

# Low-Saturation Three-Pin Regulators with Externally Mounted Power Transistor Monolithic ICs MM1215 and 1216

## Outline

These ICs are high-precision, high-voltage stabilized power supply devices which, by employing an externally mounted power transistor are able to drive loads at large currents. The input/output voltage difference is a low 0.2V, and an internal protection circuit ensures that the devices can be used in a wide range of portable equipment. Output on/off control is also provided.

## Features

- |                                      |   |
|--------------------------------------|---|
| 1. Input voltage                     | 16V max.  |
| 2. Input/output voltage difference   | 0.2V typ.   |
| 3. Maximum driving current           | 15mA max.   |
| 4. No-load input current             | 250µA typ.  |
| 5. Thermal shutdown circuit provided |   |
| 6. Output ranks                      | E : 9.0V±2% I : 4.0±2%<br>F : 6.0V±2% J : 3.0±2%<br>G : 5.0V±2% Z : 3.3±2%<br>H : 4.5V±2% |

### CONT Pin Output Logic

Model	Low	High
MM1215	ON	OFF
MM1216	OFF	ON

## Package

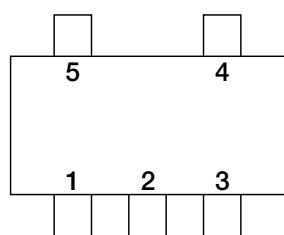
SOT-25A (MM1215□N, MM1216□N)

\*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

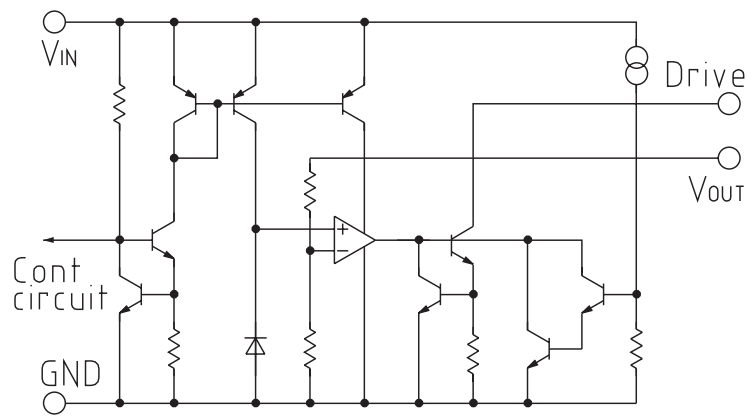
## Pin Assignment



SOT-25A

1	Drive
2	GND
3	CONT
4	V <sub>IN</sub>
5	V <sub>OUT</sub>

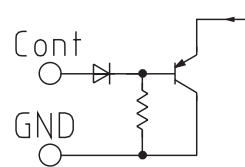
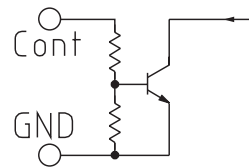
**Equivalent Circuit Diagram**



Cont pin circuit diagram

MM1215

MM1216



**Absolute Maximum Ratings**

Item	Symbol	Ratings	Units
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Operating temperature	T <sub>OPR</sub>	-20~+75	°C
Power supply voltage	V <sub>d max.</sub>	-0.3~16	V
Recommended power supply voltage	V <sub>IN</sub>	2.5~12	V
CONT pin voltage	V <sub>COH1</sub>	-0.3~V <sub>IN</sub> +0.3	V
Recommended driving current		0~10	mA
Allowable loss	P <sub>d</sub>	150	mW

**Electrical Characteristics** (Ta=25°C) : Using the 2SB956 output transistor

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit	
Output voltage	Vo	VIN=Vo+1V Io=100mA	Vo-2%	E	9.00	Vo+2%	V
				F	6.00		
				G	5.00		
				H	4.50		
				I	4.00		
				J	3.00		
				Z	3.30		
Consumption current	Iccq1	VIN=Vo+1V		250	400	μA	
Minimum I/O voltage difference	Vd min.	VIN=Vo-0.1V		0.2	0.3	V	
Input fluctuation rate	ΔV2	VIN=(Vo+1V)~12V		±0.01	±0.1	%/V	
Load fluctuation rate	ΔV1	VIN=Vo+1V, Io=0~500mA		±0.01	±0.03	%/mA	
Output voltage temperature coefficient	ΔVo/T	Tj=-20~+75°C		±100		ppm/°C	
Ripple rejection rate	RR	VIN=Vo+2V, f=120Hz VRIPPLE=1V, Io=100mA	50	60		dB	
Output noise voltage	VN	VIN=Vo+1V, Io=100mA f=10~80kHz		150		μVrms	

**MM1215**

Input current while off	Iccq2	VIN=Vo+1V		25	40	μA
CONT pin current	ION	VCONT=0.6V		1	3	μA
CONT pin current	IOFF	VCONT=2.4V		5	10	μA

**MM1216**

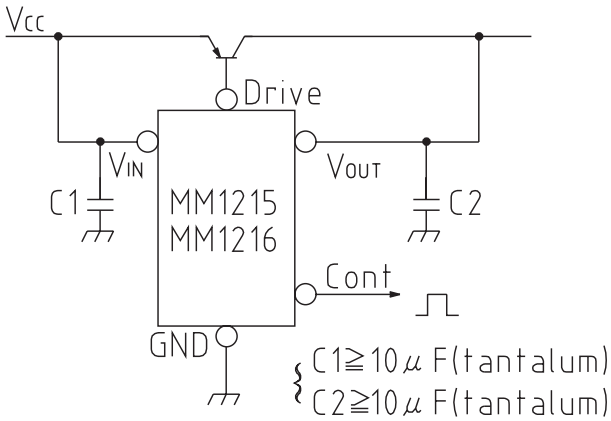
Input current while off	Iccq2	VIN=Vo+1V		25	40	μA
CONT pin current	ION	VCONT=2.4V		5	10	μA
CONT pin current	IOFF	VCONT=0.6V		1	3	μA

**CONT pin level**

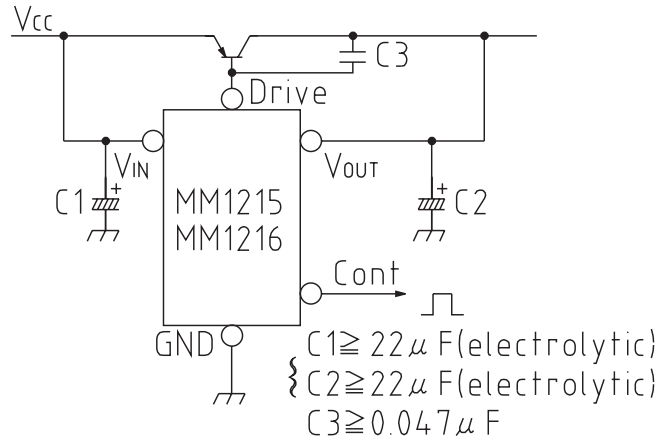
High	Vh		2.4			V
Low	VL				0.6	V

## Measuring Circuit

Measurement circuit 1



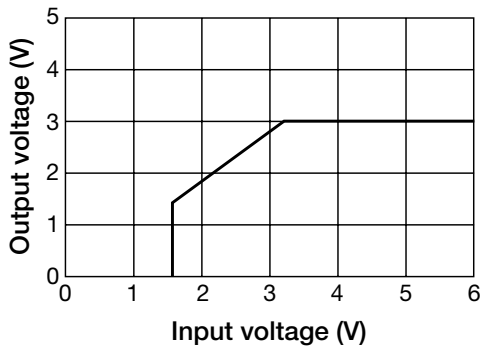
Measurement circuit 2



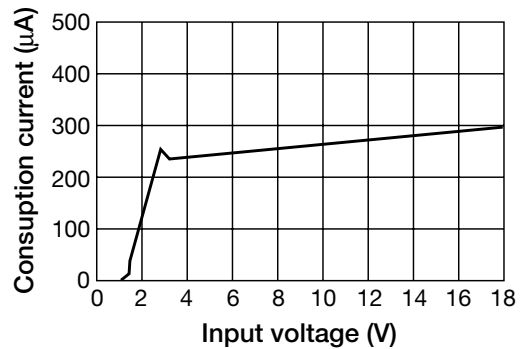
Note: When the CONT pin is unused, it should be connected to ground for the MM1215 and to Vcc for the MM1216.

## Characteristics (MM1215)

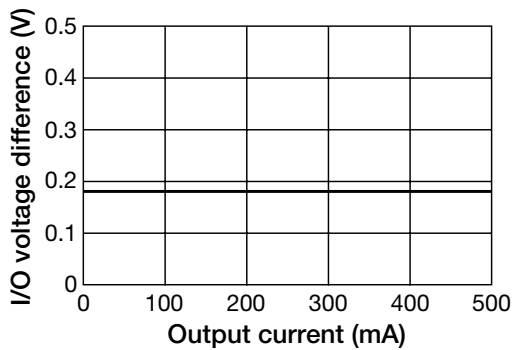
Output voltage characteristic



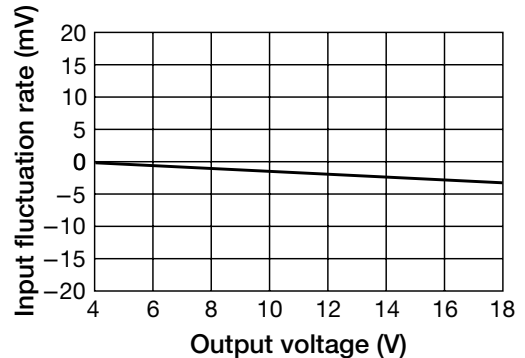
No-load input current



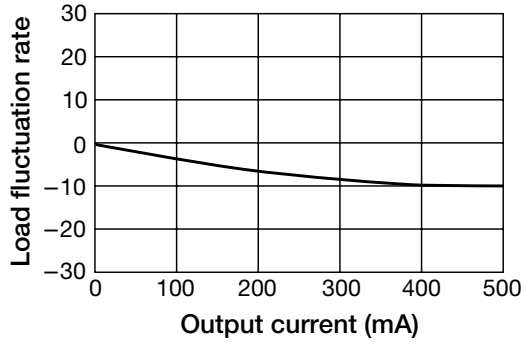
I/O voltage difference (VIN=2.8V)



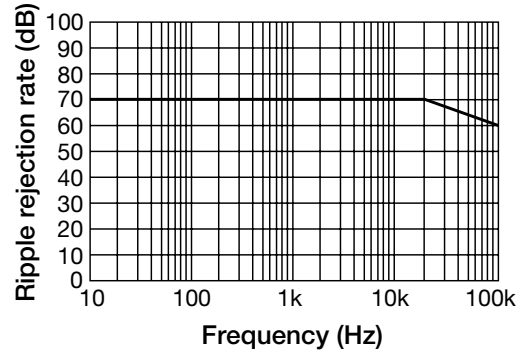
Input fluctuation rate



■ Load fluctuation



■ Ripple rejection rate



■ Output temperature characteristic

