

ON Semiconductor

Is Now

onsemi™

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.

FSA515

5 V SPST Depletion Switch with Negative Swing

Description

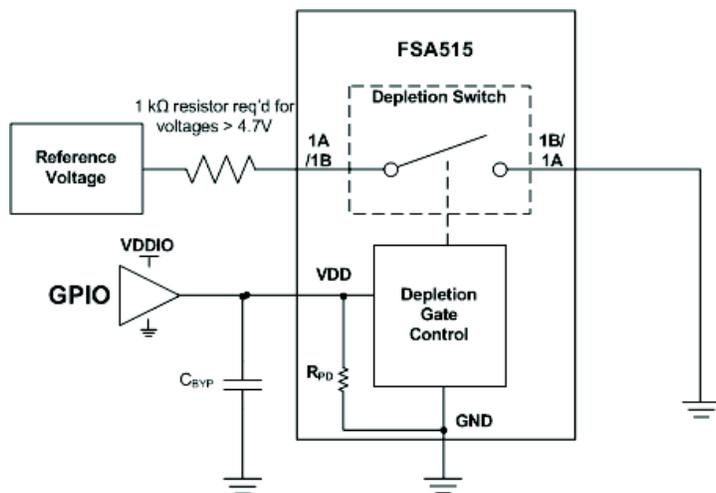
The FSA515 is a high-performance single-pole single-throw (SPST) depletion switch. The depletion technology allows the device to conduct signals when there is no V_{DD} is available and to isolate signals when V_{DD} is present. The FSA515 is 5.5 V tolerant and can pass or isolate negative signal swings down to -3.0 V.

Features

- SPST Depletion Switch
- Normally Closed when $V_{DD} < 0.5$ V
- V_{SW} : -3.0 V to $+5.5$ V
- R_{ON} : 0.7Ω (Typical)
- R_{FLAT} : $1.1 \text{ m}\Omega$ (Typical)

Typical Applications

- Mobile Accessories, Adapters, and Cables
- Phones, Tablets, and Laptops
- Headsets



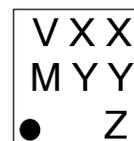
ON Semiconductor®

www.onsemi.com



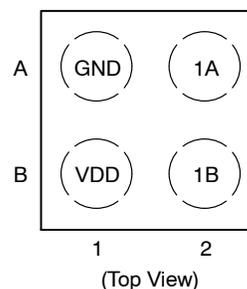
WLCSP4
CASE 567VT

MARKING DIAGRAM



VM = Specific Device Code
XX = 2-digit Lot Run Code
YY = 2-digit Date Code
Z = 1-digit Plant Code

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
FSA515UCX	WLCSP4 (Pb-Free)	3000 / Tape & Reel

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

FSA515

Table 1. PIN FUNCTION DESCRIPTION

Pin No. (WLCSP4)	Pin Name	Description
A1	GND	Ground
A2	1A	A-Port of Switch 1 (Normally Closed)
B1	VDD	Supply Voltage (Switch is closed when Low)
B2	1B	B-Port of Switch 1 (Normally Closed)

Table 2. SWITCH TRUTH TABLE

VDD	Switch State
Low	ON (Conducting)
High	OFF (Isolating)

Table 3. RECOMMENDED EXTERNAL COMPONENT

Component	Description	Vendor	Parameter	Min	Typ	Unit
C _{BYP}	0402, 1 nF, 10%, 6.3 V, X7R	Kemet C0402C102K9RACTU	C	0.65	1	nF
	0201, 1 nF, 10%, 6.3 V, X7R	AVX 02016C102KAT2A				

Table 4. MAXIMUM RATINGS

Rating		Symbol	Value	Unit	
Supply Voltage		V _{DD}	-0.5 to 6.0	V	
Switch Voltage Range	DC Switch I/O Voltage (Switch Conducting)	V _{SW(ON)}	-3.6 (AC) to 6.0	V	
	DC Switch I/O Voltage (Switch Isolated)	V _{SW(OFF)}	-3.6 (AC) to 6.0	V	
Maximum DC Switch I/O Current		I _{SW}	350	mA	
Maximum Peak Switch I/O Current - Pulsed at 1ms duration, <10% duty cycle		I _{SWPEAK}	500	mA	
Maximum Junction Temperature		T _{J(max)}	150	°C	
Storage Temperature Range		T _{STG}	-65 to 150	°C	
ESD Capability (Note 2)	Human Body Model		ESDHBM	4	kV
	Charged Device Model		ESDCDM	2	kV
	IEC 61000-4-2 System	Contact	ESDIEC	8	kV
		Air Gap		15	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.

1. Refer to ELECTRICAL CHARACTERISTICS, RECOMMENDED OPERATING RANGES and/or APPLICATION INFORMATION for Safe Operating parameters.
2. This device series incorporates ESD protection and is tested by the following methods:
 ESD Human Body Model tested per ANSI, ESDA, JEDEC JS-001-2012
 ESD Charged Device Model tested per According to "EIA/JESD22-C101 Level III"
 Latchup Current Maximum Rating: 100 mA per JEDEC standard: JESD78

Table 5. THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Characteristics, WLCSP4 Thermal Resistance, Junction-to-Air (Note 3)	R _{θJA}	77.4	°C/W

3. JEDEC Standard, Still Air, 4-layer board with vias

FSA515

Table 6. RECOMMENDED OPERATING RANGES

Rating		Symbol	Min	Max	Unit
Supply Voltage	Isolating	$V_{DD(OFF)}$	2.5	5.5	V
	Conducting	$V_{DD(ON)}$	0	0.5	V
Switch Voltage Range	Isolating	$V_{SW(OFF)}$	-3.0 (Vpk; AC)	4.7	V
	Isolating (requires 1 k Ω (typ) in series with source)		4.7	5.5	
	Conducting	$V_{SW(ON)}$	-3.0 (Vpk; AC)	4.7	V
	Isolating (requires 1 k Ω (typ) in series with source)		4.7	5.5	
Ambient Temperature		T_A	-40	85	$^{\circ}\text{C}$

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.

Table 7. ELECTRICAL CHARACTERISTICS Unless otherwise specified, typical values are for $T_A=25^{\circ}\text{C}$, $V_{DD} = 0\text{ V}$

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
-----------	-----------------	--------	-----	-----	-----	------

SWITCH DC CHARACTERISTICS

Switch Off Leakage Current	$V_{DD} = 5\text{ V}$ $1B = \text{GND}$	$1A = 5.5\text{ V}$	I_{OFF}	0.01		μA
		$1A = -1.5\text{ V}$		-0.65		
	$V_{DD} = 3.3\text{ V}$ $1B = \text{GND}$	$1A = 1.4\text{ V}$ (Note 5)		0.01	1.5	
Switch On Resistance	$I_{SW} = 100\text{ mA}$, $V_{SW} = -1.5\text{ V}$ to $+1.5\text{ V}$		R_{ON}	0.7	1.1	Ω
	$I_{SW} = 100\text{ mA}$, $V_{SW} = 0\text{ V}$ to $+5.5\text{ V}$			0.7	1.1	
On Resistance Flatness	$I_{SW} = 100\text{ mA}$, $V_{SW} = -1.5\text{ V}$ to $+1.5\text{ V}$		$R_{FLAT(ON)}$	1.1		$\text{m}\Omega$
	$I_{SW} = 100\text{ mA}$, $V_{SW} = 0\text{ V}$ to $+5.5\text{ V}$			1.1		

SWITCH AC CHARACTERISTICS

Total Harmonic Distortion Plus Noise	$V_{SW} = 1\text{ V}_{RMS}$, Ground Centered $R_L = 32\ \Omega$, $f = 1\text{ kHz}$	THD+N		-93		dB
Off Isolation Rejection Ratio	$V_{SW} = 1\text{ V}_{RMS}$, Ground Centered $R_L = 32\ \Omega$	$f = 1\text{ kHz}$	OIRR	-116		dB
		$f = 20\text{ kHz}$		-97		
Bandwidth	$V_{SW} = 200\text{ mV}_{PP}$, Ground Centered $R_L = 50\ \Omega$	BW		367		MHz

SUPPLY CURRENTS

Peak Startup Supply Current	$V_{DD} = 0\text{ V}$ to 5.5 V	I_{DDT}		3.0		mA
Quiescent Current	$V_{DD} = 5.5\text{ V}$	I_{DD}	-	30		μA
Disable Current	$V_{DD} \leq 0.2\text{ V}$	I_{DIS}		0.05	0.50	μA

CONTROL LOGIC

V_{DD} Pull-Down Resistance	$V_{DD} \leq 0.2\text{ V}$	R_{PD}		5.8		$\text{M}\Omega$
V_{DD} High Voltage		V_{DDH}	2.5			V
V_{DD} Low Voltage		V_{DDL}			0.5	V

TIMING

Switch Turn-off Time	$R_L=1\text{ k}\Omega$, $C_L=10\text{ pF}$, $V_{DD} = 0.0\text{ V}$ to 3.0 V $V_{SW} = 5.0\text{ V}$, Figure 1	t_{OFF}		85		μs
Switch Turn-on Time	$R_L=1\text{ k}\Omega$, $C_L=10\text{ pF}$, $V_{DD} = 3.0\text{ V}$ to Hi-Z, $C_{BYP} = 1\text{ nF}$, $V_{SW} = 5.0\text{ V}$, Figure 1	t_{ON}		250		μs

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.

- Performance guaranteed over the indicated operating temperature range by design and/or characterization tested at $T_J = T_A = 25^{\circ}\text{C}$.
- Maximum is guaranteed at 25°C .
- For reference only – guaranteed by design.

FSA515

Table 7. ELECTRICAL CHARACTERISTICS Unless otherwise specified, typical values are for $T_A=25^\circ\text{C}$, $V_{DD} = 0\text{ V}$

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
CAPACITANCE						
On Capacitance	$R_L = 1\text{ k}\Omega$	C_{ON}		14		pF
Off Capacitance	$V_{DD} = 5\text{ V}$, $R_L = 1\text{ k}\Omega$, $C_L = 10\text{ pF}$	C_{OFF}		17		pF
Supply Capacitance	$V_{DD} = 5\text{ V}$ with 400 mV_{PP} , $f = 1\text{ MHz}$	C_{VDD}		17		pF

OSCILLATOR FREQUENCY

On-Chip Oscillator Frequency (Note 6)	For reference only	f_{OSC}		110		kHz
---------------------------------------	--------------------	-----------	--	-----	--	-----

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.

4. Performance guaranteed over the indicated operating temperature range by design and/or characterization tested at $T_J = T_A = 25^\circ\text{C}$.

5. Maximum is guaranteed at 25°C .

6. For reference only – guaranteed by design.

Timing Diagram

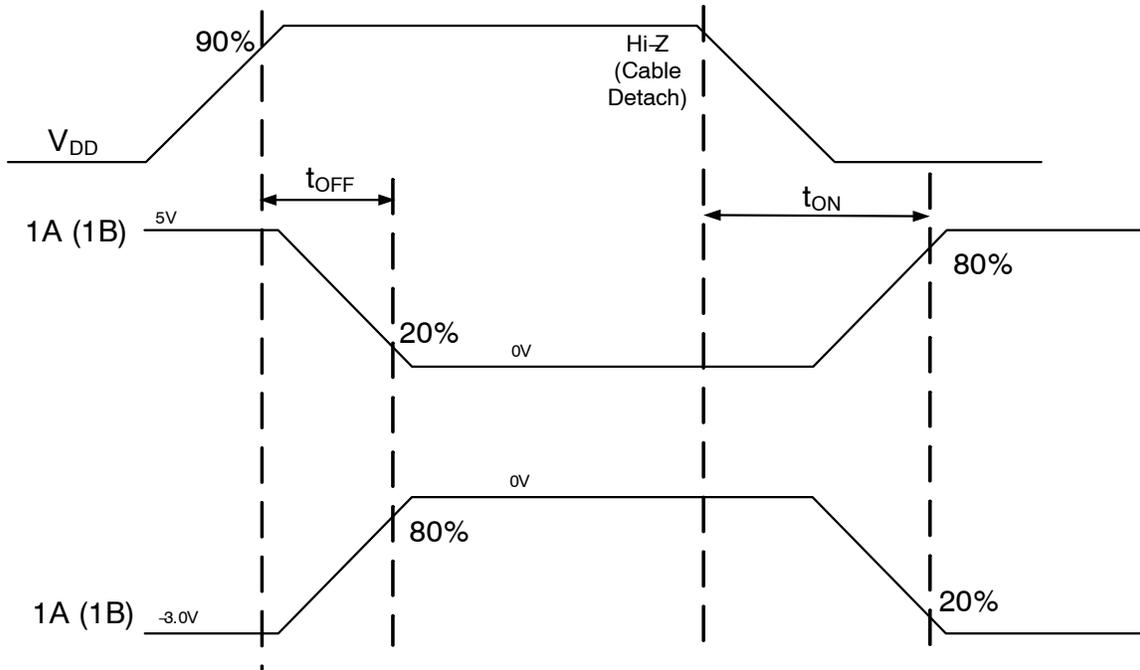
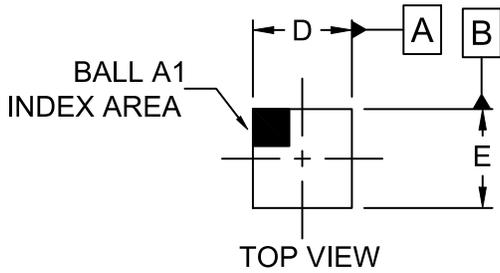


Figure 1. t_{ON} / t_{OFF} V_{CC} to Output Timing

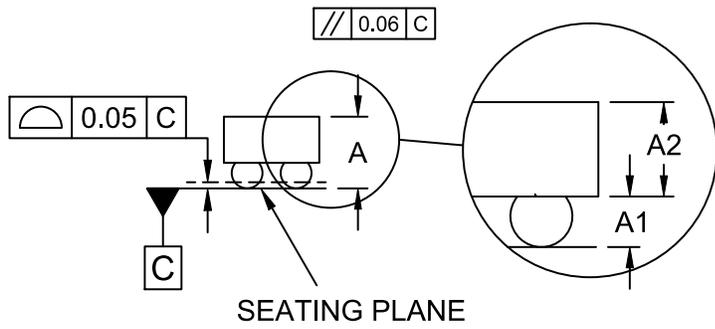
FSA515

PACKAGE DIMENSIONS

WLCSP4, 0.815x0.815x0.457
CASE 567VT
ISSUE O

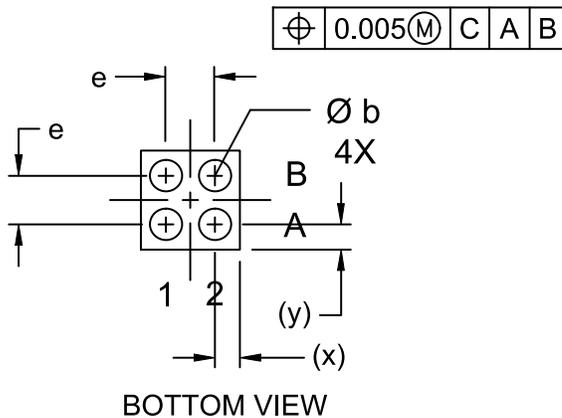


TOP VIEW



SIDE VIEW

DETAIL A

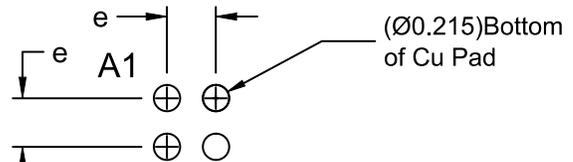


BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DATUM C APPLIES TO THE SPHERICAL CROWN OF THE SOLDER BALLS

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.419	0.457	0.495
A1	0.183	0.203	0.223
A2	0.236	0.254	0.272
b	0.240	0.260	0.280
D	0.785	0.815	0.845
E	0.785	0.815	0.845
e	0.40 BSC		
x	0.1925	0.2075	0.2225
y	0.1925	0.2075	0.2225



RECOMMENDED MOUNTING FOOTPRINT

(NSMD PAD TYPE)

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-Marking.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:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative