National Semiconductor

DM5413/DM7413 Dual 4-Input NAND Gates with Schmitt Trigger Inputs

General Description

This device contains two independent gates each of which performs the logic NAND function. Each input has hysteresis which increases the noise immunity and transforms a slowly changing input signal to a fast changing, jitter free output.

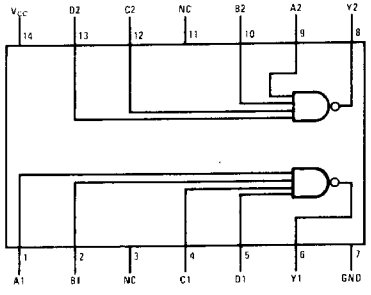
Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Storage Temperature Range	−65°C to 150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device can not be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Connection Diagram

Dual-In-Line Package



TL/F/6502-1

DM5413 (J) **DM7413 (N)**

Function Table

$Y = \overline{ABCD}$

Inputs				Output
A	B	C	D	Y
X	X	X	L	H
X	X	L	X	H
X	L	X	X	H
L	X	X	X	H
H	H	H	H	L

H = High Logic Level
L = Low Logic Level
X = Either Low or High Logic Level

Recommended Operating Conditions

Sym	Parameter	DM5413			DM7413			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{T+}	Positive-Going Input Threshold Voltage (Note 1)	1.5	1.7	2	1.5	1.7	2	V
V_{T-}	Negative-Going Input Threshold Voltage (Note 1)	0.6	0.9	1.1	0.6	0.9	1.1	V
HYS	Input Hysteresis (Note 1)	0.4	0.8		0.4	0.8		V
I_{OH}	High Level Output Current			−0.8			−0.8	mA
I_{OL}	Low Level Output Current			16			16	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature (unless otherwise noted)

Sym	Parameter	Conditions		Min	Typ (Note 2)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, $V_I = V_{T-}$ Min		2.4	3.4		V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, $V_I = V_{T+}$ Max			0.2	0.4	V
I_{T+}	Input Current at Positive-Going Threshold	V_{CC} = 5V, $V_I = V_{T+}$			−0.65		mA
I_{T-}	Input Current at Negative-Going Threshold	V_{CC} = 5V, $V_I = V_{T-}$			−0.85		mA
I_I	Input Current@Max Input Voltage	V_{CC} = Max, V_I = 5.5V				1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.4V				40	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−1.6	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 3)	DM54	−18		−55	mA
			DM74	−18		−55	
I_{CCH}	Supply Current With Outputs High	V_{CC} = Max			14	23	mA
I_{CCL}	Supply Current With Outputs Low	V_{CC} = Max			20	32	mA

Note 1: V_{CC} = 5V.

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time.

Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25°C$ (See Section 1 for Test Waveforms and Output Load)

Parameter	Conditions	$C_L = 15$ pF, $R_L = 400\Omega$			Units
		Min	Typ	Max	
t_{PLH} Propagation Delay Time Low to High Level Output			18	27	ns
t_{PHL} Propagation Delay Time High to Low Level Output			15	22	ns