Technical Note TN003 - Methods for Coding Resistor Values in Part Numbers

Introduction

TT Electronics resistors have part numbers from a mixture of European and USA origins, and for some products both are valid. The datasheets indicate how part numbers are constructed, including a brief definition with example of the coding method for the resistance value. This document gives a full definition of the two coding methods. Appendix A shows a full range of examples across the entire value range.

European Value Coding Method

Between three and six characters are used. These characters may be significant digits, zeros or a multiplier letter.

- **Significant Digits**

For E24[1] values the number of significant digits can be one or two, and most have two.

For E96[1] & E192[1] values the number of significant digits can be one, two or three, and most have three.

- **Zeros**

These are used according to the following rules:

1. Never use leading zeros (e.g. do not use “0R33” or “03K3”)
2. Use as many zeros as required between the multiplier letter and the closest significant digit (e.g. “100K”, “R02”)
3. Only use trailing zeros to bring the total number of characters up to a minimum of three (e.g. use “R10” rather than “R1”, but do not use “R100” or “1K40”)

- **Multiplier Letter**

This is used in place of a decimal point and indicates the multiplier applied to the units of measure. L indicates milliohms (and is used for some products whose ohmic range extends below one milliohm), R indicates ohms (and is also commonly used for values in the milliohm range), K indicates kilohms ($x10^3$), M indicates megohms ($x10^6$), G indicates gigohms ($x10^9$) and T indicates teraohms ($x10^{12}$).

USA Value Coding Method

For most of the value range only numerical characters are used. The majority of TT Electronics products with USA value coding use four numerical characters. The datasheet will indicate if only three characters are to be used.

For a four-character code, the first three digits are made up of the significant digits followed by enough zeros to give a total of three digits. The final digit is a multiplier which indicates how many zeros must be added to form the number expressing the value in ohms.

For example, 3304 indicates “330” + 4 zeros = 3,300,000Ω, or 3.3MΩ.

Note that the final digit may be zero. Hence 825Ω is coded as 8250, and it is important to remember that this code does **not** mean 8250Ω, or 8.25kΩ, which would in fact be coded as 8251.

For low ohmic values (below 100Ω), the multiplier would need to be less than zero, so this method cannot be used. Therefore, the value coding method becomes similar to the European one, using R as a multiplier letter. The only difference is that, where necessary, trailing zeros are added to bring the total number of characters up to **four** (e.g. 0.1Ω = R1 and then two zeros are added to give a four-character code R100).

For the small minority of cases where three-character codes are used, similar principles apply, and the formats and examples are given in brackets in the list of Appendix A.

Note 1 – For a list of E24, E96 and E192 standard resistance values, see
https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/ApplicationNotes/TN005-EIA-Standard-Values-for-Resistors.pdf

Appendix A: Coding Formats and Examples

Value Range		Number of significant digits	Example Value	European		USA[2]	
				Format	Example	Format	Example
μΩ	value <100μΩ	1	50μΩ	R0000d	R00005	R0000d	R00005
				L0d(0)[3]	L05(0)[3]		
	100μΩ≤ value <1mΩ	1	500μΩ	R000d	R0005	R000d	R0005
				(0)Ld0(0)[3]	(0)L50(0)[3]		
		2	750μΩ	R000dd	R00075	R000dd	R00075
				(0)Ldd(0)[3]	(0)L75(0)[3]		
mΩ	1mΩ≤ value <10mΩ	1	2mΩ	R00d	R002	R00d	R002
				dL0[3]	2L0[3]		
		2	2.5mΩ	R00dd	R0025	R00dd	R0025
				dLd[3]	2L5[3]		
	10mΩ≤ value <100mΩ	1	20mΩ	R0d	R02	R0d0 (R0d)	R020 (R02)
		2	33mΩ	R0dd	R033	R0dd	R033
	100mΩ≤ value <1Ω	1	200mΩ	Rd0	R20	Rd00 (Rd0)	R200 (R20)
		2	330mΩ	Rdd	R33	Rdd0 (Rdd)	R330 (R33)
		3	825mΩ	Rddd	R825	Rddd	R825
Ω	1Ω≤ value <10Ω	1	2Ω	dR0	2R0	dR00 (dR0)	2R00 (2R0)
		2	3.3Ω	dRd	3R3	dRd0 (dRd)	3R30 (3R3)
		3	8.25Ω	dRdd	8R25	dRdd	8R25
	10Ω≤ value <100Ω	1	20Ω	d0R	20R	d0R0 (d0m)	20R0 (200)
		2	33Ω	ddR	33R	ddR0 (ddm)	33R0 (330)
		3	82.5Ω	ddRd	82R5	ddRd	82R5
	100Ω≤ value <1kΩ	1	200Ω	d00R	200R	d00m (d0m)	2000 (201)
		2	330Ω	dd0R	330R	dd0m (ddm)	3300 (331)
		3	825Ω	dddR	825R	dddm	8250
kΩ	1kΩ≤ value <10kΩ	1	2kΩ	dK0	2K0	d00m (d0m)	2001 (202)
		2	3.3kΩ	dKd	3K3	dd0m (ddm)	3301 (332)
		3	8.25kΩ	dKdd	8K25	dddm	8251
	10kΩ≤ value <100kΩ	1	20kΩ	d0K	20K	d00m (d0m)	2002 (203)
		2	33kΩ	ddK	33K	dd0m (ddm)	3302 (333)
		3	82.5kΩ	ddKd	82K5	dddm	8252
	100kΩ≤ value <1MΩ	1	200kΩ	d00K	200K	d00m (d0m)	2003 (204)
		2	330kΩ	dd0K	330K	dd0m (ddm)	3303 (334)
		3	825kΩ	dddK	825K	dddm	8253
MΩ	1MΩ≤ value <10MΩ	1	2MΩ	dM0	2M0	d00m (d0m)	2004 (205)
		2	3.3MΩ	dMd	3M3	dd0m (ddm)	3304 (335)
		3	8.25MΩ	dMdd	8M25	dddm	8254
	10MΩ≤ value <100MΩ	1	20MΩ	d0M	20M	d00m (d0m)	2005 (206)
		2	33MΩ	ddM	33M	dd0m (ddm)	3305 (336)
		3	82.5MΩ	ddMd	82M5	dddm	8255
	100MΩ≤ value <1GΩ	1	200MΩ	d00M	200M	d00m (d0m)	2006 (207)
		2	330MΩ	dd0M	330M	dd0m (ddm)	3306 (337)
		3	825MΩ	dddM	825M	dddm	8256
GΩ	1GΩ≤ value <10GΩ	1	2GΩ	dG0	2G0	d00m (d0m)	2007 (208)
		2	3.3GΩ	dGd	3G3	dd0m (ddm)	3307 (338)
		3	8.25GΩ	dGdd	8G25	dddm	8257
	10GΩ≤ value <100GΩ	1	20GΩ	d0G	20G	d00m (d0m)	2008 (209)
		2	33GΩ	ddG	33G	dd0m (ddm)	3308 (339)
		3	82.5GΩ	ddGd	82G5	dddm	8258
	100GΩ≤ value <1TΩ	1	200GΩ	d00G	200G	d00m	2009
		2	330GΩ	dd0G	330G	dd0m	3309
		3	825GΩ	dddG	825G	dddm	8259
TΩ	1TΩ≤ value <10TΩ	1	2TΩ	dT0	2T0	TT Electronics products in this value range use European coding only.	
		2	3.3TΩ	dTd	3T3		
	10TΩ≤ value <100TΩ	1	20TΩ	d0T	20T		
		2	33TΩ	ddT	33T		
	100TΩ	1	100TΩ	d00T	100T		

Note 2 – Alternate formats and examples shown in brackets are for the less common three-character coding. Unless stated otherwise on the datasheet, four-character coding should be used.
Note 3 – Alternate coding used for products whose ohmic range extends below one milliohm, and where indicated on the datasheet. The datasheet also indicates whether leading or trailing zeros are to be used.