Fondamenti di elettronica analogica

Parametri elettronici

- ✓ **Carica elettrica**: Q=1 Coulomb = circa 6,24 × 10^{18} elettroni [Q]
- ✓ **Corrente**: ΔQ/Δt [Q/s] [Ampere][A]
- ✓ **Potenziale elettrico**: capacità di spostamento di cariche elettriche: si misura in Volt [V]: le cariche elettriche si spostano dal potenziale più alto a quello più basso.
- ✓ **Resistenza:** comportamento dei materiali di limitazione del movimento delle cariche elettriche [Ohm] [Ω]
- ✓ **Capacità:** attitudine di un corpo all'accumulo di cariche elettriche [Farad] [F]
- ✓ **Induttanza** Attitudine di un corpo alla generazione di campo magnetico quando attraversato da corrente elettrica. [Henry] [H]

La forza elettromotrice

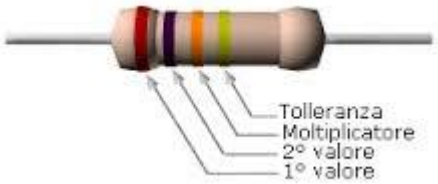
La "forza" elettromotrice (**f.e.m.**) è una sorgente di energia necessaria per mantenere le **cariche in moto**, quindi la corrente *costante*

È definita come la **ddp fra i poli di una pila a circuito aperto**

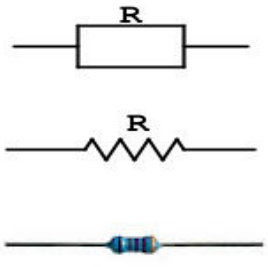
È il rapporto fra il lavoro ΔL compiuto dal generatore per portare la carica positiva Δq da polo negativo a quello positivo e la carica Δq stessa:

$$f = \frac{\Delta L}{\Delta q}$$

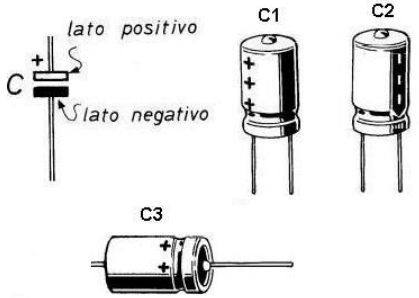
Componenti elettronici

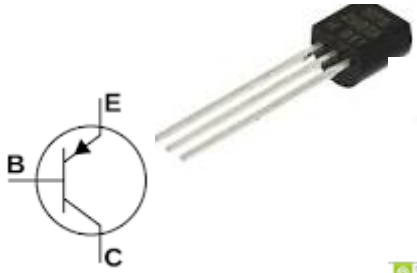


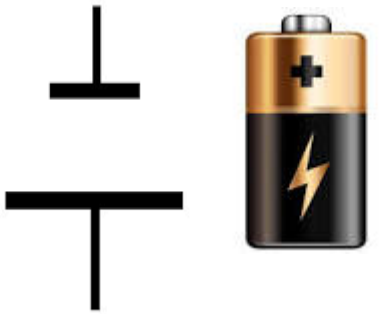
simbolo elettrico Resistore

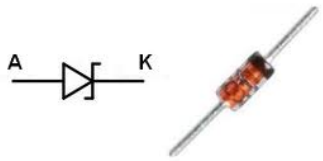


- ✓ Resistenza - Resistore
- ✓ Condensatore - Capacitore
- ✓ Induttore
- ✓ Diodo
- ✓ Transistor
- ✓ FEM

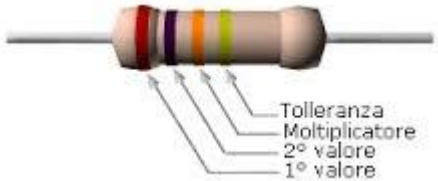








Componenti elettronici: identificazione



PRIMO E SECONDO Anello (CODICE COLORI)

0: Nero
1: Marrone
2: Rosso
3:Arancio
4: Giallo
5: Verde
6: Blu
7: Viola
8: Grigio
9: Bianco

Quarto Anello: tolleranza

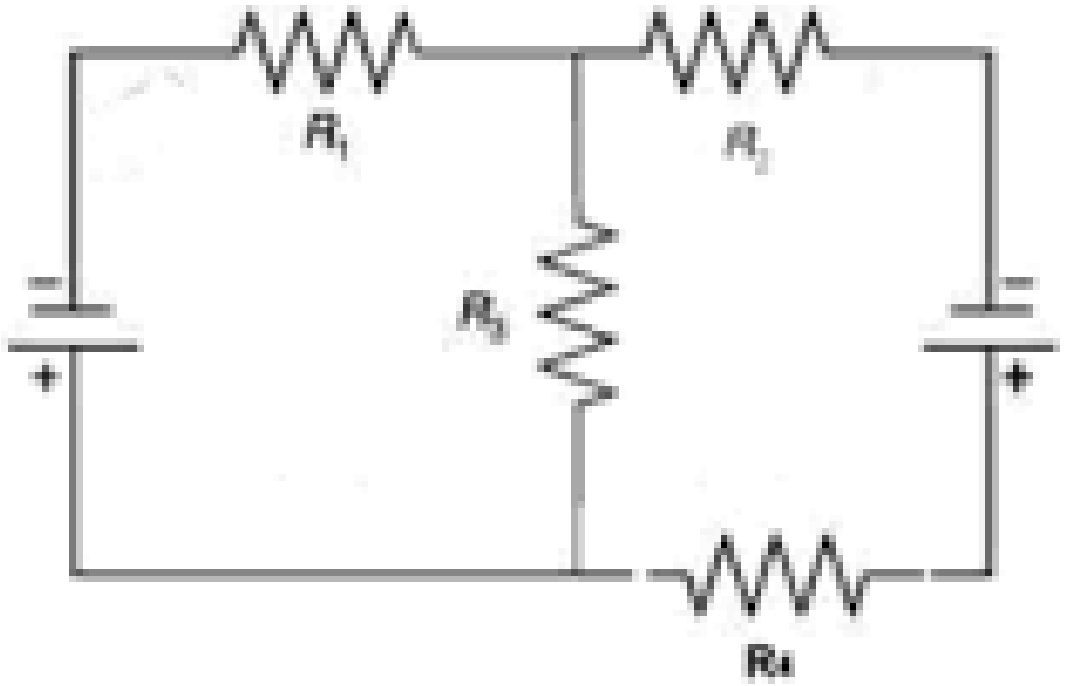
+-5%: Oro

+-10%: Argento

TERZO Anello (moltiplicatore)

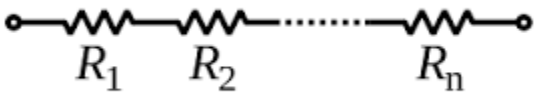
x1: Nero
x10: Marrone
x100: Rosso
X1.000:Arancio
x10.000: Giallo
X100.000: Verde
X1.000.000: Blu
X10.000.000: Viola

Circuiti elettronici

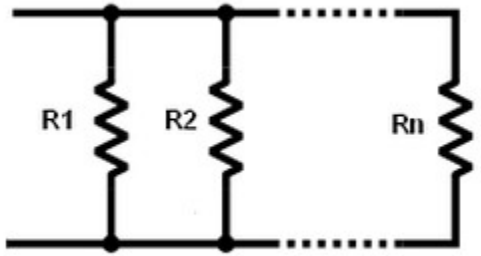


Leggi fondamentali dell'elettronica (serie e parallelo)

- ✓ R in serie: Req= R1+R2+ …+ Rn

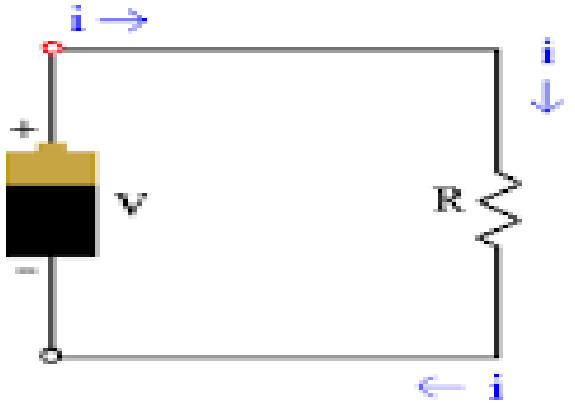


- ✓ R in parallelo: Req= 1/(1/R1+1/R2+ … +1/Rn)



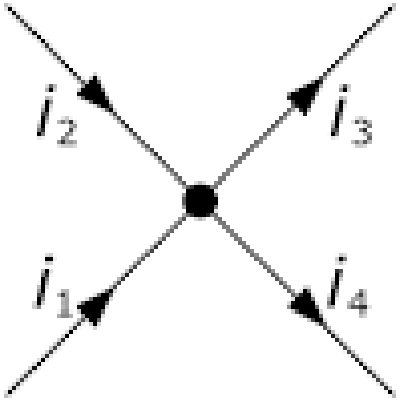
Leggi fondamentali dell'elettronica (Ohm)

- ✓ Legge di Ohm: v=Ri
- ✓ La caduta di tensione ai capi di una resitenza R è proporzionale alla corrente che la attraversa.



Leggi fondamentali dell'elettronica Kirchoff

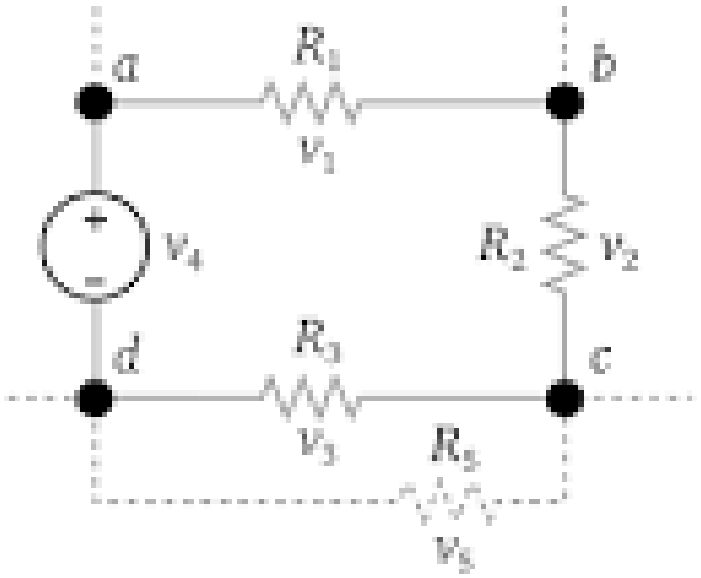
- ✓ Legge dei nodi: I1+I2+ … + In=0



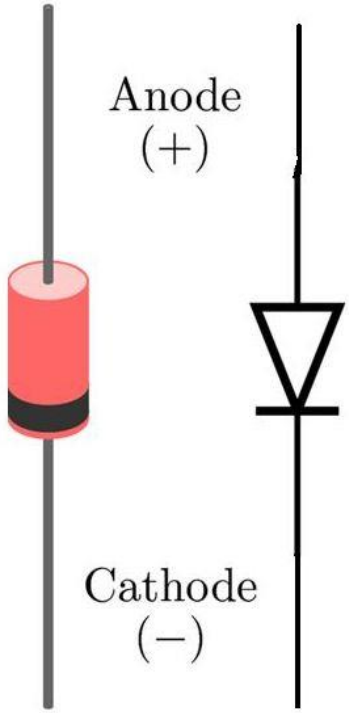
$$i_1 + i_2 = i_3 + i_4$$

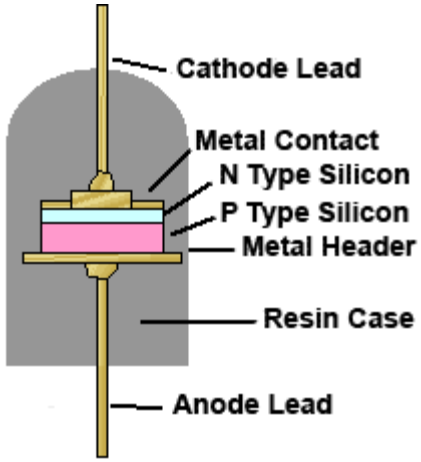
Leggi fondamentali dell'elettronica Kirchoff

- ✓ Legge delle maglie: V1+V2+ … + Vn=0

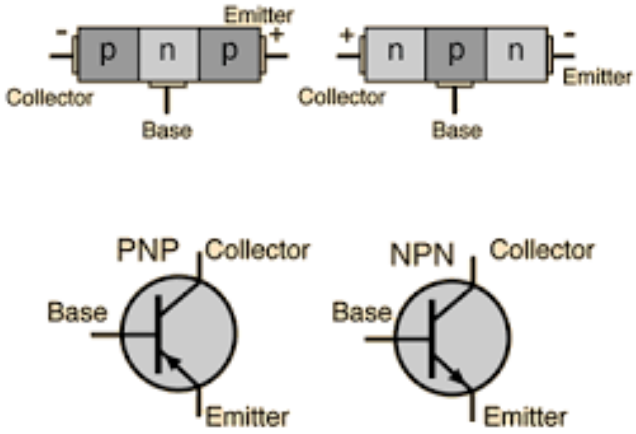


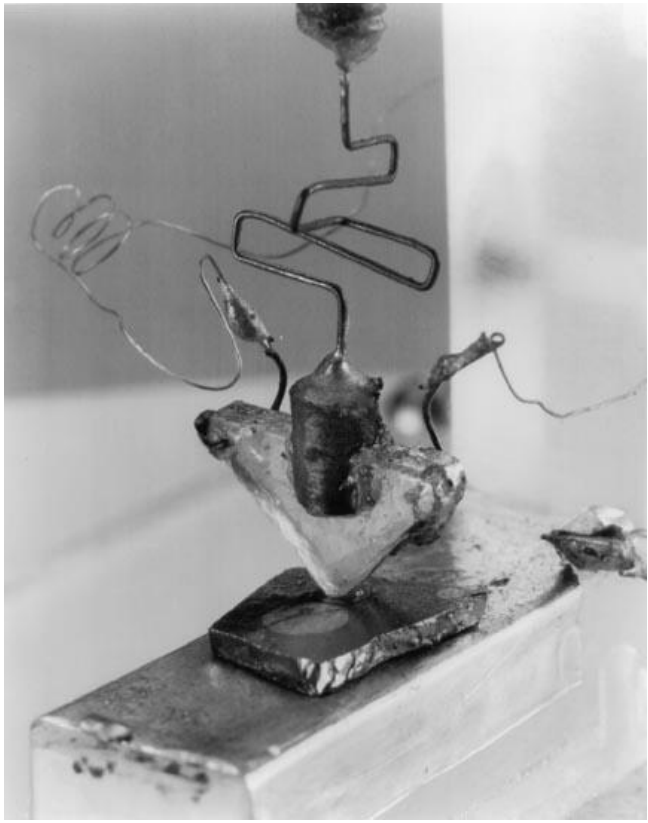
Il diodo

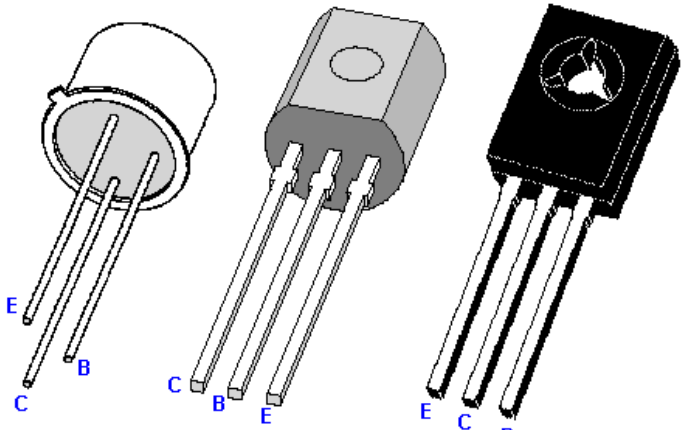

Anode
(+)
Cathode
(−)


Cathode Lead
Metal Contact
N Type Silicon
P Type Silicon
Metal Header
Resin Case
Anode Lead

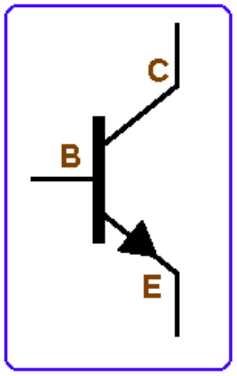
Il transistor(combinazione di TRANSconductance varISTOR)







VARI TIPI DI TRANSISTORI



SIMBOLO DI UN TRANSISTOR NPN

Replica del primo transistor
Inventato presso i laboratori
Bell nel 1947.

Misuriamo (il multimetro)

Accendiamo un LED

EVERLIGHT

Technical Data Sheet

5 mm Round White LED (T-1 3/4) **Preliminary**

334-15/T1C1-4WYA

Features

- Popular T-1 3/4 colorless 5mm package.
- High luminous power.
- Typical chromaticity coordinates x=0.30, y=0.29 according to CIE1931.
- Bulk, available taped on reel.
- ESD-withstand voltage: up to 4KV
- The product itself will remain within RoHS compliant version.

Descriptions

- The series is designed for application required high luminous intensity.
- The phosphor filled in the reflector converts the blue emission of InGaN chip to ideal white.

Applications

- Outdoor Displays
- Optical Indicators
- Backlighting
- Marker Lights

Device Selection Guide

PART NO.	Chip		Lens Color
	Material	Emitted Color	
334-15/T1C1-4WYA	InGaN	White	Water Clear

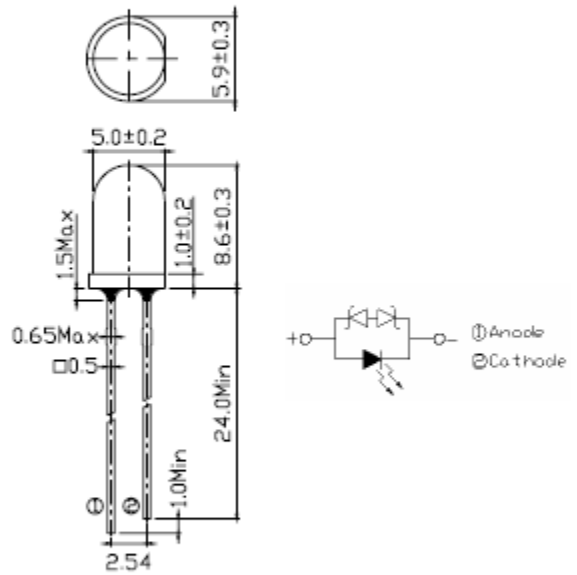
Accendiamo un LED (cont.)

EVERLIGHT

Technical Data Sheet
5 mm Round White LED (T-1 3/4) **Preliminary**

334-15/T1C1-4WYA

Package Dimensions



Notes:

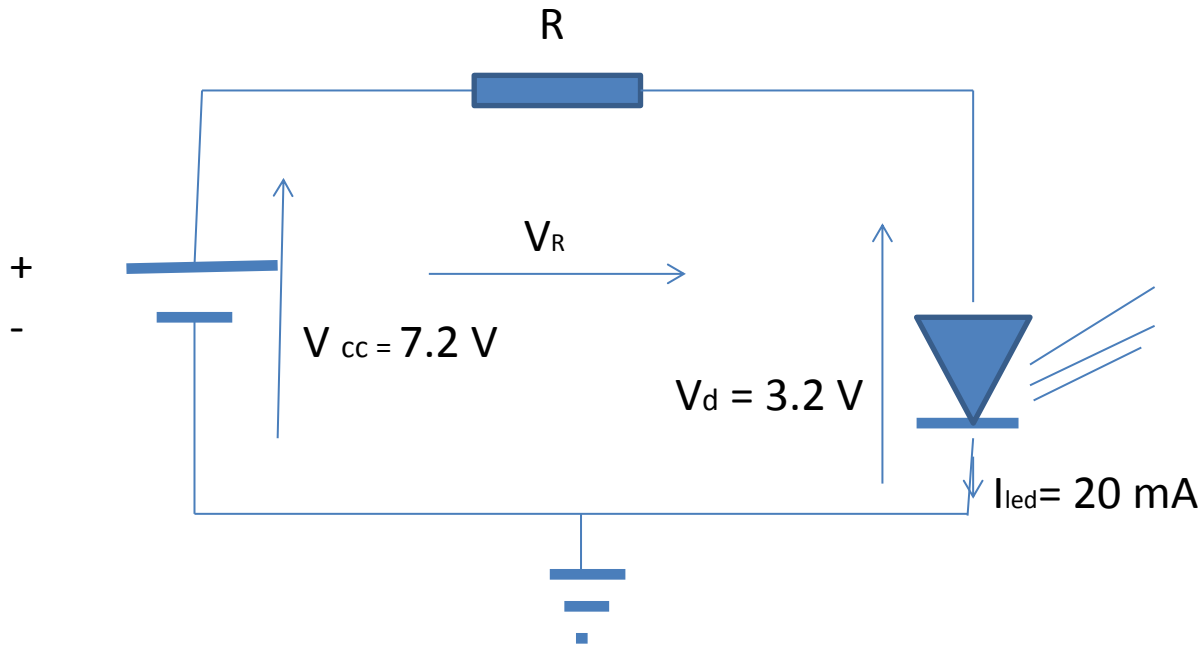
1.All dimensions are in millimeters, and tolerance is 0.25mm except being specified.
2.Lead spacing is measured where the lead emerges from the package.
3.Protruded resin under flange is 1.5mm Max. LED.

Accendiamo un LED (cont.)

Electro-Optical Characteristics (Ta=25℃)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Forward Voltage	V_F	I_F=20mA	3.0	----	3.6	V
Zener Reverse Voltage	Vz	Iz=5mA	5.2	----	----	V
Reverse Current	I_R	V_R=5V	----	----	50	uA
Luminous Intensity	Iv	I_F=20mA	14250	----	28500	mcd
Viewing Angle	2θ 1/2	I_F=20mA	----	15	----	deg
Chromaticity Coordinates	x	I_F=20mA	----	0.30	----	
	y		----	0.29	----	

Accendiamo un LED (cont.)



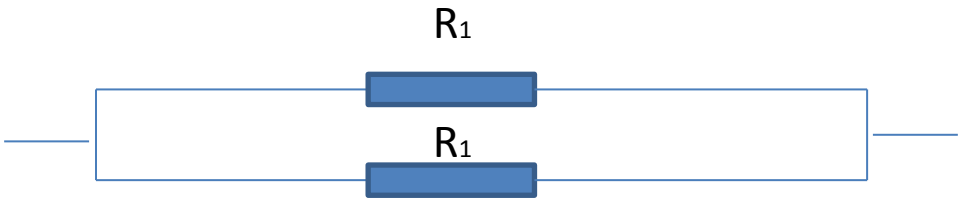
$V_R = V_{cc} + V_d = 7.2 - 3.2 = 4.0$ V

$V_R = I_{led} * R = 0.02 * R = 4.0$

$R = 4.0/0.02 = 200\ \Omega$

$R_{eq} = 1/(1/R1)+(1/R1)$

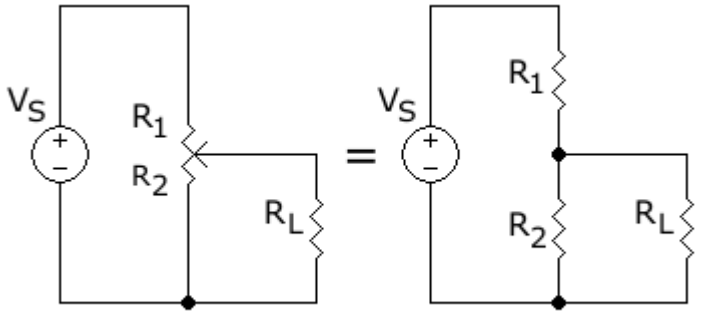
$R_{eq} = 1/(1/470)+(1/470) = 235{,}294$

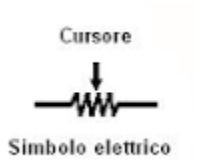


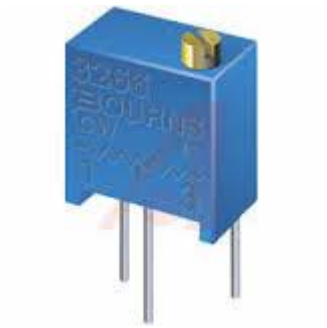
Resitori variabili

Trimmer

Il trimmer è costituito da un cilindro isolante su cui è fittamente avvolto un filo metallico con resistività opportuna, le due estremità sono connesse a due morsetti. Longitudinalmente al cilindro e da un'estremità all'altra, scorre un cursore recante un contatto strisciante sul filo, a sua volta collegato ad un morsetto.

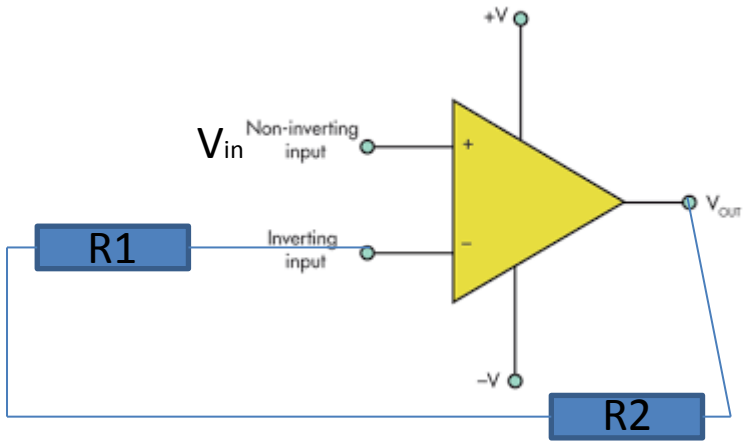






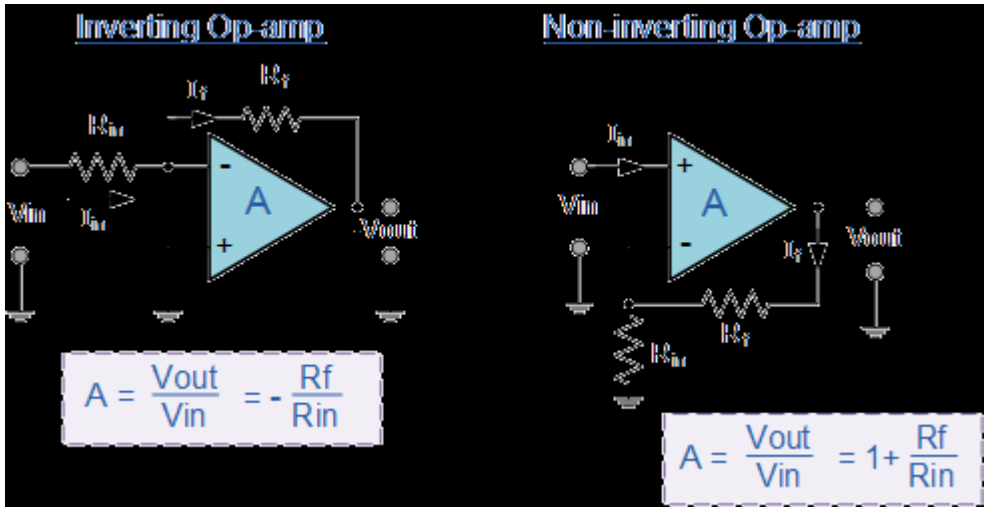
Amplificazione

Amplificatore operazionale (OPAMP)



Non inverting Gain= $V_{out}/V_{in}=1+(R2/R1)$

Inverting Gain= Vout/Vin=(R2/R1)



Amplifichiamo (cont)

TL082 Operational amplifier (data sheet)

TL082 Wide Bandwidth Dual JFET Input Operational Amplifier

Check for Samples: TL082-N

FEATURES

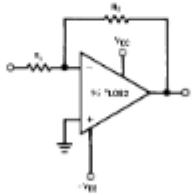
- Internally Trimmed Offset Voltage: 15 mV
- Low Input Bias Current: 50 pA
- Low Input Noise Voltage: 16nV/√Hz
- Low Input Noise Current: 0.01 pA/√Hz
- Wide Gain Bandwidth: 4 MHz
- High Slew Rate: 13 V/µs
- Low Supply Current: 3.6 mA
- High Input Impedance: $10^{12}\Omega$
- Low Total Harmonic Distortion: ≤0.02%
- Low 1/f Noise Corner: 50 Hz
- Fast Settling Time to 0.01%: 2 µs

DESCRIPTION

These devices are low cost, high speed, dual JFET input operational amplifiers with an internally trimmed input offset voltage (BI-FET II™ technology). They require low supply current yet maintain a large gain bandwidth product and fast slew rate. In addition, well matched high voltage JFET input devices provide very low input bias and offset currents. The TL082 is pin compatible with the standard LM1558 allowing designers to immediately upgrade the overall performance of existing LM1558 and most LM358 designs.

These amplifiers may be used in applications such as high speed integrators, fast D/A converters, sample and hold circuits and many other circuits requiring low input offset voltage, low input bias current, high input impedance, high slew rate and wide bandwidth. The devices also exhibit low noise and offset voltage drift.

Typical Connection



Connection Diagram

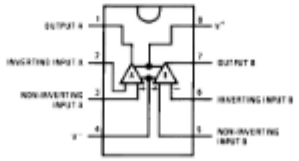


Figure 1. PDIP/SOIC Package (Top View)
See Package Number D0008A or P0008E

Prototipiamo

Amplificazione X 3