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Isolated, Full-Bridge Driver (H-Switch)

The EDR82951 belongs to a family of a small size, full bridge or H-driver modules designed to drive various loads at a high rate.
(Driver for switching between Forward and Reverse Rotation)

General Description:

The EDR82951 is a second generation of an isolated DC Motor driver designed for a motion control applications. The driver utilizes CMOS advance processing technique and HEXFET/DMOS 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:

- Small Footprint, 1.48"L x .285"W x .625"H
- TTL and CMOS compatible inputs
- Deliver up to 4A rms at 25 ^{o}C and 2.7 A at 70 ^{o}C
- Pulsed current 20A (PEAK), internal clamp diodes
- **Three different modes (forward rotation, reverse rotation, disable)**
- **Low R**ds (ON) typically, 0.050 Ohm per shoulder
- **Low-Power consumption --- in a stand-by (disable) mode, Icc <5 mA and Iss <2 mA**
- **Wide range of Vss (output) voltage 17 to 55VDC**
- **Wide range of Vcc (input) voltage 5 to 16VDC**
- **V-Slope technique applied to control Dv/Dt for lowering a chance for transient spicks**
- **Generates NO electro-magnetic interference**

There are number of the similar drivers and with various voltage/current ratings are available. Please inquire.

Applications:

- DC and Stepper Motor Driver
- Electric linear actuators
- High-speed solenoid Driver
- High-speed puncher Driver
- 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
- EDR82951 can be located near by to a sensitive equipment
- It can be use in a low-frequency PWM applications

EDR's DC-Motor driver offered in a choice of three power packages. The EDR82951 is the smallest and made for high-density designs with a minimum heat generating even at a maximum current. Each package is available in a lead free (Pb-free) version with a suffix 'Pb"

All Dimensions are in inches

Input/Output pins	.025"x.025"
Weight: (typical)	.26 oz. (0.0073 Kg)
Encapsulation:	Thermally Conductive Epoxy

Pin Function

Pin #	Symbol	Functional Description
1.	**+Vss**	Supply voltage terminal for motor
2.	**OUT1**	Connect to a DC motor.
3.	**OUT2**	Connect to a DC motor
4.	**GND**	GND terminal
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 "5" volt 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 floating or connected to +5VDC the DIR is functioned and one of the driver's output is connected to the Vss. When the EN connected to the signal's GND both outputs are floating.
7.	**+VDC**	Power Supply for the internal logic, it can be any between +5VDC to +15.5VDC
8.	**GND**	Return of the +VDC

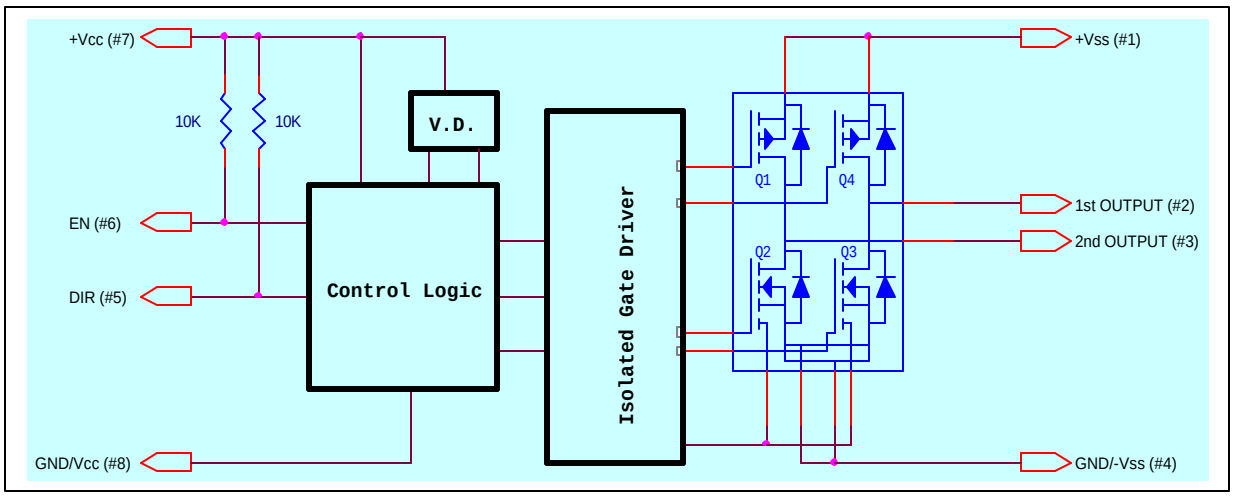
Absolute Maximum Ratings for p/n EDR82951

	Parameter	Max.	Units
Vss	**Power Supply for a DC Motor**	**60**	**V**
Id @ Tc = 25 °C	**Continuous Current (max)**	**4**	**A**
Id @ Tc = 70 °C	**Continuous Current (max)**	**2.7**	**A**
Idm	**Pulsed (PEAK) current (max)**	**20**	**A**
Pd@ Tc = 25 °C	**Power Dissipation**	**0.8**	**W**
Pd@ Tc = 70 °C	**Power Dissipation**	**0.5**	**W**
Vcc	**Power Supply to the internal logic**	**16**	**V**
Topr	**Operating temperature**	**-40 to 75**	**°C**
Tstg	**Storage Te mperature**	**-55 to 135**	**°C**

Electrical Characteristics @ Tj = 25 °C (unless otherwise specified), Vcc = 12 V, Vss = 30 V

	Parameter	Min.	Typ.	Max	Units	Conditions
	INPUT (typical application)					
Vcc	Supply voltage to the control	5	12	15.5	V	
Icc	Supply current @ Vcc = 6V			3	mA	Enable (pin#6) to GND
Vih	High level input voltage	3.15	3.8	4.2	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			0.5	mA	On each input/10K to the Vcc
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	Both inputs tide via 10K to Vcc
	OUTPUT (typical application)					
Vss	Supply to the motor	17	30	55	V	
Icc	Output Enable		750	1500	mA	Recommended current in either direction
Icc	Output Disable			2.0	µA	Current in either direction
Rds	Output Total resistance	0.055	0.060	0.070	Ohm	Either directions, CW & CCW
Ill	Output leakage current			2.0	µA	Vss=55V
Tplh	Propagation delay turn-on time		220		µS	
Tphl	Propagation delay turn-off time		170		µS	
Tdt	"Dead" time		560		µS	Between either direction
Fdir	Switching frequency (DID)			300	Hz	Load 1 A, resistive
Fen	Switching frequency (EN)			140	Hz	Load 1 A, resistive

Simplified internal Circuit of the EDR82951



Function

TRUTH/FUNCTION TABLE

PIN #5	PIN #6	1st OUT #2	2nd OUT #3
DIR	EN	O U T P U T S	
X	L	X	X
L	H	-Vss	+Vss
H	H	+Vss	-Vss

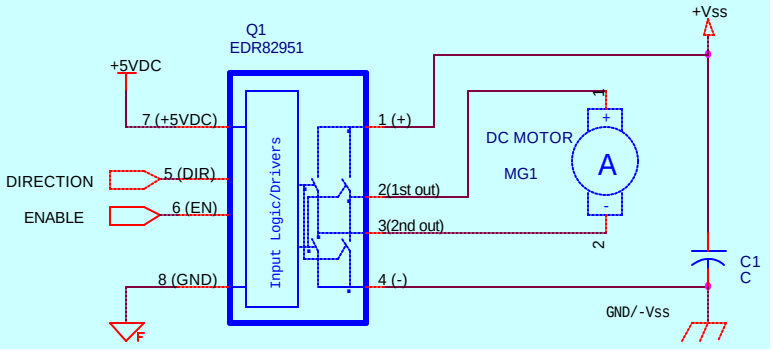


Figure 2 Truth table and a basic hook-up

Basic Operation

The EDR82951 was 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 a 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 pulled to Vcc via 10K (internally) the driver will deliver a full power onto a load (DC Motor) once hooked-up as shown in the Figure 2, above. The EDR82951 is a fully isolated device where the input and the output powers have no common conduit. On the Figure 2 shown 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 DR) allow selecting of one 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 flouting 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 EDR82951, 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.
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 0.5 mS between time-delay between changing the direction. There is no need a protection for a small DC Motor. Sudden stop and change of the rotation direction would cause any damage. 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.

Explanation of the operation

The EDR82951 designed to withstand more than 20 amperes of current surge and more than 30 amperes of transient spicks. 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 is an example of such an application. The top line is a control signal applied onto the DR and the EN kept "1" or higher. 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.

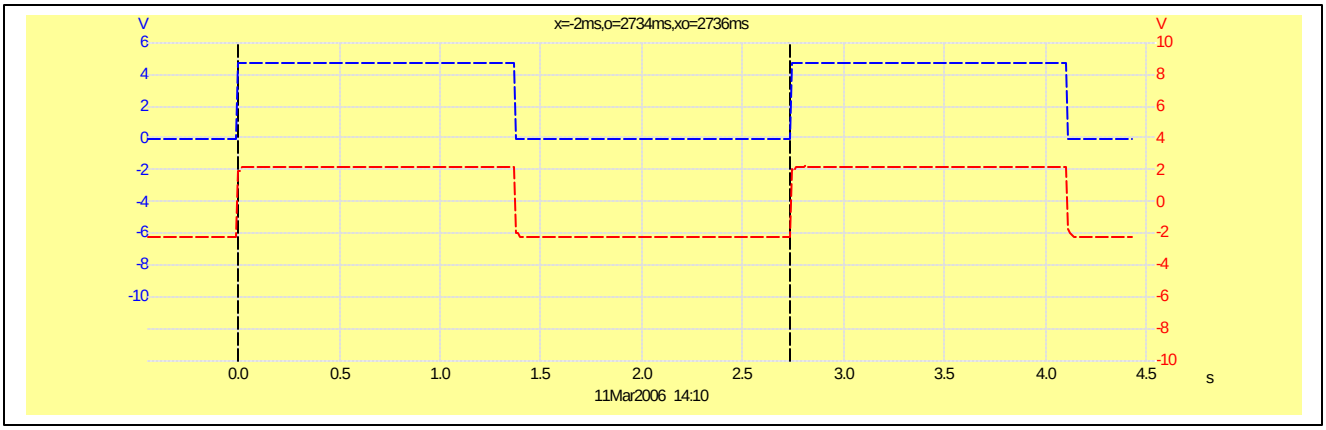


Figure 3. On the top is a control signal (the DR changed from 0 to 5VDC); on the bottom is a voltage across the motor (attenuation 10).

The driver is quite fast and can drive a load (switch direction) up to 270 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).

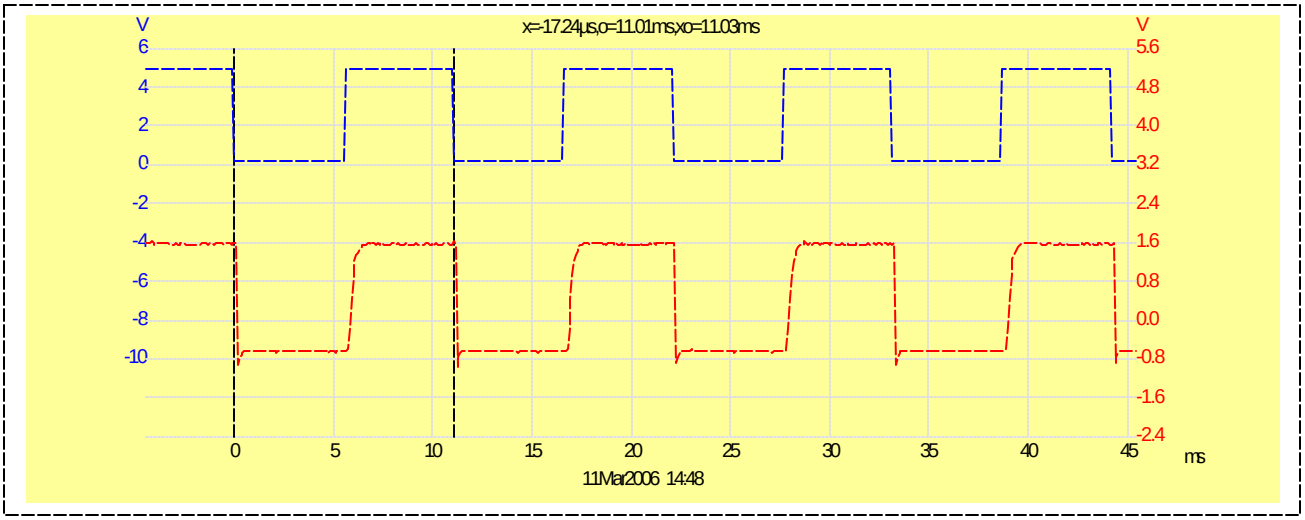


Figure 4. The EDR82951 drives a 10-Ohm resistive load at about 90 Hz. The Vss is 20V and the current is 2 A.

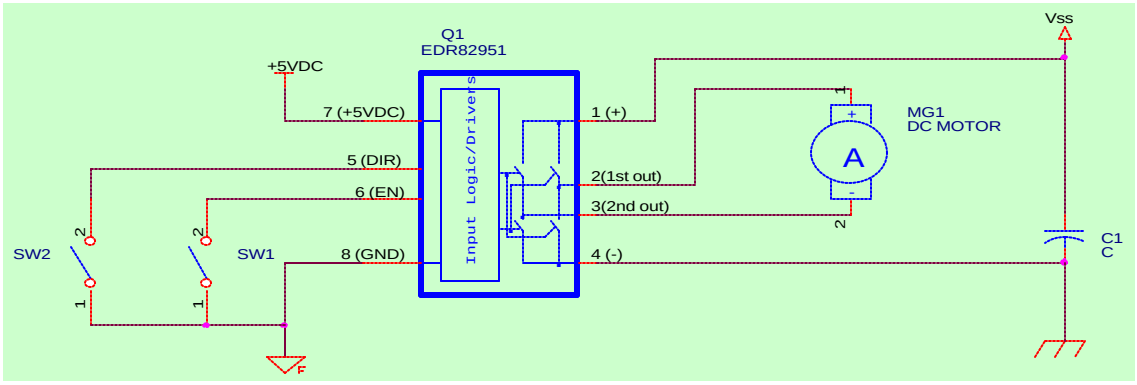


Figure 5. Application when motions of the motor controlled with two SPST switches

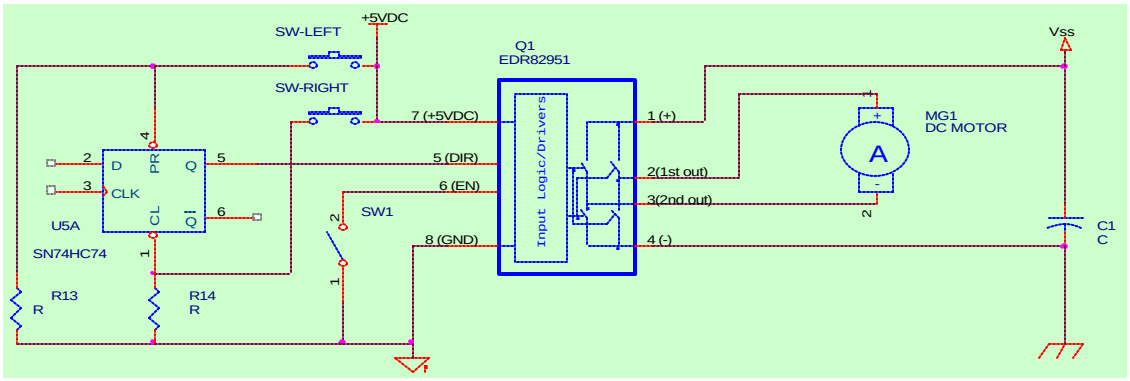


Figure 6. A flip-flop and two micro-switches at the end of the run is a simple solution in creating continues CW/CCW motion of the motor. As it shown on the drawing, both switches are normally opened. One of switch is connected to the PR and other to CLR of the flip-flops. Normally, both inputs, the PR and the CLR are low.

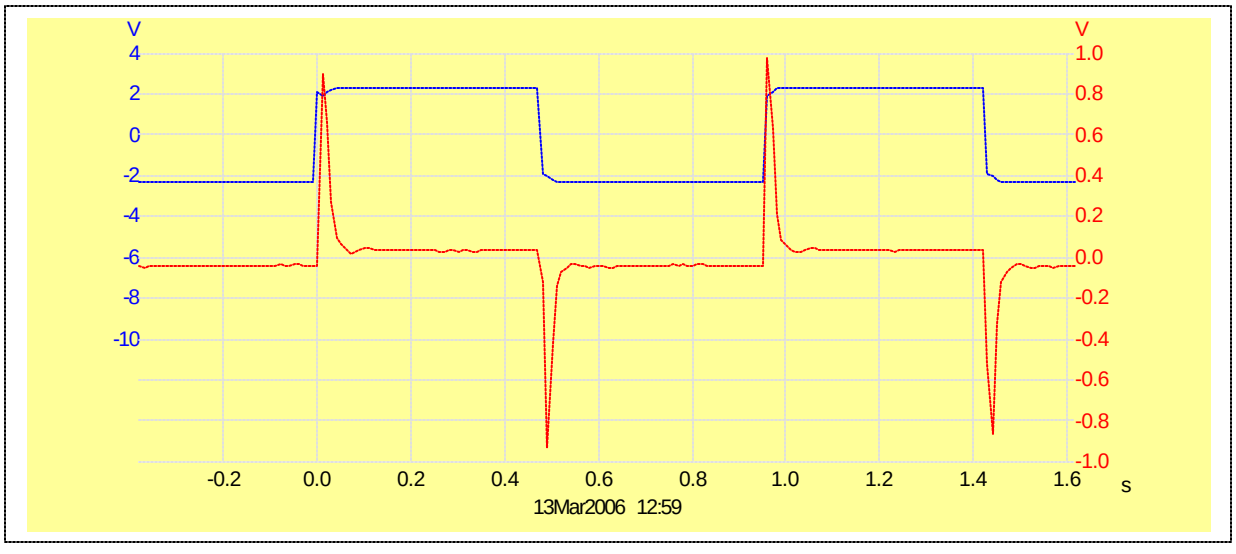


Figure 7. The EDR82951 is capable to withstand, repeatable a 20A large current surge. The top is the voltage across a DC Motor, and the bottom is a current flow through the motor. A 20V (1:10 attenuated) applied to the motor for creating a CW and CCW rotations without consequently without breaking the 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 EDR82951 designed to be controlled via a CPU, there is a need to insert an OFF/ON-TIME delay a 270 + 170 for the 500 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.

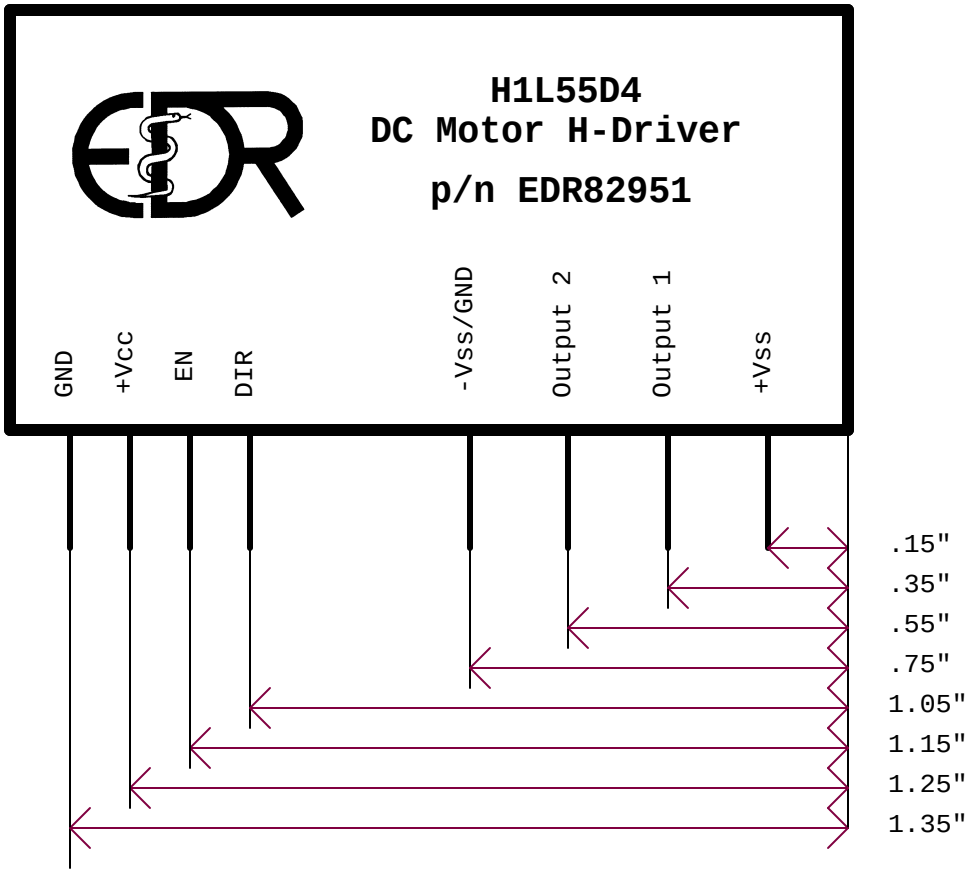
IV: For the maximum performance, there is no overcurrect protection built-in and care should be taken for preventing a possible overcurrect, which could damage your power source or the driver. The EDR82951 can deliver up to 30 amperes during a short time interval. A slow-blow fuse about 15% above a nominal average current will provide a sufficient protection to the load and power source.

V: Do not use the driver for the Vss below the specified level. Please request, an appropriate driver model if a DC Motor operates with a lower voltage.

VI: 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.

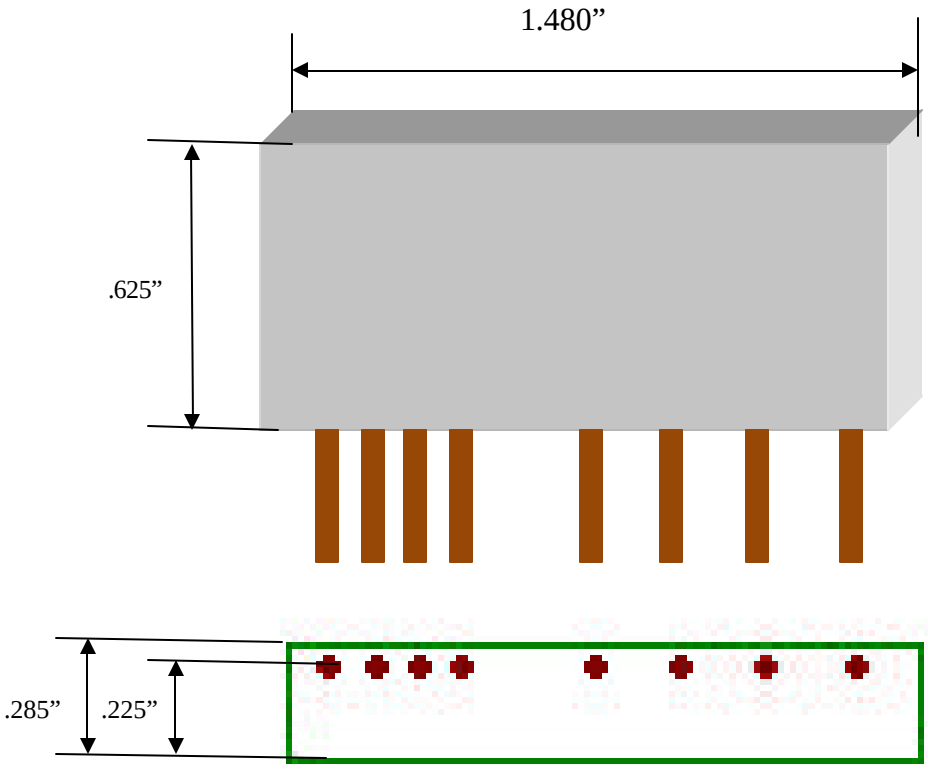
VII: The EDR82951 is an extremely low EME emission device. It can be located near by sensitive equipment. That was achieved by controlling a slope rate and thus preventing transient spikes. A negative side of that improvement, the driver's performance will depredate with an increasing switching speed above 80 per second.

Mechanical Dimensions: in Inches



Mechanical dimensions and recommended mounting holes for a PC Board

Above is a1:1view from the bottom of the driver and the space is required on a PC Board. We recommend all holes for PC Board mounting should made .050".



Pins are gold plated square bronze of .030" x 030". We recommend drilling a PC Board with a .050" diameter.

All dimensions are in inches.

Electronic Design & Research Inc., Specifications subject to change without notice.

For recommended applications and more information contact:
USA: Sales Support (800)336-1337, **Tech Support** (502) 933-8660 or email:
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