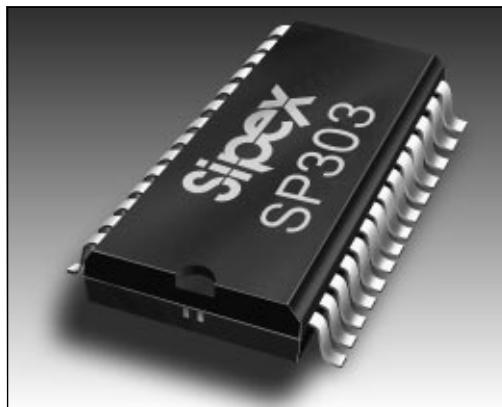


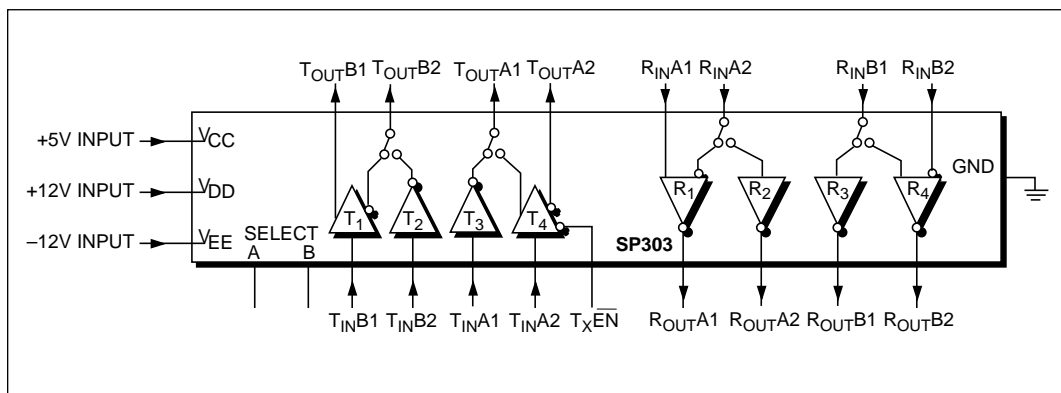
RS232/AppleTalk™ Serial Transceiver

- Single chip serial transceiver supports AppleTalk™ or RS-232 interface
- Programmable Selection of Interface
- 4 RS-232 Drivers and 4 RS-232 Receivers
- Provides Macintosh™ type interface
- $\pm 30\text{V}$ Receiver Input Levels
- Surface Mount Packaging



DESCRIPTION...

The **SP303** is a single chip device that offers both RS-232 and AppleTalk™ interfaces. When configured for RS-232 mode the **SP303** has 4 drivers and 4 receivers. When the part is programmed for AppleTalk mode, the **SP303** supports Macintosh-type ports. All drivers and receivers can operate at data rates up to 1 Mbps. The differential driver used for transmitting data signals is equipped with a tri-state function. The **SP303** is available in a 28-pin SOIC package for operation over the commercial temperature range.



SPECIFICATIONS

($T_{MIN} \leq T_A \leq T_{MAX}$ and nominal supply voltages unless otherwise noted)

| PARAMETER | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|------------------------------|---------------------|------|---------------------|------------|---|
| RS--232 DRIVER | | | | | |
| TTL Input Level | | | | | Note 1 |
| V_{IL} | 0 | | 0.8 | V | |
| V_{IH} | 2.0 | | | V | |
| High Level Output | +5.0 | | | V | $R_L = 3k\Omega$, $V_{IN} = 0.8V$ |
| Low Level Output | | | -5.0 | V | $R_L = 3k\Omega$, $V_{IN} = 2.0V$ |
| Short Circuit Current | | | ± 30 | mA | $V_{OUT} = 0V$ |
| Slew Rate | | | 30 | V/ μs | $C_L = 50pF$, $R_L = 3k\Omega$; $T_A = 25^\circ C$ |
| Transition Time | | 3 | | μs | Note 2 |
| Maximum Transmission Rate | 200 | | | kbps | |
| RS-232 RECEIVER | | | | | |
| Input Voltage Range | -15 | | +15 | V | Note 1 |
| Input High Threshold | +1.75 | | +2.5 | V | Positive-going |
| Input Low Threshold | +0.75 | | +1.35 | V | Negative-going |
| Input Impedance | 3 | | 7 | k Ω | $C_L \leq 2,500pF$; $V_{SS} \leq V_{IN} \leq V_{DD}$ |
| TTL Output Level | | | | | |
| V_{OL} | | | 0.4 | V | $V_{CC} = +4.75V$, $I_{OUT} = +1.6mA$ |
| V_{OH} | 2.4 | | | V | $V_{CC} = +4.75V$, $I_{OUT} = -0.5mA$ |
| Maximum Receiving Rate | 200 | | | kbps | |
| DIFFERENTIAL DRIVER | | | | | |
| TTL Input Level | | | | | Note 3 |
| V_{IL} | 0 | | 0.8 | V | |
| V_{IH} | 2.0 | | | V | |
| High Level Output | +3.6 | +6 | | V | $I_{OH} = 8mA$ |
| Low Level Output | -3.6 | -6 | | V | $I_{OL} = -8mA$ |
| Differential Output | ± 3.6 | | | V | $R_L = 450\Omega$ |
| | ($V_{EE} + 0.7V$) | | ($V_{DD} - 0.7V$) | V | $R_L = \infty$ |
| Short Circuit Current | | | 40 | mA | |
| Output Current | | | ± 500 | μA | $-0.25V \leq V_O \leq 6V$; Power off |
| Leakage Current | | 0.05 | ± 10 | μA | $TxEN = V_{CC}$, $0 \leq TxDO \leq 6V$, Note 4 |
| Transition Time | | 720 | | ns | $R_L = 450\Omega$, $C_L = 50pF$; Note 5 |
| Maximum Transmission Rate | 1000 | | | kbps | |
| DIFFERENTIAL RECEIVER | | | | | |
| Common Mode Range | | | ± 7 | V | Note 3 |
| Differential Input | | | ± 15 | V | Note 6 |
| Differential Input Threshold | -0.2 | | +0.2 | V | Note 6 |
| Input Voltage Hysteresis | 30 | | | mV | $T_A = 25^\circ C$ |
| Input Resistance | 3 | | | k Ω | $V_{CM} = 0V$, $T_A = 25^\circ C$ |
| TTL Output Level | | | | | $-7V \leq V_{CM} \leq +7V$ |
| V_{OL} | | | 0.4 | V | $V_{CC} = +4.75V$, $I_{OUT} = +1.6mA$ |
| V_{OH} | 2.4 | | | V | $V_{CC} = +4.75V$, $I_{OUT} = -0.5mA$ |
| Maximum Receiving Rate | 1000 | | | kbps | |
| Short Circuit Output Current | | | ± 120 | mA | $V_{OUT} = 0V$ |
| SINGLE-ENDED RECEIVER | | | | | |
| Input Threshold | -200 | | +200 | mV | Note 3 |
| Input Voltage Hysteresis | 30 | | | mV | $T_A = 25^\circ C$ |
| Input Impedance | 3 | | 7 | k Ω | $V_{CM} = 0V$; $T_A = 25^\circ C$ |
| TTL Output Level | | | | | |
| V_{OL} | | | 0.4 | V | $V_{CC} = +4.75$; $I_{OUT} = +1.6mA$ |
| V_{OH} | 2.4 | | | V | $V_{CC} = +4.75$; $I_{OUT} = -0.5mA$ |
| Maximum Transmission Rate | 1000 | | | kbps | |
| POWER REQUIREMENTS | | | | | |
| $V_{DD} = +12V, \pm 10\%$ | | 7 | 15 | mA | All Transmitter outputs $R_L = \infty$ |
| $V_{CC} = +5V, \pm 10\%$ | | 5 | 7 | mA | $T_A = 25^\circ C$ |
| $V_{EE} = -12V, \pm 10\%$ | | 11 | 20 | mA | |

SPECIFICATIONS

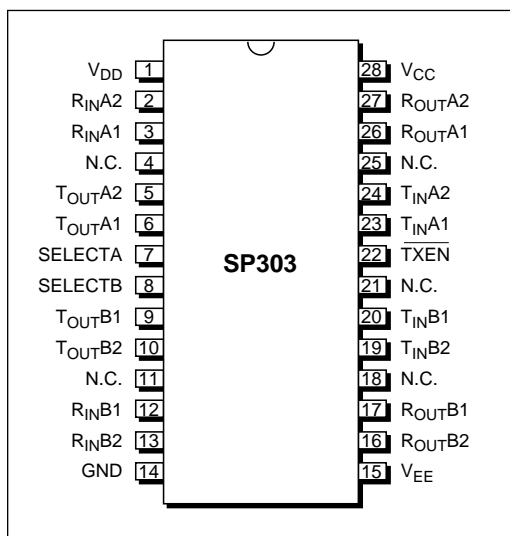
($T_{MIN} \leq T_A \leq T_{MAX}$ and nominal supply voltages unless otherwise noted)

| PARAMETER | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|-------------------------------------|-------------|------|------|------|------------|
| ENVIRONMENTAL AND MECHANICAL | | | | | |
| Operating Temperature | 0 | | +70 | °C | |
| Storage Temperature | -65 | | +150 | °C | |
| Package | 28-pin SOIC | | | | |

Note:

1. RS-232 Mode, SELA = SELB = GND.
2. V_{OUT} from +3V to -3V or -3V to +3V.
3. Macintosh™ AppleTalk™ Mode, SELA = SELB = +5V.
4. Leakage current specification applies to both TxDO- and TxDO+; $T_A = +25^\circ\text{C}$ only.
5. From 10% to 90% of steady state.
6. This is an absolute maximum rating. Normal operating levels are $V_{IN} \leq 5V$.

PINOUT



Pin 8 — SEL B — Select B; used with Select A (pin 7) to select operating mode. Logic “0” on both SEL A and SEL B selects RS-232 mode; logic “1” on both SEL A and SEL B selects AppleTalk™ mode.

Pin 9 — $T_{OUT}B1$ — DTR; RS-232 output.

Pin 10 — $T_{OUT}B2$ — RI; RS-232 output.

Pin 11 — N.C. — No Connection.

Pin 12 — $R_{IN}B1$ — CTS; RS-232 input.

Pin 13 — N.C. — No Connection.

Pin 14 — GND — Signal ground. Connected to logic and chassis ground.

Pin 15 — V_{EE} — -12V Power Supply.

Pin 16 — N.C. — No Connection.

Pin 17 — $R_{OUT}B1$ — CTS; TTL Output to UART.

Pin 18 — N.C. — No Connection.

Pin 19 — $T_{OUT}B2$ — RI; TTL input from UART.

Pin 20 — $T_{IN}B1$ — DTR; TTL input from UART.

Pin 21 — N.C. — No Connection.

Pin 22 — TxEN — Transmit Enable; Only functional in Mac Mode.

Pin 23 — $T_{IN}A1$ — TXD; TTL input from UART.

Pin 24 — N.C. — No Connection.

Pin 25 — N.C. — No Connection.

PIN ASSIGNMENTS – RS232 MODE

Pin 1 — V_{DD} — +12V Power Supply.

Pin 2 — $R_{IN}A2$ — DSR; RS-232 input.

Pin 3 — $R_{IN}A1$ — RXD; RS-232 input.

Pin 4 — N.C. — No Connection.

Pin 5 — $T_{OUT}A2$ — RTS; RS-232 output.

Pin 6 — $T_{OUT}A1$ — TXD; RS-232 output.

Pin 7 — SEL A — Select A; used with Select B (pin 8) to select operating mode. Logic “0” on both SEL A and SEL B selects RS-232 mode; logic “1” on both SEL A and SEL B selects AppleTalk™ mode.

Pin 26 — $R_{OUT}A1$ — RXD; TTL output to UART.

Pin 27 — N.C. — No Connection.

Pin 28 — V_{CC} — +5V Power Supply.

PIN ASSIGNMENTS — MACINTOSH™ APPLETALK™ MODE

Pin 1 — V_{DD} — +12V Power Supply.

Pin 2 — $R_{IN}A2$ — Receive data; received at UART's RxD (non-inverted); $V_{IH} = 0.2V$; $V_{IL} = -0.2V$; $R_{IN} = 3k\Omega$ minimum.

Pin 3 — $R_{IN}A1$ — Receive data; received at UART's RxD (inverted); $V_{IH} = 0.2V$; $V_{IL} = -0.2V$; $R_{IN} = 3k\Omega$ minimum.

Pin 4 — N.C. — No Connection.

Pin 5 — $T_{OUT}A2$ — Transmit data; driven from UART's TxD (non-inverted); tri-stated when UART's RTS is not asserted; $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$.

Pin 6 — $T_{OUT}A1$ — Transmit data; driven from UART's TxD (inverted); tri-stated when RTS is not asserted; $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min $R_L = 450\Omega$.

Pin 7 — SEL A — Select A; used with Select B (pin 8) to select operating mode. Logic "0" on both SEL A and SEL B selects RS-232 mode; logic "1" on both SEL A and SEL B selects AppleTalk™ mode.

Pin 8 — SEL B — Select B; used with Select A (pin 7) to select operating mode. Logic "0" on both SEL A and SEL B selects RS-232 mode; logic "1" on both SEL A and SEL B selects AppleTalk™ mode.

Pin 9 — $T_{OUT}B1$ — Handshake output; driven from UART's DTR (inverted); $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$.

Pin 10 — $T_{OUT}B2$ — Handshake output; driven from UART's DTR (non-inverted); $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$.

Pin 11 — N.C. — No Connection.

Pin 12 — $R_{IN}B1$ — Handshake input or external clock; received non-inverted at UART's CTS and TRxC; $V_{IH} = 0.2V$; $V_{IL} = -0.2V$; $R_{IN} = 3k\Omega$ minimum.

Pin 13 — N.C. — No Connection.

Pin 14 — GND — Signal ground. Connected to

logic and chassis ground.

Pin 15 — V_{EE} — -12V Power Supply.

Pin 16 — N.C. — No Connection.

Pin 17 — $R_{OUT}B1$ — Receive handshake output; connects to UART's CTS and TRxC.

Pin 18 — N.C. — No Connection.

Pin 19 — $T_{OUT}B2$ — Not used in AppleTalk™ mode.

Pin 20 — $T_{IN}B1$ — Transmit handshake input; connects to UART's DTR output.

Pin 21 — N.C. — No Connection.

Pin 22 — $Tx\overline{EN}$ — Transmit data driver enable; connects to UART's RTS; transmit data driver is enabled when this pin is low.

Pin 23 — $T_{IN}A1$ — Transmit data input; connects to UART's TxD output.

Pin 24 — N.C. — No Connection.

Pin 25 — N.C. — No Connection.

Pin 26 — $R_{OUT}A1$ — Receive data output; connects to UART's RxD input.

Pin 27 — N.C. — No Connection.

Pin 28 — V_{CC} — +5V Power Supply.

FEATURES...

The **SP303** is a single chip device that offers both RS-232 and AppleTalk interfaces. When configured for RS-232 mode, the **SP303** provides 4 drivers and 4 receivers. When the part is programmed for AppleTalk mode, the SP303 supports Macintosh-type ports. The mode can be changed at any time by bringing both the SEL A and the SEL B pins high for Mac mode, or low for RS-232 mode.

The RS-232 line driver circuits convert TTL-logic level inputs into inverted RS-232 output signals. The RS-232 receivers convert the EIA RS-232 input signals to inverted TTL output logic levels. The receivers have voltage hysteresis, which helps eliminate spurious output transitions that might result from low-amplitude noise voltages during slower-speed signal transitions.

When the **SP303** is programmed for Mac mode, the transmit data and receive data signals are

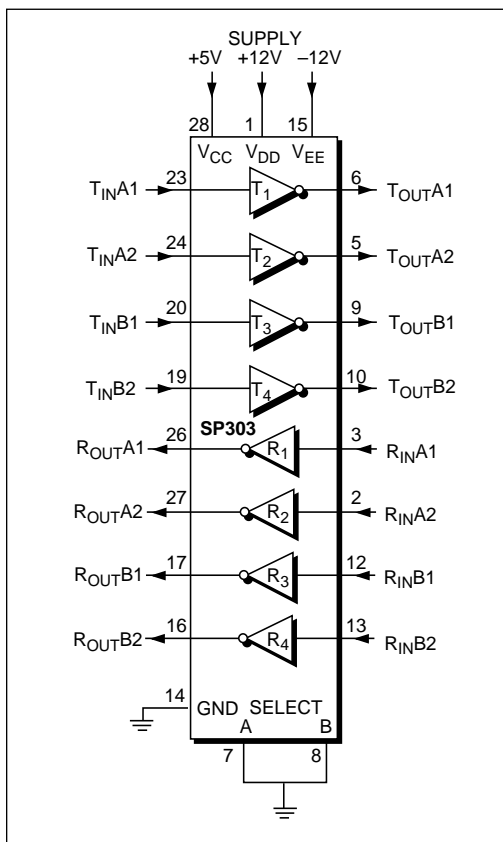


Figure 1. RS232 Operating Mode

differential, while the handshake-out and handshake-in signals are single-ended. The **SP303** does not have the extra GPI (General Purpose Input). All drivers and receivers can operate at data rates up to 1 Mbps. The differential driver used for transmitting data signals is equipped with a tri-state function. When the $\overline{\text{TxEN}}$ pin is brought low, the differential driver is enabled; when it is high, the driver outputs are tri-stated. The tri-state function does not affect any other driver in either mode of operation.

One **SP303** can significantly reduce the board space necessary for a similar discrete solution offering both RS-232 and AppleTalk interfaces. Due to the space savings, the **SP303** can provide multi-mode interfacing to equipment such as printers or modems without sacrificing additional board space or cost. This allows the OEM

to offer more flexible interface capabilities without additional material costs.

The **SP303** is available in a 28-pin SOIC package for operation over the commercial temperature range.

APPLICATION EXAMPLE RS-232 MODE SERIAL INTERFACE

Figure 3 shows the **SP303CT** used in a dual serial port application which allows both RS-232 and Macintosh™ AppleTalk™ Mode interfaces. With SEL A and SEL B low, the port can be configured for RS-232. In this mode, the **SP303CT** is set up for 4 drivers and 4 receivers. The transmitter enable pin (pin 22) has no effect in this mode.

The RFI filters shown are optional depending upon the FCC requirements of the system. The **SP303CT** has internal slew rate limiting, which keeps the RS-232 slew rate $<30\text{V}/\mu\text{s}$. Since the

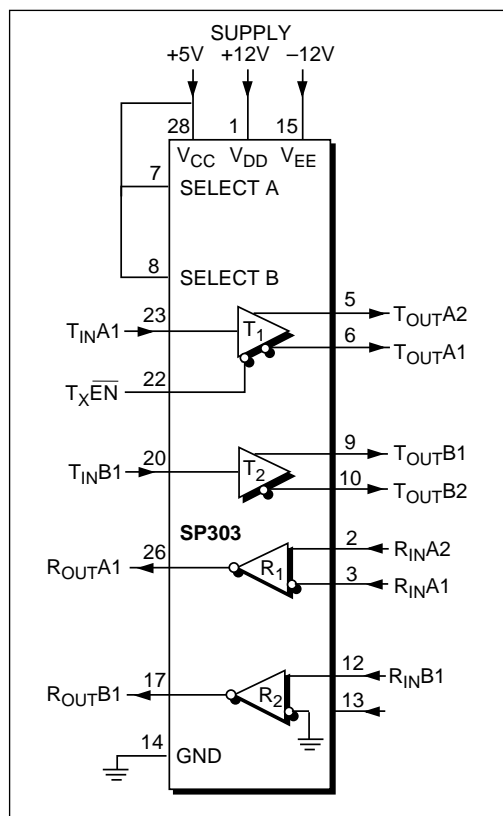


Figure 2. Macintosh™ AppleTalk™ Operating Mode

SP303CT is usually connected to the **outside** world, it is suggested that the user place transient voltage suppression devices **on each** of the I/O lines to ensure up to $\pm 25\text{kV}$ ESD protection.

While the part is programmed for RS-232 mode, the drivers and receivers can operate up to 200kbps. The RS-232 receiver inputs are capable of receiving signals up to $\pm 30\text{V}$. The Macintosh™ AppleTalk™ mode inputs and outputs are protected to guard against the situation where an RS-232 cable is connected to the port while it is configured for AppleTalk™ mode.

APPLICATION EXAMPLE MACINTOSH™ APPLETALK™ SERIAL INTERFACE

Figure 4 shows the **SP303CT** programmed for Macintosh™ AppleTalk™ operating mode. In this mode the **SP303CT** offers one differential driver used for transmitting data, one differential receiver used for receiving data, one single-ended, non-inverting receiver used to receive a handshake signal, and one single-ended inverting driver used to transmit a handshake signal.

The differential driver used for transmitting data can be put into tri-state mode by bringing the TxEN line high; a low on this pin will enable the driver output. This function only applies to

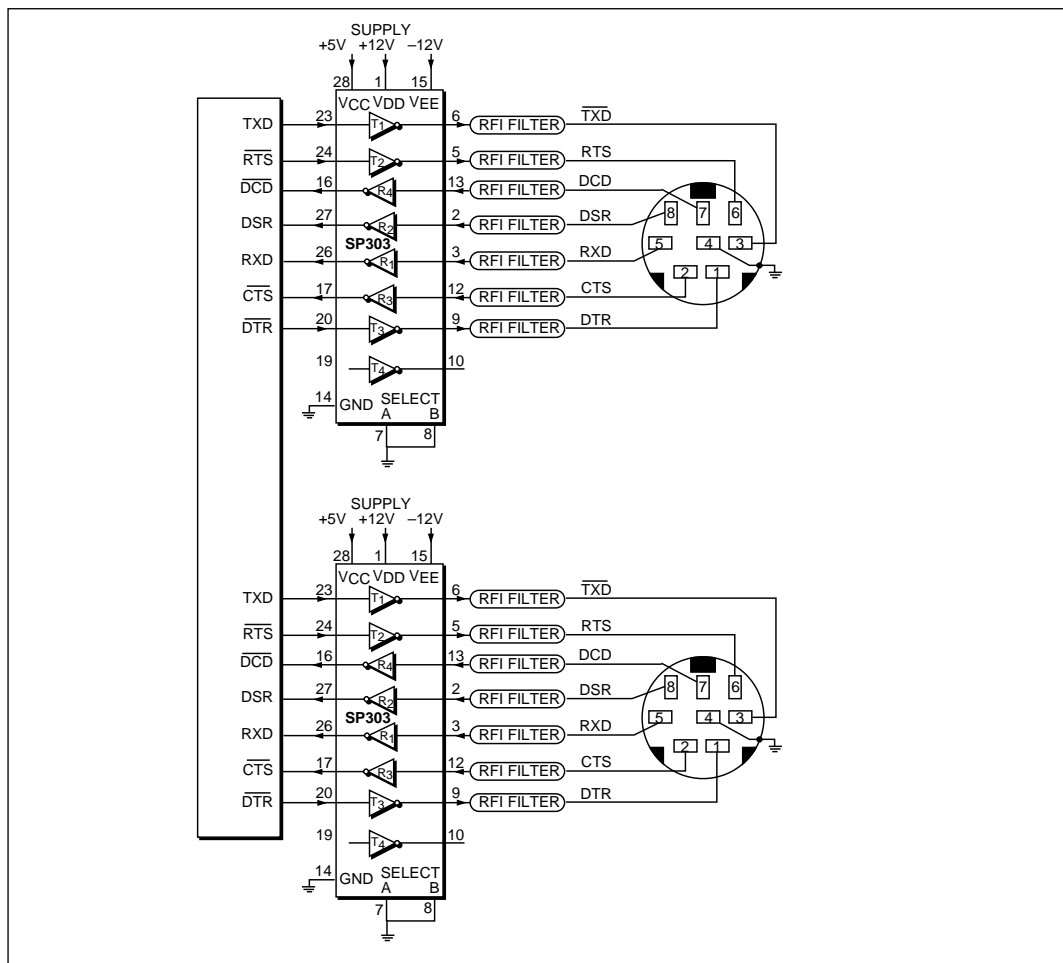


Figure 3. RS-232 Interface.

the transmit data driver in AppleTalk™ mode. Both differential drivers have output signals on each pin that typically swing $\pm 6V$. The peak to peak differential voltage swing is typically $\pm 12V$.

The second driver is used for transmitting the handshake output signal and can be used as either a differential driver or single ended. This particular application required a single-ended inverting signal for the handshake output signal.

Some Macintosh equipment requires an extra single-ended inverting receiver which is called a general purpose input. The GPI receiver is normally connected to pin 7 on the external 8 pin connector. This receiver is not available on the **SP303CT**.

Since the **SP303CT** is usually connected to the outside world, it is suggested that the user place transient voltage suppression devices on each of the 1/0 lines to ensure up to $\pm 25kV$ ESD protection.

POWER SUPPLY SEQUENCING

There are two requirements for power supply sequencing for the **SP303**. The first is that V_{DD} is always greater than V_{CC} . The second is that when the part is powered up, V_{DD} must be applied 20ms before V_{CC} .

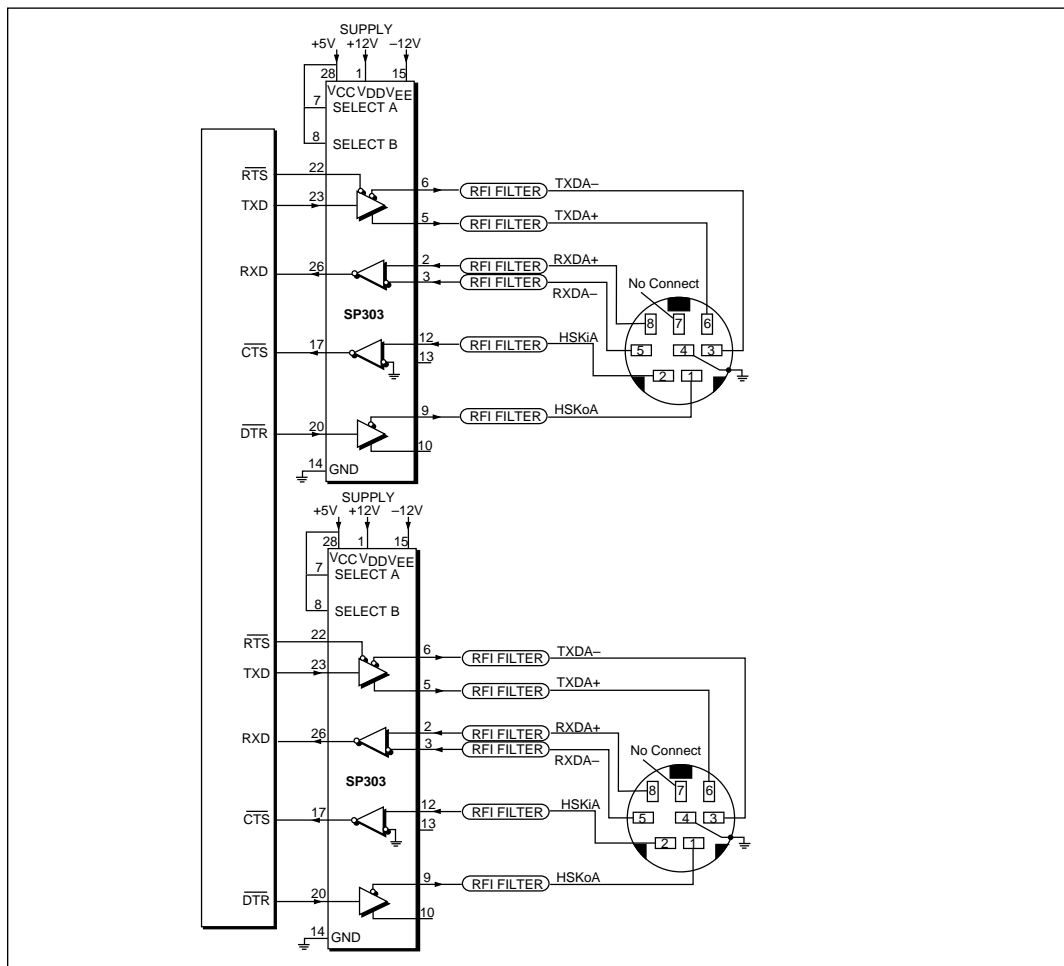


Figure 4. Macintosh™ AppleTalk™ Interface.

ORDERING INFORMATION

| Model | Temperature Range | Package |
|------------------|--------------------|--------------------------|
| SP303CT | 0°C to +70°C | 28-pin SOIC |
| SP303CT/TR | 0°C to +70°C | 28-pin SOIC/Tape-on-reel |