



## Basic Layout Tips Part 1 Power and Ground

There are a multitude of methods for successful layout of high-performance digital audio circuits. While it is not possible to provide hard rules for every situation, this series provides basic guidelines to get the projects started in the right direction.

The first area to consider is proper layout of power supplies and ground. The old rules of splitting power and ground into “digital” and “analog” sections do not necessarily apply to all devices. AKM devices have two different design techniques that dictate placement and routing of power and ground signals. Some devices are sensitive to “delta ground” and some are sensitive to “delta supply”. For these cases, it is important to maintain equal potentials at the respective pins. For example, a “delta ground” device requires that all ground pins (analog and digital) have a potential of less than 300mV between them. To identify the type of device, refer to the “Absolute Maximum Ratings” found in all AKM datasheets:

<b>ABSOLUTE MAXIMUM RATINGS</b>					
<i>(AVSS, DVSS = 0V; Note 1)</i>					
Parameter		Symbol	min	max	Units
Power Supplies:	Analog	AVDD	-0.3	6.0	V
	Digital	DVDD	-0.3	6.0	V
	$ AVSS - DVSS $ (Note 2)	$\Delta GND$	-	0.3	V
Input Current, Any pin Except Supplies		IIN	-	$\pm 10$	mA
Input Voltage		VIND	-0.3	DVDD+0.3	V
Ambient Operating Temperature		Ta	-40	85	°C
Storage Temperature		Tstg	-65	150	°C

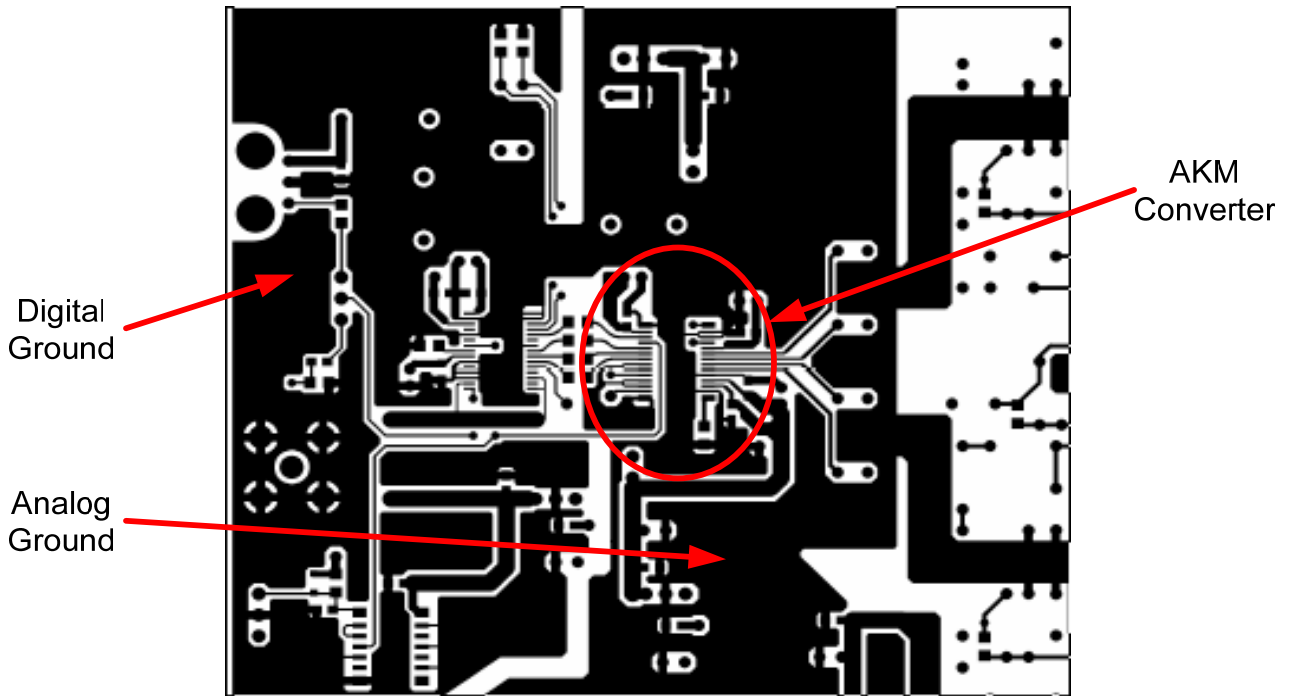
### Delta Ground

<b>ABSOLUTE MAXIMUM RATINGS</b>					
<i>(AGND, DGND=0V; Note 1)</i>					
Parameter		Symbol	min	max	Units
Power Supplies:	Analog	VA	-0.3	6.0	V
	Digital	VD	-0.3	6.0	V
	Output Buffer	VT	-0.3	6.0	V
	$VD - VA$	VDA	-	0.3	V
Input Current, Any Pin Except Supplies		IIN	-	$\pm 10$	mA
Analog Input Voltage		VINA	-0.3	VA+0.3	V
Digital Input Voltage		VIND	-0.3	VA+0.3	V
Ambient Temperature (powered applied)		Ta	-40	85	°C
Storage Temperature		Tstg	-65	150	°C

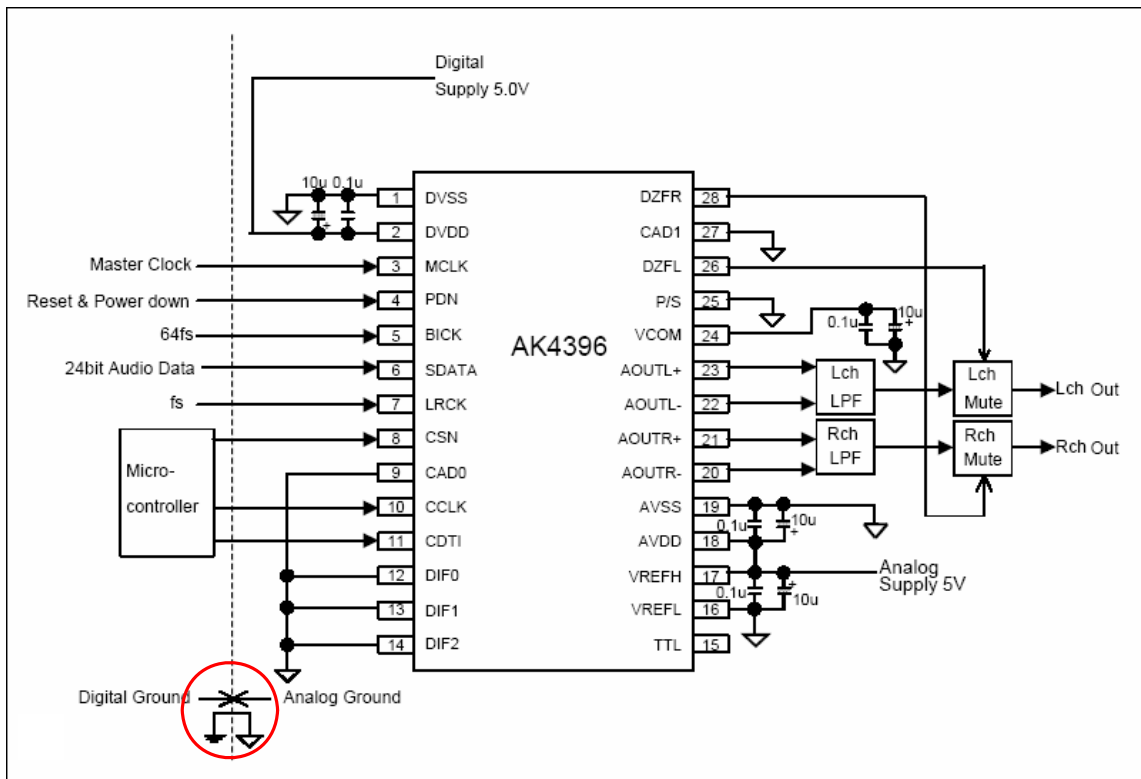
### Delta Supply

For a delta ground device, it is recommended that all of the ground pins be tied to the same plane, typically the analog ground plane. The separation of digital and analog ground planes should be done away from the AKM converter. Conventional converter wisdom often calls for splitting the ground plane underneath the converter according to its pin layout, but avoid this technique for AKM delta ground parts.

If this method must be used to reduce digital noise on the analog plane, then a robust connection between the two planes must be made very close to the AKM device, preferably underneath the package. Be aware that if the noise on the ground planes varies by more than 300mV (even transient and ripple noise), the AKM device may require a reset.

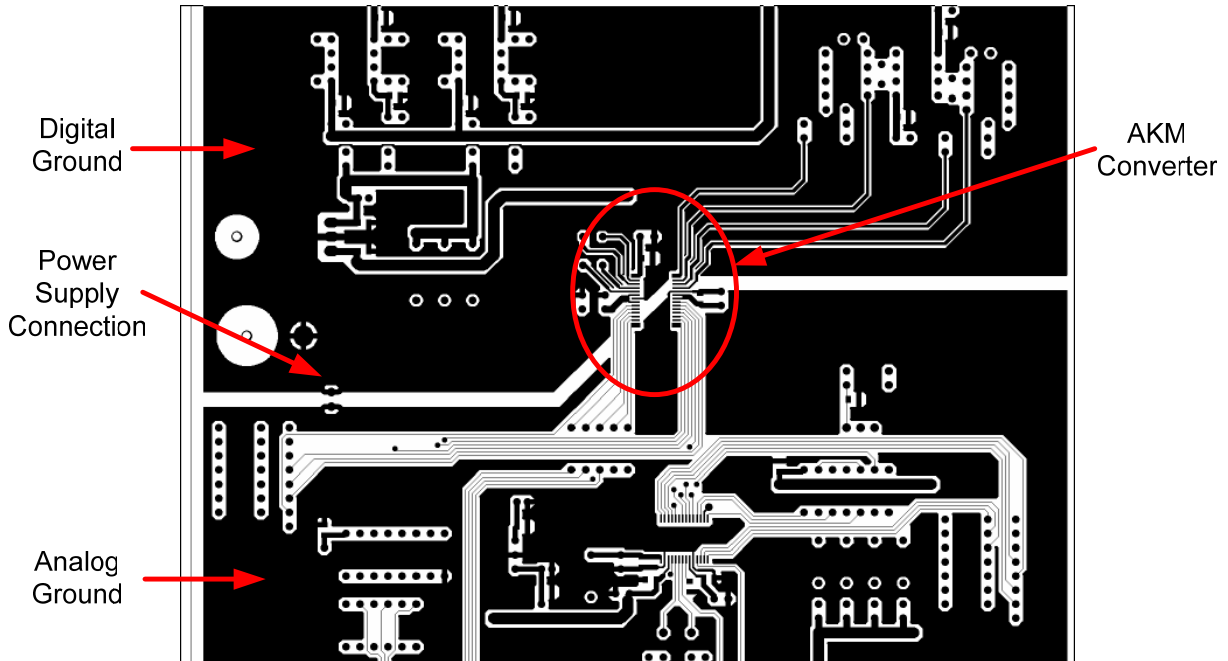


**Recommended Ground Plane Layout for a Delta Ground Converter**

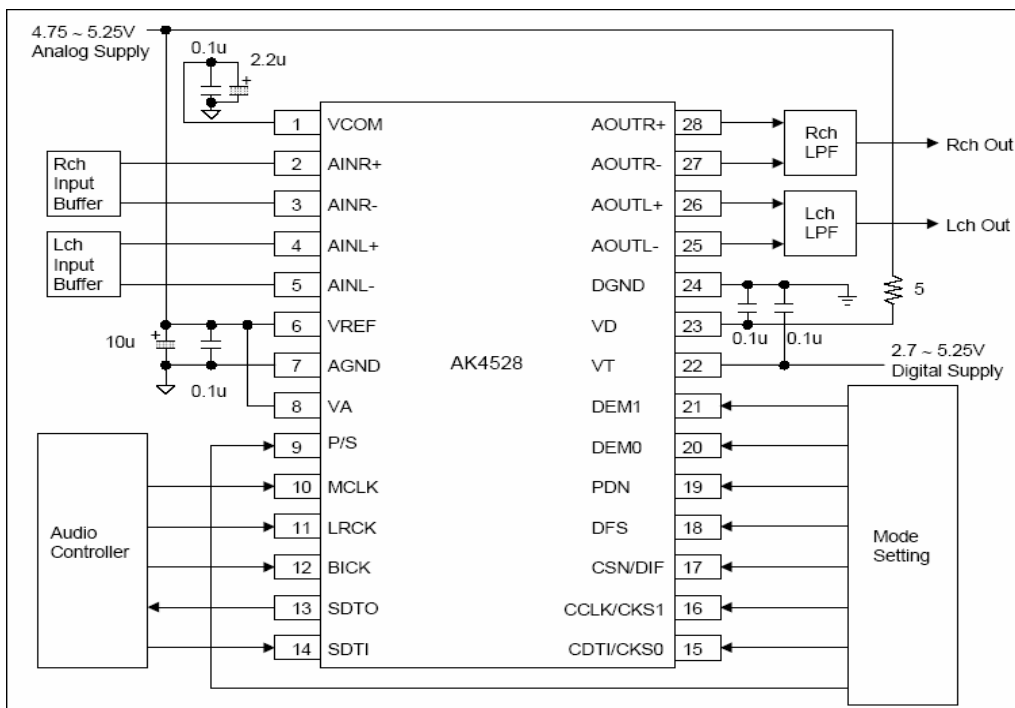


**Logical Representation of Split Ground Planes for a Delta Ground Converter**

For parts that are sensitive to delta supply, it is critical that the power supplies come up together, and to maintain less than 300mV of potential between the power supply pins, irrespective of whether they are analog or digital pins. At no time can VD be more than 300mV above VA. The easiest way to stay within this rating is to use the same power supply for analog and digital. Unlike the delta ground case, it is important to separate the analog and digital ground planes. Do not connect the ground planes at a point close to the AKM device. For these devices, the power supply planes should be tied together at the supply, far away from the converter.



**Recommended Ground Plane Layout for a Delta Supply Converter**



**Logical Representation of Split Ground Planes for a Delta Supply Converter**