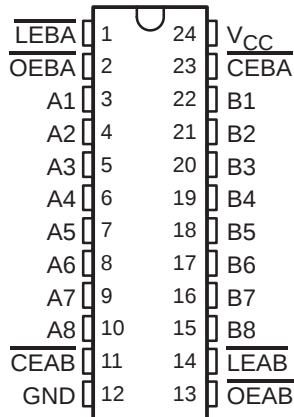


SN54LVTH543, SN74LVTH543 3.3-V ABT OCTAL REGISTERED TRANSCEIVERS WITH 3-STATE OUTPUTS

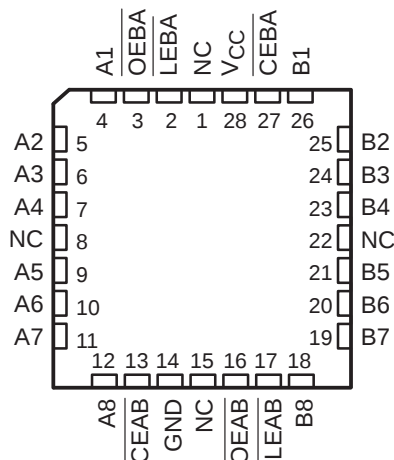
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- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V V_{CC})
- Typical V_{OLP} (Output Ground Bounce) <0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Support Unregulated Battery Operation Down to 2.7 V
- I_{off} and Power-Up 3-State Support Hot Insertion
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 500 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

SN54LVTH543 . . . JT OR W PACKAGE
SN74LVTH543 . . . DB, DGV, DW, NS, OR PW PACKAGE
(TOP VIEW)



SN54LVTH543 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

These octal transceivers are designed specifically for low-voltage (3.3-V) V_{CC} operation, but with the capability to provide a TTL interface to a 5-V system environment.

ORDERING INFORMATION

T_A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – DW	Tube	SN74LVTH543DW	LVTH543
		Tape and reel	SN74LVTH543DWR	
	SOP – NS	Tape and reel	SN74LVTH543NSR	LVTH543
	SSOP – DB	Tape and reel	SN74LVTH543DBR	LXH543
	TSSOP – PW	Tube	SN74LVTH543PW	LXH543
		Tape and reel	SN74LVTH543PWR	
–55°C to 125°C	TVSOP – DGV	Tape and reel	SN74LVTH543DGVR	LXH543
	CDIP – JT	Tube	SNJ54LVTH543JT	SNJ54LVTH543JT
	CFP – W	Tube	SNJ54LVTH543W	SNJ54LVTH543W
	LCCC – FK	Tube	SNJ54LVTH543FK	SNJ54LVTH543FK

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



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SN54LVTH543, SN74LVTH543

3.3-V ABT OCTAL REGISTERED TRANSCEIVERS

WITH 3-STATE OUTPUTS

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description/ordering information (continued)

The 'LVTH543 devices contain two sets of D-type latches for temporary storage of data flowing in either direction. Separate latch-enable ($\overline{LEAB}$ or $\overline{LEBA}$) and output-enable ($\overline{OEAB}$ or $\overline{OEBA}$) inputs are provided for each register, to permit independent control in either direction of data flow.

The A-to-B enable ($\overline{CEAB}$) input must be low to enter data from A or to output data from B. If $\overline{CEAB}$ is low and $\overline{LEAB}$ is low, the A-to-B latches are transparent; a subsequent low-to-high transition of $\overline{LEAB}$ puts the A latches in the storage mode. With $\overline{CEAB}$ and $\overline{OEAB}$ both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar, but requires using the $\overline{CEBA}$, $\overline{LEBA}$, and $\overline{OEBA}$ inputs.

Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

When V_{CC} is between 0 and 1.5 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 1.5 V, $\overline{OE}$ 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 hot-insertion applications using I_{off} and power-up 3-state. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

FUNCTION TABLE[†]

INPUTS				OUTPUT
$\overline{CEAB}$	$\overline{LEAB}$	$\overline{OEAB}$	A	B
H	X	X	X	Z
X	X	H	X	Z
L	H	L	X	$B_0^{\ddagger}$
L	L	L	L	L
L	L	L	H	H

[†] A-to-B data flow is shown; B-to-A flow control is the same, except that it uses $\overline{CEBA}$, $\overline{LEBA}$, and $\overline{OEBA}$.

[‡] Output level before the indicated steady-state input conditions were established

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3.3-V ABT OCTAL REGISTERED TRANSCEIVERS

WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 4)

		SN54LVTH543		SN74LVTH543		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	2.7	3.6	2.7	3.6	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		5.5		5.5	V
I_{OH}	High-level output current		–24		–32	mA
I_{OL}	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10	10	ns/V
$\Delta t/\Delta V_{CC}$	Power-up ramp rate	200		200		μ s/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 4: All unused control 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.

SN54LVTH543, SN74LVTH543

3.3-V ABT OCTAL REGISTERED TRANSCEIVERS

WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS		SN54LVTH543			SN74LVTH543			UNIT	
				MIN	TYP†	MAX	MIN	TYP†	MAX		
V _{IK}		V _{CC} = 2.7 V, I _I = -18 mA		-1.2			-1.2			V	
V _{OH}		V _{CC} = 2.7 V to 3.6 V, I _{OH} = -100 μA		V _{CC} -0.2			V _{CC} -0.2			V	
		V _{CC} = 2.7 V, I _{OH} = -8 mA		2.4			2.4				
		V _{CC} = 3 V	I _{OH} = -24 mA	2							
			I _{OH} = -32 mA				2				
V _{OL}		V _{CC} = 2.7 V	I _{OL} = 100 μA	0.2			0.2			V	
			I _{OL} = 24 mA	0.5			0.5				
		V _{CC} = 3 V	I _{OL} = 16 mA	0.4			0.4				
			I _{OL} = 32 mA	0.5			0.5				
			I _{OL} = 48 mA	0.55							
			I _{OL} = 64 mA				0.55				
I _I	Control inputs	V _{CC} = 3.6 V, V _I = V _{CC} or GND		±1			±1			μA	
		V _{CC} = 0 or 3.6 V, V _I = 5.5 V		10			10				
	A or B ports‡	V _{CC} = 3.6 V	V _I = 5.5 V		20			20			
			V _I = V _{CC}		1			1			
			V _I = 0		-5			-5			
I _{off}		V _{CC} = 0, V _I or V _O = 0 to 4.5 V					±100			μA	
I _I (hold)	A or B ports	V _{CC} = 3 V	V _I = 0.8 V		75			75			μA
			V _I = 2 V		-75			-75			
		V _{CC} = 3.6 V§		V _I = 0 to 3.6 V					±500		
I _{OZPU}		V _{CC} = 0 to 1.5 V, V _O = 0.5 to 3 V, OE = don't care		±100*			±100			μA	
I _{OZPD}		V _{CC} = 1.5 V to 0, V _O = 0.5 to 3 V, OE = don't care		±100*			±100			μA	
I _{CC}		V _{CC} = 3.6 V, I _O = 0, V _I = V _{CC} or GND	Outputs high		0.19			0.19			mA
			Outputs low		5			5			
			Outputs disabled		0.19			0.19			
ΔI _{CC} ¶		V _{CC} = 3 V to 3.6 V, One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND		0.2			0.2			mA	
C _i		V _I = 3 V or 0		4			4			pF	
C _{io}		V _O = 3 V or 0		9			9			pF	

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

† All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ Unused terminals are at V_{CC} or GND.

§ This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.

¶ This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.

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SN54LVTH543, SN74LVTH543

3.3-V ABT OCTAL REGISTERED TRANSCEIVERS

WITH 3-STATE OUTPUTS

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timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

				SN54LVTH543				SN74LVTH543				UNIT
				$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 2.7\text{ V}$		
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_W	Pulse duration,	$\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}$ low		3.3		3.3		3.3		3.3		ns
t_{SU}	Setup time	$\text{A or B before } \overline{\text{LEAB}} \text{ or } \overline{\text{LEBA}}\uparrow$	Data high	0.4		0.4		0.4		0.4		ns
			Data low	1		1.5		1		1.5		
		$\text{A or B before } \overline{\text{CEAB}} \text{ or } \overline{\text{CEBA}}\uparrow$	Data high	0.2		0.2		0.2		0.2		
			Data low	0.7		1.2		0.7		1.2		
t_H	Hold time	$\text{A or B after } \overline{\text{LEAB}} \text{ or } \overline{\text{LEBA}}\uparrow$	Data high	1.5		0.6		1.5		0.6		ns
			Data low	1.3		1.5		1.3		1.5		
		$\text{A or B after } \overline{\text{CEAB}} \text{ or } \overline{\text{CEBA}}\uparrow$	Data high	1.6		0.5		1.6		0.5		
			Data low	1.4		1.6		1.4		1.6		

switching characteristics over recommended operating free-air temperature range, $C_L = 50\text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVTH543				SN74LVTH543				UNIT	
			V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 2.7 V			
			MIN	MAX	MIN	MAX	MIN	TYP†	MAX	MIN		MAX
t _{PLH}	A or B	B or A	1.2	3.9	4.5		1.3	2.5	3.7	4.3		ns
t _{PHL}			1.2	3.9	4.5		1.3	2.5	3.7	4.3		
t _{PLH}	$\overline{\text{LE}}$	A or B	1.2	5.1	6.1		1.3	2.9	4.7	5.9		ns
t _{PHL}			1.2	5.1	6.1		1.3	2.9	4.7	5.9		
t _{PZH}	$\overline{\text{OE}}$	A or B	1	5.1	6.4		1.1	2.9	4.9	6.2		ns
t _{PZL}			1	5.1	6.4		1.1	3.2	4.9	6.2		
t _{PHZ}	$\overline{\text{OE}}$	A or B	1.9	5.6	6.2		2	3.4	5.3	5.9		ns
t _{PLZ}			1.9	5.6	6.2		2	3.7	5.3	5.9		
t _{PZH}	$\overline{\text{CE}}$	A or B	1.2	5.5	7		1.3	3.2	5.3	6.8		ns
t _{PZL}			1.2	5.5	7		1.3	3.5	5.3	6.8		
t _{PHZ}	$\overline{\text{CE}}$	A or B	2.2	5.7	6.2		2.3	3.8	5.4	5.9		ns
t _{PLZ}			2.2	5.7	5.9		2.3	3.9	5.4	5.6		

[†] All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

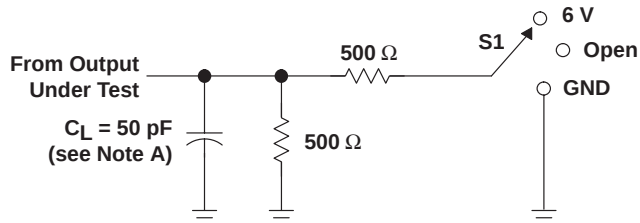
SN54LVTH543, SN74LVTH543

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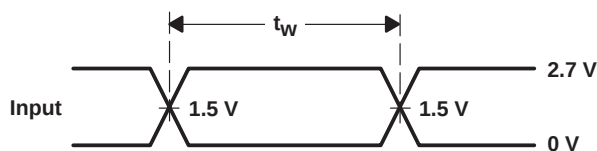
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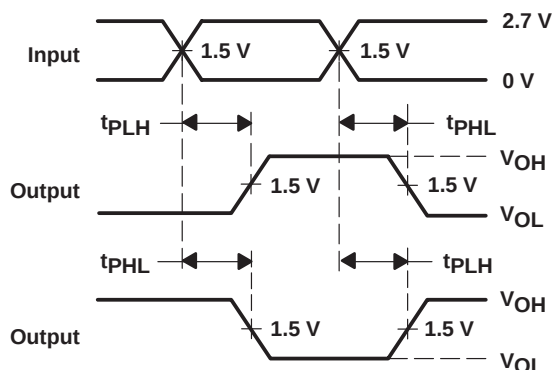
PARAMETER MEASUREMENT INFORMATION



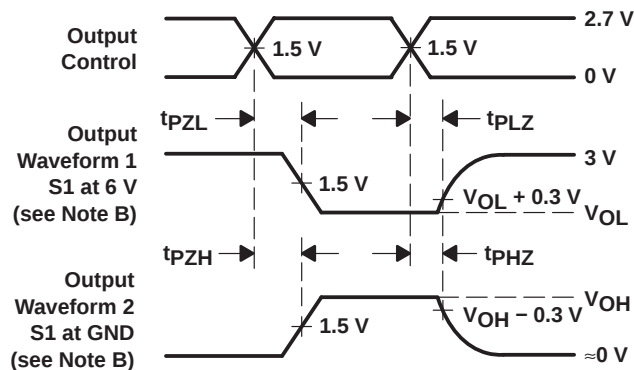
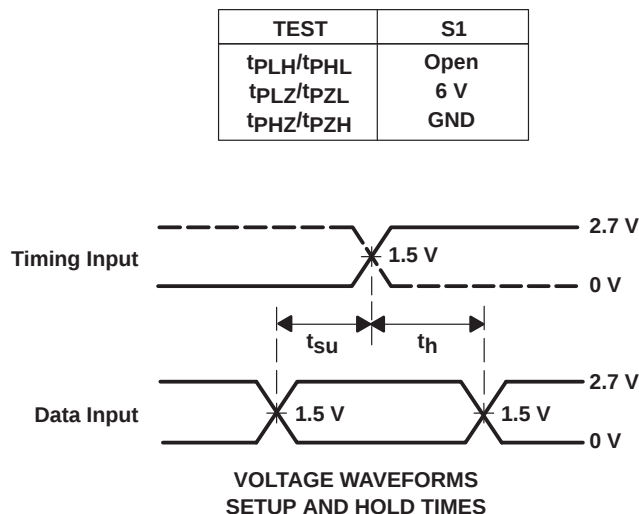
LOAD CIRCUIT



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



- 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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 - D. The outputs are measured one at a time with one 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)	Top-Side Markings (4)	Samples
SN74LVTH543DBLE	OBSOLETE	SSOP	DB	24		TBD	Call TI	Call TI	-40 to 85		
SN74LVTH543DBR	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543DBRE4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543DBRG4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH543	Samples
SN74LVTH543DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH543	Samples
SN74LVTH543DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH543	Samples
SN74LVTH543DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH543	Samples
SN74LVTH543DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH543	Samples
SN74LVTH543DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH543	Samples
SN74LVTH543PW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543PWE4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543PWG4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543PWLE	OBSOLETE	TSSOP	PW	24		TBD	Call TI	Call TI	-40 to 85		
SN74LVTH543PWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543PWRE4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples
SN74LVTH543PWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH543	Samples

(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⁾ Only one of markings shown within the brackets will appear on the physical device.

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OTHER QUALIFIED VERSIONS OF SN74LVTH543 :

- Enhanced Product: [SN74LVTH543-EP](#)

NOTE: Qualified Version Definitions:

- Enhanced Product - Supports Defense, Aerospace and Medical Applications

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
SN74LVTH543DBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74LVTH543DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74LVTH543PWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS

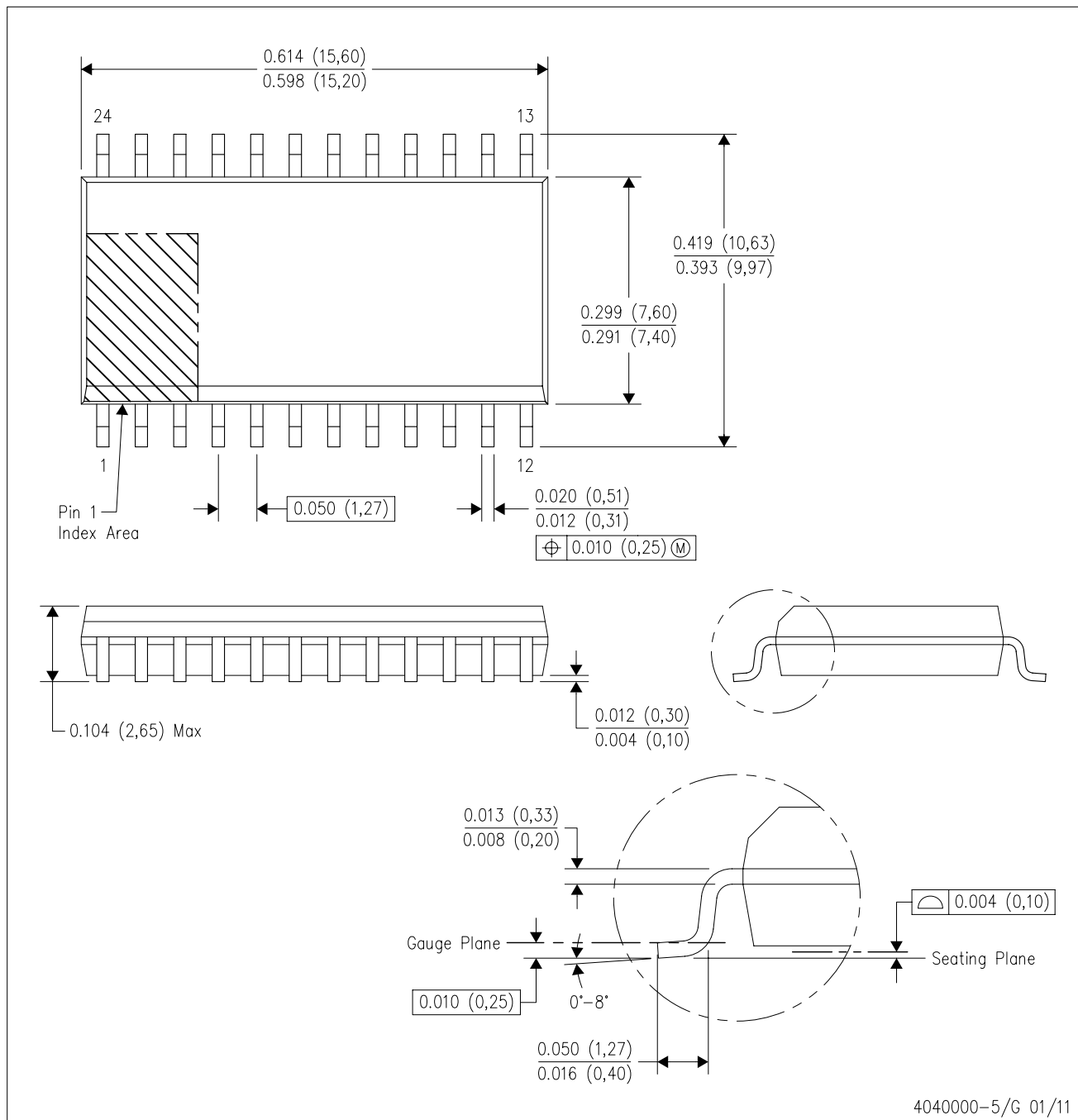


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVTH543DBR	SSOP	DB	24	2000	367.0	367.0	38.0
SN74LVTH543DWR	SOIC	DW	24	2000	367.0	367.0	45.0
SN74LVTH543PWR	TSSOP	PW	24	2000	367.0	367.0	38.0

DW (R-PDSO-G24)

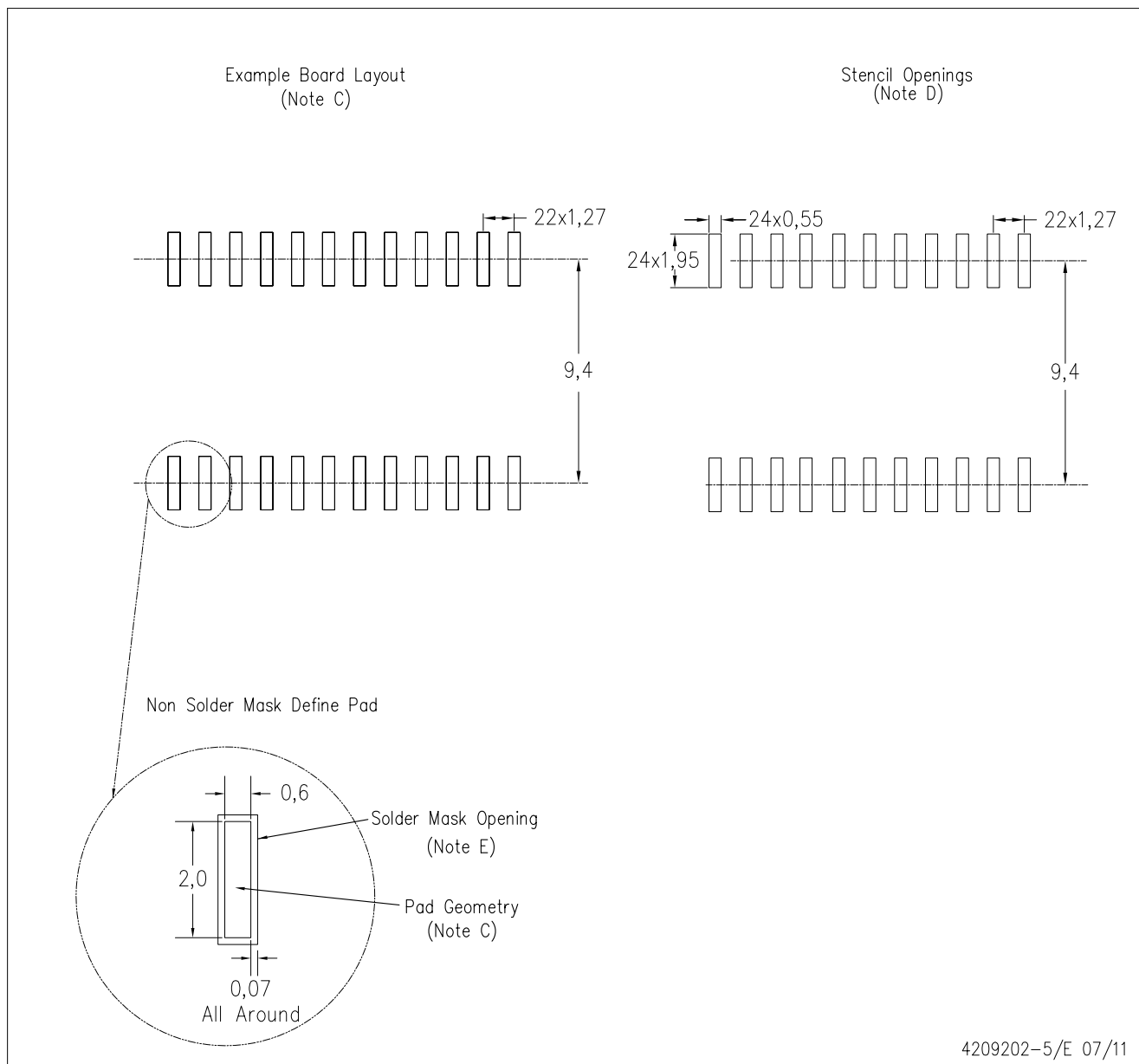
PLASTIC SMALL OUTLINE



- 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 AD.

DW (R-PDSO-G24)

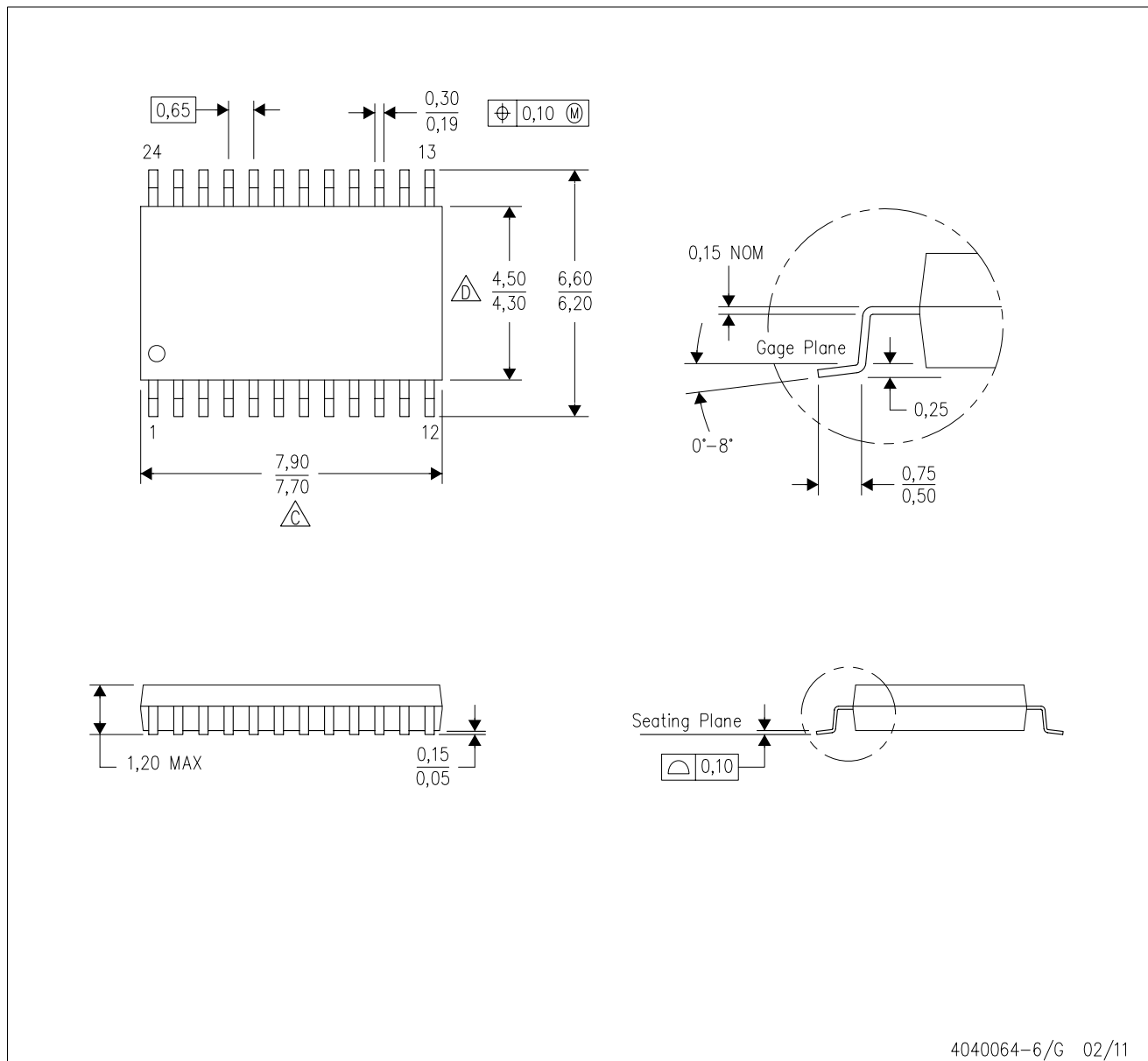
PLASTIC SMALL OUTLINE



- 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-G24)

PLASTIC SMALL OUTLINE

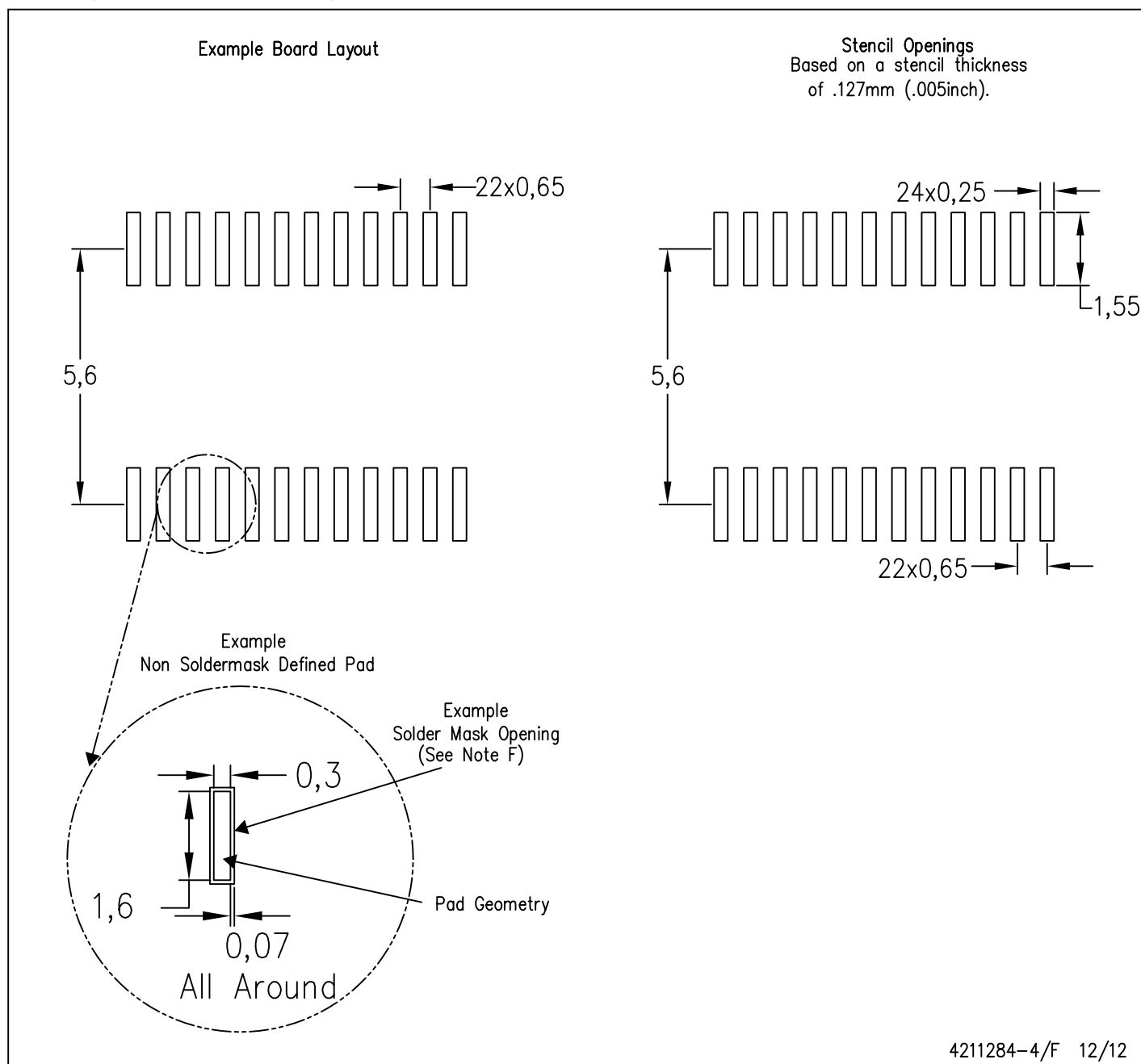


4040064-6/G 02/11

- 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

PW (R-PDSO-G24)

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.

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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