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.

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

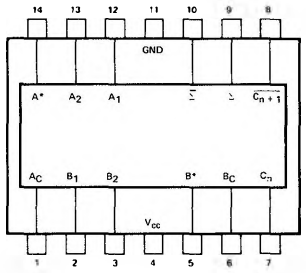
LOGIC

C_n	B	A	C_{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

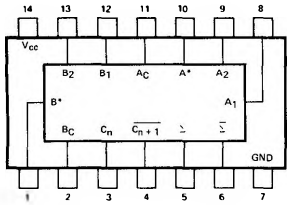
NOTES:
1. $A = \overline{A^* \cdot A_c}$, $B = \overline{B^* \cdot B_c}$ where $A^* = \overline{A_1 \cdot A_2}$, $B^* = \overline{B_1 \cdot B_2}$.
2. When A^* or B^* are used as inputs, A_1 and A_2 or B_1 and B_2 respectively, must be connected to GND.
3. When A_1 and A_2 or B_1 and B_2 are used as inputs, 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.

PIN CONFIGURATIONS

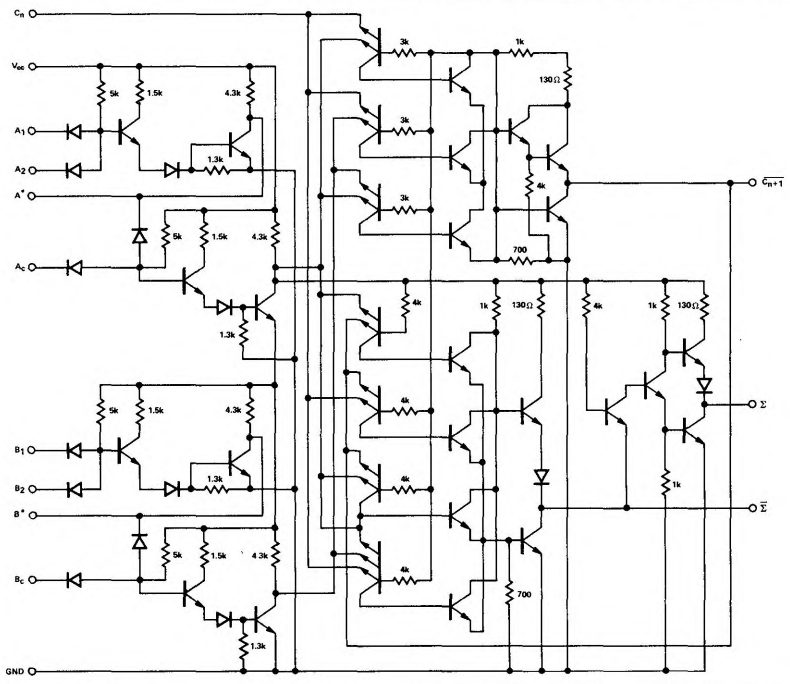
W PACKAGE



A,F PACKAGE



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_{CC} = MAX	V_{in} = 2.4V V_{in} = 5.5V				15 1	µA mA
$I_{in(1)}$	Logical 1 level input current at C_n	V_{CC} = MAX, V_{CC} = MAX,	V_{in} = 2.4V V_{in} = 5.5V				200 1	µA mA
I_{OS}	Short circuit output current at Σ or $\overline{\Sigma}$†	V_{CC} = MAX,		S5480 N7480	-20 -18		-57 -57	mA mA
I_{OS}	Short circuit output current at $\overline{C_{n+1}}$†	V_{CC} = MAX,		S5480 N7480	-20 -18		-70 -70	mA mA
I_{CC}	Supply current	V_{CC} = MAX,		S5480 N7480		21 21	31 35	mA 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.