

REAL3™ Time of Flight (ToF)

Virtual sensor experience 2020



Real3™ ToF systems: We already invested in ToF for more than 17 years



5th generation of ToF imager available



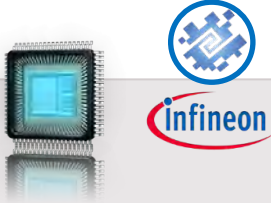
2002

pmdtechnologies founded



2012

More than 500,000 ToF sensors sold



2015

1st generation ToF imager, volume ramp up for industrial products, AR-HMD



2018

3rd generation ToF imager in volume production



2020

5th generation ToF VGA imager in development ES in Q1/2020



2005

first mass product based on pmd ToF technology

2013

Infineon and pmd announce jointly developed 3D ToF imager

2016

2nd generation ToF imager, volume ramped up, mobile phone market

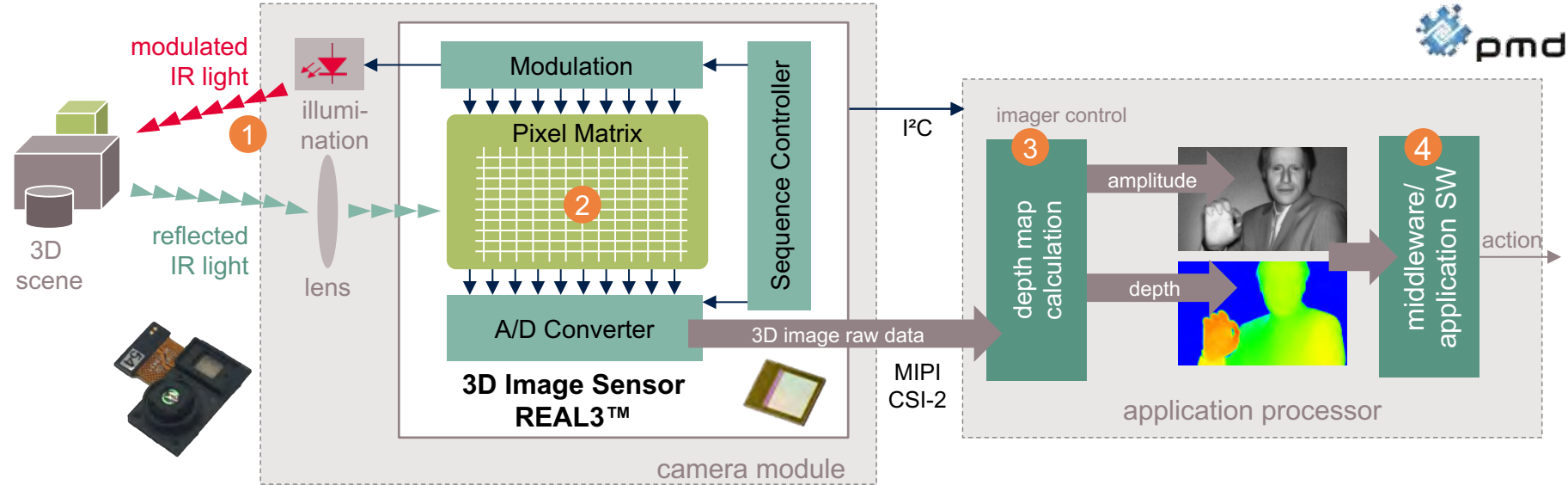
2019

4th generation ToF HVGA silicon available design-in phase

Successful execution of four imager generations driven by market requirements, enabled by technology improvements

Time of Flight Principle

Depth and amplitude is measured in every pixel



1 Active illumination

- › Near infrared, 850 or 940 nm
- › Modulated
- › LED or VCSEL

2 Distance measurement in every pixel

transmitted
reflected
Phase Shift

3 Processing

- › Depth map calculation
- › Post processing
- › Amplitude data as quality indicator

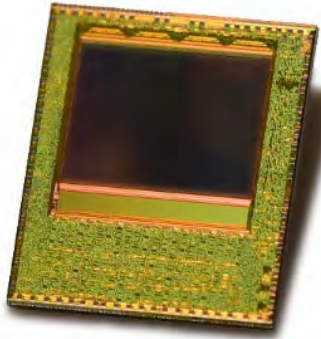
4 High quality depth map

4 Application algorithms

Latest 5th generation Infineon VGA depth imager leverages latest improvements in pixel design



REAL3™ IRS2877C Key Benefits



- › VGA depth and IR image resolution
- › Best-in-class MTF and long-range performance in outdoor environment
- › CMOS technology for increased QE and DME
- › Low Power pixel and readout
- › Highly integrated system and eye safety mechanisms
→ lowest BOM
- › Fast and reliable lifetime calibration



REAL3™ IRS9100C Key Benefits



- › Less components and design complexity
- › Low R_{on} resistance for high efficiency
- › High power operation
- › Low rise and fall times for modulation frequencies beyond 150 MHz
- › Integrated fail safe functionality
- › Optimized illumination circuit footprint
- › Small TSNP-10-4 package (1,1 x 1,5 x 0,375 mm)



REAL3™
by Infineon



IRS9100C + REAL3™ imager

System level integration key advantages



IRS9100C
illumination driver



Infineon REAL3™
ToF Imager



- › The IRS9100C is ideal driver companion chip for the Infineon REAL3™ IRS2381C and IRS2877C to design high performance 3D imaging camera systems
- › 20% smaller compared to traditional discrete transistor based module designs
- › Fully integrated eye safety solution
 - REAL3™ imager controlled eye safety monitor
 - IRS9100C with additional stuck-at check
- › Easy and fast IRS9100C design-in and bring-up

Smaller cameras | higher output power
| lower cost | easy integration | improved safety

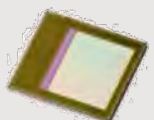
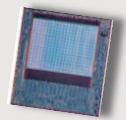
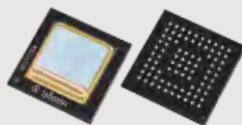

Real3™ ToF imagers

Leading position in the industry



in production since 2015, 5th generation Real3™ ToF imager



| |  2016 |  2019 |  2019 |  2020 |
|----------------------|--|--|--|--|
| Imager | IRS1645C | IRS2381C | IRS1125A | IRS2877C |
| Package T_ambient | bare die 20°C to 65°C | bare die 20°C to 65°C | LFBGA-84 -40°C to 105°C | bare die 20°C to 65°C |
| Status | volume production | volume production | volume production | silicon available |
| Resolution | HQVGA 224x172 | HQVGA 224x172 | CIF 352x287 | VGA 640x480 |
| Applications | <ul style="list-style-type: none"> › robotics › industrial › AR HMD | <ul style="list-style-type: none"> › smartphone user-facing › smartphone world-facing › robotics › IoT | <ul style="list-style-type: none"> › Car occupancy detection › Gestures › Short range LIDAR › robotics › Industrial | <ul style="list-style-type: none"> › smartphone user-facing › smartphone world-facing › AR HMD › IoT |

Front Facing Use Cases

IRS2381C Powering the LG G8 ThinQ



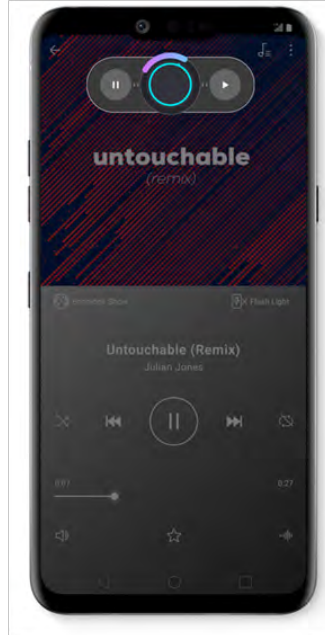
REAL3™
by Infineon



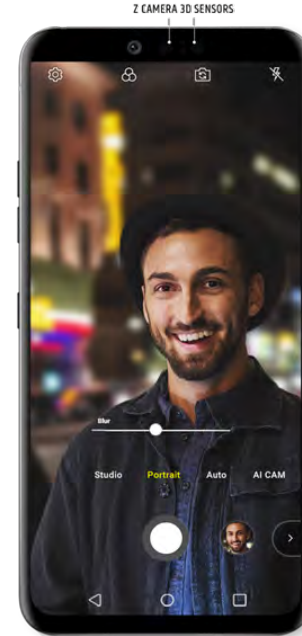
Authentication



Gesture



Photography



Courtesy of LG Electronics

Time of Flight enabling new mobile user experiences

Face Authentication



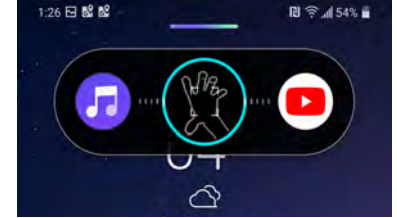
3D Biometric ID



Payment



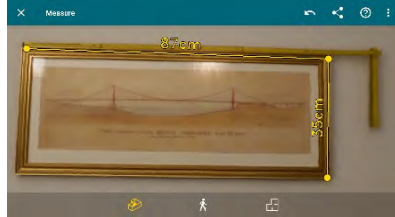
3D Gestures



3D Scanning



Measuring



AR Gaming



Night Vision



3D Avatars



Navigation



Virtual Retail



What can
you imagine?



Part of your life. Part of tomorrow.