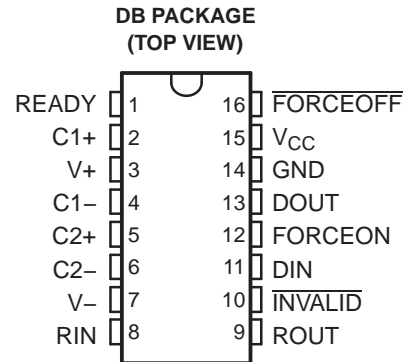


## FEATURES

- 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 at Least 1 Mbit/s
- Low Standby Current . . . 1  $\mu$ A Typ
- External Capacitors . . .  $4 \times 0.1 \mu$ F
- Accepts 5-V Logic Input With 3.3-V Supply
- Designed to Be Interchangeable With Maxim™ MAX3227E
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection for RS-232 I/O Pins
  - ±15 kV – Human-Body Model
  - ±8 kV – IEC61000-4-2, Contact Discharge
  - ±15 kV – IEC61000-4-2, Air-Gap Discharge
- Auto-Powerdown Plus Feature Automatically Disables Drivers for Power Savings
- Packaged in Plastic Shrink Small-Outline Package

## APPLICATIONS

- Battery-Powered, Hand-Held, and Portable Equipment
- PDAs and Palmtop PCs
- Notebooks, Sub-Notebooks, and Laptops
- Digital Cameras
- Mobile Phones and Wireless Devices



## DESCRIPTION/ORDERING INFORMATION

The MAX3227E consists of one line driver, one line receiver, and a dual charge-pump circuit with ±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. This device operates at data-signaling rates of 1 Mbit/s in normal operating mode and a maximum of 30-V/ $\mu$ s driver output slew rate. This device also features a logic-level output (READY) that asserts when the charge pump is regulating and the device is ready to begin transmitting.

The MAX3227E achieves a 1- $\mu$ A supply current using the auto-powerdown plus feature. This device automatically enters a low-power powerdown mode when the RS-232 cable is disconnected or the drivers of the connected peripherals are inactive for more than 30 s. They turn on again when they sense a valid transition at any driver or receiver input. Auto-powerdown saves power without changes to the existing BIOS or operating system.

The MAX3227EC is characterized for operation from 0°C to 70°C. The MAX3227EI is characterized for operation from -40°C to 85°C.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE <sup>(1)(2)</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	SSOP – DB	Tube of 80	MAX3227ECDB
		Reel of 2000	MAX3227ECDBR
-40°C to 85°C	SSOP – DB	Tube of 80	MAX3227EIDB
		Reel of 2000	MAX3227EIDBR

(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).



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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**MAX3227E**  
**3-V TO 5.5-V SINGLE-CHANNEL RS-232 LINE DRIVER/RECEIVER**  
**WITH ±15-kV IEC ESD PROTECTION**

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**FUNCTION TABLE<sup>(1)</sup>**

INPUT CONDITIONS				OUTPUT STATES				OPERATING MODE
FORCEON	$\overline{\text{FORCEOFF}}$	RECEIVER OR DRIVER EDGE WITHIN 30 s	VALID RS-232 LEVEL PRESENT AT RECEIVER	DRIVER	RECEIVER	$\overline{\text{INVALID}}$	READY	
<b>Auto-Powerdown Plus Conditions</b>								
H	H	NO	NO	Active	Active	L	H	Normal operation, auto-powerdown plus disabled
H	H	NO	YES	Active	Active	H	H	Normal operation, auto-powerdown plus disabled
L	H	YES	NO	Active	Active	L	H	Normal operation, auto-powerdown plus enabled
L	H	YES	YES	Active	Active	H	H	Normal operation, auto-powerdown plus enabled
L	H	NO	NO	Z	Active	L	L	Powerdown, auto-powerdown plus enabled
L	H	NO	YES	Z	Active	H	L	Powerdown, auto-powerdown plus enabled
X	L	X	NO	Z	Active	L	L	Manual powerdown
X	L	X	YES	Z	Active	H	L	Manual powerdown
<b>Auto-Powerdown Conditions</b>								
$\overline{\text{INVALID}}$	$\overline{\text{INVALID}}$	X	NO	Z	Active	L	L	Powerdown, auto-powerdown enabled
$\overline{\text{INVALID}}$	$\overline{\text{INVALID}}$	X	YES	Active	Active	H	H	Normal operation, auto-powerdown enabled

(1) H = high level, L = low level, X = irrelevant, Z = high impedance

### TERMINAL FUNCTIONS

TERMINAL		DESCRIPTION
NAME	NO.	
C1+	2	Positive terminal of voltage-doubler charge-pump capacitor
C1-	4	Negative terminal of voltage-doubler charge-pump capacitor
C2+	5	Positive terminal of inverting charge-pump capacitor
C2-	6	Negative terminal of inverting charge-pump capacitor
DIN	11	CMOS driver input
DOUT	13	RS-232 driver output
$\overline{\text{FORCEOFF}}$	16	Force-off input, active low. Drive low to shut down drivers, receivers, and charge pump. This overrides auto-shutdown and FORCEON (see Function Table).
FORCEON	12	Force-on input, active high. Drive high to override powerdown, keeping drivers and receivers on ( $\overline{\text{FORCEOFF}}$ must be high) (see Function Table).
GND	14	Ground
$\overline{\text{INVALID}}$	10	Valid signal detector output, active low. A logic high indicates that a valid RS-232 level is present on a receiver input.
READY	1	Ready to transmit output, active high. READY is enabled high when V- goes below $-3.5$ V and the device is ready to transmit.
RIN	8	RS-232 receiver input
ROUT	9	CMOS receiver output
V+	3	$+2 \times V_{CC}$ generated by the charge pump
V-	7	$-2 \times V_{CC}$ generated by the charge pump
V <sub>CC</sub>	15	3-V to 5.5-V single-supply voltage

### LOGIC DIAGRAM (POSITIVE LOGIC)



# MAX3227E

## 3-V TO 5.5-V SINGLE-CHANNEL RS-232 LINE DRIVER/RECEIVER

### WITH $\pm 15$ -kV IEC ESD PROTECTION

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### 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+	Positive output supply voltage range <sup>(2)</sup>	-0.3	7	V
V-	Negative output supply voltage range <sup>(2)</sup>	0.3	-7	V
V+ - V-	Supply voltage difference <sup>(2)</sup>		13	V
V <sub>I</sub>	Input voltage range	Driver ( $\overline{\text{FORCEOFF}}$ , FORCEON)		V
		Receiver		
V <sub>O</sub>	Output voltage range	Driver		V
		Receiver ( $\overline{\text{INVALID}}$ , READY)		
	Short-circuit duration	DOUT to GND		Unlimited
$\theta_{JA}$	Package thermal impedance <sup>(3)</sup>			82
		Lead temperature 1,6 mm (1/16 in) from case for 10 s		260
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) The package thermal impedance is calculated in accordance with JESD 51-7.

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

See [Figure 5](#)

		MIN	NOM	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 and control high-level input voltage	DIN, $\overline{\text{FORCEOFF}}$ , FORCEON		V	
		V <sub>CC</sub> = 3.3 V	2		5.5
		V <sub>CC</sub> = 5 V	2.4	5.5	
V <sub>IL</sub>	Driver and control low-level input voltage	DIN, $\overline{\text{FORCEOFF}}$ , FORCEON		0	0.8
V <sub>I</sub>	Receiver input voltage	-25		25	V
T <sub>A</sub>	Operating free-air temperature	MAX3227EC		0	70
		MAX3227EI		-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 5](#))

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
I <sub>I</sub>	Input leakage current	FORCEOFF, FORCEON		$\pm 0.01$	$\pm 1$	$\mu$ A
I <sub>CC</sub>	Supply current (T <sub>A</sub> = 25°C)	Auto-powerdown plus disabled	No load, $\overline{\text{FORCEOFF}}$ and FORCEON at V <sub>CC</sub>	0.3	2	mA
		Powered off	No load, $\overline{\text{FORCEOFF}}$ at GND	1	10	
		Auto-powerdown plus enabled	No load, $\overline{\text{FORCEOFF}}$ at V <sub>CC</sub> , FORCEON at GND, All RIN are open or grounded	1	10	$\mu$ A

- (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.

## DRIVER SECTION

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

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)  
(see [Figure 1](#) and [Figure 2](#))

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>	Short-circuit output current <sup>(3)</sup> V <sub>CC</sub> = 3.6 V, V <sub>O</sub> = 0 V V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0 V		$\pm 35$	$\pm 60$	mA
			$\pm 35$	$\pm 60$	
r <sub>o</sub>	Output resistance V <sub>CC</sub> , V+, and V- = 0 V, V <sub>O</sub> = $\pm 2$ V	300	10M		$\Omega$
I <sub>off</sub>	Output leakage current FORCEOFF = GND, V <sub>O</sub> = $\pm 12$ V, V <sub>CC</sub> = 0 to 5.5 V			$\pm 25$	$\mu$ A

(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 1](#) and [Figure 2](#))

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
Maximum data rate	C <sub>L</sub> = 1000 pF, One DIN switching, R <sub>L</sub> = 3 k $\Omega$ , See <a href="#">Figure 1</a>	250			kbit/s
	C <sub>L</sub> = 1000 pF, V <sub>CC</sub> = 4.5 V, R <sub>L</sub> = 3 k $\Omega$ , See <a href="#">Figure 1</a>	1000			
	C <sub>L</sub> = 250 pF, V <sub>CC</sub> = 3 V, R <sub>L</sub> = 3 k $\Omega$ , See <a href="#">Figure 1</a>	1000			
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 <a href="#">Figure 2</a>		25		ns
SR(tr)	Slew rate, transition region V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 150 pF to 1000 pF, R <sub>L</sub> = 3 k $\Omega$ to 7 k $\Omega$ , See <a href="#">Figure 1</a>	24		150	V/ $\mu$ s

(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.

### ESD Protection

TERMINAL	TEST CONDITIONS	TYP	UNIT	
NAME	NO.			
DOUT	13	Human-Body Model	$\pm 15$	kV
		Contact Discharge (IEC61000-4-2)	$\pm 8$	
		Air-Gap Discharge (IEC61000-4-2)	$\pm 15$	

**MAX3227E**  
**3-V TO 5.5-V SINGLE-CHANNEL RS-232 LINE DRIVER/RECEIVER**  
**WITH  $\pm 15$ -kV IEC ESD PROTECTION**

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**RECEIVER SECTION**

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

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

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> )			0.5		V
I <sub>off</sub>	Output leakage current			±0.05	±10	µA
r <sub>i</sub>	Input resistance	V <sub>I</sub> = ±3 V to ±25 V	3	5	7	kΩ

(1) Test conditions are C1–C4 = 0.1 µF at V<sub>CC</sub> = 3.3 V ± 0.3 V; C1 = 0.047 µF, C2–C4 = 0.33 µF at V<sub>CC</sub> = 5 V ± 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)

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, See <a href="#">Figure 3</a>	150	ns
t <sub>PHL</sub>	Propagation delay time, high- to low-level output	C <sub>L</sub> = 150 pF, See <a href="#">Figure 3</a>	150	ns
t <sub>sk(p)</sub>	Pulse skew <sup>(3)</sup>	See <a href="#">Figure 3</a>	50	ns

(1) Test conditions are C1–C4 = 0.1 µF at V<sub>CC</sub> = 3.3 V ± 0.3 V; C1 = 0.047 µF, C2–C4 = 0.33 µF at V<sub>CC</sub> = 5 V ± 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.

**ESD Protection**

TERMINAL		TEST CONDITIONS	TYP	UNIT
NAME	NO.			
RIN	8	Human-Body Model	±15	kV
		Contact Discharge (IEC61000-4-2)	±8	
		Air-Gap Discharge (IEC61000-4-2)	±15	

## AUTO-POWERDOWN SECTION

### Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
$V_{T+}$ (valid)	Receiver input threshold for $\overline{\text{INVALID}}$ high-level output voltage	FORCEON = GND, $\overline{\text{FORCEOFF}} = V_{CC}$		2.7	V
$V_{T-}$ (valid)	Receiver input threshold for $\overline{\text{INVALID}}$ high-level output voltage	FORCEON = GND, $\overline{\text{FORCEOFF}} = V_{CC}$	-2.7		V
$V_{T}$ (invalid)	Receiver input threshold for $\overline{\text{INVALID}}$ low-level output voltage	FORCEON = GND, $\overline{\text{FORCEOFF}} = V_{CC}$	-0.3	0.3	V
$V_{OH}$	$\overline{\text{INVALID}}$ , READY output voltage high	$I_{OH} = -1$ mA, FORCEON = GND, $\overline{\text{FORCEOFF}} = V_{CC}$	$V_{CC} - 0.6$		V
$V_{OL}$	$\overline{\text{INVALID}}$ , READY output voltage low	$I_{OL} = 1.6$ mA, FORCEON = GND, $\overline{\text{FORCEOFF}} = V_{CC}$		0.4	V

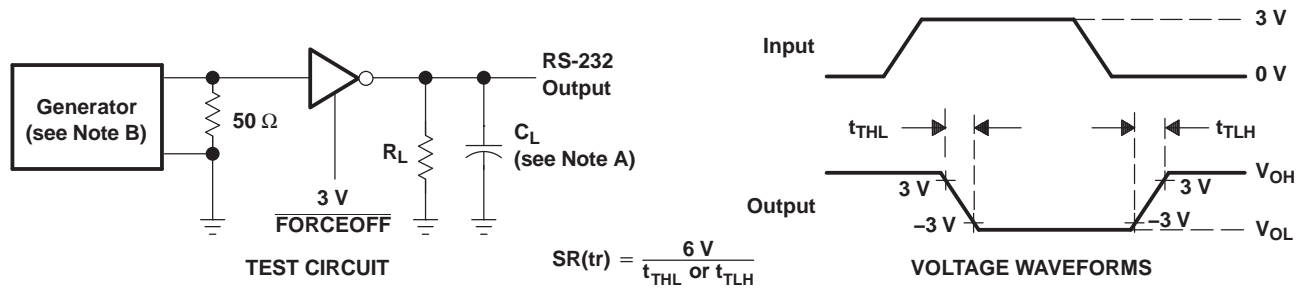
### Switching Characteristics

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

PARAMETER		MIN	TYP <sup>(1)</sup>	MAX	UNIT	
$t_{INVH}$	Propagation delay time, low- to high-level output		1		$\mu\text{s}$	
$t_{INVL}$	Propagation delay time, high- to low-level output		30		$\mu\text{s}$	
$t_{WU}$	Supply enable time		100		$\mu\text{s}$	
$t_{\text{AUTOPRDN}}$	Driver or receiver edge to driver's shutdown	$V_{CC} = 5$ V	15	30	60	s

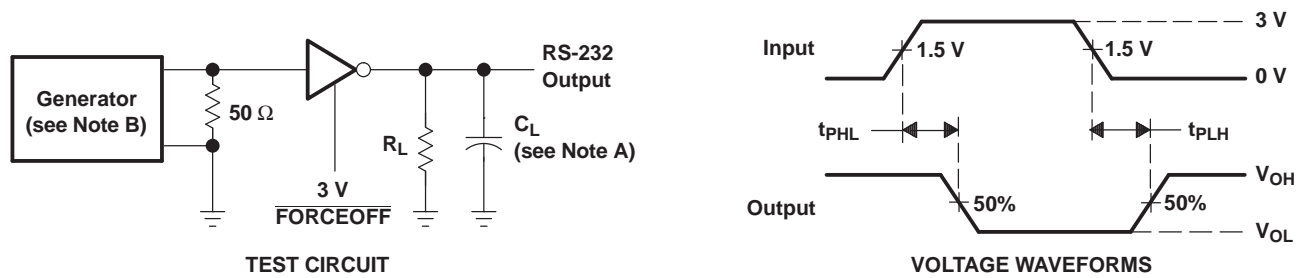
(1) All typical values are at  $V_{CC} = 3.3$  V or  $V_{CC} = 5$  V, and  $T_A = 25^\circ\text{C}$ .

**PARAMETER MEASUREMENT INFORMATION**



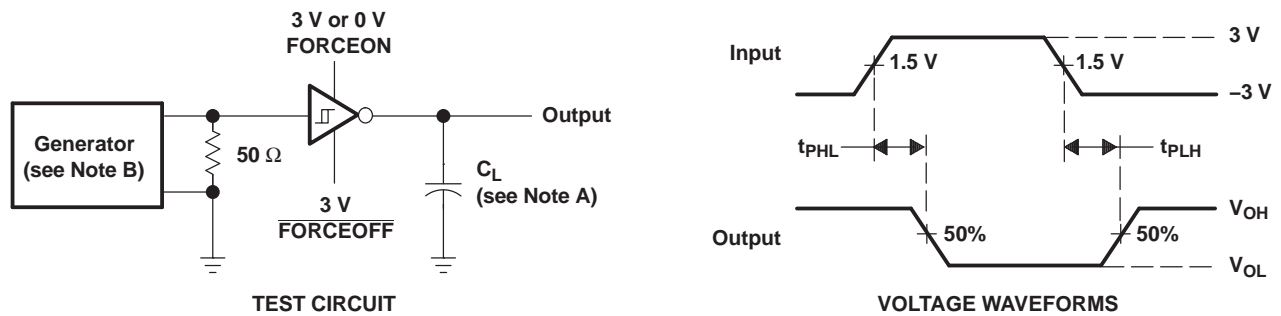
NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. The pulse generator has the following characteristics: PRR = 250 kbit/s,  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

**Figure 1. Driver Slew Rate**



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,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

**Figure 2. Driver Pulse Skew**

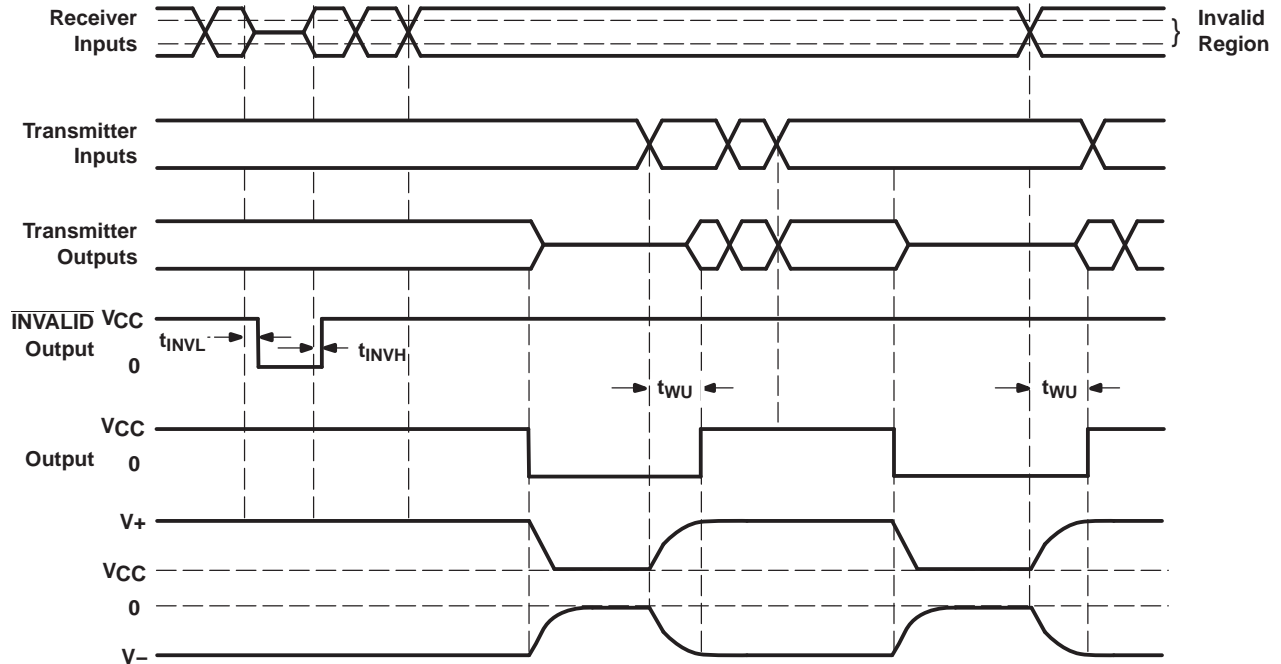


NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. The pulse generator has the following characteristics:  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

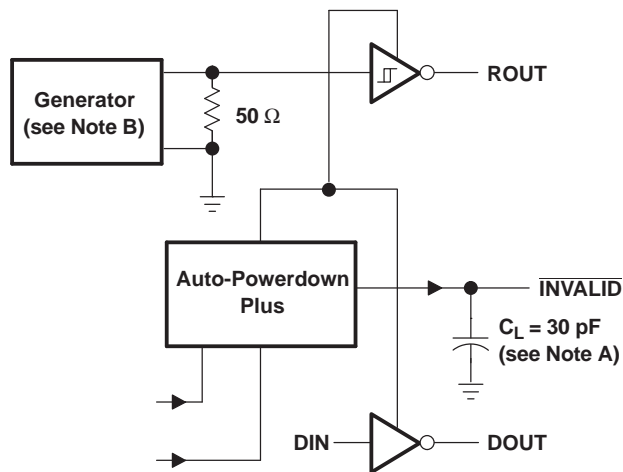
**Figure 3. Receiver Propagation Delay Times**



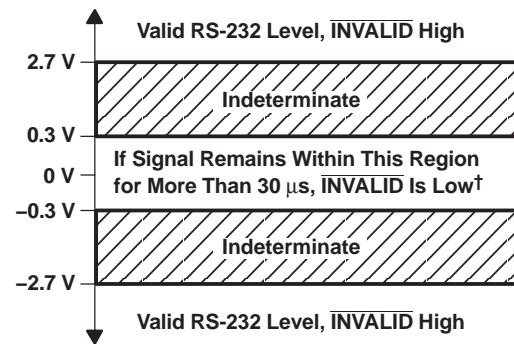
PARAMETER MEASUREMENT INFORMATION (continued)



VOLTAGE WAVEFORMS



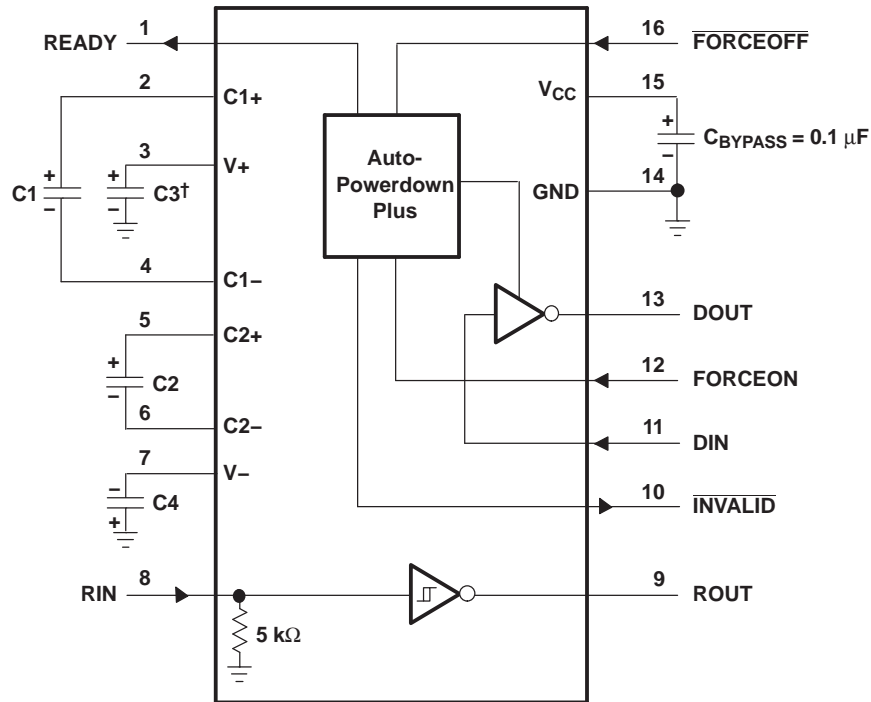
TEST CIRCUIT



<sup>†</sup> Auto-powerdown disables drivers and reduces supply current to 1  $\mu$ A.

Figure 4.  $\overline{\text{INVALID}}$  Propagation Delay Times and Driver Enabling Time

**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, and 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 5. Typical Operating Circuit and Capacitor Values**

**PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">MAX3227ECDB</a>	Obsolete	Production	SSOP (DB)   16	-	-	Call TI	Call TI	0 to 70	MP227EC
<a href="#">MAX3227ECDBR</a>	Obsolete	Production	SSOP (DB)   16	-	-	Call TI	Call TI	0 to 70	MP227EC
<a href="#">MAX3227EIDB</a>	Obsolete	Production	SSOP (DB)   16	-	-	Call TI	Call TI	-40 to 85	MP227EI
<a href="#">MAX3227EIDBR</a>	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP227EI
MAX3227EIDBR.A	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP227EI
MAX3227EIDBRG4	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP227EI
MAX3227EIDBRG4.A	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP227EI

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**TAPE AND REEL INFORMATION**

**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
MAX3227EIDBR	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
MAX3227EIDBRG4	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	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)
MAX3227EIDBR	SSOP	DB	16	2000	353.0	353.0	32.0
MAX3227EIDBRG4	SSOP	DB	16	2000	353.0	353.0	32.0

# DB0016A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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### NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



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NOTES: (continued)

- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



# EXAMPLE STENCIL DESIGN

DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

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NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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