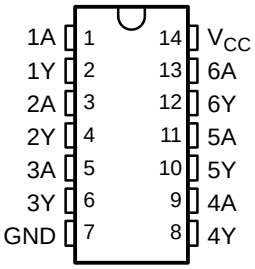
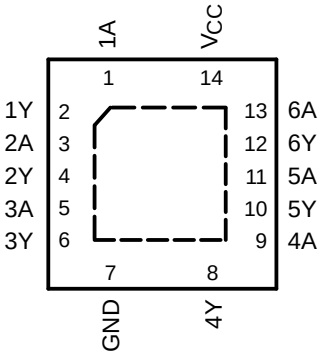
FEATURES

- **Operate From 1.65 V to 3.6 V**
- **Specified From –40°C to 85°C, –40°C to 125°C, and –55°C to 125°C**
- **Inputs Accept Voltages to 5.5 V**
- **Max t_{pd} of 4.5 ns at 3.3 V**
- **Typical V_{OLP} (Output Ground Bounce) <0.8 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at V_{CC} = 3.3 V, T_A = 25°C**
- **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)**

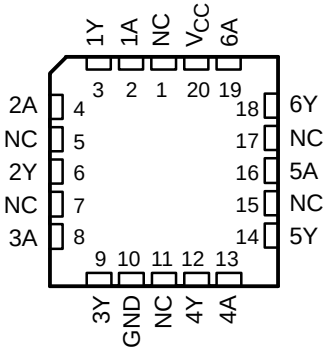
SN54LVC04A . . . J OR W PACKAGE
SN74LVC04A . . . D, DB, DGV, NS, OR PW PACKAGE
(TOP VIEW)



SN74LVC04A . . . RGY PACKAGE
(TOP VIEW)



SN54LVC04A . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

DESCRIPTION/ORDERING INFORMATION

The SN54LVC04A hex inverter contains six independent inverters designed for 2.7-V to 3.6-V V_{CC} operation, and the SN74LVC04A hex inverter contains six independent inverters designed for 1.65-V to 3.6-V V_{CC} operation. The 'LVC04A devices perform the Boolean function $Y = \overline{A}$.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

ORDERING INFORMATION

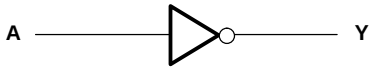
T_A	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGY	Reel of 1000	SN74LVC04ARGYR	LC04A
–40°C to 125°C	SOIC – D	Tube of 50	SN74LVC04AD	LVC04A
		Reel of 2500	SN74LVC04ADR	
		Reel of 250	SN74LVC04ADT	
	SOP – NS	Reel of 2000	SN74LVC04ANSR	LVC04A
	SSOP - DB	Reel of 2000	SN74LVC04ADBR	LC04A
	TSSOP – PW	Tube of 90	SN74LVC04APW	LC04A
		Reel of 2000	SN74LVC04APWR	
		Reel of 250	SN74LVC04APWT	
	TVSOP – DGV	Reel of 2000	SN74LVC04ADGVR	LC04A
–55°C to 125°C	CDIP – J	Tube of 25	SNJ54LVC04AJ	SNJ54LVC04AJ
	CFP – W	Tube of 150	SNJ54LVC04AW	SNJ54LVC04AW
	LCCC – FK	Tube of 55	SNJ54LVC04AFK	SNJ54LVC04AFK

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

FUNCTION TABLE (EACH INVERTER)

INPUT A	OUTPUT Y
H	L
L	H

LOGIC DIAGRAM, EACH INVERTER (POSITIVE LOGIC)



Absolute Maximum Ratings(1)

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		–0.5	6.5	V
V_I	Input voltage range(2)		–0.5	6.5	V
V_O	Output voltage range(2)(3)		–0.5	V_{CC} + 0.5	V
I_{IK}	Input clamp current	V_I < 0		–50	mA
I_{OK}	Output clamp current	V_O < 0		–50	mA
I_O	Continuous output current			±50	mA
	Continuous current through V_{CC} or GND			±100	mA
θ_{JA}	Package thermal impedance	D package (4)		86	°C/W
		DB package(4)		96	
		DGV package(4)		127	
		NS package(4)		76	
		PW package(4)		113	
		RGY package(5)		47	
T_{stg}	Storage temperature range		–65	150	°C
P_{tot}	Power dissipation	T_A = –40°C to 125°C(6)(7)		500	mW

(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 and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
(3) The value of V_{CC} is provided in the recommended operating conditions table.
(4) The package thermal impedance is calculated in accordance with JESD 51-7.
(5) The package thermal impedance is calculated in accordance with JESD 51-5.
(6) For the D package: above 70°C, the value of P_{tot} derates linearly with 8 mW/K.
(7) For the DB, DGV, NS, and PW packages: above 60°C, the value of P_{tot} derates linearly with 5.5 mW/K.

Recommended Operating Conditions(1)

			SN54LVC04A		UNIT
			–55°C to 125°C		
			MIN	MAX	
V_{CC}	Supply voltage	Operating	2	3.6	V
		Data retention only	1.5		
V_{IH}	High-level input voltage	V_{CC} = 2.7 V to 3.6 V	2		V
V_{IL}	Low-level input voltage	V_{CC} = 2.7 V to 3.6 V		0.8	V
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 2.7 V		–12	mA
		V_{CC} = 3 V		–24	
I_{OL}	Low-level output current	V_{CC} = 2.7 V		12	mA
		V_{CC} = 3 V		24	

(1) 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.

Recommended Operating Conditions (1)

			SN74LVC04A						UNIT
			T_A = 25°C		–40°C to 85°C		–40°C to 125°C		
			MIN	MAX	MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	Operating	1.65	3.6	1.65	3.6	1.65	3.6	V
		Data retention only	1.5		1.5		1.5		
V_{IH}	High-level input voltage	V_{CC} = 1.65 V to 1.95 V	0.65 × V_{CC}		0.65 × V_{CC}		0.65 × V_{CC}		V
		V_{CC} = 2.3 V to 2.7 V	1.7		1.7		1.7		
		V_{CC} = 2.7 V to 3.6 V	2		2		2		
V_{IL}	Low-level input voltage	V_{CC} = 1.65 V to 1.95 V		0.35 × V_{CC}		0.35 × V_{CC}		0.35 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		0.7		0.7		0.7	
		V_{CC} = 2.7 V to 3.6 V		0.8		0.8		0.8	
V_I	Input voltage		0	5.5	0	5.5	0	5.5	V
V_O	Output voltage		0	V_{CC}	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 1.65 V		–4		–4		–4	mA
		V_{CC} = 2.3 V		–8		–8		–8	
		V_{CC} = 2.7 V		–12		–12		–12	
		V_{CC} = 3 V		–24		–24		–24	
I_{OL}	Low-level output current	V_{CC} = 1.65 V		4		4		4	mA
		V_{CC} = 2.3 V		8		8		8	
		V_{CC} = 2.7 V		12		12		12	
		V_{CC} = 3 V		24		24		24	

(1) 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}	SN54LVC04A		UNIT
			–55°C to 125°C		
			MIN	MAX	
V_{OH}	I_{OH} = –100 µA	2.7 V to 3.6 V	V_{CC} – 0.2		V
	I_{OH} = –12 mA	2.7 V	2.2		
		3 V	2.4		
	I_{OH} = –24 mA	3 V	2.2		
V_{OL}	I_{OL} = 100 µA	2.7 V to 3.6 V		0.2	V
	I_{OL} = 12 mA	2.7 V		0.4	
	I_{OL} = 24 mA	3 V		0.55	
I_I	V_I = 5.5 V or GND	3.6 V		±5	µA
I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0	3.6 V		10	µA
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	2.7 V to 3.6 V		500	µA

Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V_{CC}	SN74LVC04A						UNIT
			T_A = 25°C			–40°C to 85°C		–40°C to 125°C		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	I_{OH} = –100 µA	1.65 V to 3.6 V	V_{CC} – 0.2			V_{CC} – 0.2		V_{CC} – 0.3		V
	I_{OH} = –4 mA	1.65 V	1.29			1.2		1.05		
	I_{OH} = –8 mA	2.3 V	1.9			1.7		1.55		
	I_{OH} = –12 mA	2.7 V	2.2			2.2		2.05		
		3 V	2.4			2.4		2.25		
	I_{OH} = –24 mA	3 V	2.3			2.2		2		
V_{OL}	I_{OL} = 100 µA	1.65 V to 3.6 V			0.1		0.2		0.3	V
	I_{OL} = 4 mA	1.65 V			0.24		0.45		0.6	
	I_{OL} = 8 mA	2.3 V			0.3		0.7		0.85	
	I_{OL} = 12 mA	2.7 V			0.4		0.4		0.6	
	I_{OL} = 24 mA	3 V			0.55		0.55		0.8	
I_I	V_I = 5.5 V or GND	3.6 V			±1		±5		±20	µA
I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0	3.6 V			1		10		40	µA
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	2.7 V to 3.6 V			500		500		5000	µA
C_i	$V_I = V_{CC}$ or GND	3.3 V		5						pF

Switching Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	SN54LVC04A		UNIT
				–55°C to 125°C		
				MIN	MAX	
t_{pd}	A	Y	2.7 V		5.5	ns
			3.3 V ± 0.3 V	0.5	4.5	

Switching Characteristics

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

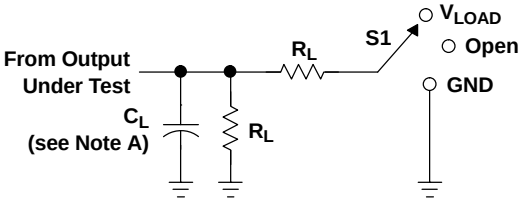
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	SN74LVC04A							UNIT
				T_A = 25°C			–40°C to 85°C		–40°C to 125°C		
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	1.8 V ± 0.15 V	1	4.1	7.5	1	8	1	9.5	ns
			2.5 V ± 0.2 V	1	3.6	7	1	7.5	1	9	
			2.7 V	1	3	5.3	1	5.5	1	7	
			3.3 V ± 0.3 V	1	2.5	4.3	1	4.5	1	6	
$t_{sk(o)}$			3.3 V ± 0.3 V					1		1.5	ns

Operating Characteristics

T_A = 25°C

PARAMETER		TEST CONDITIONS	V_{CC}	TYP	UNIT
C_{pd}	Power dissipation capacitance per gate	f = 10 MHz	1.8 V	6	pF
			2.5 V	7	
			3.3 V	8	

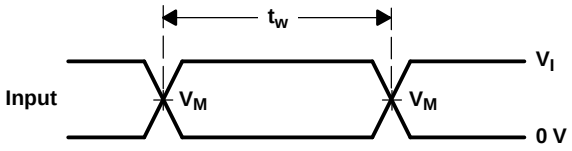
PARAMETER MEASUREMENT INFORMATION



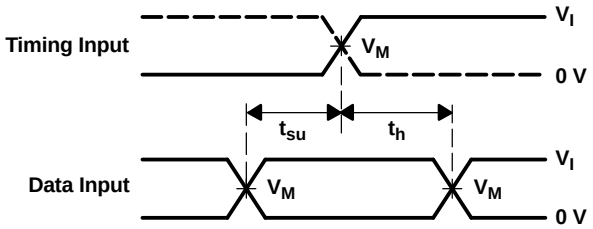
LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

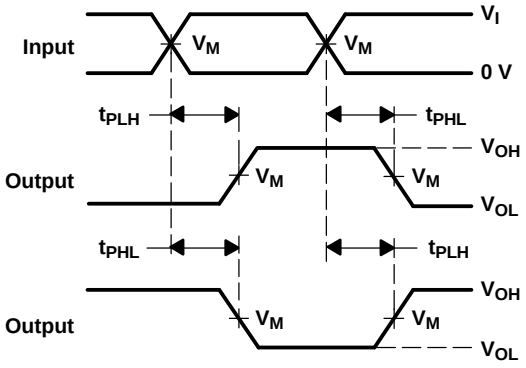
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
1.8 V ± 0.15 V	V_{CC}	≤2 ns	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 kΩ	0.15 V
2.5 V ± 0.2 V	V_{CC}	≤2 ns	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
3.3 V ± 0.3 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V



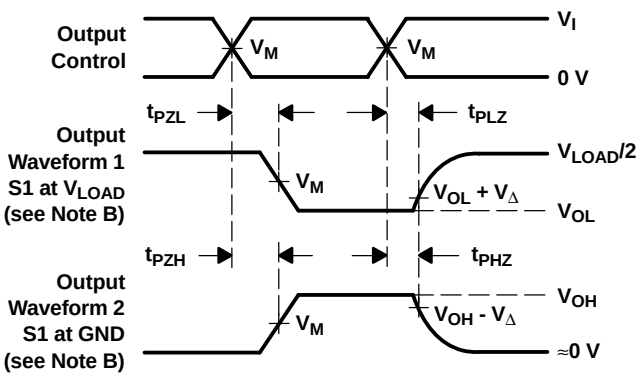
VOLTAGE WAVEFORMS
PULSE DURATION



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 Ω.
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

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
5962-9760501Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9760501QCA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9760501QDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
SN74LVC04AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADBLE	OBSOLETE	SSOP	DB	14		TBD	Call TI	Call TI
SN74LVC04ADBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADGVR	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADGVRE4	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ADTE4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ANSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI
SN74LVC04APWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04APWTE4	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC04ARGYR	ACTIVE	QFN	RGY	14	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
SN74LVC04ARGYRG4	ACTIVE	QFN	RGY	14	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
SNJ54LVC04AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54LVC04AJ	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SNJ54LVC04AW	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type

[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.

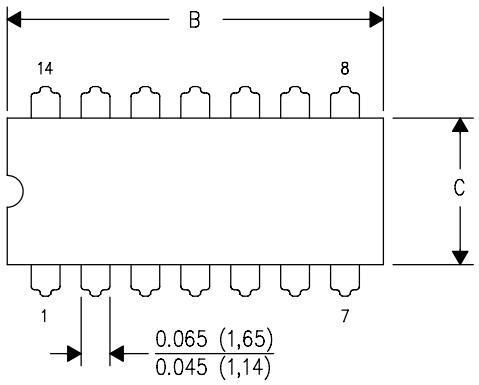
[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been 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.

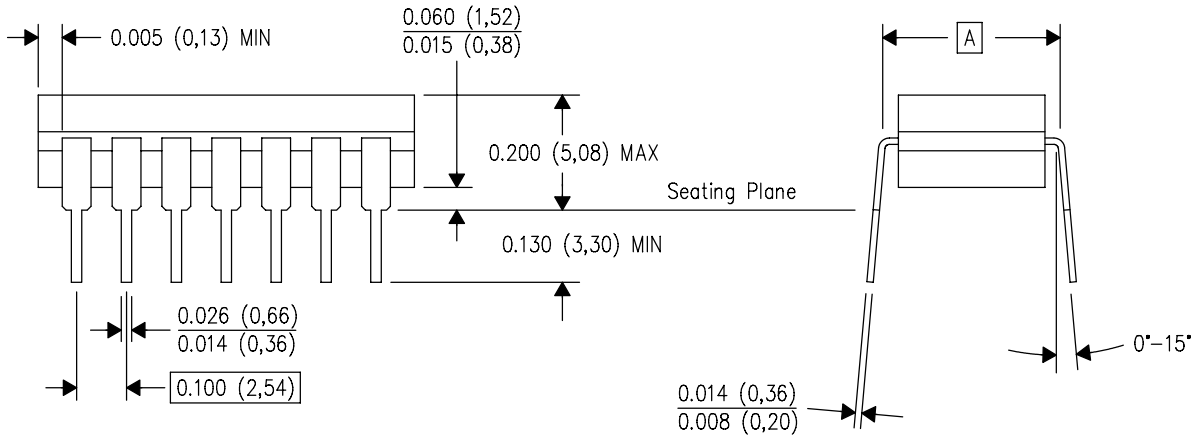
J (R–GDIP–T**)

14 LEADS SHOWN

CERAMIC DUAL IN–LINE PACKAGE



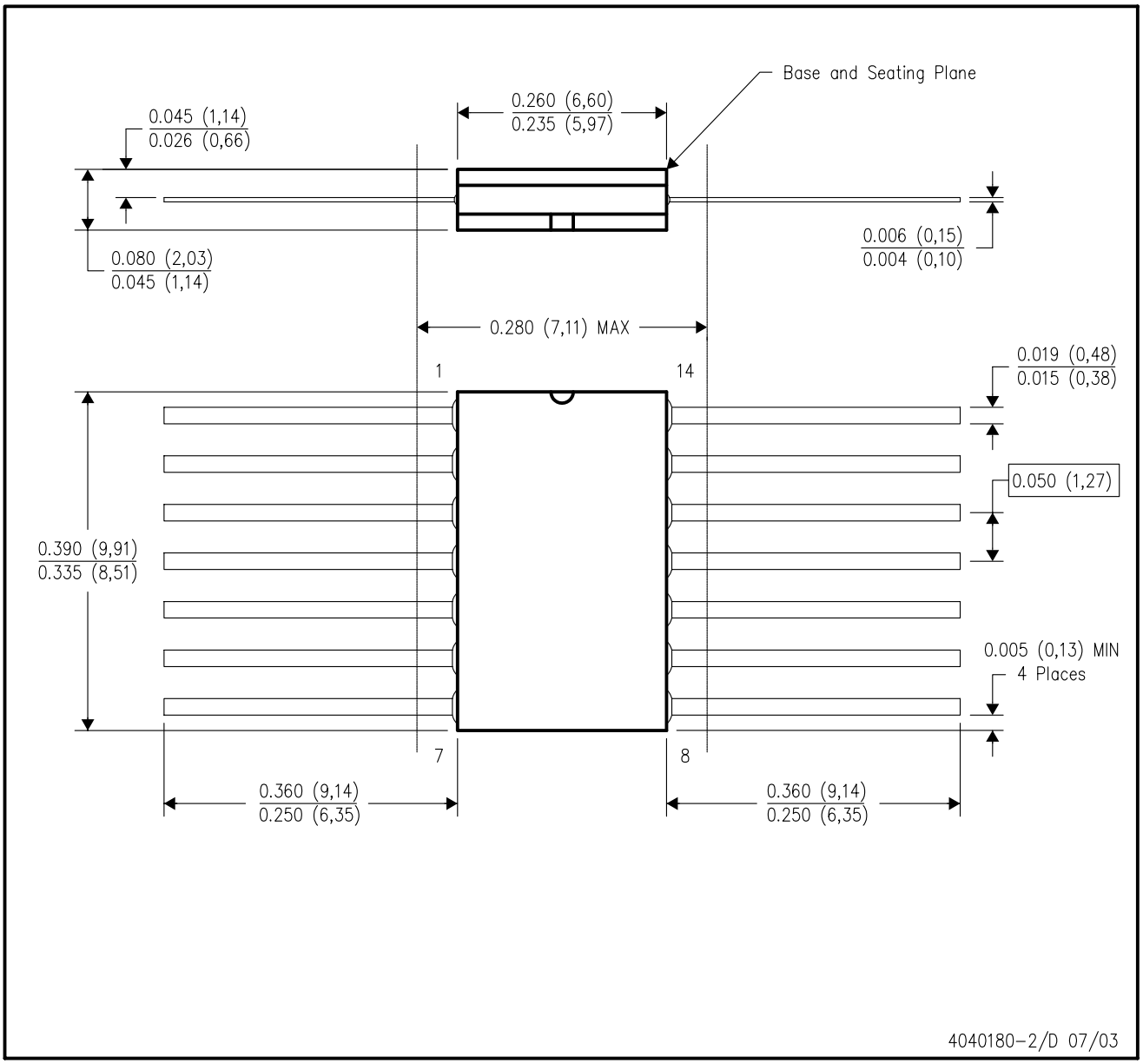
DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package is hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
E. Falls within MIL STD 1835 GDIP1–T14, GDIP1–T16, GDIP1–T18 and GDIP1–T20.

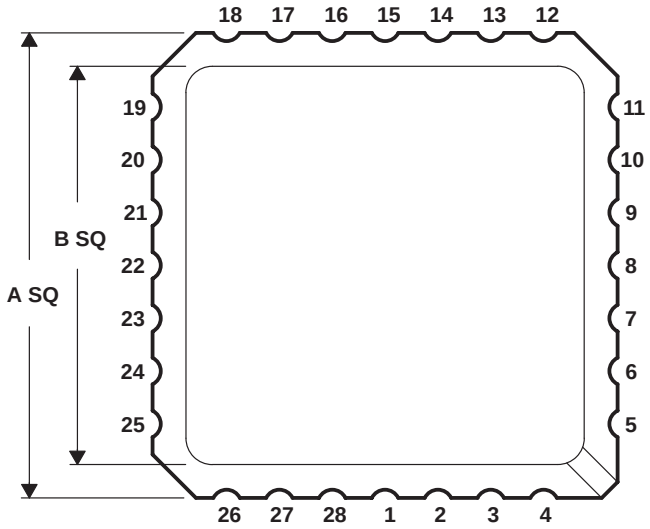
W (R–GDFP–F14) CERAMIC DUAL FLATPACK



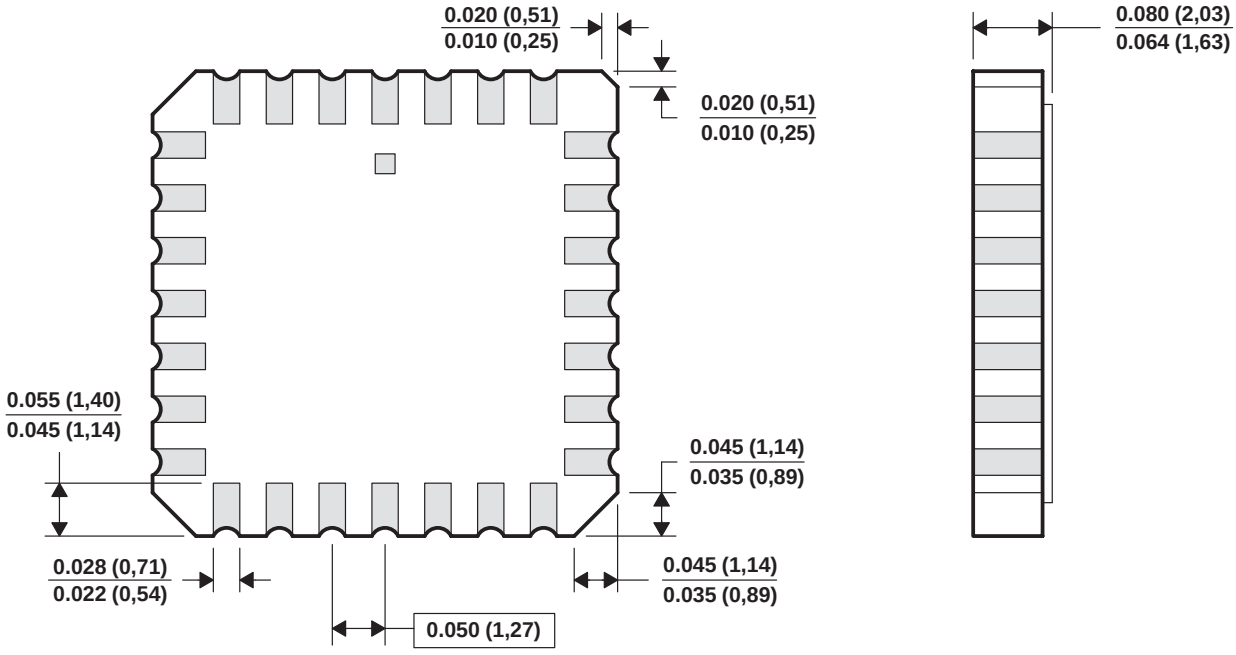
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1–F14 and JEDEC MO–092AB

FK (S-CQCC-N)** **LEADLESS CERAMIC CHIP CARRIER**

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.739 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)

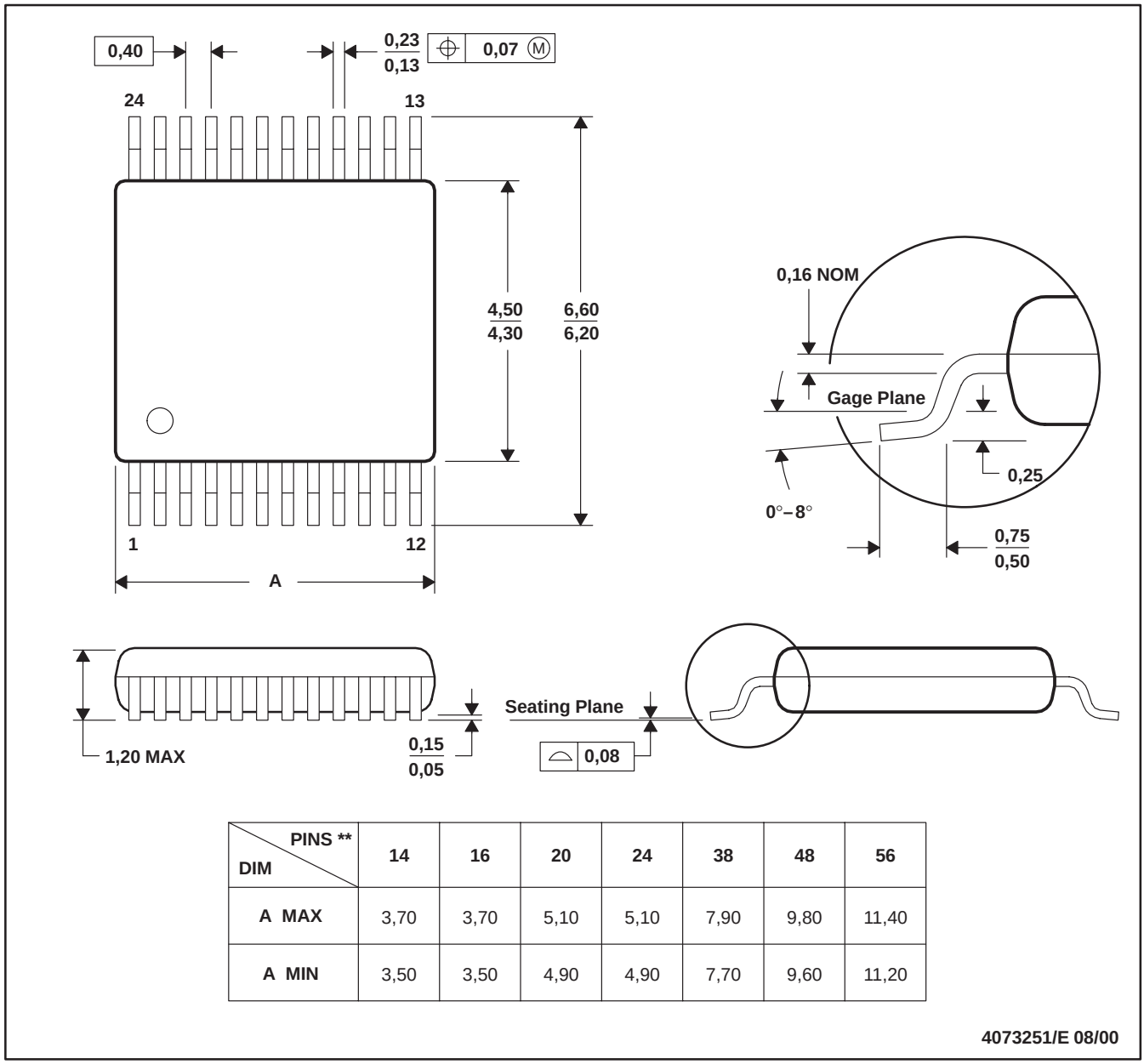


4040140/D 10/96

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a metal lid.
D. The terminals are gold plated.
E. Falls within JEDEC MS-004

DGV (R-PDSO-G)** **PLASTIC SMALL-OUTLINE**

24 PINS SHOWN

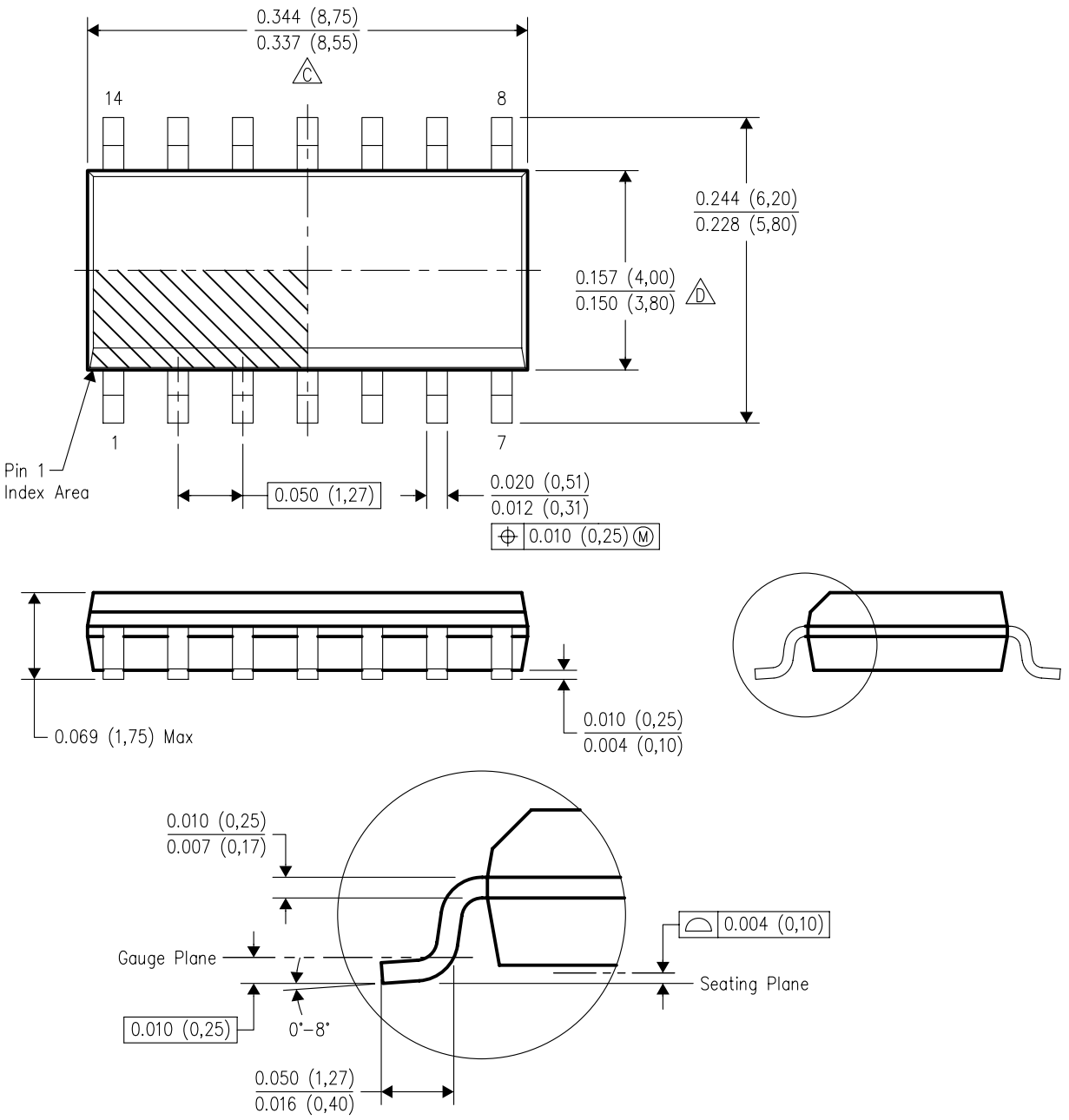


DIM \ PINS **	14	16	20	24	38	48	56
A MAX	3,70	3,70	5,10	5,10	7,90	9,80	11,40
A MIN	3,50	3,50	4,90	4,90	7,70	9,60	11,20

4073251/E 08/00

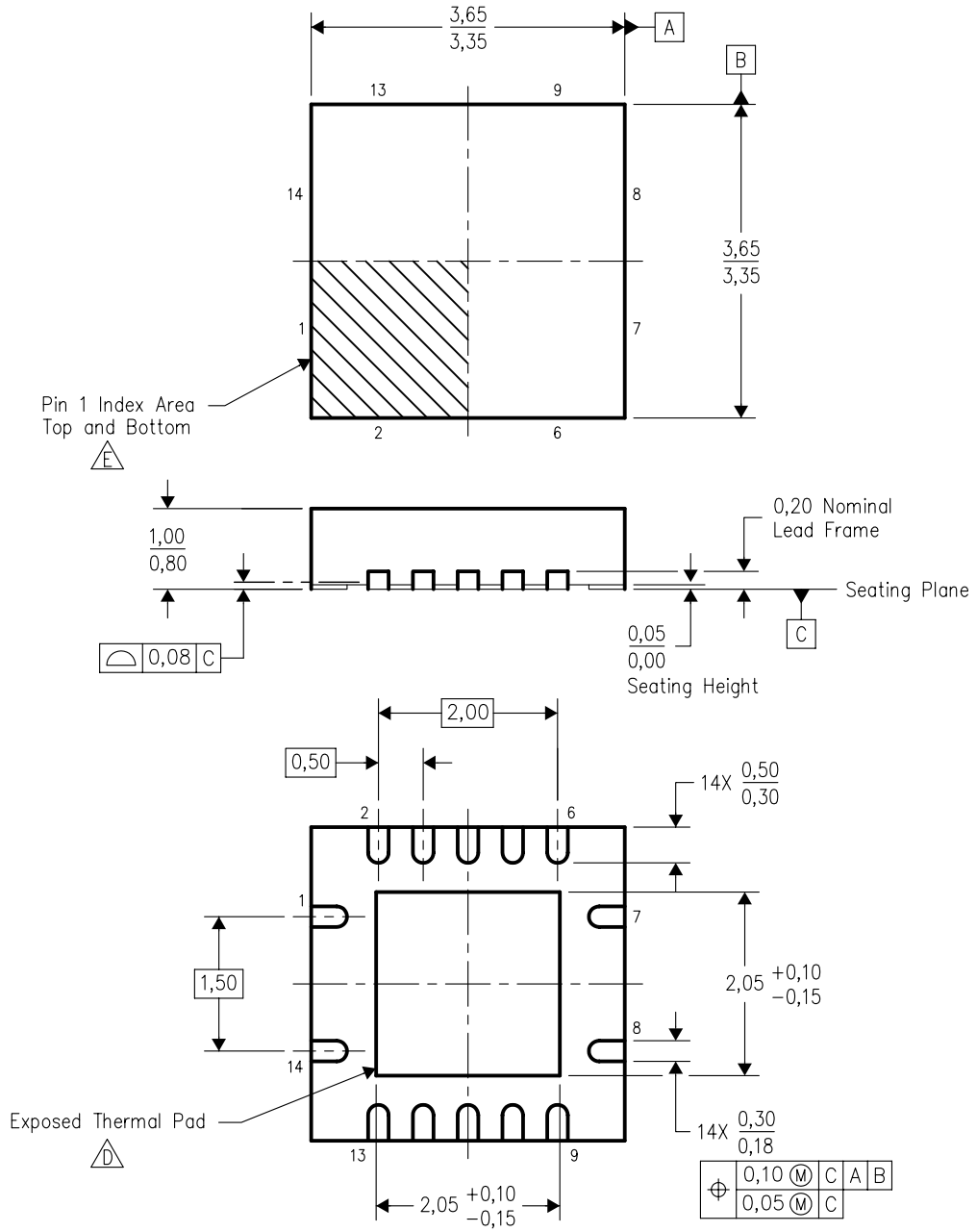
NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
D. Falls within JEDEC: 24/48 Pins – MO-153
14/16/20/56 Pins – MO-194

D (R–PDSO–G14) PLASTIC SMALL–OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
E. Reference JEDEC MS–012 variation AB.

RGY (S–PQFP–N14) PLASTIC QUAD FLATPACK



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
F. Package complies to JEDEC MO–241 variation BA.

THERMAL PAD MECHANICAL DATA

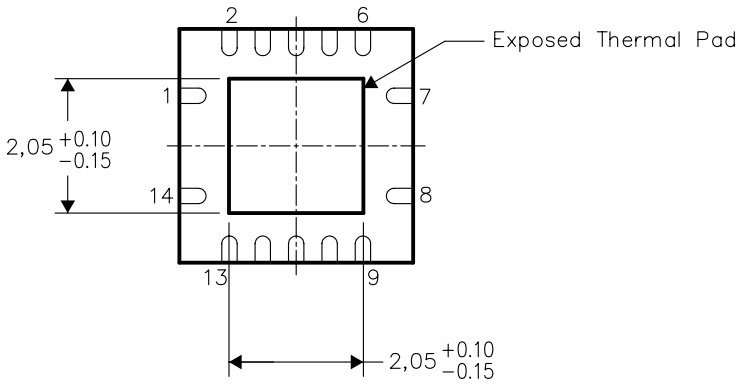
RGY (S–PQFP–N14)

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB), the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to a ground plane or special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, Quad Flatpack No–Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.

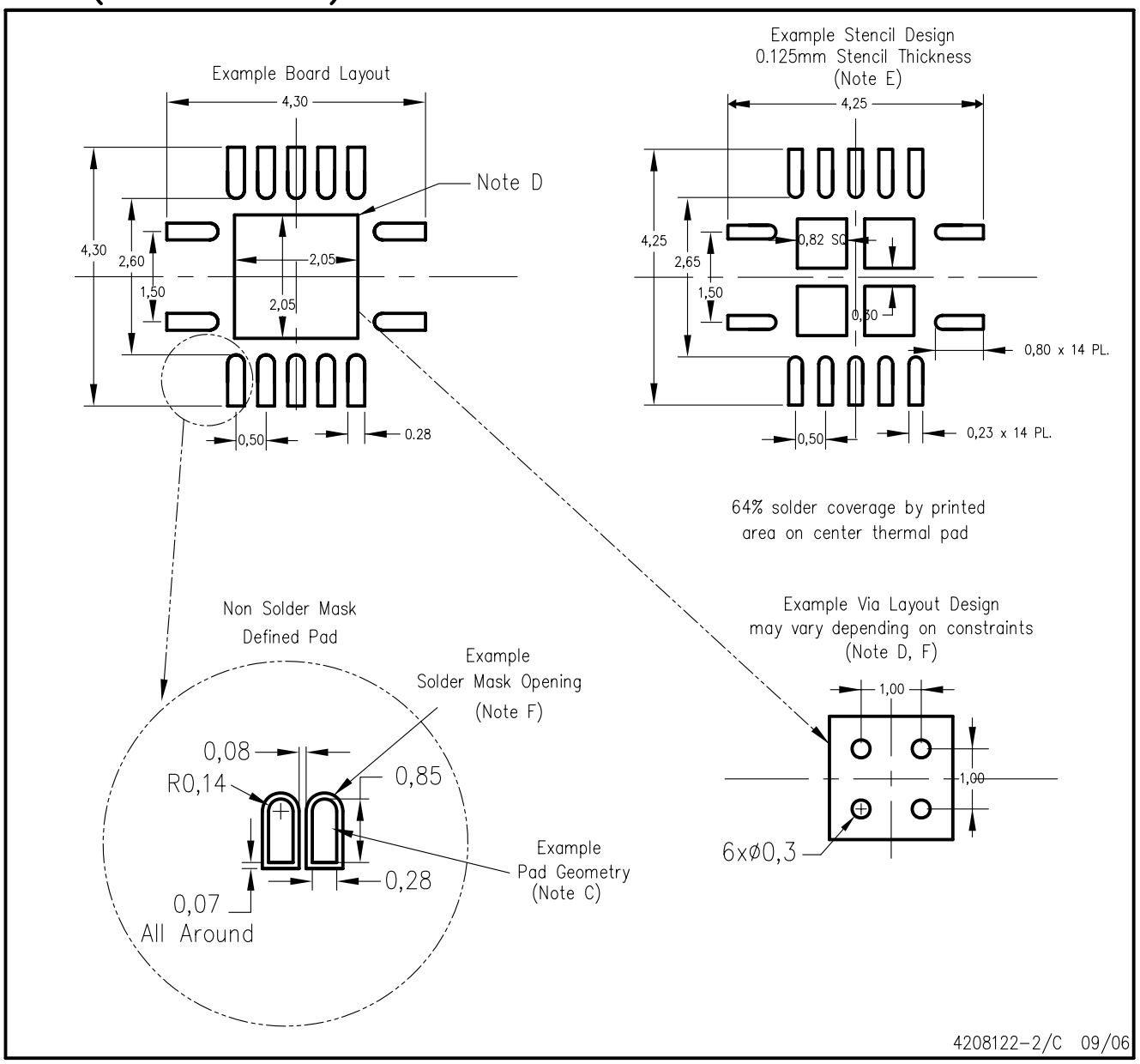


Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

RGY (R–PQFP–N14)

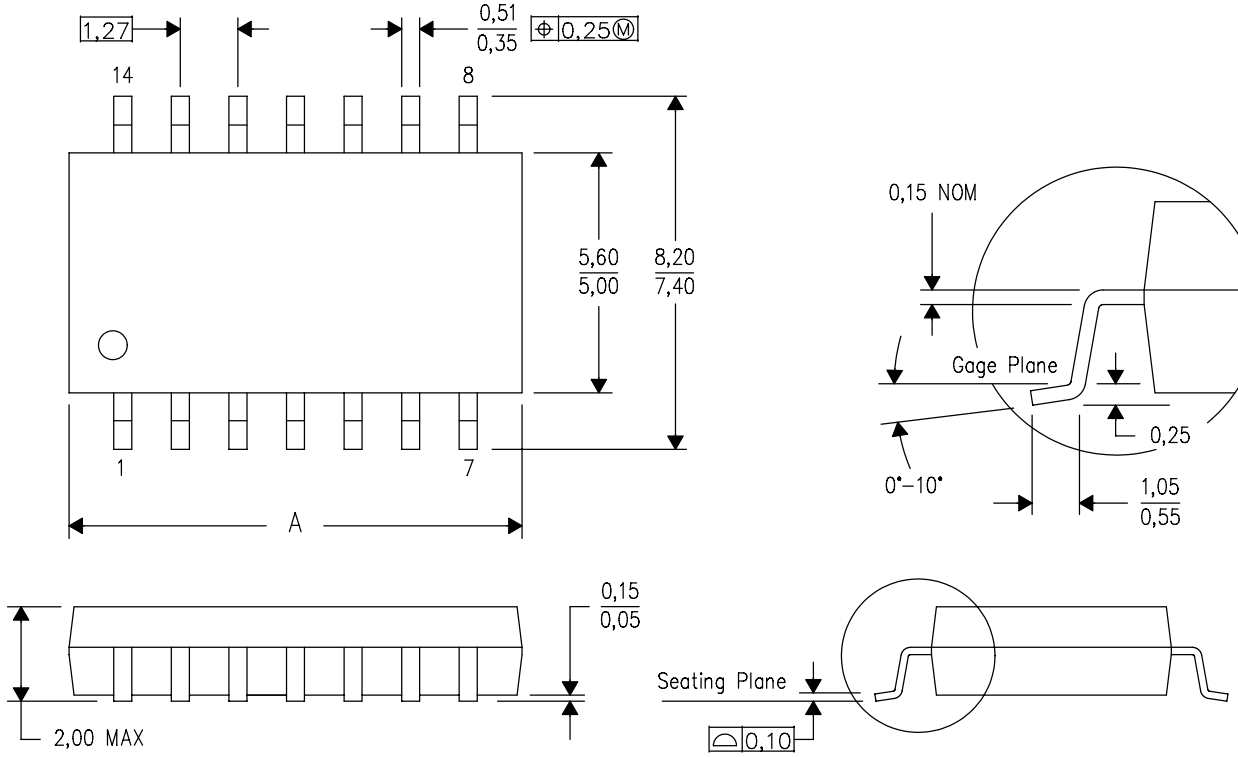


NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat–Pack Packages, Texas Instruments Literature No. SCBA017, SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http://www.ti.com>.
E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

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

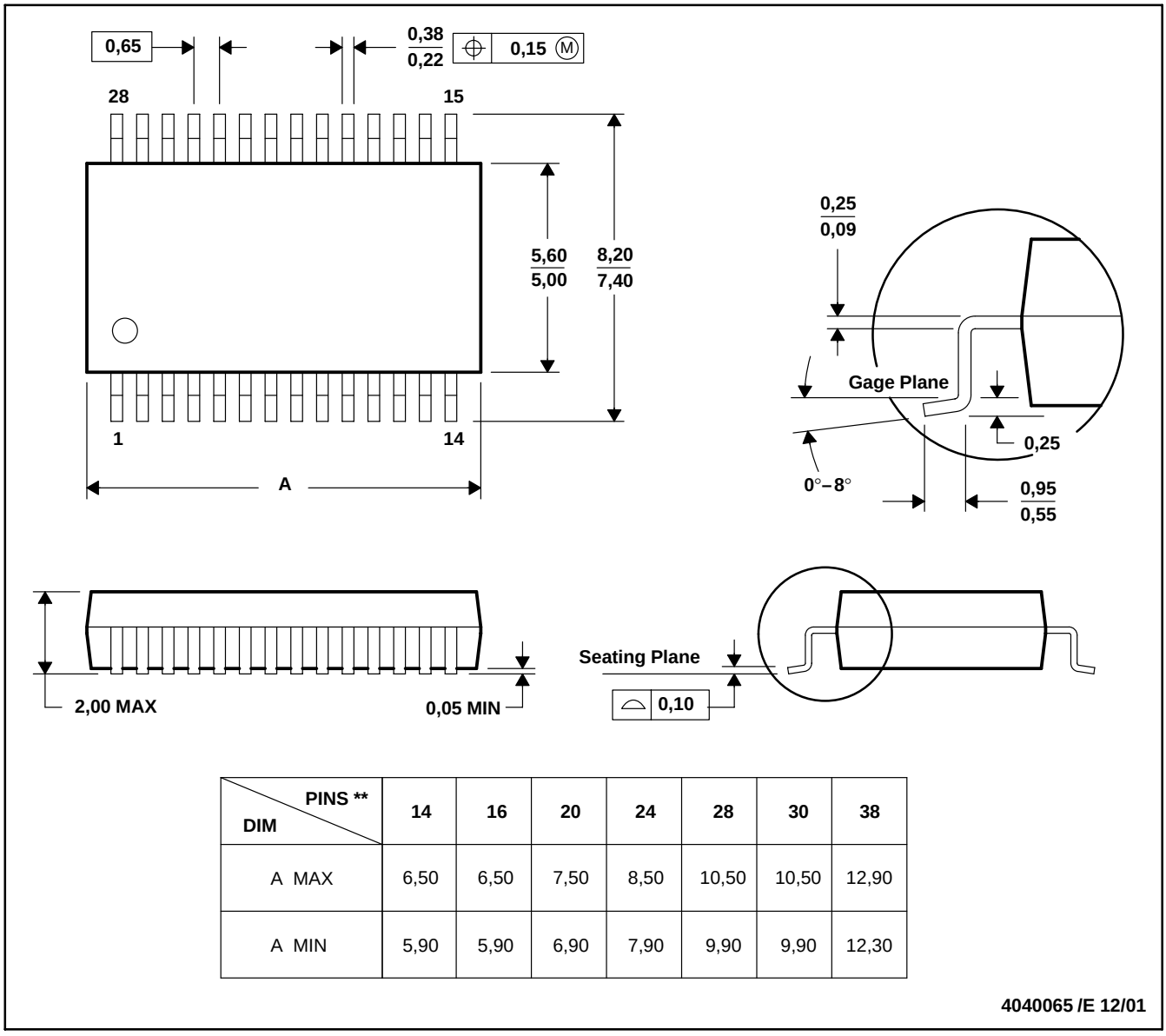
4040062/C 03/03

NOTES:
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.

MSSO002E – JANUARY 1995 – REVISED DECEMBER 2001

DB (R-PDSO-G)** **PLASTIC SMALL-OUTLINE**

28 PINS SHOWN



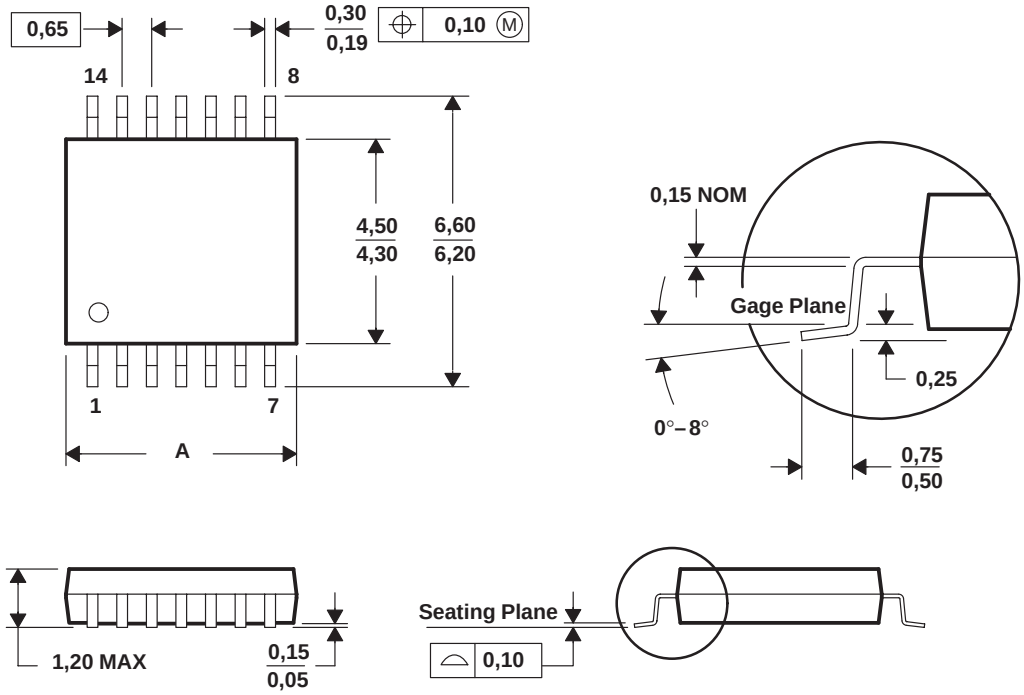
DIM \ PINS **	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

4040065 /E 12/01

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

PW (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14 PINS SHOWN



DIM \ PINS **	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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