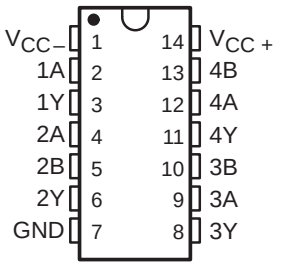
MC1488, SN55188, SN75188
QUADRUPLE LINE DRIVERS

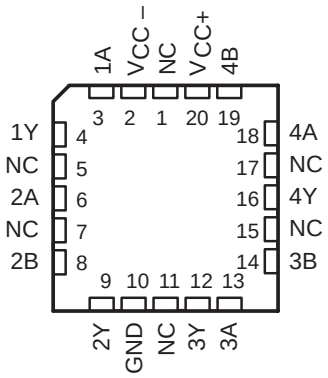
SLLS094B – SEPTEMBER 1983 – REVISED MAY 1995

- **Meet or Exceed the Requirements of ANSI EIA/TIA-232-E and ITU Recommendation V.28**
- **Designed to Be Interchangeable With Motorola MC1488**
- **Current-Limited Output: 10 mA Typical**
- **Power-Off Output Impedance: 300 Ω Minimum**
- **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)



SN55188 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

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

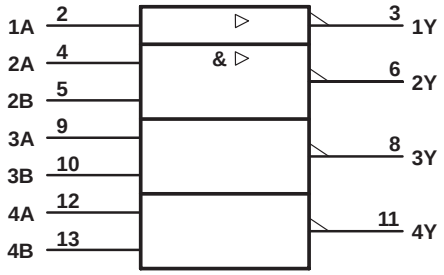
The SN55188 is characterized for operation over the full military temperature range of –55°C to 125°C. The MC1488 and SN75188 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE
(drivers 2–4)

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

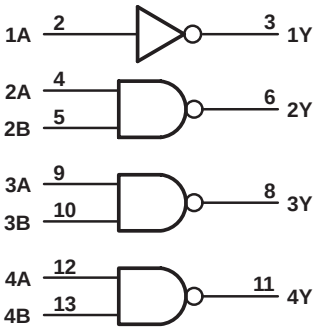
H = high level, L = low level,
X = irrelevant

logic symbol†



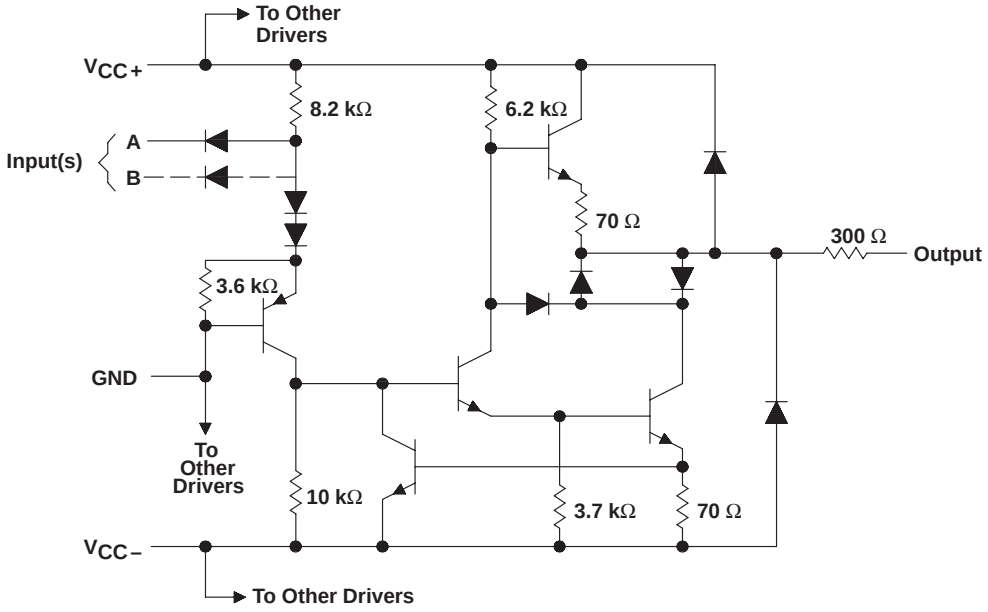
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D and N packages.

logic diagram (positive logic)



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

schematic (each driver)



Resistor values shown are nominal.

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

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

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ 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

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, $V_{CC\pm}$ = ±9 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 V, R_L = 3 kΩ	V_{CC+} = 9 V, V_{CC-} = −9 V	6	7		6	7		V
			V_{CC+} = 13.2 V, V_{CC-} = −13.2 V	9	10.5		9	10.5		
V_{OL}	Low-level output voltage	V_{IH} = 1.9 V, R_L = 3 kΩ	V_{CC+} = 9 V, V_{CC-} = −9 V		−7‡	−6		−7	−6	V
			V_{CC+} = 13.2 V, V_{CC-} = −13.2 V		−10.5‡	−9		−10.5	−9	
I_{IH}	High-level input current	V_I = 5 V				10			10	μA
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 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 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 V to 2 V	V_{CC-} = 0,	300			300			Ω
I_{CC+}	Supply current from V_{CC+}	V_{CC+} = 9 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 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	
		V_{CC+} = 15 V, No load, T_A = 25°C	All inputs at 1.9 V			34			34	
			All inputs at 0.8 V			12			12	
I_{CC-}	Supply current from I_{CC-}	V_{CC-} = −9 V, No load	All inputs at 1.9 V		−13	−17		−13	−17	mA
			All inputs at 0.8 V			−0.5			−0.015	
		V_{CC-} = −12 V, No load	All inputs at 1.9 V		−18	−23		−18	−23	
			All inputs at 0.8 V			−0.5			−0.015	
		V_{CC-} = −15 V, No load, T_A = 25°C	All inputs at 1.9 V			−34			−34	
			All inputs at 0.8 V			−2.5			−2.5	
P_D	Total power dissipation	V_{CC+} = 9 V, No load	V_{CC-} = −9 V,			333			333	mW
		V_{CC+} = 12 V, No load	V_{CC-} = −12 V,			576			576	

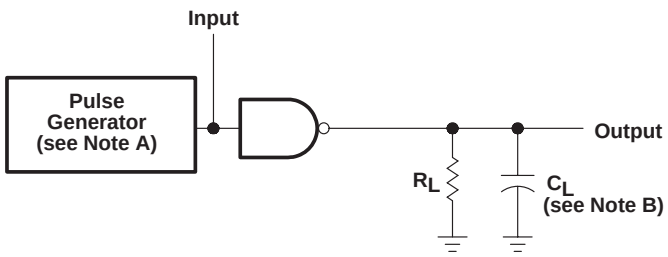
† All typical values are at T_A = 25°C.
‡ The algebraic convention, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for logic voltage levels only, e.g., if −6 V is a maximum, the typical value is a more negative voltage.
§ Not more than one output should be shorted at a time.

switching characteristics, $V_{CC\pm}$ = ±9 V, T_A = 25°C

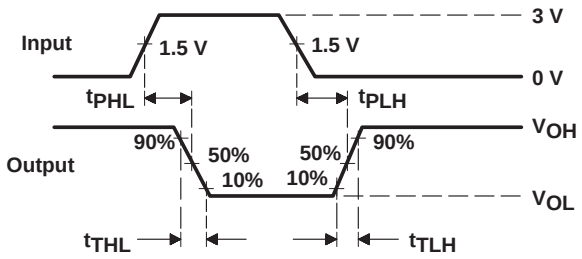
PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	R_L = 3 kΩ, See Figure 1	C_L = 15 pF,		220	350	ns
t_{PHL}	Propagation delay time, high- to low-level output				100	175	ns
t_{TLH}	Transition time, low- to high-level output†				55	100	ns
t_{THL}	Transition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

† Measured between 10% and 90% points of output waveform.
‡ Measured between 3 V and –3 V points on the output waveform (EIA/TIA-232-E conditions).

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: t_W = 0.5 µs, PRR ≤ 1 MHz, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS†

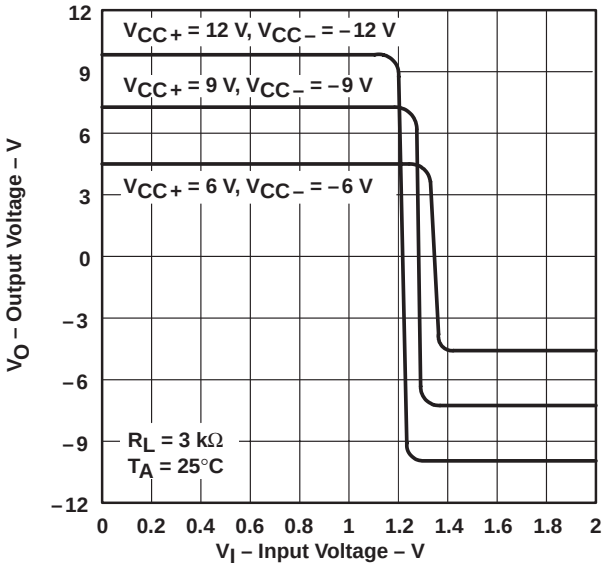


Figure 2

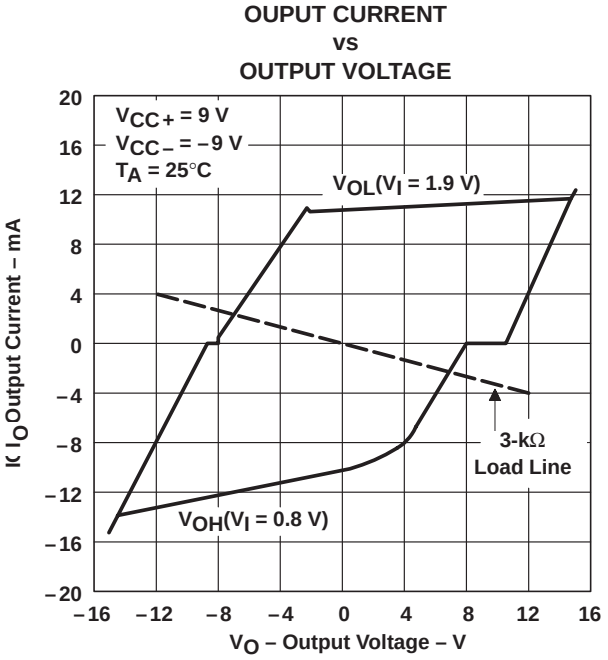


Figure 3

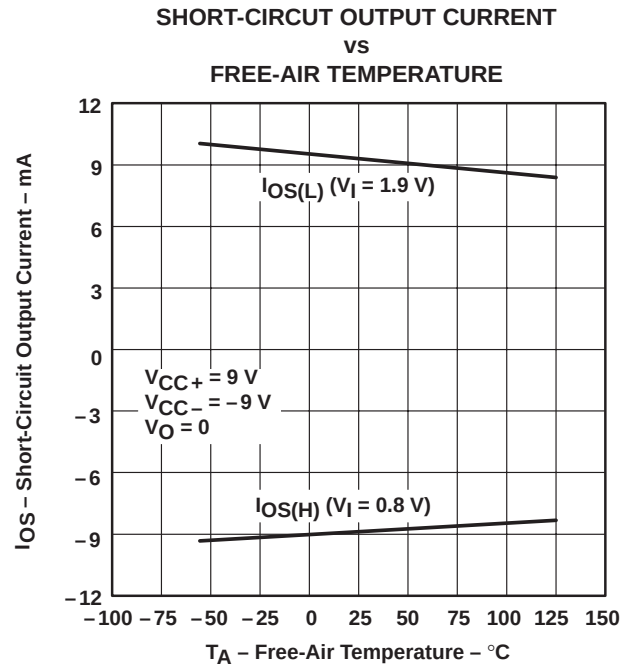


Figure 4

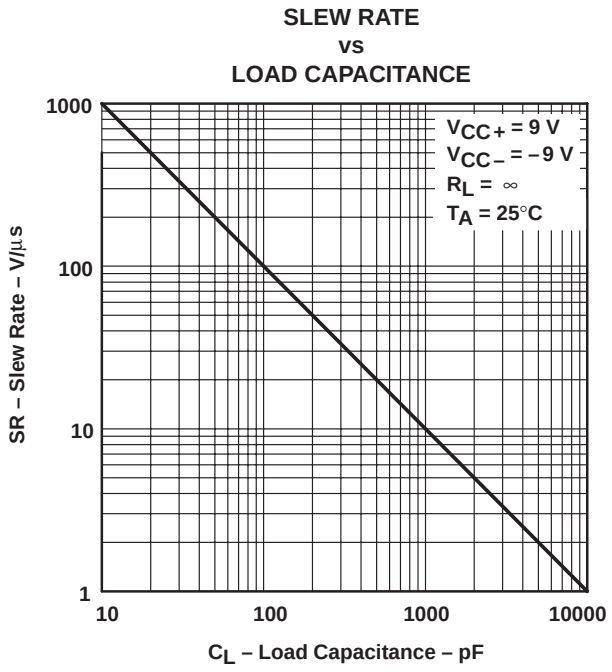


Figure 5

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

THERMAL INFORMATION†

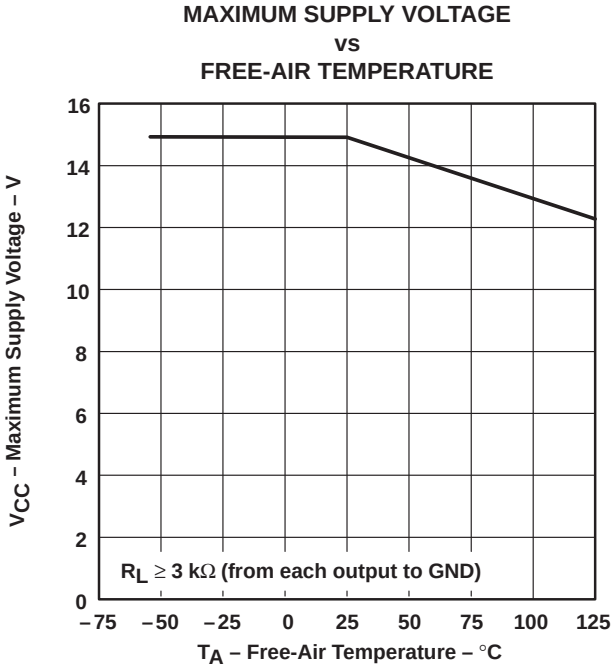


Figure 6

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

APPLICATION INFORMATION

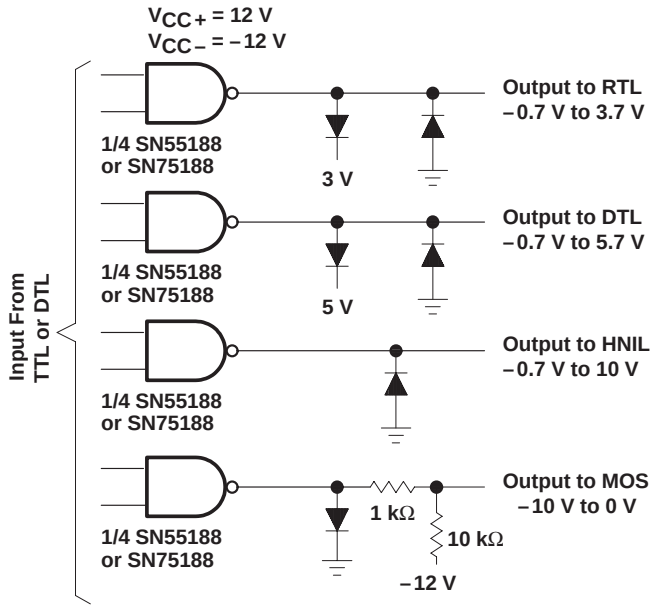
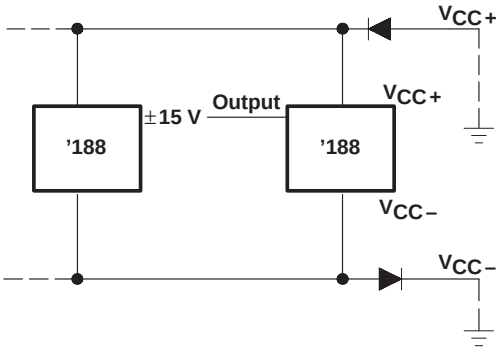


Figure 7. Logic Translator Applications



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 ±15 V and the power supplies are at low voltage and provide low-impedance paths to ground.

Figure 8. Power Supply Protection to Meet Power-Off Fault Conditions of ANSI EIA/TIA-232-E

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