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Texas Instruments Incorporated

Re: Announcement #001
**Stellaris Flash Susceptibility to Power Cycling
Information Only**

Date: November 25, 2010

Dear Customer:

This is a follow-up informational notification of an issue regarding pre-production devices that are currently offered by Texas Instruments. You are receiving this notification because our records indicate you have purchased or sampled one or more of the affected products.

The items discussed within this announcement are for your information only. Please see the attached details for more information.

For questions regarding this notice, inquiries should be directed to your local Field Sales Representative (FSE), your Field Application Engineer (FAE) or local Business Development Manager (BDM).

Sincerely,

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Announcement Number:	001.01 (follow-up)	Announcement Date:	11/25/2010
Title:	Tempest Device Derivatives: Flash Susceptibility to Power Cycling		

Announcement Details

Texas Instruments strives to provide its customers with the highest quality products and to remain in compliance with our strict quality standards. This is a follow-up to the formal notification that we have identified a Flash Susceptibility to Power Cycling in the Tempest class derivatives listed in the Affected Product section.

The new information in this follow-up is:

- **TI has determined the root cause of the issue.**
- **A permanent design fix is currently under way.**
- **The workaround has been confirmed.**

All of the devices are in pre-production status. The failure has been duplicated and final root cause of the issue has been determined. A permanent design fix is currently under way. The schedule of fixed material shipment will be communicated once available. As previously communicated, we have suspended shipping the Affected Products and are initiating a voluntary Selected Inventory Exchange Process (SIEP). If you determine that this issue negatively affects your application or if you would like to return any affected material from your stock, please work with TI customer service on an RMR for this material. If you determine that the application for which you are using these devices is not likely to be affected by this issue, we are implementing a waiver option to enable you to continue receiving affected devices until new material becomes available.

Texas Instruments appreciates your business and apologizes for any inconvenience this may cause. We stand ready to work with you to minimize any problems and address any concerns that you may have. Feel free to contact us at the contacts listed below, or your field sales representative, if you need more information.

Section Content

- * Flash susceptibility to power cycling description and workaround
- * Customer options
- * Texas Instruments response and recommendation
- * Device fix

Please see Appendix A for a complete list of affected Tempest class devices.

Flash susceptibility to power cycling description:

There is a small risk of flash corruption or device failure on power up after power cycling. Root cause for this issue has been determined as outlined below.

The Tempest family of MCUs are designed to use both 3.3V and 1.2V power supply voltages internally within the device. Functional logic modules called “level shifters” are used to translate signals from the 3.3V voltage domain to the 1.2V voltage domain. In some devices, some of the level shifters have shown a sensitivity to certain 3.3V power supply cycling. The issue occurs when the supply voltage is not fully discharged before being re-energized. Specifically, when V_{DD} is allowed to drop below 700 mV and rises again without going below 200 mV, flash corruption or device failure can occur.

The failure has been traced to the improper conduction of unstable signals through the level shifters. This can cause the logic that controls signals to the flash memory to be placed in an incorrect state, which can result in corruption of the flash memory contents or device failure. This sensitivity is

affected by normal silicon process variation.

It is important to note that the failure is not with the flash memory itself but with the control logic to the flash.

A silicon revision utilizing metal-only layers is in process. This revision will correct the level shifter sensitivity issues, and this will resolve the power cycling issues. The schedule of fixed material shipment will be communicated once available.

Workaround:

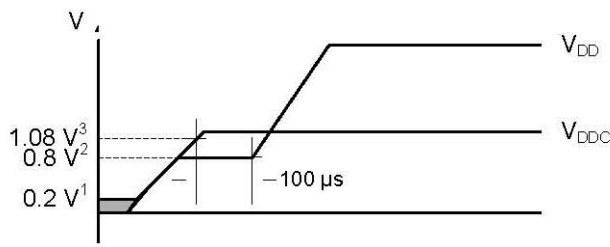
To eliminate the risk of flash corruption, two requirements must be met:

- The ramp of both V_{DD} and V_{DDC} must begin below 0.2 V
- V_{DDC} must reach 1.08 V at least 100 usec before V_{DD} rises from 0.8 V

A workaround circuit has been identified which meets these requirements and is described below. Figure 1 details these requirements and shows how the workaround circuit can meet them.

Normally V_{DDC} is supplied by the device's internal voltage regulator from the LDO output pin. The internal regulator does not meet the V_{DDC} timing requirements, so an external circuit is required. A circuit combining an external 1.2 V regulator, a voltage supervisor and a power switch can be used to ensure that V_{DDC} is always valid before V_{DD} is applied to the microcontroller. The 1.2 V regulator has an integrated Power-OK (POK) circuit that is used to enable V_{DD} when V_{DDC} reaches 1.08 V. During power-down or transient conditions, the POK circuit disables the load switch if V_{DDC} drops below 1.02 V. The load switch has an internal clamp to accelerate V_{DD} decay.

Figure 1. V_{DDC} and V_{DD} Rise Time Relationships



Note 1: Both V_{DD} and V_{DDC} must begin rising from below 0.2 V (200 mV). Note that even though power is not initially applied to the V_{DD} pins by the workaround circuit, the voltage applied to the V_{DDC} pins causes the V_{DD} voltage to rise along with V_{DDC} up to 0.8 V.

Note 2: With the workaround circuit, V_{DD} typically ramps to about 600 mV. V_{DD} must not exceed 800 mV at this stage.

Note 3: V_{DDC} must advance before V_{DD} ; once V_{DDC} reaches 1.08 V, 100 usec must pass before additional voltage is applied to V_{DD} .

When implementing this workaround, it is important to consider all possible power conditions for the system, including:

- Brown-out (momentary sags in the power source)
- Switch and contact bounce
- Other EMI susceptibility tests
- Various battery and power source disturbances

Recommended Voltage Supply Circuit

Two recommended circuits that eliminate the occurrence of this issue are shown below. Although the LDO regulator output is unused in the workaround circuit, a capacitor (1-3 μF) must remain connected for regulator stability. In addition, the LDO pin of the Stellaris device must be disconnected from the external 1.2 V LDO to prevent electronic over stress of the pin. Both of these circuits include two jumpers which provide the option to bypass the workaround circuit for future silicon revisions.

Figure 2 shows a small chip-scale load switch to control V_{DD} . This circuit is suitable for V_{DD} current up to 2 A peak.

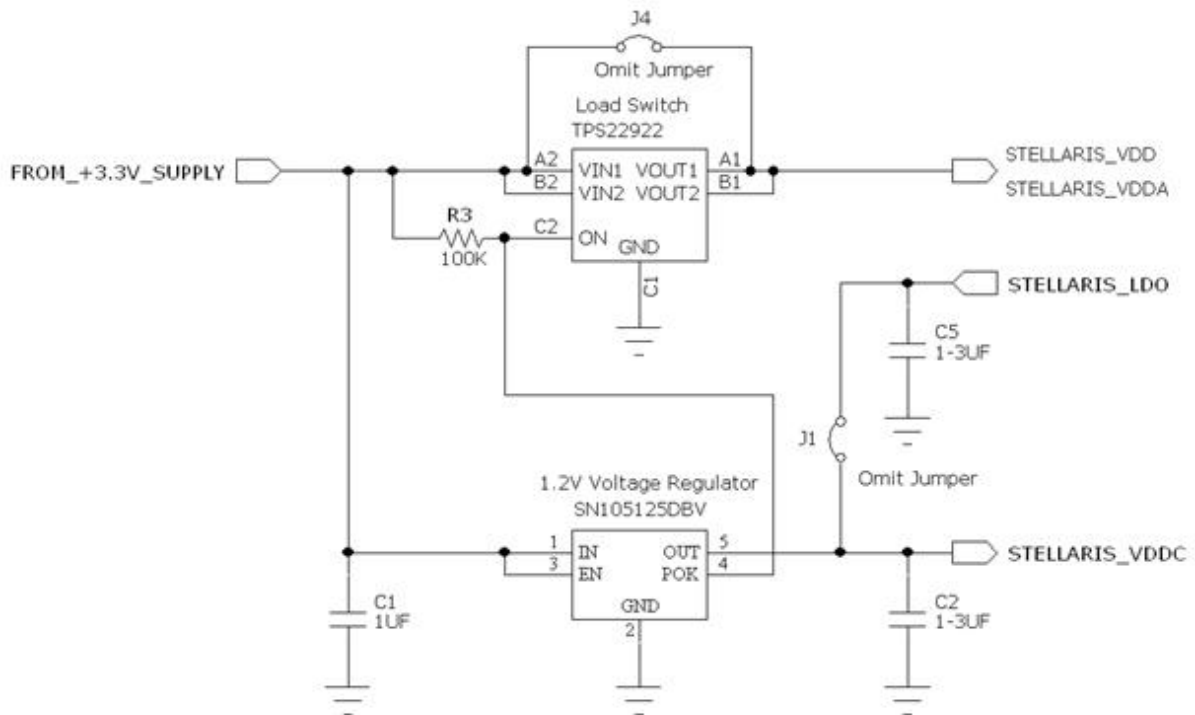
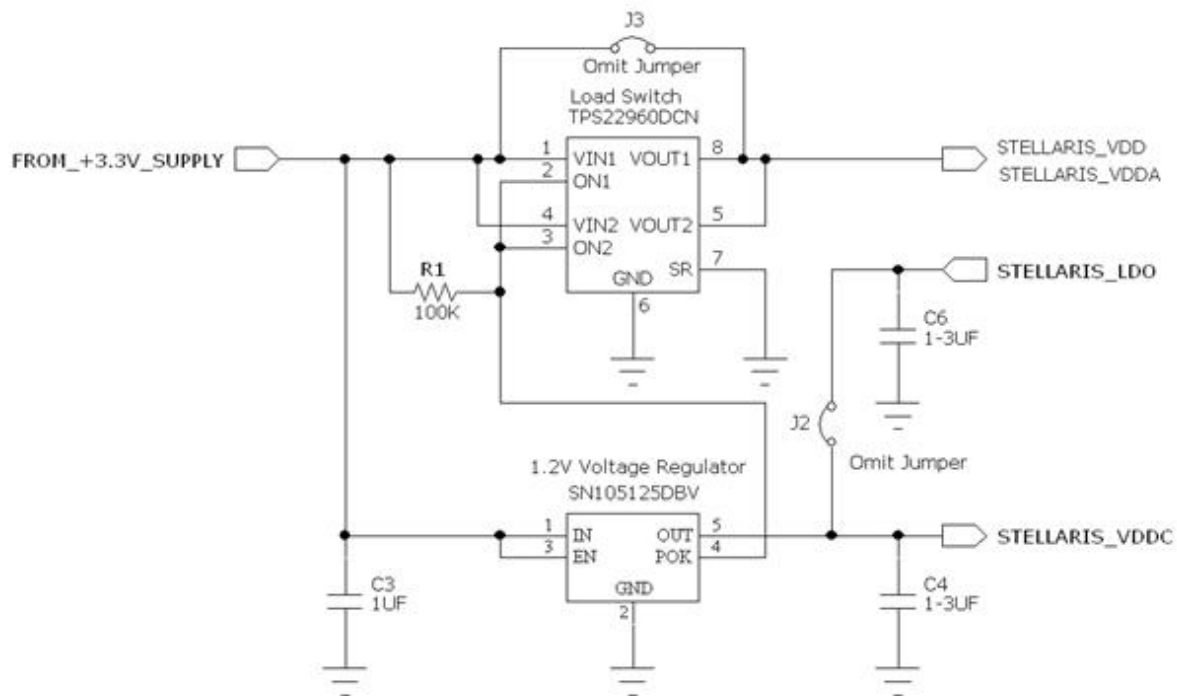


Figure 3 shows a larger SOT-packaged load switch with V_{DD} current capabilities up to 400 mA peak (both channels in parallel).



Silicon Revision Affected:
C1, C3

Customer options:

Option 1:

Line/Field Risk is deemed unacceptable by customer or customer desires to return affected devices and receive fixed replacement devices.

- Return existing inventory
- Work with customer service to RMR this material
- Selected Inventory Exchange Process (SIEP) when new material is available
- Cancel existing orders
- Replace existing order with orders for new material when available

Option 2:

Customer determines that its application is not likely to be negatively affected by this issue or that Line/Field Risk is acceptable (see Note 4).

- Retain current inventory
- Submit Acknowledgement and Additional Waiver Letter to continue receiving current material until new material is available
- Current material will be discontinued once new material becomes available

Note 4: Texas Instruments strongly recommends that affected devices not be used for any safety-critical application in which a failure of the device could result in an injury to persons or property and TI has no liability for any such safety-critical use.

Texas Instruments response and recommendation:

Texas Instruments has suspended production of all current Tempest class devices which are susceptible to this flash susceptibility to power cycling. Texas Instruments recommends that you discontinue use of any material that you have in stock and that you return that material to Texas Instruments. Texas Instruments will provide fixed replacement devices when available. However, if you determine that the application for which you are using these devices is not likely to be affected by this issue, Texas Instruments is willing to work with you to supply affected devices until new material becomes available. Texas Instruments strongly recommends that affected devices not be used for any safety-critical application in which a failure of the device could result in an injury to persons or property and TI has no liability for any such safety-critical use.

Device Fix:

The failure has been duplicated, and final root cause of the issue has been determined. A silicon revision utilizing metal-only layers (Revision C5) is in process. This revision will correct the level shifter sensitivity issues, and this will resolve the power cycling issues. The schedule of fixed material shipment will be communicated once available. If you would like additional contacts within your company to receive updates, please send an email request to lmi_marketing@list.ti.com.

Product Affected:**Table 1. For all listed part numbers, affected silicon includes Revisions “C1” and “C3”**

LM3S1621-IBZ80-C3	LM3S1621-IBZ80-C3T	LM3S1621-IQC80-C3	LM3S1621-IQC80-C3T
LM3S1651-IBZ80-C3	LM3S1651-IBZ80-C3T	LM3S1651-IQC80-C3	LM3S1651-IQC80-C3T
LM3S1811-IBZ50-C3	LM3S1811-IBZ50-C3T	LM3S1811-IQC50-C3	LM3S1811-IQC50-C3T
LM3S1B21-IBZ80-C3	LM3S1B21-IBZ80-C3T	LM3S1B21-IQC80-C3	LM3S1B21-IQC80-C3T
LM3S1J11-IBZ50-C3	LM3S1J11-IBZ50-C3T	LM3S1J11-IQC50-C3	LM3S1J11-IQC50-C3T
LM3S1N11-IBZ50-C3	LM3S1N11-IBZ50-C3T	LM3S1N11-IQC50-C3	LM3S1N11-IQC50-C3T
LM3S1P51-IBZ80-C3	LM3S1P51-IBZ80-C3T	LM3S1P51-IQC80-C3	LM3S1P51-IQC80-C3T
LM3S1R21-IBZ80-C3	LM3S1R21-IBZ80-C3T	LM3S1R21-IQC80-C3	LM3S1R21-IQC80-C3T
LM3S2793-IBZ80-C3	LM3S2793-IBZ80-C3T	LM3S2793-IQC80-C3	LM3S2793-IQC80-C3T
LM3S2B93-IBZ80-C3	LM3S2B93-IBZ80-C3T	LM3S2B93-IQC80-C3	LM3S2B93-IQC80-C3T
LM3S5651-IBZ80-C3	LM3S5651-IBZ80-C3T	LM3S5651-IQC80-C3	LM3S5651-IQC80-C3T
LM3S5791-IBZ80-C3	LM3S5791-IBZ80-C3T	LM3S5791-IQC80-C3	LM3S5791-IQC80-C3T
LM3S5951-IBZ80-C3	LM3S5951-IBZ80-C3T	LM3S5951-IQC80-C3	LM3S5951-IQC80-C3T
LM3S5B91-IBZ80-C3	LM3S5B91-IBZ80-C3T	LM3S5B91-IQC80-C3	LM3S5B91-IQC80-C3T
LM3S5K31-IBZ80-C3	LM3S5K31-IBZ80-C3T	LM3S5K31-IQC80-C3	LM3S5K31-IQC80-C3T
LM3S5P31-IBZ80-C3	LM3S5P31-IBZ80-C3T	LM3S5P31-IQC80-C3	LM3S5P31-IQC80-C3T
LM3S5P51-IBZ80-C3	LM3S5P51-IBZ80-C3T	LM3S5P51-IQC80-C3	LM3S5P51-IQC80-C3T
LM3S5R31-IBZ80-C3	LM3S5R31-IBZ80-C3T	LM3S5R31-IQC80-C3	LM3S5R31-IQC80-C3T
LM3S9781-IBZ80-C3	LM3S9781-IBZ80-C3T	LM3S9781-IQC80-C3	LM3S9781-IQC80-C3T
LM3S9790-IBZ80-C3	LM3S9790-IBZ80-C3T	LM3S9790-IQC80-C3	LM3S9790-IQC80-C3T
LM3S9792-IBZ80-C3	LM3S9792-IBZ80-C3T	LM3S9792-IQC80-C3	LM3S9792-IQC80-C3T
LM3S9997-IBZ80-C3	LM3S9997-IBZ80-C3T	LM3S9997-IQC80-C3	LM3S9997-IQC80-C3T
LM3S9B81-IBZ80-C3	LM3S9B81-IBZ80-C3T	LM3S9B81-IQC80-C3	LM3S9B81-IQC80-C3T
LM3S9B90-IBZ80-C3	LM3S9B90-IBZ80-C3T	LM3S9B90-IQC80-C3	LM3S9B90-IQC80-C3T
LM3S9B92-IBZ80-C3	LM3S9B92-IBZ80-C3T	LM3S9B92-IQC80-C3	LM3S9B92-IQC80-C3T
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LM3S1816-IQR50-C3	LM3S1816-IQR50-C3T		
LM3S1J16-IQR50-C3	LM3S1J16-IQR50-C3T		
LM3S1N16-IQR50-C3	LM3S1N16-IQR50-C3T		
LM3S1W16-IQR50-C3	LM3S1W16-IQR50-C3T		
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LM3S3W26-IQR50-C3	LM3S3W26-IQR50-C3T		
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LM3S1R26-IQR80-C3	LM3S1R26-IQR80-C3T		
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LM3S1621-IBZ80-C1	LM3S1621-IBZ80-C1T	LM3S1621-IQC80-C1	LM3S1621-IQC80-C1T
LM3S1651-IBZ80-C1	LM3S1651-IBZ80-C1T	LM3S1651-IQC80-C1	LM3S1651-IQC80-C1T
LM3S1811-IBZ50-C1	LM3S1811-IBZ50-C1T	LM3S1811-IQC50-C1	LM3S1811-IQC50-C1T
LM3S1B21-IBZ80-C1	LM3S1B21-IBZ80-C1T	LM3S1B21-IQC80-C1	LM3S1B21-IQC80-C1T
LM3S1J11-IBZ50-C1	LM3S1J11-IBZ50-C1T	LM3S1J11-IQC50-C1	LM3S1J11-IQC50-C1T
LM3S1N11-IBZ50-C1	LM3S1N11-IBZ50-C1T	LM3S1N11-IQC50-C1	LM3S1N11-IQC50-C1T
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LM3S9792-IBZ80-C1	LM3S9792-IBZ80-C1T	LM3S9792-IQC80-C1	LM3S9792-IQC80-C1T
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LM3S1J16-IQR50-C1	LM3S1J16-IQR50-C1T		
LM3S1N16-IQR50-C1	LM3S1N16-IQR50-C1T		
LM3S1W16-IQR50-C1	LM3S1W16-IQR50-C1T		
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LM3S5T36-IQR80-C1	LM3S5T36-IQR80-C1T		
LM3S5Y36-IQR80-C1	LM3S5Y36-IQR80-C1T		

For questions regarding this notice, inquiries should be directed to your local Field Sales Representative (FSE), your Field Application Engineer (FAE) or local Business Development Manager (BDM).