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=1mA)
2. Current consumption	1.5μA typ. (V_{IN}=V_O+2V)
3. Output current	80mA min. (V_{IN}−V_{OUT}=2V)
4. Output voltage rank	1.7~5.5V (0.1V step)
5. Output ON/OFF control function	High: ON, Low: OFF (MM3051H~MM3055F)
	High: OFF, Low: ON (MM3051T~MM3055R)

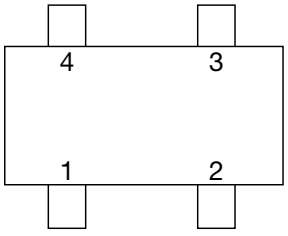
Package

SC-82ABA
SC-82ABB

Applications

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

Pin Assignment



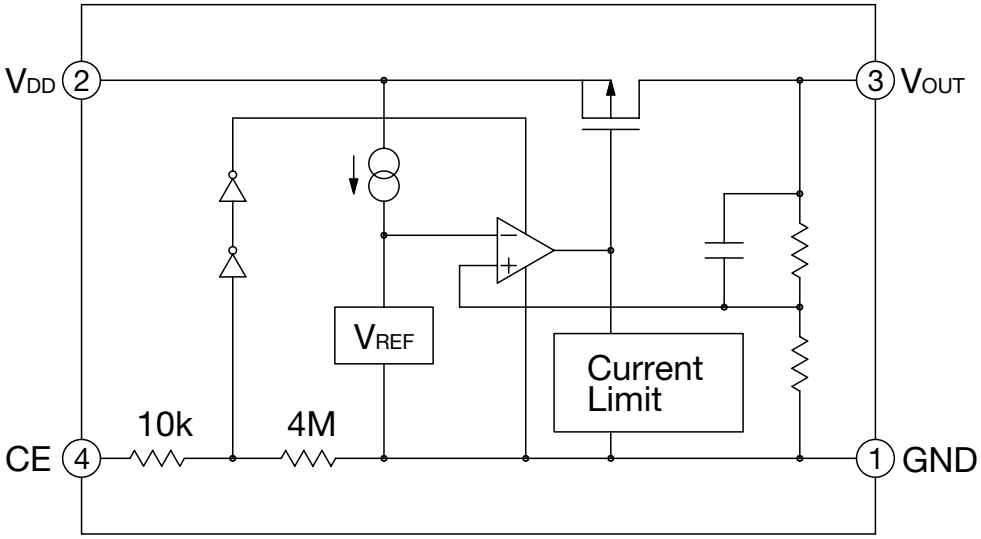
1	GND
2	V_{DD}
3	V_{OUT}
4	$\overline{CE}$ or CE

SC-82ABA
SC-82ABB
(TOP VIEW)

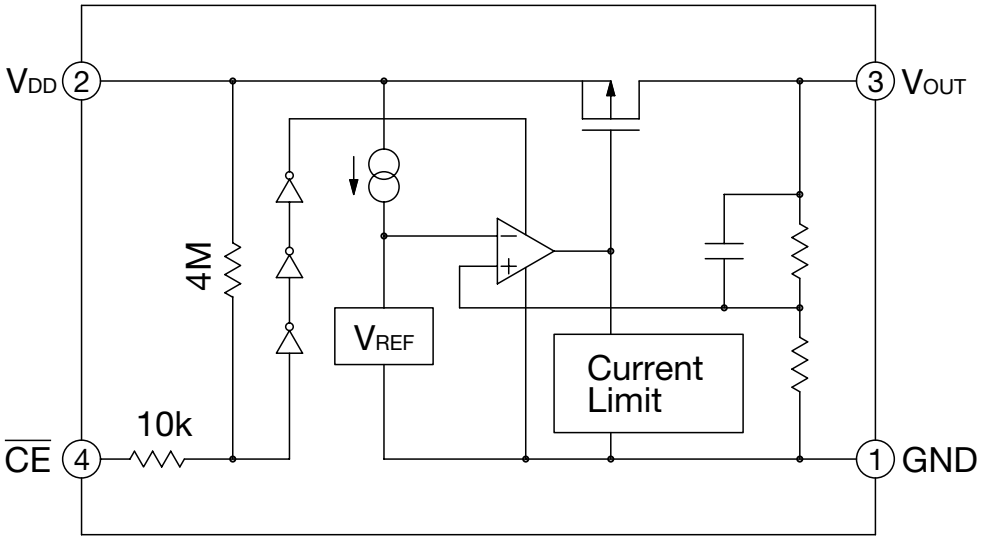
The ON/OFF control pin logic for MM3051H ~ MM3055F and MM3051T ~ MM3055R is reversed

Equivalent Circuit Diagram

MM3051H ~ MM3055FU



MM3051T ~ MM3055RU



Pin Description

Pin No.	Pin name	Function
1	GND	GND Pin
2	VDD	Voltage supply pin
3	VOUT	Regulator output voltage pin
4	$\overline{CE}$ or CE	Output voltage ON/OFF-Control pin MM3051T~MM3055R $\overline{CE}$ / Output: L / ON; H / OFF Connect $\overline{CE}$ pin with GND pin, when it is not used. MM3051H~MM3055F CE / Output: L / OFF; H / ON Connect the CE pin to VDD when not using it.

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

Item	Symbol	Ratings	Units
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	Pd	150 (Alone)	mW

Recommended Operating Conditions (Except where noted therwise, Ta=25°C)

Item	Symbol	Ratings	Units
Operating temperature	T_{OP}	–30~+85	°C
Supply voltage	V_{OP}	V_{OUT}+0.3~8	V

Electrical Characteristics (Except where noted therwise, Ta=25°C, V_{CE}=V_{IN})

MM3051H ~ MM3055FU

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Supply current	Iss	V_{IN}=V_{OUT}+2.0V, Excluding CE Pin Current (I_{CE})		1.5	3.0	µA
Supply current (OFF)	Istandby	V_{IN}=V_{OUT}+2.0V, V_{CE}=V_{IN}		0.1	1.0	µA
Line regulation	$\Delta V_{OUT}/\Delta V_{IN}$	I_{OUT}=1mA, V_{OUT}+0.5V ≦ V_{IN} ≦ 8V	0	0.05	0.20	%/V
Input voltage	V_{IN}				8.0	V
Vo temperature coefficient	$\Delta V_{OUT}/\Delta V_{opt}$	I_{OUT}=10mA –30°C ≦ T_{OPT} ≦ 85°C		±100		ppm/°C
Output short-circuit current	Ilim	V_{IN}=V_{OUT}+2.0V, V_{OUT}=0V		60		mA
$\overline{CE}$ pull down resistance	R_{PD}	V_{IN}=V_{OUT}+2.0V	1.5	4.0	12.0	MΩ
$\overline{CE}$ high threshold voltage	V_{CEH}	V_{IN}=V_{OUT}+2.0V	1.5			V
$\overline{CE}$ low threshold voltage	V_{CEL}	V_{IN}=V_{OUT}+2.0V			0.25	V

Note: V_{OUT} is the output voltage typ. value in the specifications.
Make sure that output current does not exceed loss tolerance.

MM3051T ~ MM3055RU (Except where noted therwise, Ta=25°C, V_{CE}=GND)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Supply current	Iss	V_{IN}=V_{OUT}+2.0V, Excluding CE Pin Current (I_{CE})		1.5	3.0	µA
Supply current (OFF)	Istandby	V_{IN}=V_{OUT}+2.0V, V_{CE}=V_{IN}		0.1	1.0	µA
Line regulation	$\Delta V_{OUT}/\Delta V_{IN}$	I_{OUT}=1mA, V_{OUT}+0.5V ≦ V_{IN} ≦ 8V	0	0.05	0.20	%/V
Input voltage	V_{IN}				8.0	V
Vo temperature coefficient	$\Delta V_{OUT}/\Delta V_{opt}$	I_{OUT}=10mA –30°C ≦ T_{OPT} ≦ 85°C		±100		ppm/°C
Output short-circuit current	Ilim	V_{IN}=V_{OUT}+2.0V, V_{OUT}=0V		60		mA
$\overline{CE}$ pull up resistance	R_{PU}	V_{IN}=V_{OUT}+2.0V	1.5	4.0	12.0	MΩ
$\overline{CE}$ high threshold voltage	V_{CEH}	V_{IN}=V_{OUT}+2.0V	1.5			V
$\overline{CE}$ low threshold voltage	V_{CEL}	V_{IN}=V_{OUT}+2.0V			0.25	V

Note: V_{OUT} 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, V_{IN}=V_{CE})

MM3051H ~ MM3055FU

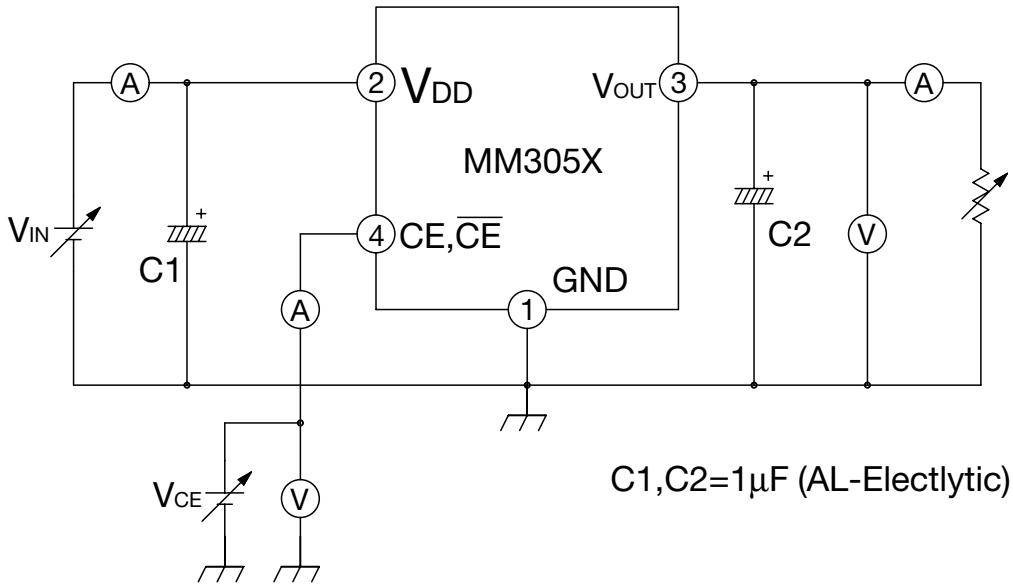
Product name	Item												
	Output voltage				Output current			Load regulation			Input-Output differential voltage		
	V_{OUT} (V)				I_{OUT} (mA)			$\Delta V_{OUT}/\Delta I_{OUT}$ (mV)			V_{DIF} (mV)		
	Test Condisions	Min.	Typ.	Max.	Test condisions	Min.	Typ.	Test condisions	Typ.	Max.	Test condisions	Typ.	Max.
MM3051H	V_{IN}–V_{OUT} =2.0V 10μA ≦ I_{OUT} ≦ 10mA	1.666	1.700	1.734	V_{IN}–V_{OUT} =2.0V	35		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 35mA	30	45	I_{OUT}=1mA	60	90
MM3051J		1.764	1.800	1.836									
MM3051K		1.862	1.900	1.938									
MM3052A		1.960	2.000	2.040									
MM3052B		2.058	2.100	2.142									
MM3052C		2.156	2.200	2.244									
MM3052D		2.254	2.300	2.346									
MM3052E		2.352	2.400	2.448								50	75
MM3052F		2.450	2.500	2.550									
MM3052G		2.548	2.600	2.652									
MM3052H		2.646	2.700	2.754									
MM3052J		2.744	2.800	2.856								40	60
MM3052K		2.842	2.900	2.958									
MM3053A		2.940	3.000	3.060		50		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 50mA	40	60			
MM3053B		3.038	3.100	3.162									
MM3053C		3.136	3.200	3.264								35	55
MM3053D		3.234	3.300	3.366									
MM3053E		3.332	3.400	3.468									
MM3053F		3.430	3.500	3.570									
MM3053G		3.528	3.600	3.672								30	45
MM3053H		3.626	3.700	3.774									
MM3053J		3.724	3.800	3.876									
MM3053K		3.822	3.900	3.978									
MM3054A		3.920	4.000	4.080		65		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 65mA	50	70		25	40
MM3054B		4.018	4.100	4.182									
MM3054C		4.116	4.200	4.284									
MM3054D		4.214	4.300	4.386									
MM3054E		4.312	4.400	4.488									
MM3054F		4.410	4.500	4.590									
MM3054G		4.508	4.600	4.692									
MM3054H		4.606	4.700	4.794									
MM3054J		4.704	4.800	4.896									
MM3054K		4.802	4.900	4.998									
MM3055A		4.900	5.000	5.100		80		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 80mA	60	90			
MM3055B		4.998	5.100	5.202									
MM3055C		5.096	5.200	5.304									
MM3055D		5.194	5.300	5.406									
MM3055E		5.292	5.400	5.508									
MM3055F		5.390	5.500	5.610									

Electrical Characteristics 3 Low Active (Except where noted therwise, Ta=25°C, V_{CE}=GND)

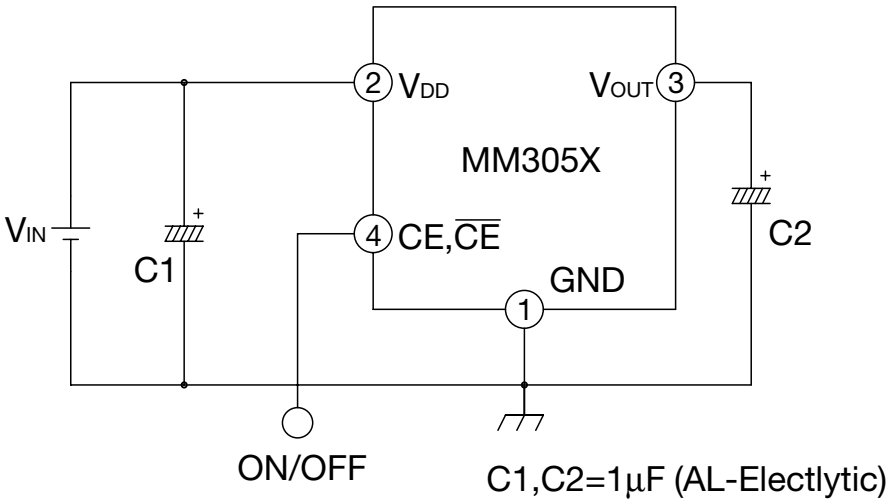
MM3051T ~ MM3055RU

Product name	Item												
	Output voltage				Output current			Load regulation			Input-Output differential voltage		
	V_{OUT} (V)				I_{OUT} (mA)			$\Delta V_{OUT}/\Delta I_{OUT}$ (mV)			V_{DIF} (mV)		
	Test condisions	Min.	Typ.	Max.	Test condisions	Min.	Typ.	Test condisions	Typ.	Max.	Test condisions	Typ.	Max.
MM3051T	V_{IN}–V_{OUT} =2.0V 10μA ≦ I_{OUT} ≦ 10mA	1.666	1.700	1.734	V_{IN}–V_{OUT} =2.0V	35		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 35mA	30	45	I_{OUT}=1mA	60	90
MM3051U		1.764	1.800	1.836									
MM3051V		1.862	1.900	1.938									
MM3052L		1.960	2.000	2.040									
MM3052M		2.058	2.100	2.142									
MM3052N		2.156	2.200	2.244									
MM3052P		2.254	2.300	2.346									
MM3052Q		2.352	2.400	2.448								50	75
MM3052R		2.450	2.500	2.550									
MM3052S		2.548	2.600	2.652									
MM3052T		2.646	2.700	2.754									
MM3052U		2.744	2.800	2.856								40	60
MM3052V		2.842	2.900	2.958									
MM3053L		2.940	3.000	3.060		50		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 50mA	40	60			
MM3053M		3.038	3.100	3.162									
MM3053N		3.136	3.200	3.264								35	55
MM3053P		3.234	3.300	3.366									
MM3053Q		3.332	3.400	3.468									
MM3053R		3.430	3.500	3.570									
MM3053S		3.528	3.600	3.672								30	45
MM3053T		3.626	3.700	3.774									
MM3053U		3.724	3.800	3.876									
MM3053V		3.822	3.900	3.978									
MM3054L		3.920	4.000	4.080		65		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 65mA	50	70		25	40
MM3054M		4.018	4.100	4.182									
MM3054N		4.116	4.200	4.284									
MM3054P		4.214	4.300	4.386									
MM3054Q		4.312	4.400	4.488									
MM3054R		4.410	4.500	4.590									
MM3054S		4.508	4.600	4.692									
MM3054T		4.606	4.700	4.794									
MM3054U		4.704	4.800	4.896									
MM3054V		4.802	4.900	4.998									
MM3055L		4.900	5.000	5.100		80		V_{IN}–V_{OUT} =2.0V 1mA ≦ I_{OUT} ≦ 80mA	60	90			
MM3055M		4.998	5.100	5.202									
MM3055N		5.096	5.200	5.304									
MM3055P		5.194	5.300	5.406									
MM3055Q		5.292	5.400	5.508									
MM3055R		5.390	5.500	5.610									

Measuring Circuit



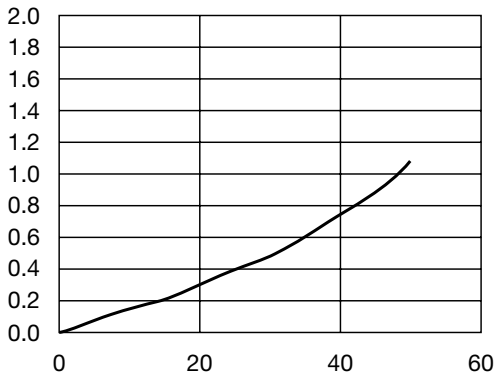
Typical Application Circuit



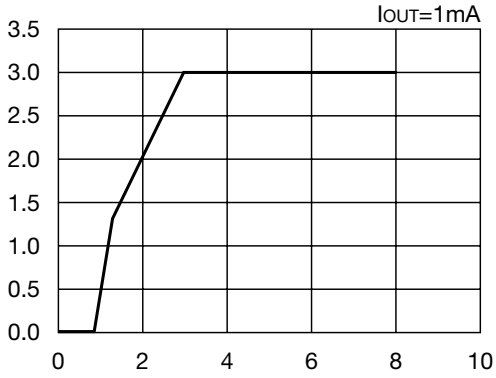
note: This regulator is not internally compensated and thus require an external output-capacitor (C_{OUT}) for stability.

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

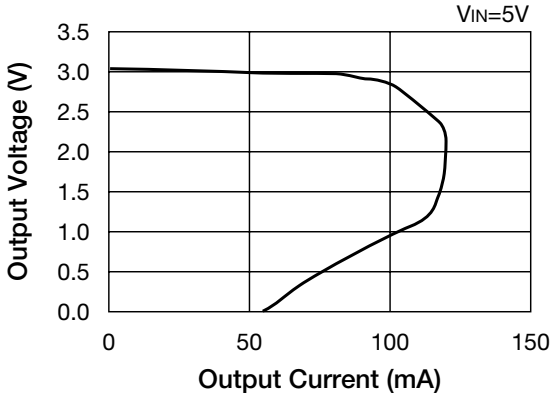
Input-Output Differential Voltage



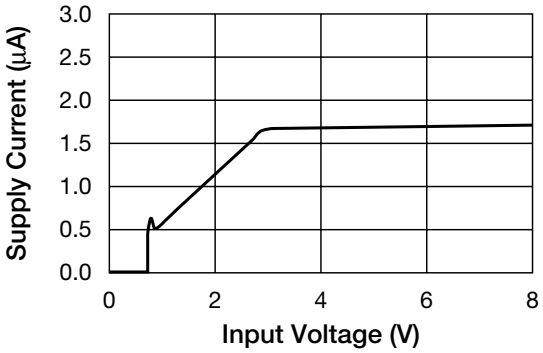
Line Regulation



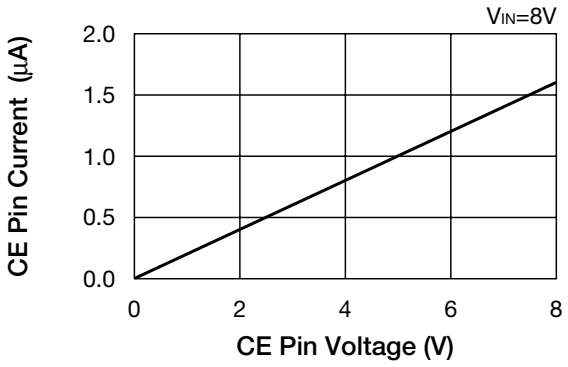
Load Regulation



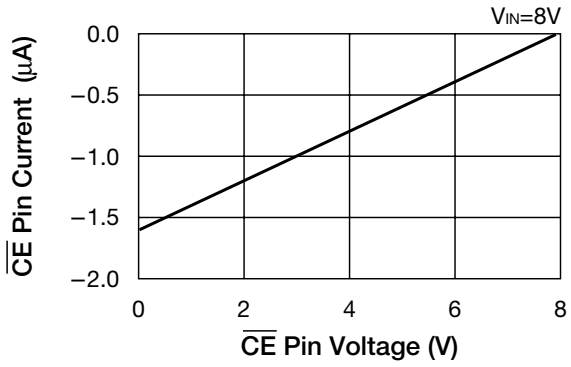
Supply Current



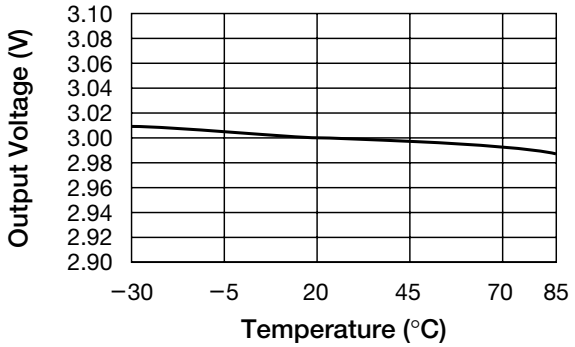
CE Pin Current VS CE Pin Voltage High Active



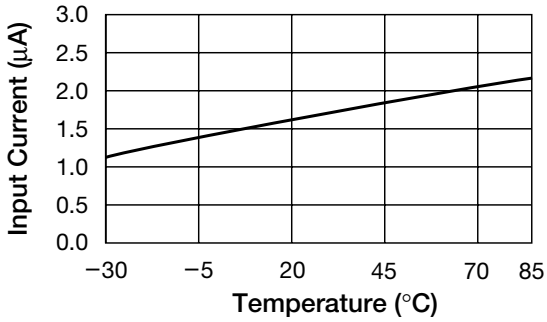
$\overline{CE}$ Pin Current VS $\overline{CE}$ Pin Voltage Low Active



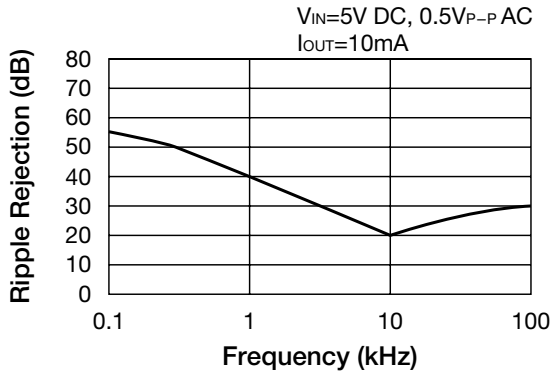
Output Voltage VS Temperature



Input Current VS Temperature



Ripple Rejection



Allowable Loss