

MUSE SEMICONDUCTOR

**Davis, CA
10/22/2018**

AGENDA

1. Muse background
2. New
 - a. Package assembly options
 - b. 180nm HV shared block
 - c. 28nm HPC RF shared block
3. ISSCC planning

MUSE SEMICONDUCTOR

Focused on serving the Multi-Project Wafer (MPW) needs of University circuit researchers.

A FLEXIBLE SERVICE TO SUPPORT RESEARCH

Small minimum areas, frequent tapeouts, PDK and IP access, short cycle times.

IT'S NOT JUST AN MPW

It is life. Your graduation. Starting your first job. Making the conference paper deadline. Realizing your dream of becoming a University Professor.

SUPPLIER

TSMC is our strategic supplier. Their reputation for excellence is well earned. We enable researchers straightforward access to TSMC's remarkable capabilities.

ON-TIME INCENTIVE

$\leq 65\text{nm}$

Complete Trial and Final GDS upload on time and receive \$200 Amazon gift card

Complete only the Final GDS upload on time and receive \$100 Amazon gift card

$> 65\text{nm}$

Complete Trial and Final GDS upload on time and receive \$100 Amazon gift card

Complete only the Final GDS upload on time and receive \$50 Amazon gift card

MILESTONES

February 2018

April 2018

May 2018

June 2018

August 2018

October 2018

Founded

1st Tapeout

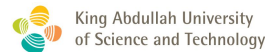
35th Tapeout

74th Tapeout

89th Tapeout

100th Tapeout

1st Shipment



UC DAVIS TAPEOUTS TO DATE

1. MAY 65nm - Momeni, Razieh Abedi - Shipped
2. MAY 40nm - Lewis, Christopher Su - Shipped
3. MAY 40nm - Lewis, Yi-Long Yu - Shipped
4. AUG 65nm - Momeni, Hao Wang - Shipped
5. OCT 65nm - Momeni, Hadi Bameri - In fab
6. OCT 65nm - Liu, Jingjun Chen, Wang Hao - In fab

SHARED BLOCK TAPEOUT SERVICES

	180 MS RF G	180 HV BCD G2	65 MS RF GP	65 MS RF LP	40 MS RF G
Metal	1P6M_4x1u (40kA)	1P6M_4x1u (40kA)	1P9M_6x1z1u	1P9M_6x1z1u	1P10M_7x1z1u
Core (V)	1.8	1.8/5	1.0	1.2	0.9
I/O (V)	3.3	70 max	2.5	2.5	1.8
MiM Cap. (fF/um ²)	2	2	2	2	N/A
Min. Area (mm ²)	5	5	1	1	1
Frequency	2-3 per quarter	Spring & fall	Monthly	Spring & fall	Spring & fall
Cycle Time (days)	42	62	62	62	76
Sample Qty.	40	40	100	100	100
Price (\$/mm ²)	1,000	1,250	4,700	4,700	7,250

FULL BLOCK TAPEOUT SERVICES

We support all TSMC MPW technologies.
Some of the most popular are summarized below.

	180 MS RF G	180 HV BCD G2	65 LP	40 LP	40 MS RF G
Core (V)	1.8	1.8	1.2	0.9	0.9
I/O (V)	3.3	70	2.5	1.8	1.8
MiM Cap. (fF/um ²)	1, 1.5, 2	1, 1.5, 2	N/A	N/A	N/A
Min. Area (mm ²)	25	25	12	9	9
Frequency	Monthly	Monthly	Monthly	Monthly	Monthly
Cycle Time (days)	42	60	62	76	76
Sample Qty.	40	40	100	100	100
Price (\$/mm ²)	800	1,100	3,850	6,500	7,000

MPW TAPEOUT PROCESS

	$T_0 - 12$ weeks	$T_0 - 37$ days	$T_0 - 14$ days	$T_0 - 7$ days	T_0	$T_0 + x$ days
Quote	Reserve	Purchase Order	Trial GDS Upload	Final GDS Upload	Tapeout	Ship
Create a quote online anytime at www.musesemi.com/order	Reserve area as far in advance as possible. TSMC shuttles frequently sell out. 8-12 weeks in advance is recommended.	Send purchase order 37 days prior to tapeout date.	We will confirm receipt within 24 hours and summarize our review within 72 hours.	We will confirm receipt within 24 hours and confirm tapeout readiness within 48 hours.	TSMC begins the process of merging databases, mask making, and wafer manufacturing.	Manufacturing cycle time is technology dependent. We'll confirm the ship date 2-3 weeks after tapeout.

ASSEMBLY AT TSMC

Single Supplier for Entire Project	Assembled at TSMC	2 Day Assembly Cycle Time	Reduced Shipping Time & Cost
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Technology	Body Size (mm)	Leads
CQFP	28 x 28	128
CQFP	27.2 x 27.2	120,144,160,208
CQFP	14 x 20	64,80,100
CLCC	29.21 x 29.21	84
CLCC	24.12 x 24.12	68
CLCC	16.5 x 16.5	44
DIP	61 x 15.24	48
DIP	50.8 x 15.24	40
DIP	35.6 x 15.24	28
DIP	22.9 x 7.62	18
DIP	17.8 x 7.62	14

CQFP = Ceramic Quad Flat Pack
CLCC = Ceramic Leadless Chip Carrier
DIP = Dual Inline Package

180NM HV BCD GEN2 SHARED BLOCK

TSMC 180nm HV BCD Gen2

Metal option: 1p6m_4X1U

Max voltage: 70V

Min. Area: 5mm²

Price: \$1,250/mm²

Cycle-time: 62 days

First shared block tapeout: March/April 2019

Follow on shared block tapeout: Fall 2019

28NM HPC RF SHARED BLOCK

TSMC 28nm HPC RF

Metal option: 1p9m_6X1Z1U

Min. Area: 1mm²

Price: \$14,000/mm²

Cycle-time: 79 days

First shared block tapeout: November 2018

Follow on shared block tapeout: May 2019

ISSCC 2020 PLANNING

Est. Submission Deadline Monday 9/10/2019

180nm - 42 day cycle time - 5mm2 min.

Trial	Final	Tapeout	Est. Ship
5/8/2019	5/15/2019	5/22/2019	7/3/2019
6/12/2019	6/19/2019	6/26/2019	8/7/2019
		Jul TBD	2H Aug

65nm - 62 day cycle time - 1mm2 min.

Trial	Final	Tapeout	Est. Ship
4/24/2019	5/1/2019	5/8/2019	7/9/2019
5/21/2019	5/28/2019	6/4/2019	8/5/2019

40nm - 74 day cycle time - 1mm2 min.

Trial	Final	Tapeout	Est. Ship
4/30/2019	5/7/2019	5/14/2019	7/27/2019

28nm - 79 day cycle time - 1mm2 min.

Trial	Final	Tapeout	Est. Ship
5/1/2019	5/8/2019	5/15/2019	8/2/2019

CONTACT

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MUSE

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