



## Programmable DTE/DCE, +5V RS-232 Transceiver

MAX214

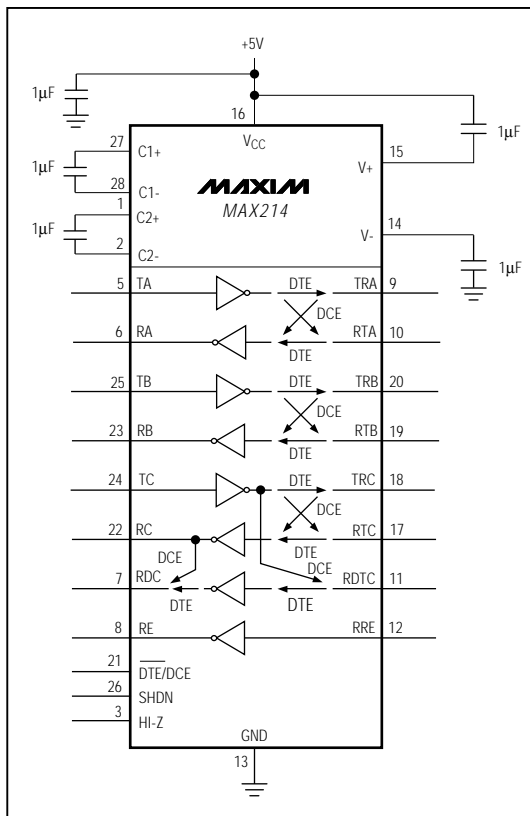
### General Description

The MAX214 +5V RS-232 transceiver provides a complete, 8-line, software-configurable, DTE or DCE port RS-232 interface. Tx, Rx, RTS, CTS, DTR, DSR, DCD, and RI circuits can be configured as either Data Terminal Equipment (DTE) or Data Circuit-Terminating Equipment (DCE) using the DTE/DCE control pin. The MAX214 eliminates the need to swap cables when switching between DTE and DCE configurations.

### Applications

AT-Compatible Laptop Computers  
AT-Compatible Desktop Computers  
Modems, Printers, and Other Peripherals

### Typical Operating Circuit



### Features

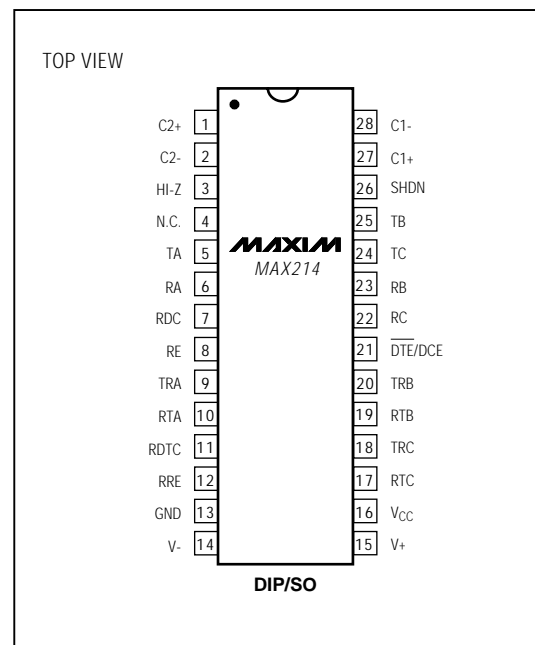
- ◆ Eliminates Null Modem Cables
- ◆ Programmable DTE or DCE Serial Port
- ◆ 1µF Charge-Pump Capacitors
- ◆ 116kbps Data Rate—Guaranteed
- ◆ 20µA Shutdown Mode
- ◆ Receivers Active in Shutdown

### Ordering Information

| PART      | TEMP. RANGE    | PIN-PACKAGE    |
|-----------|----------------|----------------|
| MAX214CPI | 0°C to +70°C   | 28 Plastic DIP |
| MAX214CWI | 0°C to +70°C   | 28 Wide SO     |
| MAX214C/D | 0°C to +70°C   | Dice*          |
| MAX214EPI | -40°C to +85°C | 28 Plastic DIP |
| MAX214EWI | -40°C to +85°C | 28 Wide SO     |

\* Dice are specified at  $T_A = +25^\circ\text{C}$ .

### Pin Configuration



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# Programmable DTE/DCE, +5V RS-232 Transceiver

## ABSOLUTE MAXIMUM RATINGS

V<sub>CC</sub> ..... -0.3V to +6V  
 Input Voltages  
 T<sub>IN</sub>, DTE/DCE, SHDN HI-Z ..... -0.3V to (V<sub>CC</sub> + 0.3V)  
 R<sub>IN</sub> ..... ±15V  
 Output Voltages:  
 T<sub>OUT</sub> ..... ±15V  
 R<sub>OUT</sub> ..... -0.3V to (V<sub>CC</sub> + 0.3V)  
 Short-Circuit (one output at a time)  
 T<sub>OUT</sub> to GND ..... Continuous  
 R<sub>OUT</sub> to GND ..... Continuous

Continuous Power Dissipation (T<sub>A</sub> = +70°C)  
 Plastic DIP (derate 9.09mW/°C above +70°C) ..... 727mW  
 Wide SO (derate 12.50mW/°C above +70°C) ..... 1000mW  
 Operating Temperature Ranges:  
 MAX214C\_I ..... 0°C to +70°C  
 MAX214E\_I ..... -40°C to +85°C  
 Storage Temperature Range ..... -65°C to +150°C  
 Lead Temperature (soldering, 10sec) ..... +300°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = 4.5V to 5.5V, C1 to C4 = 1μF, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, unless otherwise noted.)

| PARAMETER                           | CONDITIONS  | MIN                         | TYP                   | MAX  | UNITS |
|-------------------------------------|---|-----------------------------|-----------------------|------|-------|
| <b>RS-232 TRANSMITTERS</b>          |   |                             |                       |      |       |
| Logic Input Threshold Low           |   | 0.8                         | 1.4                   |      | V     |
| Logic Input Threshold High          |   |                             | 1.4                   | 2.0  | V     |
| Logic Input Pull-Up Current         | Normal operation  | 1                           | 10                    | 50   | μA    |
|                                     | Shutdown  |                             | ±0.01                 | ±1   |       |
| Output Voltage Swing                | All transmitter outputs loaded with 3kΩ to ground                                       | ±5.0                        | ±7.5                  |      | V     |
| Transmitter Output Resistance       | V <sub>CC</sub> = V <sub>+</sub> = V <sub>-</sub> = 0V, V <sub>OUT</sub> = ±2V (Note 1) | 300                         | 300k                  |      | Ω     |
| Output Short-Circuit Current        | V <sub>OUT</sub> = 0V   | ±7                          | ±25                   |      | mA    |
| <b>RS-232 RECEIVERS</b>             |   |                             |                       |      |       |
| Input Voltage Operating Range       |   |                             |                       | ±15  | V     |
| Positive Threshold Input Low        | T <sub>A</sub> = +25°C, V <sub>CC</sub> = 5V, normal operation, SHDN = 0V               | 0.8                         | 1.3                   |      | V     |
| Positive Threshold Input High       | T <sub>A</sub> = +25°C, V <sub>CC</sub> = 5V, normal operation, SHDN = 0V               |                             | 1.8                   | 2.4  | V     |
| Positive Threshold Input Hysteresis | V <sub>CC</sub> = 5V, normal operation, SHDN = 0V (no hysteresis in shutdown)           | 0.2                         | 0.5                   | 1.0  | V     |
| Negative Threshold Input Low        | T <sub>A</sub> = +25°C, V <sub>CC</sub> = 5V  | Normal operation, SHDN = 0V | -2.6                  | -1.9 | V     |
|                                     |   | Shutdown, SHDN = 5V         | 0.8                   | 1.3  |       |
| Negative Threshold Input High       | T <sub>A</sub> = +25°C, V <sub>CC</sub> = 5V  | Normal operation, SHDN = 0V | -1.5                  | -0.2 | V     |
|                                     |   | Shutdown, SHDN = 5V         | 1.3                   | 2.4  |       |
| Negative Threshold Input Hysteresis | V <sub>CC</sub> = 5V, normal operation, SHDN = 0V (no hysteresis in shutdown)           | 0.2                         | 0.4                   | 1.0  | V     |
| Input Resistance                    | HI-Z = 0V and SHDN = 0V   | 3                           | 5                     | 7    | kΩ    |
|                                     | HI-Z = 5V or SHDN = 5V  | 100                         | 300                   |      |       |
| TTL/CMOS Output Voltage Low         | I <sub>OUT</sub> = 3.2mA  |                             | 0.2                   | 0.4  | V     |
| TTL/CMOS Output Voltage High        | I <sub>OUT</sub> = -1.0mA   | 3.5                         | V <sub>CC</sub> - 0.2 |      | V     |

# Programmable DTE/DCE, +5V RS-232 Transceiver

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## ELECTRICAL CHARACTERISTICS (continued)

(V<sub>CC</sub> = 4.5V to 5.5V, C1 to C4 = 1μF, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, unless otherwise noted.)

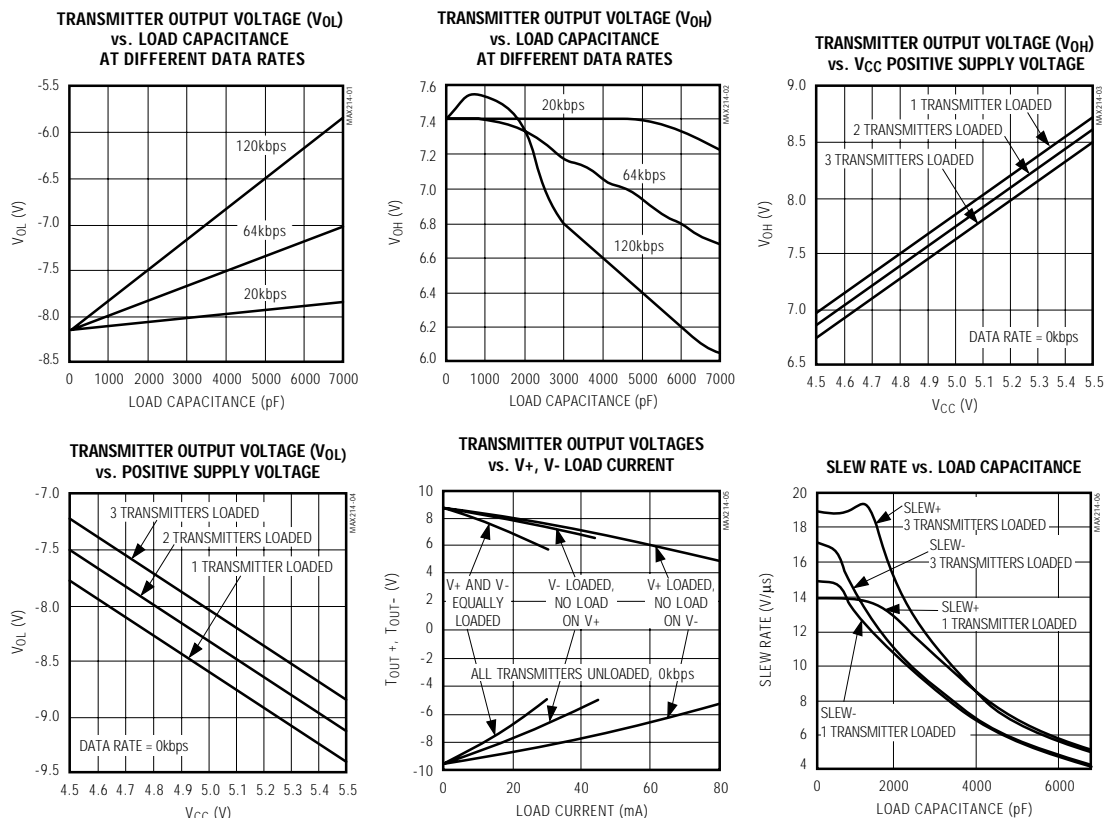
| PARAMETER  | CONDITIONS  |                   | MIN | TYP | MAX | UNITS |
|--|---|-------------------|-----|-----|-----|-------|
| POWER SUPPLY   |   |                   |     |     |     |       |
| VCC Supply Current   | No load, TA = +25°C   |                   | 9   | 20  |     | mA    |
| Shutdown Supply Current  | DTE/DCE = 0V, SHDN = HI-Z = VCC; Figure 1   | TA = +25°C        | 4   | 20  |     | μA    |
|  |   | TA = Tmin to Tmax |     | 50  |     |       |
| CONTROL LOGIC (DTE/DCE, SHDN, HI-Z)                                |   |                   |     |     |     |       |
| Logic Input Threshold Low  |   |                   | 0.8 | 1.3 |     | V     |
| Logic Input Threshold High   |   |                   |     | 1.3 | 2.0 | V     |
| Input Leakage Current  |   |                   |     |     | ±1  | μA    |
| AC CHARACTERISTICS   |   |                   |     |     |     |       |
| Data Rate  | Normal operation, transmitters and receivers  |                   | 200 | 116 |     | kbps  |
|  | Receivers in shutdown mode  |                   | 20  |     |     |       |
| Transition-Region Slew Rate  | TA = +25°C, VCC = 5V, RL = 3kΩ to 7kΩ, CL = to 2500pF, measured from 3V to -3V or -3V to 3V |                   | 6   | 12  | 30  | V/μs  |
| Transmitter Propagation Delay, TTL to RS-232 (Normal Operation)    | tPHLT   |                   | 1.3 | 3.5 |     | μs    |
|  | tPLHT   |                   | 1.4 | 3.5 |     |       |
| Transmitter + to - Propagation-Delay Difference (Normal Operation) | tPHLT - tPLHT   |                   | 100 |     |     | ns    |
| Receiver Propagation Delay, RS-232 to TTL (Normal Operation)       | tPHLR, tPLHR  |                   | 0.4 | 1.5 |     | μs    |
| Receiver Propagation Delay, RS-232 to TTL (Shutdown Mode)          | tPHLR   |                   | 0.4 | 10  |     | μs    |
|  | tPLHR   |                   | 1.5 | 10  |     |       |
| Receiver Propagation-Delay Difference (Normal Operation)           | tPHLT - tPLHT   |                   | 100 |     |     | ns    |
| MODE-CHANGE TIMING (DTE/DCE)                                       |   |                   |     |     |     |       |
| Transmitter Enable Time  | tTEN (includes charge-pump start-up time)   |                   | 250 |     |     | μs    |
| Transmitter Disable Time   | tTTR  |                   | 600 |     |     | ns    |
| Transmitter DTE/DCE Switch Time                                    | tTSW  |                   | 600 |     |     | ns    |
| Receiver DTE/DCE Switch Time                                       | tRSW  |                   | 300 |     |     | ns    |
| Receiver Termination-Resistor Connect/Disconnect Time              | (SHDN = 0V)   |                   | 300 |     |     | ns    |
| Receiver Termination-Resistor Connect Entering SHDN Time           |   |                   | 250 |     |     | μs    |
| Receiver Termination-Resistor Disconnect Exiting SHDN Time         |   |                   | 300 |     |     | ns    |

**Note 1:** The 300Ω minimum is the EIA/TIA-232E specification, but the actual resistance when in shutdown mode or when V<sub>CC</sub> = 0V is typically 300kΩ.

# Programmable DTE/DCE, +5V RS-232 Transceiver

## Typical Operating Characteristics

( $V_{CC} = 5V$ ,  $C_1$  to  $C_4 = 1\mu F$ , all transmitters loaded with  $3k\Omega$  in parallel with  $2.5nF$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)



# Programmable DTE/DCE, +5V RS-232 Transceiver

## Pin Description

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| PIN          | NAME                        | FUNCTION  |
|--------------|-----------------------------|---|
| 1, 2         | C2+, C2-                    | Terminals for negative charge-pump capacitor  |
| 3            | HI-Z                        | RS-232 receiver impedance control. Take high to disconnect the termination resistor.  |
| 4            | N.C.                        | No connect—not internally connected   |
| 5, 24, 25    | TA, TC, TB                  | TTL/CMOS driver A, C, B inputs  |
| 6, 8, 22, 23 | RA, RE, RC, RB              | TTL/CMOS receiver A, E, C, B outputs  |
| 7            | RDC                         | TTL/CMOS DTE receiver output D for $\overline{\text{DTE/DCE}} = 0\text{V}$ , or TTL/CMOS DCE receiver output C for $\overline{\text{DTE/DCE}} = +5\text{V}$ |
| 9, 18, 20    | TRA, TRC, TRB               | RS-232 DTE driver output for $\overline{\text{DTE/DCE}} = 0\text{V}$ , or RS-232 DCE receiver input for $\overline{\text{DTE/DCE}} = +5\text{V}$            |
| 10, 17, 19   | RTA, RTC, RTB               | RS-232 DTE receiver input for $\overline{\text{DTE/DCE}} = 0\text{V}$ , or RS-232 DCE driver output for $\overline{\text{DTE/DCE}} = +5\text{V}$            |
| 11           | RDC                         | RS-232 DTE receiver input D for $\overline{\text{DTE/DCE}} = 0\text{V}$ , or RS-232 DCE driver output C for $\overline{\text{DTE/DCE}} = +5\text{V}$        |
| 12           | RRE                         | RS-232 receiver input   |
| 13           | GND                         | Ground  |
| 14           | V-                          | -2V <sub>CC</sub> voltage generated by the charge pump  |
| 15           | V+                          | +2V <sub>CC</sub> voltage generated by the charge pump  |
| 16           | V <sub>CC</sub>             | +4.5V to +5.5V supply voltage   |
| 21           | $\overline{\text{DTE/DCE}}$ | Data terminal equipment (DTE) and data circuit-terminating equipment (DCE) control pin. DCE active high and DTE active low.                                 |
| 26           | SHDN                        | Shutdown control; shutdown high, normal operation low   |
| 27, 28       | C1+, C1-                    | Terminals for positive charge-pump capacitor  |

## Detailed Description

The MAX214 RS-232 transceiver provides a complete, 8-line, software-configurable, DTE or DCE port RS-232 interface. Tx, Rx, RTS, CTS, DTR, DSR, DCD, and RI circuits can be configured as either Data Terminal Equipment (DTE) or Data Circuit-Terminating Equipment (DCE) using the  $\overline{\text{DTE/DCE}}$  control pin. The MAX214 eliminates the need to swap cables when switching between DTE and DCE configurations. This is useful when, for example, a portable computer is required to communicate with printers, modems, and other computers without carrying multiple cables.

The MAX214 runs from a single +5V supply and incorporates a dual charge-pump voltage converter to generate the necessary voltages for the RS-232 transmitters. A shutdown mode is provided to save power when transmission is not required, but the receivers always stay active for simple detection of ring indicator signals.

## $\overline{\text{DTE/DCE}}$ Operation

The  $\overline{\text{DTE/DCE}}$  pin allows circuit configuration under software control. Tables 1a and 1b show the pin definitions of the MAX214 in both DTE and DCE modes. The Function columns show the direction of data flow from the input pin to the output pin of the MAX214, and onto the corresponding DB-25 connector's pin.

## +5V to $\pm 10\text{V}$ Dual Charge-Pump Voltage Converter

The +5V to  $\pm 10\text{V}$  conversion is performed by two charge-pump voltage converters (Figure 2). The first uses capacitor C1 to double the +5V to +10V, storing the +10V on the output filter capacitor, C3. The second charge-pump voltage converter uses C2 to invert the +10V to -10V, storing the -10V on the V- output filter capacitor, C4.









In shutdown mode, V+ is pulled to V<sub>CC</sub> by an internal resistor, and V- falls to GND.

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






MAX214

MAX214

**Table 1a. DTE-Operation Pin Configurations**

| TTL/CMOS<br>I/O LABEL       | MAX214<br>PIN | FUNCTION   | MAX214<br>PIN | RS-232<br>I/O LABEL | DB-25<br>PIN | INPUT<br>THRESHOLD |
|-----------------------------|---------------|--|---------------|---------------------|--------------|--------------------|
| Transmitter (TxD)           | 5             |   | 9             | TxD                 | 2            |                    |
| Receiver (RxD)              | 6             |   | 10            | RxD                 | 3            | +                  |
| Request to Send (RTS)       | 25            |   | 20            | RTS                 | 4            |                    |
| Clear to Send (CTS)         | 23            |   | 19            | CTS                 | 5            | -                  |
| Data Terminal Ready (DTR)   | 24            |   | 18            | DTR                 | 20           |                    |
| Data Set Ready (DSR)        | 22            |   | 17            | DSR                 | 6            | -                  |
| Detector Carrier Data (DCD) | 7             |   | 11            | DCD                 | 8            | +                  |
| Ring Indicator (RI)         | 8             |  | 12            | RI                  | 22           | +                  |

**Table 1b. DCE-Operation Pin Configurations**

| MAX214<br>PIN | FUNCTION  | MAX214<br>PIN | RS-232<br>I/O LABEL | DB-25<br>PIN | INPUT<br>THRESHOLD |
|---------------|---|---------------|---------------------|--------------|--------------------|
| 5             |  | 10            | RxD                 | 3            |                    |
| 6             |  | 9             | TxD                 | 2            | +                  |
| 25            |  | 19            | CTS                 | 5            |                    |
| 23            |  | 20            | RTS                 | 4            | -                  |
| 24            |  | 17            | DSR                 | 6            |                    |
|               |   | 11            | DCD                 | 8            |                    |
| 22            |  | 18            | DTR                 | 20           | -                  |
| 7             |   |               |                     |              |                    |
| 8             |  | 12            | RI                  | 22           | +                  |

## Programmable DTE/DCE, +5V RS-232 Transceiver

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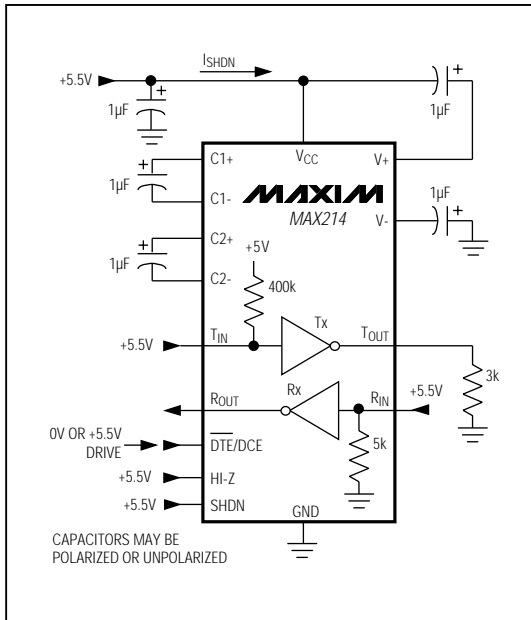


Figure 1. MAX214 Shutdown-Current Test Circuit

**RS-232 Drivers**  
With  $V_{CC} = 5V$ , the typical driver output voltage swing is  $\pm 8V$  when loaded with a nominal  $5k\Omega$  RS-232 receiver. Under worst-case operating conditions (including 116kbps data rate,  $3k\Omega \parallel 2500pF$  load,  $V_{CC} = 4.5V$ , maximum rated temperature) the output swing is guaranteed to meet the  $\pm 5V$  minimum specified by EIA/TIA-232 and V.28. The open-circuit output voltage swing ranges from  $(V_+ - 0.6V)$  to  $V_-$ .

Input thresholds are both CMOS and TTL compatible. The inputs of unused drivers can be left unconnected because  $400k\Omega$  pull-up resistors to  $V_{CC}$  are included on-chip. Since all drivers invert, the pull-up resistors force the outputs of unused drivers low. The input pull-up resistors typically source  $10\mu A$ ; in shutdown mode, they are disconnected to reduce supply current.

When in low-power shutdown mode, the driver outputs are turned off and their leakage current is less than  $1\mu A$ , even if the transmitter output is back-driven with voltages up to  $\pm 15V$ .

**RS-232 Receivers**  
The receivers convert the RS-232 signals to CMOS-logic levels. They invert, to match the inversion of RS-232 drivers. The guaranteed receiver input thresholds are significantly tighter than the  $\pm 3V$  thresholds required by the EIA/TIA-232E specification,

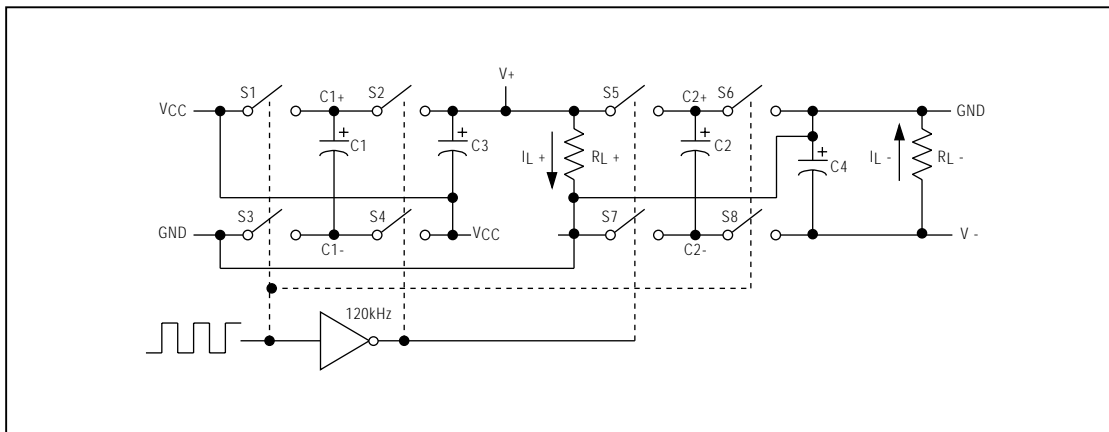


Figure 2. Charge-Pump Diagram

## Programmable DTE/DCE, +5V RS-232 Transceiver

**Table 2. Control Pin Configurations**

| CONTROL INPUTS |      |         | RS-232 PINS              |                          |                          |
|----------------|------|---------|--------------------------|--------------------------|--------------------------|
| SHUTDOWN       | HI-Z | DTE/DCE | TRA, TRB, TRC            | RTA, RTB, RTC, RDTC      | RRE                      |
| 0              | 0    | 0       | Transmit Mode            | Receive Mode/5k $\Omega$ | Receive Mode/5k $\Omega$ |
| 0              | 0    | 1       | Receive Mode/5k $\Omega$ | Transmit Mode            | Receive Mode/5k $\Omega$ |
| 0              | 1    | 0       | Transmit Mode            | Receive Mode/HI-Z        | Receive Mode/HI-Z        |
| 0              | 1    | 1       | Receive Mode/HI-Z        | Transmit Mode            | Receive Mode/HI-Z        |
| 1              | 0    | 0       | Disabled/HI-Z            | Slow Receive/HI-Z        | Slow Receive/HI-Z        |
| 1              | 0    | 1       | Slow Receive/HI-Z        | Disabled/HI-Z            | Slow Receive/HI-Z        |
| 1              | 1    | 0       | Disabled/HI-Z            | Slow Receive/HI-Z        | Slow Receive/HI-Z        |
| 1              | 1    | 1       | Slow Receive/HI-Z        | Disabled/HI-Z            | Slow Receive/HI-Z        |

which improves noise margins. The polarity of each receiver's input threshold is shown in Tables 1a and 1b. In normal operating mode, receiver inputs are internally connected to ground with 5k $\Omega$  resistors. So unconnected receivers with positive input thresholds have high outputs, and those with negative input thresholds have low outputs.

When shut down, all receivers have positive thresholds. This allows the receiver inputs to respond to TTL-/CMOS-logic levels, as well as RS-232 levels. The guaranteed 0.8V input threshold ensures that receivers shorted to ground will have a logic 1 output. Also, the 300k $\Omega$  input resistance to ground ensures that a receiver with its input left open will also have a logic 1 output.

The receiver's 0.5V of hysteresis provides clean output transitions, even with slow rise-time and fall-time signals with moderate amounts of noise and ringing. The receivers have no hysteresis in shutdown mode.

### HI-Z Control

The receiver inputs are terminated with 5k $\Omega$  resistors, to comply with the requirements of EIA/TIA-232E. However, these internal resistors can be disconnected by taking the HI-Z control pin to a logic high. This makes all of the MAX214's receiver inputs high impedance, and facilitates the transmission of RS-232 data from a single transmitter to multiple receivers. In this case, all but one of the receiving ICs should be put into the high input-impedance state.

### Shutdown Control

In shutdown mode, the charge pumps are turned off, V<sub>+</sub> is pulled down to V<sub>CC</sub>, V<sub>-</sub> is pulled to ground, and the transmitter outputs are disabled. This reduces supply current typically to 4 $\mu$ A. The time required to exit shutdown is about 250 $\mu$ s, as shown in Figure 3.

### Receivers

Receiver outputs never go into a high-impedance state; they are always active, even in shutdown mode (see Table 2). These awake-in-shutdown receivers are useful for monitoring external activity (for example, on RI), while maintaining minimal power consumption. Receivers in shutdown mode are slower (20kbps) than when not shut down (116kbps), and lack the hysteresis present in normal operation.

### Drivers

The driver outputs are high impedance in shutdown mode, even when back-driven with voltages up to  $\pm 15$ V.

## Applications Information

### Capacitor Selection

The type of capacitor (C1 to C4) used is not critical for proper operation. The MAX214 requires 1 $\mu$ F capacitors, although in all cases capacitors of up to 10 $\mu$ F can be used without harm. Ceramic dielectrics are suggested for the 1 $\mu$ F capacitors.



## Programmable DTE/DCE, +5V RS-232 Transceiver

When using the minimum recommended capacitor values, make sure the capacitance value does not degrade excessively as the operating temperature varies. If in doubt, use capacitors with a larger nominal value (for example, 2 times larger). The effective series resistance (ESR) of the capacitors may vary over temperature and increase when below 0°C. ESR influences the amount of ripple on V+ and V-, so if low ripple is required over wide temperature ranges, use larger capacitors or low-ESR types.

To reduce the output impedance at V+ and V-, use larger capacitors (up to 10 $\mu$ F). This can be useful when "stealing" power from V+ or from V-.

### Driver Outputs when Exiting Shutdown

Figure 3 shows the MAX214 driver outputs when exiting shutdown. As they become active, the two driver outputs are shown going to opposite RS-232 levels (one driver input is high, the other is low). Each driver is loaded with 3k $\Omega$  in parallel with 2.5nF.

### Power-Supply Bypassing

Decouple VCC to ground with a capacitor of the same value as the charge-pump capacitors.

### V+ and V- as Power Supplies

A small amount of power can be drawn from V+ and V-, although this will reduce noise margins. See the Output Voltage vs. Load Current graph in the *Typical Operating Characteristics*. Increasing the charge-

pump capacitor sizes up to 10 $\mu$ F reduces the impedance of the V+ and V- outputs.

### High Data Rates

The MAX214 maintains the RS-232  $\pm 5.0$ V minimum driver output voltage even at high data rates. The *Typical Operating Characteristics* show transmitter output voltage levels driving 3k $\Omega$  in parallel with various capacitive loads at data rates up to 120kbps.

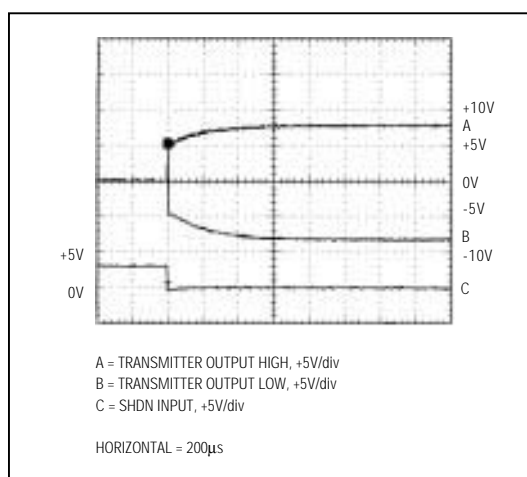


Figure 3. Transmitter Outputs When Exiting Shutdown

# Programmable DTE/DCE, +5V RS-232 Transceiver

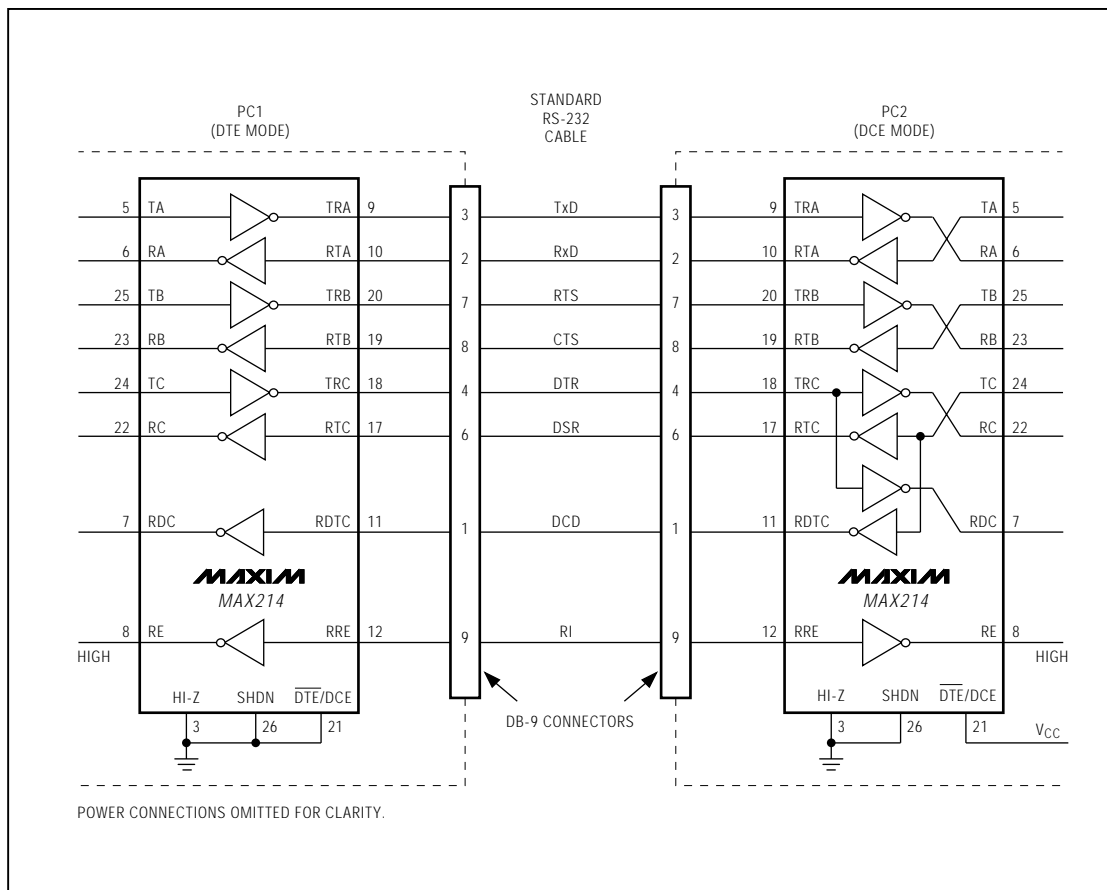


Figure 4. Typical Application Circuit Showing 2 PCs with Both DTE and DCE Operation

## MAX214

## Chip Topography

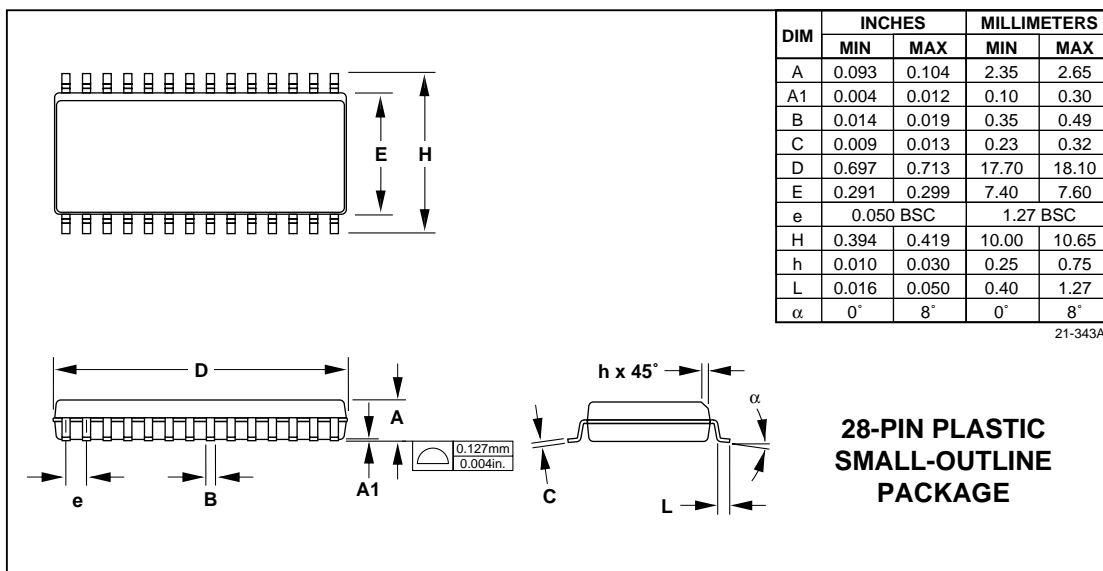
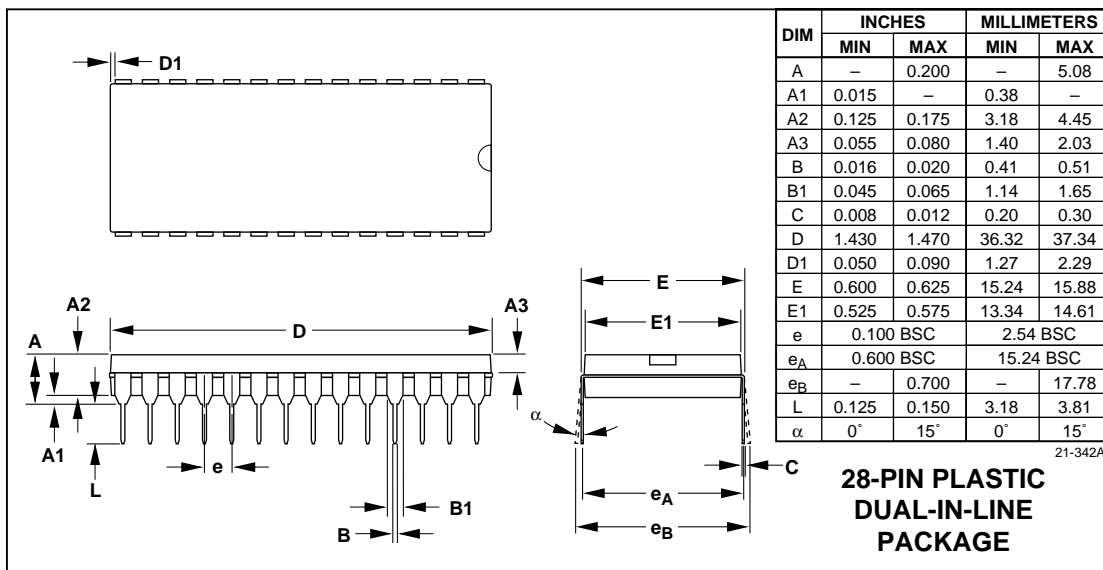
TRANSISTOR COUNT: 694;  
SUBSTRATE CONNECTED TO V+

**Table 4. DB9/DB25 Cable Connections Commonly Used for EIA/TIA-232 and V.24 Asynchronous Interfaces**

| DB9 PIN | DB25 PIN | NAME  | SYMBOL | FUNCTION                    |
|---------|----------|---|--------|-----------------------------|
| 1       | 8        | Received Line Signal Detector, sometimes called Data Carrier Detect | DCD    | Handshake from DCE          |
| 2       | 3        | Receive Data  | RxD    | Data from DCE               |
| 3       | 2        | Transmit Data   | TxD    | Data from DTE               |
| 4       | 20       | Data Terminal Ready   | DTR    | Handshake from DTE          |
| 5       | 7        | Signal Ground   | GND    | Reference point for signals |
| 6       | 6        | Data Set Ready  | DSR    | Handshake from DCE          |
| 7       | 4        | Request to Send   | RTS    | Handshake from DTE          |
| 8       | 5        | Clear to Send   | CTS    | Handshake from DCE          |
| 9       | 22       | Ring Indicator  | RI     | Handshake from DCE          |

# Programmable DTE/DCE, +5V RS-232 Transceiver

## Package Information



Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

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