

AT55EL Series

Low Dropout Regulator AT55EL XX Series

Input Voltage: up to 40V Output: 1.8V~5.0V

GENERATION DESCRIPTION

The AT55EL Series is a 40V μ A-power high accuracy LDO regulator. The 1 μ A power consumption makes it ideal for most HV power-saving systems. The maximum operating voltage can be as high as 40V. The output accuracy is as excellent as $\pm 1\%$.

The other features include low dropout voltage, current limiting protection and thermal shutdown protection.

The AT55EL Series is available in the SOT23-5/SOT-89/SOT23-3 packages.

FEATURES

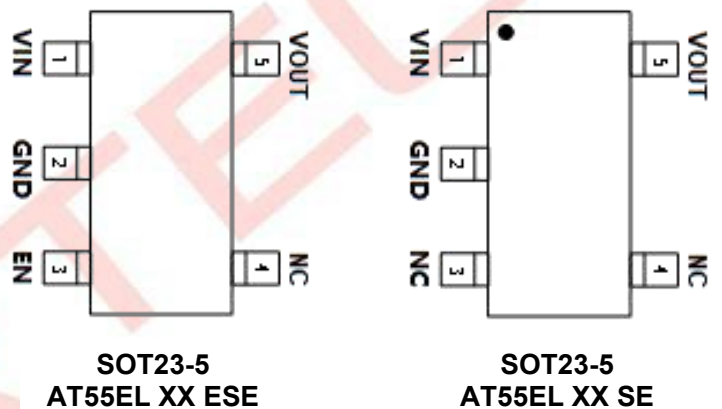
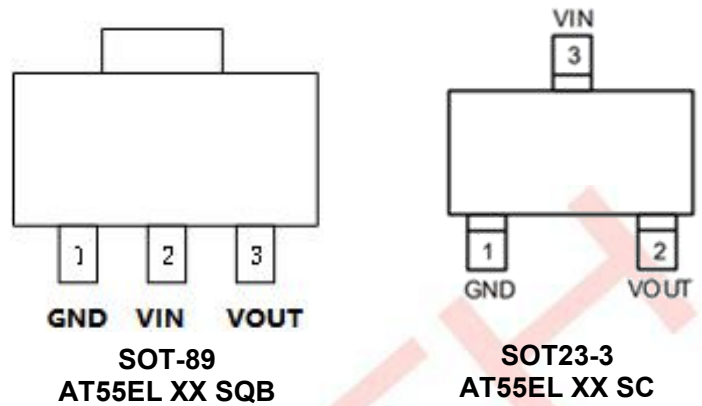
- ◆ Maximum Operating Voltage: 40V
- ◆ Output Voltage: 1.8V, 2.5V, 3.0V, 3.3V, 3.6V, 4.0V, 4.2V and 5.0V
- ◆ Output Accuracy: $\pm 2\%$
- ◆ Low Power Consumption: 1.5 μ A
- ◆ <0.1 μ A Standby Current When Shutdown
- ◆ Low Temperature Coefficient
- ◆ Current Limiting, Thermal Shutdown

APPLICATIONS

- ◆ Battery Supplied Systems
- ◆ Telecom Systems
- ◆ Audio & Video Devices

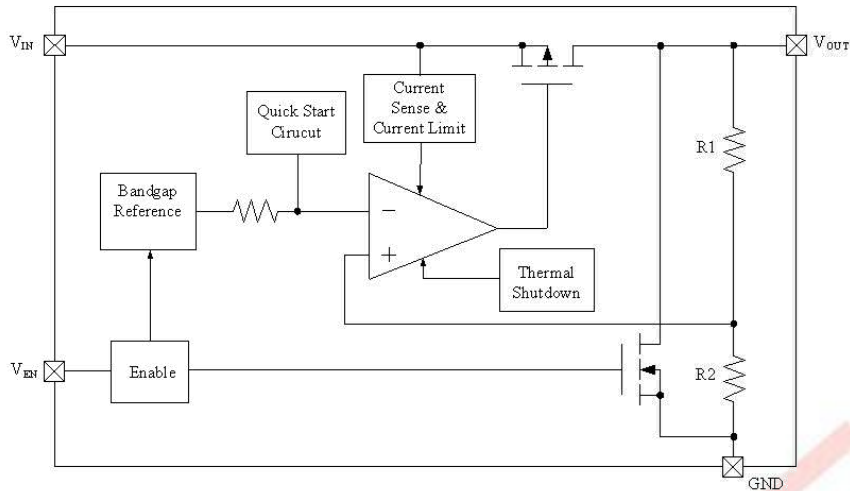
SELECTION TABLE

| AT55EL XX SE/ESE/SQB/SC Series | Designator | Symbol | Description |
|--------------------------------------|------------|--------|-------------|
| | XX | | 18 |
| | | 25 | 2.5V |
| | | 30 | 3.0V |
| | | 33 | 3.3V |
| | | 36 | 3.6V |
| | | 40 | 4.0V |
| | | 42 | 4.2V |
| | | 50 | 5.0V |



AT55EL Series

SIMPLIFIED BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS ^(Note 1) (TA =25°C, unless otherwise specified.)

| SYMBOL | ITEM | RATING | UNIT |
|---------------------|--|------------|------|
| V _{IN} | Supply Voltage | -0.3~44 | V |
| V _{EN} | EN pin to GND Voltage | -0.3~44 | V |
| V _{IO} | VOUT pin to GND Voltage | -0.3~6 | V |
| V _{IO2} | VOUT pin to V _{IN} Voltage | -46~0.3 | V |
| P _D | Maximum Power Dissipation,SOT23-5、 SOT23-3 | 0.4 | W |
| | Maximum Power Dissipation,SOT-89 | 1.2 | W |
| T _J | Junction Temperature Range | -40~100 | °C |
| T _{STG} | Storage Temperature Range | -50~125 | °C |
| T _{OP} | Operating Temperature Range | -45~80 | °C |
| T _{SOLDER} | Lead Temperature(Soldering) | 260°C, 10s | |

Note1: Absolute Maximum Ratings are threshold limit values that must not be exceeded even for an instant under any condition. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits.

ELECTRICAL CHARACTERISTICS (V_{IN}=V_{OUT}+1V,CL=1uF, TA =25°C, unless otherwise specified.)

AT55EL18 SE/ESE/SQB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 1.782 | 1.80 | 1.818 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REG1} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55ELSeries

AT55EL25 SE/ESE /SQB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 2.475 | 2.50 | 2.525 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55EL30 SE/ESE /SQB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 2.970 | 3.00 | 3.030 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55EL33 SE/ESE /SQB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 3.267 | 3.30 | 3.333 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55ELSeries

AT55EL36 SE/ESE /SQB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 3.564 | 3.60 | 3.636 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55EL40 SE/ESE/SQB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 3.960 | 4.00 | 4.040 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55EL42 SE/ESE/SQBB/SC(TA=25 °C)

| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 4.158 | 4.20 | 4.242 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

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AT55EL50 SE/ESE/SQB/SC(TA=25 °C)

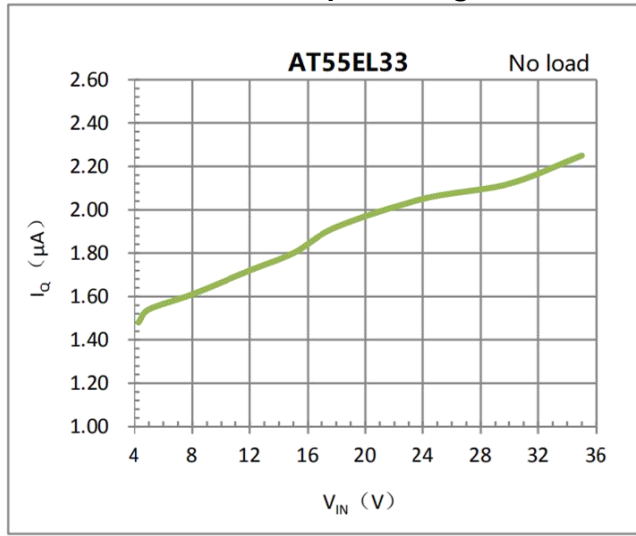
| Parameter | Symbol | Conditions | MIN | TYP | MAX | unit |
|-------------------------|-------------------|---|-------|------|-------|-------|
| Input Voltage | V _{IN} | V _{IN} =V _{OUT} +1V | 2.5 | | 40 | V |
| Output Voltage | V _{OUT} | I _{OUT} =40mA | 4.950 | 5.00 | 5.050 | V |
| Maxim Output Current | I _{OMAX} | V _{IN} =V _{OUT} +1V | | 150 | | mA |
| Load Regulation | ΔV _{OUT} | 1mA<I _{OUT} <60mA | | 25 | 50 | mV |
| Dropout Voltage | V _{DROP} | I _{OUT} =40mA, V _{OUT} =5V | | 260 | | mV |
| | | I _{OUT} =100mA, V _{OUT} =1.8V | | 700 | | mV |
| Quiescent Current | I _Q | I _{OUT} =0mA | | 1.3 | 2 | μA |
| Line Regulation | R _{REGI} | V _{IN} =V _{OUT} +1V to 24V, I _{OUT} =40mA | | 0.2 | 0.3 | %/V |
| Temperature Coefficient | T _C | I _{OUT} =40mA, -40°C~+85°C | | ±0.7 | | mV/°C |
| Thermal Shutdown | T _{SD} | Shutdown, Temp increasing | | 180 | | °C |
| Thermal Hysteresis | T _{HYS} | | | 20 | | °C |

AT55ELSeries

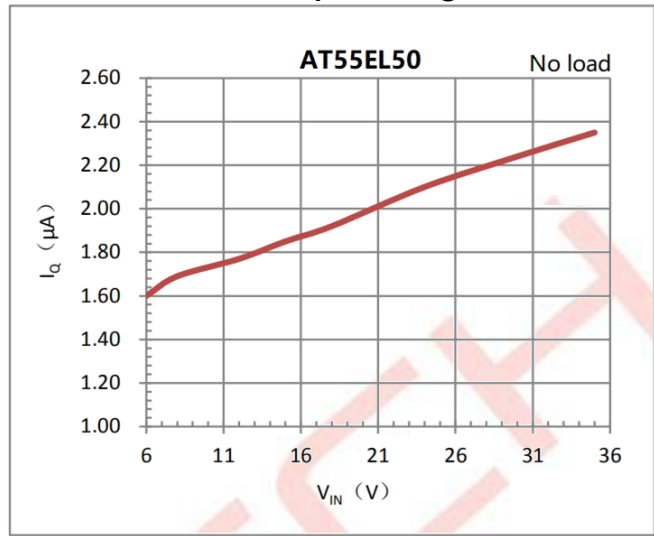
Typical Performance Characteristics

$C_{IN} = 1\mu F$, $C_{OUT} = 10\mu F$, $T_{OPT} = 25^{\circ}C$, unless specified otherwise

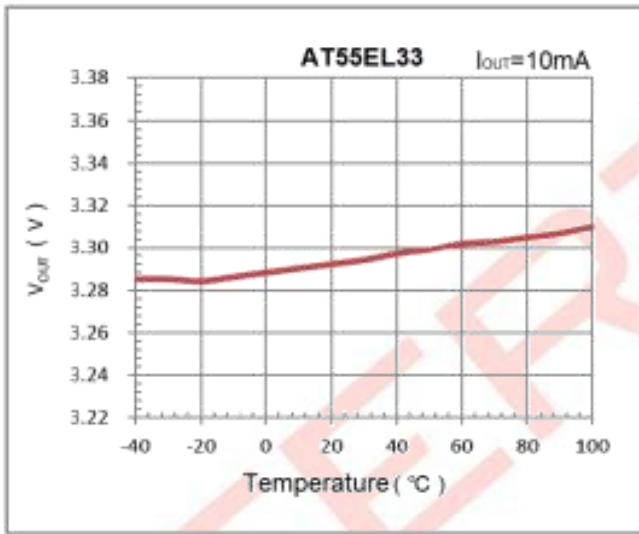
IQ vs Input Voltage



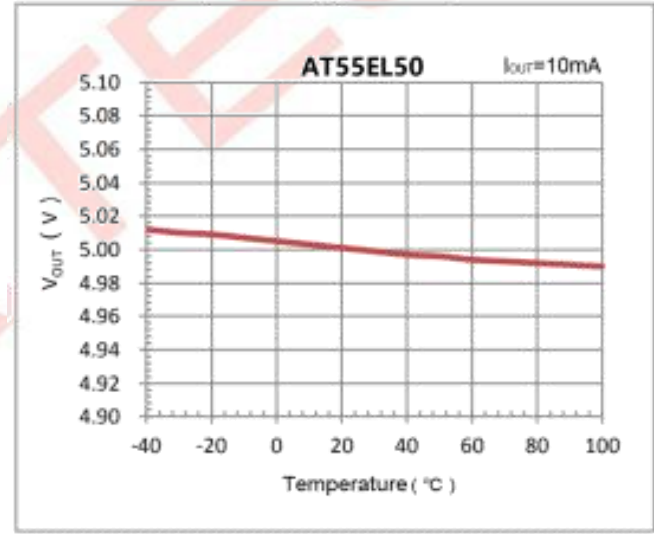
IQ vs Input Voltage



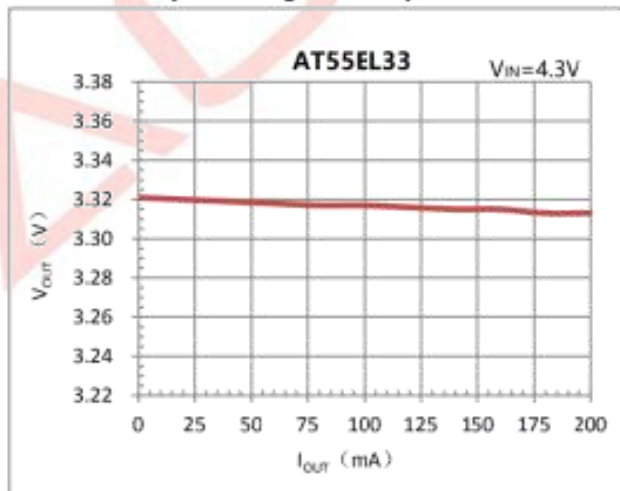
Output Voltage vs Temperature



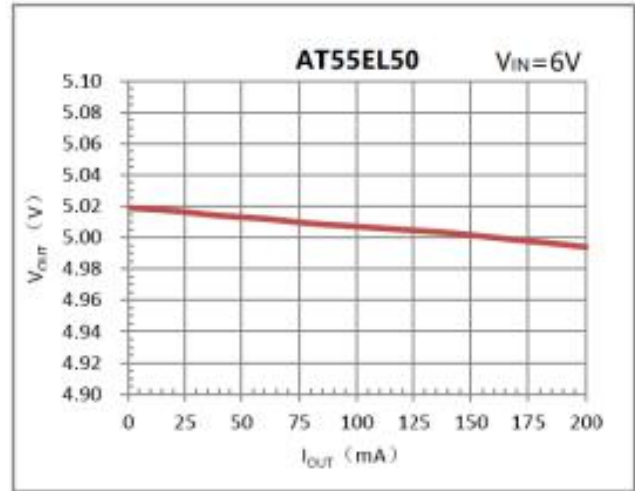
Output Voltage vs Temperature



Output Voltage vs Output current

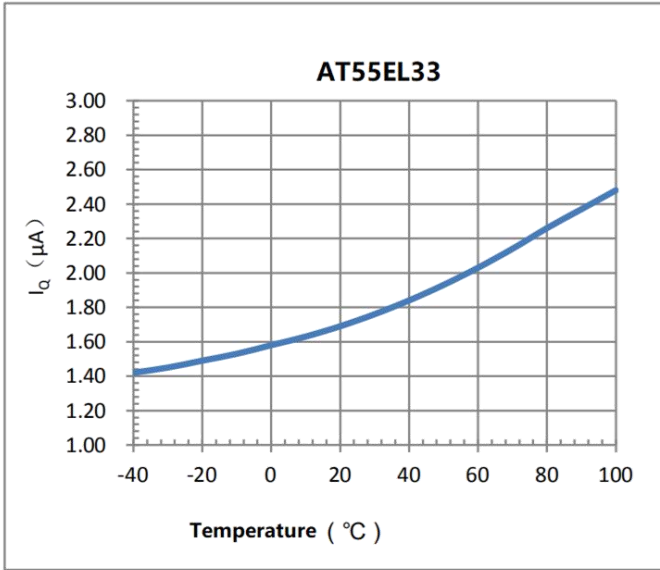


Output Voltage vs Output current

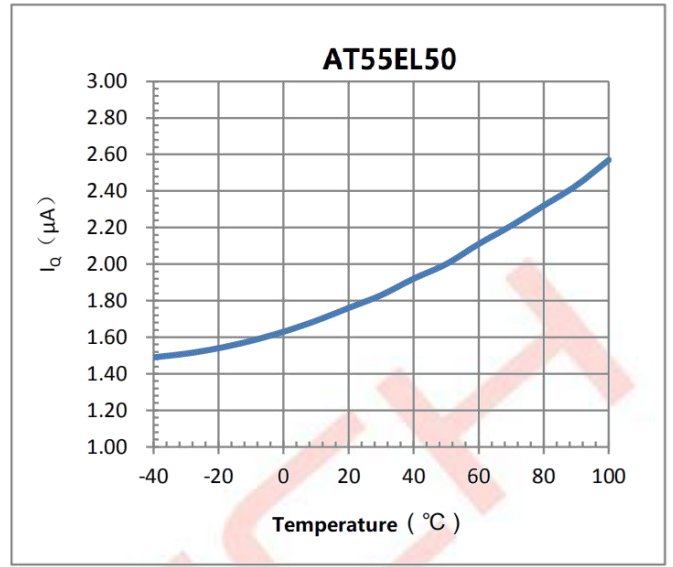


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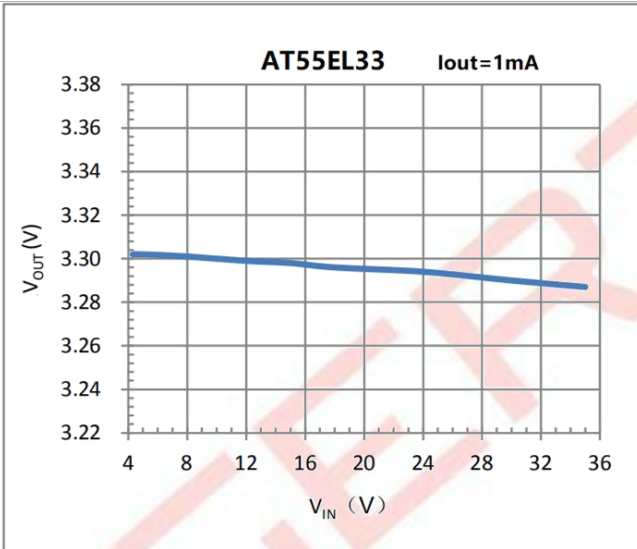
IQ vs Temperature



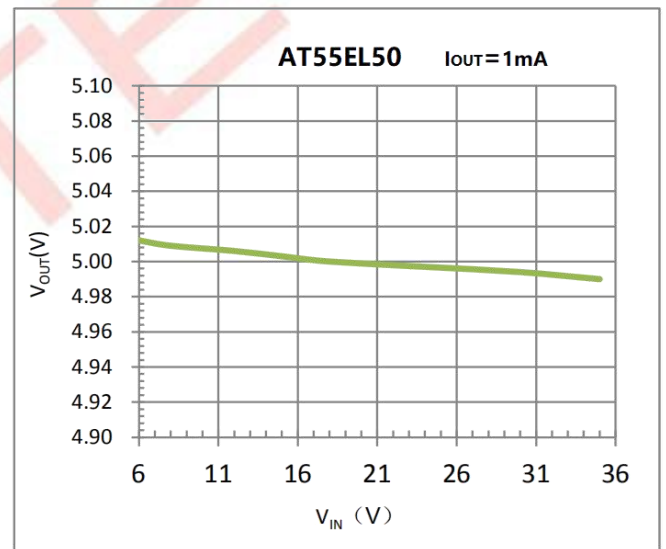
IQ vs Temperature



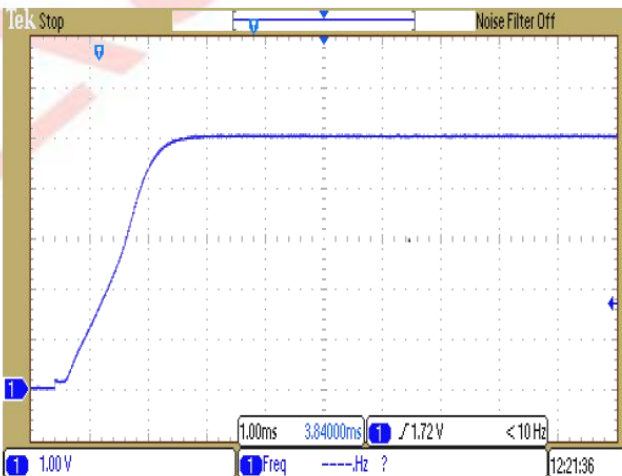
Output Voltage vs Input Voltage



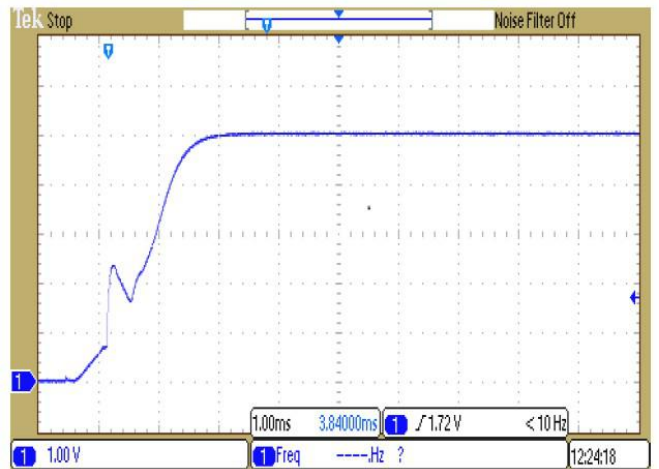
Output Voltage vs Input Voltage



Power ON C_{OUT}=10uF



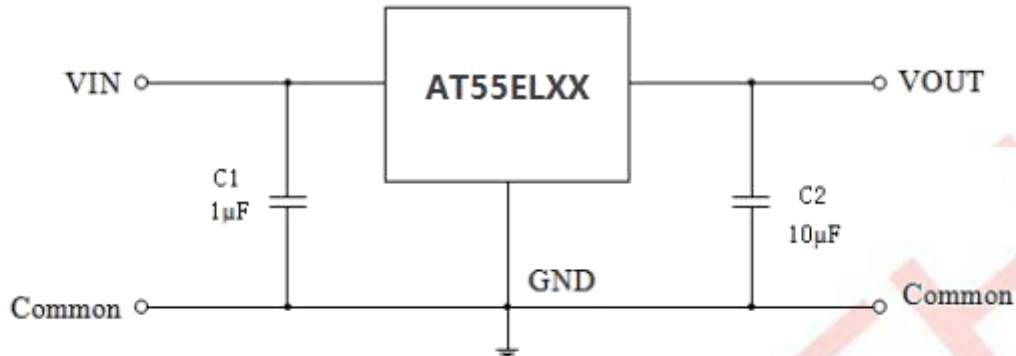
Load 30mA ON C_{OUT}=10uF



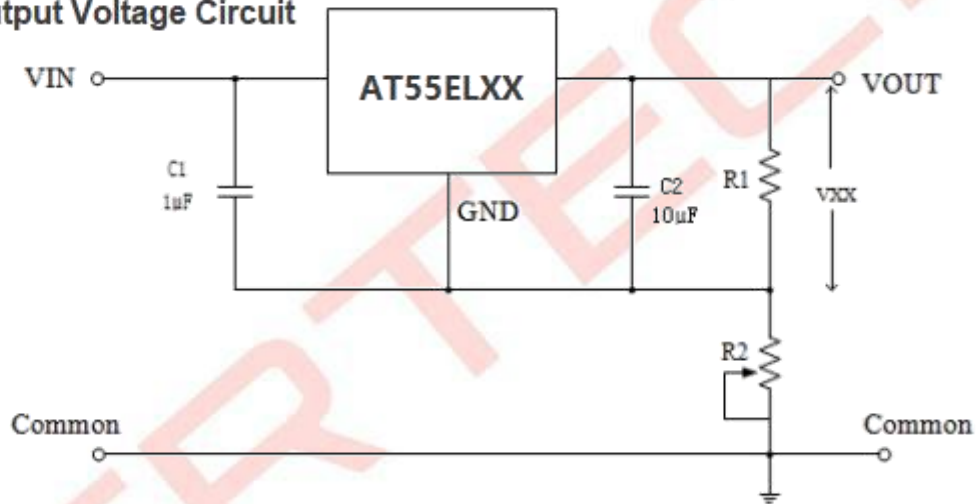
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TYPICAL APPLICATION CIRCUIT

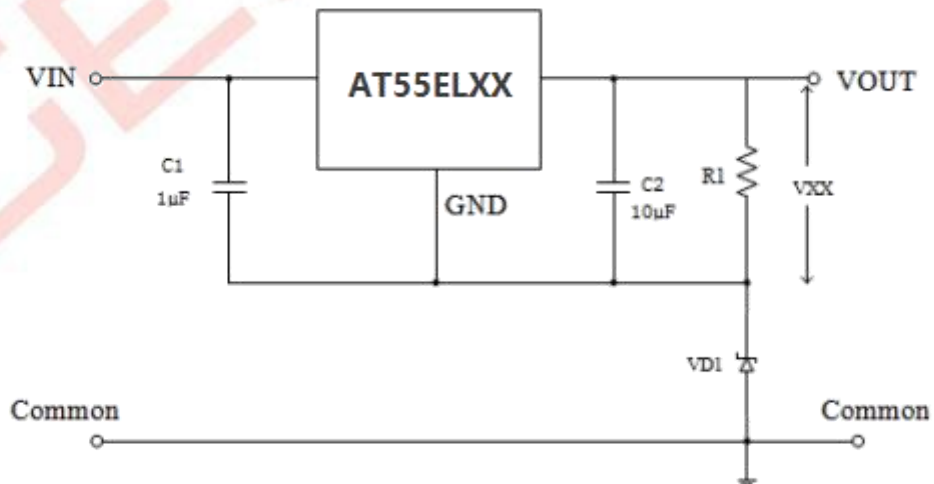
Typical Application



Increasing Output Voltage Circuit



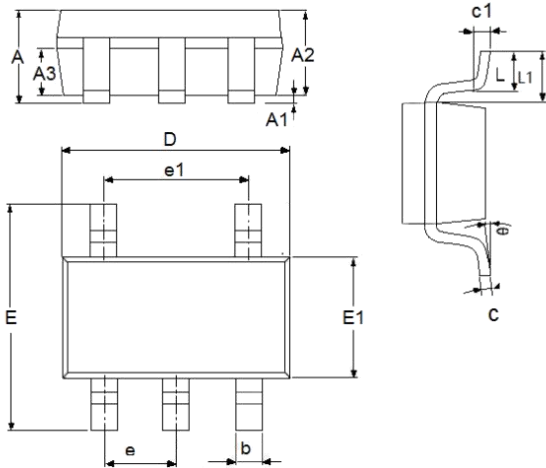
Increasing Output Voltage Circuit



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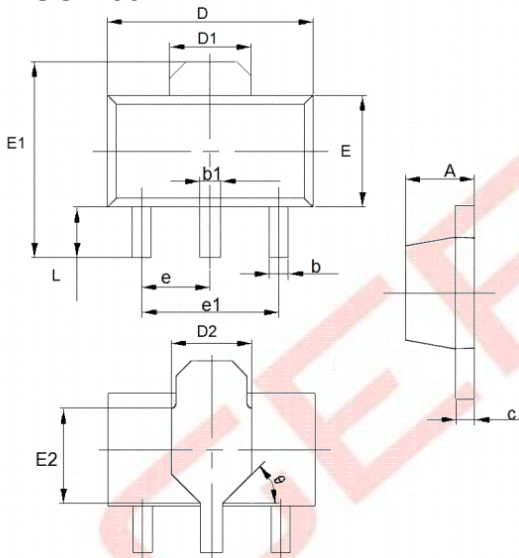
PACKAGEOUTLINE

SOT23-5



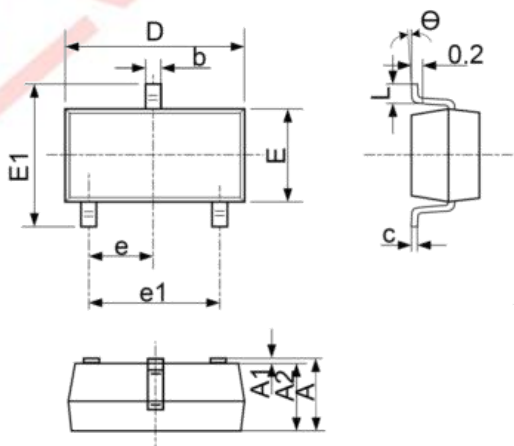
| DIM | Millimeters | | Inches | |
|----------|-------------|------|-------------|--------|
| | Min | Max | Min | Max |
| A | 1.05 | 1.45 | 0.0413 | 0.0571 |
| A1 | 0 | 0.15 | 0.0000 | 0.0059 |
| A2 | 0.9 | 1.3 | 0.0354 | 0.0512 |
| A3 | 0.6 | 0.7 | 0.0236 | 0.0276 |
| b | 0.25 | 0.5 | 0.0098 | 0.0197 |
| c | 0.1 | 0.23 | 0.0039 | 0.0091 |
| D | 2.82 | 3.05 | 0.1110 | 0.1201 |
| e1 | 1.9(TYP) | | 0.0748(TYP) | |
| E | 2.6 | 3.05 | 0.1024 | 0.1201 |
| E1 | 1.5 | 1.75 | 0.0512 | 0.0689 |
| e | 0.95(TYP) | | 0.0374(TYP) | |
| L | 0.3 | 0.6 | 0.0118 | 0.0236 |
| L1 | 0.59(TYP) | | 0.0232(TYP) | |
| θ | 0 | 8° | 0.0000 | 8° |
| C1 | 0.2(TYP) | | 0.0079(TYP) | |

SOT-89



| DIM | Millimeters | | Inches | |
|----------|-------------|------|-------------|--------|
| | Min | Max | Min | Max |
| A | 1.4 | 1.6 | 0.0551 | 0.0630 |
| b | 0.32 | 0.52 | 0.0126 | 0.0205 |
| b1 | 0.4 | 0.58 | 0.0157 | 0.0228 |
| c | 0.35 | 0.45 | 0.0138 | 0.0177 |
| D | 4.4 | 4.6 | 0.1732 | 0.1811 |
| D1 | 1.55(TYP) | | 0.061(TYP) | |
| D2 | 1.75(TYP) | | 0.0689(TYP) | |
| e1 | 3.0(TYP) | | 0.1181(TYP) | |
| E | 2.3 | 2.6 | 0.0906 | 0.1023 |
| E1 | 3.94 | 4.4 | 0.1551 | 0.1732 |
| E2 | 1.9(TYP) | | 0.0748(TYP) | |
| e | 1.5(TYP) | | 0.0591(TYP) | |
| L | 0.8 | 1.2 | 0.0315 | 0.0472 |
| θ | 45° | | 45° | |

SOT23-3L



| DIM | Millimeters | | Inches | |
|----------|-------------|------|------------|-------|
| | Min | Max | Min | Max |
| A | 1.05 | 1.25 | 0.041 | 0.049 |
| A1 | 0.000 | 0.10 | 0.000 | 0.004 |
| A2 | 1.05 | 1.15 | 0.041 | 0.045 |
| b | 0.30 | 0.50 | 0.012 | 0.020 |
| c | 0.10 | 0.20 | 0.004 | 0.008 |
| D | 2.82 | 3.02 | 0.111 | 0.119 |
| E | 1.50 | 1.70 | 0.059 | 0.067 |
| E1 | 2.65 | 2.95 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.80 | 2.00 | 0.071 | 0.079 |
| L | 0.30 | 0.60 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

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