

Liquid Lens

Developers' Kits

Introduction

Varioptic's liquid lens technology is a breakthrough in the possibilities for designing small aperture lens systems allowing variable focus with absolutely no moving parts.

The Developers' Kit is aimed to support you through your evaluation and design cycle, and ramp to volume production.

Varioptic's Arctic 320 liquid lens fits perfectly all types of variable focus imaging applications where compactness, low cost, low energy consumption, and ruggedness are important or critical.

The Arctic 320 lens and other support products are now available for orders of up to 10,000 pieces per month, with mass production targeted for the end of 2006. Varioptic is fully ISO9001 certified, and its stringent quality control and evaluation tests meet the exacting requirements of the mobile phone industry.



Main Products

Designation	Product	Description
 Liquid Lens 	Arctic 320	Arctic 320 is the world's first commercial liquid lens. Added to fixed lenses, Arctic 320 enables variable focus with no moving part.
 Lens Module <i>Liquid lens included</i> 	AFL872	Developed with Sunex, this fixed optic including liquid lens provides a ready-to-go autofocus lens module.
 Lens Driver <ul style="list-style-type: none"> ▪ DrivIC  ▪ Mini-Board  	DrivIC 60 VPS-048m	<p>Two options dependent on your requirement:</p> <p>Single chip solution with Varioptic design driver IC for high volume where size matters.</p> <p>Mini-Board with generally available electronic components.</p>

Development support products

Designation	Product	Description
 Lens Holder & Connector <ul style="list-style-type: none"> ▪ Holder  ▪ Connector  	VHD-002 VHD-003	<p>Holder designed to connect the Arctic 320 to the VPS-048 power supply. This allows you to evaluate the liquid lens added to your own optics.</p> <p>Connector designed to connect AFL872 lens module to the VPS 048 power supply.</p>
 Lens Power supply 	VPS-048	Portable power supply to operate the Arctic 320. Autofocus software running on PC can control the driver via the USB port.

A short description of each of those products is given in the following pages.



Varioptic Liquid Lens



Arctic 320

Arctic 320 is the world's first commercial liquid lens. Added to fixed lenses, Arctic 320 enables variable focus with no moving parts.

It is aimed at devices where the required operating temperature range is between -20°C and +60°C and storage temperature is between -40°C to +85°C. This meets almost all consumer electronics requirements, including mobile phones.

Technical Specifications:

	Item	Unit	-20°C to +60°C
Mechanical	Pupil diameter	mm	3
	Dimensions	mm	Φ10.5 x 2.5
Optical	Focal range	diopter	> 20
	Offset dioptric power	diopter	-5 ±3
	Wave front error (RMS)	µm	<0.5
	Minimum transmittance (400 to 700 nm)	%	>90
Electrical	Driving voltage (at 1kHz)	Vrms	0 - 60
Environmental	Storage temperature	°C	-40 to +85
	Operating cycles		> 1,000,000

Note: - Response time is 100ms typical
 - Dissipated Power is <1 mW typical



Lens Module



AFL872 (Arctic 320 included)

The AFL872 combines Varioptic's Arctic 320 liquid lens with Sunex's fixed optics to deliver a ready-to-go autofocus lens module which simply screws in to any M8x0,35 lens mount. It is designed for sensors up to 1/3" format and up to 3 Megapixel resolution.

This unique Liquid Autofocus module enables a more compact alternative to traditional autofocus technologies. It enables:

- fast time-to-market for device developers wanting to take advantage of the benefits of using liquid lens variable focus technology without having to commission a custom lens design
- a quick-and-easy solution for image sensor and camera module companies looking to demonstrate liquid-lens auto-focus products for the mobile phone market, as auto-focus rapidly becomes a must-have feature

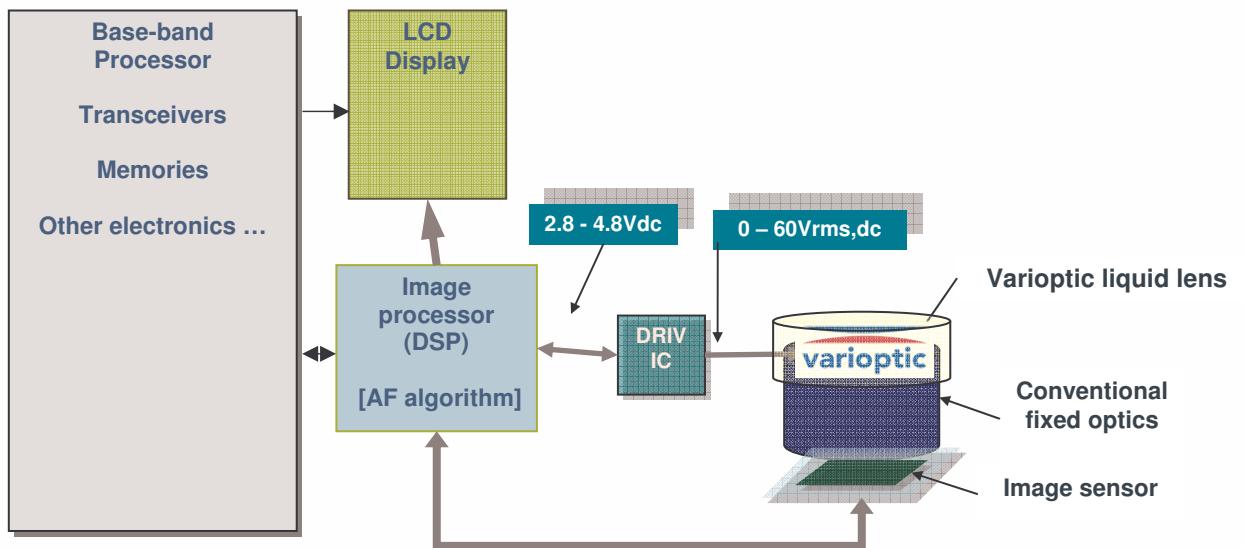
Technical Specifications:

	Description	Spec	Comments
Opto-mechanical	Total length	< 10 mm	Including Varioptic lens, Front to sensor
	Lens External diameter	<14 mm	External mechanical diameter of barrel at widest point
	Back focal length	> 1.1 mm	
Optical	Telecentricity	< 19 deg	Corner chief ray
	Relative illumination	> 50 %	Over the Full FOV, For each wavelength of the Over the Spectral range
	Effective focal length	4.8 mm	+/- 0.1mm
	Full Field of view	~ 68 °	Corresponds to diagonal of sensor ~6 mm
	F number	F/2.8	
	On axis Transmittance	> 80%	On the 470-680nm



Lens Driver

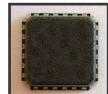
Simple System architecture (Shown for mobile phone):



To drive the liquid lens, either the DrivIC 60 or VPS-048m mini-board can be used. The DrivIC 60 is aimed for high volume designs.

The VPS-048m is for prototyping and for system designs where generally available components are preferred.

DrivIC 60



DrivIC 60 is a single chip solution with Varioptic design driver IC for Liquid Lens..

DrivIC 60	
● DC converter	3.0V ~ 5.5V to 60V Boost Up DC converter with 80V Option External Switching Transistor, Inductor and Schottky Diode
● 3 Wire Serial Bus	12bit Data Width Serial Communication with ISP(Image Signal Processor) Programmable Internal Pull-up Resister, Serial Clock and Data Line Support Serial Read and Write Function and Sleep Function
● Internal Oscillator	Precision Internal R-C Ring Oscillator
● DAC	12bit Resolution Internal Digital to Analog Converter for Lens Driver Voltage Generation
● Operating Voltage Range	VBAT : 3.0V ~ 5.5V VLDO : 2.45V ~ 2.80V VIO : 1.65V ~ VBAT+0.4V
● Operating Temperature	-40°C to +80°C
● Package Type	MLF 4mm X 4mm 24 Pin / Amkor

VPS-048m



VPS-048m is a mini-board (used in the VPS-048 power supply) with generally available electronic components and provides a High DC voltage which is adjustable by a serial DAC (I2C). The DAC makes a feedback to adjust this DC voltage.

VPS-048m

	Item	Specifications
Mechanical	Size	19mmx17.5mm
Electrical	Communication	I2C bus (up to 400 KHz mode)
	Output range	5V to 62V (Upper and lower level are "hardware selectable")
	Output waveform	pseudo-rectangular
	Duty cycle	75%
	Resolution	12 bits DAC i.e. 4096 levels between Vrms Max and Vrms Min
	Frequency	1Khz +/-10%
	Power supply	2.7Vdc to 5.0Vdc
	Average consumption	45mW (3.3v power supply)
	Typical response time	10ms

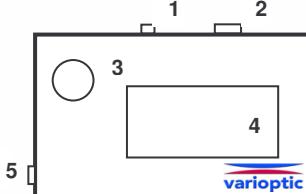
Lens Holder & Connector

A voltage needs to be applied to operate the lens, so the lens holder & connectors are provided to feed the Arctic 320 via the power supply as the means of doing this for evaluation purposes.

Lens Holder VHD-002	Lens Connector VHD-003
<ul style="list-style-type: none"> To connect the liquid lens alone to the power supply, allowing you to evaluate the liquid lens added to your own optics. 	<ul style="list-style-type: none"> To connect the liquid lens mounted on the AFL872 lens module to the power supply, giving ready-to-go autofocus optics. 

Lens Power Supply Unit

This portable power supply is required to operate the Arctic 320. It is close to real time architecture and autofocus software running on a PC can control the driver via the USB port.

VPS-048
<ul style="list-style-type: none"> Typically, VPS-048 is used in a remote-controlled mode via a PC but can be used in stand-alone mode if the USB cable is not connected.
<p>Size: 68x115x25 Weight: 164g Power supply: Li-Ion embedded battery Output: pseudo square wave</p> 
<p>1- Lens connector 2- Mini-Usb connector (PC controlled) 3- ON/OFF potentiometer (stand alone mode) 4- LCD status display 5- Connector to charge the embedded battery</p> 



Typical Kit

To evaluate the Arctic 320 performance, a typical order would include your required number of liquid lenses or lens modules (Minimum order starts at 5 units). Then to operate the Liquid Lens as the means of doing this for evaluation purposes you will need one power supply and the appropriate lens holder or connector. And if you want to integrate a driver on your prototype according to its size, you have the possibility to chose between single chip DrivIC 60 (Minimum order starts at 500 units) or the mini-board VPS-048m (Maximum order up to 100 units).

All products are provided with their appropriate documentation:

- With Arctic 320:
 - Lens test results – the dioptrre vs voltage
 - Lens mechanical drawing
- With AFL872:
 - Lens Module Mechanical drawing
- With DrivIC 60:
 - Liquid Lens Driver Datasheet
- With VPS-048m:
 - VPS-048m datasheet
- With VPS-048:
 - Power supply users' guide
 - VPS-048m datasheet

Next Steps

If you wish to place an order or discuss your requirements for our Liquid Lens Developers' Kit, Please contact Varioptic on +33 4 37 65 35 31 or contact@varioptic.com

