National Semiconductor

MICROCIRCUIT DATA SHEET

MV54ACT161-X REV 1A0

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Synchronous Presettable Binary Counter

General Description

The ACT161 is a high-speed synchronous modulo-16 binary counter. It is synchronously presettable for application in programmable dividers and has two types of Count Enable inputs plus a Terminal Count output for versatility in forming synchronous multistage counters. The ACT161 has an asynchronous Master Reset Input that overrides all other inputs and forces the outputs LOW.

Industry Part Number

54ACT161

Prime Die

J161

Controlling Document

5962-91722

NS Part Numbers

54ACT161E-QMLV *
54ACT161ERQMLV*
54ACT161J-QMLV **
54ACT161JRQMLV**
54ACT161W-QMLV ***
54ACT161WRQMLV***

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

- Synchronous counting and loading
- High-speed synchronous expansion
- Typical count rate of 125 MHz
- Outputs source/sink 24 mA
- ACT161 has TTL-compatible inputs
- Standard Military Drawing (SMD)
  - ACT161: 5962-9172201V2A*, VEA**, VFA***
  - ACT161: 5962R9172201V2A*, VEA**, VFA***

(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)	
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 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 TM 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)	
ACT Devices	
Vin from 0.8V to 2.0V	
Vcc @ 4.5V, 5.5V	125 mV/ns
Maximum Low Level Input Voltage (Vil)	0.8 V
Minimum High Level Input Voltage (Vih)	3.0 V
Maximum High Level Output Current (Ioh)	-24 mA
Maximum Low Level Output Current (Iol)	+24 mA

Note 1: For dynamic operation, a Vih level between 2.0 V and 3.0 V may be recognized by this device as a high logic level input. For static operation, a Vih greater than or equal to 2.0 V will be recognized by this device as a high logic level input. Users are cautioned to verify that this will not affect their system.

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
VOL	Low Level Output Voltage	VCC=4.5V, IOL=50.0uA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT		.10	V	1, 2, 3
		VCC=5.5V, IOL=50.0uA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT		.10	V	1, 2, 3
		VCC=4.5V, IOL=24.0mA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT		.40	V	1, 3
			1, 5, 8	OUTPUT		.50	V	2
		VCC=5.5V, IOL=24.0mA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT		.40	V	1, 3
			1, 5, 8	OUTPUT		.50	V	2
VOH	High Level Output Voltage	VCC=4.5V, IOH=-50.0uA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT	4.40		V	1, 2, 3
		VCC=5.5V, IOH=-50.0uA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT	5.40		V	1, 2, 3
		VCC=4.5V, IOH=-24.0mA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT	3.70		V	1, 2, 3
		VCC=5.5V, IOH=-24.0mA, VIL=0.8V, VIH=3.0V	1, 5, 8	OUTPUT	4.70		V	1, 2, 3
ICCH	Supply Current Outputs High	VCC=5.5V, VIH=5.5V	1, 2, 8	VCC		100	nA	1
			1, 2, 8	VCC		40	uA	2
ICCL	Supply Current Outputs Low	VCC=5.5V, VIL=0.0V	1, 2, 8	VCC		100	nA	1
			1, 2, 8	VCC		40	uA	2
ICCF	Supply Current Functional	VCC=5.5V, VIL=0.0V	1, 2, 8	VCC		100	nA	1
			1, 2, 8	VCC		40	uA	2
ICCT	Supply Current	VCC=5.5V, VINH=3.4V	1, 5, 8	VCC		1.0	mA	1, 2
			1, 5, 8	VCC		1.6	mA	3
IIH	High Level Input Current	VCC=5.5V, VIH=5.5V	1, 2, 8	INPUT		0.1	uA	1
			1, 2, 8	INPUT		1.0	uA	2

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
IIL	Low Level Input Current	VCC=5.5V, VIH=5.5V	1, 2, 8	INPUT		-0.1	uA	1
			1, 2, 8	INPUT		-1.0	uA	2
VIC+	Positive Input Clamp Voltage	VCC=0.0V, IM=1.0mA	10, 11	INPUT	0.40	1.5	V	1
VIC-	Negative Input Clamp Voltage	VCC=0pen, IM=-1.0mA	10, 11	INPUT	-0.40	-1.5	V	1
VIOL	Dynamic output current LOW	VCC=5.5V, IOL=50.0mA, VIL=0.0V, VIH=5.5V	1, 5, 8, 9	OUTPUT		1.65	V	1, 2, 3
VIOH	Dynamic Output Current HIGH	VCC=5.5V, IOH=-50.0mA, VIL=0.0V, VIH=5.5V	1, 5, 8, 9	OUTPUT	3.85		V	1, 2, 3

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pF, RL=500 OHMS, TRISE/TFALL=3.0nS, Temp Range: -55C to 125C.

tpLH(1)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CP to Qn (COUNT)	1.5	9.0	ns	9, 11
			3, 4, 7, 8	CP to Qn (COUNT)	1.5	10.5	ns	10
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CP to Qn (COUNT)	1.5	9.5	ns	9, 11
			3, 4, 7, 8	CP to Qn (COUNT)	1.5	10.5	ns	10
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CP to Qn (LOAD)	1.5	8.5	ns	9, 11
			3, 4, 7, 8	CP to Qn (LOAD)	1.5	10.0	ns	10
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CP to Qn (LOAD)	1.5	8.0	ns	9, 11
			3, 4, 7, 8	CP to Qn (LOAD)	1.5	9.5	ns	10

Electrical Characteristics

AC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pF, RL=500 OHMS, TRISE/TFALL=3.0nS, Temp Range: -55C to 125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH(3)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CP to TC	1.5	12.0	ns	9, 11
			3, 4, 7, 8	CP to TC	1.5	14.0	ns	10
tpHL(3)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CP to TC	1.5	11.0	ns	9, 11
			3, 4, 7, 8	CP to TC	1.5	12.5	ns	10
tpLH(4)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CET to TC	1.5	8.0	ns	9, 11
			3, 4, 7, 8	CET to TC	1.5	9.5	ns	10
tpHL(4)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	CET to TC	1.5	8.5	ns	9, 11
			3, 4, 7, 8	CET to TC	1.5	9.5	ns	10
tpHL(5)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	$\overline{MR}$ to Qn	1.5	8.5	ns	9, 11
			3, 4, 7, 8	$\overline{MR}$ to Qn	1.5	10.0	ns	10
tpHL(6)	Propagation Delay	VCC=4.5V	3, 4, 7, 8	$\overline{MR}$ to TC	1.5	10.0	ns	9, 11
			3, 4, 7, 8	$\overline{MR}$ to TC	1.5	11.5	ns	10
Fmax(1)	Maximum Count Frequency	VCC=4.5V	6, 8	CP	100		Mhz	9
			6, 8	CP	85		Mhz	10, 11
tw(H/L)(1)	Pulse Width (HIGH or LOW)	VCC=4.5V	6, 8	CP(COUNT)	5.0		ns	9, 10, 11
tw(H/L)(2)	Pulse Width (HIGH or LOW)	VCC=4.5V	6, 8	CP(LOAD)	5.0		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/TFALL=3.0nS, Temp Range: -55C to 125C.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tw(L)(3)	Pulse Width (LOW)	VCC=4.5V	6, 8	$\overline{MR}$	5.0		ns	9, 11
			6, 8	$\overline{MR}$	6.5		ns	10
ts(H/L)(1)	Setup Time (HIGH or LOW)	VCC=4.5V	6, 8	Pn to CP	9.5		ns	9, 11
			6, 8	Pn to CP	13.0		ns	10
th(H/L)(1)	Hold Time (HIGH or LOW)	VCC=4.5V	6, 8	Pn to CP	0.0		ns	9, 10, 11
ts(H/L)(2)	Setup Time (HIGH or LOW)	VCC=4.5V	6, 8	$\overline{PE}$ to CP	8.5		ns	9, 11
			6, 8	$\overline{PE}$ to CP	11.0		ns	10
th(H/L)(2)	Hold Time (HIGH or LOW)	VCC=4.5V	6, 8	$\overline{PE}$ to CP	0.0		ns	9, 10, 11
ts(H/L)(3)	Setup Time (HIGH or LOW)	VCC=4.5V	6, 8	CET or CEP to CP	5.5		ns	9, 11
			6, 8	CET or CEP to CP	7.0		ns	10
th(H/L)(3)	Hold Time (HIGH or LOW)	VCC=4.5V	6, 8	CET or CEP to CP	0.5		ns	9, 10, 11
TREC(1)	Recovery Time		6, 8	$\overline{MR}$ to CP	0.0		ns	9, 11
			6, 8	$\overline{MR}$ to CP	0.5		ns	10

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 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, +125C, & -55C TEMPERATURE, SUBGROUPS A9, 10, & 11.
Note 5: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C, +125C, & -55C TEMPERATURE, SUBGROUPS A1, 2, 3, 7, & 8.
Note 6: DESIGN CHARACTERIZATION DATA ONLY.
Note 7: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MINIMUM LIMITS.
Note 8: GENERAL NOTE: DUE TO THE INTERNAL NOISE PROBLEMS THIS COMPONENT CANNOT MEET THE THRESHOLD LIMITS REQUIRED PER MIL-STD-883, TEST METHOD 5005, FOR VIH (VIH=2.0V +20 PERCENT). FOR FUNTIONAL TESTS, USE VIH=3.0V + 5 PERCENT FOR ALL INPUTS. THE VIL LIMIT (0.8V - 50 PERCENT) REMAINS UNCHANGED. USERS ARE CAUTIONED TO VERIFY THAT THIS CHANGE WILL NOT AFFECT THEIR SYSTEMS.
Note 9: TRANSMISSION LINE DRIVING TEST, GUARDBANDED LIMITS SET FOR +25 C, 2 MSEC DURATION MAX.
Note 10: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY, SUBGROUP A1.
Note 11: SAMPLE TESTED (METHOD 5005, TABLE 1) AT +25C TEMPERATURE ONLY, SUBGROUP A1.

Revision History

Rev	ECN #	Rel Date	Originator	Changes
1A0	M0003402	05/17/99	Linda Collins	Added the Rad Hard NSID's. Added ICCF to the DC electricals. Added VIC+ and VIC- to the DC electricals. Added notes 10 & 11 to the notes section. New update: MV54ACT161-X Rev. 1A0