

# UT54ACS02E

**Radiation-Hardened  
Quadruple 2-Input NOR Gates**  
December 2003

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## FEATURES

- 0.6µm CRH CMOS Process
  - Latchup immune
- High speed
- Low power consumption
- Wide power supply operating range of 3.0V to 5.5V
- Available QML Q or V processes
- 14-lead flatpack

## DESCRIPTION

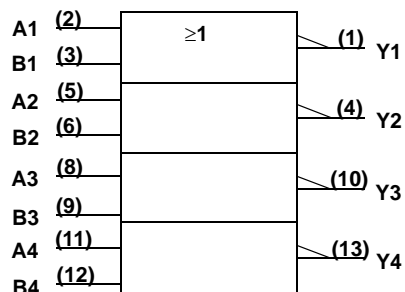
The UT54ACS02E is a quadruple, two-input NOR gate. The circuit performs the Boolean functions  $Y = A + B$  or  $Y = \overline{A} \cdot \overline{B}$  in positive logic.

The device is characterized over the full military temperature range of -55°C to +125°C.

## FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
H	X	L
X	H	L
L	L	H

## LOGIC SYMBOL



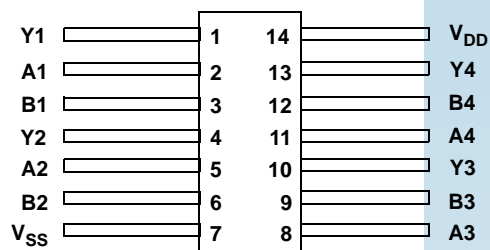
### Note:

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

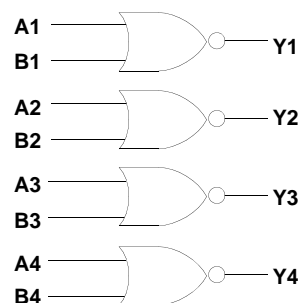


## PINOUT

### 14-Lead Flatpack Top View



## LOGIC DIAGRAM



## RADIATION HARDNESS SPECIFICATIONS <sup>1</sup>

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

**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 <sub>DD</sub>	Supply voltage	-0.3 to 7.0	V
V <sub>I/O</sub>	Voltage any pin	-.3 to V <sub>DD</sub> + .3	V
T <sub>STG</sub>	Storage Temperature range	-65 to +150	°C
T <sub>J</sub>	Maximum junction temperature	+175	°C
T <sub>LS</sub>	Lead temperature (soldering 5 seconds)	+300	°C
Θ <sub>JC</sub>	Thermal resistance junction to case	20	°C/W
I <sub>I</sub>	DC input current	±10	mA
P <sub>D</sub>	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 <sub>DD</sub>	Supply voltage	3.0 to 5.5	V
V <sub>IN</sub>	Input voltage any pin	0 to V <sub>DD</sub>	V
T <sub>C</sub>	Temperature range	-55 to + 125	°C

## DC ELECTRICAL CHARACTERISTICS FOR THE UT54ACS02E<sup>7</sup>

( $V_{DD} = 3.0V$  to  $5.5V$ ;  $V_{SS} = 0V$ <sup>6</sup>;  $-55^{\circ}C < T_C < +125^{\circ}C$ )

SYMBOL	Description	CONDITION	VDD	MIN	MAX	UNIT
$V_{IL}$	Low-level input voltage <sup>1</sup>		3.0V		0.9	V
			5.5V		1.65	
$V_{IH}$	High-level input voltage <sup>1</sup>		3.0V	2.1		V
			5.5V	3.85		
$I_{IN}$	Input leakage current	$V_{IN} = V_{DD}$ or $V_{SS}$	5.5V	-1	1	$\mu A$
$V_{OL}$	Low-level output voltage <sup>3</sup>	$I_{OL} = 100\mu A$	3.0V		0.25	V
			4.5V		0.25	
$V_{OH}$	High-level output voltage <sup>3</sup>	$I_{OH} = -100\mu A$	3.0V	2.75		V
			4.5V	4.25		
$I_{OS}$	Short-circuit output current <sup>2,4</sup>	$V_O = V_{DD}$ and $V_{SS}$	3.0V	-100	100	mA
			5.5V	-200	200	
$I_{OL}$	Low level output current <sup>9</sup>	$V_{IN} = V_{DD}$ or $V_{SS}$ $V_{OL} = 0.4V$	3.0V	6		mA
			5.5V	8		
$I_{OH}$	High level output current <sup>9</sup>	$V_{IN} = V_{DD}$ or $V_{SS}$ $V_{OH} = V_{DD}-0.4V$	3.0V		-6	mA
			5.5V		-8	
$P_{total}$	Power dissipation <sup>2, 8</sup>	$C_L = 50pF$	5.5V		1.8	mW/ MHz
$I_{DDQ}$	Quiescent Supply Current	$V_{IN} = V_{DD}$ or $V_{SS}$	5.5V		10	$\mu A$
$C_{IN}$	Input capacitance <sup>5</sup>	$f = 1MHz$	0V		15	pF
$C_{OUT}$	Output capacitance <sup>5</sup>	$f = 1MHz$	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/cm<sup>2</sup>, the maximum product of load capacitance (per output buffer) times frequency should not exceed 3,765pF/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) per MIL-STD-883 Method 1019 Condition B.
- Power dissipation specified per switching output.
- This value is guaranteed based on characterization data, but not tested.

## AC ELECTRICAL CHARACTERISTICS FOR THE UT54ACS02E<sup>2</sup>

( $V_{DD} = 3.0V$  to  $5.5V$ ;  $V_{SS} = 0V$ <sup>1</sup>,  $-55^{\circ}C < T_C < +125^{\circ}C$ )

SYMBOL	PARAMETER	CONDITION	$V_{DD}$	MINIMUM	MAXIMUM	UNIT
$t_{PLH}$	Input to $Y_n$	$C_L = 30pF$	3.0V & 3.6V	1	11	ns
			4.5V & 5.5V	1	7	
		$C_L = 50pF$	3.0V & 3.6V	1	15	ns
			4.5V & 5.5V	1	11	
$t_{PHL}$	Input to $Y_n$	$C_L = 30pF$	3.0V & 3.6V	1	13	ns
			4.5V & 5.5V	1	9	
		$C_L = 50pF$	3.0V & 3.6V	1	17	ns
			4.5V & 5.5V	1	13	

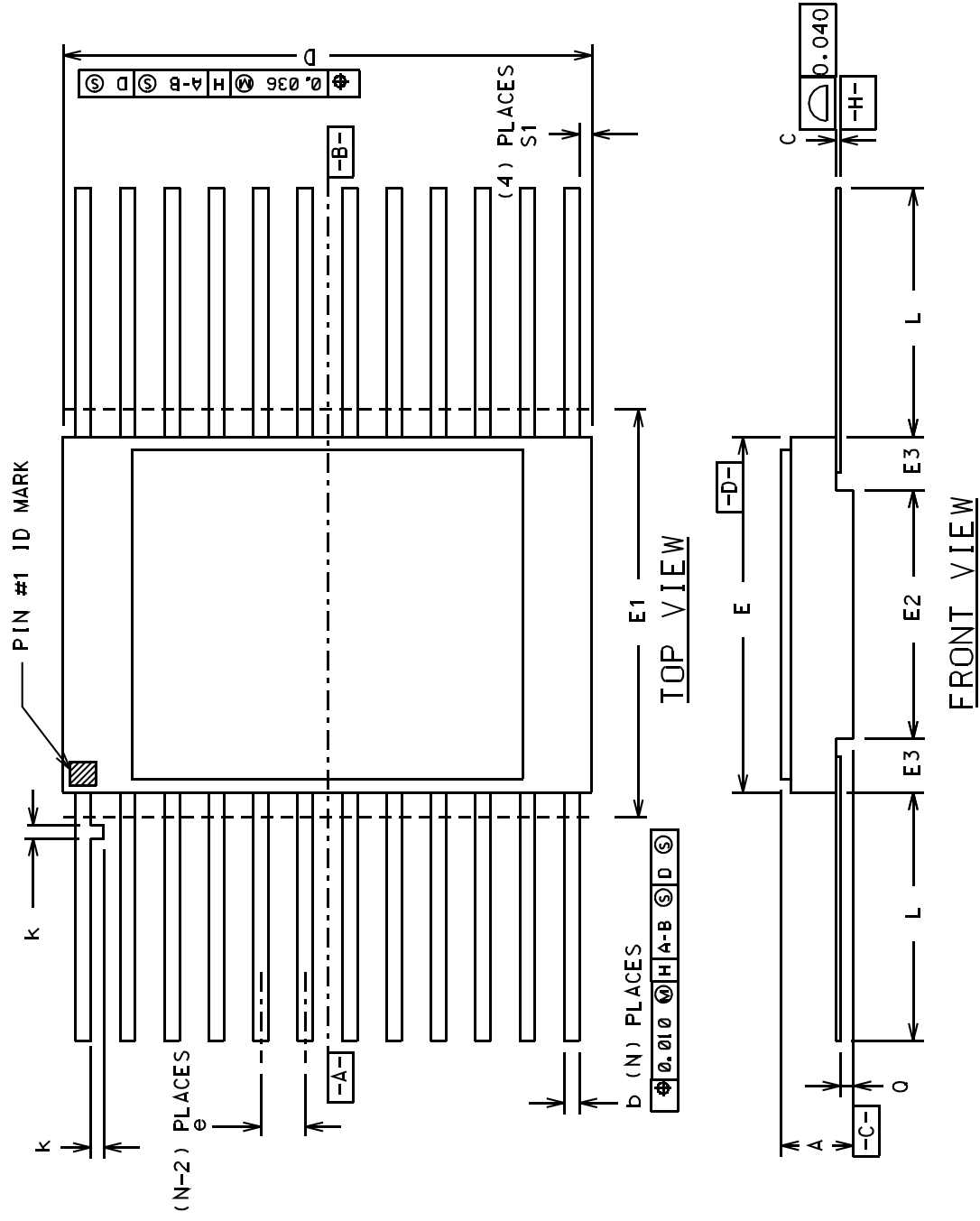
### Notes:

1. Maximum allowable relative shift equals 50mV.

2. All specifications valid for radiation dose  $\leq 1E6$  rads(Si) per MIL-STD-883 Method 1019 Condition B.

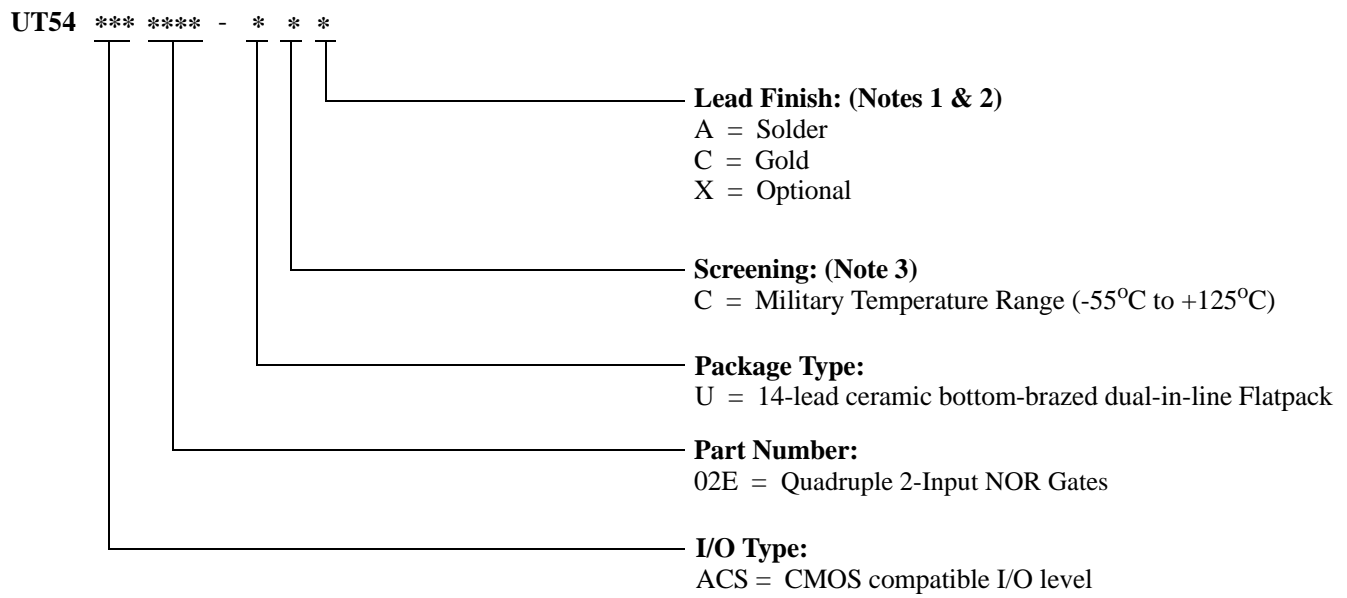


Packaging



PKG CONF LG	LEAD COUNT	MIL-STD 1835 DWG CONF B	DIMENSION SYMBOLS													
			A	b	c	D	E	E1	E2	E3	e	k	L	Q	S1	
-03	14	F-2A	0.115 0.045	0.022 0.015	0.009 0.004	0.390 -----	0.260 0.235	0.290 -----	----- 0.130	----- 0.030	0.050 BSC	0.015 0.008	0.370 0.270	0.045 0.026	----- 0.005	
-04	16	F-5A	0.115 0.045	0.022 0.015	0.009 0.004	0.440 -----	0.285 0.245	0.315 -----	----- 0.130	----- 0.030	0.050 BSC	0.015 0.008	0.370 0.250	0.045 0.026	----- 0.005	
-05	20	F-9A	0.115 0.045	0.022 0.015	0.009 0.004	0.540 -----	0.300 0.245	0.330 -----	----- 0.130	----- 0.030	0.050 BSC	0.015 0.008	0.370 0.250	0.045 0.026	----- 0.000	

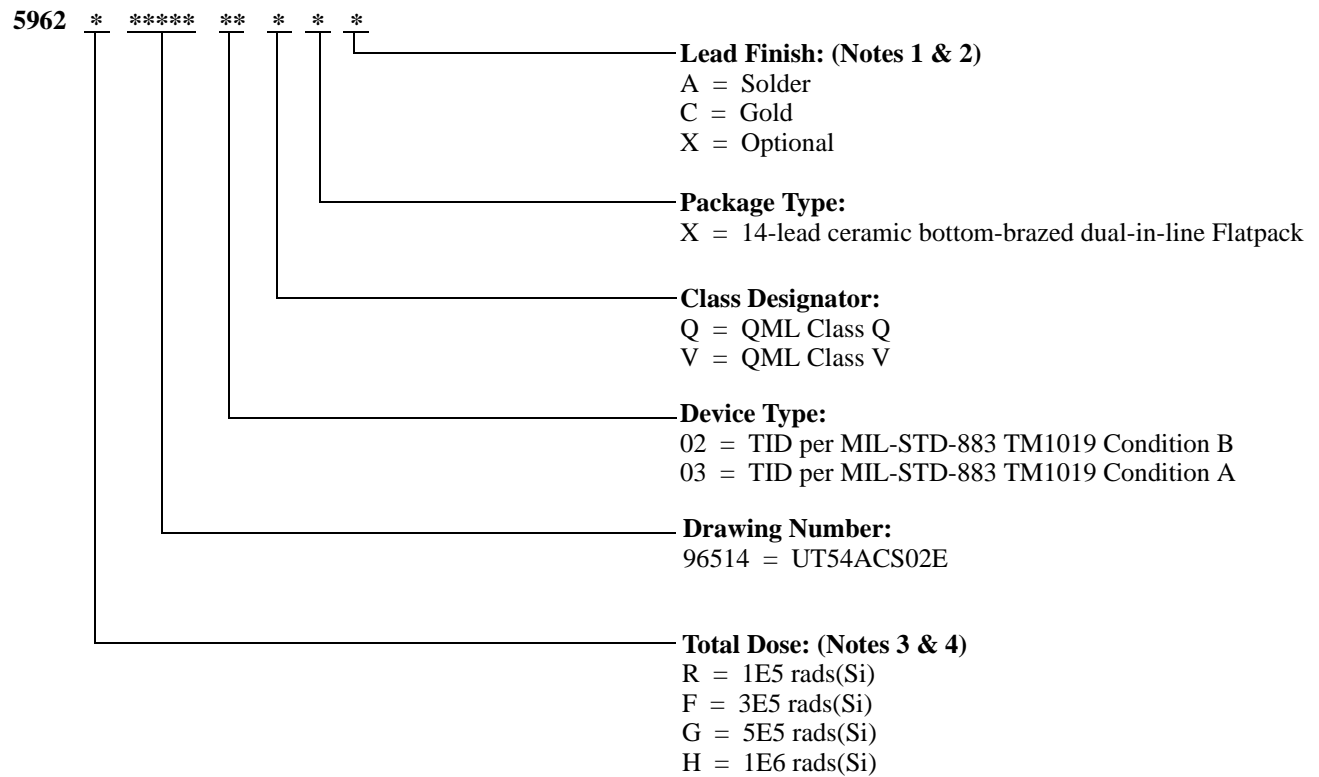
## Ordering Information UT54ACS02E



### Notes:

1. Lead finish (A, C, or X) must be specified.
2. If an "X" is specified when ordering, then the part marking will match the lead finish and will be either "A" (solder) or "C" (gold).
3. Military Temperature Range flow per Aeroflex Manufacturing Flows Document. Devices have 48 hours of burn-in and are test at -55°C, room temperature, and 125°C. Radiation characteristics are neither tested nor guaranteed and may not be specified.

## UT54ACS02E: SMD



### Notes:

1. Lead finish (A, C, or X) must be specified.
2. If an "X" is specified when ordering, then the part marking will match the lead finish and will be either "A" (solder) or "C" (gold).
3. Total dose radiation must be specified when ordering. QML V is not available without radiation testing.
4. Total dose tolerance of 1E6 rads(Si) is only available for Device Type 02.



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