

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 ADJ pin is unique as it has two specific modes.

Internal Mode:

The ADJ pin is grounded the internal resistors are used and the output voltages can be 1.2V, 1.5V, 1.8V, or 2.5V as ordered by a specific part number.

External Mode:

The ADJ pin is not grounded but connected to an external resistor divider. In this mode the device is truly adjustable and the internal resistors are ignored. This is true for all of the versions.

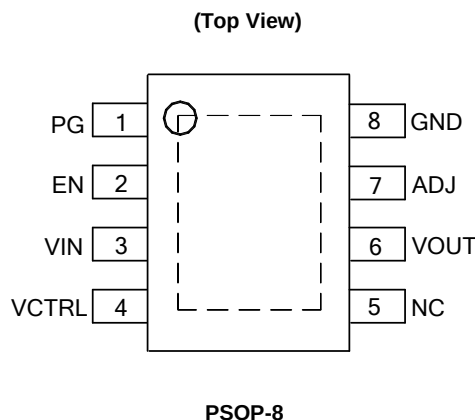
The AP2132 are available in 1.2V, 1.5V, 1.8V, 2.5V fixed output voltage versions and adjustable output voltage version. The fixed versions integrate the adjust resistors. It is also available in an adjustable version, which can set the output voltage with external resistor. If the pin of adjustable output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

The AP2132 series are available in PSOP-8 package.

Applications

- Notebook

Pin Assignments

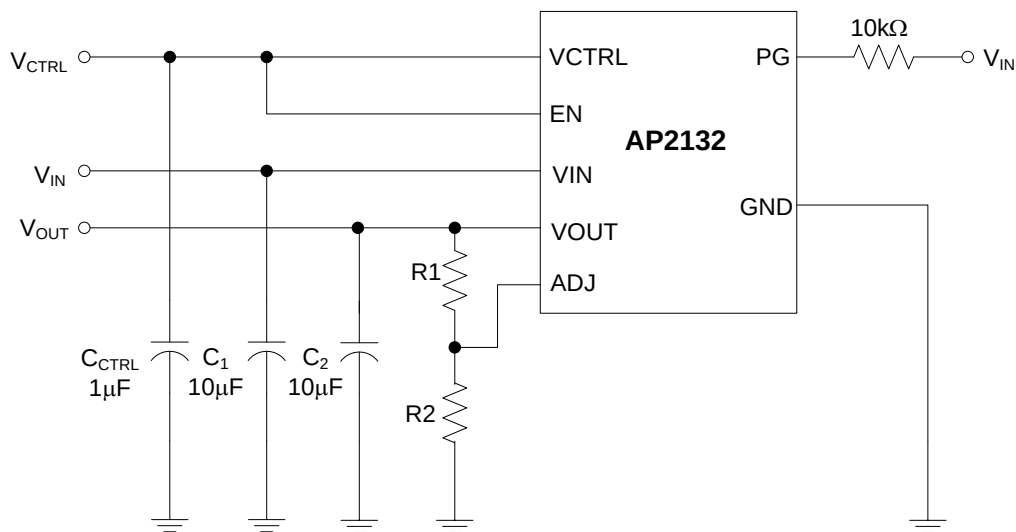


Features

- Adjustable Output: 0.6V to 3.0V
- Low Dropout Voltage: 300mV@ $I_{OUT} = 2A$, $V_{OUT} = 1.2V$
- 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
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative.**
- <https://www.diodes.com/quality/product-definitions/>

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

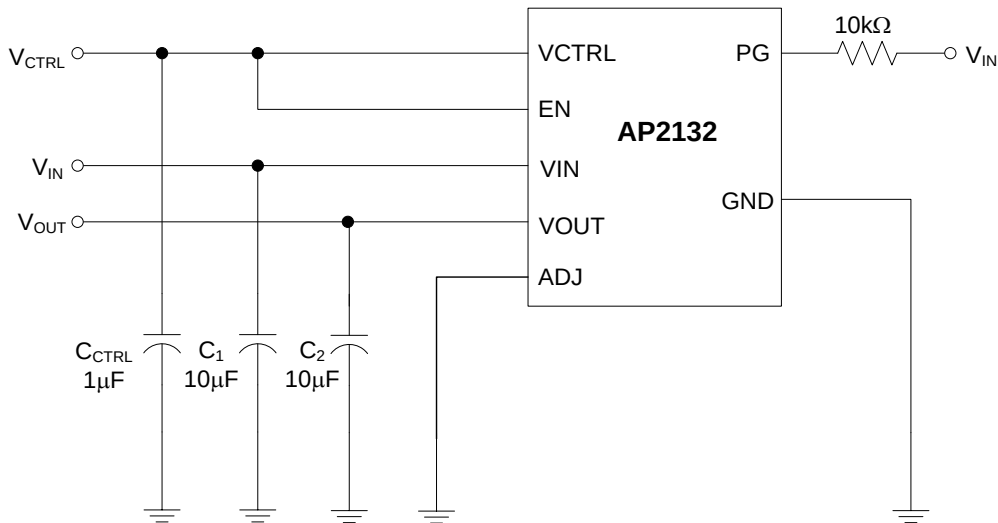
Typical Applications Circuit



$$V_{OUT} = \frac{0.6 (R1 + R2)}{R2}$$

Do not program below 0.6V

Typical Application of AP2132 for Adjustable Version



Typical Application of AP2132 for Fixed Version

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	Internal Mode ADJ is connected to ground. The output voltage is set by internal resistors External Mode ADJ is connected to external feedback resistors. The output voltage will be $V_{OUT} = 0.6 (R1+R2)/R2$. Do not program below 0.6V
8	GND	Ground
Thermal Pad	GND or Open	The pad may be grounded or left open. This does not replace the need for ground on Pin 8.

The block diagram illustrates the internal architecture of the ADP1107. Key components include:

- Input Stage:** VIN (Pin 3) is connected to the non-inverting input (+) of the Error Amp. It also passes through an OCP (Over-Current Protection) block and an OTP (Over-Temperature Protection) block.
- Reference and Bias:** VREF provides a reference voltage to the inverting input (-) of the Error Amp. The Bias block, connected to VCTRL (Pin 4), provides a bias current to the Error Amp's inputs.
- Control Logic:** The Enable block, connected to EN (Pin 2), controls the Error Amp and the Switch.
- Output Stage:** The Error Amp drives a PMOS transistor, which is connected to VOUT (Pin 6). The transistor's source is connected to GND (Pin 8) through a resistor.
- Protection and Monitoring:** The PGGood block monitors the output voltage (VOUT) and provides a feedback signal to the Error Amp. The Switch, controlled by the Enable block, is connected to the output node (Pin 7, ADJ) and GND (Pin 8) through a resistor.
- Pin 1 (PG):** This pin is connected to the output node (VOUT) and the PGGood block.

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating	Unit
V _{IN} V _{CTRL}	Input Voltage Input Voltage for Controlling Circuit	6.0	V
V _{EN}	Enable Input Voltage	-0.3 to 6.0	V
I _{OUT}	Output Current	2.5	A
θ _{JA}	Thermal Resistance (No Heatsink)	130	°C/W
T _J	Operating Junction Temperature	+150	°C
T _{STG}	Storage Temperature Range	-65 to +150	°C
T _{LEAD}	Lead Temperature (Soldering, 10sec)	+260	°C
—	ESD (Machine Model)	200	V
—	ESD (Human Body Model)	2000	V

Note 4: Stresses greater than those listed under “*Absolute Maximum Ratings*” can 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 can affect device reliability.

Recommended Operating Conditions

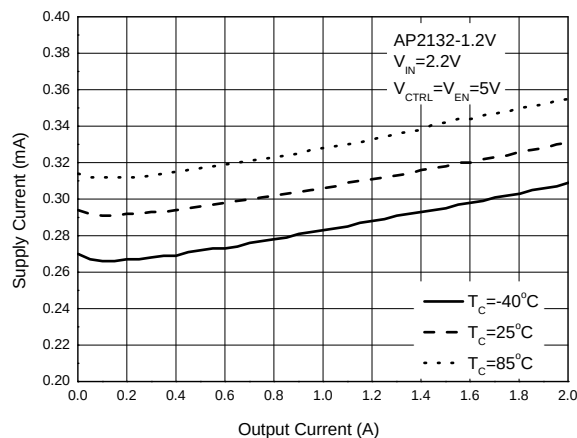
Symbol	Parameter	Min	Max	Unit
V _{IN}	Input Voltage	1.4	5.5	V
V _{CTRL}	Input Voltage for Controlling Circuit	4.5	5.5	V
T _A	Operating Ambient Temperature Range	-40	+85	°C

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.)

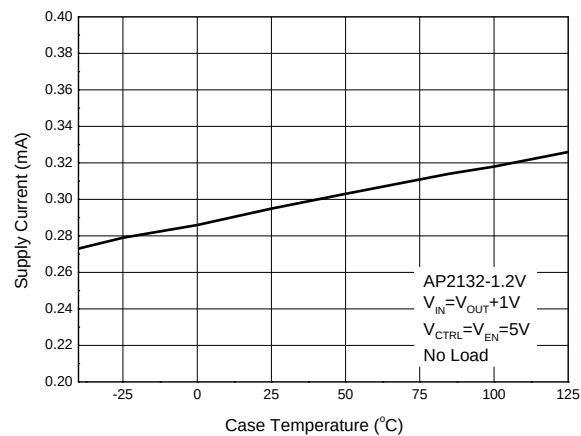
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{OUT}	Output Voltage	V _{IN} = V _{OUT} +0.5V, I _{OUT} =10mA		V _{OUT} × 98%	—	V _{OUT} × 102%	V
V _{IN}	Input Voltage	—		1.4	—	5.5	V
I _{OUT} (max)	Max. Output Current	V _{IN} – V _{OUT} = 1V, V _{OUT} = 98%×V _{OUT}		2	—	—	A
V _{RLOAD}	Load Regulation	V _{IN} = V _{OUT} +0.5V, 10mA ≤ I _{OUT} ≤ 2A		—	10	—	mV
V _{RLINE}	Line Regulation	V _{OUT} + 0.5V ≤ V _{IN} ≤ 5V, I _{OUT} = 10mA		—	2	—	mV
V _{DROP}	Dropout Voltage	I _{OUT} = 500mA		—	80	120	mV
		I _{OUT} = 1A		—	150	200	mV
		I _{OUT} = 2A		—	300	450	mV
I _{SUPPLY}	Supply Current	V _{IN} = V _{OUT} +0.5V, I _{OUT} = 0mA		—	300	—	μA
I _{CTRLH}	VCTRL Current	V _{IN} = V _{OUT} +0.5V, V _{CTRL} = V _{EN} = 5V		—	250	500	μA
I _{CTRL L}		V _{IN} = V _{OUT} +0.5V, V _{CTRL} = 5V, V _{EN} = 0V		—	0.1	1	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V _{IN} = V _{OUT} +1V	f = 100Hz	—	60	—	dB
			f = 1kHz	—	60	—	dB
$\frac{\Delta V_{OUT}}{V_{OUT} \Delta T}$	Output Voltage Temperature Coefficient	I _{OUT} = 10mA, -40°C ≤ T _A ≤ +85°C		—	±100	—	ppm/°C
V _{REF}	Reference Voltage	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
OTSD	Thermal Shutdown	—		—	+165	—	°C
—	Thermal Shutdown Hysteresis	—		—	+20	—	°C
V _{THPG}	V _{OUT} Power Good Voltage	—		—	92	—	%
—	V _{PG} Hysteresis	—		—	7	—	%
—	Adjust Pin Threshold	—		—	200	—	mV
θ _{JC}	Thermal Resistance (Junction to Case)	PSOP-8		—	40	—	°C/W

Performance Characteristics

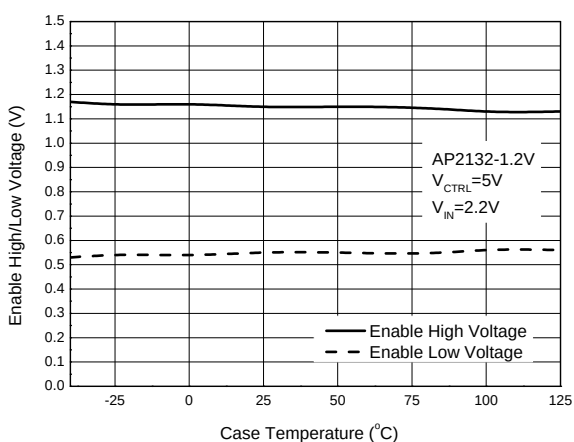
Supply Current vs. Output Current



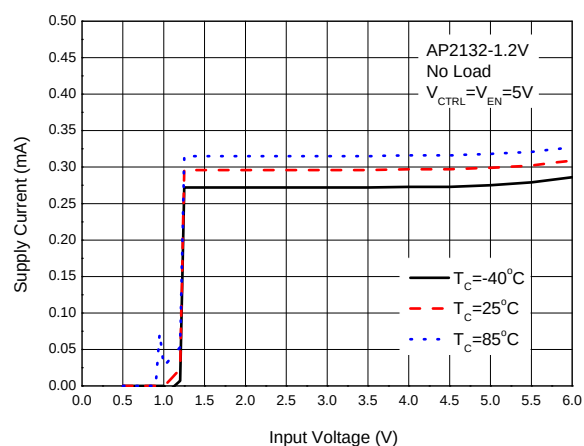
Supply Current vs. Case Temperature



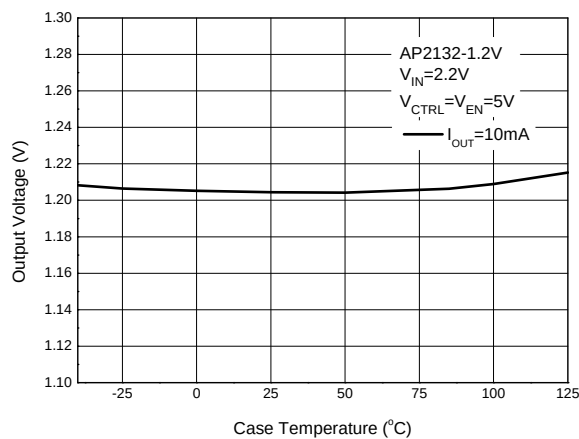
Enable High/Low Voltage vs. Case Temperature



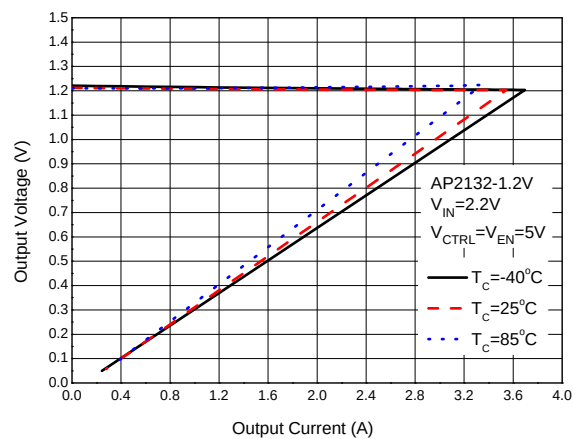
Supply Current vs. Input Voltage



Output Voltage vs. Case Temperature

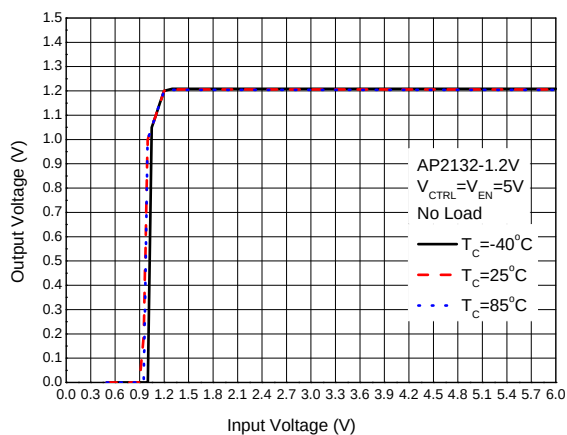


Output Voltage vs. Output Current

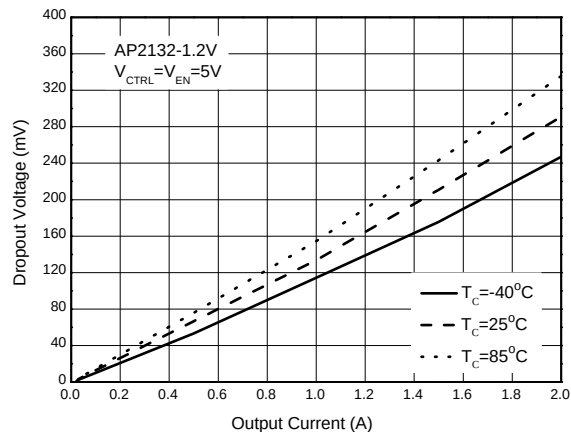


Performance Characteristics (continued)

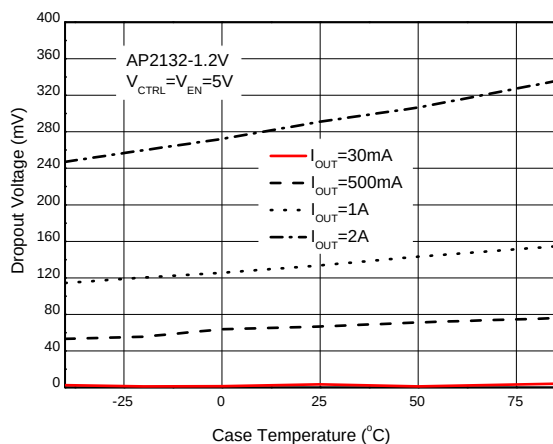
Output Voltage vs. Input Voltage



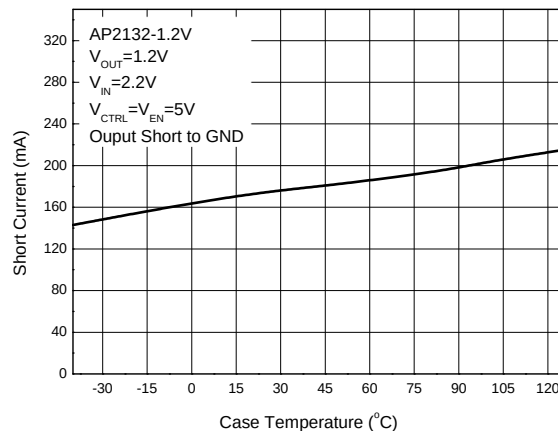
Dropout Voltage vs. Output Current



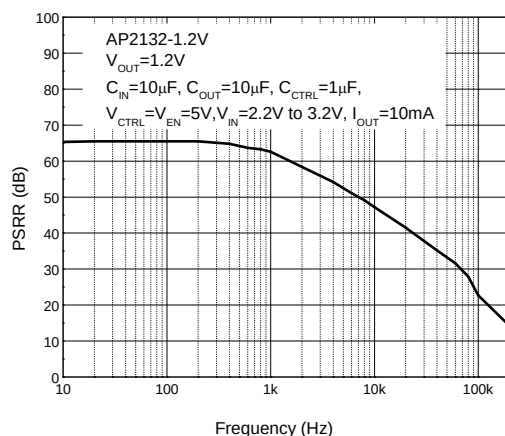
Dropout Voltage vs. Case Temperature



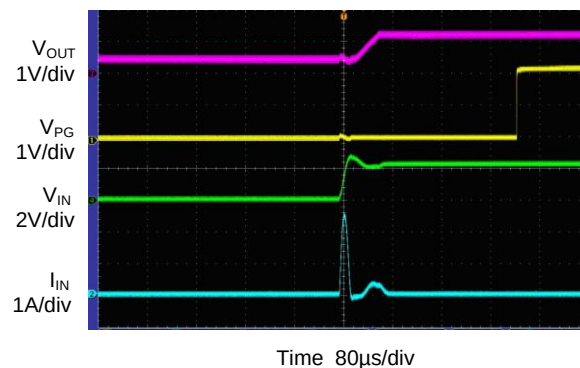
Short Current vs. Case Temperature



PSRR vs. Frequency

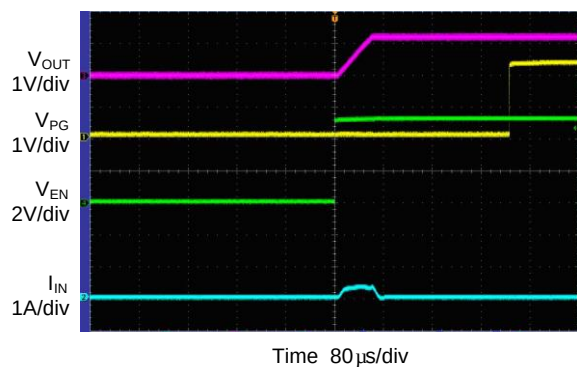


V_{IN} Start up Waveform
($V_{CTRL}=V_{EN}=5V, V_{IN}=0 \text{ to } 2.2V$, No Load)

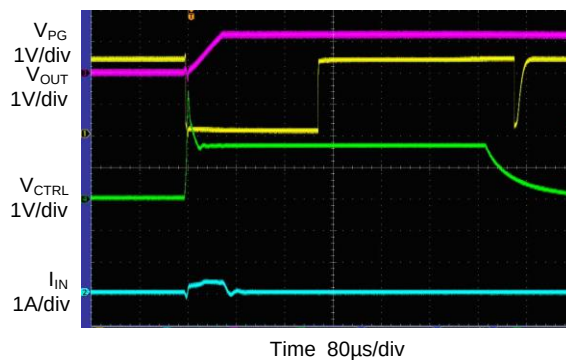


Performance Characteristics (continued)

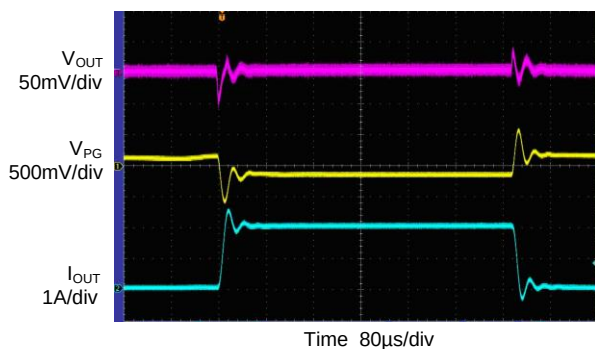
V_{EN} Start up Waveform
($V_{CTRL}=5V$, $V_{EN}=0$ to $5V$, $V_{IN}=2.2V$, No Load)



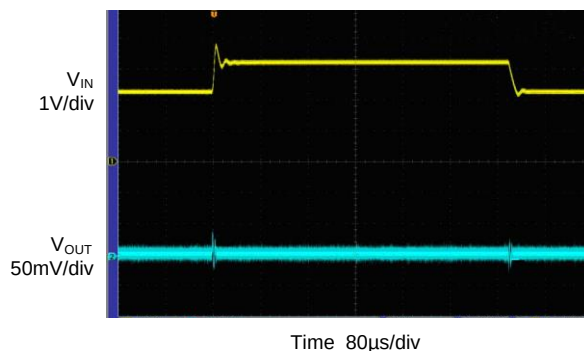
V_{CTRL} Start up and Shut down Waveform
($V_{CTRL}=0$ to $5V$, $V_{EN}=5V$, $V_{IN}=2.2V$, No Load)



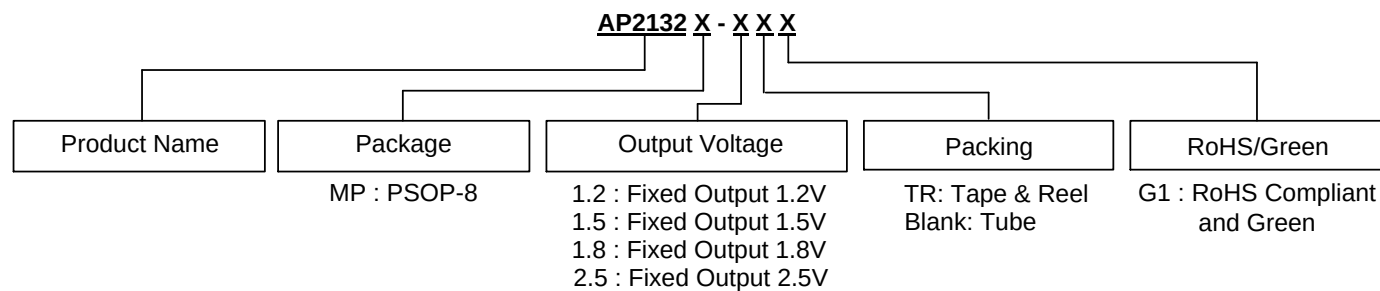
Load Transient
($V_{CTRL}=V_{EN}=5V$, $V_{IN}=2.2V$, $I_{OUT}=0$ to $2A$)



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



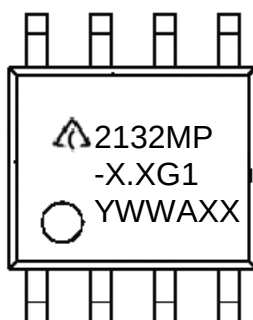
Ordering Information



Package	Temperature Range	Version Description	Part Number	Marking ID	Packing
PSOP-8	-40 to +85°C	Each fixed output version integrates ADJ version	AP2132MP-1.2G1	2132MP-1.2G1	100/Tube
			AP2132MP-1.2TRG1	2132MP-1.2G1	4000/Tape & Reel
			AP2132MP-1.5G1	2132MP-1.5G1	100/Tube
			AP2132MP-1.5TRG1	2132MP-1.5G1	4000/Tape & Reel
			AP2132MP-1.8G1	2132MP-1.8G1	100/Tube
			AP2132MP-1.8TRG1	2132MP-1.8G1	4000/Tape & Reel
			AP2132MP-2.5G1	2132MP-2.5G1	100/Tube
			AP2132MP-2.5TRG1	2132MP-2.5G1	4000/Tape & Reel

Marking Information

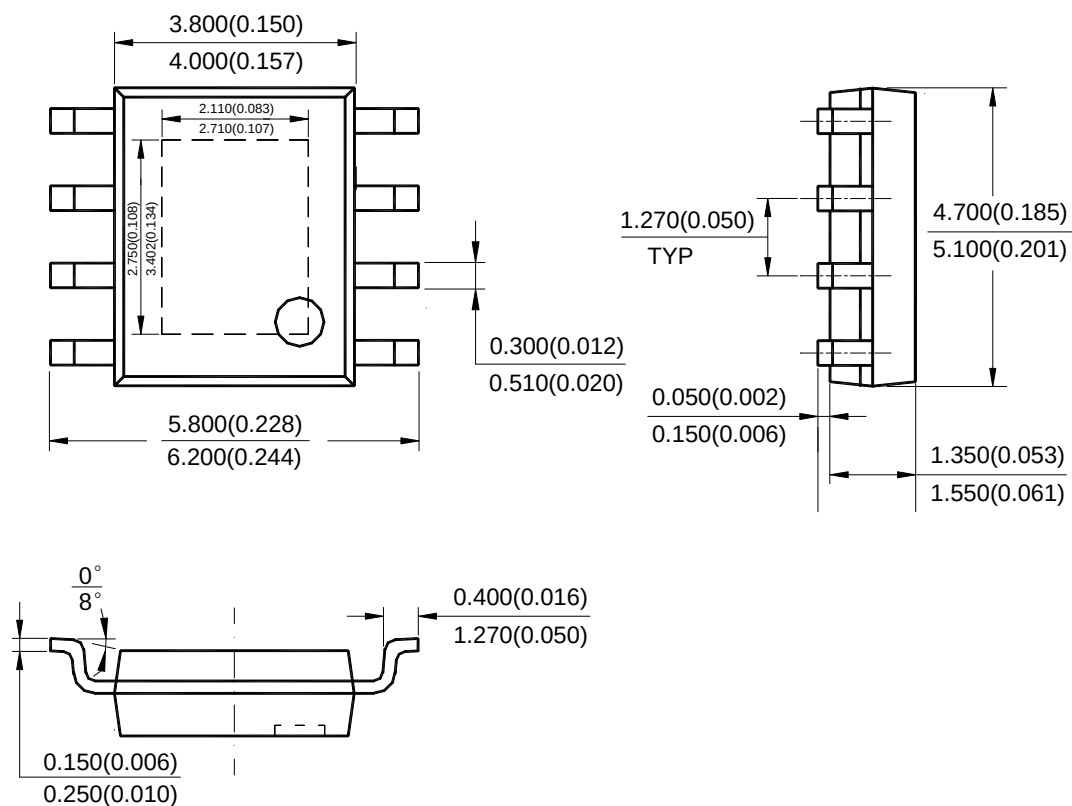
(Top View)



First and Second Lines: Logo and Marking ID
 (See Ordering Information)
 Third Line: Date Code
 Y: Year
 WW: Work Week of Molding
 A: Assembly House Code
 XX: 7th and 8th Digits of Batch Number

Package Outline Dimensions (All dimensions in mm(inch).)

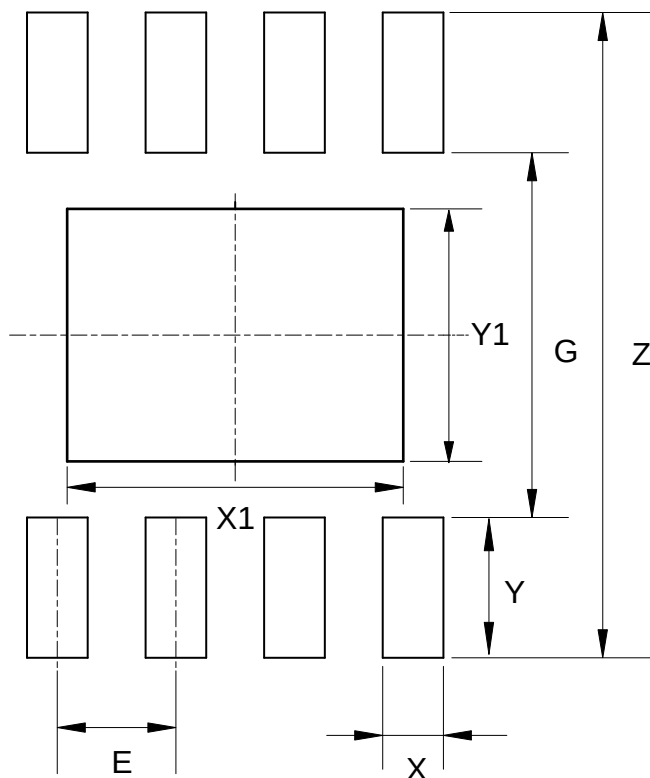
(1) Package Type: PSOP-8



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

Suggested Pad Layout

(1) Package Type: PSOP-8



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	X1 (mm)/(inch)	Y1 (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	3.600/0.142	2.700/0.106	1.270/0.050

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