

Cold Spare Functionality of the 16-Bit Logic Family

Table 1: Cross Reference of Applicable Products

Product Name:	Manufacturer Part Number	SMD #	Device Type	Internal PIC*
Schmitt CMOS 16-bit Bidirectional MultiPurpose Low Voltage Transceiver	UT54ACS162245SLV	5962-02543	01	WA04, WA05
Schmitt CMOS 16-bit Bidirectional MultiPurpose Transceiver	UT54ACS164245S/SE	5962-98580	01, 02, 03, 04, 05	JM03, JM04, JM06
Schmitt CMOS 16-bit Bidirectional MultiPurpose Transceiver with Warm Spare	UT54ACS164245SEI	5962-98580	06, 07	JM06
Schmitt CMOS 16-bit Bidirectional MultiPurpose Registered Transceiver	UT54ACS164646S	5962- 06234	06, 07	KE01

*PIC = Product Identification Code

1.0 Overview

Aeroflex Colorado Springs offers 16-bit Multipurpose Transceivers that contain cold and warm sparing buffers. These devices are ideal in applications where redundant subsystems remain in a power-off state until needed. This allows a redundant subsystem to be connected to the host system while being electrically isolated from the functioning host system.

Redundancy of mission critical subsystems is a common practice used to ensure reliable operation of a spacecraft or satellite. The inputs and outputs of the devices listed above, while no power is being supplied to the device, can be tied to an active bus and remain in a high impedance state. When VDD is within 300mV of VSS (0.0V), the outputs and inputs present a minimum impedance of 1M Ω .

2.0 Device Architecture

All the devices listed in Table 1 have the ability to translate voltage. (Please see device specific datasheets or SMD for details) The voltage translation feature calls for two different supply voltages. The supplies VDD1 = VDDB and VDD2 = VDDA, as they are referred to in the datasheets, control the cold and warm sparing features of the 16-bit logic family. VDD1 or VDDB controls data port B and VDD2 or VDDA controls data port A. Figure 1 is a notional diagram for the UT54ACS162245SLV, UT54ACS164245S/SE, and UT54ACS164245SEI devices, and Figure 2 is a notional diagram for the UT54ACS164646 device. The UT54ACS164245S/SE has special power sequencing requirements. (Please see the datasheet for specifics)

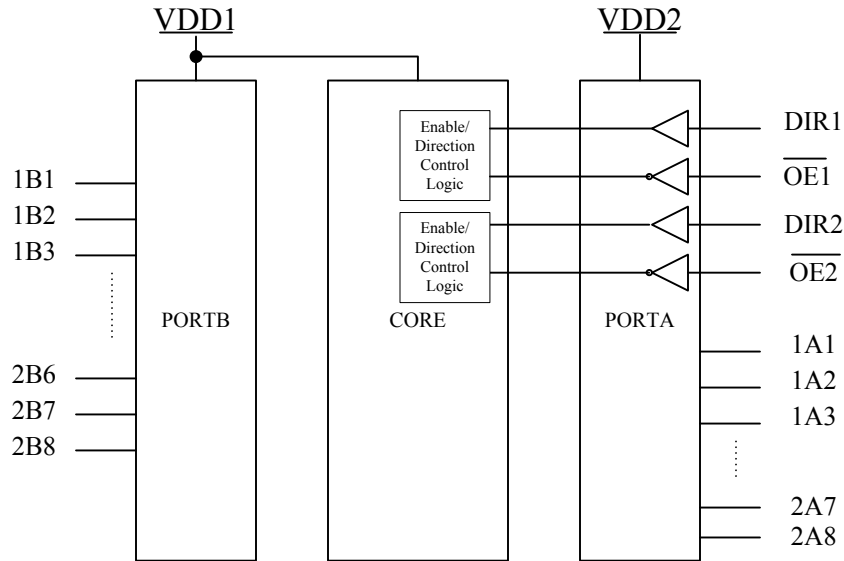


Figure 1. Notional diagram for UT54ACS162245SLV, UT54ACS164245S/SE, and UT54ACS164245SEI

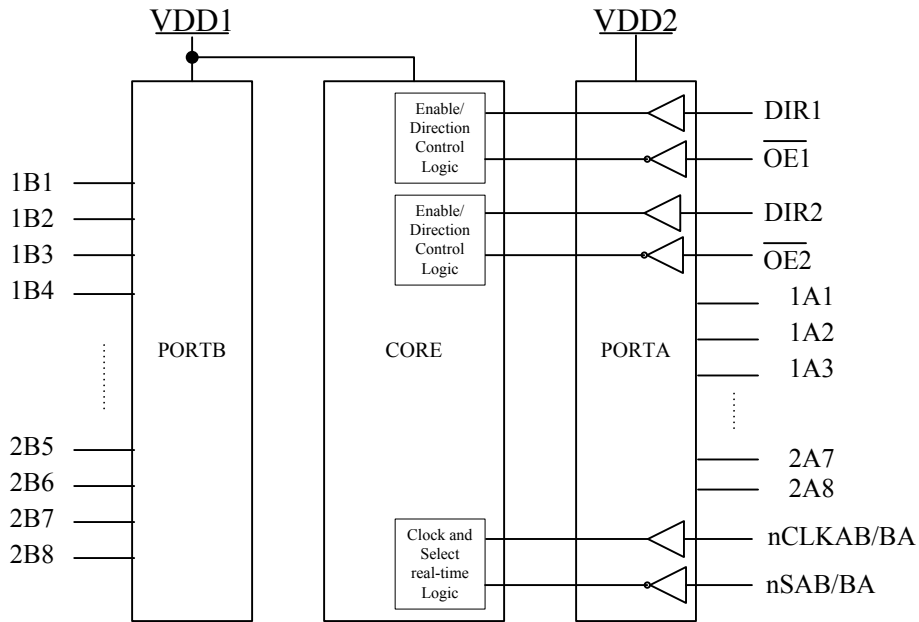


Figure 2. Notional diagram for UT54ACS164646

The UT54ACS162245SLV, UT54ACS164245S/SE, UT54ACS164245SEI, and the UT54ACS164646 all contain the cold spare feature; the UT54ACS162245SLV, UT54ACS164245SEI, and the UT54ACS164646 have warm sparing capability.

3.0 Cold Sparing

In applications requiring high reliability, cold sparing enables the designer to tie a redundant device to the data bus with its power supply within $\pm 300\text{mV}$ of VSS. This device can be kept in cold spare mode and powered only when necessary. Activating a cold spared device only when needed allows the system to save power. In order for an unpowered redundant device to hang off an active bus, the cold spare device must present a high impedance to the active signal as to not affect the signal.

The high impedance, $1\text{M}\Omega$, presented on the I/O lines of a device with $V_{DD} = V_{SS}$ does not add significant loading to the active bus, thus interfering very little with the signal. The ESD structure on a cold spare device is said to be non-typical. Aeroflex's 16-Bit Logic products contain proprietary cold-spare input and output buffers and schematics are not released. However the equivalent circuit behaves like back-to-back diodes. See Figure 3.

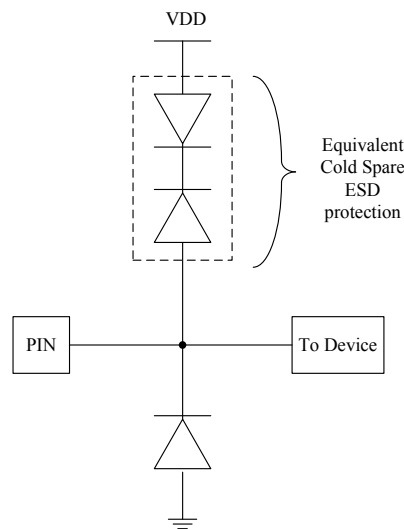


Figure 3. Notional Cold/Warm Spare ESD protection circuit

4.0 Warm Sparing

Warm sparing is initiated when one power supply, either V_{DD1} or V_{DD2} , is set to normal. A normal supply level and the other power supply is equal to $V_{SS} \pm 300\text{mV}$. When the device is "warm spared", the side that has VDD set to a normal operational supply value is "actively" tri-stated because the chip's internal enable signals are forced low. The side of the chip that has VDD set to 0.0V is "passively" tri-stated by the cold spare circuitry.

5.0 Conclusion

The Aeroflex Colorado Springs 16-Bit Transceivers are shown to be useful in providing electrical isolation to a redundant powered-down subsystem, provide power savings for infrequently used devices, asynchronous two-way communication, signal buffering, and voltage translation.

6.0 References

[1] Aeroflex Colorado Springs, "UT54ACS164646 16-bit MultiPurpose Registered Transceiver Datasheet", Colorado Springs, Colorado

[2] Aeroflex Colorado Springs, "UT54ACS162245SLV 16-bit MultiPurpose Transceiver - 3 Volt Datasheet", Colorado Springs, Colorado

[3] Aeroflex Colorado Springs, "UT54ACS164245S/SE 16-bit MultiPurpose Transceiver - 5 Volt with Cold Spare Datasheet", Colorado Springs, Colorado

[4] Aeroflex Colorado Springs, "UT54ACS164245SEI 16-bit MultiPurpose Transceiver - 5 Volt with Cold/Warm Spare Datasheet", Colorado Springs, Colorado