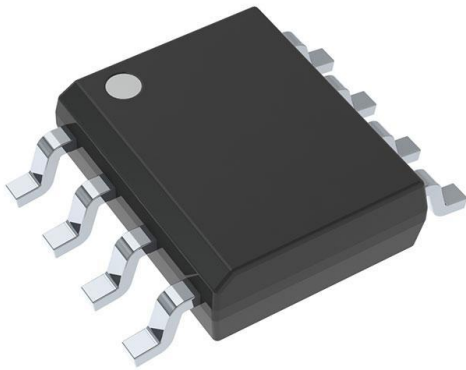


DS75176BTM Datasheet

www.digi-electronics.com



DS75176BTM

<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	DS75176BTM-DG
Manufacturer	Texas Instruments
Manufacturer Product Number	DS75176BTM
Description	IC TRANSCEIVER HALF 1/1 8SOIC
Detailed Description	1/1 Transceiver Half RS422, RS485 8-SOIC



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:

DS75176BTM

Series:

-

Type:

Transceiver

Number of Drivers/Receivers:

1/1

Receiver Hysteresis:

70 mV

Voltage - Supply:

4.75V ~ 5.25V

Mounting Type:

Surface Mount

Supplier Device Package:

8-SOIC

Manufacturer:

Texas Instruments

Product Status:

Obsolete

Protocol:

RS422, RS485

Duplex:

Half

Data Rate:

-

Operating Temperature:

-40°C ~ 85°C

Package / Case:

8-SOIC (0.154", 3.90mm Width)

Base Product Number:

DS75176

Environmental & Export classification

RoHS Status:

RoHS non-compliant

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

5A991B1

DS75176B/DS75176BT Multipoint RS-485/RS-422 Transceivers

Check for Samples: [DS75176B](#), [DS75176BT](#)

FEATURES

- Meets EIA Standard RS485 for Multipoint Bus Transmission and is Compatible with RS-422.
- Small Outline (SOIC) Package Option Available for Minimum Board Space.
- 22 ns Driver Propagation Delays.
- Single +5V Supply.
- -7V to +12V Bus Common Mode Range Permits $\pm 7V$ Ground Difference Between Devices on the Bus.
- Thermal Shutdown Protection.
- High Impedance to Bus with Driver in TRI-STATE or with Power Off, Over the Entire Common Mode Range Allows the Unused Devices on the Bus to be Powered Down.
- Pin Out Compatible with DS3695/A and SN75176A/B.
- Combined Impedance of a Driver Output and Receiver Input is Less Than One RS485 Unit Load, Allowing up to 32 Transceivers on the Bus.
- 70 mV Typical Receiver Hysteresis.

DESCRIPTION

The DS75176B is a high speed differential TRI-STATE[®] bus/line transceiver designed to meet the requirements of EIA standard RS485 with extended common mode range (+12V to -7V), for multipoint data transmission. In addition, it is compatible with RS-422.

The driver and receiver outputs feature TRI-STATE capability, for the driver outputs over the entire common mode range of +12V to -7V. Bus contention or fault situations that cause excessive power dissipation within the device are handled by a thermal shutdown circuit, which forces the driver outputs into the high impedance state.

DC specifications are guaranteed over the 0 to 70°C temperature and 4.75V to 5.25V supply voltage range.

Connection and Logic Diagram

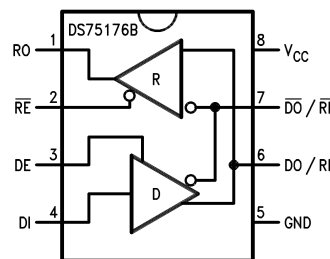


Figure 1. Top View
See Package Number P0008E or D0008A



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.

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DS75176B, DS75176BT

SNLS381C – JULY 1998 – REVISED APRIL 2013

www.ti.com**Absolute Maximum Ratings** ⁽¹⁾⁽²⁾

Supply Voltage, V_{CC}		7V
Control Input Voltages		7V
Driver Input Voltage		7V
Driver Output Voltages		+15V/ -10V
Receiver Input Voltages (DS75176B)		+15V/ -10V
Receiver Output Voltage		5.5V
Continuous Power Dissipation @ 25°C	for SOIC Package	675 mW ⁽³⁾
	for PDIP Package	900 mW ⁽⁴⁾
Storage Temperature Range		-65°C to +150°C
Lead Temperature (Soldering, 4 seconds)		260°C
ESD Rating (HBM)		500V

- (1) "Absolute Maximum Ratings" are those beyond which the safety of the device cannot be verified. They are not meant to imply that the device should be operated at these limits. The tables of "Electrical Characteristics" provide conditions for actual device operation.
- (2) If Military/Aerospace specified devices are required, please contact the TI Sales Office/Distributors for availability and specifications.
- (3) Derate linearly @ 6.11 mW/°C to 400 mW at 70°C.
- (4) Derate linearly at 5.56 mW/°C to 650 mW at 70°C.

Recommended Operating Conditions

	Min	Max	Units
Supply Voltage, V_{CC}	4.75	5.25	V
Voltage at Any Bus Terminal (Separate or Common Mode)	-7	+12	V
Operating Free Air Temperature T_A			
DS75176B	0	+70	°C
DS75176BT	-40	+85	°C
Differential Input Voltage, VID ⁽¹⁾	-12	+12	V

- (1) Differential - Input/Output bus voltage is measured at the noninverting terminal A with respect to the inverting terminal B.

Electrical Characteristics ^{(1) (2)}0°C ≤ T_A ≤ 70°C, 4.75V < V_{CC} < 5.25V unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{OD1}	Differential Driver Output Voltage (Unloaded)	$I_O = 0$			5	V
V_{OD2}	Differential Driver Output Voltage (with Load)	See (Figure 2)				
			R = 50Ω; (RS-422) ⁽³⁾	2		V
ΔV_{OD}	Change in Magnitude of Driver Differential Output Voltage For Complementary Output States	See (Figure 2)			0.2	V
V_{OC}	Driver Common Mode Output Voltage				3.0	V
$\Delta V_{OC} $	Change in Magnitude of Driver Common Mode Output Voltage For Complementary Output States				0.2	V

- (1) All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to device ground unless otherwise specified.
- (2) All typicals are given for $V_{CC} = 5V$ and $T_A = 25^\circ C$.
- (3) All worst case parameters for which this note is applied, must be increased by 10% for DS75176BT. The other parameters remain valid for $-40^\circ C < T_A < +85^\circ C$.

Electrical Characteristics ⁽¹⁾ ⁽²⁾ (continued)0°C ≤ T_A ≤ 70°C, 4.75V < V_{CC} < 5.25V unless otherwise specified

Symbol	Parameter		Conditions	Min	Typ	Max	Units
V _{IH}	Input High Voltage			2			V
V _{IL}	Input Low Voltage					0.8	
V _{CL}	Input Clamp Voltage					-1.5	
I _{IL}	Input Low Current		I _{IN} = -18 mA V _{IL} = 0.4V			-200	μA
I _{IH}	Input High Current		V _{IH} = 2.4V			20	μA
I _{IN}	Input Current	DO/RI, $\overline{DO}/\overline{RI}$	V _{CC} = 0V or 5.25V DE = 0V V _{IN} = 12V V _{IN} = -7V			+1.0 -0.8	mA mA
V _{TH}	Differential Input Threshold Voltage for Receiver		-7V ≤ V _{CM} ≤ +12V	-0.2		+0.2	V
ΔV _{TH}	Receiver Input Hysteresis		V _{CM} = 0V		70		mV
V _{OH}	Receiver Output High Voltage		I _{OH} = -400 μA	2.7			V
V _{OL}	Output Low Voltage	RO	I _{OL} = 16 mA ⁽³⁾			0.5	V
I _{OZR}	OFF-State (High Impedance) Output Current at Receiver		V _{CC} = Max 0.4V ≤ V _O ≤ 2.4V			±20	μA
R _{IN}	Receiver Input Resistance		-7V ≤ V _{CM} ≤ +12V	12			kΩ
I _{CC}	Supply Current		No Load ⁽³⁾ Driver Outputs Enabled Driver Outputs Disabled			55 35	mA mA
I _{OSD}	Driver Short-Circuit Output Current		V _O = -7V ⁽³⁾ V _O = +12V ⁽³⁾			-250 +250	mA mA
I _{OSR}	Receiver Short-Circuit Output Current		V _O = 0V	-15		-85	mA

Switching CharacteristicsV_{CC} = 5.0V, T_A = 25°C

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t _{PLH}	Driver Input to Output	R _{LDIFF} = 60Ω		12	22	ns
t _{PHL}	Driver Input to Output	C _{L1} = C _{L2} = 100 pF		17	22	ns
t _r	Driver Rise Time	R _{LDIFF} = 60Ω			18	ns
t _f	Driver Fall Time	C _{L1} = C _{L2} = 100 pF (Figure 4 and Figure 6)			18	ns
t _{ZH}	Driver Enable to Output High	C _L = 100 pF (Figure 5 and Figure 7) S1 Open		29	100	ns
t _{ZL}	Driver Enable to Output Low	C _L = 100 pF (Figure 5 and Figure 7) S2 Open		31	60	ns
t _{LZ}	Driver Disable Time from Low	C _L = 15 pF (Figure 5 and Figure 7) S2 Open		13	30	ns
t _{HZ}	Driver Disable Time from High	C _L = 15 pF (Figure 5 and Figure 7) S1 Open		19	200	ns
t _{PLH}	Receiver Input to Output	C _L = 15 pF (Figure 3 and Figure 8) S1 and S2 Closed		30	37	ns
t _{PHL}	Receiver Input to Output			32	37	ns
t _{ZL}	Receiver Enable to Output Low	C _L = 15 pF (Figure 3 and Figure 9) S2 Open		15	20	ns
t _{ZH}	Receiver Enable to Output High	C _L = 15 pF (Figure 3 and Figure 9) S1 Open		11	20	ns
t _{LZ}	Receiver Disable from Low	C _L = 15 pF (Figure 3 and Figure 9) S2 Open		28	32	ns
t _{HZ}	Receiver Disable from High	C _L = 15 pF (Figure 3 and Figure 9) S1 Open		13	35	ns

AC TEST CIRCUITS

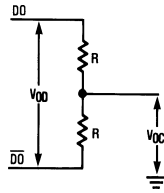
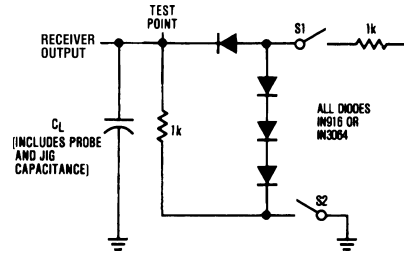


Figure 2.



Note: S1 and S2 of load circuit are closed except as otherwise mentioned.

Figure 3.

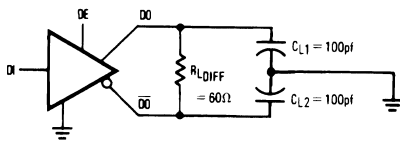
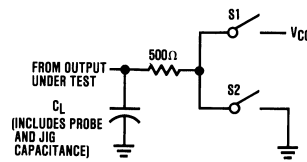


Figure 4.



Note: Unless otherwise specified the switches are closed.

Figure 5.

Switching Time Waveforms

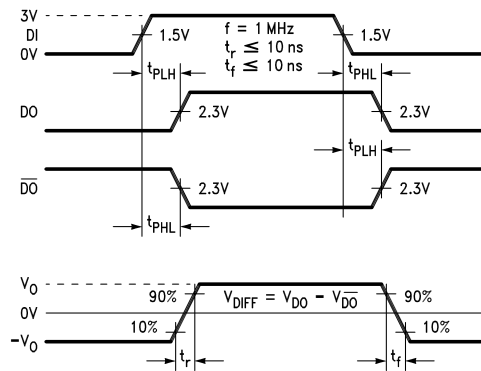


Figure 6. Driver Propagation Delays and Transition Times

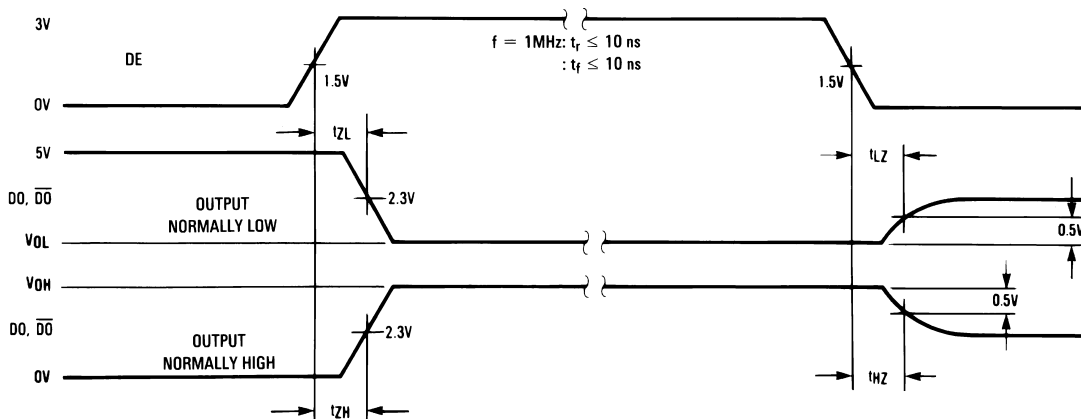
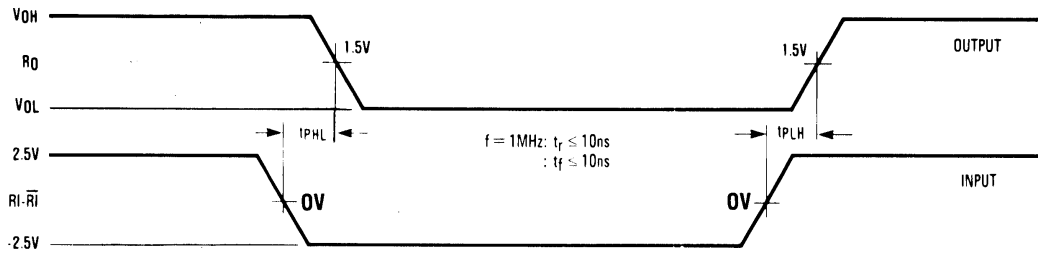


Figure 7. Driver Enable and Disable Times



Note: Differential input voltage may be realized by grounding $\overline{R1}$ and pulsing R1 between +2.5V and -2.5V

Figure 8. Receiver Propagation Delays

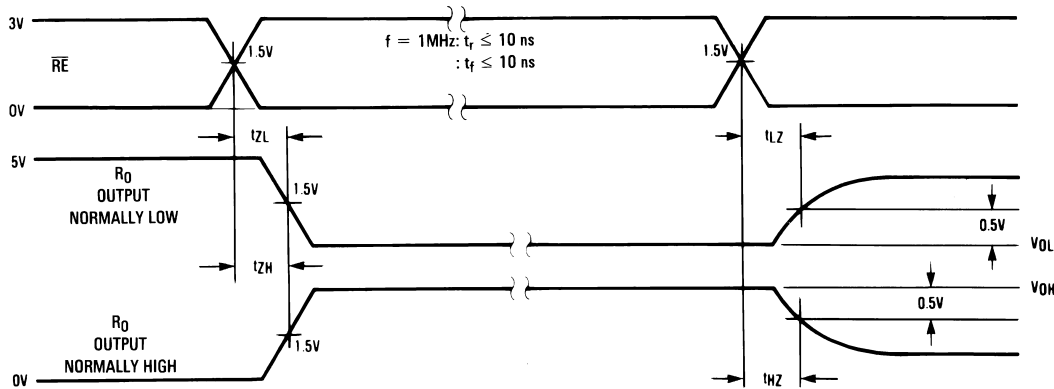


Figure 9. Receiver Enable and Disable Times

Function Tables

Table 1. DS75176B Transmitting⁽¹⁾

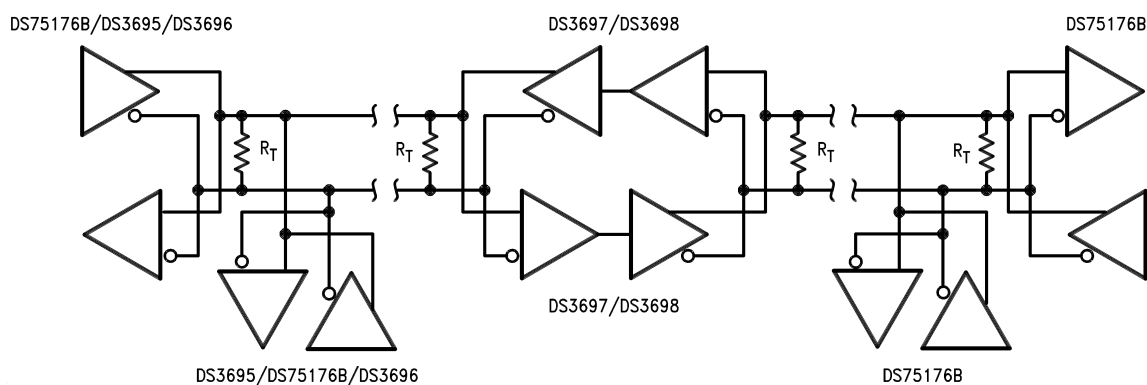
Inputs			Line Condition	Outputs	
$\overline{R1}$	DE	DI		$\overline{D0}$	D0
X	1	1	No Fault	0	1
X	1	0	No Fault	1	0
X	0	X	X	Z	Z
X	1	X	Fault	Z	Z

(1) X — Don't care condition
 Z — High impedance state
 Fault — Improper line conditions causing excessive power dissipation in the driver, such as shorts or bus contention situations
 **This is a fail safe condition

Table 2. DS75176B Receiving⁽¹⁾

Inputs			Outputs
\overline{RE}	DE	RI- \overline{RI}	RO
0	0	$\geq +0.2V$	1
0	0	$\leq -0.2V$	0
0	0	Inputs Open**	1
1	0	X	Z

- (1) X — Don't care condition
 Z — High impedance state
 Fault — Improper line conditions causing excessive power dissipation in the driver, such as shorts or bus contention situations
 **This is a fail safe condition

TYPICAL APPLICATION

REVISION HISTORY

Changes from Revision B (April 2013) to Revision C	Page
• Changed layout of National Data Sheet to TI format	6

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DS75176BM	LIFEBUY	SOIC	D	8	95	TBD	Call TI	Call TI	0 to 70	DS75176BM	
DS75176BM/NOPB	LIFEBUY	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	DS75176BM	
DS75176BMX	LIFEBUY	SOIC	D	8	2500	TBD	Call TI	Call TI	0 to 70	DS75176BM	
DS75176BMX/NOPB	LIFEBUY	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	DS75176BM	
DS75176BN/NOPB	LIFEBUY	PDIP	P	8	40	Green (RoHS & no Sb/Br)	CU SN	Level-1-NA-UNLIM	0 to 70	DS75176BN	
DS75176BTM	LIFEBUY	SOIC	D	8	95	TBD	Call TI	Call TI	-40 to 85	DS75176BTM	
DS75176BTM/NOPB	LIFEBUY	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	DS75176BTM	
DS75176BTMX	LIFEBUY	SOIC	D	8	2500	TBD	Call TI	Call TI	-40 to 85	DS75176BTM	
DS75176BTMX/NOPB	LIFEBUY	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	DS75176BTM	
DS75176BTN/NOPB	LIFEBUY	PDIP	P	8	40	Green (RoHS & no Sb/Br)	CU SN	Level-1-NA-UNLIM	-40 to 85	DS75176BTN	

(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.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

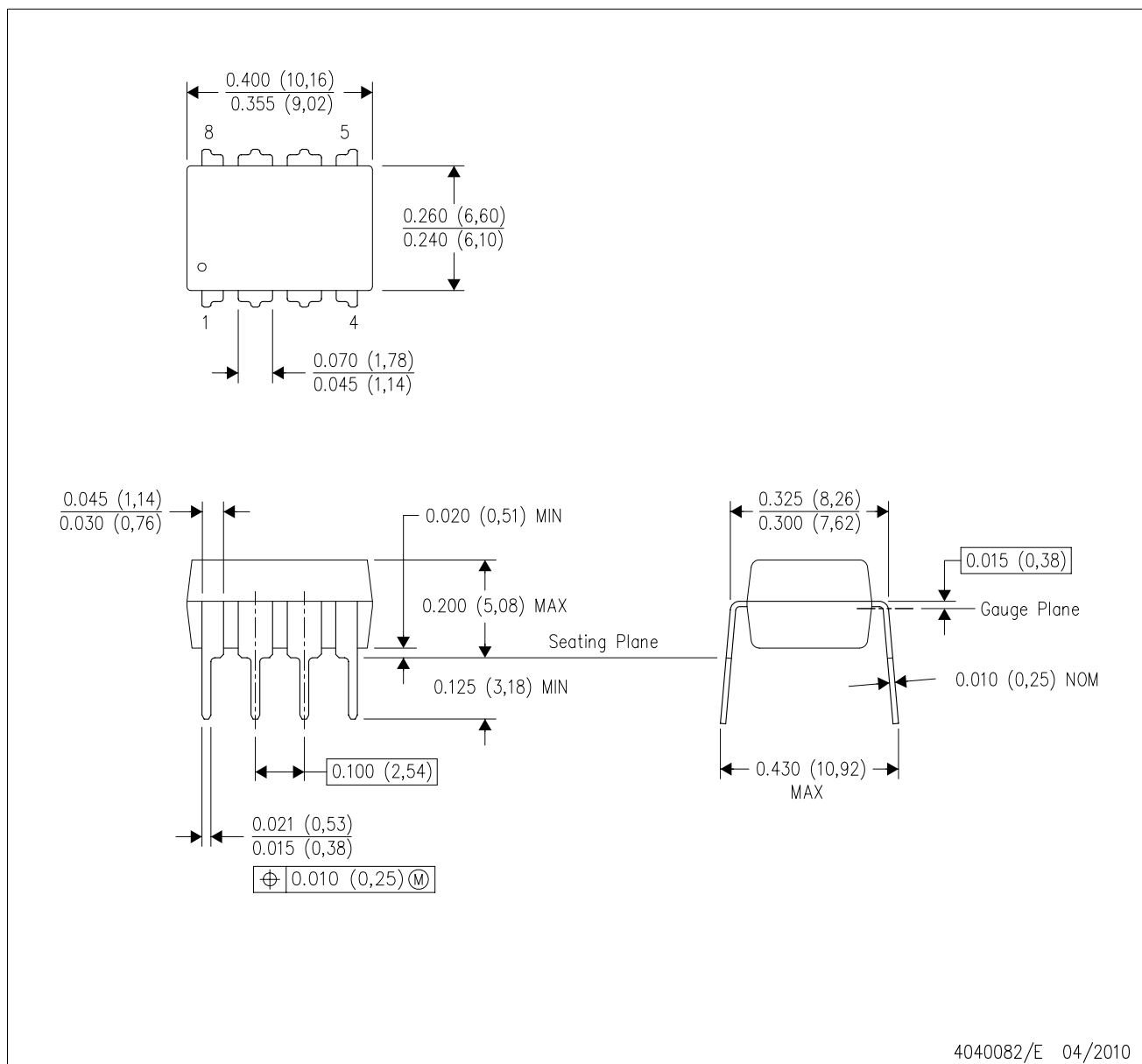
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MECHANICAL DATA

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Falls within JEDEC MS-001 variation BA.

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