## GENERAL DESCRIPTION

The CM2836/B/C family is a positive voltage linear regulator developed utilizing CMOS technology featured low quiescent current (30μA typ.), low dropout voltage, and high output voltage accuracy, making them ideal for battery applications. EN input connected to CMOS has low bias current. The space-saving SC70 package is attractive for “Pocket” and “Hand Held” applications.

These rugged devices have both Thermal Shutdown, and Current limit to prevent device failure under the “Worst” of operating conditions.

In application requiring a low noise, regulated supply, place a 1000pF capacitor between Bypass and Ground.

The CM2836/B/C is stable with a Low ESR output capacitance of 1.0μF or greater.

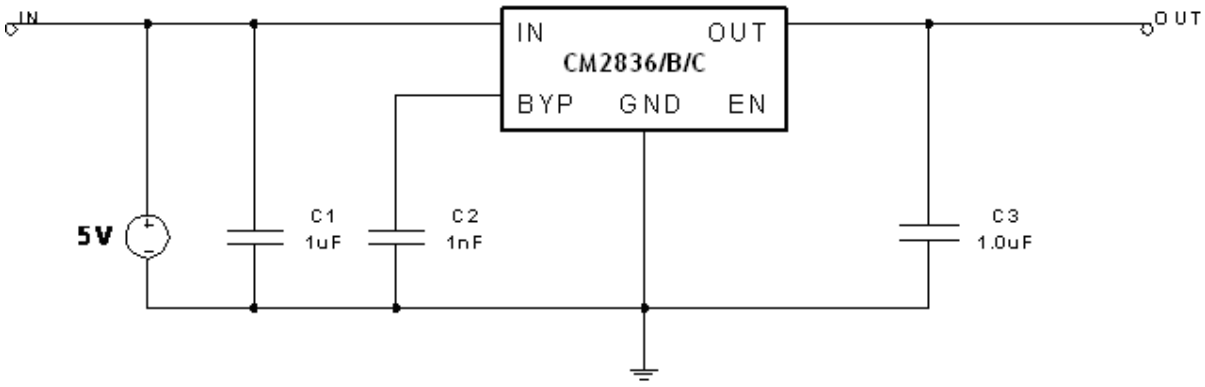
## FEATURES

- Very Low Dropout Voltage
- Low Current Consumption: Typ. 30μA, Max. 35μA
- More Options Output Voltage
- High Accuracy Output Voltage: +/- 2%
- Guaranteed 300mA Output
- Input Range up to 7.0V
- Thermal Shutdown
- Current Limiting
- Stability with Low ESR Capacitors
- Compact Package: SOT-23-3 / SOT-23-5 / SOT-89 / SC70-5
- Factory Pre-set Output Voltages
- Low Temperature Coefficient

## APPLICATIONS

- Battery-powered devices
- Personal communication devices
- Home electric/electronic appliances
- PC peripherals

## TYPICAL APPLICATIONS



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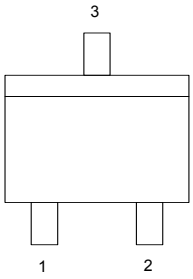
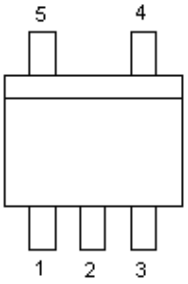
## PIN CONFIGURATION

SOT-23-3
Top View



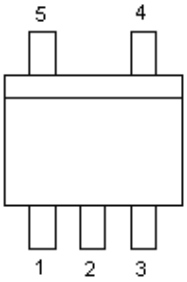

| | 2836 | 2836B |
|---|---|---|
| Pin 1 | GND | VIN |
| Pin 2 | VOUT | VOUT |
| Pin 3 | VIN | GND |

SOT-23-5
Top View



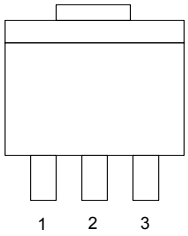

| | 2836 |
|---|---|
| Pin 1 | VIN |
| Pin 2 | GND |
| Pin 3 | EN |
| Pin 4 | BYP |
| Pin 5 | VOUT |

SC70-5
Top View



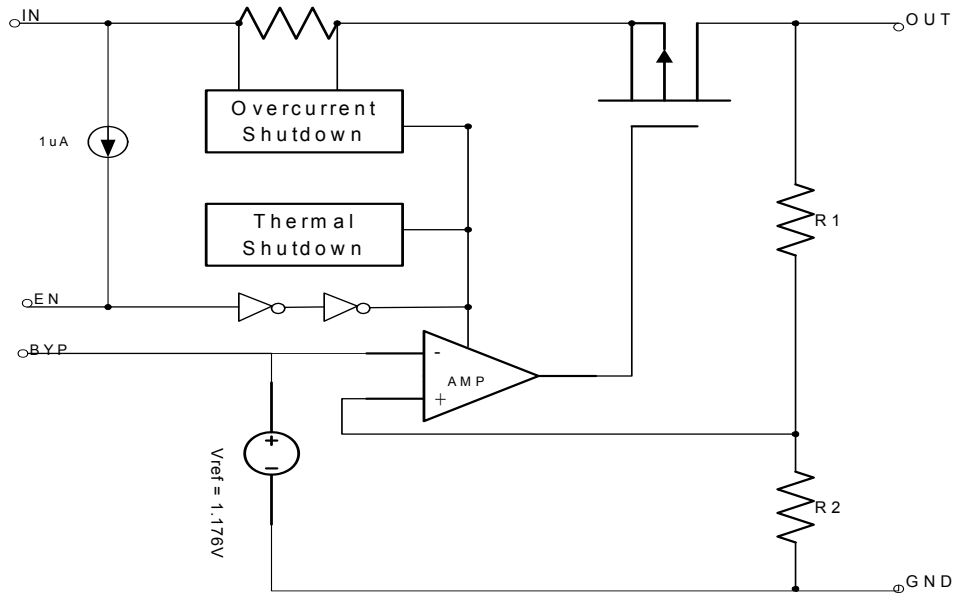

| | CM2836 | 2836B | 2836C |
|---|---|---|---|
| Pin 1 | VIN | NC | NC |
| Pin 2 | GND | GND | VIN |
| Pin 3 | EN | NC | NC |
| Pin 4 | BYP | VIN | GND |
| Pin 5 | VOUT | VOUT | VOUT |

SOT-89
Top View




| | 2836 |
|---|---|
| Pin 1 | GND |
| Pin 2 | VIN |
| Pin 3 | VOUT |

## BLOCK DIAGRAM



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## ORDERING INFORMATION

**Example:**

| Part Number | Output Voltage | Temperature Range | Package |
|---|---|---|---|
| CM2836/BGSIM23* | 3.3V | -40℃ ~ +85℃ | SOT-23-3 |
| CM2836/BXSIM23* | 3.3V | -40℃ ~ +85℃ | SOT-23-3 |
| CM2836GSIM25* | 3.3V | -40℃ ~ +85℃ | SOT-23-5 |
| CM2836XSIM25* | 3.3V | -40℃ ~ +85℃ | SOT-23-5 |
| CM2836GSIM89* | 3.3V | -40℃ ~ +85℃ | SOT-89 |
| CM2836XSIM89* | 3.3V | -40℃ ~ +85℃ | SOT-89 |
| CM2836/B/CGSIM75* | 3.3V | -40℃ ~ +85℃ | SC70-5 |
| CM2836/B/CXSIM75* | 3.3V | -40℃ ~ +85℃ | SC70-5 |

**Note: For other pre-set output voltage requirements, please contact Champion Sales office.**
**Please refer to page 10**
***G : Suffix for PB Free Product**
***X : Suffix for Halogen Free and PB Free Product**

## ABSOLUTE MAXIMUM RATINGS

Input Voltage ..... +7V

Output Current ..... $P_D$ / ($V_{IN}$ - Vo) mA

Output Voltage ..... GND-0.3V to $V_{IN}$+0.3V

ESD Classification ..... B

## OPERATING RATINGS

Ambient Temperature Range ($T_A$) ..... -40℃ to +85℃

Junction Temperature Range ..... -40℃ to +150℃

## THERMAL INFORMATION

| Parameter | Package | Maximum | Unit |
|---|---|---|---|
| Thermal Resistance ($\Theta_{jc}$) | SOT-23<br>SOT-23-5 | 160 | ℃/W |
| Thermal Resistance ($\Theta_{jc}$) | SOT-89 | 100 | ℃/W |
| Thermal Resistance ($\Theta_{jc}$) | SC70-5 | 250 | ℃/W |
| Internal Power Dissipation ($P_D$)<br>($\Delta$T = 100℃) | SOT-23<br>SOT-23-5 | 250 | mW |
| | SOT-89 | 400 | mW |
| | SC70-5 | 200 | mW |
| Maximum Junction Temperature | | 150 | ℃ |
| Maximum Lead Temperature (10 Sec) | | 300 | ℃ |

Caution: Stress above the listed absolute rating may cause permanent damage to the device.



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## ELECTRICAL CHARACTERISTICS

$T_A$ = +25℃; unless otherwise noted

| Parameter | Symbol | Test Conditions | | CM2836/B/C | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Input Voltage | $V_{IN}$ | | | **Note 1** | | 7 | V |
| Output Voltage Accuracy | $V_{OUT}$ | $I_O$ = 1mA to 300mA | | -2 | | 2 | % |
| Dropout Voltage | $V_{DROPOUT}$ | $I_O$ = 300mA, $V_{OUT}=V_{O(NOM)}$-2%, | 1.2V<$V_{O(NOM)}$≤2.0V | | | 1300 | mV |
| | | | 2.0V<$V_{O(NOM)}$≤2.5V | | | 400 | |
| | | | 2.5V<$V_{O(NOM)}$ | | | 300 | |
| Output Current | $I_O$ | $V_{OUT}$ > 1.2V | | 300 | | | mA |
| Current Limit | $I_{LIM}$ | $V_{OUT}$ > 1.2V | | 300 | 450 | | mA |
| Short Circuit Current | $I_{SC}$ | Vo<0.8V | | | 300 | 500 | mA |
| Quiescent Current | $I_Q$ | $I_O$ = 0mA | | | 30 | 35 | μA |
| Ground Pin Current | $I_{GND}$ | $I_O$ = 1mA to 300mA | | | 30 | 50 | μA |
| Line Regulation | $REG_{LINE}$ | $I_{OUT}$=5mA, $V_{IN}=V_{OUT}$+1 to $V_{OUT}$+2 | | -0.1 | 0.02 | 0.1 | % |
| Load Regulation | $REG_{LOAD}$ | $I_O$=1mA to 300mA | | | 0.2 | 1 | % |
| Over Temperature Shutdown | OTS | | | | 150 | | ℃ |
| Over Temperature Hysteresis | OTH | | | | 30 | | ℃ |
| $V_{OUT}$ Temperature Coefficient | TC | | | | 40 | | ppm/℃ |
| Power Supply Rejection (Sot23-3/Sot-89) | PSRR | $I_O$ = 100mA, $C_O$=2.2μF ceramic | f=1kHz | | 60 | | dB |
| | | | f=10kHz | | 50 | | |
| | | | f=100kHz | | 40 | | |
| Power Supply Rejection (Sot23-5/SC70-5) | PSRR | $I_O$ = 100mA, $C_O$=2.2μF ceramic, $C_{BYP}$=0.01μF | f=1kHz | | 65 | | dB |
| | | | f=10kHz | | 45 | | |
| | | | f=100kHz | | 25 | | |
| Output Voltage Noise (Sot23-3/Sot-89) | eN | f=10Hz to 100kHz, $I_O$ = 10mA, $C_{BYP}$=0μF | $C_O$=2.2μF | | 30 | | μVrms |
| | | | $C_O$=100μF | | 20 | | |
| Output Voltage Noise (Sot23-5/SC70-5) | eN | f=10Hz to 100kHz, $I_O$ = 10mA, $C_{BYP}$=0.01μF | $C_O$=2.2μF | | 30 | | μVrms |
| | | | $C_O$=100μF | | 20 | | |
| Shutdown Supply Current | $I_{SD}$ | $V_{IN}$=5.0V, $V_{OUT}$=0V, $V_{EN}$ < $V_{EL}$ | | | 0.2 | 2.0 | μA |
| EN Input Bias Current | $I_{EH}$ | $V_{EN}=V_{IN}$, $V_{IN}$=2.6V to 7V | | | | 0.1 | μA |
| | $I_{EL}$ | $V_{EN}$=0, $V_{IN}$=2.6V to 7V | | | 0.2 | 2.0 | μA |
| EN Input Threshold | $V_{EH}$ | $V_{IN}$=2.6V to 7V | | 2 | | $V_{IN}$ | V |
| | $V_{EL}$ | $V_{IN}$=2.6V to 7V | | 0 | | 0.4 | V |

**Note 1.** $V_{IN(MIN)} = V_{OUT} + V_{DROPOUT}$

**Note 2.** The input voltage should be better applied before a current source load is applied to avoid start up problem.



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## DETAILED DESCRIPTION

The CM2836/B/C family of CMOS regulators contains a PMOS pass transistor, voltage reference, error amplifier, over-current protection, output short protection, and thermal shutdown.

The P-channel pass transistor receives data from the error amplifier, over-current protection, output short protection, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150℃, or the current exceeds 300mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120℃.
The CM2836/B/C switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress.

## ENABLE

The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shut off, and all internal circuits are powered down. In this state, the quiescent current is less than 2μA. This pin behaves much like an electronic switch.

## EXTERNAL CAPACITOR

The CM2836/B/C is stable with a Low ESR output capacitor to ground of 1.0μF or greater. It can keep stable even with higher ESR capacitors. A second capacitor is recommended between the input and ground to stabilize VIN. The input capacitor should be larger than 1μF to have a beneficial effect. All capacitors should be placed in close proximity to the pins. A “quiet” ground termination is desirable.



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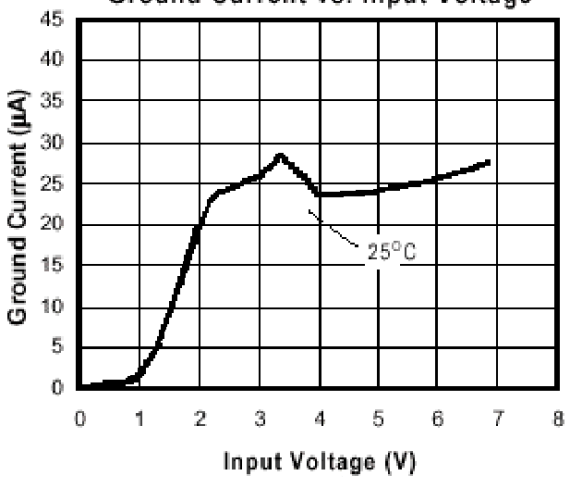
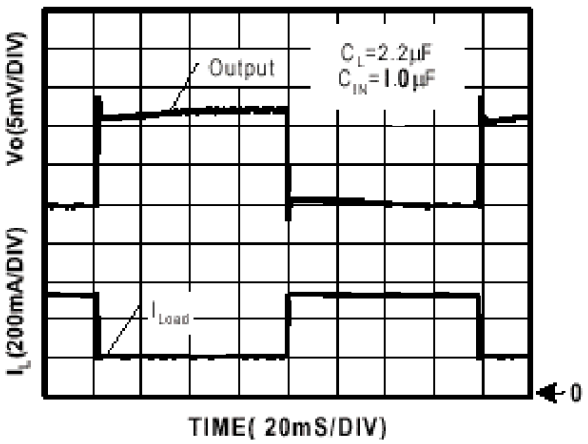
## TYPICAL CHARACTERISTICS

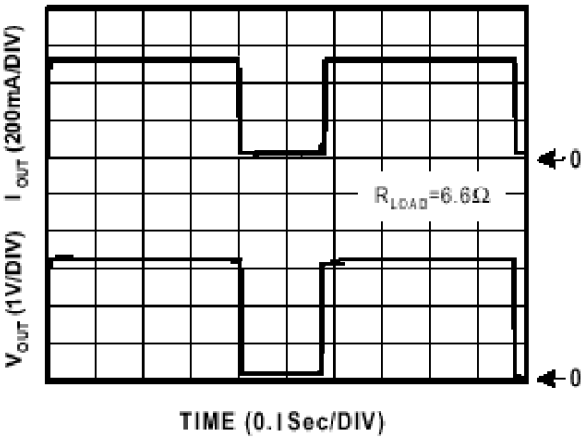
Ground Current vs. Input Voltage



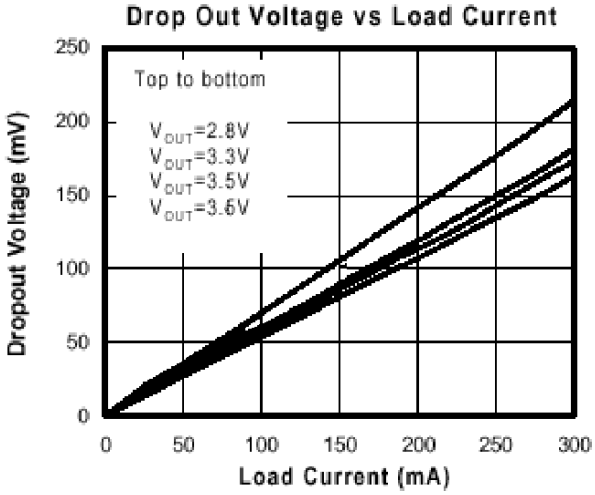

Load Step ( 1mA-300mA)



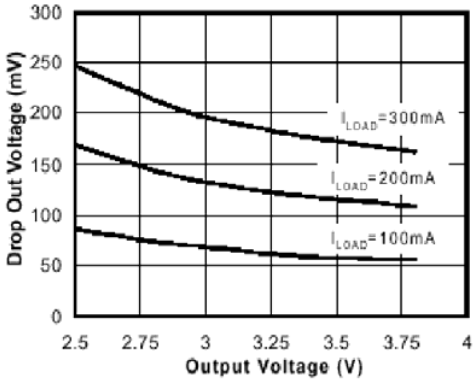

Overtemperature Shutdown



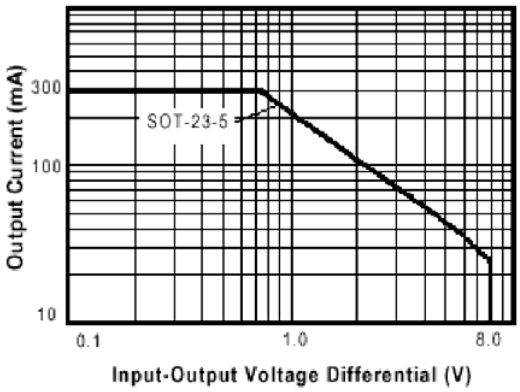

Drop Out Voltage vs Load Current




Drop Out Voltage vs Output Voltage




Safe Operating Area



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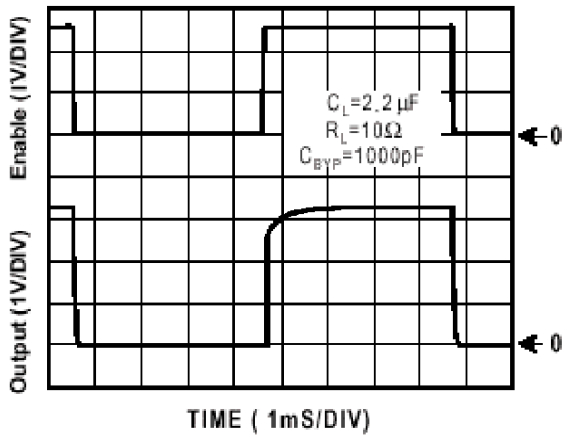
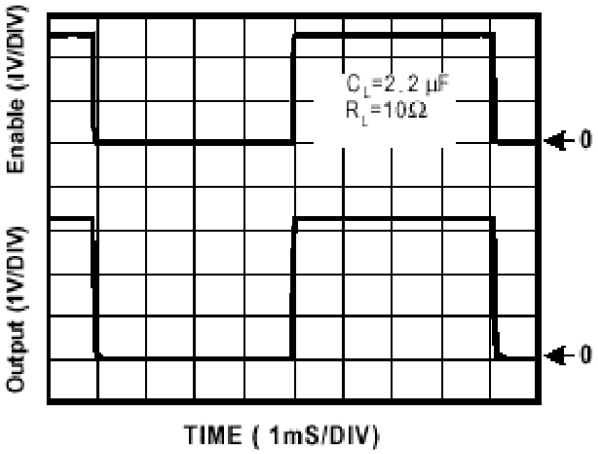
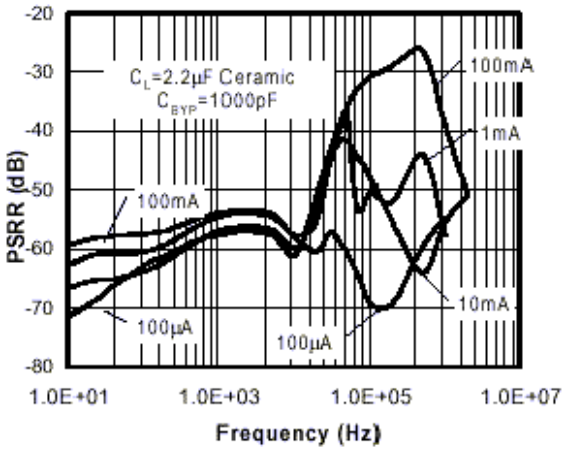
Chip Enable Transient Response



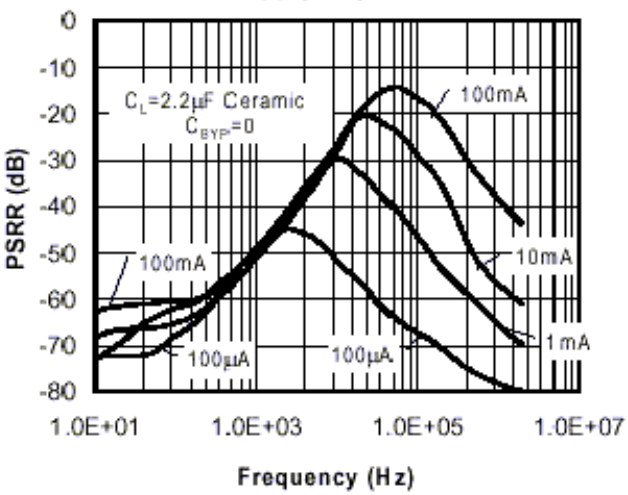

Chip Enable Transient Response



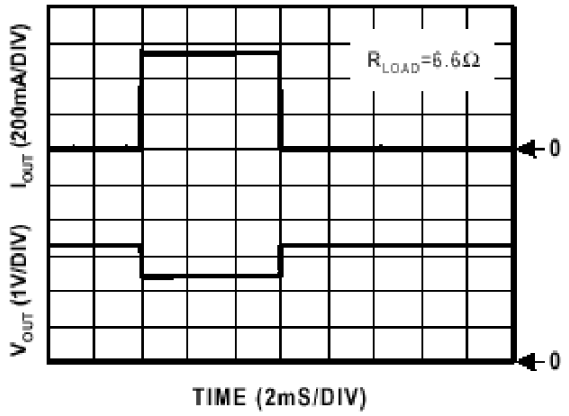

Power Supply Rejection Ratio




Power Supply Rejection Ratio




Current Limit Response



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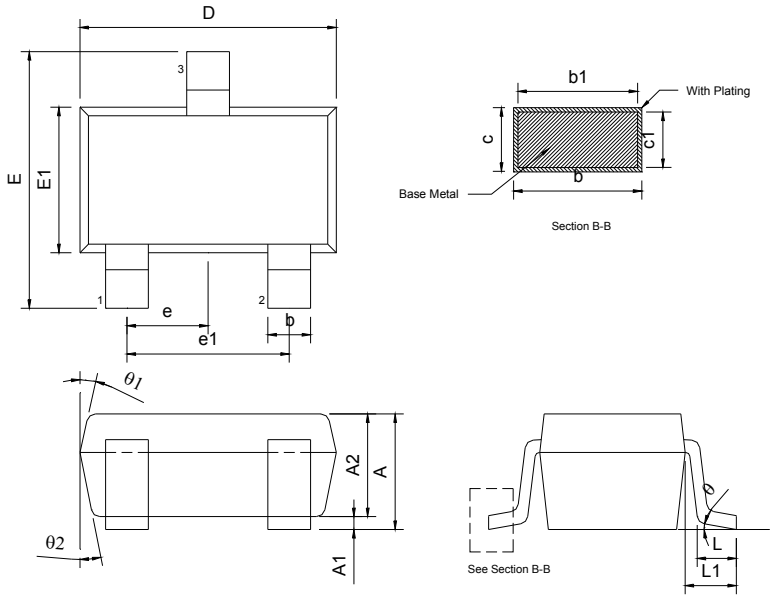
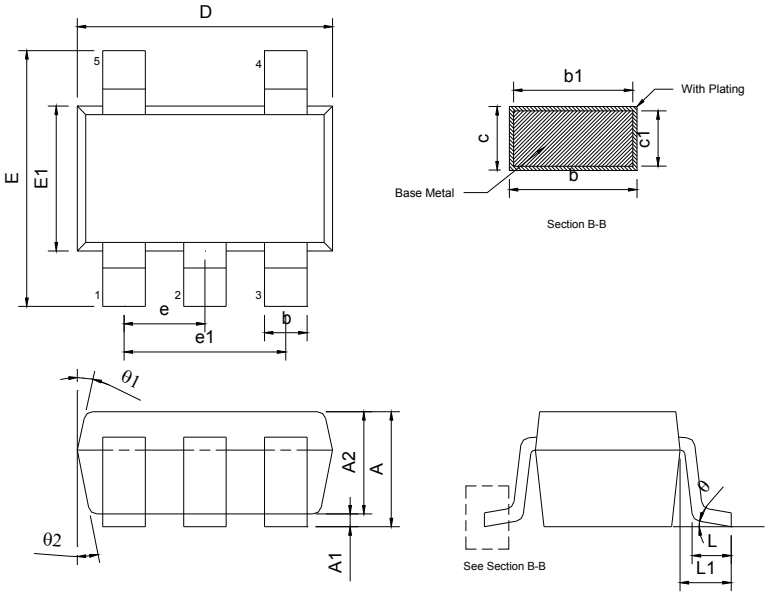
## PACKAGE DIMENSION

### SOT-23-3 (M23)




| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.05 | --- | 1.35 | 0.041 | --- | 0.053 |
| A1 | 0.05 | --- | 0.15 | 0.002 | --- | 0.006 |
| A2 | 1.00 | 1.10 | 1.20 | 0.039 | 0.043 | 0.047 |
| b | 0.25 | --- | 0.50 | 0.010 | --- | 0.020 |
| b1 | 0.25 | 0.40 | 0.45 | 0.010 | 0.016 | 0.018 |
| c | 0.08 | --- | 0.20 | 0.003 | --- | 0.008 |
| c1 | 0.08 | 0.11 | 0.15 | 0.003 | 0.004 | 0.006 |
| D | 2.70 | 2.90 | 3.00 | 0.106 | 0.114 | 0.118 |
| E | 2.60 | 2.80 | 3.00 | 0.102 | 0.110 | 0.118 |
| E1 | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| L | 0.35 | 0.45 | 0.55 | 0.014 | 0.018 | 0.022 |
| L1 | 0.60 REF | | | 0.024 REF | | |
| e | 0.95 BSC | | | 0.037 BSC | | |
| e1 | 1.90 BSC | | | 0.075 BSC | | |
| θ | 0° | 5° | 10° | 0° | 5° | 10° |
| θ1 | 3° | 5° | 7° | 3° | 5° | 7° |
| θ2 | 6° | 8° | 10° | 6° | 8° | 10° |
| | | | | | | |
| | | | | | | |

### SOT-23-5 (M25)




| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.05 | --- | 1.35 | 0.041 | --- | 0.053 |
| A1 | 0.05 | --- | 0.15 | 0.002 | --- | 0.006 |
| A2 | 1.00 | 1.10 | 1.20 | 0.039 | 0.043 | 0.047 |
| b | 0.25 | --- | 0.50 | 0.010 | --- | 0.020 |
| b1 | 0.25 | 0.40 | 0.45 | 0.010 | 0.016 | 0.018 |
| c | 0.08 | --- | 0.20 | 0.003 | --- | 0.008 |
| c1 | 0.08 | 0.11 | 0.15 | 0.003 | 0.004 | 0.006 |
| D | 2.70 | 2.90 | 3.00 | 0.106 | 0.114 | 0.118 |
| E | 2.60 | 2.80 | 3.00 | 0.102 | 0.110 | 0.118 |
| E1 | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| L | 0.35 | 0.45 | 0.55 | 0.014 | 0.018 | 0.022 |
| L1 | 0.60 REF | | | 0.024 REF | | |
| e | 0.95 BSC | | | 0.037 BSC | | |
| e1 | 1.90 BSC | | | 0.075 BSC | | |
| θ | 0° | 5° | 10° | 0° | 5° | 10° |
| θ1 | 3° | 5° | 7° | 3° | 5° | 7° |
| θ2 | 6° | 8° | 10° | 6° | 8° | 10° |
| | | | | | | |
| | | | | | | |



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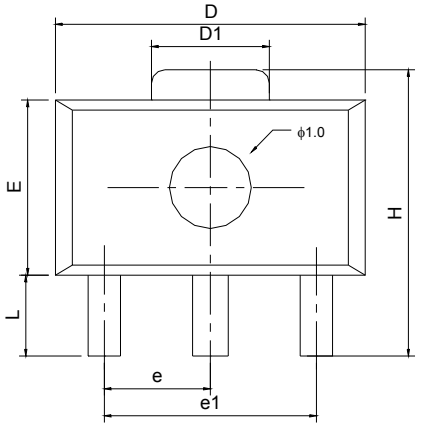
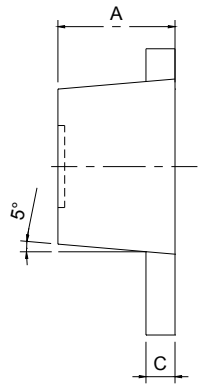
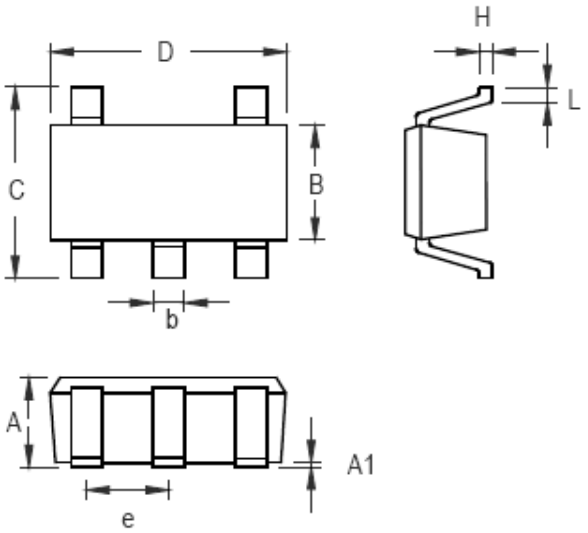
## SOT-89 (M89)




| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| L | 0.80 | --- | 1.20 | 0.031 | --- | 0.047 |
| b | 0.36 | 0.42 | 0.48 | 0.014 | 0.016 | 0.018 |
| b1 | 0.41 | 0.47 | 0.53 | 0.016 | 0.018 | 0.020 |
| C | 0.38 | 0.40 | 0.43 | 0.014 | 0.015 | 0.017 |
| D | 4.40 | 4.50 | 4.60 | 0.173 | 0.177 | 0.181 |
| D1 | 1.40 | 1.60 | 1.75 | 0.055 | 0.062 | 0.069 |
| H | 3.94 | --- | 4.25 | 0.155 | --- | 0.167 |
| E | 2.40 | 2.50 | 2.60 | 0.094 | 0.098 | 0.102 |
| e1 | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| e | 1.45 | 1.50 | 1.55 | 0.057 | 0.059 | 0.061 |

## SC70-5




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.800 | 1.100 | 0.031 | 0.044 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| B | 1.150 | 1.350 | 0.045 | 0.054 |
| b | 0.150 | 0.400 | 0.006 | 0.016 |
| C | 1.800 | 2.450 | 0.071 | 0.096 |
| D | 1.800 | 2.250 | 0.071 | 0.089 |
| e | 0.650 | | 0.026 | |
| H | 0.080 | 0.260 | 0.003 | 0.010 |
| L | 0.210 | 0.460 | 0.008 | 0.018 |



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## NUMBERING SCHEME

**Ordering Number**: CM2836/B/C**xyz (note1)**
**Ordering Number**: CM2836/B/C**G(X)xyz (note2)**

**note1**:
CM2836/B/C: 300mA CMOS LDO with enable
x : Suffix for voltage output (note 3)
y : Suffix for Temperature Range (note 4)
z : Suffix for Package Type (note 5)

**note2**:
CM2836/B/C: 300mA CMOS LDO with enable
G : Suffix for Pb Free Product
X : Suffix for Halogen Free and PB Free Product

**note 3**: see CMOS LDO Voltage Suffix Table

**CMOS LDO Voltage Suffix Table**

| Output Voltage | Suffix | Output Voltage | Suffix |
|---|---|---|---|
| 1.2V | AC | 2.5V | K |
| 1.5V | A | 2.6V | L |
| 1.7V | C | 2.7V | M |
| 1.8V | D | 2.8V | N |
| 2.0V | F | 3.0V | P |
| 2.1V | G | 3.1V | Q |
| 2.2V | H | 3.3V | S |
| 2.3V | I | 3.6V | V |

**note 4**:
y= I : -40℃~+85℃ (only I grade support for all CMOS LDOs)

**note 5:**
Z is single alphabet with or without digits
M25 : SOT-23-5 (TR only)
M23 : SOT-23 (TR only)
M89 : SOT-89 (TR only)
SC70-5 (TR only)



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