



GENERAL DESCRIPTION

The SP339 is an advanced multiprotocol transceiver supporting RS-232, RS-485, and RS-422 serial standards in a 40 pin QFN package. Integrated cable termination and four configuration modes allow all three protocols to be used interchangeably over a single cable or connector with no additional switching components. Full operation requires only four external charge pump capacitors.

The RS-485/422 modes feature one driver and one receiver (1TX/1RX) in both half and full duplex configurations. The RS-232 mode (3TX/5RX) provides full support of all eight signals commonly used with the DB9 RS-232 connector. A dedicated diagnostic loopback mode is also provided.

The high speed drivers operate up to 20Mbps in RS-485/422 modes, and up to 1Mbps in RS-232 mode. All drivers can be slew limited to 250kbps in any mode to minimize electromagnetic interference (EMI).

All transmitter outputs and receiver inputs feature robust electrostatic discharge (ESD) protection to $\pm 15\text{kV}$ IEC-61000-4-2 Air Gap, $\pm 8\text{kV}$ IEC-61000-4-2 Contact, and $\pm 15\text{kV}$ Human Body Model (HBM). Each receiver output has full fail-safe protection to avoid system lockup, oscillation, or indeterminate states by defaulting to logic-high output level when the inputs are open, shorted, or terminated but undriven. No external biasing resistors are required.

The RS-232 receiver inputs include a $5\text{k}\Omega$ pull-down to ground. The RS-485/422 receiver inputs are high impedance ($>96\text{k}\Omega$ when termination is disabled), allowing up to 256 devices on a single communication bus (1/8th unit load).

The SP339 operates from a single power supply, either 3.3V or 5V, with low idle current (2mA typical in all modes). The shutdown mode consumes less than $10\mu\text{A}$ for low power standby operation.

FEATURES

- Pin selectable Cable Termination
- No external resistors required for RS-485/422 termination and biasing
- 3.3V or 5V Single Supply Operation
- Robust ESD Protection on bus pins
 - $\pm 15\text{kV}$ IEC 61000-4-2 (Air Gap)
 - $\pm 8\text{kV}$ IEC 61000-4-2 (Contact)
 - $\pm 15\text{kV}$ Human Body Model (HBM)
- Max Data Rate of 20Mbps in RS-485/422 Modes and up to 1Mbps in RS-232 Modes
- Pin selectable 250kbps Slew Limiting
- 3 Drivers, 5 Receivers RS-232/V.28
- 1 Driver, 1 Receiver RS-485/422
 - Full and Half Duplex Configuration
 - 1/8th Unit Load, up to 256 receivers on bus
- RS-485/422 Enhanced Failsafe for open, shorted, or terminated but idle inputs
- Space saving 6mm x 6mm QFN-40 Package
- Pin compatible with SP338E

TYPICAL APPLICATIONS

- Dual Protocol Serial Ports (RS-232 or RS-485/422)
- Industrial Computers
- Industrial and Process Control Equipment
- Point-Of-Sale Equipment
- Networking Equipment
- HVAC Controls Equipment
- Building Security and Automation Equipment

ORDERING INFORMATION

PART NUMBER	PACKAGE	OPERATING TEMPERATURE RANGE	DEVICE STATUS
SP339EER1-L	40-pin QFN	-40°C to +85°C	Active
SP339EER1-L/TR	40-pin QFN	-40°C to +85°C	Active
SP339ECR1-L	40-pin QFN	0°C to +70°C	Active
SP339ECR1-L/TR	40-pin QFN	0°C to +70°C	Active

NOTE: -L = Green / RoHS Compliant, /TR = Tape and Reel

ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections to the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability and cause permanent damage to the device.

Supply Voltage V_{CC}	-0.3V to +6.0V
Receiver Input Voltage (from Ground)	$\pm 18V$
Driver Output Voltage (from Ground)	$\pm 18V$
Short Circuit Duration, TX out to Ground	Continuous
Voltage at TTL Input Pins	-0.3V to ($V_{CC} + 0.5V$)
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Power Dissipation 40-pin QFN (derate 17mW/°C above +70°C)	500mW

CAUTION:

ESD (ElectroStatic Discharge) sensitive device. Permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. Personnel should be properly grounded prior to handling this device. The protective foam should be discharged to the destination socket before devices are removed.

ESD PROTECTION

		MIN.	TYP.	MAX.	UNITS	
R1-R9	Tx Output & Rx Input Pins		± 15		kV	Human Body Model (HBM)
			± 8		kV	IEC 61000-4-2 (Contact)
			± 15		kV	IEC 61000-4-2 (Air Gap)
	All Other Pins		± 4		kV	Human Body Model (HBM)

PIN DESCRIPTIONS BY MODE (MODE1, MODE0)

Pin	Name	00, Figure 1	01, Figure 2	10, Figure 3	11, Figure 4
1	L1	R1 Output		1	1
2	L2	R2 Output		R1 Output	R1 Output
3	L3	T1 Input		T1 Input	T1 Input
4	L4	T2 Input			
5	L6	R3 Output		1	1
6	L7	T3 Input			
7	L8	R4 Output		1	1
8	L9	R5 Output		1	1
9	VCC	V _{CC}			
10	GND	Ground			
11	SLEW	SLEW = V _{CC} enables 250kbps slew limiting			
12	DIR1			T1 Enable, R1 Disable	T1 Enable
13	N/C	This pin is not used and is not connected internally			
14	MODE0	0	1	0	1
15	MODE1	0	0	1	1
16	N/C	This pin is not used and is not connected internally			
17	TERM			Enables RS-485/422 receiver termination	
18	N/C	This pin is not used and is not connected internally			
19	ENABLE	ENABLE = V _{CC} for operation, ENABLE = 0V for shutdown			
20	VCC	V _{CC}			

PIN DESCRIPTIONS BY MODE (MODE1, MODE0)

Pin	Name	00, Figure 1	01, Figure 2	10, Figure 3	11, Figure 4
21	R9		R5 Input		
22	R8		R4 Input		
23	GND	Ground			
24	R7		T3 Output		
25	R6		R3 Input		
26	GND	Ground			
27	R4		T2 Output		R1 Input B
28	R3		T1 Output		R2 Input A
29	GND	Ground			
30	R2		R2 Input	R1 Input A, T1 Out A	T1 Out A
31	R1		R1 Input	R1 Input B, T1 Out B	T1 Out B
32	VCC	V_{CC} - 1.0 μ F to ground recommended for supply decoupling			
33	VSS	V_{SS} - Charge pump negative supply, 0.1 μ F from ground			
34	C2-	C_{2+} - Charge pump cap 2 negative lead			
35	C1-	C_{1-} - Charge pump cap 1 negative lead			
36	GND	Ground			
37	C1+	C_{1+} - Charge pump cap 1 positive lead, 0.1 μ F			
38	VCC	V_{CC}			
39	C2+	C_{2+} - Charge pump cap 2 positive lead, 0.1 μ F			
40	VDD	V_{DD} - Charge pump positive supply, 0.1 μ F to ground			

ELECTRICAL CHARACTERISTICS

UNLESS OTHERWISE NOTED:

 $V_{CC} = +3.3V \pm 5\%$ or $+5.0V \pm 5\%$, $C1-C4 = 0.1\mu F$; $T_A = T_{MIN}$ to T_{MAX} . Typical values are at $V_{CC} = 3.3V$, $T_A = +25^\circ C$.

SYMBOL	PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
DC CHARACTERISTICS						
I_{CC}	Supply Current (RS-232)		2	8	mA	No load, idle inputs
I_{CC}	Supply Current (RS-485)		2	8	mA	No load, idle inputs
I_{CC}	Vcc Shutdown Current		1	10	μA	ENABLE = 0V
TRANSMITTER and LOGIC INPUT PINS: Pins 3, 4, 6, 11, 12, 14, 15, 17-19						
V_{IH}	Logic Input Voltage High	2.0			V	$V_{CC} = 3.3V$
V_{IH}	Logic Input Voltage High	2.4			V	$V_{CC} = 5.0V$
V_{IL}	Logic Input Voltage Low			0.8	V	
I_{IL}	Logic Input Leakage Current Low			1	μA	Input Low ($V_{IN} = 0V$)
I_{IH}	Logic Input Leakage Current High			1	μA	Input High ($V_{IN} = V_{CC}$), pins 3, 4 and 6
I_{PD}	Logic Input Pull-down Current			50	μA	Input High ($V_{IN} = V_{CC}$), pins 11, 12, 14, 15, 17-19
V_{HYS}	Logic Input Hysteresis		200		mV	
RECEIVER OUTPUTS: Pins 1, 2, 5, 7, 8						
V_{OH}	Receiver Output Voltage High	$V_{CC}-0.6$			V	$I_{OUT} = -1.5mA$
V_{OL}	Receiver Output Voltage Low			0.4	V	$I_{OUT} = 2.5mA$
I_{OSS}	Receiver Output Short Circuit Current		± 20	± 60	mA	$0 \leq V_O \leq V_{CC}$
I_{OZ}	Receiver Output Leakage Current		± 0.1	± 1	μA	$0 \leq V_O \leq V_{CC}$, Receivers disabled

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