

Interface

UARTs and Bridges

- USB Ethernet Bridge
- USB UARTs
- PCIe UARTs
- I²C/SPI UARTs
- 8-Bit UARTs
- GPIO Expanders

Serial Transceivers

- Multiprotocol
- RS-485/RS-422
- RS-232
- CAN Transceivers



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UARTs and Bridges

USB Ethernet Bridge w/ I2C Master, UARTs/GPIOs

No UART	1 UART	2 UARTs	4 UARTs
XR22800	XR22801	XR22802	XR22804

USB UARTs

1-Channel		2-Channel		4-Channel	
XR21V1410	XR21B1420	XR21V1412		XR21V1414	
XR21B1411	XR21B1421	XR21B1422		XR21B1424	

PCIe UARTs

2-Channel		4-Channel		8-Channel	
XR17V352		XR17V354		XR17V358	

I²C/SPI UARTs

1-Channel		2-Channel	
XR20M1170		XR20M1172	
XR20M1280			

8-Bit UARTs

1-Channel		2-Channel				4-Channel		8-Channel
ST16C1550	XR16L580	ST16C2450	XR16C2850	XR16L2552	XR16M2550	ST16C554/554D	XR16V554/554D	XR16V598
ST16C550	XR16M890	ST16C2550	XR16C2852	XR16L2750	XR16M752	ST16C654/654D	XR16V654/654D	XR16V698
		ST16C2552	XR16L2550	XR16L2751	XR16V2550	XR16C864	XR16C854/854D	XR16V798
		XR16C2550	XR16L2551	XR16L2752	XR68M752	XR16L784	XR16V564	

GPIO Expanders

16-Bit I ² C/SMBus		8-Bit SPI		16-Bit SPI	
XRA1201		XRA1402		XRA1403	
XRA1201P				XRA1405	
XRA1203					

Transceivers

Multiprotocol Transceivers

Dual Protocol						Multiprotocol
RS-232 Mode			RS-485 Mode			
2/2 Tx/Rx	3/5 Tx/Rx	4/4 Tx/Rx	1/1 Tx/Rx	2/2 Tx/Rx	2/4 Tx/Rx	8/8 Tx/Rx
SP335	SP334	SP331	SP330	SP331	SP338	SP3508
XR3160	SP337	SP332	SP335	SP332		SP508E
SP330	SP338	SP336	SP339	SP334		SP510E
	SP339		XR3160	SP336		
	XR34350		XR34350	SP337		

Transceivers (Continued)

RS-485/RS-422 Transceivers									
3.3V Only			5V Only			Wide Supply RS-485/422 Transceivers		±60V Fault Tolerant	
Half Duplex	Full Duplex	Driver	Half Duplex	Full Duplex	Driver	Half Duplex	Receiver	Half Duplex	Full Duplex
SP3072E	SP3070E	XR33193	MxL83101	SP3083E	SP487	MxL83211	MxL83411	XR33052	XR33053
SP3075E	SP3071E	XR33194	MxL83102	SP490		MxL83212	MxL83433	XR33055	XR33156
SP3078E	SP3073E	XR33195	SP1485E	SP490E		MxL83214	MxL83434	XR33058	
SP3483	SP3074E		SP1486E	SP491		MxL83111	XR33180	XR33152	
SP3485	SP3076E		SP3082E	SP491E		MxL83112	XR33181	XR33155	
SP3494	SP3077E		SP3085E	XR3087X		MxL83121	XR33183	XR33158	
XR3072X	SP3490		SP3088E			MxL83122			
XR3078X	SP3491		SP4082E			XR33202			
			SP481E			XR33032			
			SP483/ SP483E			XR33035			
			SP485			XR33038			
			SP485E						
			SP485R						
			XR3082X						
			XR3085X						
			XR3088X						

RS-232 Transceivers									
1/1 Tx/Rx	2/2 Tx/Rx		3/2 Tx/Rx	3/3 Tx/Rx	3/5 Tx/Rx	4/4 Tx/Rx	4/5 Tx/Rx	5/3 Tx/Rx	6/10 Tx/Rx
SP3220E	SP202E	SP3223EB	SP3203E	XR32330	SP3243E	SP208	SP211E	SP3238E	SP2209E
SP3220EB	SP232A	SP3223EU			SP3243EB	SP208E	SP213E	SP3239E	
SP3220EU	SP232E	SP3232E			SP3243EH		SP213EH		
SP3221E	SP3222E	SP3232EB			SP3243EU				
	SP3222EB	SP3232EH			MxL83947				
	SP3222EU	SP3232EU							
	SP3223E	SP385E							
		XR32220							

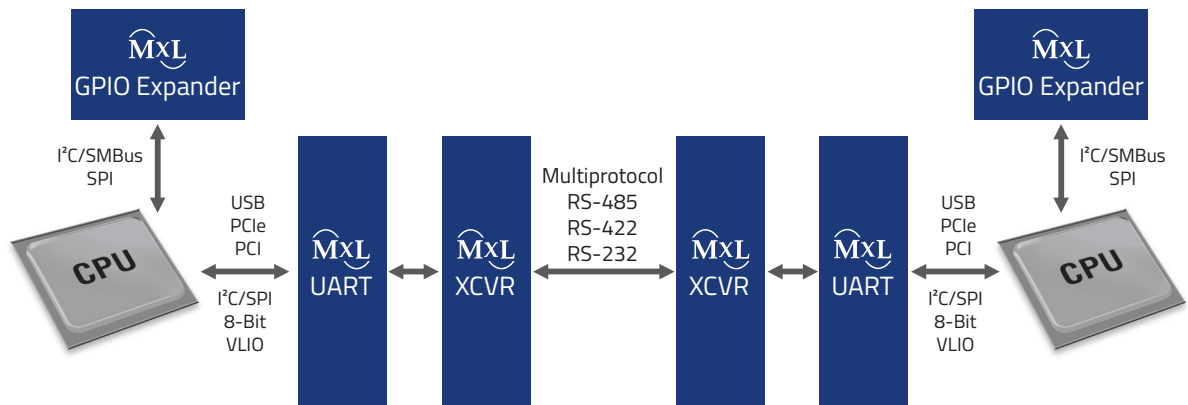
CAN Transceivers		
XR31233	XR31234	XR31235

Interface Products

Often, the simplest method to send data between two or more electronic devices is to use a Universal Asynchronous Receiver/Transmitter (UART) and a serial transceiver. MaxLinear offers a broad portfolio of industry-leading UART, serial transceiver and bridging solutions, including the industry's fastest data rate and smallest package UARTs. In addition, MaxLinear provides a complete family of general purpose input/output (GPIO) expanders. These GPIO devices enable design engineers to easily increase the number of I/O ports provided by a particular processor or to add application-specific functionality to embedded systems.

Synergistic Interface Solutions

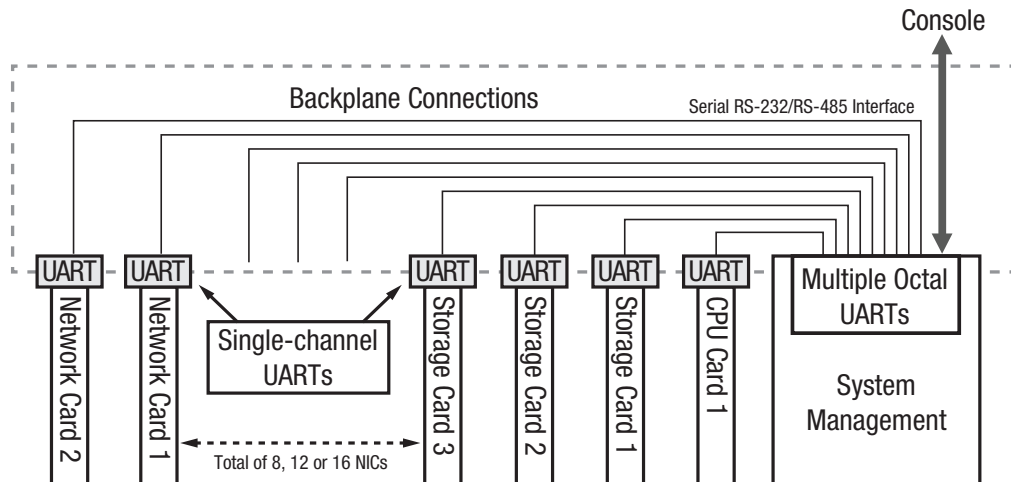
MaxLinear's interface products find ready application in a wide range of market segments, from industrial controls and telecommunications to consumer electronics and the burgeoning Internet of Things (IoT). MaxLinear has led the industry in UART and serial transceivers by developing a complete line of interface products that are engineered to work in concert with each other as well as with industry standards. MaxLinear's serial transceiver and GPIO expander portfolios include pin-compatible replacements and upgrades in industry-standard pinouts. Software drivers, including source code, that are available for download from MaxLinear's website. Custom driver development is also available, contact your local MaxLinear Sales representative or contact Technical Support at www.maxlinear.com/contact-us



Industrial/Embedded Systems
 Factory and Process Control
 HVAC and Building Automation
 Industrial PCs
 Security Systems

Networking and Storage
 Console Access Ports
 Server Management
 Remote Network Access

Infrastructure and Communications
 Wireless Access Points
 ATM Kiosks
 Point-of-Sale (POS)



UART Application Example: Server Management

USB Ethernet Bridges with I²C Master, UARTs, GPIOs

MaxLinear USB Ethernet bridges add Ethernet connectivity to any system with an available USB port. Designed for embedded and industrial applications where space is at a premium, MaxLinear's USB Ethernet bridges pack the most functionality in the smallest package. The XR22800 and XR22801 USB Ethernet devices, which integrate an I²C master and multiple GPIOs, are delivered in a 5mm by 5mm QFN package. Even the XR22804, which bridges USB to Ethernet and integrates four UARTs, an I²C master and 32 GPIOs, is delivered in a compact 8mm by 8mm footprint. Other devices in similar package sizes only offer USB to Ethernet. All of MaxLinear's USB Ethernet products are designed for reliability in consumer and industrial environments and provide the industry's highest level of ESD protection at ±15kV HBM.

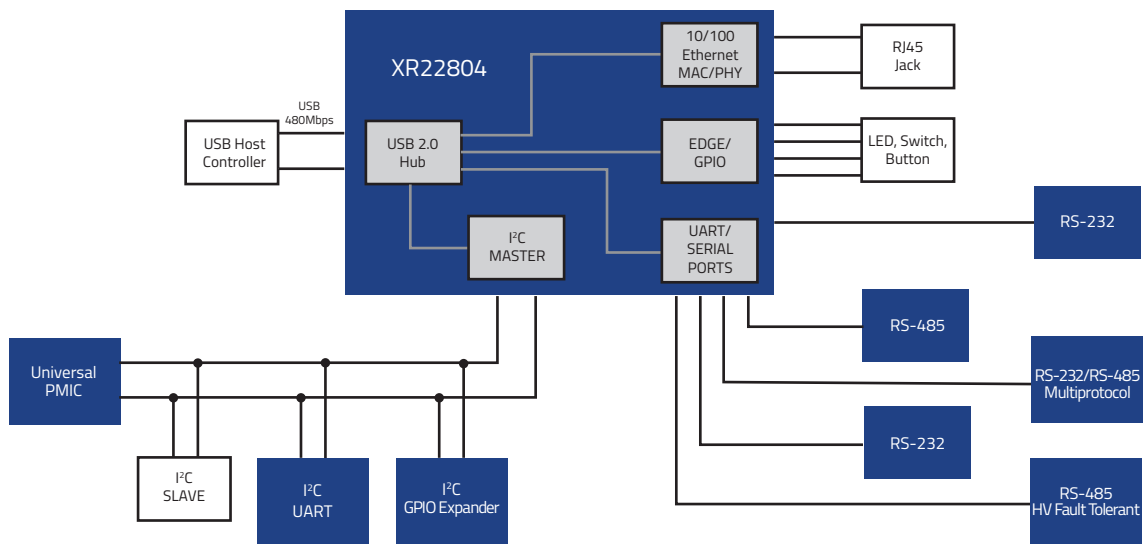
Development is simple with MaxLinear's USB bridging products. The devices work with standard software drivers in Windows, Linux, Android and Mac OS. For those designers who need to get to market quickly, enhanced features such as RS-485 Half-Duplex Control and 9-bit or Multidrop Mode can be enabled in MaxLinear's USB bridges to simplify software and hardware development. Custom software drivers and applications are also available or for those instances where a standard driver is not available or where unique functionality is required. For example, the UART ports are easily configured for any non-standard baud rate over 300 bps and the GPIOs are readily tailored for enhanced functionality. All of MaxLinear's custom Windows drivers are certified to the Microsoft WHQL standard to ensure compatibility and reliable performance.

Applications

- Point-of-Sale (POS) systems
- Docking stations
- USB Ethernet dongles
- Serial port expander
- Embedded connectivity



Part Number	CPU Interface	Ethernet MAC/PHY (Mbps)	UARTs	Max UART Data Rate (Mbps)	UART Tx/Rx FIFO (Bytes)	Max GPIOs	I ² C Master	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	ESD (USB)	Supply Voltage Range V _{CC} (V)	Max UART/GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temp Range (°C)	Packages
XR22800	USB 2.0 HS	10/100	0	n/a	n/a	8	▪			±15kV HBM	4.4 to 5.25	3.6	3.6	-40 to 85	QFN-32
XR22801	USB 2.0 HS	10/100	1	15	1024/1024	8	▪	▪	▪	±15kV HBM	4.4 to 5.25	3.6	3.6	-40 to 85	QFN-32
XR22802	USB 2.0 HS	10/100	2	15	1024/1024	32	▪	▪	▪	±15kV HBM	4.4 to 5.25	3.6	3.6	-40 to 85	QFN-56
XR22804	USB 2.0 HS	10/100	4	15	1024/1024	32	▪	▪	▪	±15kV HBM	4.4 to 5.25	3.6	3.6	-40 to 85	QFN-56



Connectivity Bridges the I/O Gaps in the IoT Landscape

MaxLinear USB UART devices are designed for peripheral or inter-system communication and offer up to four UART ports in an ultra-compact package. These USB UART bridges are designed for serial communication devices where space is at a premium. Such peripherals include keyboards, mice, barcode scanners, receipt printers and wireless modules. MaxLinear offers the industry's smallest USB UART devices targeted for these applications. The XR21B1411 and XR21V1410, for example, are delivered in 3mm by 3mm QFN packages.

All of MaxLinear's USB UART products are designed for reliability in consumer and industrial environments. Error checking is built in with MaxLinear's "Wide Mode" feature. This enables software to check error and status bits concurrently with data. For applications where the USB interface may be disconnected and reconnected while a COM port is still open, MaxLinear provides the XRUSB1 Windows driver that eliminates the need to close the COM port in the host application. To ensure robust operation and reliability in consumer and industrial environments, XR21B series devices also offer the industry's highest level of ESD protection of up to ±15kV HBM.

Development is simple with MaxLinear's USB UART bridging products. The devices work with the standard software drivers in Windows, Linux, Android and Mac OS. For those designers who need to get to market quickly, enhanced features such as RS-485 Half-Duplex Control and 9-bit or Multidrop Mode can be enabled in MaxLinear's USB UART devices to simplify software and hardware development. Custom software drivers and applications are also available or for those instances where a standard driver is not available or where unique functionality is required. For example, MaxLinear USB UARTs are easily configured for any non-standard baud rate over 300bps and the GPIOs are readily tailored for enhanced functionality. All of the custom Windows drivers are certified to the Microsoft WHQL standard to ensure compatibility and reliable performance.

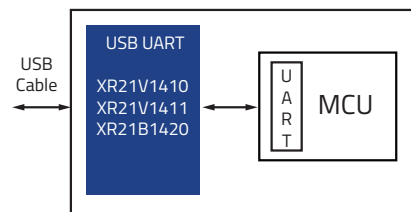
Applications

- Point-of-Sale (POS) systems
- USB to RS-232 dongle
- RS-232 debug port replacement
- Serial port expander
- Wearables

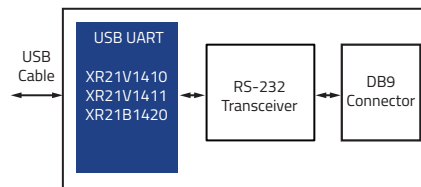


Part Number	CPU Interface	UARTs	Max Data Rate (Mbps)	Tx/Rx FIFO (Bytes)	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	IrDA Sup	Supply Voltage Range V _{CC} (V)	Max UART/GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temperature Range (°C)	Packages
XR21B1411	USB 2.0 FS	1	12	128/384	▪	▪		4.4 to 5.25	3.6	1.6 to 3.6	-40 to 85	QFN-16
XR21B1420	USB 2.0 FS	1	12	512/512	▪	▪	▪	3.0 to 3.6 4.4 to 5.25	5.5	3.6	-40 to 85	QFN-28
XR21B1421*	USB 2.0 FS	1	12	512/512	▪	▪	▪	3.0 to 3.6 4.4 to 5.25	5.5	1.6 to 3.6	-40 to 85	QFN-24 QFN-28
XR21B1422	USB 2.0 FS	2	12	512/512	▪	▪	▪	3.0 to 3.6 4.4 to 5.25	5.5	1.6 to 3.6	-40 to 85	QFN-40
XR21B1424	USB 2.0 FS	4	12	512/512	▪	▪	▪	3.0 to 3.6 4.4 to 5.25	5.5	1.6 to 3.6	-40 to 85	LQFP-64
XR21V1410	USB 2.0 FS	1	12	128/384	▪	▪		2.97 to 3.63	5.5	V _{CC}	-40 to 85	QFN-16
XR21V1412	USB 2.0 FS	2	12	128/384	▪	▪		2.97 to 3.63	5.5	V _{CC}	-40 to 85	QFN-32
XR21V1414	USB 2.0 FS	4	12	128/384	▪	▪		2.97 to 3.63	5.5	V _{CC}	-40 to 85	TQFP-48

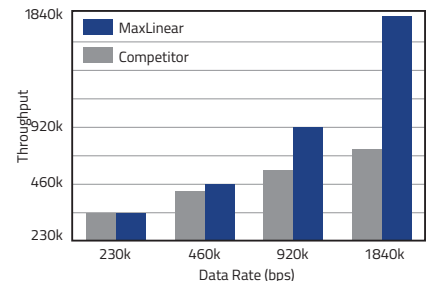
* This is a USB HID device.



USB Console (Debug Port)



USB to RS-232 Dongle



USB UART Data Throughput vs. Competitor

PCIe UARTs

The XR17V35x PCIe UARTs are designed for use in system boards or add-in cards. The 4-channel and 8-channel versions are pin compatible so a single design can support 4 or 8 ports depending on the end customer's requirements. The 4-channel and 8-channel PCIe UARTs have a proprietary master/slave expansion bus interface that enables up to 16 ports on a single x1 PCIe lane.

The XR17V35x PCIe UARTs are software compatible with the industry-standard 16550 UARTs. Native support for MaxLinear's PCIe UARTs is built-in to the latest Linux kernels. Custom software drivers for Windows, Windows Server and Linux are also available from MaxLinear.

Applications

- **Multi-port RS-232/RS-422/RS-485 cards**
- **Point-of-Sale (POS) systems**
- **Factory automation and process control**
- **Network management**
- **Vending, ticketing and gaming**

Part Number	CPU Interface	UARTs	Max Data Rate (Mbps)	Tx/Rx FIFO (Bytes)	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	Fractional Baud Rate Generator	GPIOs	Supply Voltage Range V _{CC} (V)	PCI Interface Voltage Range V _{IO} (V)	Max UART/GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temp Range (°C)	Packages
XR17V352	PCIe 2.0 (2.5Gbps)	2	31.25	256/256	▪	▪	▪	16	3 to 3.6	na	V _{CC}	V _{CC}	-40 to 85	FPBGA-113
XR17V354	PCIe 2.0 (2.5Gbps)	4	31.25	256/256	▪	▪	▪	16	3 to 3.6	na	V _{CC}	V _{CC}	-40 to 85	FPBGA-176
XR17V358	PCIe 2.0 (2.5Gbps)	8	31.25	256/256	▪	▪	▪	16	3 to 3.6	na	V _{CC}	V _{CC}	-40 to 85	FPBGA-176

I²C/SPI UARTs

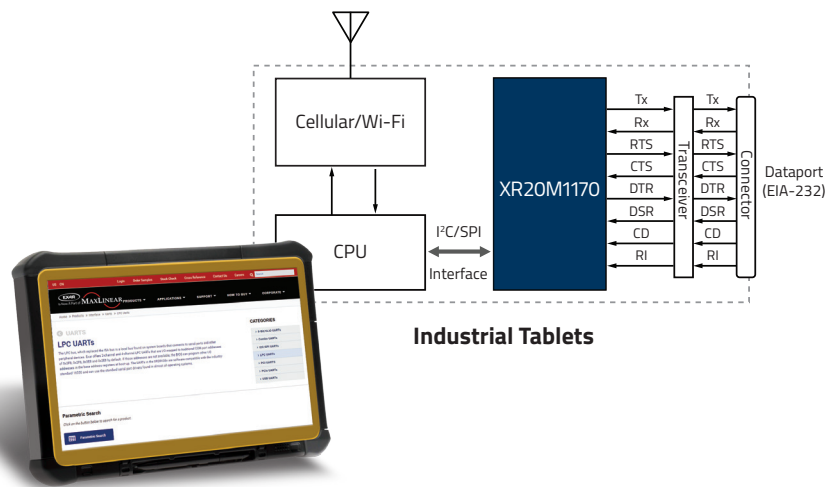
MaxLinear's I²C/SPI UARTs can easily be added to an embedded system design using a simple 2-wire (I²C) or 4-wire (SPI) interface. In addition to the UART ports, the XR20Mxxxx has up to 8 GPIOs that can be used for controlling or monitoring different functions in the embedded system.

A custom Linux software driver is available for download from MaxLinear website. For further technical assistance, please contact MaxLinear's UART technical support team.

Applications

- Mobile phones
- Tablets
- Embedded systems
- Diagnostic ports
- Industrial control

Part Number	CPU Interface	UARTs	Max Data Rate 3.3V/2.5V/1.8V (Mbps)	Tx/Rx FIFO (Bytes)	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	Integrated Level Shifters	Supply Voltage Range V _{CC} (V)	Max UART/GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temp Range (°C)	GPIOs	Packages
XR20M1170	I ² C/SPI	1	16/12.5/8	64/64	▪	▪		1.62 to 3.63	V _{CC}	V _{CC}	-40 to 85	0 0	TSSOP-16 QFN-16
XR20M1280	I ² C/SPI	1	24/16/10	128/128	▪	▪	▪	1.62 to 3.63	5.5	1.62 to 3.63	-40 to 85	4 8	QFN-24 QFN-32
XR20M1172	I ² C/SPI	2	16/12.5/8	64/64	▪	▪		1.62 to 3.63	V _{CC}	V _{CC}	-40 to 85	8 8	QFN-32 TSSOP-28



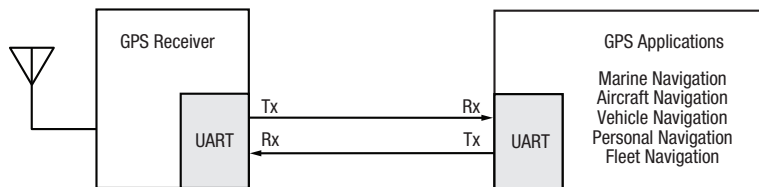
1-Channel

MaxLinear's 8-bit UARTs are the industry's largest UART product family offering devices from 1 to 8 channels and FIFO sizes up to 128 Bytes. Each UART has a parallel 8-bit bus interface. The UART offloads the serialization and de-serialization of the data from the MCU or processor. The enhanced features simplify hardware design and software development. The "Intel" interface has separate address, data, read and write lines. The "Motorola" interface has separate address and data lines, but the read/write lines are shared. The "VLIO" interface has separate read and write lines, but the address and data lines are multiplexed. Almost all of the 8-bit UARTs are compatible with the industry-standard 16550 UARTs, hence, they can use the standard serial port drivers in almost all operating systems.

Applications

- Mobile phones
- Tablets
- Diagnostic ports
- Point-of-Sale (POS) systems
- Barcode scanners

Part Number	CPU Interface	Ch.	Max Data Rate 5V/3.3V/2.5V/1.8V (Mbps)	Tx/Rx FIFO (Bytes)	Auto HW/SW Flow Control	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	Fractional Baud Rate Generator	Supply Voltage Range V _{CC} (V)	Max UART/ GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temp Range (°C)	Packages
ST16C1550	Intel	1	1.5/0.5/na/na	16 / 16					2.97 to 5.5	V _{CC}	V _{CC}	0 to 70 -40 to 85	TQFP-48
ST16C550	Intel	1	1.5/1/na/na	16 / 16					2.97 to 5.5	V _{CC}	V _{CC}	0 to 70 -40 to 85	PLCC-44 TQFP-48
XR16L580	Intel or Motorola	1	3.125/2/1.5/na	16 / 16	▪				2.25 to 5.5	5.5	V _{CC}	-40 to 85	TQFP-48
XR16M890	Intel/ Motorola/ VLIO	1	na/25/16/9	128 / 128	▪	▪	▪	▪	1.62 to 3.63	5.5	V _{CC}	-40 to 85	QFN-32



Navigation and Fleet Management

2-Channel

The 2-channel 8-bit UART family integrates 2 UARTs into a single package and further simplifies the hardware design by eliminating redundant external components. In the "Intel" mode, there is a chip select and interrupt pin per channel. In the "Motorola" mode, there is only 1 chip select and 1 interrupt pin.

Most UARTs in this family are software compatible with the industry-standard 16550 UART, so they can be used with the standard serial port drivers in most operating systems.

Applications

- Multi-port RS-232/RS-422/RS-485 cards
- Point-of-Sale (POS) systems
- Factory automation and process control
- Network management
- Vending, ticketing and gaming

Part Number	CPU Interface	Ch.	Max Data Rate 5V/3.3V/2.5V/1.8V (Mbps)	Tx/Rx FIFO (Bytes)	Auto HW/SW Flow Control	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	Fractional Baud Rate Generator	Supply Voltage Range V _{CC} (V)	Max UART/GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temp Range (°C)	Packages
ST16C2450	Intel	2	1.5/1.25/na/na	1 / 1					2.97 to 5.5	5.5	V _{CC}	0 to 70	PLCC-44
ST16C2550	Intel	2	4/1.875/na/na	16 / 16					2.97 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	PLCC-44 TQFP-48
ST16C2552	Intel	2	4/1.875/na/na	16 / 16					2.97 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	PLCC-44
XR16C2550	Intel	2	4/1.875/na/na	16 / 16					2.97 to 5.5	5.5	V _{CC}	0 to 70	TQFP-48
XR16C2850	Intel	2	6.25/4.125/na/na	128/128	▪	▪			2.97 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	PLCC-44 TQFP-48
XR16C2852	Intel	2	3.125/2.0625/na/na	128/128	▪	▪			2.97 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	PLCC-44
XR16L2550	Intel	2	3.125/1.875/1/na	16 / 16	▪				2.25 to 5.5	5.5	V _{CC}	-40 to 85	TQFP-48
XR16L2551	Intel or Motorola	2	3.125/1.875/1/na	16/16	▪				2.25 to 5.5	5.5	V _{CC}	-40 to 85	TQFP-48
XR16L2552	Intel	2	3.125/1.875/1/na	16/16	▪				2.25 to 5.5	5.5	V _{CC}	-40 to 85	PLCC-44 TQFP-48
XR16L2750	Intel	2	6.25/4.125/3/na	64 / 64	▪	▪			2.25 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	TQFP-48
XR16L2751	Intel or Motorola	2	6.25/4.125/3/na	64 / 64	▪	▪			2.25 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	TQFP-48
XR16L2752	Intel	2	6.25/4.125/3/na	64 / 64	▪	▪			2.25 to 5.5	5.5	V _{CC}	0 to 70	PLCC-44
XR16M2550	Intel	2	na/16/12.5/8	16 / 16	▪			▪	1.62-3.63	V _{CC}	V _{CC}	-40 to 85	TQFP-48
XR16M752	Intel	2	na/16/12.5/8	64 / 64	▪	▪		▪	1.62-3.63	V _{CC}	V _{CC}	-40 to 85	TQFP-48
XR16V2550	Intel	2	na/16/12.5/na	16 / 16	▪			▪	2.25-3.63	5.5	V _{CC}	-40 to 85	QFN-32
XR68M752	Intel or Motorola	2	na/16/12.5/8	64 / 64	▪	▪		▪	1.62-3.63	V _{CC}	V _{CC}	-40 to 85	TQFP-48

4-Channel and 8-Channel

The 4-channel and 8-channel product families integrate 4 and 8 UARTs into a single package. In addition, the XR16L784 and XR16xx98 families also support a single chip select and single interrupt pin in both the "Intel" and "Motorola" mode to simplify the hardware design. These devices also have a global interrupt status register so the software can quickly determine which UART generated the interrupt without having to check the status of all of the individual UART channels.

Almost all of these UARTs are based on the industry-standard 16550 UART, and are therefore compatible with standard serial port drivers. However, some driver customization may be required. Assistance for customizing software drivers is available from MaxLinear's UART technical support team.

Applications

- Multi-port RS-232/RS-422/RS-485 cards
- Point-of-Sale (POS) systems
- Factory automation and process control
- Network management
- Vending, ticketing and gaming

Part Number	CPU Interface	Ch.	Max Data Rate 5V/3.3V/2.5V/1.8V (Mbps)	Tx/Rx FIFO (Bytes)	Auto HW/SW Flow Control	Auto RS-485 Half-Duplex Control	Multi-Drop (9-bit) Mode	Fractional Baud Rate Generator	Supply Voltage Range V _{CC} (V)	Max UART/GPIO Input Voltage (V)	Max UART/GPIO Output Voltage (V)	Temp Range (°C)	Packages
ST16C554/554D	Intel or Motorola	4	1.5/0.5/na/na	16/16					2.97 to 5.5	V _{CC}	V _{CC}	0 to 70 -40 to 85	LQFP-64
ST16C654/654D	Intel or Motorola	4	1.5/0.5/na/na	64/64	▪				2.97 to 5.5	V _{CC}	V _{CC}	0 to 70 -40 to 85	MQFP-100* LQFP-64
XR16C854/854D	Intel or Motorola	4	2/1.5/na/na	128/128	▪				2.97 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	MQFP-100* LQFP-64
XR16C864	Intel or Motorola	4	2/1.5/na/na	128/128	▪	▪			2.97 to 5.5	5.5	V _{CC}	0 to 70 -40 to 85	MQFP-100
XR16L784	Intel or Motorola	4	6.25/4.125/na/na	64/64	▪	▪			2.97 to 5.5	6.0	V _{CC}	0 to 70 -40 to 85	LQFP-64
XR16V554/554D	Intel or Motorola	4	na/4/3.125/na	16/16					2.25 to 3.63	5.5	V _{CC}	-40 to 85	LQFP-64
XR16V564	Intel or Motorola	4	na/16/12.5/na	32/32	▪			▪	2.25 to 3.63	5.5	V _{CC}	-40 to 85	QFN-48
XR16V654/654D	Intel or Motorola	4	na/16/12.5/na	64/64	▪			▪	2.25 to 3.63	5.5	V _{CC}	-40 to 85	LQFP-64 QFN-48*
XR16V598	Intel or Motorola	8	na/15/10/na	16/16	▪	▪	▪	▪	2.25 to 3.63	5.5	V _{CC}	-40 to 85	MQFP-100
XR16V698	Intel or Motorola	8	na/15/10/na	32/32	▪	▪	▪	▪	2.25 to 3.63	5.5	V _{CC}	-40 to 85	MQFP-100
XR16V798	Intel or Motorola	8	na/8/6.25/na	64/64	▪	▪		▪	2.25 to 3.63	V _{CC}	V _{CC}	-40 to 85	MQFP-100

* Only for 654 / 854

I²C/SMBus and SPI GPIO Expanders

The I²C/SMBus GPIO expanders are pin and software compatible to existing 8-bit and 16-bit I²C/SMBus GPIO expanders, but with enhanced features and functionality such as:

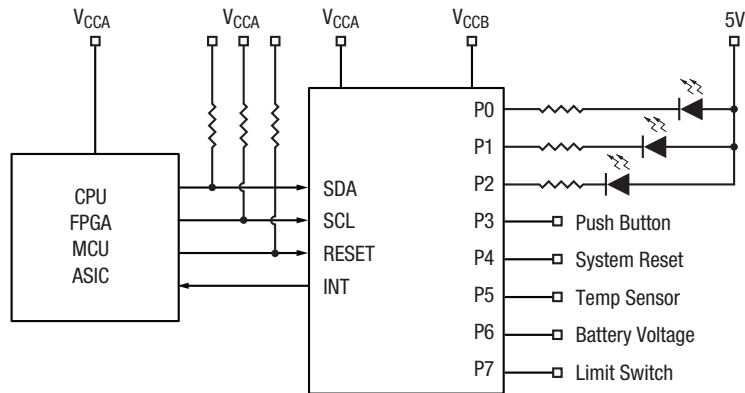
- Individually programmable interrupt masks
- Interrupts on rising edge, falling edge or both edges
- Internal pull-up resistor enable/disable
- Stored interrupt status mode
- Input glitch filtering
- Tri-stateable outputs

The SPI GPIO expanders are not pin compatible with any other 8-bit or 16-bit SPI GPIO expanders, but they do have the same enhanced features as the I²C/SMBus GPIO expanders listed above.

Applications

- Mobile phones
- Tablets
- System boards
- Embedded controllers
- Industrial control

Part Number	CPU Interface	GPIOs	Interrupt Output Pin	Reset Input Pin	Integrated Level Shifters	Internal Pull-Up Resistors Enabled at Power-up	5V Tolerant Inputs	Sup age Range V _{CC} (V)	Max GPIO Input Voltage (V)	Max GPIO Output Voltage (V)	Temp Range (°C)	Packages
XRA1201	I ² C/SMBus	16	▪				▪	1.65 to 3.6	5.5	V _{CC}	-40 to 85	QFN-24 TSSOP-24
XRA1201P	I ² C/SMBus	16	▪			▪	▪	1.65 to 3.6	5.5	V _{CC}	-40 to 85	QFN-24 TSSOP-24
XRA1203	I ² C/SMBus	16	▪	▪			▪	1.65 to 3.6	5.5	V _{CC}	-40 to 85	TSSOP-24
XRA1402	SPI	8	▪	▪			▪	1.65 to 3.6	5.5	V _{CC}	-40 to 85	TSSOP-16
XRA1403	SPI	16	▪	▪			▪	1.65 to 3.6	5.5	V _{CC}	-40 to 85	QFN-24 TSSOP-24
XRA1405	SPI	16	▪		▪		▪	1.65 to 3.6	5.5	1.6 to 3.6	-40 to 85	QFN-24



GPIO Expander Application Diagram

Multiprotocol Transceiver

MaxLinear offers the industry's largest portfolio of multiprotocol transceivers. Our dual protocol transceivers operate up to 20Mbps and allow RS-232 or RS-485 communication in a single IC. Our multiprotocol transceivers operate up to 52Mbps and support up to 12 serial protocols: RS-232, RS-485, RS-422, RS-449, EIA-530, EIA-530A, V.10, V.11, V.28, V.35, V.36 and X.21. Advanced features, like built-in cable termination, adjustable logic level, diagnostic loopback modes and 15kV ESD protection, provide maximum versatility and robust serial communication and greatly simplify the use of multiple serial protocol standards over a single connector. These products enable our customers to reduce their component and connector count, lower their Bill of Materials (BOM) costs and customize their end products on the fly or in the field.

Applications

- Factory automation
- Point-of-Sale(POS) equipment
- Industrial and single board computers
- Industrial and process control equipment
- HVAC controls
- Telecommunication equipment
- Gaming machines
- Network switches and data routers

Dual Protocol Transceivers (RS-232 + RS-485/RS-422)

Part Number	RS-232 Tx/Rx	RS-485 Tx/Rx	RS-232 Max Data Rate (Mbps)	RS-485/RS-422 Max Data Rate (Mbps)	HBM ESD (±kV)	Contact ESD (±kV)	120Ω Termination	VL Pin	Slew Limit Pin	Fault Tolerance	RS-485 Duplex	Max I _{CC} (mA)	Supply Voltage Range (V)	Temp Range (°C)	Packages
SP330	2 / 2	1 / 1	0.25 / 1	20	15	8		▪	▪	±18V	Half/Full	4.5	3 to 5.5	-40 to 85	TSSOP-24
SP331	4 / 4	2 / 2	0.12	10	2						Full	30	4.75 to 5.25	0 to 70 -40 to 85	SOIC-28
SP332	4 / 4	2 / 2	0.12	10	2						Full	120	4.75 to 5.25	0 to 70 -40 to 85	SOIC-28
SP334	3 / 5	2 / 2	0.12	10	2						Full	50	4.75 to 5.25	0 to 70 -40 to 85	SOIC-28
SP335	2 / 2	1 / 1	0.25 / 1	20	15	8	▪	▪	▪	±18V	Half/Full	4.5	3 to 5.5	0 to 70 -40 to 85	QFN-32
SP336	4 / 4	2 / 2	0.25 / 1	10	15	8			▪	±15V	Half/Full	30	3 to 5.5	0 to 70 -40 to 85	TSSOP-28
SP337	3 / 5	2 / 2	1	15	15					±15V	Full	15	3 to 5.5	0 to 70 -40 to 85	TSSOP-28
SP338	3 / 5	2 / 4	0.25 / 1	20	15	8	▪		▪	±18V	Half/Full	10	3 to 5.5	0 to 70 -40 to 85	QFN-40
SP339	3 / 5	1 / 1	0.25 / 1	20	15	8	▪		▪	±18V	Half/Full	8	3 to 5.5	0 to 70 -40 to 85	QFN-40
XR3160	2 / 2	1 / 1	0.25 / 1	20	15	8			▪	±18V	Half/Full	5.5	3 to 5.5	0 to 70 -40 to 85	SSOP-20
XR34350*	3 / 5	1 / 1	0.25 / 1	20	15	8	▪		▪	±18V	Half/Full	8	3 to 5.5	-40 to 85	QFN-40

*XR34350 features high swing RS-232 driver outputs (±10V no load).

Multiprotocol Transceivers

Part Number	Tx	Rx	Data Rate (Mbps)	HBM ESD (kV)	Internal Termination	RS-232	RS-485	RS-422	RS-449	EIA-530	EIA-530A	V.10	V.11	V.28	V.35	V.36	X.21	VL Pin	Supply Voltage Range (V)	Temp Range (°C)	Packages
SP3508	8	8	20	2	Complete	▪			▪	▪	▪	▪	▪	▪	▪	▪	▪		3.135 to 3.465	0 to 70 -40 to 85	LQFP-100
SP508E	8	8	20	15	Complete	▪			▪	▪	▪	▪	▪	▪	▪	▪	▪		4.75 to 5.25	0 to 70 -40 to 85	LQFP-100
SP510E	8	8	52	15	Complete	▪			▪	▪	▪	▪	▪	▪	▪	▪	▪		4.75 to 5.25	0 to 70 -40 to 85	LQFP-100

RS-485/RS-422 Transceiver

MaxLinear has a diverse portfolio of RS-485/RS-422 serial transceivers with wide supply voltage operation between 2.8V to 5.5V. Products range from industry-standard transceivers to ultra-high speed, 52Mbps and high differential output transceivers. In addition, MaxLinear has RS-485/RS-422 transceivers that are compliant with popular field buses including PROFIBUS. Advanced features, like hot swap, enhanced fail safe and 15kV ESD protection, ensure reliable and robust data communication over long cable lengths. Several transceivers feature a low voltage logic interface pin that allows system designers to interface directly with 1.8V devices without the need for external components, saving design time and board space.

The XR33x5x family of high performance RS-485/RS-422 transceivers are designed for improved performance in noisy industrial environments and increase tolerance to system faults. The analog bus pins can withstand direct shorts up to $\pm 60V$ and are protected against ESD events up to $\pm 15kV$ HBM. Multipoint applications over long cable runs will benefit from the extended $\pm 25V$ common mode voltage range of these transceivers.

Applications

- Motion control
- Point-of-Sale (POS) equipment
- Industrial and single board computers
- Industrial and process control equipment
- Long or unterminated transmission lines
- Remote utility reading
- Energy monitoring and control
- HVAC networks

$\pm 60V$ Fault Tolerant RS-485/RS-422 Transceivers

Part Number	Tx	Rx	Duplex	Data Rate (Mbps)	HBM ESD ($\pm kV$)	Rx Fail-Safe	Shutdown	Multi-Drop Nodes	Hot Swap	Transient Tolerance	Fault Tolerance	Tx EN	Rx EN	Cable Invert Pin	VL Pin	Supply Voltage Range (V)	Temp Range ($^{\circ}C$)	Packages
XR33052	1	1	Half	0.25	15	Open, Short, Idle	▪	320	▪	$\pm 100V$	$\pm 60V$	▪	▪			3 to 5.5	-40 to 85 -40 to 105	NSOIC-8
XR33053			Full	1				320										NSOIC-14
XR33055			Half	1				320										NSOIC-8
XR33058			Half	20				80										NSOIC-8
XR33152	1	1	Half	0.25	15	Open, Short, Idle	▪	320	▪	$\pm 100V$	$\pm 60V$	▪	▪			3 to 5.5	-40 to 85 -40 to 105	NSOIC-8
XR33155			Half	1				320										NSOIC-8
XR33156			Full	20				80										NSOIC-14
XR33158			Half	20				80										NSOIC-8

Wide Supply RS-485/RS-422 Transceivers

Part Number	Tx	Rx	Duplex	Data Rate (Mbps)	EFT (±kV)	HBM ESD (±kV)	Contact ESD (±kV)	Rx Fail-Safe	Shutdown	Multi-Drop Nodes	Hot Swap	Fault Tolerance	PROFIBUS	Tx EN	Rx EN	Cable Invert Pin	VL Pin	Supply Voltage Range (V)	Temp Range (°C)	Packages		
MxL83211	1	1	Half	0.25	4	15	12	Open, Short, Idle	▪	256	▪	▪	▪	▪	▪	▪	▪	3 to 5.5	-40 to 125	NSOIC-8		
MxL83212				0.5																NSOIC-8 MSOP-8 VSON-8		
MxL83214				50																NSOIC-8 MSOP-8 VSON-8		
MxL83111	1	1	Half	0.25	2	15	8	Open, Short, Idle	▪	256	▪	▪	▪	▪	▪	▪	▪	3 to 5.5	-40 to 125	NSOIC-8		
MxL83112				0.5																		
MxL83121	1	1	Half	0.25	2	15	12	Open, Short, Idle	▪	256	▪	▪	▪	▪	▪	▪	▪	3 to 5.5	-40 to 125	NSOIC-8		
MxL83122				0.5																		
MxL83411*	0	4	▪	10	2	15	8	Open	▪	128	▪	▪	▪	▪	▪	▪	▪	3 to 5.5	-40 to 85 -40 to 125	NSOIC-16 TSSOP-16		
MxL83433*				32	4	15	12															
MxL83434*				▪	▪	▪																
XR33202	1	1	Half	20	▪	15	8	Open, Short, Idle	▪	>256	▪	▪	▪	▪	▪	▪	▪	3 to 5.5	-40 to 125	DFN-10		
XR33032	1	1	Half	0.25	15	8	Open, Short, Idle	▪	256	▪	▪	±18V	▪	▪	▪	▪	▪	2.8 to 5.5	-40 to 85	NSOIC-8		
XR33035			Half	1																		
XR33038			Half	10																		
XR33180	0	1	▪	52	15	8	Open, Short, Idle	▪	128	▪	▪	▪	▪	▪	▪	▪	▪	3 to 5.5	-40 to 125	TSOT23-5		
XR33181																				▪	▪	TSOT23-6
XR33183																				▪	▪	TSOT23-6

*MxL83411 and MxL83433 have global enable; MxL83434 has paired enable.

RS-485/RS-422 (3.3V Only)

Part Number	Tx	Rx	Duplex	Data Rate (Mbps)	HBM ESD (±kV)	Contact ESD (±kV)	Rx Fail-Safe	Shutdown	Multi-Drop Nodes	Hot Swap	Transient Tolerance	Fault Tolerance	Temp Range (°C)	Packages
SP3070E	1	1	Full	0.25	15	8	Open, Short, Idle	▪	256	▪	▪	▪	-40 to 85 -40 to 125	NSOIC-14
SP3071E			Full					▪		NSOIC-8				
SP3072E			Half					▪		NSOIC-8				
SP3073E			Full	▪				NSOIC-14						
SP3074E			Full	0.5				▪		NSOIC-8				
SP3075E			Half	▪				NSOIC-8						
SP3076E			Full	▪				NSOIC-14						
SP3077E			Full	16				▪		NSOIC-8				
SP3078E			Half	▪				NSOIC-8						
SP3483	1	1	Half	0.25	2	Open	▪	32	▪	▪	▪	0 to 70 -40 to 85	NSOIC-8	
SP3485	1	1	Half	10	2	Open	▪	32	▪	▪	▪	0 to 70 -40 to 85	NSOIC-8	

RS-485/RS-422 (3.3V Only) (Continued)

Part Number	Tx	Rx	Duplex	Data Rate (Mbps)	HBM ESD (\pm kV)	Contact ESD (\pm kV)	Rx Fail-Safe	Shutdown	Multi-Drop Nodes	Hot Swap	Transient Tolerance	Fault Tolerance	Temp Range (°C)	Packages
SP3490	1	1	Full	10	2		Open		32				0 to 70 -40 to 85	NSOIC-8
SP3491														NSOIC-14
SP3494	1	1	Half	2.5	2		Open	▪	32				0 to 70 -40 to 85	NSOIC-8
XR3072X	1	1	Half	0.25	15	8	Open, Short, Idle	▪	256	▪	\pm 70V	\pm 18V	-40 to 85	NSOIC-8
XR3078X				20										NSOIC-8
XR33193	1	0		0.25	15	8		▪		▪			-40 to 125	TSOT23-6
XR33194				2.5										
XR33195				20										

RS-485/RS-422 Transceivers (5V Only)

Part Number	Tx	Rx	Duplex	Data Rate (Mbps)	EFT (\pm kV)	HBM ESD (\pm kV)	Contact ESD (\pm kV)	Rx Fail-Safe	Shutdown	Multi-Drop Nodes	Hot Swap	Fault Tolerance	PROFIBUS	Temp Range (°C)	Packages
MxL83101	1	1	Half	0.25	2	15	8	Open, Short, Idle	▪	256	▪		▪	-40 to 125	NSOIC-8
MxL83102				0.5											NSOIC-8
SP481E	1	1	Half	10		15	8	Open	▪	32				0 to 70 -40 to 85	NSOIC-8
SP483	1	1	Half	0.25		2	2	Open	▪	32				0 to 70 -40 to 85	NSOIC-8
SP483E	1	1	Half	0.25		15	8	Open	▪	32				0 to 70 -40 to 85	NSOIC-8
SP485	1	1	Half	5		2	2	Open		32				0 to 70 -40 to 85	NSOIC-8
SP485E	1	1	Half	10		15	8	Open		32				0 to 70 -40 to 85 -40 to 125	NSOIC-8
SP485R	1	1	Half	5		2		Open		400				0 to 70 -40 to 85	NSOIC-8
SP487	4	0	na	10		2				32				0 to 70	WSOIC-16
SP490	1	1	Full	5		2		Open		32				0 to 70 -40 to 85	NSOIC-8
SP490E				10		15									NSOIC-8
SP491				5		2									NSOIC-14
SP491E				10		15									NSOIC-14
SP1485E	1	1	Half	20		15		Open		32				0 to 70 -40 to 85	NSOIC-8
SP1486E	1	1	Half	20		15	8	Open, Short, Idle	▪	256	▪		▪	-40 to 85	NSOIC-8
SP3082E	1	1	Half	0.115		15	8	Open, Short, Idle	▪	256	▪			-40 to 85	NSOIC-8
SP3083E			Full												NSOIC-14
SP3085E			Half	0.5											NSOIC-8
SP3088E			Half	20											NSOIC-8
SP4082E	1	1	Half	0.115		15		Open		256				-40 to 85	NSOIC-8
XR3082X	1	1	Half	0.25		15	8	Open, Short, Idle	▪	256	▪	\pm 18V	▪	-40 to 85	NSOIC-8
XR3085X			Half	1											NSOIC-8
XR3087X			Full	20											NSOIC-8
XR3088X			Half	20											NSOIC-8

RS-232 Transceivers

MaxLinear offers a large portfolio of RS-232 serial transceivers. The family consists of traditional RS-232 transceivers to the more advanced RS-232 transceivers with Auto On-line Plus and low voltage logic (1.65V to 5.5V I/O logic supply) features. In addition, many of the RS-232 transceivers have enhanced ESD protection. MaxLinear offers new RS-232 products that meet rigid IEC 61000-4-2 air-gap and contact ESD standards. This protection makes the product immune to damage from ESD strikes. Many of the devices are drop-in replacements and functional equivalents to existing industry- standard solutions.

Applications

- Building and security automation
- Point-of-Sale equipment(POS)
- Industrial and single board computers
- Industrial and process control equipment

Part Number	Tx	Rx	Data Rate (kbps)	HBM ESD (±kV)	Contact ESD (±kV)	No. of Ext Caps	Shutdown	Internal Caps	TTL Tri-State	Auto On-Line	VL Pin	Supply Voltage Range (V)	Temp Range (°C)	Packages
MxL83947	3	5	1000	15	8	4	▪		▪	▪		3 to 5.5	-40 to 85	QFN-32
SP3220E	1	1	120	15	8	4	▪		▪			3 to 5.5	0 to 70 -40 to 85	TSSOP-16 SSOP-16
SP3220EB	1	1	250	15	8	4	▪		▪			3 to 5.5	0 to 70 -40 to 85	TSSOP-16 SSOP-16
SP3221E	1	1	250	15	8	4	▪		▪	▪		3 to 5.5	-40 to 85	TSSOP-16 SSOP-16
SP3220EU	1	1	1000	15	8	4	▪		▪			3 to 5.5	-40 to 85	TSSOP-16
SP202E	2	2	120	15		4			▪			4.5 to 5.5	0 to 70 -40 to 85	NSOIC-16 WSOIC-16
SP232A	2	2	120	2		4						4.5 to 5.5	0 to 70 -40 to 85	NSOIC-16 WSOIC-16
SP232E	2	2	120	15		4						4.5 to 5.5	0 to 70 -40 to 85	NSOIC-16 WSOIC-16
SP3222E	2	2	120	15	8	4	▪		▪			3 to 5.5	0 to 70 -40 to 85	TSSOP-20 SSOP-20 WSOIC-18
SP3223E	2	2	120	15	8	4	▪		▪	▪		3 to 5.5	0 to 70 -40 to 85	TSSOP-20 SSOP-20
SP3232E	2	2	120	15	8	4						3 to 5.5	0 to 70 -40 to 85	SSOP-16 NSOIC-16 WSOIC-16 TSSOP-16
SP385E	2	2	120	15	8	4	▪					3 to 5.5	0 to 70 -40 to 85	SSOP-20
SP3222EB	2	2	250	15	8	4	▪		▪			3 to 5.5	-40 to 85	TSSOP-20 SSOP-20
SP3223EB	2	2	250	15	8	4	▪		▪	▪		3 to 5.5	-40 to 85	TSSOP-20
SP3232EB	2	2	250	15	8	4						3 to 5.5	0 to 70 -40 to 85	SSOP-16 NSOIC-16 TSSOP-16 QFN-16
SP3232EH	2	2	460	15	8	4						3 to 5.5	0 to 70 -40 to 85	TSSOP-16
SP3222EU	2	2	1000	15	8	4	▪		▪			3 to 5.5	0 to 70 -40 to 85	TSSOP-20

RS-232 (Continued)

Part Number	Tx	Rx	Data Rate (kbps)	HBM ESD (\pm kV)	Contact ESD (\pm kV)	No. of Ext Caps	Shutdown	Internal Caps	TTL Tri-State	Auto On-Line	VL Pin	Supply Voltage Range (V)	Temp Range ($^{\circ}$ C)	Packages
SP3223EU	2	2	1000	15	8	4	▪		▪	▪		3 to 5.5	-40 to 85	TSSOP-20
SP3232EU	2	2	1000	15	8	4						3 to 5.5	0 to 70 -40 to 85	SSOP-16 TSSOP-16 NSOIC-16
XR32220EU	2	2	1000	15	8	4	▪		▪	▪	▪	3 to 5.5	-40 to 125	QFN-24
XR32220EB			250											
SP3203E	3	2	250	15	8	4	▪		▪			3 to 5.5	0 to 70 -40 to 85	TSSOP-20
XR32330	3	3	250	15	8	4	▪		▪	▪	▪	3 to 5.5	-40 to 85	QFN-24
SP3243E	3	5	120	15	8	4	▪		▪	▪		3 to 5.5	0 to 70 -40 to 85	SSOP-28 TSSOP-28
SP3243EB	3	5	250	15	8	4	▪		▪	▪		3 to 5.5	0 to 70 -40 to 85	SSOP-28 TSSOP-28
SP3243EH	3	5	460	15	8	4	▪		▪	▪		3 to 5.5	0 to 70 -40 TO 85	SSOP-28
SP3243EU	3	5	1000	15	8	4	▪		▪	▪		3 to 5.5	0 to 70 -40 to 85	SSOP-28 QFN-32 TSSOP-28
SP208	4	4	120	15	8	4						4.5 to 5.5	0 to 70 -40 to 85	SSOP-24
SP208E	4	4	120	15	8	4						4.5 to 5.5	0 to 70 -40 to 85	WSOIC-24 SSOP-24
SP211E	4	5	120	15	8	4	▪		▪			4.5 to 5.5	0 to 70 -40 to 85	WSOIC-28 SSOP-28
SP213E	4	5	120	15	8	4	▪		▪			4.5 to 5.5	0 to 70 -40 to 85	SSOP-28
SP213EH	4	5	1000	15	8	4	▪		▪			4.5 to 5.5	0 to 70 -40 to 85	SSOP-28
SP3238E	5	3	250	15	8	4	▪		▪	▪		3 to 5.5	0 to 70 -40 to 85	SSOP-28 TSSOP-28
SP3239E	5	3	250	15	8	4	▪		▪			3 to 5.5	-40 to 85	SSOP-28
SP2209E	6	10	460	15	8	2						10.8 to 13.2	-40 to 85	TSSOP-38

CAN Transceivers

Part Number	Bus Fault Voltage (V)	Common Mode Voltage (V)	Max Data Rate (Mbps)	Low Power Mode	HBM ESD (\pm kV)	IEC 61000-4-2 Contact (\pm kV)	Supply Voltage Range (V)	Temp Range ($^{\circ}$ C)	Packages	Features
XR31233	\pm 36	\pm 25	1	No	16	8	3 to 3.6	-40 to 125	SOIC-8	High Speed, Slope Control, Loop Back
XR31234	\pm 36	\pm 25	1	Yes	16	8	3 to 3.6	-40 to 125	SOIC-8	High Speed, Slope Control, Ultra Low Current Sleep Mode
XR31235	\pm 36	\pm 25	1	No	16	8	3 to 3.6	-40 to 125	SOIC-8	High Speed, Slope Control, Autobaud Loop Back

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