

54ACQ244 • 54ACTQ244

Quiet Series Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

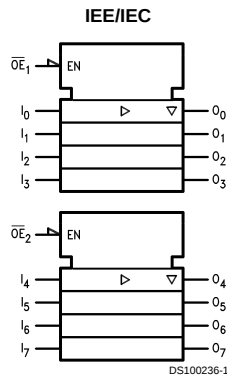
The 'ACQ/'ACTQ244 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density. The ACQ/'ACTQ utilizes NSC Quiet Series technology to guarantee quiet output switching and improved dynamic threshold performance. FACT Quiet Series™ features GTO™ output control and undershoot corrector in addition to a split ground bus for superior performance.

Features

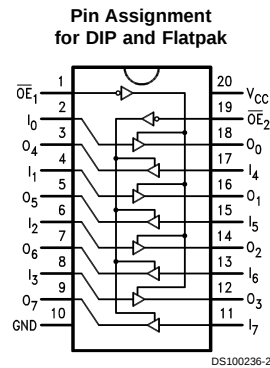
- I_{CC} and I_{OZ} reduced by 50%

- 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 'AC/'ACT244
- 4 kV minimum ESD immunity
- Standard Microcircuit Drawing (SMD)
 - 'ACTQ244: 5962-92186
 - 'ACQ244: 5962-92176

Logic Symbol

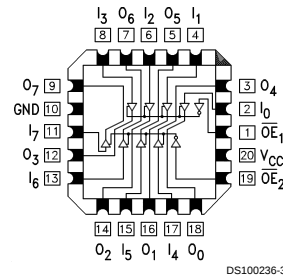


Connection Diagrams



Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE Output Enable Inputs
I_0-I_7	Inputs
O_0-O_7	Outputs

Pin Assignment for LCC



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 TRI-STATE® is a registered trademark of National Semiconductor Corporation.
 FACT® is a registered trademark of Fairchild Semiconductor Corporation.
 FACT Quiet Series™ is a trademark of Fairchild Semiconductor Corporation.

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Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)
$\overline{OE}_1$	I_n	
L	L	L
L	H	H
H	X	Z

Inputs		Outputs (Pins 3, 5, 7, 9)
$\overline{OE}_2$	I_n	
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = High Impedance

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 $\Delta V/\Delta t$	
'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 $\Delta V/\Delta t$	
'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.

Note 2: All commercial packaging is not recommended for applications requiring greater than 2000 temperature cycles from –40°C to +125°C.

DC Electrical Characteristics for 'ACQ Family Devices

Symbol	Parameter	V _{CC} (V)	54ACQ	Units	Conditions
			T _A = −55°C to +125°C Guaranteed Limits		
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 3) V _{IN} = V _{IL} or V _{IH} I _{OH} = −12 mA I _{OH} = −24 mA I _{OH} = −24 mA	3.0	2.4	V	
		4.5	3.7		
		5.5	4.7		
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 3) V _{IN} = V _{IL} or V _{IH} I _{OL} = 12 mA I _{OL} = 24 mA I _{OL} = 24 mA	3.0	0.50	V	
		4.5	0.50		
		5.5	0.50		
I _{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V _I = V _{CC} , GND (Note 5)

DC Electrical Characteristics for 'ACQ Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	54ACQ	Units	Conditions
			T _A = -55°C to +125°C Guaranteed Limits		
I _{OLD}	Minimum Dynamic (Note 4)	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current	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 5)
I _{OZ}	Maximum TRI-STATE Leakage Current	5.5	±5.0	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	(Notes 6, 7)
V _{OLV}	Quiet Output Minimum Dynamic V _{OL}	5.0	-1.2	V	(Notes 6, 7)

Note 3: All outputs loaded thresholds on input associated with output under test.

Note 4: Maximum test duration 2.0 ms, one output loaded at a time.

Note 5: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

I_{CC} for 54ACQ @ 25°C is identical to 74ACQ @ 25°C.

Note 6: Plastic DIP package.

Note 7: Max number of outputs defined as (n). Data Inputs are driven 0V to 5V. One output @ GND.

Note 8: Max number of Data Inputs (n) switching. (n - 1) Inputs switching 0V to 5V ('ACQ). Input-under-test switching: 5V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f = 1 MHz.

DC Electrical Characteristics for 'ACTQ Family Devices

Symbol	Parameter	V _{CC} (V)	54ACTQ	Units	Conditions
			-55°C to +125°C Guaranteed Limits		
V _{IH}	Minimum High Level Input Voltage	4.5	2.0	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		5.5	2.0		
V _{IL}	Maximum Low Level Input Voltage	4.5	0.8	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		5.5	0.8		
V _{OH}	Minimum High Level Output Voltage	4.5	4.4	V	I _{OUT} = -50 μA
		5.5	5.4		
		4.5	3.70	V	(Note 9) V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA I _{OH} = -24 mA
		5.5	4.70		
V _{OL}	Maximum Low Level Output Voltage	4.5	0.1	V	I _{OUT} = 50 μA
		5.5	0.1		
		4.5	0.50	V	(Note 9) V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA
		5.5	0.50		
I _{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V _I = V _{CC} , GND
I _{OZ}	Maximum TRI-STATE Leakage Current	5.5	±5.0	μA	V _I = V _{IL} , V _{IH} V _O = V _{CC} , GND
I _{CCT}	Maximum I _{CC} /Input	5.5	1.6	mA	V _I = V _{CC} - 2.1V

DC Electrical Characteristics for 'ACTQ Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	54ACTQ	Units	Conditions
			–55°C to +125°C		
			Guaranteed Limits		
I _{OLD}	Minimum Dynamic (Note 10)	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current	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 11)
V _{OLP}	Quiet Output Maximum Dynamic V _{OL}	5.0	1.5	V	(Notes 12, 13)
V _{OLV}	Quiet Output Minimum Dynamic V _{OL}	5.0	–1.2	V	(Notes 12, 13)

Note 9: All outputs loaded thresholds on input associated with output under test.

Note 10: Maximum test duration 2.0 ms, one output loaded at a time.

Note 11: I_{CC} for 54ACTQ @ 25°C is identical to 74ACTQ @ 25°C.

Note 12: Plastic DIP package.

Note 13: Max number of outputs defined as (n). Data Inputs are driven 0V to 3V. One output @ GND.

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V) (Note 14)	54ACQ		Units	Fig. No.
			T _A = –55°C to +125°C C _L = 50 pF			
			Min	Max		
t _{PHL} , t _{PLH}	Propagation Delay Data to Output	3.3 5.0	1.0 1.0	12.5 9.0	ns	
t _{PZL} , t _{PZH}	Output Enable Time	3.3 5.0	1.0 1.0	12.0 10.0	ns	
t _{PHZ} , t _{PLZ}	Output Disable Time	3.3 5.0	1.0 1.0	11.5 10.0	ns	

Note 14: Voltage Range 5.0 is 5.0V ±0.5V.

Voltage Range 3.3 is 3.3V ±0.3V.

Note 15: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}). Parameter guaranteed by design.

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V) (Note 16)	54ACTQ		Units	Fig. No.
			T _A = –55°C to +125°C C _L = 50 pF			
			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	10.5	ns	
t _{PHZ} , t _{PLZ}	Output Disable Time	5.0	1.5	10.5	ns	

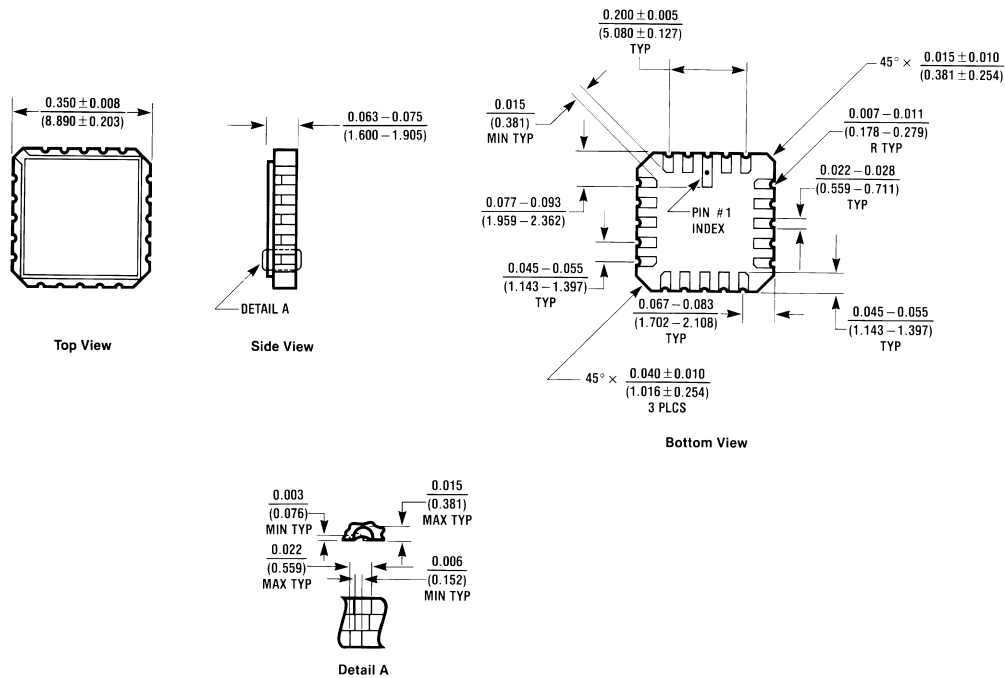
Note 16: Voltage Range 5.0 is 5.0V ±0.5V.

Note 17: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}). Parameter guaranteed by design.

Capacitance

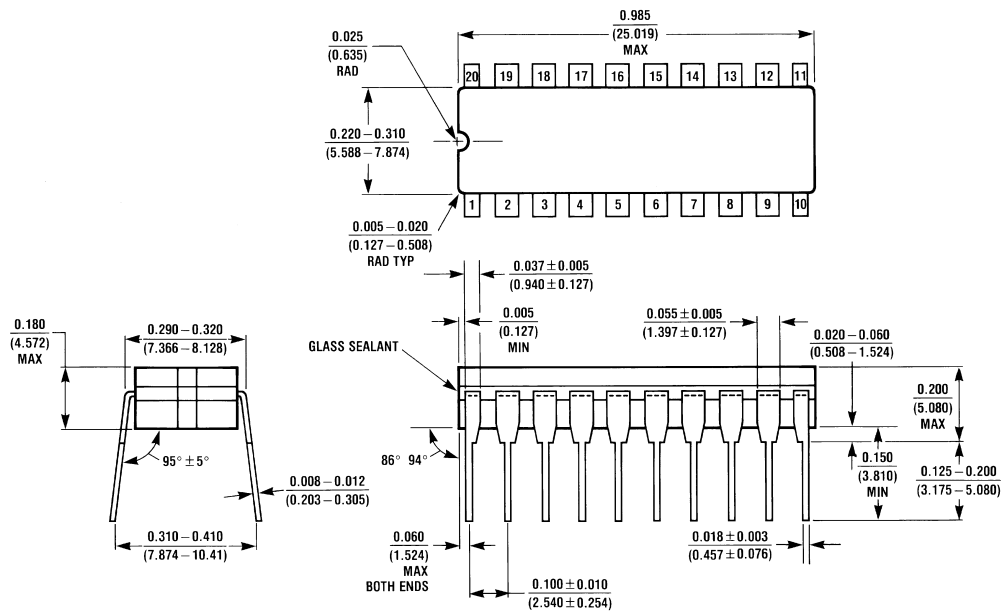
Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	$V_{CC} = \text{OPEN}$
C_{PD}	Power Dissipation Capacitance	70	pF	$V_{CC} = 5.0V$

Physical Dimensions inches (millimeters) unless otherwise noted



E20A (REV D)

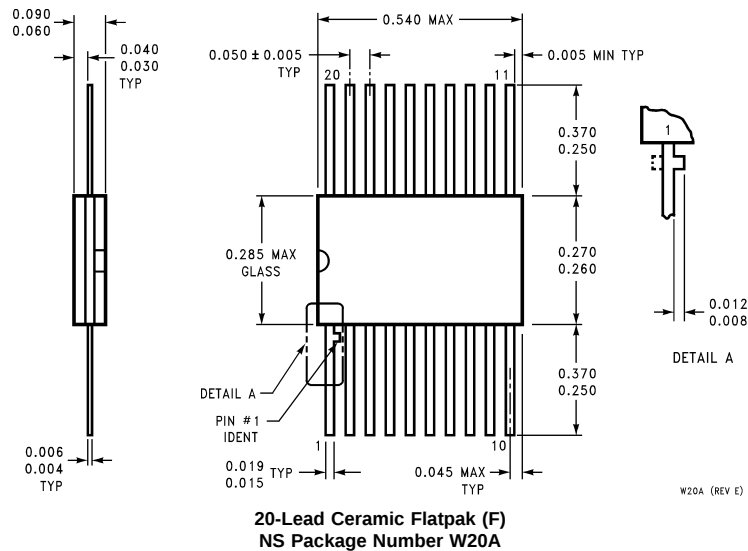
20-Terminal Ceramic Leadless Chip Carrier (L) NS Package Number E20A



J20A (REV M)

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

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



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54ACTQ244 Product Folder

Quiet Series Octal Buffer/Line Driver w/TRI-STATE Outputs

General Description	Features	Datasheet	Package & Models	Samples & Pricing
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Datasheet

Title	Size in Kbytes	Date	 View Online	 Download	 Receive via Email
54ACQ244 54ACTQ244 Quiet Series Octal Buffer Line Driver with TRI-STATE Outputs	140 Kbytes	14-Aug-98	View Online	Download	Receive via Email
54ACTQ244 Mil-Aero Datasheet MN54ACTQ244-X	16 Kbytes		View Online	Download	Receive via Email
54ACTQ244 Mil-Aero Datasheet MV54ACTQ244-X	22 Kbytes		View Online	Download	Receive via Email

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Package Availability, Models, Samples & Pricing

Part Number	Package			Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	Pins	MSL		SPICE	IBIS		Qty	\$US each		
54ACTQ244LMQB-R	LCC	20	MSL	Full production	N/A	N/A				rail of N/A	[logo]¢Z¢S¢4¢A 54ACTQ244 LMQB-R R9218601 M2A /Q¢M\$E
5962-9218601M2A (54ACTQ244LMQB)	LCC	20	MSL	Full production	N/A	N/A	Buy Now	50 +	\$12.5000	rail of 50	[logo]¢Z¢S¢4¢A 54ACTQ244 LMQB /Q¢M\$E 5962- 9218601M2A
54ACTQ244DMQB-R	CERDIP	20	MSL	Full production	N/A	N/A				rail of N/A	[logo]¢Z¢S¢4¢A\$E 54ACTQ244DMQB-R /Q¢M 5962R9218601MRA
5962-9218601MRA (54ACTQ244DMQB)	CERDIP	20	MSL	Full production	N/A	N/A	Buy Now	50 +	\$9.8000	rail of 20	[logo]¢Z¢S¢4¢A\$E 54ACTQ244DMQB /Q¢M 5962-9218601MRA
54ACTQ244FMQB-R	CERPACK	20	MSL	Full production	N/A	N/A				rail of N/A	[logo]¢Z¢S¢4¢A\$E 54ACTQ244FMQB -R /Q¢M 5962R 9218601MSA

5962-9218601MSA (54ACTQ244FMQB)	CERPACK	20	MSL	Full production	N/A	N/A		50+	\$10.4000	rail of 19	[logo]¢Z¢S¢4¢A\$E 54ACTQ244FMQB ¢M 5962- 9218601MSA
5962R9218601V2A (54ACTQ244ERQMLV)	LCC	20	MSL	Full production	N/A	N/A		50+	\$138.0000	rail of 50	[logo]¢Z¢S¢4¢A 54ACTQ244 ERQMLV \$E 5962R 9218601V2A
5962R9218601VRA (54ACTQ244JRQMLV)	CERDIP	20	MSL	Full production	N/A	N/A		50+	\$138.0000	rail of 20	[logo]¢Z¢S¢4¢A\$E 54ACTQ244JRQMLV 5962R9218601VRA
RM54ACTQ244VSA	CERPACK	20	MSL	Preliminary	N/A	N/A				rail of N/A	[logo]¢Z¢S¢4¢A\$E RM54ACTQ244VSA ¢R WAFER #
RM54ACTQ245VSA	CERPACK	20	MSL	Preliminary	N/A	N/A				rail of N/A	RM54ACTQ245VSA ¢R WAFER #
5962R9218601VSA (54ACTQ244WRQMLV)	CERPACK	20	MSL	Full production	N/A	N/A		50+	\$138.0000	rail of 19	[logo]¢Z¢S¢4¢A\$E 54ACTQ244W RQMLV 5962R 9218601VSA

General Description

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 - 'ACQ244: 5962-92176

[Information as of 5-Aug-2002]