National Semiconductor

MILITARY DATA SHEET

MN54ACTQ657-X REV 1A0

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Octal Bidirectional Transceiver with 8-Bit Parity Generator/Checker and TRI-STATE Outputs

General Description

The ACTQ657 contains eight non-inverting buffers with TRI-STATE outputs and 8-bit parity generator/checker. Intended for bus oriented applications, the device combines the 245 and the 280 functions in one package.

The ACTQ657 utilizes Quiet Series technology to guarantee quiet output switching 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

54ACTQ657

NS Part Numbers

54ACTQ657DMQB
54ACTQ657FMQB
54ACTQ657LMQB

Prime Die

D657

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

- Guaranteed simultaneous swiching noise level and dynamic threshold performance
- Guaranteed pin-to-pin skew AC performance
- Combines the 245 and the 280 function in one packge
- 300 mil 24-pin slim dual-in-line package
- Output source/sink 24 mA
- ACTQ has TTL-compatible inputs
- Standard Military Drawing (SMD)
  - ACTQ657-92197

(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)	
	-0.5 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
PDIP	140 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

(Note 1)

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

Note 1: All commercial packaging is not recommended for applications requiring greater than 200 temperature cycles from -65C to +150C.

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. 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=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, IOH=-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, IOH=-50.0uA, VIH=2.0V	1, 2	OUTPUT	4.40		V	1, 2, 3
		VCC=5.5V, VIL=0.8V, IOH=-24.0mA, VIH=2.0V	1, 2	OUTPUT	4.86		V	1
			1, 2	OUTPUT	4.70		V	2, 3
		VCC=5.5V, VIL=0.8V, IOH=-50.0uA, VIH=2.0V	1, 2	OUTPUT	5.40		V	1, 2, 3
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIH=5.5V, VIL=0.0V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
ICCH	Supply Current	VCC=5.5V	1, 2	VCC		8.0	uA	1
			1, 2	VCC		160	uA	2, 3
ICCL	Supply Current	VCC=5.5V	1, 2	VCC		8.0	uA	1
			1, 2	VCC		160	uA	2, 3
ICCZ	Supply Current	VCC=5.5V	1, 2	VCC		8.0	uA	1
			1, 2	VCC		160	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

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. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IOZHT	Maximum TRI-STATE Leakage Current	VCC=4.5V, VIH=2.0V, VM=4.5V	1, 2	I/O PINS		0.6	uA	1
			1, 2	I/O PINS		11.0	uA	2, 3
		VCC=5.5V, VIH=2.0V, VM=5.5V	1, 2	I/O PINS		0.6	uA	1
			1, 2	I/O PINS		11.0	uA	2, 3
IOZH	Maximum TRI-STATE Leakage current	VCC=4.5V, VIH=2.2V, VM=4.5V	1, 2	ERROR OUTPUT		0.5	uA	1
			1, 2	ERROR OUTPUT		10.0	uA	2, 3
		VCC=5.5V, VIH=2.0V, VM=5.5V	1, 2	ERROR OUTPUT		0.5	uA	1
			1, 2	ERROR OUTPUT		10.0	uA	2, 3
IOZLT	Maximum TRI-STATE Leakage current	VCC=4.5V, VIH=2.0V, VM=4.5V	1, 2	I/O PINS		-0.6	uA	1
			1, 2	I/O PINS		-11.0	uA	2, 3
		VCC=5.5V, VIH=2.0V, VM=5.5V	1, 2	I/O PINS		-0.6	uA	1
			1, 2	I/O PINS		-11.0	uA	2, 3
IOZL	Maximum TRI-STATE Leakage current	VCC=4.5V, VIH=2.0V, VM=4.5V	1, 2	ERROR OUTPUT		-0.5	uA	1
			1, 2	ERROR OUTPUT		-10.0	uA	2, 3
		VCC=5.5V, VIH=2.0V, VM=5.5V	1, 2	ERROR OUTPUT		-0.5	uA	1
			1, 2	ERROR OUTPUT		-10.0	uA	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

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. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
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

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. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

tpLH(1)	Propagation Delay	VCC= 4.5V	3, 4, 7	An/Bn or Bn/An	1.5	8.0	ns	9
			3, 4, 7	An/Bn or Bn/An	1.5	9.0	ns	10, 11
tpHL(1)	Propagation Delay	VCC= 4.5V	3, 4, 7	An/Bn or Bn/An	1.5	7.5	ns	9
			3, 4, 7	An/Bn or Bn/An	1.5	9.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC= 4.5V	3, 4, 7	An to PARITY	1.5	11.5	ns	9
			3, 4, 7	An to PARITY	1.5	13.5	ns	10, 11
tpHL(2)	Propagation Delay	VCC= 4.5V	3, 4, 7	An to PARITY	1.5	11.5	ns	9
			3, 4, 7	An to PARITY	1.5	13.5	ns	10, 11
tpLH(3)	Propagation Delay	VCC= 4.5V	3, 4, 7	ODD/$\overline{\text{EVEN}}$ to PAR	1.5	9.0	ns	9
			3, 4, 7	ODD/$\overline{\text{EVEN}}$ to PAR	1.5	10.5	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, TR/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
tpHL(3)	Propagation Delay	VCC= 4.5V	3, 4, 7	ODD/$\overline{\text{EVE}}$N to PAR	1.5	9.0	ns	9
			3, 4, 7	ODD/$\overline{\text{EVE}}$N to PAR	1.5	10.5	ns	10, 11
tpLH(4)	Propagation Delay	VCC= 4.5V	3, 4, 7	Bn to $\overline{\text{ERROR}}$	1.5	11.0	ns	9
			3, 4, 7	Bn to $\overline{\text{ERROR}}$	1.5	13.5	ns	10, 11
tpHL(4)	Propagation Delay	VCC= 4.5V	3, 4, 7	Bn to $\overline{\text{ERROR}}$	1.5	11.5	ns	9
			3, 4, 7	Bn to $\overline{\text{ERROR}}$	1.5	13.5	ns	10, 11
tpLH(5)	Propagation Delay	VCC= 4.5V	3, 4, 7	PAR to $\overline{\text{ERROR}}$	1.5	9.5	ns	9
			3, 4, 7	PAR to $\overline{\text{ERROR}}$	1.5	10.5	ns	10, 11
tpHL(5)	Propagation Delay	VCC= 4.5V	3, 4, 7	PAR to $\overline{\text{ERROR}}$	1.5	9.5	ns	9
			3, 4, 7	PAR to $\overline{\text{ERROR}}$	1.5	10.5	ns	10, 11
tpLH(6)	Propagation Delay	VCC= 4.5V	3, 4, 7	ODD/$\overline{\text{EVE}}$N to $\overline{\text{ER}}$	1.5	9.5	ns	9
			3, 4, 7	ODD/$\overline{\text{EVE}}$N to $\overline{\text{ER}}$	1.5	11.0	ns	10, 11
tpHL(6)	Propagation Delay	VCC= 4.5V	3, 4, 7	ODD/$\overline{\text{EVE}}$N to $\overline{\text{ER}}$	1.5	9.5	ns	9
			3, 4, 7	ODD/$\overline{\text{EVE}}$N to $\overline{\text{ER}}$	1.5	11.0	ns	10, 11
tpZH(1)	Output Enable Time	VCC= 4.5V	3, 4, 7	$\overline{\text{OE}}$ to An/Bn	1.5	10.0	ns	9
			3, 4, 7	$\overline{\text{OE}}$ to An/Bn	1.5	11.5	ns	10, 11
tpZL(1)	Output Enable Time	VCC= 4.5V	3, 4, 7	$\overline{\text{OE}}$ to An/Bn	1.5	10.0	ns	9
			3, 4, 7	$\overline{\text{OE}}$ to An/Bn	1.5	12.0	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, TR/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
tpHZ(1)	Output Disable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to An/Bn	1.5	8.0	ns	9
			3, 4, 7	$\overline{OE}$ to An/Bn	1.5	9.0	ns	10, 11
tpLZ(1)	Output Disable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to An/Bn	1.5	6.0	ns	9
			3, 4, 7	$\overline{OE}$ to An/Bn	1.5	7.0	ns	10, 11
tpZH(2)	Output Enable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to PARITY	1.5	9.5	ns	9
			3, 4, 7	$\overline{OE}$ to PARITY	1.5	11.5	ns	10, 11
tpZL(2)	Output Enable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to PARITY	1.5	10.0	ns	9
			3, 4, 7	$\overline{OE}$ to PARITY	1.5	11.5	ns	10, 11
tpHZ(2)	Output Disable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to PARITY	1.5	7.5	ns	9
			3, 4, 7	$\overline{OE}$ to PARITY	1.5	8.5	ns	10, 11
tpLZ(2)	Output Disable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to PARITY	1.5	6.0	ns	9
			3, 4, 7	$\overline{OE}$ to PARITY	1.5	7.0	ns	10, 11
tpZH(3)	Output Enable Time (See Note 10)	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	9.5	ns	9
			3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	11.0	ns	10, 11
tpZL(3)	Output Enable Time (See Note 10)	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	10.0	ns	9
			3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	11.5	ns	10, 11
tpHZ(3)	Output Disable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	8.0	ns	9
			3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	9.0	ns	10, 11
tpLZ(3)	Output Disable Time	VCC= 4.5V	3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	6.0	ns	9
			3, 4, 7	$\overline{OE}$ to $\overline{ERROR}$	1.5	7.0	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 TEMPERATURE, SUBGROUPS A9 & 10.
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.
Note 10: These delay times reflect the TRI-STATE recovery time only and not the signal through the buffers or the parity check circuitry. To assure VALID information at the $\overline{\text{ERROR}}$ pin, time must be allowed for the signal to propagate through the drivers (B to A), through the parity check circuitry (same as A to PARITY), and to the $\overline{\text{ERROR}}$ output after the $\overline{\text{ERROR}}$ pin has been enabled (Output Enabled times). VALID data at the $\overline{\text{ERROR}}$ pin $\pm$ (A to PARITY) + (Output Enable Time)