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TPWSP6580Q-16

High Fidelity Stereo SPDT Switch with Pop and Click Elimination

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Features

- Single supply range operating from 3.0V to 4.5V
- -118dB THD+N into 100kΩ load at 2Vrms
- -114dB THD+N into 32Ω load at 2Vrms
- Signal-to-Noise (SNR) Ratio 132dBA
- 100dB PSRR at 10kHz
- 145dB crosstalk & separation
- Pop/Click shunt circuit
- Audio Path Soft Turn-On/Off for Pop & Click Elimination

Applications

- Hi-Fi Smartphones and Portable Device
- Hi-Fi SACD/DVD players
- Computer sound cards
- Home theater audio products

General Description

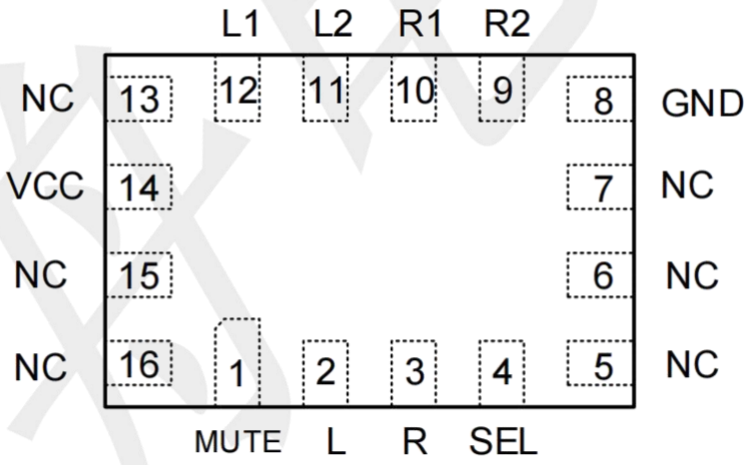
The is a Dual SPDT analog switch with ultra-low distortion, high OFF-Isolation for special stereo audio applications with negative swing audio signals capacity that features ultra-low Ron of 0.2Ω (typical) at 3.3V VCC.

The operates a single power supply over a wide range from 3.0V to 4.5V and 1.8V logic compatible with high PSRR. With a special pop-click shunt circuitry at each signal pin that eliminates pops and clicks associated at any application conditions likes switched, enable/disable, power-down and power-up.

With superior THD+N performance and other high performance, the is an ideal device for Hi-Fi system applications.

PIN CONFIGURATIONS

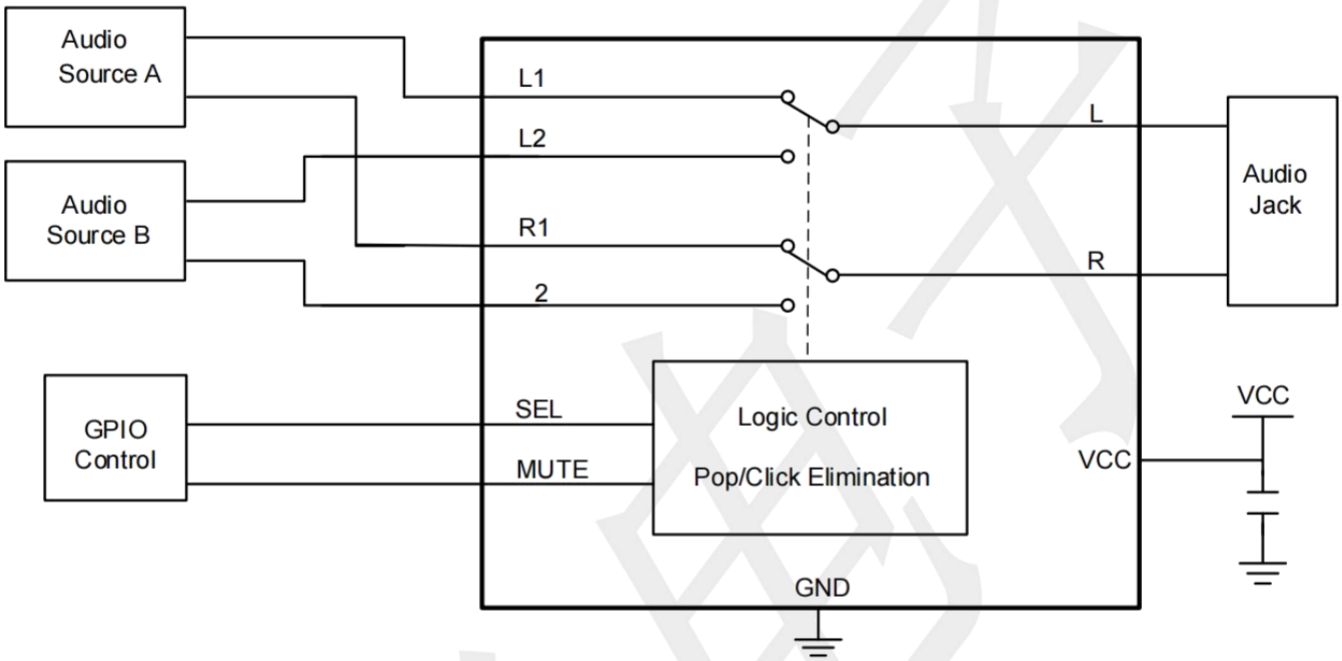
QFN1826-16L (TOP VIEW)



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION	PIN NO.	PIN NAME	DESCRIPTION
1	MUTE	Enable control, active high	9	R2	Right channel port 2, normally open
2	L	Left channel Common port	10	R1	Right channel port 1, normally closed
3	R	Right channel Common port	11	L2	Left channel port 2, normally open
4	SEL	Port selection control pin	12	L1	Left channel port 1, normally closed
5	NC	Not connection	13	NC	Not connection
6	NC	Not connection	14	VCC	Power supply
7	NC	Not connection	15	NC	Not connection
8	GND	Ground	16	NC	Not connection

BLOCK DIAGRAM



Function Table

MUTE	SEL	L1, R1	L2, R2
0	0	ON	OFF
0	1	OFF	ON
1	X	OFF	OFF

Absolute Maximum Ratings (Unless otherwise specified)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.3 ~ 5.5	V
Digital Control Input Voltage	V_{IN}	-0.3 ~ 5.5	V
Analog Input/Output Voltage (L1,L2,R1,R2,L,R)	V_{IS}	-4.0 ~ 4.0	V
Switch Continuous Current (L1,L2,R1,R2,L,R)	I_{IO}	±300	mA
Switch Peak Current (L1,L2,R1,R2,L,R)(pulsed at 1ms, 10% duty cycle, Max)	I_{IO_PK}	±500	mA
Power Dissipation in Still Air	P_D	250	mW
Storage Temperature Range	T_{STG}	-55 ~ 150	°C
Junction Temperature	T_J	150	°C
Lead Temperature (Soldering, 10 seconds)	T_L	260	°C
Thermal Resistance	$R_{\theta JA}$	80	°C/W
ESD protection (HBM)	I/O to VCC, I/O to GND	±6000	V
	I/O to I/O	±4000	V

Note:"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.

Recommend operating ratings

Parameter	Symbol	Value	Unit
Supply Voltage	VCC	3.3 ~ 4.5	V
Digital Control Input Voltage	VIN	0.0 ~ V_{CC}	V
Analog Input/Output Voltage (L1,L2,R1,R2,L,R)	VIS	-3.3 ~ V_{CC}	V
Operating Temperature	T_A	-40 ~ 85	°C

Note:The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

DC Electrical Characteristics

(Ta=25°C, VCC=3.6V, V_{AC}=V_{DIR}=0V, V_{IS}=2Vrms, R_L=32Ω, f=1kHz, CAP=0.1uF, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Analog Switch Characteristics						
Analog Signal Range	V_{IS}	VCC: 3.3 ~ 4.2	--	2.5	--	Vrms
On-Resistance	R_{ON}	V_{IS}=-3.3V~+3.3V, I_{OUT}=100mA	--	0.2	--	Ω
RON Matching Channels	Δ R_{ON}	V_{IS}= -3.3V~+3.3V,I_{OUT}=100mA	--	0.0015	--	Ω
R_{ON} Flatness	$R_{FLAT(ON)}$	V_{IS}= -3.3V~+3.3V,I_{OUT}=100mA	--	0.0015	--	Ω
Dynamic Characteristics						
Total Harmonic Distortion	THD+N	f=10Hz to 22KHz V_{IS}=2Vrms @R_L=100kΩ	--	-118	--	dB
Total Harmonic Distortion	THD+N	f=10Hz to 22KHz V_{IS}=2Vrms @R_L=32Ω	--	-114	--	dB
Total Harmonic Distortion	THD+N	f=10Hz to 500kHz VIS=1.55Vrms,@RL=100kΩ	--	-104	--	dB
Intermodulation Distortion	IMD	Mode=CCIF 19k+20k Ratio=1 VIS=500mVrms,@RL=100kΩ	--	-122	--	B
Dynamic/Transient Intermodulation Distortion	IMD	Mode=DIM100,VIS=1Vrms @ RL=100kΩ	--	-103	--	dB
Signal-to-Noise Ratio	SNR	f=10Hz to 22KHz, Inputs grounded,RL=32Ω or 100kΩ	--	132	--	dBA
Stereo Channel Imbalance L1 and R1, L2 and R2	IMB	f=10Hz to 22KHz, RL=100kΩ	--	±0.003	--	dB
Off isolation (Muting)	OIRR	f=10Hz to 22KHz, VL= VR = 2Vrms @RL=100kΩ MUTE=AC=VCC, DIR=0, SEL="X"	--	145	--	dB
		f=10Hz to 22KHz, VLx= VRx = 2Vrms @RL=100kΩ MUTE=AC=VCC DIR=VCC, SEL="X"	--	145	--	dB
		f=10Hz to 22KHz,VL= VR = 2Vrms @RL=32Ω MUTE=VCC AC=DIR=0, SEL="X"	--	127	--	dB

DC Electrical Characteristics

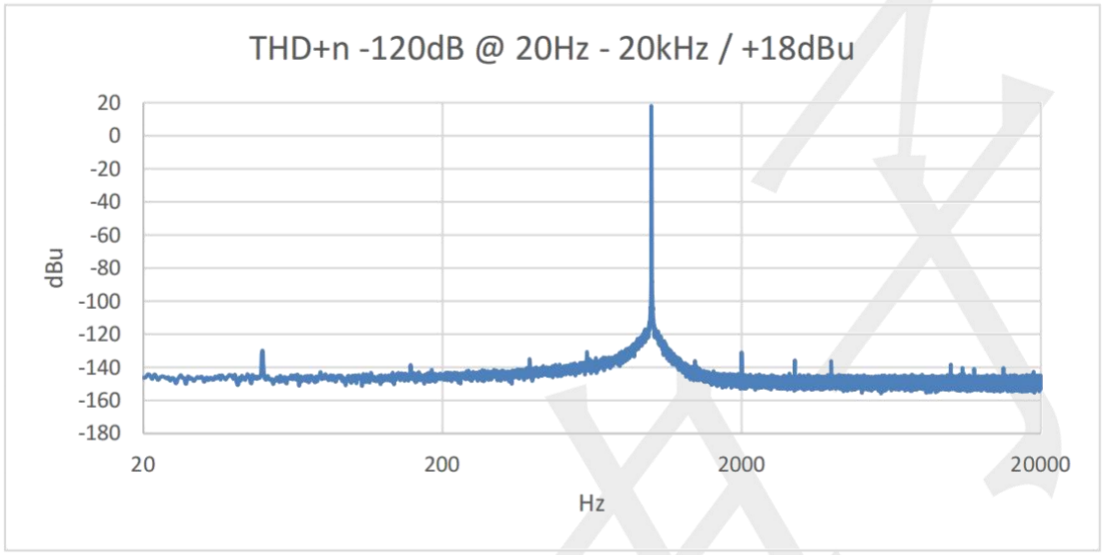
(Ta=25°C, VCC=3.6V, V_{AC}=V_{DIR}=0V, V_{IS}=2Vrms, R_L=32Ω, f=1kHz, CAP=0.1uF, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Crosstalk (Channel-to-Channel)	Xtalk	f=10Hz to 22KHz, VIS = 2Vrms,Source Impedance=0Ω RL = 100kΩ	--	145	--	dB
Power Supply Ripple Rejection	PSRR	f=10kHz,VIS = 0.1Vrms, Inputs grounded	--	100	--	dB
-3dB Bandwidth	BW	R_L=50Ω	--	50	--	MHz
On-to-Mute Time	T_{TRS-OM}	CAP=0.1uF	--	50	--	ns
Mute-to-On Time	T_{TRS-MO}	CAP=0.1uF	--	160	--	ms
Turn-Off Time	T_{OFF}	VIS=1.5V, RL=20KΩ,MUTE=0	--	60	--	ns
Turn-On Time	T_{ON}	VIS=1.5V, RL=20KΩ,MUTE=0	--	60	--	us
Break-Before-Make time	T_{BBM}	VIS=1.5V, RL=20KΩ,MUTE=0	--	50	--	us
Lx, Rx Off capacitance	C_{OFF}	f=100kHz, VLx or VRx = VL or VR =0V	--	15	--	pF
L, R On capacitance	C_{ON}	f=100kHz, VLx or VRx = VL or VR =0V	--	30	--	pF
Power Supply Characteristics						
Supply quiescent current	I_{CC}	MUTE=0V	--	190	--	uA
		MUTE=VCC	--	55	--	uA
Digital Input Characteristics						
Digital input logic high level	V_{IH}	VCC=3.6～4.5	1.6	--	--	V
		VCC=3.0～3.6	1.5	--	--	V
Digital input logic low level	V_{IL}	VCC=3.6～4.5	--	--	0.5	V
		VCC=3.0～3.6	--	--	0.4	V
Digital Input leakage current	I_{IN}		--	--	±2.0	uA
AC, DIR, SEL pull-down resistor	R_{PD}		--	4	--	MΩ
MUTE pull-up resistor	R_{PU}		--	4	--	MΩ

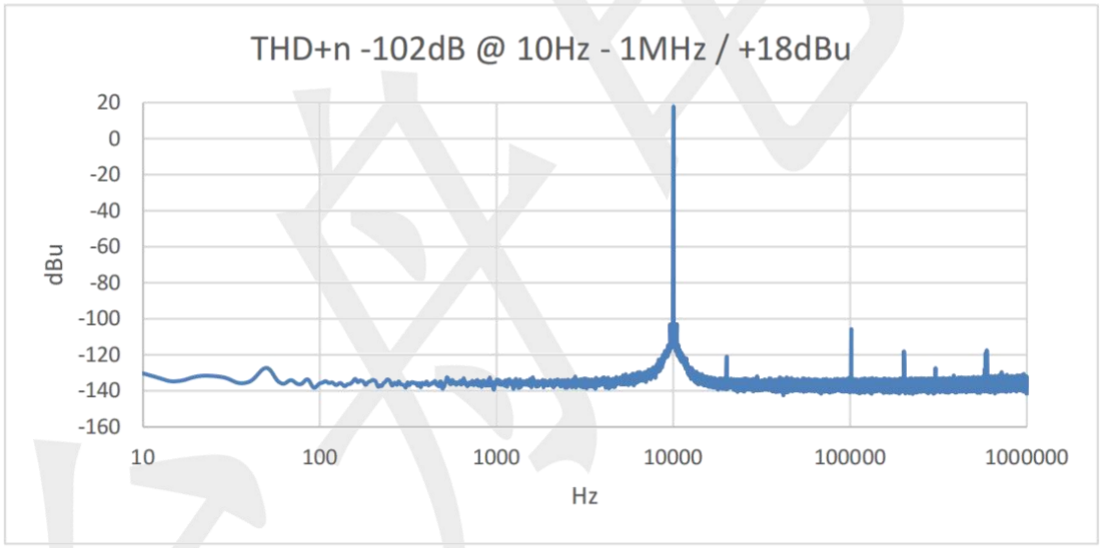
Note:Flatness is defined as the difference between maximum and minimum value of ON-resistance at the specified analog signal voltage points

Typical Characteristics (Ta=25℃, unless otherwise noted)

Typical THD+n / 1kHz Tone @ 20Hz - 20kHz (Measurement Limit)



Typical THD+n / 10kHz Tone @ 10Hz - 1MHz (Measurement Limit)



Source Impedance

Higher source impedance will degrade THD performance, so please design the source circuit carefully, add front buffer circuit for lowest source impedance is good solution generally.

Signal Swing

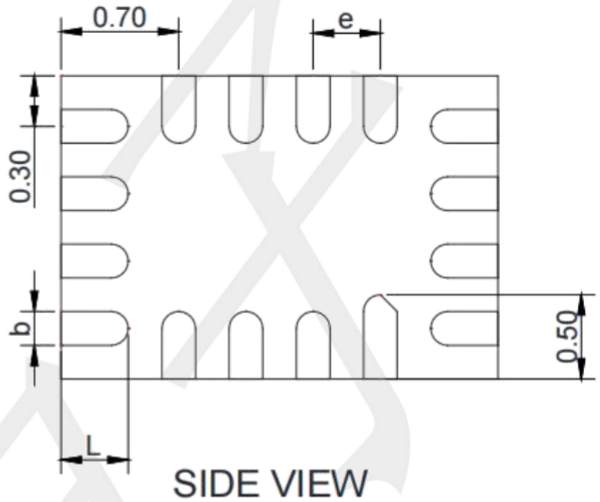
The design for +18dBu(6.15Vrms) Differential audio system. The damage limit is +20.5dBu(8.2Vrms) Differential, >2dB safe margin is retained. Recommend Table:

VCC = 3.3V	VCC = 3.6V	VCC = 3.9V	VCC = 4.2V	VCC = 4.5V
2.3Vrms SE	2.4Vrms SE	2.7Vrms SE	2.9Vrms SE	3.1Vrms SE
4.6Vrms DIFF	4.8Vrms DIFF	5.4Vrms DIFF	5.8Vrms DIFF	6.2Vrms DIFF

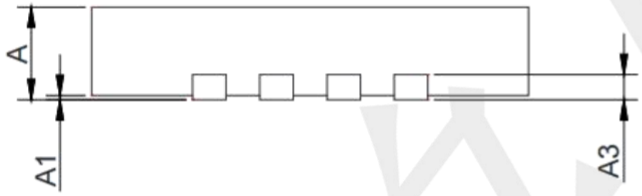
Package information

QFN1826-16L (Unit: mm)

TOP VIEW



SIDE VIEW



SIDE VIEW

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.50	0.55	0.60
A1	0.00	-	0.05
A3	0.15 Ref.		
D	2.55	2.60	2.65
E	1.75	1.80	1.85
L	0.30	0.40	0.50
b	0.15	0.20	0.25
e	0.40 BSC		