August 1998

National Semiconductor

54ACQ244 • 54ACTQ244
Quiet Series Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

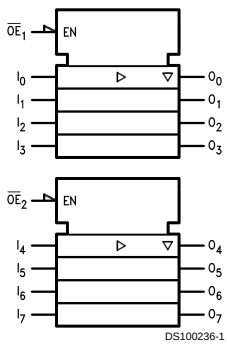
The 'ACQ/'ACTQ244 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density. The ACQ/ACTQ utilizes NSC Quiet Series technology to guarantee quiet output switching and improved dynamic 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

IEE/IEC

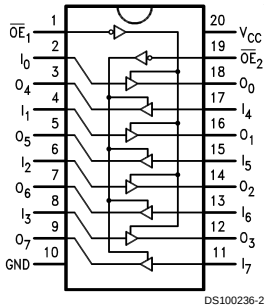


DS100236-1

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

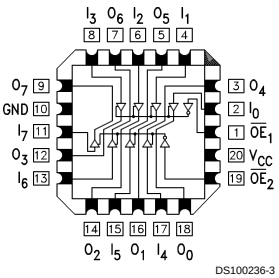
Connection Diagrams

Pin Assignment for DIP and Flatpak



DS100236-2

Pin Assignment for LCC



DS100236-3

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

Inputs		Outputs
$\overline{OE}_2$	I_n	(Pins 3, 5, 7, 9)
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 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.

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 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 3) V_{IN} = V_{IL} or V_{IH}
		3.0	2.4	V	I_{OH} = −12 mA
		4.5	3.7		I_{OH} = −24 mA
		5.5	4.7		I_{OH} = −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 3) V_{IN} = V_{IL} or V_{IH}
		3.0	0.50	V	I_{OL} = 12 mA
		4.5	0.50		I_{OL} = 24 mA
		5.5	0.50		I_{OL} = 24 mA
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 T_A = −55°C to +125°C Guaranteed Limits	Units	Conditions
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 −55°C to +125°C Guaranteed Limits	Units	Conditions
V_{IH}	Minimum High Level Input Voltage	4.5 5.5	2.0 2.0	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
V_{IL}	Maximum Low Level Input Voltage	4.5 5.5	0.8 0.8	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.4 5.4	V	I_{OUT} = −50 µA
					(Note 9) V_{IN} = V_{IL} or V_{IH}
		4.5 5.5	3.70 4.70	V	I_{OH} = −24 mA I_{OH} = −24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.1 0.1	V	I_{OUT} = 50 µA
					(Note 9) V_{IN} = V_{IL} or V_{IH}
		4.5 5.5	0.50 0.50	V	I_{OL} = 24 mA I_{OL} = 24 mA
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 $-55^{\circ}C$ to $+125^{\circ}C$ Guaranteed Limits	Units	Conditions
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 $T_A = -55^{\circ}C$ to $+125^{\circ}C$ C_L = 50 pF		Units	Fig. No.
			Min	Max		
t_{PHL}, t_{PLH}	Propagation Delay	3.3	1.0	12.5	ns	
	Data to Output	5.0	1.0	9.0		
t_{PZL}, t_{PZH}	Output Enable Time	3.3	1.0	12.0	ns	
		5.0	1.0	10.0		
t_{PHZ}, t_{PLZ}	Output Disable Time	3.3	1.0	11.5	ns	
		5.0	1.0	10.0		

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 $T_A = -55^{\circ}C$ 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	10.5	ns	
t_{PHZ}, t_{PLZ}	Output Disable Time	5.0	1.5	10.5	ns	

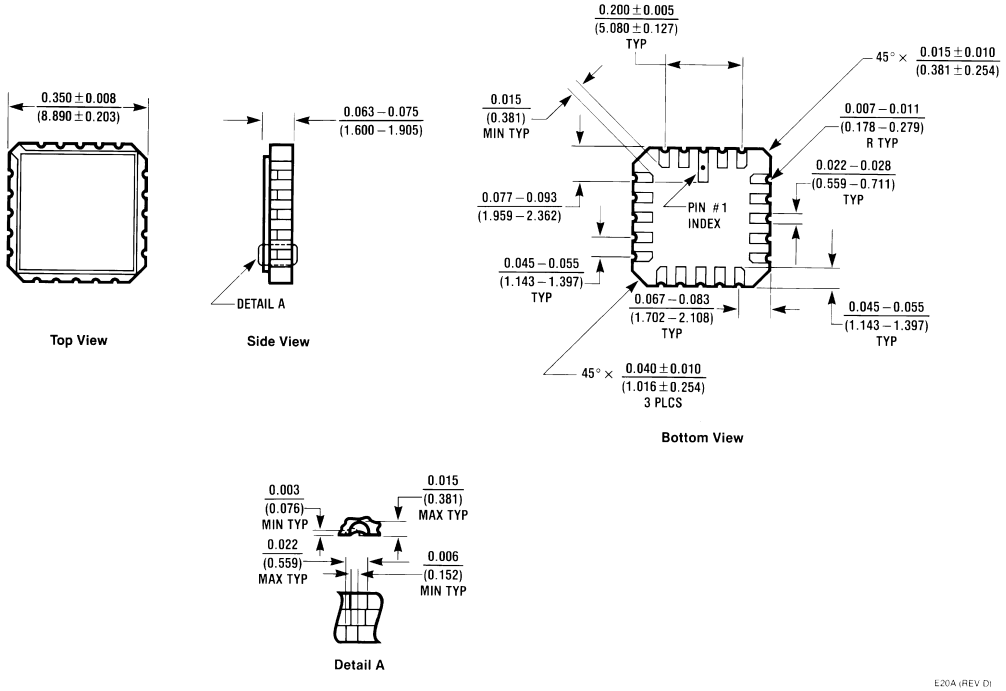
Note 16: Voltage Range 5.0 is 5.0V ±0.5V.

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.

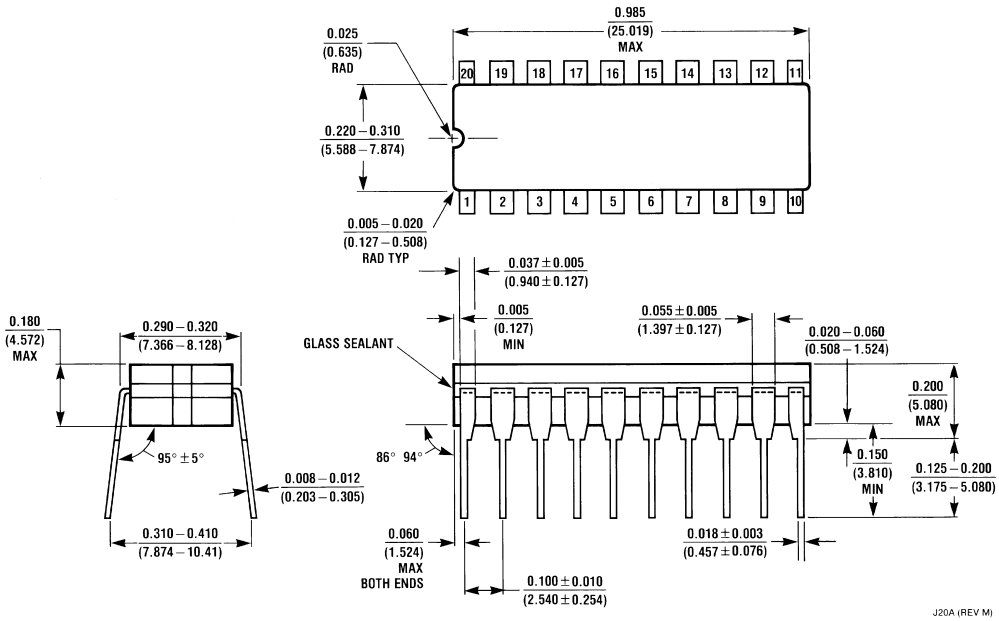
Capacitance

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

Physical Dimensions inches (millimeters) unless otherwise noted

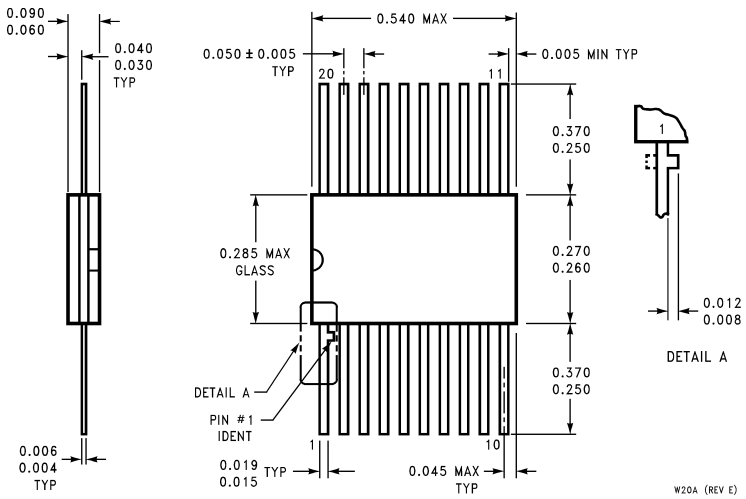


20-Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A



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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54ACTQ244 Product Folder

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

General Description | Features | Datasheet | Package & Models | Samples & Pricing

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

If you have trouble printing or viewing PDF file(s), see Printing Problems.

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 Q¢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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  - 'ACTQ244: 5962-92186
  - 'ACQ244: 5962-92176

[Information as of 5-Aug-2002]