



Programming and Functional Failure Guidelines

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Commercial and Standard Military Products

Microsemi SoC Products Group (formerly Actel) programs significant volumes of devices each month for its customer base. The programming yield for antifuse devices normally averages 98-99%. However, the yield can show a lot-to-lot spread, which generally ranges from 97% to 100%, based on volumes greater than 100 units. For volumes less than 100 units, refer to Table 1, Table 2 on page 4 or Table 3 on page 4 for maximum expected failures. Devices labeled as –F are not screened as closely for programming yield, so expected yield is 88% or better (Table 4 on page 4).

For antifuse device failures within these guidelines, please fill out an RMA request form for the units and submit it to Microsemi SoC Products Group customer service (rma@microsemi.com). Customers experiencing a programming failure greater than the sample sizes given in the following tables should suspend programming, fill out the programming failure checklist and submit it along with the programming error log to SoC Products Group Technical Support (soc_tech@microsemi.com or soc_tech_itar@microsemi.com). Programming failures in excess of this could indicate a defective programmer or a problem with the host computer or computer communications.

Since IGLOO[®]/e (including ARM-enabled), IGLOO nano, IGLOO PLUS, ProASIC[®]3/E (including ARM-enabled), Military ProASIC3/EL, ProASIC3 nano, ProASIC3L, SmartFusion[™], Fusion (including ARM-enabled), ProASIC^{PLUS}[®], and ProASIC devices are reprogrammable, Microsemi tests the programmability of these products 100%. Although no failures are expected on these devices, Microsemi accepts 0.5% fallout from IGLOO/e (including ARM-enabled), IGLOO nano, IGLOO PLUS, ProASIC3/E (including ARM-enabled), Military ProASIC3/EL, ProASIC3 nano, ProASIC3L, SmartFusion, and Fusion (including ARM-enabled) devices regardless of the sample size or the volume. For ProASIC and ProASIC^{PLUS} (including –F) devices, Microsemi accepts up to 1% for quantities below 1000, and up to 0.5% for a larger volume. If the failure quantity is greater, please fill out the programming failure checklist and submit it along with the programming error log to SoC Products Group Technical Support (soc_tech@microsemi.com or soc_tech_itar@microsemi.com).

Programming yield for antifuse FPGAs should normally be over 97% for devices other than Axcelerator[®] (88 to 92%) or A54SX32A and A54SX72A (85% or better). With a smaller number of units programmed, you may experience a larger percentage of fallout due to statistical fluctuations attributable to the small quantities. See Table 1, Table 2 on page 4, Table 3 on page 4, or Table 4 on page 4 to determine acceptable levels. **If you see higher programming failures than shown below, please stop programming and submit the programming failure checklist along with the programming error log to your Microsemi SoC Products Group representative or the Technical Support hotline mentioned above.**

Table 1: Antifuse FPGAs (non –F speed grade) Maximum Allowed Programming Failures (for SX32A and SX72A see Table 3 on page 4)

Sample Size	Maximum Number of Programming Failures Allowed
<10	1
10–18	2
19–30	3
31–45	5
46–60	7
61–75	8
76–99	10
100	3%

Table 2: Accelerator Family (all speed grades) Maximum Allowed Programming Failures

Guidelines for AX125, AX250, and AX500		Guidelines for AX1000 and AX2000	
Sample Size	Max. Number of Failures Allowed	Sample Size	Max. Number of Programming Failures Allowed
<10	2	<10	3
10–18	3	10–18	5
19–30	4	19–30	6
31–45	8	31–45	8
46–60	10	46–60	11
61–75	12	61–75	13
76–99	15	76–99	15
>100	8%	>100	12%

Table 3: SX32A and SX72A (all speed grades) Maximum Allowed Programming Failures

Sample Size	Maximum Number of Programming Failures Allowed
<10	4
10–18	6
19–30	8
31–45	11
46–60	14
61–75	16
76–99	19
100	15%

Programming yield for –F devices should normally be over 88%. The sample sizes shown in Table 4 allow a larger percentage due to statistical fluctuations attributable to the small quantities. If you see higher programming failures than shown below, please stop programming and submit the programming failure checklist along with the programming error log to your SoC Products Group representative or the Technical Support hotline mentioned above.

Table 4: –F Antifuse (other than SX32A and SX72A) FPGAs Maximum Allowed Programming Failures

Sample Size	Maximum Number of Programming Failures Allowed
<10	3
10–18	5
19–30	7
31–45	10
46–60	12
61–75	14
76–99	15
100	12%

Activator 2, Activator 2S Device Support

These programmers have been discontinued (PDN 0201, 2/1/2002). Customers must upgrade their programmer to Silicon Sculptor II or Silicon Sculptor 3. Programming failures from Activator programmers will not be accepted for RMA.

Silicon Sculptor Device Support

The Silicon Sculptor programmer was designed to program the following devices: ACT 1, ACT 2, 1200XL, ACT 3, 3200DX, 40MX, 42MX, SX, SX-A, eX, and ProASIC. No other FPGAs should be programmed on the Silicon Sculptor programmer. This programmer has been discontinued. Software support for the Silicon Sculptor I and Silicon Sculptor 6X programmers was actively disabled in Silicon Sculptor software v4.70 (August 2007). Customers should upgrade to a Silicon Sculptor 3 programmer. Programming failures from this programmer may not be accepted for RMA.

Silicon Sculptor II Device Support

The Silicon Sculptor II programmer has been designed to program the following devices: ACT 1, ACT 2, 1200XL, ACT 3, 3200DX, 40MX, 42MX, SX, SX-A, eX, Axcelerator, IGLOO/e (including ARM-enabled), IGLOO nano, IGLOO PLUS, ProASIC3/E (including ARM-enabled), ProASIC3 nano, ProASIC3L, SmartFusion, Fusion (including ARM-enabled), ProASIC^{PLUS}, and ProASIC. No other FPGAs should be programmed on the Silicon Sculptor II programmer. Silicon Sculptor 3 replaces the Silicon Sculptor II as Microsemi's programmer of choice.

Silicon Sculptor 3 Device Support

The Silicon Sculptor 3 programmer has been designed to program the following devices: ACT 1, ACT 2, 1200XL, ACT 3, 3200DX, 40MX, 42MX, SX, SX-A, eX, Axcelerator, IGLOO/e (including ARM-enabled), IGLOO nano, IGLOO PLUS, ProASIC3/E (including ARM-enabled), ProASIC3 nano, ProASIC3L, SmartFusion, Fusion (including ARM-enabled), ProASIC^{PLUS}, and ProASIC. No other FPGAs can be programmed on the Silicon Sculptor 3 programmer.

FlashPro Device Support

The FlashPro in-system programmer has been designed to program ProASIC and ProASIC^{PLUS} devices. No other FPGAs should be programmed on the FlashPro programmer. The FlashPro programmer has been discontinued (PDN 0906, August 2009). While software updates are no longer offered for this programmer, software support for the FlashPro programmer will continue.

FlashPro Lite Device Support

The FlashPro Lite in-system programmer has been designed to program the ProASIC^{PLUS} devices. No other FPGAs should be programmed on the FlashPro Lite programmer.

FlashPro3/3x Device Support

The FlashPro3 in-system programmer has been designed to program the IGLOO/e (including ARM-enabled),

IGLOO nano, IGLOO PLUS, ProASIC3/E (including ARM-enabled), ProASIC3 nano, ProASIC3L, SmartFusion, and Fusion (including ARM-enabled). No other FPGAs should be programmed on the FlashPro3 programmer. FlashPro3/3x has been discontinued (PDN 0910, November 2009); however, software support for the FlashPro3/3x programmer will continue.

FlashPro4 Device Support

FlashPro4 is the newest programmer, supporting all FPGAs in the IGLOO series and ProASIC3 series (including RT ProASIC3), SmartFusion and Fusion families, and future generation flash FPGAs.

FlashPro4 replaces FlashPro3 and FlashPro3X and is backward-compatible, supporting additional features such as lower cost, smaller form factor and the latest flash FPGA families. Libero[®] Integrated Design Environment (IDE) v8.6 SP1 or FlashPro v8.6 SP1 is the minimum software and version required to use FlashPro4. See the *FlashPro4 Backward Compatibility with FlashPro3 and Using FlashPro4 PROG_MODE for 1.5 V Programming of ProASIC3L, IGLOOV2, and IGLOO PLUS V2 Devices* application brief for more information on FlashPro3 and FlashPro4 compatibility.

Other Device Programmers

BP Microsystems' programmers that are equivalent to Silicon Sculptor II (1600/2600/1700/2700) and Silicon Sculptor 3 (1610/2610/1710/2710) are fully supported by BPM and endorsed by Microsemi. BPM automated programmers 3600/4600/3610/4610/3700/4700/3710 and MK2/4710 also support Microsemi devices and are endorsed by the Microsemi SoC Products Group. Where an automated programmer is used, the appropriate open-top adapter module from BPM Microsystems must be used. Automated programmers are not to be used for programming RT devices such as RTSX-SU and RTAX-S.

No other programming hardware is endorsed by the Microsemi at this time. All failures outside of the expected fallout, as noted on pages 3 and 4, must be handled with the vendor of that programming hardware. Functional failures may be rejected by Microsemi if the programmer is suspected to be the cause of the failure and the programmer is not listed above.

Microprocessor Programming

In-system programming (ISP) with a microprocessor applies to IGLOO/e (including M1AGLe), IGLOO nano, IGLOO PLUS, ProASIC3/E (including M1A3P/E), ProASIC3 nano, ProASIC3L, SmartFusion, Fusion (including M1AFS and P1AFS), and ProASICPLUS devices only. Please see the application notes, available on the SoC Product Group's website, for details on ISP. Customers must use the latest version of DirectC, available from the SoC Products Group website:

http://www.microsemi.com/soc/download/program_debug/directc/default.aspx

Return Material Authorization (RMA) Procedures

The following actions should be taken with respect to programming failures:

1. All devices submitted for an RMA must be within the Microsemi warranty period (one year from date of shipment for direct customers). Microsemi will reject devices that are no longer under warranty.
2. All devices returned should be in their original packaging and must have a Microsemi SoC Products Group RMA number.
3. For normal programming fallout of 0 to 3% (12% for –F), return the parts for replacement by requesting an RMA number through Microsemi sales representatives, distributors, or customer service.
4. For fallout of greater than 3% (12% for –F), or greater than that shown in Table 1 on page 3, Table 2 on page 4, or Table 3 on page 4, a case must be initiated with SoC Products Group Technical Support to investigate the issue further, as documented below.
5. RMAs will only be authorized for current Microsemi devices. Devices which have been discontinued will not be accepted for RMA.

6. All functional failure requests must be initiated by opening a case with SoC Products Group Technical Support (soc_tech@microsemi.com or soc_tech_itar@microsemi.com). See instructions below.
7. If the devices were programmed using programmers not certified by the SoC Products Group or discontinued programmers, Microsemi reserves the right to reject failure analysis and/or RMA requests.
8. For users who experience long programming time, contact SoC Products Group Technical Support (soc_tech@microsemi.com or soc_tech_itar@microsemi.com) for help. It should be noted that programming times for –F material are longer than for other speed grade material.

Programming Failure Policies

The following are Microsemi’s policies on supporting programming failures. Failure analysis requests can only be approved by SoC Products Group Technical Support. For all excessive programming failures please submit the programming failure checklist along with the programming error log to your SoC Products Group representative or the Technical Support hotline (soc_tech@microsemi.com or soc_tech_itar@microsemi.com).

The term “customer” refers to any person or company programming Microsemi devices.

- Customers may request programming failure analysis on devices only when programming failures exceed the limits of Table 1 on page 3, Table 2 on page 4, or Table 3 on page 4, and software or programmer issues have been eliminated as a cause of the failure.
- The customer must use the latest version of the programming software available at the time of programming. The latest version can be found on the SoC Products Group’s website under “Programming and Debug” (http://www.microsemi.com/soc/download/program_debug/default.aspx). If Microsemi discovers that the programming failures were caused by the use of an old version of programming software, the SoC Products Group reserves the right to reject the request for programming failure analysis and/or RMA request.
- The customer must use the latest revision of the adapter modules available at the time of programming. The latest revision of the adaptor modules can be found on the SoC Products Group’s website under “Adapter Modules”
http://www.microsemi.com/soc/products/hardware/program_debug/ss/modules.aspx
- As a new version of a module becomes available, Microsemi will issue a Product Discontinuation Notice for the previous module, instructing the customer that the new version is available and must be used for programming as soon as possible. Support for discontinued the module will be removed from the programming software. If the SoC Products Group concludes that the programming failures were caused by the use of an old revision of an adapter module and/or the adapter module’s insertion limit is exceeded, Microsemi reserves the right to reject the request for programming failure analysis and/or RMA request. The insertion limit can be found on the SoC Products Group website: http://www.microsemi.com/soc/products/hardware/program_debug/ss/modules.aspx. The limit can be checked from the Silicon Sculptor software (Tools > Socket Module Counter).
- For ISP of flash devices, customers are expected to follow the board-level guidelines provided on the available on the SoC Products Group website. These guidelines are discussed in the datasheets and application notes (refer to the “Related Documents” section of the datasheet for application note links). Customers are also expected to troubleshoot board-level signal integrity issues by measuring voltages and taking scope plots. Microsemi has the right to reject an RMA for programming failures due to any type of board-level issue.
- The customer must ensure that all programming hardware is in good, working condition. This requires regular execution of the hardware self-diagnostic test, and maintaining valid calibration of the programming hardware. The self-diagnostic test should be performed before every programming session. As a minimum, the test must be executed every week. Hardware calibration should be performed every 12 months. Information on running the self-diagnostic tests and calibration can be

found at http://www.microsemi.com/soc/documents/SiliSculptProgCali_UG.pdf. Microsemi may reject an RMA if the hardware is found to be poorly maintained, and is the cause of the failures.

- The SoC Products Group only tests the programming of Microsemi devices on the FlashPro, Silicon Sculptor, and BP Microsystem programmers. Each release of the Silicon Sculptor and FlashPro, FlashPro Lite, and FlashPro3/3x/4 software goes through a rigorous testing procedure to ensure the best programming yield possible. This test procedure includes programming of devices and functional testing of these devices. Activator and FlashPro programmers (not including FlashPro Lite and FlashPro3/3x/4) are discontinued. Software updates are no longer offered for these programmers; however, software support for the FlashPro programmer will continue.
- The SoC Products Group does not test programming hardware or software from any other vendors, and cannot guarantee programming yield. Microsemi may accept programming failure RMAs up to the allowed fallout, but reserves the right to reject any RMA requests if the fallout is excessive. Microsemi will not perform failure analysis on devices programmed by hardware from other vendors.
- Programming failure analysis will not be performed on –F devices.
- The SoC Products Group will respond within two business days and do everything feasible to find an immediate workaround for the customer. If a programming failure analysis is required, this could take up to several weeks.
- Customers MUST use the latest version of Silicon Sculptor (SculptW) software to program Microsemi FPGAs. Although Microsemi FPGAs are supported in the BPWin software from BPM Microsystems, most recent Silicon Sculptor fixes are not always included in the latest BPWin software. BPM customers should always check SoC Products Group and BPM websites or contact Tech Support to ensure they are using the latest software that includes the latest requirements from the SoC Products Group. Customers failing to use the latest version of the Silicon Sculptor software from the SoC Products Group, or its BPM equivalent, risk losing the ability to return FPGA product. If customers use BPWin to program any Microsemi device and encounter programming failures higher than the Microsemi guideline (refer to the appropriate table in this document), please contact tech@bpmicro.com.

Functional Failure Policies

The following are Microsemi's policies on supporting functional failures.

- Functional failure analysis will not be performed on –F devices.
- The customer is responsible for providing all the design files necessary to perform the failure analysis. This includes, but is not limited to: source files (schematic or HDL), Designer database file (*.adb), board schematics, test vectors and testbench, programming files, and timing analysis results. Additional files may be requested by SoC Products Group Technical Support. If any of these files are missing, it may hinder or impede our ability to perform a failure analysis.
- The customer is responsible for providing an adequate description of the failure mode. This includes Silicon Explorer probing results (if available), an explanation of the failure mechanisms along with logic analyzer/scope plots of the failure mode, test methods used, device and board configuration, and any additional information requested by Technical Support. If any of this information is missing, it may hinder or impede our ability to perform a failure analysis.
- If the security fuse is programmed (antifuse FPGAs), the SoC Products Group will not be able to perform failure analysis. Programming of the security fuse restricts our ability to locate the source of the failure within the device.
- If a flash FPGA is submitted for functional failure analysis, the customer must provide the security key if the device is secured. Without the security key, there will be no way to locate the source of the failure within the device.
- The SoC Products Group will not be able to perform failure analysis on flash FPGA devices that have been permanently locked. Permanently locking the device restricts the ability to locate the source of the failure within the device.

- Microsemi's policy in accepting products for failure analysis is conditional upon the acceptance of the physical condition of the returned part. No returns shall be accepted if any evidence of tampering or removing sections or layers of the part is evident. Microsemi will not accept a part for failure analysis if the customer has already started his own FA efforts and has changed the physical dimensions or characteristics of the initial device or product.
- All information relating to the failure analysis testing or results of such analysis is considered proprietary and confidential information and shall not be disclosed to other parties without Microsemi's written consent to such disclosure.

Improper programming setup is a potential cause of functional failures. Therefore, the following rules apply:

- The customer is responsible for using the latest version of the programming software available at the time of programming. The latest version can be found on the SoC Products Group's website under "Programming and Debug" (http://www.microsemi.com/soc/download/program_debug/default.aspx). If Microsemi discovers that the functional failures were caused by the use of an old version of programming software, the customer will be liable for all failures.
- The customer is responsible for using the latest revision of the adapter modules available at the time of programming. The latest revision can be found on the SoC Products Group's website under "Adapter Modules" (http://microsemi.com/soc/products/hardware/program_debug/ss/modules.aspx).

If Microsemi discovers that the failures were caused by the use of an old revision of an adapter module, the customer will be liable for all failures.

- The customer must ensure that all programming hardware is in good, working condition. This requires regular execution of the hardware self-diagnostic test, and maintaining valid calibration of the programming hardware. The self-diagnostic test should be performed before every programming session. As a minimum, the test must be executed every week. Hardware calibration should be performed every 12 months. Information on running the self-diagnostic tests and calibration can be found at http://www.microsemi.com/soc/documents/SiliSculptProgCali_UG.pdf. Microsemi may reject an RMA if the hardware is found to be poorly maintained, and is the cause of the failures.
- The SoC Products Group only tests the programming of Microsemi devices on the FlashPro, Silicon Sculptor, and BP Microsystem programmers. Each release of the Silicon Sculptor and FlashPro, FlashPro Lite, and FlashPro3/3x/4 software go through a rigorous testing procedure to ensure the best programming yield possible. This test procedure includes programming of devices and functional testing of these devices. Activator and FlashPro programmers (not including FlashPro Lite and FlashPro3/3x/4) are discontinued. Software updates are no longer offered for these programmers, however software support for the FlashPro programmer will continue.
- The SoC Products Group does not test programming solutions from any other vendors, and cannot guarantee programming yield. Programming failure RMAs are accepted up to the allowed fallout, but Microsemi reserves the right to reject any RMA requests if the fallout is excessive. Microsemi will not perform failure analysis on devices programmed by hardware from other vendors.

RadHard and RadTolerant Products

Background

Microsemi’s RadHard (RH), RadTolerant (RT), and RT ProASIC3 FPGAs require special considerations due to the reliability and high cost associated with each unit. All of the policies and procedures of handling commercial, industrial, and military FPGA device failures apply to RadHard, RadTolerant, and RT ProASIC3 FPGAs with the following exceptions. For your reference, the RH/RT Programming Guide provides details on programming RH and RT devices

http://www.microsemi.com/soc/documents/radhardPG_UG.pdf.

Microsemi accepts 0.5% fallout for RT ProASIC3 devices, regardless of the sample size or volume. The following guidelines are the expected programming fallout for other RT/RH devices per programming session for the volumes shown. If you see higher programming failures than shown below, or if you experience two successive failures in a row, stop programming and contact SoC Products Group Technical Support immediately (soc_tech@microsemi.com or soc_tech_itar@microsemi.com).

Table 5: RH/RT Flight Unit and PROTO (except RTAX-S/SL) Maximum Allowed Programming Failures

Sample Size	Maximum Number of Programming Failures Allowed
<10	2
10–18	3
19–30	4
30–50	5
> 50	5%

Table 6: RTAX250S/SL Flight Unit and PROTO Maximum Allowed Programming Failures

Sample Size	Maximum Number of Programming Failures Allowed
<10	2
10–18	3
19–30	4
30–50	5
> 50	5%

Table 7: RTAX1000S/SL, RTAX2000S/SL/DSP and RTAX4000S/SL/DSP Flight Unit and PROTO Maximum Allowed Programming Failures

Sample Size	Maximum Number of Programming Failures Allowed
<10	3
10–18	5
19–30	6
30–50	7
> 50	10%

Note: Programming yield should normally be over 95%. These sample sizes allow a larger percentage due to statistical fluctuations attributable to the small quantities. Since these devices are costly, contact SoC Products Group Technical Support (soc_tech@microsemi.com or soc_tech_itar@microsemi.com) if you encounter any programming failures. Also submit the programming failure checklist and error log to start the investigation. SoC Products Group Technical Support will work with you to get relevant information and then advise you on the next step.

Activator 2, Activator 2S Device Support

These programmers have been discontinued (PDN 0201, 2/1/2002). Customers must upgrade to Silicon Sculptor II or Silicon Sculptor 3. Programming failures from Activator programmers will not be accepted for RMA.

Silicon Sculptor / Silicon Sculptor II / Silicon Sculptor 3 Device Support

The Silicon Sculptor II and 3 programming platforms have been designed to program the following devices:

RT1020, RH1020, RT1280A, RH1280, RT1425A, RT1460A, RT14100A, RT54SX32S, RTSX32SU, RTSX72SU, RTAX250S/SL, RTAX1000S/SL, RTAX2000S/SL/DSP, and RTAX4000S/SL/DSP. Silicon Sculptor I (and the related six-site Silicon Sculptor 6X) should no longer be used for programming. Software support for the Silicon Sculptor I (and Silicon Sculptor 6X) programmers was actively disabled in Silicon Sculptor software v4.70 (August 2007). No other FPGAs should be programmed on the Silicon Sculptor programmers. Check for the latest device support at http://www.microsemi.com/soc/custsup/updates/silisculpt/device_list.html.

Other Programmers

No other programmers may be used to program RT or RH FPGA devices.

Note: Since RH/RT devices are expensive, a few additional measures should be taken in order to maximize the programming yield.

All RT/RH customers must verify the calibration of the programmers whenever a programming failure is experienced, in addition to the annual calibration verification. The verification of the calibration requires a special adapter module (part number SM48DB). Customers should buy this adapter module during the purchase of any Microsemi or BP programmers. The calibration verification procedure can be downloaded from the SoC Products Group website:

http://www.microsemi.com/soc/documents/SiliSculptProgCali_UG.pdf.

Other guidelines are as follows:

- Use a filtered, genuine sine-wave, uninterruptible power supply (UPS) with sufficient battery backup to allow for the entire programming time plus a safety margin of 20% (about 5 hours).
- Keep an extra programmer and adapter module as a back-up.

Run self-test with the adapter module inserted on the programmer before programming every device.

Return Material Authorization (RMA) Procedures

The following actions should be taken with respect to programming failures:

1. **For all programming failures on RH/RT devices, an FA is mandatory before any replacements are issued.** Only a maximum of three units is necessary to do a failure analysis. Request an RMA number through SoC Products Group’s sales representatives, distributors, or customer service. RMAs for RH/RT devices will be processed as credit/replace only.
Note: Programming failures related to RH1020B and RH1280B sold by BAE are handled by BAE and not Microsemi.
2. **Customers are advised to contact SoC Products Group Technical Support** (soc_tech@microsemi.com or soc_tech_itar@microsemi.com) to get a case number before requesting any programming or functional FA request.
3. RMAs will only be authorized for current Microsemi devices. Devices that have been discontinued will not be allowed for RMA.
4. All devices returned for FA and returns should be in their original packaging and must have an RMA number.
5. If the devices were programmed using programmers not certified by the SoC Products Group or discontinued programmers, Microsemi reserves the right to reject the failure analysis and/or RMA request.
6. Programming Files (*.afm or [*def and *.fus]) and *.avi files (*.txt on Sculptor) are mandatory. Any parts returned Microsemi for failure analysis without a valid RMA number and programming files/*.avi files will be returned immediately to the customer at the customer’s expense.

Programming Failure Policies

All of the policies described for commercial and standard military products apply with the following exceptions:

- Customers must successfully program a commercial equivalent device before programming RT devices every time there is a hardware change. This will help ensure the hardware is in good working condition before programming RH/RT devices. A list of compatible devices follows.
- A failure analysis report may be requested by the customer.

All of the policies described for flash products apply for RT ProASIC3 devices.

Table 8: Commercial Equivalent Devices

RadHard/RadTolerant Device	Commercial Equivalent Device
RH1020-CQ84V	A1020B-CQ84C
RT1020-CQ84B	A1020B-CQ84C
RH1280-CQ172V	A1280XL-CQ172C
RT1280A-CQ172B	A1280A-CQ172C
RT1425A-CQ132B	A1425A-CQ132C

RadHard/RadTolerant Device	Commercial Equivalent Device
RT1460A-CQ196B	A1460A-CQ196C
RT14100A-CQ256B	A14100A-CQ256C
RT54SX16-CQ208B	A54SX32A-CQ208
RT54SX16-CQ256B	A54SX32A-CQ256
RT54SX32-CQ208B	A54SX32A-CQ208
RT54SX32-CQ256B	A54SX32A-CQ256
RT54SX32S-CQ208B	A54SX32A-CQ208
RT54SX32S-CQ208E	A54SX32A-CQ208
RT54SX32S-CQ256B	A54SX32A-CQ256
RT54SX32S-CQ256E	A54SX32A-CQ256
RTSX32SU-CQ84B	A54SX32A-CQ84
RTSX32SU-CQ84E	A54SX32A-CQ84
RTSX32SU-CQ84EV	A54SX32A-CQ84
RTSX32SU-CQ208B	A54SX32A-CQ208
RTSX32SU-CQ208E	A54SX32A-CQ208
RTSX32SU-CQ208EV	A54SX32A-CQ208
RTSX32SU-CQ256B	A54SX32A-CQ256
RTSX32SU-CQ256E	A54SX32A-CQ256
RTSX32SU-CQ256EV	A54SX32A-CQ256
RTSX32SU-CC256M	A54SX32A-FG256
RTSX32SU-CC256B	A54SX32A-FG256
RTSX32SU-CC256E	A54SX32A-FG256
RTSX32SU-CC256EV	A54SX32A-FG256
RT54SX72S-CQ208B	A54SX72A-CQ208
RT54SX72S-CQ208E	A54SX72A-CQ208
RTSX72SU-CQ208B	A54SX72A-CQ208
RTSX72SU-CQ208E	A54SX72A-CQ208
RTSX72SU-CQ208EV	A54SX72A-CQ208
RTSX72SU-CQ256B	A54SX72A-CQ256
RTSX72SU-CQ256E	A54SX72A-CQ256
RTSX72SU-CQ256EV	A54SX72A-CQ256
RTAX250S-CQ208B / RTAX250SL-CQ208B	AX250-CQ208M
RTAX250S-CQ208E / RTAX250SL-CQ208E	AX250-CQ208M
RTAX250S-CQ208EV / RTAX250SL-CQ208EV	AX250-CQ208M
RTAX250S-CQ352B / RTAX250SL-CQ352B	AX250-CQ352M
RTAX250S-CQ352E / RTAX250SL-CQ352E	AX250-CQ352M
RTAX250S-CQ352EV / RTAX250SL-CQ352EV	AX250-CQ352M
RTAX250S-CG624B / RTAX250SL-CG624B	AX250-CG624M
RTAX250S-CG624E / RTAX250SL-CG624E	AX250-CG624M

RadHard/RadTolerant Device	Commercial Equivalent Device
RTAX250S-CG624EV / RTAX250SL-CG624EV	AX250-CG624M
RTAX1000S-CQ352B / RTAX1000SL-CQ352B	AX1000-CQ352M
RTAX1000S-CQ352E / RTAX1000SL-CQ352E	AX1000-CQ352M
RTAX1000S-CQ352EV / RTAX1000SL-CQ352EV	AX1000-CQ352M
RTAX1000S-CGB624B / RTAX1000SL-CGB624B	AX1000-CGB624M
RTAX1000S-CGB624E / RTAX1000SL-CGB624E	AX1000-CGB624M
RTAX1000S-CGB624EV / RTAX1000SL-CGB624EV	AX1000-CGB624M
RTAX1000S-CGS624B / RTAX1000SL-CGS624B	AX1000-CGS624M
RTAX1000S-CGS624E / RTAX1000SL-CGS624E	AX1000-CGS624M
RTAX1000S-CGS624EV / RTAX1000SL-CGS624EV	AX1000-CGS624M
RTAX1000S-LG624B / RTAX1000SL-LG624B	AX1000-LG624M
RTAX1000S-LG624E / RTAX1000SL-LG624E	AX1000-LG624M
RTAX1000S-LG624EV / RTAX1000SL-LG624EV	AX1000-LG624M
RTAX2000S-CQ256B / RTAX2000SL-CQ256B	AX2000-CQ256M
RTAX2000S-CQ256E / RTAX2000SL-CQ256E	AX2000-CQ256M
RTAX2000S-CQ256EV / RTAX2000SL-CQ256EV	AX2000-CQ256M
RTAX2000S-CQ352B / RTAX2000SL-CQ352B	AX2000-CQ352M
RTAX2000S-CQ352E / RTAX2000SL-CQ352E	AX2000-CQ352M
RTAX2000S-CQ352EV / RTAX2000SL-CQ352EV	AX2000-CQ352M
RTAX2000D-CQ352B	RTAX2000D-CQ352PROTO
RTAX2000D-CQ352E	RTAX2000D-CQ352PROTO
RTAX2000D-CQ352EV	RTAX2000D-CQ352PROTO
RTAX2000S-CGB624B / RTAX2000SL-CGB624B	AX2000-CGB624M
RTAX2000S-CGB624E / RTAX2000SL-CGB624E	AX2000-CGB624M
RTAX2000S-CGB624EV / RTAX2000SL-CGB624EV	AX2000-CGB624M
RTAX2000S-CGS624B / RTAX2000SL-CGS624B	AX2000-CGS624M
RTAX2000S-CGS624E / RTAX2000SL-CGS624E	AX2000-CGS624M
RTAX2000S-CGS624EV / RTAX2000SL-CGS624EV	AX2000-CGS624M
RTAX2000S-LG624B / RTAX2000SL-LG624B	AX2000-LG624M
RTAX2000S-LG624E / RTAX2000SL-LG624E	AX2000-LG624M
RTAX2000S-LG624EV / RTAX2000SL-LG624EV	AX2000-LG624M
RTAX2000S-CG1152B / RTAX2000SL-CG1152B	AX2000-FG1152M
RTAX2000S-CG1152E / RTAX2000SL-CG1152E	AX2000-FG1152M
RTAX2000S-CG1152EV / RTAX2000SL-CG1152EV	AX2000-FG1152M
RTAX2000S-LG1152B / RTAX2000SL-LG1152B	AX2000-FG1152M
RTAX2000S-LG1152E / RTAX2000SL-LG1152E	AX2000-FG1152M
RTAX2000S-LG1152EV / RTAX2000SL-LG1152EV	AX2000-FG1152M
RTAX2000D-CGD1272B	RTAX2000D-CGD1272PROTO
RTAX2000D-CGD1272E	RTAX2000D-CGD1272PROTO

RadHard/RadTolerant Device	Commercial Equivalent Device
RTAX2000D-CGD1272EV	RTAX2000D-CGD1272PROTO
RTAX4000S-CG1272B / RTAX4000SL-CG1272B	RTAX4000S-CG1272PROTO
RTAX4000S-CG1272E / RTAX4000SL-CG1272E	RTAX4000S-CG1272PROTO
RTAX4000S-CG1272EV / RTAX4000SL-CG1272EV	RTAX4000S-CG1272PROTO
RTAX4000D-CGD1272B	RTAX4000D-CGD1272PROTO
RTAX4000D-CGD1272E	RTAX4000D-CGD1272PROTO
RTAX4000D-CGD1272EV	RTAX4000D-CGD1272PROTO
RTAX4000S-CQ352B / RTAX4000SL-CQ352B	RTAX4000S-CQ352PROTO
RTAX4000S-CQ352E / RTAX4000SL-CQ352E	RTAX4000S-CQ352PROTO
RTAX4000S-CQ352EV / RTAX4000SL-CQ352EV	RTAX4000S-CQ352PROTO
RTAX4000D-CQ352B	RTAX4000D-CQ352PROTO
RTAX4000D-CQ352E	RTAX4000D-CQ352PROTO
RTAX4000D-CQ352EV	RTAX4000D-CQ352PROTO

Functional Failure Policies

The following are the Microsemi's policies on supporting functional failures.

- The customer is responsible for providing all the design files necessary to perform the failure analysis. This includes, but is not limited to source files (schematic or HDL), Designer database file (*.adb), board schematics, test vectors and testbench, programming files, and timing analysis results. Additional files may be requested by SoC Products Group Technical Support. If any of these files are missing, it may hinder or impede our ability to perform a failure analysis.
- The customer is responsible for providing an adequate description of the failure mode. This includes Silicon Explorer probing results (if available), an explanation of the failure mechanisms along with logic analyzer/scope plots of the failure mode, test methods used, device and board configuration, and any additional information requested by Technical Support. If any of this information is missing, it may hinder or impede our ability to perform a failure analysis.
- If the security fuse is programmed (antifuse FPGAs), then the SoC Products Group will not be able to perform failure analysis. Programming of the security fuse restricts our ability to locate the source of the failure within the device.
- Microsemi's policy in accepting products for failure analysis is conditional to the acceptance of the physical condition of the returned part. No returns shall be accepted if any evidence of tampering or removing sections or layers of the part is evident. Microsemi will not accept a part for failure analysis if the customer has already started his own FA efforts and has changed the physical dimensions or characteristics of the initial device or product.
- All information relating to the failure analysis testing or results of such analysis is considered proprietary and confidential information and shall not be disclosed to other parties without Microsemi's written consent to such disclosure.

Improper programming setup is a potential cause of functional failures. Therefore, the following rules apply:

- The customer must use the latest version of the programming software available at the time of programming. The latest version can be found on the SoC Products Group's website under "Software Updates" (<http://www.microsemi.com/soc/custsup/updates/index.html>). If Microsemi discovers that the functional failures were caused by the use of an old version of programming software, the customer will be liable for all failures.

- The customer must use the latest version of the adapter modules available at the time of programming. The latest version can be found on the SoC Products Group’s website under “Adapter Modules” (http://www.microsemi.com/soc/products/hardware/program_debug/ss/modules.aspx). If Microsemi discovers that the failures were caused by the use of an old version of an adapter module, the customer will be liable for all failures.
- The customer must ensure that all programming hardware is in good, working condition. This requires regular execution of the hardware self-diagnostic test, and maintaining valid calibration of the programming hardware. The self-diagnostic test should be performed before every programming session. As a minimum, the test must be executed every week. Hardware calibration should be performed every 12 months. Information on running the self-diagnostic tests and calibration can be found at http://www.microsemi.com/soc/documents/SiliSculptProgCali_UG.pdf. Microsemi may reject an RMA if the hardware is found to be poorly maintained, and is the cause of the failures.
- The SoC Products Group only tests the programming of Microsemi devices on the FlashPro, Silicon Sculptor, and BP Microsystem programmers. Each release of the Silicon Sculptor and FlashPro, FlashPro Lite, and FlashPro3 software go through a rigorous testing procedure to ensure the best programming yield possible. This test procedure includes programming of devices and functional testing of these devices. Activator and FlashPro programmers (not including FlashPro Lite and FlashPro3/3x) are discontinued. Software updates are no longer offered for these programmers, however software support for the FlashPro programmer will continue.
- Microsemi does not test programming solutions from any other vendor, and cannot guarantee programming yield. Microsemi accepts programming failure RMAs up to the allowed fallout, but reserves the right to reject any RMA requests if the fallout is excessive. Microsemi will not perform failure analysis on devices programmed by hardware from other vendors.

List of Changes

The following table list critical changes that were made in each revision of the document.

Revision	Change	Page
Revision 4 (October 2011)	The programming yield for A54SX32A and A54SX72A devices was changed from 70% or better to 85% or better. Table 3: SX32A and SX72A (all speed grades) Maximum Allowed Programming Failures was updated accordingly.	3
	The Silicon Sculptor Device Support section was revised to state that software support for the Silicon Sculptor I and Silicon Sculptor 6X programmers was actively disabled in Silicon Sculptor software v4.70 (August 2007).	5
	Radiation-tolerant (RT) ProASIC3 devices were added to the document. Microsemi accepts 0.5% fallout for RT ProASIC3 devices, regardless of the sample size or volume (SAR 29759).	10
Revision 3 (December 2010)	Updated programming guidelines to reflect current yields for A54SX72A and A54SX32A.	3
	RTAX2000D and RTAX4000D were added to the document and listed in Table 8: Commercial Equivalent Devices.	12
Revision 2 (August 2010)	Added SmartFusion® devices and FlashPro4 to the document. Updated the Silicon Sculptor Device Support section and FlashPro3/3x Device Support sections.	5



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