

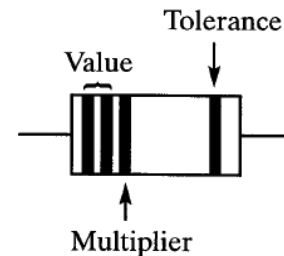
Electronics

Data Sheet

Resistors Preferred values for resistors (E24) series:
1.0, 1.1, 1.2, 1.3, 1.5, 1.6, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.6, 3.9, 4.3,
4.7, 5.1, 5.6, 6.2, 6.8, 7.5, 8.2, 9.1 ohms etc.

Resistor Printed Code (BS 1852) This code consists of letters and numbers:
R means $\times 1$
K means $\times 1000$ (i.e. 10^3)
M means $\times 1\,000\,000$ (i.e. 10^6)
Position of the letter gives the decimal point
Tolerances are given by the letter at the end of the code,
F = $\pm 1\%$, G = $\pm 2\%$, J = $\pm 5\%$, K = $\pm 10\%$, M = $\pm 20\%$.

Resistor Colour Code	Number	Colour
	0	Black
	1	Brown
	2	Red
	3	Orange
	4	Yellow
	5	Green
	6	Blue
	7	Violet
	8	Grey
	9	White



Tolerance, gold = $\pm 5\%$, silver = $\pm 10\%$, no band = $\pm 20\%$

Silicon diode $V_F = 0.7\text{ V}$

Silicon transistor $V_{be} \approx 0.7\text{ V}$ in the on state, $V_{ce} \approx 0.2\text{ V}$ when saturated

Resistance $R_T = R_1 + R_2 + R_3 + \dots$ series

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$
 parallel

Capacitance $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$ series

$$C_T = C_1 + C_2 + C_3 + \dots$$
 parallel

Time constant $T = CR$, $T_{1/2} = 0.69 CR$

ac theory $I_{\text{rms}} = \frac{I_0}{\sqrt{2}}$

$$V_{\text{rms}} = \frac{V_0}{\sqrt{2}}$$

$$X_C = \frac{1}{2\pi fC}$$
 reactance

$$X_L = 2\pi fL$$
 reactance

$$f = \frac{1}{T}$$
 frequency, period

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$
 resonant frequency

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Operational amplifier	$G_V = \frac{V_{out}}{V_{in}}$	voltage gain			
	$G_V = -\frac{R_f}{R_1}$	inverting			
	$G_V = 1 + \frac{R_f}{R_1}$	non-inverting			
	$V_{out} = -R_f \left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} \right)$	summing			
	$V_{out} = (V_+ - V_-) \frac{R_f}{R_1}$	difference			
555 Astable and Monostable	$T = 1.1RC$	monostable			
	$t_H = 0.7 (R_A + R_B)C$	astable			
	$t_L = 0.7 R_B C$				
	$f = \frac{1.44}{(R_A + 2R_B)C}$	astable frequency			
Electromagnetic waves	$c = 3 \times 10^8 \text{ m s}^{-1}$	speed in vacuo			
Assembler language microcontroller instructions					
Mnemonic	Operands	Description	Operation	Flags	Clock cycles
NOP	none	No operation	none	none	1
CALL	K	Call subroutine	stack \leq PC + 1 PC \leq K	none	2
RET	none	Return from subroutine	PC \leq stack	none	2
INC	R	Increments the contents of R	(R) \leq (R) + 1	Z	1
DEC	R	Decrements the contents of R	(R) \leq (R) - 1	Z	1
ADDW	K	Add K to W	W \leq W + K	Z, C	1
ANDW	K	AND K with W	W \leq W • K	Z, C	1
SUBW	K	Subtract K from W	W \leq W - K	Z, C	1
ORW	K	OR K and W	W \leq W + K	Z, C	1
XORW	K	XOR K and W	W \leq W \oplus K	Z, C	1
JMP	K	Jump to K (GOTO)	PC \leq K	none	2
JPZ	K	Jump to K on zero	PC \leq K if Z=1	Z=1	2
JPC	K	Jump to K on carry	PC \leq K if C=1	C=1	2
MOVWR	R	Move W to the contents of R	(R) \leq W	Z	1
MOVW	K	Move K to W	W \leq K	Z	1
MOVRW	R	Move the contents of R to W	W \leq (R)	Z	1