

Feature

- 300mA Maximum Output Current
- Low Quiescent Current: 60μA
- Shut-down Current: < 0.1μA
- Input Voltage: 1.8V ~ 5.5V
- 0.47μF~10μF Ceramic Capacitors Ensure the Stability
- Overload/Over Temperature Protection
- Package: SOT-23-5/ SC70-5/ DFN1.2*1.6-4L/ DFN2*2-6L (lead-free packaging is now available)
- Specified from: -40°C ~ +85°C

Application

- MP3/MP4 Players
- Cellular phones, radiophone, digital cameras, and portable electronics
- Laptop/notebook/palmtop computers
- Portable devices
- Disk driver
- Battery chargers
- Bluetooth and other radio products

Description

The TX3210_xx is 300mA low dropout linear regulator optimized to provide a high performance solution to low power system.

The device offers a new level of cost-effective performance in cellular phones, laptop and notebook computers, and other portable devices. Proprietary design techniques ensure high performance.

The TX3210_xx is designed to make use of low cost ceramic capacitors which ensure the stability of the output current, and enhance the efficiency in order to prolong the battery life of those portable devices.

The TX3210_xx regulators are available in the industry standard SOT-23-5/ SC70-5/ DFN1.2*1.6-4L/ DFN2*2-6L power packages (or upon request).

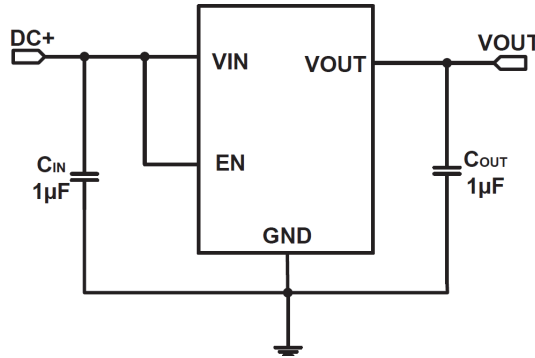
Order Information

TX3210_xx ① ②:

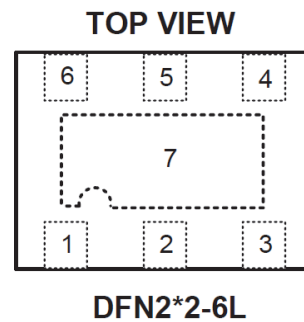
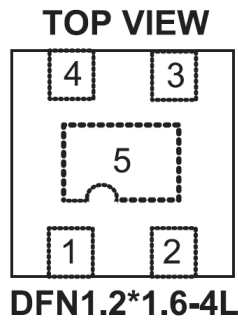
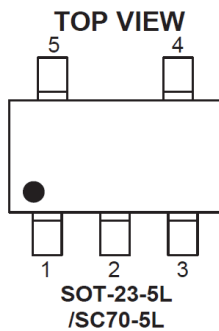
| SYMBOL | DESCRIPTION (SOT) |
|--------|--|
| ① | Denotes Output Voltage: K: 1.2V I: 1.3V B: 1.5V C: 1.8V H: 2.5V E: 2.8V F: 3.0V G: 3.3V |
| ② | Denotes Package Type: B: SOT-353-5(SC70-5) E: SOT-23-5L |

| SYMBOL | DESCRIPTION (DFN) |
|--------|--|
| ① | Denotes Output Voltage: E: 2.8V L:3.1V G: 3.3V |
| ② | Denotes Package Type: D: DFN1.2*1.6-4L K: DFN2*2-6L |

Typical Application Circuit



Pin Assignment and Description



| PIN No. | | | NAME | DESCRIPTION |
|---------------------|---------------|-----------|------|----------------|
| SOT-23-5L / SC70-5L | DFN1.2*1.6-4L | DFN2*2-6L | | |
| 2 | 2 | 5, 7 | GND | Ground |
| 5 | 4 | 4 | VOUT | Output Voltage |
| 1 | 3 | 3 | VIN | Power Supply |
| 3 | 1 | 2 | EN | ON/OFF Control |
| 4 | 5 | 1, 6 | NC | No Connect |

Absolute Maximum Ratings (Note 1)

- Input Supply, EN Voltage-0.3V ~ 6V
- Power Dissipation, PD @ TA=25°C
 SOT-23-5L0.4W
 SC70-5, DFN1.2*1.6-4L0.3W
 DFN2*2-6L0.5W
- Operating Temperature Range (Note 2).....-40°C ~ +85°C
- Storage Temperature Range..... -65°C ~ +150°C
- Junction Temperature Range.....+125°C
- Lead Temperature (Soldering, 10 sec.)..... +265°C

Note 1: Stresses beyond those listed Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The TX3210_xx is guaranteed to meet performance specifications from 0°C to 70°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with statistical process controls.

Electrical Characteristics

Operating Conditions: $T_A=25^{\circ}\text{C}$, $V_{IN}=V_{OUT}+0.5\text{V}$, $C_{IN}=C_{OUT}=1\mu\text{F}$, unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------|-------------------------------------|--|-----|------|-----|--------------------|
| V_{IN} | Operating Voltage Range | | 1.8 | | 5.5 | V |
| ΔV_{OUT} | Output Voltage Accuracy | $I_{OUT} = 10\text{mA}$ | -2 | | +2 | % |
| I_Q | Quiescent Current | $2.2\text{V} \leq V_{IN} \leq 5.5\text{V}$ | | 60 | | μA |
| I_{OFF} | Shutdown Current | $V_{EN} = 0\text{V}$, $V_{IN} = 5\text{V}$ | | 0.02 | | μA |
| V_{DROP} | Dropout Voltage: $V_{IN} - V_{OUT}$ | $I_{OUT} = 150\text{mA}$, $V_{OUT} \leq 1.8\text{V}$ $I_{OUT} = 150\text{mA}$, $V_{OUT} \geq 2.8\text{V}$ | | 150 | | mV |
| V_{ENH} | EN Threshold Voltage (High) | $V_{IN} = 5\text{V}$ | 1.4 | | | V |
| V_{ENL} | EN Threshold Voltage (Low) | | | | 0.8 | V |
| I_{EN} | Enable Pin Current | | | 0.1 | | μA |
| I_{LIM} | Current Limited | $V_{IN} = V_{OUT} + 1\text{V}$ | 330 | 400 | 560 | mA |
| PRSS | Power Supply Rejection Rate | $f = 1\text{kHz}$, $I_{OUT} = 100\text{mA}$ | | -65 | | dB |
| ΔV_{LINE} | Line Regulation | $V_{IN} = (V_{OUT} + 0.5)$ to 5.5V , $I_{OUT} = 0\text{mA}$ | | 2 | | mV |
| ΔV_{LOAD} | Load Regulation | $0\text{mA} \leq I_{OUT} \leq 100\text{mA}$ | | 10 | | mV |
| T_{SD} | Thermal Shutdown Temperature | | | 160 | | $^{\circ}\text{C}$ |
| ΔT_{SD} | Thermal Shutdown Hysteresis | | | 20 | | $^{\circ}\text{C}$ |

Pin Functions

NC: Not Connect.

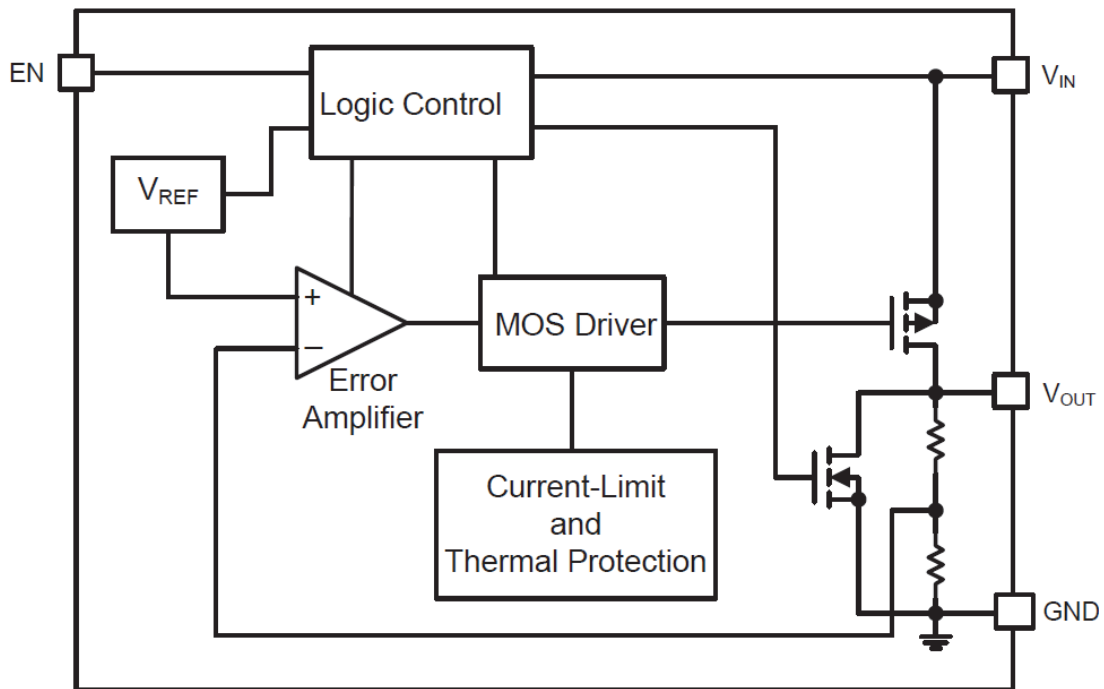
EN: ON/OFF Control (High Enable). Forcing this pin above 1.4V enables the part. Forcing this pin below 0.8V can shut down the device. In shutdown, all functions are disabled drawing $<1\mu\text{A}$ supply current. Do not leave EN floating.

VIN: Power Input Voltage. Must be locally bypassed.

VOUT: Output Voltage. It is a fixed output voltage for the Micropower LDO Regulator.

GND: Signal and Power Ground. Provide a short direct PCB path between GND and the (-) side of the output capacitor(s).

Block Diagram



Application Information

Input and Output Capacitor

Like any low dropout regulator, the external capacitors used with the TX3210_xx must be carefully selected for regulator stability and performance. Using a capacitor whose value is $>1\mu\text{F}$ on the TX3210_xx input and the amount of capacitance can be increased without limit. The input capacitor must be located a distance of not more than 0.5 inch from the input pin of the IC and returned to a clean analog ground. Any good quality ceramic or tantalum can be used for this capacitor. The capacitor with larger value and lower ESR (equivalent series resistance) provides better PSRR and line-transient response. The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application.

The TX3210_xx is designed specifically to work with low ESR ceramic output capacitor in space-saving and performance consideration. Using a ceramic capacitor whose value is at least $1\mu\text{F}$ with ESR is $> 25\text{m}\Omega$ on the TX3210_xx output ensures stability. The TX3210_xx still works well with output capacitor of other types due to the wide stable ESR range.

Enable Function

The TX3210_xx features an LDO regulator enable/disable function. To assure the LDO regulator will switch on, the EN turn on control level must be greater than 1volts.

For to protecting the system, the TX3210_xx have a quick-discharge function. If the enable function is not needed in a specific application, it may be tied to VIN to keep the LDO regulator in a continuously on state.

PSRR

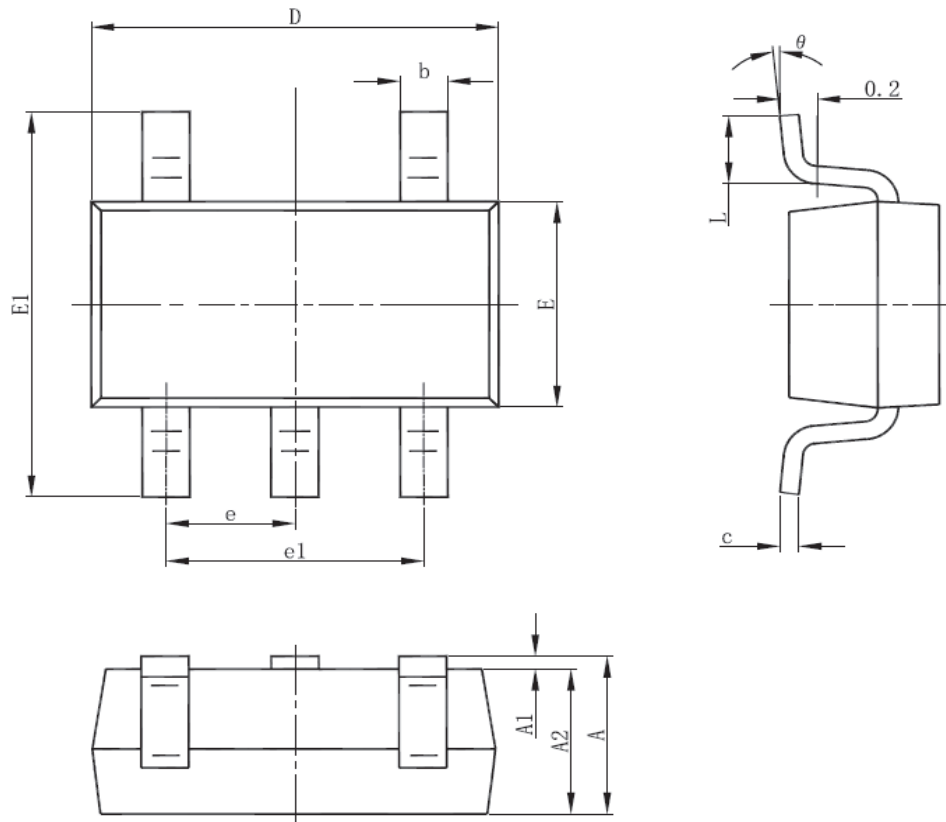
The power supply rejection ratio (PSRR) is defined as the gain from the input to output divided by the gain from the supply to the output. The PSRR is found to be :

$$\text{PSRR} = 20 \times \log \left(\frac{\Delta \text{Gain Error}}{\Delta \text{Supply}} \right)$$

Note that when heavy load measuring, Δsupply will cause $\Delta \text{temperature}$. And $\Delta \text{temperature}$ will cause $\Delta \text{output voltage}$. So the heavy load PSRR measuring must include temperature effect.

Current Limit

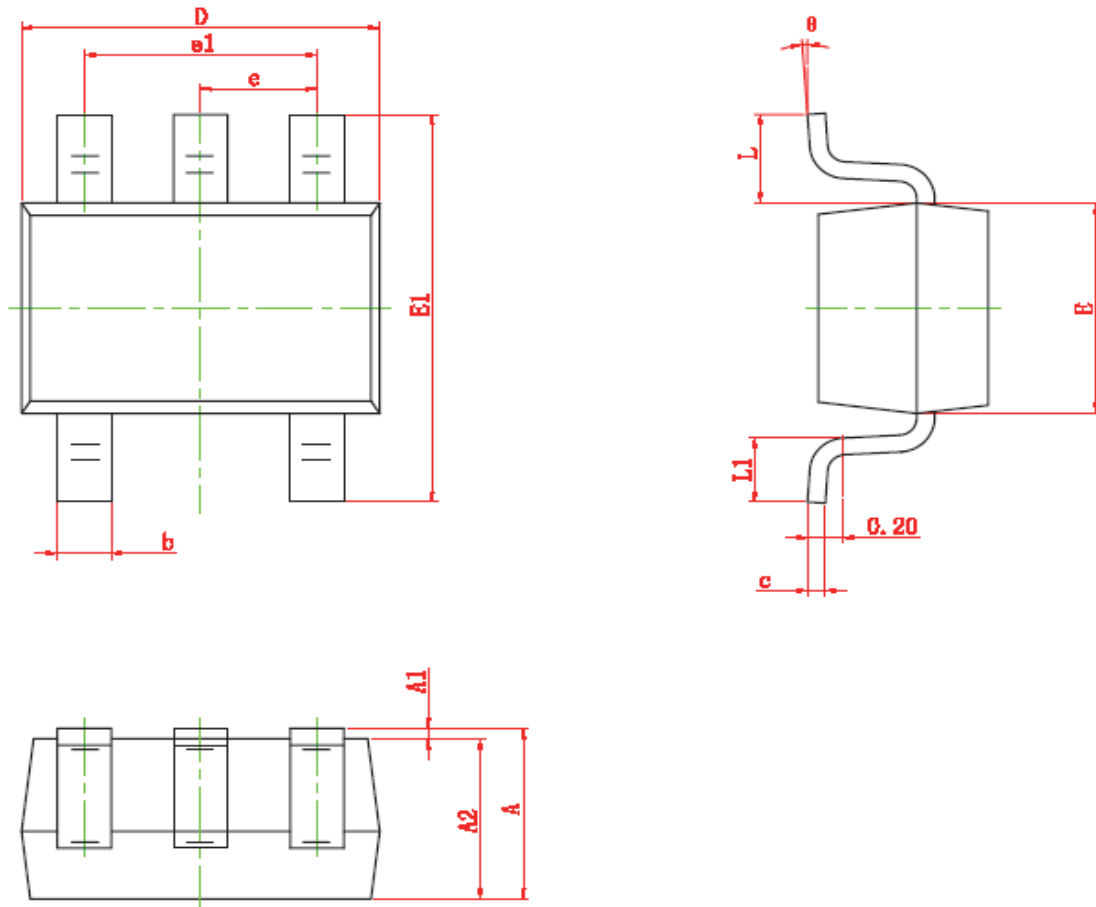
The TX3210_xx contains an independent current limiter, which monitors and controls the pass transistor's gate voltage, limiting the output current to 0.3A (typ.). The output can be shorted to ground indefinitely without damaging the part.

Packaging Information
SOT-23-5L Package Outline Dimension


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

Packaging Information

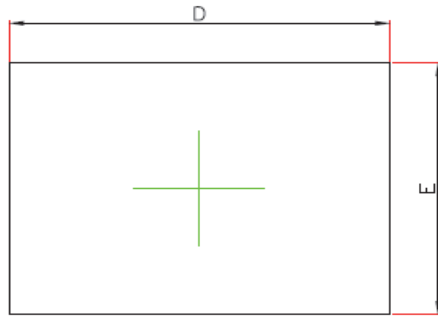
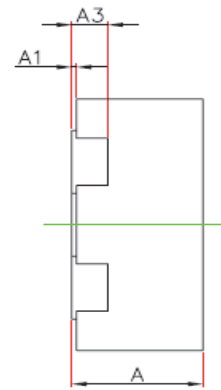
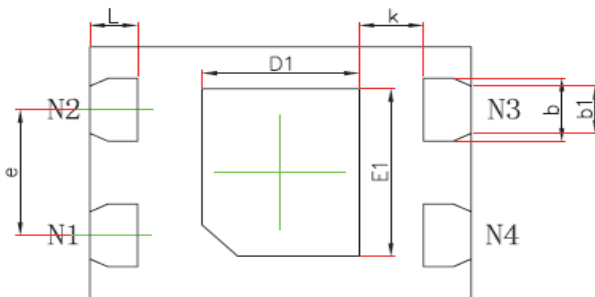
SC70-5 Package Outline Dimension



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.100 | 0.035 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| c | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 1.150 | 1.350 | 0.045 | 0.053 |
| E1 | 2.150 | 2.450 | 0.085 | 0.096 |
| e | 0.650(BSC) | | 0.026(BSC) | |
| e1 | 1.200 | 1.400 | 0.047 | 0.055 |
| L | 0.525 REF | | 0.021 REF | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| theta | 0° | 8° | 0° | 8° |

Packaging Information

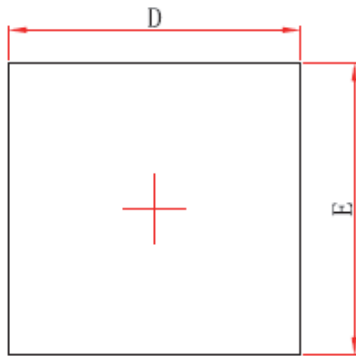
DFN1.2*1.6-4L Package Outline Dimension


TOP VIEW

SIDE VIEW

BOTTOM VIEW

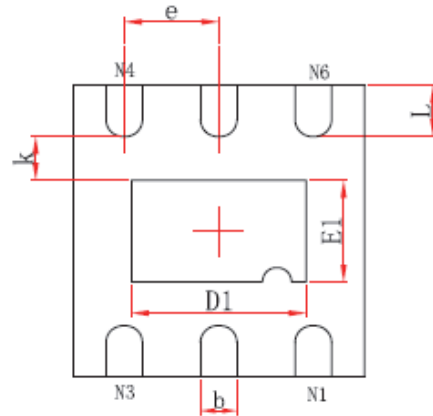
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 0.500 | 0.600 | 0.020 | 0.024 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.152 REF. | | 0.006 REF. | |
| D | 1.500 | 1.700 | 0.059 | 0.067 |
| E | 1.100 | 1.300 | 0.043 | 0.051 |
| D1 | 0.560 | 0.760 | 0.022 | 0.030 |
| E1 | 0.700 | 0.900 | 0.028 | 0.035 |
| b | 0.250 | 0.350 | 0.010 | 0.014 |
| b1 | 0.175 | 0.275 | 0.007 | 0.011 |
| e | 0.600 TYP. | | 0.024 TYP. | |
| L | 0.150 | 0.250 | 0.006 | 0.010 |
| k | 0.200 MIN. | | 0.008 TYP. | |

Packaging Information

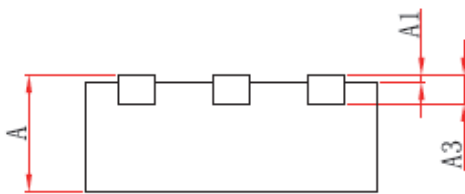
DFN2*2-6L Package Outline Dimension



Top View



Bottom View



Side View

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------------|----------------------|-------------|
| | Min | Max | Min | Max |
| A | 0.700/0.800 | 0.800/0.900 | 0.028/0.031 | 0.031/0.035 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.203 REF. | | 0.008 REF. | |
| D | 1.924 | 2.076 | 0.076 | 0.082 |
| E | 1.924 | 2.076 | 0.075 | 0.083 |
| D1 | 1.100 | 1.300 | 0.043 | 0.051 |
| E1 | 0.600 | 0.800 | 0.024 | 0.031 |
| k | 0.200 MIN. | | 0.008 MIN. | |
| b | 0.200 | 0.300 | 0.007 | 0.012 |
| e | 0.650 TYP. | | 0.026 TYP. | |
| L | 0.274 | 0.426 | 0.011 | 0.017 |