

Ultra-Low Power Consumption Low-Saturation Three-Pin Regulators with On/Off Pin Monolithic ICs MM1065 and 1165

Outline

These ICs are stabilized power supply devices with ultra-low consumption currents, designed for a greatly reduced reactive current at low input voltages, and with a small input/output difference voltage of 0.2V at an output current of 40mA. The output current is limited to a maximum of 100mA, and in the MMP-4A package, an on/off pin enables the device to be switched on and off.

Features

- | | | |
|--|------------------------------------|--|
| 1. Input/output voltage difference | 0.2V typ. ($I_o=40\text{mA}$) | |
| 2. No-load input current | 13 μA typ. | |
| 3. Maximum reactive current at low input voltages | 15 μA typ. (no-load) | |
| 4. Maximum output current | 100mA max. | |
| 5. Temperature coefficient of output voltage | $\pm 0.01\%/^{\circ}\text{C}$ typ. | |
| 6. Output voltage ranks | MM1065, 1165 | F : 6.0V $\pm 4\%$
G : 5.0V $\pm 4\%$
H : 4.5V $\pm 4\%$
I : 4.0V $\pm 4\%$
J : 3.0V $\pm 4\%$
Z : 3.3V $\pm 4\%$ |
| 7. With overcurrent protection circuit | | |
| 8. With thermal shutdown circuit | | |
| 9. With function to turn output on and off (MMP-4A package only) | | |

On/Off Pin Level	Low	High
MM1065 output	ON	OFF
MM1165 output	OFF	ON

Package

TO-92A (MM1065□T, MM1165□T)

MMP-4A (MM1065□M, MM1165□M)

*The output voltage rank appears in the boxes.

Applications

1. Handheld computers
2. Portable transceivers
3. Cordless phones
4. Other portable equipment which uses batteries

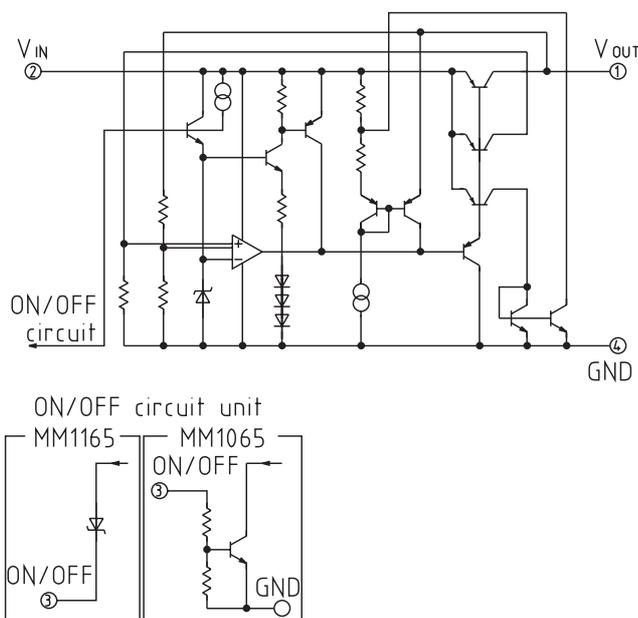
Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Operating temperature	T_{OPR}	-20~+75	°C
Storage temperature	T_{STG}	-40~+125	°C
Power supply current	$V_{CC \text{ max.}}$	-0.3~10	V
Output current	I_{OUT}	100	mA
Maximum Ratings	P_d	200 (MMP-4A) 300 (TO-92A)	mW

Electrical Characteristics

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units	
Output voltage	V_o	$V_{IN}=V_o+1V$ $I_o=40mA$	F	5.76	6.00	6.24	V
			G	4.80	5.00	5.20	
			H	4.32	4.50	4.68	
			I	3.84	4.00	4.16	
			J	2.88	3.00	3.12	
			Z	3.17	3.30	3.43	
No-load input current	I_{ccq1}	$V_{IN}=V_o+1V, I_o=0mA$		13	20	μA	
Minimum I/O voltage difference	$V_d \text{ min.}$	$V_{IN}=V_o \text{ min.}, I_o=40mA$		0.2	0.3	V	
Input fluctuation rate	ΔV_2	$V_{IN}=(V_o+1V)\sim 10V, I_o=40mA$		±0.01	±0.1	%/V	
Load fluctuation rate	ΔV_1	$V_{IN}=V_o+1V, I_o=0\sim 100mA$		±0.01	±0.03	%/mA	
Output voltage temperature coefficient	$\Delta V_o/T$	$T_j=-20\sim +75^\circ C$		±100		ppm/°C	
Ripple rejection rate	RR	$V_{RIPPLE}=1V, V_{IN}=V_o+2V$ $f=120Hz, I_o=40mA$	50	60		dB	

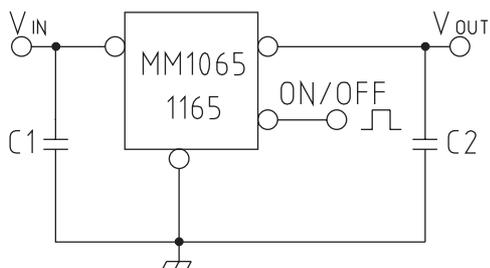
Equivalent Circuit Diagram



Electrical Characteristics (MMP-4P)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Input current while off	I _{ccq2}	MM1065 V _{IN} =6V V(ON/OFF)=High		2.5	7	μA
		MM1165 V _{IN} =6V V(ON/OFF)=Low		3	6	μA
On/off pin current while off	I _{OFF}	MM1065 V(ON/OFF)=2.4V		4	7	μA
		MM1165 V(ON/OFF)=0.4V		0.2	0.1	μA
On/off pin level						
On/off pin high level	High		2.4		V _{IN} +0.3	V
On/off pin low level	Low		-0.3		0.4	V

Basic Circuit Connection Diagram

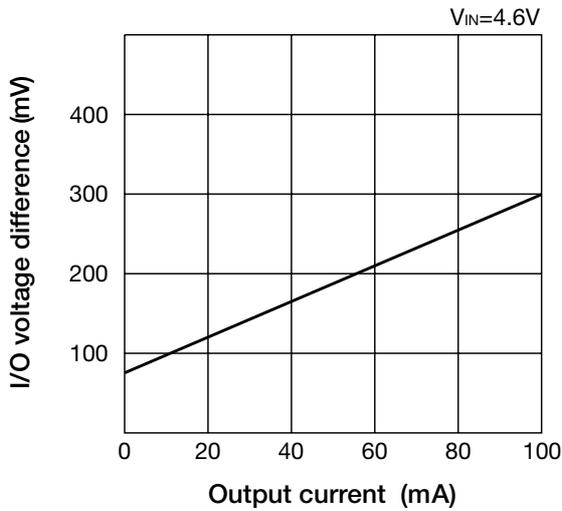


[C1 ≥ 1μF (ceramic)
C2 ≥ 1μF (ceramic)

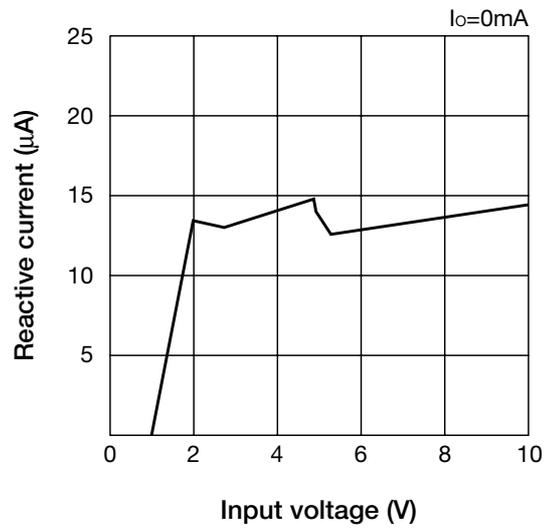
On/Off Pin Level	Low	High
MM1065 output	ON	OFF
MM1165 output	OFF	ON

Characteristics

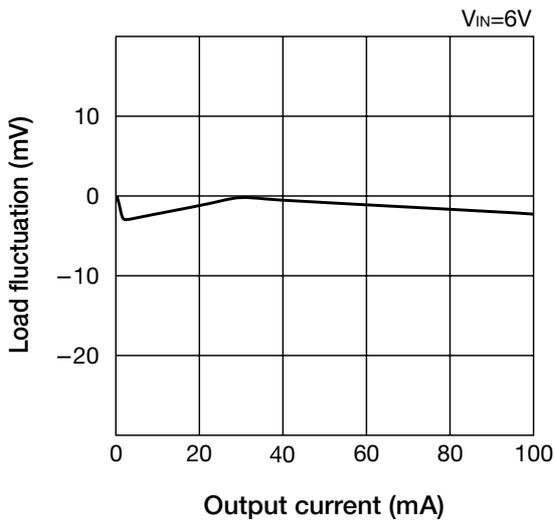
I/O voltage difference



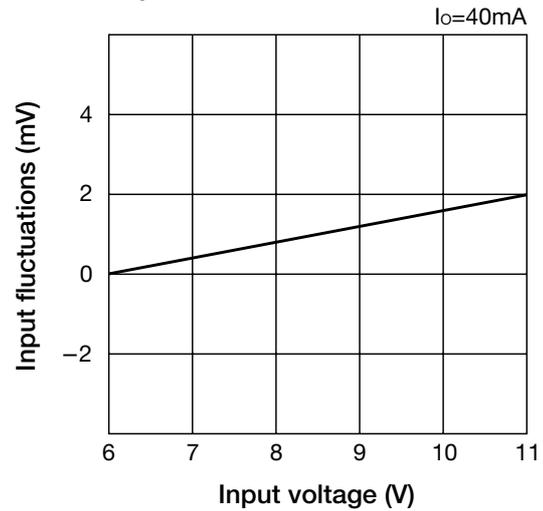
No-load input current



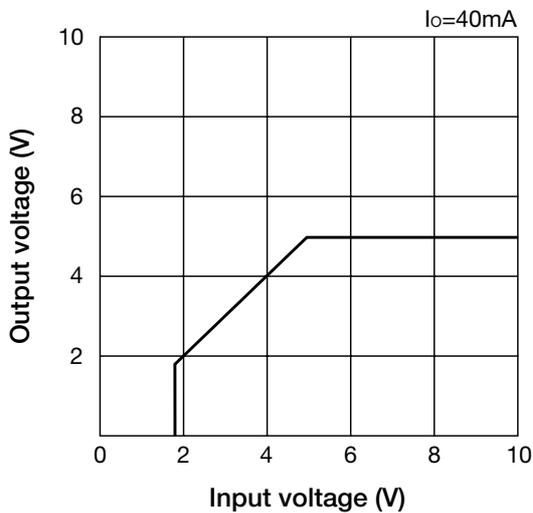
Load fluctuation rate



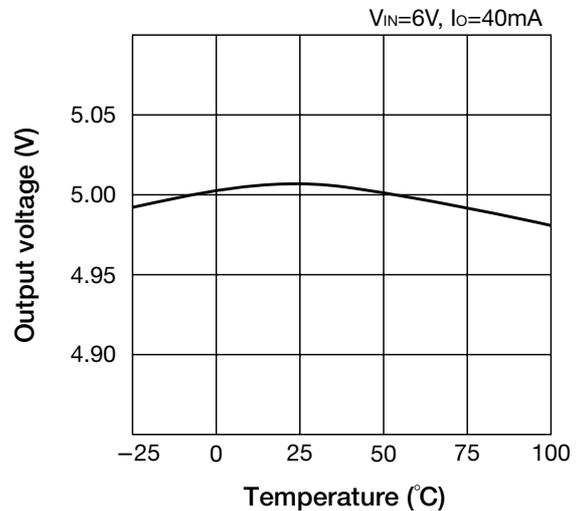
Input fluctuation rate



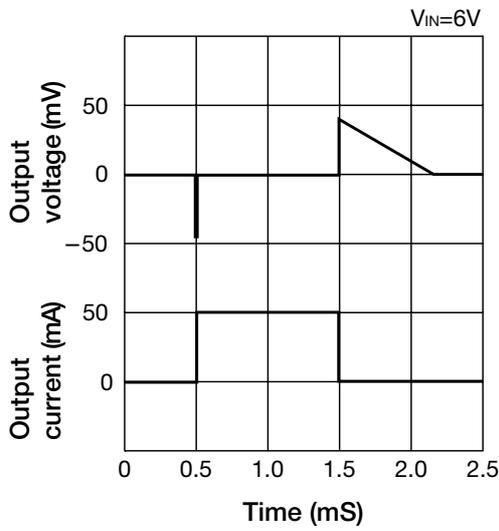
Output voltage characteristic



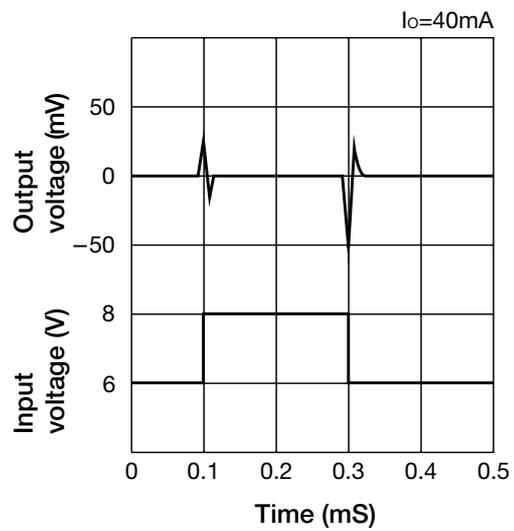
Output voltage temperature characteristic



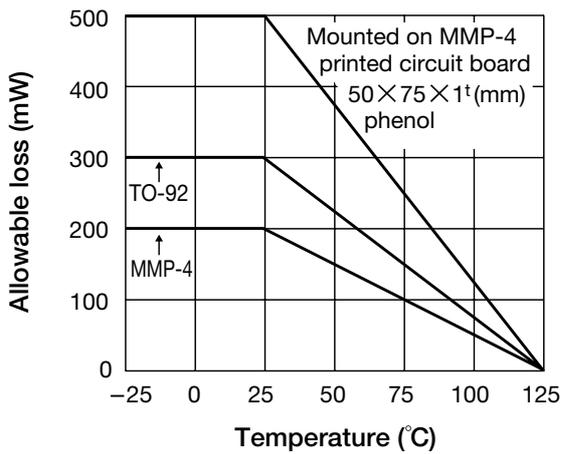
■ Load transient response



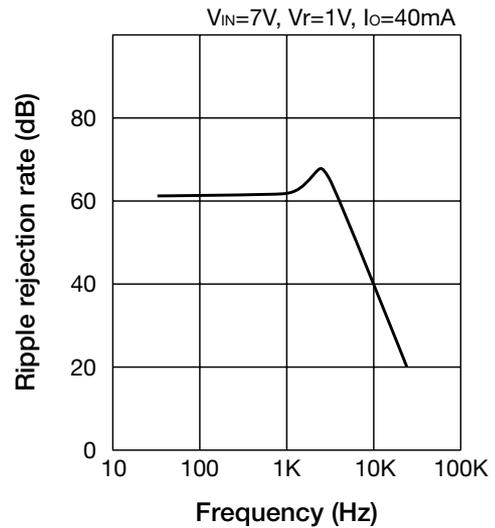
■ Transient response to input fluctuation



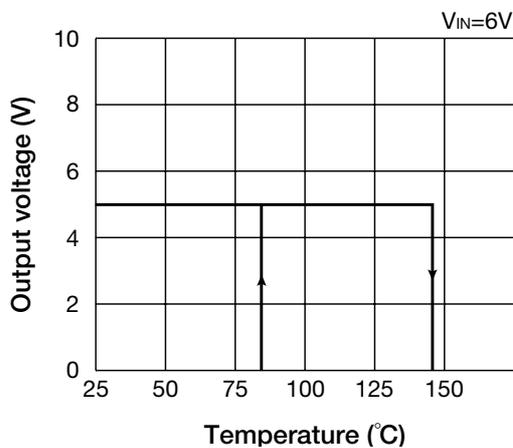
■ Allowable loss



■ Ripple rejection rate



■ Thermal shutdown



■ Output current characteristic

