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FSA515

5 V SPST Depletion Switch with Negative Swing

Description

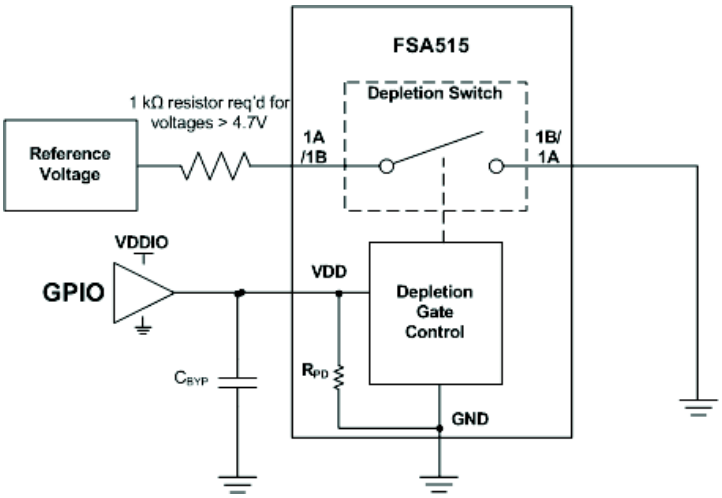
The FSA515 is a high−performance single−pole single−throw (SPST) depletion switch. The depletion technology allows the device to conduct signals when there is no V_{DD} is available and to isolate signals when V_{DD} is present. The FSA515 is 5.5 V tolerant and can pass or isolate negative signal swings 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}: 0.7 Ω (Typical)
- R_{FLAT}: 1.1 mΩ (Typical)

Typical Applications

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



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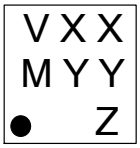
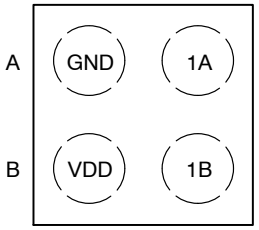
WLCSP4
CASE 567VT

MARKING DIAGRAM



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

PIN CONNECTIONS



(Top View)

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.

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			TSTG	−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)	$R_{\theta JA}$	77.4	°C/W

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

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 kΩ (typ) in series with source)		4.7	5.5	
	Conducting	$V_{SW(ON)}$	−3.0 (Vpk; AC)	4.7	V
	Isolating (requires 1 kΩ (typ) in series with source)		4.7	5.5	
Ambient Temperature		T_A	−40	85	°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°C, V_{DD} = 0 V

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
SWITCH DC CHARACTERISTICS							
Switch Off Leakage Current	V_{DD} = 5 V 1B = GND	1A = 5.5 V	I_{OFF}		0.01		μA
		1A = −1.5 V			−0.65		
	V_{DD} = 3.3 V 1B = GND	1A = 1.4 V (Note 5)			0.01	1.5	
Switch On Resistance	I_{SW} = 100 mA, V_{SW} =−1.5 V to +1.5 V		R_{ON}		0.7	1.1	Ω
	I_{SW} = 100 mA, V_{SW} = 0 V to +5.5 V				0.7	1.1	
On Resistance Flatness	I_{SW} = 100 mA, V_{SW} =−1.5 V to +1.5 V		$R_{FLAT(ON)}$		1.1		mΩ
	I_{SW} = 100 mA, V_{SW} = 0 V to +5.5 V				1.1		
SWITCH AC CHARACTERISTICS							
Total Harmonic Distortion Plus Noise	V_{SW} = 1 V_{RMS}, Ground Centered R_L = 32 Ω, f = 1 kHz		THD+N		−93		dB
Off Isolation Rejection Ratio	V_{SW} = 1 V_{RMS}, Ground Centered R_L = 32 Ω	f = 1 kHz	OIRR		−116		dB
		f = 20 kHz			−97		
Bandwidth	V_{SW} = 200 mV_{PP}, Ground Centered R_L = 50 Ω		BW		367		MHz
SUPPLY CURRENTS							
Peak Startup Supply Current	V_{DD} = 0 V to 5.5 V		I_{DDT}		3.0		mA
Quiescent Current	V_{DD} = 5.5 V		I_{DD}	–	30		μA
Disable Current	V_{DD} ≤ 0.2 V		I_{DIS}		0.05	0.50	μA
CONTROL LOGIC							
V_{DD} Pull−Down Resistance	V_{DD} ≤ 0.2 V		R_{PD}		5.8		MΩ
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 kΩ, C_L=10 pF, V_{DD} = 0.0 V to 3.0 V V_{SW} = 5.0V, Figure 1		t_{OFF}		85		μs
Switch Turn−on Time	R_L=1 kΩ, C_L=10 pF, V_{DD} = 3.0 V to Hi−Z, C_{BYP} = 1 nF, V_{SW} = 5.0 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.

4. Performance guaranteed over the indicated operating temperature range by design and/or characterization tested at T_J = T_A = 25°C.
5. Maximum is guaranteed at 25°C.
6. For reference only − guaranteed by design.

Table 7. ELECTRICAL CHARACTERISTICS Unless otherwise specified, typical values are for T_A=25°C, V_{DD} = 0 V

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
CAPACITANCE						
On Capacitance	R_L = 1 kΩ	C_{ON}		14		pF
Off Capacitance	V_{DD} = 5 V, R_L = 1 kΩ, C_L = 10 pF	C_{OFF}		17		pF
Supply Capacitance	V_{DD} = 5 V with 400 mV_{PP}, f = 1 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°C.
5. Maximum is guaranteed at 25°C.
6. For reference only − guaranteed by design.

Timing Diagram

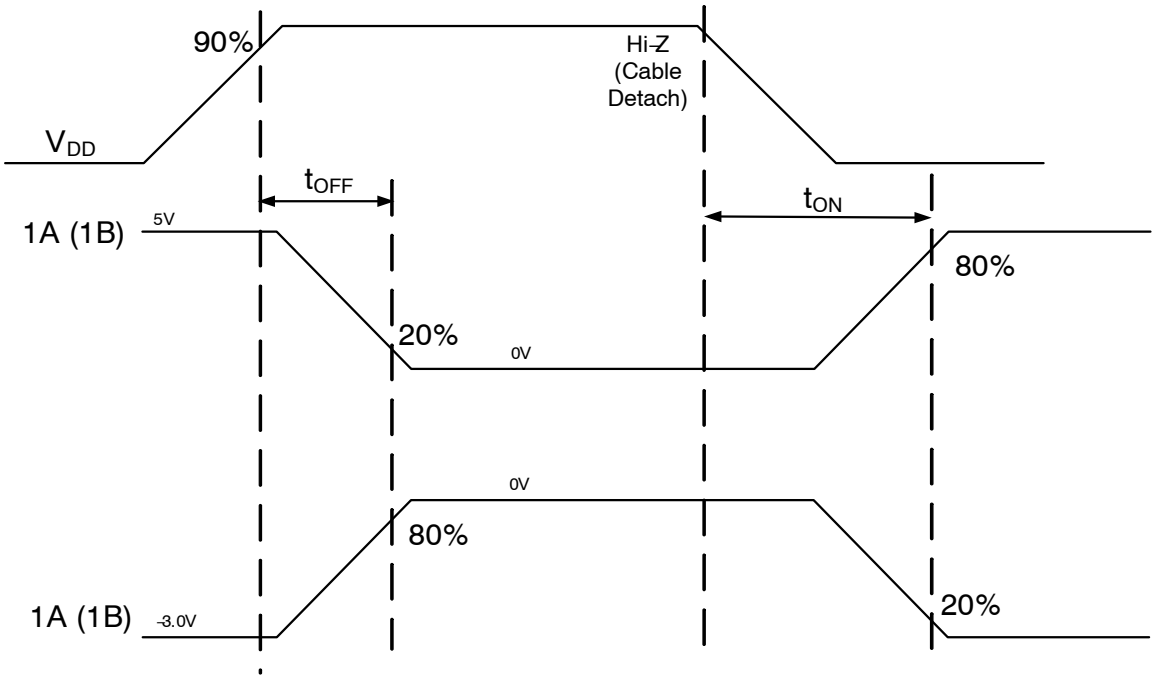
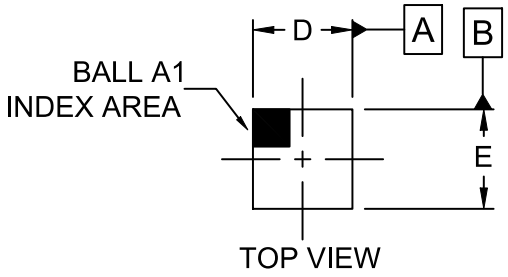


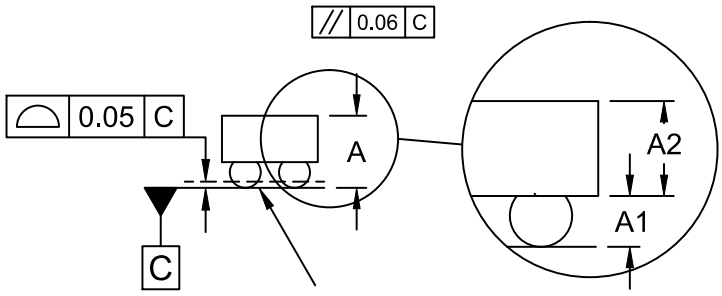
Figure 1. t_{ON} / t_{OFF} V_{CC} to Output Timing

PACKAGE DIMENSIONS

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



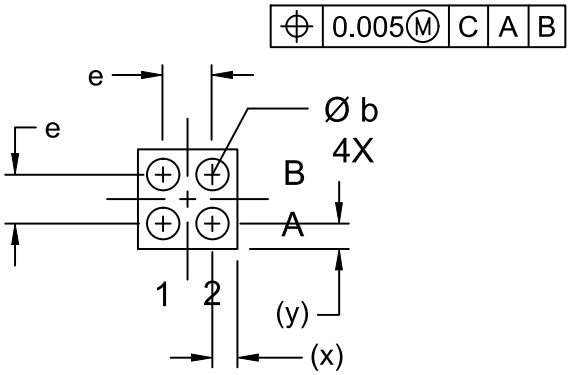
TOP VIEW



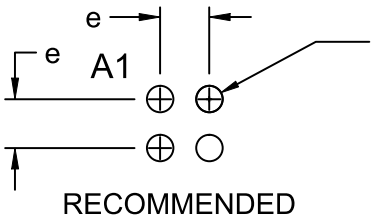
SEATING PLANE

SIDE VIEW

DETAIL A



BOTTOM VIEW



RECOMMENDED
MOUNTING FOOTPRINT

(NSMD PAD TYPE)

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

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