

# DATA SHEET

## **74F821**

10-bit bus interface register, non-inverting  
(3-State)

Product data sheet  
Replaces data sheet 74F821/822/823/824/825/826  
of 1996 Jan 05

2004 Jul 22

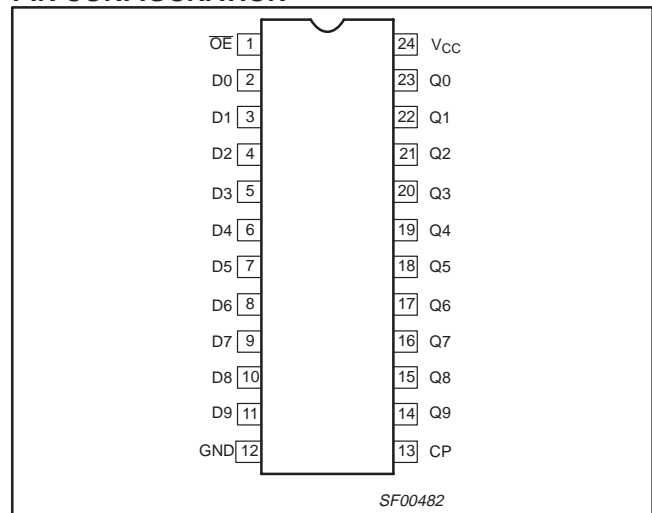
## 10-bit bus interface register, non-inverting (3-State)

74F821

## FEATURES

- High speed parallel registers with positive edge-triggered D-type flip-flops
- High performance bus interface buffering for wide data/address paths or buses carrying parity
- High-impedance PNP base inputs for reduced loading (20  $\mu$ A in HIGH and LOW states)
- $I_{IL}$  is 20  $\mu$ A versus 1000  $\mu$ A for AM29821 series
- Buffered control inputs to reduce AC effects
- Ideal where high speed, light loading, or increased fan-in as required with MOS microprocessor
- Positive and negative over-shoots are clamped to ground
- 3-State outputs glitch free during power-up and power-down
- Slim Dip 300 mil package
- Broadside pinout compatible with AMD AM 29821
- Outputs sink 64 mA and source 24 mA

## PIN CONFIGURATION



## DESCRIPTION

The 74F821 bus interface register is designed to eliminate the extra packages required to buffer existing registers and provide extra data width for wider data/address paths of buses carrying parity.

The 74F821 is a buffered 10-bit wide version of the popular 74F374/74F534 functions.

TYPE	TYPICAL $f_{max}$	TYPICAL SUPPLY CURRENT (TOTAL)
74F821	180 MHz	75 mA

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dn	Data inputs	1.0/1.0	20 $\mu$ A/0.6 mA
CP	Clock input	1.0/1.0	20 $\mu$ A/0.6 mA
$\overline{OE}$	Output enable input (active-LOW)	1.0/3.0	20 $\mu$ A/1.8 mA
Qn	Data outputs	1200/106.7	24 mA/64 mA

**NOTE:** One (1.0) FAST unit load is defined as: 20  $\mu$ A in the HIGH state and 0.6 mA in the LOW state.

## ORDERING INFORMATION

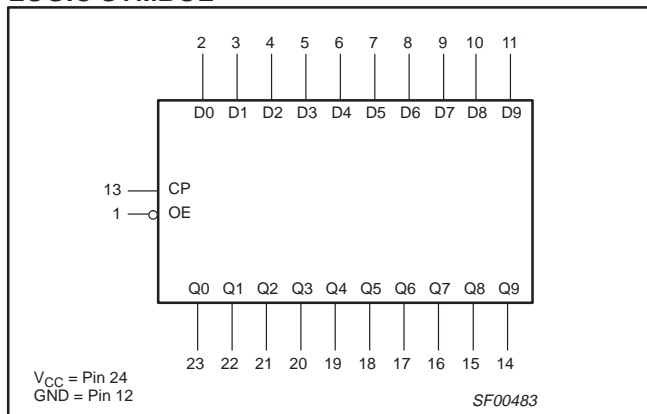
Commercial range:  $V_{CC} = 5 V \pm 10\%$ ;  $T_{amb} = 0^\circ C$  to  $+70^\circ C$

Type number	Package		
	Name	Description	Version
N74F821D	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1
N74F821N	DIP24	plastic dual in-line package; 24 leads (300 mil)	SOT222-1

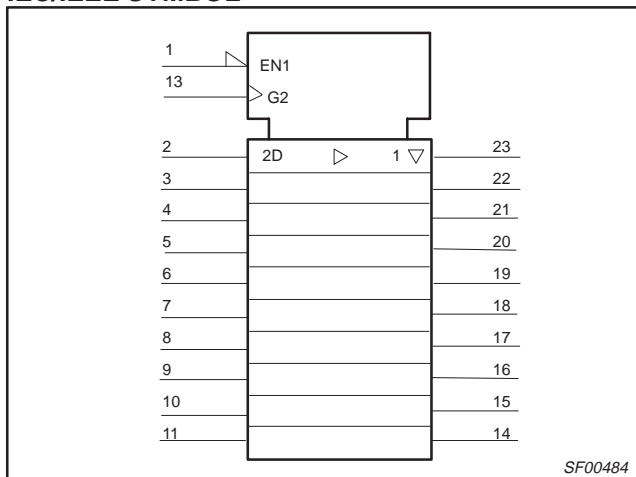
# 10-bit bus interface register, non-inverting (3-State)

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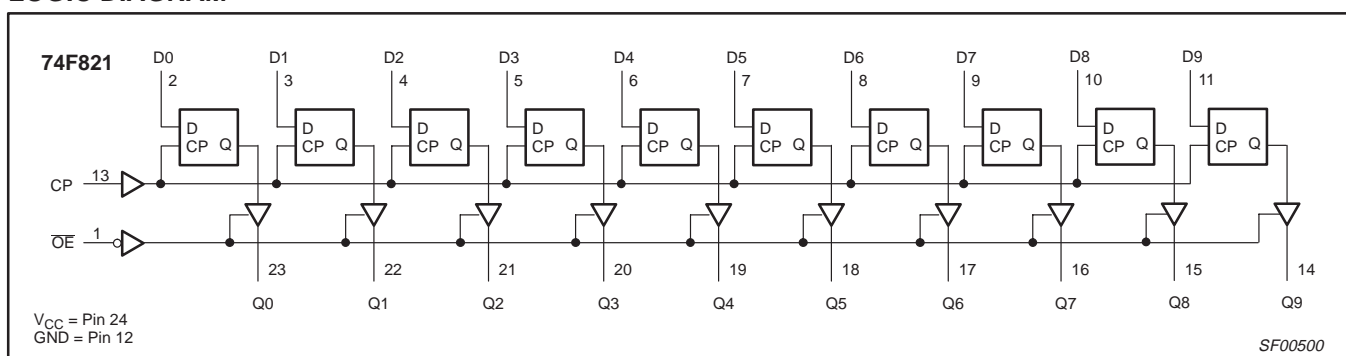
## LOGIC SYMBOL



## IEC/IEEE SYMBOL



## LOGIC DIAGRAM



## FUNCTION TABLE

INPUTS			OUTPUTS	OPERATING MODE
OE	CP	Dn	Q	
L	↑	l	L	Load and read data
L	↑	h	H	
L	↕	X	NC	Hold
H	X	X	Z	High-impedance

- H = HIGH-voltage level
- h = HIGH state must be present one setup time before the LOW-to-HIGH clock transition
- L = LOW-voltage level
- l = LOW state must be present one setup time before the LOW-to-HIGH clock transition
- NC= No change
- X = Don't care
- Z = High-impedance "off" state
- ↑ = LOW-to-HIGH clock transition
- ↕ = Not LOW-to-HIGH clock transition

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74F821

**ABSOLUTE MAXIMUM RATINGS**

(Operation beyond the limit 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 <sub>CC</sub>	Supply voltage	-0.5 to +7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +5	mA
V <sub>OUT</sub>	Voltage applied to output in HIGH output state	-0.5 to V <sub>CC</sub>	V
I <sub>OUT</sub>	Current applied to output in LOW output state	128	mA
T <sub>amb</sub>	Operating free-air temperature range	0 to +70	°C
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	HIGH-level input voltage	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	-	-	0.8	V
I <sub>IK</sub>	Input clamp current	-	-	-18	mA
I <sub>OH</sub>	HIGH-level output current	-	-	-24	mA
I <sub>OL</sub>	LOW-level output current	-	-	64	mA
T <sub>amb</sub>	Operating free-air temperature range	0	-	+70	°C

## 10-bit bus interface register, non-inverting (3-State)

74F821

**DC ELECTRICAL CHARACTERISTICS**

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

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>		LIMITS			UNIT	
				MIN	TYP <sup>2</sup>	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> = -15 mA	± 10 %V <sub>CC</sub>	2.4	-	-	V
				± 5 %V <sub>CC</sub>	2.4	-	-	V
			I <sub>OH</sub> = -24 mA	± 10 %V <sub>CC</sub>	2.0	-	-	V
				± 5 %V <sub>CC</sub>	2.0	-	-	V
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> = MAX	± 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 V; V <sub>I</sub> = 7.0 V		-	-	100	μA	
I <sub>IH</sub>	HIGH-level input current	V <sub>CC</sub> = MAX; V <sub>I</sub> = 2.7 V		-	-	20	μA	
I <sub>IL</sub>	LOW-level input current	V <sub>CC</sub> = MAX; V <sub>I</sub> = 0.5 V		-	-	-20	μA	
I <sub>OZH</sub>	Off-state output current, HIGH-level voltage applied	V <sub>CC</sub> = MAX; V <sub>O</sub> = 2.7 V		-	-	50	μA	
I <sub>OZL</sub>	Off-state output current, LOW-level voltage applied	V <sub>CC</sub> = MAX; V <sub>O</sub> = 0.5 V		-	-	-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	-	75	105	mA	
		I <sub>CCL</sub>		-	75	105	mA	
		I <sub>CCZ</sub>		-	75	115	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> = 5 V, 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.

# 10-bit bus interface register, non-inverting (3-State)

74F821

## AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			T <sub>amb</sub> = +25 °C V <sub>CC</sub> = +5.0 V C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω			T <sub>amb</sub> = 0 °C to +70 °C V <sub>CC</sub> = +5.0 V ± 10 % C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω		
			MIN	TYP	MAX	MIN	MAX	
f <sub>max</sub>	Maximum clock frequency	Waveform 1	150	180	–	140	–	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay CP to Qn	Waveform 1	4.0	6.5	8.5	4.0	9.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time OE <sub>n</sub> to Qn	Waveform 3 Waveform 4	2.0	4.5	8.0	2.0	9.0	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time OE <sub>n</sub> to Qn	Waveform 3 Waveform 4	1.5	3.5	6.5	1.5	7.5	ns

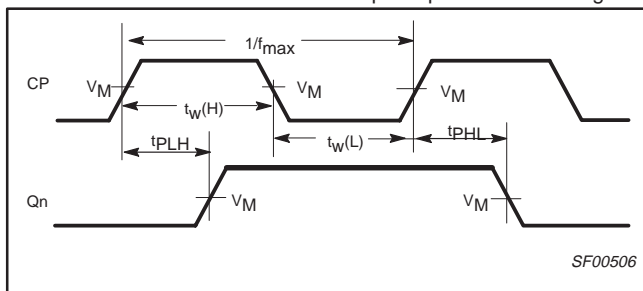
## AC SETUP REQUIREMENTS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			T <sub>amb</sub> = +25 °C V <sub>CC</sub> = +5.0 V C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω			T <sub>amb</sub> = 0 °C to +70 °C V <sub>CC</sub> = +5.0 V ± 10 % C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>su</sub> (H) t <sub>su</sub> (L)	Setup time, HIGH or LOW Dn to CP	Waveform 2	1.0	–	–	1.0	–	ns
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold time, HIGH or LOW Dn to CP	Waveform 2	2.0	–	–	2.0	–	ns
t <sub>w</sub> (H) t <sub>w</sub> (L)	CP Pulse width, HIGH or LOW	Waveform 1	3.5	–	–	4.0	–	ns

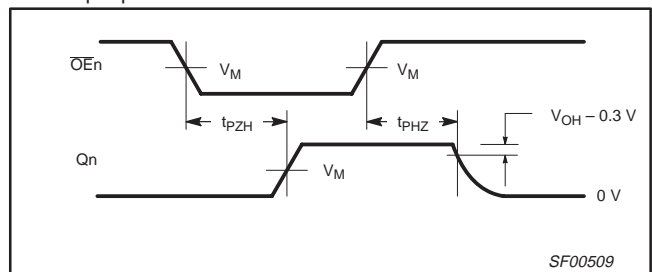
## AC WAVEFORMS

For all waveforms, V<sub>M</sub> = 1.5 V.

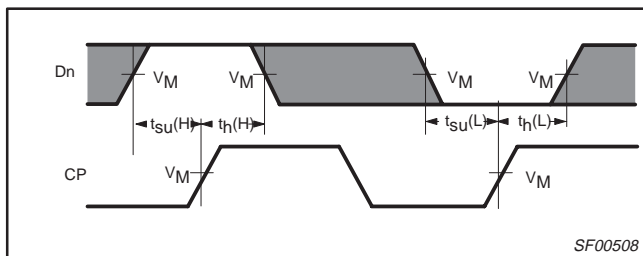
The shaded areas indicate when the input is permitted to change for predictable output performance.



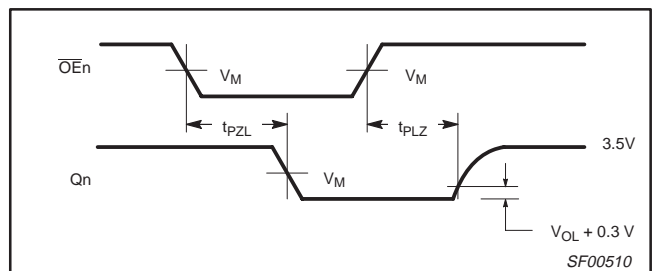
Waveform 1. Propagation delay for clock input to output, clock pulse width, and maximum clock frequency



Waveform 3. 3-State output enable time to HIGH level and output disable time from HIGH level



Waveform 2. Data setup time and hold times

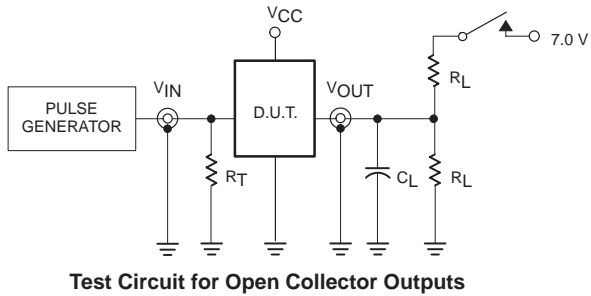


Waveform 4. 3-State output enable time to LOW level and output disable time from LOW level

# 10-bit bus interface register, non-inverting (3-State)

74F821

## TEST CIRCUIT AND WAVEFORMS

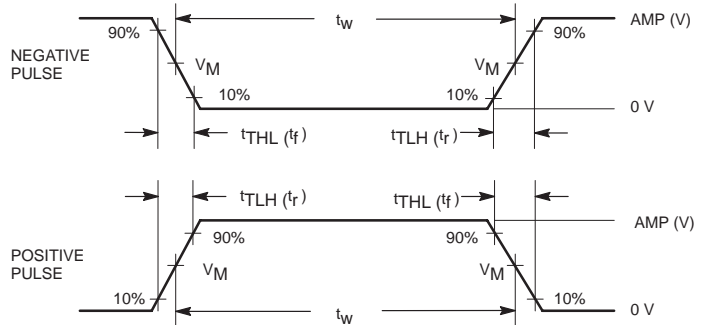


**SWITCH POSITION**

TEST	SWITCH
$t_{PLZ}$	closed
$t_{PZL}$	closed
All other	open

**DEFINITIONS:**

- $R_L$  = Load resistor; see AC electrical characteristics for value.
- $C_L$  = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.
- $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.



**Input Pulse Definition**

family	INPUT PULSE REQUIREMENTS					
	amplitude	$V_M$	rep. rate	$t_w$	$t_{TLH}$	$t_{THL}$
74F	3.0 V	1.5 V	1 MHz	500 ns	2.5 ns	2.5 ns

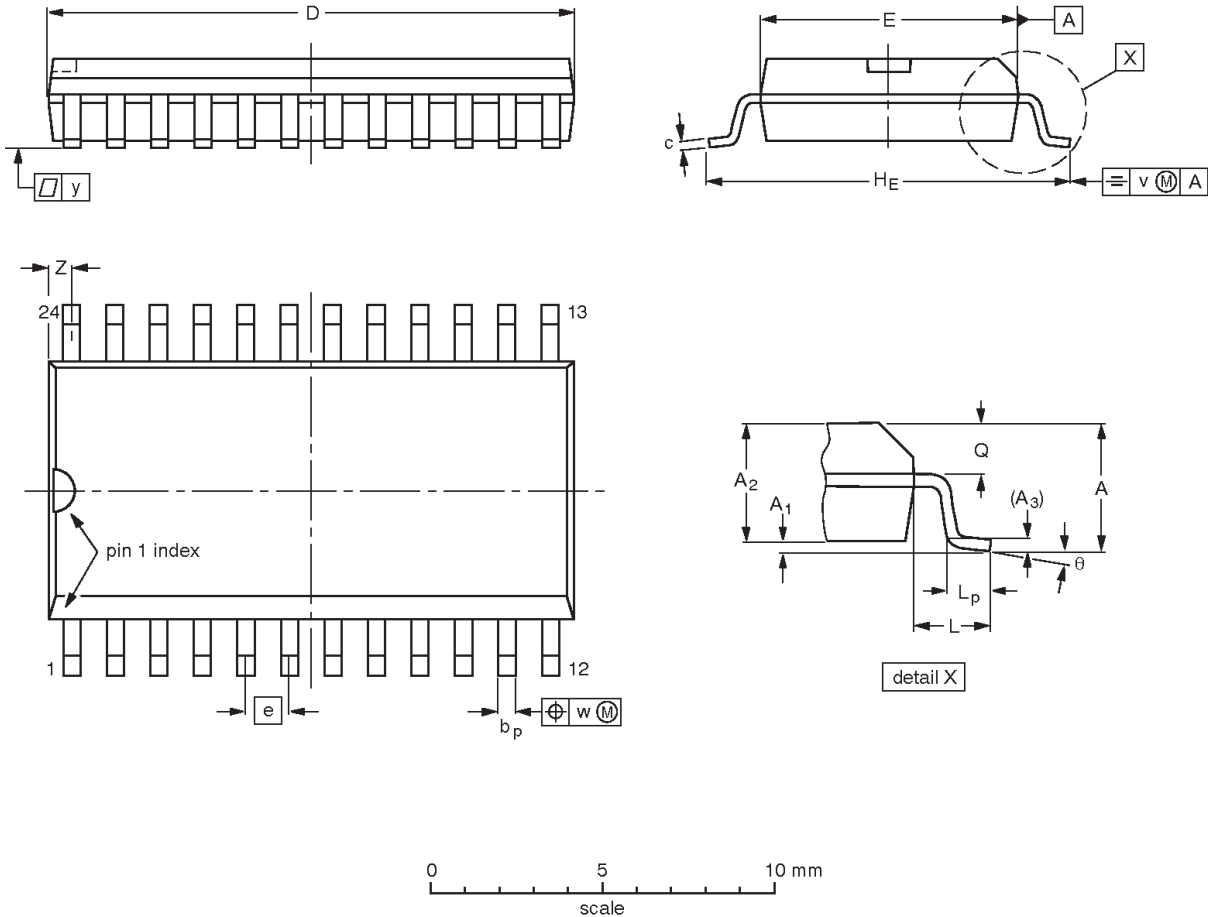
SF00128

# 10-bit bus interface register, non-inverting (3-State)

74F821

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	0.3 0.1	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	0.1	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	0.05	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 (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT137-1	075E05	MS-013				-99-12-27 03-02-19

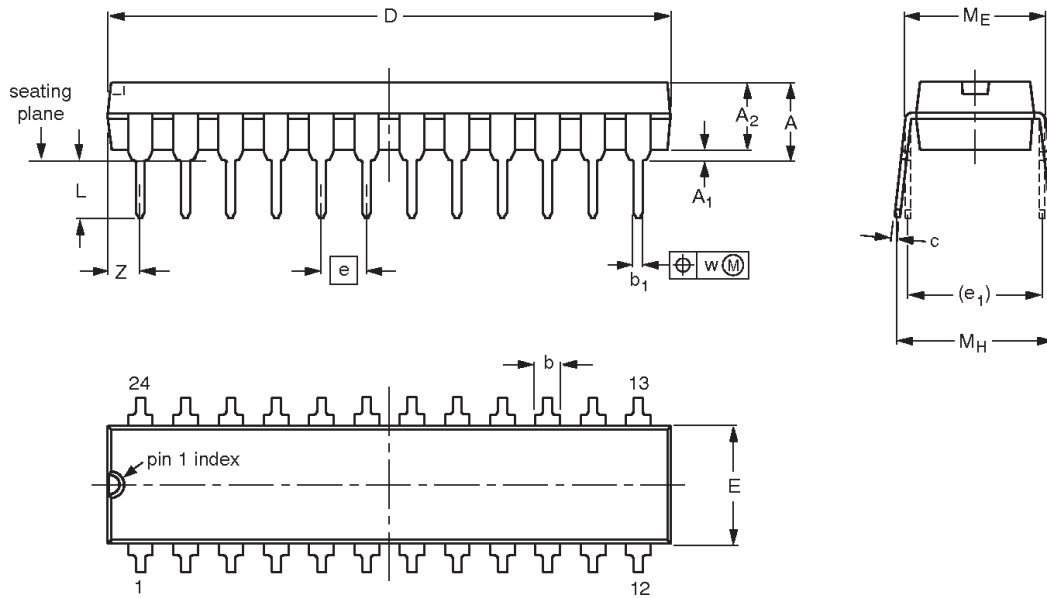


# 10-bit bus interface register, non-inverting (3-State)

74F821

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

**SOT222-1**



**DIMENSIONS (mm 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	4.7	0.38	3.94	1.63 1.14	0.56 0.43	0.36 0.25	31.9 31.5	6.73 6.25	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 0.246	0.1	0.3	0.138 0.120	0.32 0.30	0.395 0.300	0.01	0.081

**Note**

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT222-1		MS-001				<del>99-12-27</del> 03-03-12

## 10-bit bus interface register, non-inverting (3-State)

74F821

## REVISION HISTORY

Rev	Date	Description
_3	20040722	(74F821_3) Product data sheet (9397 750 13819). Replaces data sheet 74F821/822/823/824/825/826 of 1996 Jan 05 (9397 750 05185). Modifications: <ul style="list-style-type: none"> <li>Remove part numbers 74F822/823/824/825/826 and references to them.</li> </ul>
_2	19960105	(74F821–74F826_2) Product specification (9397 750 05185). ECN 853-1304 16195 of 05 January 1996.

## Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definitions
I	Objective data sheet	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**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 60134). 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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Document order number:

9397 750 13819

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