75VDC, 26Amp Relay/Switch

Powerful Fast Solid State Relay

Designed to deliver 40KW of power in a few microseconds

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

Technology for people's ideas

Features: Utilizes only 1.4 sq. in. of PCB area and only 1.15" tall
26A continuously or up to a 700A-spike in a miniature package
High sensitivity, even at high switching frequencies
1,200A surge current and only 0.01 Ohms on-state resistance

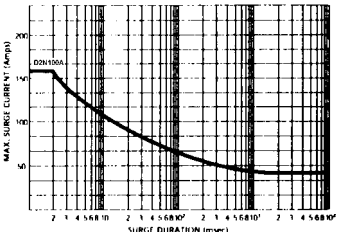
Please specify input control voltage: 12 and 24 VDC

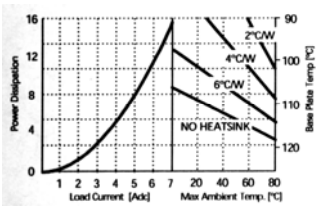
Input Specifications:

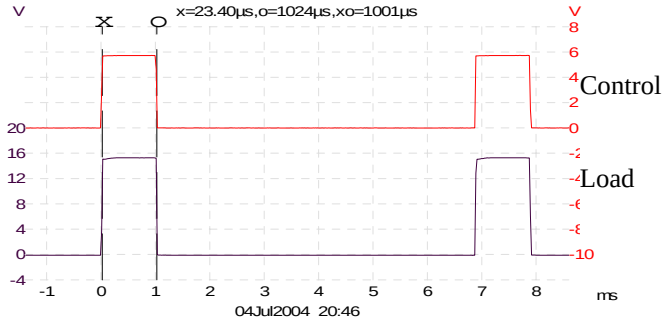
Input DC Voltage	12V	24V
Nominal Current	13mA	12mA

Output Specifications:

Operating DC voltage range	0 – 75VDC
Maximum continuous current	26A rms
Maximum surge current (IDM) - 2mS	1,200 A
IDM current	700A
Maximum on-state resistance	0.01 Ohm
Rising time	0.6µS
Delay-on time	6.0µS
Falling time	0.7µS
Delay-off time	6.4µS
Maximum switching frequency	10 KHz







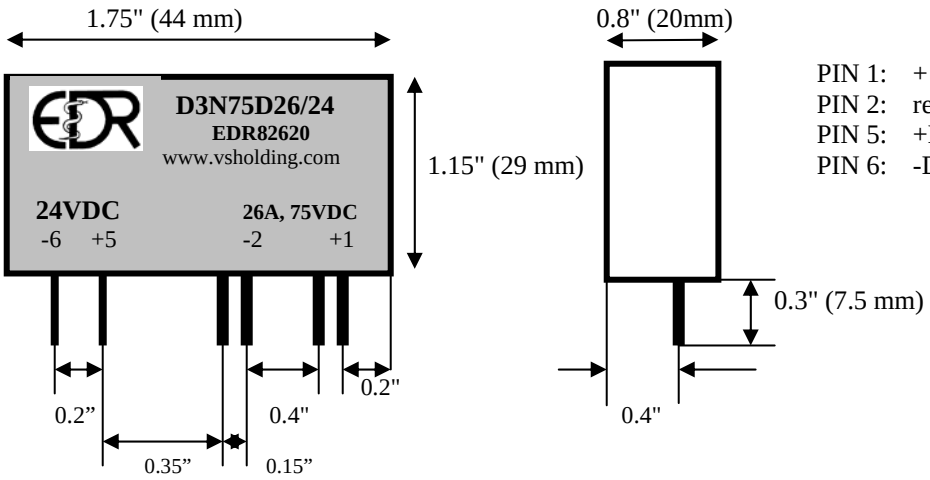
Pulse width 1mS, 500VDC, current 5A

General Specifications:

Ambient operating temperature range	-45^0 C to 85^0 C
Ambient storage temperature range	-55^0 C to 125^0 C
Dielectric Strength input-to-output	3,000VAC

Mechanical Specifications:

Weight (oz)		.2
Encapsulation	Epoxies Etc.	50-2366RFR / 50-2366CFR



PIN 1: + LOAD
PIN 2: return LOAD
PIN 5: +DC CONTROL
PIN 6: -DC CONTROL

All Dimensions are in inches (millimeters).

Dimensions for SIP4 package	1.15"H x 1.75"L x 0.8"W
Terminals/solder for SIP4 package	control - 0.40", power – 0.6"

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 AC applied voltage and unidirectional for DC applied voltage, should be used to clamp excessive spikes.

Input Electrical Characteristics (Ta = 25^{0}C) for D3N75D26/12, p/n EDR82620/3

Characteristic	Test Condition	Min	Typ.	Max.	Unit
Control voltage range		10	12	16	V
Maximum Turn-On Voltage			10		V
Maximum Turn-Off Voltage			8		V
Maximum Input Current			20		mA

Input Electrical Characteristics (Ta = 25^{0}C) for D3N75D3/24, p/n EDR82620/4

Control voltage range		18	22	26	V
Maximum Turn-On Voltage			18		V
Maximum Turn-Off Voltage			16.8		V
Maximum Input Current			18		mA

I. Switching time test – Load – 625 Ohm & 0.8A, Control Signal – 24VDC & current 12mA

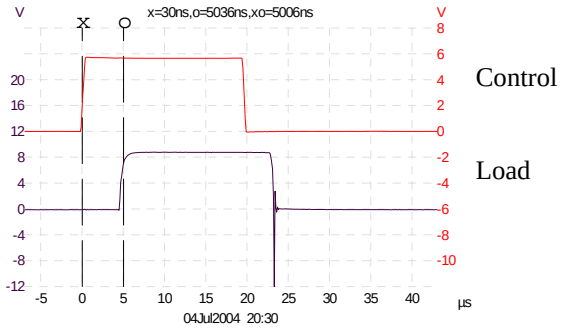


Figure 1 Turn-on delay is 5.0µS

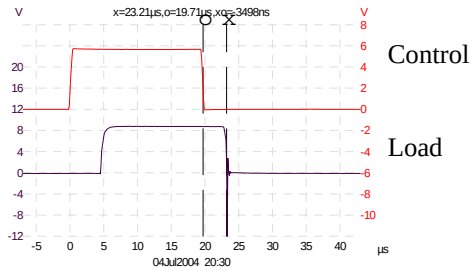


Figure 2 Turn-off delay is 3.5µS

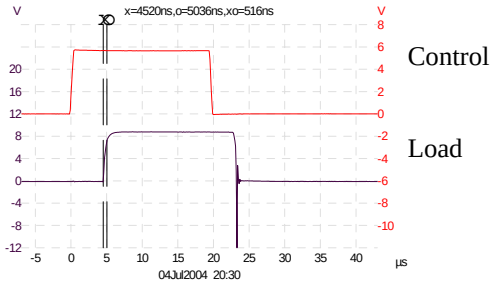


Figure 3 Rising Time is 0.516µS

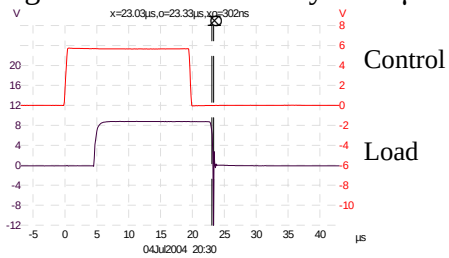


Figure 4 Fall Time is 0.302µS

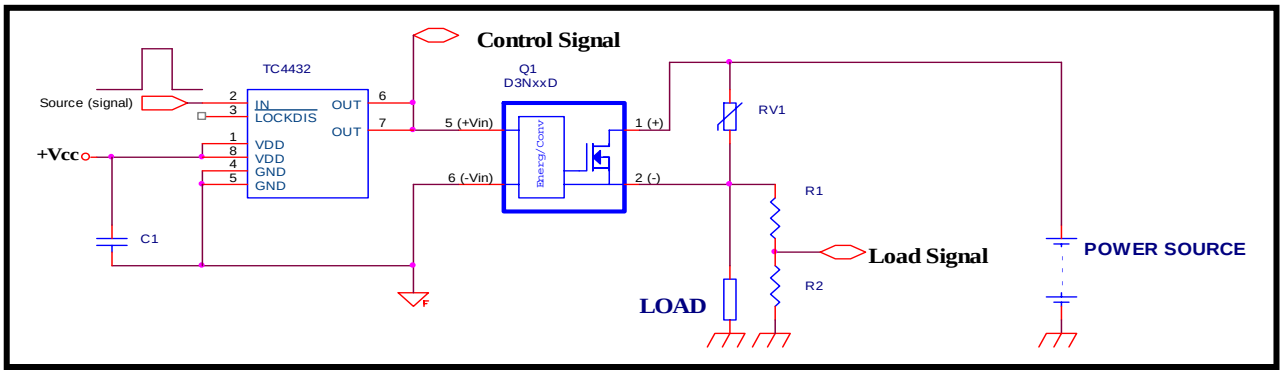


Figure 5 Switching Time Test Circuit

Solid State Relay/Switch made by Electronic Design & Research

With respect to the growing needs for the replacement of low-speed, power-hungry and bulky electro-mechanical relays EDR Inc. has introduced several families of high-speed, powerful and inexpensive Solid State Relays (SSR) with MOSFETs and IGBTs on there outputs to control either DC, AC/DC or AC power. The advantages of a solid-state relay over an electromechanical relay are well described in modern publications. These include the absence of moving parts to wear out, no acoustical noise, low controlling power, no contact bounce or arching, minimal space requirements and a long life expectancy. Mostly the high-power, DC and DC/AC types of SSR's cost less than the comparable electromechanical relay. The situation is different for low power AC-type electromechanical relays. These can cost, in some cases, much less than a SSR. The choice might look obvious. Though some simple calculations that take into consideration a relay's life expectancy, the cost of replacements, shipping expenses, loss of production time, and the labor cost of replacing a wore out relay makes a SSR the prime choice in new designs and retrofits.

Since 1997, our company has being concentrating on developing the most advanced Solid State Relays and Breakers, which have opened the door of opportunity for technological improvements in many fields of industry. Our innovations have drastically improved Solid State Relays and have expanded their applications. For an example, a MOSFET-based AC-type relay finds application in the airline industry where the heat generated by a TRIAC-based relay and its size became the obstacle in achieving high reliability and energy concerns. Our AC-type relay (D1N200A3) wastes only 0.080W and that is twenty times less than a TRIAC-based relay made by CRYDOM (D2W203) which wastes 1.5W at a load of 1A rms.

Solid State Relays manufactured by EDR fall into one of the following categories:

1. **Direct driving, super-low cost, comparable to the speed of an electromechanical relay**
2. **Direct driving, medium speed and medium cost**
3. **With a built-in DC/DC converter and independent controls, high-speed and medium cost**
4. **Direct driving, super-fast type that is capable of delivering 400Amps in a microsecond**

Along with SSRs, we manufacture a Solid State Power Controller (SSPC) or an AC/DC Intelligent Solid-State Relay/Breaker (iSSR\Breaker) to be used in Aircraft and Naval applications. This DPST (double pole, single throw) module (EDR82360) has integrated sensing capabilities to protect itself from over current and over temperature while exhibiting the properties of a time-delay fuse. Electronically controllable for faster and more reliable power management, the EDR82360 was designed to replace 4 components: an electromechanical or SSR relay, a switch, and a fuse holder with a fuse.

EDR's Solid State Relays and Breakers are potted in a thermally conductive epoxy for optimal performance in today's very demanding industrial and military environments. Most relays are produced in four popular sizes: D1N (0.6"H x 1.0"L x 0.3"W), D2-type (1.15"H x 1.78L" x 0.4"W), D3-type (1.15"H x 1.78"L x 0.8"W) and D4-type (1.15"H x 2.0"L x 0.9"W) with currents ranging from 3A up to 76A and voltages from 30V to 1,700V. These relays have configurations with SPST, DPST, 3PST or TOTEM outputs. We do not charge a set-up fee for a custom specified relay for orders of 250 or more.

Some of our customers are,

Lockheed Martin/Naval Electronics & SSUS
Metal Action Inc.
3M Co
Aerojet Corp
Flight Refueling Limited/Military System Division
iWerks Entertainment, Inc
TDG Aerospace Inc., etc.

Our customers use EDR's relays and circuit breakers in a wide variety of highly critical applications. They are also used in everyday industrial applications to control DC&AC Motors and solenoids on production lines. Our intelligent SSR/Breaker (p/n EDR82360) controls AC/DC power distribution in super-servers on submarines. Our SSR/Switches test high-speed solenoids to be used in Aviation, they distribute AC/DC power in the cockpits of airplanes, control air-valves to activate the

movement of chairs in iMax Theaters, deliver 20KW in a few microseconds for laser research and numerous other applications. Our MOSFET-based, AC-type, miniature and super low power consumption relays found applications in the power distribution on airplanes.

Notes on Operation, Driver and the Requirements for a Driving Signal

For the best performance, remember that EDR's High-Speed Solid State Relay/Switch (SSR/S) have important input and output requirements. To avoid degradation of the turn-on and turn-off delays and maximum switching speed the driver signal must be equal to the nominal voltage and have fast turn-on and turn-off slopes. A SSR is capable of switching zillions of times without any degradation and the long-life expectancy can be achieved if it is protected against harmful transient voltages. In most cases, a snubbing (R-C) network would bring a positive result. A transient voltage suppressor (TVS) could be a better choice. In this case, power dissipation must be calculated or obtained empirically if high frequency chopping is the application.

The SSR's best performance can be simply achieved by utilizing one of four types of DIN RAILs made by EDR. Our DIN RAIL mounting assemblies are available to fit a wide variety of industrial modules, such as IOC, ODC, D2W, CX, CMS and any of the D2N & D3N SSR packages made by EDR. These DIN modules provide excellent isolation, above 3000V, between the interfacing circuitry and field devices. They are designed to accommodate high power and high-speed SSRs and control up to 14Amps on the standard model and 28Amps for more power-hungry applications. There are four types of DIN RAIL assemblies are available:

1. **Direct driving with a LED to indicate the presence of the control signal (EDR82555),**
2. **With a driver and optional de-bouncing circuitry (EDR82558 and EDR82558/D respectfully) for better noise and bouncing rejections,**
3. **With a high-speed driver for applications such as the ability to enable the delivery of a very short burst of power, PWM and other high frequency applications (EDR82603),**
4. **With a built-in latchable driver (EDR82604) for easy interfacing with the push-on and push-off type of industrial applications.**

A customer made driver

EDR's relays and breakers are designed to be soldering to a PC board directly or plugged into a socket. Below are several recommended schematics for customers who want to design a relay driver. Though some SSRs functionally resemble an electromechanical relay, but they are built completely differently and demanding a better care of a circuit that drives them. The similarities being each having two terminals on the input for the control voltage and two terminals on the output for the load. This is especially true for EDR's high-speed SSRs built with a direct driving input. That family of SSR's is built with transformer-coupled devices and the input circuitry is a high-frequency generator/converter with an R-C filter on its input. A SSR consumes very little power, on average about 200mW (10mA at 20VDC). The turning on transition is quite a different story due to the built-in R-C filter. For a short moment, during the few microseconds the input current may peak up to 0.8A during a turn-on cycle. That specification makes a low power MOSFET the prime choice as the relay driver.

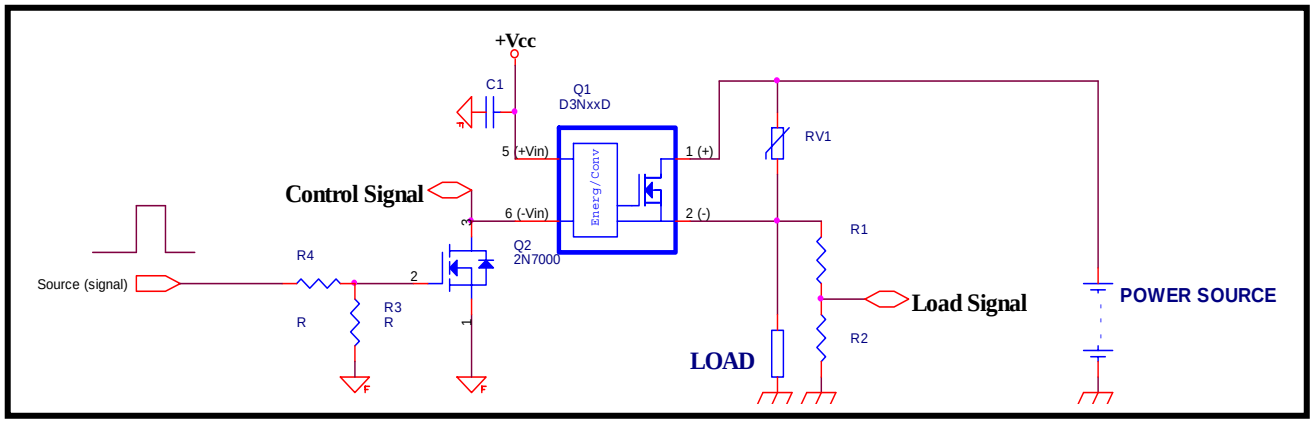


Figure 7 Driving a SSR/S with a MOSFET

For low-speed and non-critical applications, a simple push-button switch or any other mechanical device such as an elecromechanical relay (EMR), toggle switch, etc. can be used directly to

control a SSR/S. A switch (SW1) can be used on the low side as shown in Figure 5 or the high side of Vcc. It is not the best way to control the SSR/S and we could recommend such control only for EDR's low-speed SSRs.

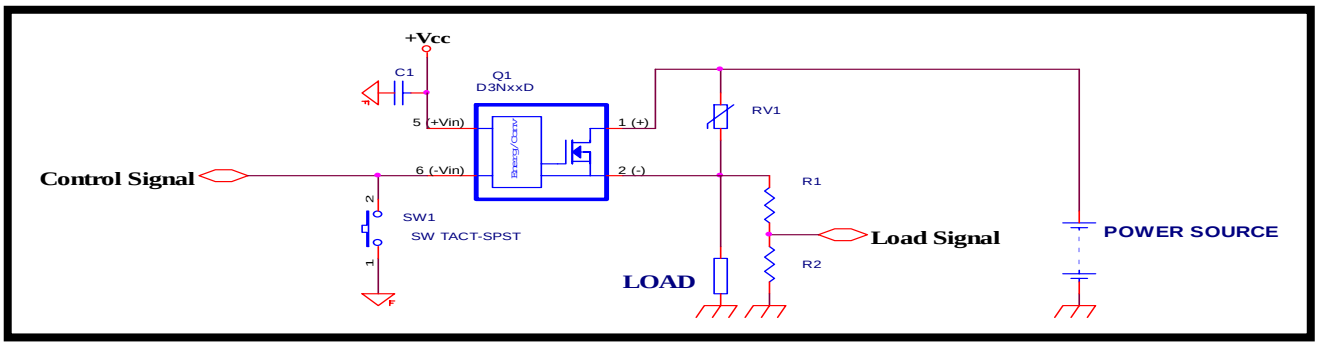


Figure 8 A bush-button controls a high-speed SSR/S

We offer a DIN RAIL (p/n EDR82555) without a driver for applications when cost is the main concern and when a customer wants to use their own driver or just an external switch. We do not recommend a mechanical switch to drive a high-speed SSR. The bouncing nature of a mechanical switch, including an EMR, would be transferred onto the SSR's output. De-bouncing circuitry must be used to avoid such a problem and a DIN RAIL (p/n EDR82558, see in Fig. 6, below)) can be the best choice for industrial applications. A DIN RAIL (p/n EDR82604) with a latchable driver will help to solve bouncing. If a customer decided to build their own driver we recommend to use the same or similar schematic solution.

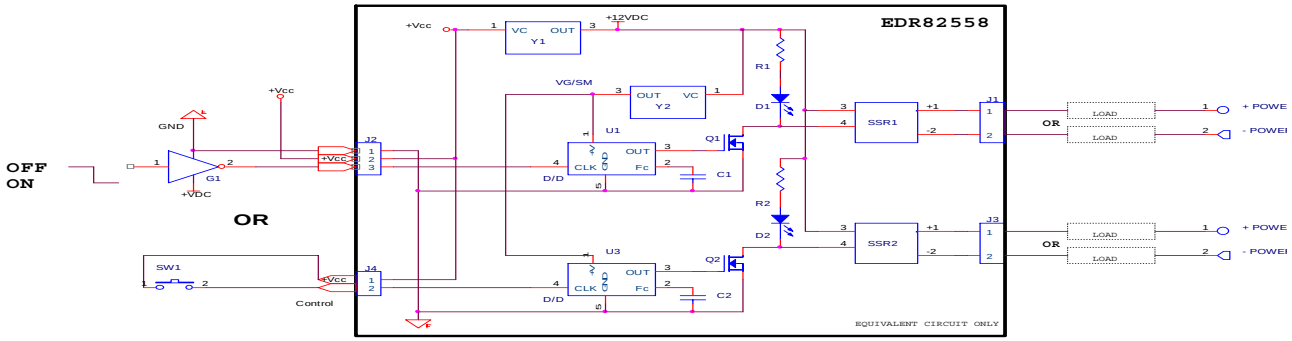


Figure 9 EDR's DIN RAIL (p/n EDR82558)

High-speed Application p/n EDR82603 could be the prime choice

EDR's Solid State Relay/Switch has opened the door of opportunity and technological innovation in many fields of industry. Our SSR/Ss have being employed to test high-speed solenoids, delivery a high-power pulse in metal lithography, control air-valves, etc. In those applications, overall high performance can be obtained without a proper relay driver. It may be surprising that the solution is available today. Nowadays several companies make a dedicated MOSFET driver. That could be the best choice especially for high speed chopping and delivering a short, high power pulse.

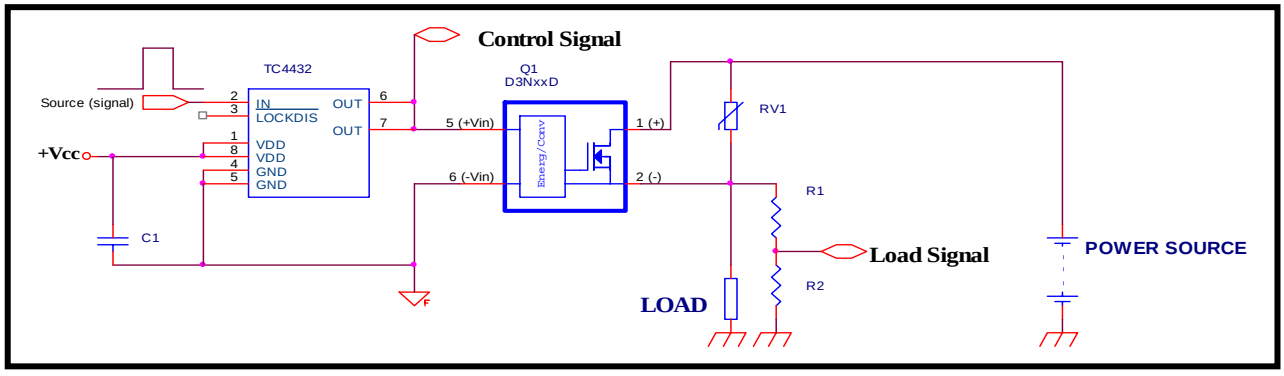


Figure 10 A high-speed Solid State Relay is controlled by a dedicated MOSFET driver.

Ordering Instruction

A part description will be marked according to the description below but p/n EDRxxxxx will stay the same for already items in circulation (already sold).

D a b c e f /h /i /k /z /0 /v

"D" is for our standard packages.

(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

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

L	a low speed relay/switch, rated DC - 800 Hz, direct driving control
A	a low speed relay/switch, rated DC – 400 Hz, direct driving for AVC applications
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 DC - 150 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

(c) Voltage - A maximum allowed voltage between output terminals

It must be replace with any of offered voltage, 30VDC, 45VDC, 75VDC, 100VDC, 200VDC, 500VDC, 650VDC, 800VDC, 900VDC, 1000VDC and 1100VDC, 1400VDC and 1700VDC.
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.

(e) A relay can be use to control DC or AC/DC power

A	- a relay/switch designed to switch/chop an AC power
C	- a relay/switch with a normal close contacts
D	- a relay/switch designed to switch/chop a DC power

(f) A maximum allowed RMS CURRENT (Ampere) without a heat sink.

(h) 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		

(i) A power supply required for a relay with an internal DC/DC converter. We offer several standard voltages 5VDC, 12VDC, 24VDC and 48VDC.

(k) Output terminals configurations

"N" or nothing	SPST or 1 Form A output terminals
"NN"	2SPST or 2 Form A output terminals
"NNN"	3SPST or 3 Form A output terminals
"T"	TOTEM output, break-before-make termination or NO-NO
"CN"	SPDT

(z) A relay/switch built with following standard isolations

"L" type relay is 2500 V
"N" type relay is 3000V, 4000VDC ("H4") and 5200 ("H5") VDC.

(0) Screening option, (NONE) for industrial, B for Class B, and S for Class S
(v) a Veri-Slope option.

Examples:

D3F1000D3/4-32/5 - a fast relay/switch designed to work with up to 1000 VDC and capable of 3 Ampere of rms. A control voltage can be any from 4VDC until 32VDC and required 5VDC to operate properly, SIP5 package.

D3N500A10/12/12 - a medium speed relay/switch designed to withstand 500VDC peak-to-peak or 350VAC and 10 Ampere of rms. A control voltage is 12VDC and the power supply is 12VDC, SIP4 package.