

RS-485 Arduino Shield Module

FEATURES

- RS-485 Arduino Shield Module
- Data Rate: 5Mbps
- Recommended Vcc Voltage: DC 5.0V
- 16 digital IO port (including a I2C interface)
- 6 analog IO port and power
- Operation/programming mode switch
- Transceiver indicating LED
- Reset button
- Compatible with Arduino Uno

APPLICATIONS

- Arduino Board

DESCRIPTION

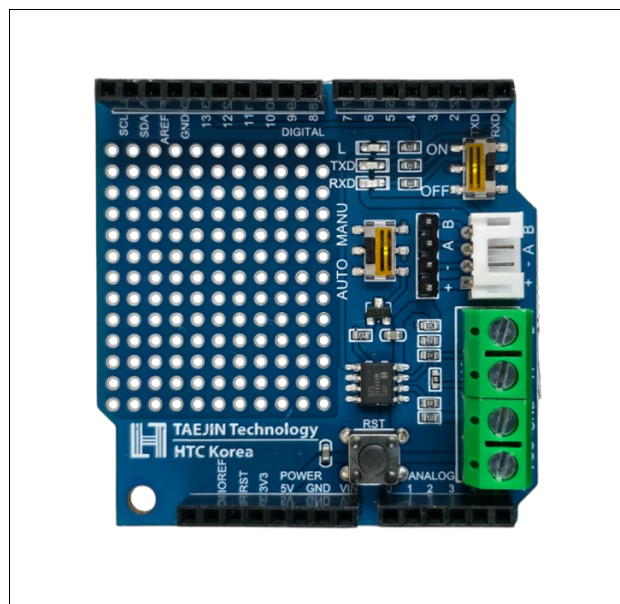
The RS-485 Arduino Shield Module converts UART/Serial protocol to the RS485 protocol. This RS485 board allows Arduino talk to industrial devices.

APPLICATION GUIDE

Integrated a standard RS485 port, a mini RS485 port, RS485 headers Provide the welding areas to make full use of the free space. Switch between automatic mode and manual transmission mode, which expands the scope of application.

Besides Tx/Rx interface, there is a switch to block/disable this shield, when Arduino needs to be programmed.

Long pins on the back adapt to most Arduino controllers.

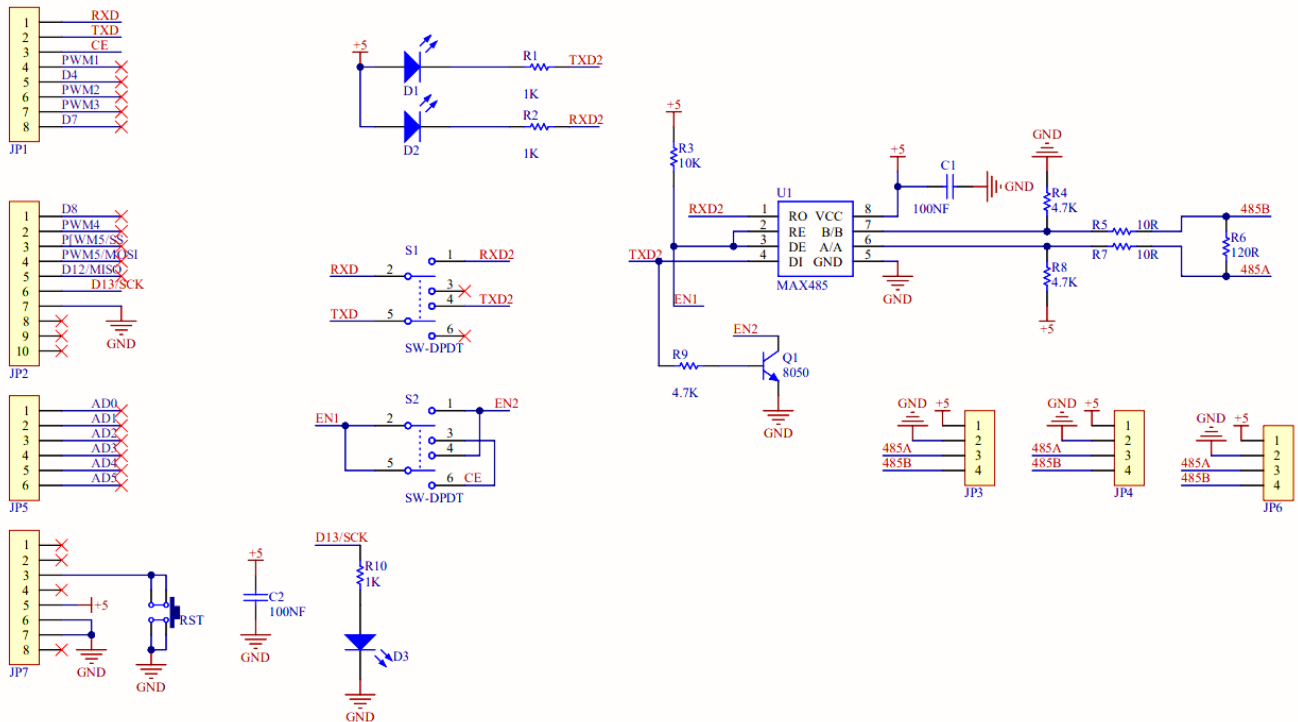


ORDERING INFORMATION

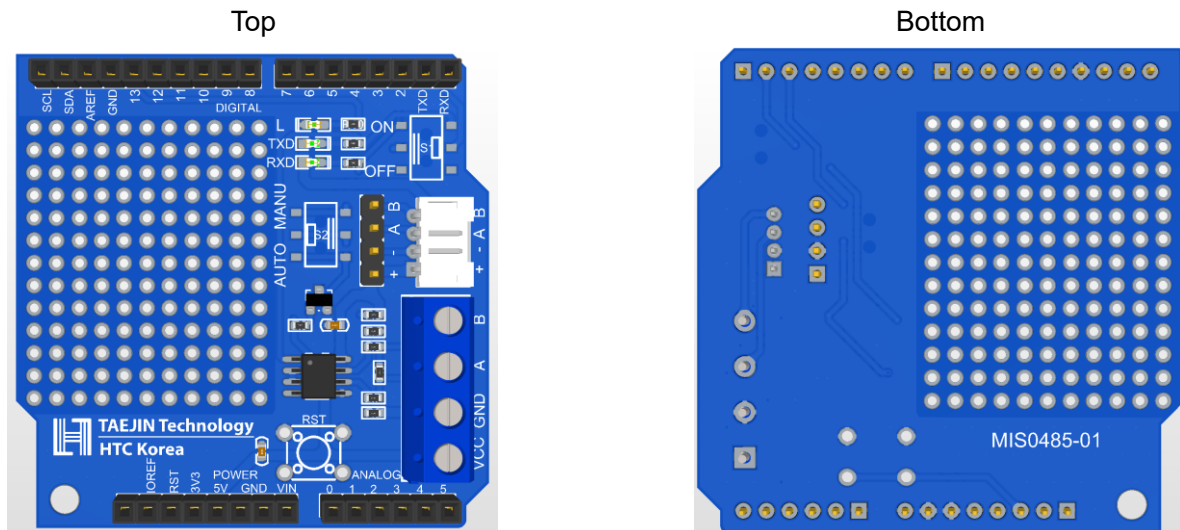
Part Number	MIS0485-01
Device	RS-485 Arduino Shield Module
Package	Assembled Module (54mm X 53mm)

RS-485 Arduino Shield Module

SCHEMATICS

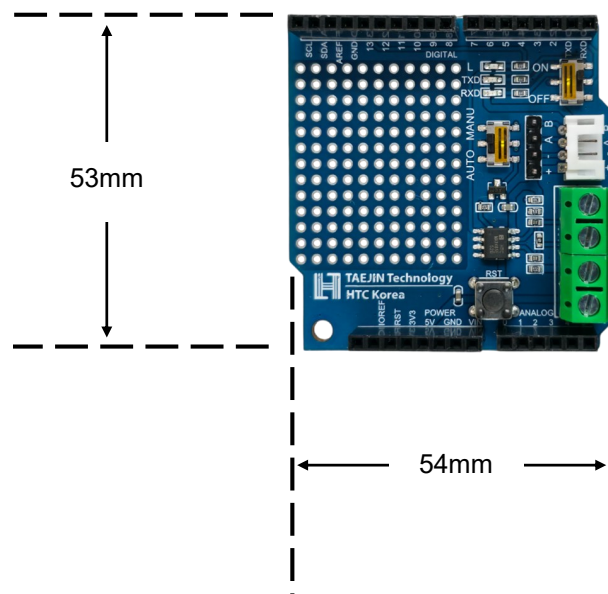


LAYOUT



RS-485 Arduino Shield Module

SIZE INFORMATION

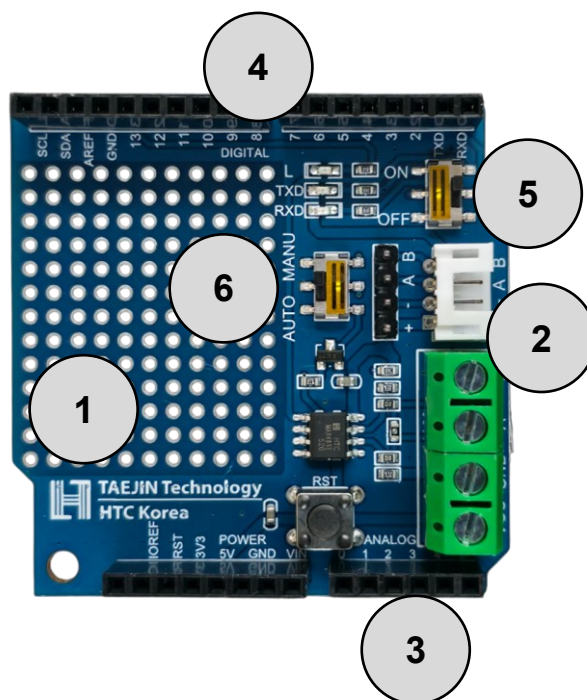


PRODUCT IMAGE



RS-485 Arduino Shield Module

I/O PORT CONFIGURATION AND DESCRIPTION



Designator	Port Name & Port Description
1	Weldable Area
2	RS485 Pins / Mini RS485 Interface
3	Analog Pins
4	Digital Pins
5	Operation / Programming Mode Switch
6	Automatic / Manual Transceiver Mode Switch

RS-485 Arduino Shield Module

REVISION NOTICE

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Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

DESCRIPTION

The MAX485 is a half-duplex transceiver that meets the specifications of RS-485 and RS-422. Its BiCMOS design allows low power operation without sacrificing performance. The MAX485 meets the requirements of the RS-485 and RS-422 protocols up to 5Mbps underload. The ESD tolerance is more than $\pm 8\text{kV}$ for both Human Body Model and $\pm 15\text{kV}$ for IEC61000-4-2 Air Discharge Method on this device.

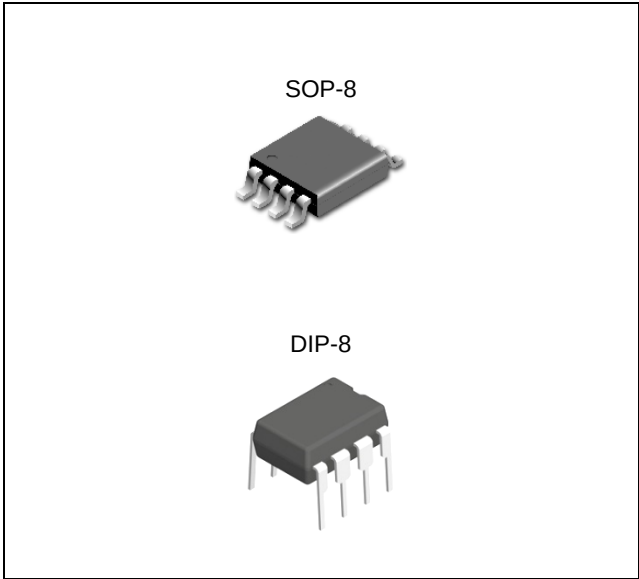
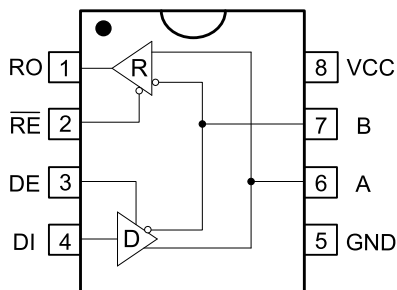
FEATURES

- Single +5V Supply
- Low Power BiCMOS
- Driver/Receiver Enable for Multi-Drop Configurations
- Half-Duplex Versions Available
- Data rate: 5 Mbps
- ESD Specifications
 - $\pm 15\text{kV}$ IEC61000-4-2 Air Discharge
 - $\pm 8\text{kV}$ Human Body Model

APPLICATIONS

- Low Power RS-485 Systems
- DTE-DCE Interface
- Packet Switching
- Local Area Networks
- Data Concentration
- Data Multiplexers
- Integrated Services Digital Network (ISDN)

PIN CONFIGURATION AND LOGIC DIAGRAM



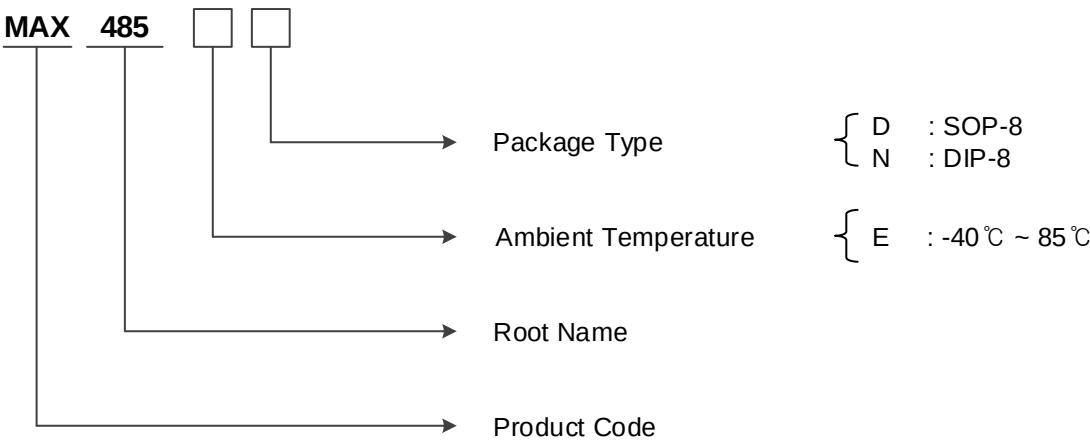
TRUTH TABLE

Transmission				
Inputs			Outputs	
$\overline{\text{RE}}$	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	Z	Z
1	0	X	Z	Z
Receiver				
Inputs			Outputs	
$\overline{\text{RE}}$	DE	A-B	RO	
0	0	$\geq +0.2\text{V}$	1	
0	0	$\leq -0.2\text{V}$	0	
0	0	Open	1	
1	0	X	Z	

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers **MAX485**

ORDERING INFORMATION

Package	Oder No.	Description	Marking	Compliance	Status
SOP-8	MAX485ED	RS-485/RS-422 Transceivers	MAX485E	RoHS, Green	Active
DIP-8	MAX485EN	RS-485/RS-422 Transceivers	MAX485E	RoHS, Green	Active



Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}		7	V
Control Input Voltage	V_{DE}, V_{RE}	-0.3	$V_{CC} + 0.5$	V
Driver Input Voltage	V_{DI}	-0.3	$V_{CC} + 0.5$	V
Driver Output Voltage	A, B	-15	15	V
Receiver Input Voltage	A, B	-15	15	V
Receiver Output Voltage	V_{RO}	-0.3	$V_{CC} + 0.5$	V
Junction Temperature	T_J	-40	125	°C
Storage Temperature Range	T_{STG}	-65	150	°C

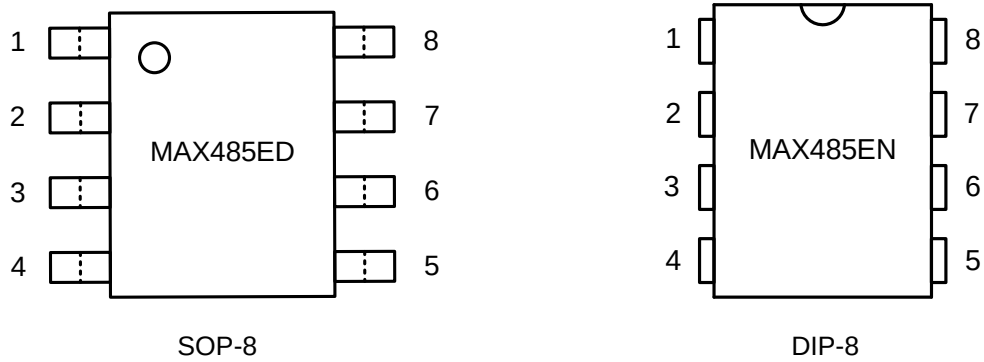
RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	4.75	5.25	V
Operating Ambient Temperature Ranges	T_A	-40	85	°C

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers

MAX485

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	SOP-8 / DIP-8 PKG	
	Name	Function
1	RO	Receiver Output
2	$\overline{\text{RE}}$	Receiver Output Enable Active Low
3	DE	Driver Output Enable Active High
4	DI	Driver Input
5	GND	Ground
6	A	Non-inverting Driver Output and Receiver Input
7	B	Inverting Driver Output and Receiver Input
8	V _{CC}	Power Supply: 4.75V to 5.25V

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

ELECTRICAL CHARACTERISTICS

Unless otherwise specified: $V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX}

PARAMETER	Symbol	CONDITIONS		MIN	TYP	MAX	UNITS
DRIVER DC Characteristics							
Differential Driver Output (no load)	V _{OD1}	R _L = ∞, Figure 1		GND		V _{CC}	V
Differential Driver Output (with load)	V _{OD2}	R _L = 50Ω (RS-422), Figure 1		2		V _{CC}	V
		R _L = 27Ω (RS-485), Figure 1		1.5		V _{CC}	
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔV _{OD}	R _L = 27Ω or 50Ω, Figure 1				0.2	V
Driver Common-Mode Output Voltage	V _{OC}	R _L = 27Ω or 50Ω, Figure 1				3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔV _{OC}	R = 27Ω or 50Ω, Figure 1				0.2	V
Input High Voltage	V _{IH}	DE, DI, RE*		2.0			V
Input Low Voltage	V _{IL}	DE, DI, RE*				0.8	V
Input Current	I _{IN1}	DE, DI, RE*				±10	uA
Driver Short Circuit Current							
Driver Short-Circuit Current, V _O = High	I _{OSD1}	-7V ≤ V _O ≤ 12V				±250	mA
Driver Short-Circuit Current, V _O = Low	I _{OSD2}	-7V ≤ V _O ≤ 12V				±250	mA
DRIVER AC Characteristics							
Max. Transmission Rate	f _{MAX}			5			Mbps
Driver Input to Output	t _{DPLH}	Figure 3 & 5 R _L = 54Ω, C _{L1} = C _{L2} = 100pF			30	60	ns
	t _{DPHL}				30	60	ns
Driver Output Skew to Output	t _{SKEW}				5	10	ns
Driver Rise or Fall Time	t _r , t _f				15	40	ns
Driver Enable to Output High	t _{ZH}	Figure 4 & 6 C _L =100pF	S ₂ closed		40	70	ns
Driver Enable to Output Low	t _{ZL}		S ₁ closed		40	70	ns
Driver Disable Time from Low	t _{HZ}		S ₂ closed		40	70	ns
Driver Disable Time from High	t _{LZ}		S ₁ closed		40	70	ns
RECEIVER DC Characteristics							
Receiver Differential Threshold Voltage	V _{TH}	-7V ≤ V _{CM} ≤ 12V		-0.2		0.2	V
Receiver Input Hysteresis	ΔV _{TH}	V _{CM} = 0V			20		mV
Receiver Output High Voltage	V _{OH}	I _O = -4mA, V _{ID} = +200mV		3.5			V
Receiver Output Low Voltage	V _{OL}	I _O = +4mA, V _{ID} = -200mV				0.4	V
Three-State (High Impedance) Output Current at Receiver	I _{OZR}	0.4V ≤ V _O ≤ 2.4V, RE* = 5V				±1	uA
Receiver Input Resistance	R _{IN}	-7V ≤ V _{CM} ≤ 12V		12	15		kΩ
Input Current (A, B)	I _{IN2}	DE = 0V	V _{IN} = 12V			1.0	mA
		V _{CC} = 0V or 5.25V	V _{IN} = -7V			-0.8	
Receiver Short-Circuit Current	I _{OSR}	0V ≤ V _O ≤ V _{CC}		7		95	mA

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RECEIVER AC Characteristics							
Receiver Input to Output	t _{PLH}	Figure 2 & 7 S ₁ , S ₂ open C _L = 15pF		20	45	100	ns
	t _{PHL}			20	45	100	ns
t _{PLH} - t _{PHL} Differential Receiver Skew	t _{SKD}				13		ns
Receiver Enable to Output Low	t _{zL}	Figure 2 & 8 C _L = 15pF	S ₁ closed		45	70	ns
Receiver Enable to Output High	t _{zH}		S ₂ closed		45	70	ns
Receiver Disable Time from Low	t _{LZ}		S ₁ closed		45	70	ns
Receiver Disable Time from High	t _{hZ}		S ₂ closed		45	70	Ns
Supply Current							
No-Load Supply Current	I _{CC}	RE = 0V or V _{CC}	DE=V _{CC}		900		uA
			DE=0V		600		

TEST CIRCUITS

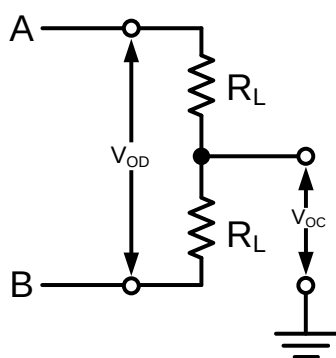


Figure1.

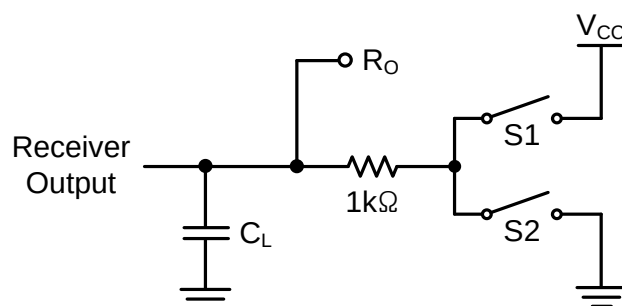


Figure 2.

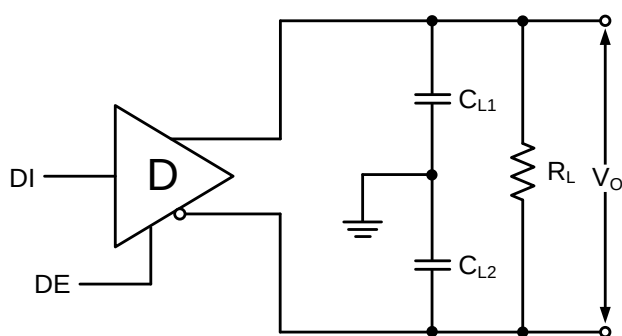


Figure 3.

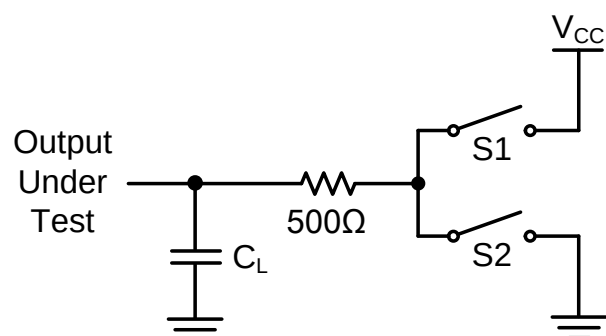


Figure 4.

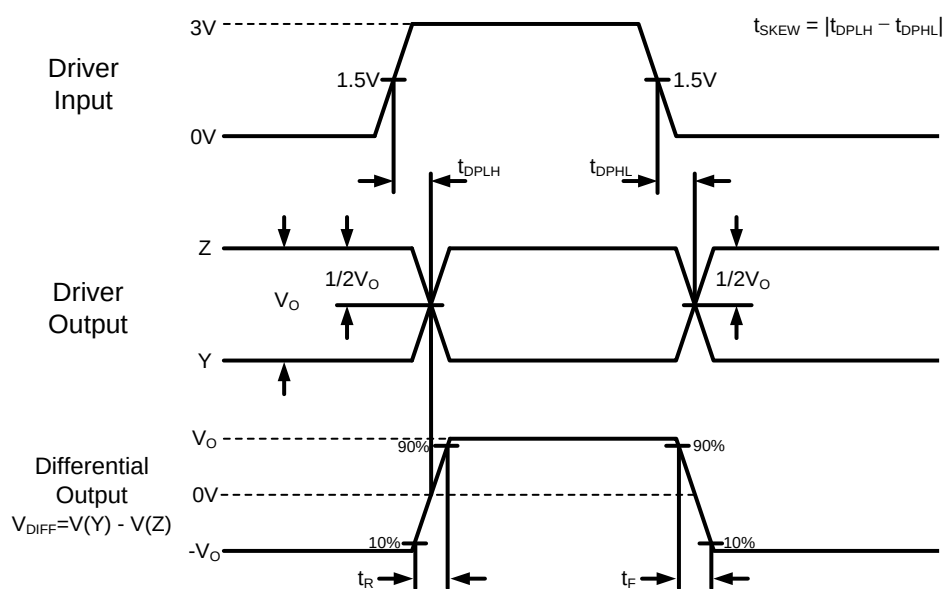


Figure 5.

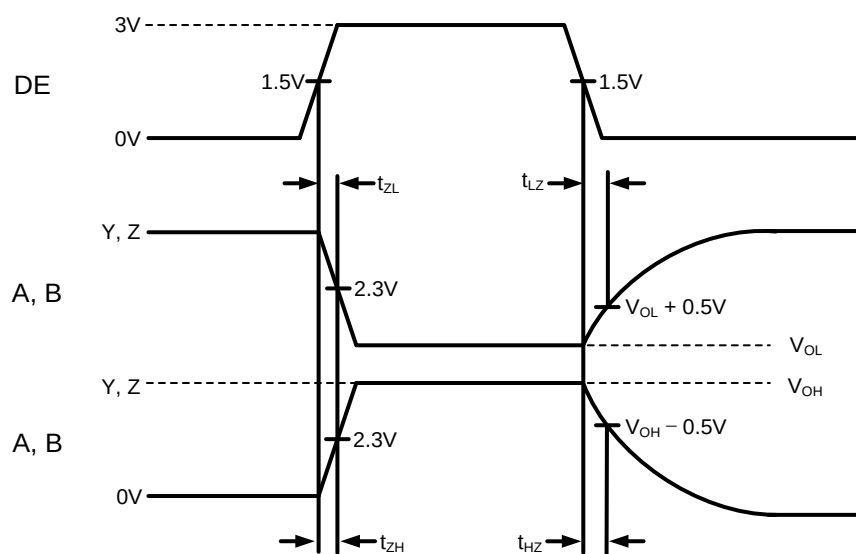


Figure 6.

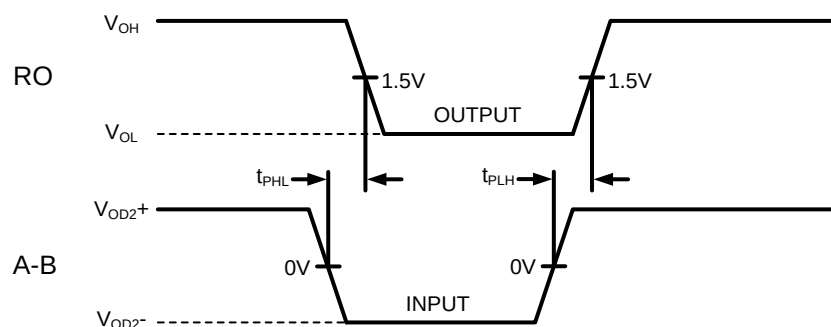


Figure 7.

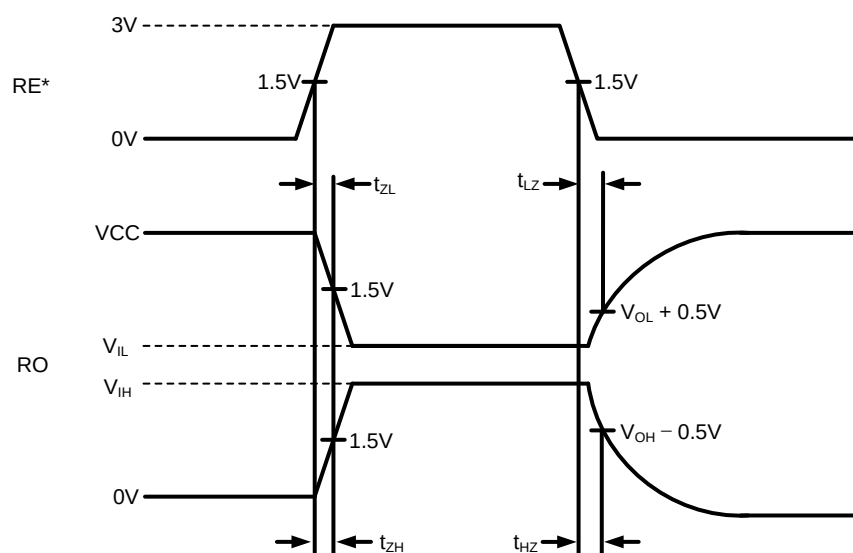


Figure 8.

APPLICATION INFORMATION

FUNCTIONAL DESCRIPTION

The MAX485 is half-duplex differential transceiver that meets the requirements of RS-485 and RS-422. The RS-485 standard is ideal for multi-drop applications and for long-distance interfaces. RS-485 allows up to 32 drivers and 32 receivers to be connected to a data bus, making it an ideal choice for multi-drop applications. Since the cabling can be as long as 4,000 feet, RS-485 transceivers are equipped with a wide (-7V to +12V) common mode range to accommodate ground potential differences. Because RS-485 is a differential interface, data is virtually immune to noise in the transmission line.

DRIVERS

The driver outputs of the MAX485 are differential outputs meeting the RS-485 and RS-422 standards. The typical voltage output swing with no load will be 0 Volts to +5 Volts. With worst case loading of 54 Ω across the differential outputs, the drivers can maintain greater than 1.5V voltage levels. The drivers of the MAX485 have an enable control line which is active HIGH. A logic HIGH on DE (pin 3) will enable the differential driver outputs. A logic LOW on the DE(pin 3) will tri-state the driver output. The transmitters of the MAX485 will operate up to at least 5Mbps.

RECEIVERS

The MAX485 receiver has differential inputs with an input sensitivity as low as $\pm 200\text{mV}$. Input impedance of the receivers is typically 15k Ω (12k Ω minimum). A wide common mode range of -7V to +12V allows for large ground potential differences between systems. The receivers of the MAX485 have a tri-state enable control pin. A logic LOW on RE* (pin 2) will enable the receiver, a logic HIGH on RE*(pin 2) will disable the receiver. The receiver for the MAX485 will operate up to at least 5Mbps. The receiver is equipped with the fail-safe feature. Fail-safe guarantees that the receiver output will be in a HIGH state when the input is left unconnected.

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