

UT54ACS283/UT54ACTS283

Radiation-Hardened 4-Bit Binary Full Adders

FEATURES

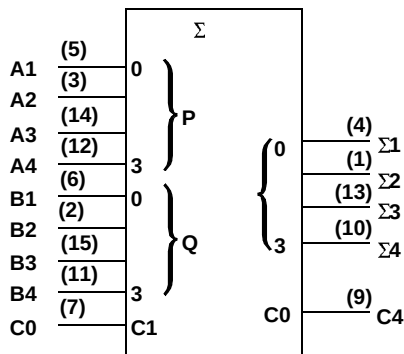
- 1.2μ radiation-hardened CMOS
 - Latchup immune
- High speed
- Low power consumption
- Single 5 volt supply
- Available QML Q or V processes
- Flexible package
 - 16-pin DIP
 - 16-lead flatpack

DESCRIPTION

The UT54ACS283 and the UT54ACTS283 are 4-bit binary adders. The adders perform addition of two 4-bit binary words. The sum (Σ) outputs are provided for each bit and the resultant carry (C4) is obtained as the fifth bit. The adders feature full internal look-ahead across all four bits for fast carry generation.

The devices are characterized over full military temperature range of -55°C to +125°C.

LOGIC SYMBOL

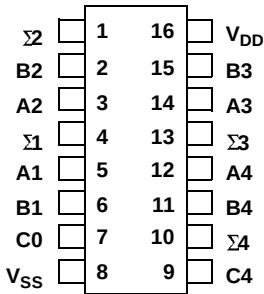


Note:

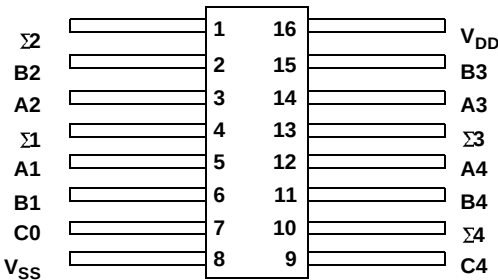
1. Logic symbol in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

PINOUTS

16-Pin DIP Top View



16-Lead Flatpack Top View



FUNCTION TABLE

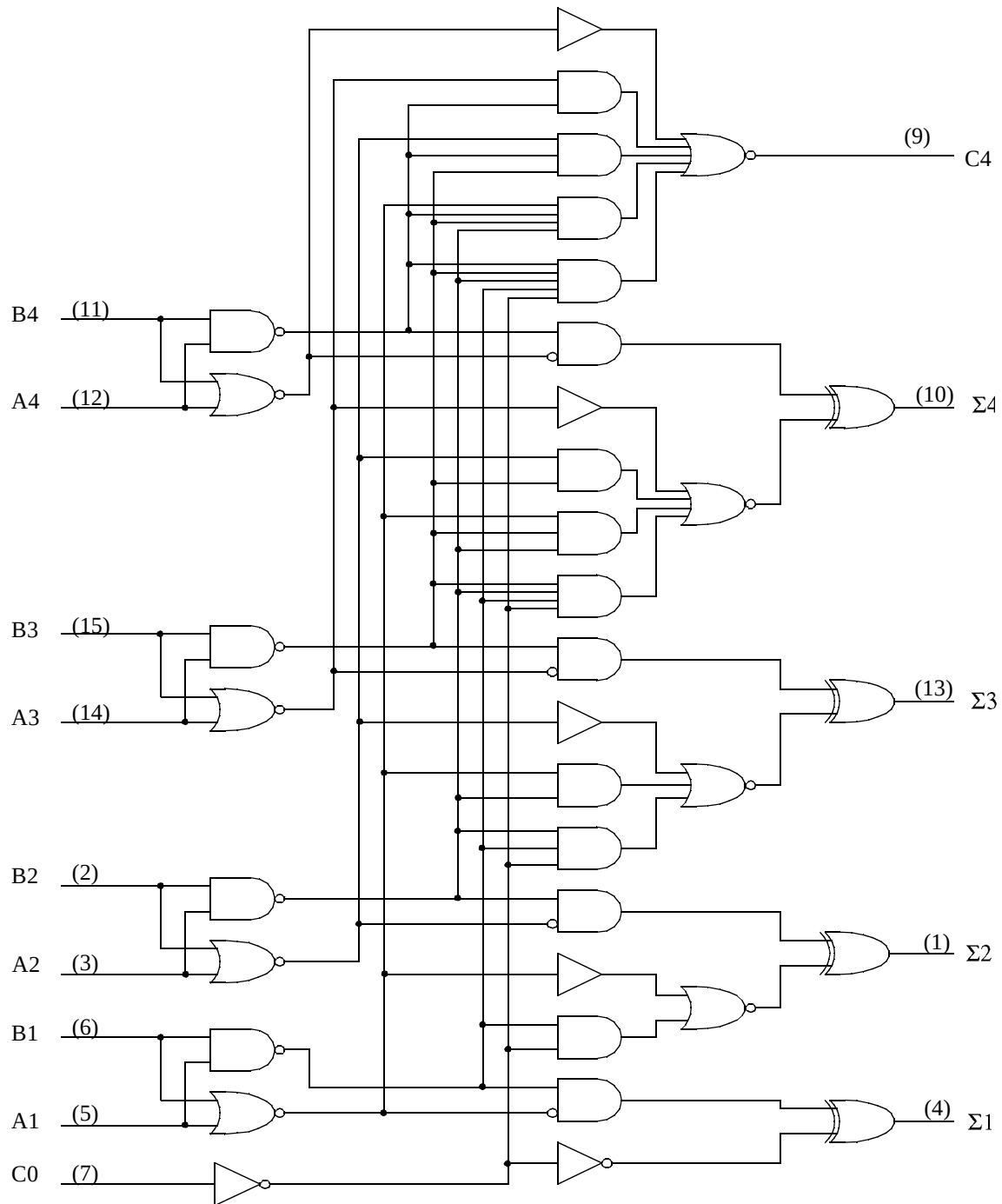
INPUT								OUTPUT											
								When C0 = L			When C2 = L			When C0 = H			When C2 = H		
A1	A3	B1	B3	A2	A4	B2	B4	$\Sigma 1$	$\Sigma 3$	$\Sigma 2$	$\Sigma 4$	C2	C4	$\Sigma 1$	$\Sigma 3$	$\Sigma 2$	$\Sigma 4$	C2	C4
L		L		L		L		L		L		L		H		L		L	
H		L		L		L		H		L		L		L		H		L	
L		H		L		L		H		L		L		L		H		L	
H		H		L		L		L		H		L		H		H		L	
L		L		H		L		L		H		L		H		H		L	
H		L		H		L		H		H		L		L		L		H	
L		H		H		L		H		H		L		L		L		H	
H		H		H		L		L		L		H		H		L		H	
L		L		L		H		L		H		L		H		H		L	
H		L		L		H		H		H		L		L		L		H	
L		H		L		H		H		H		L		L		L		H	
H		H		L		H		L		L		H		H		L		H	
L		L		H		H		L		L		H		H		L		H	
H		L		H		H		H		L		H		L		H		H	
L		H		H		H		H		L		H		L		H		H	
H		H		H		H		L		H		H		H		H		H	

H = high level, L = low level

Note:

Input conditions at A1, A2, B1, B2, and C0 are used to determine outputs $\Sigma 1$ and $\Sigma 2$ and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs $\Sigma 3$, $\Sigma 4$, and C4.

LOGIC DIAGRAM



RADIATION HARDNESS SPECIFICATIONS ¹

PARAMETER	LIMIT	UNITS
Total Dose	1.0E6	rads(Si)
SEU Threshold ²	80	MeV-cm ² /mg
SEL Threshold	120	MeV-cm ² /mg
Neutron Fluence	1.0E14	n/cm ²

Notes:

1. Logic will not latchup during radiation exposure within the limits defined in the table.
2. Device storage elements are immune to SEU affects.

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	LIMIT	UNITS
V _{DD}	Supply voltage	-0.3 to 7.0	V
V _{I/O}	Voltage any pin	-.3 to V _{DD} +.3	V
T _{STG}	Storage Temperature range	-65 to +150	°C
T _J	Maximum junction temperature	+175	°C
T _{LS}	Lead temperature (soldering 5 seconds)	+300	°C
Θ _{JC}	Thermal resistance junction to case	20	°C/W
I _I	DC input current	±10	mA
P _D	Maximum power dissipation	1	W

Note:

1. Stresses outside the listed absolute maximum ratings may cause permanent damage to the device. This is a stress rating only, functional operation of the device at these or any other conditions beyond limits indicated in the operational sections is not recommended. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMIT	UNITS
V _{DD}	Supply voltage	4.5 to 5.5	V
V _{IN}	Input voltage any pin	0 to V _{DD}	V
T _C	Temperature range	-55 to + 125	°C

DC ELECTRICAL CHARACTERISTICS ⁷(V_{DD} = 5.0V ±10%; V_{SS} = 0V ⁶, -55 °C < T_C < +125°C)

SYMBOL	PARAMETER	CONDITION	MIN	MAX	UNIT
V _{IL}	Low-level input voltage ¹ ACTS ACS			0.8 .3V _{DD}	V
V _{IH}	High-level input voltage ¹ ACTS ACS		.5V _{DD} .7V _{DD}		V
I _{IN}	Input leakage current ACTS/ACS	V _{IN} = V _{DD} or V _{SS}	-1	1	μA
V _{OL}	Low-level output voltage ³ ACTS ACS	I _{OL} = 8.0mA I _{OL} = 100μA		0.40 0.25	V
V _{OH}	High-level output voltage ³ ACTS ACS	I _{OH} = -8.0mA I _{OH} = -100μA	.7V _{DD} V _{DD} - 0.25		V
I _{OS}	Short-circuit output current ^{2,4} ACTS/ACS	V _O = V _{DD} and V _{SS}	-200	200	mA
I _{OL}	Output current ¹⁰ (Sink)	V _{IN} = V _{DD} or V _{SS} V _{OL} = 0.4V	8		mA
I _{OH}	Output current ¹⁰ (Source)	V _{IN} = V _{DD} or V _{SS} V _{OH} = V _{DD} - 0.4V	-8		mA
P _{total}	Power dissipation ^{2, 8, 9}	C _L = 50pF		1.9	mW/ MHz
I _{DDQ}	Quiescent Supply Current	V _{DD} = 5.5V		10	μA
ΔI _{DDQ}	Quiescent Supply Current Delta ACTS	For input under test V _{IN} = V _{DD} - 2.1V For all other inputs V _{IN} = V _{DD} or V _{SS} V _{DD} = 5.5V		1.6	mA
C _{IN}	Input capacitance ⁵	f = 1MHz @ 0V		15	pF
C _{OUT}	Output capacitance ⁵	f = 1MHz @ 0V		15	pF

Notes:

- Functional tests are conducted in accordance with MIL-STD-883 with the following input test conditions: $V_{IH} = V_{IH(min)} + 20\%$, -0% ; $V_{IL} = V_{IL(max)} + 0\%$, -50% , as specified herein, for TTL, CMOS, or Schmitt compatible inputs. Devices may be tested using any input voltage within the above specified range, but are guaranteed to $V_{IH(min)}$ and $V_{IL(max)}$.
- Supplied as a design limit but not guaranteed or tested.
- Per MIL-PRF-38535, for current density $\leq 5.0E5$ amps/cm², the maximum product of load capacitance (per output buffer) times frequency should not exceed 3,765 pF/MHz.
- Not more than one output may be shorted at a time for maximum duration of one second.
- Capacitance measured for initial qualification and when design changes may affect the value. Capacitance is measured between the designated terminal and V_{SS} at frequency of 1MHz and a signal amplitude of 50mV rms maximum.
- Maximum allowable relative shift equals 50mV.
- All specifications valid for radiation dose $\leq 1E6$ rads(Si).
- Power does not include power contribution of any TTL output sink current.
- Power dissipation specified per switching output.
- This value is guaranteed based on characterization data, but not tested.

AC ELECTRICAL CHARACTERISTICS ²

($V_{DD} = 5.0V \pm 10\%$; $V_{SS} = 0V$ ¹, $-55^{\circ}C < T_C < +125^{\circ}C$)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	UNIT
t_{PLH}	Propagation delay C0 to Σn	2	16	ns
t_{PHL}	Propagation delay C0 to Σn	2	19	ns
t_{PLH}	Propagation delay C0 to C4	2	16	ns
t_{PHL}	Propagation delay C0 to C4	2	17	ns
t_{PLH}	Propagation delay An, Bn to C4	2	16	ns
t_{PHL}	Propagation delay An, Bn to C4	2	15	ns
t_{PLH}	Propagation delay An, Bn to Σn	2	14	ns
t_{PHL}	Propagation delay An, Bn to Σn	2	16	ns

Notes:

- Maximum allowable relative shift equals 50mV.
- All specifications valid for radiation dose $\leq 1E6$ rads(Si).