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: ±2%
- High Ripple Rejection:
  65dB@ f=1kHz, 45dB@ f=10kHz
- Low Standby Current: 0.1μA
- Low Quiescent Current: 60μA Typical
- Low Output Noise: 60μVrms
- Short Current Limit: 50mA
- Over Temperature Protection
- Compatible with Low ESR Ceramic Capacitor: 1μF for C_{IN} and C_{OUT}
- Excellent Line/Load Regulation
- Soft Start Time: 50μs
- Auto Discharge Resistance: $R_{DS(ON)}$=60Ω

Applications

- Datacom
- Notebook Computers
- Mother Board



SOT-23-5

Figure 1. Package Type of AP2129

Pin Configuration

K Package

(SOT-23-5)

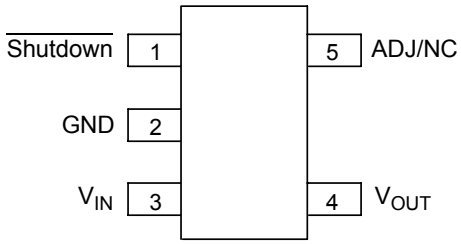
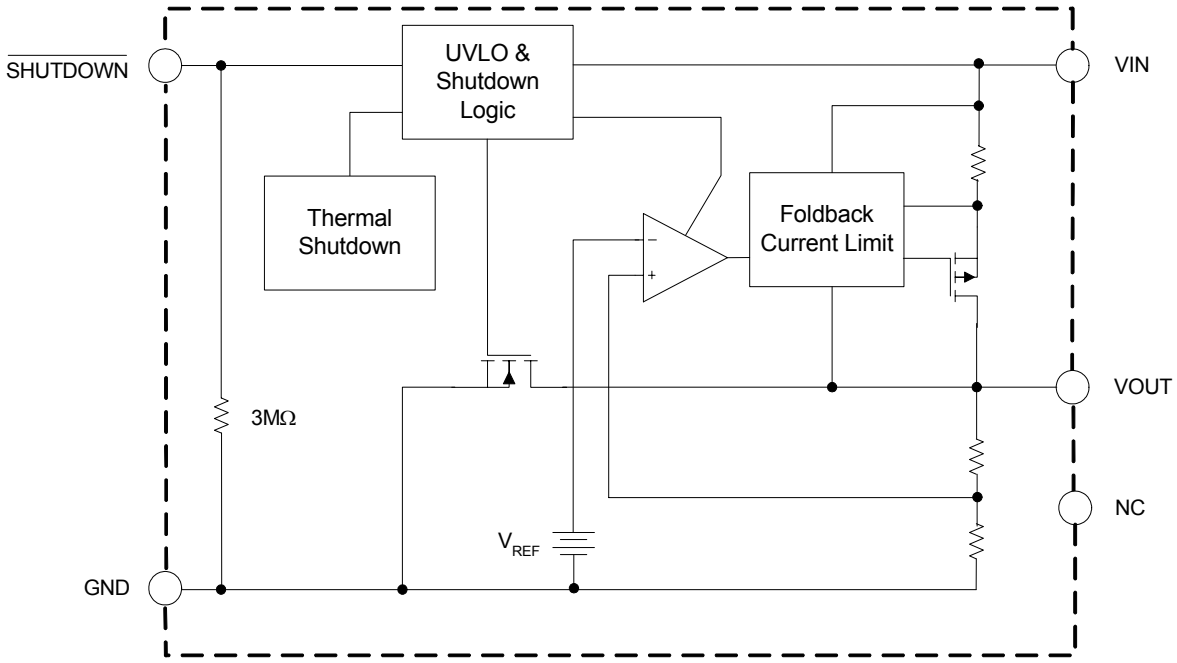


Figure 2. Pin Configuration of AP2129 (Top View)

Functional Block Diagram



Functional Block Diagram (Continued)

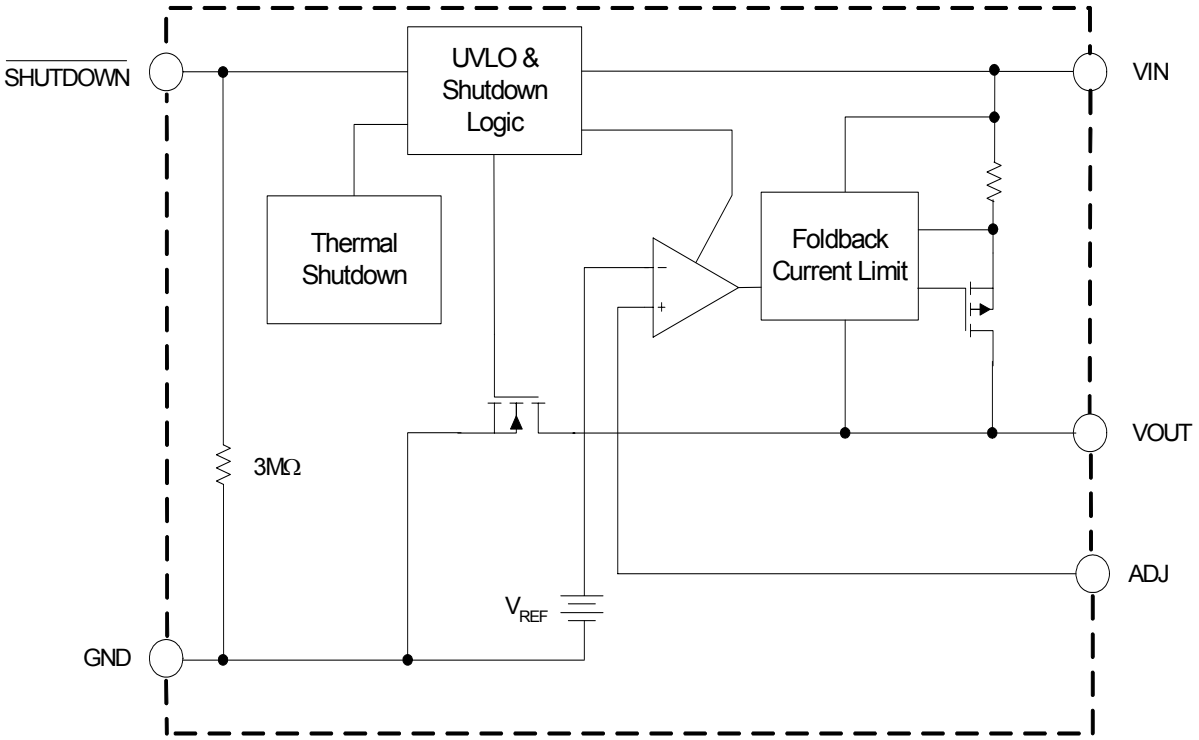
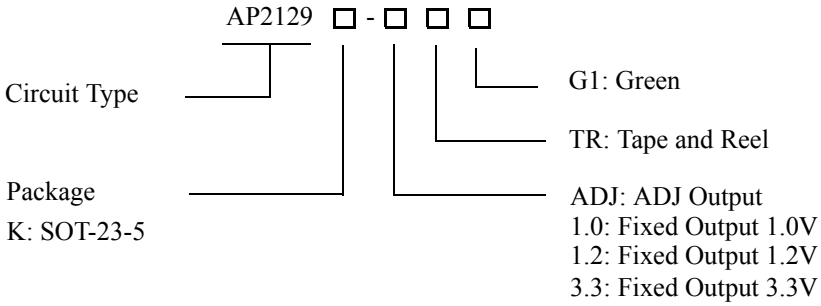


Figure 3. Functional Block Diagram of AP2129

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.

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	θ_{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

Electrical Characteristics

AP2129-1.0/1.2/3.3 Electrical Characteristics

(C_{IN}=1μF, C_{OUT}=1μF, Bold typeface applies over -40°C≤T_J≤85°C, unless otherwise specified.

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

Note 2: V_{IN}=1.8V for 1.0 and 1.2 version

Electrical Characteristics (Continued)

AP2129-ADJ Electrical Characteristics

(C_{IN}=1μF, C_{OUT}=1μF, Bold typeface applies over -40°C≤T_J≤85°C, unless otherwise specified.)

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

Typical Performance Characteristics

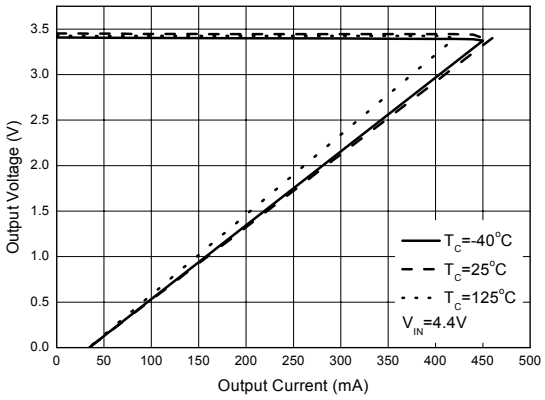


Figure 4. Output Voltage vs. Output Current

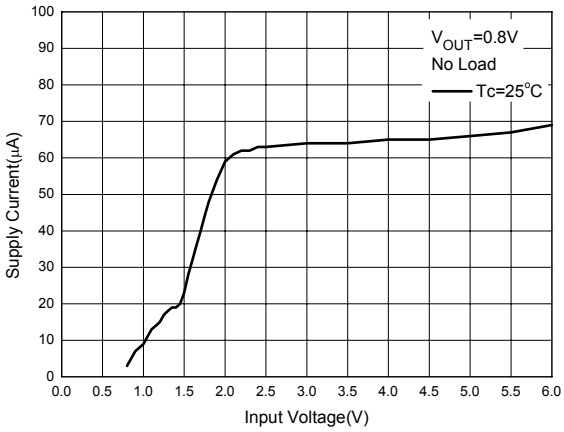


Figure 5. Supply Current vs. input Current

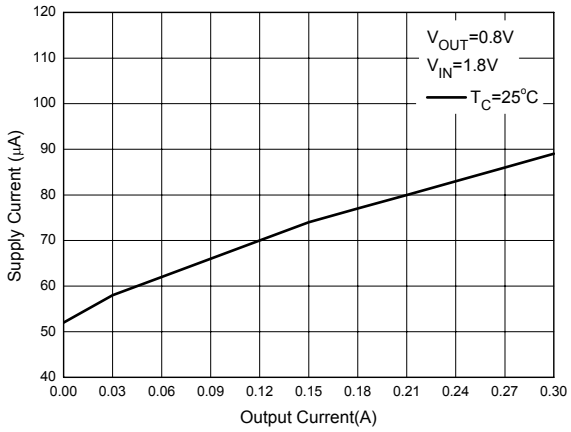


Figure 6. Supply Current vs. Output Current

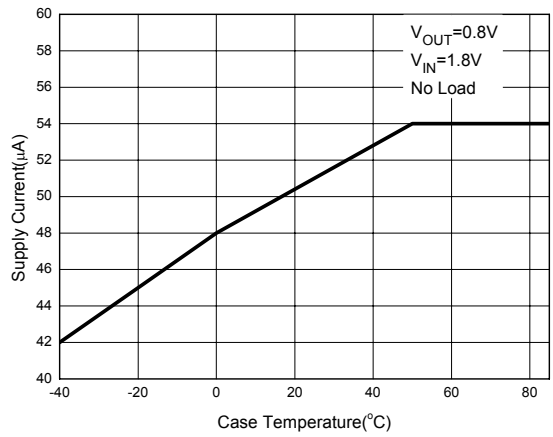


Figure 7. Supply Current vs. Case Temperature

Typical Performance Characteristics (Continued)

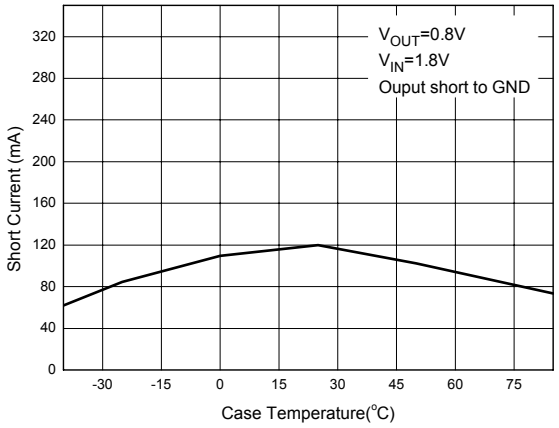


Figure 8. Shot Output vs. Case Temperature

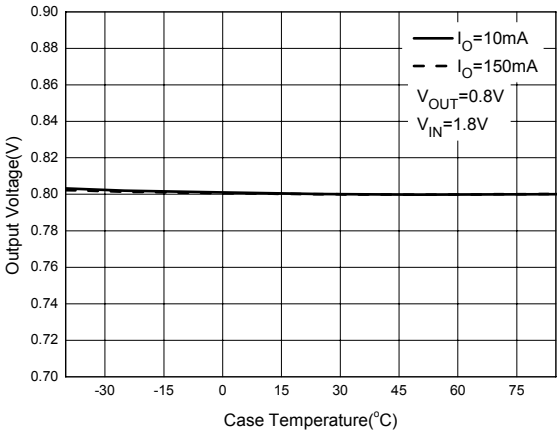


Figure 9. Output Voltage vs. Case Temperature

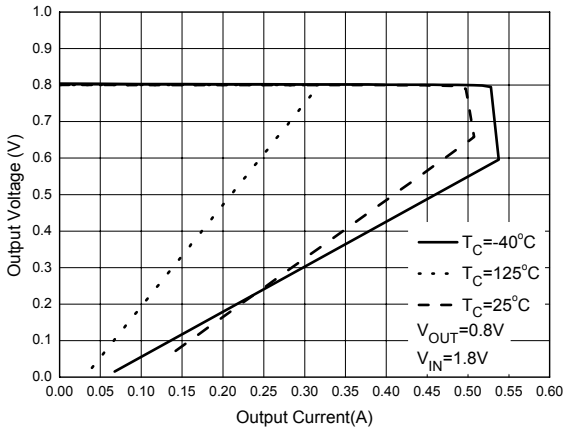


Figure 10. Output Voltage vs. Output Current

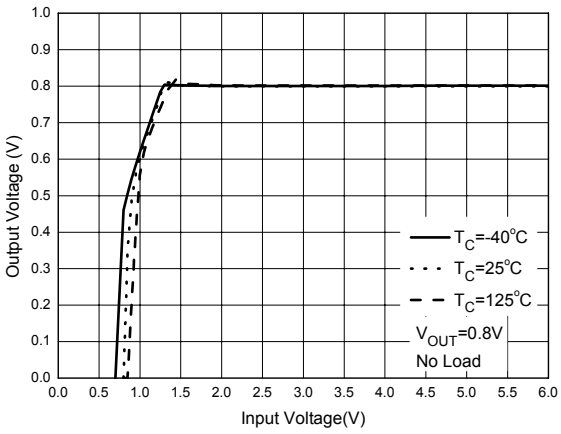


Figure 11. Output Voltage vs. Input Voltage

Typical Performance Characteristics (Continued)

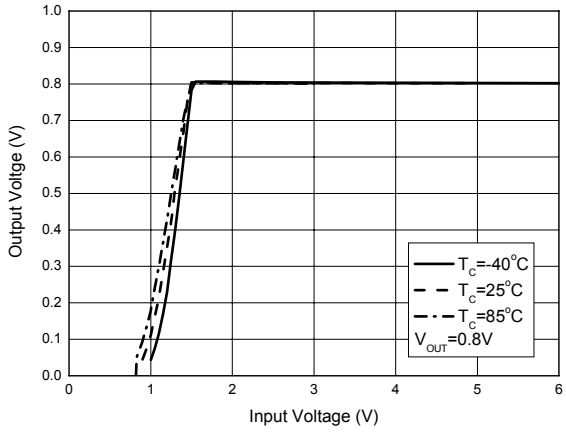


Figure 12. Output Voltage vs. Input Voltage
(I_{OUT}=300mA)

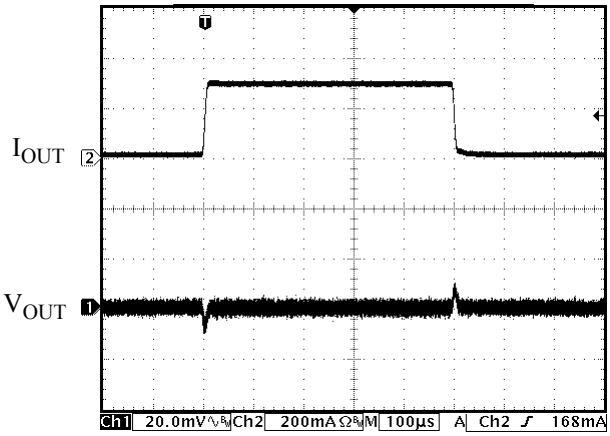


Figure 13. Load Transient
(Conditions: C_{IN}=C_{OUT}=1µF, V_{IN}=2.5V, V_{OUT}=0.8V)

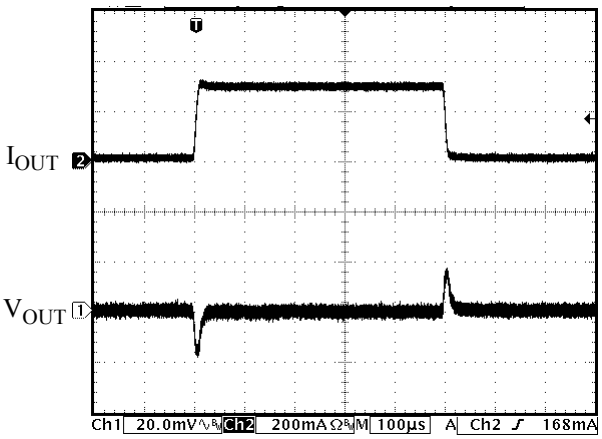


Figure 14. Load Transient
(Conditions: C_{IN}=C_{OUT}=1µF, V_{IN}=4.4V, V_{OUT}=3.3V)

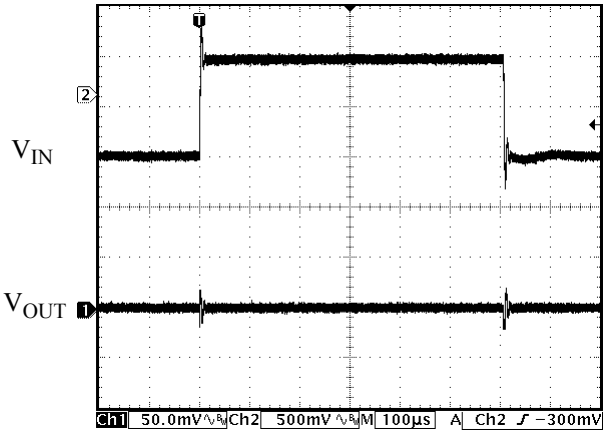


Figure 15. Line Transient
(Conditions: I_{OUT}=30mA, C_{IN}=C_{OUT}=1µF,
V_{IN}=2.5 to 3.5V, V_{OUT}=0.8V)

Typical Performance Characteristics (Continued)

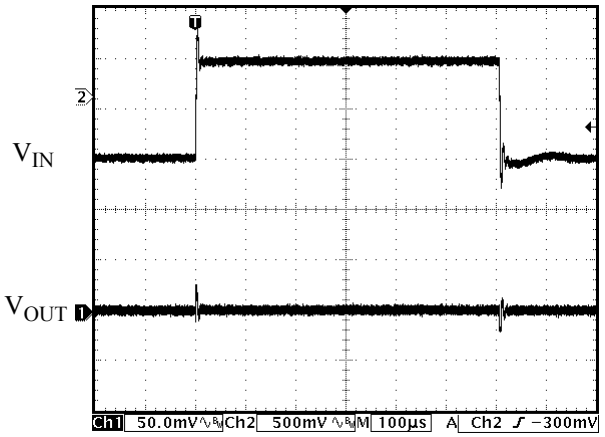


Figure 16. Line Transient

(Conditions: I_{OUT}=30mA, C_{IN}=C_{OUT}=1µF, V_{IN}=4 to 5V, V_{OUT}=3.3V)

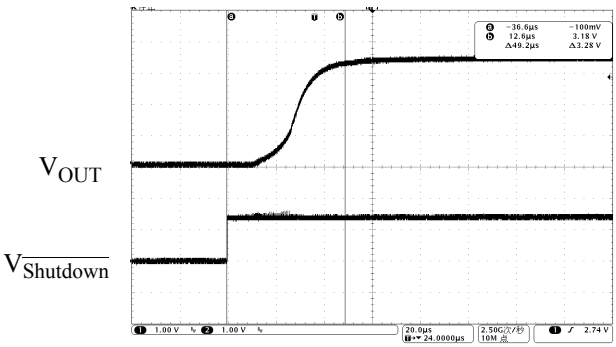


Figure 17. Soft Start Time

(Conditions: I_{OUT}=0mA, C_{IN}=C_{OUT}=1µF, $V_{\overline{Shutdown}}$=0 to 2V, V_{OUT}=3.3V)

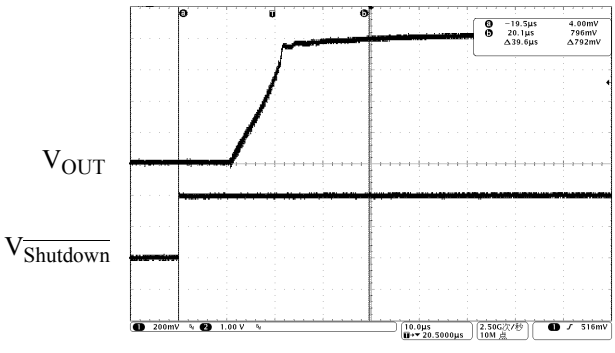


Figure 18. Soft Start Time

(Conditions: I_{OUT}=0mA, C_{IN}=C_{OUT}=1µF, $V_{\overline{Shutdown}}$=0 to 2V, V_{OUT}=0.8V)

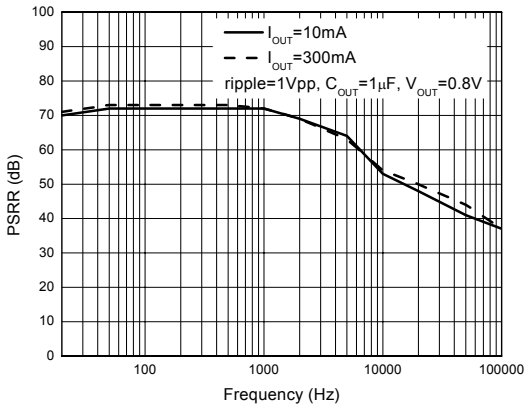


Figure 19. PSSR vs. Frequency

Typical Performance Characteristics (Continued)

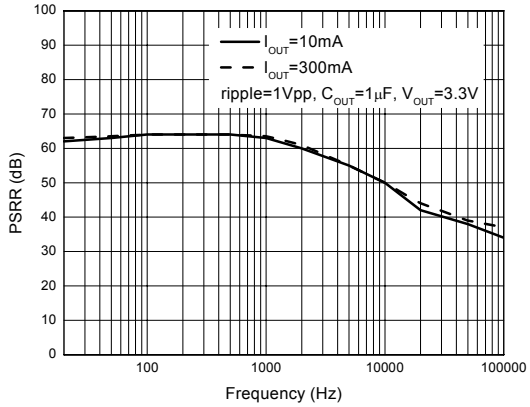


Figure 20. PSRR vs. Frequency

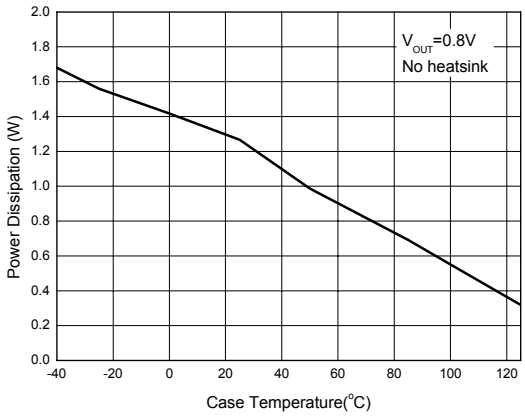
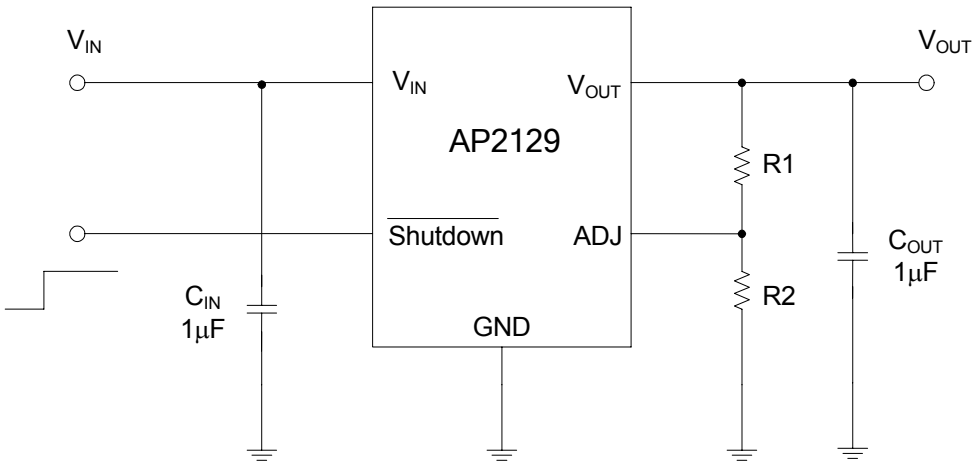
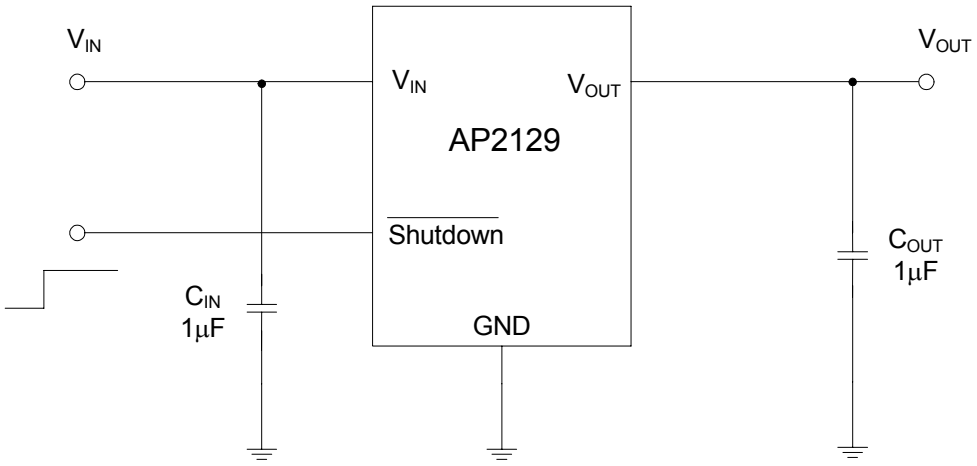


Figure 21. Power Dissipation vs. Case Temperature

Typical Application



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

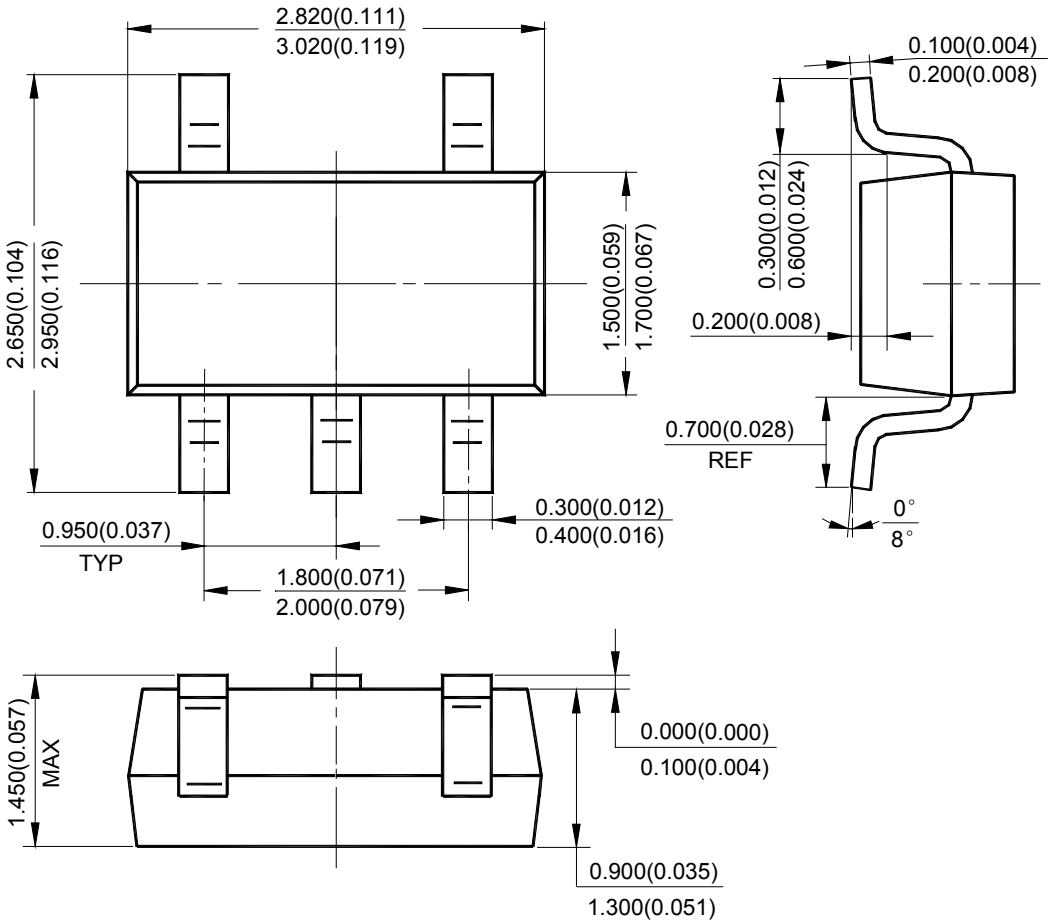


V_{OUT}=1.0V, 1.2V, 3.3V

Figure 22. Typical Application of AP2129

Mechanical Dimensions

SOT-23-5 **Unit: mm(inch)**



BCD Semiconductor Manufacturing Limited

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