

70-V Fault-Protected RS-485 Transceivers

FEATURES

- Bus-Pin Fault Protection to $> \pm 70$ V
- Operation With 3.3-V to 5-V Supply Range
- ± 16 kV HBM Protection on Bus Pins
- Reduced Unit Load for up to 320 Nodes
- Failsafe Receiver for Open-Circuit, Short-Circuit and Idle-Bus Conditions
- Low Power Consumption
 - Low Standby Supply Current, 1 μ A Max
 - I_{CC} 4 mA Quiescent During Operation
- Pin-Compatible With Industry-Standard SN75176

- Signaling Rates of 115 kbps, 1 Mbps, and up to 10 Mbps

APPLICATIONS

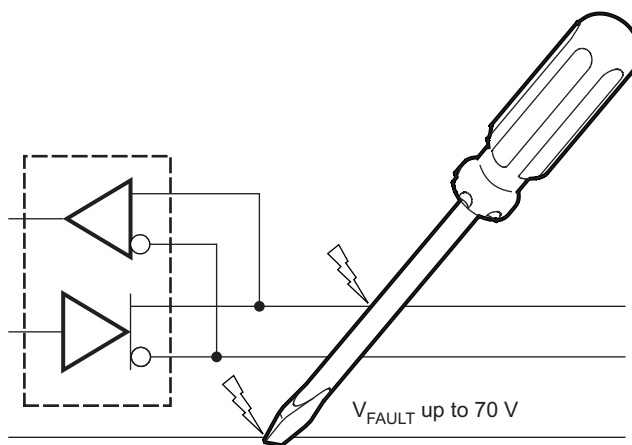
- HVAC Networks
- Security Electronics
- Building Automation
- Telecomm Equipment
- Motion Control
- Industrial Networks

DESCRIPTION

These devices are designed to survive overvoltage faults such as direct shorts to power supplies, mis-wiring faults, connector failures, cable crushes, and tool mis-applications. The internal current-limit circuits allow fault survivability without causing the high bus currents that otherwise might damage external components or power supplies. They are also robust to ESD events, with high levels of protection to the JEDEC or IEC human-body-model specification.

These devices combine a differential driver and a differential receiver, which operate from a single power supply. The driver differential outputs and the receiver differential inputs are connected internally to form a bus port suitable for half-duplex (two-wire bus) communication. This port features a wide common-mode voltage range, making the devices suitable for multipoint applications over long cable runs. These devices are characterized from -40°C to 125°C . These devices are pin-compatible with the industry-standard SN75176 transceiver, making them drop-in upgrades in most systems.

These devices are fully compliant with ANSI TIA/EIA 485-A with a 5-V supply and can operate with a 3.3-V supply with reduced driver output voltage for low-power applications. For applications where operation is required over an extended common-mode voltage range, see the SN65HVD1785 ([SLLS872](#)) data sheet.



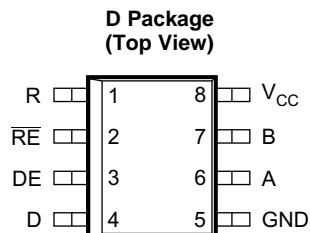
M0092-02



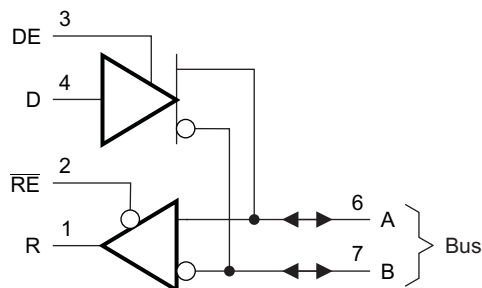
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.



LOGIC DIAGRAM (POSITIVE LOGIC)



S0299-02

DEVICE INFORMATION

DRIVER FUNCTION TABLE

Input	Enable	Outputs		Driver State
		A	B	
H	H	H	L	Actively drive bus High
L	H	L	H	Actively drive bus Low
X	L	Z	Z	Driver disabled ⁽¹⁾
X	OPEN	Z	Z	Driver disabled by default ⁽¹⁾
OPEN	H	H	L	Actively drive bus High by default

(1) When both the driver and receiver are disabled, the device enters a low-power standby mode.

RECEIVER FUNCTION TABLE

Differential Input	Enable	Output	Receiver State
$V_{ID} = V_A - V_B$	RE	R	
$V_{IT+} < V_{ID}$	L	H	Receive valid bus High
$V_{IT-} < V_{ID} < V_{IT+}$	L	?	Indeterminate bus state
$V_{ID} < V_{IT-}$	L	L	Receive valid bus Low
X	H	Z	Receiver disabled ⁽¹⁾
X	OPEN	Z	Receiver disabled by default ⁽¹⁾
Open-circuit bus	L	H	Fail-safe high output
Short-circuit bus	L	H	Fail-safe high output
Idle (terminated) bus	L	H	Fail-safe high output

(1) When both the driver and receiver are disabled, the device enters a low-power standby mode.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

	VALUE	UNIT
V _{CC} Supply voltage	–0.5 to 7	V
Voltage range at A and B inputs	–70 to 70	V
Input voltage range at any logic pin	–0.3 to V _{CC} + 0.3	V
Voltage input range, transient pulse, A and B, through 100 Ω	–70 to 70	V
Receiver output current	–24 to 24	mA
T _J Junction temperature	170	°C
Continuous total power dissipation	See Dissipation Rating Table	
IEC 60749-26 ESD (human-body model), bus terminals and GND	±16	kV
JEDEC Standard 22, Test Method A114 (human-body model), bus terminals and GND	±16	kV
JEDEC Standard 22, Test Method A114 (human-body model), all pins	±4	kV
JEDEC Standard 22, Test Method C101 (charged-device model), all pins	±2	kV
JEDEC Standard 22, Test Method A115 (machine model), all pins	±400	V

- (1) 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.

PACKAGE DISSIPATION RATINGS

PACKAGE ⁽¹⁾	JEDEC THERMAL MODEL	T _A < 25°C RATING	DERATING FACTOR ABOVE T _A = 25°C	T _A = 85°C RATING	T _A = 105°C RATING	T _A = 125°C RATING (3.3 V ONLY)
SOIC (D) 8-pin	High-K	905 mW	7.25 mW/°C	470 mW	325 mW	180 mW
	Low-K	516 mW	4.1 mW/°C	268 mW	186 mW	103 mW

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

RECOMMENDED OPERATING CONDITIONS

	MIN	NOM	MAX	UNIT
V _{CC} Supply voltage	3.15	5	5.5	V
V _I Input voltage at any bus terminal (separately or common mode) ⁽¹⁾	–7		12	V
V _{IH} High-level input voltage (driver, driver enable, and receiver enable inputs)	2		V _{CC}	V
V _{IL} Low-level input voltage (driver, driver enable, and receiver enable inputs)	0		0.8	V
V _{ID} Differential input voltage	–12		12	V
I _O Output current, driver	–60		60	mA
	–8		8	mA
R _L Differential load resistance	54	60		Ω
C _L Differential load capacitance		50		pF
1/t _{UI} Signaling rate	HVD1780		115	kbps
	HVD1781		1	Mbps
	HVD1782		10	
T _A Operating free-air temperature (See application section for thermal information)	5-V supply		–40	105
	3.3-V supply		–40	125
T _J Junction temperature	–40		150	°C

- (1) By convention, the least positive (most negative) limit is designated as minimum in this data sheet.

ELECTRICAL CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V _{OD}	Driver differential output voltage magnitude	R _L = 60 Ω, 4.75 V ≤ V _{CC} ≤ 375 Ω on each output to –7 V to 12 V Figure 1	T _A < 85°C	1.5			V
			T _A < 125°C	1.4			
		R _L = 54 Ω, 4.75 V ≤ V _{CC} ≤ 5.25 V	T _A < 85°C	1.7	2		
			T _A < 125°C	1.5			
		R _L = 54 Ω, 3.15 V ≤ V _{CC} ≤ 3.45 V		0.8	1		
		R _L = 100 Ω, 4.75 V ≤ V _{CC} ≤ 5.25 V	T _A < 85°C	2.2	2.5		
T _A < 125°C	2						
Δ V _{OD}	Change in magnitude of driver differential output voltage	R _L = 54 Ω		–50	0	50	mV
V _{OC(SS)}	Steady-state common-mode output voltage			1	V _{CC} /2	3	V
ΔV _{OC}	Change in differential driver output common-mode voltage			–50	0	50	mV
V _{OC(PP)}	Peak-to-peak driver common-mode output voltage	Center of two 27-Ω load resistors, See Figure 2			500		mV
C _{OD}	Differential output capacitance				23		pF
V _{IT+}	Positive-going receiver differential input voltage threshold				–100	–35	mV
V _{IT–}	Negative-going receiver differential input voltage threshold				–180	–150	
V _{HYS}	Receiver differential input voltage threshold hysteresis (V _{IT+} – V _{IT–})				30	50	
V _{OH}	Receiver high-level output voltage	I _{OH} = –8 mA		2.4	V _{CC} – 0.3		V
V _{OL}	Receiver low-level output voltage	I _{OL} = 8 mA	T _A < 85°C		0.2	0.4	V
			T _A < 125°C			0.5	
I _{I(LOGIC)}	Driver input, driver enable, and receiver enable input current			–50		50	μA
I _{OZ}	Receiver output high-impedance current	V _O = 0 V or V _{CC} , \overline{RE} at V _{CC}		–1		1	μA
I _{OS}	Driver short-circuit output current			–200		200	mA
I _{I(BUS)}	Bus input current (disabled driver)	V _{CC} = 3.15 to 5.5 V or V _{CC} = 0 V, DE at 0 V	V _I = 12 V		75	100	μA
			V _I = –7 V	–60	–40		
I _{CC}	Supply current (quiescent)	Driver and receiver enabled	DE = V _{CC} , RE = GND, no load		4	6	mA
		Driver enabled, receiver disabled	DE = V _{CC} , RE = V _{CC} , no load		3	5	
		Driver disabled, receiver enabled	DE = GND, RE = GND, no load		2	4	
		Driver and receiver disabled, standby mode	DE = GND, D = open, RE = V _{CC} , no load, T _A < 85°C		0.15	1	μA
			DE = GND, D = open, RE = V _{CC} , no load, T _A < 125°C			12	
			Supply current (dynamic)		See the Typical Characteristics section		

SWITCHING CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT	
DRIVER (HVD1780)								
t _r , t _f	Driver differential output rise/fall time	R _L = 54 Ω, C _L = 50 pF, See Figure 3		0.4	1.7	2.6	μs	
t _{PHL} , t _{PLH}	Driver propagation delay			0.8		2	μs	
t _{SK(P)}	Driver differential output pulse skew, t _{PHL} – t _{PLH}			20		250	ns	
t _{PHZ} , t _{PLZ}	Driver disable time		See Figure 4 and Figure 5	0.1		5	μs	
t _{PZH} , t _{PZL}	Driver enable time	Receiver enabled		0.2		3	μs	
		Receiver disabled		3		12		
DRIVER (HVD1781)								
t _r , t _f	Driver differential output rise/fall time	R _L = 54 Ω, C _L = 50 pF, See Figure 3		50		300	ns	
t _{PHL} , t _{PLH}	Driver propagation delay					200	ns	
t _{SK(P)}	Driver differential output pulse skew, t _{PHL} – t _{PLH}					25	ns	
t _{PHZ} , t _{PLZ}	Driver disable time		See Figure 4 and Figure 5			3	μs	
t _{PZH} , t _{PZL}	Driver enable time	Receiver enabled				300	ns	
		Receiver disabled				10	μs	
DRIVER (HVD1782)								
t _r , t _f	Driver differential output rise/fall time	R _L = 54 Ω, C _L = 50 pF	All V _{CC} and Temp			50	ns	
			V _{CC} > 4.5V and T < 105°C	3				30
t _{PHL} , t _{PLH}	Driver propagation delay		See Figure 3			50	ns	
t _{SK(P)}	Driver differential output pulse skew, t _{PHL} – t _{PLH}					10	ns	
t _{PHZ} , t _{PLZ}	Driver disable time		See Figure 4 and Figure 5			3	μs	
t _{PZH} , t _{PZL}	Driver enable time	Receiver enabled				300	ns	
		Receiver disabled				9	μs	
RECEIVER (ALL DEVICES UNLESS OTHERWISE NOTED)								
t _r , t _f	Receiver output rise/fall time	C _L = 15 pF, See Figure 6	All devices			4	15	ns
t _{PHL} , t _{PLH}	Receiver propagation delay time		HVD1780, HVD1781			100	200	ns
			HVD1782				80	
t _{SK(P)}	Receiver output pulse skew, t _{PHL} – t _{PLH}		HVD1780, HVD1781			6	20	ns
			HVD1782				5	
t _{PLZ} , t _{PHZ}	Receiver disable time	Driver enabled, See Figure 7				15	100	ns
t _{PZL(1)} , t _{PZH(1)} t _{PZL(2)} , t _{PZH(2)}	Receiver enable time	Driver enabled, See Figure 7				80	300	ns
		Driver disabled, See Figure 8				3	9	μs

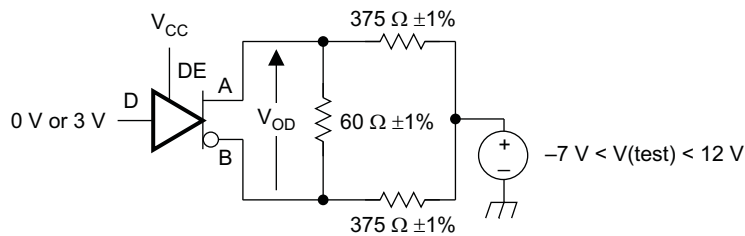
THERMAL INFORMATION

PARAMETER		TEST CONDITIONS	VALUE	UNIT
$R_{\theta JA}$ Junction-to-ambient thermal resistance (no airflow)	SOIC-8	JEDEC high-K model	138	°C/W
		JEDIC low-K model	242	
	DIP-8	JEDEC high-K model	59	
		JEDIC low-K model	128	
	SOIC-14	JEDEC high-K model	95	
		JEDIC low-K model	168	
$R_{\theta JB}$ Junction-to-board thermal resistance	SOIC-8		62	°C/W
	DIP-8		39	
	SOIC-14		40	
$R_{\theta JC}$ Junction-to-case thermal resistance	SOIC-8		61	°C/W
	DIP-8		61	
	SOIC-14		44	
P_D Power dissipation	$V_{CC} = 3.6V$, $T_J = 150^\circ C$, $R_L = 300 \Omega$, $C_L = 50 \text{ pF}$ (driver), $C_L = 15 \text{ pF}$ (receiver) 3.3-V supply, unterminated ⁽¹⁾		75	mW
	$V_{CC} = 3.6V$, $T_J = 150^\circ C$, $R_L = 100 \Omega$, $C_L = 50 \text{ pF}$ (driver), $C_L = 15 \text{ pF}$ (receiver) 3.3-V supply, RS-422 load ⁽¹⁾		95	
	$V_{CC} = 3.6V$, $T_J = 150^\circ C$, $R_L = 54 \Omega$, $C_L = 50 \text{ pF}$ (driver), $C_L = 15 \text{ pF}$ (receiver) 3.3-V supply, RS-485 load ⁽¹⁾		115	
	$V_{CC} = 5.5V$, $T_J = 150^\circ C$, $R_L = 300 \Omega$, $C_L = 50 \text{ pF}$ (driver), $C_L = 15 \text{ pF}$ (receiver) 5-V supply, unterminated ⁽¹⁾		290	
	$V_{CC} = 5.5V$, $T_J = 150^\circ C$, $R_L = 100 \Omega$, $C_L = 50 \text{ pF}$ (driver), $C_L = 15 \text{ pF}$ (receiver) 5-V supply, RS-422 load ⁽¹⁾		320	
	$V_{CC} = 5.5V$, $T_J = 150^\circ C$, $R_L = 54 \Omega$, $C_L = 50 \text{ pF}$ (driver), $C_L = 15 \text{ pF}$ (receiver) 5-V supply, RS-485 load ⁽¹⁾		400	
T_{SD} Thermal-shutdown junction temperature			170	°C

(1) Driver and receiver enabled, 50% duty cycle square-wave signal at signaling rate: 1 Mbps.

PARAMETER MEASUREMENT INFORMATION

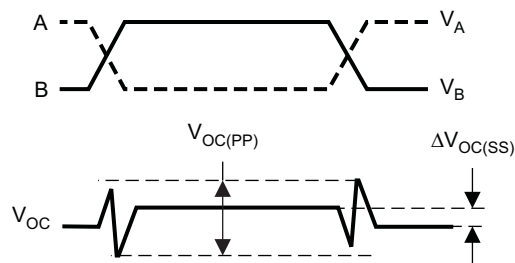
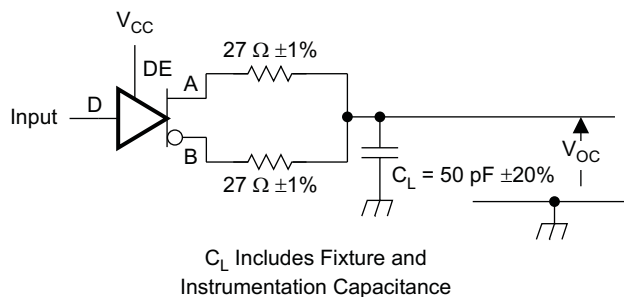
Input generator rate is 100 kbps, 50% duty cycle, rise and fall times less than 6 nsec, output impedance 50 Ω .



S0301-02

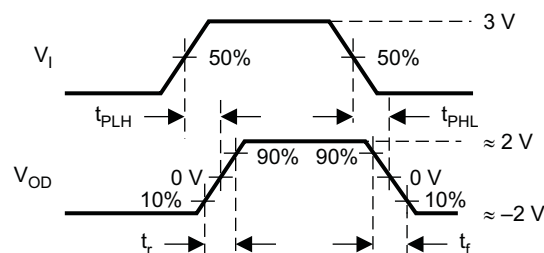
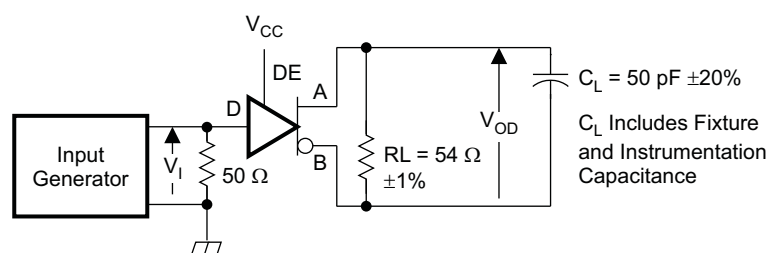
Figure 1. Measurement of Driver Differential Output Voltage With Common-Mode Load

PARAMETER MEASUREMENT INFORMATION (continued)



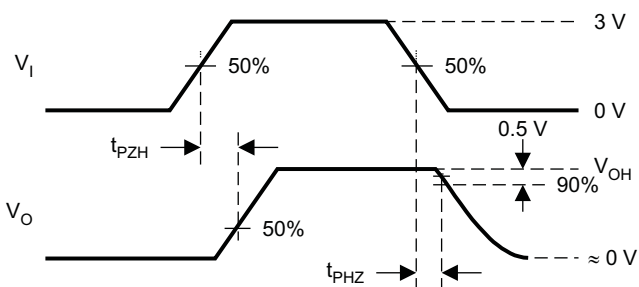
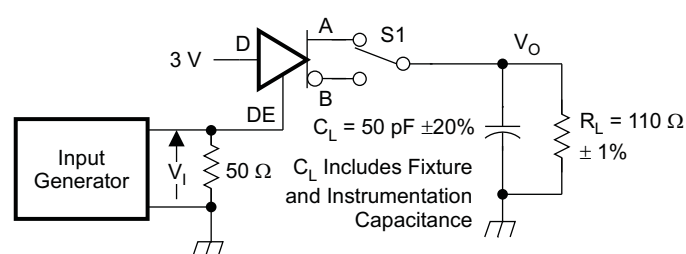
S0302-01

Figure 2. Measurement of Driver Differential and Common-Mode Output With RS-485 Load



S0303-01

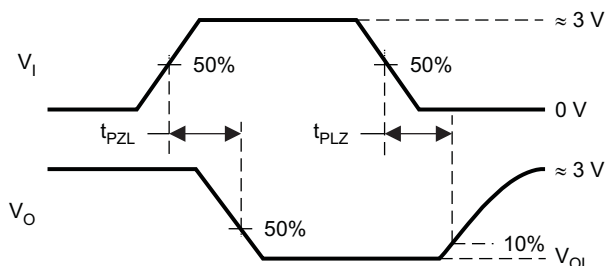
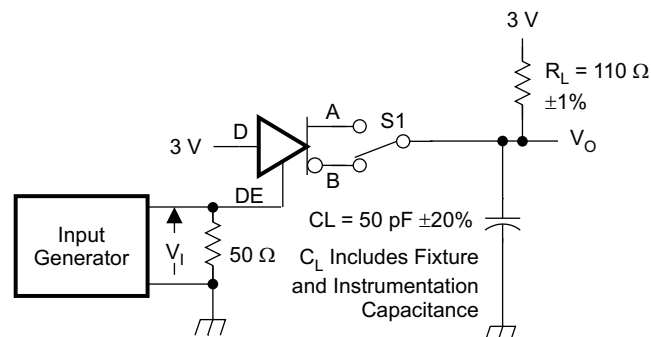
Figure 3. Measurement of Driver Differential Output Rise and Fall Times and Propagation Delays



S0304-01

NOTE: D at 3 V to test non-inverting output, D at 0 V to test inverting output.

Figure 4. Measurement of Driver Enable and Disable Times With Active High Output and Pulldown Load

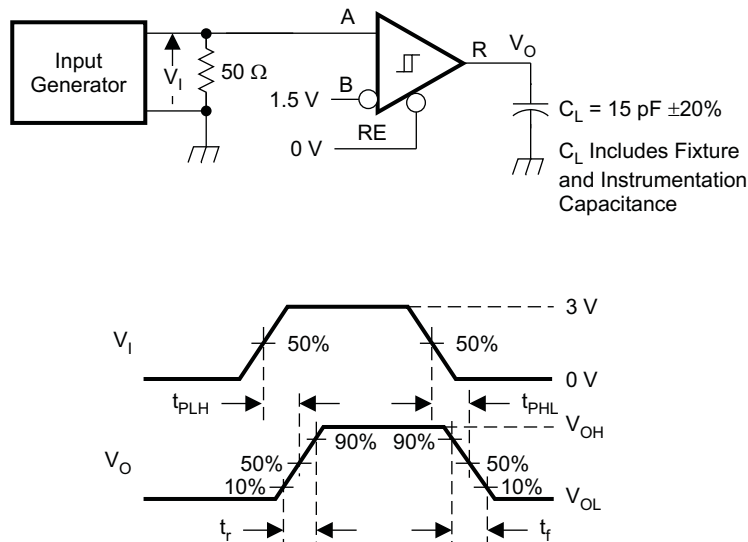


S0305-01

NOTE: D at 0 V to test non-inverting output, D at 3 V to test inverting output.

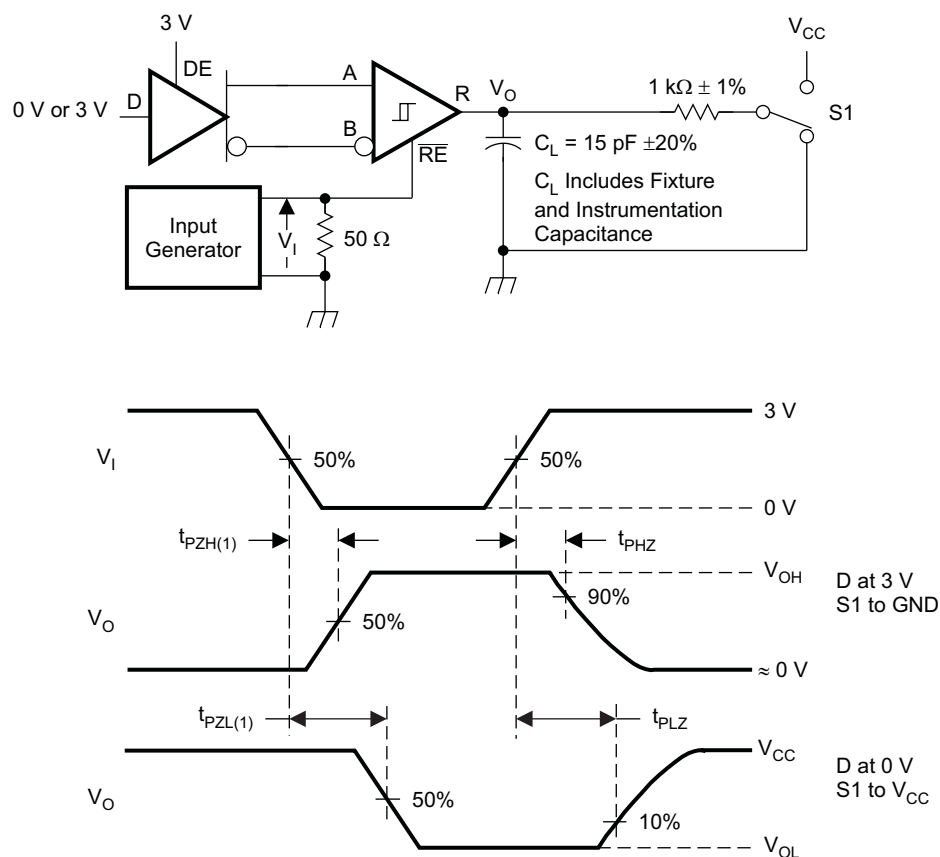
Figure 5. Measurement of Driver Enable and Disable Times With Active-Low Output and Pullup Load

PARAMETER MEASUREMENT INFORMATION (continued)



S0306-01

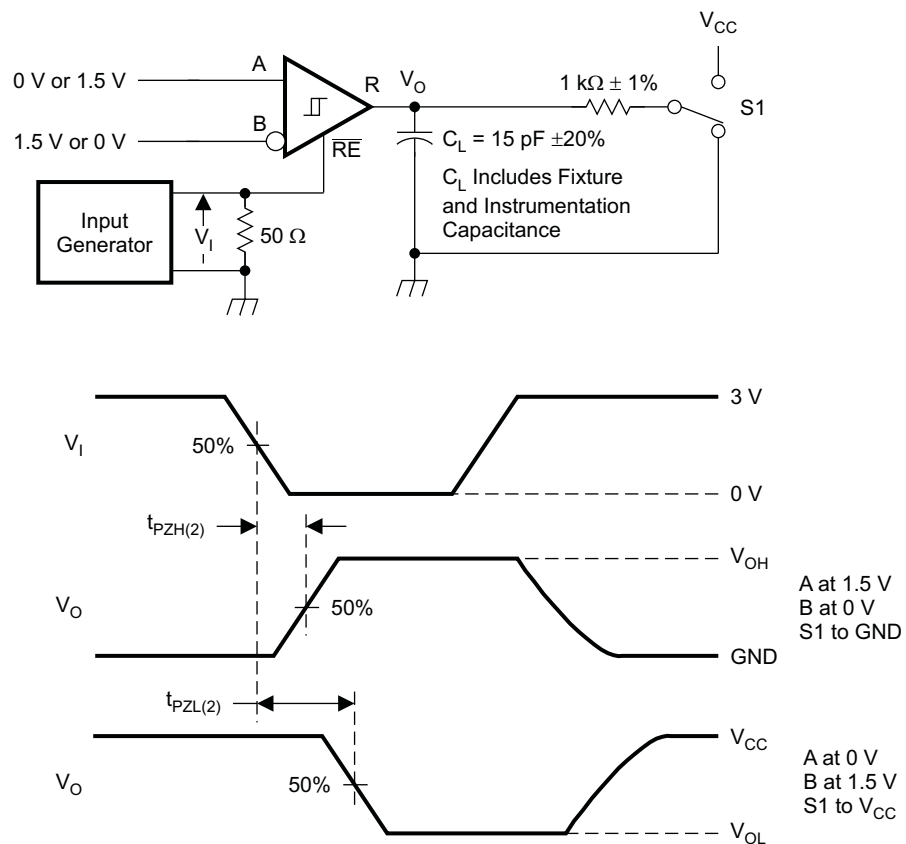
Figure 6. Measurement of Receiver Output Rise and Fall Times and Propagation Delays



S0307-01

Figure 7. Measurement of Receiver Enable/Disable Times With Driver Enabled

PARAMETER MEASUREMENT INFORMATION (continued)



S0308-01

Figure 8. Measurement of Receiver Enable Times With Driver Disabled

TYPICAL CHARACTERISTICS

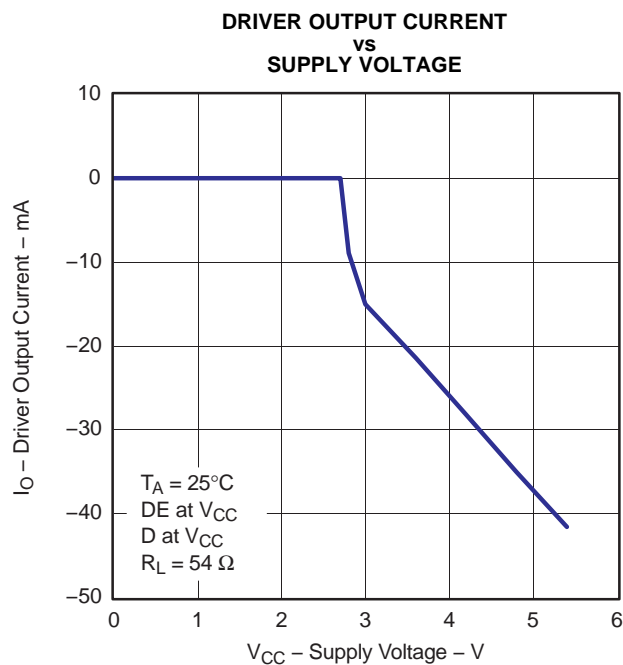


Figure 9.

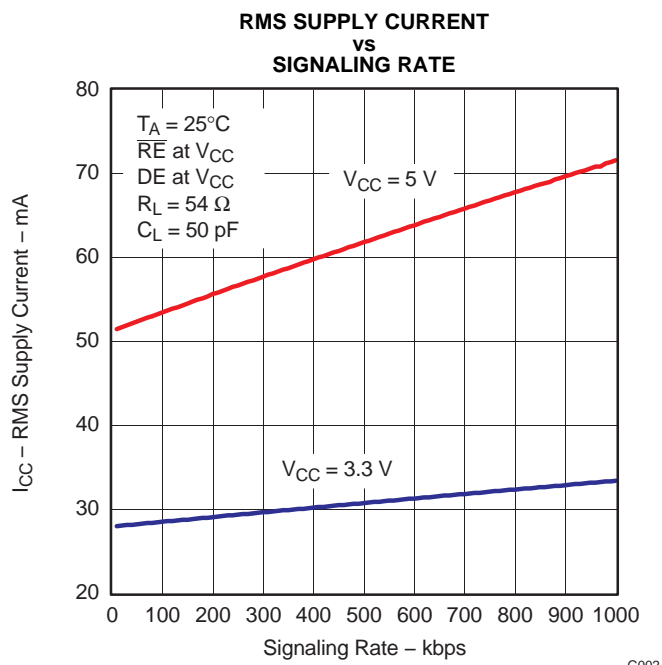


Figure 10.

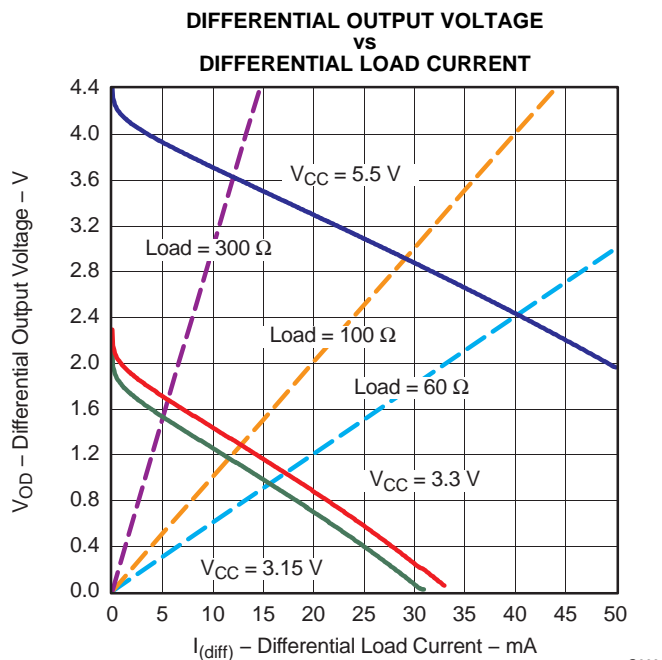


Figure 11.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN65HVD1781D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65HVD1781DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65HVD1781DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65HVD1781DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

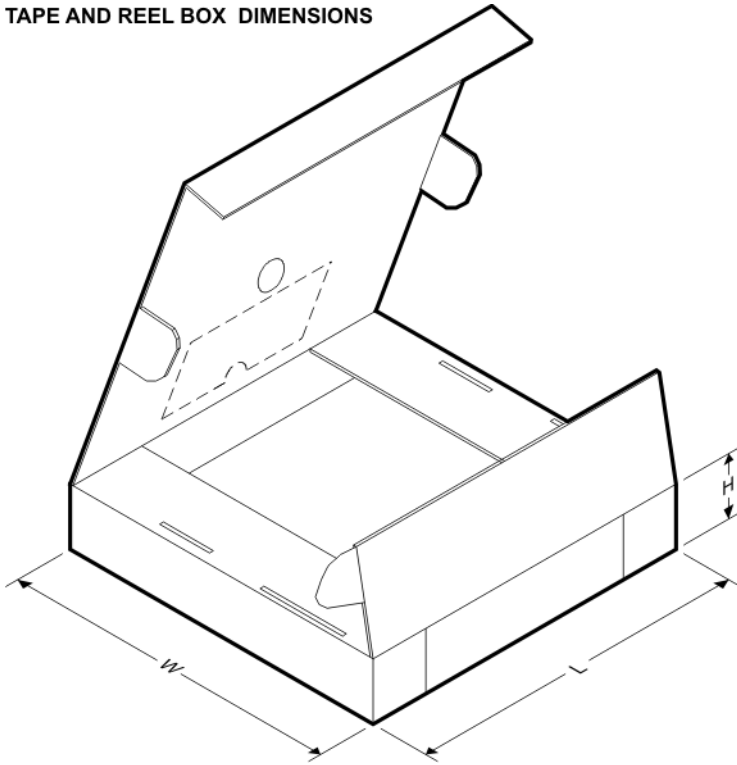
TAPE AND REEL INFORMATION



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN65HVD1781DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

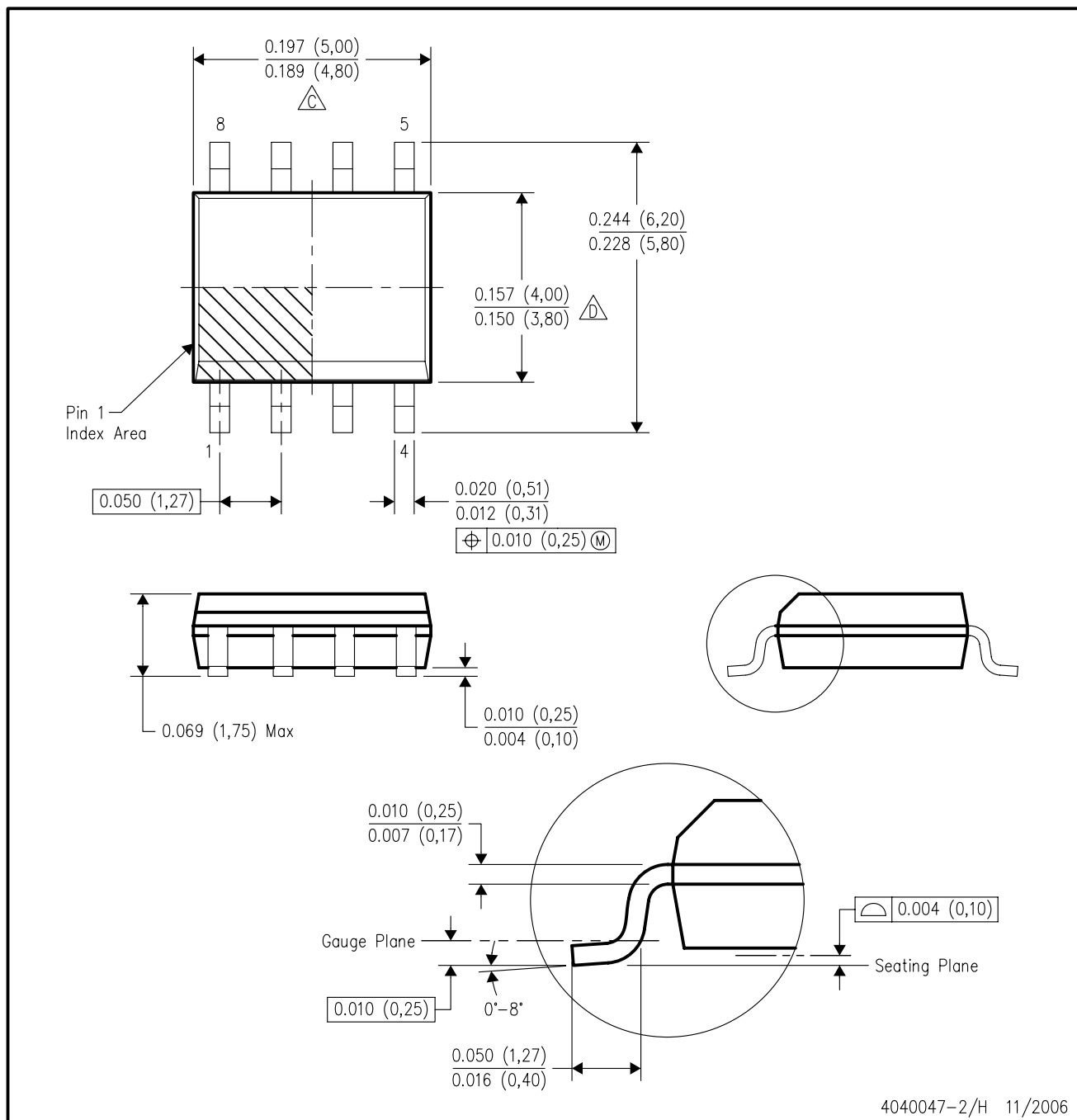


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65HVD1781DR	SOIC	D	8	2500	346.0	346.0	29.0

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



4040047-2/H 11/2006

NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AA.

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

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated