

SN54AHCT16374, SN74AHCT16374 16-BIT EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

SCLS337I – MARCH 1996 – REVISED FEBRUARY 2000

查询"74AHCT16374DGGRG4"供应商

- **Members of the Texas Instruments Widebus™ Family**
- **EPIC™ (Enhanced-Performance Implanted CMOS) Process**
- **Inputs Are TTL-Voltage Compatible**
- **Distributed V_{CC} and GND Pins Minimize High-Speed Switching Noise**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Package Options Include Plastic Shrink Small-Outline (DL), Thin Shrink Small-Outline (DGG), and Thin Very Small-Outline (DGV) Packages and 380-mil Fine-Pitch Ceramic Flat (WD) Package Using 25-mil Center-to-Center Spacings**

description

The 'AHCT16374 devices are 16-bit edge-triggered D-type flip-flops with 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

These devices can be used as two 8-bit flip-flops or one 16-bit flip-flop. On the positive transition of the clock (CLK) input, the Q outputs of the flip-flop take on the logic levels at the data (D) inputs.

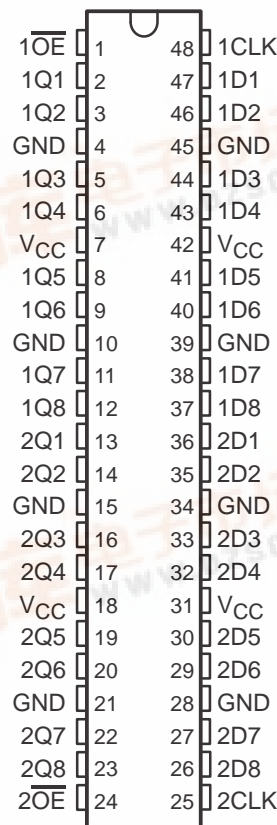
A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and the increased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

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.

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

The SN54AHCT16374 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74AHCT16374 is characterized for operation from –40°C to 85°C.

SN54AHCT16374 . . . WD PACKAGE
SN74AHCT16374 . . . DGG, DGV, OR DL PACKAGE
(TOP VIEW)



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**TEXAS
INSTRUMENTS**

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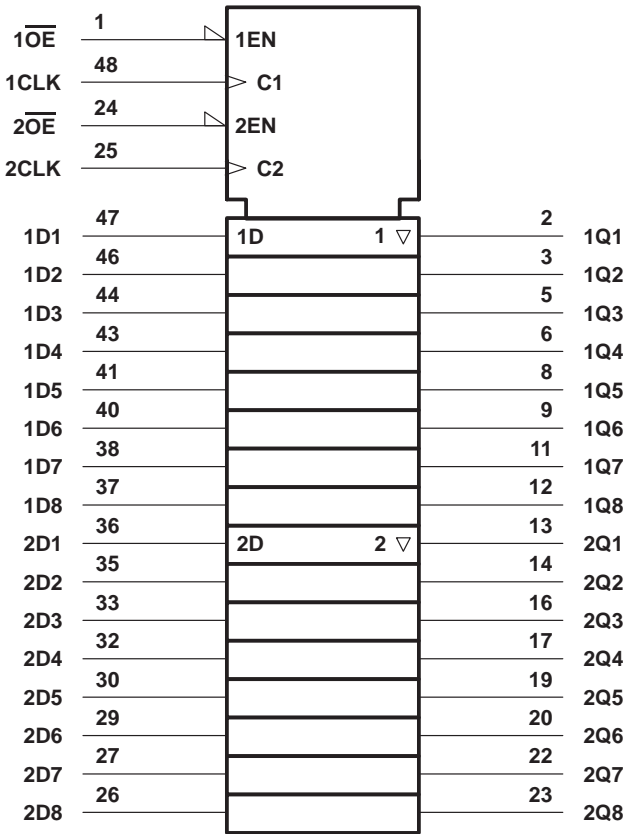
SN54AHCT16374, SN74AHCT16374
16-BIT EDGE-TRIGGERED D-TYPE FLIP-FLOPS
WITH 3-STATE OUTPUTS

SCL3571M74AHCT16374DTCBPG/200 世应商

FUNCTION TABLE
(each 8-bit flip-flop)

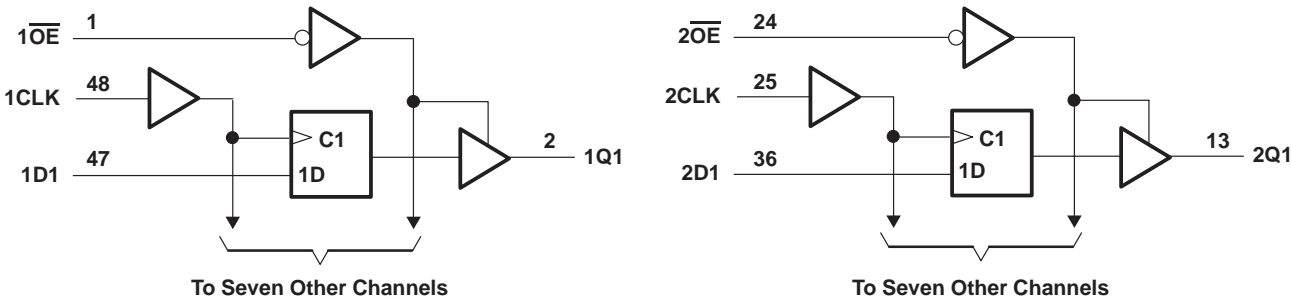
INPUTS			OUTPUT Q
\overline{OE}	CLK	D	
L	\uparrow	H	H
L	\uparrow	L	L
L	H or L	X	Q_0
H	X	X	Z

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



SN54AHCT16374, SN74AHCT16374

16-BIT EDGE-TRIGGERED D-TYPE FLIP-FLOPS

WITH 3-STATE OUTPUTS

SCL3741M74AHCT16374DTCB.PRG/2006 查询74AHCT16374DTCB.PRG/2006 供应商

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54AHCT16374		SN74AHCT16374		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} = -8 mA		3.94			3.8		3.8		
V _{OL}	I _{OL} = 50 µA	4.5 V			0.1		0.1		0.1	V
	I _{OL} = 8 mA				0.36		0.44		0.44	
I _I	V _I = V _{CC} or GND	0 V to 5.5 V			±0.1		±1*		±1	µA
I _{OZ}	V _O = V _{CC} or GND, V _I = V _{IH} or V _{IL}	5.5 V			±0.25		±2.5		±2.5	µA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			4		40		40	µA
ΔI _{CC} †	One input at 3.4 V, Other inputs at V _{CC} or GND	5.5 V			1.35		1.5		1.5	mA
C _i	V _I = V _{CC} or GND	5 V		2.5	10				10	pF
C _o	V _O = V _{CC} or GND	5 V		3.5						pF

* On products compliant to MIL-PRF-38535, this parameter is not production tested at V_{CC} = 0 V.

† 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)

		T _A = 25°C		SN54AHCT16374		SN74AHCT16374		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration, CLK high or low	6.5		6.5		6.5		ns
t _{su}	Setup time, data before CLK↑	2.5		2.5		2.5		ns
t _h	Hold time, data after CLK↑	2.5		2.5		2.5		ns

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54AHCT16374		SN74AHCT16374		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{max}			$C_L = 15\text{ pF}$	90*	140*		80*		110		MHz
			$C_L = 50\text{ pF}$	85	130		75		75		
t_{PLH}	CLK	Q	$C_L = 15\text{ pF}$		6.5*	9.4*	1*	10.5*	1	10.5	ns
t_{PHL}					6.5*	9.4*	1*	10.5*	1	10.5	
t_{PZH}	$\overline{\text{OE}}$	Q	$C_L = 15\text{ pF}$		6.5*	9.5*	1*	10.5*	1	10.5	ns
t_{PZL}					6.5*	9.5*	1*	10.5*	1	10.5	
t_{PHZ}	$\overline{\text{OE}}$	Q	$C_L = 15\text{ pF}$		6.2*	10.2*	1*	11*	1	11	ns
t_{PLZ}					6.2*	10.2*	1*	11*	1	11	
t_{PLH}	CLK	Q	$C_L = 50\text{ pF}$		7.3	10.4	1	11.5	1	11.5	ns
t_{PHL}					7.1	10.4	1	11.5	1	11.5	
t_{PZH}	$\overline{\text{OE}}$	Q	$C_L = 50\text{ pF}$		6.2	10.5	1	11.5	1	11.5	ns
t_{PZL}					5.1	10.5	1	11.5	1	11.5	
t_{PHZ}	$\overline{\text{OE}}$	Q	$C_L = 50\text{ pF}$		7.1	11.2	1	12	1	12	ns
t_{PLZ}					7.9	11.2	1	12	1	12	
$t_{\text{sk(o)}}$			$C_L = 50\text{ pF}$			1**				1	ns

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

** On products compliant to MIL-PRF-38535, this parameter does not apply.

noise characteristics, $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 4)

PARAMETER		SN74AHCT16374			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.36	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		−0.1	−0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		4.7		V
$V_{IH(D)}$	High-level dynamic input voltage		2		V
$V_{IL(D)}$	Low-level dynamic input voltage			0.8	V

NOTE 4: 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	No load, $f = 1\text{ MHz}$	27	pF

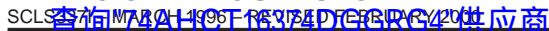
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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74AHCT16374DGGRE4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AHCT16374DGGRG4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AHCT16374DGVRE4	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AHCT16374DGVRG4	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AHCT16374DLRG4	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHCT16374DGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHCT16374DGVR	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHCT16374DL	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHCT16374DLG4	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHCT16374DLR	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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



*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
SN74AHCT16374DGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1
SN74AHCT16374DGV	TVSOP	DGV	48	2000	330.0	24.4	6.8	10.1	1.6	12.0	24.0	Q1
SN74AHCT16374DLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

TAPE AND REEL BOX DIMENSIONS

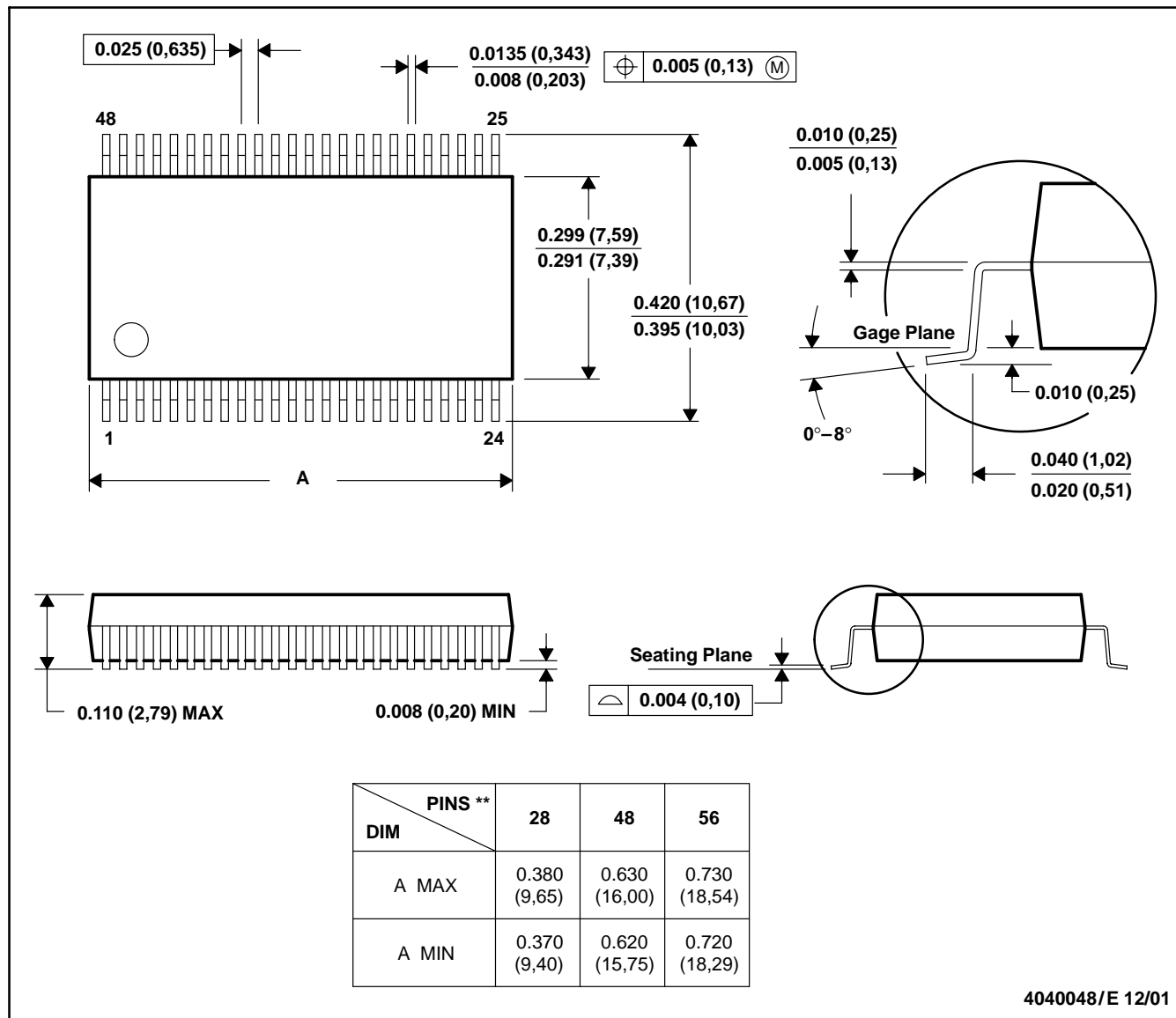

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHCT16374DGGR	TSSOP	DGG	48	2000	346.0	346.0	41.0
SN74AHCT16374DGVR	TVSOP	DGV	48	2000	346.0	346.0	41.0
SN74AHCT16374DLR	SSOP	DL	48	1000	346.0	346.0	49.0

DL (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

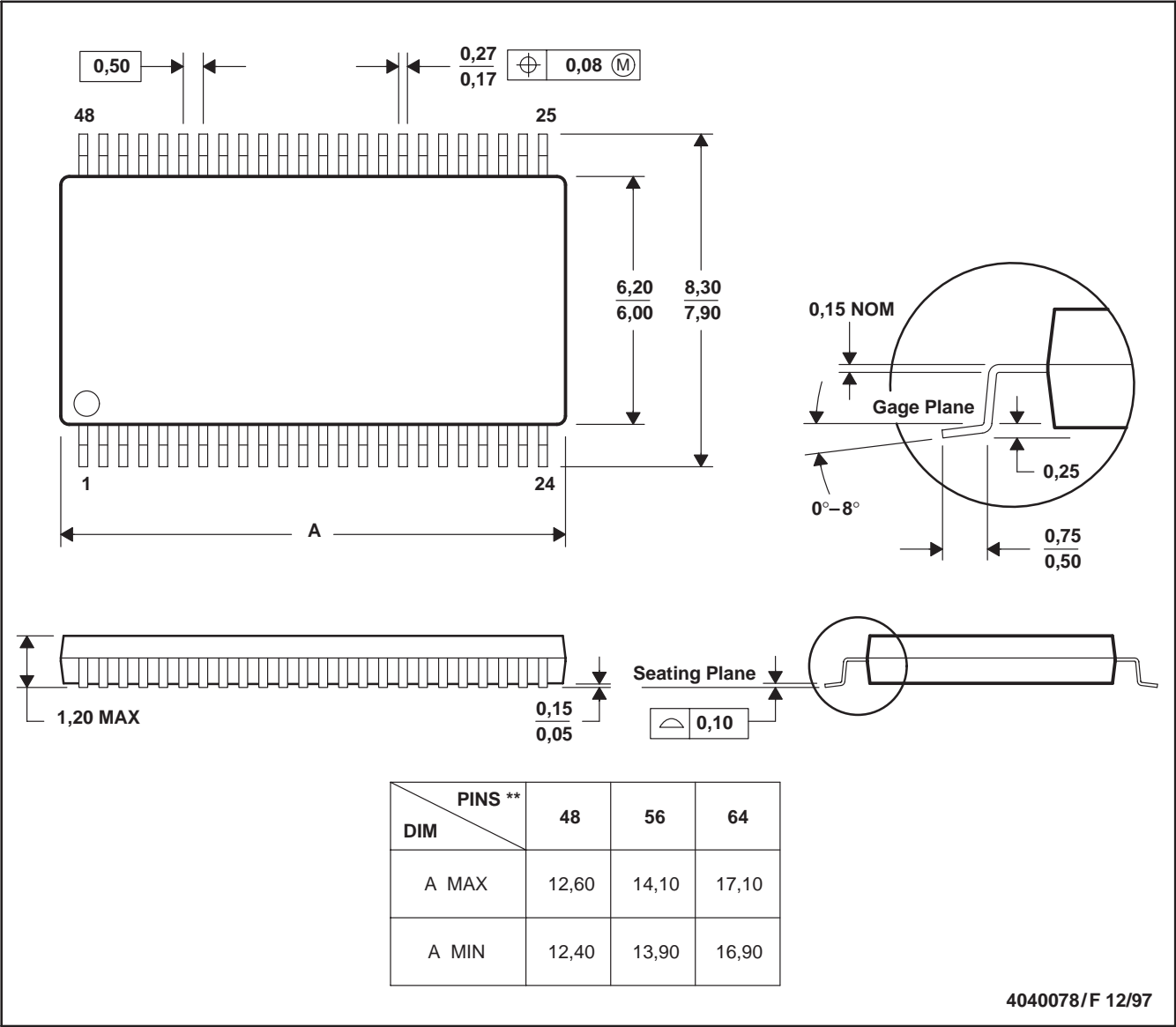


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 D. Falls within JEDEC MO-118

DGG (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

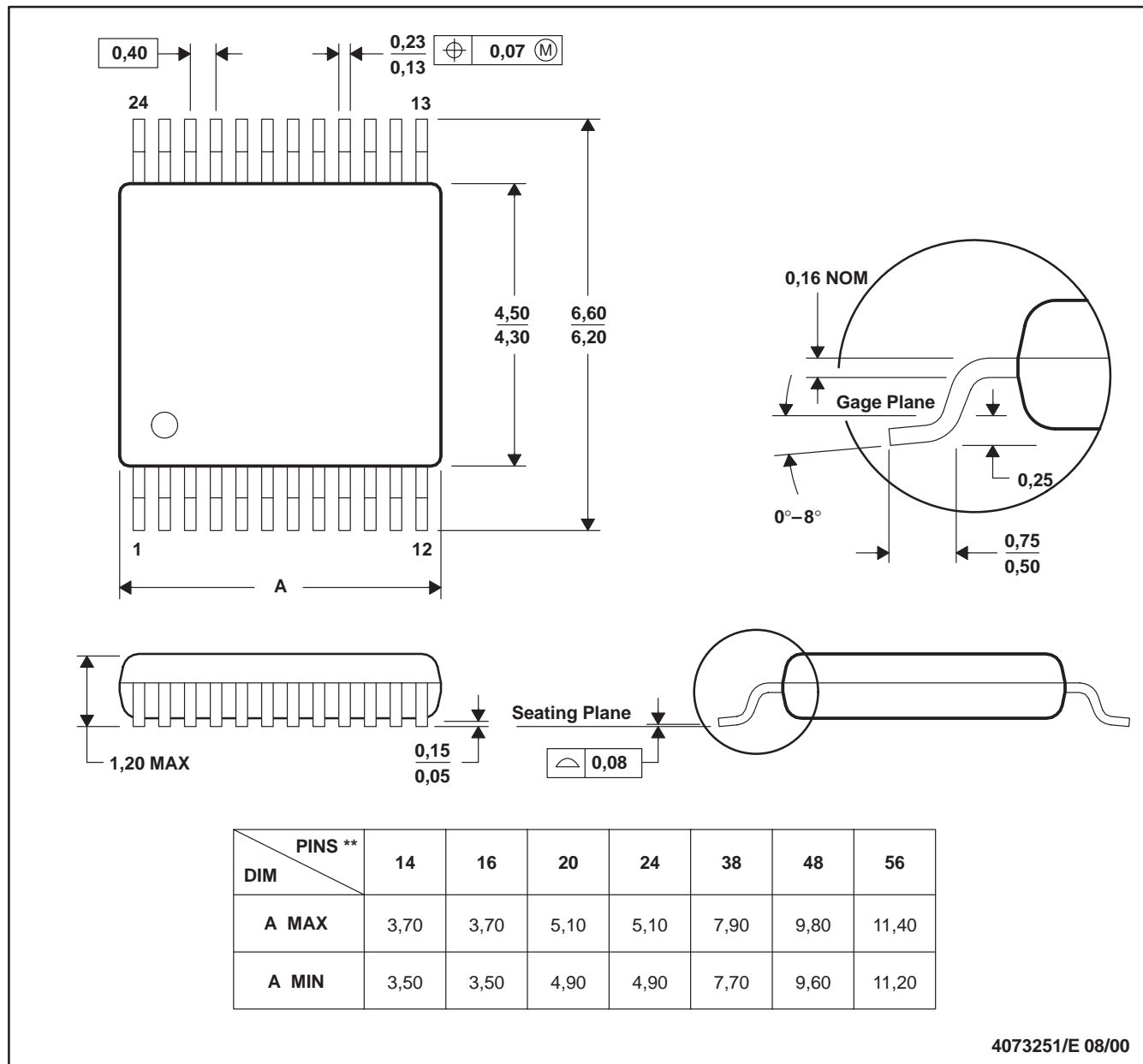


- NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold protrusion not to exceed 0,15.
D. Falls within JEDEC MO-153

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

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

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