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Surface Mount SMD Resistor Codes & Markings

- details of the SMD or SMT resistor markings and codes with the systems used to indicate the resistor values and information - including EIA SMD resistor marking / coding scheme.

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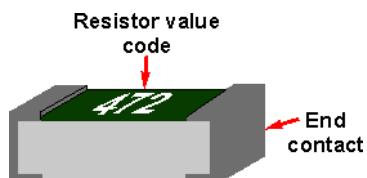
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Although not all SMD resistors, or SMT resistors are marked with their values, some are, and in view of the lack of space the SMD resistor code systems may not always provide an obvious indication of the resistor value.

The surface mount resistor code systems provide are mainly used to enable service, repair and fault-finding. During manufacture the resistors are held either in tapes that are reeled, or in hoppers used for the surface mount machines. The SMD resistor markings can be used as a check to ensure the correct values are being fitted, but normally the reels or hoppers will be suitable marked and coded.



Typical surface mount resistor code

SMD resistor code systems

Many SMD resistors do not have any markings on them to indicate their value. For these devices, once they are loose and out of their packaging it is very difficult to tell their value. Accordingly SMD resistors are typically used within reels or other packages where there is no chance of different values being mixed.

Many resistors do have markings on them. There are three systems that are used:

- Three figure SMD resistor coding system
- Four figure SMD resistor coding system
- EIA96 SMD resistor coding system

3 figure SMT resistor code system

A three figure SMT resistor coding system is the one that is normally used for standard tolerance resistors.

As the name indicates this SMD resistor marking system uses three figures. The first two figures in the code indicate the significant figures, and the third is a multiplier. This is the same as the coloured rings used for wired resistors, except that actual numbers are used instead of colours.

Therefore an SMD resistor with the figures 472 would have a resistance of 47×10^2 ohms, or $4.7k\Omega$. However beware of resistors marked with figures such as 100. This is not 100 ohms, but it follows the scheme exactly and it

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Therefore an SMD resistor with the figures 472 would have a resistance of 47×10^2 ohms, or 4.7k Ω . However beware of resistors marked with figures such as 100. This is not 100 ohms, but it follows the scheme exactly and it is 10×10^0 or $10 \times 1 = 10 \Omega$.



Three figure SMD resistor code

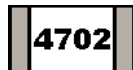
Where resistance values less than ten ohms are used, the letter "R" is used to indicate the position of the decimal point. As an example, a resistor with the value 4R7 would be 4.7 Ω .

4 figure SMT resistor code system

The four digit or four figure SMT resistor marking scheme is used for marking high tolerance SMD resistors. Its format is very similar to the three figure SMT resistor making scheme, but expanded to give the higher number of significant figures needed for higher tolerance resistors.

In this coding scheme, the first three numbers will indicate the significant digits, and the fourth is the multiplier.

Therefore an SMD resistor with the figures 4702 would have a resistance of 470×10^2 ohms, or 47k Ω .



Four figure SMD resistor code

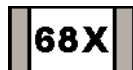
Resistors with values of less than 100 ohms are marked utilise the letter 'R', as before, to indicate the position of the decimal point.

EIA96 SMD resistor code system

A further surface mount resistor code scheme or SMD resistor coding scheme has started to be used, and it is aimed at 1% tolerance SMD resistors, i.e. those using the EIA96 or E-96 resistor series. As higher tolerance resistors are used, further figures are needed. However the small size of SMT resistors makes the figures difficult to read. Accordingly the new system seeks to address this. Using only three figures, the actual characters can be made larger than those of the four figure system that would otherwise be needed.

The EIA SMD resistor coding scheme uses a three character code: the first 2 numbers indicate the 3 significant digits of the resistor value. The third character is a letter which indicates the multiplier. In this way this SMD resistor marking scheme will not be confused with the 3 figure markings scheme as the letters will differentiate it, although the letter R can be used in both systems.

To generate the system the E-96 resistor series has been taken and each value or significant figure set has been numbered sequentially. As there are only 96 values in the E-96 series, only two figures are needed to number each value, and as a result this is a smart way of reducing the number of characters required.



EIA SMD resistor code

The details for the EIA SMT resistor code scheme are tabulated below:

EIA SMD RESISTOR CODE SCHEME	
CODE	MULTIPLIER
Z	0.001
Y or R	0.01
X or S	0.1
A	1
B or H	10
C	100
D	1 000
E	10 000
F	100 000

EIA SMT resistor code scheme multipliers

EIA SMD RESISTOR CODE SCHEME MULTIPLIERS							
CODE	SIG FIGS	CODE	SIG FIGS	CODE	SIG FIGS	CODE	SIG FIGS
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
22	165	46	294	70	523	94	931
23	169	47	301	71	536	95	953
24	174	48	309	72	549	96	976

EIA SMT resistor code scheme significant figures

For example a resistor that is marked 68X can be split into two elements. 68 refers to the significant figures 499, and X refers to a multiplier of 0.1. Therefore the value indicated is $499 \times 0.1 = 49.9\Omega$.

By Ian Poole (<https://plus.google.com/104687638164370436625/?rel=author>)

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