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=40mA)
2. No-load input current — 13μA typ.
3. Maximum reactive current at low input voltages — 15μA typ. (no-load)
4. Maximum output current — 100mA max.
5. Temperature coefficient of output voltage — ±0.01%/°C typ.
6. Output voltage ranks — MM1065, 1165
   - F : 6.0V±4%
   - G : 5.0V±4%
   - H : 4.5V±4%
   - I : 4.0V±4%
   - J : 3.0V±4%
   - Z : 3.3V±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

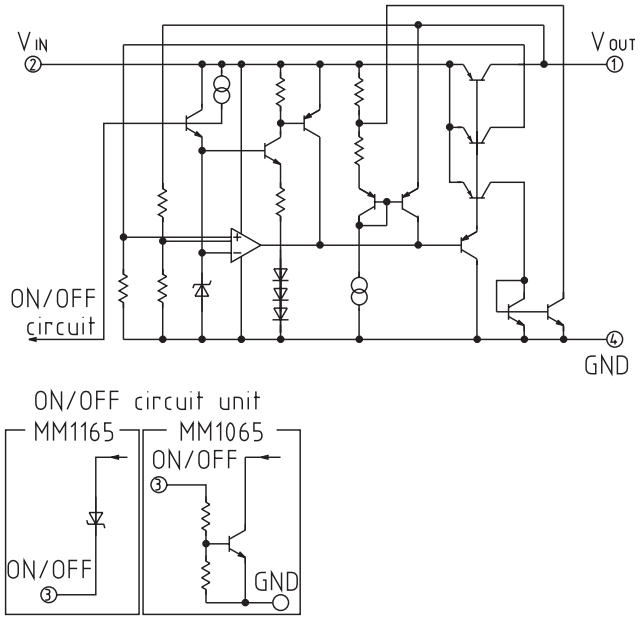
Absolute Maximum Ratings

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

Electrical Characteristics

Item	Symbol	Measurement conditions		Min.	Typ.	Max.	Units
Output voltage	Vo	V_{IN}=Vo+1V Io=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	Iccq1	V_{IN}=Vo+1V, Io=0mA			13	20	μA
Minimum I/O voltage difference	Vd min.	V_{IN}=Vo min., Io=40mA			0.2	0.3	V
Input fluctuation rate	⊿V2	V_{IN}=(Vo+1V)~10V, Io=40mA			±0.01	±0.1	%/V
Load fluctuation rate	⊿V1	V_{IN}=Vo+1V, Io=0~100mA			±0.01	±0.03	%/mA
Output voltage temperature coefficient	⊿Vo/T	Tj=–20~+75°C			±100		ppm/°C
Ripple rejection rate	RR	V_{RIPPLE}=1V, V_{IN}=Vo+2V f=120Hz, Io=40mA		50	60		dB

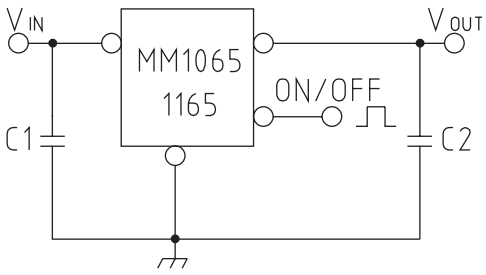
Equivalent Circuit Diagram



Electrical Characteristics (MMP-4P)

Item	Symbol	Measurement conditions		Min.	Typ.	Max.	Units
Input current while off	Iccq2	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

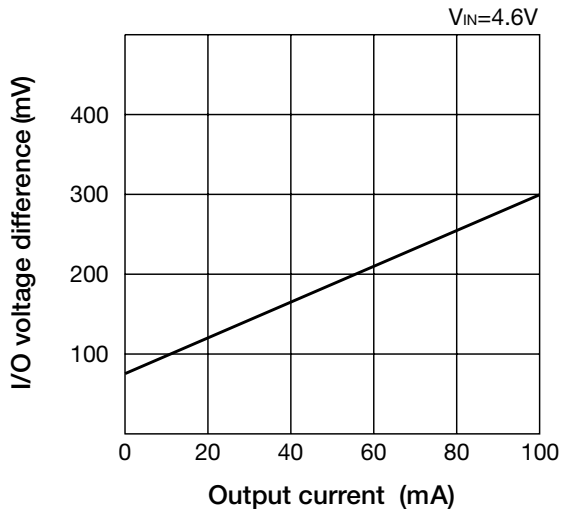


C1 ≧ 1µF (ceramic)
C2 ≧ 1µF (ceramic)

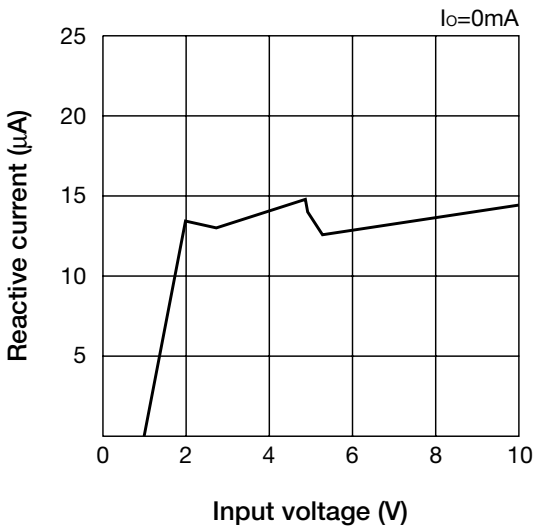
On/Off Pin Level	Low	High
MM1065 output	ON	OFF
MM1165 output	OFF	ON

Characteristics

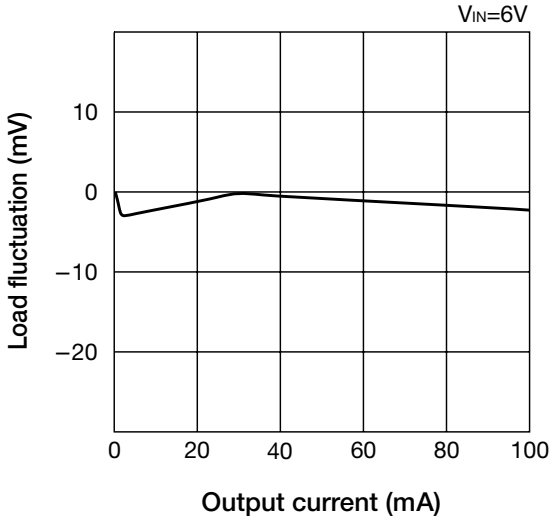
I/O voltage difference



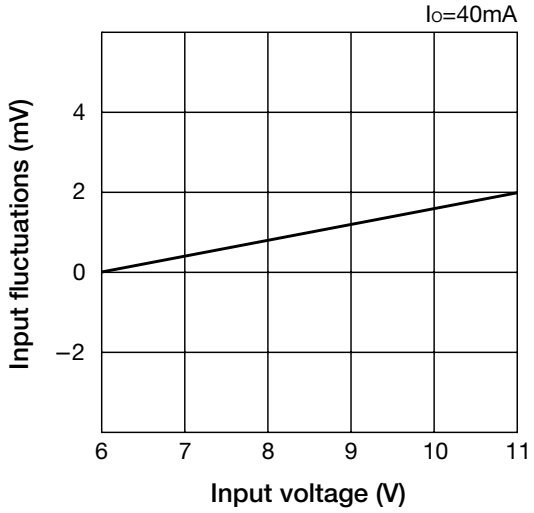
No-load input current



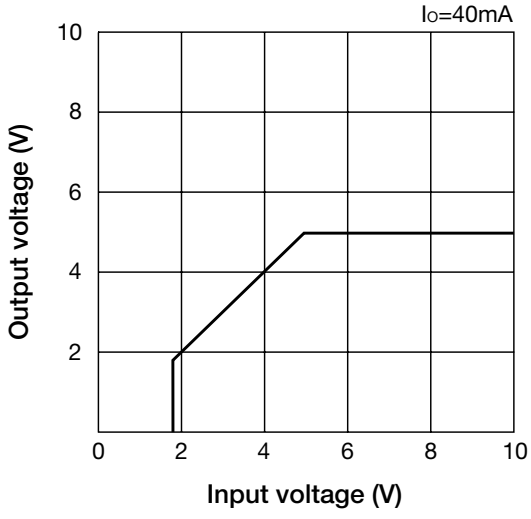
Load fluctuation rate



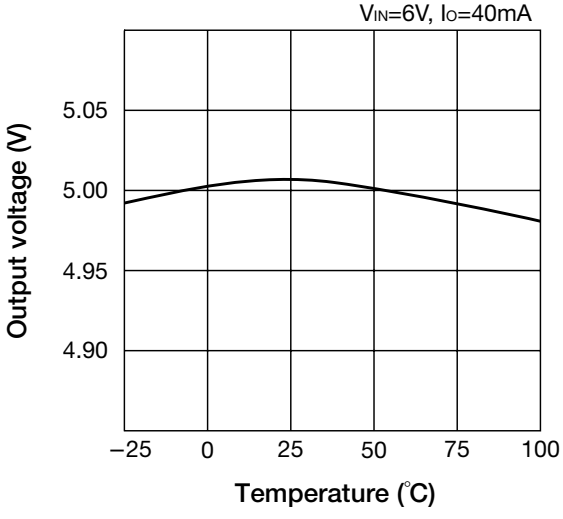
Input fluctuation rate



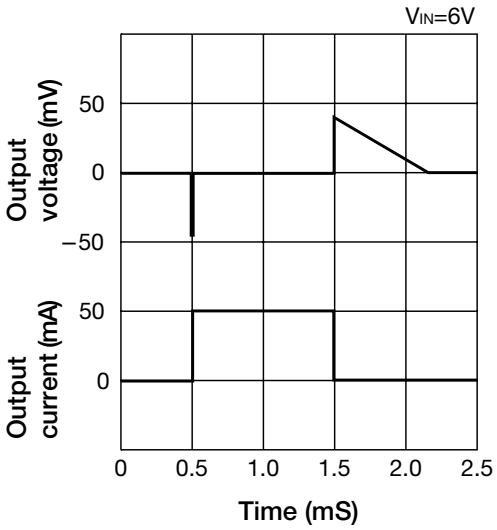
Output voltage characteristic



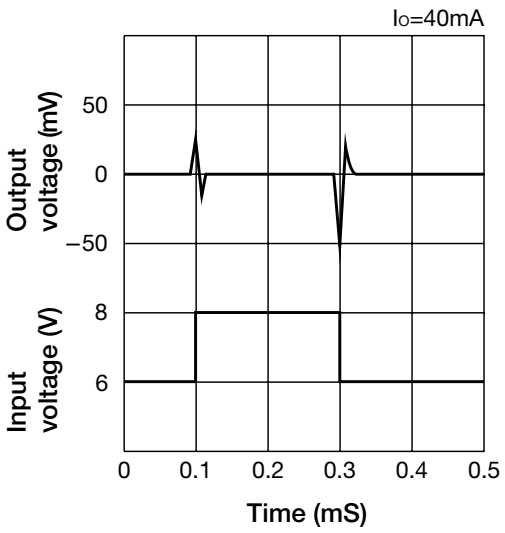
Output voltage temperature characteristic



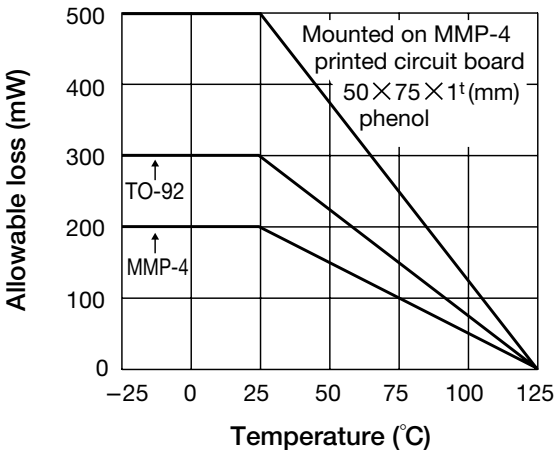
Load transient response



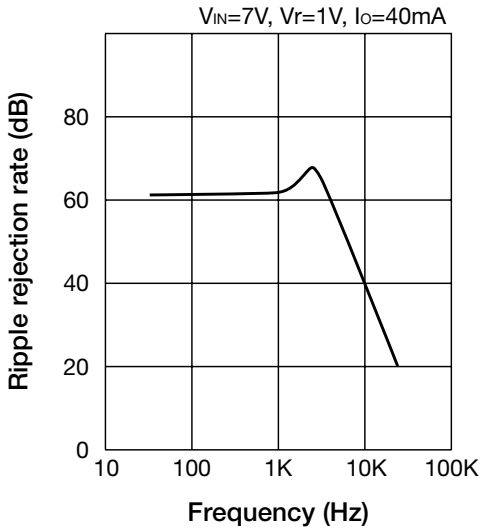
Transient response to input fluctuation



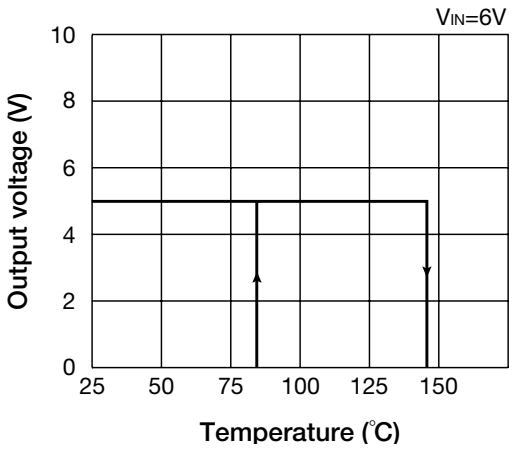
Allowable loss



Ripple rejection rate



Thermal shutdown



Output current characteristic