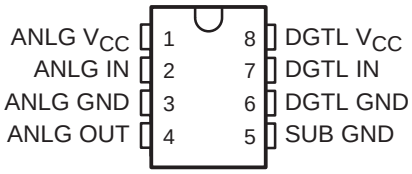
SOCS026B – SEPTEMBER 1989 – REVISED JUNE 1994

- **15-MHz Sampling Rate**
- **30-ns Acquisition Time**
- **Diode-Bridge Switch**
- **25-MHz Bandwidth**
- **Low-Voltage Supply**

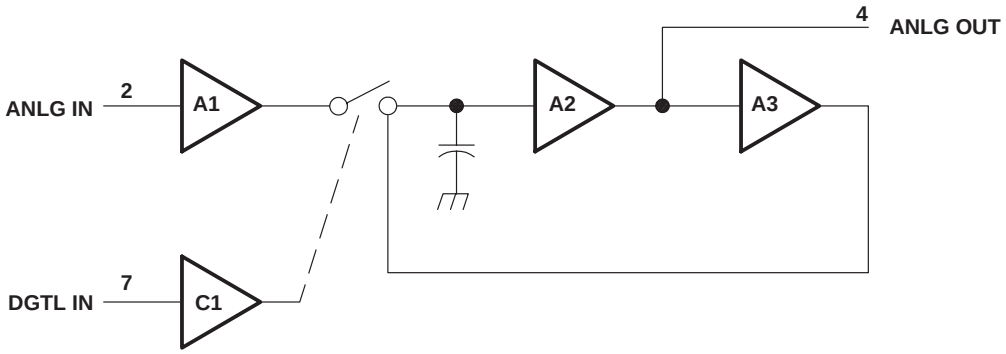
P OR PS PACKAGE
(TOP VIEW)



description

The TL1591 is a monolithic integrated sample-and-hold circuit that uses the BiFET process with Schottky-barrier diodes and is designed for use with CCD area imagers. This device consists of an ultra-fast input-buffer amplifier, a digital-controlled diode-bridge switch, and a high-impedance output buffer amplifier. The electronic switch is controlled by an LS-TTL-compatible logic input.

functional block diagram



This device contains circuits to protect its inputs and outputs against damage due to high static voltages or electrostatic fields. These circuits have been qualified to protect this device against electrostatic discharges (ESD) of up to 2 kV according to MIL-STD-883C, Method 3015; however, precautions should be taken to avoid application of any voltage higher than maximum-rated voltages to these high-impedance circuits. During storage or handling, the device leads should be shorted together or the device should be placed in conductive foam. In a circuit, unused inputs should always be connected to an appropriate logic voltage level, preferably either V_{CC} or ground. Specific guidelines for handling devices of this type are contained in the publication *Guidelines for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices and Assemblies* available from Texas Instruments.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{CC} . . . . . 7 V
Input voltage range, V_I . . . . . 0 to V_{CC}
Continuous total dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . . . –25°C to 80°C
Storage temperature range, T_{STG} . . . . . –55°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 80°C$ POWER RATING
P	1000 mW	8.0 mW/°C	560 mW
PS	725 mW	5.8 mW/°C	406 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.5	V
High-level input voltage, V_{IH}	2			V
Low-level input voltage, V_{IL}			0.8	V
Peak-to-peak input voltage, $V_{I(PP)}$			0.8	V
Operating free-air temperature, T_A	–25		80	°C

electrical characteristics over ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP‡	MAX	UNIT
V_{IK}	Input clamp voltage					–1.5	V
$V_{O(PP)}$	Peak-to-peak output voltage				1.1		V
I_{IH}	High-level input current	V_{CC} = 5.5 V,	V_{IH} = 2.7 V			20	µA
I_{IL}	Low-level input current	V_{CC} = 5.5 V,	V_{IL} = 0.4 V		–0.28	–0.4	mA
I_O	Output current				0.6		mA
I_{CC}	Supply current	V_{CC} = 5.5 V			15	20	mA
r_i	Input resistance				10		kΩ
r_o	Output resistance				50		Ω

operating characteristics

PARAMETER		MIN	TYP‡	MAX	UNIT
	Linearity		0.7%	2%	
A_v	Voltage amplification		0.8	0.9	V/V
	Sample-to-hold offset error		15		mV
	Sample-mode offset error	–150	–50	50	mV
	Hold-mode feedthrough			–50	dB
	Hold-mode droop			100	µV/µs

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

dynamic characteristics (see Figure 1)

PARAMETER	MIN	TYP†	MAX	UNIT
Acquisition time, 0.6 V to 2%		18		ns
Acquisition time, 0.6 V to 1%		31		ns
Hold-mode settling time		35		ns
Sampling-mode bandwidth		25		MHz
Sampling rate			15	MHz

† All typical values are at V_{CC} = 5 V and T_A = 25°C.

PARAMETER MEASUREMENT INFORMATION

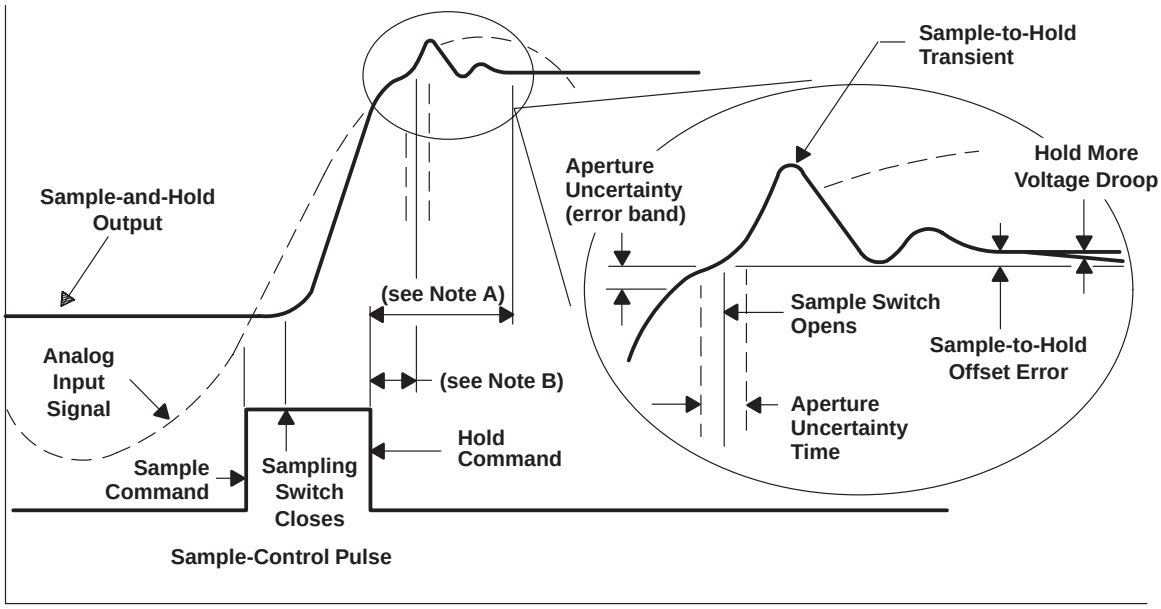


Figure 1. Sample-Hold Definitions

NOTES: A. Hold-mode settling time is the time from the hold command transistion until the output has settled within a specified error band around the final value.

B. Acquisition time is the time required, after the closing of the sampling switch, for the hold capacitor to charge to a full-scale voltage change and then remain within a specified error band around the final value.

PARAMETER MEASUREMENT INFORMATION

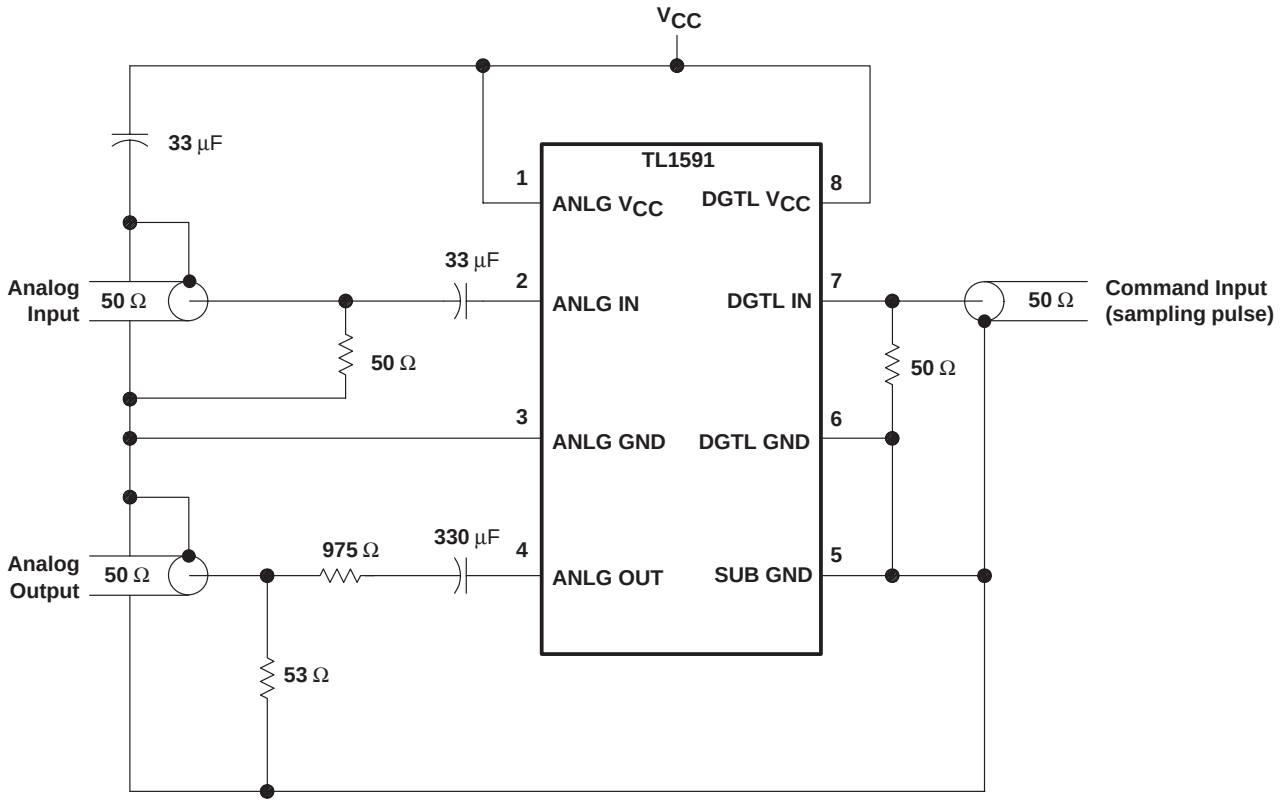


Figure 2. Test Circuit

TYPICAL CHARACTERISTICS

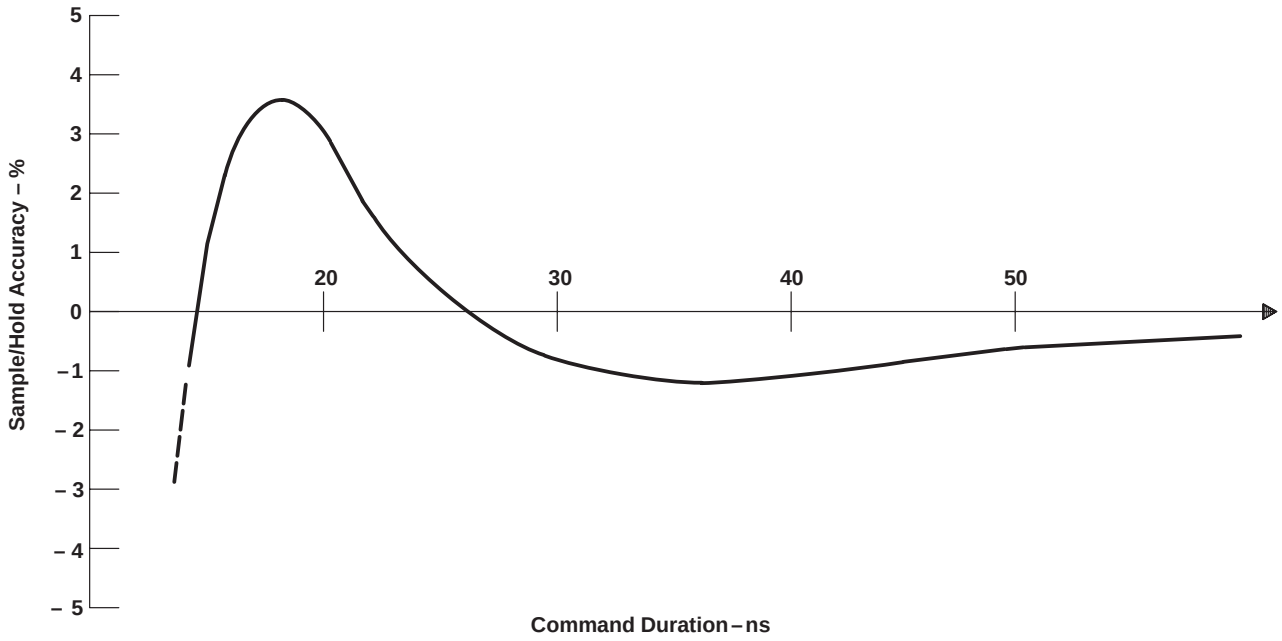
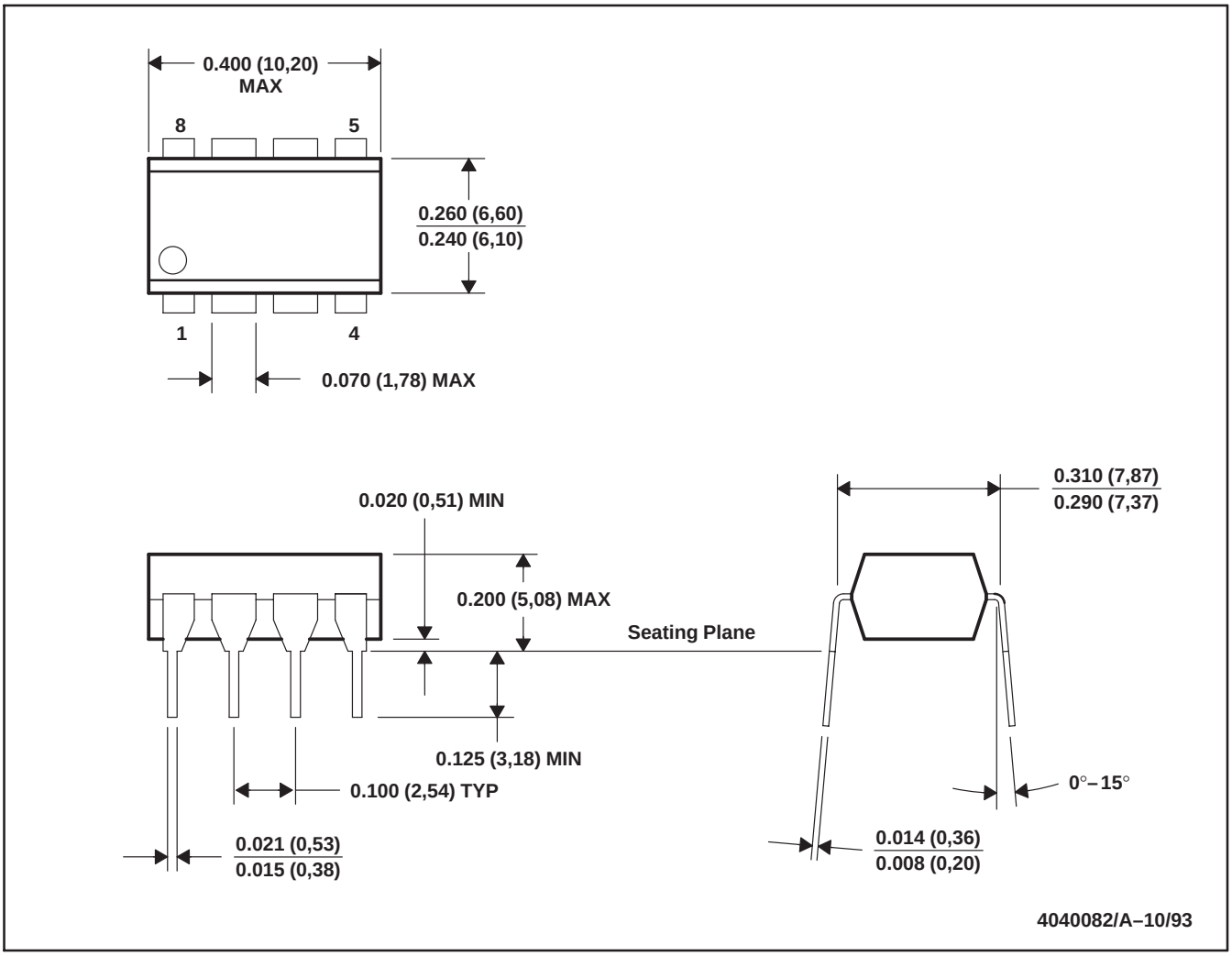


Figure 3. Sample/Hold Accuracy Versus Command Duration

MECHANICAL DATA

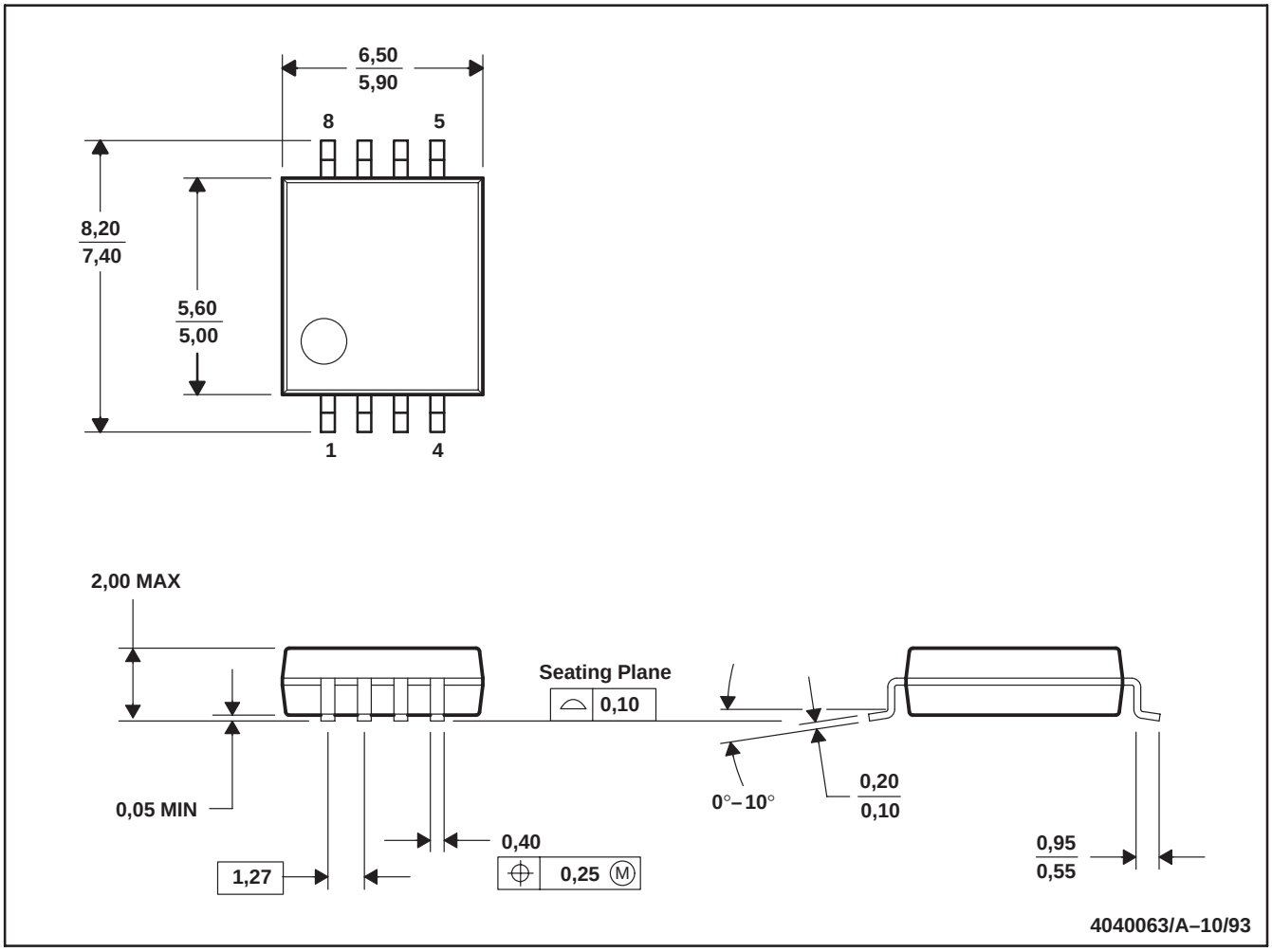
P(R-PDIP-T8) **PLASTIC DUAL-IN-LINE PACKAGE**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.

MECHANICAL DATA

PS/R-PDSO-G8 **PLASTIC SMALL-OUTLINE PACKAGE**



NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.