NL17SZ04

"NL17SZ04XV5T2G"

Single Inverter

The NL17SZ04 is an inverter in two tiny footprint packages. The device performs much as LCX multi−gate products in speed and drive.

Features

- Tiny SOT−353 and SOT−553 Packages
- 24 mA Sink and Source Output Capability
- Over−Voltage Tolerant Inputs and Outputs
- Pin For Pin with NC7SZ04P5X, TC7SZ04FU and TC7SZ04AFE
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V V_{CC} Operation
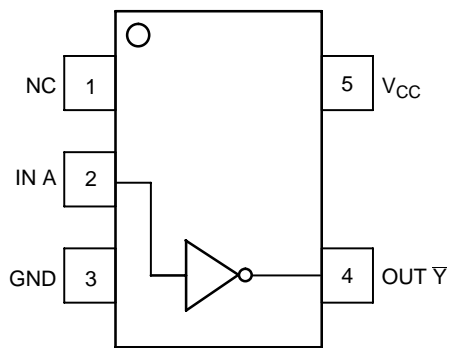- Pb−Free Packages are Available
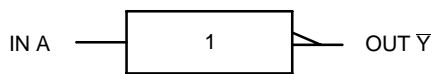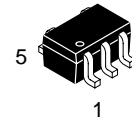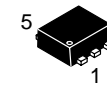

Figure 1. Pinout (Top View)

Figure 2. Logic Symbol
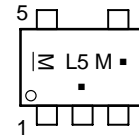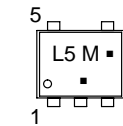
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MARKING DIAGRAMS

SOT−353/SC70−5/SC−88A
DF SUFFIX
CASE 419A

SOT−553
XV5 SUFFIX
CASE 463B

L5 = Device Code
M = Date Code*
▪ = Pb−Free Package
(Note: Microdot may be in either location)
*Date Code orientation and/or position may vary depending upon manufacturing location.

PIN ASSIGNMENT

Pin	Function
1	NC
2	IN A
3	GND
4	OUT $\overline{Y}$
5	V_{CC}

FUNCTION TABLE

A Input	$\overline{Y}$ Output
L	H
H	L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

NL17SZ04

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V$_{CC}$	DC Supply Voltage		-0.5 to $+7.0$	V
V$_I$	DC Input Voltage		$-0.5 \leq V_I \leq +7.0$	V
V$_O$	DC Output Voltage	Output in Higher or Low State (Note 1)	$-0.5 \leq V_O \leq +7.0$	V
I$_{IK}$	DC Input Diode Current	V$_I$ < GND	-50	mA
I$_{OK}$	DC Output Diode Current	V$_O$ < GND	-50	mA
I$_O$	DC Output Sink Current		± 50	mA
I$_{CC}$	DC Supply Current per Supply Pin		± 100	mA
I$_{GND}$	DC Ground Current per Supply Pin		± 100	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	SOT–353 (Note 2) SOT–553	350 496	°C/W
P$_D$	Power Dissipation in Still Air at 85°C	SOT–353 SOT–553	186 135	mW
MSL	Moisture Sensitivity		Level 1	
F$_R$	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V–0 @ 0.125 in	
ESD	ESD Classification	Human Body Model (Note 3) Machine Model (Note 4) Charged Device Model (Note 5)	Class IC Class A N/A	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.
1. IO absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm–by–1 inch, 2–ounce copper trace with no air flow.
3. Tested to EIA/JESD22–A114–A, rated to EIA/JESD22–A114–B.
4. Tested to EIA/JESD22–A115–A, rated to EIA/JESD22–A115–A.
5. Tested to JESD22–C101–A.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V$_{CC}$	DC Supply Voltage	Operating Data Retention	1.65 1.5	5.5 5.5	V
V$_{IN}$	DC Input Voltage		0	5.5	V
V$_{OUT}$	DC Output Voltage	(High or Low State)	0	5.5	V
T$_A$	Operating Temperature Range		–40	+85	°C
t$_r$, t$_f$	Input Rise and Fall Time	V$_{CC}$ = 2.5 V $\pm$ 0.2 V V$_{CC}$ = 3.0 V $\pm$ 0.3 V V$_{CC}$ = 5.0 V $\pm$ 0.5 V	0 0 0	20 10 5	ns/V

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V$_{CC}$ (V)	T$_A$ = 25°C Min	Typ	Max	−40°C ≤ T$_A$ ≤ 85°C Min	Max	Unit
V$_{IH}$	High−Level Input Voltage		1.65 to 1.95 2.3 to 5.5	0.75 V$_{CC}$ 0.7 V$_{CC}$			0.75 V$_{CC}$ 0.7 V$_{CC}$		V
V$_{IL}$	Low−Level Input Voltage		1.65 to 1.95 2.3 to 5.5			0.25 V$_{CC}$ 0.3 V$_{CC}$		0.25 V$_{CC}$ 0.3 V$_{CC}$	V
V$_{OH}$	High−Level Output Voltage V$_{IN}$ = V$_{IL}$	I$_{OH}$ = −100 μA	1.65 to 5.5	V$_{CC}$ − 0.1	V$_{CC}$		V$_{CC}$ − 0.1		V
		I$_{OH}$ = −3 mA	1.65	1.29	1.52		1.29		
		I$_{OH}$ = −8 mA	2.3	1.9	2.1		1.9		
		I$_{OH}$ = −12 mA	2.7	2.2	2.4		2.2		
		I$_{OH}$ = −16 mA	3.0	2.4	2.7		2.4		
		I$_{OH}$ = −24 mA	3.0	2.3	2.5		2.3		
		I$_{OH}$ = −32 mA	4.5	3.8	4.0		3.8		
V$_{OL}$	Low−Level Output Voltage V$_{IN}$ = V$_{IH}$	I$_{OL}$ = 100 μA	1.65 to 5.5		0.0	0.1		0.1	V
		I$_{OH}$ = 3 mA	1.65		0.08	0.24		0.24	
		I$_{OL}$ = 8 mA	2.3		0.20	0.3		0.3	
		I$_{OL}$ = 12 mA	2.7		0.22	0.4		0.4	
		I$_{OL}$ = 16 mA	3.0		0.28	0.4		0.4	
		I$_{OL}$ = 24 mA	3.0		0.38	0.55		0.55	
		I$_{OL}$ = 32 mA	4.5		0.42	0.55		0.55	
I$_{IN}$	Input Leakage Current	V$_{IN}$ = V$_{CC}$ or GND	0 to 5.5		± 1.0			± 10.0	μA
I$_{OFF}$	Power Off Leakage Current	V$_{OUT}$ = 5.5 V or V$_{IN}$ = 5.5 V	0			1		10	μA
I$_{CC}$	Quiescent Supply Current	V$_{IN}$ = V$_{CC}$ or GND	1.65 to 5.5			1		10	μA

AC ELECTRICAL CHARACTERISTICS t$_R$ = t$_F$ = 2.5 ns; C$_L$ = 50 pF; R$_L$ = 500 Ω

Symbol	Parameter	Condition	V$_{CC}$ (V)	T$_A$ = 25°C Min	Typ	Max	−40°C ≤ T$_A$ ≤ 85°C Min	Max	Unit
t$_{PLH}$ t$_{PHL7}$	Propagation Delay (Figure 3 and 4)	R$_L$ = 1 MΩ, C$_L$ = 15 pF	1.65 1.8	2.0 2.0	5.3 4.4	11.4 9.5	2.0 2.0	12.0 10.0	ns
		R$_L$ = 1 MΩ, C$_L$ = 15 pF	2.5 ± 0.2	0.2	3.5	6.5	0.8	7.0	
		R$_L$ = 1 MΩ, C$_L$ = 15 pF	3.3 ± 0.3	0.8	2.1	4.5	0.5	4.7	
		R$_L$ = 500 Ω, C$_L$ = 50 pF		1.2	2.9	5.5	1.5	5.2	
		R$_L$ = 1 MΩ, C$_L$ = 15 pF	5.0 ± 0.5	0.5	1.8	3.9	0.5	4.1	
		R$_L$ = 500 Ω, C$_L$ = 50 pF		0.8	2.4	4.3	0.8	4.5	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C$_{IN}$	Input Capacitance	V$_{CC}$ = 5.5 V, V$_I$ = 0 V or V$_{CC}$	> 2.5	pF
C$_{PD}$	Power Dissipation Capacitance (Note 6)	10 MHz, V$_{CC}$ = 3.3 V, V$_I$ = 0 V or V$_{CC}$ 10 MHz, V$_{CC}$ = 5.5 V, V$_I$ = 0 V or V$_{CC}$	9 11	pF

6. 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$_{CC}$.
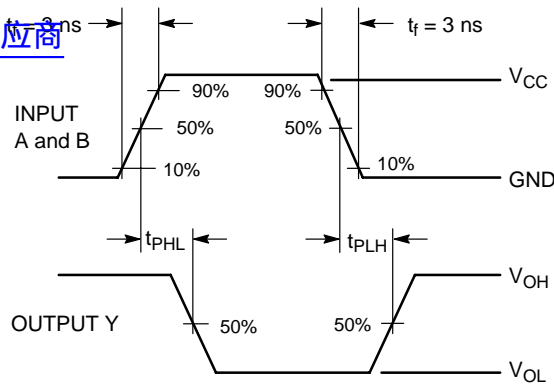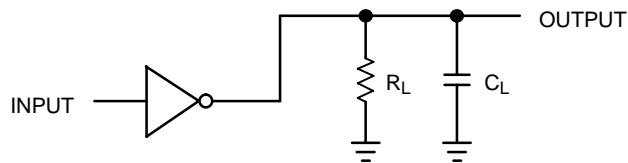
"NL17SZ04XV5T2G"

Figure 3. Switching Waveform

A 1–MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping†
NL17SZ04DFT2	SC−88A/SOT−353/SC70−5	3000 Units / Tape & Reel, 178 mm
NL17SZ04DFT2G	SC−88A/SOT−353/SC70−5 (Pb−Free)	3000 Units / Tape & Reel, 178 mm
NL17SZ04XV5T2	SOT−553*	4000 Units / Tape & Reel, 178 mm
NL17SZ04XV5T2G	SOT−553*	4000 Units / Tape & Reel, 178 mm

†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.
*All Devices in Package SOT553 are Inherently Pb−Free.

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PACKAGE DIMENSIONS

SOT−353
DF SUFFIX
5−LEAD PACKAGE
CASE 419A−02
ISSUE J
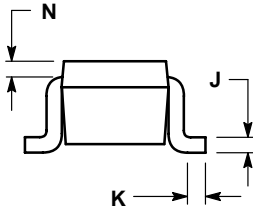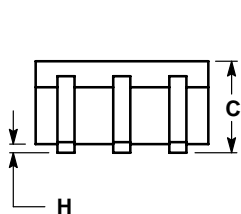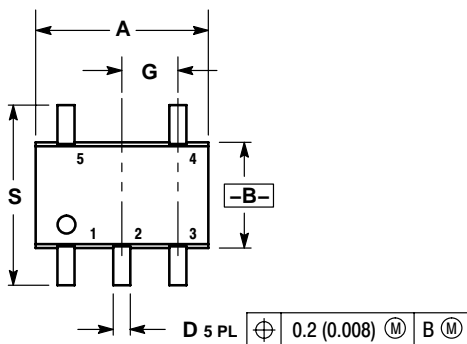
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

D 5 PL ⊕ | 0.2 (0.008) Ⓜ | B Ⓜ

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

SOLDERING FOOTPRINT*
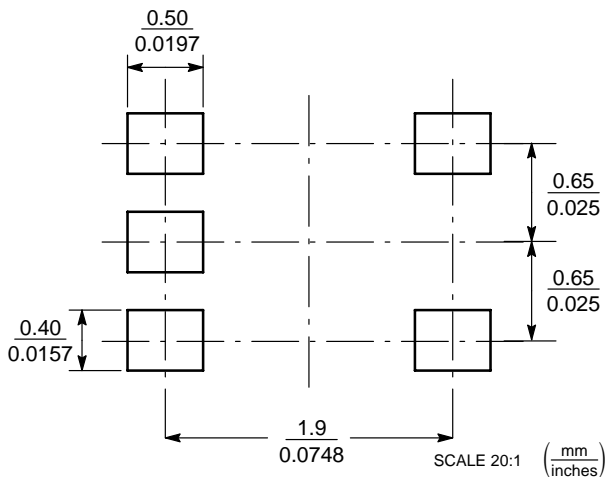
$\dfrac{0.50}{0.0197}$

$\dfrac{0.65}{0.025}$

$\dfrac{0.65}{0.025}$

$\dfrac{0.40}{0.0157}$

$\dfrac{1.9}{0.0748}$

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

*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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PACKAGE DIMENSIONS

SOT−553
XV5 SUFFIX
5−LEAD PACKAGE
CASE 463B−01
ISSUE B
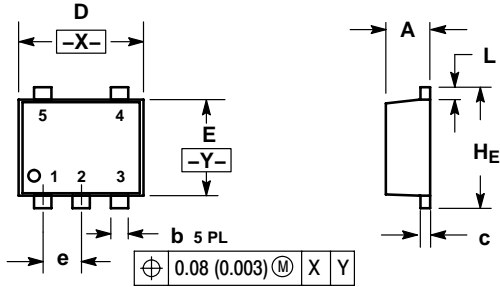
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	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	1.50	1.60	1.70	0.059	0.063	0.067
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.50 BSC			0.020 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	1.50	1.60	1.70	0.059	0.063	0.067

STYLE 1:
PIN 1. BASE 1
2. EMITTER 1/2
3. BASE 2
4. COLLECTOR 2
5. COLLECTOR 1

STYLE 2:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE

SOLDERING FOOTPRINT*

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

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