

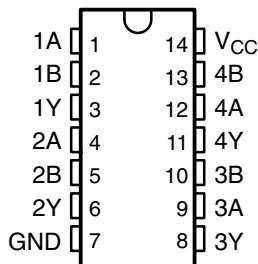
# SN54AHCT08, SN74AHCT08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

SCLS237L – OCTOBER 1995 – REVISED JULY 2003

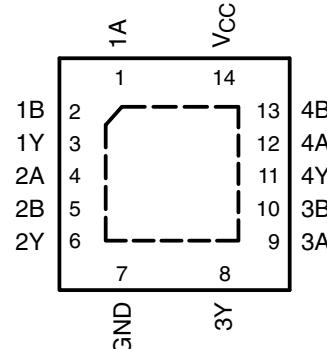
- Inputs Are TTL-Voltage Compatible
- Latch-Up Performance Exceeds 250 mA Per JESD 17

- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

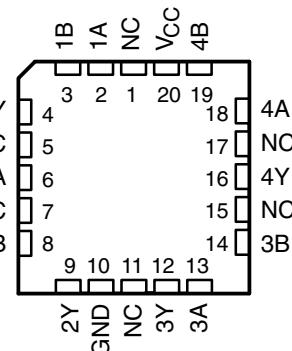
SN54AHCT08 . . . J OR W PACKAGE  
SN74AHCT08 . . . D, DB, DGV, N, NS,  
OR PW PACKAGE  
(TOP VIEW)



SN74AHCT08 . . . RGY PACKAGE  
(TOP VIEW)



SN54AHCT08 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

The 'AHCT08 devices are quadruple 2-input positive-AND gates. These devices perform the Boolean function  $Y = A \bullet B$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE <sup>†</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGY	Tape and reel	SN74AHCT08RGYR
	PDIP – N	Tube	SN74AHCT08N
	SOIC – D	Tube	SN74AHCT08D
		Tape and reel	SN74AHCT08DR
	SOP – NS	Tape and reel	SN74AHCT08NSR
	SSOP – DB	Tape and reel	SN74AHCT08DBR
	TSSOP – PW	Tube	SN74AHCT08PW
		Tape and reel	SN74AHCT08PWR
–55°C to 125°C	TVSOP – DGV	Tape and reel	SN74AHCT08DGVR
	CDIP – J	Tube	SNJ54AHCT08J
	CFP – W	Tube	SNJ54AHCT08W
	LCCC – FK	Tube	SNJ54AHCT08FK

<sup>†</sup> 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.



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## **SN54AHCT08, SN74AHCT08 QUADRUPLE 2-INPUT POSITIVE-AND GATES**

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## FUNCTION TABLE (each gate)

INPUTS		OUTPUT
A	B	Y
H	H	H
L	X	L
X	L	L

**logic diagram, each gate (positive logic)**



**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

<sup>†</sup> 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

1. The input and output voltage ratings may be exceeded if the input and output current ratings are exceeded.
2. The package thermal impedance is calculated in accordance with JESD 51-7.
3. The package thermal impedance is calculated in accordance with JESD 51-5.

**SN54AHCT08, SN74AHCT08**  
**QUADRUPLE 2-INPUT POSITIVE-AND GATES**

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**recommended operating conditions (see Note 4)**

		SN54AHCT08			SN74AHCT08			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5			V
$V_{IH}$	High-level input voltage	2		2				V
$V_{IL}$	Low-level input voltage			0.8		0.8		V
$V_I$	Input voltage	0	5.5	0	5.5			V
$V_O$	Output voltage	0	$V_{CC}$	0	$V_{CC}$			V
$I_{OH}$	High-level output current			-8		-8		mA
$I_{OL}$	Low-level output current			8		8		mA
$\Delta t/\Delta V$	Input transition rise or fall rate			20		20		ns/V
$T_A$	Operating free-air temperature	-55	125	-40	85			°C

NOTE 4: All unused inputs of the device must be held at  $V_{CC}$  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	$V_{CC}$	$T_A = 25^\circ C$			SN54AHCT08	SN74AHCT08	UNIT
			MIN	TYP	MAX	MIN	MAX	
$V_{OH}$	$I_{OH} = -50 \mu A$	4.5 V	4.4	4.5		4.4	4.4	V
	$I_{OH} = -8 \text{ mA}$		3.94			3.8	3.8	
$V_{OL}$	$I_{OL} = 50 \mu A$	4.5 V		0.1		0.1	0.1	V
	$I_{OL} = 8 \text{ mA}$			0.36		0.44	0.44	
$I_I$	$V_I = 5.5 \text{ V}$ or GND	0 V to 5.5 V		$\pm 0.1$		$\pm 1^*$	$\pm 1$	μA
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V		2		20	20	μA
$\Delta I_{CC}^\dagger$	One input at 3.4 V, Other inputs at $V_{CC}$ or GND	5.5 V		1.35		1.5	1.5	mA
$C_i$	$V_I = V_{CC}$ or GND	5 V	4	10			10	pF

\* On products compliant to MIL-PRF-38535, this parameter is not production tested at  $V_{CC} = 0 \text{ V}$ .

† This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or  $V_{CC}$ .

**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	$T_A = 25^\circ C$			SN54AHCT08	SN74AHCT08	UNIT	
				MIN	TYP	MAX	MIN	MAX		
$t_{PLH}$	A or B	Y	$C_L = 15 \text{ pF}$	5**	6.9**		1**	8**	1	8
				5**	6.9**		1**	8**	1	8
$t_{PLH}$	A or B	Y	$C_L = 50 \text{ pF}$	5.5	7.9		1	9	1	9
				5.5	7.9		1	9	1	9

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

# SN54AHCT08, SN74AHCT08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

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

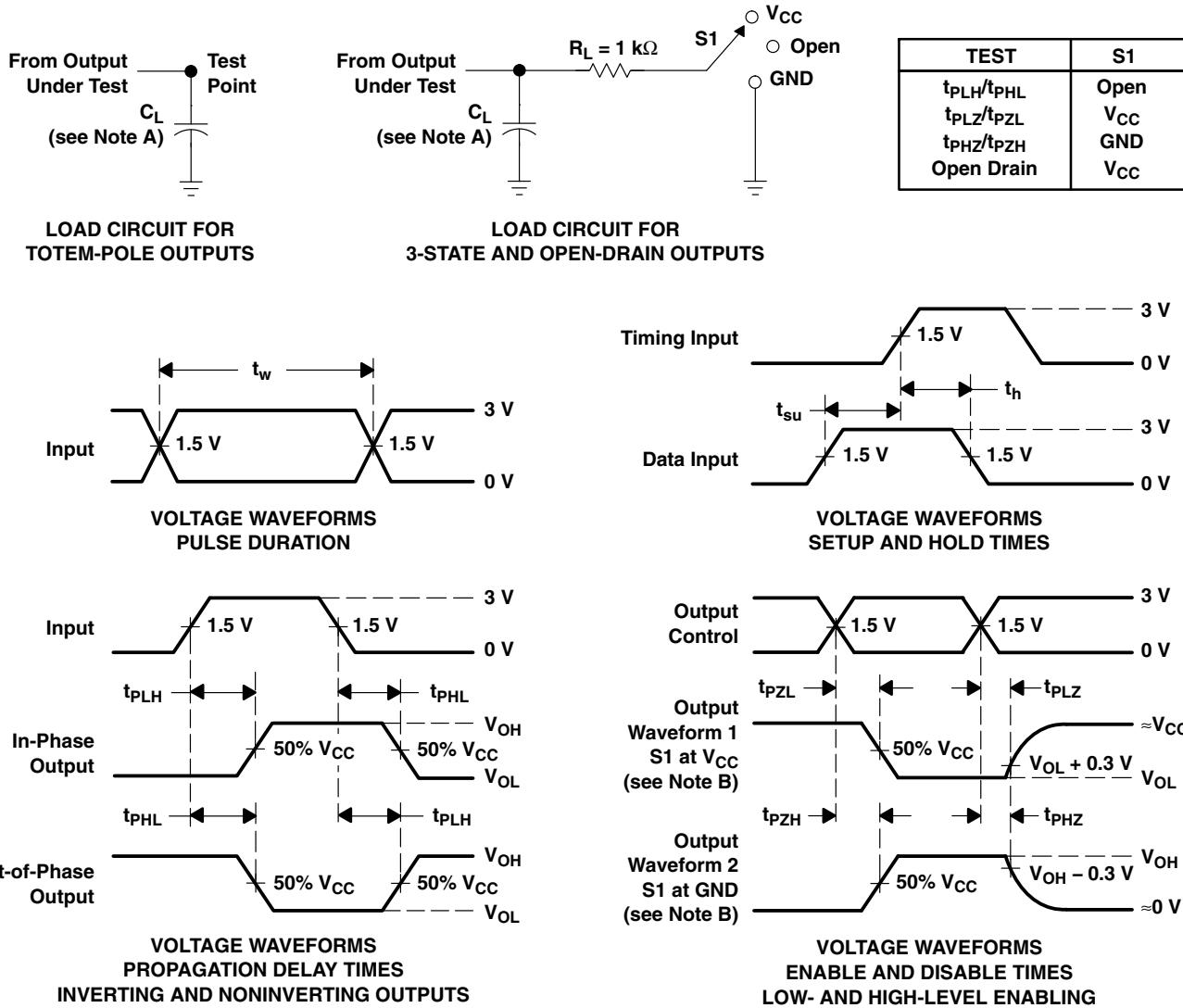
PARAMETER	SN74AHCT08			UNIT
	MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$	0.4	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$	-0.4	-0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$	4.4		V
$V_{IH(D)}$	High-level dynamic input voltage	2		V
$V_{IL(D)}$	Low-level dynamic input voltage		0.8	V

NOTE 5: Characteristics are for surface-mount packages only.

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$	Power dissipation capacitance No load, $f = 1$ MHz	18	pF

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 MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  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 (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9682101Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9682101Q2A SNJ54AHCT08FK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9682101QCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9682101QC A SNJ54AHCT08J	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9682101QDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9682101QD A SNJ54AHCT08W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9682101VCA	ACTIVE	CDIP	J	14	25	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9682101VC A SNV54AHCT08J	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9682101VDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9682101VD A SNV54AHCT08W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DBLE	OBsolete	SSOP	DB	14		TBD	Call TI	Call TI	-40 to 85		
SN74AHCT08DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DGVR	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DGVRE4	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DGVRG4	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74AHCT08DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74AHCT08N	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74AHCT08N	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08PWLE	OBsolete	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 85		
SN74AHCT08PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08PWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08RGYR	ACTIVE	VQFN	RGY	14	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74AHCT08RGYRG4	ACTIVE	VQFN	RGY	14	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	HB08	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54AHCT08FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9682101Q2A SNJ54AHCT08FK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54AHCT08J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9682101QC	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
										A SNJ54AHCT08J	
SNJ54AHCT08W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9682101QD A SNJ54AHCT08W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

(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) 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.

**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)

(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.

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**OTHER QUALIFIED VERSIONS OF SN54AHCT08, SN54AHCT08-SP, SN74AHCT08 :**

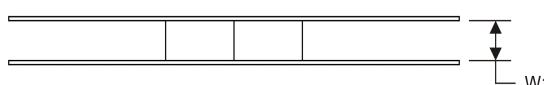
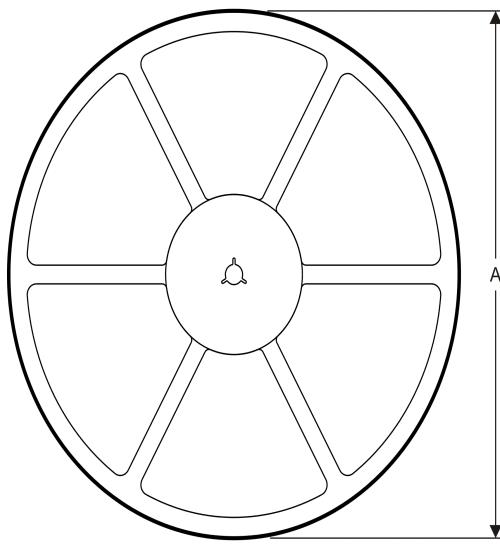
- Catalog: [SN74AHCT08](#), [SN54AHCT08](#)
- Enhanced Product: [SN74AHCT08-EP](#), [SN74AHCT08-EP](#)
- Military: [SN54AHCT08](#)
- Space: [SN54AHCT08-SP](#)

NOTE: Qualified Version Definitions:

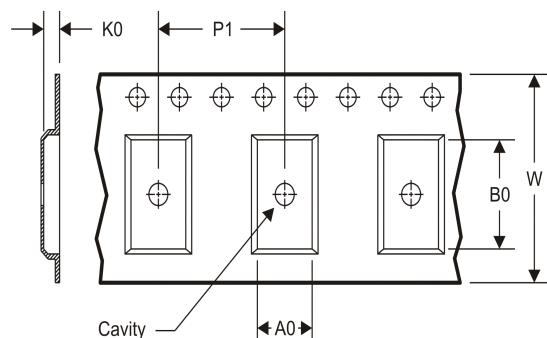
- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

## 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
SN74AHCT08DBR	SSOP	DB	14	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74AHCT08DGVR	TVSOP	DGV	14	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74AHCT08DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AHCT08DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AHCT08NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74AHCT08PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT08PWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
SN74AHCT08PWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT08RGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**

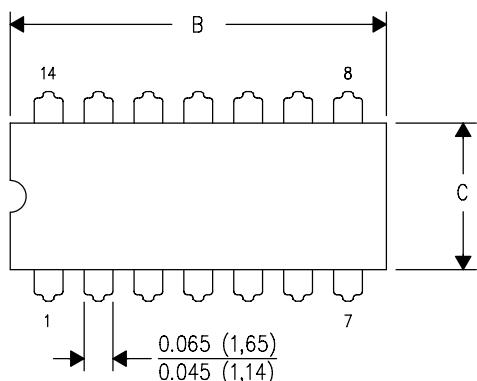

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHCT08DBR	SSOP	DB	14	2000	367.0	367.0	38.0
SN74AHCT08DGVR	TVSOP	DGV	14	2000	367.0	367.0	35.0
SN74AHCT08DR	SOIC	D	14	2500	333.2	345.9	28.6
SN74AHCT08DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74AHCT08NSR	SO	NS	14	2000	367.0	367.0	38.0
SN74AHCT08PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
SN74AHCT08PWR	TSSOP	PW	14	2000	364.0	364.0	27.0
SN74AHCT08PWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0
SN74AHCT08RGYR	VQFN	RGY	14	3000	367.0	367.0	35.0

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

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	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)

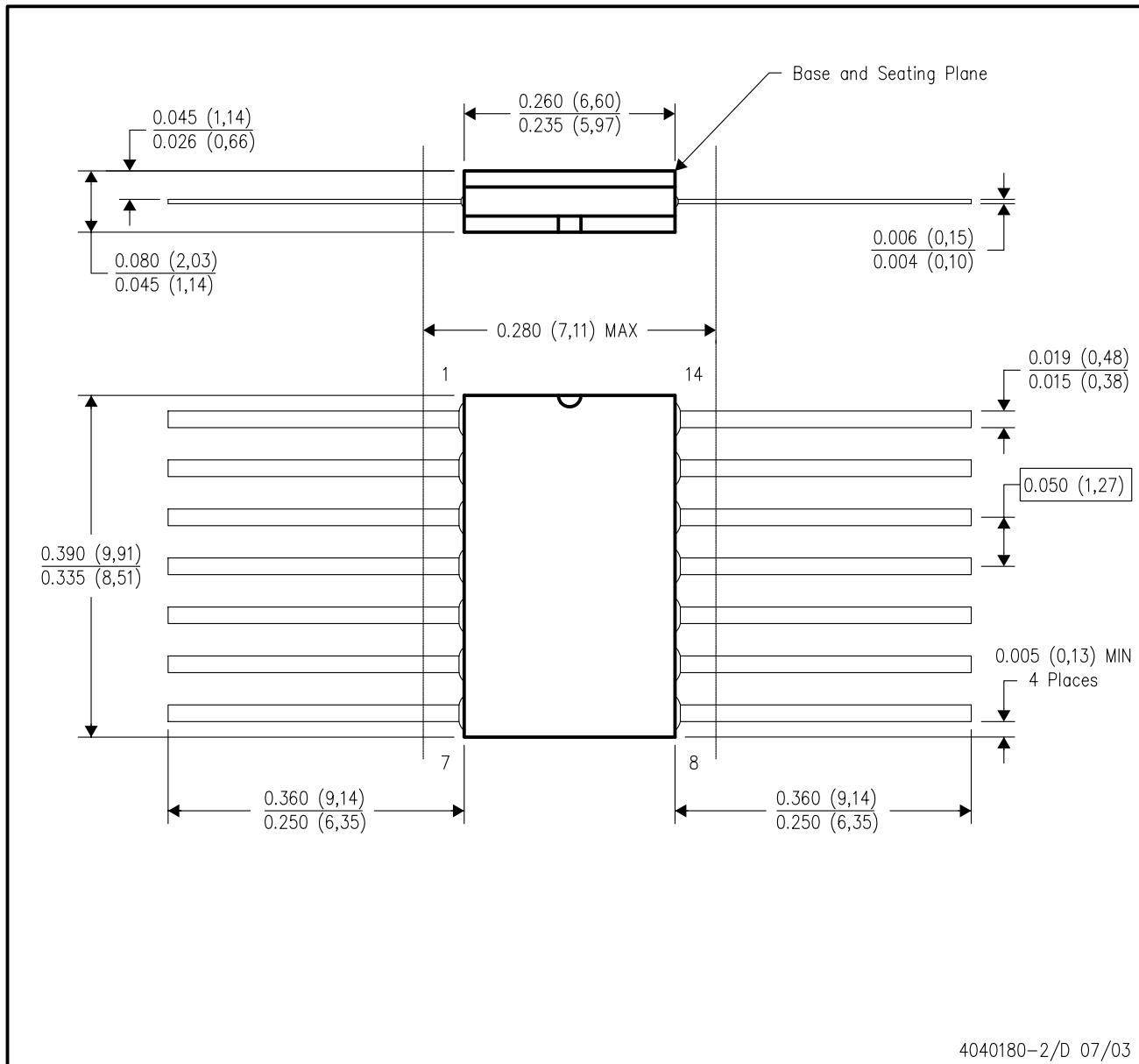


4040083/F 03/03

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

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



NOTES:

- All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- This package can be hermetically sealed with a ceramic lid using glass frit.
- Index point is provided on cap for terminal identification only.
- Falls within MIL-STD 1835 GDFP1-F14 and JEDEC MO-092AB

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

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



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 metal lid.  
 D. Falls within JEDEC MS-004

4040140/D 01/11

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

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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

## PLASTIC SMALL-OUTLINE

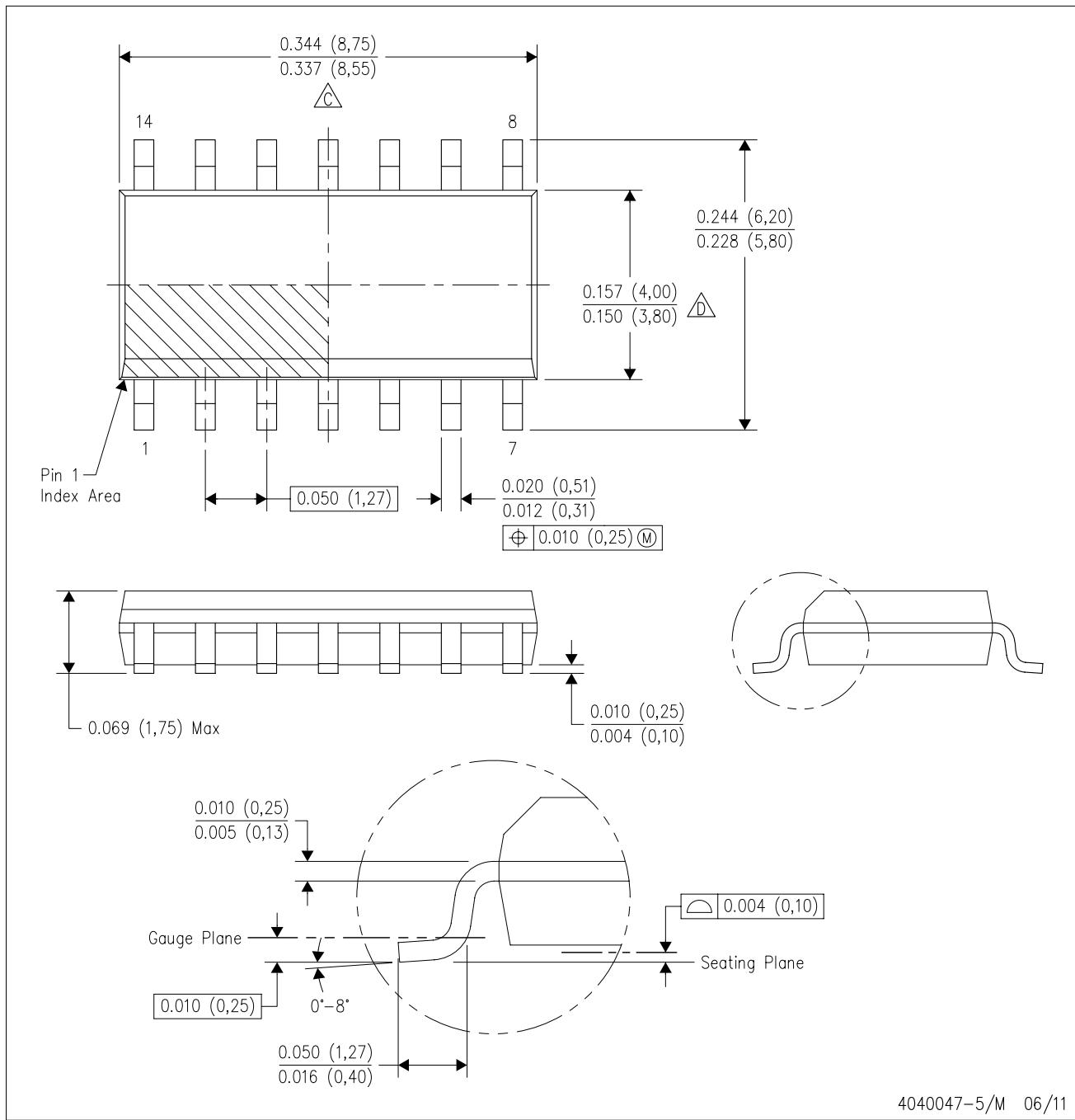
24 PINS SHOWN



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

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

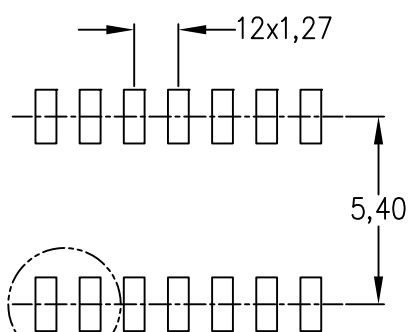
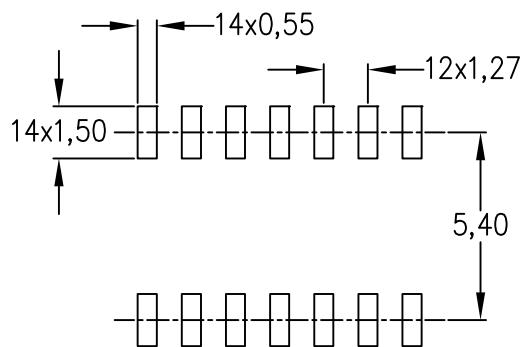
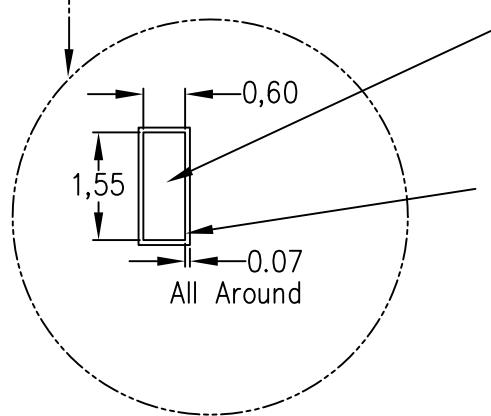
C Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0.15) each side.

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 AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE

Example Board Layout  
(Note C)Stencil Openings  
(Note D)Example  
Non Soldermask Defined PadExample  
Pad Geometry  
(See Note C)Example  
Solder Mask Opening  
(See Note E)

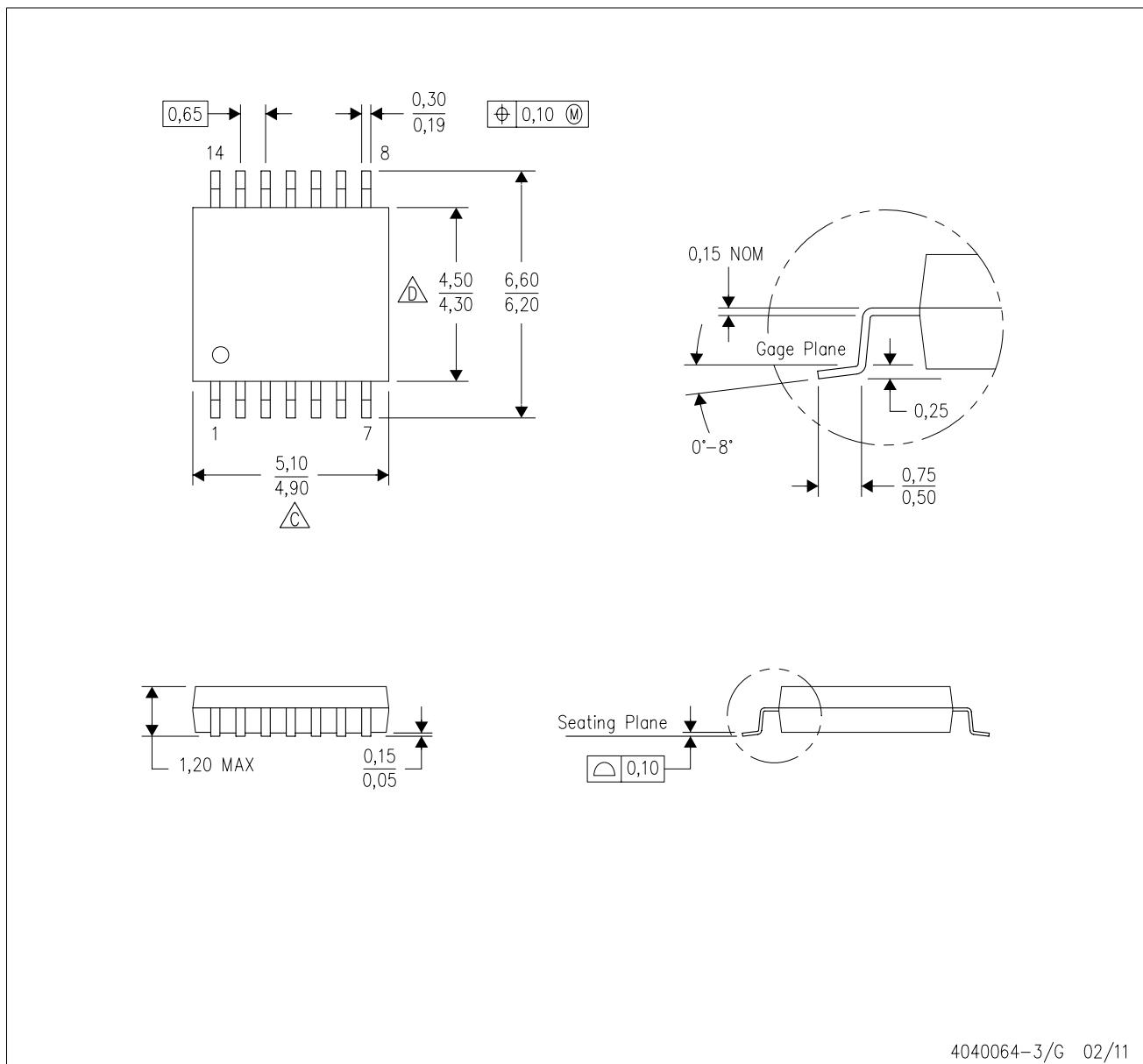
4211283-3/E 08/12

NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Publication IPC-7351 is recommended for alternate designs.
- 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.

PW (R-PDSO-G14)

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.

 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.

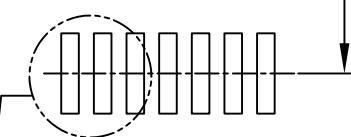
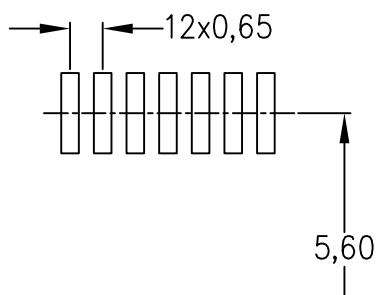
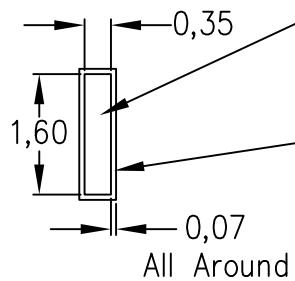
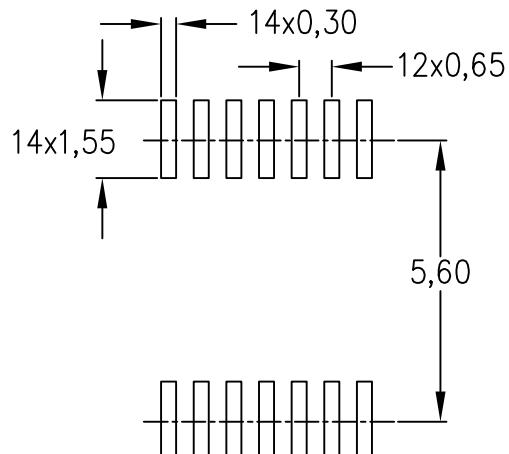
 D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153

4040064-3/G 02/11

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

Example Board Layout  
(Note C)Example  
Non Soldermask Defined PadExample  
Pad Geometry  
(See Note C)Example  
Solder Mask Opening  
(See Note E)Stencil Openings  
(Note D)

4211284-2/F 12/12

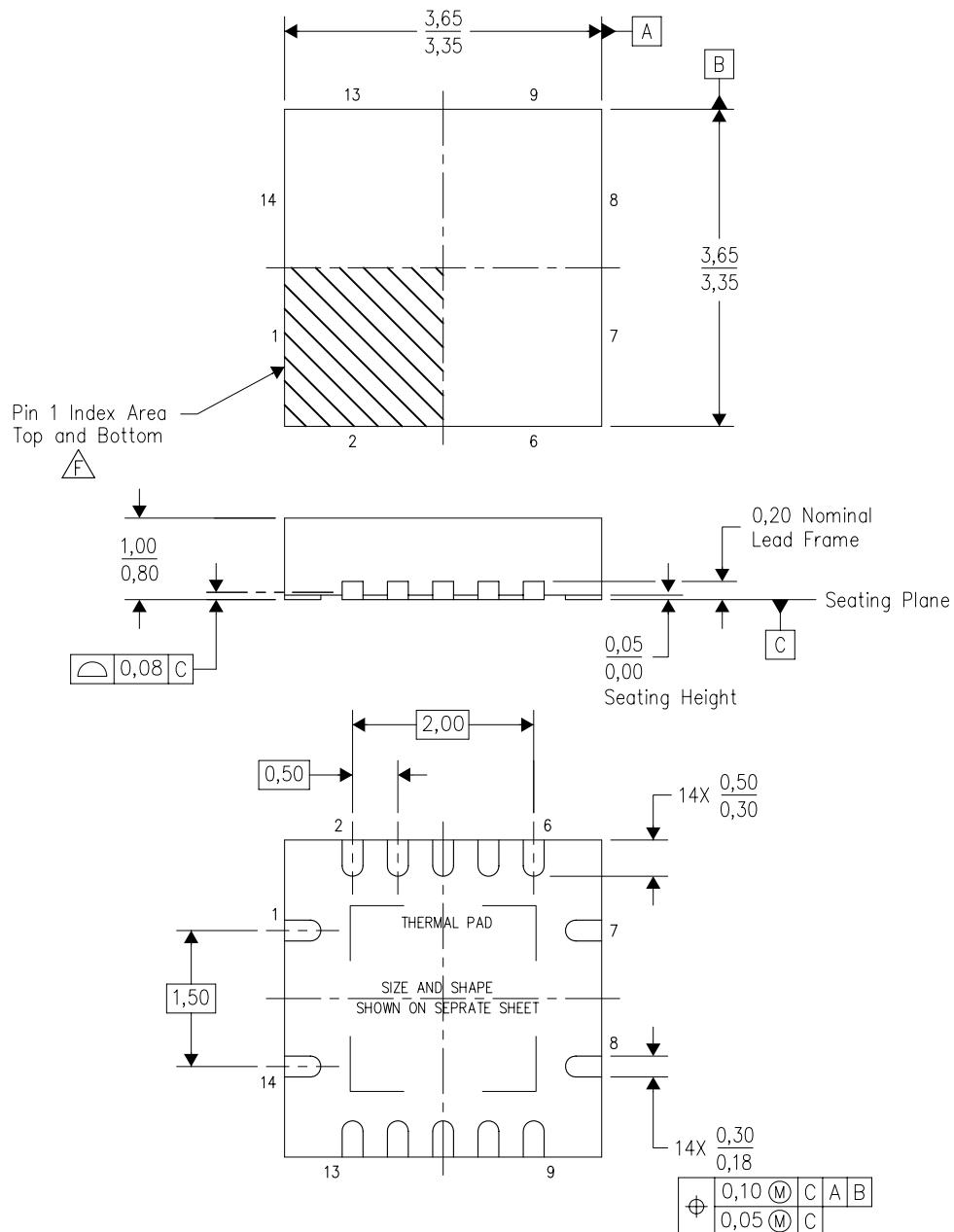
NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Publication IPC-7351 is recommended for alternate designs.
- 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.

## MECHANICAL DATA

RGY (S-PVQFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD



Bottom View

4203539-2/l 06/2011

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. QFN (Quad Flatpack No-Lead) package configuration.
- D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
- E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
- F. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
- G. Package complies to JEDEC MO-241 variation BA.

# THERMAL PAD MECHANICAL DATA

RGY (S-PVQFN-N14)

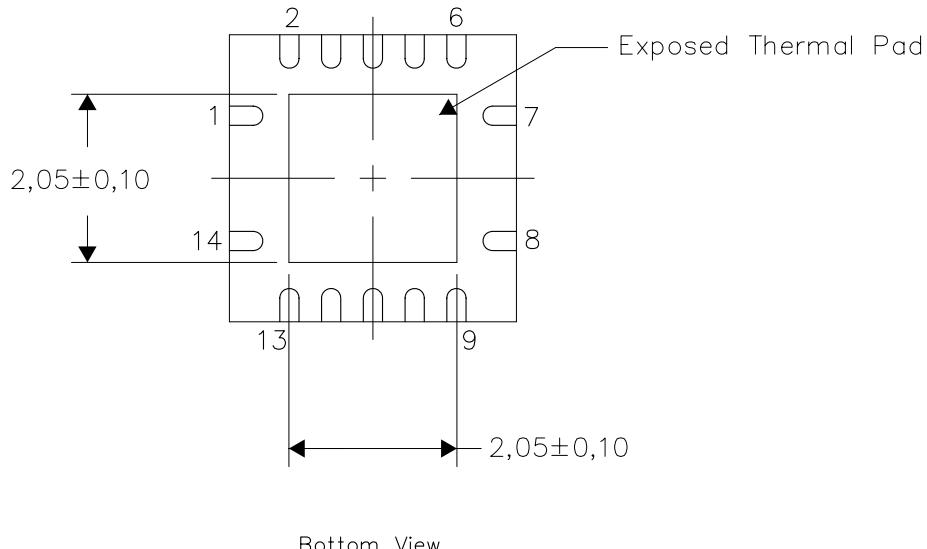
PLASTIC QUAD FLATPACK NO-LEAD

## THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

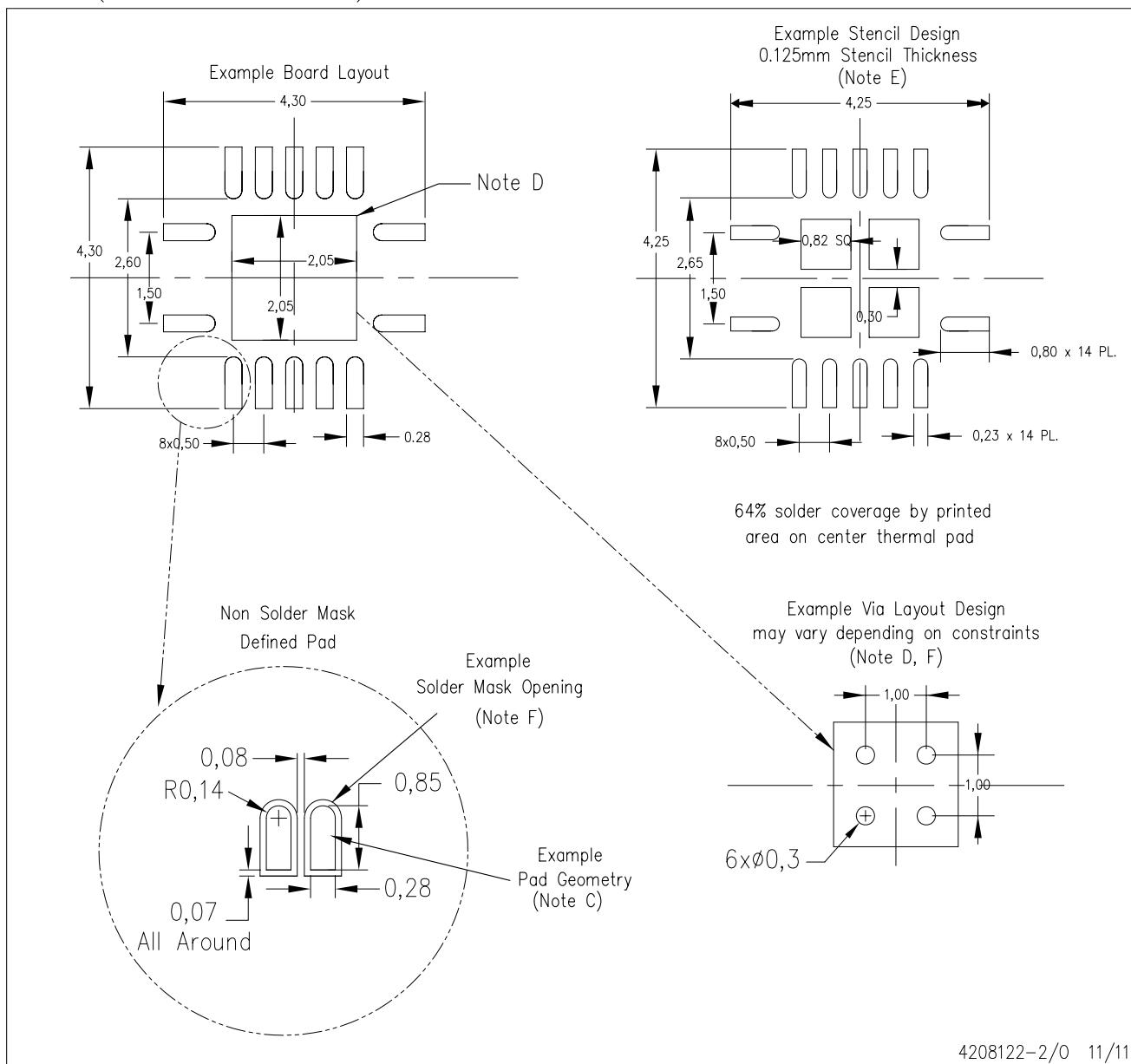
4206353-2/0 11/11

NOTE: All linear dimensions are in millimeters

## LAND PATTERN DATA

RGY (S-PVQFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD



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 designs.
- D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at [www.ti.com](http://www.ti.com) <<http://www.ti.com>>.
- E. 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 stencil design considerations.
- F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

## MECHANICAL DATA

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

## PLASTIC SMALL-OUTLINE PACKAGE

**14-PINS SHOWN**



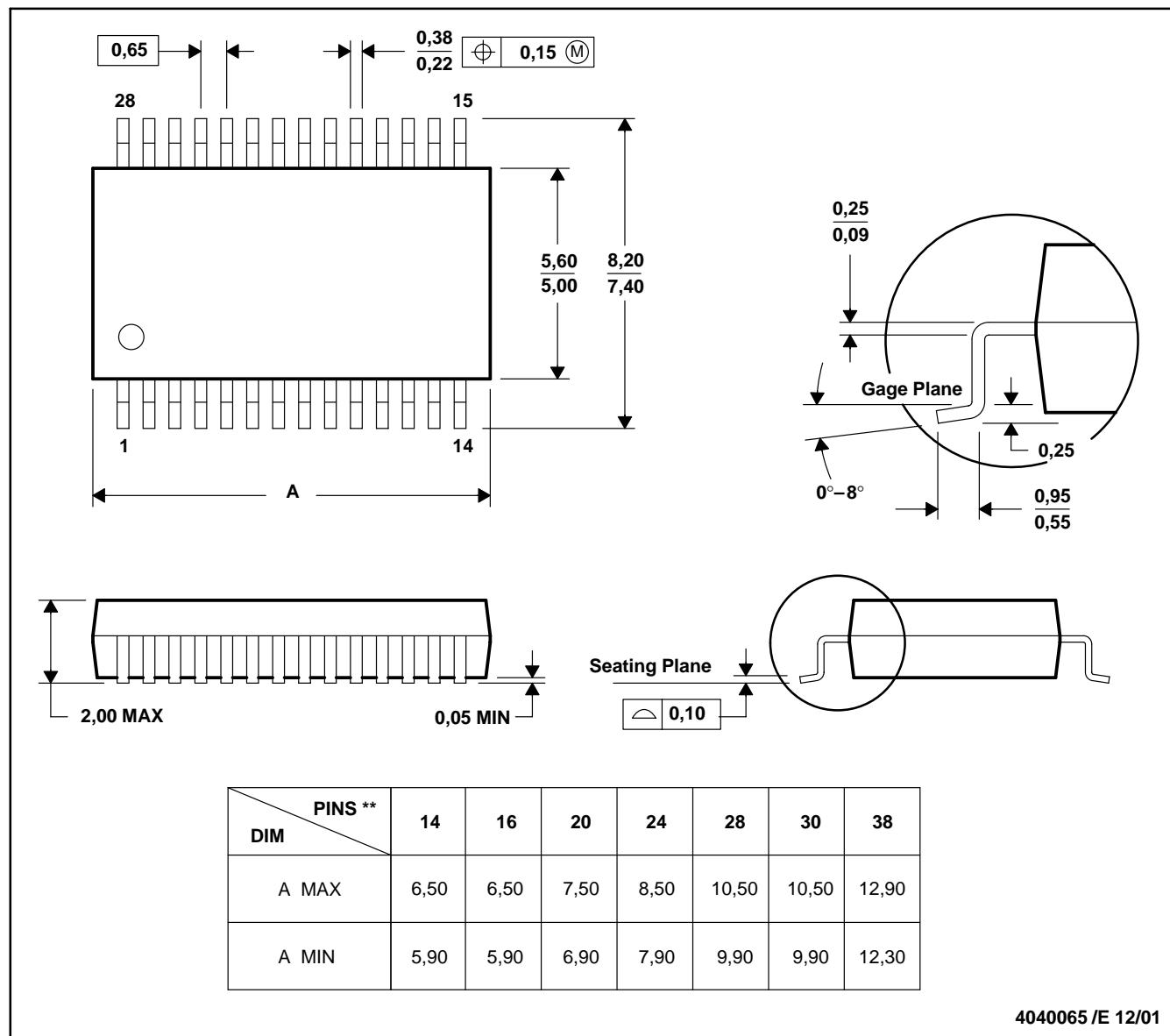
NOTES:

- 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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DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
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Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
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