

MV54ACTQ16374-X REV 1A0

Original Creation Date: 02/03/97
Last Update Date: 08/14/03
Last Major Revision Date: 07/30/03

16-Bit D Flip-Flop with TRI-STATE Outputs

General Description

The ACTQ16374 contains sixteen non-inverting D flip-flops with TRI-STATE outputs and is intended for bus oriented applications. The device is byte controlled. A buffered clock (CP) and Output Enable (OE) are common to each byte and can be shorted together for full 16-bit operation.

The ACTQ16374 utilizes NSC Quiet Series technology to guarantee quiet output switching and improved dynamic threshold performance. FACT Quiet Series TM features GTO TM output control for superior performance.

Industry Part Number

54ACTQ16374

NS Part Numbers

54ACTQ16374W-QV

Prime Die

D16374

Controlling Document

SEE FEATURES SECTION

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

- Utilizes NSC FACT Quiet Series technology
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Guaranteed pin-to-pin output skew
- Buffered Positive edge-triggered clock
- Separate control logic for each byte
- 16-bit version of the ACTQ374
- Outputs source/sink 24 mA
- Additional spec for Multiple Output Switching
- Output Loadings specs for both 50 pF and 250 pF loads

CONTROLLING DOCUMENT:

54ACTQ16374W-QV 5962-9452801VXA

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage (Vcc)	-0.5V to +7.0V
DC Input Diode Current (Iik)	
Vin = -0.5V	-20 mA
Vin = Vcc +0.5V	+20 mA
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 Vcc or Ground Current Per Output Pin	±50 mA
Thermal Resistance	
Junction-To-Case (Theta JC)	10 C/Watt
Junction-To-Ambient (Theta JA)	80 C/Watt
(1 Watt at no airflow)	
Storage Temperature	-65 C to +150 C
Lead Temperature	
(Soldering, 10 seconds)	+300 C
ESD Classification	Class 2
Maximum Power Dissipation	750 mW
DC Output Source/Sink Current (Io)	±50 mA
Junction Temperature (Tj)	
CERAMIC FLATPACK	+175 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

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 (Delta V/Delta t)	
ACTQ Devices	
Vin from 0.8V to 2.0V	
Vcc @ 4.5V, 5.5V	125 mV/ns
Maximum Output Current	
High Level (IOH)	-24 mA
Low Level (IOL)	24 mA

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.

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, VIL=0.8V, IOL=24.0mA, VIH=2.0V	1, 2	OUTPUT		.36	V	1	
			1, 2	OUTPUT		.50	V	2, 3	
		VCC=4.5V, VIL=0.8V, IOL=50.0uA, VIH=2.0V	1, 2	OUTPUT		.10	V	1, 2, 3	
			VCC=5.5V, VIL=0.8V, IOL=24.0mA, VIH=2.0V	1, 2	OUTPUT		.36	V	1
				1, 2	OUTPUT		.50	V	2, 3
VCC=5.5V, VIL=0.8V, IOL=50.0uA, VIH=2.0V	1, 2	OUTPUT		.10	V	1, 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, VIL=0.8V, IOL=-24.0mA, VIH=2.0V	1, 2	OUTPUT	3.86		V	1	
			1, 2	OUTPUT	3.70		V	2, 3	
		VCC=4.5V, VIL=0.8V, IOL=-50.0uA, VIH=2.0V	1, 2	OUTPUT	4.4		V	1, 2, 3	
			VCC=5.5V, VIL=0.8V, IOL=-24.0mA, VIH=2.0V	1, 2	OUTPUT	4.86		V	1
				1, 2	OUTPUT	4.7		V	2, 3
VCC=5.5V, VIL=0.8V, IOL=-50.0uA, VIH=2.0V	1, 2	OUTPUT	5.4		V	1, 2, 3			
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIH=5.5V, VIL=0.0V, IOL=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3	
ICCL	Supply Current Output LOW	VCC=5.5V, VIN=5.5V or Gnd	1, 2	VCC	-50	750	nA	1	
			1, 2	VCC		160	uA	2, 3	
ICCH	Supply Current Output HIGH	VCC=5.5V, VIN=5.5V or Gnd	1, 2	VCC	-50	750	nA	1	
			1, 2	VCC		160	uA	2, 3	
IC CZ	Supply Current	VCC=5.5V, VIN=5.5V or Gnd	1, 2	VCC	-50	750	nA	1	
			1, 2	VCC		160	uA	2, 3	
ICCF	Supply Current Functional	VCC=5.5V, VIN=5.5V or Gnd	1, 2	VCC	-50	750	nA	1	
			1, 2	VCC		160	uA	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.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCT	Supply Current	VCC=5.5V, VINH=3.4V	1, 2	VCC		1.0	mA	1
			1, 2	VCC		1.6	mA	2, 3
IOZH	Maximum TRI-STATE Leakage Current	VCC=4.5V, VOUT=4.5V, VIL=0.0V, VIH(OE)=2.0V	1, 2	OUTPUT		0.5	uA	1
			1, 2	OUTPUT		10	uA	2, 3
		VCC=5.5V, VOUT=5.5V, VIL=0.0V, VIH(OE)=2.0V	1, 2	OUTPUT		0.5	uA	1
			1, 2	OUTPUT		10	uA	2, 3
IOZL	Maximum TRI-STATE Leakage Current	VCC=4.5V, VOUT=4.5V, VIL=4.5V, VIH(OE)=2.0V	1, 2	OUTPUT		-0.5	uA	1
			1, 2	OUTPUT		-10	uA	2, 3
		VCC=5.5V, VOUT=5.5V, VIL=5.5V, VIH(OE)=2.0V	1, 2	OUTPUT		-0.5	uA	1
			1, 2	OUTPUT		-10	uA	2, 3
VIKL	Negative Input Clamp Voltage	VCC=4.5V, IKL=-18mA	1, 2	INPUT		-1.2	V	1, 2, 3
VIKH	Positive Input Clamp Voltage	VCC=4.5V, IKH=18mA	1, 2	INPUT		5.7	V	1, 2, 3
CIN	INPUT PIN CAPACITANCE		6	INPUT		10	pF	4
COUT	OUTPUT PIN CAPACITANCE		6	OUTPUT		15	pF	4
CPD	POWER DISSIPATION CAPACITANCE		6			100	pF	4
VILD	Maximum Low Dynamic Input Voltage Level	VCC=5.0V, LOAD 50pF / 500 OHMS	6, 9	INPUT		0.8	V	4
VIHD	Minimum High Dynamic Input Voltage Level	VCC=5.0V, LOAD 50pF / 500 OHMS	6, 9	INPUT	2.0		V	4
VOLP	Quiet Output Maximum Dynamic Vol	VCC=5.0V, LOAD 50pF / 500 OHMS Maximum High Output Noise	6, 8	OUTPUT		1100	mV	4
VOLV	Quiet Output Minimum Dynamic Vol	VCC=5.0V, LOAD 50pF / 500 OHMS Maximum Low Output Noise	6, 8	OUTPUT		-1300	mV	4
VOHP	Maximum Overshoot	VCC=5.0V, LOAD 50pF / 500 OHMS Maximum Overshoot	6, 8	OUTPUT		VOH +1200	mV	4
VOHV	Minimum Vcc Droop	VCC=5.0V, LOAD 50pF / 500 OHMS Minimum Vcc Droop	6, 8	OUTPUT		VOH -1400	mV	4

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: CL=50pf, RL=500 OHMS, TR/TFALL=3.0ns, Temp range: -55C to +125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH	Propagation Delay	Vcc = 4.5V	3, 4, 7	CP to On	3.0	9.0	ns	9
			3, 4, 7	CP to On	3.0	10.5	ns	10, 11
tpHL	Propagation Delay	Vcc = 4.5V	3, 4, 7	CP to On	3.0	9.0	ns	9
			3, 4, 7	CP to On	1.0	10.5	sn	10, 11
tpLZ	Output Disable Time	Vcc = 4.5V	3, 4, 7	\overline{OE} to On	2.0	8.0	ns	9
			3, 4, 7	\overline{OE} to On	2.0	9.0	ns	10, 11
tpHZ	Output Disable Time	Vcc = 4.5V	3, 4, 7	\overline{OE} to On	2.0	8.0	ns	9
			3, 4, 7	\overline{OE} to On	2.0	9.0	ns	10, 11
tpZL	Output Enable Time	Vcc = 4.5V	3, 4, 7	\overline{OE} to On	3.0	10.0	ns	9
			3, 4, 7	\overline{OE} to On	3.0	11.5	ns	10, 11
tpZH	Output Enable Time	Vcc = 4.5V	3, 4, 7	\overline{OE} to On	3.0	9.0	ns	9
			3, 4, 7	\overline{OE} to On	3.0	10.5	ns	10, 11
Fmax	Maximum Clock Frequency	Vcc = 4.5V	6	CP	75		Mhz	9
			6	CP	65		Mhz	10, 11
tset (H/L)	Set-up Time	Vcc = 4.5V	6	In to CP	3.0		ns	9, 10, 11
Thold (H/L)	Hold Time	Vcc = 4.5V	6	In to CP	1.0		ns	9, 10, 11
Twidth (H/L)	Pulse Width	Vcc = 4.5V	6	CP Pulse	5.0		ns	9, 10, 11
TOSHL	Pin to Pin Skew HL Data to Output	Vcc = 4.5V	6	Pin to Pin Skew		1.3	ns	9, 10, 11
TOSLH	Pin to Pin Skew LH Data to Output	Vcc = 4.5V	6	Pin to Pin Skew		2.1	ns	9, 10, 11
TOST	Pin to Pin Skew LH/HL Data to Output	Vcc = 4.5V	6	Pin to Pin Skew		4.0	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, & -55C TEMPERATURE, SUBGROUPS A1, 2, 3, 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, & -55C TEMPERATURE, SUBGROUPS A9, 10, & 11.
- 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 MIN. 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

Rev	ECN #	Rel Date	Originator	Changes
1A0	M0003410	08/14/03	Rose Malone	Updated MDS: MV54ACTQ16374-X, Rev. 0A0 to MV54ACTQ16374-X, Rev. 1A0. Changed limits for the following parameters: VOLP from 0.8V to 1100mV, VOLV from -0.8V to -1300mV, VOHP from VOH +1.0V to VOH +1200mV and VOHV from VOH -1.0V to VOH -1400mV.