- **Qualified for Automotive Applications**
- **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 Ten LSTTL Loads**
- **Low Power Consumption, 80-μA Max I_{CC}**
- **Typical t_{pd} = 10 ns**
- **$\pm$4-mA Output Drive at 5 V**

- **Low Input Current of 1 μA Max**
- **Incorporate Two Enable Inputs to Simplify Cascading and/or Data Reception**
- **ESD Protection Level per AEC-Q100 Classification**
  - **2000-V (H2) Human-Body Model**
  - **200-V (M3) Machine Model**
  - **1000-V (C5) Charged-Device Model**

D OR PW PACKAGE
(TOP VIEW)

```
        ___
1G̅  [ 1    16 ] V_CC
1A  [ 2    15 ] 2G̅
1B  [ 3    14 ] 2A
1Y0 [ 4    13 ] 2B
1Y1 [ 5    12 ] 2Y0
1Y2 [ 6    11 ] 2Y1
1Y3 [ 7    10 ] 2Y2
GND [ 8     9 ] 2Y3
```

description/ordering information

The SN74HC139 device is designed for high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, this decoder can minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay time of this decoder 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 decoder is negligible.

The SN74HC139 device comprises 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. This decoder/demultiplexer features fully buffered inputs, each of which represents only one normalized load to its driving circuit.
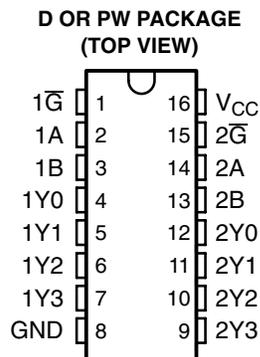
ORDERING INFORMATION[†]

T_A	PACKAGE[‡]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
−40°C to 125°C	SOIC – D	Reel of 2500	SN74HC139QDRQ1	HC139Q
	TSSOP – PW	Reel of 2000	SN74HC139QPWRQ1	HC139Q

[†] For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at http://www.ti.com.

[‡] Package drawings, thermal data, and symbolization are available at http://www.ti.com/packaging.

FUNCTION TABLE

INPUTS			OUTPUTS			
$\overline{G}$	SELECT		Y0	Y1	Y2	Y3
	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

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.

TEXAS INSTRUMENTS

logic diagram (positive logic)

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

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.

recommended operating conditions (see Note 3)

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		2	5	6	V
V_{IH}	High-level input voltage	V_{CC} = 2 V	1.5			V
		V_{CC} = 4.5 V	3.15			
		V_{CC} = 6 V	4.2			
V_{IL}	Low-level input voltage	V_{CC} = 2 V			0.5	V
		V_{CC} = 4.5 V			1.35	
		V_{CC} = 6 V			1.8	
V_I	Input voltage		0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	V
$\Delta t/\Delta v$	Input transition rise/fall time	V_{CC} = 2 V			1000	ns
		V_{CC} = 4.5 V			500	
		V_{CC} = 6 V			400	
T_A	Operating free-air temperature		−40		125	°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°C			T_A = −40°C TO 125°C		T_A = −40°C TO 85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	V_I = V_{IH} or V_{IL}	I_{OH} = −20 µA	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 mA	4.5 V	3.98	4.3		3.7		3.84		
		I_{OH} = −5.2 mA	6 V	5.48	5.8		5.2		5.34		
V_{OL}	V_I = V_{IH} or V_{IL}	I_{OL} = 20 µA	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 mA	4.5 V		0.17	0.26		0.4		0.33	
		I_{OL} = 5.2 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

TEXAS
INSTRUMENTS

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°C			T_A = −40°C TO 125°C		T_A = −40°C TO 85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	2 V		47	175		255		220	ns
			4.5 V		14	35		51		44	
			6 V		12	30		44		38	
	$\overline{G}$	Y	2 V		39	175		255		220	
			4.5 V		11	35		51		44	
			6 V		10	30		44		38	
t_t		Y	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°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per decoder	No load	25	pF

PARAMETER MEASUREMENT INFORMATION

LOAD CIRCUIT

**VOLTAGE WAVEFORM
INPUT RISE AND FALL TIMES**

**VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES**
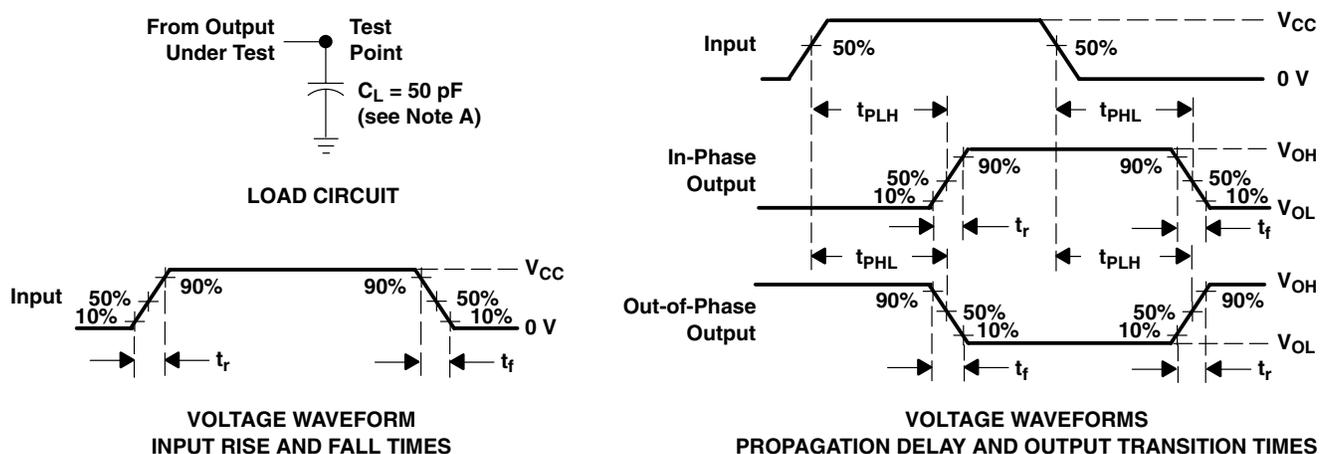
NOTES: A. C_L includes probe and test-fixture capacitance.
   B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r = 6 ns, t_f = 6 ns.
   C. The outputs are measured one at a time, with one input transition per measurement.
   D. t_{PLH} and t_{PHL} are the same as t_{pd}.

Figure 1. Load Circuit and Voltage Waveforms

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

PACKAGE OPTION ADDENDUM

PACKAGING INFORMATION

Orderable part number (1)	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74HC139QDRG4Q1	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC139Q
SN74HC139QDRG4Q1.A	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC139Q
SN74HC139QDRQ1	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC139Q
SN74HC139QDRQ1.A	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC139Q
SN74HC139QPWRG4Q1	Active	Production	TSSOP (PW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC139Q
SN74HC139QPWRG4Q1.A	Active	Production	TSSOP (PW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC139Q
SN74HC139QPWRQ1	Active	Production	TSSOP (PW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	HC139Q
SN74HC139QPWRQ1.A	Active	Production	TSSOP (PW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	HC139Q

(1) Status: For more details on status, see our product life cycle.

(2) Material type: When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) RoHS values: Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

(5) MSL rating/Peak reflow: The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) Part marking: There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN74HC139-Q1 :

- Catalog : SN74HC139

- Military : SN54HC139

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

Reel Diameter

Reel Width (W1)

TAPE DIMENSIONS

K0 · P1 · W · B0 · Cavity · A0

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers
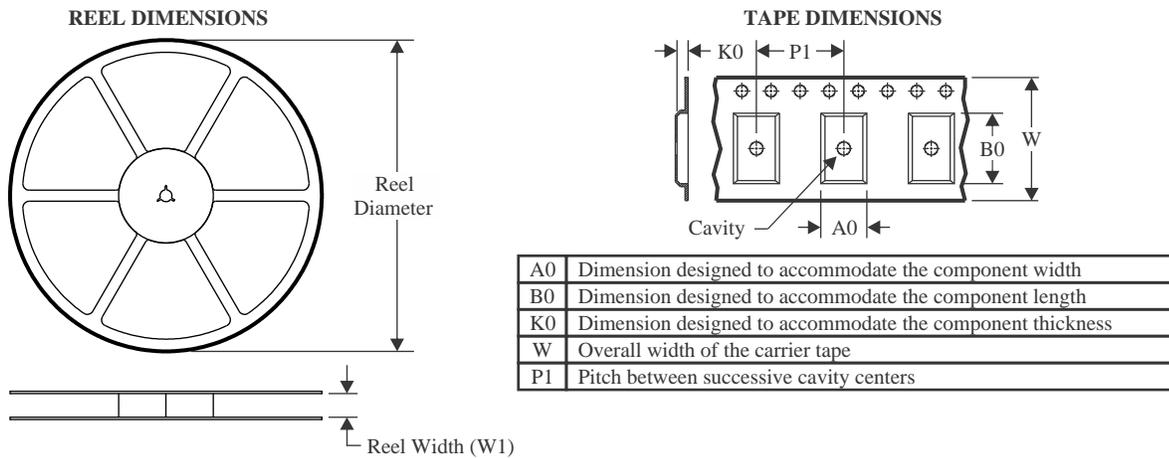
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

Sprocket Holes

Q1	Q2
Q3	Q4

User Direction of Feed

Pocket Quadrants
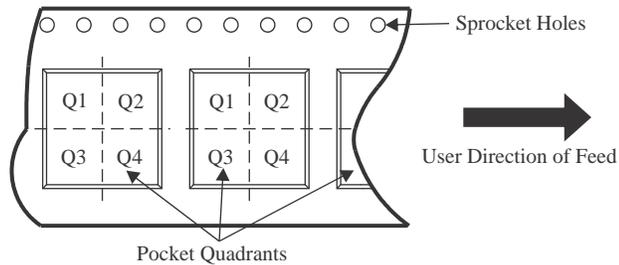
*All dimensions are nominal

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
SN74HC139QDRQ1	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC139QPWRG4Q1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC139QPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS
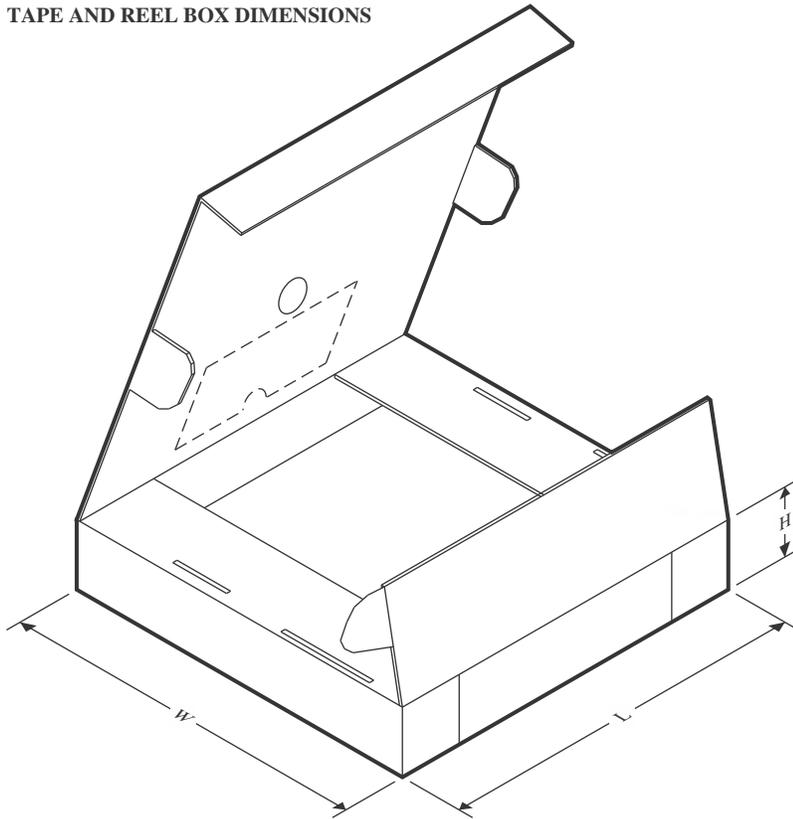
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC139QDRQ1	SOIC	D	16	2500	353.0	353.0	32.0
SN74HC139QPWRG4Q1	TSSOP	PW	16	2000	353.0	353.0	32.0
SN74HC139QPWRQ1	TSSOP	PW	16	2000	353.0	353.0	32.0

4220204/B   12/2023
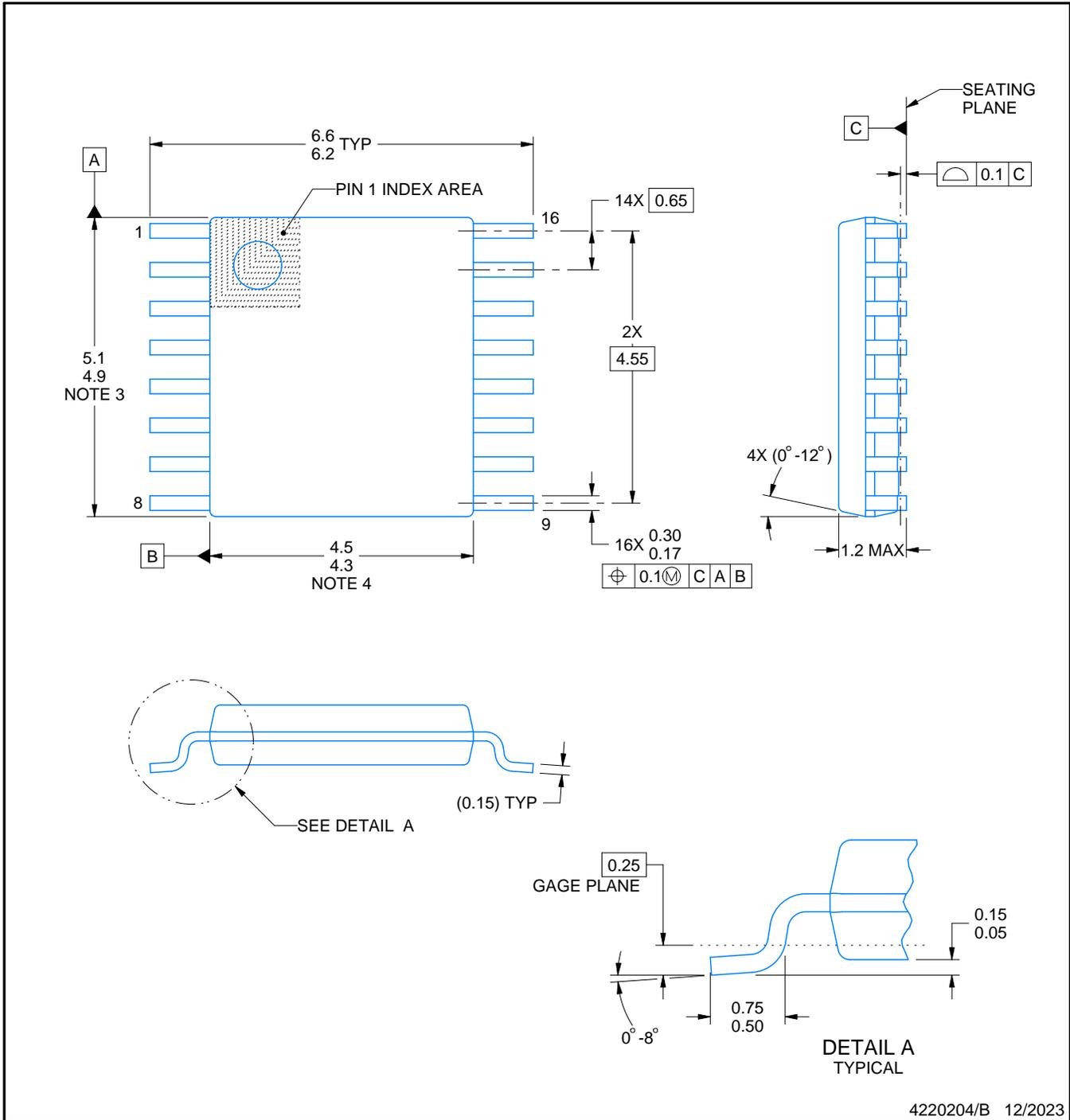
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

16X (1.5)

SYMM

1

16X (0.45)

(R0.05) TYP

16

SYMM

14X (0.65)

8

9

(5.8)
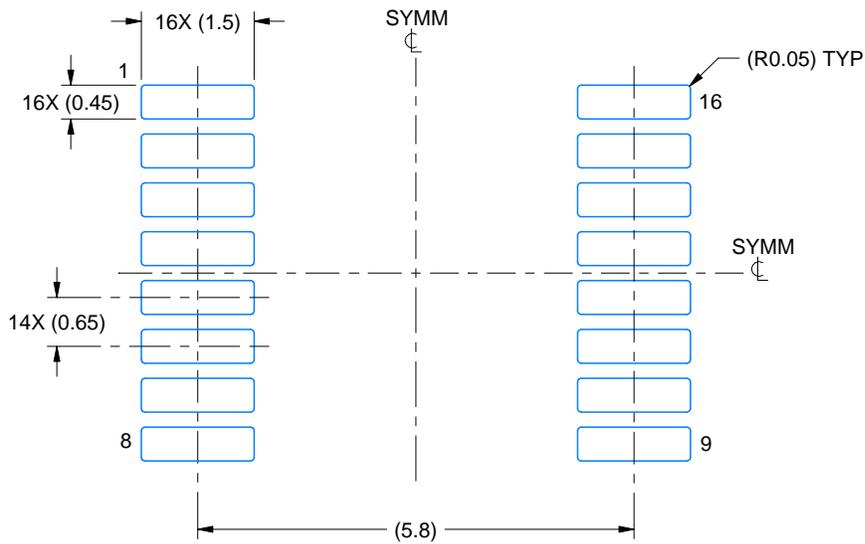
LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

SOLDER MASK
OPENING

METAL

EXPOSED METAL

0.05 MAX
ALL AROUND

NON-SOLDER MASK
DEFINED
(PREFERRED)

METAL UNDER
SOLDER MASK

SOLDER MASK
OPENING

EXPOSED METAL

0.05 MIN
ALL AROUND

SOLDER MASK
DEFINED
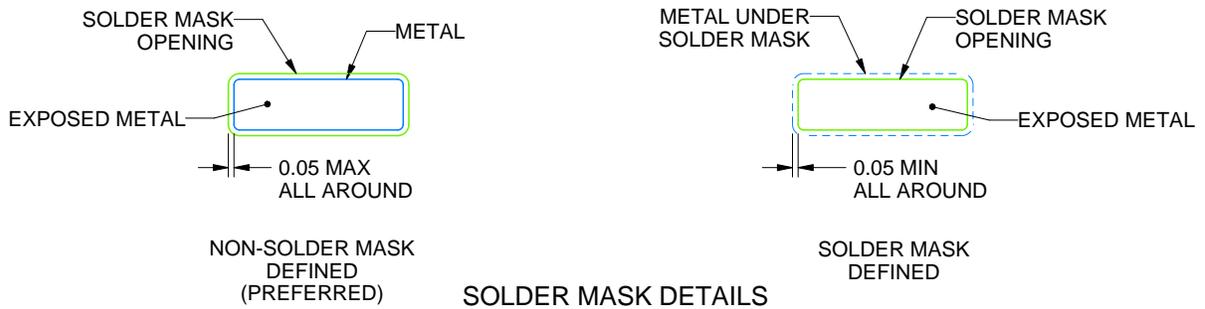
SOLDER MASK DETAILS

4220204/B   12/2023

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

16X (1.5)

SYMM

1

16X (0.45)

(R0.05) TYP

16

SYMM

14X (0.65)

8

9

(5.8)
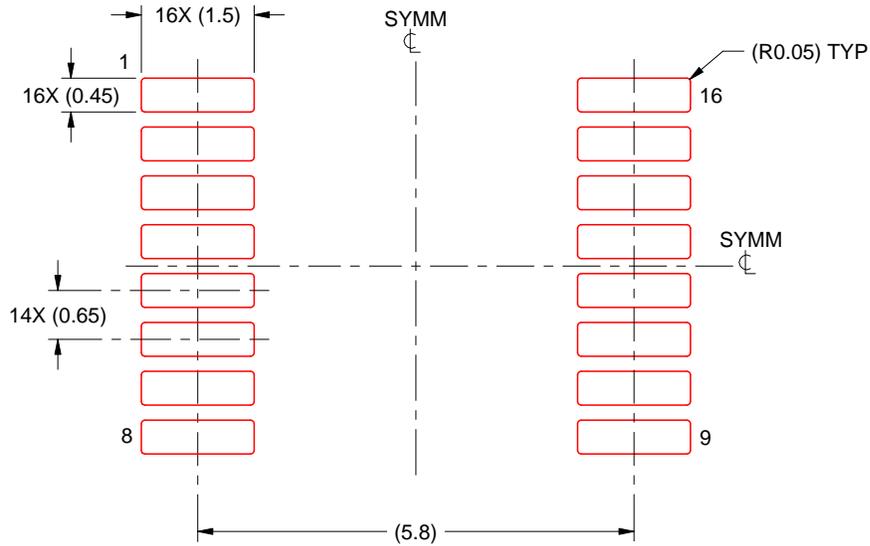
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220204/B   12/2023

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

D (R−PDSO−G16)   PLASTIC SMALL OUTLINE

0.394 (10,00)
0.386 (9,80)
⚠C

16   9

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80) ⚠D

1   8

Pin 1
Index Area

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⊕ | 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.005 (0,13)

0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)   0°−8°

0.050 (1,27)
0.016 (0,40)
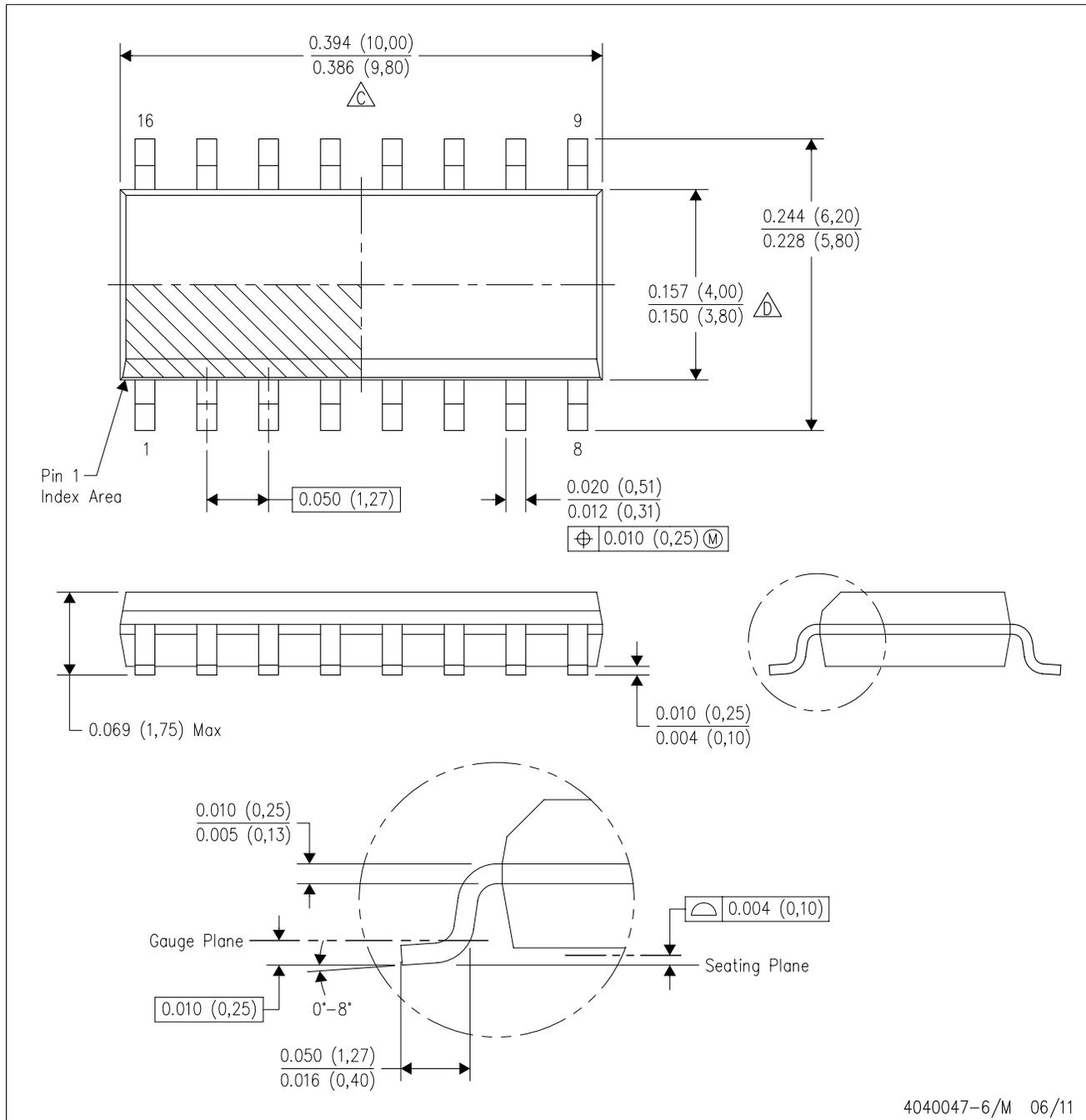
4040047−6/M   06/11

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.

TEXAS
INSTRUMENTS
www.ti.com

IMPORTANT NOTICE AND DISCLAIMER