

# DATA SHEET

**74F14**

Hex inverter Schmitt trigger

Product specification

1990 Nov 26

IC15 Data Handbook

# Hex inverter Schmitt trigger

# 74F14

## FEATURE

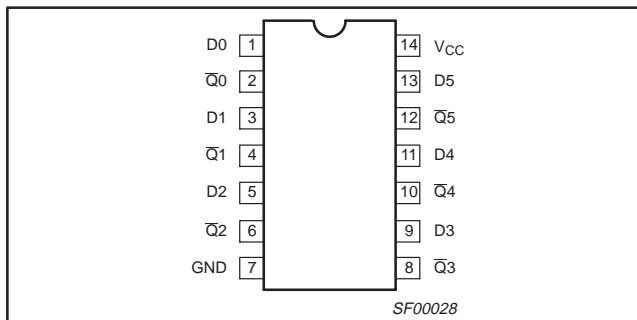
- Industrial temperature range available (-40°C to +85°C)

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F14	5.0ns	18mA

## DESCRIPTION

The 74F14 contains six logic inverters which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter free output signals. In addition, they have greater noise margin than conventional inverters. Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem-pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive-going and negative-going input threshold (typically 800mV) is determined internally by resistor ratios and is insensitive to temperature and supply voltage variations.

## PIN CONFIGURATION



## ORDERING INFORMATION

DESCRIPTION	ORDER CODE		PKG DWG #
	COMMERCIAL RANGE V <sub>CC</sub> = 5V ±10%, T <sub>amb</sub> = 0°C to +70°C	INDUSTRIAL RANGE V <sub>CC</sub> = 5V ±10%, T <sub>amb</sub> = -40°C to +85°C	
14-pin plastic DIP	N74F14N	I74F14N	SOT27-1
14-pin plastic SO	N74F14D	I74F14D	SOT108-1

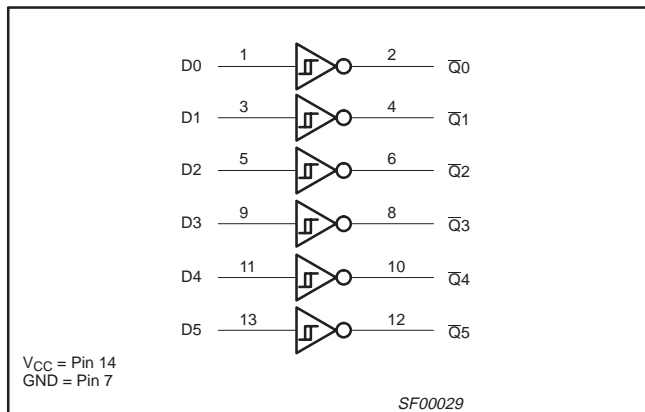
## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
D <sub>n</sub>	Data inputs	1.0/1.0	20µA/0.6mA
Q <sub>n</sub>	Data output	50/33	1.0mA/20mA

### NOTE:

1 One (1.0) FAST unit load is defined as: 20µA in the High state and 0.6mA in the Low state.

## LOGIC DIAGRAM



## FUNCTION TABLE

INPUTS	OUTPUT
D <sub>n</sub>	Q <sub>n</sub>
L	H
H	L

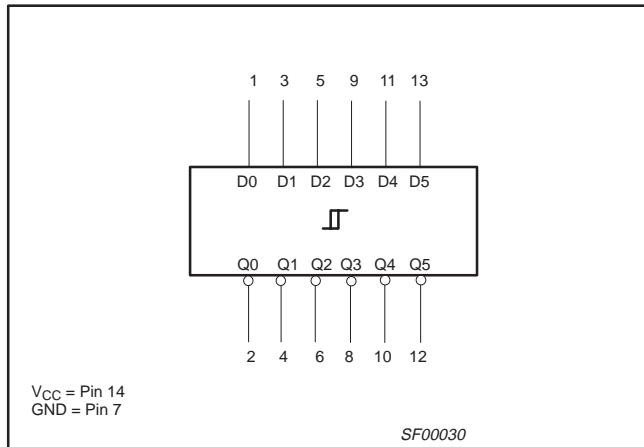
### NOTES:

H = High voltage level  
L = Low voltage level

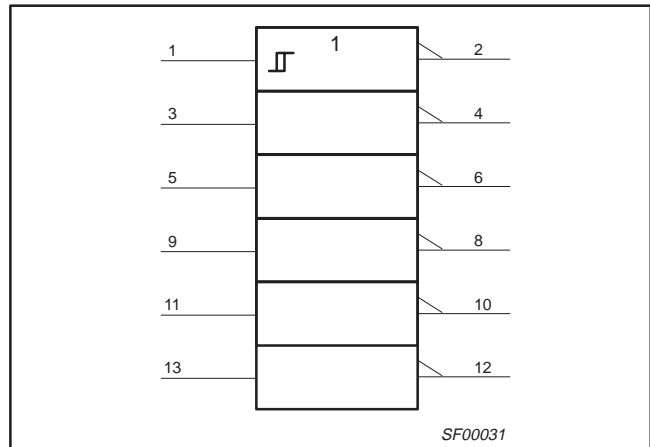
# Hex inverter Schmitt trigger

74F14

## LOGIC SYMBOL



## IEC/IEEE SYMBOL



## 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 <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	40	mA	
T <sub>amb</sub>	Operating free-air temperature range	Commercial range	0 to +70	°C
		Industrial range	-40 to +85	°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			-1	mA
I <sub>OL</sub>	Low-level output current			20	mA
T <sub>amb</sub>	Operating free air temperature range	Commercial range	0	+70	°C
		Industrial range	-40	+85	°C

## Hex inverter Schmitt trigger

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**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			
$V_{T+}$	Positive-going threshold	$V_{CC} = 5.0V$	1.4	1.7	2.0	V		
$V_{T-}$	Negative-going threshold	$V_{CC} = 5.0V$	0.7	0.9	1.1	V		
$\Delta V_T$	Hysteresis ( $V_{T+} - V_{T-}$ )	$V_{CC} = 5.0V$	0.4	0.8		V		
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN}, V_I = V_{T-\text{MIN}},$ $I_{OH} = \text{MAX}$	$\pm 10\%V_{CC}$	2.5		V		
			$\pm 5\%V_{CC}$	2.7	3.4	V		
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}, V_I = V_{T+\text{MAX}},$ $I_{OL} = \text{MAX}$	$\pm 10\%V_{CC}$		0.30	0.50	V	
			$\pm 5\%V_{CC}$		0.30	0.50	V	
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$		-0.73	-1.2	V		
$I_{T+}$	Input current at positive-going threshold	$V_{CC} = 5.0V, V_I = V_{T+}$		0		$\mu A$		
$I_{T-}$	Input current at negative-going threshold	$V_{CC} = 5.0V, V_I = V_{T-}$		-175		$\mu A$		
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7.0V$			100	$\mu A$		
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7V$			20	$\mu A$		
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.5V$			-0.6	mA		
$I_{OS}$	Short-circuit output current <sup>3</sup>	$V_{CC} = \text{MAX}$	-60		-150	mA		
$I_{CC}$	Supply current (total)	$I_{CCH}$	$V_{CC} = \text{MAX}$	$V_{IN} = \text{GND}$		13	22	mA
		$I_{CCL}$	$V_{CC} = \text{MAX}$	$V_{IN} = 4.5V$		23	32	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  $V_{CC} = 5V, T_{amb} = 25^\circ C$ .
- Not more than one output should be shorted at a time. For testing  $I_{OS}$ , 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,  $I_{OS}$  tests should be performed last.

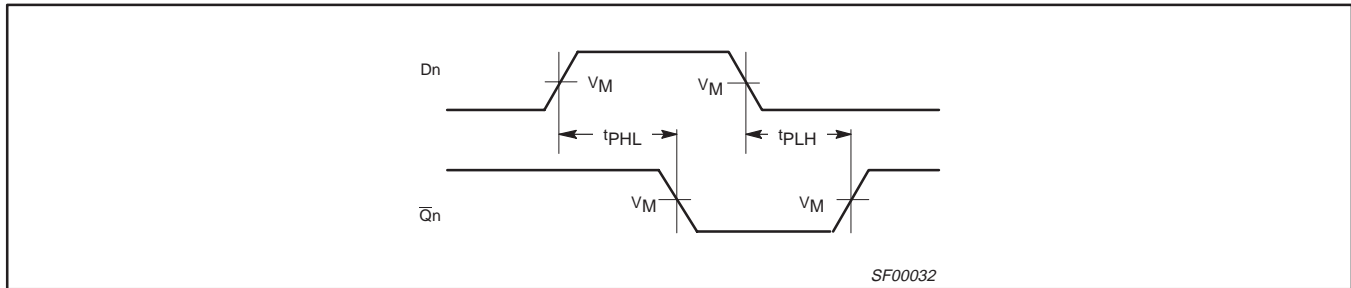
**AC ELECTRICAL CHARACTERISTICS**

SYMBOL	PARAMETER	TEST CONDITION	LIMITS						UNIT	
			$V_{CC} = +5.0V$ $T_{amb} = +25^\circ C$ $C_L = 50pF, R_L = 500\Omega$			$V_{CC} = +5.0V \pm 10\%$ $T_{amb} = 0^\circ C \text{ to } +70^\circ C$ $C_L = 50pF, R_L = 500\Omega$		$V_{CC} = +5.0V \pm 10\%$ $T_{amb} = -40^\circ C \text{ to } +85^\circ C$ $C_L = 50pF, R_L = 500\Omega$		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
$t_{PLH}$ $t_{PHL}$	Propagation delay Dn to $\bar{Q}$ n	Waveform 1	4.0 3.5	6.5 5.0	8.5 6.5	4.0 3.5	9.5 7.0	3.0 3.5	10.5 9.0	ns

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## AC WAVEFORMS

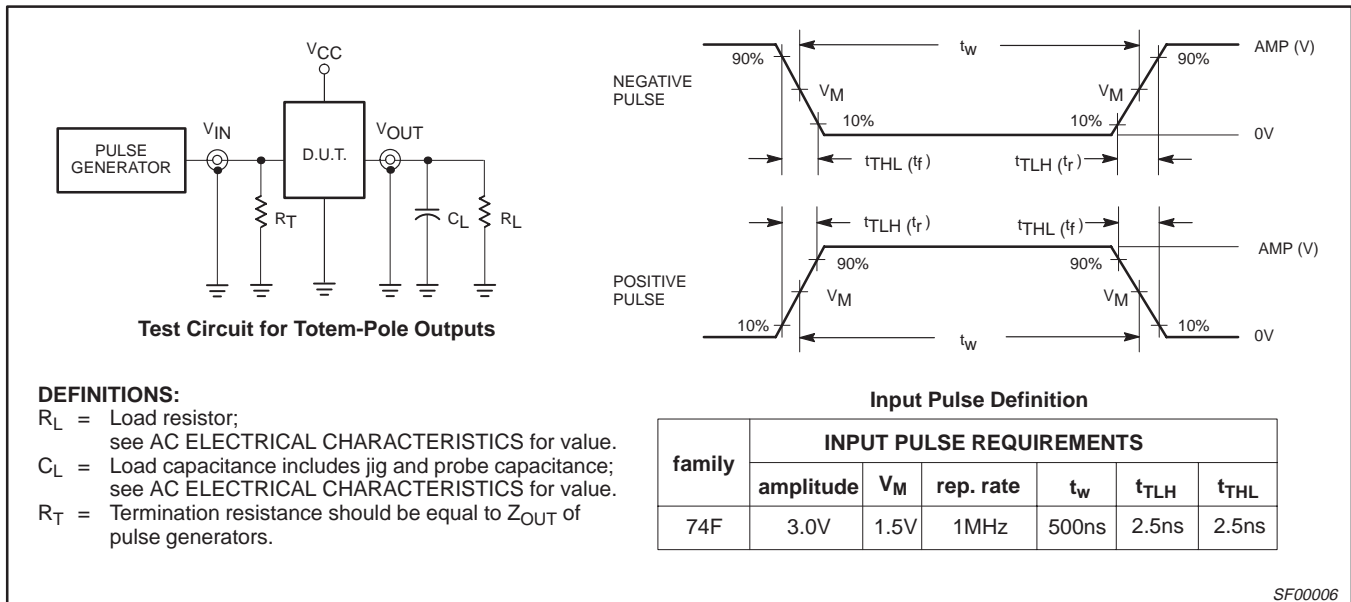


Waveform 1. Propagation delay for inverting outputs

**NOTE:**

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

## TEST CIRCUIT AND WAVEFORMS

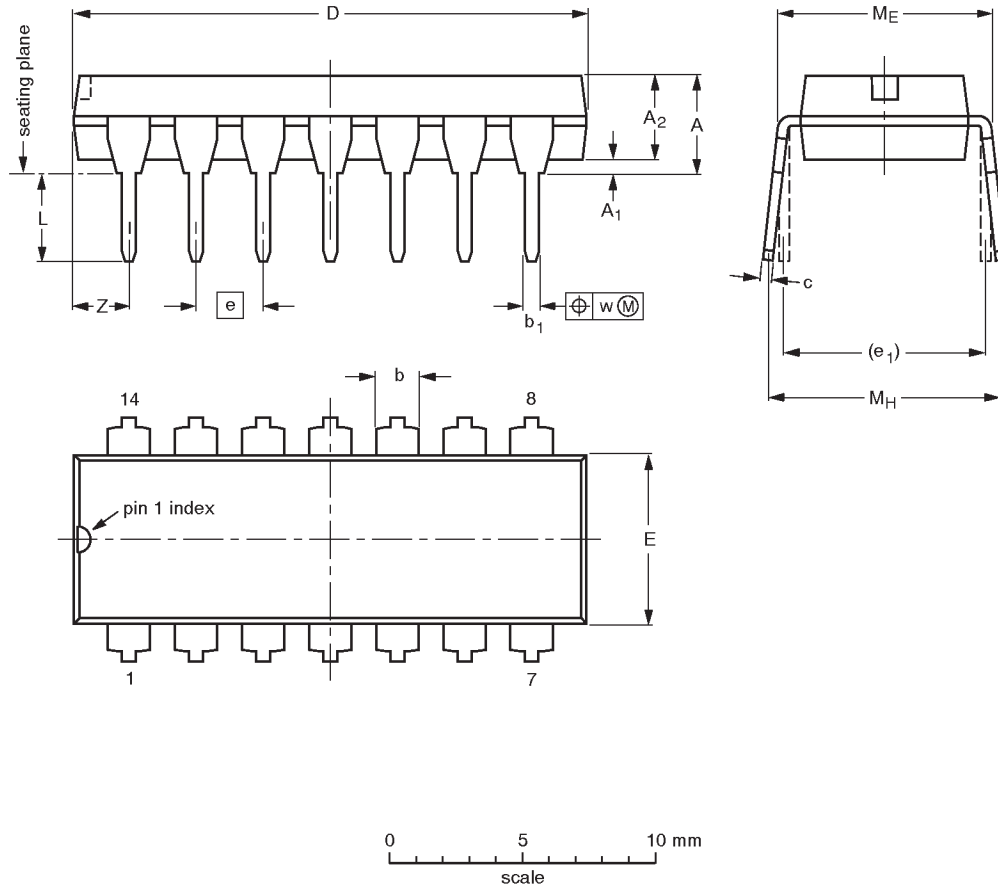


# Hex inverter Schmitt trigger

74F14

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



**DIMENSIONS (inch dimensions are derived from the original mm 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	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

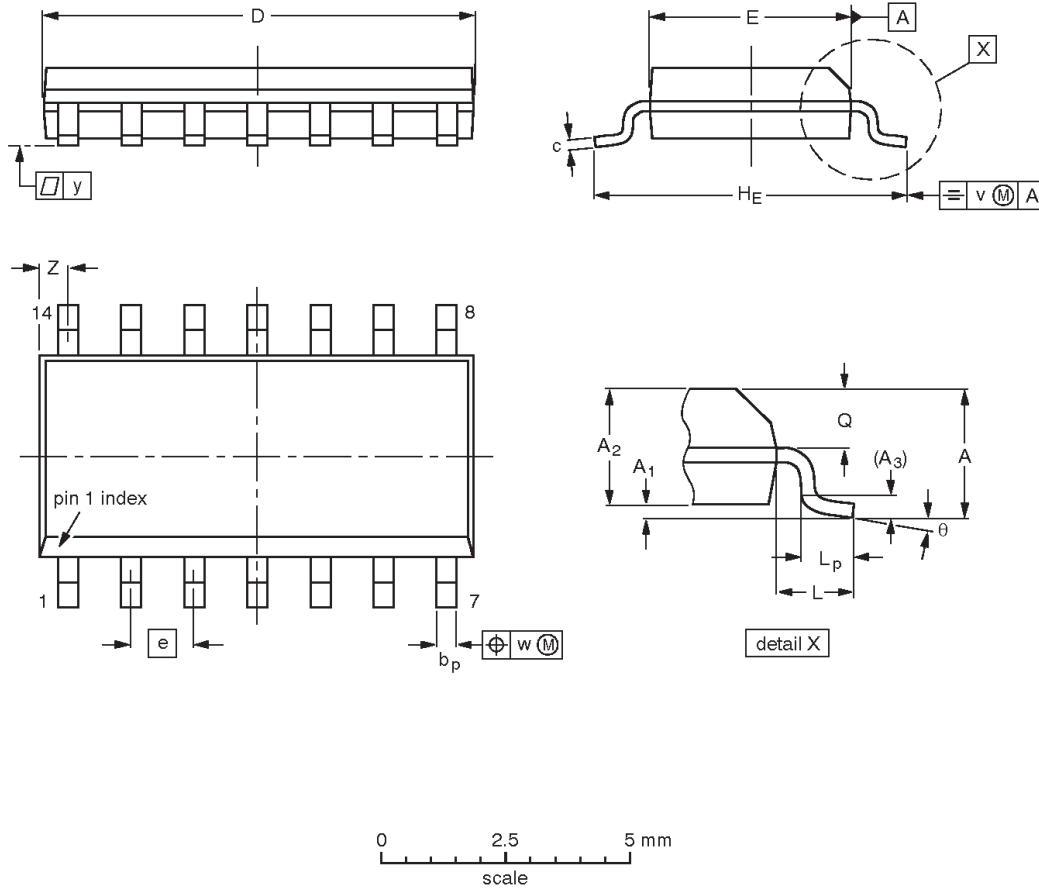
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001AA				92-11-17 95-03-11

# Hex inverter Schmitt trigger

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SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



**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	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**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			
SOT108-1	076E06S	MS-012AB				95-01-29 97-05-22

## Hex inverter Schmitt trigger

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

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