

Description

The ESR20 (Electronic Standard Relay) solid state relay is used in applications, where mechanical ISO mini relays reach their technical performance limits. The scope of versions covers both positive and negative drive levels. The 4 A version is also available as Low Side Switch.

The ESR20 is highly attractive because of its continuous current, switching frequency, long typical life and silent switching, and it is also extremely robust against environmental influences.



ESR20

Applications

The ESR20 solid state relay is suitable for all applications in DC 12 V and DC 24 V on-board electrical systems.

Typical applications:

- Road vehicles (passenger cars, bicycles, trucks, buses, working vehicles and emergency cars, special vehicles)
- Agricultural vehicles and construction machinery
- Marine vehicles (ships and boats, motor yachts etc.)

Typical applications:

- Wherever loads must be switched, e.g. when controlling pumps, valves, lamps or fans
- Positive and negative drive levels and also High Side Switch and Low Side Switch

Benefits

- The solid state relay's electronics switch wear-free, ensuring total operational readiness for the vehicle's entire typical life. Expensive complaints and service calls are omitted.
- The silent switching increases the driver's comfort in the driver's cab. The driver is not distracted by unidentified switching noises.
- The solid state relay is extraordinarily robust against vibration.

Qualifications

| | |
|--|--|
| Degree of protection | IP50 |
| Noise immunity | 95/54 EG & DIN 40839 |
| E1 number | E1*10R06/01*9393*00 for the 4 A version |
| E1 number for other current ratings upon request | |

Technical data (25 °C)

ESR20 - 3 0 0 - 0 0 0 - 0 0 0 - 4 A
 ESR20 - 3 1 0 - 0 0 0 - 0 0 0 - 4 A
 ESR20 - 3 2 0 - 0 0 0 - 0 0 0 - 4 A
 ESR20 - 3 3 0 - 0 0 0 - 0 0 0 - 4 A

| | High side switch | Low side switch |
|--------------------------------------|---|--------------------------|
| Input | positive or negative drive level (see ordering number code) | |
| Continuous current | 4 A | 4 A |
| Rated voltage | 12 V/24 V | 12 V/24 V |
| Operating voltage | 9 V ... 30 V | 9 V ... 30 V |
| Quiescent current | < 100 µA | < 100 µA |
| Max. switching current for 100 ms | 15 A | 9.8 A |
| Contact voltage drop $R_{DS(on)}$ | 40 mOhm at 25 °C | 31 mOhm at 25 °C |
| Switching time ON | 30 µs | 40-100 µs |
| Switching time OFF | 30 µs | 70-170 µs |
| PWM frequency | 500Hz | 500Hz |
| Operating temperature | -40 °C...+85 °C | -40 °C...+85 °C |
| Mass | 20 g | 20 g |
| Materials | | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 | |
| Housing material | PA6GF | |
| Output | Semi-conductor | |
| Maximum switching performance | 80 m Joule | t_{DEMAG} = 0.13 ms |

Technical data (25 °C)

ESR20 - 3 0 1 - 0 0 0 - 0 0 0 - 4 A
 ESR20 - 3 1 1 - 0 0 0 - 0 0 0 - 4 A
 ESR20 - 3 2 1 - 0 0 0 - 0 0 0 - 4 A
 ESR20 - 3 3 1 - 0 0 0 - 0 0 0 - 4 A

| | High side switch | Low side switch |
|--------------------------------------|---|--------------------------|
| Input | positive or negative drive level (see ordering number code) | |
| Continuous current | 4 A | 4 A |
| Rated voltage | 12 V/24 V | 12 V/24 V |
| Operating voltage | 9 V ... 30 V | 9 V ... 30 V |
| Quiescent current | < 100 µA | < 100 µA |
| Max. switching current for 100 ms | 15 A | 9.8 A |
| Contact voltage drop $R_{DS(on)}$ | 40 mOhm at 25 °C | 31 mOhm at 25 °C |
| Switching time ON | 30 µs | 40-100 µs |
| Switching time OFF | 30 µs | 70-170 µs |
| PWM frequency | 500 Hz | 500 Hz |
| Operating temperature | -40 °C...+85 °C | -40 °C...+85 °C |
| Mass | 20 g | 20g |
| Materials | | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 | |
| Housing material | PA6GF | |
| Output | Semi-conductor | |
| Maximum switching performance | 160 m Joule | t_{DEMAG} = 0.13 ms |

ESR20-300-000-000-10 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 10 A |
| Input | Positive voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 100 μ A |
| Max. switching current for 100 ms | 30 A |
| Contact voltage drop $R_{DS(on)}$ | 25 mOhm |
| Switching time ON | 30 μ s |
| Switching time OFF | 30 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-300-000-000-15 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 15 A |
| Input | Positive voltage |
| Rated voltage | 12 V and 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 100 μ A |
| Max. switching current for 100 ms | 50 A |
| Contact voltage drop $R_{DS(on)}$ | 9 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-301-000-000-10 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 10 A |
| Input | Positive voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 100 μ A |
| Max. switching current for 100 ms | 30 A |
| Contact voltage drop $R_{DS(on)}$ | 25 mOhm |
| Switching time ON | 30 μ s |
| Switching time OFF | 30 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

ESR20-301-000-000-15 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 15 A |
| Input | Positive voltage |
| Rated voltage | 12 V and 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 100 μ A |
| Max. switching current for 100 ms | 50 A |
| Contact voltage drop $R_{DS(on)}$ | 9 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

ESR20-310-000-000-10 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 10 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 300 µA |
| Max. switching current for 100 ms | 30 A |
| Contact voltage drop $R_{DS(on)}$ | 25 mOhm |
| Switching time ON | 30 µs |
| Switching time OFF | 30 µs |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-310-000-000-15 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 15 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 100 µA |
| Max. switching current for 100 ms | 50 A |
| Contact voltage drop $R_{DS(on)}$ | 9 mOhm |
| Switching time ON | 200-350 µs |
| Switching time OFF | 200-350 µs |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-311-000-000-10 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 10 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 300 µA |
| Max. switching current for 100 ms | 30 A |
| Contact voltage drop $R_{DS(on)}$ | 25 mOhm |
| Switching time ON | 30 µs |
| Switching time OFF | 30 µs |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

ESR20-311-000-000-15 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 15 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V ... 30 V |
| Quiescent current | < 100 µA |
| Max. switching current for 100 ms | 50 A |
| Contact voltage drop $R_{DS(on)}$ | 9 mOhm |
| Switching time ON | 200-350 µs |
| Switching time OFF | 200-350 µs |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

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ESR20-300-000-000-25 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 25 A |
| Input | Positive voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 100 μ A |
| Max. switching current for 100 ms | 100 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Semi-conductor switch (NO) | |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-310-000-000-25 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 25 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 200 μ A |
| Max. switching current for 100 ms | 100 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Semi-conductor switch (NO) | |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-301-000-000-25 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 25 A |
| Input | Positive voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 100 μ A |
| Max. switching current for 100 ms | 100 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Semi-conductor switch (NO) | |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

ESR20-311-000-000-25 A - Technical data

| High Side Switch | |
|--------------------------------------|---------------------------------------|
| Continuous current | 25 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 200 μ A |
| Max. switching current for 100 ms | 100 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 20 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | |
| Semi-conductor switch (NO) | |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

ESR20-300-000-000-35 A - Technical data

| High Side Switch | |
|--------------------------------------|---|
| Continuous current | 35 A |
| Input | Positive voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 300 μ A |
| Max. switching current for 100 ms | 115 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 30 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 A 9.5 x 1.2 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-310-000-000-35 A - Technical data

| High Side Switch | |
|--------------------------------------|---|
| Continuous current | 35 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 300 μ A |
| Max. switching current for 100 ms | 115 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 30 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 A 9.5 x 1.2 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 80 m Joule t_{DEMAG} = 0.13 ms |

ESR20-301-000-000-35 A - Technical data

| High Side Switch | |
|--------------------------------------|---|
| Continuous current | 35 A |
| Input | Positive voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 300 μ A |
| Max. switching current for 100 ms | 115 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 30 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 A 9.5 x 1.2 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

ESR20-311-000-000-35 A - Technical data

| High Side Switch | |
|--------------------------------------|---|
| Continuous current | 35 A |
| Input | Negative voltage |
| Rated voltage | 12 V / 24 V |
| Operating voltage | 9 V... 30 V |
| Quiescent current | < 300 μ A |
| Max. switching current for 100 ms | 115 A |
| Contact voltage drop $R_{DS(on)}$ | 5 mOhm |
| Switching time ON | 200-350 μ s |
| Switching time OFF | 200-350 μ s |
| PWM frequency | 500 Hz |
| Operating temperature | -40 °C...+85 °C |
| Mass | 30 g |
| Materials | |
| Blade terminals | A 6.3 x 0.8 DIN 46 244 A 9.5 x 1.2 DIN 46 244 CuZn 37 F37 |
| Housing material | PA6GF |
| Output | Semi-conductor switch (NO) |
| Degree of protection | IP50 |
| Maximum switching performance | 160 m Joule t_{DEMAG} = 0.13 ms |

5

Ordering number code

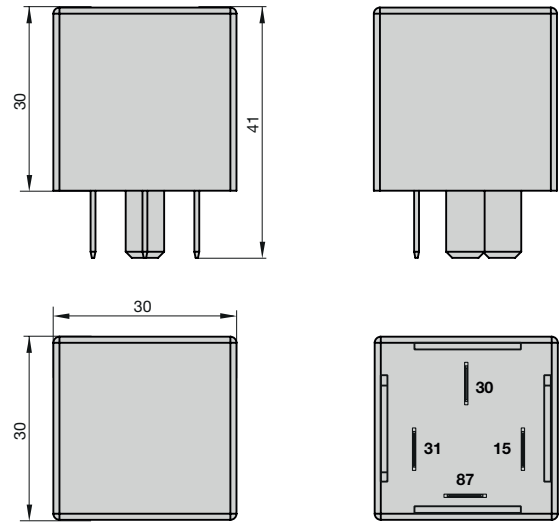
| | |
|---|--------------------------------------|
| Type No. | |
| ESR20 | Solid state relay |
| Operating voltage | |
| 3 | 12 V/24 V |
| Control | |
| 0 | Positively driven - High Side Switch |
| 1 | Negatively driven - High Side Switch |
| 2 | Positively driven - Low Side Switch |
| 3 | Negatively driven - Low Side Switch |
| Options | |
| 0 | without free-wheeling diode |
| 1 | with free-wheeling diode |
| Option 2 | |
| 000-000 | |
| Current rating | |
| 4 A | |
| ESR20 - 3 0 0-0 -000 - 4 A Ordering example | |

Ordering number code

| | |
|--|--------------------------------------|
| Type No. | |
| ESR20 | Solid state relay |
| Operating voltage | |
| 3 | 12 V/24 V |
| Control | |
| 0 | Positively driven - High Side Switch |
| 1 | Negatively driven - High Side Switch |
| Options | |
| 0 | without free-wheeling diode |
| 1 | with free-wheeling diode |
| Option 2 | |
| 000-000 | |
| Current rating | |
| 10 A | |
| 15 A | |
| 25 A | |
| 35 A | |
| ESR20 - 3 0 0-0 -000 - 35 A Ordering example | |

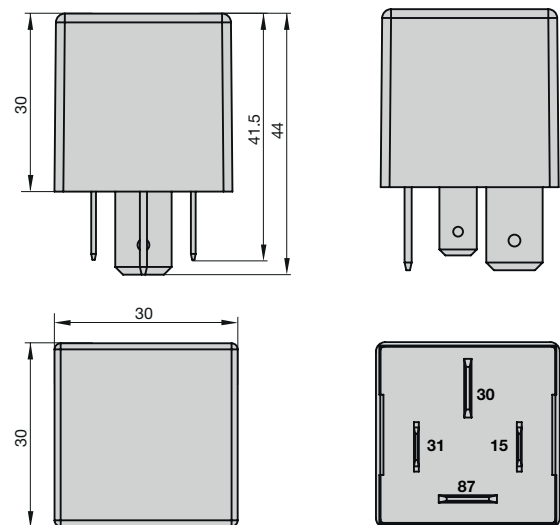
Dimensions continuous current 4 A/10 A/15 A/25 A

4 PIN



Dimensions 35 A

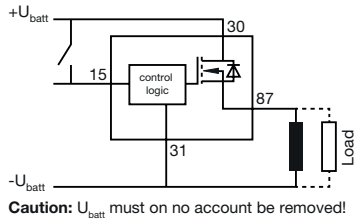
4 PIN



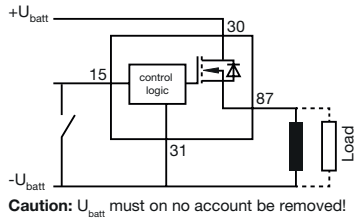
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Schematic diagram/Pin assignment

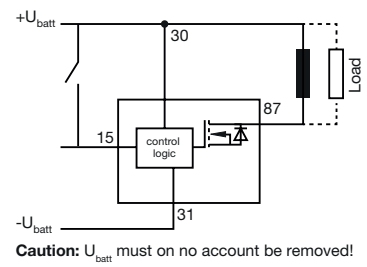
ESR20-300



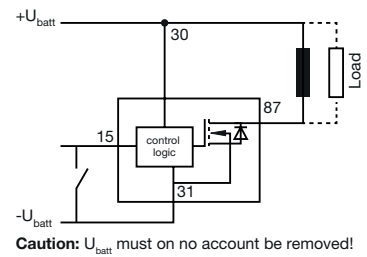
ESR20-310



ESR20-320

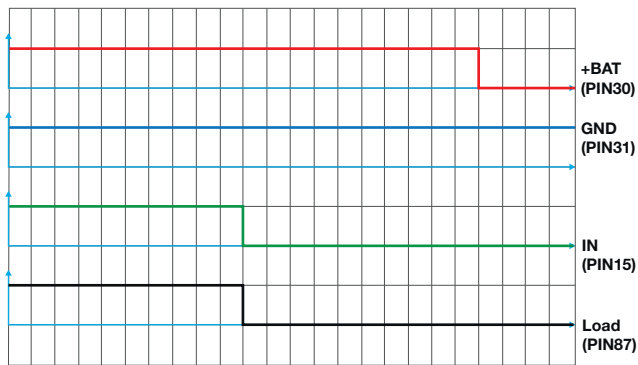


ESR20-330



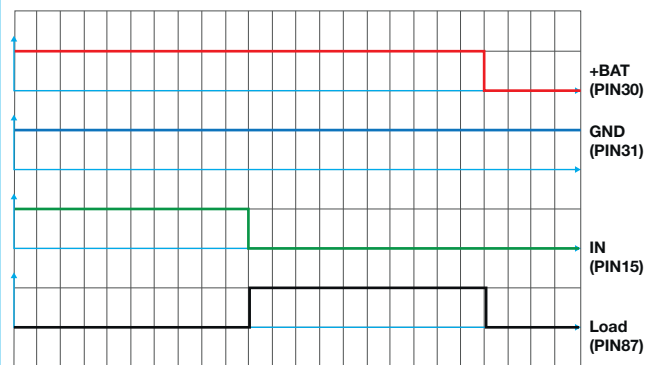
ESR20-30x-000-000-xxA status chart

ESR20-30x-000-000-xxA



ESR20-31x-000-000-xxA status chart

ESR20-31x-000-000-xxA



Note for the electrical design

ESR20-xx0-xxx-xxx-xxA without free-wheeling diode

Technical information depending on the application.

Single Pulse (inductive loads):
 Maximum switching performance. $E_{max} = 80$ m Joule
 (T-Demag = 0.13 ms)
 Formula for calculating the inductance.
 $I^2 \times L < 160$ m Joule

PWM operation (resistive loads only):
 Frequencies up to 500 Hz
 Note: Short circuit protection limited, make sure that there is sufficient interference suppression!

Other operating modes and loads:
 Coils, motors and fans depending on the application.

ESR20- xx1-xxx-xxx-xxA with free-wheeling diode

Technical information depending on the application.

Single Pulse (inductive loads):
 Maximum switching performance. $E_{max} = 160$ m Joule
 (T-Demag = 0.13 ms)
 Formula for calculating the inductance.
 $I^2 \times L < 320$ m Joule

PWM operation (resistive loads only):
 Frequencies up to 500 Hz
 Note: Short circuit protection limited, make sure that there is sufficient interference suppression!

Other operating modes and loads:
 Coils, motors and fans depending on the application.