RP Metrix

| LASOM2 Valve Driver Module | LASOM2.V1 |

Valve Driver Module for a LASOM2 Scalable Olfactometer Module
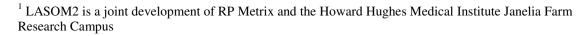
- **32 valve driver circuits**
- **Supports 24 VDC Valves**
- **Up to 500 mA per valve**
- **Up to 1500 mA per module**

- **LED indication of valve circuit excitation**
- **1-Wire® module identification**
- **Integrated with LASOM2 Controller Modules**

Ordering Information

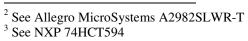| Configuration	Part Number
Scalable Olfactometer Module LASOM2[1]	LASOM-2
Olfactometer Module Control Board, Type 1	LASOM2.C1
Olfactometer Module Valve Driver Board, Type 1	LASOM2.V1
Replacement external 24 VDC adapter	LAPDC24-1

[1] LASOM2 is a joint development of RP Metrix and the Howard Hughes Medical Institute Janelia Farm Research Campus

Absolute Maximum Ratings _____

Characteristic	Symbol	Min	Typ	Max	Unit
Input Valve Supply Voltage	V_S	-0.3	24.0	35	V
Valve Circuit Current[2]	I_{VALVE}	0		-500	mA
Operating Temperature	T_A	0		70	°C
Storage Temperature	T_S	-40		85	°C
Input Logic Supply Voltage	V_{CC}	-0.5	5.0	7.0	V
Digital I/O Input Voltage	V_{DIO}	-0.5		V_{CC}+.5	V
Digital I/O Clamp Current	I_{DIOK}	-20		20	mA

Specifications _____

At T_A = +25°C, V_{S} = 24V, V_{CC} = 5V, unless otherwise noted.

Characteristic	Symbol	Min	Typ	Max	Unit
Input Valve Supply Voltage (in operation)	V_S	23	24	25	V
Operating Supply Current	I_S		-100	-1500	mA
Output Voltage Drop (V_S = 24V, I_S = -100 mA)			-1.6	-1.8	V
Clamp Diode Forward Voltage (I_S = 350 mA)			1.5	2.0	V
Clamp Diode Leakage Current				50	μA
Input Logic Supply Voltage (in operation)	V_{CC}	4.5	5.0	5.5	V
Input Logic Supply Current	I_{CC}		100	500	mA
Digital High Level Output Voltage[3]	V_{OH}	3.98	4.32		V
Digital Low Level Output Voltage	V_{OL}		0.15	0.26	V
Digital High Level Input Voltage	V_{IH}	1.6	2.0		V
Digital Low Level Input Voltage	V_{IL}	0.8	1.2		V
Board Length			297.69		mm
Board Width			44.45		mm

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[2] See Allegro MicroSystems A2982SLWR-T
[3] See NXP 74HCT594

Description _____

The LASOM2 Scalable Olfactometer Module is a plug mount module that connects to clean gas sources and delivers an odorized gas flow to an olfaction experiment. See the LASOM2.C1 datasheet for a more detailed description.

The LASOM2.V1 Valve Driver Module converts logic level control signals into valve excitation signals for up to 32 valves using 24 VDC drive coils. A LASOM2.Cx Controller Module prepares the control signals and directs the valve driver module to energize the valves.

The core logic components on the Valve Driver Module comprise a daisy chain of four 74HCT594 8-bit shift registers. The Controller Module shifts a 32-bit word of excitation signals into the register chain, and then copies the result into the 74HCT594 output registers.

Each of the 32 register output logic signals drives a monitor LED (D401..D432) and energizes a high-side 24VDC valve driver. The drivers are internally protected from short circuits and thermal overload. The per-valve current capacity of 500 mA is far above the typical 10 to 20 mA requirement of odor selection valve coils.

The LASOM2.V1 Driver Module is intended to support an olfactometer servicing 10 to 14 odor vials, with 2 valve circuits used per vial. One extra vial is typically operated with normally open valves to support a background gas flow comparable to the flow occurring when an actual odor is selected. This implies that up to 15 vials and 30 valve circuits are committed to odor selection, with 2 valve circuits unassigned. Controller Module firmware manages these conventions for valve circuit activation – the Valve Driver itself merely carries out instructions to energize an arbitrary combination of 32 valve circuits.

The previous 32-bit control word is normally looped back to the Controller via resistor R40. The J40 expansion port may be used to extend the valve driver to additional valves. (Appropriate controller firmware modifications are also required.)

The on board 1-Wire Identifier chip electronically serializes the Driver Module so that the set of odor vials coupled to the board can be tracked in managed between experiments.

Connectors _____

Designator	Description	Type
P30	Valve Driver Interface	20-pin 2mm header
V1 to V32	Valve Driver Headers	2-pin MicroFit3 3mm header
J40	Expansion Port	20-pin 2mm receptacle
R40	Expansion Jumper	22 Ω 0603 surface mount resistor

R40 is normally installed to return the final shift register output to VC_SDO. If an expansion device is attached to J40, this resistor must be removed and the output must be driven from the expansion device.

P30 (20-pin 2mm pitch header) 20-Pin Valve Driver Interface Connector

Pin #	Signal	Input/Output	Pin #	Signal	Input/Output
1	Ground	--------	2	Ground	--------
3	5V Logic Power (V_{DC})	Input	4	VD_nFAULT[4]	Output
5	5V Logic Power	Input	6	VD_nRESET	Input
7	No Connection		8	VC_RCLK	Input
9	Module 24V (V_S)	Input	10	VC_nCLR	Input
11	Module 24V	Input	12	VC_nSRCLR	Input
13	Module 24V	Input	14	VC_SDO	Output
15	1_Wire_BUS	Bidirectional	16	SPI_TO_DEV	Input
17	VC_LED_ENA	Input	18	SPI_CLK	Input
19	Ground	--------	20	Ground	--------

V1 to V32 (2-pin MicroFit3 header[5]) 2-Pin Valve Activation Header

Pin #	Signal	Input/Output
1	Ground	--------
2	24VDC Excitation Signal	Output

J40 (20-pin 2mm pitch receptacle) 20-Pin Expansion Port Connector

Pin #	Signal	Input/Output	Pin #	Signal	Input/Output
1	Ground	--------	2	Ground	--------
3	5V Logic Power (V_{DC})	Output	4	VD_nFAULT	Bidirectional
5	5V Logic Power	Output	6	VD_nRESET	Output
7	No Connection		8	VC_RCLK	Output
9	Module 24V (V_S)	Output	10	VC_nCLR	Output
11	Module 24V	Output	12	VC_nSRCLR	Output
13	Module 24V	Output	14	VC_SDO	Input
15	No Connection		16	VC_SDI	Output
17	LED_SINK	Output	18	SPI_CLK	Output
19	Ground	--------	20	Ground	--------

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[4] No connect on LASOM2.V1
[5] Molex 43650-0216 , Digi-Key WM1922-ND.
  Mates with Molex 43645-0200, Digi-Key WM1845-ND.