From,

Date: 09.12.2020

Nalina S.B

Asst Professor,

Dept of ECE,

JNNCE,Shivamogga

PD

Ele
Dev

To,

The Principal

JNNCE,Shivamogga

Through,

The HoD

Dept of ECE

JNNCE,Shivamogga

Respected Sir,

Sub: Regardinfg the partial delivery of lecture on the subject Electronic Devices for 3rd semester ECE students on 11.12.2020

With respect to the subject cited above, I would like to bring to your kind information that our alumni student Mr. Sanjay A.C, Working as Design Engineer in the VLSI Analog layout field, at Cadence Design Systems , Bangalore has acknowledged to our proposal for delivering lecture on Electronic Devices for 3rd semester students. Since he is working in the VLSI sector and enormous knowledge in the same field he has plans to deliver lecture in Fabrication Technology/Integrated Electronics.

As this program will help the students in their academic as well as it will be one of the important activity under NBA Accredation programme, I request you to please provide permission to organize this session. I hope you will kindly do the needful .

Thanks and Regards,

Nalina

Nalina S.B

Forwarded

9/12/2020

Head of the Department
Electronics and Communication
J.N.N. College of Engineering
SHIMOGA-577 204.

09/12/2020

Gmail

sanjayac074@gmail.com

Compose

Inbox 3,748

Starred

Snoozed

Sent

Meet

New meeting

My meetings

Hangouts

Nalina

No recent chats

Invitation for partial delivery

Nalina S B <nalinasb@jnnce.ac.in>
to sanjayac074, HOD

Dear Sir,

We have requested you to deliver a session for the program will help the students to acquire the knowledge hereby thank you on behalf of department of ECE and JN

The session scheduled is as follows

Date: 16th December 2020
Time: 3:30PM to 4:30PM
Platform: Go to meet

Thanks and Regards

Nalina S.B
Asst Professor

AutoSave | IC_Fabrication_Session.pptx | Sanjay A C

File Home Insert Design Transitions Animations Slide Show Review View Help Tell me what you want to do | Share | Comments

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New Slide | Layout | Reset | Section | Slides
Font | Paragraph | Drawing | Arrange | Quick Styles | Shape Fill | Shape Outline | Shape Effects
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Dictate | Voice
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1 Integrated Circuits

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3 Integrated Circuits

4 Integrated Circuits

5 IC Packages

Integrated Circuits

Sanjay A C,
Cadence Design Systems,
Bengaluru

Slide 1 of 30 | Notes | 114%

3:35 PM
12/16/2020

Integrated Circuits

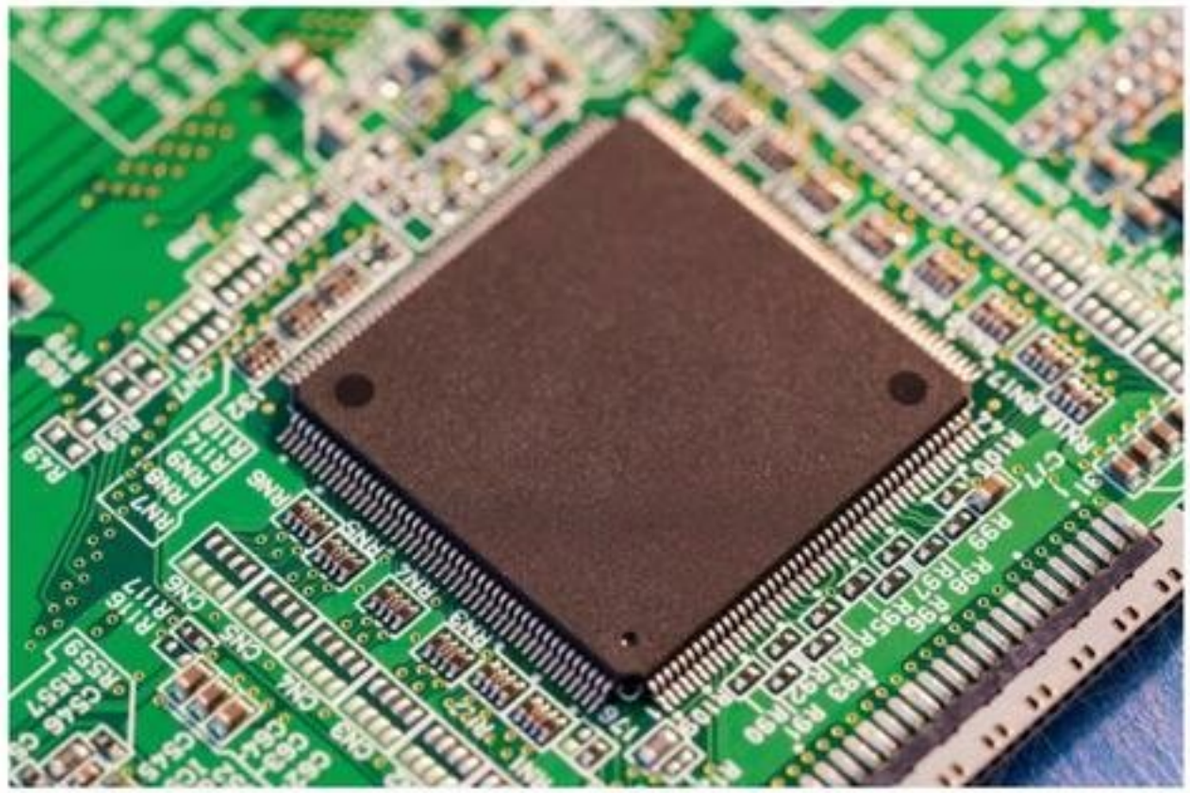
Sanjay A C,
Cadence Design Systems,
Bengaluru

contents

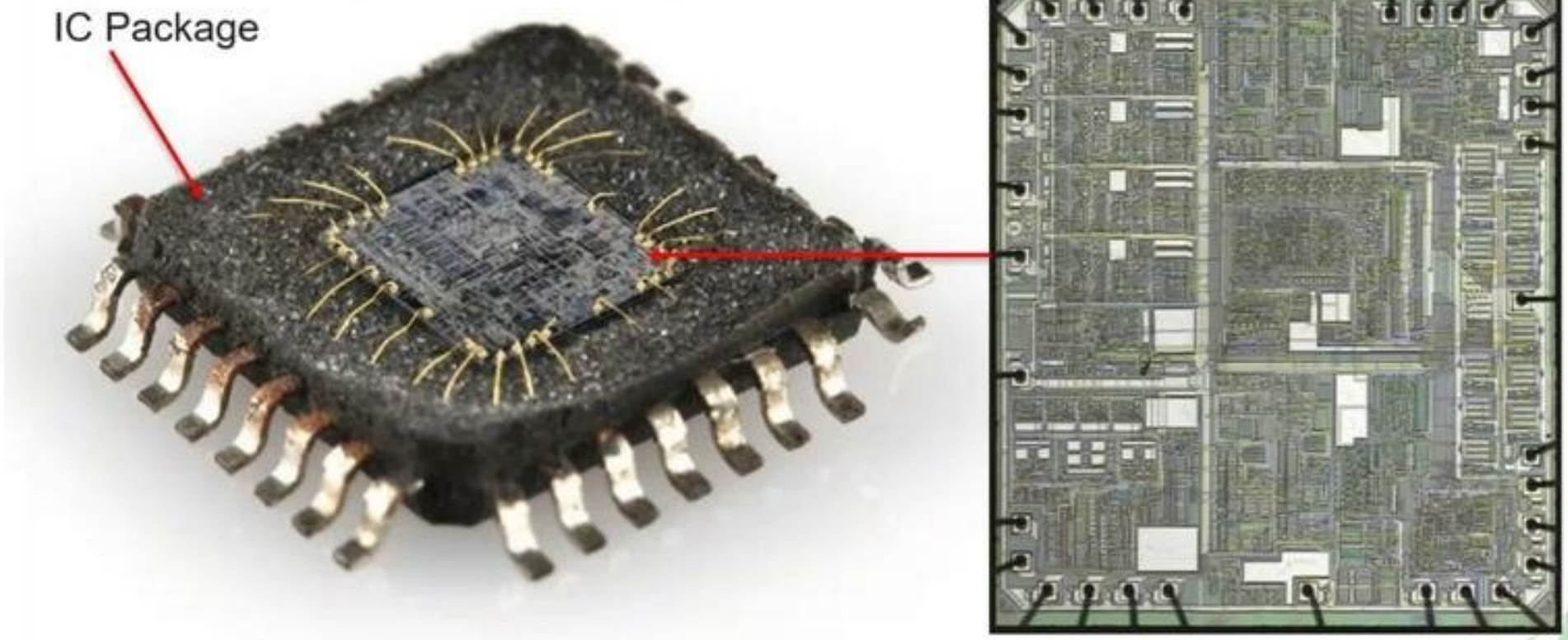
- Integrated circuit
- IC packages
- IC design flow
- Transistor
- MOSFET
- FINFET
- FDSOI
- GAAFET
- MBCFET
- Metal structure

Integrated Circuits

An **IC** is a small wafer, usually made of silicon, that can hold anywhere from hundreds to millions of transistors, resistors, and capacitors.



Integrated Circuits



IC Packages

- Through-hole technology.
- Surface-mount technology.
- Chip carrier.
- Pin grid array.
- Flat **package**.
- Small Outline **Integrated Circuit**.
- Chip-scale **package**.
- Ball grid array.

IC Packages

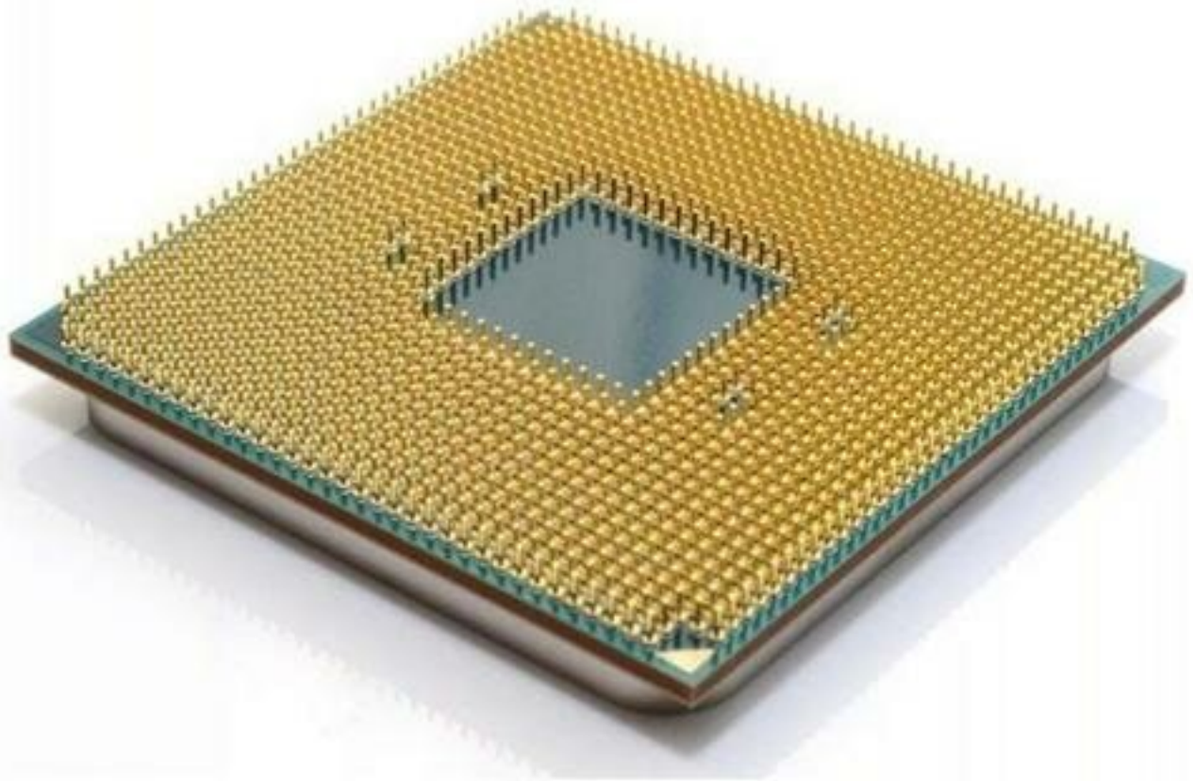

IC Package - Through Hole
PDIP
DIP
ZIP
PENTAWATT
T7-TO220
TO2205
TO220
TO99
TO92
TO18
TO03

IC Packages

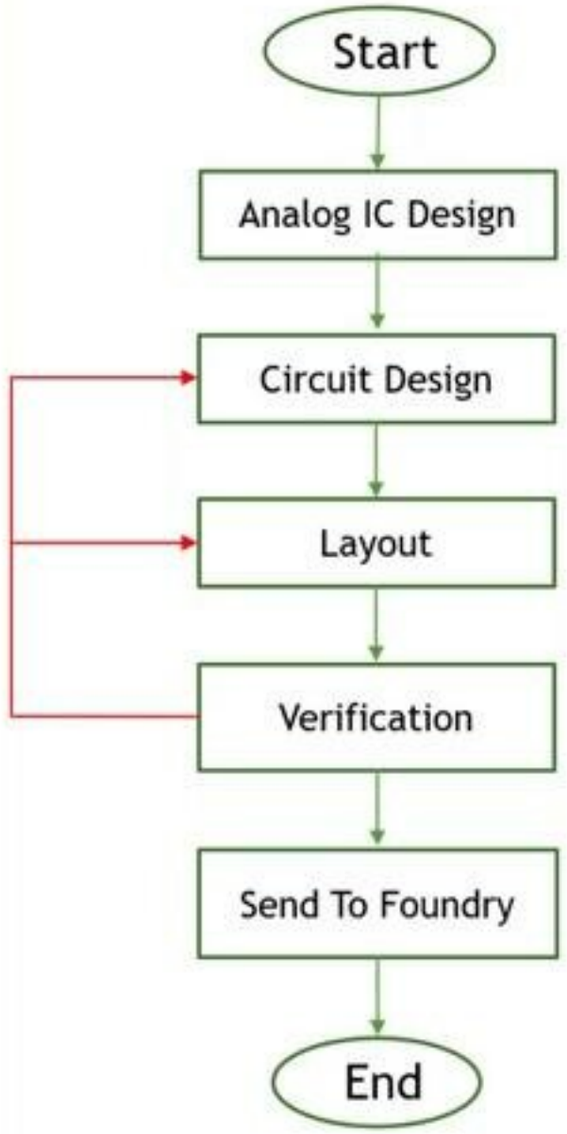

IC Package - Surface Mount
SOT23
SOT223
TO252
TO263
DDPAK
SOP
TSOP
TQFP
QFN
BGA

IC Packages

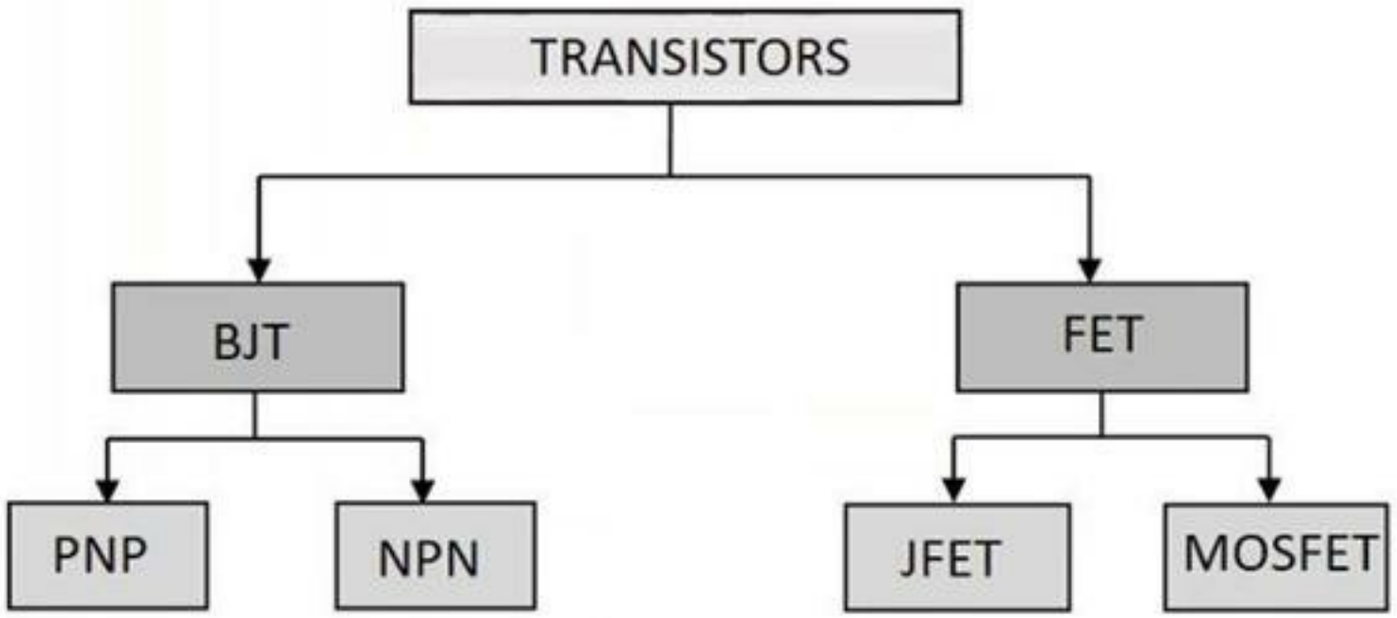
Pin grid array



IC Design Flow:



Transistors

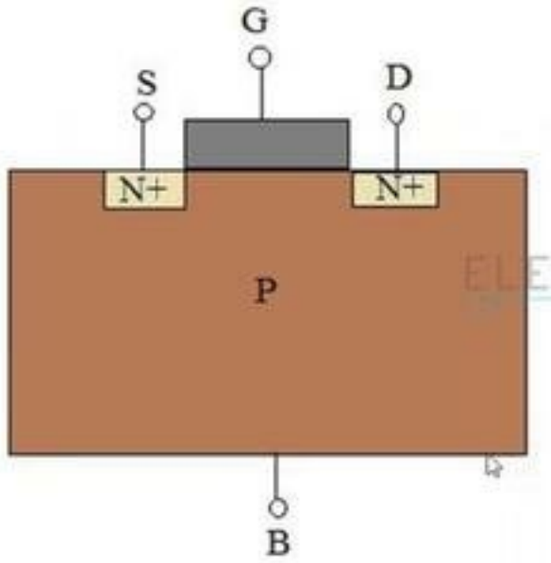


MOSFET

Metal Oxide Semiconductor Field Effect Transistor

- We have two types of MOSFET
  - NMOS - N channel MOSFET
  - PMOS - P channel MOSFET

NMOS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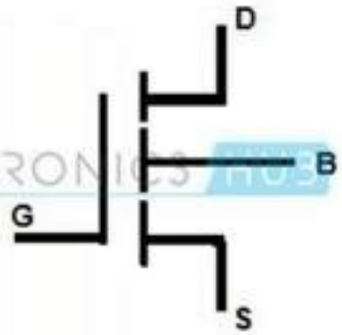
S
D
N+
N+
P
B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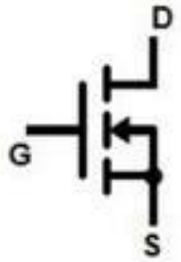
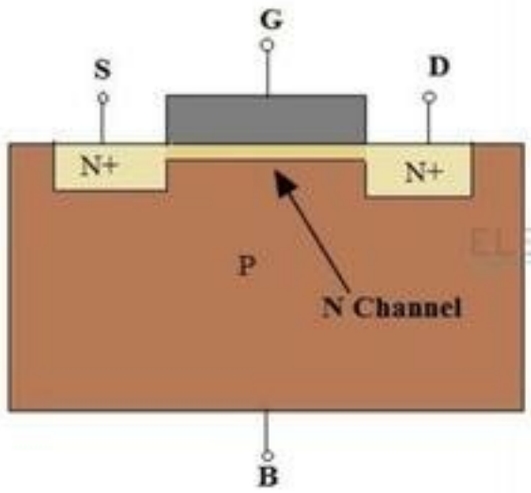
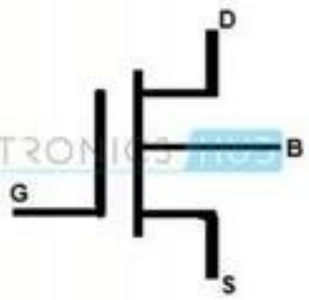
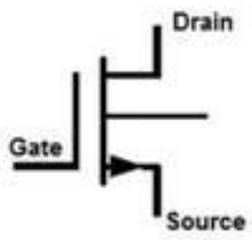
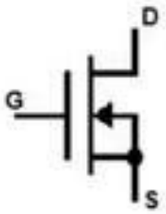

D
G
S


D
G
S


G
S
D
N+
N+
P
N Channel
B


D
B
G
S


Drain
Gate
Source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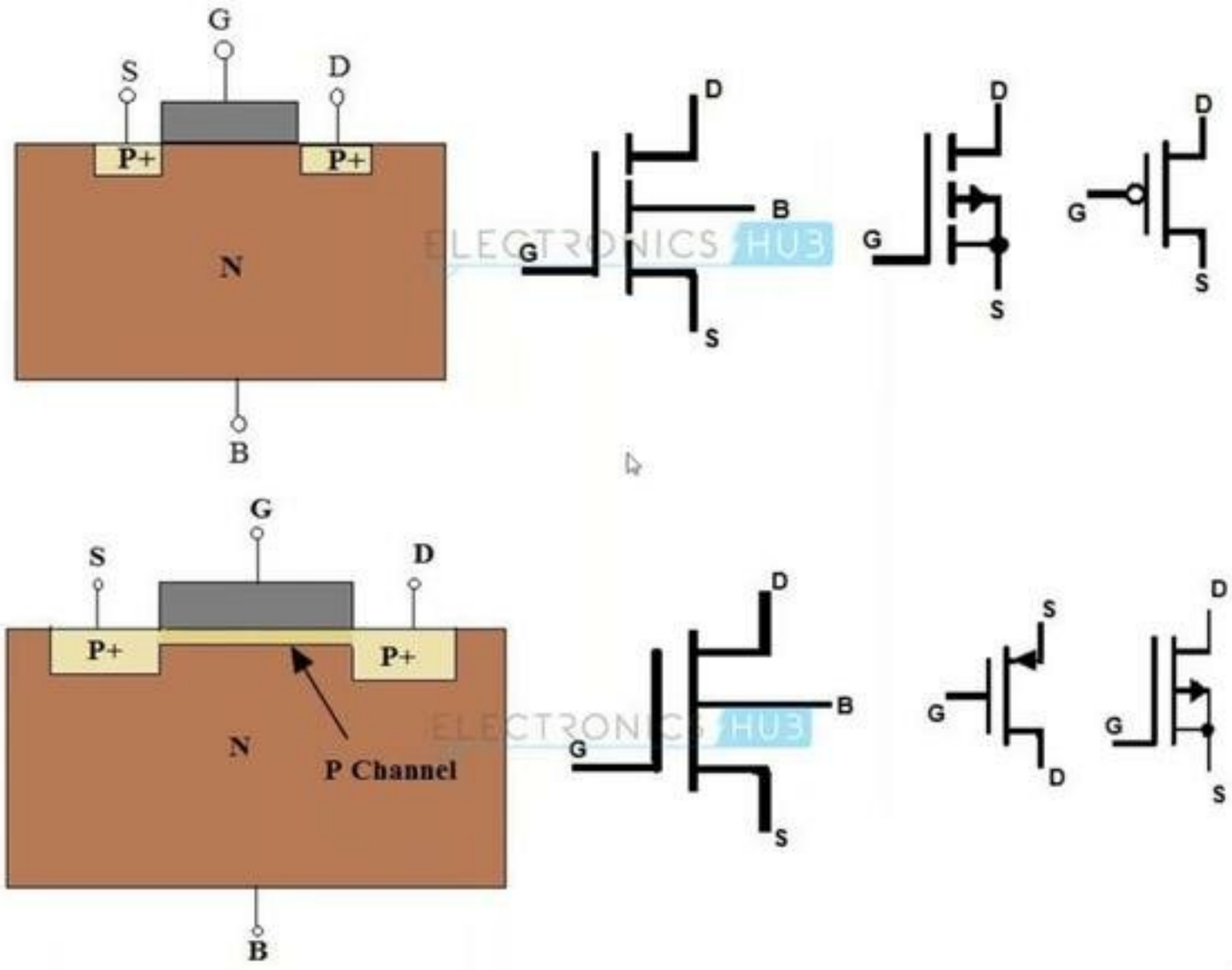
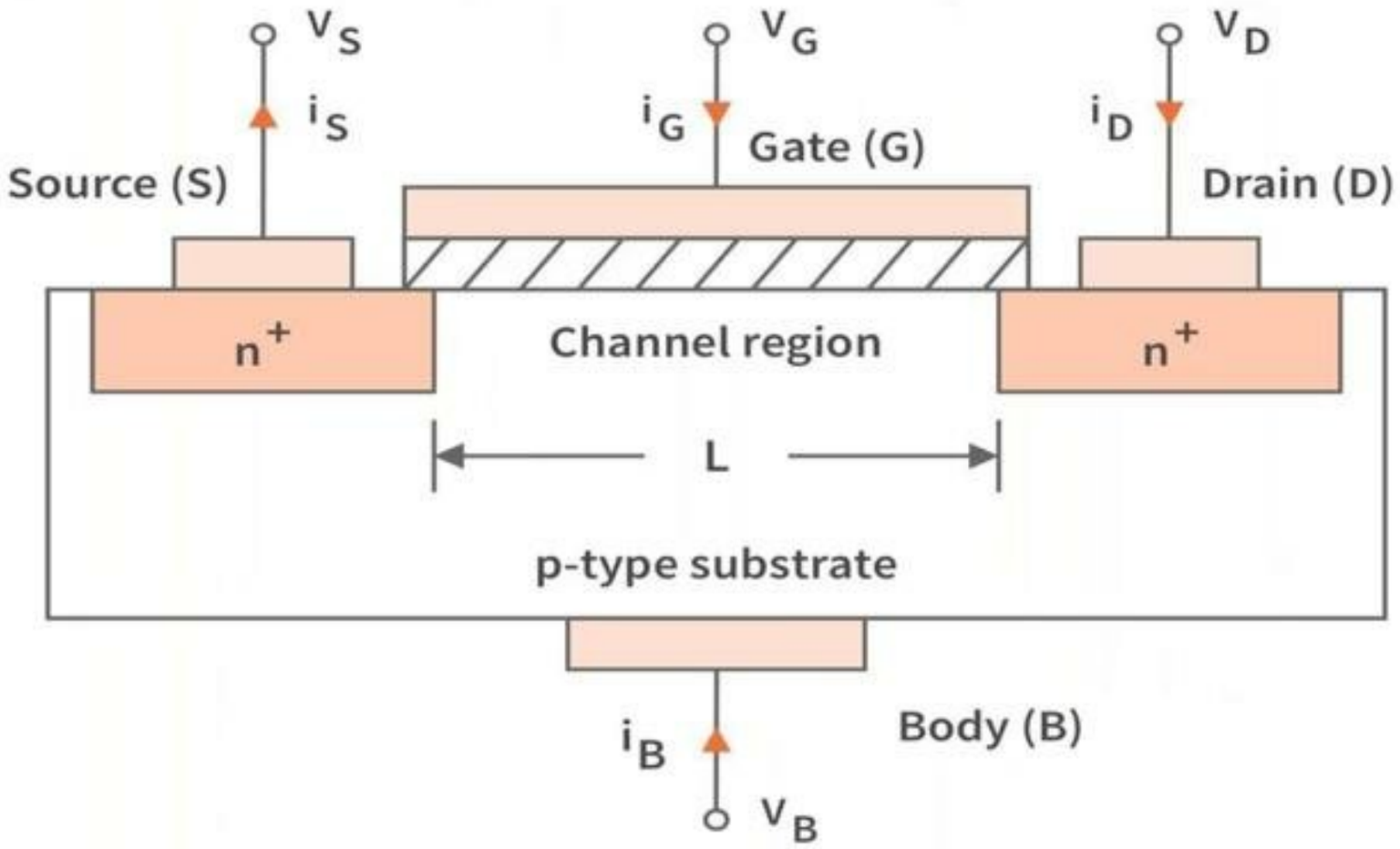
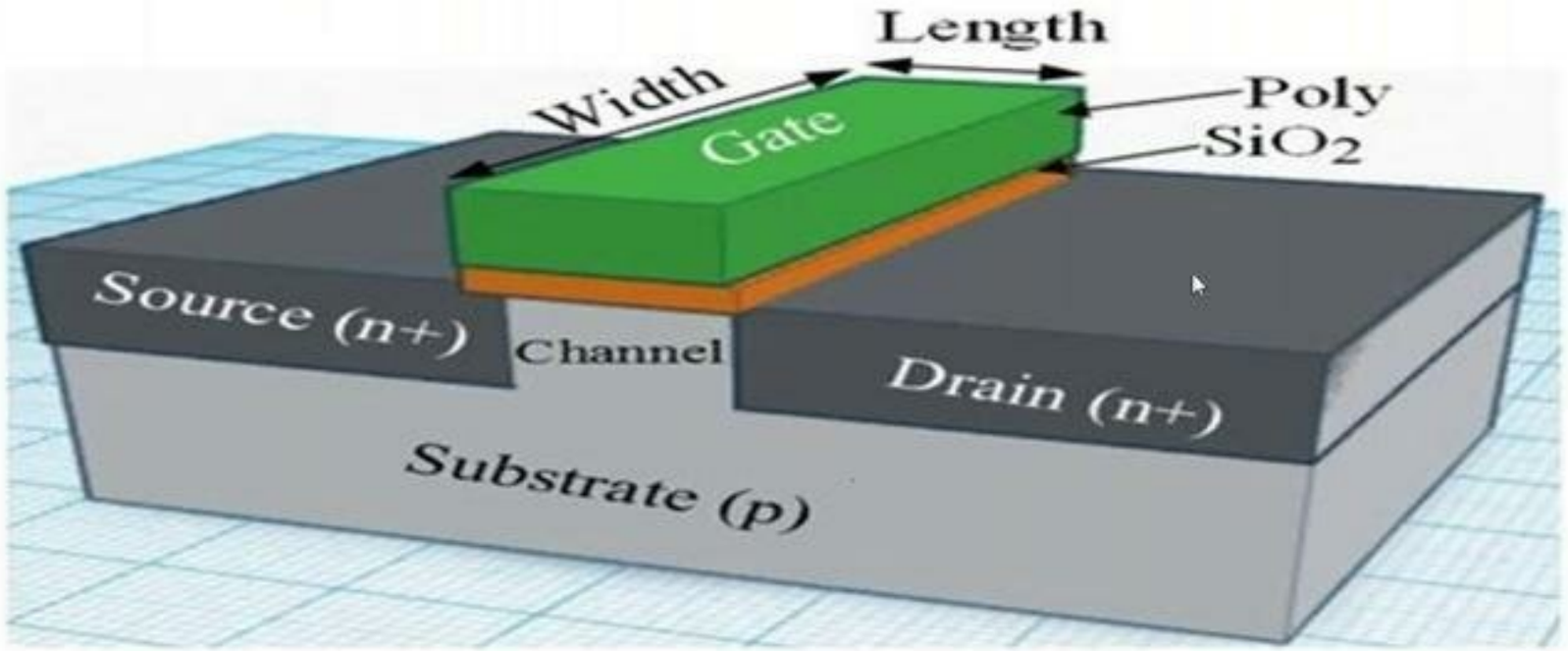
PMOS



NMOS - Negative Channel Metal Oxide Semiconductor

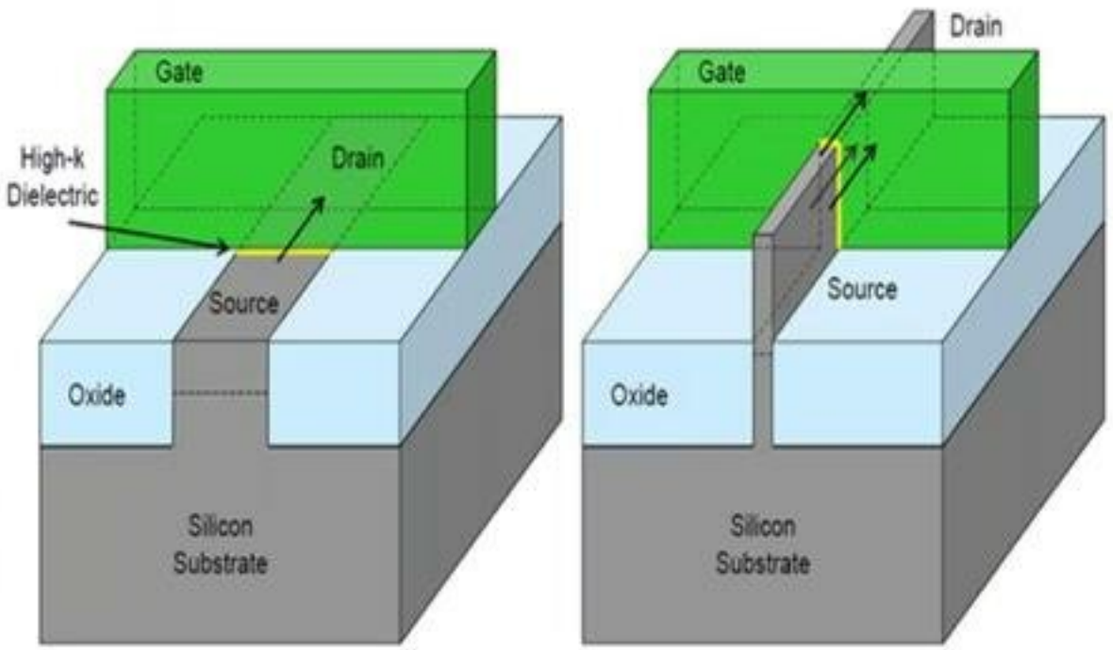




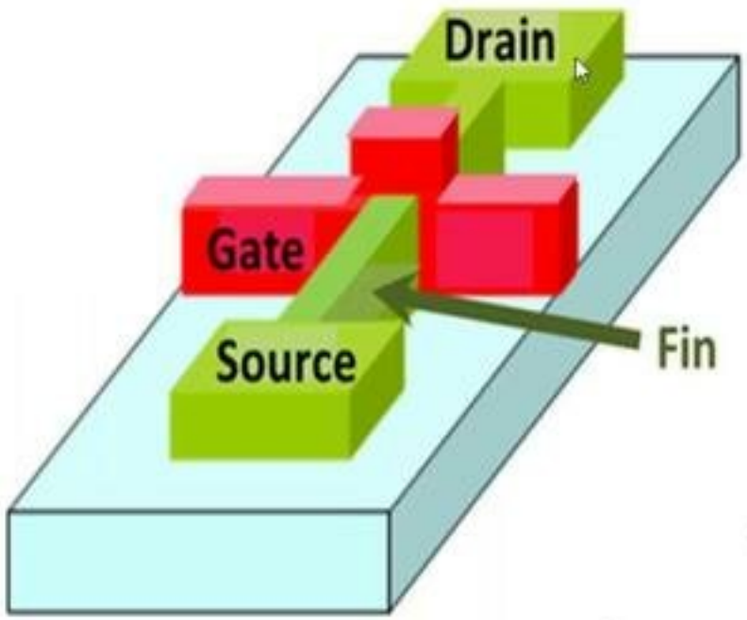
3D view of NMOS.

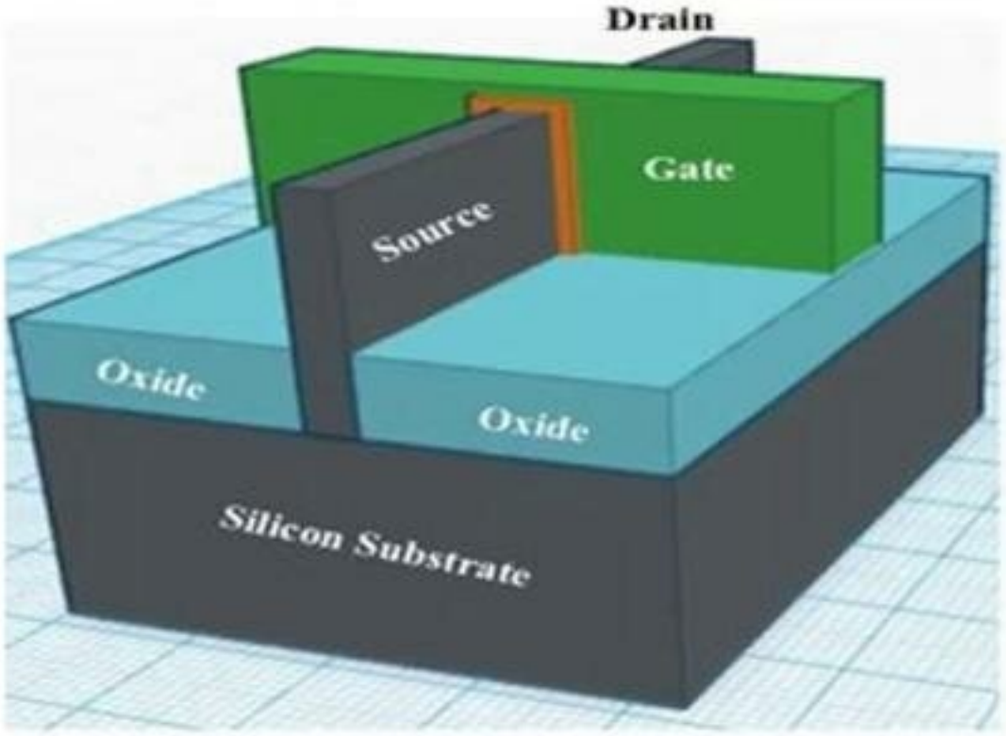
FinFET

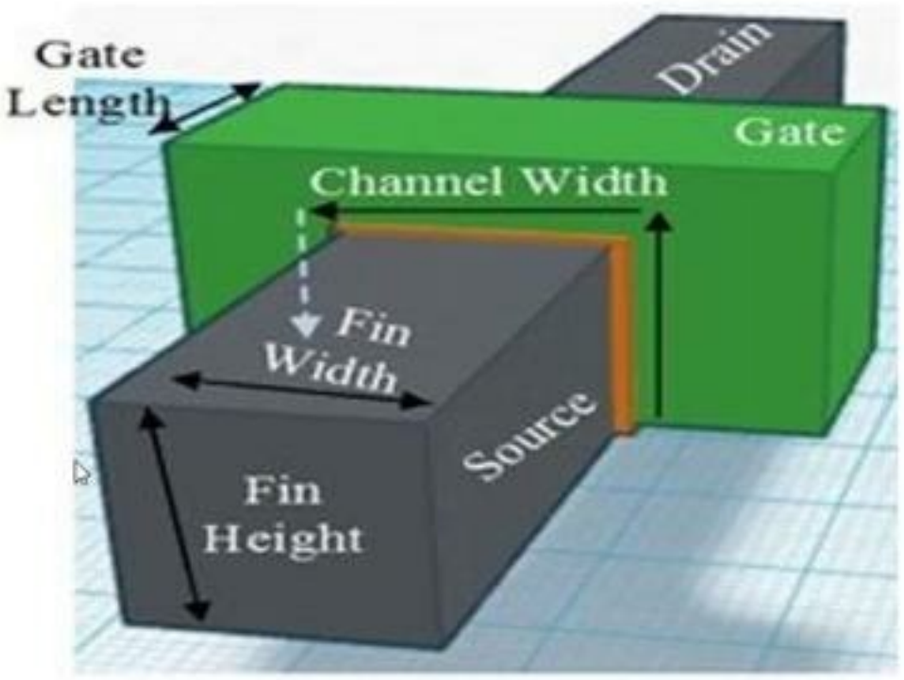
- Full form -> Fin field-effect transistor
- Source and drain region resembles the fin on the silicon surface
- In panner MOS, the channel is **horizontal**. While in FinFET channel, it is **vertical**
- Mainly used for technologies beyond 28nm



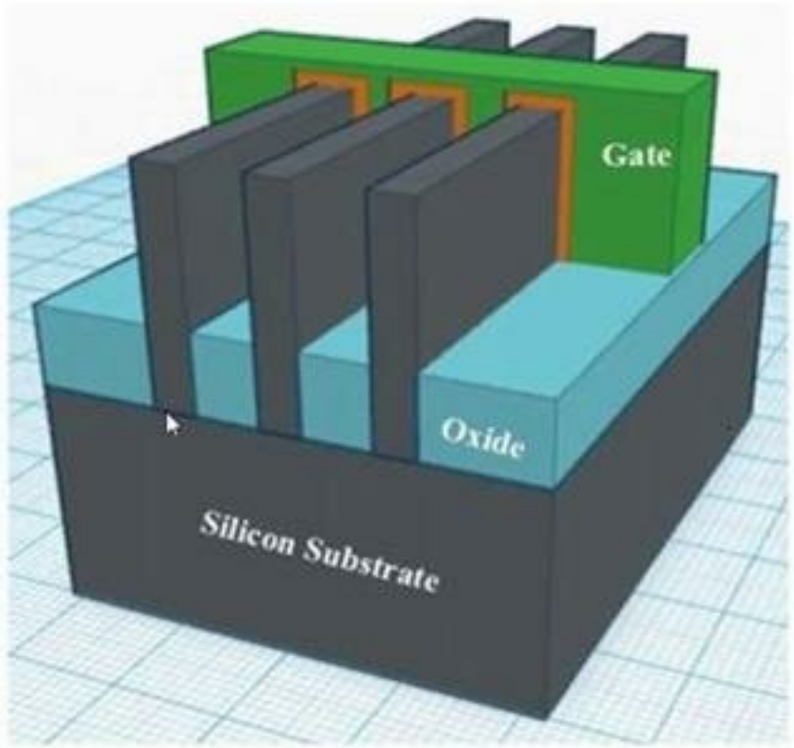
MOSFET FinFET







In FinFET drive current can be increased by increasing the width of the channel that is by increasing the height of the Fin.



Constructing parallel multiple Fins connected together to increase the device drive current.

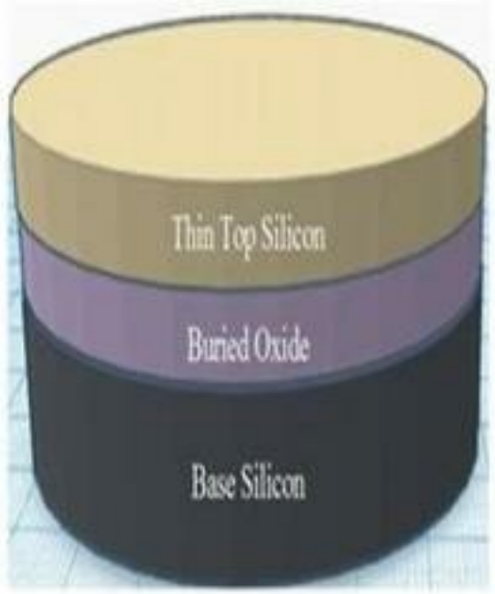
Advantages of FinFET:

- Higher drive current
- Higher speed
- Low leakage
- Low power consumption
- FinFET suffers less from dopants-induced variation
- Scaling of the transistor beyond 28nm

SOI(Silicon-On-Insulator):

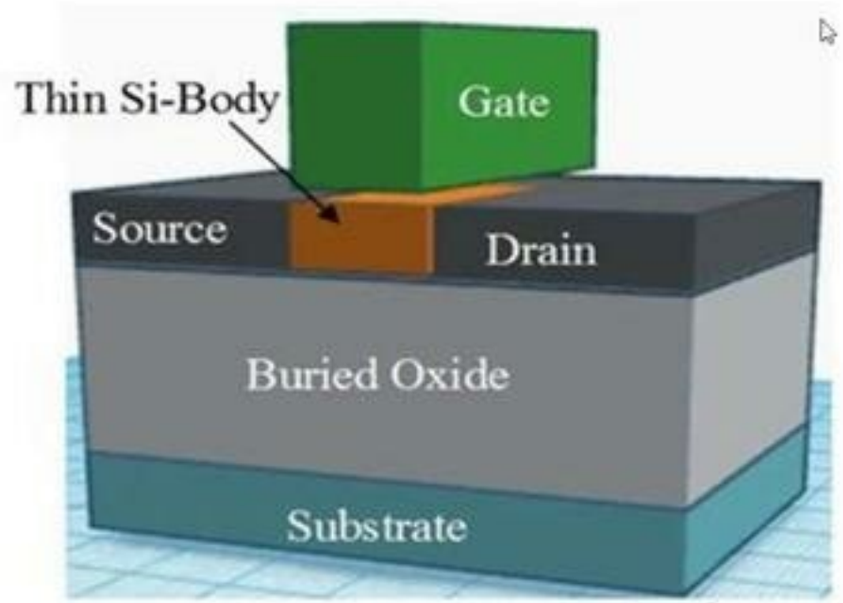
It has three layers:

1. Thin surface layer of silicon(where transistor are formed)
2. An underlying layer of insulating material
3. A support or “handle” silicon wafer



Types:

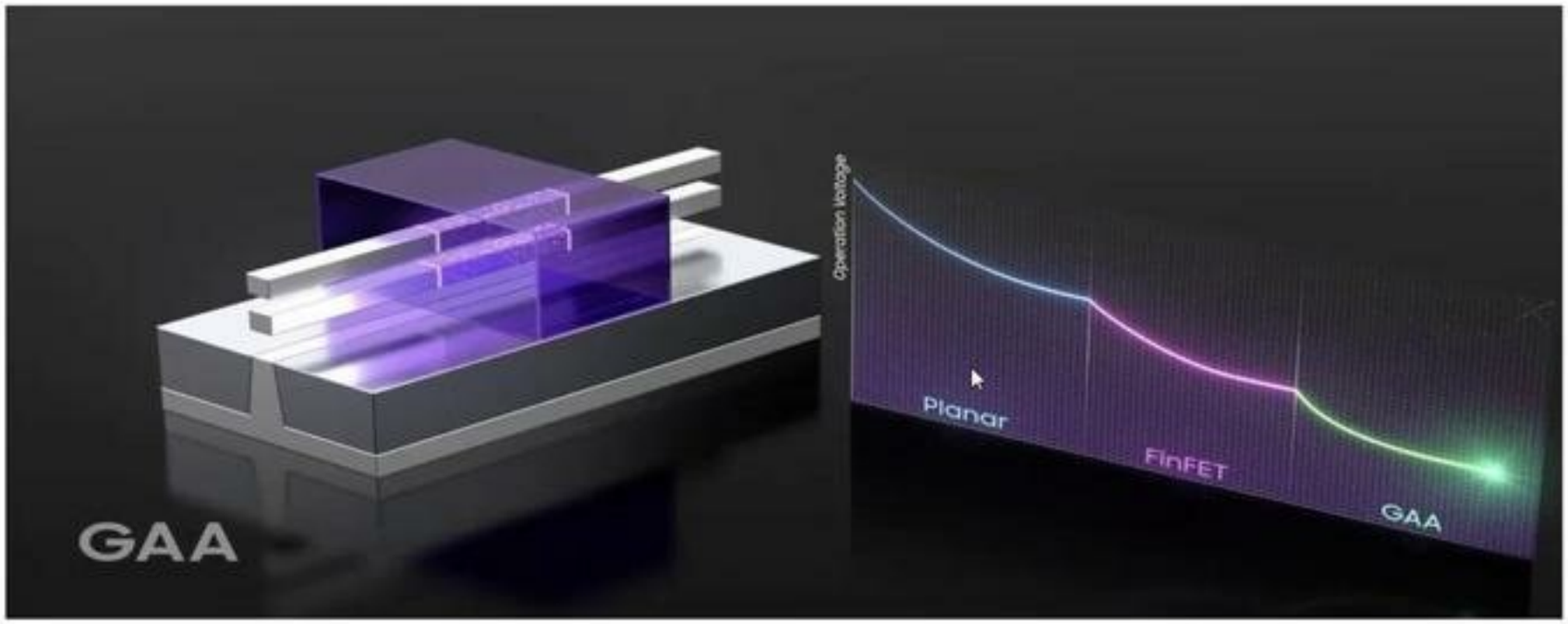
- Partially Depleted SOI(PDSOI)
- Fully Depleted SOI(FDSOI)



Advantages of FDSOI

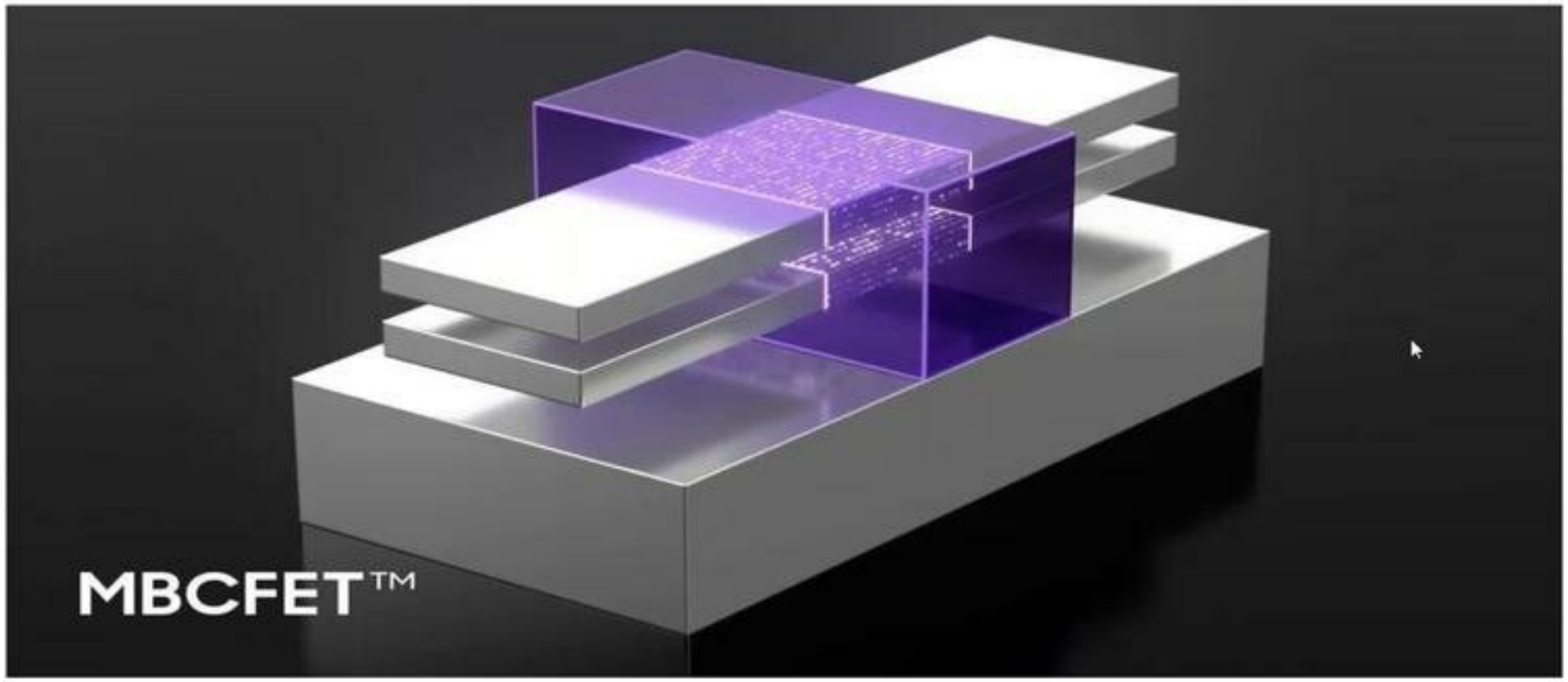
- Improved speed
- Reduced power
- Simpler manufacturing process
- It delivers a good power, performance, cost tradeoff compared to both bulk and FinFET technologies

GAAFET(Gate All Around FET):

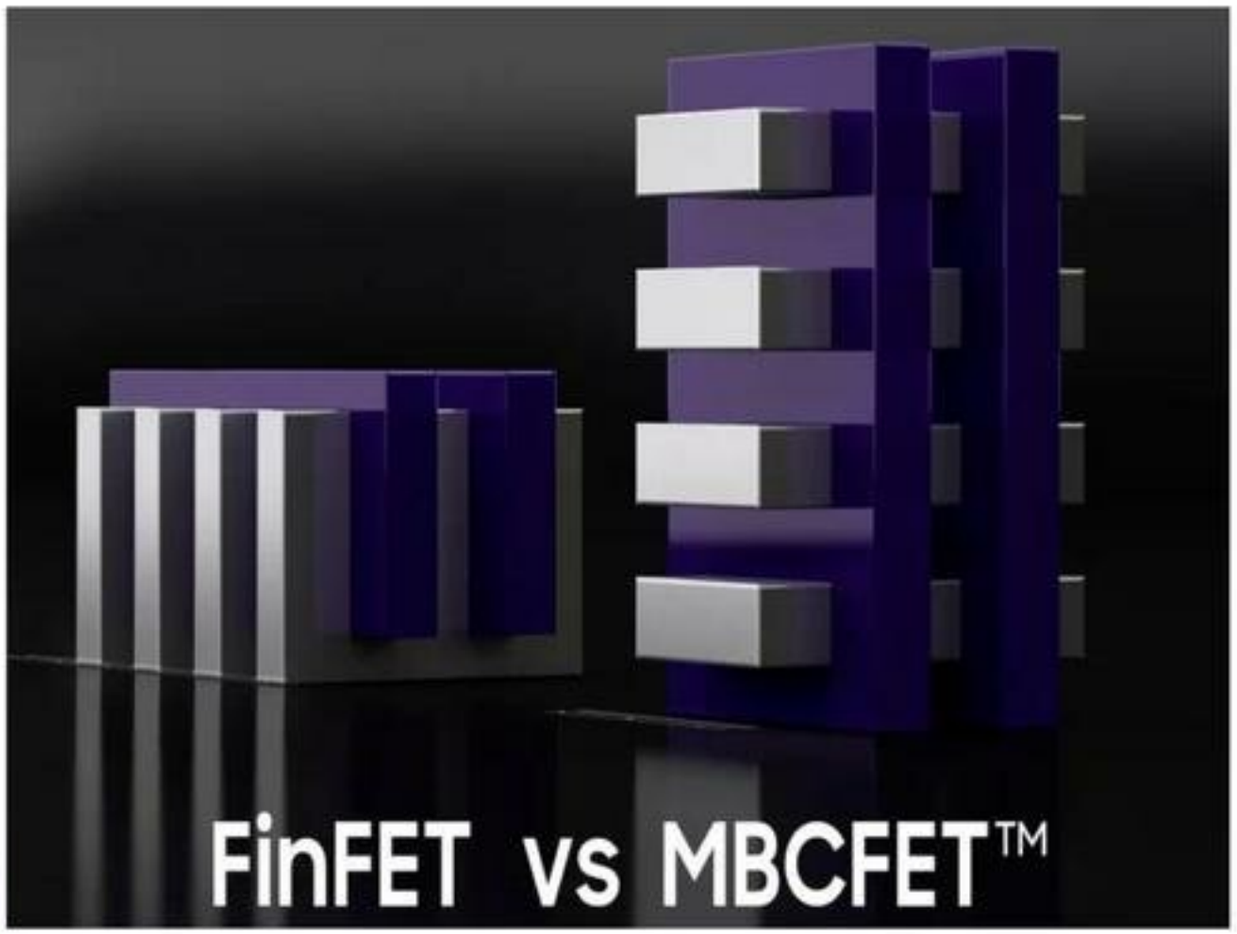


- Due to the process node becoming smaller and smaller, electrostatic effects started to cause problem
- A solution was to use GAA nanowires to limit those effect
- But nanowires are apparently really hard to integrate into silicon

MBCFET(Multi-Bridge Channel FET):

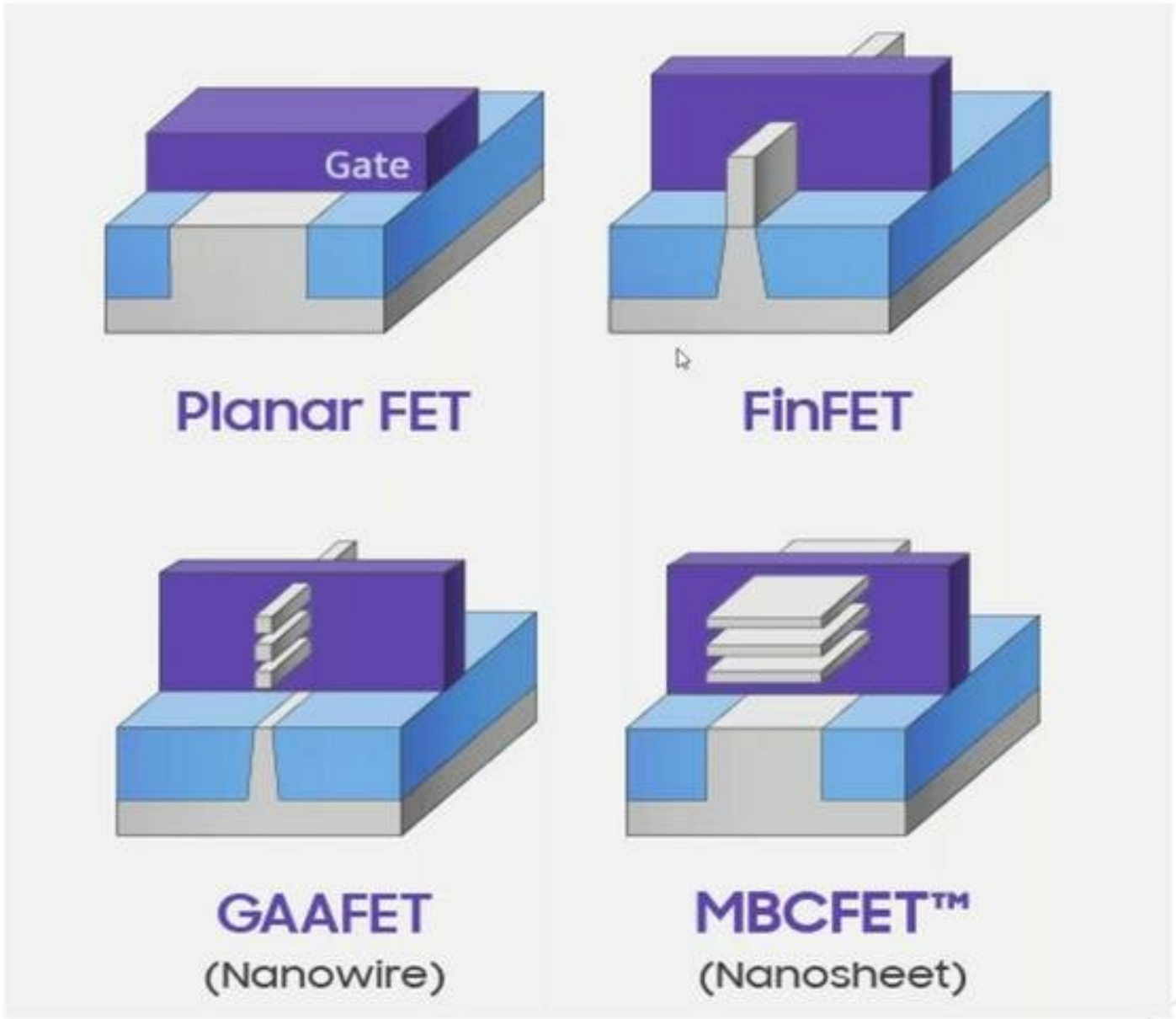


Samsung using thin layers(nanosheets) instead of nanowires enabling greater current per track.

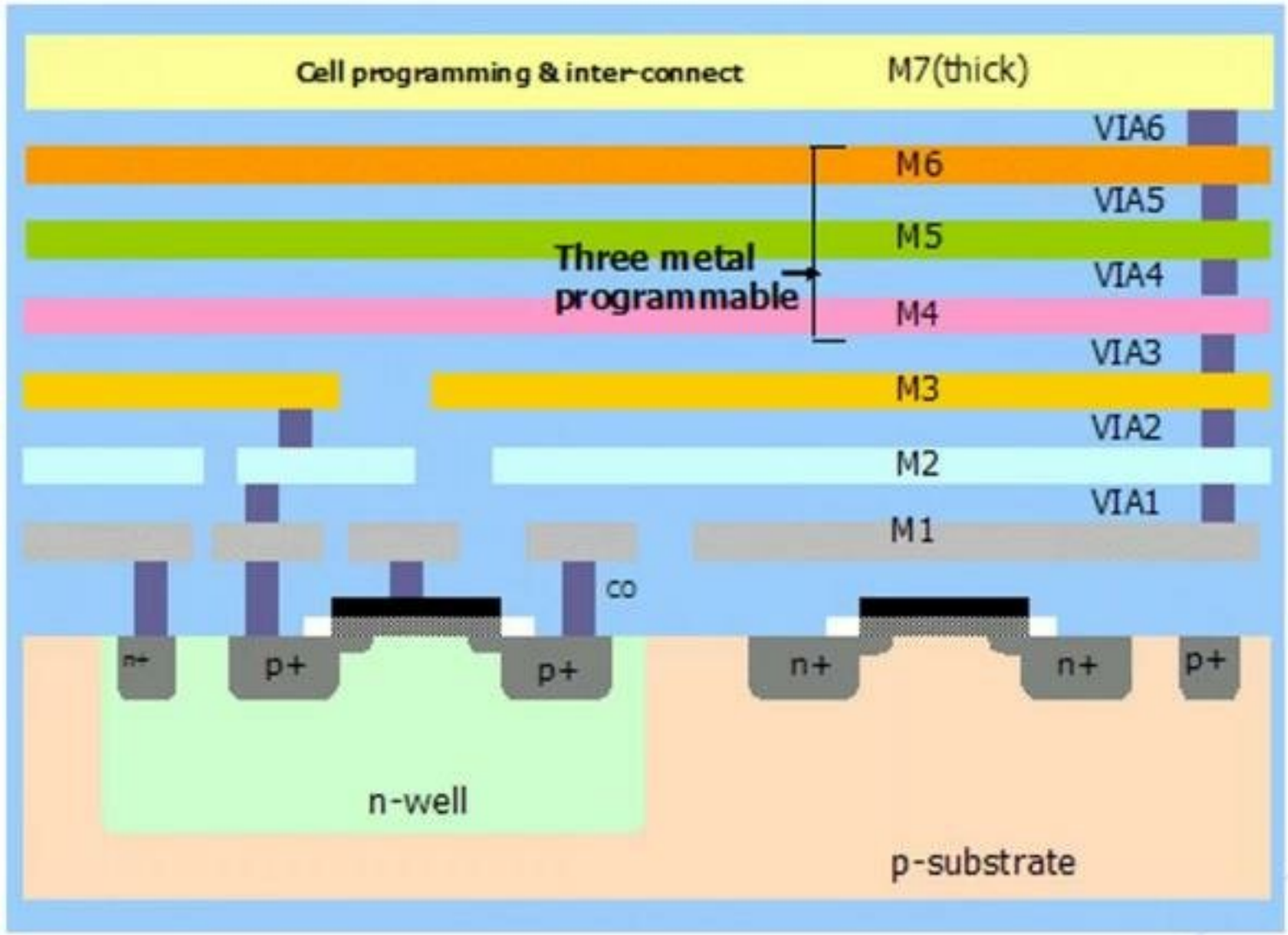


- MBCFET will enable manufacturing of chips using a 3nm process
- Compared to 7nm FinFET technology, Samsung's 3GAE/ MBCFET process should provide up to a 45% reduction in chip area with either 50% lower power consumption or 35% higher performance

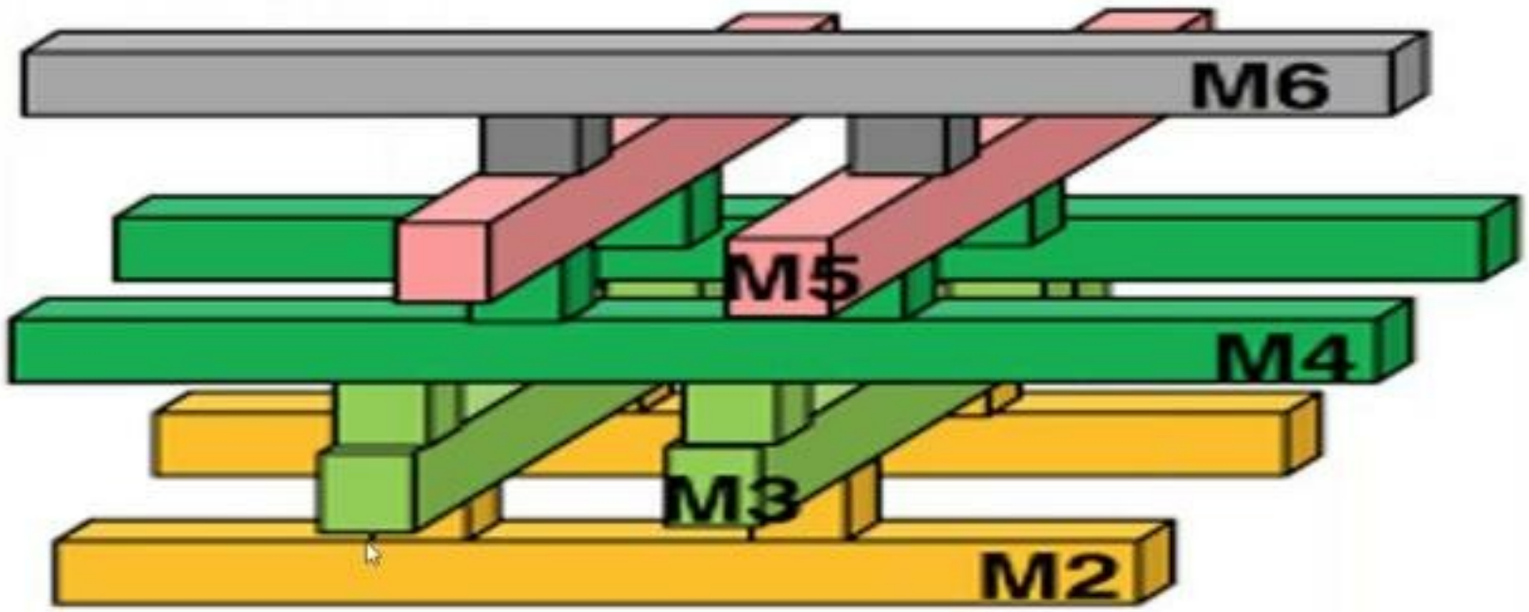
FETs

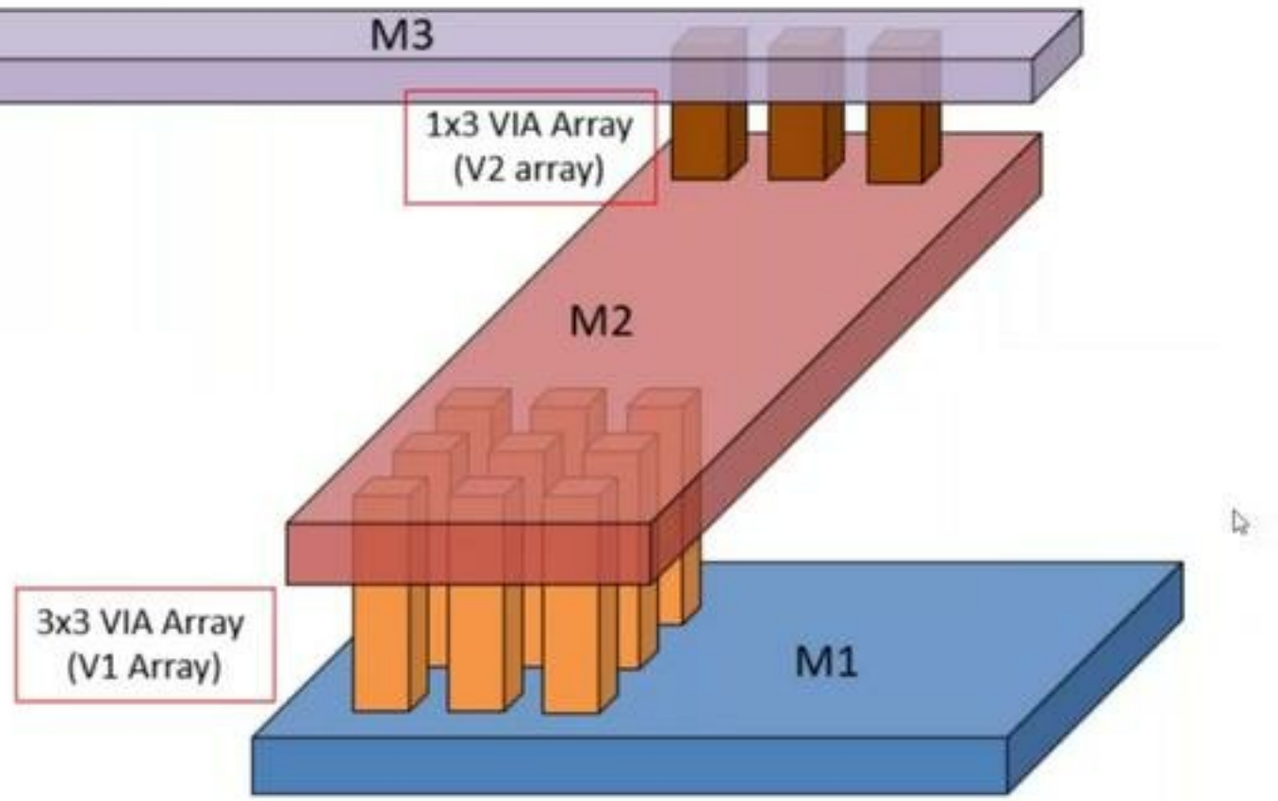


Metal Structure



Metal Structure

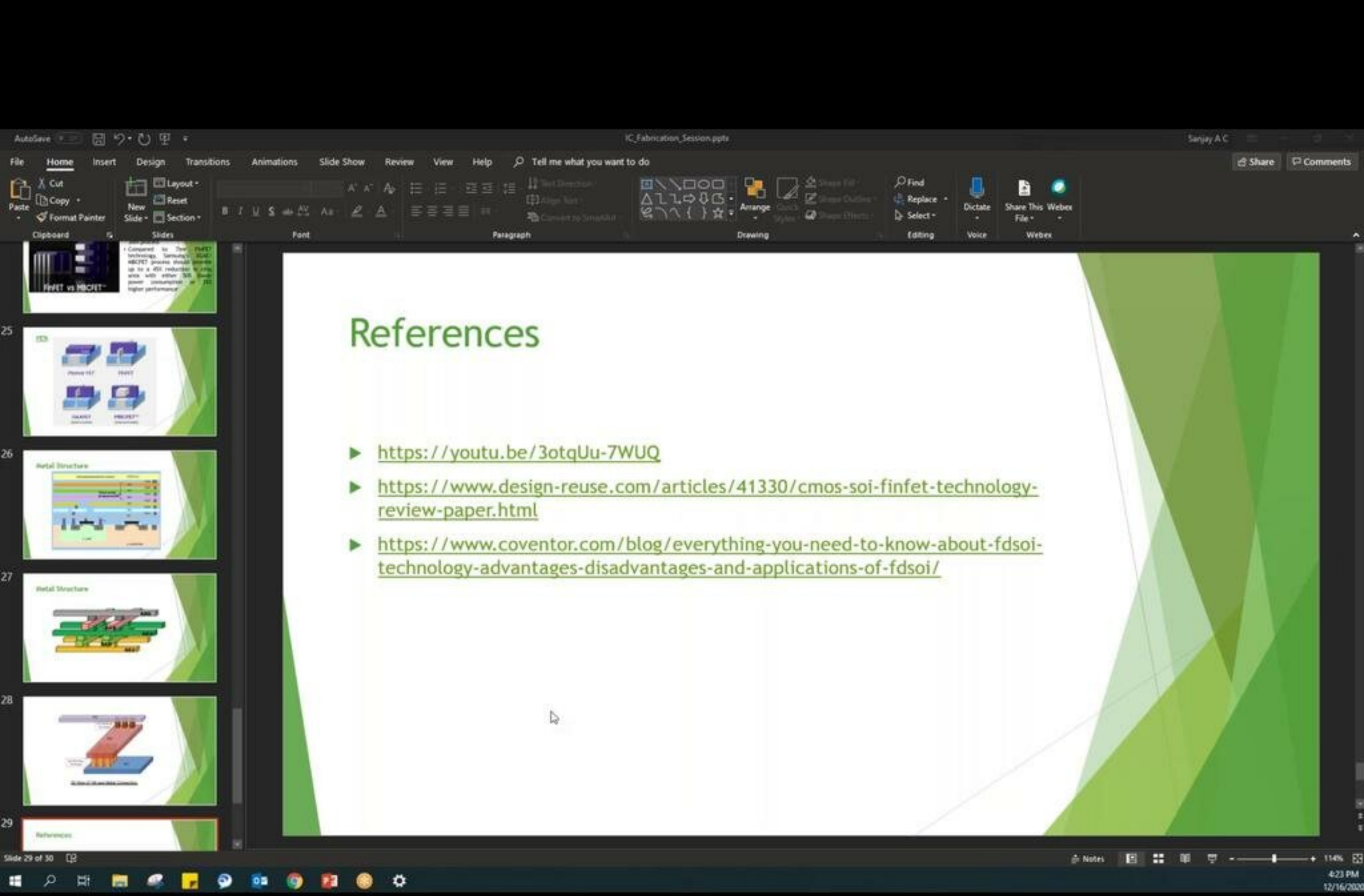




3D View of VIA and Metal Connection.

References

- https://youtu.be/3otqUu-7WUQ
- https://www.design-reuse.com/articles/41330/cmos-soi-finfet-technology-review-paper.html
- https://www.coventor.com/blog/everything-you-need-to-know-about-fdsoi-technology-advantages-disadvantages-and-applications-of-fdsoi/



References

- https://youtu.be/3otqUu-7WUQ
- https://www.design-reuse.com/articles/41330/cmos-soi-finfet-technology-review-paper.html
- https://www.coventor.com/blog/everything-you-need-to-know-about-fdsoi-technology-advantages-disadvantages-and-applications-of-fdsoi/

Industrial talk on Electronic Devices Attendees

Summary

GoToMeeting

Meeting Date	Meeting Duration	Number of Attendees	Meeting ID
December 16, 2020 3:07 PM IST	78 minutes	91	454-432-061

Details

Name	Email Address	Join Time	Leave Time	Time in Session (minutes)
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4JN19EC006 ADITHYA P		3:40 PM	4:24 PM	44
4JN19EC007 Aishwarya K M		3:29 PM	4:24 PM	54
4JN19EC010 AJITH A M		3:47 PM	4:24 PM	36
4JN19EC012 AKASH B SHETTY		3:38 PM	3:49 PM	11
4JN19EC013 Akhilesh S	theakhileshjadhav@gmail.com	3:37 PM	3:41 PM	3
4JN19EC016 Annapoorna ES		3:54 PM	4:25 PM	31
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Pavan K 4JN19EC067	pknaik2002@gmail.com	3:40 PM	4:11 PM	31
Poorvika S		3:32 PM	3:33 PM	0
Prabhanjana M N_4JN19EC069	prabhanjana5@gmail.com	3:49 PM	4:25 PM	35
Prabhanjana M N_4JN19EC069	prabhanjana5@gmail.com	3:43 PM	3:49 PM	5
Pradeep Kumar L H	pradeepkumarlhsmg65@gmail.com	3:30 PM	4:24 PM	53
Pratheek Shetty 4JN19EC071	pratheekshetty32@gmail.com	3:34 PM	3:44 PM	9
Pratheek Shetty 4JN19EC071	pratheekshetty32@gmail.com	3:47 PM	4:24 PM	37
Priyanka.h.b 4JN19EC072		3:40 PM	4:24 PM	44
Punith. G		3:35 PM	4:25 PM	49
Raghavendra G		3:37 PM	4:25 PM	47
Raghavi.B.S	raghavigowda888@gmail.com	4:13 PM	4:17 PM	3
Raghavi.B.S	raghavigowda888@gmail.com	4:17 PM	4:18 PM	0
Ramya P 4JN19EC076	rramyap920@gmail.com	3:33 PM	4:24 PM	51
SUNIL N H 4JN19EC097	suni14052001@gmail.com	3:43 PM	4:06 PM	23
SUNIL N H 4JN19EC097	suni14052001@gmail.com	4:07 PM	4:25 PM	18
Sanjay A C		3:12 PM	4:24 PM	71
Shivaprakash G M 4JN19EC082		3:38 PM	4:09 PM	31
Shreya Bijjur		3:36 PM	4:24 PM	48
Sinchana G P 4JN19EC088		3:33 PM	4:25 PM	51
Sinchana M Jagatap		3:35 PM	3:38 PM	3
Sinchana M Jagatap		3:39 PM	4:09 PM	30
Skanda R Naidu	skandarnaidu143@gmail.com	3:19 PM	3:19 PM	0
Skanda R Naidu	skandarnaidu143@gmail.com	3:17 PM	3:18 PM	0
Spurthi M 4JN19EC091		3:41 PM	4:20 PM	39

Sudeep K N	sudeepkn2018@gmail.com	3:28 PM	4:24 PM	56
Suhail Ahmed		3:36 PM	3:40 PM	3
Suhail Ahmed		4:16 PM	4:25 PM	8
Surajgk		3:34 PM	3:38 PM	4
Surajgk		3:41 PM	4:01 PM	19
Surajgk		3:40 PM	3:41 PM	1
Swasthi S 4JN19EC101		3:33 PM	4:25 PM	51
U Raksha		3:38 PM	3:41 PM	2
Umashankar		4:01 PM	4:02 PM	0
Vedashree GL 4JN19EC108	vedashreelepakshi@gmail.com	4:01 PM	4:25 PM	23
Vidya.B 4JN19EC109		3:36 PM	4:24 PM	47
Yashodha M R		4:19 PM	4:24 PM	5
Yashodha M R		3:25 PM	3:25 PM	0
Yashodha M R		3:29 PM	3:50 PM	20
Yashodha M R		3:51 PM	4:19 PM	27
Yashodha M R		3:21 PM	3:22 PM	1