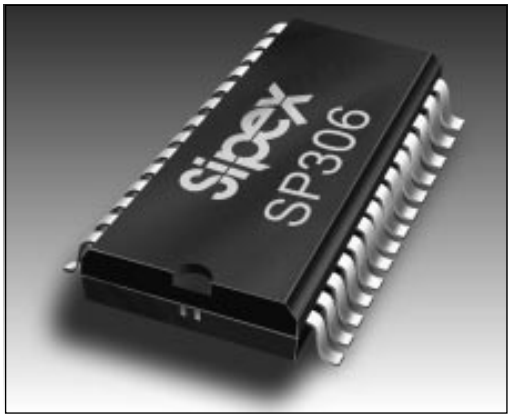
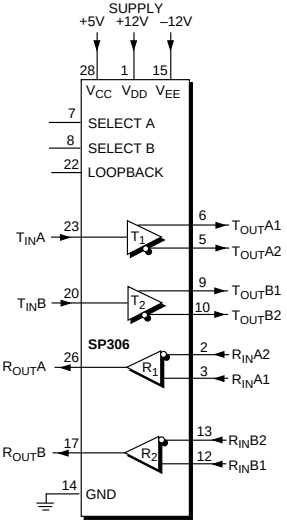
RS-422/RS-423 Line Drivers/Receivers

- Single chip serial transceiver supports RS-422 or RS-423 interfaces
- Programmable Selection of Interface
- Two Full–Duplex Channels of Either Interface
- Software–Selectable Mode
- Loopback for Self–Testing
- Short–Circuit Protected
- Surface Mount Packaging



DESCRIPTION…

The **SP306** is a single chip device that offers both RS-422 and RS-423–type serial interfaces. The device can be programmed to provide two full–duplex channels of either RS-422 or RS-423 via two mode control pins. The **SP306** also features a loopback function that can be activated in any operating mode. The **SP306** is available in a 28–pin SOIC package for operation over the commercial temperature range.



SPECIFICATIONS

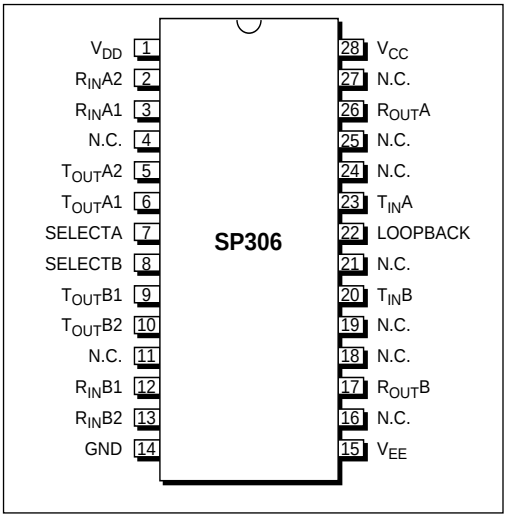
($T_{MIN} \leq T_A \leq T_{MAX}$ and nominal supply voltages unless otherwise noted)

PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITIONS
RS-423 DRIVER					
TTL Input Level					
V_{IL}	0		0.8	V	
V_{IH}	2.0			V	
High Level Output	+3.0		+6.0	V	$R_L = 450\Omega$, $V_{IN} = 0.8V$; Note 6
			(V_{DD} – 0.7V)	V	$R_L = \infty$
Low Level Output	–3.0		–6.0	V	$R_L = 450\Omega$, $V_{IN} = 2.0V$; Note 6
			(V_{EE} +0.7V)	V	$R_L = \infty$
Short Circuit Current			±40	mA	$V_{OUT} = 0V$; Note 2
Transition Time		720		ns	$R_L = 450\Omega$, $C_L = 50pF$; Note 3
Maximum Transmission Rate	100			kbps	
RS-423 RECEIVER					
Input Threshold	–200		+200	mV	Common–mode = ±7V; Note 1
Input Impedance	4			kΩ	$R_{IN} = \pm 10V$
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	100			kbps	
RS-422 DRIVER					Note 3
TTL Input Level					
V_{IL}	0		0.8	V	
V_{IH}	2.0			V	
High Level Output	+2.75		+6	V	$I_{OH} = –20mA$
Low Level Output			+1.0	V	$I_{OL} = 20mA$
Differential Output	±2.0			V	$R_L = 100\Omega$
			±6.0	V	$R_L = \infty$
Short Circuit Current			±100	mA	
Output Current			±500	µA	$–0.25V \leq V_O \leq 6V$; Power off
Transition Time			400	ns	R_L=450Ω, C_L=15pF; Note 3
Maximum Transmission Rate	500			kbps	
RS-422 RECEIVER					
Common Mode Range			±7	V	Note 4
Differential Input			±15	V	Note 4
Differential Input Threshold	–0.2		+0.2	V	T_A=25°C
Input Voltage Hysteresis	30			mV	V_{CM}=0V;T_A=25°C
Input Resistance	3			kΩ	$–7V \leq V_{CM} \leq +7V$
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	500			kbps	
Short Circuit Output Current			±120	mA	V_{OUT}=0V
POWER REQUIREIMENTS					
V_{DD} = +12V		7	15	mA	All Transmitter outputs R_L=∞
V_{CC} = +5V		5	7	mA	T_A=25°C
V_{EE} = –12V		11	20	mA	
ENVIRONMENTAL AND MECHANICAL					
Operating Temperature					
–C	0		+70	°C	
–M	–55		+125	°C	
Storage Temperature	–65		+150	°C	
Package					
–C	28–pin SOIC				
–F	28–pin Ceramic Flatpack				

Note:

1. The common mode voltage is defined as the algebraic mean of the two voltages appearing at the receiver input terminals with respect to the receiver circuit ground.
2. Only one output drive pin per package will be shorted at any time.
3. From 10% to 90% of steady state.
4. This is an absolute maximum rating. Normal operating levels are $V_{IN} \leq 5V$.
5. Outputs unloaded. Inputs tied to GND; T_A=+25°C; V_{IL} = 0V; LB = 0.
6. V_{OL}/V_{OH} will typically be ±3V over –55°C to +125°C with 450Ω loads.

PINOUT



PIN ASSIGNMENTS

Pin 1 — V_{DD} — +12V Power Supply.

Pin 2 — $R_{IN}A2$ — RS422 input.

Pin 3 — $R_{IN}A1$ — RS422/RS423 input.

Pin 4 — N.C. — No Connection.

Pin 5 — $T_{OUT}A2$ —RS422 output.

Pin 6 — $T_{OUT}A1$ — RS422/RS423 output.

Pin 7 — SEL A — Select A; used with Select B (pin 8) to select operating mode; please refer to ***SP306*** *Control Logic Configuration* section for truth table.

Pin 8 — SEL B — Select B; used with Select A (pin 7) to select operating mode; please refer to ***SP306*** *Control Logic Configuration* section for truth table.

Pin 9— $T_{OUT}B1$— RS422/RS423 output.

Pin 10 — $T_{OUT}B2$ — RS422 output.

Pin 11 — N.C. — No Connection.

Pin 12— $R_{IN}B1$— RS422/RS423 input.

Pin 13 — $R_{IN}B2$— RS422 input

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

Pin 15 — V_{EE} — –12V Power Supply.

Pin 16 — N.C. — No Connection.

Pin 17 — $R_{OUT}B$ — TTL output.

Pin 18 — N.C. — No Connection.

Pin 19 — N.C. — No Connection.

Pin 20 — $T_{IN}B$ — TTL input.

Pin 21 — N.C. — No Connection.

Pin 22 — LOOPBACK — Active low; logic "1" selects operating mode controlled by SELECT A and SELECT B; logic "0" selects loopback configuration for whatever operating mode is selected by states of SELECT A and SELECT B.

Pin 23 — $T_{IN}A$ — TTL input.

Pin 24 — N.C. — No Connection.

Pin 25 — N.C. — No Connection.

Pin 26 — $R_{OUT}A$ — TTL output.

Pin 27 — N.C. — No Connection.

Pin 28 — V_{CC} — +5V Power Supply.

FEATURES...

The **SP306** is a single chip device that offers both RS-422 and RS-423 serial interfaces. The device can be programmed via two control mode pins (7 and 8). In either operating mode, the **SP306** provides two full–duplex channels. A loopback function is also provided for chip self–test, which connects driver outputs to receiver inputs with no external circuitry.

The RS-422 drivers convert TTL logic levels into RS-422 differential output signals. The RS-422 line driver outputs feature high source

and sink current capability. The RS423 line drivers convert TTL logic levels into inverted RS-423 output signals. All line drivers are internally protected against short circuits on their outputs.

The RS-422 receivers convert the RS-422 differential input signals into non–inverted TTL logic levels. Receiver input thresholds are ±200mV. The RS-422 receivers can receive input data up to 1Mbps. The RS-423 receivers convert the RS-423 input signals into inverted TTL output logic levels. The RS-423 receivers have an input threshold of ±200mV, and can receive data up to 100kbps.

A loopback test mode is provided that puts the driver outputs into a high impedance tri–state level, and routes the driver outputs to their associated receiver inputs. In this configuration, the signal path is non–inverting from the TTL driver inputs to the receiver TTL outputs. This operating mode allows the controlling system to perform diagnostic self–test of the RS-422/ RS-423 transceiver circuitry at speeds up to 3kbps.

APPLICATION INFORMATION

Control Logic Configuration

Software control of the **SP306** is via two select pins (7 and 8) and a loopback control pin (22). SELECT A and SELECT B allow the user to program the **SP306** for four different interface modes. Loopback mode can be selected in any of these interface modes. The figures that follow outline the various operating modes that are supported by the **SP306**.

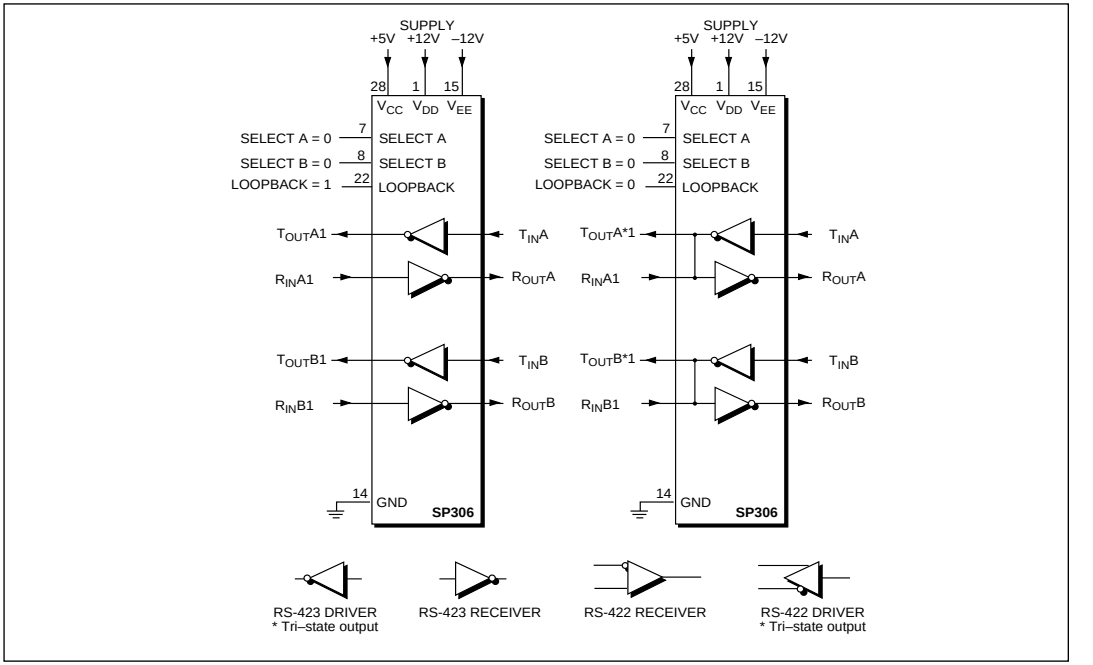


Figure 1. Control Input Configuration — SELECT A = 0, SELECT B = 0

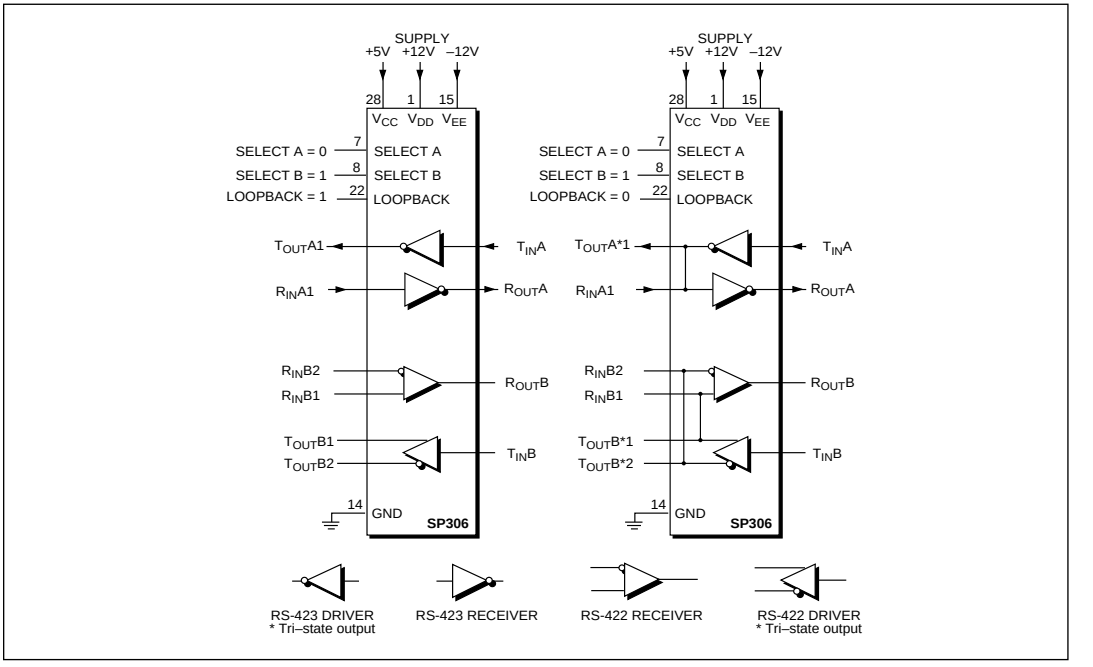


Figure 2. Control Input Configuration — SELECT A = 0, SELECT B = 1

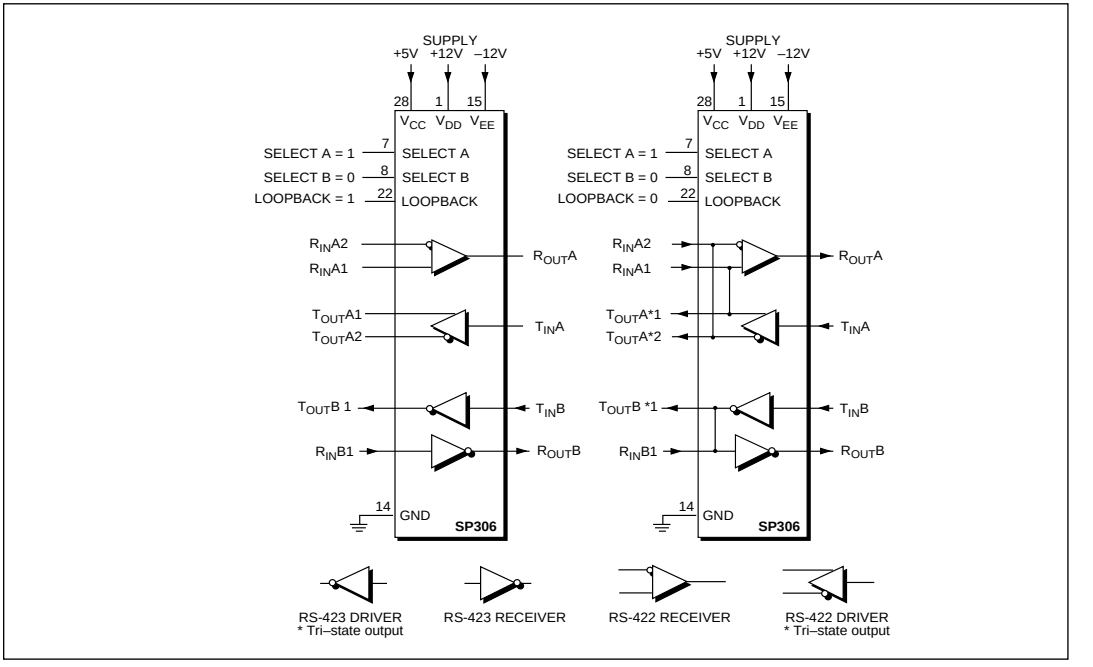


Figure 3. Control Input Configuration — SELECT A = 1, SELECT B = 0

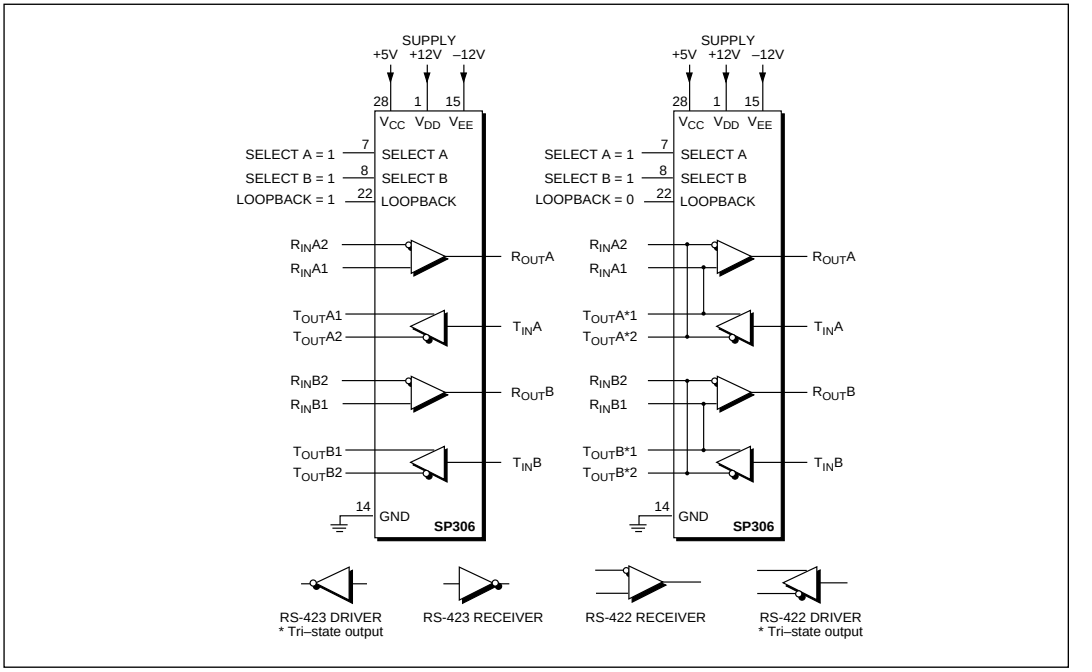


Figure 4. Control Input Configuration — SELECT A = 1, SELECT B = 1

ORDERING INFORMATION

Model	Temperature Range	Package
Two full–duplex channels RS-422/RS-423		
SP306CT	0°C to +70°C	28–pin SOIC
SP306MF	–55°C to +125°C	28–pin Ceramic Flatpack