Ultralow Quiescent, Fast Transient Low Dropout Regulator

FEATURES

- Low Quiescent Current: 1.6µA
- High Input Voltage: Up to 35V
- High Output current: 200mA
- Without Overshot in Start Up
- Without Overshot after Short Circuits Removed
- Low Dropout Voltage: 280mV@100mA, 580mV@200mA
- Fixed Output Voltages: 3.3 and 5.0V
- High-accuracy Output Voltage: ±2%
- Good Transient Response
- Low Temperature Drift: ±100ppm/°C
- Integrated Short-Circuit Protection
- Integrated Thermal Protection
- Available Packages：SOT23-3

DESCRIPTION

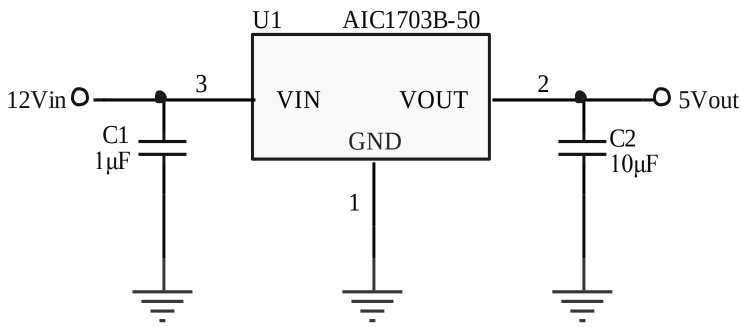
The AIC1703B series is a high voltage, ultralow-power, low dropout voltage regulator. The device can deliver 100mA output current with a dropout voltage of 300mV and allows an input voltage as high as 35V. The typical quiescent current is only 1.6µA. The device is available in fixed output voltages of 3.3 and 5.0V. The device features integrated short-circuit and thermal shutdown protection.

Although designed primarily as fixed voltage regulators, the device can be used with external components to obtain variable voltages.

APPLICATIONS

- Battery-powered equipment
- Portable equipment
- Audio/Video equipment

TYPICAL APPLICATION CIRCUIT



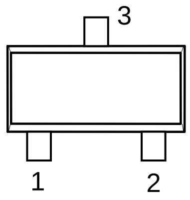
AIC1703B Typical Application Circuit

ORDERING INFORMATION

AIC1703B-XXXXXXX

- PACKING TYPE
  TR: TAPE & REEL
  BG: BAG
- PACKAGE TYPE
  U3: SOT23-3
- G: GREEN PACKAGE
- OUTPUT VOLTAGE
  33: 3.3V
  50: 5.0V

PIN CONFIGURATION
SOT23-3 TOP VIEW 1: GND 2: VOUT 3: VIN



Example: AIC1703B-33GU3TR
→ 3.3V Version, in Green SOT23-3 Package and Tape & Reel Packing Type

●Marking

Part No	Marking
AIC1703B-XXGU3	53XXB

(XX: output voltage (33=3.3V, 50=5.0V); B: output accuracy ±2%)

ABSOLUTE MAXIMUM RATINGS

VIN Pin to GND Pin Voltage .... -0.3V to 35V
VOUT Pin to GND Pin Voltage .... -0.3V to 6V
VOUT Pin to VIN Pin Voltage .... -35V to +0.3V
Peak Output Current .... Internally Limited
Storage Temperature Range .... -40ºC~150ºC
Lead Temperature (Soldering, 10 sec) 260ºC
Operating Virtual Junction Temperature 150ºC
Operating Ambient Temperature Range .... -40ºC~85ºC
Thermal Resistance Junction to Ambient, θ_{JA} SOT23-3 .... 400°C/W
Power Dissipation, P_D SOT23-3 .... 0.25W
(Assume no Ambient Airflow, no Heatsink)

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

ELECTRICAL CHARACTERISTICS

(T_A=25°C, C_{IN}=1µF, V_{IN}=V_{OUTNOM}+1.0V, C_{OUT}=10µF, unless otherwise specified) (Note 1)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage		V_{IN}			35	V
Quiescent Current	No Load	I_{GND}		1.6	2.0	µA
Output Voltage	I_{OUT}=10mA	V_{OUT}	V_{OUTNOM}* 0.98	V_{OUTNOM}	V_{OUTNOM}* 1.02	V
Output Current		I_{OUT_MAX}	200	250		mA
Dropout Voltage (Note 2)	AIC1703B-50, I_{OUT}=100mA, ΔV_{OUT}= -V_{OUTNOM}*2%	V_{DROP}		280	350	mV
	AIC1703B-50, I_{OUT}=200mA, ΔV_{OUT}= -V_{OUTNOM}*2%			580	700	
	AIC1703B-33, I_{OUT}=100mA, ΔV_{OUT}= -V_{OUTNOM}*2%			300	380	
	AIC1703B-33, I_{OUT}=200mA, ΔV_{OUT}= -V_{OUTNOM}*2%			600	750	
Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	ΔV_{OUT}		20	50	mV
Line Regulation	I_{OUT} = 1mA, V_{IN}=(V_{OUTNOM}+1V) to 35V	ΔV_{OUT}*100 /ΔV_{IN}*V_{OUT}			0.2	%/V
Current Limit	V_{IN}=(V_{OUTNOM}+1V) to 35V, R_{LOAD}=V_{OUTNOM}/1A	I_{LIMIT}		450		mA
Thermal Shutdown Threshold		T_{SHDN}		125		°C

Note 1. Specifications are production tested at T_A=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 2. Dropout Voltage is the voltage difference between the input and the output at which the output voltage drops 2% below its nominal value.

■ TYPICAL PERFORMANCE CHARACTERISTICS

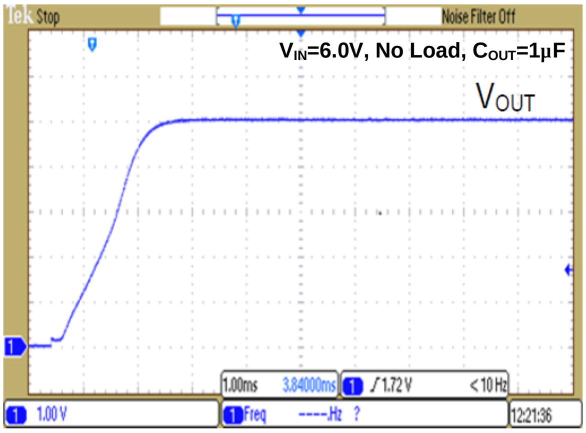


Fig. 1 Startup

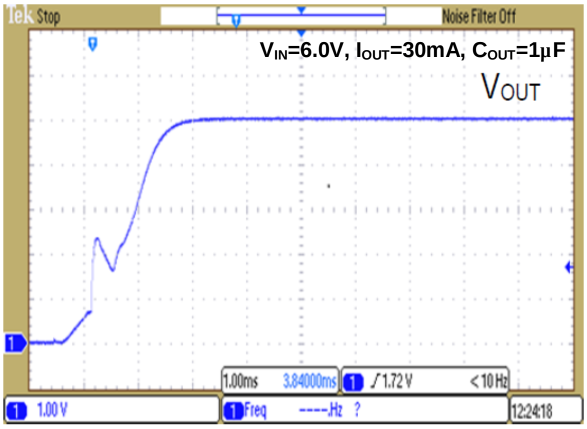


Fig. 2 Startup

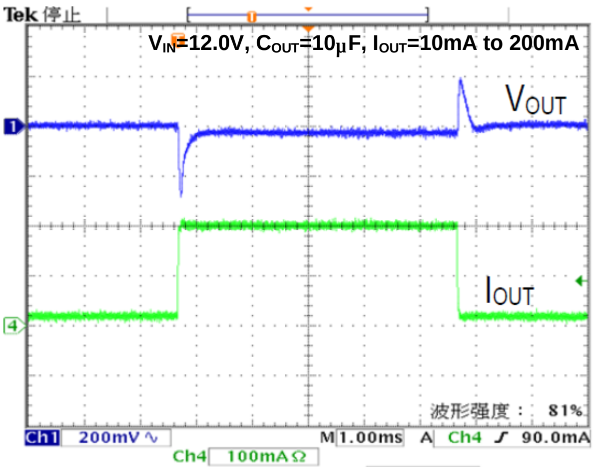


Fig. 3 Load Transient Response

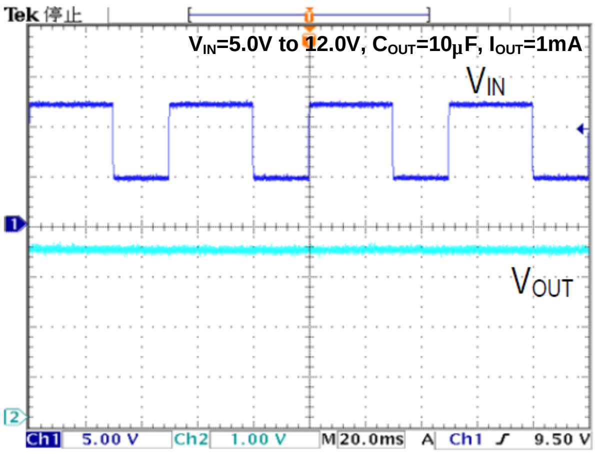


Fig. 4 Line Transient Response

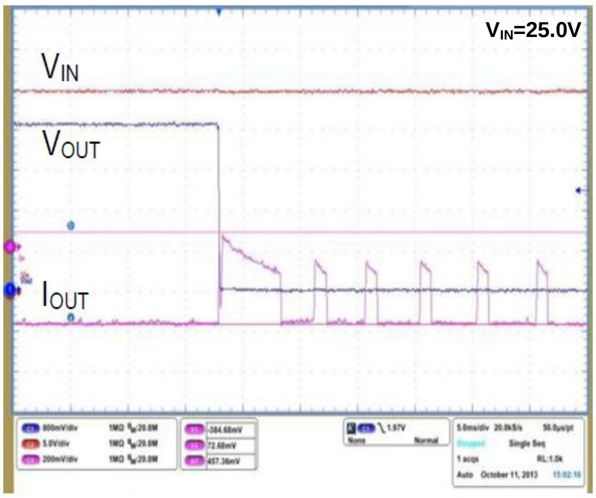


Fig. 5 Short-Circuit Occurred

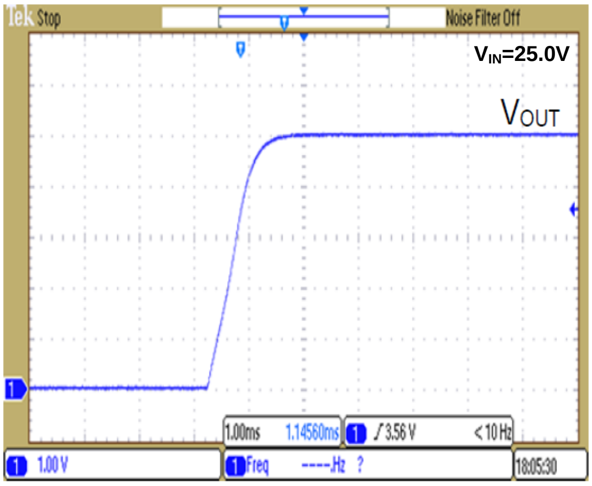
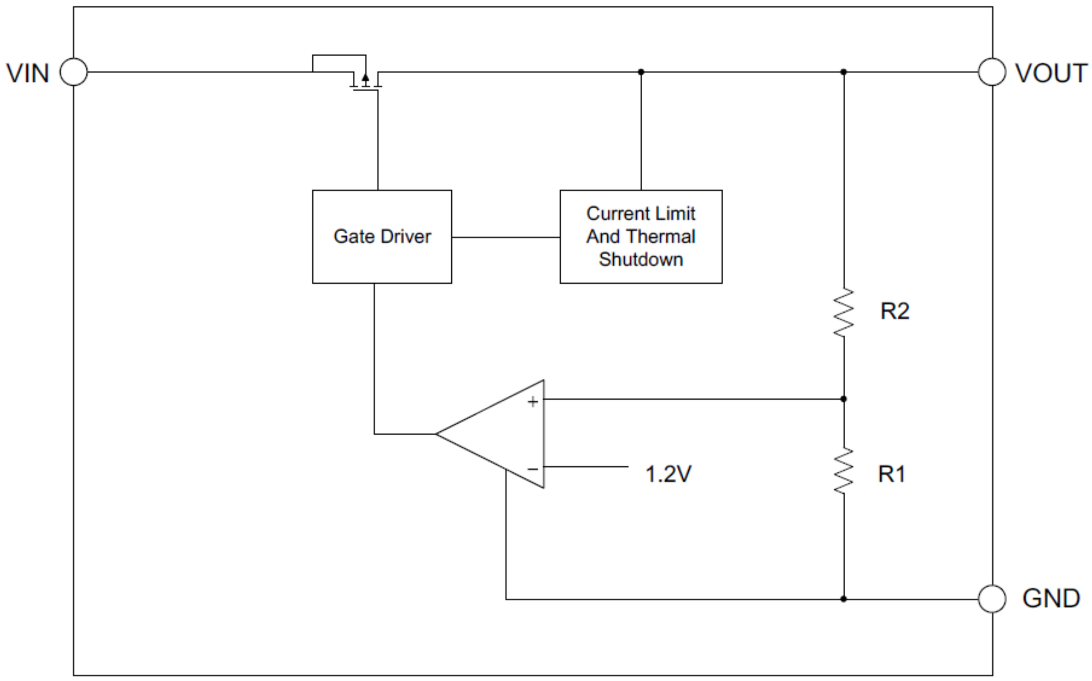


Fig. 6 Short-Circuit Removed

BLOCK DIAGRAM



Functional Block Diagram of AIC1703B

PIN DESCRIPTION

VIN - Regulator input supply pin.
GND - Ground pin.
VOUT - Regulator output pin.

APPLICATION INFORMATION

Power Dissipation

The power dissipated by the p-channel MOSFET

$P_{D(MOSFET)}=(V_{IN}-V_{OUT})*I_{OUT}$

Total Power Dissipation

$P_{D(TOTAL)}=P_{D(MOSFET)}+V_{IN}*I_{GND}$

The quiescent current I_{GND} is only 1.6μA, so that $V_{IN}*I_{GND}$ can be ignored. The maximum power dissipation can be estimated by

$P_{D(max)} = [V_{IN(max)}-V_{OUT(min)}]*I_{OUT}$

Junction Temperature

$T_J=P_{D(max)}*\theta_{JA}+T_A$

θ_{JA} is thermal resistance of junction to ambient, T_A is the ambient temperature.

■ APPLICATION EXAMPLES

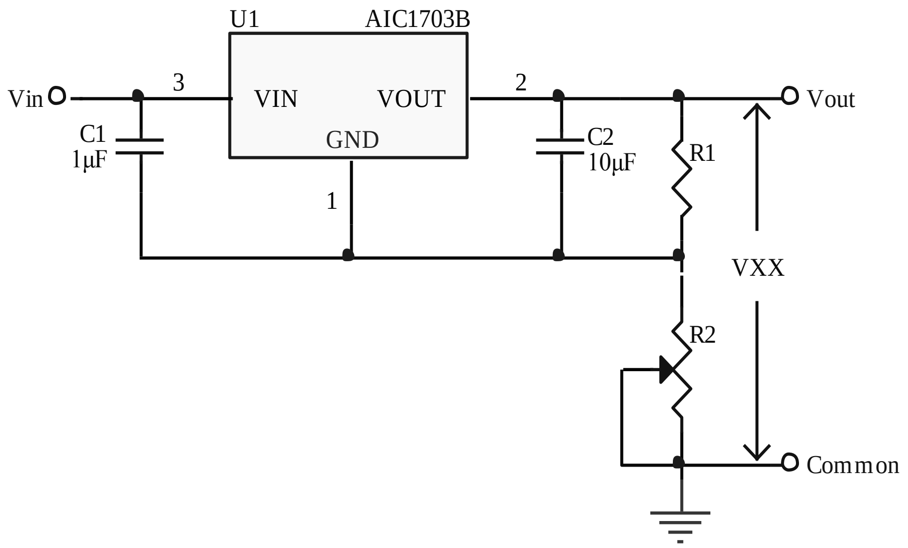


Fig. 7 Application Circuit for Increasing Output Voltage

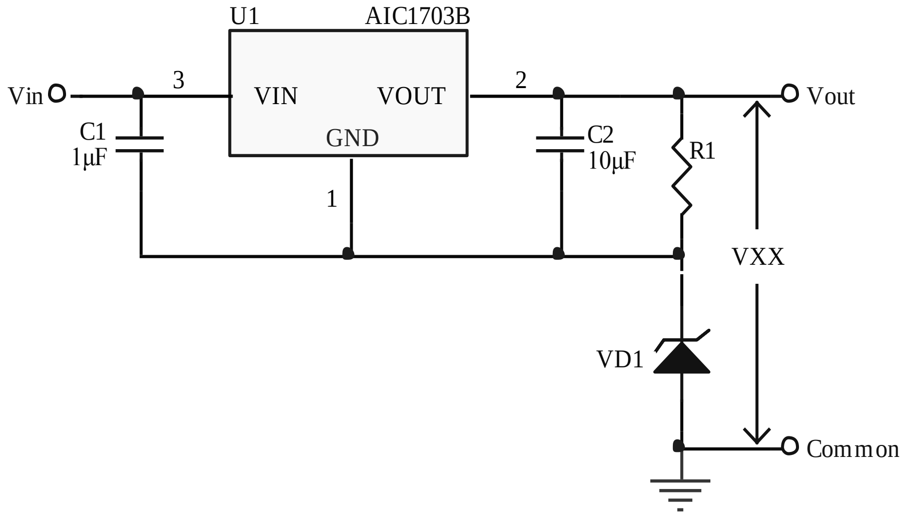
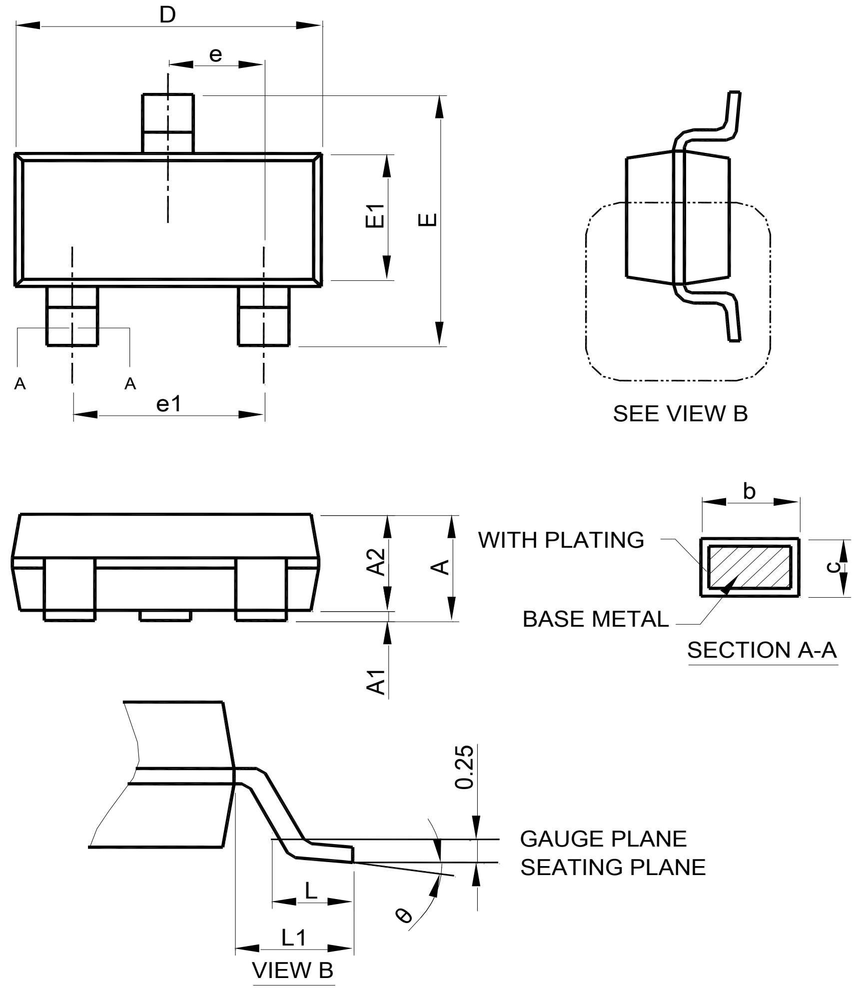


Fig. 8 Application Circuit for Increasing Output Voltage

PHYSICAL DIMENSIONS

- **SOT23-3**



Note: 1. Refer to JEDEC MO-178.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.
3. Dimension "E1" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

SYMBOL	SOT23-3	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.00	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
θ	0°	8°

Note: