0.1Ω, High Voltage, Rail-to-Rail Negative Signal Passing, Dual SPST Analog Switch

General Description

The ET7460 is a high voltage, wide range positive and negative signal passing, dual single-pole/single-throw (SPST) analog switch that is designed to operate from a single 2.7V to 5.5V power supply. Targeted applications include battery powered audio equipment that benefit from the ET7460 ultra low 0.1Ω (TYP) on-resistance for dual switches and fast switching speeds.

The ET7460 has excellent on-resistance matching 0.016Ω (MAX) between switches and guarantees excellent on-resistance flatness over all signal range. This ensures excellent linearity and low distortion when switching audio signals.

The ET7460 is a committed two single-pole/single-throw (SPST) switches which are low R_{ON} switches. This configuration can be used as a two single signals or one differential signal switch and power switches.

The ET7460 can pass -13V to 16V wide range positive and negative signals with very low distortion.

The ET7460 is available in Green WLCSP12 1.62mm×1.23mm packages. It operates over an operating temperature range of -40°C to +85°C.

Features

- Wide Voltage Operation: 2.7V to 5.5V
- Ultra Low On-Resistance: 0.1Ω (TYP)
- -13V to +16V Rail-to-Rail Low Distortion Positive and Negative Signal Passing
- Fast Switching Times
- Low Crosstalk: -100dB at 20kHz
- Low Input Leakage Current
- Rail-to-Rail Input and Output Operation
- 1.2V Logic Compatible Control Pin
- -40°C to +85°C Operating Temperature Range
- WLCSP12 (1.62mm×1.23mm 0.4mm pitch) Package
- MSL1

Application

- HiFi Audio Switch
- Portable Instrumentation
- Battery-Operated Equipment

Pin Configuration

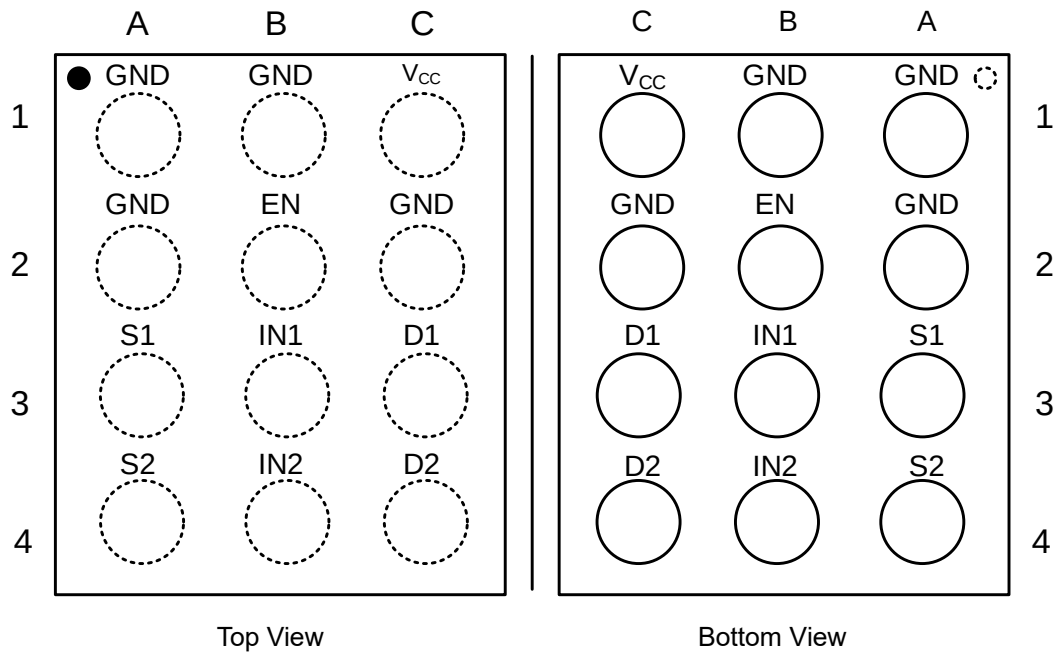


Figure1. Pin Configuration

Pin Function

Pin No.	Name	I/O	Description
A1,A2,B1,C2	GND	/	Ground Pin.
B2	EN	I	Enable Control. When EN=LOW, both Sx and Dx will be disconnected, the ET7460 will be in shutdown state. When EN=HIGH, the ET7460 will be in working state, and Sx or Dx will be connected or disconnected depending on the logical state of INx.
C3	D1	I/O	Drain Terminal 1. This pin can be an input or an output of switch 1.
C4	D2	I/O	Drain Terminal 2. This pin can be an input or an output of switch 2.
B4	IN2	I	Digital Control Pin of Switch 2. When IN2=LOW, switch 2 is turned off, and S2 and D2 are disconnected; When IN2=HIGH, switch 2 is turned on, and S2 and D2 are connected.
B3	IN1	I	Digital Control Pin of Switch 1. When IN1=LOW, switch 1 is turned off, and S1 and D1 are disconnected; When IN1=HIGH, switch 1 is turned on, and S1 and D1 are connected.
A4	S2	I/O	Source Terminal 2. This pin can be an input or an output of switch 2.
A3	S1	I/O	Source Terminal 1. This pin can be an input or an output of switch 1.
C1	VCC	I	Power Supply Pin.

Function Table

Table 1: Function Table of switch 1:

EN	IN1	S1 and D1
0	X	Disconnected
1	0	Disconnected
1	1	Connected (S1=D1)

Table 2: Function Table of switch 2:

EN	IN2	S1 and D1
0	X	Disconnected
1	0	Disconnected
1	1	Connected (S2=D2)

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters		Min	Max	Unit
V_{CC}	VCC to GND		0	6	V
V_{IN}	IN1, IN2, EN to GND		0	6	V
V_{SW}	Sx, Dx to GND		-15	18	V
I_{SW}	Continuous Current from Sx to Dx		±800		mA
I_{PEAK}	Peak Current from Sx to Dx		±2000		mA
T_J	Maximum junction temperature			+150	°C
T_{STG}	Storage Junction Temperature		-65	+150	°C
T_{LEAD}	Lead Temperature (Soldering, 10s)			+260	°C
V_{ESD}	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	±4.0		kV
		Charged Device Model,JESD22-C101	±1.0		

Recommended 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. ETEK does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameters	Min	Max	Unit
V_{CC}	Supply Voltage Range	2.7	5.5	V
T_A	Operating Temperature Range	-40	+85	°C

Electrical Characteristics

V_{CC} = 3.3V, T_A = -40°C to +85°C,typical values are at T_A = +25°C,unless otherwise noted.

Symbol	Parameters	Conditions	Temp	Min	Typ	Max	Unit
Analog Switch							
V_{ANALOG}	Analog Signal Range		+25°C	-13		16	V
R_{ON}	On-Resistance	$-V_{CC} \le V_D \le +V_{CC}$, I_S=200mA	Full		0.1	0.2	Ω
ΔR_{ON}	On-Resistance Match between Channels	$-V_{CC} \le V_D \le +V_{CC}$ I_S=200mA	Full		0.001	0.016	Ω
$R_{FLAT(ON)}$	On-Resistance Flatness	$-V_{CC} \le V_D \le +V_{CC}$ I_S=200mA	Full		0.001	0.005	Ω
$I_{S(OFF)}$	Source Off Leakage Current	V_S=-4.5V/4.5V V_D=4.5V/-4.5V	Full		0.01	0.35	uA
$I_{S(ON)}$ $I_{D(ON)}$	Channel On Leakage Current	V_S=-4.5V/4.5V,V_D=floating or V_S=floating, V_D=-4.5V/4.5V	Full		0.01	0.35	uA
Digital Inputs							
V_{INH}	Input High Voltage	V_{CC}=2.7V to 5.5V, V_{IO}=1.2V/1.8V	Full	0.9			V
V_{INL}	Input Low Voltage	V_{CC}=2.7V to 5.5V, V_{IO}=1.2V/1.8V	Full			0.5	V
R_{PD}	Pull Down Resistor		+25°C		600		kΩ
Dynamic Characteristics							
t_{ON}	Turn-On Time	V_S=2.0V,V_{IH}=1.6V,V_{IL}=0V, V_{IN1}=V_{IN2}=1.6V, R_L=50Ω,C_L=35pF	+25°C		60		us
t_{OFF}	Turn-Off Time		+25°C		5		us
O_{ISO}	Off Isolation	f=1kHz,R_L=50Ω, Signal=0dBm	+25°C		-100		dB
		f=20kHz,R_L=50Ω, Signal=0dBm	+25°C		-75		
X_{TALK}	Channel-to-Channel Crosstalk	f=1kHz,R_L=32Ω, Signal=0dBm	+25°C		-100		dB
		f=20kHz,R_L=32Ω, Signal=0dBm	+25°C		-100		
BW	-3dB Bandwidth	Signal=0dBm, R_L=50Ω,C_L=5pF	+25°C		100		MHz
C_{ON}	Channel On Capacitance		+25°C		40		pF
THD+N	Total Harmonic Distortion +Noise	V_S=2V_{RMS}, R_L=600Ω	+25°C		-110		dB
		V_S=2V_{RMS}, R_L=8Ω			-102		
t_{START}	Start Up Time	Switch V_{EN}=0V to V_{EN}=1.6V	+25°C		100		us

Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	Temp	Min	Typ	Max	Unit
Power Requirements							
I_{CC}	Power Supply Current	V_{IN}=0V or 1.0V or 1.6V, V_{EN}=1.0V or 1.6V	Full		80		uA
	Power Supply Current in Shutdown State	V_{IN}=0V or 1.0V or 1.6V, V_{EN}=0V	Full		3		uA
Thermal Protection							
T_{SHDN}	Thermal Shutdown(1)		-		150		°C
T_{HYS}	Thermal Hysteresis(1)		-		20		°C

Note1. This parameter is guaranteed by design and characterization.

Application Circuit 1

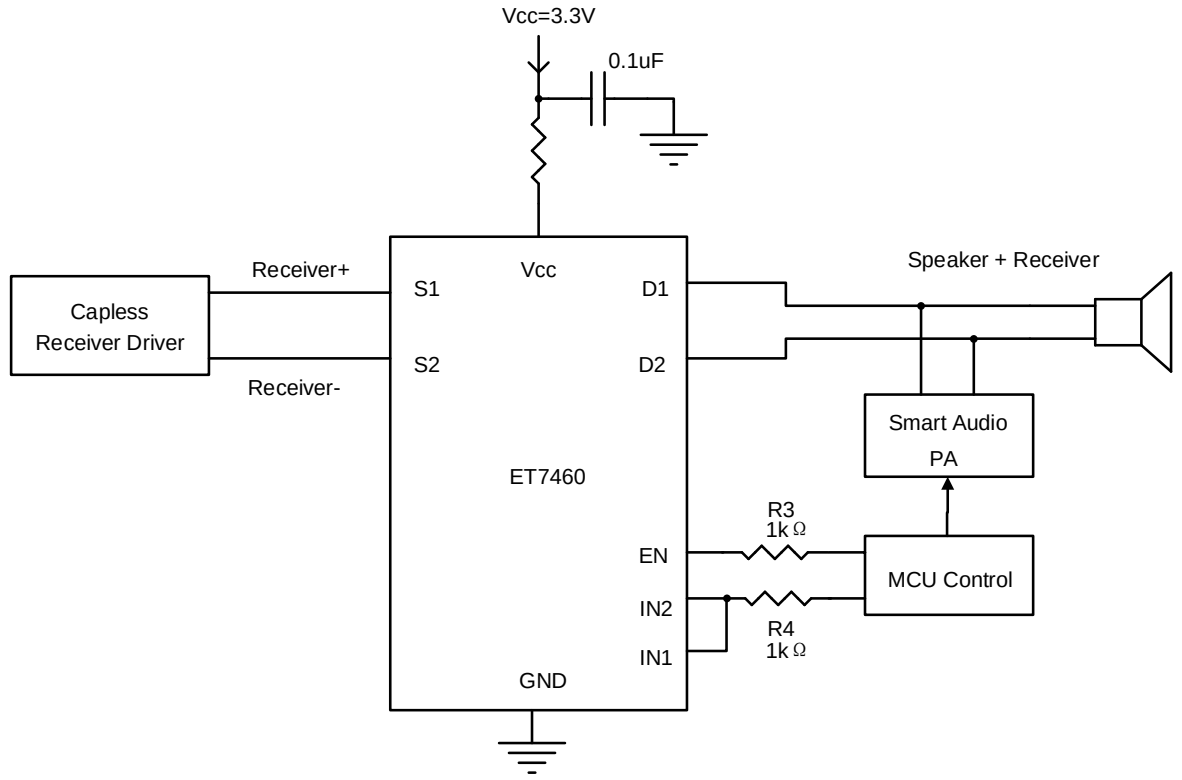


Figure2. Typical Application Circuit for Speaker+Receiver

Application Information

Speaker+Receiver is always used in portable devices, and high voltage class D speaker driver (smart audio PA) is used to drive speaker in order to provide high audio volume. But the high output voltage of class D speaker driver will damage the receiver driver because receiver driver is designed using low voltage technology. The ET7460 can solve this design issue by providing the safe isolation between receiver driver and high voltage class D speaker driver. The ET7460 provides low R_{ON} channels to pass the positive and negative signals from capless receiver and smart audio PA. The circuit is shown in Figure 2.

Application Circuit 2

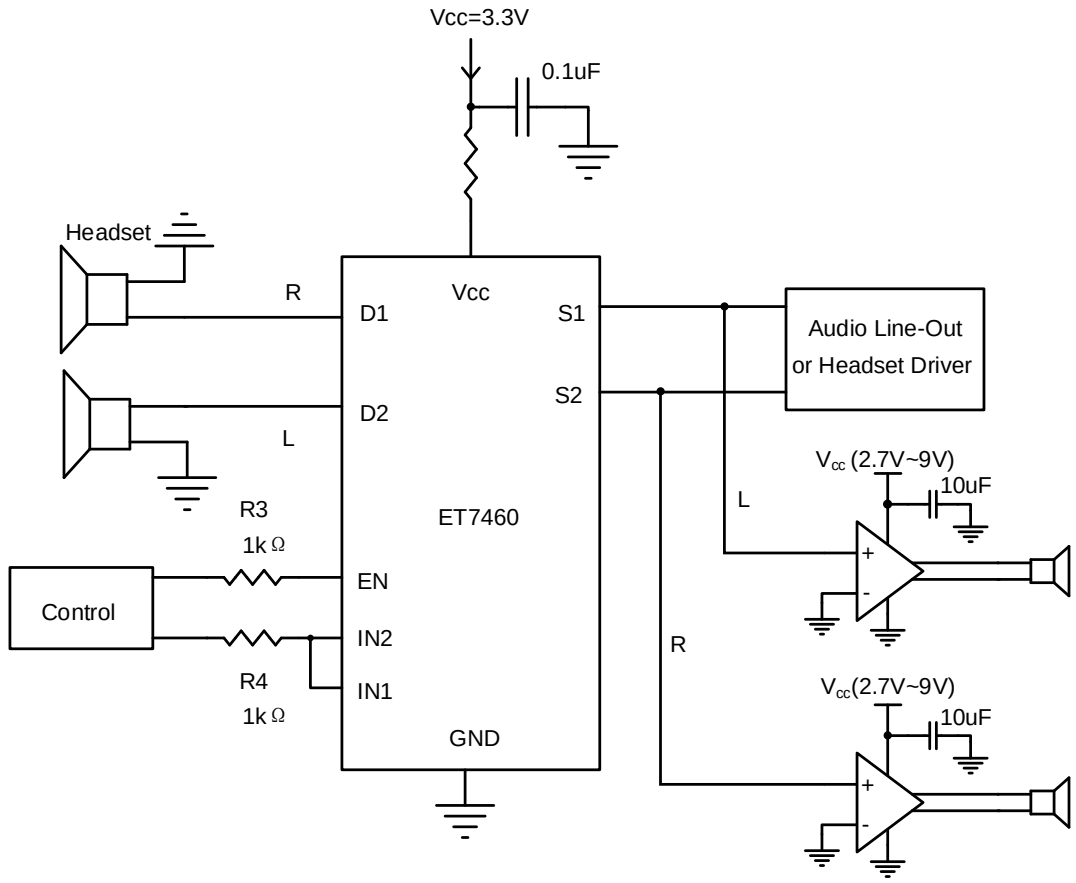


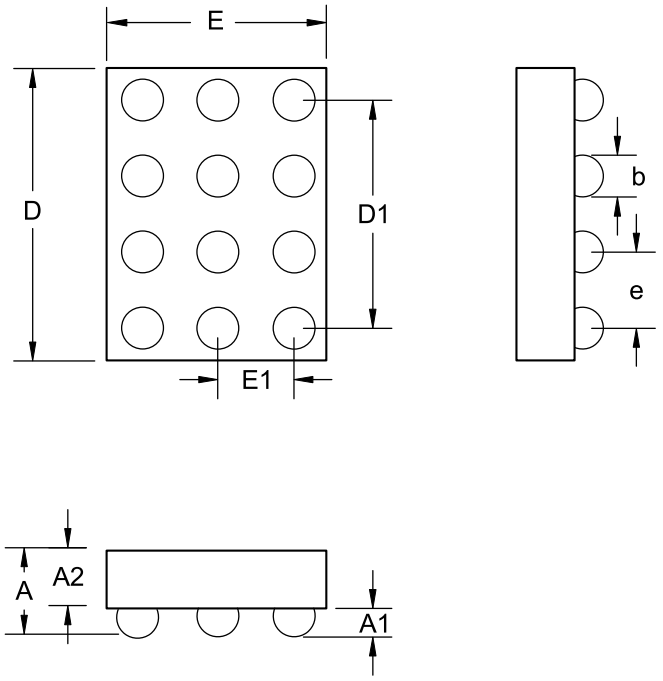
Figure3. Typical Application Circuit for 1-to-2 HiFi Audio Signal Switch

Application Information

In order to improve audio performance of portable devices, external speaker power amplifier is always selected to replace the internal integrated speaker power amplifier. Because the audio signal quality of audio line-out or headset driver is better than the integrated speaker power amplifier, the audio signal of line-out or headset driver is selected as the high performance audio signal source for external speaker power amplifier. High performance ET7460 is used as the 1-to-2 HiFi signal switch in this application. The circuit is shown in Figure 3, and a stable 3.3V power supply is required in this circuit.

Package Dimension

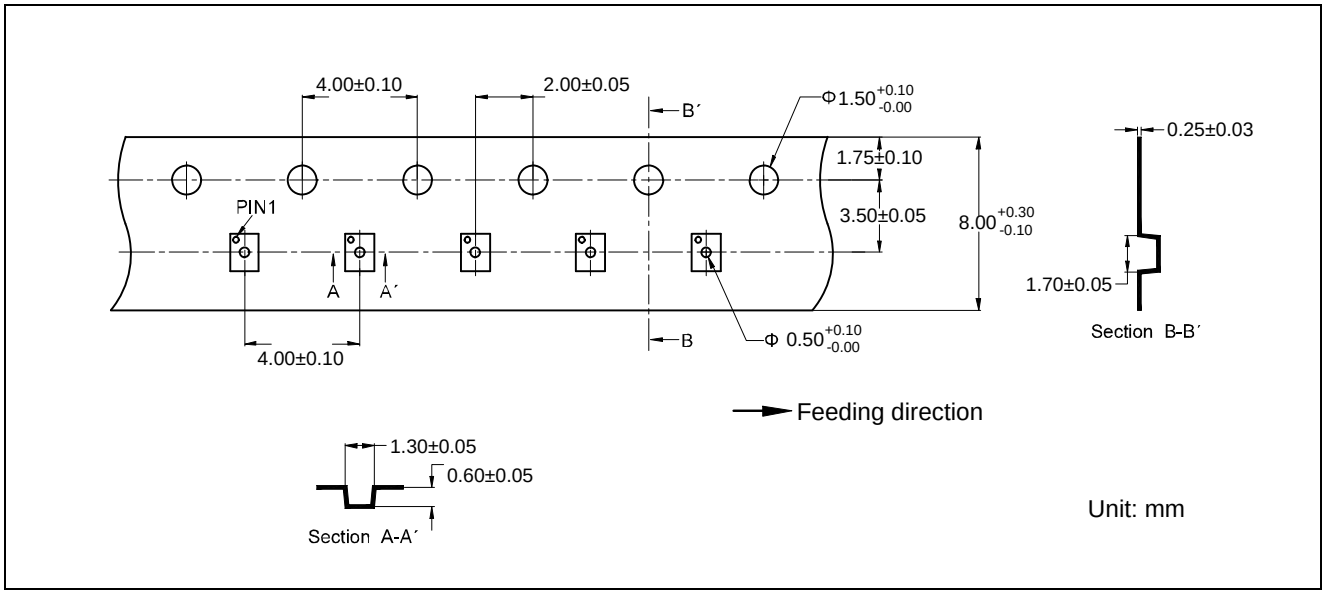
WLCSP12 1.62mm×1.23mm



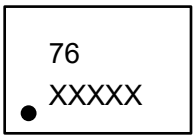
Dimensions Table (Units:mm)

Symbol	Min	Typ	Max
A	0.410	0.455	0.500
A1	0.155	0.175	0.195
A2	0.255	0.280	0.305
b	0.212	0.232	0.252
D	1.570	1.620	1.670
D1	1.200BSC		
E	1.180	1.230	1.280
E1	0.400 BSC		
e	0.400 BSC		

Tape Information



Marking Information



76 – Part Number

XXXXX – Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0	2021-03-04	Preliminary Version	Luh	Luh	Zhujl
0.1	2021-09-29	Modify some electrical parameters and fix some typing errors	Wum	Wum	Zhujl
1.0	2022-03-10	Initial Version	Wum	Wum	Zhujl
1.1	2022-09-17	Update Typeset	Wangp	Wangp	Liujy
1.2	2023-12-21	Add MSL	Wangp	Wangp	Liujy