ON Semiconductor®

Diode Forward Voltage Spread

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Background

- Maintain Power Signature Balance
- Pairset Power Balance

Tested Devices

- MBR1H100SF 100V, 1A Schottky
- MBRS2H100 100V, 2A Schottky
- MBRS1100 100V, 2A Schottky
- SBRS81100 100V, 2A Schottky, Auto

Test Methodology (Low Power)

Vf test inserted in production testing

- 5 mA (212.5/285 mW @ 42.5/57V)
- 10 mA (425/570 mW @ 42.5/57V)
- 20 mA (850/1140 mW @ 42.5/57V)

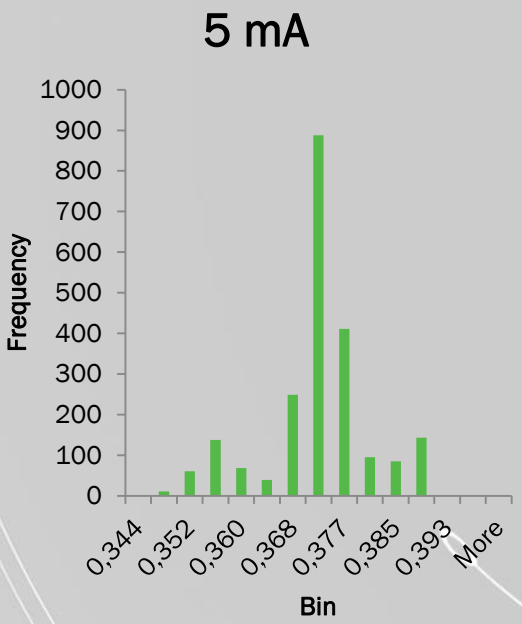
Devices (Low Power)

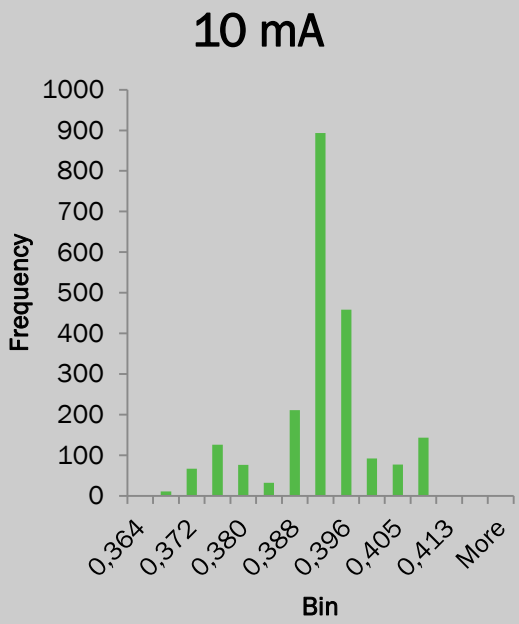
- MBR1H100SF 2188
- MBRS2H100 410
- MBRS1100 65021
- SBRS81100 4038

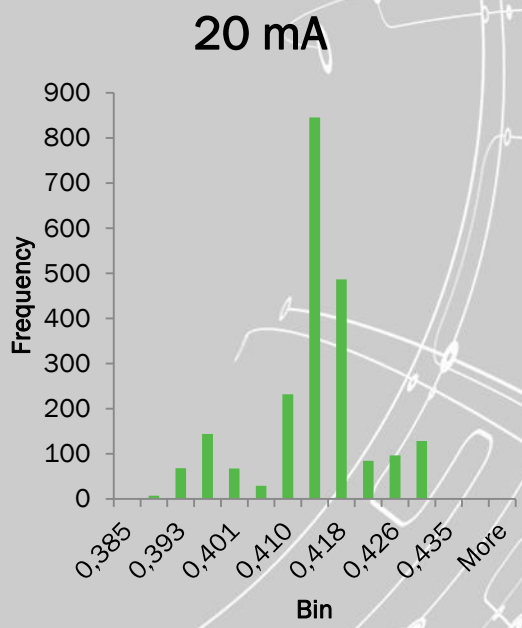
Low Power Summary

			Part Number			
			MBR1H100SF	MBRS2H100	MBRS1100	SBRS81100
VF @ IF =	5mA	Ave	0,371	0,318	0,335	0,339
		Std Dev	0,008	0,003	0,004	0,011
		Min	0,344	0,310	0,205	0,252
		Max	0,389	0,330	0,346	0,354
	10mA	Ave	0,390	0,337	0,355	0,359
		Std Dev	0,008	0,003	0,004	0,011
		Min	0,364	0,328	0,224	0,270
		Max	0,412	0,349	0,366	0,372
	20mA	Ave	0,412	0,356	0,376	0,380
		Std Dev	0,008	0,003	0,004	0,011
		Min	0,387	0,348	0,242	0,290
		Max	0,455	0,368	0,388	0,394
		Max ΔV	0.068	0.020	0.146	0.104
		# Devices	2188	410	65021	4038

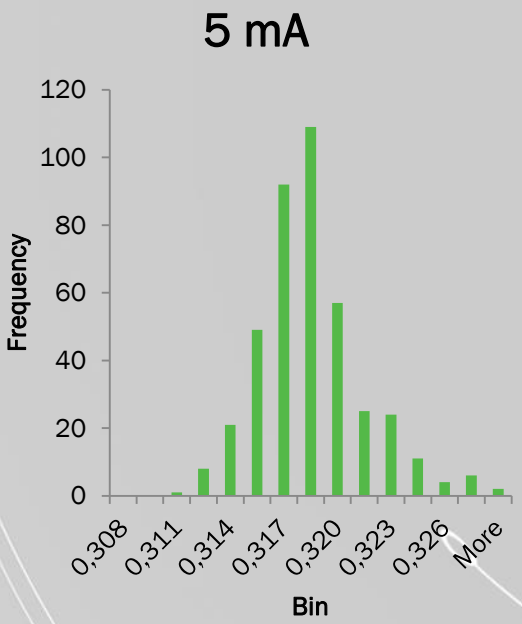
MBR1H100SFT3G

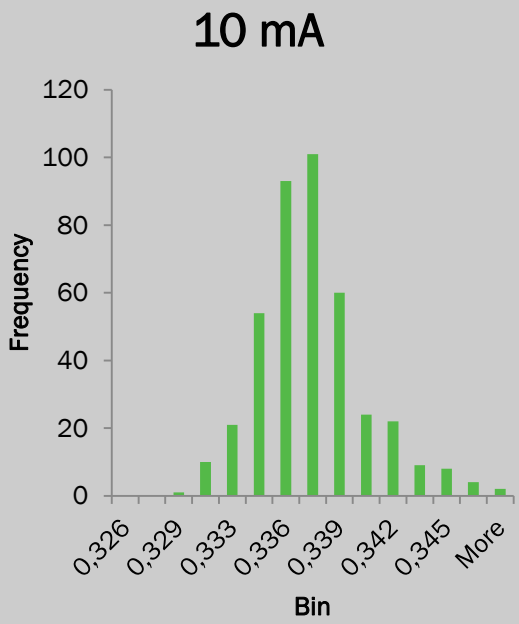


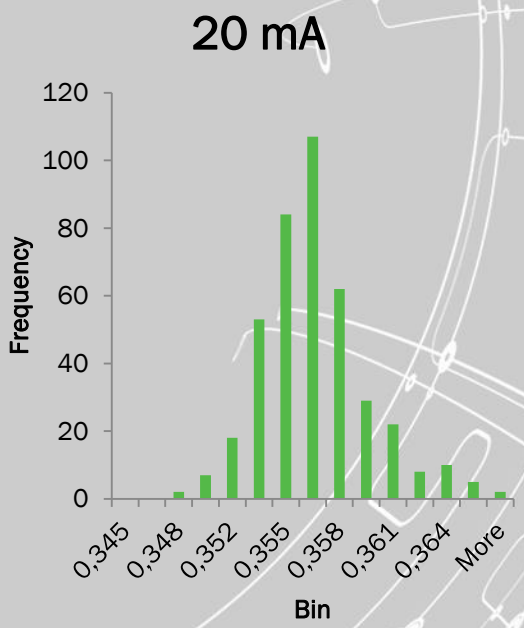




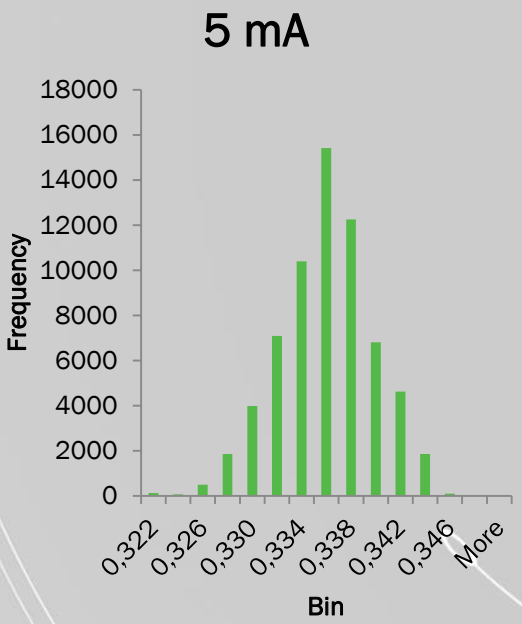
MBRS2H100T3G

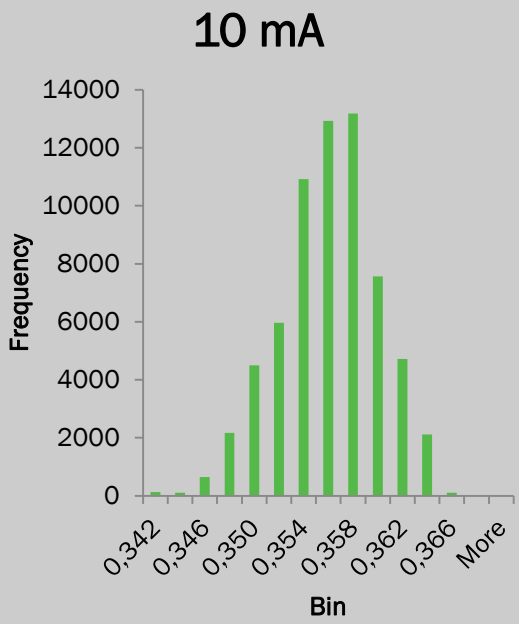


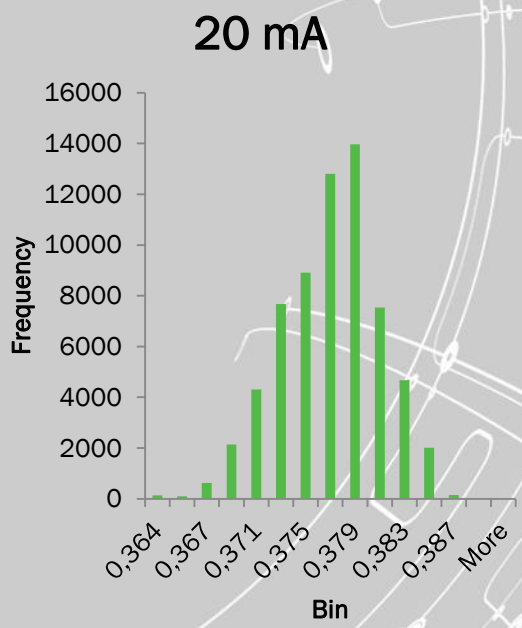




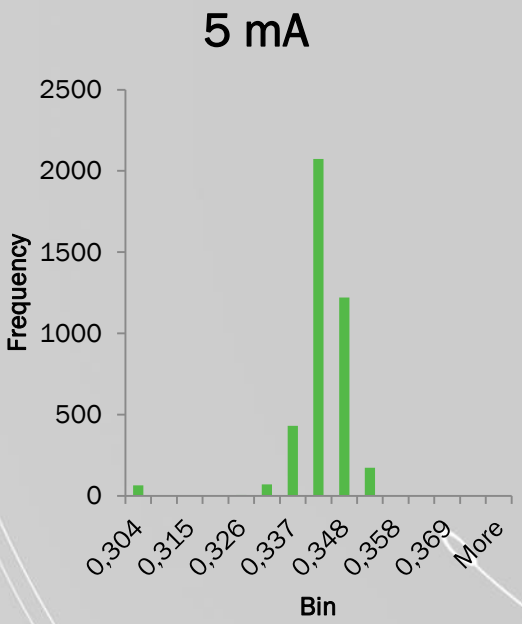
MBRS1100T3G

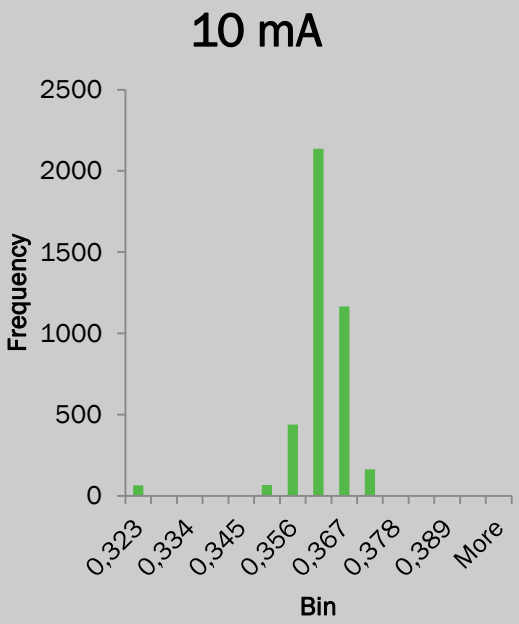






SBRS81100T3G





Influence on Pairset Balance

$\Delta I/I = 2\Delta V/I/R\_pairset$

R_pairset includes cable, magnetics, etc..

Example: 10mA, worst case, R_pairset = 1Ω

$\Delta I/I = 2*142\ mV/10mA/1 = 28.4$

Test Methodology (High Power)

Vf test in production testing

- 1A (42.5/57W @ 42.5/57V)
- 2A (85W/114W @ 42.5/57V)

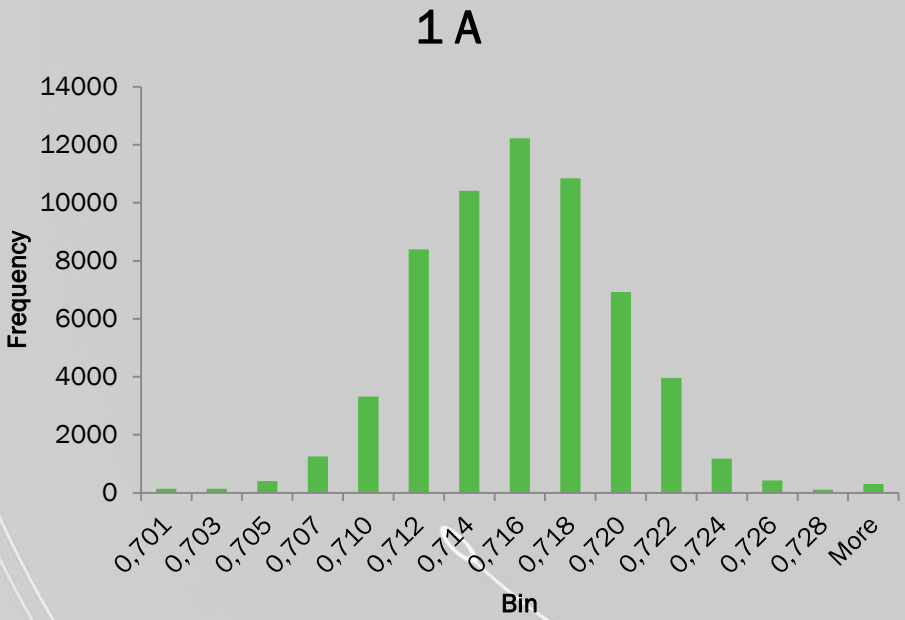
Devices (High Power)

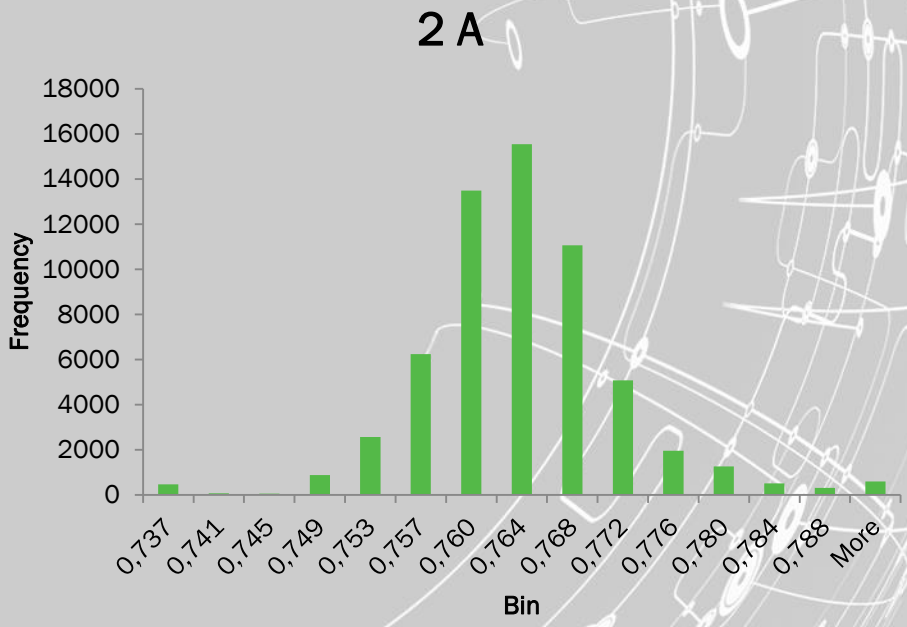
- MBR1H100SF 60014
- MBRS2H100 6355
- MBRS1100 32480
- SBRS81100 53169

High Power Summary

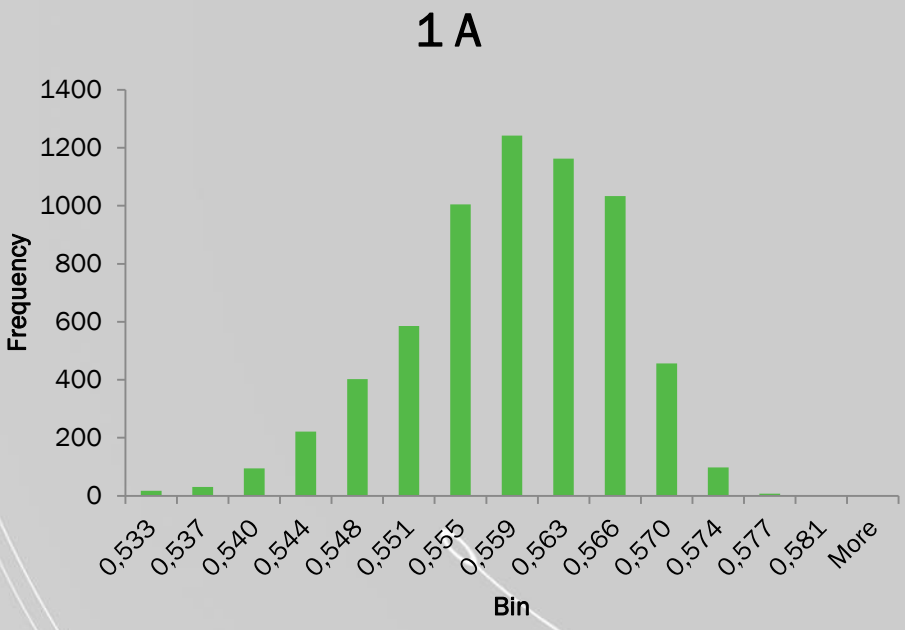
			Part Number			
			MBR1H100SF	MBRS2H100	MBRS1100	SBRS81100
VF @ IF =	1 A	Ave	0,715	0,557	0,675	0,684
		Std Dev	0,00417	0,00737	0,00381	0,00495
		Min	0,6784	0,5224	0,6448	0,6472
		Max	0,7388	0,5772	0,7116	0,7128
	2 A	Ave	0,762	0,650		
		Std Dev	0,00791	0,00734		
		Min	0,7016	0,6212		
		Max	0,8096	0,6716		
		Max ΔV	0.108	0.0548	0.0668	0.0656
		# Devices	60014	6355	32480	53169

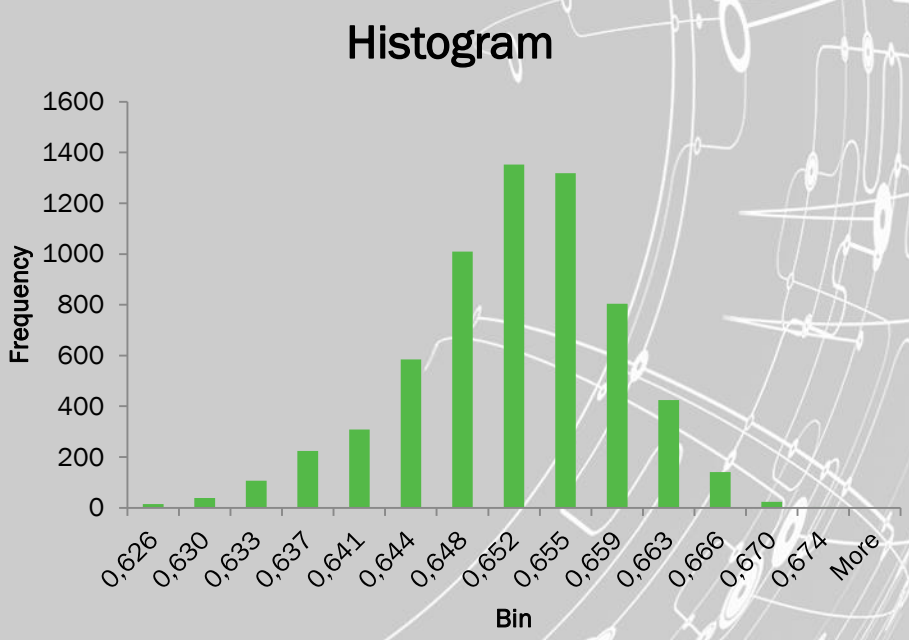
MBR1H100SFT3G





MBRS2H100T3G





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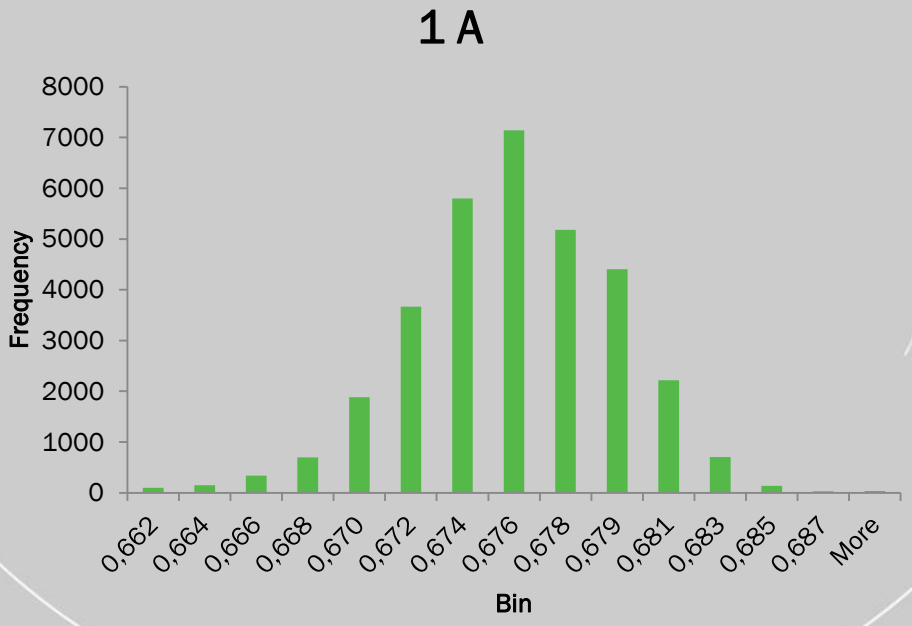
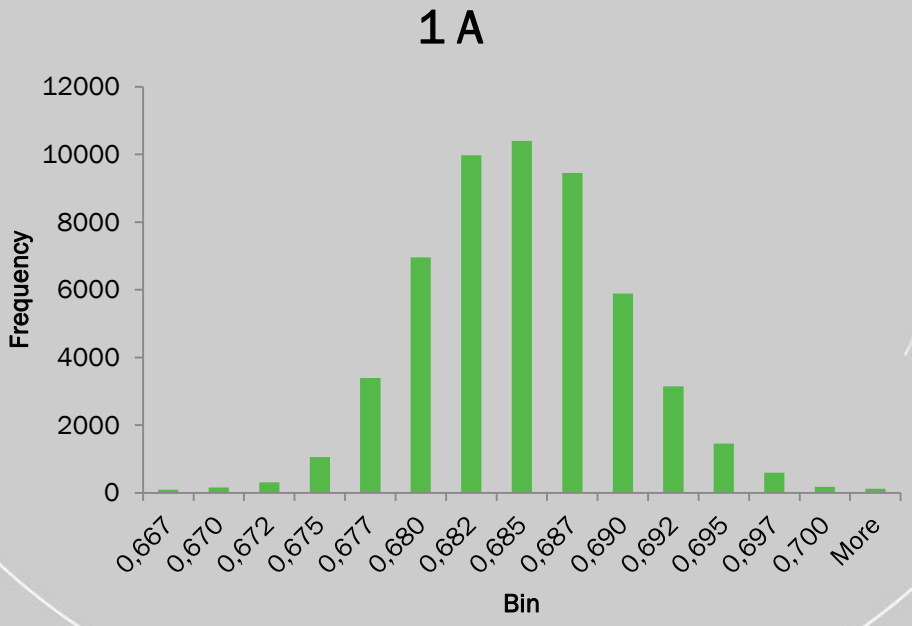


SBRS81100T3G



Influence on Pairset Balance

$\Delta I/I = 2\Delta V/I/R\_pairset$

R_pairset includes cable, magnetics, etc..

Example: 1A, worst case, R_pairset = 1Ω

$\Delta I/I = 2*108\ mV/1\ A/1 = 0.216$

Conclusion

- **Standard deviation is small**
- **Forward voltage spread is large**
  - enough to cause unbalance of MPS currents
  - not enough to cause unbalance of high currents
- **Can be worse when diodes happen to be from different lots/fabs**

Further Study

- Forward Voltage Spread for higher current rating diodes