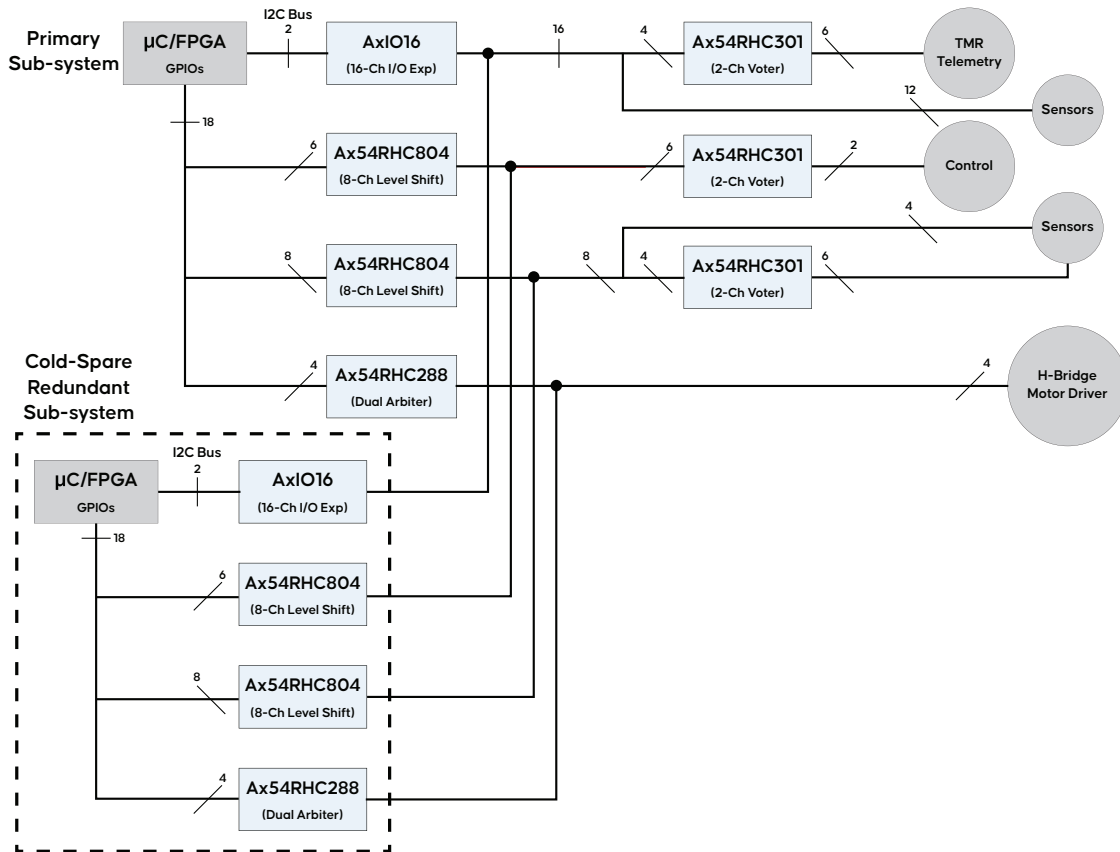




PRODUCT CATALOG | 2025-H2

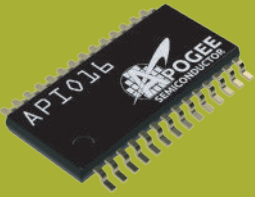
Technology for this world and beyond.

THE APOGEE APPROACH TO MISSION CRITICAL RELIABILITY



Example of cold-sparring approach using Apogee products to achieve system level reliability.

At **Apogee**, we redefine the boundaries of innovation in the space and defense markets, delivering radiation-hardened solutions that combine commercial agility with mission-critical reliability



API016/AFI016

RADIATION HARDENED LEVEL TRANSLATING I²C, SMBUS, SPI I/O EXPANDER

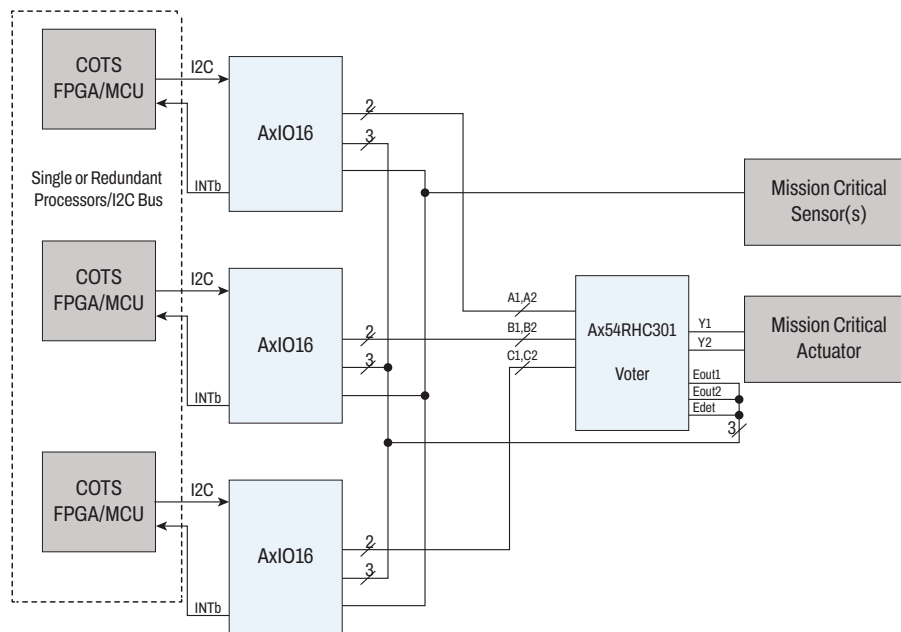
NEW PRODUCT RELEASE

Applications

Remote command and control of telemetry systems

Monitoring faults and alerting control system through interrupt

Isolation and containment of localized faults



Key Features

- 16 Software Programmable Bi-Directional I/Os
- Supports SPI (25MHz) and I²C (1MHz) / SMBUS
- Interface rail (VCCI) and Port rail (VCCP) operating from 1.4 V to 5.5 V
- Level Translation
- Internal power-on reset (POR)
- Open drain INTB pin to alert controller when inputs change
- Cold sparable I/Os with zero power penalty
- Built-in triple redundancy
- TID resilience: API016-LEO 30 krad (Si) and AFI016-GEO 300 krad(Si) variants
- SEL/SEU/SEFI immune up to LET of 75 MeV-cm²/mg
- 4 address pins yielding 16 unique I²C addresses
- 6 SEU Immune 8-bit data registers

System Level Benefits

- Flexible high-speed communications interface
- Built-in up/down level translation suitable for modern FPGAs (XPIO)
- Enables use of COTS FPGA/MCU/Processors in Hi-Reliability systems
- Ensures reliable power up and power down responses during hot plug and cold sparing operations
- Fault detection and containment
- Simplifies cold sparing implementations
- Radiation-Hardened against Single Event Effect (SEE)
- Suitable solutions for both LEO and GEO missions
- Allows up to 256 control channels on one 2-wire I²C bus
- Enables up to 768 bits of critical system data storage on single I²C bus
- Reduction of board and wiring loom mass through common serial bus



View
Product
Page



RelBridge™ | LEO/GEO Family

PART NUMBER	PACKAGE TYPE	DESCRIPTION	TID	SEE
AP54RHC301	TSSOP14	Dual 3-Input Majority Voter	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC288	TSSOP14	Dual Channel Arbiter with Dual Output Enable	30 krad (Si)	80 MeV-cm ² /mg
AF54RHC301	TSSOP14	Dual 3-Input Majority Voter	300 krad (Si)	80 MeV-cm ² /mg

Interface | LEO/GEO Family

PART NUMBER	PACKAGE TYPE	DESCRIPTION	TID	SEE
APIO16	TSSOP28	16-Channel GPIO Expander	30 krad (Si)	75 MeV-cm ² /mg
AP54RHC504	TSSOP14	5-Channel Level Translator	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC505	TSSOP14	5-Channel Level Translator with Bus Hold	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC506	TSSOP14	5-Channel Transceiver	30 krad (Si)	80 MeV-cm ² /mg
AFIO16	TSSOP28	16-Channel GPIO Expander	300 krad (Si)	75 MeV-cm ² /mg
AF54RHC504	TSSOP14	5-Channel Level Translator	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC805	TSSOP20	8-Channel Level Translator with Bus Hold	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC804	TSSOP20	8-Channel Level Translator	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC805	TSSOP20	8-Channel Level Translator with Bus Hold	300 krad (Si)	80 MeV-cm ² /mg

Logic | LEO/GEO Family

PART NUMBER	PACKAGE TYPE	DESCRIPTION	TID	SEE
AP54RHC00	TSSOP14	Quad 2-Input NAND	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC02	TSSOP14	Quad 2-Input NOR	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC04	TSSOP14	Hex Inverter	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC08	TSSOP14	Quad 2-Input AND	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC32	TSSOP14	Quad 2-Input OR	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC164	TSSOP14	8-Bit Shift Register (Serial In Parallel Out)	30 krad (Si)	80 MeV-cm ² /mg
AP54RHC705	TSSOP14	Dual D Flip-Flop with Async. Clear	30 krad (Si)	80 MeV-cm ² /mg
AF54RHC04	TSSOP14	Hex Inverter	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC14	TSSOP14	Hex Schmitt Inverter	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC132	TSSOP14	Quad Schmitt 2-Input NAND	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC164	TSSOP20	8-bit Shift Register (Serial In Parallel Out)	300 krad (Si)	80 MeV-cm ² /mg
AF54RHC244	TSSOP20	8-Channel Non-Inverting Buffer with Dual Output Enable	300 krad (Si)	80 MeV-cm ² /mg



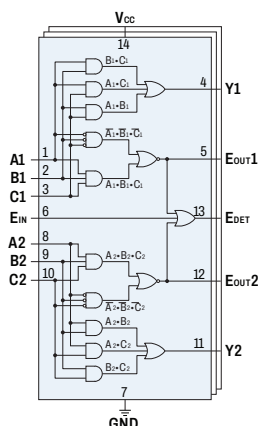
AP54RHC301 TRIPLE MAJORITY VOTER

Key Features

- Triple Majority Analog Voting Architecture with error detection
- Built-in pin to pin triple redundancy
- Individual and Group Error Flags
- Cold-sparing capability with no static power penalty
- 1.65 V to 5.5 V operation
- Internal power-on reset (POR)
- AP54RHC301-LEO and AF54RHC301-GEO
- SEL/SEU/SEFI/SET immune up to LET of 80 MeV-cm²/mg

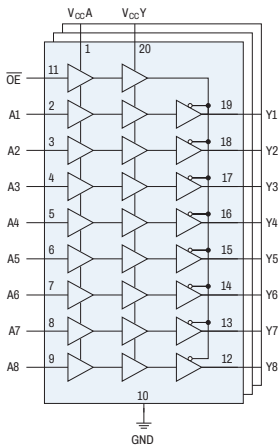
System Level Benefits

- Enables fault management of critical control/telemetry signals
- Fault detection and containment
- Simplifies cold sparing implementations
- Wide voltage range with down level translation capability
- Ensures reliable power up and power down responses during hot plug and cold sparing operations
- Suitable solutions for both LEO and GEO missions
- Radiation-Hardened against Single Event Effect (SEE)





AF54RHC804 8-CHANNEL LEVEL SHIFTER



Key Features

- 1.4 V to 5.5 V operation and level translation
- Proprietary cold-sparing capability with zero static power penalty
- Built-in triple redundancy
- TID resilience: 30 krad(Si) and 300 krad(Si) variants
- SEL/SEU/SEFI immune up to LET of 80 MeV-cm²/mg
- Internal power-on reset (POR)
- Extended operating temperature range (-55 °C to +125 °C)

System Level Benefits

- Built in up/down level translation suitable for modern FPGAs (XPIO)
- Simplifies cold sparing implementations
- Radiation-Hardened against Single Event Effect (SEE)
- Suitable solutions for both LEO and GEO missions
- Ensures reliable power up and power down responses during hot plug and cold sparing operations
- Meets Harsh environment conditions



Parts Grade Description

	A-GRADE FLIGHT (9wk lead time)	B-GRADE FLIGHT (7wk lead time)	C-GRADE FLIGHT (6wk lead time)	E-GRADE EVALUATION* (4wk lead time)
Production Burn-in	YES	NO	NO	NO
Tested Temperature Range	-55 °C to +125 °C	-55 °C to +125 °C	25 °C	25 °C
Operating Temperature Range	-55 °C to +125 °C	-55 °C to +125 °C	-55 °C to +125 °C	-55 °C to +125 °C*
Radiation (SEE)	<80 MeV*cm ² /mg	<80 MeV*cm ² /mg	<80 MeV*cm ² /mg	NO
Radiation (TID)	up to 300 krad(Si)	up to 300 krad(Si)	up to 300 krad(Si)	NO
Outgassing Tested per ASTM E595	YES	YES	YES	YES
Assembly Quality Conformance Inspection	YES	YES	YES	NO
Life Test per Wafer Lot (HTOL)	YES	YES	YES	NO
Multiple Wafer Lots per Reel Possible	NO	NO	NO	YES
Packaging	Plastic	Plastic	Plastic	Plastic
Bond Wires	Au	Au	Au	Au
Is Pure Sn Used?	NO	NO	NO	NO

*E-Grade parts are intended for engineering evaluation only. These units are not suitable for qualification, production, radiation testing, or flight use. Parts are not warranted as to performance over temperature, radiation or operating life.

CONTACT US



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Plano, TX 75074



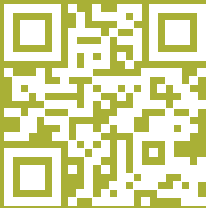
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