



腾戈智慧半导体科技

Top provider of Web-native EDA for
semiconductor yield improvement



PAT

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<https://itanggo.com>

GPAT -- Spatial Correlation

- 1.GDBC (Good Die in a Bad Cluster)
 - Type A(4)/Type B(8)
 - By User Define
 - Cut Wafer Edge N Rings
- 2.Stack/Reticle (by Wafer/Lot)

PPAT -- Statistical outliers

- 1.AEC Standard
- 2.User Define

PAT

GPAT-GDBC Rule Type A/B

A1		If one neighbor Dies in cross shape Fail, it Fail!
A2		If two neighbor Dies in cross shape Fail, it Fail!
A3		If three neighbor Dies in cross shape Fail, it Fail!
A4		If four neighbor Dies in cross shape Fail, it Fail!
B1		If any 1 neighbor Dies in 9-Grids Fail, it Fail!
B2		If any 2 neighbor Dies in 9-Grids Fail, it Fail!
B3		If any 3 neighbor Dies in 9-Grids Fail, it Fail!
B4		If any 4 neighbor Dies in 9-Grids Fail, it Fail!
B5		If any 5 neighbor Dies in 9-Grids Fail, it Fail!
B6		If any 6 neighbor Dies in 9-Grids Fail, it Fail!
B7		If any 7 neighbor Dies in 9-Grids Fail, it Fail!
B8		If any 8 neighbor Dies in 9-Grids Fail, it Fail!

GDBC- by User Define Rule

Input m value (m x m)		Init Rule	Comment																	
<table border="1"> <thead> <tr> <th>No</th> <th>Limit</th> </tr> </thead> <tbody> <tr><td>9</td><td> 1 </td></tr> <tr><td>8</td><td> 1 </td></tr> <tr><td>7</td><td> 1 </td></tr> <tr><td>6</td><td> 1 </td></tr> <tr><td>5</td><td> 1 </td></tr> <tr><td>4</td><td> 1 </td></tr> <tr><td>3</td><td> 1 </td></tr> <tr><td>2</td><td> 1 </td></tr> </tbody> </table>	No	Limit	9	1	8	1	7	1	6	1	5	1	4	1	3	1	2	1	Check Type ☒ Block Check ☐ Center Target Die Check Update New Rule	NO: • 9 means there exist 9 dies in 3x3 block • 8 means there exist 8 dies in 3x3 block • 7 means there exist 7 dies in 3x3 block Limit: • If 2 , Means if Fail Dies over or equal 2 , then the block will be set to Fail Die • If 0 , no checking Check Type: • Block Check: Check By Block • Center Target Die: Check with Center Target Die View
No	Limit																			
9	1																			
8	1																			
7	1																			
6	1																			
5	1																			
4	1																			
3	1																			
2	1																			

GDBC: Cut Edge Ring

1.

P.5

LotID :	
Vdr.Lot :	
Customer :	
Product :	K
OpName :	
LotYield :	

☒ Include PPAT Check

Risk Type:
☒ A.Profile: A1

Empty Die is ☐ Fail ☒ Pass

Surround Die's Type
☒ Fail Bin by Bin Define
☐ User Define Fail Bins
(1)BIN1 (P)
(2)BIN2 (F)
(3)BIN3 (F)
(4)BIN4 (F)
(5)BIN5 (F)
(6)BIN6 (F)
(7)BIN7 (F)
(8)BIN8 (F)

☒ B.Wafer Edge: 1 Rings

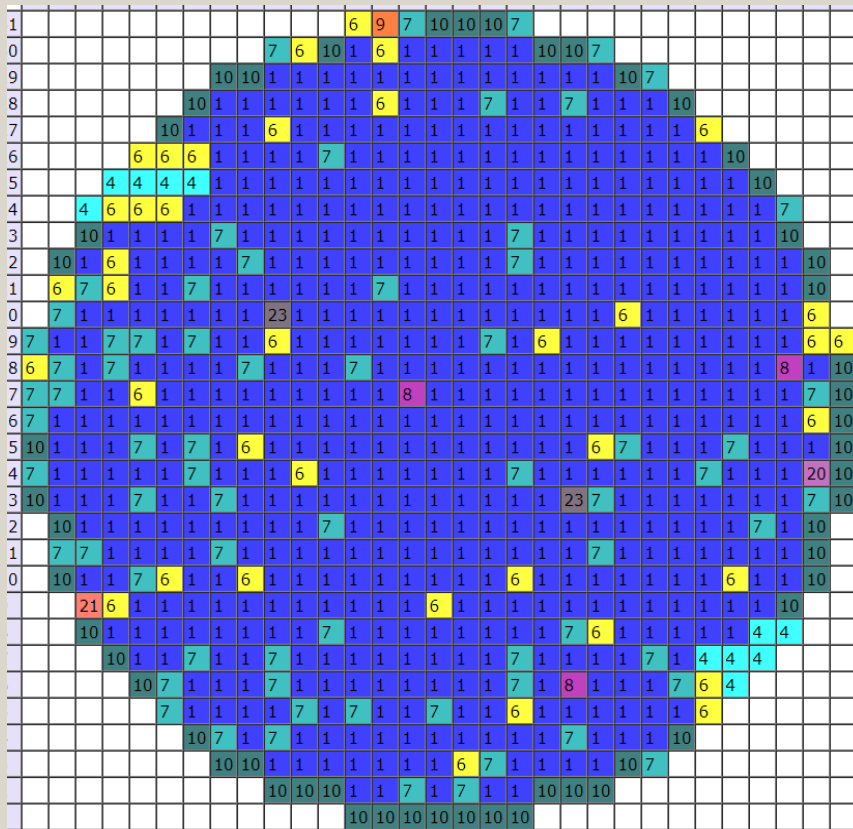
GDBC GPAT Code: 10

Process GDBC GPAT

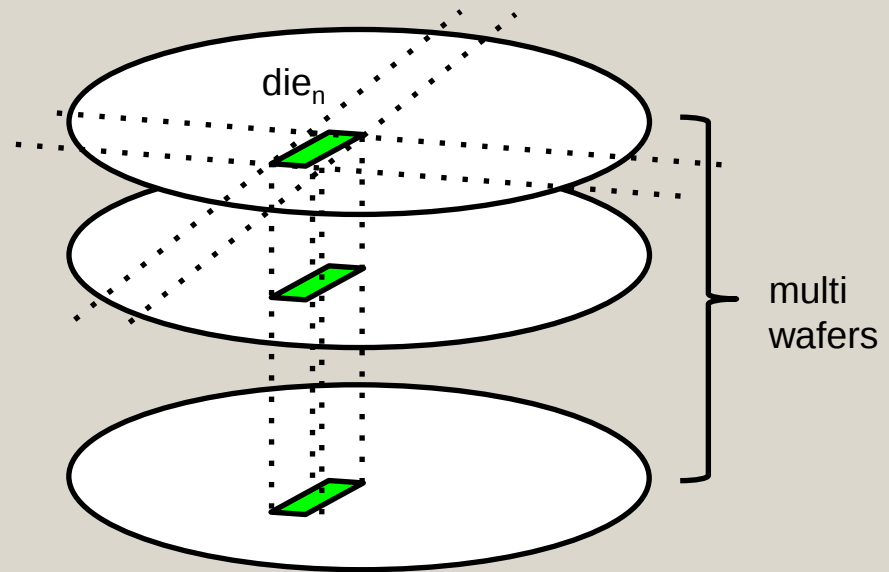
✓✗	No.	Wafer Id	Status	Yield
☒	1		1 AutoShip	99.36%
☒	2		2 AutoShip	99.35%
☒	3		3 AutoShip	99.36%
☒	4		4 Unknown	99.57%
☒	5		5 AutoShip	98.64%
☒	6		6 AutoShip	99.44%
☒	7		7 AutoShip	99.14%
☒	8		8 AutoShip	99.34%
☒	9		9 AutoShip	99.79%
☒	10		0 AutoShip	98.91%
☒	11		1 AutoShip	98.23%
☒	12		2 AutoShip	99.78%
☒	13		3 AutoShip	98.67%
☒	14		4 AutoShip	98.44%
☒	15		5 AutoShip	98.76%
☒	16		6 AutoShip	98.67%
☒	17		7 AutoShip	98.66%
☒	18		8 AutoShip	98.91%
☒	19		9 AutoShip	99.12%
☒	20		0 AutoShip	99.13%
☒	21		1 AutoShip	99.78%
☒	22		2 AutoShip	98.31%
☒	23		3 AutoShip	98.73%
☒	25		5 AutoShip	98.45%

GDBC: Cut Edge Ring

2.



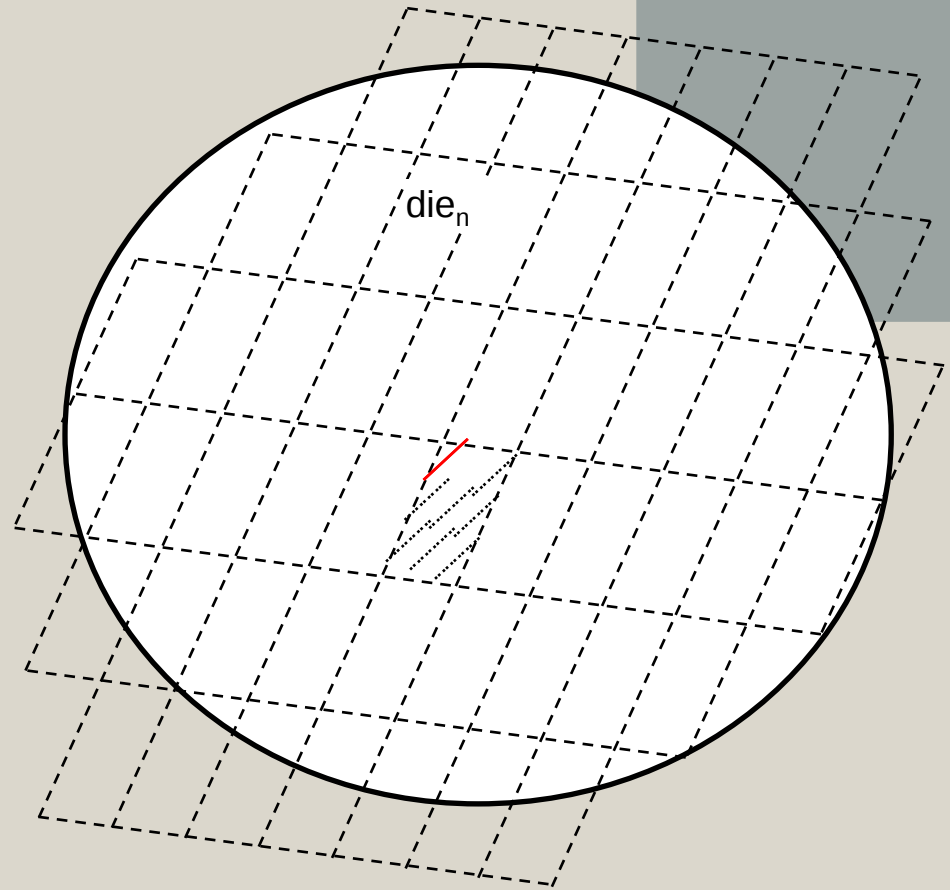
STACK GPAT



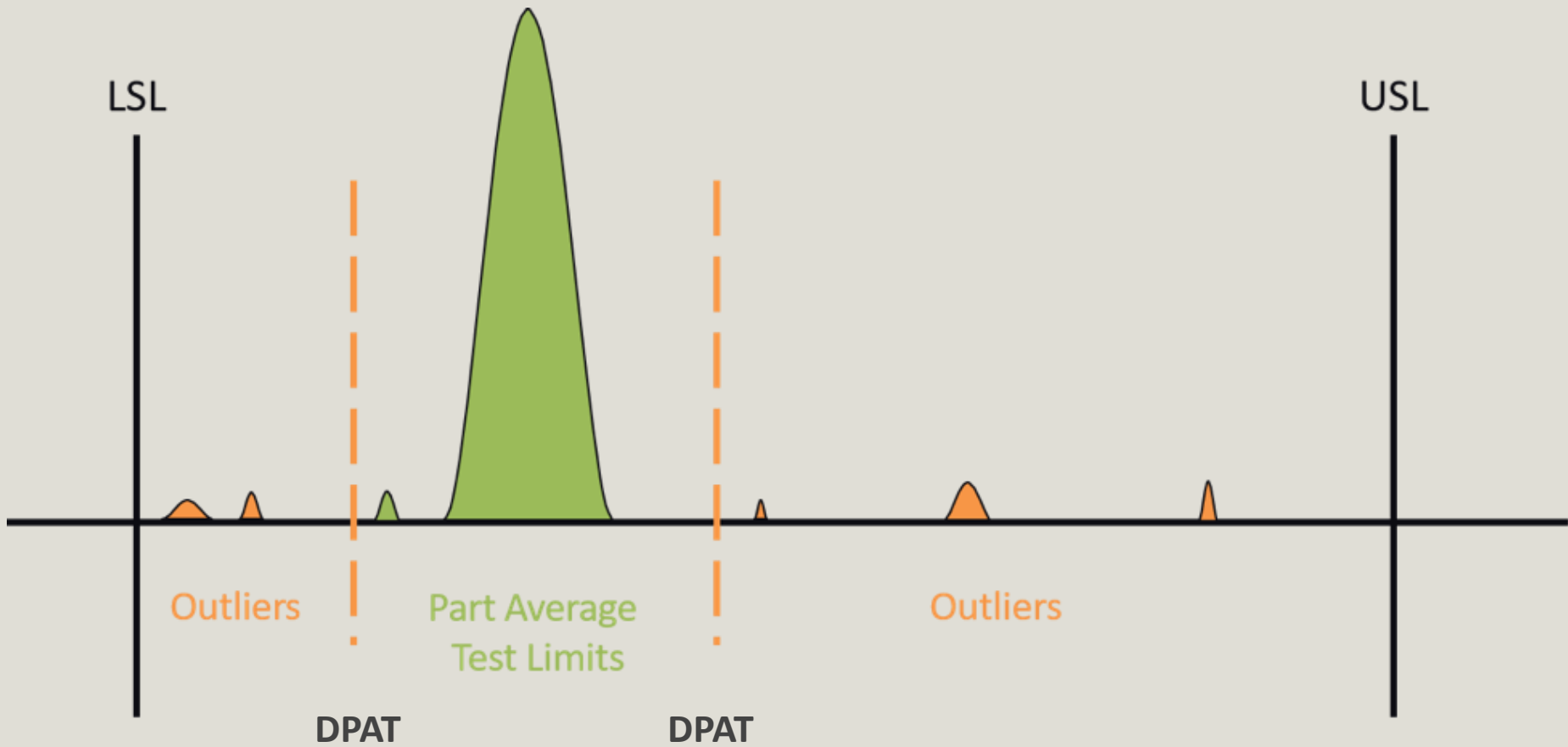
1. Calculate $stack_yield_n$ for die_n within selected multi wafers, $n=1 \sim n_{GDPW}$ (n_{GDPW} =gross die per wafer).
2. Calculate average value and standard deviation of $stack_yield$.
3. Outlier screen-out spec: fixed value or $stack_yield < average - n * \sigma$ by setting.

Photo/ Reticle GPAT

- For single/multi wafers.
- Calculate photo_yield_n for die_n within selected single/multi wafers, $n=1 \sim n_{\text{shot}}$ (n_{shot} =die count per shot).
- Calculate average value and standard deviation of photo_yield .
- Outlier screen-out spec:
fixed value or
 $\text{photo_yield} < \text{average} - n * \sigma$



PPAT





PPAT

- According to AEC_Q001_Rev D
- Assumption on Gaussian distribution of the test parameters
- Static PAT limit (production, $n > 6$)
 $\text{median} \pm 6 * [(Q3 - Q1) / 1.35]$
- Dynamic PAT limit [passing Static PAT] median $\pm 6 * \text{IQR} / 1.35$

PPAT

Step 1.

The screenshot displays the TANGO AI web application interface. The top navigation bar is purple and contains the TANGO AI logo on the left and the text "Welcome system system@INTRANET (CDC) Version : 6.1.6 Logout Old UI" on the right. A left sidebar menu lists various options: Home, INLINE, PCM, BUMP, CP (highlighted in blue), Data Extract, Target Lot, Wafer Map, Report, Operation, ASSY, FT, SLT, Defect, Advanced, Analyzer, and Monitor. The main content area is white and shows two buttons: "User Define" and "AEC Standard". A dark blue callout box with a pointer to the "User Define" button contains the text "Select method for PPAT". Above the buttons, the text "Click method button for PAT" is displayed.

Home

INLINE

PCM

BUMP

CP

Data Extract

Target Lot

Wafer Map

Report

Operation

ASSY

FT

SLT

Defect

Advanced

Analyzer

Monitor

Welcome **system system**@INTRANET (CDC)
Version : 6.1.6 Logout Old UI

Click method button for PAT

User Define AEC Standard

Select method for PPAT

PPAT

(User define)

Step
2.



TANGO AI

- Save define as profile for later use
- Do PAT calculation

Welcome **system system**@INTRANET (CDC)
Version: 6.1.6 Logout Old UI

Wafer Summary

Profile : --LOAD-PROFILE-- Save Profile Save and Register Profile Update Profile Cal Export profile Import Csv

By Site: ☒ No ☐ Yes

For unequal n sigma, set Control Type as **X** and use **L/H** in n sigma. e.g. 3/5 for mean-3*sigma, mean+5*sigma

csv file format: test_no,spec_lo,target,spec_hi,nsigma,control_type

	Test No	Name	SpecLo	Target	SpecHi	n sigma	Control Ty
						1.5	Both
☐	1	500.1 (500.1)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A0 1	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	2	500.2 (500.2)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A1 2	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	3	500.3 (500.3)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A2 3	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	4	500.4 (500.4)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A3 4	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	5	500.5 (500.5)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A4 5	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	6	500.6 (500.6)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A5 6	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	7	500.7 (500.7)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A6 7	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	8	500.8 (500.8)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0A7 8	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	9	500.9 (500.9)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B0 9	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	10	500.10 (500.10)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B1 10	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	11	500.11 (500.11)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B2 11	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	12	500.12 (500.12)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B3 12	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	13	500.13 (500.13)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B4 13	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	14	500.14 (500.14)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B5 14	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	15	500.15 (500.15)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B6 15	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	16	500.16 (500.16)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B7 16	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	17	500.17 (500.17)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B8 17	-9.000000e-01	-0.55	-2.000000e-01	3	B
☐	18	500.18 (500.18)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0B9 18	-9.000000e-01	-0.55	-2.000000e-01	3	B
☒	19	500.19 (500.19)OS_VSS_PMU:OS_PMU_VSS[1]_GPIO0C2 19	-9.000000e-01	-0.55	-2.000000e-01	3	B

- Select parameters for calculation
- Define control method: sigma and one side or both side (B/U/L/Unequal)

(AEC Standard)

PPAT

Select parameters for calculation

PPAT

Step 4.

VM file for insert DB

IQC ☐ Generate PAT XML [Download PAT Out Chip Data File](#)

✓✗	TestNo	Parameter	Count(All/data/NULL)	DynamicLow	DynamicHigh	Out
☐	10000	p2pshorts_POS/FUNC/////PRE	(3470/3470/0)	-1	-1	0
☐	10005	p2pshorts_NEG/FUNC/////PRE	(3470/3470/0)	-1	-1	0
☒	14520	Shorts/PRE/////vdd_aon_pll1	(3470/3470/0)	3.131E-07	3.591E-06	13
☒	14545	Shorts/PRE/////vdd_dll_pll	(3470/3470/0)	7.351E-05	1.170E-04	37
☒	14580	Shorts/PRE/////vdd_sof_pll2	(3470/3470/0)	5.038E-07	4.119E-06	11
☒	14585	Shorts/PRE/////vddaon_in	(3470/3470/0)	6.245E-05	1.141E-04	32
☒	14590	Shorts/PRE/////vddhv	(3470/3470/0)	-2.323E-06	1.321E-06	8
☒	14595	Shorts/PRE/////vddio_aon_gpio	(3470/3470/0)	-2.138E-06	1.301E-06	13
☒	14600	Shorts/PRE/////vddio_gpio	(3470/3470/0)	-1.980E-06	8.560E-07	12
☒	14605	Shorts/PRE/////vddio_in	(3470/3470/0)	1.765E-06	4.058E-06	3
☒	14610	Shorts/PRE/////vddioq2	(3470/3470/0)	7.832E-05	1.414E-04	34
☒	14615	Shorts/PRE/////vddsosf_in	(3470/3470/0)	4.520E-04	4.528E-04	43

Download as csv file

Click for detail out report

(Detail report)

X	Y	Value	SpecLow	SpecHigh	DynamicLow	DynamicHigh	Q1	Median	Q3	Out Criteria
2	37	8.10629e-08	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
18	5	-2.52726e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
19	50	1.97889e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
29	14	2.78952e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
30	28	3.75274e-06	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Above Dynamic High
32	32	3.593e-06	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Above Dynamic High
43	0	2.12194e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
57	8	3.86718e-06	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Above Dynamic High
58	8	3.6073e-06	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Above Dynamic High
68	50	2.69415e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
82	41	2.24115e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
83	41	-1.90736e-08	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low
87	22	-2.47957e-07	-1e-05	3e-05	3.13063776542046e-07	3.59115183054729e-06	1.58073e-06	1.95982e-06	2.32221e-06	Below Dynamic Low

PPAT

P.15

Step
5.

PPAT

Step
6.

PATXY-1.csv

搜尋工作表

常用 版面配置 表格 圖表 SmartArt 公式 資料 檢閱

新細明體 (本文) 12

對齊方式 數字 格式

通用格式 不良

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
	X	Y	(TestNo)	Par	Value	SpecLow	SpecHigh	DynamicLow	DynamicHigh	Out Criteria									
2	0		76	(1040)	IDD.0	0.00400948	0.001	0.02	0.00406541	0.0078404									
3	0		76	(1050)	III.0	0.632867	-0.001	0.001	NA	NA									
4	0		78	(1050)	III.0	0.633075	-0.001	0.001	NA	NA									
5	0		79	(1030)	pwr_sl	0.00025829	-0.001	0.01	0.00026499	0.00080223									
6	0		79	(1040)	IDD.0	0.00402265	0.001	0.02	0.00406541	0.0078404									
7	0		79	(1050)	III.0	0.625819	-0.001	0.001	NA	NA									
8	0		82	(1040)	IDD.0	0.0034966	0.001	0.02	0.00406541	0.0078404									
9	0		82	(1050)	III.0	0.632827	-0.001	0.001	NA	NA									
10	0		83	(1040)	IDD.0	0.00372062	0.001	0.02	0.00406541	0.0078404									
11	0		83	(1050)	III.0	0.627504	-0.001	0.001	NA	NA									
12	0		84	(1050)	III.0	0.627594	-0.001	0.001	NA	NA									
13	0		85	(1030)	pwr_sl	0.00024463	-0.001	0.01	0.00026499	0.00080223									
14	0		85	(1050)	III.0	0.628846	-0.001	0.001	NA	NA									
15	1		67	(1040)	IDD.0	0.00393315	0.001	0.02	0.00406541	0.0078404									
16	1		67	(1050)	III.0	0.631927	-0.001	0.001	NA	NA									
17	1		69	(1050)	III.0	0.630516	-0.001	0.001	NA	NA									
18	1		72	(1050)	III.0	0.630322	-0.001	0.001	NA	NA									
19	1		73	(1050)	III.0	0.629383	-0.001	0.001	NA	NA									
20	1		74	(1050)	III.0	0.632917	-0.001	0.001	NA	NA									
21	1		75	(1050)	III.0	0.632604	-0.001	0.001	NA	NA									
22	1		76	(1050)	III.0	0.631301	-0.001	0.001	NA	NA									
23	1		78	(1050)	III.0	0.629317	-0.001	0.001	NA	NA									
24	1		79	(1050)	III.0	0.624253	-0.001	0.001	NA	NA									
25	1		80	(1050)	III.0	0.630048	-0.001	0.001	NA	NA									
26	1		81	(1050)	III.0	0.628131	-0.001	0.001	NA	NA									
27	1		82	(1050)	III.0	0.632514	-0.001	0.001	NA	NA									
28	1		83	(1040)	IDD.0	0.00402899	0.001	0.02	0.00406541	0.0078404									
29	1		83	(1050)	III.0	0.636362	-0.001	0.001	NA	NA									
30	1		84	(1050)	III.0	0.631038	-0.001	0.001	NA	NA									
31	1		85	(1040)	IDD.0	0.0039535	0.001	0.02	0.00406541	0.0078404									
32	1		85	(1050)	III.0	0.632553	-0.001	0.001	NA	NA									
33	1		86	(1050)	III.0	0.631301	-0.001	0.001	NA	NA									
34	1		88	(1050)	III.0	0.629866	-0.001	0.001	NA	NA									
35	1		89	(1030)	pwr_sl	0.00026339	-0.001	0.01	0.00026499	0.00080223									
36	1		89	(1040)	IDD.0	0.0035338	0.001	0.02	0.00406541	0.0078404									
37	1		89	(1050)	III.0	0.632395	-0.001	0.001	NA	NA									
38	1		90	(1050)	III.0	0.631614	-0.001	0.001	NA	NA									
39	1		91	(1030)	pwr_sl	0.00025603	-0.001	0.01	0.00026499	0.00080223									
40	1		91	(1050)	III.0	0.629421	-0.001	0.001	NA	NA									
41	1		92	(1030)	pwr_sl	0.00025338	-0.001	0.01	0.00026499	0.00080223									
42	1		92	(1040)	IDD.0	0.00354386	0.001	0.02	0.00406541	0.0078404									
43	1		92	(1050)	III.0	0.626252	-0.001	0.001	NA	NA									
44	1		93	(1030)	pwr_sl	0.00024829	-0.001	0.01	0.00026499	0.00080223									
45	1		93	(1040)	IDD.0	0.00381227	0.001	0.02	0.00406541	0.0078404									
46	1		93	(1050)	III.0	0.635645	-0.001	0.001	NA	NA									
47	2		62	(1050)	III.0	0.631262	-0.001	0.001	NA	NA									
48	2		63	(1050)	III.0	0.631575	-0.001	0.001	NA	NA									
49	2		64	(1050)	III.0	0.631665	-0.001	0.001	NA	NA									

PATXY-1.csv

(download file)

Step 7.

CP→Operation→Visual Monitor(VM) →
Probe Mark V2

PPAT

≡

TANGO AI

Home

INLINE

PCM

BUMP

CP

Data Extract

Target Lot

Wafer Map

Report

Operation

ASSY

FT

SLT

Defect

Advanced

Analyzer

Monitor

Dashboard

Batch

Basic Data

Document

ChangeLog

FAQ

Workspace

Lot Number : HHJMN.00 WaferNo : 5 Operator :

1

2

3

4

5

6

Save

Report

Print

Undo

Download

Map Size: 719

CoordMargin: 1

DefectCode
(1) Scratch

Action
Mark: ☒ Erase: ☐

Type
Single: ☒ Circle: ☐ Rectangle: ☐

Coord.
X: Y:

IQC(0) CP(0) OQC(0) RISKDIE(0) SGPAT(0) PGPAT(0) EDGE(0) DIEXY(0) DTLOG(0) PAT33(0) PAT1(61) PAT2(0) WT(0) SFR(0) RSFR(0) MERGE(61)

Select PAT red chips as PAT fail

Welcome system system@INTRANET (CD

Version: 6.1.6 Logout Old

联系
Tango-AI



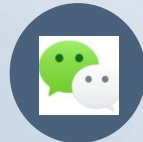
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