MAP/950 Pro 2 Port RS422/ RS485 PCI Express Serial Card Technical Notes (LF686KB)

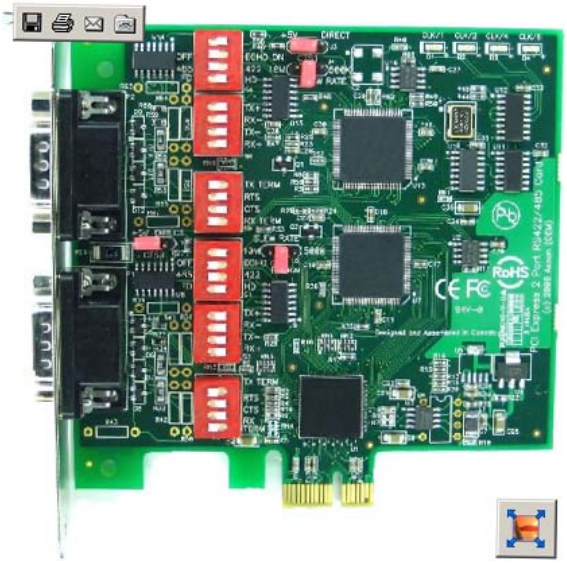
Documentation Revision 0.4 Revised 09-30-08

This is a quick installation sheet for the Axxon MAP/950 Pro RS422/RS485 2 Port I/O Card for PCI Express

This product is capable of RS422 or RS485 communications up to 10 Mbps speed with a minor clock change.

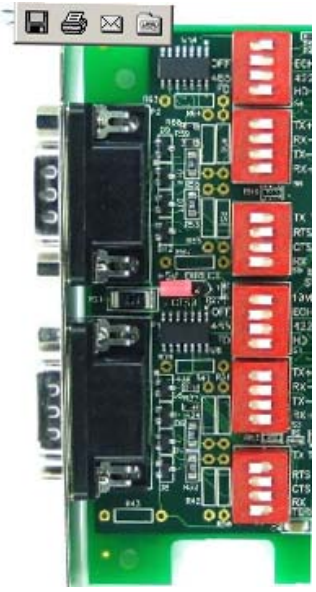
Compatible with x1, x4, x8, x16 lane expansion slots. The LF686KB is a RoHS & Pb-free compliant product.

RS422/RS485 Contacts are 25kv ESD, thermal and short circuit protected. The transceivers applied in this model are 1/8th load devices and are the part # MAX3079EESD+ (RoHS) by Maxim Semiconductor.



Dipswitches

This adapter card contains 6 banks of dipswitches. A switch positioned to the RIGHT is OFF. Positioned to the LEFT is ON. The plastic molding on the dipswitch covers contain an ON label with arrow to denote switch orientation.



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Configuration Modes

In RS422 mode of operation, the Transmitter and Receiver will be ***ALWAYS ACTIVE***.
For RS422 mode of operation, switch the dipswitch to RS422 position.

In RS485 mode of operation, the Transmitter will be ***AUTO-GATED*** (using the DTR line) for multi-drop applications under the Windows OS. The Receiver is ***ALWAYS ACTIVE*** in this mode. See the end of this document to cancel local echo.

For RS485 mode of operation, switch the dipswitch to the RS485 position. **You must also select RS485 Active High Mode under the serial port configuration.** This configuration will toggle the DTR line HIGH during a byte transmit and LOW otherwise.

RS485 communication mode is presently supported under Windows 9x, ME, NT, XP, XP64, 2000, 2003, Vista 32/64. Additional operating systems support may be available upon request. *Please contact Axxon for a WinNT device driver for RS485 operation.*

RS422 communication mode is supported in at least Win 9x, ME, NT, XP, XP64, 2000, 2003, Vista 32/64 and Linux. For RS422 configuration, as an option you may use the default Microsoft serial driver.

DB9M P1 Connector (close to the PCI edge fingers) = Lower COM Port #.
DB9M P2 Connector (close to the top mounting screw) = Higher COM Port #.

DB9 Male Pinout (Full Duplex, 4 wire mode)

S1.1 = FD to configure P1 connector as Full Duplex
S4.1 = FD to configure P2 connector as Full Duplex

Pin # 1 Ground
Pin # 2 CTS- (optional)
Pin # 3 RTS- (optional)
Pin # 4 RX-
Pin # 5 RTS+ (optional)
Pin # 6 CTS+(optional)
Pin # 7 TX+
Pin # 8 TX-
Pin # 9 RX+

The use of the balanced hardware flow control lines is optional. If the h/w flow control lines are not required, configure as follows:

J1 (CTS0) = Middle and Left pins shorted to **DISABLE** flow control on P1. Do not use pins 3 & 5 on the DB9M connector.
J3 (CTS1) = Middle and Left pins shorted to **DISABLE** flow control on P2. Do not use pins 3 & 5 on the DB9M connector.

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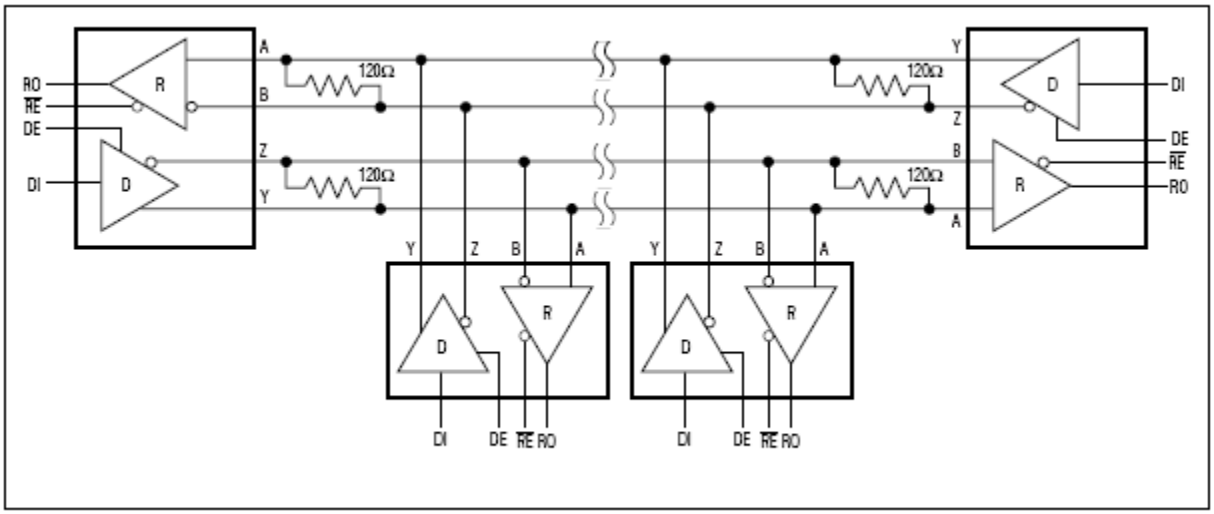
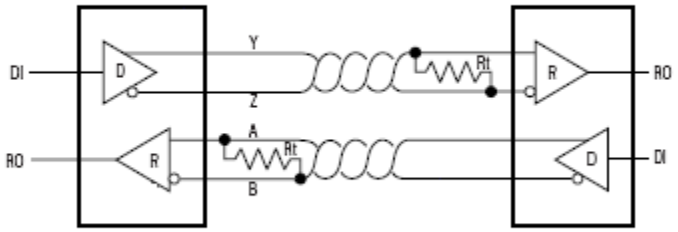


Typical Full-Duplex RS-485 Network

Recommended configuration for Full Duplex RS485 Network (H/W Flow Control Disabled)



Recommended configuration for Full Duplex (4 wire) RS422 Network (H/W Flow Control Disabled)
NOTE: Local receivers have termination ENABLED only.

To ENABLE hardware flow control:

J1 (CTS0) = Middle and Right pins shorted to **ENABLE** flow control on P1.
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

That is,

CTS+ on LF686KB -> RTS+ on remote device
CTS- on LF686KB -> RTS- on remote device
RTS+ on LF686KB -> CTS+ on remote device
RTS- on LF686KB -> CTS- on remote device

J3 (CTS1) = Middle and Right pins shorted to **ENABLE** flow control on P2.
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

DB9 Male Pinout (Half Duplex, 2 wire mode)

For Half Duplex wiring, place the dipswitch to the HD position.

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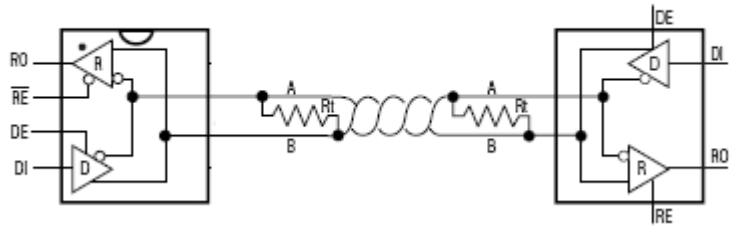
S1.1 = HD to configure P1 connector as Half Duplex
S4.1 = HD to configure P2 connector as Half Duplex

Pin # 1 Ground
Pin # 2 CTS- (optional)
Pin # 3 RTS- (optional)
Pin # 5 RTS+ (optional)
Pin # 6 CTS+(optional)
Pin #7 TX+ / RX+
Pin #8 TX- / RX-

The use of the balanced hardware flow control lines is optional. If the h/w flow control lines are not required, configure as follows:

J1 (CTS0) = Middle and Left pins shorted to **DISABLE** flow control on P1. Do not use pins 3 & 5 on the DB9M connector.
J3 (CTS1) = Middle and Left pins shorted to **DISABLE** flow control on P2. Do not use pins 3 & 5 on the DB9M connector.



Recommended configuration for Half Duplex (2 wire) RS485 Network (H/W Flow Control Disabled)

OR

J1 (CTS0) = Middle and Right pins shorted to **ENABLE** flow control on P1.
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

J3 (CTS1) = Middle and Right pins shorted to **ENABLE** flow control on P2.
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

Slew Rate Control (J2 & J4): (Default is OPEN).

J2 will configure the slew rate for the interface on connector P1 (bottom DB9M).
J4 will configure the slew rate for the interface on connector P2 (top DB9M).

Open: Maximum Baud Rate 115.2k (Default)
Short (center peg) to 500k for Maximum Baud Rate 500k operation Slew Rate
Short (center peg) to 10M for Maximum Baud Rate 10M operation Slew Rate

This circuit board offers the option for 2 methods of termination for the Transmitter, Receiver, CTS and RTS lines for each of the 2 serial ports.

Method # 1 – Use **onboard manufacturer provided termination resistors** + Dip Switch S2

S2_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)
S2_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

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S2_Switch 2: Off (Right) = No termination, ON (Left) = Terminate CTS lines with onboard 120 ohm resistor (Port P1)
S2_Switch 1: Off (Right) = No termination, ON (Left) = Terminate RX lines with onboard 120 ohm resistor (Port P1)

S5_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P2)
S5_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P2)

S5_Switch 2: Off (Right) = No termination, ON (Left) = Terminate CTS lines with onboard 120 ohm resistor (Port P2)
S5_Switch 1: Off (Right) = No termination, ON (Left) = Terminate RX lines with onboard 120 ohm resistor (Port P2)

Method # 2 – DO NOT use the Dip Switch S2 = Leave OFF. This method allows for **user provided termination** values.

R31 = User provided termination resistor for TX (through hole ¼ watt or higher) (Port P1)
R30 = User provided termination resistor for RX (through hole ¼ watt or higher) (Port P1)

R51 = User provided termination resistor for TX (through hole ¼ watt or higher) (Port P2)
R52 = User provided termination resistor for RX (through hole ¼ watt or higher) (Port P2)

Common Configuration Example # 1

4 wire RS422 mode for P1

S1.1 = FD (Left) (ON)
S1.2 = 422 (Right) (OFF)
S1.3 = Echo ON (Right) (OFF)
S1.4 = Left (ON)

4 wire RS422 mode for P2

S4.1 = FD (Left) (ON)
S4.2 = 422 (Right) (OFF)
S4.3 = Echo ON (Right) (OFF)
S4.4 = Left (ON)

Apply termination if at the end or start of the network as follows:

S2_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)
S2_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

Common Configuration Example # 2

4 wire RS485 mode for P1 with Local Echo OFF

S1.1 = FD (Left) (ON)
S1.2 = 485 (Left) (ON)
S1.3 = Echo OFF (Left) (ON)
S1.4 = Right (OFF)

Apply termination if at the end or start of the network as follows:

S2_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)
S2_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

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4 wire RS485 mode for P2 with Local Echo OFF

S4.1 = FD (Left) (ON)
S4.2 = 485 (Left) (ON)
S4.3 = Echo OFF (Left) (ON)
S4.4 = Right (OFF)

Apply termination if at the end or start of the network as follows:

S5_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P2)
S5_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P2)

4 wire RS485 mode for P1 with Local Echo ON

S1.1 = FD (Left) (ON)
S1.2 = 485 (Left) (ON)
S1.3 = Echo ON (Right) (OFF)
S1.4 = Left (ON)

Apply termination if at the end or start of the network as follows:

S2_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)
S2_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

4 wire RS485 mode for P2 with Local Echo ON

S4.1 = FD (Left) (ON)
S4.2 = 485 (Left) (ON)
S4.3 = Echo ON (Right) (OFF)
S4.4 = Left (ON)

Apply termination if at the end or start of the network as follows:

S5_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P2)
S5_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P2)

In RS485 mode of operation, the Transmitter will be ***AUTO-GATED*** (using the DTR line) for multi-drop applications. The Receiver can be switch configured to either **ENABLE or DISABLE** the Local Echo.

For RS485 mode of operation, switch the dipswitch to the RS485 position. **You must also select RS485 Active High Mode under the serial port configuration.** This configuration will toggle the DTR line HIGH during a byte transmit and LOW otherwise.

Fail-Safe Biasing

Varying with your installation, external resistors may be required for fail-safe biasing of other devices in your communication wiring. That is, to ensure an IDLE state during the absence of all transmitters in the RS485 interface, external pull up resistor for the TX+/RX+ and an external pull down resistor for the TX-/RX- connection. Note: The

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receivers used in the LF686KB design are internally fail-safe but other non-Axxon designs may not offer this feature. Without a fail-safe biasing the receiver may pick up stray noise as a start bit causing data corruption.

The values for these resistors are based on the total load of the RS485 network. A common tested value is 330 ohms for both the pull up and pull down leads. This value assumes that termination will be used, otherwise 4.7K is another choice. **Axxon uses 4.7k to fail-safe bias the externally connected devices, so termination should NOT be used**. You may use your own values as an option as noted.

Switch S3 & S6 permit selection between Axxon or user provided fail-safe resistors.

S3 is for the fail-safe biasing configuration of connector P1

S3_Switch 1: Off (Right) = No fail-safe resistor on RX+ OR User provided fail-safe resistor using R43 (Pull-Up)
S3_Switch 1: ON (Left) = 4.7k Fail-safe resistor on RX+ (**User provided fail-safe resistor at R43 should not be installed**)

S3_Switch 2: Off (Right) = No fail-safe resistor on TX- OR User provided fail-safe resistor using R41 (Pull-Down)
S3_Switch 2: ON (Left) = 4.7k Fail-safe resistor on TX- (**User provided fail-safe resistor at R41 should not be installed**)

S3_Switch 3: Off (Right) = No fail-safe resistor on RX- OR User provided fail-safe resistor using R42 (Pull-Down)
S3_Switch 3: ON (Left) = 4.7k Fail-safe resistor on RX- (**User provided fail-safe resistor at R42 should not be installed**)

S3_Switch 4: Off (Right) = No fail-safe resistor on TX+ OR User provided fail-safe resistor using R39 (Pull-Up)
S3_Switch 4: ON (Left) = 4.7k Fail-safe resistor on TX+ (**User provided fail-safe resistor at R39 should not be installed**)

R43 = User provided Pull Up resistor for RX+ (through hole ¼ watt or higher) (Port P1)
R41 = User provided Pull Down resistor for TX- (through hole ¼ watt or higher) (Port P1)
R42 = User provided Pull Down resistor for RX- (through hole ¼ watt or higher) (Port P1)
R39 = User provided Pull Up resistor for TX+ (through hole ¼ watt or higher) (Port P1)

S6 is for the fail-safe biasing configuration of connector P2

S6_Switch 1: Off (Right) = No fail-safe resistor on RX+ OR User provided fail-safe resistor using R67 (Pull-Up)
S6_Switch 1: ON (Left) = 4.7k Fail-safe resistor on RX+ (**User provided fail-safe resistor at R67 should not be installed**)

S6_Switch 2: Off (Right) = No fail-safe resistor on TX- OR User provided fail-safe resistor using R65 (Pull-Down)
S6_Switch 2: ON (Left) = 4.7k Fail-safe resistor on TX- (**User provided fail-safe resistor at R65 should not be installed**)

S6_Switch 3: Off (Right) = No fail-safe resistor on RX- OR User provided fail-safe resistor using R64 (Pull-Down)
S6_Switch 3: ON (Left) = 4.7k Fail-safe resistor on RX- (**User provided fail-safe resistor at R64 should not be installed**)

S6_Switch 4: Off (Right) = No fail-safe resistor on TX+ OR User provided fail-safe resistor using R63 (Pull-Up)
S6_Switch 4: ON (Left) = 4.7k Fail-safe resistor on TX+ (**User provided fail-safe resistor at R63 should not be installed**)

R67 = User provided Pull Up resistor for RX+ (through hole ¼ watt or higher) (Port P1)
R65 = User provided Pull Down resistor for TX- (through hole ¼ watt or higher) (Port P1)
R64 = User provided Pull Down resistor for RX- (through hole ¼ watt or higher) (Port P1)

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R63 = User provided Pull Up resistor for TX+ (through hole ¼ watt or higher) (Port P1)

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Hardware Method to Cancel Local Echo

The decision to cancel or enable Local Echo may vary with your application. With Local Echo ON, the serial port will have the RECEIVER always ENABLED providing for a “local echo” of all transmitted data if configured for half-duplex (2 wire) mode. With Local Echo OFF, the local receiver will automatically DISABLE when the local transmitter is ENABLED and remain ENABLED otherwise. For RS422 mode, the Local Echo should be ENABLED.

To ENABLE Local Echo on connector P1

S1.4 = Left (ON)
S1.3 = Echo ON (Right) (OFF)

To ENABLE Local Echo on connector P2

S4.4 = Left (ON)
S4.3 = Echo ON (Right) (OFF)

To cancel Local Echo on connector P1

S1.4 = Right (OFF)
S1.3 = Echo OFF (Left) (ON)

To cancel Local Echo on connector P2

S4.4 = Right (OFF)
S4.3 = Echo OFF (Left) (ON)

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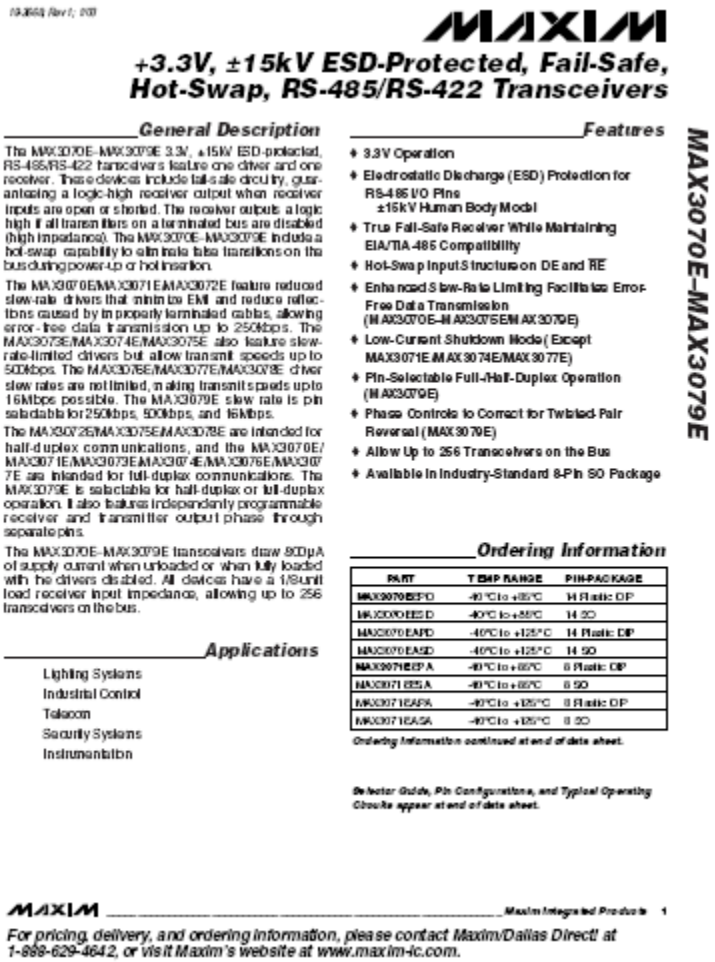
Reference reading documents:

MAX3079EESD+ datasheet:
http://pdfserv.maxim-ic.com/en/ds/MAX3070E-MAX3079E.pdf



MAXIM

+3.3V, ±15kV ESD-Protected, Fail-Safe, Hot-Swap, RS-485/RS-422 Transceivers

MAX3070E–MAX3079E

General Description

The MAX3070E–MAX3079E 3.3V, ±15kV ESD-protected, RS-485/RS-422 transceivers feature one driver and one receiver. These devices include fail-safe circuitry, guaranteeing a logic-high receiver output when receiver inputs are open or shorted. The receiver outputs a logic high if all transmitters on a terminated bus are disabled (high impedance). The MAX3070E–MAX3079E include a hot-swap capability to eliminate false transitions on the bus during power-up or hot insertion.

The MAX3070E/MAX3071E/MAX3072E feature reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. The MAX3073E/MAX3074E/MAX3075E also feature slew-rate-limited drivers but allow transmit speeds up to 500kbps. The MAX3076E/MAX3077E/MAX3078E driver slew rates are not limited, making transmit speeds up to 16Mbps possible. The MAX3079E slew rate is pin selectable for 250kbps, 500kbps, and 16Mbps.

The MAX3072E/MAX3075E/MAX3078E are intended for half-duplex communications, and the MAX3070E/MAX3071E/MAX3073E/MAX3074E/MAX3076E/MAX3077E are intended for full-duplex communications. The MAX3079E is selectable for half-duplex or full-duplex operation. It also features independently programmable receiver and transmitter output phase through separate pins.

The MAX3070E–MAX3079E transceivers draw 800µA of supply current when unloaded or when fully loaded with the drivers disabled. All devices have a 1/8-unit load receiver input impedance, allowing up to 256 transceivers on the bus.

Applications

Lighting Systems
Industrial Control
Telecom
Security Systems
Instrumentation

Features

- 3.3V Operation
- Electrostatic Discharge (ESD) Protection for RS-485 I/O Pins
  ±15kV Human Body Model
- True Fail-Safe Receiver While Maintaining EIA/TIA-485 Compatibility
- Hot-Swap Input Structure on DE and RE
- Enhanced Slew-Rate Limiting Facilitates Error-Free Data Transmission
  (MAX3070E–MAX3075E/MAX3079E)
- Low-Current Shutdown Mode (Except MAX3071E/MAX3074E/MAX3077E)
- Pin-Selectable Full-/Half-Duplex Operation (MAX3079E)
- Phase Controls to Correct for Twisted-Pair Reversal (MAX3079E)
- Allow Up to 256 Transceivers on the Bus
- Available in Industry-Standard 8-Pin SO Package

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX3070EESD	-40°C to +85°C	14 Plastic DIP
MAX3070EESD	-40°C to +85°C	14 SO
MAX3070EAPD	-40°C to +125°C	14 Plastic DIP
MAX3070EASD	-40°C to +125°C	14 SO
MAX3071EEPA	-40°C to +85°C	8 Plastic DIP
MAX3071EESA	-40°C to +85°C	8 SO
MAX3071EAPA	-40°C to +125°C	8 Plastic DIP
MAX3071EASA	-40°C to +125°C	8 SO

Ordering Information continued at end of data sheet.

Selector Guide, Pin Configurations, and Typical Operating Circuits appear at end of data sheet.

MAXIM — *Maxim Integrated Products* 1

For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

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Windows Device Driver Installation for RS422/ RS485 PCI Express Serial Card (LF686KB)

The LF686KB adapter is based on the enhanced 16950 UART devices from Oxford Semiconductor. These enhanced UARTs feature RS485 auto-toggling in hardware. A programming utility has been developed for use with this circuit board to enable this RS485 mode using bootstrap code upon a PCI / PCIe cold reset. Using this same utility, the adapter may be used in either RS485 or RS422 mode by configuring the respective mode through the onboard dipswitches. After the adapter has been programmed, the default Microsoft serial driver may be mapped for either the RS485 or RS422 mode. This EEPROM configuration is required to be ran one-time as the program code is retained onboard and is non-volatile. The factory shipped configuration does NOT contain this RS485 enabler code.

To configure the LF686KB adapter to support RS485/RS422 mode in hardware please follow the noted steps.

Using a downloadable CD image which is a bootable DOS CD, you can reprogram the card at anytime.

The procedure for this is copied below:

Please download this approx. 52 meg ISO image for burning on our side:

http://www.softio.com/axxon_pcie/axxon_pcie.iso
*** case sensitive URL**
*** cut & paste into your browser to download**

Burn a CDR using the above ISO contents for the image.

This will create a bootable special DOS CD with our s/w.

Configure your PC to boot from a CD.

Press "4" from the menu when presented with the 1st screen.

Then press ESC key till at the prompt.

Switch to the Axxon folder for our program as follows:

cd\axxon <ENTER>

cd lf686kb <ENTER>

With our circuit board seated, run the program:

cb485.exe <ENTER> ; the card will be programmed in a few seconds for RS485 and RS422 operation

Now remove the CD and reboot into your OS. We recommend the use of the Microsoft Windows provided serial port driver using the following files.

For Windows XP (32 bit) / 2003 (32 bit), the following INF file may be applied:

http://www.softio.com/ic0560kb/MSPORTS.INF
*** case sensitive URL**
*** cut & paste into your browser to download**

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For Windows XP (64 bit) / Vista (64 bit), the following INF file may be applied:

http://www.softio.com/drivers/axxon_ports_vista64.zip
*** case sensitive URL**
*** cut & paste into your browser to download -> unzip the provided 2 files -> apply for each request of the driver**

RS422 Port Installation Summary

- configure the port dipswitches to RS422 mode
- apply one of the above INF files to support the adapter under the Windows operating system

RS485 Port Installation Summary

- configure the port dipswitches to RS485 mode
- apply one of the above INF files to supported the adapter under the Windows operating system

Questions? Please contact us via email: support@softio.com or phone: 1-800-361-1913 to speak with our Tech Support staff from 10 AM to 6 PM (EST) M-F.

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