



TX73XXM series 250mA Low Power LDO

Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient
- Ultra low quiescent current: 2μA(typ.)
- High input voltage (up to 15V)
- Maximum output current: 250mA
- Output voltage accuracy: tolerance ±2%
- TO92, SOT89 ,SOT23-3 and SOT23 package

Applications

- Battery-powered equipment
- Communication equipment
- Audio/Video equipment

General Description

The TX73XXM series is a set of three-terminal low power high voltage regulators implemented in CMOS technology. They allow input voltages as high as 15V. The series features extremely low quiescent current which is typically 2μA. They are available with several fixed output voltages

ranging from 1.5V to 5.0V. CMOS technology ensures low voltage drop and low quiescent current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

Selection Table

| Part No. | Output Voltage | Package | Marking |
|-----------|----------------|-----------------------------------|---|
| TX7315Mxx | 1.5V | TO92 SOT89 SOT23-3 SOT23 | 73XX-A(for TO92) 73XX-A(for SOT89) 3XX(for SOT23-3) 3XX(for SOT23) |
| TX7318Mxx | 1.8V | | |
| TX7325Mxx | 2.5V | | |
| TX7328Mxx | 2.8V | | |
| TX7330Mxx | 3.0V | | |
| TX7333Mxx | 3.3V | | |
| TX7336Mxx | 3.6V | | |
| TX7340Mxx | 4.0V | | |
| TX7344Mxx | 4.4V | | |
| TX7350Mxx | 5.0V | | |

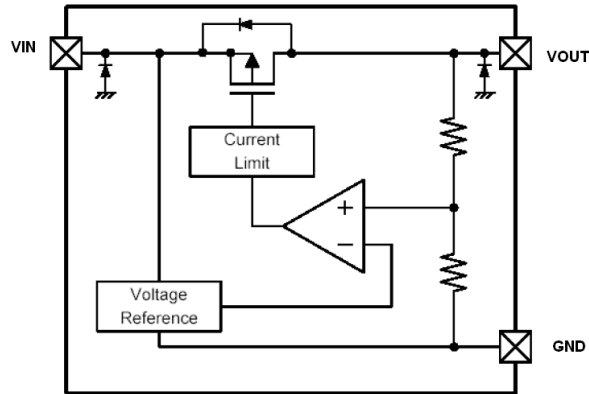
Order Information

TX73①②③④⑤

| Designator | Symbol | Description |
|------------|---------|--------------------------|
| ① ② | Integer | Output Voltage(1.5~5.0V) |
| ③ | M | Standard |
| ④ | T | Package:TO-92 |
| | P | Package:SOT89-3 |
| | M | Package:SOT23-3 |
| | N | Package:SOT23 |
| ⑤ | R | RoHS / Pb Free |
| | G | Halogen Free |



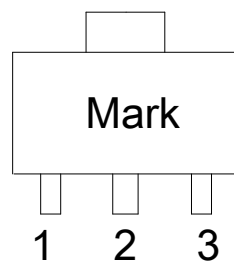
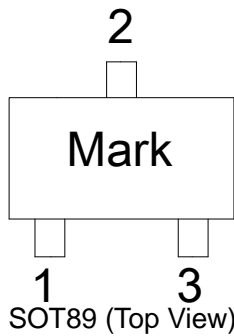
Block Diagram



*Diodes inside the circuit are an ESD protection diode and a parasitic diode.

Pin Assignment

SOT23 and SOT23-3 (Top View)



TO92 (Top View)

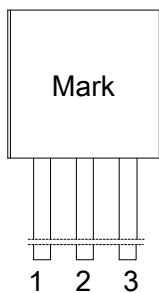


Table1: TX73XXMNR/TX73XXMMR series (SOT23/SOT23-3PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|--------------------|
| 1 | GND | GND pin |
| 2 | VIN | Input voltage pin |
| 3 | VOUT | Output voltage pin |

Table2: TX73XXMPR series (SOT89 PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|--------------------|
| 1 | GND | GND pin |
| 2 | VIN | Input voltage pin |
| 3 | VOUT | Output voltage pin |

Table3: TX73XXMTR series (TO92 PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|--------------------|
| 1 | GND | GND pin |
| 2 | VIN | Input voltage pin |
| 3 | VOUT | Output voltage pin |



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Absolute Maximum Ratings

Supply Voltage-0.3V to 18V Storage Temperature-50°C to 125°C
Operating Temperature-30°C to 85°C

Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Thermal Information

| Symbol | Parameter | Package | Max. | Unit |
|---------------|--|---------|------|------|
| θ_{JA} | Thermal Resistance (Junction to Ambient) (Assume no ambient airflow, no heat sink) | SOT23 | 500 | °C/W |
| | | SOT89 | 200 | °C/W |
| | | TO92 | 200 | °C/W |
| P_D | Power Dissipation | SOT23 | 0.20 | W |
| | | SOT89 | 0.50 | W |
| | | TO92 | 0.50 | W |

Note: P_D is measured at $T_a = 25^\circ\text{C}$

Electrical Characteristics

TX7315Mxx, +1.5V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|------|-----------|------|---------------|
| | | V_{IN} | Conditions | | | | |
| V_{OUT} | Output Voltage | 3.5V | $I_{OUT}=40\text{mA}$ | 1.47 | 1.50 | 1.53 | V |
| I_{OUT} | Output Current | 5.5V | - | - | 250 | - | mA |
| ΔV_{OUT} | Load Regulation | 3.5V | $1\text{mA} \leq I_{OUT} \leq 60\text{mA}$ | - | 45 | 90 | mV |
| V_{DIF} | Voltage Drop(Note) | - | $I_{OUT}=40\text{mA}, \Delta V_{OUT}=2\%$ | - | 650 | 750 | mV |
| I_{SS} | Current Consumption | 3.5V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | $2.5\text{V} \leq V_{IN} \leq 12\text{V}$ $I_{OUT}=40\text{mA}$ | - | 0.2 | - | %/V |
| V_{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 3.5V | $I_{OUT}=40\text{mA}$ $-40^\circ\text{C} < T_a < 85^\circ\text{C}$ | - | ± 0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at $V_{IN} = V_{OUT} + 1\text{V}$ with a fixed load.



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TX7318Mxx, +1.8V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 3.8V | I _{OUT} =10mA | 1.764 | 1.800 | 1.836 | V |
| I _{OUT} | Output Current | 5.8V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 3.8V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 620 | 720 | mV |
| I _{SS} | Current Consumption | 3.8V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 2.8V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 3.8V | I _{OUT} =10mA -40°C < T _a < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.

TX7325Mxx, +2.5V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|------|-------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 4.5V | I _{OUT} =40mA | 2.45 | 2.500 | 2.55 | V |
| I _{OUT} | Output Current | 6.0V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 4.5V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 550 | 650 | mV |
| I _{SS} | Current Consumption | 4.5V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 3.5V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 4.5V | I _{OUT} =40mA -40°C < T _a < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.



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TX7328Mxx, +2.8V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 4.8V | I _{OUT} =10mA | 2.744 | 2.800 | 2.856 | V |
| I _{OUT} | Output Current | 6.1V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 4.8V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 520 | 620 | mV |
| I _{SS} | Current Consumption | 4.8V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 3.8V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 4.8V | I _{OUT} =10mA -40°C < T _a < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.

TX7330Mxx, +3.0V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 5V | I _{OUT} =40mA | 2.94 | 3.00 | 3.06 | V |
| I _{OUT} | Output Current | 6.2V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 5V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 480 | 580 | mV |
| I _{SS} | Current Consumption | 5V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 4V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 5V | I _{OUT} =40mA -40°C < T _a < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.



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TX7333Mxx, +3.3V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 5.3V | I _{OUT} =40mA | 3.234 | 3.300 | 3.366 | V |
| I _{OUT} | Output Current | 6.8V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 5.3V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 440 | 540 | mV |
| I _{SS} | Current Consumption | 5.3V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 4.3V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 5.3V | I _{OUT} =40mA -40°C < T _a < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.

TX7336Mxx, +3.6V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 5.6V | I _{OUT} =40mA | 3.528 | 3.600 | 3.672 | V |
| I _{OUT} | Output Current | 7.0V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 5.6V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 400 | 500 | mV |
| I _{SS} | Current Consumption | 5.6V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 4.6V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 5.6V | I _{OUT} =40mA -40°C < T _a < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.



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TX7344Mxx, +4.4V Output Type

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|--|-------|-------|-------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 6.4V | I _{OUT} =40mA | 4.312 | 4.400 | 4.488 | V |
| I _{OUT} | Output Current | 7.4V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 6.4V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 280 | 380 | mV |
| I _{SS} | Current Consumption | 6.4V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 5.4V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta Ta}$ | Temperature Coefficient | 6.4V | I _{OUT} =40mA -40°C < Ta < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.

TX7350Mxx, +5.0V Output Type

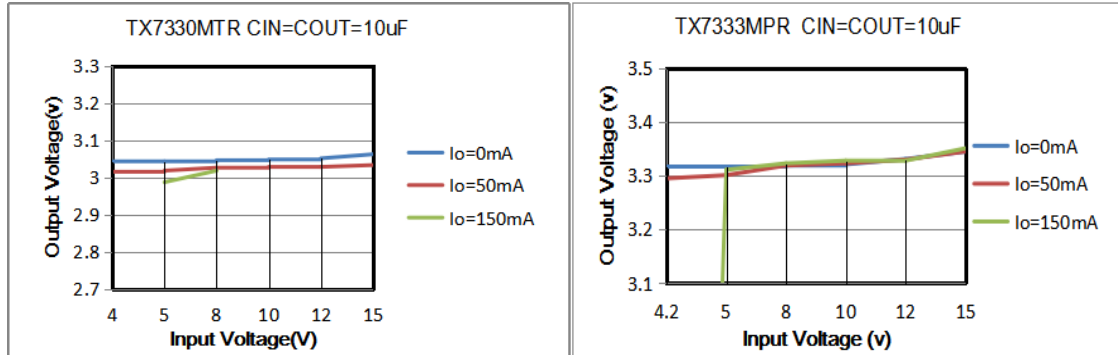
| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|-------------------------|-----------------|--|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 7V | I _{OUT} =40mA | 4.9 | 5.00 | 5.1 | V |
| I _{OUT} | Output Current | 8V | - | - | 250 | - | mA |
| ΔV _{OUT} | Load Regulation | 7V | 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV |
| V _{DIF} | Voltage Drop(Note) | - | I _{OUT} =40mA, ΔV _{OUT} =2% | - | 200 | 300 | mV |
| I _{SS} | Current Consumption | 7V | No load | - | 2.0 | 3.0 | μA |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | - | 6V ≤ V _{IN} ≤ 12V I _{OUT} =40mA | - | 0.2 | - | %/V |
| V _{IN} | Input Voltage | - | - | - | - | 15 | V |
| $\frac{\Delta V_{OUT}}{\Delta Ta}$ | Temperature Coefficient | 7V | I _{OUT} =40mA -40°C < Ta < 85°C | - | ±0.5 | - | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V_{IN} = V_{OUT}+1V with a fixed load.

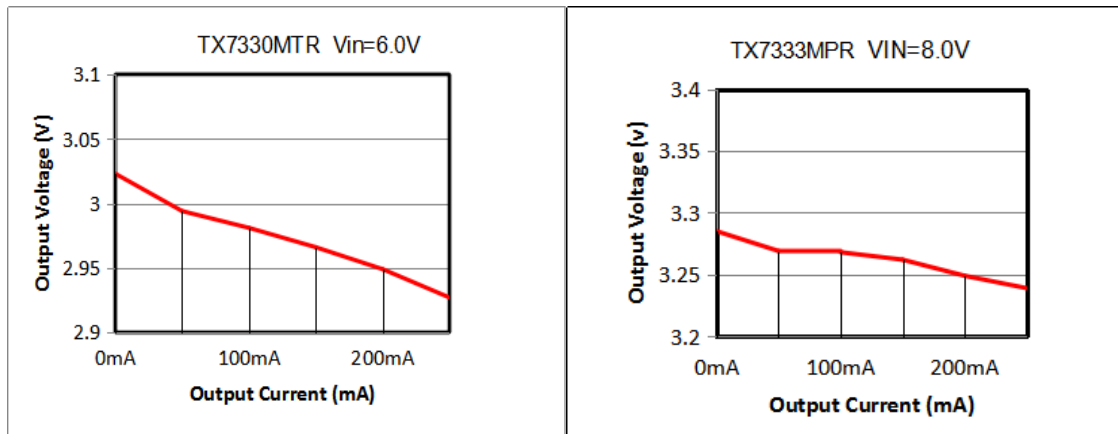


Typical Performance Characteristics

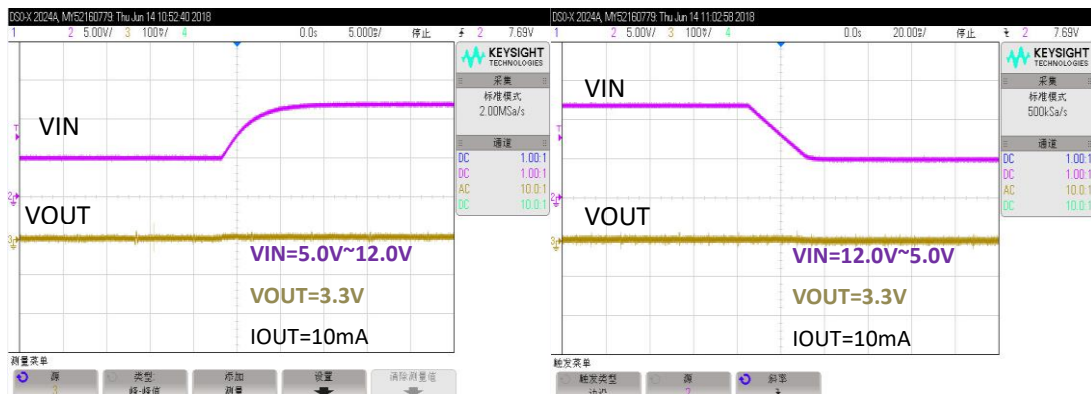
(1) Output Voltage vs Input voltage



(2) Output Voltage vs. Output Current

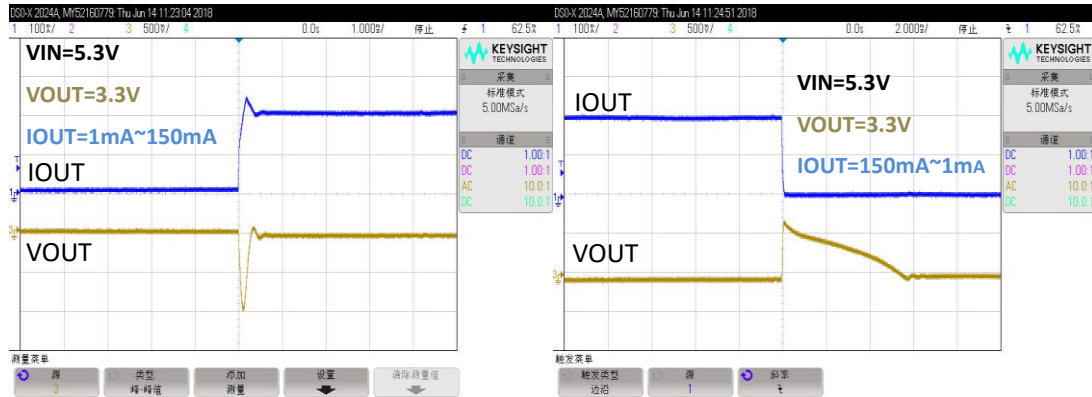


(3) Input Transient Response





(4) Load Transient Response



(5) MAX Output Current Vs. Input Voltage

TX7330MPR

| Input Voltage | Max Output Current |
|---------------|--------------------|
| 6V | 250mA |
| 9V | 200mA |
| 12V | 150mA |
| 15V | 100mA |

TX7333MPR

| Input Voltage | Max Output Current |
|---------------|--------------------|
| 6.3V | 250mA |
| 9V | 200mA |
| 12V | 150mA |
| 15V | 100mA |

TX7350MPR

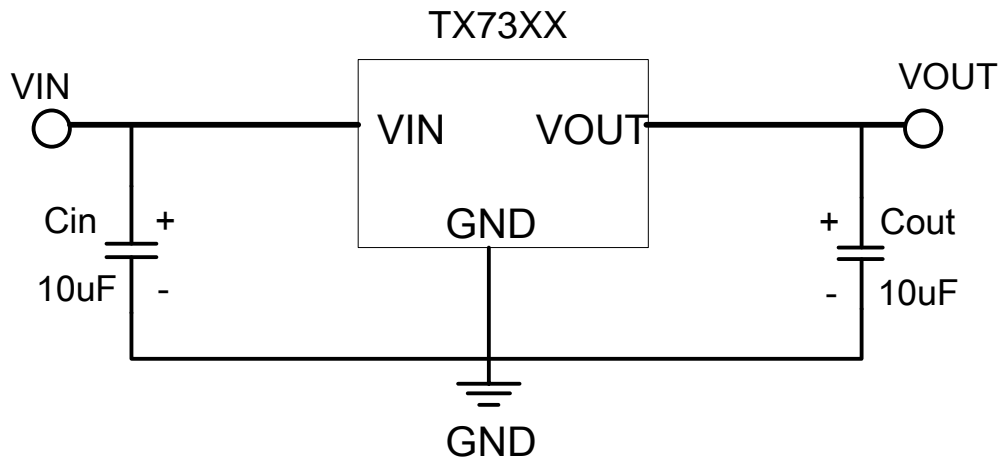
| Input Voltage | Max Output Current |
|---------------|--------------------|
| 8V | 250mA |
| 9V | 200mA |
| 12V | 150mA |
| 15V | 100mA |

Note: 1. The Max Output Current is the typical value;

2. In order to ensure that the best parameters can be achieved, the PCB is preferably provided with a large copper foil area to increase heat dissipation.

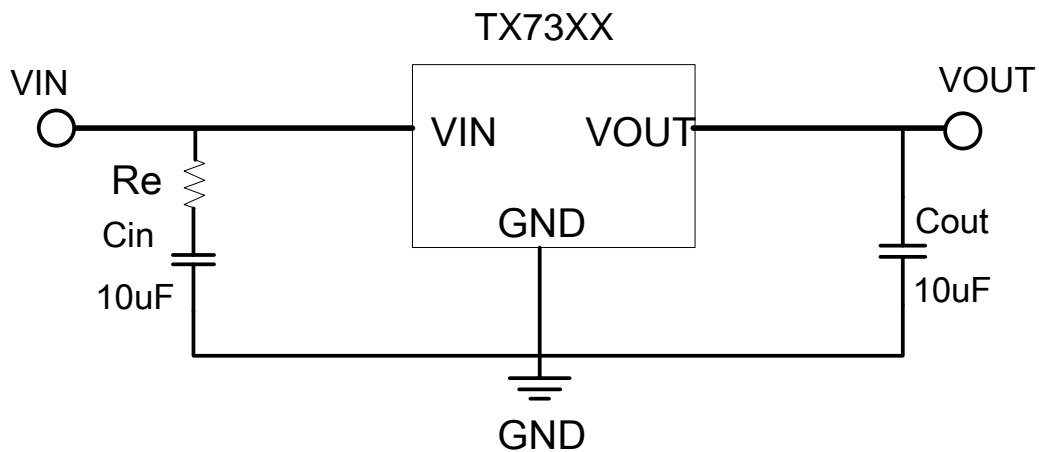


Application Circuits Basic Circuits



Note1: $C_{in}=C_{out}=10\mu F$. (10 μF Electrolytic capacitor is recommended).

Note2: If the input and output capacitors are ceramic, add a resistor at the input, as follows.



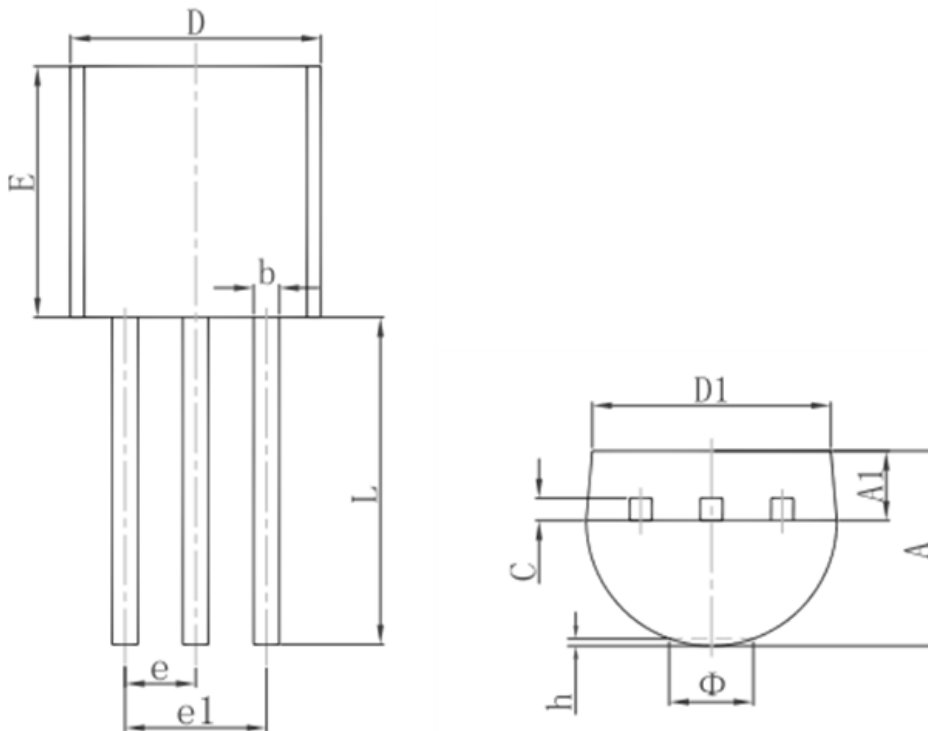
Note: $R_e = (1.2 \sim 1.8) \Omega$.



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TX73XXM series 250mA Low Power LDO

Package Information 3-pin TO92 Outline Dimensions



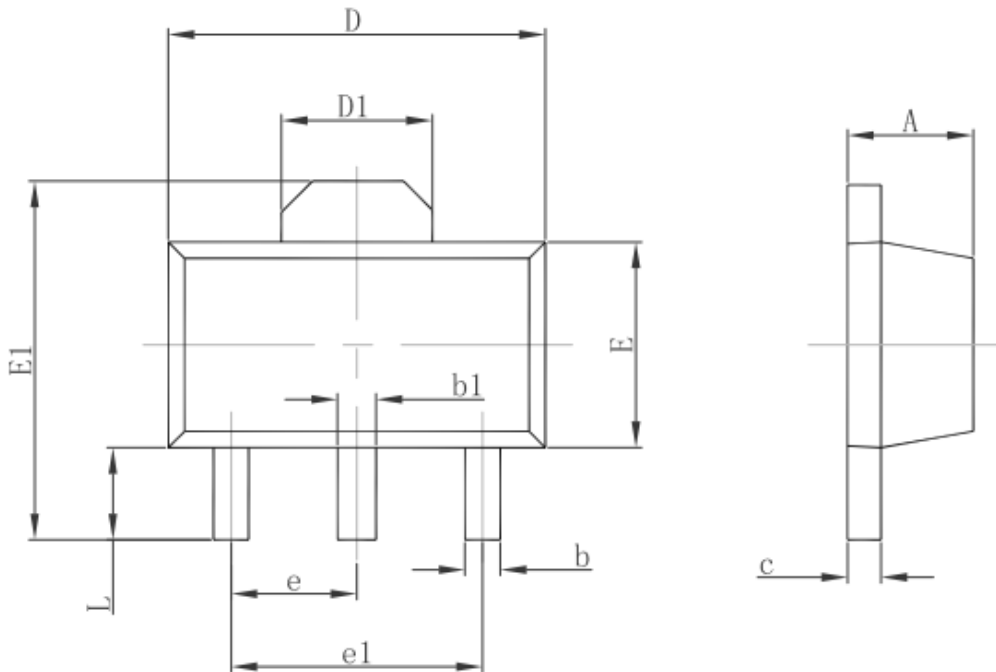
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 3.300 | 3.700 | 0.130 | 0.146 |
| A1 | 1.100 | 1.400 | 0.043 | 0.055 |
| b | 0.380 | 0.550 | 0.015 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| D | 4.300 | 4.700 | 0.169 | 0.185 |
| D1 | 3.430 | | 0.135 | |
| E | 4.300 | 4.700 | 0.169 | 0.185 |
| e | 1.270 TYP. | | 0.050 TYP. | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 14.100 | 14.500 | 0.555 | 0.571 |
| Φ | | 1.600 | | 0.063 |
| h | 0.000 | 0.380 | 0.000 | 0.015 |



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TX73XXM series 250mA Low Power LDO

3-pin SOT89 Outline Dimensions

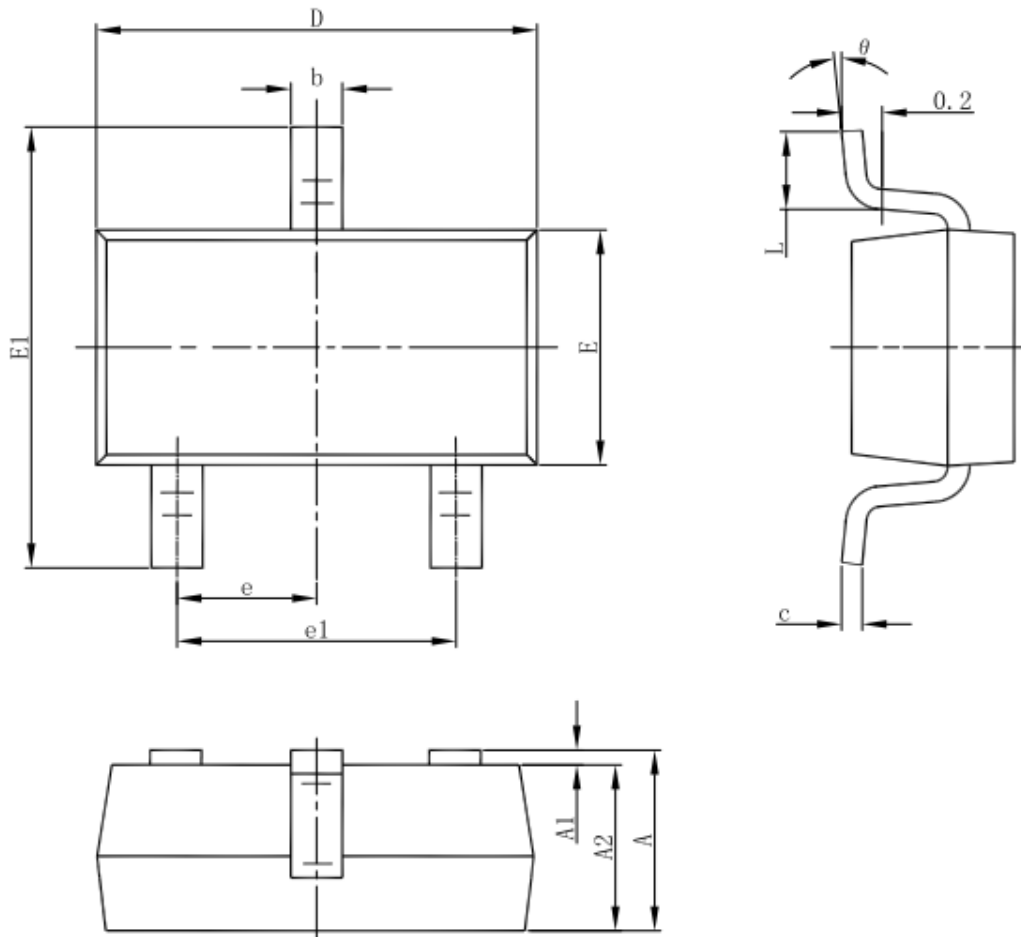


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 1.400 | 1.600 | 0.055 | 0.063 |
| b | 0.320 | 0.520 | 0.013 | 0.020 |
| b1 | 0.400 | 0.580 | 0.016 | 0.023 |
| c | 0.350 | 0.440 | 0.014 | 0.017 |
| D | 4.400 | 4.600 | 0.173 | 0.181 |
| D1 | 1.550 REF. | | 0.061 REF. | |
| E | 2.300 | 2.600 | 0.091 | 0.102 |
| E1 | 3.940 | 4.250 | 0.155 | 0.167 |
| e | 1.500 TYP. | | 0.060 TYP. | |
| e1 | 3.000 TYP. | | 0.118 TYP. | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |



TX73XXM series 250mA Low Power LDO

3-pin SOT23-3 Outline Dimensions

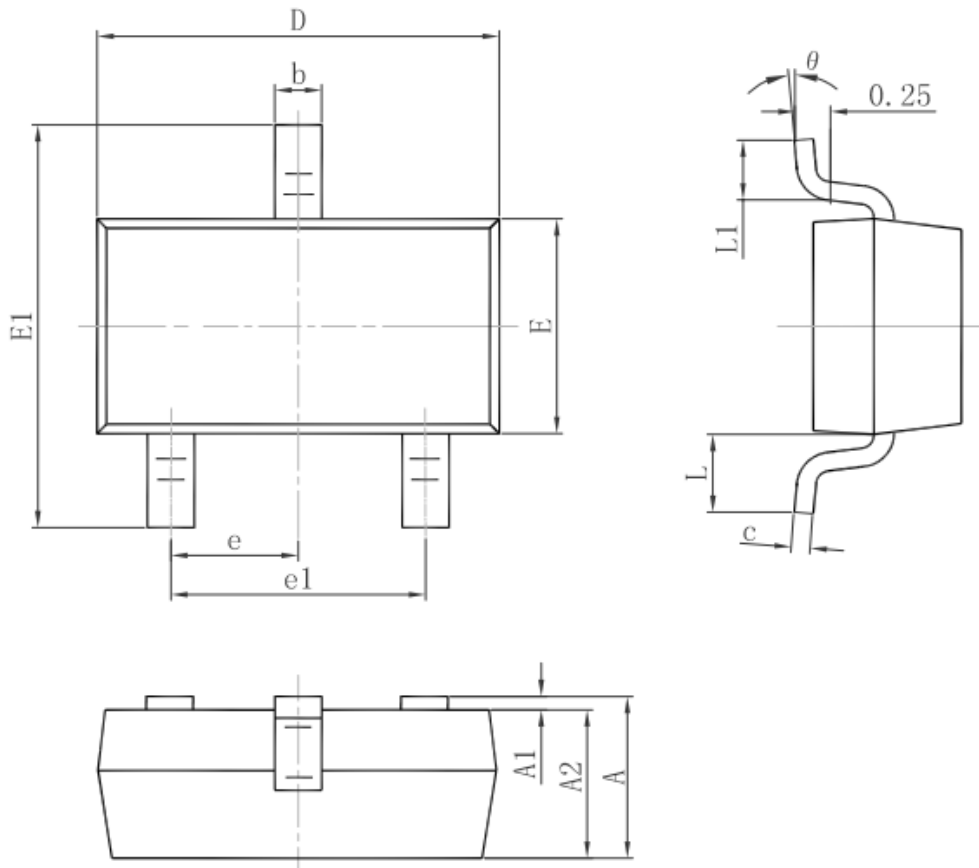


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| theta | 0° | 8° | 0° | 8° |



TX73XXM series 250mA Low Power LDO

3-pin SOT23 Outline Dimensions



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.150 | 0.035 | 0.045 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.050 | 0.035 | 0.041 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.800 | 3.000 | 0.110 | 0.118 |
| E | 1.200 | 1.400 | 0.047 | 0.055 |
| E1 | 2.250 | 2.550 | 0.089 | 0.100 |
| e | 0.950 TYP. | | 0.037 TYP. | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.550 REF. | | 0.022 REF. | |
| L1 | 0.300 | 0.500 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |



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TX73XXM series ***250mA Low Power LDO***

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