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## Application Note: FSA3357 Single Pole/Triple Throw Eliminates Second Single Pole/Double Throw and Reduces Board Space

Historically, one of two methods was used to route three analog signals. The first method used a bulky 4:1 multiplexer and connected the unused channel-to-ground. The second method connected two Single Pole/Double Throw (SPDT) analog switches in a series. Both methods need to be scrutinized carefully for board conservation and analog performance considerations.

In today's handheld electronic market, the first method presents a challenge to designers seeking to reduce board space. The smallest package that a 4:1 multiplexer comes in is a 3mm X 3mm MLP package (see Figure 1). This 9mm<sup>2</sup> package area adds unneeded board space to limited board designs. The FSA3357, a Single Pole/Triple Throw (SP3T) analog switch, offers designers a simple solution as it is offered in US8 and MicroPak™ packaging that reduces board space by over 71%.

The second method using two SPDT analog switches is more board space efficient over the 4:1 multiplexer method. However, this method costs the designer analog performance and additional part count. By connecting the two SPDT switches in series immediately hinders three critical specifications  $R_{ON}$ ,  $R_{flatness}$ , and  $\Delta R_{ON}$ .

1.  $R_{ON}$  is the resistance between the drain and source of the analog switch
2.  $R_{flatness}$  is the difference between the lowest and highest  $R_{ON}$  over the input voltage range
3.  $\Delta R_{ON}$  is the difference in resistance between channels

The connection of the series channel causes the On Resistance to double (see Figure 2). For example, if the  $R_{ON}$  of each SPDT switch is 5Ω, then series channel is 10Ω. This addition of resistance will add attenuation to the input signal.  $R_{flatness}$  has also been doubled in the series channel, which affects signal integrity.  $\Delta R_{ON}$  increases significantly by an addition of the SPDT's  $R_{ON}$  value. For example, if the  $\Delta R_{ON}$  specification is 0.2Ω and the  $R_{ON}$  specification is 5Ω the series channel  $R_{ON}$  is 10Ω, then the difference between channels is now 5.2Ω. The series channel changes the output signal into two different signals one with greater attenuation and propagation delay than the other.

The FSA3357 offers designers a new alternative to saving space, reducing part count, and increasing signal performance.

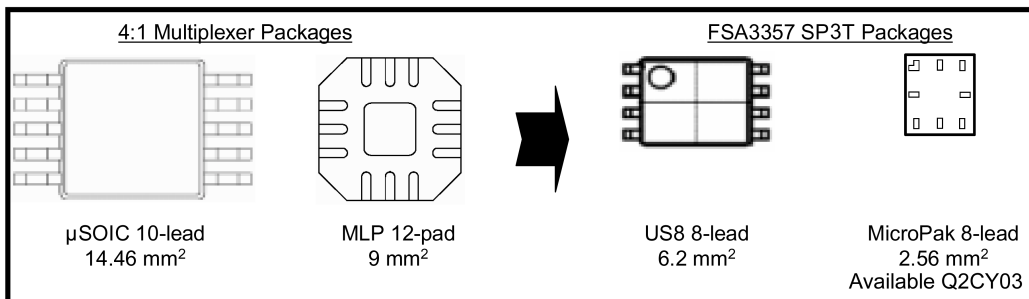


FIGURE 1. FSA3357 Package Advantage

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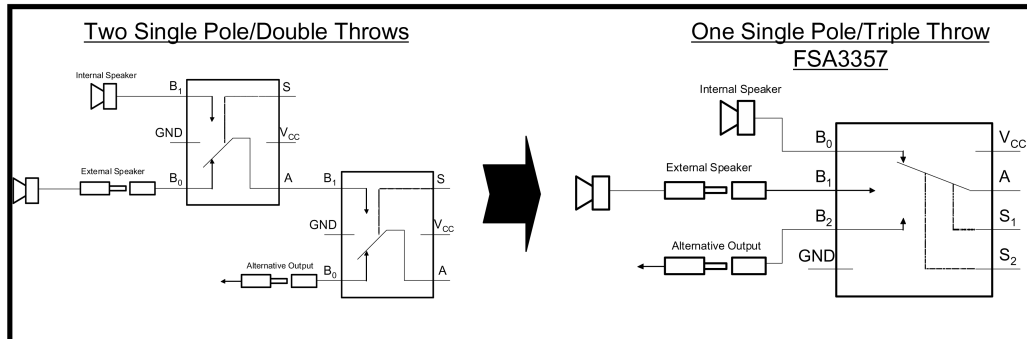


FIGURE 2. One SPTT Replaces Two SPDT Analog Switches

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