

# SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS230I – OCTOBER 1995 – REVISED JULY 2003

- Operating Range 2-V to 5.5-V  $V_{CC}$
- Latch-Up Performance Exceeds 250 mA Per JESD 17

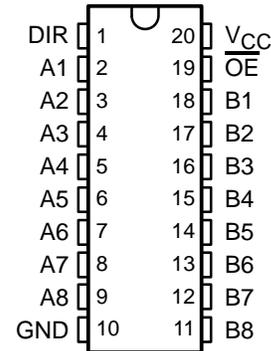
## description/ordering information

The 'AHC245 octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

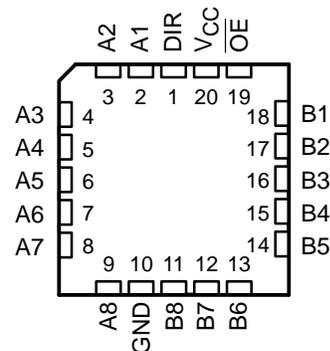
These devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

## SN54AHC245 . . . J OR W PACKAGE SN74AHC245 . . . DB, DGV, DW, N, OR PW PACKAGE (TOP VIEW)



## SN54AHC245 . . . FK PACKAGE (TOP VIEW)



## ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube	SN74AHC245N	SN74AHC245N
	SOIC – DW	Tube	SN74AHC245DW	AHC245
		Tape and reel	SN74AHC245DWR	
	SSOP – DB	Tape and reel	SN74AHC245DBR	HA245
	TSSOP – PW	Tube	SN74AHC245PW	HA245
		Tape and reel	SN74AHC245PWR	
	TVSOP – DGV	Tape and reel	SN74AHC245DGVR	HA245
-55°C to 125°C	CDIP – J	Tube	SNJ54AHC245J	SNJ54AHC245J
	CFP – W	Tube	SNJ54AHC245W	SNJ54AHC245W
	LCCC – FK	Tube	SNJ54AHC245FK	SNJ54AHC245FK

† 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).



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
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# SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 3)

		SN54AHC245		SN74AHC245		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	2	5.5	2	5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V		1.5		V
		V <sub>CC</sub> = 3 V		2.1		
		V <sub>CC</sub> = 5.5 V		3.85		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V		0.5		V
		V <sub>CC</sub> = 3 V		0.9		
		V <sub>CC</sub> = 5.5 V		1.65		
V <sub>I</sub>	Input voltage	$\overline{OE}$ or DIR		0	5.5	V
V <sub>O</sub>	Output voltage	A or B		0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2 V		-50		μA
		V <sub>CC</sub> = 3.3 V ± 0.3 V		-4		
		V <sub>CC</sub> = 5 V ± 0.5 V		-8		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2 V		50		μA
		V <sub>CC</sub> = 3.3 V ± 0.3 V		4		
		V <sub>CC</sub> = 5 V ± 0.5 V		8		
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 3.3 V ± 0.3 V		100		ns/V
		V <sub>CC</sub> = 5 V ± 0.5 V		20		
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54AHC245		SN74AHC245		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 μA	2 V	1.9	2		1.9		1.9	V	
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I <sub>OH</sub> = -4 mA	3 V	2.58			2.48		2.48		
	I <sub>OH</sub> = -8 mA	4.5 V	3.94			3.8		3.8		
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	2 V				0.1		0.1	V	
		3 V				0.1		0.1		
		4.5 V				0.1		0.1		
	I <sub>OL</sub> = 4 mA	3 V				0.36		0.5		
	I <sub>OL</sub> = 8 mA	4.5 V				0.36		0.5		
I <sub>I</sub>	A or B inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V				±0.1		±1	μA
	$\overline{OE}$ or DIR		0 V to 5.5 V				±0.1		±1*	
I <sub>OZ</sub> <sup>†</sup>	V <sub>O</sub> = V <sub>CC</sub> or GND, V <sub>I</sub> ( $\overline{OE}$ ) = V <sub>IL</sub> or V <sub>IH</sub>	5.5 V				±0.25		±2.5	±2.5	μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V				4		40	40	μA
C <sub>i</sub>	$\overline{OE}$ or DIR	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V			2.5		10	10	pF
C <sub>io</sub>	A or B inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V			4				pF

\* On products compliant to MIL-PRF-38535, this parameter is not production tested at V<sub>CC</sub> = 0 V.

† The parameter I<sub>OZ</sub> includes the input leakage current.



# SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54AHC245		SN74AHC245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	B or A	$C_L = 15\text{ pF}$	5.8**	8.4**	1**	10**	1	10	ns	
$t_{PHL}$				5.8**	8.4**	1**	10**	1	10		
$t_{PZH}$	$\overline{OE}$	A or B	$C_L = 15\text{ pF}$	8.5**	13.2**	1**	15.5**	1	15.5	ns	
$t_{PZL}$				8.5**	13.2**	1**	15.5**	1	15.5		
$t_{PHZ}$	$\overline{OE}$	A or B	$C_L = 15\text{ pF}$	8.9**	12.5**	1**	15.5**	1	15.5	ns	
$t_{PLZ}$				8.9**	12.5**	1**	15.5**	1	15.5		
$t_{PLH}$	A or B	B or A	$C_L = 50\text{ pF}$	8.3	11.9	1	13.5	1	13.5	ns	
$t_{PHL}$				8.3	11.9	1	13.5	1	13.5		
$t_{PZH}$	$\overline{OE}$	A or B	$C_L = 50\text{ pF}$	11	16.7	1	19	1	19	ns	
$t_{PZL}$				11	16.7	1	19	1	19		
$t_{PHZ}$	$\overline{OE}$	A or B	$C_L = 50\text{ pF}$	11.5	15.8	1	18	1	18	ns	
$t_{PLZ}$				11.5	15.8	1	18	1	18		
$t_{sk(o)}$			$C_L = 50\text{ pF}$		1.5**				1.5	ns	

\*\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

\*\*\* On products compliant to MIL-PRF-38535, this parameter does not apply.

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54AHC245		SN74AHC245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	B or A	$C_L = 15\text{ pF}$	4*	5.5*	1*	6.5*	1	6.5	ns	
$t_{PHL}$				4*	5.5*	1*	6.5*	1	6.5		
$t_{PZH}$	$\overline{OE}$	A or B	$C_L = 15\text{ pF}$	5.8*	8.5*	1*	10*	1	10	ns	
$t_{PZL}$				5.8*	8.5*	1*	10*	1	10		
$t_{PHZ}$	$\overline{OE}$	A or B	$C_L = 15\text{ pF}$	5.6*	7.8*	1*	9.2*	1	9.2	ns	
$t_{PLZ}$				5.6*	7.8*	1*	9.2*	1	9.2		
$t_{PLH}$	A or B	B or A	$C_L = 50\text{ pF}$	5.5	7.5	1	8.5	1	8.5	ns	
$t_{PHL}$				5.5	7.5	1	8.5	1	8.5		
$t_{PZH}$	$\overline{OE}$	A or B	$C_L = 50\text{ pF}$	7.3	10.6	1	12	1	12	ns	
$t_{PZL}$				7.3	10.6	1	12	1	12		
$t_{PHZ}$	$\overline{OE}$	A or B	$C_L = 50\text{ pF}$	7	9.7	1	11	1	11	ns	
$t_{PLZ}$				7	9.7	1	11	1	11		
$t_{sk(o)}$			$C_L = 50\text{ pF}$		1**				1	ns	

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

\*\* On products compliant to MIL-PRF-38535, this parameter does not apply.



**SN54AHC245, SN74AHC245  
OCTAL BUS TRANSCEIVERS  
WITH 3-STATE OUTPUTS**

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**noise characteristics,  $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 4)**

PARAMETER	SN74AHC245			UNIT
	MIN	TYP	MAX	
$V_{OL(P)}$ Quiet output, maximum dynamic $V_{OL}$		0.9		V
$V_{OL(V)}$ Quiet output, minimum dynamic $V_{OL}$		-0.9		V
$V_{OH(V)}$ Quiet output, minimum dynamic $V_{OH}$		4.3		V
$V_{IH(D)}$ High-level dynamic input voltage	3.5			V
$V_{IL(D)}$ Low-level dynamic input voltage			1.5	V

NOTE 4: Characteristics are for surface-mount packages only.

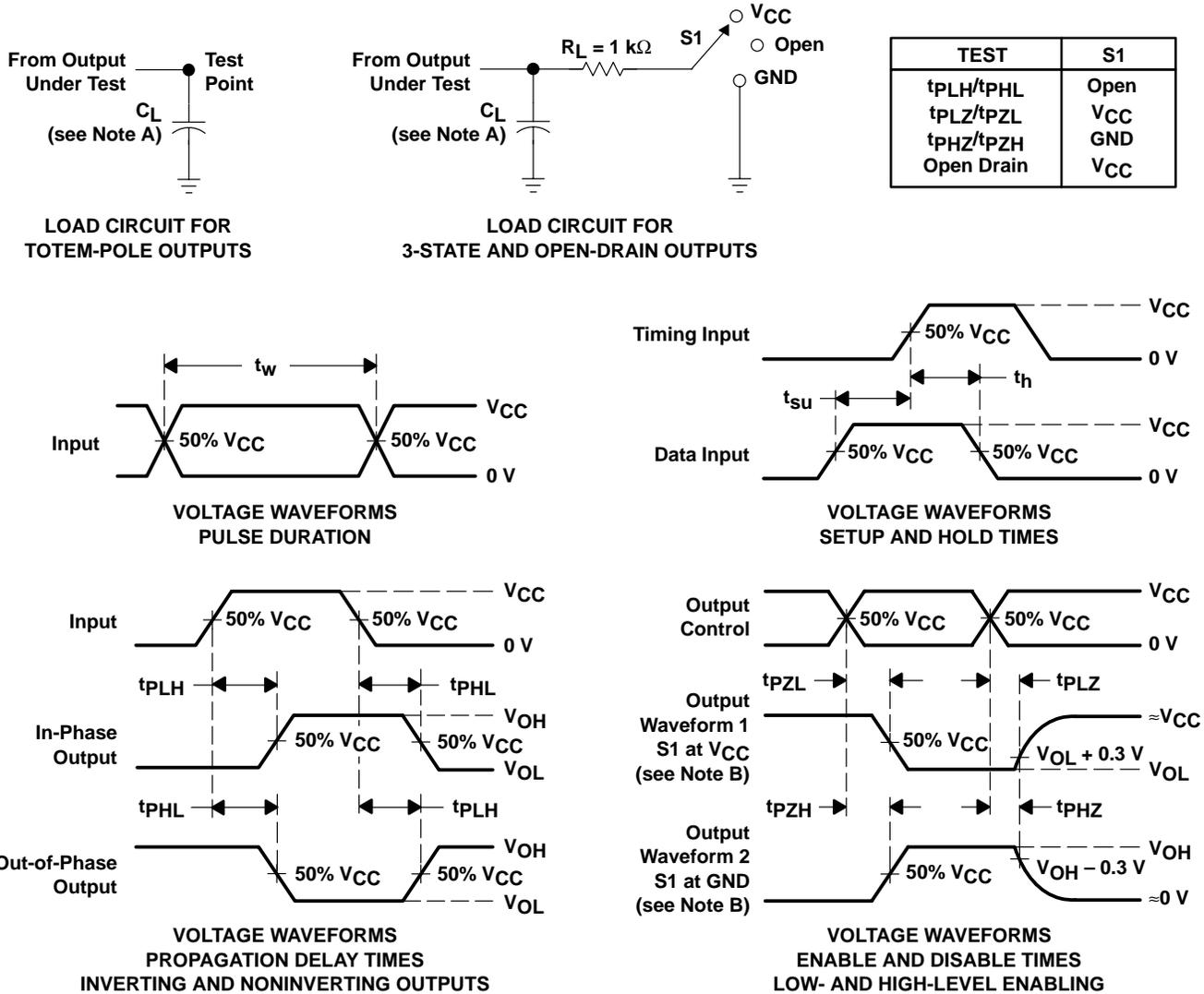
**operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$**

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	No load, $f = 1\text{ MHz}$	14	pF

# SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
  - D. The outputs are measured one at a time with one input transition per measurement.
  - E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
5962-9681801Q2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Call TI	
5962-9681801QRA	ACTIVE	CDIP	J	20	1	TBD	Call TI	Call TI	
5962-9681801QSA	ACTIVE	CFP	W	20	1	TBD	Call TI	Call TI	
5962-9681801VRA	ACTIVE	CDIP	J	20	20	TBD	A42	N / A for Pkg Type	
5962-9681801VSA	ACTIVE	CFP	W	20	25	TBD	Call TI	N / A for Pkg Type	
SN74AHC245DBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI	
SN74AHC245DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DGVR	ACTIVE	TVSOP	DGV	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DGVRE4	ACTIVE	TVSOP	DGV	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DGVRG4	ACTIVE	TVSOP	DGV	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74AHC245NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
SN74AHC245NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245PWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245PWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245PWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	
SN74AHC245PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74AHC245PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SNJ54AHC245FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	
SNJ54AHC245J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	
SNJ54AHC245W	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

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

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**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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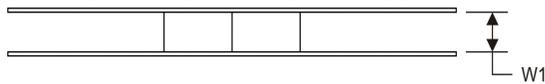
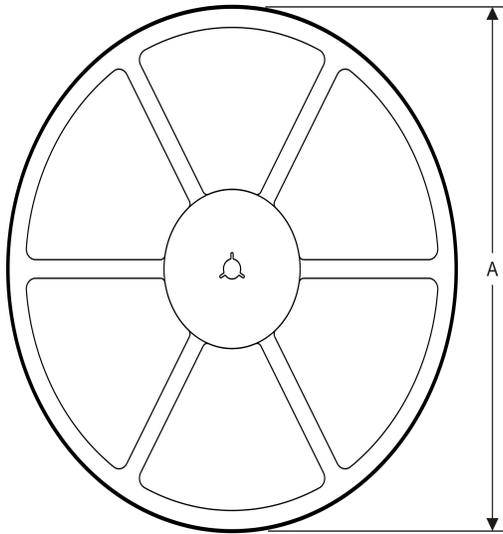
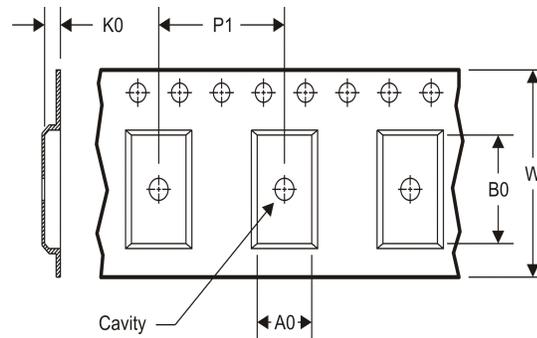
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**OTHER QUALIFIED VERSIONS OF SN54AHC245, SN54AHC245-SP, SN74AHC245 :**

- Catalog: [SN74AHC245](#), [SN54AHC245](#)
- Automotive: [SN74AHC245-Q1](#), [SN74AHC245-Q1](#)
- Enhanced Product: [SN74AHC245-EP](#), [SN74AHC245-EP](#)
- Military: [SN54AHC245](#)
- Space: [SN54AHC245-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

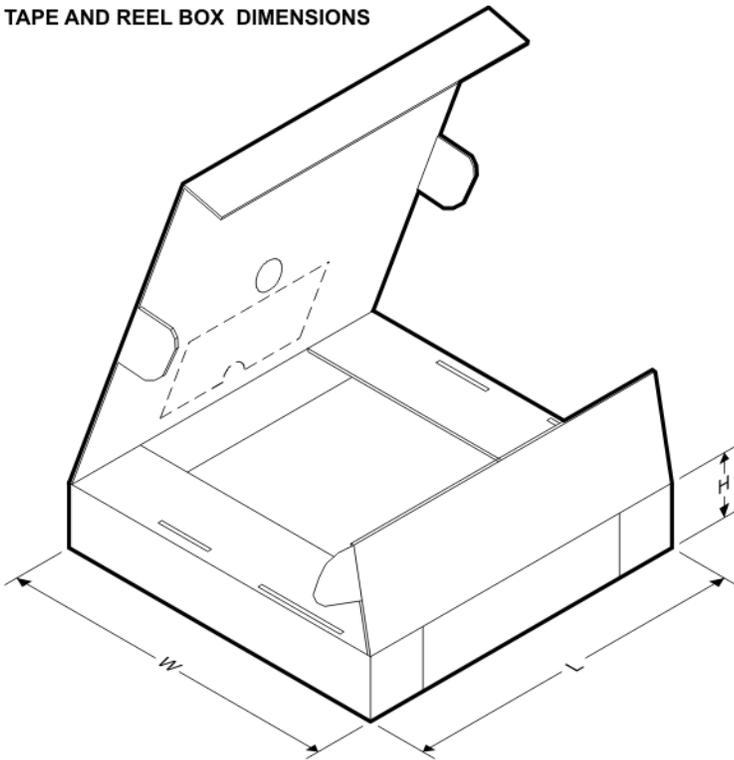
**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**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

**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
SN74AHC245DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74AHC245DGVR	TVSOP	DGV	20	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHC245DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74AHC245NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74AHC245PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74AHC245PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74AHC245PWG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


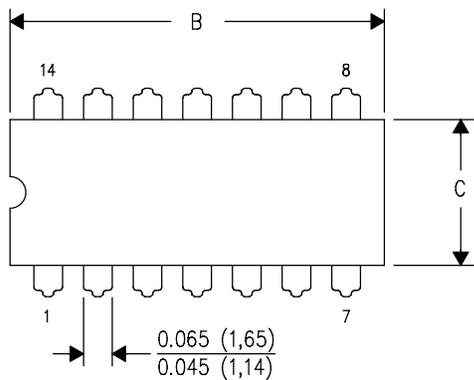
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHC245DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74AHC245DGVR	TVSOP	DGV	20	2000	367.0	367.0	35.0
SN74AHC245DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74AHC245NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74AHC245PWR	TSSOP	PW	20	2000	367.0	367.0	38.0
SN74AHC245PWR	TSSOP	PW	20	2000	364.0	364.0	27.0
SN74AHC245PWGR4	TSSOP	PW	20	2000	367.0	367.0	38.0

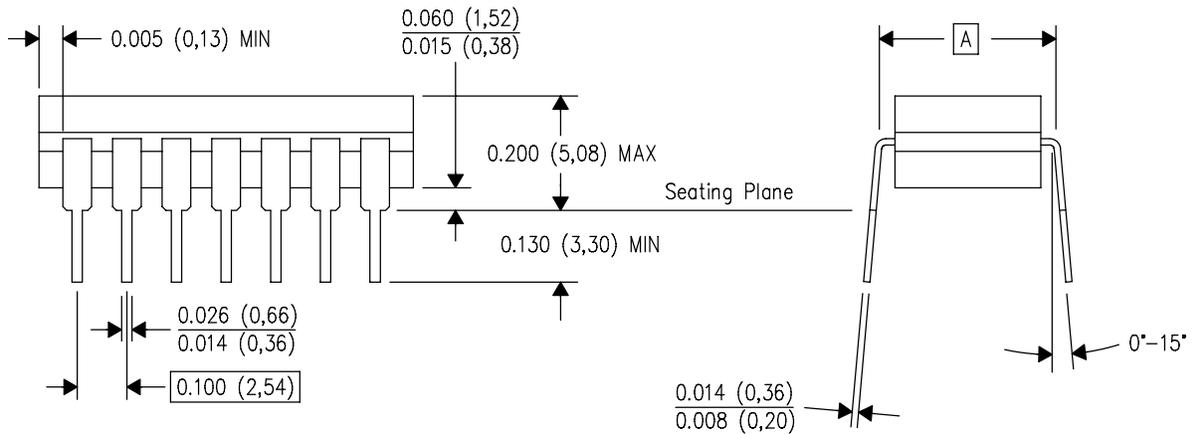
J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

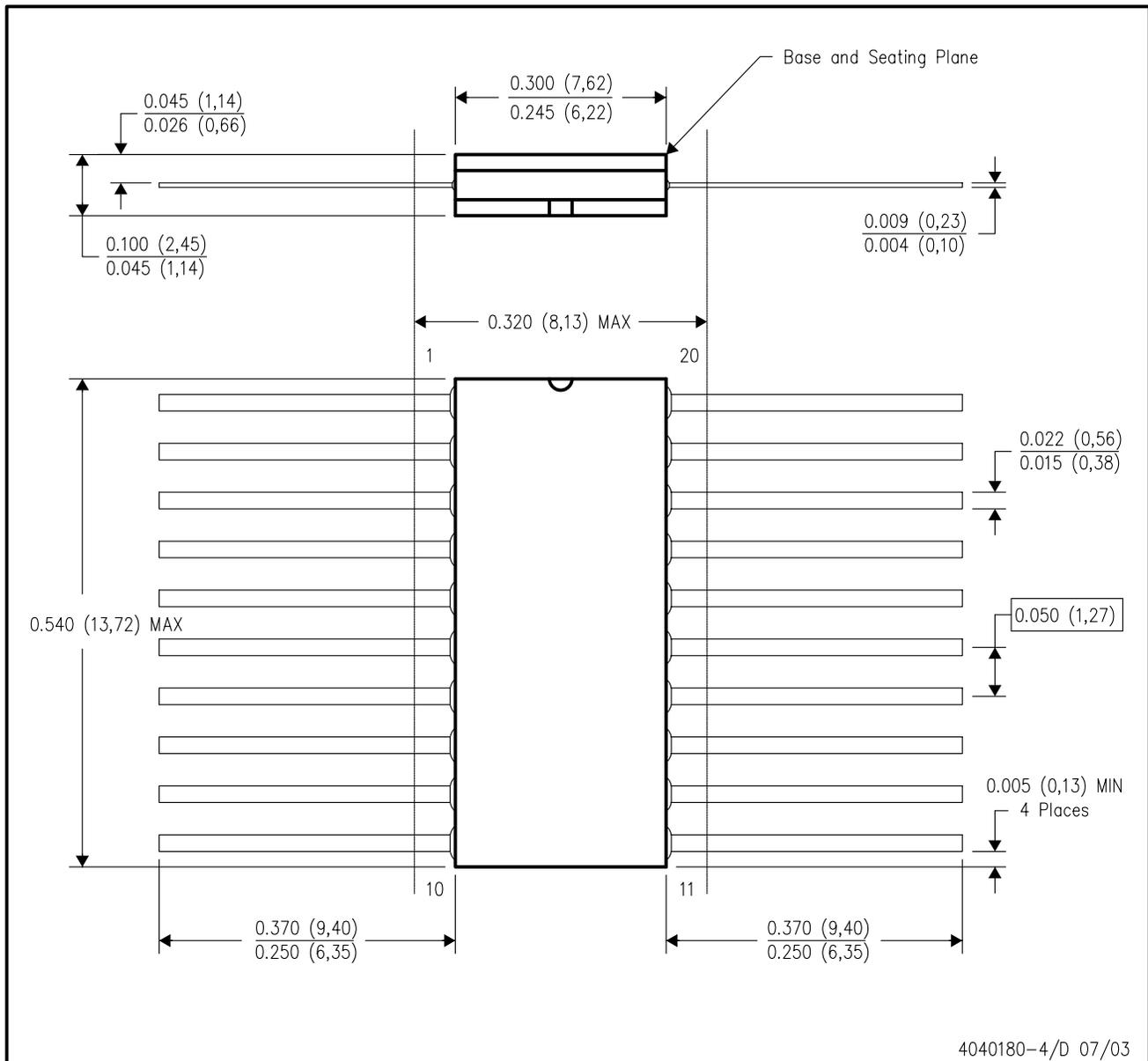


4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK

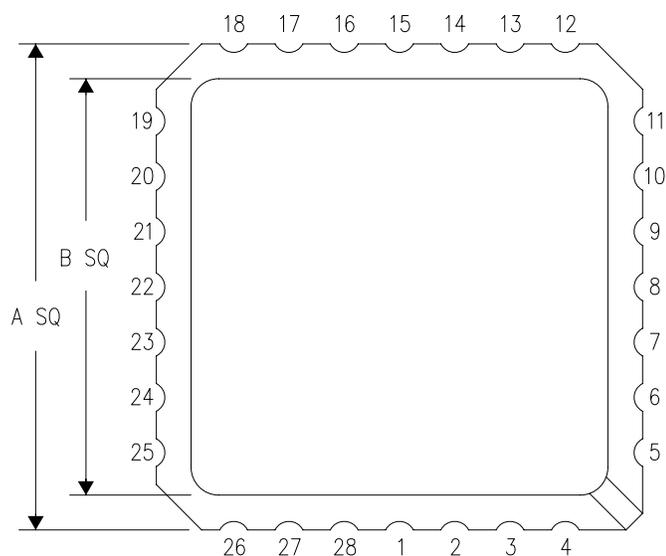


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within Mil-Std 1835 GDFP2-F20

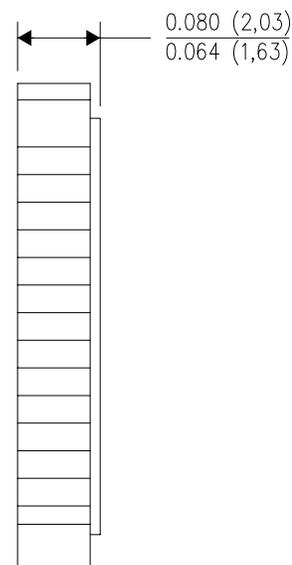
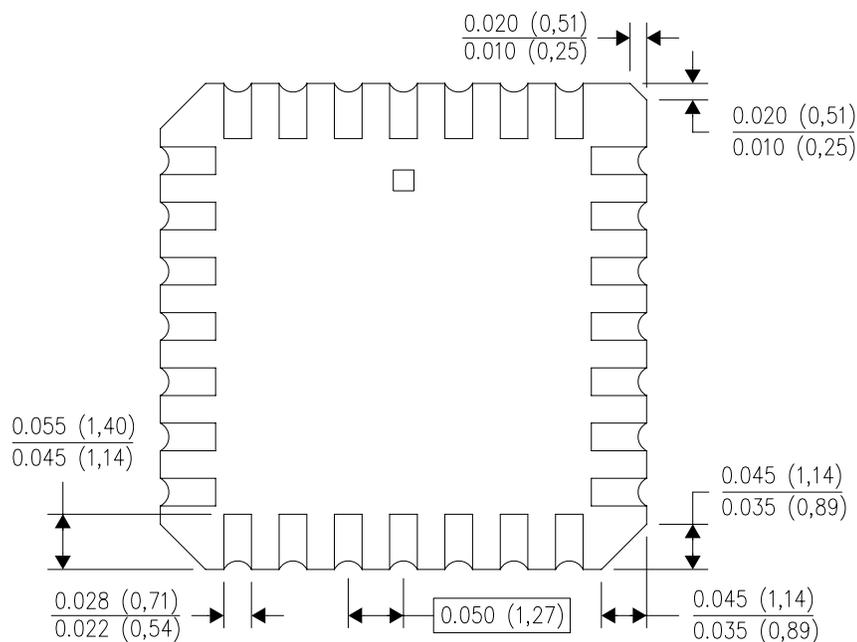
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



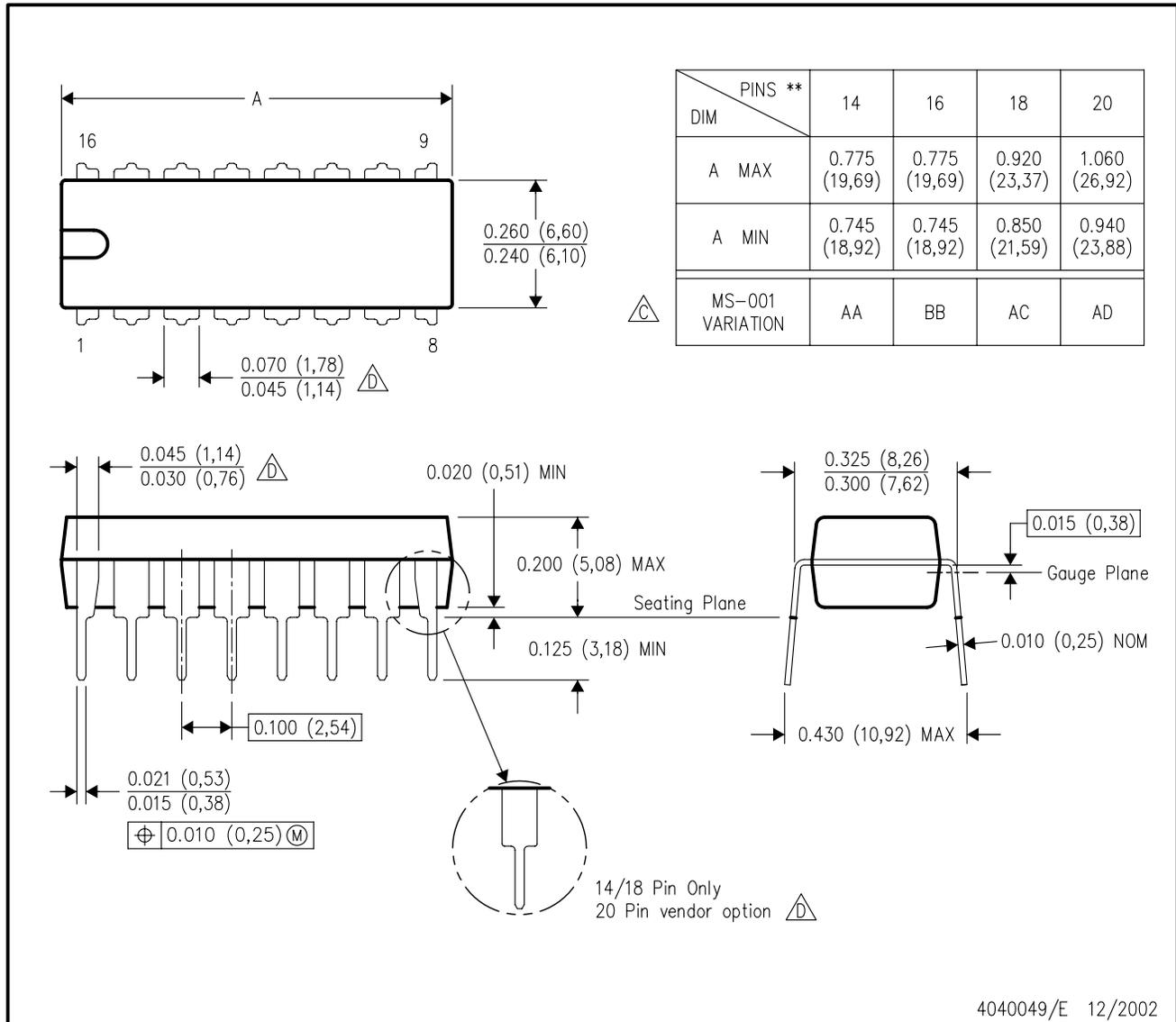
4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

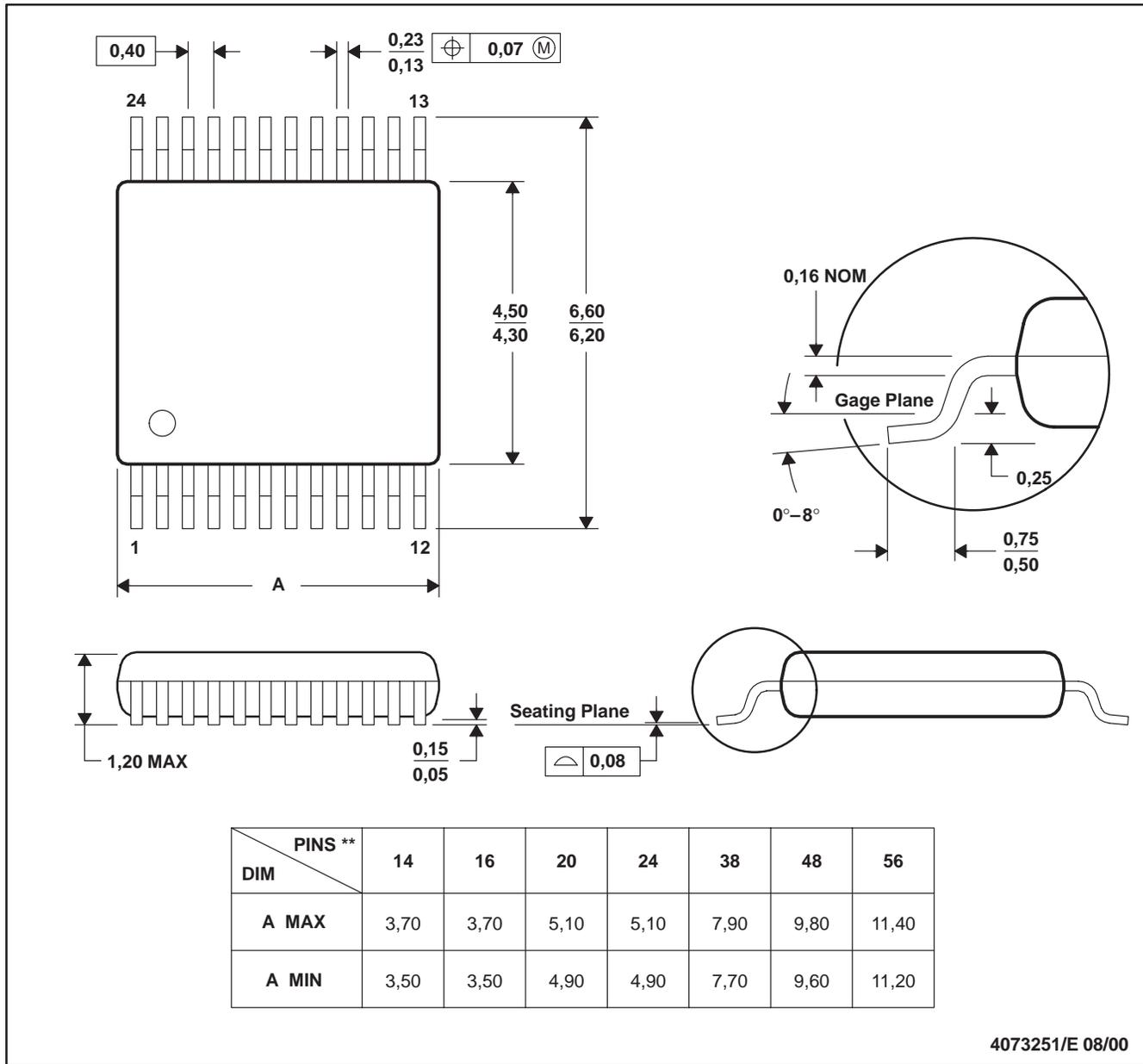


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

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

PLASTIC SMALL-OUTLINE

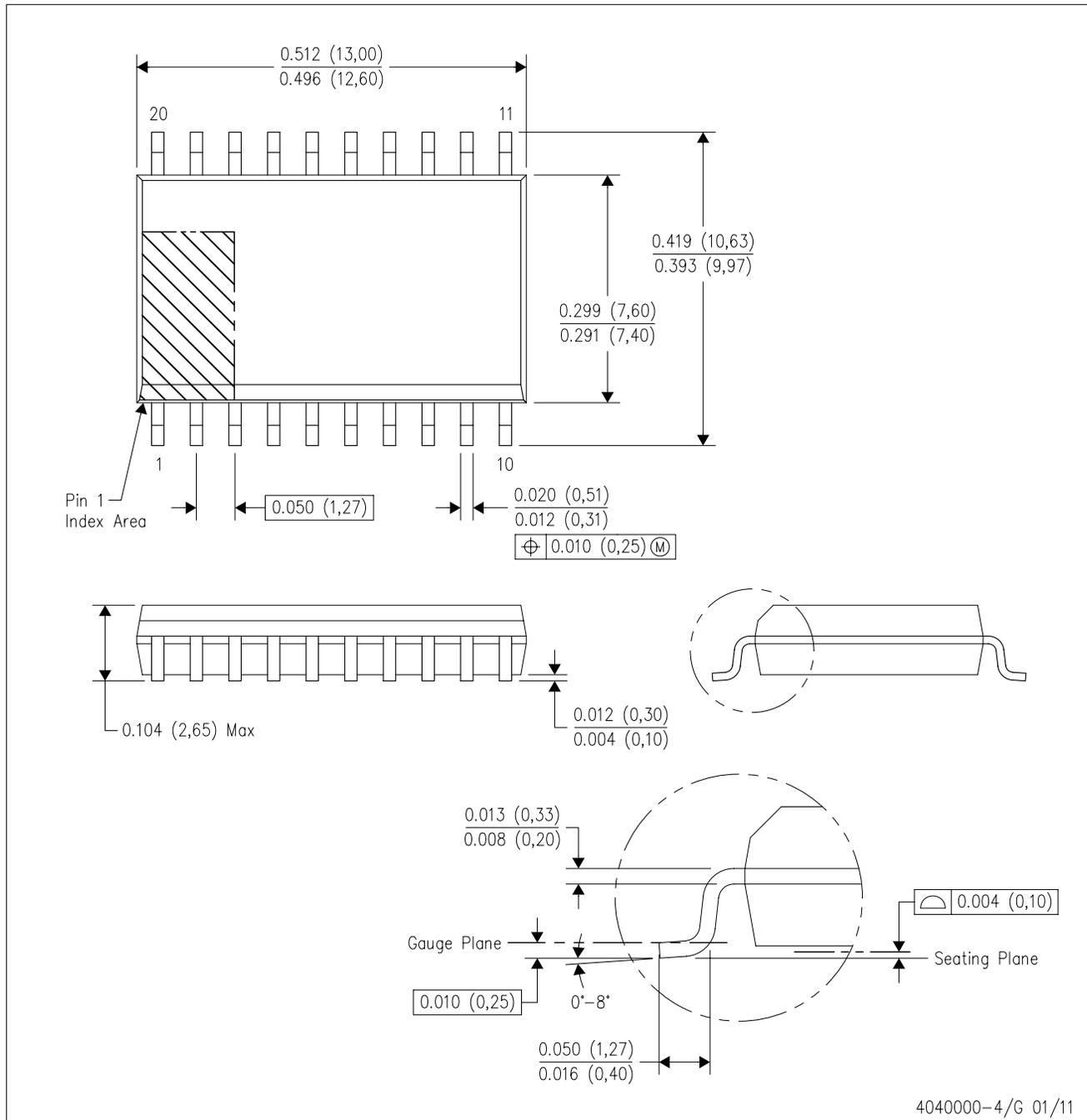
24 PINS SHOWN



- 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 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

DW (R-PDSO-G20)

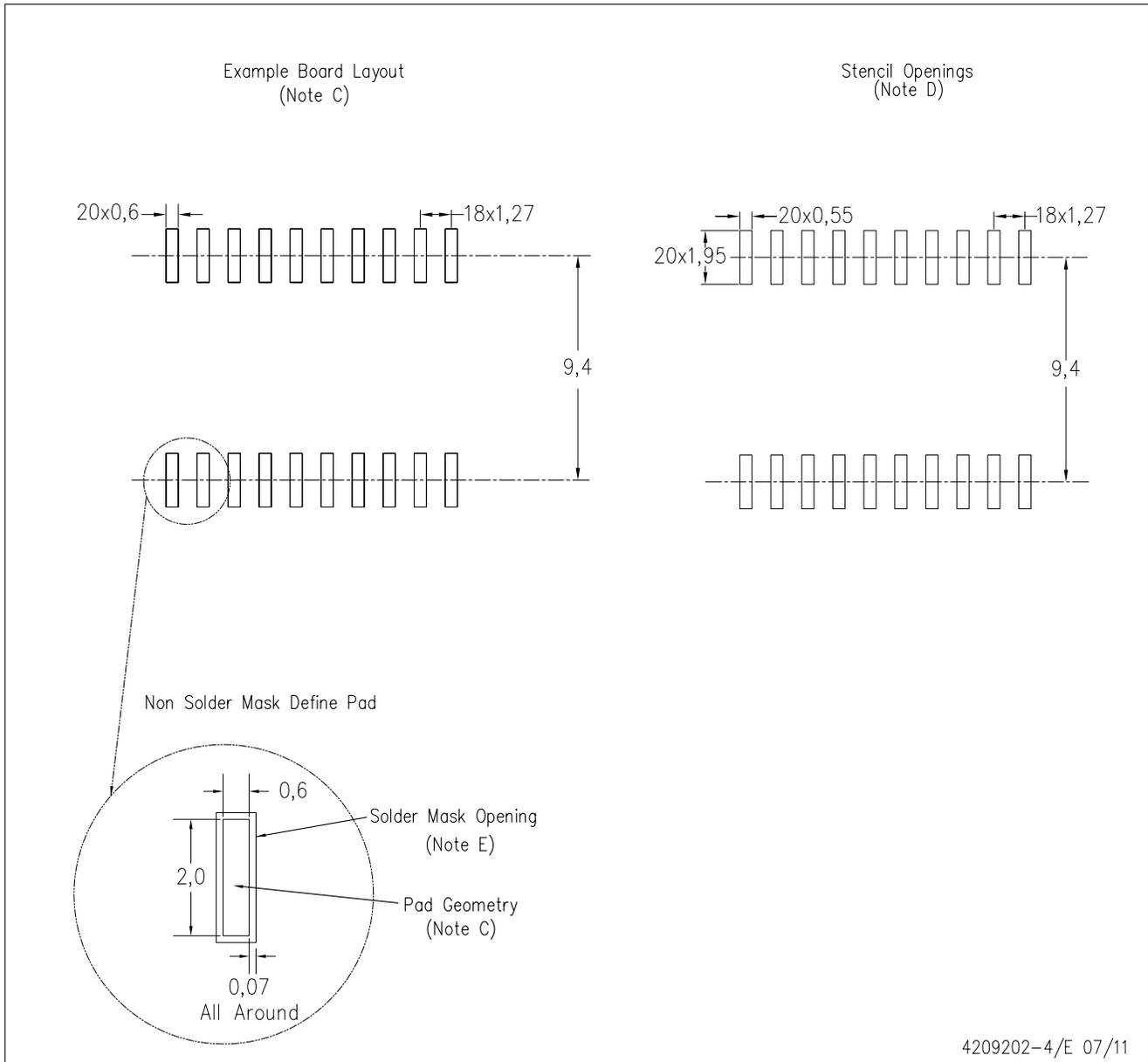
PLASTIC SMALL OUTLINE



- 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 AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



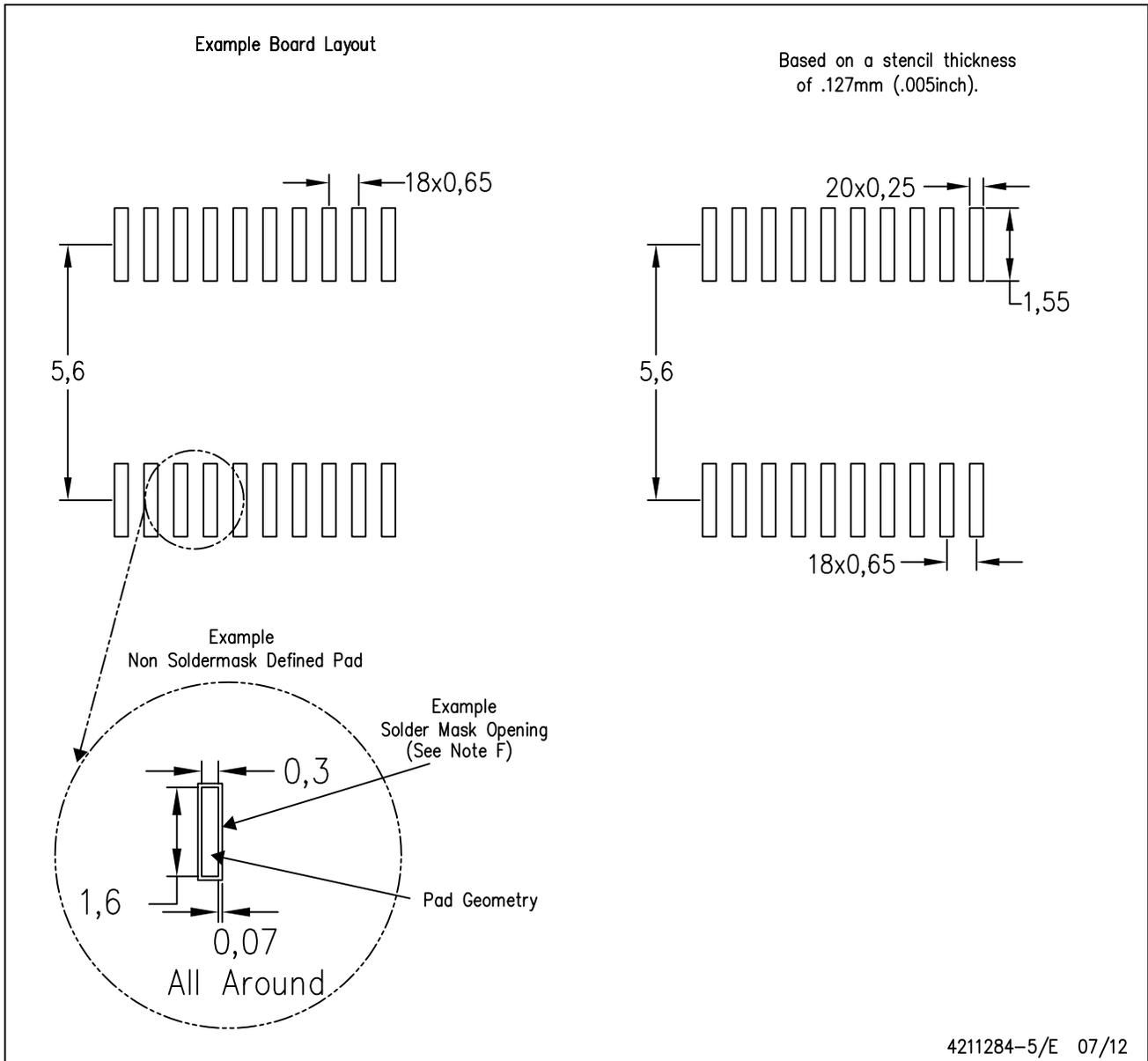
4209202-4/E 07/11

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. 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
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



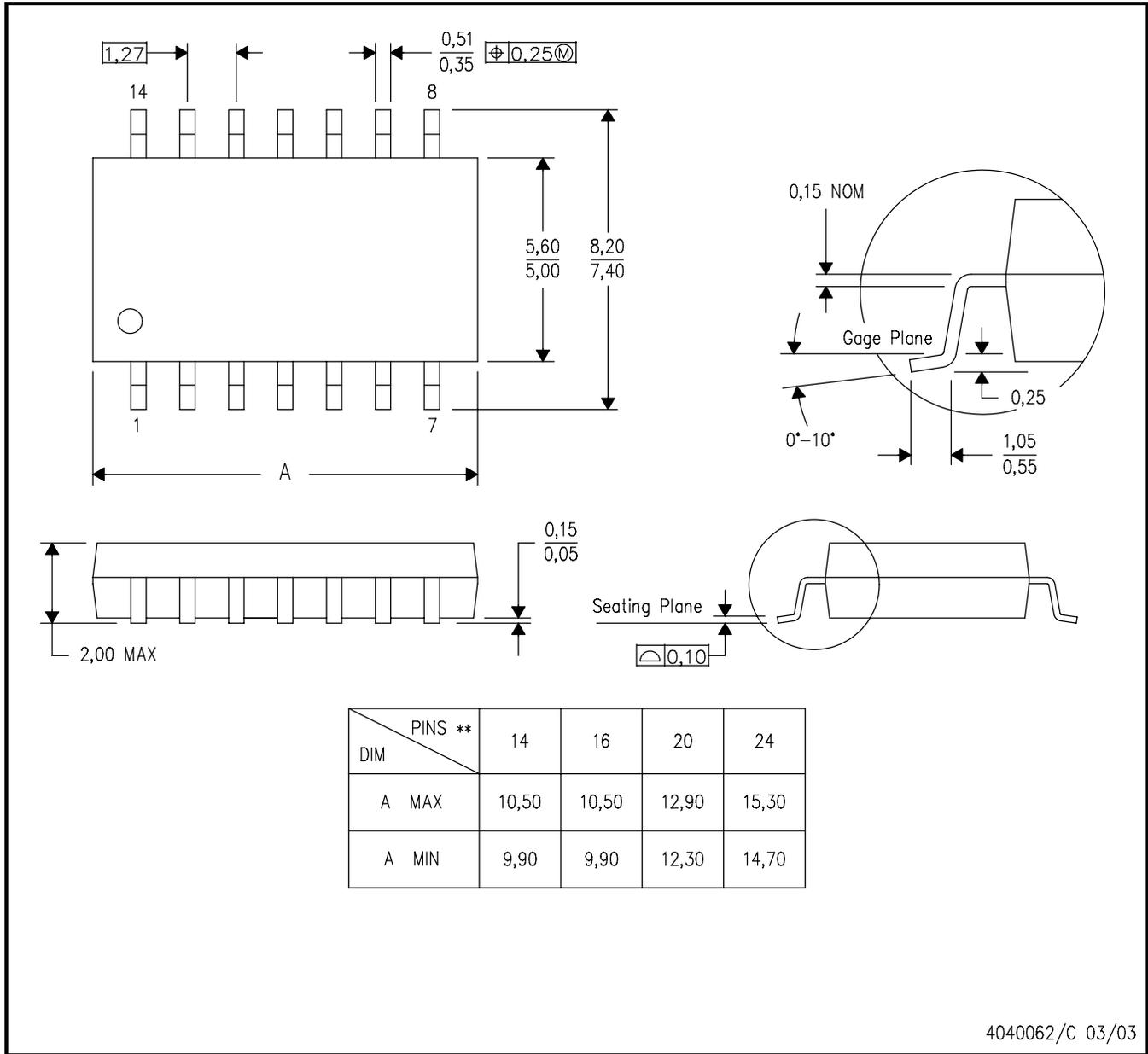
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

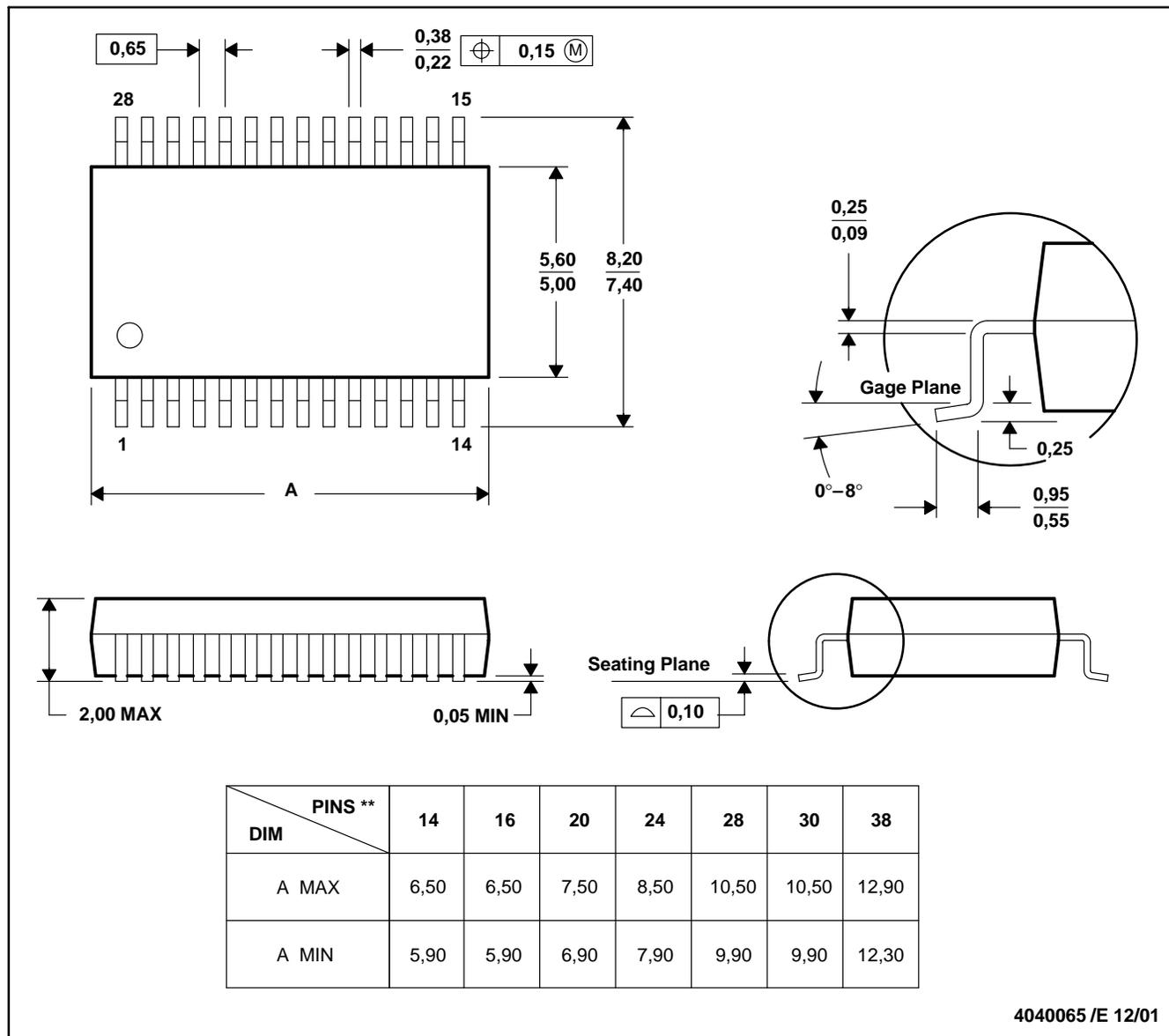


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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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