A third generation of

Double Isolated, 30kW/pulse Full-Bridge Driver

For

Brushed DC Motors, Spring-less Solenoids, Thermoelectric Cooler (Peltier) Elements, etc.

H7GvvDcc/v/T

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

At 150V & 30-A, it provides 4.5 kW to a load in a 1.95"W x 3.95"L x 1.2"H panel mounting enclosure

Electronic Design & Research Inc

Under management

VS Holding LLC

www.vsholding.com

Electronic Design & Research Inc. manufactures a vast variety of Solid State Relays, Breakers, Video Switches, H-Bridge Drivers, and Break Control Modules for Forklifts, High-Power switches, and High-Voltage Push-Pull Drivers, etc.

We have expanded our line of products by introducing two additional families of all-voltage, full-bridge drivers. Both of them are assembled in the same type of aluminum die cast enclosures. They also have the same number of input and output terminals. One is a family of an "H7GvvDcc/v/T" – designed for the simplest, easiest control and operation, the other is an "H7Gvv/cc/v" designed for precise PWM controls and break capabilities.

The third generation of all-voltage, opt-isolated, full-bridge (H-driver) drivers designed for delivering up to 4.5kW in a 1.95"W x 3.95"L x 1.2"H panel mounting enclosure. It is designed to control various devices such as intelligent toys, DC motors, robots, micro-cooling solution for Lasers, solid-state heat pumps, thermoelectric coolers based on Peltier elements, power tools, and spring-less Diaphragm Valves and solenoids. The input controls are fully 3,750V isolation allowing simple and effective interfacing of two independent power-based sources.

The H7GvvDcc/v/T family of opt-isolated H-drivers equipped with two opt-isolated inputs is among those that accept control signals of any polarity. The driver is a 3-state output including a floating state when either control signals are not applied or both of them were not present, resembling logic of an Exclusive-OR Gate.

The H7GvvDcc/v family of opt-isolated super-high speed, highly precision drivers includes several CMOS/TTL compatible such as an enable, PWM, direction, and break controls.

Contents

We bring, on industry average, one new unique device to the market every three months. Each new product allows the manufacturing hundreds of the same family of devices varying in rated voltage, current, and control signals. We work hard to satisfy your unique applications. Please use the Ordering Instruction (please see page #11), it is very informative and helpful. Do not hesitate to send us an email: info@vsholding.com for any additional information, delivery schedule, and prices.

Thank you,

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http://www.vsholding.com

Technology for people's ideas

1.4 kW, Isolated, Full-Bridge Driver (H-Switch)

H7G60D24/12/T is an H-driver module for DC motors, Solenoids, etc.

General Description:

The H7G60D22/12/T is a third generation of an isolated 60V/24A H-driver designed for motion control applications and thermoelectric coolers. It also used by driving high-speed solenoids. The driver utilizes CMOS, an advanced 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 number of industrial, space, avionics and defense applications.

H7G60D24/12/T

Features:

- H-driver assembled in a panel mount enclosure
- Deliver up to 24A rms at 25 °C and 18 A at 85 °C
- Pulsed current 240A (PEAK), 13kW
- Opt-isolated output
- PWM control, a shortest pulse width 15mS
- Opt-isolated both control inputs
- Three different modes (forward rotation, reverse rotation, disable)
- Low Rds (ON) typically, 0.004 Ohm per shoulder
- Low-Power consumption
- Wide range of Vss (output) voltage, any from 0V to 60V
- R-C (snubbing) network built-in to reduce a transient spicks
- Generates a minimum electro-magnetic interference
- Only two signals needed for its full control thus simplifying the interface requirements
- Available with Vcc of 5VDC and 12VDC
- Input connector is P/N 0901361206 by Molex Inc. http://www.molex.com/pdm_docs/sd/901361206_sd.pdf
- Die Cast aluminum box, 3.95”L x 1.05”W x .85”H

Applications:

- DC and Stepper Motors
- Bi-directional, high-speed solenoid
- Position and Velocity servomechanisms
- Hammer Solenoids
- Factory and hobby robots
- Numerically controlled machinery
- 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
- Push-Pull (bidirectional) electro-hydraulic valves
- **Thermoelectric cooler elements**
- It can be applied wherever DC solenoids are used in time critical applications including machine clutches, reject solenoids, glue and sealant applicators and solenoids subject to cyclic operation on rotating machinery

Pins Functions for H7GvvDcc/v/T devices

Pin #	Symbol	Functional Description
1.	**GND**	Return of the Vcc
2.	**+Vcc**	Power Supply (12VDC) for the internal logic
3.		R1 input control works in pair with R2
4.		R2 input control works in pair with R1
5.		L1 input control works in pair with L2
6.		L2 input control works in pair with L1
7.	**OUT L**	Output terminal to a load
8.	**OUT R**	Output terminal to a load
9.	**+Vss**	
10.	**–Vss/GND**	supply return

EDR’s H-drivers offered are in a small panel mount enclosure. The H7G60D22/12/T is made for high-density designs generating a minimum heat even at a maximum current. The driver is available in a lead free (Pb-free) version with the suffix ‘Pb”

Block Diagram of the H7GvvDcc/v/T driver and its controls

As it shown on the drawing below, the full-bridge drivers require two power suppliers for proper operation. The +Vcc/GND is for the internal logic and the +Vss/-Vss is for driving an output load. Besides that, the Vss cannot be more than the maximum allowed voltage and any other voltages that may be used.

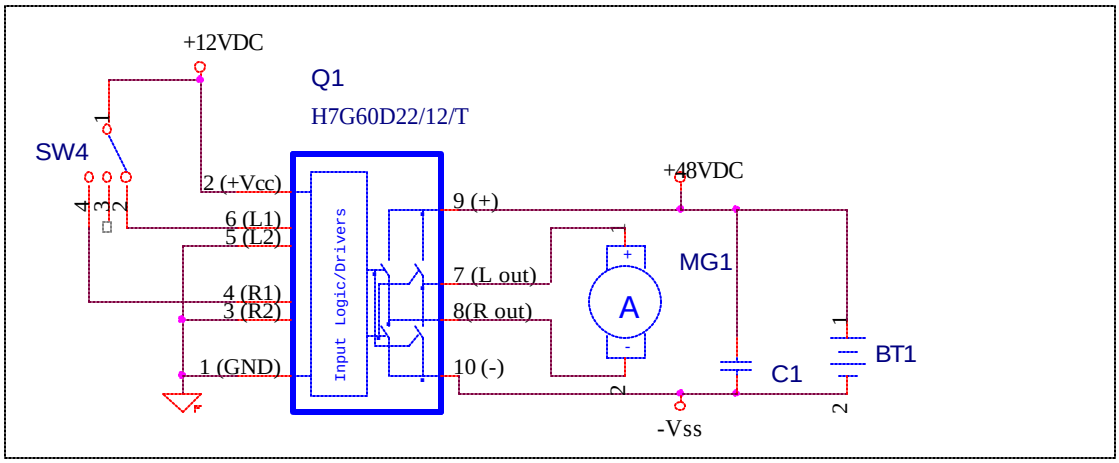

Figure 1
The driver is enabled by applying control voltages onto either input.

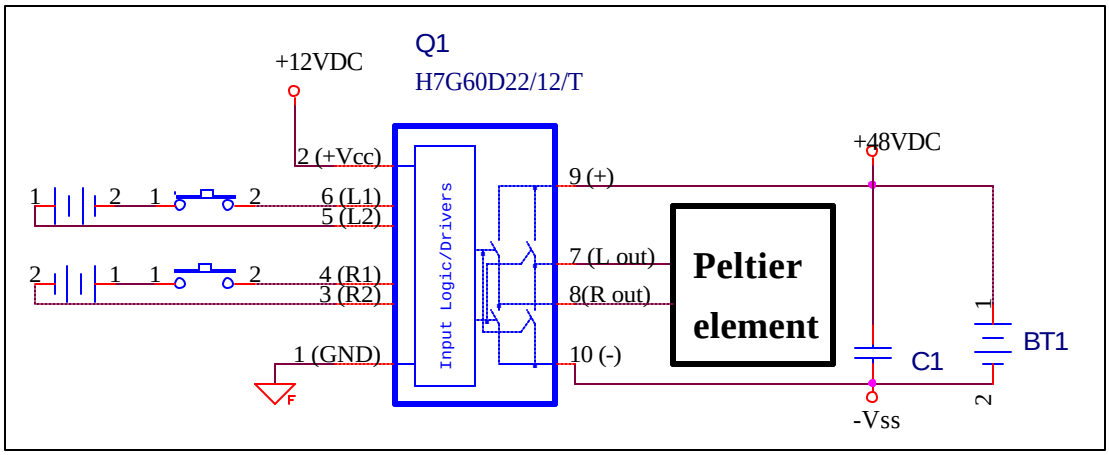

Figure 2
Both inputs are opt-isolated and have no a common path. A control signal can be of either polarity. Such an interface provides EE designers flexibility in implementing the best design solutions.

Absolute Maximum Ratings for P/N EDR83207/3/T or H7G60D24/12/T

	Parameter	Max.	Units
Vss	**Power Supply**	**60**	**V**
Id @ Tc = 25 °C	**Continuous Current, 1 min**	**180**	**A**
Id @ Tc = 85 °C	**Continuous Current, 1 min**	**20**	**A**
Idm	**Pulsed (PEAK) current, 0.1mS**	**300**	**A**
Pd@ Tc = 25 °C	**Power Dissipation at 20A current**	**0.8**	**W**
Pd@ Tc = 85 °C	**Power Dissipation at 10A current**	**1.1**	**W**
Idc @Tc = 25 °C	**Indefinite Continuous Current**	**24**	**A**
Vcc	**Power Supply to the internal logic**	**12**	**V**
Topr	**Operating temperature**	**-40 to 85**	**°C**
Tstg	**Storage Temperature**	**-55 to 135**	**°C**

Electrical Characteristics @ Tj = 25 °C (unless otherwise specified), Vcc = 12V, Vss=54V

	Parameter	Min.	Typ.	Max	Units	Conditions
	INPUT CONTROL					
Vcc	Supply voltage to the control	9	12	20	V	Maximum
Icc	Supply current @ Vcc = 12V		60		mA	
Vih	High level input voltage	15	16	17	V	On either input recommend
Vil	Low level input voltage	8	9	10	V	On either input recommend
Vi	Input voltage	10	12	13	V	Recommended control voltage
Ii	Input current, at 12V			30	mA	On either input
	OUTPUT (recommended)					
Vss	Supply to a load	0		54	V	At 22A current, 2.45-Ohm load
Rds	Output Total resistance	0.0038	0.004	0.0042	Ohm	Either directions, CW & CCW
Ill	Output leakage current			2.0	µA	Vss=54V
Tplh	Propagation delay turn-on time		96	100	µS	
Tphl	Propagation delay turn-off time		20	22	µS	
Trev	Propagation delay, phase reverse			130	µS	
P	Pulse width			14	µS	Load resistive
F	Maximum switching frequency			5000	Hz	Load resistive

PINs FUNCTION (refer to the block diagram)

PIN #	NAME	FUNCTION
10	-Vss/GND	Ground or –Vss the second terminal of the Power supply for the load
9	+Vss	Supply Voltage for the Power Output Stage. A non-inductive .1mF capacitor must be connected between this pin and –Vss/GND
8	R	Output R of the Bridge, the current flows through the load connected between (+) R and the second output L.
7	L	Output L of the Bridge, the current flows through the load connected between (+) L and the second output R.
5-6	L1&L2	A pair of terminals (L1 and L2) for enabling to output into another directions
3-4	R1&R2	A pair of terminals (R1 and R2) for enabling the output in one direction
2	+Vcc	Supply Voltage for the internal logic.
1	GND	Return of the Vcc.

Functions and Basic of Operations

The EDR made H7GvvDcc/v/T devices designed for either delivering a DC pulsing, or an alternative power onto varieties of loads. Very similar devices that do not have the suffix "/T" (H7GvvDcc/v) can deliver pulses for PWM applications as short as 15-microseconds. The drive with the suffix "/T" has only two control options and is designed as simple in terms of operation as possible. This makes the driver useful in many applications. It is designed for precision temperature control using two thermostats. Since there were cases when both sensors were on, the driver accommodated logic of ignoring both controls if they came simultaneously.

The driver was designed for operating in a high electrostatic noise environment. That achieved by having both control lines are individually opt-isolated. It accepts a control signal of any polarities and a current to be at minimum of 20-mA. There is no enable control line presented, once either a control signal is applied onto L1/L2 or R1/R2 pair the power will applied onto the load. A polarity of applied power depends which of pairs was activated. The driver will deliver full power onto a load (DC Motor) once hooked-up as shown in the Figure, below.

The H7GvvDcc/v/T is a fully isolated device where the input and the output powers have no common conduit. The control lines are also opt-isolated designed for an additional protection and better design freedom. Figure 3 shows two separate grounds, one is a signal ground belongs to the Vcc and the other is a power ground belonging to the Vss. If for whatever reasons a designer wishes to connect both grounds together than that is accomplished without any consequence or diminishing performance from the drivers.

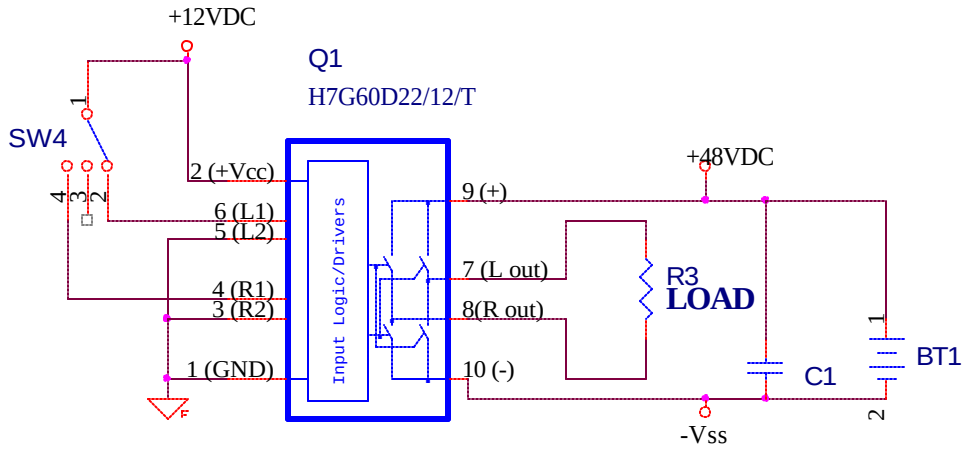

Figure 3
Two control lines and selecting one of three output functions

1. **Stand-by/power down, terminals #1 with #3 of the SW4 were connected:** The H7GvvDcc/v/T family of H-drivers offers a unique control. The output is disabled in either case, when control signals were absent or both of them applied at the same time. In both cases, both output terminals L and R are not conducting and a load disconnected from the Vss and the power ground.
2. **Clock-wise (R) rotation, terminals #1 and #2 on the SW4 were connected:** Once a control signal applies on terminals L1 and L2 in such manner that there is deference in a potential between terminals is exceeded 9VDC, the output will be activated. When the DC Motor was connected to the output terminals, it gained a motion. Full power can be applied by keeping a control voltage constant or a PWM control can be implemented by applying pulses of varying durations while keeping the frequency constant.
3. **Counter clock-wise (L) rotation, terminals #1 and #4 of the SW4 were connected:** In that position, s power will apply on L1/L2 terminals and as the result, a direction of ration is changed.

The H7G60D22/v/T designed to withstand more than 200 amperes of current surge and more than 400 amperes of transient spikes. **WARNING!!** *The maximum allowed should be taken into consideration.* Rated for a rather low current of only 22A, the driver switches fast and can drive a larger load for a short time.

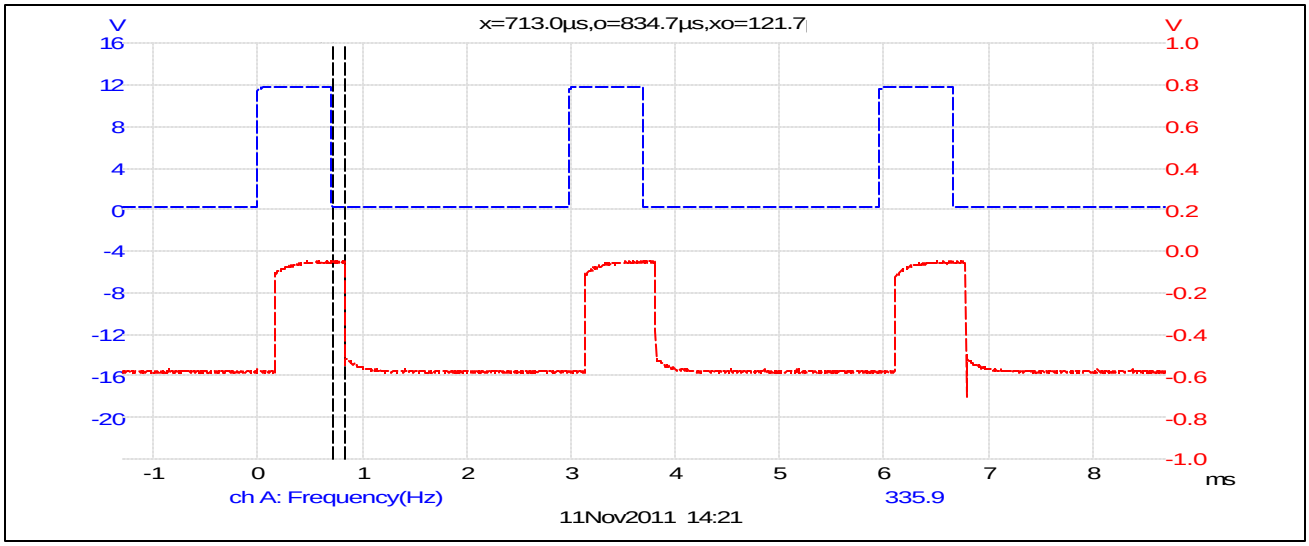

Figure 4
On the top is a control signal and on the bottom is a voltage across the motor (1:10).

The ability of withstanding current surges becomes handy during the turn-on phase and using an instant reverse polarity (rotation) to the DC Motor. A current surge could jump to x10-times the average consumption during changing polarity of applying power, as it shown on Figure 5 and that would not harm a EDR's made H-driver.

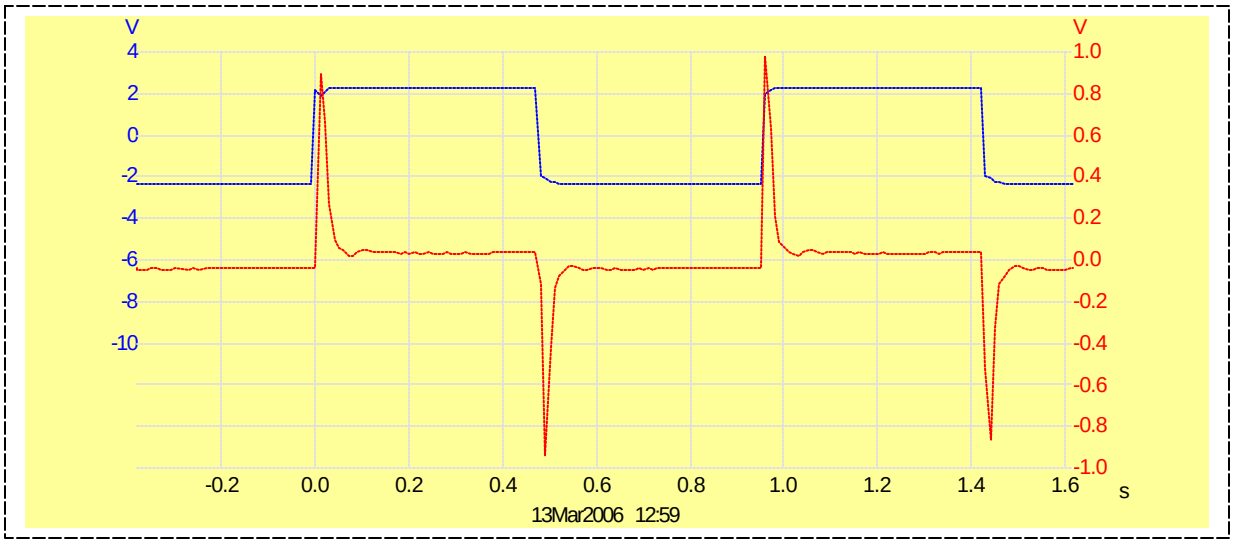

Figure 5
The H7GvvDcc/v/T is capable of withstanding a large current surge. The top recording is the voltage across a DC Motor, and the bottom is a current flow through the same motor. A sudden change in a polarity of applied voltage created a large current surge as a combination of a brake and start-up currents.

The H-bridge employed a simple logic for its operations. The input and output relationship is shown in the truth table below.

INPUTS		OUTPUTS	
L1-L2	R1-R2	L	R
H	L	+V	-V
L	H	-V	+V
H	H	Z	Z
L	L	Z	Z

Figure 6. The truth table

H high level or logic "1," when a control signal applied on an input pair
L low level or logic "0," when no voltage applied on an input pair
Z floating or high-impedance (off), when there is no current flowing through output terminals

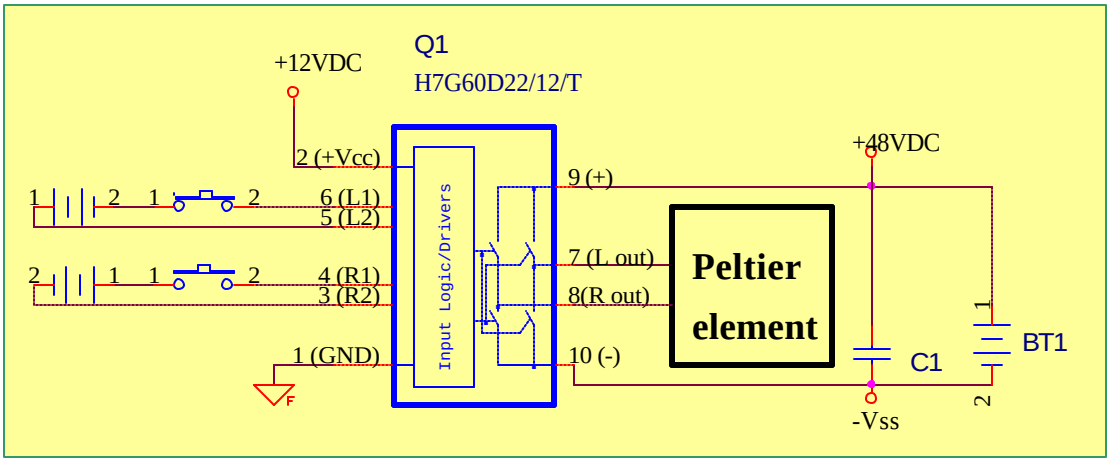

Figure 7

NOTE: There is a low-power snubbing network (R-C) built in for removing high-voltage, high-frequency spikes. It is suggested however to install a capacitor, a 10µF to 1000µF (depending on a consumed current). That capacitor should be rated at least 20% of above applied voltage and installed between +V and –V/GND terminals if there is more than a foot-long cable to a power source. An additional snubbing network is also recommended to cut EMS noise and decrease heat generation inside of the module if a load is of an inductive nature or there is long connective cable. A ceramic capacitor of 1.0µF and resistor of 50 Ohm connected, optimally, should be installed in parallel to the load terminals. If a load is capacitive of nature then a small value resistor should be added into a power supply chain limit a maximum current and avoid damaging the power supply.

Mechanical Dimensions of the H7G-package (in inches)

Input connector is http://www.molex.com/pdm_docs/sd/901361206_sd.pdf
Output terminals are M4

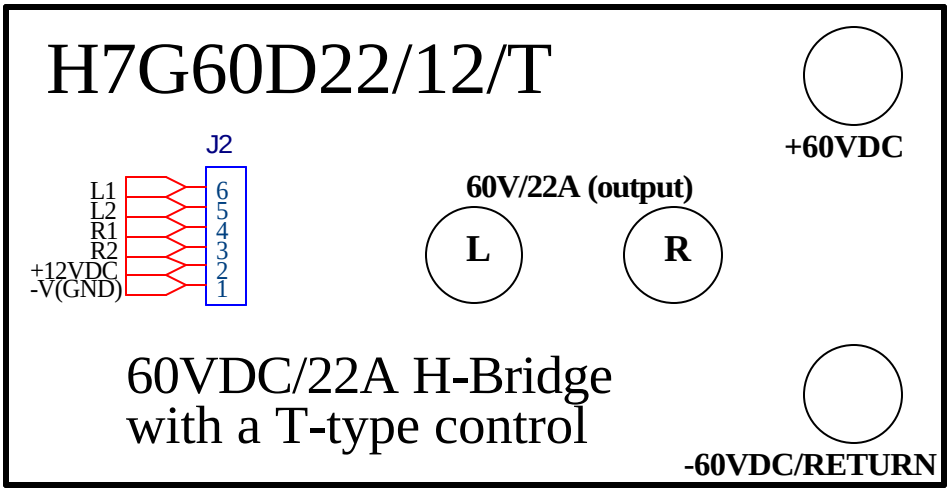

Figure 8

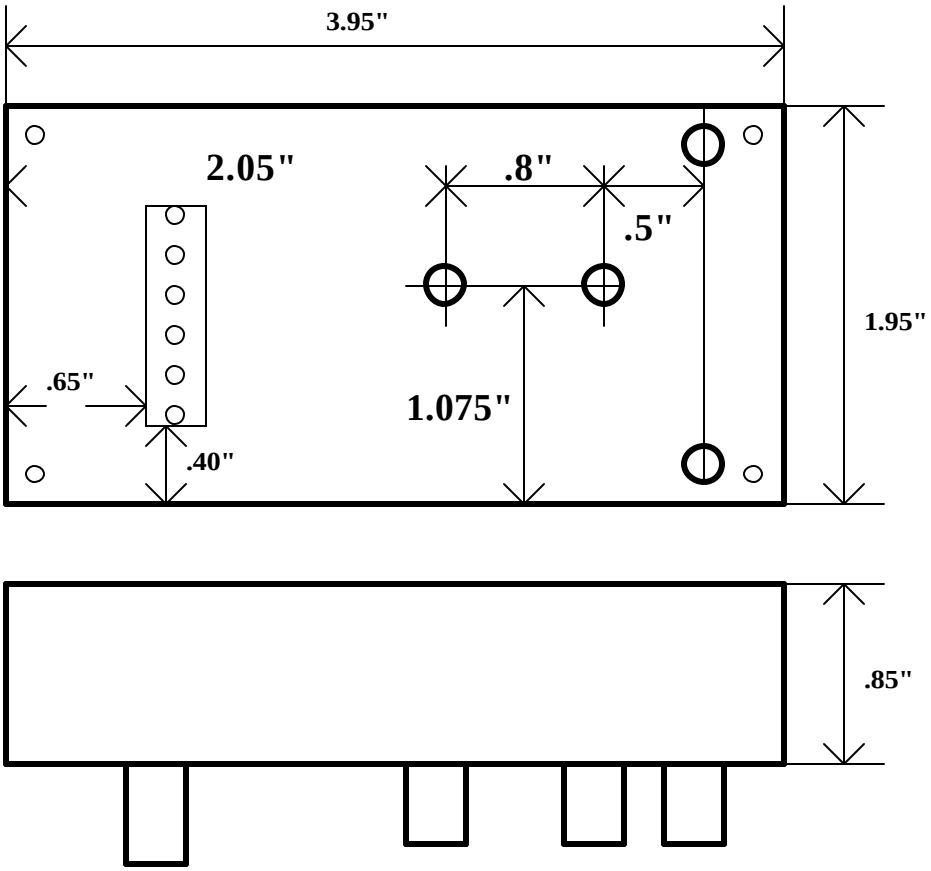

Figure 9

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

(A short list)

There is no harm of using devices at maximum ratings, but insure the lasting (trouble-free) operation, it is recommended to apply voltage and current should be 10% less of the maximum allowed.

Model Number	V maximum	Id	I dm (2mS)	Part #
H7G24D22/I/E/T	0 – 24 VDC	22 A	300 A	EDR83200/c/p/T
H7G24D40/I/E/T	0 – 24 VDC	40 A	500 A	EDR83201/c/p/T
H7G24D60/I/E/T	0 – 24 VDC	60 A	800 A	EDR83221/c/p/T *
H7G40D15/I/E/T	0 – 40 VDC	15 A	180 A	EDR83202/c/p/T
H7G40D20/I/E/T	0 – 40 VDC	20 A	250 A	EDR83203/c/p/T
H7G40D15/I/E/T	0 – 40 VDC	22A	300 A	EDR83204/c/p/T
H7G40D31/I/E/T	0 – 40 VDC	31A	400 A	EDR83219/c/p/T *
H7G40D60/I/E/T	0 – 40 VDC	60A	800 A	EDR83220/c/p/T *
H7G55D15/I/E/T	0 – 55 VDC	15 A	150 A	EDR83205/c/p/T
H7G55D24/I/E/T	0 – 55 VDC	24 A	310 A	EDR83206/c/p/T
H7G60D22/I/E/T	0 – 60 VDC	22 A	300 A	EDR83214/c/p/T
H7G60D24/I/E/T	0 – 60 VDC	24 A	320 A	EDR83207/c/p/T
H7G60D40/I/E/T	0 – 60 VDC	40 A	500 A	EDR83218/c/p/T
H7G75D15/I/E/T	0 – 75 VDC	15 A	180 A	EDR83208/c/p/T
H7G75D22/I/E/T	0 – 75 VDC	22 A	300 A	EDR83209/c/p/T
H7G75D30/I/E/T	0 – 75 VDC	30 A	450 A	EDR83215/c/p/T
H7G100D10/I/E/T	0 – 100 VDC	10 A	140 A	EDR83211/c/p/T
H7G100D17/I/E/T	0 – 100 VDC	17 A	200 A	EDR83210/c/p/T
H7G100D30/I/E/T	0 – 100 VDC	30 A	400 A	EDR83212/c/p/T
H7G150D10/I/E/T	0 – 150 VDC	10 A	130 A	EDR83223/c/p/T *
H7G150D13/I/E/T	0 – 150 VDC	13 A	150 A	EDR83216/c/p/T
H7G150D24/I/E/T	0 – 150 VDC	24 A	300 A	EDR83217/c/p/T

Above are just samples of drivers that were assembled in H7G-package. There are hundreds of additional drivers with various voltage/current ratings available in the same package. All drivers are built with the same control circuitry and the difference is only the type of output transistors (powerful MOSFETs). Do not hesitate to ask for a 40VDC/1A driver if you would need such device that brings you some savings because transistors for assembling it more cost effective than for a 40VDC/30A driver.

NOTE: In cases when a control voltage (Vcs) and power supply (Vcc) are matching, a single suffix should be used for part's identification.

Please specify the power supply voltage Vcc, as for example H7G30D12/v/x by replacing "E" with a 5 for 5VDC and 12 for 12VDC. Respectfully, the "I" should be replaced with a desirable voltage. For an example, H7G150D24/5/12 reads; a control voltage is 5VDC and power supply is 12VDC. The last page should provide more information as to how we create a part description.

Cost of a Solid State Relay coincides with the volume ordered. In most cases a relay costs in low teens whereas in order of 1000 or more it is less. *We charge a no production set-up fee for orders of 400 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).

Part description: *H* *3* *L* *200* *D* *10* */5* */12*

X	**A**	**B**	**C**	**F**	**H**	**/E**	**/I**
H-Driver	size =	Speed "L" = low	Voltage = 200V	Current = DC	Current = 10A	CS=5V	Vcc=12V

"X" module type

D	Solid-State Relay or Switch with output terminals: SPST-NO (normally open)
R	Solid-State Relay or Switch with output terminals: SPST-NC (normally closed)
W	Solid-State Relay or Switch with output terminals: DPST
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	1.75"H x 1.80"L x 0.595"W
3	1.125"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, .82"H x 3.95"L x 1.96"W
8	.575"H x 1.1"L x .2"W
9	panel mount 3"H x 10"L x 8"W
D	DIN type enclosure, 2.36"H x 2.36"L x 1.5"W, for 35mm DIN Rail
P	panel mount, .8"H x 2.275" L x 1.75"W
R	panel mount, 1.82"H x 6.0"L x 3.3"W

"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 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

We can manufacture a device for any required current.

"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
74VDC	10				

"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