

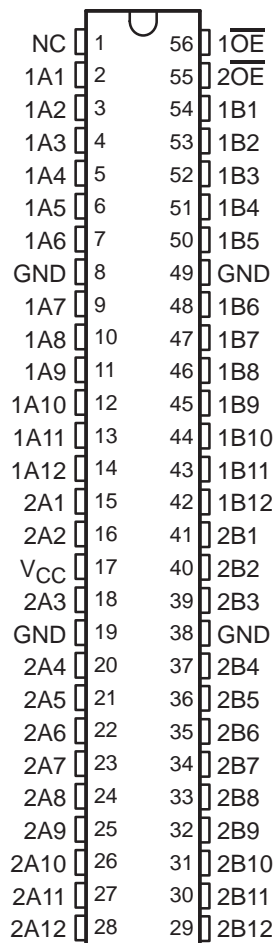
- Member of the Texas Instruments Widebus™ Family
- 5-Ω Switch Connection Between Two Ports
- TTL-Compatible Input Levels

### description/ordering information

The SN74CBT16211A provides 24 bits of high-speed TTL-compatible bus switching. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The device operates as a dual 12-bit bus switch or single 24-bit bus switch. When  $1\overline{OE}$  is low, 1A is connected to 1B. When  $2\overline{OE}$  is low, 2A is connected to 2B.

### DGG, DGV, OR DL PACKAGE (TOP VIEW)



NC – No internal connection

### ORDERING INFORMATION

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SSOP – DL	Tube	SN74CBT16211ADL	CBT16211A
		Tape and reel	SN74CBT16211ADLR	
	TSSOP – DGG	Tape and reel	SN74CBT16211ADGGR	CBT16211A
	TVSOP – DGV	Tape and reel	SN74CBT16211ADGVR	CY211A
	VFBGA – GQL	Tape and reel	SN74CBT16211AGQLR	CY211A
	VFBGA – ZQL (Pb-free)		SN74CBT16211AZQLR	

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



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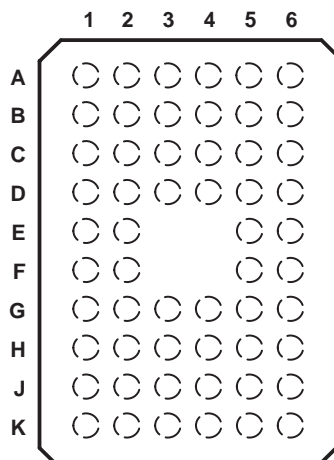
**PRODUCTION DATA** information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



# SN74CBT16211A 24-BIT FET BUS SWITCH

SCDS028M – JULY 1995 – REVISED SEPTEMBER 2003

**GQL OR ZQL PACKAGE  
(TOP VIEW)**



## terminal assignments

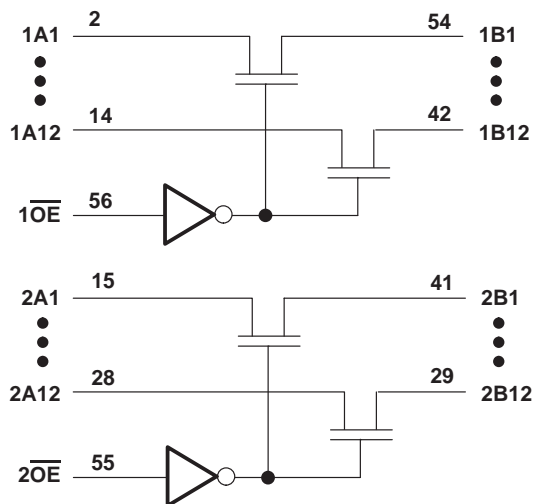
	1	2	3	4	5	6
A	1A2	1A1	NC	$\overline{1OE}$	$\overline{2OE}$	1B1
B	1A5	1A4	1A3	1B2	1B3	1B4
C	1A7	GND	1A6	1B5	GND	1B6
D	1A10	1A8	1A9	1B8	1B7	1B9
E	1A12	1A11			1B10	1B11
F	2A1	2A2			2B1	1B12
G	VCC	GND	2A3	2B3	GND	2B2
H	2A4	2A5	2A6	2B6	2B5	2B4
J	2A7	2A8	2A9	2B9	2B8	2B7
K	2A10	2A11	2A12	2B12	2B11	2B10

NC – No internal connection

**FUNCTION TABLE  
(each 12-bit bus switch)**

INPUTS		INPUTS/OUTPUTS	
$\overline{1OE}$	$\overline{2OE}$	1A, 1B	2A, 2B
L	L	1A = 1B	2A = 2B
L	H	1A = 1B	Z
H	L	Z	2A = 2B
H	H	Z	Z

## logic diagram (positive logic)



Pin numbers shown are for the DGG, DGV, and DL packages.

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

Supply voltage range, $V_{CC}$ .....	–0.5 V to 7 V	
Input voltage range, $V_I$ (see Note 1) .....	–0.5 V to 7 V	
Continuous channel current .....	128 mA	
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	–50 mA	
Package thermal impedance, $\theta_{JA}$ (see Note 2):	DGG package .....	64°C/W
	DGV package .....	48°C/W
	DL package .....	56°C/W
	GQL/ZQL package .....	42°C/W
Storage temperature range, $T_{stg}$ .....	–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.

- NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions (see Note 3)**

	MIN	MAX	UNIT
$V_{CC}$ Supply voltage	4	5.5	V
$V_{IH}$ High-level control input voltage	2		V
$V_{IL}$ Low-level control input voltage		0.8	V
$T_A$ Operating free-air temperature	–40	85	°C

NOTE 3: 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.

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

PARAMETER	TEST CONDITIONS	MIN	TYP‡	MAX	UNIT
$V_{IK}$	$V_{CC} = 4.5$ V, $I_I = -18$ mA			–1.2	V
$I_I$	$V_{CC} = 0$ V, $V_I = 5.5$ V			10	μA
	$V_{CC} = 5.5$ V, $V_I = 5.5$ V or GND			±1	
$I_{CC}$	$V_{CC} = 5.5$ V, $I_O = 0$ , $V_I = V_{CC}$ or GND			3	μA
$\Delta I_{CC}^{\S}$	Control inputs $V_{CC} = 5.5$ V, One input at 3.4 V, Other inputs at $V_{CC}$ or GND			2.5	mA
$C_i$	Control inputs $V_I = 3$ V or 0		3		pF
$C_{io(off)}$	$V_O = 3$ V or 0, $\overline{OE} = V_{CC}$		5.5		pF
$r_{on}^{\parallel}$	$V_{CC} = 4$ V, TYP at $V_{CC} = 4$ V $V_I = 2.4$ V, $I_I = 15$ mA		14	20	Ω
	$V_{CC} = 4.5$ V	$V_I = 0$ , $I_I = 64$ mA	5	7	
		$I_I = 30$ mA	5	7	
	$V_I = 2.4$ V, $I_I = 15$ mA	8	12		

‡ All typical values are at  $V_{CC} = 5$  V (unless otherwise noted),  $T_A = 25^\circ\text{C}$ .

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

∥ Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lowest voltage of the two (A or B) terminals.

# SN74CBT16211A

## 24-BIT FET BUS SWITCH

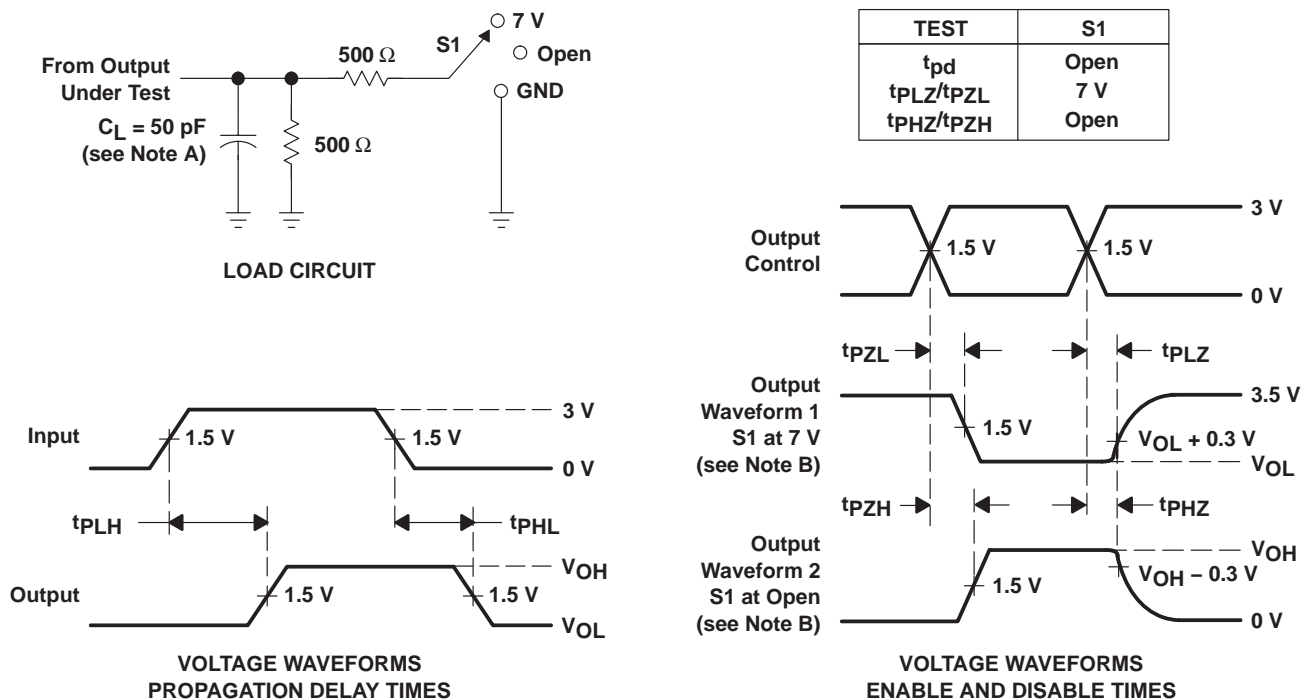
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switching characteristics over recommended operating free-air temperature range,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4 \text{ V}$		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}^\dagger$	A or B	B or A	0.35		0.25		ns
$t_{en}$	$\overline{OE}$	A or B	9.3		3.3	8.6	ns
$t_{dis}$	$\overline{OE}$	A or B	7.1		2.8	7.9	ns

$^\dagger$  The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

### PARAMETER MEASUREMENT INFORMATION

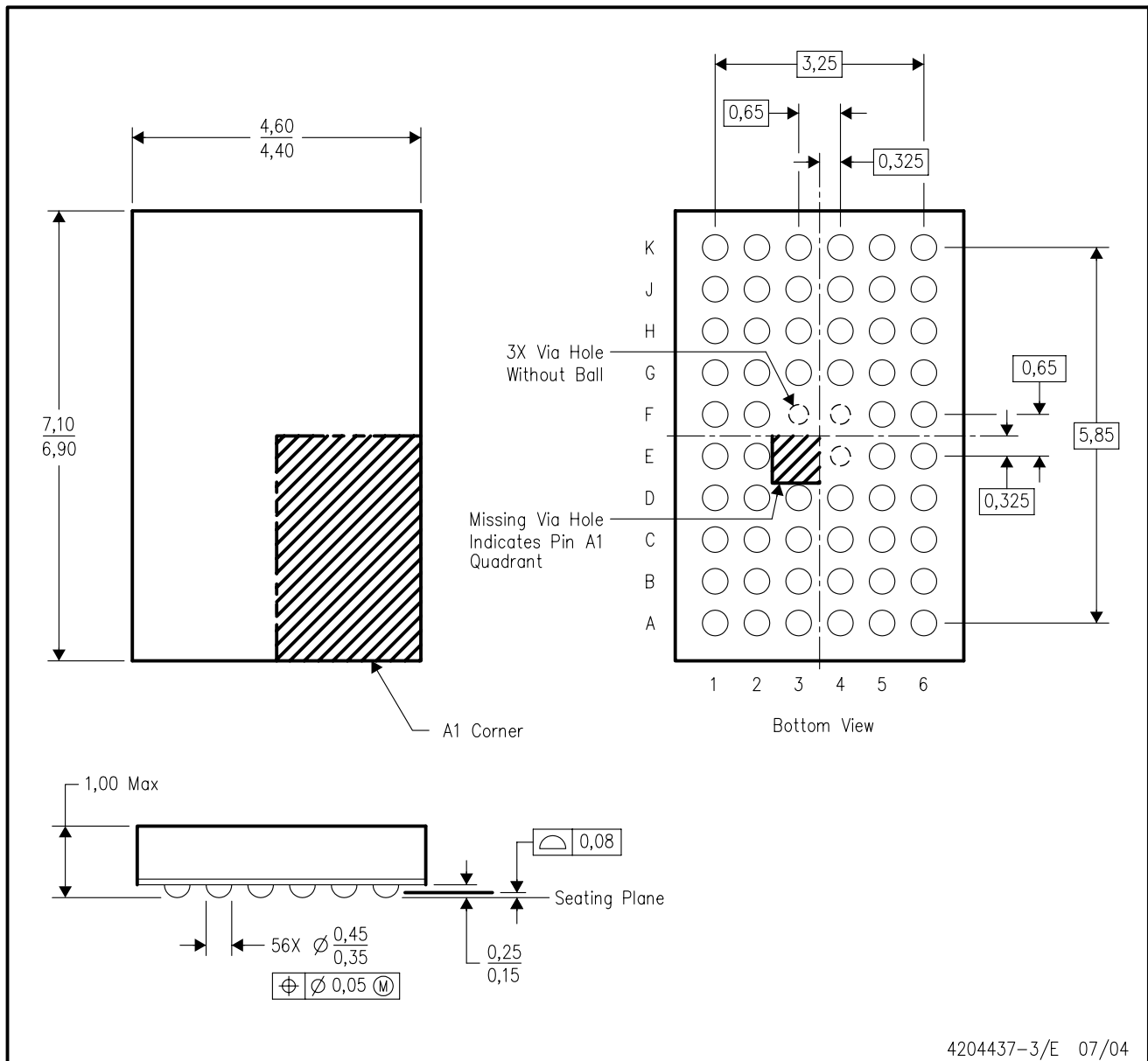


- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
  - D. The outputs are measured one at a time with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

ZQL (R-PBGA-N56)

PLASTIC BALL GRID ARRAY



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MO-225 variation BA.
  - D. This package is lead-free. Refer to the 56 GQL package (drawing 4200583) for tin-lead (SnPb).

DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN

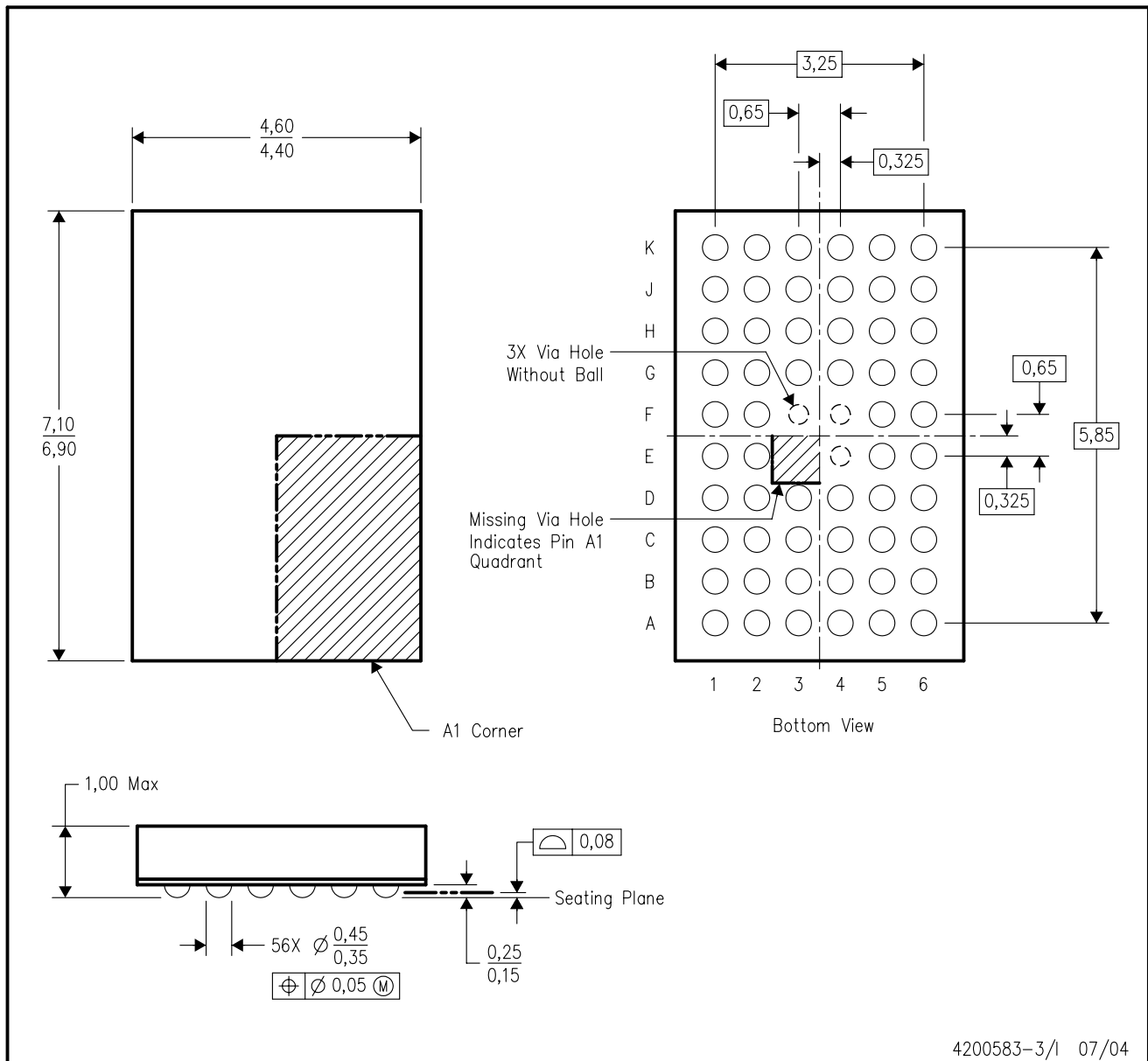


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- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

GQL (R-PBGA-N56)

PLASTIC BALL GRID ARRAY

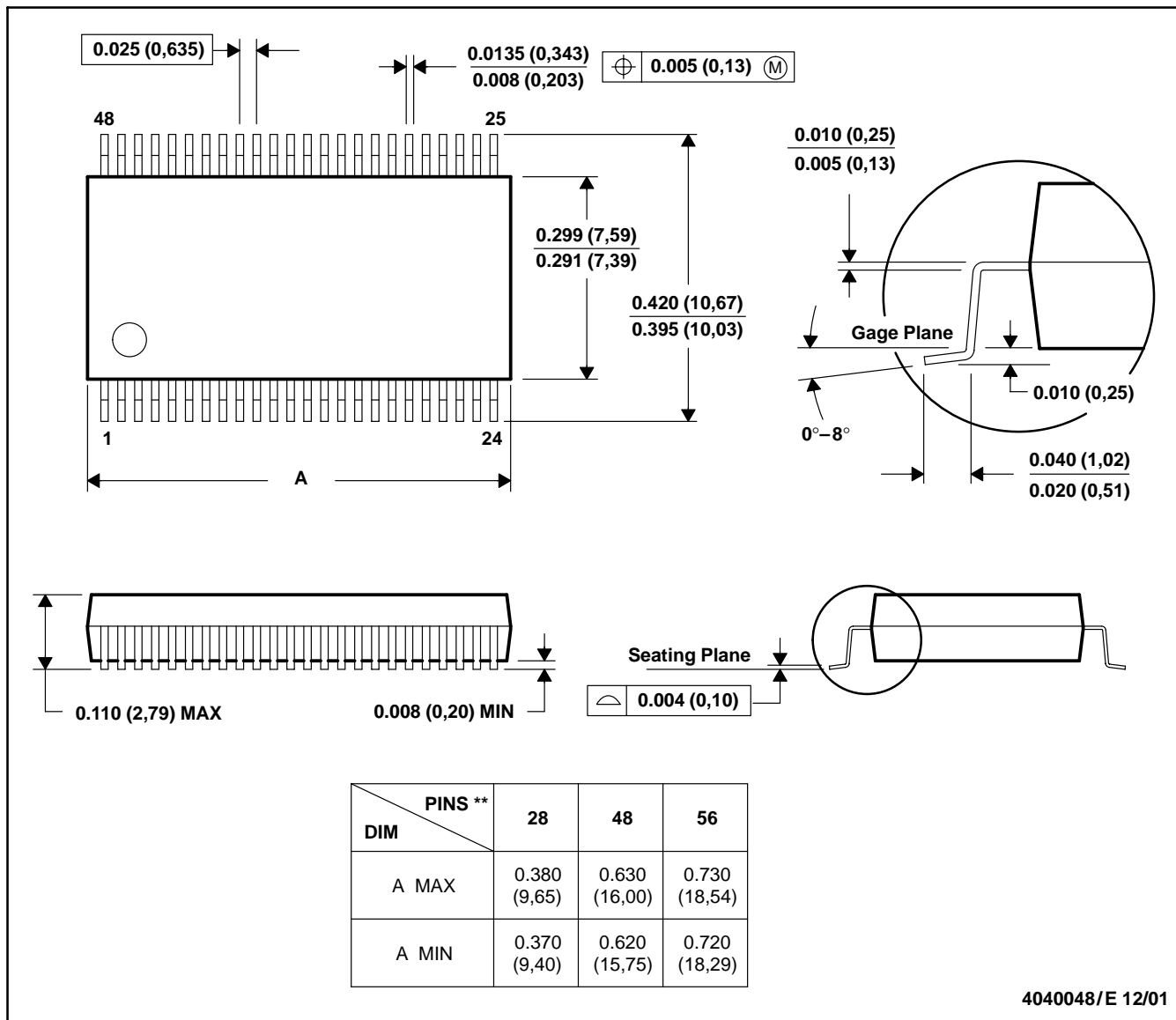


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MO-225 variation BA.
  - D. This package is tin-lead (SnPb). Refer to the 56 ZQL package (drawing 4204437) for lead-free.

DL (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

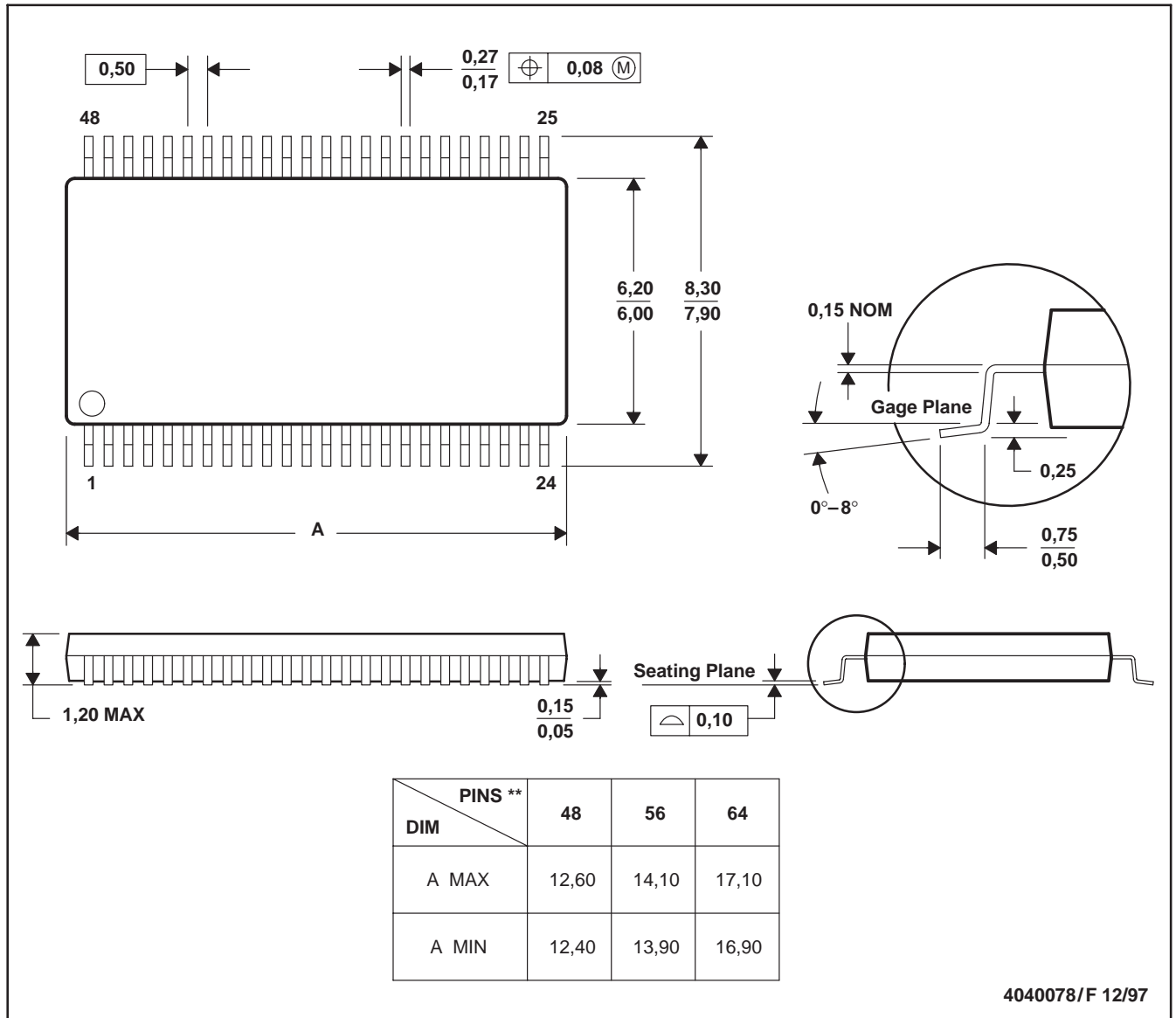


- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).  
 D. Falls within JEDEC MO-118

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

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