



DAS Signal Chains

17 February 2020

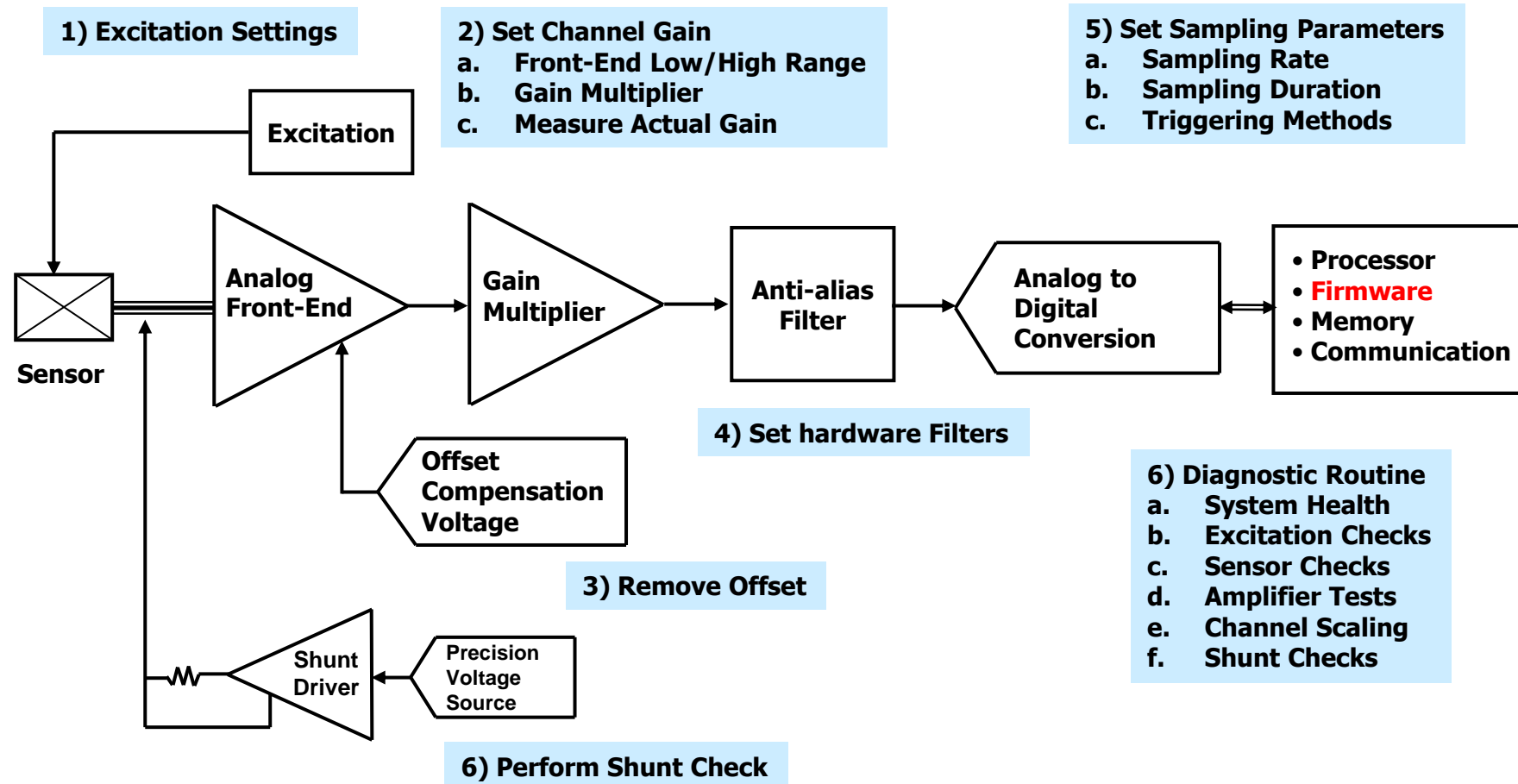
Mike Beckage

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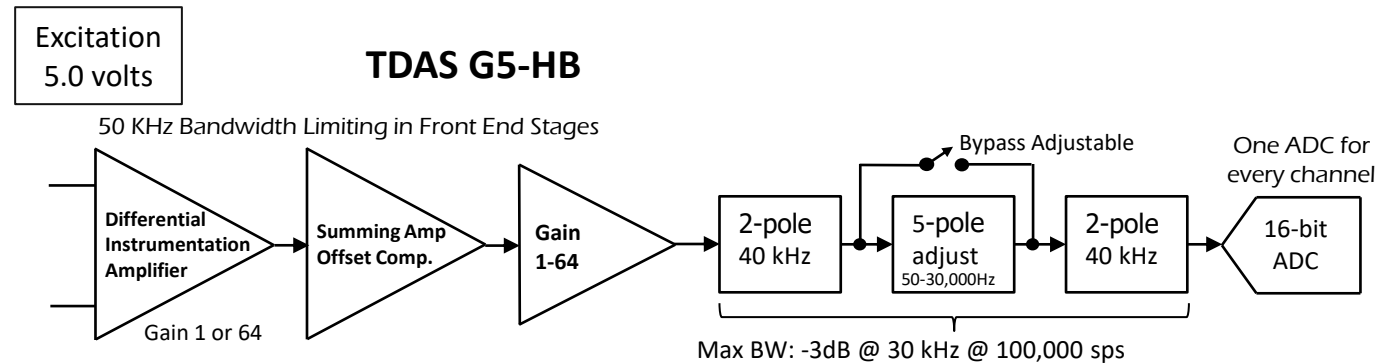
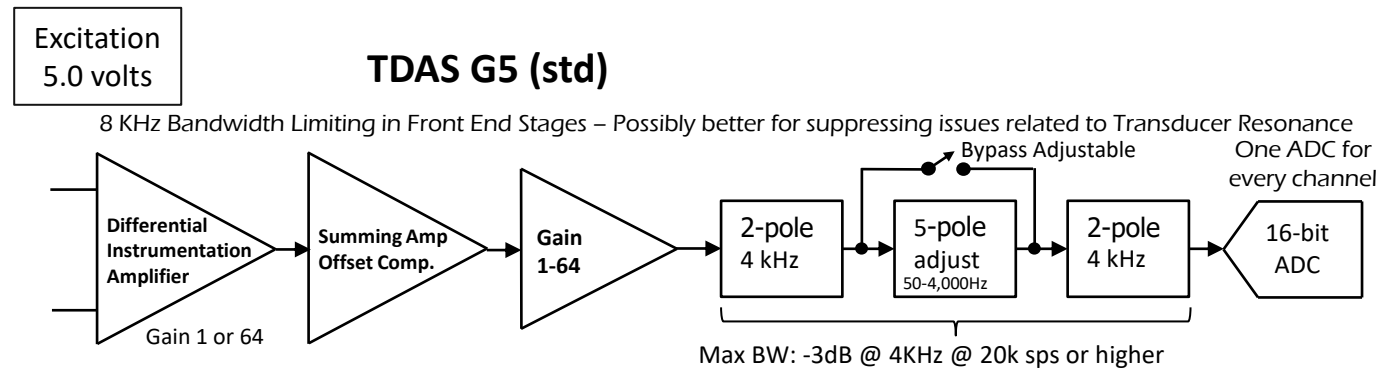
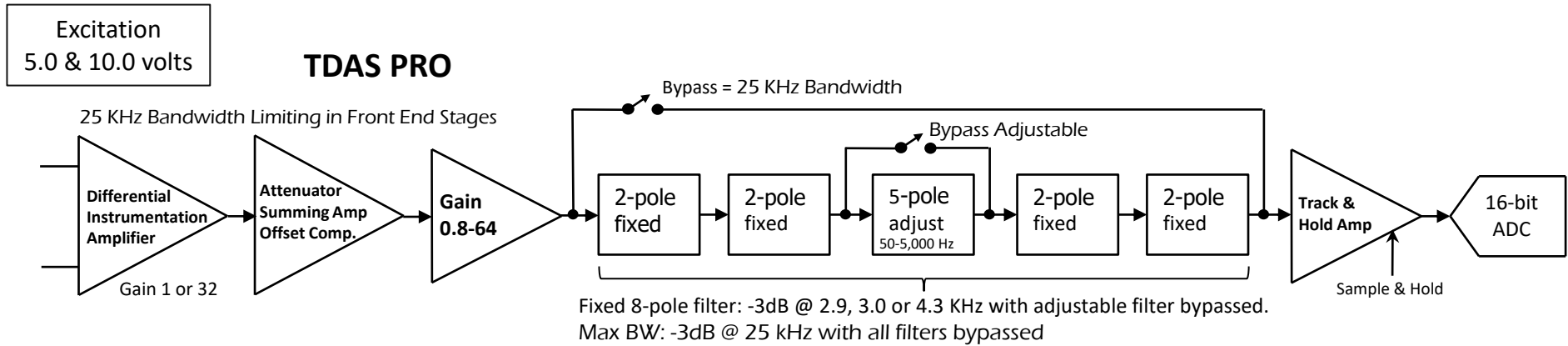
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Basic Channel Architecture

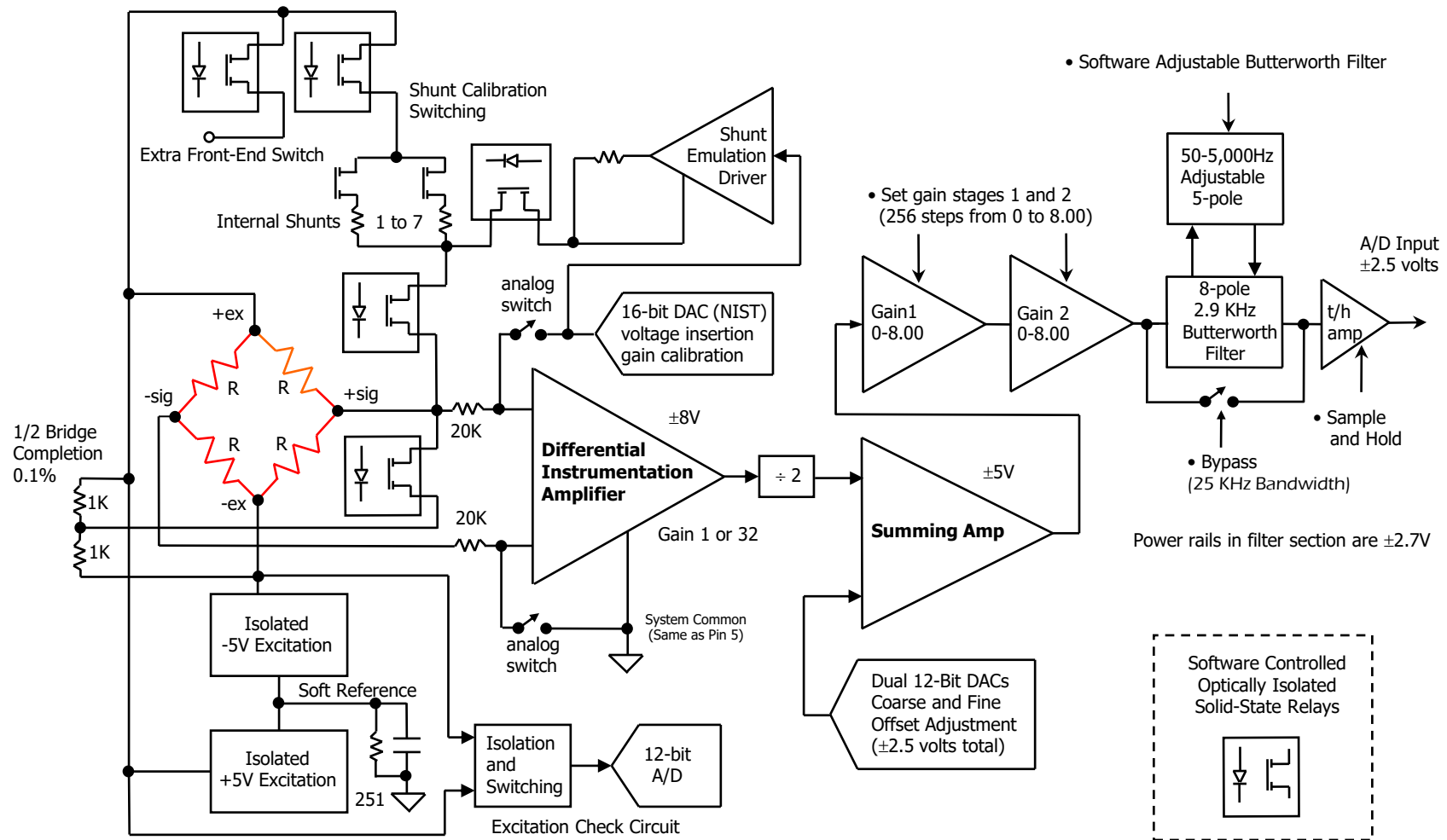
Hardware Control Functions



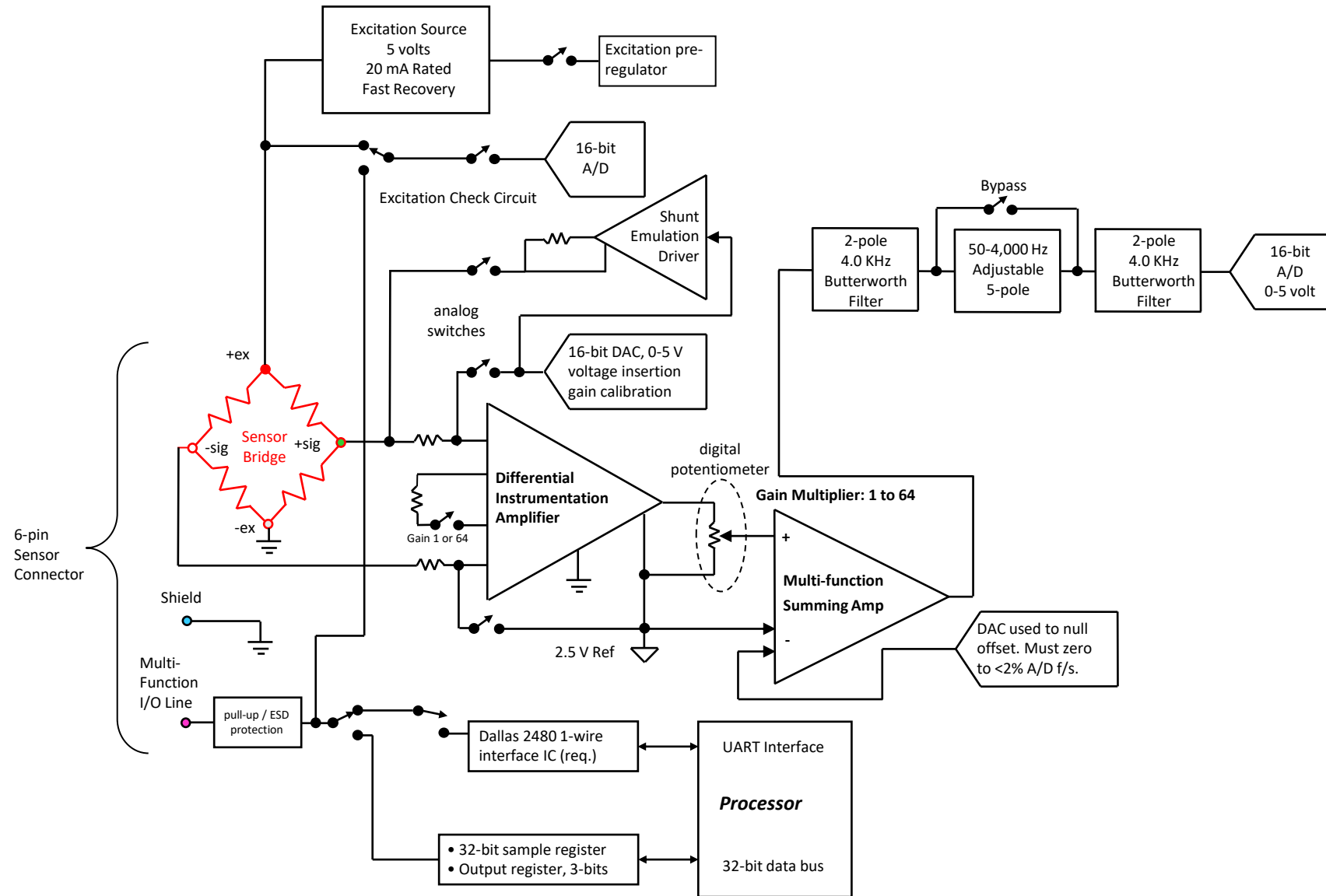
TDAS Signal Chains



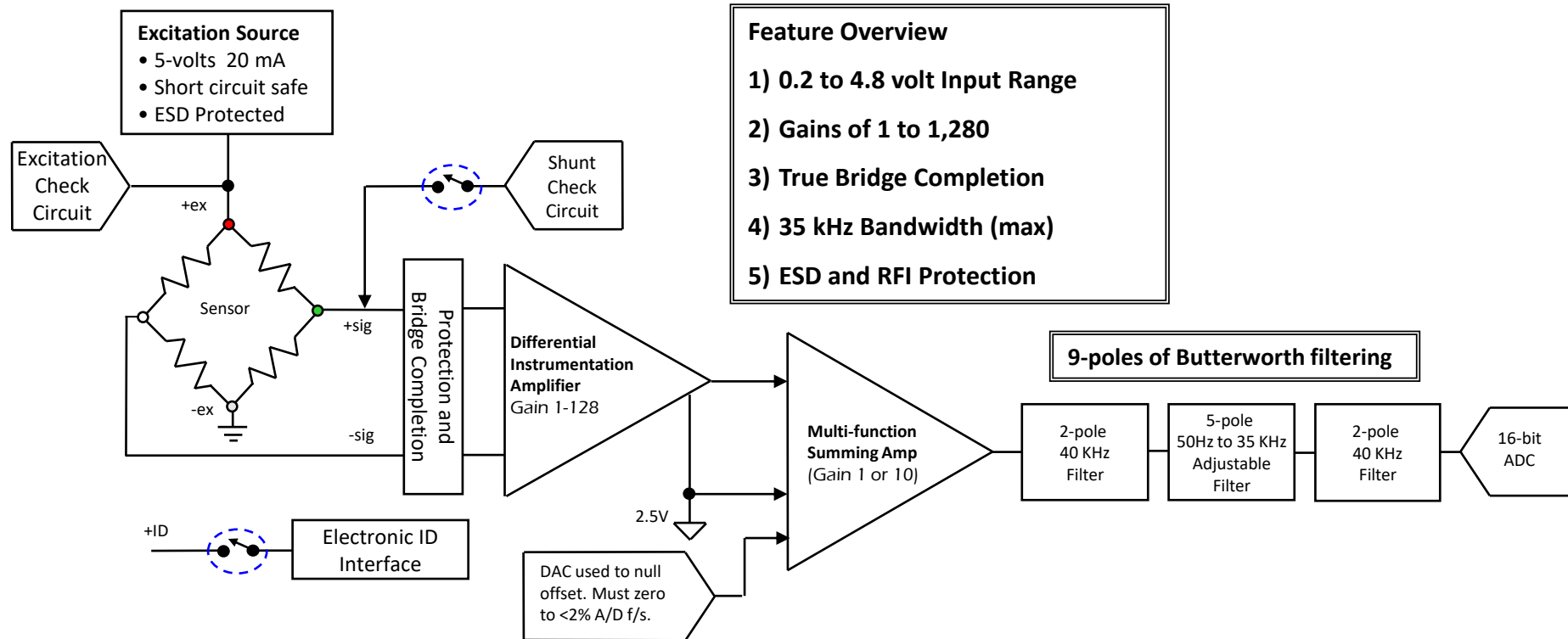
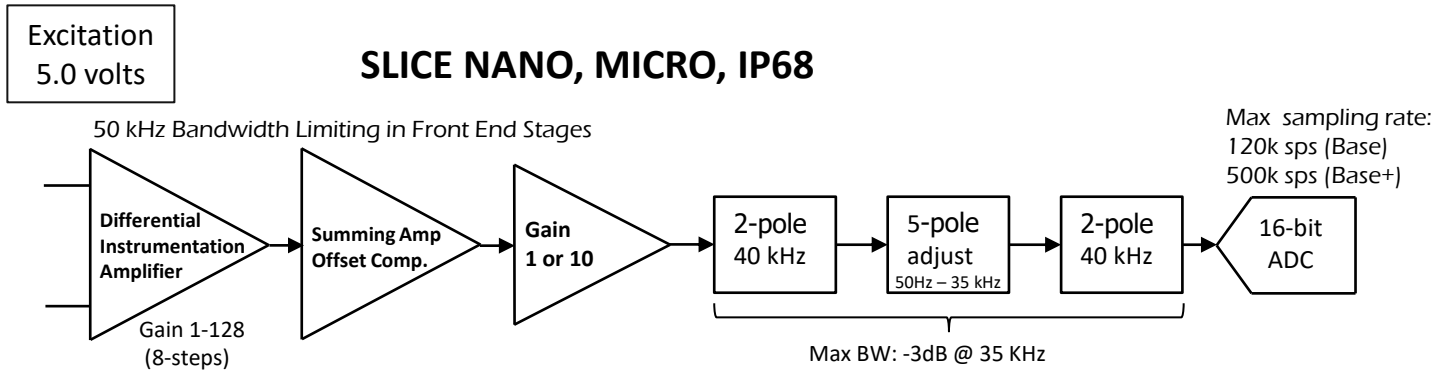
TDAS PRO SIM – Sensor Interface



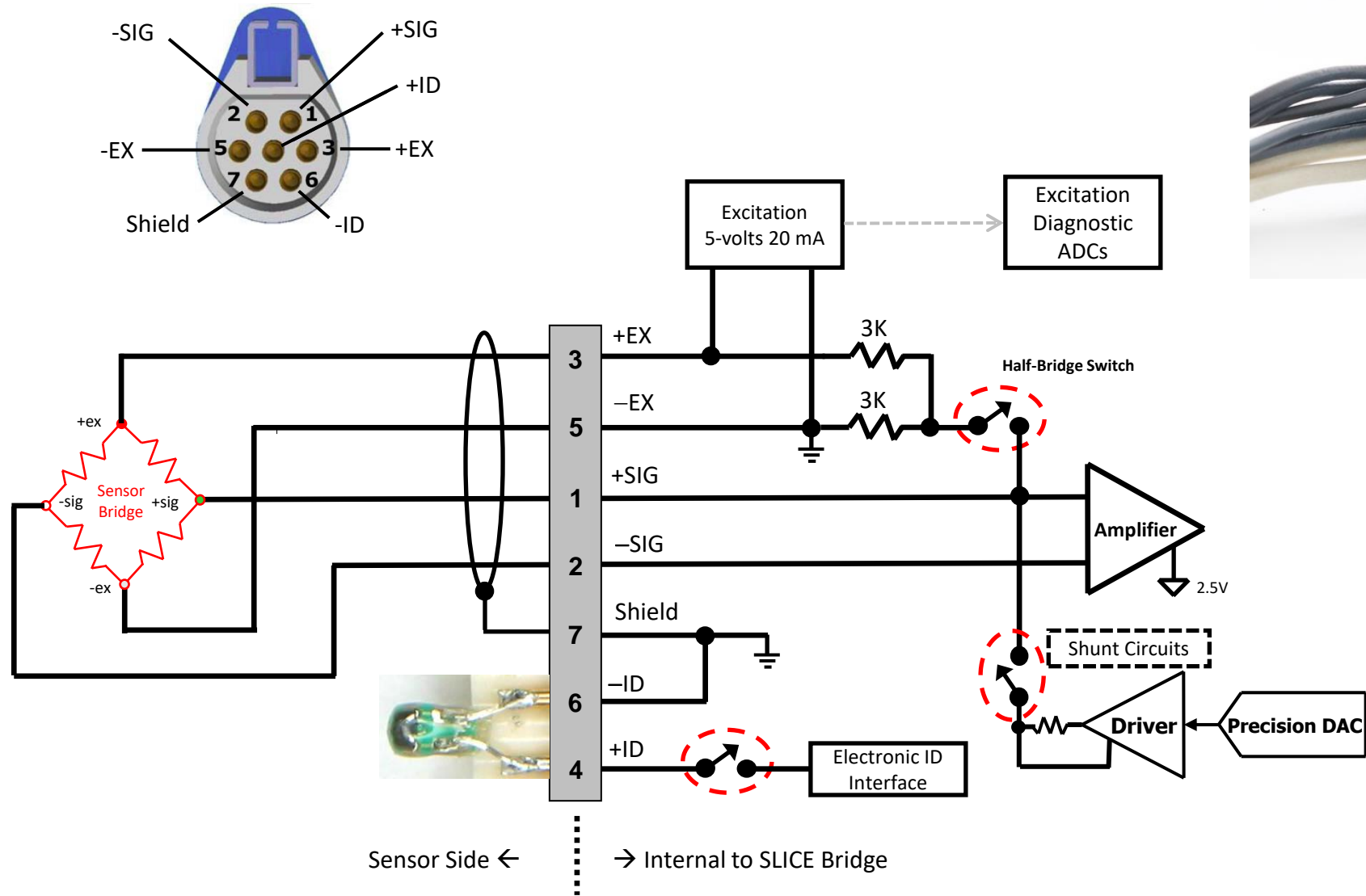
TDAS G5 – Sensor Interface



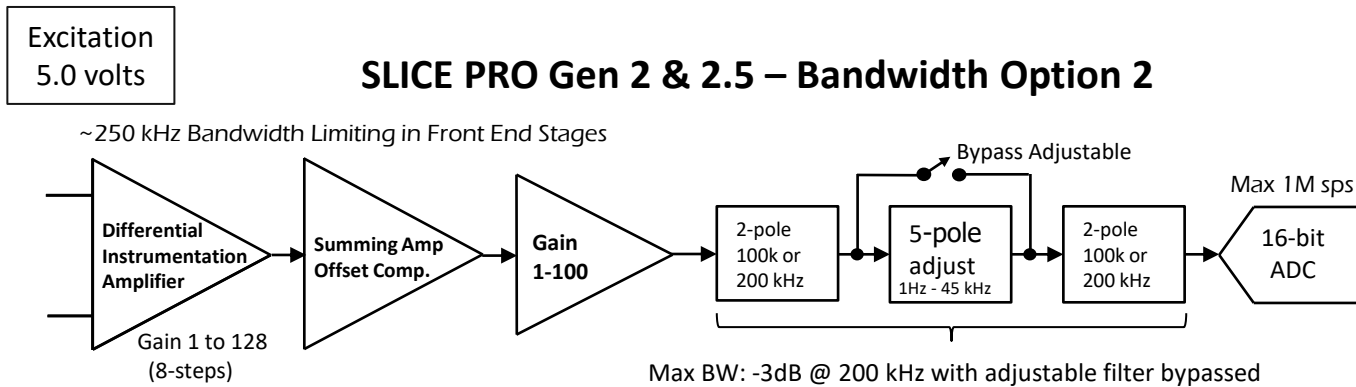
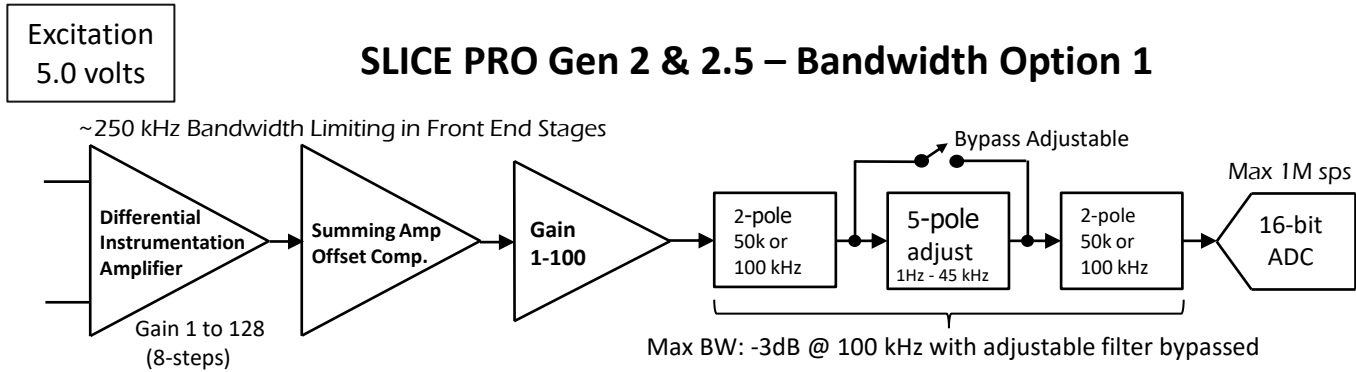
SLICE NANO, MICRO, IP68 Signal Chain



SLICE NANO/MICRO/IP68 – Sensor Interface



SLICE PRO Gen 2 – Signal Chain Options

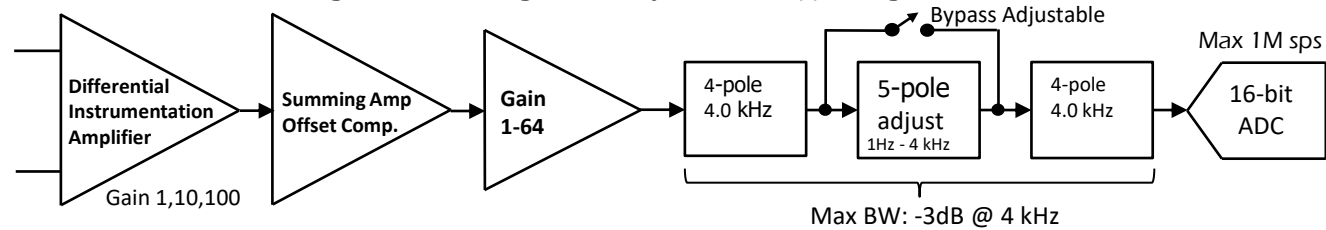


SLICE PRO SIM Gen 3 – Signal Chain Options

Excitation
2.0/5.0/10.0 volts

SLICE PRO Gen 3 – Standard Bandwidth

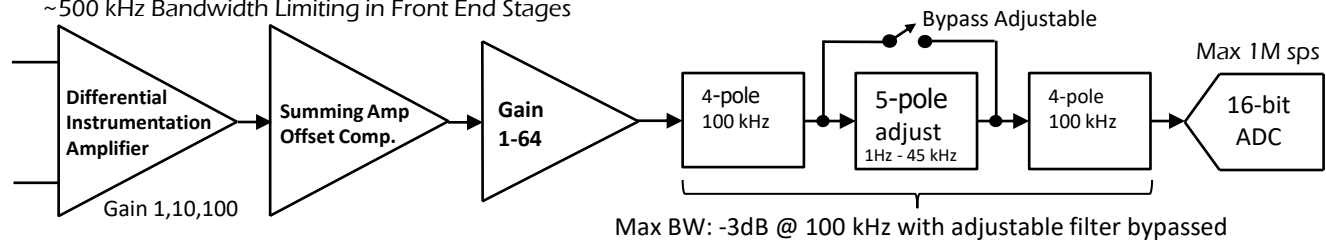
~10 kHz Bandwidth Limiting in Front End Stages – Possibly better for suppressing issues related to Transducer Resonance



Excitation
2.0/5.0/10.0 volts

SLICE PRO Gen 3 – High Bandwidth

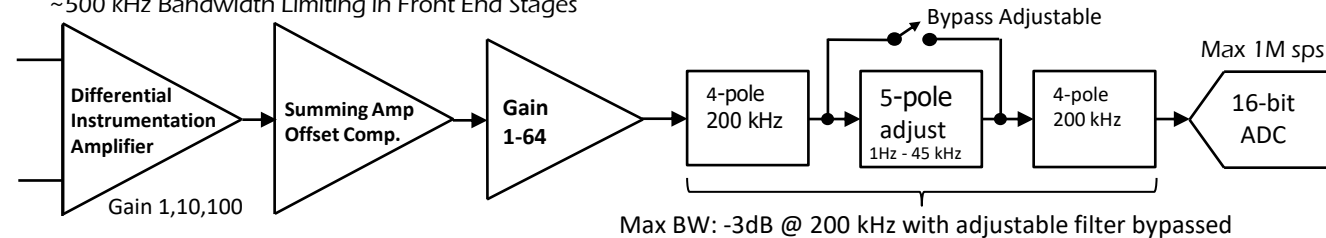
~500 kHz Bandwidth Limiting in Front End Stages



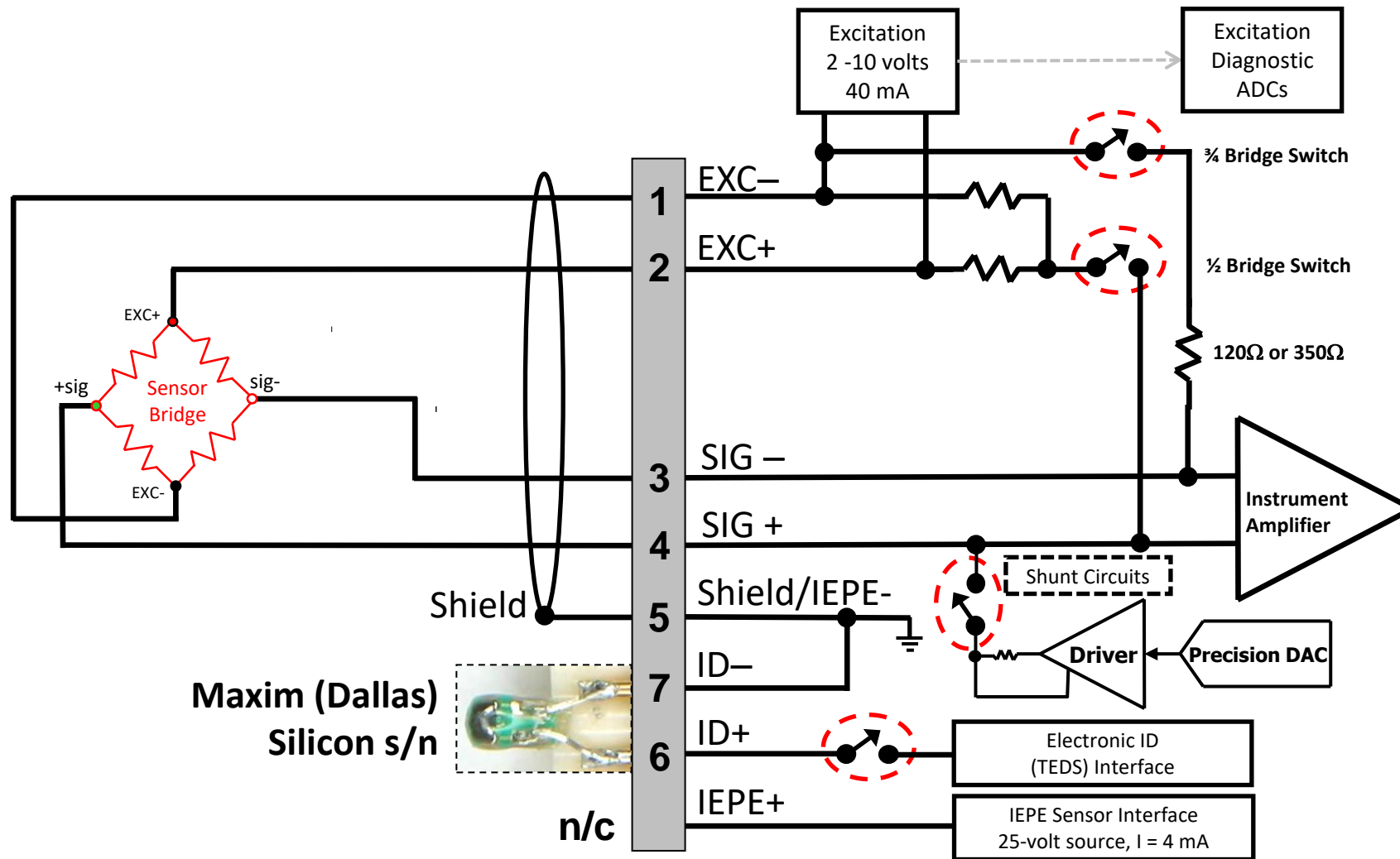
Excitation
2.0/5.0/10.0 volts

SLICE PRO Gen 3 – Maximum Bandwidth

~500 kHz Bandwidth Limiting in Front End Stages



SLICE PRO SIM Gen 3 – Sensor Interface

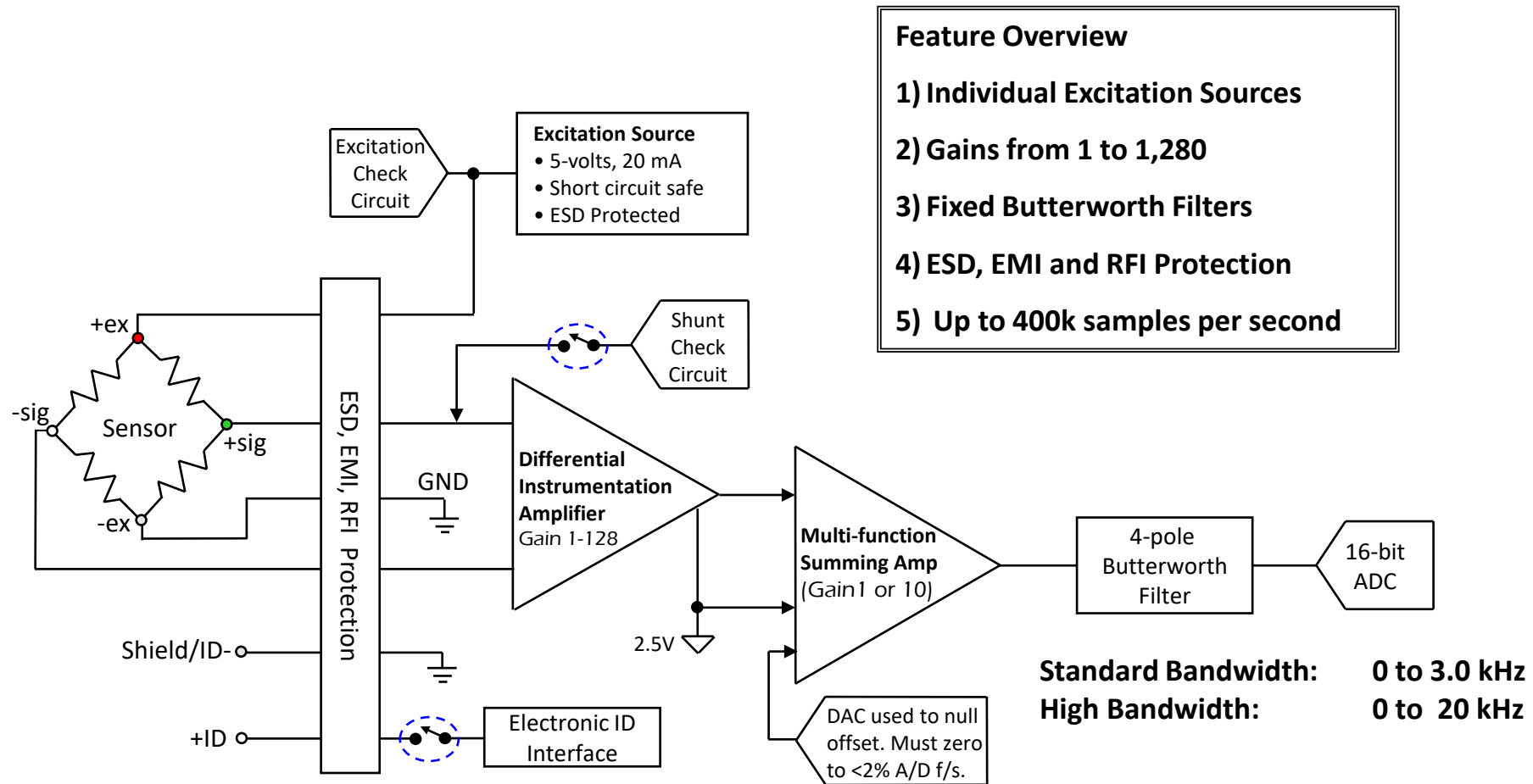


Maxim (Dallas)
Silicon s/n

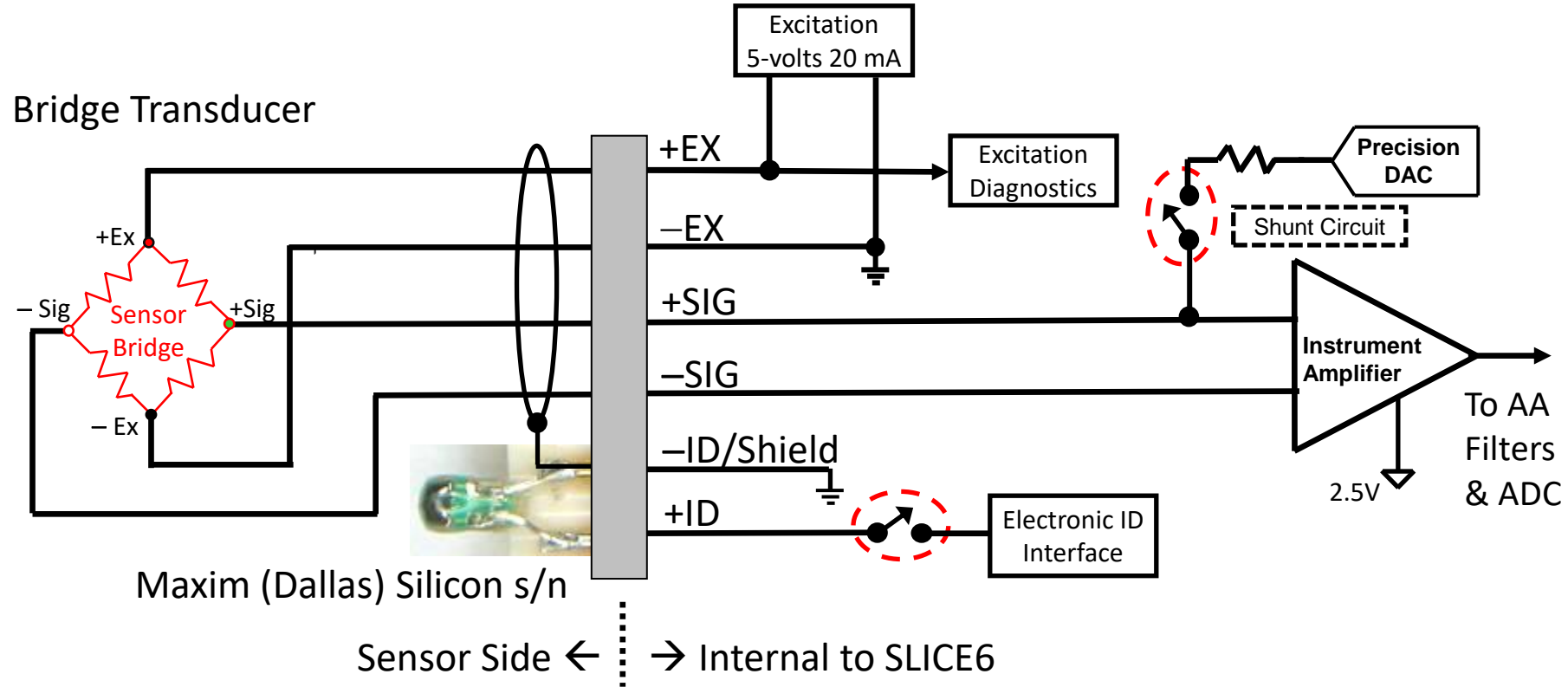


Sensor Side ← ⋮ → Internal to SLICE PRO

SLICE6 – Signal Chain

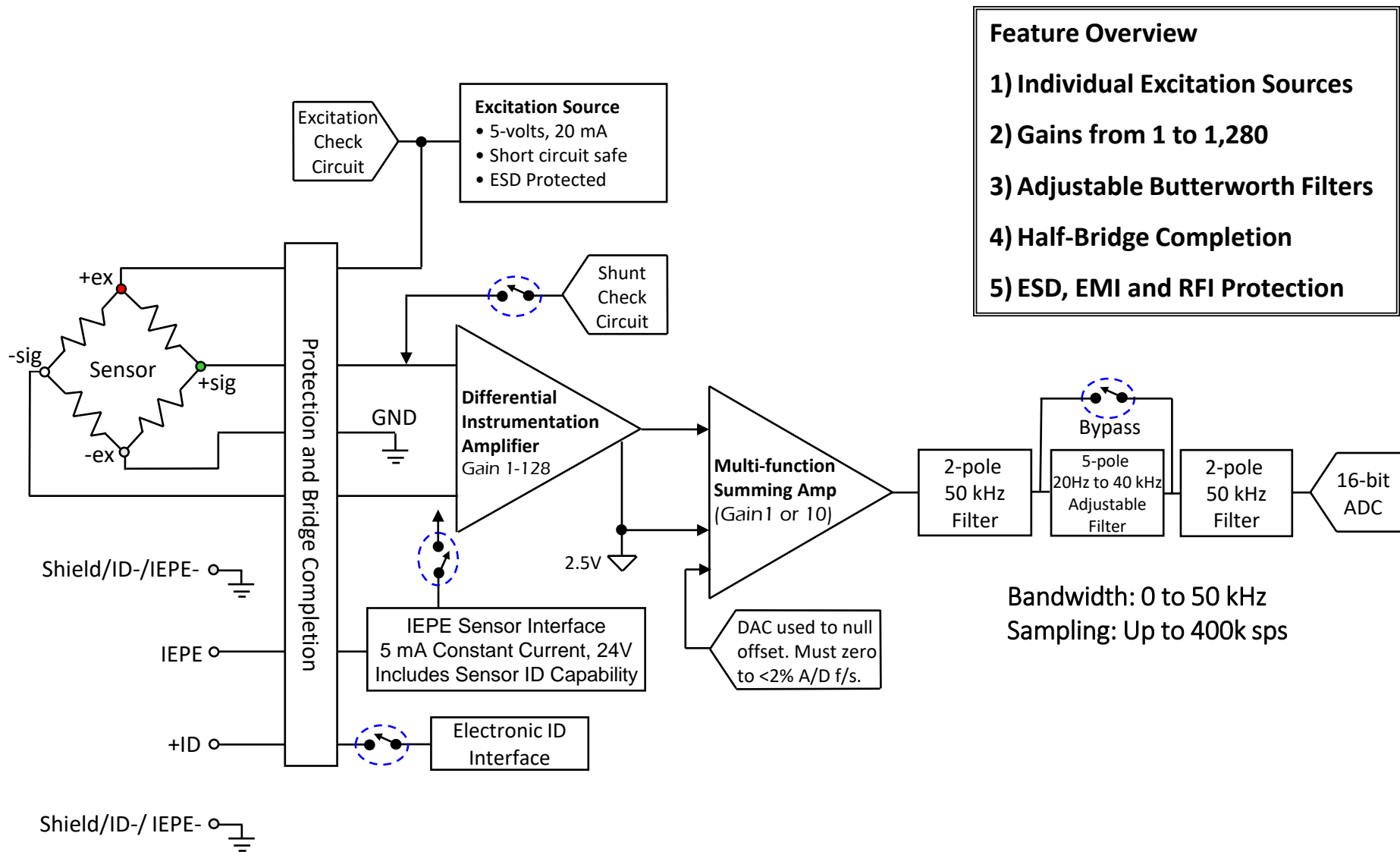


SLICE6 – Sensor Interface

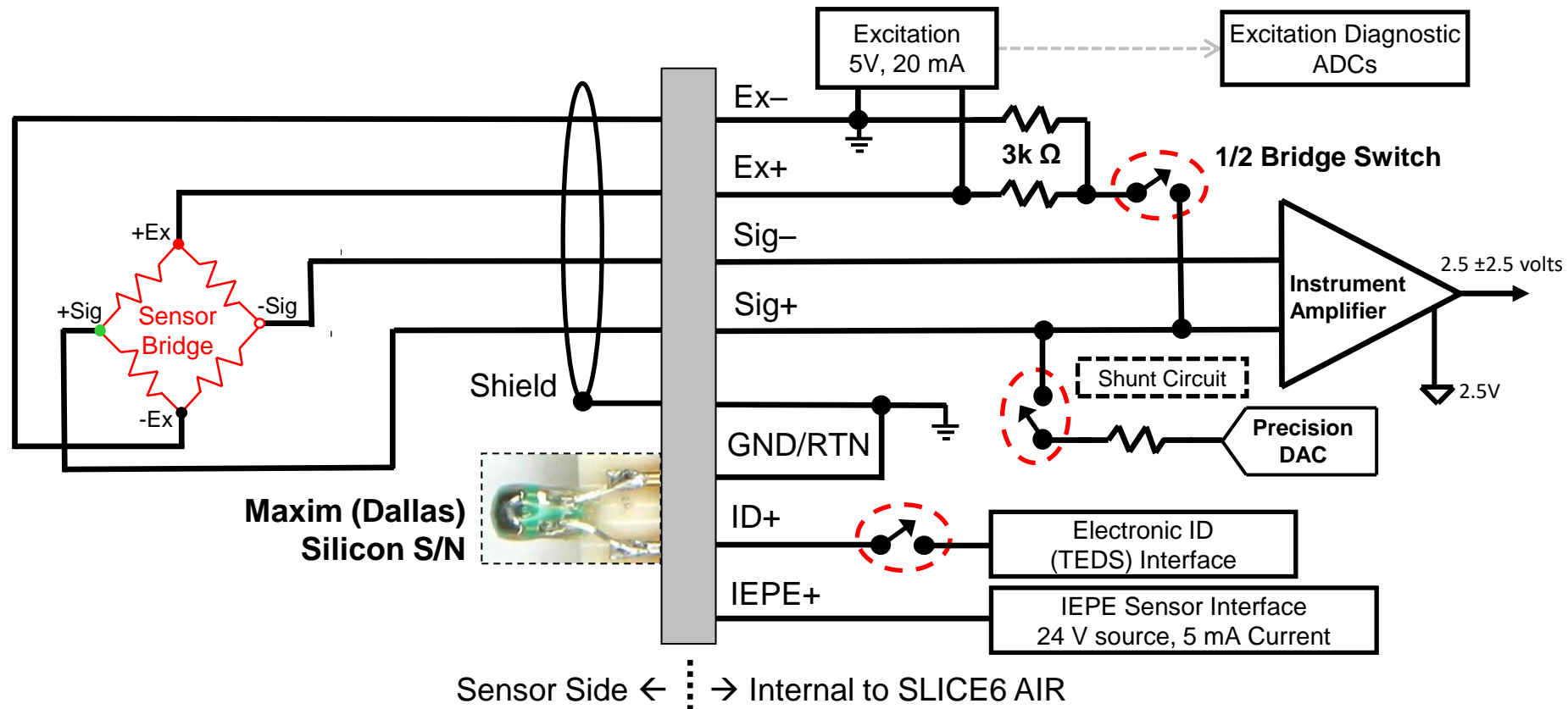


- +/- Signal are connected to a true Differential Instrumentation Amplifier (IA)
- Common Mode Range of the IA is 0.1 to 5.0 volts with respect to ground and -excitation.
- +/- Signal inputs must both be connected externally to a full bridge.
- The maximum signal swing is ± 2.4 volts (with a 2.5 volt center)

SLICE6 Air – Signal Chain



SLICE6 AIR – Sensor Interface



- +/- Signal are connected to a true Differential Instrumentation Amplifier (IA)
- Common Mode Range of the IA is 0-5 volts with respect to ground and -excitation.
- +/- Signal inputs must both be connected either externally or using ½ bridge completion.
- The maximum signal swing is 0-5 volts or ±2.5 volts (with a 2.5 volt center)

SLICE PRO SIM Bandwidth Details

- Each stage in the SLICE signal chain has specific bandwidth limiting.
 - Designed to keep signals within the linear range of the semiconductor amplifiers.
 - Front-end limiting chosen for best fit with intended applications. For example, to limit effects of undamped sensors sampled at 20k sps or less in automotive safety test applications.
 - Anti-alias filters optimized for typical sampling rates in a given application.
- The main differences between the High or Max Bandwidth version and Standard or Automotive version are as follows:
 - Front-end bandwidth limiting increased to 500 kHz.
 - Limiting in other stages increased to 200 kHz.
 - Anti-alias filters optimized to support 500k to 1M sps.
 - Quality Assurance testing parameters are different.
- High-bandwidth units can be used together with Standard Bandwidth units at the same sampling rate as long as the anti-alias filter settings and overall data bandwidths meet testing requirements.



General Comments

- Automotive safety tests generally require data bandwidth from DC to $\leq 4,000$ Hz
- For other applications, bandwidth requirements must be carefully considered
 - Experimental testing. Transducer resonance studies?
 - Acoustic or blast pressure measurements.
 - Material properties at high loading rates.
 - Biomechanics studies in certain high energy test events.
 - Validation of models used to assess structural impact response.
 - Soldier protection in a blast environment.
- DTS commitment to advanced testing requirements
 - Since 1998 TDAS PRO has had a software selectable 25 kHz bandwidth setting as a standard feature. Also max 300,000 sps.
 - Since 2007 we have offered TDAS G5-HB with bandwidth extended to 40,000 kHz (30 kHz max recommended at 100k sps).
 - SLICE NANO, MICRO, IP68, SLICE6 and SLICE6 Air support data bandwidths up to 40 kHz
 - SLICE PRO supports data bandwidth up to 200 kHz

