150mA/300mA Low Dropout Linear Regulator with 1% Output Accuracy

FEATURES

- Low Dropout Voltage of 130mV at 100mA Output Current (5V Output Version).
- Guaranteed 150mA/300mA Output Current.
- Internal 1.3Ω P-MOSFET Draws no Base Current.
- Low Ground Current: 55μA.
- 1% Accuracy Output Voltage of 3.3V/5V.
- Input Voltage Range up to 12V (5V Output Version).
- Extremely Tight Load and Line Regulation.
- Fast Transient Response.
- Current Limiting and Thermal Protection.

APPLICATIONS

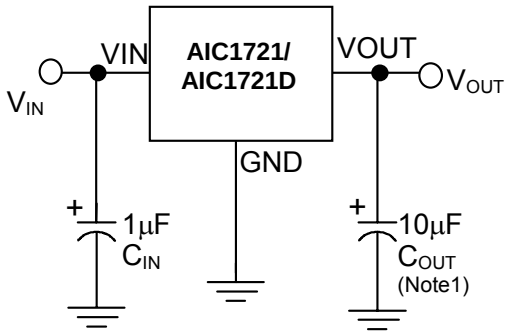
- LAN Cards.
- Wireless Communication Systems.
- Battery Powered Systems.

DESCRIPTION

AIC1721/1721D is a 150mA/300mA low dropout linear regulator. The superior characteristics of the AIC1721/1721D include zero-base current loss, very low dropout voltage, and 1% accuracy output voltage. Typical ground current remains approximately at 55μA, when loading ranges from zero to maximum. When output current is 100mA, in comparison with bipolar counterpart, dropout voltage of AIC1721/1721D is substantially lower (130mV for the AIC1721-5/1721D-5, and 180mV for the AIC1721/1721D). Built-in output current limiting and thermal limiting provide maximal protection to the AIC1721/1721D against fault conditions.

The AIC1721 and AIC1721D are available in popular SOT-89 and TO-92 packages.

TYPICAL APPLICATION CIRCUIT



Low Dropout Linear Regulator

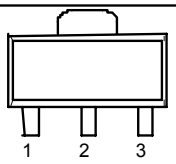
ORDERING INFORMATION

AIC1721X-XXXXX

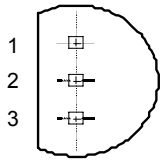
- PACKING TYPE
  - TR: TAPE & REEL
  - BG: BAG
- PACKAGE TYPE
  - X: SOT-89
  - Z: TO-92
- C: Commercial
  - P: Lead Free Commercial
  - G: Green Package
- OUTPUT VOLTAGE
  - DEFAULT: 3.3V
  - 5: 5.0V
- OUTPUT CURRENT
  - DEFAULT: 150mA
  - D: 300mA

PIN CONFIGURATION

SOT-89
FRONT VIEW
1. VOUT
2. GND
3. VIN



TO-92
FRONT VIEW
1. VOUT
2. GND
3. VIN



Example: AIC1721PXTR

→ 150mA, 3.3V Version, in SOT-89 Lead Free Package & Tape & Reel Packing Type

AIC1721D-5GZTR

→ 300mA, 5.0V Version, in TO-92 Green Package & Tape & Reel Packing Type

- **SOT89 Marking**

Part No.	CX	PX	GX
AIC1721	AF33	AF33P	AF33G
AIC1721-5	AF50	AF50P	AF50G

Part No.	CX	PX	GX
AIC1721D	AG33	AG33P	AG33G
AIC1721D-5	AG50	AG50P	AG50G

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage		-0.3~12V
Operating Junction Temperature Range		-40°C~ 85°C
Maximum Junction Temperature		125°C
Storage Temperature Range		-65°C~150°C
Lead Temperature (Soldering) 10 sec.		260°C
Thermal Resistance Junction to Case, $R\theta_{JC}$	SOT-89	30°C /W
	TO-92	120°C /W
Thermal Resistance Junction to Ambient, $R\theta_{JA}$	SOT-89	160°C /W
(Assume no ambient airflow, no heatsink)	TO-92	150°C /W

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

TEST CIRCUIT

Refer to the TYPICAL APPLICATION CIRCUIT

ELECTRICAL CHARACTERISTICS (T_A =25°C, C_{IN}=1μF, C_{OUT}=10μF, unless otherwise specified.)(Note2)

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	AIC1721/1721D-5 V_{IN}=5.5~12V, I_{OUT}=0mA	4.950	5.0	5.050	V
	AIC1721/1721D V_{IN}=3.6~12V, I_{OUT}=0mA	3.267	3.3	3.333	
Output Voltage Temperature Coefficiency	(Note 3)		50	150	PPM/°C
Line Regulation	I_{OUT}=1mA				mV
	AIC1721/1721D-5 V_{IN}=5.5~12V		3	10	
	AIC1721/1721D V_{IN}=3.6~12V		3	10	
Load Regulation (Note 4)	AIC1721-5 V_{IN}=7V, I_{OUT}=0.1~150mA		7	15	mV
	AIC1721D-5 V_{IN}=7V, I_{OUT}=0.1~300mA		7	25	
	AIC1721 V_{IN}=5V, I_{OUT}=0.1~150mA		7	15	
	AIC1721D V_{IN}=5V, I_{OUT}=0.1~300mA		7	25	
Current Limit (Note 5)	AIC1721-5 V_{IN}=7V, V_{OUT}=0V	300	440		mA
	AIC1721 V_{IN}=5V, V_{OUT}=0V	300	440		
	AIC1721D-5 V_{IN}=7V, V_{OUT}=0V	300	440		
	AIC1721D V_{IN}=5V, V_{OUT}=0V	300	440		
Dropout Voltage (Note 6)	AIC1721-5 I_{OUT}=150mA		200	300	mV
	AIC1721 I_{OUT}=150mA		270	370	
	AIC1721D-5 I_{OUT}=300mA		400	500	
	AIC1721D I_{OUT}=300mA		540	640	
Ground Current	I_{OUT}=0.1mA~I_{MAX}				μA
	AIC1721/1721D-5 V_{IN}=5.5~12V		55	80	
	AIC1721/1721D V_{IN}=4~12V		55	80	

Note 1: To avoid output oscillation, aluminum electrolytic output capacitor is recommended and ceramic capacitor is not suggested.

Note 2: 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 3: Guaranteed by design.

Note 4: Regulation is measured at a constant junction temperature, which results from the use of pulse testing.

Note 5: Current limit is measured by pulse testing.

Note 6: Dropout voltage is defined as voltage differential at which the output voltage drops 100mV with an initial 1V differential between input and output.

TYPICAL PERFORMANCE CHARACTERISTICS

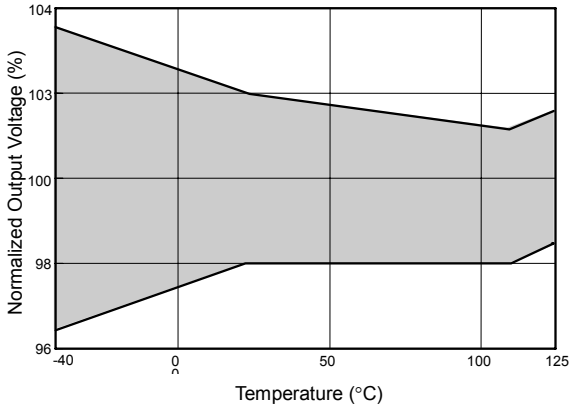


Fig. 1 Output Voltage vs. Temperature

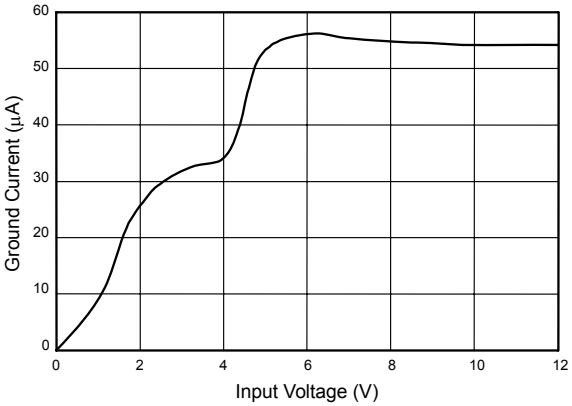


Fig. 2 Ground Current vs. Input Voltage

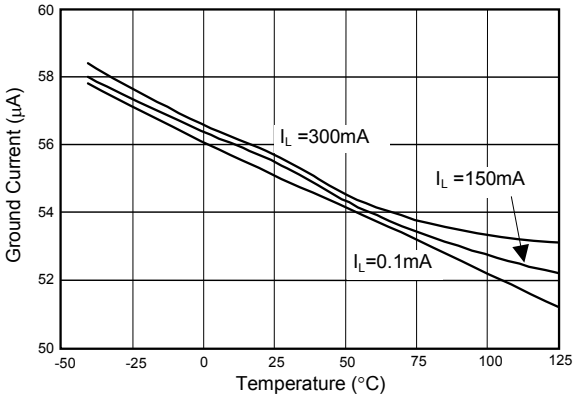


Fig. 3 Ground Current vs. Temperature

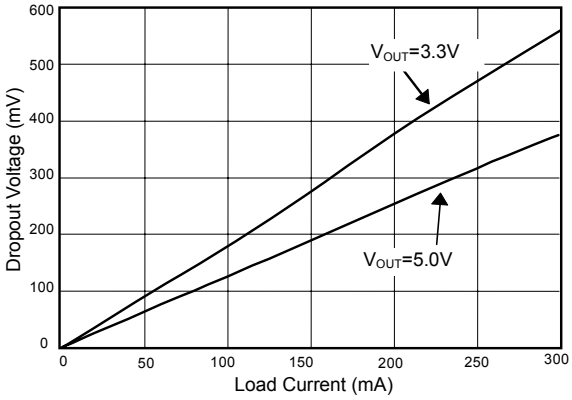


Fig. 4 Dropout Voltage vs. Load Current

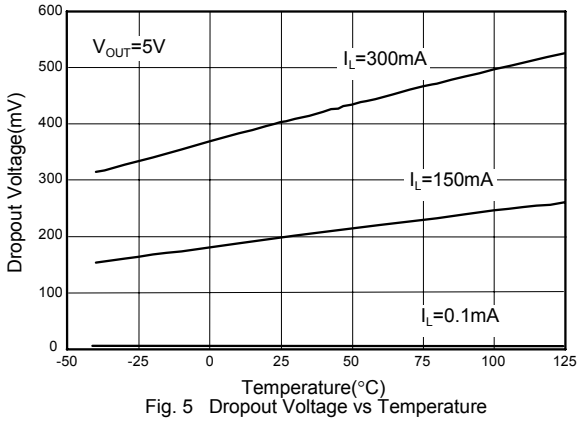


Fig. 5 Dropout Voltage vs Temperature

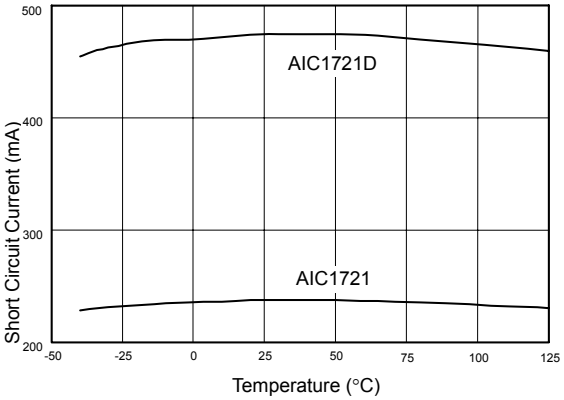


Fig. 6 Short Circuit Current vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

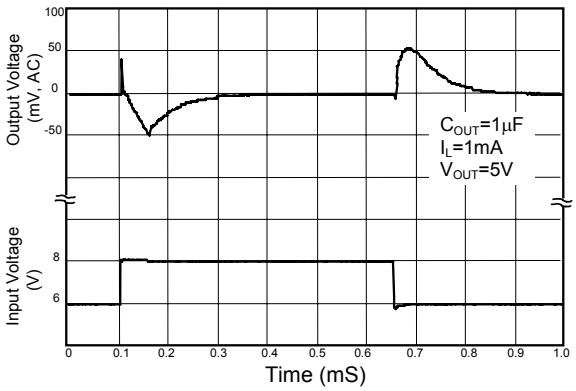


Fig. 7 Line Transient Response

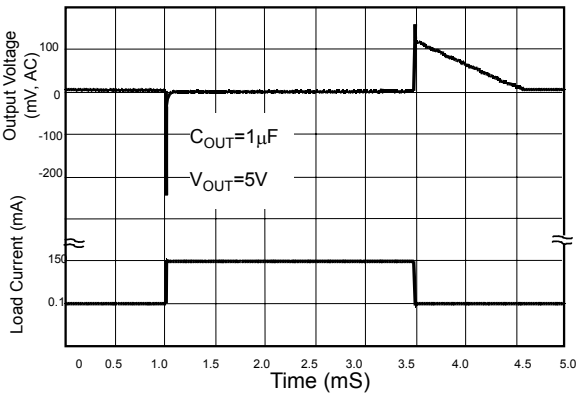


Fig. 8 Load Transient Response

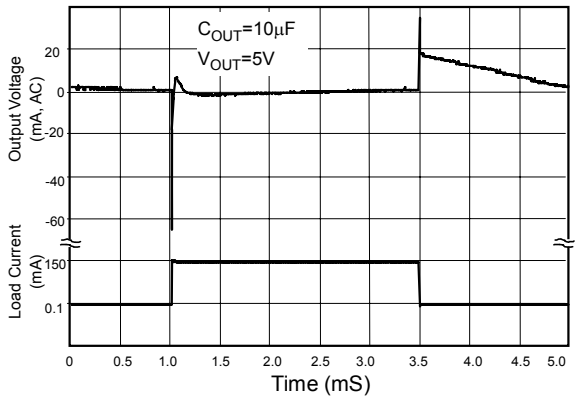
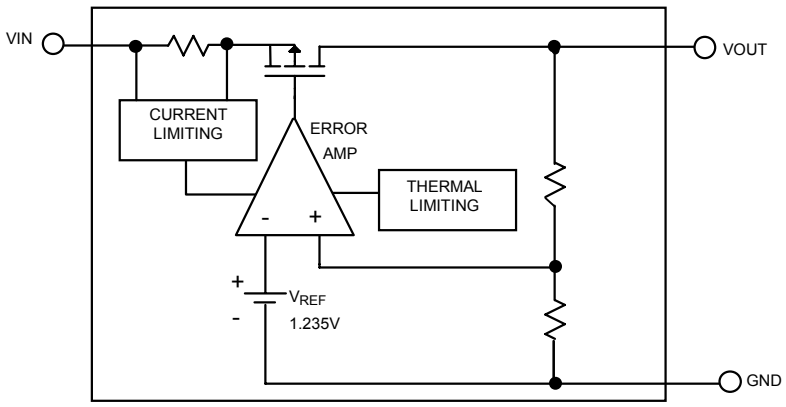


Fig. 9 Load Transient Response

BLOCK DIAGRAM



PIN DESCRIPTIONS

VOUT PIN - Output pin.
GND PIN - Power GND.
VIN PIN - Power Supply Input.

APPLICATION INFORMATION

INPUT-OUTPUT CAPACITORS

Linear regulators require input and output capacitors to maintain stability. Input capacitor at 1μF with a 10uF aluminum electrolytic output capacitor is recommended.

POWER DISSIPATION

The AIC1721/1721D obtains thermal-limiting circuitry, which is designed to protect the device against overload condition. For continuous load condition, maximum rating of junction temperature must not be exceeded. It is important to pay more attention in thermal resistance. It includes junction to case, junction to ambient. The maximum power dissipation of AIC1721/1721D depends on the thermal resistance of its case and circuit board, the temperature difference between the die junction and ambient air, and the rate of airflow. The rate of temperature rise is greatly affected by the mounting pad configuration on the PCB, the board material, and the ambient temperature. When the IC mounting with good thermal conductivity is used, the junction temperature will be low even when large power dissipation applies.

The power dissipation across the device is

$P = I_{OUT} (V_{IN}-V_{OUT})$.

The maximum power dissipation is:

$$P_{MAX} = \frac{(T_{J\text{-}max} - T_A)}{R\theta_{JA}}$$

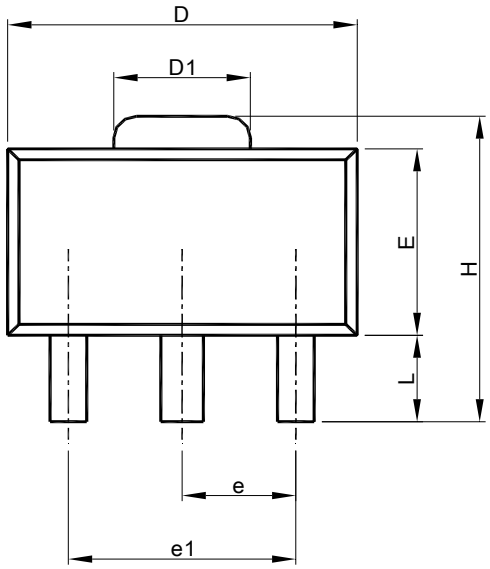
Where $T_{J\text{-}max}$ is the maximum allowable junction temperature (125°C), and T_A is the ambient temperature suitable in application.

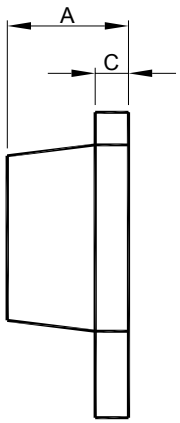
As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature.

GND pin performs a dual function for providing an electrical connection to ground and channeling heat away. Therefore, connecting the GND pin to ground with a large pad or ground plane would increase the power dissipation and reduce the device temperature.

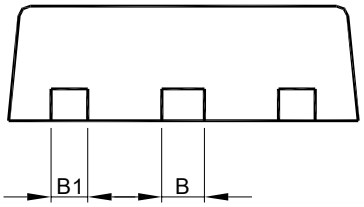
PHYSICAL DIMENSIONS (unit: mm)

- **SOT-89**



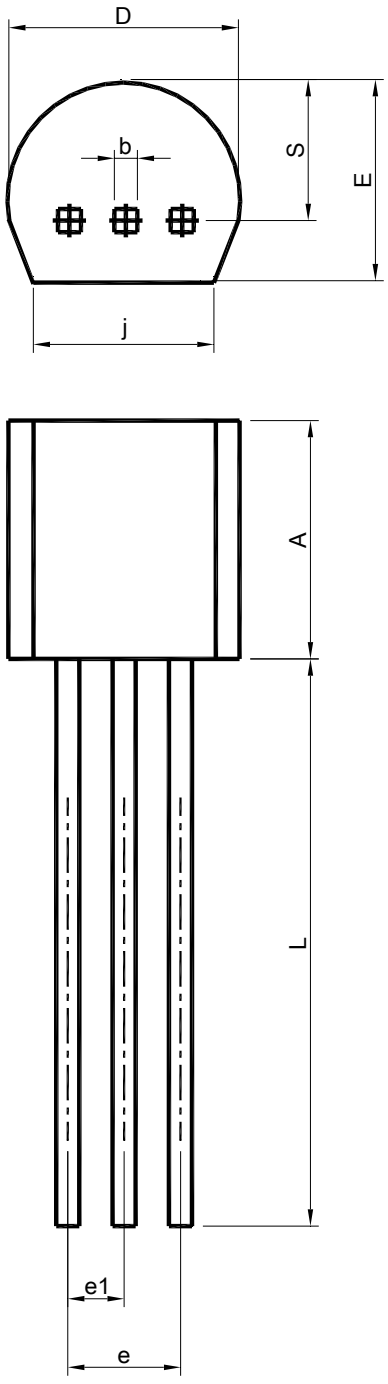


SYMBOL	SOT-89	
	MILLIMETERS	
	MIN.	MAX.
A	1.40	1.60
B	0.44	0.56
B1	0.36	0.48
C	0.35	0.44
D	4.40	4.60
D1	1.50	1.83
E	2.29	2.60
e	1.50 BSC	
e1	3.00 BSC	
H	3.94	4.25
L	0.89	1.20



Note: 1. Refer to JEDEC TO-243AA.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
3. Dimension "E" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

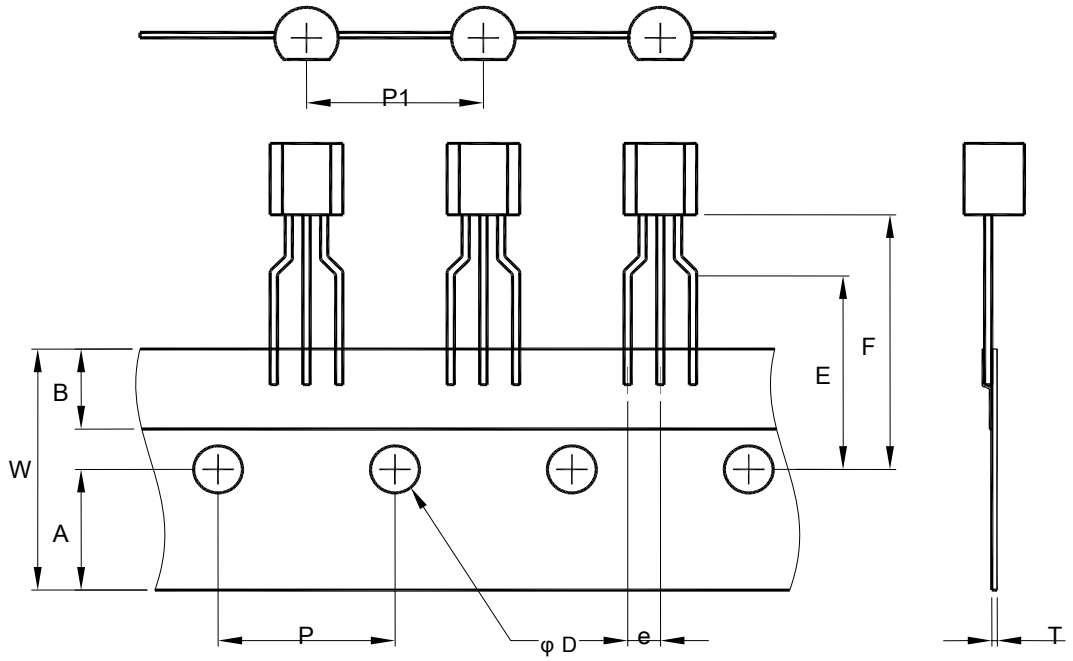
- **TO-92 (BAG)**



SYMBOL	TO-92	
	MILLIMETERS	
	MIN.	MAX.
A	4.32	5.33
b	0.36	0.47
D	4.45	5.20
E	3.18	4.19
e	2.42	2.66
e1	1.15	1.39
j	3.43	
L	12.70	
S	2.03	2.66

Note: 1. Refer to JEDEC TO-226.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "A" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

- **TO-92 (Tape & Reel)**



SYMBOL	W	A	B	E	F
SPEC.	18.0± 0.2	9.0± 0.2	6.0± 0.20	16.0± 0.5	19.0± 0.5
SYMBOL	P	P1	D	e	T
SPEC.	12.7 BSC	12.7 BSC	4.0± 0.2	2.5 BSC	0.6± 0.1

Note:

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