

# MAS9485

## LDO Voltage Regulator IC

- 100mA Very Low Dropout Voltage Regulator
- Low Noise
- Regulator Enable/Disable Control
- Stable Even with Low-ESR Output Capacitor

### DESCRIPTION

The MAS9485 is a low dropout voltage regulator with an enable/disable pin, which allows device to be turned off or on by pulling control to low or high. Due to the low noise level of only 30  $\mu$ Vrms, MAS9485 is suitable for sensitive circuits, e.g., in portable applications. In addition to the noise levels, MAS9485 excels in dropout voltage (150 mV typical at 100 mA) and rise time (15  $\mu$ s typical without bypass capacitor).

A very wide range of values of Equivalent Series Resistance (ESR) of output capacitors can be used with MAS9485. This ESR range from a few m $\Omega$  up to a couple of ten Ohms combined with no minimum output current requirement makes the usage of MAS9485 easier and low in cost.

In order to save power the device goes into sleep mode when the regulator is disabled. An internal thermal protection circuit prevents the device from overheating. Also the maximum output current is internally limited.

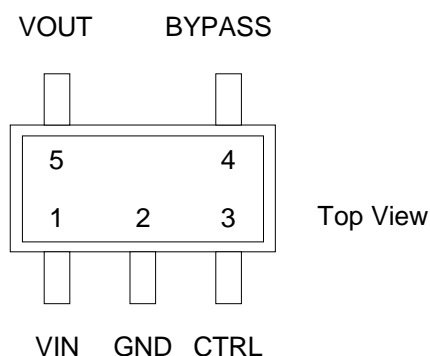
### FEATURES

- Output Accuracy  $<\pm 2\%$
- Low Noise
- Internal Thermal Shutdown
- Short Circuit Protection
- SOT23-5 Package
- Pin Compatible with LP2985
- Output Voltage Options: 3.3 V, 2.8 V, and 2.4 V

### APPLICATION

- Cellular Phones
- Cordless Phones
- Pagers
- Battery Powered Systems
- Portable Systems
- Radio Control Systems
- Low Voltage Systems

### PIN CONFIGURATION AND DESCRIPTION

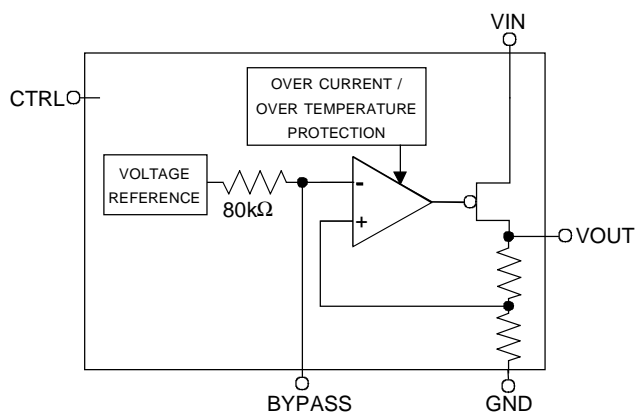


Pin Name	Pin	Type	Function
VIN	1	P	Power Supply Voltage
GND	2	G	Ground
CTRL	3	I	Enable/Disable Pin for Regulator (push down)
BYPASS	4	I	Pin for Bypass Capacitor
VOUT	5	O	Output

G = Ground, I = Input, O = Output, P = Power

For Top Marking Information see  
p. 9 Ordering Information

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

All voltages with respect to ground.

Parameter	Symbol	Conditions	Min	Max	Unit
Supply Voltage	$V_{IN}$		-0.3	6	V
ESD Rating		Human Body Model, HBM		1.5	kV
Junction Temperature	$T_{Jmax}$			+170 (limited)	°C
Operating Junction Temperature	$T_J$		- 40	+125	°C
Storage Temperature	$T_S$		-55	+150	°C
Operating Ambient Temperature	$T_A$		-40	+85	°C

Stresses beyond those listed may cause permanent damage to the device. The device may not operate under these conditions, but it will not be destroyed.

## ELECTRICAL CHARACTERISTICS

$T_A = 27^\circ\text{C}$ ,  $V_{IN} = \text{Typ } V_{OUT} + 1.0\text{ V}$ ,  $I_{OUT} = 1.0\text{ mA}$ ,  $C_{IN} = 1.0\ \mu\text{F}$ ,  $C_{OUT} = 1.0\ \mu\text{F}$ ,  $V_{CTRL} = V_{IN}$ , unless otherwise specified

### ◆ Thermal protection

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Threshold high	$T_H$		140	155	170	$^\circ\text{C}$
Threshold low	$T_L$		130	145	160	$^\circ\text{C}$

The hysteresis of  $10\ ^\circ\text{C}$  prevents the device from turning on too soon after thermal shut-down.

### ◆ Control Terminal Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control Voltage OFF State ON State	$V_{CTRL}$		1.6		0.55	V
Control Current	$I_{CTRL}$	$V_{CTRL} = V_{IN}$ $V_{CTRL} = 0\text{ V}$		5 0	10	$\mu\text{A}$

### ◆ Voltage Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage Tolerance	$V_{OUT}$		2.76		2.88	V
Operating Supply Voltage	$V_{IN}$		2.5		6	V
Dropout Voltage	$V_{DROP}$	$I_{OUT} = 1\text{ mA}$ $I_{OUT} = 50\text{ mA}$ $I_{OUT} = 100\text{ mA}$		15 70 150		mV

### ◆ Current Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Output Current	$I_{OUT}$			100		mA
Short Circuit Current	$I_{MAX}$	$R_L = 0\ \Omega$		250		mA
Peak Output Current	$I_{PK}$	$V_{OUT} > 95\% * V_{OUT\text{ typical}}$		210		mA
Ground Pin Current	$I_{GND}$	$I_{OUT} = 0\text{ mA}$ $I_{OUT} = 10\text{ mA}$ $I_{OUT} = 50\text{ mA}$ $I_{OUT} = 100\text{ mA}$ $V_{CTRL} < 0.3\text{ V}$		100 125 170 230 0.01		$\mu\text{A}$

### ◆ Power Dissipation

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Junction to Case Thermal Resistance	$R_{JC}$			81.0		°C/W
Junction to Ambient Thermal Resistance	$R_{JA}$			260		°C/W
Maximum Power Dissipation	$P_d$	any ambient temperature		$P_{dMAX} = \frac{T_{J(MAX)} - T_A}{R_{JA}}$ Note 1		mW

Note 1:  $T_{J(MAX)}$  denotes maximum operating junction temperature (+125°C),  $T_A$  ambient temperature, and  $R_{JA}$  junction-to-air thermal resistance (+260°C/W).

### ◆ Line and Load Regulation

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Line Regulation		$V_{OUT} + 1\text{ V} < V_{IN} < 6\text{ V}$ $I_{OUT} = 60\text{ mA}$		3.0		mV
Load Regulation		$I_{OUT} = 1.0\text{ to }50\text{ mA}$ $I_{OUT} = 1.0\text{ to }100\text{ mA}$		5 10	15 20	mV

### ◆ Noise and Ripple Rejection

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Noise Voltage	$V_{RMS}$	$300\text{Hz} < f < 50\text{kHz}$ , $C_{BYPASS} = 10\text{ nF}$		30		$\mu\text{V}_{rms}$
Noise Density	$V_N$	$C_{BYPASS} = 10\text{ nF}$ , $I_{OUT} = 50\text{ mA}$ , $f = 1.0\text{ kHz}$		250		$\frac{\text{nV}}{\text{sqrt(Hz)}}$
PSRR		$C_{BYPASS} = 10\text{ nF}$ $f = 1\text{ kHz}$ $f = 10\text{ kHz}$ $f = 100\text{ kHz}$		55 45 23		dB

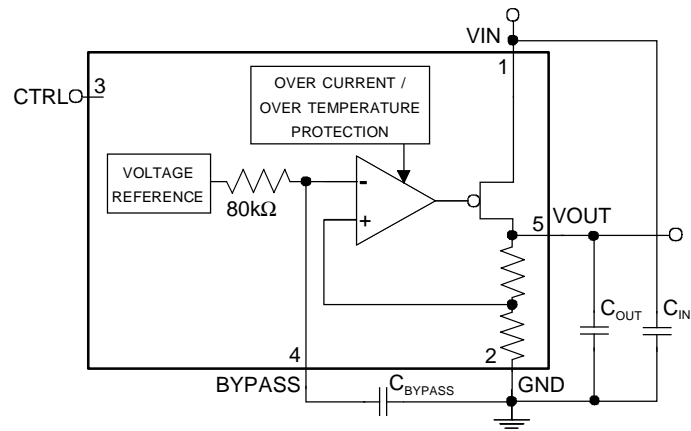
### ◆ Dynamic Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Rise Time (10%...90%)		$V_{CTRL} = 0\text{ to }2.4\text{ V}$ , $I_{OUT} = 30\text{ mA}$ $C_{BYPASS} = 10\text{ nF}$ w/o $C_{BYPASS}$		3 15		ms $\mu\text{s}$
Overshoot		$V_{CTRL} = 0\text{ to }2.4\text{ V}$ w/o $C_{BYPASS}$		3	5	%
Start-up Delay		$V_{CTRL}$ to $V_{OUT}$		60		$\mu\text{s}$

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**APPLICATION INFORMATION**

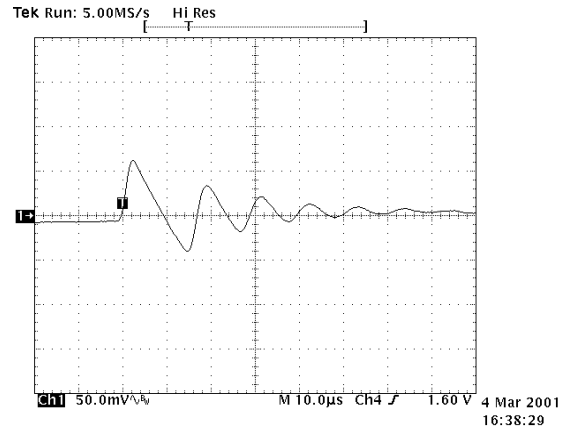
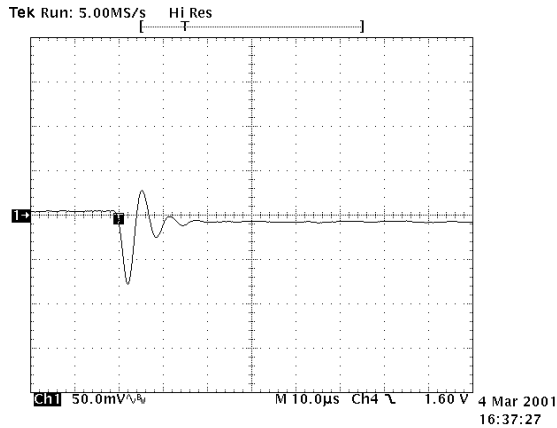
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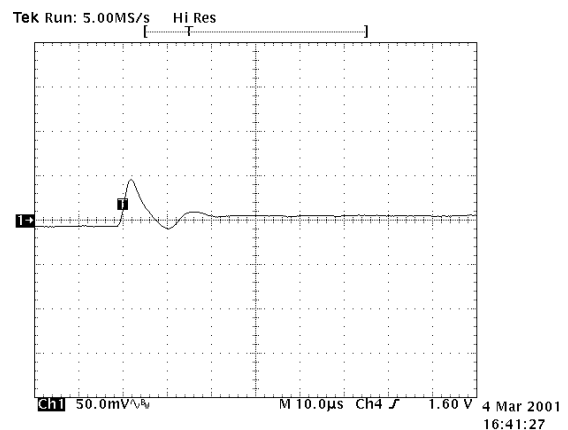
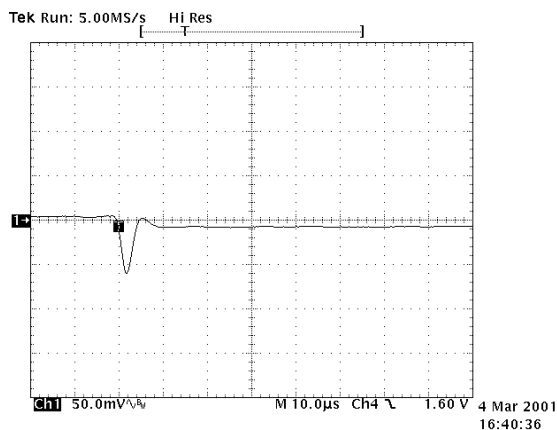
### Load transient vs. VOUT capacitor ESR

Load current changes from 10mA to 90mA during 1 $\mu$ s.

Load current changes from 90mA to 10mA during 1 $\mu$ s.



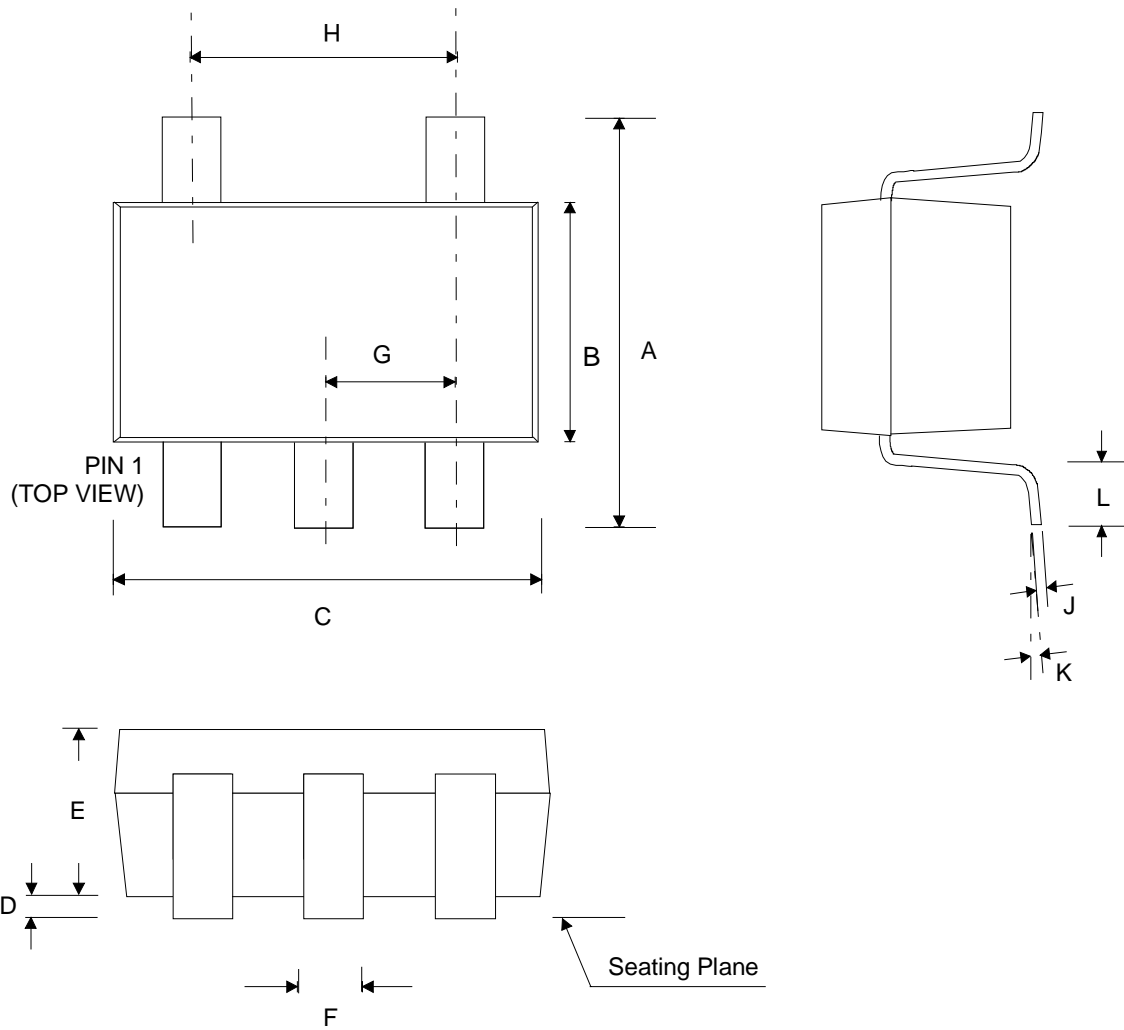
Typical load transient for battery supply and Ceramic Capacitor, ESR=0.1...0.2 $\Omega$ .



Typical load transient for battery supply and Tantalum Capacitor, ESR=1...3 $\Omega$

Parameter	Symbol	Min	Max	Unit	Comment
Output capacitor Capacitance	$C_{OUT}$	0.22		$\mu$ F	Good capacitor value is 0.47...2 $\mu$ F. To have load transient overshoot/undershoot small it is recommended to use capacitor with ESR no less than 1 $\Omega$ . With smaller ESR the regulator is stable, but load transients can get worse.
Effective Series Resistance	ESR	0.05	20	$\Omega$	
Bypass capacitor	$C_{BYPASS}$	Typically 10		nF	Using this capacitor decreases noise on regulator output. DC leakage of capacitor should be below 100nA.
Input Capacitor	$C_{IN}$	1		$\mu$ F	Any type of capacitor can be used. Small capacitor ESR and bigger capacitor value will make load transient better.

When selecting capacitors, tolerance and temperature coefficient should be considered to make sure the requirements are met.

**PACKAGE (SOT-23-5) OUTLINE**


Dimension	Min	Max	Unit
A	2.60	3.00	mm
B	1.45	1.75	mm
C	2.80	3.10	mm
D	0.00	0.15	mm
E	0.90	1.30	mm
F	0.25	0.50	mm
G	0.95ref		mm
H	1.90ref		mm
J	0.09	0.20	mm
K	0	10	°
L	0.35	0.55	mm

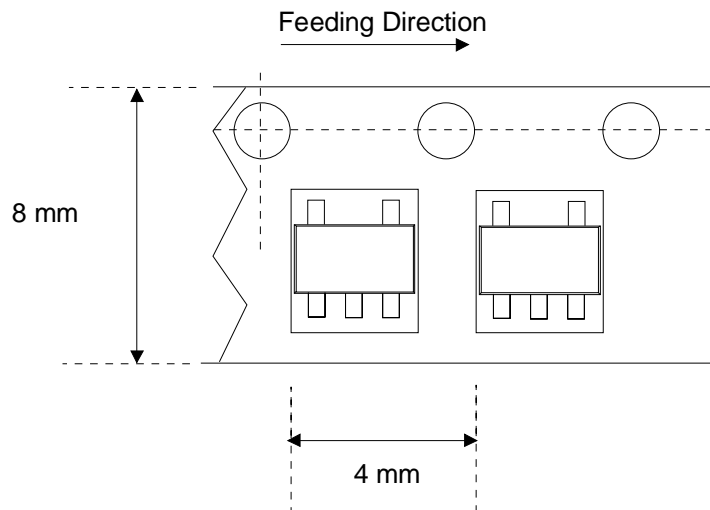
Dimensions do not include mold flash, protrusions or gate burrs.

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## TAPE SPECIFICATIONS

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### SOT23 5ld TAPE



OTHER DIMENSIONS ACCORDING TO EIA-481 STANDARD



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## ORDERING INFORMATION

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Product Code	Product	Top Marking	Package	Comments
MAS9485AST2-T	2.8 V Voltage Regulator IC	85A2	SOT23-5	Tape and Reel

For more voltage options contact Micro Analog Systems Oy.

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## LOCAL DISTRIBUTOR

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## MICRO ANALOG SYSTEMS OY CONTACTS

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