RadHard Logic Level MOSFETs for Military and Space Applications

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VPT Components

Presentation at the 2026 CMSE

- Welcome to the “Clean Up” Talk

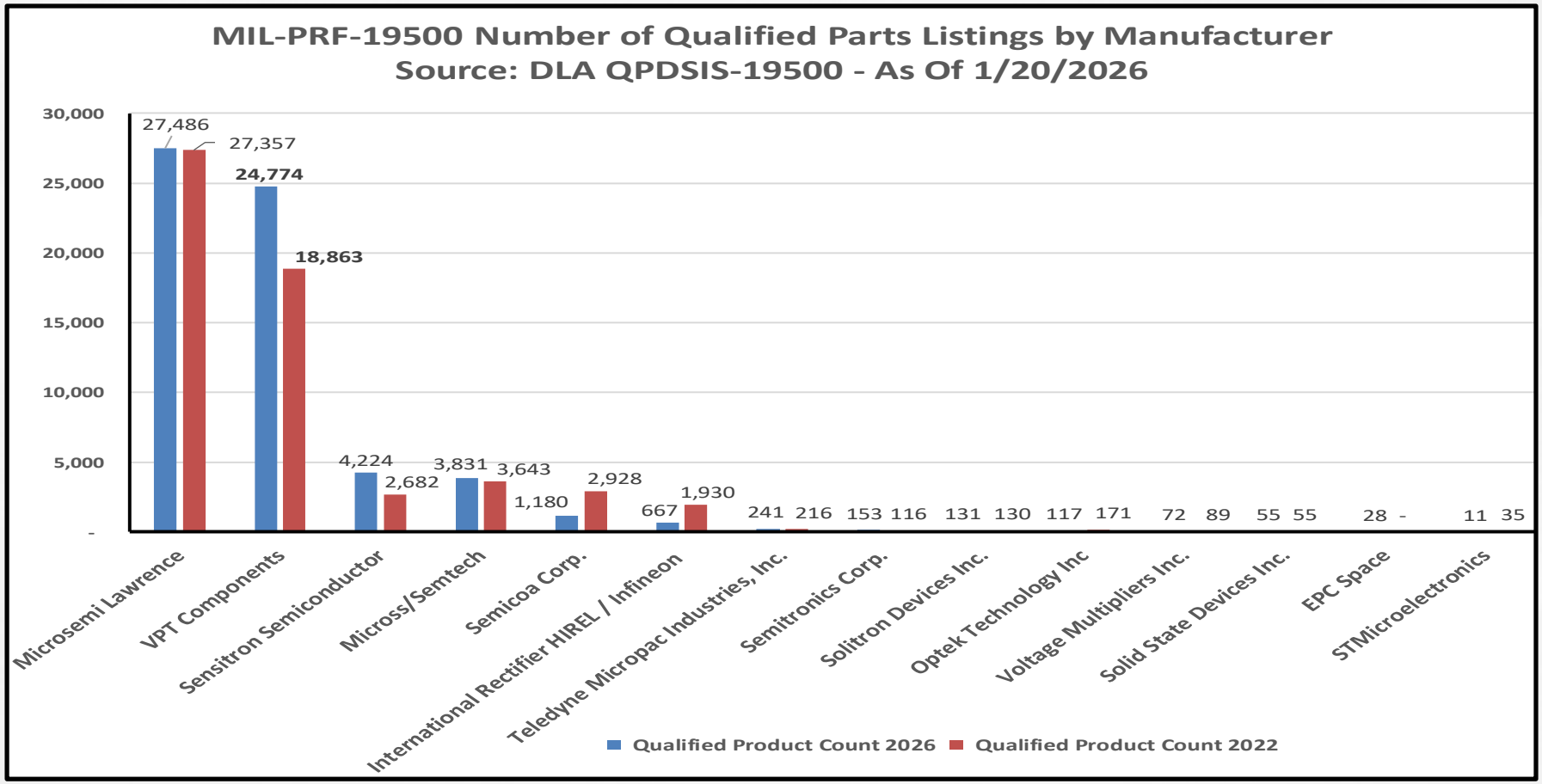
Overview

- Radhard logic-level MOSFETs are used in US Military and Aerospace systems in large quantities and are a vital and necessary component of those systems.
- Logic level MOSFEs are efficient electronic switches controlled directly by low-voltage digital electronics.
- Currently only available from a single source with wafer fabrication outside of the USA.
- VPT Components has developed a radhard logic level MOSFET process that is 100% made in the USA.
- Our demonstration part is a 100V Size 1 MOSFET, but this process can be extended to the 2N7616, which is the most popular radhard logic level part number (UB package).

VPT Components Snapshot

- Second largest supplier of JAN devices by product count
- Long established business (established in 2007 as Hi Rel Components; Acquired by Aeroflex, Cobham and MACOM). Became VPT Components Sept 21st, 2018
- Fully consolidated completely refurbished state-of-the-art 50,000 sq ft facility in Lawrence, Massachusetts
- DLA certified to MIL-PRF-19500 and MIL-PRF-38535 with JANS diode line certified December 2009 and JANS and JANSR transistor/SCR line certified March 2012.

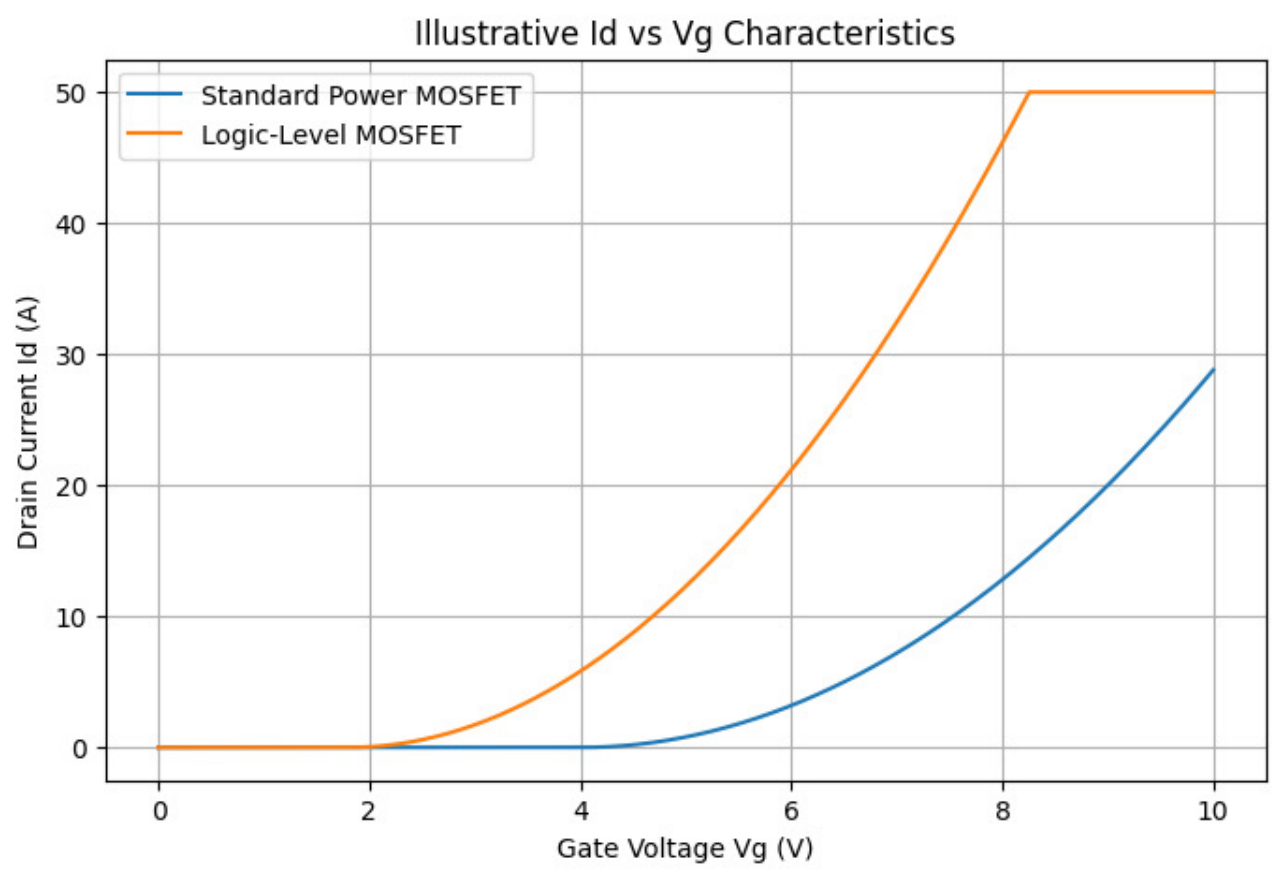
Parts on QPL


MIL-PRF-19500 Number of Qualified Parts Listings by Manufacturer
Source: DLA QPDSIS-19500 - As Of 1/20/2026
30,000
25,000
20,000
15,000
10,000
5,000
-
27,486
27,357
24,774
18,863
4,224
2,682
3,831
3,643
1,180
2,928
667
1,930
241
216
153
116
131
130
117
171
72
89
55
55
28
-
11
35
Microsemi Lawrence
VPT Components
Sensitron Semiconductor
Micross/Semtech
Semicoa Corp.
International Rectifier HIREL / Infineon
Teledyne Micropac Industries, Inc.
Semitronics Corp.
Solitron Devices Inc.
Optek Technology Inc
Voltage Multipliers Inc.
Solid State Devices Inc.
EPC Space
STMicroelectronics
Qualified Product Count 2026
Qualified Product Count 2022

RadHard Logic Level MOSFET Development

- What makes a logic-level MOSFET different than a “standard” power MOSFET is that the part is near saturation at Vgs=4.5V while the standard value is Vgs=12V
- Therefore RDSon (key metric for MOSFETs) is specified at Vgs=4.5V instead of 12V making it necessary to lower Vth and sharpen the turn-on characteristics.
- Logic level MOSFETs are perfect for switching low voltages such as DC/DC converters and battery-powered electronics. They can not be used for high voltage applications (VDS≥200V) or any “noisy” application like a motor driver.

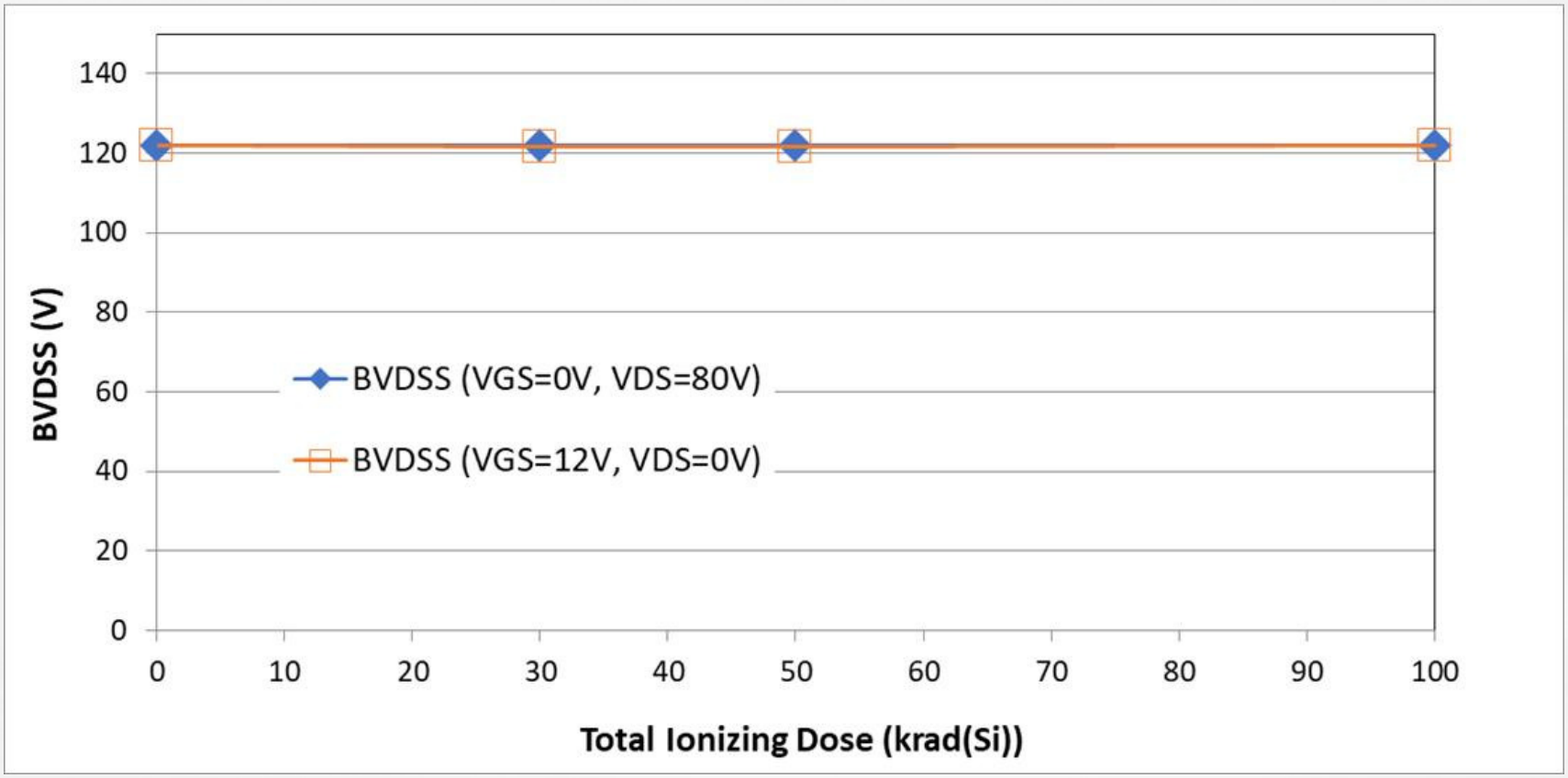
Id vs Vg Characteristics Standard Power MOSFET vs Logic Level MOSFET



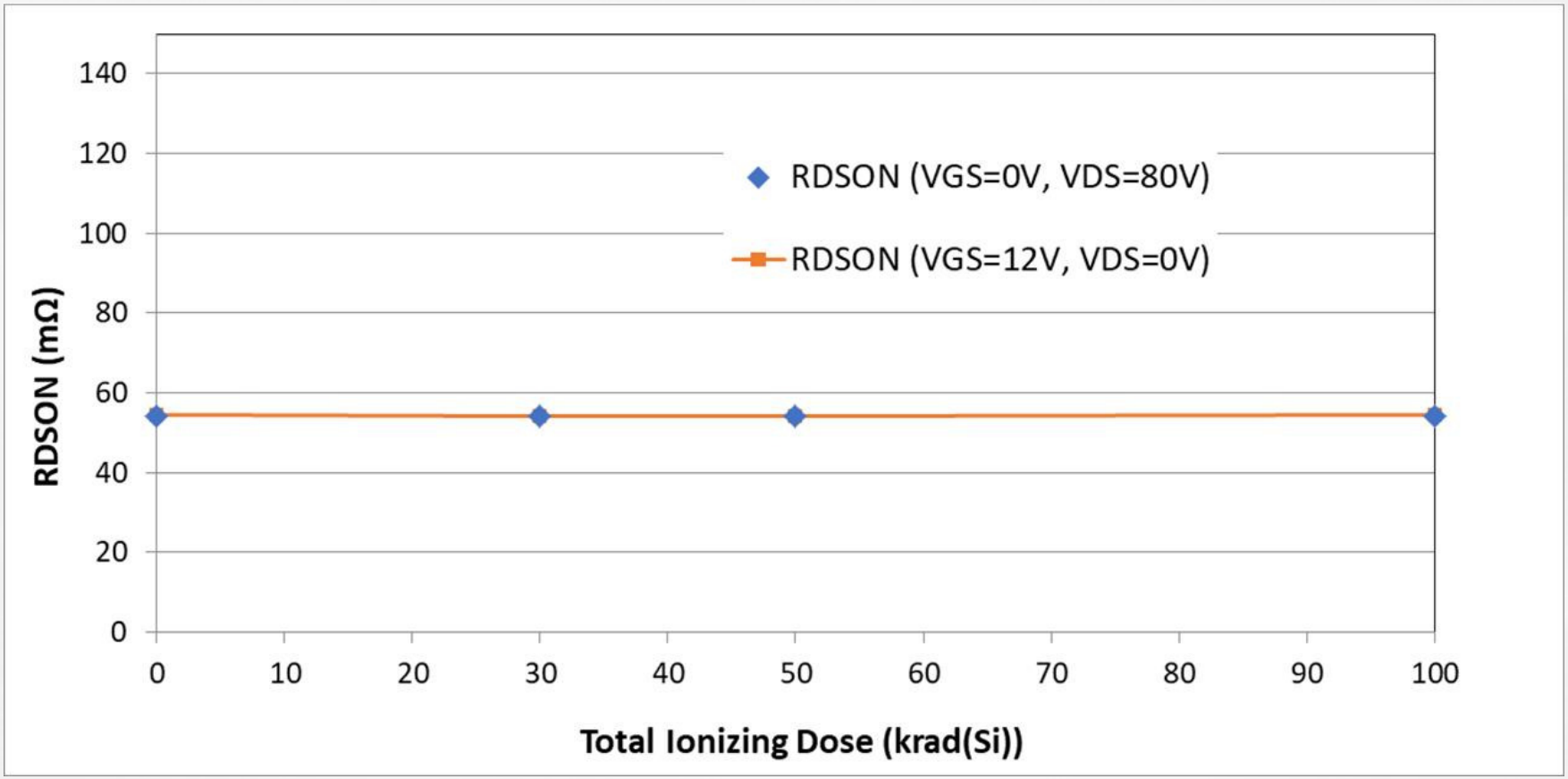
Challenge of Radiation Hardening Logic Level MOSFETs

- While “standard” devices specify Vth from 2V-4V, logic level MOSFETs specify Vth from 1V to 2V.
- The challenge is that radiation damage affects Vth more than any other parameter, therefore it is critical to optimize the radiation hardness of the gate oxide.
- A radiation hardened gate oxide needs very specialized process conditions to minimize hole traps.

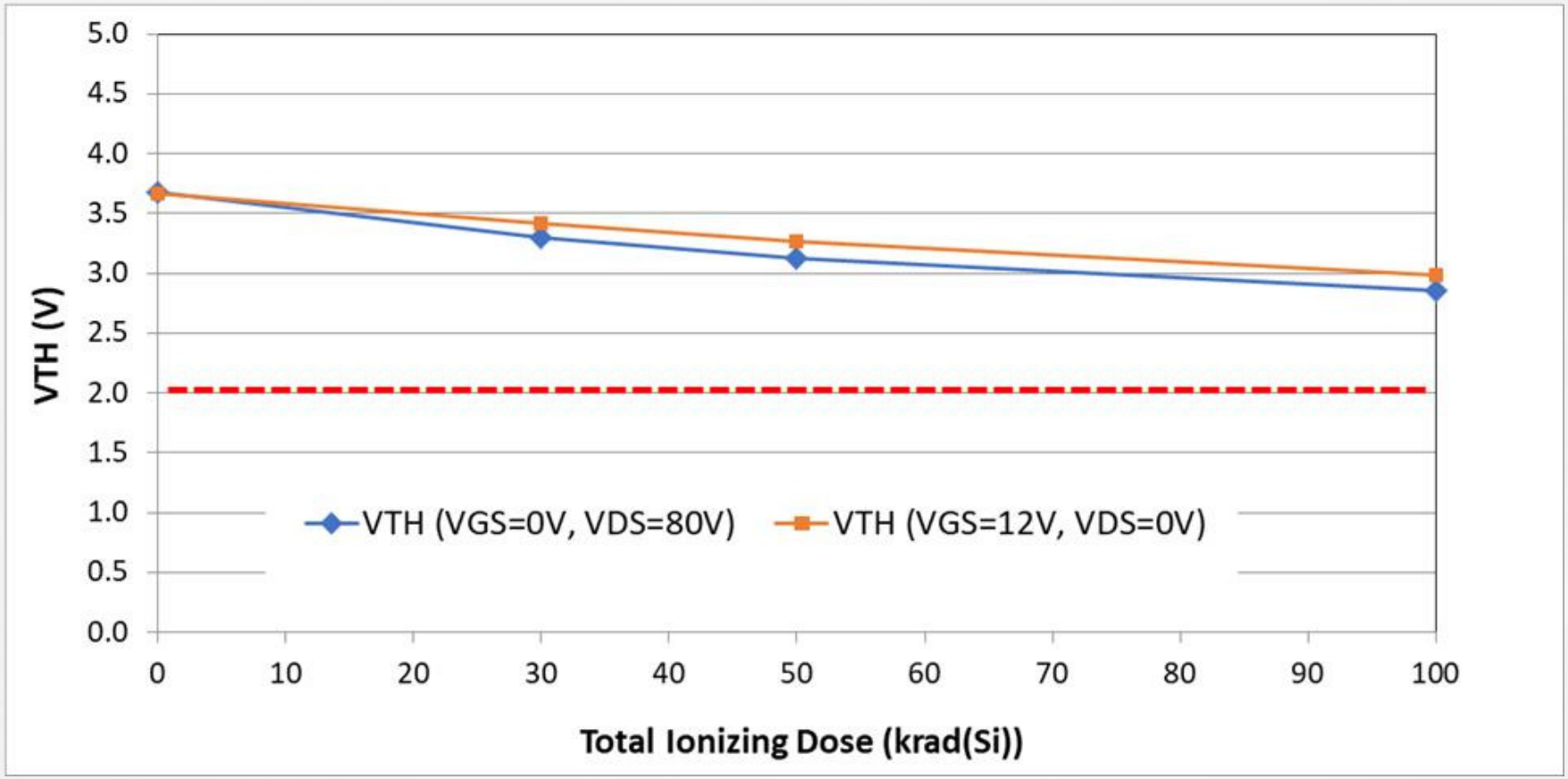
“Standard” MOSFET TID Results (BVDSS)



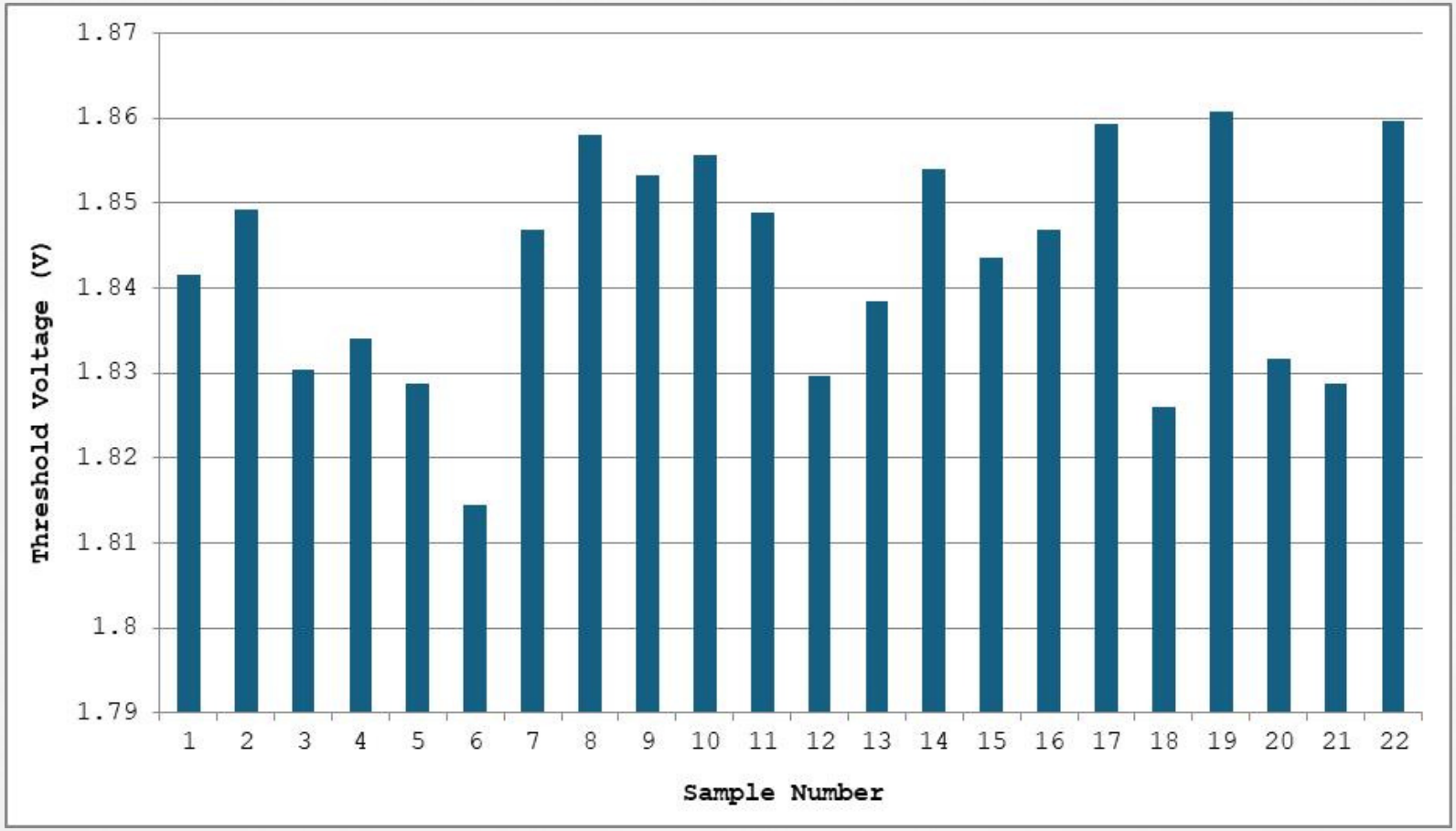
“Standard” MOSFET TID Results (RDSON)



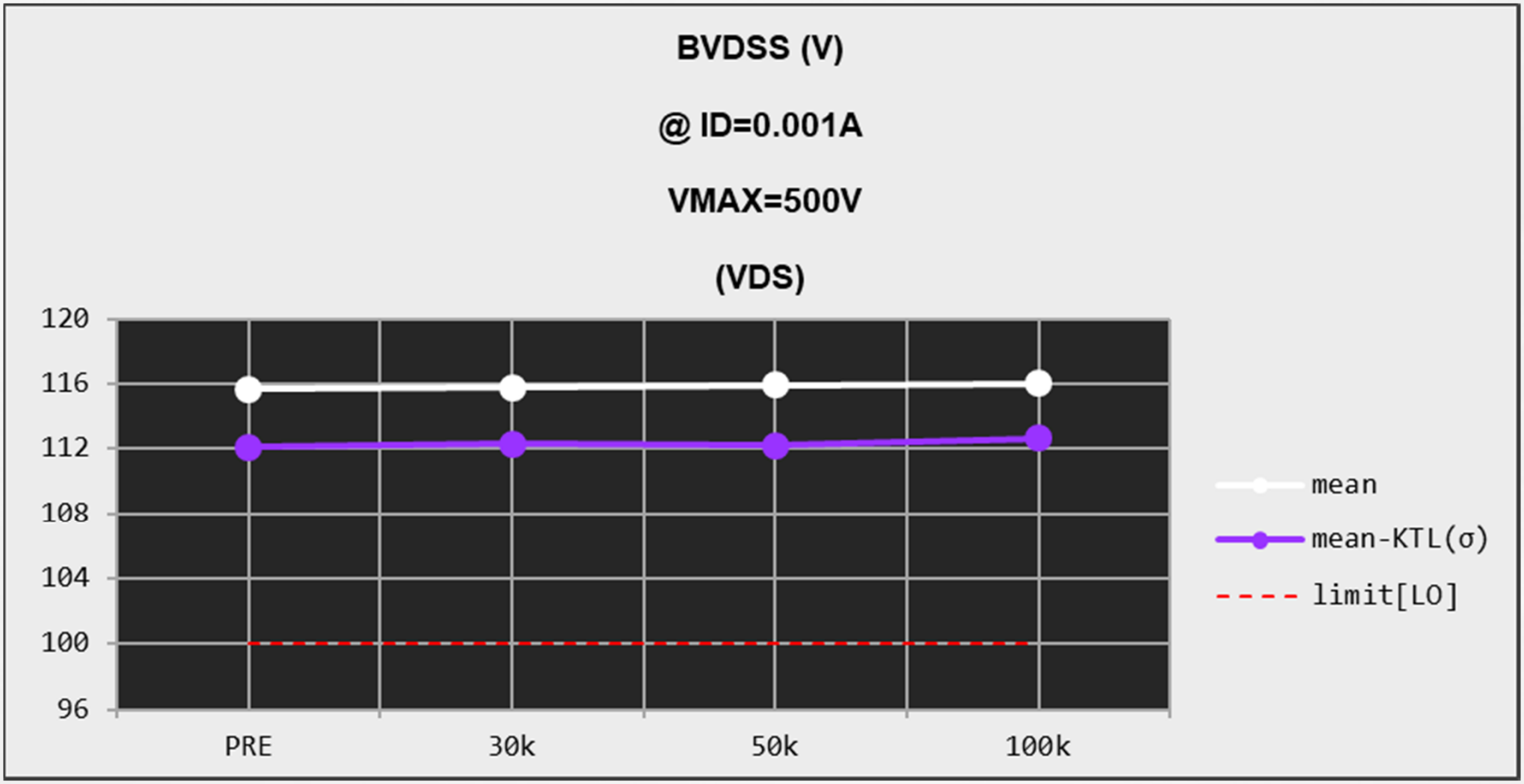
“Standard” MOSFET TID Results (VTH)



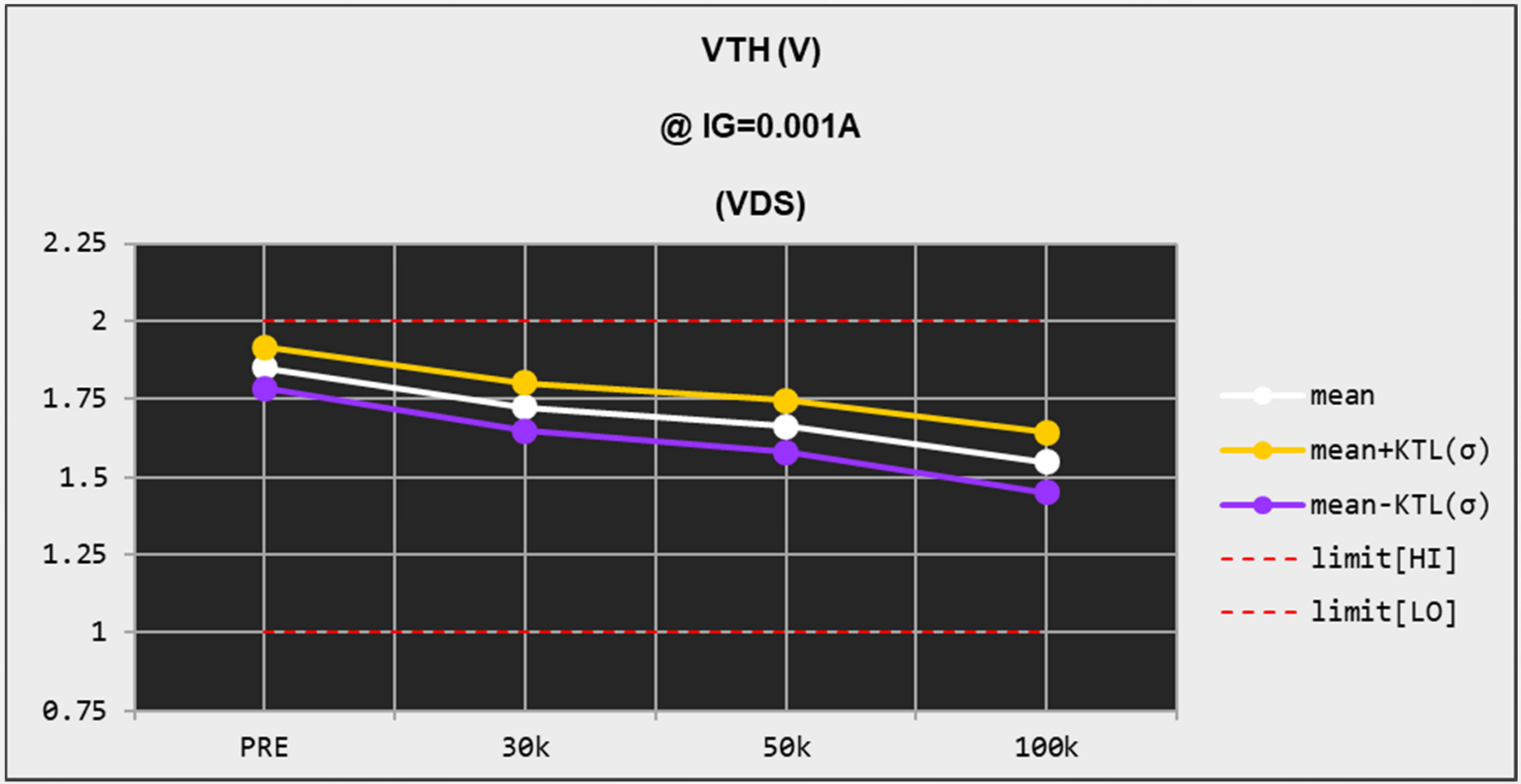
RAD7110LL MOSFET Die (Vth)



RAD7110LL MOSFET TID Results



RAD7110LL MOSFET TID Results



Summary/Conclusion

1. We developed a custom radhard logic-level MOSFET process flow “100% Made in the USA”
2. The device passed 100krad(Si) TID
3. The process and epi passed ~60MeV-cm2/mg Xe (15MeV/n) beam at full rated VDS with no SEB/SEGR

NEXT STEP: Shrink the die to fit in a UB package and meet the 2N7616 Slash Sheet