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%

F : 6.0V±2% J : 3.0±2%

G : 5.0V±2% Z : 3.3±2%

H : 4.5V±2%

C_{ONT} Pin Output Logic

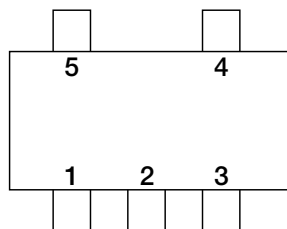| Model	Low	High
MM1215	ON	OFF
MM1216	OFF	ON

Package

SOT-25A (MM1215☐N, MM1216☐N)
*The output voltage rank appears in the boxes.

Applications

1. Mobile computers
2. transceivers
3. Cordless phones
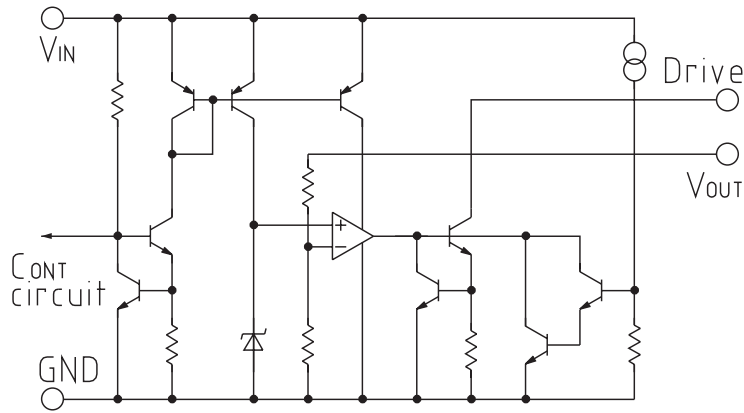4. Portable equipment which uses batteries
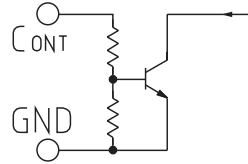
Pin Assignment

SOT-25A
(TOP VIEW)

1	Drive
2	GND
3	C_{ONT}
4	V_{IN}
5	V_{OUT}

Equivalent Circuit Diagram
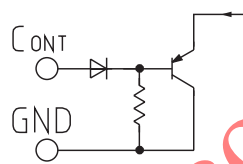

Cont pin circuit diagram

MM1215   MM1216

Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	−40~+125	°C
Operating temperature	T_{OPR}	−20~+75	°C
Power supply voltage	Vd max.	−0.3~16	V
Recommended power supply voltage	V_{IN}	2.5~12	V
Cont pin voltage	$V_{COH}1$	−0.3~V_{IN}+0.3	V
Recommended driving current		0~10	mA
Allowable loss	Pd	150	mW

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

Item	Symbol	Measurement conditions		Min.	Typ.	Max.	Unit
Output voltage	Vo	V_{IN}=Vo+1V Io=100mA	E	Vo-2%	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	Iccql	V_{IN}=Vo+1V			250	400	μA
Minimum I/O voltage difference	Vd min.	V_{IN}=Vo−0.1V			0.2	0.3	V
Input fluctuation rate	△V2	V_{IN}=(Vo+1V)~12V			±0.01	±0.1	%/V
Load fluctuation rate	△V1	V_{IN}=Vo+1V, Io=0~500mA			±0.01	±0.03	%/mA
Output voltage temperature coefficient	△Vo/T	Tj=−20~+75°C			±100		ppm/°C
Ripple rejection rate	RR	V_{IN}=Vo+2V, f=120Hz V_{RIPPLE}=1V, Io=100mA		50	60		dB
Output noise voltage	VN	V_{IN}=Vo+1V, Io=100mA f=10~80kHz			150		μVrms

MM1215

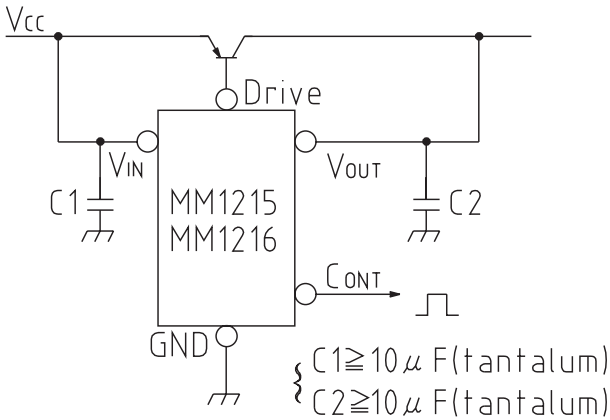| Input current while off	Iccq2	V_{IN}=Vo+1V		25	40	μA
CONT pin current	ION	VCONT=0.6V		1	3	μA
CONT pin current	IOFF	VCONT=2.4V		5	10	μA

MM1216

Input current while off	Iccq2	V_{IN}=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

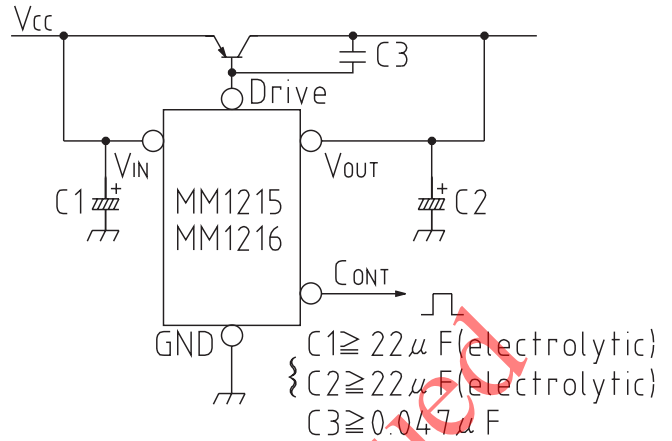| High	Vh		2.4			V
Low	VL				0.6	V

Measuring Circuit

Measurement circuit 1

$$C1 \geqq 10\mu F(\text{tantalum})$$
$$C2 \geqq 10\mu F(\text{tantalum})$$

Measurement circuit 2

$$C1 \geqq 22\mu F(\text{electrolytic})$$
$$C2 \geqq 22\mu F(\text{electrolytic})$$
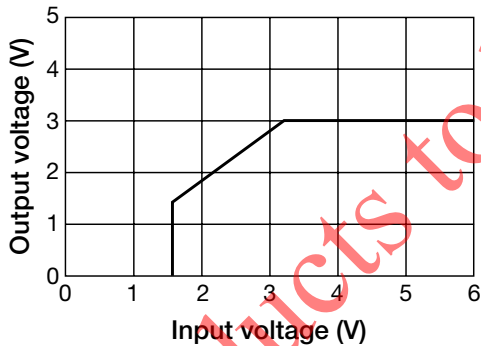$$C3 \geqq 0.047\mu F$$

Note1: When the C$_{ONT}$ pin is unused, it should be connected to ground for the MM1215 and to Vcc for the MM1216.
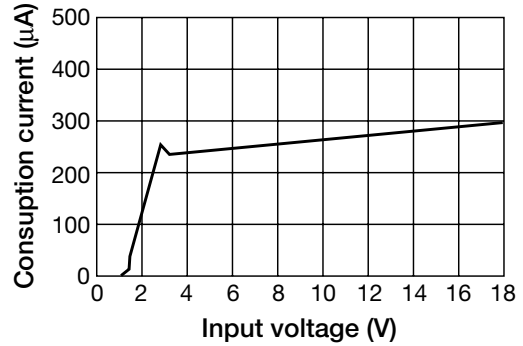
Note 2: The cause of oscillation is due to set wiring and capacitance changes in capacitor caused by temperatures changes, so please take extra care in placing the wires.
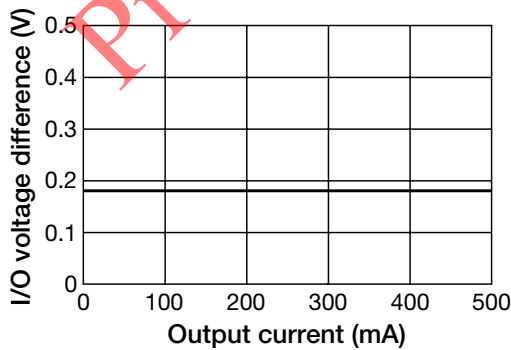
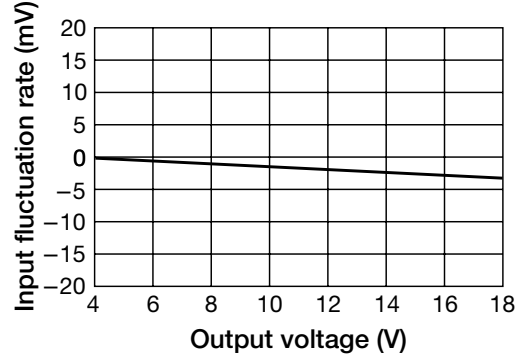# Characteristics (MM1215)

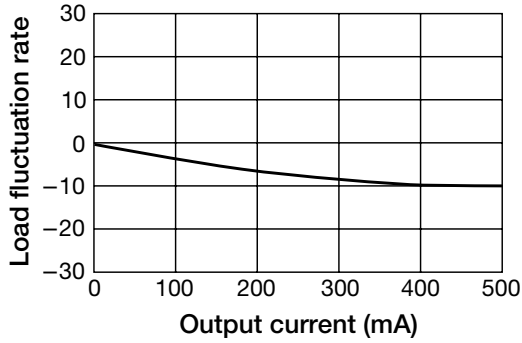## ■ Output voltage characteristic

■ No-load input current

■ I/O voltage difference (V$_{IN}$=2.8V)

■ Input fluctuation rate

■ Load fluctuation

Load fluctuation rate vs Output current (mA)

■ Ripple rejection rate

Ripple rejection rate (dB) vs Frequency (Hz)
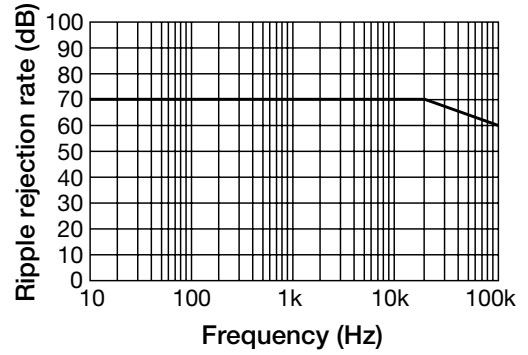
■ Output temperature characteristic

Output voltage (V) vs Temperature (°C)

Application Circuits

$V_{IN} = 7V$

Q1,Q2=2SB956

Q2

Q1

330

① DRIVE V_{OUT} ⑤

② GND MM1215J

③ C_{ONT} V_{IN} ④

1000p 100μF

470

1k

820k

1k

I_0 V_0

$C_{OUT} = 10μF$

ESR

GND

■ ESR Stable region

MM1215J
(Ceramic capacitor reference data when 10μF.)

ESR (Ω) vs Output Current (mA)

Instability Region
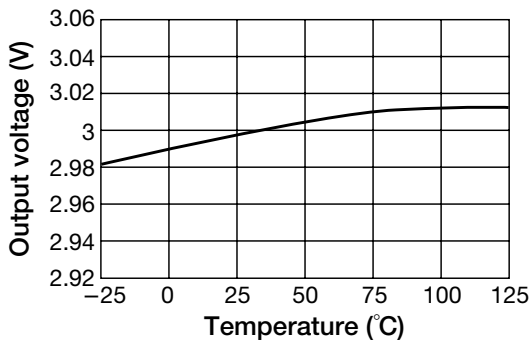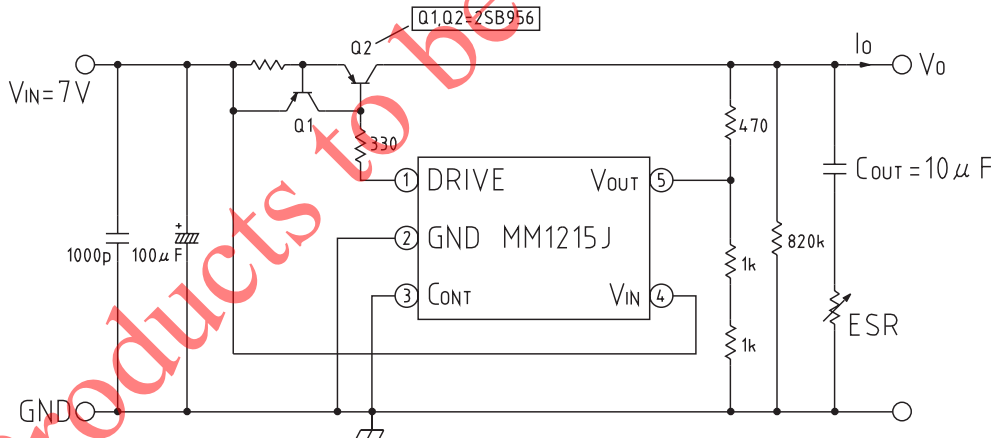
Stable Region

Unmeasurement region
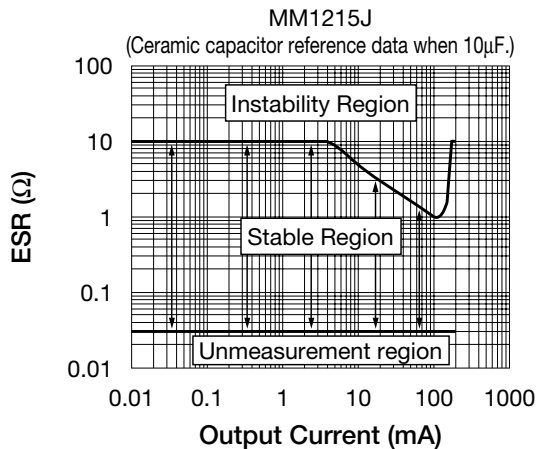
Note: Stable region reference data at this current.