

**MV54ACTQ374-X REV 0A0**

 Original Creation Date: 11/07/97  
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## Octal D-Type Flip-Flop With 3-State Outputs

### General Description

The ACTQ374 is a high-speed, low-power octal D-type flip-flop featuring separate D-type inputs for each flip-flop and TRI-STATE outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable ( $\overline{OE}$ ) are common to all flip-flops.

The ACTQ374 utilizes NSC Quiet Series technology to guarantee quiet output switching and improve dynamic threshold performance. FACT Quiet Series TM features GTO TM output control and undershoot corrector in addition to a split ground bus for superior performance.

### Industry Part Number

54ACTQ374

### Prime Die

D374

### NS Part Numbers

 54ACTQ374E-QMLV\*  
 54ACTQ374ERQMLV\*  
 54ACTQ374J-QMLV\*\*  
 54ACTQ374JRQMLV\*\*  
 54ACTQ374W-QMLV\*\*\*  
 54ACTQ374WRQMLV\*\*\*

### Controlling Document

5962-92189

### Processing

MIL-STD-883, Method 5004

### Quality Conformance Inspection

MIL-STD-883, Method 5004

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**

- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Guaranteed pin-to-pin skew AC performance
- Improved latch-up immunity
- Buffered positive edge-triggered clock
- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs source/sink 24 mA
- 4 kV minimum ESD immunity
- Standard Military Drawing (SMD)
  - ACTQ374: 5962-9218901V2A\*, VRA\*\*, VSA\*\*\*
  - ACTQ374: 5962R9218901V2A\*, VRA\*\*, VSA\*\*\*

**(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
Thermal Resistance, junction-to-case (jc)	see Mil-Std 1835
Maximum Power Dissipation (pd)	500 mW
Lead Temperature	
soldering, 10 seconds	+300 C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specification 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	125mV/ns
Maximum High Level Output Current (Ioh)	-24 mA
Maximum Low Level Output Current (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, Temperature Range: -55C to 125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High Level Input Current	VCC=5.5V, VM=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, VM=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, VINH=4.5V, VIL=0.8V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=5.5V, VINH=5.5V, VIL=0.8V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=4.5V, VINH=4.5V, VIL=0.8V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=5.5V, VINH=5.5V, 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, VINH=5.5V, VIL=0.0V, IOL=50.0mA, VIH=5.5V	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High Level Output Voltage	VCC=4.5V, VINL=0.0V, VIH=2.0V, VIL=0.8V, IOH=-50.0uA	1, 2	OUTPUT	4.40		V	1, 2, 3
		VCC=5.5V, VINH=5.5V, VIH=2.0V, VIL=0.8V, IOH=-50.0uA	1, 2	OUTPUT	5.40		V	1, 2, 3
		VCC=4.5V, VINH=4.5V, VIH=2.0, VIL=0.8V, IOH=-24.0mA	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=5.5V, VINH=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, VINH=5.5V, VIH=5.5V, VIL=0.0V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
IOZH	Maximum TRI-STATE Leakage Current	VCC=4.5V, VM=4.5V, VIH=2.0V, VINH=4.5V, VINL=0.0V	1, 2	OUTPUT		0.25	uA	1
			1, 2	OUTPUT		5.0	uA	2, 3
		VCC=5.5V, VM=5.5V, VIH=2.0V, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT		0.25	uA	1
			1, 2	OUTPUT		5.0	uA	2, 3
IOZL	Maximum TRI-STATE Leakage Current	VCC=4.5V, VM=0.0V, VIH=2.0V, VINH=4.5V	1, 2	OUTPUT		-0.25	uA	1
			1, 2	OUTPUT		-5.0	uA	2, 3
		VCC=5.5V, VM=0.0V, VIH=2.0V, VINH=5.5V	1, 2	OUTPUT		-0.25	uA	1
			1, 2	OUTPUT		-5.0	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, Temperature Range: -55C to 125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCH	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		100	nA	1
			1, 2	VCC		80	uA	2, 3
ICCL	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		100	nA	1
			1, 2	VCC		80	uA	2, 3
IC CZ	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		100	nA	1
			1, 2	VCC		80	uA	2, 3
ICCF	Supply Current Functional	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		100	nA	1
			1, 2	VCC		80	uA	2, 3
ICCT	Supply Current	VCC=5.5V, VIHT=VCC-2.1V	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
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

## Electrical Characteristics

### 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.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH	Propagation Delay	VCC=4.5V	3, 4, 7	CP to On	1.5	9.5	ns	9
			3, 4, 7	CP to On	1.5	11.5	ns	10, 11
tpHL	Propagation Delay	VCC=4.5V	3, 4, 7	CP to On	1.5	9.5	ns	9
			3, 4, 7	CP to On	1.5	11.5	ns	10, 11
tpZH	Output Enable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to On	1.5	9.5	ns	9
			3, 4, 7	$\overline{OE}$ to On	1.5	11.5	ns	10, 11
tpZL	Output Enable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to On	1.5	9.5	ns	9
			3, 4, 7	$\overline{OE}$ to On	1.5	11.5	ns	10, 11
tpHZ	Output Disable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to On	1.5	9.5	ns	9
			3, 4, 7	$\overline{OE}$ to On	1.5	10.5	ns	10, 11
tpLZ	Output Disable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to On	1.5	9.5	ns	9
			3, 4, 7	$\overline{OE}$ to On	1.5	10.5	ns	10, 11
ts(H/L)	Setup Time HIGH or LOW	VCC=4.5V	6	Dn to CP	3.5		ns	9, 10, 11
th(H/L)	Hold Time HIGH or LOW	VCC=4.5V	6	Dn to CP	2.0		ns	9, 10, 11
tw(H/L)	Pulse Width	VCC=4.5V	6	CP Pulse Width	5.0		ns	9, 10, 11
Fmax	Maximum Clock Frequency	VCC=4.5V	6		95		MHz	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, GUARDBAND LIMITS SET FOR +25C, 2 MSEC DURATION MAX.

Note 6: DESIGN CHARACTERIZATION DATA ONLY.

Note 7: 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 @ GND.

*(Continued)*

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
0A0	M0001213	08/05/99	Linda Collins	Initial MDS Release