Signetics

NE5170
Octal Line Driver

Preliminary Specification

Linear Products

DESCRIPTION

The NE5170 is an octal line driver which is designed for digital communications with data rates up to 100kb/s. This device meets all the requirements of EIA standards RS-232C/RS-423A and CCITT recommendations V.10/X.26. Three programmable features: (1) output slew rate, (2) output voltage level, and (3) 3-State control (high-impedance) are provided so that output characteristics may be modified to meet the requirements of specific applications.

FEATURES

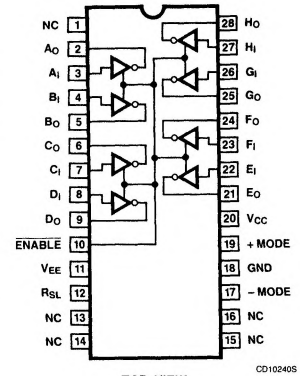
- **Meets EIA RS-232C/423A and CCITT V.10/X.26**
- **Simple slew rate programming with a single external resistor**
- **0.1 to 10V/μs slew rate range**
- **High/Low programmable voltage output modes**
- **TTL compatible inputs**

APPLICATIONS

- **High-speed modems**
- **High-speed parallel communications**
- **Computer I/O ports**
- **Logic level translation**

PIN CONFIGURATIONS

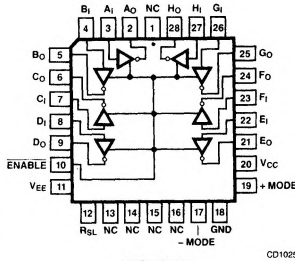
N Package



CD10240S

TOP VIEW

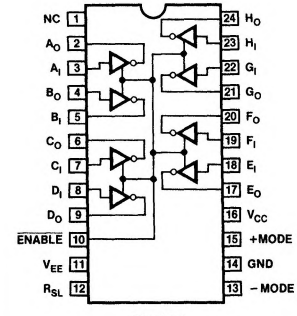
A Package



CD10250S

TOP VIEW

D Package



TOP VIEW

CD12300S

FUNCTION TABLE

ENABLE	LOGIC INPUT	OUTPUT VOLTAGE (V)		
		RS-423A[1]	RS-232C	
			Low Output Mode[1]	High Output Mode[2]
L	L	5 to 6V	5 to 6V	$\geqslant$9V
L	H	–5 to –6V	–5 to –6V	$\leqslant$–9V
H	X	Hi-Z	Hi-Z	Hi-Z

NOTES:
1. V_{CC} = +10V and V_{EE} = –10V; R_L = 3kΩ
2. V_{CC} = +12V and V_{EE} = –12V; R_L = 3kΩ

ORDERING CODE

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
28-Pin Plastic DIP	0 to +70°C	NE5170N
28-Pin PLCC	0 to +70°C	NE5170A
24-Pin SO package	0 to +70°C	NE5170D

Octal Line Driver | NE5170

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage and + MODE	15	V
V_{EE}	Supply voltage and – MODE	–15	V
I_{OUT}	Output current[1]	± 150	mA
V_{IN}	Input voltage ($\overline{ENABLE}$, Data)	–1.5 to +7	V
V_{OUT}	Output voltage[2]	± 15	V
	Minimum slew resistor[3]	1	kΩ
P_D	Power dissipation	1200	mW

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 10V ± 10%; V_{EE} = –10V ± 10%; ± MODES = 0V; R_{SL} = 2kΩ, 0°C ≤ T_A ≤ 70°C, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS		UNIT
			Min	Max	
V_{OH}	Output High voltage	V_{IN} = 0.8V, R_L = 3kΩ[4]	5	6	V
		R_L = 450Ω[4]	4.5	6	
		R_L = 3kΩ[5], C_L = 2500pF	V_{CC} – 3		
V_{OL}	Output Low voltage	V_{IN} = 2.0V, R_L = 3kΩ[4]	–6	–5	V
		R_L = 450Ω[4]	–6	–4.5	
		R_L = 3kΩ[5], C_L = 2500pF		V_{EE} + 3	
V_{OU}	Output unbalance voltage	V_{CC} = $\lvert V_{EE} \rvert$, R_L = 450Ω[4]		0.4	V
I_{CEX}	Output leakage current	$\lvert V_O \rvert$ = 6V, ENABLE = 2V or V_{CC} = V_{EE} = 0V	–100	100	μA
V_{IH}	Input High voltage		2.0		V
V_{IL}	Input Low voltage			0.8	V
I_{IL}	Logic "0" input current	V_{IN} = 0.4V	–400	0	μA
I_{IH}	Logic "1" input current	V_{IN} = 2.4V	0	40	μA
I_{OS}	Output short circuit current[1]	V_O = 0V	–150	150	mA
V_{CL}	Input clamp voltage	I_{IN} = –15mA	–1.5		V
I_{CC}	Supply current	No Load		35	mA
I_{EE}		No Load	–45		mA

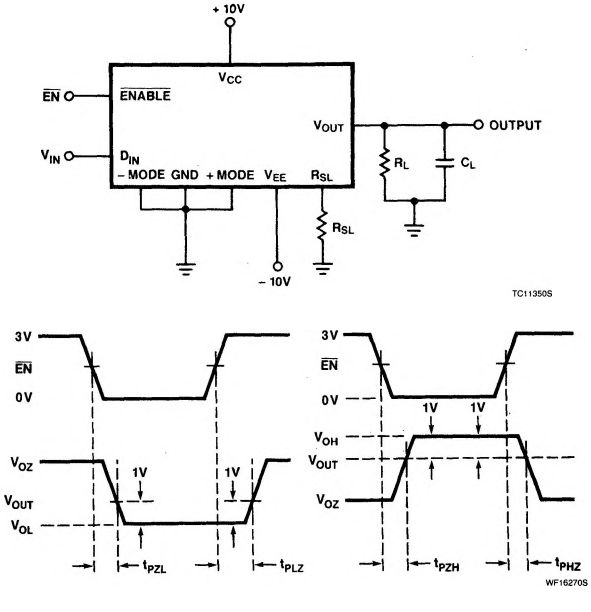
NOTES:
1. Maximum current per driver. Do not exceed maximum power dissipation if more than one output is on.
2. High-impedance mode.
3. Minimum value of the resistor used to set the slew rate.
4. V_{OH}, V_{OL} at R_L = 450Ω will be ≥ ≥90% of V_{OH}, V_{OL} at R_L = ∞.
5. High Output Mode; + MODE pin = V_{CC}; – MODE pin = V_{EE}; 9V ≤ V_{CC} ≤ 13V; –9V ≥ V_{EE} ≥ –13V.

AC ELECTRICAL CHARACTERISTICS V_{CC} = +10V; V_{EE} = −10V; Mode = GND, 0°C ≤ T_A ≤ 70°C

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS		UNIT
			Min	Max	
t_{PHZ}	Propagation delay output high to high-impedance	R_L = 450, C_L = 50pF or R_L = 3k, C_L = 2500pF		5	μs
t_{PLZ}	Propagation delay output low to high-impedance	R_L = 450, C_L = 50pF or R_L = 3k, C_L = 2500pF		5	μs
t_{PZH}	Propagation delay high-impedance to high output	R_{SL} = 200k R_L = 450, C_L = 50pF or R_L = 3k, C_L = 2500pF		150	μs
t_{PZL}	Propagation delay high-impedance to low output	R_{SL} = 200k R_L = 450, C_L = 50pF or R_L = 3k, C_L = 2500pF		150	μs
SR	Output slew rate[1]	R_{SL} = 2k	8	12	V/μs
		R_{SL} = 20k	0.8	1.2	
		R_{SL} = 200k	0.06	0.14	

NOTE:
SR: Load condition. (A) For R_{SL} < 4kΩ use R_L = 450Ω; C_L = 50pF; (B) for R_{SL} > 4kΩ use either R_L = 450Ω, C_L = 50pF or R_L = 3kΩ, C_L = 2500pF.

AC PARAMETER TEST CIRCUIT AND WAVEFORMS



NOTES:
1. See AC electrical characteristics table for values of R_{SL}, R_L and C_L.
2. V_{IN} pulse: Frequency = 1kHz, duty cycle = 50%, Z_{OUT} = 50Ω, t_r = t_f ≤ 10ns.

SLEW RATE PROGRAMMING

Slew rate for the NE5170 is set using a single external resistor connected between the R_{SL} pin and ground. Adjustment is made according to the formula:

$$R_{SL}\ (\text{in } k\Omega) = \frac{20}{\text{Slew Rate}}$$

where the slew rate is in $V/\mu s$. The slew resistor can vary between 2 and 200kΩ which gives a slew rate range of 10 to $0.1V/\mu s$. This adjustment of the slew rate allows tailoring output characteristics to recommendations for cable length and data rate found in EIA standard RS-423A. Approximations for cable length and data rate are given by:

Max. data rate (in kb/s) = 300/t

Cable length (in feet) = 100 × t

where t is the rise time in microseconds. The absolute maximum data rate is 100kb/s and the absolute maximum cable length is 4000 feet.

OUTPUT MODE PROGRAMMING

The NE5170 has two programmable output modes which provide different output voltage levels. The low output mode meets the specifications of EIA standards RS-423A and RS-232C. The high output mode meets the specifications of RS-232C only, since higher output voltages result from programming this mode. The high output mode provides the greater output voltages where higher attenuation levels must be tolerated. Programming the high output mode is accomplished by connecting the +MODE pin to V_{CC} and the −MODE pin to V_{EE}. The low output mode results when both of these pins are connected to ground.

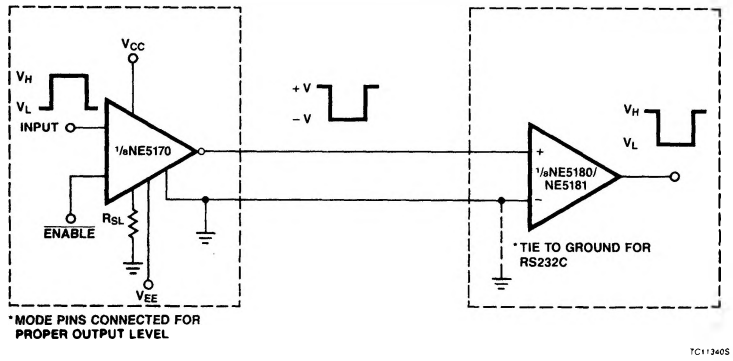


Figure 1. RS-232C/RS-423A Data Transmission

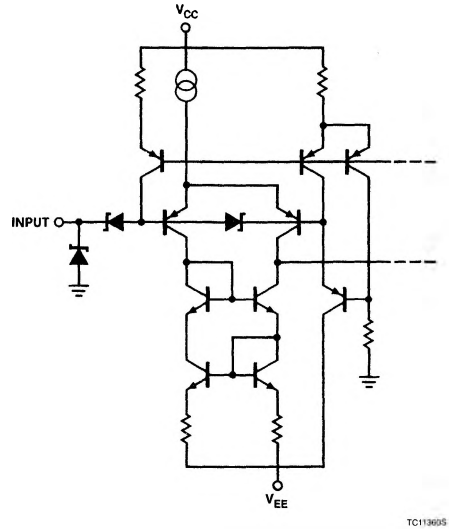


Figure 2. Input Stage Schematic

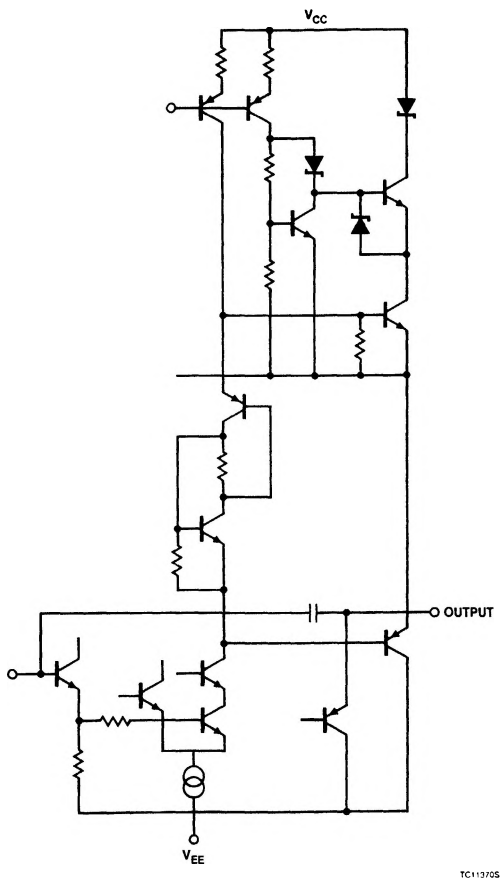


Figure 3. Output Stage Schematic

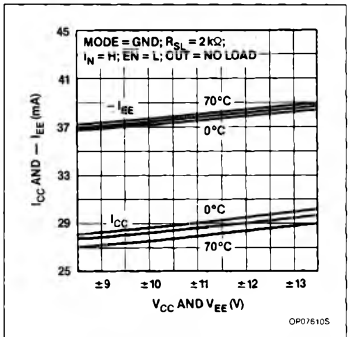


Figure 4. Typical I_{CC} and I_{EE} vs Supply Voltages

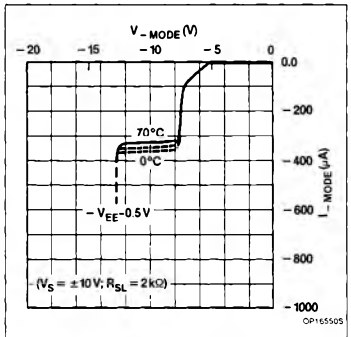


Figure 7. Typical −MODE Current vs −MODE Voltage

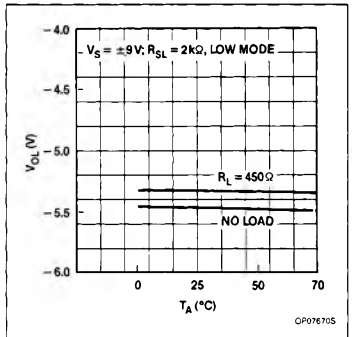


Figure 10. Typical Output Low Voltage vs Temperature

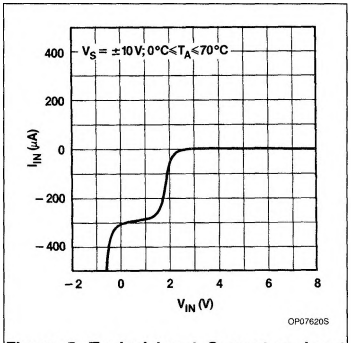


Figure 5. Typical Input Current vs Input Voltage

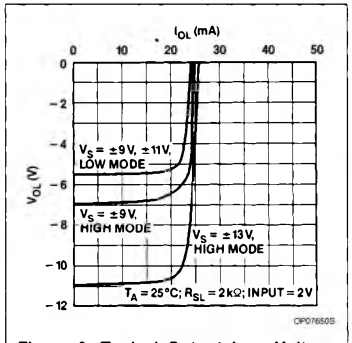


Figure 8. Typical Output Low Voltage vs Load Current

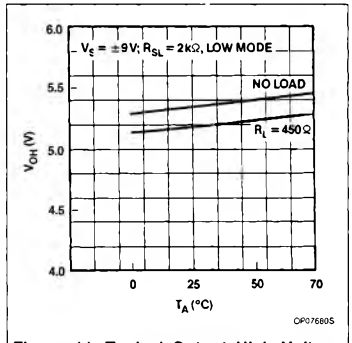


Figure 11. Typical Output High Voltage vs Temperature

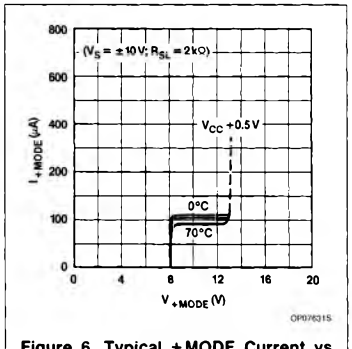


Figure 6. Typical +MODE Current vs +MODE Voltage

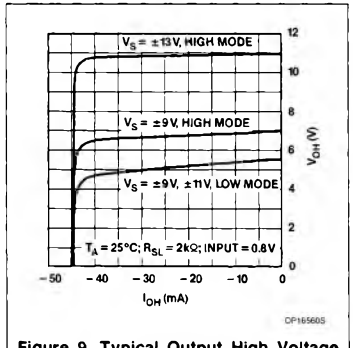


Figure 9. Typical Output High Voltage vs Load Current

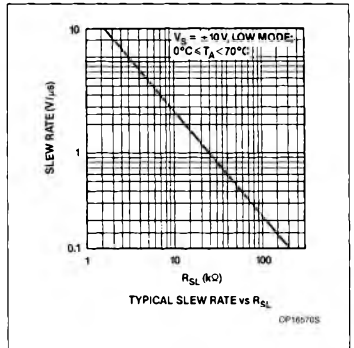


Figure 12. Typical Slew Rate vs R_{SL}