

3-V TO 5.5-V MULTICHANNEL RS-232 1-MBit/s LINE DRIVER/RECEIVER

Check for Samples: [MAX3237E](#)

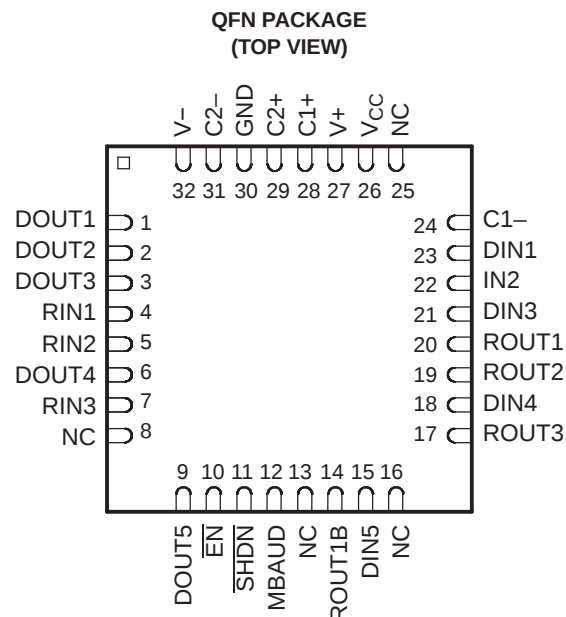
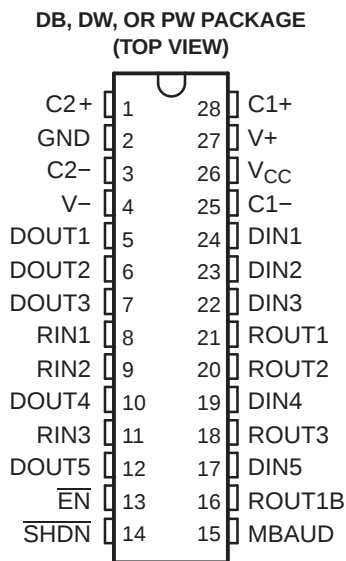
FEATURES

- 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 From 250 kbits/s to 1 Mbit/s
- Low Standby Current . . . 1 μ A Typical
- External Capacitors . . . $4 \times 0.1 \mu$ F
- Accepts 5-V Logic Input With 3.3-V Supply
- Designed to Be Interchangeable With Maxim MAX3237E
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II

- ESD Protection for RS-232 I/O Pins
 - ± 15 kV – Human-Body Model (HBM)
 - ± 8 kV – IEC61000-4-2, Contact Discharge
 - ± 15 kV – IEC61000-4-2, Air-Gap Discharge

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

The MAX3237E consists of five line drivers, three line receivers, and a dual charge-pump circuit with ± 15 -kV 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 250 kbit/s in normal operating mode (MBAUD = GND) and 1Mbit/s when MBAUD = V_{CC} . The driver output slew rate is a maximum of 30 V/ μ s.



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.

The MAX3237E transmitters are disabled and the outputs are forced into high-impedance state when the device is in shutdown mode ($\overline{\text{SHDN}} = \text{GND}$) and the supply current falls to less than 1 μA . Also, during shutdown, 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 ($\overline{\text{EN}}$) high. ROUT1B remains active all the time, regardless of the $\overline{\text{EN}}$ and $\overline{\text{SHDN}}$ condition.

The MAX3237EC is characterized for operation from 0°C to 70°C. The MAX3237EI is characterized for operation from –40°C to 85°C.

AVAILABLE OPTIONS⁽¹⁾

T_A	PACKAGED DEVICES ⁽²⁾
0°C to 70°C	MAX3237ECDBR
	MAX3237ECPWR
	MAX3237ECRHBR (QFN package)
	MAX3237ECDWR
–40°C to 85°C	MAX3237EIDBR
	MAX3237EIPWR
	MAX3237EIRHBR (QFN package)
	MAX3237EIDWR

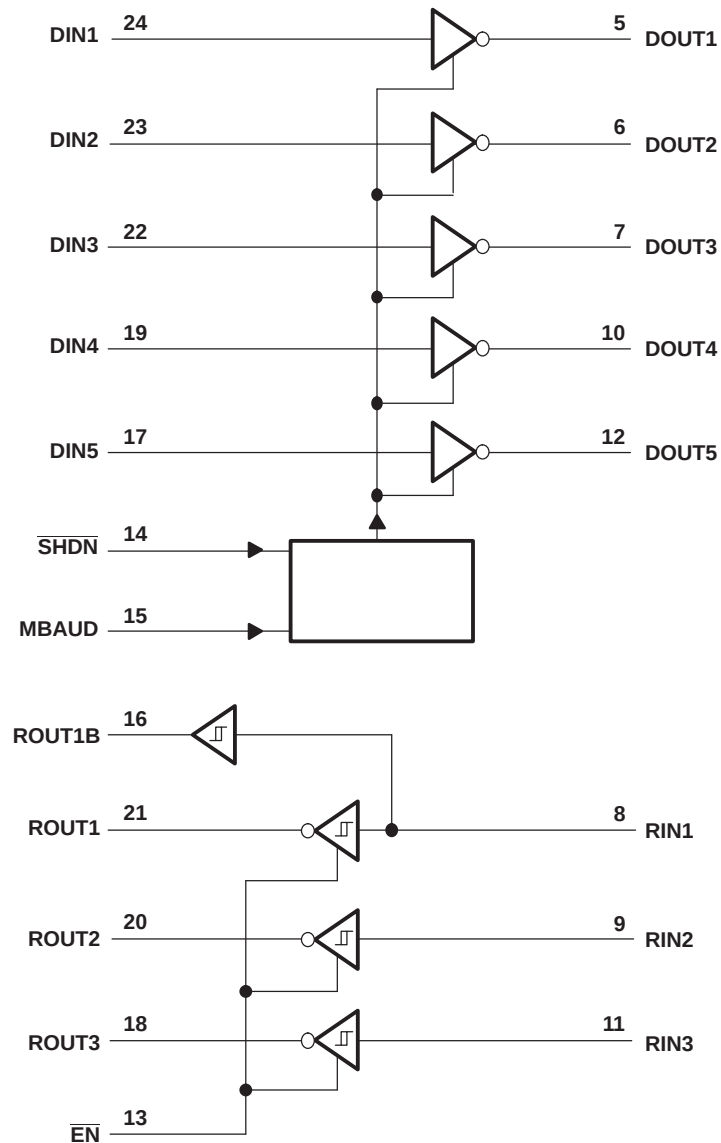
- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
- (2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

Table 1. FUNCTION TABLE

INPUTS		OUTPUTS		
$\overline{\text{SHDN}}$	$\overline{\text{EN}}$	DOUT	ROUT	ROUT1B
0	0	Z ⁽¹⁾	Active	Active
0	1	Z ⁽¹⁾	Z ⁽¹⁾	Active
1	0	Active	Active	Active
1	1	Active	Z ⁽¹⁾	Active

- (1) Z = high impedance (off)

LOGIC DIAGRAM (POSITIVE LOGIC)



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	Driver ($\overline{\text{SHDN}}$, MBAUD, $\overline{\text{EN}}$)	–0.3	6	V
		Receiver	–25	25	
V _O	Output voltage range	Driver	–13.2	13.2	V
		Receiver	–0.3	V _{CC} + 0.3	
	Short-circuit duration	DOUT to GND		Unlimited	
θ _{JA}	Package thermal impedance ⁽³⁾			62	°C/W
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) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾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	DIN, $\overline{\text{SHDN}}$, MBAUD, $\overline{\text{EN}}$	V _{CC} = 3.3 V	2	5.5	V
			V _{CC} = 5 V	2.4	5.5	
V _{IL}	Driver and control low-level input voltage	DIN, $\overline{\text{SHDN}}$, MBAUD, $\overline{\text{EN}}$	0		0.8	V
V _I	Receiver input voltage		–25		25	V
T _A	Operating free-air temperature	MAX3237EC	0		70	°C
		MAX3237EI	–40		85	

- (1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3 V to 5 V.

ELECTRICAL CHARACTERISTICS⁽¹⁾over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 5](#))

PARAMETER		TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
I _I	Input leakage current	DIN, $\overline{\text{SHDN}}$, MBAUD, $\overline{\text{EN}}$		9	18	μA
I _{CC}	Supply current (T _A = 25°C)	No load, $\overline{\text{SHDN}}$ = V _{CC}		0.5	2	mA
		$\overline{\text{SHDN}}$ = GND		1	10	μA
		Shutdown supply current $\overline{\text{SHDN}}$ = RIN = GND, DIN = GND or V _{CC}		10	300	nA

- (1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3 V to 5 V.
- (2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

DRIVER SECTION ELECTRICAL CHARACTERISTICS⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 5](#))

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
V _{OH} High-level output voltage	DOUT at R _L = 3 kΩ to GND, DIN = GND	5	5.4		V
V _{OL} Low-level output voltage	DOUT at R _L = 3 kΩ 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} Short-circuit output current ⁽³⁾	V _{CC} = 3.6 V or 3.3 V, V _O = 0 V			±60	mA
r _o Output resistance	V _{CC} , V ₊ , and V _– = 0 V, V _O = ±2 V	300	50k		Ω

(1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3 V to 5 V.

(2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 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.

DRIVER SECTION SWITCHING CHARACTERISTICS⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 5](#))

PARAMETER		TEST CONDITIONS		MIN	TYP ⁽²⁾	MAX	UNIT
Maximum data rate	C _L = 1000 pF, MBAUD = GND	R _L = 3 kΩ, 1 DIN switching, See Figure 1		250			kbit/s
	C _L = 1000 pF, V _{CC} = 4.5 V to 5.5 V, MBAUD = V _{CC}			1000			
	C _L = 250 pF, V _{CC} = 3 V to 4.5 V, MBAUD = V _{CC}			1000			
t _{sk(p)}	Pulse skew ⁽³⁾	C _L = 150 pF to 2500 pF, R _L = 3 kΩ to 7 kΩ, MBAUD = V _{CC} or GND, See Figure 2			100		ns
SR(tr)	Slew rate, transition region (see Figure 1)	V _{CC} = 3.3 V, R _L = 3 kΩ to 7 kΩ, T _A = 25°C	C _L = 150 pF to 1000 pF	MBAUD = GND	6	30	V/μs
				MBAUD = V _{CC}	24	150	
			C _L = 150 pF to 2500 pF,	MBAUD = GND	4	30	

(1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3 V to 5 V.

(2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

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

RECEIVER SECTION ELECTRICAL CHARACTERISTICS⁽¹⁾

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 5](#))

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
V _{OH} High-level output voltage	I _{OH} = –1 mA	V _{CC} – 0.6	V _{CC} – 0.1		V
V _{OL} Low-level output voltage	I _{OL} = 1 mA			0.4	V
V _{IT+} Positive-going input threshold voltage	V _{CC} = 3.3 V		1.5	2.4	V
	V _{CC} = 5 V		2	2.4	
V _{IT–} Negative-going input threshold voltage	V _{CC} = 3.3 V	0.6	1.1		V
	V _{CC} = 5 V	0.8	1.5		
V _{hys} Input hysteresis (V _{IT+} – V _{IT–})			0.5		V
I _{oz} Output leakage current	$\overline{\text{EN}} = V_{CC}$		±0.05	±10	μA
r _i Input resistance	V _I = ±3 V to ±25 V	3	5	7	kΩ

(1) Test conditions are C1–C4 = 0.1 mF at V_{CC} = 3 V to 5 V.

(2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

RECEIVER SECTION 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 pF, See Figure 3	150	ns
t _{PHL} Propagation delay time, high- to low-level output	C _L = 150 pF, See Figure 3	150	ns
t _{en} Output enable time	C _L = 150 pF, R _L = 3 kΩ, See Figure 4	2.6	μs
t _{dis} Output disable time	C _L = 150 pF, R _L = 3 kΩ, See Figure 4	2.4	μs
t _{sk(p)} Pulse skew ⁽³⁾	See Figure 3	50	ns

(1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3 V to 5 V.

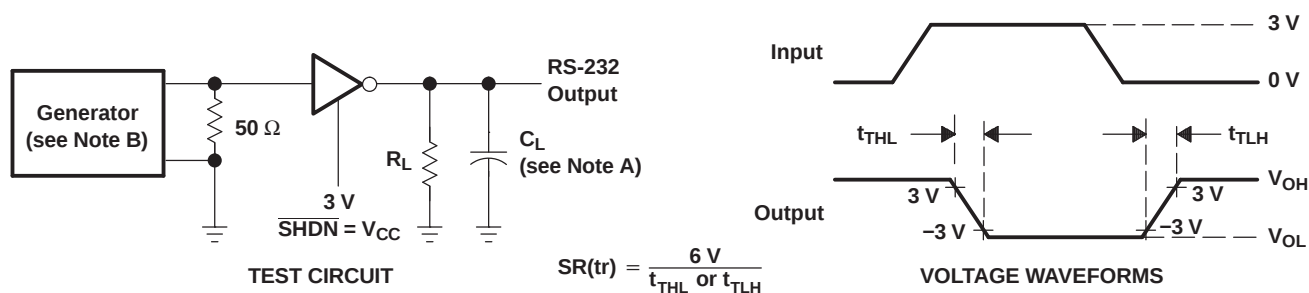
(2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

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

ESD PROTECTION

PIN	TEST CONDITIONS	TYP	UNIT
DOUT, RIN	HBM	±15	kV
	IEC61000-4-2, Contact Discharge	±8	
	IEC61000-4-2, Air-Gap Discharge	±15	

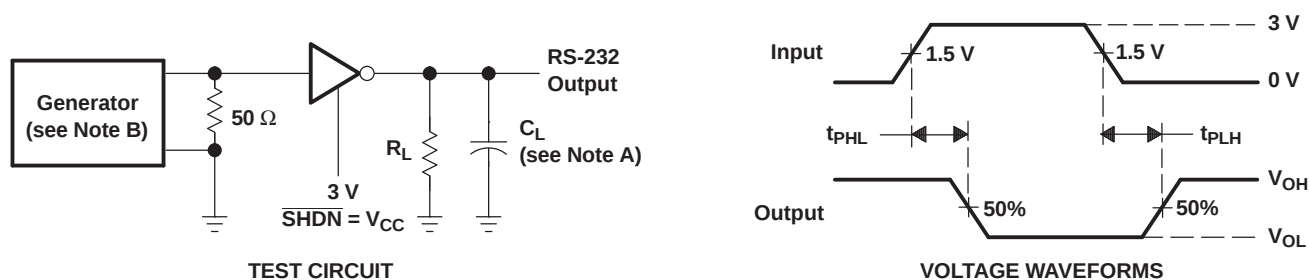
PARAMETER MEASUREMENT INFORMATION



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

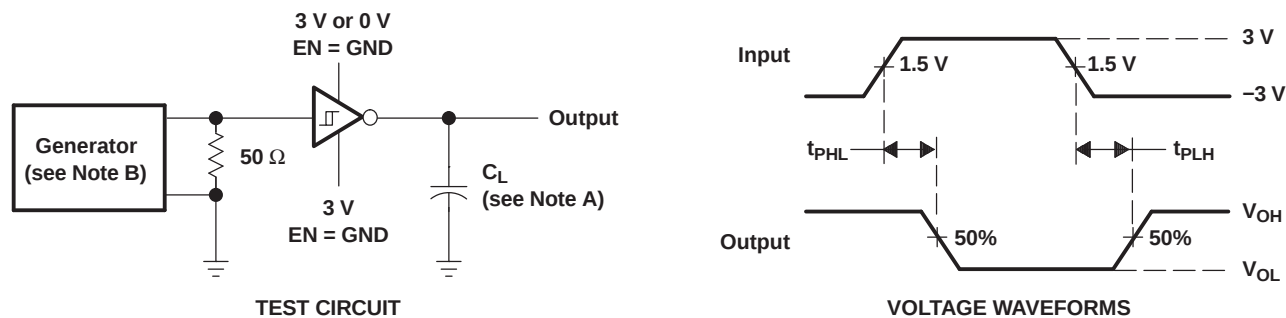
Figure 1. Driver Slew Rate



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

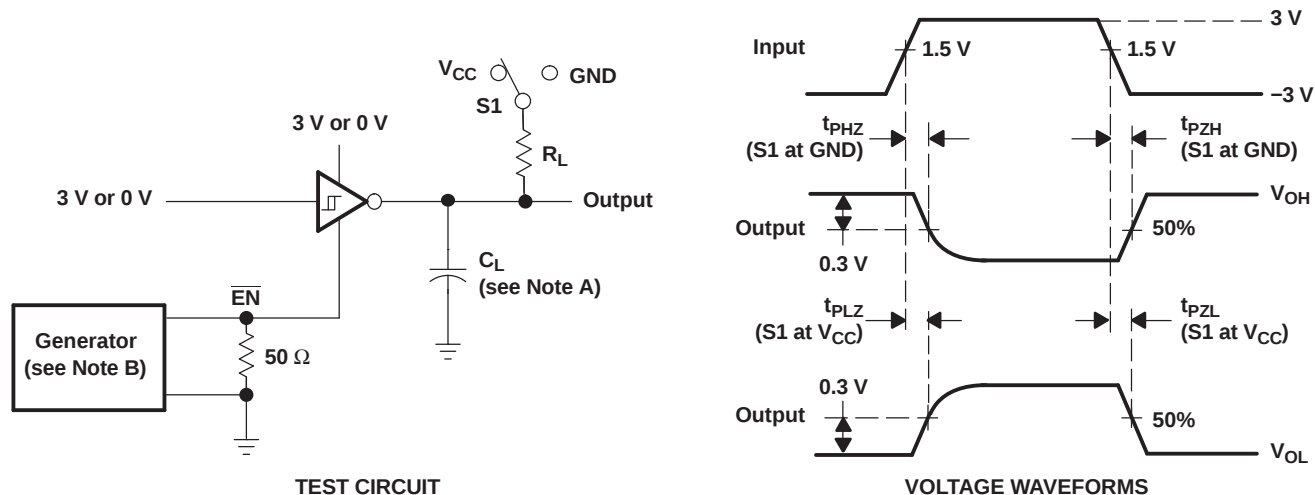


NOTES: A. C_L includes probe and jig capacitance.

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

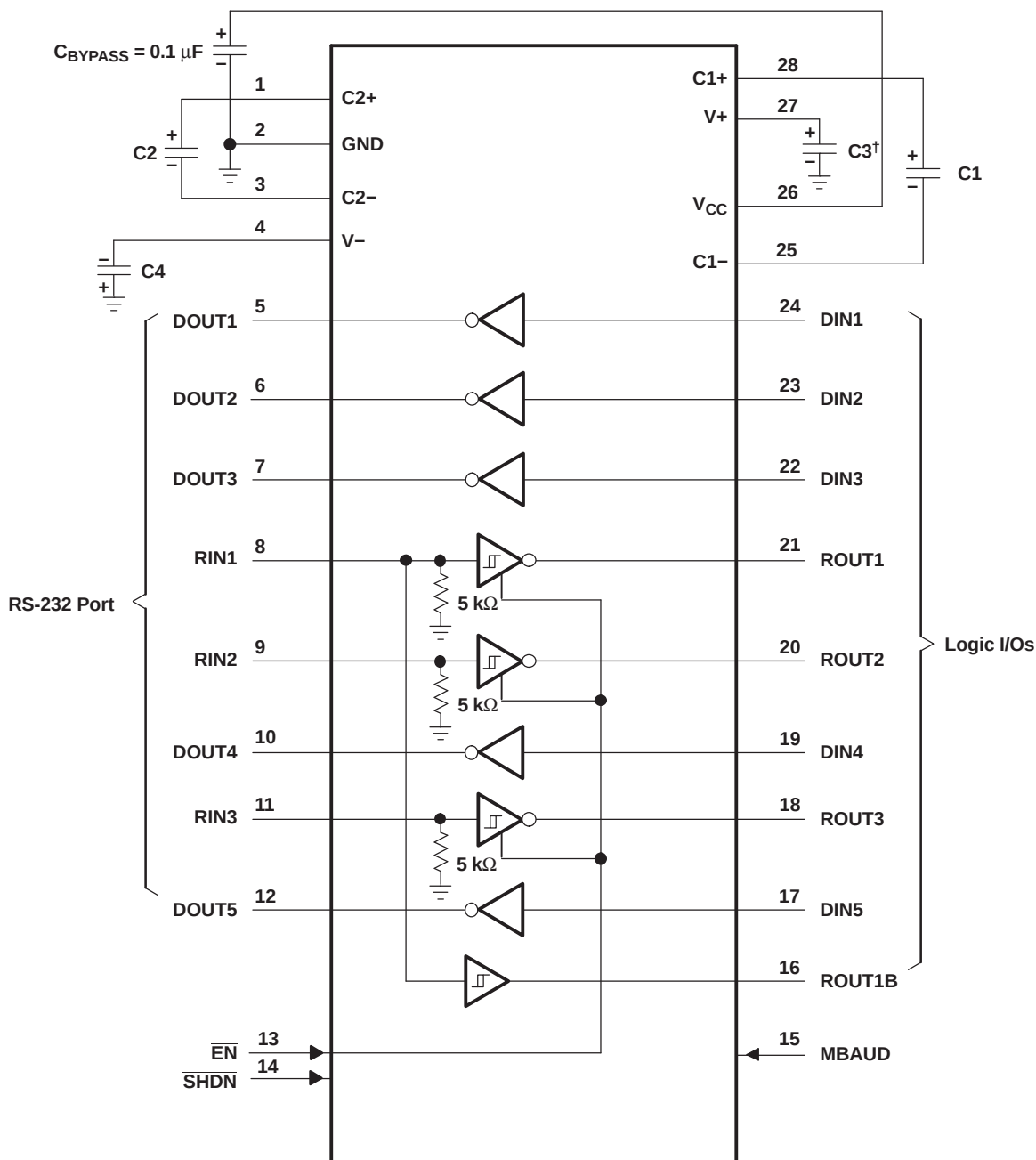
PARAMETER MEASUREMENT INFORMATION (continued)



- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. The pulse generator has the following characteristics: $Z_O = 50\ \Omega$, 50% duty cycle, $t_r \leq 10\ \text{ns}$, $t_f \leq 10\ \text{ns}$.
 - C. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - D. t_{PZL} and t_{PZH} are the same as t_{en} .

Figure 4. Receiver Enable and Disable 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, and C4
3.3 V ± 0.15 V	0.1 μF	0.1 μF
3.3 V ± 0.3 V	0.22 μF	0.22 μF
5 V ± 0.5 V	0.047 μF	0.33 μF
3 V to 5.5 V	0.22 μF	1 μF

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)
MAX3237ECDB	Obsolete	Production	SSOP (DB) 28	-	-	Call TI	Call TI	0 to 70	MAX3237EC
MAX3237ECDBR	Active	Production	SSOP (DB) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECDBR.A	Active	Production	SSOP (DB) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECDW	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECDW.A	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECDWG4	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECDWR	Active	Production	SOIC (DW) 28	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECDWR.A	Active	Production	SOIC (DW) 28	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	MAX3237EC
MAX3237ECPW	Obsolete	Production	TSSOP (PW) 28	-	-	Call TI	Call TI	0 to 70	MP237EC
MAX3237ECPWR	Obsolete	Production	TSSOP (PW) 28	-	-	Call TI	Call TI	0 to 70	MP237EC
MAX3237EIDB	Obsolete	Production	SSOP (DB) 28	-	-	Call TI	Call TI	-40 to 85	MAX3237EI
MAX3237EIDBR	Active	Production	SSOP (DB) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3237EI
MAX3237EIDBR.A	Active	Production	SSOP (DB) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3237EI
MAX3237EIDBRG4	Active	Production	SSOP (DB) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3237EI
MAX3237EIDBRG4.A	Active	Production	SSOP (DB) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3237EI
MAX3237EIDW	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3237EI
MAX3237EIDW.A	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MAX3237EI
MAX3237EIPW	Obsolete	Production	TSSOP (PW) 28	-	-	Call TI	Call TI	-40 to 85	MP237EI
MAX3237EIPWR	Active	Production	TSSOP (PW) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP237EI
MAX3237EIPWR.A	Active	Production	TSSOP (PW) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP237EI
MAX3237EIPWRG4	Active	Production	TSSOP (PW) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP237EI
MAX3237EIPWRG4.A	Active	Production	TSSOP (PW) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	MP237EI

⁽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.

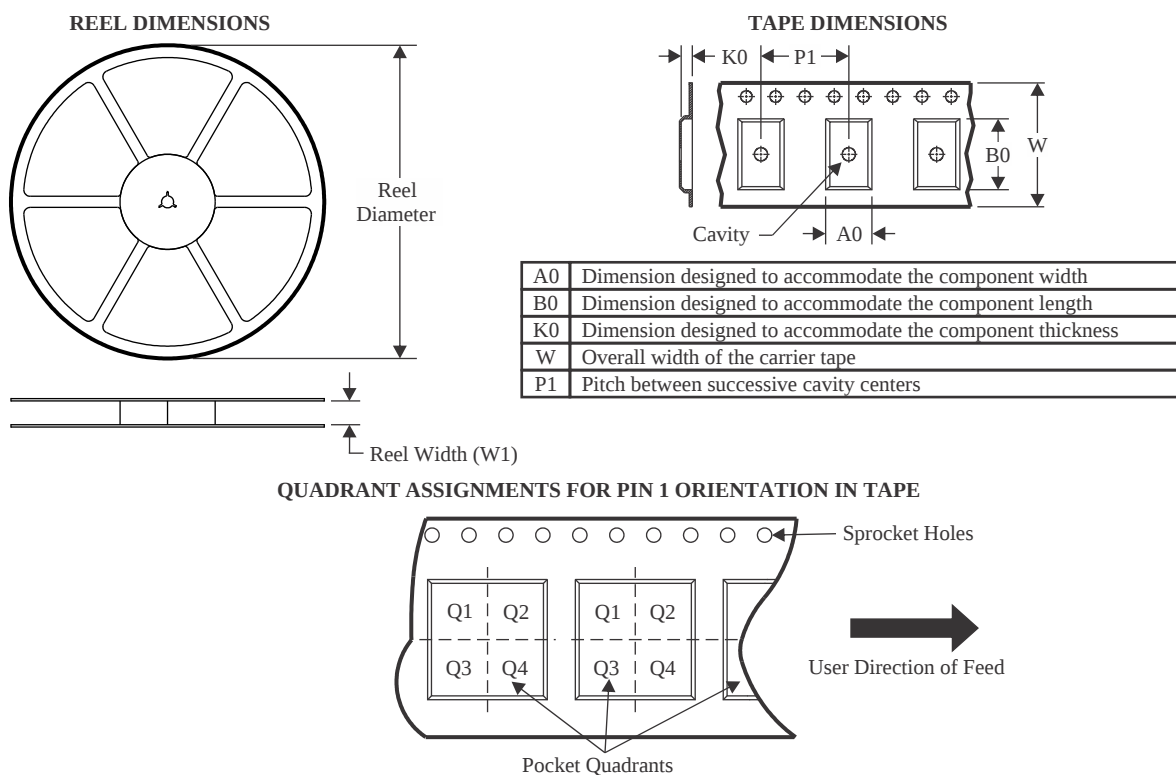
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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
MAX3237ECDBR	SSOP	DB	28	2000	330.0	16.4	8.45	10.55	2.5	12.0	16.2	Q1
MAX3237ECDWR	SOIC	DW	28	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
MAX3237EIDBR	SSOP	DB	28	2000	330.0	16.4	8.45	10.55	2.5	12.0	16.2	Q1
MAX3237EIDBRG4	SSOP	DB	28	2000	330.0	16.4	8.45	10.55	2.5	12.0	16.2	Q1
MAX3237EIPWR	TSSOP	PW	28	2000	330.0	16.4	6.75	10.1	1.8	12.0	16.0	Q1
MAX3237EIPWRG4	TSSOP	PW	28	2000	330.0	16.4	6.75	10.1	1.8	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)
MAX3237ECDBR	SSOP	DB	28	2000	356.0	356.0	35.0
MAX3237ECDWR	SOIC	DW	28	1000	350.0	350.0	66.0
MAX3237EIDBR	SSOP	DB	28	2000	356.0	356.0	35.0
MAX3237EIDBRG4	SSOP	DB	28	2000	356.0	356.0	35.0
MAX3237EIPWR	TSSOP	PW	28	2000	356.0	356.0	35.0
MAX3237EIPWRG4	TSSOP	PW	28	2000	356.0	356.0	35.0

TUBE

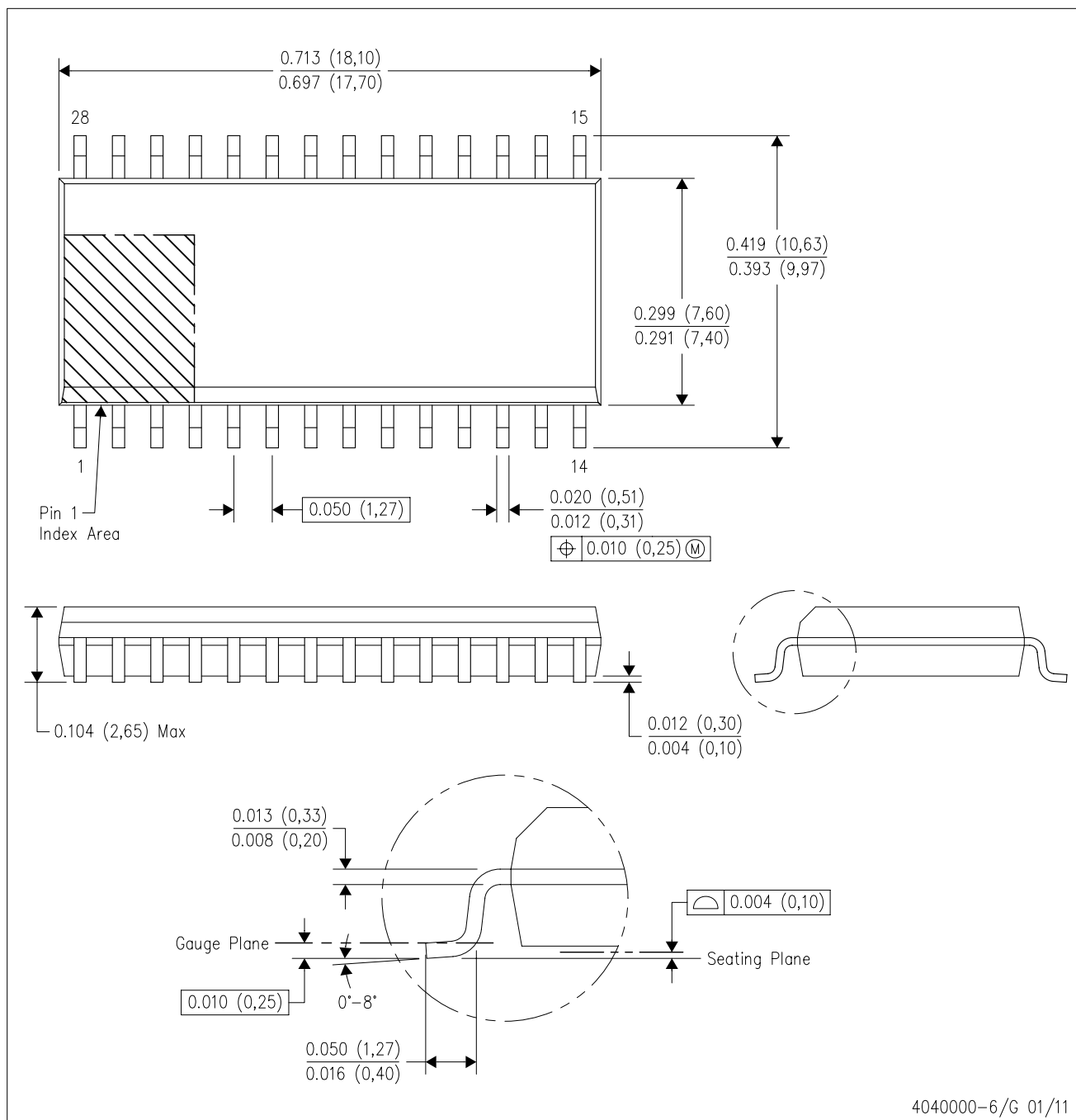


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
MAX3237ECDW	DW	SOIC	28	20	506.98	12.7	4826	6.6
MAX3237ECDW.A	DW	SOIC	28	20	506.98	12.7	4826	6.6
MAX3237ECDWG4	DW	SOIC	28	20	506.98	12.7	4826	6.6
MAX3237EIDW	DW	SOIC	28	20	506.98	12.7	4826	6.6
MAX3237EIDW.A	DW	SOIC	28	20	506.98	12.7	4826	6.6

DW (R-PDSO-G28)

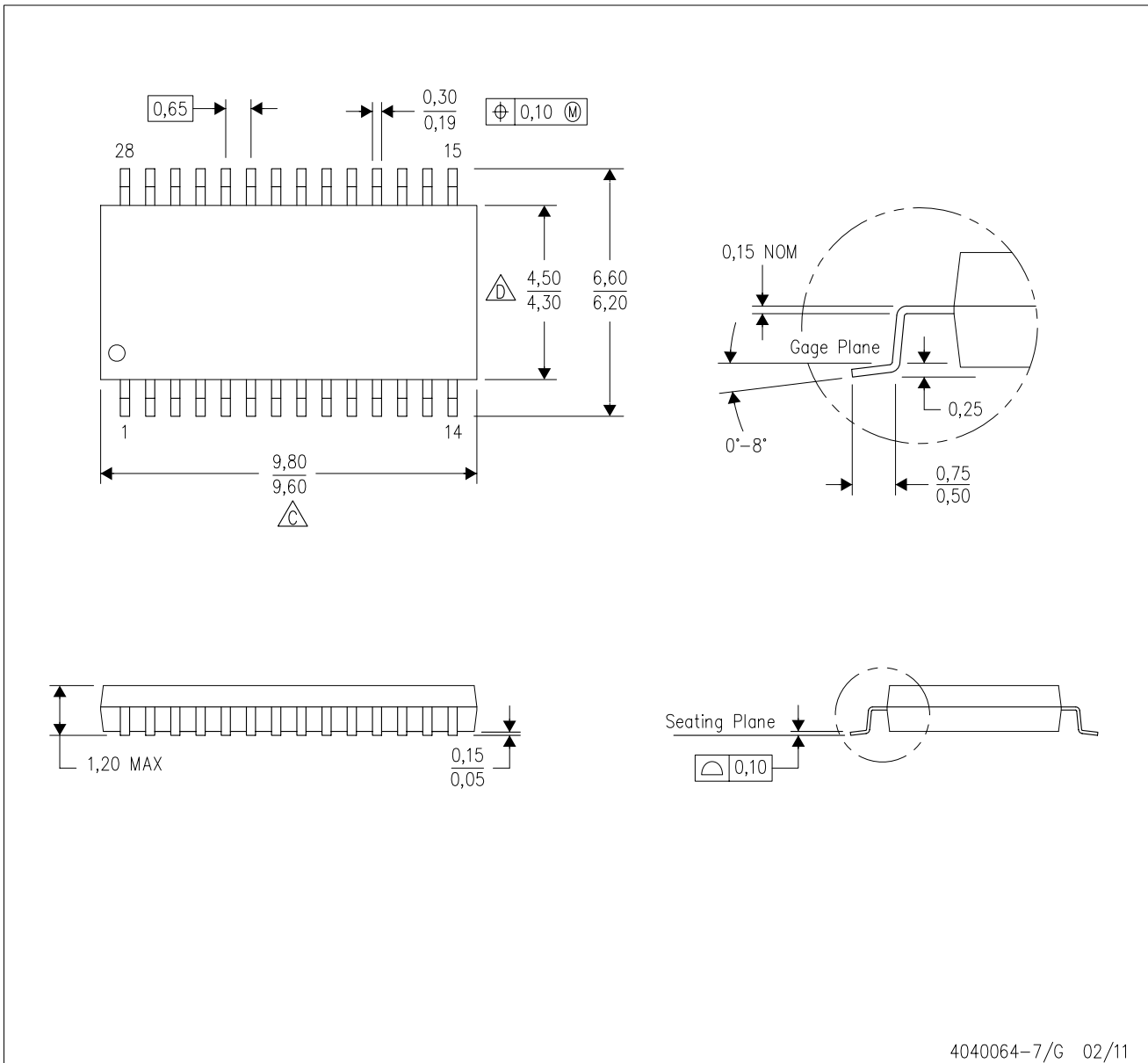
PLASTIC SMALL OUTLINE



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

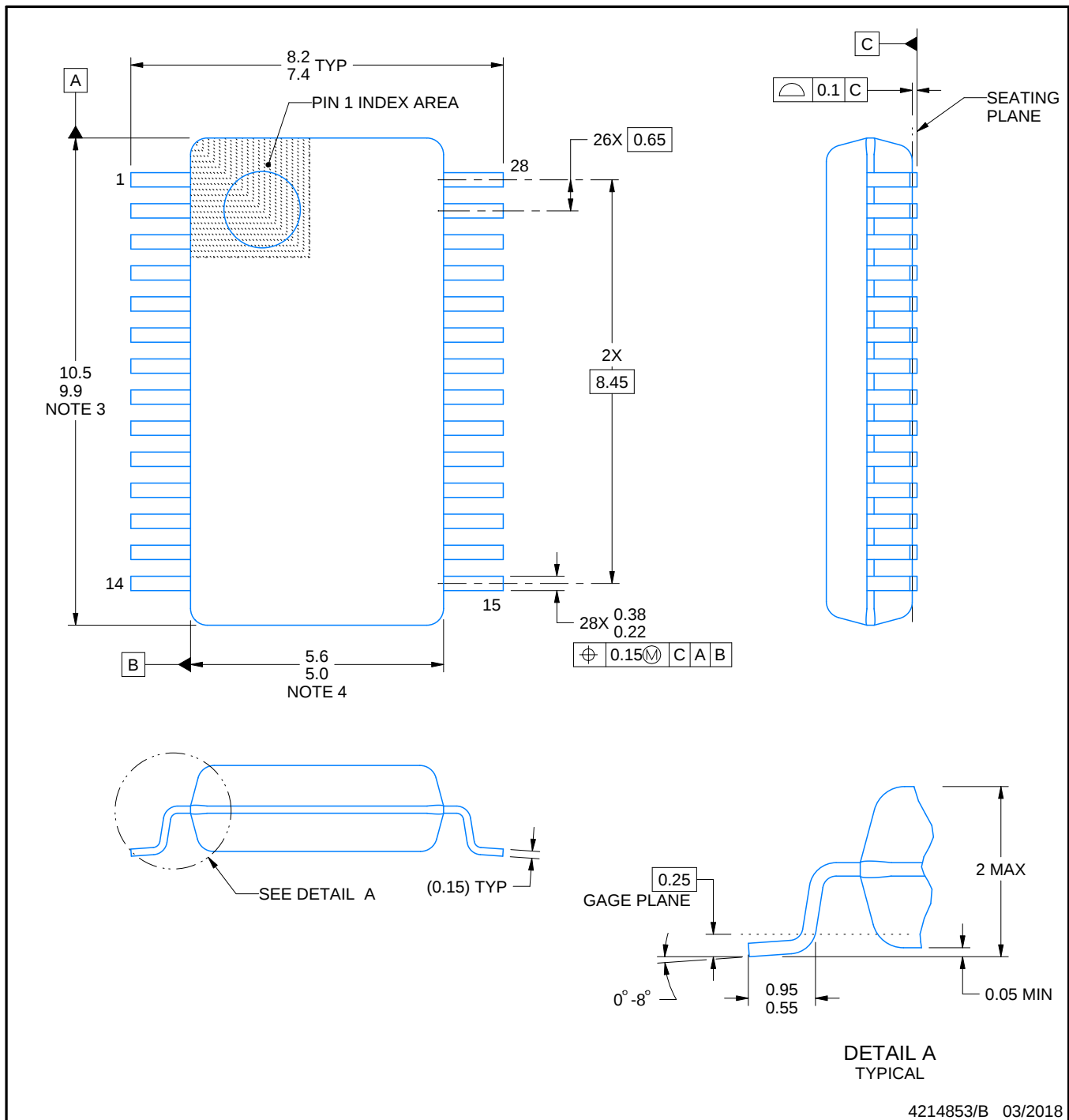
PW (R-PDSO-G28)

PLASTIC SMALL OUTLINE



4040064-7/G 02/11

- 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.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153



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NOTES:

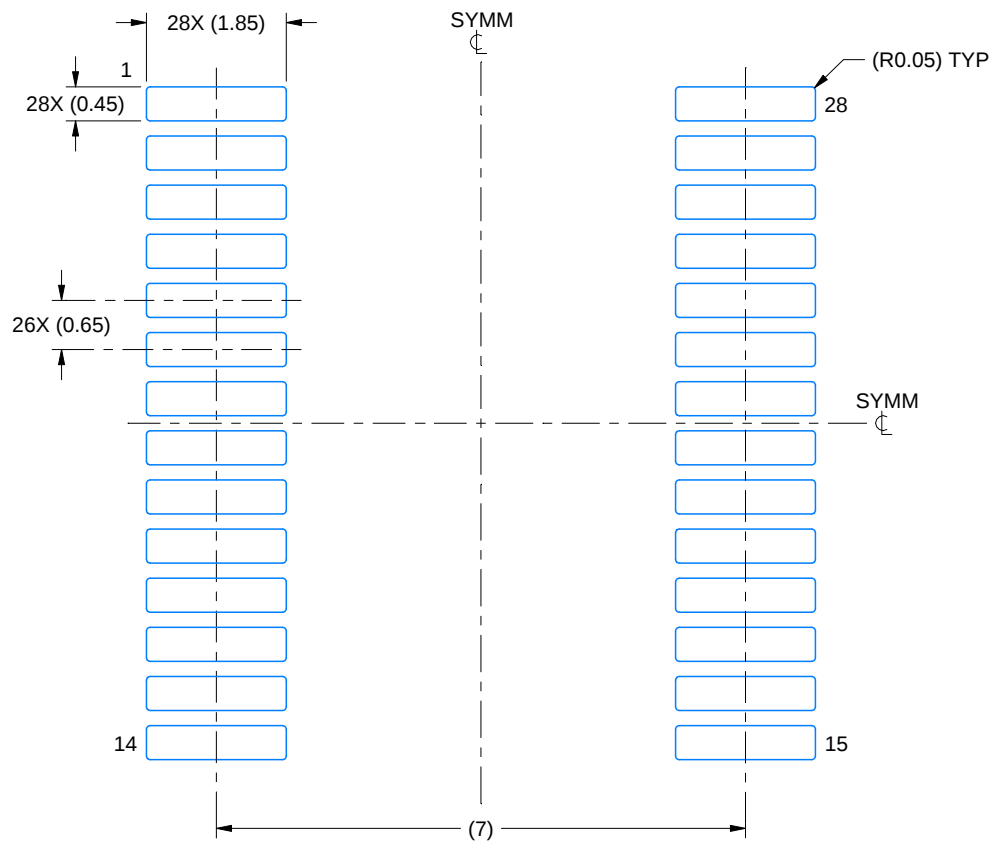
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

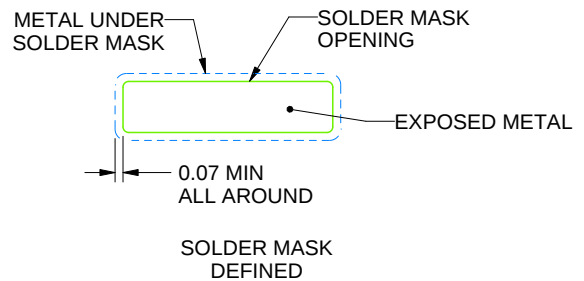
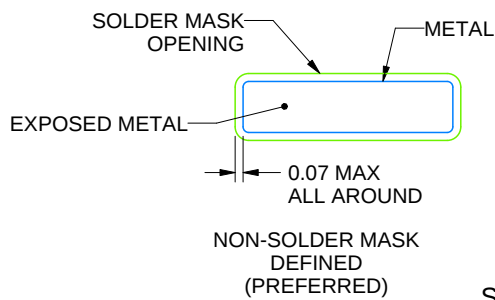
DB0028A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

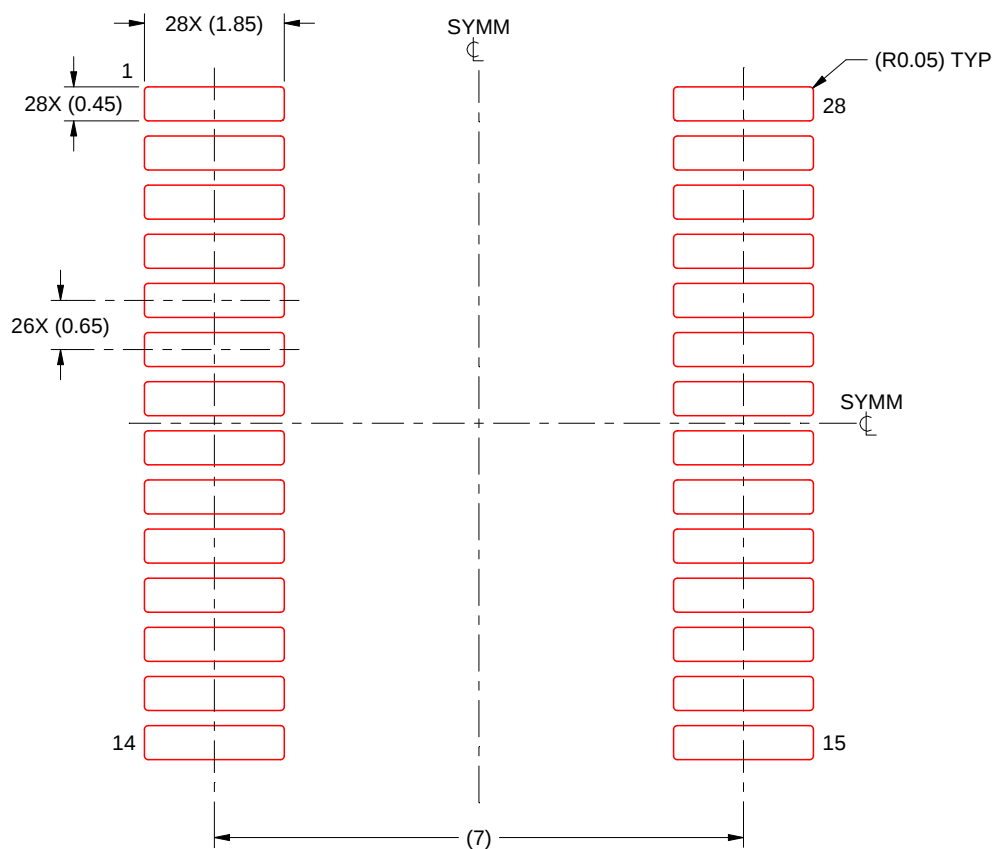
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0028A

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)

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.

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