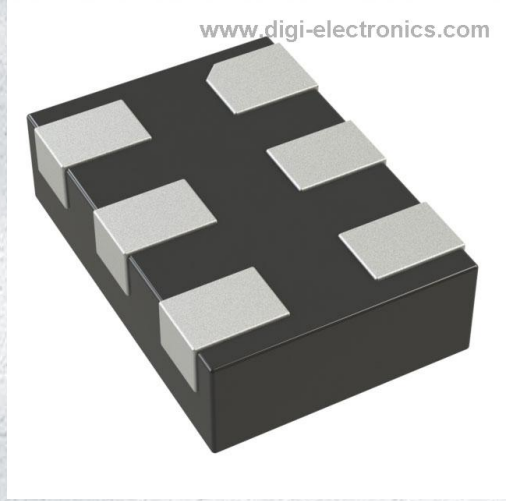
MC74VHC1GU04MU1TCG Datasheet



https://www.DiGi-Electronics.com

DiGi Electronics Part Number	MC74VHC1GU04MU1TCG-DG
Manufacturer	onsemi
Manufacturer Product Number	MC74VHC1GU04MU1TCG
Description	IC INVERTER 1CH 1-INP 6UDFN
Detailed Description	Inverter IC 1 Channel 6-UDFN (1.45x1)

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
MC74VHC1GU04MU1TCG	onsemi
Series:	Product Status:
74HC	Active
Logic Type:	Number of Circuits:
Inverter	1
Number of Inputs:	Features:
1	-
Voltage - Supply:	Current - Quiescent (Max):
2V ~ 5.5V	1 µA
Current - Output High, Low:	Input Logic Level - Low:
8mA, 8mA	0.3V ~ 1.1V
Input Logic Level - High:	Max Propagation Delay @ V, Max CL:
1.7V ~ 4.4V	7ns @ 5V, 50pF
Operating Temperature:	Mounting Type:
-55°C ~ 125°C	Surface Mount
Supplier Device Package:	Package / Case:
6-UDFN (1.45x1)	6-UFDFN
Base Product Number:	
74VHC1GU04	

Environmental & Export classification

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

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, SOT−553, SOT−953 and UDFN6 Packages
- Chip Complexity < 100 FETs
- −Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

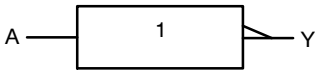
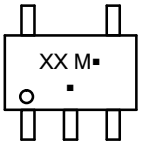
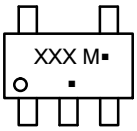
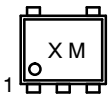
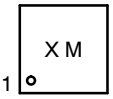


Figure 1. Logic Symbol

MARKING DIAGRAMS

	**SC−88A DF SUFFIX CASE 419A**	
	**SC−74A DBV SUFFIX CASE 318BQ**	
	**SOT−553 XV5 SUFFIX CASE 463B**	
	**SOT−953 P5 SUFFIX CASE 527AE**	
	**UDFN6 1.45 x 1.0 CASE 517AQ**	
	**UDFN6 1.2 x 1.0 CASE 517AA**	
	**UDFN6 1.0 x 1.0 CASE 517BX**	

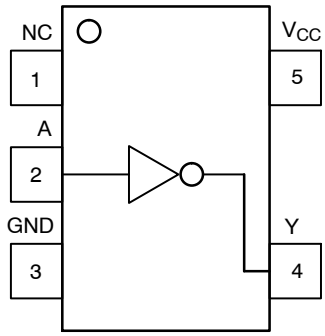
XX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

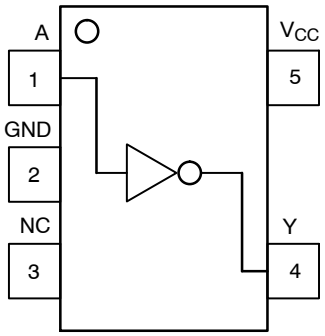
ORDERING INFORMATION

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

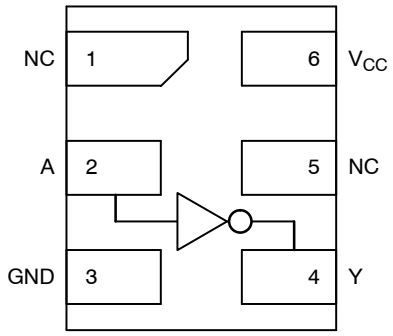
MC74VHC1GU04



(SC−88A/SOT−553/ SC−74A)



SOT−953



UDFN6

Figure 2. Pinout (Top View)

PIN ASSIGNMENT
(SC−88A/SOT−553/ SC−74A)

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

PIN ASSIGNMENT (SOT−953)

Pin	Function
1	A
2	GND
3	NC
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

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 SOT−553 SOT−953 UDFN6	377 320 324 254 154	°C/W
P_D	Power Dissipation in Still Air	SC−88A SC−74A SOT−553 SOT−953 UDFN6	332 390 386 491 812	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 V V_{CC} = 2.3 V to 2.7 V V_{CC} = 3.0 V to 3.6 V V_{CC} = 4.5 V to 5.5 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.

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 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	– – –	1.9 2.9 4.4	– – –	1.9 2.9 4.4	– – –	V
		V_{IN} = GND I_{OH} = −4 mA I_{OH} = −8 mA	3.0 4.5	2.58 3.94	– –	– –	2.48 3.80	– –	2.34 3.66	– –	
V_{OL}	Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OL} = 50 μA	2.0 3.0 4.5	– – –	0.0 0.0 0.0	0.1 0.1 0.1	– – –	0.1 0.1 0.1	– – –	0.1 0.1 0.1	V
		V_{IN} = V_{CC} I_{OL} = 4 mA I_{OL} = 8 mA	3.0 4.5	– –	– –	0.36 0.36	– –	0.44 0.44	– –	0.52 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.

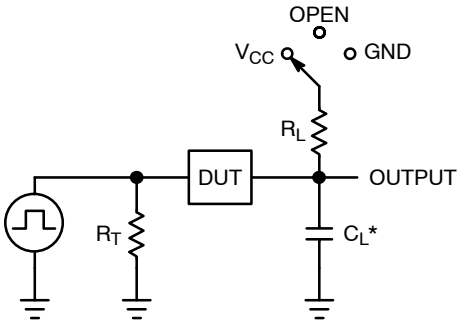
AC ELECTRICAL CHARACTERISTICS

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

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



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

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

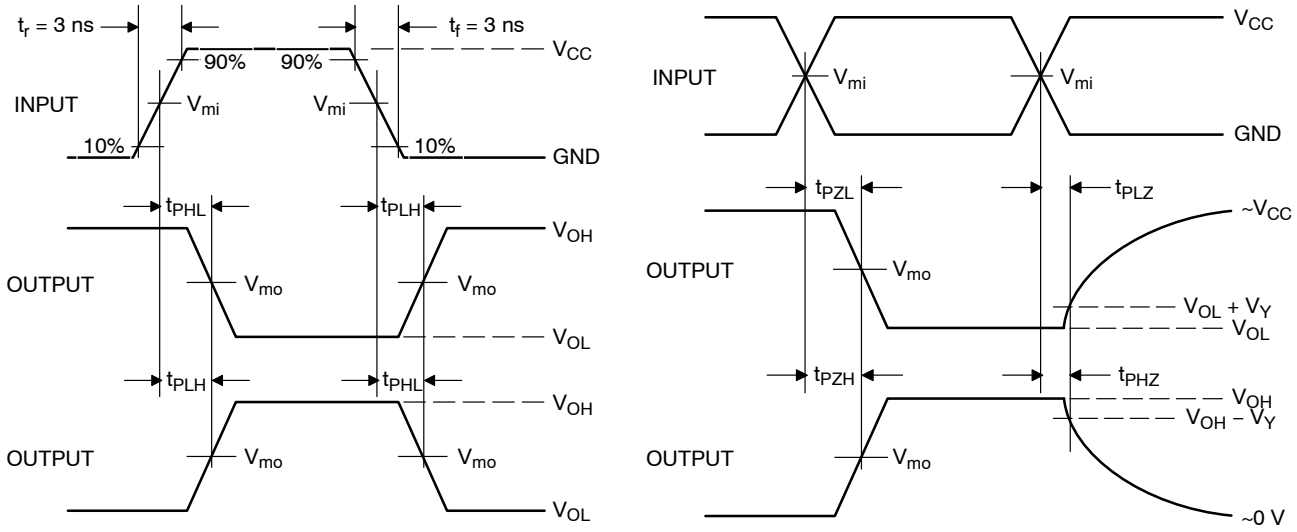


Figure 4. Switching Waveforms

V_{CC}, V	V_{mi}, V	V_{mo}, V		V_Y, V
		t_{PLH}, t_{PHL}	t_{PZL}, t_{PLZ}, 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

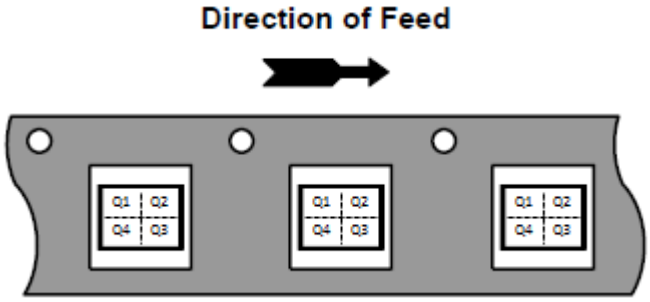
ORDERING INFORMATION

Device	Package	Specific Device Code	Pin 1 Orientation (See below)	Shipping†
MC74VHC1GU04DF1G	SC−88A	V6	Q2	3000 / Tape & Reel
MC74VHC1GU04DFT1G (Please contact **onsemi**)	SC−88A	V6	Q2	3000 / Tape & Reel
MC74VHC1GU04DFT2G (Please contact **onsemi**)	SC−88A	V6	Q4	3000 / Tape & Reel
MC74VHC1GU04DFT2G−Q* (Please contact **onsemi**)	SC−88A	V6	Q4	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
MC74VHC1GU04MU2TCG (Please contact **onsemi**)	UDFN6, 1.2 x 1.0, 0.4P	K	Q4	3000 / Tape & Reel
MC74VHC1GU04MU3TCG (Please contact **onsemi**)	UDFN6, 1.0 x 1.0, 0.35P	Y	Q4	3000 / Tape & Reel
MC74VHC1GU04XV5T2G (Please contact **onsemi**)	SOT−553	TBD	Q4	4000 / Tape & Reel
MC74VHC1GU04P5T5G (Please contact **onsemi**)	SOT−953	TBD	Q2	8000 / 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.

*−Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

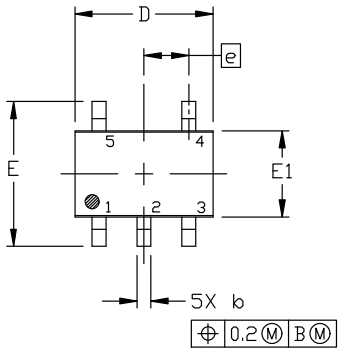
Pin 1 Orientation in Tape and Reel

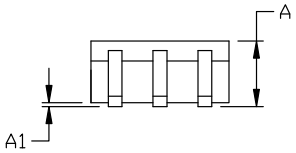


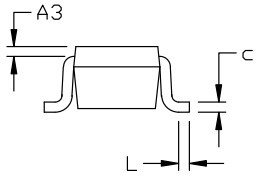
MC74VHC1GU04

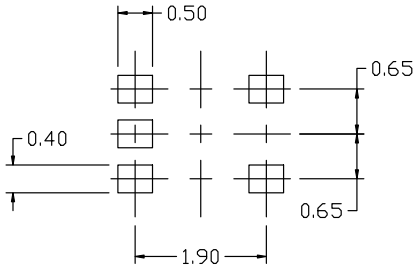
PACKAGE DIMENSIONS

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









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:

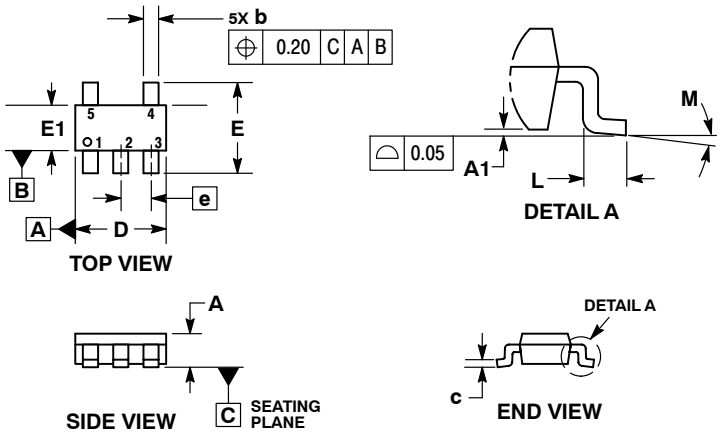
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

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

MC74VHC1GU04

PACKAGE DIMENSIONS

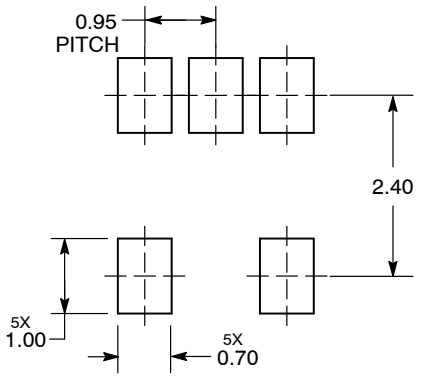
SC−74A
CASE 318BQ
ISSUE B



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

	MILLIMETERS	
DIM	MIN	MAX
A	0.90	1.10
A1	0.01	0.10
b	0.25	0.50
c	0.10	0.26
D	2.85	3.15
E	2.50	3.00
E1	1.35	1.65
e	0.95 BSC	
L	0.20	0.60
M	0 °	10 °

RECOMMENDED SOLDERING FOOTPRINT*



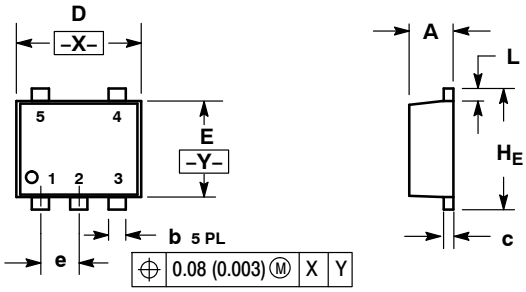
DIMENSIONS: MILLIMETERS

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

MC74VHC1GU04

PACKAGE DIMENSIONS

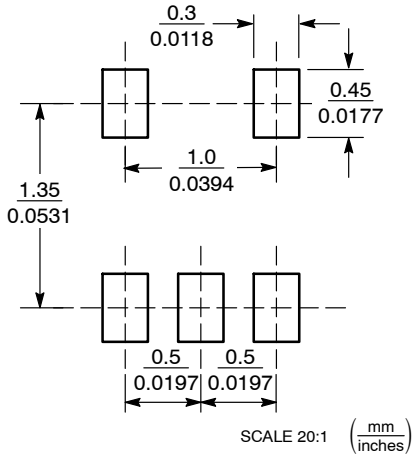
SOT−553, 5 LEAD
CASE 463B
ISSUE C



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.022	0.024
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.08	0.13	0.18	0.003	0.005	0.007
D	1.55	1.60	1.65	0.061	0.063	0.065
E	1.15	1.20	1.25	0.045	0.047	0.049
e		0.50 BSC			0.020 BSC	
L	0.10	0.20	0.30	0.004	0.008	0.012
H_E	1.55	1.60	1.65	0.061	0.063	0.065

SOLDERING FOOTPRINT*

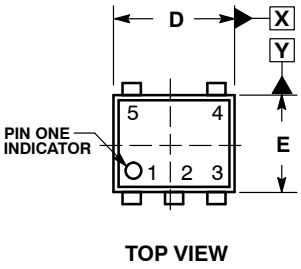


*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

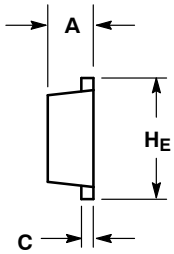
MC74VHC1GU04

PACKAGE DIMENSIONS

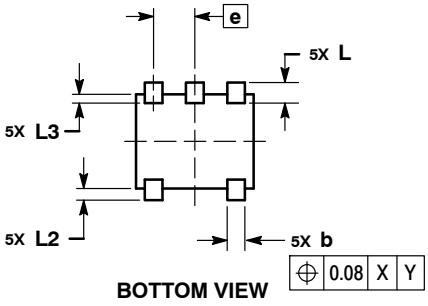
SOT−953
CASE 527AE
ISSUE E



TOP VIEW



SIDE VIEW

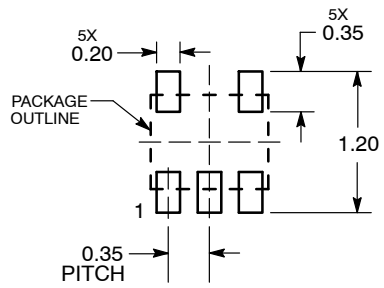


BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H_E	0.95	1.00	1.05
L	0.175 REF		
L2	0.05	0.10	0.15
L3	---	---	0.15

SOLDERING FOOTPRINT*



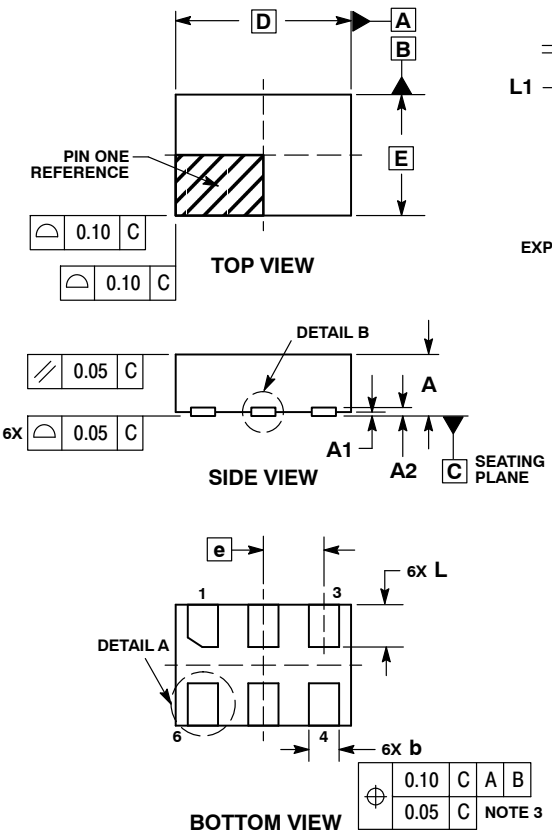
DIMENSIONS: MILLIMETERS

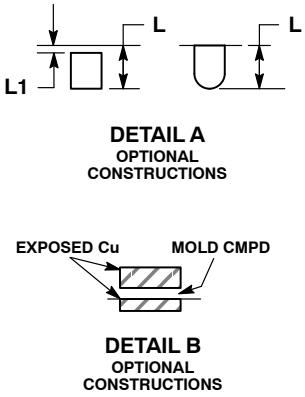
*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MC74VHC1GU04

PACKAGE DIMENSIONS

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

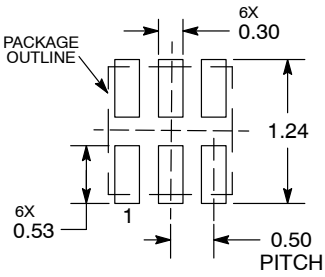




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

	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



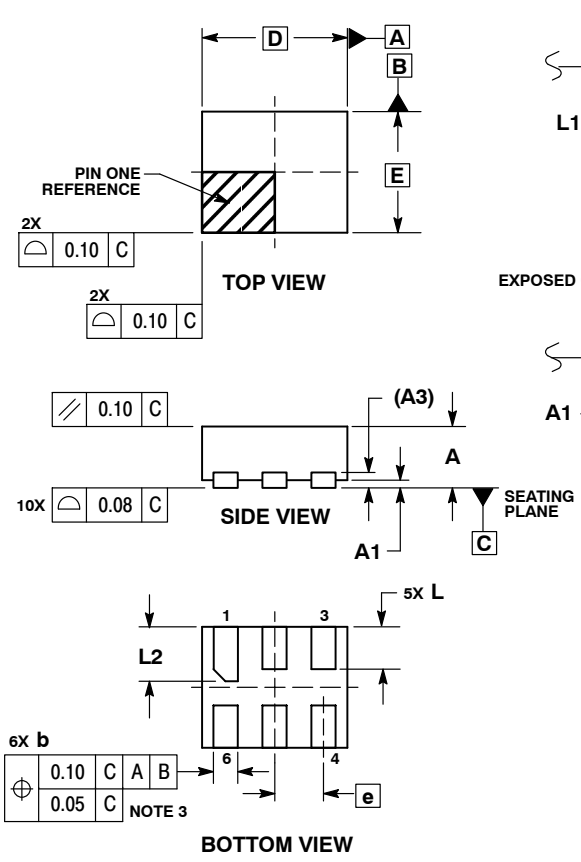
DIMENSIONS: MILLIMETERS

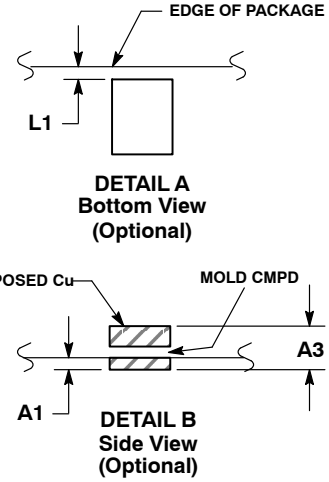
*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MC74VHC1GU04

PACKAGE DIMENSIONS

UDFN6, 1.2x1.0, 0.4P
CASE 517AA
ISSUE D

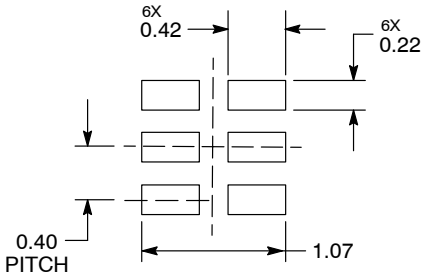




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.127 REF	
b	0.15	0.25
D	1.20 BSC	
E	1.00 BSC	
e	0.40 BSC	
L	0.30	0.40
L1	0.00	0.15
L2	0.40	0.50

MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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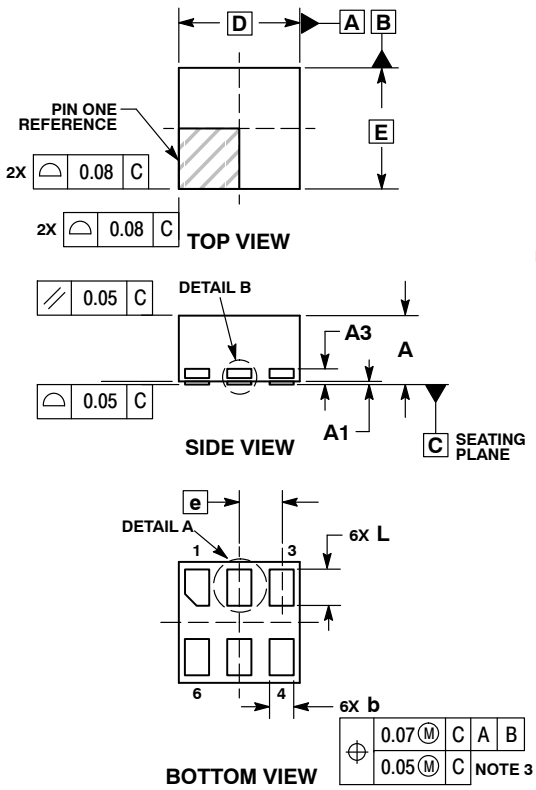
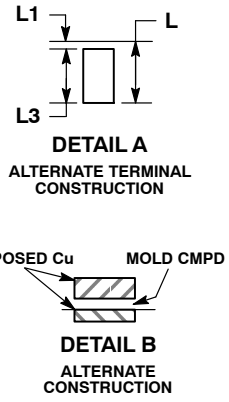
MC74VHC1GU04

PACKAGE DIMENSIONS

UDFN6, 1x1, 0.35P
CASE 517BX
ISSUE O

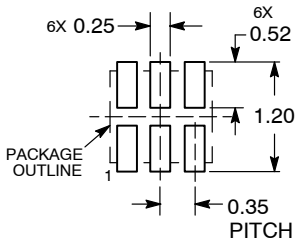




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

	MILLIMETERS	
DIM	MIN	MAX
A	0.50	0.65
A1	0.00	0.05
A3	0.13 REF	
b	0.17	0.23
D	1.00 BSC	
E	1.00 BSC	
e	0.35	
L	0.20	0.40
L1	---	0.15
L3	0.26	0.33

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSION: MILLIMETERS

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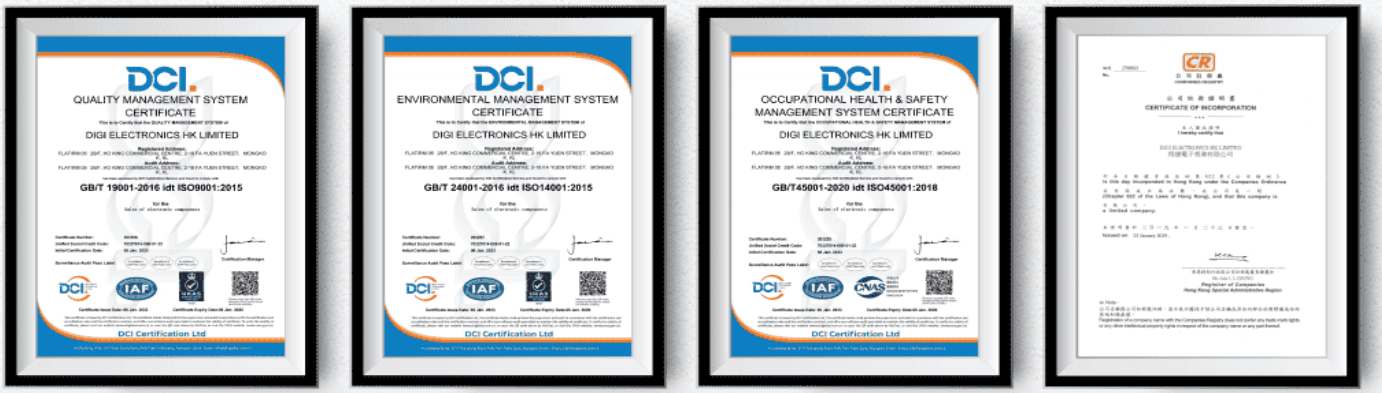

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