signetics

GATED FULL ADDER | S5480 N7480

S5480–A,F,W • N7480–A,F

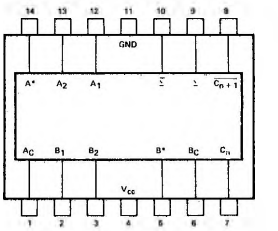
DIGITAL 54/74 TTL SERIES

DESCRIPTION

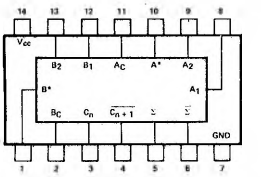
The S5480/N7480 is a single-bit, high-speed, binary full adder with gated complementary inputs, complementary sum (Σ and $\overline{\Sigma}$) outputs and inverted carry output. Designed for medium- and high-speed, multiple-bit, parallel-add/serial-carry applications, the circuit (see schematic diagram) utilizes diode-transistor logic (DTL) for the gated inputs, and high-speed, high-fan-out transistor-transistor logic (TTL) for the sum and carry outputs. The circuit is entirely compatible with both DTL and TTL logic families. The implementation of a single-inversion, high-speed, Darlington-connected serial-carry circuit minimizes the necessity for extensive "look-ahead" and carry-cascading circuits. The power dissipation has been maintained considerably below that attainable with equivalent standard integrated circuits connected to perform full-adder functions.

PIN CONFIGURATIONS

W PACKAGE



A,F PACKAGE



TRUTH TABLE (See Notes 1,2, and 3)

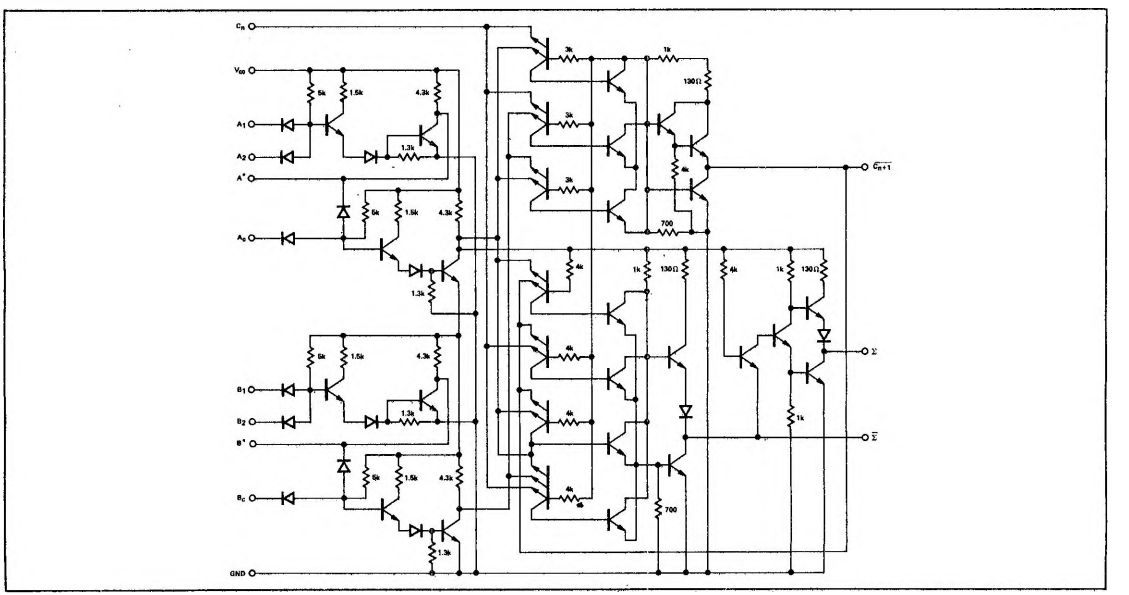
LOGIC

C_n	B	A	$C_{\overline{n+1}}$	$\overline{\Sigma}$	Σ
0	0	0	1	1	0
0	0	1	1	0	1
0	1	0	1	0	1
0	1	1	0	1	0
1	0	0	1	0	1
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	0	0	1

NOTES:

1. $A = \overline{A^* \cdot A_C}$, $B = \overline{B^* \cdot B_C}$ where $A^* = \overline{A_1 \cdot A_2}$, $B^* = \overline{B_1 \cdot B_2}$.
2. When A^* or B^* are used as inputs, A_1 and A_2 or B_1 and B_2 respectively, must be connected to GND.
3. When A_1 and A_2 or B_1 and B_2 are used as inputs, A^* or B^* respectively, must be open or used to perform Dot-OR logic.
4. The voltages are with respect to ground terminal.
5. Input signals must be zero or positive with respect to network ground terminal.

SCHEMATIC DIAGRAM



RECOMMENDED OPERATING CONDITIONS

	MIN	NOM	MAX	UNIT
Supply Voltage V_{CC}: S5480 Circuits	4.5	5	5.25	V
N7480 Circuits	4.75	5	5.25	V
Normalized Fan-Out from Outputs: $\overline{C_{n+1}}$, N			5	
Σ or $\overline{\Sigma}$, N			10	
A* or B*, N			3	
Operating Free-Air Temperature Range, T_A: S5480 Circuits	-55	25	125	°C
N7480 Circuits	0	25	70	°C

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

PARAMETER		TEST CONDITIONS*			MIN	TYP**	MAX	UNIT
$V_{in(1)}$	Logical 1 input voltage	V_{CC} = MIN			2			V
$V_{in(0)}$	Logical 0 input voltage	V_{CC} = MIN					0.8	V
$V_{out(1)}$	Logical 1 output voltage	V_{CC} = MIN			2.4	3.5		V
$V_{out(0)}$	Logical 0 output voltage	V_{CC} = MIN				0.22	0.4	V
$I_{in(0)}$	Logical 0 level input current at A_1, A_2, B_1, B_2, A_C or B_C	V_{CC} = MAX,	V_{in} = 0.4V				-1.6	mA
$I_{in(0)}$	Logical 0 level input current at A* or B*	V_{CC} = MAX,	V_{in} = 0.4V				-2.6	mA
$I_{in(0)}$	Logical 0 level input current at C_n	V_{CC} = MAX,	V_{in} = 0.4V				-8	mA
$I_{in(1)}$	Logical 1 level input current at A_1, A_2, B_1, B_2, A_C or B_C	V_{CC} = MAX,	V_{in} = 2.4V				15	µA
		V_{CC} = MAX	V_{in} = 5.5V				1	mA
$I_{in(1)}$	Logical 1 level input current at C_n	V_{CC} = MAX,	V_{in} = 2.4V				200	µA
		V_{CC} = MAX,	V_{in} = 5.5V				1	mA
I_{OS}	Short circuit output current at Σ or $\overline{\Sigma}$†	V_{CC} = MAX,		S5480	-20		-57	mA
				N7480	-18		-57	mA
I_{OS}	Short circuit output current at $\overline{C_{n+1}}$†	V_{CC} = MAX,		S5480	-20		-70	mA
				N7480	-18		-70	mA
I_{CC}	Supply current	V_{CC} = MAX,		S5480		21	31	mA
				N7480		21	35	mA

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

PARAMETER¶	FROM INPUT	TO OUTPUT	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{pd1}	C_n	$\overline{C_{n+1}}$	C_L = 15pF,	R_L = 780Ω		13	17	ns
t_{pd0}			C_L = 15pF,	R_L = 780Ω		8	12	ns
t_{pd1}	B_C	$\overline{C_{n+1}}$	C_L = 15pF,	R_L = 780Ω		18	25	ns
t_{pd0}			C_L = 15pF,	R_L = 780Ω		38	55	ns
t_{pd1}	A_C	Σ	C_L = 15pF,	R_L = 400Ω		52	70	ns
t_{pd0}			C_L = 15pF,	R_L = 400Ω		62	80	ns
t_{pd1}	B_C	$\overline{\Sigma}$	C_L = 15pF,	R_L = 400Ω		38	55	ns
t_{pd0}			C_L = 15pF,	R_L = 400Ω		56	75	ns
t_{pd1}	A_1	A*	C_L = 15pF			48	65	ns
t_{pd0}			C_L = 15pF			17	25	ns
t_{pd1}	B_1	B*	C_L = 15pF			48	65	ns
t_{pd0}			C_L = 15pF			17	25	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.

¶ t_{pd1} is propagation delay time to logical 1 level. t_{pd0} is propagation delay time to logical 0 level.