Welcome to the Texas Instruments New Product Update

We will begin promptly at 1 min past the hour- thank you for your patience
Phone lines will be muted during the presentation.

We’ve updated the Webex Audio and you can now get audio through the PC
or have Webex call your phone.

Please post questions on the chat Web-Ex Chat
or contact your salesperson or field applications engineer
Streamline your **functional safety** system designs

Bharat Rajaram
Senior Member Technical Staff
Director Functional Safety
05-March-2020
Topics

• Functionally Safe vs. *non-safe* Systems
  – Example (from automotive applications)

• Why choose TI as your **preferred supplier** for your Functionally Safe Systems?

• Functional Safety Compliance at TI

• Distinct Roles and Responsibilities
  – TI – Independent Assessors – System Integrators

• How to streamline your functional safety system certification with TI products?

• Functional Safety FIT vs. Technology FIT

• Demo of **updated** parametric search tool for Functional Safety TI Products

• Summary/why choose TI?
**Example of Automotive Functionally Safe Systems**

**Note**: glove compartment light is *not* listed.
Engineering expertise for functional safety

- Decades of functional safety engineering expertise
- Industry leadership as a participant in IEC 61508 and ISO 26262 standards organizations
- R&D processes enabling up to ASIL-D and SIL-3 systems
- Tools and expertise to simplify part selection
- Functional safety-compliant products leverage our TÜV SÜD-certified hardware and software development processes.
Functional safety **compliance**

All electronic systems *will* fail eventually

Faults are either:

- **Systematic**
  - Managed and mitigated by:
    - ✓ A rigorous development process
    - ✓ Independent assessments

- **Random**
  - Detected and prevented by:
    - ✓ Safety mechanisms to detect faults
    - ✓ Meeting quantitative safety metrics

Hardware faults can either be **systematic** or **random**
Software faults are (by definition) only **systematic**
### Distinct roles and responsibilities

<table>
<thead>
<tr>
<th>Texas Instruments</th>
<th>Independent Assessor (ex. TÜV-SÜD)</th>
<th>System Integrator/Customer</th>
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<tbody>
<tr>
<td>Delivers hardware and software products in compliance with our functional safety processes – FS-FIT, FMD, FMEDA, Safety Manual, Compliance Certificates, STL and CSP</td>
<td>Certifies our functional safety-compliant development processes</td>
<td>Completes system-level hazard analysis and risk analysis (HARA)</td>
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<tr>
<td>Maintains hardware and software products</td>
<td>Certifies selected products and assesses sub-systems and references designs</td>
<td>Determines system-level functional safety requirements, safe state, DTI, FTTI, FDTI, PST</td>
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<td>Enables customer’s system-level, functional-safety certification</td>
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<td>Builds and certifies functional safety systems using TI products</td>
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<tr>
<td>Functional Safety FIT</td>
<td></td>
<td>Diagnostic Test Interval</td>
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<tr>
<td>Failure Mode Distribution</td>
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<td>Fault Tolerant/Diagnostic Time Interval</td>
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<tr>
<td>Failure Mode Effects &amp; Diagnostics Analysis</td>
<td></td>
<td>Process Safety Time</td>
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<td>Self Test Library</td>
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<td>Compliance Support Package</td>
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Streamline your **functional safety** system certification


<table>
<thead>
<tr>
<th>Development process</th>
<th>TI quality-managed process</th>
<th>TI functional safety process</th>
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<tr>
<th>Analysis report</th>
<th>Functional safety FIT rate calculation</th>
<th>Failure mode distribution (FMD) and/or pin FMA*</th>
<th>FMEDA</th>
<th>Fault-tree analysis (FTA)*</th>
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- **FMEDA**
- **Fault-tree analysis (FTA)**

<table>
<thead>
<tr>
<th>Diagnostics description</th>
<th>Functional safety manual</th>
<th>Functional safety product certificate**</th>
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- * May only be available for analog power and signal chain products.
- ** Available for select products.
Functional Safety FIT vs. Technology FIT

- Is the functional safety FIT rate different than the technology FIT rate? How is functional safety FIT-rate calculated?
  - Yes, the functional safety FIT rate is different than the technology (intrinsic) FIT rate.
  - Our online MTBF/FIT estimator for technology FIT rate is derived using the JESD85 methodology from intrinsic (silicon only) HTOL and ELFR reliability testing.
    - The derived MTBF & FIT are estimated with a 60% confidence interval for reliability.
    - This method provides an accurate FIT rate for the process technology but does not consider silicon package interactions or other important factors.
  - TI provides functional safety FIT rate based on one of two standards, IEC TR 62380 or SN 29500 which are both calculated based on a 90% confidence interval.
    - Functional safety standards, such IEC 61508 and ISO 26262, recommend 90% confidence intervals be used for safety related random FIT rate estimation.
Finding **functional safety products** on TI.com
Finding **functional safety products on TI.com**

### What to expect for each category

- **Processors**
  - Jacinto™ DMx digital cockpit SoCs
  - Jacinto™ TDx ADAS SoCs

- **Microcontrollers**
  - C2000™ real-time controllers
  - Hercules™ MCUs for functional safety

- **Power management**
  - Automotive LED drivers
  - Bus converters (integrated switch)
  - Boost controllers (integral switch)
  - Linear regulators (LDG)
  - Power management multi-channel ICs (PMICs)
  - Supervisory and reset ICs

- **Power switches**
  - eFuses & power switches
  - Ideal-diode/ohmic switches
  - Smart switches

- **Voltage references**
  - Sensitive voltage references
  - Shunt voltage references

- **Motor drivers**
  - Brushless DC (BLDC) motor drivers

- **Sensors**
  - Automotive mmWave sensors
  - Specialty signal conditioners
  - Ultrasonic

### Products for functional safety

Your design starts with finding the right parts. Start exploring our most robust, functional-safety-compliant and functional safety quality-managed products, many designed with integrated safety mechanisms to help detect and prevent dangerous failures resulting from systematic or random hardware faults, ultimately helping you achieve up to ASIL D or SC-2 functional safety system certification.

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**Link to product families**
Finding **analysis documentation** for your product

GPN-specific documentation associated here

**Finding analysis documentation for your product**

GPN-specific documentation associated here
Finding **analysis documentation** for your product

**Microcontrollers (MCU)**

**C2000 real-time control MCUs – Products**

**Finding analysis documentation for your product**

**TMS320F28379S**

Delfino™ 32-bit MCU with 400 MIPS, 1xCPU, 1xCLA, FPU, TMU, 512 KB Flash, CLB, EMIF, 16b ADC

- **DATASHEET**
  - TMS320F28379S Microcontrollers datasheet (Rev. H)
- **USER GUIDES**
- **ERRATA**
  - TMS320F28379S MCUs Silicon Errata (Rev. H)

**Technical documentation**

- **Type**
  - All
  - Safety

- **Title**
  - Certification for SafeTI Functional Safety Hardware Process (Rev. A)
  - Report on certificate of the Safety MCU by TÜV SÜD
  - TMS320F28379xD, TMS320F28379xS, and TMS320F2807x safety manual user's guide (Rev. C)
  - SafeTI™ Functional Safety: A tunable FMEFAILA for C2000™ MCUs
  - C2000™ Safety Mechanisms
  - Achieving Coexistence of Safety Functions for EV/HEV Using C2000 MCUs

- **Date**
  - Jun. 07, 2019
  - May 09, 2019
  - Mar. 27, 2019
  - Jul. 27, 2018
  - Jul. 17, 2018
  - May 21, 2018
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## Upcoming Broadcasts

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<th>Date</th>
<th>Topic</th>
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<td>3/19/2020</td>
<td>Sitara ARM™ Processors</td>
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<tr>
<td>3/26/2020</td>
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