

CMOS Regulator Monolithic IC MM302X Series

Outline

This IC is a voltage regulator IC developed using the CMOS process. Super low consumption current of 2.5 μA typ. (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 | 2.5 μA typ. (when not loaded, excluding the CE terminal current) |
| 2. Super low consumption current (when off) | 0.1 μA typ. |
| 3. High precision output voltage | $\pm 2\%$ |
| 4. Input/output voltage difference | 0.3V typ. ($I_o=60\text{mA}$ MM3023A) |
| 5. Good input stability | 0.15%/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 | 2.0~5.5V (0.1V step) |

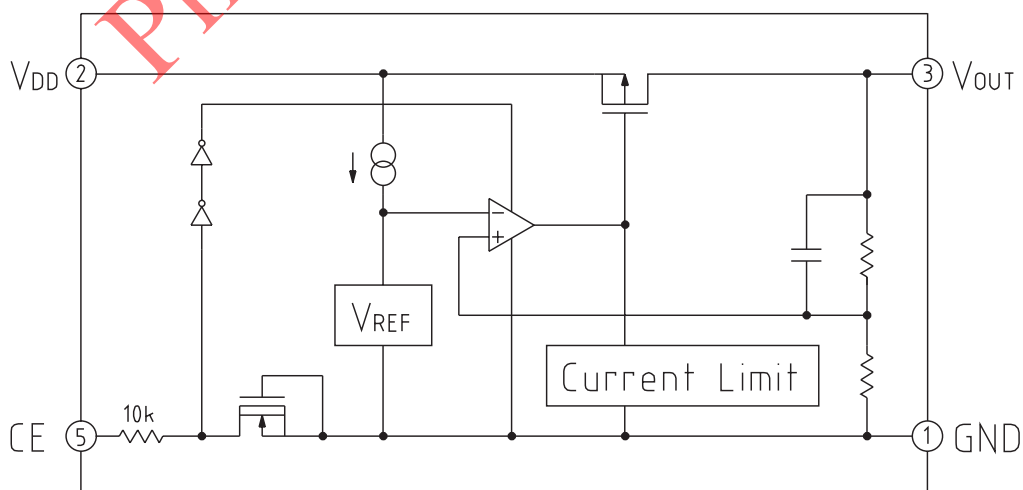
Package

SOT-25A (Mini Mold)

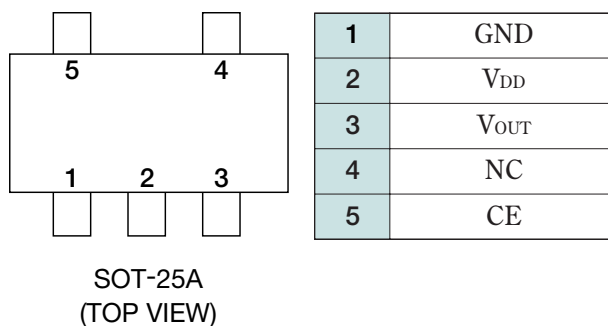
Applications

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 _{DD}	Voltage-supply pin
3	V _{OUT}	Regulator output pin
4	NC	
5	CE	ON/OFF-Control pin
		CE OUTPUT
		L OFF
		H ON

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

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

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

Item	Symbol	Ratings	Unit
Operating Temperature	T _{OP}	-30~+85	°C
Supply Voltage	V _{OP}	V _{OUT} +0.3~8	V

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

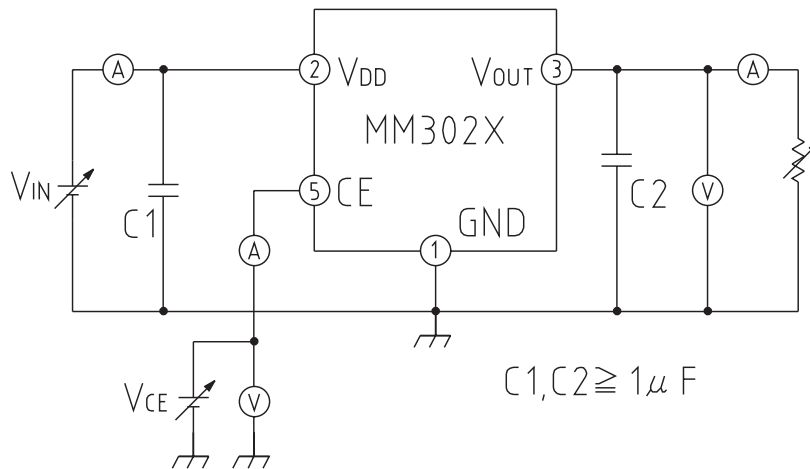
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Quiescent Current	I_{SS}	$V_{IN}=V_{OUT}+1.0\text{V}$		2.5	5.0	μA
Input Current(OFF)	$I_{standby}$	$V_{IN}=V_{OUT}+1.0\text{V}$, $V_{CE}=0\text{V}$		0.1	1.0	μA
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$I_{OUT}=30\text{mA}$, $V_{OUT}+0.5\text{V} \leq V_{IN} \leq 8\text{V}$	0	0.15	0.30	%/V
Input Voltage	V_{IN}				8.0	V
Output voltage temperature coefficient	$\Delta V_{OUT}/\Delta T_{opt}$	$I_{OUT}=10\text{mA}$ $-30^{\circ}\text{C} \leq T_{OPT} \leq 85^{\circ}\text{C}$		± 100		ppm/ $^{\circ}\text{C}$
Short current	I_{lim}	$V_{IN}=V_{OUT}+1.0\text{V}$, $V_{OUT}=0\text{V}$		60		mA
CE pin current when ON	I_{CE}	$V_{IN}=V_{OUT}+1.0\text{V}$		0.5	1.0	μA
CE input voltage "H"	V_{CEH}	$V_{IN}=V_{OUT}+1.0\text{V}$	$V_{IN}-1$		V_{IN}	V
CE input voltage "L"	V_{CEL}	$V_{IN}=V_{OUT}+1.0\text{V}$			0.25	V

Phased Out Products

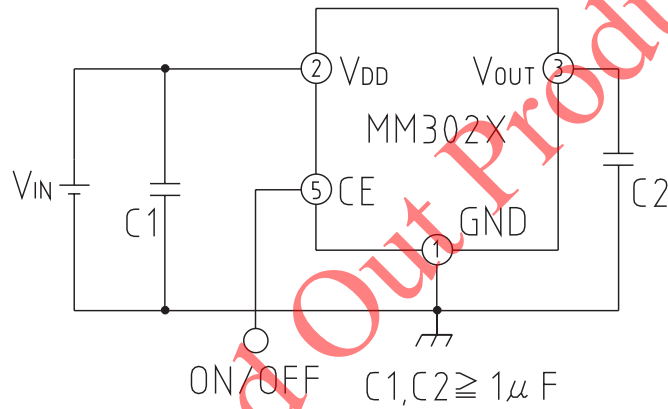
Electrical Characteristics 2 (Ambient Temperature, Ta=25°C, VIN=VCE)

Product Name	PARAMETER												
	Output Voltage			Output Current			Load Regulation			Input-Output differential Voltage			
	V _{OUT} (V)			I _{OUT} (mA)			ΔV _{OUT} /ΔI _{OUT} (mV)			V _{DIF} (V)			
	TEST CONDITIONS	MIN.	TYP.	MAX.	TEST CONDITIONS	MIN.	TYP.	TEST CONDITIONS	TYP.	MAX.	TEST CONDITIONS	TYP.	MAX.
MM3022A	V _{IN} -V _{OUT} =1.0V	1.960	2.000	2.040	V _{IN} -V _{OUT} =1.0V	25	40	V _{IN} -V _{OUT} =1.0V 1mA ≤ I _{OUT} ≤ 40mA			V _{IN} =V _{OUT} -0.2V I _{OUT} = 40mA		
MM3022B		2.058	2.100	2.142									
MM3022C		2.156	2.200	2.244									
MM3022D		2.254	2.300	2.346									
MM3022E		2.352	2.400	2.448									
MM3022F		2.450	2.500	2.550									
MM3022G		2.548	2.600	2.652									
MM3022H		2.646	2.700	2.754									
MM3022J		2.744	2.800	2.856									
MM3022K		2.842	2.900	2.958									
MM3023A		2.940	3.000	3.060									
MM3023B		3.038	3.100	3.162									
MM3023C		3.136	3.200	3.264									
MM3023D		3.234	3.300	3.366									
MM3023E		3.332	3.400	3.468									
MM3023F		3.430	3.500	3.570									
MM3023G		3.528	3.600	3.672									
MM3023H		3.626	3.700	3.774									
MM3023J		3.724	3.800	3.876									
MM3023K		3.822	3.900	3.978									
MM3024A	I _{OUT} =10mA	3.920	4.000	4.080	V _{IN} -V _{OUT} =1.0V	40	60	V _{IN} -V _{OUT} =1.0V 1mA ≤ I _{OUT} ≤ 60mA	40	80	V _{IN} =V _{OUT} -0.2V I _{OUT} = 60mA	0.3	0.5
MM3024B		4.018	4.100	4.182									
MM3024C		4.116	4.200	4.284									
MM3024D		4.214	4.300	4.386									
MM3024E		4.312	4.400	4.488									
MM3024F		4.410	4.500	4.590									
MM3024G		4.508	4.600	4.692									
MM3024H		4.606	4.700	4.794									
MM3024J		4.704	4.800	4.896									
MM3024K		4.802	4.900	4.998									
MM3025A		4.900	5.000	5.100									
MM3025B		4.998	5.100	5.202									
MM3025C	5.096	5.200	5.304										
MM3025D	5.194	5.300	5.406										
MM3025E	5.292	5.400	5.508										
MM3025F	5.390	5.500	5.610										
MM3024A	I _{OUT} =10mA	3.920	4.000	4.080	V _{IN} -V _{OUT} =1.0V	50	80	V _{IN} -V _{OUT} =1.0V 1mA ≤ I _{OUT} ≤ 80mA			V _{IN} =V _{OUT} -0.2V I _{OUT} = 80mA		
MM3024B		4.018	4.100	4.182									
MM3024C		4.116	4.200	4.284									
MM3024D		4.214	4.300	4.386									
MM3024E		4.312	4.400	4.488									
MM3024F		4.410	4.500	4.590									
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MM3025E	5.292	5.400	5.508										
MM3025F	5.390	5.500	5.610										
MM3025A	I _{OUT} =10mA	4.900	5.000	5.100	V _{IN} -V _{OUT} =1.0V	65	100	V _{IN} -V _{OUT} =1.0V 1mA ≤ I _{OUT} ≤ 100mA			V _{IN} =V _{OUT} -0.2V I _{OUT} = 100mA		
MM3025B		4.998	5.100	5.202									
MM3025C		5.096	5.200	5.304									
MM3025D		5.194	5.300	5.406									
MM3025E		5.292	5.400	5.508									
MM3025F		5.390	5.500	5.610									

Measuring Circuit



Typical Application Circuit

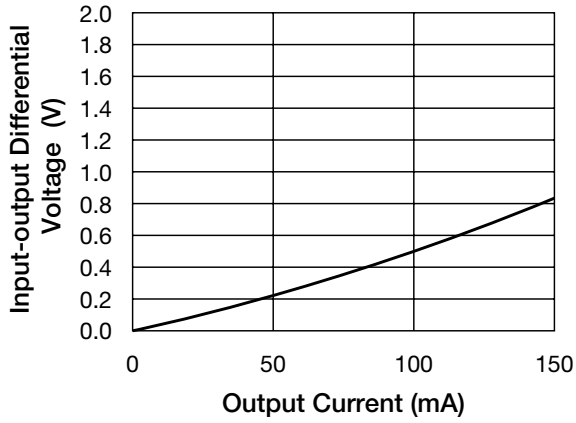


Note: This regulator is not internally compensated and thus requires an external output-capacitor(COUT) for stability.

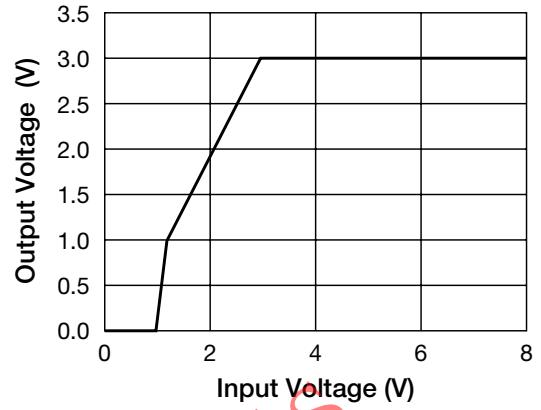
Phased Out Products

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

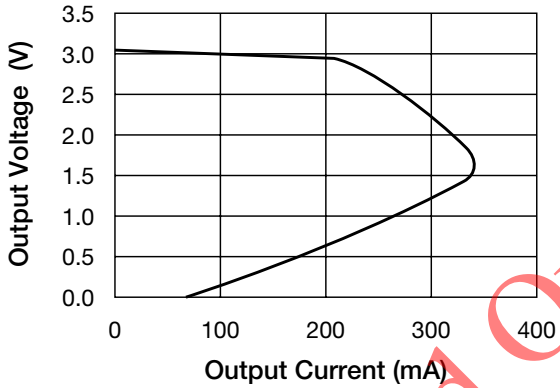
Input-output Differential Voltage



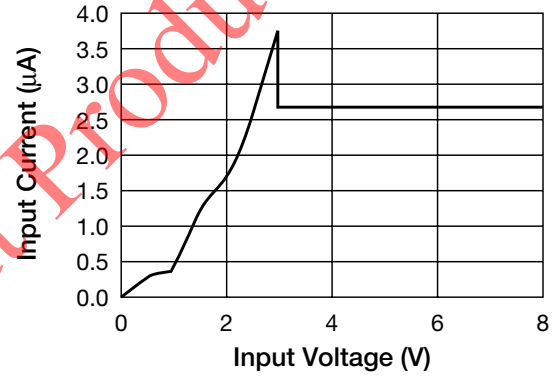
Line Stability



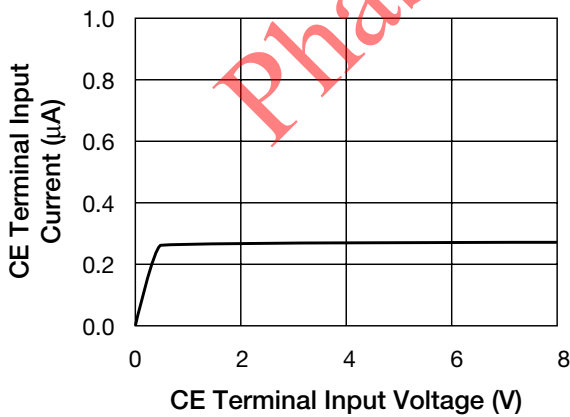
Load Regulation



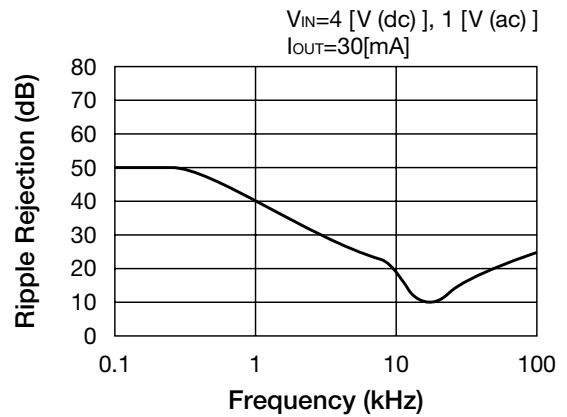
Input Current



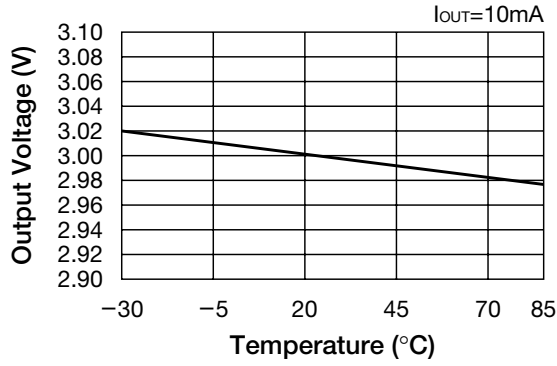
CE Terminal Input Current – CE Terminal Input Voltage



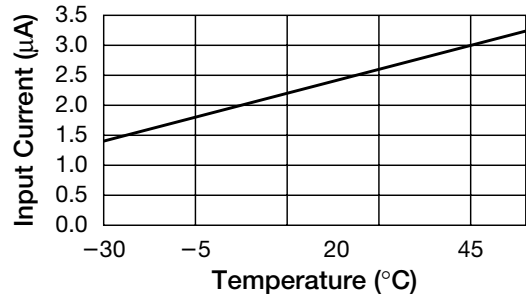
Ripple Rejection



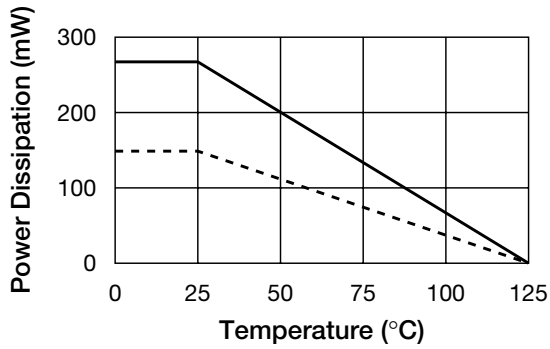
■ Output Voltage – Temperature



■ Input Current – Temperature

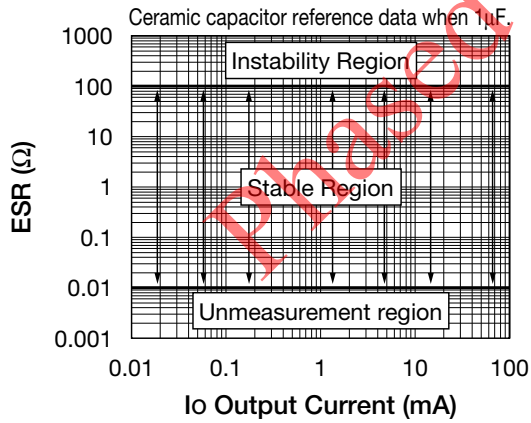


■ Power Dissipation



— On Board (Glass Epoxy Resin)
11.9 × 17.9 × 0.7mm
- - - Alone

■ ESR Stable region



Note: Reference data