Full-Bridge (H-switch), Isolated, Bidirectional Drivers

For

Brushed DC Motors, Bipolar Permanent Magnet Stepping Motors, Solenoids, Thermoelectric Cooler Elements, etc.

Designed for a single or dual power supplies

Available for wide supply range of 0 VDC to 1,200 VDC

Up to 16 Amperes Output-Current Capability (1.2 kW)

A small-SIP-8 or DIN enclosure packagings are available

Electronic Design & Research Inc

Under management

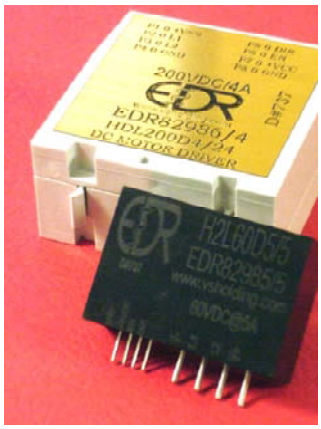
VS Holding LLC

www.vsholding.com

Full-bridge or H-driver for a DC Motor, solenoid and puncher

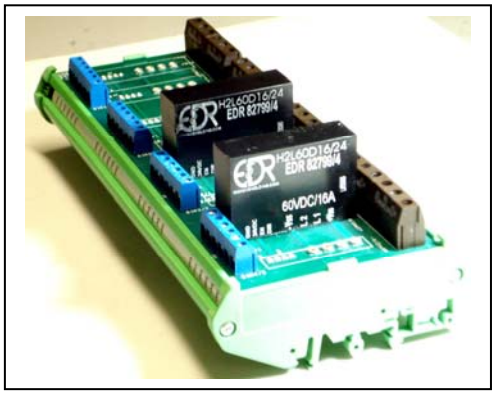
Electronic Design & Research Inc. manufactures vast varieties of Solid State Relays, Breakers, Video Switches, ½ Bridge Drivers, H-Bridge Drivers, Push-Pull Drivers, etc. EDR expended the product lines by adding to the family of H-drivers a new All-Voltage, full-bridge drivers.

The second generation of the low-cost driver (on the left) is an all-voltage, full-bridge (H-driver) drivers designed to deliver up to 1,200W in a small D2- size or DIN mountable enclosures (on the right). Both types is used in applications to control various devices such as intelligent toys, appliances, power tools, relays, solenoids, dc and bipolar stepping motors. Full 3,750V input-output isolation allows save interfacing directly to a low-power CMOS (or TTL) logics. The enable input can be simple paralleled with a brake control input (large varieties of EDR made switches can be used in such application.



Low-cost, 200W H-driver **.8 kW H-driver**

Each bridge controls by two inputs (ENABLE and DIRECTION). They are high impedance and compatible with TTL and low- level CMOS logic. A wide logic power supply (5VDC to 15VDC) requires only 35 mA for operation. The direction (DIR) sets the bridge state when the enable (EN) is high (logic "1"). A low state of the EN input inhibits the bridge. Output is a 3-state (floating) when the enable (EN) control is at low state.



There is a low-power snubbing network (R-C) built in to remove high-voltage, high-frequency spikes'. It is suggested to install a non inductive capacitor, at least 100 nF (rated at 1.2 of Vss) install between +Vss and –Vss/GND terminals and snubbing network. An additional snubbing network is recommended to cut EMS noise and decrease a heat generation inside of the module. At least capacitor of 100 nF and resistor of 10 Ohm connected in serious to be installed in parallel to the load (dc motor, etc.).

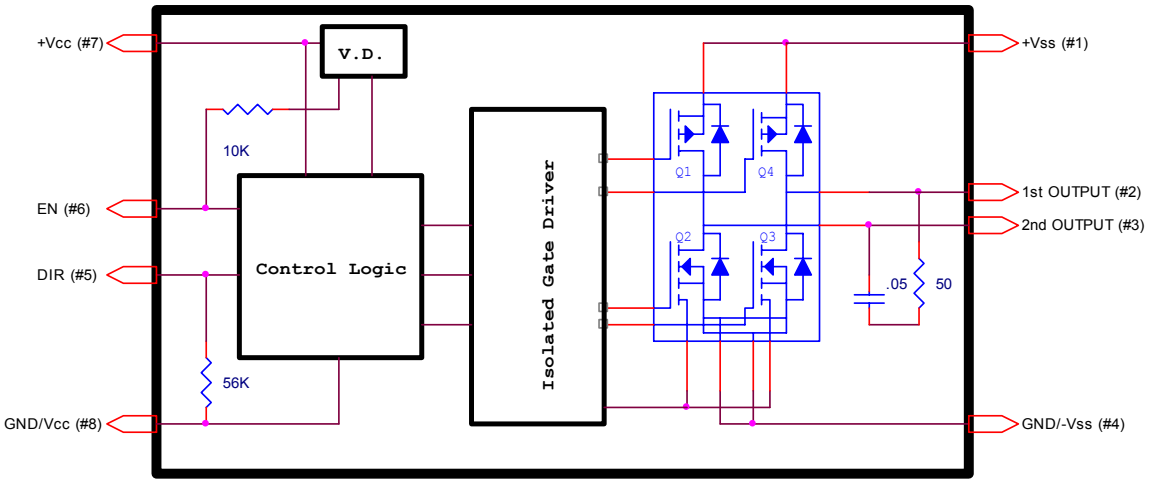
Contents

NOTES: We are bringing, in an average one new unique device to the market per every three months. Each new product allows manufacturing hundreds of the same family devices different in rated voltage, current and control signals. We work hard to satisfy your unique applications. Please use the Ordering Instruction (please see page #21) 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

Simplified internal Circuit of EDR's made All-Voltage, Full-Bridge Driver

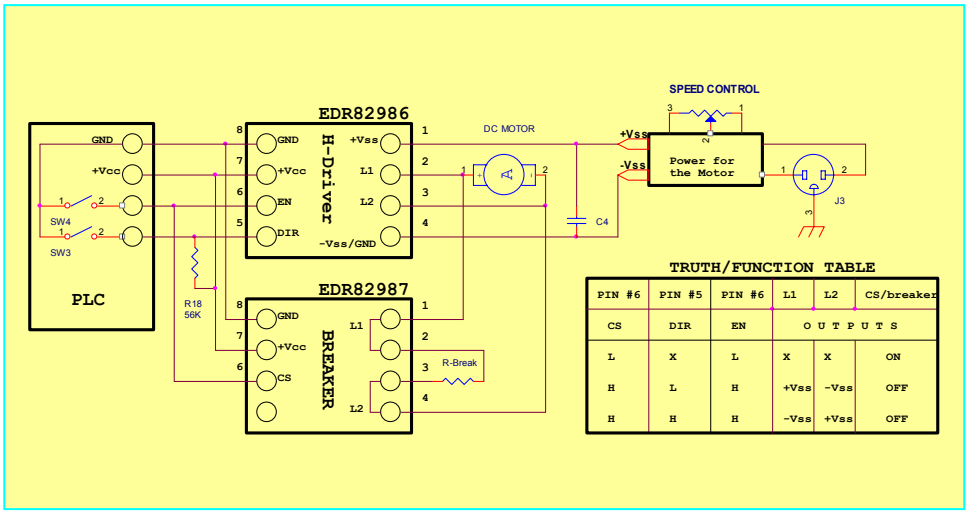


The EDR's full-bridge drivers integrate two power suppliers. The input (Vcc) is for the internal logic and the Vss is for the output stage to drive an output load. Any voltage from 0V to the +Vss can be used to control a speed of a DC Motor.

The H-bridge outputs are corresponding to the following truth table.

INPUTS		OUTPUTS	
DR	EN	L1	L2
L	H	L	H
H	H	H	L
X	L	Z	Z

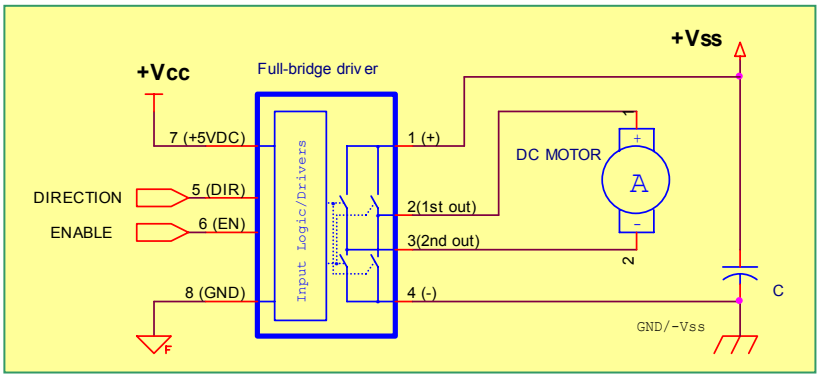
H - high level or logic "1", the internal pull-up resistor keeps the input high
L - low level or logic "0
Z – flouting or high-impedance (off)



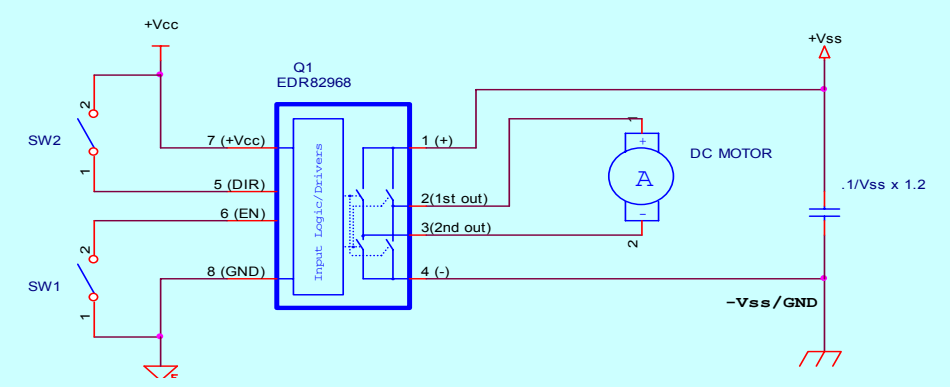
The above shows a possible (typical) connection from a programmable logic device (PLC) or directly from any TTL or CMOS logic. A brake control (p/n EDR82987) added to insure abrupt stopping the motor's rotation but it is not required. If your motor is turning opposite of what you want, either switch the motor connections, or the control in your program. A resistor R18 (56K) added to change the logic phase and enable control with two switches (SW3 and SW4) vie GND of the PLC to control a direction of rotations and brake of the DC Motor.

Functions and Basic Operation

The EDR82986 and other models designed as a full bridge driver. It can deliver, either a DC, pulsing, or an alternative power onto a load. It was not designed as a fast switch but it can be used in low frequency PWM applications. The drive has only two control lines to be as simple in operation as it can be and as broad in applications as possible.



With both control lines are a low power and any modern IC device can be use to control it. The enable (short off) control line via 10K (internally) connected to the internal voltage source. The DIR input is grounded via 10K ground to through a 56K. The driver will deliver a full power onto a load (DC Motor) once hooked-up as shown in the Figure, above. The EDR82986 is a fully isolated device where the input and the output powers have no common conduit. On the Figure shows two separate grounds, one is a signal ground belongs to the Vcc and the other is a power ground belongs to the Vss. If for whatever reasons a designer wishes to connect both grounds together than that can be done without any consequence or diminishing the driver's performance.



Two control lines (EN and DIR) allow selecting one of four functions

1. **Stand-by:** The stand-by function is achievable by lowering the EN input below 0.9V or just connecting it to the signal ground. In the sand-by mode, both outputs (1st and 2nd) are floating and a load disconnected from the Vcc and the power ground.
2. **Clock-wise (CW) rotation:** Once, both powers (Vcc and Vss) and a load (DC Motor) are connected to the EDR82968, the Vcc applied onto the motor and the motor turns. The EN starts and stops the motor rotation. A CMOS, TTL, and many other semiconductors could control the EN. There is no extra resistor required to control the EN with any transistor or open collector output logic. If a motor turns wrong direction simply switch connecting wires on the motor.
3. **Counter clock-wise (CCW) rotation:** The CCM mode is easy to accomplish by connecting the DR to the signal ground or lower the DR voltage below 0.9V. The ration direction doesn't change as fast as the DIR. There is about 1.4 mS between time-delay between changing the direction. For a small DC Motor and where a sudden stop and change of the rotation direction would cause no damage there is no need for any additional intervention. A heavy loaded and powerful motor it is required a time to stop rotation completely. It is possible an extra gadget such as a brake control would be required if the stopping time is too long or an extra rotation due to the inertia is not allowed. Please inquire; EDR Inc. manufactures break modules and drivers with a brake function.

4. **Stop and continue a rotation:** As mentioned above, an applied power to a load (DC motor) can be interrupted and continue at any time and such a rotation. That's easily accomplished by controlling the EN input, by connecting it the CND pin.

The operation

The EDR82986 designed to withstand more than 40 amperes of current surge and more than 100 amperes of transient spikes. That simplified interfacing with an inductive load (motor). A direction of ration can be changed with a small (low power) DC Motor without a prior brake. Below (see figure 3) is resulting of such application. The top line is a control signal applied onto the DR and the EN kept "1" or floating. The bottom line is the Vss = 20V applied to a motor in sequence which is a +20VDC by the followed –20VDC. The oscilloscope reads the voltage across the motor.

The driver is quite fast and can drive a load (switch direction) up to 200 Hz. **WARNING!!** *A maximum current should be taken into consideration. T*he driver designed with rather slow slopes and though it can switch at that frequency, it would be able to drive a large load (big current).

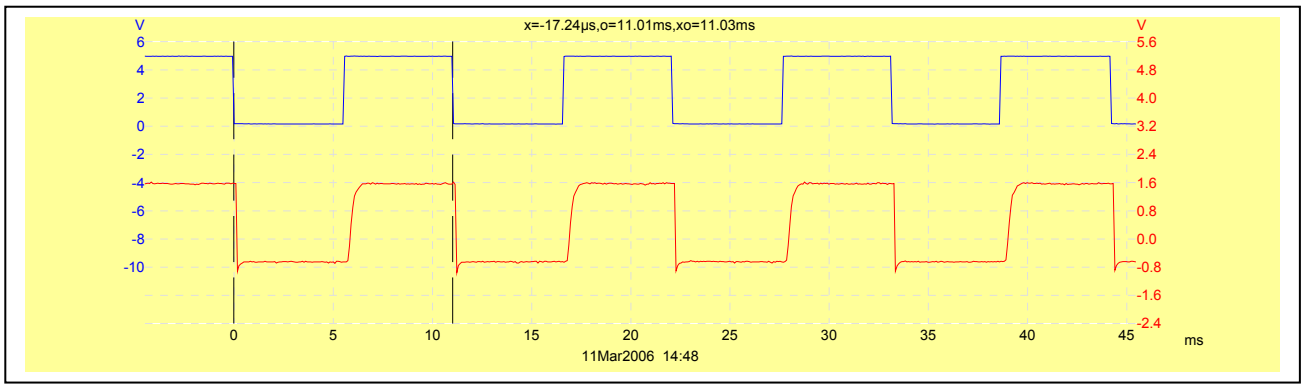


Figure 3. On the top is a control signal and on the bottom is a voltage across the motor (atten. 10).

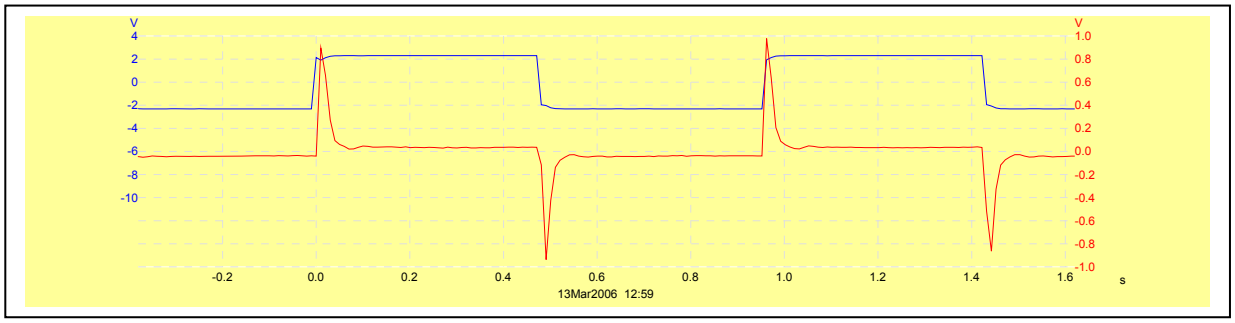


Figure 4. The EDR83986 is capable to withstand, repeatable a 100A large current surge. The top is the voltage across a DC Motor, and the bottom is a current flow through the motor. A 20V (1:10 attenuated) applied to the motor for creating CW and CCW rotations without breaking the motor first. A sadden change in a polarity of applied voltage created a large current surge as a combination of a brake and start-up currents. A current measured by a current sensor, p/n NNC-01GMH2 set to 1V = 20A.

NOTES:

I: In cases when the EDR82986 designed to be controlled via a CPU insert an OFF/ON-TIME delay a 740 µS + 130µS for the 900 µS when the input signal is switched (between forward and reverse rotations).

II: When turning on the power (Vcc/Vss) keep the EN (Pin #6) on a low level.

III: Do not switch the inputs (EN/DR) before the Vcc/Vss reaches its rated value (as shown on the Figure 5.

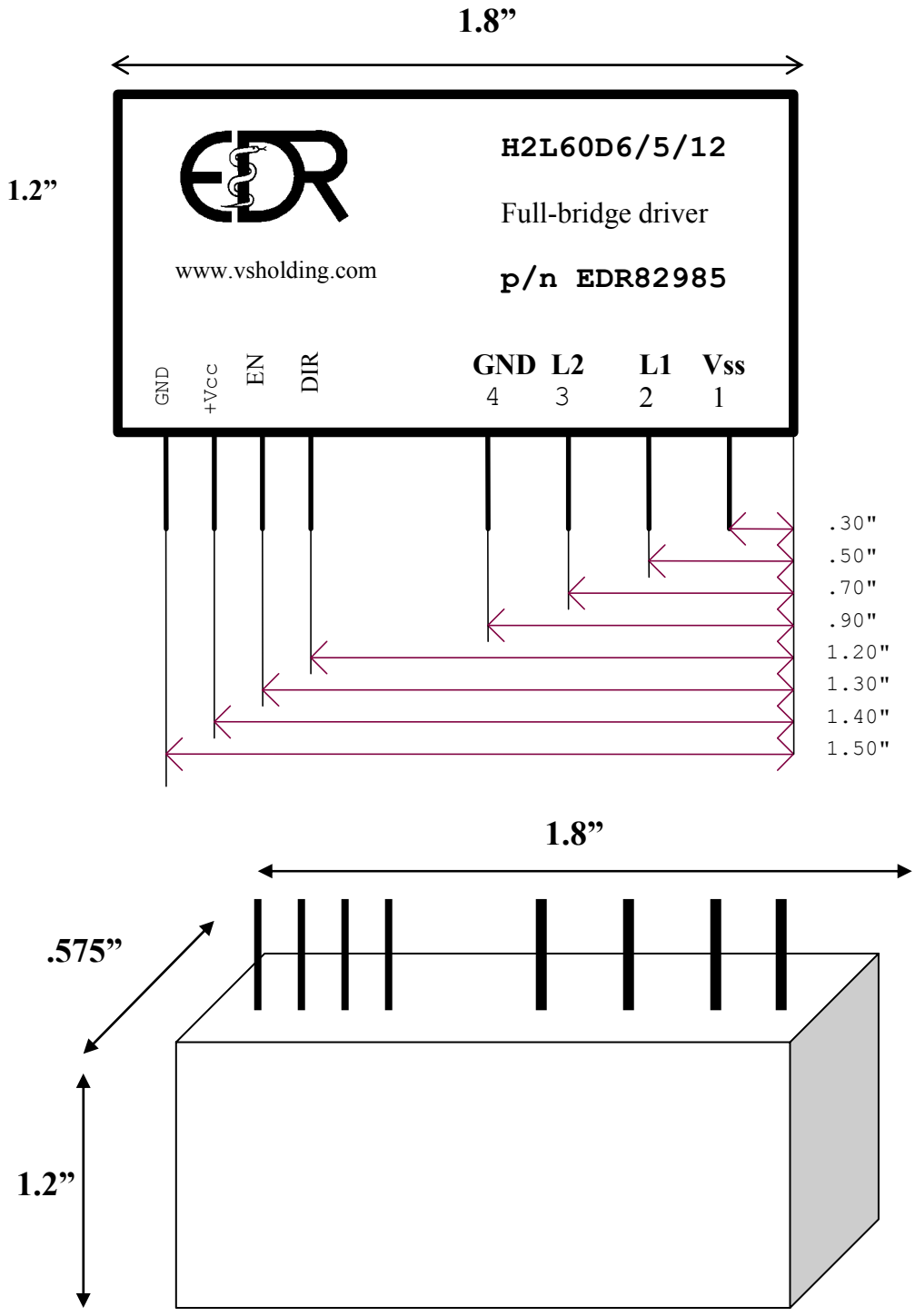
IV: For the maximum performance there is no overcurrect protection built-in and care should be taken for preventing a possible overcurrect which could damage your power source or the driver. The EDR82986 can pass up to 100 amperes during a short time interval. A

slow-blow fuse about 30% above a nominal average current will provide a sufficient protection to the load and power source.

V: Since there is no overcurrent built-in protection, an extra precaution must be taking to prevent shorting outputs in between, or to the power ground, or the Vss.

VI: The EDR82986 is an extremely low EME emission device. It can be located near by sensitive equipment. That was achieved by controlling a slope rate and thus preventing transient spikes. A negative side of that improvement, the driver's performance will depredate with an increasing switching speed above 80 per second.

Mechanical Dimensions of the H2L-package (in inches)



Inputs pins diameter is .03”. A diameter of output pins is .050”

http://www.vsholding.com

Technology for people's ideas

.8 kW, Isolated, Full-Bridge Driver (H-Switch)

Miniature, "any" voltage, H-driver module for DC motors, Solenoids, etc.

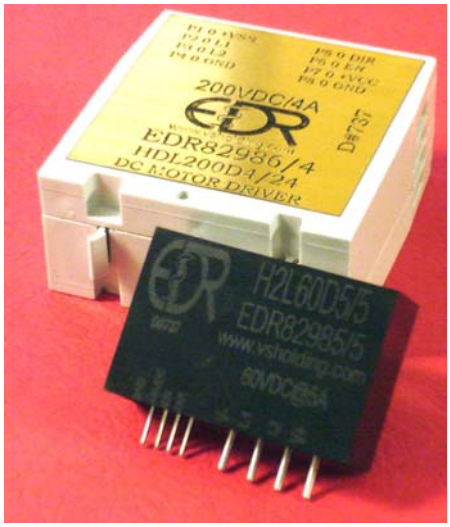
Two the same drivers
EDR82986/4 in DIN Enclosure
EDR82988/4 in SIP8, for PCB mounting

General Description:

The EDR82986/4 is a second generation of an isolated 200V/4A DC Motor driver designed for a motion control applications. It also found use in driving a high-speed solenoid. The driver utilizes CMOS advance processing technique and MOSFET power devices to achieve extremely low Rds. This benefit, combined with the fast switching speed provides the designer with an extremely efficient and reliable device for use in a wide industrial, space, avionics and defense applications.

Features:

- H-drivers are available in two packages. HDL- is in a DIN enclosure, K04070 Series by Altech. http://www.altechcorp.com/PDFS/KO4070.pdf and H2L-enlcodure for PC Board mounting, SIP8 package,
- TTL and CMOS compatible inputs
- Deliver up to 30A rms at 25 ^{o}C and 18 A at 85 ^{o}C
- Pulsed current 120A (PEAK), internal clamp diodes
- Three different modes (forward rotation, reverse rotation, disable)
- Low Rds (ON) typically, 0.150 Ohm per shoulder
- Low-Power consumption --- in a stand-by (disable) mode, Icc <5 μA and Iss <2 μA
- Wide range of Vss (output) voltage 0V to 200V
- R-C (snubbing) network built-in to reduce a transient



EDR's DC-Motor driver offered in a choice of two power packages. The H2L200D4 is the smallest and made for high-density designs with a minimum heat generating even at a maximum current. The HDL200D4 assembled in a small size DIN enclosure. Each package is available in a lead free (Pb-free) version with a suffix 'Pb"

Applications:

- DC and Stepper Motor
- Bi-directional, high-speed solenoid
- Position and Velocity servomechanisms
- Factory and hobby robots
- Numerically controlled machinery
- Computer printers and plotters
- Directly interfaced to a low power CPU
- In any application where a load (motor) and its power supply must be isolated form a control circuitry
- Low-noise design allows it be located near sensitive equipment
- It can be use in a low-frequency PWM applications
- Push-Pull (bidirectional) solenoid for electro-hydraulic valves
- **Thermoelectric cooler elements**

Pin Function, p/n EDR82986/4

Pin #	Symbol	Functional Description
1.	**+Vss**	Supply voltage for the load
2.	**OUT1**	Connect to a load
3.	**OUT2**	Connect to a load
4.	**–Vss or GND**	supply return
5.	**DIR**	Input for controlling the state of the outputs; at "0" volt the output is CCW or the +Vss at 2nd output and 1st output connected to the GND at +Vcc the output is CW or the +Vss at the 1st output and 2nd output connected to the GND
6.	**EN**	When the EN pin is not connected or jumped to +Vcc the DIR is functioned and one of output connected to the Vss. When the EN is connected to signal GND both outputs are floating.
7.	**+Vcc**	Power Supply (24VDC) for the internal logic
8.	**GND**	Return of the Vcc

Absolute Maximum Ratings for p/n EDR82986/4 or p/n EDR82988/4 (24V Vcc)

	Parameter	Max.	Units
Vss	**Power Supply for a DC Motor**	**200**	**V**
Id @ Tc = 25 °C	**Continuous Current, 1 min**	**30**	**A**
Id @ Tc = 85 °C	**Continuous Current, 1 min**	**18**	**A**
Idm	**Pulsed (PEAK) current, 0.1mS**	**120**	**A**
Pd@ Tc = 25 °C	**Power Dissipation at 4A current**	**1.6**	**W**
Pd@ Tc = 85 °C	**Power Dissipation at 2 A current**	**0.8**	**W**
Idc @Tc = 25 °C	**Indefinite Continuous Current**	**4**	**A**
Vcc	**Power Supply to the internal logic**	**30**	**V**
Topr	**Operating temperature**	**-40 to 85**	**°C**
Tstg	**Storage Temperature**	**-55 to 135**	**°C**

Electrical Characteristics @ Tj = 25 °C (unless otherwise specified), Vcc = 24V, Vss=180V

	Parameter	Min.	Typ.	Max	Units	Conditions
	INPUT					
Vcc	Supply voltage to the control	20	24	30	V	
Icc	Supply current @ Vcc = 24V			22	μA	Enable (pin#6) to GND
Vih	High level input voltage	19	24	30	V	At corresponded Vcc
Vil	Low level input voltage	0.9	1.0	1.2	V	At corresponded Vcc
Vi	Input voltage	0		Vcc	V	
Ii	Input current, at 24V			40	mA	
Vinl	Enable (EN) and Direction (DIR)			0.9		Low-level input voltage
Vinh	Enable (EN) and Direction (DIR)	3.15				High-level input voltage
Ii	Enable (EN) and Direction (DIR)			0.5	mA	
	OUTPUT, Load is 50 Ohm					
Vss	Supply to the motor	0		200	V	
Icc	Output Disable			2	μA	
Rds	Output Total resistance	0.080	0.076	0.095	Ohm	Either directions, CW & CCW
Ill	Output leakage current			2.0	μA	Vss=55V
Tplh	Propagation delay turn-on time		740	750	μS	
Tphl	Propagation delay turn-off time		130	140	μS	
Trev	Propagation delay, phase reverse			1.8	mS	
P	Pulse width			2.0	mS	Load resistive
F	Maximum switching frequency			200	Hz	Load resistive

PIN FUNCTIONS (refer to the block diagram)

PIN #	NAME	FUNCTION
1	+Vss	Supply Voltage for the Power Output Stage. A non-inductive .1mF capacitor must be connected between this pin and –Vss/GND
2	L1	Output L1 of the Bridge, the current flows through the load connected between and the second output L2.
3	L2	Output L1 of the Bridge, the current flows through the load connected between and the second output L2.
4	-Vss/GND	Ground or –Vss the second terminal of the Power supply for the load
5	DIR	CMOS/TTL Compatible input of the bridge, to set a direction of rotation
6	EN	CMOS/TTL Compatible input of the bridge, to enable/disable outputs and turn the driver in a stand-by state
7	+Vcc	Supply Voltage for the internal Logic.
8	GND	Return of the Vcc.

Terminal Board (p/n EDR82976) for H2L- serious full-bridge drivers

Rack with Terminal Strip on both control and filed connections

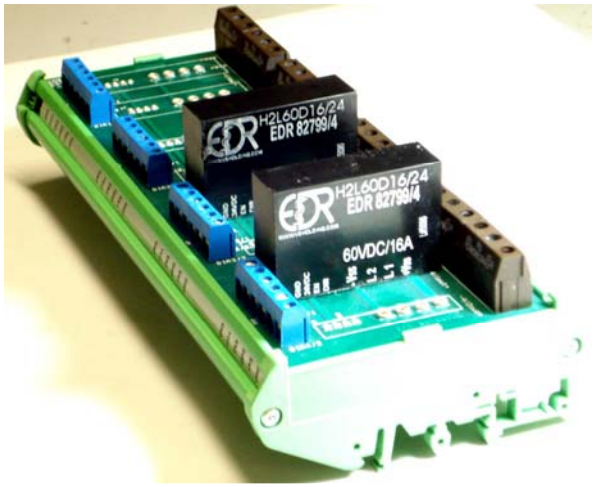
Description

The EDR82976 mounting rack (PC board) accommodates up to two of H2L- drivers. The rack let you insert and remove module easily and quickly without disturbing control and filed wires.

Barrier strips with screw terminals provide the field, control and powers connections.

P/N EDR82976 is stackable to any even number of sections. On the picture, (left) shown p/n EDR82976/4 assembled to accommodate up to eight drivers.

Other mouthing options are available please inquire.



EDR82976/4 for up to eight of D2L- drivers assembled for a DIN Rail mounting. There are two drivers (p/n EDR82799) installed for demonstration.

Specifications

Operating temperature -40° C to +105° C, 95% relative humidity, non condensing

	Filed terminals	Control terminals
Spacing	7.5mm	5.00mm
Ratings	20A, 300V UL 16A, 500V VDE	15A, 300V
Withstand Voltage	1,250	1,500
Housing	UL94V-0 housing	UL94V-0
Torque	6 lb-in max.	3.5 lb-in
Wire range	12-20 AWG	14-22 AWG
Entry	Horizontal, wire protector UL, CSA and SEV Approvals Designed to VDE 0110	Horizontal, wire protector
Terminal	Screw	Screw

Part numbers for ordering

EDR82976	Mounting rock for two of H2L- type drivers
EDR82976/n	Mounting rock for (2 x n) of H2L-type drivers
EDR82983	DIN RAIL housing for p/n EDR82976
EDR82983/n	DIN RAIL housing for p/n EDR82976/n
EDR82984	Housing for p/n EDR82976 to mount it on a flat surface
EDR82984/n	Housing for p/n EDR82976/n to mount it on a flat surface

Second generation of all-voltage Full-bridge (H-bridge) drivers

Model numbers are listed below in a SIP-8 small enclosure for PC Board mounting. All equivalent parts are available in DIN enclosure, please replace "2" with "8" to order correct product and add the D at the end of the part number.
For a 60VDCD/5A and 24V control, the model is H8L60D5/24 and the part number is EDR92985/4/D

Model Number	Operating Voltage	Id (A) cont.	p/n
H2L30D26/I/E	0 – 30 VDC	26 A	EDR82012/I/E
H2L30D14/I/E	0 – 30 VDC	14 A	EDR83009/I/E
H2L40D16/I/E	0 – 40 VDC	16 A	EDR82997/I/E
H2L40D28/I/E	0 – 40 VDC	28A	EDR83013/I/E
H2L60D5/I/E	0 – 60 VDC	5 A	EDR82985/I/E
H2L60D9/I/E	0 – 60 VDC	8.5 A	EDR82998/I/E
H2L60D16/I/E	0 – 60 VDC	16 A	EDR82799/I/E
H2L60D20/I/E	0 – 60 VDC	20 A	EDR83010/I/E
H2L75D18/I/E	0 – 75 VDC	18 A	EDR83011/I/E
H2L100D5/I/E	0 – 100 VDC	5 A	EDR82999/I/E
H2L100D12/I/E	0 – 100 VDC	12 A	EDR83000/I/E
H2L150D7/I/E	0 – 150 VDC	8 A	EDR83001/I/E
H2L200D4/I/E	0 – 200 VDC	4 A	EDR82988/I/E
H2L200D8/I/E	0 – 200 VDC	8 A	EDR82989/I/E
H2L400D2/I/E	0 – 400 VDC	2 A	EDR83002/I/E
H2L500D2/I/E	0 – 500 VDC	2 A	EDR83003/I/E
H2L600D2/I/E	0 – 600 VDC	2 A	EDR83004/I/E
H2L800D2/I/E	0 – 800 VDC	2 A	EDR83005/I/E
H2L900D07/I/E	0 – 900 VDC	.7A	EDR83006/I/E
H2L1200D03/I/E	0 – 1200 VDC	.3 A	EDR83007/I/E

Above are just sample of drivers that were assembled in H2L-package. There are hundredth of additional drivers with a various voltage/current ratings can be manufactured in the same package. All drivers build with the same control circuitry and difference is only a type of output transistors (powerful MOSFETs). Do not hesitate to ask for a 30VDC/1A driver if you would need such that brings some saving to you because transistors for assembling 30VDC/1A driver costs less than for a 30VDC/14A driver.

New parts added monthly and depend on available components and customers requirements. If you need a driver for a voltage and current, which is not listed above, please do not hesitate to email (info@vsholding.com) your requirements.

Please specify the power supply voltage, as for example H2L30D12/v/x. Replace "E" with a 5, 12, 24, 48 they are for 5VDC, 12VDC, 24VDC, 48VDC and respectfully the control voltage represented by "I." For an example, EDR82997/3/2 and EDR82997/8/2 are almost the same, and only a control voltage is different, "3" if for 12VDC and "8" is for 18-38VDC;

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.*

Selection and Ordering Instruction for EDR's made Solid State Modules such as Relays, Switches, Breakers, ½ and H-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 A B C F /H /I E /Z /0 /V

"X" module type

- **D** **Solid State Relay**
- **T** **Driver, such as ½-bridge or a SPDT relay which can work as a ½ driver**
- **H** **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 replaced 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, up to 100A.

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" 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;

"E"

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

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

"E" 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"	Normal Close output
"CN"	SPDT, or 1 Form C output terminals
"V"	VIDEO switch

"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

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