

Model TeraFAST-256

USER MANUAL Revision 1.0

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Notation



left-click





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*** actual appearance may be different from the one shown

Overview

Terasense[™] camera model teraFAST-256 is a compact linear sub-THz imaging sensor operating at room temperature intended for operation on conveyor belts or other scanning setups. Due to acquisition rate up to 5000 lines per second it can accommodate scan speed up to 15 m/s.

The sensor has single sensitivity band at 100±10GHz (or according to customer's specification). It is sensitive to polarization of incoming radiation. Preferred direction of electric field is indicated in the figure.

The devices use PC (connected via USB) for data acquisition and processing. Only Windows operating system is supported at the moment. Performance of the camera may be affected by performance of the PC, it is recommended to use PC with CPU score in Windows Experience Index of at least 5.

The cameras are powered by external DC adapter rated +24V, 2A.

Specifications

Dimensions:
Sensor size:
Acquisition rate:
Connection:
Sync output
Power:
Operating conditions:
Storage conditions:

452x175x44,5 mm 384x3 mm, 256x1 pixels 100 – 5000 lines/second miniUSB 5V TTL (LEMO 00.250 series socket) 24V, 2A 15 to 30°C, humidity < 80% -30 to 45°C, humidity < 90%

Sync out waveform







TeraFAST (TeraSense Viewer) icon is created on your desktop and Terasense folder is created in your Start Menu.

Software Installation Advanced

TeraSense software depends on the following Python packages:



If you have all of them installed, you only need to download and install Terasense package proper:



When software installation finishes, connect your device to PC using USB-miniUSB cable, turn it on with the power switch and wait for Windows to install driver for the device controller (Opal Kelly XEM6001).

You can obtain missing packages from the respective repositories, or from complete software package on our website (in the "prerequisites" folder):



TeraSense software may or may not work with earlier versions of the prerequisite packages. Consult our support for more information.

TeraSense software won't work with Python 3.x ! It is not supported by some prerequisite packages, notably, Numpy. It is possible to install Python 2.7 and Python 3.x side by side, though.

Getting started



When connecting for the first time to a new PC you'll need to wait while Windows installing drivers for the device.

TeraSense camera is sensitive to changes in temperature. If you brought camera from a cold or hot place, please, wait until its temperature comes into balance and you'll likely need to take new recording of background data (see p.13).

Software operation Basics

Terasense View	_ _ ×
File Help	
	B/C/G Options
Image origin	Gamma
■ 512 pix	Mode Time Space Rate, lines/s
Selection 0.000 Save image Save video	Belt speed, cm/s 1000 + Subframe length 64 512
0.000 Save Image Save Video	
Controller name Device id Data acquisition begins	_ _ X
Terasense View	
Time arrow	B/C/G Options White Black Gamma Reset
	Mode Time Space Rate, lines/s Belt speed, cm/s Subframe length 64 512
Save image Save video Stop]
	\sim

Software operation **Time Mode**

When working in the time mode, the image is shown with time scan along the horizontal axis. The time resolution is inversely proportional to the selected acquisition rate, for example, for the rate of 1000 lines per second the resolution is 1ms/pixel.

erasense View Help	The fale								
Help					MOUR BEARING		B/C/G	Options	
							White		_
							\sim	ode	7
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		0.512	sec				Gamma	\checkmark	· ·
						•	-	Û	
		512 line	es					Ļ	Rese
							Mode Time	Space]
							Rate, lines/s		1000
							Belt speed,	cm/s	1
	Caratranto I Charan						Subframe le 64	ength	
			Save image			Stop			0
			_			3.7	4 fps		
		C	hange ra	ate from 1	1000 to				
-		Ĭ	100 line		oond				
		Ũ	100 line	es per se	cond				
			100 line	es per sec	cond				
Help			100 line	es per sec	cond				
Help			100 line	es per sec	cond		B/C/G	Options	
Help			100 line	es per sec	cond		White	Options	
Help			100 line	es per sec	cond		White	Options	
Help			100 line	es per sec	cond		White	Options .	
Help			100 line	es per sec	cond		Black	Options .	
Help			100 line	es per sec	cond		White Black Gamma	Options .	Res
Help		5.12 s	100 line	es per sec	cond		White Black Gamma	Options .	Res
Help			100 line	es per sec	cond		White Black Gamma		Res
Help		5.12 s	100 line	es per sec	cond		White Black Gamma) Space	Res
Help		5.12 s	100 line	es per sec	cond		White Black Gamma Mode () Time	© Space	
Help		5.12 s	100 line	es per sec	cond		White Black Gamma Mode © Time Rate, lines/s	© Space s ccm/s	100
Help		5.12 s	100 line ec es	Save video	cond	Stor	White Black Gamma Mode © Time Rate, lines/s Belt speed, Subframe lo 64	© Space s ccm/s	100
Help		5.12 s	100 line	es per sec		Stop	White Black Gamma Mode © Time Rate, lines/s Belt speed, Subframe lo 64	© Space s ccm/s	

Space Mode

When working in the space mode, the image is shown with space (length) scan along the horizontal axis. The distance is calculated using the belt speed parameter, resolution of the image in horizontal direction is always 3mm/pixel. The speed can be changed between 10 and 1500 cm/s.

Geographics	Ministra		Diserent and	and the second second	a and a second	White
						K Mode switch
		1536 n	m			Gamma
		512 line	s			
						Mode Time Space
						Rate, lines/s Belt speed, cm/s
						Subframe length
			Save image S	ave video	Sto	qq
			f	rame #3269		

below 900 cm/s or 5000 lines/s for speeds between 900 and 1500 cm/s. The data then rescaled linearly to form the image.

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Subframe length



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Software operation Region of interest

			B/C/G Options		
Click-n-drag selects a region in the image			White Black Gamma Mode (a) Space	Reset	-0
			Rate, lines/s	3000	
			Belt speed, cm/s	1000	* *
	Save image Save video	Stop	Subframe length 64		512
	frame #5038	34.38 fps			

File Help				
			B/C/G Options	
			White Black Gamma	0
			Mode O Space	
			Rate, lines/s	3000 × 1000 ×
and the second			Belt speed, cm/s Subframe length	1000
Selection: 105:273, 61:203 Min: 0.239 Max: 0.829 Average: 5.336e-01	Save image Save video	Stop	64	512
	frame #1798	37.85 fp	s	
	Statistics for the selected region			

File Help				
			B/C/G Options	
	Left-click selects single point		White Black Gamma	Ó
			U	Reset
			Mode Time Space	
And the second			Rate, lines/s	3000
and the second			Belt speed, cm/s	1000 ^
Selection: 47, 83 0.327	Save image Save video frame #4299	Stop	Subframe length 64	512
	trame #4299	36.76 fps		
Coordinates and value at the point				

		B/C/G Options	
Right-click removes selection		White	Ó
		Gamma	
		·	i
	A	Mode	Reset
		🖲 Time 🕤 Space	
		Rate, lines/s	3000
		Belt speed, cm/s	1000
	Save image	Subframe length 64	512
	frame #5038	34.38 fps	

Software operation **Brightnes/Contrast/Gamma** When working in the space mode, the image is shown with - -.... Terasense View space (length) scan along the horizontal axis. The distance is File Help calculated using the belt speed parameter, resolution of the B/C/G Options image in horizontal direction is always 3mm/pixel. hite Black Ô-Gamma Reset Mode Time Space Brightness and contrast 1000 * Rate, lines/s are adjusted (white point) 1000 Subframe length

Terasense View		X
File Help		B/C/G Options
		White Black
Brightness and contrast are adjusted (black point)		Mode ● Time ● Space Rate, lines/s 1000 ▲ Belt speed, cm/s 1000 ▲
	Save image Save video	Subframe length 64 512
	frame #386	3.80 fps

Save image...

Save video...

frame #293

512

64

Stop

3.83 fps

	Terasense View				x
Fi	ile Help		B/C/G Options		
			White Black Gamma	Reset	-
			Mode Time Space		
	Gamma is		Rate, lines/s	1000	
	adjusted		Belt speed, cm/s Subframe length 64	1000	× 512
	Save image	Stop		U	
E	frame #464	3.75 fps			

Terasense View				- 🗆 X
File Help				
	的名为的的名称的 的复数		B/C/G Options	
			White	ó
			Black	
			Gamma	
			·	Raset
			Mode	N
			Time Space	
Reset returns settings			Rate, lines/s	1000
to default values				1000
			Subframe length 64	512
Save in	mage Save video	Stop		
	frame #525	3.80 fps		

• Adjustments in white point, black point and gamma affect only digital image postprocessing.

Software operation Options

The Teb		B/C/G Options
Original		Negative Mirror V Color
		Difference
		Smooth ,
		Config
		Rec. BG Rec. Norm
		Save config Load config
	Save image Save video St	op @ default
	frame #1814 1	4.49 fps











Software operation Background compensation

	B/C/G Options
Non-uniform	Direction Different Differen
background	Negative Mirror Color
	Difference
	Smooth Median
	Config
	Rep. BC., Rec. Norm
	Save Save Load config
Save image Save video Stop	default
frame #3122 14.93 fps	
I Decoderante Proces	
Help	
	B/C/G Options
Deskereund	
Background	Negative Mirror Color
recording	
COMMENCES	
Recording background data.	Difference
Please, wait while recording finishes.	
	Smooth Median
	Config
	Rec. BG Rec. Norm
	Save config Load config
Save image Save video Stop	Normalization
	default recorded
Help	
	ound information using
New background "Load config" and	
information is applied "Load config"	buttons.
	on data are saved too
automatically. Recorded normalization	
	Difference
	Simboli Median
	Smooth Median
	Simboli Median
	Smooth ' Median
	Smooth Median Config Rec. BG Rec. Norm Save config Normalization
automatically. Recorded normalization Save image Save video Stop	Difference Smooth Config Rec. BG Rec. Norm Save config Load config Normalization @ default recorded
automatically.	Difference Smooth Config Rec. BG Rec. Norm Save config Load config Normalization @ default recorded

Software operation Normalization

(compensation for beam profile)

Teh				B/C/G Options
Non-uniform field				Negative Mirror V Color
				Difference
				Smooth Median
				Config
				Rec. BG Rec. Norm Save config Load config.
		Save image Save video	Stop	Normalization default recorded
		frame #3122	14.93 fps	
Help				
				B/C/G Options
Normalization recording				Negative Mirror 🖉 Color
commences		Recording Dialog		Difference
		Recording normalization data. Please, wait while recording finishes.		Difference
		 Показать подробности 	Cancel	Smooth Median
				Config
				Rec. BG Rec. Norm Save config Load config
		Save image Save video	Stop	Normalization
		frame #639	14.95 fps	
Help				default orecorded
	+	, ,		B/C/G Options
Uniform field				Negative Mirror Color
				"Recorded"
			C C	normalization
Data a	re rejected			options becomes ~ active.
where	signal level			
	een too low			Config Rec. BG Rec. Norm
				Save config Load config
		Save image Save video	Stop	Normalization

10.37 fp

Software operation Saving Image



Software operation Recording video



Software operation Difference mode

In this mode software displays absolute value of the difference between two consecutive frames. In order for the mode to be useful, you need to modulate radiation source by the sync out signal of the device. The sync signal is +5V TTL with level changes corresponding to frame boundaries (see p.5). You can equally well use high level as "radiation on" and low as "off" or vice versa.

In the difference mode background and all its slow variations are automatically canceled out.

File Help		
		B/C/G Options
		Negative Mirror V Color
		N.
		R Difference
		hà
		Smooth Median
		Config
		Rec. BG Rec. Norm
		Save config Load config
	Save image Save video	Stop
		efault recorded
	frame #648	15.07 fps
File Help		
		B/C/G Options
Difference mode		Negative Mirror V Color
is activated		
		V Difference
		Smooth Median
		Config
The mode is indicated	in the status bar	Rec. BG Rec. Norm
		Save config Load config
	Save image Save video	Stop
Difference mode		
If you are	using one of TeraSense (TM) IMPATT
sub-THz ge	enerators, you should conn	ect "sync
out" output	connector of the camera to	"MOD IN"
input conne	ector of the generator.	
	J	

Maintenance

- Do not expose the device to excessive heat, do not leave it in direct sunlight for a long time.
- If ambient temperature changes, let the device to come in equilibrium before use.
- Device is not protected against environment. Do not use in very wet or very dusty surroundings.
- PTFE window is soft be careful not to apply force to it.
- To clean the device use soft cloth. If necessary, moisten it slightly with mild detergent and then dry the device thoroughly. Never submerge it in water!

Troubleshooting



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