

Single Unbuffered Inverter

MC74VHC1GU04

The MC74VHC1GU04 is an advanced high speed CMOS unbuffered inverter in tiny footprint packages.

This device consists of a single unbuffered inverter. In combination with others, or in the MC74VHCU04 Hex Unbuffered Inverter, these devices are well suited for use as oscillators, pulse shapers, and in many other applications requiring a high-input impedance amplifier. For digital applications, the MC74VHC1G04 or the MC74VHC04 are recommended.

The input structures provide protection when voltages up to 5.5 V are applied, regardless of the supply voltage. This allows the device to be used to interface 5 V circuits to 3 V circuits.

Features

- Designed for 2.0 V to 5.5 V V_{CC} Operation
- 2.5 ns t_{PD} at 5 V (typ)
- Inputs Over-Voltage Tolerant up to 5.5 V
- I_{OFF} Supports Partial Power Down Protection on Input
- Source/Sink 8 mA at 3.0 V
- Available in SC-88A, SC-74A and UDFN6 Packages
- Chip Complexity < 100 FETs
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

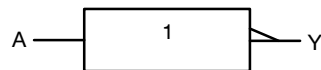
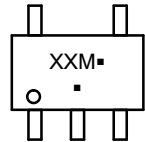


Figure 1. Logic Symbol

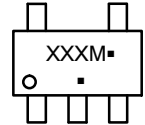
MARKING DIAGRAMS



SC-88A
DF SUFFIX
CASE 419A



SC-74A
DBV SUFFIX
CASE 318BQ



UDFN6
1.45 x 1.0
CASE 517AQ



XX = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

MC74VHC1GU04

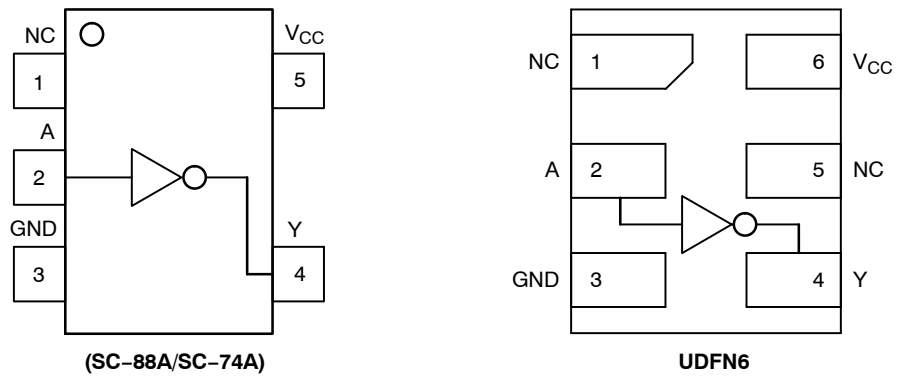


Figure 2. Pinout (Top View)

PIN ASSIGNMENT (SC-88A/ SC-74A)

Pin	Function
1	NC
2	A
3	GND
4	Y
5	V _{CC}

PIN ASSIGNMENT (UDFN)

Pin	Function
1	NC
2	A
3	GND
4	Y
5	NC
6	V _{CC}

FUNCTION TABLE

Input	Output
A	Y
L	H
H	L

MC74VHC1GU04

MAXIMUM RATINGS

Symbol	Characteristics	Value	Unit
V_{CC}	DC Supply Voltage	-0.5 to +6.5	V
V_{IN}	DC Input Voltage	-0.5 to +6.5	V
V_{OUT}	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current $V_{IN} < GND$	-20	mA
I_{OK}	DC Output Diode Current	±20	mA
I_{OUT}	DC Output Source/Sink Current	±25	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 secs	260	°C
T_J	Junction Temperature Under Bias	+150	°C
θ_{JA}	Thermal Resistance (Note 2) SC-88A SC-74A UDFN6	377 320 154	°C/W
P_D	Power Dissipation in Still Air SC-88A SC-74A UDFN6	332 390 812	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 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	Min	Max	Unit
V_{CC}	Positive DC Supply Voltage	2.0	5.5	V
V_{IN}	DC Input Voltage	0	5.5	V
V_{OUT}	DC Output Voltage	0	V_{CC}	V
T_A	Operating Temperature Range	-55	+125	°C
t_r, t_f	Input Rise and Fall Time $V_{CC} = 2.0\text{ V}$ $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ $V_{CC} = 4.5\text{ V to }5.5\text{ V}$	0 0 0 0	20 20 10 5	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.

MC74VHC1GU04

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = 25 °C			-40 °C ≤ T _A ≤ 85 °C		-55 °C ≤ T _A ≤ 125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	High-Level Input Voltage		2.0	1.7	–	–	1.7	–	1.7	–	V
			3.0	2.4	–	–	2.4	–	2.4	–	
			4.5	3.6	–	–	3.6	–	3.6	–	
			5.5	4.4	–	–	4.4	–	4.4	–	
V _{IL}	Low-Level Input Voltage		2.0	–	–	0.3	–	0.3	–	0.3	V
			3.0	–	–	0.6	–	0.6	–	0.6	
			4.5	–	–	0.9	–	0.9	–	0.9	
			5.5	–	–	1.1	–	1.1	–	1.1	
V _{OH}	High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OH} = -50 μA	2.0	1.9	2.0	–	1.9	–	1.9	–	V
			3.0	2.9	3.0	–	2.9	–	2.9	–	
			4.5	4.4	4.5	–	4.4	–	4.4	–	
		V _{IN} = GND I _{OH} = -4 mA I _{OH} = -8 mA	3.0	2.58	–	–	2.48	–	2.34	–	
			4.5	3.94	–	–	3.80	–	3.66	–	
V _{OL}	Low-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OL} = 50 μA	2.0	–	0.0	0.1	–	0.1	–	0.1	V
			3.0	–	0.0	0.1	–	0.1	–	0.1	
			4.5	–	0.0	0.1	–	0.1	–	0.1	
		V _{IN} = V _{CC} I _{OL} = 4 mA I _{OL} = 8 mA	3.0	–	–	0.36	–	0.44	–	0.52	
			4.5	–	–	0.36	–	0.44	–	0.52	
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	2.0 to 5.5	–	–	±0.1	–	±1.0	–	±1.0	μA
I _{OFF}	Power Off Leakage Current	V _{IN} = 5.5 V	0	–	–	1.0	–	10	–	10	μA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5	–	–	1.0	–	20	–	40	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.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25 °C			-40 °C ≤ T _A ≤ 85 °C		-55 °C ≤ T _A ≤ 125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay, A to Y (Figures 3 and 4)	C _L = 15 pF	3.0 to 3.6	–	3.5	8.9	–	10.5	–	12.0	ns
		C _L = 50 pF		–	4.8	11.4	–	13.0	–	15.5	
		C _L = 15 pF	4.5 to 5.5	–	2.5	5.5	–	6.5	–	8.0	
		C _L = 50 pF		–	3.8	7.0	–	8.0	–	9.5	
C _{IN}	Input Capacitance			–	4.0	10	–	10	–	10	pF

C _{PD}	Power Dissipation Capacitance (Note 5)	Typical @ 25 °C, V _{CC} = 5.0 V	pF
		22.0	

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} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

MC74VHC1GU04

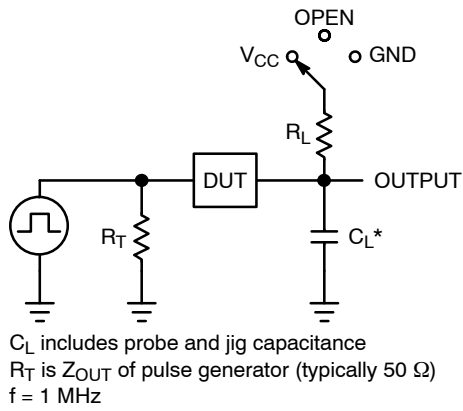


Figure 3. Test Circuit

Test	Switch Position	C_L , pF	R_L , Ω
t_{PLH} / t_{PHL}	Open	See AC Characteristics Table	X
t_{PLZ} / t_{PZL}	V_{CC}		1 k
t_{PHZ} / t_{PZH}	GND		1 k

X = Don't Care

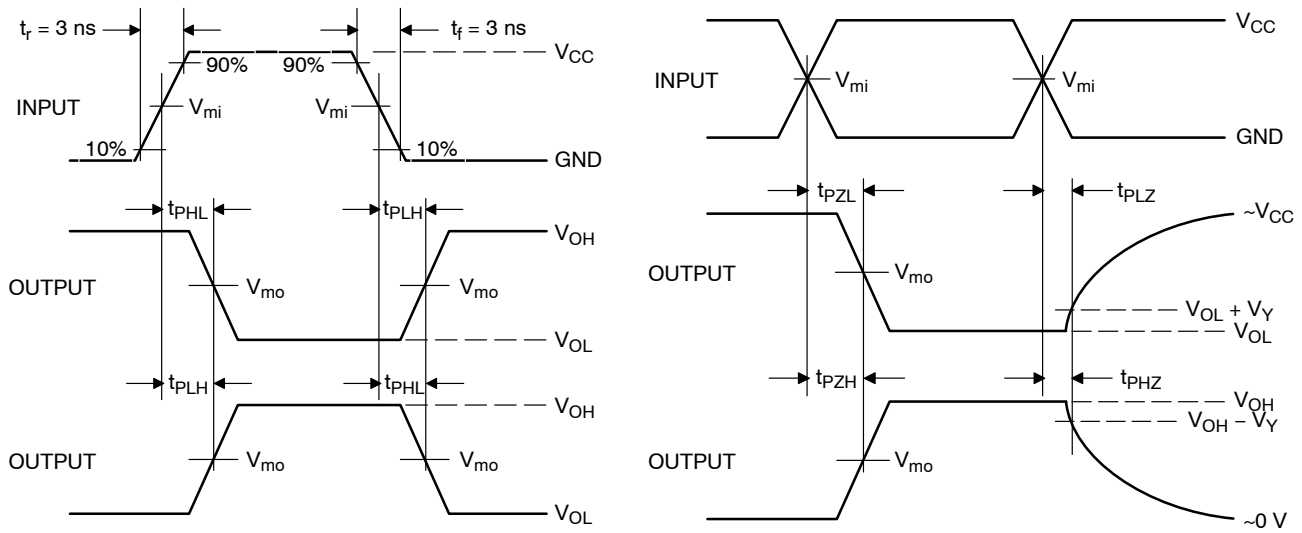


Figure 4. Switching Waveforms

V_{CC} , V	V_{mi} , V	V_{mo} , V		V_Y , V
		t_{PLH}, t_{PHL}	$t_{PLZ}, t_{PZL}, t_{PZH}, t_{PHZ}$	
3.0 to 3.6	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3
4.5 to 5.5	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3

MC74VHC1GU04

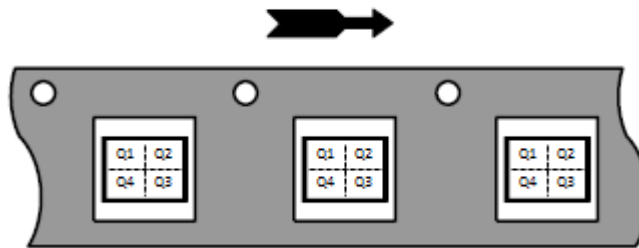
ORDERING INFORMATION

Device	Package	Specific Device Code	Pin 1 Orientation (See below)	Shipping [†]
MC74VHC1GU04DF1G	SC-88A	V6	Q2	3000 / Tape & Reel
MC74VHC1GU04DBVT1G	SC-74A	V6	Q4	3000 / Tape & Reel
MC74VHC1GU04MU1TCG	UDFN6, 1.45 x 1.0, 0.5P	T	Q4	3000 / 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

Direction of Feed

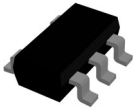


REVISION HISTORY

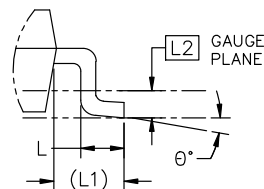
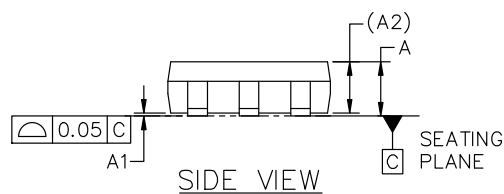
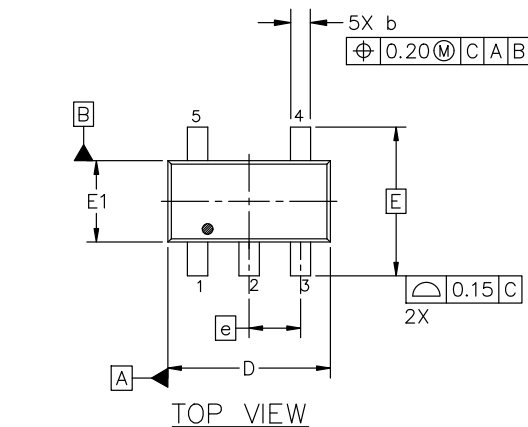
Revision	Description of Changes	Date
25	Removed four package ordering options and OPNs	1/13/2026

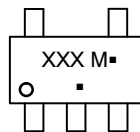
* Please note that this document has been previously updated prior to the inclusion of this revision history table and that the changes tracked only reflect what has occurred on the noted approval dates.




SC-74A-5 3.00x1.50x0.95, 0.95P
CASE 318BQ
ISSUE C

DATE 26 FEB 2024


DETAIL "A"
SCALE 2:1

GENERIC
MARKING DIAGRAM*


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

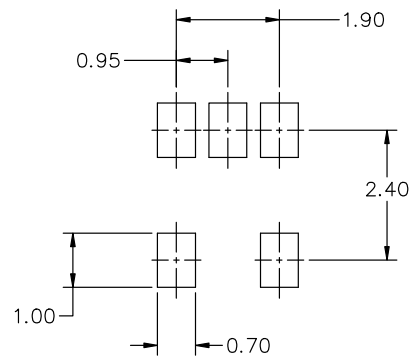
(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS (ANGLES IN DEGREES).
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OF GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.01	0.18	0.10
A2	0.95 REF.		
b	0.25	0.37	0.50
c	0.10	0.18	0.26
D	2.85	3.00	3.15
E	2.75 BSC		
E1	1.35	1.50	1.65
e	0.95 BSC		
L	0.20	0.40	0.60
L1	0.62 REF.		
L2	0.25 BSC		
θ	0°	5°	10°



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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DESCRIPTION:	SC-74A-5 3.00x1.50x0.95, 0.95P	PAGE 1 OF 1

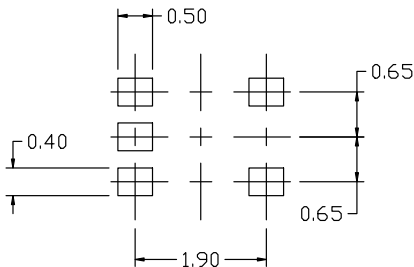
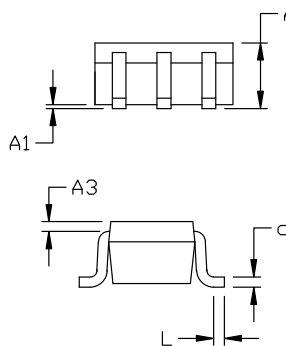
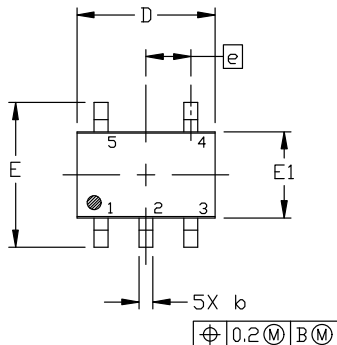
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SCALE 2:1

SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE M

DATE 11 APR 2023



RECOMMENDED
MOUNTING FOOTPRINT

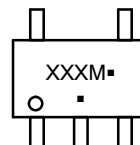
* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30

GENERIC MARKING
DIAGRAM*



*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

STYLE 1:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 2:

- PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:

- PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

STYLE 4:

- PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

STYLE 5:

- PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

STYLE 6:

- PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

STYLE 7:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 8:

- PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:

- PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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DESCRIPTION:	SC-88A (SC-70-5/SOT-353)	PAGE 1 OF 1

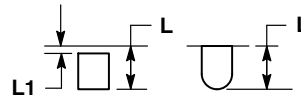
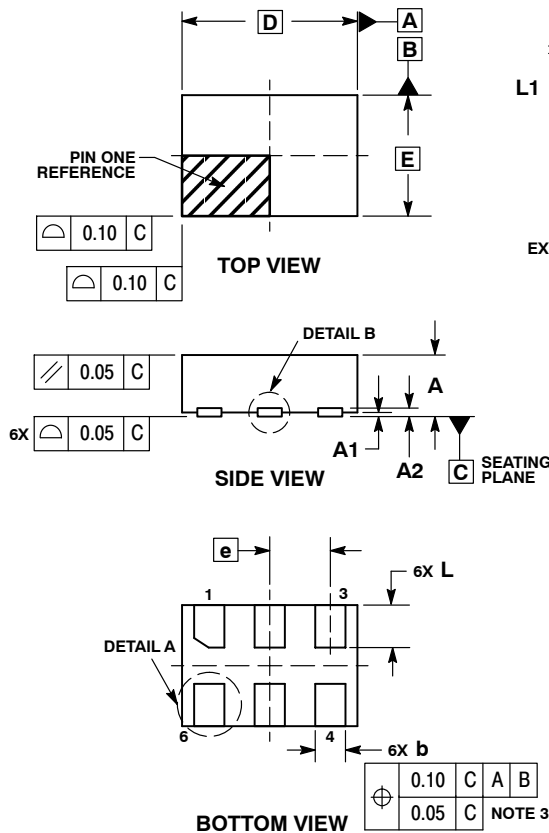
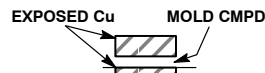
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SCALE 4:1

UDFN6, 1.45x1.0, 0.5P
CASE 517AQ
ISSUE O

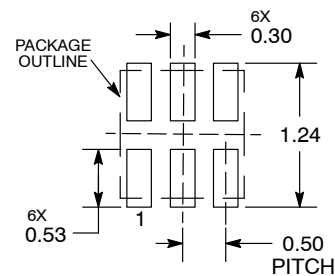
DATE 15 MAY 2008


DETAIL A
OPTIONAL
CONSTRUCTIONS

DETAIL B
OPTIONAL
CONSTRUCTIONS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07 REF	
b	0.20	0.30
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	---	0.15

MOUNTING FOOTPRINT


DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC
MARKING DIAGRAM*

X = Specific Device
Code

M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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DESCRIPTION:	UDFN6, 1.45x1.0, 0.5P	PAGE 1 OF 1

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