



**MICROCIRCUIT DATA SHEET**

**MN54ACTQ04-X REV 2A0**

Original Creation Date: 07/11/96  
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Last Major Revision Date: 03/03/99

**Hex Inverter**

**General Description**

The ACTQ04 contains six inverters.

The ACTQ utilize NSC Quiet Series technology to guarantee quiet output switching and improved dynamic threshold performance. FACT Quiet Series features GTO output control and undershoot correction in addition to a split ground bus for superior AC MOS performance.

**Industry Part Number**

54ACTQ04

**NS Part Numbers**

54ACTQ04DMQB\*  
54ACTQ04FMQB\*\*  
54ACTQ04LMQB\*\*\*

**Prime Die**

D004

**Controlling Document**

5962-89734

**Processing**

MIL-STD-883, Method 5004

**Quality Conformance Inspection**

MIL-STD-883 5005

Subgrp	Description	Temp ( °C)
1	Static tests at	+25 C
2	Static tests at	+125 C
3	Static tests at	-55 C
4	Dynamic tests at	+25 C
5	Dynamic tests at	+125 C
6	Dynamic tests at	-55 C
7	Functional tests at	+25 C
8A	Functional tests at	+125 C
8B	Functional tests at	-55 C
9	Switching tests at	+25 C
10	Switching tests at	+125 C
11	Switching tests at	-55 C

**Features**

- Icc reduced by 50%
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Improved latch-up immunity
- Minimum 4kV ESD protection
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
  - ACTQ04: 5962-8973401CA\*, DA\*\*, 2A\*\*\*

**(Absolute Maximum Ratings)**

(Note 1)

Supply Voltage (Vcc)	-0.5V to +7.0V
DC input Diode Current (Iik)	
Vi = -0.5V	-20 mA
Vi = Vcc +0.5V	+20 mA
DC Input Voltage (Vi)	-0.5V to Vcc +0.5V
DC Output Diode Current (Iok)	
Vo = -0.5V	-20 mA
Vo = Vcc +0.5V	+20 mA
DC Output Voltage (Vo)	-0.5V to Vcc +0.5V
DC Output Source or Sink Current (Io)	±50 mA
DC Vcc or Ground Current per Output Pin (Icc or Ignd)	±50 mA
Storage Temperature (Tstg)	-65 C to +150 C
DC Latch-up Source or Sink Current	±300 mA
Junction Temperature (Tj)	
CDIP	175 C
PDIP	140 C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

**Recommended Operating Conditions**

(Note 1)

Supply Voltage (Vcc)	4.5V to 5.5V
Input Voltage (Vi)	0V to Vcc
Output Voltage (Vo)	0V to Vcc
Operating Temperature (Ta)	-55 C to +125 C
Minimum Input Edge Rate (DeltaV/Delta t)	
ACTQ Devices	
Vin from 0.8V to 2.0V	
Vcc @ 4.5V, 5.5V	125 mV/ns

Note 1: PLCC packaging is not recommended for applications requiring greater than 2000 temperature cycles from -40C to + 125C.

## Electrical Characteristics

### DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 DC: VCC 4.5V to 5.5V, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High Level input Current	VCC=5.5V, VIH=5.5V	1, 2	INPUT		0.1	uA	1
			1, 2	INPUT		1.0	uA	2, 3
IIL	Low Level input Current	VCC=5.5V, VIL=0.0V	1, 2	INPUT		-0.1	uA	1
			1, 2	INPUT		-1.0	uA	2, 3
VOL	Low level output voltage	VCC=4.5V, VIH=2.0V, VIL=0.8V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
			1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=4.5V, VIH=2.0V, VIL=0.8V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=5.5V, VIH=2.0V, VIL=0.8V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
VIOL	Dynamic Output Current LOW	VCC=5.5V, VIH=5.5V, VIL=0.0V, IOL=50.0mA	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High Level Output Voltage	VCC=4.5V, VIH=2.0V, VIL=0.8V, IOH=-50.0uA	1, 2	OUTPUT	4.40		V	1, 2, 3
			1, 2	OUTPUT	5.40		V	1, 2, 3
		VCC=4.5V, VIH=2.0V, VIL=0.8V, IOH=-24.0mA	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=5.5V, VIH=2.0V, VIL=0.8V, IOH=-24.0mA	1, 2	OUTPUT	4.86		V	1
			1, 2	OUTPUT	4.70		V	2, 3
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIH=5.5V, VIL=0.0V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
ICCH	Positive Supply Current	VCC=5.5V, VIH=5.5V	1, 2	VCC		2.0	uA	1
			1, 2	VCC		40	uA	2, 3
ICCL	Negative Supply Current	VCC=5.5V, VIH=0.0V	1, 2	VCC		2.0	uA	1
			1, 2	VCC		40	uA	2, 3
ICCT	Supply Current	VCC=5.5V, VIH=3.4V	1, 2	VCC		1.0	mA	1
			1, 2	VCC		1.6	mA	2, 3
VIKL		VCC=4.5V, IKL=-18mA	1, 2	INPUT		-1.2	V	1, 2, 3
VIKH		VCC=4.5V, IKH=18mA	1, 2	INPUT		5.7	V	1, 2, 3

## Electrical Characteristics

### DC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 DC: VCC 4.5V to 5.5V, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
VILD	Maximum Low Level Dynamic Input Voltage	VCC=5.0V, LOAD 50pF / 500 OHMS	6, 9	INPUT		0.8	V	4
VIHD	Minimum High Level Dynamic Input Voltage	VCC=5.0V, LOAD 50pF / 500 OHMS	6, 9	INPUT	2.2		V	4
VOLP	Quiet Output Maximum Dynamic VOL	VCC=5.0V, LOAD 50pF / 500 OHMS	6, 8	OUTPUT		1.5	V	4
VOLV	Quiet Output Minimum Dynamic VOL	VCC=5.0V, LOAD 50pF / 500 OHMS	6, 8	OUTPUT		-1.2	V	4

### AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC: CL=50pF, RL=500 OHMS, TR=3.0ns & TF=3.0ns, Temp range: -55C to +125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

tpLH	Propagation Delay	VCC = 4.5V	3, 4, 7	An to $\bar{O}n$	1.5	9.0	ns	9
			3, 4, 7	An to $\bar{O}n$	1.5	10.0	ns	10, 11
tpHL	Propagation Delay	VCC = 4.5V	3, 4, 7	An to $\bar{O}n$	1.5	8.5	ns	9
			3, 4, 7	An to $\bar{O}n$	1.5	9.5	ns	10, 11
tOSLH	Output to Output Skew	VCC = 4.5V	6	$\bar{O}n$ to $\bar{O}n$		1.0	ns	9, 10, 11
tOSHL	Output to Output Skew	VCC = 4.5V	6	$\bar{O}n$ to $\bar{O}n$		1.0	ns	9, 10, 11

- Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C TEMPERATURE, SUBGROUPS 1, 2, 7, & 8.  
 Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A1, 2, 7, & 8.  
 Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY SUBGROUP A9.  
 Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A9 & 10.  
 Note 5: TRANSMISSION LINE DRIVING TEST, GUARDBANDED LIMITS SET FOR +25C, 2 MSEC DURATION MAX.  
 Note 6: GUARANTEED BUT NOT TESTED. (DESIGN CHARACTERIZATION DATA)  
 Note 7: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MINIMUM LIMITS.  
 Note 8: MAX NUMBER OF OUTPUTS DEFINED AS (N). DATA INPUTS ARE DRIVEN 0V TO 3V. ONE OUTPUT @ VOL.  
 Note 9: MAX NUMBER OF DATA INPUTS (N) SWITCHING. (N-1) INPUTS SWITCHING 0V TO 3V. INPUT-UNDER-TEST SWITCHING 3V TO THRESHOLD (VILD), 0V TO THRESHOLD (VIHD), FREQ= 1 MHZ.

**Revision History**

<b>Rev</b>	<b>ECN #</b>	<b>Rel Date</b>	<b>Originator</b>	<b>Changes</b>
2A0	M0003292	04/27/99	Linda Collins	Changed the VIOH test condition from VIH=2.0V to VIH=5.5V and VIL=0.8V to VIL=0.0V. Changed IOL to IOH in the VOH test condition.