

# DATA SHEET

~~74F655A\*~~

~~Octal buffer/driver with parity, inverting  
(3-State)~~

**74F656A**

Octal buffer/driver with parity,  
non-inverting (3-State)

\* Discontinued part. Please see the Discontinued Product List.

Product specification

1991 Jul 17

IC15 Data Handbook

## Buffers/drivers

74F655A\*  
74F656A

74F655A Octal buffer/driver with parity, inverting (3-State)

74F656A Octal buffer/driver with parity, non-inverting (3-State)

### FEATURES

- Significantly improved AC performance over 74F655 and 74F656
- High impedance NPN base input for reduced loading (40µA in High and Low states)
- Ideal in applications where high output drive and light bus loading are required ( $I_{IL}$  is 40µA vs. FAST std of 600µA)
- 74F655A combines 74F240 and 74F280A functions in one package
- 74F656A combines 74F244 and 74F280A functions in one package
- 74F655A Inverting
- 74F656A Non-inverting
- 3-State outputs sink 64mA and source 15mA
- 24-pin plastic Slim DIP (300mil) package
- Inputs on one side and outputs on the other side simplifies PC board layout
- Combined functions reduce part count and enhance system performance
- Industrial temperature range available (−40°C to +85°C)

### DESCRIPTION

The 74F655A and 74F656A are octal buffers and line drivers with parity generation/checking designed to be employed as memory address drivers, clock drivers and bus-oriented transmitters/receivers. These parts include parity generator/checker to improve PC board density.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F655A	6.5ns	64mA
74F656A	6.5ns	64mA

### ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	INDUSTRIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$	PKG DWG #
24-pin Plastic Slim DIP (300mil)	N74F656AN	I74F656AN	SOT222-1
24-pin Plastic SOL	N74F656AD	I74F656AD	SOT137-1

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

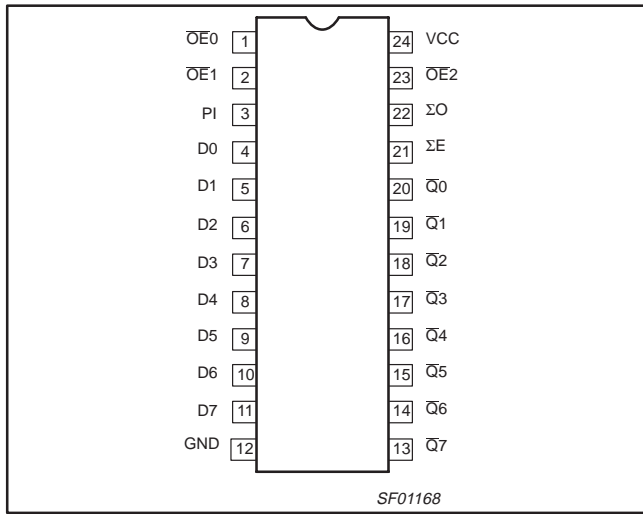
PINS	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
D0–D7	Data inputs	2.0/0.066	40µA/40µA
PI	Parity input	1.0/0.033	20µA/20µA
$\overline{OE}0, \overline{OE}1, \overline{OE}2$	Output Enable Inputs (active Low)	1.0/0.033	20µA/20µA
$\Sigma E, \Sigma O$	Parity outputs	750/106.7	15mA/64mA
$\overline{Q}0-\overline{Q}7$	Data outputs (74F655A)	750/106.7	15mA/64mA
Q0–Q7	Data outputs (74F656A)	750/106.7	15mA/64mA

**NOTE:** One (1.0) FAST Unit Load (U.L.) is defined as: 20µA in the High state and 0.6mA in the Low state.

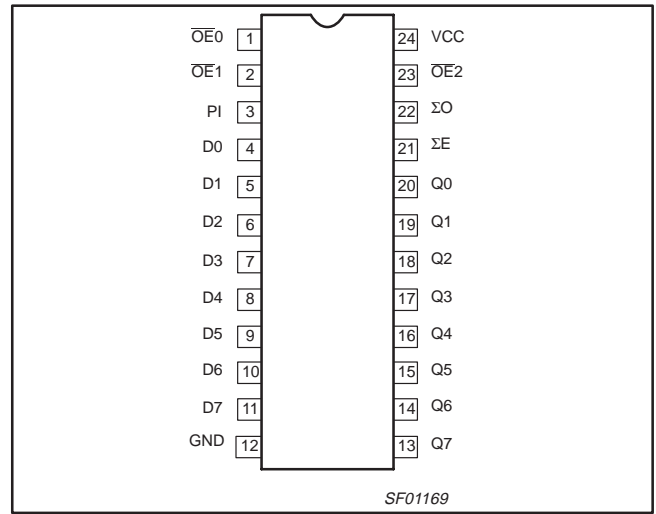
# Buffers/drivers

## 74F655A\* 74F656A

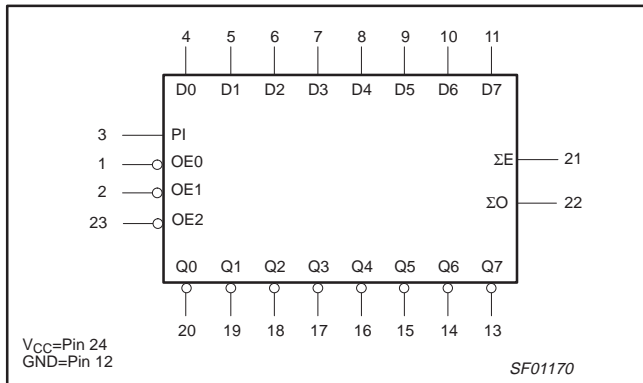
### PIN CONFIGURATION – 74F655A



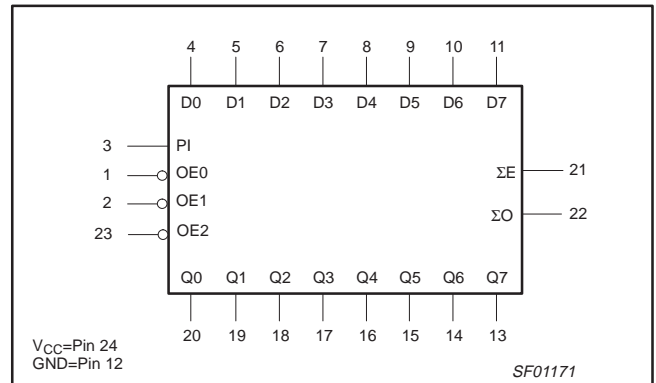
### PIN CONFIGURATION – 74F656A



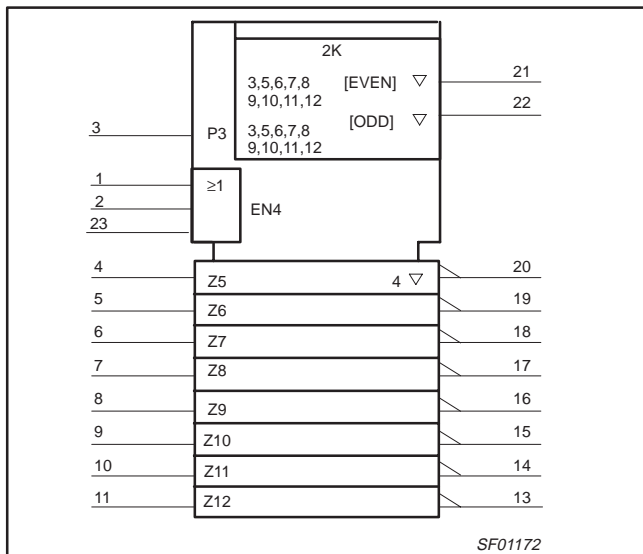
### LOGIC SYMBOL – 74F655A



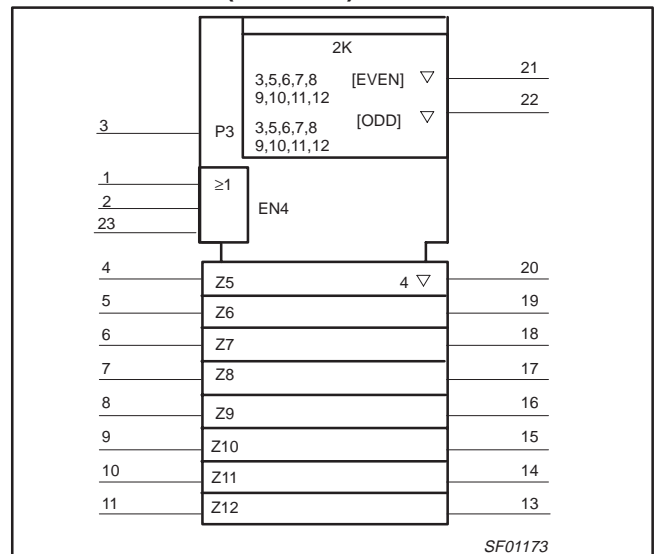
### LOGIC SYMBOL – 74F656A



### IEEE/IEC SYMBOL – 74F655A



### LOGIC SYMBOL (IEEE/IEC) – 74F656A

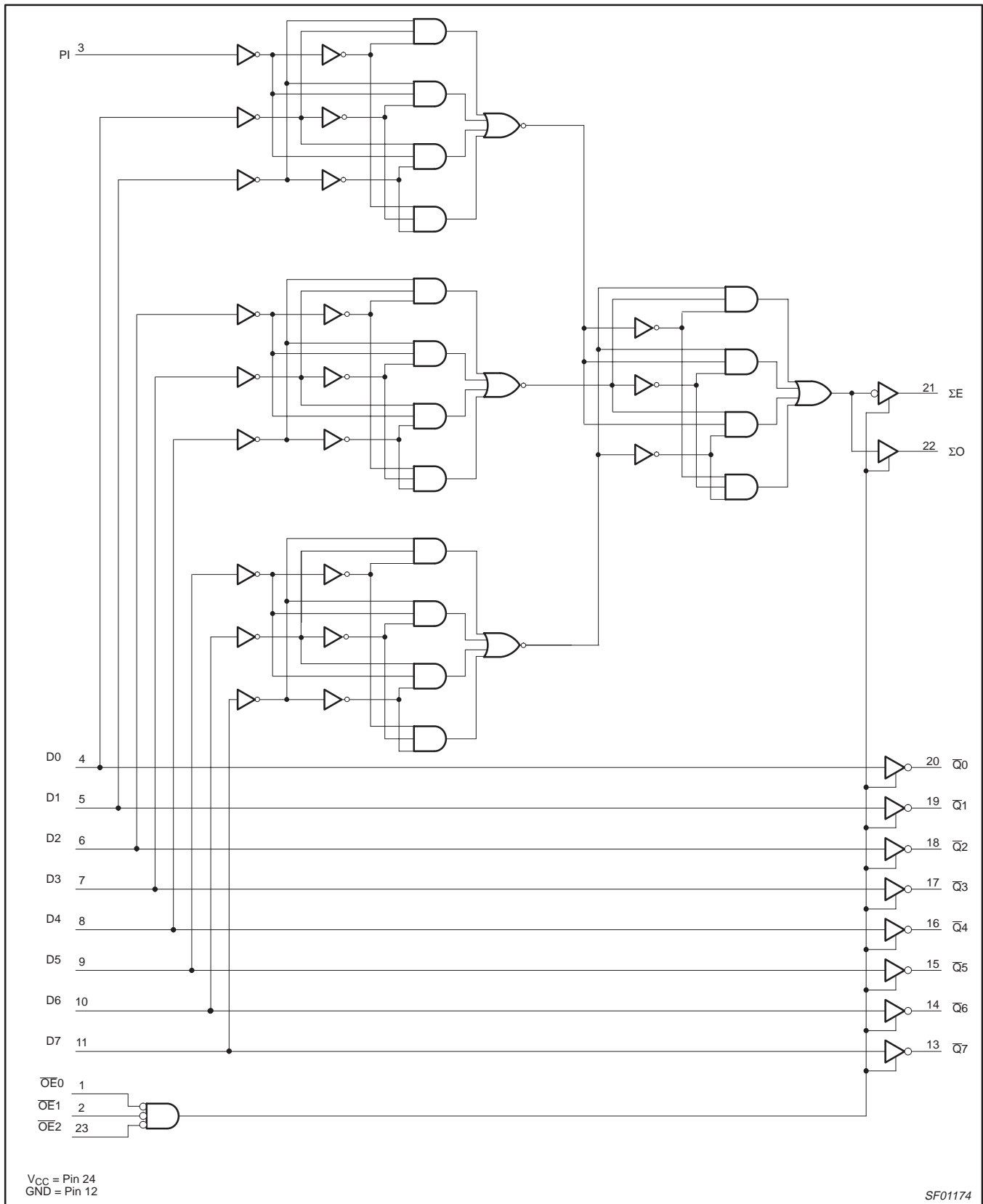


\* Discontinued part. Please see the Discontinued Products List.

Buffers/drivers

74F655A\*  
74F656A

LOGIC DIAGRAM – 74F655A



V<sub>CC</sub> = Pin 24  
GND = Pin 12

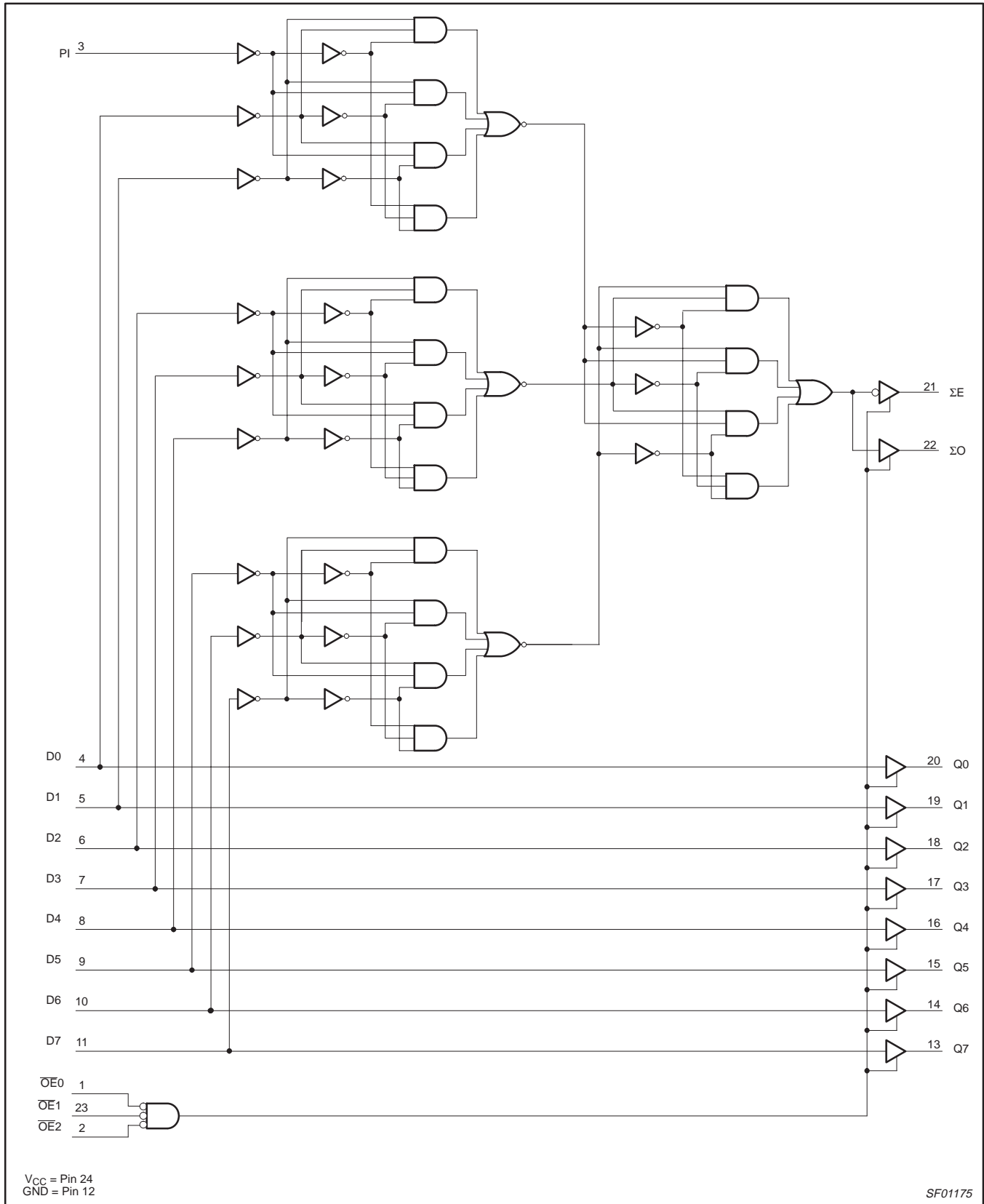
SF01174

\* Discontinued part. Please see the Discontinued Products List.

# Buffers/drivers

74F655A\*  
74F656A

## LOGIC DIAGRAM – 74F656A



\* Discontinued part. Please see the Discontinued Products List.

# Buffers/drivers

**74F655A\***  
**74F656A**

## FUNCTION TABLE

INPUTS				OUTPUTS	
$\overline{OE}0$	$\overline{OE}1$	$\overline{OE}2$	Dn	74F655A $\overline{Qn}$	74F656A Qn
L	L	L	L	H	L
L	L	L	H	L	H
H	X	X	X	Z	Z
X	H	X	X	Z	Z
X	X	H	X	Z	Z

H = High voltage level  
L = Low voltage level  
X = Don't care  
Z = High impedance "off" state

## FUNCTION TABLE for PARITY OUTPUTS

INPUTS	PARITY OUTPUTS	
Number of inputs, High (PI, D0–D7)	$\Sigma E$	$\Sigma O$
Even - 0, 2, 4, 6, 8	H	L
Odd - 1, 3, 5, 7, 9	L	H
Any $\overline{OE}n = \text{High}$	Z	Z

H = High voltage level  
L = Low voltage level  
Z = High impedance "off" state

## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
$V_{CC}$	Supply voltage	-0.5 to +7.0	V
$V_{IN}$	Input voltage	-0.5 to +7.0	V
$I_{IN}$	Input current	-30 to +5	mA
$V_{OUT}$	Voltage applied to output in High output state	-0.5 to + $V_{CC}$	V
$I_{OUT}$	Current applied to output in Low output state	128	mA
$T_{amb}$	Operating free-air temperature range	Commercial range	0 to +70 °C
		Industrial range	-40 to +85 °C
$T_{stg}$	Storage temperature range	-65 to +150	°C

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5.0	5.5	V
$V_{IH}$	High-level input voltage	2.0			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			-18	mA
$I_{OH}$	High-level output current			-15	mA
$I_{OL}$	Low-level output current			64	mA
$T_{amb}$	Operating free-air temperature range	Commercial range	0	70	°C
		Industrial range	-40	85	°C

\* Discontinued part. Please see the Discontinued Products List.

## Buffers/drivers

74F655A\*  
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## DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER		TEST CONDITIONS <sup>NO TAG</sup>			LIMITS			UNIT
						MIN	TYP NO TAG	MAX	
V <sub>OH</sub>	High-level output voltage		V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX V <sub>IH</sub> = MIN	I <sub>OH</sub> = -3mA	±10%V <sub>CC</sub>	2.4			V
					±5%V <sub>CC</sub>	2.7	3.3		V
					I <sub>OH</sub> = -15mA	±10%V <sub>CC</sub>	2.0		
V <sub>OL</sub>	Low-level output voltage		V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX V <sub>IH</sub> = MIN	I <sub>OL</sub> = 64mA	±10%V <sub>CC</sub>			0.55	V
					±5%V <sub>CC</sub>		0.42	0.55	V
V <sub>IK</sub>	Input clamp voltage		V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>				-0.73	-1.2	V
I <sub>I</sub>	Input current at maximum input voltage		V <sub>CC</sub> = 0.0, V <sub>I</sub> = 7.0V					100	μA
I <sub>IH</sub>	High-level input current	Commercial range	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V	Dn				40	μA
				PI, $\overline{O}E_n$				20	μA
		Industrial range		Dn				80	μA
				PI, $\overline{O}E_n$				40	μA
I <sub>IL</sub>	Low-level input current		V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V	Dn				-40	μA
				PI, $\overline{O}E_n$				-20	μA
I <sub>OZH</sub>	Off-state current High-level voltage applied		V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.7V					50	μA
I <sub>OZL</sub>	Off-state current Low-level voltage applied		V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5V					-50	μA
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>		V <sub>CC</sub> = MAX			-100		-225	mA
I <sub>CC</sub>	Supply current (total)	I <sub>CCH</sub>	V <sub>CC</sub> = MAX				50	80	mA
		I <sub>CCL</sub>					78	110	mA
		I <sub>CCZ</sub>					83	90	mA

## NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
- Not more than one output should be shorted at a time. For testing I<sub>OS</sub>, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.

## AC ELECTRICAL CHARACTERISTICS

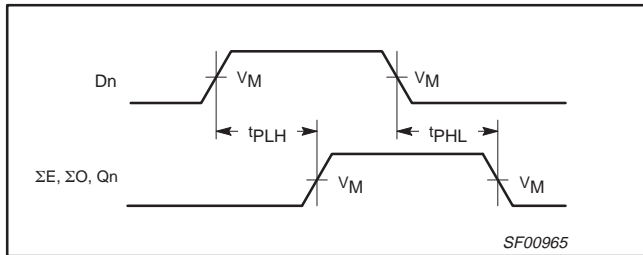
SYMBOL	PARAMETER		TEST CONDITIONS	LIMITS								UNIT
				T <sub>amb</sub> = +25°C, V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			T <sub>amb</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V ± 10% C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		T <sub>amb</sub> = -40°C to +85°C V <sub>CC</sub> = +5.0V ± 10% C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			
				MIN	TYP	MAX	MIN	MAX	MIN	MAX		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Dn to Qn	74F655A	Waveform 2	2.0 1.0	4.5 2.5	6.5 4.0	2.0 1.0	7.5 4.5	2.0 1.0	8.5 5.5	ns ns	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Dn to Qn	74F656A	Waveform 1	2.0 2.5	4.0 5.5	6.5 7.0	2.0 2.5	7.0 7.5	2.0 2.5	8.0 9.0	ns ns	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Dn to ΣE, ΣO		Waveform 1, 2	5.5 5.5	10.0 11.0	13.0 14.5	5.5 5.5	14.0 16.5	4.5 5.5	16.5 18.0	ns ns	
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time to High or Low level		Waveform 3 Waveform 4	3.5 4.0	7.0 8.0	10.5 11.0	3.5 4.5	11.5 12.0	3.0 4.0	13.0 13.5	ns ns	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time from High or Low level		Waveform 3 Waveform 4	1.5 2.0	4.5 5.0	8.0 8.0	1.5 2.0	9.0 9.0	1.5 1.5	10.0 10.0	ns ns	

\* Discontinued part. Please see the Discontinued Products List.

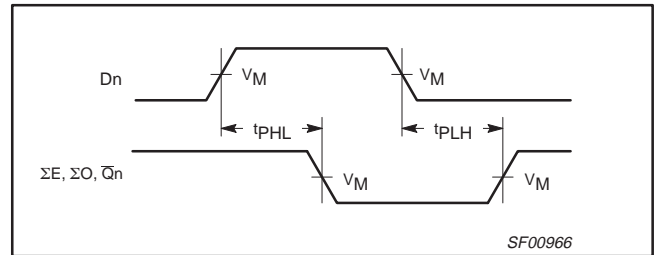
Buffers/drivers

74F655A\*  
74F656A

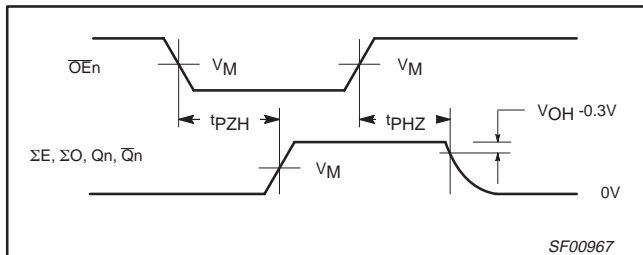
AC WAVEFORMS



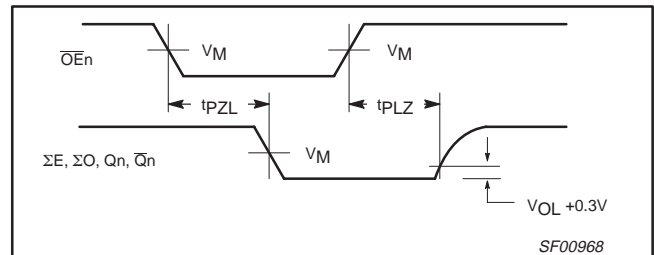
Waveform 1. Propagation Delay, Non-Inverting Outputs



Waveform 2. Propagation Delay, Inverting Outputs



Waveform 3. 3-State Output Enable Time to High Level and Output Disable Time from High Level



Waveform 4. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

TEST CIRCUIT AND WAVEFORM

**Test Circuit for 3-State Outputs**

**Input Pulse Definition**

SWITCH POSITION	
TEST	SWITCH
t <sub>PLZ</sub>	closed
t <sub>PZL</sub>	closed
All other	open

**DEFINITIONS:**  
 R<sub>L</sub> = Load resistor; see AC electrical characteristics for value.  
 C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.  
 R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of pulse generators.

family	INPUT PULSE REQUIREMENTS					
	amplitude	V <sub>M</sub>	rep. rate	t <sub>w</sub>	t <sub>TLH</sub>	t <sub>THL</sub>
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

SF00777

\* Discontinued part. Please see the Discontinued Products List.

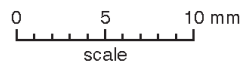
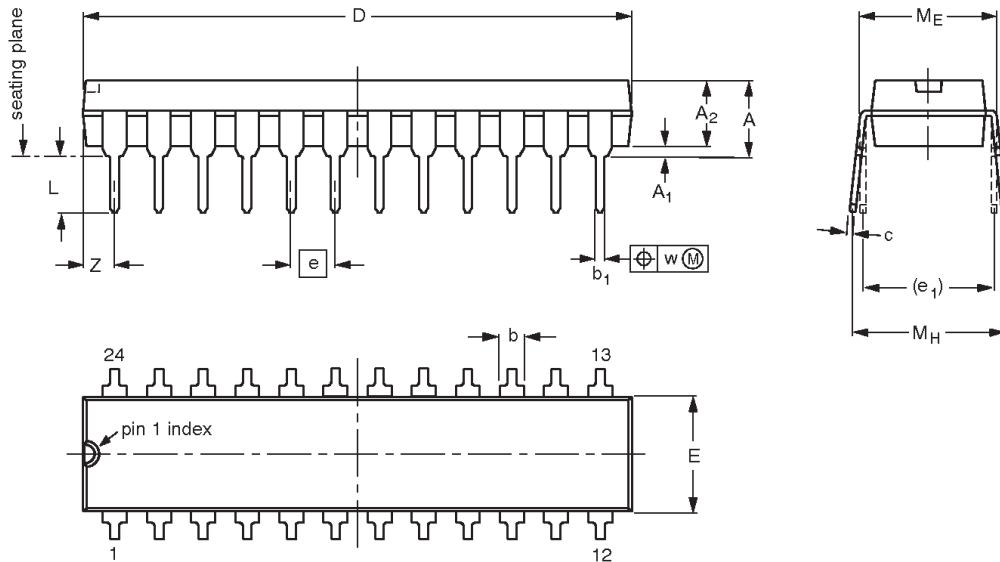


Buffers/drivers

74F655A\*, 74F656A

DIP24: plastic dual in-line package; 24 leads (300 mil)

SOT222-1



**DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)**

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.70	0.38	3.94	1.63 1.14	0.56 0.43	0.36 0.25	31.9 31.5	6.73 6.48	2.54	7.62	3.51 3.05	8.13 7.62	10.03 7.62	0.25	2.05
inches	0.185	0.015	0.155	0.064 0.045	0.022 0.017	0.014 0.010	1.256 1.240	0.265 0.255	0.100	0.300	0.138 0.120	0.32 0.30	0.395 0.300	0.01	0.081

**Note**

1. Plastic or metal protrusions of 0.01 inches maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT222-1		MS-001AF				95-03-11

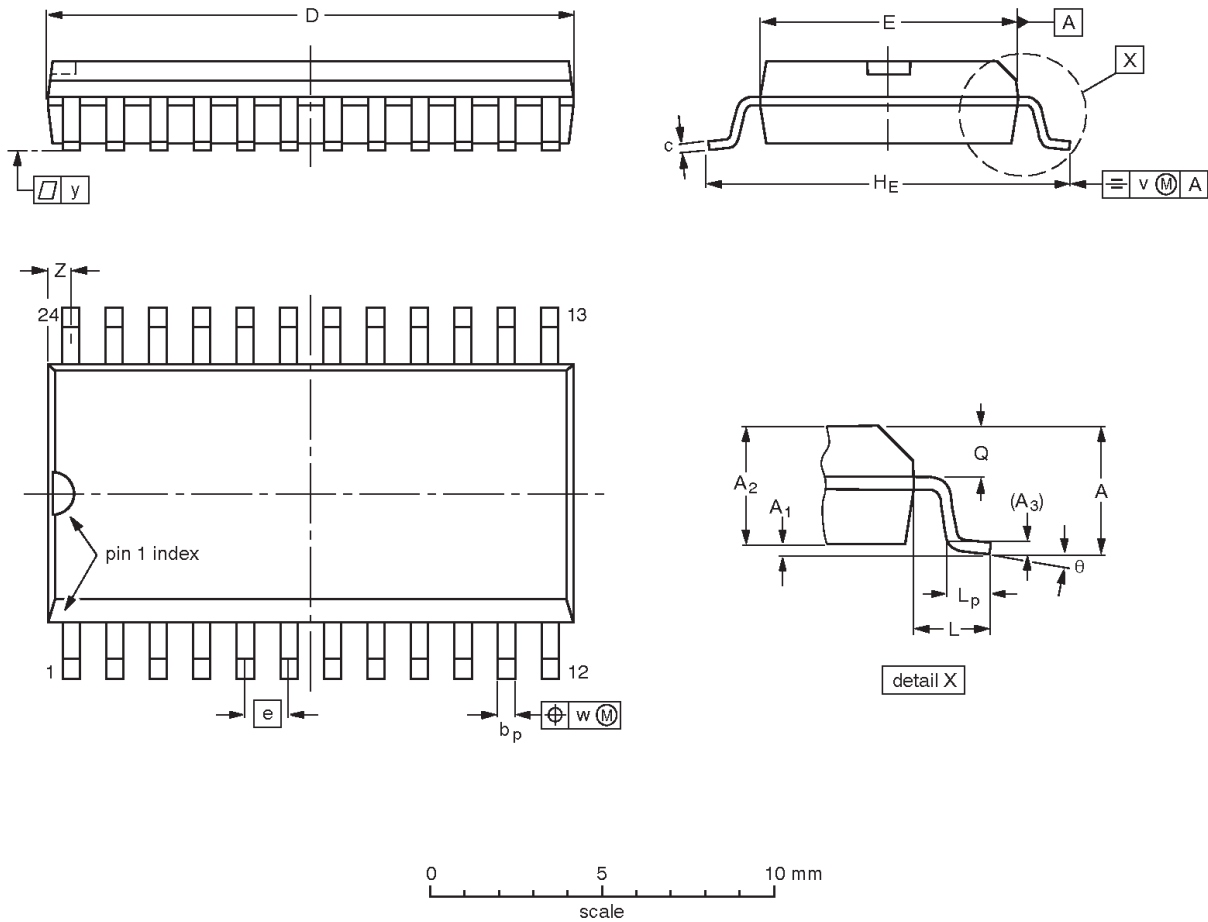
\* Discontinued part. Please see the Discontinued Product List.

Buffers/drivers

74F655A\*, 74F656A

SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	15.6 15.2	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.61 0.60	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT137-1	075E05	MS-013AD				95-01-24 97-05-22

\* Discontinued part. Please see the Discontinued Product List.

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Buffers/drivers

74F655A\*, 74F656A

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**NOTES**

\* *Discontinued part. Please see the Discontinued Product List.*

## Buffers/drivers

74F655A\*, 74F656A

## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

## Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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print code

Date of release: 10-98

Document order number:

9397-750-05169

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