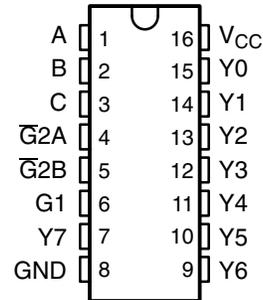


SN54HC138, SN74HC138 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

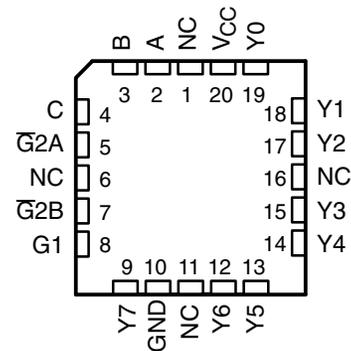
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- Targeted Specifically for High-Speed Memory Decoders and Data-Transmission Systems
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 80- μ A Max I_{CC}
- Typical $t_{pd} = 15$ ns
- ± 4 -mA Output Drive at 5 V
- Low Input Current of 1 μ A Max
- Incorporate Three Enable Inputs to Simplify Cascading and/or Data Reception

SN54HC138 . . . J OR W PACKAGE
SN74HC138 . . . D, DB, N, NS, OR PW PACKAGE
(TOP VIEW)



SN54HC138 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The 'HC138 devices are designed to be used in high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, these decoders can be used to minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay times of these decoders and the enable time of the memory are usually less than the typical access time of the memory. This means that the effective system delay introduced by the decoders is negligible.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube of 25	SN74HC138N	SN74HC138N
	SOIC – D	Tube of 40	SN74HC138D	HC138
		Reel of 2500	SN74HC138DR	
		Reel of 250	SN74HC138DT	
	SOP – NS	Reel of 2000	SN74HC138NSR	HC138
	SSOP – DB	Reel of 2000	SN74HC138DBR	HC138
	TSSOP – PW	Tube of 90	SN74HC138PW	HC138
Reel of 2000		SN74HC138PWR		
Reel of 250		SN74HC138PWT		
-55°C to 125°C	CDIP – J	Tube of 25	SNJ54HC138J	SNJ54HC138J
	CFP – W	Tube of 150	SNJ54HC138W	SNJ54HC138W
	LCCC – FK	Tube of 55	SNJ54HC138FK	SNJ54HC138FK

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



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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.

 **TEXAS
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54HC138, SN74HC138

3-LINE TO 8-LINE DECODERS/DEMULPLEXERS

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description/ordering information (continued)

The conditions at the binary-select inputs at the three enable inputs select one of eight output lines. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters, and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

FUNCTION TABLE

INPUTS						OUTPUTS							
ENABLE			SELECT										
G1	$\overline{G2A}$	$\overline{G2B}$	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	L	H	H	H	H	H	L	H	H	H	H
H	L	L	H	L	L	H	H	H	H	L	H	H	H
H	L	L	H	H	L	H	H	H	H	H	L	H	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L

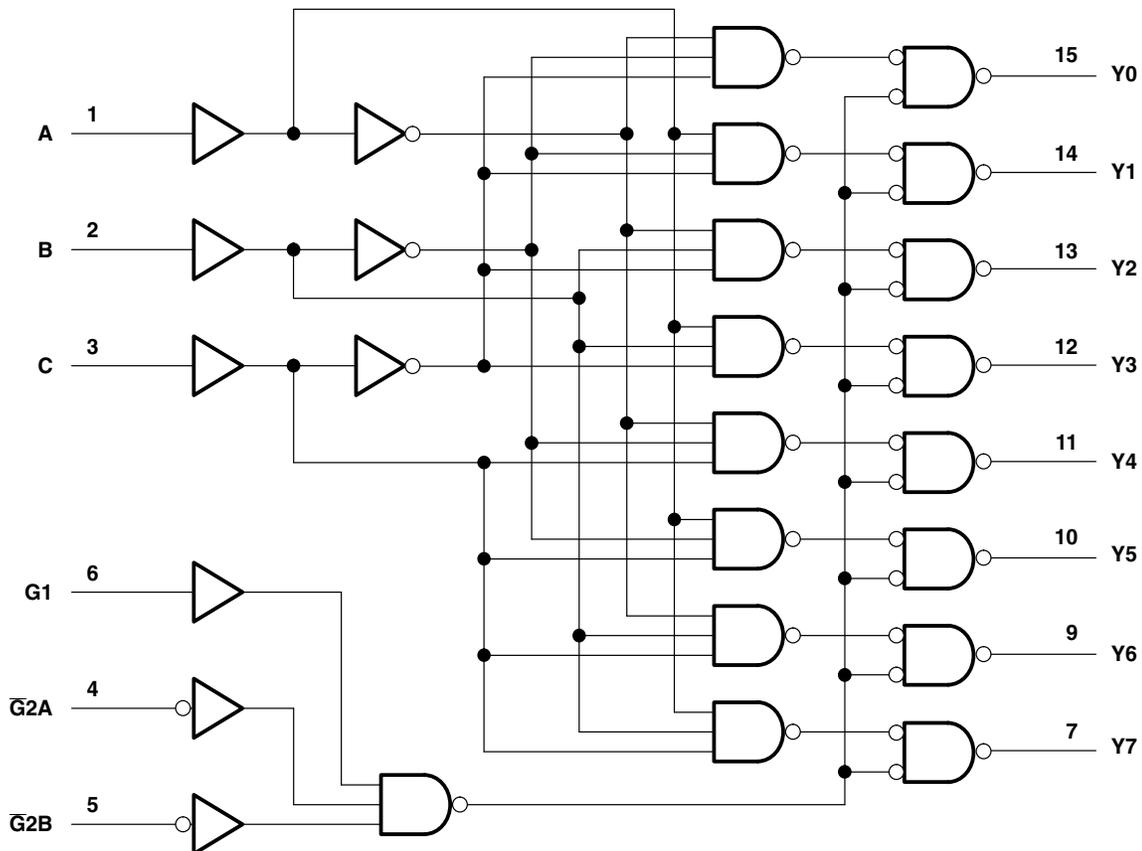


SN54HC138, SN74HC138

3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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logic diagram (positive logic)



Pin numbers shown are for the D, DB, J, N, NS, PW, 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 clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1)	± 20 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 2):	
D package	73°C/W
DB package	82°C/W
N package	67°C/W
NS package	64°C/W
PW package	108°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. The package thermal impedance is calculated in accordance with JESD 51-7.

SN54HC138, SN74HC138

3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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recommended operating conditions (see Note 3)

		SN54HC138			SN74HC138			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	2	5	6	2	5	6	V
V_{IH}	High-level input voltage	$V_{CC} = 2\text{ V}$		1.5	1.5		V	
		$V_{CC} = 4.5\text{ V}$		3.15	3.15			
		$V_{CC} = 6\text{ V}$		4.2	4.2			
V_{IL}	Low-level input voltage	$V_{CC} = 2\text{ V}$			0.5	0.5	V	
		$V_{CC} = 4.5\text{ V}$			1.35	1.35		
		$V_{CC} = 6\text{ V}$			1.8	1.8		
V_I	Input voltage	0		V_{CC}	0	V_{CC}	V	
V_O	Output voltage	0		V_{CC}	0	V_{CC}	V	
$\Delta t/\Delta v$	Input transition rise/fall time	$V_{CC} = 2\text{ V}$			1000	1000	ns	
		$V_{CC} = 4.5\text{ V}$			500	500		
		$V_{CC} = 6\text{ V}$			400	400		
T_A	Operating free-air temperature	-55		125	-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.

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

PARAMETER	TEST CONDITIONS		V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC138		SN74HC138		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL}	$I_{OH} = -20\ \mu\text{A}$	2 V	1.9	1.998		1.9	1.9	V		
			4.5 V	4.4	4.499		4.4	4.4			
			6 V	5.9	5.999		5.9	5.9			
		$I_{OH} = -4\ \text{mA}$	4.5 V	3.98	4.3		3.7	3.84			
		$I_{OH} = -5.2\ \text{mA}$	6 V	5.48	5.8		5.2	5.34			
V_{OL}	$V_I = V_{IH}$ or V_{IL}	$I_{OL} = 20\ \mu\text{A}$	2 V		0.002	0.1	0.1	0.1	V		
			4.5 V		0.001	0.1	0.1	0.1			
			6 V		0.001	0.1	0.1	0.1			
		$I_{OL} = 4\ \text{mA}$	4.5 V		0.17	0.26	0.4	0.33			
		$I_{OL} = 5.2\ \text{mA}$	6 V		0.15	0.26	0.4	0.33			
I_I	$V_I = V_{CC}$ or 0		6 V		± 0.1	± 100	± 1000	± 1000	nA		
I_{CC}	$V_I = V_{CC}$ or 0, $I_O = 0$		6 V			8	160	80	μA		
C_i			2 V to 6 V		3	10	10	10	pF		



SN54HC138, SN74HC138 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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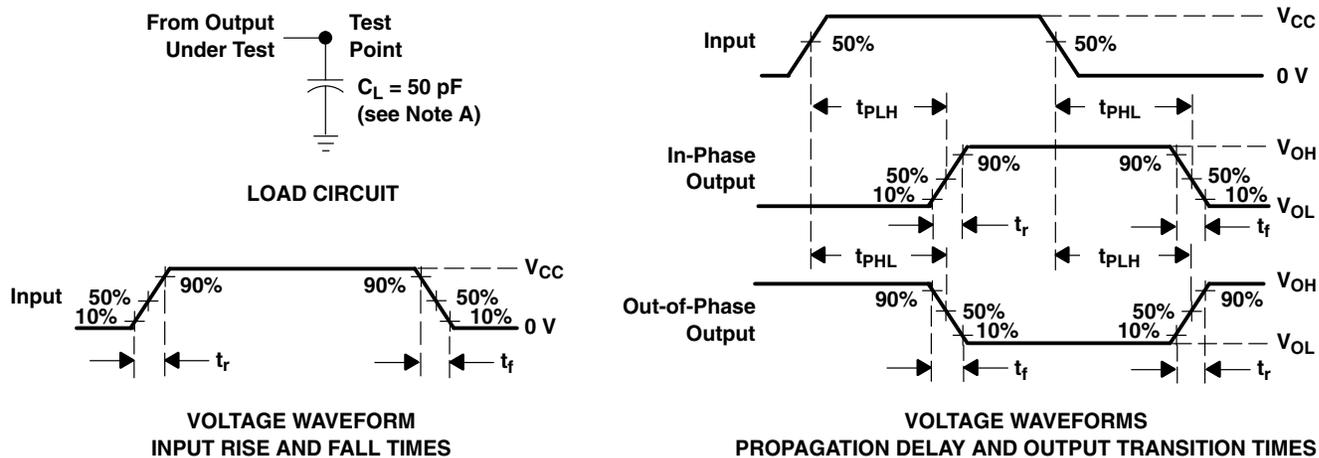
switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC138		SN74HC138		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A, B, or C	Any Y	2 V		67	180		270		225	ns
			4.5 V		18	36		54		45	
			6 V		15	31		46		38	
	Enable	Any Y	2 V		66	155		235		195	
			4.5 V		18	31		47		39	
			6 V		15	26		40		33	
t_t		Any	2 V		38	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	No load	85	pF

PARAMETER MEASUREMENT INFORMATION



- NOTES:
- C_L includes probe and test-fixture capacitance.
 - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - The outputs are measured one at a time with one input transition per measurement.
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

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 (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8406201VEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8406201VE A SNV54HC138J	Samples
5962-8406201VFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8406201VF A SNV54HC138W	Samples
84062012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84062012A SNJ54HC 138FK	Samples
8406201EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8406201EA SNJ54HC138J	Samples
8406201FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8406201FA SNJ54HC138W	Samples
JM38510/65802B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 65802B2A	Samples
JM38510/65802BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65802BEA	Samples
JM38510/65802BFA	NRND	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65802BFA	
M38510/65802B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 65802B2A	Samples
M38510/65802BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65802BEA	Samples
M38510/65802BFA	NRND	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65802BFA	
SN54HC138J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54HC138J	Samples
SN74HC138D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DBRG4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC138DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU CU SN	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DT	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DTE4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138DTG4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC138N	Samples
SN74HC138N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	-40 to 85		
SN74HC138NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC138N	Samples
SN74HC138NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138NSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWLE	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85		
SN74HC138PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC138PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWTE4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SN74HC138PWTG4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC138	Samples
SNJ54HC138FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84062012A SNJ54HC 138FK	Samples
SNJ54HC138J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8406201EA SNJ54HC138J	Samples
SNJ54HC138W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8406201FA SNJ54HC138W	Samples

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "--" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN54HC138, SN54HC138-SP, SN74HC138 :

- Catalog: [SN74HC138](#), [SN54HC138](#)

- Automotive: [SN74HC138-Q1](#), [SN74HC138-Q1](#)

- Military: [SN54HC138](#)

- Space: [SN54HC138-SP](#)

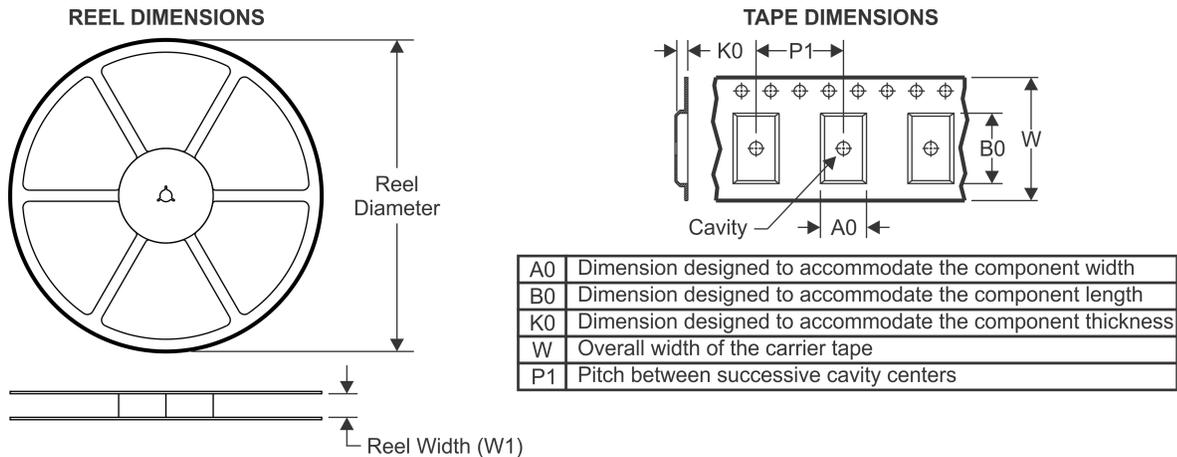
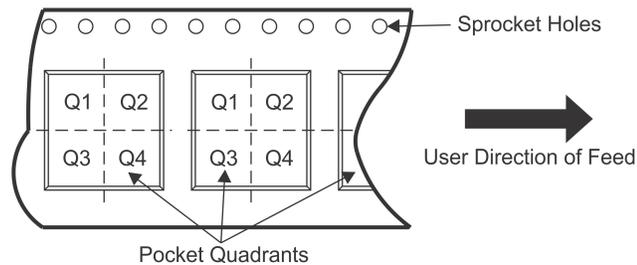
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

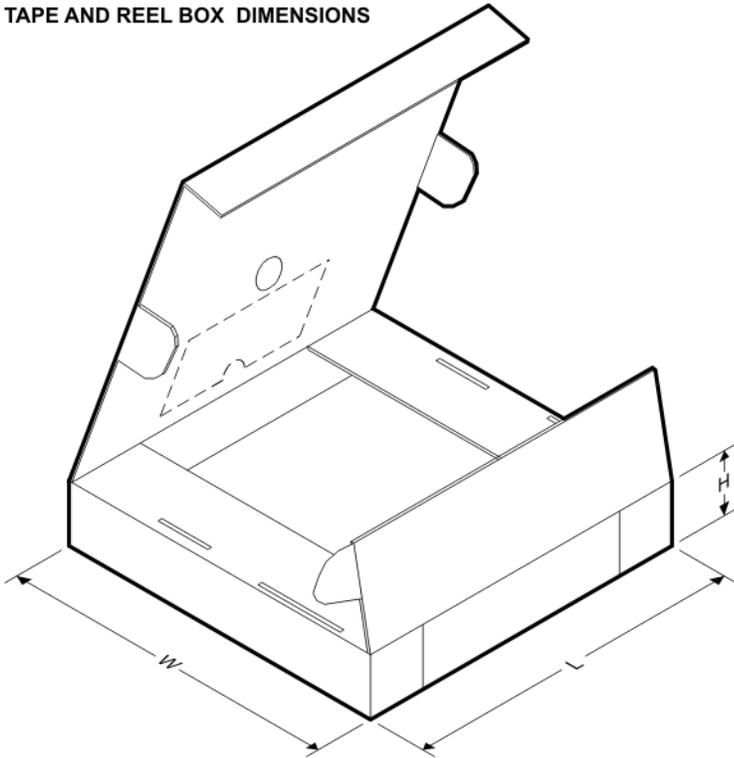
- Military - QML certified for Military and Defense Applications

- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HC138DBR	SSOP	DB	16	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74HC138DR	SOIC	D	16	2500	330.0	16.8	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC138DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC138DRG4	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC138PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC138PWT	TSSOP	PW	16	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS


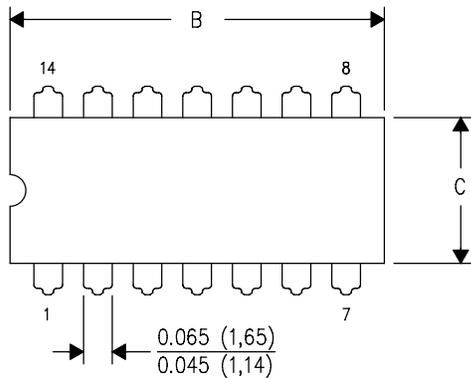
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC138DBR	SSOP	DB	16	2000	367.0	367.0	38.0
SN74HC138DR	SOIC	D	16	2500	364.0	364.0	27.0
SN74HC138DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74HC138DRG4	SOIC	D	16	2500	333.2	345.9	28.6
SN74HC138PWR	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74HC138PWT	TSSOP	PW	16	250	367.0	367.0	35.0

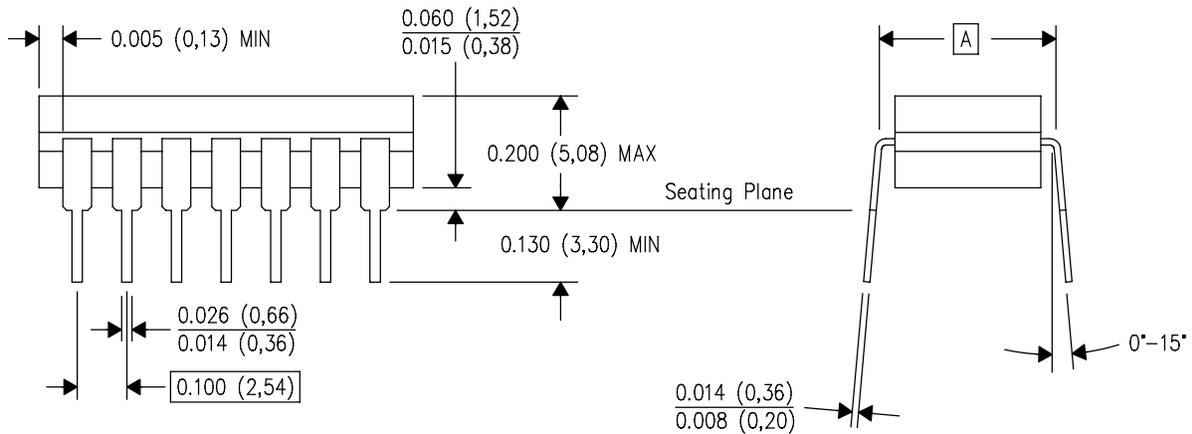
J (R-GDIP-T**)

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)

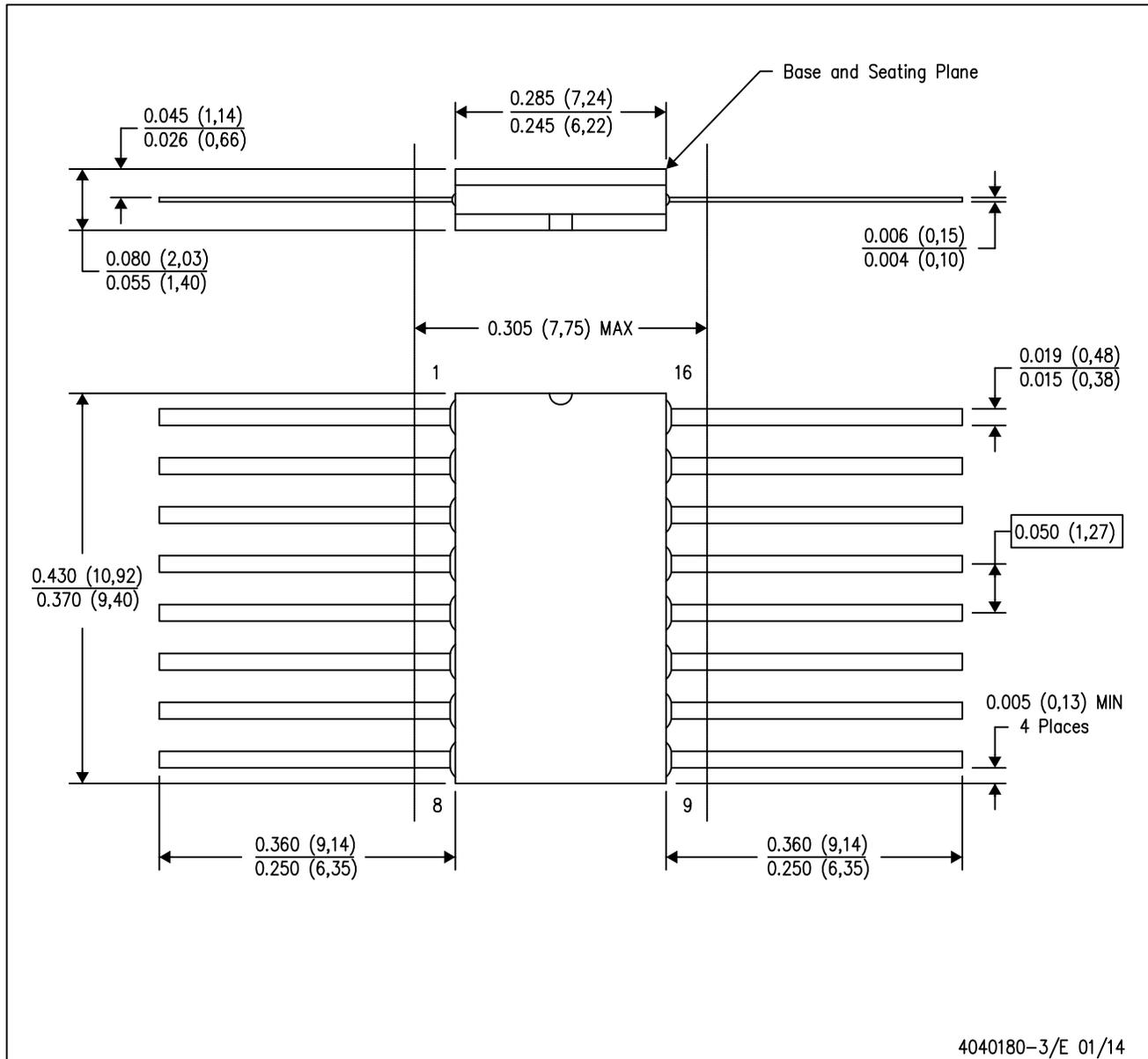


4040083/F 03/03

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

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK

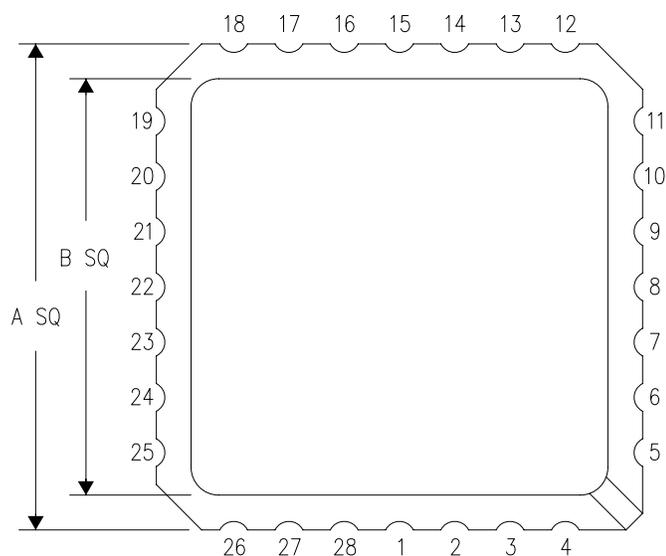


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD 1835 GDFP2-F16 and JEDEC MO-092AC

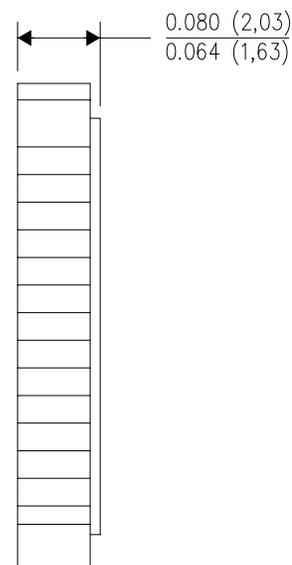
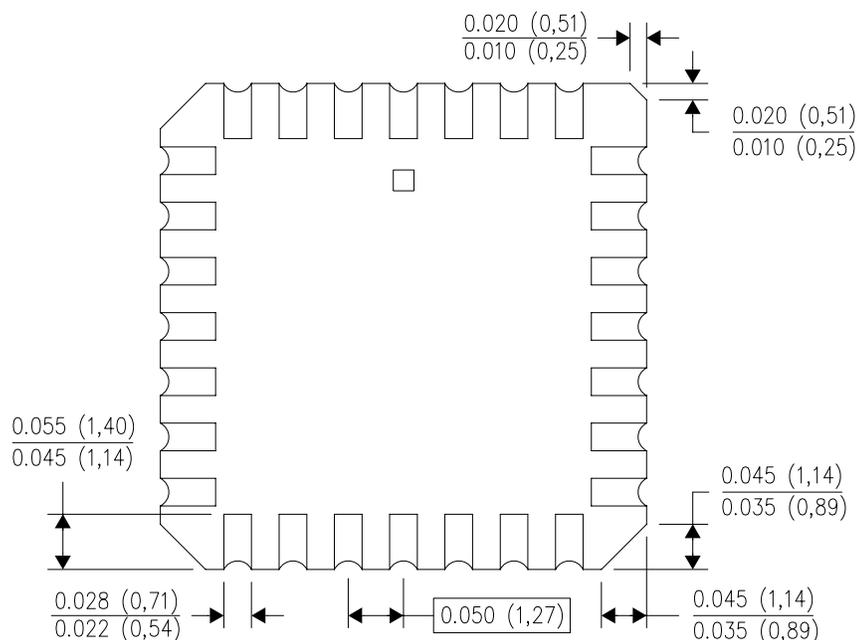
FK (S-CQCC-N**)

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	0.740 (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)



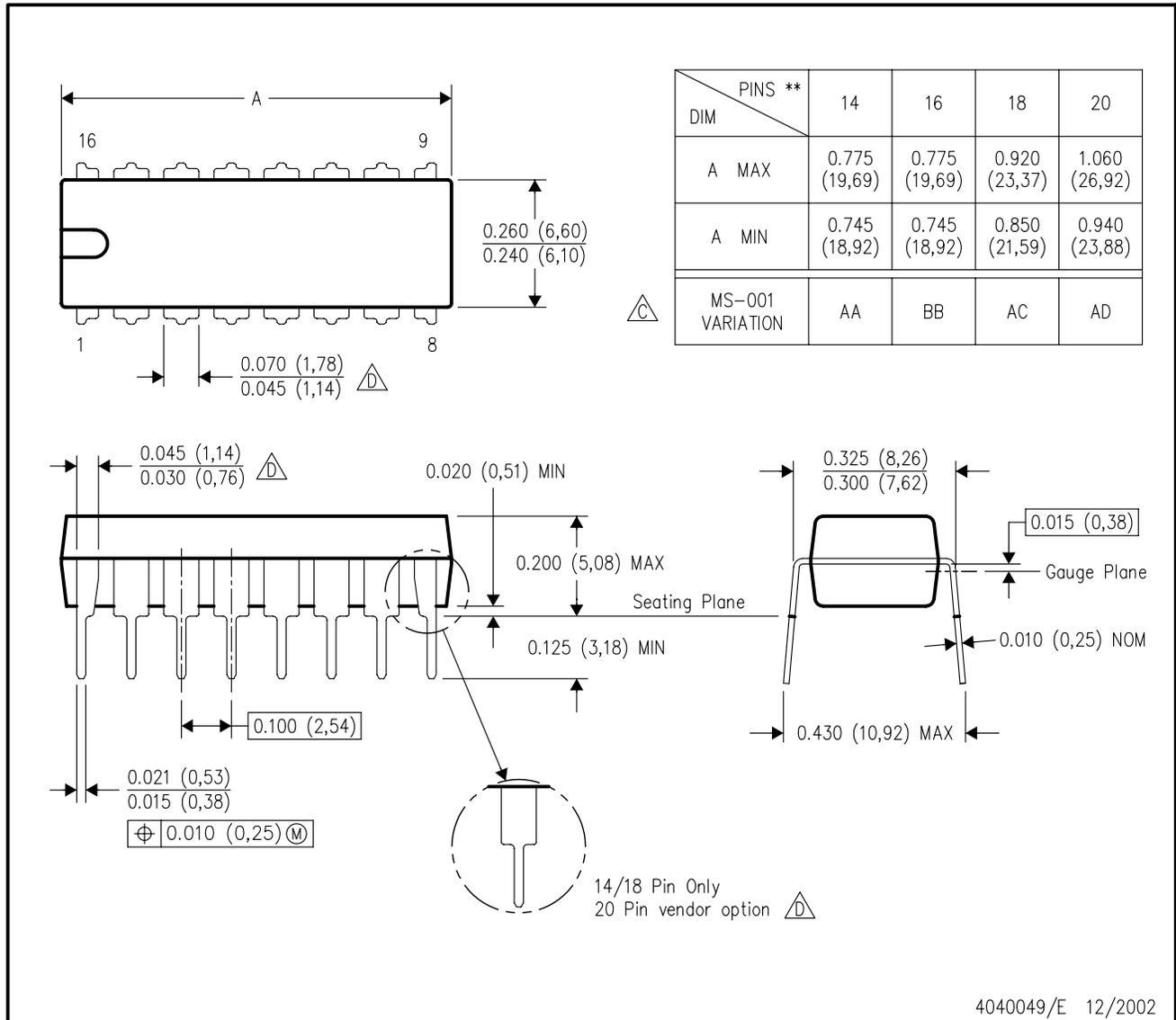
4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - Falls within JEDEC MS-004

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

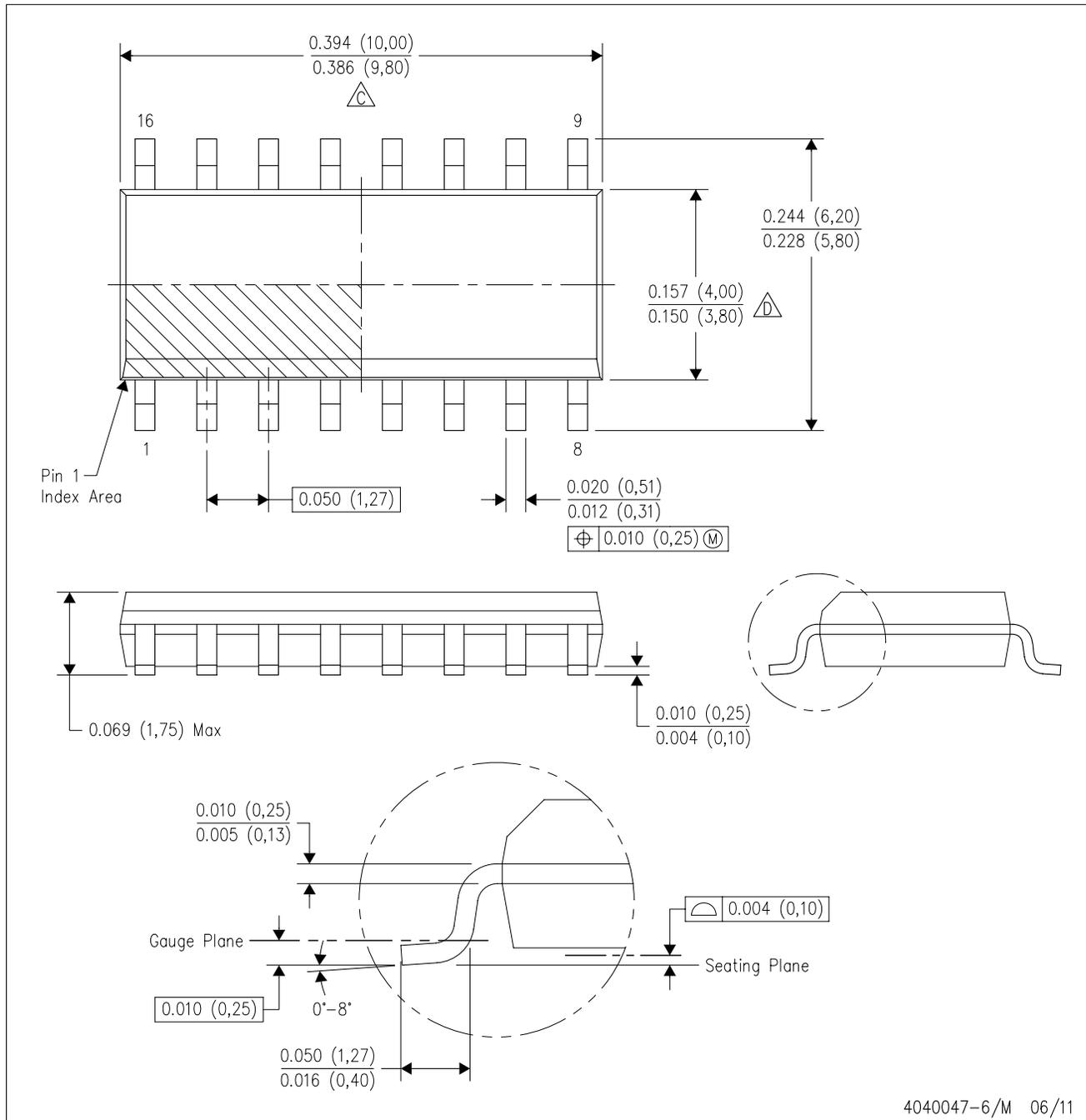


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - D The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002

D (R-PDSO-G16)

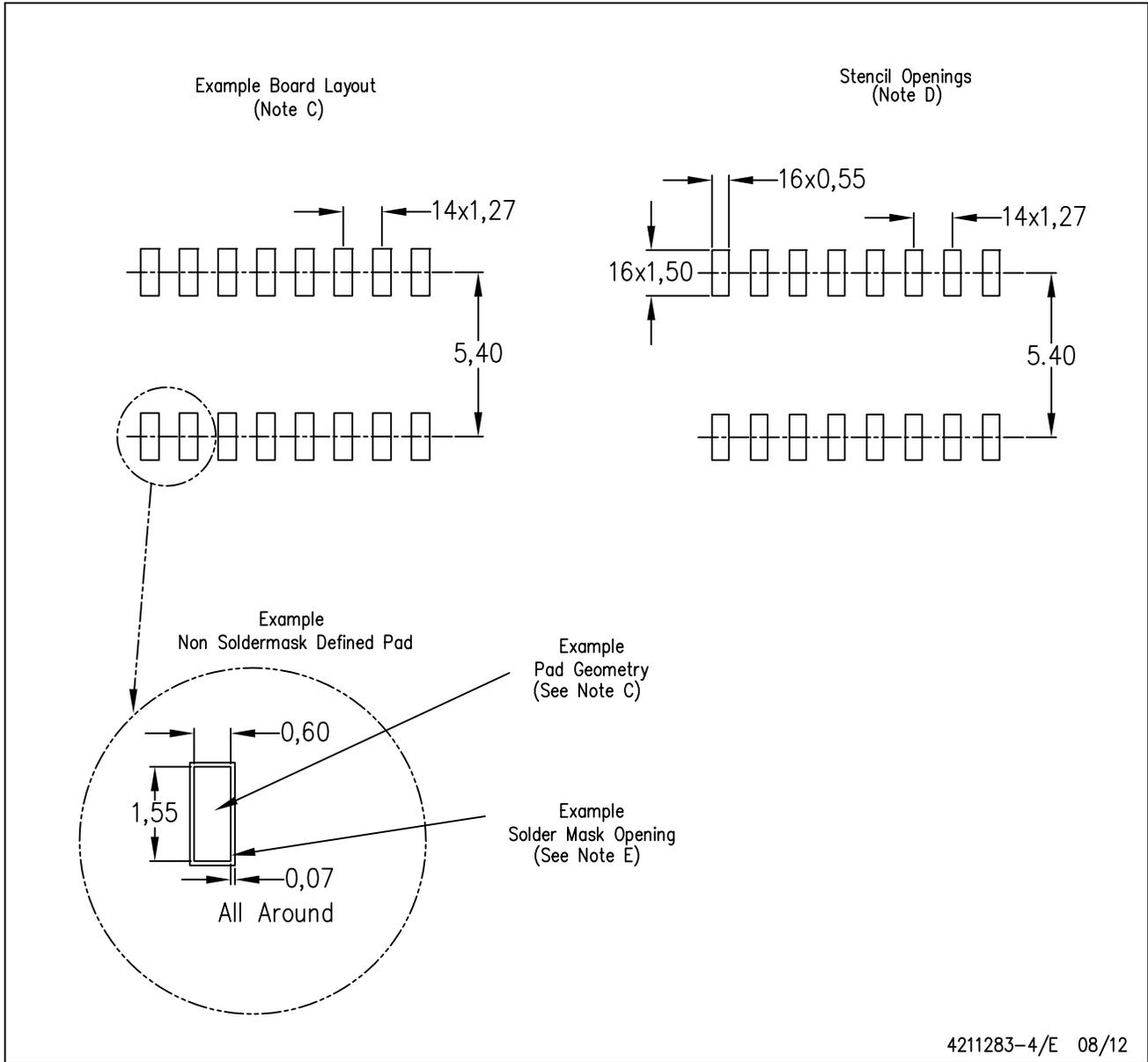
PLASTIC SMALL OUTLINE



- 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 0.006 (0,15) each side.
 -  D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

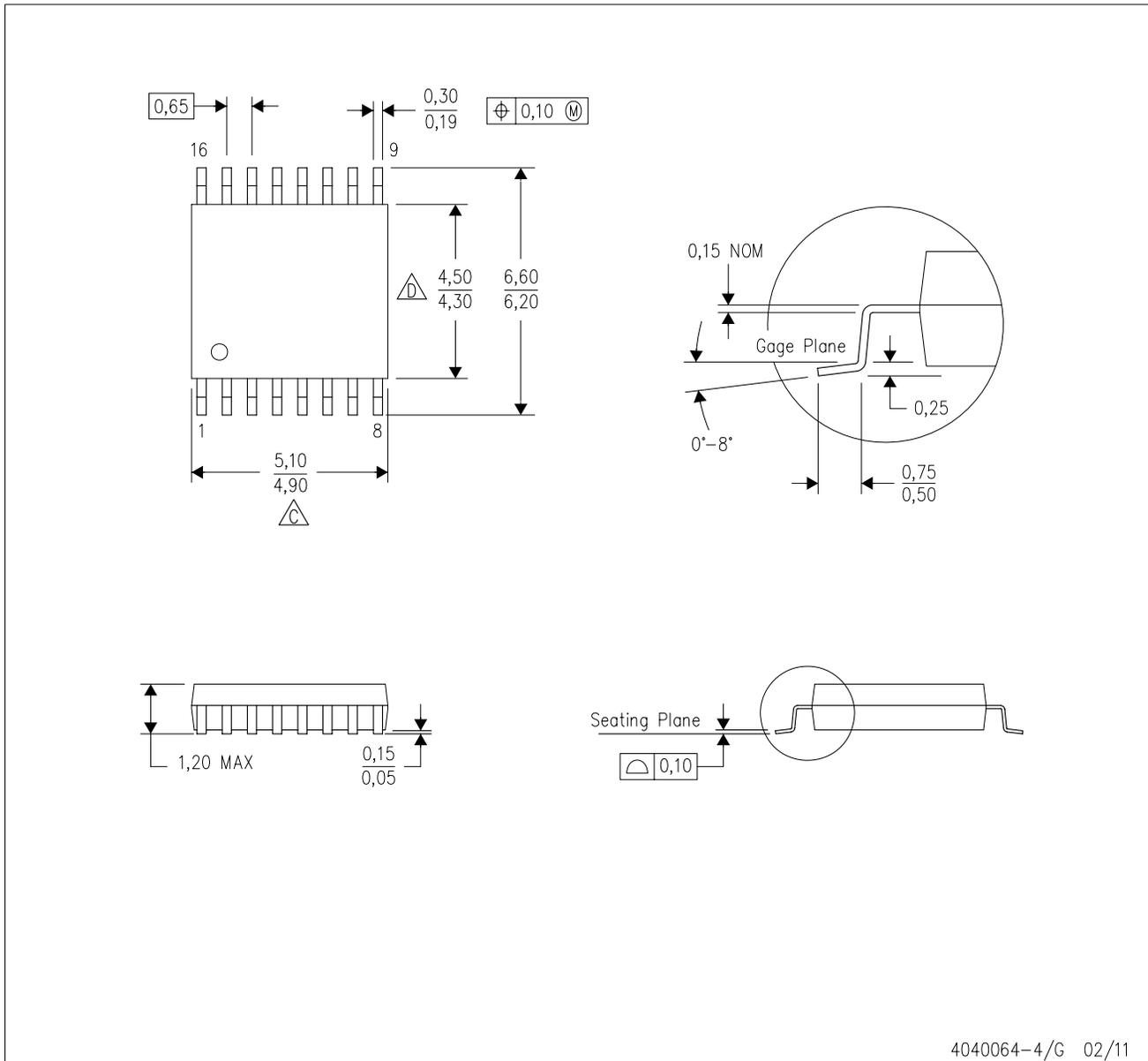
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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 other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE

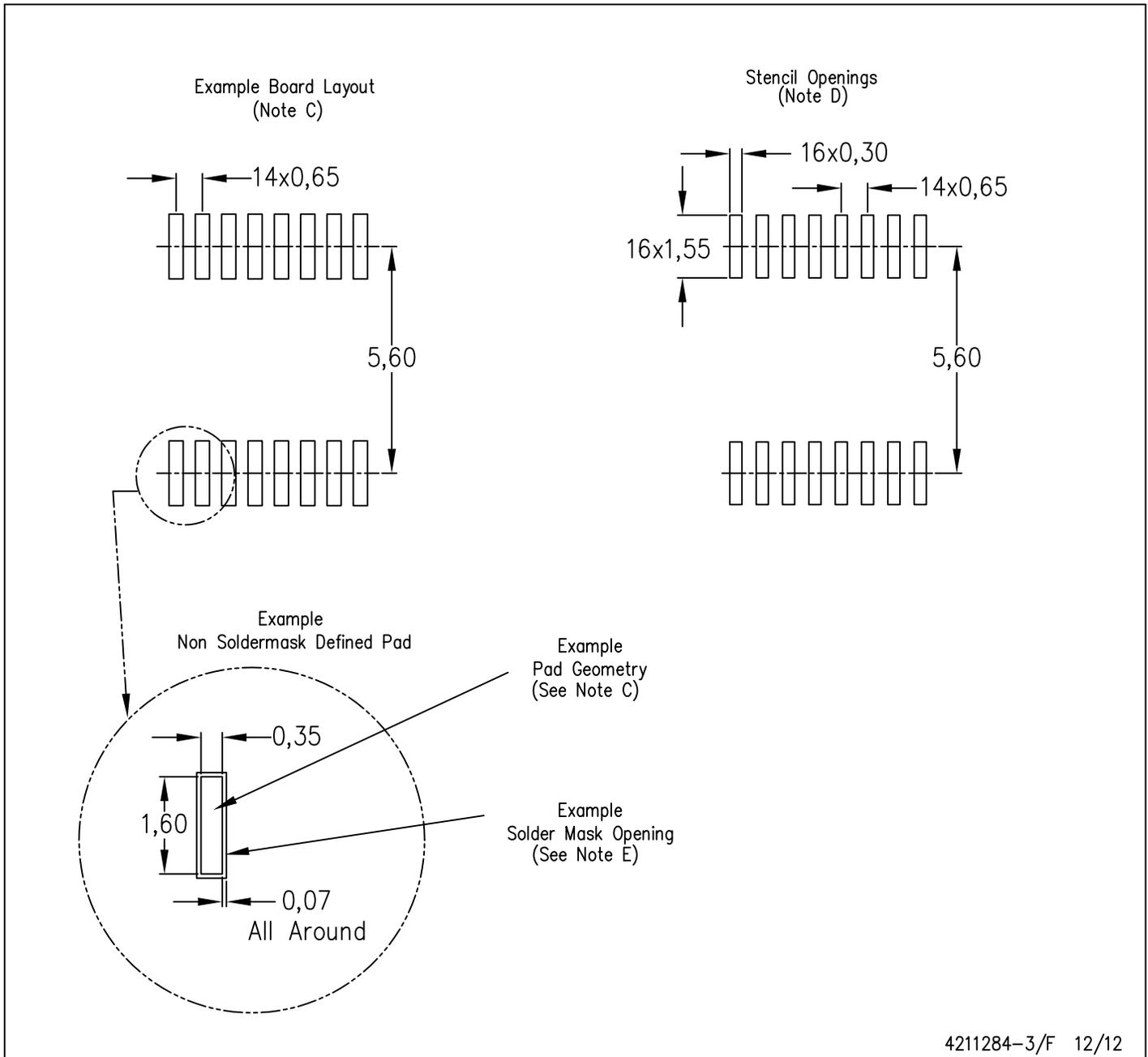


4040064-4/G 02/11

- 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. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 -  D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE

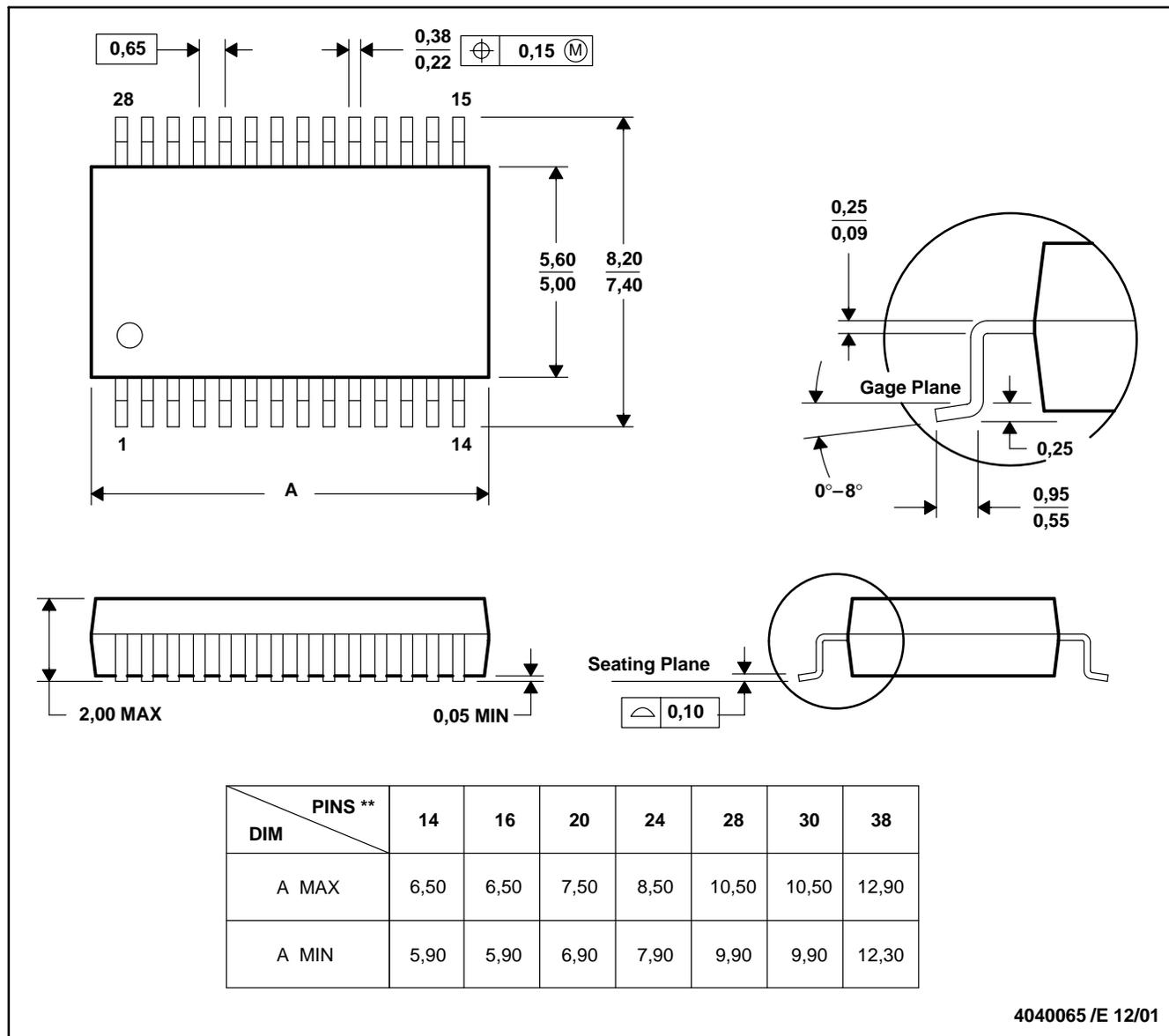


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



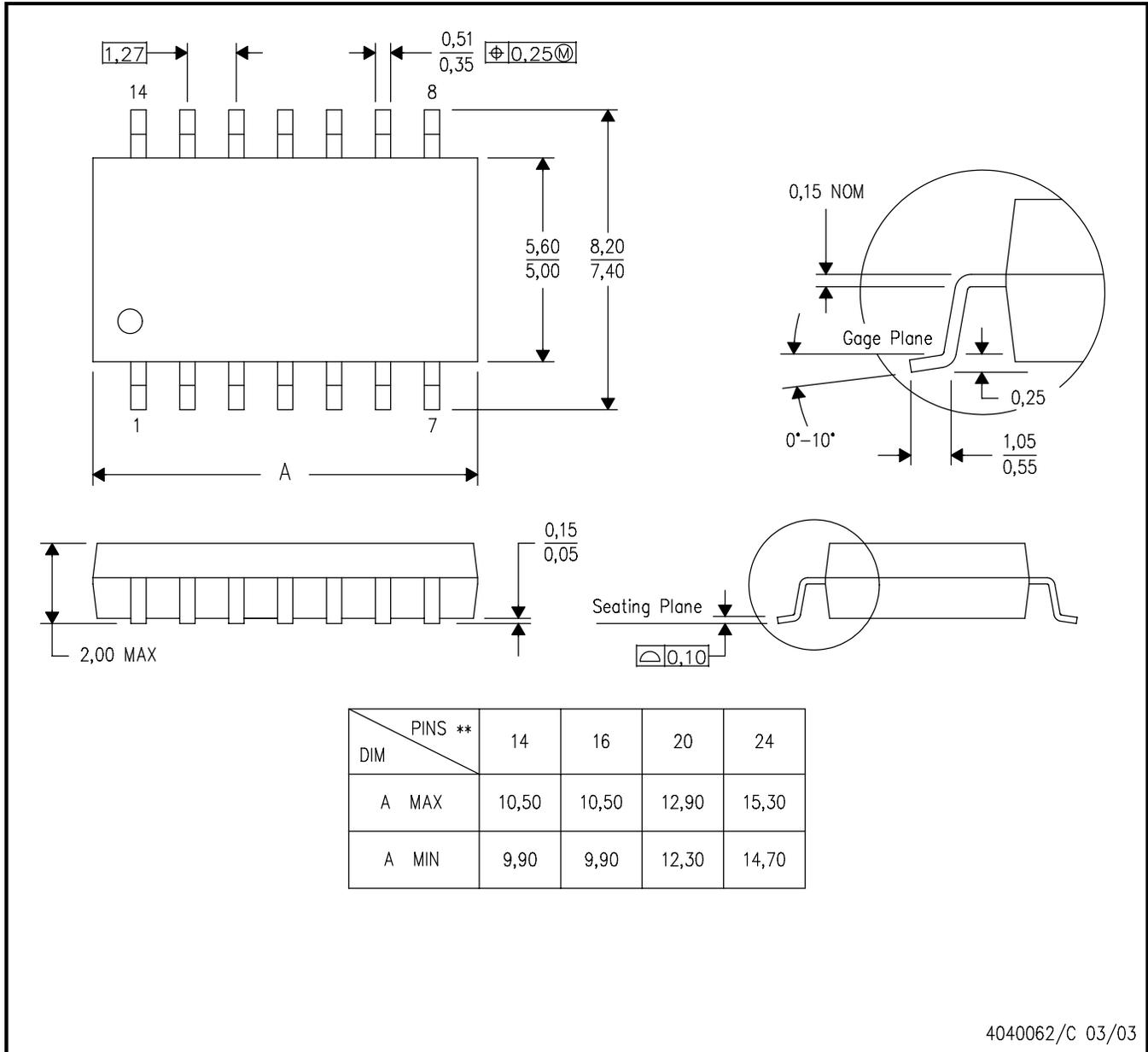
- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-150

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

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