hps Accessories

Plug-in Components



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Film Resistors



Types 9105... Types 9310...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Tolerance on resistance: +/-5 %
- Max. load : 2 W
 (1.0 MΩ ... 10 MΩ: 0.5 W)
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

| value | type | value | type |
|--------------|-----------|-----------------|-----------|
| 0.2 Ω | 9105.1-1* | 1.8 kΩ | 9104.2-25 |
| 0.5 Ω | 9105.1-2 | 2.0 kΩ | 9310.5-12 |
| 1.0 Ω | 9105.1-3 | 2.2 kΩ | 9104.2-4 |
| 1.2 Ω | 9105.2-1 | 2.4 kΩ | 9310.5-13 |
| 1.5 Ω | 9105.3-1 | 2.7 kΩ | 9104.2-26 |
| 1.8 Ω | 9105.4-1 | 3.3 kΩ | 9104.2-5 |
| 2.0 Ω | 9310.5-1 | 3.6 kΩ | 9310.5-14 |
| 2.2 Ω | 9105.6-1 | 3.9 kΩ | 9104.2-27 |
| 2.7 Ω | 9105.7-1 | 4.7 kΩ | 9104.2-6 |
| 3.3 Ω | 9105.8-1 | 5.1 kΩ | 9310.5-15 |
| 3.9Ω | 9105.9-1 | 5.6 kΩ | 9104.2-28 |
| 4.7Ω | 9105.1-4 | 6.8 kΩ | 9104.2-7 |
| 0.0 Ω | 9105.10-1 | 8.2 kΩ | 9104.2-8 |
| 0.0 12 | 9105.11-1 | | |
| 0.2 12 | 9105.12-1 | 10 kΩ | 9104.2-9 |
| 10.0 | Q10/ 1_1 | 12 kΩ | 9104.2-10 |
| 12 0 | 9104.1-1 | 15 kΩ | 9104.2-11 |
| 15 0 | 9104.1-16 | 18 KΩ | 9104.2-12 |
| 18 0 | 9104.1-17 | 22 KΩ 27 kΩ | 9104.2-13 |
| 20 Ω | 9104.4-1 | 27 KS2 22 kO | 9104.2-14 |
| 22 Ω | 9104.1-2 | 30 kO | 9104.2-15 |
| 27 Ω | 9104.1-18 | 47 kO | 9104.2-10 |
| 33 Ω | 9104.1-19 | 56 kO | 9104.2-17 |
| 39 Ω | 9104.1-20 | 68 kΩ | 9104.2-24 |
| 43 Ω | 9310.5-3 | 82 kΩ | 9104.2-18 |
| 47 Ω | 9104.1-3 | | |
| 51 Ω | 9310.5-4 | 100 kΩ | 9104.2-19 |
| 56 Ω | 9104.1-4 | 120 kΩ | 9104.2-30 |
| 60 Ω | 9104.4-4 | 150 kΩ | 9104.2-20 |
| 68 Ω | 9104.1-5 | 180 kΩ | 9104.2-31 |
| 75 Ω | 9104.4-5 | 220 kΩ | 9104.2-21 |
| 82 <u>Ω</u> | 9104.1-6 | 270 kΩ | 9104.2-32 |
| 100.0 | 0104.1.7 | 330 kΩ | 9104.2-22 |
| 120 0 | 9104.1-7 | 390 kΩ | 9104.2-33 |
| 120 32 | 9104.1-0 | 470 kΩ | 9104.2-23 |
| 180 0 | 9104.1-21 | 560 KΩ | 9104.2-34 |
| 200 Ω | 9104.4-6 | 820 kO | 9104.2-35 |
| 220 Ω | 9104.1-10 | 020 KS2 | 9104.2-30 |
| 240 Ω | 9104.4-7 | 1.0 MO | 9104 3-1 |
| 270 Ω | 9104.1-22 | 1.2 MΩ | 9104.3-5 |
| 300 Ω | 9104.4-8 | 1.5 MΩ | 9104.3-6 |
| 330 Ω | 9104.1-14 | 1.8 MΩ | 9104.3-7 |
| 360 Ω | 9310.5-7 | 2.2 MΩ | 9104.3-2 |
| 390 Ω | 9104.1-11 | 2.7 MΩ | 9104.3-8 |
| 470 Ω | 9104.1-12 | 3.3 MΩ | 9104.3-3 |
| 510 Ω | 9310.5-8 | 3.9 MΩ | 9104.3-9 |
| 560 Ω | 9104.1-23 | 4.7 MΩ | 9104.3-10 |
| 600 Ω | 9104.4-9 | 5.6 MΩ | 9104.3-11 |
| 750 0 | 9104.1-13 | 6.8 MΩ | 9104.3-12 |
| 820 0 | 9104 1-24 | 8.2 MΩ | 9104.3-13 |
| 020 32 | 0104.1-24 | 10 10122 | 9104.3-4 |
| 1.0 kΩ | 9104.2-1 | | |
| 1.2 kΩ | 9104.2-2 | * Wire resistor | |
| 1.5 kΩ | 9104.2-3 | | |
| | | | |

Single types (0.2 Ω ... 10 M Ω)



Resistors





Resistors

Accessories

Precision Resistors



Types 9107...

| Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front. Plug spacing: 19 mm Plug diameter: 4 mm Tolerance on resistance: +/-1 % Max. load: 0.5 W Housing dimensions: | value 1 kΩ 2 kΩ 4 kΩ 8 kΩ 10 kΩ 20 kΩ 22 kΩ 40 kΩ 100 kΩ 100 kΩ 160 kΩ 220 kΩ 500 kΩ 1 MΩ | type 9107.2-1 9107.2-2 9107.2-3 9107.2-4 9107.2-5 9107.2-10 9107.2-11 9107.2-11 9107.2-12 9107.2-13 9107.2-9 9107.2-9 9107.3-1 |
|--|---|---|
| Housing dimensions: 38 x 19 x 35 mm | 2 ΜΩ | 9107.3-2 |
| | | |

(w x d x h)



Power Resistors (10 W)



Types 9310 ...

Pluggable, consisting of an black metal housing, with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 35 x 19 x 51 mm (w x d x h)

- Tolerance on resistance: +/-5 %
- Max. load: 10 W

| value | type |
|-------|----------|
| 1 Ω | 9310.1-1 |
| 2.2 Ω | 9310.1-2 |
| 5.1 Ω | 9310.1-3 |
| 10 Ω | 9310.1-4 |
| 15 Ω | 9310.1-5 |
| 22 Ω | 9310.1-6 |
| 33 Ω | 9310.1-7 |
| 43 Ω | 9310.1-8 |



VDR Resistor



Туре 9114.10

NTC Resistors



Types 9116...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

Pluggable, consisting of an

gold-plated laminated plugs.

The circuit symbol is printed

unbreakable transparent

plastic housing with two

in white on the front.

- Plug spacing: 19 mm

- Plug diameter: 4 mm

- Housing dimensions:

38 x 19 x 35 mm (w x d x h)

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- $U_{rms} = 14 \text{ V} / U_{DC} = 18 \text{ V}$
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- (w x d x h)
- Tolerance on resistance: +/-10 %
- Limit temperature: 125 °C

Type 9116.1

- Description: K 252
- Nominal resistance: R_{20} = 4,7 k Ω

Туре 9116.4

- with series resistor 200 $\boldsymbol{\Omega}$
- Description: K 164
- Nominal resistance: R_{25} = 470 Ω

hps s

Training in Technology



PTC Resistors (P 330 - C 11)

Resistors Potentiometers



Type 9116.2

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Operating voltage:
 U_{max} = 30 V (bei 40 °C)

- Nominal resistor: $R_{60}\approx 80~\Omega$
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

LDR Resistors (FW 200)



Type 9116.3

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Resistance value: $R_{01} = 8.3 \text{ k}\Omega$ $R_{05} = 85 \text{ k}\Omega$ $R_{10} = 255 \text{ k}\Omega$
- Operating voltage: U_{max} = 200 V
- Power: P_{max} = 200 mW
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- The light, e. g. from Light Source Type 9122.1, enters on the left side of the housing.

Variable Potentiometer



Types 9108...

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs, rotary knob with scale 0 ...10 on the top side of the housing

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Tolerance on resistance: +/-20 %

| Max load: 0 E W | | |
|---|---|--|
| - Max. 10au. 0.5 W | value | type |
| - Housing dimensions: 38 x 57 x 35 mm (w x d x h) | 100 Ω 220 Ω 470 Ω 1.0 kΩ 4.7 kΩ 10 kΩ 22 kΩ 47 kΩ 100 kΩ 500 kΩ 1.0 MΩ 100 kΩ (log. / 0.25 W) | 9108.1-1 9108.1-2 9108.1-2 9108.2-1 9108.2-2 9108.2-3 9108.2-3 9108.2-4 9108.2-5 9108.2-5 9108.2-6 9108.2-7 9108.3-1 9108.4-1 |



Power Potentiometer (4 W)



Types 9109...

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs, rotary knob with scale 0 ...10 on the top side of the housing

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Tolerance on resistance: +/-20 %
- Max. load: 4 W

- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

| value | type |
|------------------------------------|------------|
| 100 Ω | 9109.4 |
| 560 Ω | 9109.1 |
| 1 kΩ | 9109.2 |
| 4.7 kΩ | 9109.3 |
| with loop serie 100 Ω / 2 W | s resistor |
| 1 kΩ | 9109.9 |

Resistors

Power Potentiometer (20 W)



Types 9109...

Pluggable, consisting of an black metal housing, with three gold-plated laminated plugs, rotary knob with scale 0 ...10 on the top side of the housing

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm Max. load: 20 W

- Tolerance on resistance: +/-10 %
- Housing dimensions: 67 x 56 x 66 mm (w x d x h)

| value | type |
|-------|--------|
| 4.7 Ω | 9109.6 |
| 1 kΩ | 9109.5 |



Capacitors

Accessories

Capacitors



Types 9110...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- Tolerance of capacity: +/-20 %
- Operating voltage, max.: min. 100 V

The types 9112... marked * in the list below have a bigger housing.



Types 9112...

- Plug spacing: 38 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

Single types (10 pF ... 10 μ F)

| value | type | value | type | value | type | value | type |
|--------|-----------|--------|-----------|---------|-----------|---------------|-----------|
| 10 pF | 9110.1-10 | 560 pF | 9110.1-8 | 33 nF | 9110.2-9 | 4.7 μF | 9112.1-3* |
| 15 pF | 9110.1-11 | 680 pF | 9110.1-9 | 47 nF | 9110.2-10 | 10 µF | 9112.1-4* |
| 22 pF | 9110.1-12 | | | 68 nF | 9110.2-12 | | |
| 33 pF | 9110.1-1 | 1 nF | 9110.2-1 | | | * big housing | g |
| 47 pF | 9110.1-2 | 1.5 nF | 9110.2-2 | 0.1 μF | 9110.3-1 | - | - |
| 56 pF | 9110.1-3 | 2.2 nF | 9110.2-3 | 0.15 μF | 9110.3-5 | | |
| 68 pF | 9110.1-13 | 3.3 nF | 9110.2-4 | 0.22 μF | 9110.3-2 | | |
| 100 pF | 9110.1-4 | 4.7 nF | 9110.2-5 | 0.33 µF | 9110.3-6 | | |
| 150 pF | 9110.1-14 | 6.8 nF | 9110.2-6 | 0.47 μF | 9110.3-3 | | |
| 220 pF | 9110.1-5 | 10 nF | 9110.2-7 | 0.68 µF | 9110.3-7 | | |
| 330 pF | 9110.1-6 | 15 nF | 9110.2-11 | 1 μF | 9110.3-4 | | |
| 470 pF | 9110.1-7 | 22 nF | 9110.2-8 | 2.2 µF | 9112.1-2* | | |
| | | | | | | | |

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.



Electrolytic Capacitors



Typeen 9111...

pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Tolerance of capacity: +50 %... -20 %
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

The types 9112... marked * in the list below have a bigger housing.



Types 9112...

value

47 μF/63 V

470 µF/16 V

polarized

polarized

* big housing

- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

type

9112.1-14*

9112.1-6*

9111.1-6

9111.2-2

Capacitors

Single types 2.2 µF ... 2200 µF) value type 2.2 μF/63 V 9111.1-1 1000 μF/35 V polarized polarized 4.7 μF/63 V 2200 µF/25 V 9111.1-2 10 µF/63 V polarized 9111.1-3 22 µF/63 V polarized 9111.1-4 Electrolytic capacitor . 22 µF/63 V non-polarized 9112.1-9* 47 μF/63 V with reverse polarity protection diode (1N 4007) polarized 9111.1-5 47 μF/40 V 9112.1-10* non-polarized polarized 100 µF/35 V 9111.2-1 100 µF/40 V non-polarized 9112.1-11* 220 µF/35 V polarized 9112.1-13* 470 µF/35 V polarized 9112.1-5

Variable Capacitor



Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 38 mm
- Plug diameter: 4 mm
- Capacity continuously adjustable from 20 ... 200 pF

- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.



Type 9113



Diodes

Semiconductor Components



Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Types 9114...

- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

| Diodes | | | | | | |
|--------|----------------|--|--------|--------|-------|--------|
| kind | I _F | I _F U _R U _{RM} U _F at I _F | | | Туре | |
| Si | 200 mA | 75 V | 100 V | 1 V | 10 mA | 9114.1 |
| Ge | 30 mA | 90 V | 115 V | 1.05 V | 10 mA | 9114.2 |
| Si | 1 A | 1000 V | 1000 V | 1.3 V | 1 A | 9114.3 |

- J_R = reverse voltage
- RM = inverse peak voltage
 - = forward voltage
- = forward current

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Varactor Diode



Type 9114.5

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Reverse voltage:
 U_{max} = 30 V
- Diode capacity:
 C_D = 5 pF...28 pF
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)



Zener Diodes



Types 9114...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 35 x 19 mm (w x d x h)

The types 9115... marked * in the list below have a bigger housing.



Types 9115...

- Plug spacing: 38 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

| | Zene | er diodes | |
|---------------------|--------------------|---|---------|
| I _Z (mA) | U _Z (V) | U _Z (V), tolerance values | Туре |
| 130 | 3.3 | 3.13.5 | 9114.14 |
| 90 | 4.7 | 4.45.0 | 9114.7 |
| 210 | 4.7 | 4.45.0 | 9115.3* |
| 64 | 6.2 | 5.86.6 | 9114.15 |
| 160 | 6.2 | 5.86.6 | 9115.1* |
| 40 | 10 | 9.410.6 | 9114.8 |
| 105 | 10 | 9.410.6 | 9115.2* |
| 32 | 12 | 11.412.7 | 9114.16 |
| 86 | 12 | 11.412.7 | 9115.4* |
| 27 | 15 | 13.815.6 | 9114.17 |
| 71 | 15 | 13.815.8 | 9115.5* |
| 44 | 22 | 20.823.3 | 9114.9 |
| 16 | 24 | 22.825.6 | 9114.18 |
| 45 | 24 | 22.825.6 | 9115.6* |
| z = Zener voltage | * big | housing | |

U_z = Zener voltage





Semiconductor **Components**



Diac

Semiconductor Components



Type 9114.4

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm

 Break down voltage: (symmetrical)
 U_{BR} = 32 V (+/-4V)

- Break down current: I_{BRF} , I_{BRR} = 0.4 mA typ. 1.0 mA max.
- Peak current: $I_{max} = 1 \text{ A}$ (at t = 20 µS) Backward voltage: (symmetrical) $\Delta U = 5 \text{ V typ.}$
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

Triac



Type 9117.2

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Inverse peak voltage: $U_{DRM} = 400 \text{ V}^{-1}$

- Continuous effective current: I_{TRMS} = 4 A
- Ignition current: I_{GT} = 10 mA
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

¹⁾ For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Thyristor



Types 9117.1

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Max. positive and negative inverse peak voltage: U_{DRM} , U_{RRM} = 400 V ¹⁾
- Limiting value of mean on-state current: (average value) I_{TAVM} = 3 A
- Ignition current: I_{GT} = 10 mA
- Ignition voltage:
 U_{GT} = 1.5 V

 Housing dimensions: 38 x 57 x 35 mm (w x d x h)

¹⁾ For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.



Transistors



Types 9118... with base contact left

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.



Types 9118... with base contact right

The Transistors are supplied with base contact left or base contact right (not Type 9118.1).

 Plug arrangement in 19 mm grid



Types 9117... in metal housing

- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)



Semiconductor Components

The types 9117... marked * in the list below have a powder-coated light metal housing.

 Housing dimensions: 55 x 54 x 36 mm (w x d x h)

| Transistors | | | | | | | | |
|-------------|--------------|------------------|------------------|-------------------------|----------------|------------------|----------|--|
| kind | base contact | U _{CE0} | U _{EB0} | U _{CBO} | Ι _C | P _{tot} | Туре | |
| PNP | left | -24 V | -10 V | -32 V | -200 mA | 0.9 W | 9118.1 | |
| PNP | left | -20 V | -5 V | -20 V | -100 mA | 0.3 W | 9118.4 | |
| PNP | right | -20 V | -5 V | -20 V | -100 mA | 0.3 W | 9118.12 | |
| PNP | left | -40 V | -5 V | -40 V | -1 A | 3.2 W | 9118.7 | |
| PNP | right | -40 V | -5 V | -40 V | -1 A | 3.2 W | 9118.10 | |
| NPN | left | 20 V | 6 V | 50 V | 100 mA | 0.5 W | 9118.2 | |
| NPN | right | 20 V | 6 V | 50 V | 100 mA | 0.5 W | 9118.3 | |
| NPN | left | 40 V | 7 V | 80 V | 1 A | 3.7 W | 9118.5 | |
| NPN | right | 40 V | 7 V | 80 V | 1 A | 3.7 W | 9118.6 | |
| NPN | left | 60 V | 7 V | 90 V | 15 A | 12 W | 9117.3* | |
| NPN | right | 60 V | 7 V | 90 V | 15 A | 12 W | 9117.31* | |
| | | with | base series res | istor (180 Ω / 2 | W) | | | |
| NPN | left | 40 V | 15 V | 80 V | 1 A | 3.7 W | 9118.15 | |

U_{CE0} = collector-emitter voltage

U_{EB0} = emitter-base voltage

U_{CB0} = collector-base voltage

 I_C = collector current

P_{tot} = total power loss

For safety reasons the components must not be operated at voltages higher than the maximum

* metal housing



Junction Gate Field-effect Transistors

Semiconductor Components



Types 9118...

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.

The N-channel transistor is supplied with gate contact left or right.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

- Housing dimensions:

38 X 57 x 35 mm

(w x d x h)

| | U_{DS} = drain-source voltage | | | | | | | |
|-----------|---------------------------------|------------------|-----------------|-----------------|-----------------|------------------|---------|-------------------------------------|
| kind | gate contact | +U _{DS} | U _{GS} | U _{DG} | I _{GF} | P _{tot} | Туре | U_{DG} = drain-gate voltage |
| N-channel | left | 25 V | -25 V | 25 V | 10 mA | 200 mW | 9118.8 | I _{GF} = gate current |
| N-channel | right | 25 V | -25 V | 25 V | 10 mA | 200 mW | 9118.19 | P _{tot} = total power loss |
| P-channel | left | 20 V | 20 V | -20 V | -10 mA | 200 mW | 9118.20 | |

MOS Field-effect Transistor



Type 9118.11

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Drain-source voltage: U_{DS} = -40 V
- Drain-gate voltage:
 U_{DG} = -40 V
- Drain current:
 I_D = -50 mA
- total power loss:
 P_{tot} = 375 mW
- Gate contact: left
- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm



Unijunction Transistor



Туре 9118.9

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm gridPlug diameter: 4 mm
- Emitter-base reverse voltage: -U_{EB} = 30 V
- Inter-base voltage
 B₁ / B₂:
 U_{BB} = 35 V

- Emitter current: $I_E = 50 \text{ mA}$
- total power loss:
 P_{tot} = 300 mW
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)



Semiconductor Components

Transistor Socket



Type 9158

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs.

Apart from the circuit symbol the top of the housing is provided with a four-pin plug-in socket for connecting commercial transistors.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)





LEDs

Semiconductor Components



Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm

Types 9121...

- Housing dimensions:

38 x 19 x 35 mm

(w x d x h)

- Colour Туре U_F (at I_F = 20 mA) U_R green 9121.10.1 5 V 2.0 V...2.6 V 9121.10.2 5 V 2.0 V...2.6 V yellow red 9121.10.3 5 V 1.6 V...2.0 V with series resistor 9121.12 5 V 15 V / 20 mA red
 - U_R = reverse voltage
 - I_F = forward current
 - U_F = forward voltage

Transistor Coupler



Type 9117.26

Pluggable, consisting of an unbreakable transparent plastic housing with four gold-plated laminated plugs.

The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mmHousing dimensions:
 - 38 x 57 x 35 mm (w x d x h)

Technical data of the Ga-As-LED:

- Reverse voltage: U_R = 3 V
- Forward current: $I_F = 60 \text{ mA}$
- Total power loss: P_{tot} = 100 mW
- Forward current: (at I_F = 10 mA) U_F = 1.2...1.7 V

Technical datas of the phototransistors:

- Collector-emitter voltage
 U_{CE0} = 30 V
- Collector current: $I_C = 100 \text{ mA}$
- Total power loss:
 P_{tot} = 150 mW



Thyristor Coupler



Type 9117.40

Pluggable, consisting of an unbreakable transparent plastic housing with four gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Max. positive and negative inverse peak voltage of the Thyristors: U_{DRM}, U_{RRM} = 600 V
- Continuous effective current: I_{TRMS} = 3 A
- Voltage range: 24 V...230 V (AC); 50...60 Hz

- Control current: 10 mA (at 5 V) The control input is TTL compatible (active low)
- and galvanically isolated from the load side. - The Thyristor Coupler can
- The Thyristor Coupler can be used to switch loads by means of TTL pulses.
- Housing dimensions: 57 x 38 x 35 mm (w x d x h)



Semiconductor Components

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Triac Coupler



Type 9117.41

Pluggable, consisting of an unbreakable transparent plastic housing with four gold-plated laminated plugs.

- The circuit symbol is printed in white on the front.
- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Inverse peak voltage and continuous effective current of the Triacs: U_{DRM} = 600 V I_{TRMS} = 3 A
- Voltage range: 24 V... 230 V (AC); 50 ... 60 Hz
- Control current: 10 mA (at 5 V) The control input is TTL compatible (active low) and galvanically isolated from the load side.
- The Triac Coupler can be used to switch loads by means of TTL pulses.
- Housing dimensions: 57 x 38 x 35 mm (w x d x h)

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.





Solar Cell

Semiconductor Components



Type 9117.28

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 38 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)
- Short-circuit current: I_k = 290 mA

- No-load current $U_L = 570 \text{ mV}$ $U_L = 440 \text{ mV}$ (at EV = 1000 lx)
- Photo current: I_P = 280 mA (at U_A = 400 mV)

Operational Amplifier



Type 9240

Pluggable, consisting of an unbreakable transparent plastic housing with five gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)
- Type: 741
- Operating voltage: +/-15 V
- Offset voltage: 7.5 mV
- Voltage amplification:
 > 15000
- Input voltage: +/-12 V

- Output voltage: (at R_L > 2 kΩ) +/-10 V
- Input resistance:
 > 300 kΩ

Power supply and connection of the operational amplifier is done via five lamella plugs on the bottom of the housing.

Туре 9240.1

(without picture)

Power supply of the operational amplifier type 9240.1 is done via two 4 mm jacks on the top side of the housing.

Connection of the operational amplifier is done via three lamella plugs on the bottom of the housing.

Voltage Regulator 5 V



Type 9235

Pluggable, consisting of an unbreakable transparent plastic housing with three gold-plated laminated plugs.

The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
 - Plug diameter: 4 mm
 - Input voltage:
 +7 V DC ... +15 V DC
 - Output voltage: 5 V DC
 - Output current: 0.8 ... 0.4 A
- Housing dimensions:
 57 x 38 x 35 mm
 (w x d x h)
- Weight ca. 50 g



Light Source



Types 9122.1

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

- Nominal current: 12 V (max.)
- Power: 1 W

The light comes out of the right side of the housing. The Light Source can be used in combination with the LDR Resistor Type 9116.3.



Special Components

Lamps



Types 9121...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

| Colour | Туре | nominal voltage | current input |
|--------|--------|-----------------|---------------|
| green | 9121.1 | 15 V | 82 mA |
| gren | 9121.6 | 15 V | 35 mA |
| red | 9121.2 | 15 V | 82 mA |
| blue | 9121.3 | 15 V | 82 mA |

Lamp Holder (E 10)



Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 19 mm
- Plug diameter: 4 mm

- Housing dimensions: 38 x 19 x 35 mm (w x d x h)



Type 9121.8



Special Components

Accessories

Coils (with air gap)



Types 9119...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

The circuit symbol is printed in white on the front.

- Plug spacing: 38 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)
- Current: max. 50 mA

The coils with type numbers 9119.5 ... 9119.10 are provided with an inductance coil.

The type 9119.15 marked * in the list below has a small housing.

- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- Plug spacing: 19 mm



Type 9119.15

| va | type | |
|--------|--------------|----------|
| 10 mH | (4 Ω) | 9119.5 |
| 10 mH | (21 Ω) | 9119.15* |
| 20 mH | (6 Ω) | 9119.6 |
| 40 mH | (8 Ω) | 9119.7 |
| 80 mH | (12 Ω) | 9119.8 |
| 100 mH | (13 Ω) | 9119.9 |
| 200 mH | (19 Ω) | 9119.10 |

* small housing



Experimenting Transformer



Туре 9120.23

The Experimenting Transformer consists of a two-part tape wound core and five coils. Winding turns:
 N = 100 (1 piece)
 N = 300 (2 piece)
 N = 900 (2 piece)

The coils are equipped with two gold-plated lamella plugs for use with the hps Assembly Boards (19 mm grid).

- Plug spacing: 38 mm
- Plug diameter: 4 mm

- Dimensions Coils: 48 x 25 x 58 mm (w x d x h)

> Tape wound core: (composite) 38 x 13 x 68 mm (w x d x h)



Special Components

Relay (with driver)



permissible protective low voltage.

Type 9131.2

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)

The Relay has three change-over contacts which are connected to 2 mm jacks on the top of the housing.

For safety reasons the components must not be operated at voltages higher than the maximum

The operating voltage (5 V DC) is supplied via the plugs on the bottom of the housing.

An integrated driver stage switches the relay by means of TTL pulses.

The switching state is indicated by an LED.

- Operating voltage:
 5 V DC
- Input of the drivers: TTL-signal
- Input current: 100 μA

Relay contacts:

- Material: Ag
- Switching current: 1 A (DC/AC)
- Switching voltage: 100 V (DC/AC)
- Switching power: 30 VA
- Contact resistance: 50 mΩ





Relay (without driver)

Special Components



Types 9131...

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)

The Relay has three change-over contacts which are connected to 2 mm jacks on the top of the housing.

The coil can be connected either via two 4 mm plugs on the bottom of the housing or via two 2 mm jacks on the top of the housing.

| | | | relay contacts | relay coil | | | | |
|--------|----------|-------|----------------------|----------------------|-----------------------|-----------------------|---------------|-----------------------|
| Туре | material | power | switching current | switching voltage | contact resistance | nominal DC voltage | winding turns | winding resistance |
| 9131.1 | Ag/Pd | 30 VA | 1 A (DC/AC) | 100 V (DC/AC) | 60 mΩ | 15 V | 3120 | 210 Ω +/- 21 Ω |
| 9131.3 | Ag/Pd | 30 VA | 1 A (DC/AC) | 100 V (DC/AC) | 60 mΩ | 5 V | 1200 | 40 Ω +/- 4 Ω |

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Toggle Switch (on/off, single-pole)



Type 9125

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- Switching current: 5 A (at 120 V AC; 28 V DC)
- Switching current: 2 A (at 250 V AC)
- Contact resistance of the Toggle Switch: 10 $m\Omega$

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.



Change-over Switch (single-pole)



Type 9126

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: im 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

- Switching current: 5 A (at 120 V AC; 28 V DC)
- Switching current: 2 A (at 250 V AC)
- Contact resistance des Change-over Switch: 10 mΩ



Special Components

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Push-button Switch



Type 9126.1

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

- Switching current: 1 A (at 120 V AC; 28 V DC)
- Contact resistance of the Push-button Switch: 10 mΩ

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.





Push-button Switch (NCC)





Type 9125.1

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- Switching current: 1 A (at 120 V AC; 28 V DC)
- Contact resistance of the Push-button Switch: 10 m Ω

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Push-button Switch (NOC)



Туре 9125.2

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)
- Switching current: 1 A (at 120 V AC; 28 V DC)
- Contact resistance of the Push-button Switch: 10 mΩ

For safety reasons the components must not be operated at voltages higher than the maximum permissible protective low voltage.

Fuse Holder



Type 9129

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs. The circuit symbol is printed in white on the front.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

The Fuse Holder is suitable for accommodating fuses with a diameter of 5 mm and a length of 20 mm at maximum.



Battery Holder



Pluggable (two gold-plated laminated plugs), consisting of a sturdy plastic housing with penlight battery

- Plug spacing: 76 mm
- Plug diameter: 4 mm

Dimensions:
 86 x 19 x 24 mm
 (w x d x h)

IC Sockets

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Type 9128
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IC Socket (dual-in-line)



Type 9156

Pluggable, consisting of a sturdy transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 57 mm
- Plug diameter: 4 mm
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)

The IC socket is used for accommodating IC components (dual-in-line) with up to 16 pins.

The connections are fed out through 2 mm jacks and are numbered. The socket is fitted with a removal wedge for easy withdrawal of the IC component.

IC Socket (TO)



Type 9156.1

Pluggable, consisting of a sturdy transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 57 mm
- Plug diameter: 4 mm
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)

The IC socket (10-pin) is used for plugging transistors and integrated circuits into TO 5 and TO 8 housings.

The connections are fed out through 2 mm jacks and are numbered.





IC Socket (dual-in-line, 28-pin)

IC Sockets



Type 9156.3

Pluggable, consisting of a sturdy transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 57 mm
- Plug diameter: 4 mm
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)

The IC socket serves to accommodate IC components (dual-in-line) with up to 28 pins. The connections are fed out through 2 mm jacks and are numbered.

Dual-in-line ICs can be used in narrow and wide versions.

The socket is fitted with a quick-release device for easy removal of the IC component.



Empty Housings



Type 9150 and Type 9150.1

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug spacing: 19 mm
- Plug diameter: 4 mm
- Housing dimensions: 38 x 19 x 35 mm (w x d x h)

Type 9150

with 2 plugs and 2 nuts (see Type 9160)

Type 9150.1 without plugs and nuts

You can install commercially available components such as resistors, capacitors, diodes etc. in the empty housing yourself.



Empty Housings

Empty Housing



Type 9151.1

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)
- With 3 plugs, 6 nuts and 3 solder lugs (see Type 9160)

You can install commercially available components such as transistors in the empty housing yourself.

Empty Housings



Type 9152.5

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)
- With 2 plugs and 2 nuts (see Type 9160)

You can install commercially available components such as capacitors in the empty housing yourself.



Empty Housings

Accessories

Empty Housings



Type 9152.6

Pluggable, consisting of an unbreakable transparent plastic housing with two gold-plated laminated plugs.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 38 x 57 x 35 mm (w x d x h)

Pluggable, consisting of an

gold-plated laminated plugs

(2 with solder sink), 4 nuts,

one solder lug and a knob

There is an opening (9 mm diameter) in the housing cover for installing potenti-

with a 6 mm clamp

ometers.

unbreakable transparent plastic housing with three

- With 2 plugs, 4 nuts and 2 solder lugs (see Type 9160.1)

You can install commercially available components or modules in the empty housing yourself.

 Plug arrangement in 19 mm grid

- Plug diameter: 4 mm

- Housing dimensions:

38 x 57 x 35 mm

(w x d x h)

Type 9152.0

Empty Housing



Туре 9152.4

Empty Housing



Type 9153

Black metal housing, with three gold-plated laminated plugs.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 54 x 54 x 36 mm (w x d x h)
- Colour: black

You can install commercially available components such as transistors, triacs, thyristors in the empty housing yourself.



Empty Housing



Black metal housing, with two gold-plated laminated plugs.

- Plug arrangement in 19 mm grid
- Plug diameter: 4 mm
- Housing dimensions: 35 x 19 x 51 mm (w x d x h)

You can install commercially available 2-pole components in the empty housing yourself.



Empty Housings

Type 9153.1

Laminated Plug



gold-plated, for 4 mm jacks, with nut, serrated washer and solder lug

- Plug diameter: 4 mm
- Plug length: 20 mm
- Total length: 38 mm

Type 9160

Laminated Plug



Type 9160.1

gold-plated, for 4 mm jacks, with 2 nuts and solder lug

- Plug diameter: 4 mm
- Plug length: 19 mm
- Total length: 30 mm
- Without solder sink





Empty

Housings

Accessories

Stickers







Туре 9161.6

Туре 9161.1



Type 9161.7

Туре 9161.2



Type 9161.8

self-adhesive, made of black plastic foil with printed symbol (except Type 9161.8), for labelling the Empty Housing Type 9150

| _ | Dimensions: 34 v | 15 | mm | |
|---|------------------|----|----|--|
| | Dimensions. 34 X | 15 | | |
| | | | | |

The Stickers are supplied on DIN A5 sheet of 35 pieces.

| Sticker | Туре |
|-------------------|--------|
| Resistor | 9161.1 |
| Capacitor | 9161.2 |
| Diode | 9161.6 |
| Z-diode | 9161.7 |
| Blank | 9161.8 |
| for labelling you | rself) |

Marking Pen



Туре 9161.20

for labelling the pluggable components

- Colour: white



Stickers





Туре 9162.3





Туре 9162.5-2

self-adhesive, made of black plastic foil with printed symbol (except Type 9162.5-5), for labelling the Empty Housings Types 9151.1, 9152.4 and 9152.5



Туре 9162.5-5

- Dimensions: 34 x 52 mm

The Stickers are supplied on DIN A5 sheets of 9 pieces.



Type 9162.5-1

| Sticker | Туре |
|---------------------------------|----------|
| Potentiometer | 9162.3 |
| Capacitor | 9162.4 |
| Transistor, NPN (base left) | 9162.5-1 |
| Transistor, NPN (base right) | 9162.5-2 |
| Transistor, PNP (base left) | 9162.5-3 |
| Transistor, PNP | 9162.5-4 |

9162.5-5

Blank

(for labelling yourself)



Empty Housings



Assembly Kit

Accessories

Assembly Kit



The assembly kit has been designed to manufacture your own plug-in modules with simple to complex electrical/electronic circuits, also outside the hps standard programm. It consists of the following individual components:

- Empty Housing (Type 9152.7)
- Sticker for labelling the Empty Housing (Type 9162.5-6)
- Universal PCB (Type 9167 or Type 9167.1)

Assembly arrangement

- Jacks (Type 9168) The individual components of the Assembly Kit are listed below.

Empty Housing



Туре 9152.7

The Empty Housing is designed for installing the Universal PCB. It consists of a top section made of unbreakable transparent plastic and a sturdy bottom section made of black fibre-glass reinforced plastic.

Drill holes are arranged in the bottom section in a 19 mm grid for fixing in laminated plugs.

The top and bottom sections are connected by two quick-release catches; this enables fast, easy closing and opening of the housing. The Universal PCB is installed by a clamp, additional screwing is not necessary.

There are 14 holes drilled on the front of the top section on both the right and left hand long sides for pushing through the jacks soldered into the Universal PCB.

- Distance of the installed Universal PCB to the housing top section: 18 mm
- Distance of the installed Universal PCB to the

housing bottom section: 9 mm

- Accessories included with the Empty Housing:
 2 Laminated Plugs (4 mm), Type 9160.1, with solder lugs and nuts
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)



Sticker



Type 9162.5-6

Universal PCB (with dot grid)



Type 9167

for manufacturing your own plug-in modules in connection with the Empty Housing Type 9152.7

The Sticker consists of a

self-adhesive black plastic

foil and is used to label the

Empty Housing Type

The Marking Pen Type 9161.20 is recommended for

9152.7.

labelling.

There are 14 holes (2.8 mm diameter) drilled on the right and left hand long sides of the Universal PCB for soldering in the Jacks (Type 9168).

- Material: 1.5 mm epoxy
- Dimensions of one Universal PCB: 70 x 52 mm

- Dimensions:37.5 x 70 mm

The Sticker is supplied on DIN A5 sheets of 6 pieces.

- Number of holes: 375,

- Dimensions of panel:

250 x 260 mm

1 mm diameter

panel

arranged in 2.54 mm grid,

- Delivered in lots of 12 on a



Assembly Kit

Jack



Type 9168

for soldering in the Universal PCBs Types 9167 and 9167.1, with collar for spacing

The Jack connects the Universal PCBs electrically to the top section of the housing (for measuring points or other connections).

- Material: brass (tinned)

- Internal diameter: 2.0 mm

- External diameter: 2.5 mm
- Length: 27 mm

The Jacks are delivered in packs of 100.

Universal PCB (with line grid)



Туре 9167.1

for manufacturing your own plug-in modules in connection with the Empty Housing Type 9152.7

There are 14 holes (2.8 mm diameter) drilled on the right and left hand long sides of the Universal PCB for soldering in the Jacks (Type 9168).

- Material: 1.5 mm epoxy
- Dimensions of one Universal PCB: 70 x 52 mm

- Number of holes: 375, arranged in 2.54 mm grid, 1 mm diameter
- Delivered in lots of 12 on a panel
- Dimensions of panel: 250 x 260 mm

