

Standard Interface Guide

Technology ideal for all applications

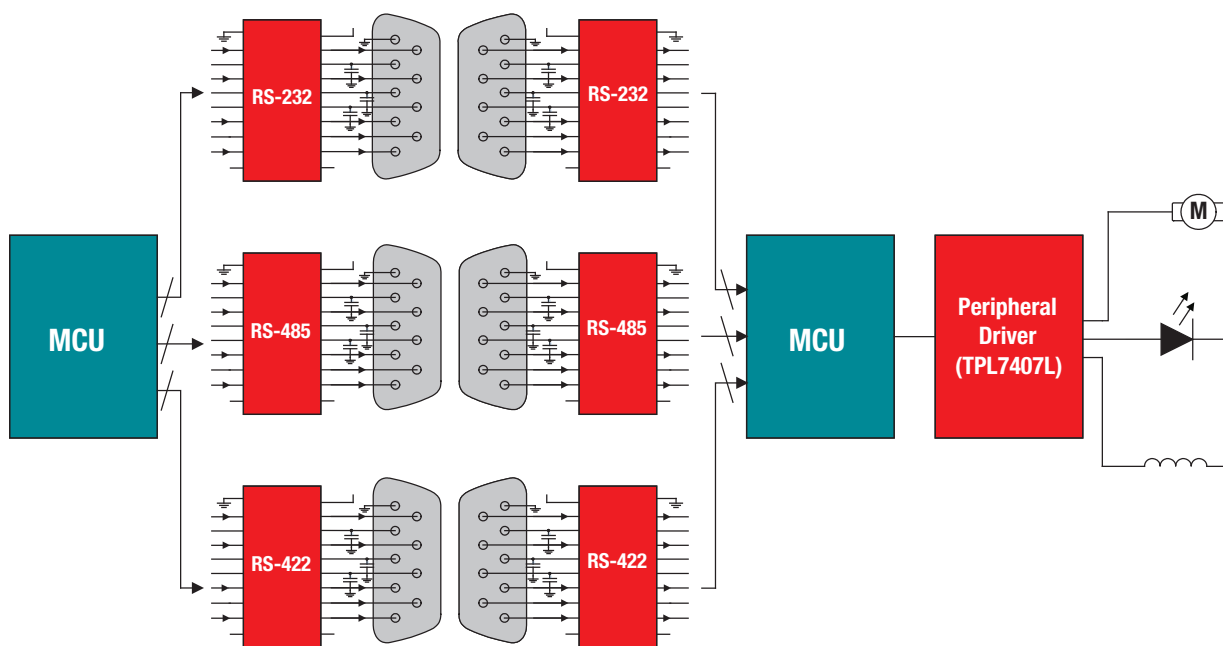


Standard Interface Overview

Why RS Serial Communication?

RS-232/422/485 are standards for serial communication transmission of data. These interface standards were once used in personal computers in order to communicate with peripherals such as printers, displays and other external systems. Although USB has displaced the RS standard in personal computers, it remains present within systems such as networking equipment, industrial machines and scientific instruments. Unlike USB, RS-232/422/485 is not limited to cable lengths of 5 meters or less, thus favoring applications that require longer distances; i.e. across a room, from one system to another. Furthermore; the RS standard does not require complex software support since it does not incorporate a protocol for transfer and does not require an external device for decoding data. Within industrial applications such as PLCs, servo drivers or other automation systems, RS-232 is used for direct programming. Serial ports are also commonly used to communicate to headless systems such as servers or other networking systems like routers, where no monitor or keyboard is installed and during boot when no network connection is possible and condition monitoring is needed. Here are some of the key benefits from these standards:

- RS-232: Single ended and can drive high voltage devices
- RS-422: Differential operation and up to 1000m of cable length
- RS-485: Similar to RS-422 but allows an increased number of drivers and receivers (up to 32)



Why Peripheral Drivers?

Low voltage logic systems, microcontrollers and FPGAs are often tasked with controlling or driving high voltage or high current systems. A common solution to driving these high voltage systems is the use of discrete MOSFETs; however when the system requires a large number of peripherals, an integrated solution is a great space and cost saving alternative. TI has a broad portfolio of peripheral drivers covering applications with a large number of peripherals to very high voltages and currents.

RS232 Interfaces

3V to 5.5V Supply, with ESD Protection, and automatic power down

TI's RS-232 devices are commonly used in computer serial ports for battery powered systems, laptops, industrial automation, and home automation. These devices generate their own higher voltage to drive the RS-232 and operate with a 3V to 5.5V supply. TI's RS-232 devices also offer ESD protection up to 15kV, data transfer rates of up to 1,000kbit/s, and a power down state to reduce the supply current.

RS-232

Device	Data Rate (kbps)	# of TX	# of RX	Supply Voltage(s) (V)	ESD (kV)	IEC 61000-4-2 Support	Icc (max) (mA)	Powerdown Feature
MC1489/A	>1,000	0	4	5	—	—	26	—
SN75x189/A	>1,000	0	4	5	—	—	26	—
SN65C3221E	1,000	1	1	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
SN751701	300	1	1	±12.0	—	—	14	—
SN75C3221E	1,000	1	1	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
MAX/TRS3221	250	1	1	3.3 or 5.0	±15	—	1	Auto-Powerdown
MAX/TRS3221E	250	1	1	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
MAX/TRS3227E	1,000	1	1	3.3 or 5.0	±15	Yes	2	Auto-Powerdown+
TRSF3221E	1,000	1	1	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
UA9636A	7+	2	0	±12.0	—	—	±18	—
SN65C32x2E	1,000	2	2	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
SN75C32xxE	1,000	2	2	3.3 or 5.0	±15	Yes	1	—
SNx5C322xE	100	2	2	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
MAX/TRS202	120	2	2	5	±15	—	15	—
MAX/TRS232/E	250	2	2	5	±15	Yes	10	—
MAX/TRS322xE	500	2	2	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
MAX/TRS3232E	250	2	2	3.3 or 5.0	±15	Yes	1	—
MAX/TRS3318/E	460	2	2	2.25 to 3.0	±15	Yes	2	Auto-Powerdown+
TRS202E	120	2	2	5	±15	Yes	15	—
TRSF32xxE	1,000	2	2	3.3 or 5.0	±15	Yes	1	—
MAX/TRS3386E	250	3	2	3.3 or 5.0 and 1.8	±15	Yes	1	Powerdown
TL145406	120	3	3	±9.0 and 5.0	±2	—	±25	—
SN75185	120	3	5	±9.0 and 5.0	±10	—	30	—
SN75C185	120	3	5	±12.0 and 5.0	±2	—	0	—
SN75LV4737A	128	3	5	3.3 or 5.0	±4	—	21	—
MAX/TRS3243	250	3	5	3.3 or 5.0	±15	—	1	Auto-Powerdown
MAX/TRS3243E	500	3	5	3.3 or 5.0	±15	Yes	1	Auto-Powerdown
TRS3253E	1,000	3	5	3.3 or 5.0 and 1.8	±15	—	1	Auto-Powerdown+
TRSF3243	1,000	3	5	3.3 or 5.0	±15	—	1	Auto-Powerdown
LT1030	120	4	0	±15.0	—	—	1	—
MAX/TRS208	120	4	4	5	±15	—	20	—
MAX/TRS211/3	120	4	5	5	±15	—	20	—
GD75323	120	5	3	±9.0 and 5.0	—	—	±32	—
SN65C3238E	1,000	5	3	3.3 or 5.0	±15	Yes	2	Auto-Powerdown+
SN75C3238E	1,000	5	3	3.3 or 5.0	±15	Yes	2	Auto-Powerdown+
MAX/TRS3237E	1,000	5	3	3.3 or 5.0	±15	Yes	2	—
MAX/TRS3238	250	5	3	3.3 or 5.0	±15	—	2	Auto-Powerdown
MAX/TRS3238E	400	5	3	3.3 or 5.0	±15	Yes	2	Auto-Powerdown
TRSF3238E	1,000	5	3	3.3 or 5.0	±15	Yes	2	Auto-Powerdown+
TRSF23243	250	6	10	3.3 or 5.0	±15	—	2	Auto-Powerdown

RS422/RS485 Interfaces

Low supply voltage, with three state driver and receiver output

Texas Instruments is the world leader in RS-422/RS-485, with a selection of transceivers for any application. TI provides industry-standard RS-422/RS-485 solutions for industrial automation, motion control, e-meters, security electronics, building automation and hundreds of other applications where robust communication with high noise-immunity is needed over long cable lengths. TI offers single channels or multiple channels, half- or full-duplex, 3.3V-supply or 5V-supply, with a variety of features including high voltage standoff, failsafe receivers, and integrated isolation. Evaluation kits, simulation models, and application notes make it easy to design with RS-422/RS-485 from Texas Instruments.

RS-422

Part Number	# of TX/RX	Supply Voltage(s) (V)	Sampling Rate (Mbps)	ESD (kV)	Icc (max) (mA)	Footprint	RS422	RS423
UA9637A	0 TX/2 RX	5	10	2	50	uA9637	Yes	Yes
AM26C32/LS32A/LS33A	0 TX/4 RX	5	10	2	70	AM26LS32	Yes	Yes
AM26LV32/E	0 TX/4 RX	3	32	15	17	AM26LS32	Yes	—
SN75176A/6B/8B	1 TX/1 RX	5	10	2	50	SN75176	Yes	—
SN75179B	1 TX/1 RX	5	10	2	70	SN75179	Yes	—
SN75ALS180/181	1 TX/1 RX	5	25	2	30	SN75ALS180	Yes	—
UA9638	2 TX/0 RX	5	15	2	65	uA9638	Yes	—
SN7534051/ALS1178	2 TX/2 RX	5	10	2	110	MC34051	Yes	—
SN75C1168	2 TX/2 RX	5	10	2	9	MC34051	Yes	—
AM26LS31/C31	4 TX/0 RX	5	10	2	80	AM26LS31	Yes	—
AM26LV31/E	4 TX/0 RX	3	32	15	0	AM26LS31	Yes	—
MC3487	4 TX/0 RX	5	10	2	85	MC3487	Yes	—
SN75ALS174/A	4 TX/0 RX	5	20	2	55	MC3487	Yes	—

RS-485

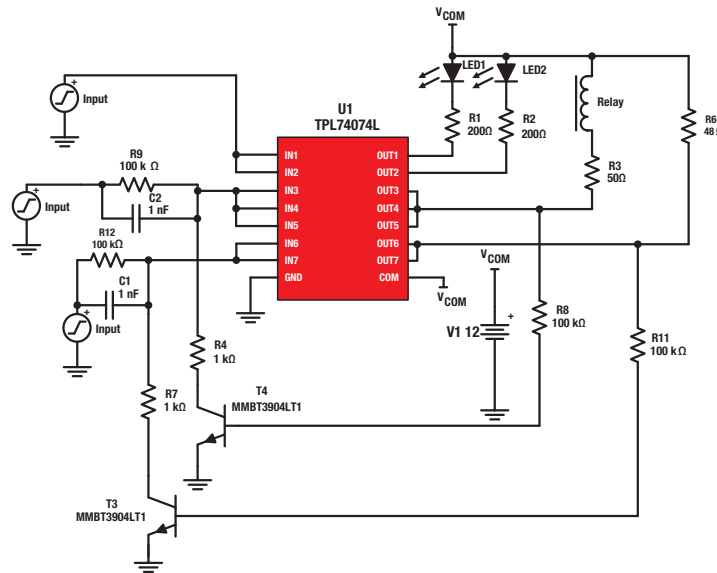
Device Name	# of TX/RX	Supply Voltage(s) (V)	Sampling Rate (Mbps)	Duplex	ESD (kV)	Icc (mA)	Fail Safe	Footprint
SN75157	0 TX/2 RX	5	4	Simplex	2	50	None	SN75157
SN75173/ALS173	0 TX/4 RX	5	10	Simplex	2	70	Open	AM26LS32
SN65175	0 TX/4 RX	5	10	Simplex	2	70	None	MC3486
SN75175/ALS175	0 TX/4 RX	5	10	Half	2	70	None	MC3486
SN65HVD3080E/83E/86E	1 TX/1 RX	5	20	Full	16	0	Short,Open,Idle	LBC180
SN65176B	1 TX/1 RX	5	10	Half	2	70	None	SN75176
SN65ALS176	1 TX/1 RX	5	35	Half	2	30	Open	SN75176
SN65HVD3082E/5E/8E	1 TX/1 RX	5	20	Half	15	0	Short,Open,Idle	SN75176
SN65HVD485E	1 TX/1 RX	5	10	Half	15	2	Open	SN75176
SN75176A	1 TX/1 RX	5	10	Half	2	50	None	SN75176
SN7517xB	1 TX/1 RX	5	10	Half	2	70	None	SN75176
SN75ALS176/A/B	1 TX/1 RX	5	35	Half	2	30	Open	SN75176
TL3695	1 TX/1 RX	5	10	Half	2	50	Open	SN75176
SN75179B	1 TX/1 RX	5	10	Full	2	70	None	SN75179
SNx5ALS180	1 TX/1 RX	5	25	Full	2	30	Open	SN75ALS180
SN751177/ALS1177	2 TX/2 RX	5	10	Full	2	110	None	MC34050
SN65C1168	2 TX/2 RX	5	10	Full	2	9	Open	MC34051
SN751178/ALS1178	2 TX/2 RX	5	10	Full	2	110	Open	MC34051
SN75ALS170/A	3 TX/3 RX	5	20	Half	2	90	Open	SN75ALS170

Peripheral Drivers

Dual Very-High Speed, High-Current, Open-Collector, Quadruple Half-H Peripheral Drivers

TI's peripheral drivers are the perfect choice for relay drivers, power supplies, motor control, incandescent lamps, and driving MOSFET gates. These devices use logic gates and output transistors to switch large currents at high voltages. With support for up to 2A of current output per channel, and up to 50V, these devices are useful for driving low and high voltage peripherals within refrigerators, washing machines, HVAC, motor control, and power delivery for telecom infrastructure.

Over Current Protected Relay Driver

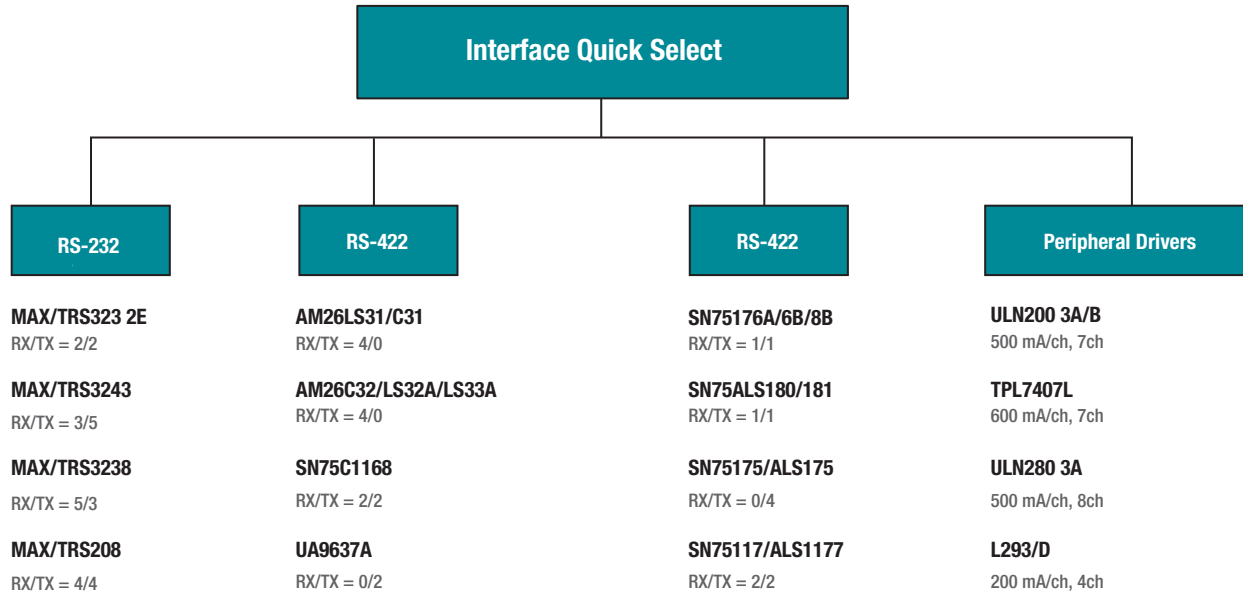


Peripheral Drivers

Device	Peak Output Current (mA)	Output Voltage (max) (V)	Delay Time (typ) (ns)	Input Compatibility	Drives per Package	GATE	Quad Half-H	Output Clamp Diodes
DS3680	100	60	1,000	CMOS, TTL	4	BUFFER	—	Yes
ULN2003LV	140	8	80	CMOS	7	INVERT	—	Yes
ULN2003V12	140	16	80	CMOS	7	INVERT	—	Yes
TPL9201/2	150	17	10, 80	CMOS	8	INVERT	—	Yes
SN75372	500	24	20	TTL	2	NAND	—	Yes
SN75374	500	24	20	TTL	4	NAND	—	Yes
SN7545xB	500	30	27	TTL	2	AND, NAND, OR, NOR	—	—
SN75462/3	500	35	45	TTL	2	NAND, OR	—	—
SN75468/9	500	100	250	CMOS, TTL	7	INVERT	—	Yes
SN75471/2	500	70	45	TTL	2	AND, NAND	—	—
SN75477/8	500	100	200	CMOS, TTL	2	NAND, OR	—	Yes
ULN2002A	500	50	250	CMOS	7	INVERT	—	Yes
ULN2003A/B	500	50	250	CMOS, TTL	7	INVERT	—	Yes
ULN2004A	500	50	250	CMOS	7	INVERT	—	Yes
ULN2803A	500	50	130	CMOS, TTL	8	INVERT	—	Yes
TPL7407L	600	40	250	CMOS, TTL	7	INVERT	—	Yes
SN75437A	750	70	1,950	CMOS, TTL	4	INVERT	—	Yes
L293/D	2,000	36	800	TTL	4	BUFFER	Yes	Yes
SN754410	2,000	36	800	CMOS, TTL	4	BUFFER	Yes	Yes

Product and Packaging Quick Select Tool

TI has developed the industry's largest selection of low-power and wide functionality interface parts with features designed to satisfy an extensive range of applications. Use the below tool to help make the selection process easier.



Small Packaging

Pin Count	Package Type	TI Package Designator	Body Length (mm)	Body Width (mm)	Lead Width (mm)	Pitch Nom (mm)	Lead Foot (mm)	Pkg Width (mm)	Height (max) (mm)
8	SOIC	D	4.8-5	3.81-4	0.35-0.51	1	0.4-1.12	5.8-6.2	2
14	SOIC	D	8.55-8.75	3.81-4	0.35-0.51	1	0.4-1.12	5.8-6.2	2
16	SOIC	D	9.8-10	3.81-4	0.35-0.51	1	0.4-1.12	5.8-6.2	2
14	SSOP	DB	5.9-6.5	5-5.6	0.22-0.38	0	0.55-0.95	7.4-8.2	2
16	SSOP	DB	5.9-6.5	5-5.6	0.22-0.38	0	0.55-0.95	7.4-8.2	2
8	MSOP	DGK	2.9-3.1	2.9-3.1	0.25-0.38	0	0.4-0.7	4.75-5.05	1
18	SOIC	DWR	11.35-11.75	7.4-7.6	0.31-0.51	1	0.4-1.27	9.97-10.63	3
14	PDIP	N	18.92-19.69	6.1-6.6	0.76-1.14	3	N/A	6.1-6.6	5
16	PDIP	N	18.92-19.69	6.1-6.6	0.76-1.14	3	N/A	6.1-6.6	5
20	PDIP	N	23.88-26.92	6.1-6.6	0.76-1.14	3	N/A	6.1-6.6	5
14	TSSOP	PW	4.9-5.1	4.3-4.5	0.19-0.3	0	0.5-0.75	6.2-6.6	1
16	TSSOP	PW	4.9-5.1	4.3-4.5	0.19-0.3	0	0.5-0.75	6.2-6.6	1
20	TSSOP	PW	6.4-6.6	4.3-4.5	0.19-0.3	0	0.5-0.75	6.2-6.6	1
8	X2QFN	RUG	1.45-1.55	1.45-1.55	0.2-0.3	0	0.3-0.4	1.45-1.55	0

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