M75175P/FP

QUADRUPLE DIFFERENTIAL LINE RECEIVER

DESCRIPTION

The M75175P/FP is an integrated circuit consisting of 4 line receivers for use with balanced and unbalanced digital data transmissions meeting EIA standards RS-485, RS-422A and RS-423A.

FEATURES

- Input characteristics meet EIA standards RS-485, RS-422A and RS-423A.
- Input with hysteresis (A, $\overline{A}$ 50 mV typ)
- Common mode input voltage range −12∼+12V
- Input sensitivity of ±200 mV (max)
- High input impedance 12kΩ (min)
- Fail safe operation. Output always high when inputs A and $\overline{A}$ are open
- Three-state output
- Operated by single 5V power supply

APPLICATION

For use as a data transmission interface in digital equipment.

FUNCTIONAL DESCRIPTION

Within the common mode voltage range of −12V to +12V, the threshold voltage of A and $\overline{A}$ is ± 200mV. The hysteresis of A and $\overline{A}$ is 50mV typ. As the input impedance of A and $\overline{A}$ is 12kΩ (min), the device will be easy to use.

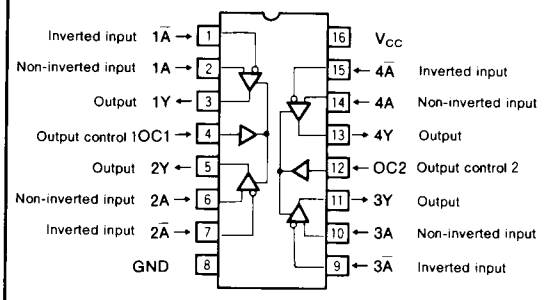
Output control inputs OCs common to each two circuits of the receiver. Output Y has three-state and will be high impedance when OC is low.

Y output characteristics are compatible with TTL circuits.

The M75175P/FP can be used as a receiver for balanced and unbalanced receiver. The device is suitable for data transmission and multi-point transmission circuit can be made in combination with drivers compatible with RS-485 standards. Up to 32 driver/receiver pairs can be connected to the bus.

Refer to the APPLICATION EXAMPLE for further information.

PIN CONFIGURATION (TOP VIEW)



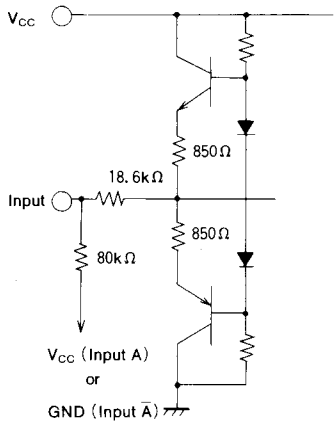
Outline 16P4
16P2N

FUNCTION TABLE (Note 1)

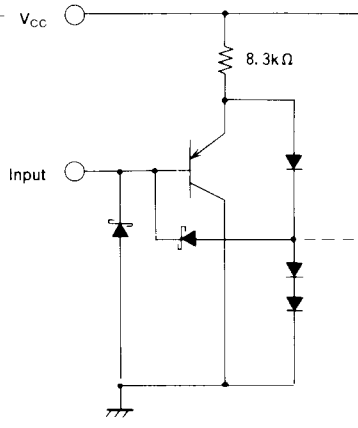
A	$\overline{A}$	OC	Y
$V_{ID} > V_{TH}$		H	H
$V_{TL} < V_{ID} < V_{TH}$		H	*
$V_{ID} < V_{TL}$		H	L
X		L	Z

Note 1 : V_{ID} : (applied voltage A)−(applied voltage $\overline{A}$)
V_{TH} : 0.2V
V_{TL} : −0.2V
X : irrelevant
* : indeterminate
Z : high-impedance

INPUT EQUIVALENT CIRCUIT

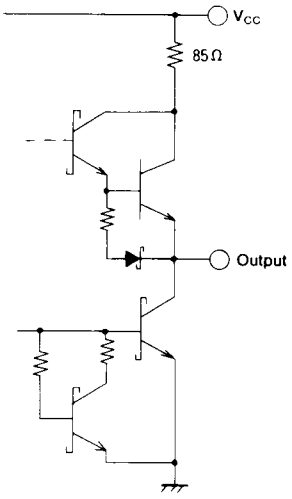


a) Input A, Ā



b) Output control input OC

OUTPUT EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS (T_a=−20∼+75℃, unless otherwise noted)

Symbol	Parameter		Conditions	Ratings	Unit
V_{CC}	Supply voltage			−0.5∼+7	V
V_I	Input voltage	A, Ā		−25∼+25	V
		OC		−0.5∼+7	
V_{ID}	Voltage difference between inputs	A, Ā		−25∼+25	V
I_{OL}	Low-level output current			0∼50	mA
Pd	Power dissipation	DIP	T_a=25℃ (Note 2)	1000	mW
		SOP	T_a=25℃ (Note 3)	640	
Tstg	Storage temperature range			−65∼+150	℃

Note 2 : A derating of 9mW/℃ should be made when $T_a \geq 40$℃.
3 : A derating of 5.1mW/℃ should be made when $T_a \geq 25$℃.

RECOMMENDED OPERATING CONDITIONS (T_a=−20∼+75℃, unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage		4.75	5	5.25	V
V_{IC}	Common mode input voltage (Note 4)	A, Ā	−12		+12	V
I_{OH}	High-level output current	$V_{OH} \geq 2.7$V	0		−400	μA
I_{OL}	Low-level output current	$V_{OL} \leq 0.5$V	0		16	mA
Topr	Ambient temperature range		−20		+75	℃

Note 4 : Common mode input voltage A, Ā is the average value of the voltages applied on A, Ā.

ELECTRICAL CHARACTERISTICS (V_{CC}=5V±5%, V_{IC}=−12∼+12V, T_a=−20∼+75℃)

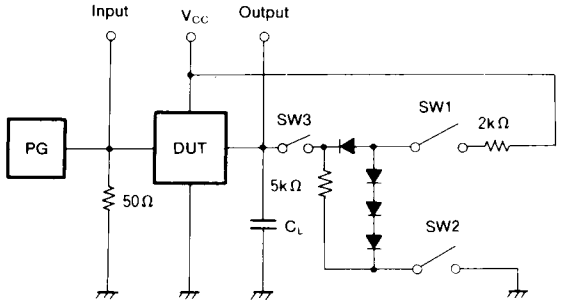
Symbol	Parameter		Test conditions		Limits Min	Limits Typ*	Limits Max	Unit
V_{TH}	High threshold voltage	A, $\bar{A}$	V_{OH}=2.7V, I_{OH}=−400μA				0.2	V
V_{TL}	Low threshold voltage	A, $\bar{A}$	V_{OL}=0.5V, I_{OL}=16mA		−0.2			V
$V_{T+}-V_{T-}$	Hysterisis (Note 5)	A, $\bar{A}$				50		mV
V_{IH}	High-level input voltage	OC			2			V
V_{IL}	Low-level input voltage	OC					0.8	V
V_{IK}	Input clamp voltage	OC	I_I=−18mA				−1.5	V
V_{OH}	High-level output voltage		V_{ID}=0.2V, I_{OH}=−400μA		2.7	3.5		V
V_{OL}	Low-level output voltage		V_{ID}=−0.2V	I_{OL}=8mA		0.31	0.45	V
				I_{OL}=16mA		0.40	0.5	
I_{OZH}	Off-state high-level output current		V_O=2.4V				20	μA
I_{OZL}	Off-state low-level output current		V_O=0.4V				−20	μA
I_I	Input current	A, $\bar{A}$	Other inputs 0V	V_I=12V			1	mA
				V_I=−7V			−0.8	
I_{IH}	High-level input current	OC	V_I=2.7V				20	μA
I_{IL}	Low-level input current	OC	V_I=0.4V				−100	μA
r_i	Input resistance	A, $\bar{A}$			11(Note 6)	15		kΩ
I_{OS}	Output short circuit current (Note 7)				−15		−85	mA
I_{CC}	Supply current		All outputs in disable state			55	75	mA

* : Typical values are at V_{CC}=5V, T_a=25℃ and V_{IC}=0V.
Note 5 : Hysteresis is the difference between the positive input threshold voltage V_{T+} and negative input threshold voltage V_{T-}.
6 : Minimum value is 12kΩ within T_a=0∼75℃.
7 : All measurements should be done quickly and not more than one output should be shorted at a time.

SWITCHING CHARACTERISTICS (V_{CC}=5V, T_a=25℃, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits Min	Limits Typ	Limits Max	Unit
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input A, $\bar{A}$ to output Y	C_L=15pF(Note 8)		17	35	ns
t_{PHL}				26	35	ns
t_{PZH}	High-level output enable time	C_L=15pF(Note 8)		13	30	ns
t_{PZL}	Low-level output enable time			16	30	ns
t_{PHZ}	High-level output disable time	C_L=5pF(Note 8)		16	35	ns
t_{PLZ}	Low-level output disable time			22	35	ns

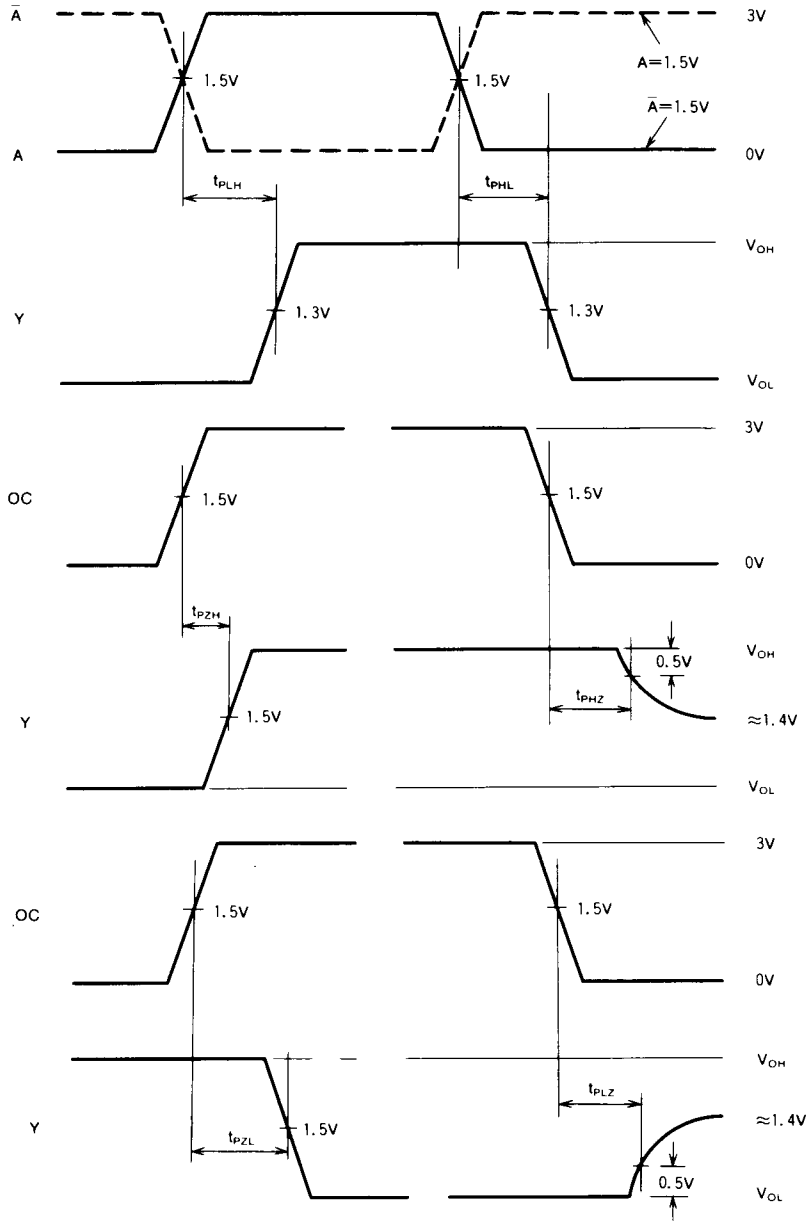
Note 8 : Test circuit



(1) The pulse generator(PG) has the following characteristiscs : PRR=1MHz, t_w=500ns, t_r≦5ns, t_f≦5ns, Z_O=50Ω
(2) All diodes are high-speed switching diodes (t_{rr}≦4ns)
(3) The capacitance C_L includes stray wiring capacitance and the probe input capacitance.

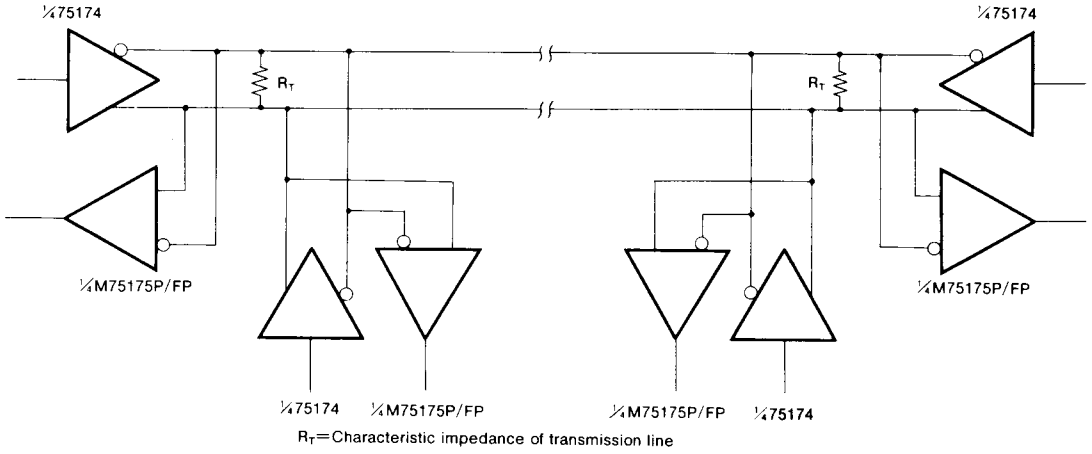
Parameter	SW 1	SW 2	SW3
t_{PLH}, t_{PHL}	—	—	Open
t_{PZH}	Open	Closed	Closed
t_{PZL}	Closed	Open	Closed
t_{PHZ}	Closed	Closed	Closed
t_{PLZ}	Closed	Closed	Closed

TIMING DIAGRAM



APPLICATION EXAMPLE

a) Balanced type



R_T=Characteristic impedance of transmission line

b) Unbalanced type