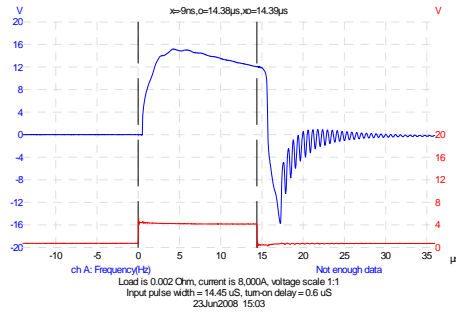
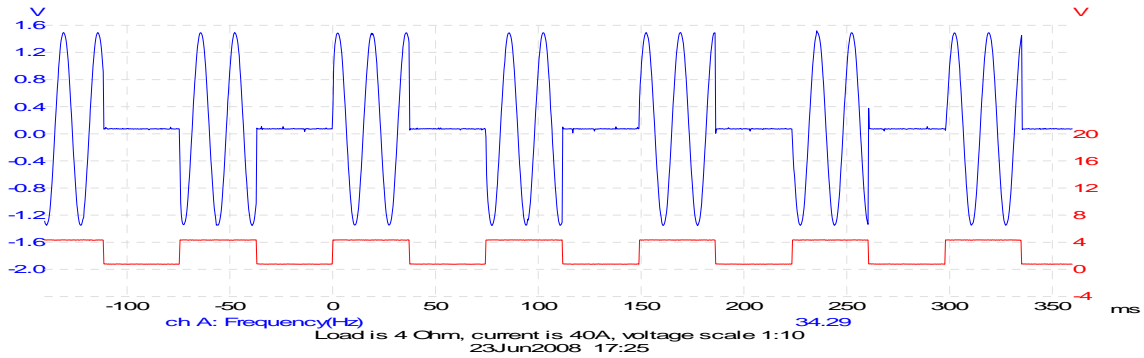


Super-high Power 1 Form A (SPST) Solid-State Relays/Switches



& Applications



Electronic Design & Research Inc.

Under management



Vs Holding LLC

www.vsholding.com



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During the past ten years, Electronic Design & Research Inc. has developed and manufactured a new class of Solid-State devices, such as varieties of Solid State Relays, Breakers, Video Switches, ½ Bridge Drivers, H-Bridge Drivers, Push-Pull Drivers, Soft-landing solenoid drivers, and many other devices. We make the most powerful, the fastest and some of them are controlled by the smallest amount of power. Many devices are covered by one or two PATENTS issued to us, please ask us for more information.

Here is one more family of high-power devices to be used as high-power relays, high-power and fast drivers, fast switches capable of delivering megawatts of power in microseconds and self-powered high-power choppers for driving remote sirens and power conversion.

The D9G- is a middle speed relay/switch and once its production is established we will introduce a D9F- family of high-speed, high-power switches.

General introduction of the D9G- family relays/switches	3
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We are bringing, in an average of two new devices to the market per month. Above is just an example of switches/drivers that we keep in our stock in small quantities and are ready to ship them at once. For your unique application that requires a different voltage, current or speed, the ordering Instruction (please see page #9) it could be rather useful. Do not hesitate to send us an email to: info@vsholding.com for any additional information, delivery schedule and prices.

Thank you,

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



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

Technology for people's ideas

Family of a Super-high power Relays/Switches

Isolated, SPST relay/switch designed to switch a DC or AC power in microseconds

Features:

- High RMS current 600 A
- High pulsing current 8,000A
- The design allows accommodating up to 48 MOSFETs
- Wide range of a DC output voltage up to 1,500 VDC
- Wide range of a AC output voltage up to 1,200 VAC
- Chopping frequencies up to 800 KHz with a few output transistors and up to 45 KHz with all 48 MOSFETs
- Extremely low "ON" resistance > milliohms
- Available -- Unidirectional and bi-directional relays/switches, or for a VDC or VAC power.
- Short propagation delay input-output 550 nS
- Fast Switching Action:
- Ton100 nS
- Toff 100 nS
- TTL, CMOS and LMOS Compatible
- Single Power Supply5VDC, 12VDC or 24VDC
- Self-powered optional for a modulation/chopping application with a frequency from 15 Hz to 800 KHz
- **High input-output isolation 3,000 V**

Applications:

- High-power Solid-State Relay with an extremely low controlling power
- Driver for AC and DC motors
- Modulator for a high-power siren
- Modulator for grid metering
- Ultra-High energy pulse formation
- High power, high frequency driver
- High-power solenoid driver
- High energy efficiency, high-power relay/switch
- Switch for Automatic Test Equipment
- AC and DC power switch
- Servo-Motor driver
- Driver with a Pulse-Width Modulation (PWM) control
- High-power, precision PWM driver
- Flash-lamp supply for pumping solid-state laser
- Plasma and Electrostatic Paint
- Self-powered modulator/chopper
- Electrical Discharge Machine (EDM)
- Arc-Drilling

The EDR's Solid State Relays (SSR) use proprietary and unique design to deliver fast, reliable, bounce-free switching in various packages. They are an ideal solid-state replacement for large reed and electromechanical (EM) relays. Compared to the old electromagnetic technology, the EDR's SSRs offer significantly lower drive current, small package size, superb speed, high power DC commutation, no susceptibility to magnetic interaction and solid state reliability. All of these are key requirements for the design of today's complex low-power, fast and long-lasting products.

EDR's family of "D9G" – type Solid State Relays/Switches designed for speed and high power. The D9G relays/switches have the capacity to switch efficiently DC or AC and can deliver a megawatt power in a single pulse. They were designed to operate at wide frequencies, DC to 800 KHz. High switching frequency allows it to deliver power with high precision. At 8 KHz PWM can be controlled in wide range for 1% to 100% duty cycle and it is an ideal choice for high-speed and high-accuracy applications such as motor control, SMPS (switch mode power supplies), laser diode driver or a high frequency ultrasound cleaner.

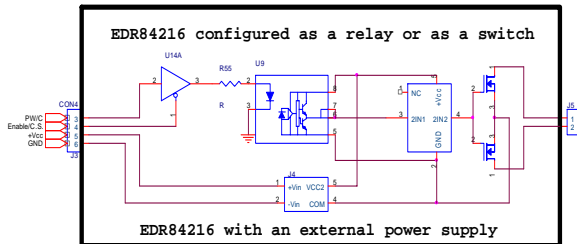
A 2.0 MHz relay/switch is also available with ability to deliver a powerful a > 50 nS pulse.

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Simplified block-diagram of the high-power relay/switch

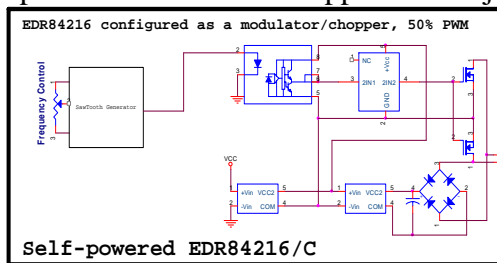
A super-high power relay/switch of the D9G -family designed around a few essential blocks, such as an array of high-power MOSFETs and its drivers, opto-isolated driver, an adjustable square-wave generator, a triangle-wave generator and comparator for PWM control, control logic and required power supplies. Offered options allow creating of a device specifically fitting various industrial and military applications.

1. A high-power, high-speed Solid-State Relay/Switch



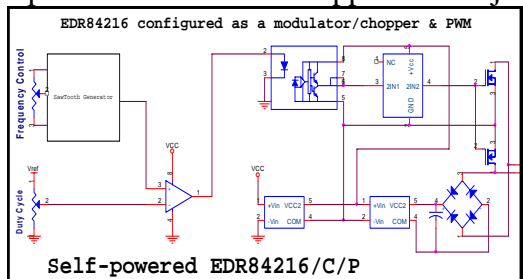
In such case, the p/n is
EDR84216/e/I, which is
9G500A200/E/I
E (e) -- for a control voltage
I (i) --- for Vcc (power supply)

2. A self-powered modulator/chopper with adjustable frequency and 50% duty cycle



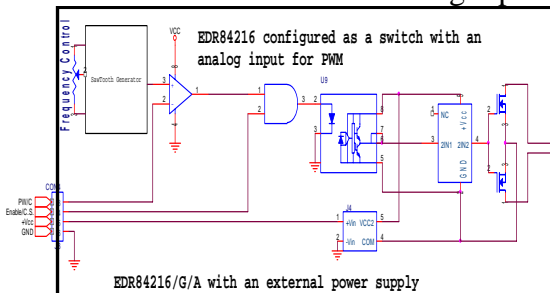
In such case, the p/n is
EDR84216/C/v, which is
9G500A200/C/V
C -- for a chopper (modulator)
V – applied voltage (rms)

3. A self-powered modulator/chopper with adjustable frequency and adjustable duty cycle



In such case, the p/n is
EDR84216/C/P/v, which is
9G500A200/C/P/V
C -- for a chopper (modulator)
P -- for a Pulse-Width adjustment
V – for applied voltage (rms)

4. A PWM switch/driver with an analog input for adjusting the PWM (duty cycle).



In such case, the p/n is
EDR84216/G/A/e/i, which is
9G500A200/G/A/E/I
G – for a basic frequency
A - for a Pulse-Width control with an analog input
I – for Vcc/power supply

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Technology for people's ideas

+/-500VDC(350AVC) & 200A SPSTRelay/Switch

D9G500A200 - Powerful, Fast Solid State Switch

Designed to deliver 20 MW of power in microseconds

Features: Utilizes only 63 sq. in. of PCB area and only 4.0" tall
 200A continuously or up to a 1,500A-pulse
 High sensitivity, even at high switching frequencies
 8,000A surge current and only 0.0012 Ohms on-state resistance

Please specify input control voltage and power supply

Input Specifications:

Input Control Current/Voltage V=any/1mA
 Power Supply Voltage 5VDC, 12VDC, 24VDC, or 48VDC

Output Specifications:

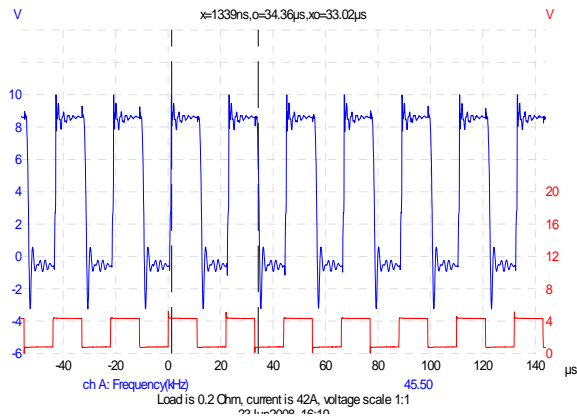
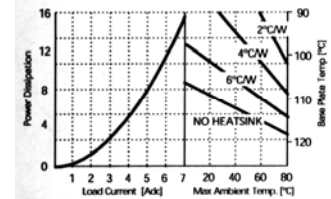
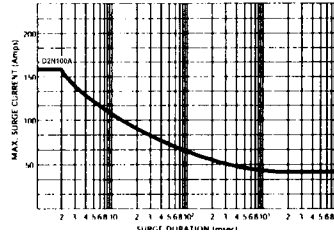
Operating DC voltage range 0V to +/-500 VDC (350VAC)
 Maximum continuous current, I_{mc} 200 A
 Maximum Pulsing Current, I_{mp}, 25°C 2,000 A
 Maximum surge current, (I_{ms}) - .1mS 4,000 A
 Maximum pulsing current, I_{mpc}, duty 1/50 300 A/10mS
 Maximum on-state resistance 0.0012 Ohm
 Rising time .149 μS
 Delay-on time .505 μS
 Falling time (determined by a load)
 Delay-off time 1.27 μS
 Maximum switching frequency 25.00 KHz
 Maximum burst frequency (> 2 min) 45.00 KHz
 Shortest pulse width 2 μS

General Specifications:

Ambient operating temperature range 45⁰ C to 85⁰ C
 Ambient storage temperature range -55⁰ C to 125⁰ C
 Dielectric Strength input-to-output 2,500Vrms (min)

Mechanical Specifications:

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

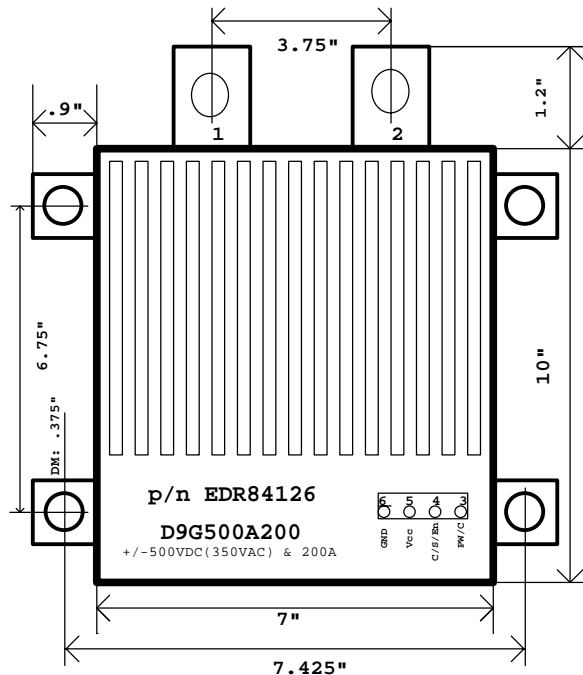


Switching at 45 KHz on a .2 Ohm load

TER 1: ~ LOAD
 TER 2: ~ LOAD
 TER 3: Pulse-Width Control (for the internal generator)
 PIN 3: + Control Signal or Enable for the internal generator
 PIN 4: + Vcc
 PIN 5: GND

Dimensions 4"H x 10"L x 7"W
 Power terminals Tinned Plated Copper Bar, .75" x .25"
 Terminals .312" diameter of holes

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.



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Input Electrical Characteristics (Ta = 25°C) for D9G500A220/5/24 – EDR84126/2/4

	Minimum	Nominal	Maximum	
Power Supply VDC, Pins 5-6	21	24		V
Power Supply, Current	40/100Hz	80/4Khz	350/25Khz	mA/frequency
“OFF” state, Control Voltage, normally “HIGH”		5		V
“ON” state, Control Voltage, “LOW”		0.8		V
Maximum Input Current			1.0	mA

Switching test with a resistive load of 3 Ohm & 40A, a single 20 μS pulse width

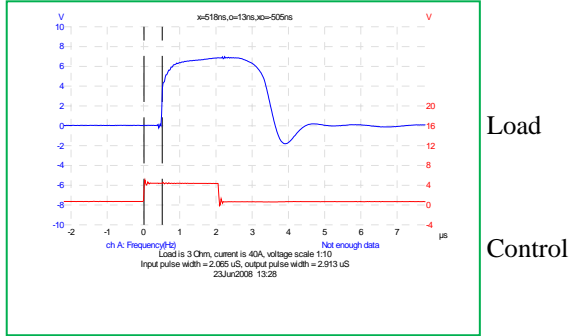


Figure 1 Turn-on delay is .505μS

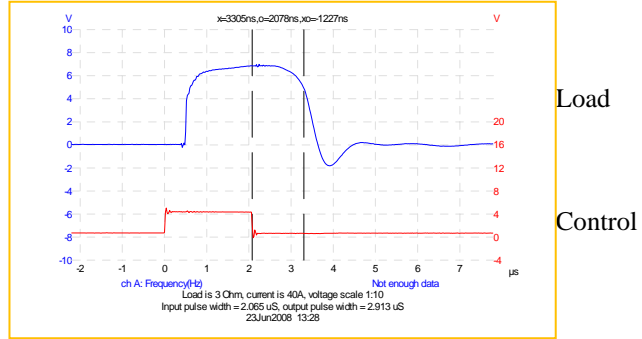


Figure 2 Turn-off delay is 1.227μS

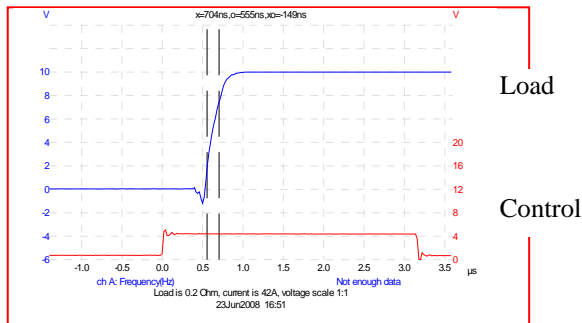


Figure 3 Rising time is 0.149μS

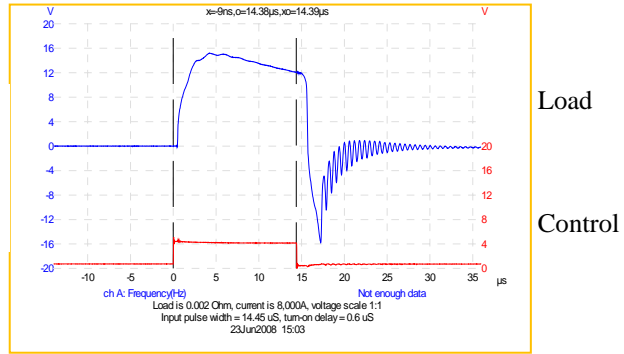
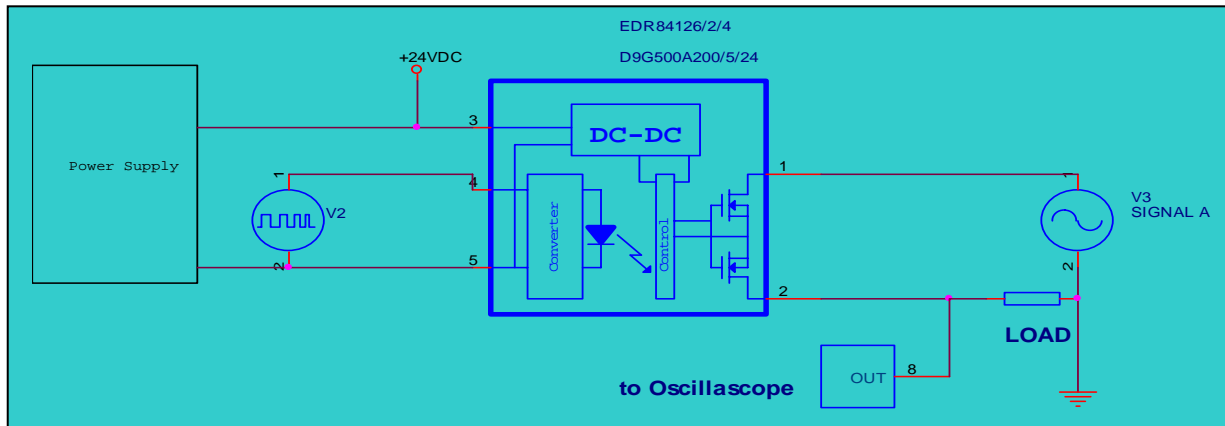


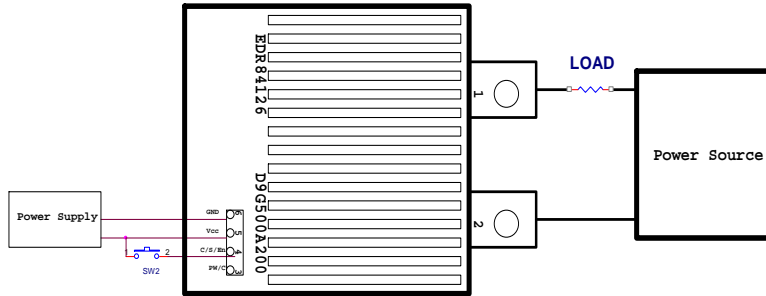
Figure 4: A 14.4μS pulse width & 8,000 A



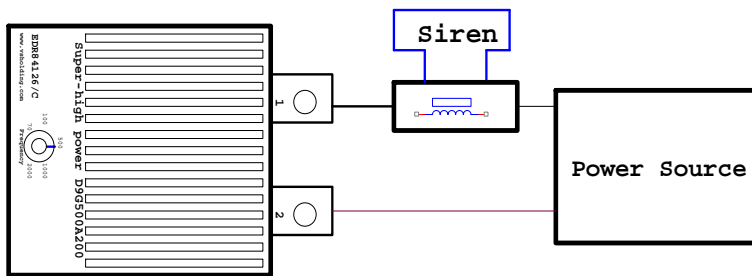
Switching Test Circuit

Applications

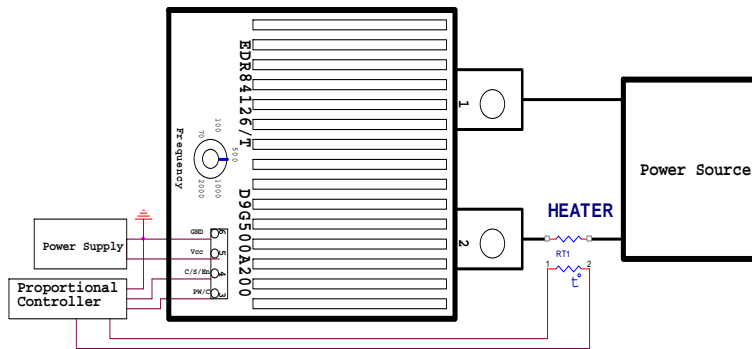
There are numerous applications where the family of D9G- provides the best solution.



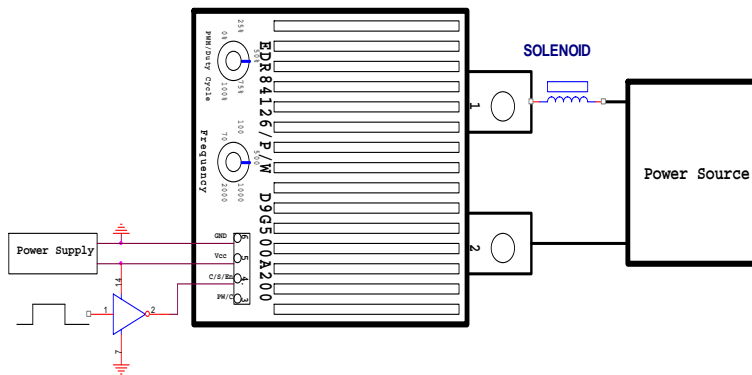
Any member of the D9G family designed to drive any type of load on either low or high side of the power. Due to the extremely low power of the control signal, the D9G can be directly controlled by low voltage CMOS logic. The input/output power ration is astronomical, a few milliwatts controls megawatts of the output power.



With a self-powered option, any member of the D9G family is the best suited to drive a high-power siren in a remote location, or chop the power line for power converging, or drive high-power solenoid, or DC and AC motors.



The D9G devices are well suited for delivering a precise amount of power onto a load. Using a temperature, current, either light, or any other type of sensors as a feedback device the D9G could replace expensive and cumbersome systems.



The D9G with an installed optional internal generator and a duty cycle controller will deliver a precise amount of power onto a load every time once enabled by an external control.

Above are just a few possible applications for the high-power D9G family of SPST type relays/switches. We are working with our customers on additional applications. You're welcome to ask any question you might have about your specific application. We will gladly assist you if you would have question how to use and protect Solid-State Devices.

A short list of super-high power relays/switches of the D9G- family

We offer varieties of high-power relays/switches. Below are devices with current ratings what a 24x2 high-power connected in parallel MOSFETs could deliver.

There are hundredth more devices available for lesser current.

<u>p/n</u>	<u>Vmax</u>	<u>Imc(A rms)</u>	<u>Ims pulse</u>	<u>description</u>
EDR84131	100VDC	600	4,000	D9G100D600/e/i
EDR84132	75VAC	500	3,500	D9G100A500/e/i
EDR84129	200VDC	400	2,500	D9G200D400/e/i
EDR84130	140VAC	370	2,200	D9G200A370/e/i
EDR84133	250VDC	400	2,400	D9G250D400/e/i
EDR84134	175VAC	370	2,100	D9G250A370/e/i
EDR84135	300VDC	480	3,300	D9G300D480/e/i
EDR84136	210VAC	450	3,100	D9G300A450/e/i
EDR84126	500VDC	220	2,000	D9G500D220/e/i
EDR84127	350VAC	200	1,800	D9G500A200/e/i
EDR84147	500VDC	250	2,300	D9G500D250/e/i
EDR84148	350VAC	230	2,100	D9G500A230/e/i
EDR84137	600VDC	280	1,900	D9G600D280/e/i
EDR84138	420VAC	220	1,600	D9G600A220/e/i
EDR84139	800VDC	200	1,400	D9G800D200/e/i
EDR84140	560VAC	180	1,200	D9G800A180/e/i
EDR84241	1000VDC	130	900	D9G102D130/e/i
EDR84142	700VAC	110	700	D9G102A110/e/i
EDR84143	1200VDC	90	620	D9G122D90/e/i
EDR84144	840VAC	80	590	D9G122A80/e/i
EDR84145	1500VDC	13	90	D9G152D13/e/i
EDR84146	1200VAC	12	80	D9G152A12/e/i

The speed and frequency properties of many D9G-types of relays/switches very much resembled the p/n EDR84127. There are some differences for various relays and all dependent on the output current (number of MOSFETs). Please request a specific data sheet if that is important for your application.

Cost of a Solid State Relay is very much tied to an ordered volume, in most cases a relay costs in low teens in order of 1000 or more. *We charge no production set-up fee for an order of 100 and above for any type (input and output specifications) Solid State Relay/Switch and Solid State Breaker.* 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).

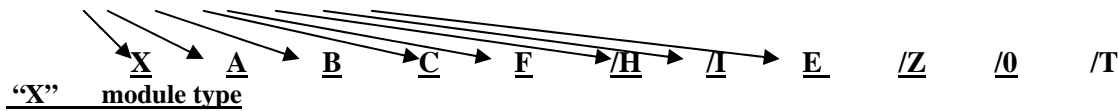
We manufacture a vast number of Solid-State Modules, such as relays (SPST-NO, SPST-NC, SPDT, DPST, SPDT/DPST, etc.), high-speed switches, ½-bridge drivers, H-bridge (or full-bridge) drivers, soft-landing solenoid drivers, Solid-State Breakers, super-speed, high-voltage push-pull drivers, a relay with a micro-power control, ultra-low noise preamplifiers, filters, DC/DC converters, uninterrupted DC/DC converters, etc.

We're actively developing a new product. Please inquire what else we are working on. If you have needs for a product but could not find it on the market place, please contact us.

Selection and Ordering Instruction for EDR's made Solid State Modules such as Relays, Switches, Breakers, 1/2 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).

H 3 L 200 D 10 /5 /12 H-driver, low speed, 200VDC/10A, control voltage is 5V, and 12V power



“X” module type

- D Solid State Relay
- T Driver, such as 1/2-bridge or a SPDT relay which can work as a 1/2 driver
- H Full-bridge (H-bridge) Driver
- V Fast High Voltage Solid-State Switches with Nanoseconds rise time
- 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

“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

“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.

“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

“T” 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.

“Z” Output terminals configurations

- “N” or nothing SPST-NO or 1 Form A output terminals,
- “NN” 2SPST, or 2 Form A output terminals, or DPST
- “NNN” 3SPST, or 3 Form A output terminals
- “C” Normally true closed terminal
- “CN” SPDT, or 1 Form C with a normally true closed output terminals

“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.

“0” Screening option, (NONE) for industrial, B for Class B, and S for Class S

“T” Turn on/off 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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