3ch positive voltage discharge IC

MM3818 Series

Overview

This IC is a discharge IC for fast discharge the electric charge of capacitor when power supply is turned off.
The IC can be used to turn off multiple power supply of microcomputer, SoC and image sensor.
The IC has three output, and it is possible to change the various options by exteranal connection.

Features

- 3ch discharge
- NMOS with low on-resistance
- Fast discharge
- Low current consumption

Main specifications

- Maximum rating supply voltage : -0.3V to 7.0V
- Operating voltage range : 1.1V to 6.5V
- Operating ambient temperature : -40℃ to 85℃
- Output current : 200mA/ch × 3ch
- Input current(Active) : Typ. 0.1uA
- Input current(Non active) : Typ. 0.1uA
- CE input voltage H : Min. 1.1V
- CE input voltage L : Max.0.3V
- CE input current : Typ. 0.5uA
- Output current : Typ. 2mA (VDD=1.2V, VCE=0V, Vout=0.1V)
  (One Vout terminal)   Typ. 8mA (VDD=1.2V, VCE=0V, Vout=5.0V)
     Typ. 10mA (VDD=6.0V, VCE=0V, Vout=0.1V)
     Typ. 200mA (VDD=6.0V, VCE=0V, Vout=5.0V)
- H Transfer delay time : Typ. 2us (CE=L⇒H)
- L Transfer delay time : Typ. 60us (CE=H⇒L)
- Vout Turn-off time : Typ. 3.0ms (MM3781A, CE=H⇒L, Vout=5V, Co=100uF)
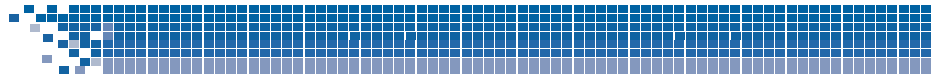 (One Vout terminal)

Packages
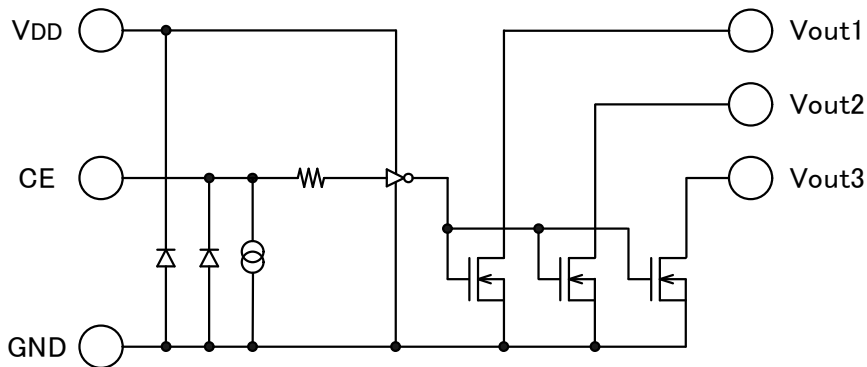
- SSON-6A

Application

- Power OFF sequence control.

Jun, 2023 Rev.0

Model Name

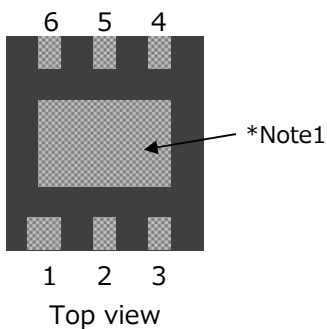M M 3 8 1 8 X X X X

Series name   (A)   (B)   (C)   (D)

(A)	Function Type	A	L Transfer delay time Typ. 60us
(B)	Package	R	SSON-6A
(C)	Packing specifications 1	R	R housing (Standard)
(D)	Packing specifications 2	E	Embos tape / Halogen free

Block Diagram

Pin Configuration

- SSON-6A

Top view

Pin No.	Pin name	Function
1	VDD	Voltage supply pin
2	GND	GND pin
3	Vout1	Output pin (Open-drain)
4	Vout2	Output pin (Open-drain)
5	Vout3	Output pin (Open-drain)
6	CE	ON/OFF-control pin CE=L ⇒ discharge ON, CE=H ⇒ discharge OFF Pull-down with constant current source

*Note1:Heat spreader bottom with GND.

Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Storage temperature	Tstg	-55	125	℃
Junction temperature	Tj_{MAX}	-55	125	℃
Supply voltage	VDD	-0.3	7.0	V
CE input voltage	VCE	-0.3	7.0	V
Output voltage	Vout	-0.3	7.0	V
Output current *Note2	Iout	-	300	mA
Power dissipation *Note3	Pd	-	1,300	mW

*Note2:One Vout terminal

*Note3:JEDEC51-7 standard

Recommended Operating Conditions

Item	Symbol	Min.	Max.	Unit
Operating junction temperature	Topr	-40	85	℃
Operating voltage	Vop	1.1	6.5	V

Electrical Characteristics

(Ta=25℃, VDD=6V, VCE=0V unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test Circuit
Input current(Active)	IDD	VCE=0V	-	0.1	1.0	μA	1
Input current(Non active)	IDDoff	VCE=VDD	-	0.1	1.0	μA	1
CE input voltage H	VCE_H		1.0	-	6.5	V	2
CE input voltage L	VCE_L		0.0	-	0.3	V	2
CE input current	ICE	Vout≦2.0V	-	0.5	1.0	uA	1
Output current	Iout	VDD=1.2V, VCE=0V, Vout=0.1V Vout × 1ch	1	2	5	mA	3
		VDD=1.2V, VCE=0V, Vout=5.0V Vout × 1ch	5	8	15	mA	3
		VDD=6.0V, VCE=0V, Vout=0.1V Vout × 1ch	6	10	20	mA	3
		VDD=6.0V, VCE=0V, Vout=5.0V Vout × 1ch	120	200	260	mA	3
Drain-Source ON state resistance	Ron	VDD=6V, Iout=10mA	-	10	18.0	Ω	4

Electrical Characteristics

(Ta=25℃, VDD=6V, VCE=0V unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test Circuit
H Transfer delay time *Note4	tPLH	VCE=L→H	-	1	-	us	5
L Transfer delay time *Note4	tPHL	VCE=H→L	30	60	100	us	6
Vout Turn-off time (Vout×1)*Note4	tf1	VCE=H→L Vout=5V, Co=100uF	2.0	3.0	4.3	ms	6
Vout Turn-off time (Vout×2)*Note4	tf2	VCE=H→L Vout=5V, Co=100uF	1.0	1.5	2.2	ms	6
Vout Turn-off time (Vout×3)*Note4	tf3	VCE=H→L Vout=5V, Co=100uF	0.5	1.0	1.5	ms	6

*Note4:The parameter is guaranteed by design.
　　　　Refer to Fig1 for measurement timing.
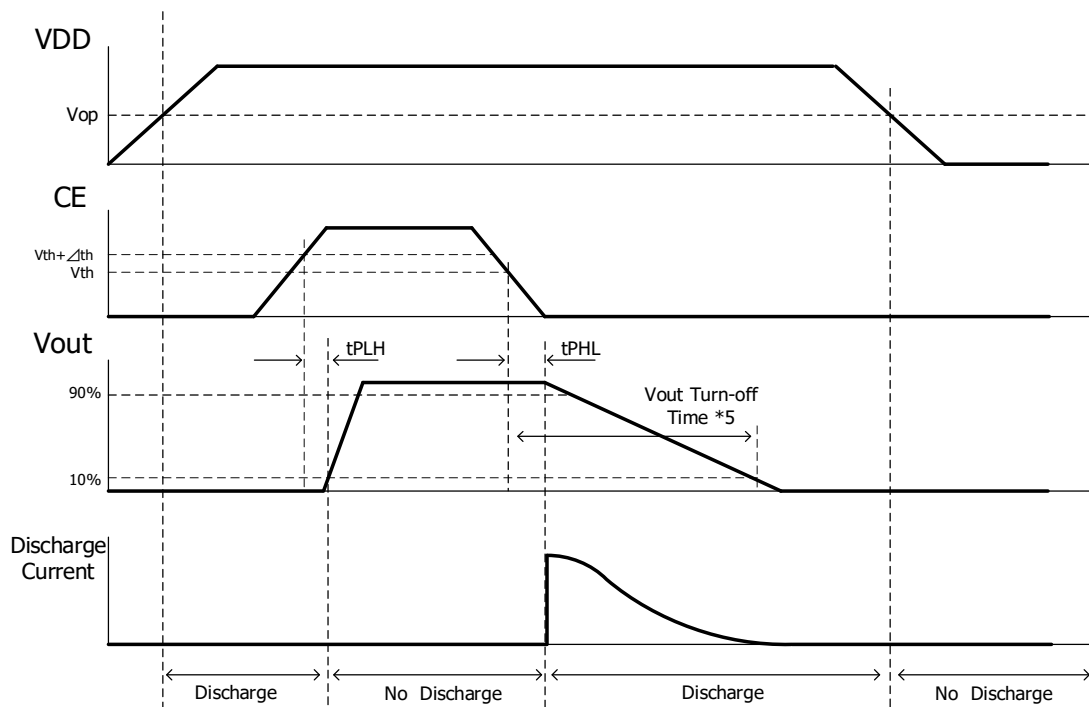
Fig1.Measurement timing.

MITSUMI
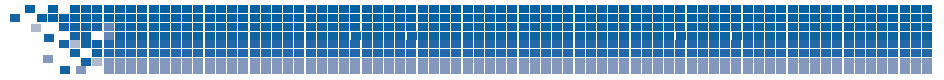
Test Circuit

(1)
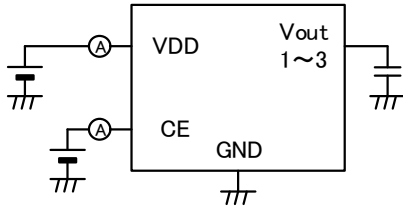
(2)
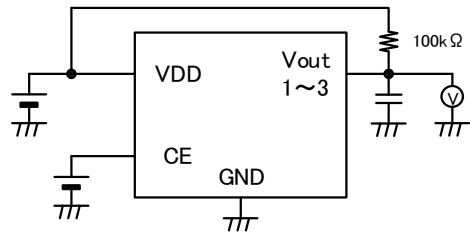
(3)
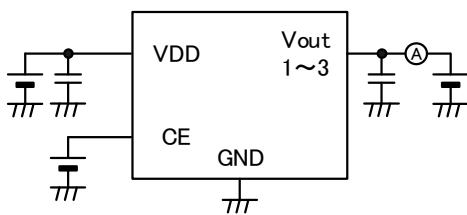
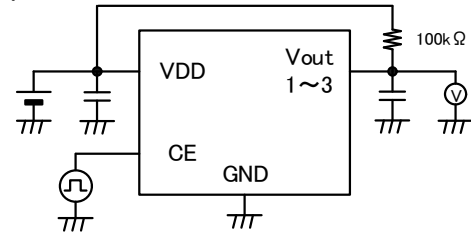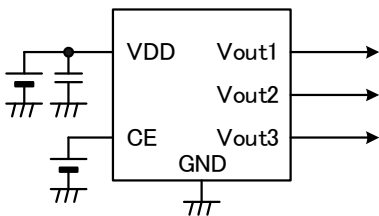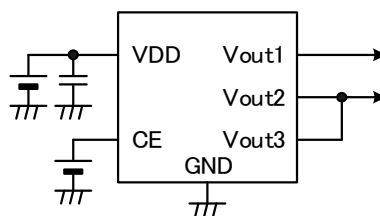
(4)
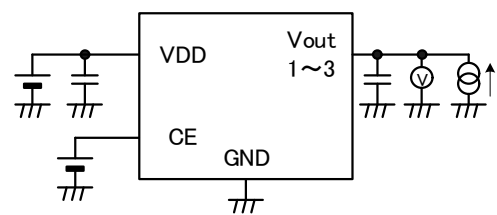
(5)
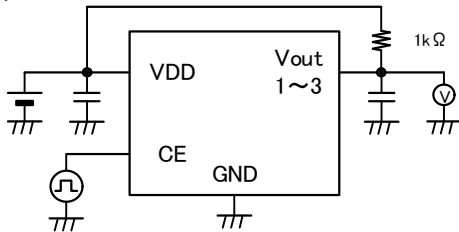
(6)

*Note5:A capacitance of 1uF is connected to VDD and Vout for measurement.
When actually using it, LDO capacity can be substituted.
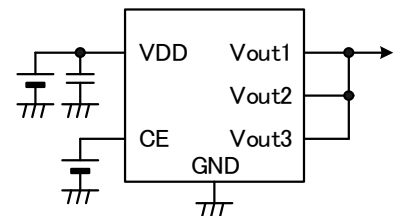
Application Circuit

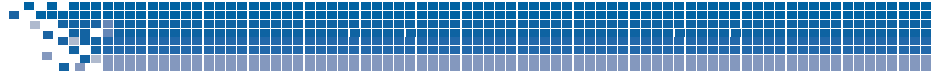(1) 200mA × 3ch

(2) 200mA × 1ch + 400mA × 1ch

(3) 600mA × 1ch

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

## Explanation About Function

■ About Function

MM3818 is discharge IC for Positive voltage.
Electric charge in output capacitor(CL) discharged and voltage become 0V.
Used to output in regulator IC, voltage is turn off fast, and sequential control is easy.

MM3818 turn on When regulator IC turn off, discharge current occur.
Electric charge in output capacitor discharged and output turn off to 0V.
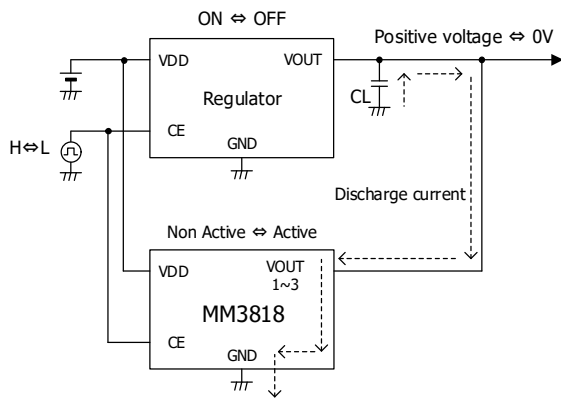
Operation table

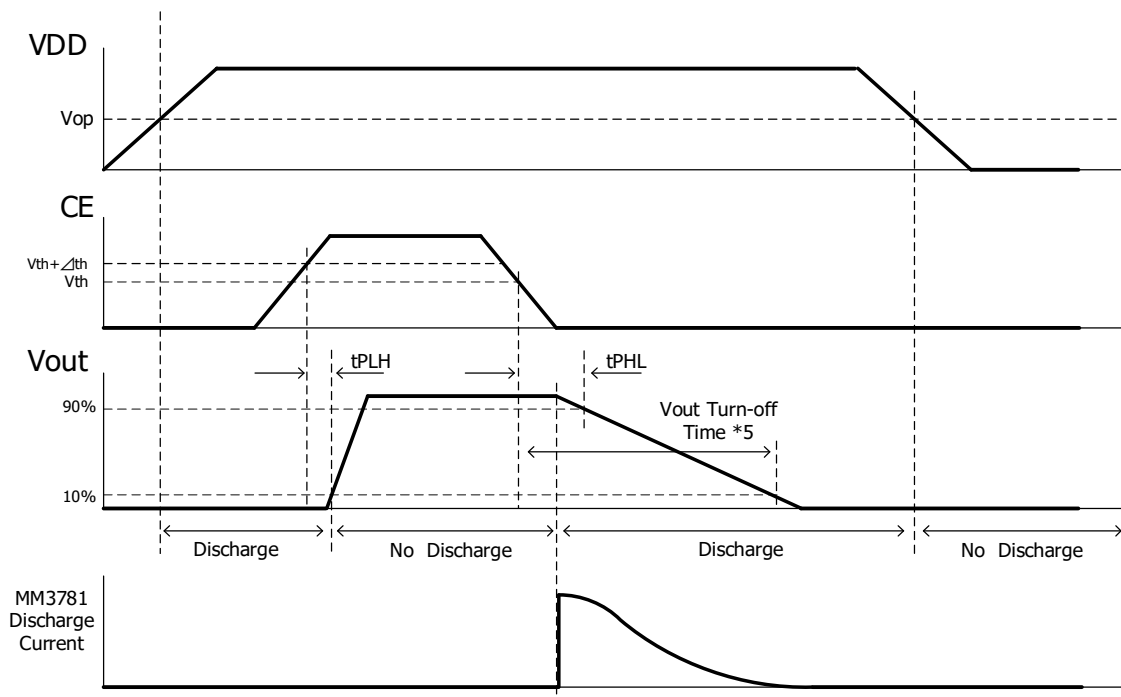| VCE	Regulator Vout	MM3781 Function
High	ON	Non Active
Low	OFF	Active （Discharge）

Timing Chart

Fig2.Timing chart

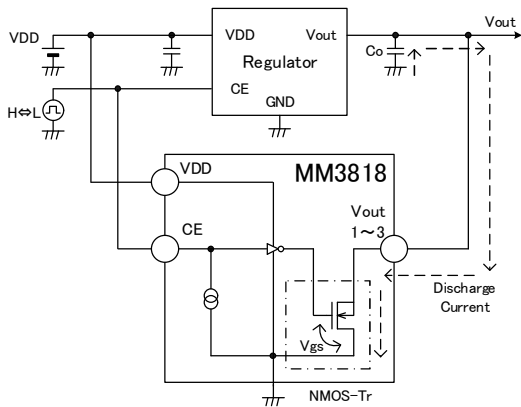Fig2 is Timing chart by "Application circuit". Vout is the regulator output voltage.
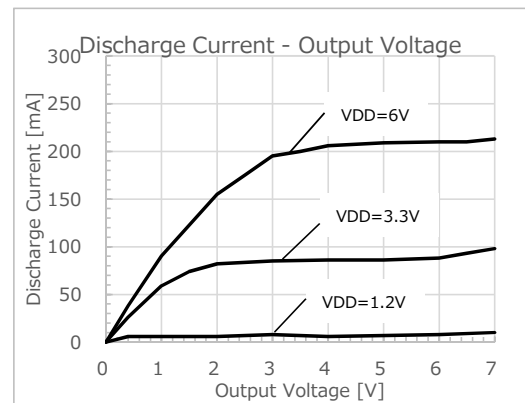

Fig3.Measurement circuit

Fig4.Discharge Current characteristics
(NMOS-Tr Current characteristics)

As shown in Fig3, Output device of the MM3818 is an NMOS transistor.
The voltage between gate and source Vgs is "Vgs=VDD" when CE=L.
From current characteristics of NMOS-Tr, discharge current change with VDD
And discharge current change with output voltage Vout.
Refer to Fig4 for the relationship between VDD, Vout and discharge current.

Note

1. The IC must be used within the absolute maximum ratings.
   If the IC is used over the absolute maximum ratings, it may be destroyed or deteriorated.

2. The output current may be limited by the package power dissipation.

3. The wiring routing of VDD, Vout and GND is long, it may cause noise and operation instability.
   Wiring should be as short as possible.

4. If the function is not stable, it is recommended to connect an input capacitor with VDD.

5. The output voltage is active at CE=Low. (CE=Low, Vout Discharge: ON)

6. The IC can force voltage at VDD pin in condition of VDD<Vout.
   But VDD input voltage can't be forced over the absolute maximum ratings.

7. The IC can force voltage at CE pin in condition of CE>VDD.
   But CE input voltage can't be forced over the absolute maximum ratings.

8. The CE pin has a pull-down device.
   The pull-down device characteristics refer to typical performance characteristics.

9. The IC don't has a over-current protection and a thermal protection circuits.

10. If the slew rate of the CE voltage is slow, discharge current may flow from the regulator-output
    to the MM3818-output due to the difference in the CE threshold voltage of the Regulator and MM3818.

11. Input current (through current) flows when the difference between VDD and CE is large. Please be careful.
    Refer to the "Input Current (through current) characteristics" of 13-1.TYPICAL PERFORMANCE CHARACTERISTICS .

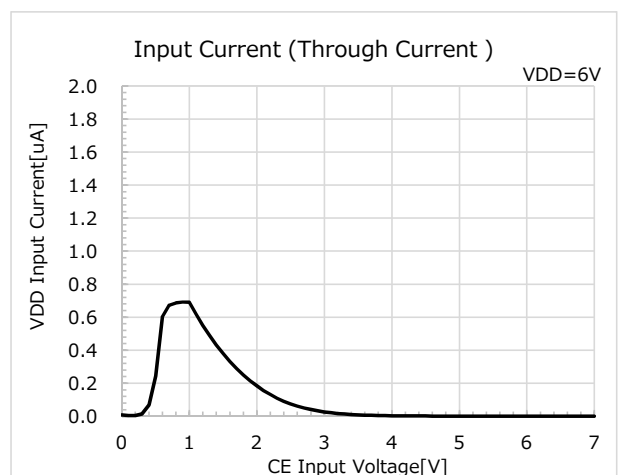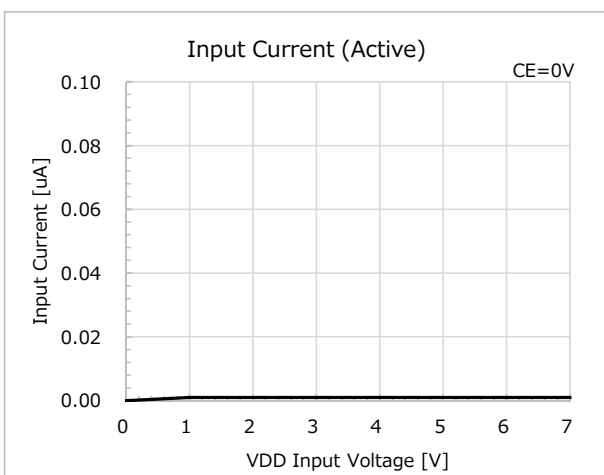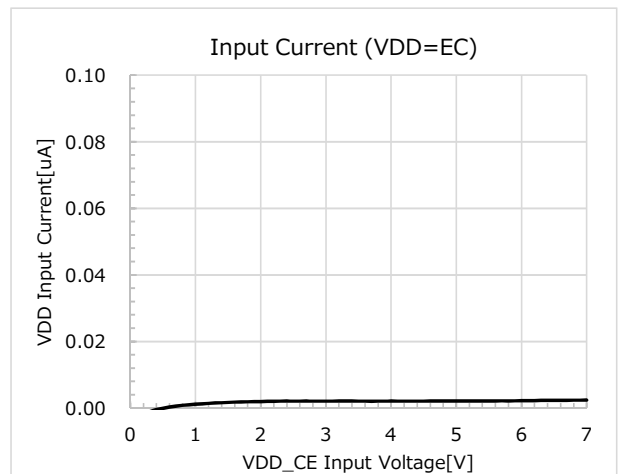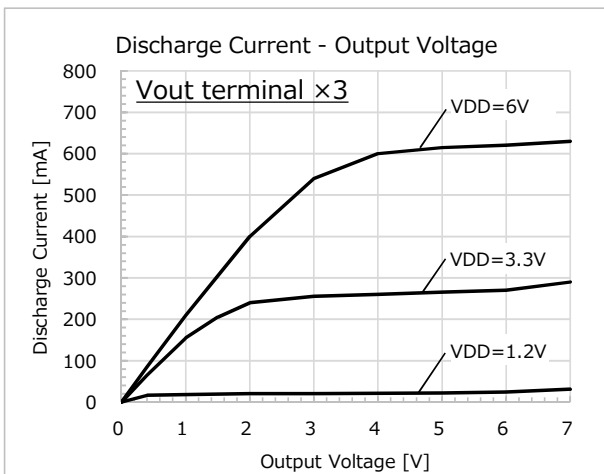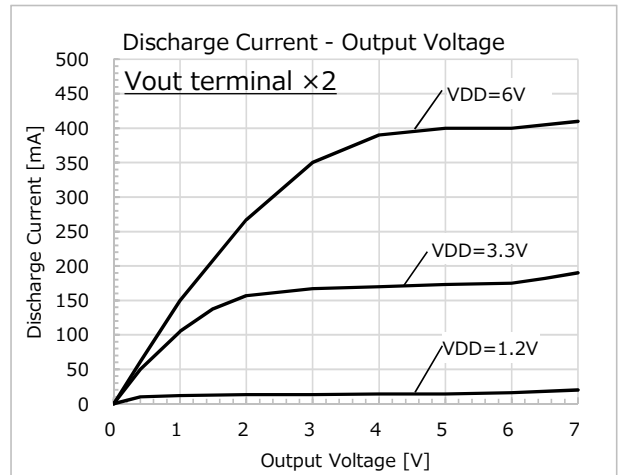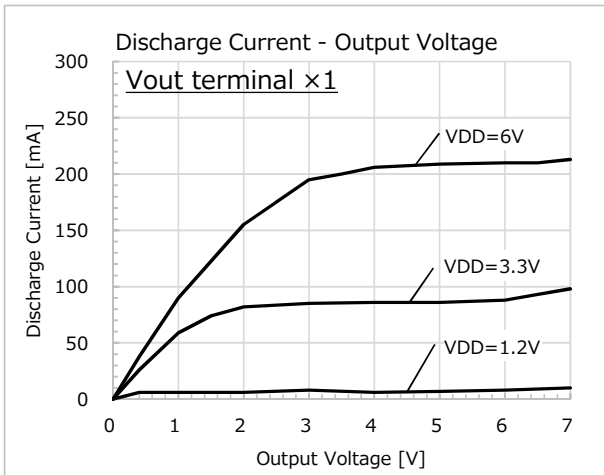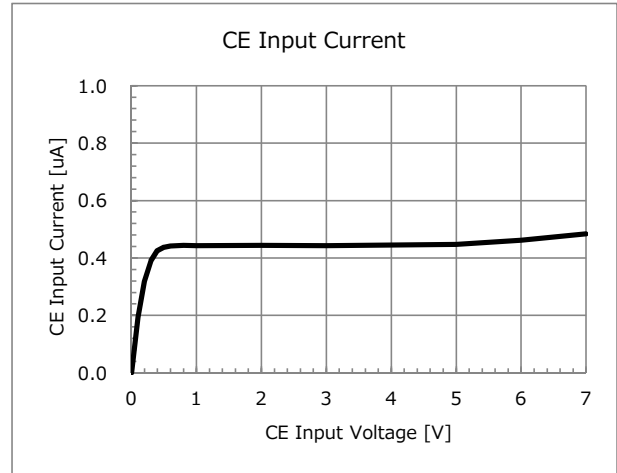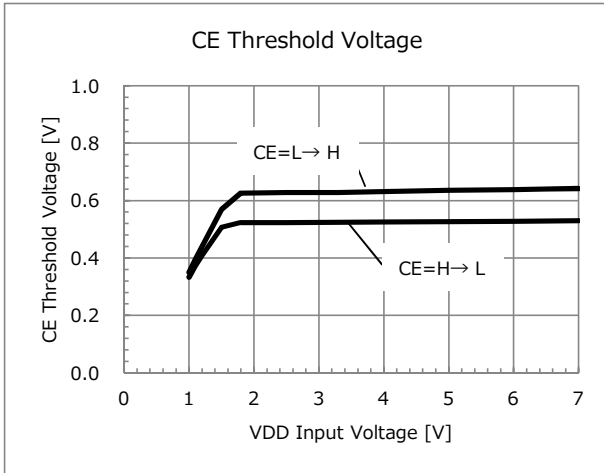12. Connect unused Vout terminals to open or GND.

Typical Performance Characteristics

(Ta=25℃ unless otherwise specified)

Discharge Current - Output Voltage

Vout terminal ×1

VDD=6V
VDD=3.3V
VDD=1.2V

X axis: Output Voltage [V] (0 to 7)
Y axis: Discharge Current [mA] (0 to 300)

Discharge Current - Output Voltage

Vout terminal ×2

VDD=6V
VDD=3.3V
VDD=1.2V

X axis: Output Voltage [V] (0 to 7)
Y axis: Discharge Current [mA] (0 to 500)

Discharge Current - Output Voltage

Vout terminal ×3

VDD=6V
VDD=3.3V
VDD=1.2V

X axis: Output Voltage [V] (0 to 7)
Y axis: Discharge Current [mA] (0 to 800)

Input Current (VDD=EC)

X axis: VDD_CE Input Voltage[V] (0 to 7)
Y axis: VDD Input Current[uA] (0.00 to 0.10)

Input Current (Active)

CE=0V

X axis: VDD Input Voltage [V] (0 to 7)
Y axis: Input Current [uA] (0.00 to 0.10)

Input Current (Through Current)

VDD=6V

X axis: CE Input Voltage[V] (0 to 7)
Y axis: VDD Input Current[uA] (0.0 to 2.0)

9

Jun, 2023 Rev.0

Typical Performance Characteristics   (Ta=25℃ unless otherwise specified)

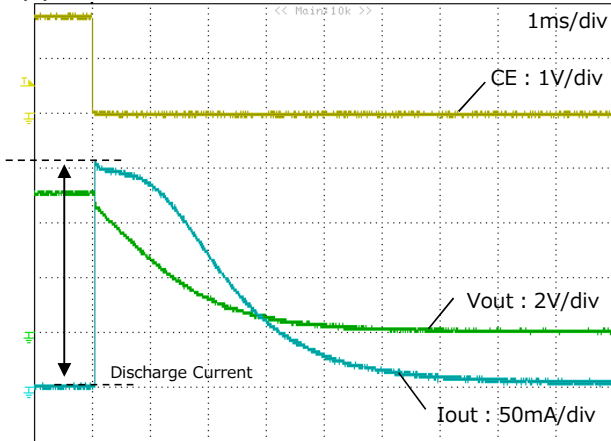CE Threshold Voltage

CE=L→ H

CE=H→ L

CE Input Current

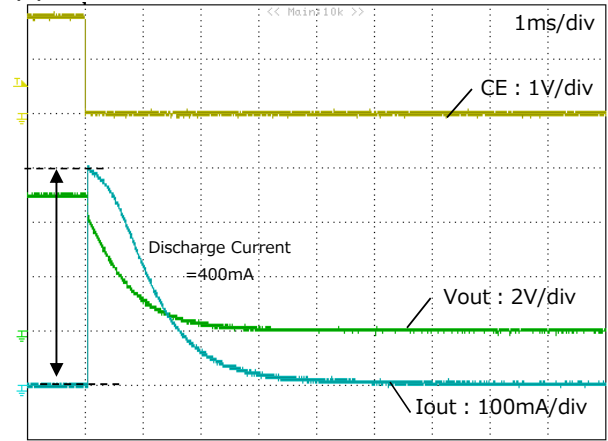## Typical Performance Characteristics

(Ta=25℃ unless otherwise specified)

- Discharge wave
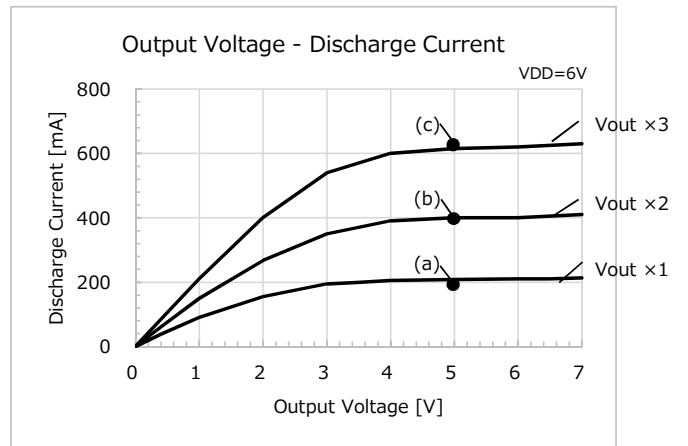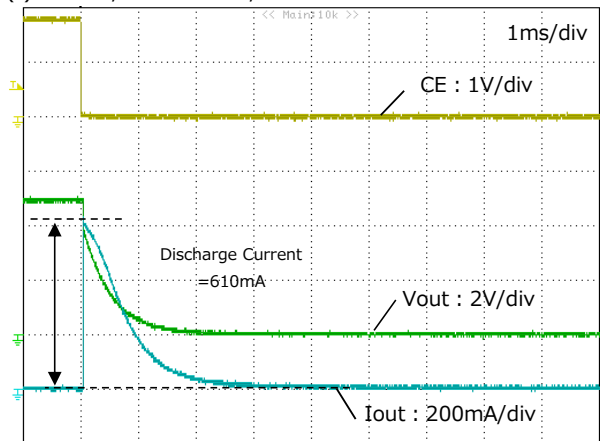
Connect positive LDO (5.0V), Use one Vout terminal

(a)VDD=6V, CE=1.8V→0V, Co=100uF

(b)VDD=6V, CE=1.8V→0V, Co=100uF

(c)VDD=6V, CE=1.8V→0V, Co=100uF

Output Voltage - Discharge Current

Vout turn-off time is specified by CE=L to Vout × 10%.
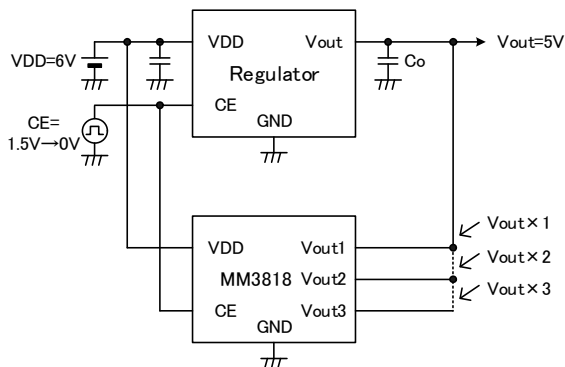
Measured in no load condition .

11

Typical Performance Characteristics

- Vout Turn-off Time
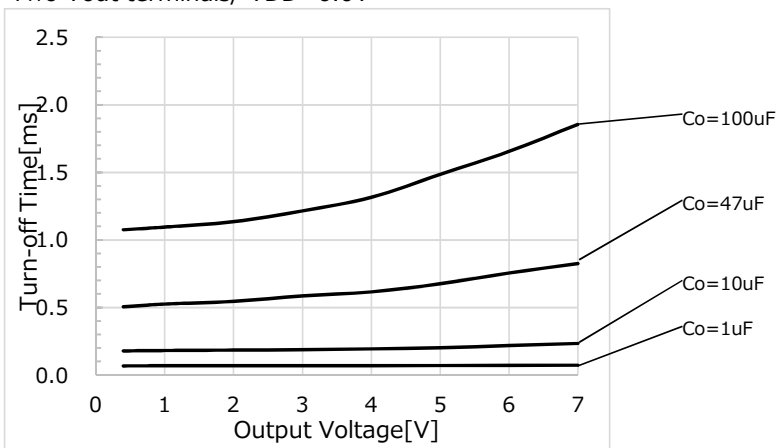
One Vout terminal / VDD=6.0V

Turn-off Time[ms] vs Output Voltage[V]

- Co=100uF
- Co=47uF
- Co=10uF
- Co=1uF

Two Vout terminals/ VDD=6.0V

Turn-off Time[ms] vs Output Voltage[V]

- Co=100uF
- Co=47uF
- Co=10uF
- Co=1uF

Three Vout terminals / VDD=6.0V

Turn-off Time[ms] vs Output Voltage[V]

- Co=100uF
- Co=47uF
- Co=10uF
- Co=1uF