Philips Components–Signetics

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Data Communication Products	

MC1488
Quad line driver

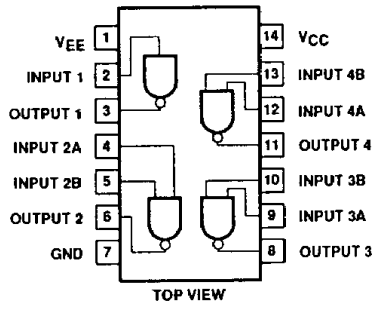
DESCRIPTION
The MC1488 is a quad line driver which converts standard DTL/TTL input logic levels through one stage of inversion to output levels which meet EIA Standard No. RS-232C and CCITT Recommendation V.24.

FEATURES
- Current limited output: ±10mA Typ
- Power-off source impedance: 300Ω min
- Simple slew rate control with external capacitor
- Flexible operating supply range
- Inputs are DTL/TTL compatible

APPLICATIONS
- Computer port driver
- Digital transmission over long lines
- Slew rate control
- TTL/DTL-to-MOS translation

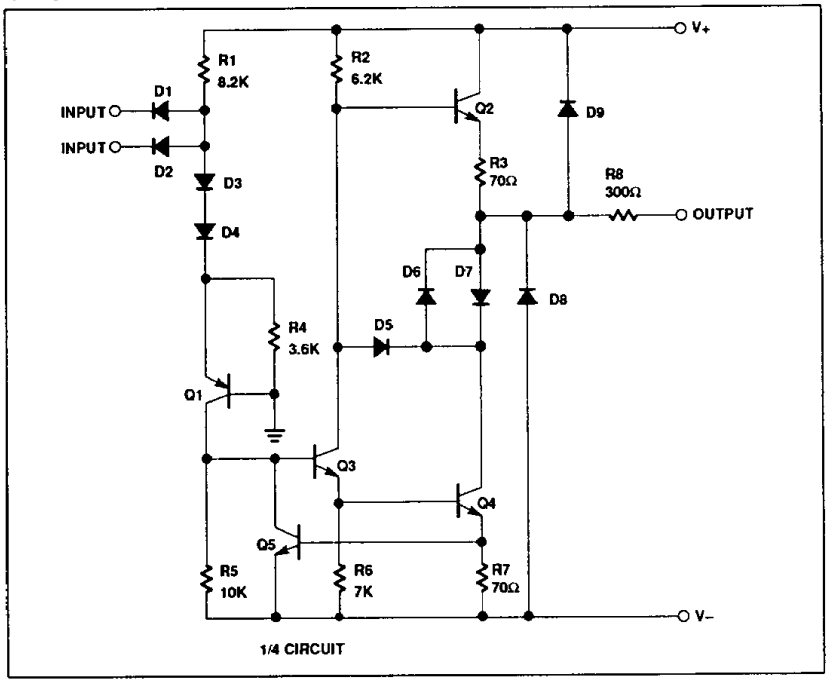
PIN CONFIGURATION

D, F, N Packages



TOP VIEW

CIRCUIT SCHEMATIC



1/4 CIRCUIT

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
14-Pin Plastic SO	0°C to +75°C	MC1488D
14-Pin Plastic DIP	0°C to +75°C	MC1488N
14-Pin Ceramic DIP	0°C to +75°C	MC1488F

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage V+	+15	V
	V–	–15	V
V_{IN}	Input voltage	$-15 \leq V_{IN} \leq 7.0$	V
V_{OUT}	Output voltage	±15	V
P_D	Maximum power dissipation, T_A = 25°C (still-air)[1]		
	F package	1190	mW
	N package	1420	mW
	D package	1040	mW
T_A	Operating ambient temperature range	0 to +75	°C
T_{STG}	Storage temperature range	–65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTE:
1. Derate above 25°C, at the following rates:
   F package at 9.5mW/°C.
   N package at 11.4mW/°C.
   D package at 8.3mW/°C.

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DC AND AC ELECTRICAL CHARACTERISTICS

$V+ = +9.0V \pm 1\%$, $V- = -9.0V \pm 1\%$, $T_A = 0°C$ to $+75°C$, unless otherwise specifed. All typicals are for $V+ = 9.0V$, $V- = -9.0V$, and $T_A = 25°C$[1]

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS Min	LIMITS Typ	LIMITS Max	UNIT
V_{IH} V_{IL}	Logic "0" input current Logic "1" input current	$V_{IN} = 0V$ $V_{IN} = +5.0V$			−1.0 0.005	−1.6 10.0	mA μA
V_{OH}	High level output voltage	$R_L = 3.0k\Omega$, $V_{IN} = 0.8V$	$V+ = 9.0V$, $V- = -9.0V$	6.0	7.0		V
			$V+ = 13.2V$, $V- = -13.2V$	9.0	10.5		V
V_{OL}	Low level output voltage	$R_L = 3.0k\Omega$, $V_{IN} = 1.9V$	$V+ = 9.0V$, $V- = -9.0V$	−6.0	−6.8		V
			$V+ = 13.2V$, $V- = -13.2V$	−9.0	−10.5		V
I_{SC+}	High level output short-circuit current	$V_{OUT} = 0V$, $V_{IN} = 0.8V$		−6.0	−10.0	−12.0	mA
I_{SC-}	Low level output short-circuit current	$V_{OUT} = 0V$, $V_{IN} = 1.9V$		5.0	10.0	12.0	mA
R_{OUT}	Output resistance	$V+ = V- = 0V$, $V_{OUT} = \pm 2V$		300			Ω
$I+$	Positive supply current (output open)	$V_{IN} = 1.9V$	$V+ = 9.0V$, $V- = -9.0V$		15.0	20.0	mA
			$V+ = 12V$, $V- = -12V$		19.0	25.0	mA
			$V+ = 15V$, $V- = -15V$		25.0	34.0	mA
		$V_{IN} = 0.8V$	$V+ = 9.0V$, $V- = -9.0V$		4.5	6.0	mA
			$V+ = 12V$, $V- = -12V$		5.5	7.0	mA
			$V+ = 15V$, $V- = -15V$		8.0	12.0	mA
$I-$	Negative supply current (output open)	$V_{IN} = 1.9V$	$V+ = 9.0V$, $V- = -9.0V$		−13.0	−17.0	mA
			$V+ = 12V$, $V- = -12V$		−18.0	−23.0	mA
			$V+ = 15V$, $V- = -15V$		−25.0	−34.0	mA
		$V_{IN} = 0.8V$	$V+ = 9.0V$, $V- = -9.0V$		−1	−15	μA
			$V+ = 12V$, $V- = -12V$		−1	−15	μA
			$V+ = 15V$, $V- = -15V$		−0.01	−2.5	mA
P_D	Maximum power dissipation, $T_A = 25°C$ (still-air)[2] F package N package D package					1190 1420 1040	mW mW mW
t_{PD1}	Propagation delay to "1"	$R_L = 3.0k\Omega$, $C_L = 15pF$, $T_A = 25°C$			275	560	ns
t_{PD0}	Propagation delay to "0"	$R_L = 3.0k\Omega$, $C_L = 15pF$, $T_A = 25°C$			70	175	ns
t_R	Rise time	$R_L = 3.0k\Omega$, $C_L = 15pF$, $T_A = 25°C$			75	100	ns
t_F	Fall time	$R_L = 3.0k\Omega$, $C_L = 15pF$, $T_A = 25°C$			40	75	ns

NOTES:
1. Voltage values shown are with respect to network ground terminal. Positive current is defined as current into the referenced pin.
2. Derate above 25°C, at the following rates:
   F package at 9.5mW/°C.
   N package at 11.4mW/°C.
   D package at 8.3mW/°C.

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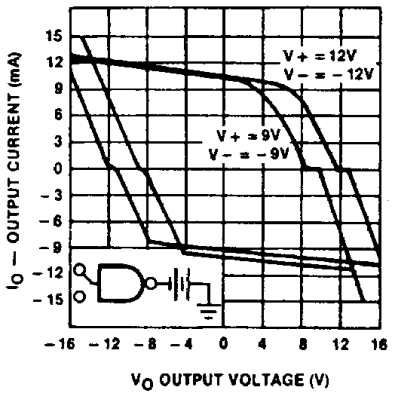
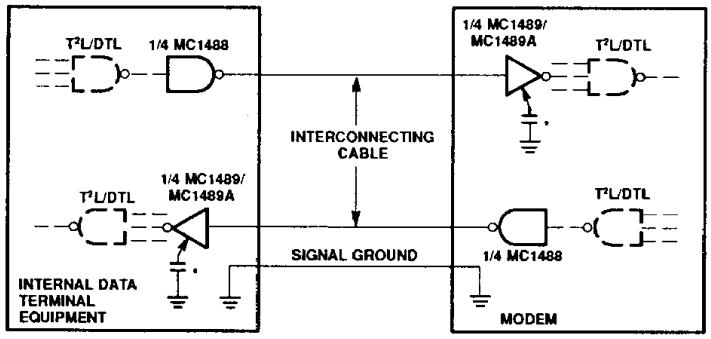
TYPICAL PERFORMANCE CHARACTERISTICS



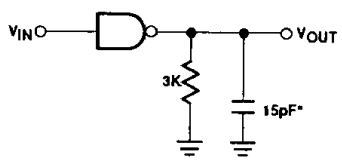
Output Voltage and Current-Limiting Characteristics



NOTE:
*Optional for noise filtering

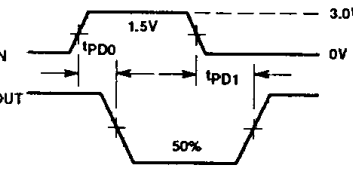
RS-232C Data Transmission

AC LOAD CIRCUIT



NOTE:
*C_L includes probe and jig capacitance.

SWITCHING WAVEFORMS



NOTE:
t_R and t_F are measured between 10% and 90% of the output waveform.

APPLICATIONS

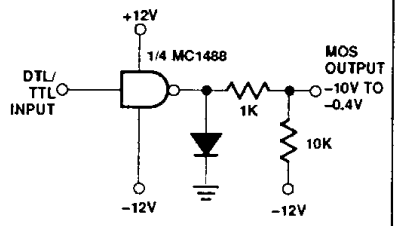
By connecting a capacitor to each driver output the slew rate can be controlled utilizing the output current–limiting characteristics of the MC1488. For a set slew rate the appropriate capacitor value may be calculated using the following relationship

$$C = I_{SC}(\Delta T/\Delta V)$$

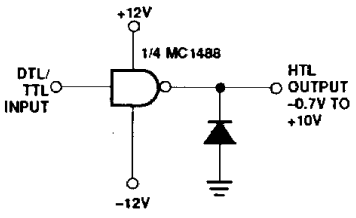
where C is the required capacitor, I_{SC} is the short–circuit current value, and $\Delta V/\Delta T$ is the slew rate.

RS–232C specifies that the output slew rate must not exceed 30V/μs. Using the worst–case output short–circuit current of 12mA in the above equation, calculations result in a required capacitor of 400pF connected to each output.

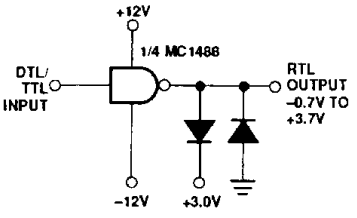
TYPICAL APPLICATIONS



DTL/TTL-to-MOS Translator



DTL/TTL-to-HTL Translator



DTL/TTL-to-RTL Translator