



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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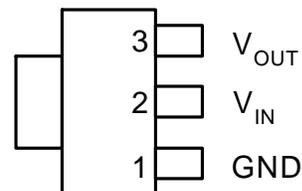
## Description

The NK-AP7217D low-dropout linear regulator operates from 2.5V to 5.5V supply and delivers a guaranteed 600mA continuous load current.

The space-saving SOT89-3L package is suitable for "pocket" and hand-held application.

## Pin Assignments

### ( Top View )



**Tab is  $V_{IN}$**

**SOT89-3L**

## Features

- Low Current Consumption: Typ. 40 $\mu$ A
- Output Voltage: 1.2V
- Guaranteed 600mA Output Current
- Dropout Voltage 850mV at 600mA Output Current
- Input Voltage Range: 2.5V to 5.5V
- Current Limit Protection
- Thermal shutdown Protection
- Stability with Low ESR Capacitors
- Low Temperature Coefficient

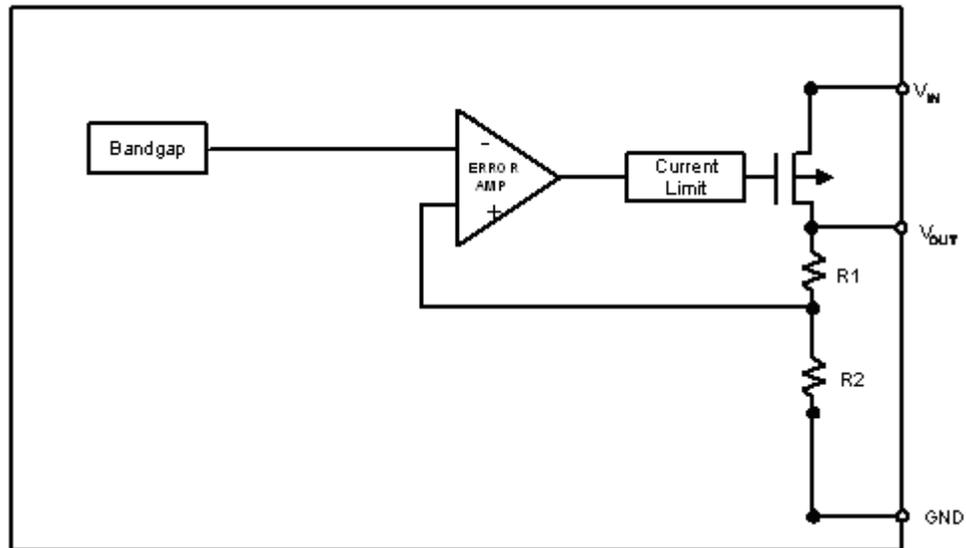
## Applications

- CD and MP3 players
- Cellular and PCS phones
- Digital still cameras
- Hand-held computers

## Pin Descriptions

Pin Name	Pin No.	Function
GND	1	Ground
$V_{IN}$	2	Supply Voltage
$V_{OUT}$	3	Voltage Output

## Functional Block Diagram



## Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
ESD HBM	Human Body Model ESD Protection		3	KV
ESD MM	Machine Model ESD Protection		450	V
$V_{IN}$	Input Voltage		+6	V
$P_D$	Power Dissipation @ $T_A = +25^{\circ}\text{C}$ (Note 4)	SOT89-3L	578	mW
$T_{MJ}$	Maximum Junction Temperature		150	$^{\circ}\text{C}$

Note: 4. Maximum  $P_D$  is under minimum recommended pad layout condition.

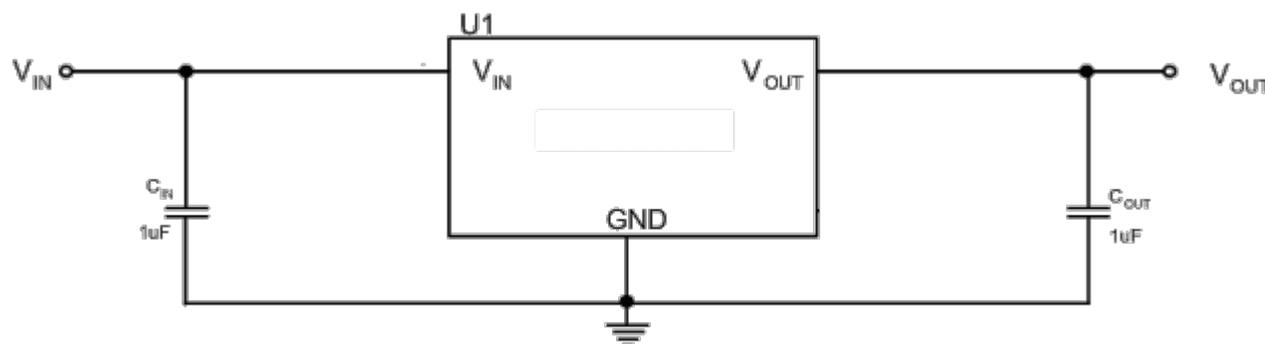
## Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
$V_{IN}$	Input Voltage	2.5	5.5	V
$I_{OUT}$	Output Current	0	600	mA
$T_A$	Operating Ambient Temperature	-40	85	$^{\circ}\text{C}$
$T_J$	Operating Junction Temperature	-40	125	$^{\circ}\text{C}$

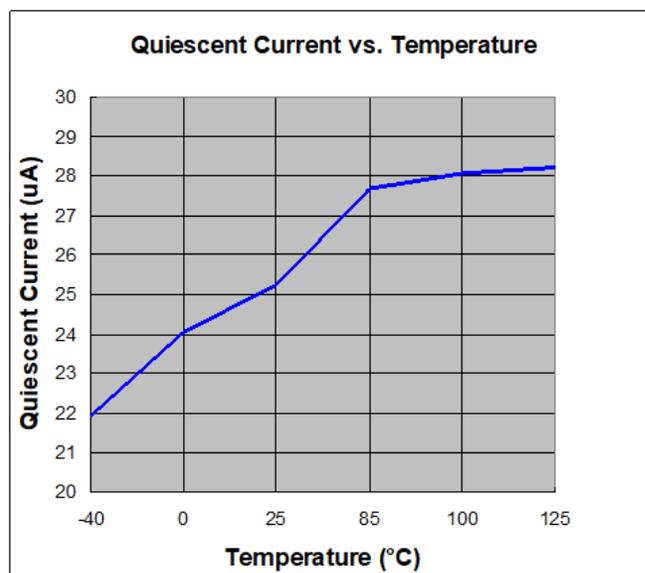
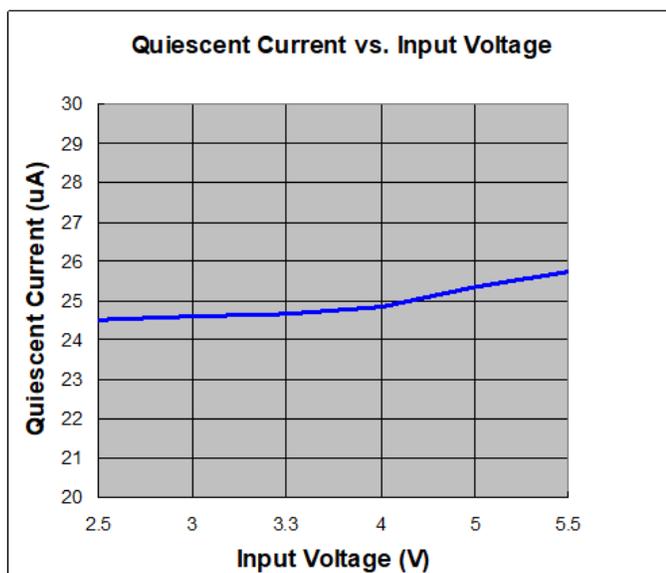
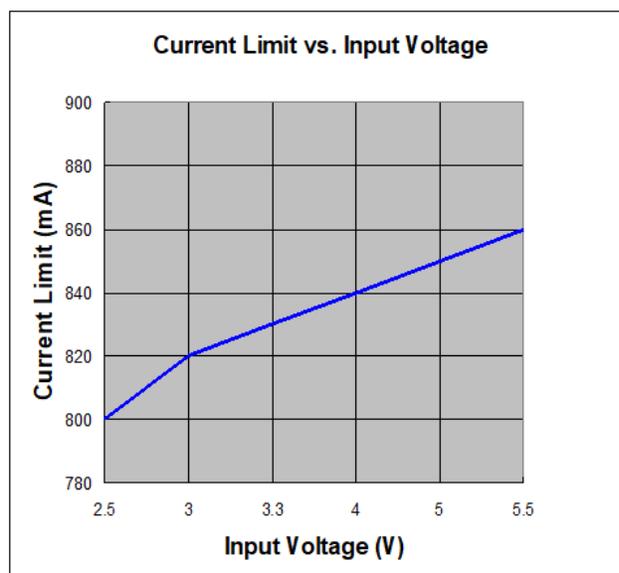
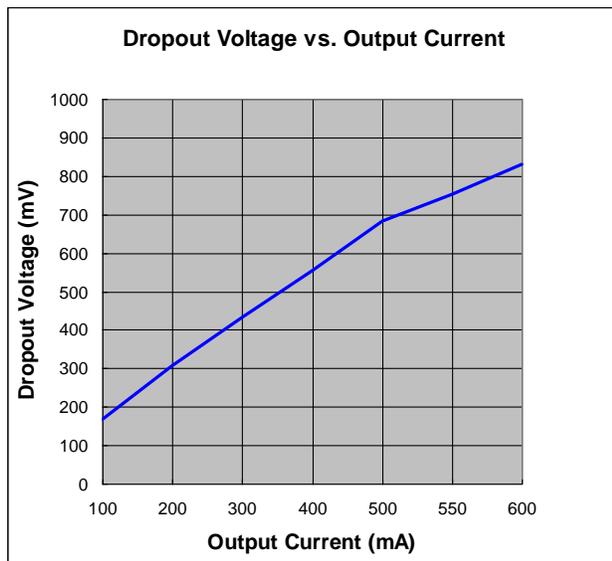
**Electrical Characteristics** ( $T_A = +25^\circ\text{C}$ ,  $C_{IN} = 1\mu\text{F}$ ,  $C_{OUT} = 1\mu\text{F}$ ,  $V_{IN} = 5\text{V}$ , unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
$I_Q$	Quiescent Current	$I_O = 0\text{mA}$	—	40	60	$\mu\text{A}$
$V_{OUT}$	Output Voltage Accuracy	$I_O = 30\text{mA}$	1.176	1.2	1.224	V
	$V_{OUT}$ Temperature Coefficient	$-40^\circ\text{C}$ to $85^\circ\text{C}$ , $I_{OUT} = 30\text{mA}$	—	$\pm 100$	—	ppm/ $^\circ\text{C}$
$V_{DROPOUT}$	Dropout Voltage	$I_{OUT} = 600\text{mA}$ , $V_{OUT} = 1.2\text{V}$	—	850	1300	mV
$I_{OUT}$	Maximum Output Current	—	600	—	—	mA
$I_{LIMIT}$	Current Limit	—	—	850	—	mA
$I_{SHORT}$	Short Circuit Current	—	—	200	—	mA
$\Delta V_{LINE}$	Line Regulation	$2.5\text{V} \leq V_{IN} \leq 5.5\text{V}$ ; $I_{OUT} = 30\text{mA}$	—	0.2	—	%/V
$\Delta V_{LOAD}$	Load Regulation (Note 5)	$1\text{mA} \leq I_{OUT} \leq 300\text{mA}$	—	15	35	mV
		$1\text{mA} \leq I_{OUT} \leq 600\text{mA}$	—	30	55	mV
PSRR	Power Supply Rejection	$V_{IN} = 4.3\text{V} + 0.5\text{Vp-pAC}$ , $I_{OUT} = 50\text{mA}$	—	—	—	dB
—	Thermal Shutdown Temperature	—	—	150	—	$^\circ\text{C}$
—	Thermal Shutdown Hysteresis	—	—	30	—	$^\circ\text{C}$
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT89-3L (Note 6)	—	173	—	$^\circ\text{C/W}$
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT89-3L (Note 6)	—	51	—	$^\circ\text{C/W}$

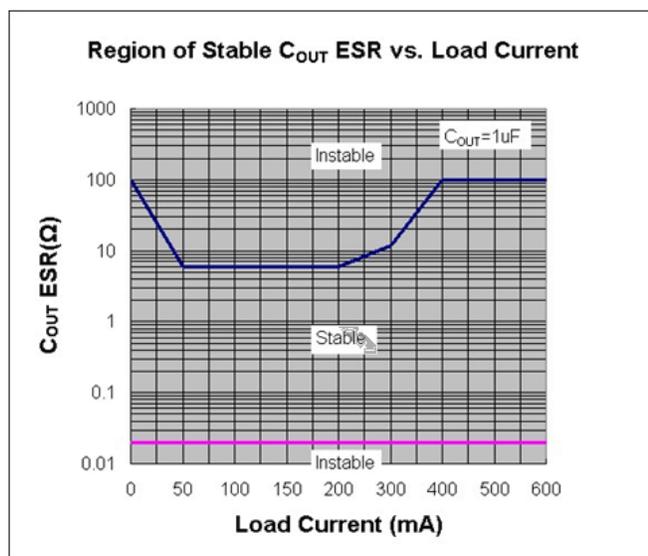
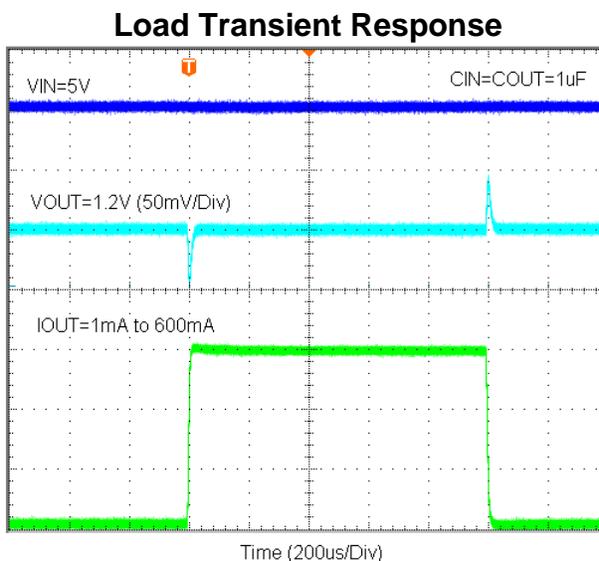
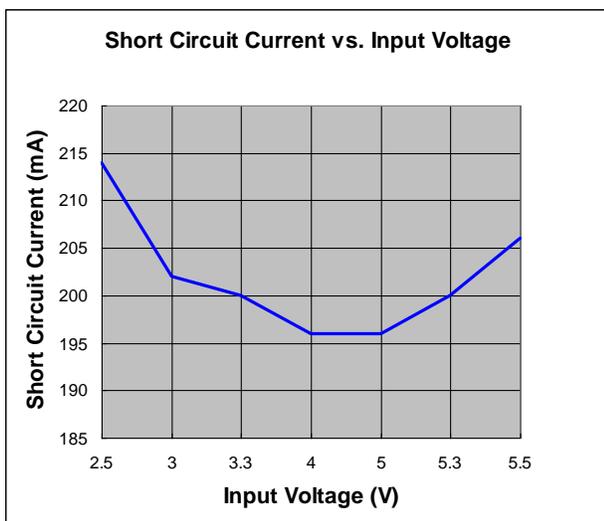
Notes: 5. Regulation is measured at constant junction temperature by low duty cycle pulse testing.  
 6. Test condition for SOT89-3L: Devices mounted on FR-4 substrate, single sided PC board, 2oz copper, with minimum recommended pad layout, no air flow.

**Typical Application**


## Typical Performance Characteristics



Typical Performance Characteristics (continued)



## Application Information

### Input Capacitor

A 1 $\mu$ F ceramic capacitor is recommended to connect between IN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. A lower ESR (Equivalent Series Resistance) capacitor allows the use of less capacitance, while higher ESR type requires more capacitance. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both IN and GND.

### Output Capacitor

The output capacitor is required to stabilize and help the transient response of the LDO. The NK-AP7217D is designed to have excellent transient response for most applications with a small amount of output capacitance. The NK-AP7217D is stable with any small ceramic output capacitors of 1.0 $\mu$ F or higher value, and the temperature coefficients of X7R or X5R type. Additional capacitance helps to reduce undershoot and overshoot during transient. For PCB layout, the output capacitor must be placed as close as possible to OUT and GND pins, and keep the leads as short as possible.

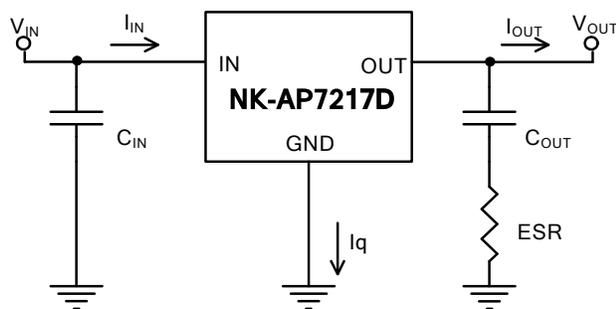
Thermal Shutdown Protection limits power dissipation in the NK-AP7217D. When the operation junction temperature exceeds +150°C, the Over Temperature Protection circuit starts the thermal shutdown function and turns the pass element off. The pass element turn on again after the junction temperature cools by +30°C. For continuous operation, do not exceed recommend maximum operation junction temperature +125°C. The power dissipation definition in device is:

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT} + V_{IN} \times I_Q$$

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junctions to ambient. The maximum power dissipation can be calculated by following formula:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Where  $T_{J(MAX)}$  is the maximum operation junction temperature +125°C,  $T_A$  is the ambient temperature and the  $\theta_{JA}$  is the junction to ambient thermal resistance.



### Current Limit Protection

When output current at OUT pin is higher than current limit threshold, the current limit protection will be triggered and clamp the output current to approximately 850mA to prevent over-current and to protect the regulator from damage due to overheating.

### Short circuit protection

When  $V_{OUT}$  pin is shorted to GND or  $V_{OUT}$  voltage is less than 200mV, short circuit protection will be triggered and clamp the output current to approximately 200mA.

**Package Outline Dimensions** (All Dimensions in mm)

**SOT89-3L**

