

**Low Dropout Voltage
 300mA CMOS LDO Reulator**

CE2139 Series

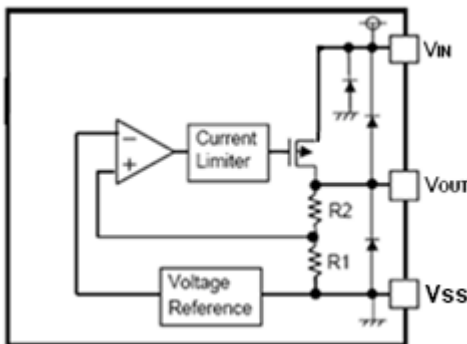
■ **INTRODUCTION**

The CE2139 Series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, extremely low power consumption and low dropout voltage, which provide large output currents even when the difference of the input-output voltage is small. Thus the CE2139 series are very suitable for the battery-powered equipments, such as portable/palm computers, portable consumer equipments, industry equipments and so on, which want to prolong the using life of the battery.

■ **APPLICATIONS**

- Battery powered systems
- Portable instrumentations
- Radio control systems

■ **BLOCK DIAGRAM**



■ **FEATURES**

- Output Current: 300mA
- Output Voltage Range: 0.9V ~ 5.0V, (selectable in 0.1V steps)
- High Accuracy: ±2% (Typ.)
- Low Dropout Voltage: 150mV@100mA (3.0V Typ.)
- Excellent Line Regulation: 0.1%/V
- Built-in Current Limiter
- Built-in Short Circuit Protection
- Static safety: 2KV@HBM
- TC: 100ppm/°C
- Ceramic Capacitor Compatible

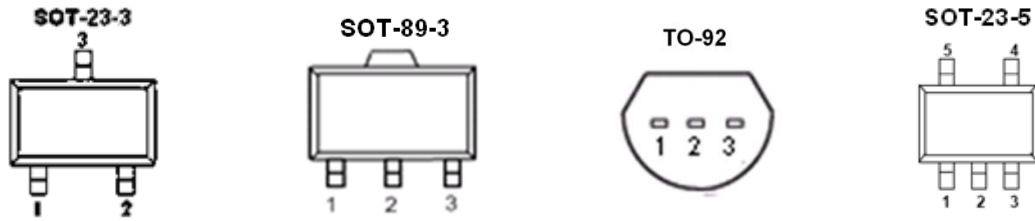
- Portable consumer equipments
- Portable/Palm computers
- Reference Voltage Sources

■ **ORDER INFORMATION**

CE2139①②③④

| DESIGNATOR | SYMBOL | DESCRIPTION |
|------------|---------|---|
| ① | P | Standard |
| ②③ | Integer | Output Voltage(0.9~5V) e.g:3.0V=②:3, ③:0 |
| ④ | M | Package:SOT-23-3 |
| | P | Package:SOT-89-3 |
| | T | Package:TO-92 |
| | MR | Package:SOT-23-5 |

■ PIN CONFIGURATION (Pin output sequence can be ordered by customer)



| PIN NUMBER | | | | | | PIN NAME | FUNCTION |
|------------|----|----------|----|----|-------|------------------|-------------|
| SOT-23-3 | | SOT-89-3 | | | TO-92 | | |
| M | MC | P | PT | PW | T | | |
| 1 | 3 | 1 | 2 | 1 | 1 | V _{SS} | Ground |
| 2 | 2 | 3 | 1 | 2 | 3 | V _{OUT} | Output |
| 3 | 1 | 2 | 3 | 3 | 2 | V _{IN} | Power input |

SOT-23-5

| PIN NUMBER | SYMBOL | FUNCTION |
|------------|------------------|-----------------|
| 1 | V _{IN} | Power Input Pin |
| 2 | V _{SS} | Ground |
| 3 | NC | No Connection |
| 4 | NC | No Connection |
| 5 | V _{OUT} | Output Pin |

■ ABSOLUTE MAXIMUM RATINGS

(Unless otherwise specified, Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | UNITS |
|------------------------------|---------------------|---|-------|
| Input Voltage | V _{IN} | V _{SS} -0.3~V _{SS} +8 | V |
| Output Current | I _{OUT} | 600 | mA |
| Output Voltage | V _{OUT} | V _{SS} -0.3~V _{IN} +0.3 | V |
| Power Dissipation | SOT-23-3 | Pd | 250 |
| | SOT-23-5 | Pd | 250 |
| | SOT-89-3 | Pd | 500 |
| | TO-92 | Pd | 500 |
| Operating Temperature | T _{opr} | -40~+85 | °C |
| Storage Temperature | T _{stg} | -40~+125 | °C |
| Soldering Temperature & Time | T _{solder} | 260°C, 10s | |

■ ELECTRICAL CHARACTERISTICS

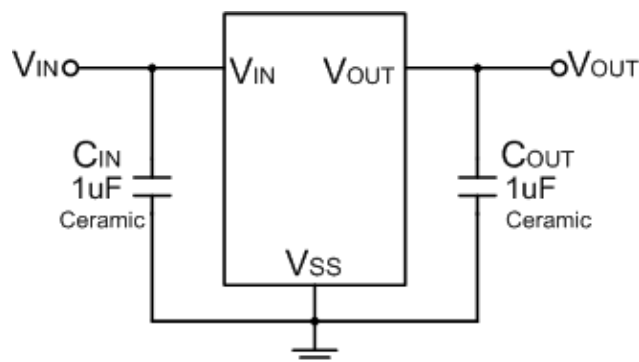
CE2139 Series ($V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$, $T_a=25^\circ C$, unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | |
|--|--|--|-------------------------------|------------------|-----------------------|------------------|---|
| Output Voltage | $V_{OUT(E)}$ (Note 2) | $I_{OUT}=40mA$, $V_{IN}=V_{OUT}+1V$, $V_{IN}\geq 2V$ | $1.5V < V_{OUT} \leq 5.0V$ | $V_{OUT} * 0.98$ | V_{OUT} (Note 1) | $V_{OUT} * 1.02$ | V |
| | | | $0.9V \leq V_{OUT} \leq 1.5V$ | $V_{OUT} - 0.03$ | V_{OUT} | $V_{OUT} + 0.03$ | V |
| Supply Current | I_{SS} | $V_{CE}=V_{IN}=V_{OUT}+1V$ | | 5 | 10 | μA | |
| Output Current | I_{OUT} | $V_{IN}\geq 2V$, $V_{IN}=V_{OUT}+1V$ | 300 | | | mA | |
| Dropout Voltage (Note 3) | V_{dif1} | $I_{OUT} = 40mA$ | | 60 | | mV | |
| | V_{dif2} | $I_{OUT} = 100mA$ | | 150 | | mV | |
| Load Regulation | ΔV_{OUT} | $V_{IN}= V_{OUT} + 1V$, $1mA \leq I_{OUT} \leq 100mA$ | | 10 | | mV | |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$ | $I_{OUT} = 40mA$ $V_{OUT} + 1V \leq V_{IN} \leq 6V$ | | 0.1 | 0.3 | %/V | |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T * V_{OUT}}$ | $I_{OUT} = 40mA$ $-40 \leq T \leq +85$ | | 100 | | ppm/ $^\circ C$ | |
| Power Supply Ripple Rejection | PSRR | $I_{OUT} = 10mA$ $f = 1KHz$ | | 40 | | dB | |
| Short Current | I_{Short} | $V_{OUT} = V_{SS}$ | | 30 | | mA | |
| Current Limit | I_{Lim} | $V_{IN}= V_{OUT} + 1V$ | | 600 | | mA | |
| Input Voltage | V_{IN} | — | 2.0 | | 6.0 | V | |

NOTE:

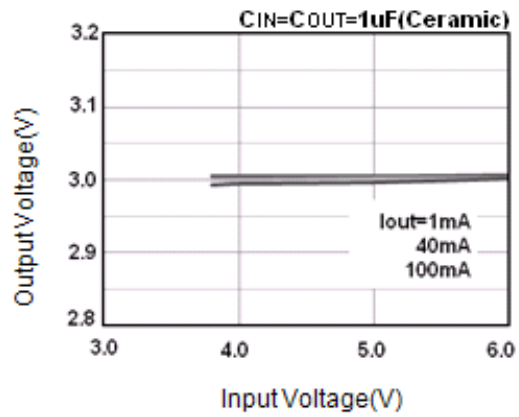
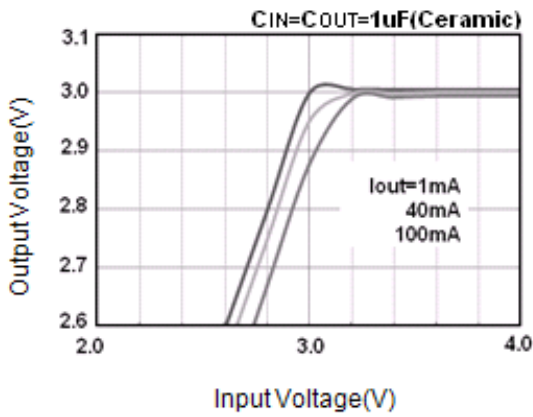
1. V_{OUT} : Specified Output Voltage.
2. $V_{OUT} (E)$: Effective Output Voltage (I.e. The Output Voltage When $V_{IN} = (V_{OUT} + 1.0V)$ And Maintain A Certain I_{OUT} Value).
3. V_{dif} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of $V_{OUT} (E)$; When $V_{OUT} < 2.0V$, $V_{IN} \geq 2.0V$ Should be Guaranteed.

■ TYPICAL APPLICATION CIRCUIT

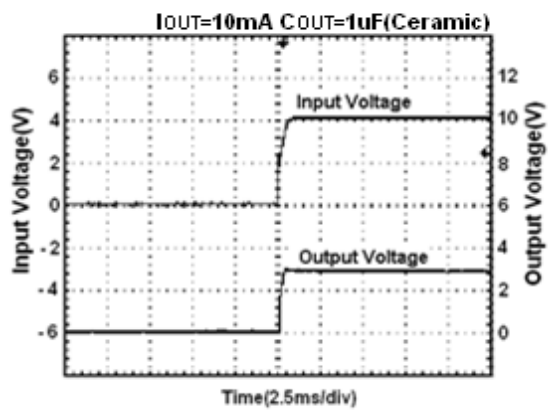
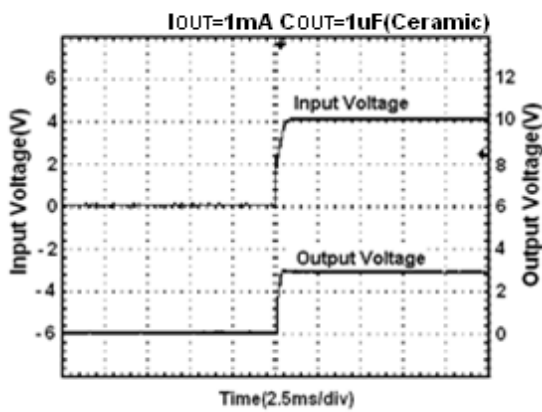


■ TYPICAL PERFORMANCE CHARACTERISTICS (CE2139P30P, for instance)

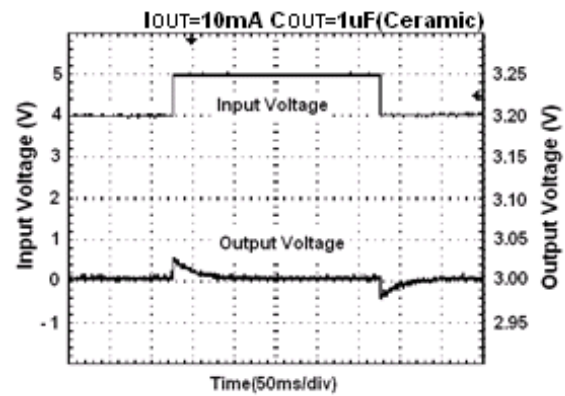
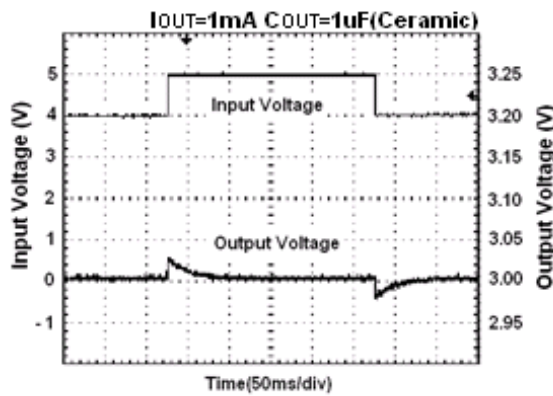
(1) Output Voltage vs. Input Voltage



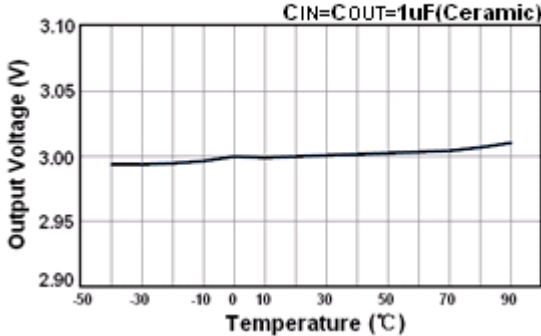
(2) Input Transient Response 1



(3) Input Transient Response 2

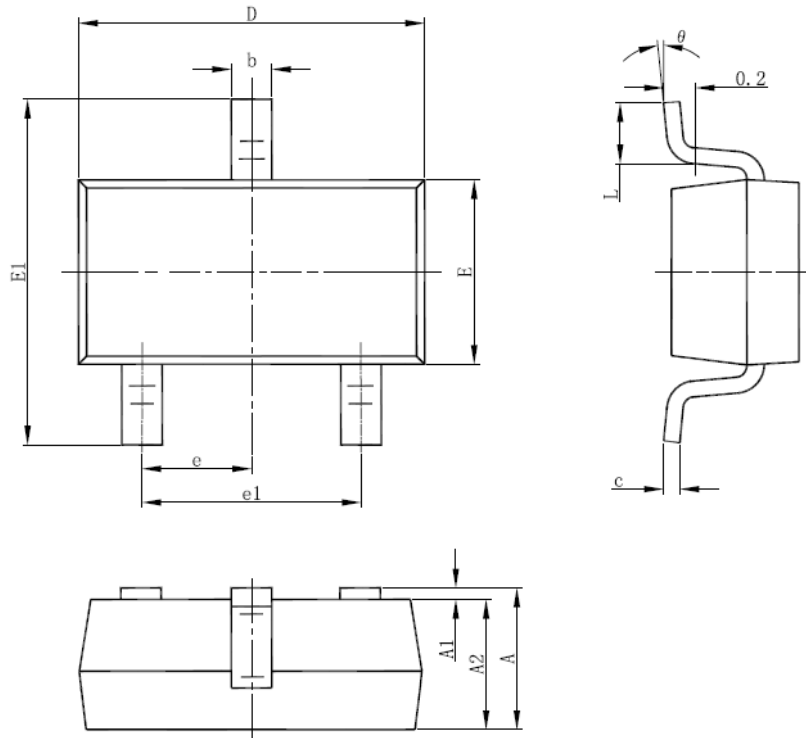


(4) Output Voltage vs. Temperature



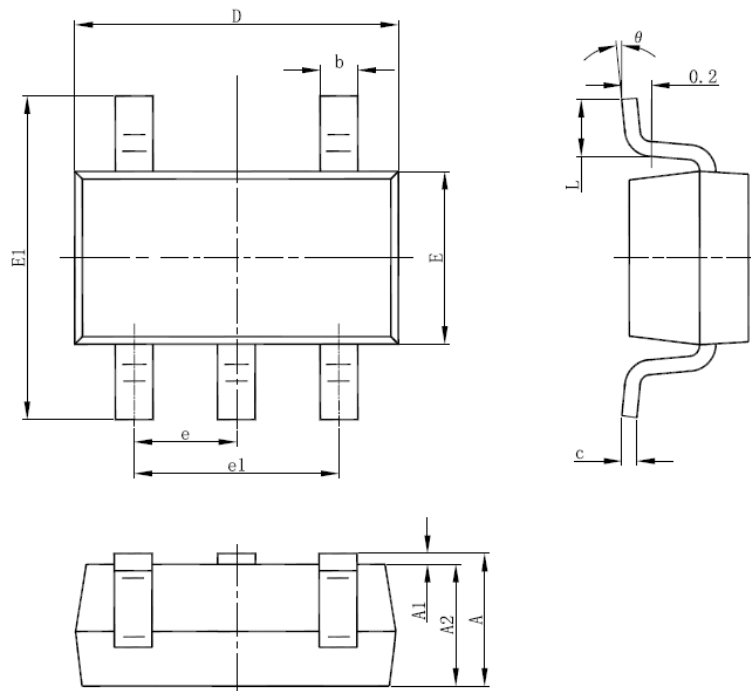
■ PACKAGING INFORMATION

● SOT-23-3 PACKAGE OUTLINE DIMENSIONS



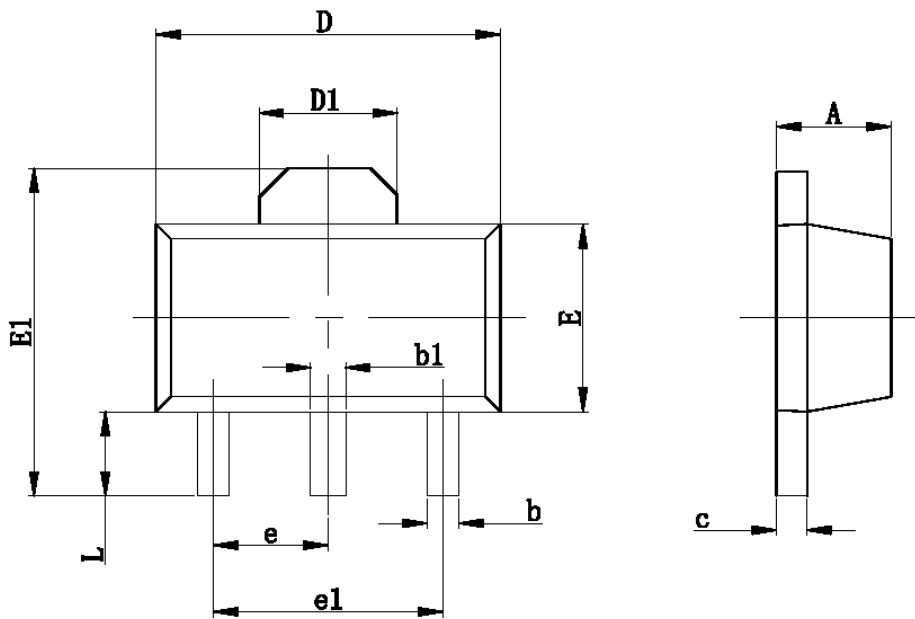
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 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 |
| θ | 0° | 8° | 0° | 8° |

• SOT-23-5 PACKAGE OUTLINE DIMENSIONS



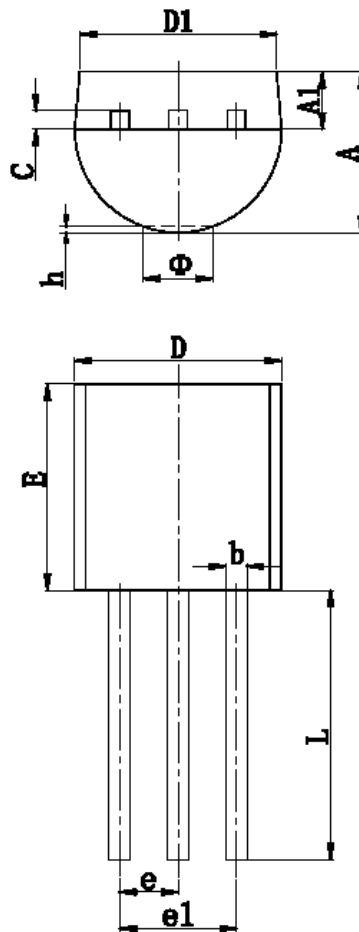
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 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 |
| θ | 0° | 8° | 0° | 8° |

• SOT-89-3 PACKAGE 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 | 0.197 |
| 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 | | 0.060TYP | |
| e1 | 3.000 TYP | | 0.118TYP | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |

• TO-92 PACKAGE 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 | 4.400 | 4.700 | 0.173 | 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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