

Description

The Smart Power Relay E-1048-8D. is a remotely controllable electronic load disconnecting relay with two functions in a single unit:

- electronic relay
- electronic overcurrent protection

The 4 pin DICE version is designed for use with standard automotive relay sockets. A choice of current ratings is available from 1 A through 30 A. An operating voltage range of DC 9...32 V allows the connection of DC 12 V and DC 24 V loads.

In order to switch and protect loads remotely, it has until now been necessary to connect several discreet components together:

- an electro-mechanic relay, control cable and integral contact to close the load circuit
- an additional protective element (circuit breaker or fuse) for cable or equipment protection

Now type E-1048-8D. combines these two functions in a single unit, thus minimising the number of connections in the circuit and thereby reducing the risk of failures.

Applications

Type E-1048-8D. is suited to all applications with DC 12 V or DC 24 V circuits, where magnetic valves, motors or lamp loads have to be switched, protected or monitored:

- road vehicles (utility vehicles, buses, special vehicles)
- rail vehicles
- marine industry (ships, boats, yachts etc.)

The Power Relay is also suitable for industrial use (process control, machine-building, engineering) as an electronic coupling relay between PLC and DC 12 V or DC 24 V load

Features

- Integral power electronics provide a wear-resistant switching function, insensitive to shock and vibration.
- Only a fraction of the control power needed by electro-mechanical relays is required for switching loads. This is important for battery buffered load circuits which have to remain controlled even with the generator off line.
- The extremely low induced current consumption of less than 1 mA is absolutely necessary for battery buffered applications.
- The load circuit is disconnected in the event of a short circuit (ENTRY version) or overload/short circuit (ENTRYprotect version).
- For switching and monitoring loads of 30 A plus it is possible to connect several units in parallel. Uniform power distribution between units must be ensured by symmetrical design of the supply cables (length and cross section).
- Coloured label, e. g. red = 10 A, see ordering information.



E-1048-8D. DICE version

Technical Data ($T_{amb.} = 25\text{ }^{\circ}\text{C}$, $U_N = \text{DC } 24\text{ V}$)

Power supply LINE +

Type	DC power supply with small R_i battery and generator etc.
Voltage ratings U_N	DC 12 V / DC 24 V
Operating voltage U_S	DC 9...32 V

Load circuit LOAD

Load output	Power MOSFET, high side switching
Max. current rating I_N	30 A
Types of loads	resistive, inductive, capacitive, lamp loads, motors (depending on duration of inrush current)
Current rating range I_N	1 A...20 A (fixed ratings) up to 85 °C ambient without load reduction, 25 A...30 A up to 80 °C
ENTRY version	Load output with short circuit protection
ENTRYprotect version	Load output with short circuit and overload protection (typically 200 ms at $I_{Load} >$ typically $1.3 \times I_N$) $I_N = 1\text{ A}...10\text{ A}$: see trip curve 1 $I_N = 15\text{ A}...30\text{ A}$: see trip curve 2

Induced current consumption I_0 of the unit (OFF condition) < 1 mA

Typical voltage drop U_{ON} at rated current I_N (at 25 °C)

I_N	U_{ON}	I_N	U_{ON}
1 A	50 mV	10 A	110 mV
2 A	55 mV	15 A	70 mV
3 A	60 mV	20 A	90 mV
5 A	80 mV	25 A	120 mV
7.5 A	90 mV	30 A	140 mV

Switching point (only ENTRYprotect)	typically $1.3 \times I_N$ (-40 °C...+85 °C: $1.1...1.5 \times I_N$)
Trip time (standard curve) (only ENTRYprotect)	typically 200 ms with switch-on onto overload and/or load increase on duty
Current limitation	$I_N = 1\text{ A}...10\text{ A}$: typically 75 A $I_N = 15\text{ A}...30\text{ A}$: typically 350 A

Temperature disconnection After trip	power transistor > 150 °C - resettable via external control signal (low-high) at control input IN+ - reset of supply voltage
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Parallel connection of channels for loads of 30 A plus, several units of identical current ratings may be connected in parallel. To ensure equal distribution of current between units, symmetrical design of the supply feed is necessary (length and cross section).

Leakage current in OFF condition

$I_N = 1\text{ A}...10\text{ A}$: max. 100 μA
$I_N = 15\text{ A}...30\text{ A}$: max. 500 μA

Technical Data ($T_U = 25\text{ }^\circ\text{C}$, $U_S = \text{DC } 24\text{ V}$) ($T_U = \text{ambient temperature at } U_N$)

Free-wheeling diode for connected load	integral $I_N = 1\text{ A} \dots 10\text{ A}$: max. 40 A $I_N = 15\text{ A} \dots 30\text{ A}$: max. 100 A
Delay time t_{on} / t_{off} (resistive load)	typically 0.5 ms / typically 1.5 ms (EMC filter in control input)
Short circuit, overload in load circuit	- disconnection of load - no automatic re-start - after remedy of the fault unit has to be reset via control input IN+
Control input IN+	
Control voltage IN+	0...5 V = "OFF", 8.5...32 V = "ON"
Control current I_E	typically 1 mA at 12 V / typically 5 mA at 24 V
Reset in the event of a failure	- reset via external control signal (low-high) at control input IN+ - via reset of supply voltage possible, see max. switching frequency
Dimmer operation (e.g. PWM signal)	
Switching frequency at resistive or inductive load	max. 100 Hz
Rising edge of IN+	< 5 ms
General data	
Reverse polarity protection	
Control circuit	yes
Load circuit	no (due to integral free-wheeling diode)
Temperature range	
ambient temperature	- standard: $-40 \dots +85\text{ }^\circ\text{C}$ without load reduction ($80\text{ }^\circ\text{C}$ at $25 \dots 30\text{ A}$)

Tests

Humid heat	combined test, 9 cycles with functional test
Temperature change	test to DIN EN 60068-2-30, Z/AD min. temperature $-40\text{ }^\circ\text{C}$, max. temperature $+90\text{ }^\circ\text{C}$ test to DIN IEC 60068-2-14, Nb in operation, with temperature change 6 g eff. (10 Hz...2,000 Hz)
Vibration (random)	test to DIN EN 60068-2-64 25 g/11 ms, 10 shocks
Shock	test to DIN EN 60068-2-27
Corrosion	test to DIN EN 60068-2-52, severity 3
Protection class	housing -8D4 IP30 to DIN 40050 housing -8D5 IP54 to DIN 40050, higher protection class upon request
EMC requirements	EMC directive: emitted interference EN 50081-1 noise immunity EN 61000-6-2 Automotive directive: emitted interference, noise immunity: 72/245/EWG and 2006/28/EG

Terminals (4 pin)

4 blade terminals 6.3 mm x 0.8 mm
contact material CuZn37F44
- on automotive relay socket 4-pole

Housing

max. dimensions	30 x 30 x 30 mm when plugged in 30 x 30 x 41.6 mm including terminals
Materials	housing PA66-GF30 base plate PA6-GF30
Mass	approx. 20 g

Approvals

CE, e1 logo: to EMC directive and vehicles directive
Approved by Kraftfahrt-Bundesamt
approvals no. e1 035636

Ordering Information

Type

E-1048-8D Smart Power Relay DC 12 V/24 V, 1 A...30 A
in DICE version

Housing / temperature range

- 4 with housing $-40\text{ }^\circ\text{C} \dots 85\text{ }^\circ\text{C}$ (for rated current up to 20 A)
- 5 with housing $-40\text{ }^\circ\text{C} \dots 85\text{ }^\circ\text{C}$ ($80\text{ }^\circ\text{C}$ at $I_N = 25/30\text{ A}$)
increased environmental requirements (IP protection class etc.)

Control input

C0 with control input (+ control 8.5...32 V)

Options

A0 without options

Characteristic curve

- 0 ENTRY, short circuit protected
- 4 ENTRYprotect, 200 ms standard
switch-off delay with overload, short circuit protected

Voltage rating

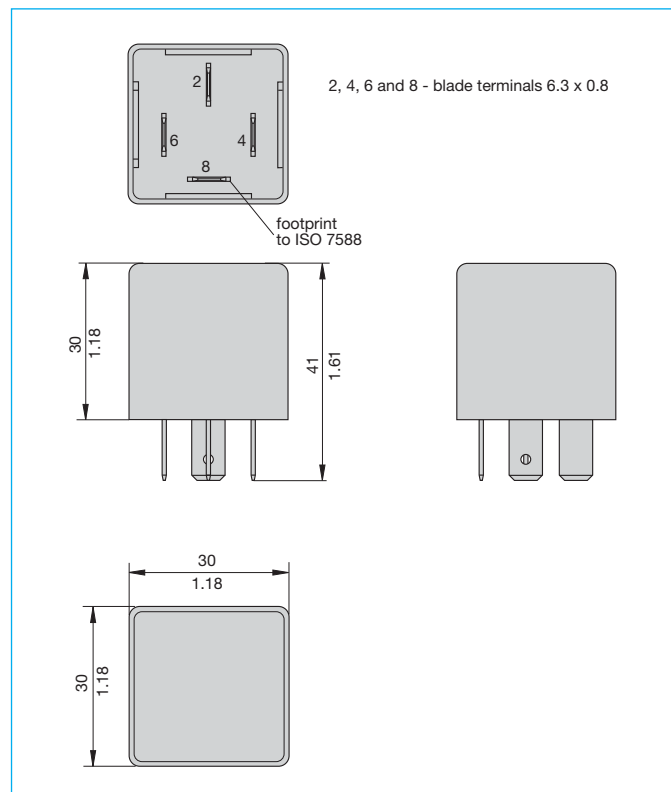
U3 DC 12/24 V

Current ratings / colour of label

- 1 A / black
- 2 A / grey
- 3 A / purple
- 5 A / light-brown
- 7.5 A / brown
- 10 A / red
- 15 A / blue
- 20 A / yellow
- 25 A / white
- 30 A / green

E-1048-8D 4 - C0 A0 - 0 U3 - 10 A ordering example:
ENTRY version 4 pin

Dimensions DICE version (4 pin version)

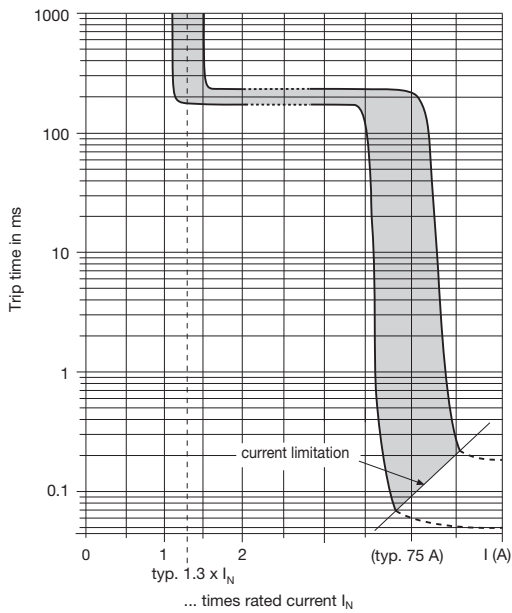


This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

Typical time/current characteristics ($T_A = 25\text{ }^\circ\text{C}$)

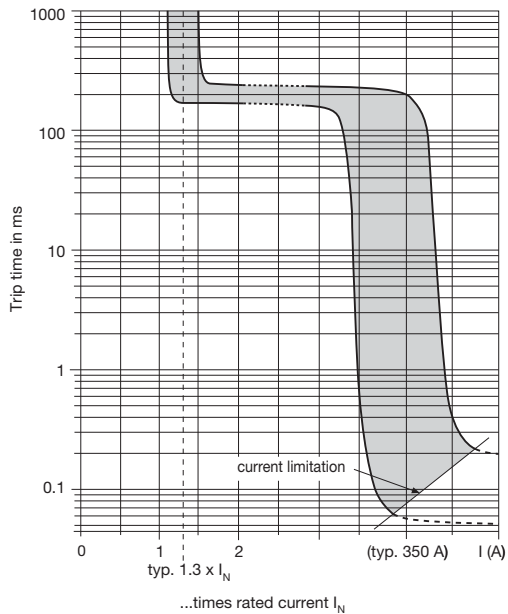
Trip curve 1 "ENTRYprotect"

1 A, 2 A, 3 A, 5 A, 7,5 A and 10 A (standard 200 ms)

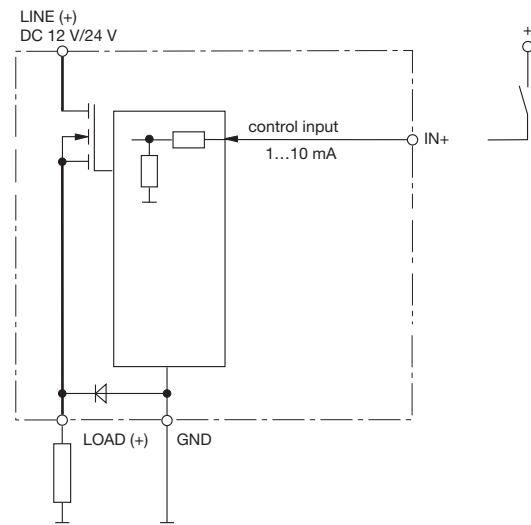


Trip curve 2 "ENTRYprotect"

15 A, 20 A, 25 and 30 A (standard 200 ms)



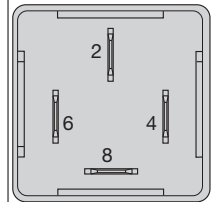
Connection diagram DICE version



Pin selection DICE version (4 pin)

E-1048-8D. DICE version

LINE +	(1)	plus U_S (DC 12 V/24 V)
IN+	(4)	control input
GND	(6)	minus U_S
LOAD	(8)	load output



All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.