

SN74AUC16245

16-BIT BUS TRANSCEIVER

WITH 3-STATE OUTPUTS

SCES392E – MARCH 2002 – REVISED DECEMBER 2002

- Member of the Texas Instruments Widebus™ Family
- Optimized for 1.8-V Operation and is 3.6-V I/O Tolerant to Support Mixed-Mode Signal Operation
- I_{off} Supports Partial-Power-Down Mode Operation
- Sub 1-V Operable
- Max t_{pd} of 2 ns at 1.8 V
- Low Power Consumption, 20- μ A Max I_{CC}
- ± 8 -mA Output Drive at 1.8 V
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- 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/ordering information

This 16-bit (dual-octal) noninverting bus transceiver is operational at 0.8-V to 2.7-V V_{CC} , but is designed specifically for 1.65-V to 1.95-V V_{CC} operation.

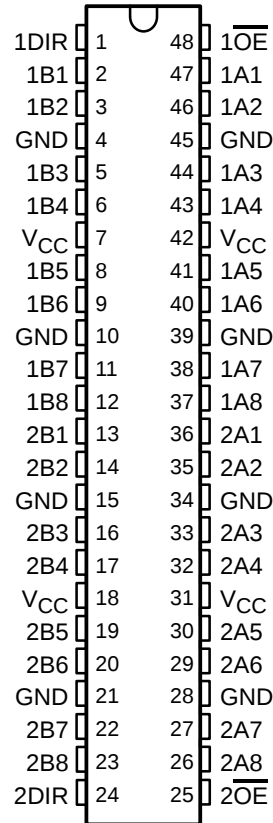
The SN74AUC16245 is designed for asynchronous communication between data buses. The control-function implementation minimizes external timing requirements.

This device can be used as two 8-bit transceivers or one 16-bit transceiver. It allows data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ($\overline{OE}$) input can be used to disable the device so that the buses are effectively isolated.

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.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

DGG OR DGV PACKAGE (TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	TSSOP – DGG	Tape and reel	SN74AUC16245DGGR	AUC16245
	TVSOP – DGV	Tape and reel	SN74AUC16245DGV	MH245
	VFBGA – GQL	Tape and reel	SN74AUC16245GQLR	MH245

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



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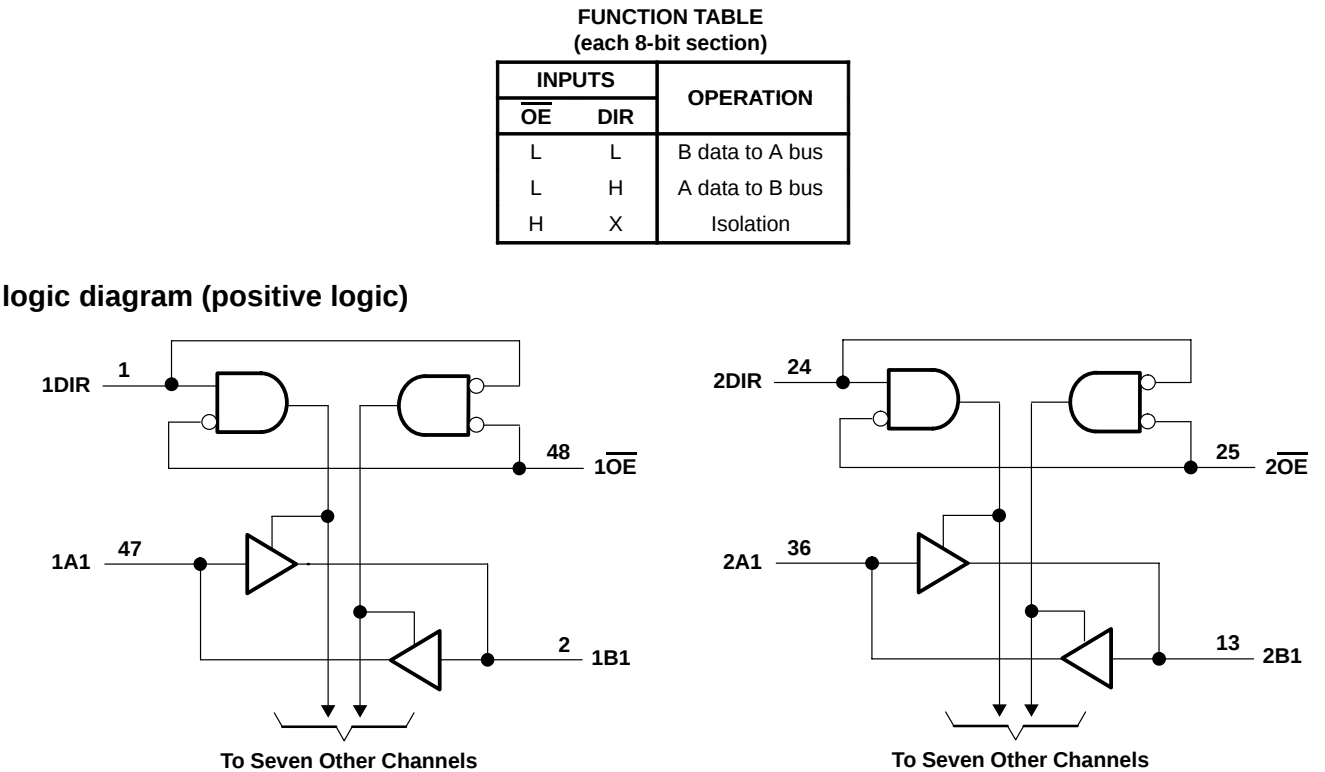
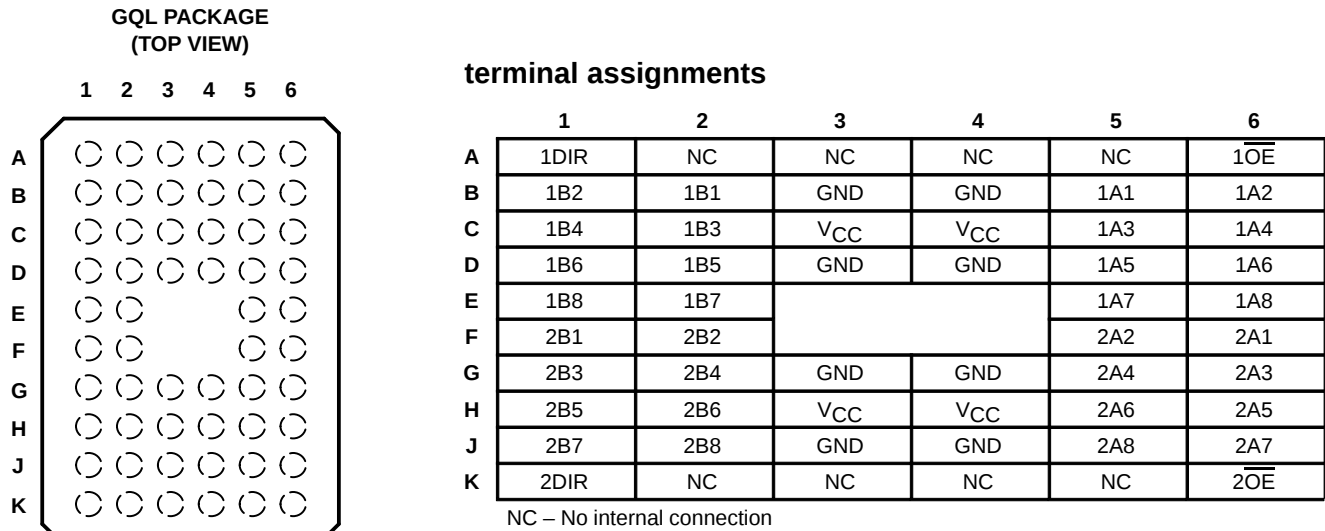
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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	–0.5 V to 3.6 V
Input voltage range, V_I (see Note 1)	–0.5 V to 3.6 V
Voltage range applied to any output in the high-impedance or power-off state, V_O (see Note 1)	–0.5 V to 3.6 V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Continuous output current, I_O	±20 mA
Continuous current through V_{CC} or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 2): DGG package	70°C/W
DGV package	58°C/W
GQL 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 negative-voltage and output voltage ratings may be exceeded if the input and output 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	0.8	2.7	V
V_{IH}	High-level input voltage	$V_{CC} = 0.8$ V	V_{CC}	V
		$V_{CC} = 1.1$ V to 1.95 V	$0.65 \times V_{CC}$	
		$V_{CC} = 2.3$ V to 2.7 V	1.7	
V_{IL}	Low-level input voltage	$V_{CC} = 0.8$ V	0	V
		$V_{CC} = 1.1$ V to 1.95 V	$0.35 \times V_{CC}$	
		$V_{CC} = 2.3$ V to 2.7 V	0.7	
V_I	Input voltage	0	3.6	V
V_O	Output voltage	Active state	0 V_{CC}	V
		3-state	0 3.6	
I_{OH}	High-level output current	$V_{CC} = 0.8$ V	–0.7	mA
		$V_{CC} = 1.1$ V	–3	
		$V_{CC} = 1.4$ V	–5	
		$V_{CC} = 1.65$ V	–8	
		$V_{CC} = 2.3$ V	–9	
I_{OL}	Low-level output current	$V_{CC} = 0.8$ V	0.7	mA
		$V_{CC} = 1.1$ V	3	
		$V_{CC} = 1.4$ V	5	
		$V_{CC} = 1.65$ V	8	
		$V_{CC} = 2.3$ V	9	
$\Delta t/\Delta v$	Input transition rise or fall rate		5	ns/V
T_A	Operating free-air temperature	–40	85	°C

NOTE 3: All unused 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.

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16-BIT BUS TRANSCEIVER

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

PARAMETER		TEST CONDITIONS	V _{CC}	MIN	TYP [†]	MAX	UNIT
V _{OH}		I _{OH} = –100 μA	0.8 V to 2.7 V	V _{CC} –0.1			V
		I _{OH} = –0.7 mA	0.8 V	0.55			
		I _{OH} = –3 mA	1.1 V	0.8			
		I _{OH} = –5 mA	1.4 V	1			
		I _{OH} = –8 mA	1.65 V	1.2			
		I _{OH} = –9 mA	2.3 V	1.8			
V _{OL}		I _{OL} = 100 μA	0.8 V to 2.7 V			0.2	V
		I _{OL} = 0.7 mA	0.8 V	0.25			
		I _{OL} = 3 mA	1.1 V			0.3	
		I _{OL} = 5 mA	1.4 V			0.4	
		I _{OL} = 8 mA	1.65 V			0.45	
		I _{OL} = 9 mA	2.3 V			0.6	
I _I	All inputs	V _I = V _{CC} or GND	0 to 2.7 V			±5	μA
I _{off}		V _I or V _O = 2.7 V	0			±10	μA
I _{OZ} [‡]		V _O = V _{CC} or GND	2.7 V			±10	μA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	0.8 V to 2.7 V			20	μA
C _i		V _I = V _{CC} or GND	2.5 V	3			pF
C _{io}		V _O = V _{CC} or GND	2.5 V	7			pF

[†] All typical values are at T_A = 25°C.

[‡] For I/O ports, the parameter I_{OZ} includes the input leakage current.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 0.8 V	V _{CC} = 1.2 V ± 0.1 V		V _{CC} = 1.5 V ± 0.1 V		V _{CC} = 1.8 V ± 0.15 V			V _{CC} = 2.5 V ± 0.2 V		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	TYP	MAX	MIN	MAX	
t _{pd}	A or B	B or A	5.6	0.5	3.1	0.5	2	0.5	1.5	2	0.4	1.9	ns
t _{en}	$\overline{\text{OE}}$	A or B	10	0.7	4.6	0.7	3.1	0.7	2.1	3.1	0.7	2.6	ns
t _{dis}	$\overline{\text{OE}}$	A or B	12.8	0.8	6.8	0.8	5	0.8	3.4	4.8	0.5	2.9	ns

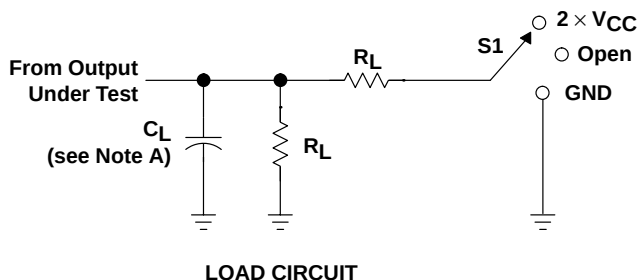
operating characteristics, T_A = 25°C

PARAMETER		TEST CONDITIONS	V _{CC} = 0.8 V	V _{CC} = 1.2 V	V _{CC} = 1.5 V	V _{CC} = 1.8 V	V _{CC} = 2.5 V	UNIT
			TYP	TYP	TYP	TYP	TYP	
C _{pd} Power dissipation capacitance	Outputs enabled	f = 10 MHz	22	23	24	25	29	pF
	Outputs disabled		1	1	1	1	1	



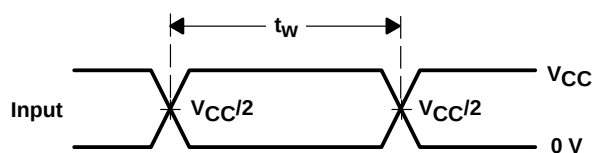
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PARAMETER MEASUREMENT INFORMATION

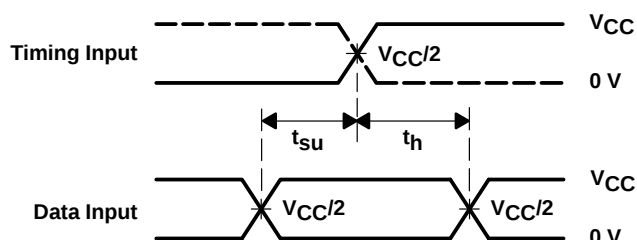


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$
t_{PHZ}/t_{PZH}	GND

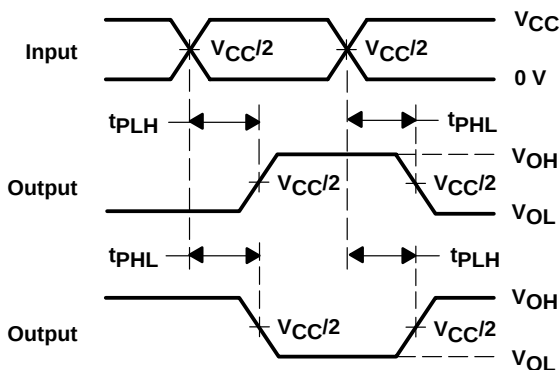
V_{CC}	C_L	R_L	V_{Δ}
0.8 V	15 pF	2 k Ω	0.1 V
1.2 V $\pm$ 0.1 V	15 pF	2 k Ω	0.1 V
1.5 V $\pm$ 0.1 V	15 pF	2 k Ω	0.1 V
1.8 V $\pm$ 0.15 V	30 pF	1 k Ω	0.15 V
2.5 V $\pm$ 0.2 V	30 pF	500 Ω	0.15 V



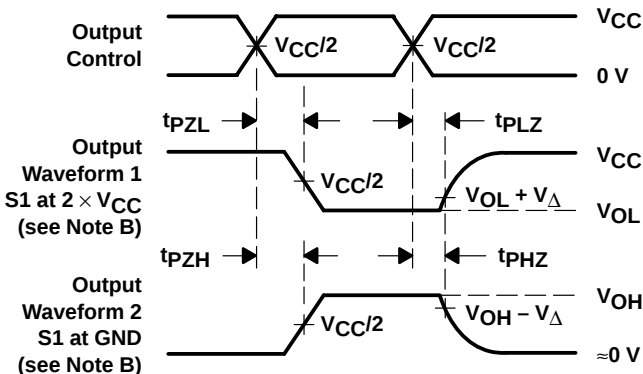
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

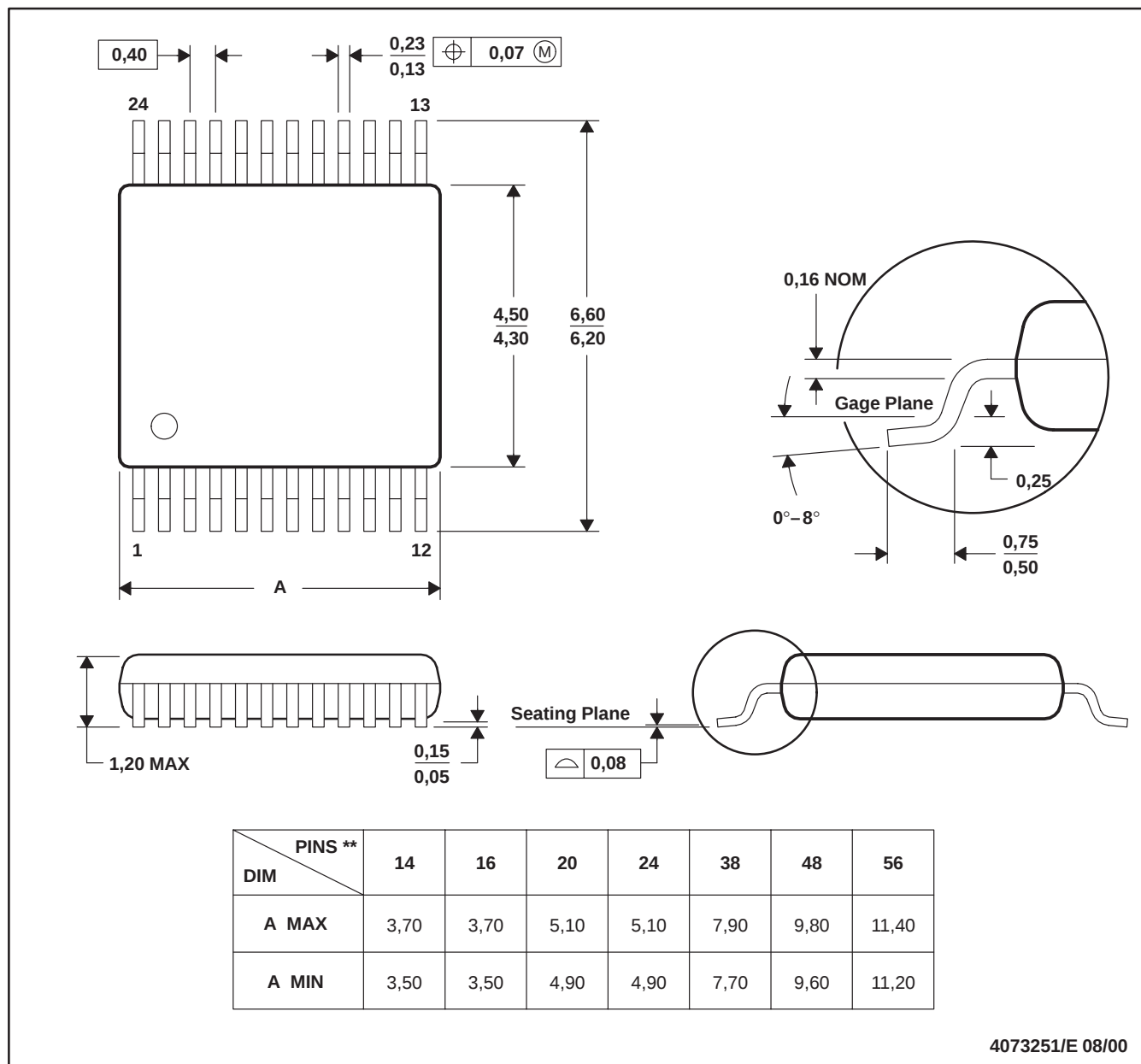
- NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O = 50 \Omega$, slew rate ≥ 1 V/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

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

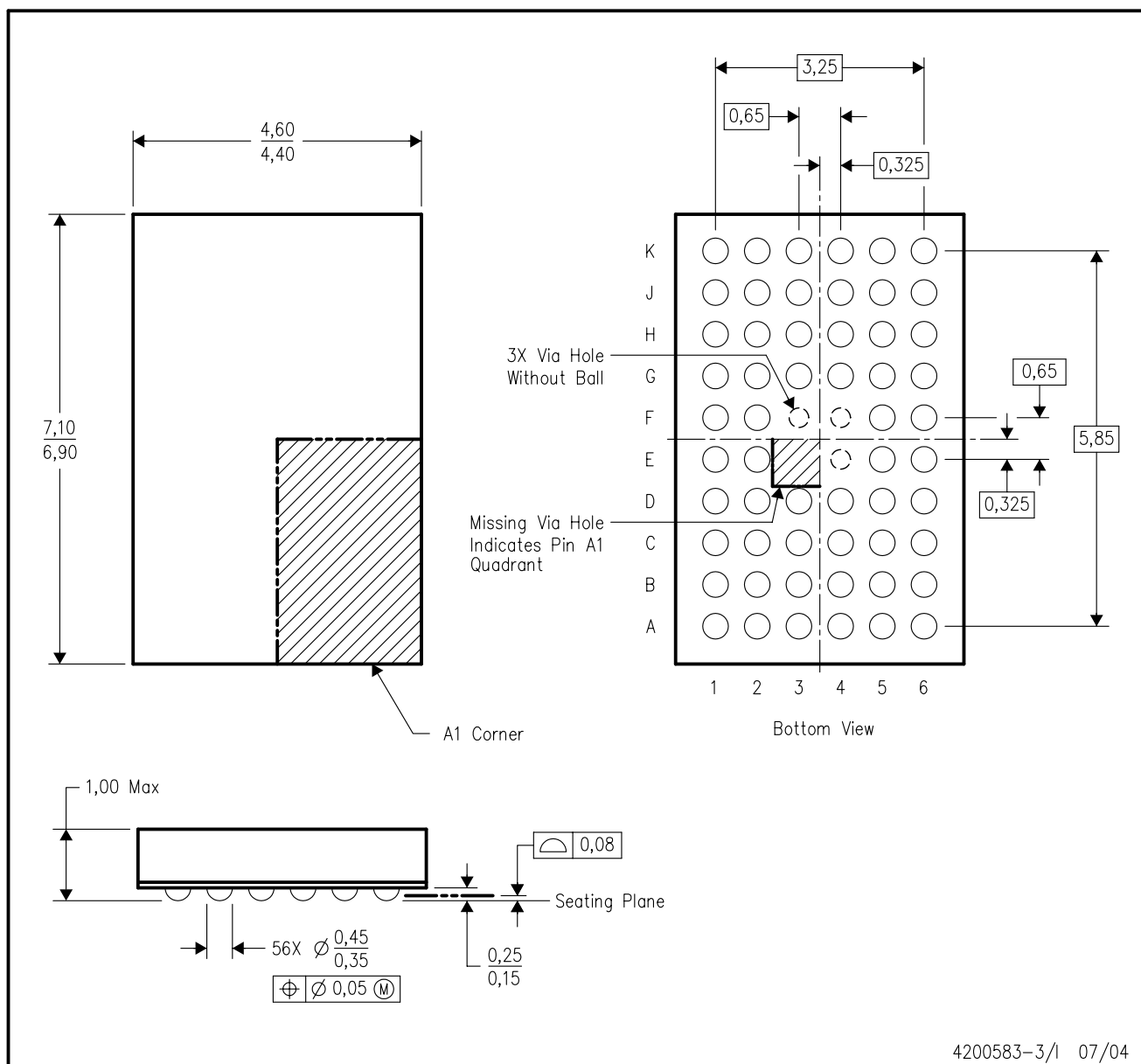
24 PINS SHOWN



- 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)

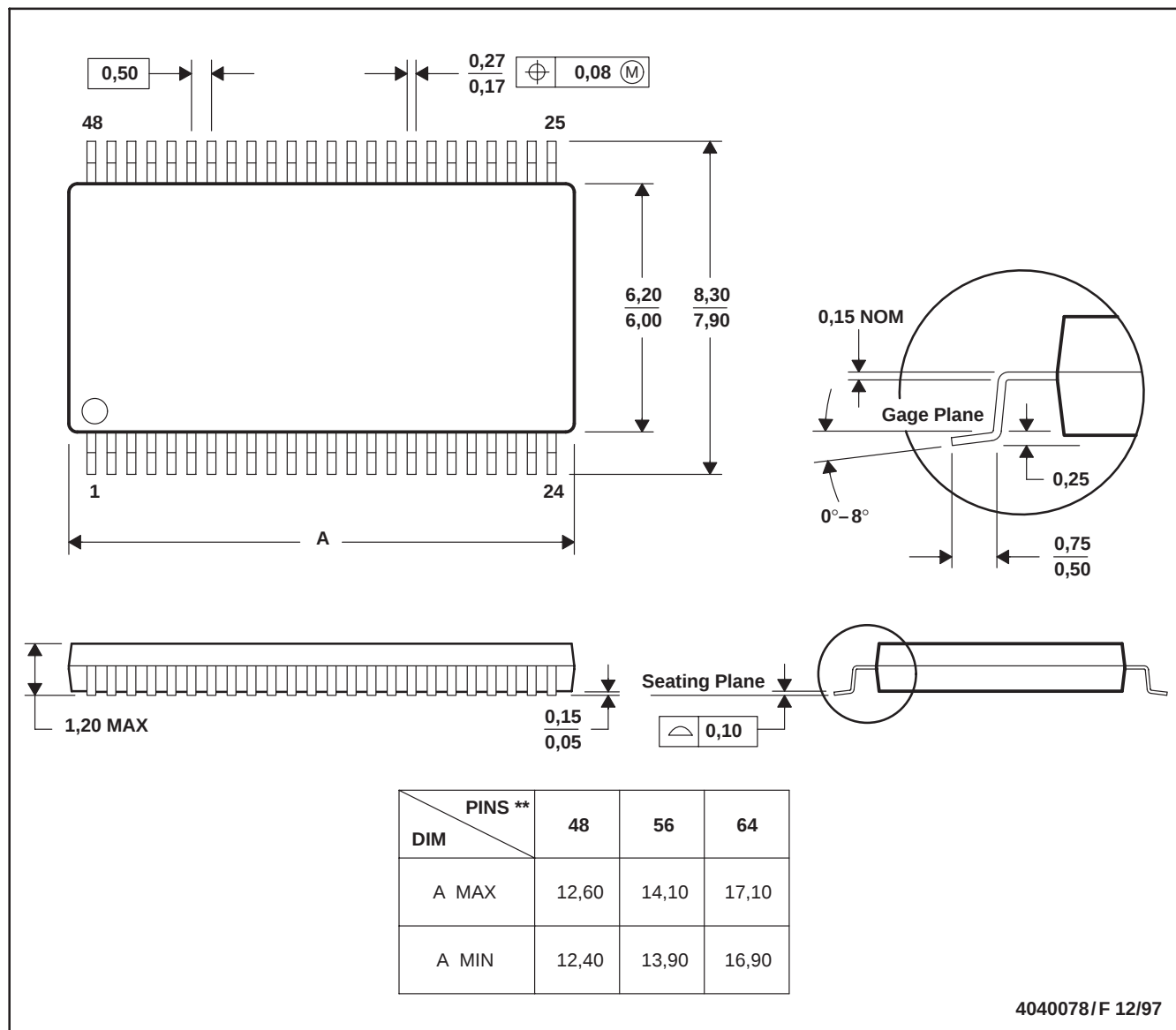
PLASTIC BALL GRID ARRAY



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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