

# SN5472, SN7472 AND-GATED J-K MASTER-SLAVE FLIP-FLOPS WITH PRESET AND CLEAR

SDLS117 – DECEMBER 1983 – REVISED MARCH 1988

- Package Options Include Plastic and Ceramic DIPs and Ceramic Flat Packages
- Dependable Texas Instruments Quality and Reliability

## description

These J-K flip-flops are based on the master-slave principle and each has AND gate inputs for entry into the master section which are controlled by the clock pulse. The clock pulse also regulates the state of the coupling transistors which connect the master and slave sections. The sequence of operation is as follows:

1. Isolate slave from master
2. Enter information from AND gate inputs to master
3. Disable AND gate inputs
4. Transfer information from master to slave

The logical states of the J and K inputs must not be allowed to change when the clock pulse is in a high state.

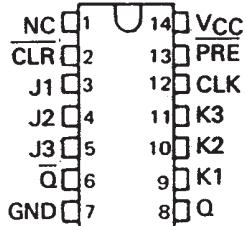
The SN5472, and the SN54H72 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN7472 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE

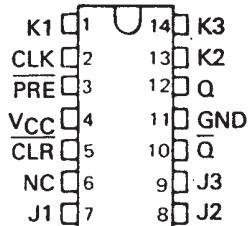
INPUTS					OUTPUTS	
PRE	CLR	CLK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H <sup>†</sup>	H <sup>†</sup>
H	H	⊜	L	L	Q <sub>0</sub>	$\bar{Q}_0$
H	H	⊜	H	L	H	L
H	H	⊜	L	H	L	H
H	H	⊜	H	H	TOGGLE	

<sup>†</sup> This configuration is nonstable; that is, it will not persist when either preset or clear returns to its inactive (high) level.

SN5472 . . . J PACKAGE  
SN7472 . . . N PACKAGE  
(TOP VIEW)

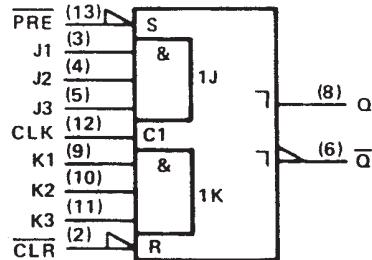


SN5472 . . . W PACKAGE  
(TOP VIEW)



NC – No internal connection

## logic symbol<sup>‡</sup>



<sup>‡</sup>This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

Pin numbers shown are for J and N packages.

## positive logic

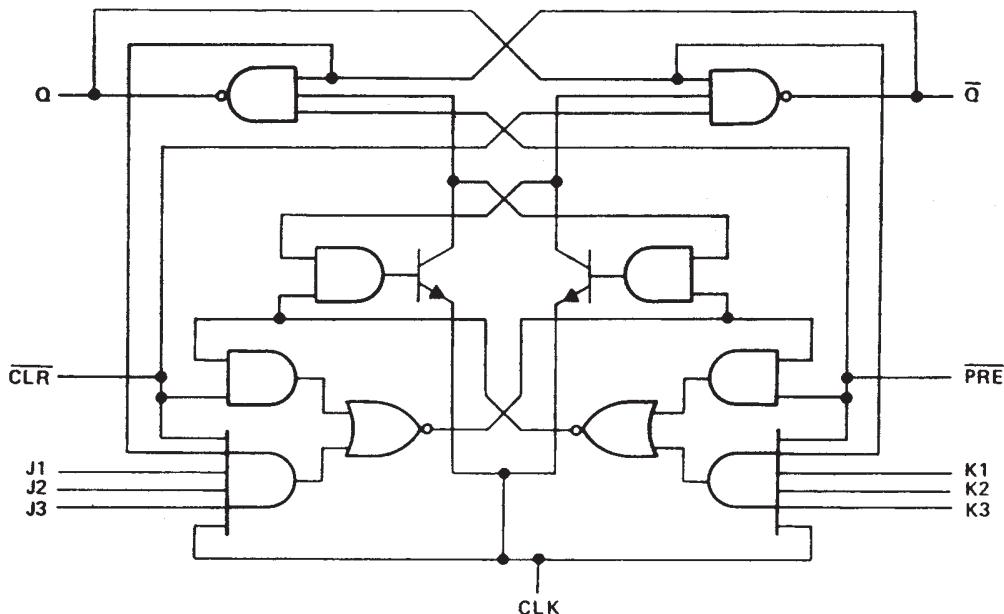
$$J = J_1 \cdot J_2 \cdot J_3$$

$$K = K_1 \cdot K_2 \cdot K_3$$

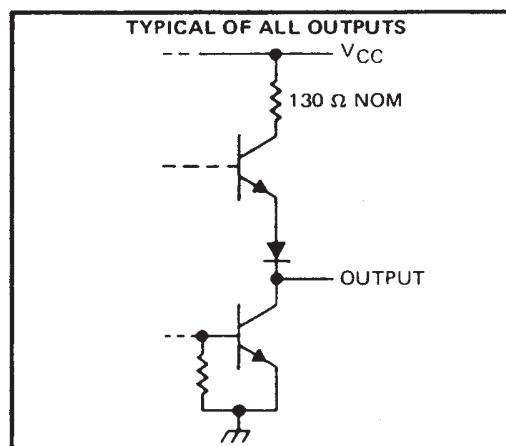
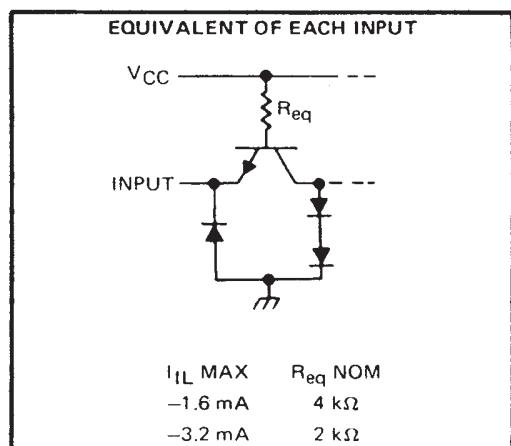
# **SN5472, SN7472 AND-GATED J-K MASTER-SLAVE FLIP-FLOPS WITH PRESET AND CLEAR**

SDLS117 – DECEMBER 1983 – REVISED MARCH 1988

### logic diagram (positive logic)



### **schematics of inputs and outputs**



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

NOTE 1: Voltage values are with respect to network ground terminal.

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## recommended operating conditions

			SN5472			SN7472			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage		4.5	5	5.5	4.75	5	5.25	V
$V_{IH}$	High-level input voltage		2			2			V
$V_{IL}$	Low-level input voltage				0.8			0.8	V
$I_{OH}$	High-level output current				-0.4			-0.4	mA
$I_{OL}$	Low-level output current				16			16	mA
$t_W$	Pulse duration	CLK high	20			20			ns
		CLK low	47			47			
		PRE or CLR	25			25			
$t_{SU}$	Input setup time before CLK $\uparrow$		0			0			ns
$t_h$	Input hold time-data after CLK $\downarrow$		0			0			ns
$T_A$	Operating free-air temperature		-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS <sup>†</sup>			SN5472		SN7472		UNIT	
				MIN	TYP <sup>‡</sup>	MAX	MIN		
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -12 \text{ mA}$					-1.5		-1.5	V
$V_{OH}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -0.4 \text{ mA}$			2.4	3.4		2.4	3.4	V
$V_{OL}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OL} = 16 \text{ mA}$			0.2	0.4		0.2	0.4	V
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$					1		1	mA
$I_{IH}$	J or K					40		40	$\mu\text{A}$
	All other	$V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$				80		80	
$I_{IL}$	J or K					-1.6		-1.6	mA
	All other	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$				-3.2		-3.2	
$I_{OS\$}$	$V_{CC} = \text{MAX}$			-20	-57	-18	-57	mA	
$I_{CC}$	$V_{CC} = \text{MAX}$ , See Note 2			10	20		10	20	mA

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

<sup>‡</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§ Not more than one output should be shorted at a time.

NOTE 2: With all outputs open,  $I_{CC}$  is measured with the Q and  $\bar{Q}$  outputs high in turn. At the time of measurement, the clock input is grounded.

## switching characteristics, $V_{CC} = 5 \text{ V}$ , $T_A = 25^\circ\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS			MIN	TYP	MAX	UNIT
$f_{max}$						15	20		MHz
$t_{PLH}$						16	25		ns
$t_{PHL}$	$\overline{\text{PRE or CLR}}$	Q or $\bar{Q}$	$R_L = 400 \Omega$ , $C_L = 15 \text{ pF}$			25	40		ns
$t_{PLH}$						16	25		ns
$t_{PHL}$	CLK	Q or $\bar{Q}$				25	40		ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

**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)
<a href="#">SN5472J</a>	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN5472J
SN5472J.A	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN5472J
SN5472J.A	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN5472J
<a href="#">SNJ5472J</a>	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472J
<a href="#">SNJ5472J</a>	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472J
SNJ5472J.A	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472J
SNJ5472J.A	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472J
<a href="#">SNJ5472W</a>	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472W
<a href="#">SNJ5472W</a>	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472W
SNJ5472W.A	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472W
SNJ5472W.A	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ5472W

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **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.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

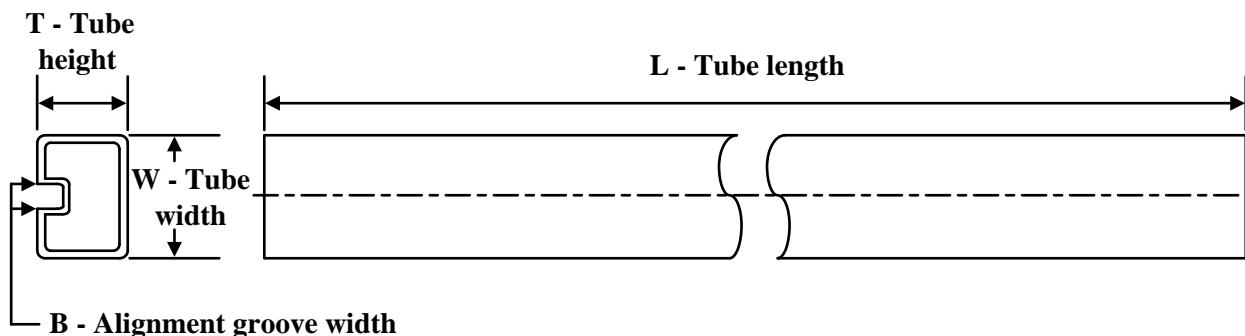
<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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.

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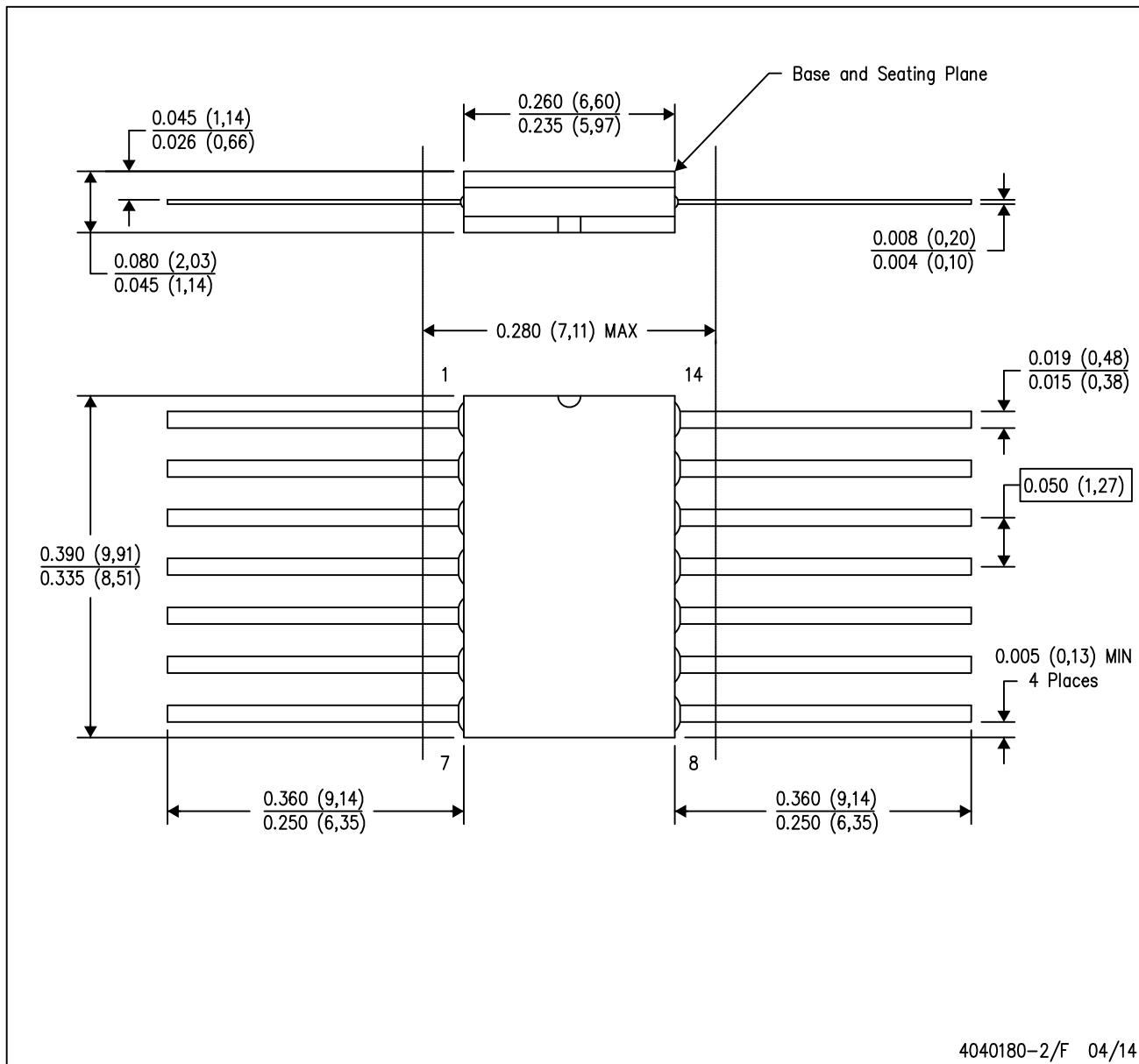
**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SNJ5472W	W	CFP	14	25	506.98	26.16	6220	NA
SNJ5472W.A	W	CFP	14	25	506.98	26.16	6220	NA

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



NOTES:

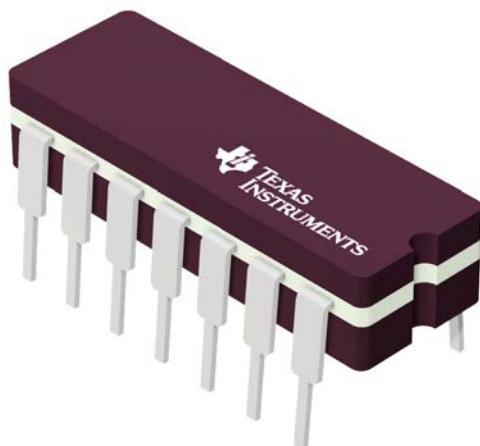
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within MIL-STD 1835 GDFP1-F14

# GENERIC PACKAGE VIEW

**J 14**

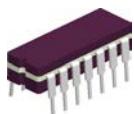
**CDIP - 5.08 mm max height**

CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4040083-5/G

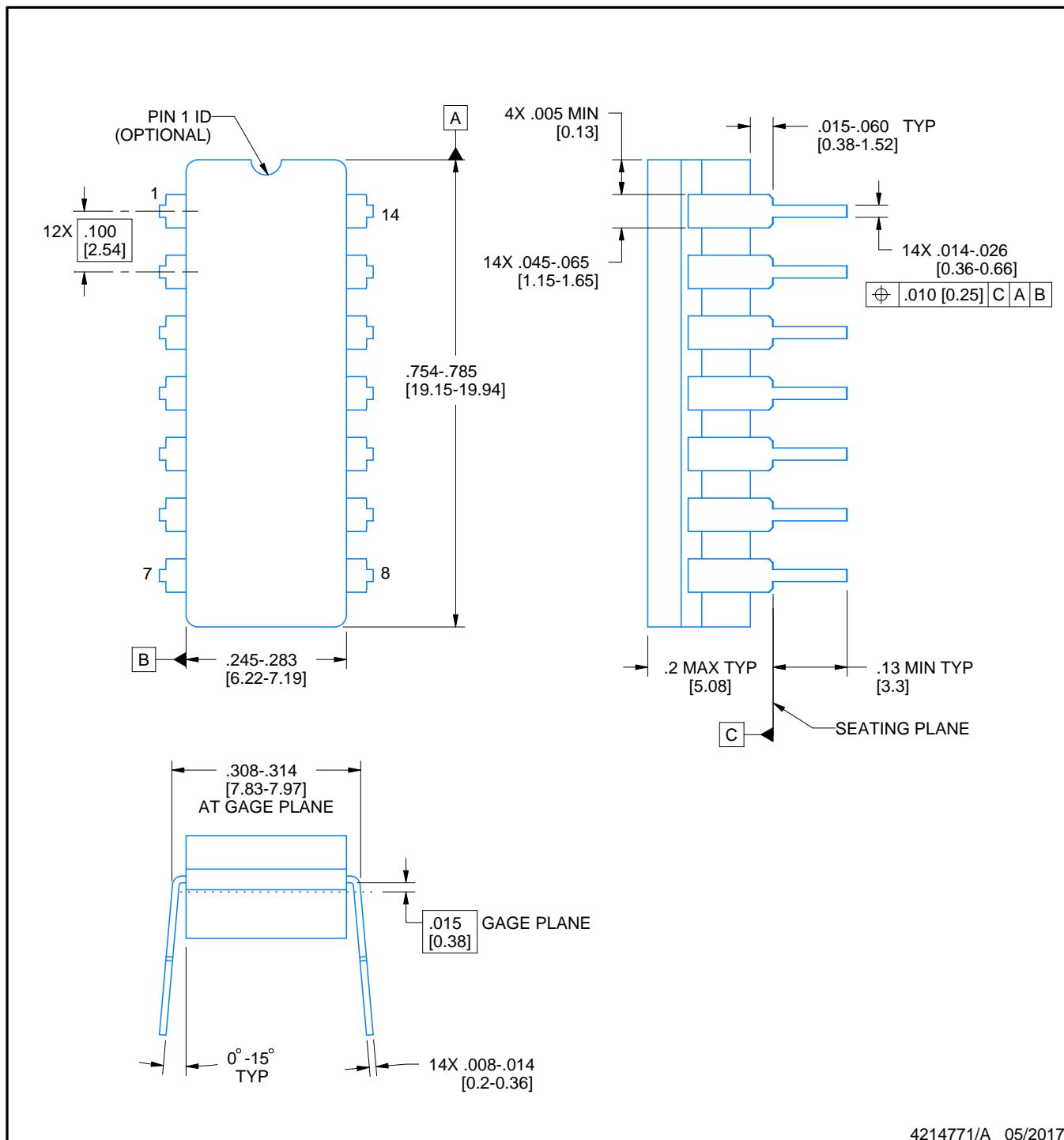


# PACKAGE OUTLINE

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

## NOTES:

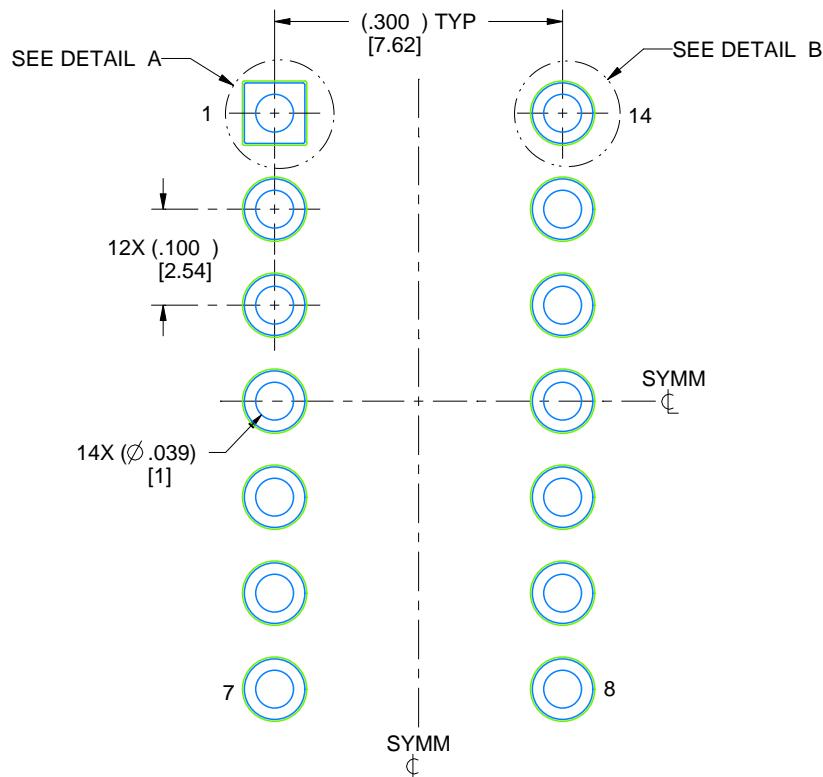
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

# EXAMPLE BOARD LAYOUT

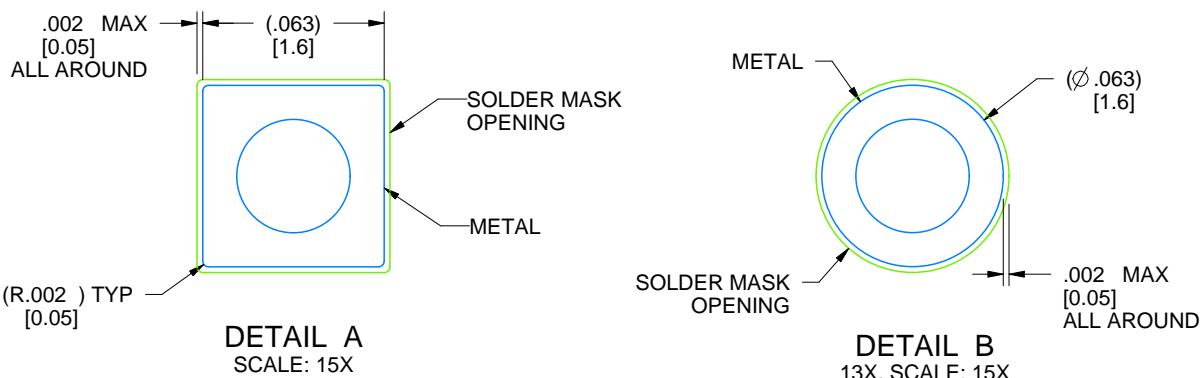
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE  
NON-SOLDER MASK DEFINED  
SCALE: 5X



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