signetics

DUAL NAND SCHMITT TRIGGER

S5413 N7413

S5413–A,F,W • N7413–A,F

DIGITAL 54/74 TTL SERIES

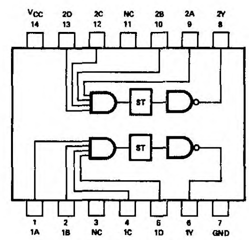
DESCRIPTION

The 5413 and 7413 dual Schmitt triggers consist of two identical Schmitt-trigger circuits in monolithic integrated circuit form. Logically, each circuit functions as a four-input NAND gate, but because of the Schmitt action, the gate has different input threshold levels for positive- and negative-going signals. The hysteresis, or backlash, which is the difference between the two threshold levels, is typically 800mV.

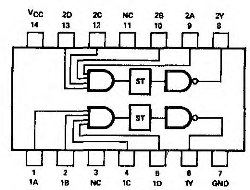
An important design feature is the built-in temperature compensation which ensures very high stability of the threshold levels and the hysteresis over a very wide temperature range. Typically, the hysteresis changes by 3% over the temperature range of −55°C to 125°C and the upper threshold changes by 1% over the same range. The 5413/7413 can be triggered from the slowest of input ramps and still give clean, jitter-free output signals. It can not be triggered from straight dc levels.

These circuits are fully compatible with most other TTL, DTL, or MSI circuits. The 5413 is characterized for operation over the full military temperature range of −55°C to 125°C; the 7413 is characterized for operation from 0°C to 70°C.

W PACKAGE



A, F PACKAGE



RECOMMENDED OPERATING CONDITIONS

		5413			7413			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply Voltage V_{CC}		4.5	5	5.5	4.75	5	5.25	V
Fan-Out From Each Output, N	High Logic Level			20			20	
	Low Logic Level			10			10	
Operating Free-Air Temperature Range, T_A		-55	0	125	0	25	70	°C
Maximum Input Rise and Fall Times		No Restriction			No Restriction			

ELECTRICAL CHARACTERISTICS (over recommended operating free-air temperature range unless otherwise noted)

PARAMETER		TEST CONDITIONS*		MIN	TYP**	MAX	UNIT
V_{T+}	Positive-going threshold voltage	V_{CC} = 5V		1.5	1.7	2	V
V_{T-}	Negative-going threshold voltage	V_{CC} = 5V		0.6	0.9	1.1	
$V_{T+}-V_{T-}$	Hysteresis	V_{CC} = 5V		0.4	0.8		V
V_I	Input clamp voltage	V_{CC} = MIN,	I_I = -12mA			-1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, I_{OH} = -800μA	V_I = 0.6V,	2.4	3.3		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, I_{OL} = 16mA	V_I = 2V,		0.22	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 at maximum 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	-1.6	mA
I_{OS}	Short-circuit output current†	V_{CC} = MAX,		-18		-55	mA
I_{CCH}	Supply current, high-level output	V_{CC} = MAX,	V_I = 0		14	23	mA
I_{CCL}	Supply current, low-level output	V_{CC} = MAX,	V_I = 4.5V		20	32	mA

SWITCHING CHARACTERISTICS, V_{CC} = 5V, T_A = 25°C, N = 10

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 15pF,	R_L = 400Ω		18	27	ns
t_{PHL}	Propagation delay time, high-to-low-level output	C_L = 15pF,	R_L = 400Ω		15	22	ns

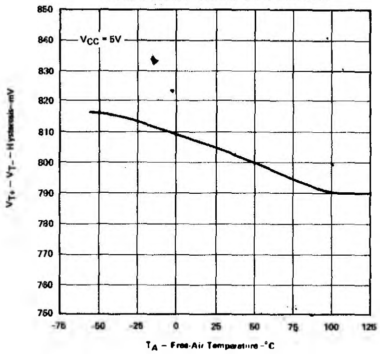
* For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.

** All typical values are at V_{CC} = 5V, T_A = 25°C.

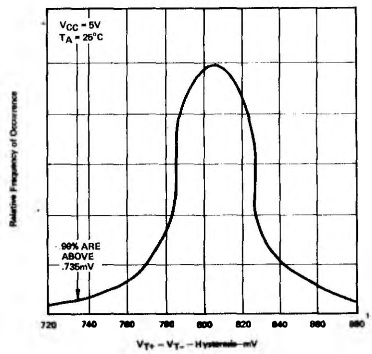
† Not more than one output should be shorted at a time.

TYPICAL CHARACTERISTICS

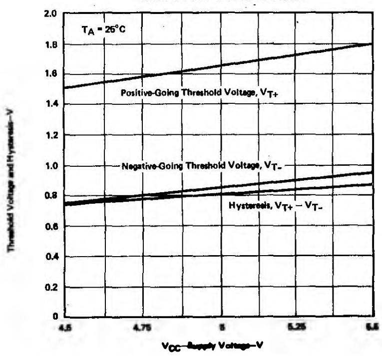
HYSTERESIS VS FREE-AIR TEMPERATURE



DISTRIBUTION OF UNITS FOR HYSTERESIS



THRESHOLD VOLTAGES AND HYSTERESIS VS SUPPLY VOLTAGE



OUTPUT VOLTAGE VS INPUT VOLTAGE