

**Developed the industry's smallest class VCSEL with built-in driver,  
Entry into the laser market with 3 types of lineup.**

– Contributes to improving the measurement distance and accuracy of the latest 3D sensing sensor –

About VCSEL : Vertical Cavity Surface Emitting LASER

By emitting fine laser light in the vertical direction from the substrate, it is used  
as a light source for various purposes.

**Industry's smallest class VCSEL with built-in driver**

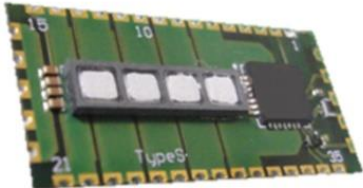
- ◆Lineup
- 1) 2in1/3in1 VCSEL package
  - 2) VCSEL module
  - 3) Stack structure package

◆Application

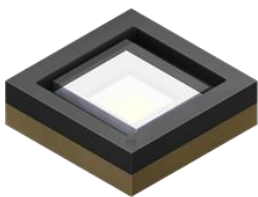
VCSEL is widely used for object measurement and obstacle detection in the industrial machinery market, face recognition of smartphones, distance measurement by camera, and automotive in-cabin monitoring .



1) 2in1/3in1 VCSEL package  
Size D4.5mm × W4.5mm × H1.8mm  
Sample Available



2) VCSEL module  
Size D31mm × W13mm × H2mm  
Sample Mar.2021



3) Stack structure VCSEL package  
Size D5.0mm × W5.0mm × H1.5mm  
Sample Apr.2021

This product applies the electric board design technology that we have cultivated to minimize the impedance of the wiring between each chips , such as the VCSEL and driver , achieving high-speed response and high output.

In addition, our packaging technology has succeeded in downsizing while maintaining high thermal dissipation , making it possible to meet a wide range of demand.

**■ Development background**

As a light source for 3D sensing, VCSEL is widely used for object measurement and obstacle detection in the industrial machinery market, face recognition of smartphones, distance measurement by cameras, and in-cabin monitoring in automotive market, those markets are expected to expand rapidly. In those applications, high-speed response and high output of VCSEL light sources are required to realize more accurate and long-distance sensing. In support to this needs, Citizen Electronics has realized even higher speed response and higher output by utilizing its unique packaging technology. Through this VCSEL lineup, we will contribute to improving the measurement distance and accuracy of 3D sensing.

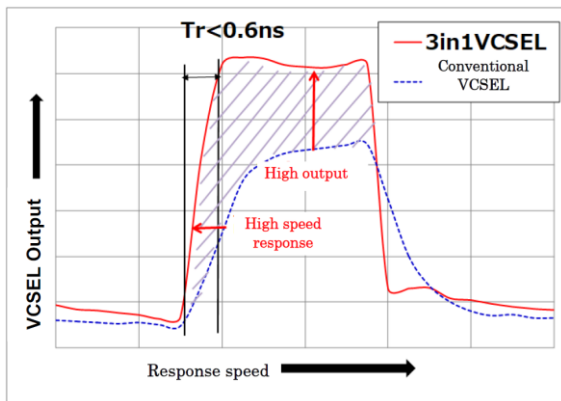
## ■ Feature

### 1) 2in1/3in1 VCSEL package

2in1 : Achieves high-speed response by built in switching FET\*1 and VCSELs in a small package. Ideal for phase TOF \*2 that requires high-speed response and linearity.

3in1 : A capacitor is built in 2in1 type to achieve 1.6 times higher output than conventional . Ideal for direct TOF that require high output with short pulses.

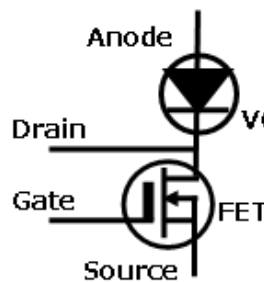
Output performance



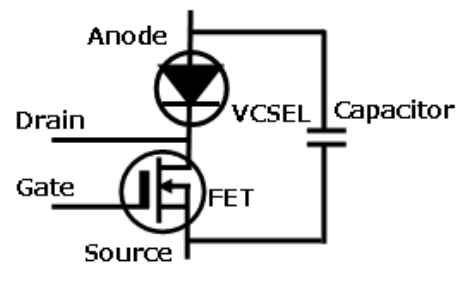
※1 FET : Field Effect Transistor Especially suitable for switching large currents at high speed.

※2 TOF : Time Of Flight Measuring the distance based on the time it takes for the light from the light source to reflect off the object and return..

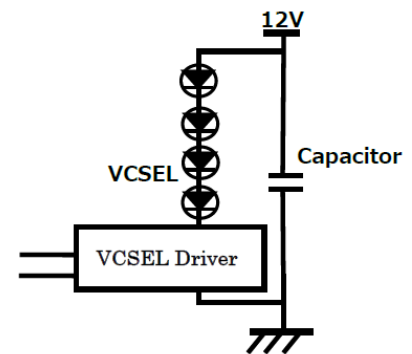
2in1VCSELcircuit



3in1VCSELcircuit



VCSEL Module circuit



### 2) VCSEL Module

Built in 4 VCSELs to achieve industry-leading 20W output and high-speed response

Ideal for industrial machinery applications that require long-distance measurement over a wide detection range

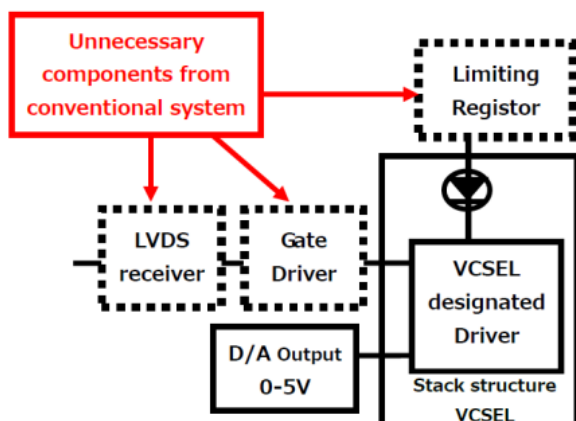
### 3) Stack structure VCSEL package

The new developed driver and VCSEL are downsized by the stack structure, Ideal for all TOF system by function of protection circuit (current, voltage, temperature).

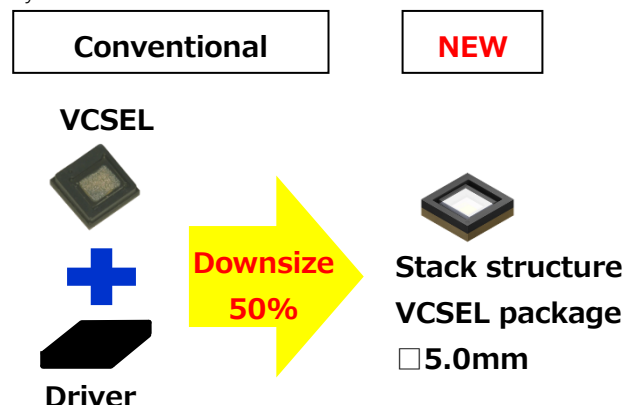
※Stack structure VCSEL package




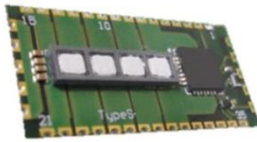
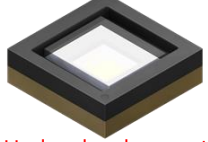
Reduction number of components



System downsize



## ■ Product overview

Product	1) 2in1 ,3in1VCSEL package	2) VCSEL module	3) Stack structure VCSEL package
Sample	Available	Mar.2021	Apr.2021
			 Under development
Size	4.5×4.5×1.8 【mm】	31×13×2 【mm】	5.0×5.0×1.5 【mm】
Peak optical output	5W (6A)	20W (7A)	14W (20A) *Target
Peak spectrum	850nm/940nm	850nm/940nm	850nm/940nm
Lineup FOI (H x V)	60x45 90x70 120x90	60x45 90x70 120x90	60x45 90x70 120x90
Feature	<ul style="list-style-type: none"> <li>•High-speed response Rise time 0.6ns at 4A</li> <li>•Package with built in FET</li> </ul>	<ul style="list-style-type: none"> <li>•All in one PKG</li> <li>•High-speed response Rise time &lt;1ns at 10A</li> <li>•12V input is most suitable for industrial machinery by 4 in series VCSEL</li> <li>•Built-in current, voltage, and temperature protection circuit functions</li> <li>• Temperature compensation control is possible by built in temperature sensor</li> </ul>	<ul style="list-style-type: none"> <li>•Pursuit more high speed response by minimized wiring impedance</li> <li>•Minimized 50% system size</li> <li>•Built-in auto-current-control (ACC) drive circuit</li> <li>•Built-in current, voltage, and temperature protection circuit functions</li> </ul>

●The content of the release is information as of the announcement date. Product design and price, release date, specifications, etc. are subject to change.

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