

DIO32276

DPDT (0.8 Ω) HiFi Audio Switch with Negative Swing

Features

- Power supply voltage range: 1.65 to 5.5 V
- $R_{ON} = 0.8 \Omega$ (Typ.) at 3.3 V
- THD+N = -110 dB; 2 V_{RMS} , 600 Ω load; f = 1 kHz
- $X_{TALK} = -110$ dB at 1 V_{RMS} , 50 Ω load; f = 1 kHz
- Off isolation = -110 dB at 1 V_{RMS} , 50 Ω load; f = 1 kHz
- External capacitor connection for pop and click noise suppression
- Power-off protection on common ports
- DQFN 1.8*1.8-12 package
- $V_{CC} = 0$ V/float, all switch-I/O Hi-Z

Applications

- Mobile phones
- Tablets
- Notebook PCs
- Media players
- Docking stations
- TVs
- Set-top boxes
- LCD monitors

Descriptions

The DIO32276 is a high-performance, double-pole double-throw (DPDT) analog switch with negative V_{CC} swing audio capability. The DIO32276 is featured in ultra-low audio R_{ON} of 0.8 Ω (typical) at 3.3 V. The DIO32276 operates over a V_{CC} range of 1.65 to 5.5 V, and it is made of sub-micron CMOS technology to achieve fast switching speeds, aiming at break-before-make operation. When it is operating, the turn-on ramp time is selectable by using an external capacitor (C_{EXT}) to minimize pop and click during operation.

The DIO32276 is advantaged in THD+N specifications which target a Hi-Fidelity audio quality into both 32 Ω headphones and line out type loads (> 600 Ω).

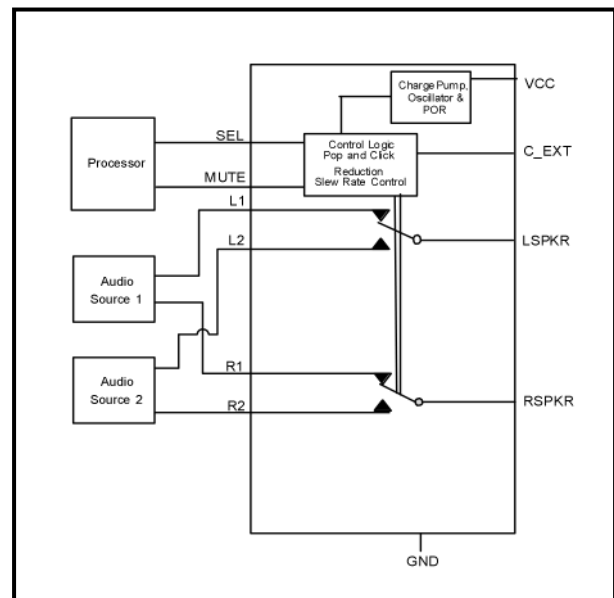


Figure 1. Application block diagram

Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO32276LN12	YWHE	1	Green	-40 to 85°C	DQFN1.8*1.8-12	Tape & Reel, 3000

Pin Assignment

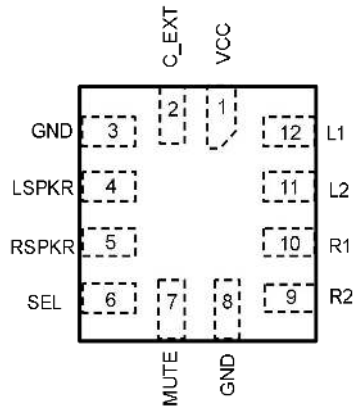


Figure 2. Top view

DQFN1.8*1.8-12

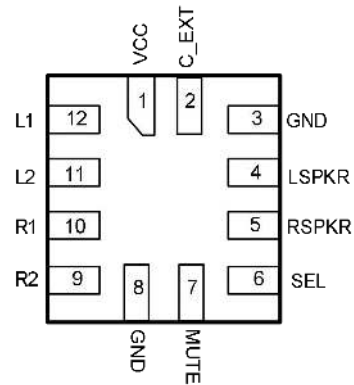


Figure 3. Bottom view

Pin Descriptions

Pin Name	Description
VCC	Power supply
C_EXT	Slow turn on external capacitor
GND	Ground
LSPKR	Audio LSPKR common I/O port
RSPKR	Audio RSPKR common I/O port
SEL	Select pin
MUTE	Mute enable - Active high
R2	Audio – Right channel source2 I/O port
R1	Audio – Right channel source1 I/O port
L2	Audio – Left channel source2 I/O port
L1	Audio – Left channel source1 I/O port

Truth Table

MUTE	SEL	Function
0	0	L1 = LSPKR; R1 = RSPKR
0	1	L2 = LSPKR; R2 = RSPKR
1	0	L1 ≠ LSPKR; L2 ≠ LSPKR; R1 ≠ RSPKR; R2 ≠ RSPKR (All paths Hi-Z)
1	1	L1 ≠ LSPKR; L2 ≠ LSPKR; R1 ≠ RSPKR; R2 ≠ RSPKR (All paths Hi-Z)



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Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. DIOO does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply/Control voltage		-0.3	6.0	V
V_{CNTRL}	Control input voltage	SEL, MUTE	-0.3	6.0	V
V_{SW}	DC switch I/O voltage	L1, L2, R1, R2, LSPKR, RSPKR	-3.5	6	V
I_{IK}	ESD input diode current			-50	mA
I_{SW}	Switch I/O current			700	mA
T_A	Absolute maximum operating temperature		-40	85	°C
T_{STG}	Storage temperature		-65	150	°C
ESD	Human body model	All pins	±5.5		kV

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications.

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply voltage		1.65	3.3	5.5	V
V_{SW}	DC switch I/O voltage	L1, L2, R1, R2, LSPKR, RSPKR	-3.0		5.5	V
V_{CNTRL}	Control input voltage	SEL, MUTE	0		V_{CC}	V
I_{SW}	DC switch I/O current			100		mA
T_A	Ambient operating temperature		-40	25	85	°C



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DC Electrical Characteristics

$V_{CC} = 1.65$ to 5.5 V, V_{CC} (Typ.) = 3.3 V, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	Control pin input high voltage (SEL, MUTE)	$V_{CC} = 3.3$ V, $C_{EXT} = \text{Float}$	1.5			V
V_{IL}	Control pin input low voltage (SEL, MUTE)	$V_{CC} = 3.3$ V, $C_{EXT} = \text{Float}$			0.5	V
I_{ON}	Switch-to-GND on leakage current	$L1, R1, L2, R2 = -3$ V to 3 V, $LSPKR, RSPKR = \text{Float}$ ($I_{SW} = 0$ mA), $MUTE = \text{Low}$, $SEL = 0$ or V_{CC} , $C_{EXT} = \text{Float}$	-2		2	μA
I_{NO_MUTE}	Switch-to-GND OFF leakage current (when muted)	$L1, R1, L2, R2 = -3$ V to 3 V, $LSPKR, RSPKR = \text{Float}$ ($I_{SW} = 0$ mA), $MUTE = \text{High}$, $SEL = 0$ or V_{CC} , $C_{EXT} = \text{Float}$			2	μA
I_{OFF}	Input leakage current ⁽¹⁾	$L1, R1, L2, R2 = -3$ V to 3 V, $LSPKR, RSPKR = \text{Float}$ ($I_{SW} = 0$ mA), $MUTE = \text{Low}$, $SEL = 0$ or V_{CC} , $C_{EXT} = \text{Float}$	-2		2	μA
I_{IN}	Control input leakage current ⁽²⁾ (SEL, MUTE)	$L1, R1, L2, R2 = -3$ V to 3 V, $LSPKR, RSPKR = \text{Float}$ ($I_{SW} = 0$ mA), $C_{EXT} = \text{Float}$			2	μA
I_{CC}	V_{CC} supply current	$MUTE = \text{Low}$, $SEL = 0$ or V_{CC} , $C_{EXT} = \text{Float}$		20	30	μA
I_{CCZ}	V_{CC} Hi-Z supply current	$MUTE = \text{High}$, $SEL = 0$ or V_{CC} , $C_{EXT} = \text{Float}$			1	μA
I_{CCT}	Increase in I_{CC} per control voltage	$MUTE = \text{Low}$, $SEL = 0$ or 1.8 V, $SEL = \text{Low}$, $MUTE = 0$ or 1.8 V, $C_{EXT} = \text{Float}$			2	μA
R_{ON}	Switch on resistance	$I_{SW} = 100$ mA, $V_{SW} = -3$ V to 3 V, $C_{EXT} = \text{Float}$		0.8	1	Ω
ΔR_{ON}	On resistance matching, channel to channel	$I_{SW} = 100$ mA, $V_{SW} = -3$ V to 3 V, $C_{EXT} = \text{Float}$		50		m Ω
R_{FLAT}	On resistance flatness	$I_{SW} = 100$ mA, $V_{SW} = -3$ V to 3 V, $C_{EXT} = \text{Float}$		10		m Ω

Note:

- (1) Only valid for $V_{SW} > 0$ V.
- (2) $V_{MUTE} \leq V_{CC} + 0.3$ otherwise additional input leakage current may flow.
- (3) Specifications subject to change without notice.



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AC Electrical Characteristics

$V_{CC} = 1.65$ to 5.5 V, V_{CC} (Typ.) = 3.3 V, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{MUTE_ON}	Enable time (MUTE to output)	L1 = R1 = L2 = R2 = 1.5 V, L _{SPKR} , R _{SPKR} = 50 Ω to GND, SEL = 0 or V _{CC}	C_EXT = Float	0.75		ms
			C_EXT = 0.1 μF	300		
t_{ON_MUTE}	Disable time (MUTE to output)	L1 = R1 = L2 = R2 = 1.5 V, L _{SPKR} , R _{SPKR} = 50 Ω to GND, SEL = 0 or V _{CC}	C_EXT = Float	200		ns
			C_EXT = 0.1 μF	150		
t_{ON_SEL}	Turn-on time (SEL to output)	L1(L2) = R1(R2) = 1.5 V, L2(L1) = R2(R1) = 0 V, L _{SPKR} , R _{SPKR} = 50 Ω to GND, SEL = 0 or V _{CC} ; MUTE = 0	C_EXT = Float	0.75		ms
			C_EXT = 0.1 μF	300		
t_{OFF_SEL}	Turn-on time (SEL to output)	L1(L2) = R1(R2) = 1.5 V, L2(L1) = R2(R1) = 0 V, L _{SPKR} , R _{SPKR} = 50 Ω to GND, SEL = 0 or V _{CC} ; MUTE = 0	C_EXT = Float	200		ns
			C_EXT = 0.1 μF	150		
t_{BBM}	Break-before-make time (SEL to output)	L1(L2) = R1(R2) = 1.5 V, L _{SPKR} , R _{SPKR} = 50 Ω to GND, SEL = 0 or V _{CC} ; C_EXT = Float, MUTE = 0 V		750		μs
O_{IRR}	Off-Isolation ⁽¹⁾	f = 1 kHz, R _L = 50 Ω, C _L = 0 pF, MUTE = 0, V _{SW} = 1 V _{RMS}		-110		dB
			f = 80 kHz, R _L = 50 Ω, C _L = 0 pF, MUTE = 0, V _{SW} = 1 V _{RMS}		-80	
O_{IRRM}	Off-isolation- muted ⁽¹⁾	f = 1 kHz, R _L = 50 Ω, C _L = 0 pF, MUTE = V _{CC} ; V _{SW} = 1 V _{RMS}		-110		dB
			f = 80 kHz, R _L = 50 Ω, C _L = 0 pF, MUTE = V _{CC} ; V _{SW} = 1 V _{RMS}		-80	
X_{TALK}	Cross-talk (Adjacent) ⁽¹⁾	f = 1 kHz, R _L = 50 Ω, V _{SW} = 1 V _{RMS}		-110		dB
BW	-3 dB bandwidth ⁽¹⁾	R _L = 50 Ω		550		MHz
PSRR	Power supply rejection ratio ⁽¹⁾	V _{PSRR} = V _{CC} +100 mV _{RMS} , R _L = 32 Ω (at LSPKR, RSPKR, MUTE = 0 or V _{CC} , f = 1 kHz, V _{SW} = GND or Float)		-100		dB
THD+N	Total harmonic distortion + Noise ⁽¹⁾	R _L = 600 Ω, f = 1 kHz, V _{SW} = 2 V _{RMS} , With A-weighted		-110		dB
		R _L = 32 Ω, f = 1 kHz, V _{SW} = 1 V _{RMS} , with A-weighted		-100		dB
		R _L = 16 Ω, f = 1 kHz, V _{SW} = 0.5 V _{RMS} , with A-weighted		-100		dB

Note:

(1) Guaranteed by characterization. Not production tested.

(2) Specifications subject to change without notice.



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Capacitance

Unless otherwise stated, $V_{CC} = 1.65$ to 5.5 V, V_{CC} (Typ.) = 3.3 V, and $T_A = 25^\circ\text{C}$.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_{ON}	On capacitance (Common port) ⁽¹⁾	$f = 1$ MHz, 100 mV _{PK-PK} , 100 mV DC bias MUTE = 0 V		10		pF
C_{OFF1}	Off capacitance (Common port) ⁽¹⁾	$f = 1$ MHz, 100 mV _{PK-PK} , 100 mV DC bias MUTE = V_{CC}		10		pF
C_{OFF2}	Off capacitance (Non-common ports) ⁽¹⁾	$f = 1$ MHz, 100 mV _{PK-PK} , 100 mV DC bias MUTE = 0 V		5		pF
$C_{OFF-MUTE}$	Off capacitance - MUTED (Non-common ports) ⁽¹⁾	$f = 1$ MHz, 100 mV _{PK-PK} , 100 mV DC bias, MUTE = V_{CC}		5		pF
C_{CNTRL}	Control input pin capacitance (MUTE, SEL) ⁽¹⁾	$f = 1$ MHz, 100 mV _{PP} , 100 mV DC bias	SEL		3	pF
			MUTE		6	

Note:

- (1) Guaranteed by characterization. Not production tested.
- (2) Specifications subject to change without notice.

Typical Performance Characteristics

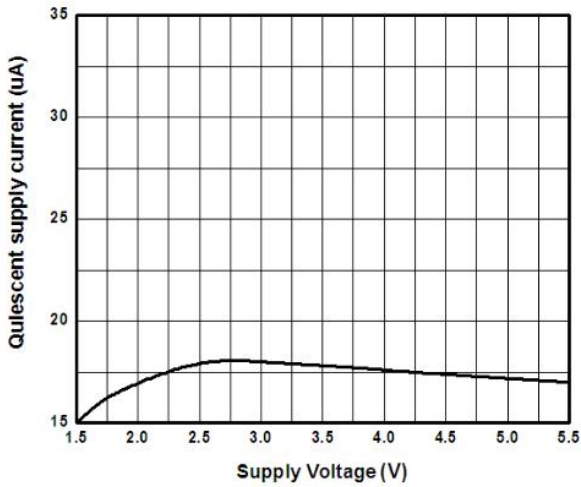


Figure 4. Quiescent supply current vs. Supply voltage

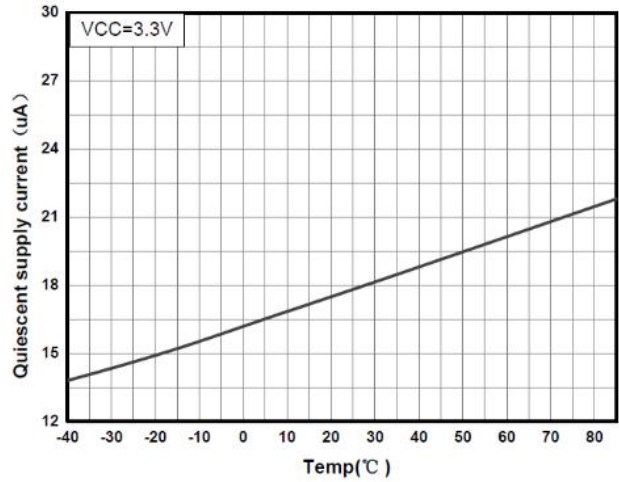


Figure 5. Quiescent supply current vs. Temperature

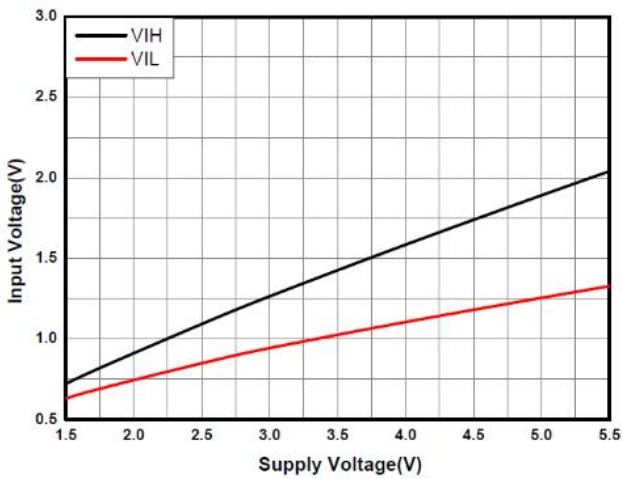


Figure 6. Input voltage vs. Supply voltage

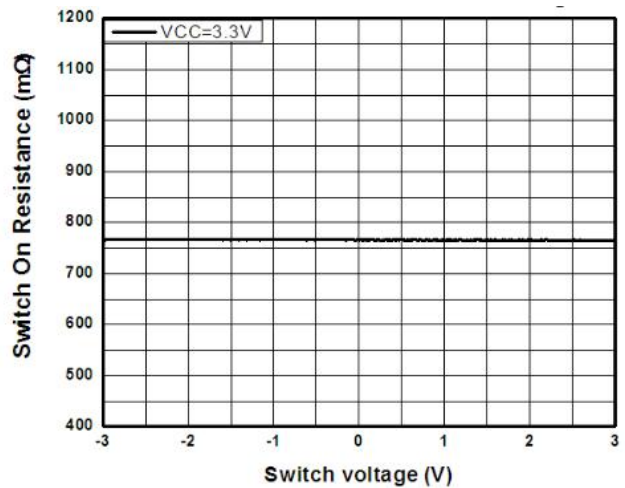


Figure 7. Switch on resistance vs. Switch voltage

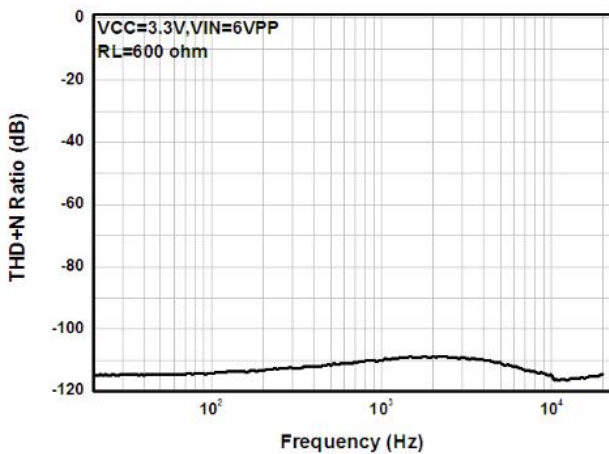


Figure 8. THD+N ratio vs. Frequency

Test Diagrams

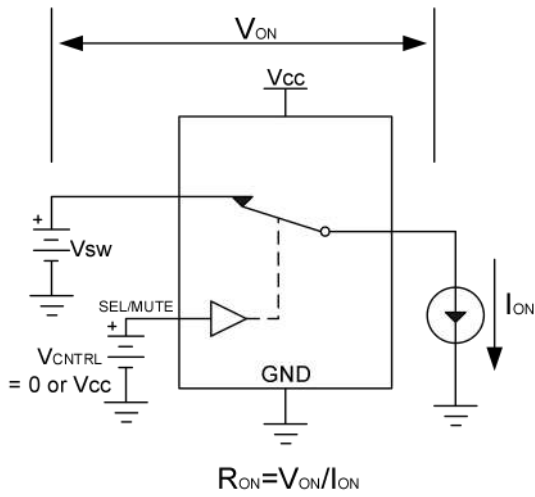


Figure 9. Switch on resistor

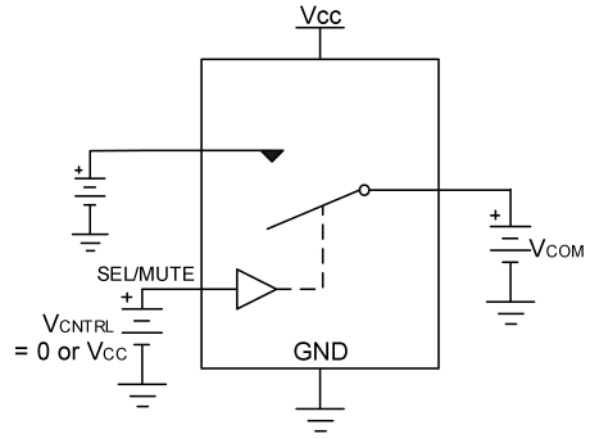


Figure 10. Switch off leakage

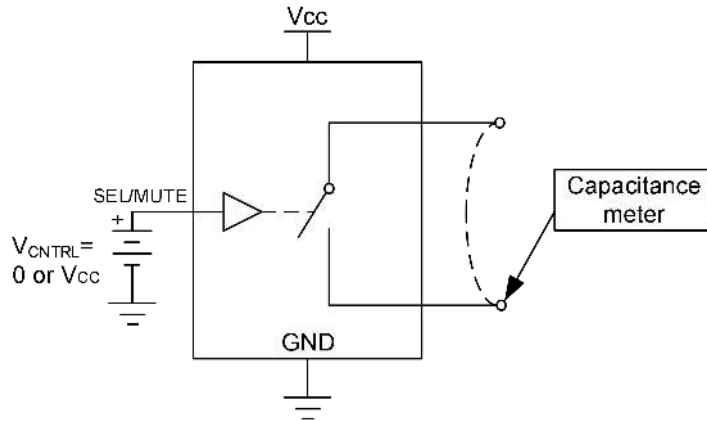


Figure 11. On/off capacitance test

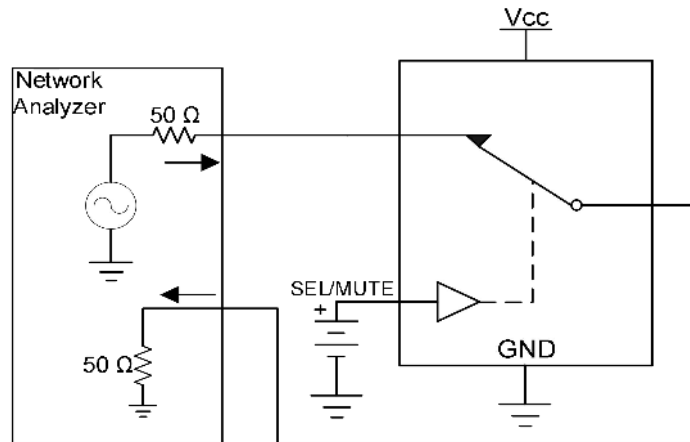


Figure 12. Bandwidth

Test Diagrams (Continued)

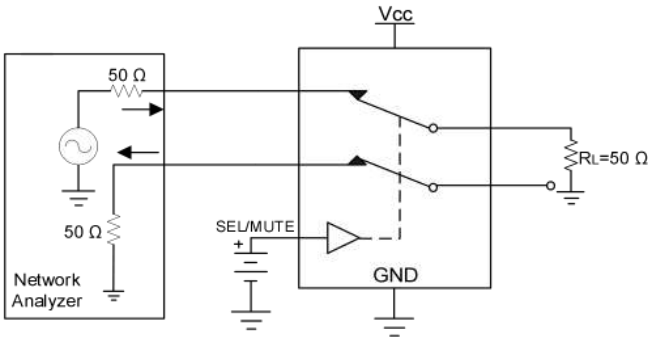


Figure 13. Channel-to-channel crosstalk

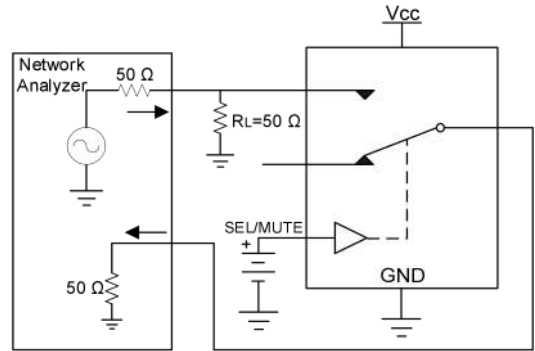


Figure 14. Off-isolation

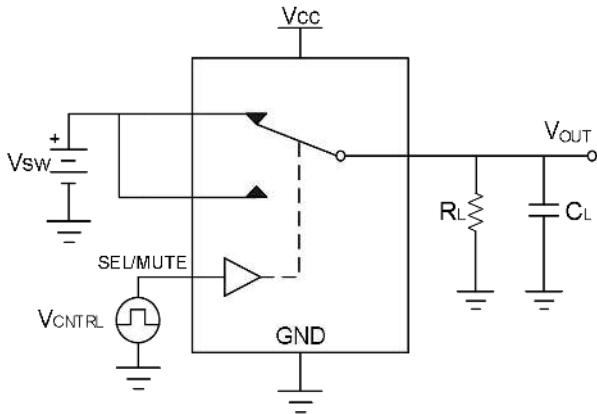


Figure 15. Break-before-make

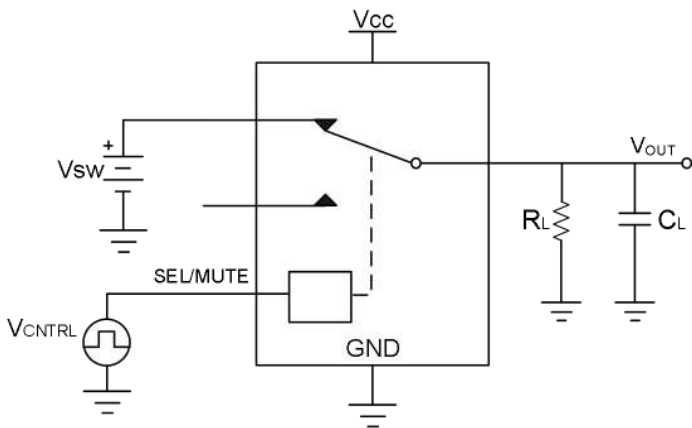
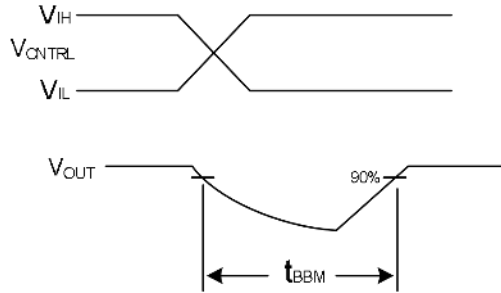
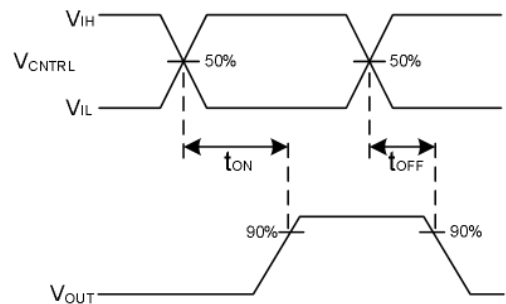
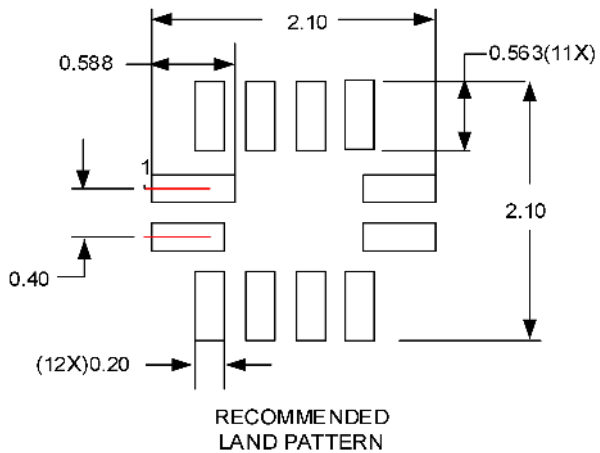
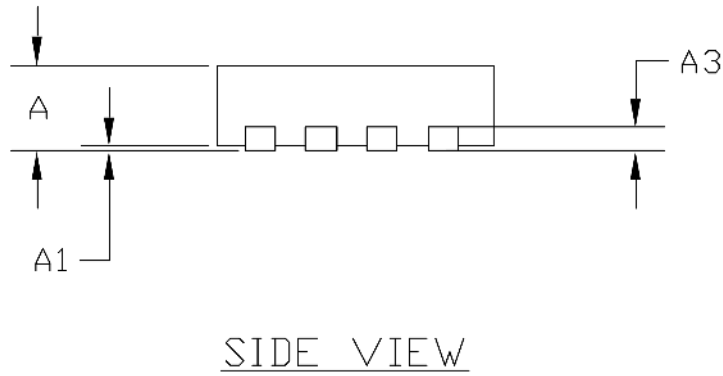
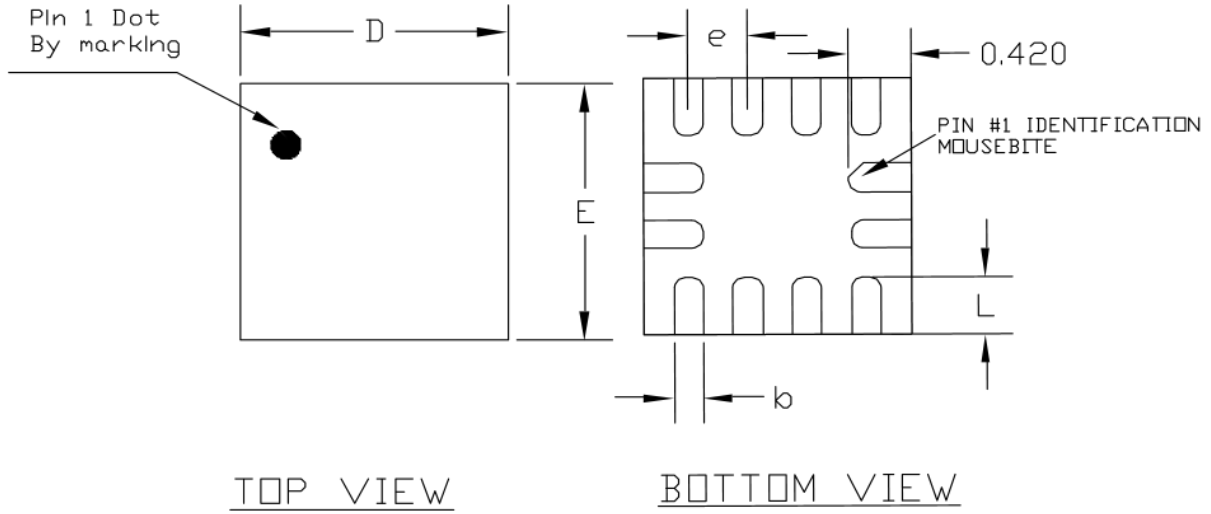


Figure 16. Turn-on / Turn-off



Physical Dimensions: DQFN1.8*1.8-12



Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.50	0.55	0.60
A1	0	-	0.05
A3	0.15 REF		
D	1.75	1.80	1.85
E	1.75	1.80	1.85
L	0.35	0.40	0.45
b	0.15	0.20	0.25
e	0.40 BSC		

CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as cell phones, handheld products, laptops, medical equipment, and so on. Dioo's product families include analog signal processing and amplifying, LED drivers, and charger ICs. Go to <http://www.dioo.com> for a complete list of Dioo product families.

For additional product information or full datasheet, please contact our sales department or representatives.