DS75110A

DS75110A Dual Line Drivers

Literature Number: SNOSC36A

National Semiconductor

January 1996

DS75110A
Dual Line Drivers

General Description

The DS75110A is a dual line driver with independent channels, common supply and ground terminals featuring constant current outputs. These drivers are designed for optimum performance when used with the DS75107, DS75108 line receivers.

The output current of the DS75110A is nominally 12 mA and may be switched to either of two output terminals with the appropriate logic levels at the driver input.

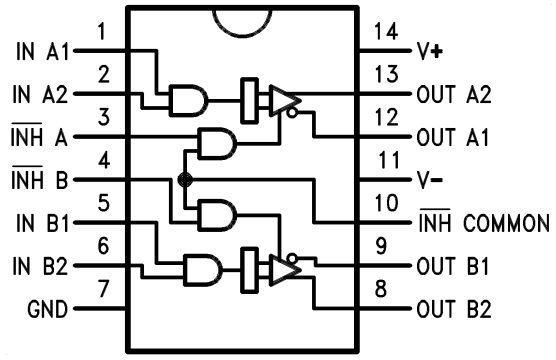
Separate or common control inputs are provided for increased logic versatility. These control or inhibit inputs allow the output current to be switched off (inhibited) by applying low logic levels to the control inputs. The output current in the inhibit mode, $I_{O(Off)}$, is specified so that minimum line loading is induced. This is highly desirable in system applications using party line data communications.

Features

- Improved stability over supply voltage and temperature ranges
- Constant current, high impedance outputs
- High speed: 15 ns max propagation delay
- Standard supply voltages
- Inhibitor available for driver selection
- High common mode output voltage range (−3.0V to 10V)
- TTL input compatibility

Connection Diagram

14–Lead Dual-In-Line Package and SO-14 Package



DS009619-1

Top View
Order Number DS75110AM or DS75110AN
See NS Package Number M14A or N14A

Function Table

Inputs				Outputs	
Logic		Inhibitor			
1	2	A/B	$\overline{INH}$	A1/B1	A2/B2
X	X	L	X	Off	Off
X	X	X	L	Off	Off
L	X	H	H	Off	On
X	L	H	H	Off	On
H	H	H	H	On	Off

H = High
L = Low
X = Don't Care

Absolute Maximum Ratings (Note 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Storage Temperature Range	
Ceramic DIP	−65˚C to +175˚C
Molded DIP and SO-14	−65˚C to +150˚C
Lead Temperature	
Ceramic DIP (Soldering, 60 sec.)	300˚C
Molded DIP and SO-14 (Soldering, 10 sec.)	265˚C
Maximum Power Dissipation (Note 1) at 25˚C	
Molded Package	1040 mW
SO Package	930 mW
Suppy Voltage	±7.0V
Input Voltage (Any Input)	5.5V
Output Voltage (Any Output)	−5.0V to +12V

Recommended Operating Conditions

	DS75110A			Units
	Min	Typ	Max	
Positive Supply Voltage (V^+)	4.75	5.0	5.25	V
Negative Supply Voltage (V^-)	−4.75	−5.0	−5.25	V
Positive Common Mode Voltage (V_{CM+})	0		10	V
Negative Common Mode Voltage (V_{CM-})	0		−3.0	V
Operating Temperature (T_A)	0	25	70	˚C

Note 1: Derate molded DIP package 8.3 mW/˚C above 25˚C, derate SO package 7.5 mW/˚C above 25˚C.

Electrical Characteristics (Notes 3, 4)

Over recommended operating temperature range, unless otherwise specified.

Symbol	Parameter		Conditions	Min	Typ	Max	Units
V_{IH}	Input Voltage HIGH			2.0			V
V_{IL}	Input Voltage LOW					0.8	V
V_{IC}	Input Clamp Voltage		V_{CC} = Min, I_I = −12 mA		−0.9	−1.5	V
$I_{O(On)}$	On-State Output Current		V_{CC} = Max, V_O = 10V		12	15	mA
			V_{CC} = Min, V_O = −3.0V	6.5	12		
$I_{O(Off)}$	Off-State Output Current (Inhibited Only)		V_{CC} = Min, V_O = 10V			100	µA
I_I	Input Current At Maximum Input Voltage	A, B or C Inputs	V_{CC} = Max, V_I = 5.5V			1.0	mA
		D Input				2.0	
I_{IH}	Input Current HIGH	A, B or C Input	V_{CC} = Max, V_I = 2.4V			40	µA
		D Input				80	
I_{IL}	Input Current LOW	A, B or C Input	V_{CC} = Max, V_I = 0.4V			−3.0	mA
		D Input				−6.0	
$I^+_{(On)}$	Positive Supply Current with Driver Enabled		V_{CC} = Max, A & B Inputs at 0.4V, C & D Inputs at 2.0V		23	35	mA
$I^-_{(On)}$	Negative Supply Current with Driver Enabled				−34	−50	mA
$I^+_{(Off)}$	Positive Supply Current with Driver Inhibited		V_{CC} = Max, A, B, C & D Inputs at 0.4V		21		mA
$I^-_{(Off)}$	Negative Supply Current with Driver Inhibited				−17		mA

Note 2: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The tables of "Electrical Characteristics" provide conditions for actual device operation.

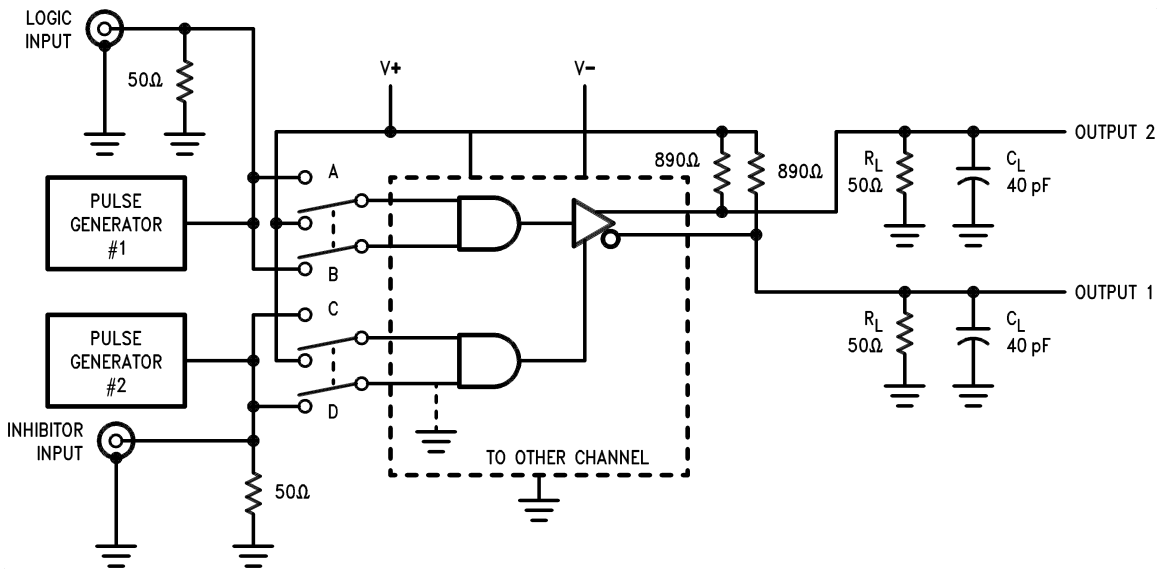
Note 3: Unless otherwise specified min/max limits apply across 0˚C to +70˚C range for the DS75110. All typicals are given for V_{CC} = 5V and T_A = 25˚C.

Note 4: When using only one channel of the line drivers, the other channel should be inhibited and/or its outputs grounded.

Switching Characteristics

V_{CC} = ±5V, T_A = 25˚C

Symbol	Parameter	Conditions	From (Input)	To (Output)	Min	Typ	Max	Units
t_{PLH}	Propagation Delay Time, LOW to HIGH	C_L = 40 pF,	A or B	1 or 2		9.0	15	ns
t_{PHL}	Propagation Delay Time, HIGH to LOW	R_L = 50Ω				9.0	15	ns
t_{PLH}	Propagation Delay Time, LOW to HIGH	See Test Circuit	C or D	1 or 2		16	25	ns
t_{PHL}	Propagation Delay Time, HIGH to LOW					13	25	ns



The pulse generators have the following characteristics:
$t_r = t_f$ = 10 ns ±5.0 ns, t_{w1} = 500 ns, PRR = 1.0 MHz, t_{W2} = 1.0 µs, PRR = 500 kHz, Z_O = 50Ω.
C_L includes probe and jib capacitance.
For simplicity, only one channel and the inhibitor connections are shown.

FIGURE 1. AC Test Circuit

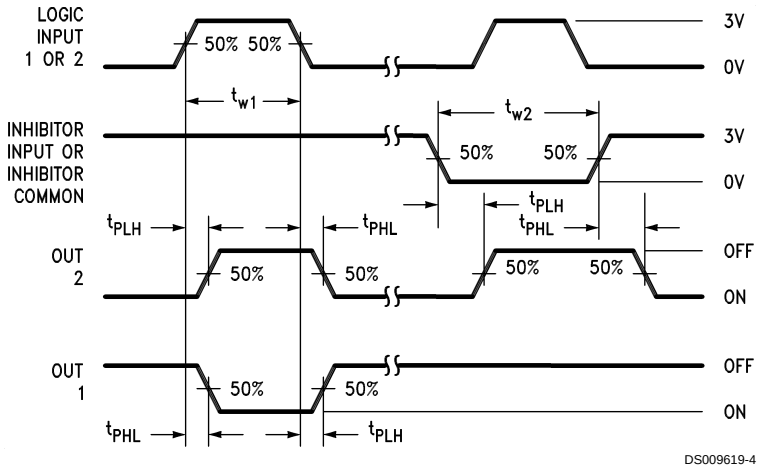


FIGURE 2. AC Waveforms

Equivalent Circuit

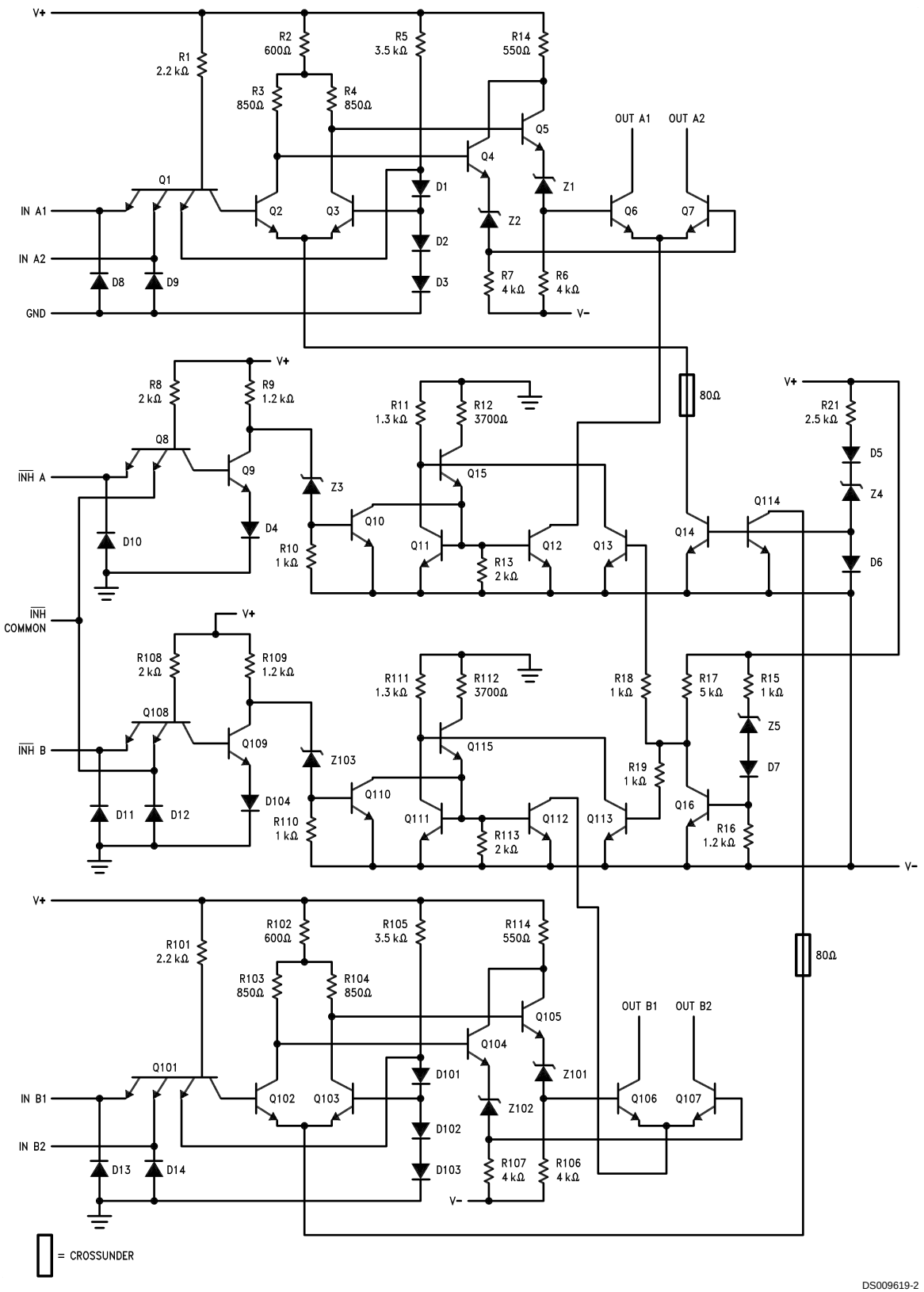


FIGURE 3. Equivalent Circuit

Typical Applications

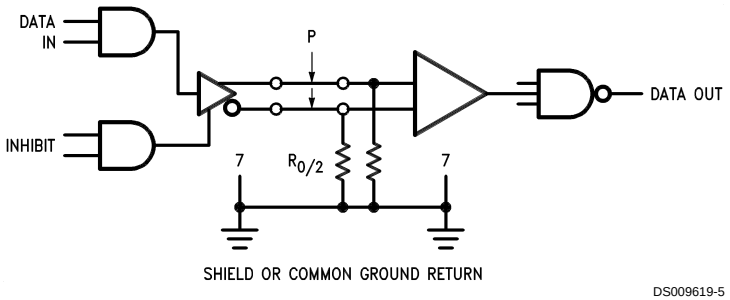
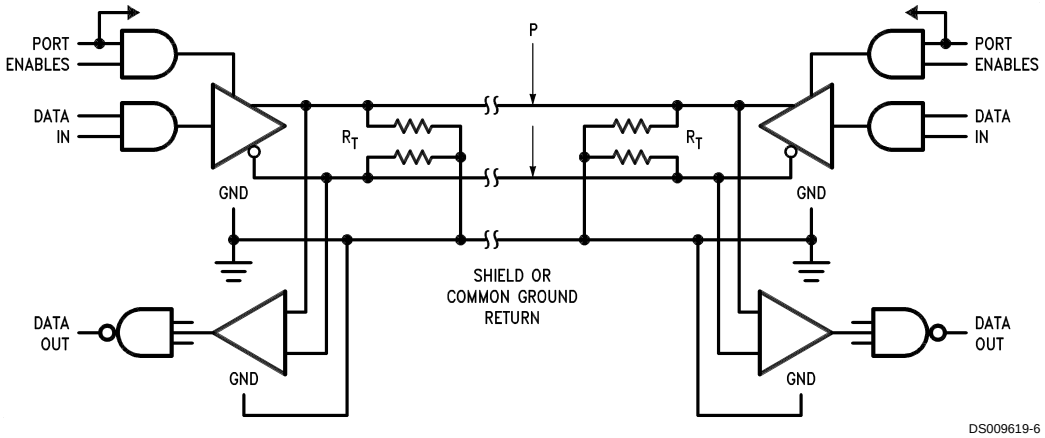


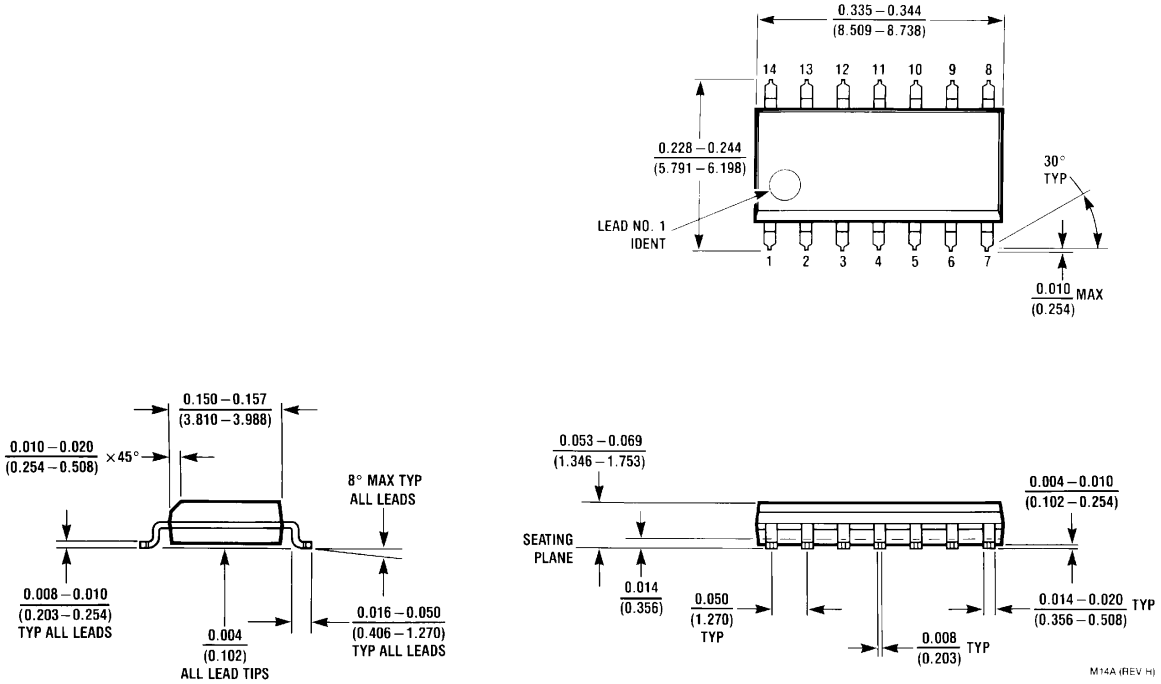
FIGURE 4. Simplex Operation



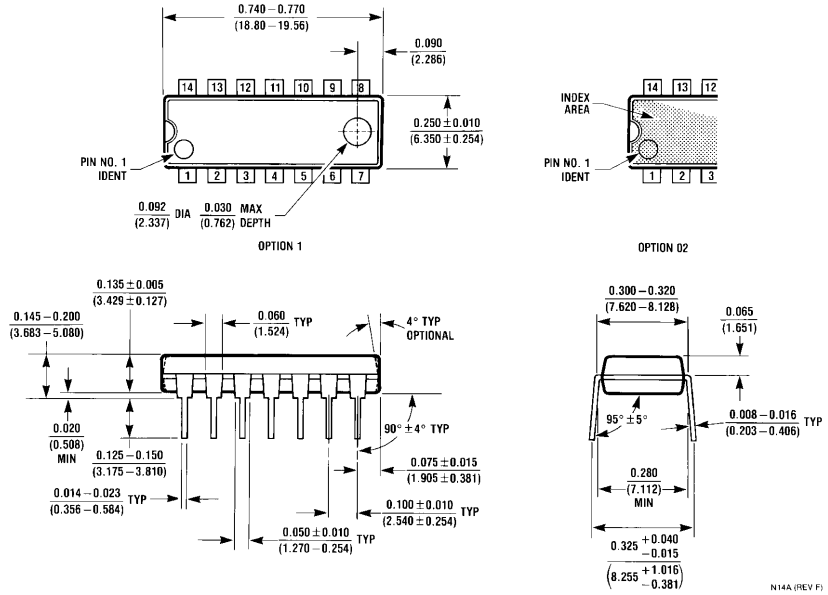
All drivers are DS75110A. Receivers are DS75107 or DS75108. Twisted-pair or coaxial transmission line should be used for minimum noise and cross talk. When only one driver in a package is being used, the outputs of the other driver should either be grounded or inhibited to reduce power dissipation.

FIGURE 5. Half-Duplex Operation

Physical Dimensions inches (millimeters) unless otherwise noted



Molded Surface Mount Package (M)
Order Number DS75110AM
NS Package Number M14A



Molded Dual-In-Line Package (N)
Order Number DS75110AN
NS Package Number N14A

Notes

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

National Semiconductor Corporation
Americas
Email: support@nsc.com

www.national.com

National Semiconductor Europe
Fax: +49 (0) 180-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 69 9508 6208
English Tel: +44 (0) 870 24 0 2171
Français Tel: +33 (0) 1 41 91 8790

National Semiconductor Asia Pacific Customer Response Group
Tel: 65-2544466
Fax: 65-2504466
Email: ap.support@nsc.com

National Semiconductor Japan Ltd.
Tel: 81-3-5639-7560
Fax: 81-3-5639-7507

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		
	TI E2E Community Home Page		e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265