The most important thing we build is trust

ADVANCED ELECTRONIC SOLUTIONS | AVIATION SERVICES | COMMUNICATIONS AND CONNECTIVITY | MISSION SYSTEMS

UT64CAN333x CAN Transceivers for Space Applications

Aeroflex Colorado Springs, Inc. dba Cobham Semiconductor Solutions

CAN in Space Workshop 2017

Date: June 15 2017

Presenter: Elaine Gonsalves

Commercial in Confidence

COBHAM OFFICIAL SPONSOR

VOLVO OCEAN RACE ROUND THE WORLD

CAES Cobham Semiconductor Solutions

Aeroflex Hi Rel – Snapshot Standard Product Family Offerings

Cobham Semiconductor Solutions (formerly Aeroflex – Hi-Rel) solves customers' problems.

Whether they are focusing on payload or platform electronics, Cobham has the products, expertise, and flight history to achieve customers' goals.

We are a Solutions supplier for the Space Market.

UT64CAN333x CAN Transceiver Overview

Agenda

- CAN XCVR Product Family Overview
- Key Features and Differentiation
- Status / Export Classification
- Success Stories
- Radiation Performance Summary – TID & SEE
- Tools / Support
- Value Proposition
- Future Plans
  - NEW: Synergistic CAN Product Offering

UT64CAN333x CAN Transceiver Overview

UT64CAN333x Offerings

- Three Product Offerings (all in same package)
  1. UT64CAN3330: low power sleep mode of operation
  2. UT64CAN3331: supports a bus isolated diagnostic loopback *
  3. UT64CAN3332: monitor capability of bus traffic (local controller can change its baud rate to match bit timing to traffic on the bus)

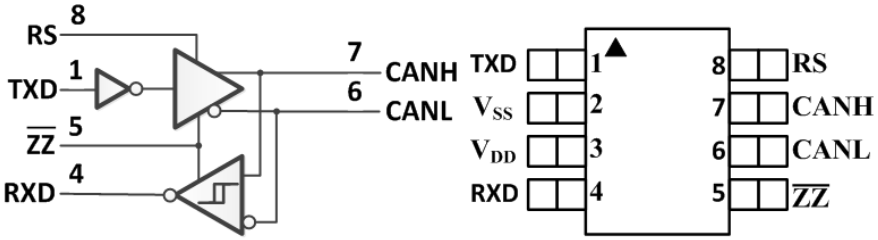


Figure 1: Sleep Mode

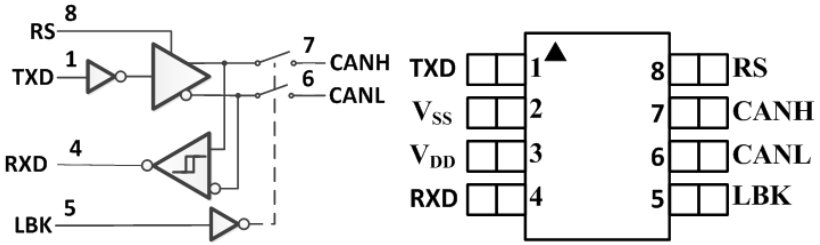


Figure 2: Diagnostic Loopback *

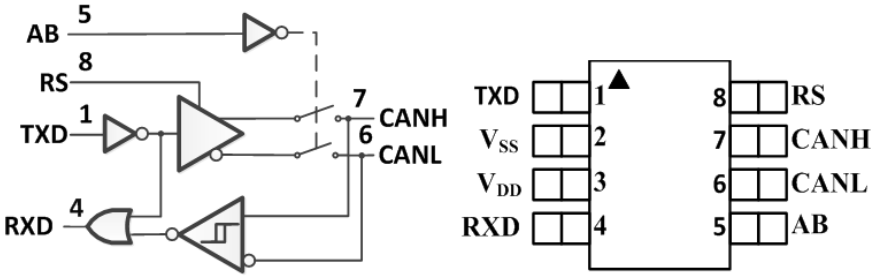
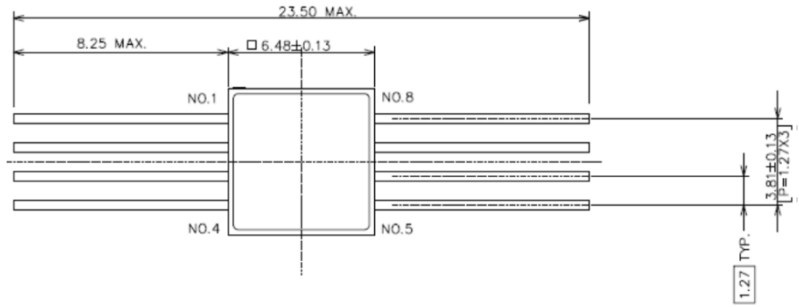


Figure 3: Auto-baud Loopback

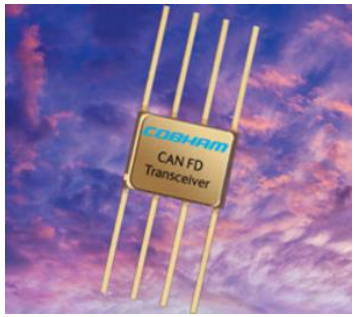


UT64CAN333x CAN Transceiver Overview

UT64CAN333x – Features Overview

Key Specifications and Features

- Compatible with ISO 11898-2 (2016)
- Baud Rate: 10Kbps to **8Mbps**
  - **"CAN-FD" "Flexible Data Rate"**
- Max Power: <200mW
- Supply Voltage: Single 3.3V
- Digital I/O: 3V (5V tolerant)
- Cold Spare of digital I/O
- Bus Fault Protection: ±16V (in orbit)
- Common Mode Range: -7V, 12V
- CAN Bus Output Drive: Up to 100mA
- Supports up to 120 nodes
- Class 3A ESD for CAN bus pins (4000V)
- Packaging: 8-lead ceramic flat pack
- Temperature range -55°C to +125°C
- **Superior Radiation performance**



- **Over current protection**
- Low current standby mode
- Differential Input Impedance: 40KΩ
- Differential Input Capacitance: 10pF
- **Worst Case Loop Propagation Delay: 125ns**
- CAN Bus Output Drive: Up to 100mA

UT64CAN333x CAN Transceiver Overview

Production Status / Success Stories

- QML Qualified SMD: 5962-15232
  - QML-Q qualified (First in industry, Early 2016), QML-V (Fall 2016)
- Export Classification (Export Control Classification Number (ECCN))
  - ECCN look up tool on our website: http://ams.aeroflex.com/pagesproduct/eccn-search.cfm
  - 9A515.e.2 (US Department of Commerce)
- Endorsement
  - http://ams.aeroflex.com/news/2016/161006-CAN-QMLV.pdf
  - "Cobham/Aeroflex products provide competitive leeway (thanks to the compatibility with CAN-FD PHY and support for large networks) to support this process for many years to come, providing a solid foundation for current and future designs."
- Design Wins
  - Dominated by UT64CAN3331 (version with loop back)
  - Dozens of Design Wins ~ Recent single order for 500+ pieces
  - Displacement of Incumbent solution due to Superior Radiation performance

UT64CAN333x CAN Transceiver Overview

Summary of Radiation Performance - TID

- TID Performance
  - **100 krad(Si);** 5962**R**152323
    - Per MIL-STD-883 TM2019 Condition A (Dose Rate: 50 -300 rad(Si)/s)
    - Functionally tested both pre and post radiation exposure
  - **This TID performance is appropriate / necessary for electric propulsion systems**
    - Repeated crossings of radiation belts, solar flares, and lunar albedo
    - Power will need to be applied to system to continue path of orbit
    - Problematic for devices (including CAN Transceivers) with lower TID ratings

UT64CAN333x CAN Transceiver Overview

Summary of Radiation Performance – SEE

- SEL Performance
  - Latch-up Immune to an LET ≤ 141* MeV-cm^2/mg
  - Tested at +16V and -16V (max fault conditions vs. testing at common mode range (-7V to +12 V))
  - Testing performed at 125˚C at Vdd = 3.6V and Vin = 5.5V
  - No destructive events observed on CAN Transceiver at any test or bias condition
- SET Performance
  - Upset rate of 8.79E-7 * upsets/device-day; MTTF of 3115 years
  - Performed at 3.0V with LETs ranging from 90 MeV-cm^2/mg to 3 MeV-cm^2/mg using ions Au, Xe, Ar, and Xe
- SEGR and SEB (burn out) gate oxide leakage characterization
  - No delta in gate leakage observed
- Immune to Proton upsets, across all earth orbits*
- Radiation report available upon request

* Updated Info

UT64CAN333x CAN Transceiver Overview

Resources and Tool Availability

- Documentation
  - Released datasheet and SMD available (radiation number updates pending)
  - Other updates/clarifications for "FD": coming
- Evaluation board available: UT64CANEVB333
  - Also support loan agreements
- Samples available upon request
  - For Evaluations, Validation tests, etc.
- IBIS Models Available
- Applications Support/Future application notes
- Die Sales Available
- Plastic Package Option Possible – pending customer interest

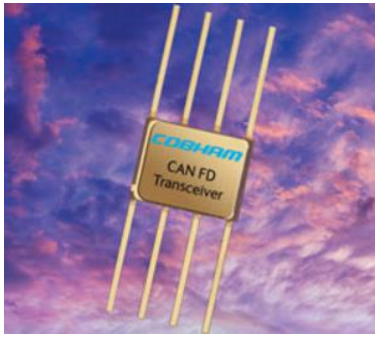
Try before you buy…

UT64CAN333x CAN Transceiver Overview

Value Proposition

- Superior, Guaranteed Radiation Performance
  - TID: 100 krad(Si); Supports electric propulsion systems
  - SEL Immune to LET ≤ 141 MeV-cm^2/mg
  - SEU rate of 8.79E-7 upsets/device-day
  - no SEGR, SEB or Proton upsets
- Superior loop delay specification (over temperature)
- Flexible baud rate
  - 10kbps to 8Mbps baud rates
- QML Qualified SMD: 5962-15232
- Future Products/Synergistic Products
  - Input Welcome from Industry/ESA

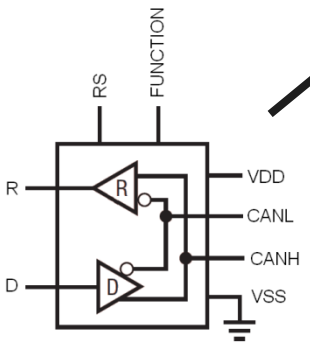
In Production
QML Q & QML V



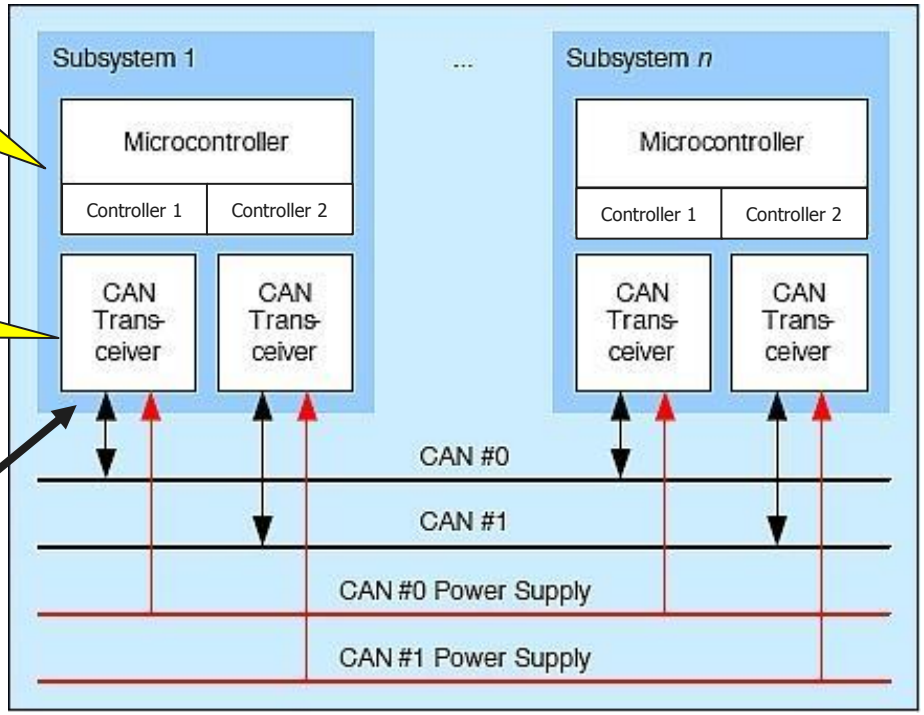
Microcontroller with CAN Transceivers

UT32M0R500 Microcontroller with Internal CAN 2.0 Controller

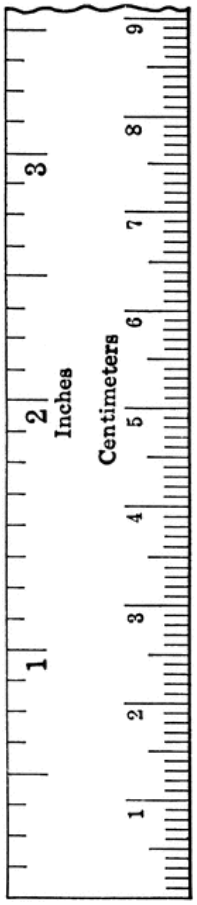
Cobham CAN Transceiver **(UT64CAN333x)**



- CAN XCVR



CAN Micro Controller Network Configuration
For Distributed Command/Control and Telemetry



Small Foot Print!