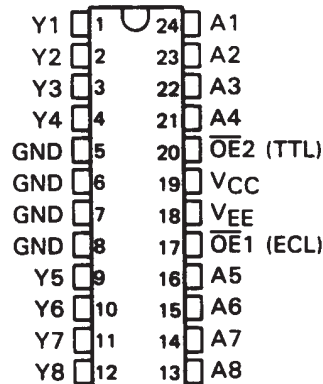


SN10KHT5542, SN10KHT5543 OCTAL TTL-TO-ECL TRANSLATORS WITH OUTPUT ENABLE

SDZS001A – D3136, AUGUST 1988 – REVISED DECEMBER 1988

- 10KH Compatible
- ECL and TTL Control Inputs
- P-N-P Inputs Reduce DC Loading
- Flow-Through Architectures Optimizes PCB Layout
- Center Pin VCC, VEE and GND Configurations Minimize High-Speed Switching Noise
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015
- Package Options Include "Small Outline" Packages and Standard Plastic 300-mil DIPs

**DW OR NT PACKAGE
(TOP VIEW)**



description

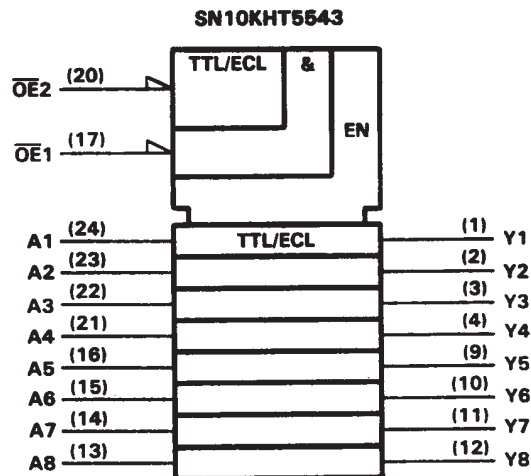
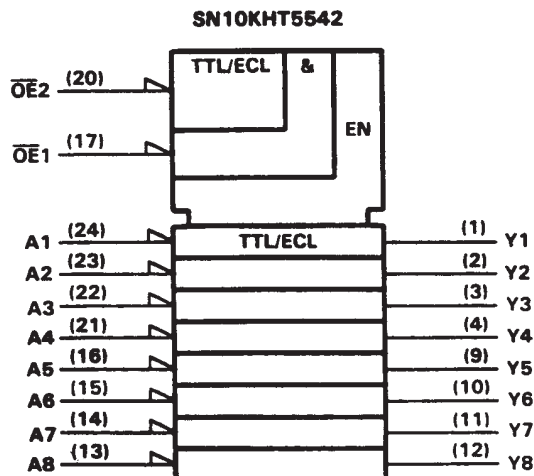
These octal TTL-to-ECL translators are designed to provide efficient translation between a TTL signal environment and a 10KH ECL signal environment. The designer has a choice of inverting ('5542) or true ('5543) outputs. Two pins, $\overline{OE1}$ and $\overline{OE2}$, are provided for output enable control. These control inputs are negative ANDed together, with $\overline{OE1}$ being ECL compatible and $\overline{OE2}$ being TTL compatible. This offers the choice of controlling the outputs of the device from either a TTL or ECL signal environment. The outputs, when disabled, go to a normal ECL logic low level.

The SN10KHT5542 and SN10KHT5543 are characterized for operation from 0°C to 75°C.

FUNCTION TABLE

OUTPUT CONTROL		DATA INPUT	OUTPUT	
$\overline{OE1}$	$\overline{OE2}$	A	'5542	'5543
H	X	X	L	L
X	H	X	L	L
L	L	L	H	L
L	L	H	L	H

logic symbols†

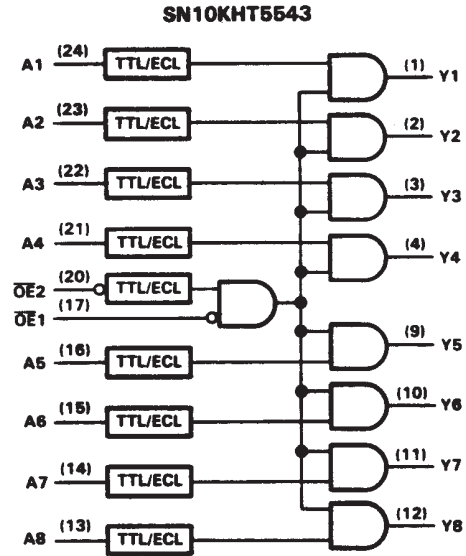
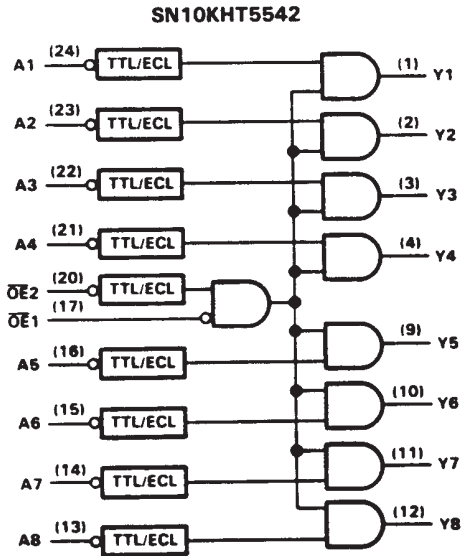


†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

SN10KHT5542, SN10KHT5543 OCTAL TTL-TO-ECL TRANSLATORS WITH OUTPUT ENABLE

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logic diagrams (positive logic)



absolute maximum ratings over operating ambient temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	–0.5 V to 7 V
Supply voltage range, V_{EE}	–8 V to 0 V
Input voltage range (TTL) (See Note 1)	–1.2 V to 7 V
Input voltage range (ECL)	V_{EE} to 0 V
Input current range (TTL)	–30 mA to 5 mA
Operating ambient temperature range	0°C to 75°C
Storage temperature range	–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.

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

recommended operating conditions (see Note 2)

		MIN	NOM	MAX	UNIT	
V_{CC}	TTL supply voltage	4.5	5.0	5.5	V	
V_{EE}	ECL supply voltage	–4.94	–5.2	–5.46	V	
V_{IH}	TTL high-level input voltage	2			V	
V_{IH}	ECL high-level input voltage [‡]	0°C	–1170	–840	mV	
		25°C	–1130	–810		
		75°C	–1070	–735		
V_{IL}	TTL low-level input voltage	0.8			V	
V_{IL}	ECL low-level input voltage [‡]	0°C	–1950	–1480	mV	
		25°C	–1950	–1480		
		75°C	–1950	–1450		
I_{IK}	TTL input clamp current	–18			mA	
T_A	Operating ambient temperature (see Note 3)	0			75	°C

[‡]The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for logic voltage levels and temperature only.

NOTES: 2. If unused, OE1 should be tied directly to –2 V.

3. Each 10KH series circuit has been designed to meet the dc specifications shown in the electrical characteristics table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board, and transverse air flow greater than 500 linear ft/min is maintained.

SN10KHT5542, SN10KHT5543 OCTAL TTL-TO-ECL TRANSLATORS WITH OUTPUT ENABLE

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electrical characteristics over recommended operating ambient temperature range (unless otherwise noted) (see Note 2)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	A inputs and $\overline{OE}2$	$V_{CC} = 4.5\text{ V}, V_{EE} = -4.94\text{ V}, I_I = -18\text{ mA}$				-1.2	V
I_I	A inputs and $\overline{OE}2$	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = 7\text{ V}$				0.1	mA
I_{IH}	A inputs and $\overline{OE}2$	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = 2.7\text{ V}$				20	μA
	$\overline{OE}1$ only	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -840\text{ mV}$	0°C		350		
		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -810\text{ mV}$	25°C		350		
		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -735\text{ mV}$	75°C		350		
I_{IL}	A inputs and $\overline{OE}2$	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = 0.5\text{ V}$				-500	μA
	$\overline{OE}1$ only	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -1950\text{ mV}$	0°C	0.5			
			25°C	0.5			
			75°C	0.5			
V_{OH}^\ddagger		$V_{CC} = 4.5\text{ V}, V_{EE} = -5.2\text{ V}, \pm 5\%, \text{ See Note 3}$	0°C	-1020	-840		
			25°C	-980	-810		
			75°C	-920	-735		
V_{OL}^\ddagger		$V_{CC} = 4.5\text{ V}, V_{EE} = -5.2\text{ V}, \pm 5\%, \text{ See Note 3}$	0°C	-1950	-1630		
			25°C	-1950	-1630		
			75°C	-1950	-1600		
I_{CCH}		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}$			15	22	mA
I_{CCL}		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}$			17	25	mA
I_{EE}		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}$			-78	-111	mA
C_i		$V_{CC} = 5\text{ V}, V_{EE} = -5.2\text{ V}, f = 10\text{ MHz}$			5		pF

switching characteristics over recommended ranges of operating ambient temperature and supply voltage (unless otherwise noted) (see Note 4)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	TYP†	MAX	UNIT
t_{PLH}	Any A	Y	0.1	1.7	3.7	ns
t_{PHL}			0.1	1.6	3.3	
t_{PLH}	$\overline{OE}1$ (ECL)	Y	0.8	2.8	5	ns
t_{PHL}			0.4	2.3	4.5	
t_{PLH}	$\overline{OE}2$ (TTL)	Y	0.8	3	5.3	ns
t_{PHL}			0.6	2.5	4.7	
t_r		Y	1.5			ns
t_f			1.5			

† All typical values are at $V_{CC} = 5\text{ V}, V_{EE} = -5.2\text{ V}, T_A = 25^\circ\text{C}$.

‡ The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for logic voltage levels and temperature only.

- NOTES: 2. Each 10KH series circuit has been designed to meet the dc specifications shown in the electrical characteristics table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear ft/min is maintained.
3. Outputs are terminated through a 50- Ω resistor to -2 V.
4. Load circuit and switching waveforms are shown in Section 1.

SN10KHT5542, SN10KHT5543 OCTAL TTL-TO-ECL TRANSLATORS WITH OUTPUT ENABLE

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electrical characteristics over recommended operating ambient temperature range (unless otherwise noted) (see Note 2)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	A inputs and $\overline{OE}2$	$V_{CC} = 4.5\text{ V}, V_{EE} = -4.94\text{ V}, I_I = -18\text{ mA}$				-1.2	V
I_I	A inputs and $\overline{OE}2$	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = 7\text{ V}$				0.1	mA
I_{IH}	A inputs and $\overline{OE}2$	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = 2.7\text{ V}$				20	μA
	$\overline{OE}1$ only	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -840\text{ mV}$	0°C		350		
		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -810\text{ mV}$	25°C		350		
		$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -735\text{ mV}$	75°C		350		
I_{IL}	A inputs and $\overline{OE}2$	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = 0.5\text{ V}$				-500	μA
	$\overline{OE}1$ only	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}, V_I = -1950\text{ mV}$		0°C	0.5		
				25°C	0.5		
				75°C	0.5		
V_{OH}^\ddagger	$V_{CC} = 4.5\text{ V}, V_{EE} = -5.2\text{ V}, \pm 5\%, \text{ See Note 3}$		0°C	-1020	-840	mV	
			25°C	-980	-810		
			75°C	-920	-735		
V_{OL}^\ddagger	$V_{CC} = 4.5\text{ V}, V_{EE} = -5.2\text{ V}, \pm 5\%, \text{ See Note 3}$		0°C	-1950	-1630	mV	
			25°C	-1950	-1630		
			75°C	-1950	-1600		
I_{CCH}	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}$				17	25	mA
I_{CCL}	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}$				15	22	mA
I_{EE}	$V_{CC} = 5.5\text{ V}, V_{EE} = -5.46\text{ V}$				-77	-111	mA
C_i	$V_{CC} = 5\text{ V}, V_{EE} = -5.2\text{ V}, f = 10\text{ MHz}$				5		pF

switching characteristics over recommended ranges of operating ambient temperature and supply voltage (unless otherwise noted) (see Note 4)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	TYP†	MAX	UNIT
t_{PLH}	Any A	Y	0.1	1.5	3	ns
t_{PHL}			0.1	1.5	3.3	
t_{PLH}	$\overline{OE}1$ (ECL)	Y	0.6	2.2	4.3	ns
t_{PHL}			0.5	2.4	4.3	
t_{PLH}	$\overline{OE}2$ (TTL)	Y	0.7	2.2	4.4	ns
t_{PHL}			0.5	2.6	4.7	
t_r		Y	1.5			ns
t_f			1.5			

† All typical values are at $V_{CC} = 5\text{ V}, V_{EE} = -5.2\text{ V}, T_A = 25^\circ\text{C}$.

‡ The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for logic voltage levels and temperature only.

- NOTES: 2. Each 10KH series circuit has been designed to meet the dc specifications shown in the electrical characteristics table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear ft/min is maintained.
3. Outputs are terminated through a 50- Ω resistor to -2 V.
4. Load circuit and voltage waveforms are shown in Section 1.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN10KHT5542DWR	OBSOLETE	SOIC	DW	24		TBD	Call TI	Call TI
SN10KHT5543DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN10KHT5543DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN10KHT5543DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN10KHT5543DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN10KHT5543NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN10KHT5543NTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	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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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN10KHT5543DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

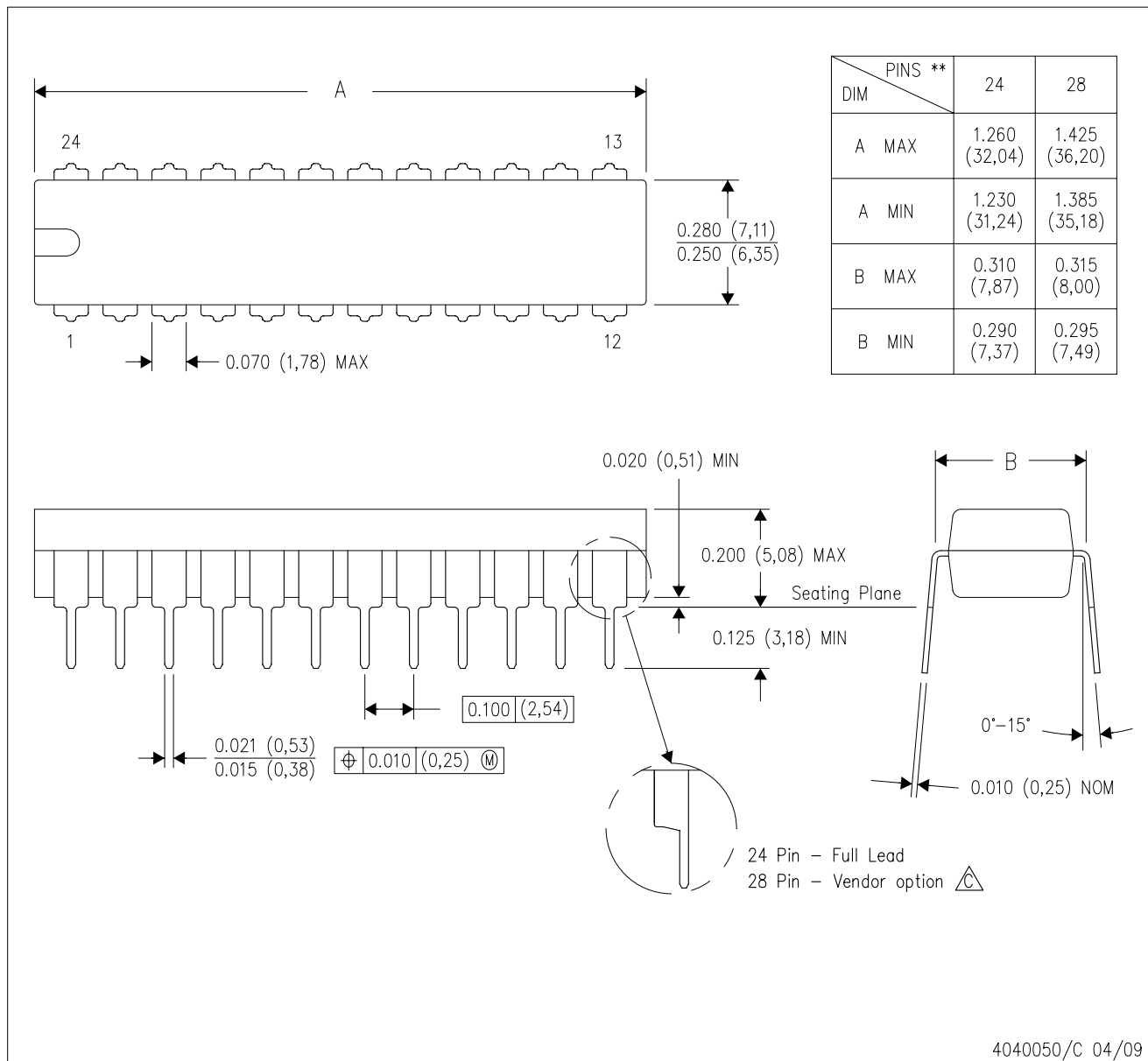
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN10KHT5543DWR	SOIC	DW	24	2000	346.0	346.0	41.0


MECHANICAL DATA

NT (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

24 PINS SHOWN



- 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.
 -  The 28 pin end lead shoulder width is a vendor option, either half or full width.

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