

# Octal Line Driver

## FEATURES

- Eight Single-Ended Line Drivers in One Package
- Meets Standards EIA232E/CCITT V.28, and EIA423A/CCITT V.10/X.26
- Single External Resistor Controls Slew Rate
- Wide Supply Voltage Range
- Tri-State Outputs
- Output Short-Circuit Protection
- Low Power Consumption
- 2kV ESD Protection on all Pins
- EOS on all Output Pins 35V under all Output Conditions
- High Current Output for Long Line Drive, Exceeds Standards

## DESCRIPTION

The UC5172 is a single-ended octal line driver designed to meet both standard modem control applications (EIA232E/V.28), and long line drive applications (EIA423A/V.10/X.26). The slew rate for all 8 drivers is controlled by a single external resistor. The slew rate and output levels are independent of the power variations.

The UC5172 has high output current, and current balance for long line drive applications. EOS - Output parasitic SCRs powered on and off are 35V, well above signal levels, allowing protection devices to work.

Inputs are compatible TTL+MOS logic families and are diode protected against negative transients.

## FUNCTIONAL TABLE

INPUTS		OUTPUT
EN	DATA	EIA232E/EIA423A
0	0	5V to 6V
0	1	-5V to -6V
1	X	High Z

Note 2: Minimum output swings.

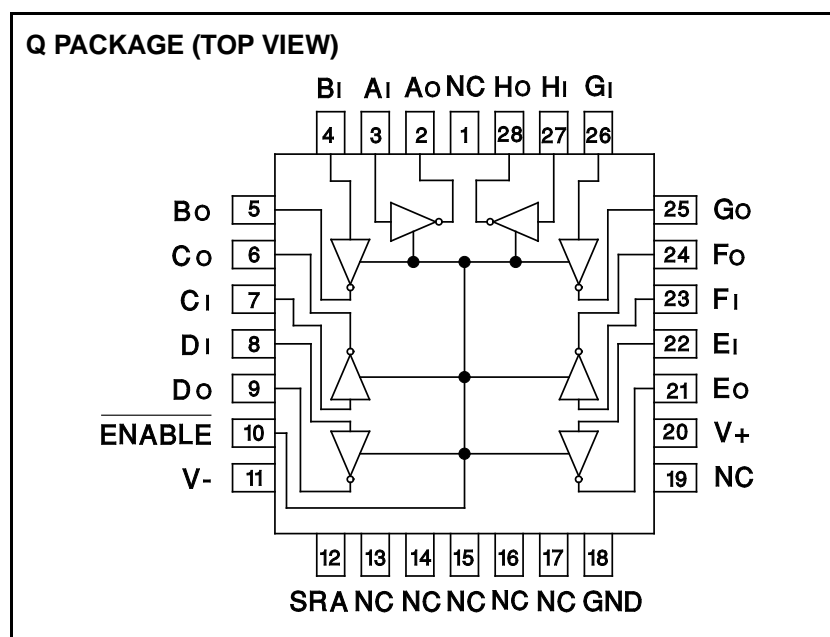
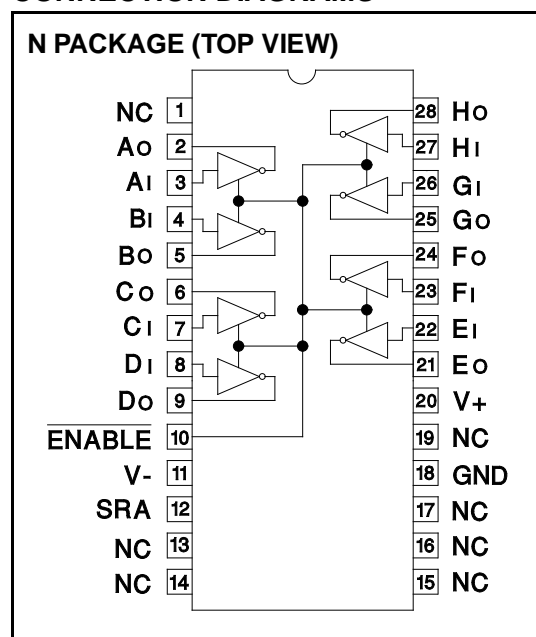
## ABSOLUTE MAXIMUM RATINGS (Note 1)

V+ (Pin 20) ..... 15V  
V- (Pin 11) ..... -15V  
PLCC Power Dissipation, TA=25°C (Note 3) ..... 1000 mW  
DIP Power Dissipation, TA=25°C (Note 3) ..... 1250 mW  
Input Voltage ..... -1.5V to +7V  
Output Voltage ..... -6V to +6V  
Slew Rate Resistor ..... 2k to 10kΩ  
Storage Temperature ..... -65°C to +150°C

Note 1: All voltages are with respect to ground, pin 18.

Note 3: Consult Packaging section of Databook for thermal limitations and considerations of package.

## CONNECTION DIAGRAMS



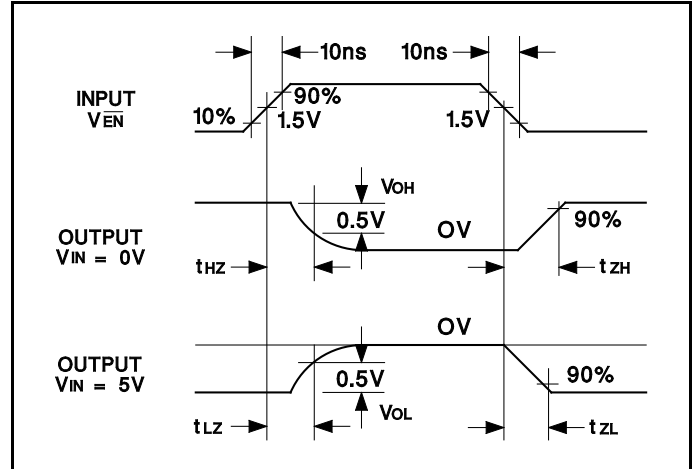
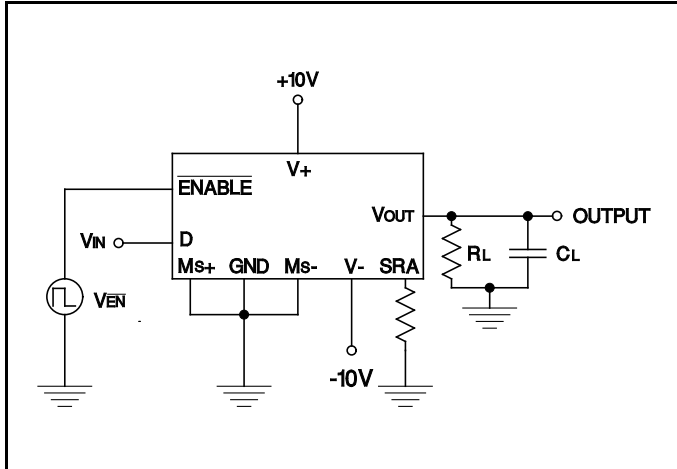
**DC ELECTRICAL CHARACTERISTICS:** Unless otherwise stated these specifications hold for  $|V_+| = |V_-| = 10V$ ,  $0^\circ C < T_A < +70^\circ C$ ,  $R_{SRA} = +10k$ ,  $T_A = T_J$ .

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
<b>POWER SUPPLY REQUIREMENTS</b>						
V+ Range			9		15	V
V- Range			-9		-15	V
V+ Supply Current	I+	$R_L = \text{Infinite}$ $\overline{E_n} = 0V$		15	25	mA
V- Supply Current	I-	$R_L = \text{Infinite}$ $\overline{E_n} = 0V$		-17	-25	mA
<b>INPUTS</b>						
High-Level Input Voltage	$V_{IH}$		2.0			V
Low-Level Input Voltage	$V_{IL}$				0.8	V
Input Clamp Voltage	$V_{IK}$	$I_i = -15 \text{ mA}$		-1.1	-18	V
High Level Input Current	$I_{IH}$	$V_{IH} = 2.4V$	-2	0.25	40	$\mu A$
Low Level Input Current	$I_{IL}$	$V_{IL} = 0.4V$	-200	-8.0		$\mu A$
<b>OUTPUTS</b>						
High Level Output Voltage EIA232E (EIA-423A)	$V_{OH}$	$V_{IN} = 0.8V$ $R_L = \text{Inf.}$	5.0	5.3	6.0	V
		$\overline{E_n} = 0.8V$ $R_L = 3k$	5.0	5.3	6.0	V
		$R_L = 450$	4.5	5.2	6.0	V
Low Level Output Voltage EIA232E (EIA-423A)	$V_{OL}$	$V_{IN} = 2.0V$ $R_L = \text{Inf.}$	-5.0	-5.3	-6.0	V
		$\overline{E_n} = 0.8V$ $R_L = 3k$	-5.0	-5.6	-6.0	V
		$R_L = 450$	-4.5	-5.4	-6.0	V
Output Balance (EIA-423A)	$V_{BAL}$	$R_L = 450$ , $V_{OH} - V_{OL} = V_{BAL}$		0.2	0.4	V
Off-State Output Current	$I_{OZ}$	$\overline{E_n} = 2.0V$ , $V_O = \pm 6V$ , $V_+ = 15V$ , $V_- = -15V$	-100		100	$\mu A$
Short-Circuit Current	$I_{OS}$	$\overline{E_n} = 0V$ $V_{IN} = 0V$	25	65		mA
		$V_{IN} = 5V$	25	70		mA
Power Off Output Current	$I_{PO}$	$V_O = \pm 6V$ , $V_+ = V_- = 0V$	-100		100	mA

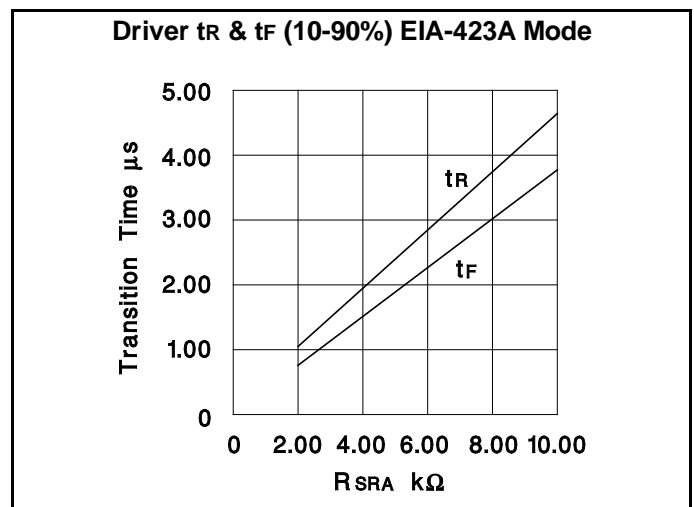
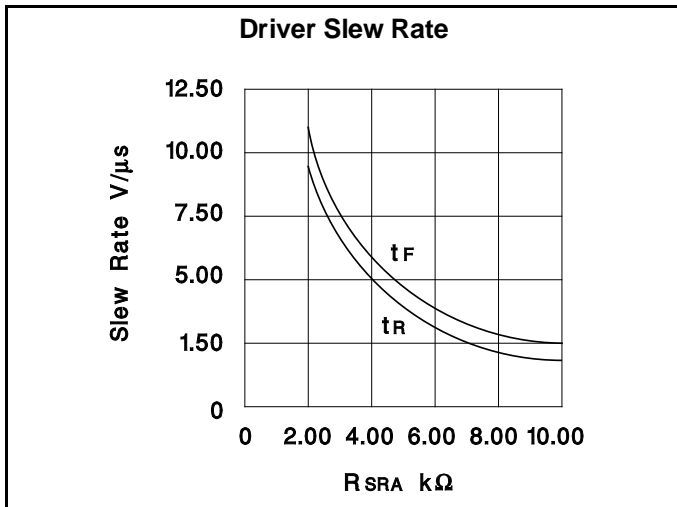
**AC ELECTRICAL CHARACTERISTICS:** at  $|V_+| = |V_-| = +10V$ ,  $0^\circ C < T_A < +70^\circ C$ ,  $T_A = T_J$ .

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Output Slew Rate	$t_R$	$R_{SRA} = 2k$	7.6	8.5	9.4	$V/\mu s$
	$t_F$	$R_L = 450$ , $C_L = 50pF$	7.6	8.5	9.4	$V/\mu s$
Output Slew Rate	$t_R$	$R_{SRA} = 10k$	1.5	1.7	1.9	$V/\mu s$
	$t_F$	$R_L = 450$ , $C_L = 50pF$	1.5	1.7	1.9	$V/\mu s$
Propagation Output to High Impedance	$t_{Hz}$	$R_{SRA} = 10k$		0.8	2.0	$\mu s$
	$t_{Lz}$	$R_L = 450$ , $C_L = 50pF$		0.5	2.0	$\mu s$
Propagation High Impedance to Output	$t_{zH}$	$R_{SRA} = 10k$		2.0	7.0	ms
	$t_{zL}$	$R_L = 450$ , $C_L = 50pF$		1.0	7.0	$\mu s$

## AC PARAMETER TEST CIRCUIT AND WAVEFORMS



## AC CHARACTERISTICS



## APPLICATIONS

### Slew Rate Programming

Slew rate for the UC5172 is set up by a single external resistor connected between the SRA pin and ground. Slew rate adjustments can be approximated by using the following formula:

$$V/\mu s = \frac{20}{R_{SRA}} (R_{SRA} \text{ in } k\Omega)$$

The slew rate resistor can vary between 2k and 10kΩ which allows slew rates between 10 to 2.2V/μs, respectively. The relationship between slew rate and R<sub>SRA</sub> is shown in the typical characteristics.

Waveshaping of the output lets the user control the level of interference (near-end crosstalk) that may be coupled

to adjacent circuits in an interconnection. The recommended output characteristics for cable length and data rates can be found in EIA standard EIA-423A. Approximations of these standards are given by the following equations:

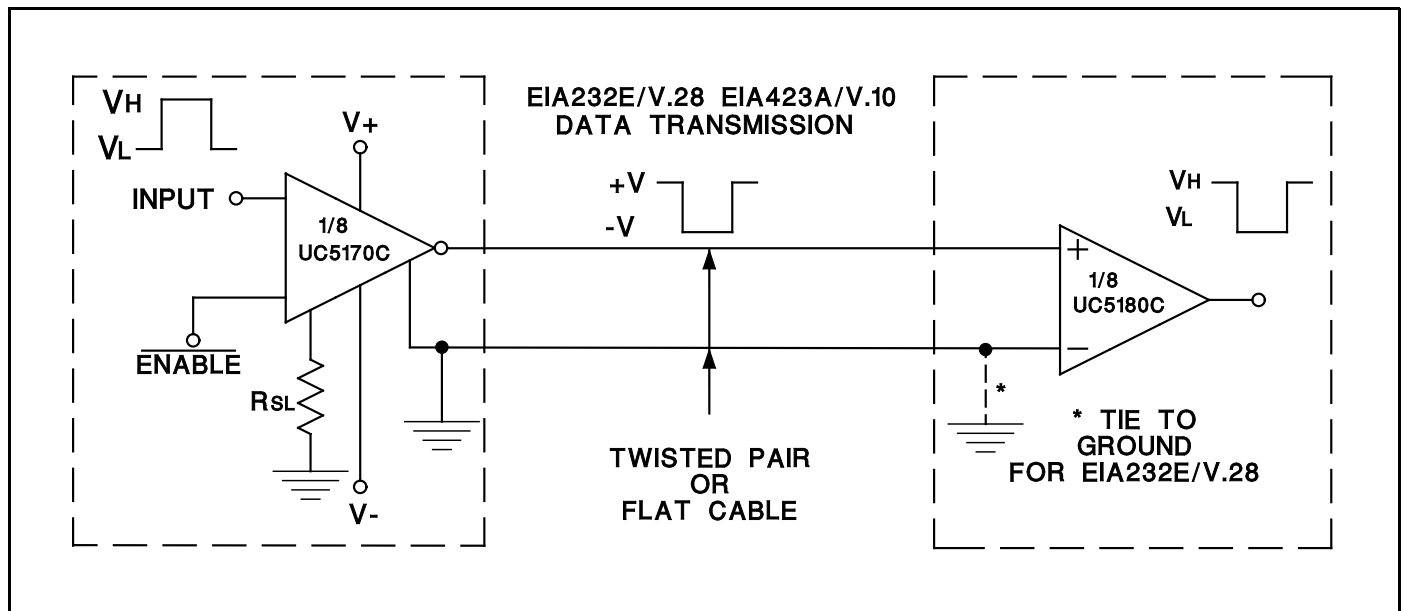
$$\text{Max. Data Rate} = 300/t \text{ (For data rates 1k to 100k bit/s)}$$

$$\text{Max. Cable Length (feet)} = 100 \times t \text{ (Max. length 4000 feet)}$$

where  $t$  is the transition time from 10% to 90% of the output swing in microseconds. For data rates below 1k bit/s,  $t$  may be up to 300 microseconds.

The UC5172 has been used in applications up to 460KBPS.

## APPLICATIONS

**Specific Layout Notes**

The UC5172 layout must have bulk bypassing close to the device. Peak slew current is greater than 500mA when all eight drivers slew at once in the same direction. Some applications mount the UC5172 on a bulkhead or isolated plane for RFI/FCC/VDE reasons. If bulk bypassing is not used, the -10V supply may go above -8.5 volts, causing the slew rate control circuit to become unstable.

The UC5172 can have output oscillation at 100kHz if the +10V supply is applied before the -10V supply. This has been a problem in some terminal designs where the +10V was developed from the flyback, which can result in a 500ms difference in the application of the supplies at power up.

**General Layout Notes**

The drivers and receivers should be mounted close to the system common ground point, with the ground reference tied to the common point to reduce RFI/EMI.

Filter connectors or transzorb should be used to reduce the RFI/EMI, protecting the system from static (ESD), and electrical overstress (EOS). A filter connector or capacitor will reduce the ESD pulse by 90% typically. A cable dragged across a carpet and connected to a system can easily be charged to over 25,000 volts. This is a metal to metal contact when the cable is connected to the system (no resistance), currents exceed 80 amps with less than a nanosecond rise time. A transzorb provides two functions, the device capacitance inherently acts as a filter capacitor, and the device clamps the ESD and EOS pulses which would pass through the capacitor and destroy the devices. The recommended transzorb for the UC5172 is P6KEIOCA.

\*Transzorb is a trademark of General Semiconductor Industries.

## PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
UC5172N	NRND	PDIP	N	28		TBD	Call TI	Call TI
UC5172QTR	NRND	PLCC	FN	28		TBD	Call TI	Call TI

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBsolete:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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