Low R_{ON}, High Voltage, Rail-to-Rail Negative Signal Passing, SPST Analog Switch

General Description

The ET32121 is a high voltage, wide range positive and negative signal passing, single-pole/single-throw (SPST) analog switch that is designed to operate from a single 2.3V to 5.5V power supply. Targeted applications include battery powered audio equipment that benefit from the ET32121 ultra low 95mΩ (max@25°C) on-resistance for switch.

The ET32121 is a committed single-pole/single-throw (SPST) switch which is low R_{ON} switch. This configuration can be used as a single signals switch and power switch.

The ET32121 can pass -3V to 18V wide range positive and negative signals with very low distortion.

The ET32121 is available in Green FCDFN-6 1.2mm×1.5mm packages. It operates over an operating temperature range of -40°C to +85°C.

Features

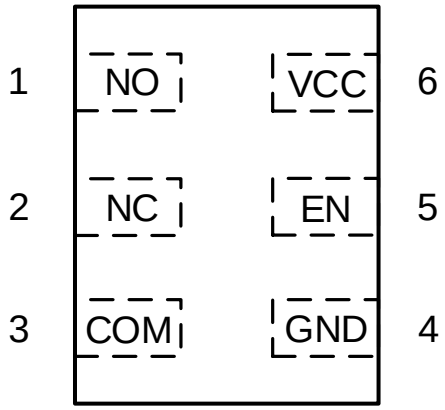
- Wide Voltage Operation: 2.3V to 5.5V
- Ultra Low On-Resistance: 95mΩ (max@25°C)
- -3V to +18V Rail-to-Rail Low Distortion Positive and Negative Signal Passing
- Fast Switching Times
- Low Input Leakage Current
- Rail-to-Rail Input and Output Operation
- 1.2V Logic Compatible Control Pin
- -40°C to +85°C Operating Temperature Range
- Package Information:

Part No.	Package	MSL
ET32121	FCDFN-6 (1.2mm×1.5mm)	Level 1

Application

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

Pin Configuration



Top View

Figure 1. Pin Configuration

Pin Function

Pin No.	Name	I/O	Description
1	NO	I/O	NO Terminal. This pin can be an input or an output of switch.
2	NC	-	Null Pin.
3	COM	I/O	COM Terminal. This pin can be an input or an output of switch.
4	GND	/	Ground Pin.
5	EN	I	Enable Control. When EN=LOW, both COM and NO will be disconnected, the ET32121 will be in shutdown state. When EN=HIGH, the ET32121 will be in working state, COM and NO will be connected.
6	VCC	I	Power Supply Pin.

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_{EN}	EN to GND		0	6	V
V_{SW}	COM, NO to GND		-5	20	V
I_{SW}	Continuous Current from COM to NO		±1500		mA
I_{PEAK}	Peak Current from COM to NO		±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	±2.0		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	2.3	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	-3		18	V
R_{ON}	On-Resistance	$-V_{CC} \le V_{COM} \le +V_{CC}$, I_S=200mA	+25°C			95	mΩ
			Full			130	
$R_{FLAT(ON)}$	On-Resistance Flatness	$-V_{CC} \le V_{COM} \le +V_{CC}$ I_S=200mA	Full		0.001	0.01	Ω
$I_{COM/NO(OFF)}$	COM/NO Off Leakage Current	V_{COM}=-3V/3V V_{NO}=3V/-3V	Full		0.01	0.35	uA
$I_{COM(ON)}$ $I_{NO(ON)}$	Channel On Leakage Current	V_{NO}=-3V/3V, V_{COM}=floating or V_{NO}=floating, V_{COM}=-3V/3V	Full		0.01	0.35	uA
EN Inputs							
V_{IH}	Input High Voltage	V_{CC}=2.3V to 5.5V,	Full	0.9			V
V_{IL}	Input Low Voltage	V_{CC}=2.3V to 5.5V,	Full			0.4	V
R_{PD}	Pull Down Resistor		+25°C		5		MΩ
Dynamic Characteristics							
O_{ISO}	Off Isolation	f=1kHz, R_L=50Ω, Signal=0dBm	+25°C		-95		dB
		f=20kHz, R_L=50Ω, Signal=0dBm	+25°C		-70		
BW	-3dB Bandwidth	Signal=0dBm, R_L=50Ω, C_L=5pF	+25°C		150		MHz
C_{ON}	Channel On Capacitance		+25°C		30		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 to1.6V, V_{SW}=0.6V, R_L=50Ω	+25°C		180		us
Power Requirements							
I_{CC}	Power Supply Current	V_{EN}=1.0V or 1.6V	Full		95		uA
	Power Supply Current in Shutdown State	V_{EN}=0V	Full		1		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

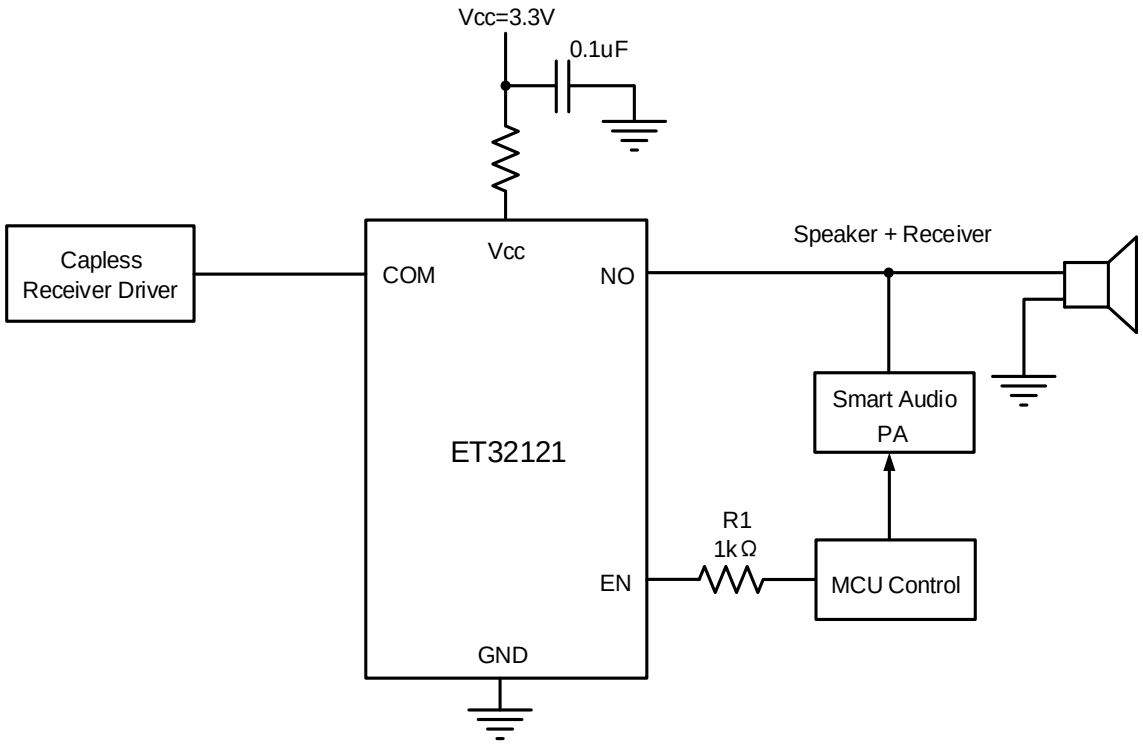


Figure 2. Typical Application Circuit for Speaker+Receiver

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 ET32121 can solve this design issue by providing the safe isolation between receiver driver and high voltage class D speaker driver. The ET32121 provides low R_{ON} channel to pass the positive and negative signals from capless receiver and smart audio PA. The circuit is shown in Figure 2.

Application Circuit 2

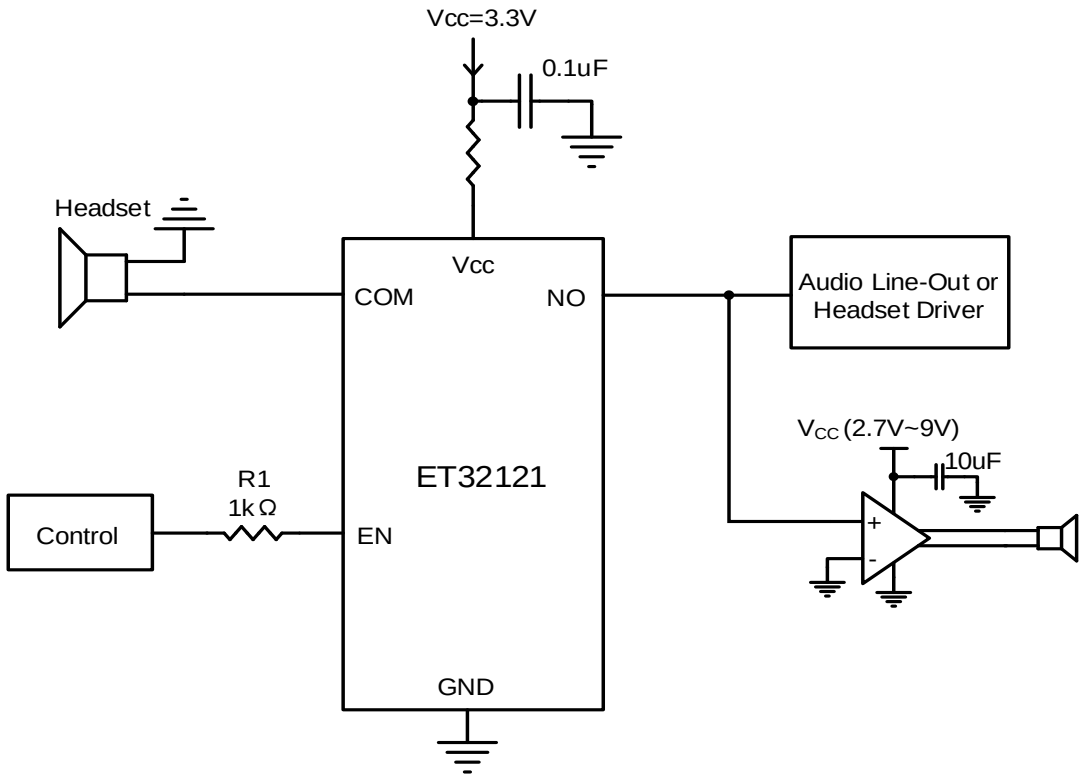
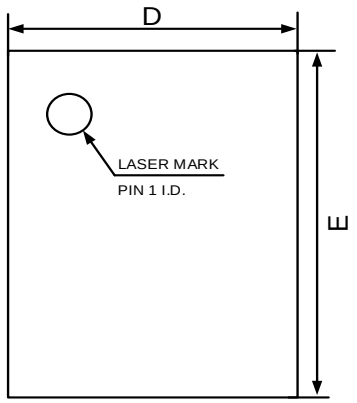


Figure3. Typical Application Circuit for 1-to-1 HiFi Audio Signal Switch

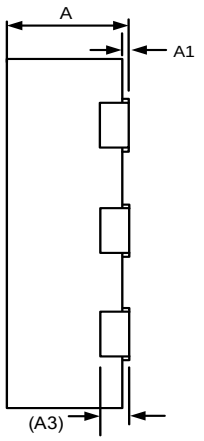
In order to improve audio performance of portable devices, external speaker power amplifier is always selected to replace the internal integrated speaker power amplifier. Because the audio signal quality of audio line-out or headset driver is better than the integrated speaker power amplifier, the audio signal of line-out or headset driver is selected as the high-performance audio signal source for external speaker power amplifier. High performance ET32121 is used as the 1-to-1 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

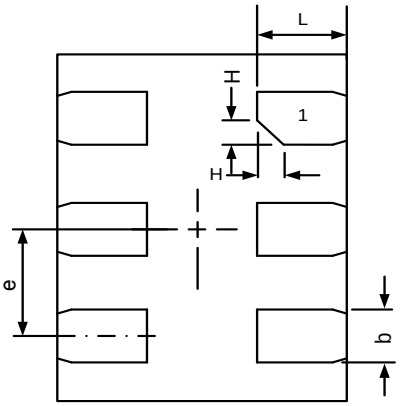
FCDFN-6 1.2mm×1.5mm



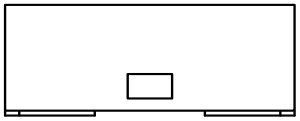
TOP VIEW



SIDE VIEW



BOTTOM VIEW



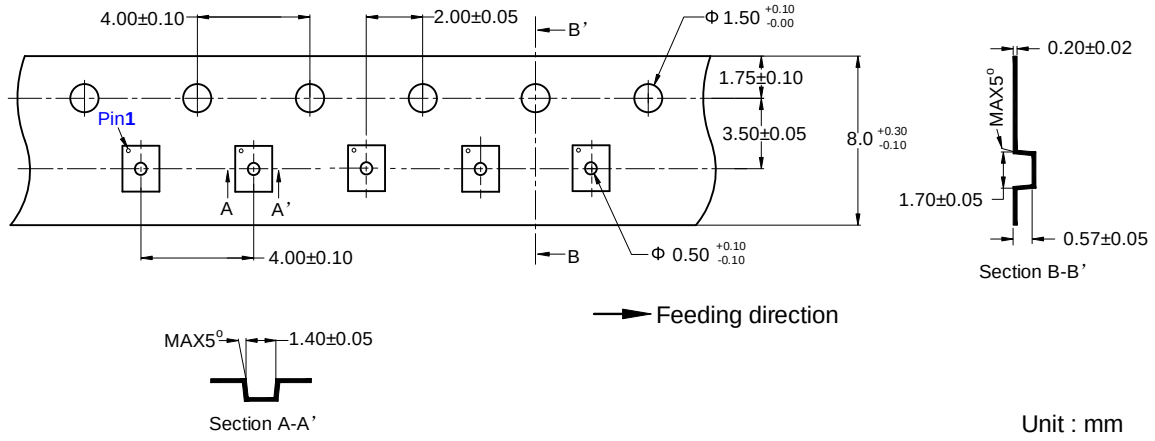
SIDE VIEW

COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

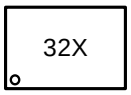
SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0.00	0.02	0.05
A3		0.127 REF	
b	0.15	0.20	0.25
D	1.15	1.20	1.25
E	1.45	1.50	1.55
e	0.45	0.50	0.55
L	0.30	0.35	0.40
H		0.10 REF	

Tape Information



Marking Information

FCDFN-6 Package



$32^{(1)}$ = Part Number

$X^{(2)}$ = Track Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2024-09-14	Initial Version	Wum	Wum	Liujy
0.1	2024-12-27	Preliminary Version	Licx	Wum	Liujy
0.2	2025-03-24	Update Typ Value & Tape & Marking	Licx	Wum	Liujy