

Resistor

List of Nominal Resistance Values

The nominal resistance values of ROHM's resistors are determined (with some exceptions) based on the number series referred to as the E series, which is an international standard established by the International Electrotechnical Commission (IEC). Marking codes of resistor values also comply with an IEC standard. This application note provides a list of nominal resistance values and an overview of the standards.

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1. List of nominal resistance values: 0.1 mΩ to 10 mΩ

Main resistors: Ultra-low ohmic type shunt resistors

Resistance [Ω]	IEC Code	
	3 digits	4 digits
	J	F, G
0.1 m	L10	0L10
0.2 m	L20	0L20
0.27 m	L27	0L27
0.3 m	L30	0L30
0.4 m	L40	0L40
0.5 m	L50	0L50
1 m	1L0	1L00
2 m	2L0	2L00
2.2 m	2L2	2L20
2.5 m	2L5	2L50
3 m	3L0	3L00
4 m	4L0	4L00
5 m	5L0	5L00
6 m	6L0	6L00
7 m	7L0	7L00
8 m	8L0	8L00
9 m	9L0	9L00
10 m	10L	10L0

- Not comply with the E series. Ultra-low ohmic resistors such as shunt resistors are often used in applications for current detection. Therefore, integral multiples may be employed as the resistor values for the sake of convenience.
- Tolerance F: $\pm 1\%$, G: $\pm 2\%$, J: $\pm 5\%$

Product lineup

Chip resistors (shunt resistors) for current detection: [website](#)

- High power ultra-low ohmic PSR series: [website](#)
- Wide terminal PML series: [website](#)
- Ultra-low ohmic PMR series: [website](#)

2. List of nominal resistance values: 10 mΩ to 1Ω

Resistance [Ω]			IEC Code		ROHM Code
E6	E12	E24	3 digits	4 digits	4 digits
			J	D, F	D, F, J
10 m	10 m	10 m	10L	10L0	
		11 m	11L	11L0	R011
	12 m	12 m	12L	12L0	R012
		13 m	13L	13L0	R013
15 m	15 m	15 m	15L	15L0	R015
		16 m	16L	16L0	R016
	18 m	18 m	18L	18L0	R018
		20 m	20L	20L0	R020
22 m	22 m	22 m	22L	22L0	R022
		24 m	24L	24L0	R024
	27 m	27 m	27L	27L0	R027
		30 m	30L	30L0	R030
33 m	33 m	33 m	33L	33L0	R033
		36 m	36L	36L0	R036
	39 m	39 m	39L	39L0	R039
		43 m	43L	43L0	R043
47 m	47 m	47 m	47L	47L0	R047
		51 m	51L	51L0	R051
	56 m	56 m	56L	56L0	R056
		62 m	62L	62L0	R062
68 m	68 m	68 m	68L	68L0	R068
		75 m	75L	75L0	R075
	82 m	82 m	82L	82L0	R082
		91 m	91L	91L0	R091
0.1	0.1	0.1	R10	R100	
		0.11	R11	R110	
	0.12	0.12	R12	R120	
		0.13	R13	R130	
0.15	0.15	0.15	R15	R150	
		0.16	R16	R160	
	0.18	0.18	R18	R180	
		0.2	R20	R200	
0.22	0.22	0.22	R22	R220	
		0.24	R24	R240	
	0.27	0.27	R27	R270	
		0.3	R30	R300	
0.33	0.33	0.33	R33	R330	
		0.36	R36	R360	
	0.39	0.39	R39	R390	
		0.43	R43	R430	
0.47	0.47	0.47	R47	R470	
		0.51	R51	R510	
	0.56	0.56	R56	R560	
		0.62	R62	R620	
0.68	0.68	0.68	R68	R680	
		0.75	R75	R750	
	0.82	0.82	R82	R820	
		0.91	R91	R910	
1	1	1	1R0	1R00	

- The ROHM code is used for some products. Refer to the data sheet for more details.

- Tolerance D: ±0.5%, F: ±1%, J: ±5%

3. List of nominal resistance values: 1Ω to 10 MΩ (E6, E12, and E24 series)

Resistance [Ω]			IEC Code	
E6	E12	E24	3 digits J	4 digits D, F
1	1	1	1R0	1R00
		1.1	1R1	1R10
	1.2	1.2	1R2	1R20
		1.3	1R3	1R30
1.5	1.5	1.5	1R5	1R50
		1.6	1R6	1R60
	1.8	1.8	1R8	1R80
		2	2R0	2R00
2.2	2.2	2.2	2R2	2R20
		2.4	2R4	2R40
	2.7	2.7	2R7	2R70
		3	3R0	3R00
3.3	3.3	3.3	3R3	3R30
		3.6	3R6	3R60
	3.9	3.9	3R9	3R90
		4.3	4R3	4R30
4.7	4.7	4.7	4R7	4R70
		5.1	5R1	5R10
	5.6	5.6	5R6	5R60
		6.2	6R2	6R20
6.8	6.8	6.8	6R8	6R80
		7.5	7R5	7R50
	8.2	8.2	8R2	8R20
		9.1	9R1	9R10
10	10	10	100	10R0
		11	110	11R0
	12	12	120	12R0
		13	130	13R0
15	15	15	150	15R0
		16	160	16R0
	18	18	180	18R0
		20	200	20R0
22	22	22	220	22R0
		24	240	24R0
	27	27	270	27R0
		30	300	30R0
33	33	33	330	33R0
		36	360	36R0
	39	39	390	39R0
		43	430	43R0
47	47	47	470	47R0
		51	510	51R0
	56	56	560	56R0
		62	620	62R0
68	68	68	680	68R0
		75	750	75R0
	82	82	820	82R0
		91	910	91R0
100	100	100	101	1000
		110	111	1100
	120	120	121	1200
		130	131	1300
150	150	150	151	1500
		160	161	1600
	180	180	181	1800
		200	201	2000

Resistance [Ω]			IEC Code	
E6	E12	E24	3 digits J	4 digits D, F
220	220	220	221	2200
		240	241	2400
	270	270	271	2700
		300	301	3000
330	330	330	331	3300
		360	361	3600
	390	390	391	3900
		430	431	4300
470	470	470	471	4700
		510	511	5100
	560	560	561	5600
		620	621	6200
680	680	680	681	6800
		750	751	7500
	820	820	821	8200
		910	911	9100
1 k	1 k	1 k	102	1001
		1.1 k	112	1101
	1.2 k	1.2 k	122	1201
		1.3 k	132	1301
1.5 k	1.5 k	1.5 k	152	1501
		1.6 k	162	1601
	1.8 k	1.8 k	182	1801
		2 k	202	2001
2.2 k	2.2 k	2.2 k	222	2201
		2.4 k	242	2401
	2.7 k	2.7 k	272	2701
		3 k	302	3001
3.3 k	3.3 k	3.3 k	332	3301
		3.6 k	362	3601
	3.9 k	3.9 k	392	3901
		4.3 k	432	4301
4.7 k	4.7 k	4.7 k	472	4701
		5.1 k	512	5101
	5.6 k	5.6 k	562	5601
		6.2 k	622	6201
6.8 k	6.8 k	6.8 k	682	6801
		7.5 k	752	7501
	8.2 k	8.2 k	822	8201
		9.1 k	912	9101
10 k	10 k	10 k	103	1002
		11 k	113	1102
	12 k	12 k	123	1202
		13 k	133	1302
15 k	15 k	15 k	153	1502
		16 k	163	1602
	18 k	18 k	183	1802
		20 k	203	2002
22 k	22 k	22 k	223	2202
		24 k	243	2402
	27 k	27 k	273	2702
		30 k	303	3002
33 k	33 k	33 k	333	3302
		36 k	363	3602
	39 k	39 k	393	3902
		43 k	433	4302

Resistance [Ω]			IEC Code	
E6	E12	E24	3 digits J	4 digits D, F
47 k	47 k	47 k	473	4702
		51 k	513	5102
	56 k	56 k	563	5602
		62 k	623	6202
68 k	68 k	68 k	683	6802
		75 k	753	7502
	82 k	82 k	823	8202
		91 k	913	9102
100 k	100 k	100 k	104	1003
		110 k	114	1103
	120 k	120 k	124	1203
		130 k	134	1303
150 k	150 k	150 k	154	1503
		160 k	164	1603
	180 k	180 k	184	1803
		200 k	204	2003
220 k	220 k	220 k	224	2203
		240 k	244	2403
	270 k	270 k	274	2703
		300 k	304	3003
330 k	330 k	330 k	334	3303
		360 k	364	3603
	390 k	390 k	394	3903
		430 k	434	4303
470 k	470 k	470 k	474	4703
		510 k	514	5103
	560 k	560 k	564	5603
		620 k	624	6203
680 k	680 k	680 k	684	6803
		750 k	754	7503
	820 k	820 k	824	8203
		910 k	914	9103
1 M	1 M	1 M	105	1004
		1.1 M	115	1104
	1.2 M	1.2 M	125	1204
		1.3 M	135	1304
1.5 M	1.5 M	1.5 M	155	1504
		1.6 M	165	1604
	1.8 M	1.8 M	185	1804
		2 M	205	2004
2.2 M	2.2 M	2.2 M	225	2204
		2.4 M	245	2404
	2.7 M	2.7 M	275	2704
		3 M	305	3004
3.3 M	3.3 M	3.3 M	335	3304
		3.6 M	365	3604
	3.9 M	3.9 M	395	3904
		4.3 M	435	4304
4.7 M	4.7 M	4.7 M	475	4704
		5.1 M	515	5104
	5.6 M	5.6 M	565	5604
		6.2 M	625	6204
6.8 M	6.8 M	6.8 M	685	6804
		7.5 M	755	7504
	8.2 M	8.2 M	825	8204
		9.1 M	915	9104
10 M	10 M	10 M	106	1005

- Tolerance D: ±0.5%, F: ±1%, J: ±5%

4. List of nominal resistance values: 1Ω to 10 MΩ (E96 series)

Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code
E96	4 digits D, F	E96	4 digits D, F	E96	4 digits D, F	E96	4 digits D, F
1	1R00	3.83	3R83	14.7	14R7	56.2	56R2
1.02	1R02	3.92	3R92	15	15R0	57.6	57R6
1.05	1R05	4.02	4R02	15.4	15R4	59	59R0
1.07	1R07	4.12	4R12	15.8	15R8	60.4	60R4
1.1	1R10	4.22	4R22	16.2	16R2	61.9	61R9
1.13	1R13	4.32	4R32	16.5	16R5	63.4	63R4
1.15	1R15	4.42	4R42	16.9	16R9	64.9	64R9
1.18	1R18	4.53	4R53	17.4	17R4	66.5	66R5
1.21	1R21	4.64	4R64	17.8	17R8	68.1	68R1
1.24	1R24	4.75	4R75	18.2	18R2	69.8	69R8
1.27	1R27	4.87	4R87	18.7	18R7	71.5	71R5
1.3	1R30	4.99	4R99	19.1	19R1	73.2	73R2
1.33	1R33	5.11	5R11	19.6	19R6	75	75R0
1.37	1R37	5.23	5R23	20	20R0	76.8	76R8
1.4	1R40	5.36	5R36	20.5	20R5	78.7	78R7
1.43	1R43	5.49	5R49	21	21R0	80.6	80R6
1.47	1R47	5.62	5R62	21.5	21R5	82.5	82R5
1.5	1R50	5.76	5R76	22.1	22R1	84.5	84R5
1.54	1R54	5.9	5R90	22.6	22R6	86.6	86R6
1.58	1R58	6.04	6R04	23.2	23R2	88.7	88R7
1.62	1R62	6.19	6R19	23.7	23R7	90.9	90R9
1.65	1R65	6.34	6R34	24.3	24R3	93.1	93R1
1.69	1R69	6.49	6R49	24.9	24R9	95.3	95R3
1.74	1R74	6.65	6R65	25.5	25R5	97.6	97R6
1.78	1R78	6.81	6R81	26.1	26R1	100	1000
1.82	1R82	6.98	6R98	26.7	26R7	102	1020
1.87	1R87	7.15	7R15	27.4	27R4	105	1050
1.91	1R91	7.32	7R32	28	28R0	107	1070
1.96	1R96	7.5	7R50	28.7	28R7	110	1100
2	2R00	7.68	7R68	29.4	29R4	113	1130
2.05	2R05	7.87	7R87	30.1	30R1	115	1150
2.1	2R10	8.06	8R06	30.9	30R9	118	1180
2.15	2R15	8.25	8R25	31.6	31R6	121	1210
2.21	2R21	8.45	8R45	32.4	32R4	124	1240
2.26	2R26	8.66	8R66	33.2	33R2	127	1270
2.32	2R32	8.87	8R87	34	34R0	130	1300
2.37	2R37	9.09	9R09	34.8	34R8	133	1330
2.43	2R43	9.31	9R31	35.7	35R7	137	1370
2.49	2R49	9.53	9R53	36.5	36R5	140	1400
2.55	2R55	9.76	9R76	37.4	37R4	143	1430
2.61	2R61	10	10R0	38.3	38R3	147	1470
2.67	2R67	10.2	10R2	39.2	39R2	150	1500
2.74	2R74	10.5	10R5	40.2	40R2	154	1540
2.8	2R80	10.7	10R7	41.2	41R2	158	1580
2.87	2R87	11	11R0	42.2	42R2	162	1620
2.94	2R94	11.3	11R3	43.2	43R2	165	1650
3.01	3R01	11.5	11R5	44.2	44R2	169	1690
3.09	3R09	11.8	11R8	45.3	45R3	174	1740
3.16	3R16	12.1	12R1	46.4	46R4	178	1780
3.24	3R24	12.4	12R4	47.5	47R5	182	1820
3.32	3R32	12.7	12R7	48.7	48R7	187	1870
3.4	3R40	13	13R0	49.9	49R9	191	1910
3.48	3R48	13.3	13R3	51.1	51R1	196	1960
3.57	3R57	13.7	13R7	52.3	52R3	200	2000
3.65	3R65	14	14R0	53.6	53R6	205	2050
3.74	3R74	14.3	14R3	54.9	54R9	210	2100

- Tolerance D: ±0.5%, F: ±1%, J: ±5%

4. List of nominal resistance values: 1Ω to 10 MΩ (E96 series), continued

Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code
E96	4 digits D, F	E96	4 digits D, F	E96	4 digits D, F	E96	4 digits D, F
215	2150	825	8250	3.16 k	3161	12.1 k	1212
221	2210	845	8450	3.24 k	3241	12.4 k	1242
226	2260	866	8660	3.32 k	3321	12.7 k	1272
232	2320	887	8870	3.4 k	3401	13 k	1302
237	2370	909	9090	3.48 k	3481	13.3 k	1332
243	2430	931	9310	3.57 k	3571	13.7 k	1372
249	2490	953	9530	3.65 k	3651	14 k	1402
255	2550	976	9760	3.74 k	3741	14.3 k	1432
261	2610	1 k	1001	3.83 k	3831	14.7 k	1472
267	2670	1.02 k	1021	3.92 k	3921	15 k	1502
274	2740	1.05 k	1051	4.02 k	4021	15.4 k	1542
280	2800	1.07 k	1071	4.12 k	4121	15.8 k	1582
287	2870	1.1 k	1101	4.22 k	4221	16.2 k	1622
294	2940	1.13 k	1131	4.32 k	4321	16.5 k	1652
301	3010	1.15 k	1151	4.42 k	4421	16.9 k	1692
309	3090	1.18 k	1181	4.53 k	4531	17.4 k	1742
316	3160	1.21 k	1211	4.64 k	4641	17.8 k	1782
324	3240	1.24 k	1241	4.75 k	4751	18.2 k	1822
332	3320	1.27 k	1271	4.87 k	4871	18.7 k	1872
340	3400	1.3 k	1301	4.99 k	4991	19.1 k	1912
348	3480	1.33 k	1331	5.11 k	5111	19.6 k	1962
357	3570	1.37 k	1371	5.23 k	5231	20 k	2002
365	3650	1.4 k	1401	5.36 k	5361	20.5 k	2052
374	3740	1.43 k	1431	5.49 k	5491	21 k	2102
383	3830	1.47 k	1471	5.62 k	5621	21.5 k	2152
392	3920	1.5 k	1501	5.76 k	5761	22.1 k	2212
402	4020	1.54 k	1541	5.9 k	5901	22.6 k	2262
412	4120	1.58 k	1581	6.04 k	6041	23.2 k	2322
422	4220	1.62 k	1621	6.19 k	6191	23.7 k	2372
432	4320	1.65 k	1651	6.34 k	6341	24.3 k	2432
442	4420	1.69 k	1691	6.49 k	6491	24.9 k	2492
453	4530	1.74 k	1741	6.65 k	6651	25.5 k	2552
464	4640	1.78 k	1781	6.81 k	6811	26.1 k	2612
475	4750	1.82 k	1821	6.98 k	6981	26.7 k	2672
487	4870	1.87 k	1871	7.15 k	7151	27.4 k	2742
499	4990	1.91 k	1911	7.32 k	7321	28 k	2802
511	5110	1.96 k	1961	7.5 k	7501	28.7 k	2872
523	5230	2 k	2001	7.68 k	7681	29.4 k	2942
536	5360	2.05 k	2051	7.87 k	7871	30.1 k	3012
549	5490	2.1 k	2101	8.06 k	8061	30.9 k	3092
562	5620	2.15 k	2151	8.25 k	8251	31.6 k	3162
576	5760	2.21 k	2211	8.45 k	8451	32.4 k	3242
590	5900	2.26 k	2261	8.66 k	8661	33.2 k	3322
604	6040	2.32 k	2321	8.87 k	8871	34 k	3402
619	6190	2.37 k	2371	9.09 k	9091	34.8 k	3482
634	6340	2.43 k	2431	9.31 k	9311	35.7 k	3572
649	6490	2.49 k	2491	9.53 k	9531	36.5 k	3652
665	6650	2.55 k	2551	9.76 k	9761	37.4 k	3742
681	6810	2.61 k	2611	10 k	1002	38.3 k	3832
698	6980	2.67 k	2671	10.2 k	1022	39.2 k	3922
715	7150	2.74 k	2741	10.5 k	1052	40.2 k	4022
732	7320	2.8 k	2801	10.7 k	1072	41.2 k	4122
750	7500	2.87 k	2871	11 k	1102	42.2 k	4222
768	7680	2.94 k	2941	11.3 k	1132	43.2 k	4322
787	7870	3.01 k	3011	11.5 k	1152	44.2 k	4422
806	8060	3.09 k	3091	11.8 k	1182	45.3 k	4532

- Tolerance D: ±0.5%, F: ±1%, J: ±5%

4. List of nominal resistance values: 1Ω to 10 MΩ (E96 series), continued

Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code	Resistance [Ω]	IEC Code
E96	4 digits D, F	E96	4 digits D, F	E96	4 digits D, F	E96	4 digits D, F
46.4 k	4642	178 k	1783	681 k	6813	2.61 M	2614
47.5 k	4752	182 k	1823	698 k	6983	2.67 M	2674
48.7 k	4872	187 k	1873	715 k	7153	2.74 M	2744
49.9 k	4992	191 k	1913	732 k	7323	2.8 M	2804
51.1 k	5112	196 k	1963	750 k	7503	2.87 M	2874
52.3 k	5232	200 k	2003	768 k	7683	2.94 M	2944
53.6 k	5362	205 k	2053	787 k	7873	3.01 M	3014
54.9 k	5492	210 k	2103	806 k	8063	3.09 M	3094
56.2 k	5622	215 k	2153	825 k	8253	3.16 M	3164
57.6 k	5762	221 k	2213	845 k	8453	3.24 M	3244
59 k	5902	226 k	2263	866 k	8663	3.32 M	3324
60.4 k	6042	232 k	2323	887 k	8873	3.4 M	3404
61.9 k	6192	237 k	2373	909 k	9093	3.48 M	3484
63.4 k	6342	243 k	2433	931 k	9313	3.57 M	3574
64.9 k	6492	249 k	2493	953 k	9533	3.65 M	3654
66.5 k	6652	255 k	2553	976 k	9763	3.74 M	3744
68.1 k	6812	261 k	2613	1 M	1004	3.83 M	3834
69.8 k	6982	267 k	2673	1.02 M	1024	3.92 M	3924
71.5 k	7152	274 k	2743	1.05 M	1054	4.02 M	4024
73.2 k	7322	280 k	2803	1.07 M	1074	4.12 M	4124
75 k	7502	287 k	2873	1.1 M	1104	4.22 M	4224
76.8 k	7682	294 k	2943	1.13 M	1134	4.32 M	4324
78.7 k	7872	301 k	3013	1.15 M	1154	4.42 M	4424
80.6 k	8062	309 k	3093	1.18 M	1184	4.53 M	4534
82.5 k	8252	316 k	3163	1.21 M	1214	4.64 M	4644
84.5 k	8452	324 k	3243	1.24 M	1244	4.75 M	4754
86.6 k	8662	332 k	3323	1.27 M	1274	4.87 M	4874
88.7 k	8872	340 k	3403	1.3 M	1304	4.99 M	4994
90.9 k	9092	348 k	3483	1.33 M	1334	5.11 M	5114
93.1 k	9312	357 k	3573	1.37 M	1374	5.23 M	5234
95.3 k	9532	365 k	3653	1.4 M	1404	5.36 M	5364
97.6 k	9762	374 k	3743	1.43 M	1434	5.49 M	5494
100 k	1003	383 k	3833	1.47 M	1474	5.62 M	5624
102 k	1023	392 k	3923	1.5 M	1504	5.76 M	5764
105 k	1053	402 k	4023	1.54 M	1544	5.9 M	5904
107 k	1073	412 k	4123	1.58 M	1584	6.04 M	6044
110 k	1103	422 k	4223	1.62 M	1624	6.19 M	6194
113 k	1133	432 k	4323	1.65 M	1654	6.34 M	6344
115 k	1153	442 k	4423	1.69 M	1694	6.49 M	6494
118 k	1183	453 k	4533	1.74 M	1744	6.65 M	6654
121 k	1213	464 k	4643	1.78 M	1784	6.81 M	6814
124 k	1243	475 k	4753	1.82 M	1824	6.98 M	6984
127 k	1273	487 k	4873	1.87 M	1874	7.15 M	7154
130 k	1303	499 k	4993	1.91 M	1914	7.32 M	7324
133 k	1333	511 k	5113	1.96 M	1964	7.5 M	7504
137 k	1373	523 k	5233	2 M	2004	7.68 M	7684
140 k	1403	536 k	5363	2.05 M	2054	7.87 M	7874
143 k	1433	549 k	5493	2.1 M	2104	8.06 M	8064
147 k	1473	562 k	5623	2.15 M	2154	8.25 M	8254
150 k	1503	576 k	5763	2.21 M	2214	8.45 M	8454
154 k	1543	590 k	5903	2.26 M	2264	8.66 M	8664
158 k	1583	604 k	6043	2.32 M	2324	8.87 M	8874
162 k	1623	619 k	6193	2.37 M	2374	9.09 M	9094
165 k	1653	634 k	6343	2.43 M	2434	9.31 M	9314
169 k	1693	649 k	6493	2.49 M	2494	9.53 M	9534
174 k	1743	665 k	6653	2.55 M	2554	9.76 M	9764
						10 M	1005

- Tolerance D: ±0.5%, F: ±1%, J: ±5%

5. Standards overview

5-1. E series

The international standard IEC 60063 specifies series of preferable numbers for resistor values. The E series have a certain number (r) of numerical values every 10^n (nth power of 10) and are represented as “Er” based on the number of numerical values. r is determined from a formula, $r = 3 \times 2^i$, where i is an integer (0, 1, 2, 3, 4, 5, or 6). Based on this calculation, r is 3, 6, 12, 24, 48, 96, or 192. For example, if the series has 24 numerical values every 10^n (10 or more and less than 100), it is referred to as “E24”. The E3, E6, E12, E24, E48, E96, and E192 series are commonly used.

5-2. Number series

Table 1 shows the E3, E6, E12, and E24 series with two significant figures. Table 2 shows the E48, E96, and E192 series with three significant figures. The values in the number series are the product of the table values multiplied by 10^n (n is an integer).

Each numerical series is a geometric progression consisting of theoretical values determined with the applicable formula shown in Table 3 rounded to two or three significant figures.

A geometric progression is a number series in which the ratio between two neighboring terms is common. When the progression is displayed on a logarithmic scale as shown in Figure 1, the values should be equally spaced in a theoretical calculation. However, there are errors due to rounding. In this figure, the E6 series is shown as an example so that the equal spaces are easily visible.

For the numerical series with two significant figures (Table 1), the values in the E12 series match every other value in the E24 series. Similarly, the values in E6 match every other value in E12 and the values in E3 match every other value in E6.

Also for the number series with three significant figures (Table 2), the values in the E96 series match every other value in the E192 series. Similarly, the values in E48 match every other value in E96.

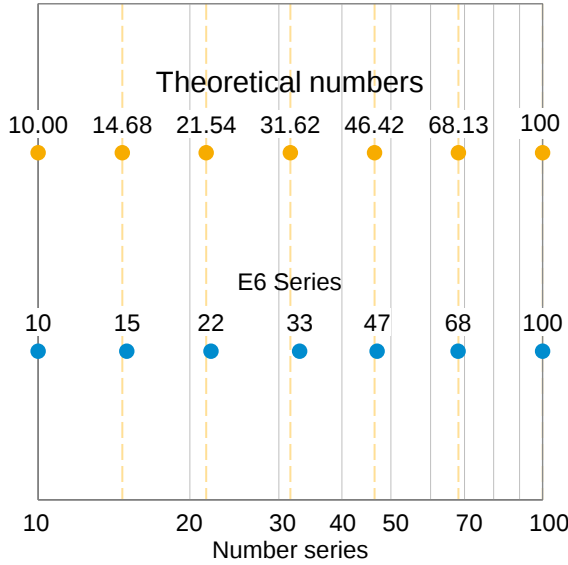


Figure 1. Equally spaced values of geometrical progression displayed on logarithmic scale for E6 series

Table 1. Number series with two significant figures
The resistor values are the product of the table values multiplied by 10^n (n is an integer).

E3	E6	E12	E24
10	10	10	10
			11
		12	12
			13
	15	15	15
			16
		18	18
			20
22	22	22	22
			24
		27	27
			30
	33	33	33
			36
		39	39
			43
47	47	47	47
			51
		56	56
			62
	68	68	68
			75
		82	82
			91

Table 2. Number series with three significant figures

The resistor values are the product of the table values multiplied by 10^n (n is an integer).

E48	E96	E192	E48	E96	E192	E48	E96	E192	E48	E96	E192
100	100	100	178	178	178	316	316	316	562	562	562
		101			180			320			569
	102	102		182	182		324	324		576	576
		104			184			328			583
105	105	105	187	187	187	332	332	332	590	590	590
		106			189			336			597
	107	107		191	191		340	340		604	604
		109			193			344			612
110	110	110	196	196	196	348	348	348	619	619	619
		111			198			352			626
	113	113		200	200		357	357		634	634
		114			203			361			642
115	115	115	205	205	205	365	365	365	649	649	649
		117			208			370			657
	118	118		210	210		374	374		665	665
		120			213			379			673
121	121	121	215	215	215	383	383	383	681	681	681
		123			218			388			690
	124	124		221	221		392	392		698	698
		126			223			397			706
127	127	127	226	226	226	402	402	402	715	715	715
		129			229			407			723
	130	130		232	232		412	412		732	732
		132			234			417			741
133	133	133	237	237	237	422	422	422	750	750	750
		135			240			427			759
	137	137		243	243		432	432		768	768
		138			246			437			777
140	140	140	249	249	249	442	442	442	787	787	787
		142			252			447			796
	143	143		255	255		453	453		806	806
		145			258			459			816
147	147	147	261	261	261	464	464	464	825	825	825
		149			264			470			835
	150	150		267	267		475	475		845	845
		152			271			481			856
154	154	154	274	274	274	487	487	487	866	866	866
		156			277			493			876
	158	158		280	280		499	499		887	887
		160			284			505			899
162	162	162	287	287	287	511	511	511	909	909	909
		164			291			517			920
	165	165		294	294		523	523		931	931
		167			298			530			942
169	169	169	301	301	301	536	536	536	953	953	953
		172			305			542			965
	174	174		309	309		549	549		976	976
		176			312			556			988

Table 4 shows the calculation result for the values in the E24 series using the formula and significant figures in Table 3 as a condition. The values in the range from 27 to 47 and the value of 82 deviate from the mathematical rule. However, the number series was established (and commonly used) before 1952, when the first edition of this international standard was issued. Therefore, the existing number series have been employed rather than theoretically calculated values because correction of the values is inappropriate considering the historical background.

Table 3. Theoretical calculation and significant figures for E series

E series	Theoretical numbers	Progression ratio	Significant numerals
E3	$(\sqrt[3]{10})^n$	2.154	Values rounded to two significant figures
E6	$(\sqrt[6]{10})^n$	1.468	
E12	$(\sqrt[12]{10})^n$	1.212	
E24	$(\sqrt[24]{10})^n$	1.101	
E48	$(\sqrt[48]{10})^n$	1.049	Values rounded to three significant figures
E96	$(\sqrt[96]{10})^n$	1.024	
E192	$(\sqrt[192]{10})^n$	1.012	

n is an integer.

Table 4. Comparison of numerical series table and theoretical calculation for E24 series

E24	Theoretical numbers	2 significant numerals
10	10.000	10
11	11.007	11
12	12.115	12
13	13.335	13
15	14.678	15
16	16.156	16
18	17.783	18
20	19.573	20
22	21.544	22
24	23.714	24
27	26.102	26
30	28.730	29
33	31.623	32
36	34.807	35
39	38.312	38
43	42.170	42
47	46.416	46
51	51.090	51
56	56.234	56
62	61.897	62
68	68.129	68
75	74.989	75
82	82.540	83
91	90.852	91

5-3. Marking codes

The international standard IEC 60062 specifies the following three systems as marking codes for resistors. Among them, the second and third system are employed for ROHM's chip resistors.

5-3-1. RKM code system

In this code system, resistor values are expressed in units of ohms (Ω) with powers of 10, where 10^{-3} , 1, 10^3 , 10^6 , and 10^9 are represented by the character codes L, R, K, M, and G (always uppercase), respectively. A marking example is shown in Table 5.

Table 5. Marking example of RKM code system

Resistance	Code	
	System 1	System 2
0.1 m Ω	L10	L100
0.12 m Ω	L12	L120
0.127 m Ω	L127	L127
1 m Ω	1L0	1L00
1.2 m Ω	1L2	1L20
1.27 m Ω	1L27	1L27
10 m Ω	10L	10L0
12 m Ω	12L	12L0
12.7 m Ω	12L7	12L7
0.1 Ω	R10	R100
0.12 Ω	R12	R120
0.127 Ω	R127	R127
1 Ω	1R0	1R00
1.2 Ω	1R2	1R20
1.27 Ω	1R27	1R27
10 Ω	10R	10R0
12 Ω	12R	12R0
12.7 Ω	12R7	12R7
100 Ω	100R	100R
120 Ω	120R	120R
127 Ω	127R	127R
1 k Ω	1K0	1K00
1.2 k Ω	1K2	1K20
1.27 k Ω	1K27	1K27
10 k Ω	10K	10K0
12 k Ω	12K	12K0
12.7 k Ω	12K7	12K7

Resistance	Code	
	System 1	System 2
100 k Ω	100K	100K
120 k Ω	120K	120K
127 k Ω	127K	127K
1 M Ω	1M0	1M00
1.2 M Ω	1M2	1M20
1.27 M Ω	1M27	1M27
10 M Ω	10M	10M0
12 M Ω	12M	12M0
12.7 M Ω	12M7	12M7
100 M Ω	100M	100M
120 M Ω	120M	120M
127 M Ω	127M	127M
1 G Ω	1G0	1G00
1.2 G Ω	1G2	1G20
1.27 G Ω	1G27	1G27
10 G Ω	10G	10G0
12 G Ω	12G	12G0
12.7 G Ω	12G7	12G7
100 G Ω	100G	100G
120 G Ω	120G	120G
127 G Ω	127G	127G

System 1: The length of marking codes depends on the number of significant figures of the resistor values.

System 2: Fixed length RKM code system with the length fixed at four characters.

5-3-2. Three-character code system

Resistor values expressed in units of ohms (Ω) are represented with three-character codes as shown in Table 6. Since resistor values are represented with two significant figures, the three-character code system is applicable to the E3, E6, E12, and E24 series only.

Table 6. Three-character code system for resistor values

Resistance	Code	Example
0.1 m Ω to 0.91 m Ω	L10 to L91	0.12 m Ω $\rightarrow$ L12
1 m Ω to 9.1 m Ω	1L0 to 9L1	1.2 m Ω $\rightarrow$ 1L2
10 m Ω to 91 m Ω	10L to 91L	12 m Ω $\rightarrow$ 12L
0.1 Ω to 0.91 Ω	R10 to R91	0.12 Ω $\rightarrow$ R12
1 Ω to 9.1 Ω	1R0 to 9R1	1.2 Ω $\rightarrow$ 1R2
10 Ω to 91 Ω	100 to 910	12 Ω = $12 \times 10^0 \Omega \rightarrow$ 120
100 Ω to 910 Ω	101 to 911	120 Ω = $12 \times 10^1 \Omega \rightarrow$ 121
1 k Ω to 9.1 k Ω	102 to 912	1.2 k Ω = $12 \times 10^2 \Omega \rightarrow$ 122
10 k Ω to 91 k Ω	103 to 913	12 k Ω = $12 \times 10^3 \Omega \rightarrow$ 123
100 k Ω to 910 k Ω	104 to 914	120 k Ω = $12 \times 10^4 \Omega \rightarrow$ 124
1 M Ω to 9.1 M Ω	105 to 915	1.2 M Ω = $12 \times 10^5 \Omega \rightarrow$ 125
10 M Ω to 91 M Ω	106 to 916	12 M Ω = $12 \times 10^6 \Omega \rightarrow$ 126
100 M Ω to 910 M Ω	107 to 917	120 M Ω = $12 \times 10^7 \Omega \rightarrow$ 127
1 G Ω to 9.1 G Ω	108 to 918	1.2 G Ω = $12 \times 10^8 \Omega \rightarrow$ 128
10 G Ω to 91 G Ω	109 to 919	12 G Ω = $12 \times 10^9 \Omega \rightarrow$ 129

- The first two digits represent significant figures. The last digit represents the exponent of the power of 10 following the significant figures.
- For the resistor values of less than 10 Ω , L and R represent the decimal point and all numbers are considered significant figures. In addition, L represents the m Ω unit.

5-3-3. Four-character code system

Resistor values expressed in units of ohms (Ω) are represented with four-character codes as shown in Table 7. Since resistor values are represented with three significant figures, the four-character code system is applicable to the E48, E96, and E192 series.

Table 7. Four-character code system for resistor values

Resistance	Code	Example
0.1 m Ω to 0.988 m Ω	L100 to L988	0.127 m Ω $\rightarrow$ L127
1 m Ω to 9.88 m Ω	1L00 to 9L88	1.27 m Ω $\rightarrow$ 1L27
10 m Ω to 98.8 m Ω	10L0 to 98L8	12.7 m Ω $\rightarrow$ 12L7
0.1 Ω to 0.988 Ω	R100 to R988	0.127 Ω $\rightarrow$ R127
1 Ω to 9.88 Ω	1R00 to 9R88	1.27 Ω $\rightarrow$ 1R27
10 Ω to 98.8 Ω	10R0 to 98R8	12.7 Ω $\rightarrow$ 12R7
100 Ω to 988 Ω	1000 to 9880	127 Ω = $127 \times 10^0 \Omega \rightarrow$ 1270
1 k Ω to 9.88 k Ω	1001 to 9881	1.27 k Ω = $127 \times 10^1 \Omega \rightarrow$ 1271
10 k Ω to 98.8 k Ω	1002 to 9882	12.7 k Ω = $127 \times 10^2 \Omega \rightarrow$ 1272
100 k Ω to 988 k Ω	1003 to 9883	127 k Ω = $127 \times 10^3 \Omega \rightarrow$ 1273
1 M Ω to 9.88 M Ω	1004 to 9884	1.27 M Ω = $127 \times 10^4 \Omega \rightarrow$ 1274
10 M Ω to 98.8 M Ω	1005 to 9885	12.7 M Ω = $127 \times 10^5 \Omega \rightarrow$ 1275
100 M Ω to 988 M Ω	1006 to 9886	127 M Ω = $127 \times 10^6 \Omega \rightarrow$ 1276
1 G Ω to 9.88 G Ω	1007 to 9887	1.27 G Ω = $127 \times 10^7 \Omega \rightarrow$ 1277
10 G Ω to 98.8 G Ω	1008 to 9888	12.7 G Ω = $127 \times 10^8 \Omega \rightarrow$ 1278
100 G Ω to 988 G Ω	1009 to 9889	127 G Ω = $127 \times 10^9 \Omega \rightarrow$ 1279

- The first three digits represent significant figures. The last digit represents the exponent of the power of 10 following the significant figures.
- For the resistor values of less than 100 Ω , L and R represent the decimal point and all numbers are considered significant figures. In addition, L represents the m Ω unit.

References

- [1] IEC 60062 Edition 6.0 2016-07, *Marking codes for resistors and capacitors*
- [2] IEC 60063 Edition 3.0 2015-03, *Preferred number series for resistors and capacitors*

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