Data Sheet

150kHz 3A BUCK DC-DC CONVERTER AP3003

General Description

The AP3003 series of regulators are fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A load with excellent line and load regulation. These regulators include internal frequency compensation and a fixed frequency oscillator so that they are easy to use. A system adopting AP3003 requires a minimum number of external components to work.

A standard series of inductors, optimized for use with the AP3003 series, are available from several manufacturers. This feature greatly simplifies the design of switch-mode power supplies.

These ICs are available in TO-220-5 and TO-263-5 packages.

Features

- 3.3V, 5V, 12V Fixed (±4% Tolerance) and Adjustable (±3% Tolerance) Output Versions
- Guaranteed 3A Output Load Current
- 150kHz Fixed Frequency Internal Oscillator
- Input Voltage Range up to 32V
- Requires only 4 external components
- High Efficiency up to 90%
- Excellent Line and Load Regulation
- TTL Shutdown Capability
- Low Power Standby Mode, I_Q Typically 80μA
- Built-in Current Limit Protection and Thermal Shutdown Circuit

Applications

- LCD Monitor and LCD TV
- On-Card DC-DC Converter
- DVD Recorder
- PDP

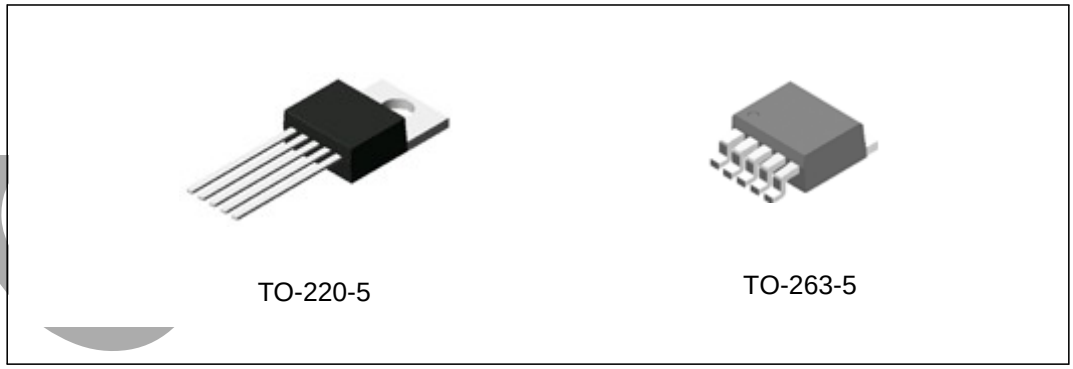


Figure 1. Package Types of AP3003

Pin Configuration

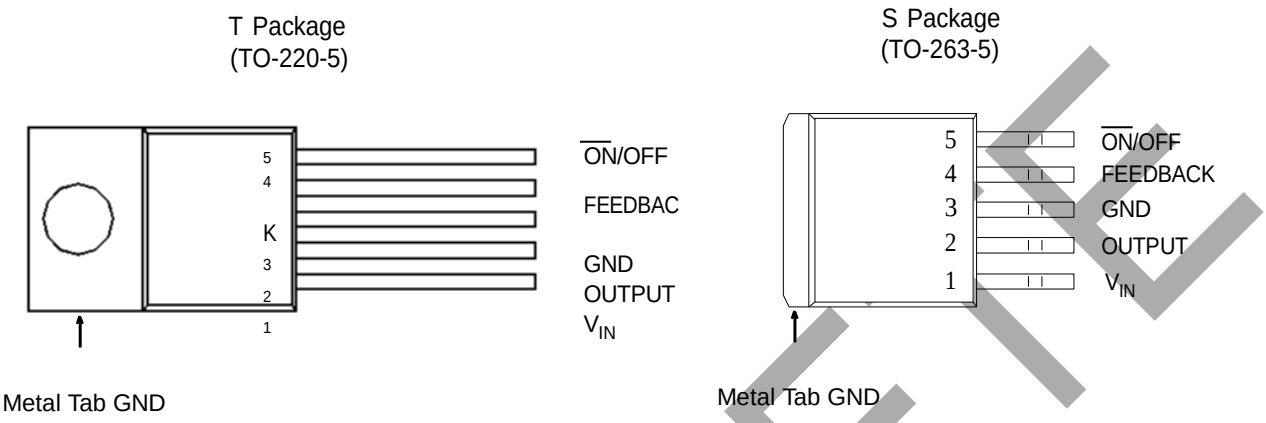


Figure 2. Pin Configuration of AP3003 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	V_{IN}	Unregulated input voltage
2	OUTPUT	Switch driver output
3	GND	Ground
4	FEEDBACK	Feedback Pin. For fixed version, connect it to system output. For adjustable version, connect it with an external resistor and capacitor feedback network to program the system output voltage
5	$\overline{ON}$/OFF	The TTL logic compatible input to control the regulator on or off

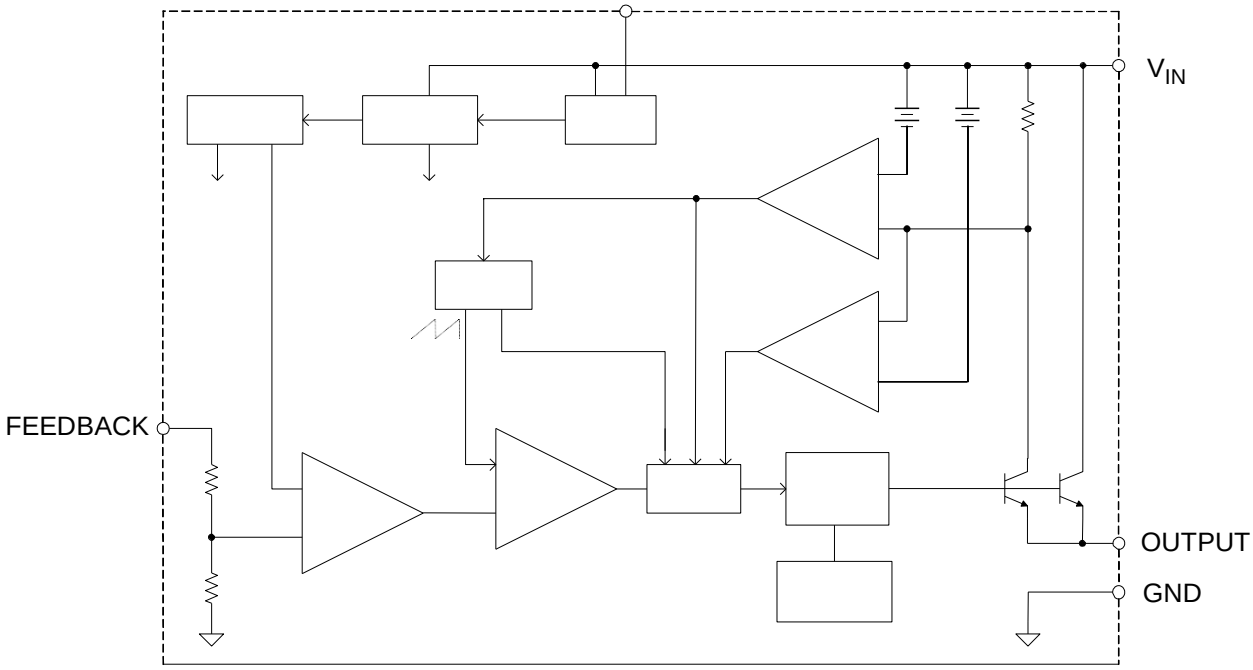
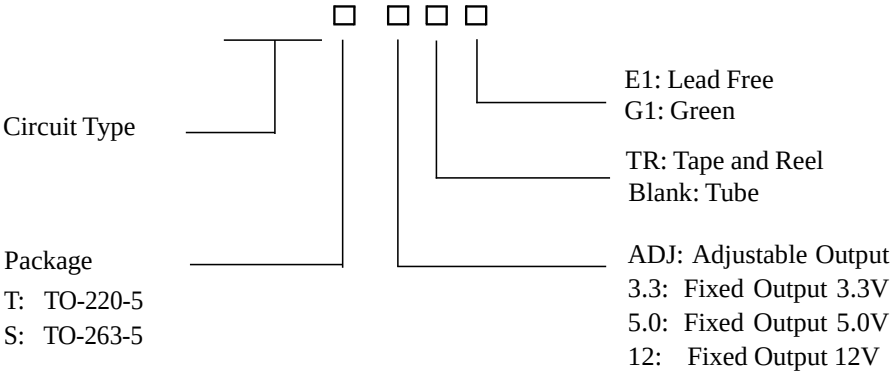


Figure 3. Functional Block Diagram of AP3003



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TO-220-5	-40 to 85°C	AP3003T-ADJE1	AP3003T-ADJG1	AP3003T-ADJE1	AP3003T-ADJG1	Tube
		AP3003T-3.3E1	AP3003T-3.3G1	AP3003T-3.3E1	AP3003T-3.3G1	Tube
		AP3003T-5.0E1	AP3003T-5.0G1	AP3003T-5.0E1	AP3003T-5.0G1	Tube
		AP3003T-12E1	AP3003T-12G1	AP3003T-12E1	AP3003T-12G1	Tube
TO-263-5	40 to 85°C	AP3003S-ADJE1	AP3003S-ADJG1	AP3003S-ADJE1	AP3003S-ADJG1	Tube
		AP3003S-ADJTRE1	AP3003S-ADJTRG1	AP3003S-ADJE1	AP3003S-ADJG1	Tape & Reel
		AP3003S-3.3E1	AP3003S-3.3G1	AP3003S-3.3E1	AP3003S-3.3G1	Tube
		AP3003S-3.3TRE1	AP3003S-3.3TRG1	AP3003S-3.3E1	AP3003S-3.3G1	Tape & Reel
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Input Voltage		V_{IN}	40	V
$\overline{ON}$/OFF Pin Voltage		$V_{\overline{ON}/OFF}$	40	V
Feedback Pin Voltage		V_{FB}	40	V
Operating Junction Temperature		T_J	150	°C
Thermal Resistance (Junction to Ambient, No Heatsink)	TO-220-5	$R_{\theta JA}$	60	°C/W
	TO-263-5			
Lead Temperature (Soldering, 10sec)		T_{LEAD}	260	°C
Storage Temperature Range		T_{STG}	-65 to 150	°C

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.

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	ADJ (V_{OUT}=2.5V)		25	
Operating Junction Temperature		T_J	-40 to 125	°C

Note 2: For ADJ version, the recommended supply voltage depends on the needed output voltage.

Temperature Range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	5.5V≤V_{IN}≤32V, 0.2A≤I_{LOAD}≤3A	3.168 **3.135**	3.3	3.432 **3.465**	V
Efficiency	η	V_{IN}=12V, I_{LOAD}=3A		75		%

For 5V Output Voltage Version

Unless otherwise specified, T_J=25ºC. The specifications with **boldface type** apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	7V≤V_{IN}≤32V, 0.2A≤I_{LOAD}≤3A	4.800 **4.750**	5	5.200 **5.250**	V
Efficiency	η	V_{IN}=12V, I_{LOAD}=3A		80		%

For 12V Output Voltage Version

Unless otherwise specified, T_J=25ºC. The specifications with **boldface type** apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
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Feedback Voltage	V_{FB}	4.5V≤V_{IN}≤25V, 0.2A≤I_{LOAD}≤3A, V_{OUT} programmed for 2.5V	1.193 **1.18**	1.23	1.267 **1.28**	V
Efficiency	η	V_{IN}=12V, I_{LOAD}=3A, V_{OUT}=2.5V		73		%

I_{LOAD}=500mA, T_J=25°C. Specifications with **boldface type** apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Feedback Bias Current	I_{FB}	Adjustable Version Only, V_{FB}=1.3V		10	50 **100**	nA
Oscillator Frequency	f	(Note 3)	127 **110**	150	173 **173**	kHz
Saturation Voltage	V_{SAT}	I_{LOAD}=3A (No output devices, V_{FB}=0V)		1.2	1.5 **1.6**	V
Maximum Duty Cycle	D_{MAX}	V_{FB}=0V		100		%
Minimum Duty Cycle	D_{MIN}	V_{FB}=1.3V		0		%
Current Limit	I_{CL}	Peak Current , No output devices, V_{FB}=0V	3.6 **3.4**	4.5	6.9 **7.5**	A
Output Leakage Current	I_{SWL}	Output=0V, No output devices, V_{FB}=1.3V, V_{IN}=32V		50		μA
		Output=-1V, No output devices, V_{FB}=1.3V, V_{IN}=32V		2	**30**	mA
Quiescent Current	I_Q	V_{FB}=1.3V		5	10	mA
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Note 3:

Note 4: [illegible]

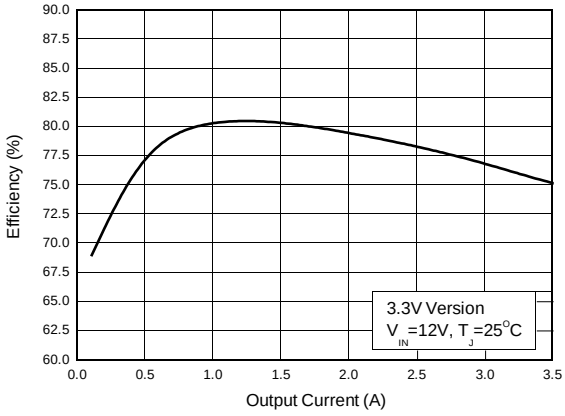


Figure 4. Efficiency vs. Output Current

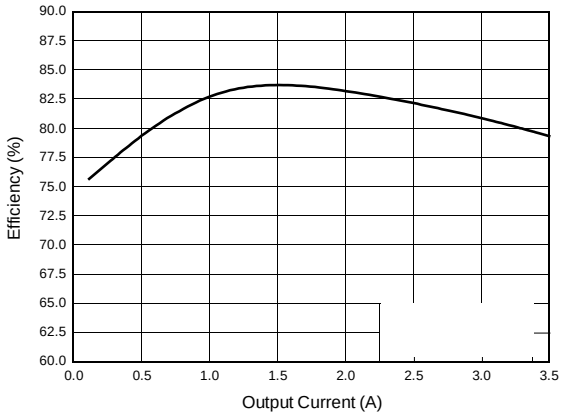


Figure 5. Efficiency vs. Output Current

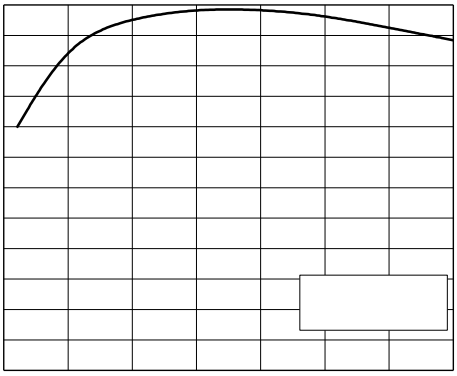


Figure 6. Efficiency vs. Output Current

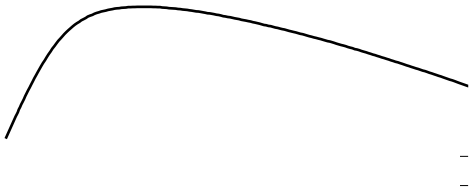


Figure 7. Efficiency vs. Output Current

Typical Performance Characteristics (Continued)

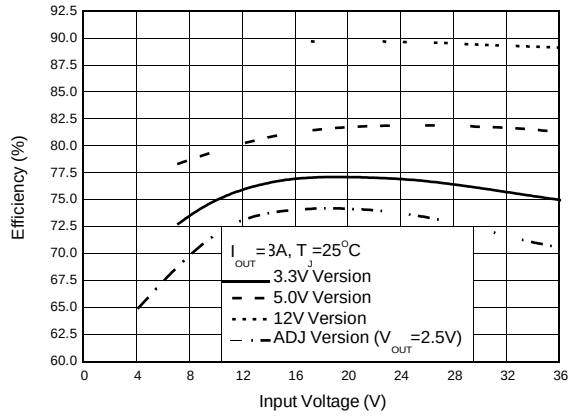


Figure 8. Efficiency vs. Input Voltage

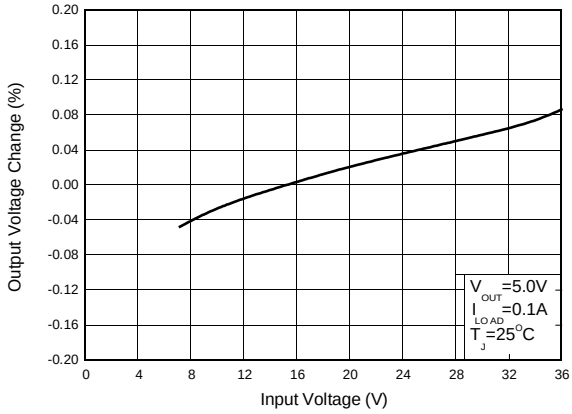


Figure 9. Line Regulation

Figure 10. Load Regulation

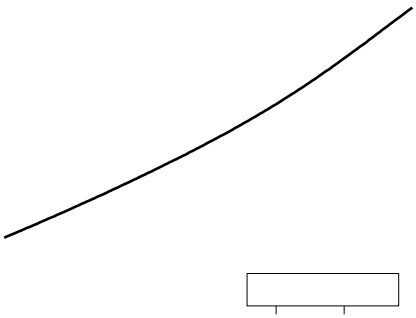


Figure 11. Switch Saturation Voltage vs. Switch Current

Typical Performance Characteristics (Continued)

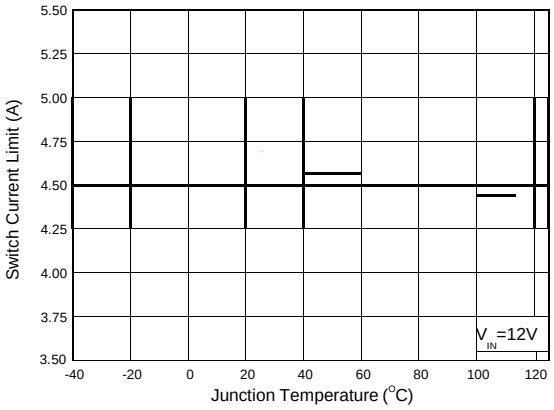


Figure 12. Switch Current Limit vs. Junction Temperature

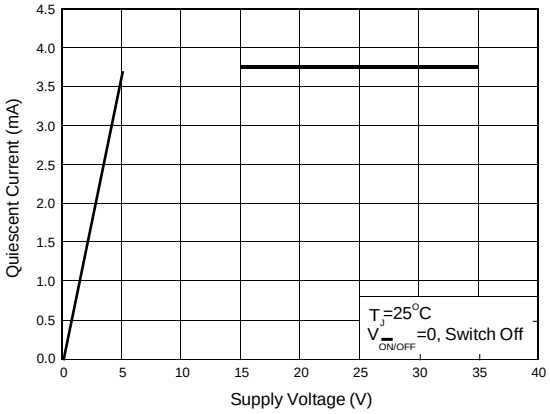


Figure 13. Quiescent Current vs. Supply Voltage

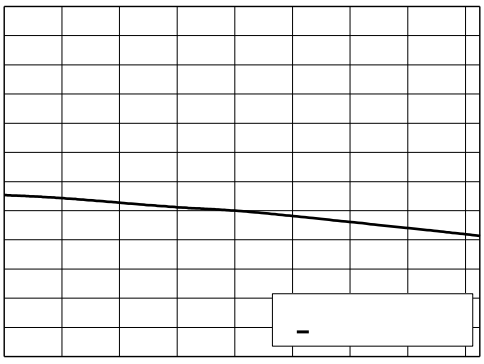


Figure 14. Quiescent Current vs. Junction Temperature

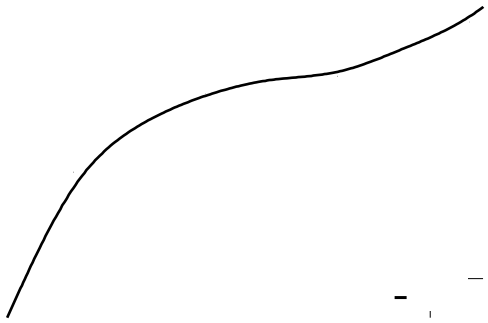


Figure 15. Shutdown Quiescent Current vs. Input Voltage

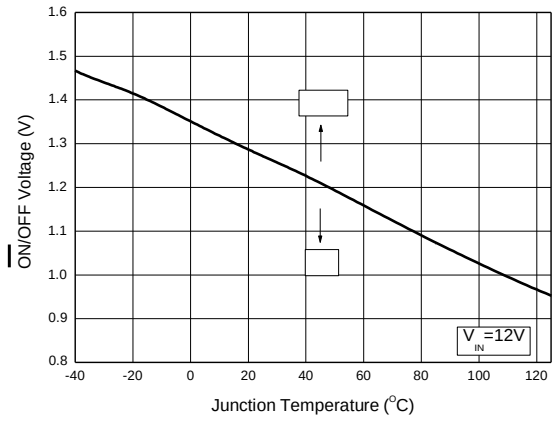


Figure 16. On/Off Threshold Voltage vs. Junction Temperature

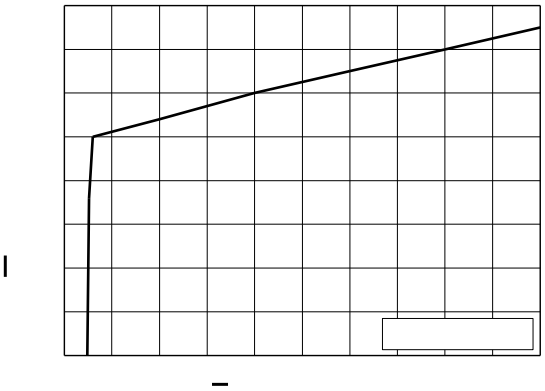
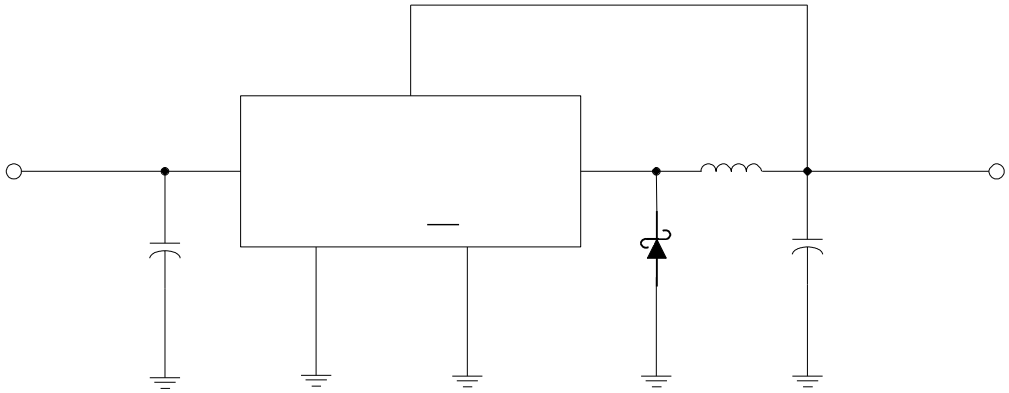


Figure 17. On/Off Pin Current vs. On/Off Pin Voltage

Figure 18. Switching Frequency vs. Junction Temperature



L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 19. Typical Application of AP3003-3.3V

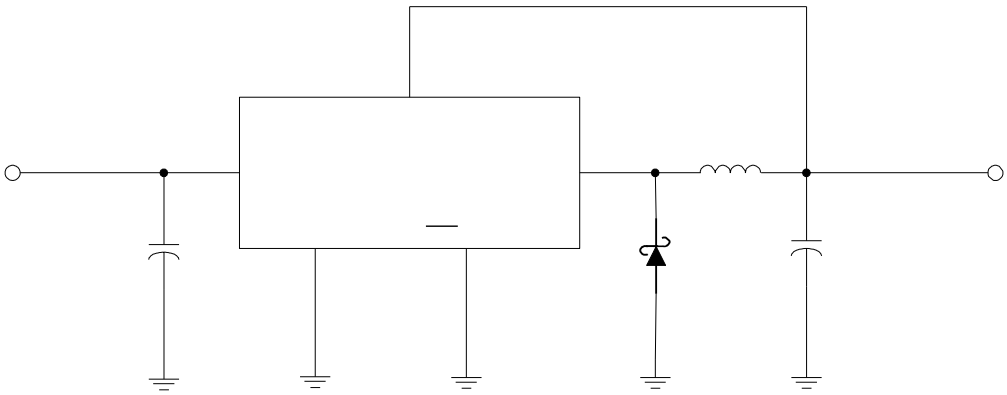


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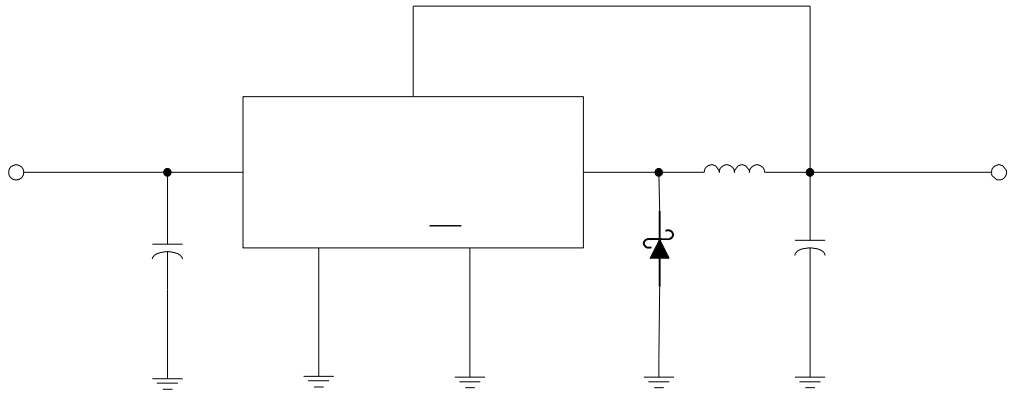
Figure 20. Typical Application of AP3003-5.0V



L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 19. Typical Application of AP3003-12V

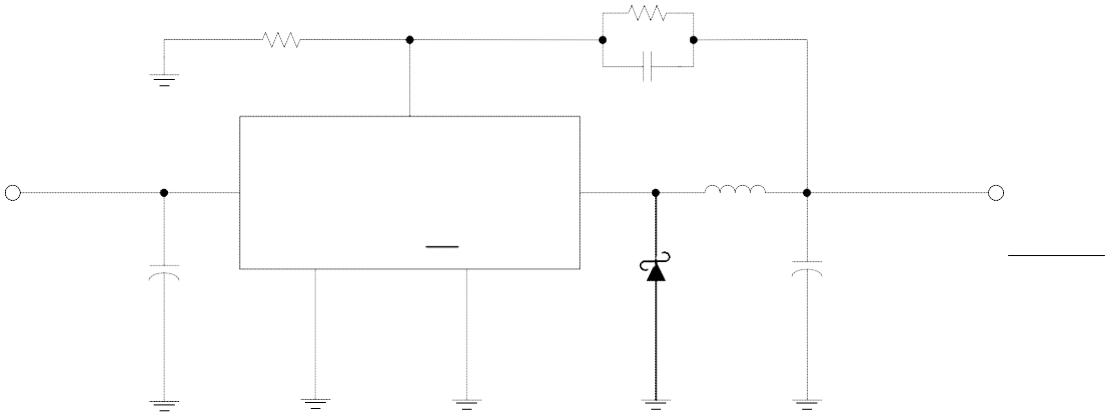


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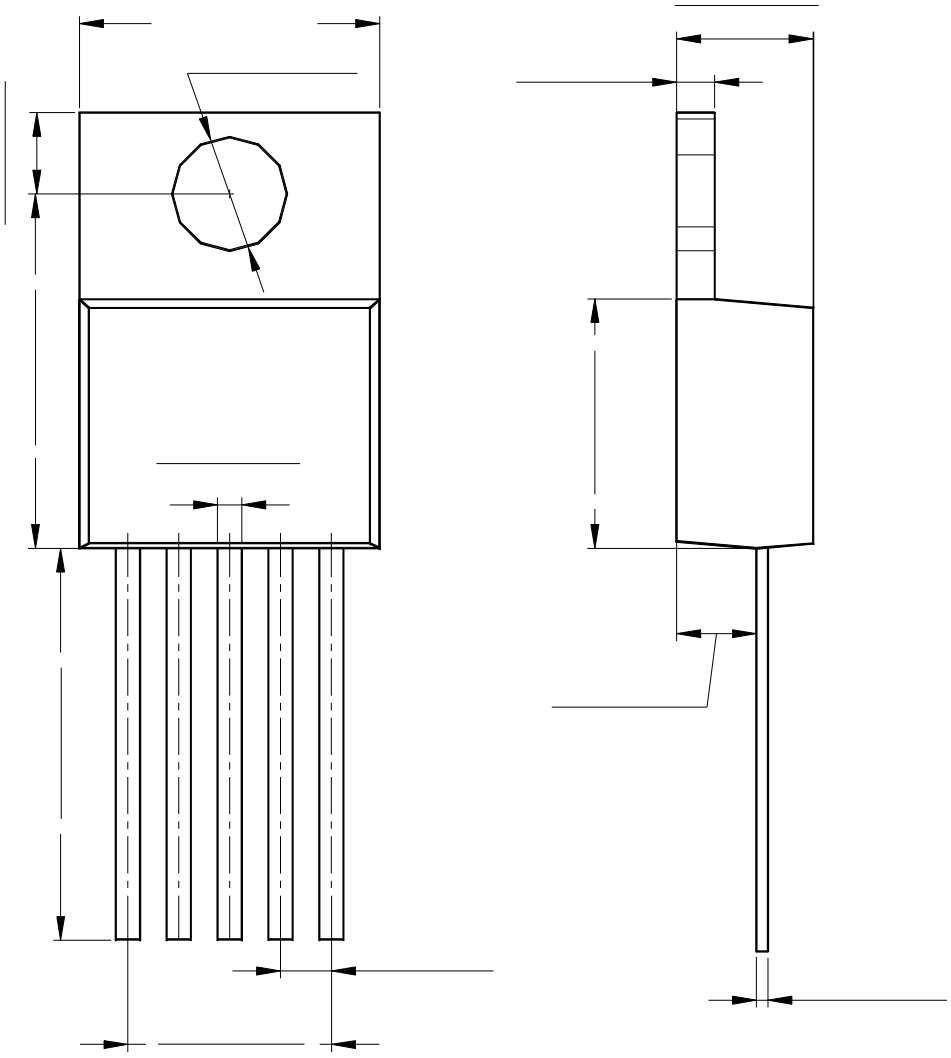
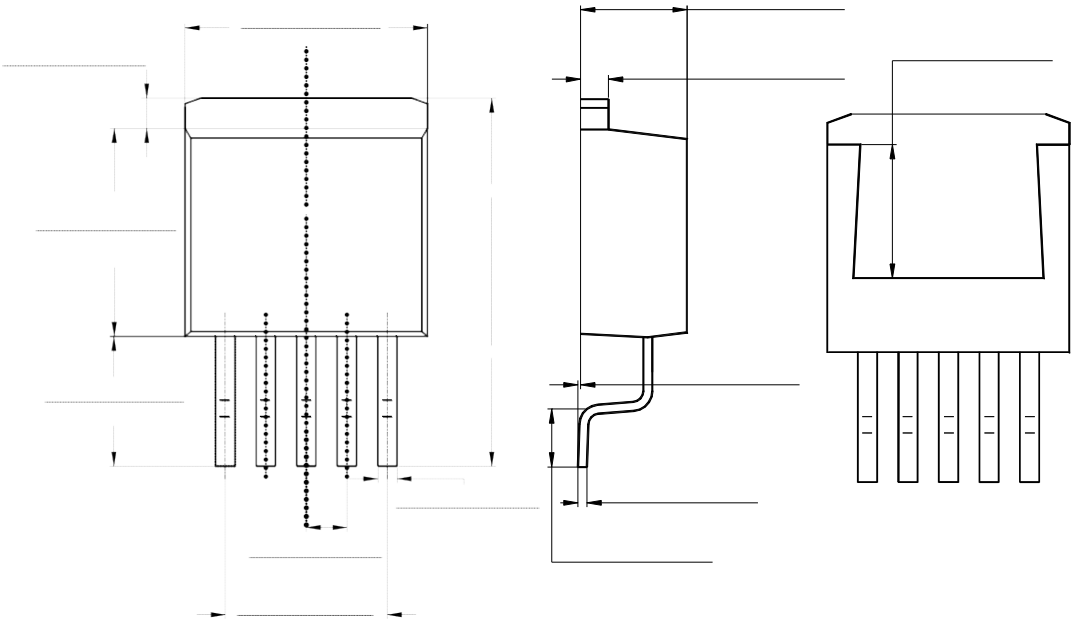
Figure 20. Typical Application of AP3003-ADJ





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