200mA Regulator IC
Monolithic IC MM3404 Series

Outline

This IC is a high speed response 200mA regulator IC with low quiescent current and high ripple rejection.
No load input current is 20μA typ.
And ripple rejection is 75dB typ. Dropout voltage is low at 80mV typ., and the output current is 200mA.
Therefore the IC applies to most mobile equipment.

Features

1.	Output current	200mA
2.	No load input current	20μA typ.
3.	Input current(OFF)	0.1μA max.
4.	Output voltage range	0.8~5.0V
5.	Output voltage accuracy	±1%(±20mV, Vo<2V)
6.	Dropout voltage	80mV typ. (Io=100mA)
7.	Line regulation	0.2%/V max.
8.	Load regulation	40mV max. (Io=0.1~100mA)
9.	Ripple rejection	75dB typ. (f=1kHz)
10.	Output capacitor	1μF

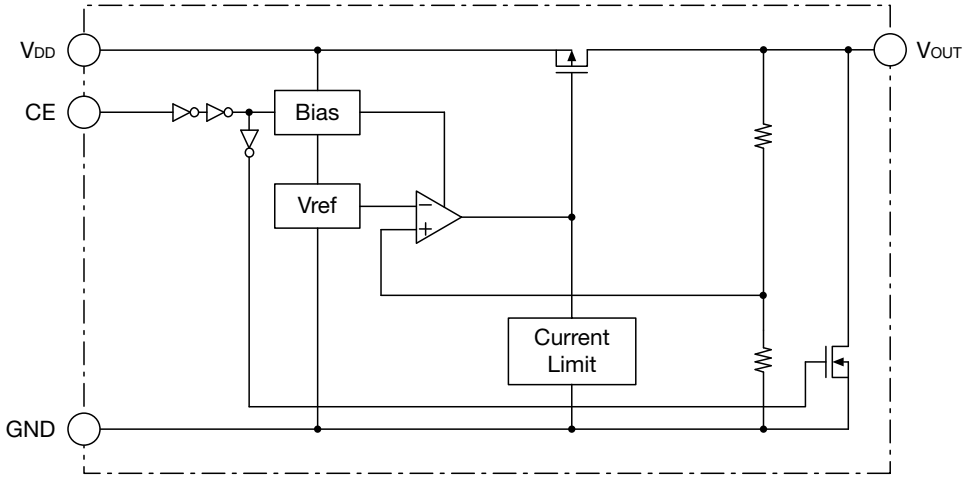
Package

SOT-25A
SC-82
PLP-4B

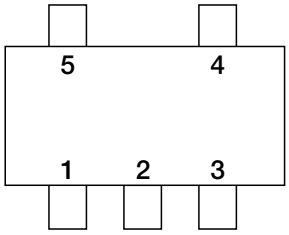
Applications

1. Cellular phones
2. Digital still cameras
3. Mobile equipments

Block Diagram

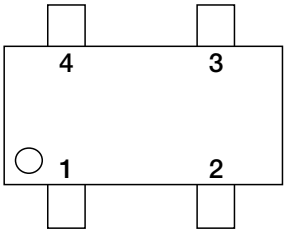


Pin Assignment



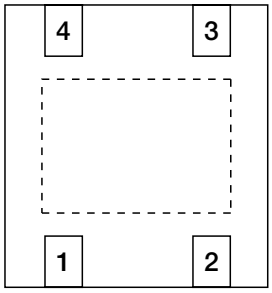
SOT-25A
(TOP VIEW)

1	VDD
2	GND
3	CE
4	NC
5	VOUT



SC-82
(TOP VIEW)

1	CE
2	GND
3	VOUT
4	VDD



PLP-4B
(TOP VIEW)

1	VOUT
2	GND
3	CE
4	VDD

Pin Description

SOT-25A

Pin No.	Pin name	Functions
1	V_{DD}	Voltage-supply pin
2	GND	Ground pin
3	CE	ON/OFF-Control pin CE: Low → OFF; High → ON Connect CE pin with V_{DD} pin, when it is not used.
4	NC	No connection
5	V_{OUT}	Output pin

SC-82

Pin No.	Pin name	Functions
1	CE	ON/OFF-Control pin CE: Low → OFF; High → ON Connect CE pin with V_{DD} pin, when it is not used.
2	GND	Ground pin
3	V_{OUT}	Output pin
4	V_{DD}	Voltage-Supply pin

PLP-4B

Pin No.	Pin name	Functions
1	V_{OUT}	Output pin
2	GND	Ground pin
3	CE	ON/OFF-Control pin CE: Low → OFF; High → ON Connect CE pin with V_{DD} pin, when it is not used.
4	V_{DD}	Voltage-supply pin

Absolute Maximum Ratings (Except where noted otherwise Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	−55~+150	°C
Supply voltage	V_{DD}	−0.3~7.0	V
CE input voltage	V_{CE}	−0.3~V_{DD}+0.3	V
Output voltage	V_{OUT}	−0.3~V_{DD}+0.3	V
Output current	Io max.	400	mA
Power dissipation	Pd	350(Note1) (SOT-25A)	mW
		330(Note2) (SC-82)	
		120(Note3) (PLP-4B)	

Note1 : With PC Board of glass epoxy 60 × 40 × 1.6^{t}mm
Note2 : With PC Board of glass epoxy 110 × 40 × 0.8^{t}mm
Note3 : Single device

Recommended Operating Conditions (Except where noted otherwise Ta=25°C)

Item	Symbol	Ratings	Units
Operating ambient temperature	T_{JOP}	−40~85	°C
Operating voltage	V_{OP}	1.6~6.5	V
Output current	Io	0~200	mA

Electrical Characteristics 1 (Except where noted otherwise $V_{DD}=V_{OUT}$(typ.)+1V, $V_{CE}=V_{DD}$, Ta=25°C)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Input current(OFF)	I_{DDoff}	V_{CE}=0V		0.01	0.1	µA
No-load input current	I_{DD}	I_{OUT}=0mA		20	50	µA
Output voltage	V_{OUT}	I_{OUT}=10mA (V_{OUT}≧2.0V)	×0.99		×1.01	V
		I_{OUT}=10mA (V_{OUT}≦1.95V)	–0.02		0.02	V
Line regulation	V_{LINE}	V_O(typ.)+0.5V≦V_{DD}≦6.5V V_{OUT}≧1.1V, I_{OUT}=10mA		0.01	0.2	%/V
		1.6V≦V_{DD}≦6.5V V_{OUT}≦1.05V, I_{OUT}=10mA				
Load regulation	V_{LOAD}	0.1mA≦I_{OUT}≦100mA		10	40	mV
Dropout voltage	Vio	Please refer to another page				V
Ripple rejection (Note4)	RR	f=1kHz, Vripple=0.5V, I_{OUT}=30mA V_{OUT}≧0.85V		75		dB
		f=1kHz, Vripple=0.5V, I_{OUT}=30mA V_{OUT}=0.8V				
V_{OUT} Temperature coefficient (Note4)	$\Delta V_{OUT}/\Delta T$	I_{OUT}=30mA –40°C≦T_{OP}≦85°C		±50		ppm/°C
Output current limit	Ilim		200	250		mA
Output short-circuit current	Ishort	V_{OUT}=0V		30		mA
CE H threshold voltage	V_{CEH}		1.2		6.0	V
CE L threshold voltage	V_{CEL}				0.3	V
CE H threshold voltage	I_{CEH}		–0.1		0.1	µA
CE L threshold voltage	I_{CEL}		–0.1		0.1	µA
CL Discharge resistance	Rdisc			780		Ω

Note4 : The item is guaranteed by design.

Electrical Characteristics 2 (Except where noted otherwise $V_{DD}=V_{OUT}$(typ.)+1V, $V_{CE}=V_{DD}$, Ta=25°C)

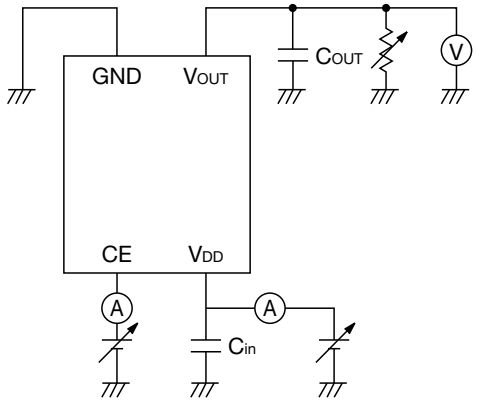
Model No.	Item							
	Output voltage				Dropout voltage			
	V_{OUT} (V)				Vio (mV)			
	Measurement conditions	Min.	Typ.	Max.	Measurement conditions	Min.	Typ.	Max.
MM3404A08	I_{OUT}=10mA	0.780	0.800	0.820	I_{OUT}=100mA V_{OUT}<1.5V (Note5)		500	850
MM3404Z08		0.830	0.850	0.870				
MM3404A09		0.880	0.900	0.920			410	750
MM3404Z09		0.930	0.950	0.970				
MM3404A10		0.980	1.000	1.020			330	650
MM3404Z10		1.030	1.050	1.070				
MM3404A11		1.080	1.100	1.120				
MM3404Z11		1.130	1.150	1.170				
MM3404A12		1.180	1.200	1.220			230	380
MM3404Z12		1.230	1.250	1.270				
MM3404A13		1.280	1.300	1.320				
MM3404Z13		1.330	1.350	1.370				
MM3404A14		1.380	1.400	1.420			200	360
MM3404Z14		1.430	1.450	1.470				
MM3404A15		1.480	1.500	1.520	I_{OUT}=100mA V_{OUT}≧1.5V $V_{DD}=V_{OUT}$(typ.)−0.2V		180	290
MM3404Z15		1.530	1.550	1.570				
MM3404A16		1.580	1.600	1.620			160	250
MM3404Z16		1.630	1.650	1.670				
MM3404A17		1.680	1.700	1.720				
MM3404Z17		1.730	1.750	1.770				
MM3404A18		1.780	1.800	1.820			125	210
MM3404Z18		1.830	1.850	1.870				
MM3404A19		1.880	1.900	1.920				
MM3404Z19		1.930	1.950	1.970				
MM3404A20		1.980	2.000	2.020			115	195
MM3404Z20		2.030	2.050	2.071				
MM3404A21		2.079	2.100	2.121				
MM3404Z21		2.129	2.150	2.172				
MM3404A22		2.178	2.200	2.222				
MM3404Z22		2.228	2.250	2.273				
MM3404A23		2.277	2.300	2.323				
MM3404Z23		2.327	2.350	2.374				
MM3404A24		2.376	2.400	2.424				
MM3404Z24		2.426	2.450	2.475				
MM3404A25		2.475	2.500	2.525			95	170
MM3404Z25		2.525	2.550	2.576				
MM3404A26		2.574	2.600	2.626				
MM3404Z26		2.624	2.650	2.677				
MM3404A27		2.673	2.700	2.727				
MM3404Z27		2.723	2.750	2.778				
MM3404A28		2.772	2.800	2.828				
MM3404Z28		2.822	2.850	2.879				
MM3404A29		2.871	2.900	2.929				
MM3404Z29		2.921	2.950	2.980				

Note5 : Dropout voltage max. value in the input and it is confirmed that there is no output abnormal voltage impression the load 100mA in the model less than V_{OUT}=1.45V.

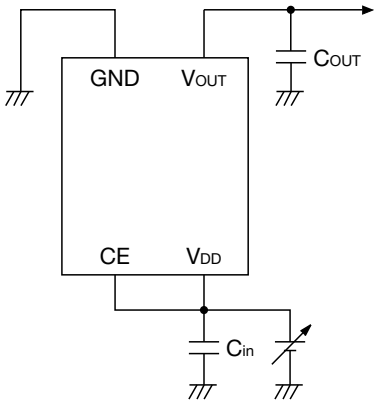
Model No.	Item							
	Output voltage				Dropout voltage			
	V_{OUT} (V)				Vio (mV)			
	Measurement conditions	Min.	Typ.	Max.	Measurement conditions	Min.	Typ.	Max.
MM3404A30		2.970	3.000	3.030				
MM3404Z30		3.020	3.050	3.081				
MM3404A31		3.069	3.100	3.131				
MM3404Z31		3.119	3.150	3.182				
MM3404A32		3.168	3.200	3.232				
MM3404Z32		3.218	3.250	3.283				
MM3404A33		3.267	3.300	3.333				
MM3404Z33		3.317	3.350	3.384				
MM3404A34		3.366	3.400	3.434				
MM3404Z34		3.416	3.450	3.485				
MM3404A35		3.465	3.500	3.535				
MM3404Z35		3.515	3.550	3.586				
MM3404A36		3.564	3.600	3.636				
MM3404Z36		3.614	3.650	3.687				
MM3404A37		3.663	3.700	3.737				
MM3404Z37		3.713	3.750	3.788				
MM3404A38		3.762	3.800	3.838				
MM3404Z38		3.812	3.850	3.889				
MM3404A39		3.861	3.900	3.939				
MM3404Z39		3.911	3.950	3.990	I_{OUT}=100mA			
MM3404A40	I_{OUT}=10mA	3.960	4.000	4.040	V_{OUT}≧1.5V		80	140
MM3404Z40		4.010	4.050	4.091	V_{DD}=V_{OUT}(typ.)−0.2V			
MM3404A41		4.059	4.100	4.141				
MM3404Z41		4.109	4.150	4.192				
MM3404A42		4.158	4.200	4.242				
MM3404Z42		4.208	4.250	4.293				
MM3404A43		4.257	4.300	4.343				
MM3404Z43		4.307	4.350	4.394				
MM3404A44		4.356	4.400	4.444				
MM3404Z44		4.405	4.450	4.495				
MM3404A45		4.455	4.500	4.545				
MM3404Z45		4.504	4.550	4.595				
MM3404A46		4.554	4.600	4.646				
MM3404Z46		4.603	4.650	4.696				
MM3404A47		4.653	4.700	4.747				
MM3404Z47		4.702	4.750	4.797				
MM3404A48		4.752	4.800	4.848				
MM3404Z48		4.801	4.850	4.898				
MM3404A49		4.851	4.900	4.949				
MM3404Z49		4.900	4.950	4.999				
MM3404A50		4.950	5.000	5.050				

Note5 : Dropout voltage Max. value in the input and it is confirmed that there is no output abnormal voltage impression the load 100mA in the model less than V_{OUT}=1.45V.

Measuring Circuit



Application Circuit



(reference example of external parts)

· Output capacitor Ceramic capacitor 1.0µF

· Input capacitor Ceramic capacitor 1.0µF

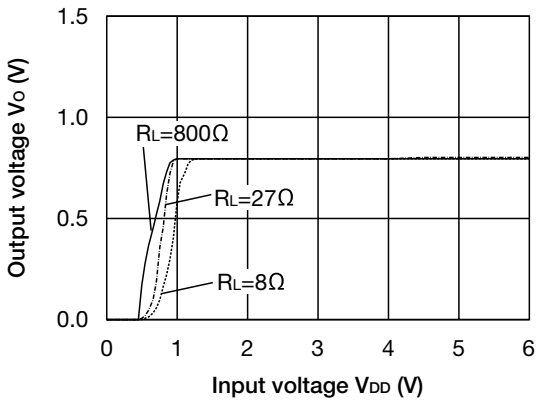
∗ Temperature Characteristics : B

· Note

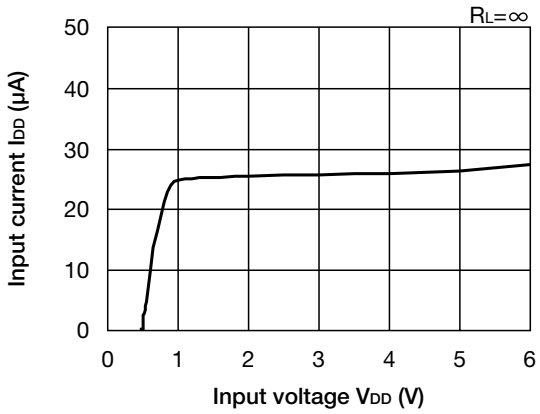
1. The output capacitor is required between output and GND to prevent oscillation.
2. The ESR of capacitor must be defined in ESR stability area.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 1.0µF and B temperature characteristics.
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. In case the output voltage is above the input voltage, the overcurrent flow by internal parastic diode from output to input.

Characteristics (Vo=0.8V) (Except where noted otherwise $V_{DD}=V_{OUT}$ (typ.) +1V, $V_{CE}=V_{DD}$, Ta=25°C)

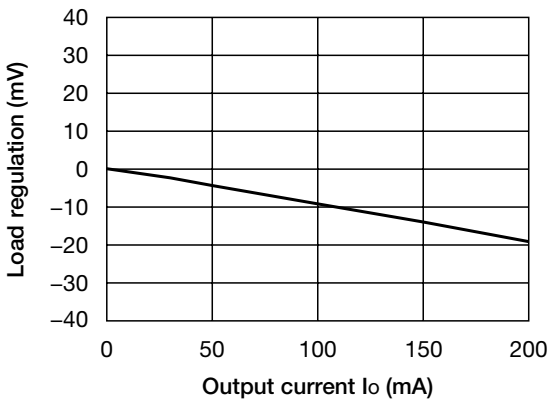
Output - Input voltage



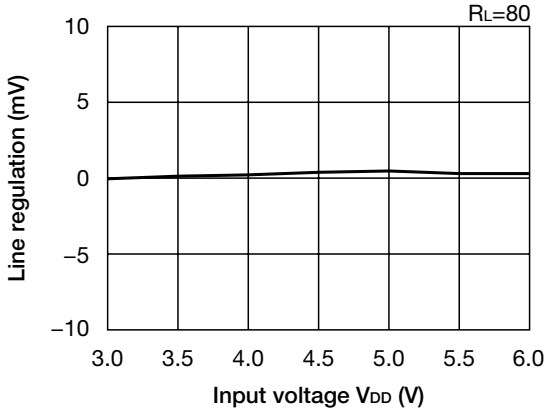
Input current - Input voltage



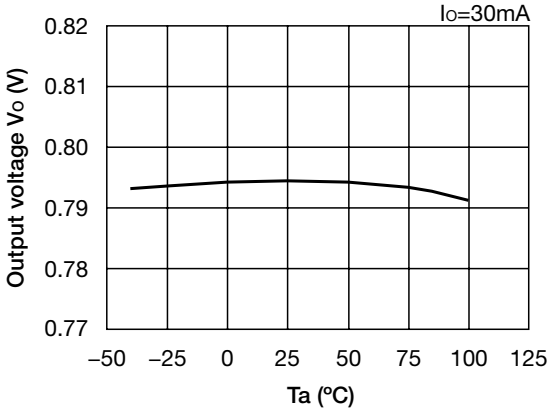
Load regulation



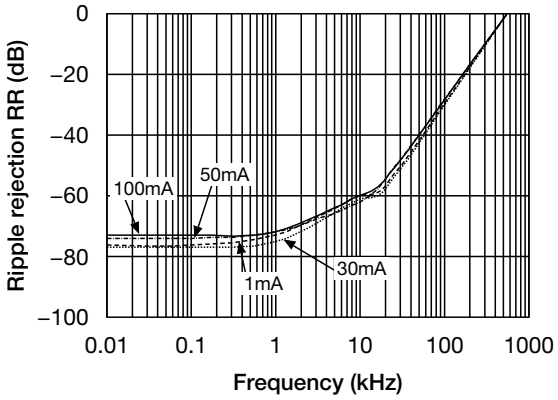
Line regulation



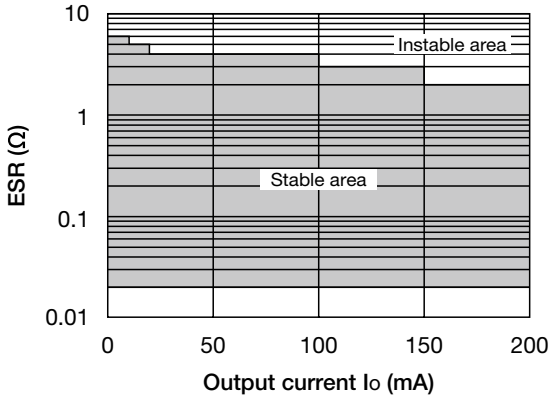
V_{OUT} temperature coefficient



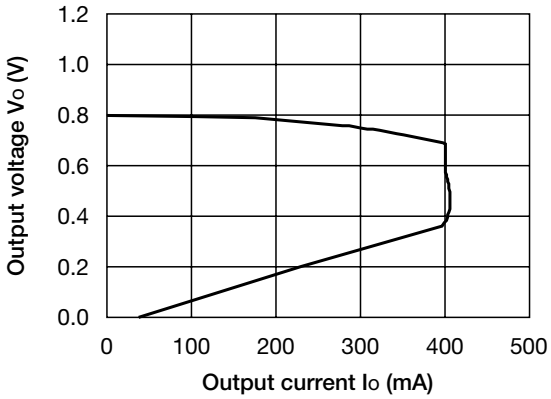
Ripple Rejection



ESR stability area

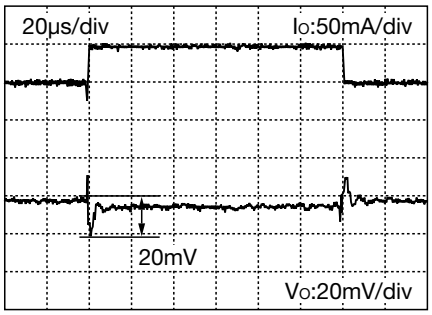


Current Limit

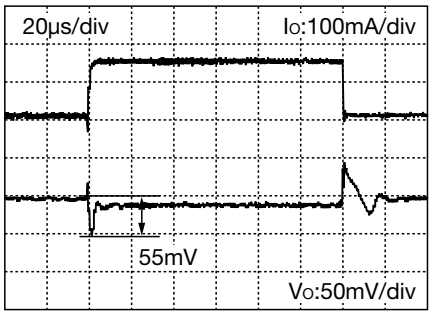


Load transient response (V_{DD}=Vo+1V, V_{CE}=V_{DD}, Cin=Co=1μF)

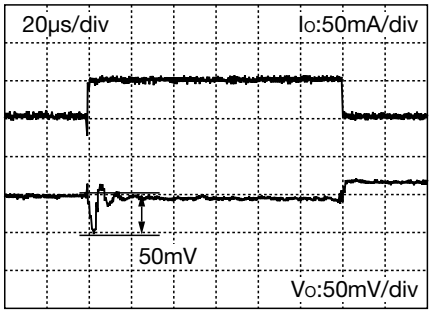
Io:50mA⇔100mA



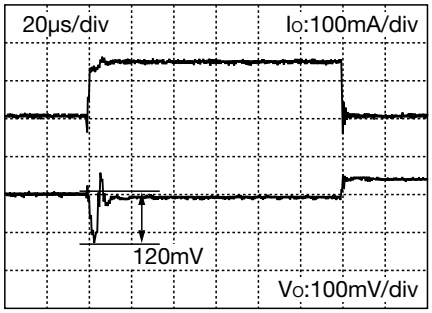
Io:10mA⇔150mA



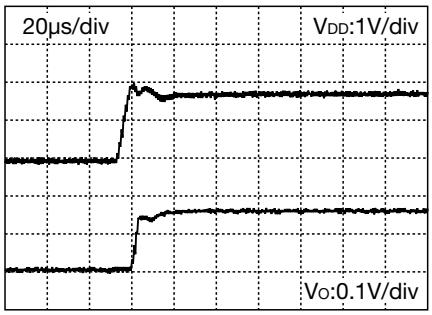
Io:0.1mA⇔50mA



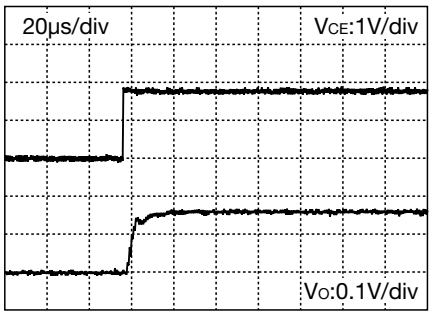
Io:0.1mA⇔150mA



Input rise characteristics (V_{DD}=0V→1.8V, V_{CE}=V_{DD}, Io=30mA)

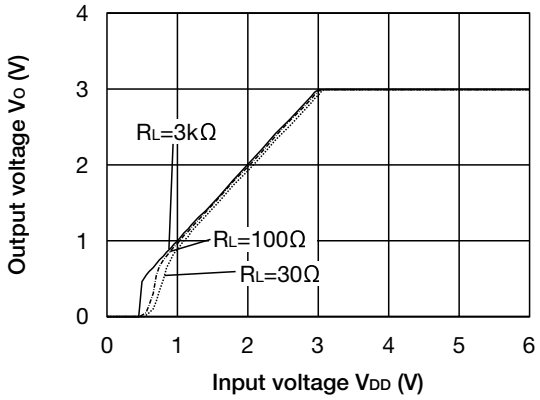


CE rise characteristics (V_{DD}=1.8V, V_{CE}=0V→V_{DD}, Io=30mA)

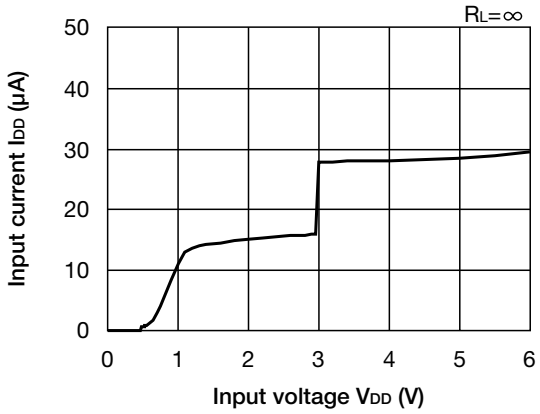


Characteristics (Vo=3.0V) (Except where noted otherwise $V_{DD}=V_{OUT}$ (typ.) +1V, $V_{CE}=V_{DD}$, Ta=25°C)

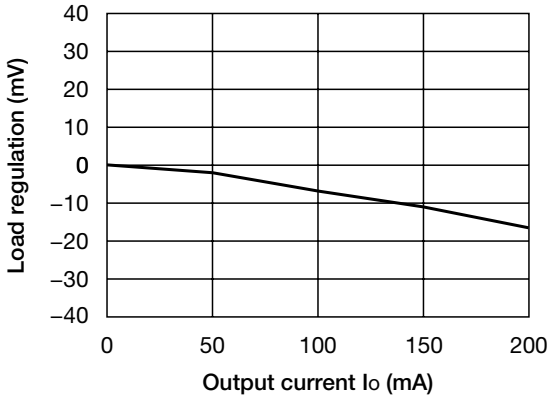
Output - Input voltage



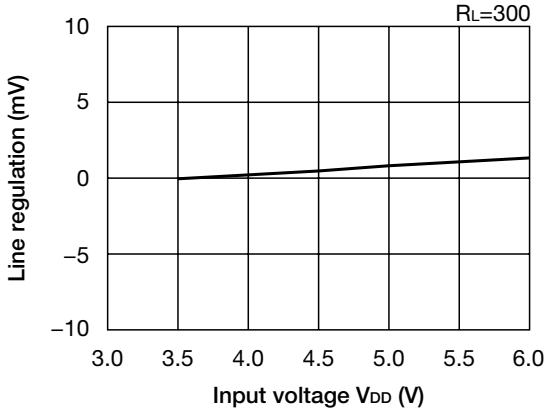
Input current - Input voltage



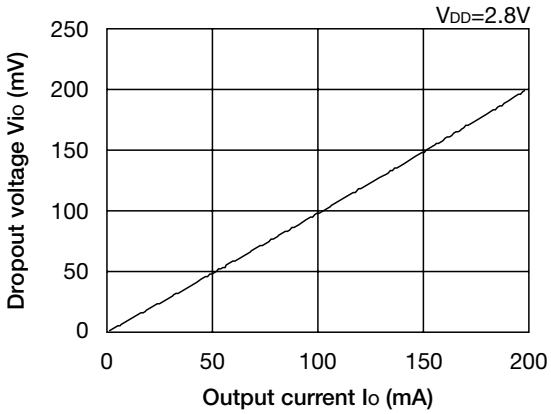
Load regulation



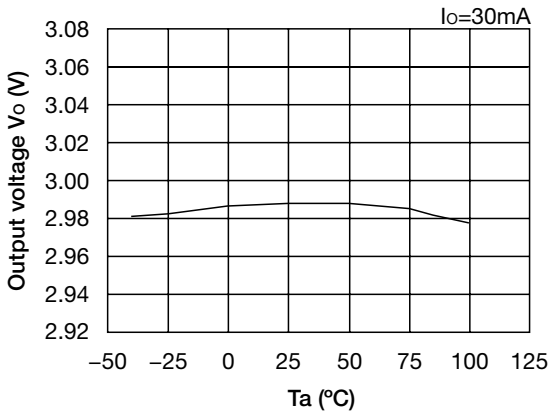
Line regulation



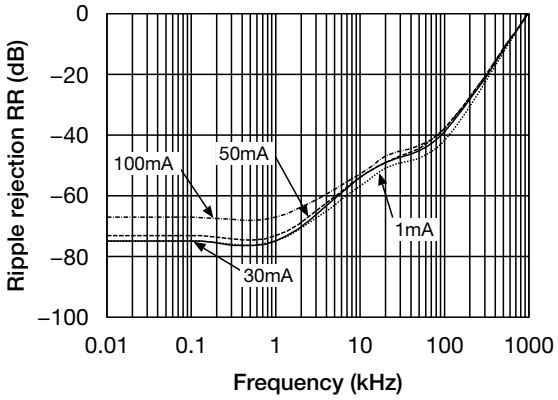
Dropout voltage



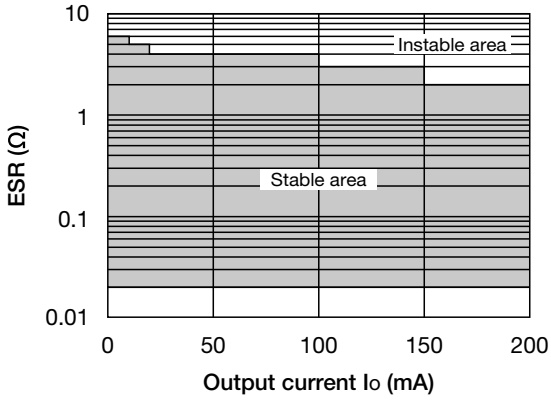
V_{OUT} temperature coefficient



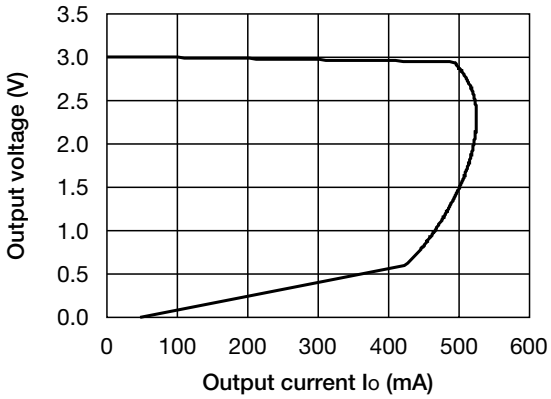
Ripple Rejection



ESR stability area

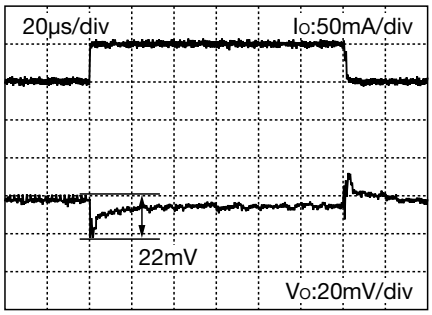


Current Limit

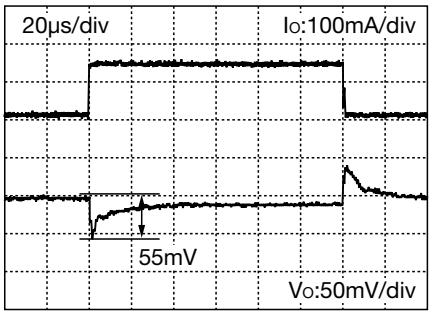


Load transient response (V_{DD}=Vo+1V, V_{CE}=V_{DD}, Cin=Co=1μF)

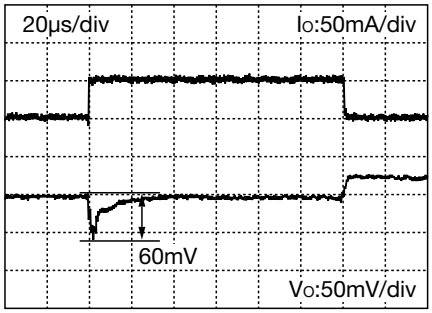
Io:50mA⇔100mA



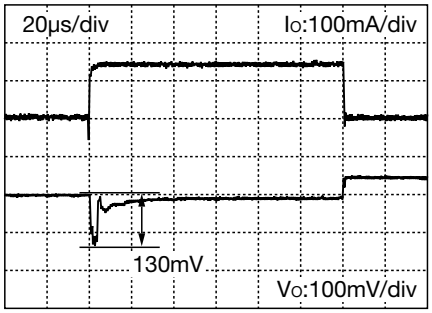
Io:10mA⇔150mA



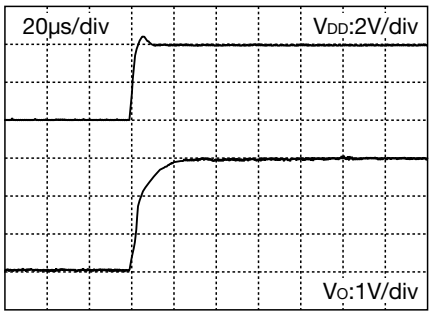
Io:0.1mA⇔50mA



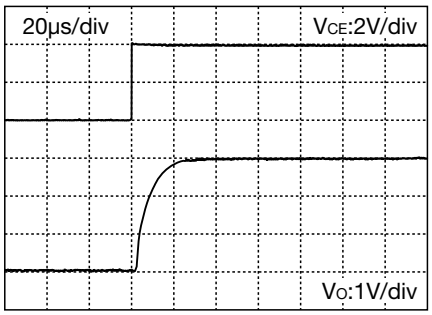
Io:0.1mA⇔150mA



Input rise characteristics (V_{DD}=0V→4.0V, V_{CE}=V_{DD}, Io=30mA)

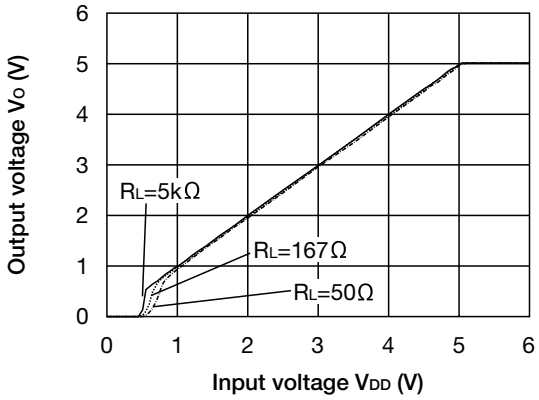


CE rise characteristics (V_{DD}=4V, V_{CE}=0V→V_{DD}, Io=30mA)

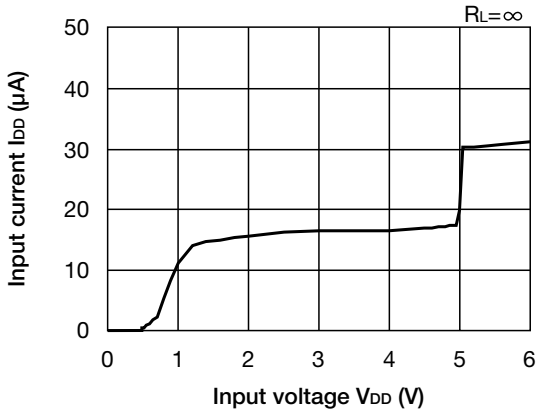


Characteristics (Vo=5.0V) (Except where noted otherwise V_{DD}=V_{OUT} (typ.) +1V, V_{CE}=V_{DD}, Ta=25°C)

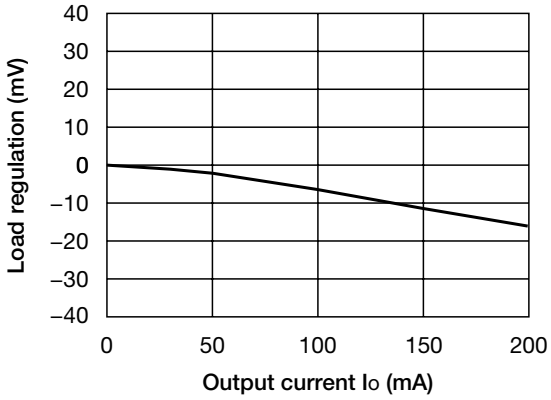
Output - Input voltage



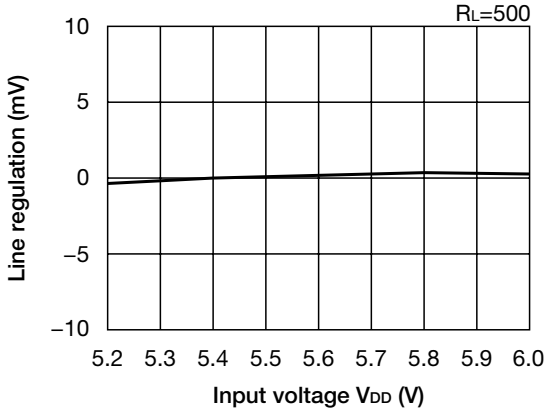
Input current - Input voltage



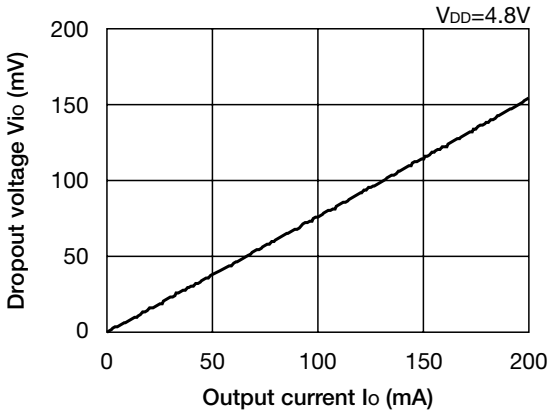
Load regulation



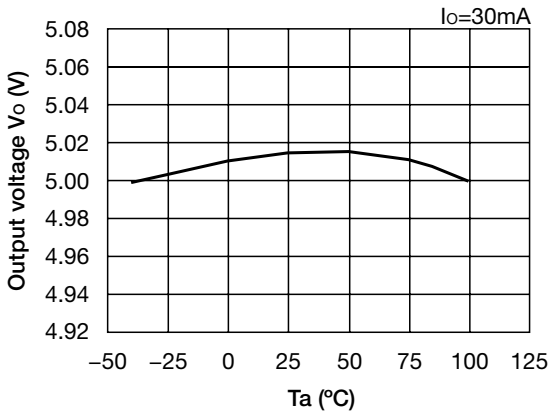
Line regulation



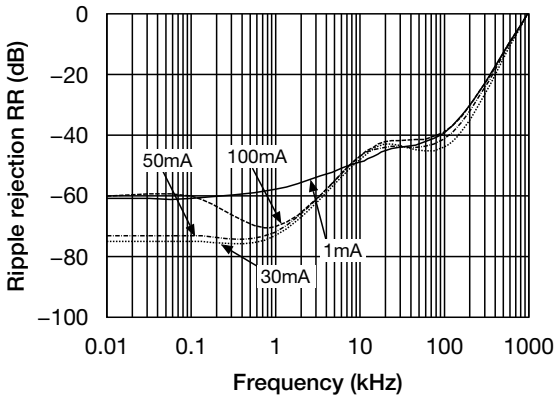
Dropout voltage



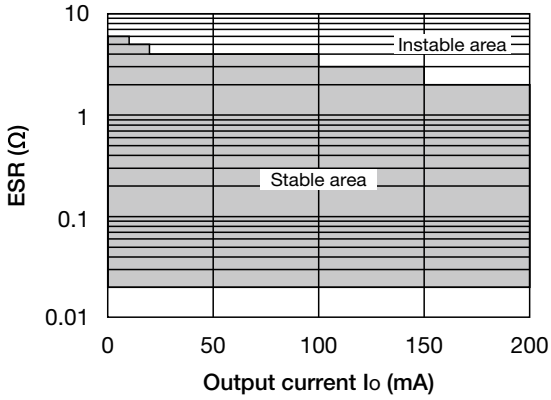
V_{OUT} temperature coefficient



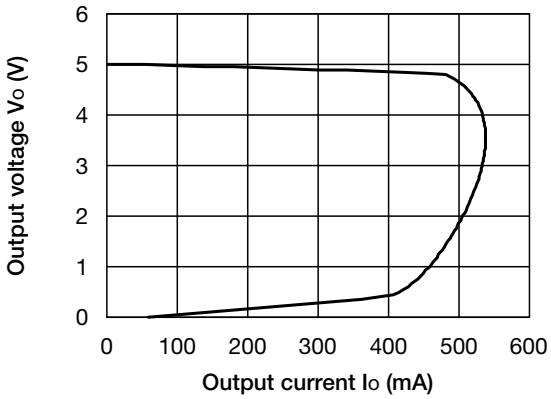
Ripple Rejection



ESR stability area

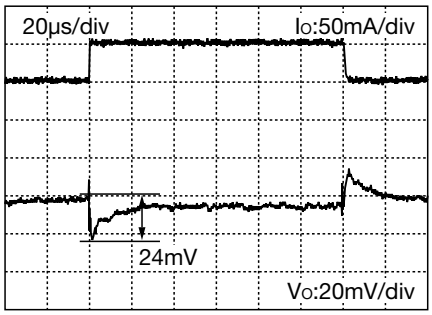


Current Limit

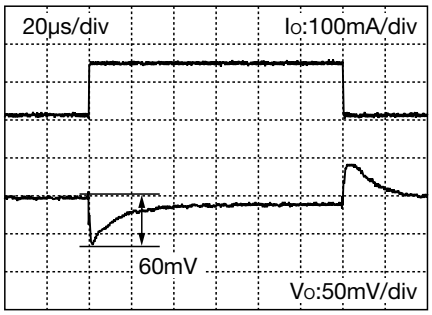


Load transient response (V_{DD}=Vo+1V, V_{CE}=V_{DD}, Cin=Co=1μF)

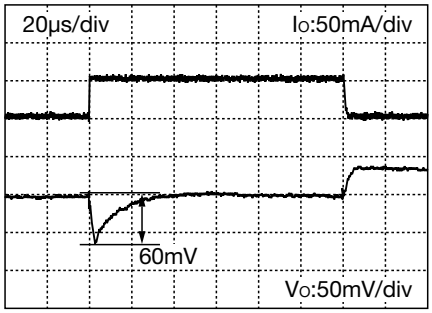
Io:50mA⇔100mA



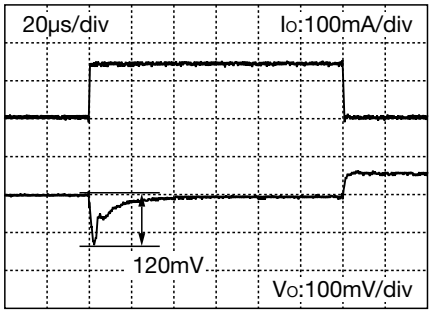
Io:10mA⇔150mA



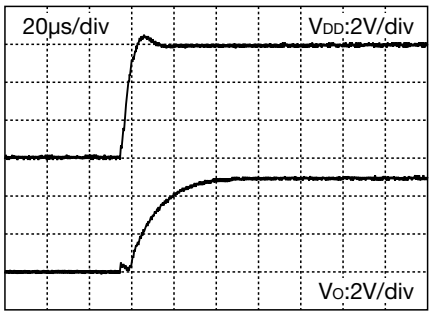
Io:0.1mA⇔50mA



Io:0.1mA⇔150mA



Input rise characteristics (V_{DD}=0V→6.0V, V_{CE}=V_{DD}, Io=30mA)



CE rise characteristics (V_{DD}=6.0V, V_{CE}=0V→V_{DD}, Io=30mA)