NC7SP86L6X Datasheet

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DiGi Electronics Part Number	NC7SP86L6X-DG
Manufacturer	onsemi
Manufacturer Product Number	NC7SP86L6X
Description	IC GATE XOR 1CH 2-INP 6MICROPAK
Detailed Description	XOR (Exclusive OR) IC 1 Channel 6-MicroPak

DiGi Electronics

Purchase and inquiry

Manufacturer Product Number:	**Manufacturer:**
NC7SP86L6X	onsemi
Series:	**Product Status:**
7SP	Obsolete
Logic Type:	**Number of Circuits:**
XOR (Exclusive OR)	1
Number of Inputs:	**Features:**
2	-
Voltage - Supply:	**Current - Quiescent (Max):**
0.9V ~ 3.6V	900 nA
Current - Output High, Low:	**Input Logic Level - Low:**
2.6mA, 2.6mA	0.7V ~ 0.9V
Input Logic Level - High:	**Max Propagation Delay @ V, Max CL:**
1.6V ~ 2.1V	8ns @ 3.3V, 30pF
Operating Temperature:	**Mounting Type:**
-40°C ~ 85°C	Surface Mount
Supplier Device Package:	**Package / Case:**
6-MicroPak	6-UFDFN
Base Product Number:	
7SP86	

Environmental & Export classification

RoHS Status:	**Moisture Sensitivity Level (MSL):**
ROHS3 Compliant	1 (Unlimited)
REACH Status:	**ECCN:**
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	

onsemi

TinyLogic ULP-A Exclusive-OR Gate

NC7SP86

The NC7SP86 is a single 2−input exclusive−OR gate in tiny footprint packages. The device is designed to operate for V_{CC} = 0.9 V to 3.6 V.

Features

- Designed for 0.9 V to 3.6 V V_{CC} Operation
- 2.2 ns t_{PD} at 3.3 V (Typ)
- Inputs/Outputs Over−Voltage Tolerant up to 3.6 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 2.6 mA at 3.3 V
- Available in SC−88A and MicroPak™ Packages
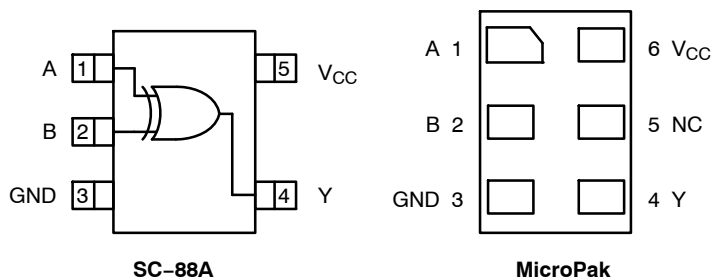- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MARKING DIAGRAMS

SIP6 1.45X1.0
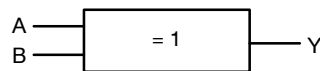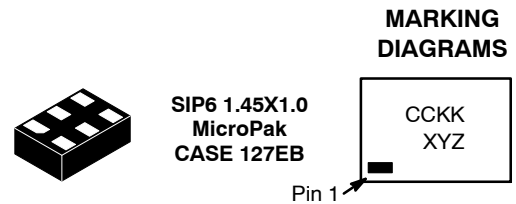MicroPak
CASE 127EB

Pin 1

CCKK
XYZ

CC	= Specific Device Code
KK	= 2−Digit Lot Run Traceability Code
XY	= 2−Digit Date Code
Z	= Assembly Plant Code

SC−88A
CASE 419A−02

XXXM▪

XXX	= Specific Device Code
M	= Date Code
▪	= Pb−Free Package

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 6 of this data sheet.

Figure 1. Pinout Diagrams (Top Views)
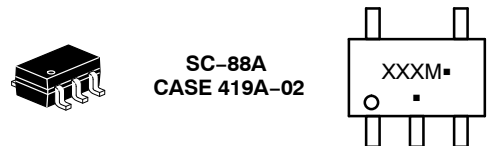

Figure 2. Logic Symbol

PIN ASSIGNMENT

Pin	SC88A	MicroPak
1	A	A
2	B	B
3	GND	GND
4	Y	Y
5	V_{CC}	N.C.
6	–	V_{CC}

N.C. = No Connect

FUNCTION TABLE

Input		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

MAXIMUM RATINGS

Symbol	Characteristics		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +4.3	V
V_{IN}	DC Input Voltage		−0.5 to +4.3	V
V_{OUT}	DC Output Voltage	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} + 0.5 −0.5 to +4.3 −0.5 to +4.3	V
I_{IK}	DC Input Diode Current	V_{IN} < GND	−50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	−50	mA
I_{OUT}	DC Output Source/Sink Current		±50	mA
I_{CC} or I_{GND}	DC Supply Current per Supply Pin or Ground Pin		±50	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 2)	SC−88A MicroPak	377 154	°C/W
P_D	Power Dissipation in Still Air	SC−88A MicroPak	332 812	mW
MSL	Moisture Sensitivity		Level 1	–
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	–
V_{ESD}	ESD Withstand Voltage (Note 3)	Human Body Model Charged Device Model	2000 1000	V
$I_{Latchup}$	Latchup Performance (Note 4)		±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
1. Applicable to devices with outputs that may be tri−stated.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2 ounce copper trace no air flow per JESD51−7.
3. HBM tested to EIA / JESD22−A114−A. CDM tested to JESD22−C101−A. JEDEC recommends that ESD qualification to EIA/JESD22−A115A (Machine Model) be discontinued.
4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		0.9	3.6	V
V_{IN}	DC Input Voltage		0	3.6	V
V_{OUT}	DC Output Voltage	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	0 0 0	V_{CC} 3.6 3.6	
T_A	Operating Temperature Range		−40	+85	°C
t_r , t_f	Input Transition Rise and Fall Time	V_{CC} = 3.3 V ± 0.3 V	0	10	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			T_A = −40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	High−Level Input Voltage		0.9	–	0.5	–	–	–	V
			1.1 to 1.3	0.65 x V_{CC}	–	–	0.65 x V_{CC}	–	
			1.4 to 1.6	0.65 x V_{CC}	–	–	0.65 x V_{CC}	–	
			1.65 to 1.95	0.65 x V_{CC}	–	–	0.65 x V_{CC}	–	
			2.3 to 2.7	1.6	–	–	1.6	–	
			3.0 to 3.6	2.1	–	–	2.1	–	
V_{IL}	Low−Level Input Voltage		0.9	–	0.5	–	–	–	V
			1.1 to 1.3	–	–	0.35 x V_{CC}	–	0.35 x V_{CC}	
			1.4 to 1.6	–	–	0.35 x V_{CC}	–	0.35 x V_{CC}	
			1.65 to 1.95	–	–	0.35 x V_{CC}	–	0.35 x V_{CC}	
			2.3 to 2.7	–	–	0.7	–	0.7	
			3.0 to 3.6	–	–	0.9	–	0.9	
V_{OH}	High−Level Output Voltage	V_{IN} = V_{IH} or V_{IL}							V
		I_{OH} = −20 µA	0.9	–	V_{CC} − 0.1	–	–	–	
			1.1 to 1.3	V_{CC} − 0.1	–	–	V_{CC} − 0.1	–	
			1.4 to 1.6	V_{CC} − 0.1	–	–	V_{CC} − 0.1	–	
			1.65 to 1.95	V_{CC} − 0.1	–	–	V_{CC} − 0.1	–	
			2.3 to 2.7	V_{CC} − 0.1	–	–	V_{CC} − 0.1	–	
			3.0 to 3.6	V_{CC} − 0.1	–	–	V_{CC} − 0.1	–	
		I_{OH} = −0.5 mA	1.1 to 1.3	0.75 x V_{CC}	–	–	0.70 x V_{CC}	–	
		I_{OH} = −1 mA	1.4 to 1.6	1.07	–	–	0.99	–	
		I_{OH} = −1.5 mA	1.65 to 1.95	1.24	–	–	1.22	–	
		I_{OH} = −2.1 mA	2.3 to 2.7	1.95	–	–	1.87	–	
		I_{OH} = −2.6 mA	3.0 to 3.6	2.61	–	–	2.55	–	
V_{OL}	Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL}							V
		I_{OL} = 20 µA	0.9	–	0.1	–	–	–	
			1.1 to 1.3	–	–	0.1	–	0.1	
			1.4 to 1.6	–	–	0.1	–	0.1	
			1.65 to 1.95	–	–	0.1	–	0.1	
			2.3 to 2.7	–	–	0.1	–	0.1	
			3.0 to 3.6	–	–	0.1	–	0.1	
		I_{OL} = 0.5 mA	1.1 to 1.3	–	–	0.3 x V_{CC}	–	0.3 x V_{CC}	
		I_{OL} = 1 mA	1.4 to 1.6	–	–	0.31	–	0.37	
		I_{OL} = 1.5 mA	1.65 to 1.95	–	–	0.31	–	0.35	
		I_{OL} = 2.1 mA	2.3 to 2.7	–	–	0.31	–	0.33	
		I_{OL} = 2.6 mA	3.0 to 3.6	–	–	0.31	–	0.33	
I_{IN}	Input Leakage Current	V_{IN} = 0 V to 3.6 V	0.9 to 3.6	–	–	±0.1	–	±0.5	µA
I_{OFF}	Power Off Leakage Current	V_{IN} = 0 V to 3.6 V or V_{OUT} = 0 V to 3.6 V	0	–	–	0.5	–	0.5	µA
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND	0.9 to 3.6	–	–	0.9	–	0.9	µA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

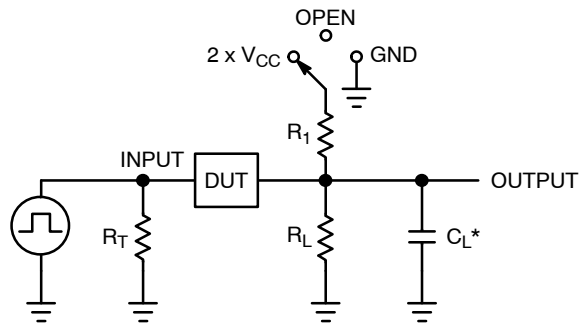# NC7SP86

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25°C$			$T_A = -40°C$ to $+85°C$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay, (A or B) to Y (Figures 3 and 4)	$R_L = 1\ M\Omega$, $C_L = 10\ pF$	0.9	–	44.8	–	–	–	ns
			1.10 to 1.30	–	12.3	24.7	–	32.9	
			1.40 to 1.60	–	6.3	13.9	–	15.6	
			1.65 to 1.95	–	4.3	11.1	–	13.6	
			2.3 to 2.7	–	2.9	8.0	–	9.0	
			3.0 to 3.6	–	2.2	6.7	–	7.9	
t_{PLH}, t_{PHL}	Propagation Delay, (A or B) to Y (Figures 3 and 4)	$R_L = 1\ M\Omega$, $C_L = 15\ pF$	0.9	–	46.3	–	–	–	ns
			1.10 to 1.30	–	12.8	26.0	–	35.9	
			1.40 to 1.60	–	6.7	14.8	–	17.5	
			1.65 to 1.95	–	4.7	11.8	–	14.1	
			2.3 to 2.7	–	3.2	8.4	–	9.2	
			3.0 to 3.6	–	2.4	7.1	–	8.0	
t_{PLH}, t_{PHL}	Propagation Delay, (A or B) to Y (Figures 3 and 4)	$R_L = 1\ M\Omega$, $C_L = 30\ pF$	0.9	–	50.6	–	–	–	ns
			1.10 to 1.30	–	14.4	30.0	–	45.0	
			1.40 to 1.60	–	8.0	17.5	–	19.5	
			1.65 to 1.95	–	5.8	13.5	–	15.5	
			2.3 to 2.7	–	3.9	10.0	–	11.0	
			3.0 to 3.6	–	3.0	8.0	–	9.9	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Typical ($T_A = 25°C$)	Unit
C_{IN}	Input Capacitance	$V_{CC} = 0\ V$	2.0	pF
C_{OUT}	Output Capacitance	$V_{CC} = 0\ V$	4.0	pF
C_{PD}	Power Dissipation Capacitance (Note 5)	f = 10 MHz, $V_{CC} = 0.9$ to 3.6 V, $V_{IN} = 0\ V$ or V_{CC}	6.0	pF

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no–load dynamic power consumption: $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

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Test	Switch Position
t_{PLH} / t_{PHL}	Open
t_{PLZ} / t_{PZL}	2 x V_{CC}
t_{PHZ} / t_{PZH}	GND

C_L includes probe and jig capacitance
R_T is Z_{OUT} of pulse generator (typically 50 Ω)
f = 1 MHz

Figure 3. Test Circuit
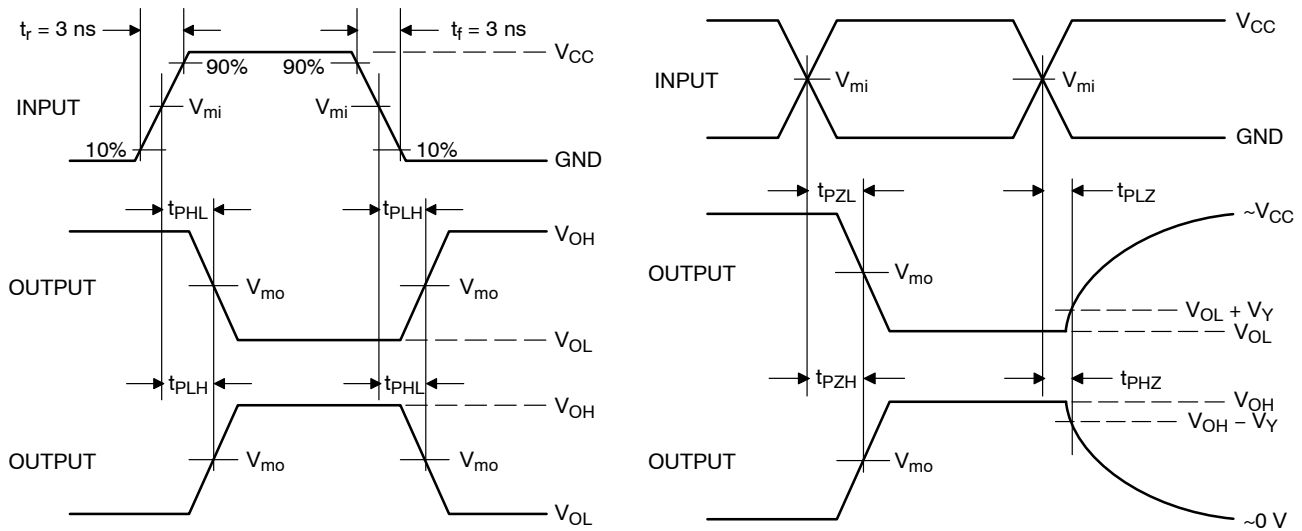
V_{CC}, V	V_{mi}, V	V_{mo}, V	V_Y, V
0.9	V_{CC} / 2	V_{CC} / 2	0.1
1.1 to 1.3	V_{CC} / 2	V_{CC} / 2	0.1
1.4 to 1.6	V_{CC} / 2	V_{CC} / 2	0.1
1.65 to 1.95	V_{CC} / 2	V_{CC} / 2	0.15
2.3 to 2.7	V_{CC} / 2	V_{CC} / 2	0.15
3.0 to 3.6	1.5	1.5	0.3

Figure 4. Switching Waveforms

NC7SP86

ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping†
NC7SP86P5X	SC−88A	P86	Q4	3000 / Tape & Reel
NC7SP86L6X	MicroPak	L4	Q4	5000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Pin 1 Orientation in Tape and Reel
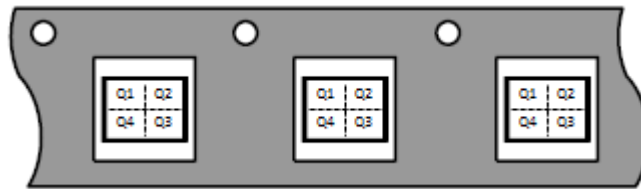
MicroPak is a trademark of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries.

NC7SP86

PACKAGE DIMENSIONS

SIP6 1.45X1.0
CASE 127EB
ISSUE O

2X

| ⌒ | 0.05 | C |

1.45 → B

2X

| ⌒ | 0.05 | C |

(0.254)

1.00

PIN 1 IDENTIFIER

△5

TOP VIEW

A

0.50±0.05

0.05
0.00

| ⌒ | 0.05 | C |

C

1.45±0.05

DETAIL A

1.0

0.20±0.05   6X

| ⊕ | 0.10 Ⓜ | C | B | A |
| | 0.05 Ⓜ | C | | |

0.30±0.05   5X

1.00±0.05

0.35±0.05   5X

(0.050)
6X

0.5

(0.125)
4X

BOTTOM VIEW

(1)

(0.49)
5X

(0.75)

(0.52)
1X

(0.30)
6X

PIN 1

RECOMMENED
LAND PATTERN

0.35±0.05

0.40±0.05

0.075 X 45°
CHAMFER

DETAIL A
PIN 1 TERMINAL
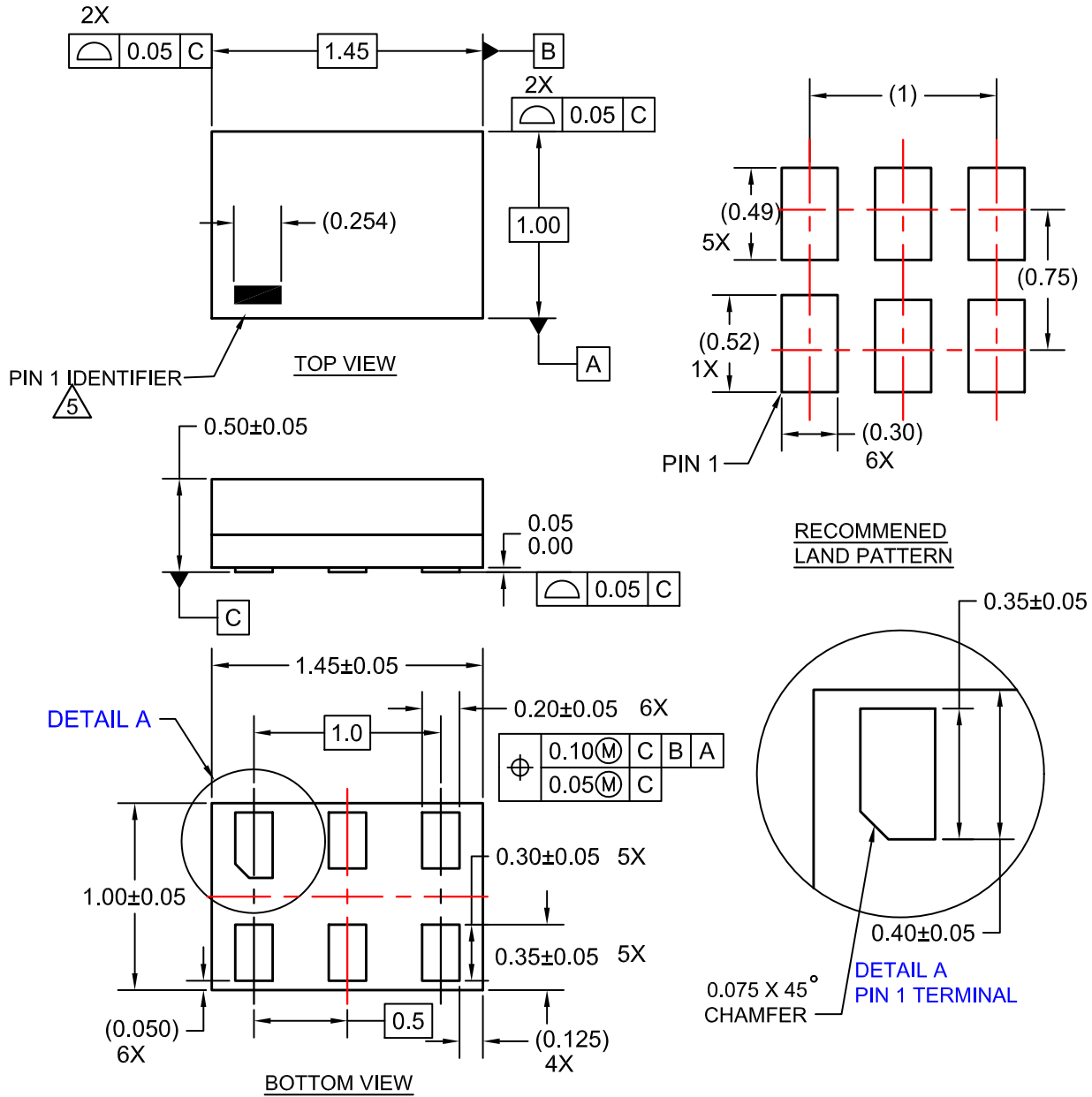
NOTES:

1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
△4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY
    OTHER LINE IN THE MARK CODE LAYOUT.

NC7SP86

PACKAGE DIMENSIONS

SC−88A (SC−70−5/SOT−353)
CASE 419A−02
ISSUE L
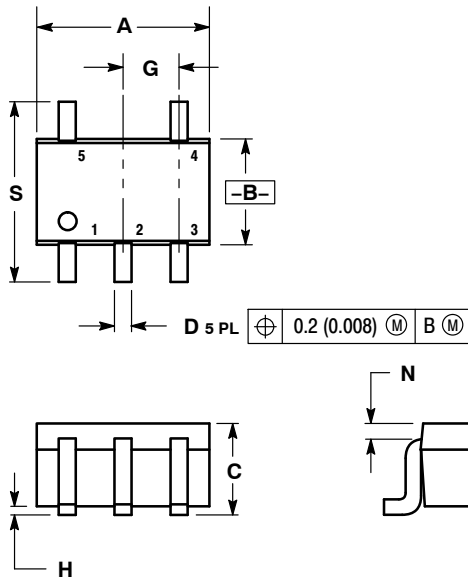
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

SOLDER FOOTPRINT

SCALE 20:1 $\left(\dfrac{mm}{inches}\right)$

PUBLICATION ORDERING INFORMATION

◊

OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we striciy control the quality of products and services. Welcome your RFQ to Email: Info@DiGi-Electronics.com