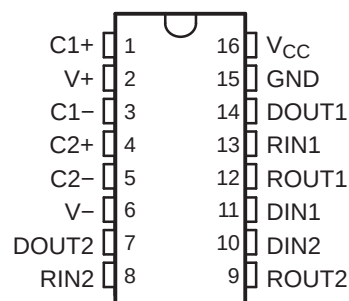


FEATURES

- Operate With 3-V to 5.5-V V_{CC} Supply
- Operate up to 1 Mbit/s
- Low Supply Current . . . 300 μ A Typ
- External Capacitors . . . $4 \times 0.1 \mu$ F
- Accept 5-V Logic Input With 3.3-V Supply
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection for RS-232 Pins
 - ±15-kV Human-Body Model (HBM)
 - ±15-kV IEC 61000-4-2 Air-Gap Discharge
 - ±8-kV IEC 61000-4-2 Contact Discharge

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



APPLICATIONS

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

DESCRIPTION/ORDERING INFORMATION

The SN65C3232E and SN75C3232E consist of two line drivers, two line receivers, and a dual charge-pump circuit with ±15-kV ESD protection pin to pin (serial-port connection pins, including GND). These devices provide 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 1 Mbit/s and a driver output slew rate of 14 V/ μ s to 150 V/ μ s.

ORDERING INFORMATION

T _A	PACKAGE ⁽¹⁾⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – D	Tube of 40	SN65C3232ED	65C3232E
		Reel of 2500	SN65C3232EDR	
	SOIC – DW	Tube of 40	SN65C3232EDW	65C3232E
		Reel of 2000	SN65C3232EDWR	
	SSOP – DB	Reel of 2000	SN65C3232EDBR	MU232E
	TSSOP – PW	Tube of 90	SN65C3232EPW	MU232E
Reel of 2000		SN65C3232EPWR		
0°C to 70°C	SOIC – D	Tube of 40	SN75C3232ED	75C3232E
		Reel of 2500	SN75C3232EDR	
	SOIC – DW	Tube of 40	SN75C3232EDW	75C3232E
		Reel of 2000	SN75C3232EDWR	
	SSOP – DB	Reel of 2000	SN75C3232EDBR	MY232E
	TSSOP – PW	Tube of 90	SN75C3232EPW	MY232E
Reel of 2000		SN75C3232EPWR		

(1) Package drawings, thermal data, and symbolization are available at 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.



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.

SN65C3232E, SN75C3232E
3-V TO 5.5-V TWO-CHANNEL RS-232 1-MBIT/S LINE DRIVERS/RECEIVERS
WITH ±15-kV IEC ESD PROTECTION

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Table 1. 1-Mbit/s RS-232 Parts

TEMPERATURE RANGE	PART NO.	NO. OF DRIVERS	NO. OF RECEIVERS	ESD	SUPPLY V_{CC} (V)	FEATURE	PIN/PACKAGE
–40°C to 85°C	SN65C3221E	1	1	±15-kV Air-Gap, ±8-kV Contact, ±15-kV HBM	3.3 or 5	Auto powerdown	16-pin SOIC, SSOP, TSSOP
	SN65C3232E	2	2	±15-kV Air-Gap, ±8-kV Contact, ±15-kV HBM	3.3 or 5	Low pin count	16-pin SOIC, SSOP, TSSOP
	MAX3227I	1	1	±8-kV Air-Gap, ±8-kV Contact, ±15-kV HBM	3.3 or 5	Auto powerdown plus, ready signal	16-pin SSOP
	SN65C3221	1	1	±15-kV HBM	3.3 or 5	Auto powerdown	16-pin SOIC, SSOP, TSSOP
	SN65C3223	2	2	±15-kV HBM	3.3 or 5	Auto powerdown, enable signal	20-pin SOIC, SSOP, TSSOP
	SN65C3222	2	2	±15-kV HBM	3.3 or 5	Enable, powerdown signal	20-pin SOIC, SSOP, TSSOP
	SN65C3232	2	2	±15-kV HBM	3.3 or 5	Low pin count	16-pin SOIC, SSOP, TSSOP
	SN65C3238	5	3	±15-kV HBM	3.3 or 5	Auto powerdown plus	28-pin SOIC, SSOP, TSSOP
	SN65C3243	3	5	±15-kV HBM	3.3 or 5	Auto powerdown	28-pin SOIC, SSOP, TSSOP
0°C to 70°C	SN75C3221E	1	1	±15-kV Air-Gap, ±8-kV Contact, ±15-kV HBM	3.3 or 5	Auto powerdown	16-pin SOIC, SSOP, TSSOP
	SN75C3232E	2	2	±15-kV Air-Gap, ±8-kV Contact, ±15-kV HBM	3.3 or 5	Low pin count	16-pin SOIC, SSOP, TSSOP
	MAX3227C	1	1	±8-kV Air-Gap, ±8-kV Contact, ±15-kV HBM	3.3 or 5	Auto powerdown plus, ready signal	16-pin SSOP
	SN75C3221	1	1	±15-kV HBM	3.3 or 5	Auto powerdown	16-pin SOIC, SSOP, TSSOP
	SN75C3223	2	2	±15-kV HBM	3.5 or 5	Auto powerdown, enable signal	20-pin SOIC, SSOP, TSSOP
	SN75C3222	2	2	±15-kV HBM	3.3 or 5	Enable, powerdown signal	20-pin SOIC, SSOP, TSSOP
	SN75C3232	2	2	±15-kV HBM	3.3 or 5	Low pin count	16-pin SOIC, SSOP, TSSOP
	SN75C3238	5	3	±15-kV HBM	3.3 or 5	Auto powerdown plus	28-pin SOIC, SSOP, TSSOP
	SN75C3243	3	5	±15-kV HBM	3.3 or 5	Auto powerdown	28-pin SOIC, SSOP, TSSOP

FUNCTION TABLES

EACH DRIVER⁽¹⁾

INPUT DIN	OUTPUT DOUT
L	H
H	L

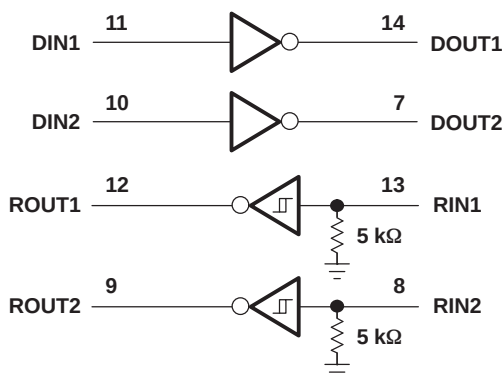
(1) H = high level, L = low level

EACH RECEIVER⁽¹⁾

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)



SN65C3232E, SN75C3232E

3-V TO 5.5-V TWO-CHANNEL RS-232 1-MBIT/S LINE DRIVERS/RECEIVERS

WITH ± 15 -kV IEC ESD PROTECTION

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Absolute Maximum Ratings⁽¹⁾

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage range ⁽²⁾		–0.3	6	V
V^+	Positive output supply voltage range ⁽²⁾		–0.3	7	V
V^-	Negative output supply voltage range ⁽²⁾		0.3	–7	V
$V^+ - V^-$	Supply voltage difference ⁽²⁾			13	V
V_I	Input voltage range	Drivers	–0.3	6	V
		Receivers	–25	25	
V_O	Output voltage range	Drivers	–13.2	13.2	V
		Receivers	–0.3	$V_{CC} + 0.3$	
θ_{JA}	Package thermal impedance ⁽³⁾⁽⁴⁾	D package		82	°C/W
		DB package		46	
		DW package		57	
		PW package		108	
T_J	Operating virtual junction temperature			150	°C
T_{stg}	Storage temperature range		–65	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.
- All voltages are with respect to network GND.
- Maximum power dissipation is a function of $T_J(\text{max})$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
- The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions⁽¹⁾

			MIN	NOM	MAX	UNIT
Supply voltage		$V_{CC} = 3.3 \text{ V}$	3	3.3	3.6	V
		$V_{CC} = 5 \text{ V}$	4.5	5	5.5	
V_{IH}	Driver high-level input voltage	DIN	$V_{CC} = 3.3 \text{ V}$	2		V
			$V_{CC} = 5 \text{ V}$	2.4		
V_{IL}	Driver low-level input voltage	DIN			0.8	V
V_I	Driver input voltage	DIN	0		5.5	V
	Receiver input voltage		–25		25	
T_A	Operating free-air temperature	SN65C3232E	–40		85	°C
		SN75C3232E	0		70	

- 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 $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ (see [Figure 4](#)).

Electrical Characteristics⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
I_{CC}	Supply current	No load, $V_{CC} = 3.3 \text{ V}$ or 5 V	0.3	1	mA

- 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 $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ (see [Figure 4](#)).
- All typical values are at $V_{CC} = 3.3 \text{ V}$ or $V_{CC} = 5 \text{ V}$, and $T_A = 25^\circ\text{C}$.

DRIVER SECTION

Electrical Characteristics⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
V_{OH} High-level output voltage	DOUT at $R_L = 3\text{ k}\Omega$ to GND, DIN = GND	5	5.5		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	$V_I = V_{CC}$		± 0.01	± 1	μA
I_{IL} Low-level input current	V_I at GND		± 0.01	± 1	μA
I_{OS} ⁽³⁾ Short-circuit output current	$V_{CC} = 3.6\text{ V}$, $V_O = 0\text{ V}$		± 35	± 60	mA
	$V_{CC} = 5.5\text{ V}$, $V_O = 0\text{ V}$		± 35	± 90	
r_o Output resistance	V_{CC} , V^+ , and $V^- = 0\text{ V}$, $V_O = \pm 2\text{ V}$	300	10M		Ω

(1) Test conditions are C_1 – $C_4 = 0.1\text{ }\mu\text{F}$ at $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$; $C_1 = 0.047\text{ }\mu\text{F}$, C_2 – $C_4 = 0.33\text{ }\mu\text{F}$ at $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (see Figure 4).

(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⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
Maximum data rate (see Figure 1)	$R_L = 3\text{ k}\Omega$, One DOUT switching		$C_L = 250\text{ pF}$, $V_{CC} = 3\text{ V to }4.5\text{ V}$	1000	kbit/s
			$C_L = 1000\text{ pF}$, $V_{CC} = 3.5\text{ V to }5.5\text{ V}$	1000	
$t_{sk(p)}$ Pulse skew ⁽³⁾	$C_L = 150\text{ pF to }2500\text{ pF}$, $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$, See Figure 2		300		ns
SR(tr) Slew rate, transition region (see Figure 1)	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$, $C_L = 150\text{ pF to }1000\text{ pF}$, $V_{CC} = 3.3\text{ V}$	14		150	V/ μs

(1) Test conditions are C_1 – $C_4 = 0.1\text{ }\mu\text{F}$ at $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$; $C_1 = 0.047\text{ }\mu\text{F}$, C_2 – $C_4 = 0.33\text{ }\mu\text{F}$ at $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (see Figure 4).

(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

TERMINAL		TEST CONDITIONS	TYP	UNIT
NAME	NO.			
DOUT	7, 14	HBM	± 15	kV
		IEC 61000-4-2 Air-Gap Discharge	± 15	
		IEC 61000-4-2 Contact Discharge	± 8	

SN65C3232E, SN75C3232E

3-V TO 5.5-V TWO-CHANNEL RS-232 1-MBIT/S LINE DRIVERS/RECEIVERS

WITH ± 15 -kV IEC ESD PROTECTION

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RECEIVER SECTION

Electrical Characteristics⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	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
r_i Input resistance	$V_i = \pm 3 \text{ V to } \pm 25 \text{ V}$	3	5	7	k Ω

(1) Test conditions are C1–C4 = 0.1 μF at $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$; C1 = 0.047 μF , C2–C4 = 0.33 μF at $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ (see Figure 4).

(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⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TYP ⁽²⁾	UNIT
t_{PLH} Propagation delay time, low- to high-level output	$C_L = 150 \text{ pF}$	300	ns
t_{PHL} Propagation delay time, high- to low-level output		300	ns
$t_{sk(p)}$ Pulse skew ⁽³⁾		300	ns

(1) Test conditions are C1–C4 = 0.1 μF at $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$; C1 = 0.047 μF , C2–C4 = 0.33 μF at $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ (see Figure 4).

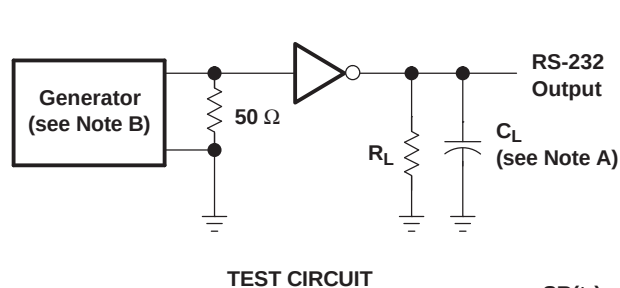
(2) All typical values are at $V_{CC} = 3.3 \text{ V}$ or $V_{CC} = 5 \text{ V}$, and $T_A = 25^\circ\text{C}$.

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

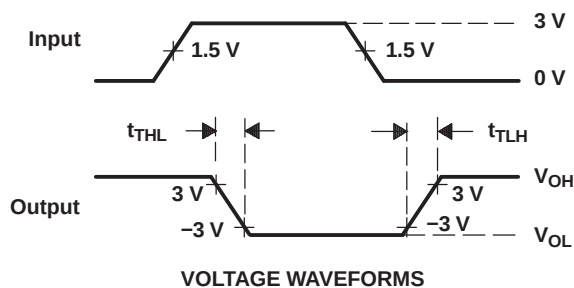
ESD Protection

TERMINAL		TEST CONDITIONS	TYP	UNIT
NAME	NO.			
RIN	8, 13	HBM	± 15	kV
		IEC 61000-4-2 Air-Gap Discharge	± 15	
		IEC 61000-4-2 Contact Discharge	± 8	

PARAMETER MEASUREMENT INFORMATION



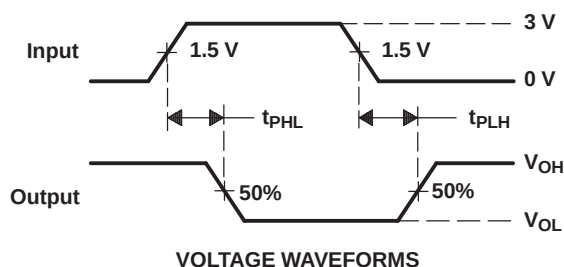
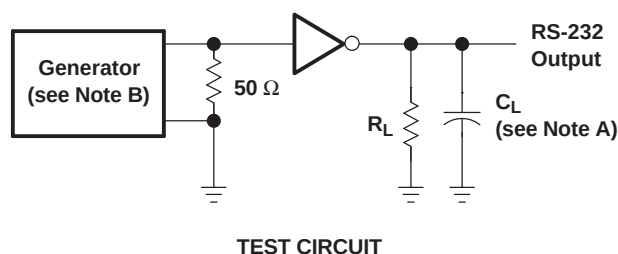
$$SR(tr) = \frac{6\text{ V}}{t_{THL} \text{ or } t_{TLH}}$$



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, $t_r \leq 10\text{ ns}$, $t_f \leq 10\text{ ns}$.

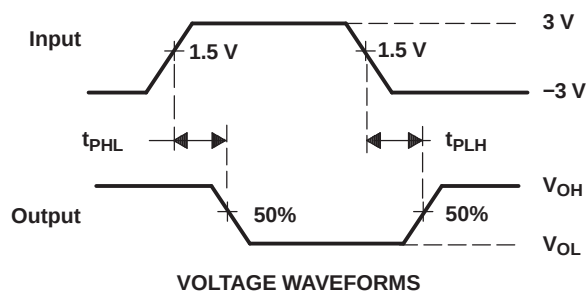
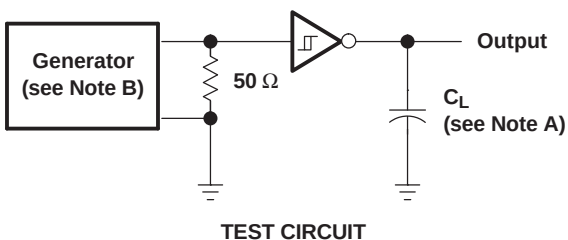
Figure 1. Driver Slew Rate



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



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

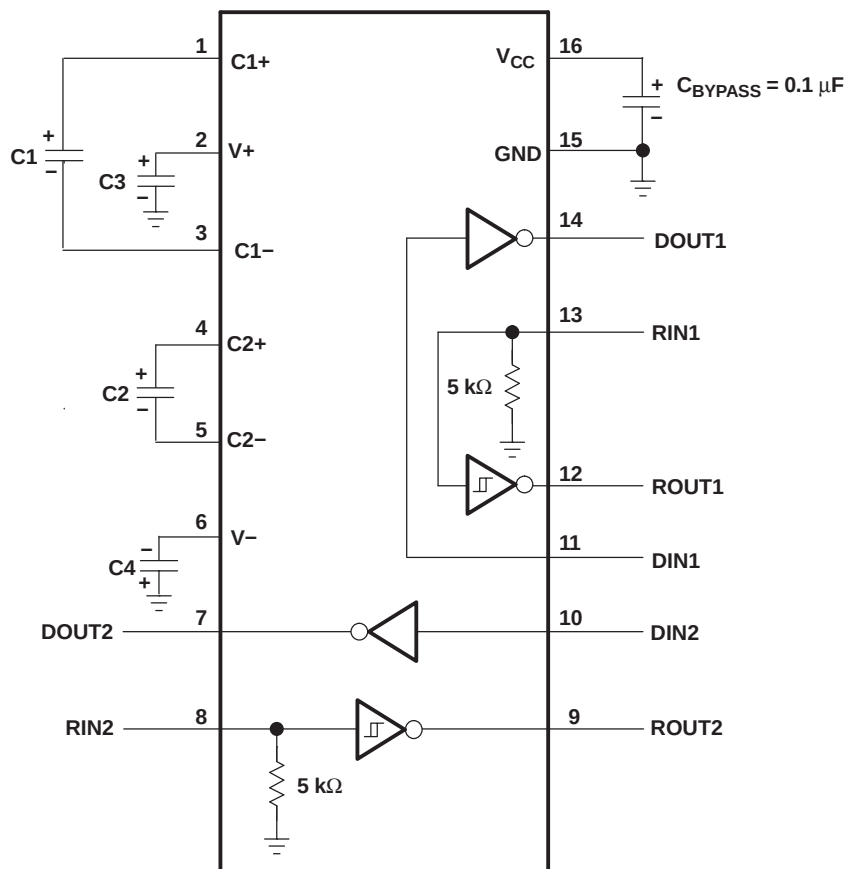
SN65C3232E, SN75C3232E

3-V TO 5.5-V TWO-CHANNEL RS-232 1-MBIT/S LINE DRIVERS/RECEIVERS

WITH ± 15 -kV IEC ESD PROTECTION

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APPLICATION INFORMATION



V_{CC} vs CAPACITOR VALUES

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

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

Figure 4. 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
SN65C3232ED	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65C3232E	Samples
SN65C3232EDB	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN65C3232EDBG4	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN65C3232EDBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN65C3232EDBRG4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN65C3232EDE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65C3232E	Samples
SN65C3232EDR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65C3232E	Samples
SN65C3232EDRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65C3232E	Samples
SN65C3232EDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65C3232E	Samples
SN65C3232EDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	65C3232E	Samples
SN65C3232EPW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN65C3232EPWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN65C3232EPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MU232E	Samples
SN75C3232ED	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	75C3232E	Samples
SN75C3232EDB	ACTIVE	SSOP	DB	16	80	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	MY232E	Samples
SN75C3232EDBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	MY232E	Samples
SN75C3232EDR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	75C3232E	Samples

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
SN75C3232EDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	75C3232E	Samples
SN75C3232EDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	75C3232E	Samples
SN75C3232EPW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	MY232E	Samples
SN75C3232EPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	MY232E	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) **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.

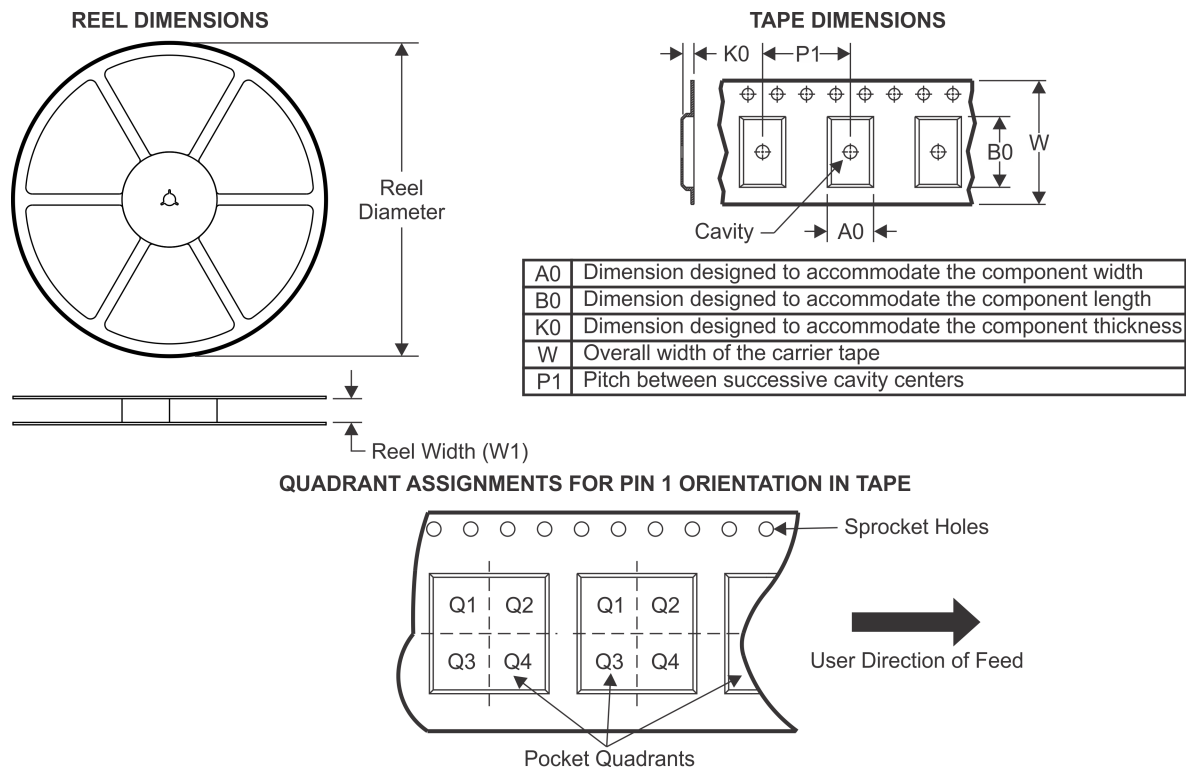
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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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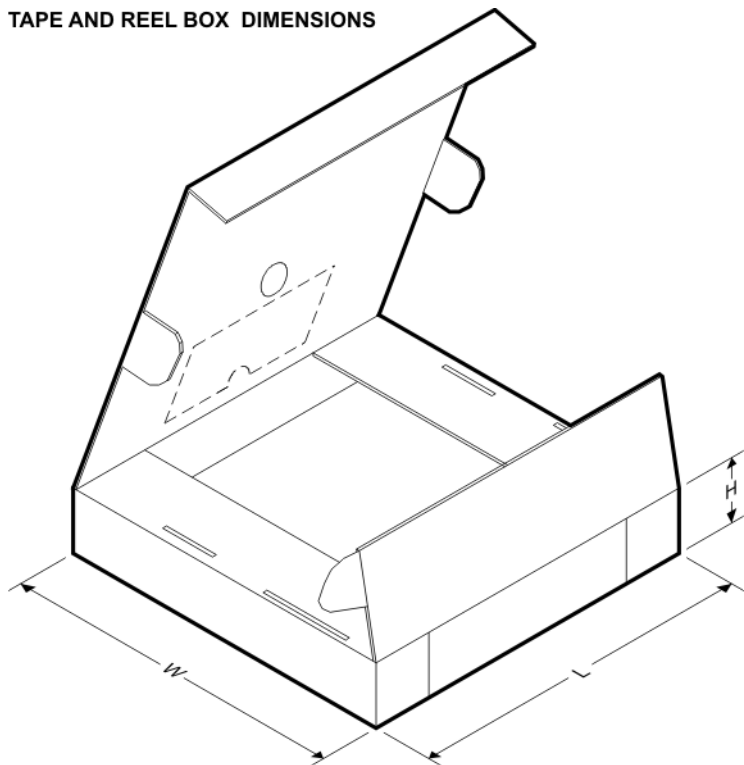
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TAPE AND REEL INFORMATION


*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
SN65C3232EDR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN65C3232EDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
SN65C3232EPWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN75C3232EDR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN75C3232EDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
SN75C3232EPWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

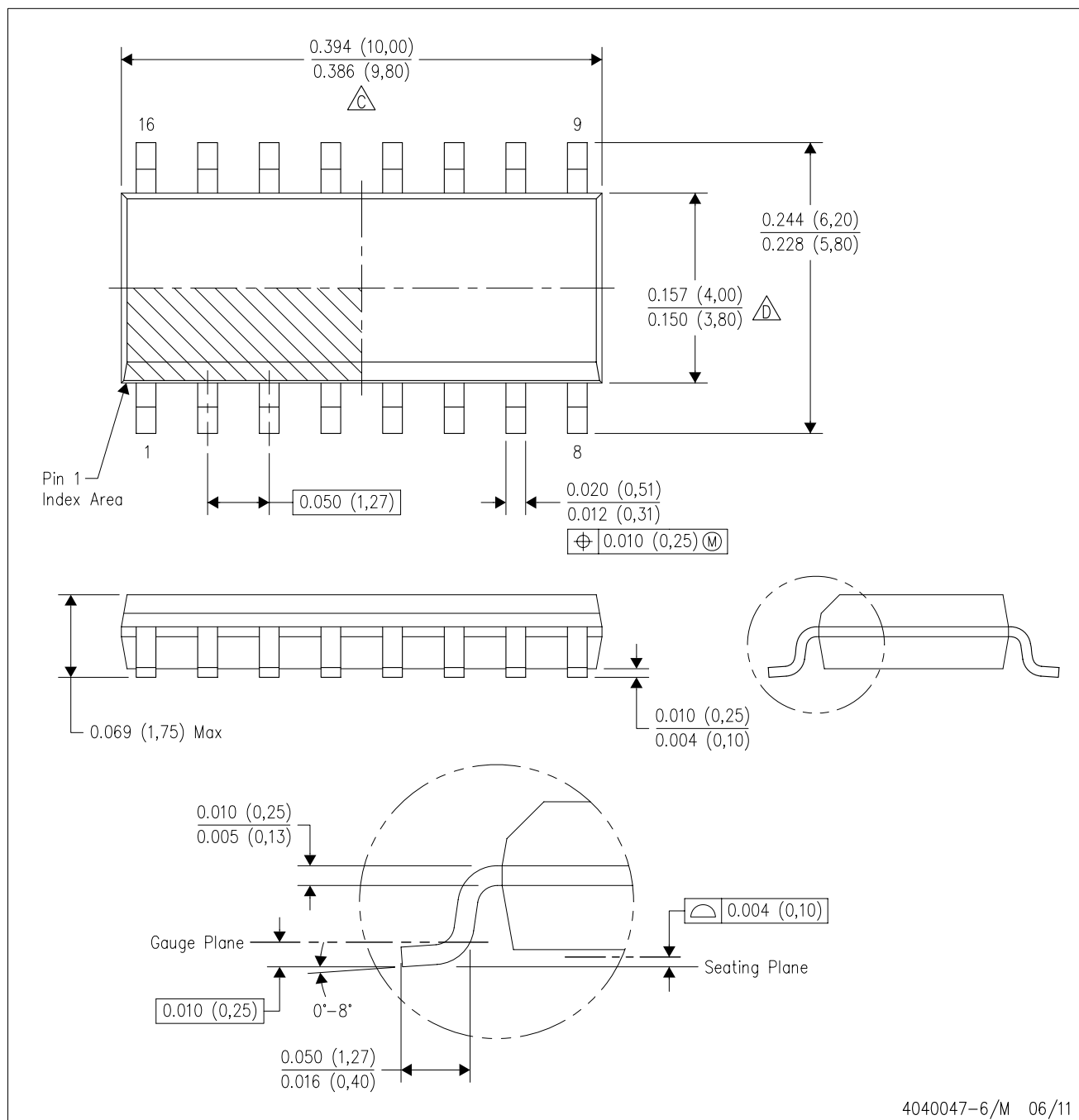


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65C3232EDR	SOIC	D	16	2500	367.0	367.0	38.0
SN65C3232EDWR	SOIC	DW	16	2000	350.0	350.0	43.0
SN65C3232EPWR	TSSOP	PW	16	2000	367.0	367.0	35.0
SN75C3232EDR	SOIC	D	16	2500	367.0	367.0	38.0
SN75C3232EDWR	SOIC	DW	16	2000	350.0	350.0	43.0
SN75C3232EPWR	TSSOP	PW	16	2000	367.0	367.0	35.0

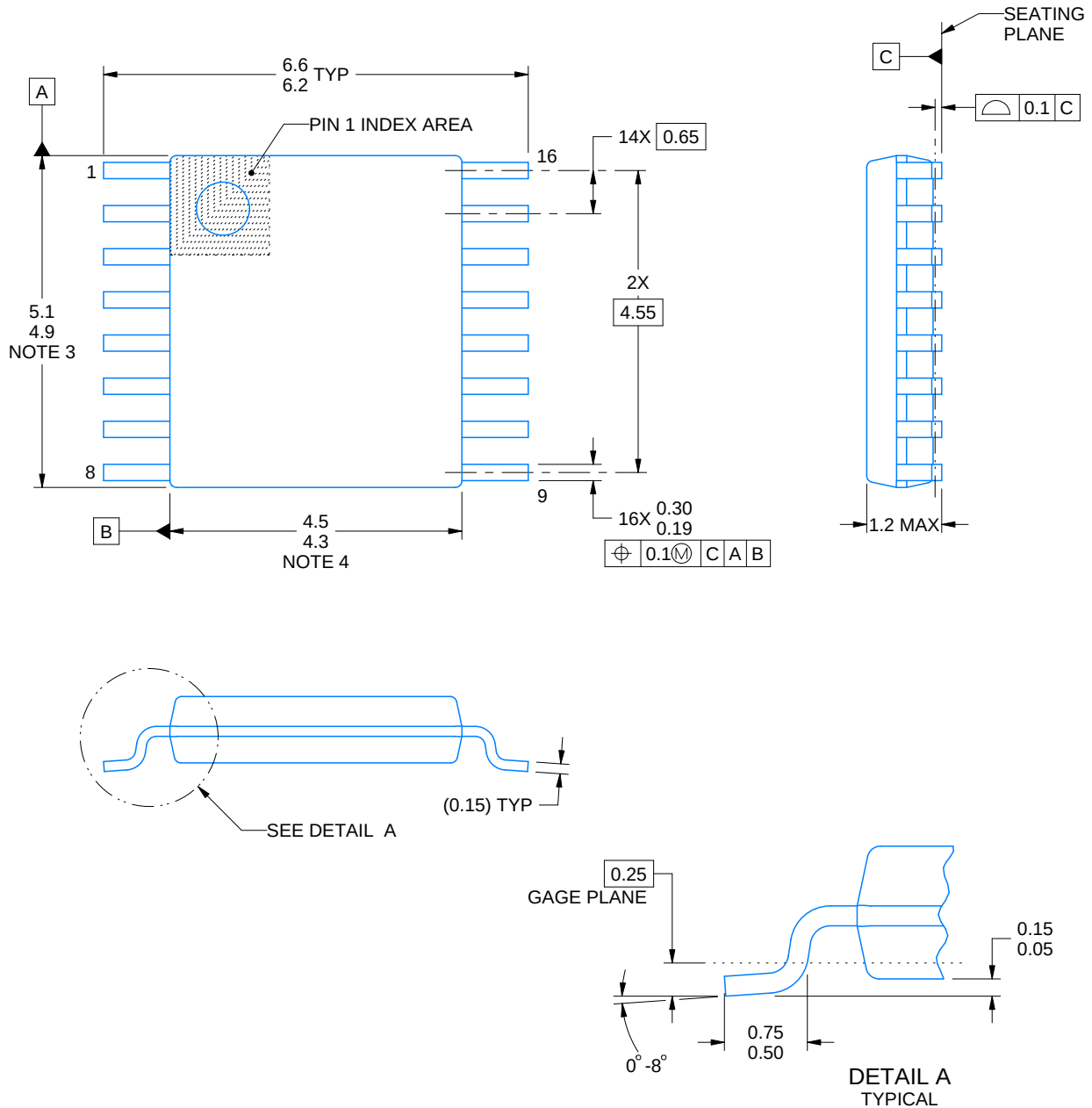
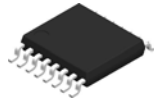
D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



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.



4220204/A 02/2017

NOTES:

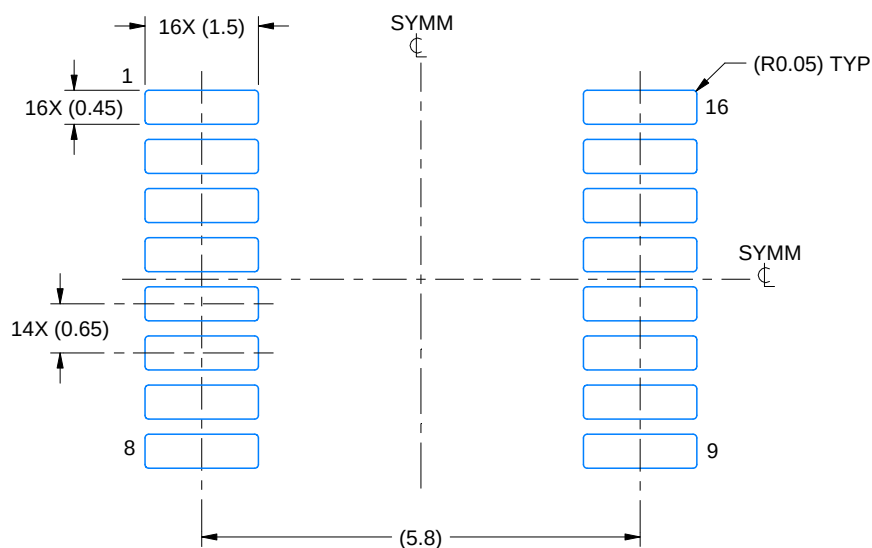
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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-153.

EXAMPLE BOARD LAYOUT

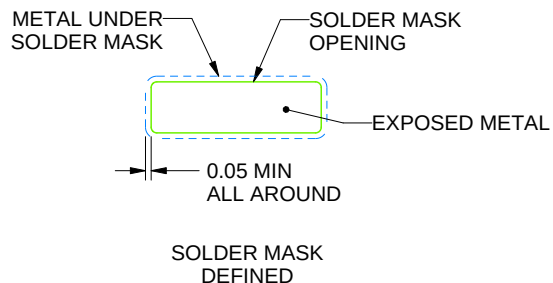
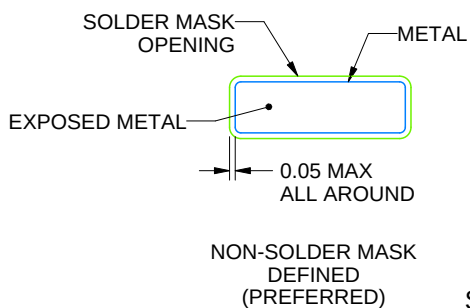
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4220204/A 02/2017

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

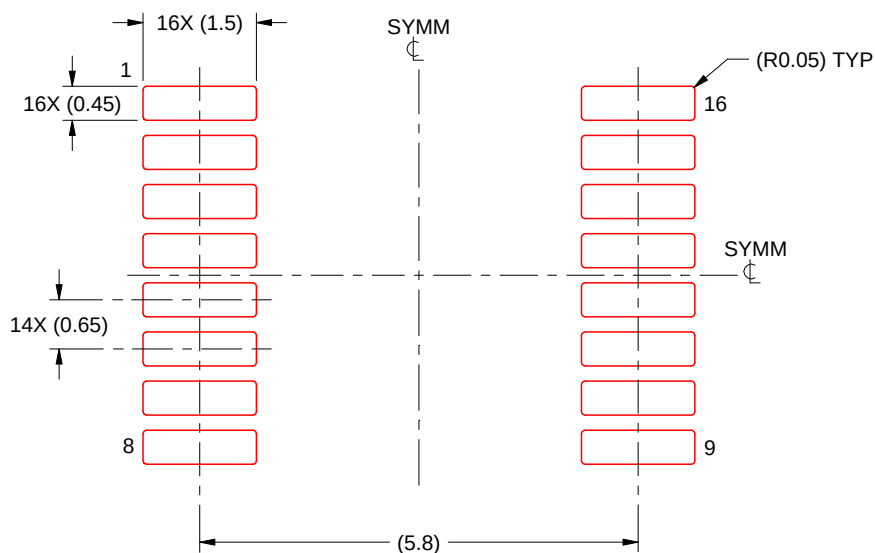
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220204/A 02/2017

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.

GENERIC PACKAGE VIEW

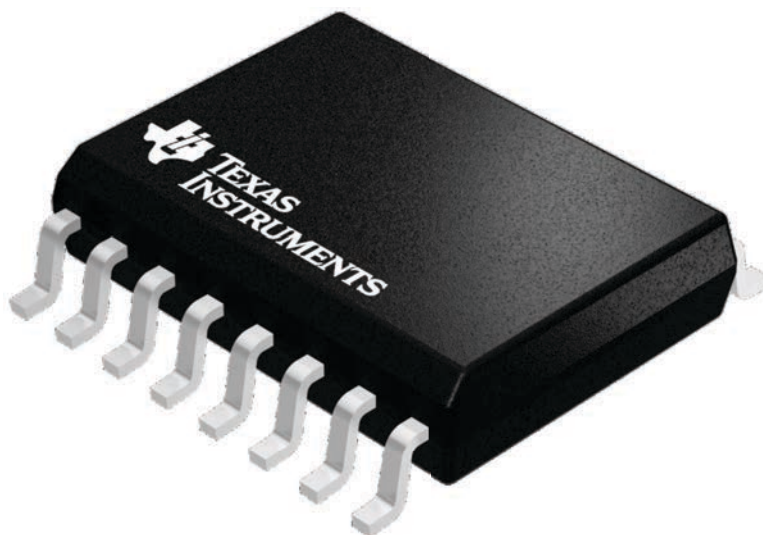
DW 16

SOIC - 2.65 mm max height

7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



4224780/A



SOIC - 2.65 mm max height

SOIC



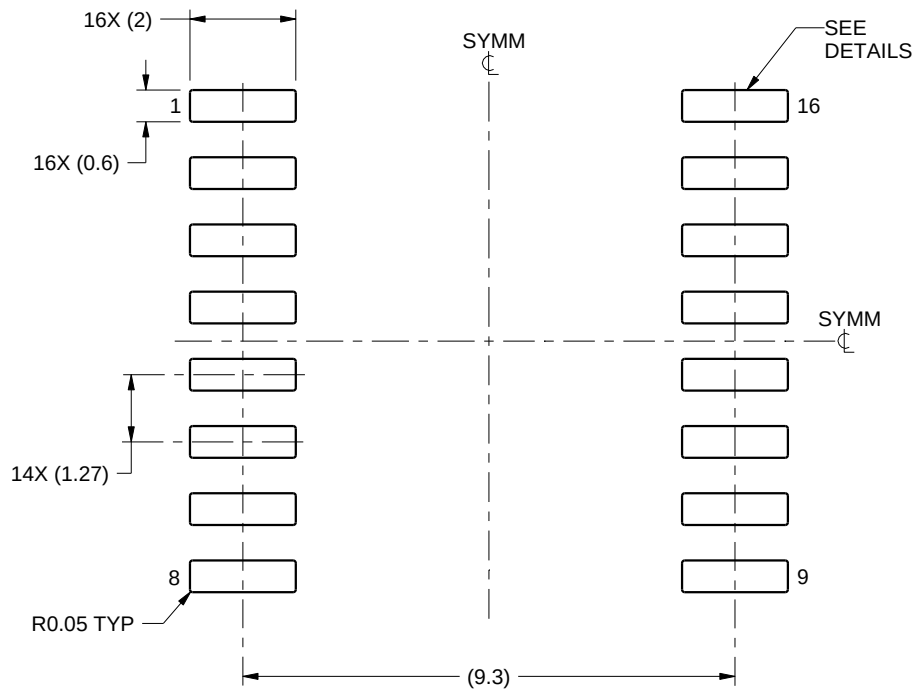
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

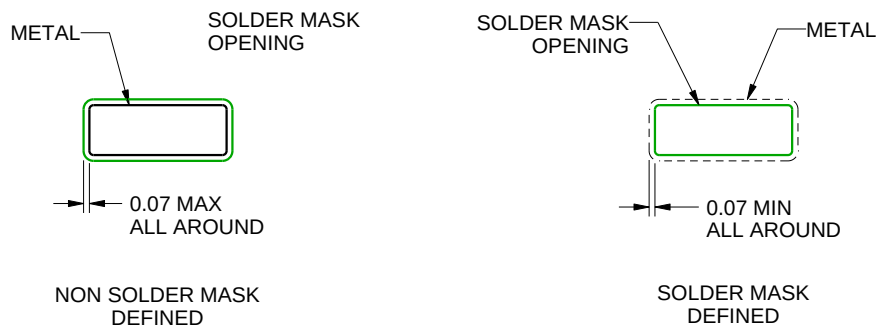
DW0016A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:7X



SOLDER MASK DETAILS

4220721/A 07/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

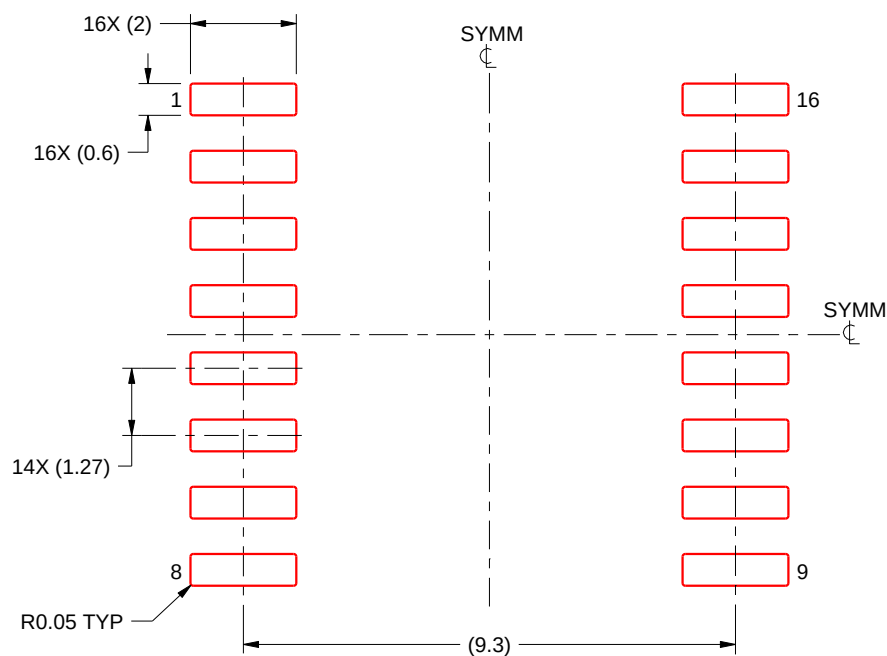
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0016A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

4220721/A 07/2016

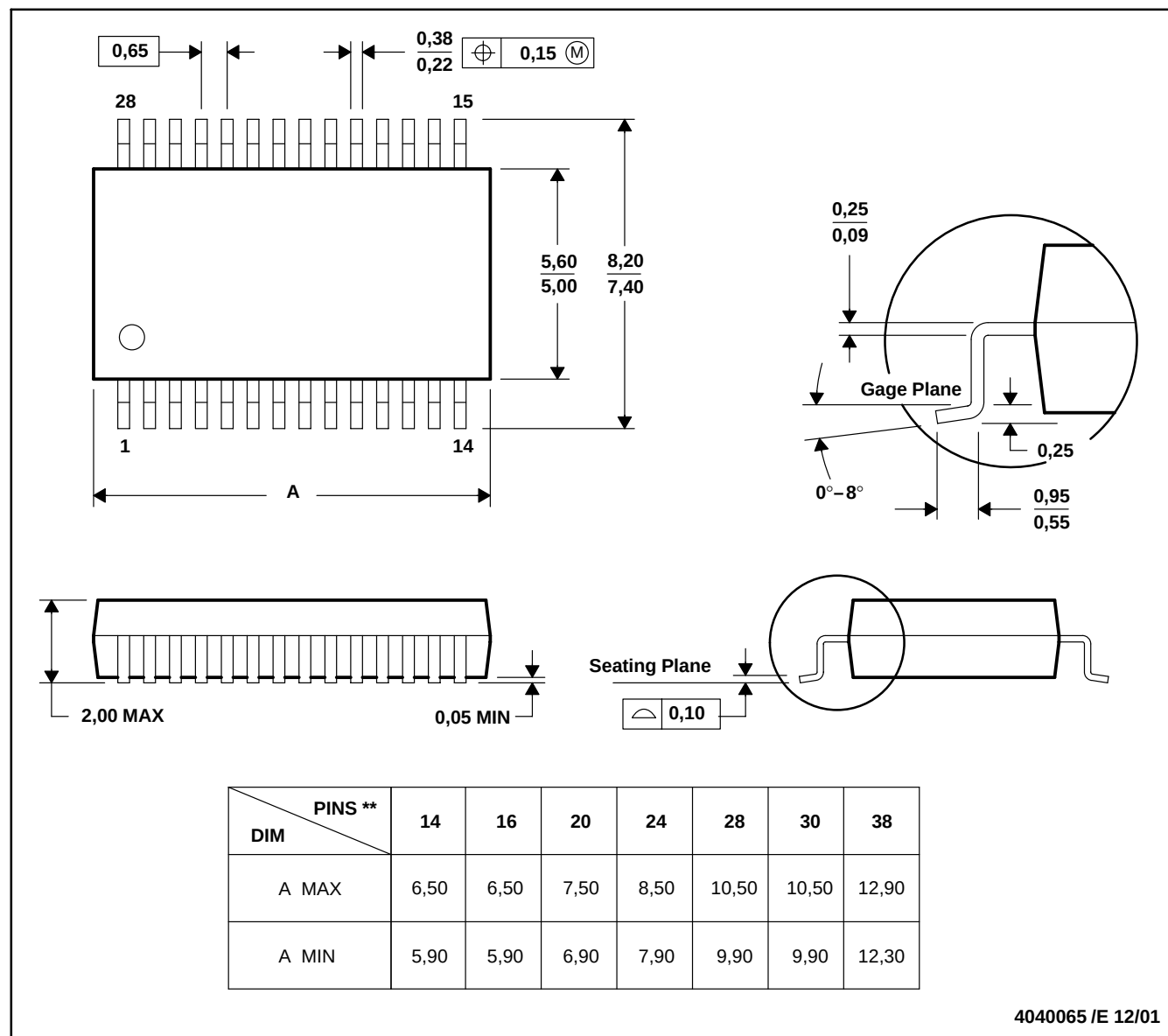
NOTES: (continued)

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.

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

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