Negative Voltage Regulator

FEATURES

- Low Power Consumption, 0.78W(TO-92 Package)
- Output Short Circuit Protected.
- Wide Operating Voltage up to -13V.
- Low 6μA Quiescent Supply Current
- Stable with 1μF C_{OUT}
- -5.0V, -3.3V, or -3.0V Output Voltage
- Space-Saving Package: TO-92 or SOT-89

APPLICATIONS

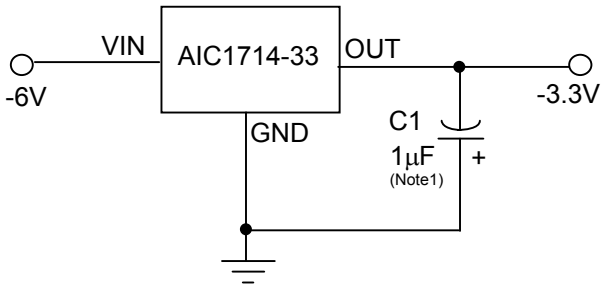
- LCD display
- Cameras

DESCRIPTION

The AIC1714 is 3-terminal negative voltage regulators, which transform from negative supply voltage. The high capacity and long service life of battery, which result from the characteristics of AIC1714 – low quiescent current consumed and low dropout voltage needed, perfectly meet the requirement for battery-powered portable devices as well as LCD displays.

The AIC1714 is available in several preset output voltage versions (-5.0V, -3.3V, and -3.0V) with short circuit protection and offered in TO-92 and SOT-89 packages.

TYPICAL APPLICATION CIRCUIT



Negative Voltage Regulator

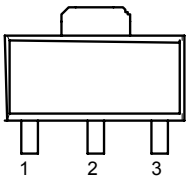
ORDERING INFORMATION

AIC1714-XXXXXX

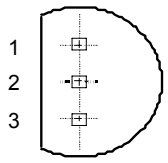
- PACKING TYPE
  - TR: TAPE & REEL
  - TB: TUBE
- PACKAGE TYPE
  - X: SOT-89
  - Z: TO-92
- C: Commercial
  P: Lead Free Commercial
  G:Green Pqckage
- OUTPUT VOLTAGE
  - 30: -3.0V
  - 33: -3.3V
  - 50: -5.0V

PIN CONFIGURATION

SOT-89(CX&PX)
TOP VIEW
1. VIN
2. GND
3. VOUT



TO-92(CZ&PZ)
TOP VIEW
1. GND
2. VIN
3. VOUT



Example: AIC1714-30CXTR

→ -3.0V Version, in SOT-89 Package & Tape & Reel Packing Type

AIC1714-30PXTR

→ -3.0V Version, in SOT-89 Lead Free Package & Tape & Reel Packing Type

AIC1714-30GXTR

→ -3.0V Version, in SOT-89 Green Package & Tape & Reel Packing Type

- **SOT89 Marking**

Part No.	CX	PX	GX
AIC1714-30	AP30	AP30P	AP30G
AIC1714-33	AP33	AP33P	AP33G
AIC1714-50	AP50	AP50P	AP50G

ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... -13V

Operating Temperature Range ..... - 40°C~85°C

Storage Temperature Range ..... - 65°C~150°C

Maximum Junction Temperature ..... 125°C

Lead Temperature (Soldering) 10 sec. ..... 260°C

Thermal Resistance (Junction to Case) SOT-89 ..... 30°C /W

TO-92 ..... 120°C /W

Thermal Resistance (Junction to Ambient) 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 "TYPICAL APPLICATION CIRCUIT"

ELECTRICAL CHARACTERISTICS (V_{IN}= -6.0V, T_J=25°C, unless otherwise specified.) (Note2)

PARAMETER	TEST CONDITIONS		SYMBOL	MIN.	TYP.	MAX.	UNIT
Output Voltage	I_{OUT}=300μA	AIC1714-30	V_{OUT}	-2.95	-3.0	-3.05	V
		AIC1714-33		-3.25	-3.3	-3.35	V
		AIC1714-50		-4.93	-5.0	-5.07	V
Load Regulation	I_{OUT}=0~5mA		ΔV_{OUT}		20	100	mV
I/O Voltage Difference	I_{OUT}=300μA		V_{DIFF}		50	200	mV
Supply Current	I_{OUT}=0		I_{IN}		6	12	μA
Input Stability			$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT}}$		0.05		%/ V
Temperature Coefficient	-25°C~85°C		T_C		50		ppm
Output Short Circuit Current	R_{LOAD}=0			15	24		mA

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).

TYPICAL PERFORMANCE CHARACTERISTICS

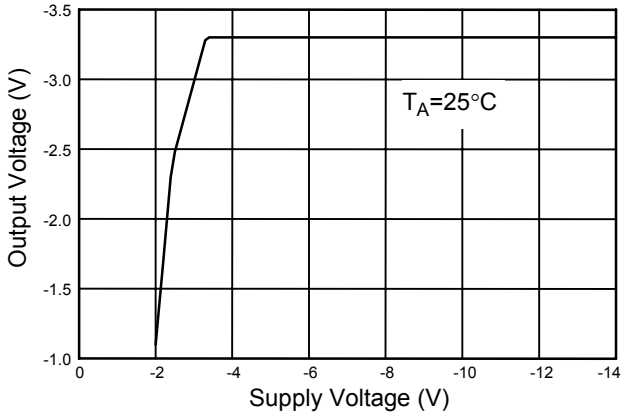


Fig. 1 Output Voltage vs. Supply Voltage
(Load Current=300μA)

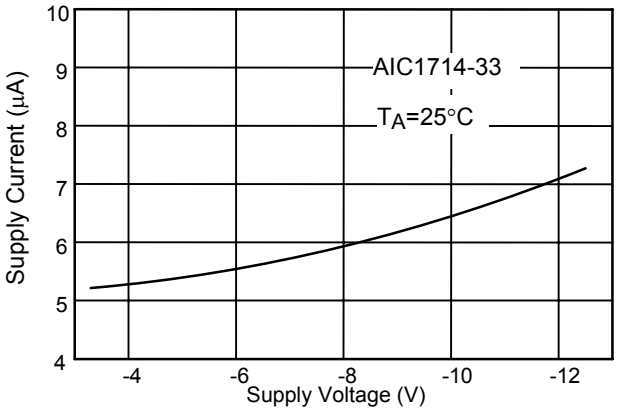


Fig. 2 Supply Current vs. Supply Voltage
(No Load)

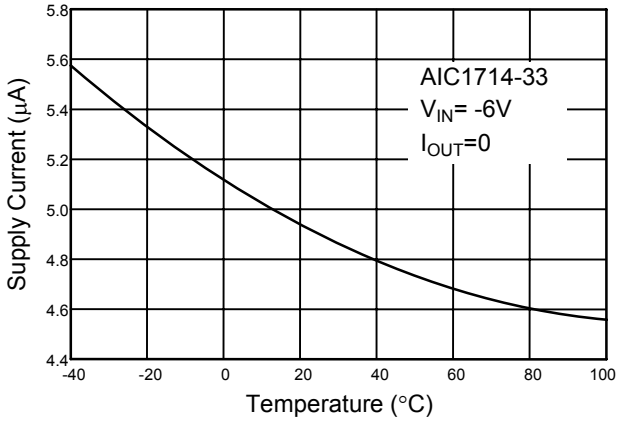


Fig. 3 Supply Current vs Temperature

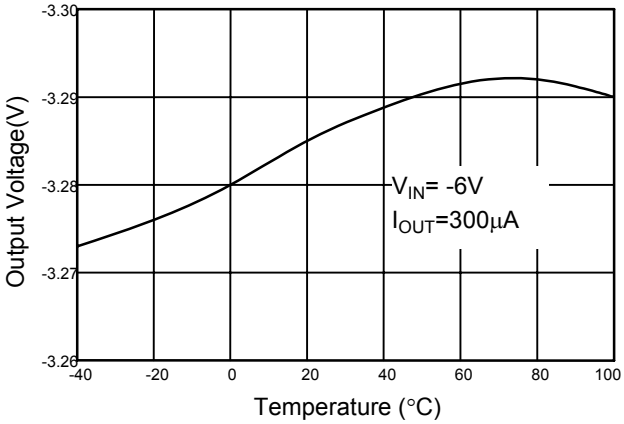


Fig 4 Output Voltage vs Temperature

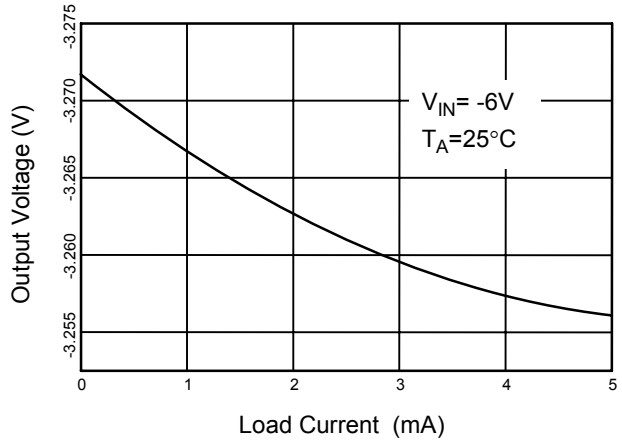
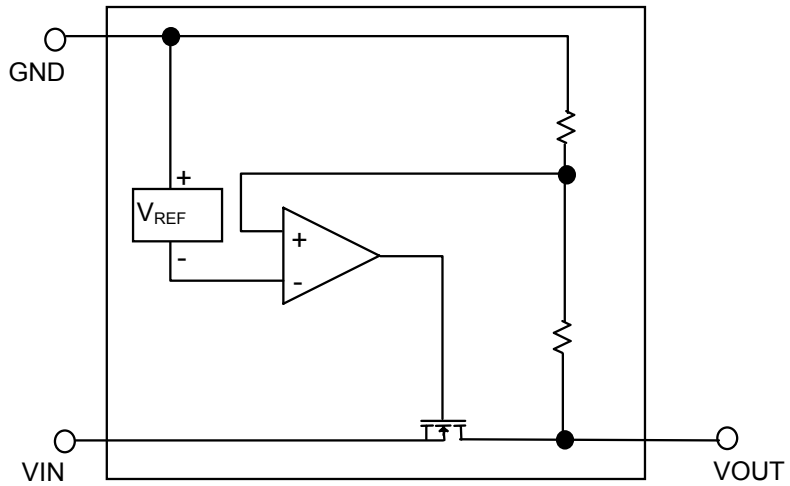


Fig. 5 Output Voltage vs Load Current

BLOCK DIAGRAM



PIN DESCRIPTIONS

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

APPLICATION INFORMATION

INPUT-OUTPUT CAPACITORS

The linear regulator requires the output capacitor to maintain stability. An aluminum electrolytic output capacitor at 1μF is recommended for most AIC1714 applications. A 0.1 μF input capacitor (or greater) should be placed from the AIC1714 input to ground if the lead inductance between the input and the power source exceeds 500nH.

POWER DISSIPATION

The maximum power dissipation of AIC1714 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:

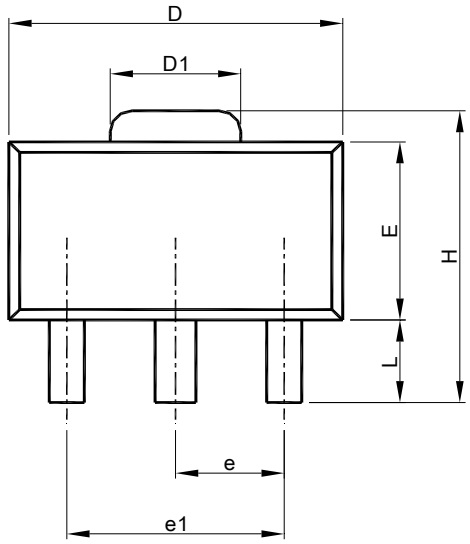
$$P_{MAX} = \frac{(T_{J\text{-}max} - T_A)}{R\theta_{JA}}$$

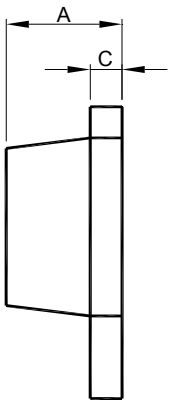
Where $T_{J\text{-}max}$ is the maximum allowable junction temperature (125°C), and T_A is the ambient temperature suitable in application.

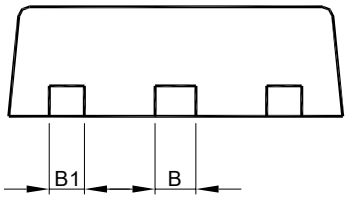
As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature.

PHYSICAL DIMENSIONS (unit: mm)

- **SOT-89**



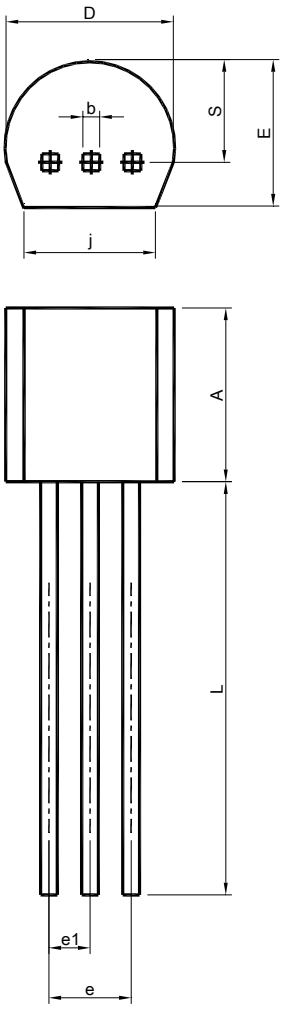




SYMBOL	SOT-89	
	MILLIMETERS	
	MIN.	MAX.
A	1.40	1.60
B	0.44	0.56
B1	0.36	0.48
C	0.35	0.44
D	4.40	4.60
D1	1.50	1.83
E	2.29	2.60
e	1.50 BSC	
e1	3.00 BSC	
H	3.94	4.25
L	0.89	1.20

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.

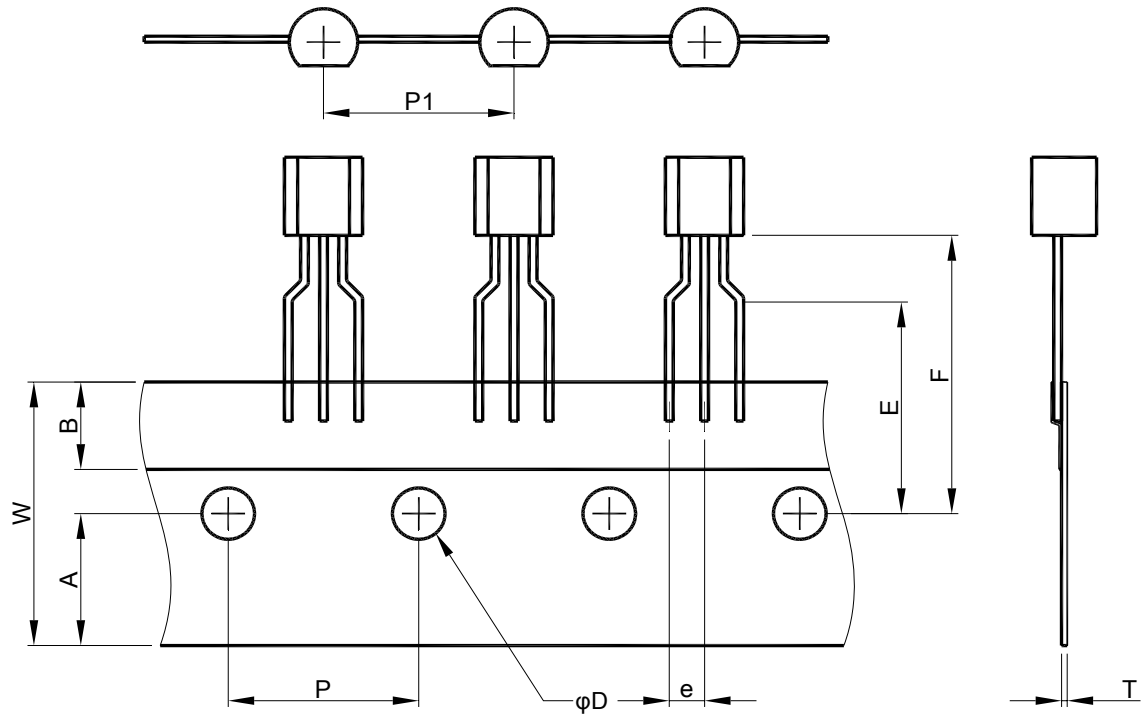
- **TO-92 (BAG)**



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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