

MITSUBISHI <DIGITAL ASSP>
M75189AP/AFP

QUADRUPLE LINE RECEIVER

DESCRIPTION

The M75189AP/AFP is a semiconductor integrated circuit containing 4 line receivers for use with unbalanced digital data transmission, which meets EIA Standards RS-232-C.

FEATURES

- Input characteristics meet EIA Standards RS-232-C
- Input resistance of 3k to 7kΩ ($V_i = -3$ to $-25V/3$ to $25V$)
- Input voltage range from -30 to $+30V$
- Input hysteresis is 1.0V typ.
- Response control provides :
input threshold shifting,
input noise filtering.
- Output characteristics are compatible with TTL circuits
- Operates from single 5V power supply

APPLICATION

For use as a data transmission interface in digital equipment.

FUNCTIONAL DESCRIPTION

A 4kΩ (typ) resistor is connected in series with input I and the input impedance is 3k to 7kΩ, (the applied input voltage V_i equalling -3 to $-25V$ or 3 to $25V$).

A resistor or a resistor and bias voltage can be connected between RC and GND to shift the input threshold voltage levels.

The input hysteresis is set to 1.0V (typ).

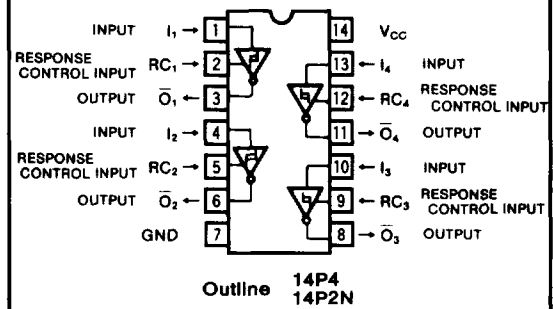
Input noise can be rejected by connecting a capacitor between RC and GND. Refer to TYPICAL APPLICATION b).

Output \bar{O} is pulled up by 2kΩ resistor to V_{CC} so that the AND tie can be made, and can drive TTL circuits directly.

The supply voltage is from a single 5V power supply.

This integrated circuit is suitable for data transmission interface in digital equipment since the input characteristics meet EIA Standards RS-232-C. Refer to Table 1, which shows the EIA Standards RS-232-C. M75188P may be used as a driver which meets these standards. An unbalanced form of transmission is used. Refer to TYPICAL APPLICATION a) for further information.

PIN CONFIGURATION (TOP VIEW)



CIRCUIT DIAGRAM (EACH CIRCUIT)

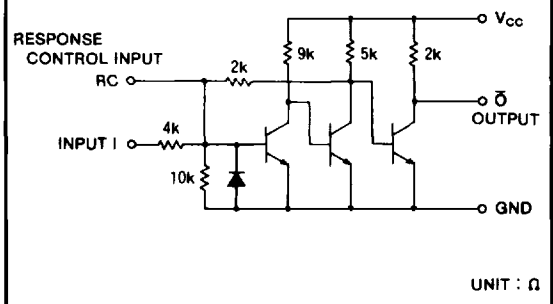


Table 1 Eia standards RS-232-C

	Parameter	RS-232-C	M75189AP Corresponding Parameters (Symbol)
Common	Transmission form	Unbalanced	Input I
	Maximum transmission distance	15m	
	Maximum transmission speed	20kbit/s	
Driver	Maximum output voltage (no load)	$\pm 25V$	
	Minimum output voltage (loaded)	$\pm 5 \sim \pm 15V$	
	Minimum output resistance (power off)	$R_o \approx 300\Omega$	
	Maximum short-circuit output current	$\pm 500mA$	
Receiver	Slew rate	Maximum 30V/ μs	
	Input resistance	3k ~ 7kΩ	
	Maximum input threshold	$-3 \sim +3V$	V_{T+}, V_{T-}
	Maximum input voltage	$-25 \sim +25V$	I_{IH}, I_{IL}

QUADRUPLE LINE RECEIVER

ABSOLUTE MAXIMUM RATINGS ($T_a=0\sim 75^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit	
V_{CC}	Supply voltage		-0.5~+10	V	
V_i	Input voltage		-30~+30	V	
I_o	Output current	When output is low	0~20	mA	
P_d	Power dissipation	DIP	$T_a=25^\circ\text{C}$ (Note 1)	1000	mW
		SOP	$T_a=25^\circ\text{C}$ (Note 2)	570	
T_{stg}	Storage temperature range		-65~+150	$^\circ\text{C}$	

Note 1 : A derating of 9.1mW/ $^\circ\text{C}$ should be made when $T_a \geq 40^\circ\text{C}$
 Note 2 : A derating of 4.5mW/ $^\circ\text{C}$ should be made when $T_a \geq 25^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limits			Unit
		Min	Typ	Max	
V_{CC}	Supply voltage	4.75	5	5.25	V
V_i	Input voltage	-15		15	V
T_{opr}	Operating free-air ambient temperature range	0		75	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($V_{CC}=5\text{V}$, $T_a=0\sim 75^\circ\text{C}$, unless otherwise noted)

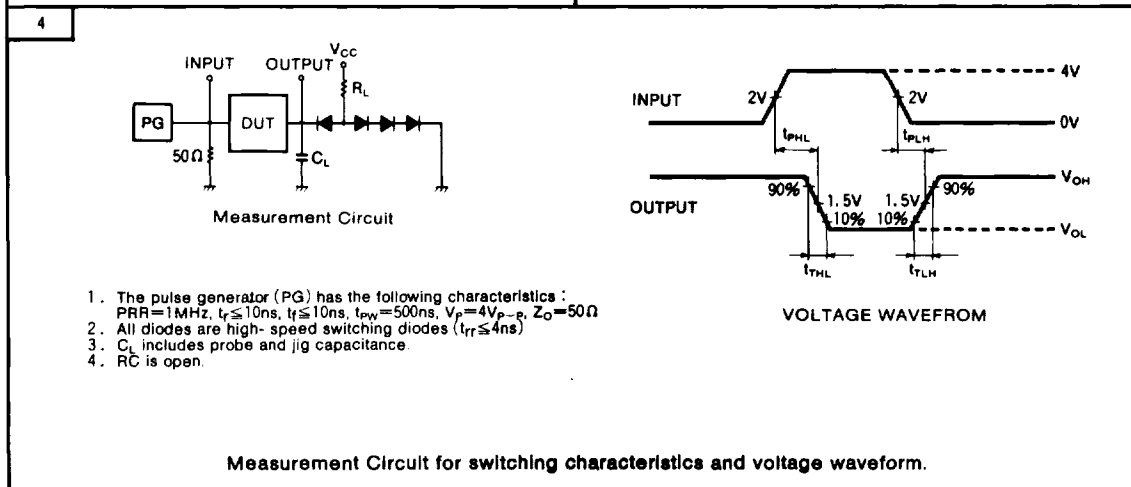
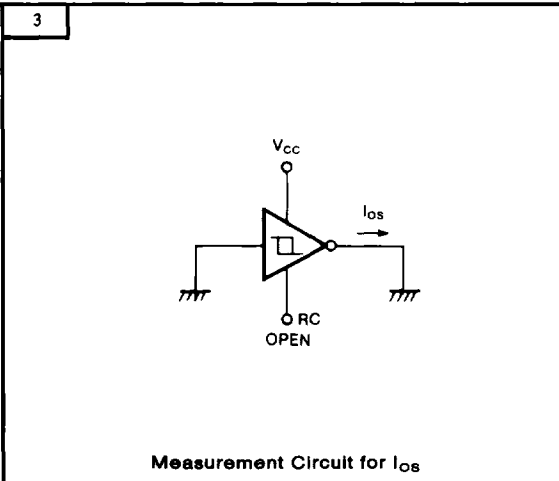
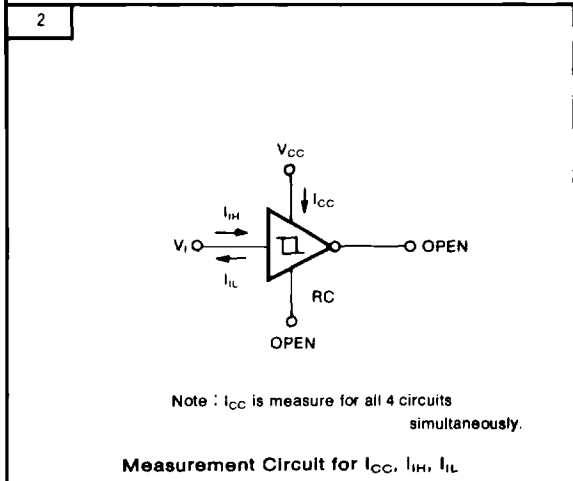
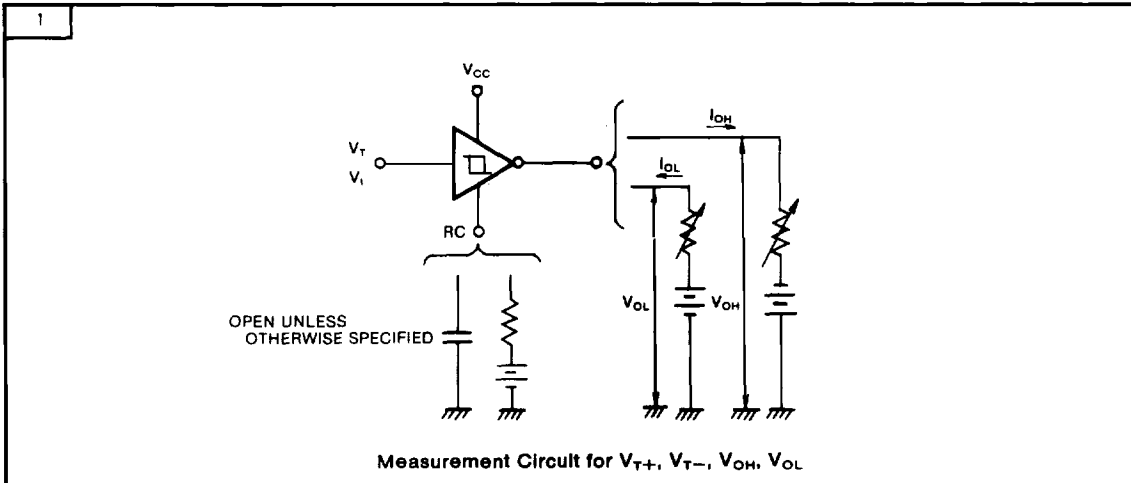
Symbol	Parameter	Test conditions	Limits			Unit	Measurement circuit
			Min	Typ*	Max		
V_{T+}	Positive-going threshold voltage	$T_a=25^\circ\text{C}$	1		1.5	V	1
			0.9		1.6		
V_{T-}	Negative-going threshold voltage	$T_a=25^\circ\text{C}$	0.75		1.25	V	1
			0.65		1.25		
$V_{T+}-V_{T-}$	Hysteresis	$T_a=25^\circ\text{C}$	0	0.25	0.75	V	1
V_{OH}	High-level output voltage	$V_i=0.75\text{V}$, $I_{OH}=-0.5\text{mA}$	2.6	4	5	V	1
		V_i : Open, $I_{OH}=-0.5\text{mA}$	2.6	4	5		
V_{OL}	Low-level output voltage	$V_i=3\text{V}$, $I_{OL}=10\text{mA}$		0.2	0.45	V	1
I_{IH}	High-level input current	$V_i=25\text{V}$	DIP	3.6	8.3	mA	2
		$V_i=15\text{V}$	SOP		5.0		
		$V_i=3\text{V}$		0.43			
I_{IL}	Low-level input current	$V_i=-25\text{V}$	DIP	-3.6	-8.3	mA	2
		$V_i=-15\text{V}$	SOP		-5.0		
		$V_i=-3\text{V}$		-0.43			
I_{OS}	Short-circuit output current	$V_i=0\text{V}$, $V_o=0\text{V}$	-1.6	-2.5	-5	mA	3
I_{CC}	Supply current	$V_{CC}=5\text{V}$, $V_i=5\text{V}$		20	26	mA	2

* : All typical values are at $V_{CC1}=5\text{V}$, $T_a=25^\circ\text{C}$.

SWITCHING CHARACTERISTICS ($V_{CC}=5\text{V}$, $T_a=25^\circ\text{C}$, unless otherwise noted)

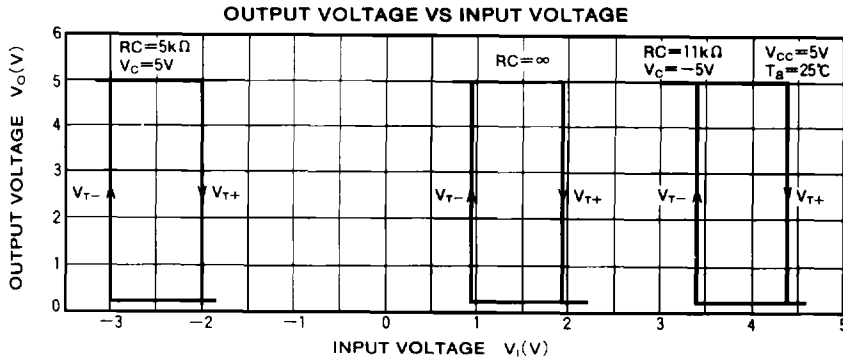
Symbol	Parameter	Test conditions	Limits			Unit	Measurement circuit
			Min	Typ	Max		
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input I to output O	$C_L=15\text{pF}$, $R_L=3.9\text{k}\Omega$		25	85	ns	4
t_{PHL}	propagation time, from input I to output O	$C_L=15\text{pF}$, $R_L=390\Omega$		25	50		
t_{TLH}	Low-to-high-level output transition time	$C_L=15\text{pF}$, $R_L=3.9\text{k}\Omega$		120	175		
t_{THL}	High-to-low-level output transition time	$C_L=15\text{pF}$, $R_L=390\Omega$		10	20		

MEASUREMENT CIRCUITS

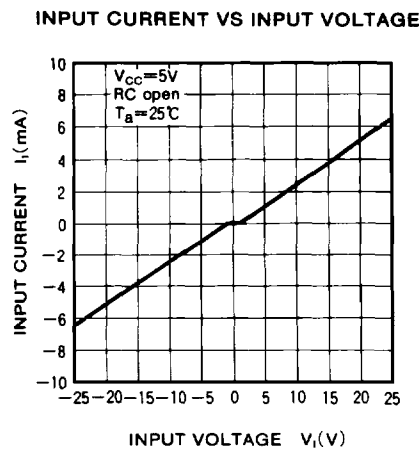
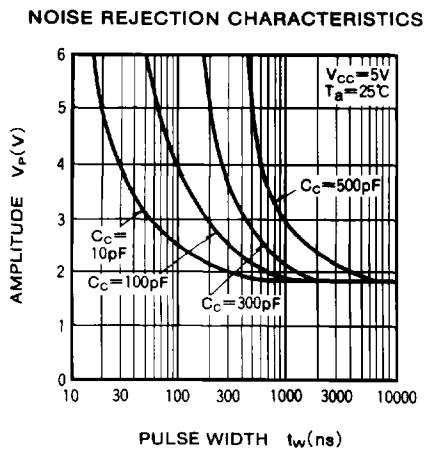
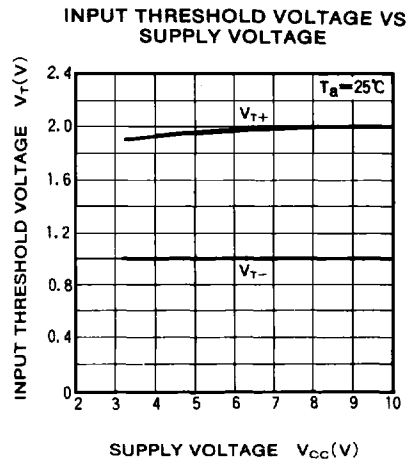
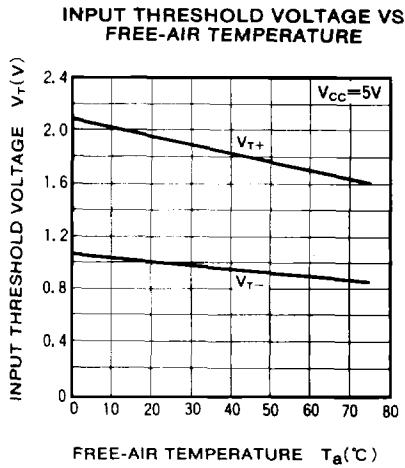
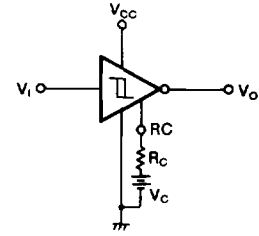


QUADRUPLE LINE RECEIVER

TYPICAL CHARACTERISTICS

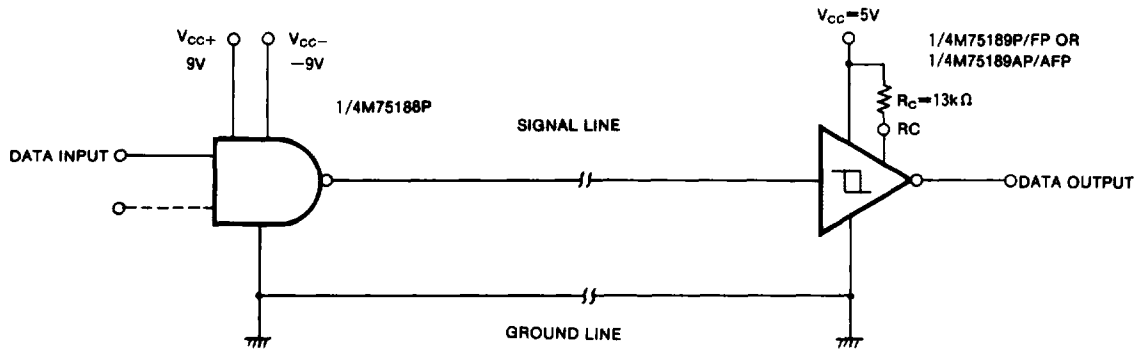


MEASUREMENT CIRCUIT

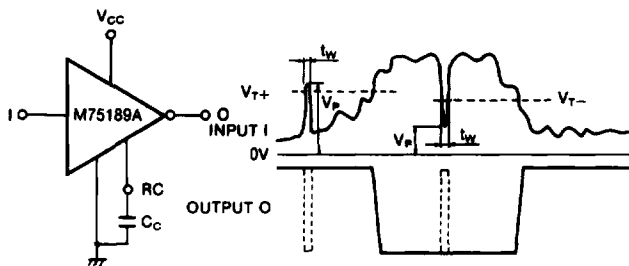


TYPICAL APPLICATION

a) COMBINATION OF DRIVER AND RECEIVER



b) WAVEFORM RESTORATION AND NOISE REJECTION



As in the above diagram, in preventing inversion of output O by input pulse, whose width t_w and amplitude greater than V_{r+} or less than V_{r-} , connect capacitor C_c , the value of which can be obtained from a noise rejection characteristics table. Shorten the rise and fall time of input I if C_c is connected.