

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)
High: OFF, Low: ON (MM3051T~MM3055R) |

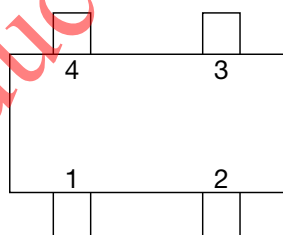
Package

- SC-82ABA
- SC-82ABB

Applications

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

Pin Assignment



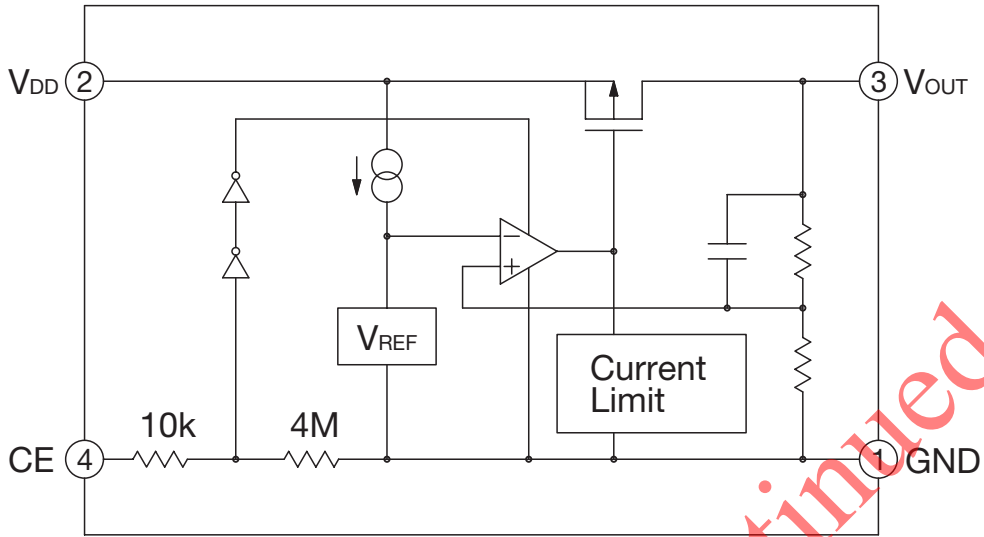
1	GND
2	V_{DD}
3	V_{OUT}
4	\overline{CE} or CE

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

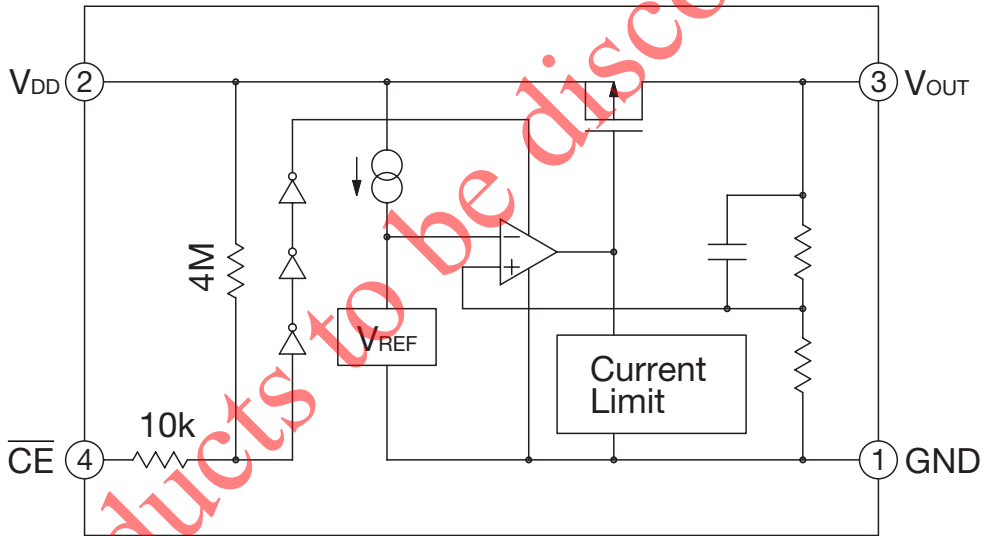
*The ON/OFF control pin logic for MM3051H ~ MM3055F and MM3051T ~ MM3055R is reversed

Equivalent Circuit Diagram

MM3051H ~ MM3055FU



MM3051T ~ MM3055RU



Pin Description

Pin No.	Pin name	Function						
1	GND	GND Pin						
2	V _{DD}	Voltage supply pin						
3	V _{OUT}	Regulator output voltage pin						
4	\overline{CE} or CE	Output voltage ON/OFF-Control pin						
		MM3051T~MM3055R						
		MM3051H~MM3055F						
		<table border="1"> <tr> <td>\overline{CE}</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 _{DD} when not using it.							

Absolute Maximum Ratings (Except where noted otherwise, 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	P _d	150 (Alone)	mW

Recommended Operating Conditions (Except where noted otherwise, 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 otherwise, Ta=25°C, V_{CE}=V_{IN})

■ MM3051H ~ MM3055FU

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Supply current	I _{SS}	V _{IN} =V _{OUT} +2.0V, Excluding CE Pin Current (I _{CE})		1.5	3.0	μA
Supply current (OFF)	I _{standby}	V _{IN} =V _{OUT} +2.0V, V _{CE} =V _{IN}		0.1	1.0	μA
Line regulation	ΔV _{OUT} /ΔV _{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	ΔV _{OUT} /ΔV _{opt}	I _{OUT} =10mA -30°C ≤ T _{OPT} ≤ 85°C		±100		ppm/°C
Output short-circuit current	I _{lim}	V _{IN} =V _{OUT} +2.0V, V _{OUT} =0V		60		mA
CE pull down resistance	R _{PD}	V _{IN} =V _{OUT} +2.0V	1.5	4.0	12.0	MΩ
CE high threshold voltage	V _{CEH}	V _{IN} =V _{OUT} +2.0V	1.5			V
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 otherwise, Ta=25°C, V_{CE}=GND)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Supply current	I _{SS}	V _{IN} =V _{OUT} +2.0V, Excluding CE Pin Current (I _{CE})		1.5	3.0	μA
Supply current (OFF)	I _{standby}	V _{IN} =V _{OUT} +2.0V, V _{CE} =V _{IN}		0.1	1.0	μA
Line regulation	ΔV _{OUT} /ΔV _{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	ΔV _{OUT} /ΔV _{opt}	I _{OUT} =10mA -30°C ≤ T _{OPT} ≤ 85°C		±100		ppm/°C
Output short-circuit current	I _{lim}	V _{IN} =V _{OUT} +2.0V, V _{OUT} =0V		60		mA
CE pull up resistance	R _{PU}	V _{IN} =V _{OUT} +2.0V	1.5	4.0	12.0	MΩ
CE high threshold voltage	V _{CEH}	V _{IN} =V _{OUT} +2.0V	1.5			V
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 otherwise, Ta=25°C, VIN=VCE)

■ MM3051H ~ MM3055FU

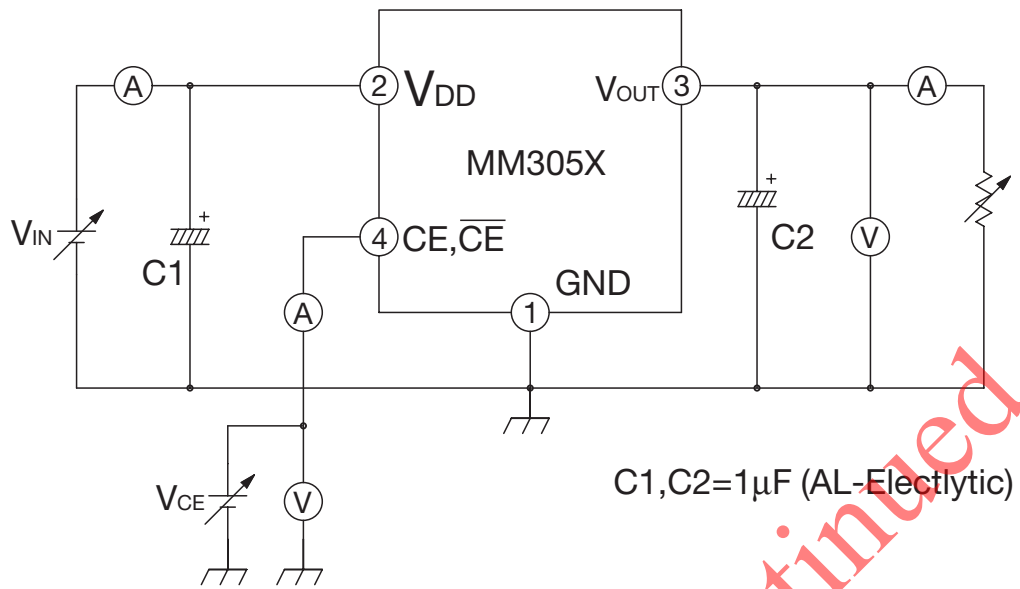
Product name	Item												
	Output voltage			Output current			Load regulation			Input-Output differential voltage			
	V _{OUT} (V)			I _{OUT} (mA)			ΔV _{OUT} /ΔI _{OUT} (mV)			V _{DIF} (mV)			
	Test Condisions	Min.	Typ.	Max.	Test condicions	Min.	Typ.	Test condicions	Typ.	Max.	Test condicions	Typ.	Max.
MM3051H	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	IOUT=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									
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									
MM3052K		2.842	2.900	2.958									
MM3053A		2.940	3.000	3.060									
MM3053B		3.038	3.100	3.162									
MM3053C		3.136	3.200	3.264									
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									
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									
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										
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										
						50			40	60		35	55
						65			50	70		25	40
						80			60	90			

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

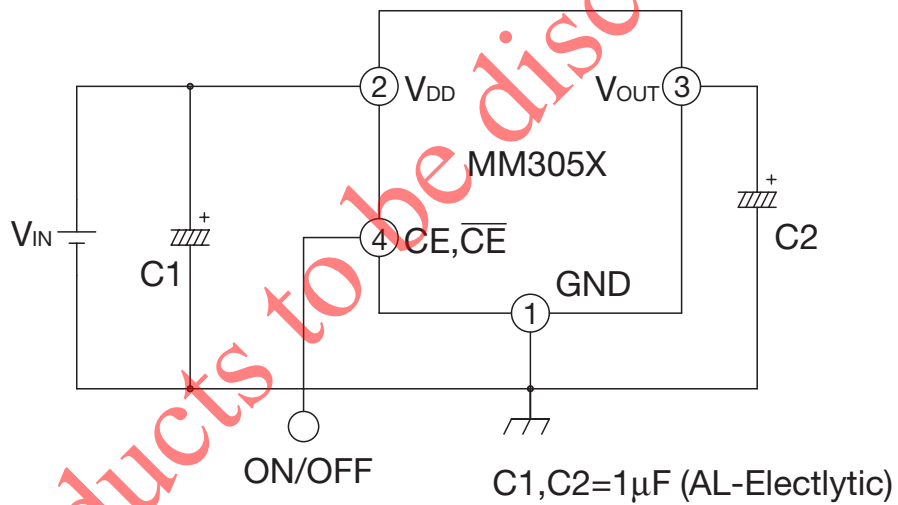
■ MM3051T ~ MM3055RU

Product name	Item												
	Output voltage			Output current			Load regulation			Input-Output differential voltage			
	V _{OUT} (V)			I _{OUT} (mA)			ΔV _{OUT} /ΔI _{OUT} (mV)			V _{DIF} (mV)			
	Test condicions	Min.	Typ.	Max.	Test condicions	Min.	Typ.	Test condicions	Typ.	Max.	Test condicions	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		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									
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									
MM3052V		2.842	2.900	2.958									
MM3053L		2.940	3.000	3.060									
MM3053M		3.038	3.100	3.162									
MM3053N		3.136	3.200	3.264									
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									
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



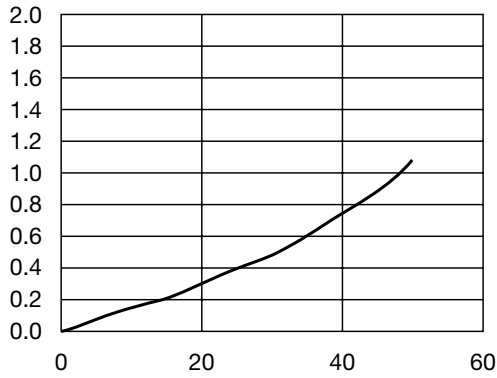
Typical Application Circuit



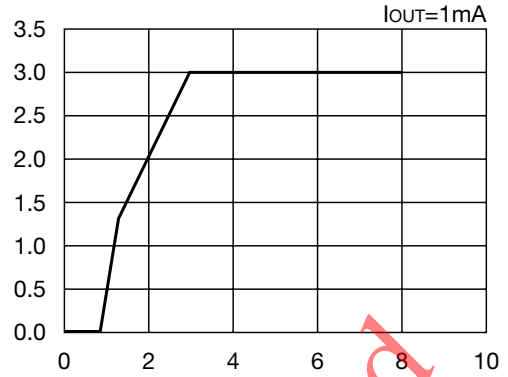
note: This regulator is not internally compensated and thus require an external output-capacitor (C_{out}) for stability.

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

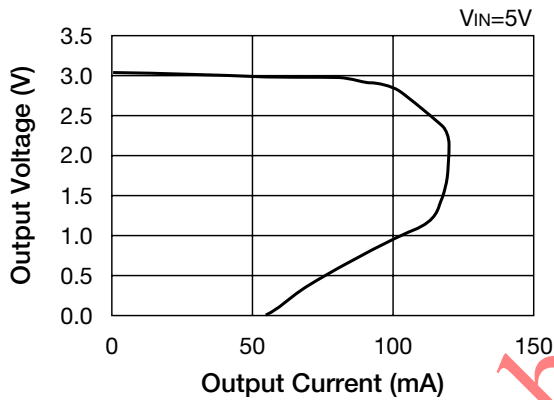
■ Input-Output Differential Voltage



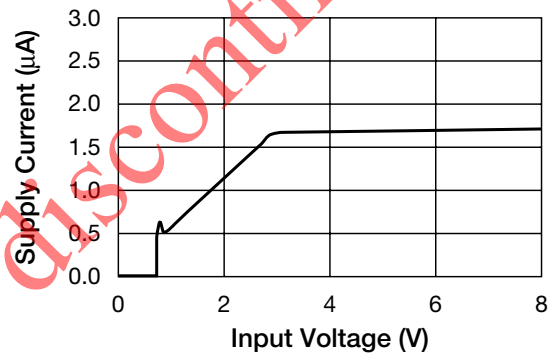
■ Line Regulation



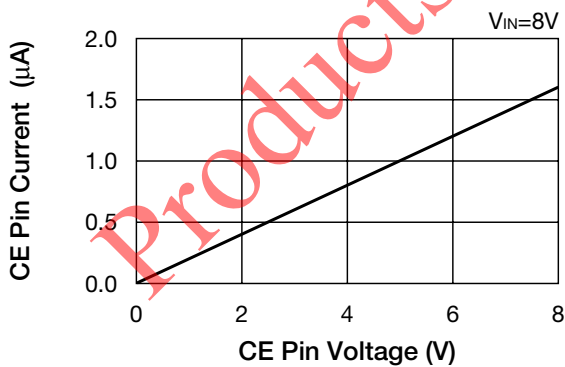
■ Load Regulation



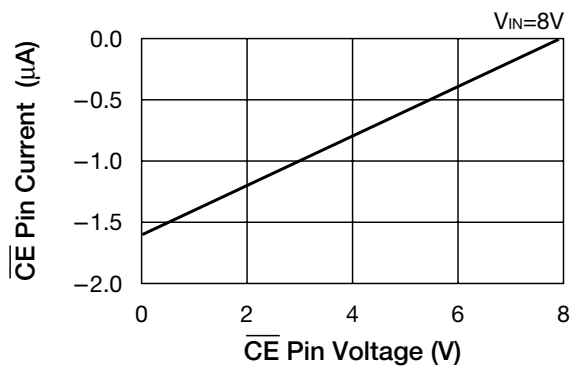
■ Supply Current



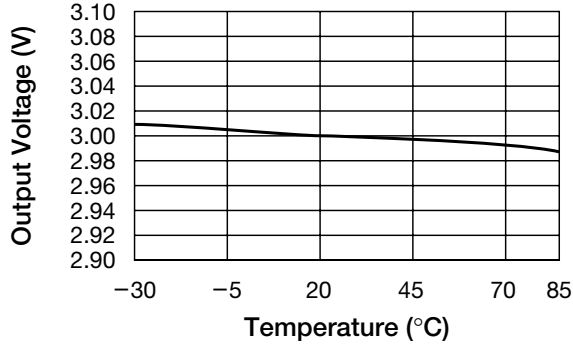
■ CE Pin Current – CE Pin Voltage High Active



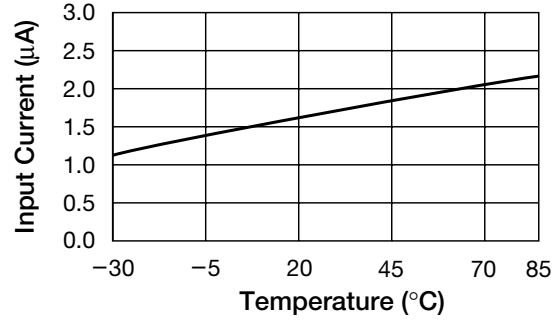
■ CE Pin Current – CE Pin Voltage Low Active



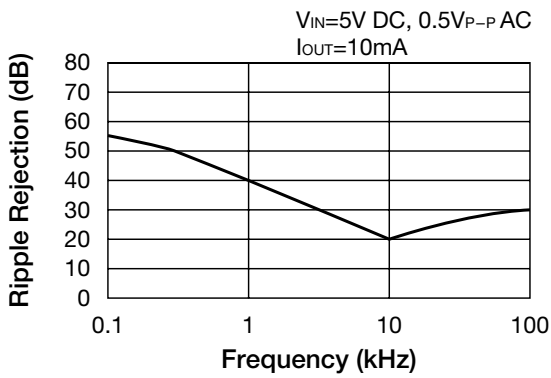
■ Output Voltage – Temperature



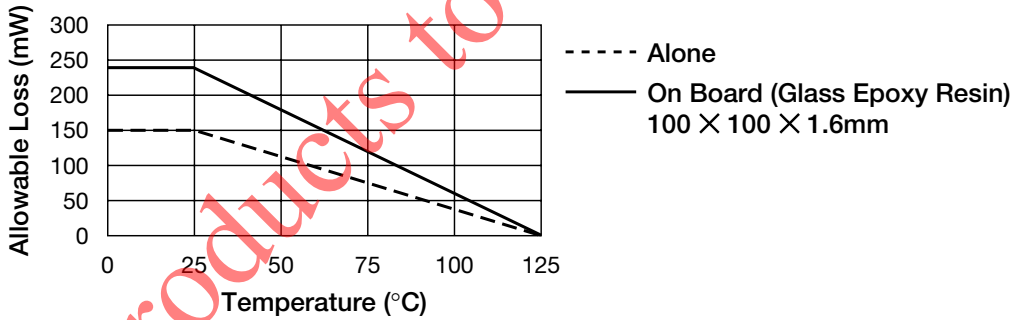
■ Input Current – Temperature



■ Ripple Rejection



■ Allowable Loss



Products to be discontinued