

**300mA HIGH SPEED, EXTREMELY LOW NOISE CMOS LDO REGULATOR****AP2129****General Description**

The AP2129 is a 300mA, positive Voltage regulator ICs fabricated by CMOS process. The AP2129 provides two kinds of output voltage operation modes for setting the output voltage. Fixed output voltage mode senses the output voltage on  $V_{OUT}$ , adjustable output voltage mode needs two resistors as a voltage divider

The AP2129 Series have features of low dropout voltage, low noise, high output voltage accuracy, and low current consumption which make them ideal for use in various battery-powered devices.

AP2129 has 1.0V, 1.2V, 3.3V fixed voltage version and 0.8V to 4.5V adjustable voltage version.

AP2129 series are available in SOT-23-5 Package.

**Features**

- Wide Operating Voltage: 1.8V to 6V
- High Output Voltage Accuracy:  $\pm 2\%$
- High Ripple Rejection:  
65dB@  $f=1\text{kHz}$ , 45dB@  $f=10\text{kHz}$
- Low Standby Current: 0.1 $\mu\text{A}$
- Low Quiescent Current: 60 $\mu\text{A}$  Typical
- Low Output Noise: 60 $\mu\text{Vrms}$
- Short Current Limit: 50mA
- Over Temperature Protection
- Compatible with Low ESR Ceramic Capacitor:  
1 $\mu\text{F}$  for  $C_{IN}$  and  $C_{OUT}$
- Excellent Line/Load Regulation
- Soft Start Time: 50 $\mu\text{s}$
- Auto Discharge Resistance:  $R_{DS(ON)}=60\Omega$

**Applications**

- Datacom
- Notebook Computers
- Mother Board

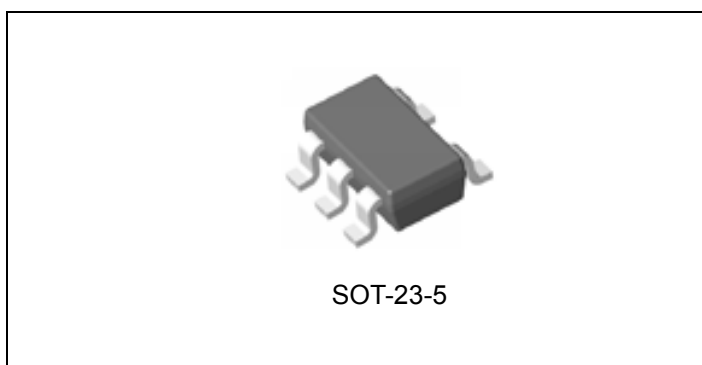


Figure 1. Package Type of AP2129

## Pin Configuration

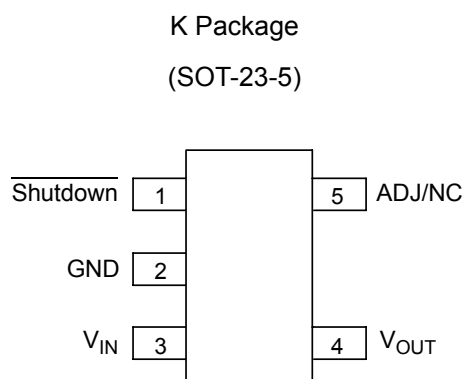
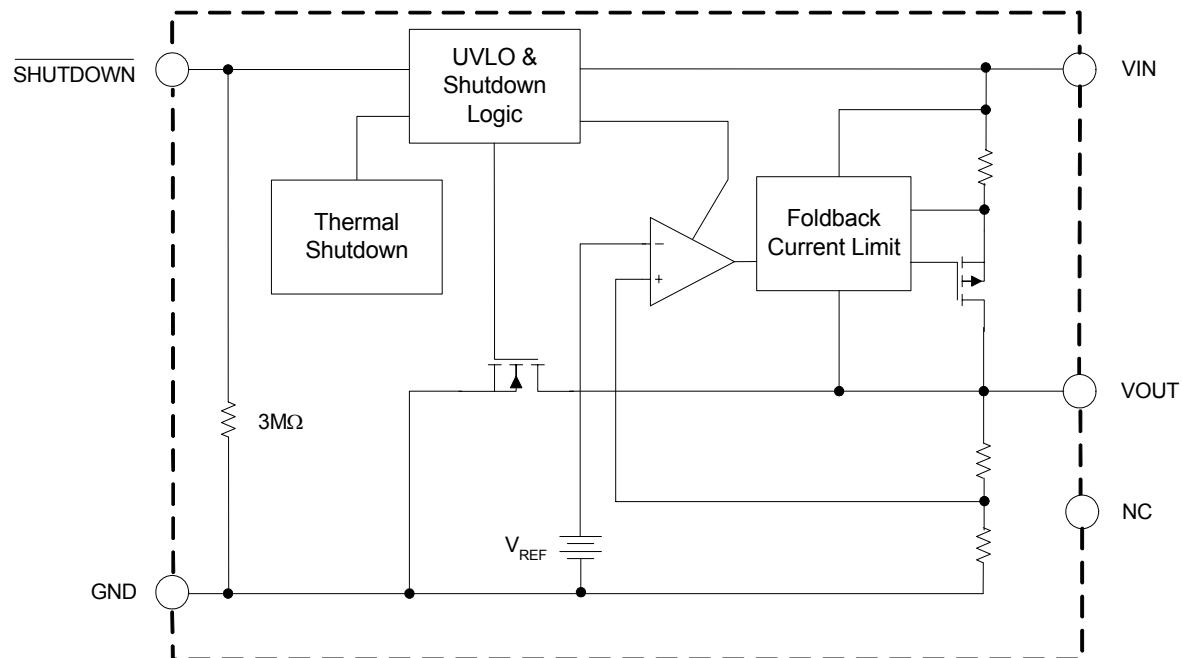


Figure 2. Pin Configuration of AP2129 (Top View)

## Functional Block Diagram



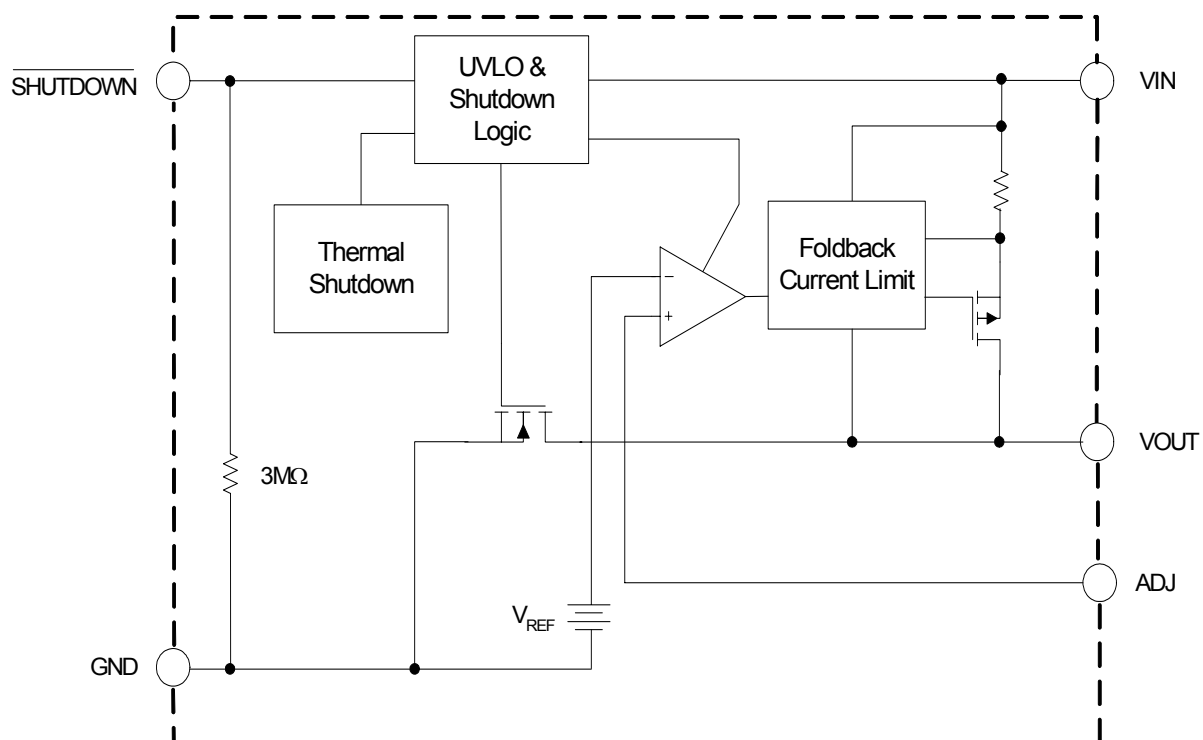
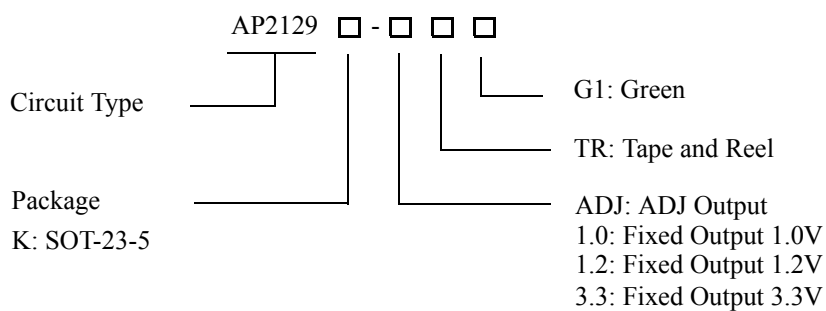
**Functional Block Diagram (Continued)**


Figure 3. Functional Block Diagram of AP2129

**300mA HIGH SPEED, EXTREMELY LOW NOISE CMOS LDO REGULATOR****AP2129****Ordering Information**

| Product | Package  | Temperature Range | Part Number      | Marking ID | Packing Type |
|---------|----------|-------------------|------------------|------------|--------------|
| AP2129  | SOT-23-5 | -40 to 85°C       | AP2129K- ADJTRG1 | GEJ        | Tape & Reel  |
|         |          |                   | AP2129K-1.0TRG1  | GEK        | Tape & Reel  |
|         |          |                   | AP2129K-1.2TRG1  | GEL        | Tape & Reel  |
|         |          |                   | AP2129K-3.3TRG1  | GEM        | Tape & Reel  |

BCD Semiconductor's products, as designated with "G1" suffix in the part number, are RoHS compliant and Green.

**300mA HIGH SPEED, EXTREMELY LOW NOISE CMOS LDO REGULATOR****AP2129****Absolute Maximum Ratings (Note 1)**

| Parameter                           | Symbol        | Value                | Unit |
|-------------------------------------|---------------|----------------------|------|
| Input Voltage                       | $V_{IN}$      | 6.5                  | V    |
| Shutdown Input Voltage              | $V_{CE}$      | -0.3 to $V_{IN}+0.3$ | V    |
| Output Current                      | $I_{OUT}$     | 450                  | mA   |
| Junction Temperature                | $T_J$         | 150                  | °C   |
| Storage Temperature Range           | $T_{STG}$     | -65 to 150           | °C   |
| Lead Temperature (Soldering, 10sec) | $T_{LEAD}$    | 260                  | °C   |
| Thermal Resistance                  | $\theta_{JA}$ | 250                  | °C/W |
| ESD (Human Body Model)              | ESD           | 6000                 | V    |
| ESD (Machine Model)                 | ESD           | 200                  | V    |

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

**Recommended Operating Conditions**

| Parameter                            | Symbol   | Min | Max | Unit |
|--------------------------------------|----------|-----|-----|------|
| Input Voltage                        | $V_{IN}$ | 1.8 | 6   | V    |
| Operating Junction Temperature Range | $T_J$    | -40 | 85  | °C   |


**300mA HIGH SPEED, EXTREMELY LOW NOISE CMOS LDO REGULATOR**
**AP2129**
**Electrical Characteristics**
**AP2129-1.0/1.2/3.3 Electrical Characteristics**

(C<sub>IN</sub>=1μF, C<sub>OUT</sub>=1μF, Bold typeface applies over -40°C≤T<sub>J</sub>≤85°C, unless otherwise specified.)

| Parameter                                             | Symbol                                                  | Conditions                                                                        | Min                      | Typ  | Max                       | Unit   |
|-------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------|------|---------------------------|--------|
| Output Voltage                                        | V <sub>OUT</sub>                                        | V <sub>IN</sub> =V <sub>OUT</sub> +1V, (Note 2)<br>1mA≤I <sub>OUT</sub> ≤300mA    | 98%*<br>V <sub>OUT</sub> |      | 102%*<br>V <sub>OUT</sub> | V      |
| Input Voltage                                         | V <sub>IN</sub>                                         |                                                                                   | 1.8                      |      | 6                         | V      |
| Maximum Output Current                                | I <sub>OUT(MAX)</sub>                                   |                                                                                   |                          | 450  |                           | mA     |
| Load Regulation                                       | $\frac{\Delta V_{OUT}}{(\Delta I_{OUT} \cdot V_{OUT})}$ | V <sub>IN</sub> -V <sub>OUT</sub> =1V, (Note 2)<br>1mA≤I <sub>OUT</sub> ≤300mA    |                          |      | 0.6                       | %/A    |
| Line Regulation                                       | $\frac{\Delta V_{OUT}}{(\Delta V_{IN} \cdot V_{OUT})}$  | V <sub>OUT</sub> +0.5V≤V <sub>IN</sub> ≤6V, (Note 2)<br>I <sub>OUT</sub> =30mA    |                          |      | 0.06                      | %/V    |
| Dropout Voltage                                       | V <sub>DROP</sub>                                       | V <sub>OUT</sub> =1.0V, I <sub>OUT</sub> =300mA                                   |                          | 1400 | 1500                      | mV     |
|                                                       |                                                         | V <sub>OUT</sub> =1.2V, I <sub>OUT</sub> =300mA                                   |                          | 1200 | 1300                      |        |
|                                                       |                                                         | V <sub>OUT</sub> =3.3V, I <sub>OUT</sub> =300mA                                   |                          | 170  | 300                       |        |
| Quiescent Current                                     | I <sub>Q</sub>                                          | V <sub>IN</sub> =V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA                      |                          | 60   | 90                        | μA     |
| Standby Current                                       | I <sub>STD</sub>                                        | V <sub>IN</sub> =V <sub>OUT</sub> +1V,<br>V <sub>SHUTDOWN</sub> in off mode       |                          | 0.1  | 1.0                       | μA     |
| Power Supply Rejection Ratio                          | PSRR                                                    | Ripple 1Vp-p<br>V <sub>IN</sub> =V <sub>OUT</sub> +1V                             | f=100Hz                  |      | 65                        | dB     |
|                                                       |                                                         |                                                                                   | f=1KHz                   |      | 65                        | dB     |
|                                                       |                                                         |                                                                                   | f=10KHz                  |      | 45                        | dB     |
| Output Voltage Temperature Coefficient                | $(\Delta V_{OUT}/V_{OUT})/\Delta T$                     | I <sub>OUT</sub> =30mA, -40°C≤T <sub>J</sub> ≤85°C                                |                          | ±100 |                           | ppm/°C |
| Output Current Limit                                  | I <sub>LIMIT</sub>                                      | V <sub>IN</sub> -V <sub>OUT</sub> =1V,<br>V <sub>OUT</sub> =0.98*V <sub>OUT</sub> |                          | 400  |                           | mA     |
| Short Current Limit                                   | I <sub>SHORT</sub>                                      | V <sub>OUT</sub> =0V                                                              |                          | 50   |                           | mA     |
| Soft Start Time                                       | t <sub>UP</sub>                                         |                                                                                   |                          | 50   |                           | μs     |
| RMS Output Noise                                      | V <sub>NOISE</sub>                                      | T <sub>A</sub> =25°C, 10Hz≤f≤100kHz                                               |                          | 60   |                           | μVrms  |
| Shutdown "High" Voltage                               |                                                         | Shutdown input voltage "High"                                                     | 1.5                      |      | 6                         | V      |
| Shutdown "Low" Voltage                                |                                                         | Shutdown input voltage "Low"                                                      | 0                        |      | 0.4                       | V      |
| V <sub>OUT</sub> Discharge MOSFET R <sub>DS(ON)</sub> |                                                         | Shutdown input voltage "Low"                                                      |                          | 60   |                           | Ω      |
| Shutdown Pull Down Resistance                         |                                                         |                                                                                   |                          | 3    |                           | MΩ     |
| Thermal Shutdown                                      |                                                         |                                                                                   |                          | 165  |                           | °C     |
| Thermal Shutdown Hysteresis                           |                                                         |                                                                                   |                          | 30   |                           | °C     |
| Thermal Resistance                                    | θ <sub>JC</sub>                                         | SOT-23-5                                                                          |                          | 150  |                           | °C/W   |

Note 2: V<sub>IN</sub>=1.8V for 1.0 and 1.2 version


**300mA HIGH SPEED, EXTREMELY LOW NOISE CMOS LDO REGULATOR**
**AP2129**
**Electrical Characteristics (Continued)**
**AP2129-ADJ Electrical Characteristics**

(C<sub>IN</sub>=1μF, C<sub>OUT</sub>=1μF, Bold typeface applies over -40°C≤T<sub>J</sub>≤85°C, unless otherwise specified.)

| Parameter                                             | Symbol                                                  | Conditions                                                                  | Min     | Typ  | Max   | Unit   |
|-------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------|---------|------|-------|--------|
| Reference Voltage                                     | V <sub>REF</sub>                                        | V <sub>IN</sub> =1.8V<br>1mA≤I <sub>OUT</sub> ≤300mA                        | 0.748   | 0.8  | 0.816 | V      |
| Input Voltage                                         | V <sub>IN</sub>                                         |                                                                             | 1.8     |      | 6     | V      |
| Maximum Output Current                                | I <sub>OUT(MAX)</sub>                                   |                                                                             |         | 450  |       | mA     |
| Load Regulation                                       | $\frac{\Delta V_{OUT}}{(\Delta I_{OUT} \cdot V_{OUT})}$ | V <sub>IN</sub> -V <sub>OUT</sub> =1V,<br>1mA≤I <sub>OUT</sub> ≤300mA       |         |      | 0.6   | %/A    |
| Line Regulation                                       | $\frac{\Delta V_{OUT}}{(\Delta V_{IN} \cdot V_{OUT})}$  | V <sub>OUT</sub> +0.5V≤V <sub>IN</sub> ≤6V<br>I <sub>OUT</sub> =30mA        |         |      | 0.06  | %/V    |
| Quiescent Current                                     | I <sub>Q</sub>                                          | V <sub>IN</sub> =V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA                |         | 60   | 90    | μA     |
| Standby Current                                       | I <sub>STD</sub>                                        | V <sub>IN</sub> =V <sub>OUT</sub> +1V,<br>V <sub>SHUTDOWN</sub> in off mode |         | 0.1  | 1.0   | μA     |
| Power Supply Rejection Ratio                          | PSRR                                                    | Ripple 1Vp-p<br>V <sub>IN</sub> =V <sub>OUT</sub> +1V                       | f=100Hz | 65   |       | dB     |
|                                                       |                                                         |                                                                             | f=1KHz  | 65   |       | dB     |
|                                                       |                                                         |                                                                             | f=10KHz | 45   |       | dB     |
| Output Voltage Temperature Coefficient                | $(\frac{\Delta V_{OUT}}{V_{OUT}}) / \Delta T$           | I <sub>OUT</sub> =30mA, -40°C≤T <sub>J</sub> ≤85°C                          |         | ±100 |       | ppm/°C |
| Output Current Limit                                  | I <sub>LIMIT</sub>                                      |                                                                             |         | 400  |       | mA     |
| Short Current Limit                                   | I <sub>SHORT</sub>                                      | V <sub>OUT</sub> =0V                                                        |         | 50   |       | mA     |
| Soft Start Time                                       | t <sub>UP</sub>                                         |                                                                             |         | 50   |       | μs     |
| RMS Output Noise                                      | V <sub>NOISE</sub>                                      | T <sub>A</sub> =25°C, 10Hz ≤f≤100kHz                                        |         | 60   |       | μVrms  |
| Shutdown "High" Voltage                               |                                                         | Shutdown input voltage "High"                                               | 1.5     |      | 6     | V      |
| Shutdown "Low" Voltage                                |                                                         | Shutdown input voltage "Low"                                                | 0       |      | 0.4   | V      |
| V <sub>OUT</sub> Discharge MOSFET R <sub>DS(ON)</sub> |                                                         | Shutdown input voltage "Low"                                                |         | 60   |       | Ω      |
| Shutdown Pull Down Resistance                         |                                                         |                                                                             |         | 3    |       | MΩ     |
| Thermal Shutdown                                      |                                                         |                                                                             |         | 165  |       | °C     |
| Thermal Shutdown Hysteresis                           |                                                         |                                                                             |         | 30   |       | °C     |
| Thermal Resistance                                    | θ <sub>JC</sub>                                         | SOT-23-5                                                                    |         | 150  |       | °C/W   |

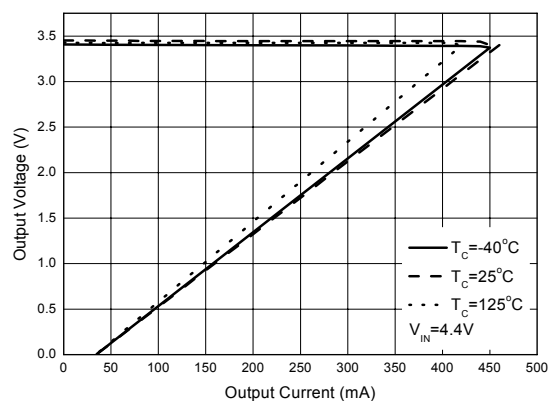
**Typical Performance Characteristics**

Figure 4. Output Voltage vs. Output Current

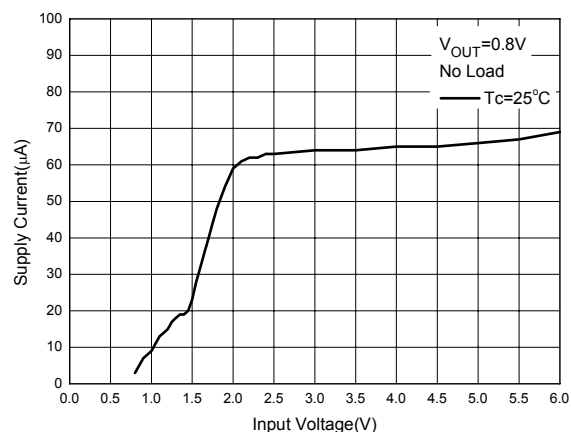


Figure 5. Supply Current vs. input Current

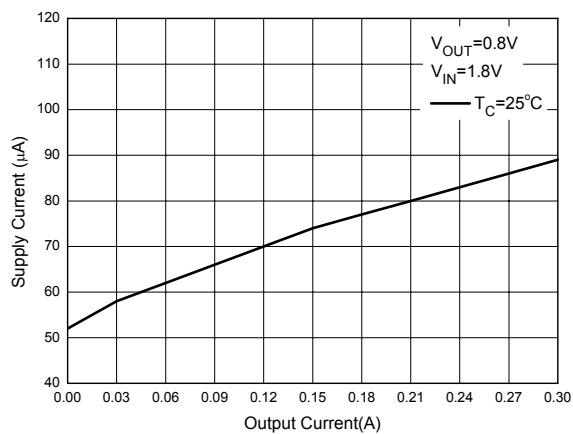


Figure 6. Supply Current vs. Output Current

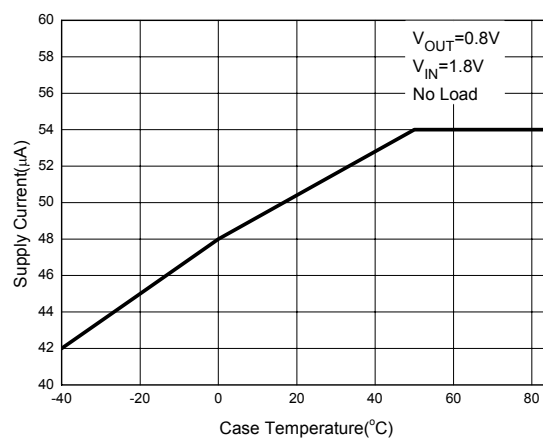


Figure 7. Supply Current vs. Case Temperature

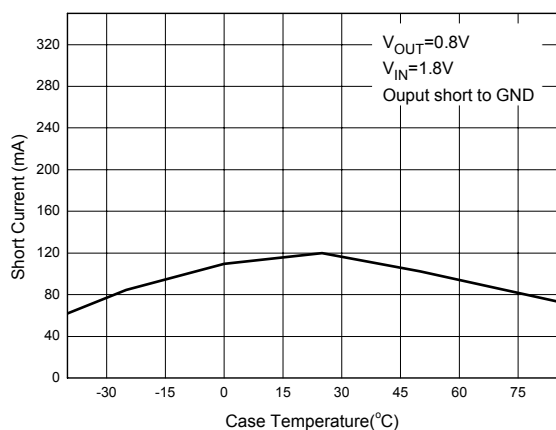
**Typical Performance Characteristics (Continued)**

Figure 8. Shot Output vs. Case Temperature

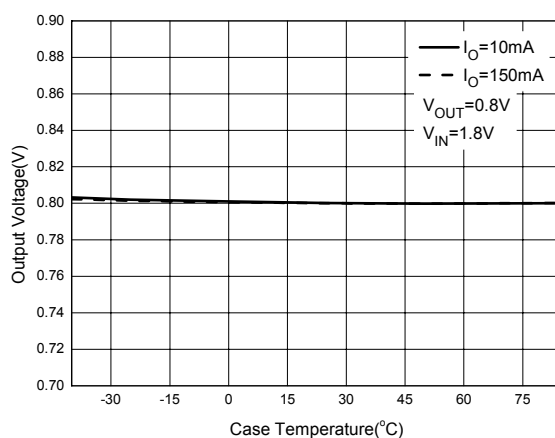


Figure 9. Output Voltage vs. Case Temperature

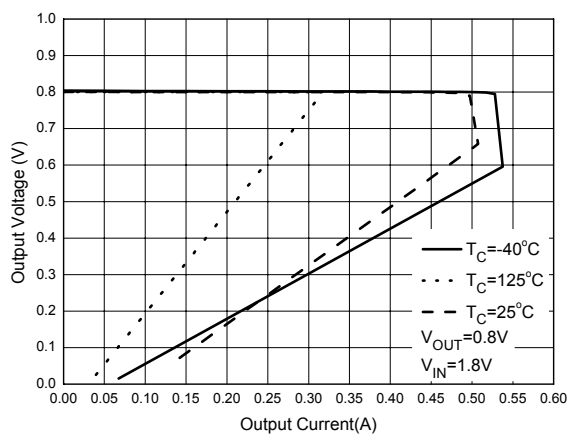


Figure 10. Output Voltage vs. Output Current

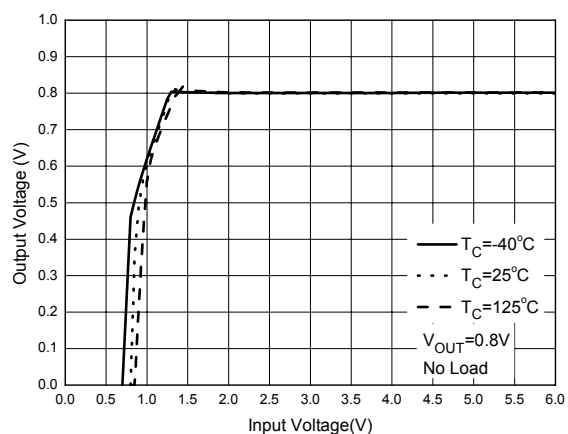


Figure 11. Output Voltage vs. Input Voltage

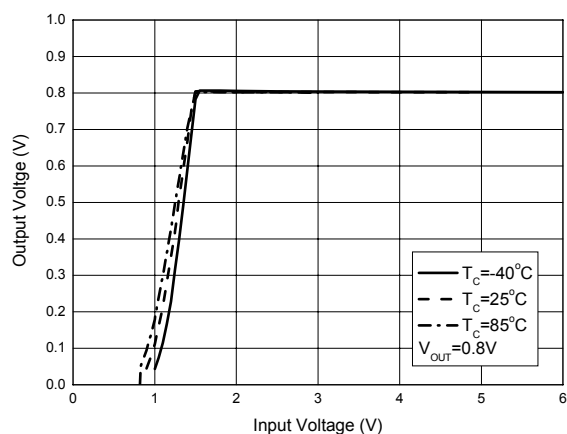
**Typical Performance Characteristics (Continued)**

Figure 12. Output Voltage vs. Input Voltage  
( $I_{OUT}=300\text{mA}$ )

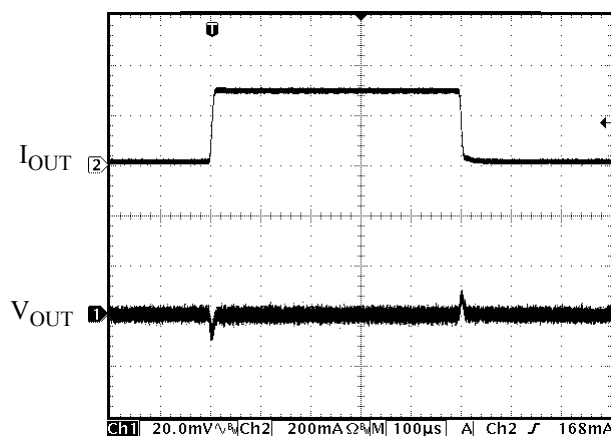


Figure 13. Load Transient  
(Conditions:  $C_{IN}=C_{OUT}=1\mu\text{F}$ ,  $V_{IN}=2.5\text{V}$ ,  $V_{OUT}=0.8\text{V}$ )

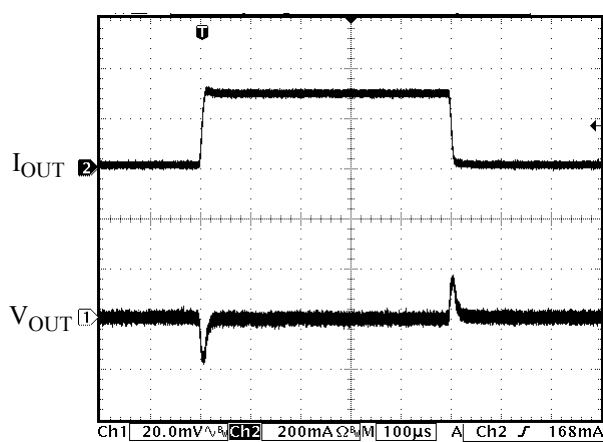


Figure 14. Load Transient  
(Conditions:  $C_{IN}=C_{OUT}=1\mu\text{F}$ ,  $V_{IN}=4.4\text{V}$ ,  $V_{OUT}=3.3\text{V}$ )

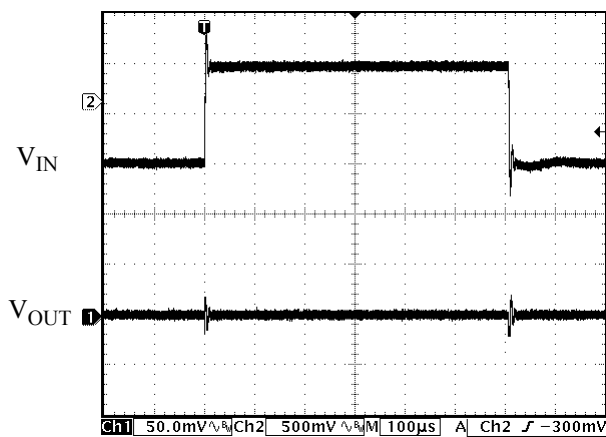


Figure 15. Line Transient  
(Conditions:  $I_{OUT}=30\text{mA}$ ,  $C_{IN}=C_{OUT}=1\mu\text{F}$ ,  
 $V_{IN}=2.5$  to  $3.5\text{V}$ ,  $V_{OUT}=0.8\text{V}$ )

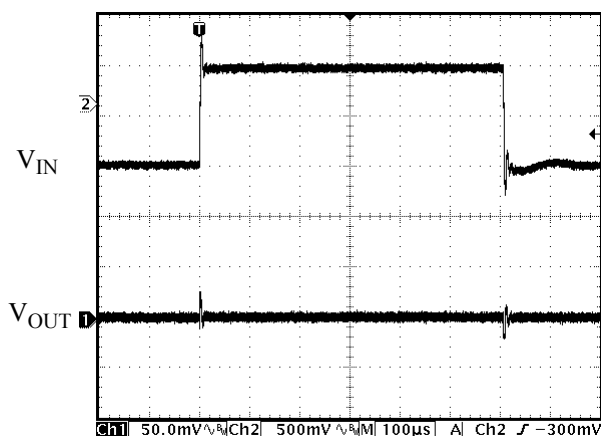
**Typical Performance Characteristics (Continued)**

Figure 16. Line Transient  
(Conditions:  $I_{OUT}=30\text{mA}$ ,  $C_{IN}=C_{OUT}=1\mu\text{F}$ ,  
 $V_{IN}=4$  to  $5\text{V}$ ,  $V_{OUT}=3.3\text{V}$ )

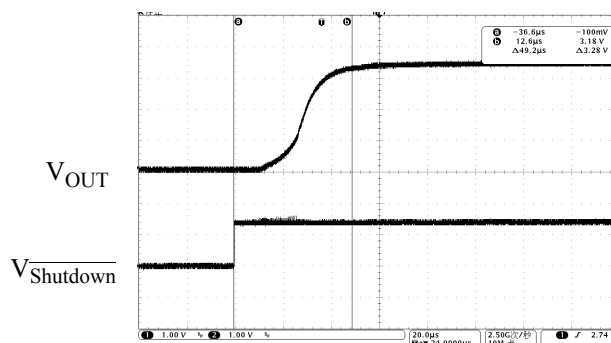


Figure 17. Soft Start Time  
(Conditions:  $I_{OUT}=0\text{mA}$ ,  $C_{IN}=C_{OUT}=1\mu\text{F}$ ,  
 $V_{Shutdown}=0$  to  $2\text{V}$ ,  $V_{OUT}=3.3\text{V}$ )

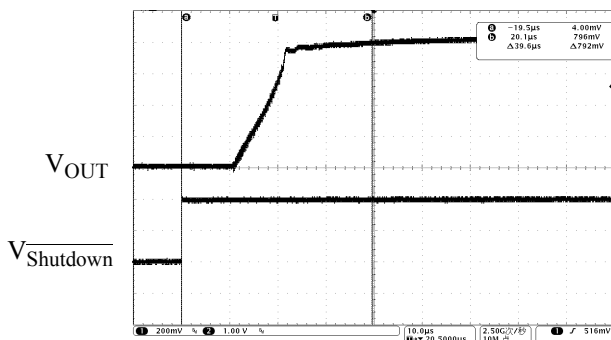


Figure 18. Soft Start Time  
(Conditions:  $I_{OUT}=0\text{mA}$ ,  $C_{IN}=C_{OUT}=1\mu\text{F}$ ,  
 $V_{Shutdown}=0$  to  $2\text{V}$ ,  $V_{OUT}=0.8\text{V}$ )

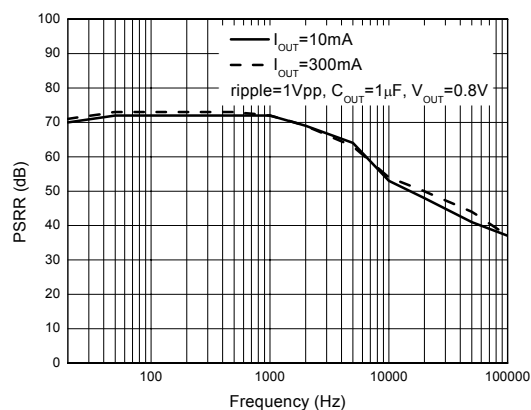


Figure 19. PSRR vs. Frequency

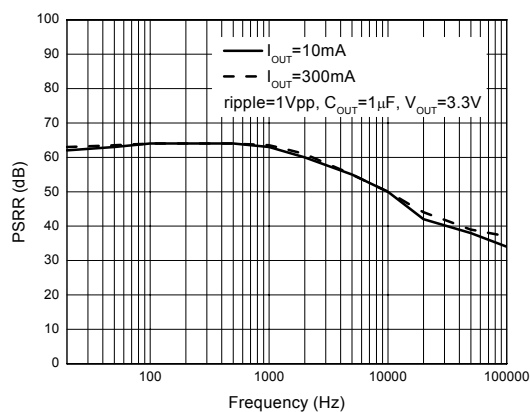
**Typical Performance Characteristics (Continued)**

Figure 20. PSRR vs. Frequency

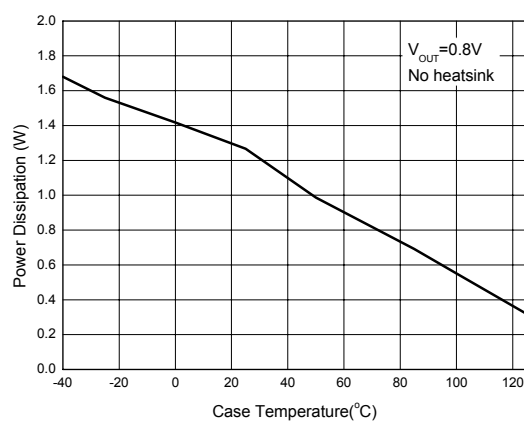
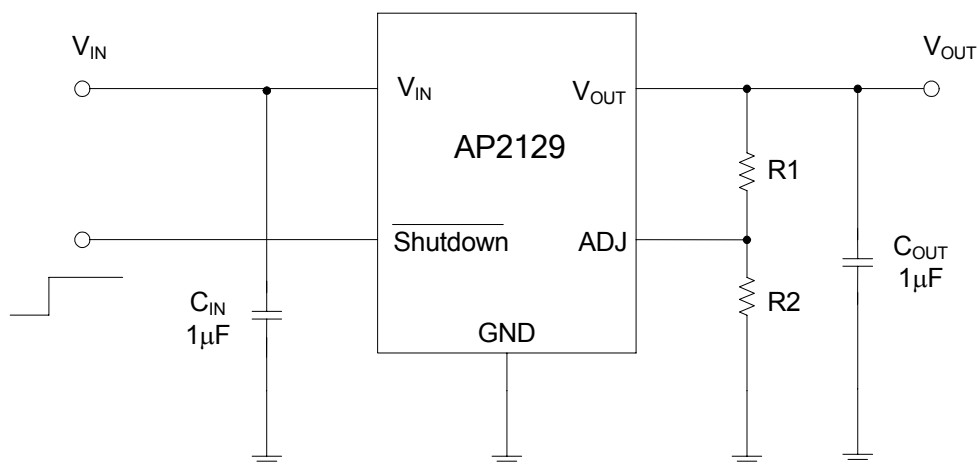
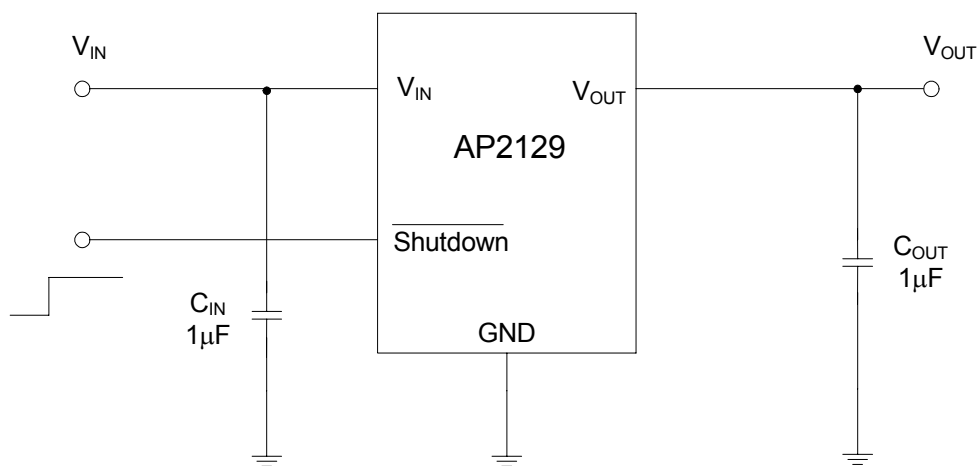


Figure 21. Power Dissipation vs. Case Temperature

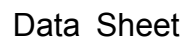
**Typical Application**

$$V_{OUT}=0.8*(1+R1/R2) V$$



$$V_{OUT}=1.0V, 1.2V, 3.3V$$

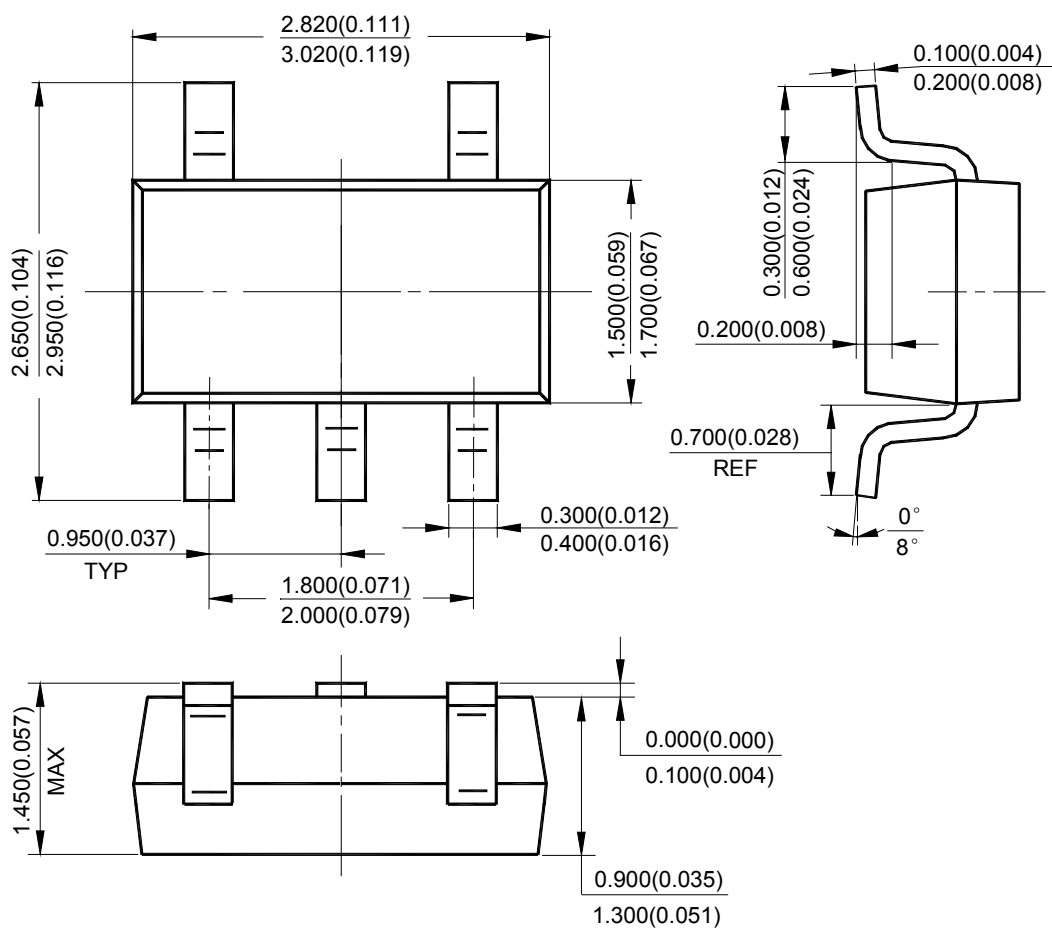
Figure 22. Typical Application of AP2129



**AP2129**

**SOT-23-5**

Unit: mm(inch)





## **BCD Semiconductor Manufacturing Limited**

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- Поставка более 17-ти миллионов наименований электронных компонентов;
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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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