

ON Semiconductor

Is Now



To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and onsemi. and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that onsemi was negligent regarding the design or manufacture of the part. onsemi is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.

5 Ω SPDT Switch

NL5S4257B, NL5S4257C

The NL5S4257B and NL5S4257C are 5 Ω SPDT analog switches with soft-start feature. The devices are designed for a wide operating voltage range.

Features

- Wide V_{CC} Operating Range: 1.65 V to 5.5 V
- OVT up to +5.5 V for Control pin
- R_{ON} : Typically < 5 Ω at V_{CC} = 4.5 V
- Rail-to-Rail Input/Output
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

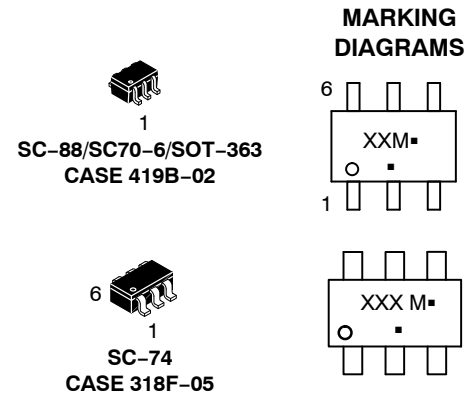
Typical Applications

- Cell Phone Speaker/Microphone Switching
- RF PA Routing



ON Semiconductor®

www.onsemi.com

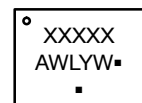


XX = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

WDFN8 2x3, 0.5P
CASE 511EE



XXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

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

NL5S4257B, NL5S4257C

PIN ASSIGNMENTS

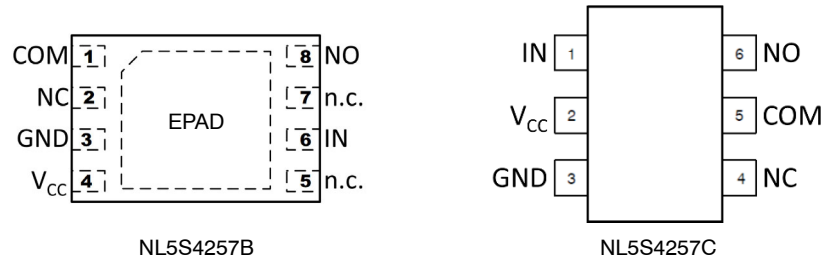


Figure 1. Pin Assignments (Top View)

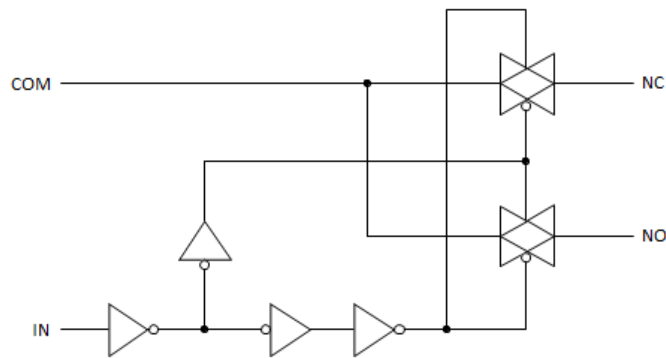


Figure 2. Analog Symbol

PIN DESCRIPTIONS

NL5S4257B	NL5S4257C	Name	Description
8	6	NO	Normally-Open Port
4	2	V _{CC}	Supply
2	4	NC	Normally-Closed Port
1	5	COM	Common Port
3, EPAD	3	GND	Supply Ground
6	1	IN	Switch Select Input
5, 7		n.c.	No Internal Connection

FUNCTION TABLE

IN	Switch
L	NC to COM
H	NO to COM

NL5S4257B, NL5S4257C

MAXIMUM RATINGS

Symbol	Rating	Value	Unit
V_{CC}	Positive DC Supply Voltage	-0.5 to +6.0	V
V_{IS}	Switch Input / Output Voltage	-0.5 to $V_{CC}+0.5$	V
V_{IN}	Digital Select Input Voltage	-0.5 to +6.0	V
I_{OK}	I/O Port Diode Current	± 50	mA
I_{IK}	Select Input Diode Current	-50	mA
$I_{I/O}$	Continuous DC Current Through Analog Switch	± 50	mA
$I_{I/O-pk}$	Peak Current Through Analog Switch, 10% Duty Cycle	± 100	mA
T_s	Storage Temperature	-65 to +150	°C
ESD	Human Body Model (HBM)	2	kV

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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		1.65	5.5	V
V_{IS}	Switch Input / Output Voltage		GND	V_{CC}	V
V_{IN}	Digital Select Input Voltage		GND	5.5	V
T_A	Operating Temperature Range		-40	+125	°C
t_r, t_f	Input Transition Rise or Fall Time (Select Input IN)	$V_{CC} \leq 3.0 \text{ V}$	0	20	ns/V
		$V_{CC} > 3.0 \text{ V}$	0	10	

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.

NL5S4257B, NL5S4257C

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	Guaranteed Limit							Unit
				25°C			–40°C to 85°C		–40°C to 125°C		
				Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	Input High Voltage		2.7	1.1			1.1		1.1		V
			5.0	1.42			1.42		1.42		
V _{IL}	Input Low Voltage		2.7			0.4		0.4		0.4	V
			5.0			0.7		0.7		0.7	
I _{IN}	Input Leakage Current	V _{IN} = 0 V to 5.5 V	1.65 – 5.5			±0.1		±1		±1	μA
I _{OFF}	Input Leakage Current	V _{IN} = 0 to 5.5 V	0			0.05		1		1	μA
I _{S(ON)}	ON-State Switch Leakage Current	V _{IS} = GND to V _{CC} , V _{OS} = Open	5.5			±4.0		±40		±200	nA
I _{S(OFF)}	OFF-State Switch Leakage Current	V _{IS} = V _{CC} and V _{OS} = GND, or I _S = GND and V _{OS} = V _{CC}	5.5			±4.0		±20		±200	nA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND, I _{OS} = 0 mA	5.5			0.5		5		5	μA

NL5S4257B, NL5S4257C

ANALOG SWITCH CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	Guaranteed Limit					Unit
				25°C			−40°C to 125°C		
				Min	Typ	Max	Min	Max	
R _{ON} (Note 1)	Switch ON Resistance	V _{IS} = 0 to V _{CC} , I _O = 15 mA	2.7		8.0	15.0		16.0	Ω
			4.5		5.0	6.0		7.5	
ΔR _{ON} (Notes 1, 2, 3)	ON Resistance Match Between Channels	V _{IS} = 1.5 V, I _A = 15 mA	2.7		0.1	0.5		0.5	Ω
		V _{IS} = 2.5 V, I _A = 15 mA	4.5		0.08	0.5		0.5	
R _{FLAT} (Notes 1, 2, 4)	ON Resistance Flatness	V _{IS} = 0 to V _{CC} , I _O = 15 mA	2.7		3.7				Ω
			4.5		1.2				
Q (Note 5)	Charge Injection	C _L = 1 nF, V _{GEN} = 0 V, R _{GEN} = 0 Ω	2.7		26				pC
			4.5		48				
V _{ISO} (Note 6)	Off-Isolation	R _L = 50 Ω, f = 1 MHz	2.7 – 5.5		−65				dB
V _{CT}	Crosstalk	R _L = 50 Ω, f = 1 MHz	2.7 – 5.5		−70				dB
BW	−3 dB Bandwidth	R _L = 50 Ω	2.7 – 5.5		130				MHz
THD (Note 5)	Total Harmonic Distortion	R _L = 600 Ω, V _{IS} = 0.5 V _{P-P} , f = 20 Hz to 20 kHz	2.7 – 5.5		0.019				%
C _I	Select Input Capacitance	f = 1 MHz	0		4.5				pF
C _{OFF}	NC/NO Port Off Capacitance	f = 1 MHz	4.5		14				pF
C _{ON}	COM Port ON Capacitance	f = 1 MHz	4.5		35				pF

1. Measured by the voltage drop between NC/NO and COM pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (NO, NC, COM).
2. Parameter is characterized but not tested in production.
3. ΔR_{ON} = R_{ON} max – R_{ON} min measured at identical V_{CC}, temperature and voltage levels.
4. Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.
5. Guaranteed by Design.
6. V_{ISO} = 20 log₁₀ [V_{COM}/V_{NO,NC}].

NL5S4257B, NL5S4257C

SWITCHING CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	Guaranteed Limit					Unit
				25°C			−40°C to 125°C		
				Min	Typ	Max	Min	Max	
t _{PD} (Note 7)	Propagation Delay	V _{IN} = V _{IH} or V _{IL}	2.7			1.0		1.0	ns
			4.5			0.5		0.5	
t _{ON}	Turn-on Time, (COM to NO or NC)	R _L = 50 Ω, C _L = 100 pF							ns
		V _{IS} = 1.5 V	2.7			300		300	
		V _{IS} = 3.0 V	4.5			300		300	
		R _L = 50 Ω, C _L = 100 pF							
		V _{IS} = 1.5 V	3.3			300		300	
t _{OFF}	Turn-off Time, (COM to NO or NC)	R _L = 50 Ω, C _L = 100 pF							ns
		V _{IS} = 1.5 V	2.7			300		300	
		V _{IS} = 3.0 V	4.5			300		300	
		R _L = 50 Ω, C _L = 100 pF							
		V _{IS} = 1.5 V	3.3			300		300	
t _{BBM} (Note 5)	Break Before Make Time	R _L = 50 Ω, C _L = 100 pF	2.7	15			15		ns
			4.5	10			10		

7. This parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the On Resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).

ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping [†]
NL5S4257BMT1TAG (Contact ON Semiconductor)	WDFN8 2x3, 0.5P	AA	Q1	3000 / Tape & Reel
NL5S4257CDFT2G	SC-88/SC70-6/SOT-363	AV	Q4	3000 / Tape & Reel
NL5S4257CDBVT1G (Contact ON Semiconductor)	SC-74	TBD	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

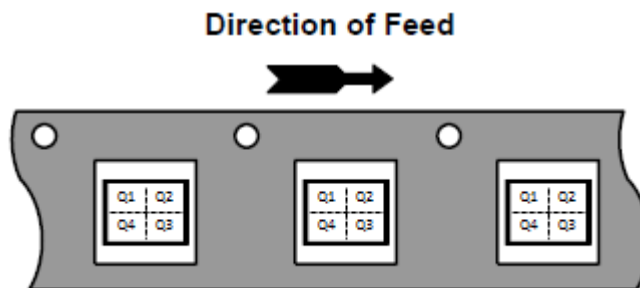


Figure 3.

NL5S4257B, NL5S4257C

Test Setups

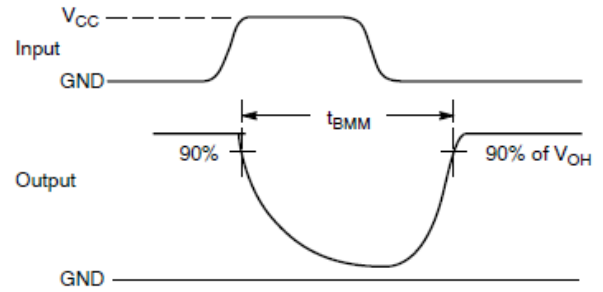
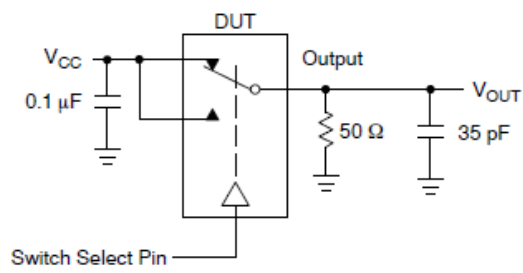


Figure 4. t_{BMM} (Time Break-Before-Make)

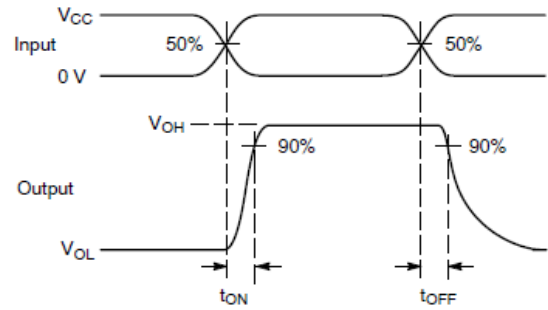
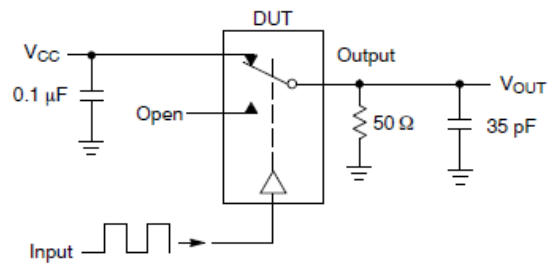
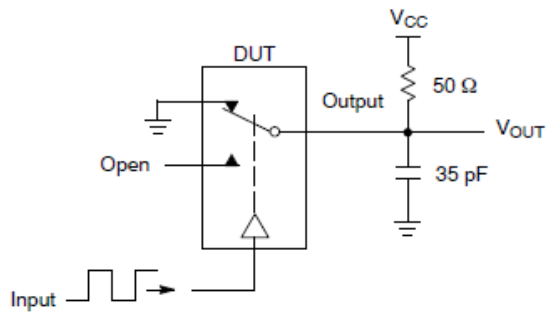


Figure 5. t_{ON}/t_{OFF}



Test Set-Up

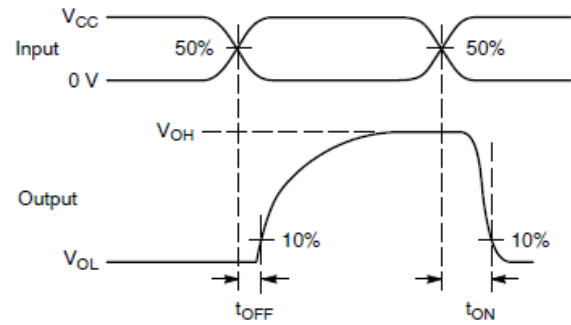
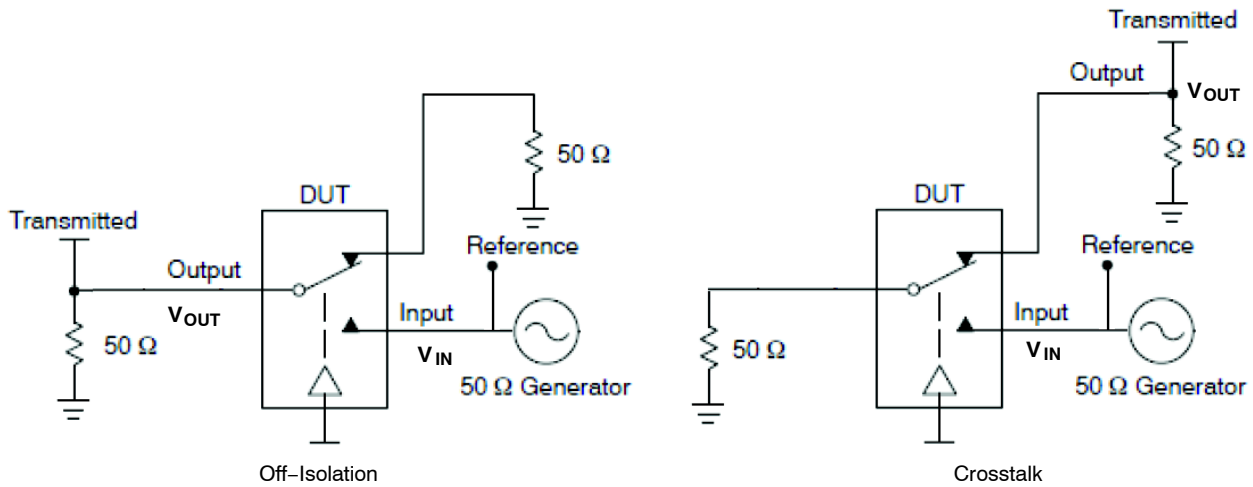


Figure 6. t_{ON}/t_{OFF}



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. Crosstalk is measured from an off channel to an on channel. On loss is the bandwidth of an On switch. V_{ISO} , V_{CT} , Bandwidth and V_{ONL} are independent of the input signal direction.

V_{ISO} or V_{CT} = Off Channel Isolation or crosstalk = $20 \text{ Log for } V_{OUT} / V_{IN}$

V_{ONL} = On Channel Loss = $20 \text{ Log for } V_{OUT} / V_{IN}$ at 100 kHz to 50 MHz

Bandwidth (BW) = the frequency 3 dB below V_{ONL}

Figure 7. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/ V_{ONL}

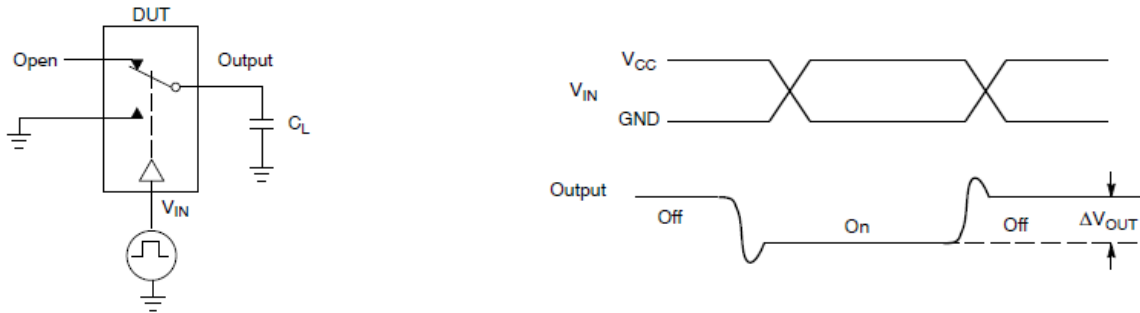


Figure 8. Charge Injection: (Q)

TYPICAL CHARACTERISTICS

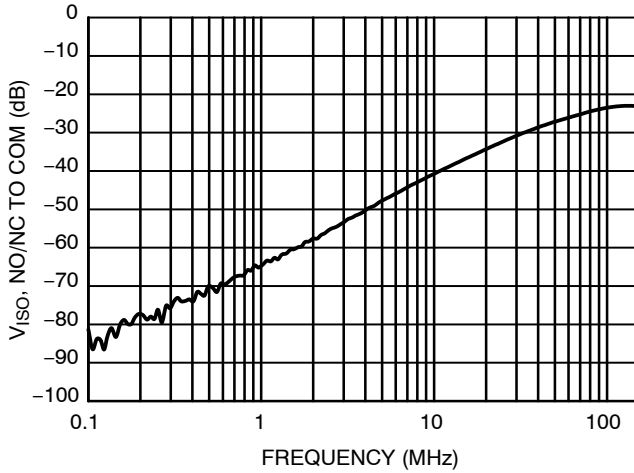


Figure 9. V_{ISO} vs. Frequency
@ $V_{CC} = 4.5\text{ V}$

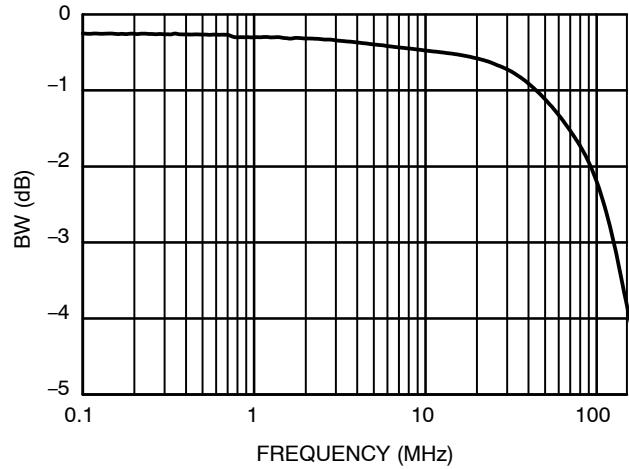


Figure 10. Bandwidth vs. Frequency

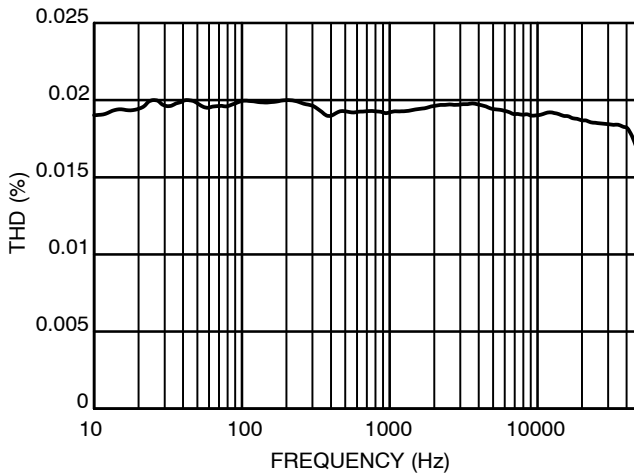


Figure 11. Total Harmonic Distortion

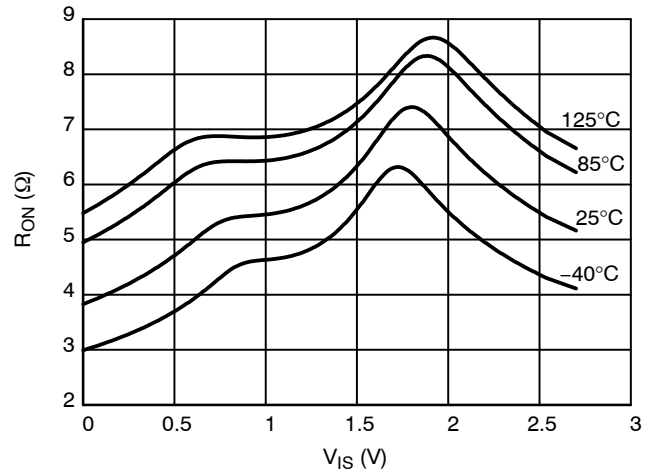


Figure 12. ON Resistance vs. Switch Voltage
@ $V_{CC} = 2.7\text{ V}$

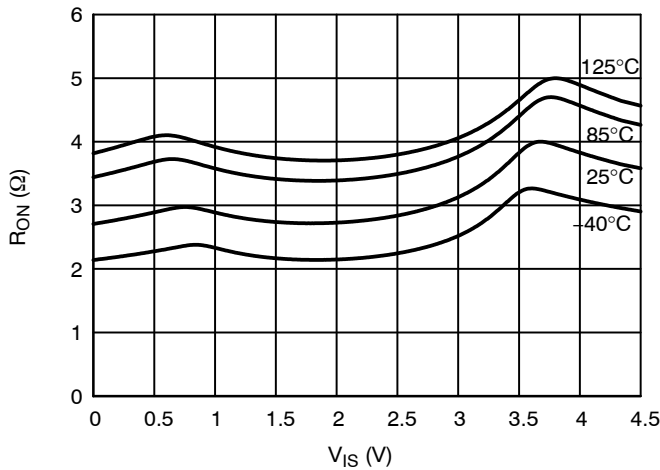


Figure 13. ON Resistance vs. Switch Voltage
@ $V_{CC} = 4.5\text{ V}$

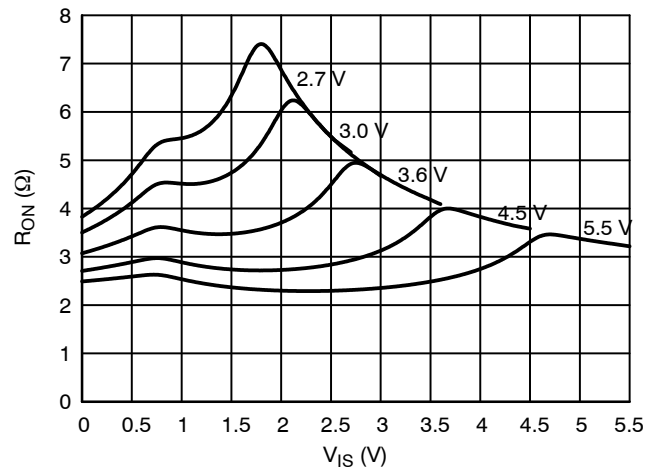


Figure 14. ON Resistance vs. Switch Voltage

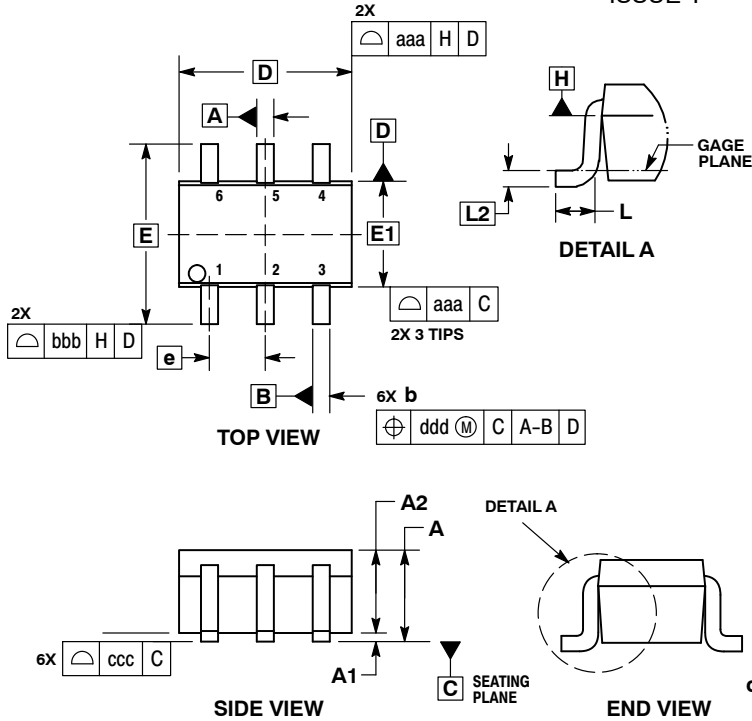
NL5S4257B, NL5S4257C

PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363

CASE 419B-02

ISSUE Y

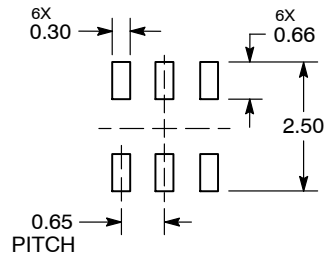


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0.000	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

RECOMMENDED SOLDERING FOOTPRINT*

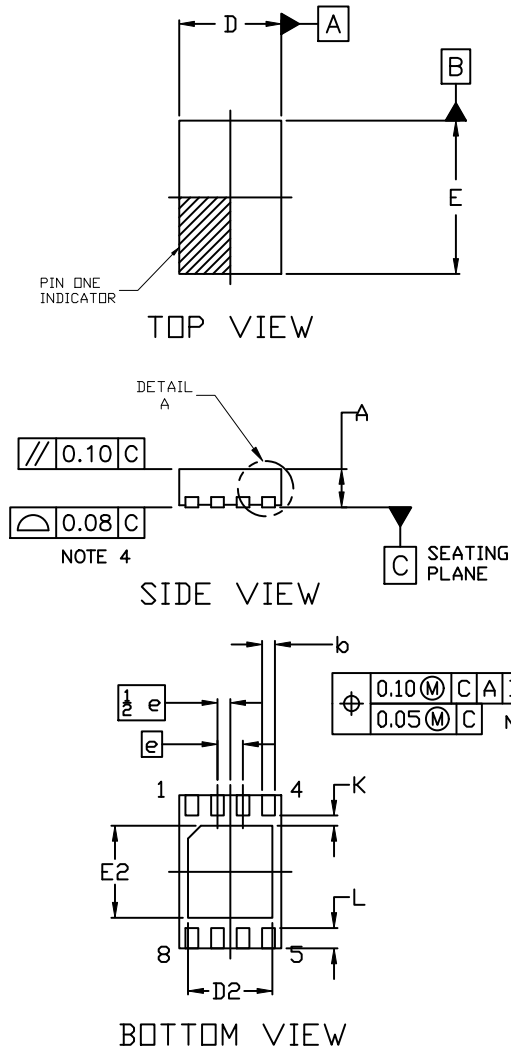


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NL5S4257B, NL5S4257C

PACKAGE DIMENSIONS

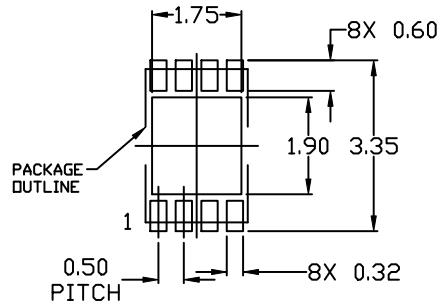
WDFN8 2x3, 0.5P
CASE 511EE
ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. POSITIONAL TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS		
	MIN	NDM	MAX
A	0.70	0.75	0.80
A1	0.00	---	0.05
A3	0.20 REF		
b	0.20	0.25	0.30
D	1.90	2.00	2.10
D2	1.55	1.65	1.75
E	2.90	3.00	3.10
E2	1.70	1.80	1.90
e	0.50 BSC		
K	0.20 REF		
L	0.30	0.40	0.50

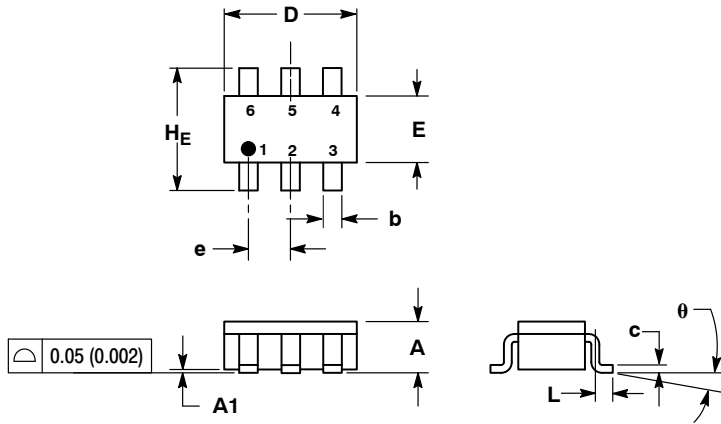


- * For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NL5S4257B, NL5S4257C

PACKAGE DIMENSIONS

SC-74 CASE 318F-05 ISSUE N

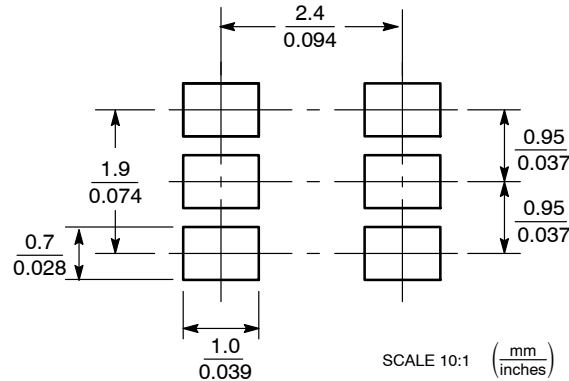


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318F-01, -02, -03, -04 OBSOLETE. NEW STANDARD 318F-05.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.37	0.50	0.010	0.015	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
H _E	2.50	2.75	3.00	0.099	0.108	0.118
θ	0°	—	10°	0°	—	10°

SOLDERING 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.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marketing.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[onsemi:](#)

[NL5S4257CDFT2G](#)