

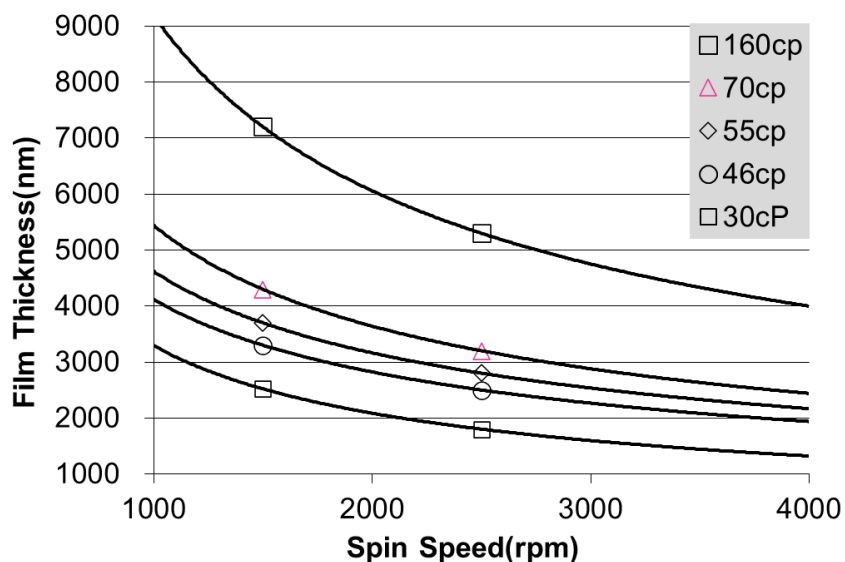
# Technical datasheet

## AZ TX1311

MERCK

### INTRODUCTION OF AZ TX1311

#### SPIN CURVE



Substrate : Bare Si with HMDS 120C/60s

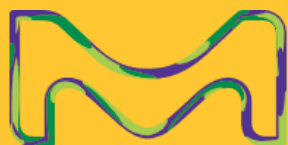
Resist : AZ TX1311, FT=Various, PAB=140C/150s, PEB=110C/150s

#### REFRACTIVE INDEX

$\lambda$	n value	k value
248nm	1.773	0.0075
633nm	1.560	0

#### CAUCHY COEFFICIENTS

A	B(1/nm <sup>2</sup> )	C(1/nm <sup>4</sup> )
1.543	0.00671	0

$$N_{\lambda} = A + B/\lambda^2 + C/\lambda^4$$


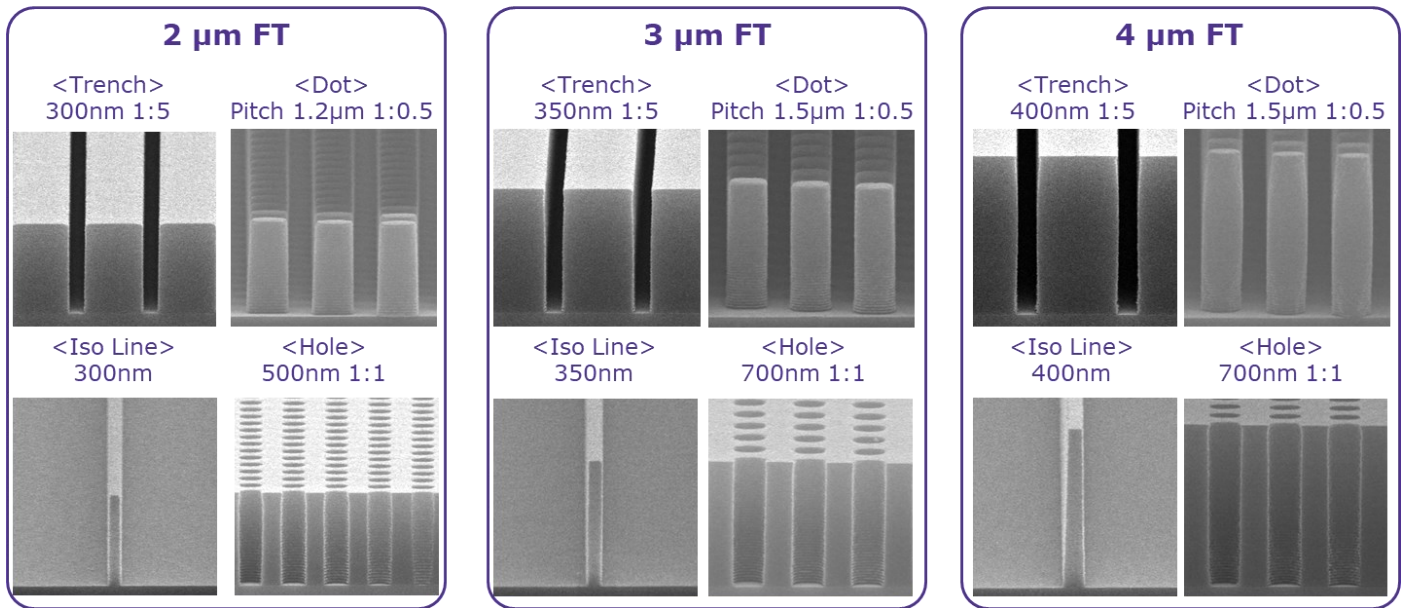
## LITHO PERFORMANCE OF AZ TX1311

Substrate : Bare Si with HMDS 120C/60s

Resist : AZ TX1311, FT=Various, PAB=140C/150s, PEB=110C/150s

Exposure : Canon FPA-3000 EX5, NA/Sigma=0.55/0.8, Single exposure

Development: AZ 300MIF(TMAH 2.38%) , 23C/60s puddle



## RESOLUTION OF AZ TX1311

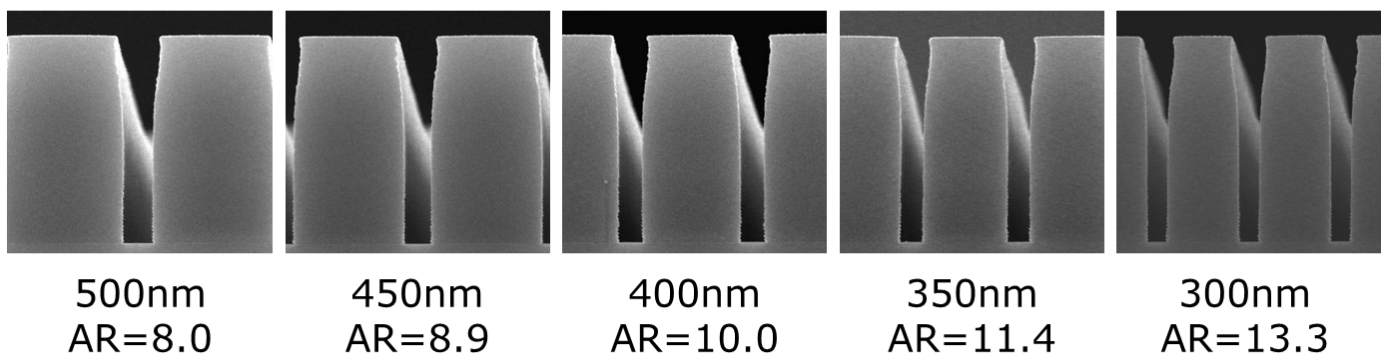
Substrate : Bare Si with HMDS 120C/60s

Resist : AZ TX1311, FT=4000nm, PAB=140C/150s, PEB=110C/150s

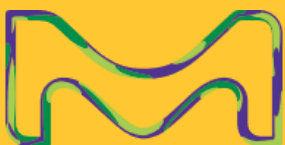
Exposure : Canon FPA-3000 EX5, NA/Sigma=0.55/0.8, Single exposure

Development: AZ 300MIF(TMAH 2.38%) , 23C/60s puddle

Focus:-1.0μm



\*AR=Aspect Ratio



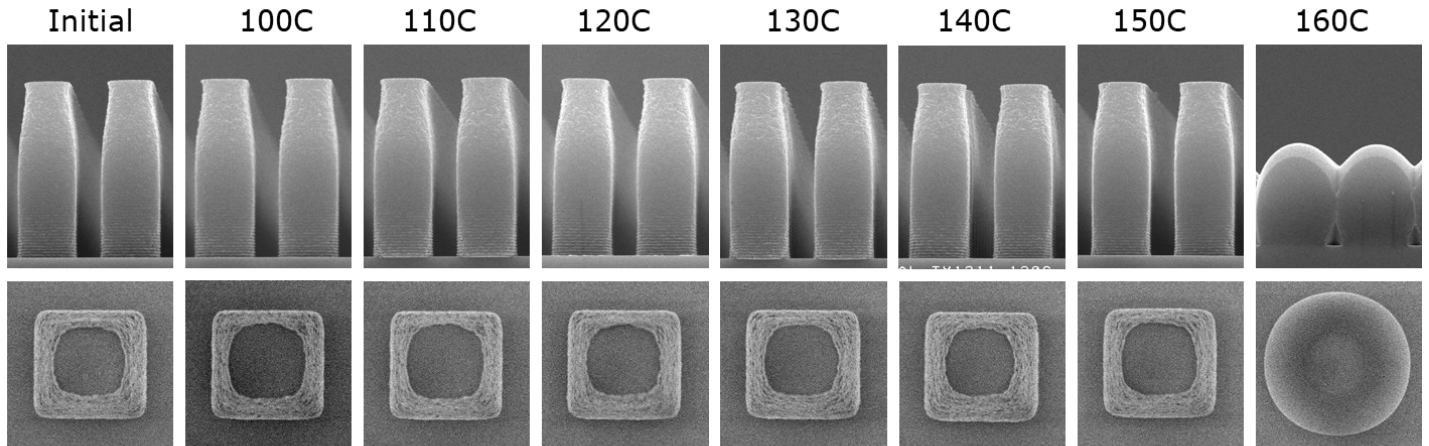
## THERMAL STABILITY OF AZ TX1311

Substrate : Bare Si with HMDS 120C/60s

Resist : AZ TX1311, FT=4000nm, PAB=140C/150s, PEB=110C/150s

Exposure : Canon FPA-3000 EX5, NA/Sigma=0.55/0.8, Single exposure

Development: AZ 300MIF(TMAH 2.38%) , 23C/60s puddle



\*Post bake = xxxdegC/120sec

## INTRODUCTION OF TARC AZ AUATAR-8A

### IMPROVEMENT OF CD VARIATION BY TARC

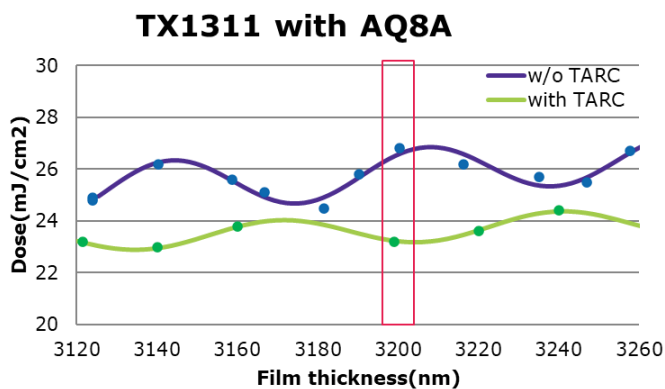
Substrate : Bare Si with HMDS 120C/60s

Resist : AZ TX1311, FT=3200nm, PAB=150C/130s, PEB=110C/160s

TARC : AZ AQUATAR-8A 30, FT=43nm

Exposure : Canon FPA-3000 EX5, NA/Sigma=0.55/0.55, Single exposure

Mask : 1000nmDot/250nmSpace



TARC FT	Resist Swing Ra tio
0 nm	10%
43 nm	3%

Focus: -0.4um

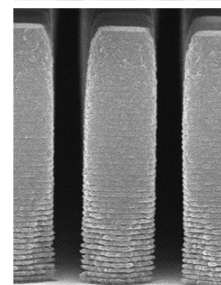
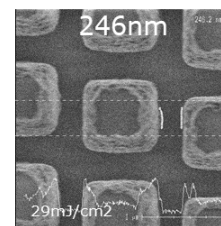
Top-SEM

X-SEM

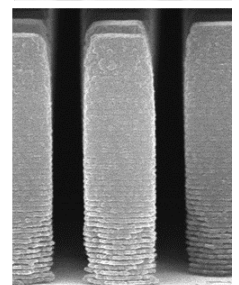
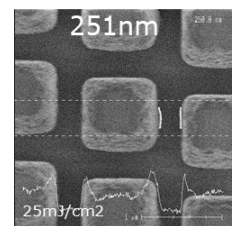
CDU range

wo AQ8A

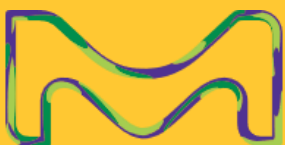
AQ8A 43nm



44nm



42nm

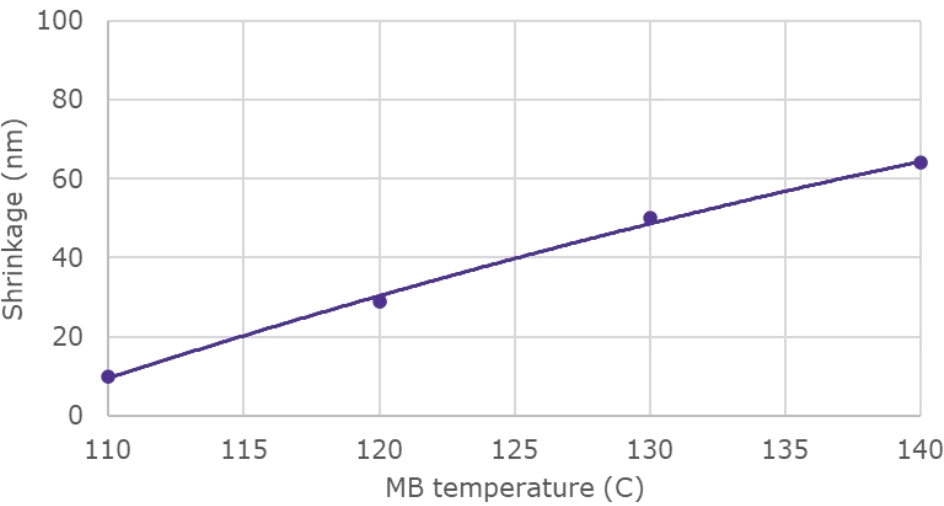


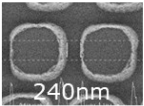
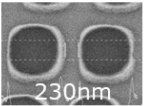
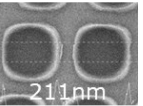
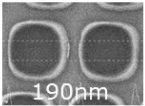
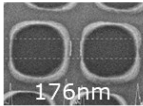
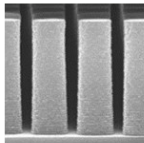
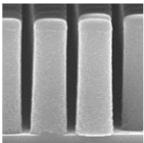
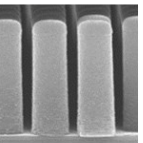
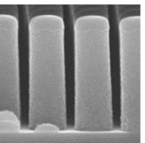
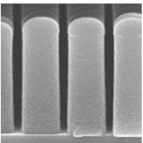
INTRODUCTION OF TM-100

SHRINKAGE VS. MB TEMPERATURE WITH DOT @3.2UM FT

Substrate : Si wafer  
Resist : AZ TX-1311 FT=3.2μm, PAB=150C/130sec,PEB=110C/160s  
Exp. : Canon/FPA-3000EX5, NA/Sigma=0.55/0.55  
1<sup>st</sup> Exp. : 12.5 mJ/cm<sup>2</sup>@-1.1um  
2<sup>nd</sup> Exp. : 12.5 mJ/cm<sup>2</sup>@+0.1um  
Mask : 1000 nm Dot/250 nm Space w/o bias  
Develop : AZ 300MIF developer (2.38%) 60s Single puddle  
Shrink : AZ TM-100 MB=Various/70s

AZ TM-100 with Dot pattern



	ADI	MB110C	MB120C	MB130C	MB140C
Top view					
Bottom CD	240nm	230nm	211nm	190nm	176nm
X-section					
Shrinkage (nm)	-	10	29	50	64
G-CDU range (nm)	25	26	25	25	30

\*240 points in wafer





## INTRODUCTION OF RINSE

### AZ TX-1311 PROCESS MARGIN@FT3.2UM

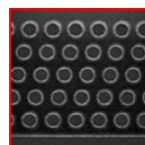
Substrate : Si wafer  
 Resist : AZ TX-1311 FT=3.2μm, PAB=150C/130sec, PEB=110C/160s  
 Exp. : Canon/FPA-3000EX5, NA/Sigma=0.55/0.55  
 1<sup>st</sup> Exp. : 1/2Eo mJ/cm<sup>2</sup>@various  
 2<sup>nd</sup> Exp. : 1/2Eo mJ/cm<sup>2</sup>@+0.1um  
 Mask : 500 nm dot/500 nm Space  
 Develop : AZ 300MIF developer (2.38%) 60s Single puddle  
 Rinse : DIW or SPC-402

First focus (um)	-1.6	-1.5	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.8	-0.7	-0.6
TX-1311											
15.2mJ/cm2											
TX-1311 with SPC-402											
19.6mJ/cm2											

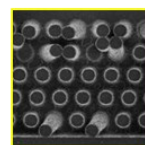
### Capillary force formula

$$\sigma_{max} = 6\gamma A^2 \cdot \cos \theta / D$$

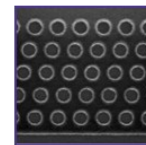
$\sigma$  : Stress to resist  
 $\gamma$  : Surface tension of rinse  
 $A$  : Aspect ratio = H/W  
 $\theta$  : Contact angle  
 $D$  : Space width



Residue



Collapse



no Residue, no Collapse

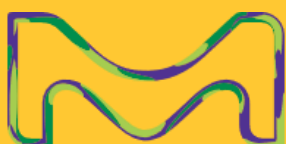
### TX1311 w/o SPC-402

	-1.6	-1.5	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.8	-0.7	-0.6
14.8mJ/cm <sup>2</sup>											
15.2mJ/cm <sup>2</sup>											
15.6mJ/cm <sup>2</sup>											
16.0mJ/cm <sup>2</sup>											
16.4mJ/cm <sup>2</sup>											
16.8mJ/cm <sup>2</sup>											
17.2mJ/cm <sup>2</sup>											

All patterns collapsed

### TX1311 with SPC-402

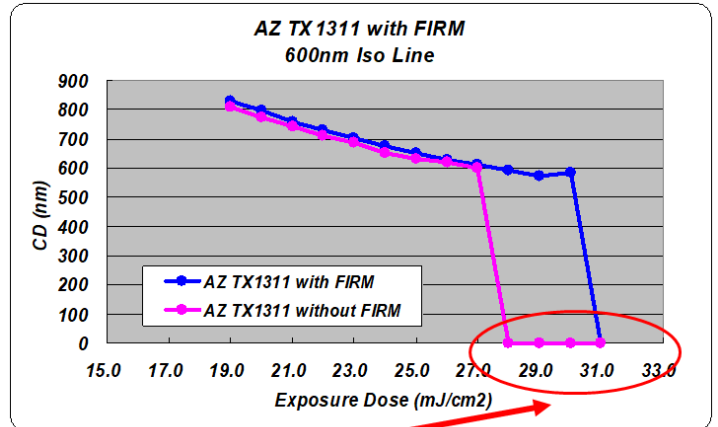
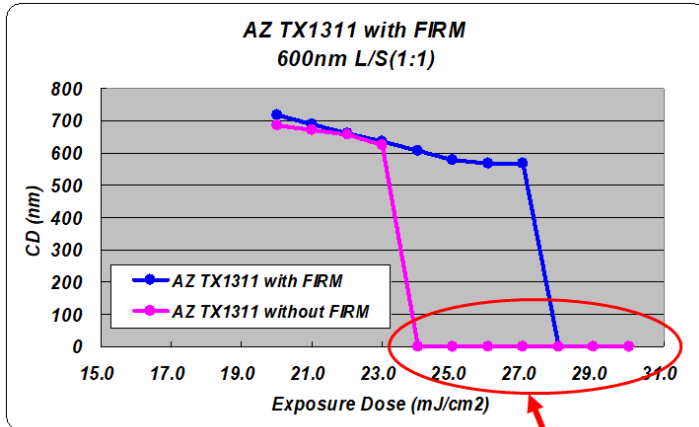
	-1.6	-1.5	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.8	-0.7	-0.6
19.2mJ/cm <sup>2</sup>											
19.6mJ/cm <sup>2</sup>											
20.0mJ/cm <sup>2</sup>											
20.4mJ/cm <sup>2</sup>											
20.8mJ/cm <sup>2</sup>											
21.2mJ/cm <sup>2</sup>											
21.6mJ/cm <sup>2</sup>											



## INTRODUCTION OF AZ TX1311

### AZ TX1311 WITH AZ SPC-124A

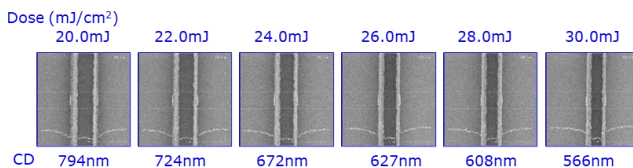
Substrate : Bare Si with HMDS 120C/60s  
 Resist : AZ TX1311, FT=4000nm, PAB=140C/150s, PEB=110C/150s  
 Exposure : Canon FPA-3000 EX5, NA/Sigma=0.55/0.8, Single exposure  
 Dose:Various, Focus: -1.0um  
 Pattern : 600nm, Dense & Iso  
 Development: AZ 300MIF(TMAH 2.38%) , 23C/60s puddle



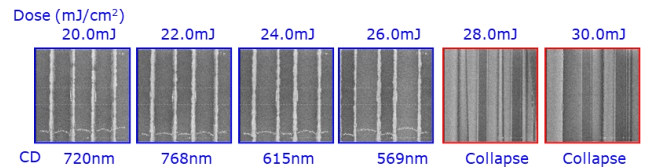
**Pattern Collapse**

Substrate : Bare Si with HMDS 120C/60s  
 Resist : AZ TX1311, FT=4000nm, PAB=140C/150s, PEB=110C/150s  
 Exposure : Canon FPA-3000 EX5, NA/Sigma=0.55/0.8, Single exposure  
 Dose:Various, Focus: -1.0um  
 Pattern : 600nm, Dense & Iso  
 Development : AZ 300MIF(TMAH 2.38%) , 23C/60s puddle

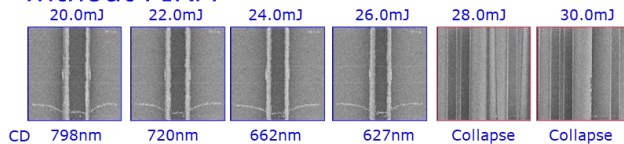
with FIRM



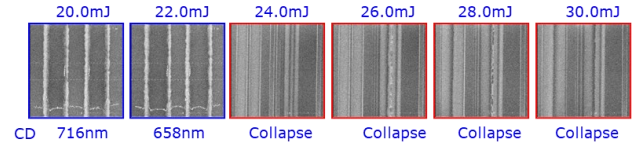
with FIRM



without FIRM



without FIRM



## EL OF AZ TX1311(30CP)

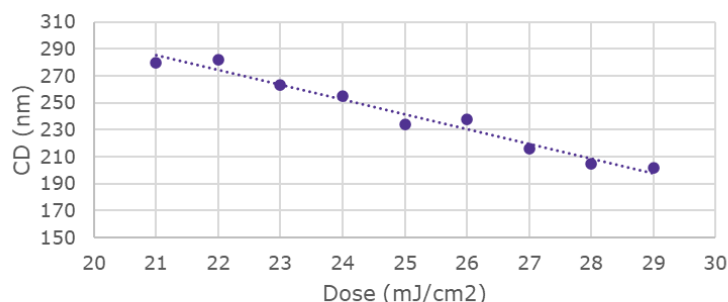
Substrate : Si wafer with HMDS

Resist : AZ TX-1311 FT=2.3 $\mu$ m, PAB=130C/90sec, PEB=110C/60s

Exp. : Canon/FPA-3000EX5, NA/Sigma=0.55/0.50, single exposure

Mask : 1000 nm dot/250 nm Space

Develop : AZ 300MIF developer (2.38%) 60s Single puddle



### TX-1311 30cP

Eop@250space (mJ/cm²)

24

EL (Target CD $\pm$ 10%)

18.8%

Focus (-0.2 $\mu$ m)	Exposure energy (mJ/cm²)						
	22	23	24 (BD)	25	26	27	28
Top view image (100k)							
Side view image (k)							
CD size ( $\mu$ m)	282	264	255	234	238	216	204

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