National Semiconductor

54ACTQ/74ACTQ827 Quiet Series 10-Bit Buffer/Line Driver with TRI-STATE® Outputs

General Description

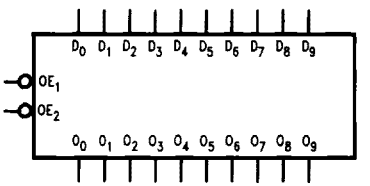
The 'ACTQ827 10-bit bus buffer provides high performance bus interface buffering for wide data/address paths or buses carrying parity. The 10-bit buffers have NOR output enables for maximum control flexibility. The 'ACTQ827 utilizes NSC Quiet Series technology to guarantee quiet output switching and improved dynamic threshold performance. FACT Quiet Series™ feature GTO™ output control and undershoot corrector in addition to a split ground bus for superior performance.

Features

- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Guaranteed pin-to-pin skew AC performance
- Inputs and outputs on opposite sides of package allow easy interface with microprocessors
- Improved latch-up immunity
- Outputs source/sink 24 mA
- Functionally and pin-compatible to AMD's AM29827
- 'ACTQ827 has TTL-compatible inputs
- 4 kV minimum ESD immunity
- Standard Military Drawing (SMD)
  — 'ACTQ827: 5962-92199

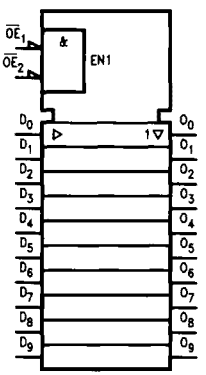
Ordering Code: See Section 8

Logic Symbols



TL/F/10687–1

IEEE/IEC

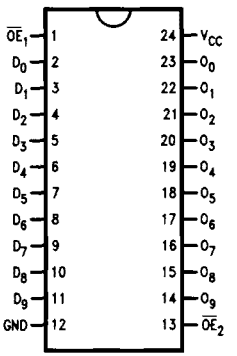


TL/F/10687–2

Pin Names	Description
$\overline{OE}_1$, $\overline{OE}_2$	Output Enable
D_0–D_9	Data Inputs
O_0–O_9	Data Outputs

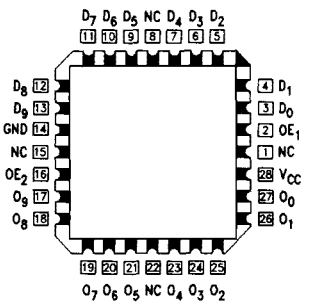
Connection Diagrams

Pin Assignment for DIP, Flatpak and SOIC



TL/F/10687–3

Pin Assignment for LCC



TL/F/10687–4

Functional Description

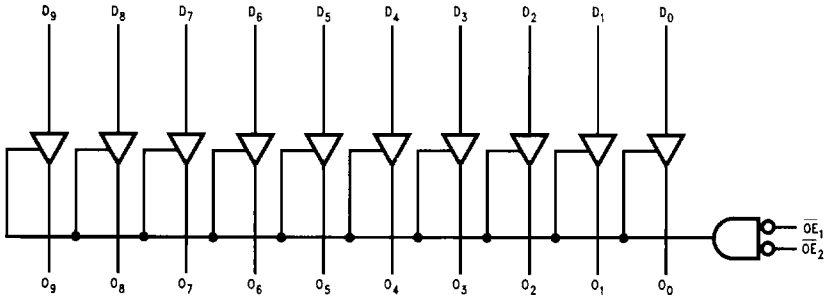
The 'ACTQ827 line driver is designed to be employed as memory address driver, clock driver and bus-oriented transmitter/receiver. The devices have TRI-STATE outputs controlled by the Output Enable ($\overline{OE}$) pins. When the $\overline{OE}$ is LOW, the device is transparent. When $\overline{OE}$ is HIGH, the device is in TRI-STATE mode.

Function Table

Inputs		Outputs	Function
$\overline{OE}$	D_n	O_n	
L	H	H	Transparent
L	L	L	Transparent
H	X	Z	High Z

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

Logic Diagram



TL/F/10687–5

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Rating (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
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™ circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'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)	
74ACTQ	−40°C to +85°C
54ACTQ	−55°C to +125°C
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: All commercial packaging is not recommended for applications requiring greater than 2000 temperature cycles from −40°C to +125°C.

DC Electrical Characteristics for 'ACTQ Family Devices

Symbol	Parameter	V_{CC} (V)	74ACTQ T_A = +25°C	54ACTQ T_A = −55°C to +125°C	74ACTQ T_A = −40°C to +85°C	Units	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		5.5	1.5	2.0	2.0		
V_{IL}	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		5.5	1.5	0.8	0.8		
V_{OH}	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I_{OUT} = −50 μA
		5.5	5.49	5.4	5.4		
		4.5		3.86	3.70	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} −24 mA
		5.5		4.86	4.70		
V_{OL}	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I_{OUT} = 50 μA
		5.5	0.001	0.1	0.1		
		4.5		0.36	0.50	V	*V_{IN} = V_{IL} or V_{IH} I_{OL} 24 mA
		5.5		0.36	0.50		
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V_I = V_{CC}, GND
I_{OZ}	Maximum TRI-STATE® Current	5.5		±0.5	±10.0	μA	V_I = V_{IL}, V_{IH} V_O = V_{CC}, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	0.6		1.6	mA	V_I = V_{CC} − 2.1V

*All outputs loaded; thresholds on input associated with output under test.

DC Electrical Characteristics for 'ACTQ Family Devices (Continued)

Symbol	Parameter	V_{CC} (V)	74ACTQ $T_A = +25°C$		54ACTQ $T_A = -55°C$ to $+125°C$	74ACTQ $T_A = -40°C$ to $+85°C$	Units	Conditions
			Typ	Guaranteed Limits				
I_{OLD}	†Minimum Dynamic Output Current	5.5			50	75	mA	V_{OLD} = 1.65V Max
I_{OHD}		5.5			−50	−75	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5		8.0	160.0	80.0	μA	$V_{IN} = V_{CC}$ or GND (Note 1)
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	5.0	1.1	1.6V			V	*Figures 2-12, 13* (Notes 2, 3)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	5.0	−0.6	−1.3			V	*Figures 2-12, 13* (Notes 2, 3)
V_{IHD}	Minimum High Level Dynamic Input Voltage	5.0	1.9	2.0			V	(Notes 2, 4)
V_{ILD}	Maximum Low Level Dynamic Input Voltage	5.0	1.2	0.8			V	(Notes 2, 4)

†Maximum test duration 2.0 ms, one output loaded at a time.

Note 1: I_{CC} for 54ACTQ @ 25°C is identical to 74ACTQ @ 25°C.

Note 2: Plastic DIP package.

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

Note 4: Max number of data inputs (n − 1) inputs switching 0V to 3V ('ACTQ). Input-under-test switching: 3V to threshold (V_{ILD}), 0V to threshold. (V_{IHD}), f = 1 MHz.

AC Electrical Characteristics: See Section 2 for Waveforms

Symbol	Parameter	V_{CC}* (V)	74ACTQ $T_A = +25°C$, $C_L = 50$ pF			54ACTQ $T_A = -55°C$ to $+125°C$, $C_L = 50$ pF		74ACTQ $T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units	Fig. No.
			Min	Typ	Max	Min	Max	Min	Max		
t_{PHL}, t_{PLH}	Propagation Delay Data to Output	5.0	2.5	5.6	8.0	2.0	9.5	2.5	9.0	ns	2-3, 4
t_{PZL}, t_{PZH}	Output Enable Time	5.0	3.0	7.1	10.0	2.0	12.5	3.0	11.0	ns	2-5, 6
t_{PHZ}, t_{PLZ}	Output Disable Time	5.0	1.0	5.8	8.0	1.0	9.0	1.0	8.5	ns	2-5, 6
t_{OSHL}, t_{OSLH}	Output to Output Skew** Data to Output	5.0		0.5	1.5				1.5	ns	

*Voltage Range 5.0 is 5.0V ±0.5V.

**Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs within the same packaged 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. Not tested.

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	82	pF	V_{CC} = 5.0V