

MN54AC175-X REV 2A0

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Quad D Flip-Flop
General Description

The AC175 is a high-speed quad D flip-flop. The device is useful for general flip-flop requirements where clock and clear inputs are common. The information on the D inputs is stored during the LOW-to-HIGH clock transition. Both true and complemented outputs of each flip-flop are provided. A Master Reset input resets all flip-flops, independent of the Clock or D inputs, when LOW.

Industry Part Number

54AC175

NS Part Numbers

 54AC175DMQB
 54AC175FMQB
 54AC175LMQB

Prime Die

Z175

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

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

Features

- Icc reduced by 50%
- Edge-triggered D-type inputs
- Buffered positive edge-triggered clock
- Asynchronous common reset
- True and complement output
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
- AC175: 5962-89552

(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
Junction Temperature (Tj)	175 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)	2.0V to 6.0V
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)	
AC Devices	
Vin from 30% to 70% of Vcc	
Vcc @ 3.0V, 4.5V, 5.5V	125 mV/ns

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
 DC: VCC 3.0V to 5.5V, Temperature Range -55 C to 125 C. 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, 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=3.0V, VIL=0.9V, VIH=2.1V, IOL=12.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=3.0V, VIL=0.9V, VIH=2.1V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
			1, 2	OUTPUT		.36	V	1
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
			1, 2	OUTPUT		.36	V	1
VCC=5.5V, VIL=1.65V, VIH=3.85V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1		
	1, 2	OUTPUT		.50	V	2, 3		
VCC=5.5V, VIL=1.65V, VIH=3.85V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3		
	1, 2	OUTPUT		.36	V	1		
VIOL	Dynamic Output Current LOW	VCC=5.5V, VIL=1.65V, VIH=3.85V, IOL=50.0mA	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High level output voltage	VCC=3.0V, VIL=0.9V, VIH=2.1V, IOH=-12.0mA	1, 2	OUTPUT	2.56		V	1
			1, 2	OUTPUT	2.40		V	2, 3
		VCC=3.0V, VIL=0.9V, VIH=2.1V, IOH=-50.0uA	1, 2	OUTPUT	2.90		V	1, 2, 3
			1, 2	OUTPUT	3.86		V	1
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOH=-24.0mA	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOH=-50.0uA	1, 2	OUTPUT	4.40		V	1, 2, 3
			1, 2	OUTPUT	4.86		V	1
VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-24.0mA	1, 2	OUTPUT	4.86		V	1		
	1, 2	OUTPUT	4.70		V	2, 3		
VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-50.0uA	1, 2	OUTPUT	5.40		V	1, 2, 3		
	1, 2	OUTPUT	3.85		V	1, 2, 3		
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
ICCH	Supply Current	VCC=5.5V	1, 2	VCC		8	uA	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 3.0V to 5.5V, Temperature Range -55 C to 125 C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCL	Supply Current	VCC=5.5V	1, 2	VCC		8	uA	1
			1, 2	VCC		160	uA	2, 3

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: CL=50pf, RL=500 ohms, TRISE=3.0ns, TFALL=3.0ns, Temp Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

tpLH(1)	Propagation Delay	VCC=3.0V	3, 4	CP to Qn or Qn	1.0	12.0	ns	9
			3, 4	CP to Qn or Qn	1.0	14.5	ns	10, 11
tpHL(1)	Propagation Delay	VCC=3.0V	3, 4	CP to Qn or Qn	1.0	13.0	ns	9
			3, 4	CP to Qn or Qn	1.0	15.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC=3.0V	3, 4	MR to Qn	1.0	12.5	ns	9
			3, 4	MR to Qn	1.0	15.0	ns	10, 11
tpHL(2)	Propagation Delay	VCC=3.0V	3, 4	MR to Qn	1.0	11.5	ns	9
			3, 4	MR to Qn	1.0	13.5	ns	10, 11
ts(H/L)(1)	Set-up Time, HIGH or LOW	VCC=3.0V	6	Dn to CP	4.5		ns	9
			6	Dn to CP	5.0		ns	10, 11
th(H/L)(1)	Hold Time, HIGH or LOW	VCC=3.0V	6	Dn to CP	2.0		ns	9, 10, 11
tw(H/L)(1)	Pulse Width, HIGH or LOW	VCC=3.0V	6	CP	5.0		ns	9
			6	CP	6.0		ns	10, 11
tw(L)(2)	Pulse Width, LOW	VCC=3.0V	6	MR	5.0		ns	9
			6	MR	5.5		ns	10, 11
trec(1)	Recovery Time	VCC=3.0V	6	MR to CP	1.5		ns	9, 10, 11

Electrical Characteristics

AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: CL=50pf, RL=500 ohms, TRISE=3.0ns, TFALL=3.0ns, Temp Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Fmax(1)	Maximum Clock Frequency	VCC=3.0V	6	CP	95		MHz	9, 10, 11
tpLH(3)	Propagation Delay	VCC=4.5V	3, 4	CP to Qn or Qn	1.5	9.0	ns	9
			3, 4	CP to Qn or Qn	1.5	10.5	ns	10, 11
tpHL(3)	Propagation Delay	VCC=4.5V	3, 4	CP to Qn or Qn	1.5	9.5	ns	9
			3, 4	CP to Qn or Qn	1.5	11.5	ns	10, 11
tpLH(4)	Propagation Delay	VCC=4.5V	3, 4	MR to Qn	1.5	9.0	ns	9
			3, 4	MR to Qn	1.5	11.0	ns	10, 11
tpHL(4)	Propagation Delay	VCC=4.5V	3, 4	MR to Qn	1.5	9.0	ns	9
			3, 4	MR to Qn	1.5	10.5	ns	10, 11
ts(H/L)(2)	Set-up Time, HIGH or LOW	VCC=4.5V	6	Dn to CP	3.0		ns	9
			6	Dn to CP	3.5		ns	10, 11
th(H/L)(2)	Hold Time, HIGH or LOW	VCC=4.5V	6	Dn to CP	2.5		ns	9, 10, 11
tw(H/L)(3)	Pulse Width, HIGH or LOW	VCC=4.5V	6	CP	5.0		ns	9, 10, 11
tw(L)(4)	Pulse Width, LOW	VCC=4.5V	6	MR	5.0		ns	9, 10, 11
trec(2)	Recovery Time	VCC=4.5V	6	MR to CP	1.5		ns	9, 10, 11
Fmax(2)	Maximum Clock Frequency	VCC=4.5V	6	CP	95		MHz	9, 10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C TEMP., SUBGROUPS A1, 2, 7 & 8.

Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMP., 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 SUBGROUP A9 & AT +125C TEMP., SUBGROUPS 10 & 11.

Note 5: TRANSMISSION LINE DRIVING TEST, GUARDBAND LIMITS SET FOR +25C, 2 MSEC DURATION MAX.

Note 6: GUARANTEED BUT NOT TESTED. (DESIGN CHARACTERIZATION DATA)

(Continued)

Note 7: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MIN LIMITS.