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SMD resistor code calculator

Marking on the SMD resistor: 102 Calculate

Calculated resistance value: **1 kΩ**

This simple calculator will help you determine the value of any SMD resistor. To get started, input the 3 or 4 digit code and hit the "Calculate" button or *Enter*.

Note: The program was tested rigorously, but it still may have a few bugs. So, when in doubt (and when it's possible) don't hesitate to use a multimeter to double-check the critical components.

See also the color code calculator on this page for MELF and standard through-hole resistors.

How to calculate the value of an SMD resistor

Most chip resistors are marked with a 3-digit or 4-digit code -- the numerical equivalent of the familiar color code for through-hole components. Recently, a new coding system (the EIA-96) has appeared on precision SMDs.

The 3-digit code

Standard-tolerance SMD resistors are marked with a simple **3-digit code**. The first two numbers will indicate the significant digits, and the third will be the multiplier, telling you the power of ten to which the two significant digits must be multiplied (or how many zeros to add). Resistances of less than 10 ohms do not have a multiplier, the letter 'R' is used instead to indicate the position of the decimal point.

3-digit code examples:

220 *= 22 × 10^0 (1) = 22Ω (not 220Ω!)*
471 *= 47 × 10^1 (10) = 470Ω*
102 *= 10 × 10^2 (100) = 1000Ω or 1kΩ*
3R3 *= 3.3Ω*

more 3-digit SMD resistor examples...

The 4-digit code

The **4-digit code** is used for marking precision surface mount resistors. It's similar to the previous system, the only difference is the number of significant digits: the first *three numbers* will tell us the significant digits, and the fourth will be the multiplier, indicating the power of ten to which the three significant digits must be multiplied (or how many zeros to add). Resistances of less than 100 ohms are marked with the help of the letter 'R', indicating the position of the decimal point.

4-digit code examples:

4700 *= 470 × 10^0 (1) = 470Ω (not 4700Ω!)*
2001 *= 200 × 10^1 (10) = 2000Ω or 2kΩ*
1002 *= 100 × 10^2 (100) = 10000Ω or 10kΩ*
15R0 *= 15.0Ω*

more 4-digit SMD resistor examples...

EIA-96

Recently, a new coding system (EIA-96) has appeared on 1% SMD resistors. It consists of a three character code: the first 2 numbers will tell us the 3 significant digits of the resistor value (see the lookup table below) and the third marking (a letter) will indicate the multiplier.

Code	Value	Code	Value	Code	Value	Code	Value
01	100	25	178	49	316	73	562
02	102	26	182	50	324	74	576
03	105	27	187	51	332	75	590
04	107	28	191	52	340	76	604
05	110	29	196	53	348	77	619
06	113	30	200	54	357	78	634
07	115	31	205	55	365	79	649
08	118	32	210	56	374	80	665
09	121	33	215	57	383	81	681
10	124	34	221	58	392	82	698
11	127	35	226	59	402	83	715
12	130	36	232	60	412	84	732
13	133	37	237	61	422	85	750
14	137	38	243	62	432	86	768
15	140	39	249	63	442	87	787
16	143	40	255	64	453	88	806
17	147	41	261	65	464	89	825
18	150	42	267	66	475	90	845
19	154	43	274	67	487	91	866
20	158	44	280	68	499	92	887
21	162	45	287	69	511	93	909

Code	Multiplier
Z	0.001
Y or R	0.01
X or S	0.1
A	1
B or H	10
C	100
D	1000
E	10000
F	100000

EIA-96 code examples:

01Y *= 100 × 0.01 = 1Ω*
68X *= 499 × 0.1 = 49.9Ω*
76X *= 604 × 0.1 = 60.4Ω*
01A *= 100 × 1 = 100Ω*
29B *= 196 × 10 = 1.96kΩ*
01C *= 100 × 100 = 10kΩ*

more EIA-96 SMD examples...

22	165	46	294	70	523	94	931
23	169	47	301	71	536	95	953
24	174	48	309	72	549	96	976

Notes:

- an SMD resistor with a marking of **0**, **00**, **000** or **0000** is a jumper (a zero-ohm link).
- a chip resistor marked with the standard 3 digit code and a short bar below the marking denotes a precision (1% or less) resistor with a value taken from the E24 series (these values are usually reserved for 5% resistors). For example: **122** = 1.2kΩ 1%. Some manufacturers underline all three digits -- do not confuse this with the code used on low value current sensing resistors.
- SMDs with values in order of milliohms, made for current sensing applications are often marked with the help of the letter M or m, showing the decimal point location (with the value in milliohms). For example: **1M50** = 1.50mΩ, **2M2** = 2.2mΩ.
- Current sensing SMDs can also be marked with a long bar on top (**1m5** = 1.5mΩ, **R001** = 1mΩ, etc.) or a long bar under the code (**101** = 0.101Ω, **047** = 0.047Ω). The underline is used when the starting 'R' has to be omitted due to the limited space on the resistor's body. So, for example, **R068** becomes **068** = 0.068Ω (68mΩ).

Power rating

To find out the **approximative power rating** of your SMD resistor, measure its length and width. A few commonly used package dimensions with the corresponding typical power ratings are presented in the table below. Use this table as a guide only, and always consult the component's datasheet for the exact value.

Package	Size in inches (L×W)	Size in mm (L×W)	Power rating
0201	0.024" × 0.012"	0.6 mm × 0.3 mm	**1/20W**
0402	0.04" × 0.02"	1.0 mm × 0.5 mm	**1/16W**
0603	0.063" × 0.031"	1.6 mm × 0.8 mm	**1/16W**
0805	0.08" × 0.05"	2.0 mm × 1.25 mm	**1/10W**
1206	0.126" × 0.063"	3.2 mm × 1.6 mm	**1/8W**
1210	0.126" × 0.10"	3.2 mm × 2.5 mm	**1/4W**
1812	0.18" × 0.12"	4.5 mm x 3.2 mm	**1/3W**
2010	0.20" × 0.10"	5.0 mm × 2.5 mm	**1/2W**
2512	0.25" × 0.12"	6.35 mm × 3.2 mm	**1W**

Tolerance

The standard 3 and 4 digit code does not give us a way to determine the SMD resistor's tolerance.

In most cases, however, you'll find that a surface mount resistor marked with the **3-digit code** has a tolerance of **5%** and a resistor marked with **4-digit code or the new EIA-96 code** has a tolerance of **1% or less**.

There are many exceptions to this rule, so always check the manufacturer's datasheet, especially if the component's tolerance is critical for your application.