- **Meets or Exceeds the Requirements of ANSI Standards EIA/TIA-422-B and EIA/TIA-423-B and ITU Recommendations V.10 and V.11**
- **3-State, TTL-Compatible Outputs**
- **Fast Transition Times**
- **Operates From Single 5-V Supply**
- **Designed to Be Interchangeable With Motorola™ MC3486**

D, N, OR NS PACKAGE
(TOP VIEW)

1B	1	16	V_{CC}
1A	2	15	4B
1Y	3	14	4A
1,2EN	4	13	4Y
2Y	5	12	3,4EN
2A	6	11	3Y
2B	7	10	3A
GND	8	9	3B
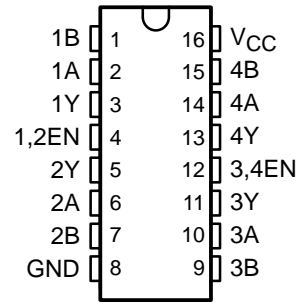
description

The MC3486 is a monolithic quadruple differential line receiver designed to meet the specifications of ANSI Standards TIA/EIA-422-B and TIA/EIA-423-B and ITU Recommendations V.10 and V.11. The MC3486 offers four independent differential-input line receivers that have TTL-compatible outputs. The outputs utilize 3-state circuitry to provide a high-impedance state at any output when the appropriate output enable is at a low logic level.

The MC3486 is designed for optimum performance when used with the MC3487 quadruple differential line driver. It is supplied in a 16-pin package and operates from a single 5-V supply.

The MC3486 is characterized for operation from 0°C to 70°C.

AVAILABLE OPTIONS

	PACKAGED DEVICES	
T_A	PLASTIC SMALL OUTLINE (D, NS)	PLASTIC DIP (N)
0°C to 70°C	MC3486D MC3486NS	MC3486N

The D package is available taped and reeled. Add the suffix R to the device type (e.g., MC3486DR). The NS package is only available taped and reeled.

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.

Motorola is a trademark of Motorola, Incorporated.

TEXAS INSTRUMENTS

FUNCTION TABLE
(each receiver)

DIFFERENTIAL INPUTS A–B	ENABLE	OUTPUT Y
$V_{ID} \leq 0.2$ V	H	H
-0.2 V $< V_{ID} < 0.2$ V	H	?
$V_{ID} \leq -0.2$ V	H	L
Irrelevant	L	Z
Open	H	?

H = high level, L = low level, Z = high impedance (off),
? = indeterminate

logic diagram (positive logic)
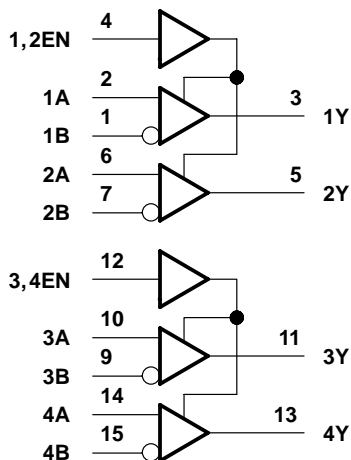
schematics of inputs and outputs

| EQUIVALENT OF EACH INPUT EXCEPT OUTPUT ENABLE | EQUIVALENT OF OUTPUT ENABLE | TYPICAL OF ALL OUTPUTS |

TEXAS INSTRUMENTS

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

Supply voltage, V_{CC} (see Note 1)	8 V
Input voltage, V_I (A or B inputs)	±15 V
Differential input voltage, V_{ID} (see Note 2)	±25 V
Enable input voltage	8 V
Low-level output current, I_{OL}	50 mA
Package thermal impedance, θ_{JA} (see Note 3): D package	73°C/W
N package	67°C/W
NS package	67°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, T_{stg}	−65°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.

NOTES: 1. All voltage values, except differential-input voltage, are with respect to network ground terminal.
2. Differential-input voltage is measured at the noninverting input with respect to the corresponding inverting input.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.75	5	5.25	V
V_{IC}	Common-mode input voltage			±7	V
V_{ID}	Differential input voltage			±6	V
V_{IH}	High-level enable input voltage	2			V
V_{IL}	Low-level enable input voltage			0.8	V
T_A	Operating free-air temperature	0		70	°C

**TEXAS
INSTRUMENTS**

electrical characteristics over recommended ranges of common-mode input voltage, supply voltage, and operating free-air temperature (unless otherwise noted)

	PARAMETER	TEST CONDITIONS			MIN	MAX	UNIT
V_{IT+}	Differential input high-threshold voltage	V_O = 2.7 V,	I_O = −0.4 mA			0.2	V
V_{IT-}	Differential input low-threshold voltage	V_O = 0.5 V,	I_O = −8 mA		−0.2†		V
V_{IK}	Enable-input clamp voltage	I_I = −10 mA				−1.5	V
V_{OH}	High-level output voltage	V_{ID} = 0.4 V, I_O = −0.4 mA, See Note 4 and Figure 1			2.7		V
V_{OL}	Low-level output voltage	V_{ID} = −0.4 V, I_O = 8 mA, See Note 4 and Figure 1				0.5	V
I_{OZ}	High-impedance-state output current	V_{IL} = 0.8 V,	V_{ID} = −3 V,	V_O = 2.7 V		40	µA
		V_{IL} = 0.8 V,	V_{ID} = 3 V,	V_O = 0.5 V		−40	
I_{IB}	Differential-input bias current	V_{CC} = 0 V or 5.25 V, Other inputs at 0 V	V_I = −10 V			−3.25	mA
			V_I = −3 V			−1.5	
			V_I = 3 V			1.5	
			V_I = 10 V			3.25	
I_{IH}	High-level enable input current	V_I = 5.25 V				100	µA
		V_I = 2.7 V				20	
I_{IL}	Low-level enable input current	V_I = −0.5 V				−100	µA
I_{OS}	Short-circuit output current	V_{ID} = 3 V,	V_O = 0,	See Note 5	−15	−100	mA
I_{CC}	Supply current	V_{IL} = 0				85	mA

† The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet for threshold voltages only.

NOTES: 4. Refer to ANSI Standards TIA/EIA-422-B and TIA/EIA-423-B for exact conditions.
        5. Only one output should be shorted at a time.

switching characteristics, V_{CC} = 5 V, C_L = 15 pF, T_A = 25°C

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation delay time, high- to low-level output	See Figure 2		28	35	ns
t_{PLH}	Propagation delay time, low- to high-level output			27	30	ns
t_{PZH}	Output enable time to high level	See Figure 3		13	30	ns
t_{PZL}	Output enable time to low level			20	30	ns
t_{PHZ}	Output disable time from high level			26	35	ns
t_{PLZ}	Output disable time from low level			27	35	ns

TEXAS
INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

PARAMETER MEASUREMENT INFORMATION

Figure 1. V_{OH}, V_{OL}
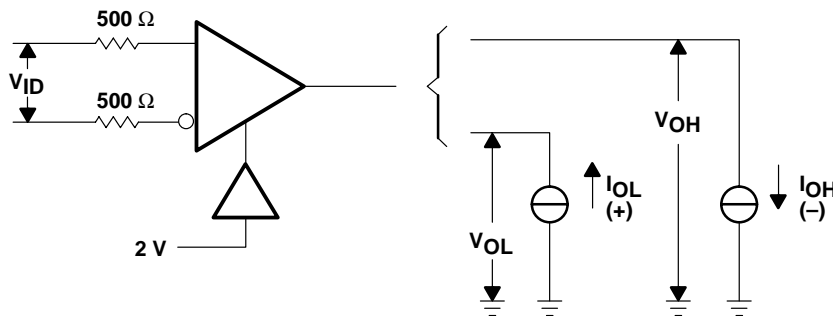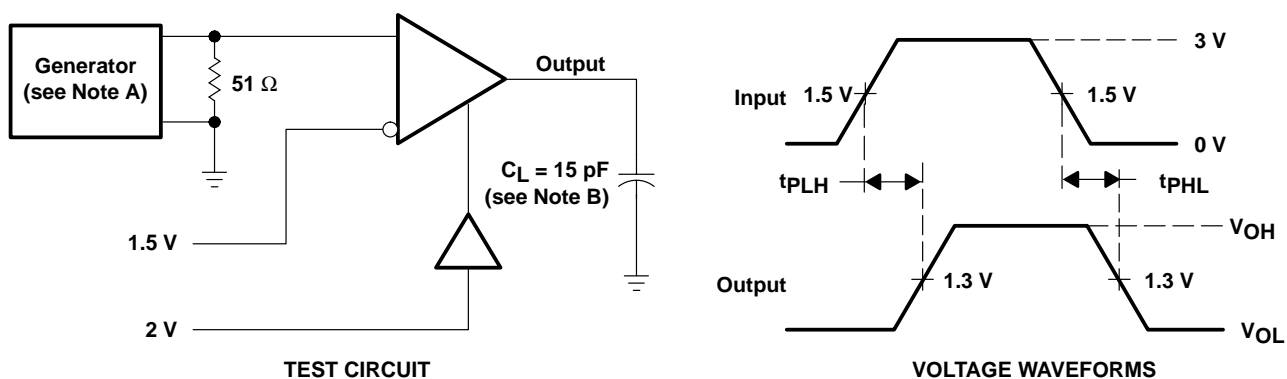
TEST CIRCUIT

VOLTAGE WAVEFORMS
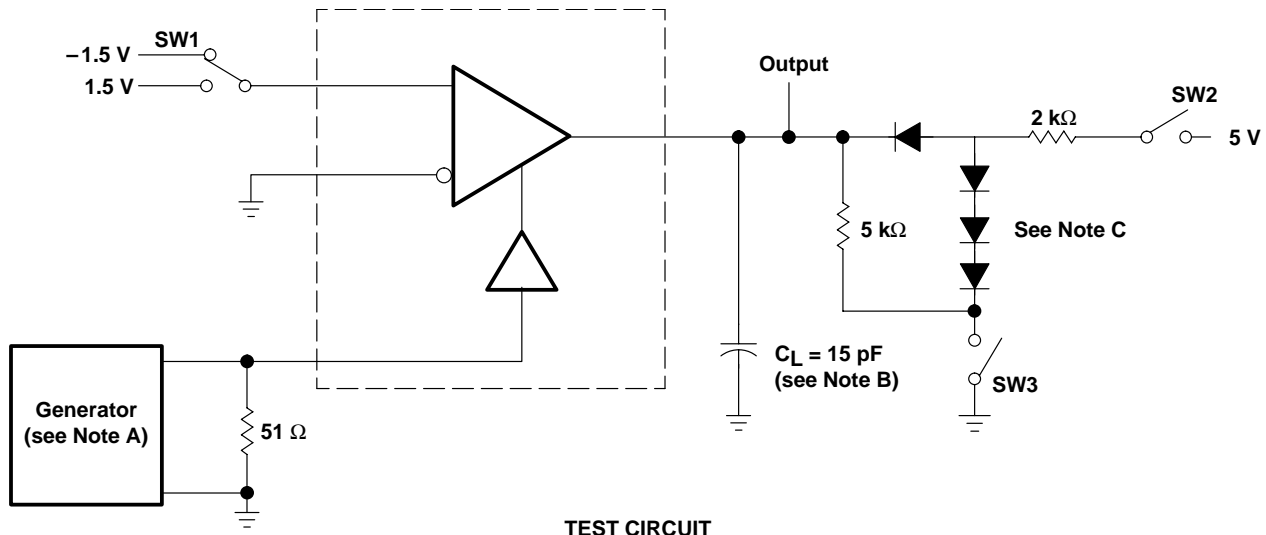
NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 1 MHz, duty cycle = 50%, t_r ≤ 6 ns, t_f ≤ 6 ns.
B. C_L includes probe and stray capacitance.
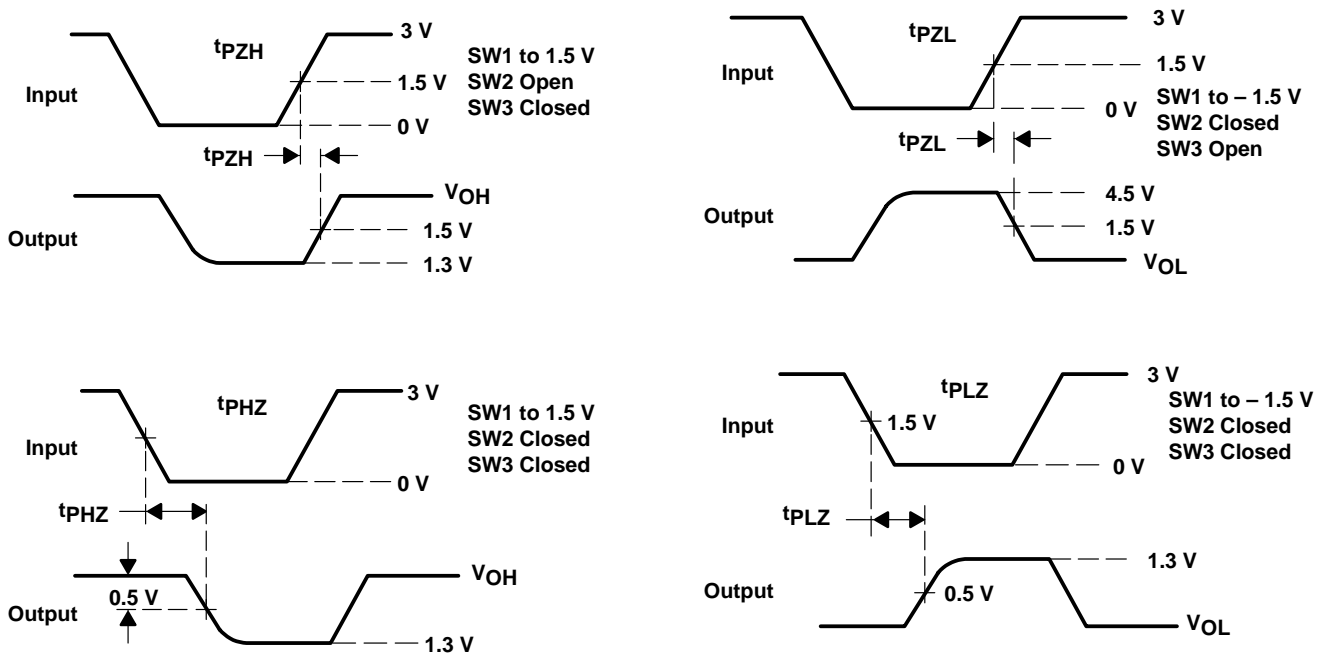
Figure 2. Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION

TEST CIRCUIT

Input / **Output** waveforms:

t_{PZH} — SW1 to 1.5 V, SW2 Open, SW3 Closed (Input: 3 V, 1.5 V, 0 V; Output: V_{OH}, 1.5 V, 1.3 V)

t_{PZL} — SW1 to −1.5 V, SW2 Closed, SW3 Open (Input: 3 V, 1.5 V, 0 V; Output: 4.5 V, 1.5 V, V_{OL})

t_{PHZ} — SW1 to 1.5 V, SW2 Closed, SW3 Closed (Input: 3 V, 0 V; Output: V_{OH}, 0.5 V, 1.3 V)

t_{PLZ} — SW1 to −1.5 V, SW2 Closed, SW3 Closed (Input: 3 V, 1.5 V, 0 V; Output: 1.3 V, 0.5 V, V_{OL})

Test circuit: −1.5 V / 1.5 V through SW1; Output with $C_L = 15\ pF$ (see Note B); 5 kΩ; 2 kΩ to SW2 5 V; See Note C; SW3; Generator (see Note A) with 51 Ω.

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 1 MHz, duty cycle = 50%, t_r ≤ 6 ns, t_f ≤ 6 ns.
   B. C_L includes probe and stray capacitance.
   C. All diodes are 1N916 or equivalent.

Figure 3. Test Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
MC3486D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI	-55 to 125		
MC3486N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	MC3486N	Samples
MC3486NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	MC3486N	Samples
MC3486NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples
MC3486NSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MC3486	Samples

(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.

(4) Only one of markings shown within the brackets will appear on the physical device.

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.

PACKAGE MATERIALS INFORMATION

TEXAS INSTRUMENTS

TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSIONS

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

*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
MC3486DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
MC3486NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
MC3486DR	SOIC	D	16	2500	333.2	345.9	28.6
MC3486NSR	SO	NS	16	2000	367.0	367.0	38.0

J (R−GDIP−T∗∗)

14 LEADS SHOWN

CERAMIC DUAL IN−LINE PACKAGE

DIM	PINS ∗∗	14	16	18	20
A		0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX		0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN		——	——	——	——
C MAX		0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN		0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

B

14   8

1   7

0.065 (1,65)
0.045 (1,14)

C

A

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)

0°−15°

0.014 (0,36)
0.008 (0,20)

4040083/F 03/03

NOTES: A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
         C.   This package is hermetically sealed with a ceramic lid using glass frit.
         D.   Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
         E.   Falls within MIL STD 1835 GDIP1−T14, GDIP1−T16, GDIP1−T18 and GDIP1−T20.

N (R−PDIP−T**)

16 PINS SHOWN

PLASTIC DUAL−IN−LINE PACKAGE

DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS−001 VARIATION	AA	BB	AC	AD

⟨C⟩

0.260 (6,60) / 0.240 (6,10)

0.070 (1,78) / 0.045 (1,14) ⟨D⟩

0.045 (1,14) / 0.030 (0,76) ⟨D⟩

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0.021 (0,53) / 0.015 (0,38)

⊕ 0.010 (0,25) Ⓜ

0.325 (8,26) / 0.300 (7,62)

0.015 (0,38)

Gauge Plane

0.010 (0,25) NOM

0.430 (10,92) MAX

14/18 Pin Only
20 Pin vendor option ⟨D⟩

4040049/E 12/2002

NOTES: A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
    ⟨C⟩   Falls within JEDEC MS−001, except 18 and 20 pin minimum body length (Dim A).
    ⟨D⟩   The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R−PDSO−G16)   PLASTIC SMALL OUTLINE

0.394 (10,00)
0.386 (9,80)
⚠C

16   9

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80) ⚠D

1   8

Pin 1
Index Area

0.050 (1,27)   0.020 (0,51)
                            0.012 (0,31)

⊕ | 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.005 (0,13)

△ | 0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)   0°−8°

0.050 (1,27)
0.016 (0,40)

4040047−6/M 06/11

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 0.006 (0,15) each side.
      ⚠D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
         E. Reference JEDEC MS−012 variation AC.

TEXAS INSTRUMENTS
www.ti.com

D (R–PDSO–G16)   PLASTIC SMALL OUTLINE

Example Board Layout
(Note C)

Stencil Openings
(Note D)

←—14x1,27

←—16x0,55

←—14x1,27

16x1,50—

5,40

5.40

Example
Non Soldermask Defined Pad

Example
Pad Geometry
(See Note C)

←0,60

1,55

Example
Solder Mask Opening
(See Note E)

←0,07

All Around

4211283–4/E   08/12

NOTES: A.   All linear dimensions are in millimeters.
          B.   This drawing is subject to change without notice.
          C.   Publication IPC–7351 is recommended for alternate designs.
          D.   Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should
               contact their board assembly site for stencil design recommendations. Refer to IPC–7525 for other stencil recommendations.
          E.   Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

TEXAS
INSTRUMENTS
www.ti.com

MECHANICAL DATA

DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

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

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