

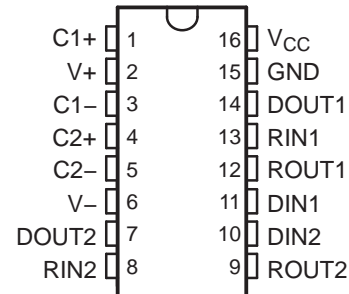
## FEATURES

- ESD Protection for RS-232 Bus Pins
  - $\pm 15$  kV (HBM)
  - $\pm 8$  kV (IEC61000-4-2, Contact Discharge)
  - $\pm 15$  kV (IEC61000-4-2, Air-Gap Discharge)
- Meets or Exceeds the Requirements of TIA/EIA-232-F and ITU v.28 Standards
- Operates With 3-V to 5.5-V  $V_{CC}$  Supply
- Operates up to 250 kbit/s
- Two Drivers and Two Receivers
- Low Supply Current . . . 300  $\mu$ A Typ
- External Capacitors . . .  $4 \times 0.1 \mu$ F
- Accepts 5-V Logic Input With 3.3-V Supply
- Pin Compatible to Alternative High-Speed Device (1 Mbit/s)
  - SNx5C3232

## APPLICATIONS

- Battery-Powered Systems
- PDAs
- Notebooks
- Laptops
- Palmtop PCs
- Hand-Held Equipment

D, DB, DW, OR PW PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

### ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–0°C to 70°C	SOIC – D	Tube of 40	MAX3232ECD	MAX3232EC
		Reel of 2500	MAX3232ECDR	
	SOIC – DW	Tube of 40	MAX3232ECDW	MAX3232EC
		Reel of 2000	MAX3232ECDWR	
	SSOP – DB	Tube of 80	MAX3232ECDB	MP232EC
		Reel of 2000	MAX3232ECDBR	
	TSSOP – PW	Tube of 90	MAX3232ECPW	MP232EC
		Reel of 2000	MAX3232ECPWR	
–40°C to 85°C	SOIC – D	Tube of 40	MAX3232EID	MAX3232EI
		Reel of 2500	MAX3232EIDR	
	SOIC – DW	Tube of 40	MAX3232EIDW	MAX3232EI
		Reel of 2000	MAX3232EIDWR	
	SSOP – DB	Tube of 80	MAX3232EIDB	MP232EI
		Reel of 2000	MAX3232EIDBR	
	TSSOP – PW	Tube of 90	MAX3232EIPW	MP232EI
		Reel of 2000	MAX3232EIPWR	

- (1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).
- (2) 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](http://www.ti.com).



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**MAX3232E**  
**3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER**  
**WITH  $\pm 15$ -kV IEC ESD PROTECTION**

SLLS664A – AUGUST 2005 – REVISED APRIL 2007

**DESCRIPTION/ORDERING INFORMATION (CONTINUED)**

The MAX3232E device consists of two line drivers, two line receivers, and a dual charge-pump circuit with  $\pm 15$ -kV IEC ESD protection pin to pin (serial-port connection pins, including GND). The device meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3-V to 5.5-V supply. The devices operate at data signaling rates up to 250 kbit/s and a maximum of 30-V/ $\mu$ s driver output slew rate.

**FUNCTION TABLES**

**EACH DRIVER<sup>(1)</sup>**

INPUT DIN	OUTPUT DOUT
L	H
H	L

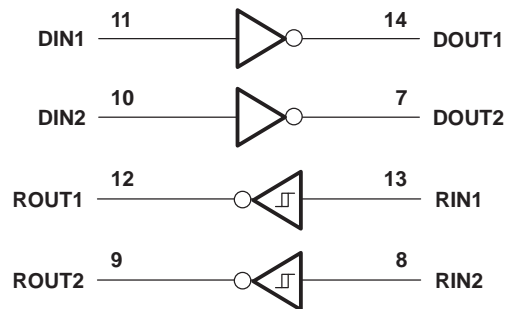
(1) H = high level, L = low level

**EACH RECEIVER<sup>(1)</sup>**

INPUT RIN	OUTPUT ROUT
L	H
H	L
Open	H

(1) H = high level, L = low level,  
Open = input disconnected or  
connected driver off

**LOGIC DIAGRAM (POSITIVE LOGIC)**



## Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage range <sup>(2)</sup>	-0.3	6	V	
V <sub>+</sub>	Positive output supply voltage range <sup>(2)</sup>	-0.3	7	V	
V <sub>-</sub>	Negative output supply voltage range <sup>(2)</sup>	0.3	-7	V	
V <sub>+</sub> – V <sub>-</sub>	Supply voltage difference <sup>(2)</sup>		13	V	
V <sub>I</sub>	Input voltage range	Drivers	-0.3	6	V
		Receivers	-25	25	V
V <sub>O</sub>	Output voltage range	Drivers	-13.2	13.2	V
		Receivers	-0.3	V <sub>CC</sub> + 0.3	V
$\theta_{JA}$	Package thermal impedance <sup>(3)(4)</sup>	D package		73	°C/W
		DB package		82	
		DW package		57	
		PW package		108	
T <sub>J</sub>	Operating virtual junction temperature		150	°C	
T <sub>stg</sub>	Storage temperature range	-65	150	°C	

(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.

(2) All voltages are with respect to network GND.

(3) Maximum power dissipation is a function of T<sub>J</sub>(max),  $\theta_{JA}$ , and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub> = (T<sub>J</sub>(max) – T<sub>A</sub>)/ $\theta_{JA}$ . Operating at the absolute maximum T<sub>J</sub> of 150°C can affect reliability.

(4) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions<sup>(1)</sup>

See [Figure 4](#)

		MIN	NO M	MAX	UNIT		
Supply voltage		V <sub>CC</sub> = 3.3 V	3	3.3	3.6	V	
		V <sub>CC</sub> = 5 V	4.5	5	5.5		
V <sub>IH</sub> Driver high-level input voltage	DIN	V <sub>CC</sub> = 3.3 V	2		5.5	V	
		V <sub>CC</sub> = 5 V	2.4		5.5		
V <sub>IL</sub> Driver low-level input voltage					0.8	V	
V <sub>I</sub> Receiver input voltage					-25	25	V
T <sub>A</sub> Operating free-air temperature		MAX3232EC			0	70	°C
		MAX3232EI			-40	85	

(1) Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

## Electrical Characteristics<sup>(1)</sup>

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 4](#))

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
I <sub>CC</sub> Supply current	No load, V <sub>CC</sub> = 3.3 V or 5 V		0.3	1	mA

(1) Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

**MAX3232E**  
**3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER**  
**WITH  $\pm 15$ -kV IEC ESD PROTECTION**

SLLS664A – AUGUST 2005 – REVISED APRIL 2007

**DRIVER SECTION**

**Electrical Characteristics<sup>(1)</sup>**

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 4](#))

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
V <sub>OH</sub>	High-level output voltage	DOUT at R <sub>L</sub> = 3 k $\Omega$ to GND, DIN = GND	5	5.4		V
V <sub>OL</sub>	Low-level output voltage	DOUT at R <sub>L</sub> = 3 k $\Omega$ to GND, DIN = V <sub>CC</sub>	-5	-5.4		V
I <sub>IH</sub>	High-level input current	V <sub>I</sub> = V <sub>CC</sub>		$\pm 0.01$	$\pm 1$	$\mu$ A
I <sub>IL</sub>	Low-level input current	V <sub>I</sub> at GND		$\pm 0.01$	$\pm 1$	$\mu$ A
I <sub>OS</sub> <sup>(3)</sup>	Short-circuit output current	V <sub>CC</sub> = 3.6 V, V <sub>O</sub> = 0 V		$\pm 35$	$\pm 60$	mA
		V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0 V				
r <sub>O</sub>	Output resistance	V <sub>CC</sub> , V+, and V- = 0 V, V <sub>O</sub> = $\pm 2$ V	300	10M		$\Omega$

(1) Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

(3) Short-circuit durations should be controlled to prevent exceeding the device absolute power dissipation ratings, and not more than one output should be shorted at a time.

**Switching Characteristics<sup>(1)</sup>**

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 4](#))

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT	
	Maximum data rate	C <sub>L</sub> = 1000 pF, R <sub>L</sub> = 3 k $\Omega$ , One DOUT switching, See Figure 1	150	250		kbit/s	
t <sub>sk(p)</sub>	Pulse skew <sup>(3)</sup>	C <sub>L</sub> = 150 pF to 2500 pF, R <sub>L</sub> = 3 k $\Omega$ to 7 k $\Omega$ , See Figure 2		300		ns	
SR(tr)	Slew rate, transition region (see Figure 1)	R <sub>L</sub> = 3 k $\Omega$ to 7 k $\Omega$ , V <sub>CC</sub> = 3.3 V	C <sub>L</sub> = 150 pF to 1000 pF		6	30	V/ $\mu$ s
			C <sub>L</sub> = 150 pF to 2500 pF		4	30	

(1) Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

(3) Pulse skew is defined as |t<sub>PLH</sub> - t<sub>PHL</sub>| of each channel of the same device.

## RECEIVER SECTION

### Electrical Characteristics<sup>(1)</sup>

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 4](#))

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
V <sub>OH</sub>	High-level output voltage	I <sub>OH</sub> = -1 mA	V <sub>CC</sub> - 0.6	V <sub>CC</sub> - 0.1		V
V <sub>OL</sub>	Low-level output voltage	I <sub>OL</sub> = 1.6 mA			0.4	V
V <sub>IT+</sub>	Positive-going input threshold voltage	V <sub>CC</sub> = 3.3 V		1.5	2.4	V
		V <sub>CC</sub> = 5 V		1.8	2.4	
V <sub>IT-</sub>	Negative-going input threshold voltage	V <sub>CC</sub> = 3.3 V	0.6	1.2		V
		V <sub>CC</sub> = 5 V	0.8	1.5		
V <sub>hys</sub>	Input hysteresis (V <sub>IT+</sub> - V <sub>IT-</sub> )			0.3		V
r <sub>i</sub>	Input resistance	V <sub>I</sub> = $\pm 3$ V to $\pm 25$ V	3	5	7	k $\Omega$

(1) Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

### Switching Characteristics<sup>(1)</sup>

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 3](#))

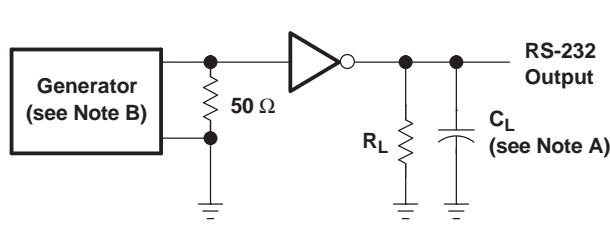
PARAMETER		TEST CONDITIONS	TYP <sup>(2)</sup>	UNIT
t <sub>PLH</sub>	Propagation delay time, low- to high-level output	C <sub>L</sub> = 150 pF	300	ns
t <sub>PHL</sub>	Propagation delay time, high- to low-level output		300	ns
t <sub>sk(p)</sub>	Pulse skew <sup>(3)</sup>		300	ns

(1) Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

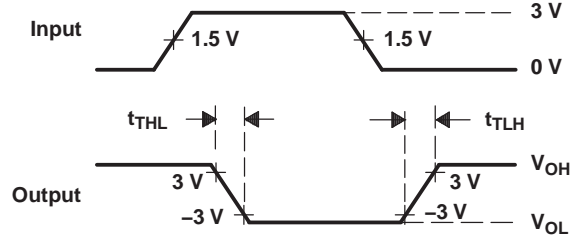
(3) Pulse skew is defined as |t<sub>PLH</sub> - t<sub>PHL</sub>| of each channel of the same device.

**PARAMETER MEASUREMENT INFORMATION**



**TEST CIRCUIT**

$$SR(tr) = \frac{6\text{ V}}{t_{THL} \text{ or } t_{TLH}}$$

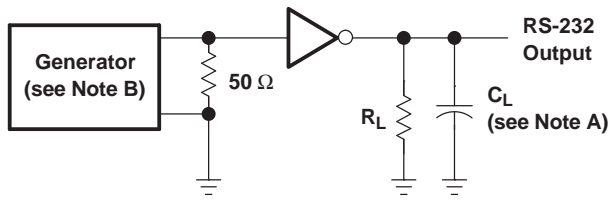


**VOLTAGE WAVEFORMS**

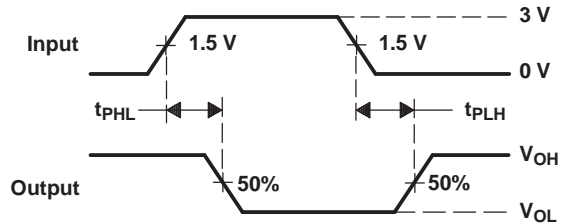
NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 250 kbit/s,  $Z_O = 50\ \Omega$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

**Figure 1. Driver Slew Rate**



**TEST CIRCUIT**

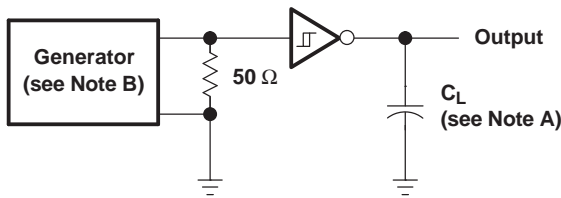


**VOLTAGE WAVEFORMS**

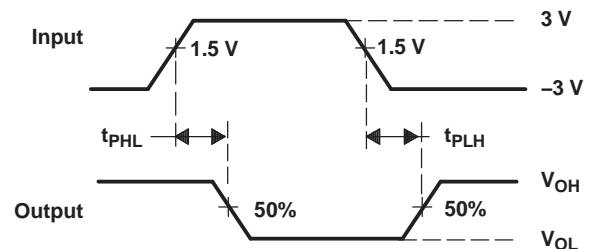
NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 250 kbit/s,  $Z_O = 50\ \Omega$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

**Figure 2. Driver Pulse Skew**



**TEST CIRCUIT**



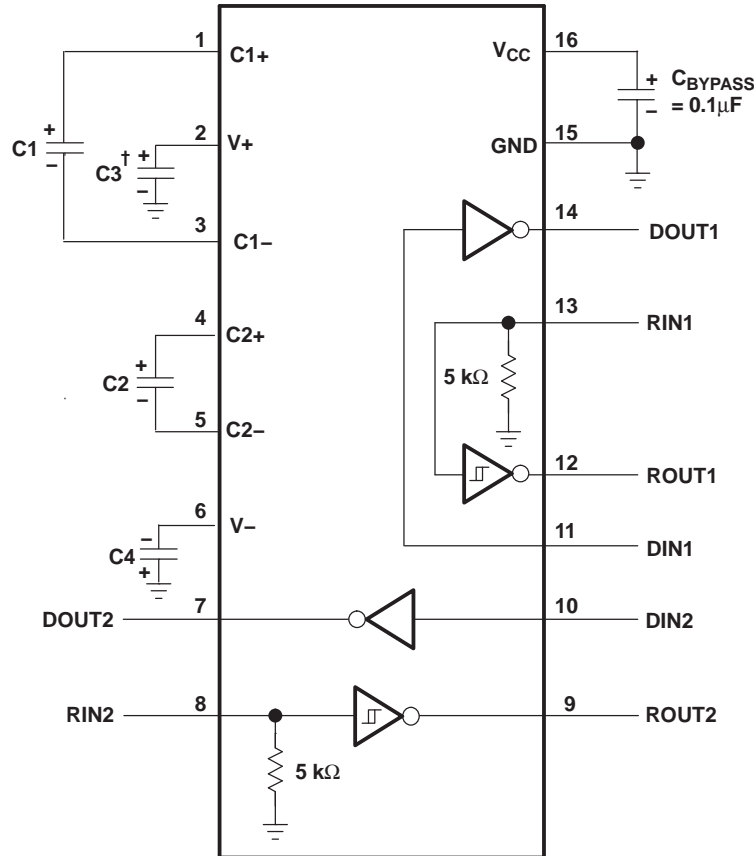
**VOLTAGE WAVEFORMS**

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The pulse generator has the following characteristics:  $Z_O = 50\ \Omega$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

**Figure 3. Receiver Propagation Delay Times**

APPLICATION INFORMATION



† C3 can be connected to  $V_{CC}$  or GND.

NOTES: A. Resistor values shown are nominal.

B. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.

$V_{CC}$  vs CAPACITOR VALUES

$V_{CC}$	C1	C2, C3, C4
3.3 V $\pm$ 0.3 V	0.1 $\mu$ F	0.1 $\mu$ F
5 V $\pm$ 0.5 V	0.047 $\mu$ F	0.33 $\mu$ F
3 V to 5.5 V	0.1 $\mu$ F	0.47 $\mu$ F

Figure 4. Typical Operating Circuit and Capacitor Values

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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
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Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Low Power Wireless	<a href="http://www.ti.com/lpw">www.ti.com/lpw</a>	Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
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**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
MAX3232ECD	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDB	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDBE4	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECPW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECPWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232ECPWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EID	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDB	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDBE4	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
MAX3232EIDRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIPW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIPWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIPWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIPWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3232EIPWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> 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.

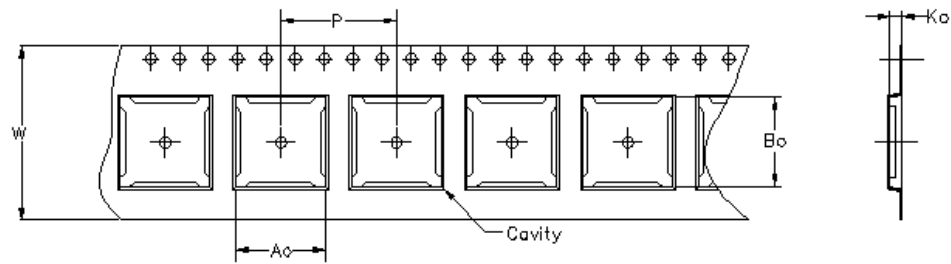
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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)

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

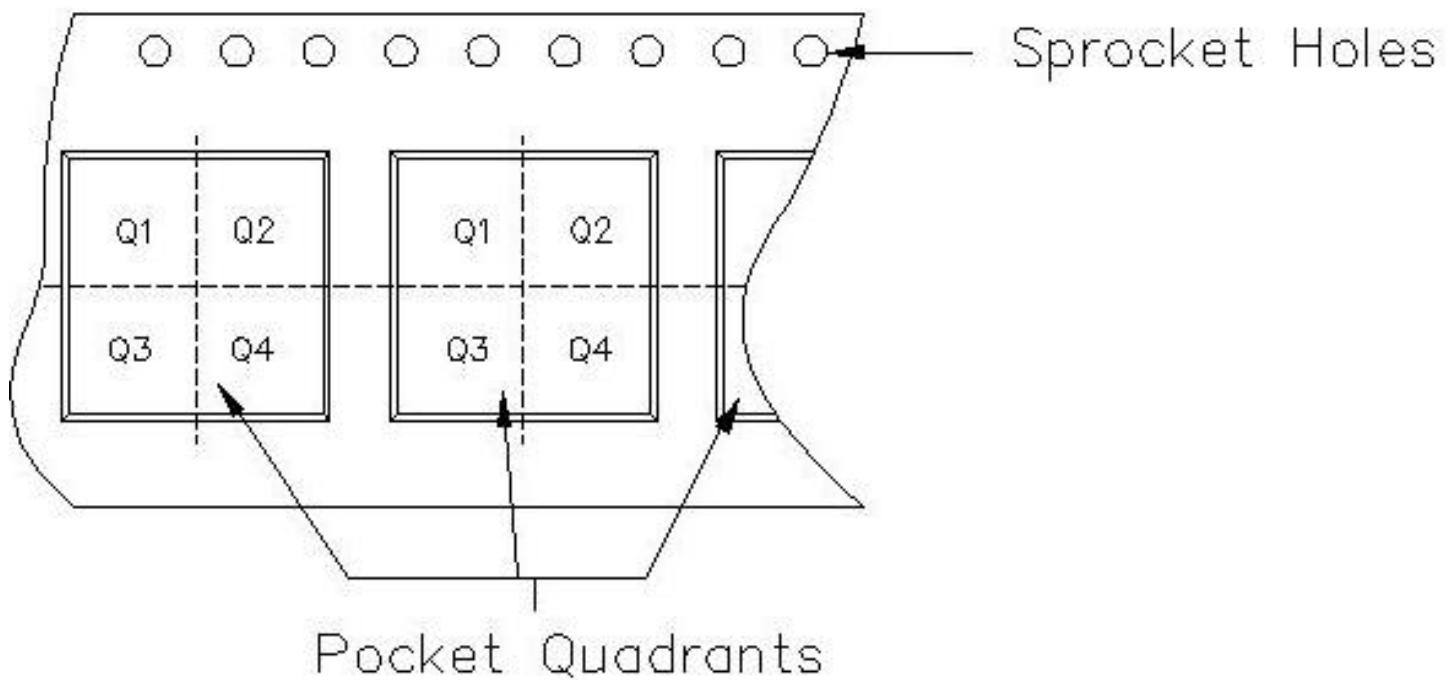
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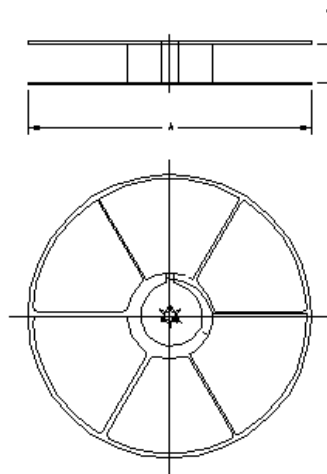
Carrier tape design is defined largely by the component length, width, and thickness.

$A_o$ = Dimension designed to accommodate the component width.
$B_o$ = Dimension designed to accommodate the component length.
$K_o$ = Dimension designed to accommodate the component thickness.
$W$ = Overall width of the carrier tape.
$P$ = Pitch between successive cavity centers.



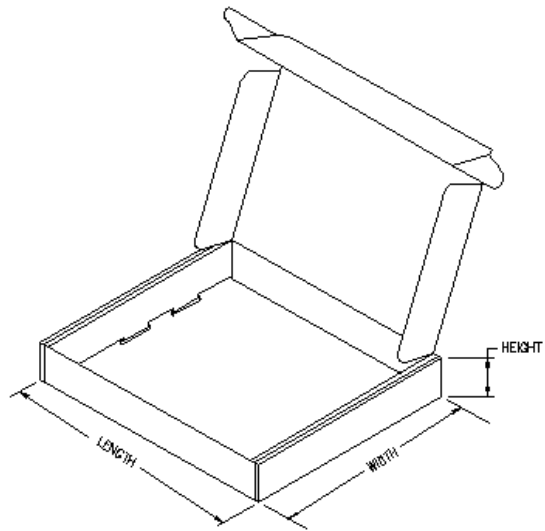
**TAPE AND REEL INFORMATION**

Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
MAX3232ECDBR	DB	16	MLA	330	16	8.2	6.6	2.5	12	16	Q1
MAX3232ECDR	D	16	MLA	330	16	6.5	10.3	12.1	2	16	Q1
MAX3232ECDWR	DW	16	TAI	330	16	10.75	10.7	2.7	12	16	Q1
MAX3232ECPWR	PW	16	MLA	330	12	7.0	5.6	1.6	8	12	Q1
MAX3232EIDBR	DB	16	MLA	330	16	8.2	6.6	2.5	12	16	Q1
MAX3232EIDR	D	16	MLA	330	16	6.5	10.3	12.1	2	16	Q1
MAX3232EIDWR	DW	16	TAI	330	16	10.75	10.7	2.7	12	16	Q1
MAX3232EIPWR	PW	16	MLA	330	12	7.0	5.6	1.6	8	12	Q1



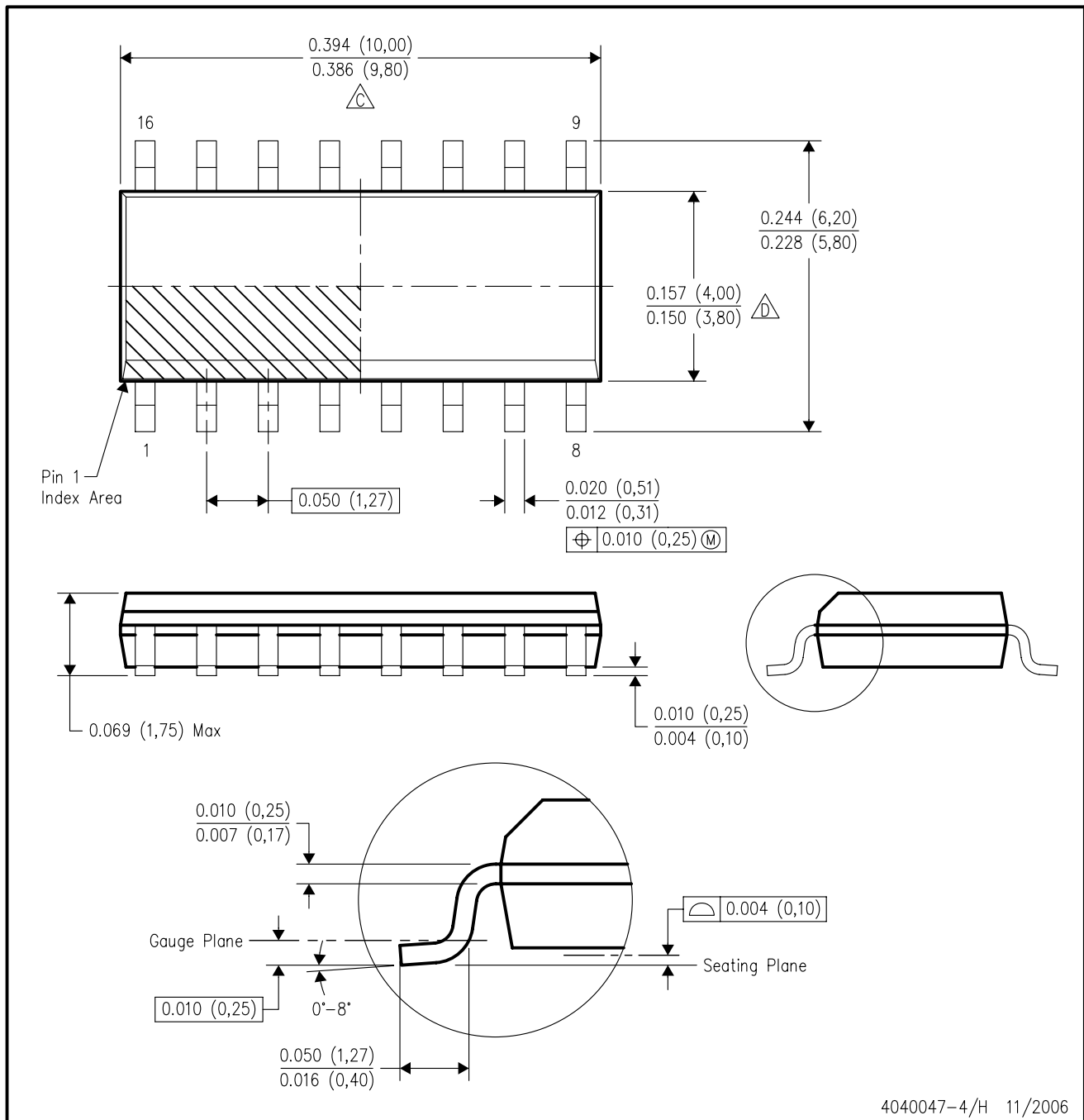
**TAPE AND REEL BOX INFORMATION**

Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
MAX3232ECDBR	DB	16	MLA	333.2	333.2	28.58
MAX3232ECDR	D	16	MLA	333.2	333.2	28.58
MAX3232ECDWR	DW	16	TAI	346.0	346.0	33.0
MAX3232ECPWR	PW	16	MLA	338.1	340.5	20.64
MAX3232EIDBR	DB	16	MLA	333.2	333.2	28.58
MAX3232EIDR	D	16	MLA	333.2	333.2	28.58
MAX3232EIDWR	DW	16	TAI	346.0	346.0	33.0
MAX3232EIPWR	PW	16	MLA	338.1	340.5	20.64



D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE

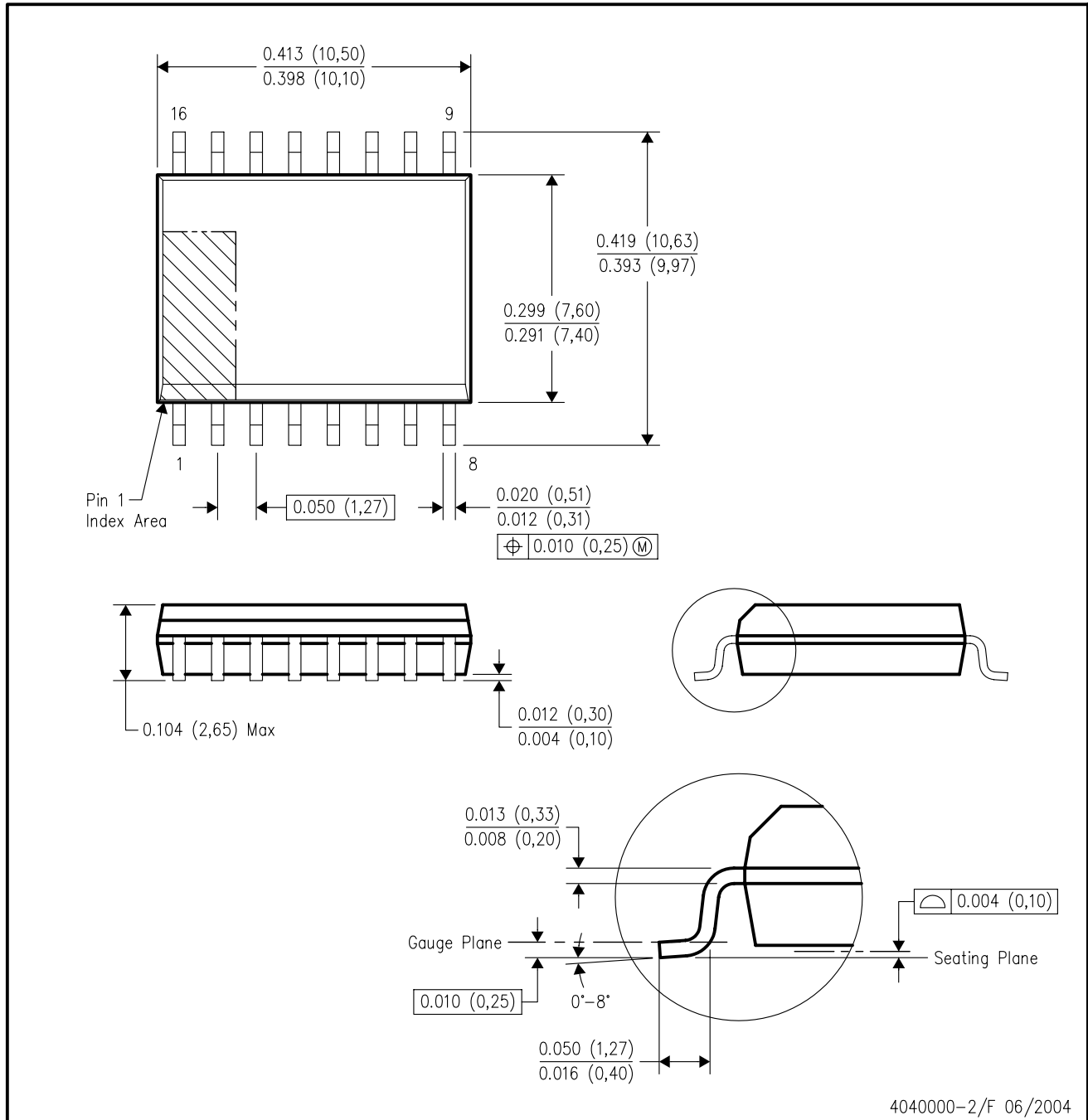


4040047-4/H 11/2006

- 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 AC.

DW (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



4040000-2/F 06/2004

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - 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 AA.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- 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.  
 D. Falls within JEDEC MO-150



PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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.  
 D. Falls within JEDEC MO-153

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