



Vidya Vikas Education Trust's  
**Universal College of Engineering**  
Kaman - Bhiwandi Road, Vasai, Maharashtra  
Accredited with 'B+' grade by NAAC, approved by AICTE, DTE  
Recognized as Gujrati Linguistic Minority

## *CURRENT WAVES*

*The Official Newsletter of Dept. of EXTC, UCOE*  
*OCTOBER VOLUME 4, EDITION 4*



## *College Profile*

*Everything you need to know about us.*

Embraced by lush greenery and scenic beauty, Universal College of Engineering is a treasured place for aspiring engineers to leave their imprints towards success.

As a college within the wider network frame, we are one of the fastest growing institutions in India. Our institute has been accredited by National Assessment and Accreditation

Council (NAAC) with **B+ grade** in the first cycle of accreditation. Times of India Survey **Ranked No. 1** in India among Top Emerging Private Engineering Institutes for 6 consecutive years 2015, 2016, 2017, 2018, 2019 and 2020 and the saga of accolades still continues.

In response to the expectations of quality technical education, our college is approved by the "All India Council for Technical Education" (AICTE), New Delhi; recognized by the Directorate of Technical Education (DTE), Government of Maharashtra; affiliated to Mumbai University.

Our college is also associated with professional bodies like IEEE, IETE, ISA and CSI to update the revolutionary technological advancements.

### ARTICLES INSIDETHIS ISSUE:

*IIT Guwahati researchers develop device for early and easy detection of diabetic retinopathy*

*How wearable technology could help fight Covid-19*

*Understanding 5G New Radio in Non-standalone Operation Applications*

*Cadence Releases First ECAD Platform Dedicated to 3D System Design*

*'Zero temp-co' current limiting diodes up to 575mA*

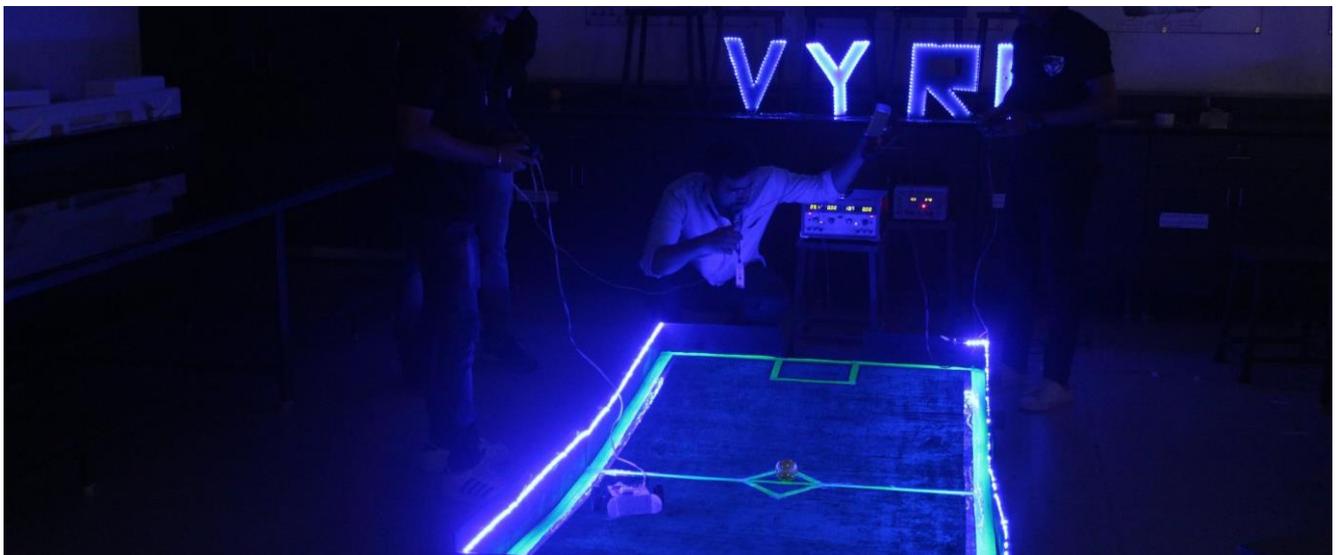
*Crossword*

*We offer 4 years full-time Bachelor of Technology in Computer Engineering, Civil Engineering, Artificial Intelligence & Machine Learning, Information Technology Engineering and Data Engineering.*

The unique state-of-the-art facility of the institute has been carefully designed to accommodate the needs of the students. Laboratories are equipped with world-class facilities based on the latest technology of different sectors. Our smart classrooms are well ventilated, spacious and equipped with overhead and LCD projectors along with the public address system. College library provides a rich collection of specialist library resources and services to support students' academic work and enrich their research skills.

We are obliged to equip our students to get placed in highly reputed companies by mentoring their necessary skill set for cutting-edge technologies. The core highlighted areas are helping students with their technical competency, communication skills along with career guidance and counselling.

Universal College of Engineering has produced a large number of successful alumni who are working in reputed organizations in India and abroad and have contributed immensely to the cause of nation-building and society. We welcome all engineering aspirants to create an incredible legacy in the field of engineering.



# *IIT Guwahati researchers develop device for early and easy detection of diabetic retinopathy*

## *The Story*

Guwahati: Indian Institute of Technology are complicated and require skilled operators and can show the malady only after it has progressed enough to be detected. The IIT Guwahati team wondered if there was a simple test such as a blood or urine test, that can detect retinopathy even before symptoms are seen in the eye. This induced the researchers to look for appropriate biomarkers of retinopathy – chemicals that are found in body fluids, that can indicate impending or ongoing retinopathy.

The researchers found that  $\beta$ -2-microglobulin (B2M), a protein found in tears and urine, is a reliable indicator for retinopathy. Armed with this knowledge, they set out to develop a device that can detect this protein in these body fluids.

The team developed a device in which the sensing element was an antibody to B2M that was immobilised on gold particles a hundred thousand times smaller than the width of the human hair. When the nanogold-laden antibody came in contact with B2M, there was a colour change.

“We designed a microfluidic system, in which, the body fluid – tear or urine – was drawn into very thin tubes or capillaries, where they came in contact with the gold-antibody nanoparticles, and the change in colour was assessed to detect B2M”, explains the lead researcher.

Guwahati in collaboration with Sankaradeva Nethralaya Guwahati, have developed a point-of-care testing device that can detect diabetic retinopathy at an early stage, without need for invasive testing.

The research team is led by Dr. Dipankar Bandyopadhyay, Professor, Department of Chemical Engineering and Head of Center for Nanotechnology, IIT Guwahati. Descriptions and results of their testing device have been recently published in the ACS journal, ACS Sustainable Chemistry & Engineering.

The paper has been authored by Prof. Bandyopadhyay and his students, Surjendu Maity, Subhradip Ghosh, Tamanna Bhuyan, at IIT Guwahati. The other author and collaborator

Dr. Dipankar Das, a Senior Consultant and practicing Ophthalmologist, is the Head of the Department of Ocular Pathology and Uvea in Sankaradeva Nethralaya, Guwahati.

The team has also filed an Indian patent for this idea and device. The research is funded by the Ministry of Human Resource and Development, Indian Council of Medical Research and Ministry of Electronics and Information Technology, Government of India.

Diabetic retinopathy is a serious non-communicable disease in India, with a conservative estimate that 11 - 20 million Indians will suffer from this malady by 2025. It is caused by abnormal growth in the retinal blood vessels in people with diabetes, and it is usually worsened when the patient is on insulin for diabetic treatment.

“Currently, the first step in the test for diabetic retinopathy is an invasive eye exam, in which the eyes are dilated and the ophthalmologist inspects the eye,” explains Dr. Bandyopadhyay. As people who have had eye examination know, this is inconvenient, with blurry vision for a long time after examination.

Advanced detection methods such as optical coherence tomography, fluorescein angiography, detection of exudates in retina, and image analysis are complicated and require skilled operators and can show the malady only after it has progressed enough to be detected. The IIT Guwahati team wondered if there was a simple test such as a blood or urine test, that can detect retinopathy even before symptoms are seen in the eye. This induced the researchers to look for appropriate biomarkers of retinopathy – chemicals that are found in body fluids, that can indicate impending or ongoing retinopathy.

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# How wearable technology could help fight Covid-19

Coronavirus has taken us all by surprise, with many parts of the world in or heading into virtual lockdown. Can developments in tech and healthcare devices now come into their own and help us fight back against the current crisis?

We are only too aware that early detection is absolutely key to monitoring the spread of disease and ultimately improving survival rates, so how can these developments in devices come into play, now so desperately needed?

## **MORE ON THE ENGINEERING RESPONSE TO COVID-19 HERE**

Whereas popular wearable health devices, such as Fitbits and Garmins, are very effective at monitoring a range of accessible physiological parameters including heart rate, body temperature, blood pressure, sleep, movement and even oxygen saturation levels; they produce a distinct lack of actionable information. It is only when this data is combined and cross-referenced that we are able to build a more complete profile of our overall health.

This integrated approach to health monitoring and measurement can also provide more accurate alerts to anomalous physiological changes, which can potentially identify deteriorating health or the onset of a serious medical problem – which is what we are seeing now. After all, general well-being is the most effective way of measuring the onslaught of illnesses which can have a multitude of different symptoms.

Most serious clinical diagnostic procedures require deeper analyses, such as biochemical analysis of blood chemistry, or identification of marker molecules that are predictive of disease. So, if we can start to access that information non-intrusively, the benefits could have a profound impact on disease outcomes.

### **The current state of play**

When it comes to general health monitoring, we are already seeing where technology is making an important contribution. For example, *MonitorMe* from Sanandco, developed with the help of Plextek, is a simple but reliable physiological monitoring system, which reports directly to a health provider or care body. Sanandco are currently awaiting regulatory approval for medical use of their device but options remain open for release of the device as a well-being product to help people look after themselves at home.

And while the popularity of existing consumer wearables has waned, going forward we are likely to see more integration with the ability to offer more effective health advisory alerts and sync to other clinical diagnostic apps.

Plextek is assisting in exploring areas of innovation, such as the development of a non-invasive device for measuring fluctuating glucose levels in patients' blood, which uses electrical field sensors.

Plextek has explored the use of electrical field sensors to measure fluctuating glucose levels in patients' blood for development of a non-invasive glucose monitor.

Accurate non-invasive procedures are the holy grail here and would have a profound effect on the lives of those with diabetes, an underlying health condition which has been flagged up as a concern when it comes to COVID-19.

Another company developing non-invasive tests is Owlstone Medical, which has developed breath biopsy technology to obtain deep biochemical information from patients. It has developed and refined detection devices to identify Volatile Organic Compounds from samples of our breath that may indicate underlying diseases and therefore if someone is at more risk from the virus.

Challenges in this field include the reliance on the detection of key biomarkers for the diagnosis and prognosis of underlying health issues. Innovative ways of measuring and monitoring these molecules through advancing technologies could well lead to improved early detection rates for a whole range of diseases, impacting significantly on survival rates.

There are a range of technologies that could be adopted quite rapidly to assist in the fight against Covid-19. Just think of the potential of apps to report on daily health, to track and trace infected people and identify their contacts, to provide information about symptoms and treatment options. Some of these options may of course require changes in our attitude to privacy, but that may be a small price to pay for peace of mind. It may be possible that drones could be fitted with thermal cameras to detect and monitor infected individuals going forward.

# Understanding 5G New Radio in Non-standalone Operation Applications

5G New Radio (NR) is still a growing technology, even though its development dates back the better part of the last decade. The development of 5G NR is following the standards set forth by 3GPP in a series of ‘releases.’

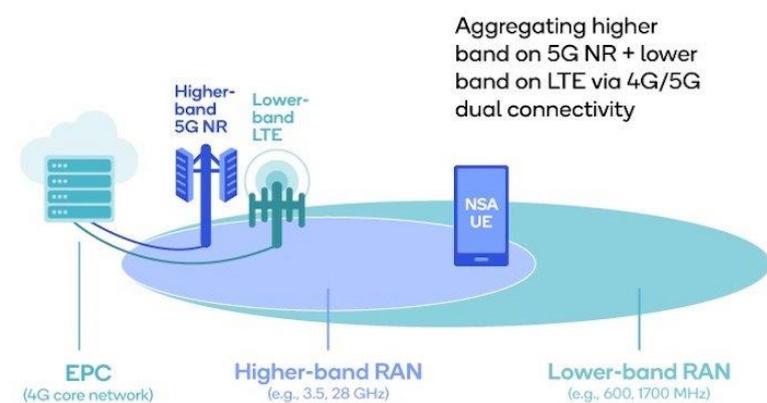
There are three leading 5G technologies: enhanced mobile broadband (eMBB), massive machine-type communications (mMTC) & ultra-reliable low latency communications (URLLC).

Additionally, there are two deployment formats for the 5G NR: non-standalone (NSA) and standalone (SA). Currently, mobile network operators (MNOs) are operating NSA-style 5G, which connects to the long-term evolution (LTE) evolved packet core (EPC) 4G core network.

## 5G Networks Will Connect Everything Together

Although developed as a trinity specification for connecting different network elements for different purposes to a single core network, true 5G will have overlapping application requirements.

eMBB applications will use URLLC for real-time processing, and machine-type communications will also require URLLC to facilitate in-the-moment decision-making.

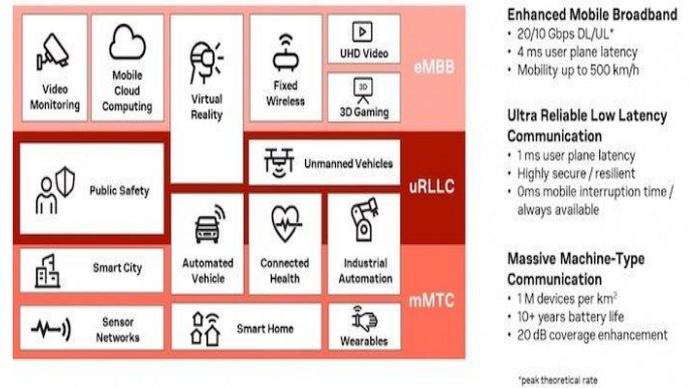


In many ways, the glue that will hold 5G together is ultra-reliable low latency communications. When considering the divergent power requirements and data throughput differences between eMBB & mMTC, there is not a significant overlap between these two technologies.

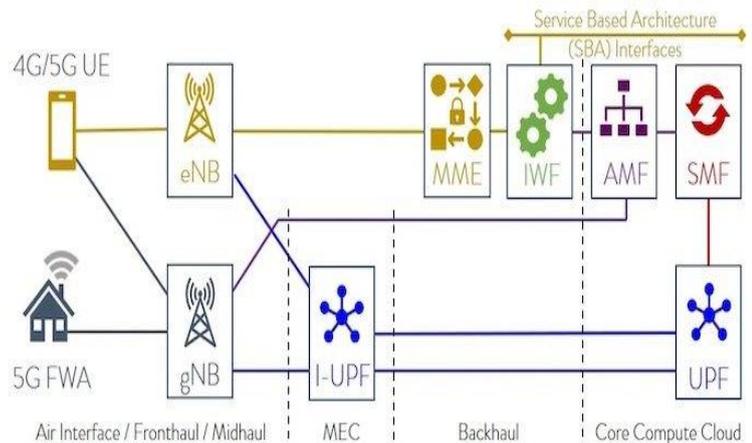
## Now let's dive into the applications for eMBB. 5G NR Applications for eMBB

Possibly the most exciting application offered by eMBB is the ability to have fixed wireless access (FWA) points in both remote or rural areas and high-density locales,

offering speeds comparable to fiber connections without the infrastructure costs.



Beyond opening up new markets of internet subscribers, eMBB will help to enable applications requiring high throughput such as video monitoring & surveillance, video conference calls anywhere, and support the growing cloud-based gaming environment.



## Potential 5G NR Deployments For mMTC

Officially, 3GPP supports two deployment technologies for mMTC, including Narrowband-IoT (NB-IoT) and LTE-M. These are based on the low-power wide-area (LPWA) network with one million devices per square km rated density.

Various mMTC applications can include low transmission rate remote monitoring of industrial and civil infrastructure, as well as asset tracking & logistical analysis, with operational lives measured in years.

Beyond 3GPP, ETSI released DECT-2020 last year to support mMTC and IoT local wireless networks within the NR frequency bands supporting mesh, star, and point-to-point topologies.

# Cadence Releases First ECAD Platform Dedicated to 3D System Design

Cadence announced the release of an "industry's first:" a comprehensive platform called Integrity 3D-IC. The platform is said to bring together workflows facilitating system planning, co-design with other Cadence platforms, and system-level analysis and sign-off of 3D advanced packaging for chiplet-based system-on-chip (SoC) designs.

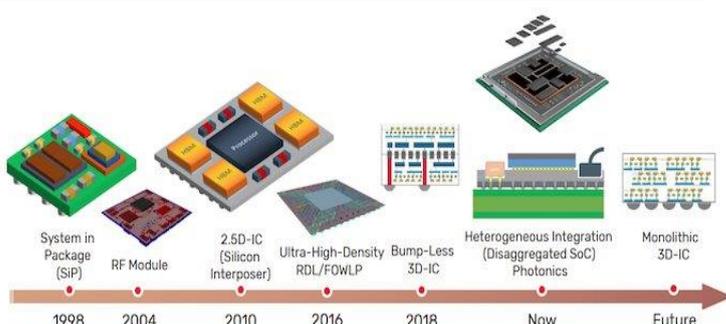
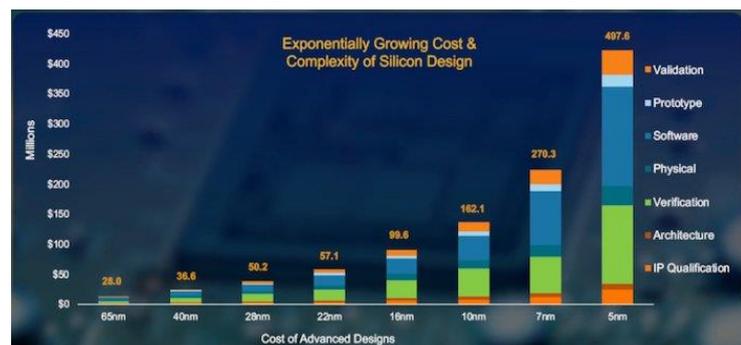
A trending fabrication method to overcome limitations in Moore's Law scaling is to stack chiplets in 2.5D and 3D configurations to form a vertically integrated SoC. "More than Moore" expresses the need to move beyond node scaling to facilitate improvements in power, performance, and area (PPA).

Moving from complex advanced nodes to more cost-advantaged modular IP-chiplets requires ECAD capabilities to support analysis in thermal management, power requirements, and inter-chiplet timing constraints.

## The Industry Needs 3D-IC Design-System Analysis

The Integrity 3D-IC platform is a timely addition to the ECAD ecosystem. The industry is approaching a time where the cost of monolithic SoC designs is increasing exponentially, which is pushing the NRE costs beyond the recovery point.

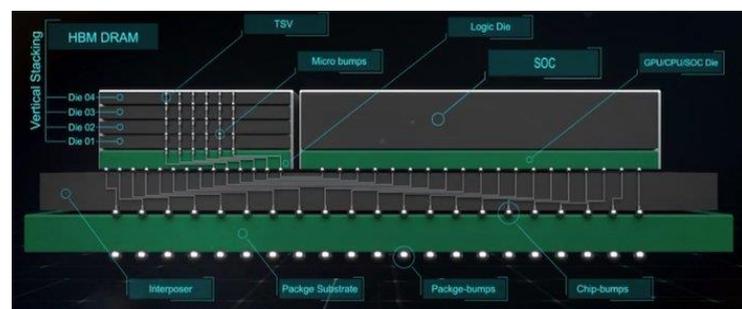
High expenses and advanced package technology have given rise to a need for a 3D IC workflow. This platform must be capable of a complete package and system analysis of thermal, power, and static timing metrics.



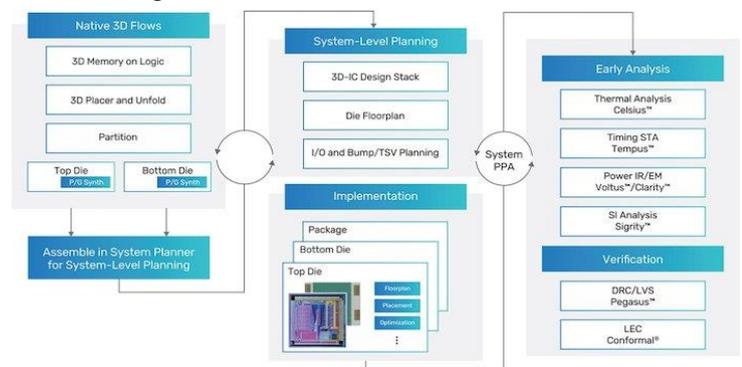
## Introducing the Cadence Integrity 3D-IC Platform

The current paradigm for stacked SoC technology is based on the heterogeneous integration of chiplets. Chiplets are small IP blocks with standardized interfaces designed to be dropped into a larger system-on-chip device.

3D integrated circuits are interconnected by Through Silicon Via (TSV) technology, microbumps, and interposers to elevate performance and reduce power requirements while maintaining or reducing system area.

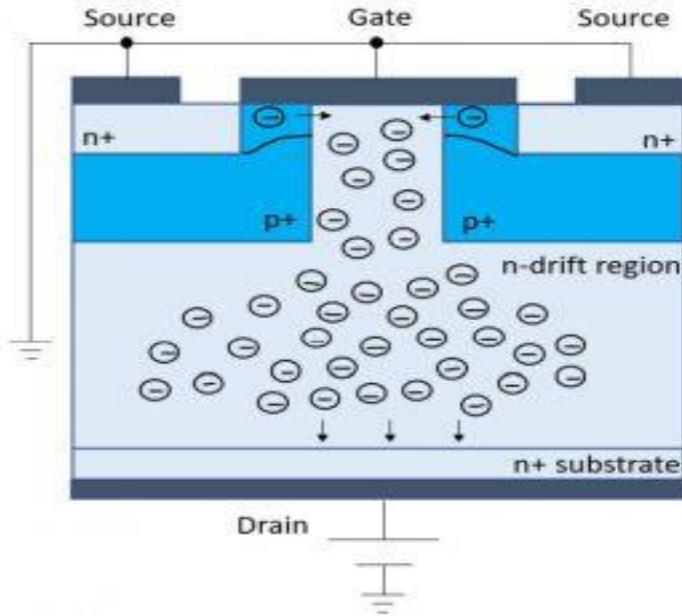


Cadence Integrity 3D-IC is said to be a single-cockpit, high-capacity ECAD for the design, planning, analysis, and verification of stacked 3D chips. The platform supports multiple advanced packaging configurations including fan-out wafer level packaging (FOWLP), RDL and silicon interposer, wafer on wafer/wafer on-chip, and 3D stacking.

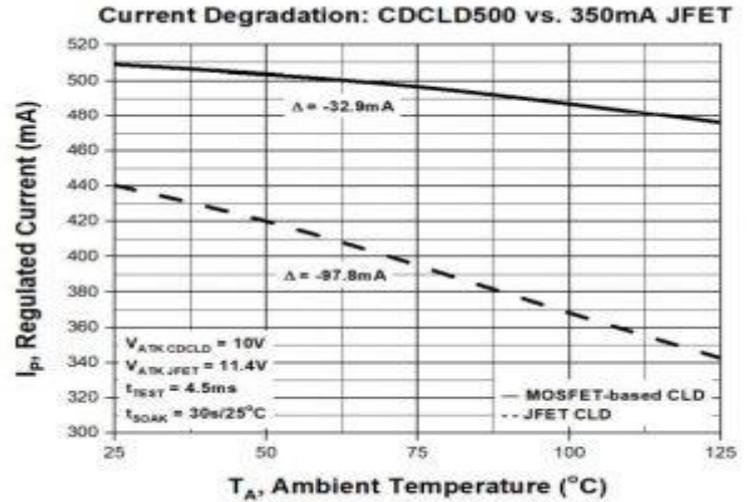


Integrity 3D-IC is intended to bring a host of system-driven PPA closure features under one ECAD suite including a native TCL database, co-design for digital and analog/RF chiplets, native 3D stacking, and advanced routing. Central to the seamless workflow of Integrity 3D-IC is a hierarchical database that is said to support multiple technology files from different design nodes. This database is an extension of Innovus database, and this allows the 3D-IC database to support a digital die hierarchical design.

# 'Zero temp-co' current limiting diodes up to 575mA



through the P-type to the body of the device. With a few volts on the drain, the depletion region expands enough to regulate current flow – due to the height of the channel being decreased, lowering the pinch-off voltage of the device.



Minimum voltages range across 1.5 to 2V – see table. Manufactured in the industry standard DPAK surface mount package, these Industry First devices are

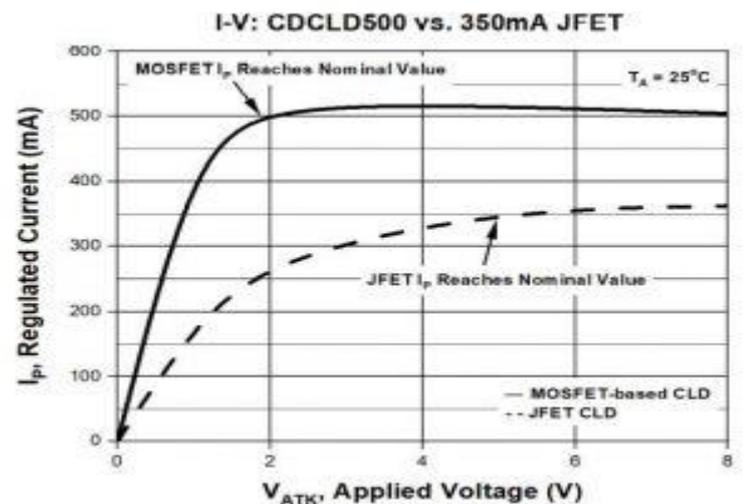
“This technology is a distinct innovation in current limiting device technology,” said Central engineering v-p Joseph Beck. Compared to traditional current regulating devices, the CDCLD series of devices provides designers with a discrete solution for current regulation that is virtually independent of ambient temperature variations when operated within the specified voltage range.”

Rather than being JFET-based, the devices are built using mosfet structure (**diagram right**).

It is a mosfet with gate and source on the same side, and shorted to form the device cathode. Gate terminal and gate passivation are sandwiched between two source terminals, and the passivation contacts the device body and p-type regions that surround the source terminals.

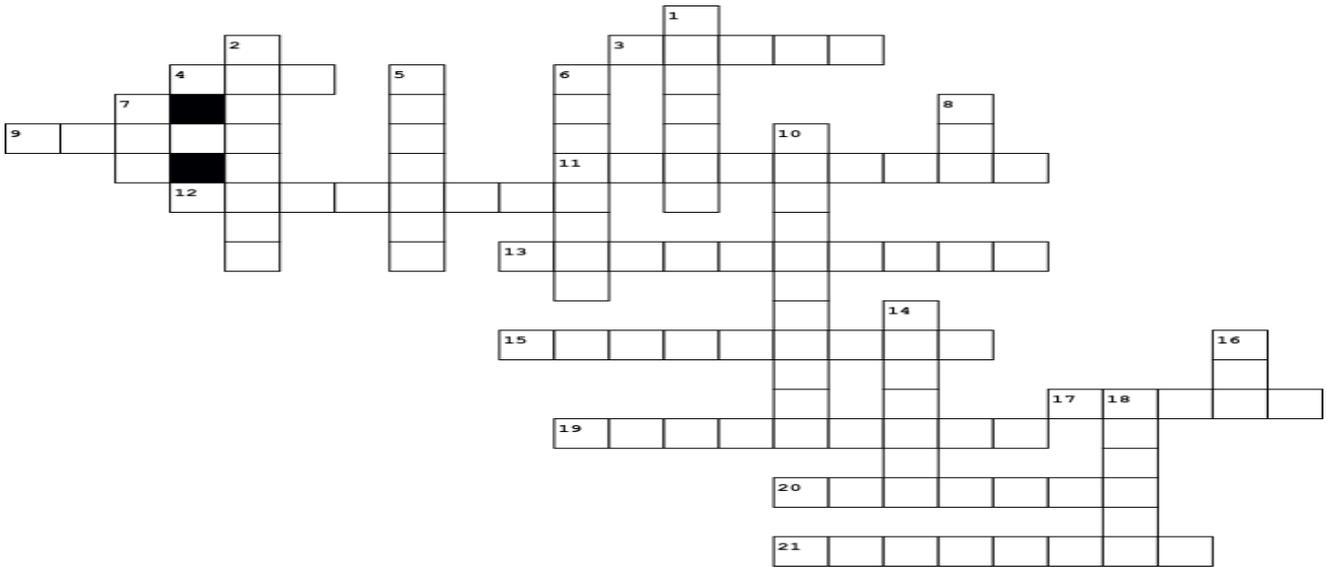
The drain terminal is on the opposite side of the device. Positive potential applied to the drain terminal forms an n-channel in the p-type between the sources and gate passivation, allowing electrons to flow from the sources,

By placing the drain terminal directly opposite the gate-source, vertical charge carrier movement is induced for the electrons that have just moved to drift region, and this large drift region is able to withstand the thermal stress generated by electron flow – removing the free-hole-generation that compromises JFET constant current diodes as they heat and reducing temperature coefficient (**left**).



The highest current version, CDCLD500, has a limiting voltage of 0.9V and reaches its nominal current at 2V applied (right).

# Crossword



Across		Down	
3.	What we use to move the cursor on a screen or what a cat chases	1.	The screen what we look at
4.	Wide area network	2.	The thing that keeps your emails safe
9.	The thing that can destroy your computer from the inside	5.	The place where people post videos
11.	What people post to others that look like faces or other things	6.	It connects us all
12.	The thing we use in class	7.	Uniform Resource Locators
13.	Title of the crossword	8.	Local Area Network
15.	The background of the screen	10.	The games we play on computers
17.	What kids use everyday	14.	To start your computer again
19.	Remove something from the computer	16.	Metropolitan Area Network
20.	A thing that connects us all that is not the internet	18.	The person that gets into your computer and takes all your info illegally
21.	What we type with		



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