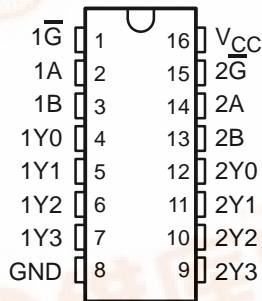


SN54LV139A, SN74LV139A DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

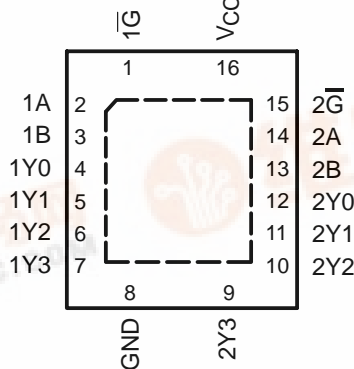
SCLS396G – APRIL 1998 – REVISED JULY 2003

- 2-V to 5.5-V V_{CC} Operation
- Max t_{pd} of 7.5 ns at 5 V
- Support Mixed-Mode Voltage Operation on All Ports
- Designed Specifically for High-Speed Memory Decoders and Data-Transmission Systems
- Incorporate Two Enable Inputs to Simplify Cascading and/or Data Reception
- I_{off} Supports Partial-Power-Down Mode Operation
- 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)

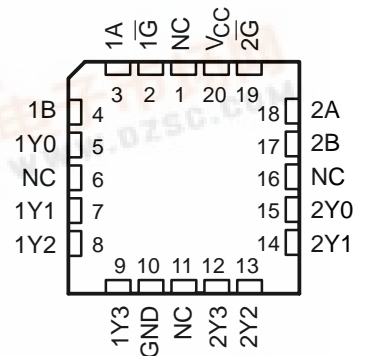
SN54LV139A ... J OR W PACKAGE
SN74LV139A ... D, DB, DGV, NS,
OR PW PACKAGE
(TOP VIEW)



SN74LV139A ... RGY PACKAGE
(TOP VIEW)



SN54LV139A ... FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The 'LV139A devices are dual 2-line to 4-line decoders/demultiplexers designed for 2-V to 5.5-V V_{CC} operation.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGY	Reel of 1000	SN74LV139ARGYR	LV139A
	SOIC – D	Tube of 40	SN74LV139AD	LV139A
		Reel of 2500	SN74LV139ADR	
	SOP – NS	Reel of 2000	SN74LV139ANSR	74LV139A
	SSOP – DB	Reel of 2000	SN74LV139ADBR	LV139A
	TSSOP – PW	Tube of 90	SN74LV139APW	LV139A
		Reel of 2000	SN74LV139APWR	
		Reel of 250	SN74LV139APWT	
	TVSOP – DGV	Reel of 2000	SN74LV139ADGVR	LV139A
–55°C to 125°C	CDIP – J	Tube of 25	SNJ54LV139AJ	SNJ54LV139AJ
	CFP – W	Tube of 150	SNJ54LV139AW	SNJ54LV139AW
	LCCC – FK	Tube of 55	SNJ54LV139AFK	SNJ54LV139AFK

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

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SN54LV139A, SN74LV139A

DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

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description/ordering information(continued)

These devices are designed for high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, these decoders can minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay time of these decoders and the enable time of the memory usually are less than the typical access time of the memory. This means that the effective system delay introduced by the decoders is negligible.

The 'LV139A devices comprise two individual 2-line to 4-line decoders in a single package. The active-low enable (\overline{G}) input can be used as a data line in demultiplexing applications. These decoders/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit.

These devices are fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

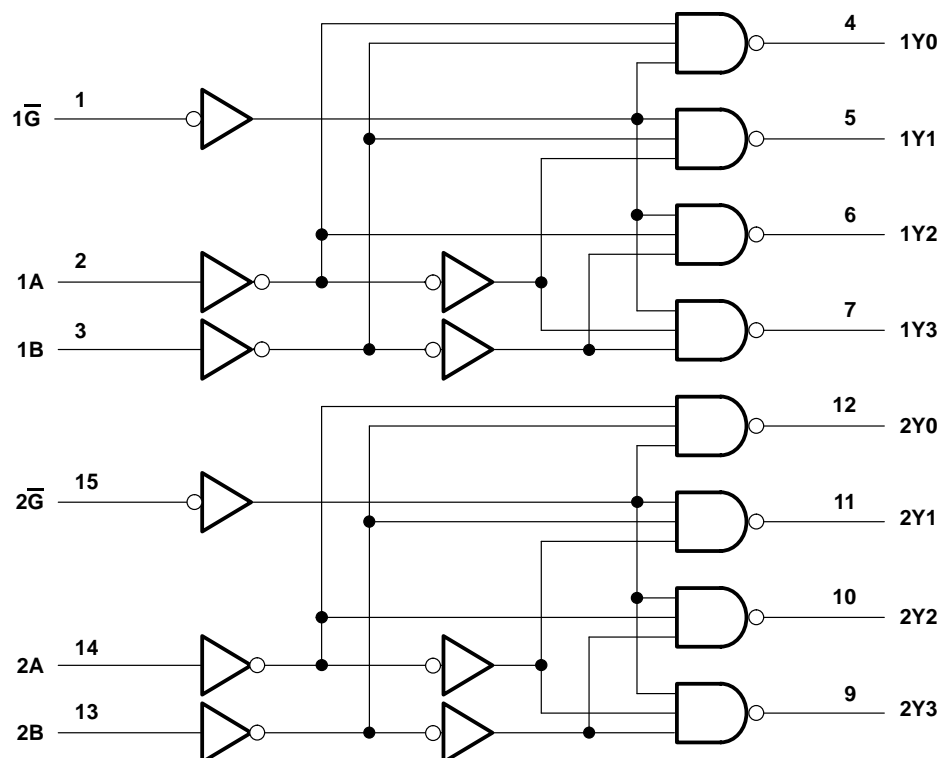
FUNCTION TABLE

INPUTS			OUTPUTS			
\overline{G}	SELECT					
	B	A				
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

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logic diagram (positive logic)



Pin numbers shown are for the D, DB, DGV, J, NS, PW, RGY, and W 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
Voltage range applied to any output in the high-impedance or power-off state, V_O (see Note 1)	–0.5 V to 7 V
Output voltage range, V_O (see Notes 1 and 2)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±50 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Package thermal impedance, θ_{JA} (see Note 3): D package	73°C/W
(see Note 3): DB package	82°C/W
(see Note 3): DGV package	120°C/W
(see Note 3): NS package	64°C/W
(see Note 3): PW package	108°C/W
(see Note 4): RGY package	39°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 voltage ratings may be exceeded if the input and output current ratings are observed.
 2. This value is limited to 5.5 V maximum.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.
 4. The package thermal impedance is calculated in accordance with JESD 51-5.

SN54LV139A, SN74LV139A

DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

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recommended operating conditions (see Note 5)

			SN54LV139A		SN74LV139A		UNIT
			MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage		2	5.5	2	5.5	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		1.5		V
		V _{CC} = 2.3 V to 2.7 V	V _{CC} × 0.7		V _{CC} × 0.7		
		V _{CC} = 3 V to 3.6 V	V _{CC} × 0.7		V _{CC} × 0.7		
		V _{CC} = 4.5 V to 5.5 V	V _{CC} × 0.7		V _{CC} × 0.7		
V _{IL}	Low-level input voltage	V _{CC} = 2 V	0.5		0.5		V
		V _{CC} = 2.3 V to 2.7 V	V _{CC} × 0.3		V _{CC} × 0.3		
		V _{CC} = 3 V to 3.6 V	V _{CC} × 0.3		V _{CC} × 0.3		
		V _{CC} = 4.5 V to 5.5 V	V _{CC} × 0.3		V _{CC} × 0.3		
V _I	Input voltage		0	5.5	0	5.5	V
V _O	Output voltage		0	V _{CC}	0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 2 V	−50		−50		μA
		V _{CC} = 2.3 V to 2.7 V	−2		−2		mA
		V _{CC} = 3 V to 3.6 V	−6		−6		
		V _{CC} = 4.5 V to 5.5 V	−12		−12		
I _{OL}	Low-level output current	V _{CC} = 2 V	50		50		μA
		V _{CC} = 2.3 V to 2.7 V	2		2		mA
		V _{CC} = 3 V to 3.6 V	6		6		
		V _{CC} = 4.5 V to 5.5 V	12		12		
Δt/Δv	Input transition rise or fall rate	V _{CC} = 2.3 V to 2.7 V	200		200		ns/V
		V _{CC} = 3 V to 3.6 V	100		100		
		V _{CC} = 4.5 V to 5.5 V	20		20		
T _A	Operating free-air temperature		−55	125	−40	85	°C

NOTE 5: 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.

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

PARAMETER	TEST CONDITIONS	V _{CC}	SN54LV139A			SN74LV139A			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V _{OH}	I _{OH} = –50 μA	2 V to 5.5 V	V _{CC} –0.1			V _{CC} –0.1			V
	I _{OH} = –2 mA	2.3 V	2			2			
	I _{OH} = –6 mA	3 V	2.48			2.48			
	I _{OH} = –12 mA	4.5 V	3.8			3.8			
V _{OL}	I _{OL} = 50 μA	2 V to 5.5 V	0.1			0.1			V
	I _{OL} = 2 mA	2.3 V	0.4			0.4			
	I _{OL} = 6 mA	3 V	0.44			0.44			
	I _{OL} = 12 mA	4.5 V	0.55			0.55			
I _I	V _I = 5.5 V or GND	0 to 5.5 V	±1			±1			μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V	20			20			μA
I _{off}	V _I or V _O = 0 to 5.5 V	0	5			5			μA
C _i	V _I = V _{CC} or GND	3.3 V	1.9			1.9			pF

SN54LV139A, SN74LV139A

DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

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switching characteristics over recommended operating free-air temperature range, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54LV139A		SN74LV139A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	$C_L = 15\text{ pF}$		7.7*	17.6*	1*	21*	1	21	ns
	\overline{G}	Y			7.4*	15.8*	1*	19*	1	19	
t_{pd}	A or B	Y	$C_L = 50\text{ pF}$		10.2	22.5	1	26.5	1	26.5	ns
	\overline{G}	Y			9.9	20.2	1	24	1	24	

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

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54LV139A		SN74LV139A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	$C_L = 15\text{ pF}$		5.3*	11*	1*	13*	1	13	ns
	\overline{G}	Y			5.1*	9.2*	1*	11*	1	11	
t_{pd}	A or B	Y	$C_L = 50\text{ pF}$		7.3	14.5	1	16.5	1	16.5	ns
	\overline{G}	Y			7	12.7	1	14.5	1	14.5	

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

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	$T_A = 25^\circ\text{C}$			SN54LV139A		SN74LV139A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	$C_L = 15\text{ pF}$		3.7*	7.2*	1*	8.5*	1	8.5	ns
	\overline{G}	Y			3.5*	6.3*	1*	7.5*	1	7.5	
t_{pd}	A or B	Y	$C_L = 50\text{ pF}$		5.2	9.2	1	10.5	1	10.5	ns
	\overline{G}	Y			4.9	8.3	1	9.5	1	9.5	

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

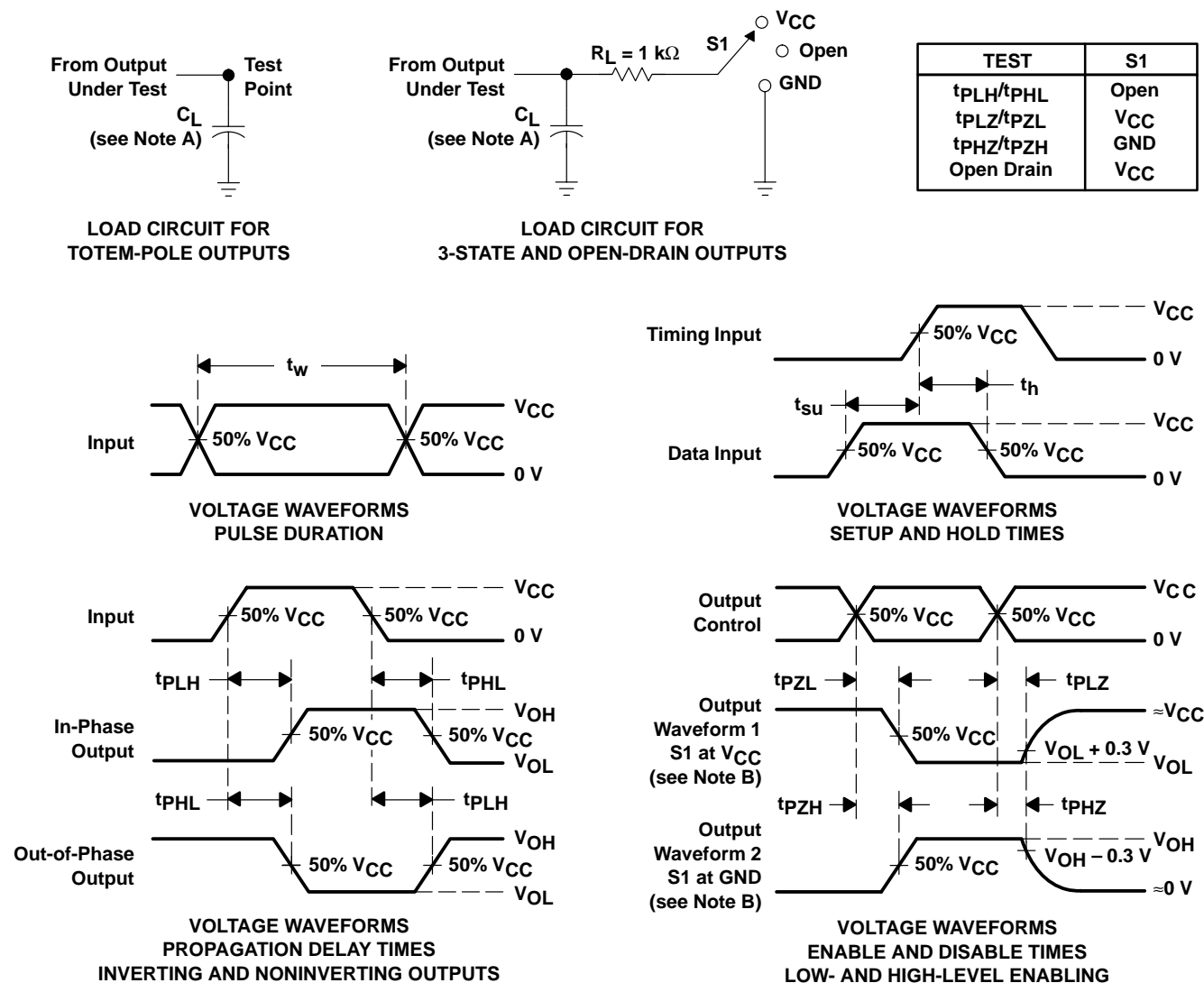
operating characteristics, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		V_{CC}	TYP	UNIT
C_{pd}	Power dissipation capacitance	$C_L = 50\text{ pF}$, $f = 10\text{ MHz}$		3.3 V	17.3	pF
				5 V	18.2	

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SCLS396G – APRIL 1998 – REVISED JULY 2003

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: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 - D. The outputs are measured one at a time with one input 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_{PHL} and t_{PLH} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

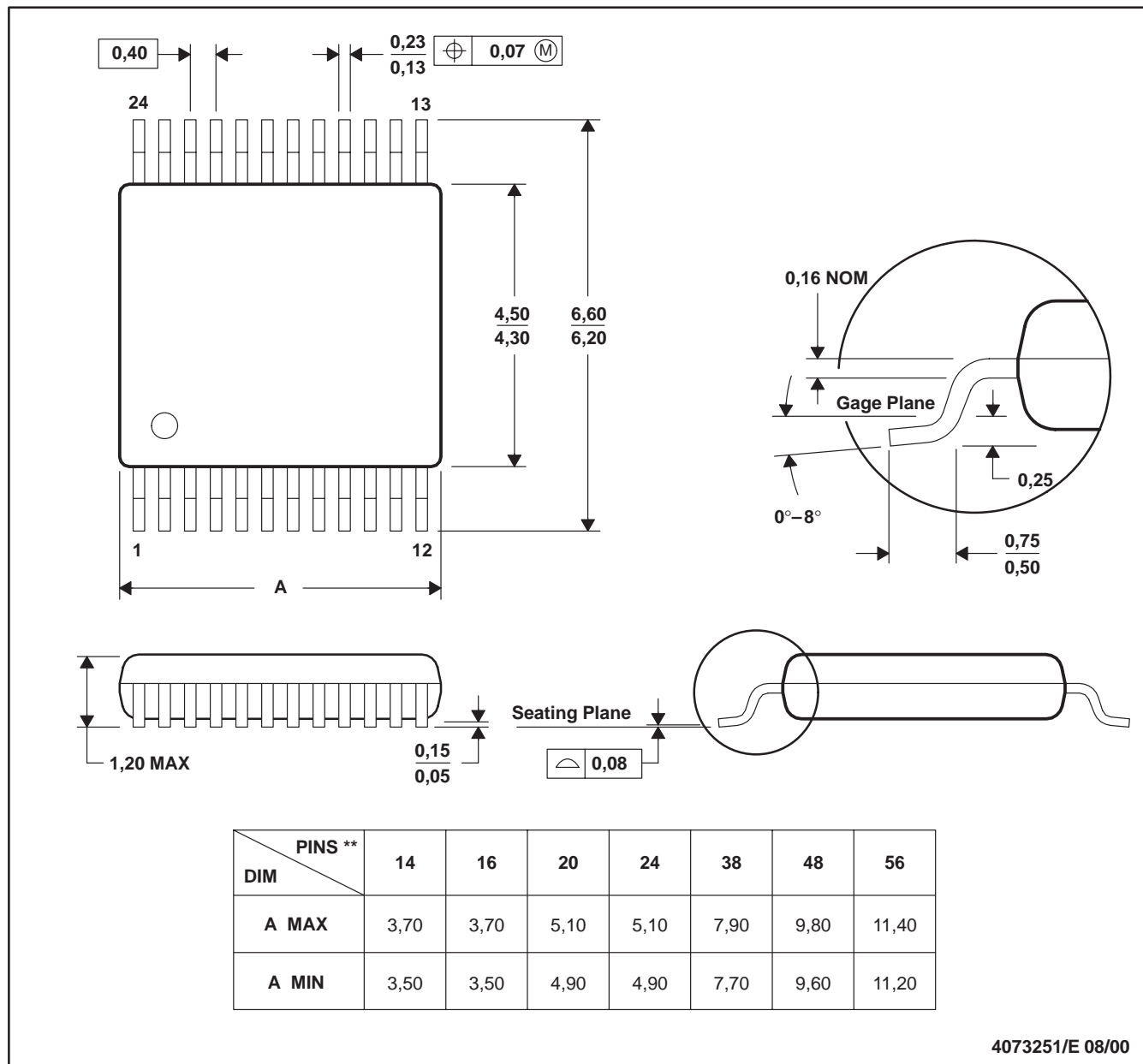
MECHANICAL DATA

MPDS006C – FEBRUARY 1996 – REVISED AUGUST 2000

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN

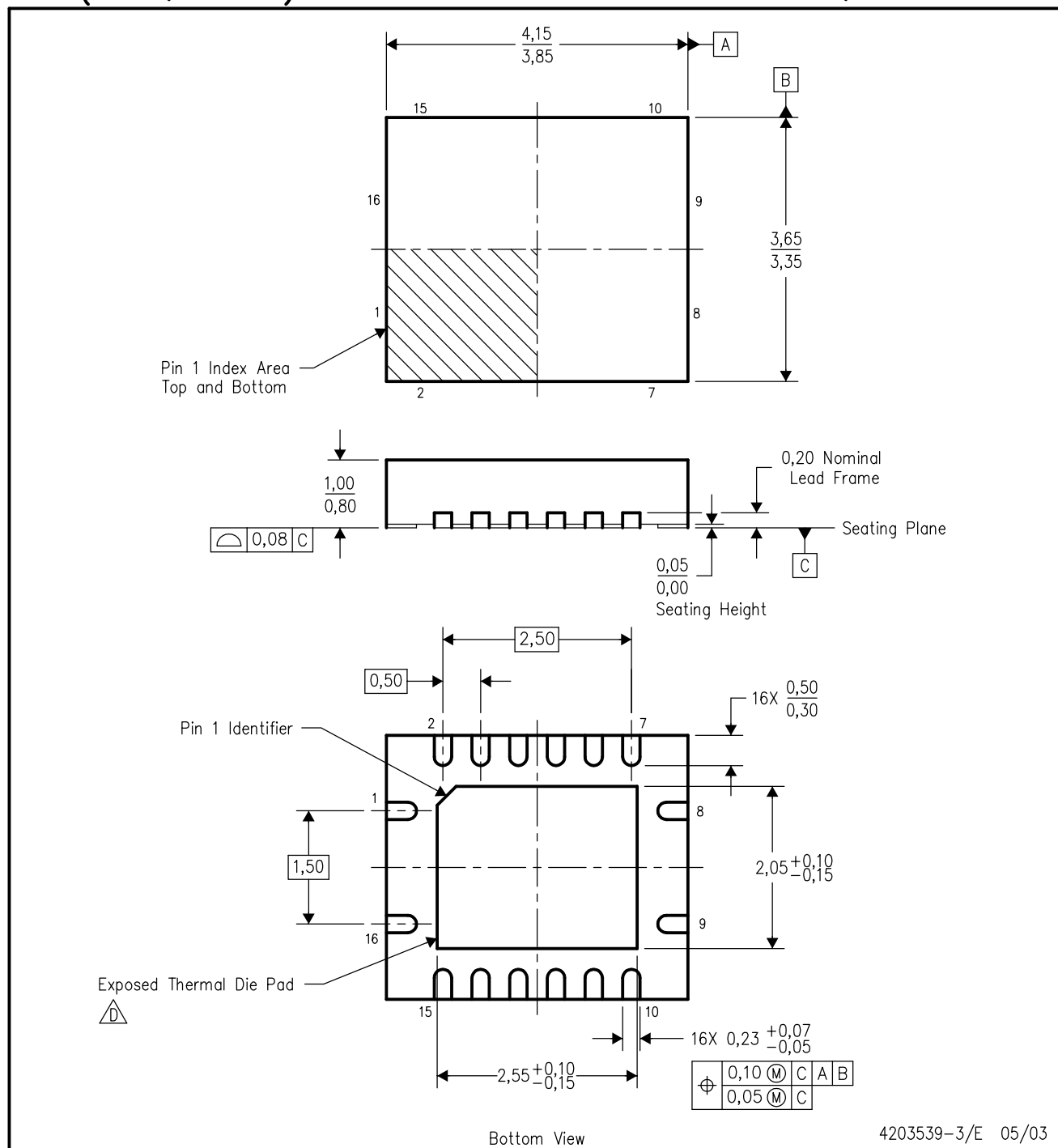



- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

MECHANICAL DATA

RGY (R-PQFP-N16)

PLASTIC QUAD FLATPACK



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 -  D. The package thermal performance may be enhanced by bonding the thermal die pad to an external thermal plane. This pad is electrically and thermally connected to the backside of the die and possibly selected ground leads.
 - E. Package complies to JEDEC MO-241 variation BB.

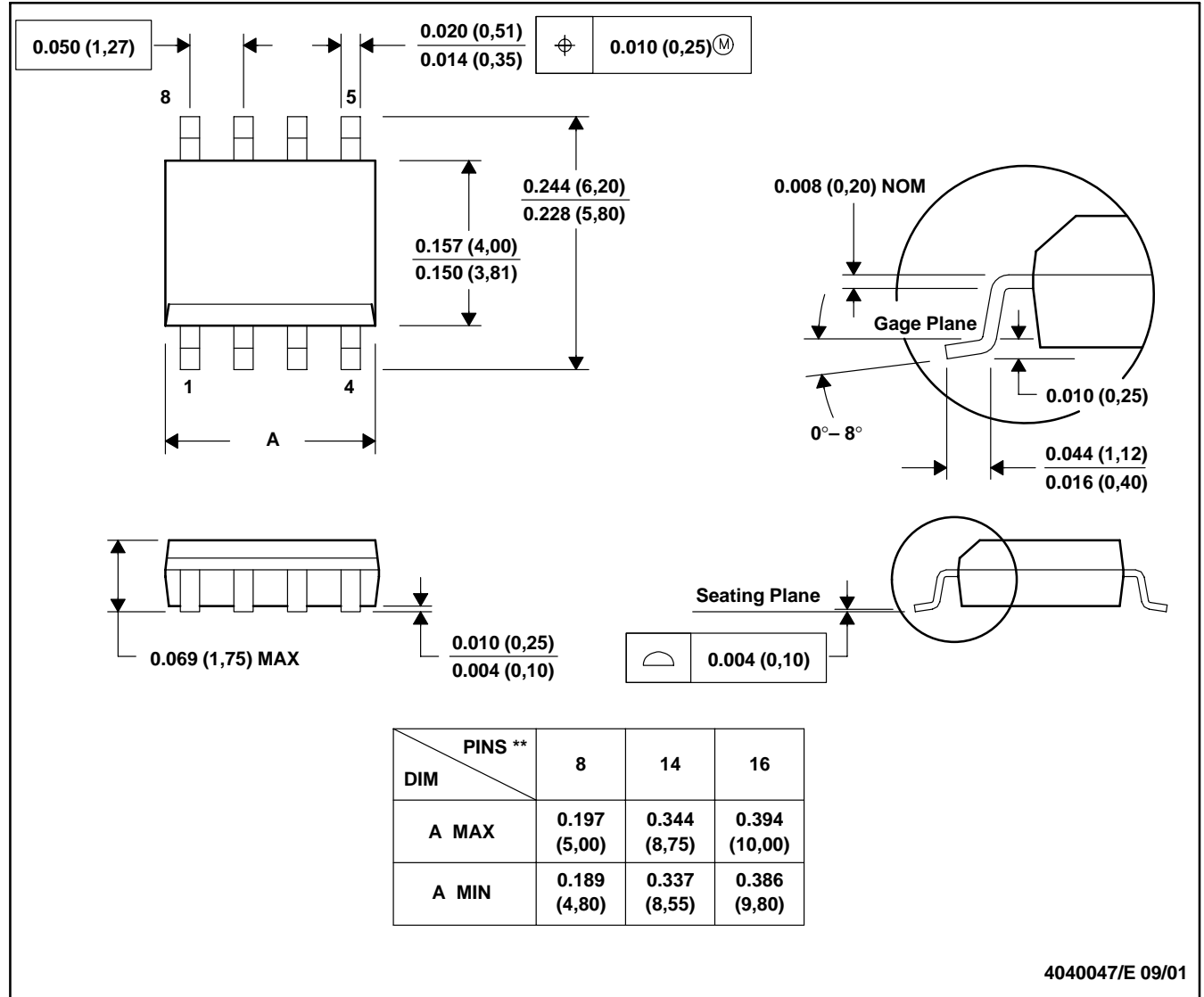
MECHANICAL DATA

MSOI002B – JANUARY 1995 – REVISED SEPTEMBER 2001

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



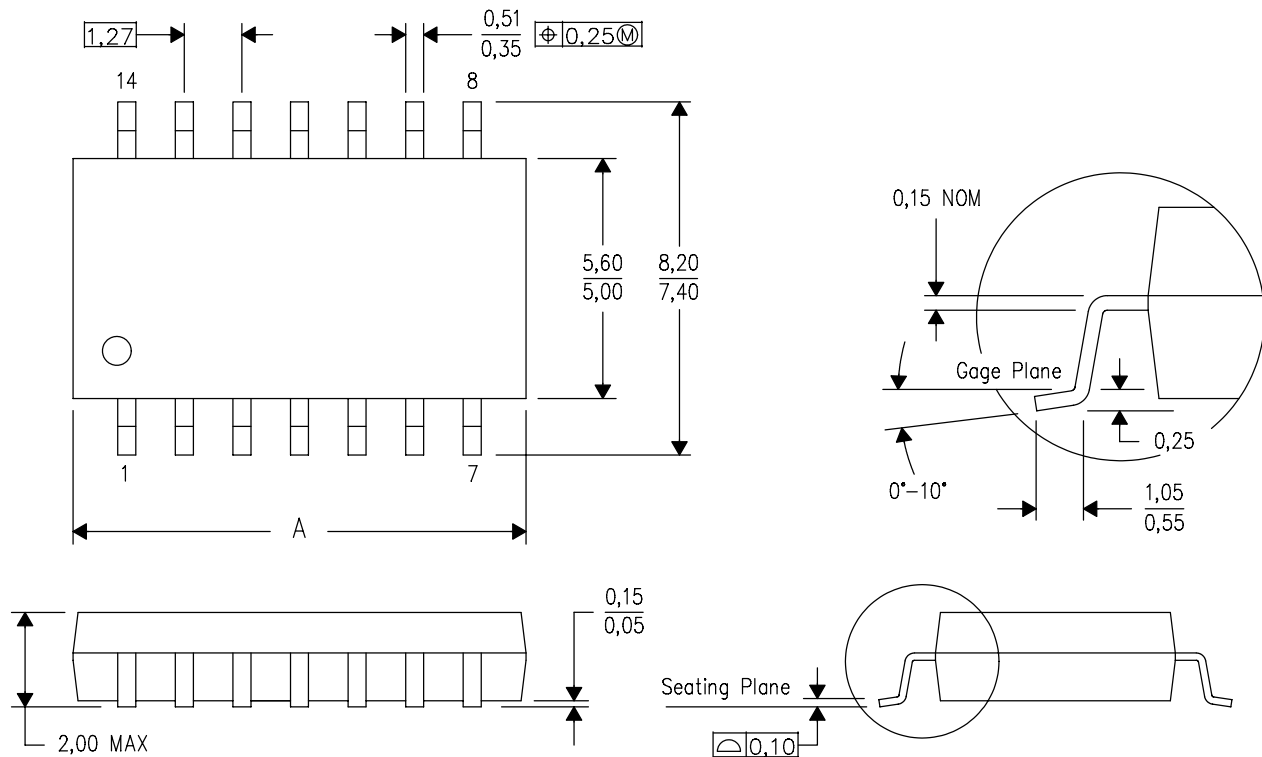
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-012

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

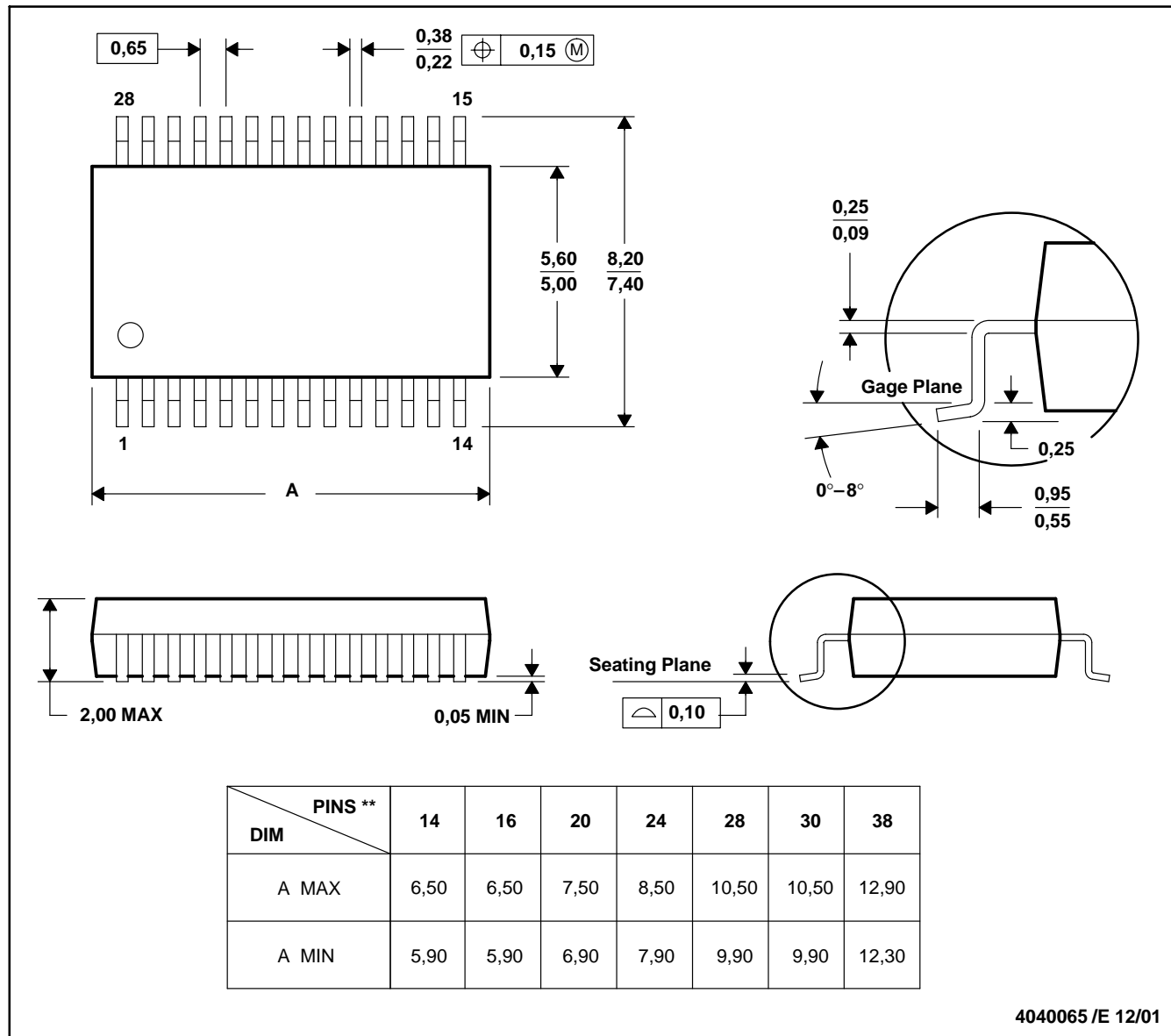
MECHANICAL DATA

MSS0002E – JANUARY 1995 – REVISED DECEMBER 2001

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 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.
 - D. Falls within JEDEC MO-150

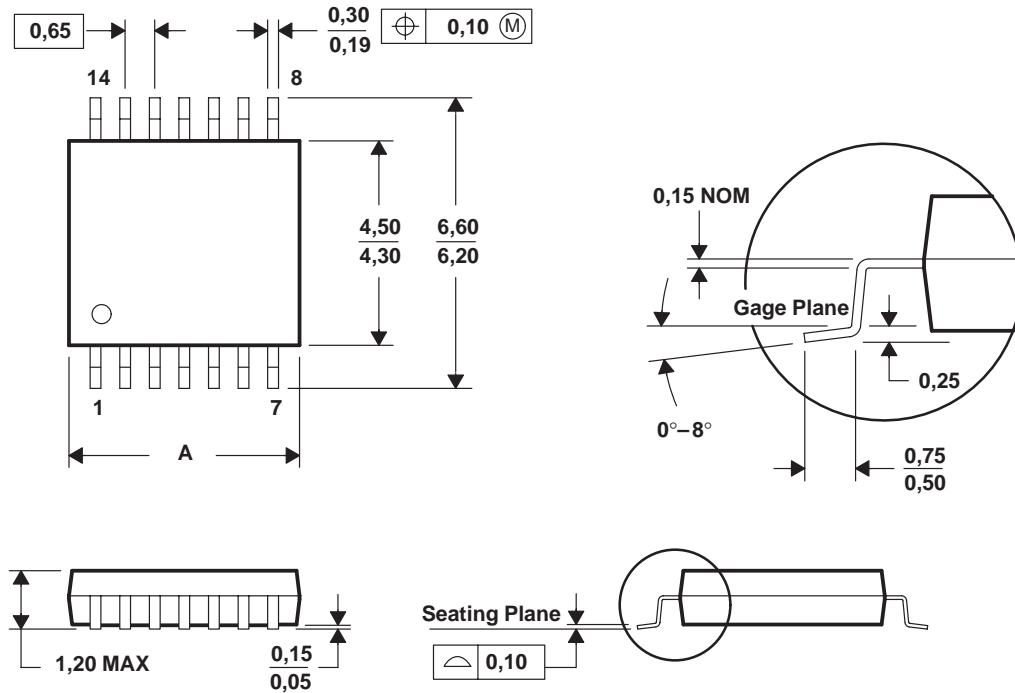
MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



PINS ** DIM	8	14	16	20	24	28
A MAX	3,10	5,10	5,10	6,60	7,90	9,80
A MIN	2,90	4,90	4,90	6,40	7,70	9,60

4040064/F 01/97

- 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.
 - D. Falls within JEDEC MO-153

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