



# CM2860/CM2861 600mA CMOS LDO

## GENERAL DESCRIPTION

The CM2860/2861 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. Built-in low on-resistance transistor provides low dropout voltage and large output current. A 2.2µF or greater can be used as an output capacitor.

The SOT-89 and SOT-223 packages are attractive for "Pocket" and "Hand Held" applications.

These robust devices are designed to prevent device failure under the worst operation condition with both Thermal Shutdown and Current Fold-back.

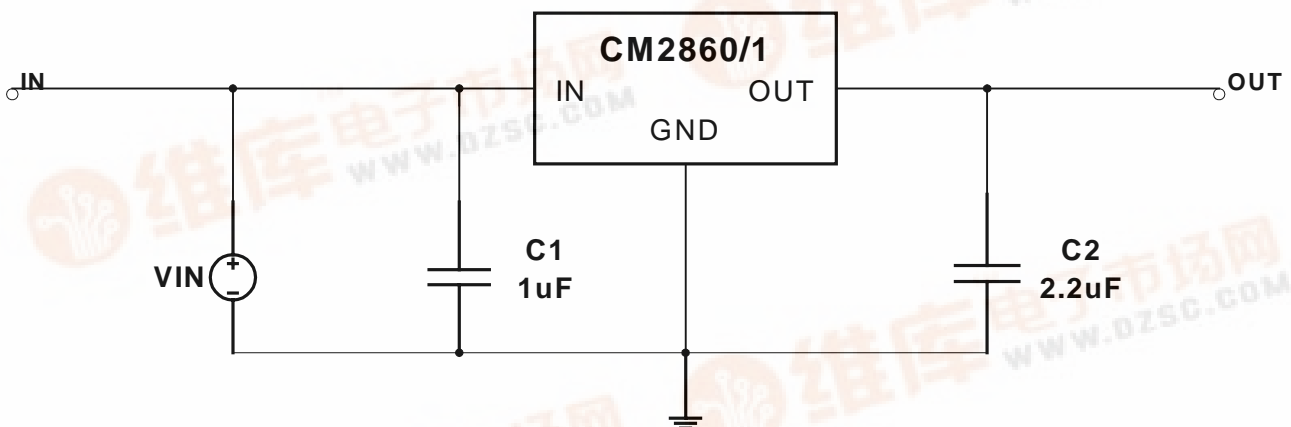
## FEATURES

- ◆ Very Low Dropout Voltage
- ◆ Low Current Consumption: Typ. 30µA, Max. 35µA
- ◆ High Accuracy Output Voltage: +/- 1.5%
- ◆ Guaranteed 600mA Output
- ◆ Thermal Shutdown
- ◆ Current Limiting
- ◆ Compact Package: SOT-89 and SOT-223
- ◆ Factory Pre-set Output Voltages
- ◆ Short Circuit Current Fold-Back
- ◆ Low Temperature Coefficient

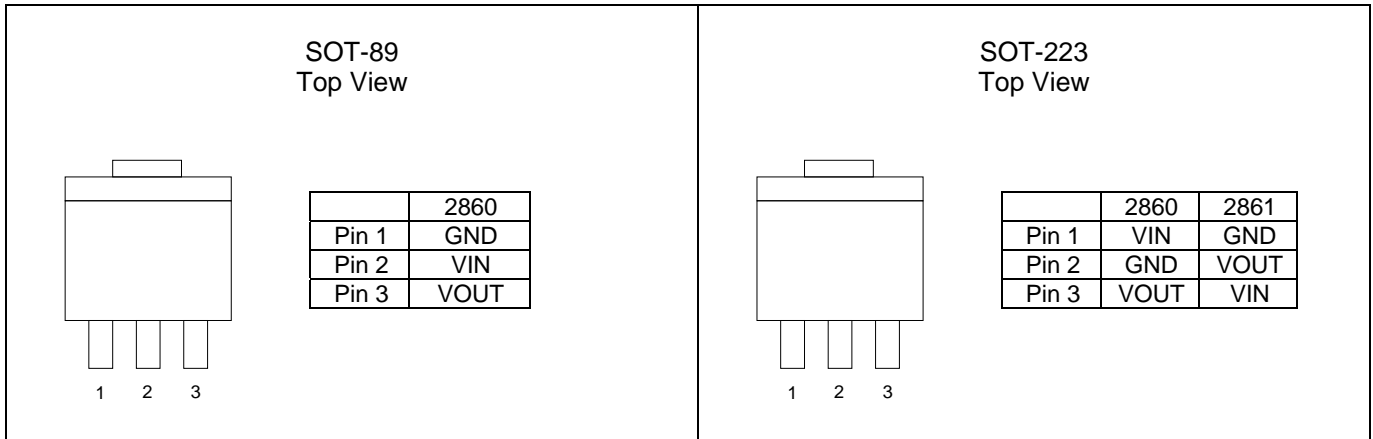
## APPLICATIONS

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

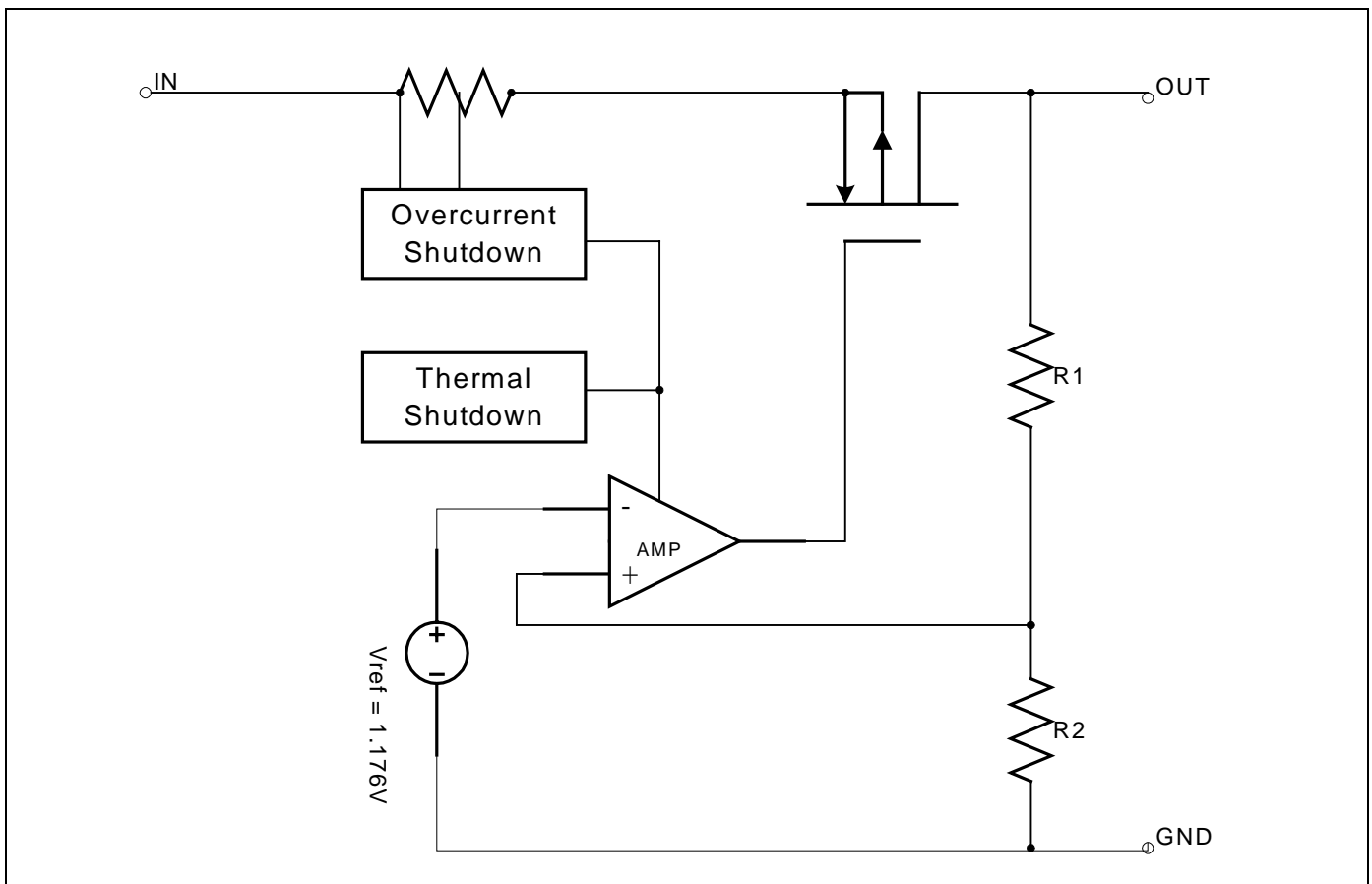
## TYPICAL APPLICATIONS



### PIN CONFIGURATION



### BLOCK DIAGRAM





# CM2860/CM2861 600mA CMOS LDO

## ORDERING INFORMATION

Part Number	Output Voltage	Temperature Range	Package
CM2860KIM89	2.5V	-40°C ~ +85°C	SOT-89
CM2860KIM223	2.5V	-40°C ~ +85°C	SOT-223
CM2860SIM89	3.3V	-40°C ~ +85°C	SOT-89
CM2860SIM223	3.3V	-40°C ~ +85°C	SOT-223
CM2861KIM223	2.5V	-40°C ~ +85°C	SOT-223
CM2861SIM223	3.3V	-40°C ~ +85°C	SOT-223
CM2860GKIM89	2.5V	-40°C ~ +85°C	SOT-89
CM2860GKIM223	2.5V	-40°C ~ +85°C	SOT-223
CM2860GSIM89	3.3V	-40°C ~ +85°C	SOT-89
CM2860GSIM223	3.3V	-40°C ~ +85°C	SOT-223
CM2861GKIM223	2.5V	-40°C ~ +85°C	SOT-223
CM2861GSIM223	3.3V	-40°C ~ +85°C	SOT-223

Note: For other pre-set output voltage, please contact Champion Sales office.

## ABSOLUTE MAXIMUM RATINGS

Input Voltage ..... +7V  
 Output Current ..... 1A  
 Output Voltage ..... GND-0.3V to  $V_{IN}+0.3V$   
 ESD Classification ..... B

## OPERATING RATINGS

Ambient Temperature Range ( $T_A$ ) ..... -40°C to +85°C  
 Junction Temperature Range ..... -40°C to +125°C

## THERMAL INFORMATION

Parameter		Maximum	Unit
Thermal Resistance ( $\theta_{jc}$ )	SOT-89	100	°C/W
	SOT-223	50	
Thermal Resistance ( $\theta_{ja}$ )	SOT-89	180	°C/W
	SOT-223	100	
Internal Power Dissipation ( $P_D$ ) ( $\Delta T = 100^\circ C$ , No Heatsink)	SOT-89	400	mW
	SOT-223 (CM2860)	900	
	SOT-223 (CM2861)	800	
Maximum Junction Temperature		150	°C
Maximum Lead Temperature (10 Sec)		300	°C

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

### ELECTRICAL CHARACTERISTICS

$T_A = +25^{\circ}\text{C}$ ;  $V_{IN} = V_{IN(MIN)}$  unless otherwise noted

Parameter	Symbol	Test Conditions	CM2860/CM2861			Unit
			Min.	Typ.	Max.	
Input Voltage	$V_{IN}$		Note 1		7	V
Output Voltage Accuracy	$V_{OUT}$	$I_O = 1\text{mA}$	-1.5		1.5	%
Dropout Voltage	$V_{DROPOUT}$	$I_O = 600\text{mA}$ , $V_{OUT} = V_{O(NOM)} - 1.5\%$	$1.5\text{V} < V_{O(NOM)} \leq 2.0\text{V}$		1000	mV
			$2.0\text{V} < V_{O(NOM)} \leq 2.8\text{V}$		800	mV
			$2.8\text{V} < V_{O(NOM)} < 3.8\text{V}$		600	mV
Output Current	$I_O$	$V_{OUT} > 1.2\text{V}$	600			mA
Current Limit	$I_{LIM}$	$V_{OUT} > 1.2\text{V}$ , $V_{IN} = V_{IN(MIN)}$	600	1000		mA
Short Circuit Current	$I_{SC}$	$V_{OUT} < 0.8\text{V}$		250		mA
Quiescent Current	$I_Q$	$I_O = 0\text{mA}$		30	50	$\mu\text{A}$
Ground Pin Current	$I_{GND}$	$I_O = 1\text{mA}$ to $600\text{mA}$		30	50	$\mu\text{A}$
Line Regulation	$REG_{LINE}$	$I_{OUT} = 5\text{mA}$ , $V_{IN} = V_{OUT} + 1$ to $V_{OUT} + 2$	$V_{OUT} \leq 2.0\text{V}$		0.15	%
			$V_{OUT} > 2.0\text{V}$		0.02	0.1
Load Regulation	$REG_{LOAD}$	$I_O = 1\text{mA}$ to $600\text{mA}$		0.2	1	%
Over Temperature Shutdown	OTS			150		$^{\circ}\text{C}$
Over Temperature Hysteresis	OTH			30		$^{\circ}\text{C}$
$V_{OUT}$ Temperature Coefficient	TC			30		ppm/ $^{\circ}\text{C}$
Power Supply Rejection	PSRR	$I_O = 100\text{mA}$ $C_O = 2.2\mu\text{F}$ ceramic	$f = 1\text{kHz}$		50	dB
			$f = 10\text{kHz}$		20	
			$f = 100\text{kHz}$		15	
Output Voltage Noise	eN	$f = 10\text{Hz}$ to $100\text{kHz}$ $I_O = 10\text{mA}$ , $C_{VBG} = 0\mu\text{F}$	$C_O = 2.2\mu\text{F}$		30	$\mu\text{Vrms}$
			$C_O = 100\mu\text{F}$		20	

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

**Note 2.** As  $V_{IN}$  is larger than  $V_{IN(MIN)}$ , the Current Limit and output short current Spec value will increase



## **DETAILED DESCRIPTION**

The CM2860/CM2861 family of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, thermal shutdown, and short circuit protection.

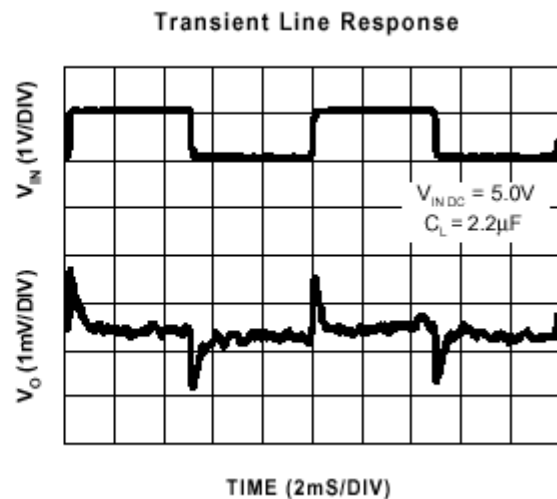
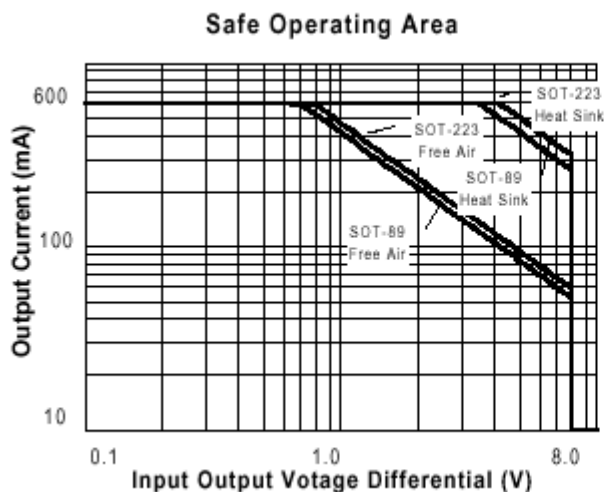
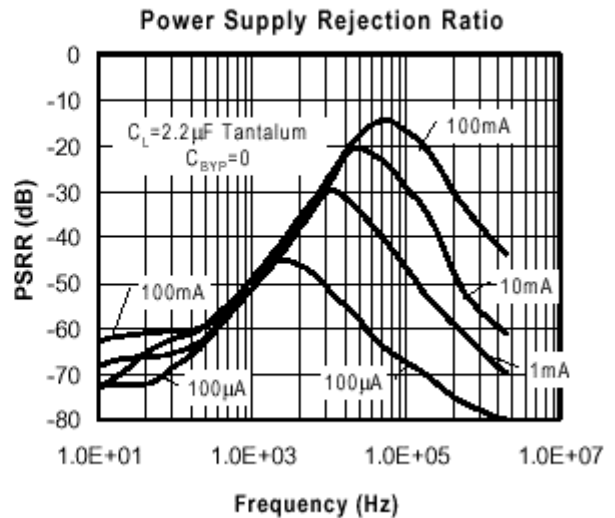
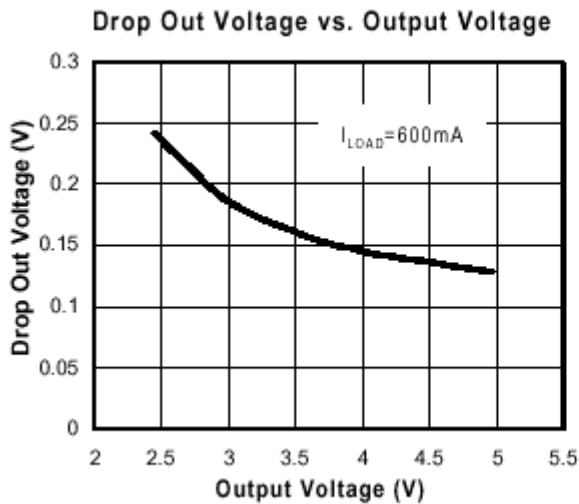
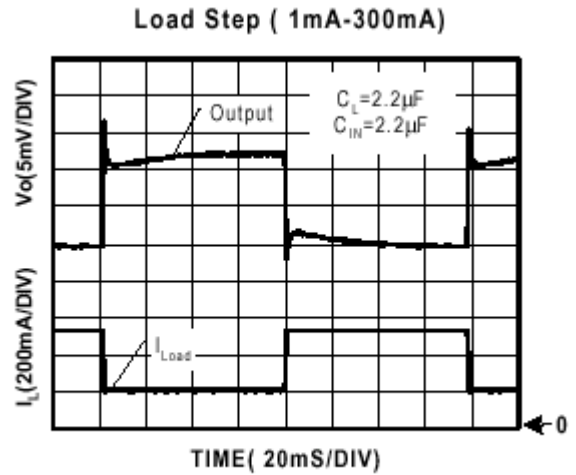
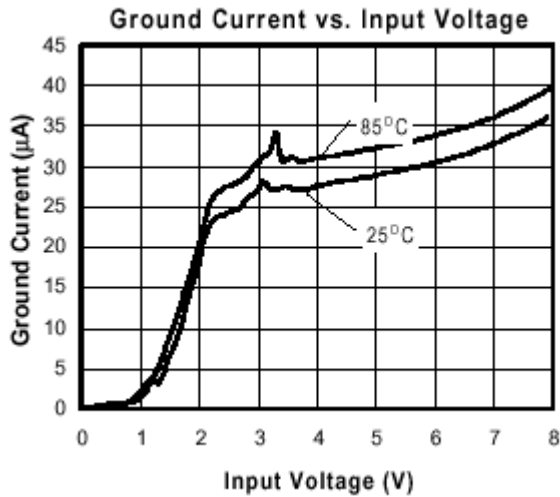
The P-channel pass transistor receives data from the error amplifier, over-current shutdown, short output protection, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150°C, or the current exceeds 600mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

The CM2860/CM2861 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The CM2860/2861 also incorporates current fold-back to reduce power dissipation when the output is short-circuited. This feature becomes active when the output drops below 0.8V, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8V.

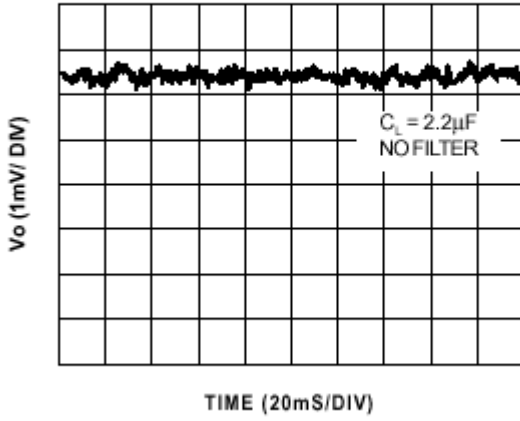
## **EXTERNAL CAPACITOR**

The CM2860/CM2861 is stable with an output capacitor to ground of 2.2 $\mu$ F or greater. It can keep stable even with higher or poor ESR capacitors. A second capacitor is recommended between the input and ground to stabilize VIN. The input capacitor should be larger than 0.1 $\mu$ F to have a beneficial effect. All capacitors should be placed in close proximity to the pins. A "quiet" ground termination is desirable.

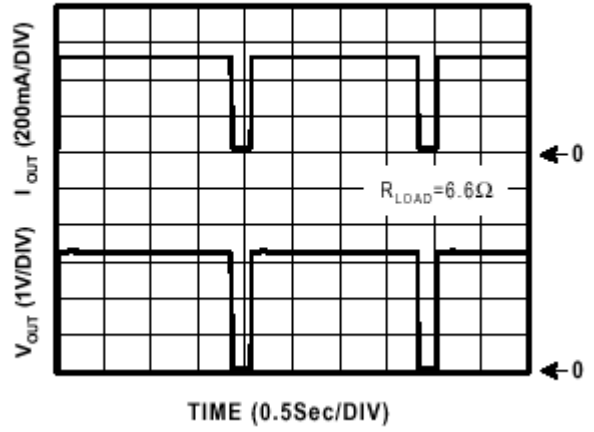
### TYPICAL ELECTRICAL CHARACTERISTICS



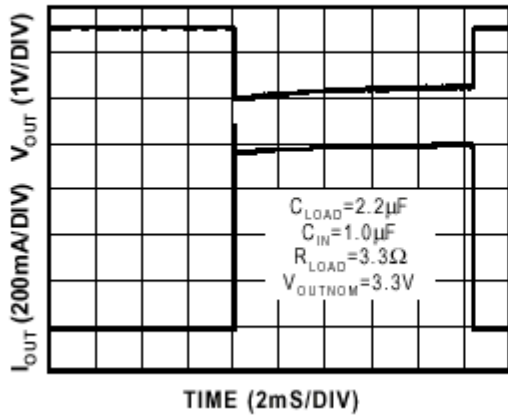
Noise Measurement



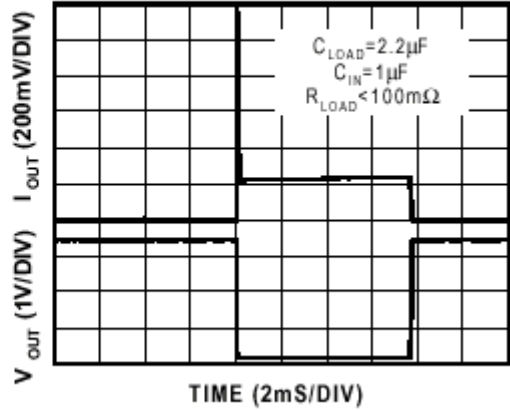
Overtemperature Shutdown



Current Limit Response

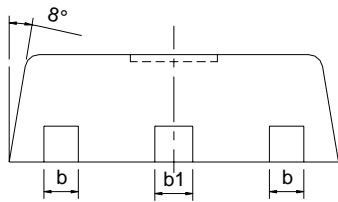
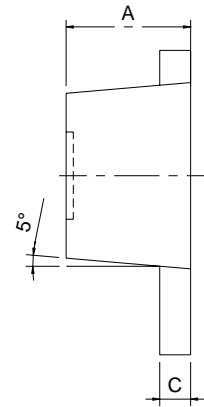
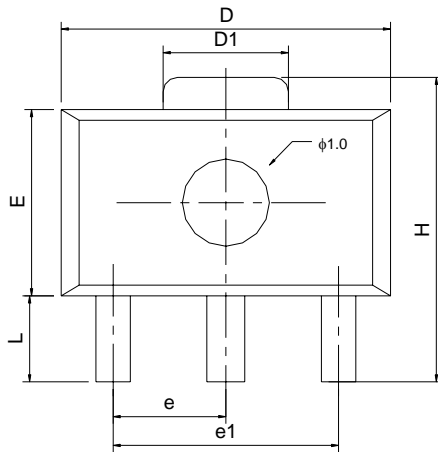


Short Circuit Response



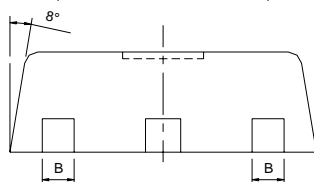
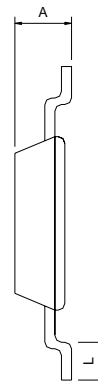
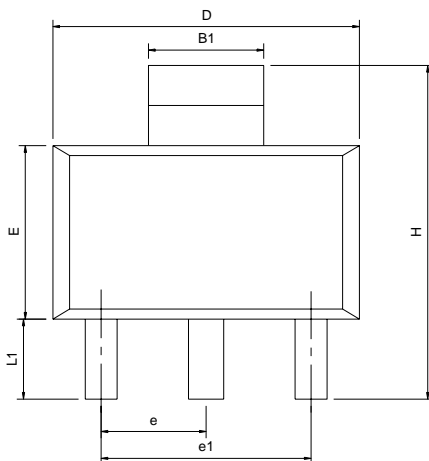
### PACKAGE DIMENSION

#### SOT-89 (M89)



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	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

#### SOT-223 (M223)



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	---	1.80	0.0591	---	0.0709
B	0.60	---	0.838	0.0236	---	0.033
B1	2.895	---	3.15	0.114	---	0.124
D	6.299	---	6.706	0.248	---	0.264
E	3.30	---	3.709	0.1299	---	0.146
e	---	2.3088C	---	---	0.0908C	---
e1	---	4.8088C	---	---	0.18188C	---
H	6.70	---	7.30	0.2638	---	0.2874
L	---	0.91MIN	---	---	0.036MIN	---
L1	---	2.00MAX	---	---	0.0787MAX	---
θ	---	---	13°	---	---	13°





# CM2860/CM2861 600mA CMOS LDO

## NUMBERING SCHEME

Ordering Number: CM2860XYZ/CM2861XYZ (note1)

Ordering Number: CM2860GXYZ/CM2861GXYZ (note2)

**note1:**

CM2860/CM2861: 600mA CMOS LDO

X: Suffix for voltage output (note 3)

Y: Suffix for Temperature Range (note 4)

Z: Suffix for Package Type (note 5)

**note2:**

CM2860/CM2861: 600mA CMOS LDO

G: Suffix for Pb Free Product

X: Suffix for voltage output (note 3)

Y: Suffix for Temperature Range (note 4)

Z: Suffix for Package Type (note 5)

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

**note 4:**

Y= I : -40°C~+85°C (only I grade support for all CMOS LDOs)

**note 5:**

Z is single alphabet with or without digits

M223 : SOT-223 (TR only)

M89 : SOT-89 (TR only)

CMOS LDO Voltage Suffix Table

Output Voltage	Suffix	Output Voltage	Suffix
1.5V	A	3.0V	P
1.6V	B	3.1V	Q
1.7V	C	3.2V	R
1.8V	D	3.3V	S
1.9V	E	3.4V	T
2.0V	F	3.5V	U
2.1V	G	3.6V	V
2.2V	H	3.7V	W
2.3V	I	3.8V	X
2.4V	J	3.9V	Y
2.5V	K	4.0V	Z
2.6V	L		
2.7V	M		
2.8V	N		
2.9V	O		



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