

2A CMOS LDO Regulator**AP2132****General Description**

The AP2132 series are positive voltage regulator ICs fabricated by CMOS process. The ICs consist of a voltage reference, an error amplifier, a power transistor, a resistor network for setting output voltage, a current limit circuit for current protection, and a chip enable circuit.

The AP2132 have features of large current, low dropout voltage, high output voltage accuracy, and low input voltage. The AP2132 provide a power good (PG) signal to indicate if the voltage level of V_{OUT} reaches 92% of its rating value. And it operates with a V_{IN} as low as 1.4V and V_{PP} voltage 5V with output voltage programmable as low as 0.6V.

The AP2132 are available in 1.2V, 1.5V, 1.8V, 2.5V fixed output voltage versions and adjustable output voltage version. The fixed versions integrate the adjust resistors. It is also available in an adjustable version, which can set the output voltage with external resistor. If the pin of adjustable output voltage is to ground, it will switch to fixed output voltage.

The AP2132 series are available in PSOP-8 package.

Features

- Adjustable Output: 0.6V to 3.0V
- Low Dropout Voltage: $300\text{mV}@I_{OUT}=2\text{A}$, $V_{OUT}=1.2\text{V}$
- Over Current and Over Temperature Protection
- Enable Pin
- PSOP-8 Package with Thermal Pad
- Maximum Output Current: 2A
- High Output Voltage Accuracy: 2%
- V_{OUT} Power Good Signal
- Excellent Line/Load Regulation

Applications

- Notebook

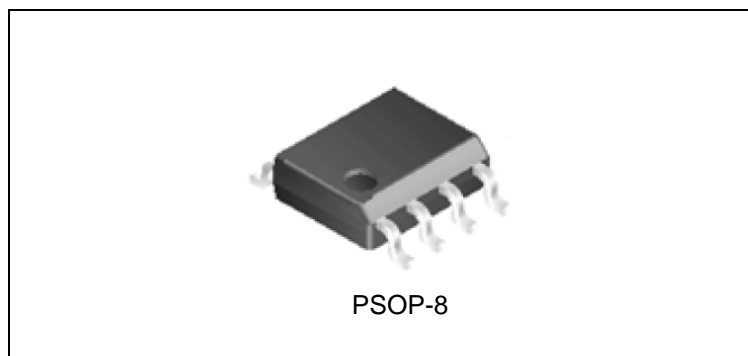


Figure 1. Package Type of AP2132

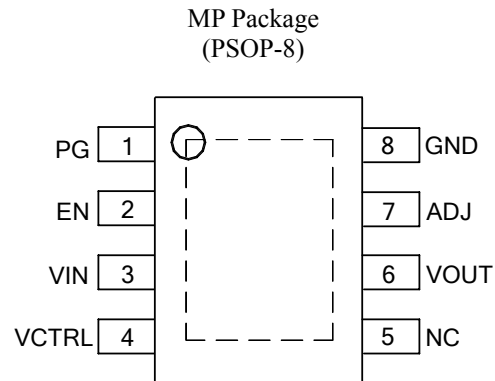
2A CMOS LDO Regulator
AP2132
Pin Configuration


Figure 2. Pin Configuration of AP2132 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	PG	Assert high once V_{OUT} reaches 92% of its rating voltage
2	EN	Enable input
3	VIN	Input voltage
4	VCTRL	Input voltage for controlling circuit
5	NC	Not connected
6	VOUT	Regulated output voltage
7	ADJ	Adjust output: when connected to ground, the output voltage is set by internal resistors; when external feedback resistors are connected, the output voltage will be $V_{OUT}=0.6(R1+R2)/R2$
8	GND	Ground

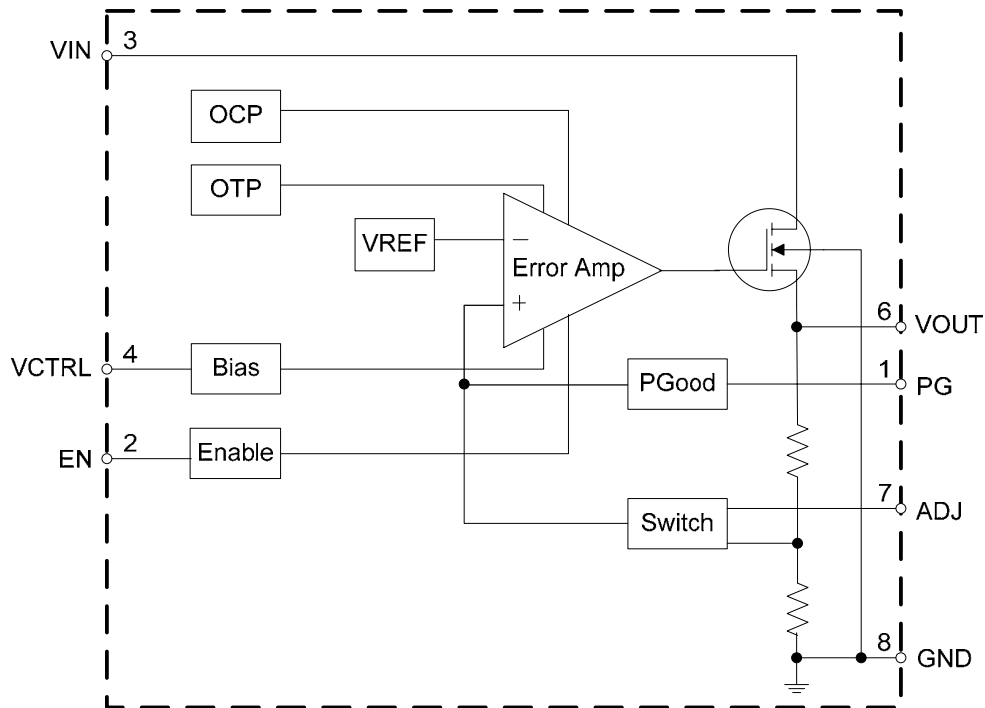
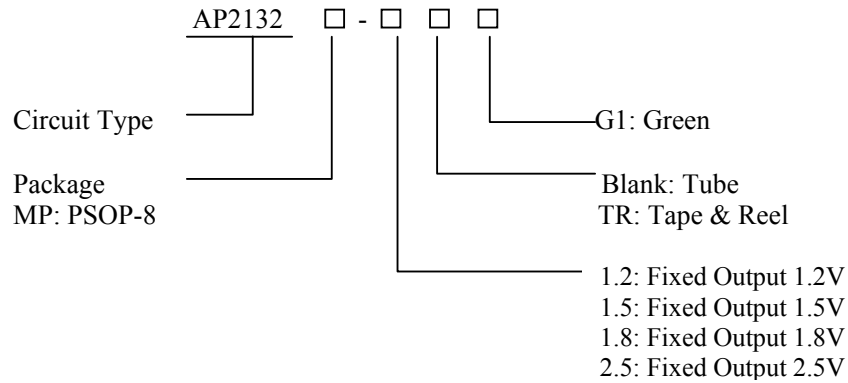
2A CMOS LDO Regulator
AP2132
Functional Block Diagram


Figure 3. Functional Block Diagram of AP2132

2A CMOS LDO Regulator

AP2132

Ordering Information



Package	Temperature Range	Version Description	Part Number	Marking ID	Packing Type
PSOP-8	-40 to 85°C	Each fixed output version integrates ADJ version	AP2132MP-1.2G1	2132MP-1.2G1	Tube
			AP2132MP-1.2TRG1	2132MP-1.2G1	Tape & Reel
			AP2132MP-1.5G1	2132MP-1.5G1	Tube
			AP2132MP-1.5TRG1	2132MP-1.5G1	Tape & Reel
			AP2132MP-1.8G1	2132MP-1.8G1	Tube
			AP2132MP-1.8TRG1	2132MP-1.8G1	Tape & Reel
			AP2132MP-2.5G1	2132MP-2.5G1	Tube
			AP2132MP-2.5TRG1	2132MP-2.5G1	Tape & Reel

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

**2A CMOS LDO Regulator****AP2132****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	6.0	V
Input Voltage for Controlling Circuit	V_{CTRL}		
Enable Input Voltage	V_{EN}	-0.3 to 6.0	V
Output Current	I_{OUT}	2.5	A
Thermal Resistance (No Heatsink)	θ_{JA}	130	°C/W
Operating Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C
ESD (Machine Model)		200	V
ESD (Human Body Model)		2000	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}	1.4	5.5	V
Input Voltage for Controlling Circuit	V_{CTRL}	4.5	5.5	V
Operating Ambient Temperature Range	T_A	-40	85	°C



2A CMOS LDO Regulator

AP2132

Electrical Characteristics

$V_{IN}=V_{OUT}+0.5V$, $V_{CTRL}=V_{EN}=5V$, $T_A=25^{\circ}C$, $C_{IN}=C_{OUT}=10\mu F$, $C_{CTRL}=1\mu F$, $I_{OUT}=10mA$, **Bold** typeface applies $-40^{\circ}C \leq T_A \leq 85^{\circ}C$ unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	$V_{IN} = V_{OUT} + 0.5V$, $I_{OUT} = 10mA$	$V_{OUT} \times 98\%$		$V_{OUT} \times 102\%$	V
Input Voltage	V_{IN}		1.4		5.5	V
Max. Output Current	$I_{OUT(max)}$	$V_{IN} - V_{OUT} = 1V$, $V_{OUT} = 98\% \times V_{OUT}$	2			A
Load Regulation	V_{RLOAD}	$V_{IN} = V_{OUT} + 0.5V$, $10mA \leq I_{OUT} \leq 2A$		10		mV
Line Regulation	V_{RLINE}	$V_{OUT} + 0.5V \leq V_{IN} \leq 5V$, $I_{OUT} = 10mA$		2		mV
Dropout Voltage	V_{DROP}	$I_{OUT} = 500mA$		80	120	mV
		$I_{OUT} = 1A$		150	200	mV
		$I_{OUT} = 2A$		300	450	mV
Supply Current	I_{SUPPLY}	$V_{IN} = V_{OUT} + 0.5V$, $I_{OUT} = 0mA$		300		μA
VCTRL Current	I_{CTRLH}	$V_{IN} = V_{OUT} + 0.5V$, $V_{CTRL} = V_{EN} = 5V$		250	500	μA
	I_{CTRLL}	$V_{IN} = V_{OUT} + 0.5V$, $V_{EN} = 0V$, $V_{CTRL} = 5V$		0.1	1	μA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $V_{IN} = V_{OUT} + 1V$	$f = 100Hz$		60	dB
			$f = 1kHz$		60	dB
Output Voltage Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta T}$	$I_{OUT} = 10mA$, $-40^{\circ}C \leq T_A \leq 85^{\circ}C$		± 100		ppm/ $^{\circ}C$
Reference Voltage	V_{REF}	Adjust Short to V_{OUT}	0.588	0.6	0.612	V
Enable “High” Voltage		Enable Input Voltage “High”	1.5			V
Enable “Low” Voltage		Enable Input Voltage “Low”			0.4	V
Thermal Shutdown	OTSD			165		$^{\circ}C$
Thermal Shutdown Hysteresis				20		$^{\circ}C$
V_{OUT} Power Good Voltage	V_{THPG}			92		%
V_{PG} Hysteresis				7		%
Adjust Pin Threshold				200		mV
Thermal Resistance (Junction to Case)	θ_{JC}	PSOP-8		40		$^{\circ}C/W$

2A CMOS LDO Regulator

AP2132

Typical Performance Characteristics

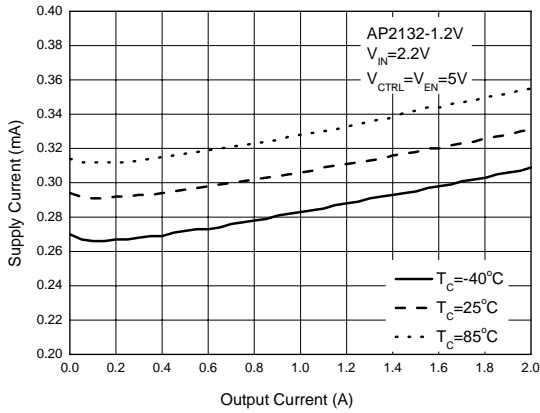


Figure 4. Supply Current vs. Output Current

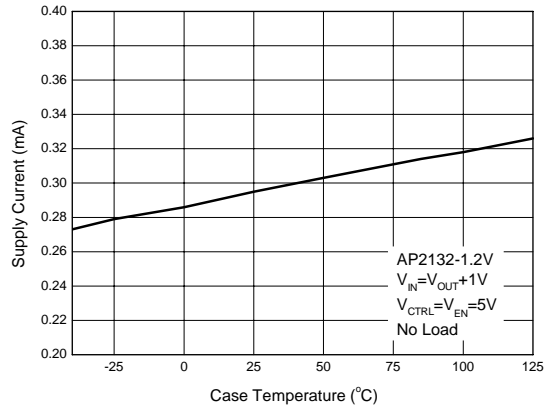


Figure 5. Supply Current vs. Case Temperature

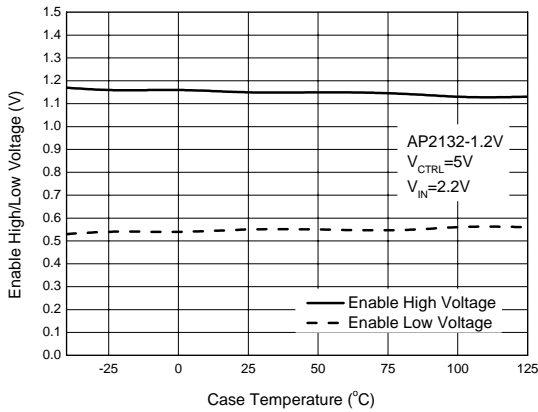


Figure 6. Enable High/Low Voltage vs. Case Temperature

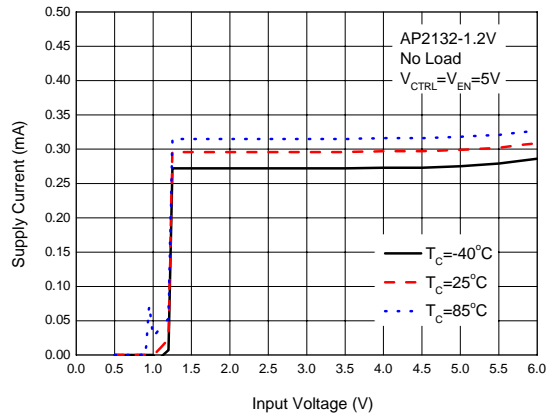


Figure 7. Supply Current vs. Input Voltage

Typical Performance Characteristics (Continued)

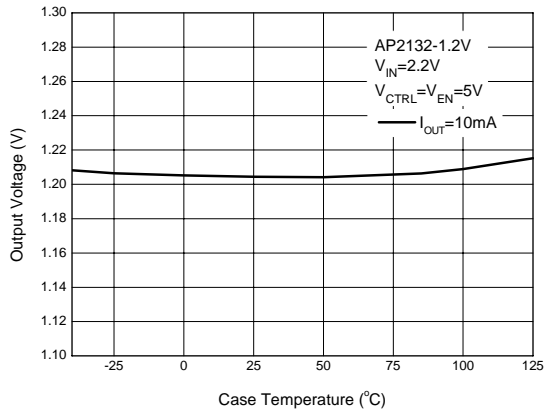


Figure 8. Output Voltage vs. Case Temperature

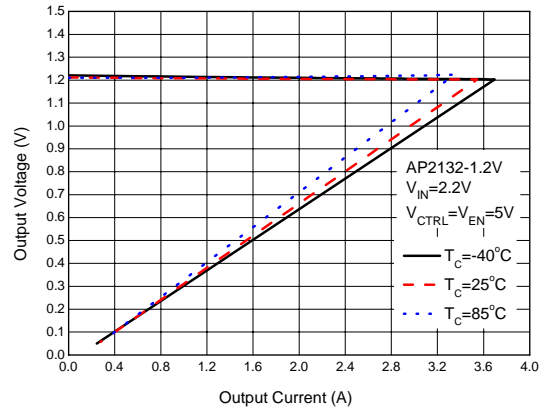


Figure 9. Output Voltage vs. Output Current

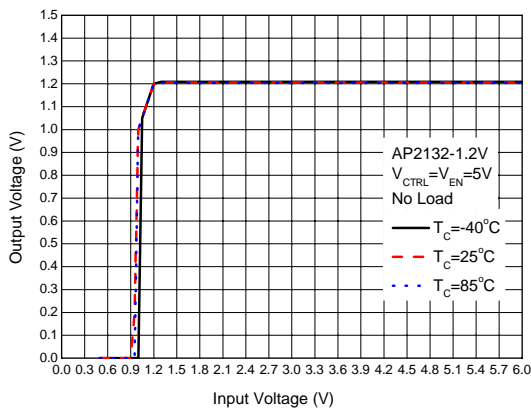


Figure 10. Output Voltage vs. Input Voltage

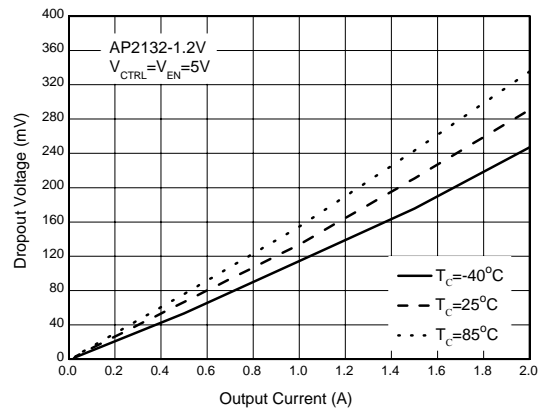


Figure 11. Dropout Voltage vs. Output Current

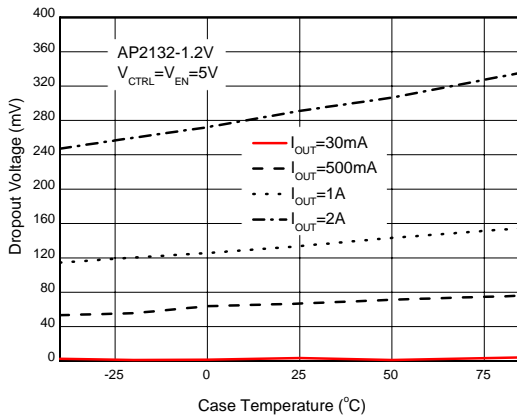
2A CMOS LDO Regulator
AP2132
Typical Performance Characteristics (Continued)


Figure 12. Dropout Voltage vs. Case Temperature

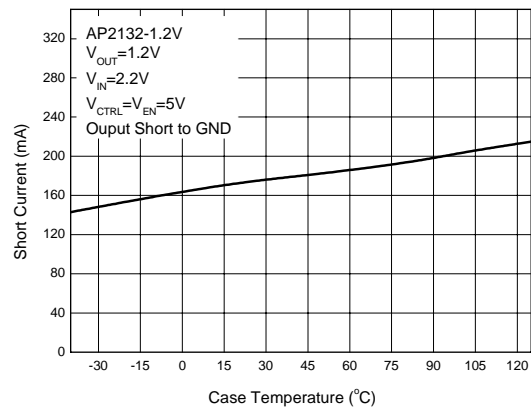


Figure 13. Short Current vs. Case Temperature

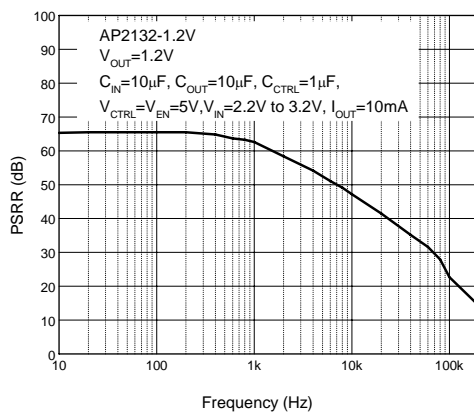
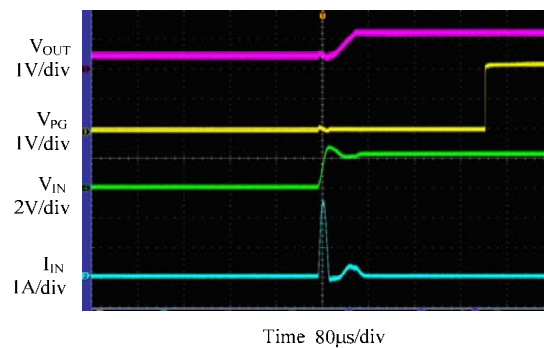


Figure 14. PSRR vs. Frequency


 Figure 15. V_{IN} Start up Waveform
 ($V_{CTRL}=V_{EN}=5V$, $V_{IN}=0$ to 2.2V, No Load)

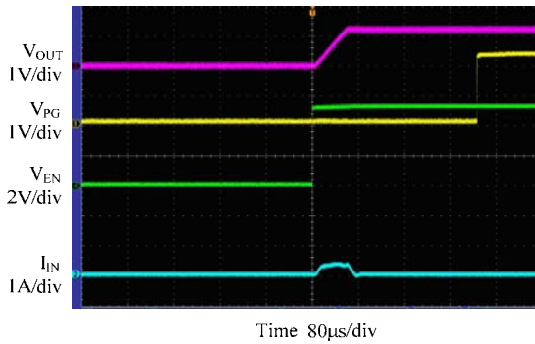
Typical Performance Characteristics (Continued)


Figure 16. V_{EN} Start up Waveform
($V_{CTRL}=5V$, $V_{EN}=0$ to $5V$, $V_{IN}=2.2V$, No Load)

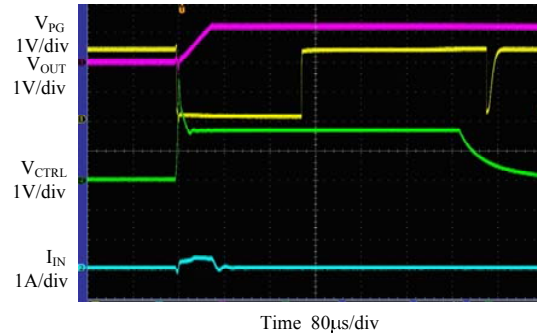


Figure 17. V_{CTRL} Start up and Shut down Waveform
($V_{CTRL}=0$ to $5V$, $V_{EN}=5V$, $V_{IN}=2.2V$, No Load)

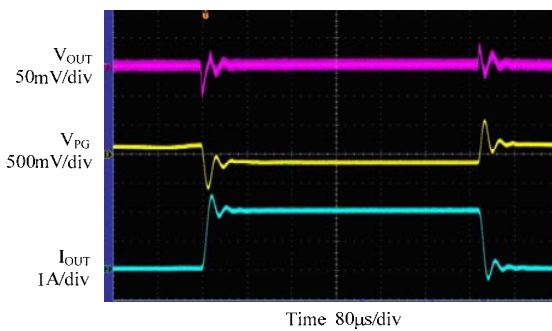


Figure 18. Load Transient
($V_{CTRL}=V_{EN}=5V$, $V_{IN}=2.2V$, $I_{OUT}=0$ to $2A$)

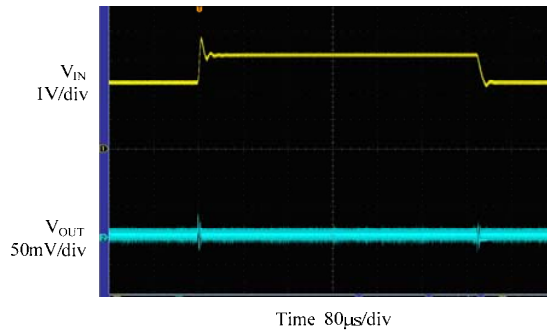


Figure 19. Line Transient
($V_{CTRL}=V_{EN}=5V$, $C_{IN}=C_{CTRL}=1\mu F$, $C_{OUT}=10\mu F$,
 $V_{IN}=2.2V$ to $3.2V$, $I_{OUT}=10mA$)

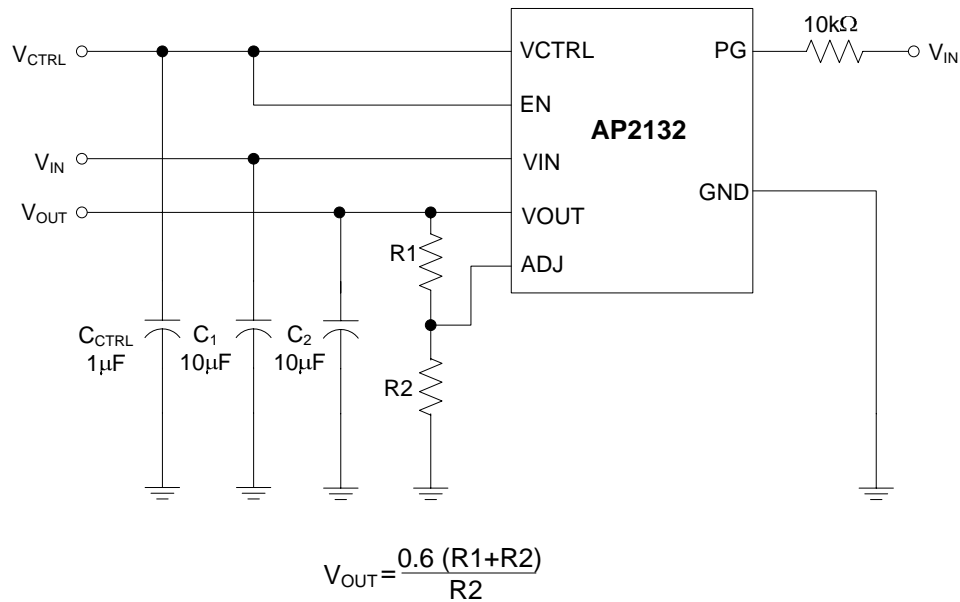
2A CMOS LDO Regulator
AP2132
Typical Application


Figure 20. Typical Application of AP2132 for Adjustable Version

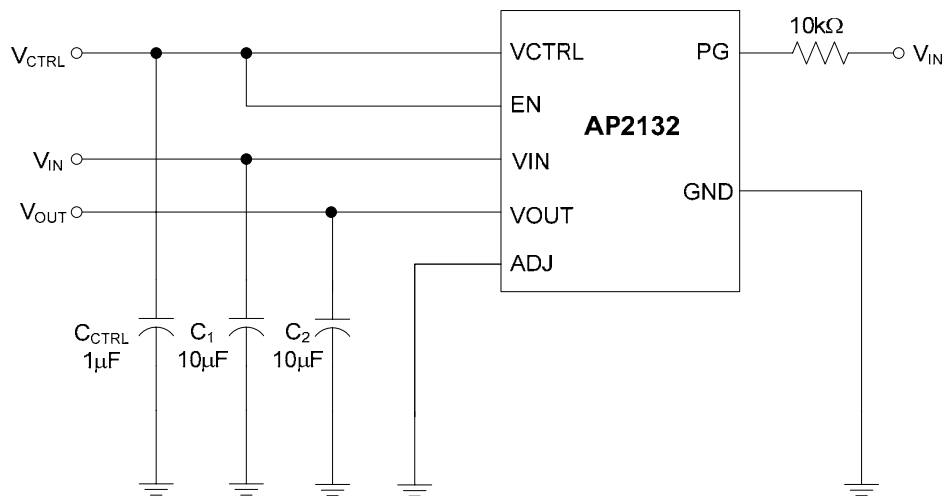
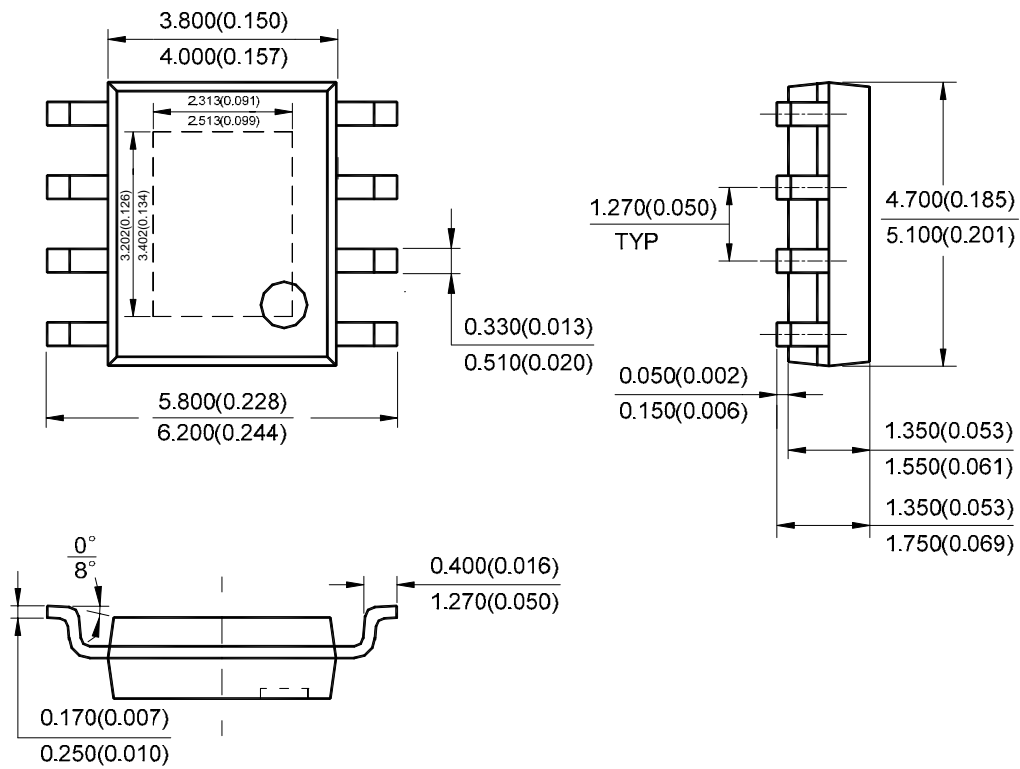


Figure 21. Typical Application of AP2132 for Fixed Version

2A CMOS LDO Regulator
AP2132
Mechanical Dimensions
PSOP-8
Unit: mm(inch)


Note: Eject hole, oriented hole and mold mark is optional.



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