



February 23, 2011

PCN Number: 1019 Addendum

PCN Change Level: Minor

Subject: Addendum to Product Change Notice 1019, Programming Software  
Enhancement for RTAX-S/SL/DSP Product Families

Dear Customer,

In Silicon Sculptor programming software version 5.8.0 and later, Microsemi has implemented an enhancement to the End of Programming (EOP) test for all the products in the RTAX™-S/SL/DSP family. The new EOP test modifies the existing test program to more effectively detect unintentionally programmed antifuses.

## Background

The purpose of the EOP test suite is to detect the presence of unintentionally programmed antifuses. In all Microsemi / Actel antifuse FPGA architectures, unused routing tracks are connected to either Ground or VCCA. If an antifuse on a signal track has become unintentionally programmed, that antifuse will connect a legitimate signal track to an unused track which is tied to either Ground or VCCA. By applying a test voltage to each legitimately programmed signal track, the EOP test senses leakage current to detect the presence of any unintentionally programmed antifuses. When an unintentionally programmed antifuse is detected, the Silicon Sculptor programmer will exit the programming process, notifying the user that the part has failed to program. Such programming yield loss is considered entirely normal and has been seen in all antifuse families over the 20 year legacy of this high reliability technology.

Further, operation of an FPGA in which an antifuse has been unintentionally programmed will reveal the presence of the unintentionally programmed antifuse because the signal track on which the unintentionally programmed antifuse is located will be pulled to a logic high or logic low value by the unintentionally programmed antifuse, resulting in a time zero “stuck at 0” or “stuck at 1” fault.

Microsemi recently became aware of the presence of a single unintentionally programmed antifuse in an RTAX2000S device from wafer lot D2T2A1 which resulted in the loss of functionality at time zero testing. The additional antifuse was **not** detected by the EOP test in Silicon Sculptor software version 5.6.0 because the leakage current during EOP test was insufficient to be detected by the Silicon Sculptor programmer. In subsequent versions of Silicon Sculptor software (version 5.8.0 and later), the resolution of the EOP test has been improved by increasing the test voltage. The unintentionally programmed antifuse which escaped the EOP test in Silicon Sculptor software version 5.6.0 is detected and rejected by the enhanced EOP test in Silicon Sculptor software version 5.8.0 and later. The test escape rate for RTAX2000S parts has been calculated to



be approximately 200–350 PPM with Silicon Sculptor software version 5.6.0 and earlier. Customers should note that an EOP test escape of an unintentionally programmed antifuse will always appear as a stuck net at **time zero** when 1.5 V VCCA is applied in normal operation. Data accumulated over many millions of antifuses by Microsemi demonstrates that unintentionally programmed antifuses do not represent a long-term reliability concern. Functional testing using a **net toggle (not logic state)** coverage of 95% reduces the failure rate to approximately 17 PPM or lower with Silicon Sculptor software versions 5.6.0 and earlier .

The enhanced test perceptivity implemented in Silicon Sculptor software version 5.8.0 has been shown to be effective on a factory-generated test-set of approximately 29,000 unintentionally programmed antifuses (equivalent to approximately 1.5 million RTAX2000S FPGAs). In 100% of these factory-generated test cases, the use of Silicon Sculptor programming software version 5.8.0 or later was shown to be 100% effective in detecting an unintentionally programmed antifuse. Further, normal operation of the device at nominal VCCA of 1.5 V was also demonstrated to be 100% effective in detecting an unintentionally programmed antifuse. This data and analysis were presented to the customer involved and The Aerospace Corporation, and the case was closed.

Microsemi recommends the following course of action:

- (a) Unprogrammed parts: Program with Silicon Sculptor software version 5.8.0 or later.
- (b) Programmed parts which have NOT been integrated onto flight boards: Run ACT\_VERIFY in Silicon Sculptor software version 5.8.0 and later to rescreen the parts. More information about ACT\_VERIFY can be found in the Silicon Sculptor II/3 User Guide:  
[http://www.actel.com/documents/silisculptII\\_sculpt3\\_ug.pdf](http://www.actel.com/documents/silisculptII_sculpt3_ug.pdf).
- (c) Programmed parts which have been integrated: No action is needed if no time zero functional failure has been observed.



Table 1 lists the affected part numbers.

**Table 1: Affected Part Numbers**

RTAXS250S/SL		
RTAX250S-CG624B	RTAX250S-CQ208EV	5962-0421907QXC
5962-0421901QUA	RTAX250S-1CQ208EV	RTAX250SL-1CQ352E
RTAX250S-1CG624B	RTAX250SL-CQ208B	5962-0421908QXC
5962-0421902QUA	5962-0421905QYC	RTAX250SL-CQ352EV
RTAX250S-CG624E	RTAX250SL-1CQ208B	RTAX250SL-1CQ352EV
5962-0421903QUA	5962-0421906QYC	RTAX250S-CQ352PROTO
RTAX250S-1CG624E	RTAX250SL-CQ208E	RTAX250S-1CQ352PROTO
5962-0421904QUA	5962-0421907QYC	RTAX250S-LG624B
RTAX250S-CG624EV	RTAX250SL-1CQ208E	5962-0421901QZC
RTAX250S-1CG624EV	5962-0421908QYC	RTAX250S-1LG624B
RTAX250SL-CG624B	RTAX250SL-CQ208EV	5962-0421902QZC
5962-0421905QUA	RTAX250SL-1CQ208EV	RTAX250S-LG624E
RTAX250SL-1CG624B	RTAX250S-CQ208PROTO	5962-0421903QZC
5962-0421906QUA	RTAX250S-1CQ208PROTO	RTAX250S-1LG624E
RTAX250SL-CG624E	RTAX250S-CQ352B	5962-0421904QZC
5962-0421907QUA	5962-0421901QXC	RTAX250S-LG624EV
RTAX250SL-1CG624E	RTAX250S-1CQ352B	RTAX250S-1LG624EV
5962-0421908QUA	5962-0421902QXC	RTAX250SL-LG624B
RTAX250SL-CG624EV	RTAX250S-CQ352E	5962-0421905QZC
RTAX250SL-1CG624EV	5962-0421903QXC	RTAX250SL-1LG624B
RTAX250S-CG624PROTO	RTAX250S-1CQ352E	5962-0421906QZC
RTAX250S-1CG624PROTO	5962-0421904QXC	RTAX250SL-LG624E
RTAX250S-CQ208B	RTAX250S-CQ352EV	5962-0421907QZC
5962-0421901QYC	RTAX250S-1CQ352EV	RTAX250SL-1LG624E
RTAX250S-1CQ208B	RTAX250SL-CQ352B	5962-0421908QZC
5962-0421902QYC	5962-0421905QXC	RTAX250SL-LG624EV
RTAX250S-CQ208E	RTAX250SL-1CQ352B	RTAX250SL-1LG624EV



**Table 1: Affected Part Numbers**

5962-0421903QYC	5962-0421906QXC	RTAX250S-LG624PROTO
RTAX250S-1CQ208E	RTAX250SL-CQ352E	RTAX250S-1LG624PROTO
5962-0421904QYC		
<b>RTAX1000S/SL</b>		
RTAX1000S-CGS624B	RTAX1000S-CQ352B	RTAX1000S-LG624B
5962-0422001QUA	5962-0422001QXC	5962-0422001QYC
RTAX1000S-1CGS624B	RTAX1000S-1CQ352B	RTAX1000S-1LG624B
5962-0422002QUA	5962-0422002QXC	5962-0422002QYC
RTAX1000S-CGS624E	RTAX1000S-CQ352E	RTAX1000S-LG624E
5962-0422003QUA	5962-0422003QXC	5962-0422003QYC
RTAX1000S-1CGS624E	RTAX1000S-1CQ352E	RTAX1000S-1LG624E
5962-0422004QUA	5962-0422004QXC	5962-0422004QYC
RTAX1000S-CGS624EV	RTAX1000S-CQ352EV	RTAX1000S-LG624EV
RTAX1000S-1CGS624EV	RTAX1000S-1CQ352EV	RTAX1000S-1LG624EV
RTAX1000SL-CGS624B	RTAX1000SL-CQ352B	RTAX1000SL-LG624B
5962-0422005QUA	5962-0422005QXC	5962-0422005QYC
RTAX1000SL-1CGS624B	RTAX1000SL-1CQ352B	RTAX1000SL-1LG624B
5962-0422006QUA	5962-0422006QXC	5962-0422006QYC
RTAX1000SL-CGS624E	RTAX1000SL-CQ352E	RTAX1000SL-LG624E
5962-0422007QUA	5962-0422007QXC	5962-0422007QYC
RTAX1000SL-1CGS624E	RTAX1000SL-1CQ352E	RTAX1000SL-1LG624E
5962-0422008QUA	5962-0422008QXC	5962-0422008QYC
RTAX1000SL-CGS624EV	RTAX1000SL-CQ352EV	RTAX1000SL-LG624EV
RTAX1000SL-1CGS624EV	RTAX1000SL-1CQ352EV	RTAX1000SL-1LG624EV
RTAX1000S-CG624PROTO	RTAX1000S-CQ352PROTO	RTAX1000S-LG624PROTO
RTAX1000S-1CG624PROTO	RTAX1000S-1CQ352PROTO	RTAX1000S-1LG624PROTO
<b>RTAX2000S/SL</b>		
RTAX2000S-CG1152B	RTAX2000S-CQ256B	RTAX2000S-LG1152B
5962-0422101QTA	5962-0422101QUC	5962-0422101QMC



**Table 1: Affected Part Numbers**

RTAX2000S-1CG1152B	RTAX2000S-1CQ256B	RTAX2000S-1LG1152B
5962-0422102QTA	5962-0422102QUC	5962-0422102QMC
RTAX2000S-CG1152E	RTAX2000S-CQ256E	RTAX2000S-LG1152E
5962-0422103QTA	5962-0422103QUC	5962-0422103QMC
RTAX2000S-1CG1152E	RTAX2000S-1CQ256E	RTAX2000S-1LG1152E
5962-0422104QTA	5962-0422104QUC	5962-0422104QMC
RTAX2000S-CG1152EV	RTAX2000S-CQ256EV	RTAX2000S-LG1152EV
RTAX2000S-1CG1152EV	RTAX2000S-1CQ256EV	RTAX2000S-1LG1152EV
RTAX2000SL-CG1152B	RTAX2000SL-CQ256B	RTAX2000SL-LG1152B
5962-0422105QTA	5962-0422105QUC	5962-0422105QMC
RTAX2000SL-1CG1152B	RTAX2000SL-1CQ256B	RTAX2000SL-1LG1152B
5962-0422106QTA	5962-0422106QUC	5962-0422106QMC
RTAX2000SL-CG1152E	RTAX2000SL-CQ256E	RTAX2000SL-LG1152E
5962-0422107QTA	5962-0422107QUC	5962-0422107QMC
RTAX2000SL-1CG1152E	RTAX2000SL-1CQ256E	RTAX2000SL-1LG1152E
5962-0422108QTA	5962-0422108QUC	5962-0422108QMC
RTAX2000SL-CG1152EV	RTAX2000SL-CQ256EV	RTAX2000SL-LG1152EV
RTAX2000SL-1CG1152EV	RTAX2000SL-1CQ256EV	RTAX2000SL-1LG1152EV
RTAX2000S-CG1152PROTO	RTAX2000S-CQ256PROTO	RTAX2000S-LG1152PROTO
RTAX2000S-1CG1152PROTO	RTAX2000S-1CQ256PROTO	RTAX2000S-1LG1152PROTO
RTAX2000S-CGS624B	RTAX2000S-CQ352B	RTAX2000S-LG624B
5962-0422101QNA	5962-0422101QXC	5962-0422101QYC
RTAX2000S-1CGS624B	RTAX2000S-1CQ352B	RTAX2000S-1LG624B
5962-0422102QNA	5962-0422102QXC	5962-0422102QYC
RTAX2000S-CGS624E	RTAX2000S-CQ352E	RTAX2000S-LG624E
5962-0422103QNA	5962-0422103QXC	5962-0422103QYC
RTAX2000S-1CGS624E	RTAX2000S-1CQ352E	RTAX2000S-1LG624E
5962-0422104QNA	5962-0422104QXC	5962-0422104QYC
RTAX2000S-CGS624EV	RTAX2000S-CQ352EV	RTAX2000S-LG624EV



**Table 1: Affected Part Numbers**

RTAX2000S-1CGS624EV	RTAX2000S-1CQ352EV	RTAX2000S-1LG624EV
RTAX2000SL-CGS624B	RTAX2000SL-CQ352B	RTAX2000SL-LG624B
5962-0422105QNA	5962-0422105QXC	5962-0422105QYC
RTAX2000SL-1CGS624B	RTAX2000SL-1CQ352B	RTAX2000SL-1LG624B
5962-0422106QNA	5962-0422106QXC	5962-0422106QYC
RTAX2000SL-CGS624E	RTAX2000SL-CQ352E	RTAX2000SL-LG624E
5962-0422107QNA	5962-0422107QXC	5962-0422107QYC
RTAX2000SL-1CGS624E	RTAX2000SL-1CQ352E	RTAX2000SL-1LG624E
5962-0422108QNA	5962-0422108QXC	5962-0422108QYC
RTAX2000SL-CGS624EV	RTAX2000SL-CQ352EV	RTAX2000SL-LG624EV
RTAX2000SL-1CGS624EV	RTAX2000SL-1CQ352EV	RTAX2000SL-1LG624EV
RTAX2000S-CG624PROTO	RTAX2000S-CQ352PROTO	RTAX2000S-LG624PROTO
RTAX2000S-1CG624PROTO	RTAX2000S-1CQ352PROTO	RTAX2000S-1LG624PROTO
<b>RTAX4000S/SL</b>		
RTAX4000S-CG1272B	RTAX4000S-CQ352B	RTAX4000S-LG1272B
5962-0822401QZA	5962-0822401QXC	5962-0822401QYC
RTAX4000S-1CG1272B	RTAX4000S-1CQ352B	RTAX4000S-1LG1272B
5962-0822402QZA	5962-0822402QXC	5962-0822402QYC
RTAX4000S-CG1272E	RTAX4000S-CQ352E	RTAX4000S-LG1272E
5962-0822403QZA	5962-0822403QXC	5962-0822403QYC
RTAX4000S-1CG1272E	RTAX4000S-1CQ352E	RTAX4000S-1LG1272E
5962-0822404QZA	5962-0822404QXC	5962-0822404QYC
RTAX4000S-CG1272EV	RTAX4000S-CQ352EV	RTAX4000S-LG1272EV
RTAX4000S-1CG1272EV	RTAX4000S-1CQ352EV	RTAX4000S-1LG1272EV
RTAX4000SL-CG1272B	RTAX4000SL-CQ352B	RTAX4000SL-LG1272B
5962-0822405QZA	5962-0822405QXC	5962-0822405QYC
RTAX4000SL-1CG1272B	RTAX4000SL-1CQ352B	RTAX4000SL-1LG1272B
5962-0822406QZA	5962-0822406QXC	5962-0822406QYC
RTAX4000SL-CG1272E	RTAX4000SL-CQ352E	RTAX4000SL-LG1272E



**Table 1: Affected Part Numbers**

5962-0822407QZA	5962-0822407QXC	5962-0822407QYC
RTAX4000SL-1CG1272E	RTAX4000SL-1CQ352E	RTAX4000SL-1LG1272E
5962-0822408QZA	5962-0822408QXC	5962-0822408QYC
RTAX4000SL-CG1272EV	RTAX4000SL-CQ352EV	RTAX4000SL-LG1272EV
RTAX4000SL-1CG1272EV	RTAX4000SL-1CQ352EV	RTAX4000SL-1LG1272EV
RTAX4000S-CG1272PROTO	RTAX4000S-CQ352PROTO	RTAX4000S-LG1272PROTO
RTAX4000S-1CG1272PROTO	RTAX4000S-1CQ352PROTO	RTAX4000S-1LG1272PROTO
<b>RTAX2000D</b>		
RTAX2000D-CGD1272B	RTAX2000D-LGD1272B	RTAX2000D-CQ352B
RTAX2000D-CGD1272E	RTAX2000D-LGD1272E	RTAX2000D-CQ352E
RTAX2000D-CGD1272EV	RTAX2000D-LGD1272EV	RTAX2000D-CQ352EV
RTAX2000D-CGD1272PROTO	RTAX2000D-LGD1272PROTO	RTAX2000D-CQ352PROTO
<b>RTAX4000D</b>		
RTAX4000D-CGD1272B	RTAX4000D-LGD1272B	RTAX4000D-CQ352B
RTAX4000D-CGD1272E	RTAX4000D-LGD1272E	RTAX4000D-CQ352E
RTAX4000D-CGD1272EV	RTAX4000D-LGD1272EV	RTAX4000D-CQ352EV
RTAX4000D-CGD1272PROTO	RTAX4000D-LGD1272PROTO	RTAX4000D-CQ352PROTO

If you have any questions related to this topic, please contact Microsemi's ITAR Application Technical Support at [soc\\_tech\\_itar@microsemi.com](mailto:soc_tech_itar@microsemi.com).

Regards,

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