

# CMOS Regulator Monolithic IC MM303X Series

## Outline

This IC is a voltage regulator IC developed using the CMOS process. Super low consumption current of 1.5  $\mu\text{A}$  typ. (MM303X) (when not loaded) has been achieved through the use of the CMOS process. Also, the output voltage has a high accuracy of  $\pm 2\%$ .

## Features

- |   |   |
|---|---|
| 1. Super low consumption current              | 1.5 $\mu\text{A}$ typ. (when not loaded, excluding the CE terminal current) |
| 2. Super low consumption current (when off)   | 0.1 $\mu\text{A}$ typ.  |
| 3. High precision output voltage              | $\pm 2\%$   |
| 4. Input/output voltage difference            | 40mV typ. ( $I_o=1\text{mA}$ MM3033A)                                       |
| 5. Good input stability                       | 0.05%/V typ.  |
| 6. Built-in short-circuit restriction circuit | 60mA typ.   |
| 7. Wide operating temperature range           | $-30\sim+85^\circ\text{C}$  |
| 8. Output voltage                             | 1.7~5.5V (0.1V step)  |

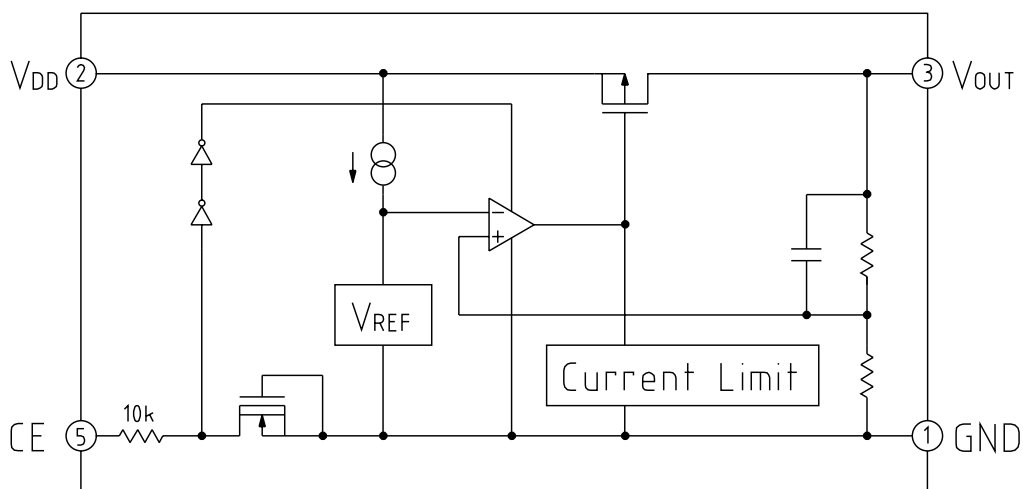
## Package

SC-82AB

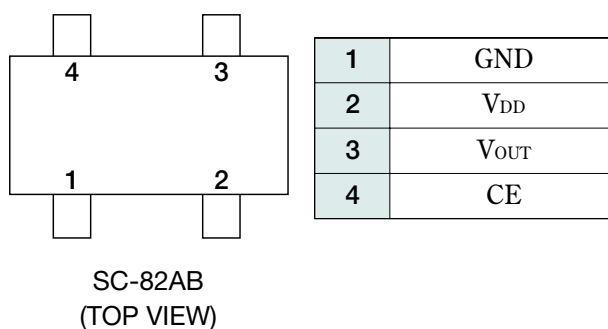
## Applications

1. Devices that use batteries
2. Portable communications devices
3. Household electronics products

## Block Diagram



### Pin Assignment



### Pin Description

Pin No.	Pin name	Functions						
1	GND	GND Pin						
2	V <sub>DD</sub>	Voltage-Supply pin						
3	V <sub>OUT</sub>	Regulator output pin						
4	CE	No connection pin						
		<table border="1" style="width: 100%;"> <tr> <td>CE</td> <td>OUTPUT</td> </tr> <tr> <td>L</td> <td>OFF</td> </tr> <tr> <td>H</td> <td>ON</td> </tr> </table>	CE	OUTPUT	L	OFF	H	ON
		CE	OUTPUT					
		L	OFF					
H	ON							
ON/OFF-Control pin								
Connect CE-pin with VDD-pin, when it is not used.								

### Absolute Maximum Ratings (Ambient Temperature, Ta=25°C)

Item	Symbol	Ratings	Unit
Storage Temperature	T <sub>STG</sub>	-40~+125	°C
Operating Temperature	T <sub>OPR</sub>	-30~+85	°C
Supply Voltage	V <sub>DD</sub>	-0.3~+9	V
Output Current	I <sub>OUT</sub>	150	mA
Allowable loss	P <sub>d</sub>	150 (Alone)	mW

### Recommended Operating Conditions (Ambient Temperature, Ta=25°C)

Item	Symbol	Ratings	Unit
Operating Temperature	T <sub>OP</sub>	-30~+85	°C
Supply Voltage	V <sub>OP</sub>	V <sub>OUT</sub> +0.3~8	V

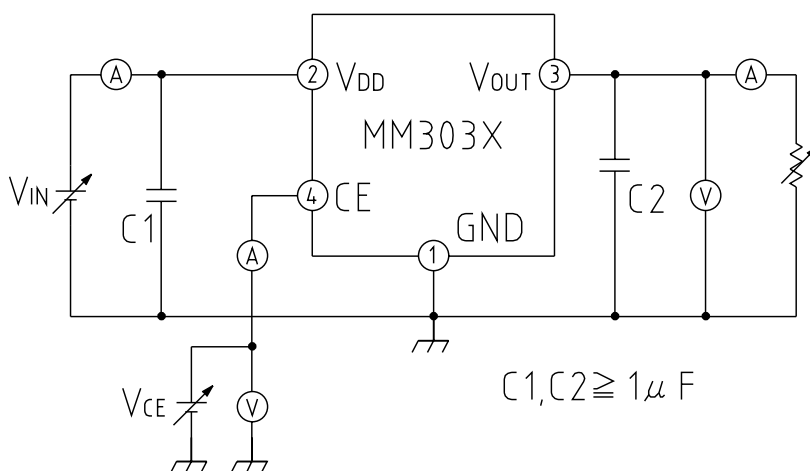
**Electrical Characteristics** (Ambient Temperature,  $T_a=25^{\circ}\text{C}$ ,  $V_{IN}=V_{CE}$ )

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Quiescent Current	$I_{SS}$	$V_{IN}=V_{OUT}+2.0\text{V}$		1.5	3.0	$\mu\text{A}$
Input Current(OFF)	$I_{standby}$	$V_{IN}=V_{OUT}+2.0\text{V}$ , $V_{CE}=0\text{V}$		0.1	1.0	$\mu\text{A}$
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$I_{OUT}=1\text{mA}$ , $V_{OUT}+0.5\text{V} \leq V_{IN} \leq 8\text{V}$	0	0.05	0.20	%/V
Input Voltage	$V_{IN}$				8	V
Output voltage temperature coefficient	$\Delta V_{OUT}/\Delta T_{opt}$	$I_{OUT}=10\text{mA}$ $-30^{\circ}\text{C} \leq T_{OPT} \leq 85^{\circ}\text{C}$		$\pm 100$		ppm/ $^{\circ}\text{C}$
Short current	$I_{lim}$	$V_{IN}=V_{OUT}+2.0\text{V}$ , $V_{OUT}=0\text{V}$		60		mA
CE pin current when ON	$I_{CE}$	$V_{IN}=V_{OUT}+2.0\text{V}$		0.1	1.0	$\mu\text{A}$
CE input voltage "H"	$V_{CEH}$	$V_{IN}=V_{OUT}+2.0\text{V}$	$V_{IN}-1$		$V_{IN}$	V
CE input voltage "L"	$V_{CEL}$	$V_{IN}=V_{OUT}+2.0\text{V}$			0.25	V

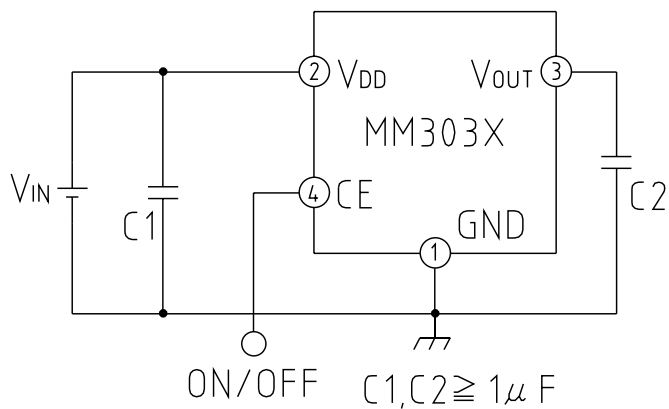
**Electrical Characteristics 2** (Ambient Temperature, Ta=25°C, VIN=VCE)

Product Name	PARAMETER												
	Output Voltage			Output Current			Load Regulation			Input-Output differential Voltage			
	VOUT (V)			IOUT (mA)			ΔVOUT/ΔIOUT (mV)			VDIF (V)			
	TEST CONDITIONS	MIN.	TYP.	MAX.	TEST CONDITIONS	MIN.	TYP.	TEST CONDITIONS	TYP.	MAX.	TEST CONDITIONS	TYP.	MAX.
MM3031H	VIN-VOUT=2.0V 10μA ≤ IOUT ≤ 10mA	1.666	1.700	1.734	VIN-VOUT=2.0V	35		VIN-VOUT=2.0V 1mA ≤ IOUT ≤ 35mA	30	45		60	90
MM3031J													
MM3031K													
MM3032A													
MM3032B													
MM3032C													
MM3032D													
MM3032E													
MM3032F													
MM3032G													
MM3032H													
MM3032J													
MM3032K													
MM3033A													
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MM3034H													
MM3034J													
MM3034K													
MM3035A													
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MM3035C													
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MM3035E													
MM3035F													

Measuring Circuit



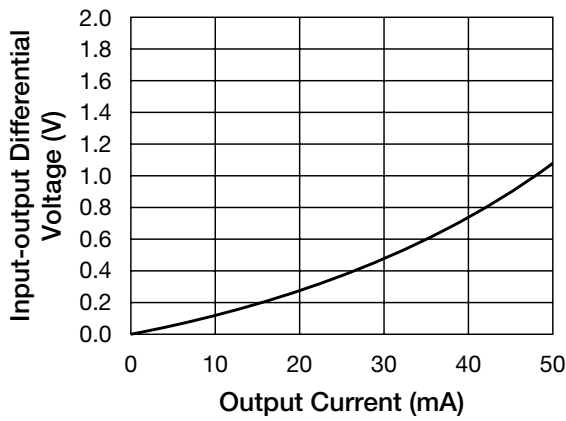
Typical Application Circuit



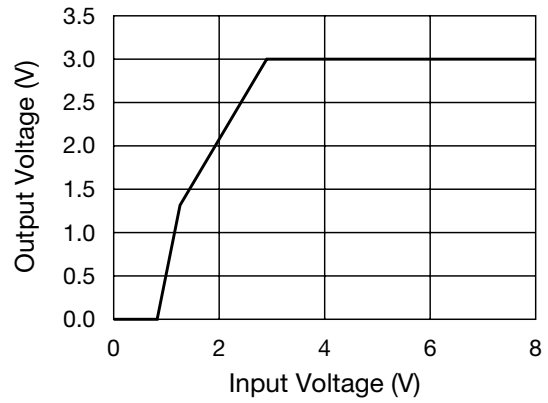
Note: This regulator is not internally compensated and thus requires an external output-capacitor(COUT) for stability.

**Characteristics** (3.0V product Ambient Temperature,  $T_a=25^{\circ}\text{C}$ )

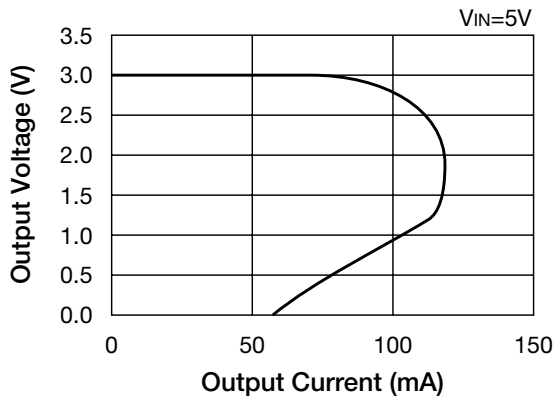
**Input-output Differential Voltage**



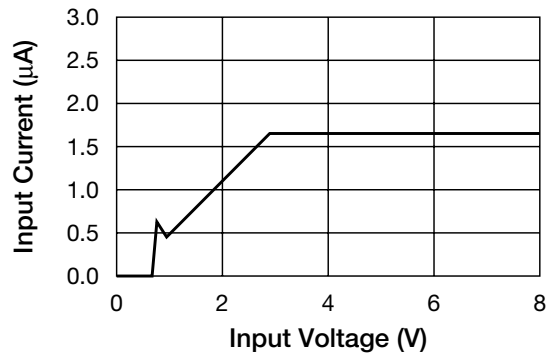
**Line Regulation**



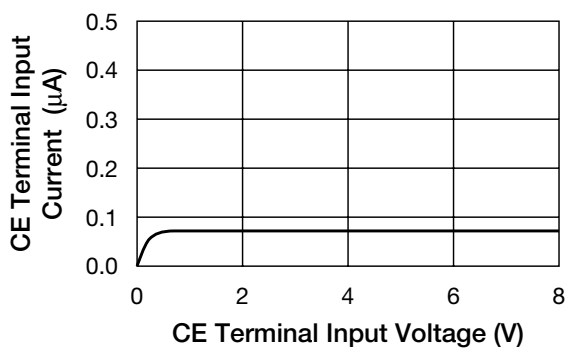
**Load Regulation**



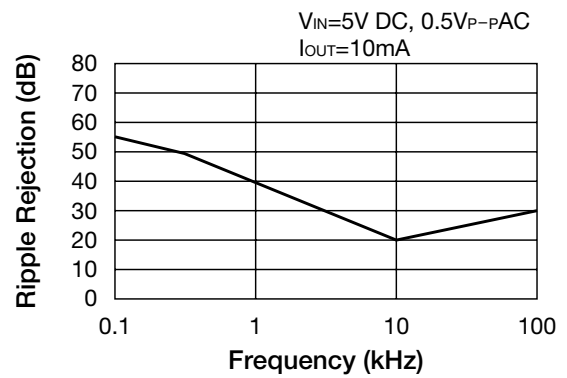
**Input Current**



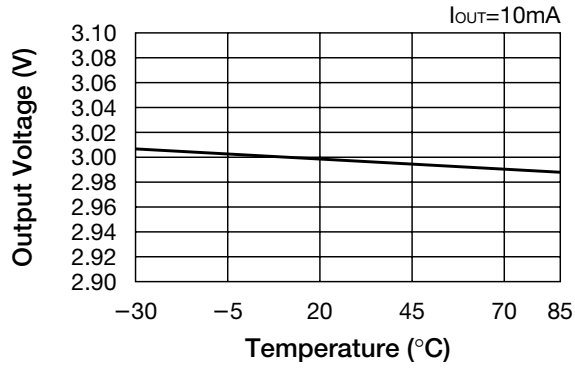
**CE Terminal Input Current VS CE Terminal Input Voltage**



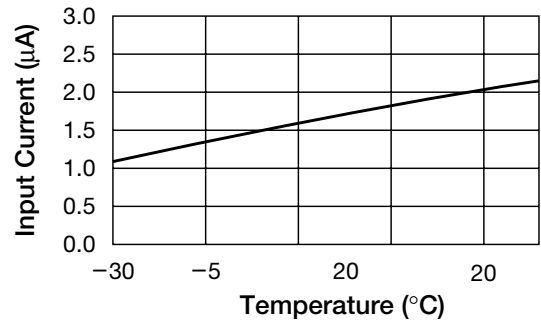
**Ripple Rejection**



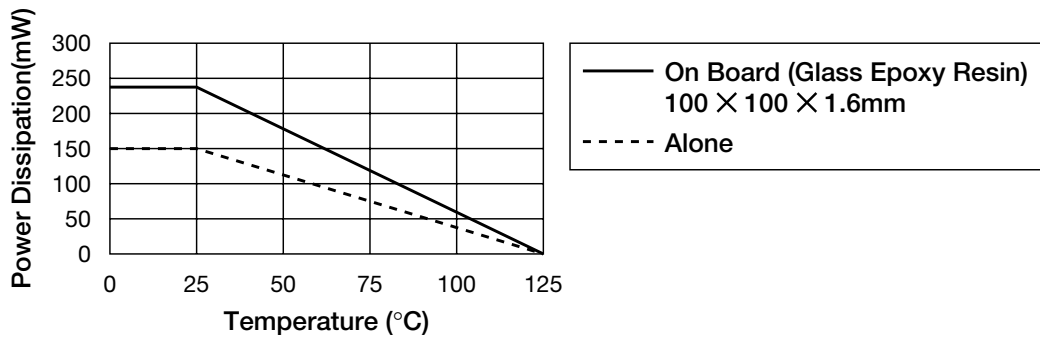
■ Output Voltage VS Temperature



■ Input Current VS Temperature



■ Power Dissipation



■ ESR Stable region

