.195	1.19	1.77	27.5	90.2	29.5	96.8
24	Solid	0.0201	0.511	404	0.205	1.22	1.82	25.7	84.3	26.7	87.6
24	7/32	0.024	0.610	448	0.227	1.38	2.05	23.6	77.4	25.3	83.0
24	10/34	0.023	0.584	397	0.201	1.23	1.83	26.6	87.3	28.6	93.8
24	19/36	0.025	0.635	475	0.241	1.47	2.19	22.3	73.2	23.9	78.4
22	Solid	0.0253	0.643	640	0.324	1.94	2.89	16.2	53.1	16.9	55.4
22	7/.0096	0.029	0.737	645	0.327	1.99	2.96	16.4	53.8	17.6	57.7
22	7/30	0.030	0.762	700	0.355	2.16	3.21	15.1	49.5	16.2	53.1
22	16/34	0.030	0.762	635	0.322	1.96	2.92	16.7	54.8	17.9	58.7
22	19/34	0.0315	0.800	754	0.382	2.33	3.47	14.0	45.9	15.1	49.5
20	Solid	0.032	0.813	1024	0.519	3.10	4.61	10.1	33.1	10.5	34.4
20	7/.0121	0.036	0.914	1022	0.518	3.16	4.70	10.4	34.1	11.0	36.1
20	7/28	0.038	0.965	1113	0.564	3.44	5.12	9.5	31.2	10.1	33.1
20	10/30	0.037	0.940	1000	0.507	3.09	4.60	10.6	34.8	11.4	37.4
20	19/32	0.040	1.016	1216	0.616	3.75	5.58	8.7	28.5	9.3	30.6
20	26/34	0.038	0.965	1032	0.523	3.19	4.75	10.2	33.5	11.0	36.1
20	41/36	0.037	0.940	1025	0.519	3.16	4.70	10.3	33.8	11.1	36.4
20	63(7x9)/38	0.040	1.016	1008	0.511	3.17	4.72	10.7	35.1	11.5	37.7

*Nominal resistance at 20˚C.

AWG/Metric Conductor Table

		Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
AWG	Stranding	Inch	mm	CMA	mm²	Lb/ 1000 ft	kg/km	Ohms/ 1000 ft	Ohms/ km	Ohms/ 1000 ft	Ohms/ km
18	Solid	0.040	1.016	1624	0.823	4.92	7.32	6.39	21.0	6.64	21.8
18	7/.0152	0.046	1.168	1617	0.819	4.99	7.43	6.54	21.5	6.95	22.8
18	7/26	0.048	1.219	1771	0.897	5.47	8.14	5.97	19.6	6.34	20.8
18	16/30	0.047	1.194	1600	0.811	4.94	7.35	6.61	21.7	7.10	23.3
18	19/30	0.050	1.270	1900	0.963	5.87	8.74	5.57	18.3	5.98	19.6
18	41/34	0.047	1.194	1628	0.825	5.03	7.49	6.50	21.3	6.98	22.9
18	65/36	0.047	1.194	1625	0.823	5.02	7.47	6.51	21.4	6.99	22.9
18	105(7x15)/38	0.052	1.321	1680	0.851	5.29	7.87	6.42	21.1	6.89	22.6
16	Solid	0.051	1.295	2581	1.31	7.81	11.62	4.02	13.2	4.18	13.7
16	7/.0192	0.058	1.473	2583	1.31	7.98	11.88	4.10	13.5	4.35	14.3
16	7/24	0.060	1.524	2828	1.43	8.73	12.99	3.74	12.3	3.89	12.8
16	19/.0117	0.059	1.499	2603	1.32	8.04	11.96	4.06	13.3	4.32	14.2
16	19/29	0.057	1.448	2432	1.23	7.51	11.18	4.35	14.3	4.62	15.2
16	26/30	0.060	1.524	2600	1.32	8.03	11.95	4.07	13.4	4.37	14.3
16	65/34	0.059	1.499	2580	1.31	7.97	11.86	4.10	13.5	4.40	14.4
16	168(7x24)/38	0.067	1.702	2688	1.36	8.46	12.59	4.01	13.2	4.31	14.1
14	Solid	0.064	1.626	4109	2.08	12.4	18.45	2.52	8.27	2.62	8.60
14	7/22	0.076	1.930	4480	2.27	13.8	20.53	2.36	7.74	2.46	8.07
14	7/.0242	0.073	1.854	4102	2.08	12.7	18.90	2.58	8.46	2.68	8.79
14	19/.0147	0.074	1.880	4104	2.08	12.7	18.90	2.58	8.46	2.74	8.99
14	19/27	0.071	1.803	3838	1.94	11.8	17.56	2.76	9.06	2.93	9.61
14	41/30	0.074	1.880	4100	2.08	12.7	18.90	2.58	8.46	2.77	9.09
14	105/34	0.075	1.905	4168	2.11	12.9	19.20	2.54	8.33	2.72	8.92
14	266(7x38)/38	0.080	2.032	4256	2.16	13.4	19.94	2.53	8.30	2.72	8.92
12	Solid	0.081	2.057	6529	3.31	19.8	29.47	1.59	5.22	1.65	5.41
12	7/20	0.096	2.438	7168	3.63	22.1	32.88	1.48	4.85	1.53	5.02
12	7/.0305	0.092	2.337	6510	3.30	20.1	29.91	1.62	5.31	1.69	5.54
12	19/.0185	0.093	2.362	6498	3.29	20.1	29.91	1.63	5.35	1.73	5.68
12	19/25	0.090	2.286	6080	3.08	18.8	27.98	1.74	5.71	1.85	6.07
12	65/30	0.093	2.362	6500	3.29	20.1	29.91	1.63	5.35	1.75	5.74
12	168(7x24)/34	0.106	2.692	6670	3.38	21.0	31.25	1.62	5.31	1.74	5.71
12	413(7x59)/38	0.106	2.692	6608	3.35	20.8	30.95	1.63	5.35	1.75	5.74
10	Solid	0.102	2.591	10384	5.26	31.4	46.73	0.999	3.28	1.04	3.41
10	7/.0385	0.116	2.946	10374	5.26	32.0	47.62	1.02	3.35	1.06	3.48
10	19/.0234	0.117	2.972	10412	5.28	32.1	47.77	1.02	3.35	1.06	3.48
10	19/23	0.113	2.870	9709	4.92	30.0	44.64	1.09	3.58	1.13	3.71
10	37/.0167	0.117	2.972	10323	5.23	31.9	47.47	1.02	3.35	1.09	3.58
10	37/26	0.111	2.819	9361	4.74	28.9	43.01	1.13	3.71	1.20	3.94
10	105/30	0.118	2.997	10500	5.32	32.4	48.22	1.01	3.31	1.08	3.54
10	658(7x94)/38	0.132	3.353	10528	5.33	33.1	49.26	1.02	3.35	1.10	3.61

*Nominal resistance at 20˚C.

AWG/Metric Conductor Table

		Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
AWG	Stranding	Inch	mm	CMA	mm²	Lb/ 1000 ft	kg/km	Ohms/ 1000 ft	Ohms/ km	Ohms/ 1000 ft	Ohms/ km
8	Solid	0.129	3.277	16512	8.37	50.0	74.41	0.628	2.06	0.646	2.12
8	19/.0295	0.148	3.759	16530	8.38	51.0	75.90	0.640	2.10	0.665	2.18
8	19/21	0.143	3.632	15428	7.82	47.6	70.84	0.686	2.25	0.713	2.34
8	49(7x7)/.0184	0.166	4.216	16611	8.42	52.3	77.83	0.649	2.13	0.690	2.26
8	65/26	0.148	3.759	16445	8.33	50.8	75.60	0.643	2.11	0.683	2.24
8	133(7x19)/29	0.169	4.293	17024	8.63	53.6	79.77	0.634	2.08	0.673	2.21
8	168(7x24)/30	0.167	4.242	16800	8.51	52.9	78.72	0.642	2.11	0.689	2.26
8	266(7x38)/32	0.166	4.216	17024	8.63	53.6	79.77	0.634	2.08	0.680	2.23
6	19/.0372	0.186	4.724	26296	13.3	81.2	120.84	0.402	1.32	0.418	1.37
6	19/19	0.180	4.572	24491	12.4	75.6	112.51	0.432	1.42	0.449	1.47
6	37/23	0.158	4.013	18907	9.58	58.4	86.91	0.559	1.83	0.582	1.91
6	49(7x7)/.0231	0.208	5.283	26166	13.3	81.6	121.43	0.408	1.34	0.425	1.39
6	105/26	0.188	4.775	26565	13.5	82.0	122.03	0.398	1.31	0.423	1.39
6	133(7x19)/27	0.213	5.410	26866	13.6	84.6	125.90	0.401	1.32	0.426	1.40
6	266(7x38)/30	0.210	5.334	26600	13.5	83.7	124.56	0.405	1.33	0.435	1.43
6	413(7x59)/32	0.212	5.385	26432	13.4	83.2	123.82	0.408	1.34	0.438	1.44
4	19/.0469	0.235	5.969	41800	21.2	129	191.97	0.253	0.830	0.263	0.863
4	49(7x7)/.0292	0.263	6.680	41797	21.2	130	193.46	0.256	0.840	0.266	0.873
4	133(7x19)/25	0.269	6.833	42560	21.6	134	199.41	0.253	0.830	0.269	0.883
4	168(7x24)/26	0.266	6.756	42504	21.5	134	199.41	0.254	0.833	0.270	0.886
4	413(7x59)//30	0.265	6.731	41300	20.9	130	193.46	0.261	0.856	0.280	0.919
4	420(7x60)/30	0.268	6.807	42000	21.3	132	196.44	0.257	0.843	0.276	0.906
4	665(19x35)/32	0.270	6.858	42560	21.6	134	199.41	0.253	0.830	0.272	0.892
2	19/.0591	0.296	7.518	66367	33.6	205	305.07	0.159	0.522	0.166	0.545
2	133(7x19)/23	0.339	8.611	67963	34.4	214	318.47	0.159	0.522	0.165	0.541
2	259(7x37)/26	0.334	8.484	65527	33.2	207	308.05	0.165	0.541	0.176	0.577
2	266(7x38)/26	0.334	8.484	67298	34.1	212	315.49	0.160	0.525	0.170	0.558
2	665 (7x95)/30	0.336	8.534	66500	33.7	209	311.03	0.162	0.531	0.174	0.571
2	665(19x35)/30	0.338	8.585	66500	33.7	209	311.03	0.162	0.531	0.174	0.571
2	1045(19x55)/32	0.342	8.687	66880	33.9	213	316.98	0.163	0.535	0.175	0.574
1	19/.0664	0.332	8.433	83771	42.4	259	385.43	0.126	0.413	0.131	0.430
1	133(7x19)/22	0.380	9.652	85120	43.1	268	398.83	0.127	0.417	0.132	0.433
1	259(7x37)/25	0.376	9.550	82880	42.0	262	389.90	0.131	0.430	0.139	0.456
1	836(19x44)/30	0.383	9.728	83600	42.4	266	395.85	0.130	0.427	0.140	0.459
1/0	19/.0745	0.373	9.474	105450	53.4	326	485.14	0.100	0.328	0.104	0.341
1/0	133(7x19)/21	0.428	10.871	107996	54.7	340	505.98	0.100	0.328	0.104	0.341
1/0	259(7x37)/24	0.422	10.719	104636	53.0	331	492.58	0.104	0.341	0.108	0.354
1/0	1045(19x55)/30	0.428	10.871	104500	53.0	332	494.07	0.104	0.341	0.112	0.367
1/0	1064(19x56)/30	0.430	10.922	106400	53.9	338	503.00	0.102	0.335	0.110	0.361
2/0	19/.0837	0.419	10.643	133114	67.4	411	611.64	0.079	0.259	0.083	0.272
2/0	133(7x19)/20	0.480	12.192	136192	69.0	429	638.42	0.079	0.259	0.082	0.269
2/0	259(7x37)23	0.474	12.040	132349	67.1	419	623.54	0.082	0.269	0.085	0.279
2/0	1323(7x7x27)/30	0.539	13.691	132300	67.0	424	630.98	0.083	0.272	0.089	0.292
2/0	1330(19x70)/30	0.483	12.268	133000	67.4	427	635.45	0.083	0.272	0.089	0.292

*Nominal resistance at 20˚C.

AWG/Metric Conductor Table

		Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
AWG	Stranding	Inch	mm	CMA	mm²	Lb/ 1000 ft	kg/km	Ohms/ 1000 ft	Ohms/ km	Ohms/ 1000 ft	Ohms/ km
3/0	19/.0940	0.470	11.938	167884	85.1	518	770.87	0.063	0.207	0.066	0.217
3/0	133(7x19)/19	0.538	13.665	171437	86.9	540	803.61	0.063	0.207	0.065	0.213
3/0	259(7x37)/22	0.530	13.462	165760	84.0	524	779.80	0.065	0.213	0.068	0.223
3/0	1666(7x7x34)30	0.604	15.342	166600	84.4	535	796.17	0.066	0.217	0.071	0.233
3/0	1672(19x88)/30	0.540	13.716	167200	84.7	536	797.66	0.066	0.217	0.071	0.233
4/0	19/.1055	0.528	13.411	211470	107	653	971.77	0.050	0.164	0.051	0.167
4/0	133(7x19)/18	0.604	15.342	215992	109	680	1011.95	0.050	0.164	0.052	0.171
4/0	259(7x37)/21	0.598	15.189	210308	107	665	989.63	0.052	0.171	0.054	0.177
4/0	2107(7x7x43)/30	0.681	17.297	210700	107	676	1006.00	0.052	0.171	0.056	0.184
4/0	2109 (37x57)/30	0.590	14.986	210900	107	677	1007.49	0.052	0.171	0.056	0.184

*Nominal resistance at 20˚C.

AWG/Metric Comparison

Stranded Conductors

Cond. Diameter (mm²)	Stranding x Strand Dia. (mm)	Corresponding AWG
0.014	7 x 0.05	–
0.035	7 x 0.08	32
0.047	24 x 0.05	–
0.049	1 x 0.25	30
0.055	7 x 0.10	30
0.079	10 x 0.10	–
0.079	7 x 0.12	–
0.080	1 x 0.32	28
0.093	7 x 0.13	28
0.094	12 x 0.10	–
0.094	48 x 0.05	–
0.096	19 x 0.08	28
0.113	10 x 0.12	–
0.118	60 x 0.05	–
0.118	15 x 0.10	–
0.124	7 x 0.15	26
0.126	1 x 0.40	26
0.149	19 x 0.10	26
0.177	10 x 0.15	24
0.188	24 x 0.10	–
0.196	1 x 0.50	24
0.212	27 x 0.10	–
0.212	12 x 0.15	–
0.220	7 x 0.20	24
0.251	32 x 0.10	–
0.252	19 x 0.13	24
0.283	1 x 0.60	–
0.291	37 x 0.10	–
0.314	40 x 0.10	–
0.322	1 x 0.64	22
0.336	19 x 0.15	22
0.344	7 x 0.25	22
0.377	12 x 0.20	–
0.377	48 x 0.10	–
0.389	22 x 0.15	–
0.442	1 x 0.75	–
0.459	26 x 0.15	20
0.491	10 x 0.25	20
0.495	7 x 0.30	–
0.503	16 x 0.20	–
0.515	1 x 0.81	20
0.563	7 x 0.32	20
0.597	19 x 0.20	20
0.636	36 x 0.15	–
0.754	24 x 0.20	–
0.785	16 x 0.25	18
0.817	1 x 1.02	18
0.848	12 x 0.30	–
0.880	7 x 0.40	18
0.933	19 x 0.25	18
0.990	56 x 0.15	–
1.005	32 x 0.20	–
1.276	26 x 0.25	16
1.327	1 x 1.30	16
1.343	19 x 0.30	16
1.374	7 x 0.50	16
1.473	30 x 0.25	–
1.508	12 x 0.40	–
1.828	19 x 0.35	14
1.885	60 x 0.20	–
1.909	27 x 0.030	–
1.979	7 x 0.60	–
2.011	16 x 0.40	–
2.013	41 x 0.25	14
2.087	1 x 1.63	14
2.454	50 x 0.25	14
3.022	19 x 0.45	12
3.142	16 x 0.50	–
3.181	45 x 0.30	–
3.191	65 x 0.25	12
3.393	48 x 0.30	–
3.958	56 x 0.30	–
4.650	37 x 0.40	–
4.714	7 x 7 x 0.35	–
5.154	105 x 0.25	–
5.160	73 x 0.30	10
5.300	75 x 0.30	10

Properties of Common Insulation and Jacket Materials

Plastics									
Property	**Low-Density PE**	**High-Density PE**	**Cellular PE**	**Nylon**	**PP**	**Cellular PP**	**PVC**	**Plenum PVC**	**PUR**
Abrasion Resistance	G	E	F	E	F–G	F–G	F–G	F–G	O
Acid Resistance	G–E	E	G–E	P–F	E	E	G–E	G	F
Alcohol Resistance	E	E	E	P	E	E	P–F	G	P–G
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene, etc.)	G–E	G–E	G	G	P–F	P	P	P	P–G
Alkali Resistance	G–E	E	G–E	E	E	E	G–E	G	F
Aromatic Hydrocarbons Resistance (Benzol, Toluol, etc.)	P	P	P	G	P–F	P	P–F	P–F	P–G
Electrical Properties	E	E	E	P	E	E	F–G	G	P
Flame Resistance	P	P	P	P	P	P	E	E	P
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	G	G	G	G	P	P	P–F	P–F	P–G
Heat Resistance	G	E	G	E	E	E	G–E	G–E	G
Low-Temperature Flexibility	E	E	E	G	P	P	P–G	P–G	G
Nuclear Radiation Resistance	G–E	G–E	G	F–G	F	F	F	F	G
Oil Resistance	G–E	G–E	G	E	F	F	F	F	E
Oxidation Resistance	E	E	E	E	E	E	E	E	E
Ozone Resistance	E	E	E	E	E	E	E	E	E
Underground Burial	G	E	N/A	P	N/A	N/A	P–G	P	G
Water Resistance	E	E	E	P–F	E	E	F–G	F	P–G
Weather, Sun Resistance	E	E	E	E	E	E	G–E	G	G

Ratings based on average performance of general-purpose compounds. Specific properties can usually be improved by selective compounding.

P Poor
F Fair
G Good
E Excellent
O Outstanding

Fluoropolymers						
Property	**FEP**	**PTFE**	**ETFE**	**ECTFE**	**PVDF**	**TPE**
Abrasion Resistance	E	O	E	E	E	F–G
Acid Resistance	E	E	E	E	G–E	G
Alcohol Resistance	E	E	E	E	E	G
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene, etc.)	E	E	E	E	E	P
Alkali Resistance	E	E	E	E	E	G–E
Aromatic Hydrocarbons Resistance (Benzol, Toluol, etc.)	E	E	E	E	G–E	P
Electrical Properties	E	E	E	E	G–E	E
Flame Resistance	O	E	G	E–O	E	F–G
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	E	E	E	E	G	
Heat Resistance	O	O	E	O	O	E
Low-Temperature Flexibility	O	O	E	O	F	E
Nuclear Radiation Resistance	P–G	P	E	E	E	G
Oil Resistance	O	E–O	E	O	E	G
Oxidation Resistance	O	O	E	O	O	E
Ozone Resistance	E	O	E	E	E	E
Underground Burial	E	E	E	E	E	P
Water Resistance	E	E	E	E	E	G–E
Weather, Sun Resistance	O	O	E	O	E–O	E

Ratings based on average performance of general-purpose compounds. Specific properties can usually be improved by selective compounding.

P Poor
F Fair
G Good
E Excellent
O Outstanding

Properties of Common Insulation and Jacket Materials

Rubber				
Property	**Rubber**	**Neoprene**	**EPDM**	**Silicone**
Abrasion Resistance	E	G–E	G	P
Acid Resistance	F–G	G	G–E	F–G
Alcohol Resistance	G	F	P	G
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene, etc.)	P	G	P	P–F
Alkali Resistance	F–G	G	G–E	F–G
Aromatic Hydrocarbons Resistance (Benzol, Toluol, etc.)	P	P-F	F	P
Electrical Properties	G	P	E	G
Flame Resistance	P	G	P	F–G
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	P	P	P	P–G
Heat Resistance	F	G	E	O
Low-Temperature Flexibility	G	F–G	G- E	O
Nuclear Radiation Resistance	F	F–G	G	E
Oil Resistance	P	G	P	F–G
Oxidation Resistance	F	G	E	E
Ozone Resistance	P	G	E	O
Water Resistance	G	E	G–E	G-E
Weather, Sun Resistance	F	G	E	O

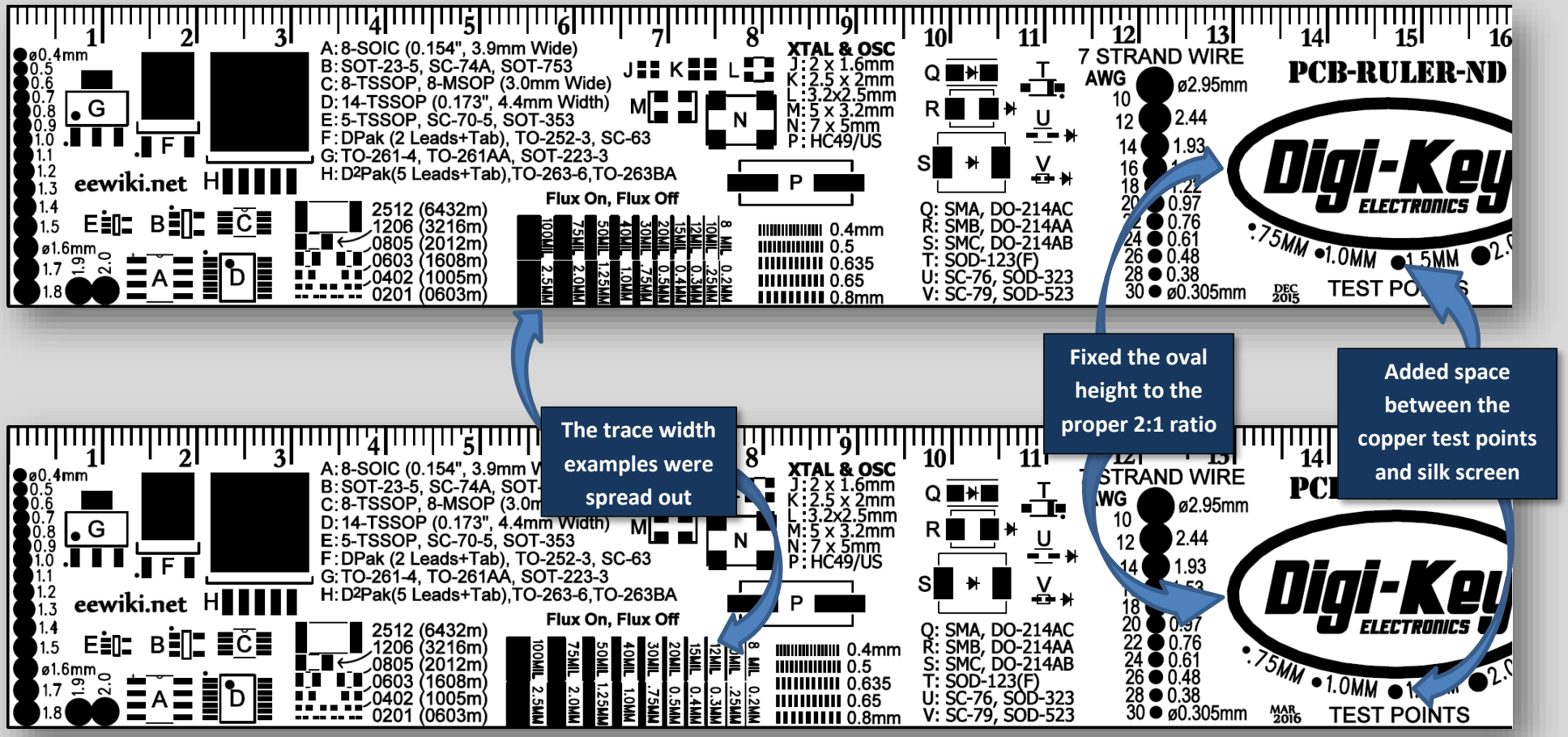
Ratings based on average performance of general-purpose compounds. Specific properties can usually be improved by selective compounding.

P Poor
F Fair
G Good
E Excellent
O Outstanding

Temperature Ranges of Insulation and Jacket Materials				
Material	**Normal Low**	**Normal High**	**Special Low**	**Special High**
ECTFE	-70°C	150°C	—	—
EPDM	-55°C	105°C	—	150°C
ETFE	-65°C	150°C	—	—
FEP	-70°C	200°C	—	—
Neoprene	-20°C	60°C	-55°C	90°C
PE	-60°C	80°C	—	—
Plenum PVC	-20°C	75°C	—	—
PP	-40°C	105°C	—	—
PTFE	-70°C	260°C	—	—
PVC	-20°C	80°C	-55°C	105°C
PVDF	-20°C	125°C	-40°C	150°/150°C
Rubber	-30°C	60°C	-55°C	75°C
Silicone	-80°C	150°C	—	200°C
TPE	-40°C	105°C	-50°C	125°C

Changes from Rev 0 (labeled DEC 2015) to Rev 1 (MAR 2016)

Metric Side, Left



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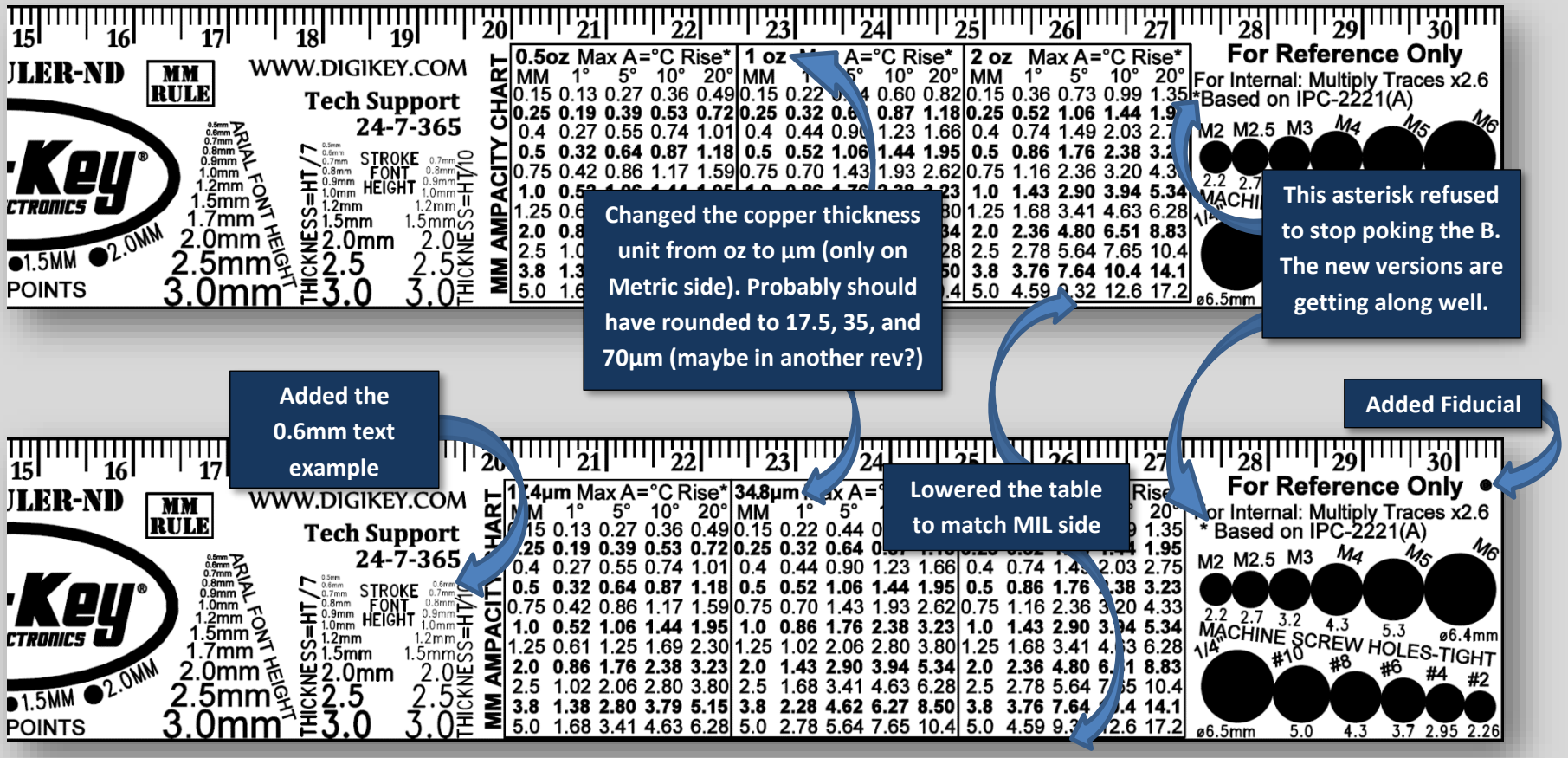
Changes from Rev 0 (labeled DEC 2015) to Rev 1 (MAR 2016)

Metric Side, Right



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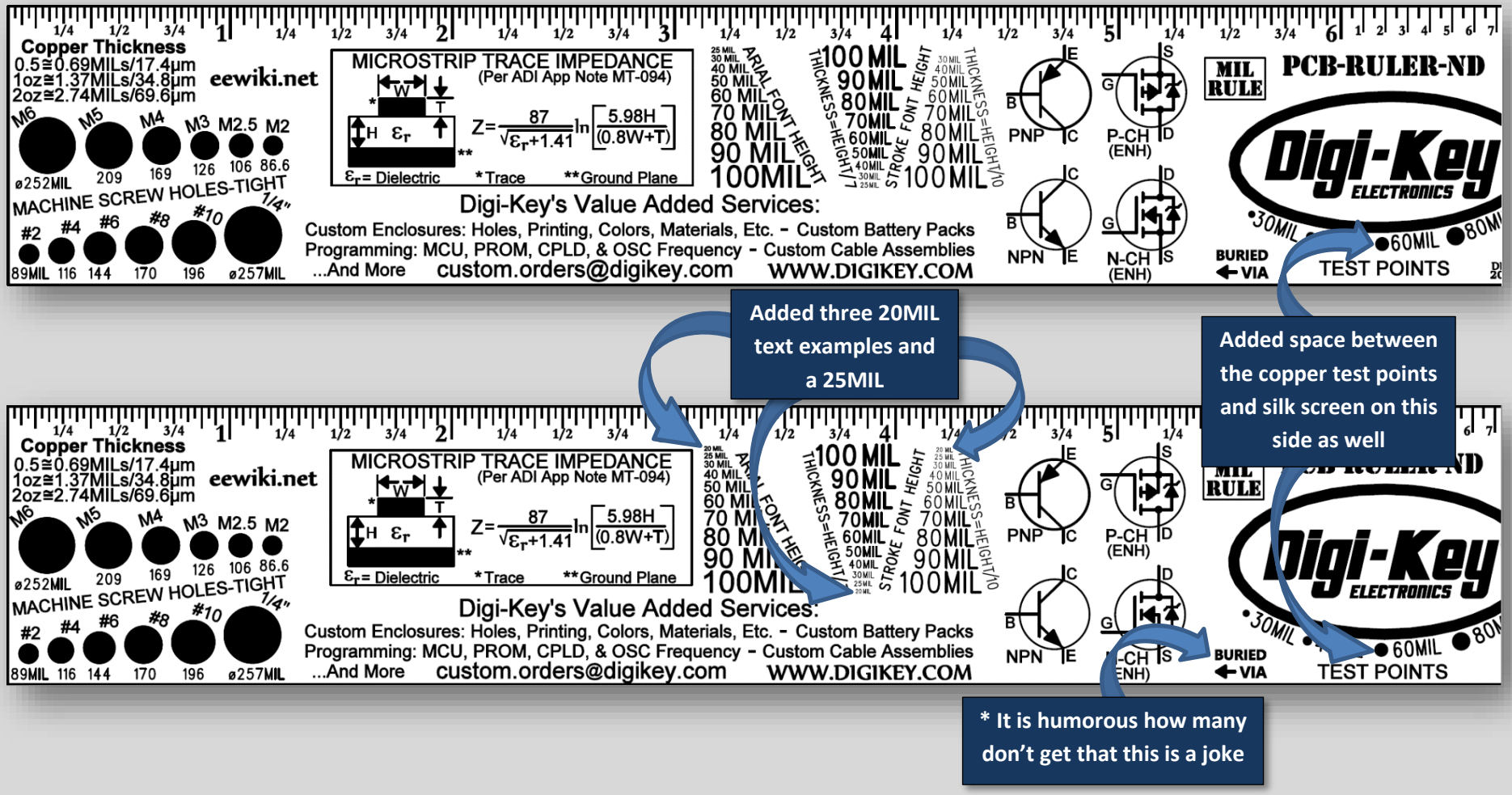
Changes from Rev 0 (labeled DEC 2015) to Rev 1 (MAR 2016)

MIL Side, Left



Added three 20MIL text examples and a 25MIL

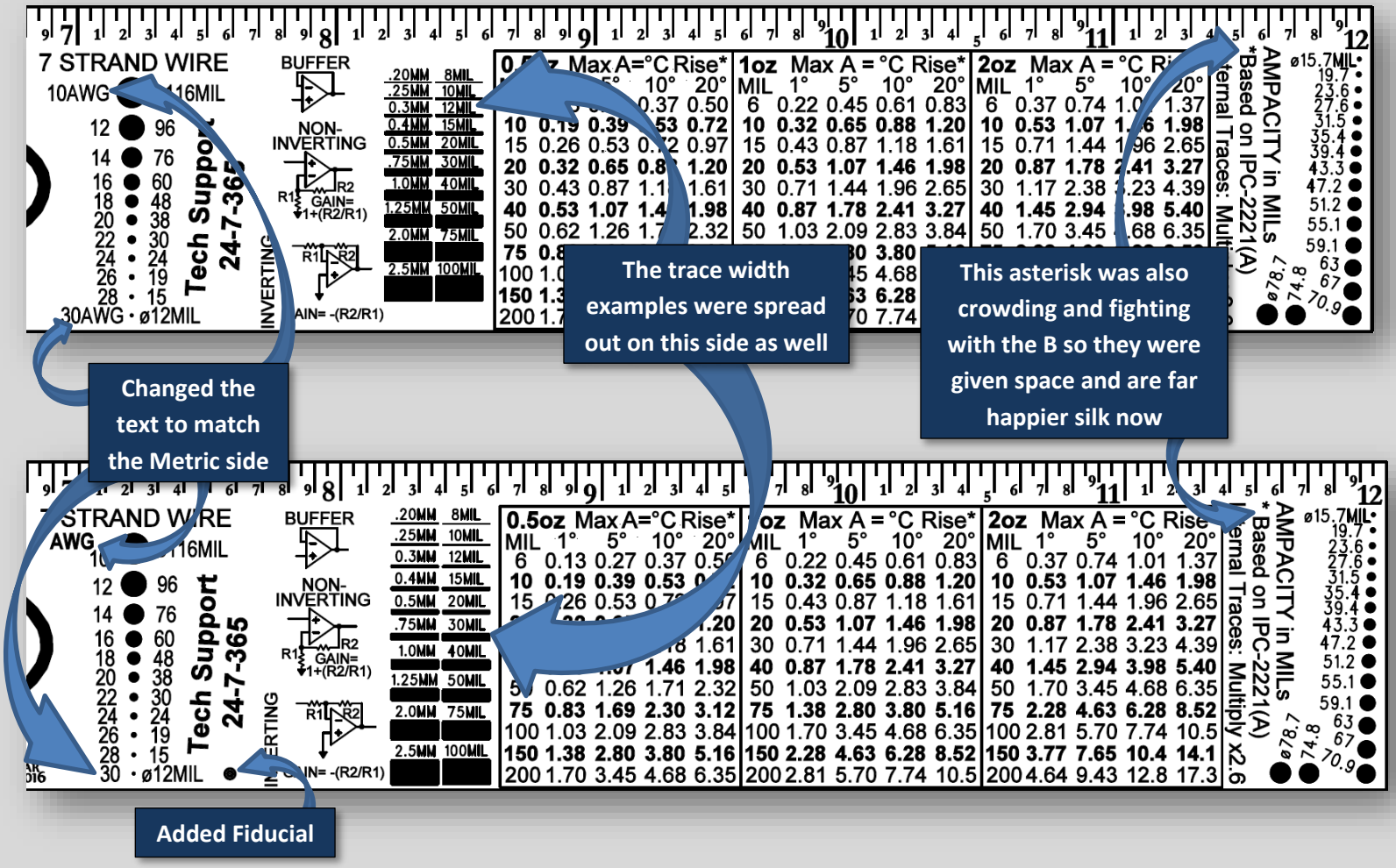
Added space between the copper test points and silk screen on this side as well

* It is humorous how many don't get that this is a joke

Doc Rev 9-MAR-2017

Changes from Rev 0 (labeled DEC 2015) to Rev 1 (MAR 2016)

MIL Side, Right



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