# FPA-320x256-C InGaAs Imager

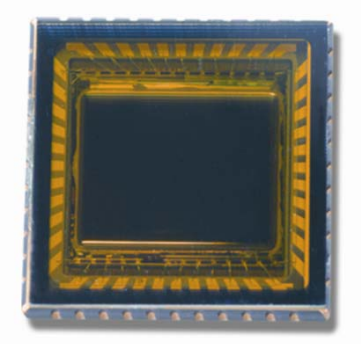
**NEAR INFRARED (0.9 µm - 1.7 µm) IMAGE SENSOR**

## FEATURES

- 320 x 256 Array Format
- Light Weight 44CLCC Package
- Hermetic Sealed Glass Lid
- Typical Pixel Operability > 99.5 %
- Quantum Efficiency > 70 %
- Room temperature operation

## 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 µm - 1.7 µm |
| Image Format | 320 (H) x 256 (V) |
| Pixel Size | 30 µm x 30 µm (> 99 % Fill Factor) |
| Image Size | 9.6 mm (H) x 7.68 mm (V) |
| Package Type | 44-pin Ceramic LCC |
| Weight | 1.6 g |

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## FPA CHARACTERISTICS ($T_a$ = 25°C)

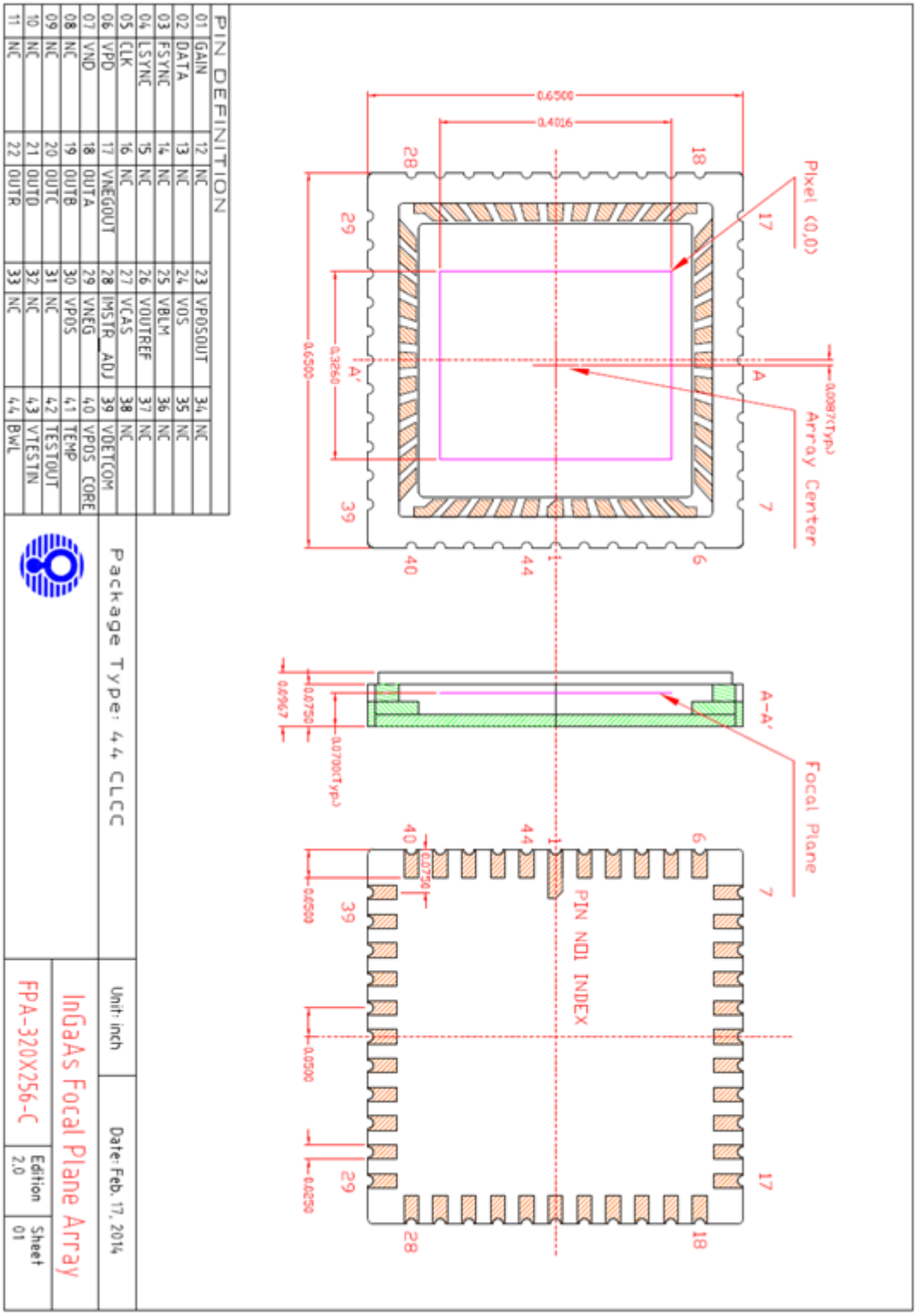
| PARAMETER | TYPICAL | CONDITIONS |
|---|---|---|
| Dark Current | < 0.4 pA | 0.1 Volt detector bias |
| Quantum Efficiency | ≥ 70 % | λ = 1.0 µm - 1.6 µm |
| Fill Factor | > 99 % | |
| Adjacent pixel crosstalk | < 1% | |
| Detectivity | ≥ 5 x $10^{12}$ Jones | $T_{int}$= 16 ms, High Gain, λ = 1.55 µm |
| Response Nonuniformity | ≤ 10 % | Under 50% Saturation |
| Nonlinearity (Max. Deviation) | ≤ 2 % | 10 % - 90 % Full Well Capacity |
| Max. Pixel Rate | 10 MHz | |
| Gain | High gain: 13.3 uV/$e^-$<br>Low gain: 0.7 uV/$e^-$ | |
| Full Well | High gain: 170 K $e^-$<br>Low gain: 3.5 M $e^-$ | |
| Pixel Operability* | > 99 % (Minimum) | Dark Current ≤ 20 % Full Well<br>Response Nonuniformity ≤ 20 % |

* Pixel Operability is defined within the center 318 x 254 regions

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | UNIT | MIN | MAX |
|---|---|---|---|
| Operation Temperature | °C | - 20 | 85 |
| Storage Temperature | °C | - 40 | 85 |
| Power Consumption | mW | --- | 175 |

# PACKAGE OUTLINE




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

# OPERATING CONDITIONS

## Bias Input

| Pin # | Bias | Voltage | Current | Remark |
|---|---|---|---|---|
| 6 | VPD | 5.5 V | < 1 mA | Logic positive supply |
| 7 | VND | 0 V | < 1 mA | Logic negative supply |
| 23 | VPOSOUT | 5.5 V | < 25 mA | Output stage analog supply |
| 17 | VNEGOUT | 0 V | < 25 mA | Output stage analog ground |
| 30 | VPOS | 5.5 V | < 5 mA | Positive analog supply |
| 29 | VNEG | 0 V | < 15 mA | Negative analog supply and substrate |
| 40 | VPOS_CORE | 5.5 V | < 15 mA | CTIA amplifier positive supply |
| 39 | VDETCOM | 4.7 V - 5.5 V | < 5 mA | Detector common voltage<br>Detector bias = VDETCOM - 4.7* |

* VDETCOM lower than 4.7 V will forward bias the sensor, the exact zero bias voltage is device and temperature dependent.

## Digital Pattern Input

| Pin # | Clocks | Levels | Rise/Fall | Remark |
|---|---|---|---|---|
| 5 | CLK | 0 V - 5.5 V | < 10 ns | Master clock<br>Max. Freq. = 5 MHz |
| 3 | FSYNC | 0 V - 5.5 V | < 10 ns | Frame sync - controls frame start and integration time |
| 4 | LSYNC | 0 V - 5.5 V | < 10 ns | Line sync - controls line readout timing |
| 2 | DATA | 0 V - 5.5 V | < 10 ns | Data code input - programs device function registers in Control Mode<br>Left open in Default Mode |

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

## Analog video Output

| Pin # | Outputs | Levels | Settle | Remark |
|---|---|---|---|---|
| 18 | OUTA | 1.3 V to 4.2 V | < 50 ns to 0.1 % | Output A used in single output mode |
| 19 | OUTB | 1.3 V to 4.2 V | < 50 ns to 0.1 % | Output A and B used in two output mode |
| 20 | OUTC | 1.3 V to 4.2 V | < 50 ns to 0.1 % | Output A, B, C, and D used in four output mode |
| 21 | OUTD | 1.3 V to 4.2 V | < 50 ns to 0.1 % | Output A, B, C, and D used in four output mode |
| 22 | OUTR | 3 V | - | Reference for common mode output |

## Gain & Bandwidth Selection in Default Mode

| Pin # | Functions | Low | High | Remark |
|---|---|---|---|---|
| 1 | GAIN | 0 V<br>C = 10 fF | 5.5 V<br>C = 210 fF | Selects unit cell integration capacitor<br>Left open in Control Mode |
| 44 | BWL | 0V<br>Low BW | 5.5 V<br>High BW | Selects bandwidth limiting capacitor in unit cell<br>Left open in Control Mode |

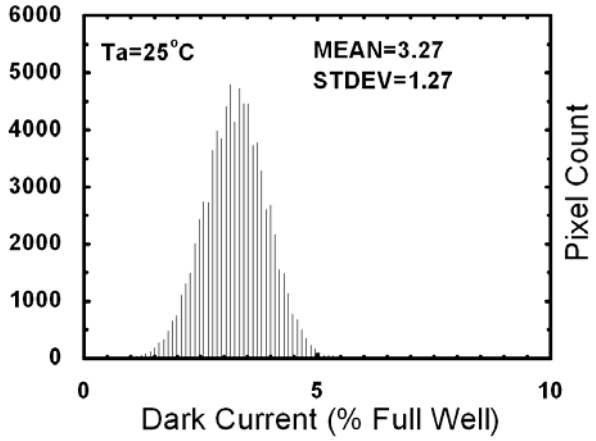
## Advanced Function

| Pin # | Functions | Voltages | Remark |
|---|---|---|---|
| 27 | VCAS* | 3.75 V | CTIA amplifier cascode FET bias |
| 26 | VOUTREF* | 3 V | Output reference level during blanking period |
| 25 | VBLM* | 2 V | Detector bloom control |
| 28 | IMSTR_ADJ** | 0 V - 5.5 V | Adjusts analog master bias current |
| 24 | VOS | 0 V - 5.5 V | Variable Offset/Skimming Control Voltage |
| 41 | TEMP | 0 V - 5.5 V | On chip temperature monitor<br>0.74 V at 300 K, **Slope = -14.8 mV/10K in 50 - 300 K** |
| 43 | VTESTIN | 1.5 V - 4.5 V | For use in IC function test |
| 42 | TESTOUT | 0 V - 5.5 V | Left open in FPA operation |

* Internally generated after bias input, but can be overridden.
** Also addressable through control register (DATA).

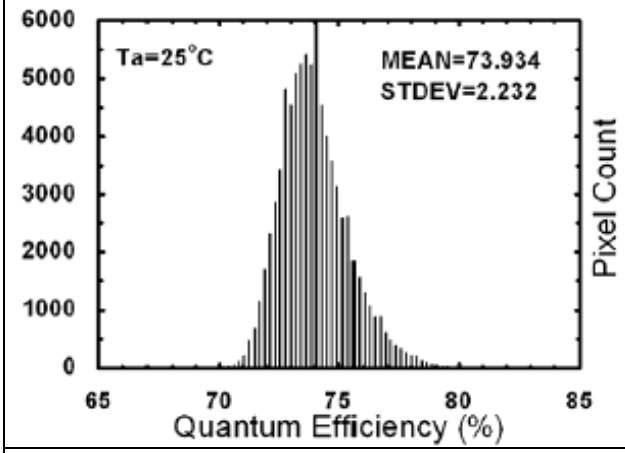
# EXAMPLE CURVES

Statistical Histogram of Dark Current



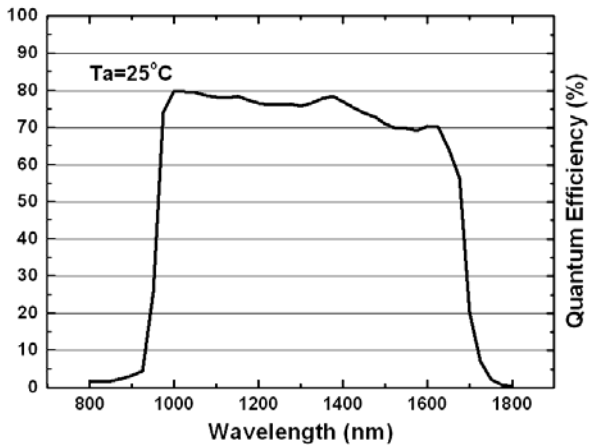

| Test Conditions: | |
|---|---|
| Illumination | Dark |
| Wavelength | --- |
| Gain | Low |
| Integration Time | 16 ms |
| Remark | Effective Screen |

Statistical Histogram of Quantum Efficiency



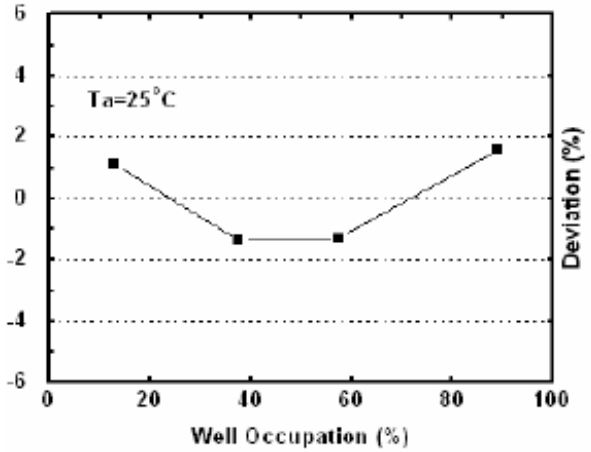

| Test Conditions: | |
|---|---|
| Illumination | Nonuniformity ≤ ± 0.15 % |
| Wavelength | 1310 nm |
| Gain | Low |
| Integration Time | 5 msec, 50 % saturation |
| Remark | Effective Screen |

Quantum Efficiency Spectrum



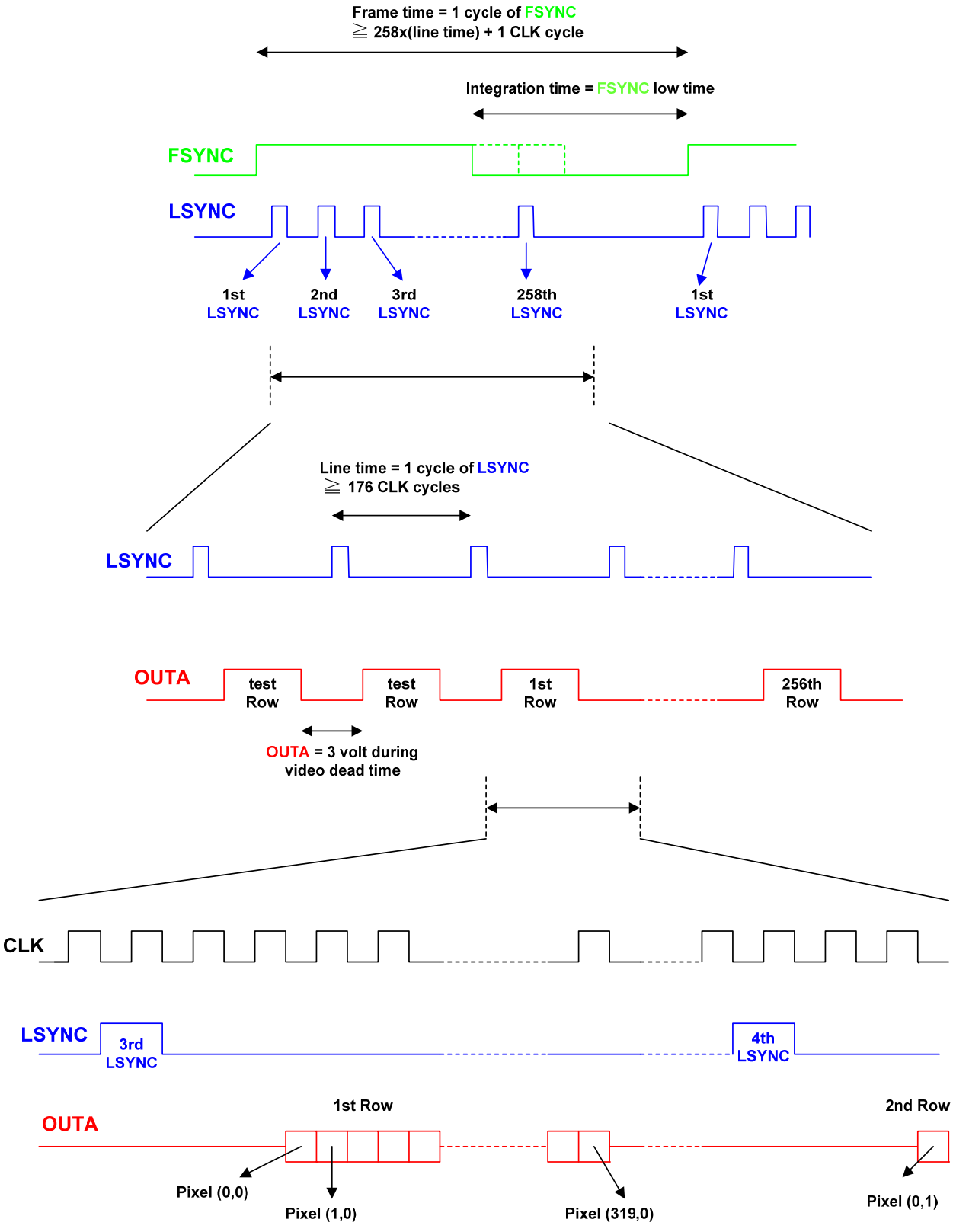

| Test Conditions: | |
|---|---|
| Illumination | Nonuniformity ≤ ± 0.15 % |
| Wavelength | Broadband |
| Gain | Low |
| Integration Time | 5 ms, 50 % saturation |
| Remark | Effective Screen<br>Array Average |

Linearity

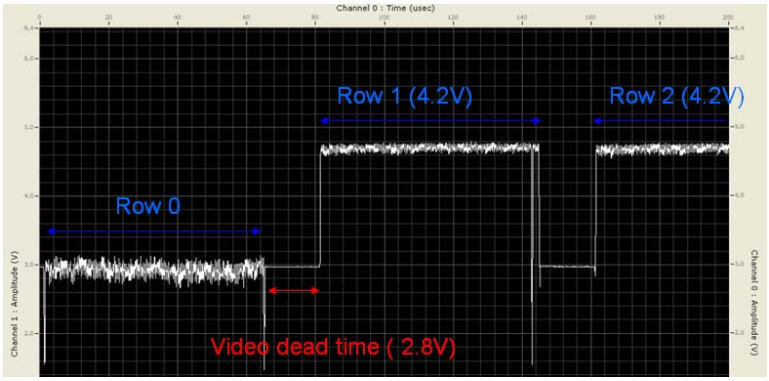



| Test Conditions: | |
|---|---|
| Illumination | Nonuniformity ≤ ± 0.15 % |
| Wavelength | 1310 nm |
| Gain | Low |
| Integration Time | --- |
| Remark | Effective Screen<br>Array Average |

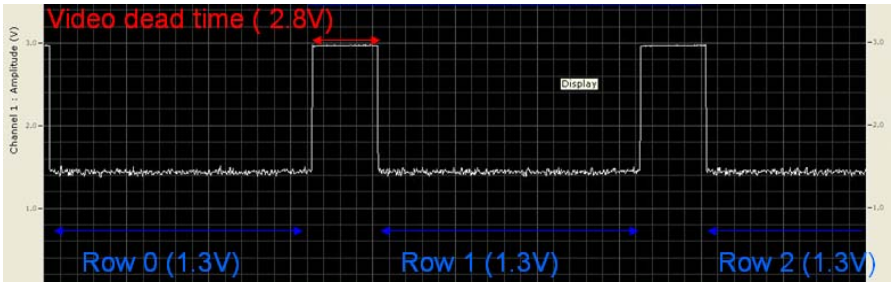
# TIMING CHART FOR DEFAULT MODE OPERATION



## OUTA waveform under dark




## OUTA waveform under saturation




## OUTA waveform under half saturation