Features

- Very Low Dropout Voltage
- Low Current Consumption: Typ. 45μA, max. 60uA
- Output Voltage: 1.5V, 1.8V, 2.0V, 2.5V, 2.8V, 3.0V 3.3V, and 3.5V
- Guaranteed 300mA Output
- Input Range from 2.7 up to 5.5V
- Thermal Shutdown
- Current Limiting
- Stability with Low ESR Capacitors
- Low Temperature Coefficient
- Lead-free Package: SOT25
- SOT25: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/RoHS Compliant (Note 1)

General Description

The AP139 is a positive voltage linear regulator utilizing CMOS technology. The features that include low quiescent current (45μA typ.), low dropout voltage, and high output voltage accuracy, make it ideal for battery applications. EN input connected to the device will produce a low bias current.
The space-saving SOT25 package is attractive for "pocket" and "hand held" applications.

This rugged device has both thermal shutdown, and current limit protections to prevent device failure under the "worst" operating conditions.

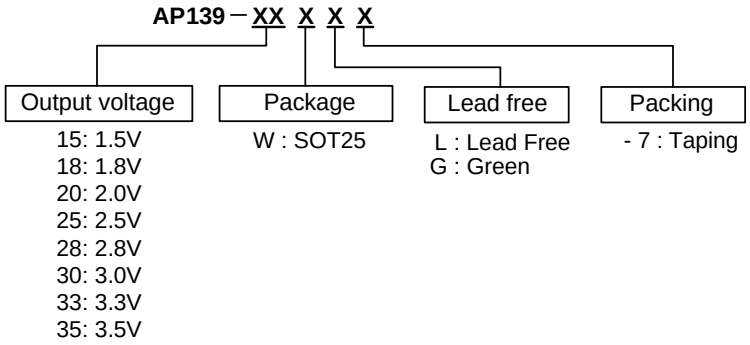
In a low noise, regulated supply application, a 10nF capacitor is necessary to be placed in between Bypass and Ground.

The AP139 is stable with a low ESR output capacitor of 1.0μF or greater.

Applications

- Personal Communication Devices
- Home Electric/Electronic Appliances
- PC Peripherals
- Battery-Powered Devices

Ordering Information



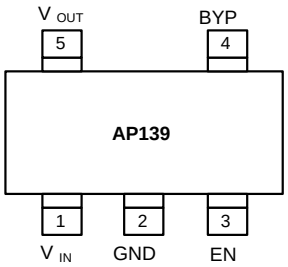
Note: 1. RoHS revision 13.2.2003. Glass and High Temperature Solder Exemptions Applied, see *EU Directive Annex Notes 5 and 7.*

Device	Package Code	Packaging (Note 2)	7" Tape and Reel	
			Quantity	Part Number Suffix
AP139-XXW	W	SOT25	3000/Tape & Reel	-7

Note: 2. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.

Pin Assignments

(Top View)

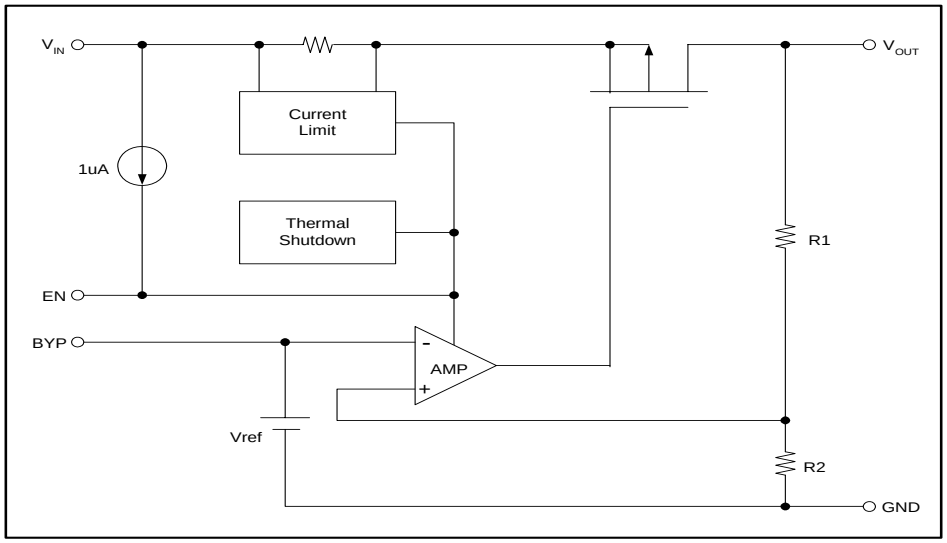


SOT25

Pin Descriptions

Pin Name	Pin No.	Function
V_{IN}	1	Power Supply
GND	2	Ground
EN	3	Enable Pin
BYP	4	Bypass Signal Pin
V_{OUT}	5	Output

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{IN}	Input Voltage	+6	V
I_{OUT}	Output Current	$P_D/(V_{IN}-V_O)$	mA
V_{OUT}	Output Voltage	GND - 0.3 to V_{IN}+ 0.3	V
	ESD Classification	B	
T_{OP}	Operating Junction Temperature Range	-40 to +125	ºC
T_{MJ}	Maximum Junction Temperature	150	ºC
P_D	Internal Power Dissipation	250	mW

Recommended Operating Conditions

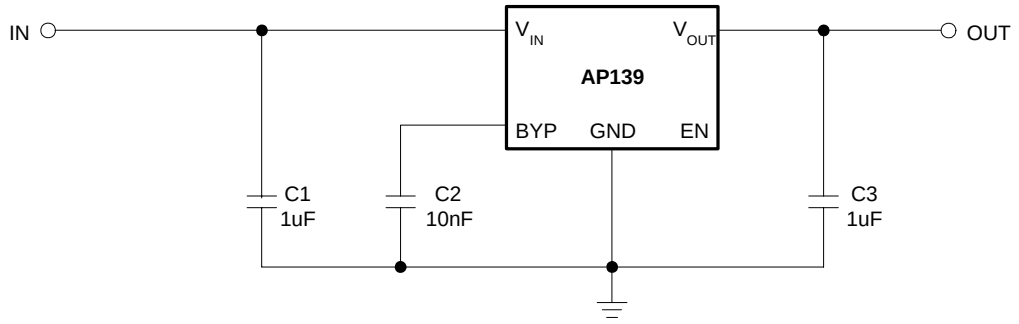
Symbol	Parameter	Min	Max	Unit
V_{IN}	Input voltage	2.7	5.5	V
I_{OUT}	Output Current	0	300	mA
T_A	Operating Ambient Temperature	-40	85	°C

Electrical Characteristics (T_A = +25ºC, unless otherwise noted)

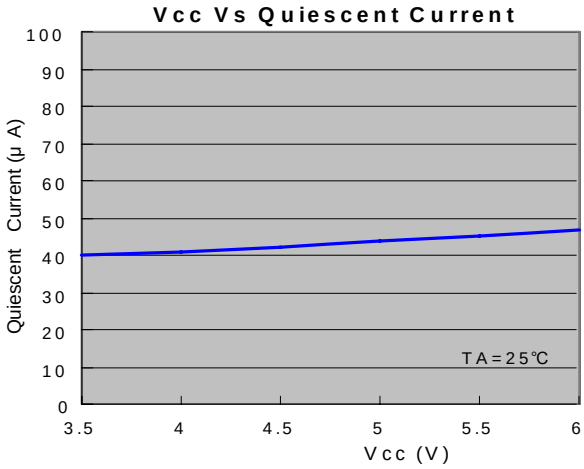
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_{IN}	Input Voltage			**Note 4**	-	5.5	V
I_Q	Quiescent Current	I_O = 0mA		-	45	60	µA
I_{STB}	Standby Current	V_{IN} = 5.0V, V_{OUT} = 0V, V_{EN} < V_{EL}		-	2.0	3.0	µA
V_{OUT}	Output Voltage Accuracy	I_O = 1mA, V_{IN} = 5V		-2	-	2	%
	V_{OUT} Temperature Coefficient			-	50	-	ppm/ °C
$V_{DROPOUT}$	Dropout Voltage	I_O = 1mA to 300mA, V_{OUT} = $V_{O(NOM)}$ - 1.5%	V_O ≥2.8V	-	-	0.45	V
I_{OUT}	Output Current			300	-	-	mA
I_{LIMIT}	Current Limit	V_{OUT} > 1.05V		300	450	-	mA
I_{short}	Short Circuit Current	V_{cc} = 5V, V_{out} < 1.05V		-	150	300	mA
△V_{LINE}	Line Regulation	I_{OUT} = 1mA, V_{IN} = (V_{OUT} +1V) to 5.5V		-	0.1	0.3	%
△V_{LOAD}	Load Regulation	I_O = 1mA to 300mA, V_{IN} = 5V		-	0.3	1	%
PSRR	Power Supply Rejection	I_O = 100mA, C_O = 2.2µF ceramic	f = 1KHz	-	60	-	dB
			f = 10KHz	-	50	-	
			f = 100KHz	-	40	-	
PSRR	Power Supply Rejection	I_O = 100mA, C_O = 2.2µF ceramic, C_{BYP} = 20nF	f = 1KHz	-	75	-	dB
			f = 10KHz	-	55	-	
			f = 100KHz	-	30	-	
V_{EH}	EN Input Threshold	Output ON		1.7	-	-	V
V_{EL}		Output OFF		-	-	0.8	V
I_{EN}	Enable Pin Current			-	-	<0.1	µA
OTS	Over Temperature Shutdown			-	130	-	°C
OTH	Over Temperature Hysteresis			-	20	-	°C
$θ_{JA}$	Thermal Resistance	SOT25 (Note 4)			226		ºC/W
$θ_{JC}$	Thermal Resistance	SOT25 (Note 4)			34		ºC/W

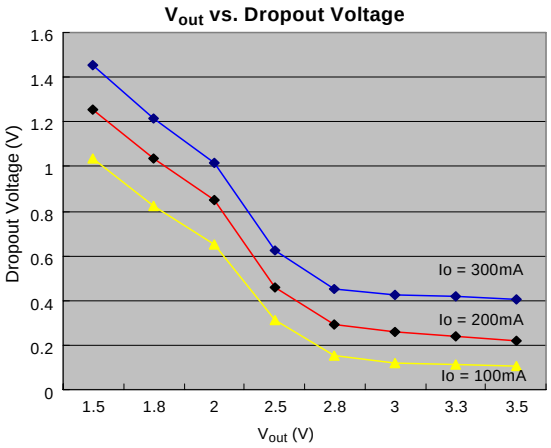
Note: 3. $V_{IN(MIN)}$ = V_{OUT} + $V_{DROPOUT}$.
4. Test conditions for SOT25: Devices mounted on FR-4 PC board, MRP, 1 oz. copper, single sided, calibrate at T_J=85 ºC, measure at T_A=25 ºC, no heat Sink, no air flow.

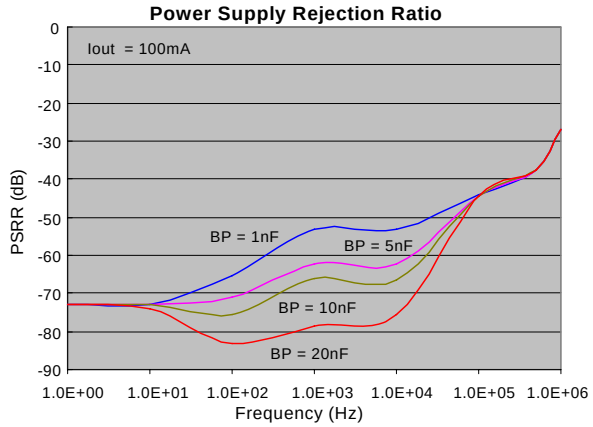
Typical Application

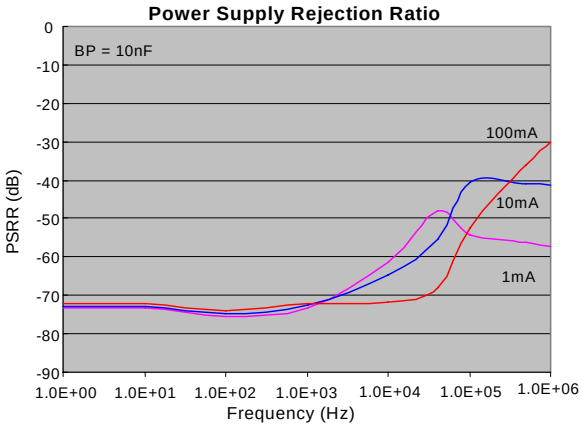


Typical Performance Characteristics

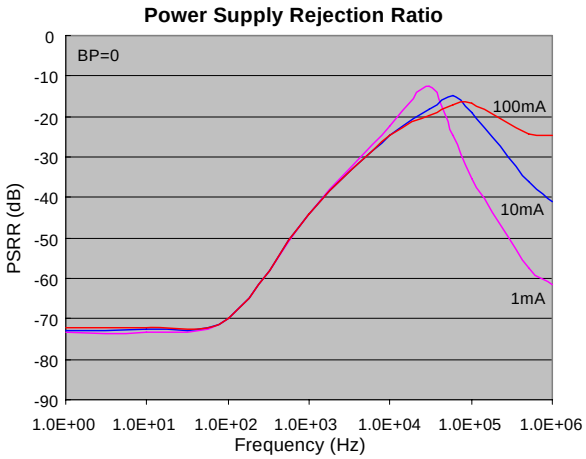


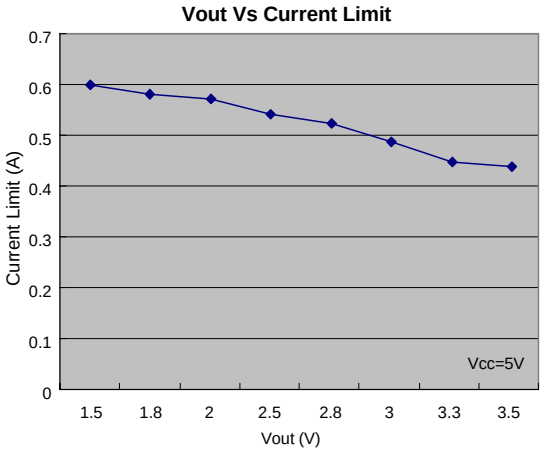


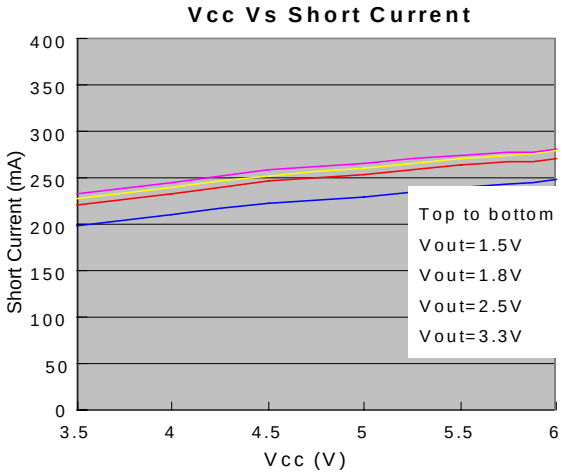




Typical Performance Characteristics (Continued)







Function Description

The AP139 of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, thermal shutdown.

The P-channel pass transistor receives data from the error amplifier, over-current protection, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. The over-current and thermal shutdown circuits become active when the junction temperature exceeds 130°C, or the current exceeds 300mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 110°C.

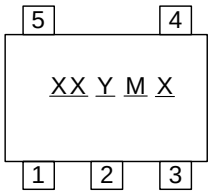
The AP139 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress.

Enable
The enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 2μA. This pin behaves much like an electronic switch.

External Capacitor
The AP139 is stable with a low ESR output capacitor to ground of 1.0μF or greater. It can keep stable even with higher ESR capacitors. A second capacitor is recommended between the input and ground to stabilize V_{IN}. The input capacitor should be larger than 0.1μF to have a beneficial effect. All capacitors should be placed in close proximity to the pins. A "quiet" ground termination is desirable.

Marking Information

(Top View)



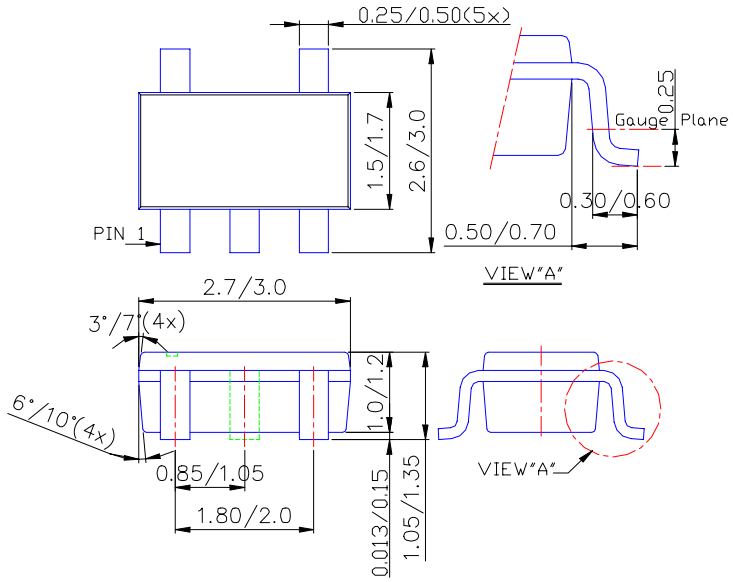
SOT 25

XX : Identification Code
Y : Year: 0-9
M : Month A~L
X : Blank : Lead Free
G : Green

Identification Code	Output Version
N0	AP139-1.5V
N1	AP139-1.8V
N2	AP139-2.0V
N3	AP139-2.5V
N4	AP139-2.8V
N5	AP139-3.0V
N6	AP139-3.3V
N7	AP139-3.5V

Package Information (unit: mm)

Package Type: SOT25



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