

DS14196 EIA/TIA-232 5 Driver x 3 Receiver

Check for Samples: [DS14196](#)

FEATURES

- Replaces Two 1488s and One 1489
- Conforms to EIA/TIA-232-E and ITU-T V.28
- 5 Drivers and 3 Receivers
- Flow-Through Pinout
- Failsafe Receiver Outputs High when Inputs Open
- 20-Pin Wide SOIC Package
- LapLink® Compatible—230.4 kbps Data Rate
- Pin Compatible with: SN75196, GD75323

DESCRIPTION

The DS14196 is a five driver, three receiver device which conforms to the EIA/TIA-232-E and the ITU-T V.28 standards.

The flow-through pinout facilitates simple non-crossover board layout. The DS14196 provides a peripheral side one-chip solution for the common 9-pin serial RS-232 interface between data terminals and data communications equipment.

The DS14196 offers optimum performance when used with the DS14185 3 x 5 Driver/Receiver, a host side one-chip solution for the common 9-pin serial RS-232 interface between data terminals and data communications equipment.

CONNECTION DIAGRAM

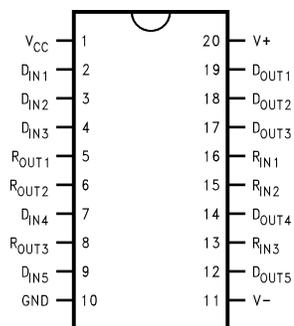
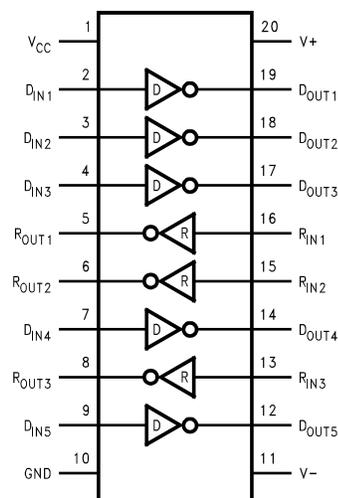


Figure 1. SOIC
See Package Number DW

FUNCTIONAL DIAGRAM



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.



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.

LapLink is a registered trademark of Travelling Software.
All other trademarks are the property of their respective owners.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾⁽²⁾

Supply Voltage (V_{CC})		+7V
Supply Voltage (V^+)		+15V
Supply Voltage (V^-)		-15V
Driver Input Voltage		0V to V_{CC}
Driver Output Voltage (Power Off)		± 15 V
Receiver Input Voltage		± 25 V
Receiver Output Voltage (R_{OUT})		0V to V_{CC}
Maximum Power Package Dissipation @ +25°C	DW Package	1524 mW
	Derate DW Package	12.2 mW/°C above 25°C
Storage Temperature Range		-65°C to +150°C
Lead Temperature Range (Soldering, 4 sec.)		+260°C
ESD Ratings (HBM, 1.5 k Ω , 100 pF)		≥ 1.5 kV

- (1) Absolute Maximum Ratings are those values beyond which the safety of the device cannot be ensured. They are not meant to imply that the devices should be operated at these limits. The table of Electrical Characteristics specifies conditions of device operation.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.

RECOMMENDED OPERATING CONDITIONS

	Min	Nom	Max	Units
Supply Voltage (V_{CC})	+4.75	+5.0	+5.25	V
Supply Voltage (V^+)	+9.0	+12.0	+13.2	V
Supply Voltage (V^-)	-13.2	-12.0	-9.0	V
Operating Free Air Temperature (T_A)	0	+25	+70	°C

ELECTRICAL CHARACTERISTICS⁽¹⁾⁽²⁾

Over recommended operating supply and temperature ranges unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DEVICE CHARACTERISTICS						
I_{CC}	V_{CC} Supply Current	No Load, All Inputs at +5V		13	22	mA
I^+	V^+ Supply Current	No Load, All Driver Inputs at 0.8V or +2V. All Receiver Inputs at 0.8V or 2.4V.		16	26	mA
			$V^+ = +9V, V^- = -9V$ $V^+ = +13.2V, V^- = -13.2V$		23	36
I^-	V^- Supply Current			-18	-26	mA
			$V^+ = +9V, V^- = -9V$ $V^+ = +13.2V, V^- = -13.2V$		-25	-36
DRIVER CHARACTERISTICS						
V_{IH}	High Level Input Voltage		2.0			V
V_{IL}	Low Level Input Voltage				0.8	V
I_{IH}	High Level Input Current	$V_{IN} = 5V$			10	μ A
I_{IL}	Low Level Input Current	$V_{IN} = 0V$		-1.1	-1.5	mA
V_{OH}	High Level Output Voltage	$R_L = 3\text{ k}\Omega, V_{IN} = 0.8V, V^+ = +9V, V^- = -9V$	6	7		V
		$R_L = 3\text{ k}\Omega, V_{IN} = 0.8V, V^+ = +12V, V^- = -12V$	8	9		V
		$R_L = 7\text{ k}\Omega, V_{IN} = 0.8V, V^+ = +13.2V, V^- = -13.2V$	10	11.5		V
V_{OL}	Low Level Output Voltage	$R_L = 3\text{ k}\Omega, V_{IN} = 2V, V^+ = +9V, V^- = -9V$		-7	-6	V
		$R_L = 3\text{ k}\Omega, V_{IN} = 2V, V^+ = +12V, V^- = -12V$		-10	-8	V
		$R_L = 7\text{ k}\Omega, V_{IN} = 2V, V^+ = +13.2V, V^- = -13.2V$		-11.5	-10	V

- (1) Current into device pins is defined as positive. Current out of the device pins is defined as negative. All voltages are referenced to ground unless otherwise specified. For current, minimum and maximum values are specified as an absolute value and the sign is used to indicate direction. For voltage logic levels, the more positive value is designated as maximum. For example, if -6V is a maximum, the typical value -6.8V is more negative.
- (2) All typicals are given for: $V_{CC} = +5V, V^+ = +12V, V^- = -12V, T_A = +25^\circ\text{C}$.

ELECTRICAL CHARACTERISTICS⁽¹⁾⁽²⁾ (continued)

Over recommended operating supply and temperature ranges unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_{OS+}	Output High Short Circuit Current ⁽³⁾	$V_{OUT} = 0V, V_{IN} = 0.8V$	-6	-12	-18	mA
I_{OS-}	Output Low Short Circuit Current ⁽³⁾	$V_{OUT} = 0V, V_{IN} = 2.0V$	6	12	18	mA
R_O	Output Resistance	$-2V \leq V_{OUT} \leq +2V, V^+ = V^- = V_{CC} = 0V$	300			Ω
		$-2V \leq V_{OUT} \leq +2V, V^+ = V^- = V_{CC} = \text{Open Circuit}$	300			Ω
RECEIVER CHARACTERISTICS						
V_{TH}	Input High Threshold (Recognized as a High Signal)	$V_{OUT} \leq 0.4V, I_O = 3.2 \text{ mA}$		1.85	2.4	V
V_{TL}	Input Low Threshold (Recognized as a Low Signal)	$V_{OUT} \geq 2.5V, I_O = -0.5 \text{ mA}$	0.7	1.0		V
R_{IN}	Input Resistance	$V_{IN} = \pm 3V \text{ to } \pm 15V$	3.0	3.8	7.0	k Ω
I_{IN}	Input Current	$V_{IN} = +15V$	2.1	4.0	5.0	mA
		$V_{IN} = +3V$	0.43	0.7	1.0	mA
		$V_{IN} = -15V$	-2.1	-4.0	-5.0	mA
		$V_{IN} = -3V$	-0.4 3	-0.7	-1.0	mA
V_{OH}	High Level Output Voltage ⁽⁴⁾	$I_{OH} = -0.5 \text{ mA}, V_{IN} = -3V$	2.6	4.0		V
		$I_{OH} = -10 \mu A, V_{IN} = -3V$	4.0	4.9		V
		$I_{OH} = -0.5 \text{ mA}, V_{IN} = \text{Open Circuit}$	2.6	4.0		V
		$I_{OH} = -10 \mu A, V_{IN} = \text{Open Circuit}$	4.0	4.9		V
V_{OL}	Low Level Output Voltage	$I_{OL} = 3.2 \text{ mA}, V_{IN} = +3V$		0.2	0.4	V
I_{OSR}	Short Circuit Current	$V_{OUT} = 0V, V_{IN} = 0V^{(5)}$	-1.7	-2.7	-4	mA

(3) Only one driver output shorted at a time.

(4) If receiver inputs are unconnected, receiver output is a logic high.

(5) Only one driver output shorted at a time.

SWITCHING CHARACTERISTICS⁽¹⁾⁽²⁾⁽³⁾

$T_A = 25^\circ\text{C}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DRIVER CHARACTERISTICS						
t_{PHL}	Propagation Delay High to Low	$R_L = 3 \text{ k}\Omega, C_L = 50 \text{ pF}$ (Figure 2, Figure 3)		60	350	ns
t_{PLH}	Propagation Delay Low to High			300	450	ns
t_r, t_f	Rise/Fall Time ⁽⁴⁾			40		ns
RECEIVER CHARACTERISTICS						
t_{PHL}	Propagation Delay High to Low	$R_L = 1.5 \text{ k}\Omega, C_L = 15 \text{ pF}$ (includes fixture plus probe), (Figure 4, Figure 5)		150	350	ns
t_{PLH}	Propagation Delay Low to High			240	350	ns
t_r	Rise Time			40	175	ns
t_f	Fall Time			40	100	ns

(1) All typicals are given for: $V_{CC} = +5V, V^+ = +12V, V^- = -12V, T_A = +25^\circ\text{C}$.

(2) Generator characteristics for driver input: $f = 64 \text{ kHz}$ (128 kbps), $t_r = t_f < 10 \text{ ns}$, $V_{IH} = 3V, V_{IL} = 0V$, duty cycle = 50%.

(3) Generator characteristics for receiver input: $f = 64 \text{ kHz}$ (128 kbps), $t_r = t_f = 200 \text{ ns}$, $V_{IH} = 3V, V_{IL} = -3V$, duty cycle = 50%.

(4) Refer to typical curves. Driver output slew rate is measured from the +3V to the -3V level on the output waveform. Inputs not under test are connected to V_{CC} or GND. Slew rate is determined by load capacitance. To comply with a 30 V/ μs maximum slew rate, a minimum load capacitance of 390 pF is recommended.

PARAMETER MEASUREMENT INFORMATION

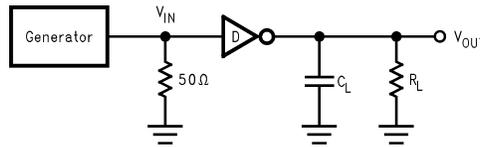


Figure 2. Driver Propagation Delay and Transition Time Test Circuit ⁽⁵⁾

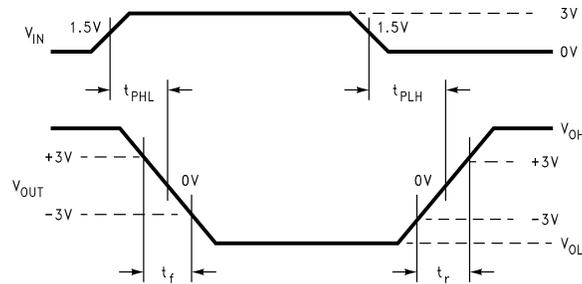


Figure 3. Driver Propagation Delay and Transition Time Waveforms Slew Rate (SR) = 6V/(tr or tf)

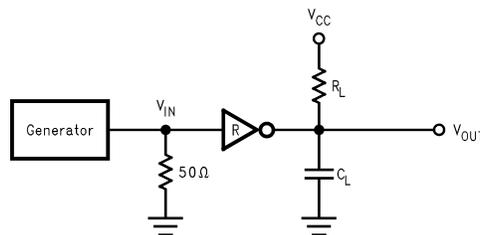


Figure 4. Receiver Propagation Delay and Transition Time Test Circuit ⁽⁶⁾

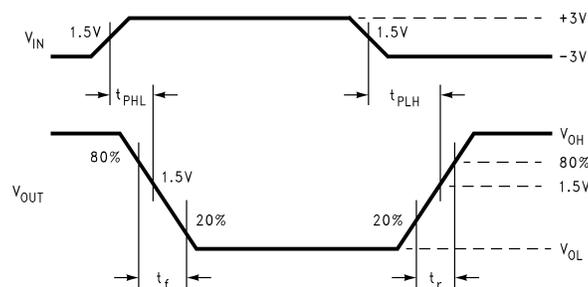


Figure 5. Receiver Propagation Delay and Transition Time Waveform

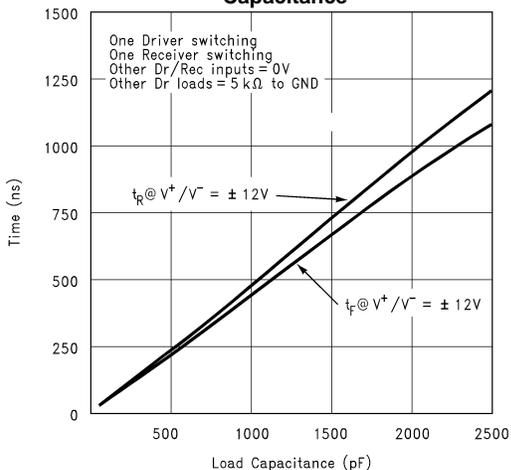
- (5) Generator characteristics for driver input: $f = 64$ kHz (128 kbps), $t_r = t_f < 10$ ns, $V_{IH} = 3V$, $V_{IL} = 0V$, duty cycle = 50%.
 (6) Generator characteristics for receiver input: $f = 64$ kHz (128 kbps), $t_r = t_f = 200$ ns, $V_{IH} = 3V$, $V_{IL} = -3V$, duty cycle = 50%.

PIN DESCRIPTIONS

Pin #	Pin Name	Description
2, 3, 4, 7, 9	D _{IN}	Driver Input Pins
12, 14, 17, 18, 19	D _{OUT}	Driver Output Pins, RS-232 Levels
13, 15, 16	R _{IN}	Receiver Input Pins, RS-232 Levels
5, 6, 8	R _{OUT}	Receiver Output Pins
10	GND	Ground
20	V ⁺	Positive Power Supply Pin (+9.0 ≤ V ⁺ ≤ +13.2)
11	V ⁻	Negative Power Supply Pin (-9.0 ≤ V ⁻ ≤ -13.2)
1	V _{CC}	Positive Power Supply Pin (+5V ±5%)

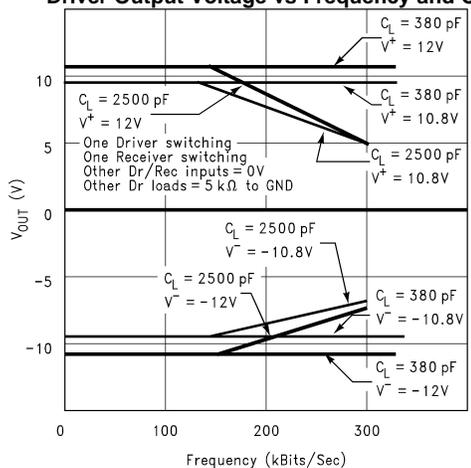
TYPICAL PERFORMANCE CHARACTERISTICS

Driver Output Slew Rate between +3V and -3V vs Load Capacitance



$V_{CC} = 5V$, $R_L = 5\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, $f_{IN} = 64\text{ kHz}$ Square Wave
Figure 6.

Driver Output Voltage vs Frequency and C_L



$V_{CC} = 5V$, $R_L = 5\text{ k}\Omega$, $T_A = 25^\circ\text{C}$
Figure 7.

Driver Output Current vs Output Voltage

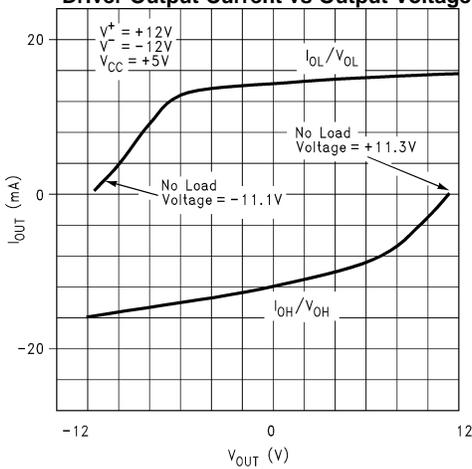


Figure 8.

APPLICATIONS INFORMATION

In a typical Data Terminal Equipment (DTE) to Data Circuit-Terminating Equipment (DCE) 9-pin de-facto interface implementation, 2 data lines and 6 control lines are required. The data lines are TXD and RXD. The control lines are RTS, DTR, DSR, DCD, CTS and RI.

The DS14196 is a 5 x 3 Driver/Receiver and offers a single chip solution for this DTE interface. As shown in Figure 9, this interface allows for direct flow-thru interconnect. For a more conservative design, the user may wish to insert ground traces between the signal lines to minimize cross talk.

FAILSAFE RECEIVER OUTPUTS

The DS14196 features failsafe receiver outputs. In failsafe mode, if the receiver input becomes zero or an open-circuit, the receiver output is pulled to a high level.

LapLink COMPATIBILITY

The DS14196 can easily provide 128 kbps data rate under maximum driver load conditions of $C_L = 2500 \text{ pF}$ and $R_L = 3 \text{ k}\Omega$, while power supplies are:

$$V_{CC} = +4.75\text{V}, V^+ = 10.8\text{V}, V^- = -10.8\text{V} \tag{1}$$

MOUSE DRIVING

A typical mouse can be powered from the drivers. Two driver outputs connected in parallel and set to V_{OH} can be used to supply power to the V^+ pin of the mouse. The third driver output is set to V_{OL} to sink the current from the V^- terminal. Refer to typical curves of V_{OUT}/I_{OUT} . Typical mouse specifications are:

$$10 \text{ mA at } +6\text{V} \quad 5 \text{ mA at } -6\text{V} \tag{2}$$

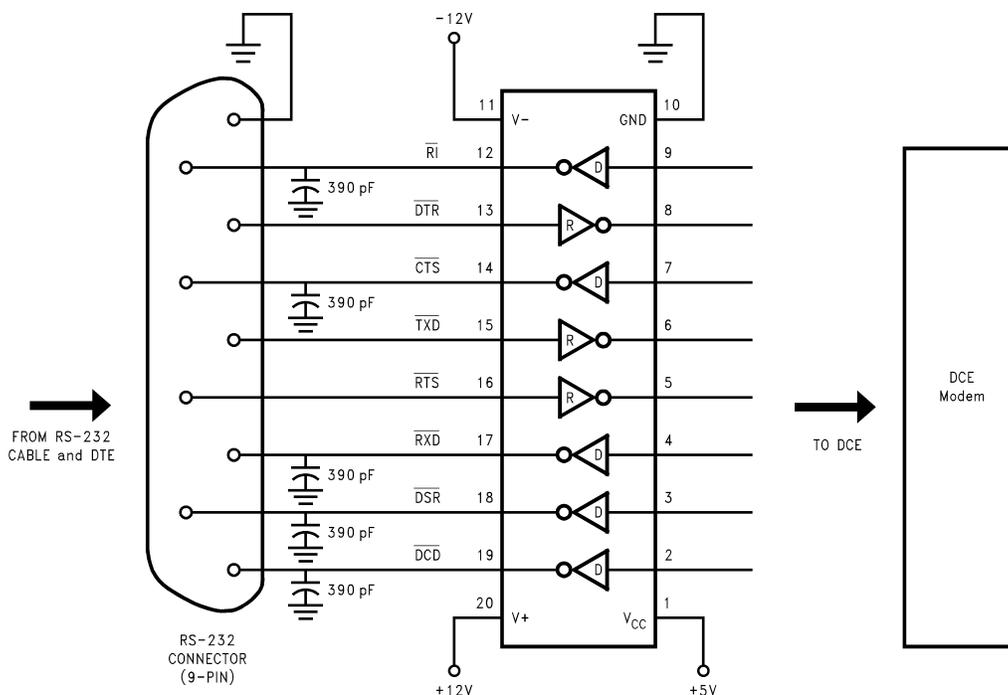
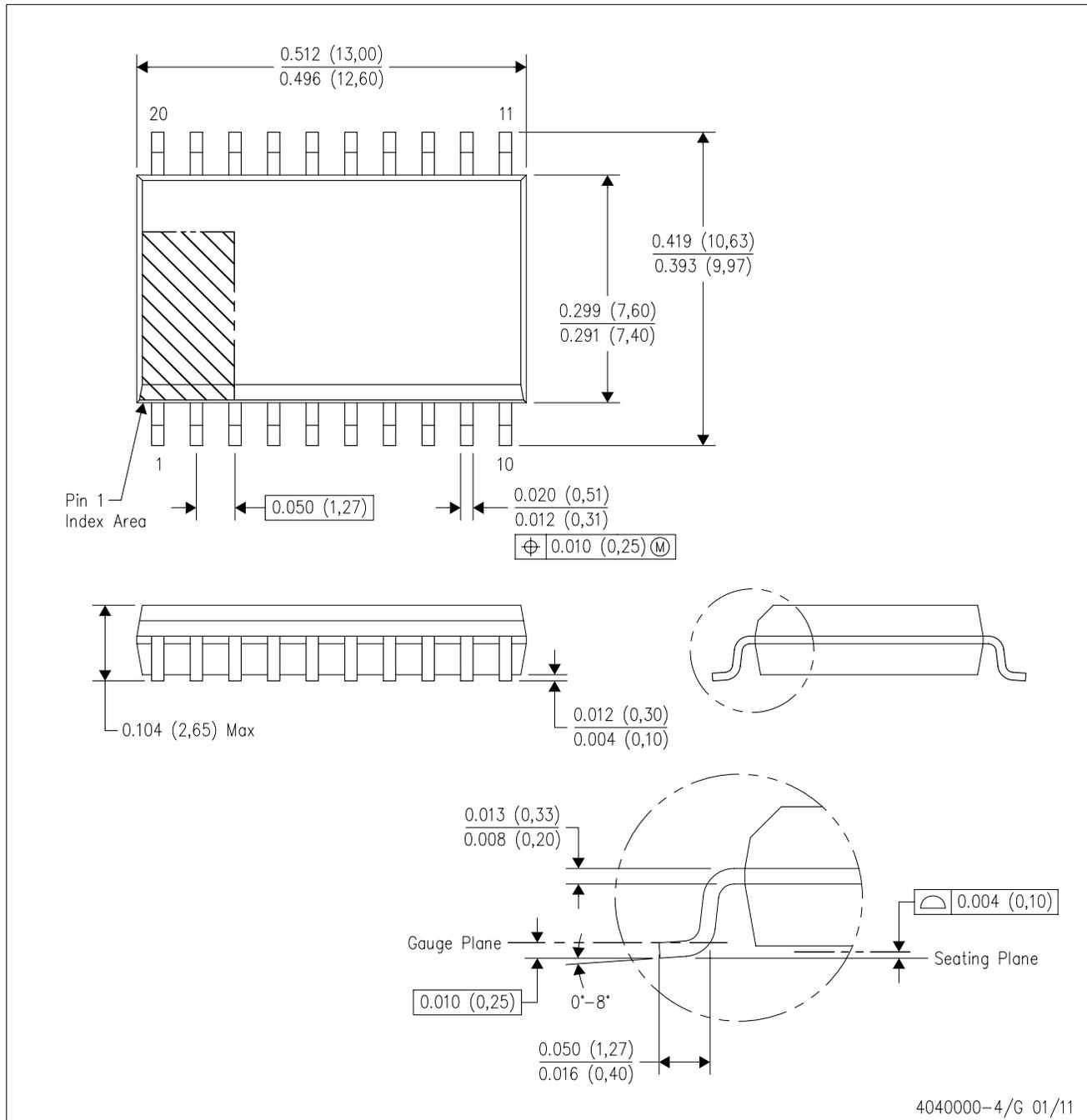


Figure 9. Typical DCE Application

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AC.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

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 relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.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
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com