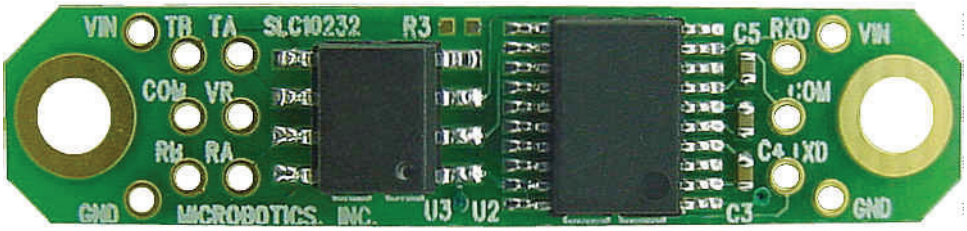
SLC10232

SINGLE-CHANNEL SERIAL VOLTAGE LEVEL CONVERTER



USER MANUAL
(October 2008)

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1 Introduction. The Microbotics SLC10232 is a single-channel full-duplex serial voltage converter supporting RS-232 ⇔ RS-422 and RS-232 ⇔ TTL voltage level conversions. The board's small size allows it to be mounted directly in the user wiring harness, and the SLC10232 can be powered by any convenient DC source of 4 to 40 VDC, thus reducing the real estate needed to effect these voltage level conversions. Each board has an RS-232 receiver connected to an RS-422 output driver, and an RS-422 receiver connected to an RS-232 output driver. Each receiver-driver set is independent except for common ground and power connections. A 1.65V reference is provided by the SLC10232 in order to bias the RS-422 receiver in order to operate the RS-422 receiver as a TTL-level receiver. ***NOTE THAT THE SLC10232 IS STRICTLY A VOLTAGE LEVEL CONVERTER – THE BOARD DOES NOT PERFORM ANY DATA RECLOCKING OR DATA FORMAT CONVERSIONS.***

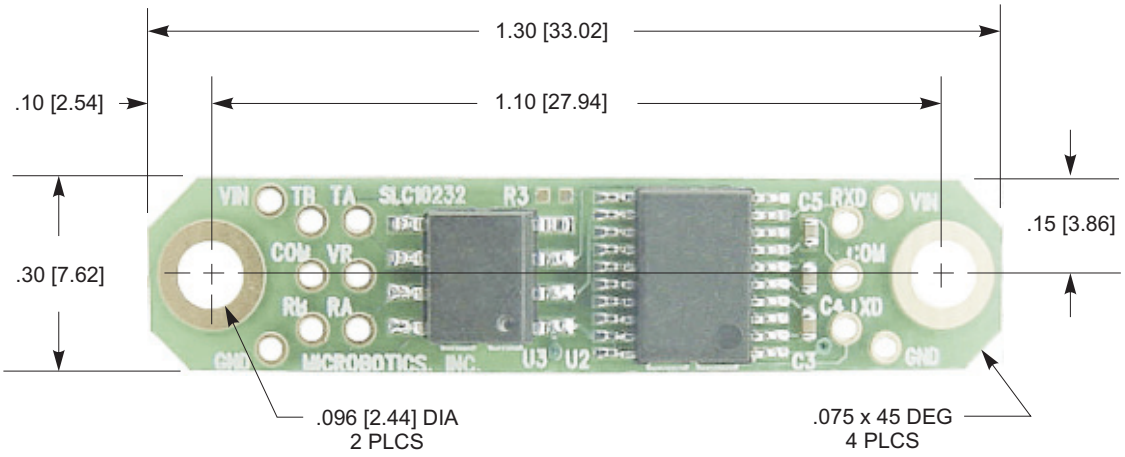


Figure 1. SLC10232 Physical Dimensions.

2 Wiring the SLC10232 to the User System. Connections to the SLC10232 are normally made via direct wiring to the holes on the board. ***Extreme care should be taken when soldering to the board to prevent damage to the pads or adjacent components.*** The RS-422 signals are grouped at one end of the board (Figure 2), while the RS-232 signals are grouped at the other end (Figure 3). Power input and return lines are available at both groups of signals. The signal pads for the SLC10232 are:

VIN	Board Power (4V to 40V Input) (Two pads provided)
GND	Power Ground (negative side) (Two pads provided)
RA	RS-422 negative data ***receipt into SLC10232*** (*MARK* Low) – data passed to ***TXD***
RB	RS-422 positive data ***receipt into SLC10232*** (*MARK* High) – data passed to ***TXD***
TA	RS-422 negative data ***transmit from SLC10232*** (*MARK* Low) – data passed from ***RXD***
TB	RS-422 positive data ***transmit from SLC10232*** (*MARK* High) – data passed from ***RXD***
RXD	RS-232 data ***receipt into SLC10232*** (*MARK* negative) – data passed to ***TA/TB***
TXD	RS-232 data ***transmit from SLC10232*** (*MARK* negative) – data passed from ***RA/RB***
COM	Ground returns for the RS-422 and RS-232 signals – Tie to Ground of User RS-232 and RS-422 Ports (Two pads provided)
VR	Voltage supplied by SLC10232 when needed to bias ***RA*** for TTL-level receipts

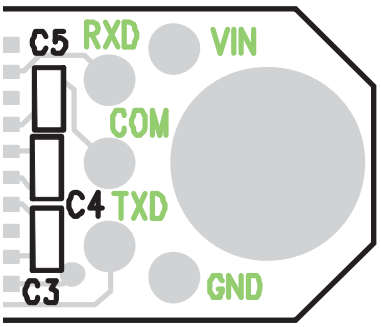


Figure 2. RS-232 Signals.

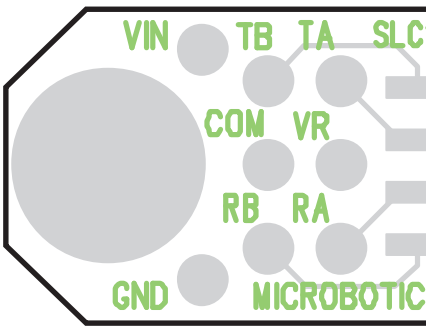


Figure 3. RS-422 Signals.

2.1 Power Connections. Any voltage between 4VDC and 40VDC may be used to power the SLC10232. The positive side of the power source is connected to either of the ***VIN*** pads, while the negative side of the power source is connected to either of the ***GND*** pads. While all ***GND*** and ***COM*** signals are electrically connected to the board Ground, the ***COM*** lines are not designed nor sized for returning the power supply current. ***DO NOT USE THE COM LINES FOR POWER RETURN.***

There are two pads each for ***VIN*** and ***GND***, one set near the RS-232 signal pads, and one set near the RS-422 signal pads. Either pad may be used for its associated power connection. The ***VIN*** and ***GND*** pad pairs can also be used to pass power from one side of the board to the other in order to improve cable wiring (this would eliminate one pair of wires in the cable). If the ***VIN*** and ***GND*** pad pairs are used to pass power through the board, the current must be limited to less than 100 milliamps. ***FAILURE TO LIMIT THE CURRENT TO LESS THAN 100 MILLIAMPS WHEN USING THE SLC10232 TO PASS THE POWER RAILS (VIN AND GND) MAY CAUSE ELECTRICAL FAILURE OF THE SLC10232 BOARD AND VOIDS THE BOARD WARRANTY.***

2.2 RS-232 Connections. Three signal lines are used for RS-232 connections (Figure 2). The ***RXD*** line is the RS-232 signal ***received by the SLC10232*** from the user system, which is then passed to the ***TA*** and ***TB*** outputs. The ***TXD*** line is the RS-232 signal ***transmitted by the SLC10232*** to the user system, having been passed from the ***RA*** and ***RB*** inputs. The ***COM*** line is a signal Ground return for the RS-232 signals, and ***must*** be connected to the Ground of the user RS-232 Port. Figure 4 shows a typical connection for the RS-232 signals, while Figure 5 shows a typical connection to a user PC. ***FAILURE TO CONNECT THE COM LINE TO THE USER PORT GROUND MAY CAUSE ELECTRICAL FAILURE OF THE SLC10232 AND VOIDS THE BOARD WARRANTY.***

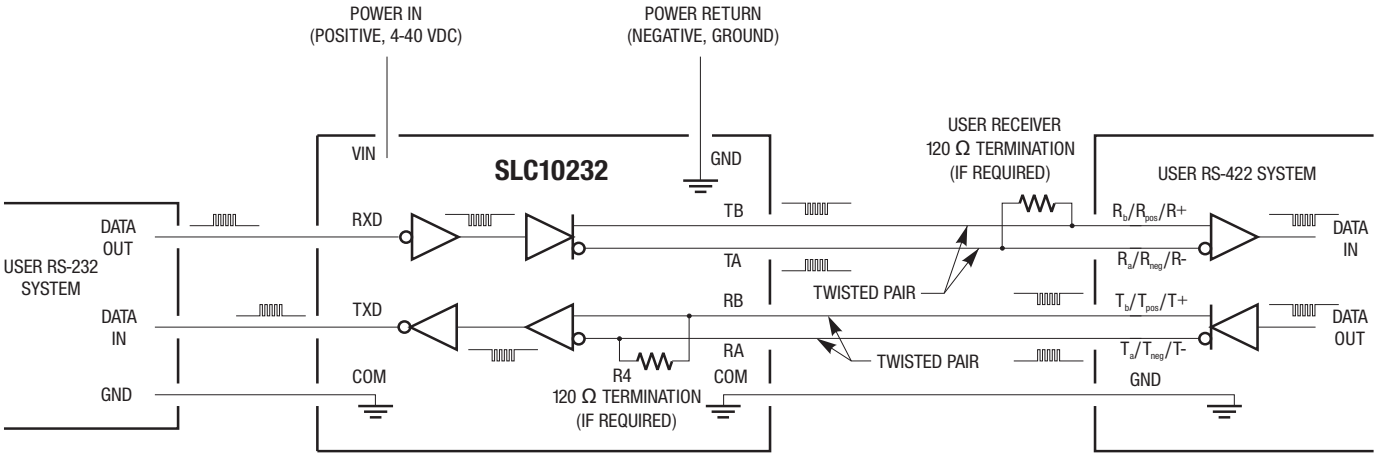


Figure 4. Typical User Connections to the SLC10232 Board.

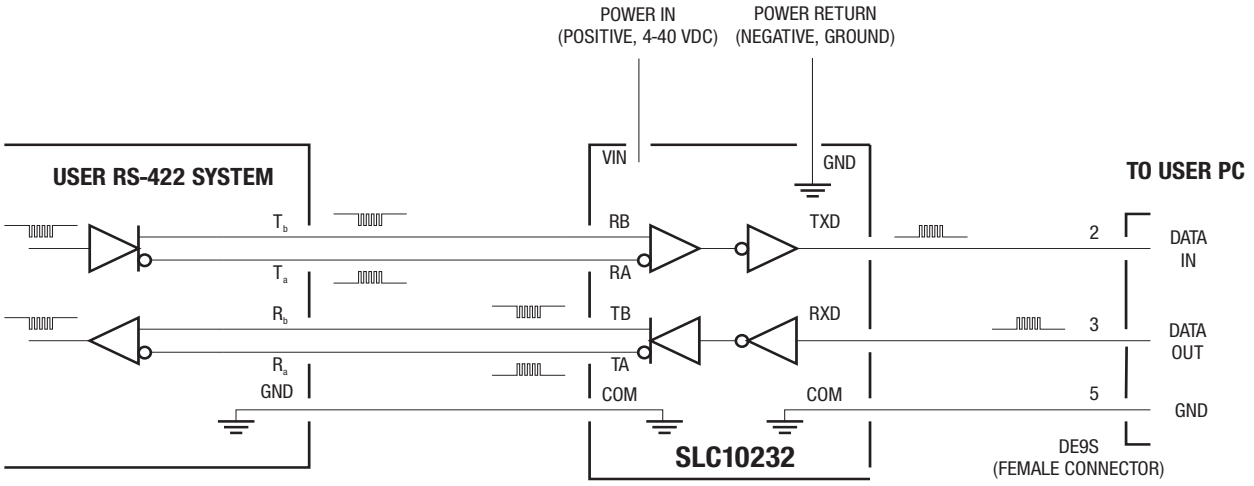


Figure 5. Using the SLC10232 to Interface a PC to an RS-422 System.

2.3 RS-422 Connections. Five signal lines are used for RS-422 connections (Figure 3). The ***TA*** and ***TB*** pair is the differential signal ***transmitted from the SLC10232*** to the user system, having been passed from the ***RXD*** input. The ***RA*** and ***RB*** pair is the differential signal ***received by the SLC10232*** from the user system, which is then passed to the ***TXD*** output. Note that, in both transmitter and receiver signals, the '***A***' references the ***negative*** signals, while the '***B***' references the ***positive*** signal. The ***COM*** line is a signal Ground return for the RS-422 signals, and ***must*** be connected to the Ground of the user RS-422 port. Figure 4 shows a typical connection for the RS-422 signals. ***FAILURE TO CONNECT THE COM LINE TO THE USER PORT GROUND MAY CAUSE ELECTRICAL FAILURE OF THE SLC10232 AND VOIDS THE BOARD WARRANTY.***

RS-422 differential transmissions, when using twisted pair cabling, drastically reduces electrical noise generated by the transmitted signals while rejecting electrical noise induced into the receiving signals. When data rates are high or the cable lengths are long, signal reflection can become an issue in transmissions. In these cases, a 120Ω termination resistor is placed across the twisted pair lines as close to the RS-422 receiver as possible. The SLC10232 board provides a location for installing a 0402-sized termination resistor across the ***RA*** and ***RB*** lines (Figure 6).

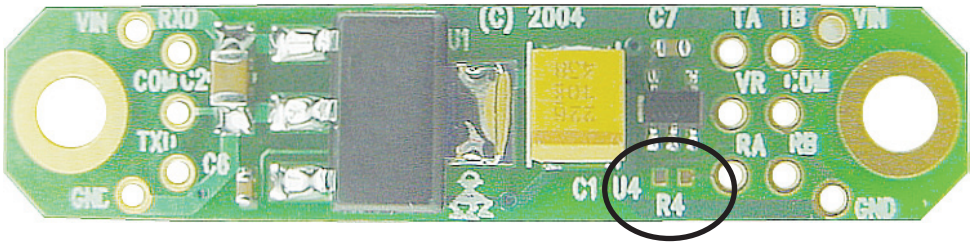


Figure 6. Location of On-Board Receive Line Termination Resistor.

2.4 TTL-Level Connections Using the RS-422 Port. The RS-422 Port of the SLC10232 may be used to interface TTL-level signals, effectively creating a TTL ⇔ RS-232 converter (Figure 7). In this case the ***TB*** signal is used as the TTL-level output to the user system, while the ***TA*** signal is unused. The ***RB*** signal is used to receive the TTL-Level signal from the user system (note that, in this case, the default state of the ***RB*** signal with no input is '*LOW*'). To force the RS-422 receiver to "see" the TTL-level signal at the ***RB*** input as a differential signal, the ***RA*** input must be biased by connecting it to the on-board 1.65V ***VR*** output.

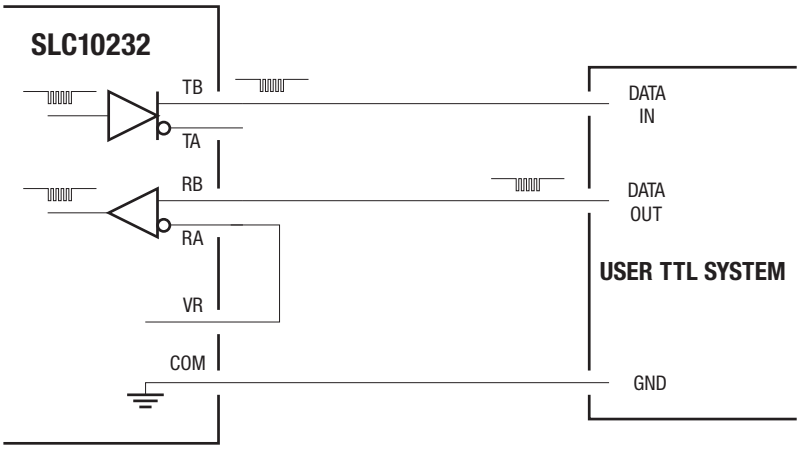


Figure 7. Using the RS-422 Port for TTL-Level Signals.

GENERAL SPECIFICATIONS, SLC10232

(August 2008)

All specifications subject to change without notice

	Max	Typ	Min	
Power				
Input Voltage	40		4	V
Input Current	4.5	3		ma
Signal Rate				
Baud Rate	250		DC	KBaud
RS-422 Signals				
Differential Driver Output (No Termination)		3.3		V
Differential Driver Output (120Ω Termination)			2.0	V
Receiver Input Voltage	12.0		-7.0	V
Receiver Differential Threshold	200		-200	mV
Receiver Input Hysteresis		50		mV
Input Resistance			12	KΩ
TTL-Level Conversions				
VR Out (Connected to ***RA***)		1.65		V
V_{IH} (***RB***)	5.5		2.0	V
V_{IL} (***RB***)	.8		0	V
V_{OH} (***TB***)	3.3		2.0	V
V_{OL} (***TB***)	.4		0	V
I_{OH} (***TB***)	8			ma
I_{OL} (***TB***)	-8			ma
RS-232 Signals				
Input Range	25		-25	V
Input Threshold High	2.4	1.5		V
Input Threshold Low		1.2	.6	V
Input Hysteresis		.5		V
Input Resistance	7	5	3	KΩ
Output Voltage Swing		±5.4	±3.7	V

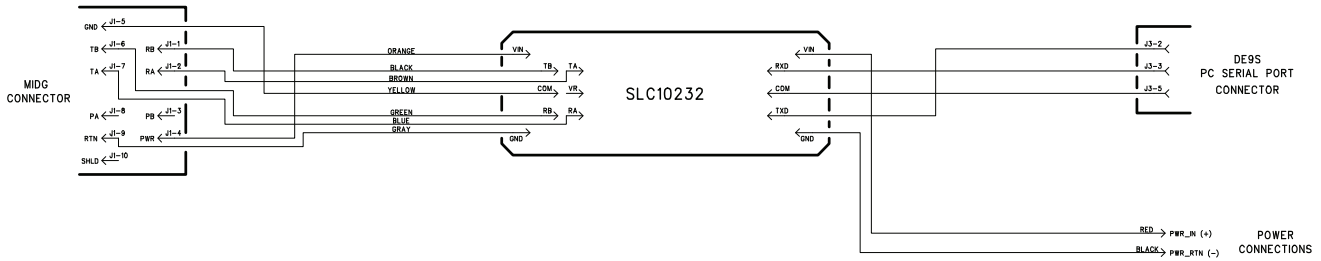
Physical

Size	1.3” [33.02 mm] L x .3” [7.62 mm] W x .22” [5.59 mm] T
Weight	1.2 g [.042 oz]

Environment

Operating Temperature	-40 to +85 °C
Storage Temperature	-55 to +125 °C
Vibration	6 g_{rms}
Shock	100 g, 8 ms, ½ sine

Wiring of the MIDG II PC Interface Cable Using the SLC10232.



NOTES :

REV	ECO #	DATE	DESCRIPTION

TOLERANCES UNLESS OTHERWISE SPECIFIED
DEGREES ± .005 ANGLES ± .005

APPROVALS	DATE
DRAWN:	
CHECKED:	
ENGINEER:	
PCB REV	

MICROBOTICS, INC. HAMPTON, VA

SLC2J09SF CABLE USING SLC10232

SCALE: N.T.S. D

FILE:

SHEET: 1 OF

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