

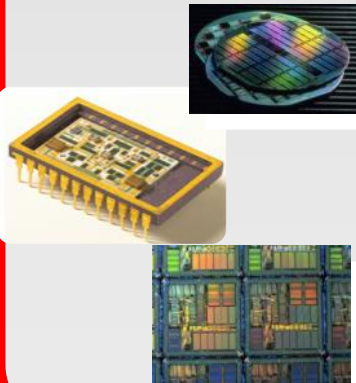
TI Enhanced Industrial Packaging

Complete signal chain solutions

Smallest Footprint

Bare Die/Wafers Solutions

- Smallest size
- Most Integration
- Multiple options
- 25°C tested wafers to
- Broad portfolio
- Future Die Business see Micross Components
- <http://www.micross.com>



Widest Package Type Options

Up to 150°C Plastic Packaging

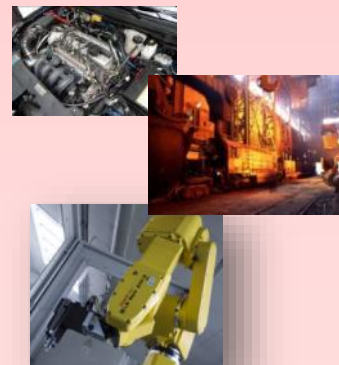
- Ruggedized Applications
- Enhanced Qualification
- Extended Temperature
- Std -55°C to 125°C
- Select device up to 150°C
- Multiple Package types



Ruggedized Packages

Up to 175°C Plastic Packaging

- *High Temp Material Sets*
- Ruggedized Applications
- Enhanced Qualification
- Extended Temperature
- Up to -55°C to 150°C
- Up to 175°C Characterization
- Multiple Package types
- Special High Temperature Material Sets



Hermetic Packages

Up to 210°C Ceramic Packaging

- Extreme Applications
- HT Qualification
- Extended Temperature
- Up to -55°C to 210°C
- Multiple Package types
- Pre-formed leads flat-pack
- -55°C to 210°C Known Good Die (KGD)



TI HiRel High Temperature Products

Two HT Product Types

- High Temperature (HT) 200°C parts
 - -55°C to +210°C - 1000 hours
 - Ceramic & KGD packaging
- 150°C & 175°C Plastic Parts
 - -55°C up to +175°C operation
 - Plastic surface mount packaging



High Temperature 210°C Quality and Reliability

These qualification tests are typically preformed for each new HT Ceramic product release

- **Package Qualification**

- Bond Strength
- Die Attach Strength
- Mechanical Shock (1.5K g)
- Constant acceleration (30K g)
- Variable Frequency Vibration (20 g peak 20Hz to 2KHz)
- Temperature Cycle (-65°C/+150°C 1000 cycles)
- Hermetic test (Fine and Gross Leak)
- Thermal Shock (-65°C/+150°C 100 cycles)

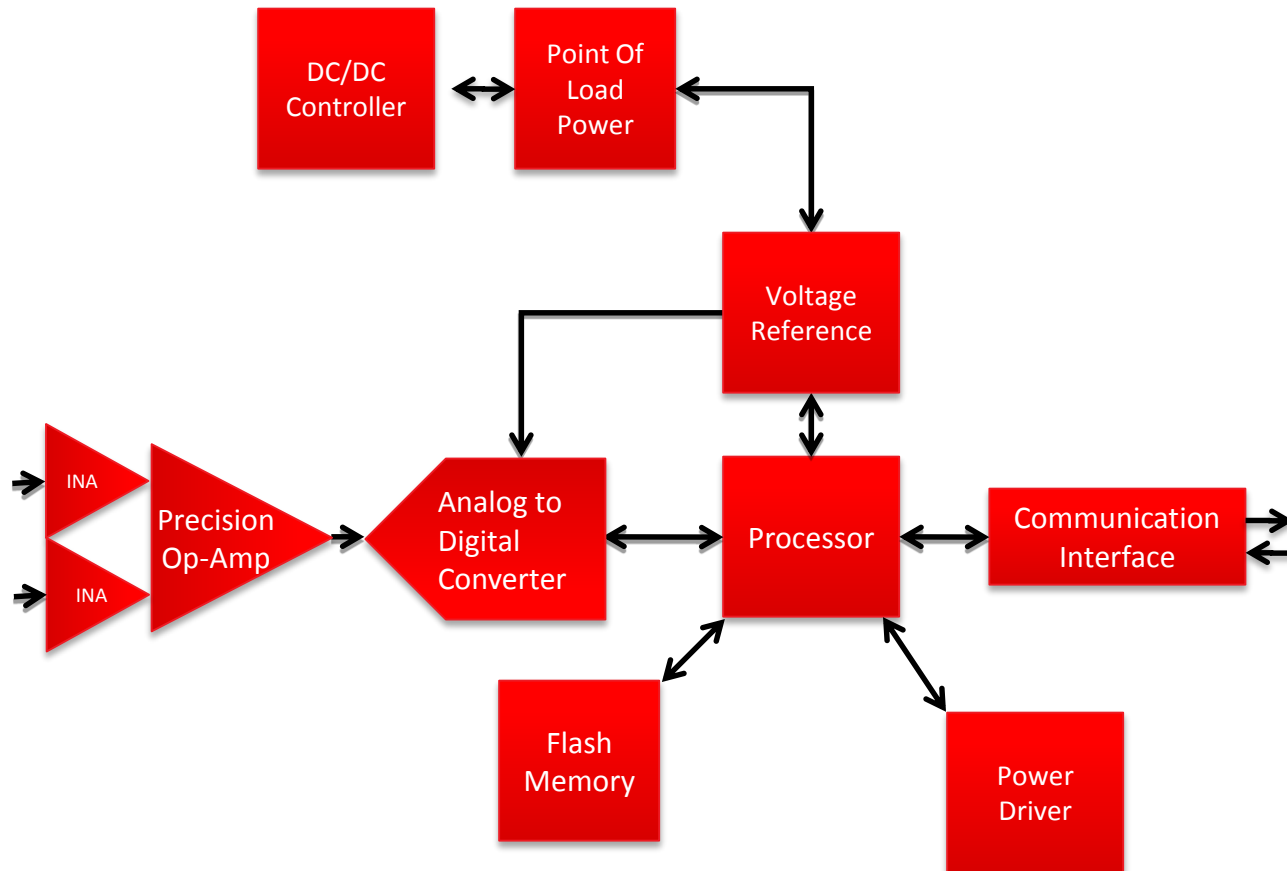
- **Technology Verification**

- Electromigration Design Rule Verification
- Voltage Box Characterization
- Negative Bias Temperature Instability Rules Verification
- Operational Characterization (from three lots)

- **Life Test (1000Hours/200°C)**

- By technology node (function, wafer fabrication process, and feature size)
- 2,000 hours at 200°C, 1000 hours to release
- Static (e.g., Analog) or Dynamic (e.g. DSP/MCU)
- Sample size is 15 units minimum (3 lots) with no failures

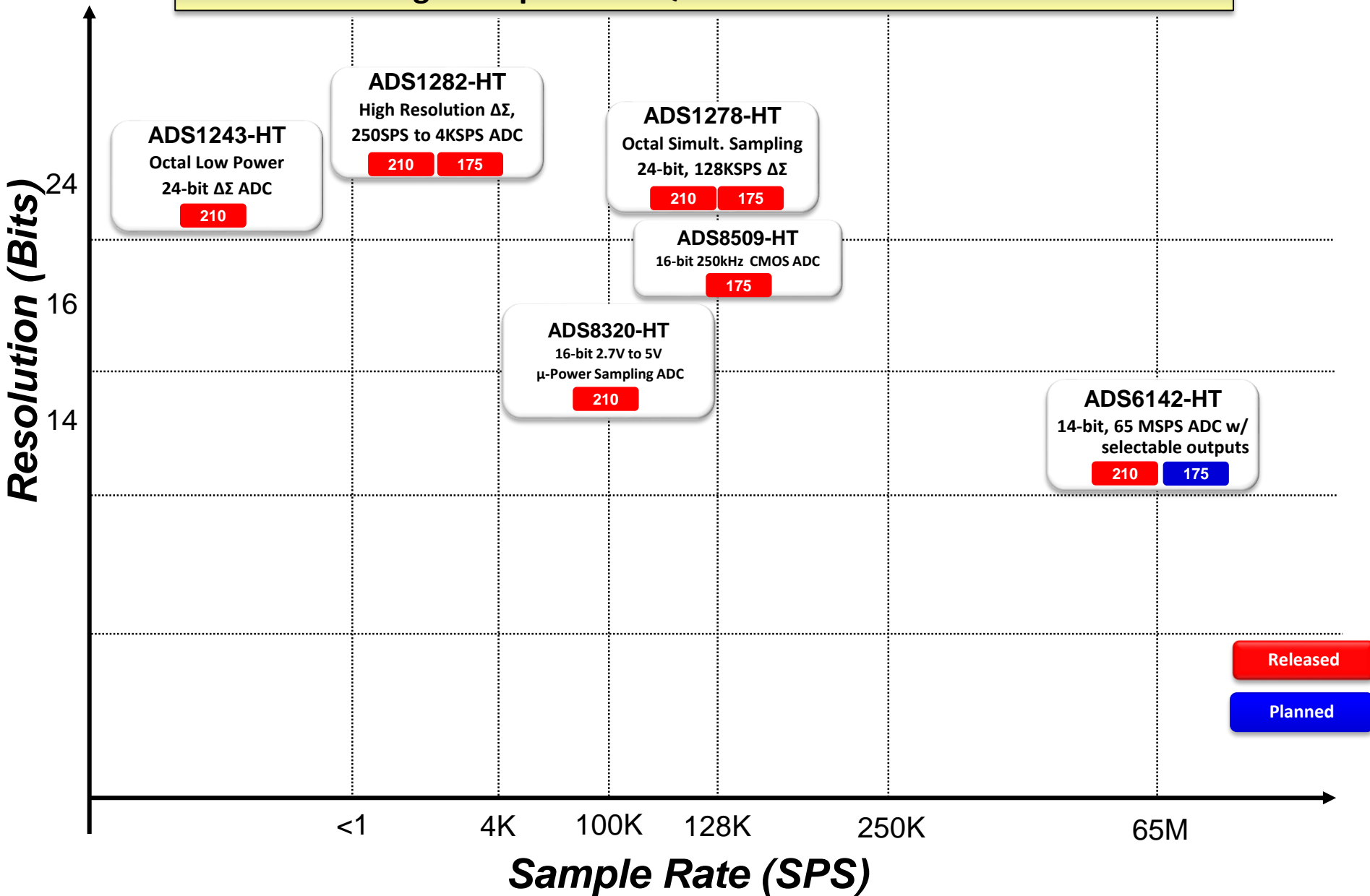
High Temperature Signal Chain



Use slideshow mode to navigate



High Temperature Qualified Data Converters



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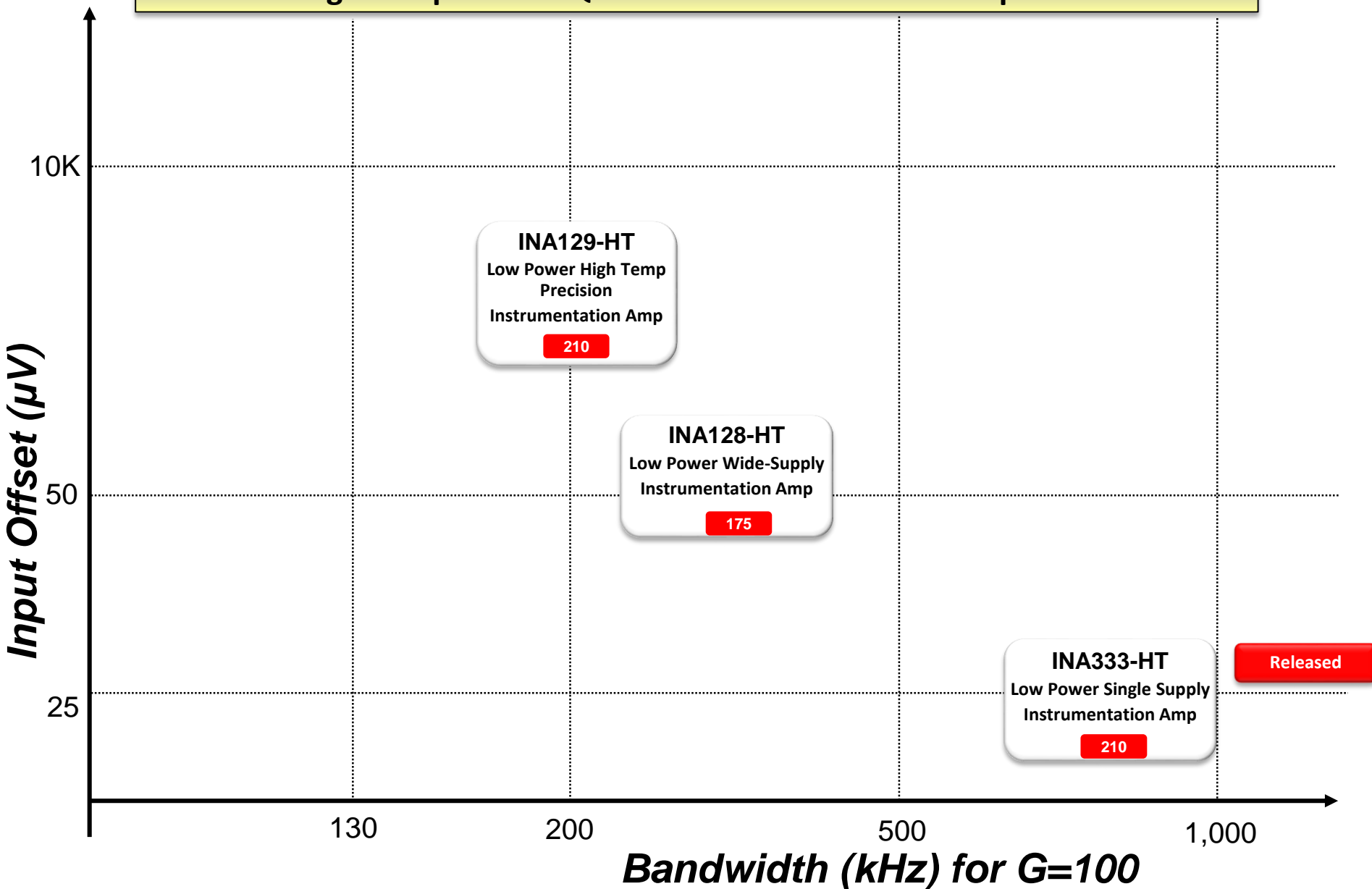


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TEXAS
INSTRUMENTS

High Temperature Qualified Instrumentation Amplifiers

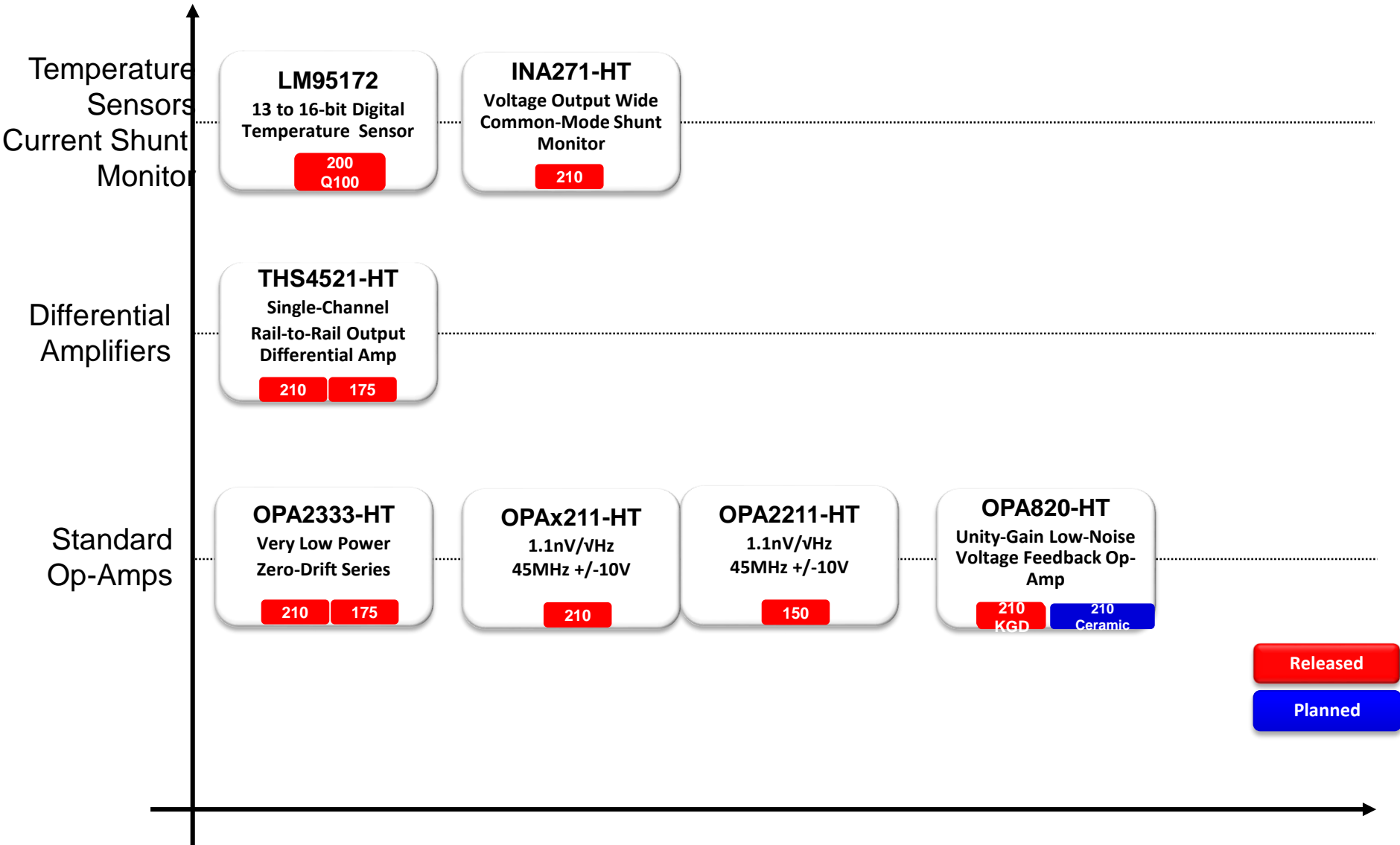


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High Temperature Qualified Amplifiers

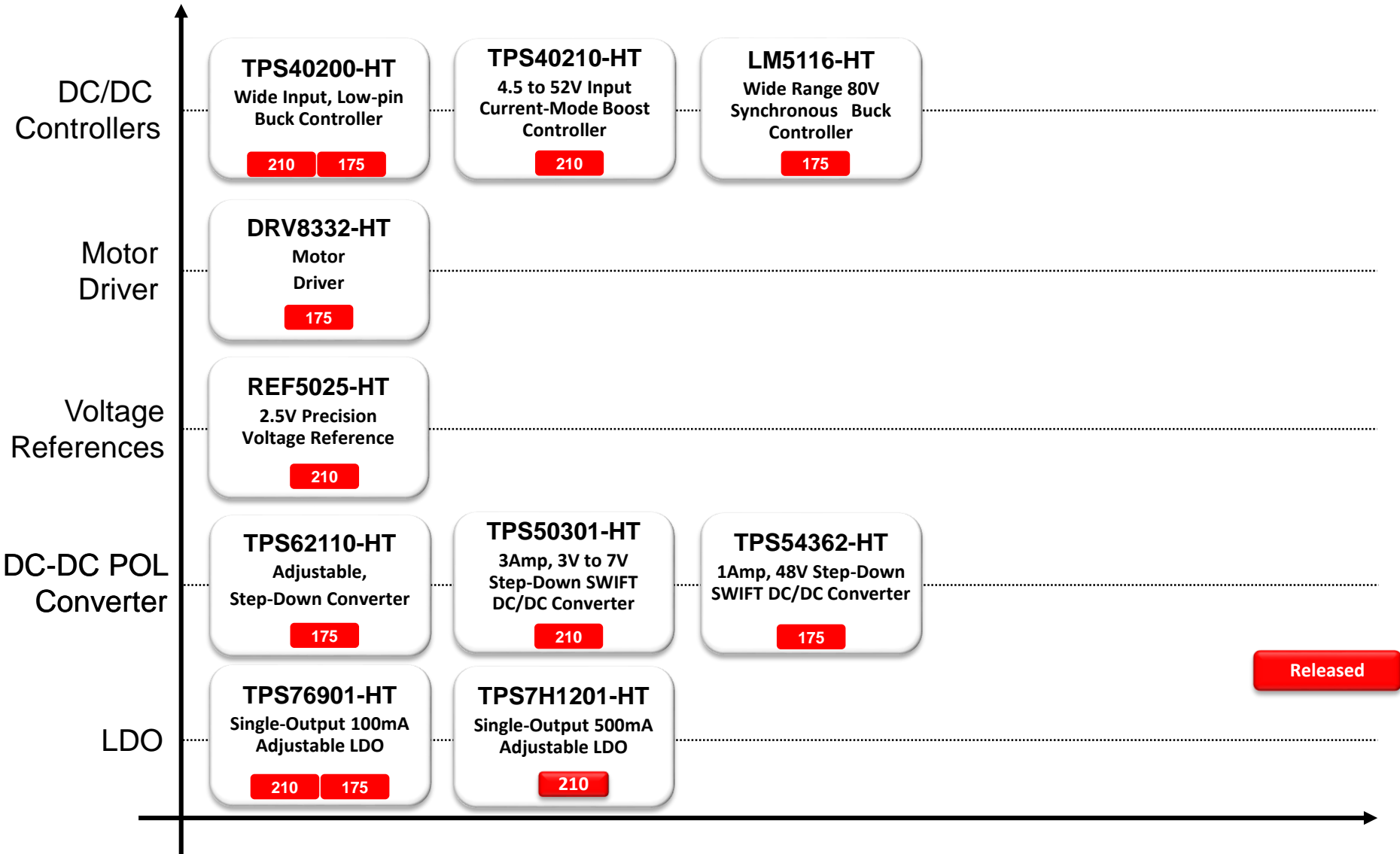


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High Temperature Qualified Power Management

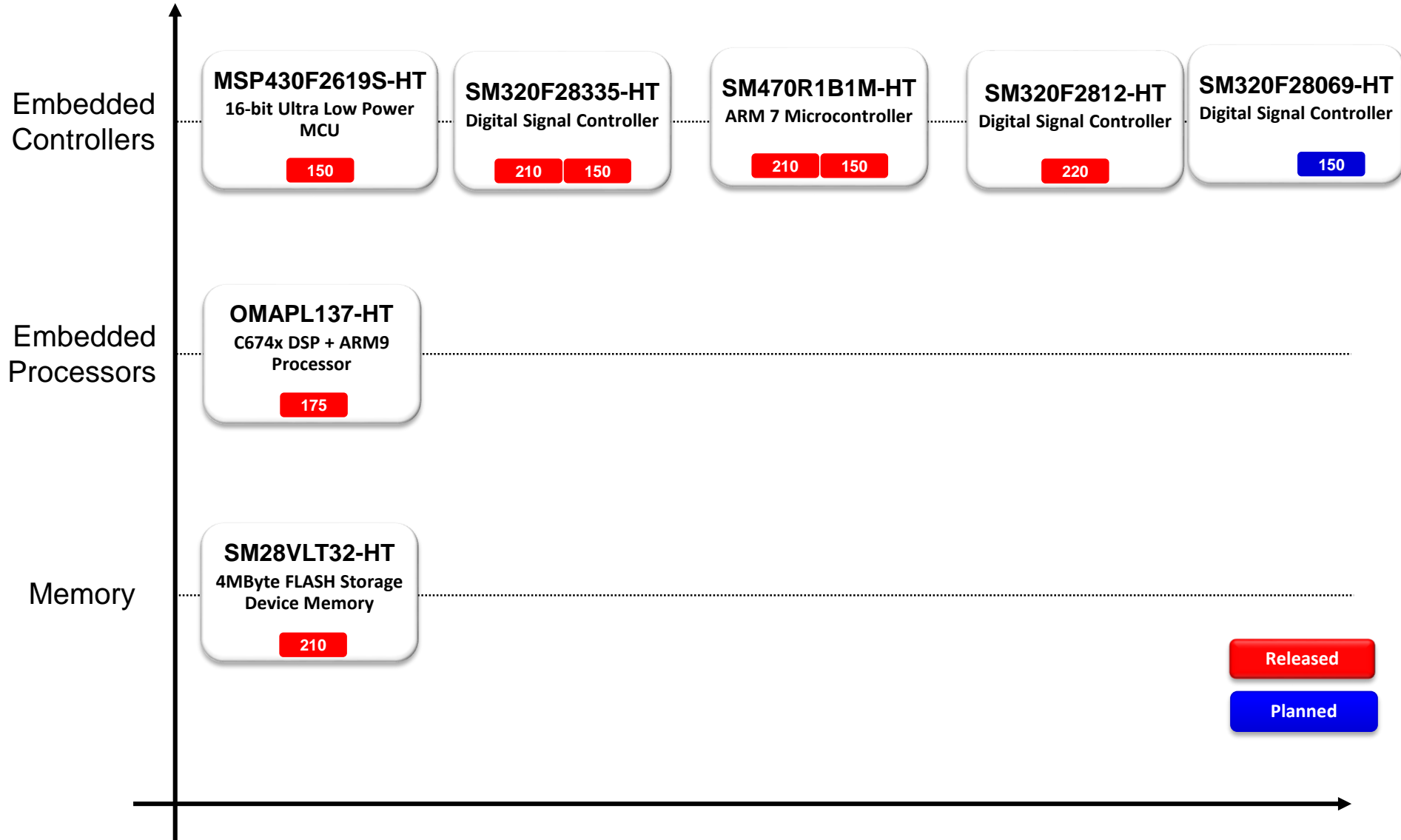


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High Temperature Qualified Processors and Memory

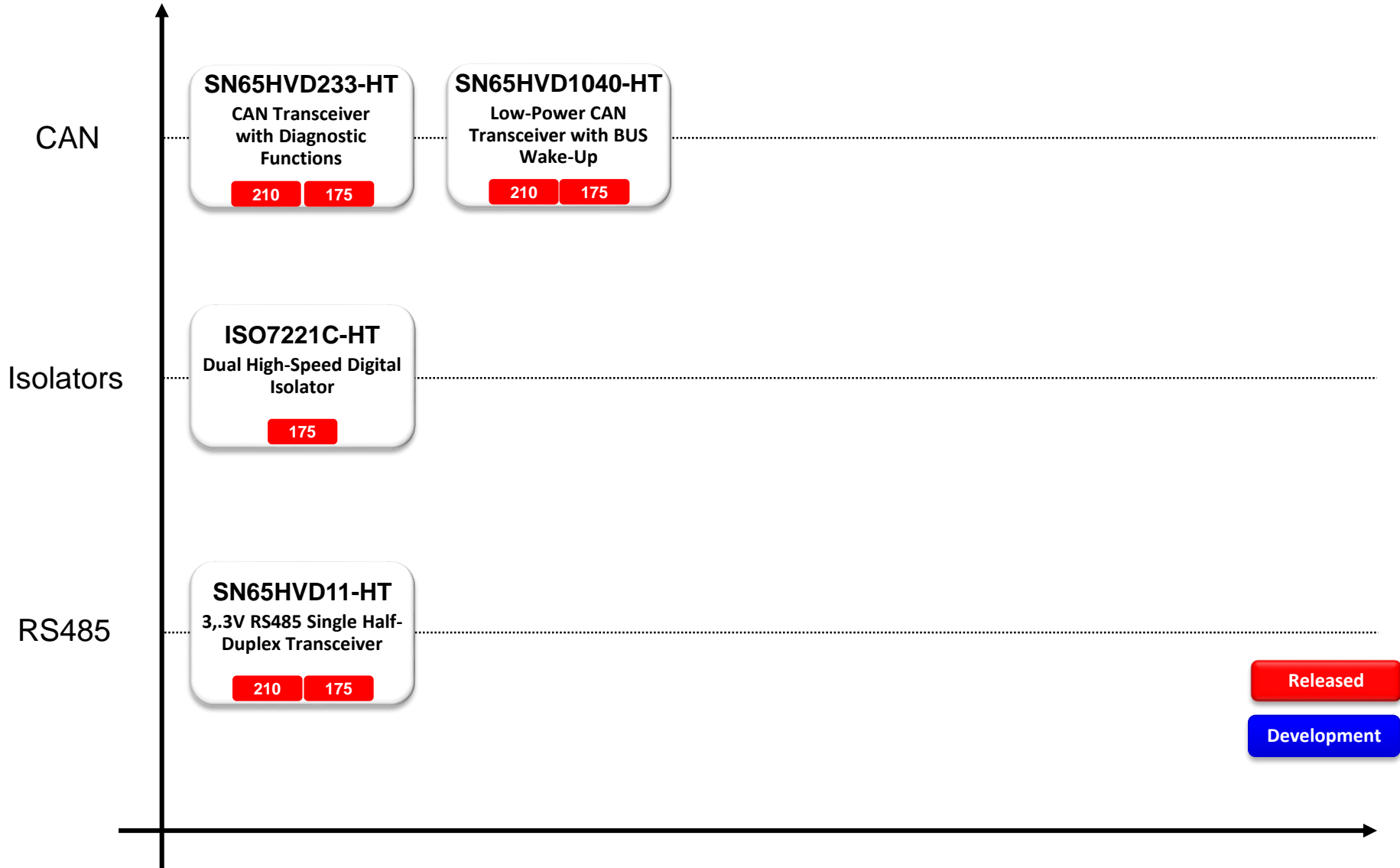


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High Temperature Qualified Interface Products

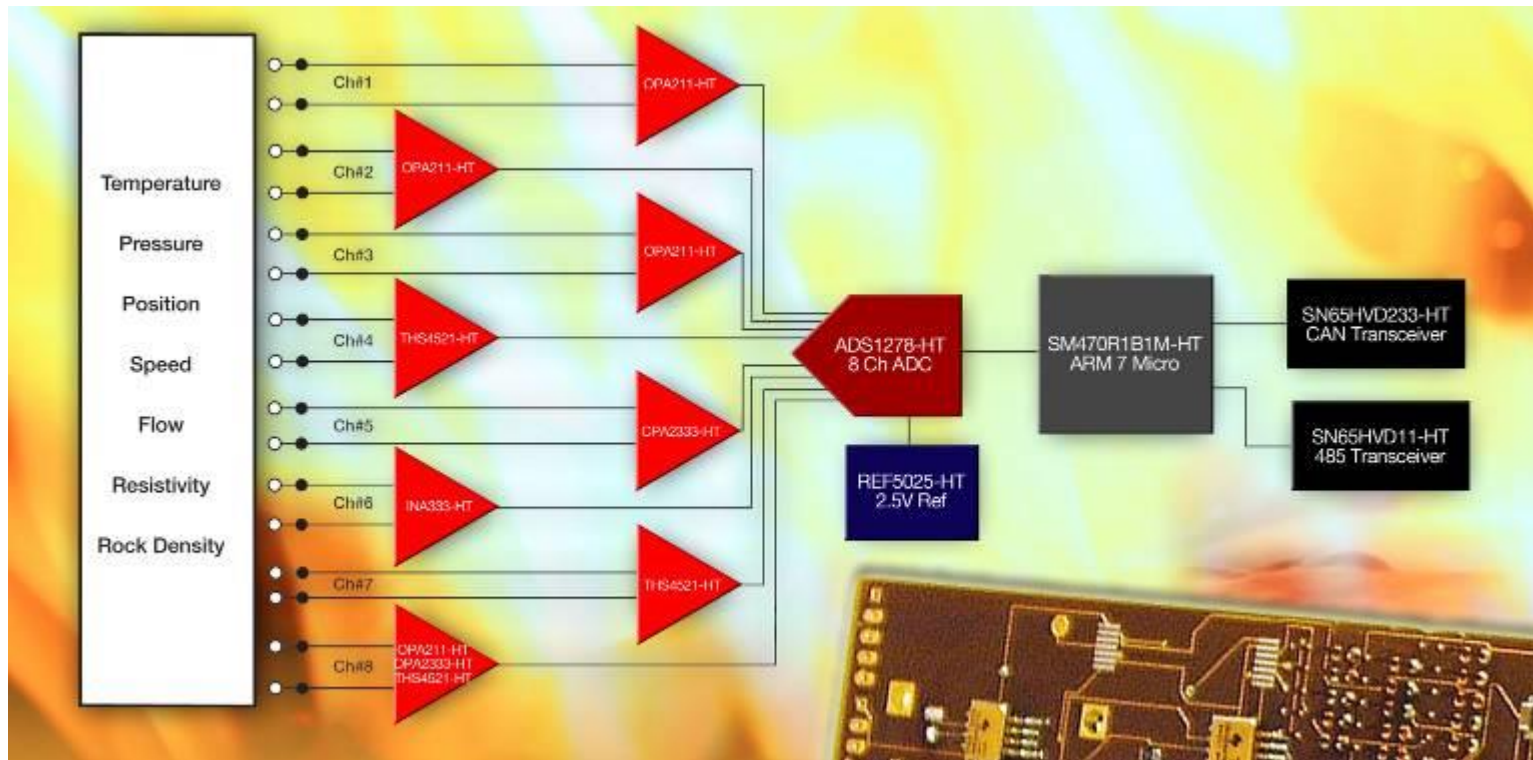


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H.E.A.T. EVM high-temperature components



- **SM470R1B1M-HT** – ARM7 microcontroller
- **ADS1278-HT** – octal simultaneous sampling 24- bit 128KSPS ADC
- **OPA211-HT** – low-noise operational amplifier
- **OPA2333-HT** – low power zero-drift series operational amplifier
- **INA333-HT** – zero drift, low power, single supply instrumentation amplifier
- **THS4521-HT** – low-power fully differential amplifier
- **REF5025-HT** – 2.5V precision voltage reference
- **SN65HVD233-HT** – CAN transceiver
- **SN65HVD11-HT** – RS485 transceiver