Electronic Design & Research Inc.
http://www.vsholding.com

True Double Pole, Single Through (DPST or 2 Form A+B) Connectable as a SPDT and others DPST Solid-State Relays

Technical Information

DPST relays with two isolated pairs, 1 Form A + 1 Form B terminals configuration for DC and AC/DC applications.

Form B terminal is a true normally closed pair

Designed time-delay between terminations allows configuring a DPST relay as a true SPDT relay, or converting

1 Form A + 1 Form B relay **into** ***1 Form C*** ***relay***

Under management

VS Holding LLC
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INTRODUCTION

Solid-State Relays/Switches from Electronic Design & Research offers a broad range of functions from a basic normal open and normal close relays to a bus-compatible, fuzzy logic input high-speed drivers, power distribution modules made for motorcycles, power boats, etc. and solid-state breakers. Some EDR's devices are pin-for-pin and functionally comparable to similar relays accepted in the industry and manufacture by other company, and most of them grow to be the standard by itself.

Devices included in this publication offer speed and power capability with low power dissipation the way beyond what is available in the industry today. A precise control of turning-on and turning-off timing allows using high-power DPST devices as ½ drivers (or as a true SPDT relay) simplifies designing a high-power controlling and driving equipment. A SIP-packaging is especially attractive for use in the systems where a board space is critical.

IMPORTEN NOTICE

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EDR warrants performance of its product to current specification in according with EDR's standard warranty. Testing and other quality control techniques are utilized to the extend EDR deems necessary to support this warranty. Unless mandated by government requirements, specific testing of all parameters of each device in not necessarily performed.

EDR assumes no liability for EDR applications assistance, customer product design, or infringement of patent or services described herein. Nor does EDR warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property rights of EDR covering or relating to any combination, machine, or process in which such modules products or services might be or are used.

There are plenty of an electromechanical normal-close relays on the market but if a high current, high-voltage power must be controlled a solid-switch is the best choice. Many companies and so EDR manufacture varieties of normal-open switches and until now, only a low-power normal-close switch was available on the market. This publication is about our newest family of unique solid-state devices. We proud to offer you a family of high-current, normal-close/normal-close DPST relays that can be used as a SPDT relay, or as a break-before-make analog switch, or as a ½ driver. This publication included the Ordering Instruction. You can create a new part number, for your unique application that required a different voltage, current or speed following the Instruction. Please, do not hesitate to send an email to: info@vsholding.com for any additional information, delivery schedule and prices.

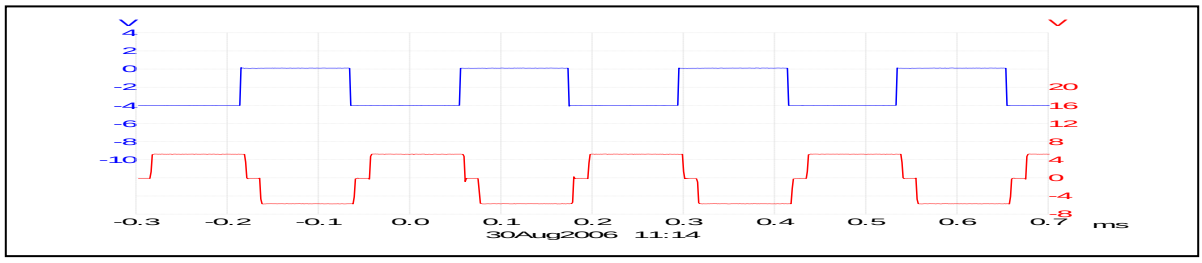
Thank you,

Vladimir A. Shavrtsman, Ph.D.
President & CEO
V_Shvartsman@vsholding.com

From the creation time, Electronic Design & Research Inc. is working to satisfy, as it looks like an endless flow of requirements for a new and unique products and technology. We gave life in 1982 to a neural-cell technology and now a new branch of science Neural Networks is flourishing. Based on that invention we introduced in 1984 a Multichannel signal processor, which for the first time detected a faint signal from the heart from the body surface. Since 1998, we put a heavy emphasis on developing varieties of modules, such as solid-state relays, drivers and switches. Our modules are working in many critical applications providing a power inside of super-power, redundant servers installed on submarines, control movements of chairs in iMax Theatres,

One of the most popular relays from that family (p/n EDR82450 with a 2 FORM A wiring diagram) has found application in high-speed printers. Precise turning on/off timing allows connecting both terminals for a large current capacitance and that is exactly what was exploited by one of our customer for controlling heavy, fast machinery.

Recently, we expended the family with adding more advance switching products. A new relay (p/n EDR82308) with 1A+1B terminal configurations employed that is used can be found only in advanced analog and sophisticated switches. An internal electronic insures and guarantees that there is no shoot-through current when and if a N.C. (normal close) pair and a N.O. (normally open) terminals wired in series. Only expensive ½-bridge drivers and analog switches so far offered such precision switching. It is a fast, powerful relay and more appropriate is a switch rated at 20 amps @ 75VDC. For the first time in the industry, the EDR82308 provides a high-current, normally close solid-state relay.



The EDR82308 with two pair of terminals (one is N.C. and the other N.O.) can work, as a driver when terminals connected in serious and a load is common.

The internal control circuitry allows the driver, large varieties of powerful MOSFETs and as the result of that; we offer a large variation of relays to switch a DC and DC/AC power. Please send us an inquiry. We do not charge a set-up production fee for an order of 200 relays and up.

T4N75D20/24/C

Powerful, N.C./N.O. Solid State Relay

Designed to control 20 A, 75VDC in microseconds

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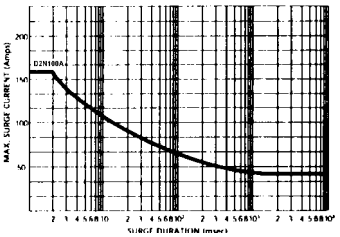
Features:
- **Utilizes only 1.84 sq. in. of PCB area and only 1.2" tall**
- **20 Amp continuous or up to 160 Amp-pick in miniature size**
- **High sensitivity, even at a high switching frequency**
- **300 A surge current, and only 10 mill-Ohms low on-state resistance**
- **24V input, and only 20 mA**

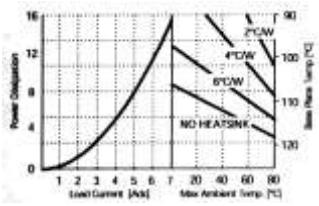
Input Specifications:

Input DC Voltage	24 VDC	or 12 VDC
Nominal Current, at 10 Hz	12mA	18mA
Maximum Current, at 1 KHz	13 mA	20mA
Maximum Current, at 25 KHz	16 mA	23mA

Output Specifications:

Operating DC voltage range	0 – 75 VDC
Maximum continuous current	20A rms
Maximum surge current (IDM)	300A @ 1.0ms
Continues current (ID)	160A @ 25 °C
Maximum on-state resistance	0.010 Ohm
Rising time	0.5 µS
Delay-on time	7.5 µS
Falling time	0.2 µS
Delay-off time	21.2 µS
Maximum switching frequency	25.0 KHz



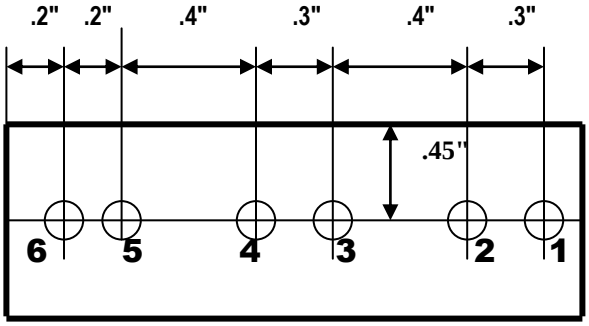


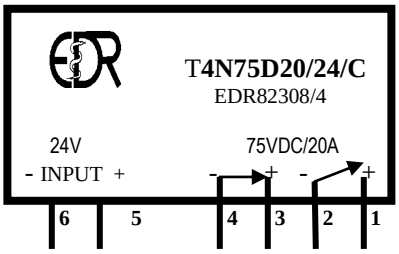
General Specifications:

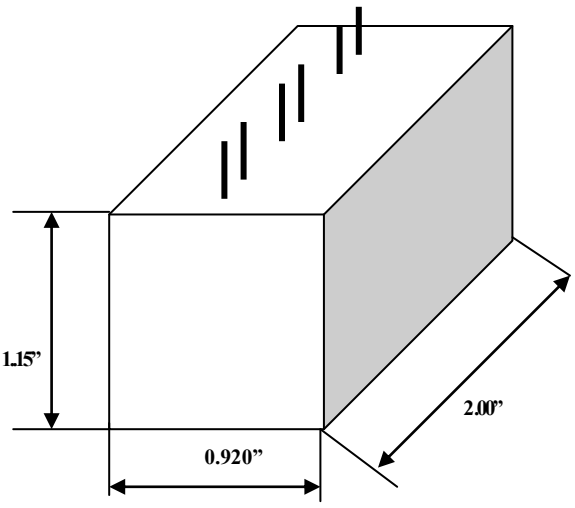
Ambient operating temperature range	-35^0 C to 85^0 C
Ambient storage temperature range	-40^0 C to 95^0 C
Dialectic Strength input-to-output	3000VAC
Dialectic Strength between terminals	3000VAC

Mechanical Specifications:

Weight(oz)	.5
Encapsulation	ResTech 10207/053
Terminals; input/output	.040"/0.60" diameter
Dimensions	.1.15"Hx2.0"Lx.92"W







Transient Protection: All loads are inductive, even ones that are not so obvious or labeled. An inductive load produces a harmful transient voltage, which is much higher than the applied voltage, when it is turned on and off. A SSR built with a MOSFET output acts as an ideal switch and can produce a seemingly "non-inductive" load, which can cause damage if not suppressed. A transient voltage suppressor, which is bi-directional for an AC applied voltage and unidirectional for a DC applied voltage, should be used to clamp excessive spikes.

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The SPDT relay (p/n EDR82308) is unique in its class. Below are time-diagrams snap-shorts prepared for better understanding its time-responses and its performance in variety tasks.

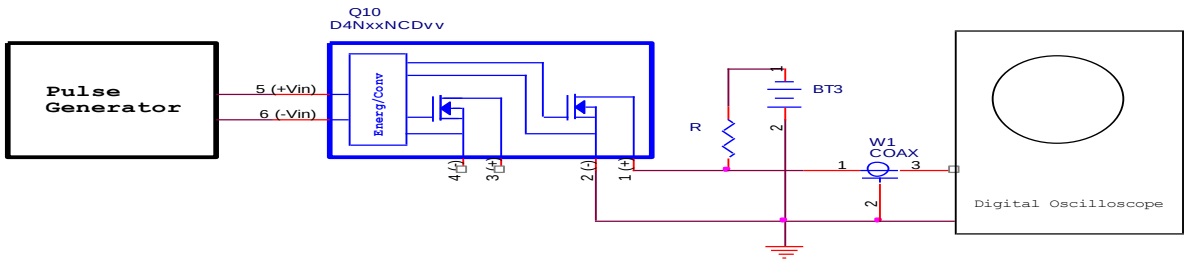


Figure 1 A testing set-up for a normal-open (N.O.) pair

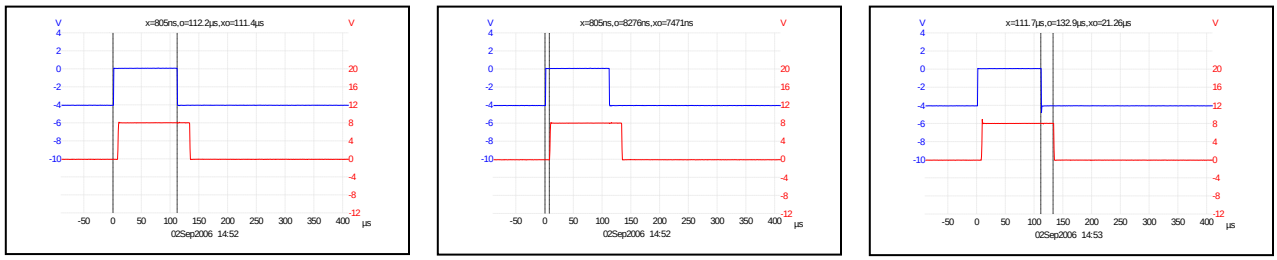


Fig. 2

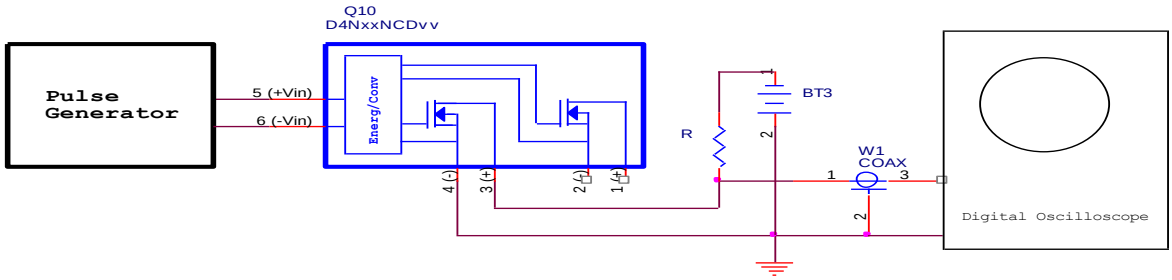
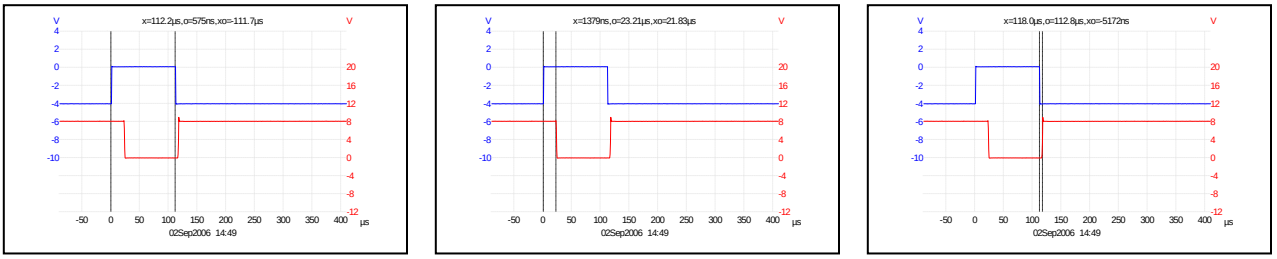


Figure 5 A testing set-up for a normal-close (N.C.) pair



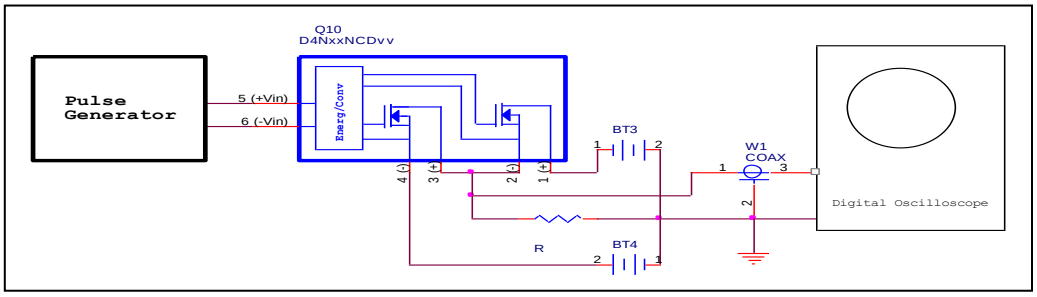
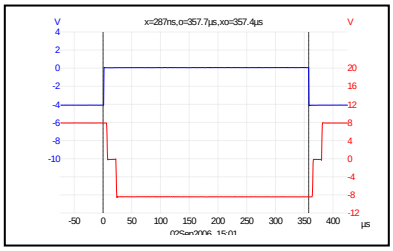
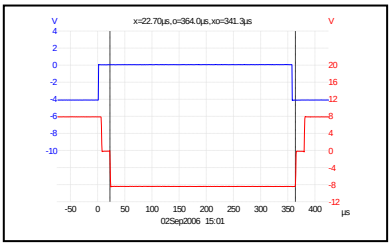
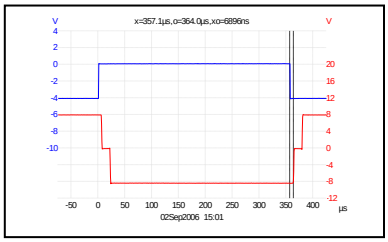
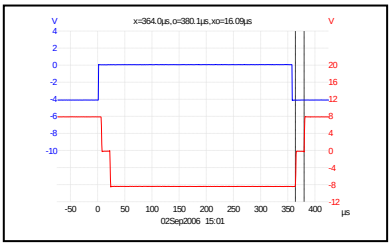
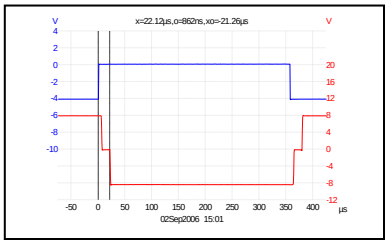
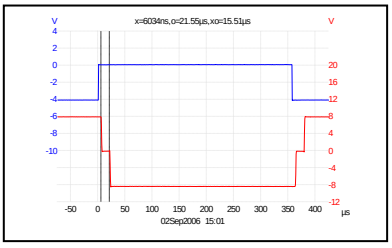
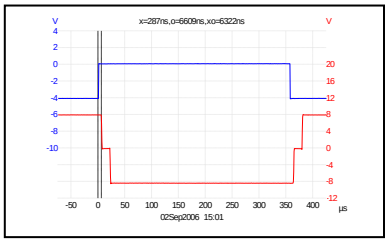
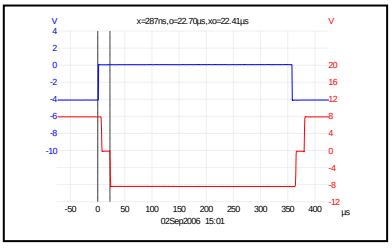
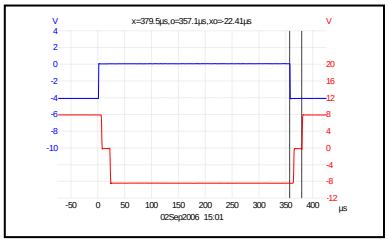
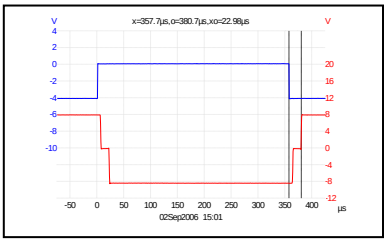


Figure 5 Set-up for test of a SPDT hook-up

Occurred timing relationship between an input signal (pulse) and output signal (pulse) at a load.

T6N200A2/24/C

Powerful, N.C./N.O. Solid State Relay

Designed to control 2A at +/-200VDC in microseconds

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Technology for people's ideas

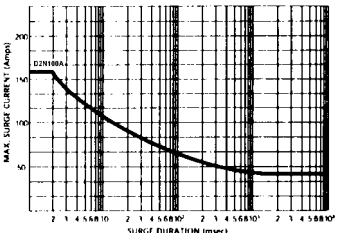
Features:
- **Utilizes only 1.84 sq. in. of PCB area and only 1.2" tall**
- **2.2 Amp continuous or up to 18 Amp-pick in miniature size**
- **High sensitivity, even at a high switching frequency**
- **70 A surge current, and only .30 Ohms low on-state resistance**
- **At 24V input the relay consumes only 12 mA**

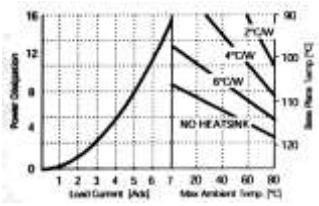
Input Specifications:

Input DC Voltage	24 VDC or 12 VDC	
Nominal Current, at 10 Hz	12mA	18mA
Maximum Current, at 1 KHz	13 mA	20mA
Maximum Current, at 25 KHz	16 mA	23mA

Output Specifications:

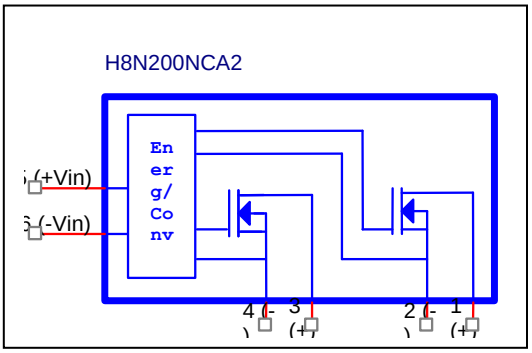
Operating DC voltage range	+/-200 VDC (140VAC)
Maximum continuous current	2.2 A rms
Maximum surge current (IDM)	70 A @ 1.0ms
Continues current (ID)	18A @ 25 °C
Maximum on-state resistance	0.30 Ohm
Rising time	0.5 µS
Delay-on time	7.5 µS
Falling time	0.2 µS
Delay-off time	21.2 µS
Maximum switching frequency	25.0 KHz



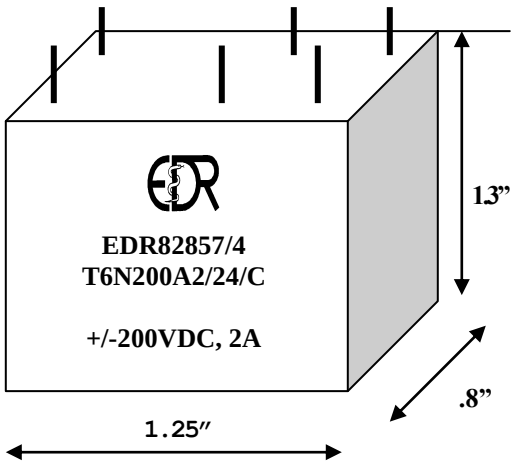


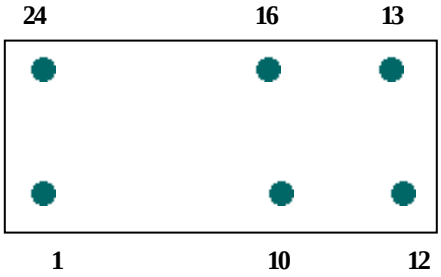
General Specifications:

Ambient operating temperature range	-35^0 C to 85^0 C
Ambient storage temperature range	-40^0 C to 95^0 C
Dielectric Strength input-to-output	3000VAC
Dielectric Strength between terminals	3000VAC
Mechanical Specifications:	
Weight(oz)	.5
Encapsulation	ResTech 10207/053
Terminals; input/output	.040"/0.60" diameter
Dimensions	.1.15"Hx2.0"Lx.92"W



Simplified block-diagram of the relay





View from the bottom:

1 – control signal
10 & 12 – N.C. pair
13 & 16 – N.O. pair
20 – Control Signal

Transient Protection: All loads are inductive, even ones that are not so obvious or labeled. An inductive load produces a harmful transient voltage, which is much higher than the applied voltage, when it is turned on and off. A SSR built with a MOSFET output acts as an ideal switch and can produce a seemingly "non-inductive" load, which can cause damage if not suppressed. A transient voltage suppressor, which is bi-directional for an AC applied voltage and unidirectional for a DC applied voltage, should be used to clamp excessive spikes.

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D4N200D8/24/NN

Powerful Subminiature Solid State Relay/Switch

Designed to control 8 A, 200 VDC in microseconds

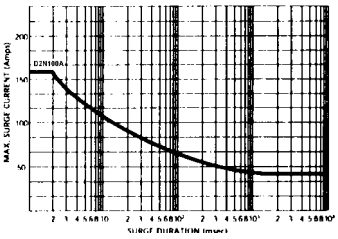
Features:
- **Utilizes only 1.84 sq. in. of PCB area and only 1.2" tall**
- **8 Amp continues or up to 16 Amp-pick in miniature size**
- **High sensitivity, even at a high switching frequency**
- **300 A surge current, and only 40 mill-Ohms low on-state resistance**
- **24V input, and only 20 mA**

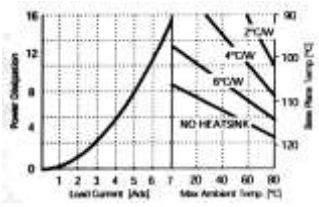
Input Specifications:

Input DC Voltage	24 VDC or 12 VDC	
Nominal Current, at 10 Hz	12mA	18mA
Maximum Current, at 1 KHz	13 mA	20mA
Maximum Current, at 25 KHz	16 mA	23mA

Output Specifications:

Operating DC voltage range	0 – 200 VDC
Maximum continuous current	8A no heat-sink
Maximum surge current (IDM)	300A @ 0.01mS
Continues current (ID)	120A @ 1.0ms
Maximum on-state resistance	0.080 Ohm
Rising time	0.5 µS
Delay-on time	1 µS
Falling time	0.2 µS
Delay-off time	1 µS
Maximum switching frequency	25.0 KHz



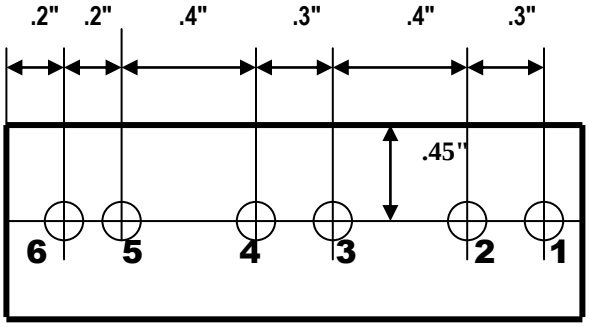


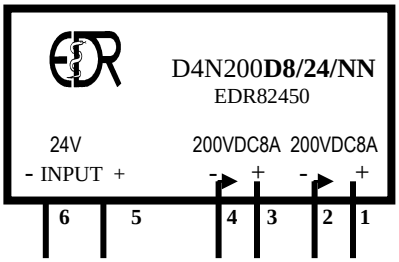
General Specifications:

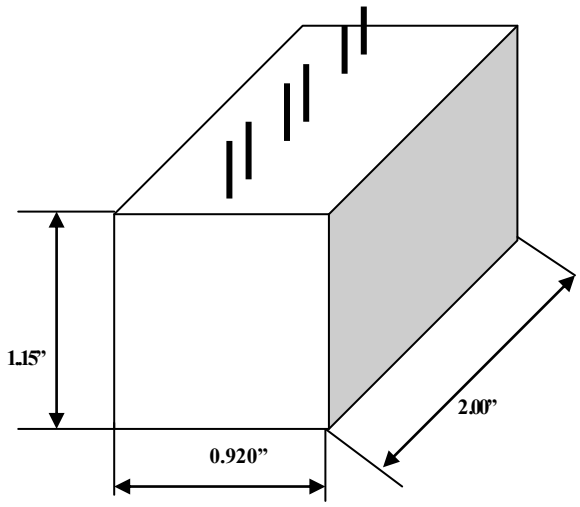
Ambient operating temperature range	-35^0 C to 85^0 C
Ambient storage temperature range	-45^0 C to 95^0 C
Dialectic Strength input-to-output	1000VAC
Dialectic Strength between open contacts	200VAC

Mechanical Specifications:

Weight(oz)	.5
Encapsulation	ResTech 10207/053
Terminals	.040"
Dimensions	.1.15"Hx2.0"Lx.92"W
Terminals - Solder	.040" diameter







Transient Protection: All loads are inductive, even ones that are not so obvious or labeled. An inductive load produces a harmful transient voltage, which is much higher than the applied voltage, when it is turned on and off. A SSR built with a MOSFET output acts as an ideal switch and can produce a seemingly "non-inductive" load, which can cause damage if not suppressed. A transient voltage suppressor, which is bi-directional for an AC applied voltage and unidirectional for a DC applied voltage, should be used to clamp excessive spikes.

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EDR82441 SPDT Analog Switch

1 Form A + 1 From B terminals SSR

Designed to control 4 A, +/-75VDC (52VAC)

Electronic Design & Research
http://www.vsholding.com

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Features:

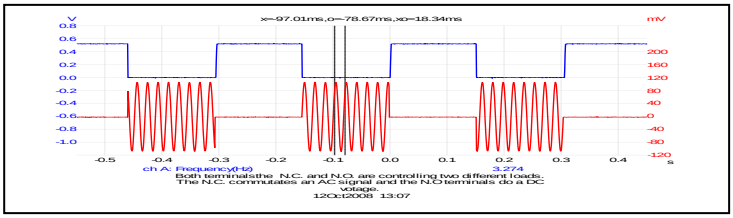
- **Utilizes only 1.84 sq. in. of PCB area and only 1.2" tall**
- **4 Amp continuous or up to 29 Amp-pick in miniature size**
- **100 A surge current and only .06 Ohms low on-state resistance**
- **Wide input range 4-15V input, and only 14 mA**
- **Designed with small internal delays, circuitry virtually eliminates terminals cross conduction and current shoot-through allows the relay to work as a SPDT or DPST output terminals configuration.**
- **Built-in a 7mS de-bouncing protection simplifies an interfacing with electro-mechanical controls.**
- **Break-before-make SPDT switch configurable as a DPST**

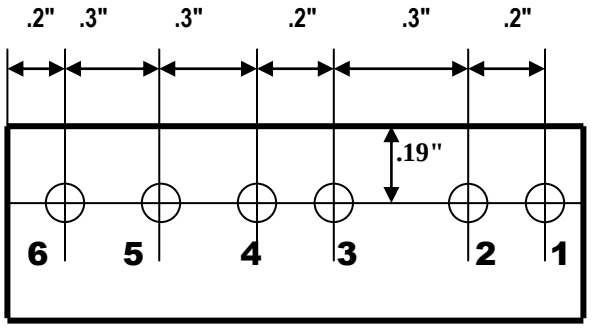
Input Specifications:

Input DC Voltage	3.7VDC 15 VDC
Nominal Current	11 mA 14.6mA
Must Turn On Voltage	3.6 VDC
Must Turn Off Voltage	2.4 VDC

Output Specifications:

Operating DC voltage range	+/-75VDC (52VAC)
Maximum continuous current	4A rms
Maximum surge current (IDM)	100A @ 1.0ms
Continues current (ID)	29A @ 25 °C
Maximum on-state resistance	0.060 Ohm
Rising time	14.9 µS
Delay-on time	22.5µS
Falling time	0.2 µS
Delay-off time	33.25 µS
Maximum switching frequency	70 Hz



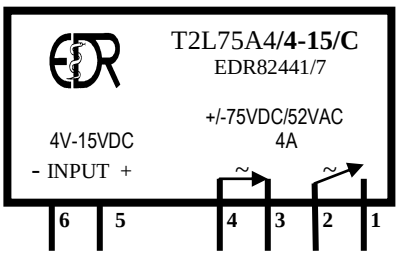


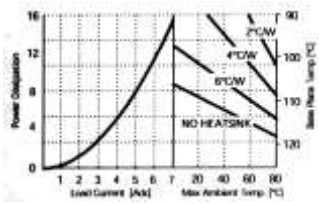
General Specifications:

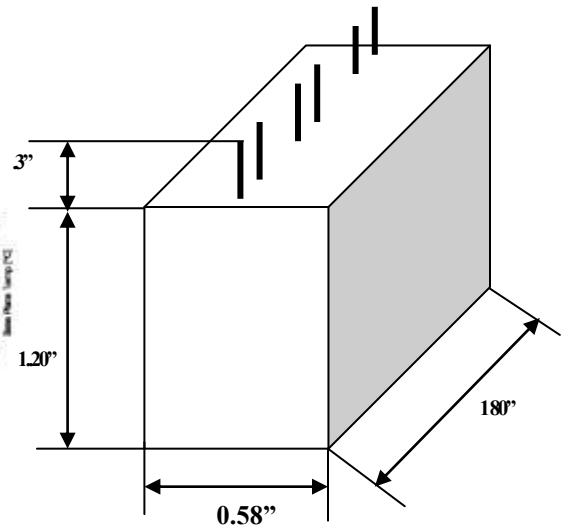
Ambient operating temperature range	-35^0 C to 85^0 C
Ambient storage temperature range	-40^0 C to 95^0 C
Dialectic Strength input-to-output	3000VAC
Dialectic Strength between terminals	3000VAC

Mechanical Specifications:

Weight(oz)	.5
Encapsulation	ResTech 10207/053
Terminals; input/output	.031"/0.051" diameter
Dimensions	1.2"H x 1.8"L x .58"W







Transient Protection: All loads are inductive, even ones that are not so obvious or labeled. An inductive load produces a harmful transient voltage, which is much higher than the applied voltage, when it is turned on and off. A SSR built with a MOSFET output acts as an ideal switch and can produce a seemingly "non-inductive" load, which can cause damage if not suppressed. A transient voltage suppressor, which is bi-directional for an AC applied voltage and unidirectional for a DC applied voltage, should be used to clamp excessive spikes.

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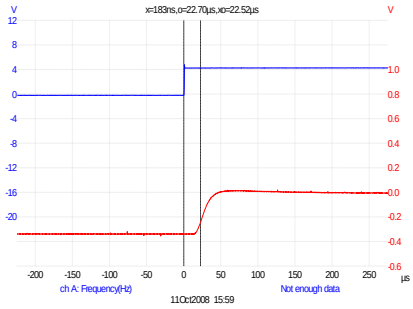
Input Electrical Characteristics (Ta = 25^{0}C) for T2L75A4/4-15, p/n EDR82441/7

	Minimum	Nominal	Maximum	Unit
Control Voltage, pins 5-6	3.5		18	V
Control Current, pins 5-6	11.09		14.8	mA
Current Leakage/75VDC, pins 1-2 and 3-4			20	µA
Capacitance, pins 1-2 and pins 3-4 (turn off)			290	pF

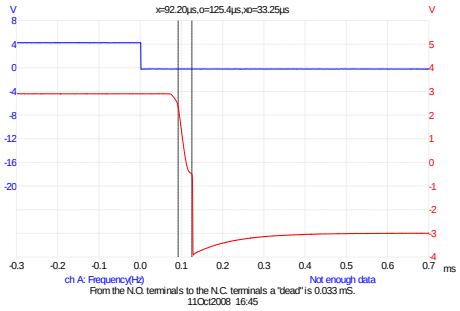
Switching time test: voltage +/-20VDC, load is 10 Ohm & 2A and V1 is 4V



Control

Load

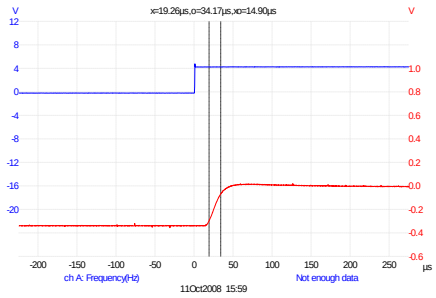
Figure 1 Turn-on delay is 22.5µS



Control

Load

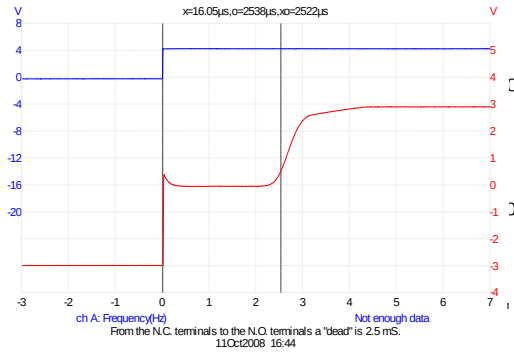
Figure 2 Turn-off "dead" time is 33.25µS



Control

Load

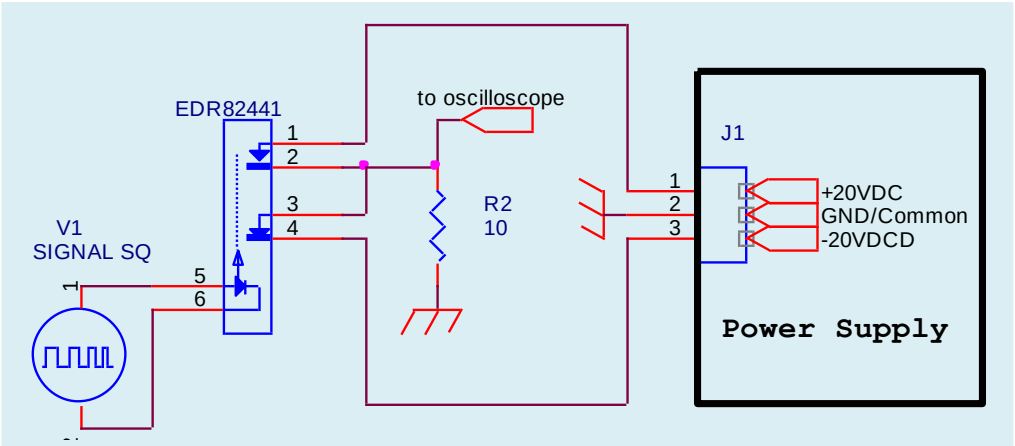
Figure 3 Rising time is 14.9µS



ontrol

oad

Figure 4 A turn-on "dead" time 2.5 mS

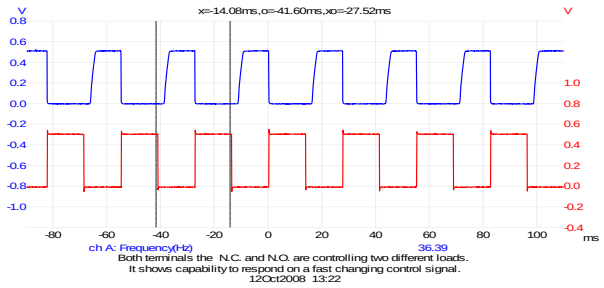


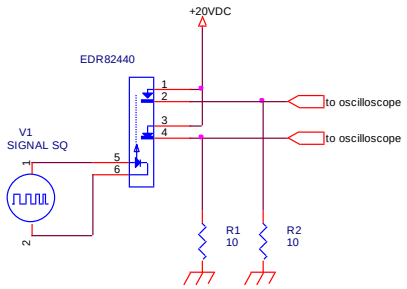
Switching Time Test Circuit

APPLICATIONS

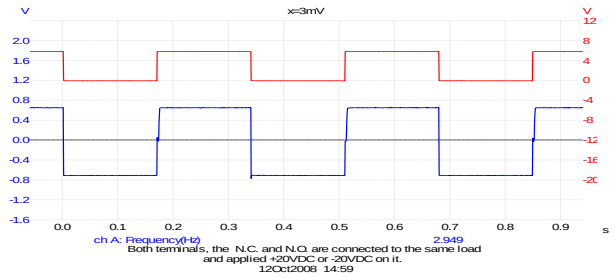
Application for a SPDT/DPST with true N.C. terminal series Solid-State Relay is illustrated by just a few examples below. The EDR82441 from that series is a bi-direction switch taking place over the full analog signal range of +/-75VDC, with break-before- make operation to prevent momentary shorting of output signals. The EDR82441 is an analog switch that switches positive or negative signals while using a single control voltage that can vary from 4V to 15V.

The EDR82441, as 1 Form A + 1 Form B relay switches power alternatively between two loads



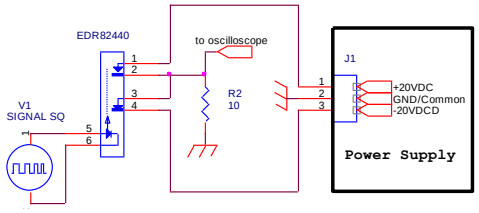


The EDR82441 is configured as a DPST switch (1 Form C)

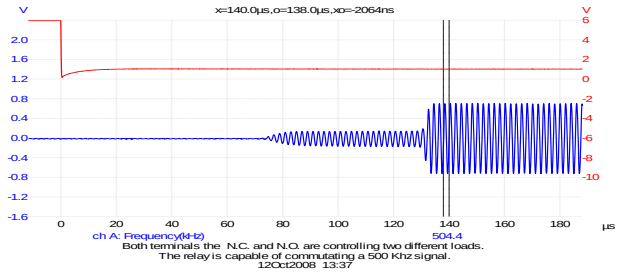


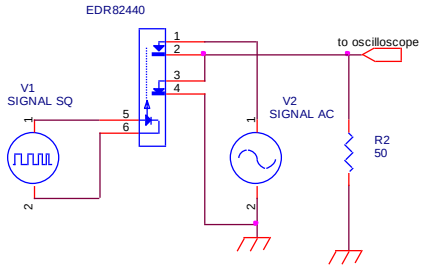
control

output

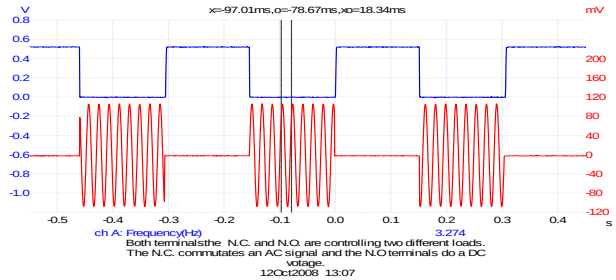


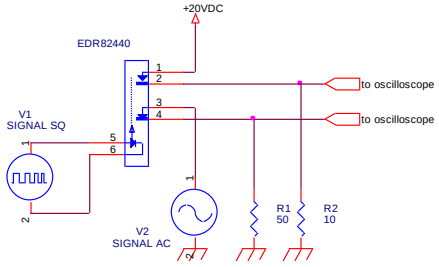
The EDR82441 is capable to commutate a high frequency, as it shown 500 KHz.





Both terminals of EDR82441 are isolated of each other that allow commutating DC and AC powers.

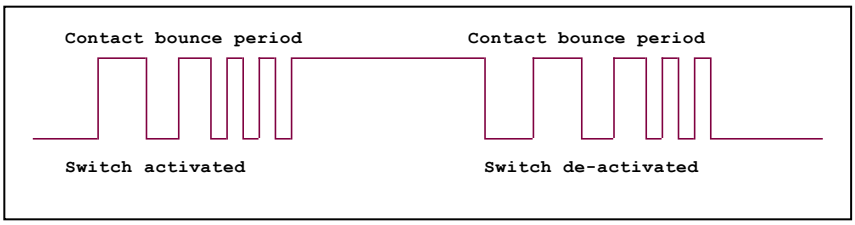




CONTACT BOUNCE AND EDR82440 IS DE-BOUNCING SOLUTION

The situation

Push-button switches, toggle switches, and electro-mechanical relays all have one thing in common: contacts. It's the metal contacts that make and break the circuit and carry the current in switches and relays. Since at least one of the contacts is on a movable strip of metal, it has springiness. Contacts are designed to open and close quickly with a little resistance (damping) to their movement. Contacts have mass and springiness with low damping that make them bouncy as they make and break. When a normally open (N.O.) pair of contacts is closed, the contacts will come together and bounce off each other several times before finally coming to rest in a closed position. The effect is called "contact bounce" or, in a switch, "switch bounce," contacts can bounce on opening as well as on closing.

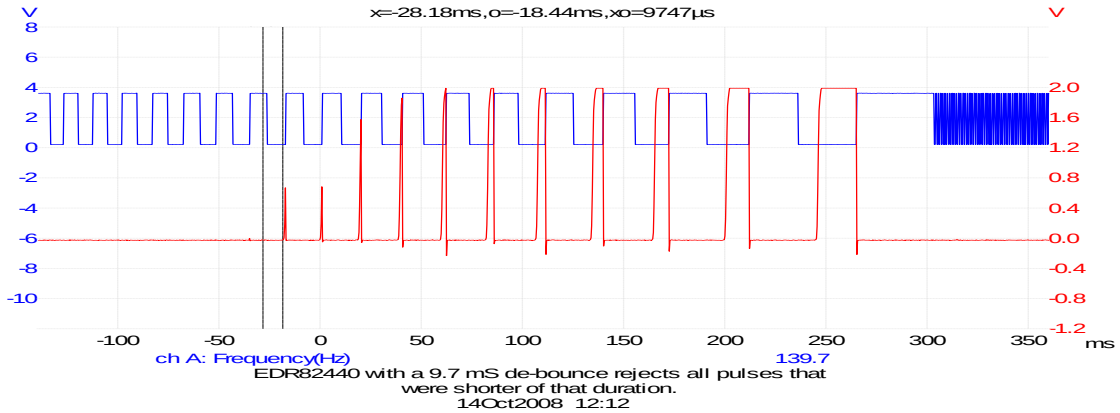


The Problem

In some cases, a contact bouncing is irrelevant when a switch or relay is used to turn on a lamp or start a fan motor. However, it becomes a problem when a switch or electromechanical relay is the input to a digital counter, a personal computer, or a micro-processor based piece of equipment. In such cases, a designer must consider contact bounce. The reason for concern is that the time it takes contacts to stop bouncing is measured in milliseconds, but digital circuits respond in microseconds.

The Solution

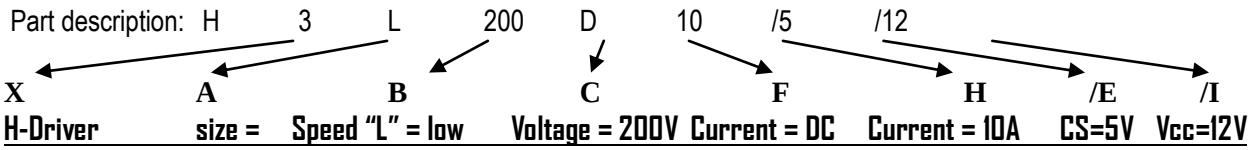
There are several ways to solve the problem of contact bounce (that is, to "de-bounce" the input signal). Often the easiest way is to get a piece of equipment that is designed to accept "bouncy" input and EDR's made Solid-State Relays are a solution.



Any relay of the SPDT/DPST with a true N.C. terminals family can be ordered with the de-bouncing. In most cases a 10 mS de-bounce is sufficient to avoid nuisances of mechanical and electromechanical devices but please let us know if any another period would be required.

Selection and Ordering Instruction for EDR's made Solid State Modules such as Relays, Switches, Breakers, ½ and Full-bridge Drivers, etc.

Notes: During past ten years rapid development of new and additional [products gave us no choice but to expend, modify and unify part descriptions. Below represent the third modification. Our modules description will be marked according to the specifications below but p/n EDRxxxxx will stay the same for already items in circulation (already sold).



"X" module type

D	Solid State Relay, SPST-NO and SPST-NC switches
T	Driver, such as ½-bridge or a SPDT relay which can work as a ½ driver
M	Driver, such as a switch with built-in PWM controller
H	Full-bridge (H-bridge) Driver
C	Relay with built-in de-bouncing or a turn-on/off delay
B	Solid State Breaker and brakes control modules

"A" package dimensions

1	0.615"H x 1.48"L x 0.290"W
2	1.15"H x 1.75"L x 0.4"W
3	1.15"H x 1.75"L x 0.8"W
4	1.15"H x 2.0"L x 0.92"W
5	1.15"H x 2.8"L x 1.15"W
6	DIP24, 0.375"H x 0.925"L x 0.53"W
7	panel mount, 0.82"H x 2.7"L x 2.0"W
8	DIN type enclosure, 2.36"H x 2.36" x 1.5"W, for 35mm DIN Rail
9	10" x 8"
P	panel mount, 2.275" x 1.75" x .8"

"B" Speed - A device's ability to turn ON/OFF output terminal(s) times per second

L	a low speed relay/switch, rated DC - 200 Hz, direct driving control
A	a low speed relay/switch, AC input relays
N	a medium speed relay/switch, rated DC - 25 KHz, direct driving control
G	a medium speed relay/switch, rated DC - 25 KHz, low current control and power
F	a fast relay/switch, rated up to DC - 350 KHz, low current control and power
S	a super-fast relay/switch, rated DC - 1.4 MHz, low current control and power
U	a super-fast relay/switch, rated DC – 1.2 MHz, direct driving control
V	Fast, High Voltage Solid-State Switches with Nanoseconds rise time

"C" Output Voltage - A maximum allowed voltage between output terminals, up to 100kV

It must be replace with required voltage and we offer the closest and highest value available.
Note: In an "AC" -relay a voltage specified a peak-to-peak maximum voltage and the maximum VAC can be calculated by multiplying a maximum allowed voltage by factor of 0.7

"F" A relay can be use to control either AC, DC or AC/DC power

A	- a relay/switch designed to switch/chop an AC/DC power
D	- a relay/switch designed to switch/chop a DC power
"none"	- relay with a SCR or TRIAC on the output to control only AC power

"H" A maximum allowed RMS CURRENT (Ampere) without a heat sink

A maximum current limited to a size of the enclosure (box). We can produce a device for any required current in a customer enclosure.

"I" Some of our products use an internal DC/DC converter no provide a power to the internal electronics.

Varieties voltages are available: 5VDC+/-5%, 12VDC+/-5%, 24VDC+/-5% and 48VDC+/-5%. For a wider input power voltage swing, please add "W" after the voltage. For an example, 24W is for 24V +/-12V.

"E" We offer several standard control voltages 5VDC, 12VDC, 24VDC, 48VDC, 3-20VDC and 18-38VDC. Please specify the input control voltage, as for example D1L30D12/xx. Replace xx with a 3, 5, 12, 24, 48, 3-20 and 18-38 that is for 3VDC, 5VDC, 12VDC, 24VDC, 48VDC, 3-20VDC and 18-38VDC. Respectful control voltage represented at the end of part number in the following way, for an example EDR82653/1 and EDR82653/8. Both relays are almost the same and difference is only an applied control voltage, "1" if for 3VDC and "8" is for 18-38VDC;

Control Voltage	Representation	Control Voltage	Representation	Control Voltage	Representation
3VDC	1	5VDC	2	12VDC	3
24VDC	4	48VDC	5	26VDC	6
3-20VDC	7	18-38VDC	8	90-120VAC	9

"Z" A relay/switch built with following standard isolations

"L" or "none"	type relay is 2500 V
"N"	type relay is 3000V, 4000VDC ("H4") and 5200 ("H5") VDC.

"T" Turn-on delays; "S" for seconds, "M" for milliseconds, "U" for microseconds, M102 – 100 mS turn-off delay, 102M mS – turn-on delay

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