1ch negative voltage discharge IC

MM3782 Series

Overview

This IC is a negative output discharge IC for fast discharge the electric charge of capacitor when power supply is turned off. The IC can be used to turn off the multiple power supply of image sensor etc. And it is easy to control by positive voltage of microcomputer. The IC can reduce the parts, the peripheral wiring and loss current for a built-in an inverter and NMOS transistor. Package is small PLP-4C/SC-82 that contribute to reduce a space of PCB.

Features

- Negative voltage discharge
- NMOS with low on-resistance
- Fast discharge

Main specifications

- Maximum rating supply voltag : -6.0V to 0.3V
- Operating voltage range : -5.5V to 1.8V
- Operating ambient temperatu : -40℃ to 85℃
- Output current : 500mA
- Input current(Active) : Typ. 1.0uA
- Input current(Non active) : Typ. 1.0uA
- CE input voltage H : Min. 1.2V
- CE input voltage L : Max.0.3V
- CE input current : Typ. 0.1uA
- Output current : Typ. 20mA (VSS=-3.0V, VCE=0V, VOUT=-0.1V)
  Typ. 250mA (VSS=-3.0V, VCE=0V, VOUT=-3.0V)
  Typ. 25mA (VSS=-5.0V, VCE=0V, VOUT=-0.1V)
  Typ. 500mA (VSS=-5.0V, VCE=0V, VOUT=-3.0V)
- H Transfer delay time : Typ. 1us (VSS=-5V, CE=0⇒5V)
- L Transfer delay time : Typ. 100us (VSS=-5V, CE=5V⇒0V)
- Vout Turn-off time : Typ. 400us (VSS=-5V, Co=47uF, VOUT=-1.3V⇒-0.1V)

Packages

- SC-82ABB
- PLP-4C

Application

- Power OFF sequence control.

Mitsumi Electric CO.,LTD.
Semiconductor Business Division
Strategy Engineering Department
tel:+81-46-230-3470

Jun, 2023 Rev.0

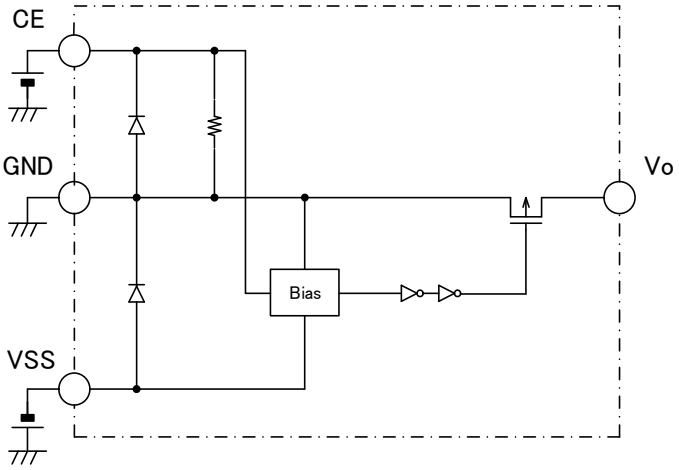
Model Name

M M 3 7 8 2 X X X X

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

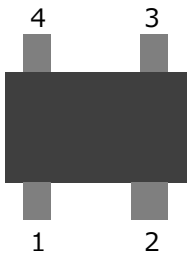
(A)	Function Type	A	L Transfer delay time Typ. 100us
(B)	Package	U	SC-82ABB
		R	PLP-4C
(C)	Packing specifications 1	R	R housing (Standard)
(D)	Packing specifications 2	E	Embos tape / Halogencontained (SC-82ABB) Embos tape / Halogen free (PLP-4C)

Block Diagram



Pin Configuration

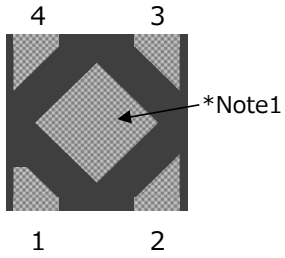
■ SC-82ABB



Top view

Pin No.	Pin name	Function
1	CE	ON/OFF-control pin with pull-down resistar CE=L ⇒ discharge ON, CE=H ⇒ discharge OFF
2	VSS	Voltage supply pin (Negative voltage)
3	VOUT	Output pin (Open-drain)
4	GND	GND pin

■ PLP-4C



Top view

Pin No.	Pin name	Function
1	VOUT	Output pin (Open-drain)
2	VSS	Voltage supply pin (Negative voltage)
3	CE	ON/OFF-control pin with pull-down resistar CE=L ⇒ discharge ON, CE=H ⇒ discharge OFF
4	GND	GND pin

*Note1:Heat spreader bottom with VSS.

Absolute Maximum Ratings

Item		Symbol	Min.	Max.	Unit
Storage temperature		Tstg	-55	150	℃
Junction temperature		Tj_{MAX}	-	150	℃
Supply voltage		VSS	-6	0.3	V
CE input voltage		VCE	-0.3	5.0	V
Output voltage		VOUT	-6	0.3	V
Output current		IOUT	-	1	A
Power dissipation	SC-82ABB	Pd	-	650	mW
*Note2	PLP-4C		-	1,300	mW

*Note2:JEDEC51-7 standard

推奨動作範囲

Item	Symbol	Min.	Max.	Unit
Operating junction temperature	Topr	-40	85	℃
Operating voltage	Vop	-5.5	-1.8	V

Electrical Characteristics

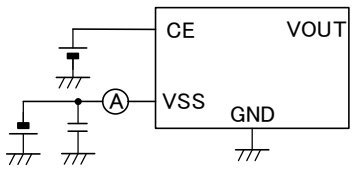
(Ta=25℃ unless otherwise specified))

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test Circuit
Input current(Active)	ISS	VSS=-5.5V, VCE=0V	-	1.0	2.0	μA	1
Input current(Non active)	ISSOFF	VSS=-5.5V, VCE=5V	-	1.0	2.0	μA	1
CE input voltage H	VCE_H		1.2	-	5.0	V	2
CE input voltage L	VCE_L		0.0	-	0.3	V	2
CE input current H	ICE	VCE=5V	-	5	-	uA	2
Output current	Iout	VSS=-3V, VCE=0V, Vout=-0.1V	8	20	-	mA	3
		VSS=-3V, VCE=0V, Vout=-3V	100	250	-	mA	3
		VSS=-5V, VCE=0V, Vout=-0.1V	10	25	-	mA	3
		VSS=-5V, VCE=0V, Vout=-3V	300	500	-	mA	3
Output leakage current	Ileak	VSS=-5V, VOUT=-5V	-	-	0.1	uA	3
H transfer delay time *Note3	tPLH	VSS=-5V, VCE=0V→5V	-	1	-	us	4
L transfer delay time *Note3	tPHL	VSS=-5V, VCE=5V→0V	-	100	-	us	5
Turn-off time *Note3	tf	VSS=-5V, Co=47uF VOUT=-1.3 V→-0.1V	-	400	-	us	5

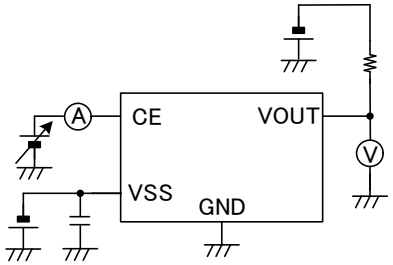
*Note3:The parameter is guaranteed by design.

測定回路図

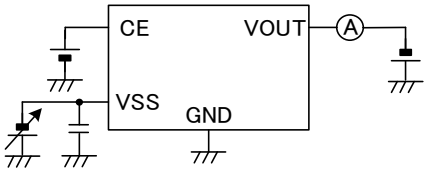
(1)



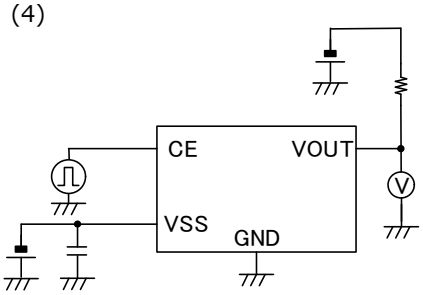
(2)



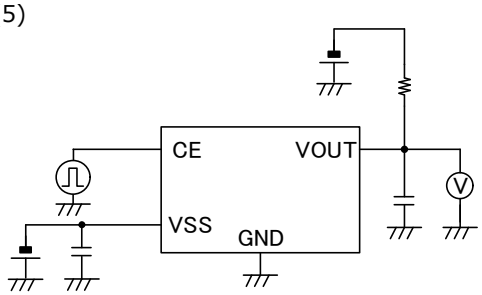
(3)



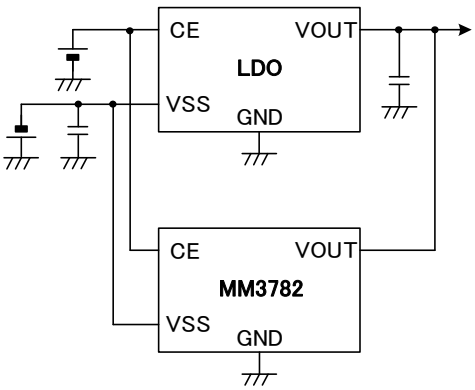
(4)

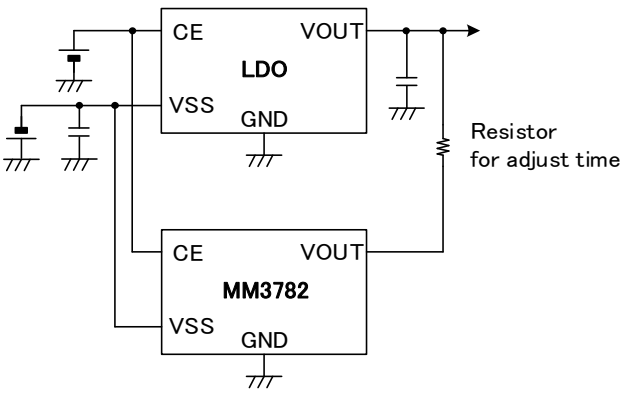


(5)



応用回路図





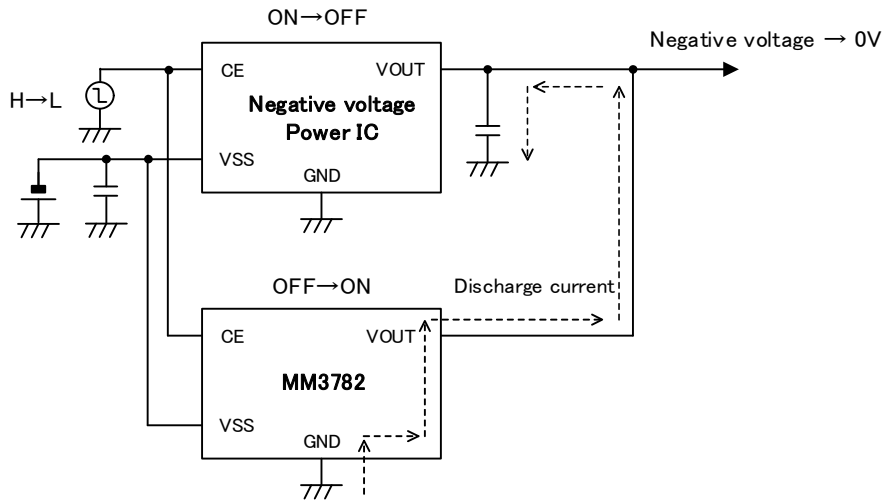
In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, we shall not be liable for any such problem, nor grant a license therefore.

Explanation About Function

- About Function

MM3782 is dhischarge IC for negative voltage.
Electric charge in capacitor discharged and voltage become 0V.
Used to output in negative power IC, voltage is turn off fast, and sequential control is easy.

MM3782 turn on When negative voltage power IC turn off, discharge current occur.
Electric charge in output capacitor discharged and output turn off to 0V.



- Voltage dependence of discharge current

Output device in MM3782 is PMOS FET.
The voltage between gate and source is equal to input voltage VSS, output current chage by VSS.
Refer to Output Voltage - Output Current in TYPICAL PERFORMANCE CHARACTERISTICS.

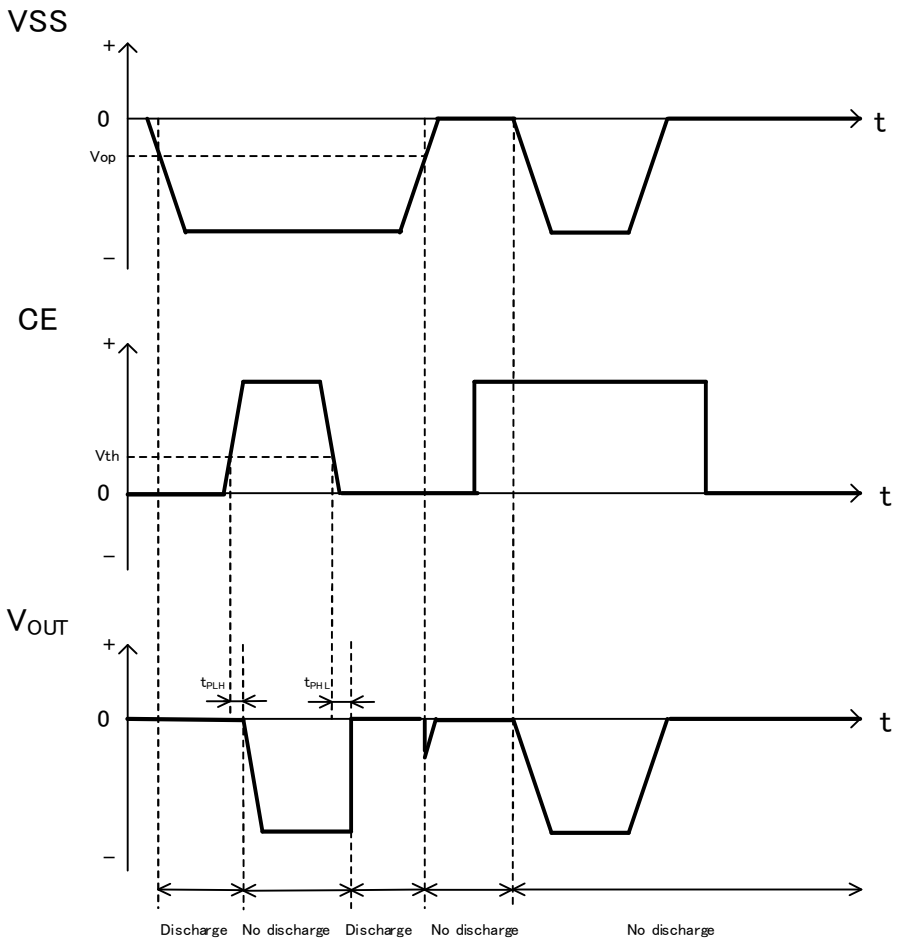
- Vout Turn-off time

Turn-off time t depend below fomulation by capacitor Co connected VOUT and discharge current IOUT.
If VOUT connected load device, discharge current include this current.

$$Q=Co\times VOUT(t)=IOUT(t)\times t$$

Q : electric charge, Co : output capacitor, VOUT(t) : output voltage,
IOUT(t) : discharge current, t : time

Timing Chart



Timing chart by "Application circuit".

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 wire of VSS and GND is required to print full ground plane for noise and stability.

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

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

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

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

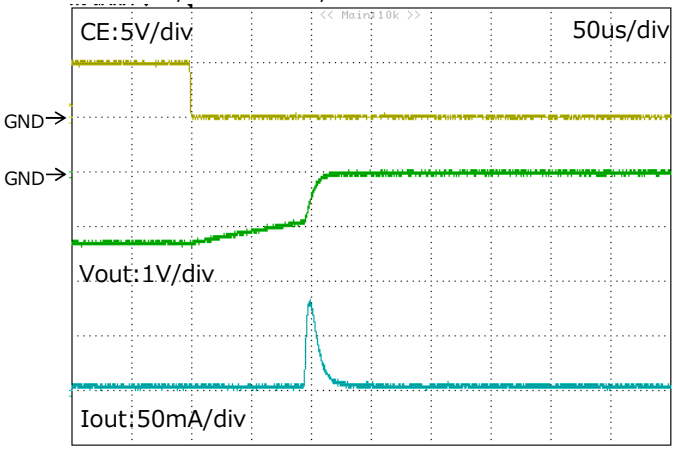
Typical Performance Characteristics

(Ta=25℃ unless otherwise specified)

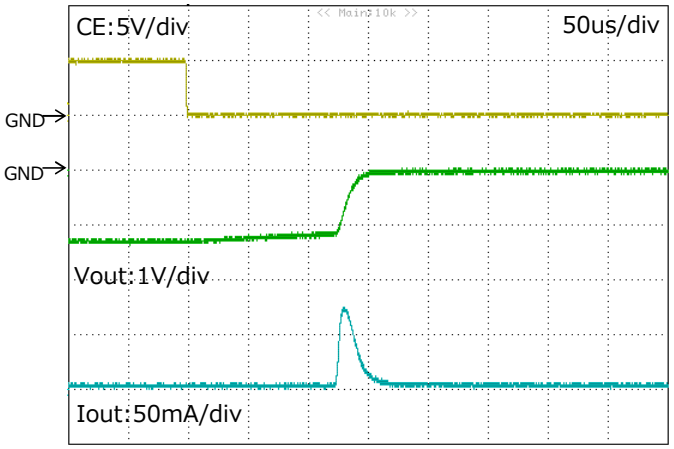
■ Discharge wave

Connect negative LDO (-1.3V).

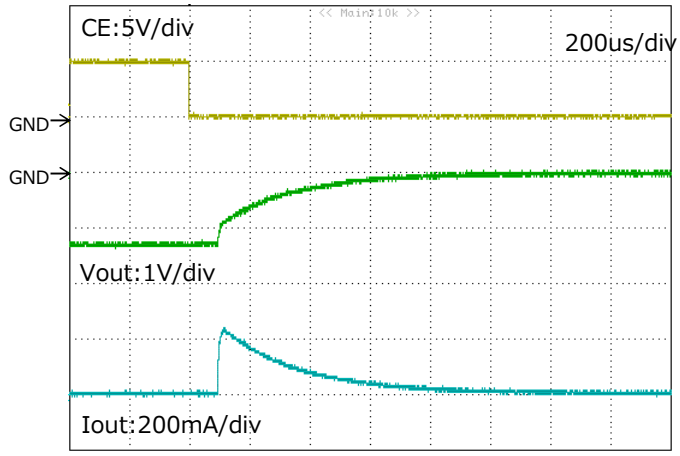
VSS=-5V, CE=5V→0V, Co=1uF



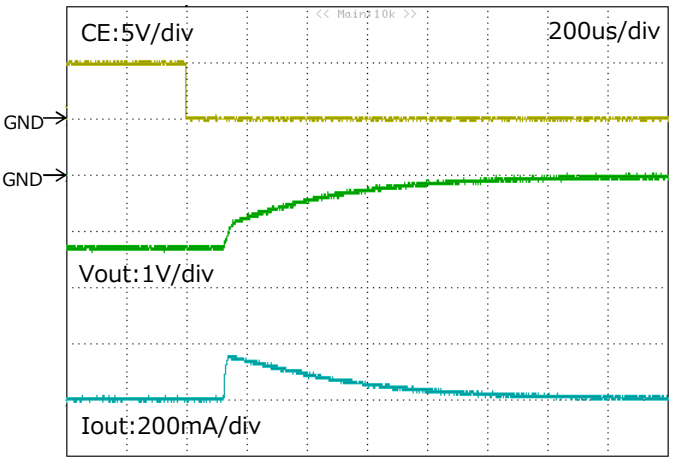
VSS=-3V, CE=5V→0V, Co=1uF



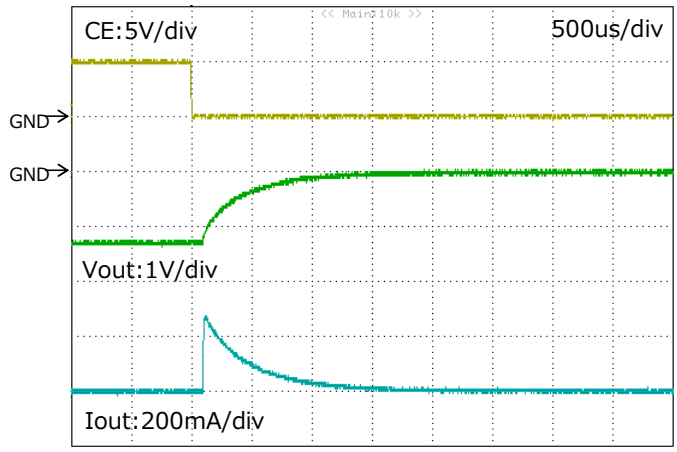
VSS=-5V, CE=5V→0V, Co=47uF



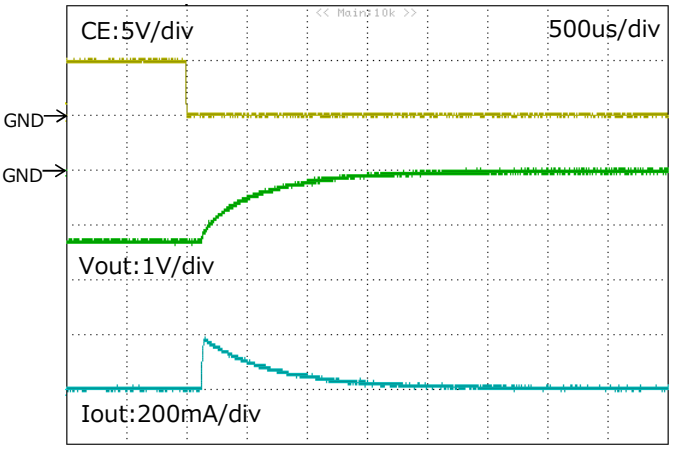
VSS=-3V, CE=5V→0V, Co=47uF



VSS=-5V, CE=5V→0V, Co=100uF



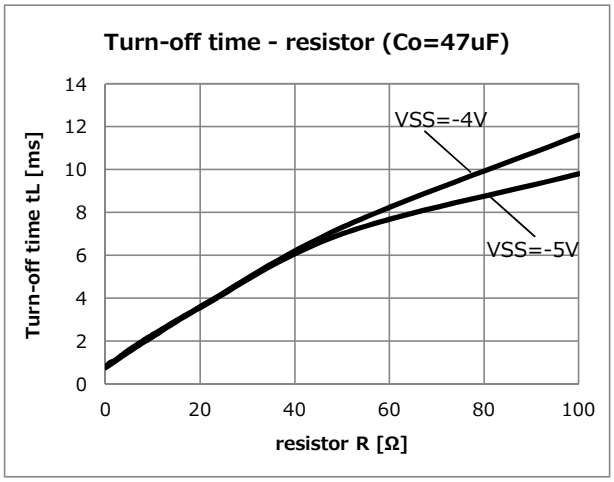
VSS=-3V, CE=5V→0V, Co=100uF

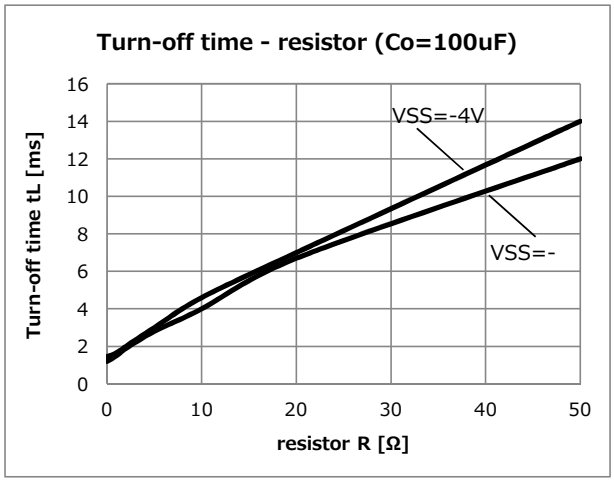


Typical Performance Characteristics

(Ta=25℃ unless otherwise specified)

- Turn-off with resistor to adjust time





Typical Performance Characteristics

(Ta=25℃ unless otherwise specified)