

# Regulator with ON/OFF

# Monolithic IC MM3051□~MM3055□U

## Outline

This IC is a low current consumption (1.5μA typ.), ultra-small CMOS regulator with ON/OFF control function. The ON/OFF control pin logic for MM3051H ~ MM3055F and MM3051T ~ MM3055R is reversed.

## Features

- |  |  |
|--|--|
| 1. I/O voltage difference (MM3054□~ MM3055□) | 25mV typ. ( $I_o=1\text{mA}$ )   |
| 2. Current consumption                       | 1.5μA typ. ( $V_{IN}=V_O+2\text{V}$ )  |
| 3. Output current                            | 80mA min. ( $V_{IN}-V_{OUT}=2\text{V}$ )                                     |
| 4. Output voltage rank                       | 1.7~5.5V (0.1V step)   |
| 5. Output ON/OFF control function            | High: ON, Low: OFF (MM3051H~MM3055F)<br>High: OFF, Low: ON (MM3051T~MM3055R) |

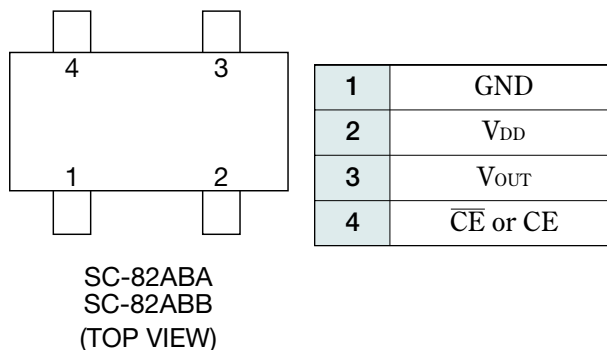
## Package

- SC-82ABA
- SC-82ABB

## Applications

1. Portable equipment
2. Cellular telephone, PHS
3. Cordless telephone
4. Other battery-powered portable equipment

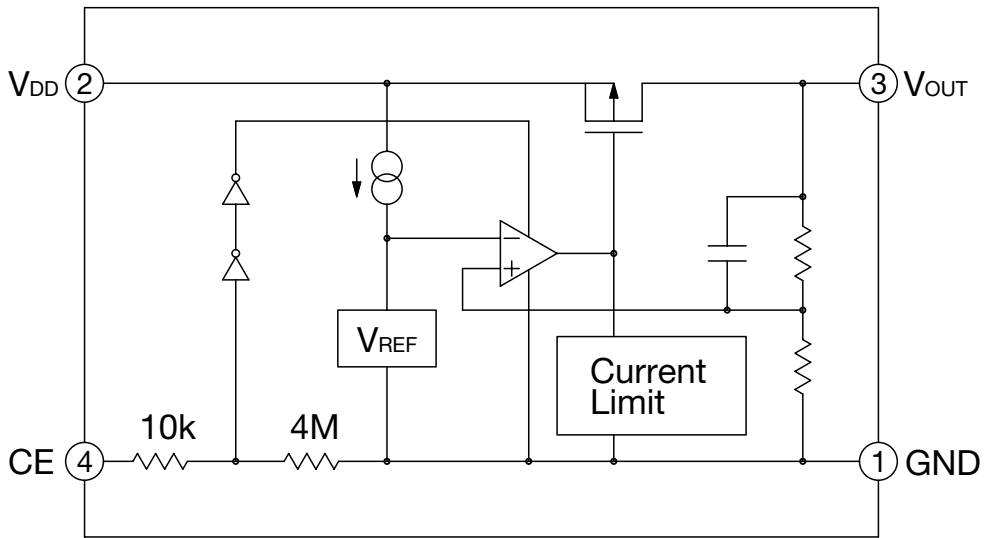
## Pin Assignment



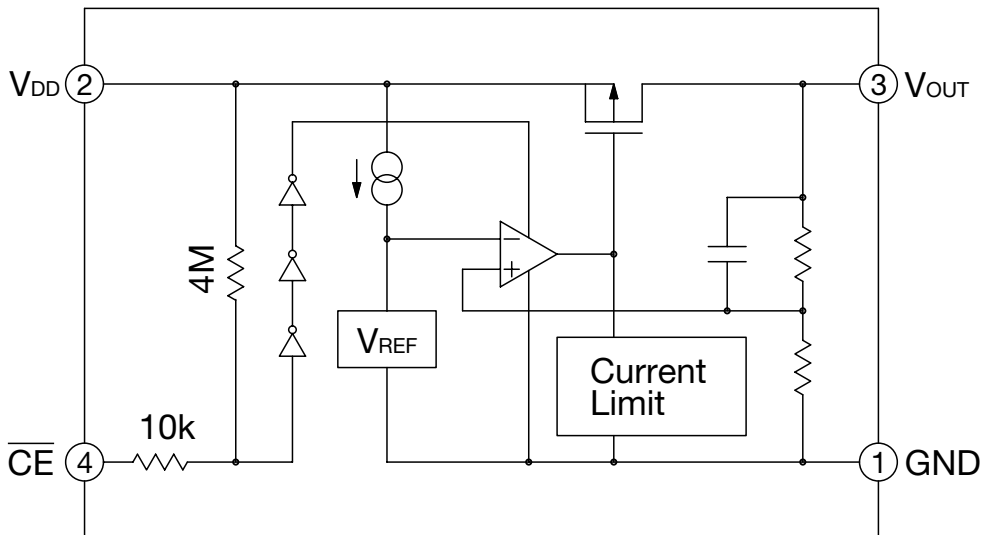
The ON/OFF control pin logic for MM3051H ~ MM3055F and MM3051T ~ MM3055R is reversed

Equivalent Circuit Diagram

MM3051H ~ MM3055FU



MM3051T ~ MM3055RU



Pin Description

Pin No.	Pin name	Function						
1	GND	GND Pin						
2	V <sub>DD</sub>	Voltage supply pin						
3	V <sub>OUT</sub>	Regulator output voltage pin						
4	$\overline{CE}$ or CE	Output voltage ON/OFF-Control pin						
		MM3051T~MM3055R						
		MM3051H~MM3055F						
		<table border="1"> <tr> <td><math>\overline{CE}</math></td> <td>Output</td> </tr> <tr> <td>L</td> <td>ON</td> </tr> <tr> <td>H</td> <td>OFF</td> </tr> </table>	$\overline{CE}$	Output	L	ON	H	OFF
		$\overline{CE}$	Output					
L	ON							
H	OFF							
<table border="1"> <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							
		Connect $\overline{CE}$ pin with GND pin, when it is not used.						
		Connect the CE pin to V <sub>DD</sub> when not using it.						

**Absolute Maximum Ratings** (Except where noted otherwise, Ta=25°C)

Item	Symbol	Ratings	Units
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** (Except where noted otherwise, Ta=25°C)

Item	Symbol	Ratings	Units
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** (Except where noted otherwise, Ta=25°C, V<sub>CE</sub>=V<sub>IN</sub>)

■ MM3051H ~ MM3055FU

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Supply current	I <sub>SS</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V, Excluding CE Pin Current (I <sub>CE</sub> )		1.5	3.0	μA
Supply current (OFF)	I <sub>standby</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V, V <sub>CE</sub> =V <sub>IN</sub>		0.1	1.0	μA
Line regulation	ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	I <sub>OUT</sub> =1mA, V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 8V	0	0.05	0.20	%/V
Input voltage	V <sub>IN</sub>				8.0	V
Vo temperature coefficient	ΔV <sub>OUT</sub> /ΔV <sub>opt</sub>	I <sub>OUT</sub> =10mA -30°C ≤ T <sub>OPT</sub> ≤ 85°C		±100		ppm/°C
Output short-circuit current	I <sub>lim</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V, V <sub>OUT</sub> =0V		60		mA
CE pull down resistance	R <sub>PD</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V	1.5	4.0	12.0	MΩ
CE high threshold voltage	V <sub>CEH</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V	1.5			V
CE low threshold voltage	V <sub>CEL</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V			0.25	V

Note: V<sub>OUT</sub> is the output voltage typ. value in the specifications.  
 Make sure that output current does not exceed loss tolerance.

■ MM3051T ~ MM3055RU (Except where noted otherwise, Ta=25°C, V<sub>CE</sub>=GND)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Supply current	I <sub>SS</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V, Excluding CE Pin Current (I <sub>CE</sub> )		1.5	3.0	μA
Supply current (OFF)	I <sub>standby</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V, V <sub>CE</sub> =V <sub>IN</sub>		0.1	1.0	μA
Line regulation	ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	I <sub>OUT</sub> =1mA, V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 8V	0	0.05	0.20	%/V
Input voltage	V <sub>IN</sub>				8.0	V
Vo temperature coefficient	ΔV <sub>OUT</sub> /ΔV <sub>opt</sub>	I <sub>OUT</sub> =10mA -30°C ≤ T <sub>OPT</sub> ≤ 85°C		±100		ppm/°C
Output short-circuit current	I <sub>lim</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V, V <sub>OUT</sub> =0V		60		mA
CE pull up resistance	R <sub>PU</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V	1.5	4.0	12.0	MΩ
CE high threshold voltage	V <sub>CEH</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V	1.5			V
CE low threshold voltage	V <sub>CEL</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +2.0V			0.25	V

Note: V<sub>OUT</sub> is the output voltage typ. value in the specifications.  
 Make sure that output current does not exceed loss tolerance.

**Electrical Characteristics 2** High Active (Except where noted therwise, Ta=25°C, VIN=VCE)

■ MM3051H ~ MM3055FU

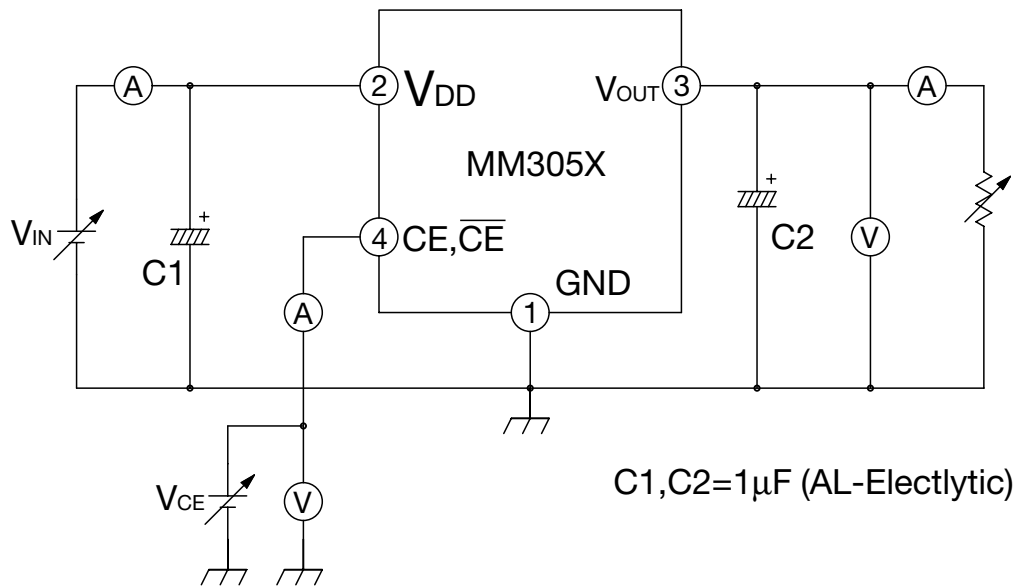
Product name	Item												
	Output voltage			Output current			Load regulation			Input-Output differential voltage			
	V <sub>OUT</sub> (V)			I <sub>OUT</sub> (mA)			ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub> (mV)			V <sub>DIF</sub> (mV)			
	Test Condisions	Min.	Typ.	Max.	Test condisions	Min.	Typ.	Test condisions	Typ.	Max.	Test condisions	Typ.	Max.
MM3051H	V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  10μA ≤ I <sub>OUT</sub> ≤ 10mA	1.666	1.700	1.734	V <sub>IN</sub> -V <sub>OUT</sub> =2.0V	35		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 35mA	30	45		60	90
MM3051J													
MM3051K													
MM3052A													
MM3052B													
MM3052C													
MM3052D													
MM3052E													
MM3052F													
MM3052G													
MM3052H													
MM3052J													
MM3052K													
MM3053A													
MM3053B													
MM3053C													
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MM3053E													
MM3053F													
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MM3053H													
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MM3054C													
MM3054D													
MM3054E													
MM3054F													
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MM3054H													
MM3054J													
MM3054K													
MM3055A													
MM3055B													
MM3055C													
MM3055D													
MM3055E													
MM3055F													
						50		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 50mA	40	60		35	55
						65		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 65mA	50	70		25	40
						80		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 80mA	60	90			

**Electrical Characteristics 3** Low Active (Except where noted otherwise, Ta=25°C, VCE=GND)

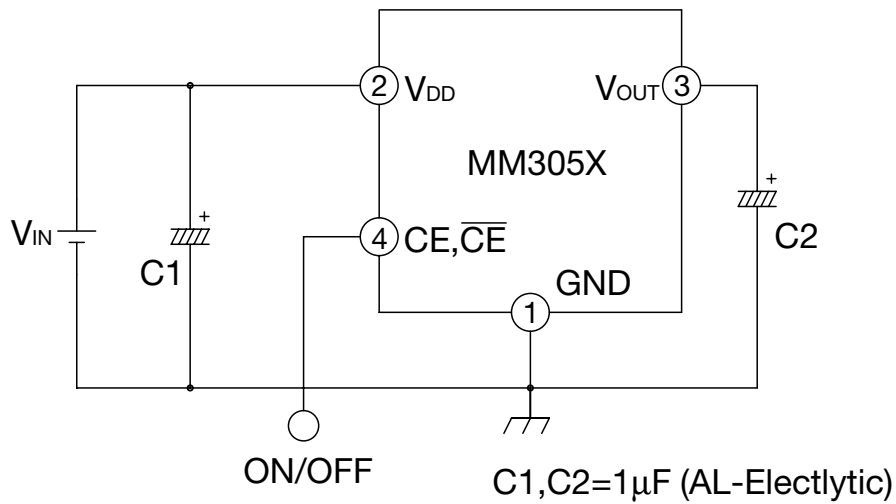
**MM3051T ~ MM3055RU**

Product name	Item												
	Output voltage			Output current			Load regulation			Input-Output differential voltage			
	V <sub>OUT</sub> (V)			I <sub>OUT</sub> (mA)			ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub> (mV)			V <sub>DIF</sub> (mV)			
	Test condicions	Min.	Typ.	Max.	Test condicions	Min.	Typ.	Test condicions	Typ.	Max.	Test condicions	Typ.	Max.
MM3051T	V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  10μA ≤ I <sub>OUT</sub> ≤ 10mA	1.666	1.700	1.734	V <sub>IN</sub> -V <sub>OUT</sub> =2.0V	35		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 35mA	30	45		60	90
MM3051U													
MM3051V													
MM3052L													
MM3052M													
MM3052N													
MM3052P													
MM3052Q													
MM3052R													
MM3052S													
MM3052T													
MM3052U													
MM3052V													
MM3053L													
MM3053M													
MM3053N													
MM3053P													
MM3053Q													
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						50		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 50mA	40	60		35	55
						65		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 65mA	50	70		25	40
						80		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 80mA	60	90			

Measuring Circuit



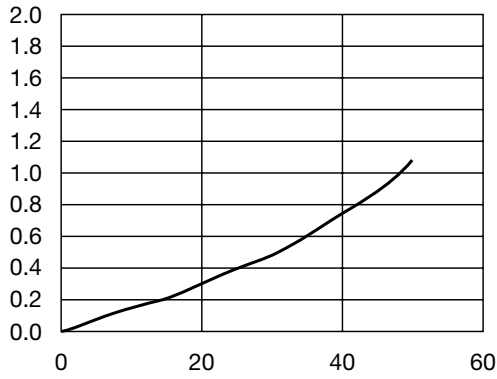
Typical Application Circuit



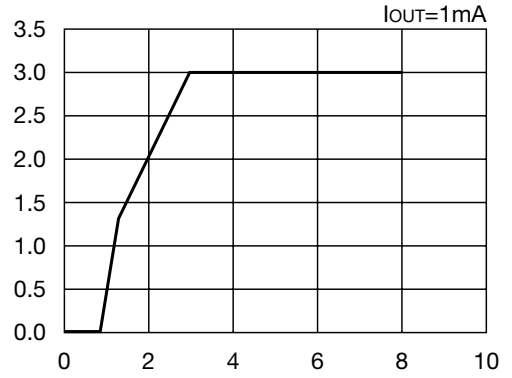
note: This regulator is not internally compensated and thus require an external output-capacitor ( $C_{out}$ ) for stability.

**Characteristics** (3.0V product except where noted therwise, Ta=25°C)

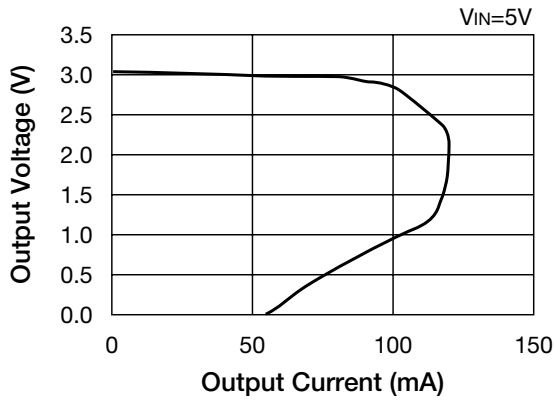
■ Input-Output Differential Voltage



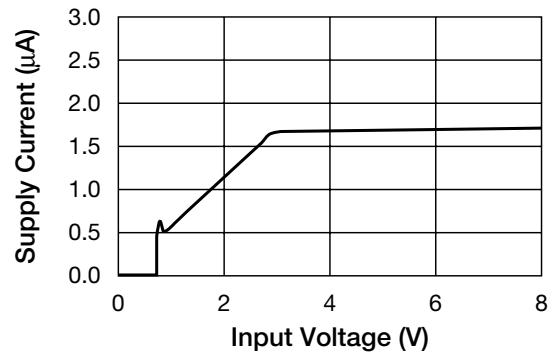
■ Line Regulation



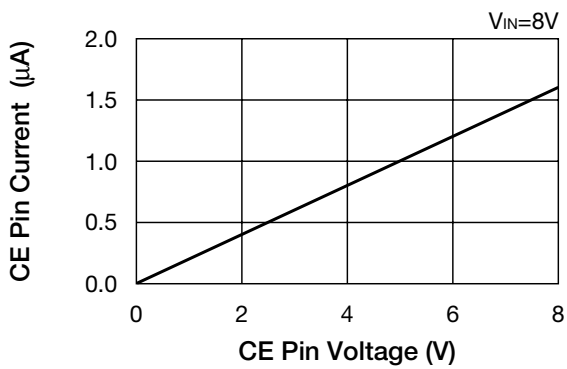
■ Load Regulation



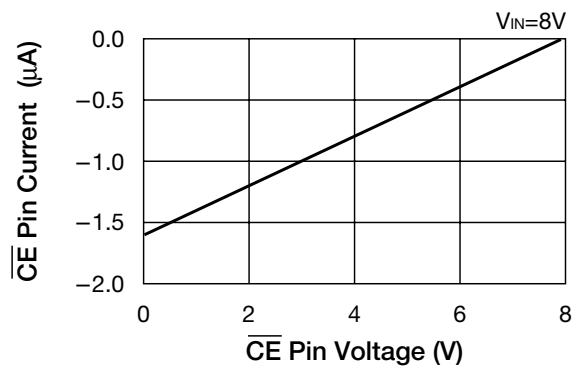
■ Supply Current



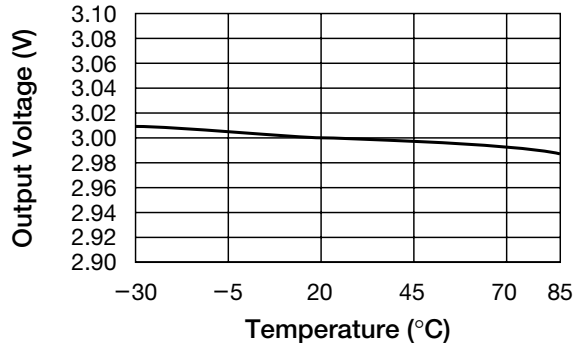
■ CE Pin Current VS CE Pin Voltage High Active



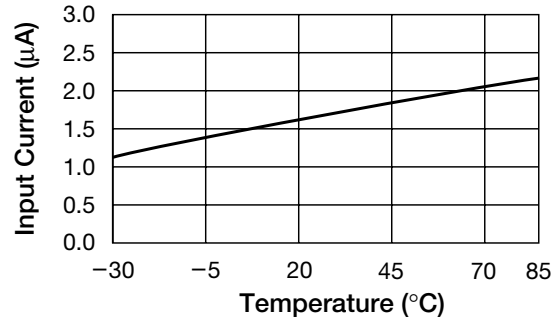
■ CE Pin Current VS CE Pin Voltage Low Active



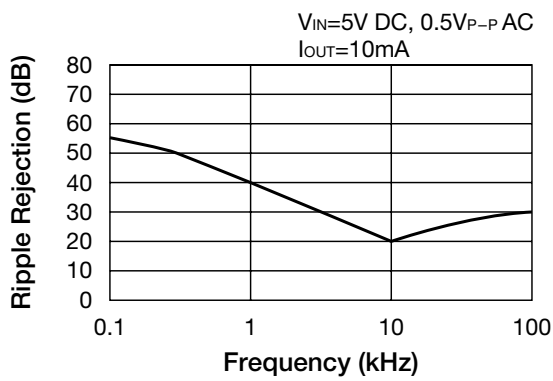
■ Output Voltage VS Temperature



■ Input Current VS Temperature



■ Ripple Rejection



■ Allowable Loss

