

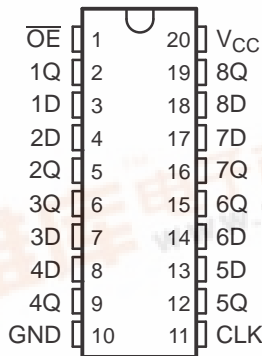
OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOP WITH 3-STATE OUTPUTS

Check for Samples: [SN74LV374AT](#)

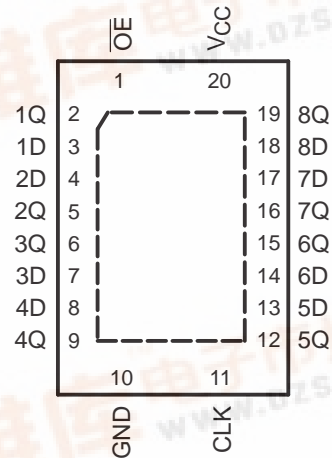
FEATURES

- Inputs Are TTL-Voltage Compatible
- 4.5-V to 5.5-V V_{CC} Operation
- Typical t_{pd} of 4.9 ns at 5 V
- Typical V_{OLP} (Output Ground Bounce) <0.8 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) >2.3 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Voltage Operation on All Ports
- I_{off} Supports Partial-Power-Down Mode Operation
- 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)

DB, DW, NS, OR PW PACKAGE
(TOP VIEW)



RGY PACKAGE
(TOP VIEW)



DESCRIPTION

The SN74LV374AT is an octal edge-triggered D-type flip-flop. This device features 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. The device is particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

On the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels set up at the data (D) inputs.

A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and the increased drive provide the capability to drive bus lines without need for interface or pullup components.

\overline{OE} does not affect internal operations of the latch. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

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.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.



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

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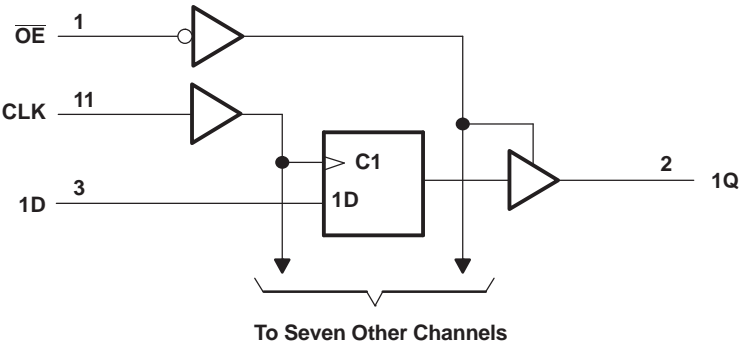
ORDERING INFORMATION

T _A	PACKAGE		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	QFN – RGY	Reel of 1000	SN74LV374ATRGYR	VV374
	SOIC – DW	Tube of 25	SN74LV374ATDW	LV374AT
		Reel of 2000	SN74LV374ATDWR	
	SOP – NS	Reel of 2000	SN74LV374ATNSR	74LV374AT
	SSOP – DB	Reel of 2000	SN74LV374ATDBR	LV374AT
	TSSOP – PW	Tube of 70	SN74LV374ATPW	LV374AT
		Reel of 2000	SN74LV374ATPWR	
		Tube of 250	SN74LV374ATPWT	

**FUNCTION TABLE
(EACH FLIP-FLOP)**

INPUTS			OUTPUT Q
\overline{OE}	CLK	D	
L	↑	H	H
L	↑	L	L
L	L	X	Q ₀
H	X	X	Z

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	–0.5	7	V
V_I	Input voltage range ⁽²⁾	–0.5	7	V
V_O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	–0.5	7	
V_O	Output voltage range ^{(2) (3)}	–0.5	$V_{CC} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$ or $V_I > V_{CC}$		±20 mA
I_{OK}	Output clamp current	$V_O < 0$ or $V_O > V_{CC}$		±50 mA
I_O	Continuous output current	$V_O = 0$ to V_{CC}		±35 mA
	Continuous current through V_{CC} or GND			±70 mA
θ_{JA}	Package thermal impedance	DB package ⁽⁴⁾		70
		DW package ⁽⁴⁾		58
		NS package ⁽⁴⁾		60
		PW package ⁽⁴⁾		83
		RGY package ⁽⁵⁾		37
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) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 5.5 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7
- (5) The package thermal impedance is calculated in accordance with JESD 51-5.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

		MIN	MAX	UNIT
V_{CC}	Supply voltage	4.5	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 4.5$ V to 5.5 V		V
V_{IL}	Low-level input voltage	$V_{CC} = 4.5$ V to 5.5 V		V
V_I	Input voltage	0	5.5	V
V_O	Output voltage	High or low state		0 V_{CC}
		3-state		0 5.5
I_{OH}	High-level output current	$V_{CC} = 4.5$ V to 5.5 V		–16 mA
I_{OL}	Low-level output current	$V_{CC} = 4.5$ V to 5.5 V		16 mA
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 4.5$ V to 5.5 V		20 ns/V
T_A	Operating free-air temperature	–40	125	°C

- (1) 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°C			T _A = -40°C to 85°C		T _A = -40°C to 125°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = -50 μA	4.5 V	4.4	4.5		4.4		4.4		V
	I _{OH} = -16 mA	4.5 V	3.8			3.8		3.8		
V _{OL}	I _{OL} = 50 μA	4.5 V		0	0.1		0.1		0.1	V
	I _{OL} = 16 mA	4.5 V			0.55		0.55		0.55	
I _I	V _I = 5.5 V or GND	0 to 5.5 V			±0.1		±1		±1	μA
I _{OZ}	V _O = V _{CC} or GND	5.5 V			±0.25		±2.5		±2.5	μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			2		20		20	μA
ΔI _{CC} ⁽¹⁾	One input at 3.4 V, Other inputs at V _{CC} or GND	5.5 V			40		50		50	μA
I _{off}	V _I or V _O = 0 to 5.5 V	0			0.5		5		5	μA
C _i	V _I = V _{CC} or GND			4						pF

(1) 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}.

TIMING REQUIREMENTS

over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see [Figure 1](#))

	LOAD CAPACITANCE	T _A = 25°C		T _A = -40°C to 85°C		T _A = -40°C to 125°C		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock} Clock frequency	C _L = 15 pF		90		80		70	MHz
	C _L = 50 pF		85		75		65	
t _w Pulse duration, CLK high or low			6.5		8.5		8.5	ns
t _{su} Setup time, data before CLK↑			2.5		2.5		5	ns
t _h Hold time, data after CLK↑			2.5		2.5		2.5	ns

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see [Figure 1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T _A = 25°C			T _A = -40°C to 85°C		T _A = -40°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			C _L = 15 pF	90	140		80		70		MHz
			C _L = 50 pF	85	150		75		65		
t _{pd}	CLK	Q	C _L = 15 pF	3	4.9	8.1	1	10.5	1	11	ns
t _{en}	\overline{OE}	Q		3.2	4.6	7.6	1	11.5	1	12	
t _{dis}	\overline{OE}	Q		1.7	3.4	6.8	1	8	1	9	
t _{pd}	CLK	Q	C _L = 50 pF	4.2	5.9	10.1	1	11.5	1	13	ns
t _{en}	\overline{OE}	Q		4.5	5.5	9.6	1	12.5	1	13	
t _{dis}	\overline{OE}	Q		2.4	4	8.8	1	12	1	12.5	
t _{sk(o)}						1		1		1	

NOISE CHARACTERISTICS⁽¹⁾

 $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER		MIN	TYP	MAX	UNIT
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		1.3	1.6	V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		–0.3	–1.65	V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		4.6		V
$V_{IH(D)}$	High-level dynamic input voltage	2			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.8	V

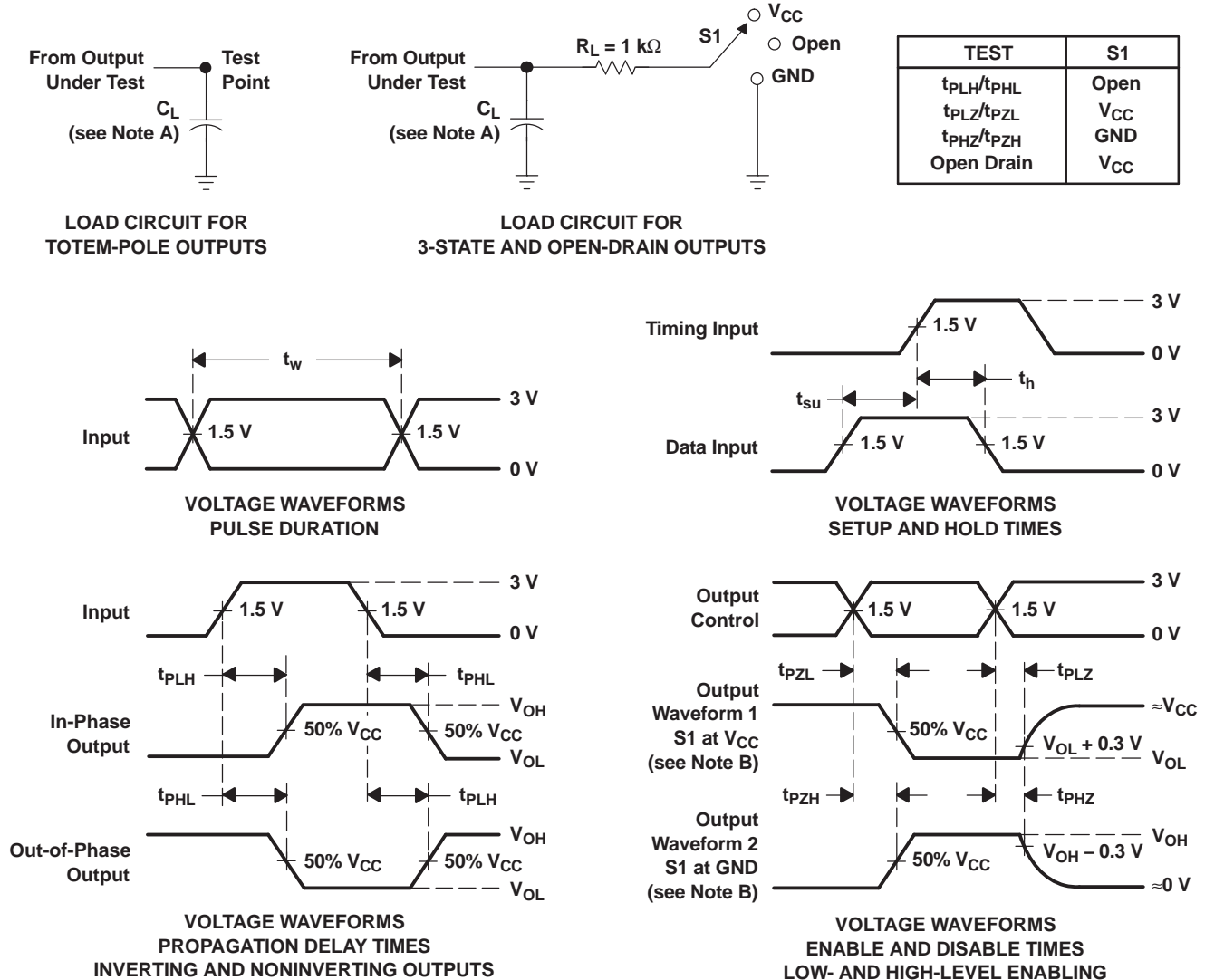
(1) Characteristics are for surface-mount packages only.

OPERATING CHARACTERISTICS

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

PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	Outputs enabled	$C_L = 50\text{ pF}$, $f = 10\text{ MHz}$	42.5	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: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 - D. The outputs are measured one at a time, with one input transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PHL} and t_{PLH} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuits and Voltage Waveforms



PACKAG

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Pe
SN74LV374ATDB	PREVIEW	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDBG4	PREVIEW	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDBR	PREVIEW	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDBRG4	PREVIEW	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDW	PREVIEW	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDWG4	PREVIEW	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDWR	PREVIEW	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATDWRG4	PREVIEW	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATNS	PREVIEW	SO	NS	20	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATNSG4	PREVIEW	SO	NS	20	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATNSR	PREVIEW	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATNSRG4	PREVIEW	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATPW	PREVIEW	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATPWE4	PREVIEW	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATPWG4	PREVIEW	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATPWR	PREVIEW	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600
SN74LV374ATPWRE4	PREVIEW	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-2600



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Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp. ⁽³⁾
SN74LV374ATPWG4	PREVIEW	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C
SN74LV374ATPWT	PREVIEW	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C
SN74LV374ATPWTE4	PREVIEW	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C
SN74LV374ATPWG4	PREVIEW	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C
SN74LV374ATRGYR	PREVIEW	VQFN	RGY	20	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C
SN74LV374ATRGYRG4	PREVIEW	VQFN	RGY	20	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C

⁽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/eco> for more 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 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 high temperature soldering 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 attach 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 (as required by UL94V-0) 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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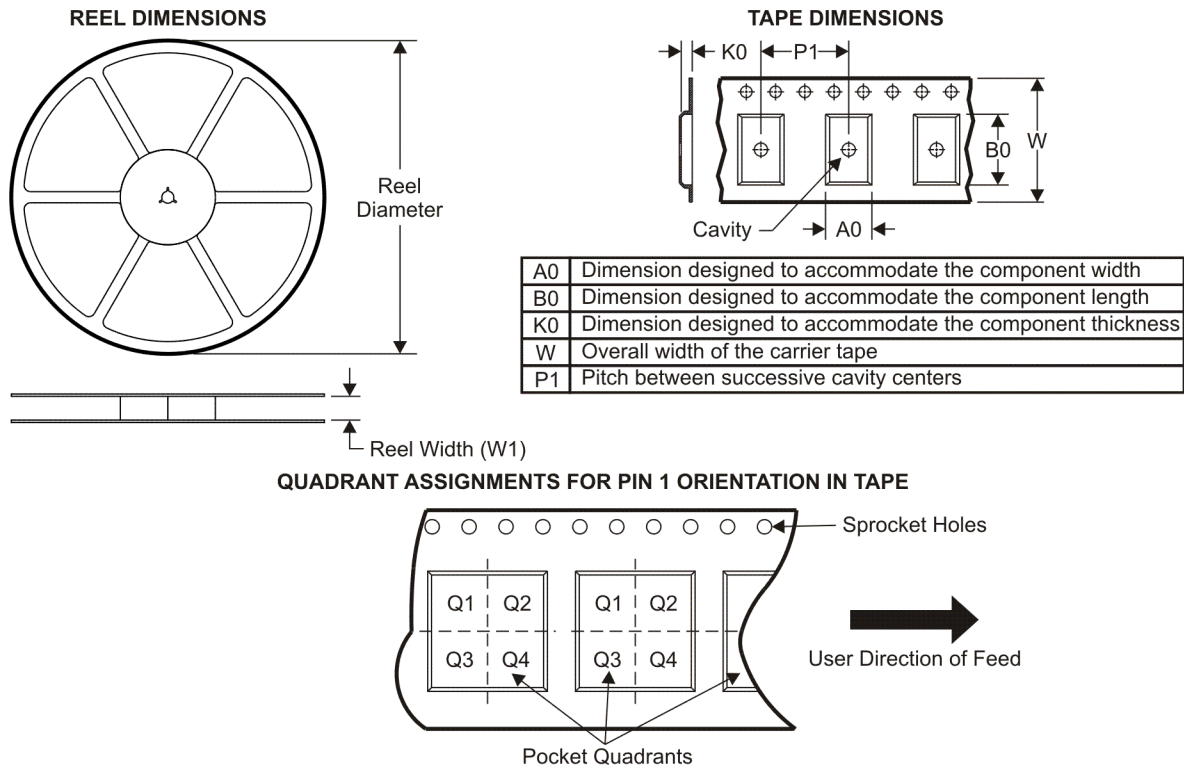
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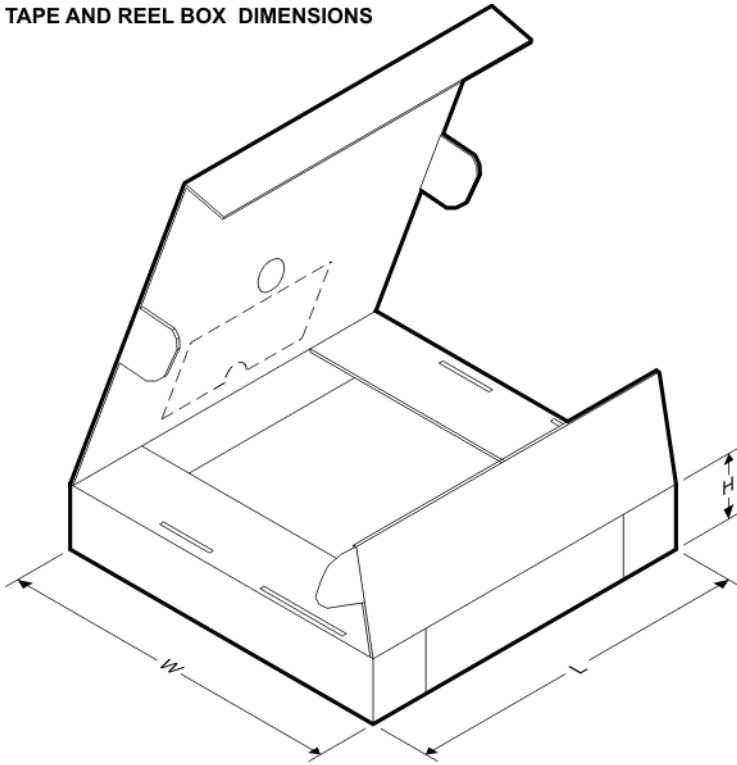
TAPE AND REEL INFORMATION



*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
SN74LV374ATDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74LV374ATDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74LV374ATNSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74LV374ATPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74LV374ATPWT	TSSOP	PW	20	250	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74LV374ATRGYR	VQFN	RGY	20	3000	330.0	12.4	3.8	4.8	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

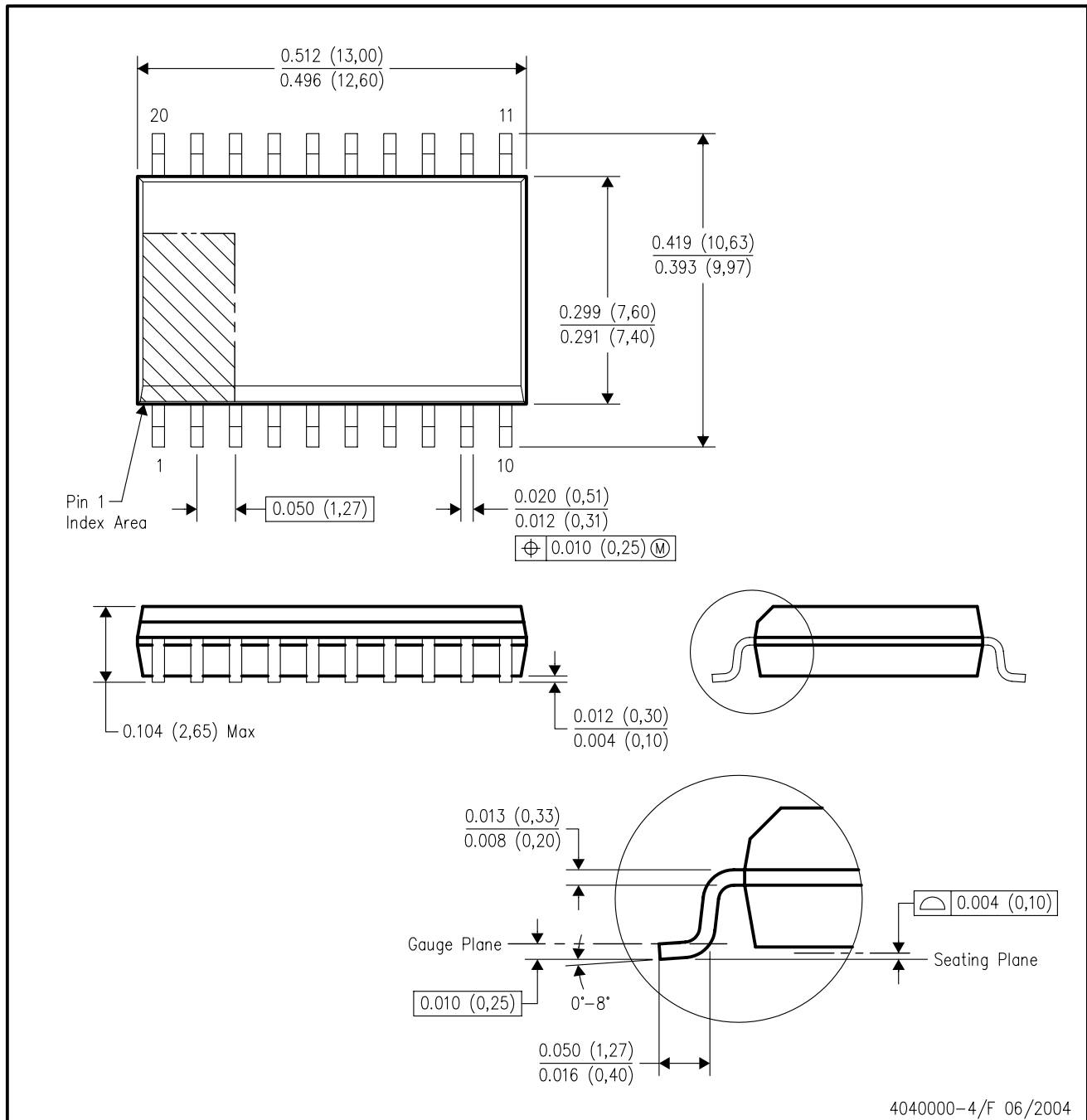


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LV374ATDBR	SSOP	DB	20	2000	346.0	346.0	33.0
SN74LV374ATDWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN74LV374ATNSR	SO	NS	20	2000	346.0	346.0	41.0
SN74LV374ATPWR	TSSOP	PW	20	2000	346.0	346.0	33.0
SN74LV374ATPWT	TSSOP	PW	20	250	346.0	346.0	33.0
SN74LV374ATRGYR	VQFN	RGY	20	3000	346.0	346.0	29.0

DW (R-PDSO-G20)

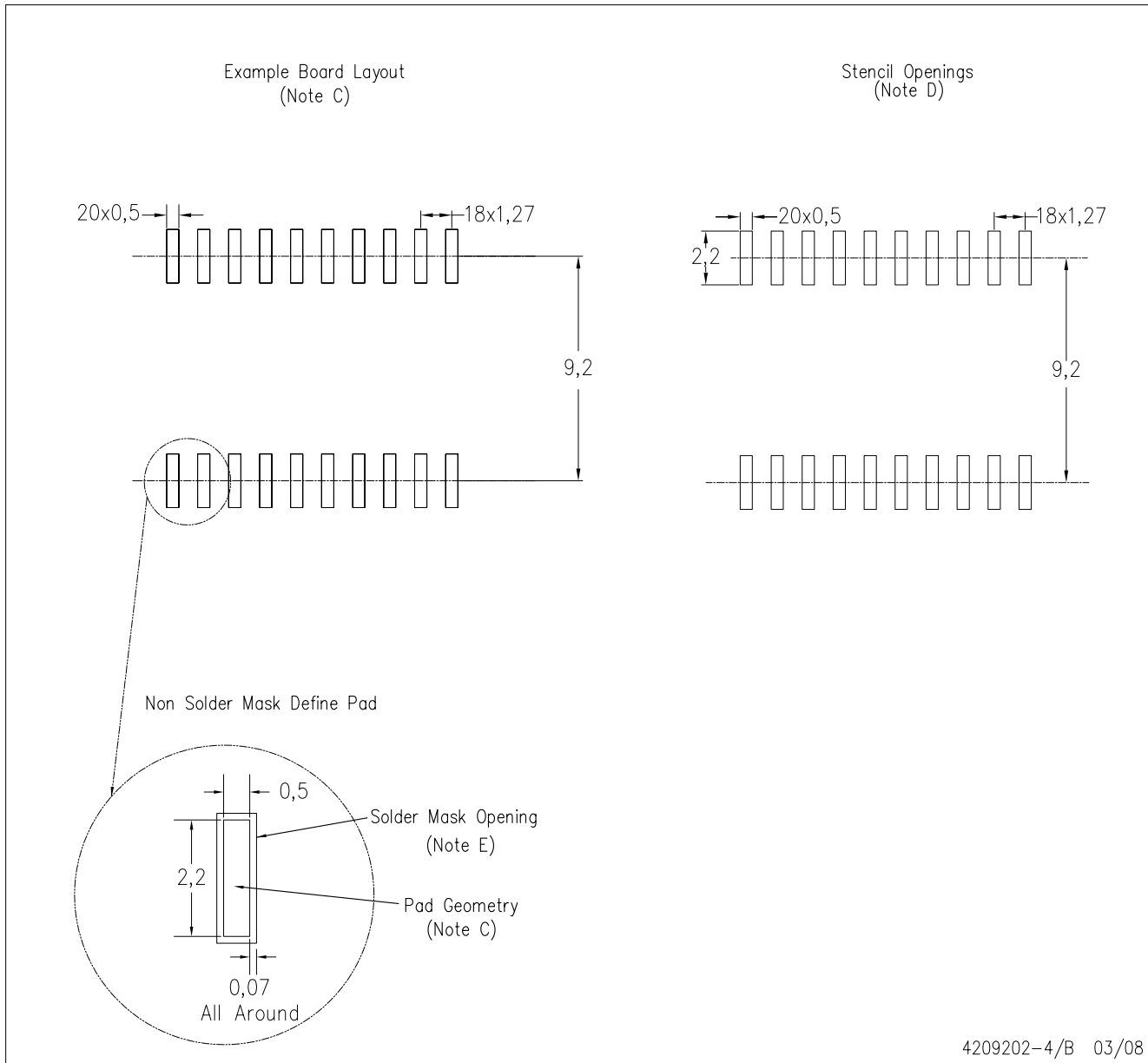
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 variation AC.

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DW (R-PDSO-G20)

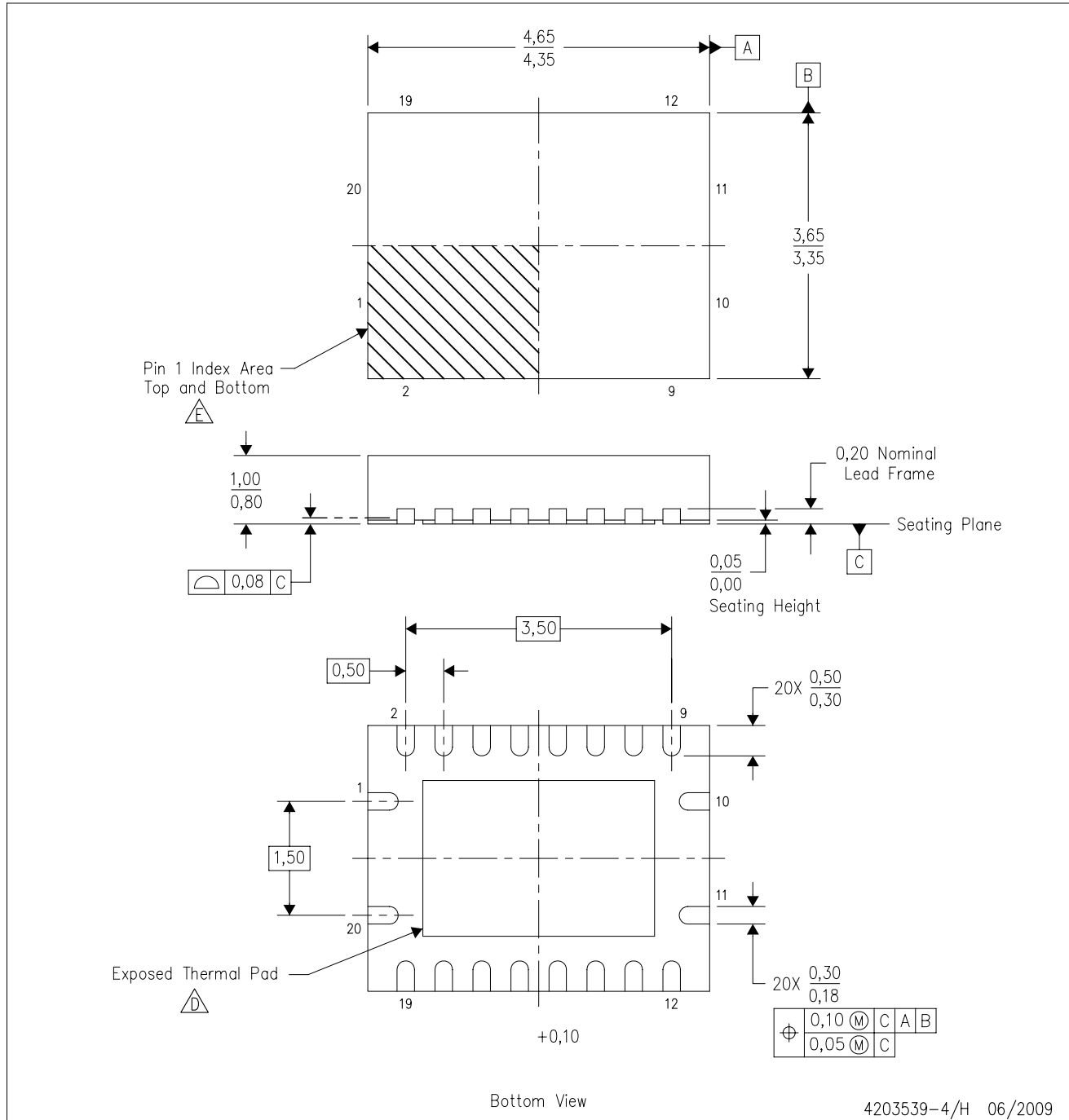


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Laser cutting apertures with trapezoidal walls and also rounding 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.

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RGY (R-PVQFN-N20)

PLASTIC QUAD FLATPACK NO-LEAD



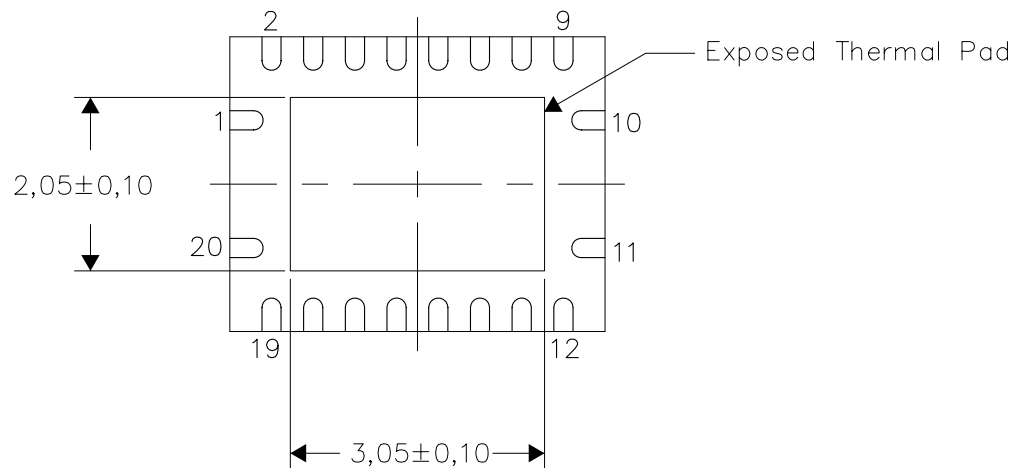
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - △D The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
 - △E 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 BC.

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.

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



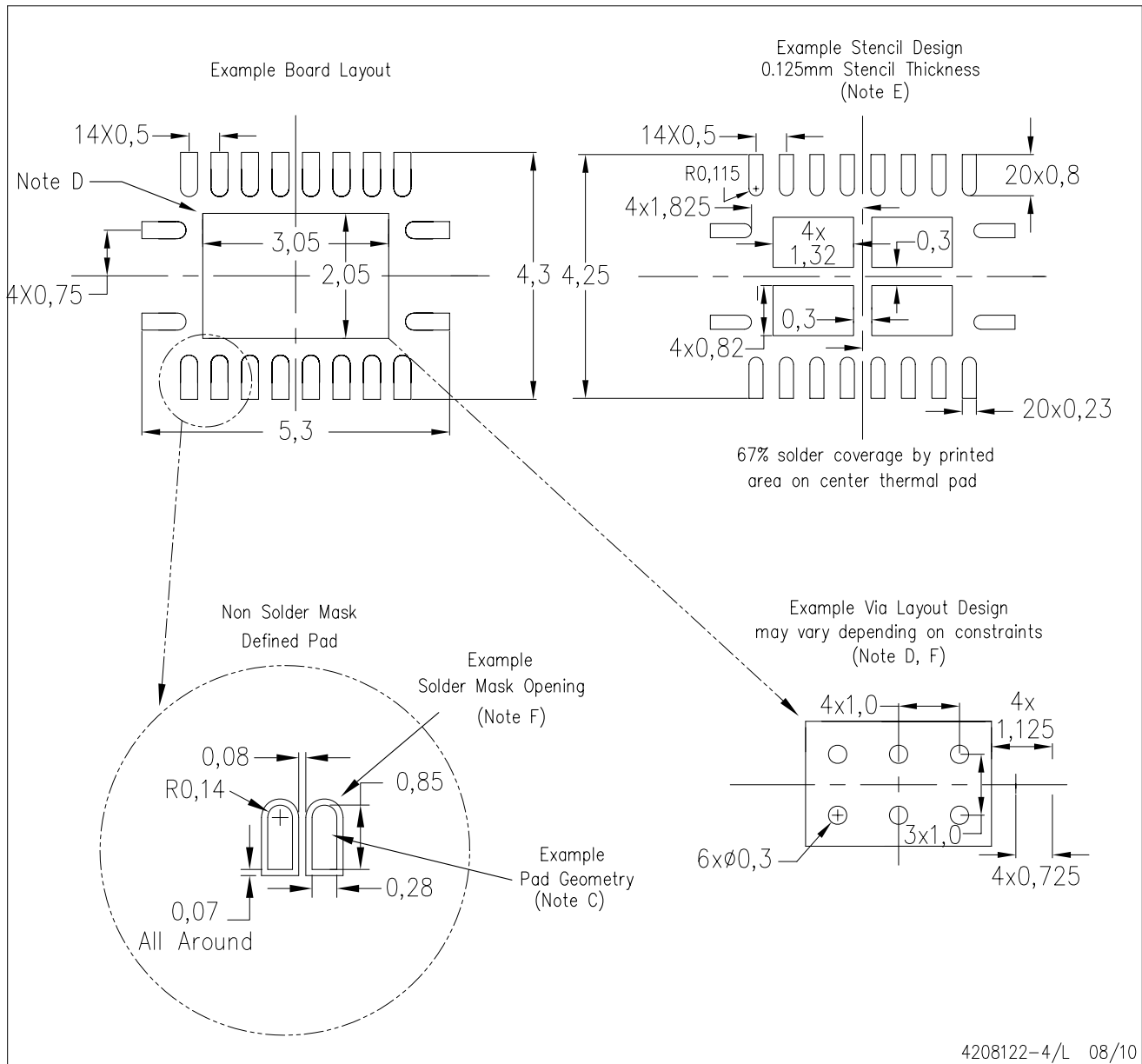
Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

RGY (R-PVQFN-N20)

PLASTIC QUAD FLATPACK NO-LEAD



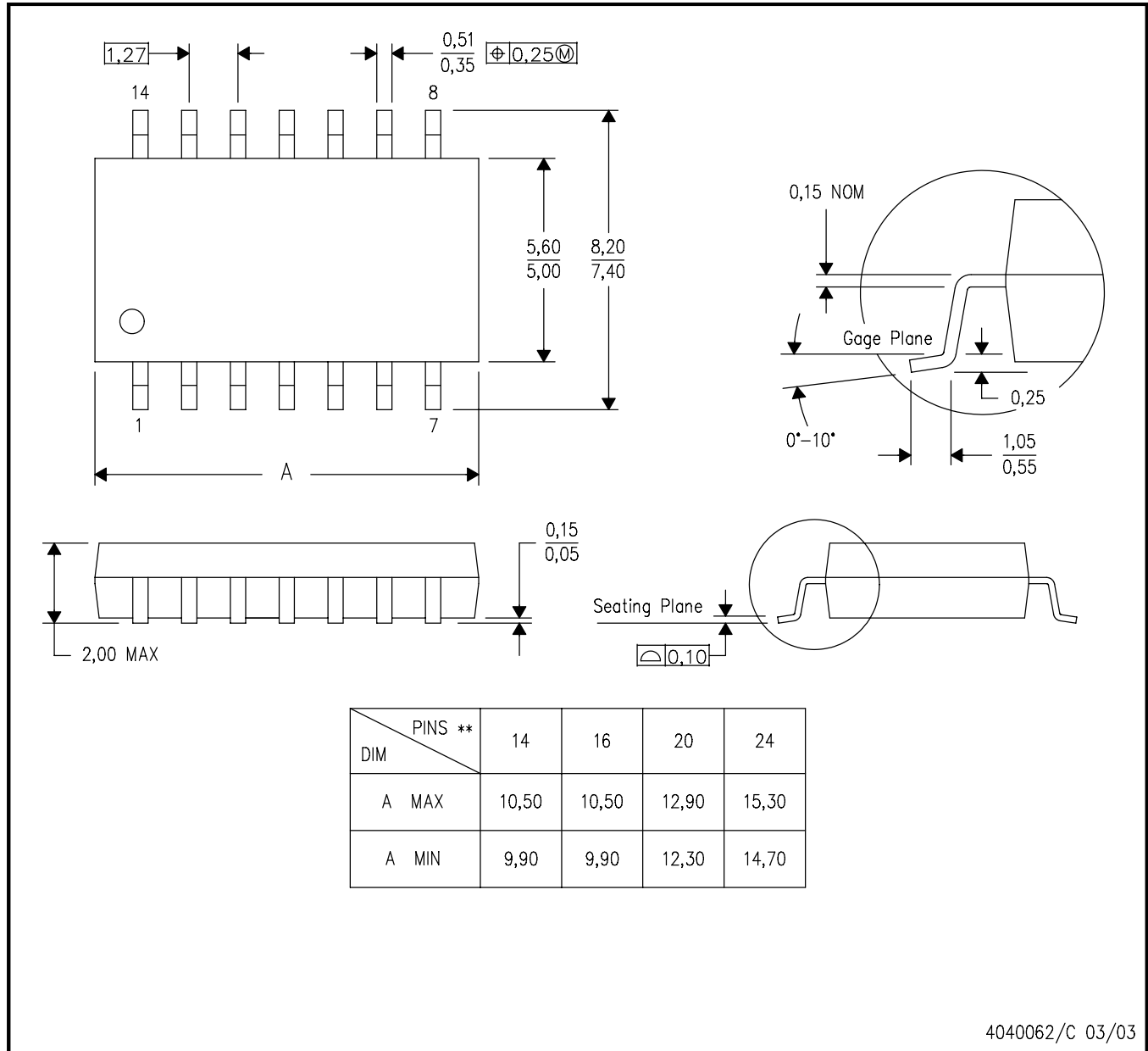
- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, 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>>.
 - 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.
 - 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

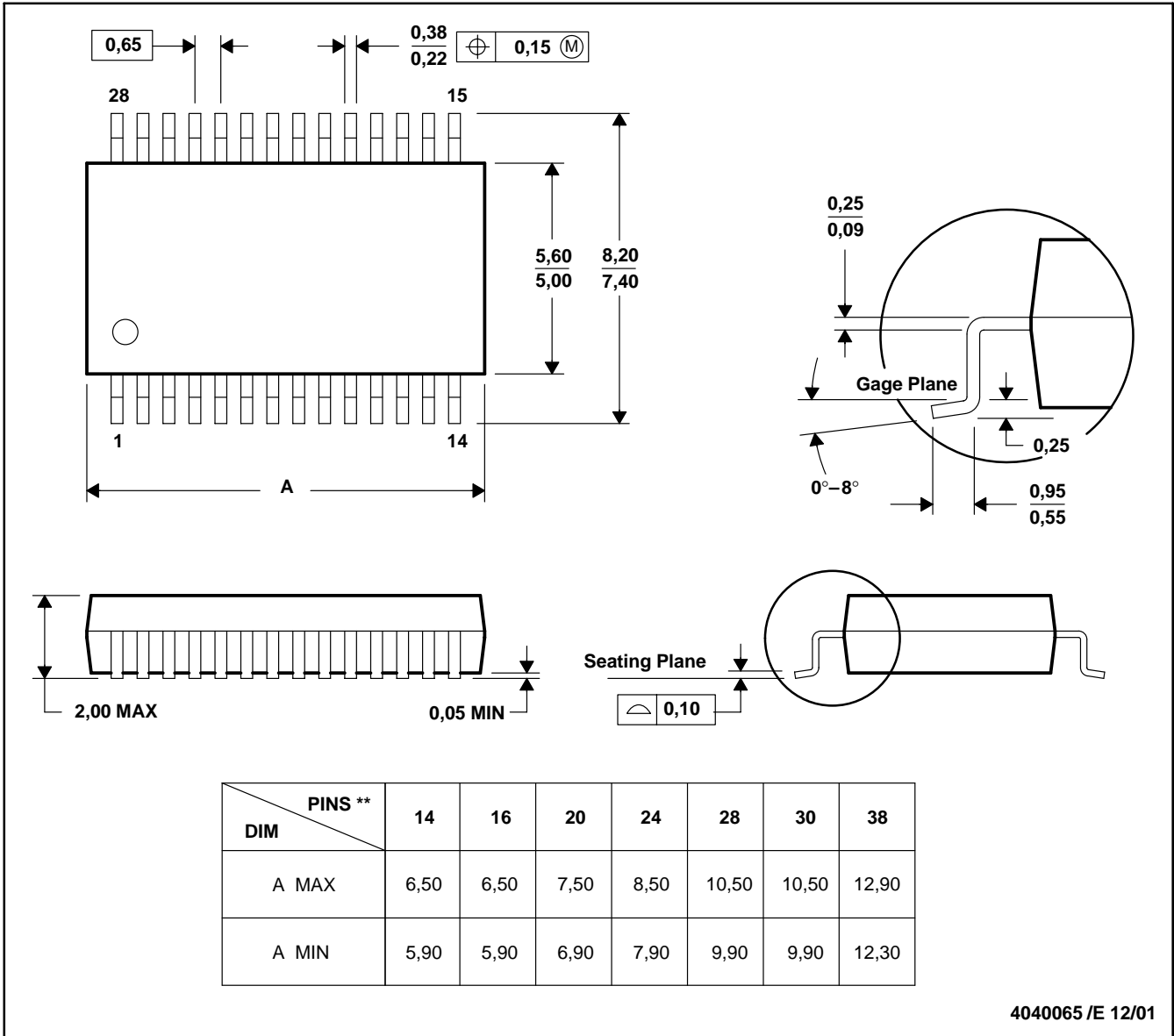


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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

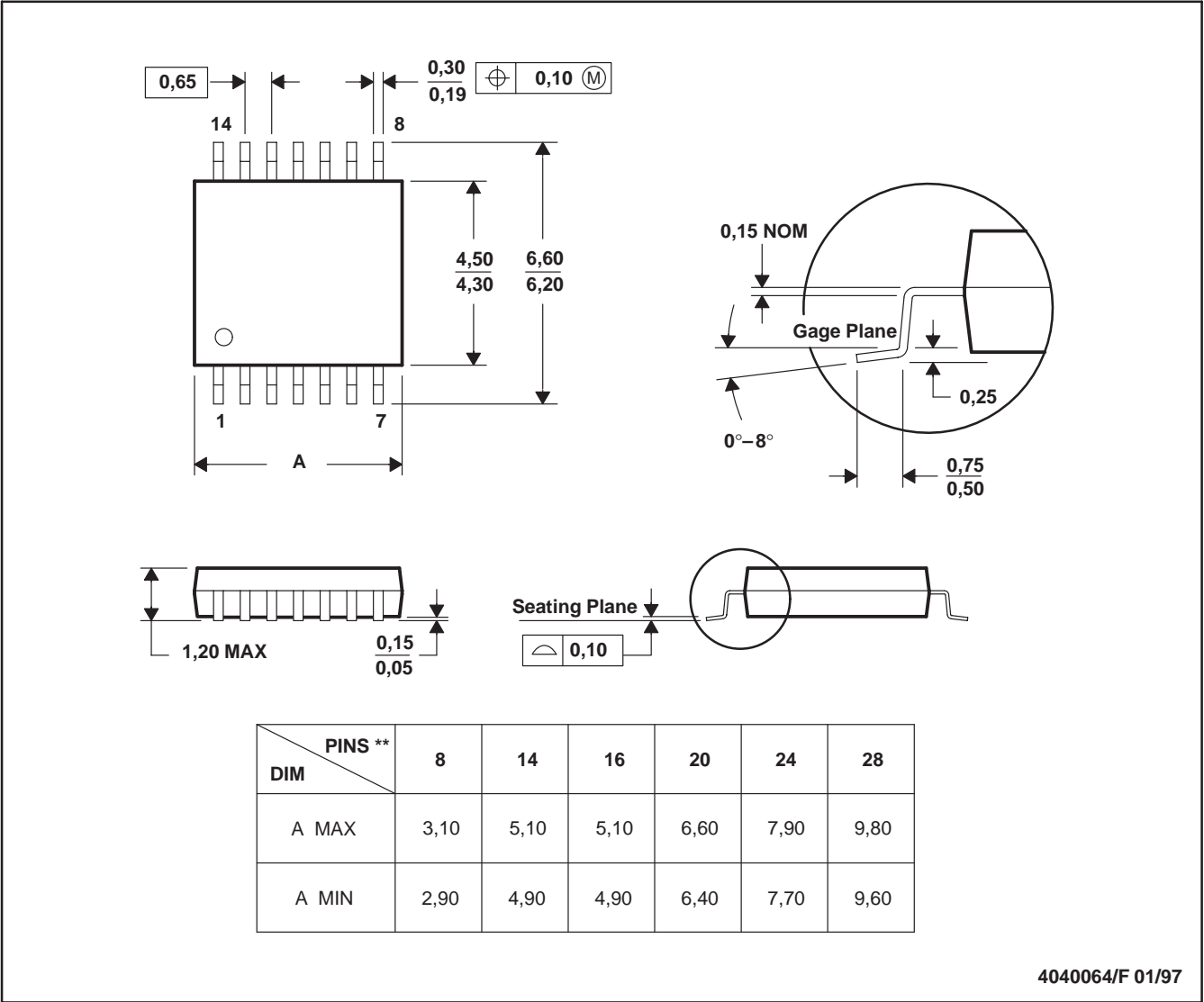
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MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

PW (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.
D. Falls within JEDEC MO-153

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