

## FEATURES

- Member of the Texas Instruments Widebus™ Family
- Operates From 1.65 V to 3.6 V
- Max  $t_{pd}$  of 3.6 ns at 3.3 V
- $\pm 24$ -mA Output Drive at 3.3 V
- 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)

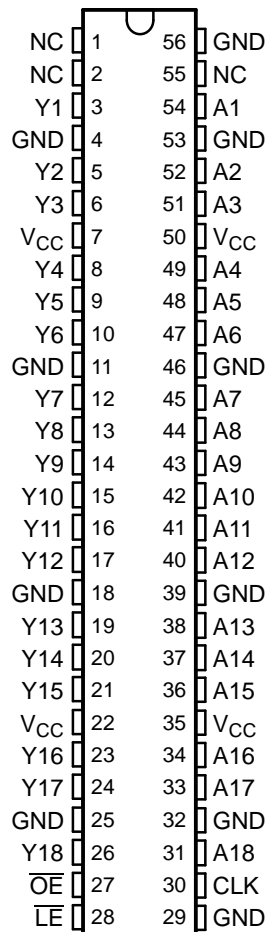
## DESCRIPTION

This 18-bit universal bus driver is designed for 1.65-V to 3.6-V  $V_{CC}$  operation.

Data flow from A to Y is controlled by the output-enable ( $\overline{OE}$ ) input. The device operates in the transparent mode when the latch-enable ( $\overline{LE}$ ) input is low. The A data is latched if the clock (CLK) input is held at a high or low logic level. If  $\overline{LE}$  is high, the A data is stored in the latch/flip-flop on the low-to-high transition of CLK. When  $\overline{OE}$  is high, 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.

DGG, DGV, OR DL PACKAGE  
(TOP VIEW)



NC – No internal connection

## ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SSOP - DL	Tube	SN74ALVC16834DL	ALVC16834
		Tape and reel	SN74ALVC16834DLR	
	TSSOP - DGG	Tape and reel	SN74ALVC16834DGGR	ALVC16834
	TVSOP - DGV	Tape and reel	SN74ALVC16834DGVR	VC834
	VFBGA - GQL	Tape and reel	SN74ALVC16834GQLR	VC834
VFBGA - ZQL (Pb-free)	SN74ALVC16834ZQLR			

(1) 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).



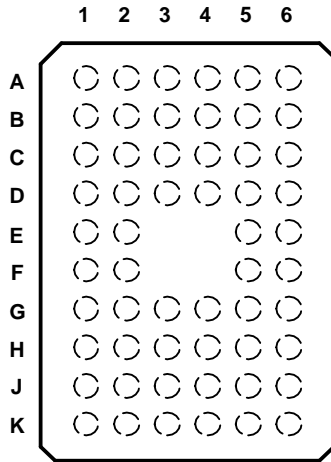
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# SN74ALVC16834 18-BIT UNIVERSAL BUS DRIVER WITH 3-STATE OUTPUTS

SCES140H—JULY 1998—REVISED AUGUST 2004

## GQL OR ZQL PACKAGE (TOP VIEW)



## TERMINAL ASSIGNMENTS

	1	2	3	4	5	6
A	Y1	NC	NC	GND	NC	A1
B	Y3	Y2	GND	GND	A2	A3
C	Y5	Y4	V <sub>CC</sub>	V <sub>CC</sub>	A4	A5
D	Y7	Y6	GND	GND	A6	A7
E	Y9	Y8			A8	A9
F	Y10	Y11			A11	A10
G	Y12	Y13	GND	GND	A13	A12
H	Y14	Y15	V <sub>CC</sub>	V <sub>CC</sub>	A15	A14
J	Y16	Y17	GND	GND	A17	A16
K	Y18	$\overline{OE}$	$\overline{LE}$	GND	CLK	A18

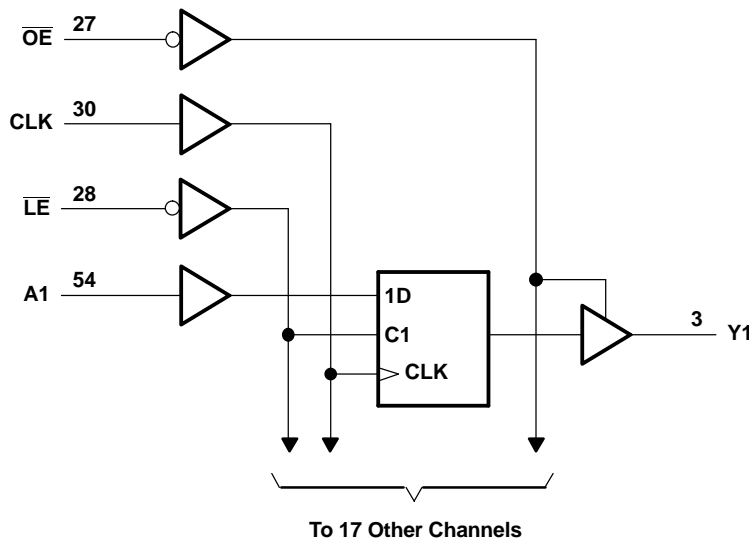
NC – No internal connection

## FUNCTION TABLE

INPUTS				OUTPUT
$\overline{OE}$	$\overline{LE}$	CLK	A	Y
H	X	X	X	Z
L	L	X	L	L
L	L	X	H	H
L	H	↑	L	L
L	H	↑	H	H
L	H	H	X	Y <sub>0</sub> <sup>(1)</sup>
L	H	L	X	Y <sub>0</sub> <sup>(2)</sup>

- (1) Output level before the indicated steady-state input conditions were established, provided that CLK is high before  $\overline{LE}$  goes high
- (2) Output level before the indicated steady-state input conditions were established

## LOGIC DIAGRAM (POSITIVE LOGIC)



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

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	-0.5	4.6	V
V <sub>I</sub>	Input voltage range <sup>(2)</sup>	-0.5	4.6	V
V <sub>O</sub>	Output voltage range <sup>(2)(3)</sup>	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		-50 mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50 mA
I <sub>O</sub>	Continuous output current			±50 mA
Continuous current through each V <sub>CC</sub> or GND				±100 mA
θ <sub>JA</sub>	Package thermal impedance <sup>(4)</sup>	DGG package		64
		DGV package		48
		DL package		56
		GQL/ZQL package		42
T <sub>stg</sub>	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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 4.6 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

**RECOMMENDED OPERATING CONDITIONS<sup>(1)</sup>**

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	1.65	3.6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	
		V <sub>CC</sub> = 2.7 V to 3.6 V	2	
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7	
		V <sub>CC</sub> = 2.7 V to 3.6 V	0.8	
V <sub>I</sub>	Input voltage	0	3.6	V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 1.65 V	-4	mA
		V <sub>CC</sub> = 2.3 V	-12	
		V <sub>CC</sub> = 2.7 V	-12	
		V <sub>CC</sub> = 3 V	-24	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 1.65 V	4	mA
		V <sub>CC</sub> = 2.3 V	12	
		V <sub>CC</sub> = 2.7 V	12	
		V <sub>CC</sub> = 3 V	24	
Δt/Δv	Input transition rise or fall rate			10 ns/V
T <sub>A</sub>	Operating free-air temperature	-40	85	°C

- (1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN74ALVC16834

## 18-BIT UNIVERSAL BUS DRIVER WITH 3-STATE OUTPUTS

SCES140H–JULY 1998–REVISED AUGUST 2004

### ELECTRICAL CHARACTERISTICS

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

PARAMETER		TEST CONDITIONS	V <sub>CC</sub>	MIN	TYP <sup>(1)</sup>	MAX	UNIT
V <sub>OH</sub>		I <sub>OH</sub> = -100 μA	1.65 V to 3.6 V	V <sub>CC</sub> - 0.2			V
		I <sub>OH</sub> = -4 mA	1.65 V	1.2			
		I <sub>OH</sub> = -6 mA	2.3 V	2			
		I <sub>OH</sub> = -12 mA	2.3 V	1.7			
			2.7 V	2.2			
			3 V	2.4			
	I <sub>OH</sub> = -24 mA	3 V	2				
V <sub>OL</sub>		I <sub>OL</sub> = 100 μA	1.65 V to 3.6 V	0.2			V
		I <sub>OL</sub> = 4 mA	1.65 V	0.45			
		I <sub>OL</sub> = 6 mA	2.3 V	0.4			
		I <sub>OL</sub> = 12 mA	2.3 V	0.7			
			2.7 V	0.4			
		I <sub>OL</sub> = 24 mA	3 V	0.55			
I <sub>I</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V	±5			μA
I <sub>OZ</sub>		V <sub>O</sub> = V <sub>CC</sub> or GND	3.6 V	±10			μA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6 V	40			μA
ΔI <sub>CC</sub>		One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	3 V to 3.6 V	750			μA
C <sub>i</sub>	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V	4			pF
	Data inputs			5.5			
C <sub>o</sub>	Outputs	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3 V	7			pF

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

### TIMING REQUIREMENTS

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

		V <sub>CC</sub> = 1.8 V		V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		UNIT	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
f <sub>clock</sub>	Clock frequency	(1)		150		150		150		MHz	
t <sub>w</sub>	Pulse duration	LE low		(1)		3.3		3.3		ns	
		CLK high or low		(1)		3.3		3.3			
t <sub>su</sub>	Setup time	Data before CLK↑		(1)		2.1		1.7		ns	
		Data before LE↑	CLK high		(1)		2.2		1.9		
			CLK low		(1)		1.5		1.5		
t <sub>h</sub>	Hold time	Data after CLK↑		(1)		0.6		0.7		ns	
		Data after LE↑	CLK high or low		(1)		0.8		0.9		

(1) This information was not available at the time of publication.

**SWITCHING CHARACTERISTICS**

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V}$		$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		UNIT
			MIN	TYP	MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\max}$			(1)		150		150		150		MHz
$t_{pd}$	A	Y	(1)		1	4.4	4.2		1	3.6	ns
	$\overline{LE}$		(1)		1.3	6	5.9		1.5	4.9	
	CLK		(1)		1.2	6	5.3		1.5	4.6	
$t_{en}$	$\overline{OE}$	Y	(1)		1.4	5.6	5.6		1.5	5	ns
$t_{dis}$	$\overline{OE}$	Y	(1)		1	4	4.7		1.8	4.5	ns

(1) This information was not available at the time of publication.

**SWITCHING CHARACTERISTICS**

 from 0°C to 65°C,  $C_L = 50\text{ pF}$ 

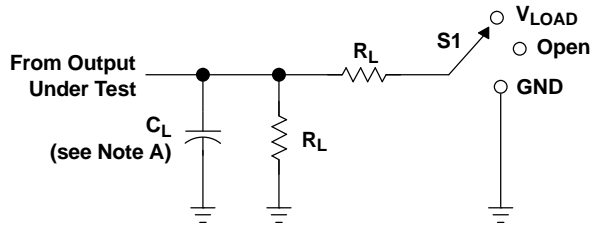
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 3.3\text{ V}$ $\pm 0.15\text{ V}$		UNIT
			MIN	MAX	
$t_{pd}$	CLK	Y	1.7	4.3	ns

**OPERATING CHARACTERISTICS**
 $T_A = 25^\circ\text{C}$ 

PARAMETER		TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	UNIT
			TYP	TYP	TYP	
$C_{pd}$	Power dissipation capacitance	$C_L = 0\text{ pF}, f = 10\text{ MHz}$	(1)	38	41	pF
			(1)	13	15	

(1) This information was not available at the time of publication.

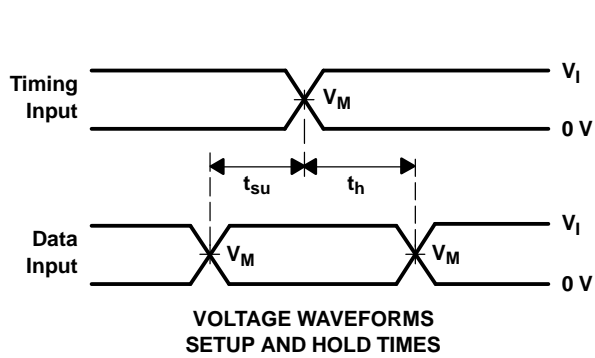
**PARAMETER MEASUREMENT INFORMATION**



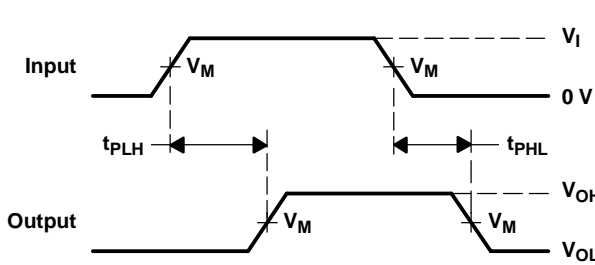
TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	V <sub>LOAD</sub>
$t_{PHZ}/t_{PZH}$	GND

**LOAD CIRCUIT**

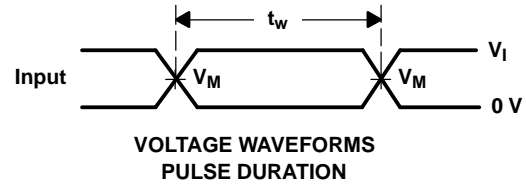
V <sub>CC</sub>	INPUT		V <sub>M</sub>	V <sub>LOAD</sub>	C <sub>L</sub>	R <sub>L</sub>	V <sub>Δ</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>					
1.8 V	V <sub>CC</sub>	≤2 ns	V <sub>CC</sub> /2	2 × V <sub>CC</sub>	30 pF	1 kΩ	0.15 V
2.5 V ± 0.2 V	V <sub>CC</sub>	≤2 ns	V <sub>CC</sub> /2	2 × V <sub>CC</sub>	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
3 V ± 0.3 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V



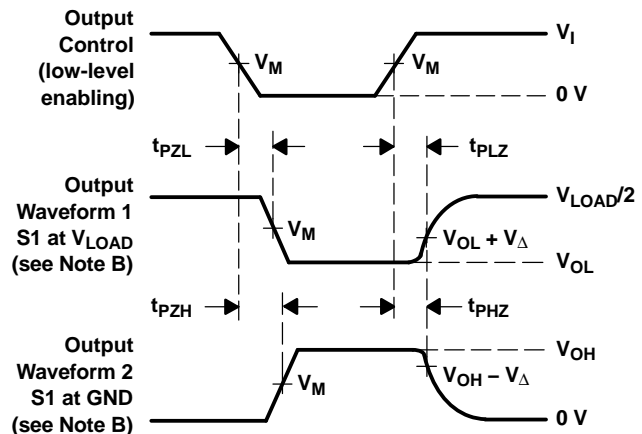
**VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES**



**VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES**



**VOLTAGE WAVEFORMS  
PULSE DURATION**



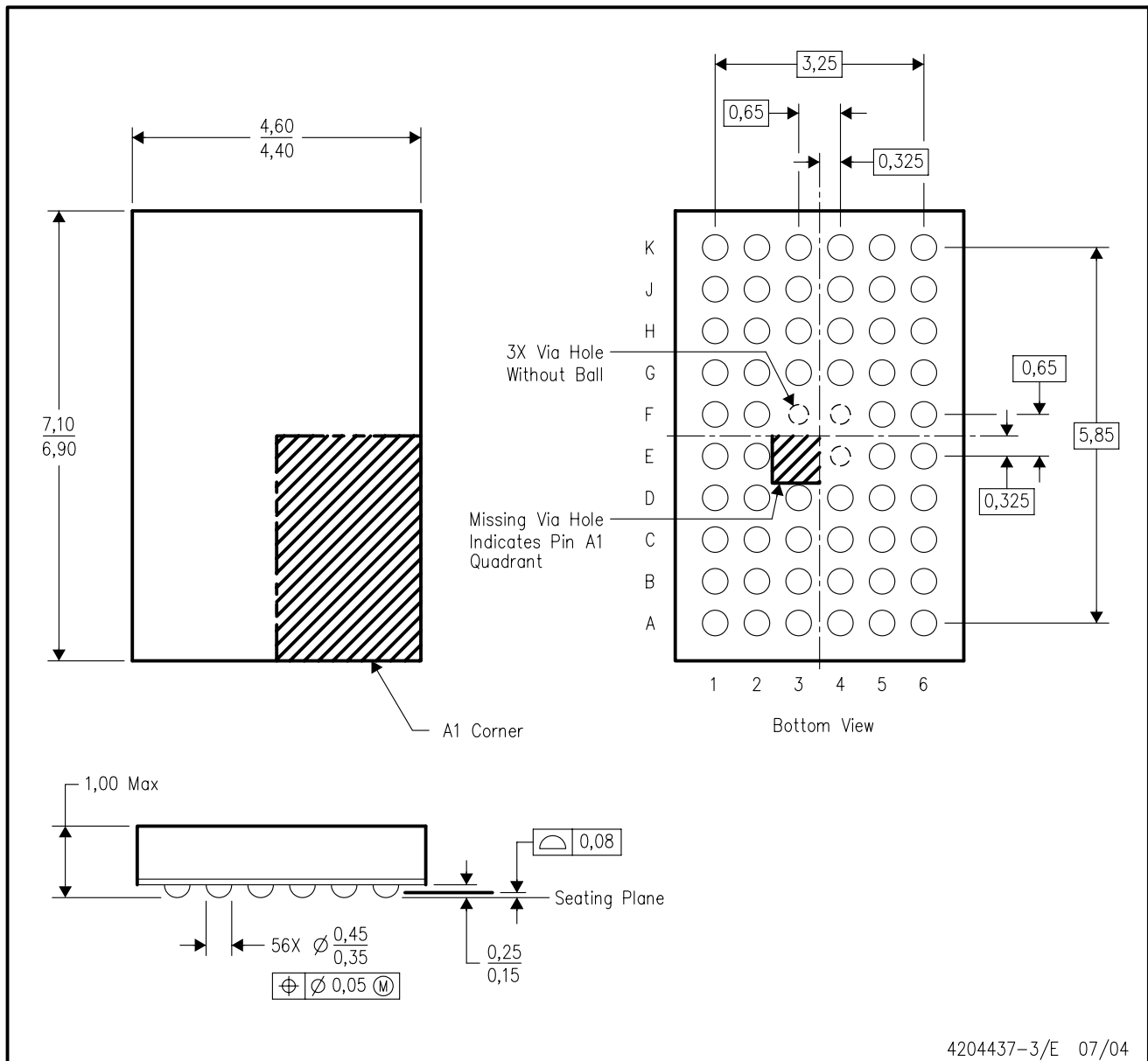
**VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES**

- 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 ≤ 10 MHz,  $Z_O = 50 \Omega$ .  
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



4204437-3/E 07/04

- 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

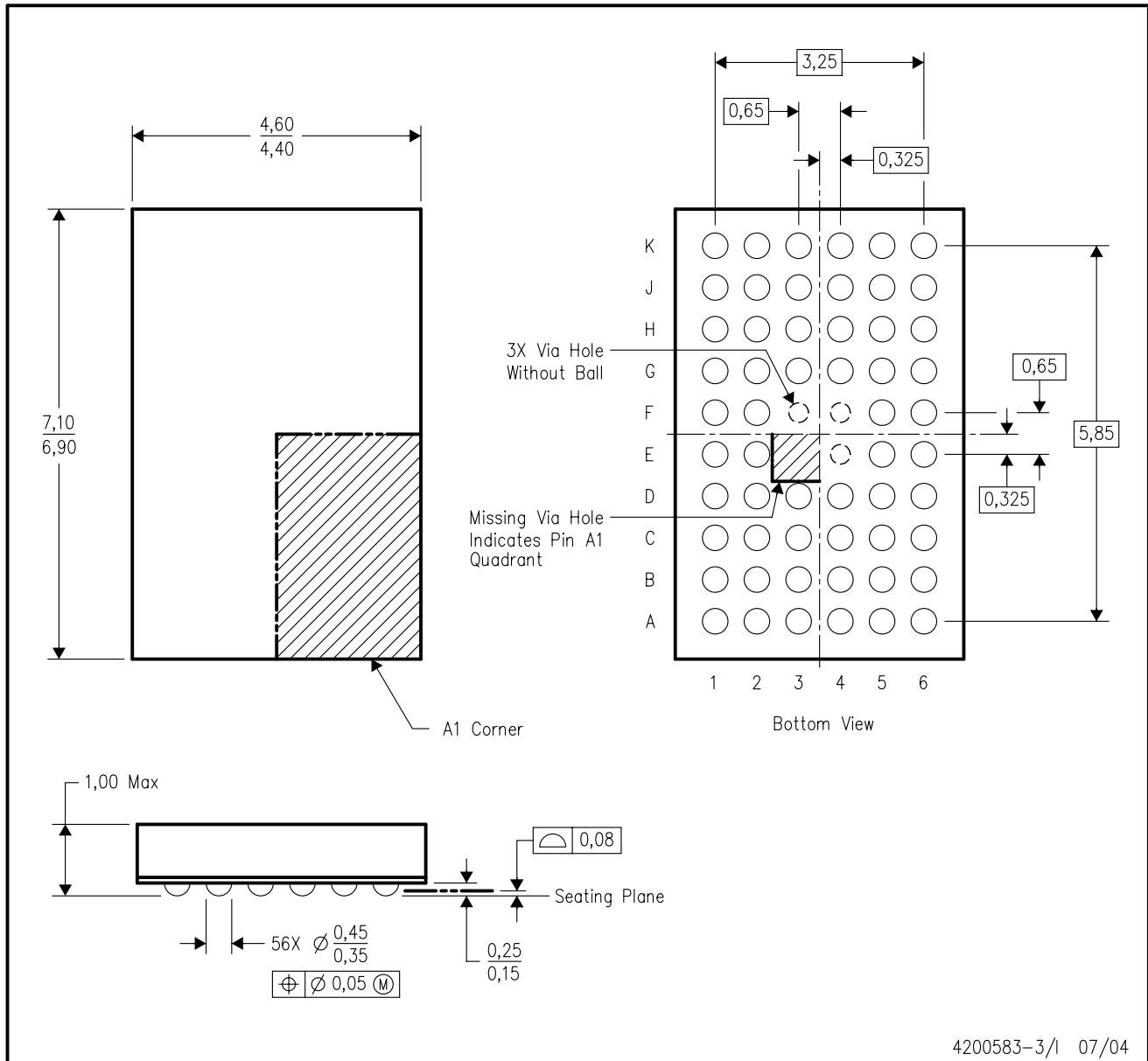
24 PINS SHOWN



- 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

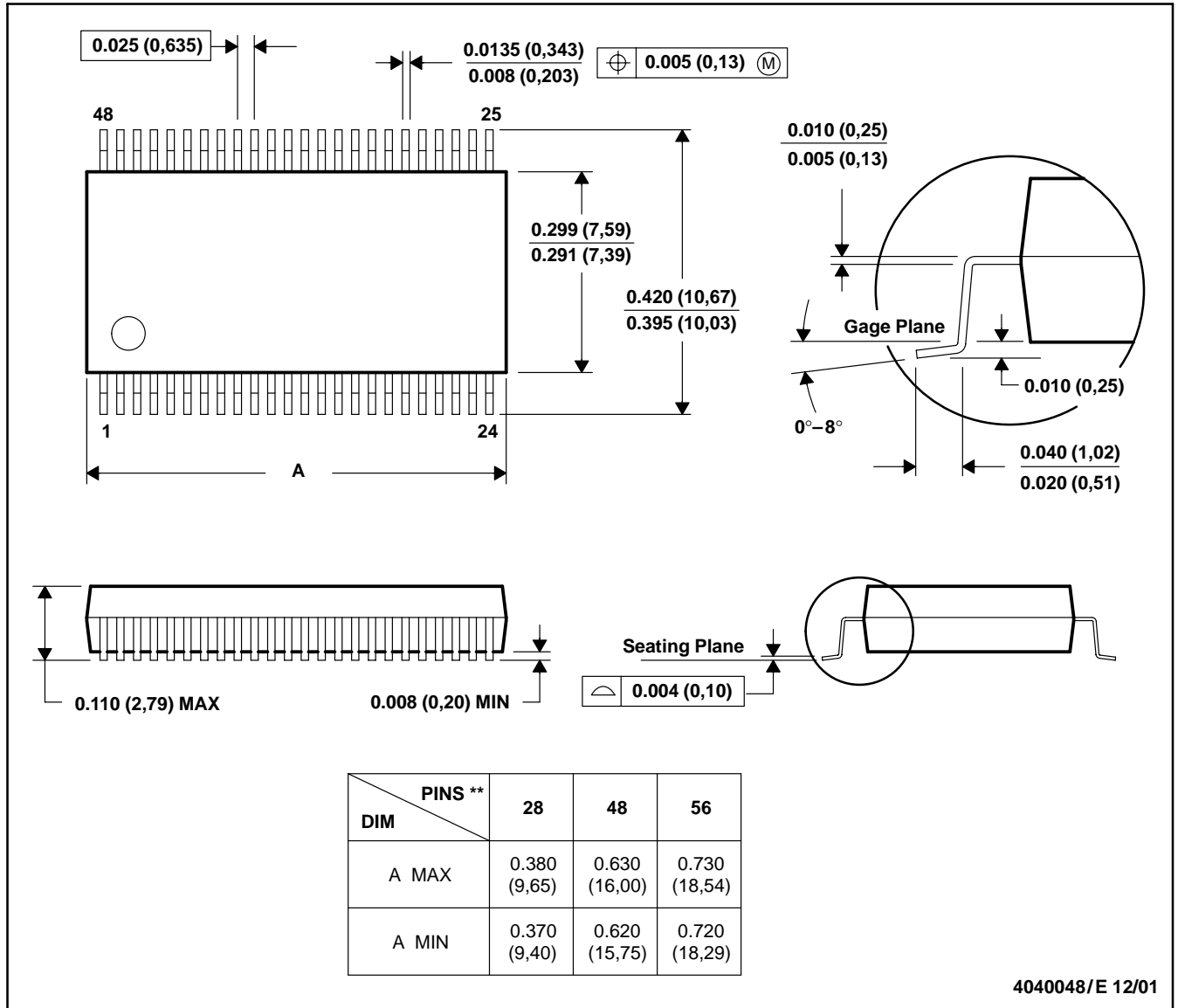


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MO-225 variation BA.
  - D. This package is tin-lead (SnPb). Refer to the 56 ZQL package (drawing 4204437) for lead-free.

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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DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
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		Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
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