500mA Regulator
Monolithic IC MM156□□F

Outline

This IC is a small, stable power supply with output voltage precision of ±2% (when I_O = 250mA), maximum output current of 500mA, and I/O voltage difference of 0.3V typ. at 250mA.
Output noise reduction and output ON/OFF control pins are provided, making it ideal for portable equipment.

Features

1. No-load current consumption   1.9mA typ.
2. I/O voltage difference   0.3V typ. (I_O=250mA)
3. Ripple rejection rate   64dB typ. (f=120Hz, V_{RIPPLE}=1V_{P-P}, I_O=250mA)
4. Output current   500mA max.
5. Output noise voltage   75μVrms typ.
6. Output voltage rank   1.5 ~ 5.0V (0.1V steps)
7. Output ON/OFF control   High→ON, Low→OFF
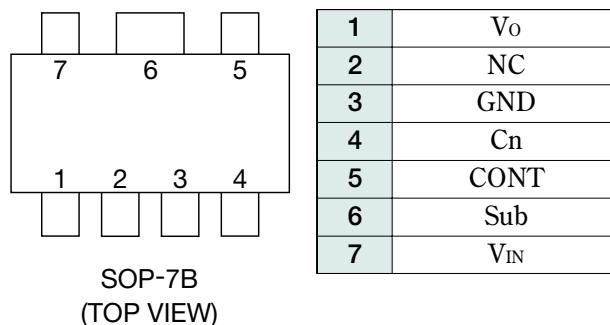
Package

SOP-7B
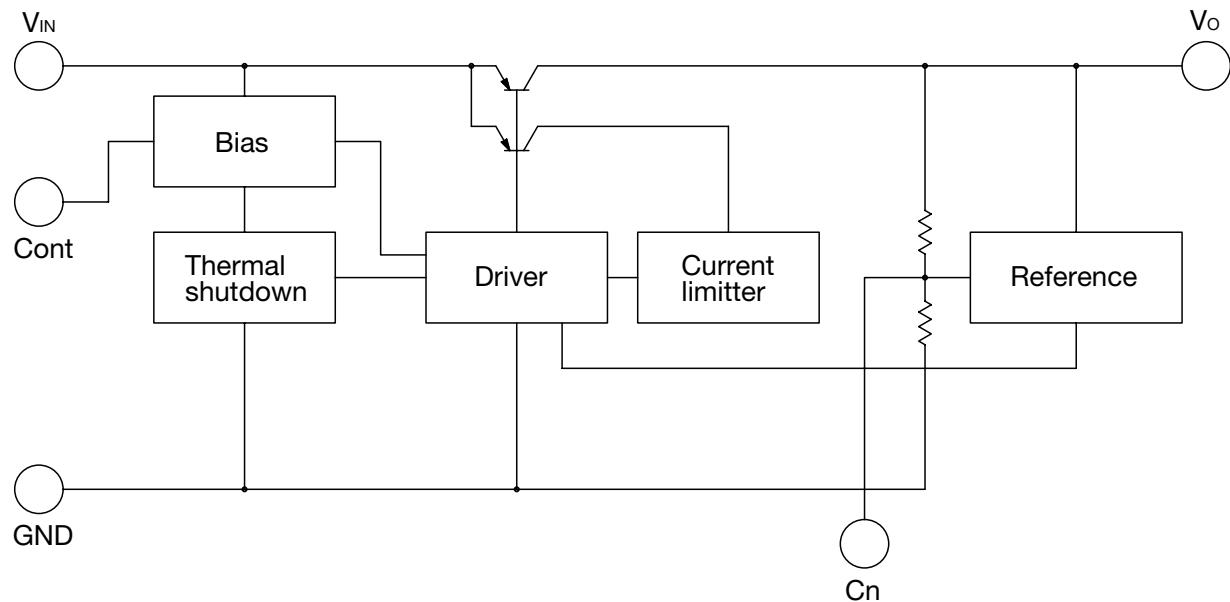
Applications

1. Cordless telephone
2. Portable equipment, etc.

Pin Assignment

SOP-7B
(TOP VIEW)

Pin	Signal
1	V_O
2	NC
3	GND
4	Cn
5	CONT
6	Sub
7	V_{IN}
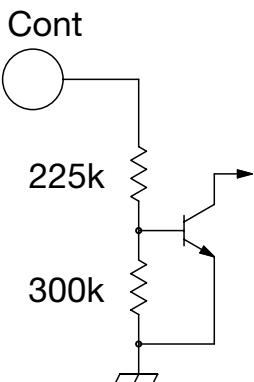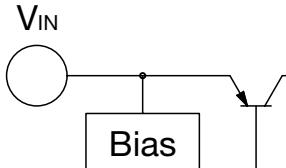
Equivalent Circuit Diagram

Pin Description

Pin No.	Pin name	Function	Internal equivalent circuit diagram
1	V_{OUT}	Output pin	
2	NC	No connection	
3	GND	Ground	
4	Cn	Noise decrease pin	

Pin No.	Pin name	Function	Internal equivalent circuit diagram
5	CONT	Control pin <table><tr><td>COUT</td><td>Output</td></tr><tr><td>H</td><td>ON</td></tr><tr><td>L</td><td>OFF</td></tr></table>	Cont 225k 300k
6	Sub	Substrate The 6pin must be connected to GND.	
7	V_{IN}	Input pin	V_{IN} Bias

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	−40~+150	°C
Supply voltage	V_{IN}	−0.3~+12	V
Allowable loss	Pd	400 (Not attached) 950 (∗1)	mW

∗1 With the double sided PC Board of glass epoxy
(Copper plane 80%, 192×142×1.2mm)

Recommended Operating Conditions

Item	Symbol	Ratings	Units
Operating temperature	T_{OPR}	−30~+85	°C
Output current	I_{OUT}	0~500	mA
Operating voltage	V_{OP}	Vo Typ.+0.5~+10	V

Electrical Characteristics 1 (Except where noted therwise, Ta=25°C, Vcc=9V)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
No-Load input current	I_{CC}	Io=0mA		1.9	5	mA
Input current (OFF)	I_{CCOFF}	V_{CONT}=0V		0	1	μA
Output voltage *3	V_{OUT}	Io=250mA	×0.98		×1.02	V
Dropout voltage *4	V_{IO}	V_{IN}=Vo−0.2V, Io=250mA		0.3	0.5	V
Line regulation	$\triangle V1$	V_{IN}=Vo+1.5~Vo+2.5V, Io=250mA		10	20	mV
Load regulation	$\triangle V2$	Io=0~250mA		20	120	mV
V_{OUT} temperature coefficient *2	$\triangle V_{OUT}/\triangle T$	Tj=−30~+85°C		100		ppm/°C
Ripple rejection *2	RR	f=120Hz V_{RIPPLE}=1V, Io=250mA	50	64		dB
Output noise voltage *2	Vn	fBW=20~80kHz Cn=470pF		75		μVrms
CONT pin input current	I_{CONT}	V_{CONT}=V_{IN}	10	20	30	μA
CONT pin high threshold level	$V_{CONT}H$		1.6		V_{IN}+0.3	V
CONT pin low threshold level	$V_{CONT}L$		−0.3		0.4	V

*2. The parameter is guaranteed by design.

*3. Please refer to another page.
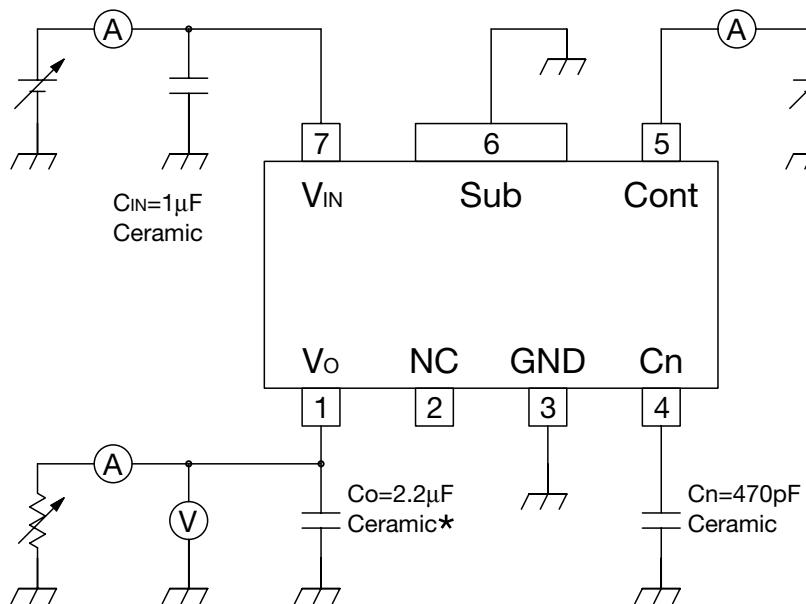
*4. The parameter is not guaranteed in the model less than V_{OUT}=2V.

Electrical Characteristics 2
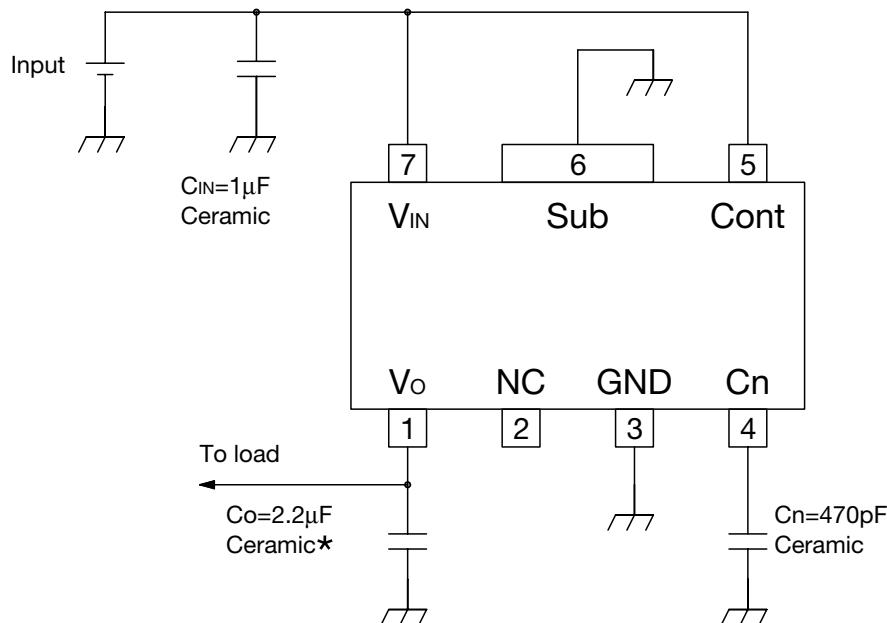
■Output Voltage

Product name	Test condisions	Output voltage				Product name	Test condisions	Output voltage		
		Min.	Typ.	Max.				Min.	Typ.	Max.
MM1561F	Io=250mA	1.470	1.5	1.530		MM1563H	Io=250mA	3.626	3.7	3.774
MM1561G		1.568	1.6	1.632		MM1563J		3.724	3.8	3.876
MM1561H		1.666	1.7	1.734		MM1563K		3.822	3.9	3.978
MM1561J		1.764	1.8	1.836		MM1564A		3.920	4.0	4.080
MM1561K		1.862	1.9	1.938		MM1564B		4.018	4.1	4.182
MM1562A		1.960	2.0	2.040		MM1564C		4.116	4.2	4.284
MM1562B		2.058	2.1	2.142		MM1564D		4.214	4.3	4.386
MM1562C		2.156	2.2	2.244		MM1564E		4.312	4.4	4.488
MM1562D		2.254	2.3	2.346		MM1564F		4.410	4.5	4.590
MM1562E		2.352	2.4	2.448		MM1564G		4.508	4.6	4.692
MM1562F		2.450	2.5	2.550		MM1564H		4.606	4.7	4.794
MM1562G		2.548	2.6	2.652		MM1564J		4.704	4.8	4.896
MM1562H		2.646	2.7	2.754		MM1564K		4.802	4.9	4.998
MM1562J		2.744	2.8	2.856		MM1565A		4.900	5.0	5.100
MM1562K		2.842	2.9	2.958						
MM1563A		2.940	3.0	3.060						
MM1563B		3.038	3.1	3.162						
MM1563C		3.136	3.2	3.264						
MM1563D		3.234	3.3	3.366						
MM1563E		3.332	3.4	3.468						
MM1563F		3.430	3.5	3.570						
MM1563G		3.528	3.6	3.672						

Measuring Circuit

CIN=1µF
Ceramic

7	6	5
VIN	Sub	Cont

VO	NC	GND	Cn
1	2	3	4

Co=2.2µF
Ceramic*

Cn=470pF
Ceramic

Application Circuit

Input

CIN=1µF
Ceramic

7	6	5
VIN	Sub	Cont

VO	NC	GND	Cn
1	2	3	4

To load

Co=2.2µF
Ceramic*

Cn=470pF
Ceramic
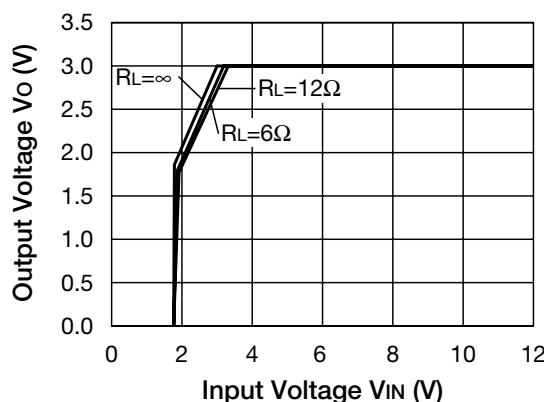
*Temperature Characteristics: B Type

Note
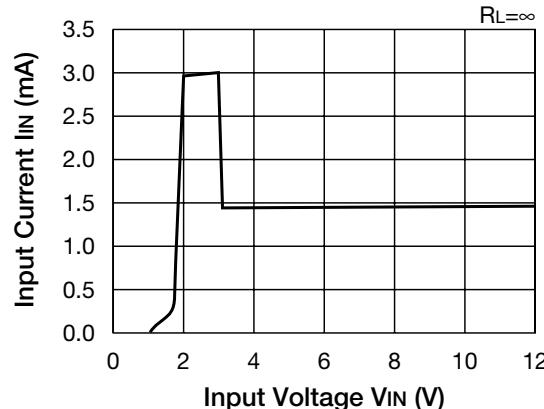
1. The output capacitor is required between output and GND to prevent oscillation.
2. Use a capacitance that is within the ESR characteristics stable range for output capacity.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 2.2µF and B type temperature characteristics.
3. The wire of Vcc and GND is required to print full ground plane for noise and stability.
4. The input capacitor must be connected a distance of less than 1cm from input pin.
5. The capacitor is connected to Cn must have low leakage current characteristics, because Cn pin is high impedance.
6. The 6pin (heat sink pin) must be connected to GND. This pin can be only connected to GND.
7. In case the output voltage is above the input voltage, the overcurrent flow by internal parasitic diode from output to input. In such application, the external bypass diode must be connected between output and input pin.

Characteristics (3.0V product Except where noted therwise, Ta=25°C, V$_{IN}$=5V, V$_{CONT}$=5V, C$_{IN}$=1μF, C$_{O}$=2.2μ)
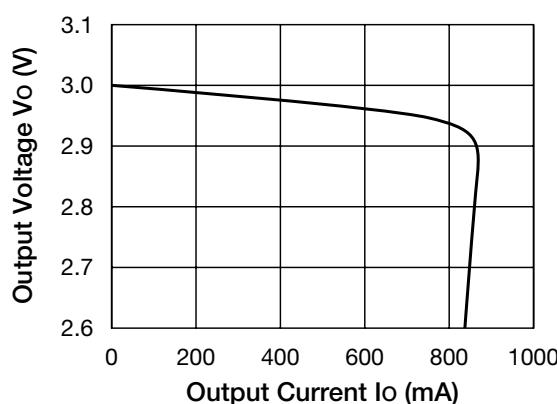
Output-Input Voltage
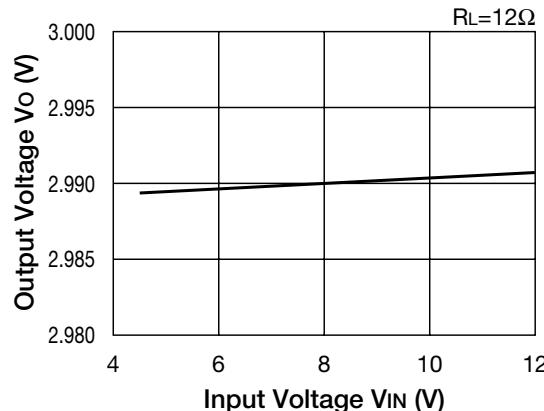

Input Current-Input Voltage
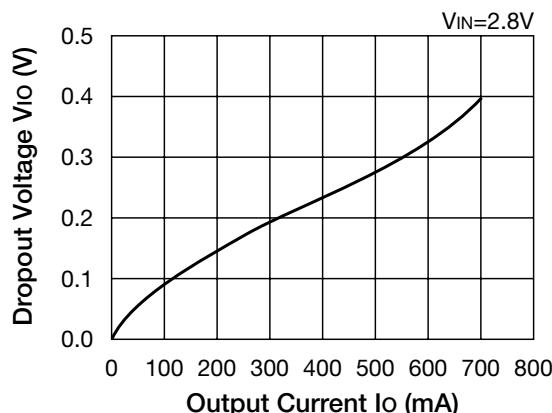

Load Regulation
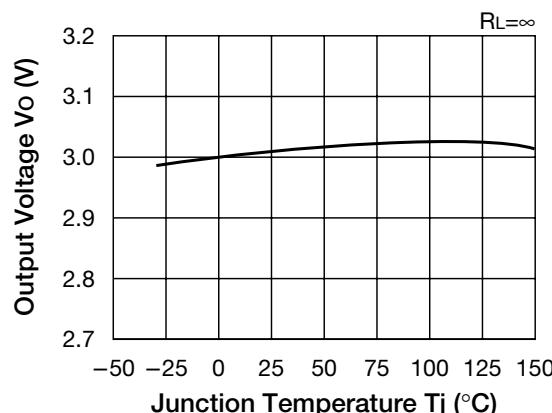


Line Regulation
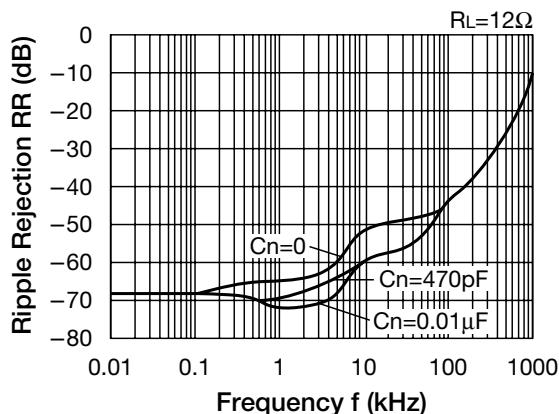
Dropout Voltage-Output Current
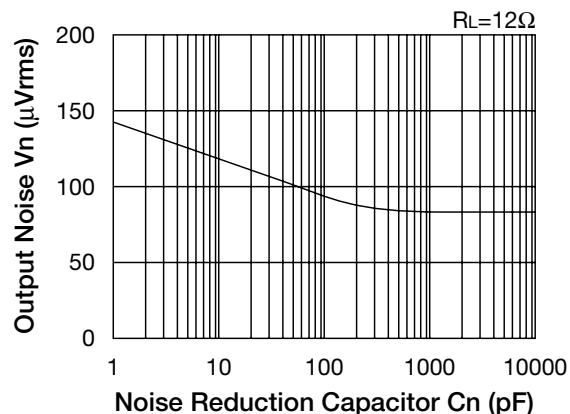
Output Voltage-Junction Temperature

■ Ripple Rejection

RL=12Ω

Ripple Rejection RR (dB) vs Frequency f (kHz)

Cn=0
Cn=470pF
Cn=0.01μF

■ Output Noise

RL=12Ω

Output Noise Vn (μVrms) vs Noise Reduction Capacitor Cn (pF)
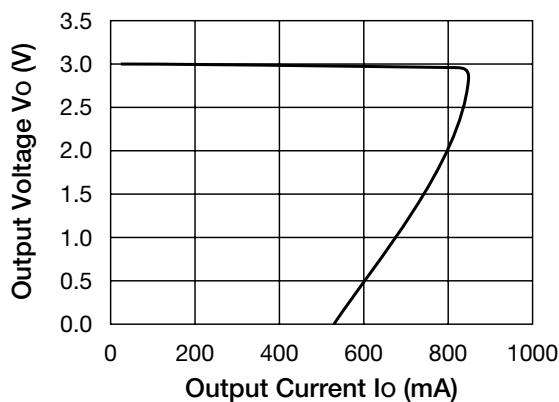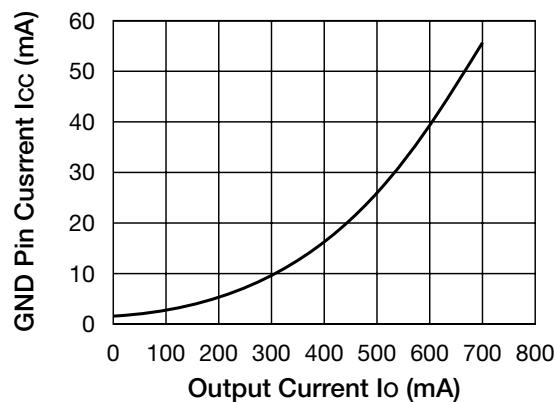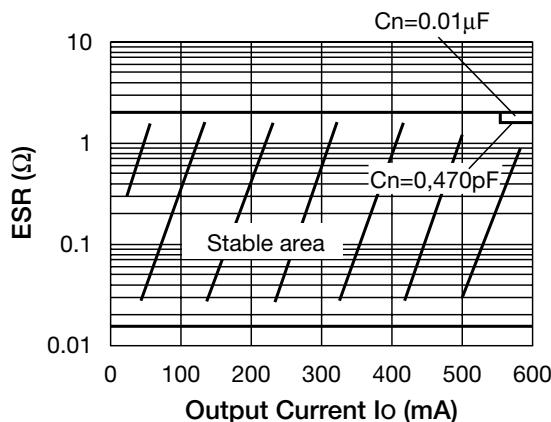
■ Current Limit Characteristics

Output Voltage Vo (V) vs Output Current Io (mA)

■ GND Pin Current

GND Pin Cusrrent Icc (mA) vs Output Current Io (mA)

■ ESR Stability Area

Cn=0.01μF

ESR (Ω) vs Output Current Io (mA)

Cn=0,470pF

Stable area

■ Power Dissipation

Pd (mW) vs Ambient Temperature Ta (°C)

192×142×1.2mm
On board
Copper plane 80%

Not attached
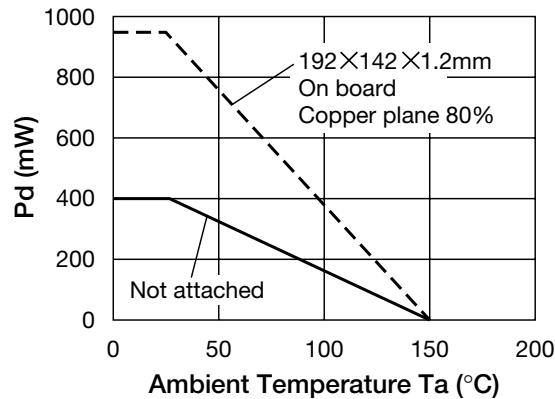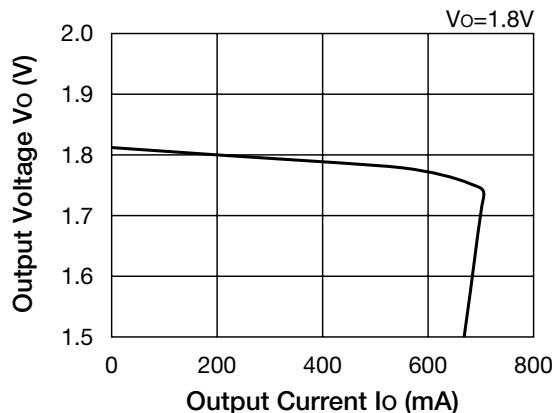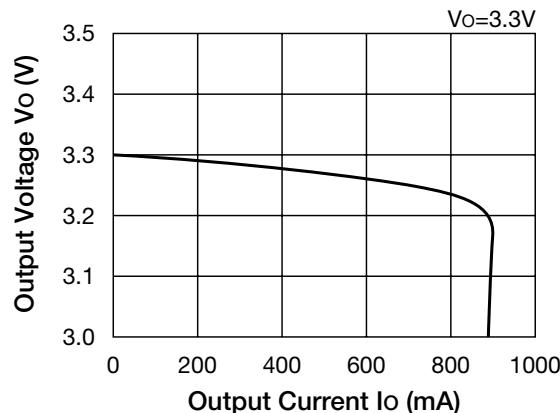
Characteristics (1.8V, 3.0V product Except where noted therwise, Ta=25°C, V_{IN}=5V, V_{CONT}=5V, C_{IN}=1μF, C_O=2.2μ)
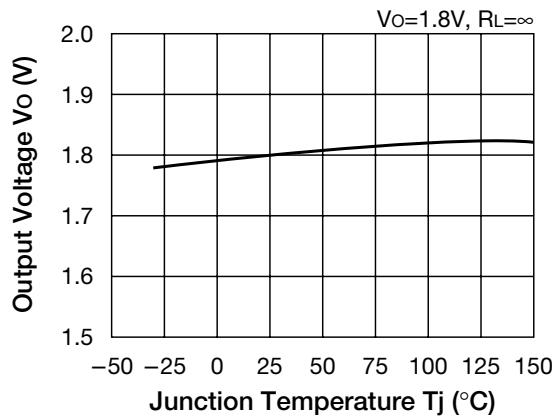
■ Load Regulation

V_O=1.8V

Output Voltage V_O (V) vs Output Current I_O (mA)

■ Load Regulation

V_O=3.3V

Output Voltage V_O (V) vs Output Current I_O (mA)

■ Output Voltage-Junction Temperature

V_O=1.8V, R_L=∞

Output Voltage V_O (V) vs Junction Temperature Tj (°C)

■ Output Voltage-Junction Temperature

V_O=3.3V, R_L=∞

Output Voltage V_O (V) vs Junction Temperature Tj (°C)

■ ESR Stability Area

V_O=1.8V

ESR (Ω) vs Output Current I_O (mA)

Stable area

■ ESR Stability Area

V_O=3.3V

ESR (Ω) vs Output Current I_O (mA)
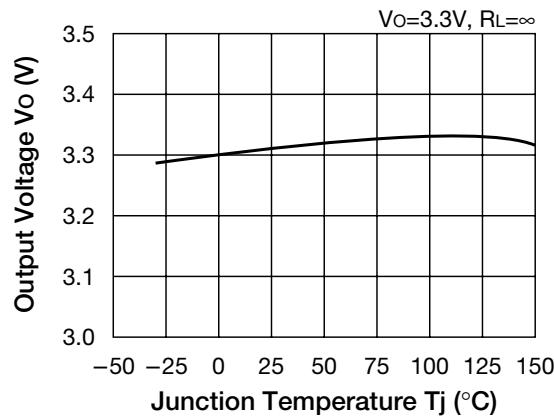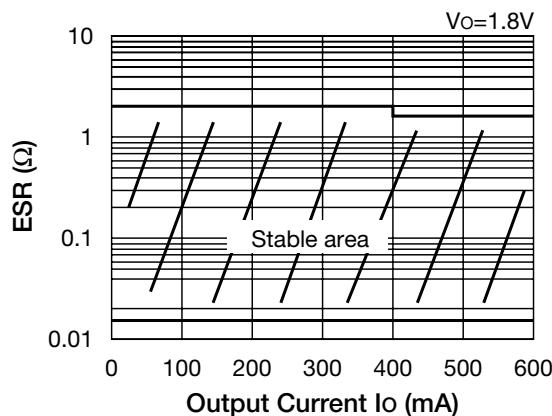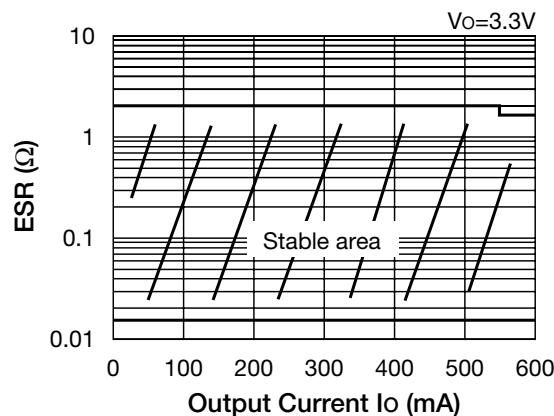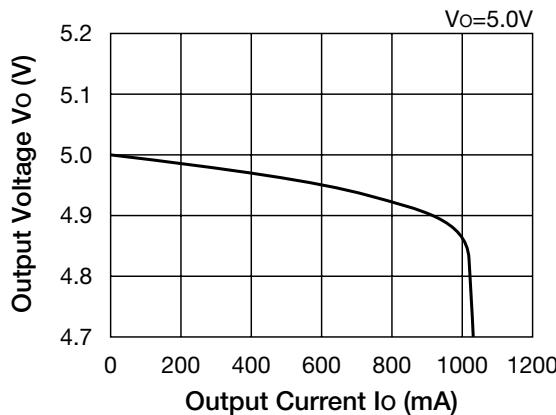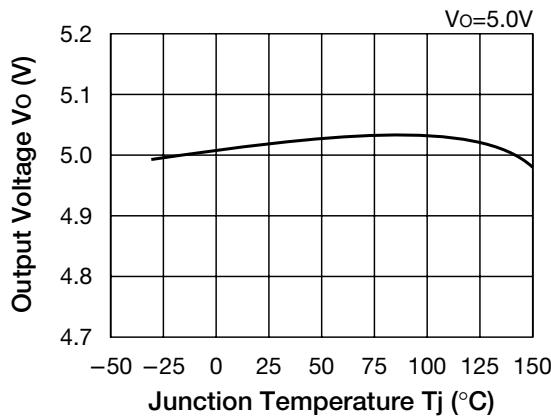
Stable area

Characteristics (5.0V product Except where noted therwise, Ta=25°C, V_{IN}=5V, V_{CONT}=5V, C_{IN}=1μF, C_O=2.2μ)

■Load Regulation

V_O=5.0V

Output Voltage V_O (V) vs Output Current I_O (mA)

■Output Voltage-Junction Temperature

V_O=5.0V

Output Voltage V_O (V) vs Junction Temperature T_j (°C)

■ESR Stability Area

V_O=5.0V

ESR (Ω) vs Output Current I_O (mA)

Stable area