MB413

## QUAD DIFFERENTIAL LINE RECEIVER WITH THREE-STATE OUTPUTS

<Outline>

The Fujitsu MB413 is the balanced
transmission receiver with Schottky
TTL technology and is designed to
satisfy CCITT recommendation V11.

Since input pin A has a pull-up
resistor and input pin B has a pull-
down resistor, output is set to high
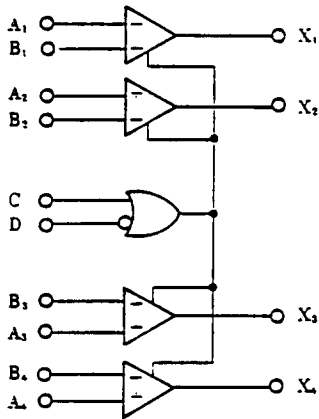level when input A and input B are
open.

<Features>

o Differential input

o Input sensitivity: 300 mV

o CCITT recommendation is satisfied

o Output is high level when differen-
   tial input is open

o Low power Schottky TTL

o Three-state outputs

PIN ASSIGNMENT (TOP VIEW)

B_1	1	16	V_{cc}
A_4	2	15	B_4
X_1	3	14	A_4
C	4	13	X_4
X_2	5	12	D
A_2	6	11	X_3
B_2	7	10	A_3
GND	8	9	B_3

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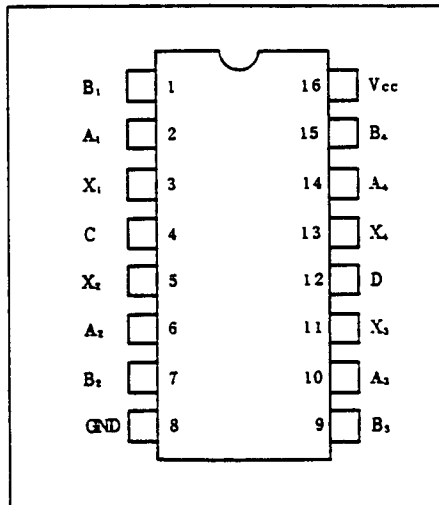
BLOCK DIAGRAM

FUNCTION TABLE

Input			Output
C	D	V_{DIFF}	X
H	✳	+	H
✳	L	+	H
H	✳	−	L
✳	L	−	L
L	H	✳	Hz

[Note]
$V_{DIFF} = V_{IA} - V_{IB}$
✳: Irrelevant level
HZ: High impedance state

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Voltage	V_{cc}	÷ 7	V
In-Phase Input Voltage*	V_{CM}	− 25 ~ ÷ 25	V
Differential Input Voltage*	$|V_{DIFF}|$	0 ~ ÷ 25	V
Input Voltage C, D	V_I	÷ 7	V
Output Current	I_o	+ 50	mA
Operating Temperature	T_A	− 25 ~ ÷ 125	℃
Storage Temperature	T_{stg}	− 65 ~ ÷ 165	℃

[Note]
1. Applied voltage (*) should not exceed ±25 V for GND pin.
2. $V_{CM} = \frac{1}{2}(V_{IA} + V_{IB})$,
   $|V_{DIFF}| = |V_{IA} - V_{IB}|$

.RECOMMENDED OPERATING CONDITIONS

Rating	Symbol	Value	Unit
Power Voltage	V_{cc}	÷ 4.75 ~ ÷ 5.25	V
In-phase Input Voltage	V_{CM}	− 7 ~ ÷ 7	V
Differential Input Voltage	$|V_{DIFF}|$	+ 0.3 ~ ÷ 6	V
Operating Temperature	T_A	0 ~ + 70	℃

[Note]
2. $V_{CM} = \frac{1}{2}(V_{IA} + V_{IB})$,
   $|V_{DIFF}| = |V_{IA} - V_{IB}|$

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ELECTRICAL CHARACTERISTIC

1. DC Characteristics (T_A = 0°C - +70°C)

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Threshold Voltage	V_{TH}	$Vcc = 5.0 V \pm 5\%$	$V_{OH} \geq 2.7 V$ $I_{OH} = -440 \mu A$	–	–	0.3	V
Differential Input	V_{TL}	$-7 V \leq V_{CM} \leq 7 V$	$V_{OL} \leq 0.4 V$ $I_{OL} = 4 mA$	– 0.3	–	–	
High Level Output Voltage	V_{OH}	$Vcc = 4.75 V, I_{OH} = -440 \mu A$ $V_{DIFF} = 0.3 \sim 6 V$ $V_{IC} = 2.0 V, V_{ID} = 0.8 V$		2.7	–	–	V
Low Level Output Voltage	V_{OL}	$Vcc = 4.75 V$ $V_{DIFF} = -0.3 \sim -6 V$ $V_{IC} = 2.0 V, V_{ID} = 0.8 V$	$I_{OL} = 4 mA$	–	–	0.4	V
			$I_{OL} = 8 mA$	–	–	0.45	
Input Current (Input A, B)	I_I	$Vcc = 5.25 V$ or $Vcc = 0 V$	$V_I = 10 V$	–	–	2.2	mA
			$V_I = 3 V$	0	–	1.0	
			$V_I = -3 V$	– 1.0	–	0	
			$V_I = -10 V$	– 2.2	–	–	
Input Clamp Voltage (Input C, D)	V_{IK}	$Vcc = 4.75 V, I_I = -18 mA$		–	–	– 1.5	V
Input Current (Input C, D)	I_{IL}	$Vcc = 5.25 V, V_I = 0.4 V$		–	–	–0.36	mA
Input Current (Input C, D)	I_{IH}	$Vcc = 5.25 V$	$V_I = 2.7 V$	–	–	20	μA
			$V_I = 5.5 V$	–	–	100	
Output Leakage Current (High Impedance)	I_{OZ}	$Vcc = 5.25 V$ $V_{IC} = 0.8 V$ $V_{ID} = 2.0 V$	$V_O = 2.4 V$	–	–	20	μA
			$V_O = 0.4 V$	–	–	– 20	
Output Short Current	I_{OS}	$Vcc = 5.25 V, V_O = 0 V$		– 15	–	– 85	mA
Power Current	I_{CC}	$Vcc = 5.25 V, V_I = 0 V$		–	–	70	mA

[Note]
$V_{CM} = \frac{1}{2} (V_{IA} + V_{IB})$,
$V_{DIFF} = V_{IA} - V_{IB}$

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2. Switching Characteristics (V_{CC} = +5.0 V, T_A = 25°C)

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Delay Time	t_{PLH}	$C_L = 15\,pF$	S_1 : Close	—	—	25	ns
	t_{PHL}	$V_{ID} = GND$	S_2 : Close	—	—	25	
Output Disable Time	t_{PLZ}	$C_L = 5\,pF$	S_1 : Close S_2 : Close	—	—	30	ns
	t_{PHZ}		S_1 : Close S_2 : Close	—	—	22	
Output Enable Time	t_{PZL}	$C_L = 15\,pF$	S_1 : Close S_2 : Open	—	—	22	ns
	t_{PZH}		S_1 : Open S_2 : Close	—	—	22	

3. Switching Characteristic Measurement Circuit and Switching Waveform
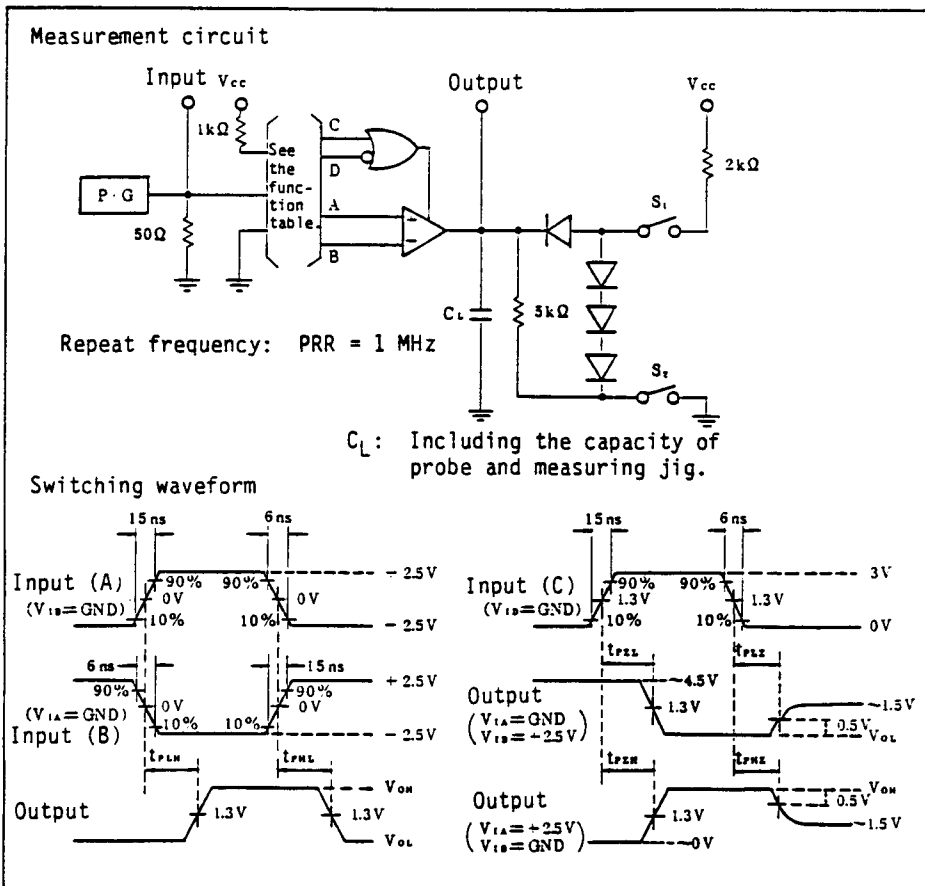
Fig. 1

TYPICAL CHARACTERISTIC CURVE
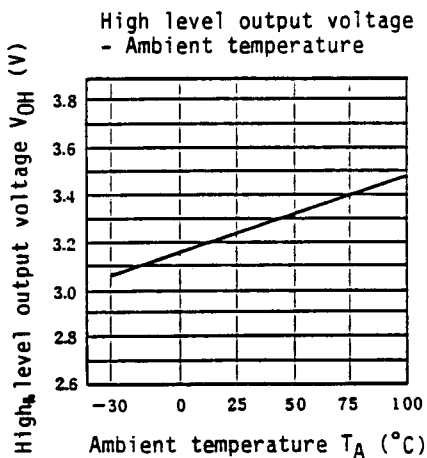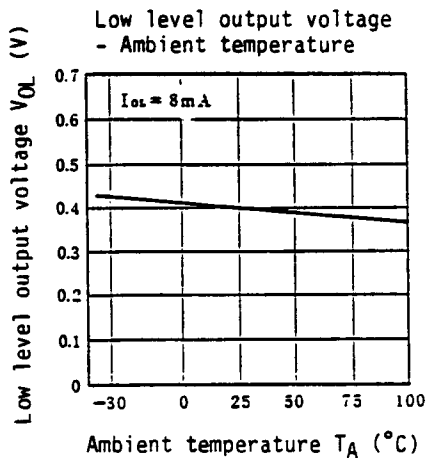
Low level output voltage - Ambient temperature

$I_{OL} = 4\,mA$

Low level output voltage V_{OL} (V) — vertical axis (0 to 0.7)
Ambient temperature T_A (°C) — horizontal axis (−30, 0, 25, 50, 75, 100)

Low level output voltage - Ambient temperature

$I_{OL} = 8\,mA$

Low level output voltage V_{OL} (V) — vertical axis (0 to 0.7)
Ambient temperature T_A (°C) — horizontal axis (−30, 0, 25, 50, 75, 100)

High level output voltage - Ambient temperature

High level output voltage V_{OH} (V) — vertical axis (2.6 to 3.8)
Ambient temperature T_A (°C) — horizontal axis (−30, 0, 25, 50, 75, 100)

Delay time - Ambient temperature

Delay time t_{PLH} t_{PHL} (ns) — vertical axis (8 to 20)
t_{PLH}
t_{PHL}
Ambient temperature T_A (°C) — horizontal axis (−30, 0, 25, 50, 75, 100)

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Switching waveform
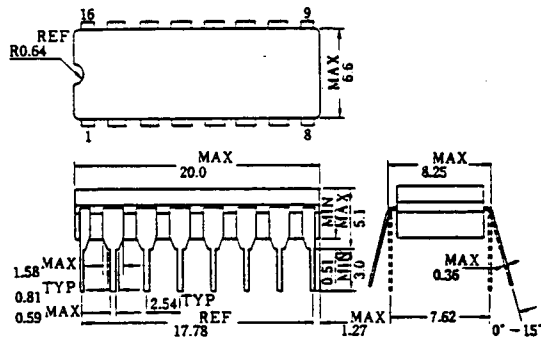**Input A - Output X**
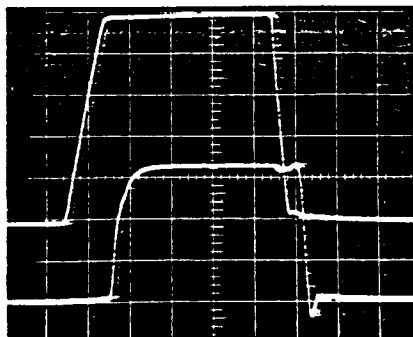
H: 20ns/DIV
V: 1V/DIV

DIP-16C-C05

Dimensions in
millimeters

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