MITSUMI

IC for CMOS Regulator+Reset
Monolithic IC MM3173/3174 Series

Outline

This IC is a reset+regulator combined IC developed using a CMOS process. Output voltage of the regulator and detection voltage of the reset are fixed, while regulator output voltage and reset detection voltage are programmable ranging from 1.2V to 5.0V, and 1.2V to 5.0V respectively upon request.

Features

1. Output voltage accuracy   ±2%
2. Incorporates a current limit circuit
3. Output current   150mA max.
4. Reset detection voltage   1.2 to 5.0V
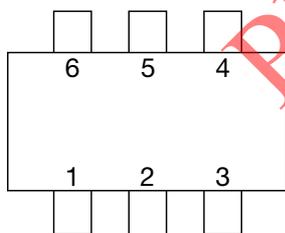5. Delay time from voltage detection to reset release can be easily programmed.

Packages
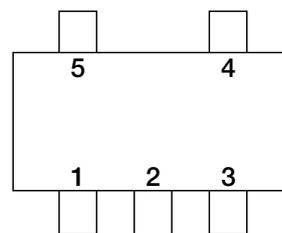
1. SOT-25A
2. SOT-26A

Applications

1. Reset circuit for microcomputers, CPU, and MPU
2. Reset circuit for logic circuits
3. Battery voltage check
4. Switch circuit for backup circuits
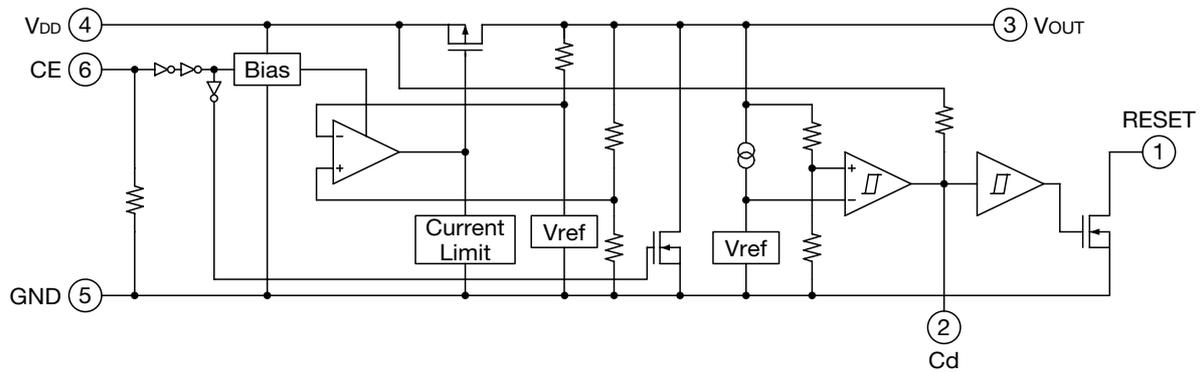5. Mechanical reset circuit

Pin Assignment

1	RESET
2	Cd
3	V_{OUT}
4	V_{DD}
5	GND
6	CE

SOT-26A
(TOP VIEW)

1	V_{DD}
2	GND
3	Cd
4	RESET
5	V_{OUT}

SOT-25A
(TOP VIEW)

Block Diagram

Pin Description

Pin No. SOT-26A	Pin name	Function
3	VOUT	Output pin
2	Cd	Capacitor connect pin with delay Delay time is decided by the internal resistance (2MΩ) and the capacitor.
1	RESET	Reset output pin

	RESET
VOUT<VS	L
VOUT>VS	H

6	CE	ON/OFF-control pin

CE	VOUT
L	OFF
H	ON

Connect CE pin with VDD pin, when it is not used.

5	GND	Ground
4	VDD	Voltage-supply pin

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	−55~+125	°C
Supply voltage	V_{DD}	6.5	V
CE input voltage	V_{CE}	−0.3~V_{DD}+0.3	V
Cd pin voltage	V_{Cd}	−0.3~V_{DD}+0.3	V
RESET pin voltage	V_{RST}	6.5	V
Output voltage	V_{OUT}	−0.3~V_{DD}+0.3	V
Power dissipation ∗2	Pd	350 ∗1	mW

Note1: ∗1 With PC Board of glass epoxy. (25×25×1.6mm, Copper foil area 60%)

Note2: ∗2 The Absolute Maximum power dissipation depens on the PC board and temperature.

Recommended Operating Conditions (Ta=25°C)

Item	Symbol	Ratings	Units
Operating ambient temperature	T_{JOP}	−40~85	°C
Operating voltage	V_{OP}	2~6	V
Output current	I_O	0~200	mA

Electrical Characteristics 1 (Except where noted otherwise, Ta=25°C, V_DD=V_OUT (typ.) +1V, V_CE=V_DD)

| Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Input current (OFF)	$I_{DD}off$	V_{CE}=0V		0.1	1.0	µA
No-load input current	I_{DD}	I_{OUT}=0mA		50	75	µA
Voltage regulator						
Output voltage	V_{OUT}	1mA ≦ I_{OUT} ≦ 30mA	×0.98		×1.02	V
Line regulation	V_{LINE}	V_{DD}=Vo (Typ.) +0.5~6V, I_{OUT}=30mA (V_{OUT} ≦ 1.6V, V_{DD}=2.2~6V)		0.02	0.10	%/V
Load regulation	V_{LOAD}	1mA ≦ I_{OUT} ≦ 150mA		22	40	mV
Dropout voltage	Vio	Please refer to another page				V
Ripple rejection 1 *1	RR1	f=1kHz, Vripple=0.5V, I_{OUT}=30mA (V_{OUT} ≦ 1.7V, V_{DD}=V_{OUT}+1.2V)		70		dB
Ripple rejection 2 *1	RR2	f=10kHz, Vripple=0.5V, I_{OUT}=30mA (V_{OUT} ≦ 1.7V, V_{DD}=V_{OUT}+1.2V)		60		dB
V_{OUT} temperature coefficient *1	$\triangle V_{OUT}/\triangle T$	I_{OUT}=30mA −40 ≦ T_{OP} ≦ 85°C		±100		ppm/°C
Output noise voltage *1	Vn	f_{BW}=10~100kHz		30		µVrms
Output short-circuit current *1	Ilim	V_{OUT}=0V		40		mA
CE pull-down resistance	R_{pd}		0.7	2	8	MΩ
CE high threshold voltage	V_{CEH}		1.5		V_{DD}	V
CE low threshold voltage	V_{CEL}		0		0.3	V
Output NMOS ON resistance	R_{DON}	V_{CE}=0V V_{DD}=4V (V_{OUT}<3V)		60		Ω
V_{OUT} RESET						
Detecting voltage	Vs	V_{OUT}=H→L Rpu=100kΩ	×0.98		×1.02	V
Vs temperature coefficient *1	$\triangle Vs/\triangle T$	V_{OUT}=H→L −40 ≦ T_{OP} ≦ 85°C		±100		ppm/°C
Hysteresis voltage	$\triangle Vs$	V_{OUT}=H→L→H	56	140	224	mV
Reset output current	I_{ORST}	V_{DD}=2V V_{RST}=0.5V	3.0	6.0		mA
		V_{DD}=3V V_{RST}=0.5V	4.0	8.0		mA
		V_{DD}=4V V_{RST}=0.5V	5.0	10.0		mA
		V_{DD}=5V V_{RST}=0.5V	6.0	12.0		mA
		V_{DD}=6V V_{RST}=0.5V	10.0	15.0		mA
Resistance for Delay	Rd	V_{DD}=1.5V V_{RST}=0.5V	1	2	3.5	MΩ

Note1: *1   The parameter is guaranteed by design.

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

Item											
Output voltage				Detecting voltage				Dropout voltage			
Vo (V)				Vs (V)				Vio (V)			
Test conditions	Min.	Typ.	Max.	Test conditions	Min.	Typ.	Max.	Test conditions	Min.	Typ.	Max.
1mA ≦ Io ≦ 30mA	1.170	1.200	1.230	V_{OUT}=H→L Rpu=100kΩ	1.170	1.200	1.230	⋆2			
	1.270	1.300	1.330		1.270	1.300	1.330				
	1.370	1.400	1.430		1.370	1.400	1.430				
	1.470	1.500	1.530		1.470	1.500	1.530	Io=150mA		0.38	0.70
	1.568	1.600	1.632		1.568	1.600	1.632			0.36	0.65
	1.666	1.700	1.734		1.666	1.700	1.734			0.34	0.60
	1.764	1.800	1.836		1.764	1.800	1.836	1.8V ≦ Vo ≦ 2.0V		0.32	0.55
	1.862	1.900	1.938		1.862	1.900	1.938				
	1.960	2.000	2.040		1.960	2.000	2.040				
	2.058	2.100	2.142		2.058	2.100	2.142	2.1V ≦ Vo ≦ 2.7V		0.28	0.50
	2.156	2.200	2.244		2.156	2.200	2.244				
	2.254	2.300	2.346		2.254	2.300	2.346				
	2.352	2.400	2.448		2.352	2.400	2.448				
	2.450	2.500	2.550		2.450	2.500	2.550				
	2.548	2.600	2.652		2.548	2.600	2.652				
	2.646	2.700	2.754		2.646	2.700	2.754				
	2.744	2.800	2.856		2.744	2.800	2.856	2.5V ≦ Vo ≦ 5.0V		0.22	0.35
	2.842	2.900	2.958		2.842	2.900	2.958				
	2.940	3.000	3.060		2.940	3.000	3.060				
	3.038	3.100	3.162		3.038	3.100	3.162				
	3.136	3.200	3.264		3.136	3.200	3.264				
	3.234	3.300	3.366		3.234	3.300	3.366				
	3.332	3.400	3.468		3.332	3.400	3.468				
	3.430	3.500	3.570		3.430	3.500	3.570				
	3.528	3.600	3.672		3.528	3.600	3.672				
	3.626	3.700	3.774		3.626	3.700	3.774				
	3.724	3.800	3.876		3.724	3.800	3.876				
	3.822	3.900	3.978		3.822	3.900	3.978				
	3.920	4.000	4.080		3.920	4.000	4.080				
	4.018	4.100	4.182		4.018	4.100	4.182				
	4.116	4.200	4.284		4.116	4.200	4.284				
	4.214	4.300	4.386		4.214	4.300	4.386				
	4.312	4.400	4.488		4.312	4.400	4.488				
	4.410	4.500	4.590		4.410	4.500	4.590				
	4.508	4.600	4.692		4.508	4.600	4.692				
	4.606	4.700	4.794		4.606	4.700	4.794				
	4.704	4.800	4.896		4.704	4.800	4.896				
	4.802	4.900	4.998		4.802	4.900	4.998				
	4.900	5.000	5.100		4.900	5.000	5.100				

Note2: ⋆2 The parameter is not guaranteed in the model less than 1.4V (V_{OUT}).

Measuring Circuit
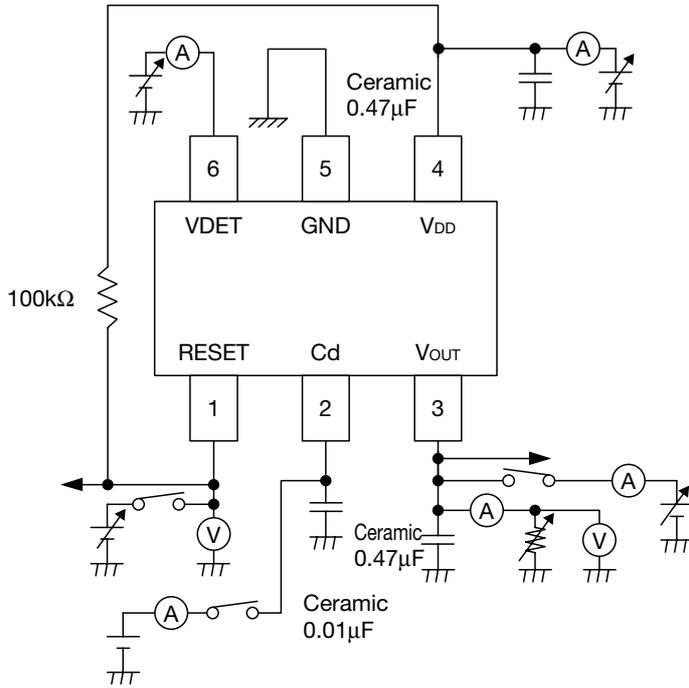
Application Circuit
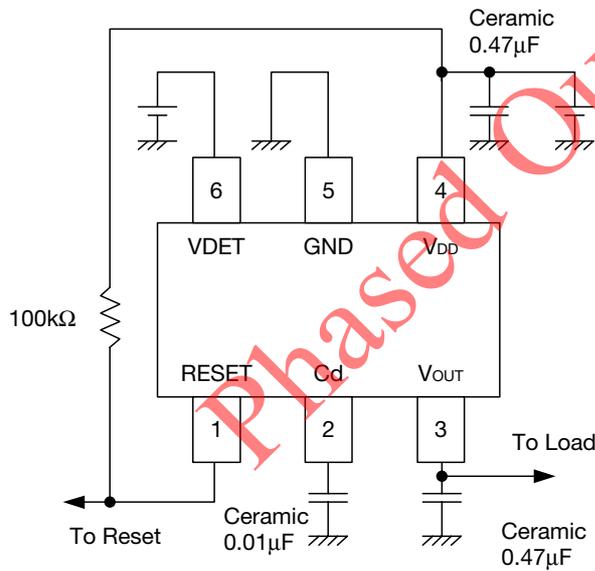
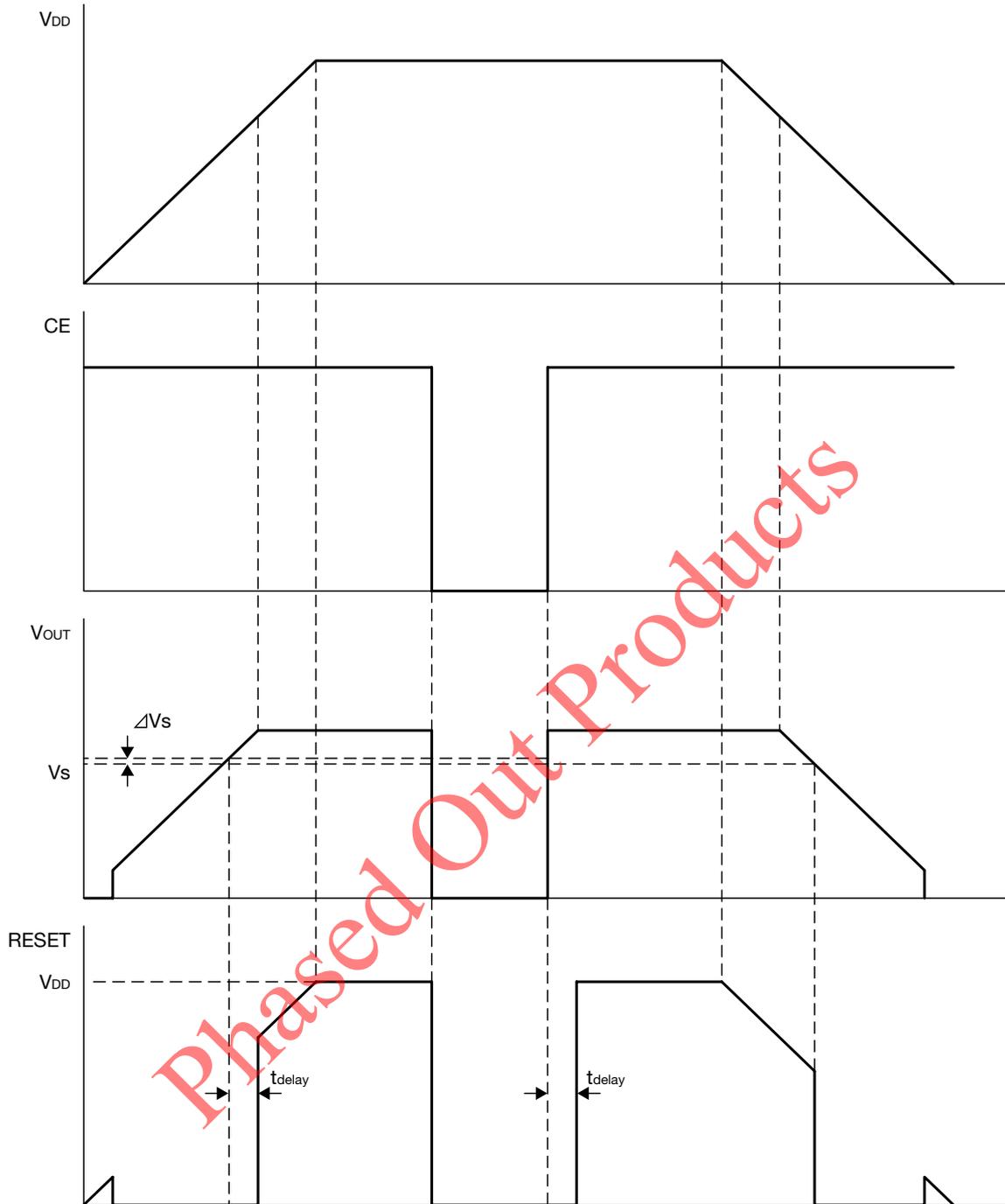(reference example of external parts)
· Output capacitor   Ceramic capacitor   0.47µF
· Input Capacitor   Ceramic capacitor   0.47µF

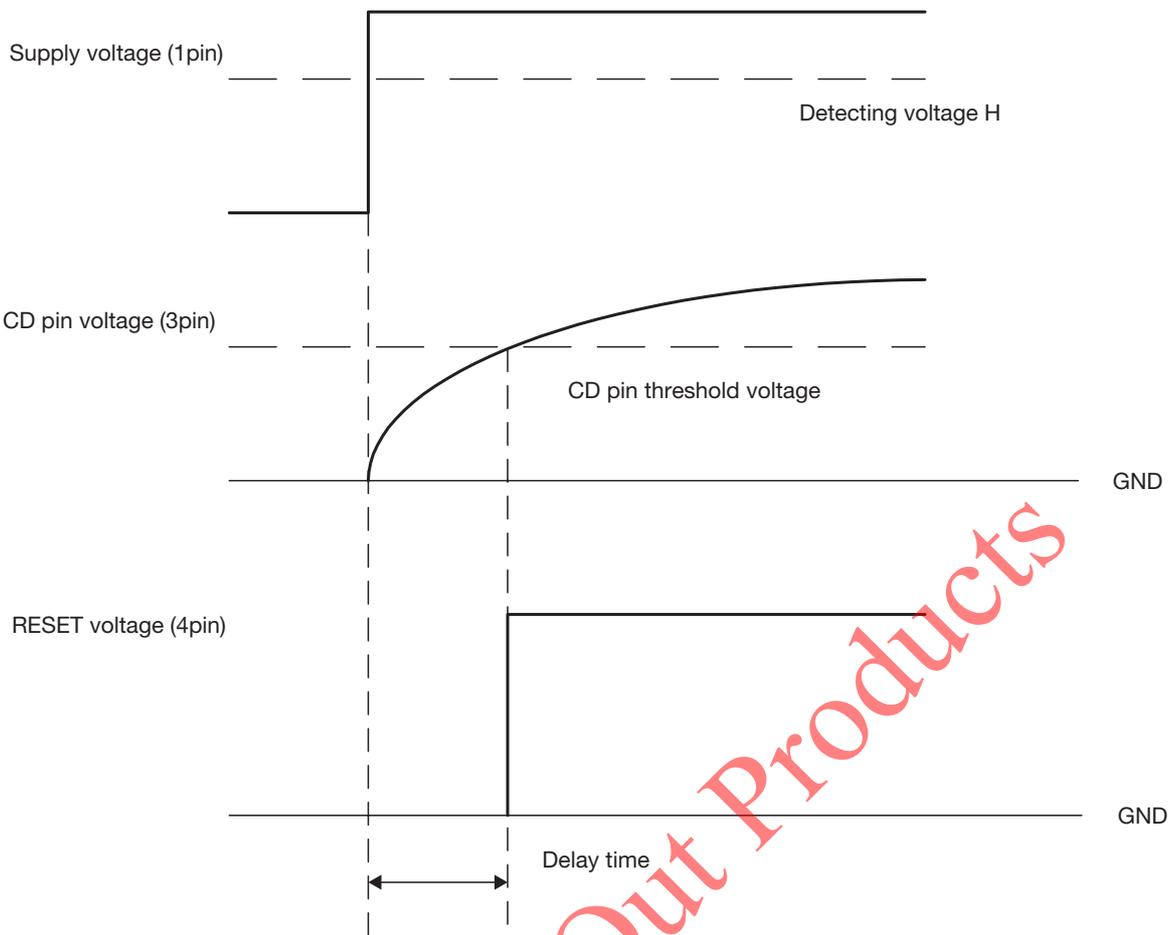*Temperature Characteristics : B

Note

1. The output capacitor is required between output and GND to prevent oscillation.
2. The output capacitor must be used in ESR stable area.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 0.47µF and B temperature characteristics.
3. The wire of V_{CC} and GND is required to print full ground plane for noise and stability.
4. The input capacitor must be connected in 1cm from input pin.
5. In case the output voltage is above the input voltage, the overcurrent flows by internal parasitic diode from output to input.

Timing Chart

Delay Time

Supply voltage (1pin)

Detecting voltage H

CD pin voltage (3pin)

CD pin threshold voltage

GND

RESET voltage (4pin)

GND

Delay time

Delay Time (t_{PLH}) $t_{PLH} \fallingdotseq 0.50 \times RD\ (\Omega) \times CD\ (F) + IC's\ delay\ time$

RD: CD pin resistance
CD: Outer capacitor
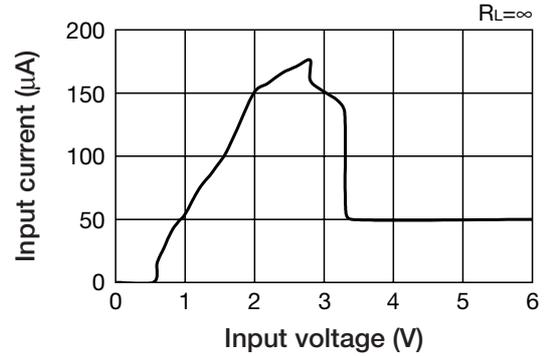IC's delay time : 100μs

■Outer Capacitor-Delay Time

RD=2000kΩ

Delay time (ms): 1000, 100, 10, 1, 0.1, 0.01

Outer capacitor (pF): 1, 10, 100, 1000, 10000, 100000
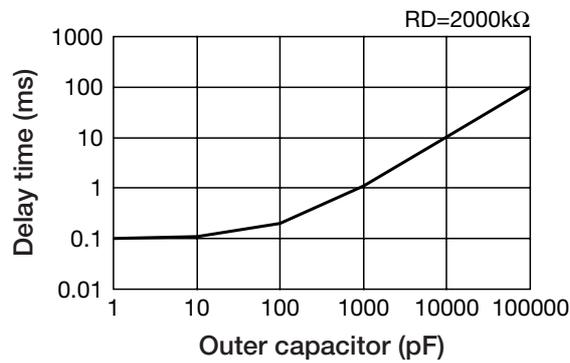
Note: These are typical characteristics.

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

■ Output-Input Voltage

R_L=3.3kΩ

R_L=66Ω

Output voltage Vo (V)
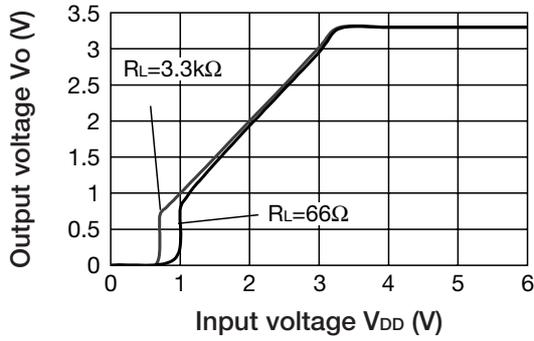
Input voltage V_{DD} (V)

■ Input Current-Input Voltage

R_L=∞

Input current (μA)
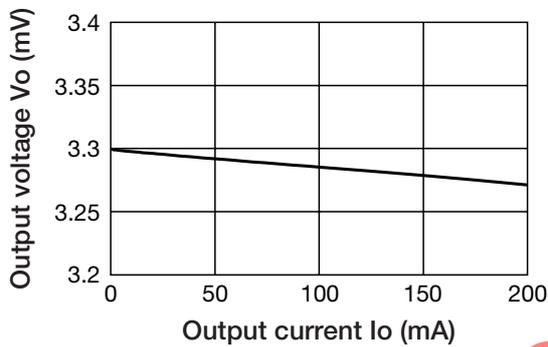
Input voltage (V)

■ Load Regulation

Output voltage Vo (mV)

Output current Io (mA)

■ Line Regulation

R_L=110Ω

Output voltage Vo (V)

Input voltage V_{DD} (V)
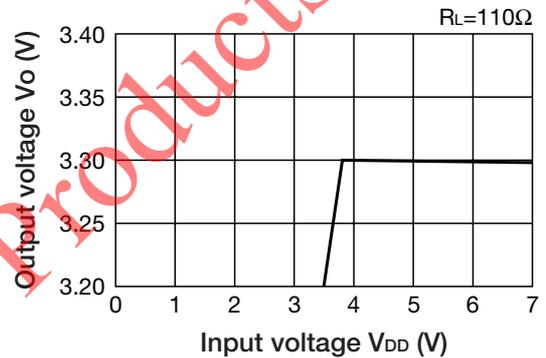
■ Output Voltage-Ambient Temperature

Output voltage Vo (V)

Ambient temperature Ta (°C)

■ Dropout Voltage
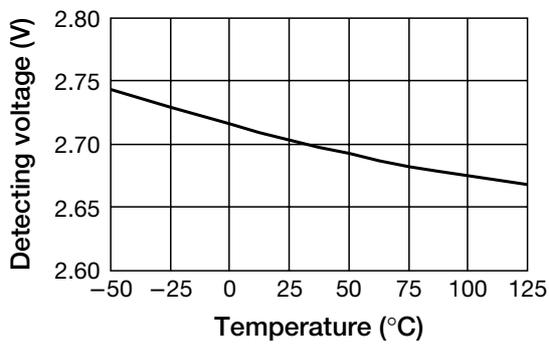

Dropout voltage Vio (mV)
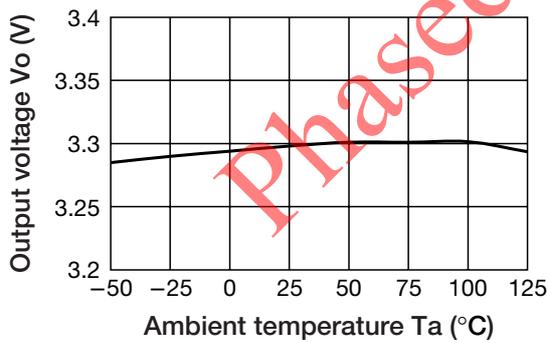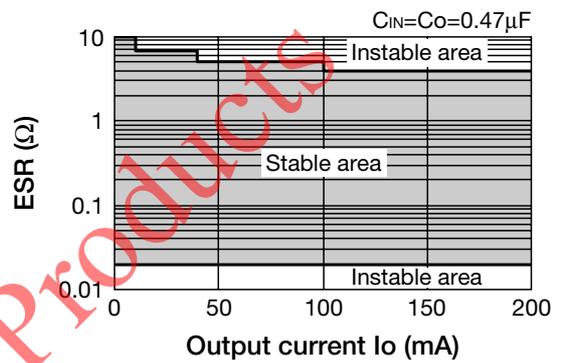
Output current Io (mA)
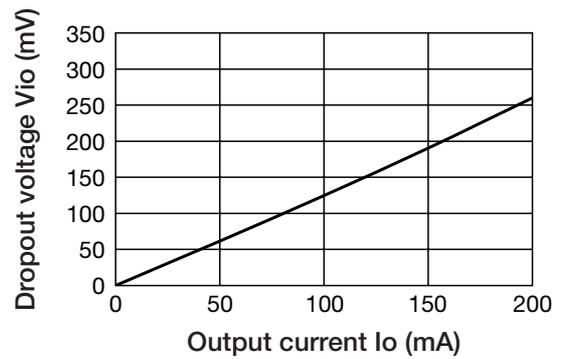
■ Output Voltage-Output Current
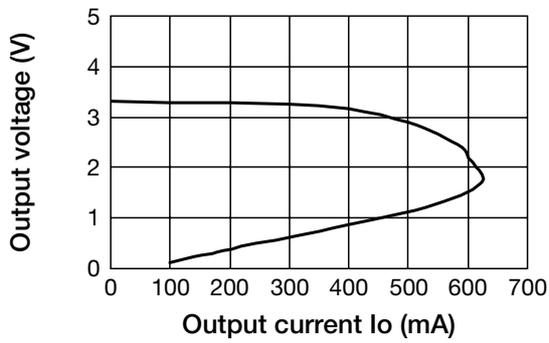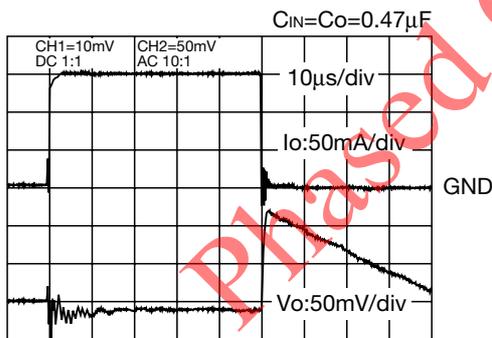
■ Ripple Rejection
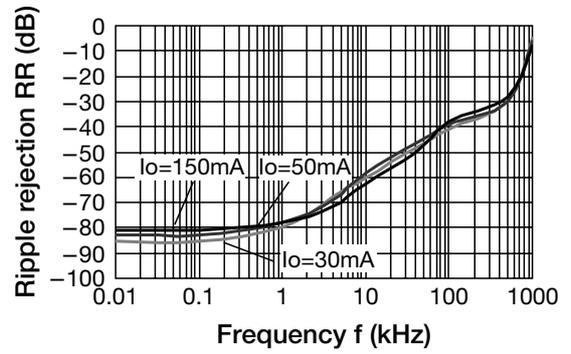
■ Detecting Voltage (H→L)-Temperature

■ ESR Stable Area

■ Load transient response (Io=10→150mA)

■ Turn-On & Turn-Off Transient Responses