



# FPA-640x512-TE2 InGaAs Imager

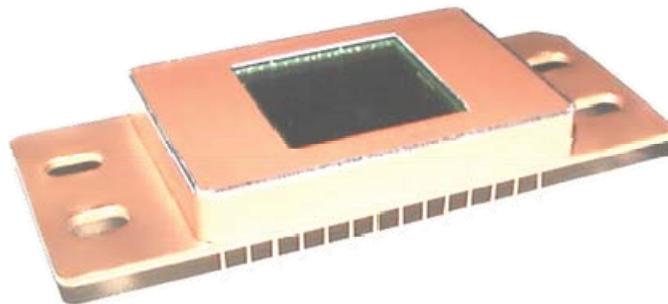
## NEAR INFRARED (0.9 $\mu\text{m}$ - 1.7 $\mu\text{m}$ ) IMAGE SENSOR

### FEATURES

- 640x512 Array Format
- 28-pin Metal DIP Package
- Embedded Thermoelectric Cooler
- Typical Pixel Operability >99.5%
- Quantum Efficiency >70%

### APPLICATIONS

- Near-infrared Imaging
- Imaging Spectroscopy
- Covert Surveillance
- Semiconductor Inspection
- Medical Science and Biology
- Fiberoptic Telecommunication
- Astronomy and Scientific
- Industrial Thermal Imaging
- Moisture Mapping



### GENERAL DESCRIPTIONS

PARAMETER	VALUE
Sensor Technology	Standard InGaAs/InP
Spectral Range	0.9 $\mu\text{m}$ - 1.7 $\mu\text{m}$
Image Format	640 (H) x 512 (V)
Pixel Size	25 $\mu\text{m}$ x 25 $\mu\text{m}$ (> 99 % Fill Factor)
Image Size	16 mm (H) x 12.8 mm (V)
Package Type	28-pin Metal DIP Package
Weight	24.5 g



## FPA CHARACTERISTICS ( $T_a = 25\text{ °C}$ )

PARAMETER	TYPICAL	CONDITIONS
Dark Current	$\leq 0.2\text{ pA}$	Pixel bias = 0.1 Volt
Quantum Efficiency	$\geq 70\%$	$\lambda = 1.0\text{ }\mu\text{m} - 1.6\text{ }\mu\text{m}$
Fill Factor	$> 99\%$	
Adjacent pixel crosstalk	$< 1\%$	
Detectivity	$\geq 7.5 \times 10^{12}\text{ Jones}$	$T_{\text{int}} = 16\text{ms}$ , High Gain, $\lambda = 1.55\text{ }\mu\text{m}$
Response Nonuniformity	$\leq 10\%$	Under 50 % Saturation
Nonlinearity (Max. Deviation)	$\leq 2\%$	Over 15 % - 85 % Full Well Capacity
Max. Pixel Rate	10 MHz	
Gain	High gain*: $23.6\text{ uV} / e^-$ Low gain: $1.26\text{ uV} / e^-$	
Full Well	High gain* : $118\text{ K } e^-$ Low gain: $1.9\text{ M } e^-$	
Pixel Operability**	$> 99\%$ (Minimum)	Dark Current $\leq 20\%$ Full Well Response Nonuniformity $\leq 20\%$

\* Gain and full well under high gain mode may vary from lot to lot.

\*\* Pixel Operability is defined within the center 636x508 regions

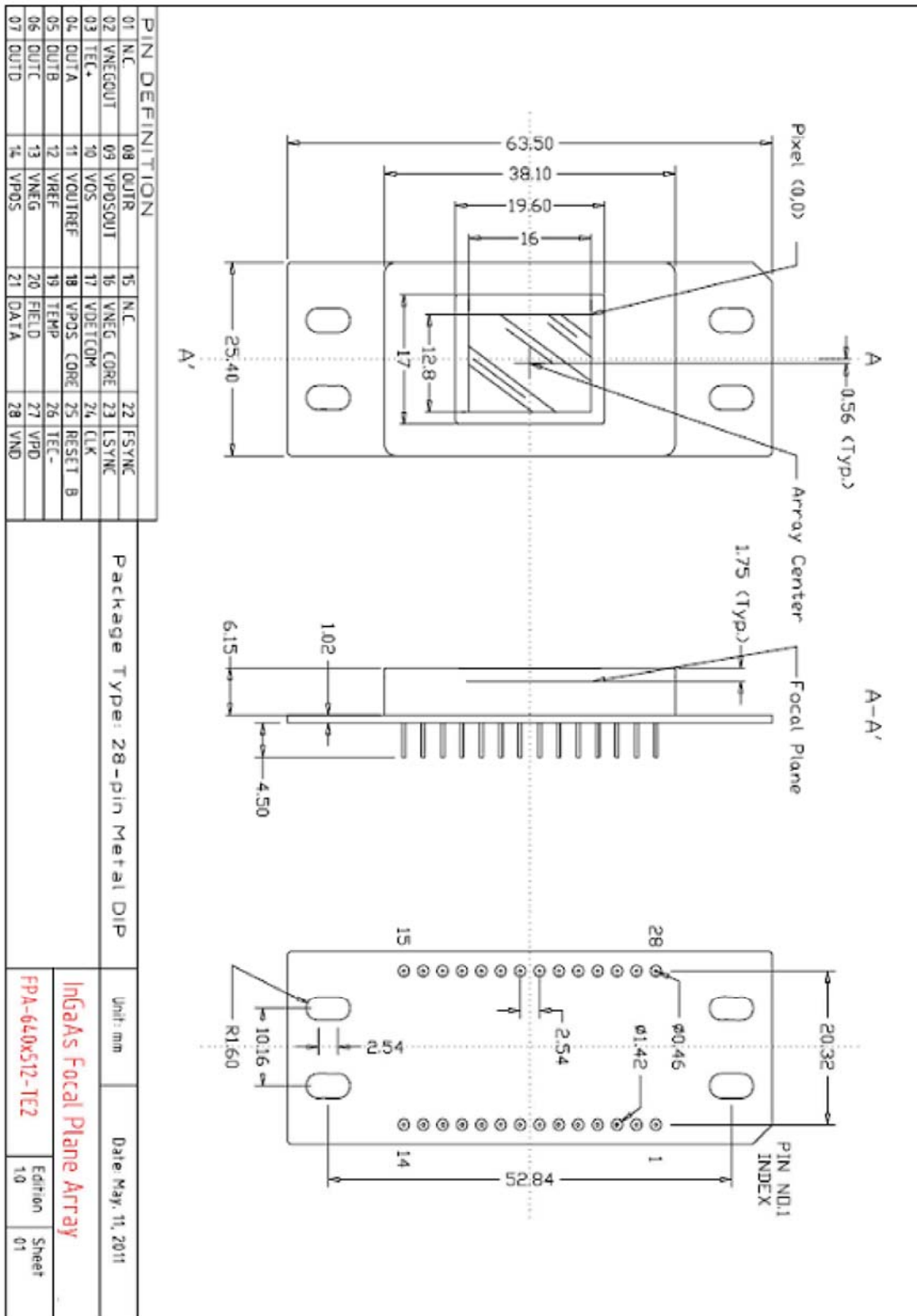
## ABSOLUTE MAXIMUM RATINGS

PARAMETER	UNIT	MIN	MAX
Operation Temperature	$^{\circ}\text{C}$	- 40	85
Storage Temperature	$^{\circ}\text{C}$	- 40	85
Power Consumption	mW	---	325 ***

\*\*\* Without driving the cooler



## PACKAGE OUTLINE



Note : ID number of the imager is printed on the flank of the package



## OPERATING CONDITIONS

### Bias Input

Pin #	Bias	Voltage	Current	Remark
27	VPD	5.5 V	< 15 mA	Logic positive supply
28	VND	0 V	< 15 mA	Logic negative supply
9	VPOSOUT	5.5 V	< 25 mA	Output driver positive supply
2	VNEGOUT	0 V	< 25 mA	Output driver negative supply
14	VPOS	5.5 V	< 15 mA	Positive analog supply
13	VNEG	0 V	< 15 mA	Negative analog supply and substrate
18	VPOS_CORE	5.5 V	< 80 mA	Positive analog supply
16	VNEG_CORE	0 V	< 80 mA	Negative analog supply
11	VOUTREF	1.6 V	< 1 mA	Output reference level
12	VREF	2.2 V - 3.2 V	< 1 mA	CTIA amplifier reference supply
17	VDETCOM	2.7 V - 5.5 V	< 20 mA	Detector common voltage Detector bias = VREF-VDETCOM*

\* VDETCOM lower than VREF will forward bias the detector pixels.

### Digital Pattern Input

Pin #	Clocks	Levels	Rise/Fall	Remark
25	RESET_B	0 V - 5.5 V	< 10 ns	Resets digital registers and latches when logic "0" is applied, normally pull up to logic "1"
24	CLK	0 V - 5.5 V	< 10 ns	Master clock, Max. Freq.= 5 MHz
23	LSYNC	0 V - 5.5 V	< 10 ns	Line sync - controls line readout timing
22	FSYNC	0 V - 5.5 V	< 10 ns	Frame sync - controls frame start and integration time
21	DATA	0 V - 5.5 V	< 10 ns	Data code input - programs chip function registers
20	FIELD	0 V - 5.5 V	< 10 ns	Field sync – controls interlaced field readout



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Clocks	Synchronization
FSYNC	Rising and falling when CLK is falling
LSYNC	Rising and falling when CLK is falling
DATA	Rising and falling when CLK is rising
FIELD	Rising and falling when CLK is falling

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## Video Output

Pin #	Outputs	Levels	Settle	Remark
4	OUTA	2.3 V to 4.7 V*	< 70 ns to 0.1 %	Output A used in single output mode
5	OUTB	2.3 V to 4.7 V*	< 70 ns to 0.1 %	Output A and B used in two output mode
6	OUTC	2.3 V to 4.7 V*	< 70 ns to 0.1 %	Output A, B, C, and D used in four output mode
7	OUTD	2.3 V to 4.7 V*	< 70 ns to 0.1 %	Output A, B, C, and D used in four output mode
8	OUTR	1.6 V	-	Reference for common mode output

\* Low gain mode, the swing under high gain mode is 2.3 V ~ 5.1 V

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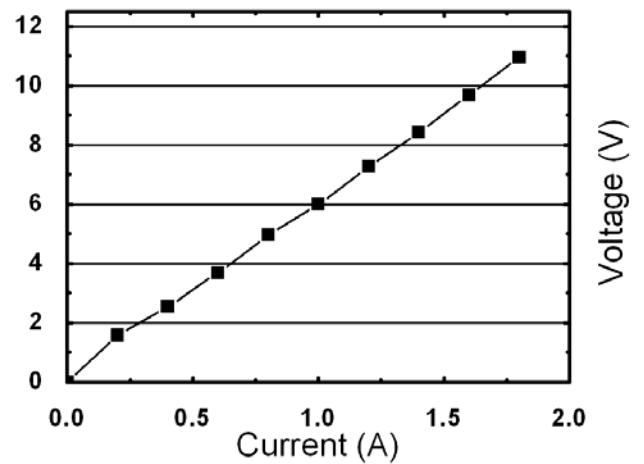
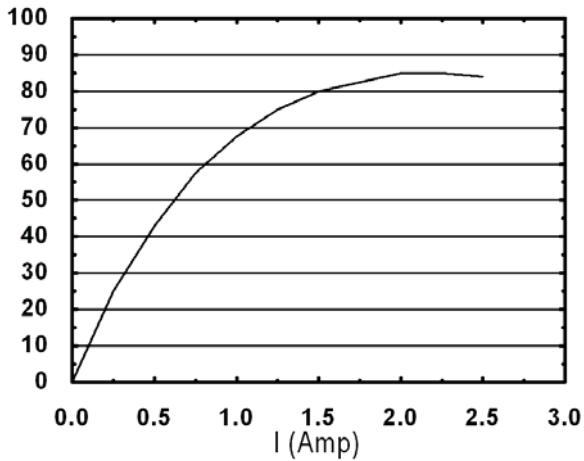
## Advanced Function

Pin #	Functions	Voltages	Remark
10	VOS	1.6 V - 5.5 V	Variable Offset/Skimming Control Voltage
19	TEMP	0 V - 5.5 V	On chip temperature monitor 0.74 V at 300 K, <b>Slope = -14.8 mV / 10K in 50 - 300K</b>

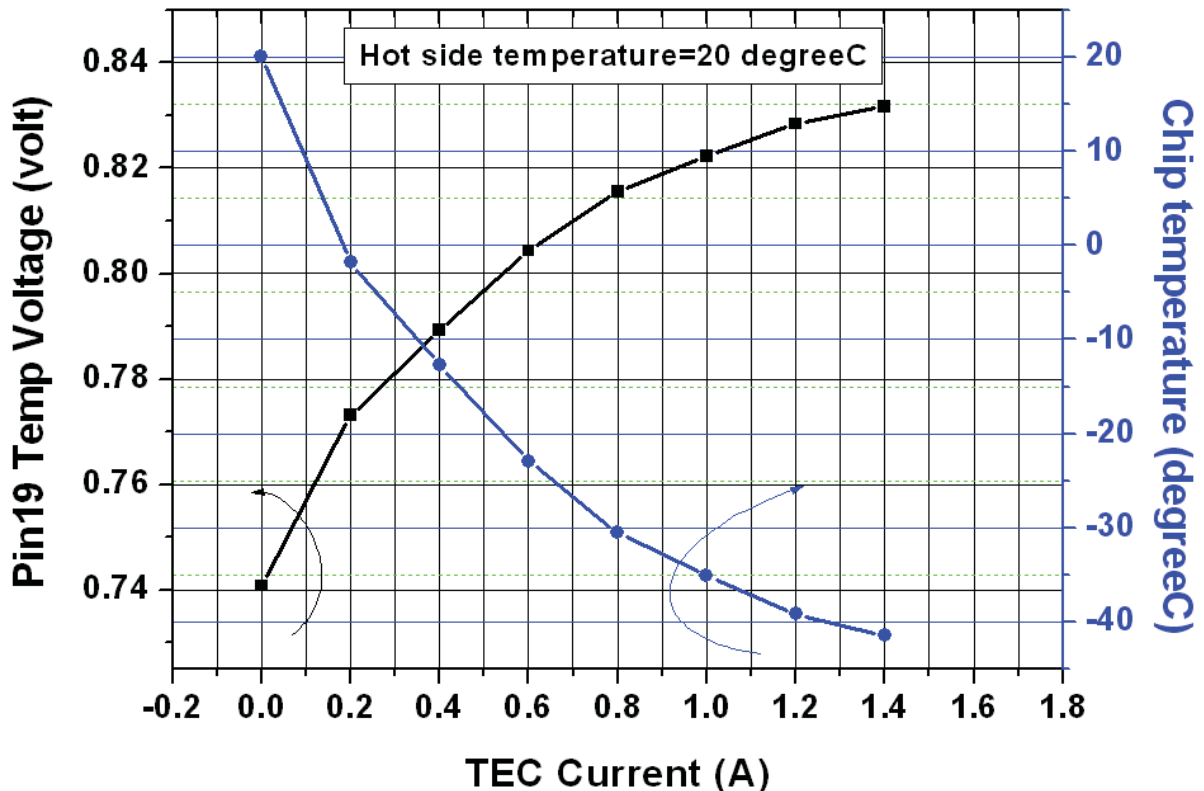


Thermoelectric Cooler Data (Without thermal loading)

$\Delta T_{\max}$	$I_{\max}$	$V_{\max}$
> 91 °C	2.40 A	11.70 V

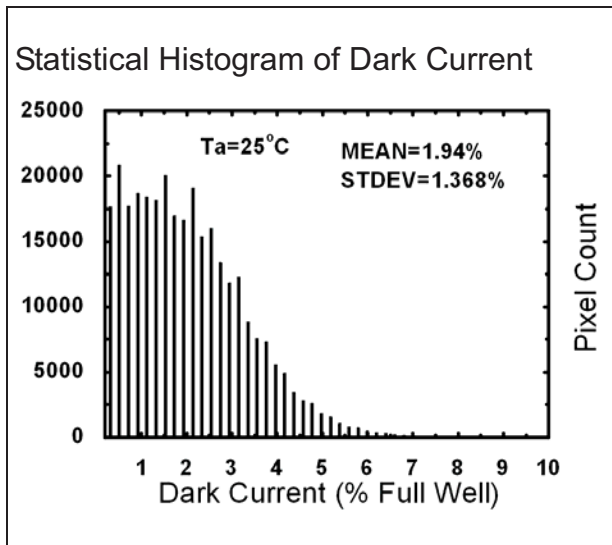


Cooling Performance with sensor loading and operating

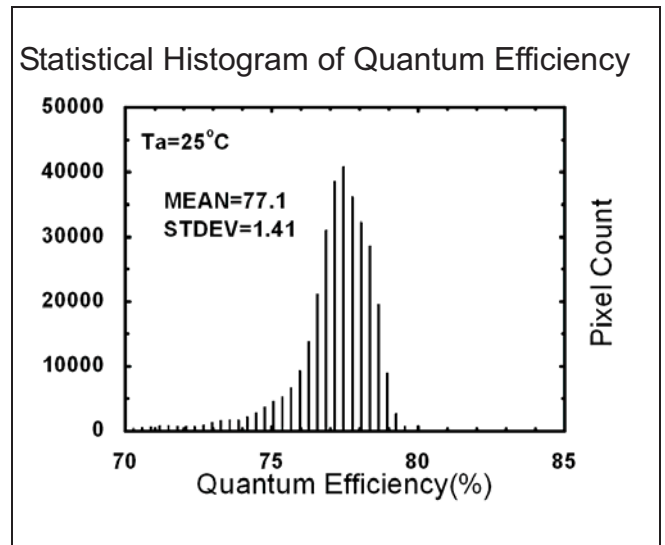




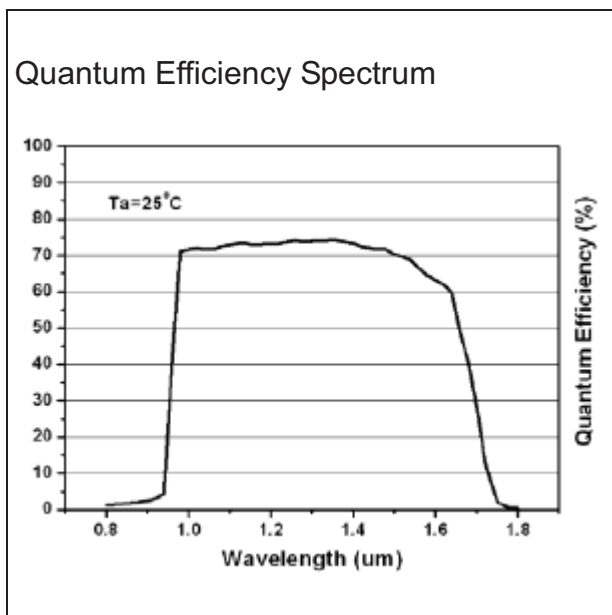
## EXAMPLE CURVES



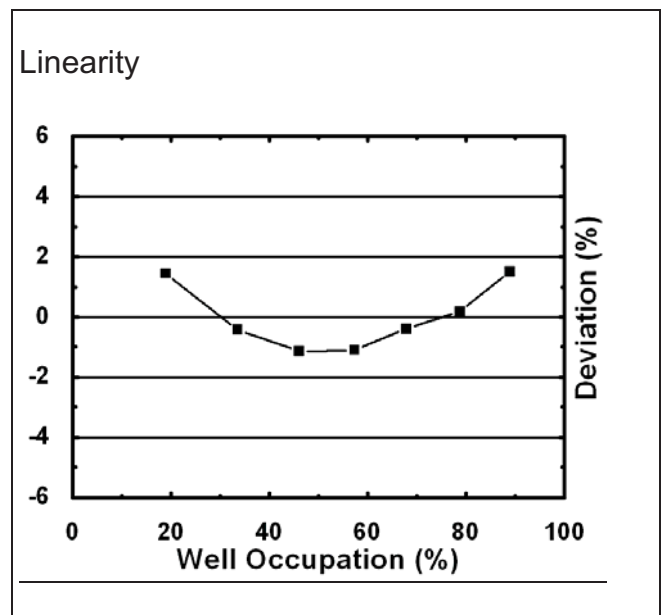
Test Conditions:	
Illumination	Dark
Wavelength	---
Gain	Low
Integration Time	16 ms
Remark	Effective Screen



Test Conditions:	
Illumination	Nonuniformity $\leq \pm 0.15\%$
Wavelength	1310 nm
Gain	Low
Integration Time	5 msec, 50 % saturation
Remark	Effective Screen



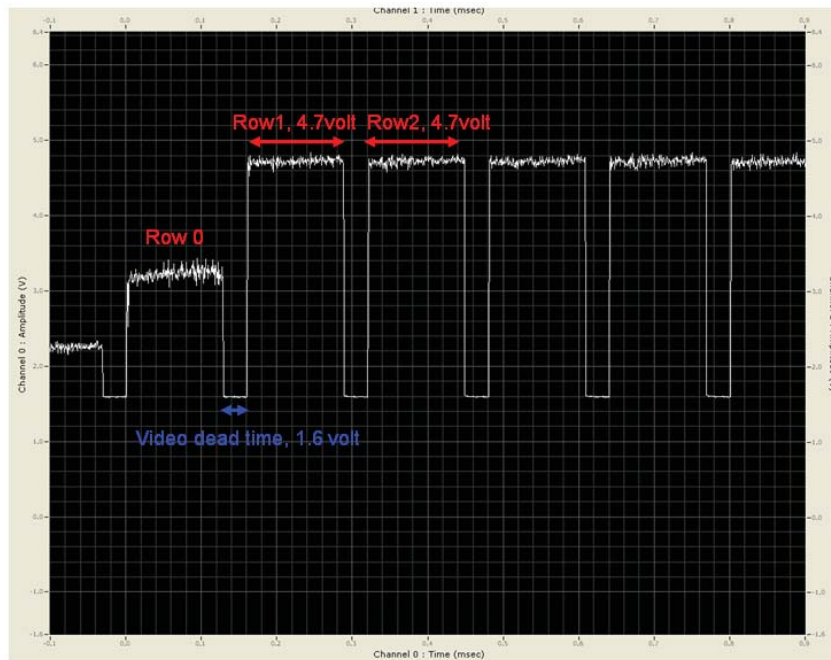
Test Conditions:	
Illumination	Nonuniformity $\leq \pm 0.15\%$
Wavelength	Broadband
Gain	Low
Integration Time	5 msec, 50 % saturation
Remark	Effective Screen Array Average



Test Conditions:	
Illumination	Nonuniformity $\leq \pm 0.15\%$
Wavelength	1310 nm
Gain	Low
Integration Time	---
Remark	Effective Screen Array Average

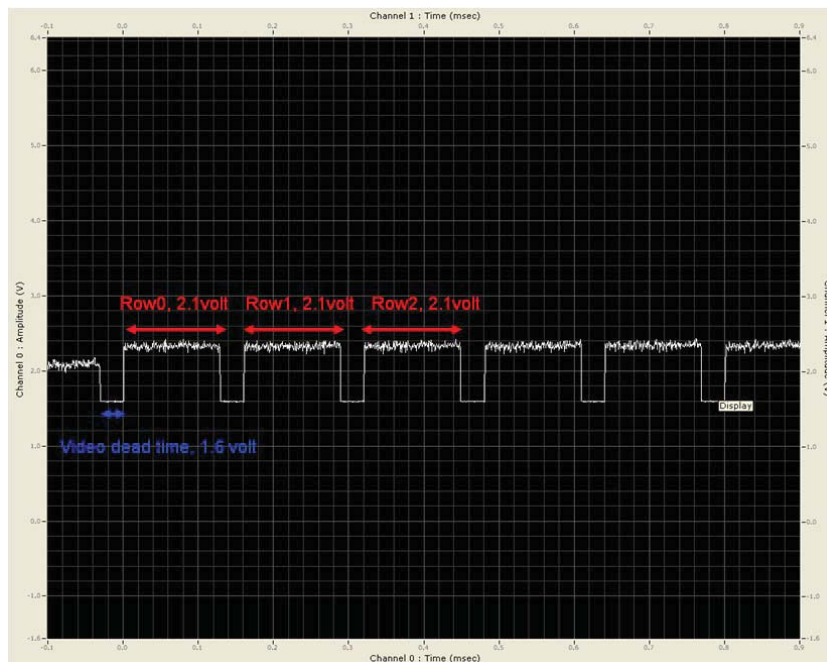


### OUTA Waveform under dark\*



\* The dark level under high gain mode is 5.1 volt.

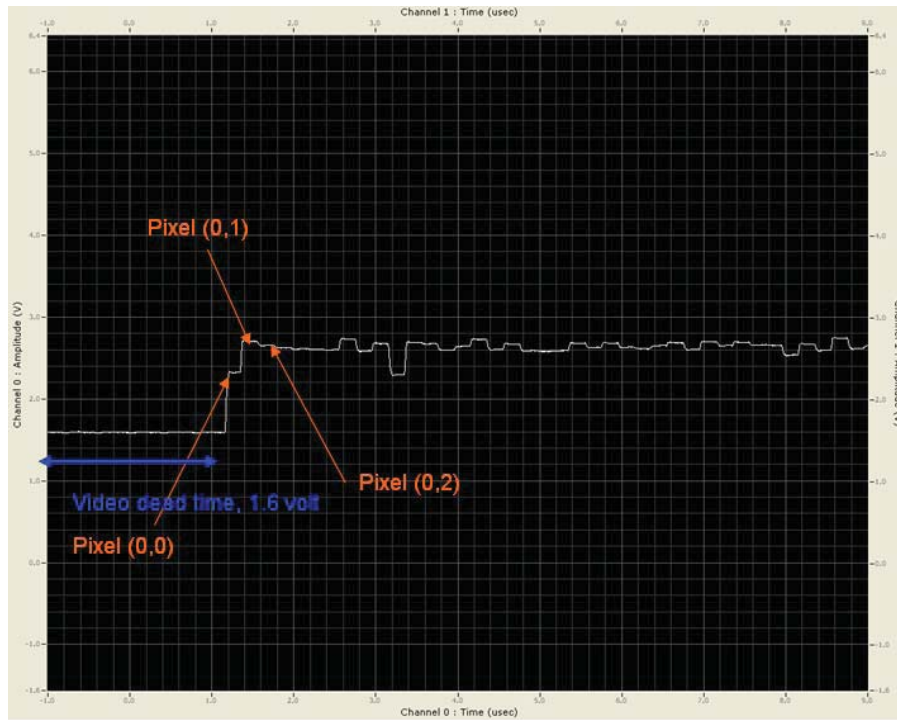
### Waveform under saturation







## OUTA waveform under half saturation



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