Issue 26 August 2011

InfoTracks

Semitracks Monthly Newsletter

New Semitracks Blog!

In order to keep our readers better up-to-date and informed, Semitracks Inc. has launched its new blog!

Read more, Page 3

Capacitance-Voltage Plotting, Part II

By Christopher Henderson

Continued from July's Newsletter

Let's discuss deep depletion in ideal MOS structures for a moment. The CV plot (shown on the following page) is a high frequency plot showing the difference regular and deep depletion. Deep depletion occurs when the supply of minority carriers cannot keep up with the sweep rate. The depletion is deeper than at steady-state. To satisfy neutrality, the depletion width expands deeper, exposing more bulk charge. The capacitance in the silicon decreases to the point where it decreases below the steady-state condition. The capacitance relaxes with time toward steady-state. This relaxation is a measure of bulk and surface quality. There are several applications for this. The first application is characterization. The relaxation is a measure of bulk and surface quality. A long relaxation time equals a long lifetime which indicates less defects. The second application is devices which take advantage of the effect. The most important is charge-coupled devices, or CCD's. CCD's consist of closely-spaced MOS structures. The magnitude of inversion charge is the signal. It can vary from 0 in deep depletion to a maximum value associated with accumulation. The charge is sequentially transferred from one MOS to the other. In imaging CCDs, the charge is generated by incident light.

Continued on Page 2

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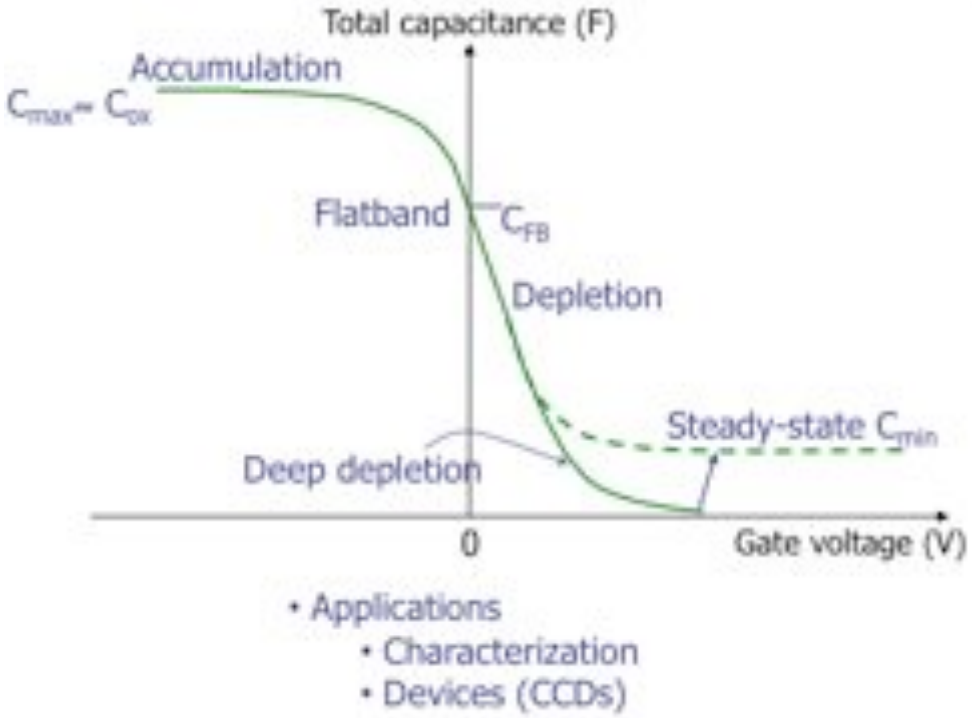

Fig. 4. Deep depletion in MOS structures.

August 29, 2011
Boston, Massachusetts

The 6th Annual AMFA is just around the corner! Please plan to attend now, you may register at the door. Semitracks' President Christopher Henderson will be running the event this year.

Learn more about this conference at:
http://www.amfaworkshop.org/

Ask the Experts

Q: I need the actual info on: MSL 2 sample (Rel stress soaking: 85°C/60%RH, 168hrs). Floor life is 1 year under 30°C/60%RH storage. What is the floor life if storage under 30°C/70%RH?

A: The best way to make this calculation is to use Peck's Formula to calculate an acceleration factor.

$$AF = \left(\frac{RH_{Stress}}{RH_{Use}} \right)^{a} e^{E_A/k\left(1/T_{Use} - 1/T_{Stress}\right)}$$

The AF (ratio of TF values, 70%RH/60%RH) = $(RH_{70\%}/RH_{60\%})^{-a}$ * exp([E_a /k](1/ $T_{70\%}$ -1/ $T_{60\%}$])
The temperatures are the same between the two, so only the humidity is a factor. We'll use 2.7 for a (the humidity exponent) – a typical value for this calculation.

AF (70%/60%) = $(70/60)^{2.7}$
AF (70%/60%) = 1.516

So the floor life storage would be 1 year / 1.516 or 0.6595 years (7.914 months) at 70%RH.

To post, read, or answer a question, visit our forums.
We look forward to hearing from you!

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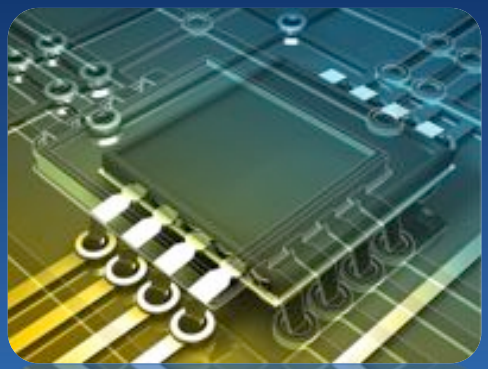

Semitracks has started a blog to keep you up to date on industry developments and items that affect Semiconductor Product Engineering and Reliability. In addition to industry developments, we'll include some short articles on technology items of interest. These may vary from historical items that help place current developments in context, to future developments that are likely to affect the industry. If you have comments or feedback, or topics you would like to see addressed, please feel free to e-mail us at info@semitracks.com.

See it for yourself at:
http://www.semitracks.com/index.php/en/blog

Technical Tidbit: More on MSL 2 Sample Life

Sometimes the floor environment is different than the standard values given of 30°C/60%RH. One must understand how to calculate the correct floor life. Let's work through that calculation for parts that pass MSL 4. The packages have a thickness of <2.1mm, and they will be placed in an environment at 30°C/90%RH.

Example: Parts pass in MSL 4. Floor life in pkg with thickness <2.1mm, under environment 30°C/90%RH, floor life is 0.5 day.

If you look in J-STD-033B in Table 7.1 (Page 21), you should be able to find this part of the figure (bottom part of table). Locate MSL 4 (Level 4), go over to the 90% RH column and locate the row for 30°C. The value reads 1 day, so the recommended total equivalent floor life is 1 day. If you have specified a floor life of 0.5 days, you are within the specification called out by JEDEC J-STD-033B.

		∞	3	2	2	2	2	2	2	2	1	20°C
Body Thickness <2.1 mm including SOICs <18 pins All TQFPs, TSOPs or All BGAs <1 mm body thickness	Level 2a	∞	∞	∞	∞	∞	∞	17	1	0.5	0.5	35°C
		∞	∞	∞	∞	∞	∞	28	1	1	1	30°C
		∞	∞	∞	∞	∞	∞	∞	2	1	1	25°C
		∞	∞	∞	∞	∞	∞	∞	2	2	1	20°C
	Level 3	∞	∞	∞	∞	∞	8	5	1	0.5	0.5	35°C
		∞	∞	∞	∞	∞	11	7	1	1	1	30°C
		∞	∞	∞	∞	∞	14	10	2	1	1	25°C
		∞	∞	∞	∞	∞	20	13	2	2	1	20°C
	Level 4	∞	∞	∞	7	4	3	2	1	0.5	0.5	35°C
		∞	∞	∞	9	5	4	3	1	1	1	30°C
		∞	∞	∞	12	7	5	4	2	1	1	25°C
		∞	∞	∞	17	9	7	6	2	2	1	20°C
	Level 5	∞	∞	7	3	2	2	1	1	0.5	0.5	35°C
		∞	∞	13	5	3	2	2	1	1	1	30°C
		∞	∞	18	6	4	3	3	2	1	1	25°C
		∞	∞	26	8	6	5	4	2	2	1	20°C
	Level 5a	∞	7	2	1	1	1	1	1	0.5	0.5	35°C
		∞	10	3	2	1	1	1	1	1	0.5	30°C
		∞	13	5	3	2	2	2	1	1	1	25°C
		∞	18	6	4	3	2	2	2	2	1	20°C

∞ Represents indefinite exposure time allowed at conditions specified.

To post, read, or answer a question, visit our forums.
We look forward to hearing from you!

Upcoming Courses

IC Packaging Metallurgy

September 12-13, 2011 – Munich, Germany

Wafer Fab Processing

Septermber 26-29, 2011 - Singapore

Failure and Yield Analysis

October 3-6, 2011 – San Jose, CA

Semiconductor Reliability

October 11-13, 2011 – San Jose, CA

PV Technology & Manufacturing

October 20, 2011 – Dallas, TX

Feedback

If you have a suggestion or a comment regarding our courses, online training, discussion forums, or reference materials, or if you wish to suggest a new course or location, please call us at 1-505-858-0454 or e-mail us at info@semitracks.com.

To submit questions to the Q&A section, inquire about an article, or suggest a topic you would like to see covered in the next newsletter, please contact Jeremy Henderson by email at jeremy.henderson@semitracks.com.

We are always looking for ways to enhance our courses and educational materials.

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For more information on Semitracks online training or public courses, visit our website!

http://www.semitracks.com