

MV54ACT163-X REV 0A0

 Original Creation Date: 09/29/97
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Synchronous Presettable Binary Counter

General Description

The ACT163 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 ACT163 has a Synchronous ResetInput that overrides counting and parallel loading and allows the outputs to be simultaneously reset on the rising edge of the clock.

Industry Part Number

54ACT163

Prime Die

J163

NS Part Numbers

 54ACT163E-QMLV*
 54ACT163ERQMLV*
 54ACT163J-QMLV**
 54ACT163JRQMLV***
 54ACT163W-QMLV***
 54ACT163WRQMLV***

Controlling Document

5962-91723

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 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

- Synchronous Counting and loading
- High-speed synchronous expansion
- Typical count rate 125 MHz
- Outputs source/sink 24 mA
- ACT163 has TTL-Compatible inputs
- Standard Military Drawing (SMD)
 - ACT163: 5962-9172301V2A*, VEA**, VFA***
 - ACT163: 5962R9172301V2A*, 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™ 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)	
(Note 1)	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 V_{ih} level between 2.0V and 3.0V may be recognized by this device as a high logic level input. For static operation, a V_{ih} greater than or equal to 2.0V 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 PARAMETER

(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 PARAMETER (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, VIL=0.0V	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=Open, 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	CP - Qn (COUNT)	1.5	9.5	ns	9, 11
			3, 4, 7	CP - Qn (COUNT)	1.5	10.5	ns	10
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 7	CP - Qn (COUNT)	1.5	9.5	ns	9, 11
			3, 4, 7	CP - Qn (COUNT)	1.5	10.5	ns	10
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 7	CP - Qn (LOAD)	1.5	9.0	ns	9, 11
			3, 4, 7	CP - Qn (LOAD)	1.5	10.0	ns	10
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 7	CP - Qn (LOAD)	1.5	8.5	ns	9, 11
			3, 4, 7	CP - Qn (LOAD)	1.5	9.5	ns	10
tpLH(3)	Propagation Delay	VCC=4.5V	3, 4, 7	CP - TC	1.5	11.0	ns	9, 11
			3, 4, 7	CP - TC	1.5	12.5	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
tpHL(3)	Propagation Delay	VCC=4.5V	3, 4, 7	CP - TC	1.5	12.0	ns	9, 11
			3, 4, 7	CP - TC	1.5	13.0	ns	10
tpLH(4)	Propagation Delay	VCC=4.5V	3, 4, 7	CET to TC	1.5	8.5	ns	9, 11
			3, 4, 7	CET to TC	1.5	9.5	ns	10
tpHL(4)	Propagation Delay	VCC=4.5V	3, 4, 7	CET to TC	1.5	9.0	ns	9, 11
			3, 4, 7	CET to TC	1.5	9.5	ns	10
Fmax(1)	Maximum Count Frequency	VCC=4.5V	6	CP	100		Mhz	9
			6	CP	90		Mhz	10, 11
tw(H/L)(1)	Clock Pulse Width (HIGH or LOW)	VCC=4.5V	6	CP (COUNT)	5.0		ns	9, 10, 11
tw(H/L)(2)	Clock Pulse Width (HIGH or LOW)	VCC=4.5V	6	CP (LOAD)	5.0		ns	9, 10, 11
ts(H/L)(1)	Setup Time (HIGH or LOW)	VCC=4.5V	6	Pn to CP	10.0		ns	9
			6	Pn to CP	13.5		ns	10, 11
th(H/L)(1)	Hold Time (HIGH or LOW)	VCC=4.5V	6	Pn to CP	0.5		ns	9, 10, 11
			6	\overline{SR} to CP	10.0		ns	9
ts(H/L)(2)	Setup Time (HIGH or LOW)	VCC=4.5V	6	\overline{SR} to CP	10.0		ns	9
			6	\overline{SR} to CP	13.5		ns	10, 11
th(H/L)(2)	Hold Time (HIGH or LOW)	VCC=4.5V	6	\overline{SR} to CP	0.0		ns	9, 10, 11
			6	\overline{PE} to CP	8.5		ns	9
ts(H/L)(3)	Setup Time (HIGH or LOW)	VCC=4.5V	6	\overline{PE} to CP	8.5		ns	9
			6	\overline{PE} to CP	11.5		ns	10, 11
th(H/L)(3)	Hold Time (HIGH or LOW)	VCC=4.5V	6	\overline{PE} to CP	0.0		ns	9, 10, 11
			6	CET or CEP-CP	5.5		ns	9
ts(H/L)(4)	Setup Time (HIGH or LOW)	VCC=4.5V	6	CET or CEP-CP	5.5		ns	9
			6	CET or CEP-CP	7.0		ns	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
th(H/L)(4)	Hold Time (HIGH or LOW)	VCC=4.5V	6	CET or CEP-CP	0.0		ns	9
			6	CET or CEP-CP	0.5		ns	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 & -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: 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 FUNCTIONAL 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
0A0	M0003403	08/18/99	Linda Collins	Initial MDS Release