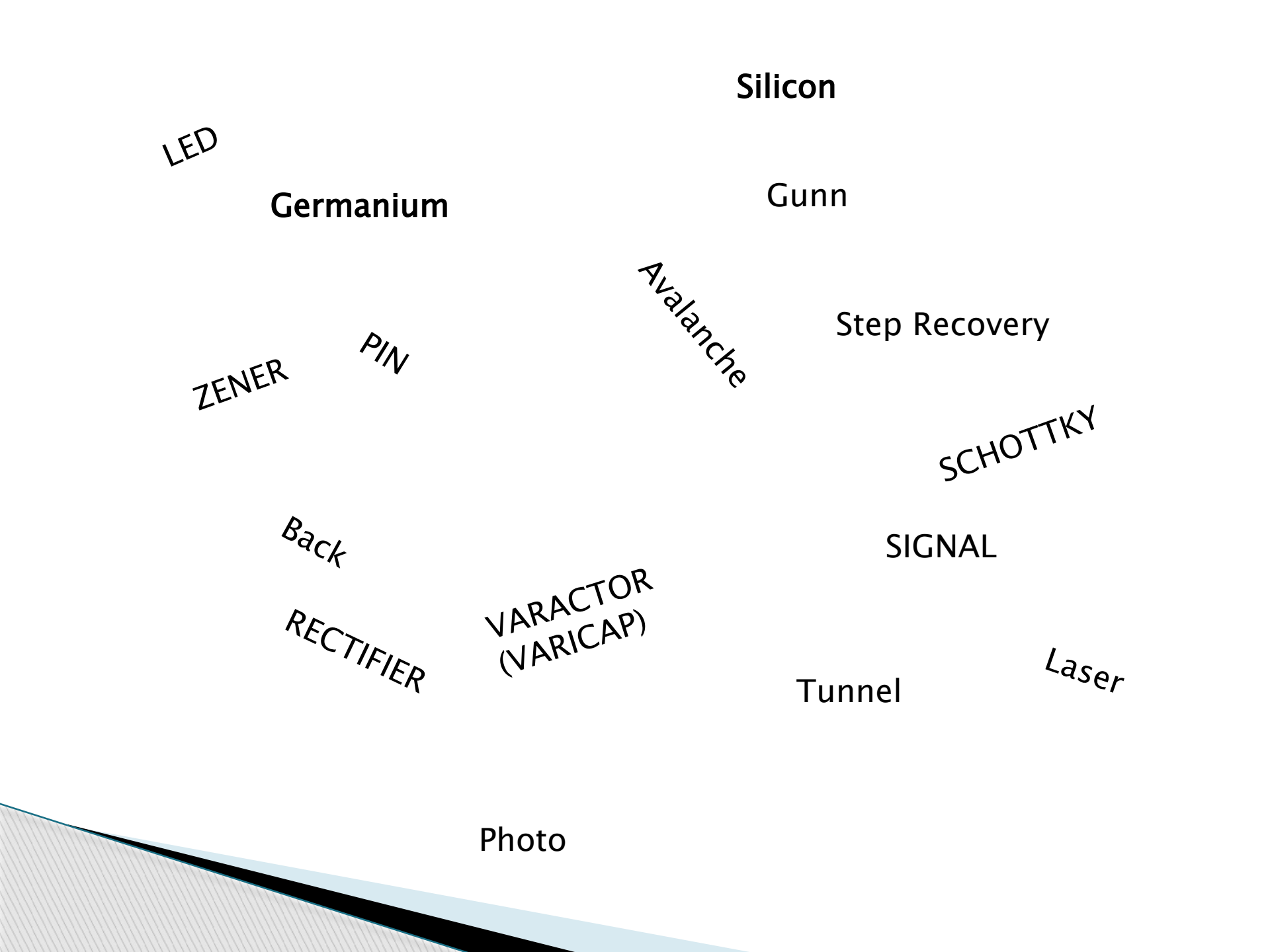
Diodes

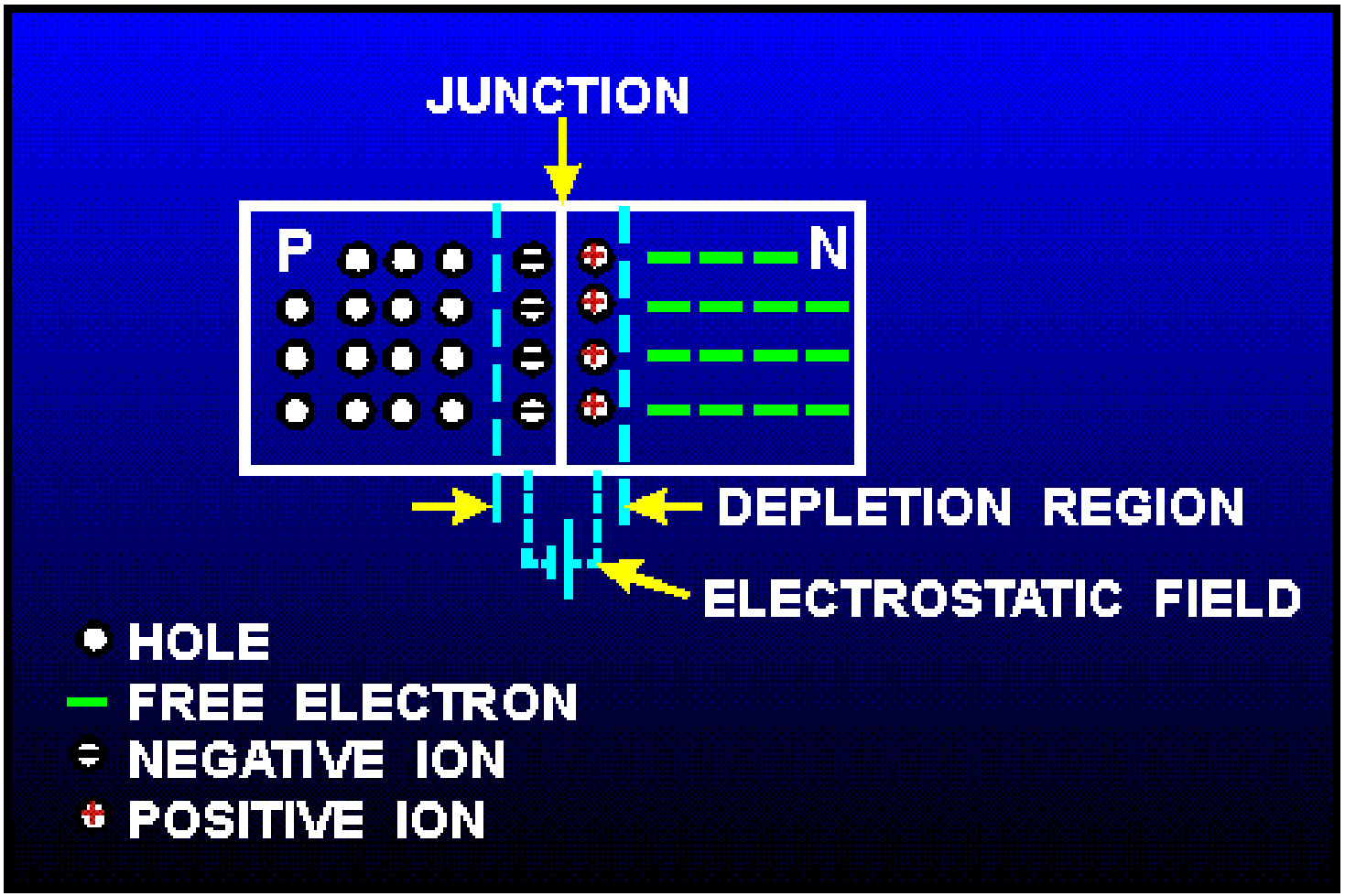
Aim

- Basic theory
- Types
- Tricks / Applications

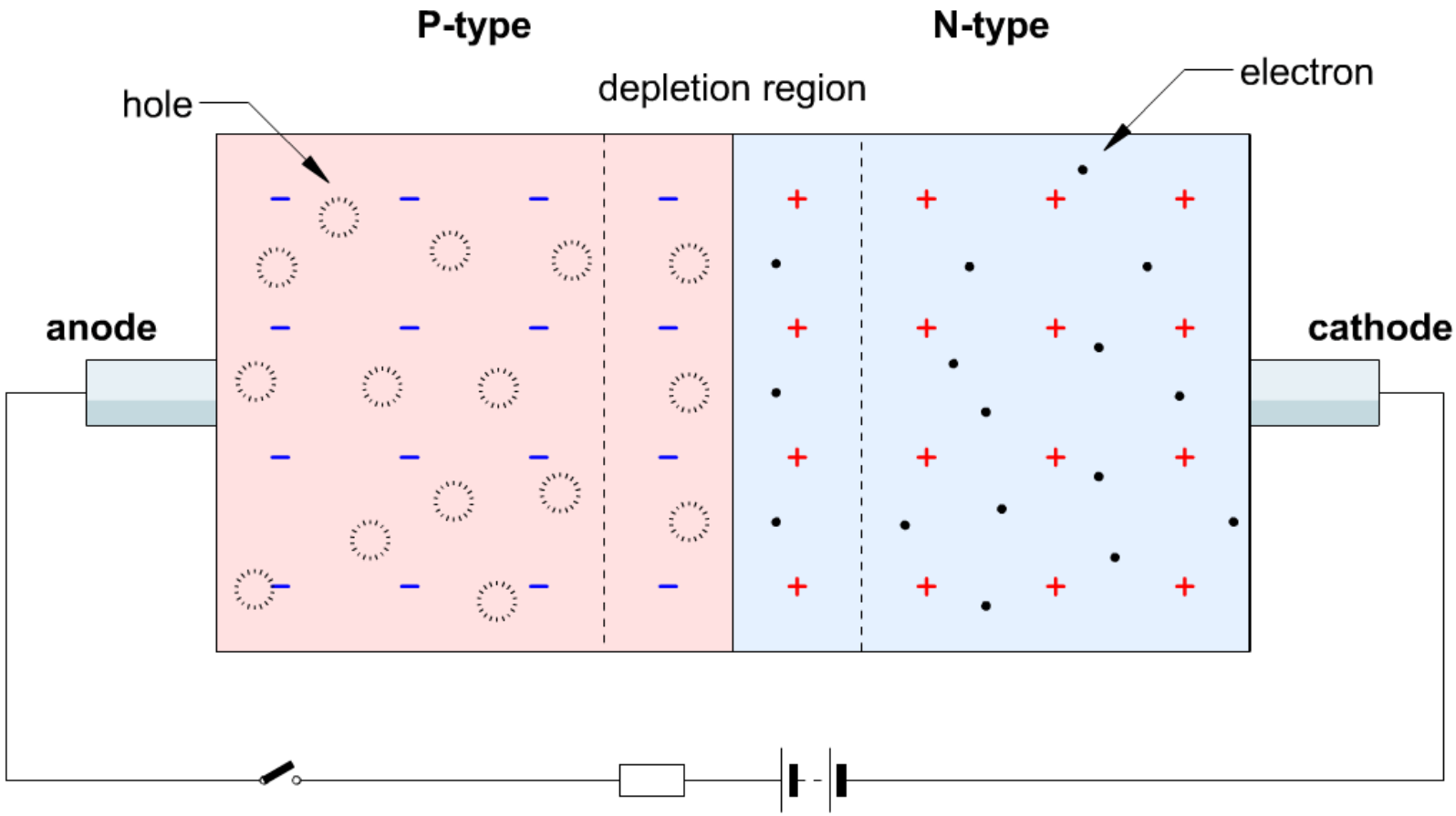

Silicon
LED
Germanium
Gunn
Avalanche
Step Recovery
ZENER
PIN
SCHOTTKY
Back
SIGNAL
VARACTOR
(VARICAP)
RECTIFIER
Laser
Tunnel
Photo

BASIC THEORY

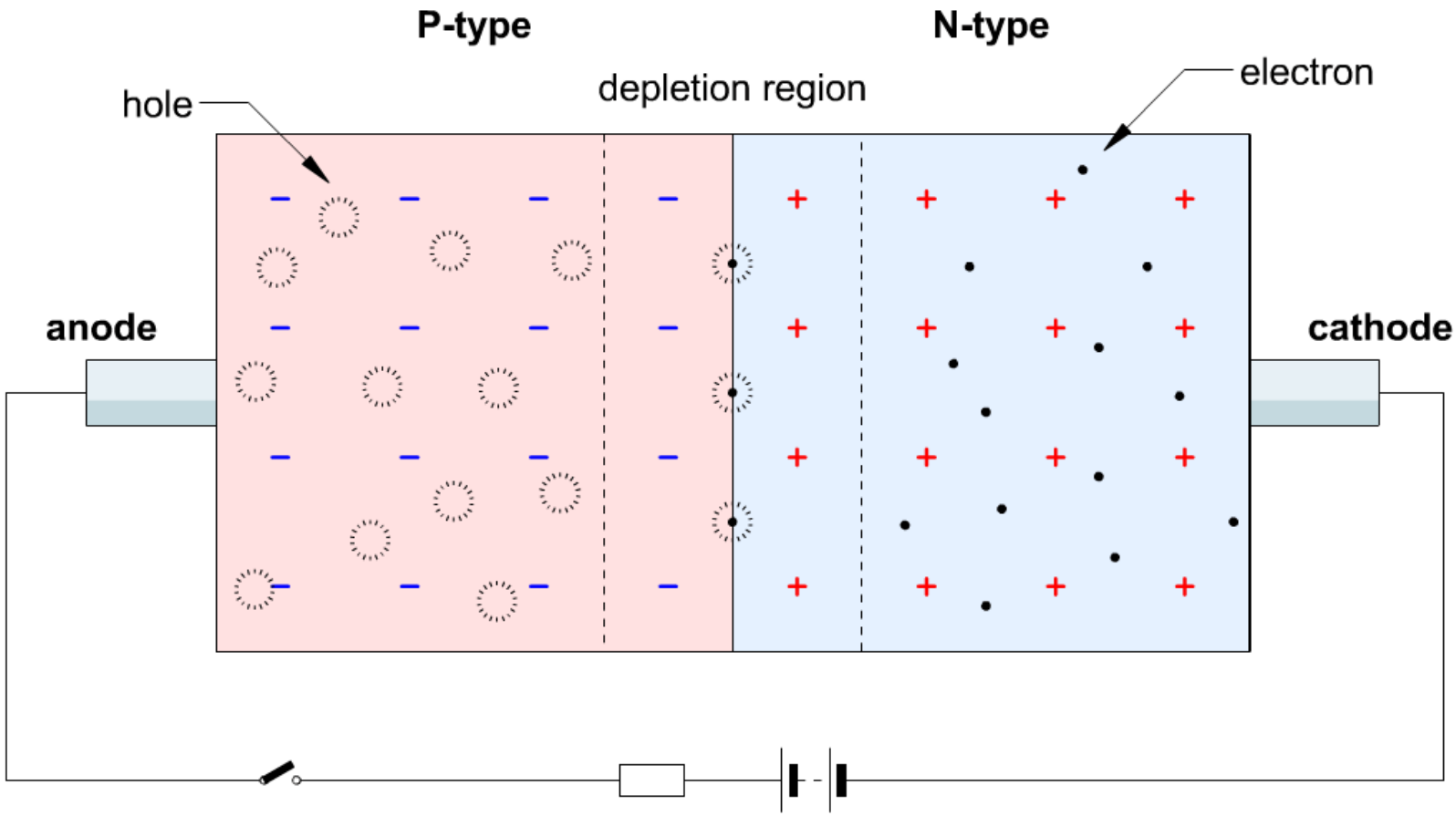
The P–N Junction



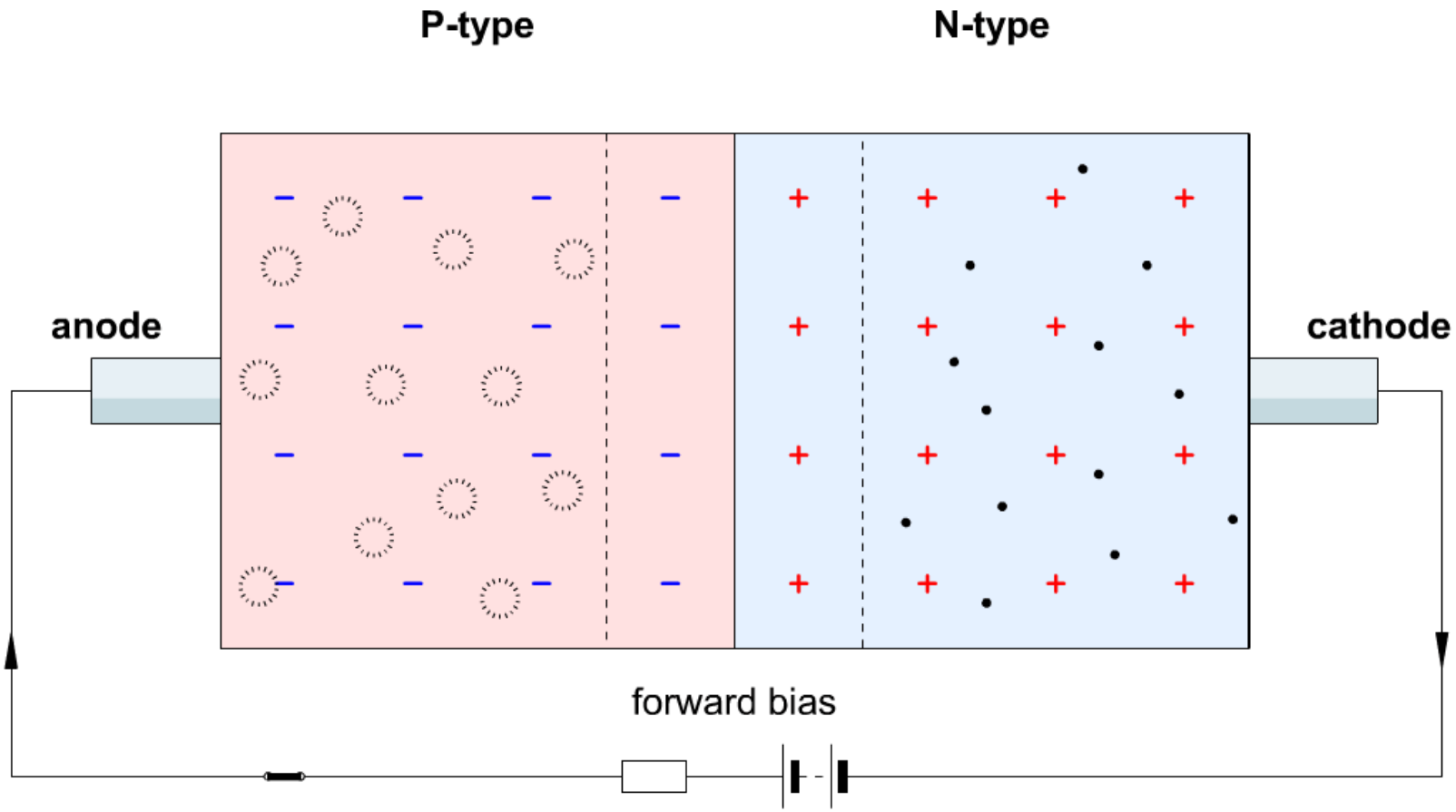
The P–N Junction



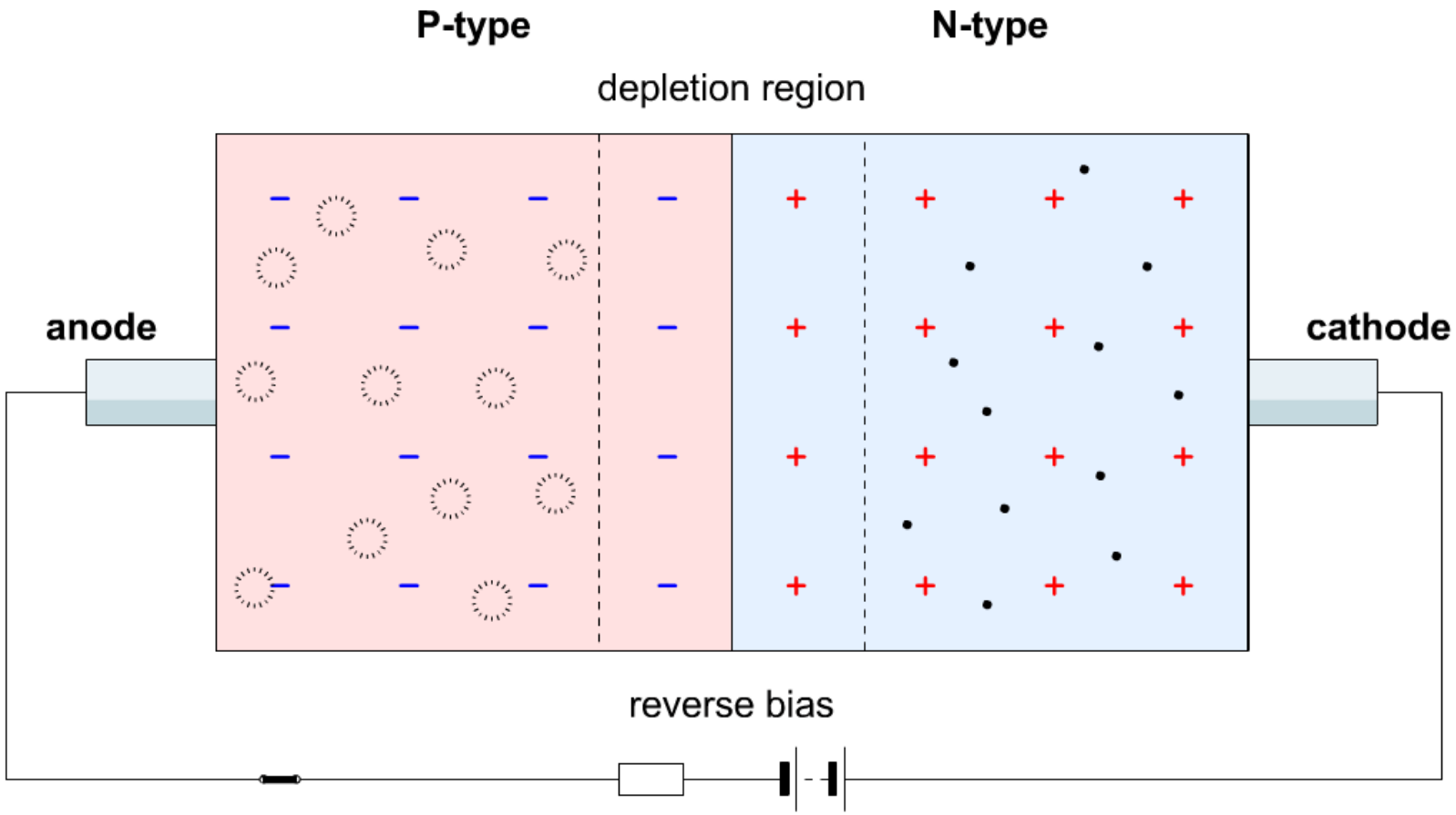
The P–N Junction

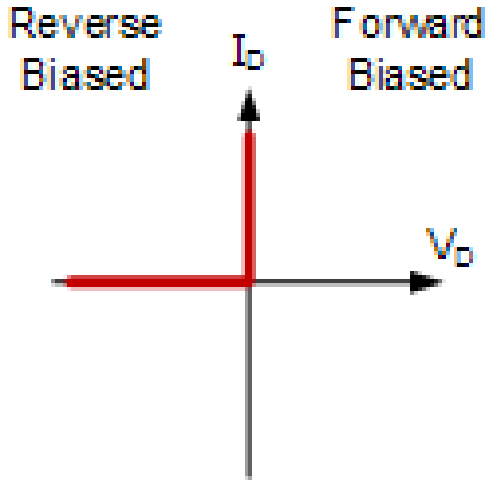


The P–N Junction

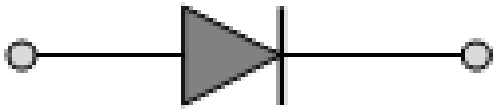


The P–N Junction



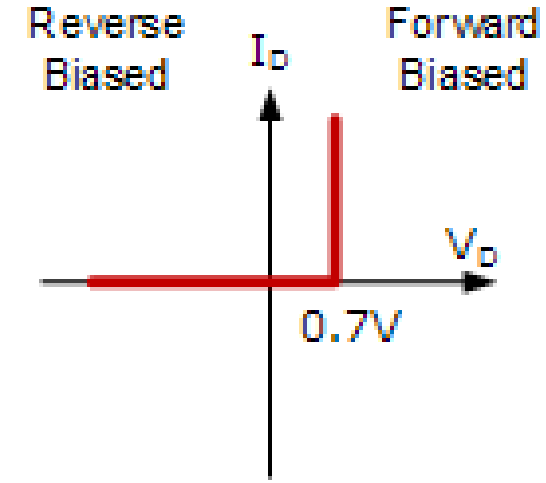


Ideal Diode

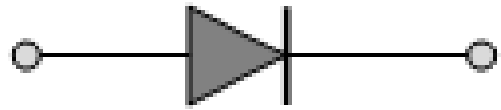


Forward Biased

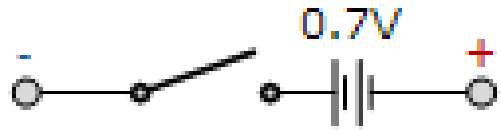
Reverse Biased



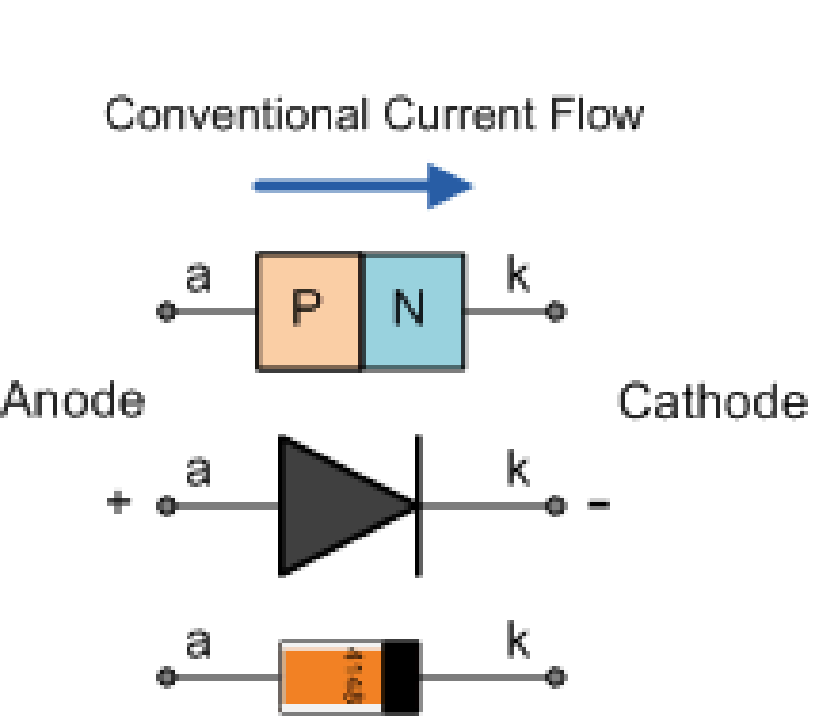
Real Diode

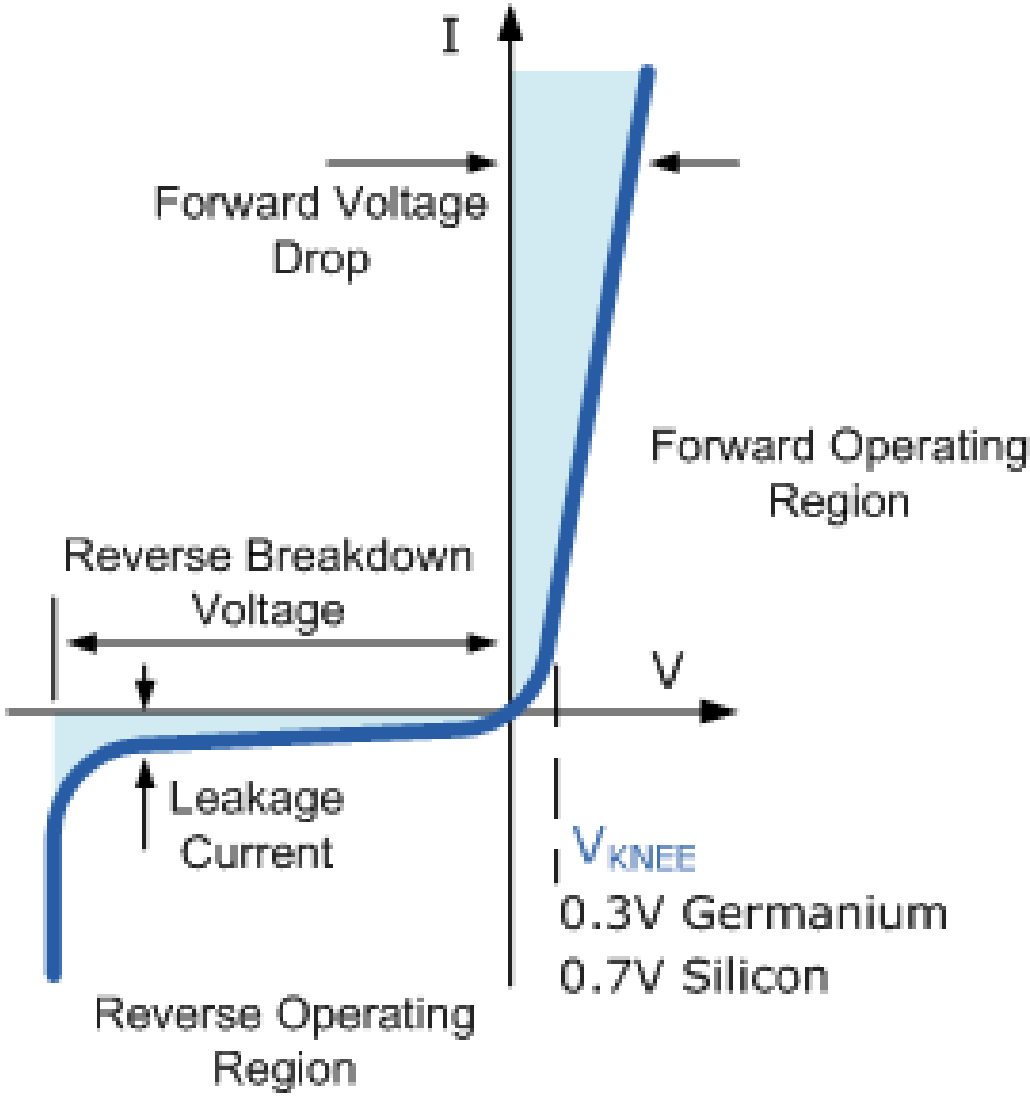


Forward Biased



Reverse Biased





Silicon Diode and its V-I Characteristics

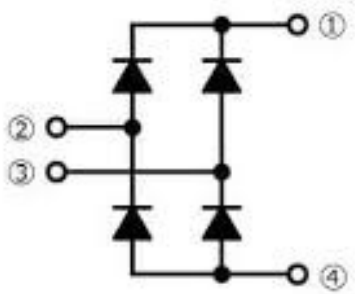
DIODE TYPES

- Silicon (NOT Silicone)
- Germanium
- Junction
- Point contact
- Varicap (varactor)
- Zener
- PIN
- Schottky

Common Types: Rectifiers

1N4001

Bridge Diode

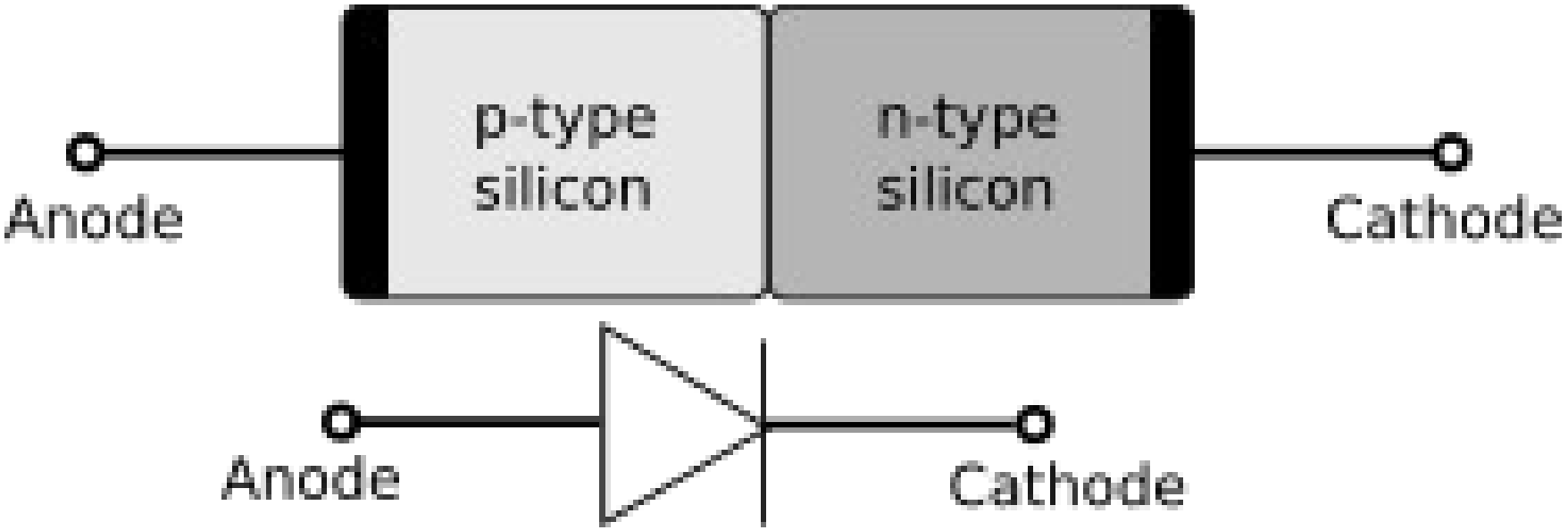


Common Types Signal

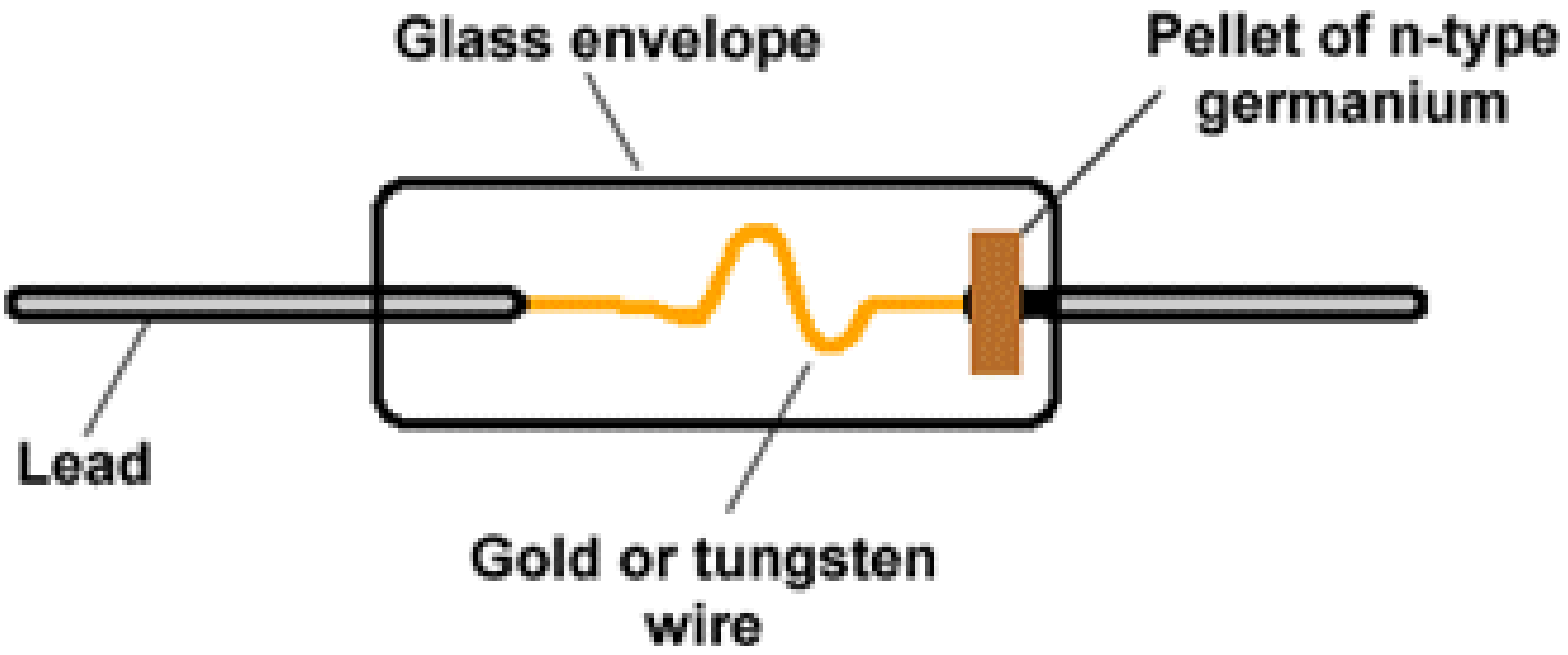
1N914

1N4148

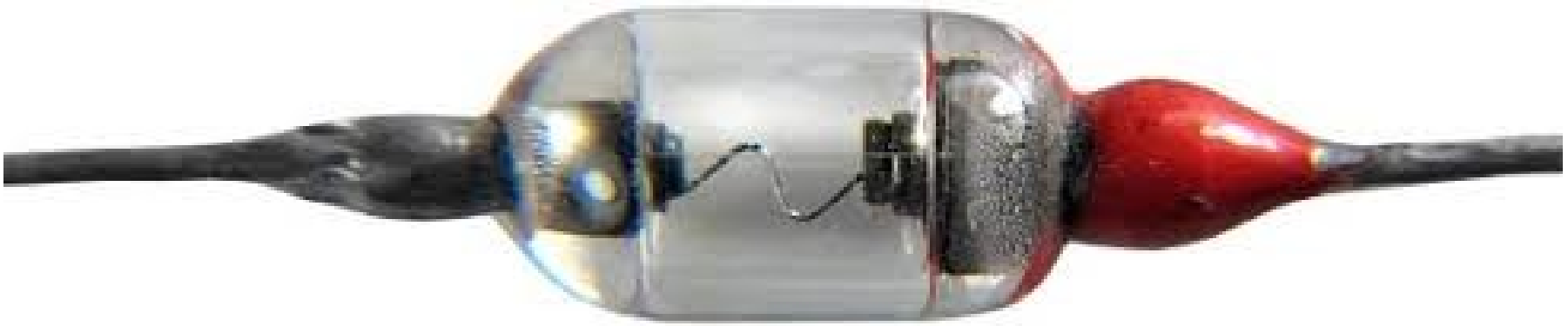
Junction Diode



Point Contact Diode

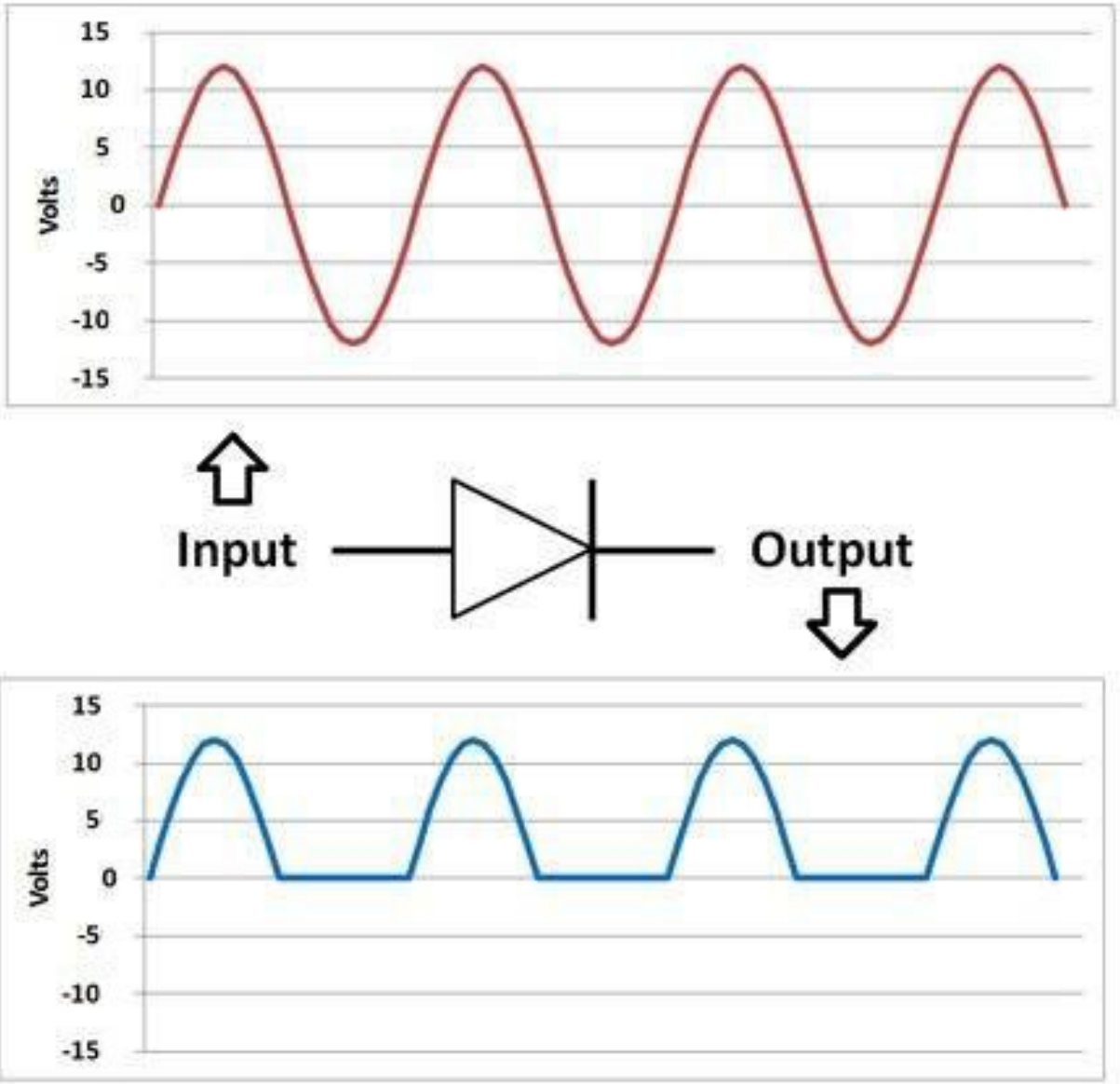


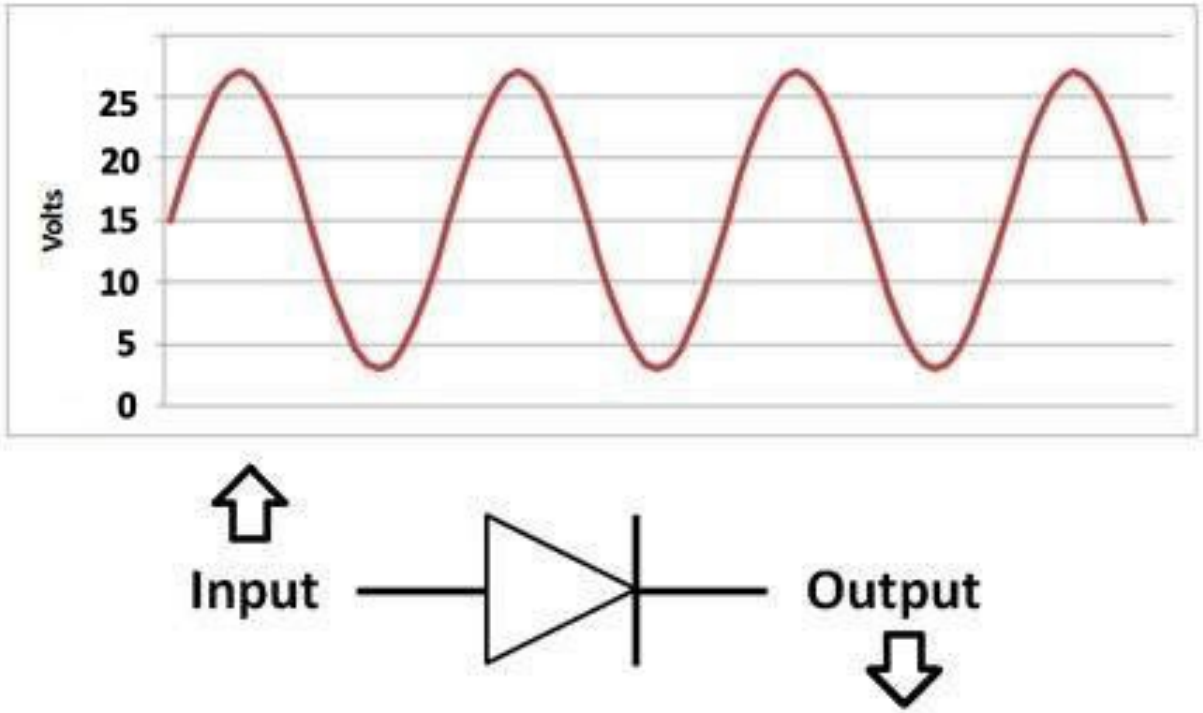
Point Contact Diode

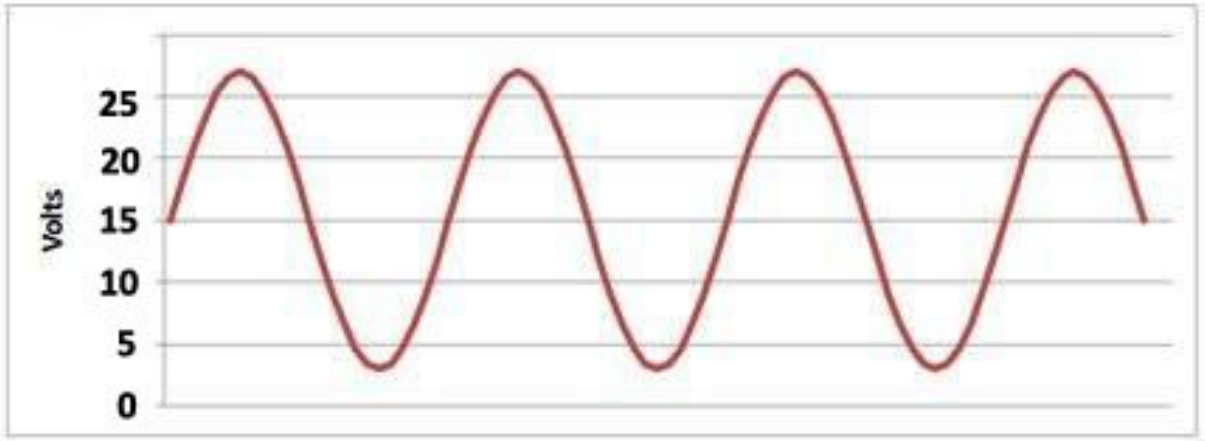


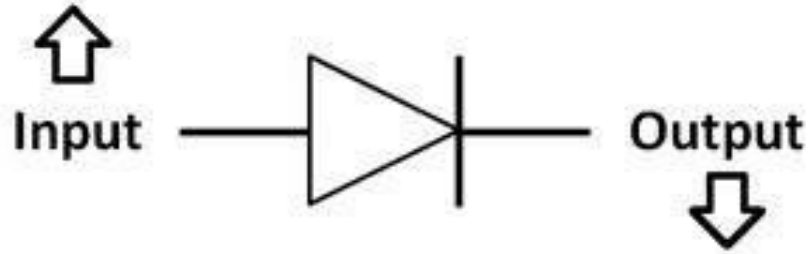
What do they do?

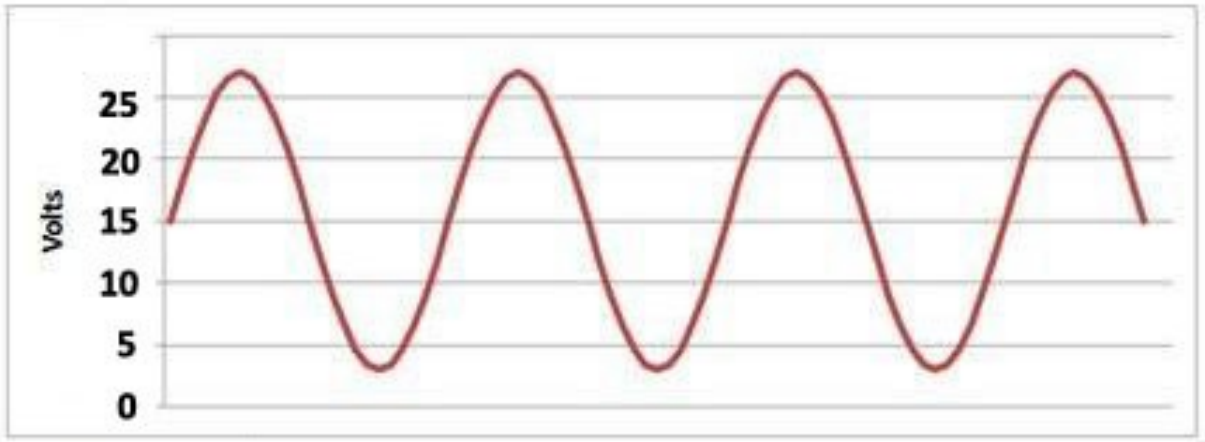
- Rectification
- Switching
- Signal steering
- Voltage regulation
- Protection
- Tuning


15
10
5
0
-5
-10
-15
Volts
Input
Output
15
10
5
0
-5
-10
-15
Volts


Volts
25
20
15
10
5
0
Input
Output

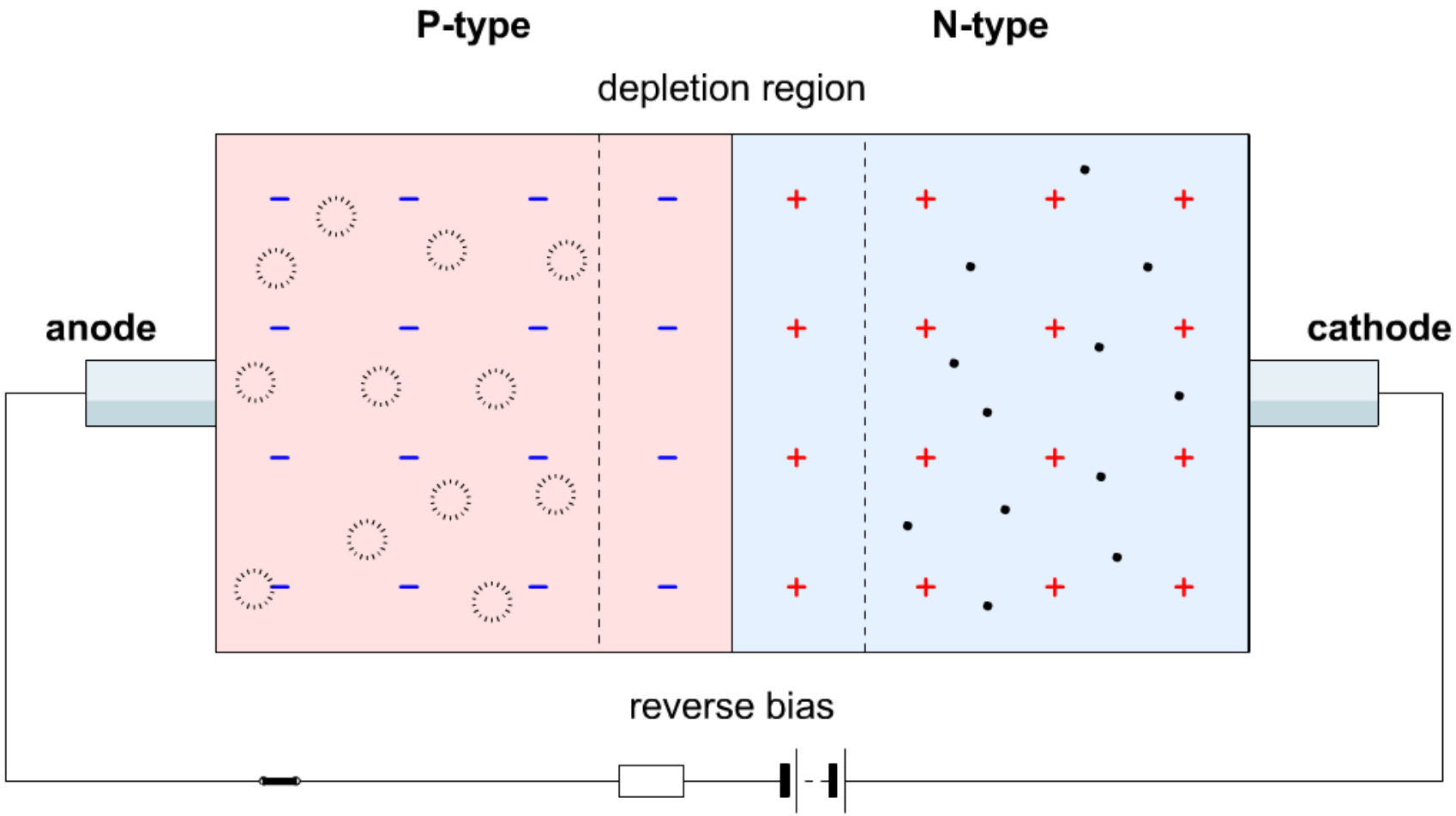

Volts
25
20
15
10
5
0


Input
Output

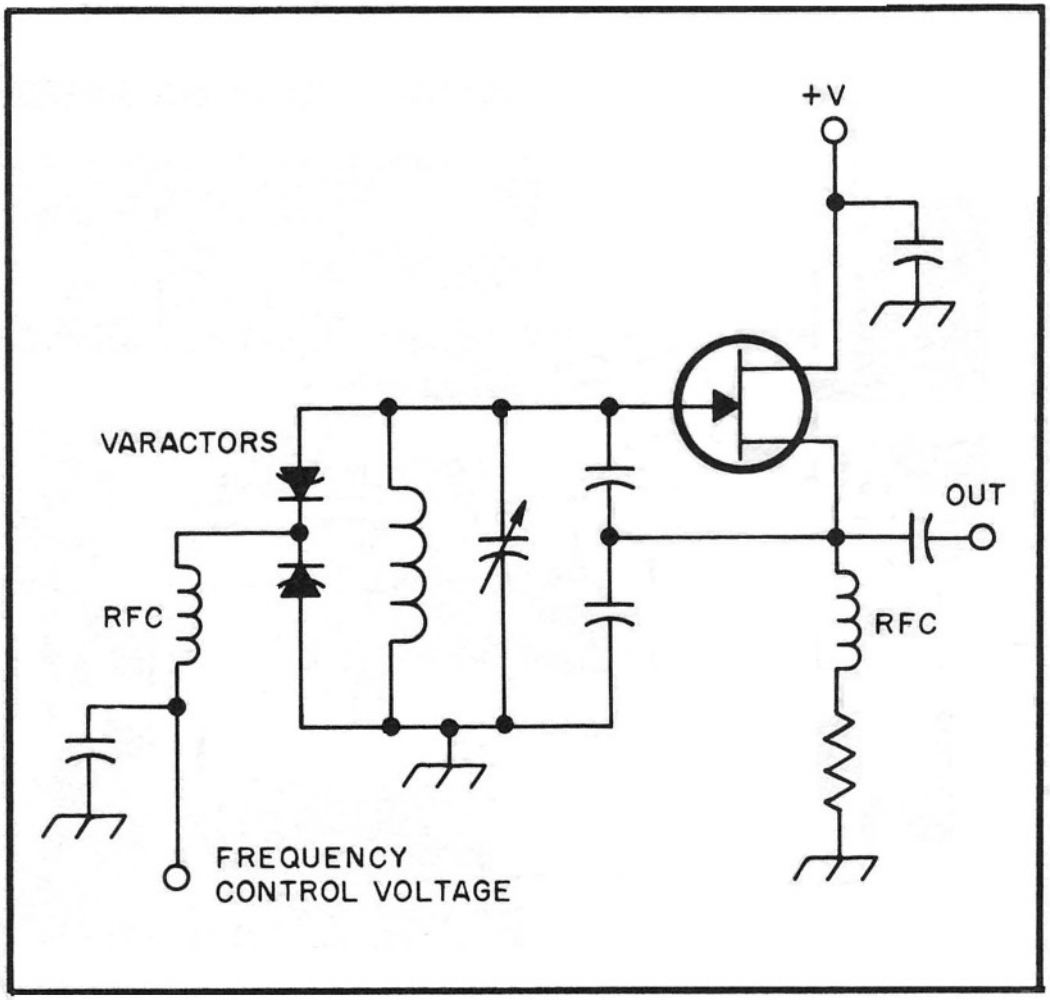

Volts
25
20
15
10
5
0

A forward biased diode will conduct in both directions

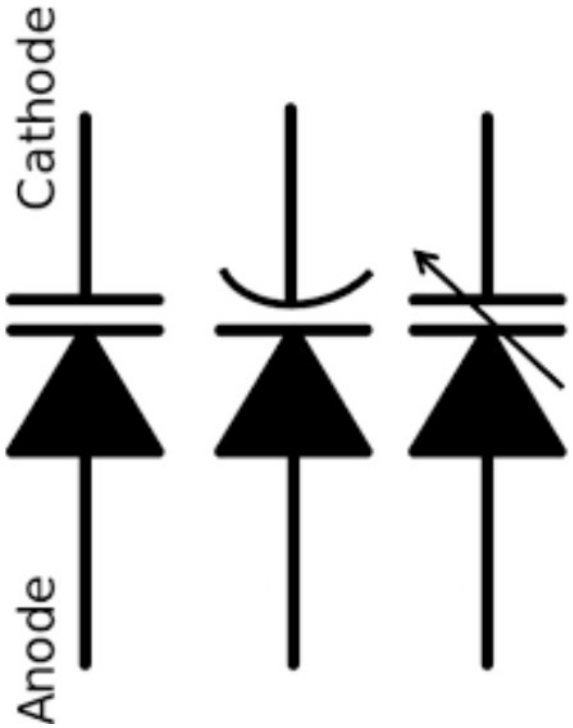
Varicap Diode (Varactor)

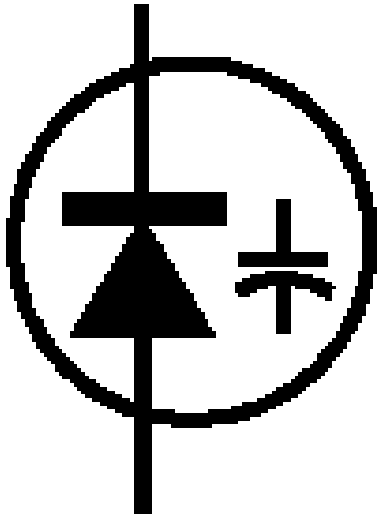


Varicap Diode

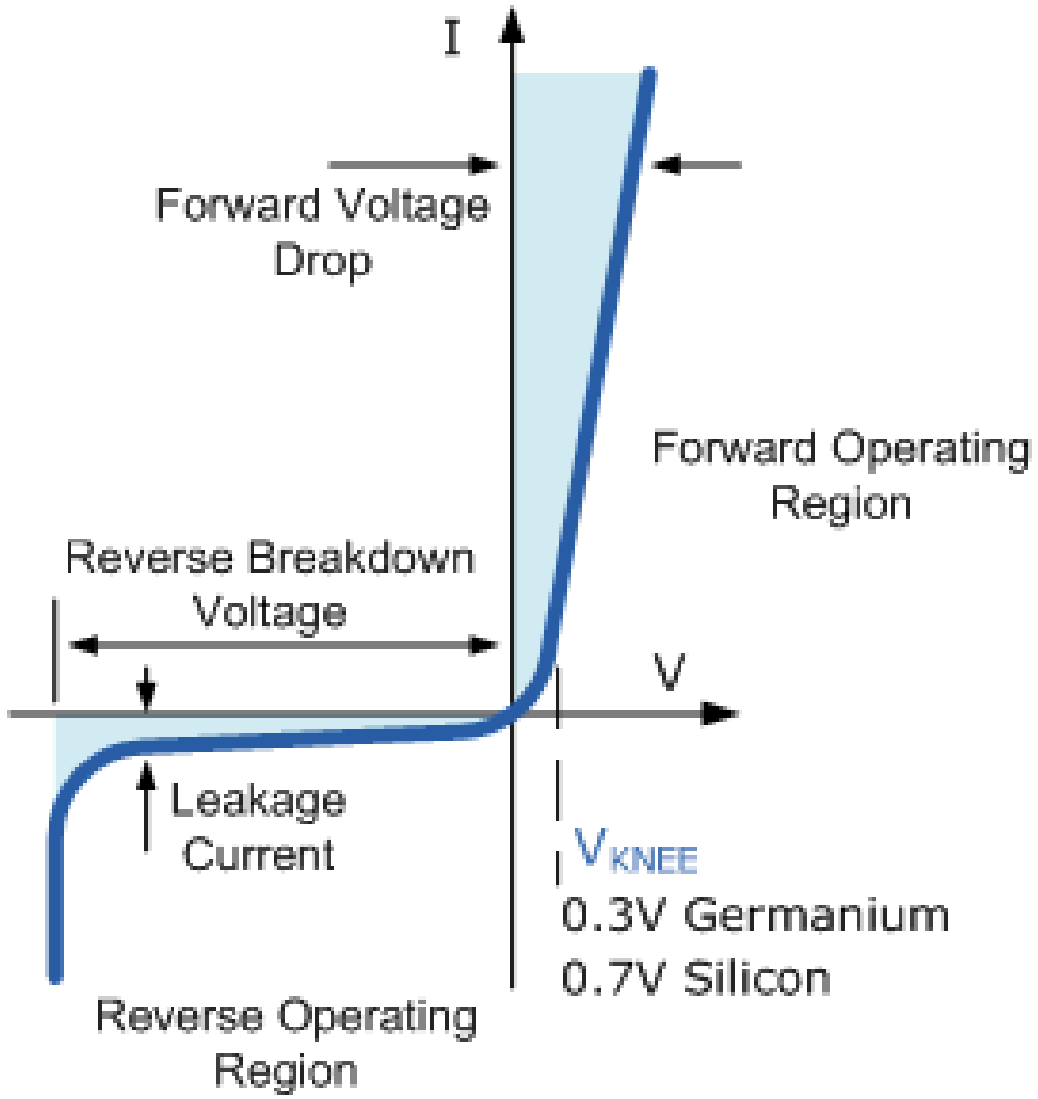


Varicap Diode (Varactor)

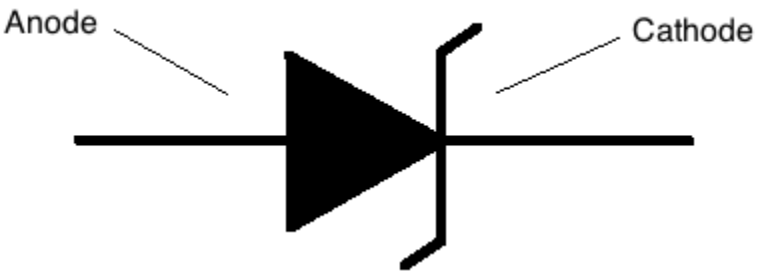




Zener Diode

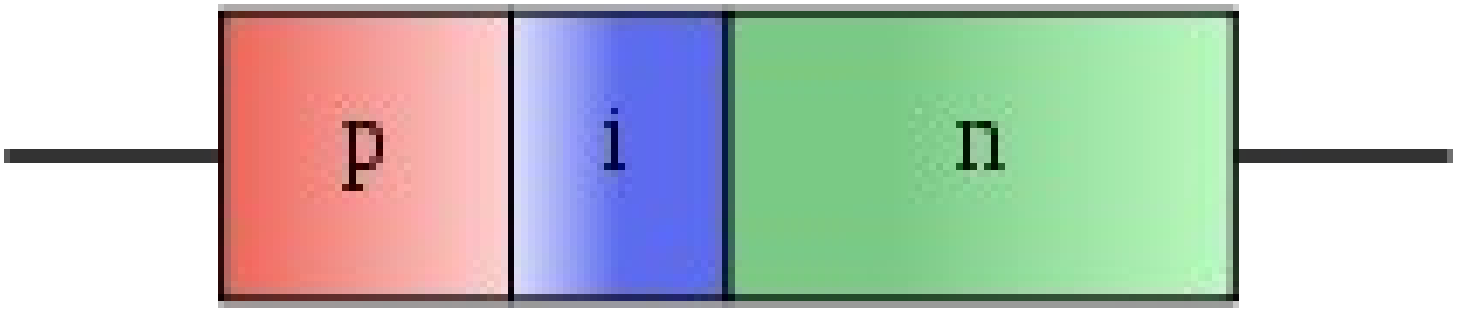

I
Forward Voltage Drop
Forward Operating Region
Reverse Breakdown Voltage
V
Leakage Current
V_{KNEE}
0.3V Germanium
0.7V Silicon
Reverse Operating Region

Avalanche Diode



PIN Diode

- P type / Intrinsic / N type

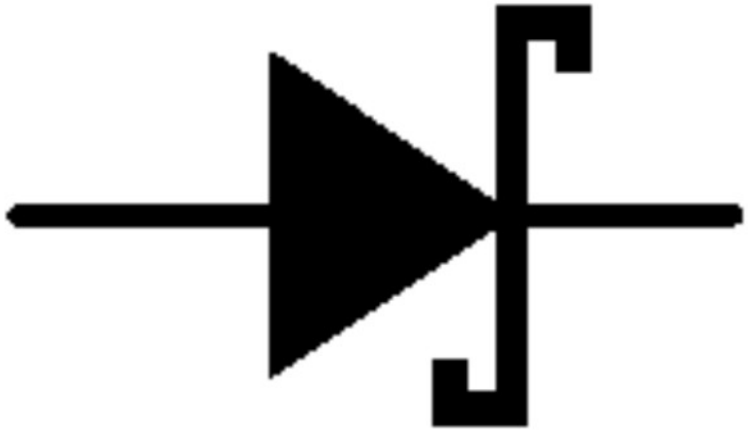


PIN Diode Applications

- RF Switching
- Attenuators

Schottky Diode

- Metal to Semiconductor Junction
- N type silicon
- Hot Carrier Diode
- Used at RF , Fast Switching
- Low Vf – Reverse polarity protection



Applications

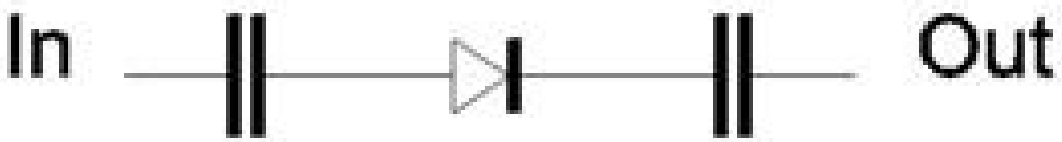
- Switching
- Diode Matrix
- Protection

- Bias tee

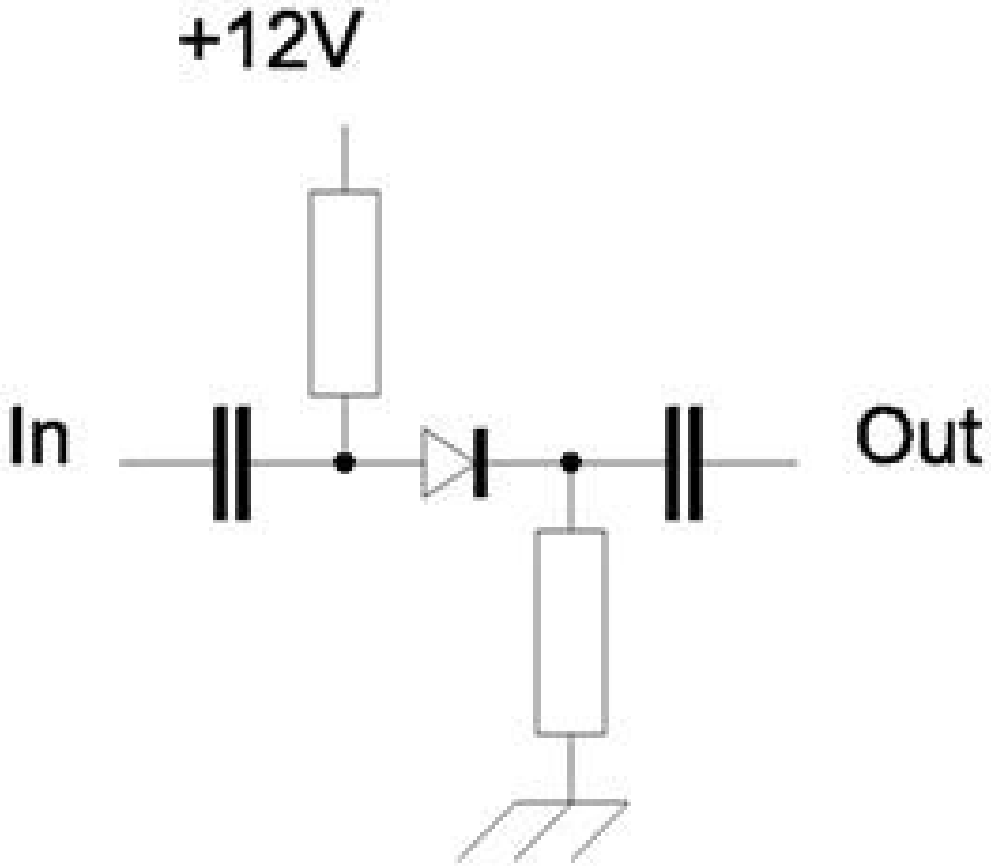
Switching

- Cheap
- DC controlled

Switching

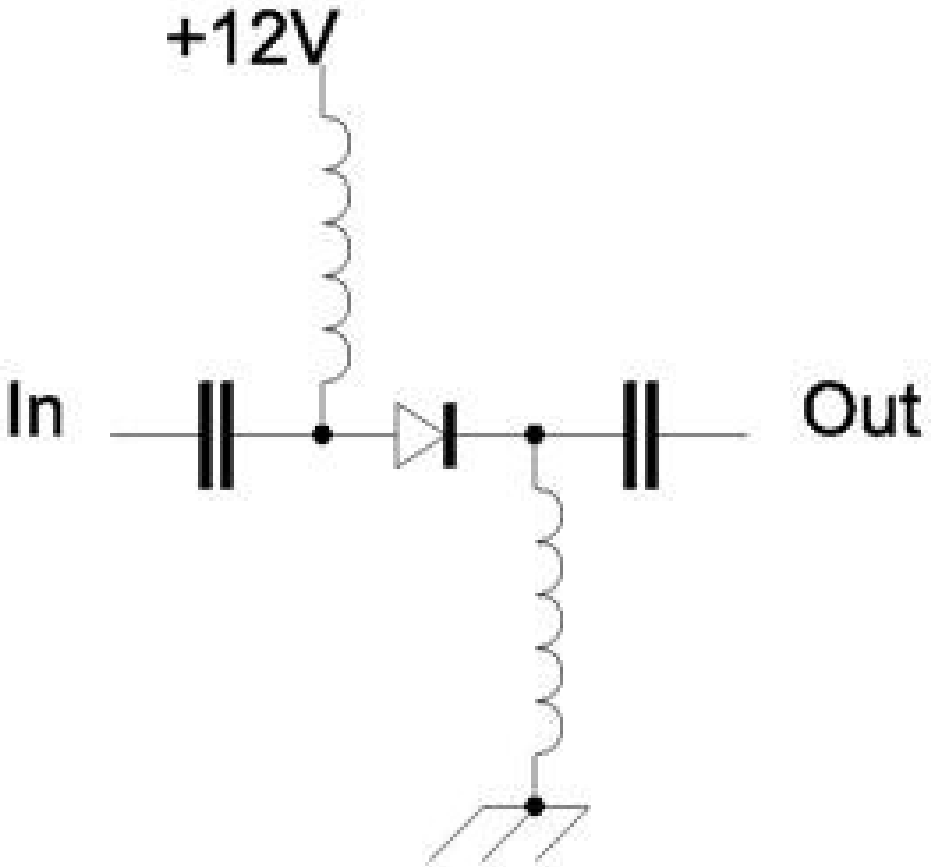


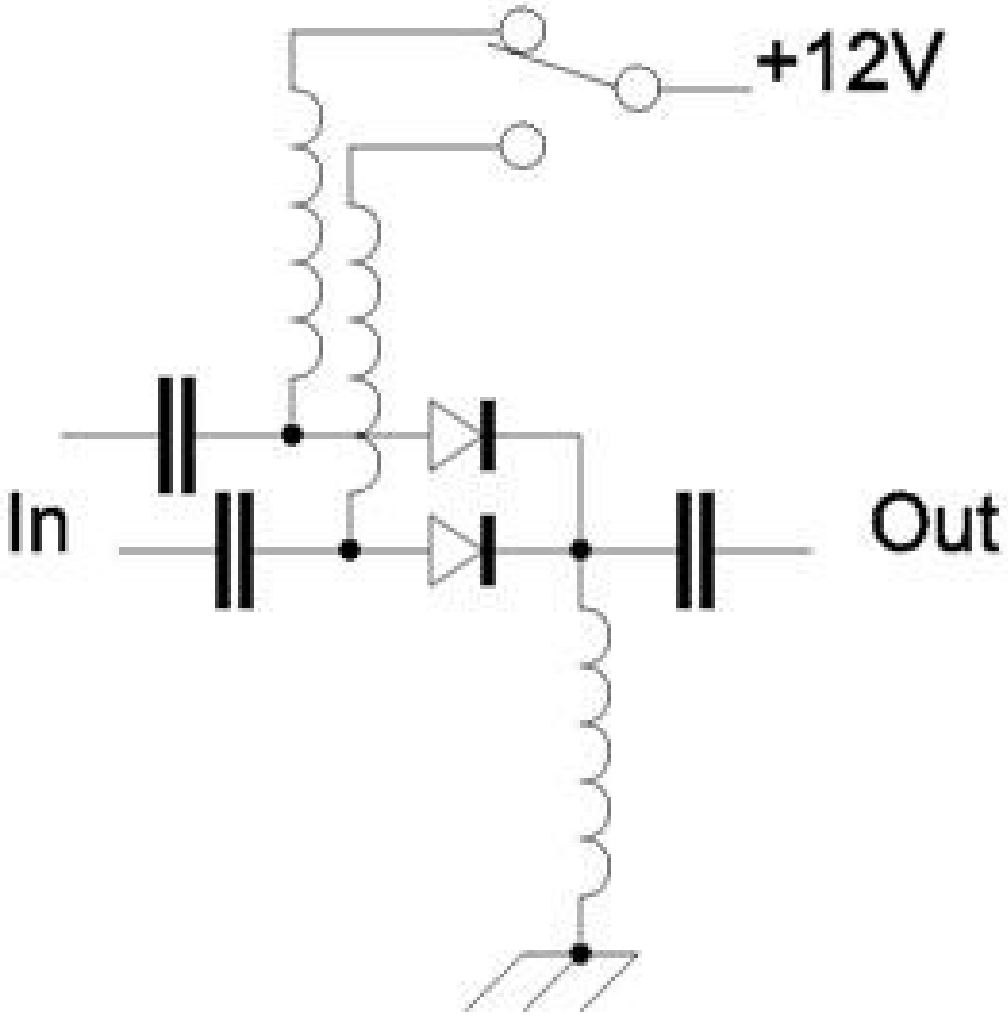
Switching

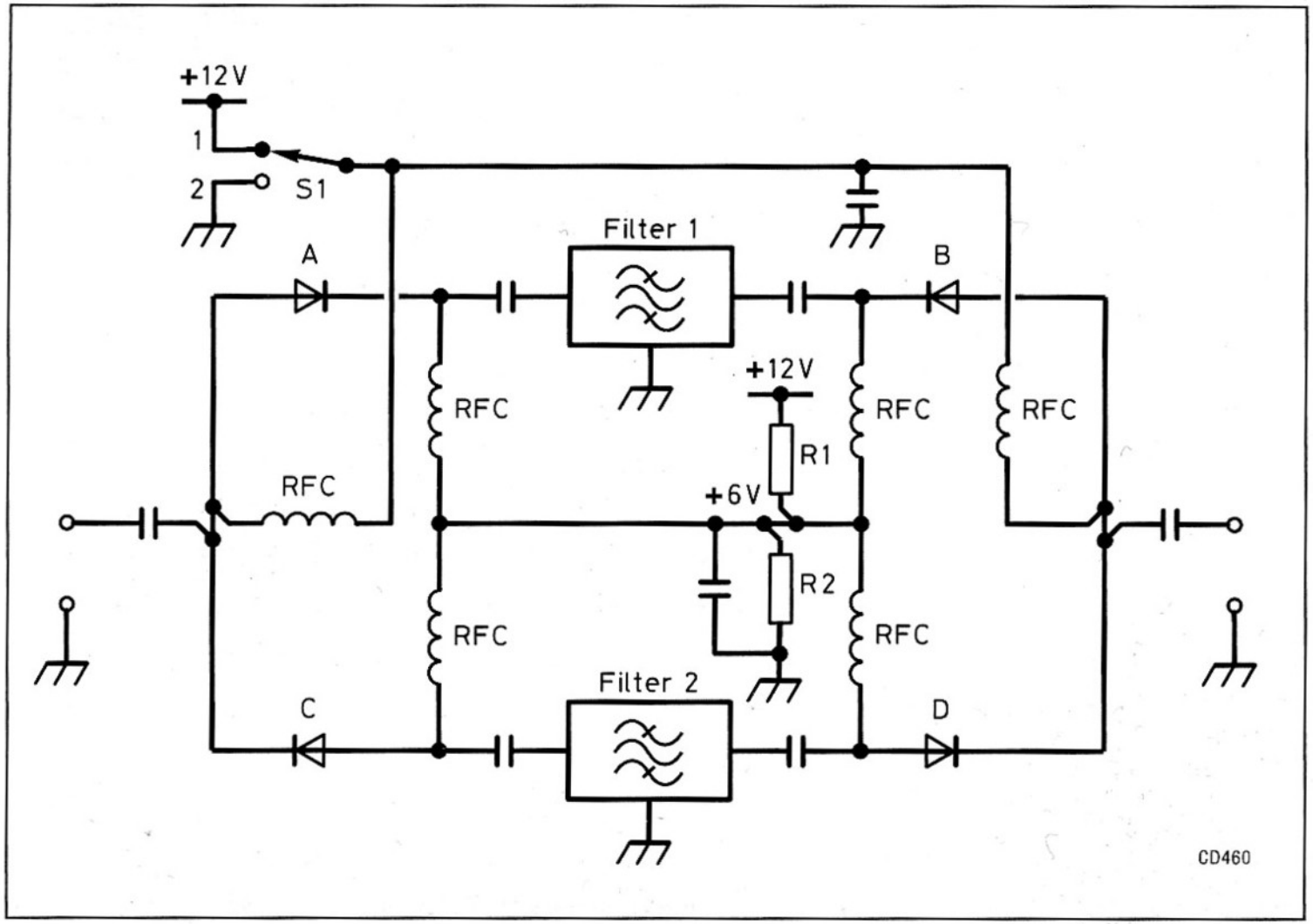


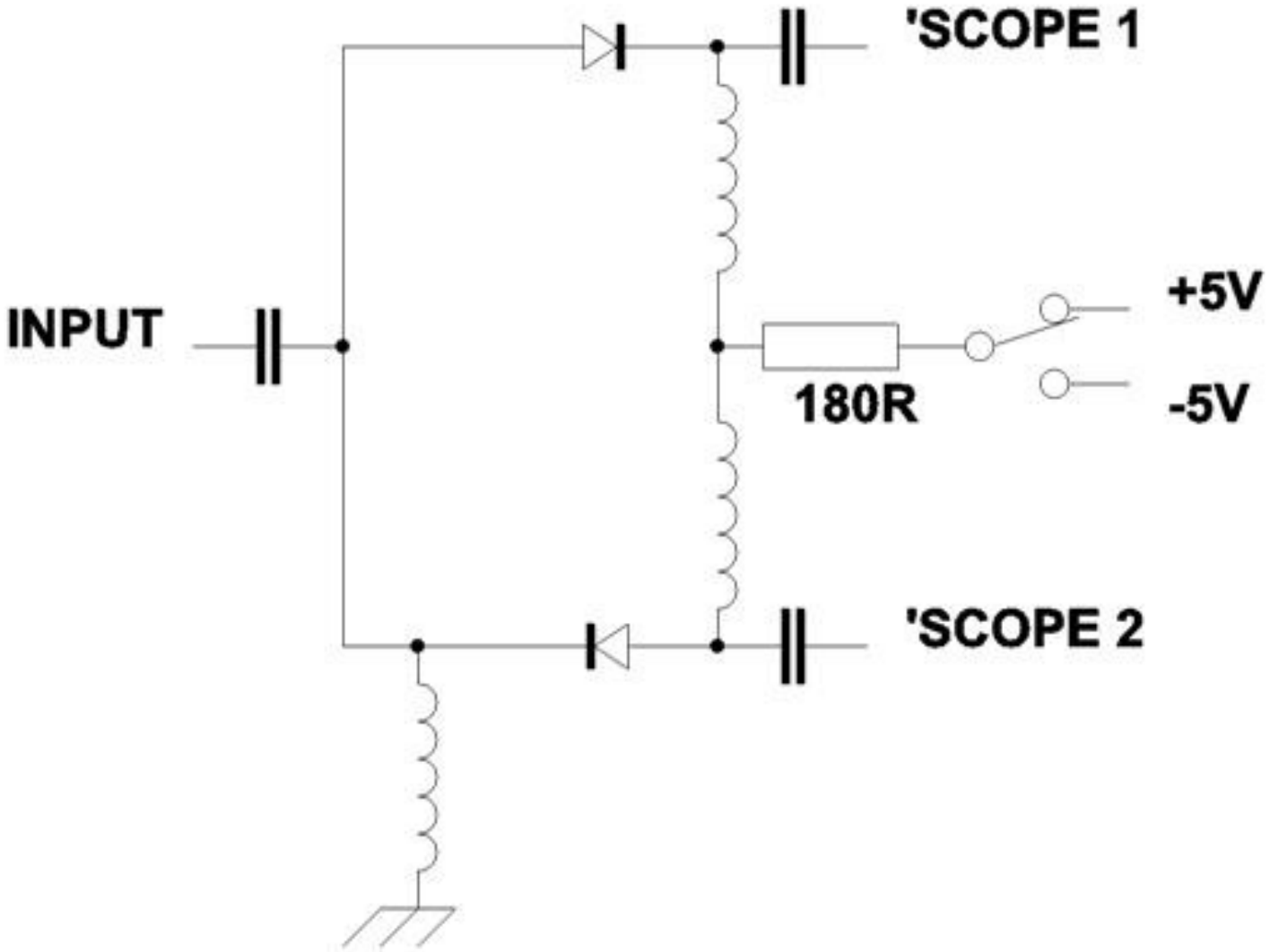
Switching

- Radio Frequencies

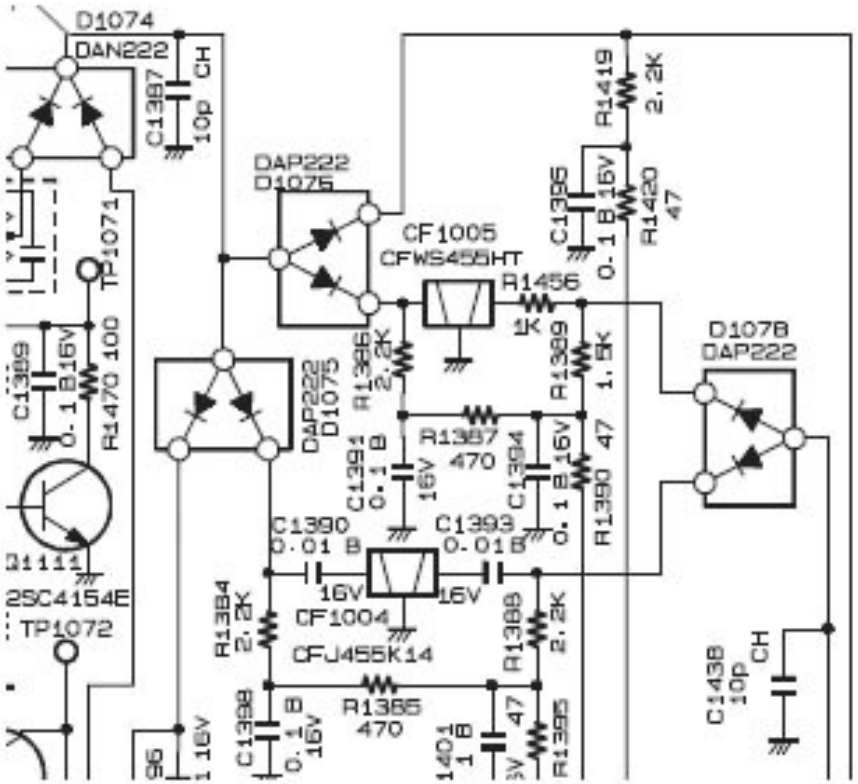



+12V
In
Out

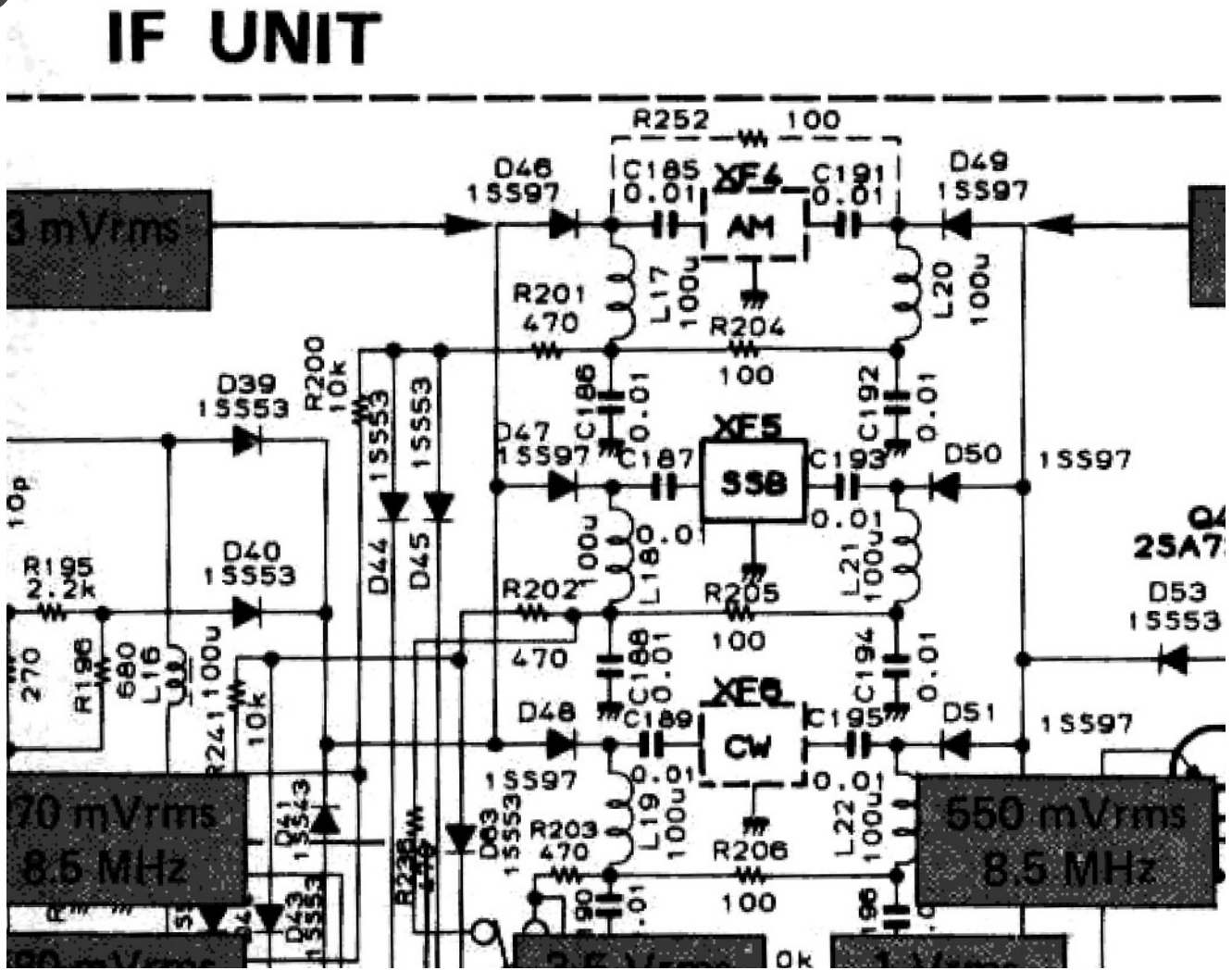

+12V
1
2
S1
A
Filter 1
B
RFC
+12V
R1
RFC
RFC
RFC
+6V
R2
RFC
RFC
C
Filter 2
D
CD460


'SCOPE 1
INPUT
+5V
180R
-5V
'SCOPE 2

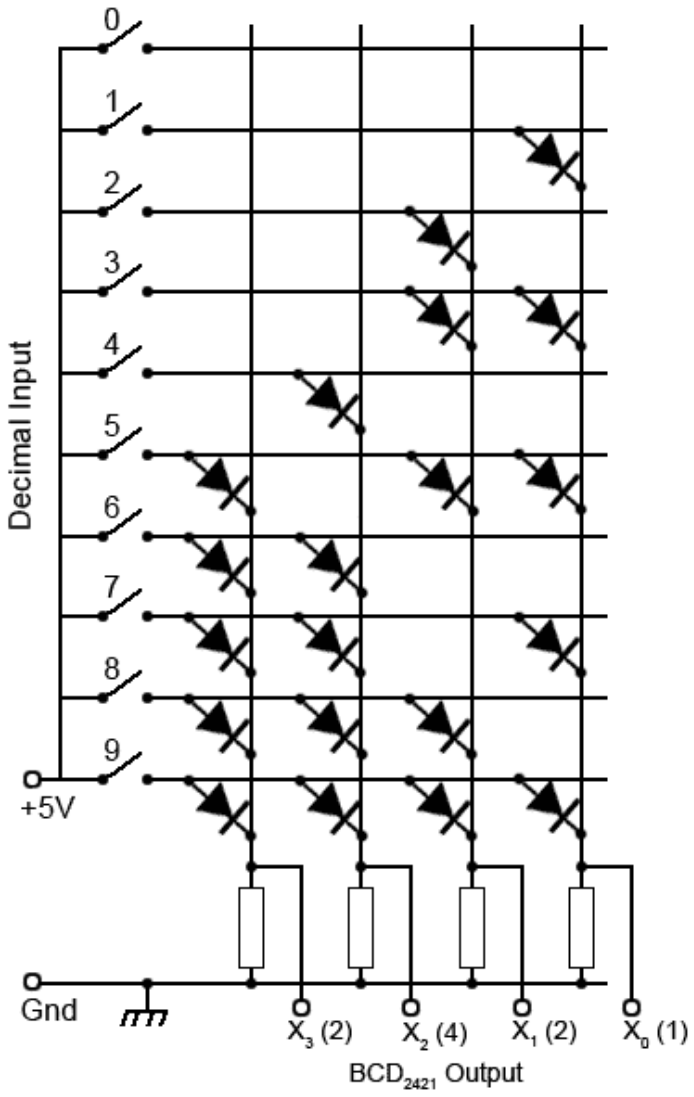
FT817

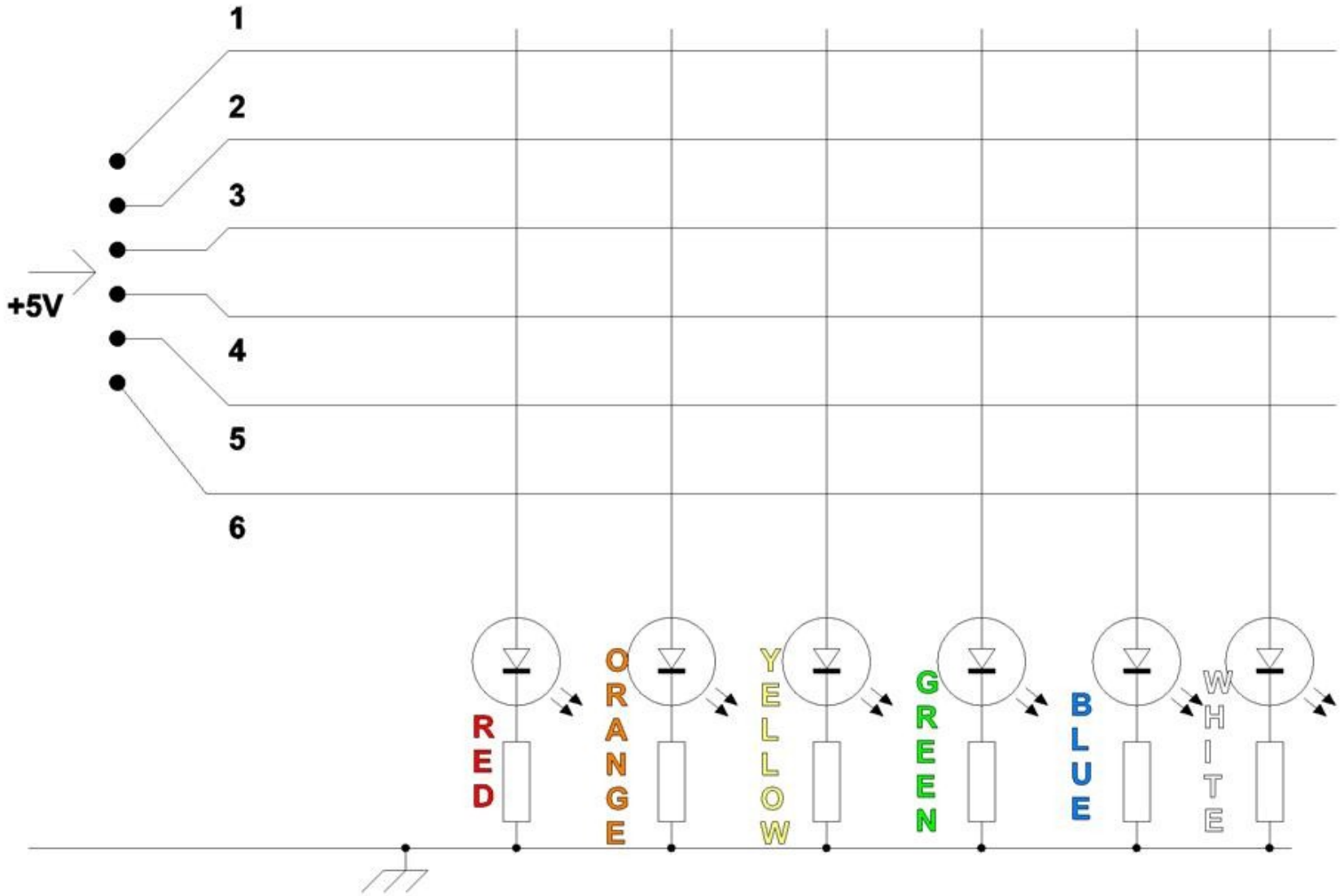

D1074
DAN222
C1387
10p CH
DAP222
D1075
CF1005
CFWS455HT
R1456
1K
C1395
0.1 B 16V
R1419
2.2K
R1420
47
D1078
DAP222
C1389
0.1 B 16V
R1470 100
TP1071
R1386
2.2K
R1389
1.5K
C1391
0.1 B
16V
R1387
470
C1394
0.1 B 16V
R1390 47
C1390
0.01 B
16V
C1393
0.01 B
16V
2SC4154E
TP1072
R1384
2.2K
CF1004
CFJ455K14
R1388
2.2K
R1385
470
C1398
0.1 B
16V
C1438
10p CH

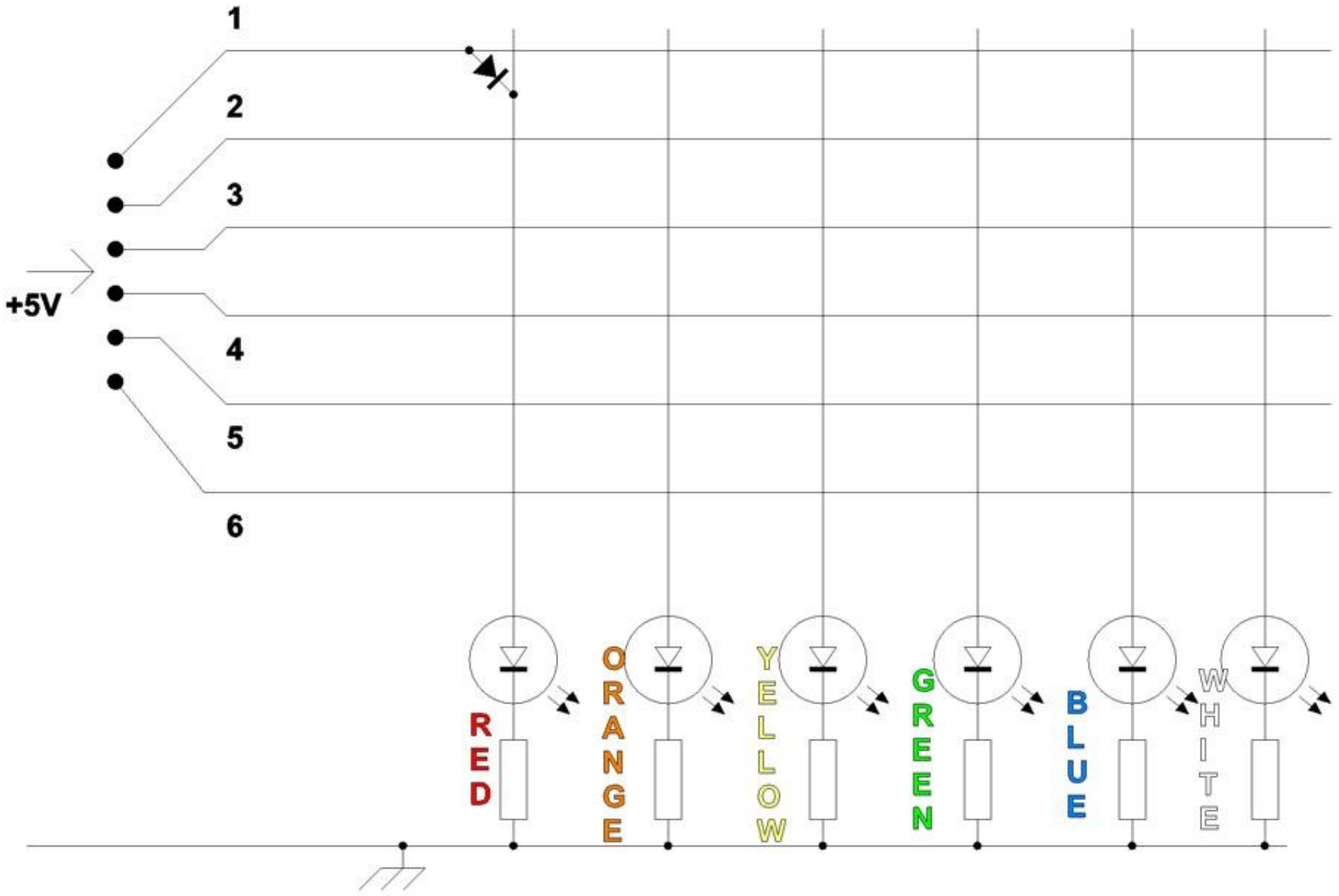
FT980

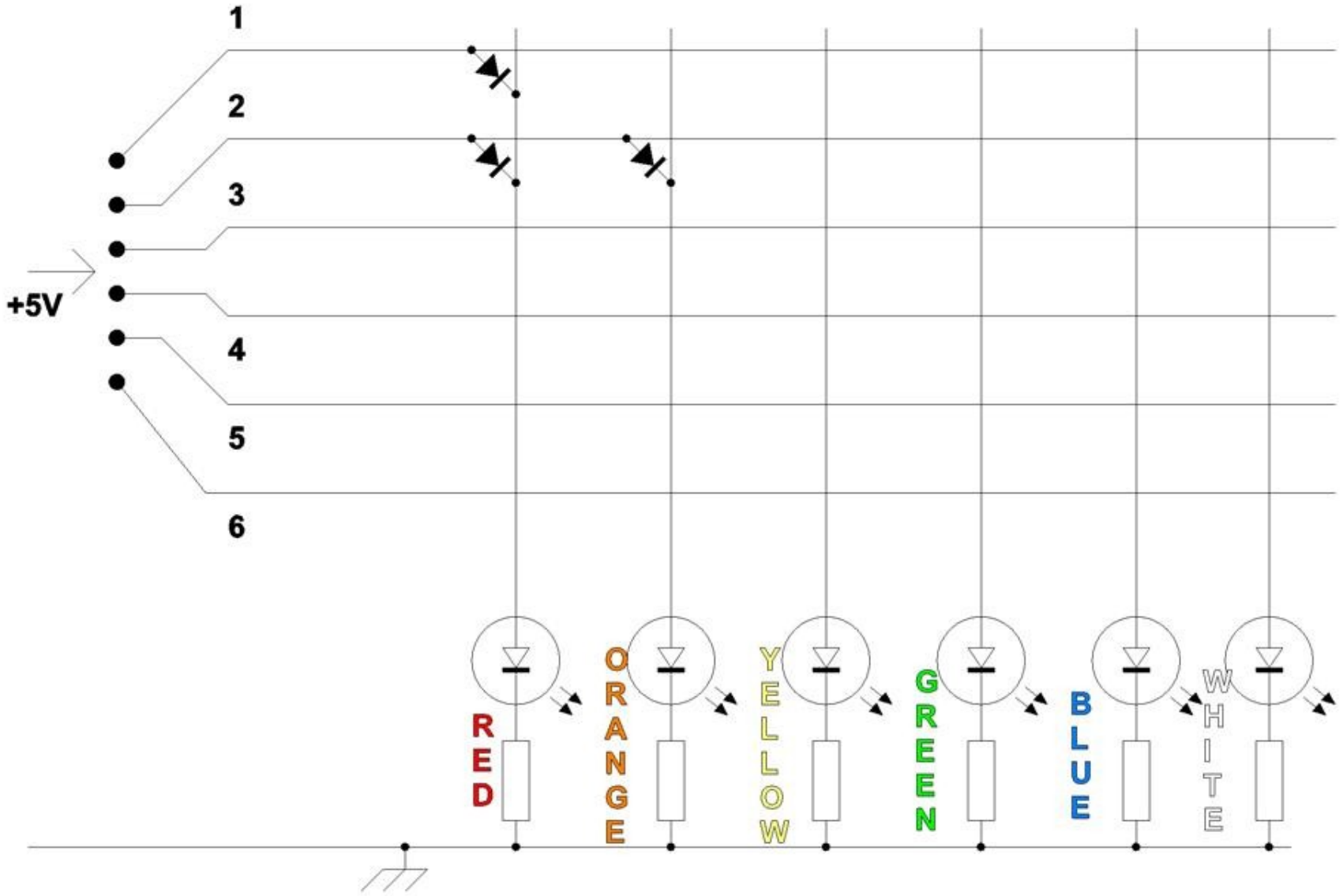

IF UNIT
R252 100
D46 1SS97
C185 0.01
XF4
AM
C191 0.01
D49 1SS97
3 mVrms
R201 470
L17 100u
R204 100
L20 100u
D39 1SS553
R200 10k
C186 0.01
C192 0.01
D47 1SS97
C187
XF5
SSB
C193
D50 1SS97
10p
D40 1SS553
D44 1SS553
D45 1SS553
R195 2.2k
R202 470
L18 0.01
R205 100
L21 100u
D53 1SS553
270
R196 680
L16
R241 10k
C188 0.01
XF6
CW
C194 0.01
D48 1SS97
C189
C195
D51 1SS97
70 mVrms 8.5 MHz
D41 1SS343
D43 1SS553
D63 1SS553
R203 470
L19 100u
R206 100
L22 100u
550 mVrms 8.5 MHz

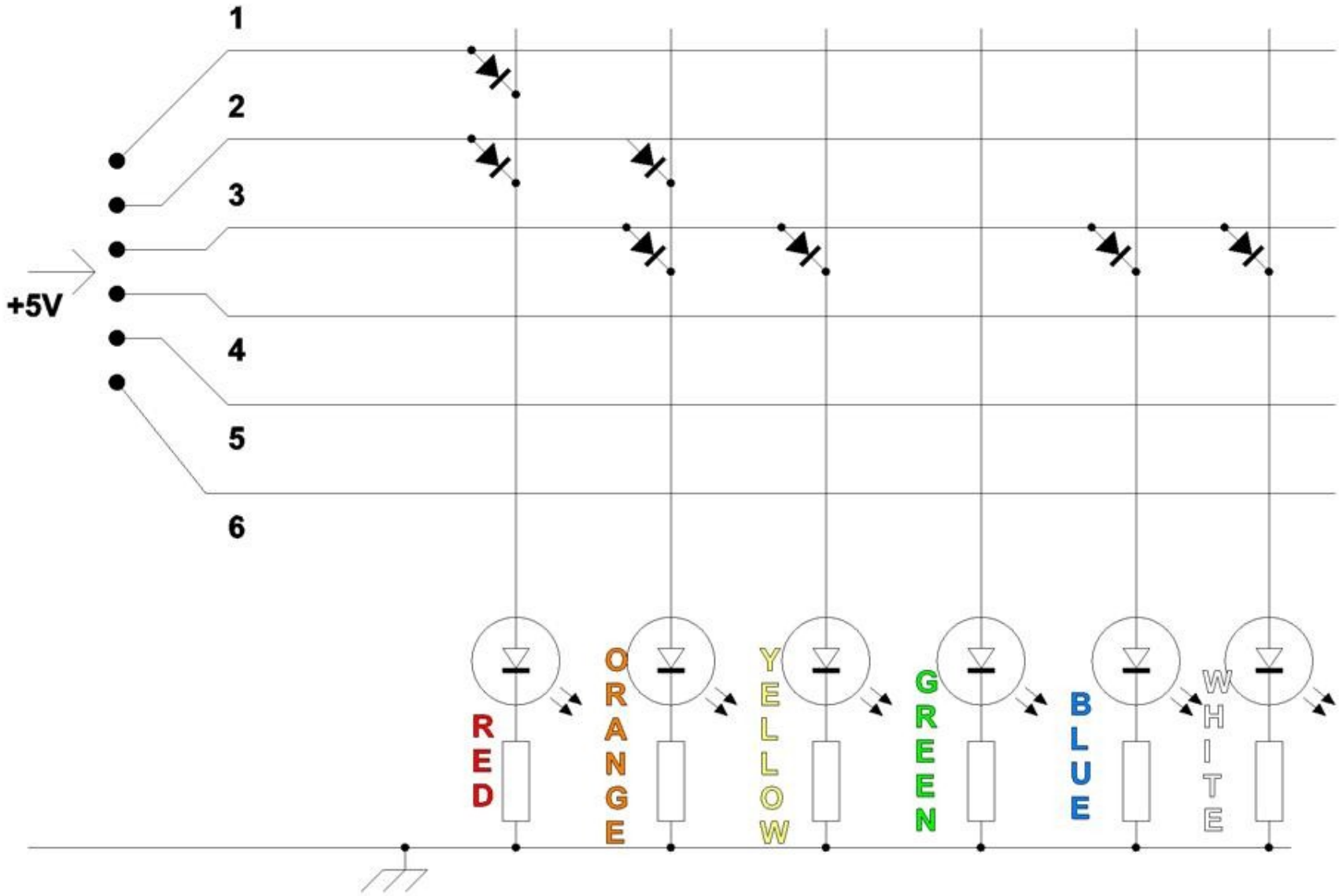
Diode Matrix



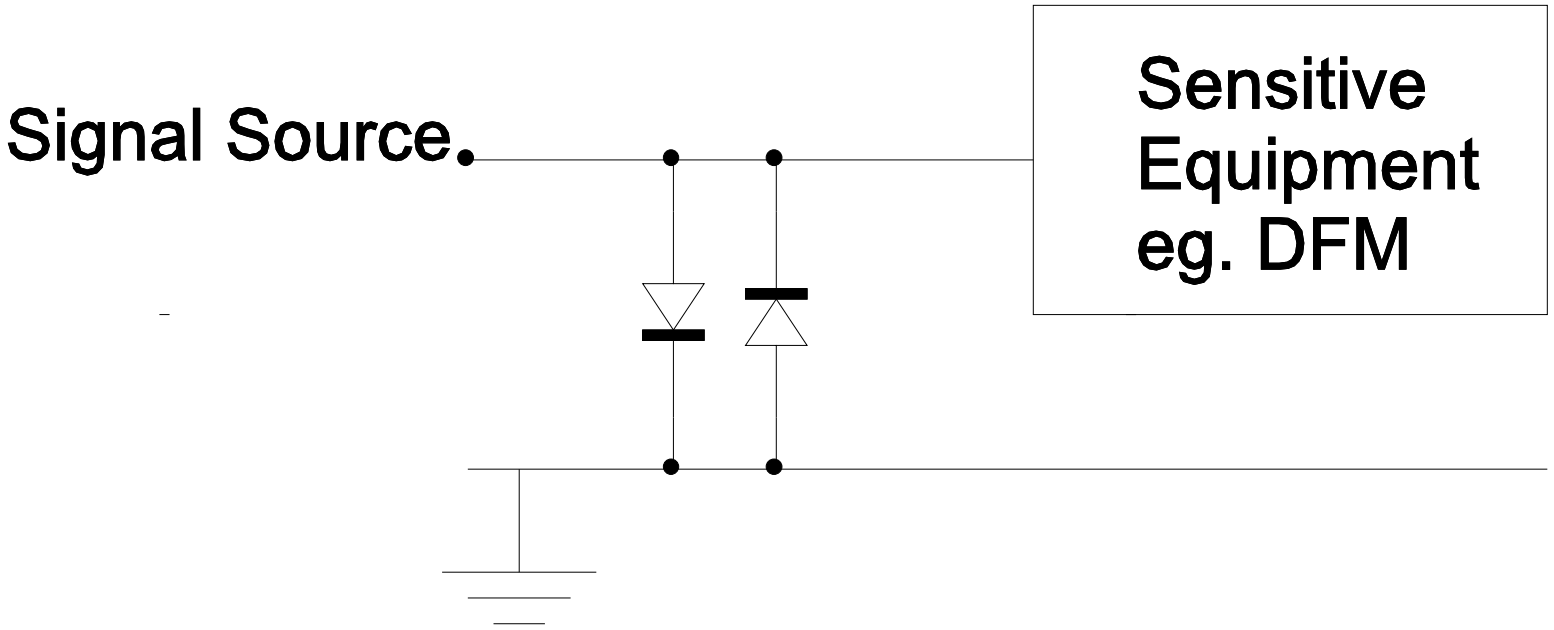

1
2
3
+5V
4
5
6
RED
ORANGE
YELLOW
GREEN
BLUE
WHITE

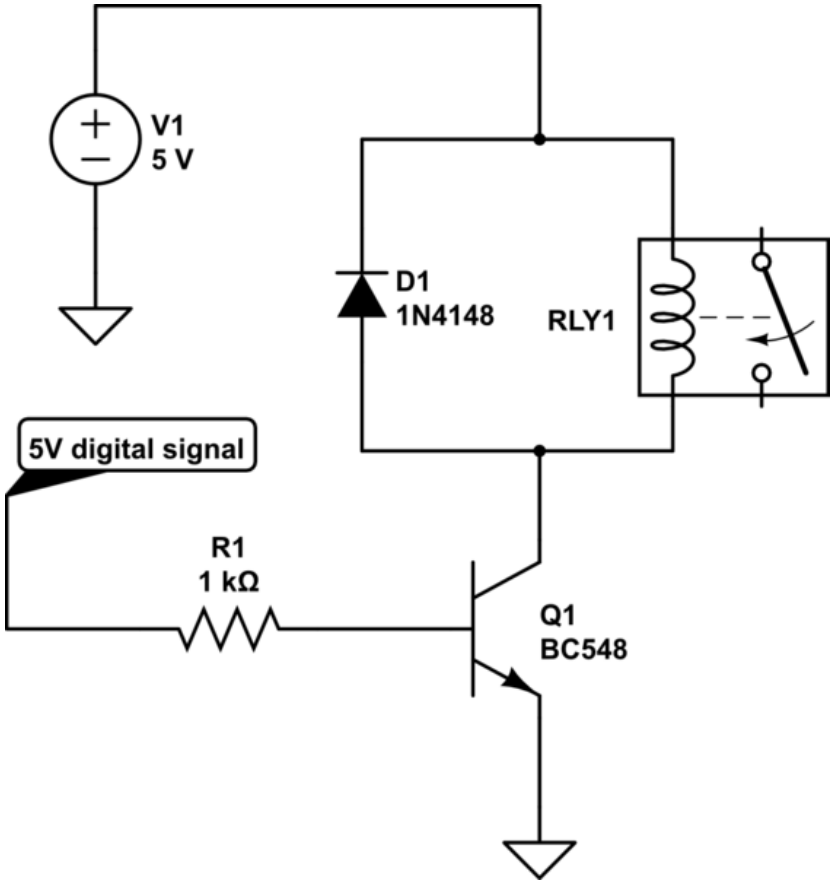

1
2
3
+5V
4
5
6
RED
ORANGE
YELLOW
GREEN
BLUE
WHITE


1
2
3
+5V
4
5
6
RED
ORANGE
YELLOW
GREEN
BLUE
WHITE


1
2
3
+5V
4
5
6
RED
ORANGE
YELLOW
GREEN
BLUE
WHITE

Protection



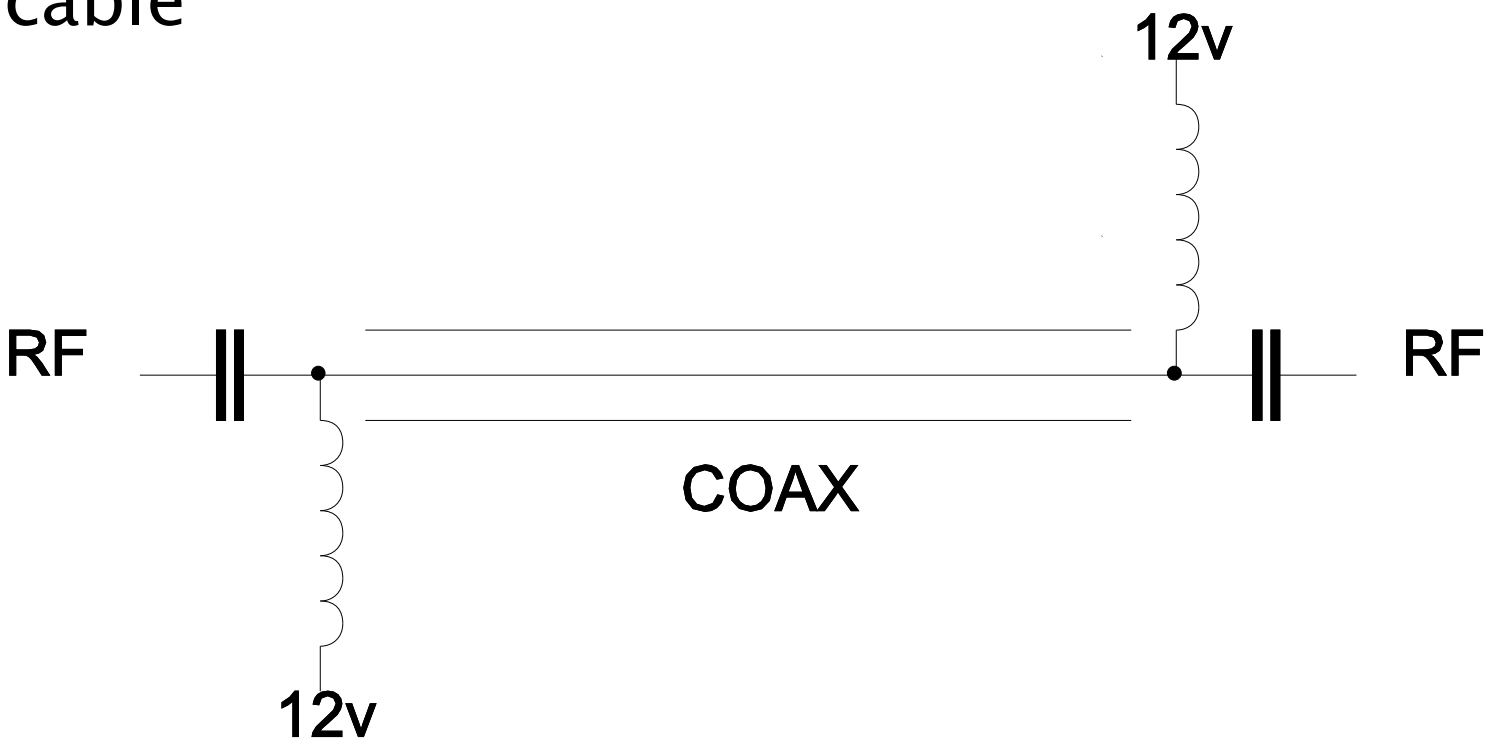

V1
5 V
D1
1N4148
RLY1
5V digital signal
R1
1 kΩ
Q1
BC548

Bias Tee

- How can we get water and wine down the same pipe at the same time- and separately?

Bias Tee

- Enables DC and Signal to pass along a single cable



Bias Tee


what are you like at multi-tasking?
pretty good, I often read the paper while I'm having a shit


That's all Folks!


GX3SBL
Stafford and Districts
Amateur Radio Society