

Passive RF-ID & Temperature Sensing



based on **SAW technology**

CTR is setting new standards in RF-ID technology and passive remote access sensors.



RF-ID tags and sensors based on surface acoustic wave (SAW) technology are now available with a unique set of properties:

- **Range** - Remote object tagging and instrumentation at reading distances far greater than those offered by standard passive transponder technologies.
- **Robust** - Transponder operation under severe conditions, e.g. at extreme temperatures, in strong electric or magnetic fields or at high levels of ionising radiation.
- **Temperature Measurement** - The ability to sense temperatures ranging from cryogenic to well beyond 300°C.
- **Passive**, maintenance-free operation over the transponder's lifetime.
- **Compact** SAW Reader system.
- **Flexible** - Transponder size and geometries can be adapted to customer requirements.

SAW Principle

An industrially applicable wireless SAW system requires three basic components

- SAW-transponder(s) with ID and/or sensing functionality
- an antenna and
- the SAW Reader Unit

SAW transponders rely on piezoelectric effects for operation. The transponder is therefore entirely passive, that is, it requires no power supply. SAW devices are not subject to many well-known constraints of semiconductor components. With the selection of appropriate materials, CTR's SAW ID-T system (identification and temperature monitoring) can be used under harsh industrial conditions.

An **antenna** enables the SAW transponder to communicate with the SAW Reader Unit. Transmission characteristics such as range, beam width and emitted power, can be adapted to specific needs by selecting suitable antenna geometries.

SAW Operation Principle

The SAW Reader generates an electromagnetic HF signal, which is received by the transponder antenna. The electromagnetic waves are then converted into mechanical surface oscillations by special structures ("Interdigital Transducer") located on the SAW element. The resultant surface acoustic waves spread over the surface of the piezoelectric crystal. When the mechanical waves reach a reflector, they are partially reflected and then converted back into electromagnetic radiation. Since the process draws its energy from the initial electromagnetic wave, SAW transponders are entirely passive and the transponder does not require a power supply.

By putting an appropriate encoded pattern of reflectors on the surface, a characteristic response signal is generated that can be used for identification purposes. Further-more, variations in temperature cause the crystal to expand or contract, this, in turn, causes a change in the delay before the signal is received. By measuring this delay, the temperature of the SAW element can be determined with high precision. The same principle allows the measurement of other physical parameters that influence the time delay between emitted and received signal.

SAW Reader Unit

The SAW Reader Unit is based on the frequency-stepped continuous wave (FSCW) radar technique and operates in the ISM-band at 2.4 GHz. It supports multiplexed measurements of up to four independent channels or up to two 2-channel systems with separate transmit and receiver antennae. The reader is available as a stand-alone unit or in an OEM-version for integration into customer systems.

The standard system is capable of ID reading and/or temperature measurements. Additional capabilities can be introduced on request. PC software that offers comfortable operation and a diagnostics interface is also included.



SAW Applications

SAW technology can be profitably employed in many industrial fields including automation industry, logistics, medical technology, automotive, engineering, heavy industry, chemicals/pharmaceuticals, building materials and many more.

Identification:

- Rugged tagging of machine parts and devices
- ID in enamelling and drying furnaces
- Product traceability in production processes involving high temperatures
- Property tracking: unique identification of large structures e.g. pre-cast concrete modules, boats, construction machinery, product inventories, etc.
- Logistics: material flow, container cargo, etc.

Sensing:

- Temperature monitoring in continuous furnaces and on rotating machine parts
- Temperature monitoring of high-voltage power lines
- Chemical apparatus, reaction chamber (sensor fish)

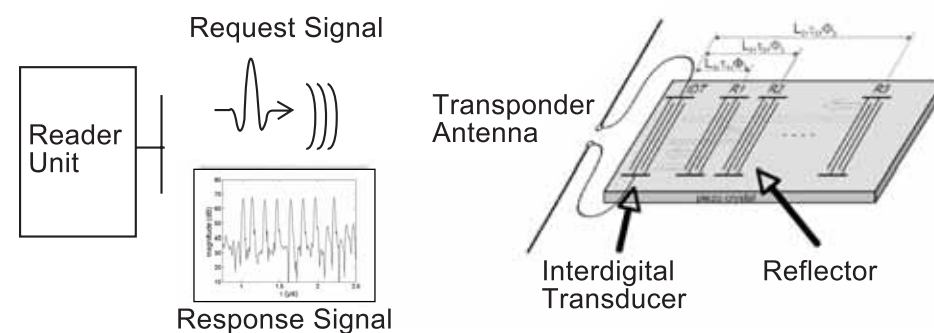
Any physical parameter that alters the characteristic response of the SAW device can be measured. This opens up a wide field of applications, ranging from force, pressure or torsion measurements to electric or magnetic field sensing or the detection of chemical parameters.

SAW Tags

Uniquely encoded SAW transponder tags, with or without temperature-sensing capability, are available in various designs. With the actual SAW element encased in a hermetically sealed stainless steel housing, the effective geometry can easily be adapted to specific requirements. For example, temperature sensing applications need good thermal conductivity, applications in chemically corrosive environments call for hermetically sealed systems and property tagging requires concealable, tamper-proof systems. The transponder antenna can be incorporated into the tag or attached to it, allowing the transponder to be adapted to customer requirements such as the required read distance, temperature range and ambient RF noise levels.



SAW Transponder



CTR has several years of experience in the development of SAW-based sensor systems and the development of HF readers, SAW data evaluation algorithms, tag design and tag integration. We will be pleased to advise you on how to use SAW technology to your advantage.

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SAW DEMOKIT

Test the technology and check out the advantages you can gain from SAW systems - *quickly and easily, with the CTR SAW Demokit.*

The SAW Demokit consists of a reader, a sensing/receiving RF antenna, a selection of different tags and the PC evaluation software.

Additional components are available on request.

SAW Data sheet

For more details, please consult our SAW data sheets or our application experts, who will be happy to advise you on our R&D-services to help you develop your specific SAW system.



CTR Carinthian Tech Research AG

Technologiepark Villach
Europastraße 4/1
9524 Villach / Austria

Kontakt:

Heimo Müller
Tel.: +43 (0) 4242 / 56300-213
Fax: +43 (0) 4242 / 56300-400
E-mail: heimo.mueller@ctr.at
Web: www.ctr.at



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