54ACQ245,54ACTQ245

54ACQ245 54ACTQ245 Quiet Series Octal Bidirectional Transceiver with TRI-STATE Inputs/Outputs

Literature Number: SNOS060

National Semiconductor

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54ACQ245 • 54ACTQ245
Quiet Series Octal Bidirectional Transceiver with TRI-STATE® Inputs/Outputs

General Description

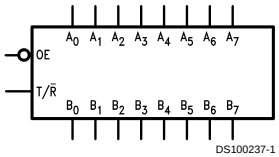
The 'ACQ/'ACTQ245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 24 mA at both the A and B ports. The Transmit/Receive (T/R) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

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

Features

- I_{CC} and I_{OZ} reduced by 50%
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Improved latch-up immunity
- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs source/sink 24 mA
- Faster prop delays than the standard 'ACT245
- 4 kV minimum ESD immunity ('ACQ)
- Standard Military Drawing (SMD)
  — 'ACTQ245: 5962-92187
  — 'ACQ245: 5962-92177

Logic Symbols



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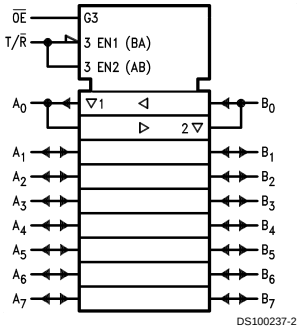
IEEE/IEC



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Pin Names	Description
$\overline{OE}$	Output Enable Input
T/$\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A TRI-STATE Inputs or TRI-STATE Outputs
B_0–B_7	Side B TRI-STATE Inputs or TRI-STATE Outputs

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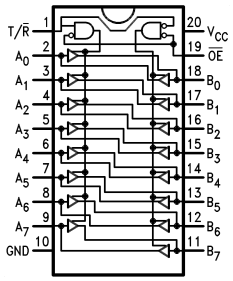
Connection Diagrams

Pin Assignment for DIP and Flatpak



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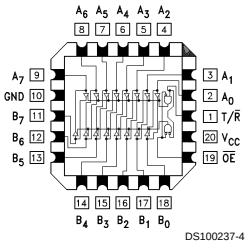
Pin Assignment for LCC



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Truth Table

Inputs		Outputs
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	HIGH-Z State

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
V_I = V_{CC} + 0.5V	+20 mA
DC Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65˚C to +150˚C
DC Latch-Up Source or Sink Current	±300 mA
Junction Temperature (T_J)	
CDIP	175˚C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'ACQ	2.0V to 6.0V
'ACTQ	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
54ACQ/ACTQ	−55˚C to +125˚C
Minimum Input Edge Rate ΔV/Δt	
'ACQ Devices	
V_{IN} from 30% to 70% of V_{CC} V_{CC} @ 3.0V, 4.5V, 5.5V	125 mV/ ns
Minimum Input Edge Rate ΔV/Δt	
'ACTQ Devices	
V_{IN} from 0.8V to 2.0V V_{CC} @ 4.5V, 5.5V	125 mV/ns

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.

DC Characteristics for 'ACQ Family Devices

Symbol	Parameter	V_{CC} (V)	54ACQ T_A = −55˚C to +125˚C Guaranteed Limits	Units	Conditions
V_{IH}	Minimum High Level Input Voltage	3.0	2.1	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		4.5	3.15		
		5.5	3.85		
V_{IL}	Maximum Low Level Input Voltage	3.0	0.9	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		4.5	1.35		
		5.5	1.65		
V_{OH}	Minimum High Level Output Voltage	3.0	2.9	V	I_{OUT} = −50 μA
		4.5	4.4		
		5.5	5.4		
					(Note 2) V_{IN} = V_{IL} or V_{IH}
		3.0	2.4		−12 mA
		4.5	3.7	V	I_{OH} −24 mA
		5.5	4.7		−24 mA
V_{OL}	Maximum Low Level Output Voltage	3.0	0.1	V	I_{OUT} = 50 μA
		4.5	0.1		
		5.5	0.1		
					(Note 2) V_{IN} = V_{IL} or V_{IH}
		3.0	0.50		12 mA
		4.5	0.50	V	I_{OL} 24 mA
		5.5	0.50		24 mA
I_{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V_I = V_{CC}, GND (Note 4)

DC Characteristics for 'ACQ Family Devices (Continued)

Symbol	Parameter	V_{CC} (V)	54ACQ T_A = −55°C to +125°C Guaranteed Limits	Units	Conditions
I_{OLD}	(Note 3) Minimum Dynamic Output Current	5.5	50	mA	V_{OLD} = 1.65V Max
I_{OHD}		5.5	−50	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	80.0	µA	$V_{IN} = V_{CC}$ or GND (Note 4)
I_{OZT}	Maximum I/O Leakage Current	5.5	±5.5	µA	V_I(OE) = V_{IL}, V_{IH} $V_I = V_{CC}$, GND $V_O = V_{CC}$, GND
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	5.0	1.5	V	(Note 5)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	5.0	−1.2	V	(Note 5)

Note 2: All outputs loaded; thresholds on input associated with output under test.

Note 3: Maximum test duration 2.0 ms, one output loaded at a time.

Note 4: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

Note 5: Max number of outputs defined as (n). Data Inputs are driven 0V to 5V; one output @ GND.

DC Characteristics for 'ACTQ Family Devices

Symbol	Parameter	V_{CC} (V)	54ACTQ T_A = −55°C to +125°C Guaranteed Limits	Units	Conditions
V_{IH}	Minimum High Level Input Voltage	4.5	2.0	V	V_{OUT} = 0.1V
		5.5	2.0		or V_{CC} − 0.1V
V_{IL}	Maximum Low Level Input Voltage	4.5	0.8	V	V_{OUT} = 0.1V
		5.5	0.8		or V_{CC} − 0.1V
V_{OH}	Minimum High Level Output Voltage	4.5	4.4	V	I_{OUT} = −50 µA
		5.5	5.4		
					(Note 6) $V_{IN} = V_{IL}$ or V_{IH}
		4.5	3.70	V	I_{OH} −24 mA
		5.5	4.70		−24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5	0.1	V	I_{OUT} = 50 µA
		5.5	0.1		
					(Note 6) $V_{IN} = V_{IL}$ or V_{IH}
		4.5	0.50	V	I_{OL} 24 mA
		5.5	0.50		24 mA
I_{IN}	Maximum Input Leakage Current	5.5	±1.0	µA	$V_I = V_{CC}$, GND
I_{OZT}	Maximum TRI-STATE Leakage Current	5.5	±5.0	µA	$V_I = V_{IL}$, V_{IH} $V_O = V_{CC}$, GND

DC Characteristics for 'ACTQ Family Devices (Continued)

Symbol	Parameter	V_{CC} (V)	54ACTQ T_A = −55°C to +125°C Guaranteed Limits	Units	Conditions
I_{CCT}	Maximum I_{CC}/Input	5.5	1.6	mA	$V_I = V_{CC} - 2.1V$
I_{OLD}	(Note 7) Minimum Dynamic Output Current	5.5	50	mA	V_{OLD} = 1.65V Max
I_{OHD}		5.5	−50	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	80.0	µA	$V_{IN} = V_{CC}$ or GND
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	5.0	1.65	V	(Note 8)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	5.0	−1.2	V	(Note 8)

Note 6: All outputs loaded; thresholds on input associated with output under test.

Note 7: Maximum test duration 2.0 ms, one output loaded at a time.

Note 8: Max number of outputs defined as (n). n−1 Data Inputs are driven 0V to 3V; one output @ GND.

AC Electrical Characteristics for 'ACQ Devices

Symbol	Parameter	V_{CC} (V) (Note 9)	54ACQ T_A = −55°C to +125°C C_L = 50 pF Min	54ACQ Max	Units	Fig. No.
t_{PHL}, t_{PLH}	Propagation Delay Data to Output	3.0	1.5	11.5	ns	
		4.5	1.5	10.0		
t_{PZL}, t_{PZH}	Output Enable Time	3.0	1.5	13.0	ns	
		4.5	1.5	10.0		
t_{PHZ}, t_{PLZ}	Output Disable Time	3.0	1.5	13.0	ns	
		4.5	1.5	10.0		

Note 9: Voltage Range 5.0 is 5.0V ±0.5V

Voltage Range 3.3 is 3.3V ±0.3V

AC Electrical Characteristics for 'ACTQ Devices

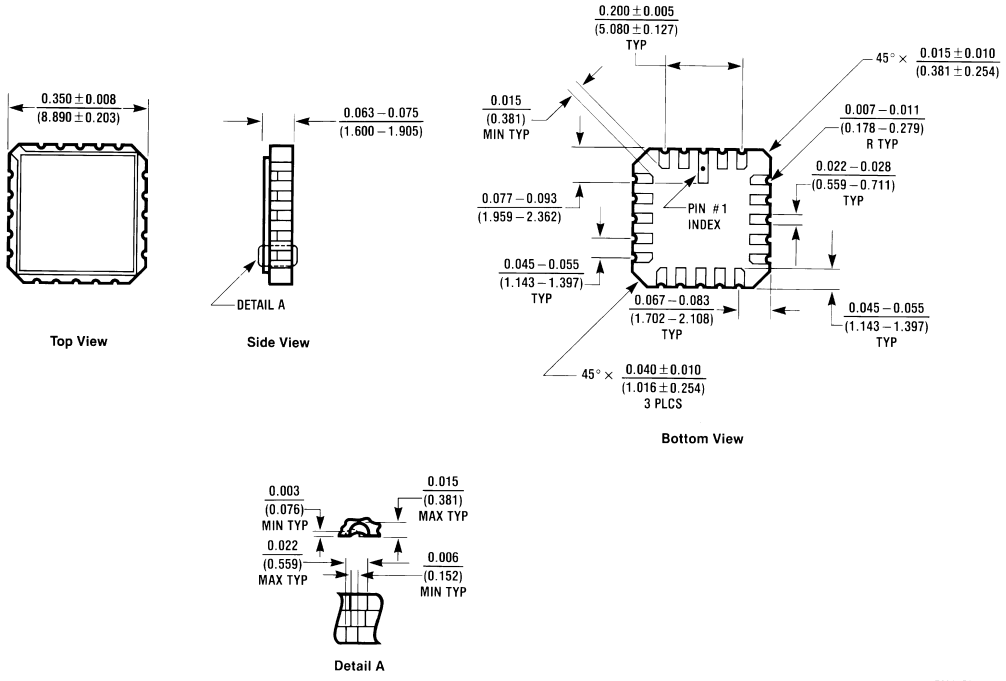
Symbol	Parameter	V_{CC} (V) (Note 10)	54ACTQ $T_A = -55^\circ C$ to $+125^\circ C$ $C_L = 50$ pF		Units	Fig. No.
			Min	Max		
t_{PHL}, t_{PLH}	Propagation Delay Data to Output	5.0	1.5	9.0	ns	
t_{PZL}, t_{PZH}	Output Enable Time	5.0	1.5	12.0	ns	
t_{PHZ}, t_{PLZ}	Output Disable Time	5.0	1.5	11.5	ns	

Note 10: Voltage Range 5.0 is 5.0V ±0.5V

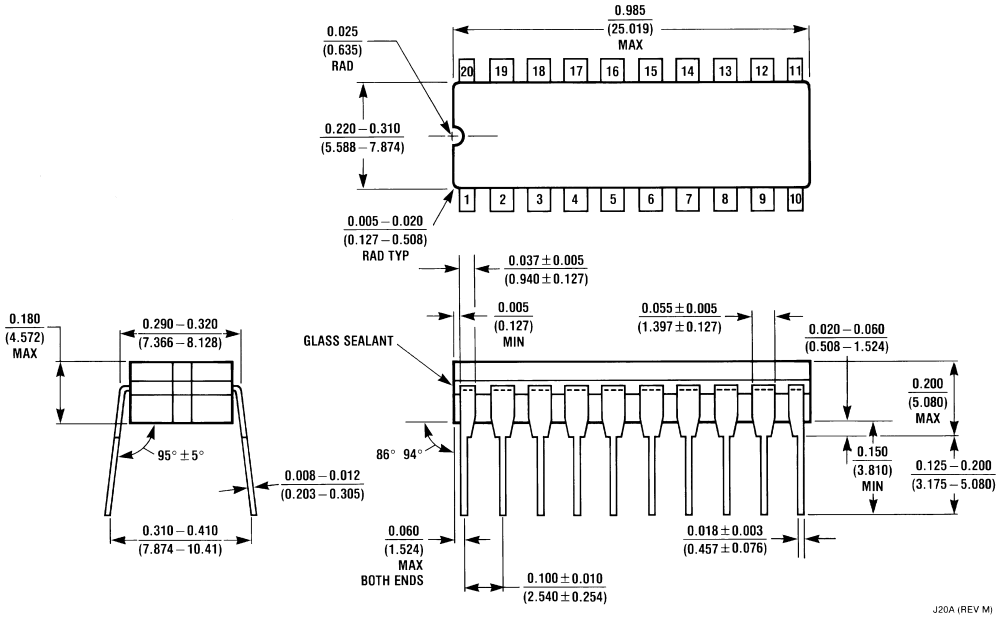
Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
$C_{I/O}$	Input/Output Capacitance	15	pF	V_{CC} = 5.0V
C_{PD}	Power Dissipation Capacitance	80.0	pF	V_{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted

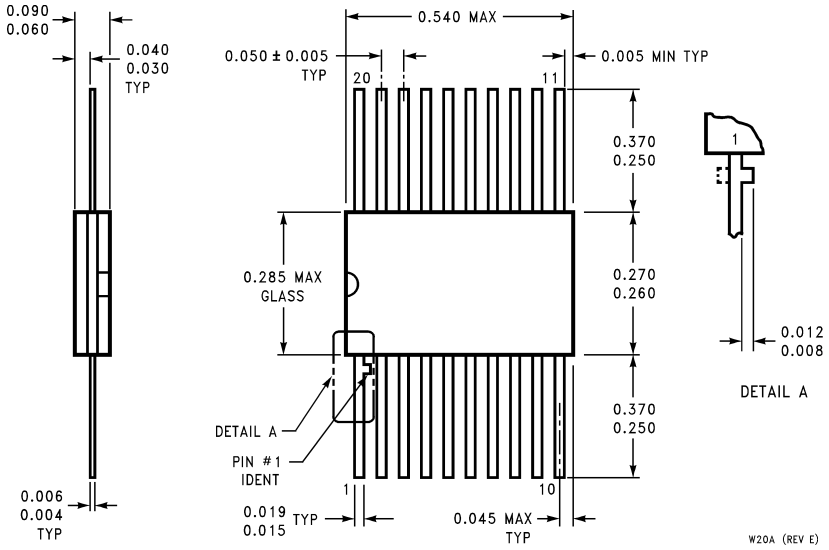


20-Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A



20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Ceramic Flatpak (F)
NS Package Number W20A

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