Line Drivers/Receivers

LM1488 quad line driver

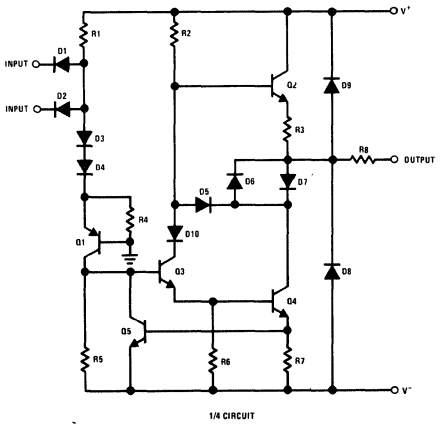
general description

The LM1488 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

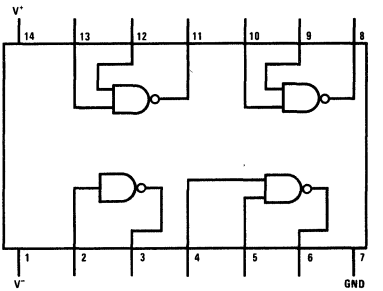
- Current limited output ±10 mA typ
- Power-off source impedance 300Ω min
- Simple slew rate control with external capacitor
- Flexible operating supply range
- Inputs are DTL/TTL compatible

schematic and connection diagrams



1/4 CIRCUIT

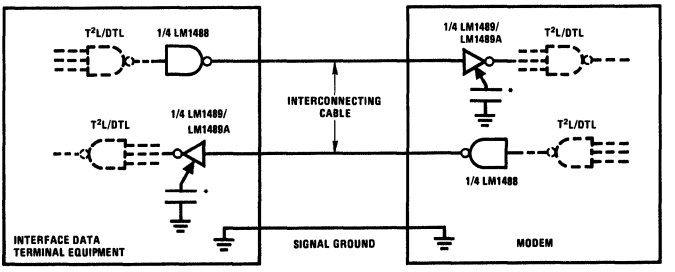
Dual-In-Line Package



TOP VIEW
Order Number LM1488J
See Package 16

typical applications

RS232C Data Transmission



*OPTIONAL FOR NOISE FILTERING

absolute maximum ratings (Note 1)

Supply Voltage	
V^+	+15V
V^-	−15V
Input Voltage (V_{IN})	$-15V \leq V_{IN} \leq 7.0V$
Output Voltage	±15V
Power Derating (Note 2)	
(Package Limitation, J Package)	1000 mW
Derating above T_A = +25°C ($1/\theta_{JA}$)	6.7 mW/°C
Operating Temperature Range	0°C to +75°C
Storage Temperature Range	−65°C to +175°C
Lead Temperature (Soldering, 10 sec)	300°C

electrical characteristics (Note 3)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Logic "0" Input Current	V_{IN} = 0V		−1.0	−1.3	mA
Logic "1" Input Current	V_{IN} = +5.0V		.005	10.0	μA
High Level Output Voltage	R_L = 3.0kΩ, V_{IN} = 0.8V; V^+ = 9.0V, V^- = −9.0V	6.0	7.0		V
	R_L = 3.0kΩ, V_{IN} = 0.8V; V^+ = 13.2V, V^- = −13.2V	9.0	10.5		V
Low Level Output Voltage	R_L = 3.0kΩ, V_{IN} = 1.9V; V^+ = 9.0V, V^- = −9.0V	−6.0	−6.8		V
	R_L = 3.0kΩ, V_{IN} = 1.9V; V^+ = 13.2V, V^- = −13.2V	−9.0	−10.5		V
High Level Output Short-Circuit Current	V_{OUT} = 0V, V_{IN} = 0.8V	−6.0	−10.0	−12.0	mA
Low Level Output Short-Circuit Current	V_{OUT} = 0V, V_{IN} = 1.9V	6.0	10.0	12.0	mA
Output Resistance	$V^+ = V^- = 0V$, V_{OUT} = ±2V	300			Ω
Positive Supply Current (Output Open)	V_{IN} = 1.9V; V^+ = 9.0V, V^- = −9.0V		15.0	20.0	mA
	V_{IN} = 1.9V; V^+ = 12V, V^- = −12V		19.0	25.0	mA
	V_{IN} = 1.9V; 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_{IN} = 0.8V; V^+ = 12V, V^- = −12V		5.5	7.0	mA
	V_{IN} = 0.8V; V^+ = 15V, V^- = −15V		8.0	12.0	mA
Negative Supply Current (Output Open)	V_{IN} = 1.9V; V^+ = 9.0V, V^- = −9.0V		−13.0	−17.0	mA
	V_{IN} = 1.9V; V^+ = 12V, V^- = −12V		−18.0	−23.0	mA
	V_{IN} = 1.9V; V^+ = 15V, V^- = −15V		−25.0	−34.0	mA
	V_{IN} = 0.8V; V^+ = 9.0V, V^- = −9.0V		−.001	−1.0	mA
	V_{IN} = 0.8V; V^+ = 12V, V^- = −12V		−.001	−1.0	mA
	V_{IN} = 0.8V; V^+ = 15V, V^- = −15V		−.01	−2.5	mA
Power Dissipation	V^+ = 9.0V, V^- = −9.0V		252	333	mW
	V^+ = 12V, V^- = −12V		444	576	mW
Propagation Delay to "1" (t_{pd1})	R_L = 3.0 kΩ C_L = 15 pF, T_A = 25°C		230	350	ns
Propagation Delay to "0" (t_{pd0})	R_L = 3.0 kΩ C_L = 15 pF, T_A = 25°C		70	175	ns
Rise Time (t_r)	R_L = 3.0 kΩ C_L = 15 pF, T_A = 25°C		75	100	ns
Fall Time (t_f)	R_L = 3.0 kΩ C_L = 15 pF, T_A = 25°C		40	75	ns

Note 1: Voltage values shown are with respect to network ground terminal. Positive current is defined as current into the referenced pin.

Note 2: The maximum junction temperature of the LM1488 is 150°C. For operating at elevated temperatures the cavity Dual-In-Line Package (J) must be derated based on a thermal resistance of 85°C/W, junction to ambient.

Note 3: These specifications apply for V^+ = +9.0V ± 1%, V^- = −9.0V ± 1%, T_A = 0°C to +75°C unless otherwise noted. All typicals are for V^+ = 9.0V, V^- = −9.0V, and T_A = 25°C.

applications

By connecting a capacitor to each driver output the slew rate can be controlled utilizing the output current limiting characteristics of the LM1488. For a set slew rate the appropriate capacitor value may be calculated using the following relationship,

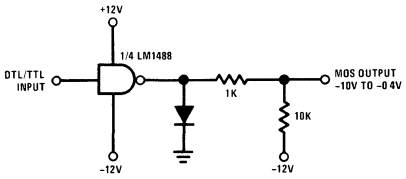
$$C = I_{SC}\,(\Delta T/\Delta V)$$

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

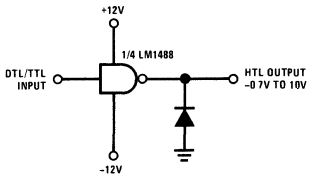
RS232C specifies that the output slew rate must not exceed 30V per microsecond. Using the worst case output short circuit current of 12 mA in the above equation, calculations result in a required capacitor of 400 pF connected to each output.

typical applications (con't)

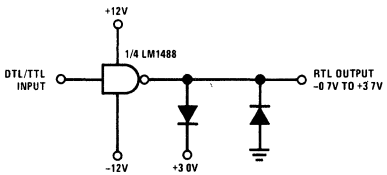
DTL/TTL-to-MOS Translator



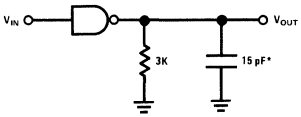
DTL/TTL-to-HTL Translator



DTL/TTL-to-RTL Translator

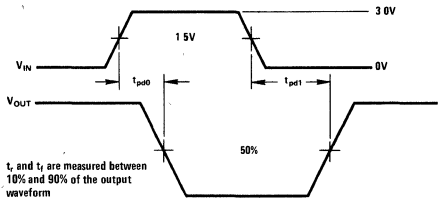


ac load circuit



*C_L includes probe and jig capacitance

switching time waveforms



t_r and t_f are measured between 10% and 90% of the output waveform

typical performance characteristics

Output Voltage and Current-Limiting Characteristics