

### Features

- Vsw: -3V to +4.7V
- Normally closed when VDD<0.5V
- Ron: 0.85Ω @ Vsw from -3V to +3V
- Rflat (ON): Typical 8.7mΩ  
@ Vsw from -3v to +3v
- THD+N: -102 dB
- SPST depletion switch
- RoHS and Halogen free compliance
- ESD Protection: (I/O to GND)±6kV  
(Others)±7kV
- Package WLCSP -4B

### General Description

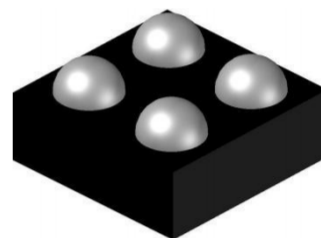
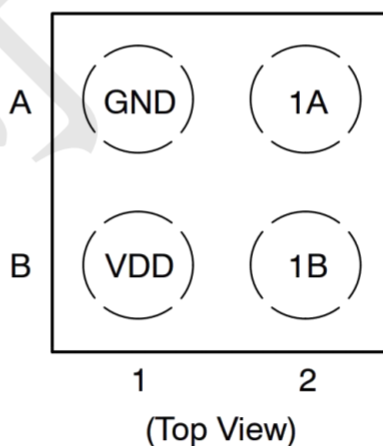
The is a high-performance single-pole single-throw (SPST) depletion switch. Depletion technology enables the device to conduct signals in the absence of VDD and to isolate signals in the presence of VDD. The can pass or isolate negative signal fluctuations as low as -3.0 V and is 5.5 V tolerable. The depletion gate control enables it to achieve exceptional THD+N performance while using very little power during signal conduction.

The are available in a small WLCSP -4B Package. Standard products are Pb-free and Halogen-free.

### Applications

- Tablets
- laptops
- Smart phones
- Bluetooth headsets
- Mobile accessories

### Pin Configurations



WLCSP -4B

### Pin Descriptions

Pin Number	Pin Name	Pin Function
A1	GND	Ground.
A2	1A	A-port of switch
B1	VDD	Supply voltage (switch is turned-on when VDD is low)
B2	1B	B-port of switch

### Absolute Maximum Ratings<sup>(1)</sup>

Parameter	Symbol	Value	Unit
Supply Voltage	VDD	-0.5~5.5	V
DC switch I/O voltage (switch conducting)	<b>V<sub>sw</sub></b>	-4.5~5.0	V
DC switch I/O voltage (switch isolated)		-4.5~5.0	
Storage Temperature		-65~150	°C
Maximum peak switch I/O current -pulsed at 1ms duration <10% duty cycle	I <sub>sw</sub>	500	mA
HBM, JEDEC: JESD22-A114	I/O to GND	±6	kV
	Others	±7	

### Recommend operating ratings<sup>(2)</sup>

Parameter	Symbol	Value	Unit
Supply Voltage	VDD	2.0 ~ 5.0	V
Isolating (VDD=2.0V, RL=32Ω, f<30kHz)	<b>V<sub>sw</sub> (OFF)</b>	< 1.7	Vrms
Isolating (VDD=2.5V, RL=32Ω, f<30kHz)		< 2.0	
Isolating (VDD=3.0V, RL=32Ω, f<30kHz)		< 2.6	
Isolating (VDD=3.5V, RL=32Ω, f<30kHz)		< 2.8	
Isolating (VDD=4.0V, RL=32Ω, f<30kHz)		< 2.9	
Isolating (VDD=4.5V, RL=32Ω, f<30kHz)		< 3.0	
Isolating (VDD=5.0V, RL=32Ω, f<30kHz)		< 3.0	
Conducting (f<30kHz)	<b>V<sub>sw</sub> (ON)</b>	< 3.0	Vrms
Ambient operating Temperature	TA	-40 ~ +85	°C

#### Note:

1. "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

### Electrical Characteristics

(typical values are at , TA = +25°C, unless otherwise noted)

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
Switch DC Characteristics							
I <sub>off</sub>	Switch Off Leakage Current	VDD= 3.3~4.5 V, 1B=	1A = VDD	--	0.2	--	μA
		GND	1A = -1.5V ~ +1.5V	--	0.7	--	μA
		VDD=2~3.3 V, 1B=	1A = -1.5V ~ +1.5V	--	0.5	--	μA
R <sub>on</sub>	Switch On Resistance	ISW=50mA, <b>V<sub>sw</sub></b> = -3V to +3V		--	0.85	--	Ω
R <sub>flat(on)</sub>	On Resistance Flatness	ISW=50mA, <b>V<sub>sw</sub></b> = -3V to +3V		--	8.7	--	mΩ
Switch AC Characteristics							
THD+N	Total Harmonic Distortion plus Noise	<b>V<sub>sw</sub></b> = 0.7Vrms, f=1kHz @R=32Ω,		--	-102	--	dB
OIRR	Off Isolation Rejection Ratio	VDD=2.0V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <1.7Vrms, f=20kHz	RL=1kΩ	--	-100	--	dB
		VDD=2.5V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <2.0Vrms, f=20kHz	RL=1kΩ	--	-100	--	dB
		VDD=3.0V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <2.4Vrms, f=20kHz	RL=1kΩ	--	-100	--	dB
		VDD=3.5V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <2.6Vrms, f=20kHz	RL=1kΩ	--	-100	--	dB
		VDD=4.0V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <2.7Vrms, f=20kHz	RL=1kΩ	--	-108	--	dB
		VDD=4.5V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <2.8Vrms, f=20kHz	RL=1kΩ	--	-108	--	dB
BW	Band Width	VDD=5.0V	RL=32Ω	--	-115	--	dB
		<b>V<sub>sw</sub></b> <3.0Vrms, f=20kHz	RL=1kΩ	--	-108	--	dB
BW	Band Width	RL = 50Ω, CL= 0pF		--	50	--	MHz

### Electrical Characteristics

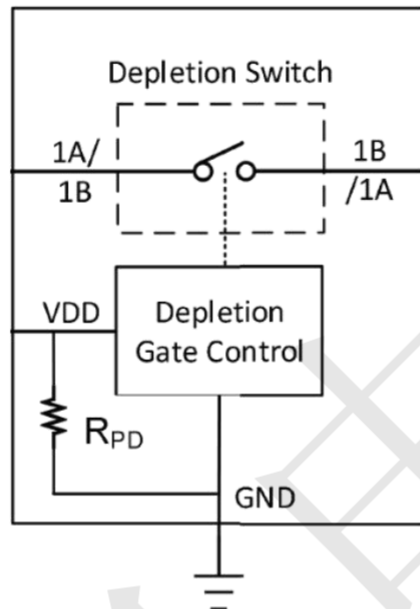
(typical values are at , TA = +25°C, unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
<b>Supply Current</b>						
IDD	Quiescent Current	VDD = 1.8V	--	28	--	μA
		VDD = 2.5V	--	37	--	μA
		VDD = 3.3V	--	46	--	μA
		VDD = 4.2V	--	62	--	μA
		VDD = 5.0V	--	79	--	μA
IDIS	Disable Current	VDD ≤ 0.2 V	--	0.1	--	μA
<b>Control Logic</b>						
Rpd	VDD Pull-Down Resistance	VDD ≤ 0.2 V	--	5.5	--	MΩ
VDDH	VDD High Voltage		1.6	--	--	V
VDDL	VDD Low Voltage		--	--	0.4	V
<b>Timing</b>						
Toff	Switch Turn-Off Time	RL=1kΩ, CL=10pF VDD = 0V to 2V, <b>Vsw</b> = 1.5V	--	170	--	μs
Ton	Switch Turn-On Time	RL=1kΩ, CL=10pF, VDD = 2V to 0V, <b>Vsw</b> = 1.5V	--	2	--	μs
<b>Capacitance</b>						
Con	On Capacitance	<b>Vsw</b> = 0 dBm, f = 1 MHz	--	23	--	pF
Coff	Off Capacitance	<b>Vsw</b> = 0 dBm, f = 1 MHz	--	38	--	pF
<b>Oscillator frequency</b>						
Fosc	On-Chip Oscillator Frequency	For reference only	--	3.3	--	MHz

#### Note:

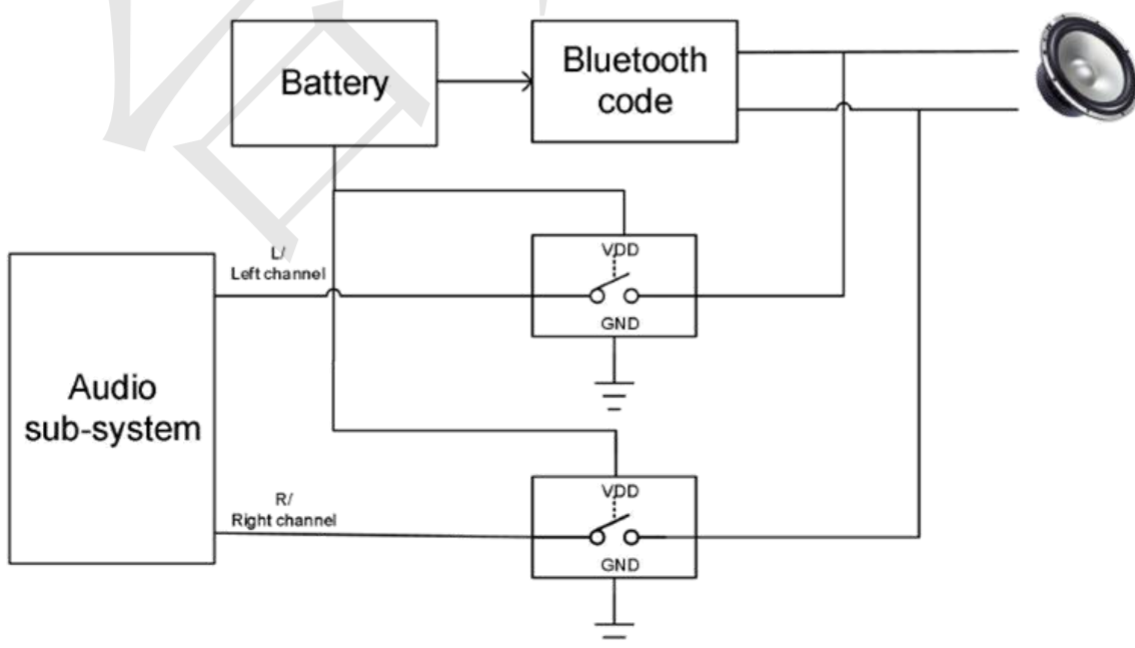
- (1) Flatness is defined as the difference between maximum and minimum value of ON-resistance at the specified analog signal voltage points.
- (2) RON matching between channels is calculated by subtracting the channel with the lowest max Ron value from the channel with the highest max Ron value.

### BLOCK DIAGRAM



### Typical Application One: Bluetooth Noise Reduction Headphones

The is a high-performance single-pole single-throw (SPST) depletion switch. The depletion switch can be conducted without a power source. It is widely used in blue tooth noise reduction headphones. When the batteries are run down, two single-channel SPST depletion analog switches can be used directly to realize the closed conduction without power supply.

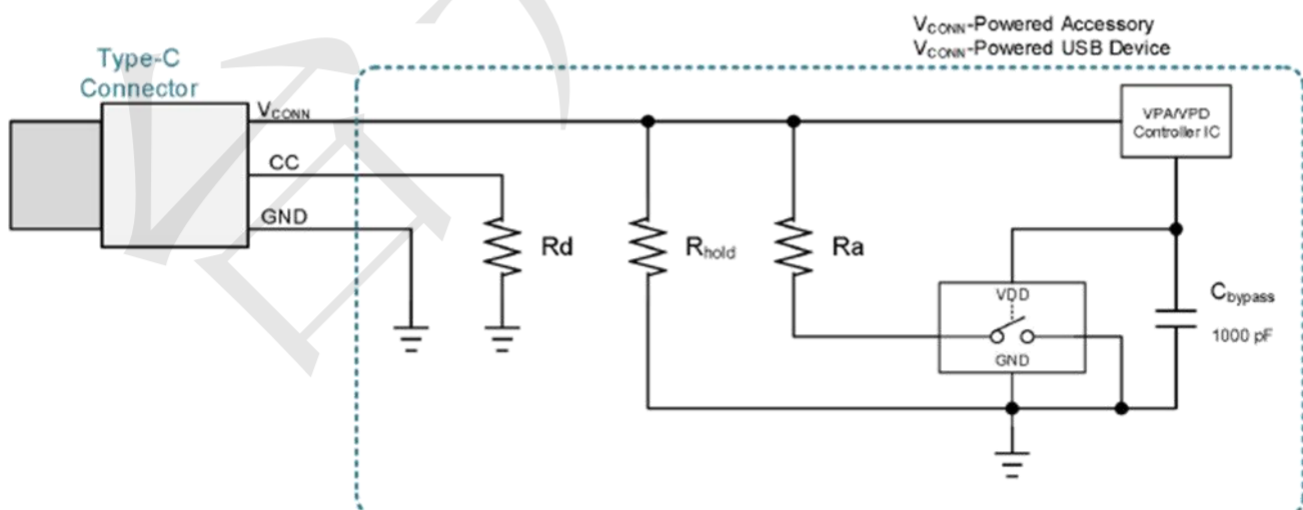


### Typical Application Two:

#### Type-C accessory with $R_a$ resistor isolated after detection

The can be applied to connect mobile devices to the powered accessories via USB Type C. As soon as the accessory is attached and powered by  $V_{CONN}$ , the current still flows through the grounded  $R_a$  in the accessory. For 5 V  $V_{CONN}$  and 1 k $\Omega$   $R_a$ , mobile devices need to supply 5 mA of DC current. However, for accessories that use a micro-controller or similar devices, a single-channel SPST depletion-mode analog switch on the accessory device in series with a  $R_a$  resistor provides the ability to isolate the  $R_a$  resistor ground path after USB Type C detection is complete.

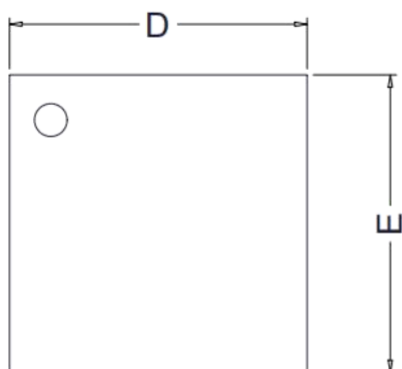
By using GPIO and some firmware coding on the accessory controller to power the VDD pin of the depletion switch after successful detection, the increased current consumption can be reduced from 5 mA to the quiescent power dissipation of the depletion switch while connected.



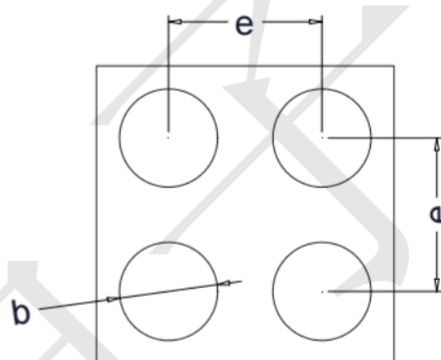


### Package information

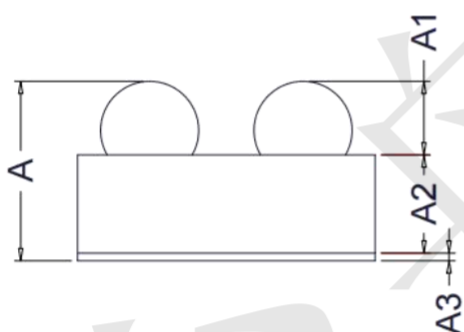
#### WLCSP-4B



TOP VIEW



BOTTOM VIEW



SIDE VIEW

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.395	0.445	0.495
A1	0.144	0.160	0.176
A2	0.255	0.285	0.315
A3	0.020	0.025	0.030
D	0.900	0.930	0.960
E	0.900	0.930	0.960
e	0.350	0.400	0.450
d	0.190	0.210	0.230