

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

Check for Samples: [MAX3222E](#)

### FEATURES

- **ESD Protection for RS-232 Bus Pins**
  - $\pm 15$ -kV Human-Body Model (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 500 kbit/s**
- **Two Drivers and Two Receivers**
- **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**
- **Alternative High-Speed Pin-Compatible Device (1 Mbit/s) for SNx5C3222E**

### APPLICATIONS

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

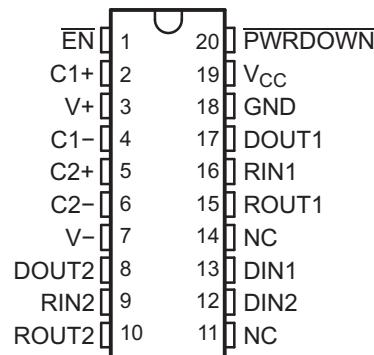
### DESCRIPTION/ORDERING INFORMATION

The MAX3222E consists of two line drivers, two line receivers, and a dual charge-pump circuit with  $\pm 15$ -kV ESD protection pin to pin (serial-port connection pins, including GND).

The MAX3222E can be placed in the power-down mode by setting the power-down (PWRDOWN) input low, which draws only 1  $\mu$ A from the power supply. When the device is powered down, the receivers remain active while the drivers are placed in the high-impedance state. Also, during power down, the onboard charge pump is disabled;  $V_+$  is lowered to  $V_{CC}$ , and  $V_-$  is raised toward GND. Receiver outputs also can be placed in the high-impedance state by setting enable (EN) high.

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 device operates at typical data signaling rates up to 500 kbit/s and a maximum of 30-V/ $\mu$ s driver output slew rate.

DB, DW, OR PW PACKAGE  
(TOP VIEW)



NC – No internal connection



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.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE <sup>(1)</sup> <sup>(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	SOIC – DW	Tube of 25	MAX3222ECDW	MAX3222EC
		Reel of 2000	MAX3222ECDWR	
	SSOP – DB	Tube of 70	MAX3222ECDB	MP222EC
		Reel of 2000	MAX3222ECDBR	
–40°C to 85°C	TSSOP – PW	Tube of 70	MAX3222ECPW	MP222EC
		Reel of 2000	MAX3222ECPWR	
	SOIC – DW	Tube of 25	MAX3222EIDW	MAX3222EI
		Reel of 2000	MAX3222EIDWR	
	SSOP – DB	Tube of 70	MAX3222EIDB	MP222EI
		Reel of 2000	MAX3222EIDBR	
	TSSOP – PW	Tube of 70	MAX3222EIPW	MP222EI
		Reel of 2000	MAX3222EIPWR	

(1) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).

(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).

Table 1. FUNCTION TABLES

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

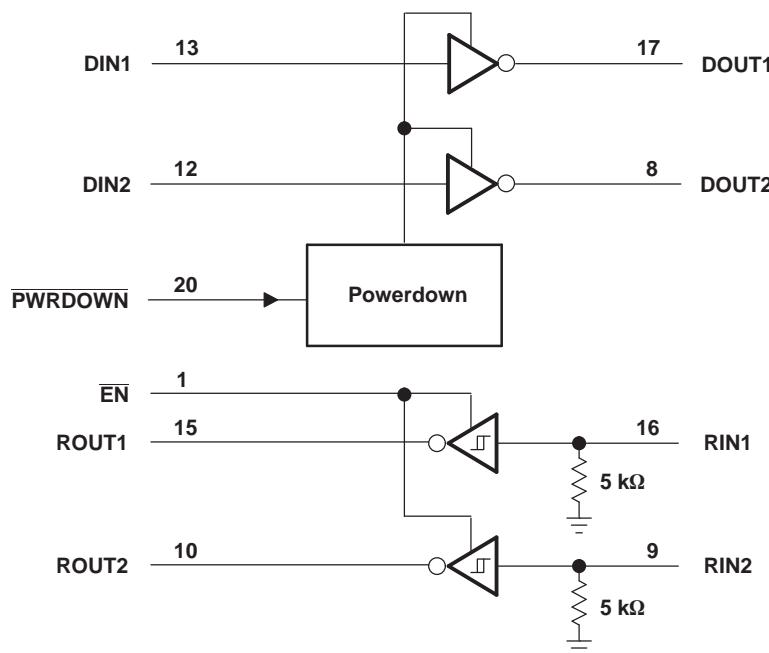
INPUTS		OUTPUT DOUT
DIN	POWERDOWN	
X	L	Z
L	H	H
H	H	L

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

Table 2. EACH RECEIVER<sup>(1)</sup>

INPUTS		OUTPUT ROUT
RIN	EN	
L	L	H
H	L	L
X	H	Z
Open	L	H

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

**LOGIC DIAGRAM (POSITIVE LOGIC)**


Pin numbers are for the DB, DW, and PW packages.

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

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

		MIN	MAX	UNIT
$V_{CC}$	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
$V_I$	Input voltage range	Driver ( $\overline{EN}$ , $\overline{PWRDOWN}$ )	-0.3	6
		Receiver	-25	25
$V_O$	Output voltage range	Driver	-13.2	13.2
		Receiver	-0.3	$V_{CC} + 0.3$
$\theta_{JA}$	Package thermal impedance <sup>(3) (4)</sup>	DB package		70
		DW package		58
		PW package		83
$T_J$	Operating virtual junction temperature		150	°C
$T_{stg}$	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  $T_J(max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(max) - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  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 5](#)

			MIN	NOM	MAX	UNIT
Supply voltage		$V_{CC} = 3.3$ V	3	3.3	3.6	V
		$V_{CC} = 5$ V	4.5	5	5.5	
$V_{IH}$	Driver and control high-level input voltage	$V_{CC} = 3.3$ V	2			V
		$V_{CC} = 5$ V	2.4			
$V_{IL}$	Driver and control low-level input voltage	DIN, $\overline{EN}$ , $\overline{PWRDOWN}$			0.8	V
$V_I$	Driver and control input voltage	DIN, $\overline{EN}$ , $\overline{PWRDOWN}$		0	5.5	V
$V_I$	Receiver input voltage			-25	25	V
$T_A$	Operating free-air temperature	MAX3222EC	0	70		°C
		MAX3222EI	-40	85		

(1) Test conditions are  $C1-C4 = 0.1$   $\mu$ F at  $V_{CC} = 3.3$  V  $\pm 0.3$  V;  $C1 = 0.047$   $\mu$ F,  $C2-C4 = 0.33$   $\mu$ F at  $V_{CC} = 5$  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
$I_I$	Input leakage current ( $\overline{EN}$ , $\overline{PWRDOWN}$ )			$\pm 0.01$	$\pm 1$	$\mu$ A
$I_{CC}$	Supply current	No load, $\overline{PWRDOWN}$ at $V_{CC}$		0.3	1	mA
	Supply current (powered off)	No load, $\overline{PWRDOWN}$ at GND		1	10	$\mu$ A

(1) Test conditions are  $C1-C4 = 0.1$   $\mu$ F at  $V_{CC} = 3.3$  V  $\pm 0.3$  V;  $C1 = 0.047$   $\mu$ F,  $C2-C4 = 0.33$   $\mu$ F at  $V_{CC} = 5$  V  $\pm 0.5$  V.

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

## DRIVER SECTION

### 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
$V_{OH}$	High-level output voltage	DOUT at $R_L = 3 \text{ k}\Omega$ to GND, DIN = GND	5	5.4		V
$V_{OL}$	Low-level output voltage	DOUT at $R_L = 3 \text{ k}\Omega$ to GND, DIN = $V_{CC}$	-5	-5.4		V
$I_{IH}$	High-level input current	$V_I = V_{CC}$		$\pm 0.01$	$\pm 1$	$\mu\text{A}$
$I_{IL}$	Low-level input current	$V_I$ at GND		$\pm 0.01$	$\pm 1$	$\mu\text{A}$
$I_{OS}$	Short-circuit output current <sup>(3)</sup>	$V_{CC} = 3.6 \text{ V}$ $V_{CC} = 5.5 \text{ V}$	$V_O = 0 \text{ V}$	$\pm 35$	$\pm 60$	mA
$r_o$	Output resistance	$V_{CC}$ , $V_+$ , and $V_- = 0 \text{ V}$ ,	$V_O = \pm 2 \text{ V}$	300	10M	$\Omega$
$I_{OZ}$	Output leakage current	PWRDOWN = GND	$V_{CC} = 3 \text{ V to } 3.6 \text{ V}$ , $V_O = \pm 12 \text{ V}$		$\pm 25$	$\mu\text{A}$
			$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $V_O = \pm 10 \text{ V}$		$\pm 25$	

(1) Test conditions are  $C1-C4 = 0.1 \mu\text{F}$  at  $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ ;  $C1 = 0.047 \mu\text{F}$ ,  $C2-C4 = 0.33 \mu\text{F}$  at  $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ .

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

(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 5](#))

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
Maximum data rate		$C_L = 1000 \text{ pF}$ , One DOUT switching, See <a href="#">Figure 1</a>	$R_L = 3 \text{ k}\Omega$ ,	250	500	kbit/s
$t_{sk(p)}$	Pulse skew <sup>(3)</sup>	$C_L = 150 \text{ pF to } 2500 \text{ pF}$ , See <a href="#">Figure 2</a>	$R_L = 3 \text{ k}\Omega$ to $7 \text{ k}\Omega$ ,		300	ns
SR(tr)	Slew rate, transition region (see <a href="#">Figure 1</a> )	$R_L = 3 \text{ k}\Omega$ to $7 \text{ k}\Omega$ , $V_{CC} = 3.3 \text{ V}$	$C_L = 150 \text{ pF to } 1000 \text{ pF}$	6	30	$\text{V}/\mu\text{s}$
			$C_L = 150 \text{ pF to } 2500 \text{ pF}$	4	30	

(1) Test conditions are  $C1-C4 = 0.1 \mu\text{F}$  at  $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ ;  $C1 = 0.047 \mu\text{F}$ ,  $C2-C4 = 0.33 \mu\text{F}$  at  $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ .

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

(3) Pulse skew is defined as  $|t_{PLH} - t_{PHL}|$  of each channel of the same device.

### ESD Protection

		TYP	UNIT
Driver outputs (DOUTx)	Human-Body Model (HBM)	$\pm 15$	kV
	IEC61000-4-2, Air-Gap Discharge	$\pm 15$	
	IEC61000-4-2, Contact Discharge	$\pm 8$	

## RECEIVER SECTION

### 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
$V_{OH}$	High-level output voltage	$I_{OH} = -1 \text{ mA}$	$V_{CC} = 0.6$	$V_{CC} = 0.1$		V
$V_{OL}$	Low-level output voltage	$I_{OL} = 1.6 \text{ mA}$			0.4	V
$V_{IT+}$	Positive-going input threshold voltage	$V_{CC} = 3.3 \text{ V}$		1.5	2.4	V
		$V_{CC} = 5 \text{ V}$		1.8	2.4	
$V_{IT-}$	Negative-going input threshold voltage	$V_{CC} = 3.3 \text{ V}$	0.6	1.2		V
		$V_{CC} = 5 \text{ V}$	0.8	1.5		
$V_{hys}$	Input hysteresis ( $V_{IT+} - V_{IT-}$ )			0.3		V
$I_{OZ}$	Output leakage current	$\overline{EN} = 1$		$\pm 0.05$	$\pm 10$	$\mu\text{A}$
$r_i$	Input resistance	$V_I = \pm 3 \text{ V}$ to $\pm 25 \text{ V}$	3	5	7	$\text{k}\Omega$

(1) Test conditions are  $C1-C4 = 0.1 \mu\text{F}$  at  $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ ;  $C1 = 0.047 \mu\text{F}$ ,  $C2-C4 = 0.33 \mu\text{F}$  at  $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ .

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

### 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
$t_{PLH}$	Propagation delay time, low- to high-level output	$C_L = 150 \text{ pF}$ , See <a href="#">Figure 3</a>	300	ns
$t_{PHL}$	Propagation delay time, high- to low-level output	$C_L = 150 \text{ pF}$ , See <a href="#">Figure 3</a>	300	ns
$t_{en}$	Output enable time	$C_L = 150 \text{ pF}$ , $R_L = 3 \text{ k}\Omega$ , See <a href="#">Figure 4</a>	200	ns
$t_{dis}$	Output disable time	$C_L = 150 \text{ pF}$ , $R_L = 3 \text{ k}\Omega$ , See <a href="#">Figure 4</a>	200	ns
$t_{sk(p)}$	Pulse skew <sup>(3)</sup>	See <a href="#">Figure 3</a>	300	ns

(1) Test conditions are  $C1-C4 = 0.1 \mu\text{F}$  at  $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ ;  $C1 = 0.047 \mu\text{F}$ ,  $C2-C4 = 0.33 \mu\text{F}$  at  $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ .

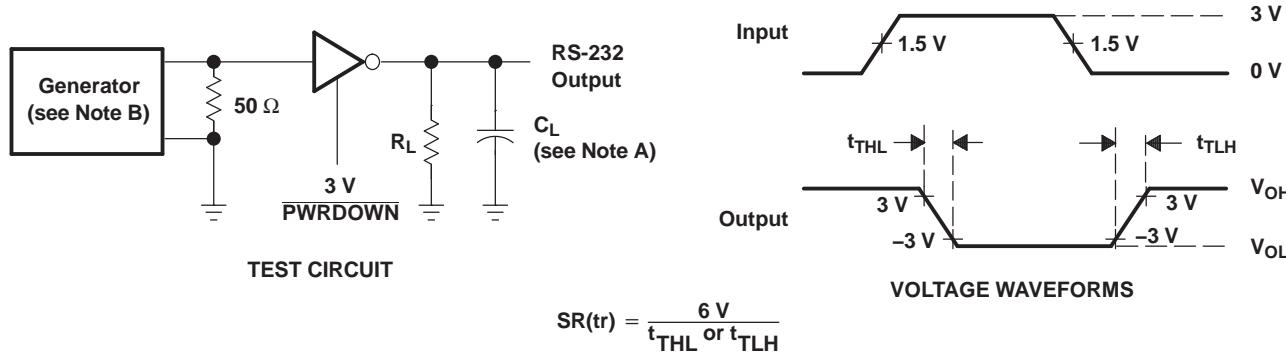
(2) All typical values are at  $V_{CC} = 3.3 \text{ V}$  or  $V_{CC} = 5 \text{ V}$ , and  $T_A = 25^\circ\text{C}$ .

(3) Pulse skew is defined as  $|t_{PLH} - t_{PHL}|$  of each channel of the same device.

## ESD Protection

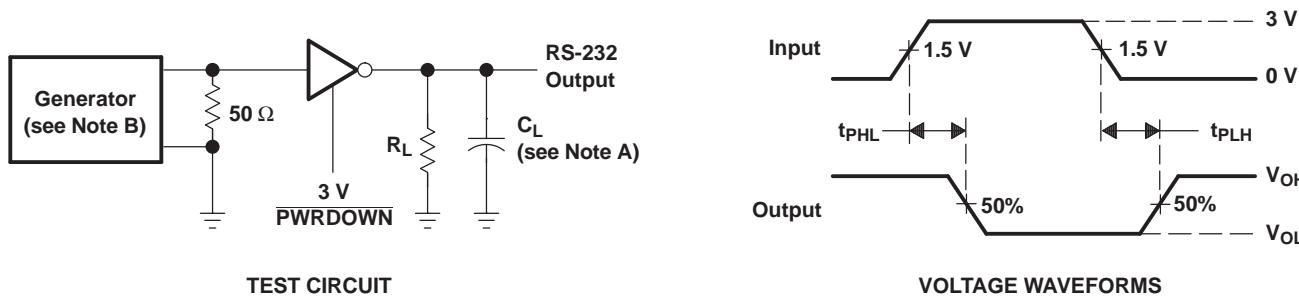
		TYP	UNIT
Receiver inputs (RINx)	Human-Body Model (HBM)	$\pm 15$	kV
	IEC61000-4-2, Air-Gap Discharge	$\pm 15$	
	IEC61000-4-2, Contact Discharge	$\pm 8$	

## PARAMETER MEASUREMENT INFORMATION



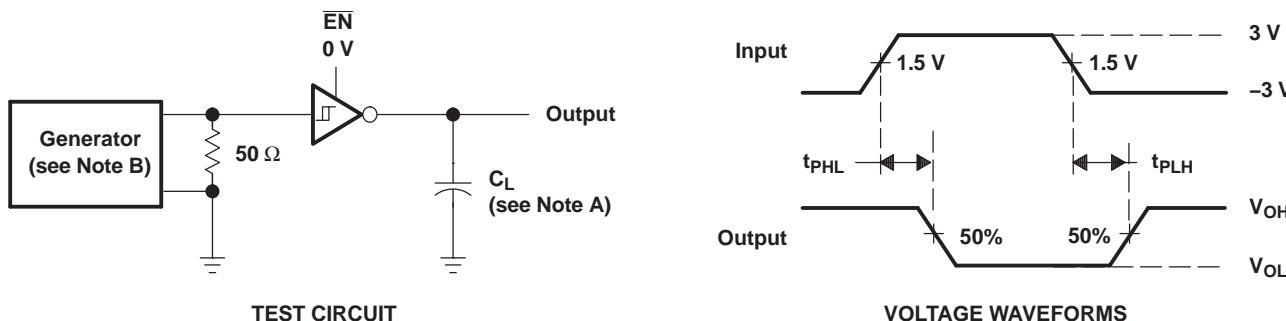
- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: PRR = 250 kbit/s,  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

**Figure 1. Driver Slew Rate**



- 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.

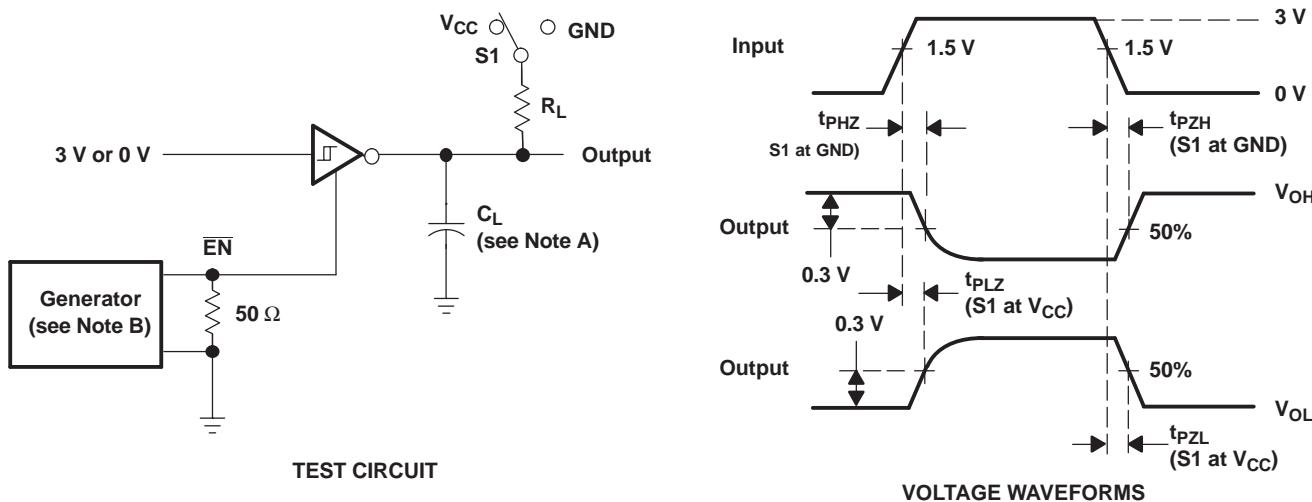
**Figure 2. Driver Pulse Skew**



- 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.

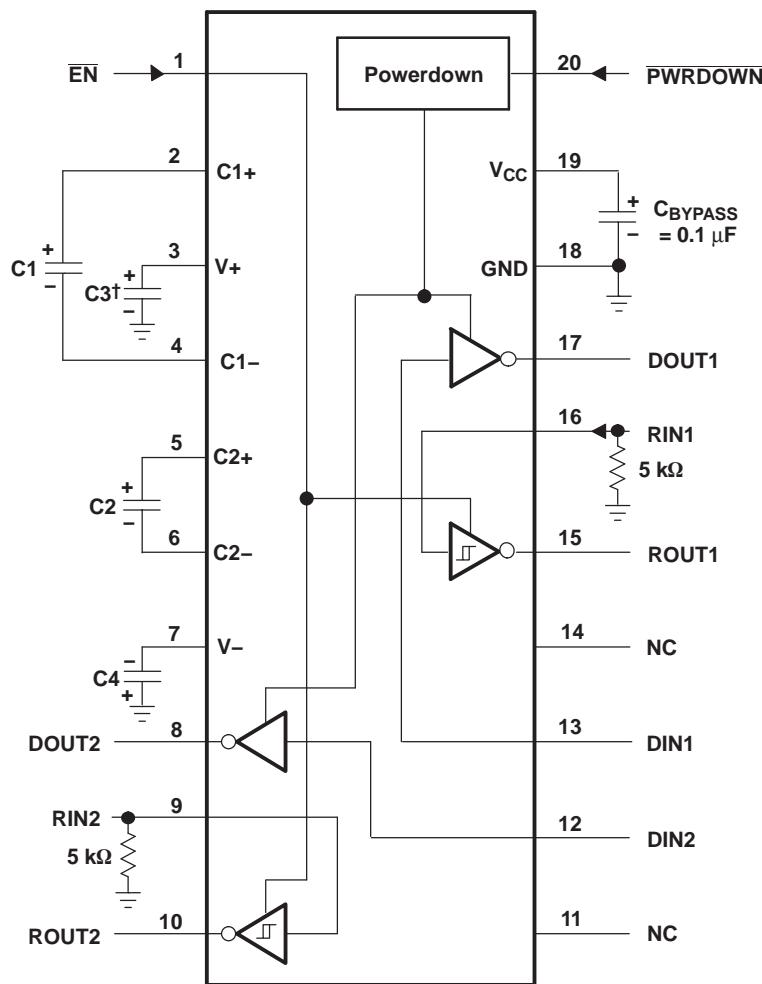
**Figure 3. Receiver Propagation Delay Times**

## PARAMETER MEASUREMENT INFORMATION (continued)



A.  $C_L$  includes probe and jig capacitance.  
 B. The pulse generator has the following characteristics:  $Z_0 = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10 \text{ ns}$ ,  $t_f \leq 10 \text{ ns}$ .

Figure 4. Receiver Enable and Disable Times

**APPLICATION INFORMATION**


† C3 can be connected to V<sub>CC</sub> or GND.

NOTES: A. Resistor values shown are nominal.

B. NC – No internal connection

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

**V<sub>CC</sub> vs CAPACITOR VALUES**

V <sub>CC</sub>	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 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
MAX3222ECDB	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MP222EC	<a href="#">Samples</a>
MAX3222ECDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MP222EC	<a href="#">Samples</a>
MAX3222ECDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3222EC	<a href="#">Samples</a>
MAX3222ECDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3222EC	<a href="#">Samples</a>
MAX3222ECPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MP222EC	<a href="#">Samples</a>
MAX3222ECPWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MP222EC	<a href="#">Samples</a>
MAX3222ECPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	MP222EC	<a href="#">Samples</a>
MAX3222EIDB	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP222EI	<a href="#">Samples</a>
MAX3222EIDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP222EI	<a href="#">Samples</a>
MAX3222EIDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3222EI	<a href="#">Samples</a>
MAX3222EIDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3222EI	<a href="#">Samples</a>
MAX3222EIPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP222EI	<a href="#">Samples</a>
MAX3222EIPWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP222EI	<a href="#">Samples</a>
MAX3222EIPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP222EI	<a href="#">Samples</a>

(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) 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.

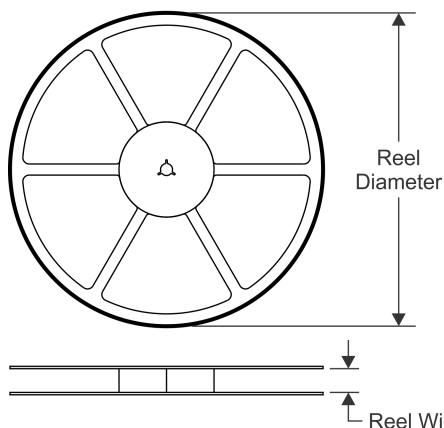
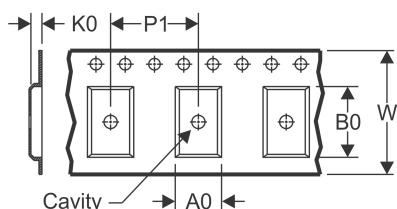
**(4)** There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

**(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.

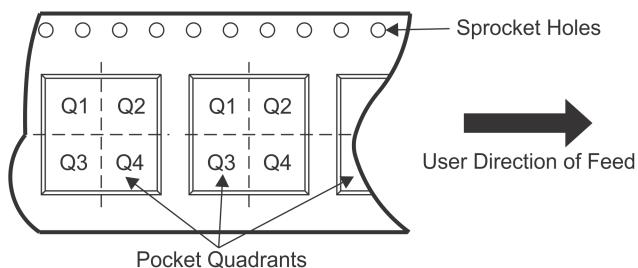
**(6) Lead/Ball Finish** - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**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
MAX3222ECDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
MAX3222ECDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
MAX3222ECPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
MAX3222EIDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
MAX3222EIDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
MAX3222EIPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	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)
MAX3222ECDBR	SSOP	DB	20	2000	367.0	367.0	38.0
MAX3222ECDWR	SOIC	DW	20	2000	367.0	367.0	45.0
MAX3222ECPWR	TSSOP	PW	20	2000	367.0	367.0	38.0
MAX3222EIDBR	SSOP	DB	20	2000	367.0	367.0	38.0
MAX3222EIDWR	SOIC	DW	20	2000	367.0	367.0	45.0
MAX3222EIPWR	TSSOP	PW	20	2000	367.0	367.0	38.0

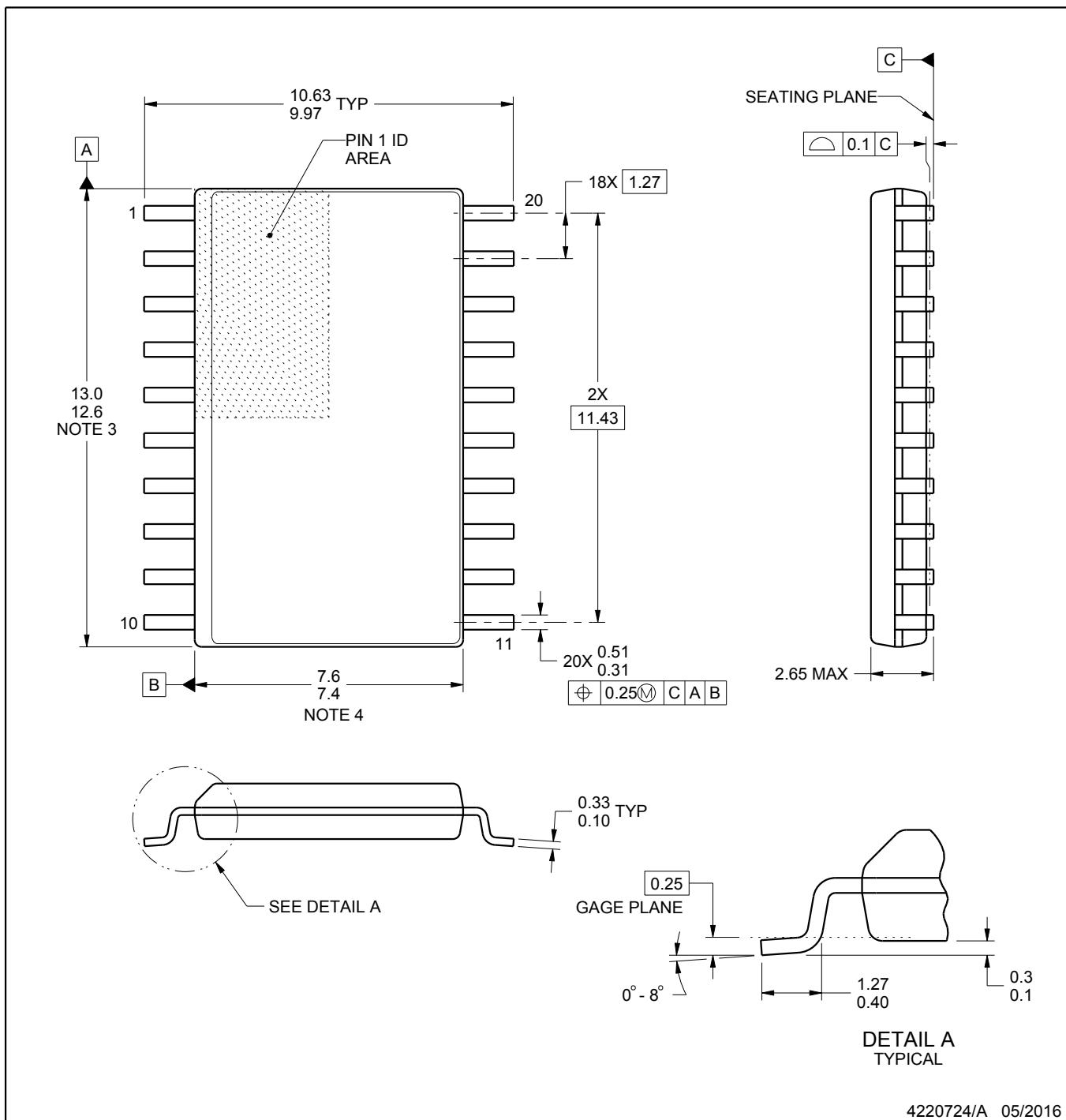
# PACKAGE OUTLINE

DW0020A



SOIC - 2.65 mm max height

SOIC



NOTES:

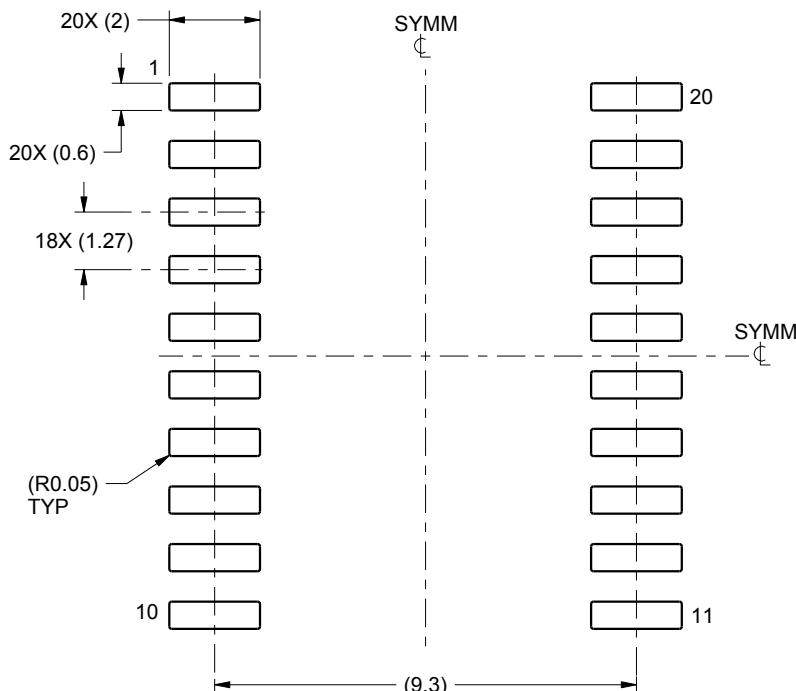
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

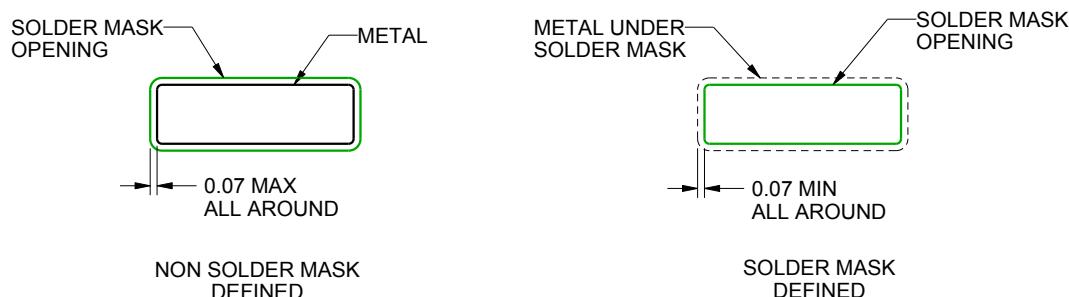
DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

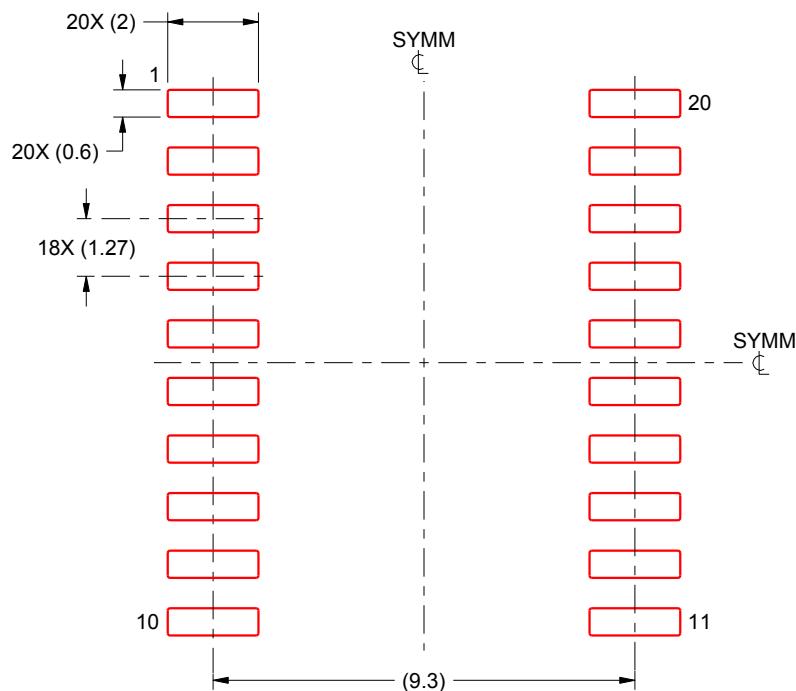
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

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

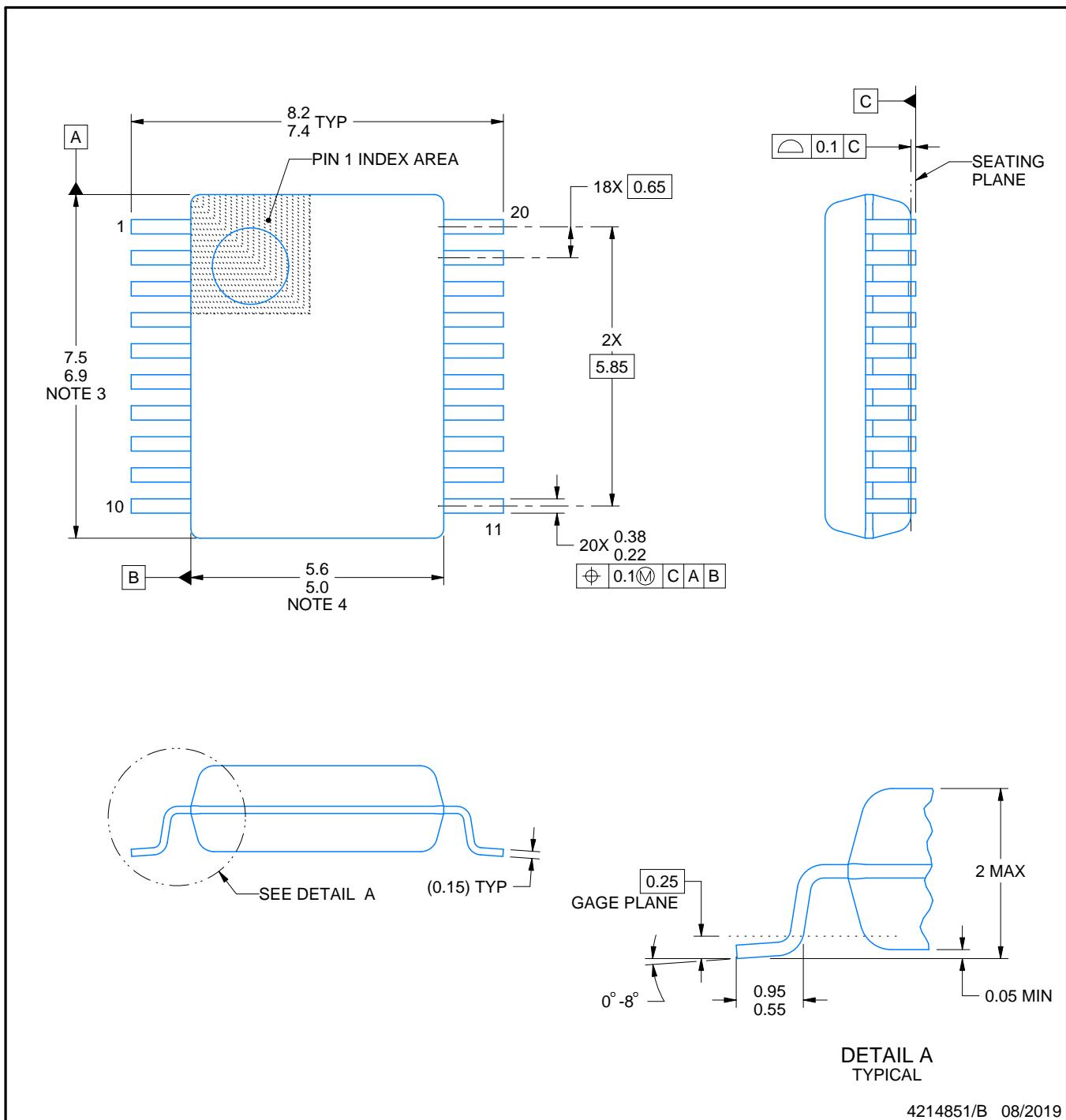
## PACKAGE OUTLINE

DB0020A



## SSOP - 2 mm max height

## SMALL OUTLINE PACKAGE



## NOTES:

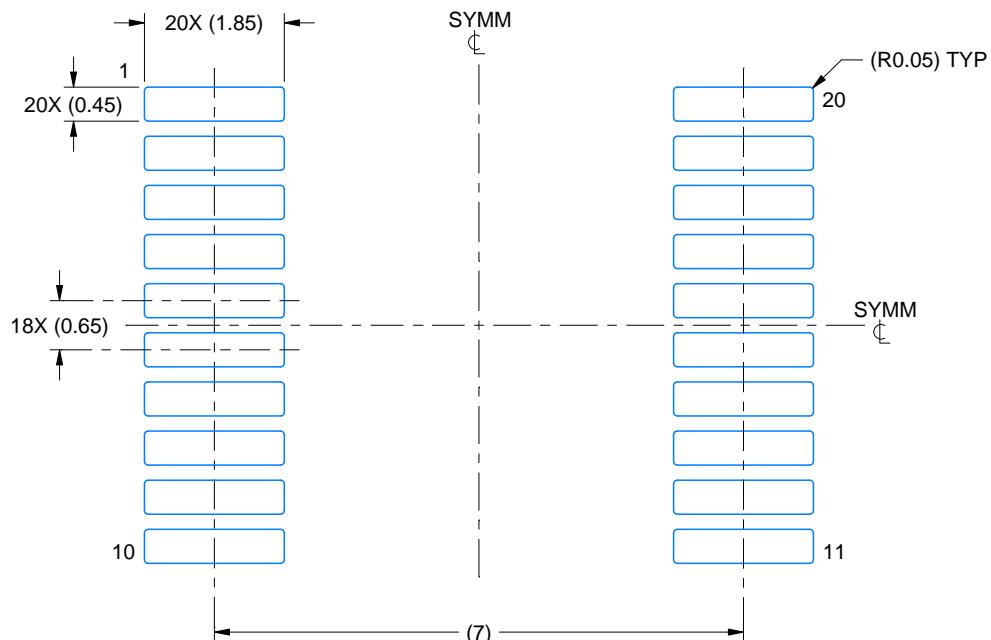
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

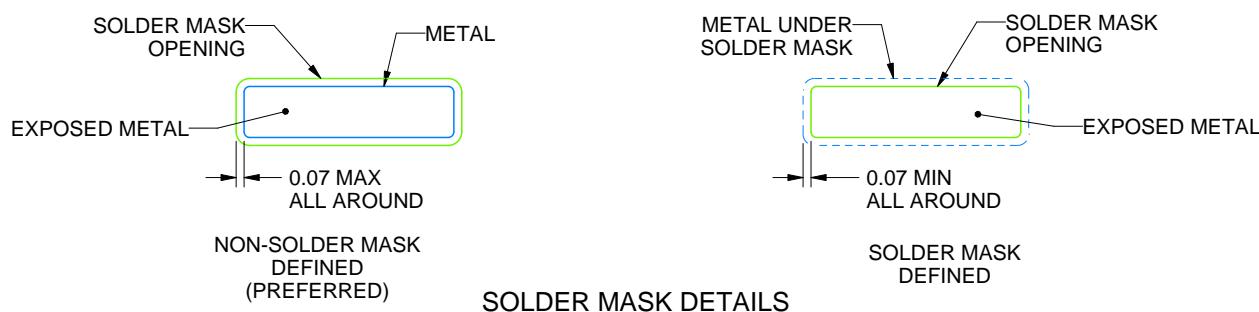
DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4214851/B 08/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

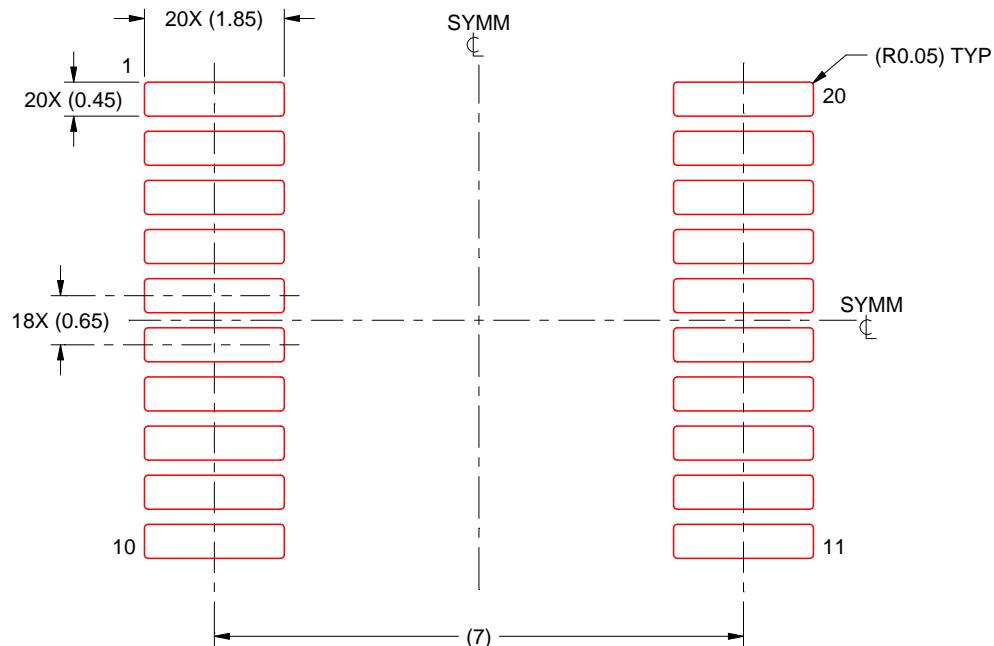
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

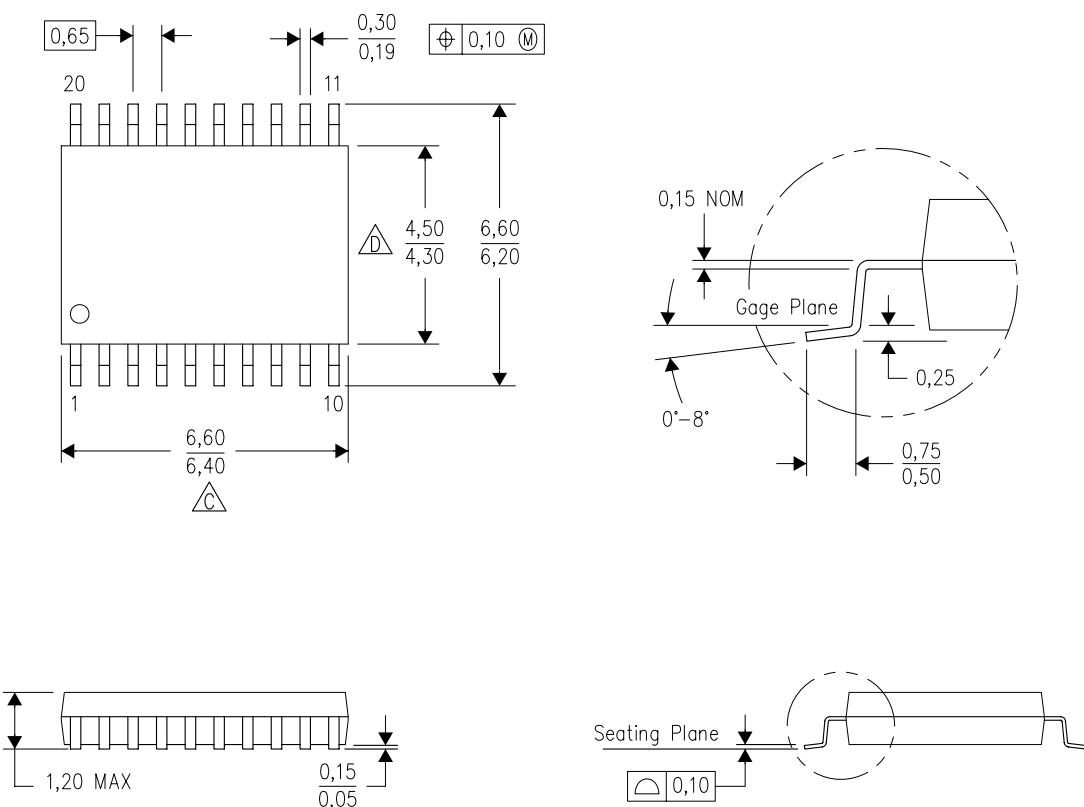
4214851/B 08/2019

NOTES: (continued)

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

PW (R-PDSO-G20)

## PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.

B. This drawing is subject to change without notice.

 Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 each side.

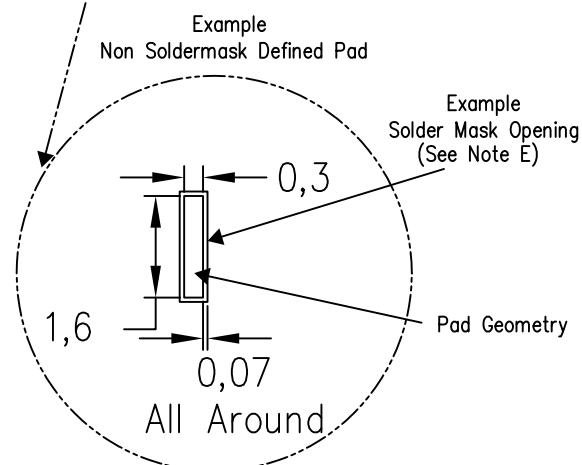
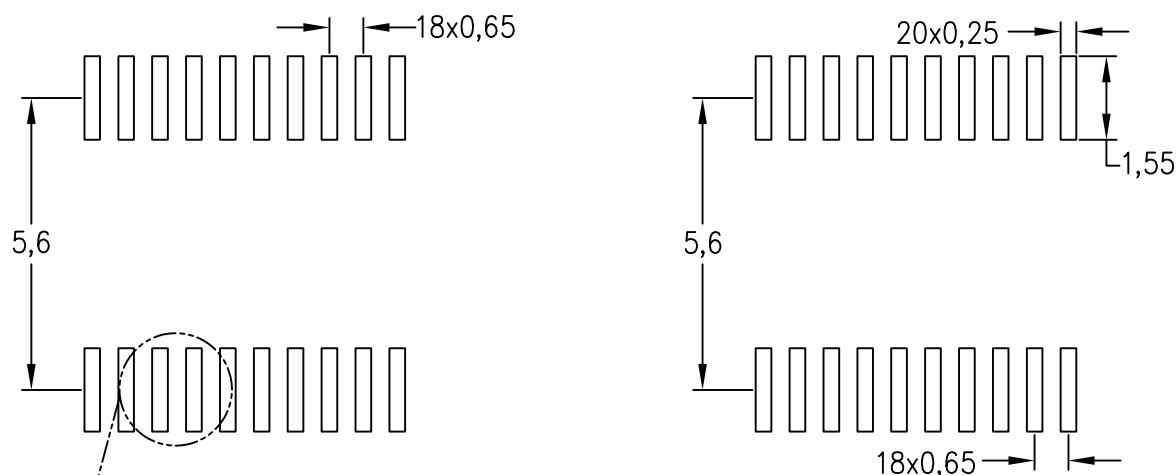
 Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDDEC MO-153

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

## Example Board Layout

Based on a stencil thickness  
of .127mm (.005inch).

4211284-5/G 08/15

NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Publication IPC-7351 is recommended for alternate design.
- 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.
- Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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