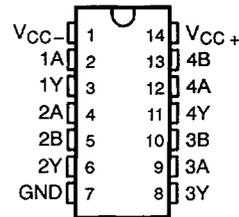


# MC1488, SN55188, SN75188 QUAD LINE DRIVERS

SLLS094A - D1323, SEPTEMBER 1983 - REVISED MARCH 1993

- Meets Specifications of EIA RS-232-C
- Designed to Be Interchangeable With Motorola MC1488
- Current-Limited Output: 10 mA Typ
- Power-Off Output Impedance: 300  $\Omega$  Min
- Slew Rate Control by Load Capacitor
- Flexible Supply Voltage Range
- Input Compatible With Most TTL Circuits

SN55188 . . . J OR W PACKAGE  
MC1488, SN75188 . . . D OR N PACKAGE  
(TOP VIEW)

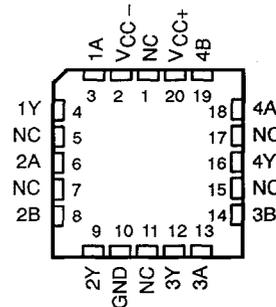


## description

The MC1488, SN55188, and SN75188 are monolithic quad line drivers designed to interface data terminal equipment with data communications equipment in conformance with EIA Standard RS-232-C using a diode in series with each supply-voltage terminal as shown under typical applications.

The and SN55188 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The MC1488 and SN75188 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN55188 . . . FK PACKAGE  
(TOP VIEW)



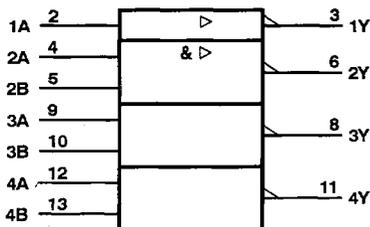
NC - No internal connection

FUNCTION TABLE  
(drivers 2 through 4)

A	B	Y
H	H	L
L	X	H
X	L	H

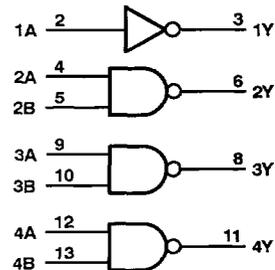
H = high level, L = low level,  
X = irrelevant

## logic symbol



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagram (positive logic)



Positive logic  
 $Y = \bar{A}$  (driver 1)  
 $Y = \bar{A}\bar{B}$  or  $\bar{A} + \bar{B}$  (drivers 2 thru 4)

Pin numbers shown are for the D and N packages.

PRODUCTION DATA Information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS  
INSTRUMENTS

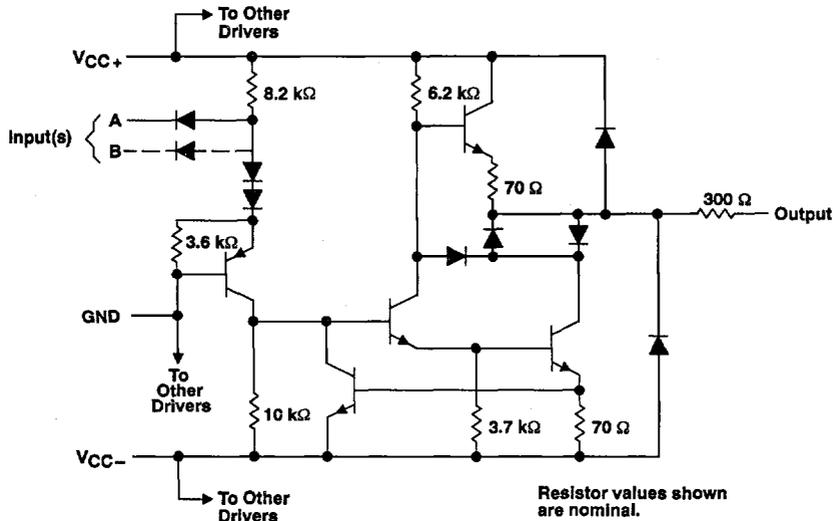
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# MC1488, SN55188, SN75188 QUAD LINE DRIVERS

SLLS094A—D1323, SEPTEMBER 1983—REVISED MARCH 1993

## schematic (each driver)



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

	SN55188	MC1488 SN75188	UNIT
Supply voltage, $V_{CC+}$ , at (or below) 25°C free-air temperature (see Notes 1 and 2)	15	15	V
Supply voltage, $V_{CC-}$ , at (or below) 25°C free-air temperature (see Notes 1 and 2)	-15	-15	V
Input voltage range	-15 to 7	-15 to 7	V
Output voltage range	-15 to 15	-15 to 15	V
Continuous total power dissipation (see Note 2)	See Dissipation Rating Table		
Operating free-air temperature range	-55 to 125	0 to 70	°C
Storage temperature range	-65 to 150	-65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D or N package	260	°C
Case temperature for 60 seconds	FK package	260	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J or W package	300	

NOTES: 1. All voltage values are with respect to the network ground terminal.

2. For operation above 25°C free-air temperature, refer to the maximum supply voltage curve, Figure 6. In the FK and J packages, SN55188 chips are alloy mounted.

DISSIPATION RATING TABLE

PACKAGE	$T_A = 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	—
FK	1375 mW	11.0 mW/°C	880 mW	275 mW
J	1375 mW	11.0 mW/°C	880 mW	275 mW
N	1150 mW	9.2 mW/°C	736 mW	—
W	1000 mW	8.0 mW/°C	640 mW	200 mW

# MC1488, SN55188, SN75188 QUAD LINE DRIVERS

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## recommended operating conditions

	SN55188			MC1488, SN75188			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC+}$	7.5	9	15	7.5	9	15	V
Supply voltage, $V_{CC-}$	-7.5	-9	-15	-7.5	-9	-15	V
High-level input voltage, $V_{IH}$	1.9			1.9			V
Low-level input voltage, $V_{IL}$			0.8			0.8	V
Operating free-air temperature, $T_A$	-55		125	0		70	°C

## electrical characteristics over operating free-air temperature range, $V_{CC\pm} = \pm 9\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		SN55188			MC1488, SN75188			UNIT	
			MIN	TYP†	MAX	MIN	TYP†	MAX		
$V_{OH}$ High-level output voltage	$V_{IL} = 0.8\text{ V}$ , $R_L = 3\text{ k}\Omega$	$V_{CC+} = 9\text{ V}$ , $V_{CC-} = -9\text{ V}$	6	7		6	7		V	
		$V_{CC+} = 13.2\text{ V}$ , $V_{CC-} = -13.2\text{ V}$	9	10.5		9	10.5			
$V_{OL}$ Low-level output voltage	$V_{IH} = 1.9\text{ V}$ , $R_L = 3\text{ k}\Omega$	$V_{CC+} = 9\text{ V}$ , $V_{CC-} = -9\text{ V}$		-7‡	-6		-7	-6	V	
		$V_{CC+} = 13.2\text{ V}$ , $V_{CC-} = -13.2\text{ V}$		-10.5‡	-9		-10.5	-9		
$I_{IH}$ High-level input current	$V_I = 5\text{ V}$				10			10	$\mu\text{A}$	
$I_{IL}$ Low-level input current	$V_I = 0$			-1	-1.6		-1	-1.6	mA	
$I_{OS(H)}$ Short-circuit output current at high level§	$V_I = 0.8\text{ V}$ , $V_O = 0$		-4.6	-9	-13.5	-6	-9	-12	mA	
$I_{OS(L)}$ Short-circuit output current at low level§	$V_I = 1.9\text{ V}$ , $V_O = 0$		4.6	9	13.5	6	9	12	mA	
$r_o$ Output resistance, power off	$V_{CC+} = 0$ , $V_O = -2\text{ V to } 2\text{ V}$	$V_{CC-} = 0$ ,	300			300			$\Omega$	
$I_{CC+}$ Supply current from $V_{CC+}$	$V_{CC+} = 9\text{ V}$ , No load	All inputs at 1.9 V		15	20		15	20	mA	
		All inputs at 0.8 V		4.5	6		4.5	6		
		$V_{CC+} = 12\text{ V}$ , No load	All inputs at 1.9 V		19	25		19		25
		All inputs at 0.8 V		5.5	7		5.5	7		
$I_{CC-}$ Supply current from $I_{CC-}$	$V_{CC+} = 15\text{ V}$ , No load, $T_A = 25^\circ\text{C}$	All inputs at 1.9 V		34			34	mA		
		All inputs at 0.8 V		12			12			
		$V_{CC-} = -9\text{ V}$ , No load	All inputs at 1.9 V		-13	-17			-13	-17
		All inputs at 0.8 V		-0.5			-0.015			
$I_{CC-}$ Supply current from $I_{CC-}$	$V_{CC-} = -12\text{ V}$ , No load	All inputs at 1.9 V		-18	-23		-18	-23	mA	
		All inputs at 0.8 V		-0.5			-0.015			
		$V_{CC-} = -15\text{ V}$ , No load, $T_A = 25^\circ\text{C}$	All inputs at 1.9 V		-34			-34		mA
		All inputs at 0.8 V		-2.5			-2.5			
$P_D$ Total power dissipation	$V_{CC+} = 9\text{ V}$ , No load	$V_{CC-} = -9\text{ V}$ ,			333			333	mW	
		$V_{CC-} = -12\text{ V}$ , No load			576			576		

† All typical values are at  $T_A = 25^\circ\text{C}$ .

‡ The algebraic convention in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for logic voltage levels only, e.g., if  $-6\text{ V}$  is a maximum, the typical value is a more negative voltage.

§ Not more than one output should be shorted at a time.

# MC1488, SN55188, SN75188 QUAD LINE DRIVERS

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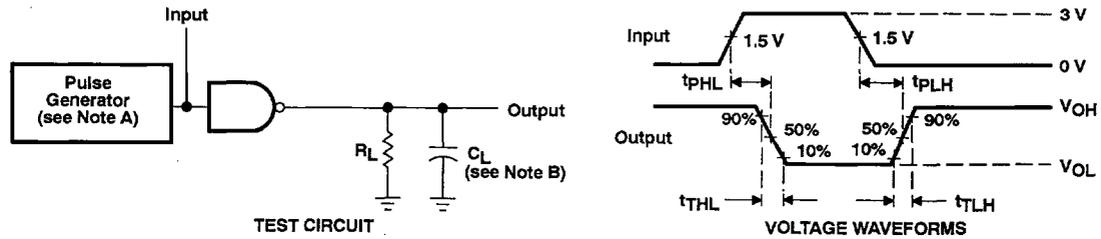
switching characteristics,  $V_{CC\pm} = \pm 9\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$ Propagation delay time, low-to-high-level output	$R_L = 3\text{ k}\Omega$ , $C_L = 15\text{ pF}$ , See Figure 1		220	350	ns
$t_{PHL}$ Propagation delay time, high-to-low-level output			100	175	ns
$t_{TLH}$ Transition time, low-to-high-level output†			55	100	ns
$t_{THL}$ Transition time, high-to-low-level output†			45	75	ns
$t_{TLH}$ Transition time, low-to-high-level output‡	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ , $C_L = 2500\text{ pF}$ , See Figure 1		2.5		$\mu\text{s}$
$t_{THL}$ Transition time, high-to-low-level output‡			3.0		$\mu\text{s}$

† Measured between 10% and 90% points of output waveform.

‡ Measured between 3 V and  $-3\text{ V}$  points on the output waveform (EIA RS-232-C conditions).

## PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generator has the following characteristics:  $t_w = 0.5\ \mu\text{s}$ ,  $\text{PRR} \leq 1\text{ MHz}$ ,  $Z_0 = 50\ \Omega$ .  
B.  $C_L$  includes probe and jig capacitance.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS†

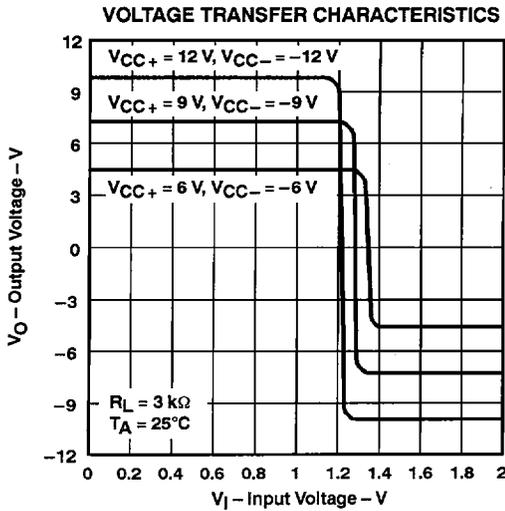


Figure 2

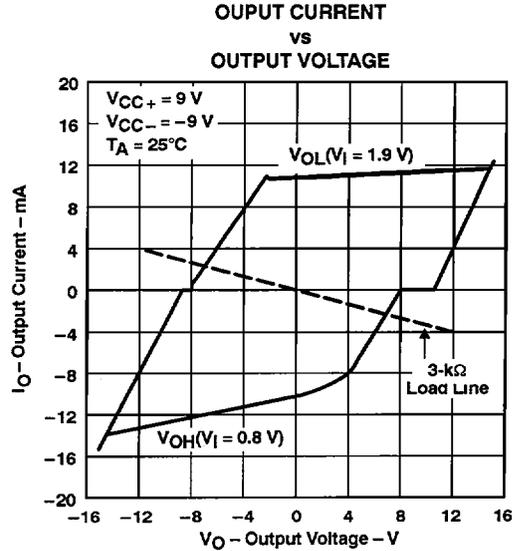


Figure 3

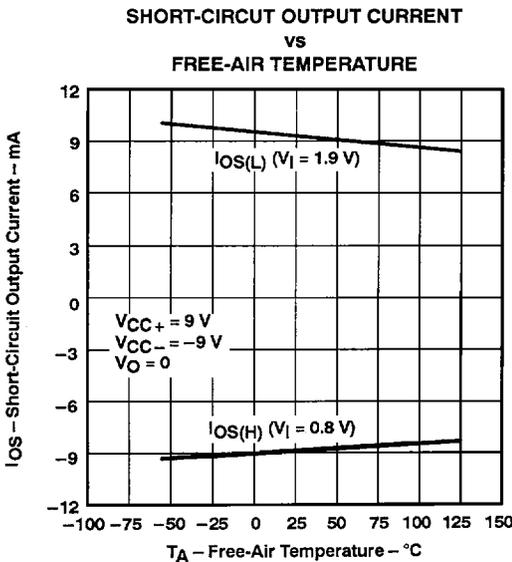


Figure 4

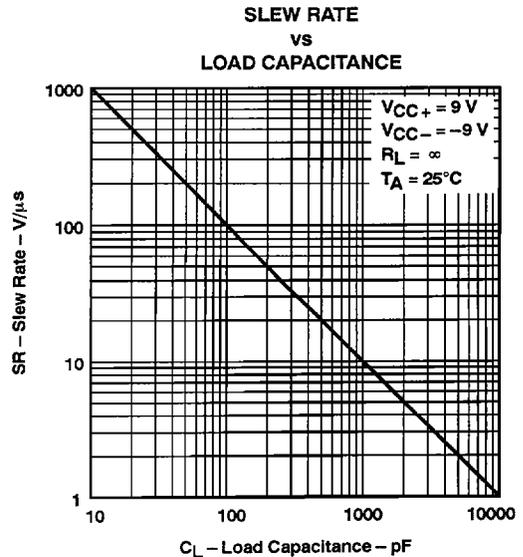


Figure 5

† Data for temperatures below 0°C and above 70°C are applicable to SN55188 circuit only.

# MC1488, SN55188, SN75188 QUAD LINE DRIVERS

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## THERMAL INFORMATION†

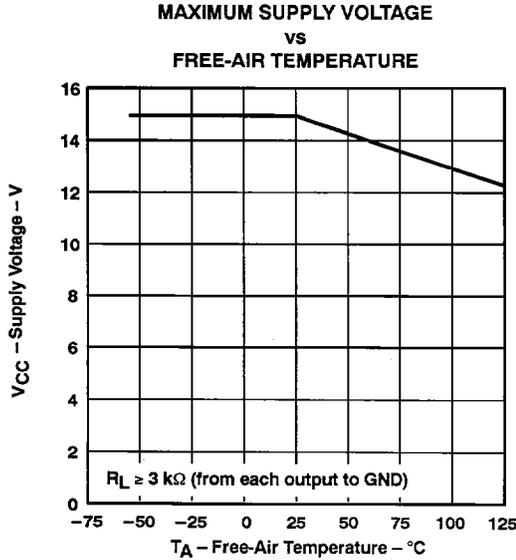


Figure 6

## APPLICATION INFORMATION

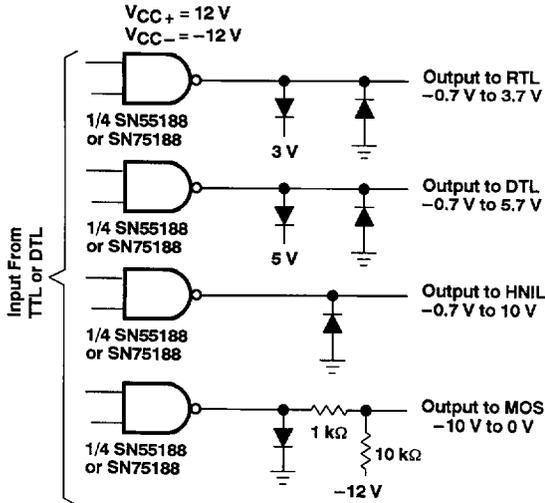


Figure 7. Logic Translator Applications

Diodes placed in series with the  $V_{CC+}$  and  $V_{CC-}$  leads will protect the SN55188/SN75188 in the fault condition in which the device outputs are shorted to  $\pm 15\text{ V}$  and the power supplies are at low and provide low-impedance paths to ground.

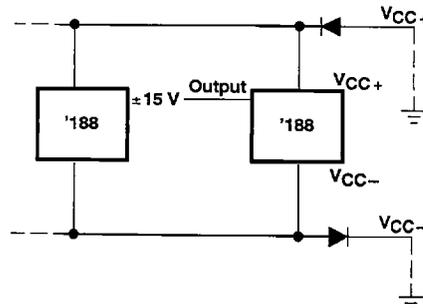


Figure 8. Power Supply Protection to Meet Power-Off Fault Conditions of EIA Standard RS-232-C