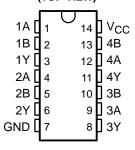
SN54AHC08, SN74AHC08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

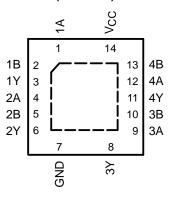
SCLS236H - OCTOBER 1995 - REVISED JULY 2003

- Operating Range 2-V to 5.5-V V_{CC}
- 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)

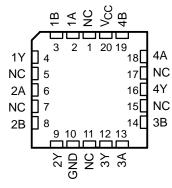
SN54AHC08...J OR W PACKAGE SN74AHC08...D, DB, DGV, N, NS, OR PW PACKAGE (TOP VIEW)



SN74AHC08...RGY PACKAGE (TOP VIEW)



SN54AHC08...FK PACKAGE (TOP VIEW)



NC - No internal connection

description/ordering information

The 'AHC08 devices are quadruple 2-input positive-AND gates. These devices perform the Boolean function $Y = A \bullet B$ or $Y = \overline{A + B}$ in positive logic.

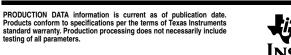
ORDERING INFORMATION

TA	PACKA	GE†	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	QFN – RGY	Tape and reel	SN74AHC08RGYR	HA08
	PDIP – N	Tube	SN74AHC08N	SN74AHC08N
	SOIC - D	Tube	SN74AHC08D	AHC08
	3010-1	Tape and reel	SN74AHC08DR	ALICOS
–40°C to 85°C	SOP – NS	Tape and reel	SN74AHC08NSR	AHC08
	SSOP – DB	Tape and reel	SN74AHC08DBR	HA08
	TSSOP – PW	Tube	SN74AHC08PW	HA08
	1330F = FW	Tape and reel	SN74AHC08PWR	TIAUO
	TVSOP – DGV	Tape and reel	SN74AHC08DGVR	HA08
	CDIP – J	Tube	SNJ54AHC08J	SNJ54AHC08J
–55°C to 125°C	CFP – W	Tube	SNJ54AHC08W	SNJ54AHC08W
	LCCC – FK	Tube	SNJ54AHC08FK	SNJ54AHC08FK

[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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.



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FUNCTION TABLE (each gate)

INP	UTS	OUTPUT
Α	В	Y
Н	Н	Н
L	X	L
Х	L	L

logic diagram, each gate (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V _{CC}	
Input voltage range, V _I (see Note 1)	
Output voltage range, V _O (see Note 1)	
Input clamp current, I _{IK} (V _I < 0)	
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	
Continuous output current, $I_O(V_O = 0 \text{ to } V_{CC})$	±25 mA
Continuous current through V _{CC} or GND	±50 mA
Package thermal impedance, θ _{JA} (see Note 2): D package	86°C/W
(see Note 2): DB package	96°C/W
(see Note 2): DGV package	127°C/W
(see Note 2): N package	80°C/W
(see Note 2): NS package	76°C/W
(see Note 2): PW package	113°C/W
(see Note 3): RGY package	47°C/W
Storage temperature range, T _{sta}	–65°C to 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.

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

recommended operating conditions (see Note 4)

			SN54A	HC08	SN74A	HC08	UNIT	
			MIN	MAX	MIN	MAX	UNII	
Vcc	Supply voltage		2	5.5	2	5.5	V	
		V _{CC} = 2 V	1.5		1.5			
VIН	High-level input voltage	V _{CC} = 3 V	2.1		2.1		V	
		$V_{CC} = 5.5 V$	3.85		3.85			
		V _{CC} = 2 V		0.5		0.5		
VIL	Low-level input voltage	V _{CC} = 3 V		0.9		0.9	٧	
		V _{CC} = 5.5 V		1.65		1.65		
٧ı	Input voltage		0	5.5	0	5.5	V	
٧o	Output voltage		0	VCC	0	VCC	V	
		V _{CC} = 2 V		-50		-50	μΑ	
IOH	High-level output current	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		-4		-4	mA	
		$V_{CC} = 5 V \pm 0.5 V$		-8		-8		
		V _{CC} = 2 V		50		50	μΑ	
lOL	Low-level output current	$V_{CC} = 3.3 V \pm 0.3 V$		4		4	mΛ	
		$V_{CC} = 5 V \pm 0.5 V$		8		8	mA	
Δt/Δν	Input transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		100		100	20/1/	
ΔυΔν	Input transition rise or fall rate	$V_{CC} = 5 V \pm 0.5 V$		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)

DADAMETED	TEGT COMPLETIONS	.,	T,	λ = 25°C	;	SN54A	HC08	SN74A	HC08	UNIT
PARAMETER	TEST CONDITIONS	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	
			1.9	2		1.9		1.9		
	I _{OH} = -50 μA	3 V	2.9	3		2.9		2.9		
Voн		4.5 V	4.4	4.5		4.4		4.4		V
	$I_{OH} = -4 \text{ mA}$	3 V	2.58			2.48		2.48		
	I _{OH} = -8 mA	4.5 V	3.94			3.8		3.8		
		2 V			0.1		0.1		0.1	
	I _{OL} = 50 μA	3 V			0.1		0.1		0.1	
v_{OL}		4.5 V			0.1		0.1		0.1	V
	I _{OL} = 4 mA	3 V			0.36		0.5		0.44	
	I _{OL} = 8 mA	4.5 V			0.36		0.5		0.44	
lį	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1*		±1	μΑ
Icc	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			2		20		20	μΑ
Ci	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 $V_{CC} = 0 \text{ V}$.



SN54AHC08, SN74AHC08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

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

PARAMETER	FROM	TO LOAD		ROM TO LOAD		FROM TO LOAD TA = 25°C		;	SN54AHC08		SN74AHC08		UNIT
PARAMETER	(INPUT)	(OUTPUT)	CAPACITANCE	MIN	TYP	MAX	MIN	MAX	MIN	MAX	OMI		
^t PLH	A or B	V	C _I = 15 pF		6.2*	8.8*	1*	10.5*	1	10.5	no		
^t PHL	AUB	ī	CL = 15 pr		6.2*	8.8*	1*	10.5*	1	10.5	ns		
^t PLH	A or B	V	C: - 50 pF		8.7	12.3	1	14	1	14	20		
^t PHL	AUB	r	C _L = 50 pF		8.7	12.3	1	14	1	14	ns		

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

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

PARAMETER	FROM	то	TO LOAD		4 = 25°C	;	SN54A	HC08	SN74A	HC08	UNIT
PARAMETER	(INPUT)	(OUTPUT)	CAPACITANCE	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
^t PLH	A or B	V	C 15 pF		4.3*	5.9*	1*	7*	1	7	no
^t PHL	AUB	ī	C _L = 15 pF		4.3*	5.9*	1*	7*	1	7	ns
t _{PLH}	A or B	V	C: - 50 pE		5.8	7.9	1	9	1	9	no
^t PHL	AUIB	r	C _L = 50 pF		5.8	7.9	1	9	1	9	ns

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

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

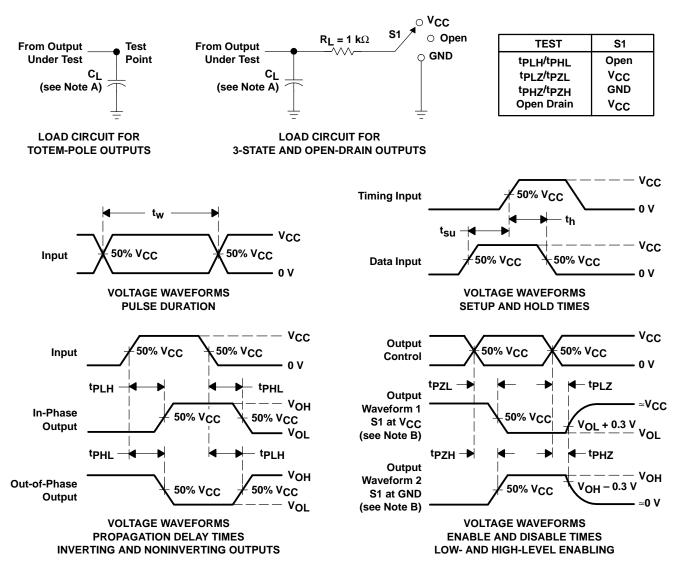
	PARAMETER	SN74A	HC08	UNIT
	PARAMETER	MIN	MAX	UNIT
V _{OL(P)}	Quiet output, maximum dynamic V _{OL}		0.8	V
V _{OL(V)}	Quiet output, minimum dynamic V _{OL}		-0.8	V
V _{OH(V)}	Quiet output, minimum dynamic VOH	4.4		V
V _{IH(D)}	High-level dynamic input voltage	3.5		V
V _{IL(D)}	Low-level dynamic input voltage		1.5	V

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

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

	PARAMETER	TEST C	ONDITIONS	TYP	UNIT
Cr	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, $Z_O = 50 \Omega$, $t_f \leq$ 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	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
5962-9682001Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SN74AHC08D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DBLE	OBSOLETE	SSOP	DB	14		TBD	Call TI	Call TI
SN74AHC08DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DGVR	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DGVRE4	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AHC08NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AHC08NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08PWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI
SN74AHC08PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08PWRE4	ACTIVE	TSSOP	PW	14	2000	· · · · · · · · · · · · · · · · · · ·	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC08RGYR	ACTIVE	QFN	RGY	14	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
SN74AHC08RGYRG4	ACTIVE	QFN	RGY	14	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR



PACKAGE OPTION ADDENDUM

2-Nov-2006

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins Packag Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SNJ54AHC08FK	ACTIVE	LCCC	FK	20 1	TBD	POST-PLATE	N / A for Pkg Type

(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.

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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. The terminals are gold plated.
- E. Falls within JEDEC MS-004



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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**)

24 PINS SHOWN

PLASTIC SMALL-OUTLINE



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

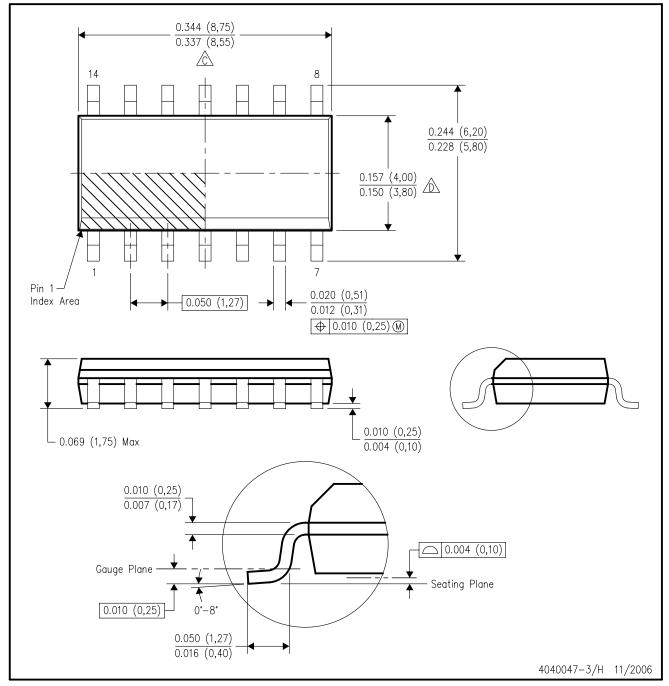
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.

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



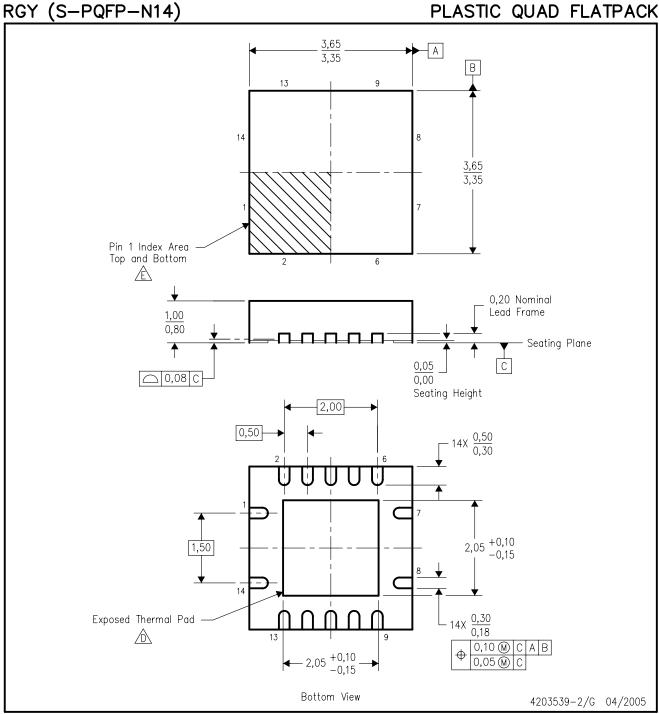
D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AB.





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.
- The package thermal pad must be soldered to the board for thermal and mechanical performance.
- 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.
- F. Package complies to JEDEC MO-241 variation BA.



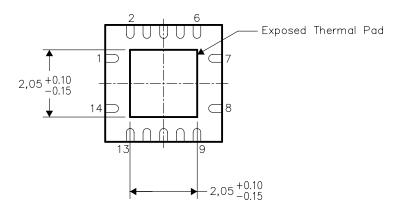


THERMAL INFORMATION

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), the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to a ground plane or 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, Quad Flatpack No—Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at www.ti.com.

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

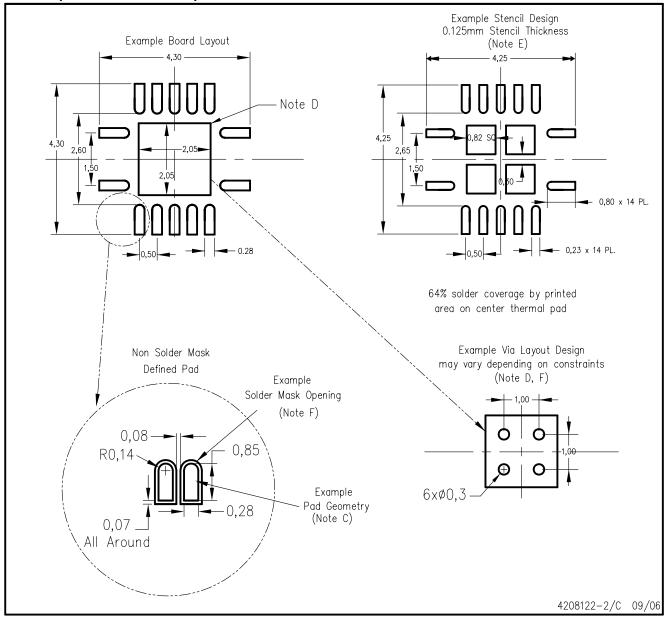


Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

RGY (R-PQFP-N14)



- 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 Packages, Texas Instruments Literature No. SCBA017, 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.
- 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**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- 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

PW (R-PDSO-G**)

14 PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



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-153

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