Dual LDO
Monolithic IC MM3549 Series

Outline

MM3549 are dual LDO by small package. The IC are used for a smart phone's and mobile phone's RF or CMOS sensor power supply by high PSRR and load response.
300mA *2ch, PLP-8 (1216size)

Features

1.	Maximum input voltage	7V
2.	Maximum operating voltage	6V
3.	No load input current	40μA typ. (1ch)
4.	Quiescent current (OFF)	0.1μA typ. (Vce=0V)
5.	Output voltage range	1.2 to 5.0V (0.1V step)
6.	Output voltage accuracy	±1.0%/±20mV (Vo≦2V)
7.	Dropout voltage	0.22V typ. (Io=300mA, Vo=3V)
8.	Line regulation	0.1%/V max.
9.	Load regulation	40mV max. (Io=1 to 300mA)
10.	Vout temperature coefficient	±100ppm/°C typ.
11.	Output NMOS ON resistance	10Ω typ.
12.	Output Capacitor	1.0μF

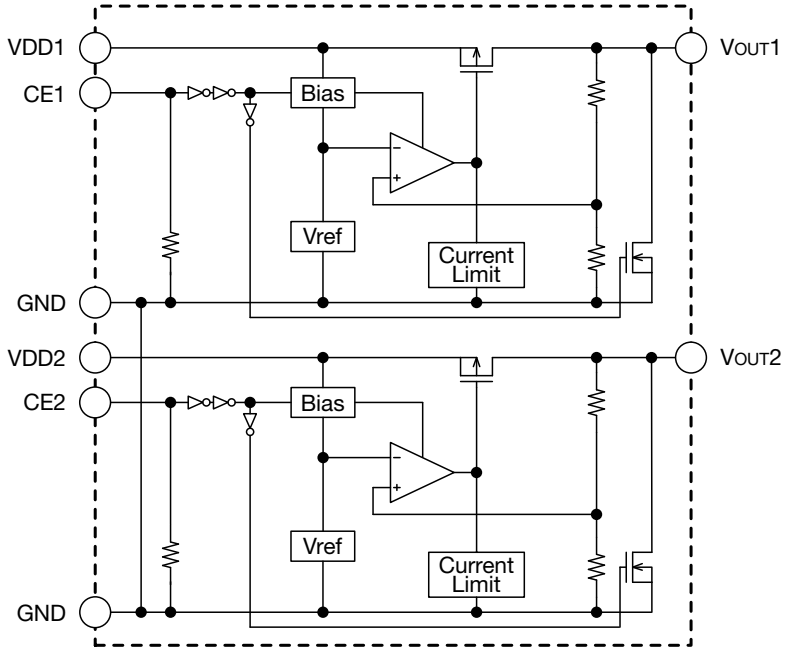
Package

PLP-8E

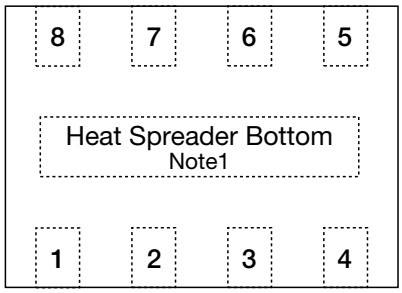
Applications

1. Smart phone
2. Mobile phone
3. DSC

Block Diagram



Pin Assignment



PLP-8E
(TOP VIEW)

1	GND
2	VOUT1
3	VOUT2
4	GND
5	CE2
6	VDD2
7	VDD1
8	CE1

Note1 : Heat Spreader Bottom with GND.

Pin Description

Pin No.	Pin name	Functions
1, 4	GND	GND pin Please connect the terminal GND mutually when you mount the substrate.
2	VOUT1	Output pin
3	VOUT2	Output pin
4, 6	CE2, CE1	ON/OFF-Control pin CE: L → OUTPUT: OFF CE: H → OUTPUT: ON Connect CE pin with VDD pin, when it is not used.
6, 7	VDD2, VDD1	Voltage-Supply pin

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

Item	Symbol	Ratings	Units
Storage Temperature	Tstg	−55~+150	°C
Junction Temperature	T_{jMAX}	150	°C
Supply Voltage 1, 2	$V_{DD}1$, $V_{DD}2$	−0.3~+7.0	V
CE1, 2 input Voltage	V_{CE}	−0.3~+7.0	V
Output Voltage 1, 2	$V_{OUT}1, 2$	−0.3~+7.0	V
Output Current 1	$I_{OMAX}1$	400	mA
Output Current 2	$I_{OMAX}2$	400	mA
Power Dissipation (Note1)	Pd	1250	mW

Note1 : JEDEC51-7 standard 114.3mm × 76.2mm t=1.6mm

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

Item	Symbol	Ratings	Units
Operating Ambient Temperature	Topr	−40~+85	°C
Operating Junction Temperature (Note2)	Tjop	125	°C
Operating Voltage	Vop	1.6~6.0	V
Output Current 1, 2	Iop	0~150	mA

Note2 : In consideration of product life, the use in less than 80% of Tjop(max.) is recommended.

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 It is a value for each 1ch.		0.1	1.0	µA
No-Load Input Current	I_{DD}	I_{OUT}=0mA It is a value for each 1ch.		40	80	µA
Output Voltage 1	$V_{OUT}1$	I_{OUT}=1mA, V_{OUT}≧2.0V	×0.99		×1.01	V
		I_{OUT}=1mA, V_{OUT}≦2.0V	−0.020		+0.020	
Output Voltage 2 (Note3)	$V_{OUT}2$	I_{OUT}=1mA, V_{OUT}≧2.0V −40≦Topr≦85°C	×0.97		×1.03	V
		I_{OUT}=1mA, V_{OUT}≦2.0V −40≦Topr≦85°C	−0.060		+0.060	
Line Regulation	V_{LINE}	V_{OUT}(typ.)+0.5V≦V_{DD}≦6.0V I_{OUT}=1mA, V_{OUT}>1.5V		0.02	0.10	%/V
		2.0V≦V_{DD}≦6.0V I_{OUT}=1mA, V_{OUT}≦1.5V				
Load Regulation	V_{LOAD}	1mA≦I_{OUT}≦300mA		10	40	mV
Dropout Voltage	Vio	Please refer to another page				V
Output Short-Circuit Current (Note3)	Ishort	V_{OUT}=0V		40		mV
V_{OUT} Temperature Coefficient (Note3)	⊿Vout/⊿Top	I_{OUT}=1mA −40≦Top≦85°C		±100		ppm/°C
Ripple Rejection (Note3)	RR	f=1kHz, Vripple=0.5V, I_{OUT}=30mA		65		dB
CE High Threshold Voltage	V_{CEH}		1.0		6.0	V
CE Low Threshold Voltage	V_{CEL}				0.4	mA
CE Pin Current (Note3)	I_{CE}			0.3		µA
Output Noise Voltage (Note3)	Vn	Bw=10Hz to 100kHz I_{OUT}=10mA		100		µVrms
Output NMOS ON Resistance (Note3)	R_{DON}			10		Ω

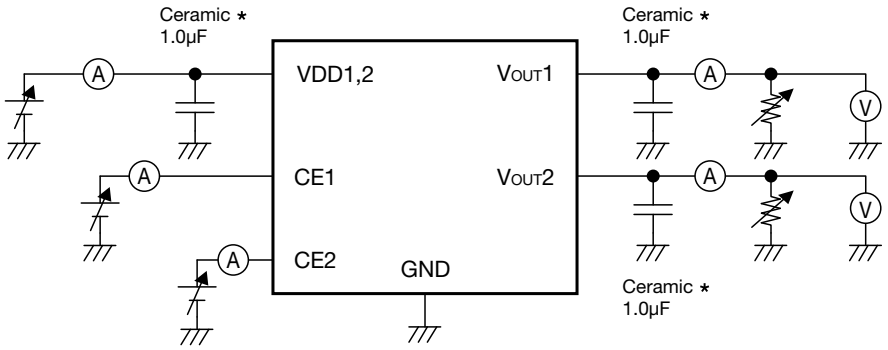
Note3 : The parameter is guaranteed by design.

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

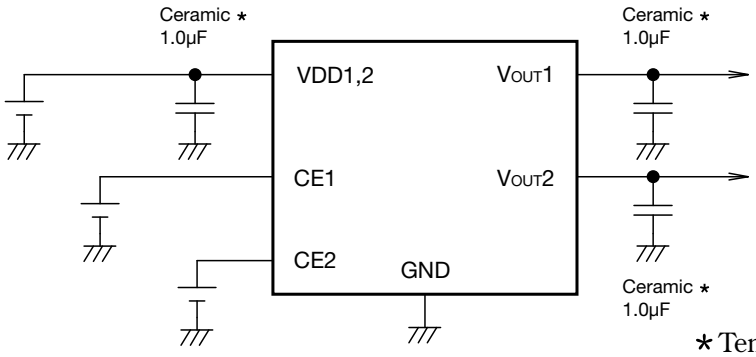
Output Voltage V_{OUT} (V)	Item							
	Output Voltage				Dropout Voltage			
	V_{OUT} (V)				Vio (V)			
	Measurement Conditions	Min.	Typ.	Max.	Measurement Conditions	Min.	Typ.	Max.
1.20	I_{OUT}=1mA	1.180	1.200	1.220	I_{OUT}=300mA, 1.2V≦V_{OUT}≦2.0V (Note4)		0.39	0.50
1.30		1.280	1.300	1.320				
1.40		1.380	1.400	1.420			0.35	0.44
1.50		1.480	1.500	1.520				
1.60		1.580	1.600	1.620				
1.70		1.680	1.700	1.720			0.30	0.39
1.80		1.780	1.800	1.820				
1.90		1.880	1.900	1.920				
2.00		1.980	2.000	2.020				
2.10		2.079	2.100	2.121	I_{OUT}=300mA, 2.0V<V_{OUT}≦5.0V $V_{DD}=V_{OUT}$(TYP.)−0.2V		0.26	0.34
2.20		2.178	2.200	2.222				
2.30		2.277	2.300	2.323				
2.40		2.376	2.400	2.424				
2.50		2.475	2.500	2.525			0.25	0.30
2.60		2.574	2.600	2.626				
2.70		2.673	2.700	2.727				
2.80		2.772	2.800	2.828				
2.85		2.822	2.850	2.879				
2.90		2.871	2.900	2.929				
3.00		2.970	3.000	3.030			0.22	0.29
3.10		3.069	3.100	3.131				
3.20		3.168	3.200	3.232				
3.30		3.267	3.300	3.333				
3.40		3.366	3.400	3.434				
3.50		3.465	3.500	3.535				
3.60		3.564	3.600	3.636				
3.70		3.663	3.700	3.737				
3.80		3.762	3.800	3.838				
3.90		3.861	3.900	3.939				
4.00		3.960	4.000	4.040				
4.10		4.059	4.100	4.141				
4.20		4.158	4.200	4.242				
4.30		4.257	4.300	4.343				
4.40		4.356	4.400	4.444				
4.50		4.455	4.500	4.545				
4.60		4.554	4.600	4.646				
4.70		4.653	4.700	4.747				
4.80		4.752	4.800	4.848				
4.90		4.851	4.900	4.949				
5.00		4.950	5.000	5.050				

Note4 : It applies dropout voltage MAX level to an input terminal, include a load regulation and confirms that the output voltageis less than ±60mV at load 300mA (V_{OUT}≦2.0V).

Measuring Circuit



Application Circuit



* Temperature Characteristics : B

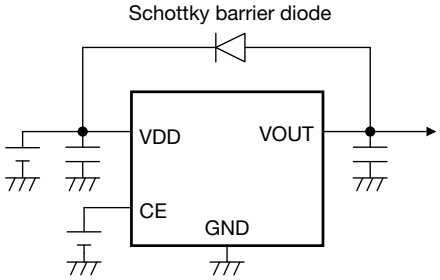
(Reference example of external parts)

· Output capacitor Ceramic capacitor 1.0µF
· Input capacitor Ceramic capacitor 1.0µF

· In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, we shall not be liable for any such problem, nor grant a license therefore.

· Note

1. There is a possibility with deterioration and destruction of IC when using it exceeding the absolute maximum rating.
   The absolute maximum rating, Never exceed it.
   The functional operation is not assured.
2. There is a possibility that it becomes impossible to maintain this performance and reliability IC original when using it exceeding recommended operation voltage.
   Please use it in recommended operation voltage.
3. Due to restrictions on the package power dissipation, the output current value may not be satisfied.
   Attention should be paid to the power dissipation of the package when the output current is large or the voltage between Input and Output is high.
4. The output capacitor is required between output and GND to prevent oscillation.
5. 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.
6. The wire of VDD and GND is required to print full ground plane for noise and stability.
7. The input capacitor must be connected a distance of less than 1cm from input pin.
8. 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.

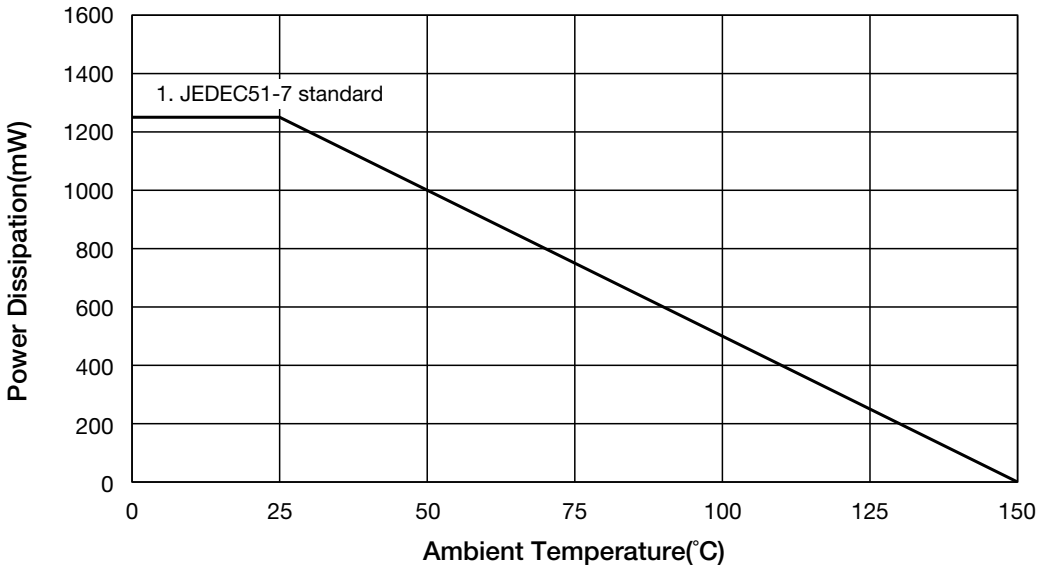


9. It is able to an unstable operation when you use the capacitor with intense capacitance change
   The capacitor has the dependency at the power-supply voltage and the temperature.
   The capacity value changes by the environment used. Please evaluate IC in the set.
10. The overcurrent protection circuit of foldback current limit type is built into this IC.
11. This IC have not the thermal shutdown protection.
12. This IC will limit the output current with the overcurrent protection circuit when the overcurrent and the output do short-circuit.
    However, IC generates heat because of the substrate and use conditions and there is a possibility of destroying it exceeding a permissible loss.
    The characteristic changes depending on the substrate condition.
    Please evaluate IC in the set.
13. This IC has the pull-down function of the CE terminal.
    The pull-down function uses the internal constant current source.
14. The short circuit electric current has dependence of the input voltage.
    Short circuit electric currents more than 100mA may flow (VDD≦2V).
15. Transient response characteristics may turn worse, when dropout voltage is less than 0.5V.
    When a dropout voltage does not have a margin, please evaluate it enough.
16. It may become unstable when output current is less than 10mA (Vout(typ.)<1.7V).
17. When the terminal VDD(CE) is OFF→ON, the overshoot might be generated.
    The size of the overshoot depends on "output capacity", "output load", a "voltage rank", and "VDD standup speed." and evaluate it enough with a real machine, please.

About Power Dissipation

The Power dissipation change if board to mount IC change because radiative heat fix at board.It is reference data below, Evaluate IC in the set.

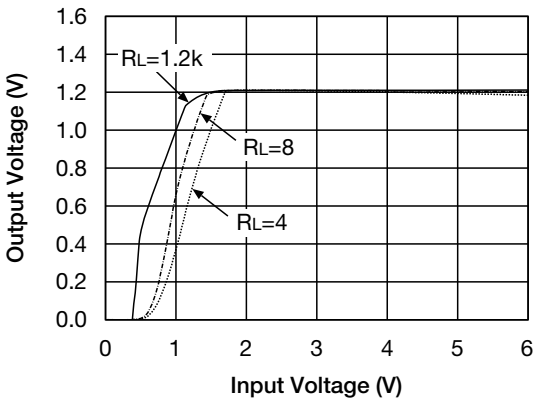
1. JEDEC51-7 standard
   Board size 114.3mm×76.2mm t=1.6mm Copper foil area 80%
   Power dissipation 1250mW Ta=25°C (It is reference value measured by JEDEC51-7 standard.)



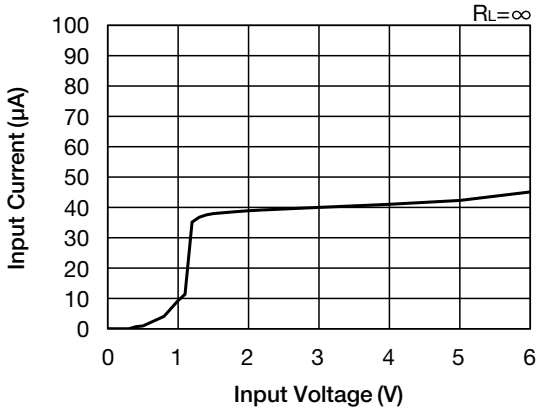
It is recommended to layout the VIA for heat radiation in the GND pattern of reverse (of IC) when there is the GND pattern in the inner layer (in using multiplayer substrate).
By increasing these copper foil pattern area of PCB, Power dissipation improves.

Characteristics (V_{OUT}=1.2V) (Except where noted otherwise V_{DD}=V_{OUT}(TYP.)+1V, V_{CE}=V_{DD}, Ta=25°C)

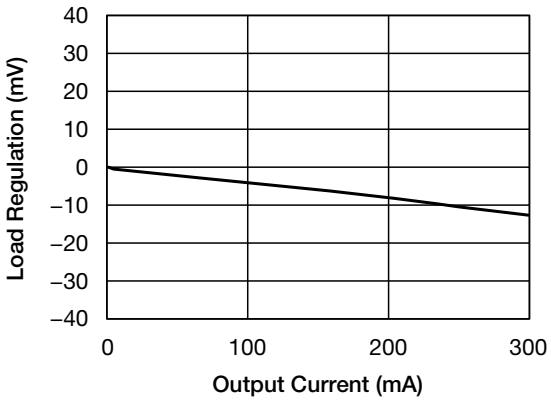
Input Voltage - Output Voltage



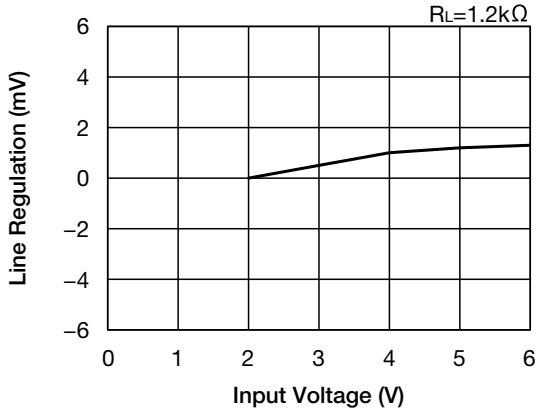
Input Voltage - Input Current



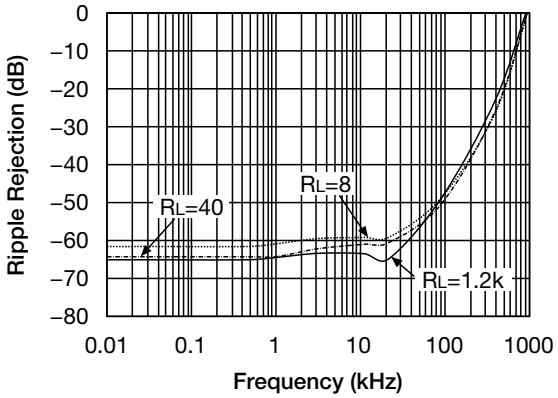
Load Regulation



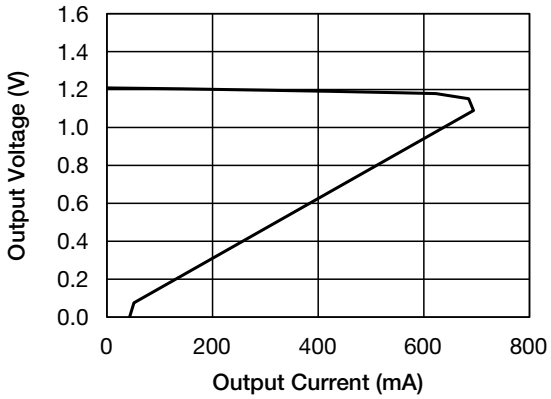
Line Regulation



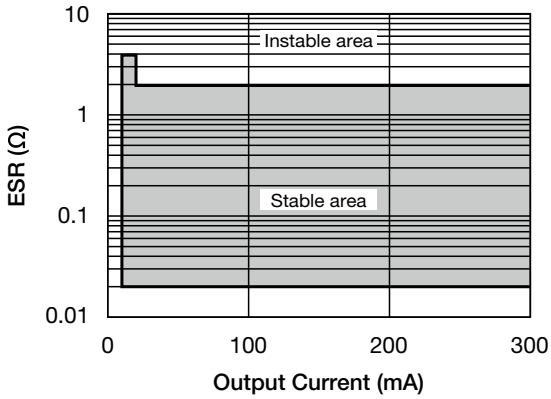
Ripple Rejection



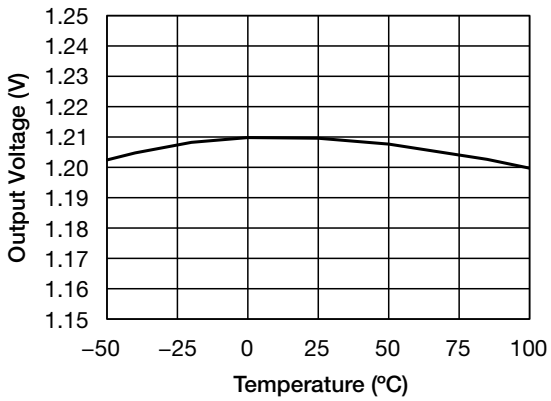
Output Current – Output Voltage



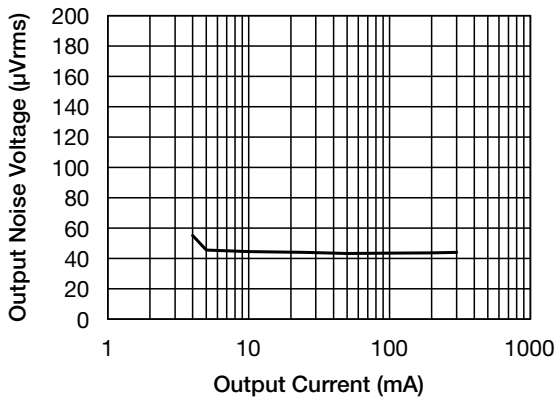
ESR stable area (Note5)



Output Voltage – Temperature Coefficient



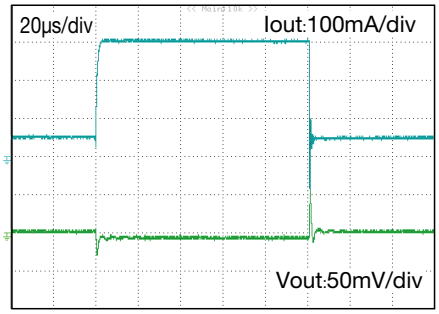
Output Noise Voltage (Note5)



Note5 : Refer to "Note 16".

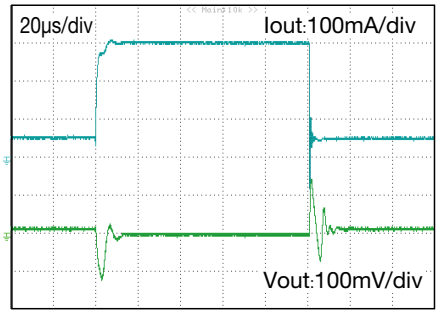
Load Transient response (VDD=2.2V)

Io=50mA⇔300mA



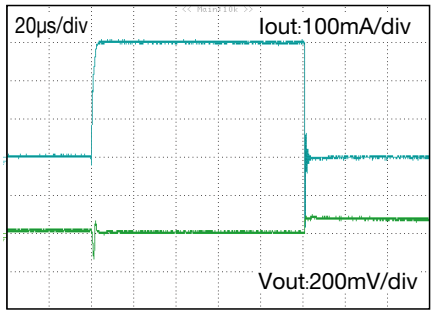
(VDD=1.7V)

Io=50mA⇔300mA



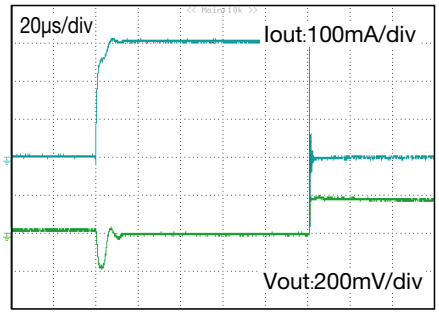
CE rise characteristics (VDD=2.2V)

Io=0.1mA⇔300mA

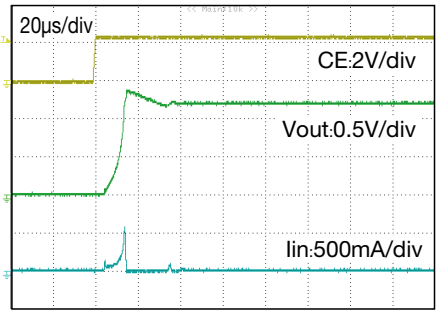


Vout discharge characteristics (VDD=1.7V)

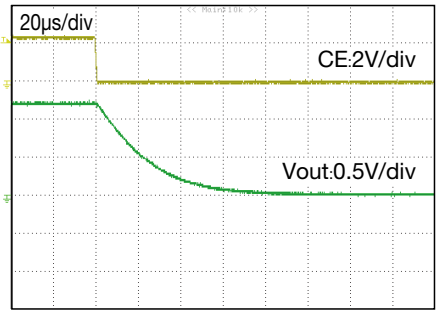
Io=0.1mA⇔300mA



CE rise characteristics (VDD=2.2V, CE=0V→VDD, RL=120Ω)

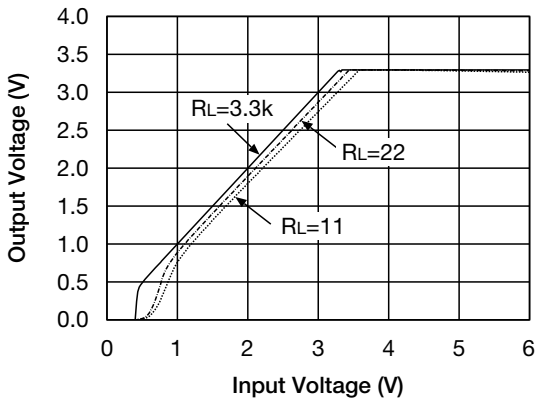


Vout discharge characteristics (VDD=2.2V, CE=VDD→0V)

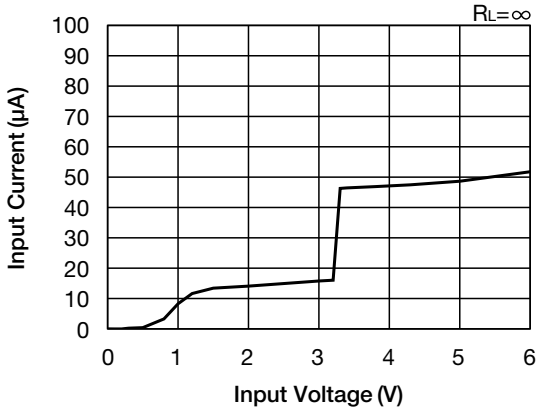


Characteristics (V_{OUT}=3.3V) (Except where noted otherwise V_{DD}=V_{OUT}(TYP.)+1V, V_{CE}=V_{DD}, Ta=25°C)

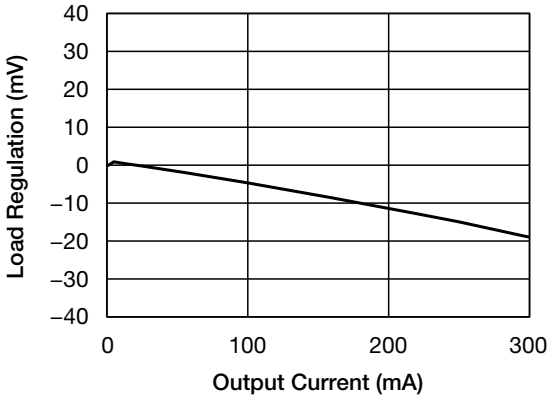
Input Voltage – Output Voltage



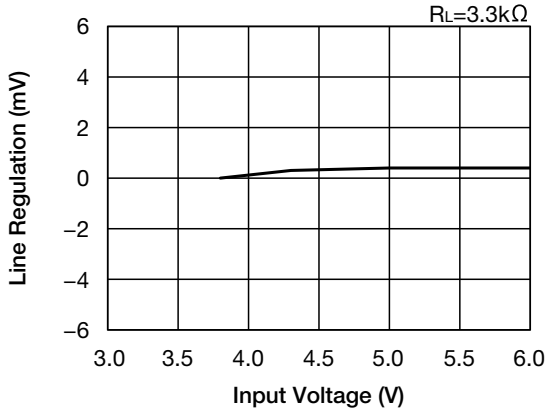
Input Voltage – Input Current



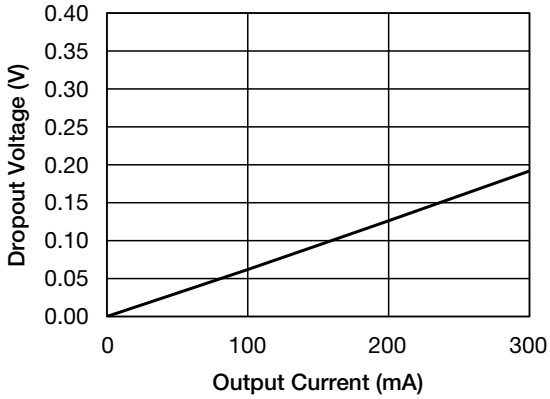
Load Regulation



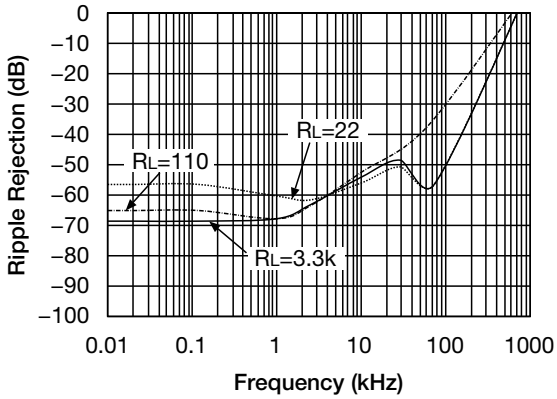
Line Regulation



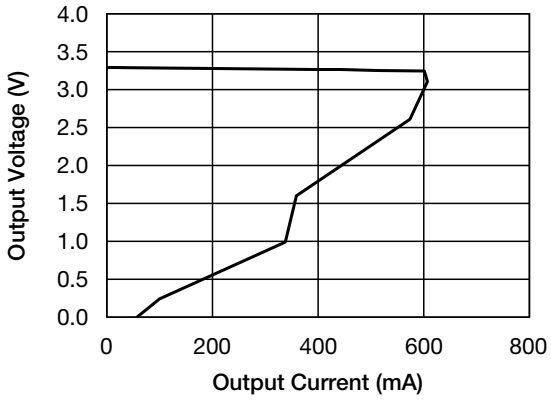
Dropout Voltage



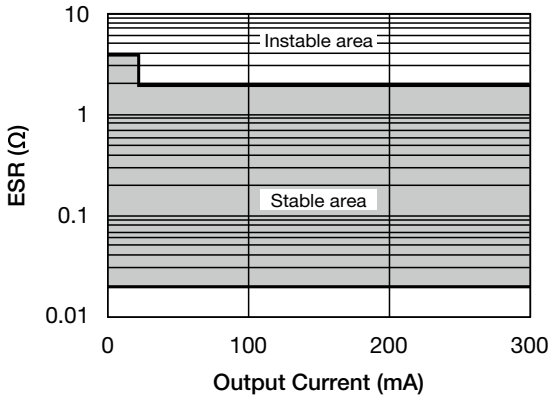
Ripple Rejection



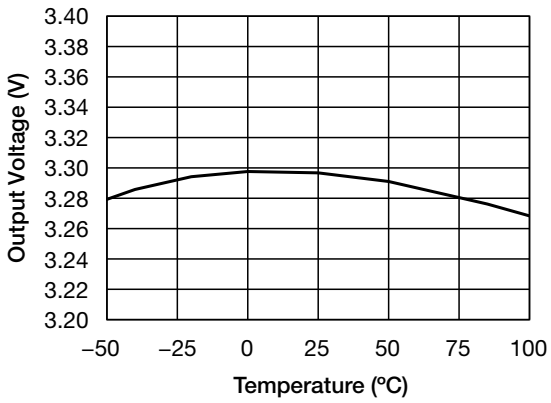
Output Current – Output Voltage



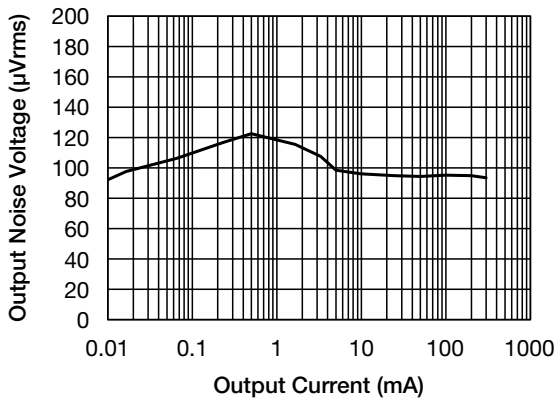
ESR stable area



Output Voltage – Temperature Coefficient

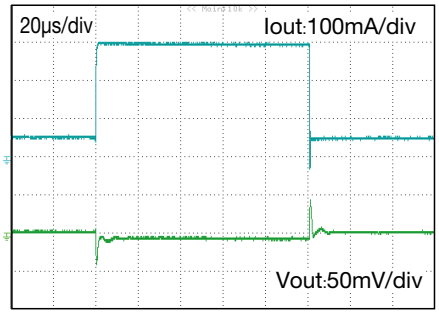


Output Noise Voltage



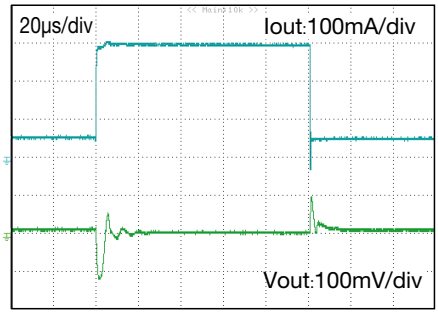
Load Transient response (VDD=4.3V)

Io=50mA⇔300mA



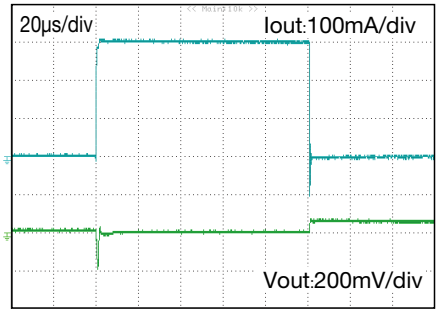
(VDD=3.8V)

Io=50mA⇔300mA



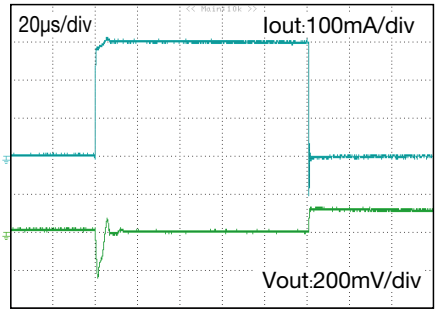
CE rise characteristics (VDD=4.3V)

Io=0.1mA⇔300mA

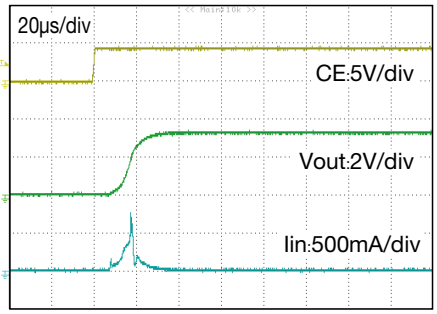


Vout discharge characteristics (VDD=3.8V)

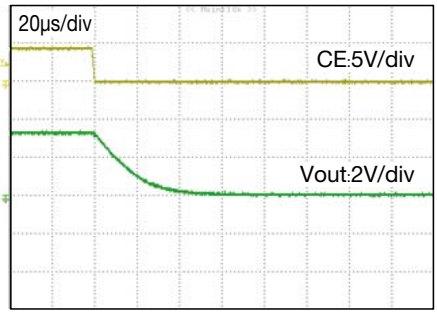
Io=0.1mA⇔300mA



CE rise characteristics (VDD=4.3V, CE=0V→VDD, RL=300Ω)

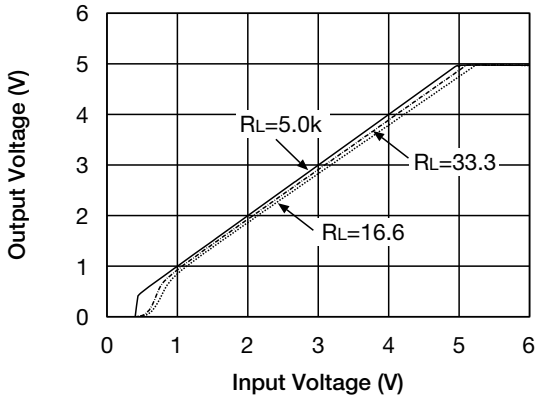


Vout discharge characteristics (VDD=4.3V, CE=VDD→0V)

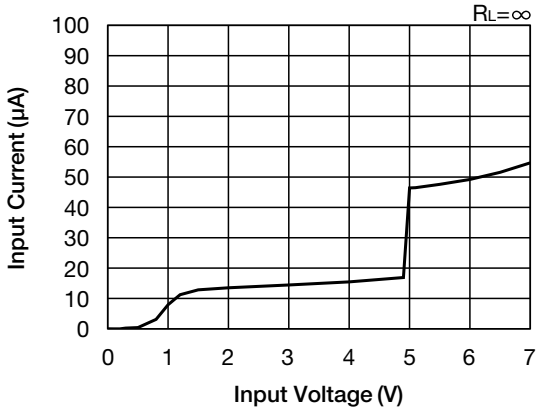


Characteristics (V_{OUT}=5.0V) (Except where noted otherwise V_{DD}=V_{OUT}(TYP.)+1V, V_{CE}=V_{DD}, Ta=25°C)

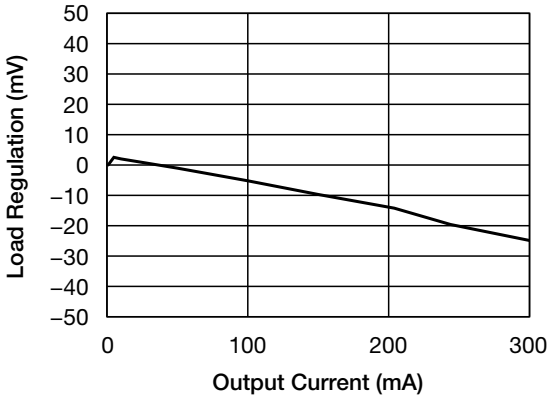
Input Voltage – Output Voltage



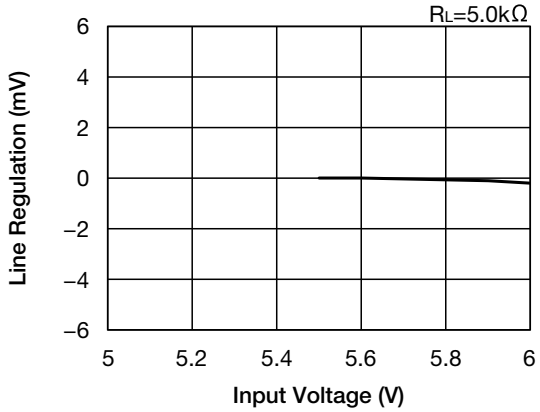
Input Voltage – Input Current



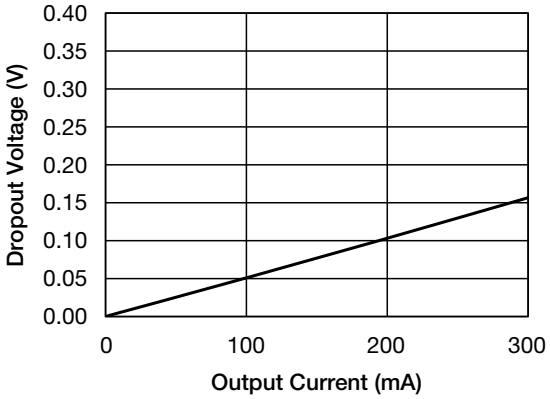
Load Regulation



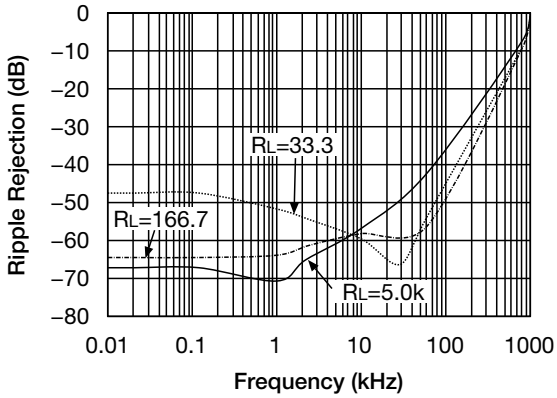
Line Regulation



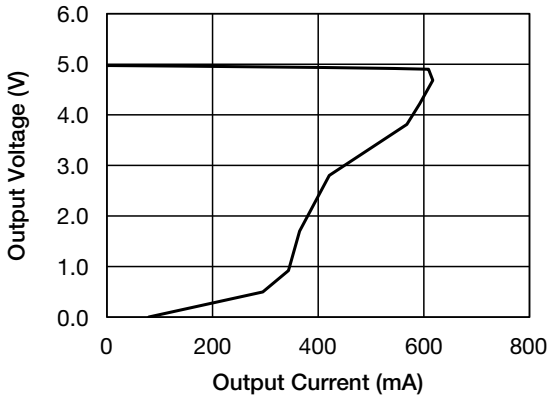
Dropout Voltage



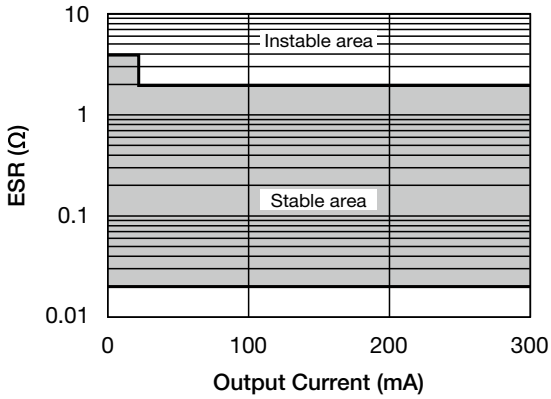
Ripple Rejection



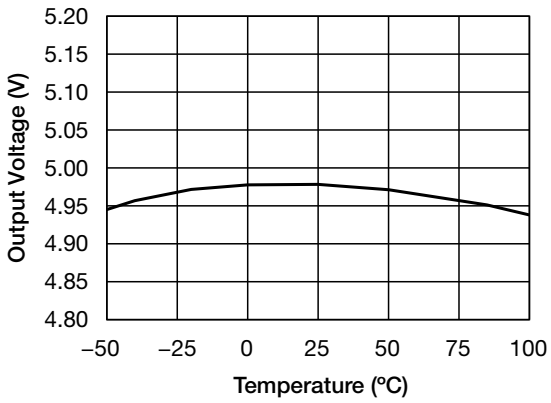
Output Current – Output Voltage



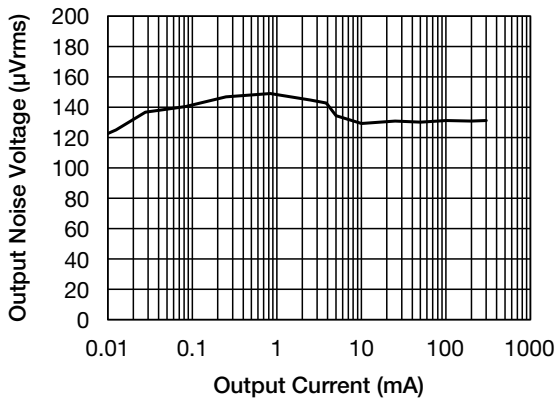
ESR stable area



Output Voltage – Temperature Coefficient

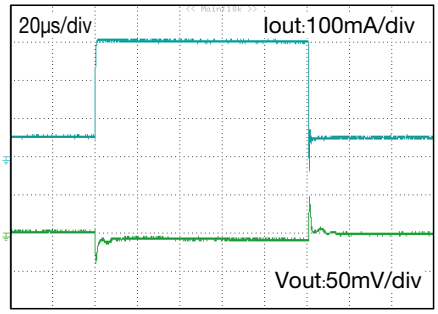


Output Noise Voltage



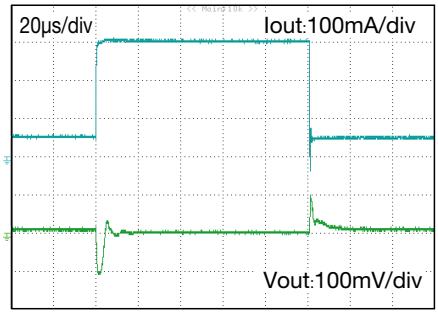
Load Transient response (VDD=6.0V)

Io=50mA⇔300mA



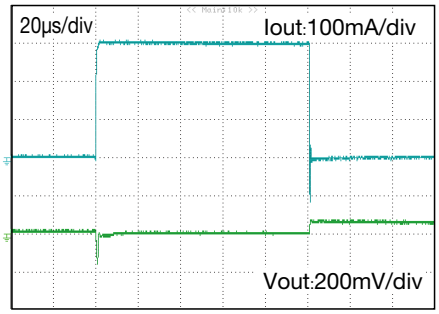
(VDD=5.5V)

Io=50mA⇔300mA



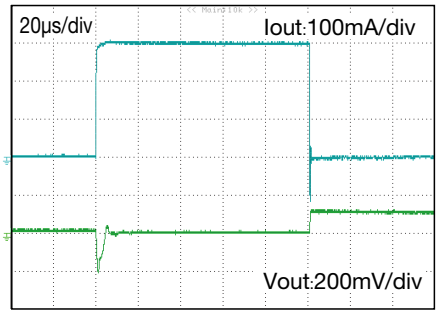
CE rise characteristics (VDD=6.0V)

Io=0.1mA⇔300mA

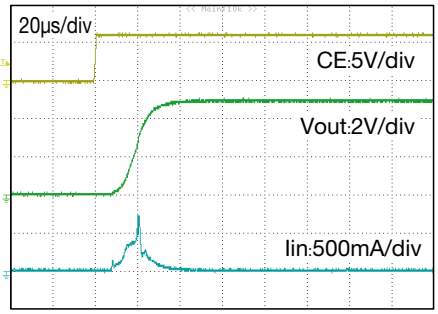


Vout discharge characteristics (VDD=5.5V)

Io=0.1mA⇔300mA



CE rise characteristics (VDD=6.0V, CE=0V→VDD, RL=500Ω)



Vout discharge characteristics (VDD=6.0V, CE=VDD→0V)