

Newsight Offering For Automotive Innovation

February 2021

About Newsight

- ✓ Israeli semiconductor company, founded on May 2016
- ✓ 3D & Spectral sensors already deployed in many commercial products
- ✓ Collaborating with global leading companies
- ✓ Main Business Units: Machine vision and Spectral Imaging
- ✓ Successful breakthrough for COVID-19 and other pathogens immediate

detection, using a spectral profiling classification AI model.







רשות החדשנות אראיי Israel Innovation Authority



PROJECT'S ROADMAP



UPCOMING PRODUCTS



Q1 2021

SPECTRAL MOBILE MODULE

A smart sensor for portable Spectral applications with high color resolution and immediate response. (more details under NDA)



END 2021

EVENT BASED AREA SENSOR

Currently being developed as part of the Israeli innovation authority smart imaging consortium. 3D Camera based on proprietary eTOF[™] technology with a resolution of 1024 x 480 global shutter pixels 5µm x 5µm. Has 12 bits accuracy & supports HDR(high dynamic range). The Event detection (per pixel) is done by comparing with a pre-configured threshold.



VGA MOBILE MODULE

The NSI5800 eTOF[™] based 3D depth camera for smartphone featuring: LEFM acceleration, BSI, VGA 640 x 480 pixels, 5um x 5um pixels, ¼" sensor. Looking for a Smartphone developer partner, negotiation is ongoing with major players.

END 2021

1st Project in Prototype Stage - 5-year Collaboration Contract





Solid State LiDAR Reference Design eTOF™ Li ∩AR

by Newsight Imaging

Newsight's **enhanced Time-of-Flight** (eTOF[™]) solid-state LiDAR is a complete solution for a versatile and affordable 3D mapping device, using Newsight's patented eTOF[™] technology for **improved performance**.

Based on Newsight's flag sensor the NSI1000, the reference design is highly configurable for different applications and very flexible in coping with different scenarios and environmental conditions.

The NSI1000 Sensor

- Pixel array of **32 x 1024**
- Separate linear line solution of 2K
- **Global shutter** for all array pixels
- Improved eTOF™ solution, supports accumulation of 100,000 pulses per frame for long distance
- High frame rate (@100MHz) :
 - 50,000 fps per 2048 pixels, 100,000 fps per 1024 line
 - > 3,125 fps per 32 x 1024
 - ► eTOFTM 260 fps per pixel array (and more with less lines)
 - ➢ eTOF[™] 120 fps per pixel array with accumulation
- Tower **0.18 um process**, 6T special pixels
- Can be used as: camera, multi (32) triangulation, eTOF[™]
- Up to 32 configurations that can switch every frame for combined applications. Scenario of up to 32 steps.

eTOF[™] LiDAR Setup





RDC with Sensor imaging lens + VCSEL projecting lens

eTOF[™] Lidar assembled module

etof" LIDAR

Allows flexibility of choosing various VCSELs, Lasers and Optics to fit customer requirements

eTOF[™] LiDAR Features



No MEMS Solid State LiDAR



Indoor and outdoor

Auto exposure

All-weather

Through fog visibility



Compact size 95 x 72 x 61mm



FOV Horizontal 30º - 120º Vertical 1.170 - 4.70







Range 0.2 to 100 meters - Distance error < 1%

Acquisition 32x1024 depth points



RDC Module Includes:

- NSI1000 sensor pixel array 32 x 1024, global shutter
- RDC board
- On board ST MCU ARM[®] Cortex[®]-M4, 1M Flash.
- Imaging lens with a BP filter to fit selected FOV
- On board VCSEL and driver with high peak power.
- Full software application package (runs on windows)



eTOF[™] Technology

Newsight's eTOF[™] patented technology allows unparalleled distance measurement with less than 1% error rate. Supports a flexible multiset configuration that changes frame by frame for an increased dynamic range. The sensor supports in-pixel accumulation and a high frame rate of up to 100,000 fps.



Explaining eTOF[™] Principal

enhanced Time-of-Flight

Returned pulse sampled in 4 windows, distance is calculated by the ratio of window A and window B- Normalized by Window A and Window B. The technology has the ability to reduce ambient light.





eTOF™/ iTOF/ DTOF Technological Comparison Chart

CRITERIA	Newsight eTOF™	itof	DTOF
Eye-safe Range	0.2>200m*	0.2>few tens meters	Difficulty to support close range
Resolution	VGA+	Up to VGA	Up to QVGA
Gated Imaging (ability to see beyond the fog)	 Image: A set of the set of the	×	×
Frame Rate	Up to 100K fps (for one line)	Up to hundreds fps per line	Low fps due to heavy calculations
Computation Need	Low	Low	High
Configurable Flexibility	 Image: A set of the set of the	×	×
Ambiguity Issues	 Image: A second s	×	Depends on the design
Motion Artifacts Issues	Low	Medium	High – typically long exposu due to time of mirror scan.
Price BOM	Low	Medium	High (complex BOM +MEMs)
Integration to system	Fast	Relatively Fast	Slow
Power Consumption	Low	Low	High
Form Factor Size	Very Small	Small	Medium-Large

Key Product Features



Range

Long distance range while keeping an accurate distance map by pulses of accumulation sets



Low Power

integration of analog & digital on one chip, no need for modulation to create depth



Sensitivity

Switch between parameter sets (configurations) to cover various real time conditions. Allows coverage of different distances and different objects reflectivity



Flexibility

Frame by frame configuration switching allow fast adaptation to rapidly changing conditions



Accuracy

Special configuration sets for higher accuracy and for multipath avoidance, sharp edge pulses

Target Markets



Obstacle avoidance

E

120

Robotics navigation

Simultaneous near field and far field mapping

Gated imaging – manipulating the capture parameters allows us to see beyond the fog

Customized field of view per the client's use case



Indoor outdoor rapid adaptivity

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eTOF[™] LiDAR Spec

Measuring Method	enhanced Time-of-Flight (eTOF™)
Resolution (H x V Pixels)	1024 x 32 (full resolution)
Field of View (H x V)	30/60/120 x 1.37/2.74/4.7
Indoor Range	0.2-100 meter
Outdoor Range	0.2-50 meter
Accuracy	Better than 1%
Power Consumption	Low
Depth image max frame rate	200 fps(for 2 meter)
Communication Interface	USB –C, UART, MIPI
Camera Power Requirements	5 VDC, supplied via the USB connector
Size (W x H x L)	99.6 mm x 80.6 mm x 63.1 mm

GUI Demo

<u>3D color map</u>

Depth Imaging Using eTOF™



Depth Image Color Coded, Before Image Processing

Original Setting

Engagement Model

We offer 3 Options:



NSI1000 Chip with license of eTOF[™] technology

NSI1000 RDC module including examples code and special support







Full solution of eTOF[™] LIDAR customized by client's requirement (possibility for white label)



Solution Roadmap

NSI1000

NSI1000 & MEMS

Immediate

LiDAR ADAS: Blind Spot Mirror AFS Automated Parking

Mid 2021

LiDAR DMS System ADAS: Blind Spot Mirror AFS Automated Parking

NSI9000

End 2021

Event-based & Higher resolution: LiDAR DMS System ADAS

Newsight's Solution Based NSI9000

- Matrix camera: 1024 x 480 global shutter pixels 5μm x 5μm
 (possible to operate as VGA 640X480, ¼" optics)
- ✓ Target distance up to 100 meters, accuracy at least 1%
- ✓ Per-frame configuration and scenario scheduler
- ✓ Solid state eTOF[™] support (enhanced Time-of-Flight)
- ✓ Multi-Triangulation support, up to 480 concurrent vertical points (using a line laser)
- \checkmark Output speed/ internal processing at up to 100 MHz

3 configurable operation modes:

Full frame data out with programmable frame rate up to 300 fps (when event-based or sub-array modes can reach thousands fps). Event driven frame data out to reduce bandwidth:

- Configurable guaranteed minimum full Frame rate
- Detected event (per each half row/per pixel) aggregated from all pixels in the half row. Camera mode, acquiring single frame upon command.

NSI9000 Features

- ✓ 3D Camera based on proprietary eTOF[™] technology
- ✓ 12 bits accuracy & support HDR(high dynamic range)
- ✓ Event detection (per pixel) by comparing with a pre-configured threshold
- Optional automatic Multi-Triangulation peak detection per each line (center of mass algorithm support in HW)
- ✓ Configurable WOI (Window Of Interest)
- \checkmark Stop/resume video mode or frame clock for decreasing power consumption
- ✓ Optional frame data out inversion
- ✓ Ambient light subtraction support (Analog module)
- \checkmark Tristate on data out pins for multiple parallel sensor connections
- \checkmark Integrated CDS for fixed-pattern noise reduction

NSI9000 Applications

Smart City- smart street lighting, movement detection etc. High resolution camerafor face recognition(DMS for automotive)

Security camera for measuring distance and speed of objects Obstacle Detection for Automotive (event based-LiDAR)











Potential applications

See Beyond the Fog

Capture range interval by using eTOF[™] synchronized exposure. eTOF allows to control the exposure, pulse width and shutter delay:

- Reduce blinding from the fog to increase visibility.
 Fog in front of the car is not visible
 Car at far distance in the fog, could be detected
- ✓ Use machine learning to create a full image(short + long range):
 - -Choose optimal configurations set
 - -Analyze images
 - -Fuse various objects into unified view



Mirror Blind Spot Monitoring

- ✓ Complete low-cost solution inside the side mirror
- ✓ Programmable distance threshold
- Programmable field of view (on top of optics)
- ✓ Alarm led set "on" when object is in the range (red arrows)



Rear Blind Spot Detection for Truck Trailers

✓ Multi Point eTOF[™] & Imaging

- ✓ Track the trailer angle by using NSI1000 special features of eTOF[™] and imaging.
- ✓ ML and AI will be used to define the feature or edge trailer to track and differentiate it







Detection of Free Space Around the Vehicle

 \checkmark For safety and parking assist

- ✓ Four units with 8 sensing modules cover car from 360°
- \checkmark Passive solid state or MEMS scanned
- ✓ Improve sensitivity while parking at home or at work by AI and surrounding ML



Driver Monitoring Systems



Short **Distance Depth Map Image** of the driver face, Allows for **face condition and eye movement detection**. Face and eye movement is translated to health and fatigue condition detection which **trigger the care safety systems**

NSI9000 could be used for to provide VGA resolution.



Driver Condition Detection Unit

Automated Parking

- An analysis of accident data from the AZT, a German accident research institute, shows that roughly half of all traffic accidents in Germany involving vehicle damage are a result of collisions while parking.
- ✓ Currently, based on Surround View Camera and large number of ultrasonic sensors
- ✓ The car is automatically maneuvering to the final parking position.
- ✓ Newsight's NSI1000 CMOS Image Line Sensors, in a combination with 120° Cylindrical lens and a laser source, while working in <u>Enhanced Time of Flight (eTOF™) mode</u>, allows for better long-distance accurate detection of the parking place dimensions.
- ✓ The system will require 4 sensors only. Will eliminate the need of surround cameras and costly image processing equipment.







Contact Us

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