Datasheet

1 Channel High Side Switch IC

Current Limit High Side Switch IC

BD82048QVZ BD82049QVZ BD8205xQVZ Series

Description

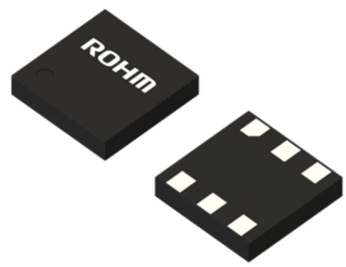
BD820xxQVZ are Single Channel High Side Switch ICs employing N-channel power MOSFET with low On Resistance for the power supply line of universal serial bus (USB).
These ICs have a built-in over current detection circuit, thermal shutdown circuit, under voltage lockout and soft start circuit.

Key Specifications

- Input Voltage Range: 2.7V to 5.5V
- On Resistance(V_{IN}=5V): 63mΩ(Typ)
- Over-Current Threshold
  - BD82048QVZ, BD82049QVZ: 1.15A(Typ)
  - BD82050QVZ, BD82051QVZ: 1.65A(Typ)
  - BD82052QVZ, BD82053QVZ: 2.20A(Typ)
  - BD82054QVZ, BD82055QVZ: 2.80A(Typ)
- Standby Current: 0.01µA(Typ)
- Operating Temperature Range: -40°C to +85°C

Package

Package	W(Typ) x D(Typ) x H(Max)
SMMP006Z2020	2.00mm x 2.00mm x 0.40mm



SMMP006Z2020

Features

- Over-Current Threshold
  - 1.15A(BD82048QVZ, BD82049QVZ)
  - 1.65A(BD82050QVZ, BD82051QVZ)
  - 2.20A(BD82052QVZ, BD82053QVZ)
  - 2.80A(BD82054QVZ, BD82055QVZ)
- Control Input Logic
  - Active-High (BD82048QVZ, BD82050QVZ, BD82052QVZ, BD82054QVZ)
  - Active-Low (BD82049QVZ, BD82051QVZ, BD82053QVZ, BD82055QVZ)
- Output Discharge Function
- Reverse Current Protection when Power Switch Off
- Thermal Shutdown
- Open-Drain Fault Flag Output
- Under-Voltage Lockout
- OCD Fast Response
- Soft-Start Circuit

Applications

USB hub in consumer appliances, PC,
PC peripheral equipment, etc.

Typical Application Circuit

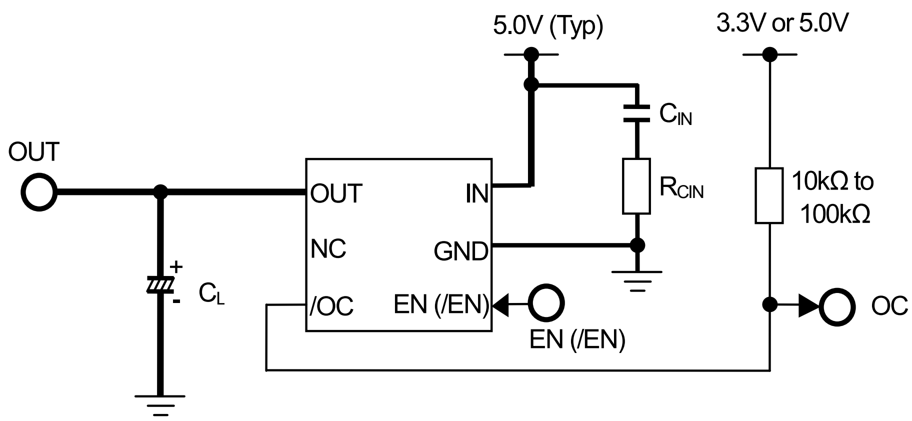


Figure 1. Typical Application Circuit

○Product structure : Silicon monolithic integrated circuit ○This product has no designed protection against radioactive rays

Contents

Block Diagram

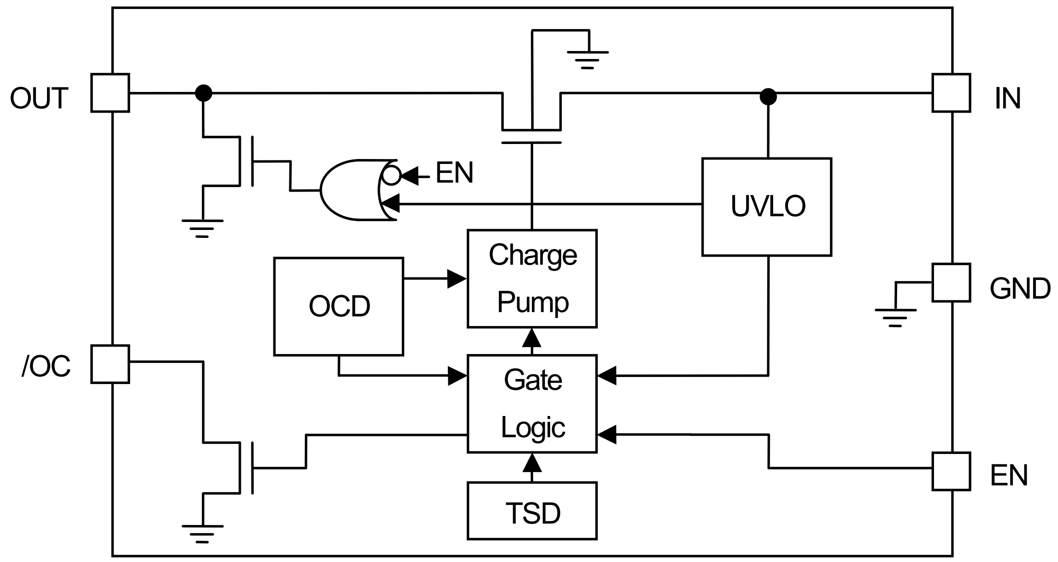


Figure 2. Block Diagram
(BD82048QVZ, BD82050QVZ, BD82052QVZ, BD82054QVZ)

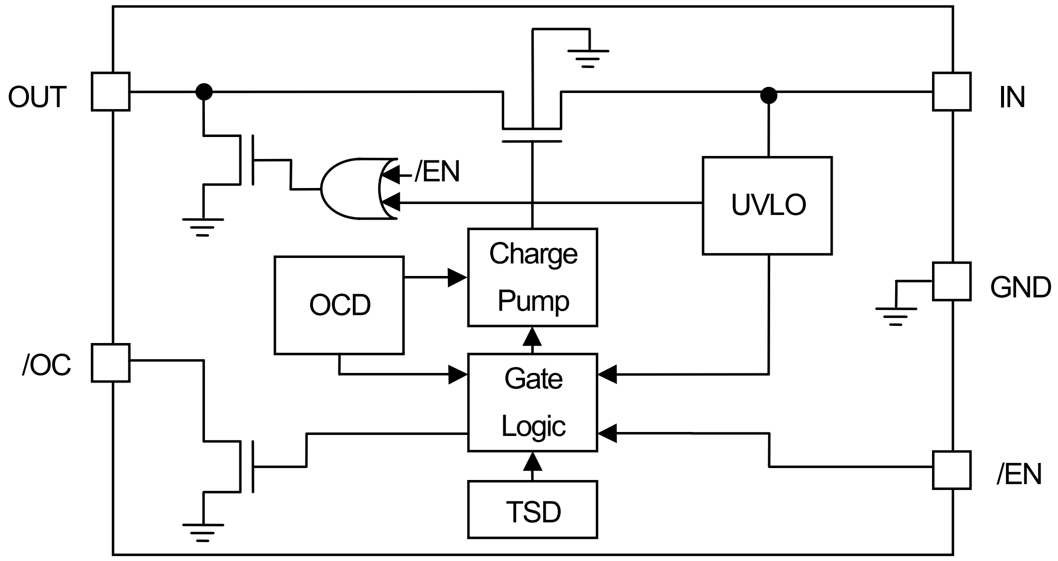


Figure 3. Block Diagram
(BD82049QVZ, BD82051QVZ,BD82053QVZ, BD82055QVZ)

Pin Configuration

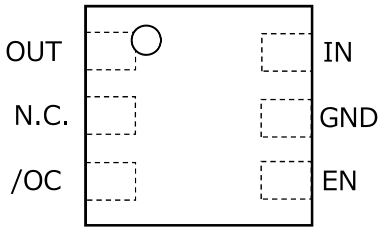


Figure 4. Pin Configuration (TOP VIEW)
(BD82048QVZ, BD82050QVZ,
BD82052QVZ, BD82054QVZ)

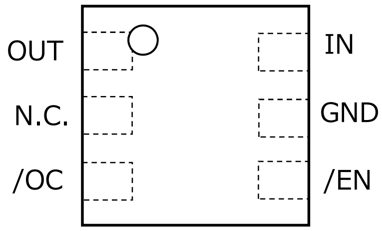


Figure 5. Pin Configuration (TOP VIEW)
(BD82049QVZ, BD82051QVZ,
BD82053QVZ, BD82055QVZ)

Pin Descriptions

Pin No.	Symbol	I/O	Function
1	OUT	O	Power switch output
2	N.C.	-	No Connection(Note 1)
3	/OC	O	Error flag output Low when over-current or thermal shutdown is activated Open drain output
4	EN, /EN	I	Enable input EN: High-level input turns on the switch /EN: Low-level input turns on the switch High level input > 2.0V, Low level input < 0.8V
5	GND	-	Ground
6	IN	I	Power supply input Input pin to the power switch and power supply input pin of the internal circuit

(Note 1) N.C. Pin is recommended to be shorted to GND. However, it can also be left open since it isn't internally connected to the IC.

Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
IN Supply Voltage	V_{IN}	-0.3 to +6.0	V
EN (/EN) Input Voltage	V_{EN}, $V_{/EN}$	-0.3 to +6.0	V
/OC Voltage	$V_{/OC}$	-0.3 to +6.0	V
/OC Sink Current	$I_{/OC}$	5	mA
OUT Voltage	V_{OUT}	-0.3 to +6.0	V
Maximum Junction Temperature	Tjmax	150	°C
Storage Temperature Range	Tstg	-55 to +150	°C

Caution 1: *Operating the IC over the absolute maximum ratings may damage the IC. The damage can either be a short circuit between pins or an open circuit between pins and the internal circuitry. Therefore, it is important to consider circuit protection measures, such as adding a fuse, in case the IC is operated over the absolute maximum ratings.*

Caution 2: *Should by any chance the maximum junction temperature rating be exceeded the rise in temperature of the chip may result in deterioration of the properties of the chip. In case of exceeding this absolute maximum rating, design a PCB boards with thermal resistance taken into consideration by increasing board size and copper area so as not to exceed the maximum junction temperature rating.*

Thermal Resistance(Note 1)

Parameter	Symbol	Thermal Resistance (Typ)		Unit
		1s(Note 3)	2s2p(Note 4)	
SMMP006Z2020				
Junction to Ambient	θ_{JA}	380.2	196.0	°C/W
Junction to Top Characterization Parameter(Note 2)	Ψ_{JT}	126	93	°C/W

(Note 1) Based on JESD51-2A(Still-Air).

(Note 2) The thermal characterization parameter to report the difference between junction temperature and the temperature at the top center of the outside surface of the component package.

(Note 3) Using a PCB board based on JESD51-3.

Layer Number of Measurement Board	Material	Board Size
Single	FR-4	114.3mm x 76.2mm x 1.57mmt

Top	
Copper Pattern	Thickness
Footprints and Traces	70μm

(Note 4) Using a PCB board based on JESD51-7.

Layer Number of Measurement Board	Material	Board Size
4 Layers	FR-4	114.3mm x 76.2mm x 1.6mmt

Top		2 Internal Layers		Bottom	
Copper Pattern	Thickness	Copper Pattern	Thickness	Copper Pattern	Thickness
Footprints and Traces	70μm	74.2mm x 74.2mm	35μm	74.2mm x 74.2mm	70μm

Recommended Operating Conditions

Parameter	Symbol	Rating			Unit
		Min	Typ	Max	
IN Operating Voltage	V_{IN}	2.7	5.0	5.5	V
Operating Temperature	Topr	-40	-	+85	°C

Electrical Characteristics (V_{IN}= 5V, Ta= 25°C, unless otherwise specified.)

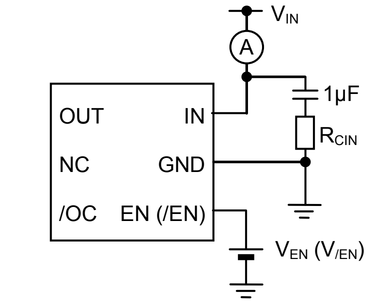
DC Characteristics

Parameter		Symbol	Limit			Unit	Conditions
			Min	Typ	Max		
Operating Current		I_{DD}	-	110	150	μA	V_{EN}=5V, V_{OUT}=Open (Active-High) $V_{/EN}$=0V, V_{OUT}=Open (Active-Low)
Standby Current		I_{STB}	-	0.01	5	μA	V_{EN}=0V, V_{OUT}=Open (Active-High) $V_{/EN}$ =5V, V_{OUT}=Open (Active-Low)
EN Input Voltage		V_{ENH}, $V_{/ENH}$	2.0	-	-	V	High input
		V_{ENL}, $V_{/ENL}$	-	-	0.8	V	Low input
EN Input Leakage		I_{EN}, $I_{/EN}$	-1	+0.01	+1	μA	V_{EN}, $V_{/EN}$=0V or 5V
On Resistance		R_{ON}	-	63	80	mΩ	I_{OUT}=0.5A
Reverse Leak Current		I_{REV}	-	-	1	μA	V_{OUT}=5.5V, V_{IN}=0V
Over-Current Threshold	BD82048QVZ BD82049QVZ	I_{TH}	0.86	1.15	1.44	A	Current Load Slew rate 100A/s
	BD82050QVZ BD82051QVZ		1.24	1.65	2.06	A	
	BD82052QVZ BD82053QVZ		1.65	2.20	2.75	A	
	BD82054QVZ BD82055QVZ		2.10	2.80	3.50	A	
Short Circuit Output Current	BD82048QVZ BD82049QVZ	I_{SC}	0.45	0.75	1.05	A	V_{OUT}=0V, C_L=100μF RMS
	BD82050QVZ BD82051QVZ		0.66	1.10	1.54	A	
	BD82052QVZ BD82053QVZ		0.90	1.50	2.10	A	
	BD82054QVZ BD82055QVZ		1.20	2.00	2.80	A	
Output Discharge Resistance		R_{DISC}	-	55	100	Ω	I_{OUT}=1mA, V_{EN}=0V (Active-High) I_{OUT}=1mA, $V_{/EN}$=5V (Active-Low)
/OC Output Low Voltage		$V_{/OC}$	-	-	0.4	V	$I_{/OC}$=1mA
/OC Output Leak Current		$IL_{/OC}$	-	0.01	1	μA	$V_{/OC}$=5V
UVLO Threshold		V_{TUVH}	2.1	2.3	2.5	V	V_{IN} increasing
		V_{TUVL}	2.0	2.2	2.4	V	V_{IN} decreasing

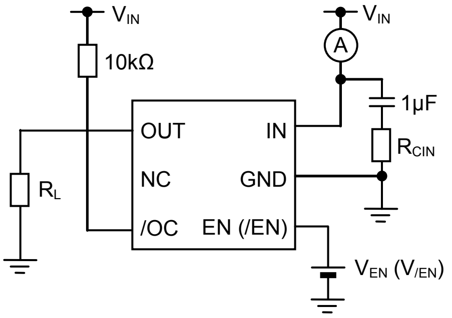
AC Characteristics

Parameter	Symbol	Limit			Unit	Conditions
		Min	Typ	Max		
Output Rise Time	t_{ON1}	-	0.5	10	ms	R_L=10Ω
Output Turn-on Time	t_{ON2}	-	0.6	20	ms	
Output Fall Time	t_{OFF1}	-	2	10	μs	
Output Turn-off Time	t_{OFF2}	-	4	20	μs	
/OC Delay Time	$t_{/OC}$	4	7	15	ms	

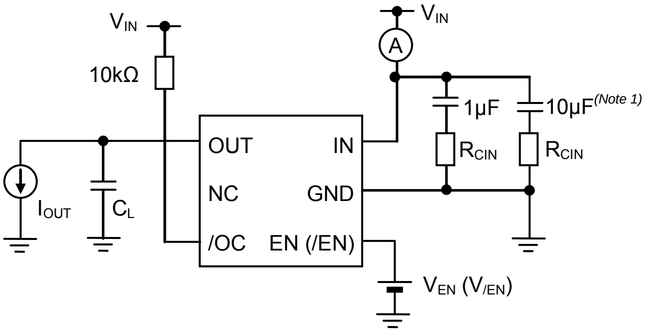
Measurement Circuit



Operating Current, Standby Current

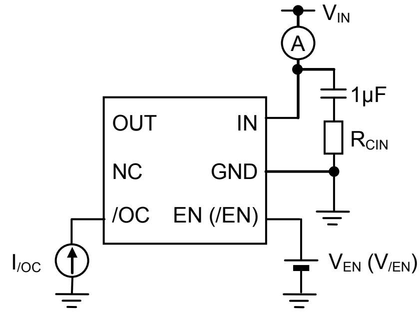


EN Input Voltage, Output Rise/Fall Time



On Resistance, Over-Current Protection

(Note 1) Use capacitance of 10µF or more at output short test by using external supply.



/OC Output Low Voltage

Figure 6. Measurement Circuit

Timing Diagram

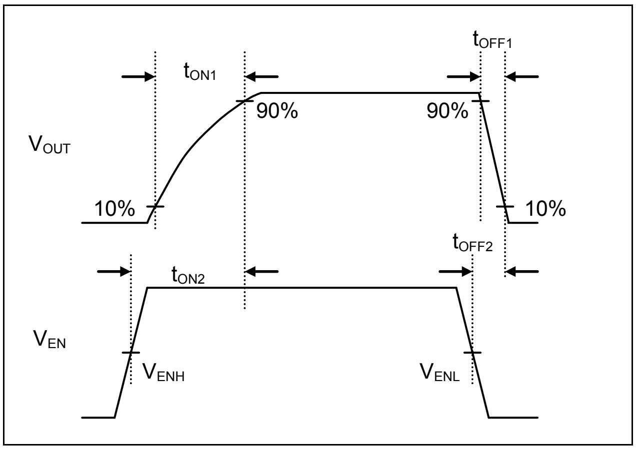


Figure 7. Output Rise/Fall Time (Active-High)

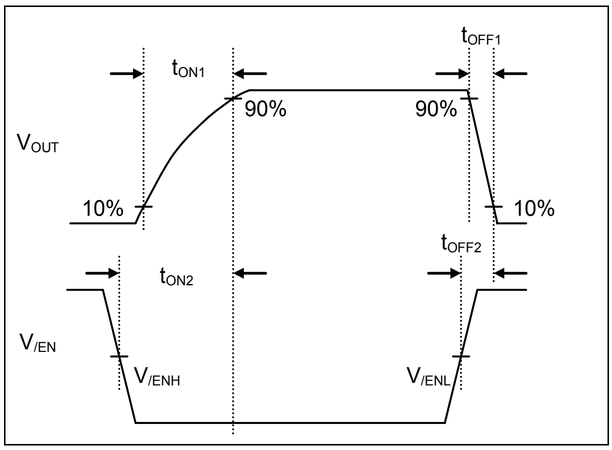


Figure 8. Output Rise/Fall Time (Active-Low)

Typical Performance Curves

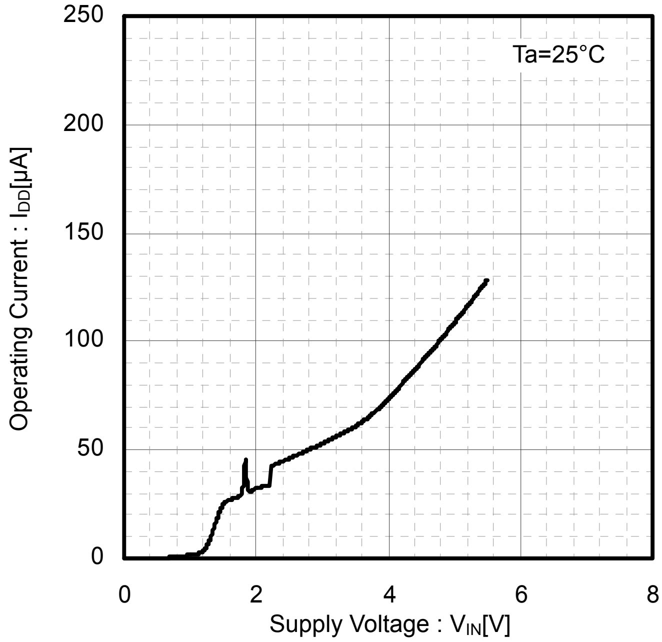


Figure 9. Operating Current vs Supply Voltage (EN Enable)

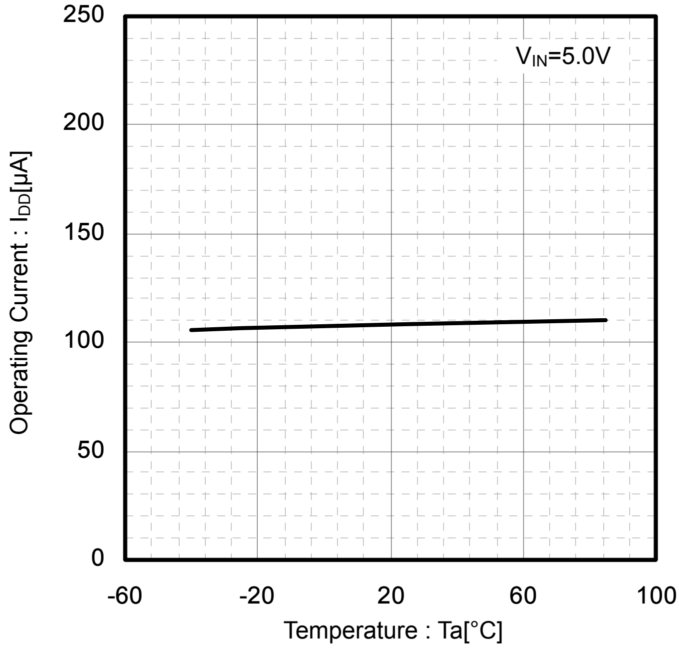


Figure 10. Operating Current vs Temperature (EN Enable)

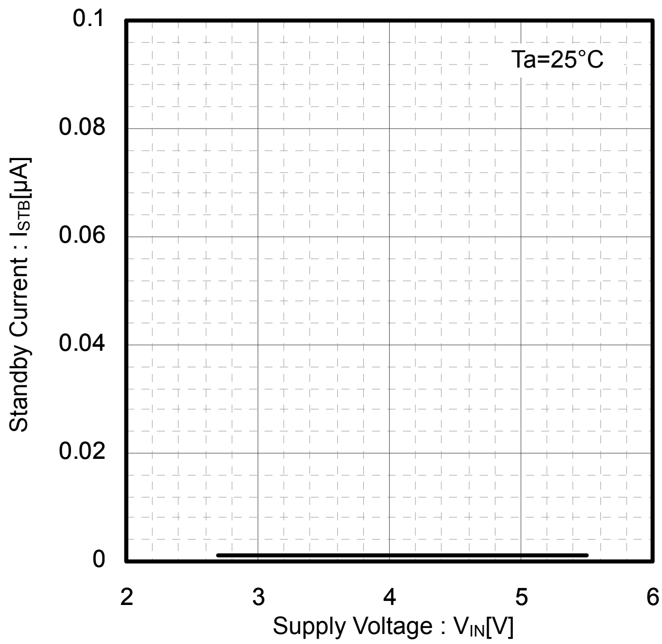


Figure 11. Standby Current vs Supply Voltage (EN Disable)

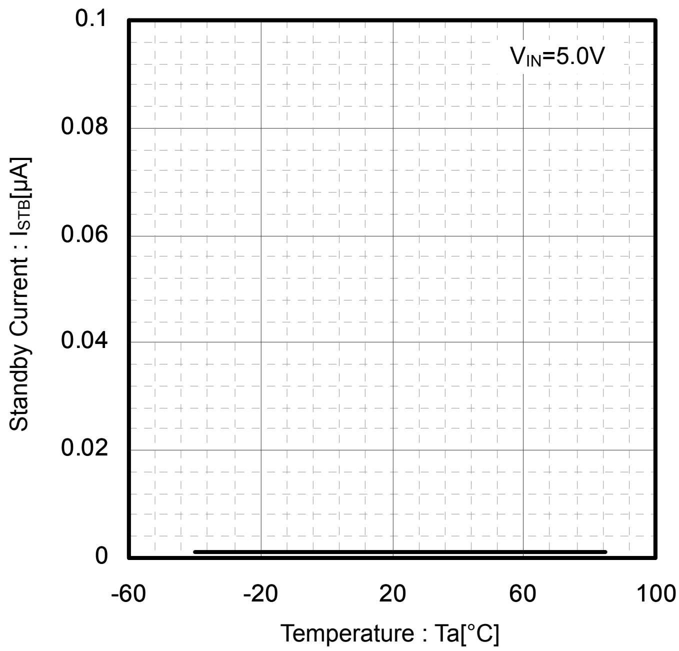


Figure 12. Standby Current vs Temperature (EN Disable)

Typical Performance Curves – continued

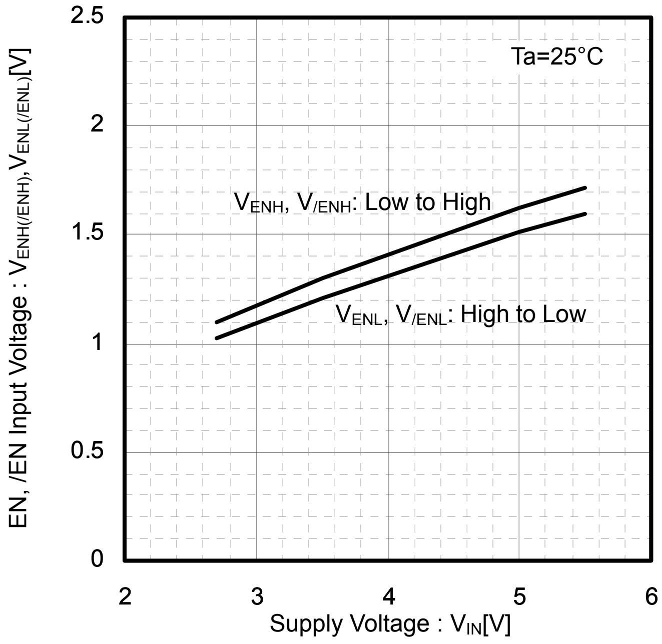


Figure 13. EN, /EN Input Voltage vs Supply Voltage

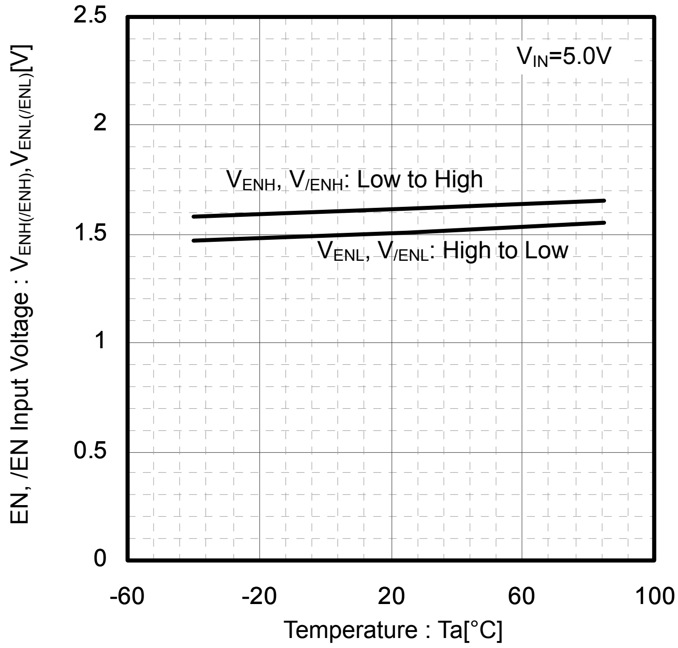


Figure 14. EN, /EN Input Voltage vs Temperature

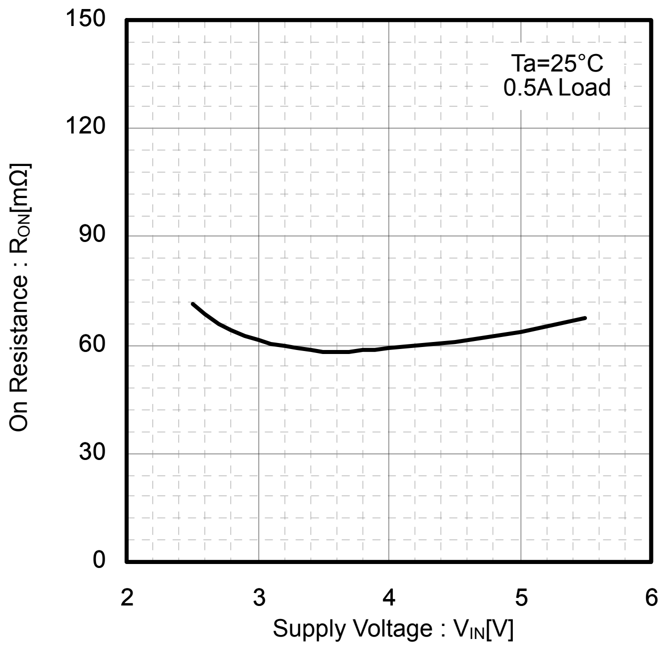


Figure 15. On Resistance vs Supply Voltage

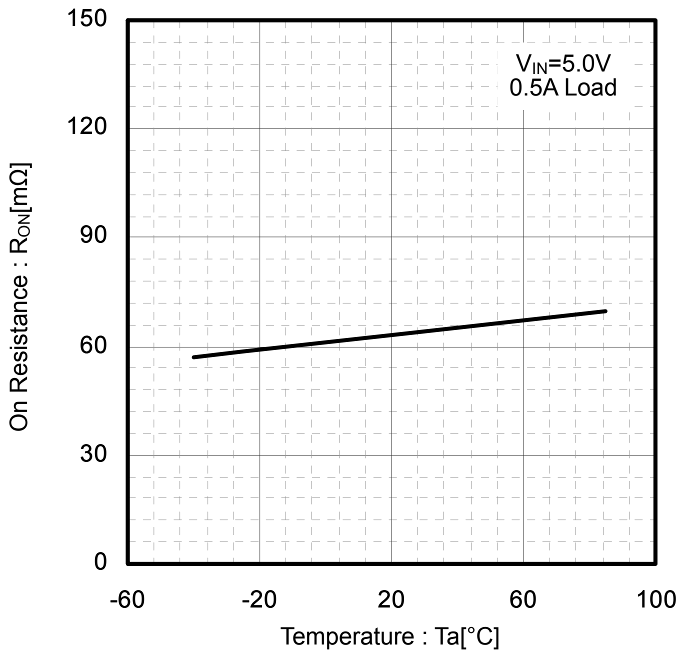


Figure 16. On Resistance vs Temperature

Typical Performance Curves – continued

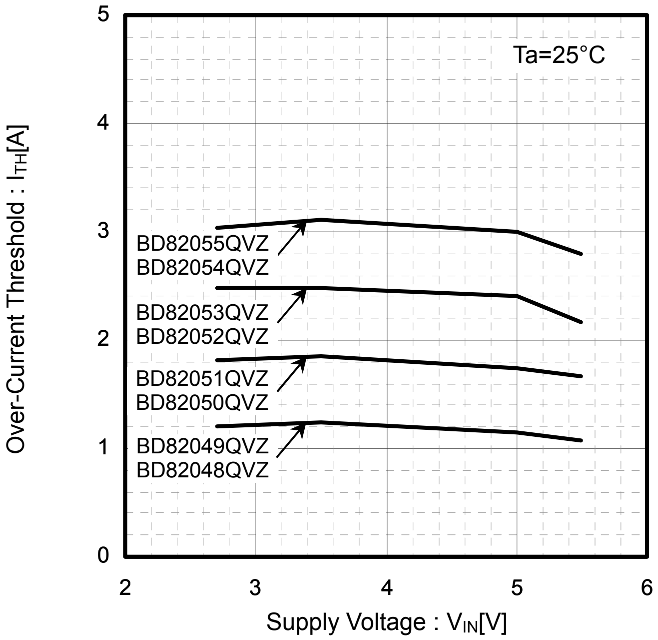


Figure 17. Over-Current Threshold vs Supply Voltage

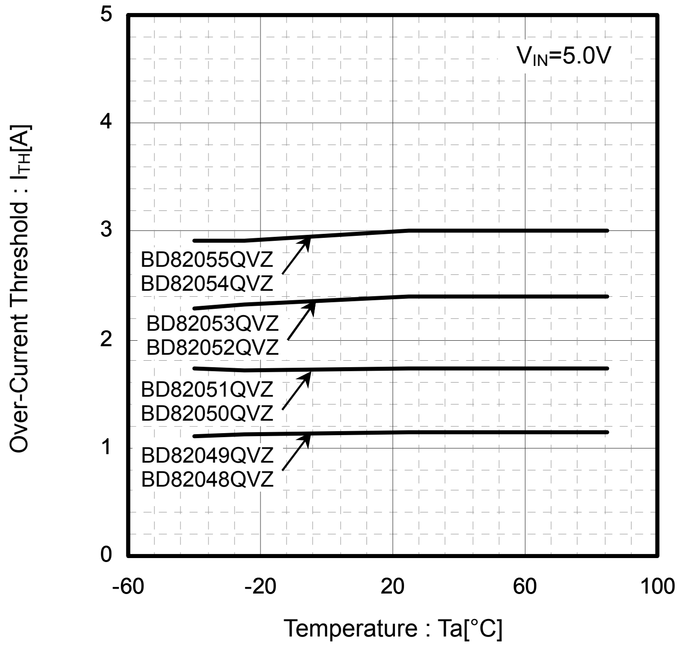


Figure 18. Over-Current Threshold vs Temperature

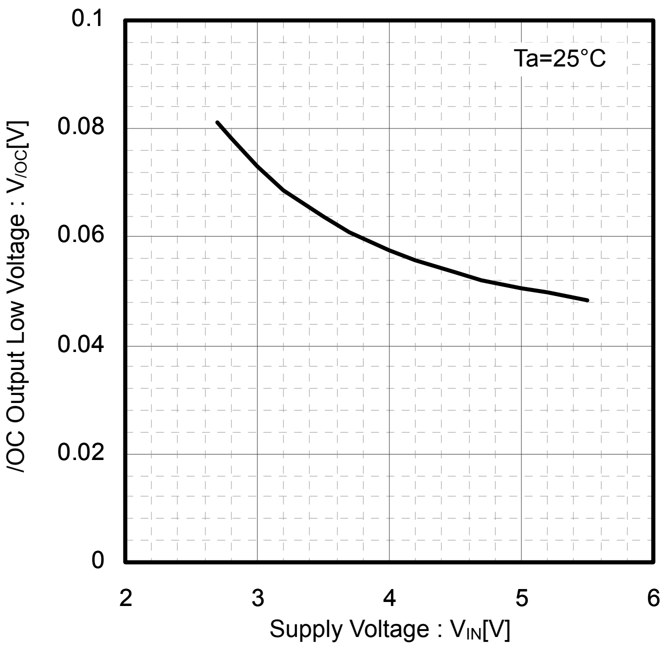


Figure 19. /OC Output Low Voltage vs Supply Voltage

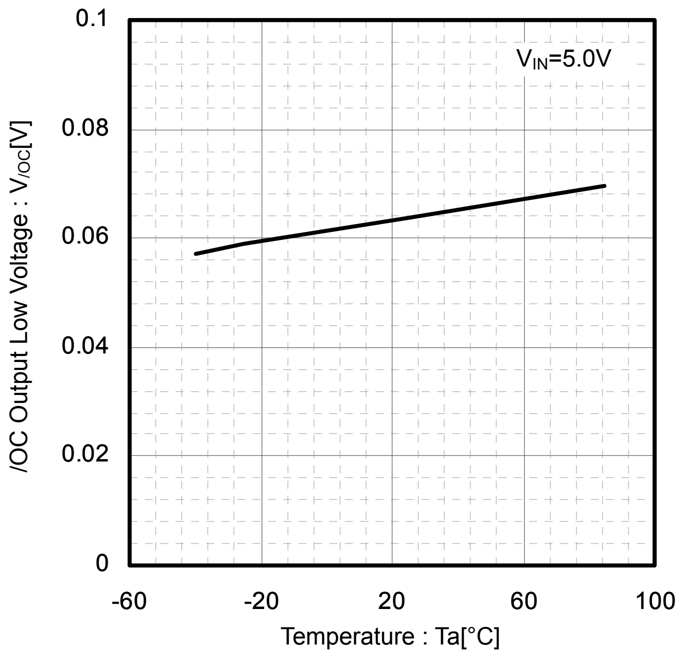


Figure 20. /OC Output Low Voltage vs Temperature

Typical Performance Curves – continued

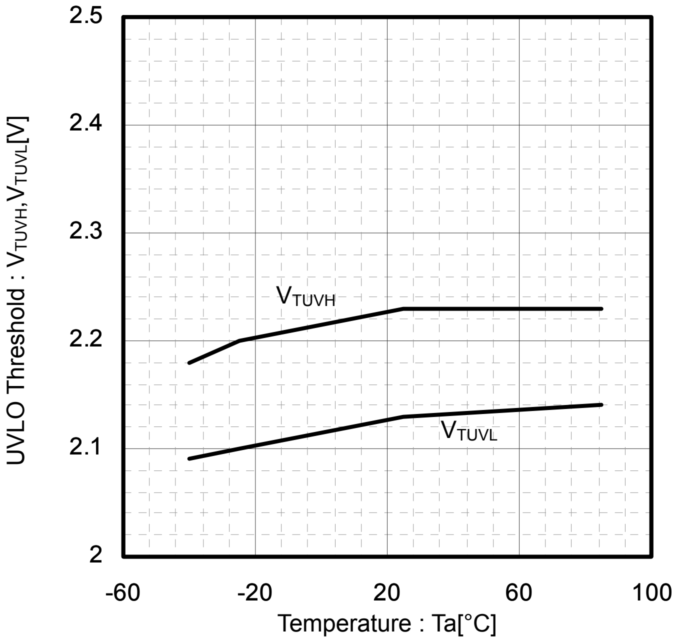


Figure 21. UVLO Threshold vs Temperature

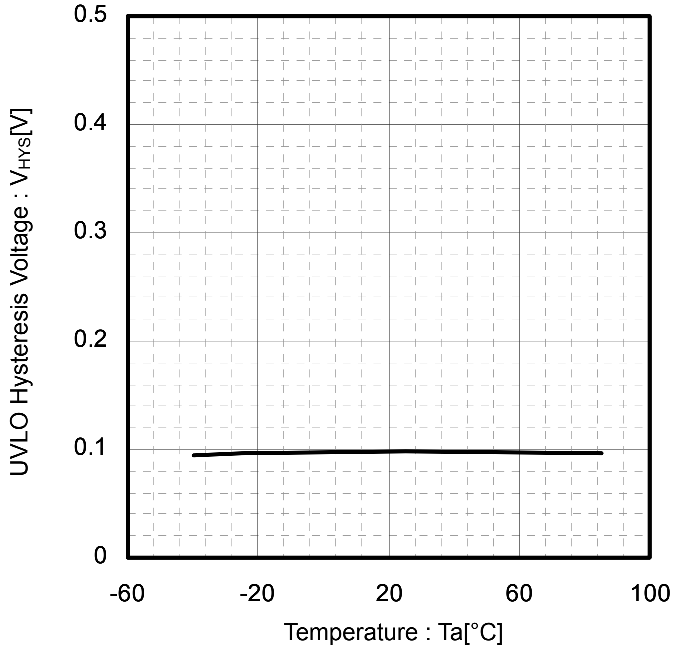


Figure 22. UVLO Hysteresis Voltage vs Temperature

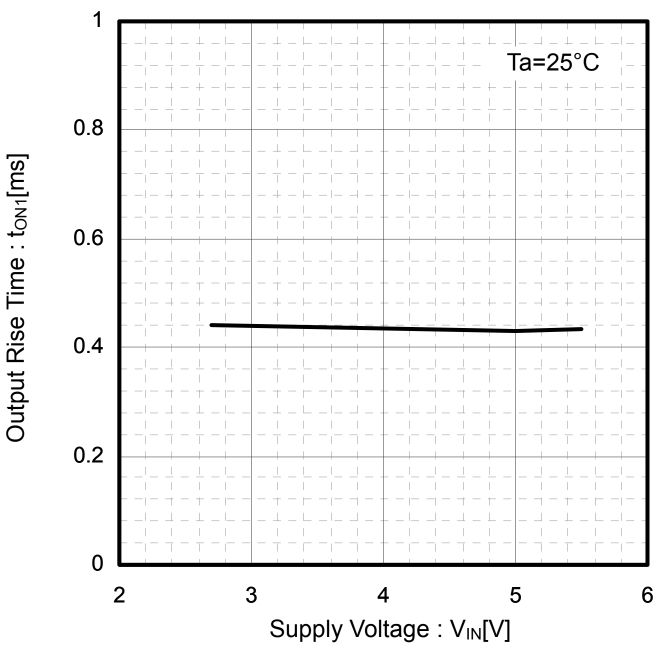


Figure 23. Output Rise Time vs Supply Voltage

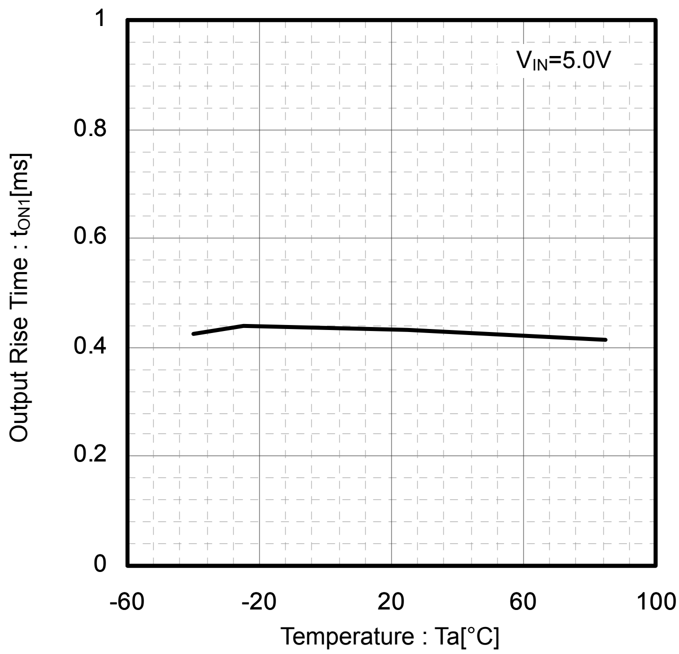


Figure 24. Output Rise Time vs Temperature

Typical Performance Curves – continued

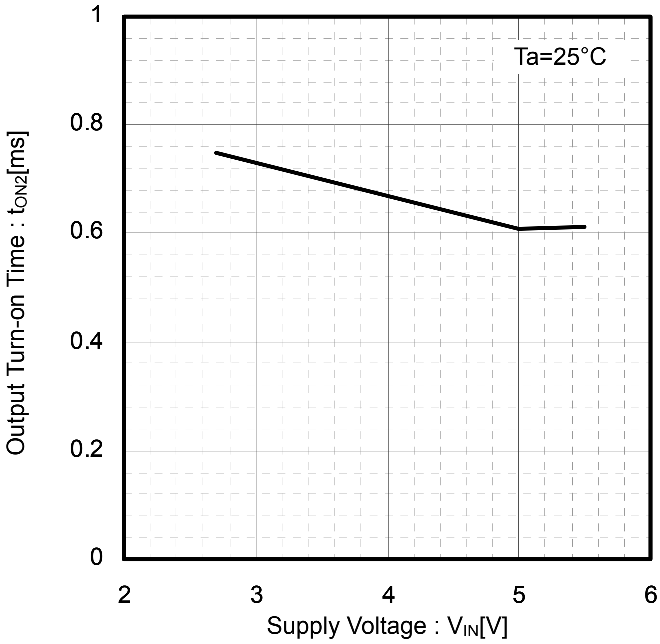


Figure 25. Output Turn-on Time vs Supply Voltage

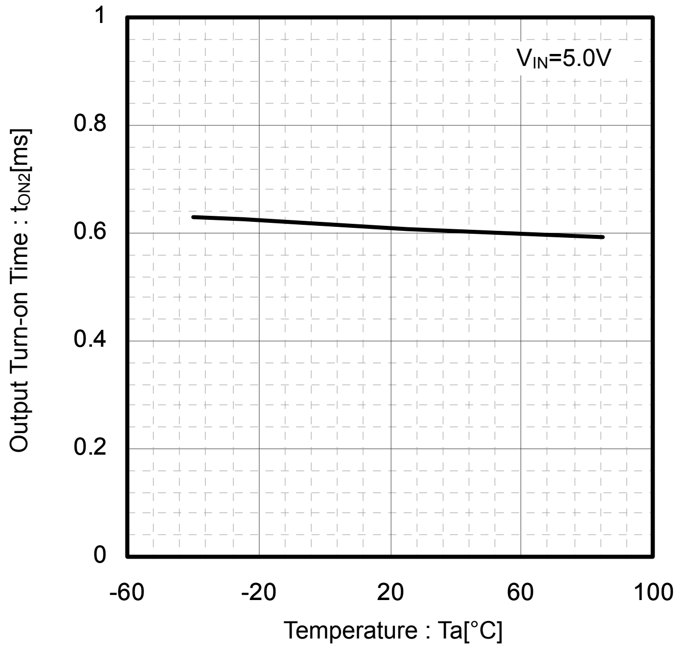


Figure 26. Output Turn-on Time vs Temperature

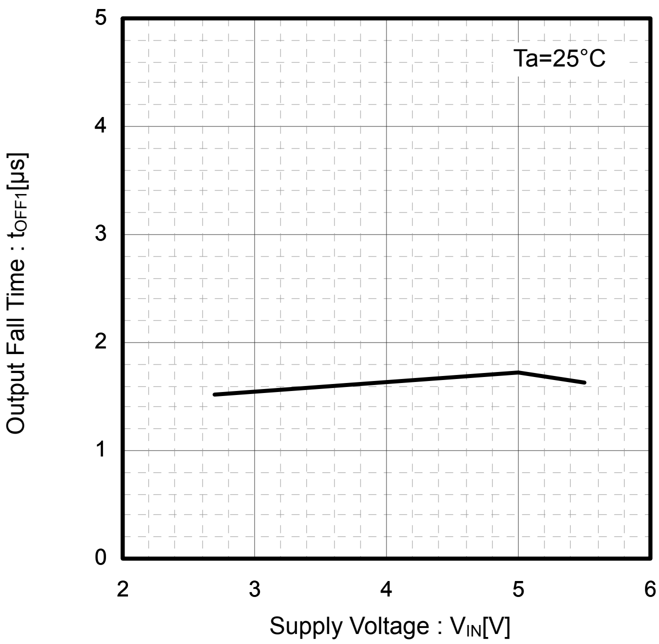


Figure 27. Output Fall Time vs Supply Voltage

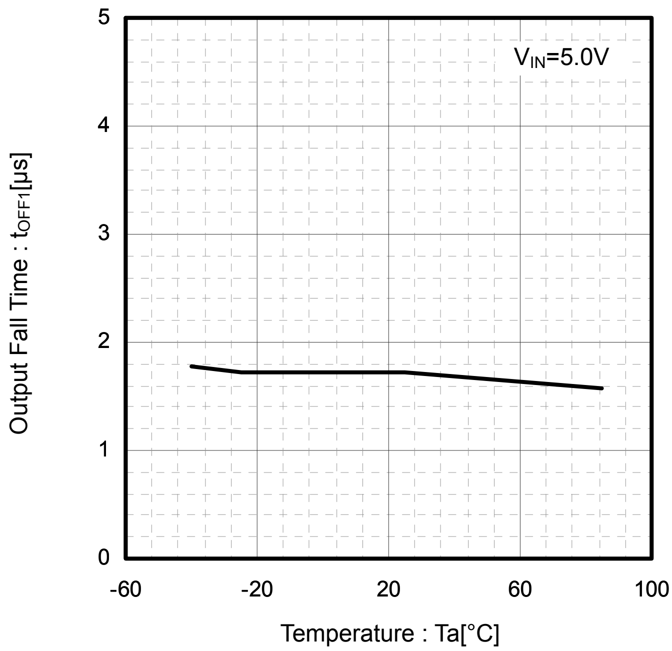


Figure 28. Output Fall Time vs Temperature

Typical Performance Curves – continued

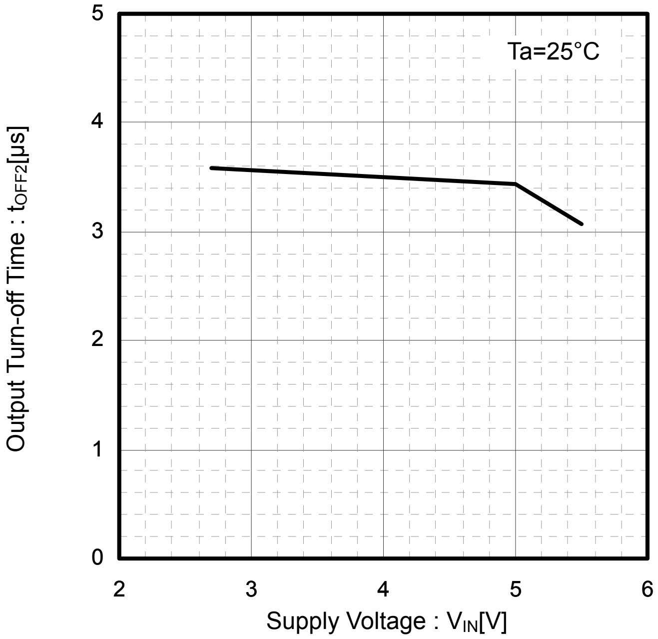


Figure 29. Output Turn-off Time vs Supply Voltage

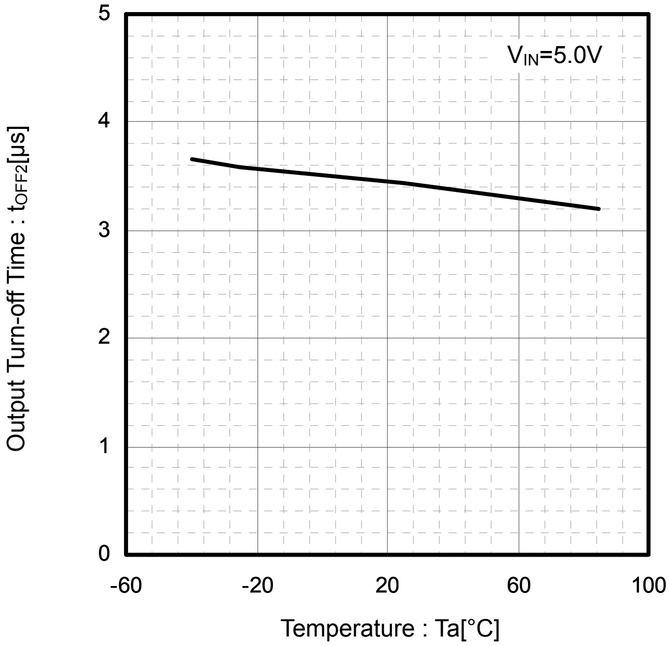


Figure 30. Output Turn-off Time vs Temperature

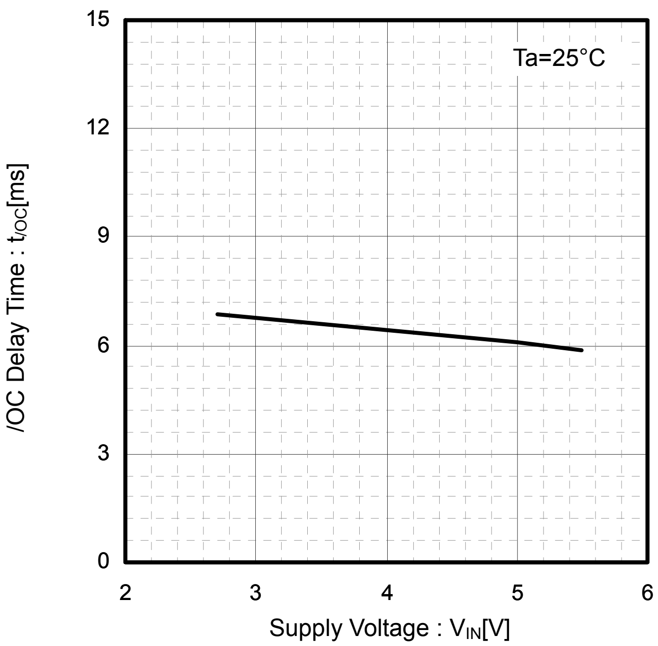


Figure 31. /OC Delay Time vs Supply Voltage

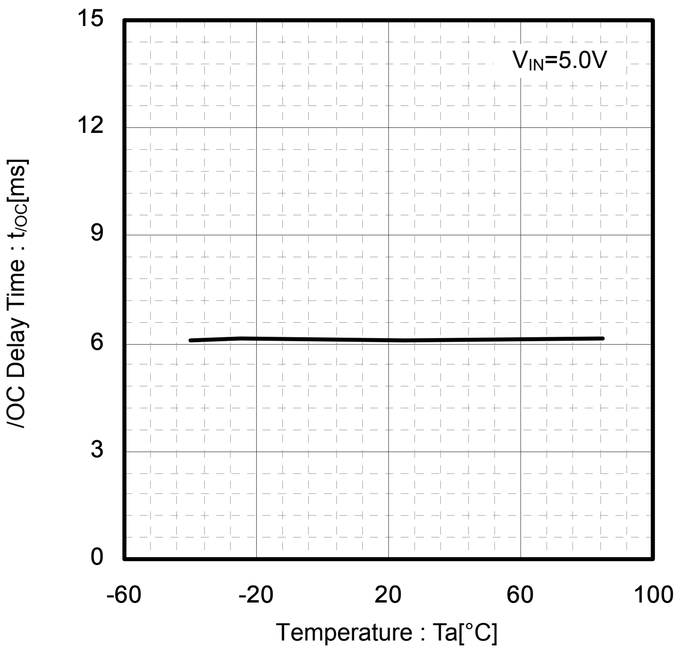


Figure 32. /OC Delay Time vs Temperature

Typical Performance Curves – continued

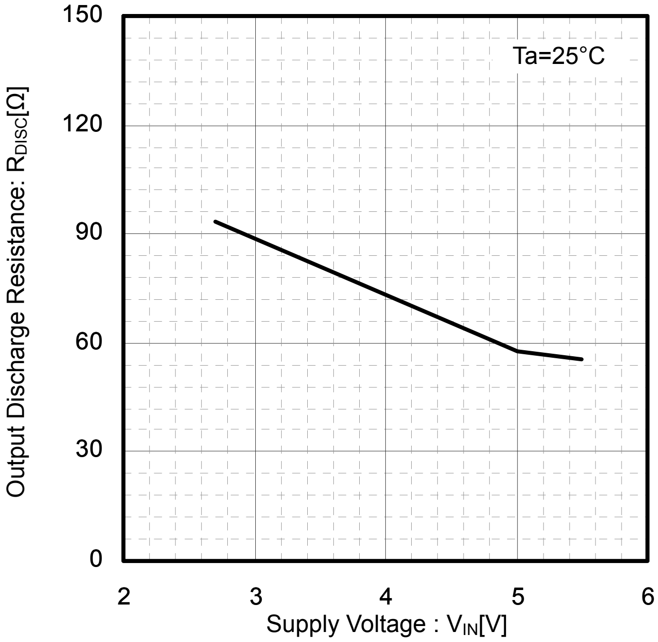


Figure 33. Output Discharge Resistance vs Supply Voltage

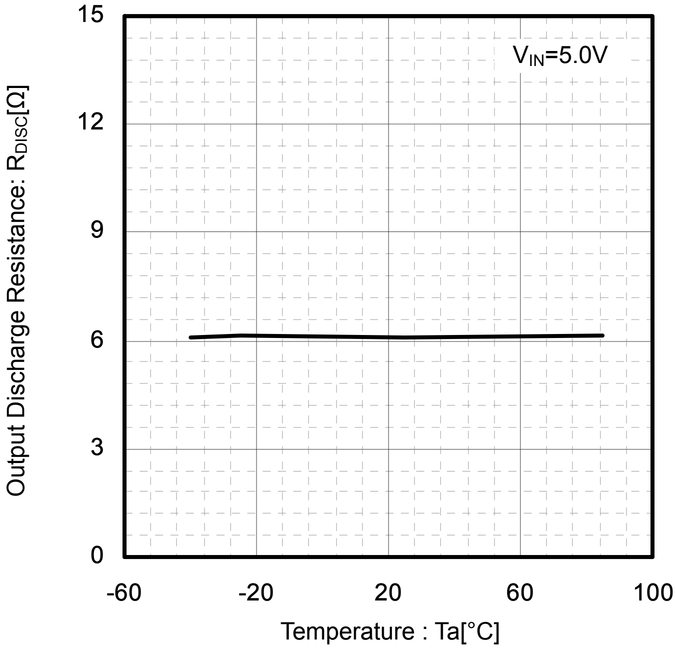
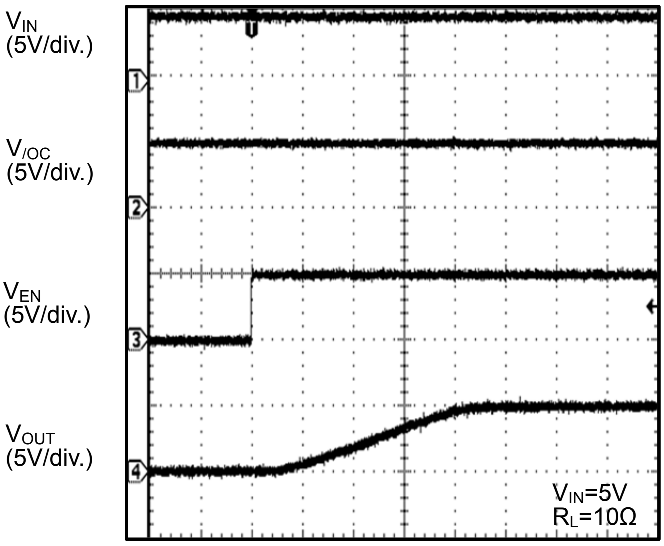
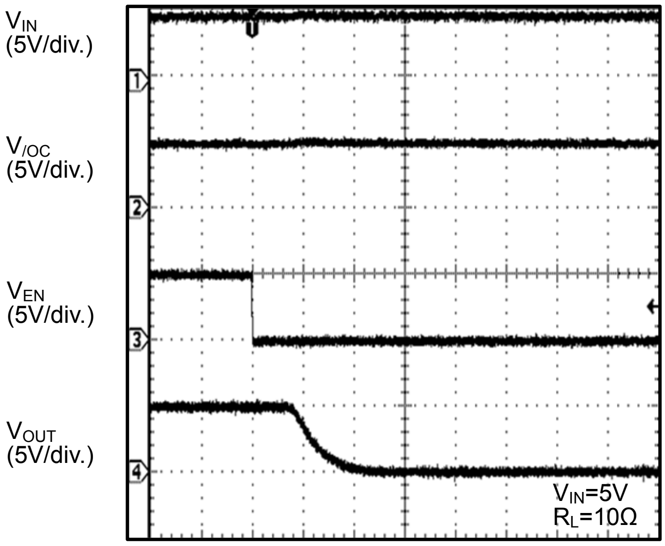


Figure 34. Output Discharge Resistance vs Temperature

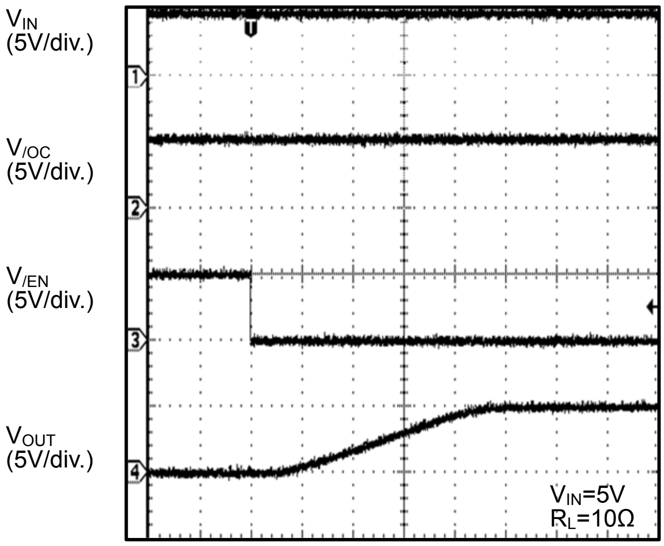
Typical Waveforms
(Ta= 25°C, unless otherwise specified.)



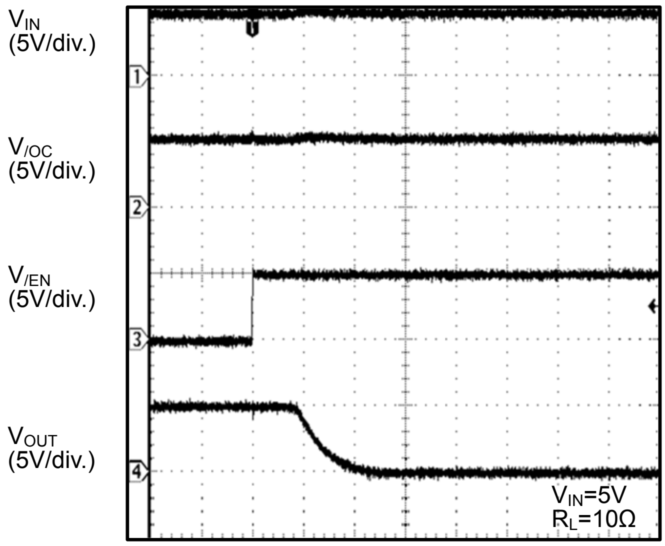
TIME(0.2ms/div.)
Figure 35. Output Rise Characteristic
(Active-High)



TIME(2μs/div.)
Figure 36. Output Fall Characteristic
(Active-High)

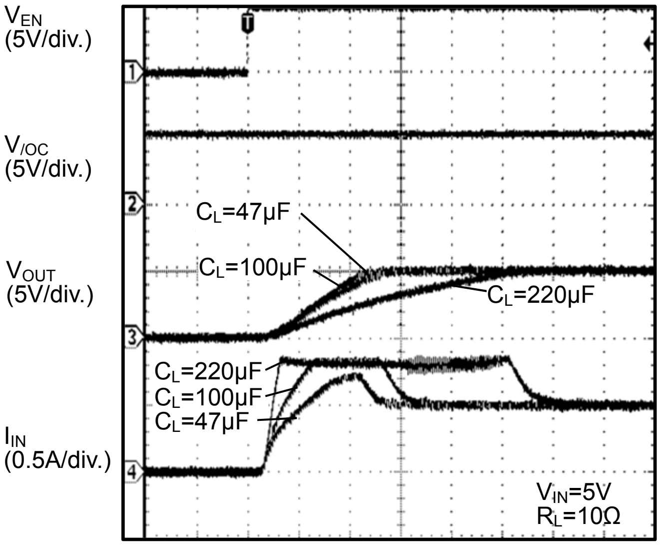


TIME(0.2ms/div.)
Figure 37. Output Rise Characteristic
(Active-Low)

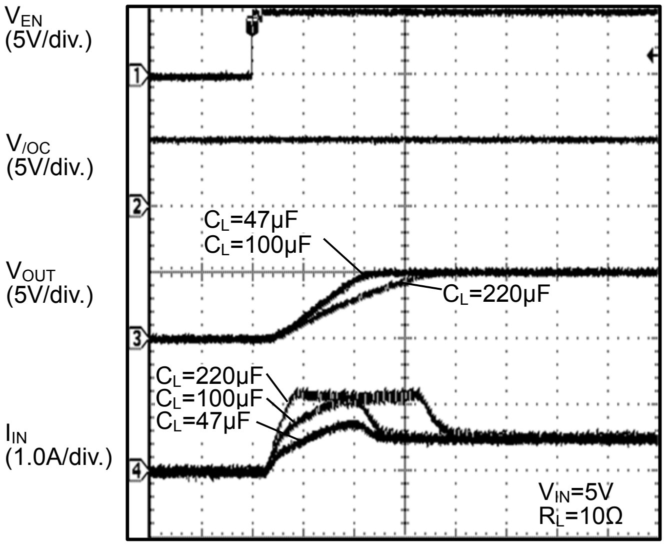


TIME(2μs/div.)
Figure 38. Output Fall Characteristic
(Active-Low)

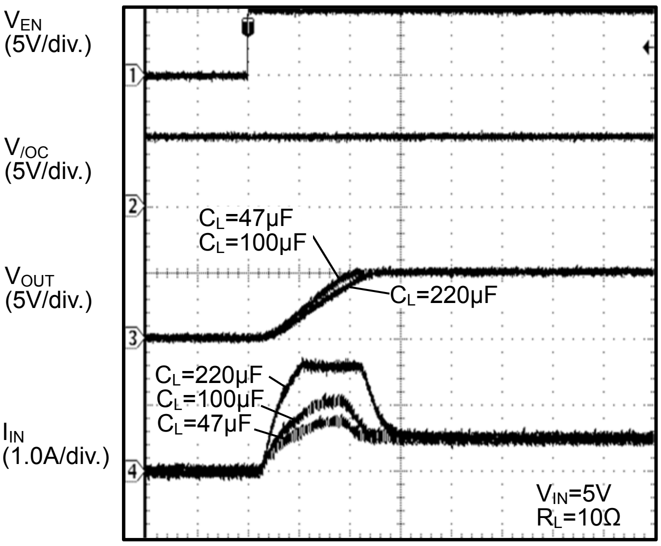
Typical Waveforms – continued
(Ta= 25°C, unless otherwise specified.)



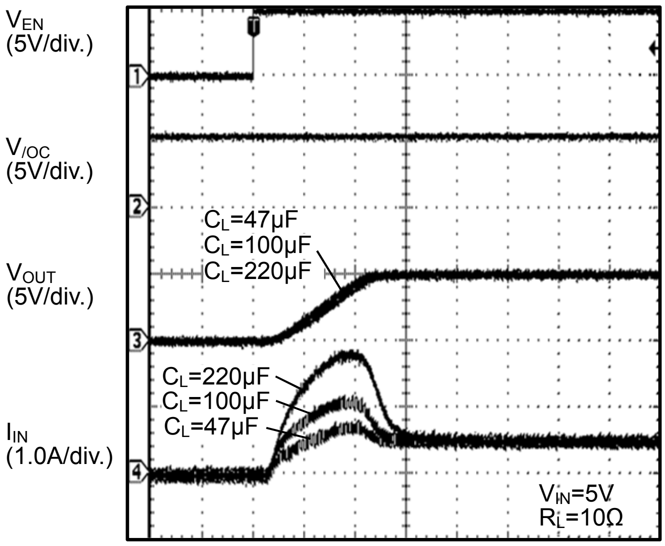
TIME(0.4ms/div.)
Figure 39. Inrush Current Response
(BD82048QVZ)



TIME(0.4ms/div.)
Figure 40. Inrush Current Response
(BD82050QVZ)

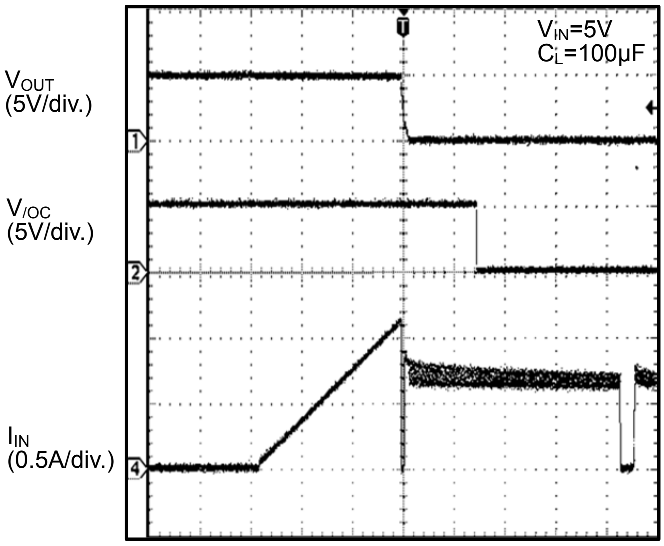


TIME(0.4ms/div.)
Figure 41. Inrush Current Response
(BD82052QVZ)

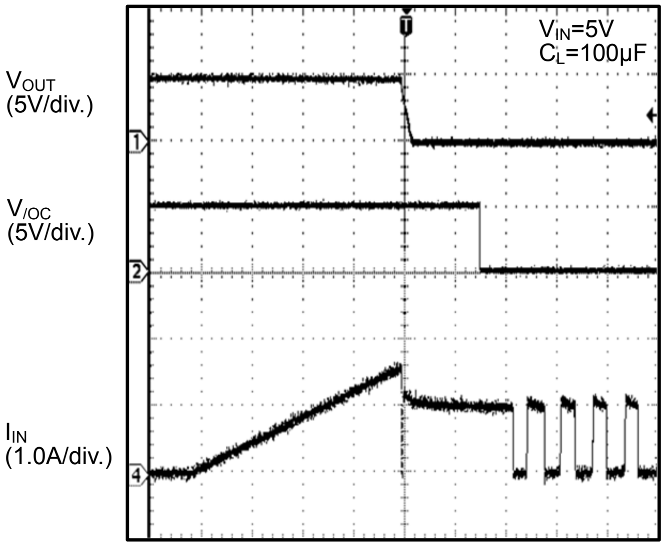


TIME(0.4ms/div.)
Figure 42. Inrush Current Response
(BD82054QVZ)

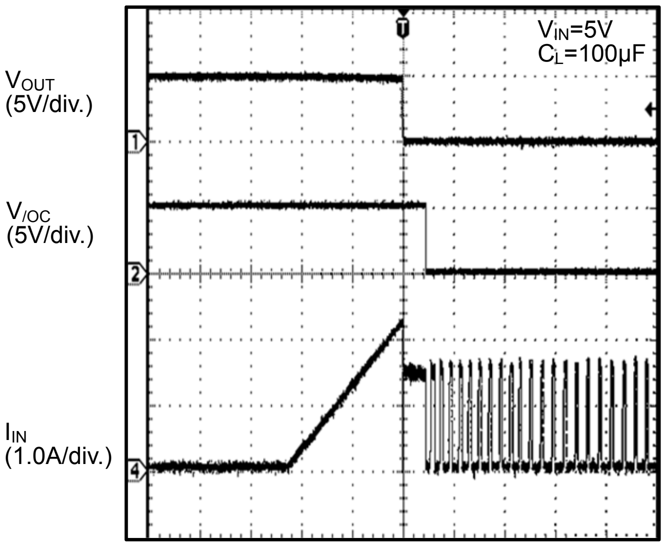
Typical Waveforms – continued
(Ta= 25°C, unless otherwise specified.)



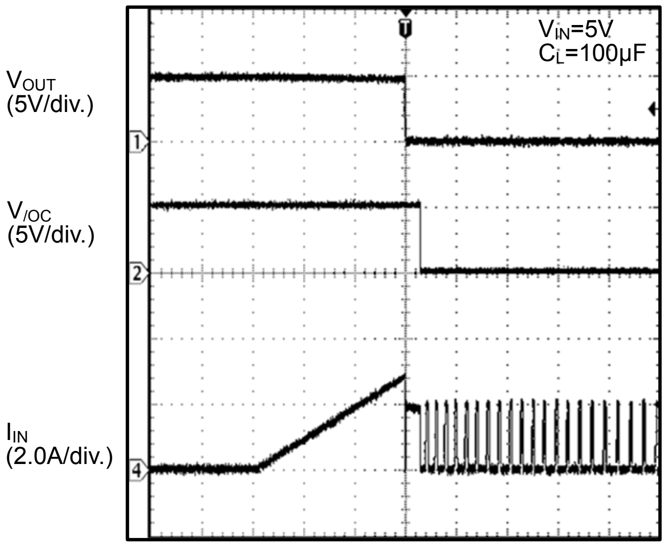
TIME(4ms/div.)
Figure 43. Over-Current Response Ramped Load (BD82048QVZ)



TIME(4ms/div.)
Figure 44. Over-Current Response Ramped Load (BD82050QVZ)

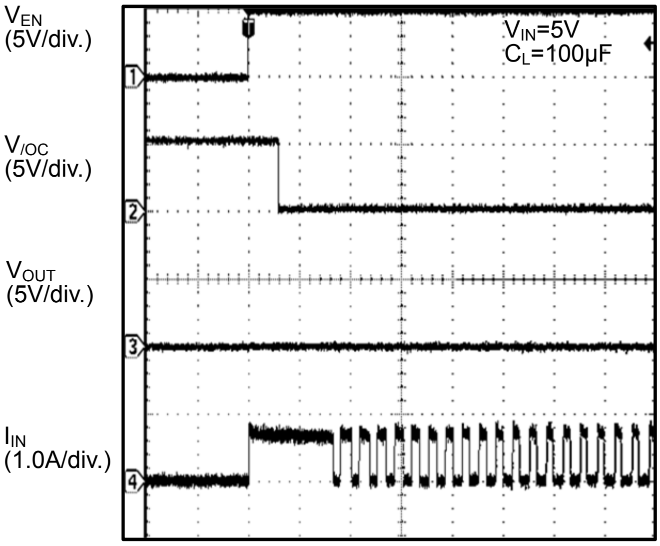


TIME(10ms/div.)
Figure 45. Over-Current Response Ramped Load (BD82052QVZ)

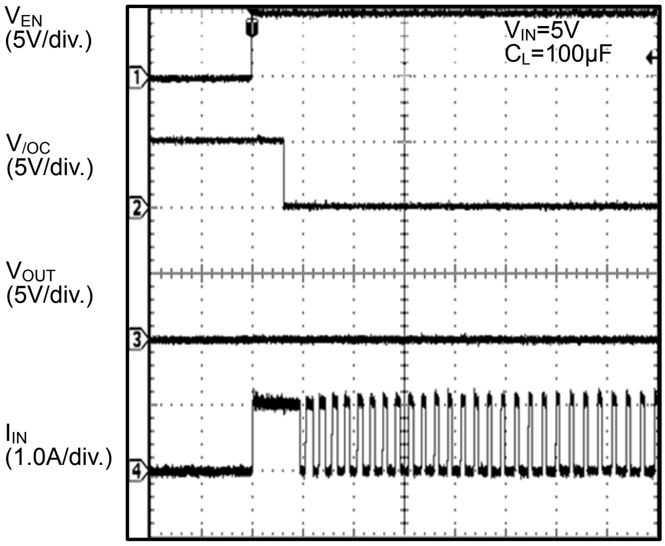


TIME(10ms/div.)
Figure 46. Over-Current Response Ramped Load (BD82054QVZ)

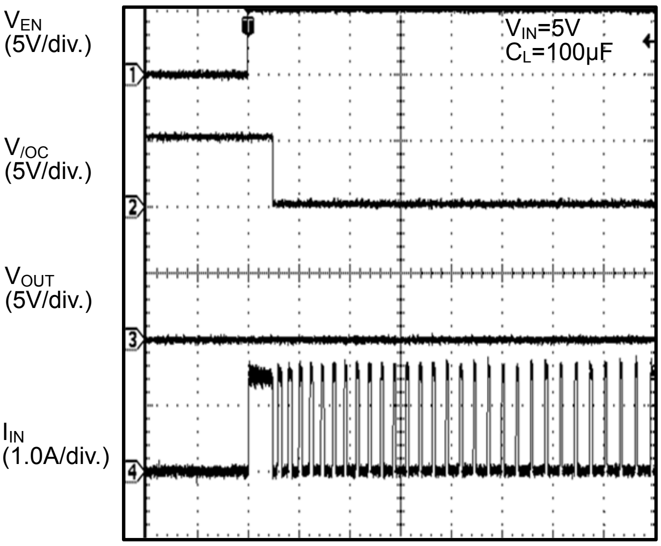
Typical Waveforms – continued
(Ta= 25°C, unless otherwise specified.)



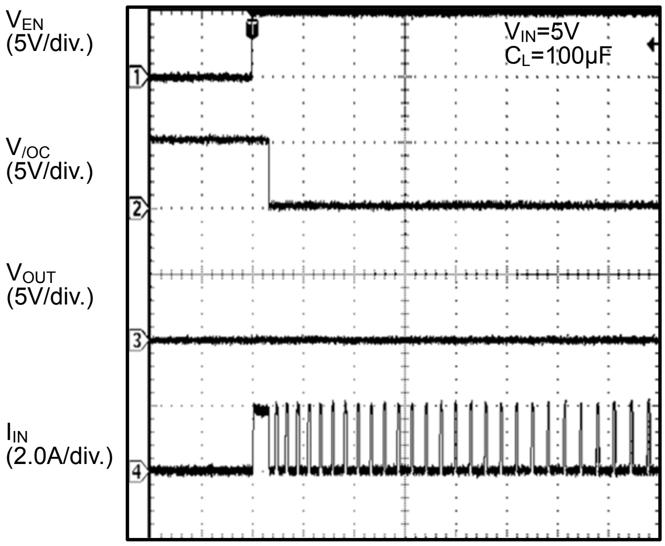
TIME(10ms/div.)
Figure 47. Over-Current Response
Enable during Short Circuit
(BD82048QVZ)



TIME(10ms/div.)
Figure 48. Over-Current Response
Enable during Short Circuit
(BD82050QVZ)

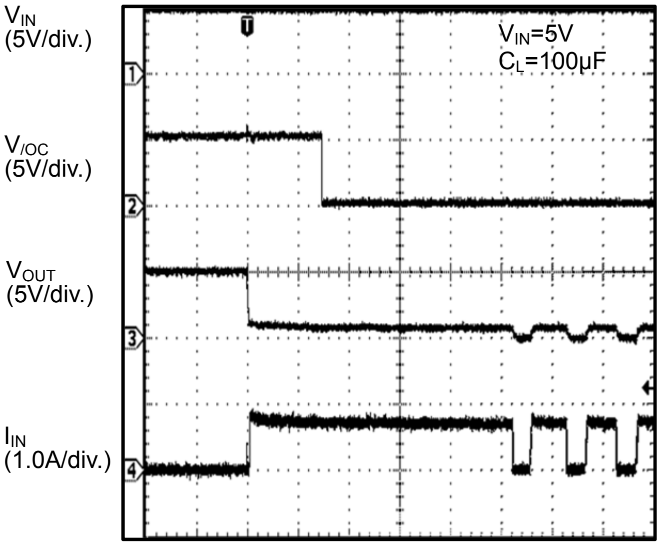


TIME(10ms/div.)
Figure 49. Over-Current Response
Enable during Short Circuit
(BD82052QVZ)

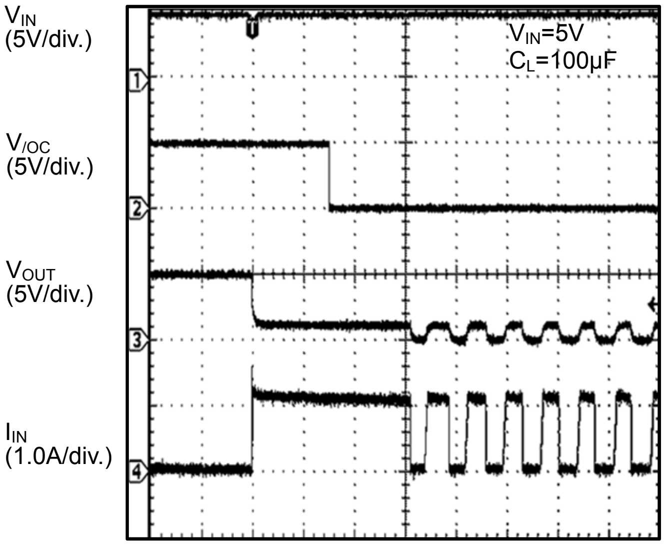


TIME(0.4ms/div.)
Figure 50. Over-Current Response
Enable during Short Circuit
(BD82054QVZ)

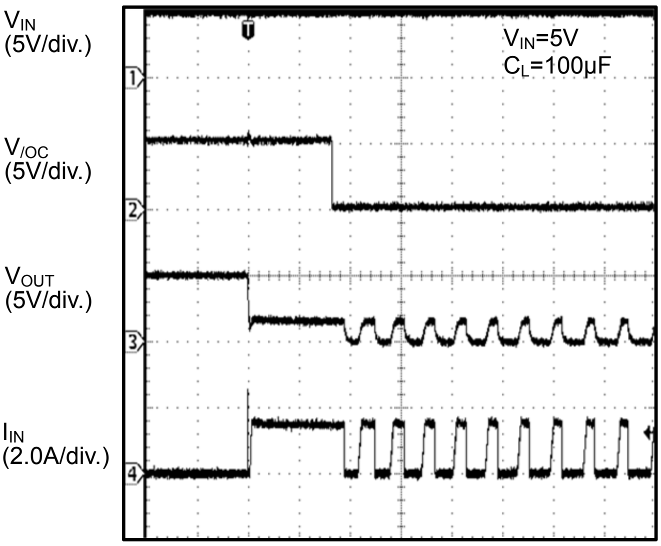
Typical Waveforms – continued
(Ta= 25°C, unless otherwise specified.)



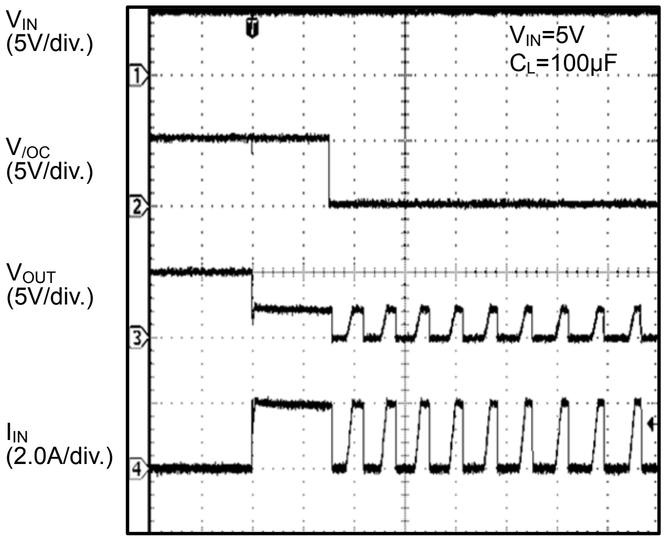
TIME(4ms/div.)
Figure 51. Over-Current Response
1Ω Load connected between VOUT and GND
(BD82048QVZ)



TIME(4ms/div.)
Figure 52. Over-Current Response
1Ω Load connected between VOUT and GND
(BD82050QVZ)



TIME(4ms/div.)
Figure 53. Over-Current Response
1Ω Load connected between VOUT and GND
(BD82052QVZ)



TIME(4ms/div.)
Figure 54. Over-Current Response
1Ω Load connected between VOUT and GND
(BD82054QVZ)

Typical Waveforms – continued
(Ta= 25°C, unless otherwise specified.)

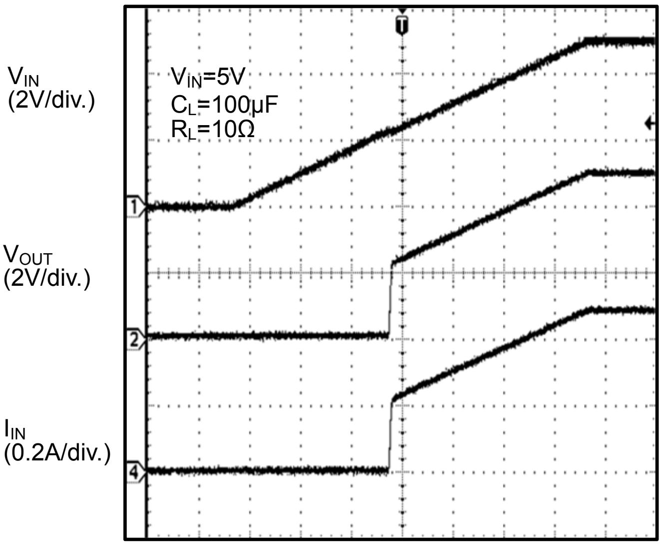


Figure 55. UVLO Response
Increasing V_{IN}

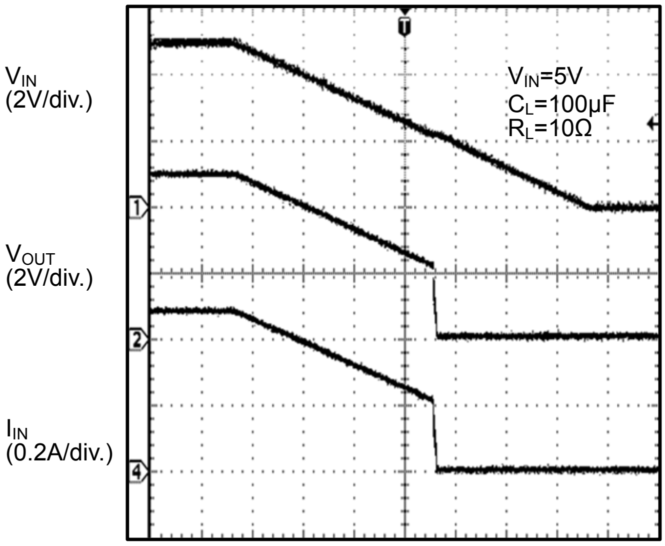


Figure 56. UVLO Response
Decreasing V_{IN}

Typical Application Circuit

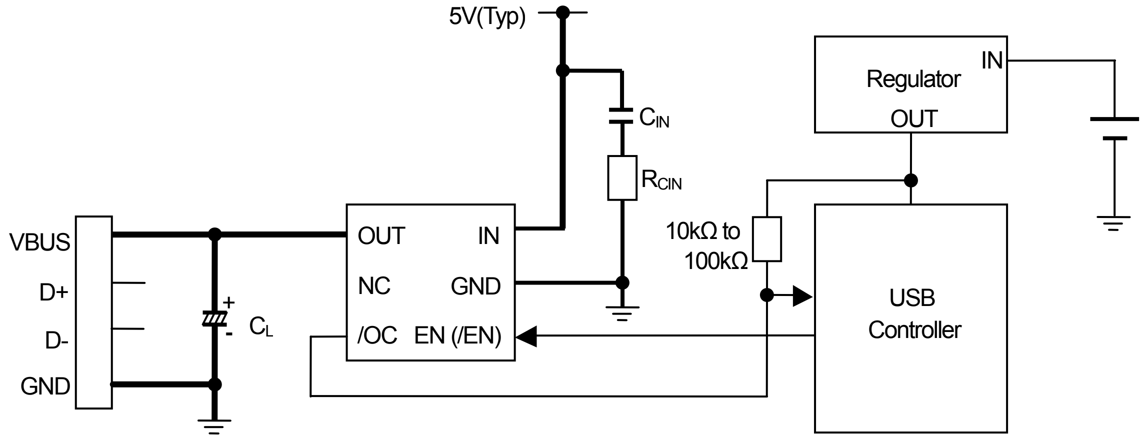


Figure 57. Typical Application Circuit

Application Information

The IN pin is used as the input of the switch and the power supply for the internal circuit of the IC. Therefore, there is a possibility that IC operation may be adversely affected by power line noise. This can be prevented by connecting a 1µF or higher bypass capacitor C_{IN} between the IN pin of the IC and the GND pin.

Additionally, when an excessive electric current flows during output short, the characteristic response of the IC could be influenced by noise due to inductance of power supply line. To decrease this effect, it is recommended to connect a 10µF to 100µF capacitor in parallel with CIN.

However, please use a capacitor connect to power line with ESR of at least 100mΩ but less than 2Ω . If C_{IN} ESR is low, when overcurrent is detected, the current limit function may not be produced after TSD occurs as shown in Figure 59. To return from this state, the load should be disconnected or by resetting IN or EN.

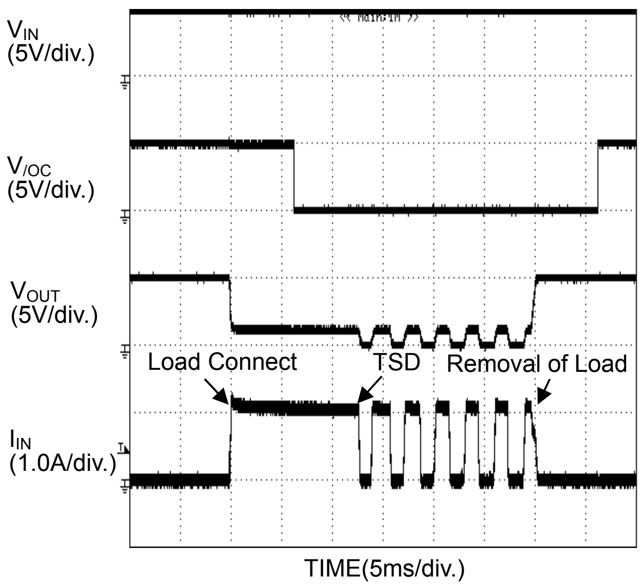


Figure 58. Over-Current Response
1Ω Load connected between VOUT and GND
during Normal Operation

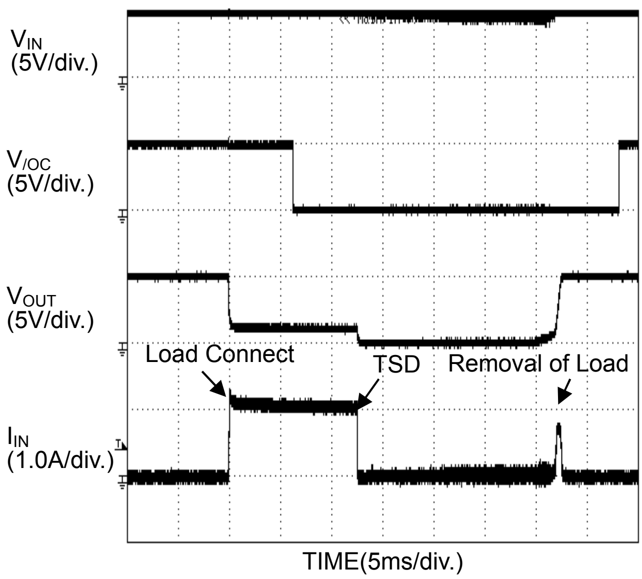


Figure 59. Over-Current Response
1Ω Load connected between VOUT and GND
when ESR of C_{IN} is less than 100mΩ

Pull up /OC output via resistance value of 10kΩ to 100kΩ.

Set up a value for C_L which satisfies the application, and should be connected near OUT pin.

When using the circuit with changes to the external circuit values, make sure to leave an adequate margin for external components including static and transitional characteristics as well as the design tolerances of the IC.

Functional Description

1. Switch Operation

IN pin and OUT pin are connected to the drain and the source of switch MOSFET respectively. The IN pin is also used as power source input to internal control circuit.

When the switch is turned on from EN control input, the IN pin and OUT pin are connected by a 63mΩ(Typ) switch. In ON status, the switch is bidirectional. Therefore, when the potential of OUT pin is higher than that of the IN pin, current flows from OUT pin to IN pin.

Since the parasitic diode between the drain and the source of switch MOSFET is canceled, current flow from OUT to IN is prevented during off state (EN, /EN signal is disable). In addition, when the switch is off, an output electric discharge function is activated.

2. Thermal Shutdown Circuit (TSD)

If over current would continue, the temperature of the IC would increase drastically due to internal losses. If the junction temperature reaches beyond 135°C(Typ) during the condition of over-current detection, thermal shutdown circuit operates and turns power switch off and outputs error flag (/OC). Then, when the junction temperature decreases below 115°C(Typ), power switch is turned on and error flag (/OC) is cancelled. Unless the cause of the increase of the chip's temperature is removed or the output of power switch is turned off, this operation repeats.
The thermal shutdown circuit operates when the switch is on (EN, /EN signal is active).

3. Over Current Detection (OCD)

The over current detection circuit (OCD) limits current (I_{SC}) and outputs error flag (/OC) when current flowing in each switch MOSFET exceeds a specified value. There are three cases when the OCD circuit is activated. The OCD operates when the switch is on (EN, /EN signal is active).

(1) When the switch is turned on while the output is in short-circuit status, the switch gets in current limit status immediately

(2) When the output short-circuits or when high current load is connected while the switch is on, very large current will flow until the over-current limit circuit reacts. When this happens, the over-current limit circuit is activated and the current limitation is carried out.

(3) When the output current increases gradually, current limitation does not work until the output current exceeds the over-current detection value. When it exceeds the detection value, current limitation is carried out.

4. Under-Voltage Lockout (UVLO)

UVLO circuit prevents the switch from turning on until V_{IN} exceeds 2.3V(Typ). If V_{IN} drops below 2.2V(Typ) while the switch is still on, then the UVLO will shut off the power switch. UVLO has a hysteresis of 100mV(Typ).
Under-voltage lockout circuit works when EN, /EN signal is active. During UVLO operation and EN, /EN is active, output electric discharge function is activated.

5. Error Flag (/OC) Output

Error flag output is an N-channel MOSFET open drain output. Upon detection of over current or thermal overrun, the output level becomes low.

Over current detection has a delay filter. This delay filter prevents current detection flags from being sent during instantaneous events such as surge current due to switching or hot plug. If fault flag output is unused, /OC pin should be connected to open or ground line.

Functional Description – continued

6. Output Discharge Function

When the switch is turned off by disabling control input or when UVLO function is triggered, the 55Ω(Typ) discharge circuit between OUT and GND turns on which quickly discharges the electric charge of the capacitive load. However, if the voltage of IN declines rapidly, then the OUT pin becomes Hi-Z without UVLO function.

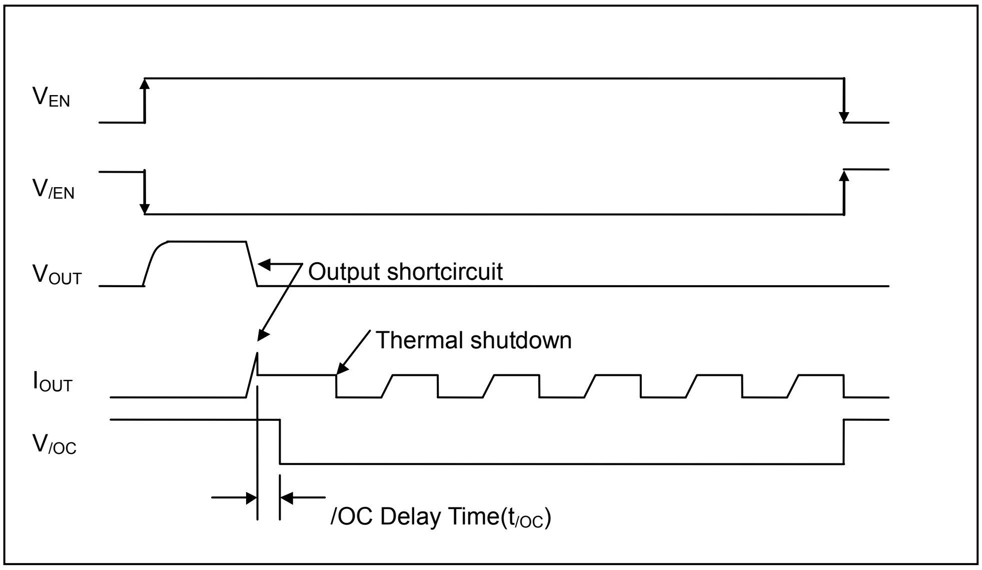
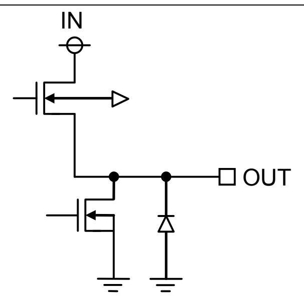
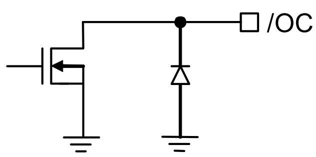
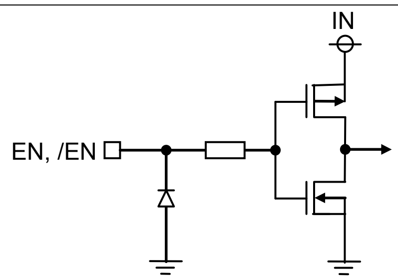


Figure 60. Over-Current Detection, Thermal Shutdown Timing.

I/O Equivalent Circuit

Symbol	Pin No.	Equivalent Circuit
OUT	1	
/OC	3	
EN, /EN	4	

Operational Notes

1. **Reverse Connection of Power Supply**
Connecting the power supply in reverse polarity can damage the IC. Take precautions against reverse polarity when connecting the power supply, such as mounting an external diode between the power supply and the IC's power supply pins.

2. **Power Supply Lines**
Design the PCB layout pattern to provide low impedance supply lines. Furthermore, connect a capacitor to ground at all power supply pins. Consider the effect of temperature and aging on the capacitance value when using electrolytic capacitors.

3. **Ground Voltage**
Ensure that no pins are at a voltage below that of the ground pin at any time, even during transient condition.

4. **Ground Wiring Pattern**
When using both small-signal and large-current ground traces, the two ground traces should be routed separately but connected to a single ground at the reference point of the application board to avoid fluctuations in the small-signal ground caused by large currents. Also ensure that the ground traces of external components do not cause variations on the ground voltage. The ground lines must be as short and thick as possible to reduce line impedance.

5. **Recommended Operating Conditions**
The function and operation of the IC are guaranteed within the range specified by the recommended operating conditions. The characteristic values are guaranteed only under the conditions of each item specified by the electrical characteristics.

6. **Inrush Current**
When power is first supplied to the IC, it is possible that the internal logic may be unstable and inrush current may flow instantaneously due to the internal powering sequence and delays, especially if the IC has more than one power supply. Therefore, give special consideration to power coupling capacitance, power wiring, width of ground wiring, and routing of connections.

7. **Operation Under Strong Electromagnetic Field**
Operating the IC in the presence of a strong electromagnetic field may cause the IC to malfunction.

8. **Testing on Application Boards**
When testing the IC on an application board, connecting a capacitor directly to a low-impedance output pin may subject the IC to stress. Always discharge capacitors completely after each process or step. The IC's power supply should always be turned off completely before connecting or removing it from the test setup during the inspection process. To prevent damage from static discharge, ground the IC during assembly and use similar precautions during transport and storage.

9. **Inter-pin Short and Mounting Errors**
Ensure that the direction and position are correct when mounting the IC on the PCB. Incorrect mounting may result in damaging the IC. Avoid nearby pins being shorted to each other especially to ground, power supply and output pin. Inter-pin shorts could be due to many reasons such as metal particles, water droplets (in very humid environment) and unintentional solder bridge deposited in between pins during assembly to name a few.

10. **Unused Input Pins**
Input pins of an IC are often connected to the gate of a MOS transistor. The gate has extremely high impedance and extremely low capacitance. If left unconnected, the electric field from the outside can easily charge it. The small charge acquired in this way is enough to produce a significant effect on the conduction through the transistor and cause unexpected operation of the IC. So unless otherwise specified, unused input pins should be connected to the power supply or ground line.

Operational Notes – continued

11. Regarding the Input Pin of the IC

This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P-N junctions are formed at the intersection of the P layers with the N layers of other elements, creating a parasitic diode or transistor. For example (refer to figure below):

When GND > Pin A and GND > Pin B, the P-N junction operates as a parasitic diode.
When GND > Pin B, the P-N junction operates as a parasitic transistor.

Parasitic diodes inevitably occur in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Therefore, conditions that cause these diodes to operate, such as applying a voltage lower than the GND voltage to an input pin (and thus to the P substrate) should be avoided.

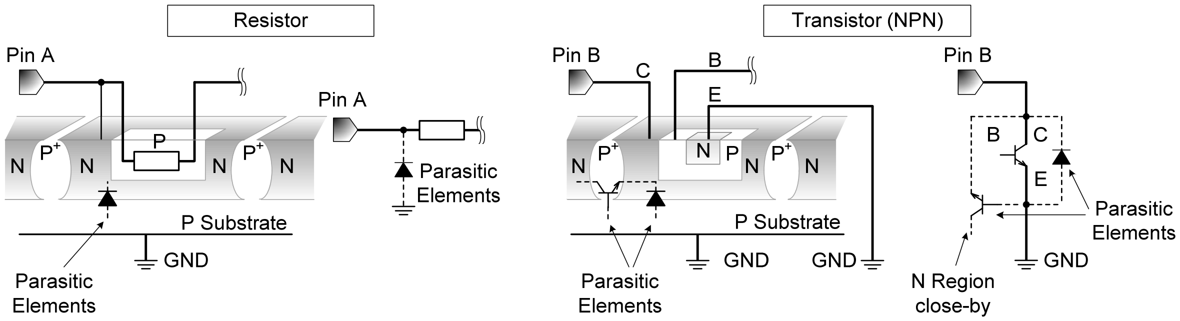


Figure 61. Example of monolithic IC structure

12. Ceramic Capacitor

When using a ceramic capacitor, determine a capacitance value considering the change of capacitance with temperature and the decrease in nominal capacitance due to DC bias and others.

13. Thermal Shutdown Circuit(TSD)

This IC has a built-in thermal shutdown circuit that prevents heat damage to the IC. Normal operation should always be within the IC’s maximum junction temperature rating. If however the rating is exceeded for a continued period, the junction temperature (Tj) will rise which will activate the TSD circuit that will turn OFF power output pins. When the Tj falls below the TSD threshold, the circuits are automatically restored to normal operation.
Note that the TSD circuit operates in a situation that exceeds the absolute maximum ratings and therefore, under no circumstances, should the TSD circuit be used in a set design or for any purpose other than protecting the IC from heat damage.

Ordering Information

B D 8 2 0 x x Q V Z - E2

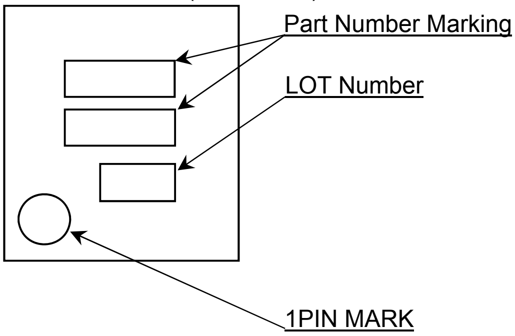
Part Number
BD82048QVZ
BD82049QVZ
BD82050QVZ
BD82051QVZ
BD82052QVZ
BD82053QVZ
BD82054QVZ
BD82055QVZ

Package
QVZ: SMMP006Z2020

Packaging and forming specification
E2: Embossed tape and reel

Marking Diagram

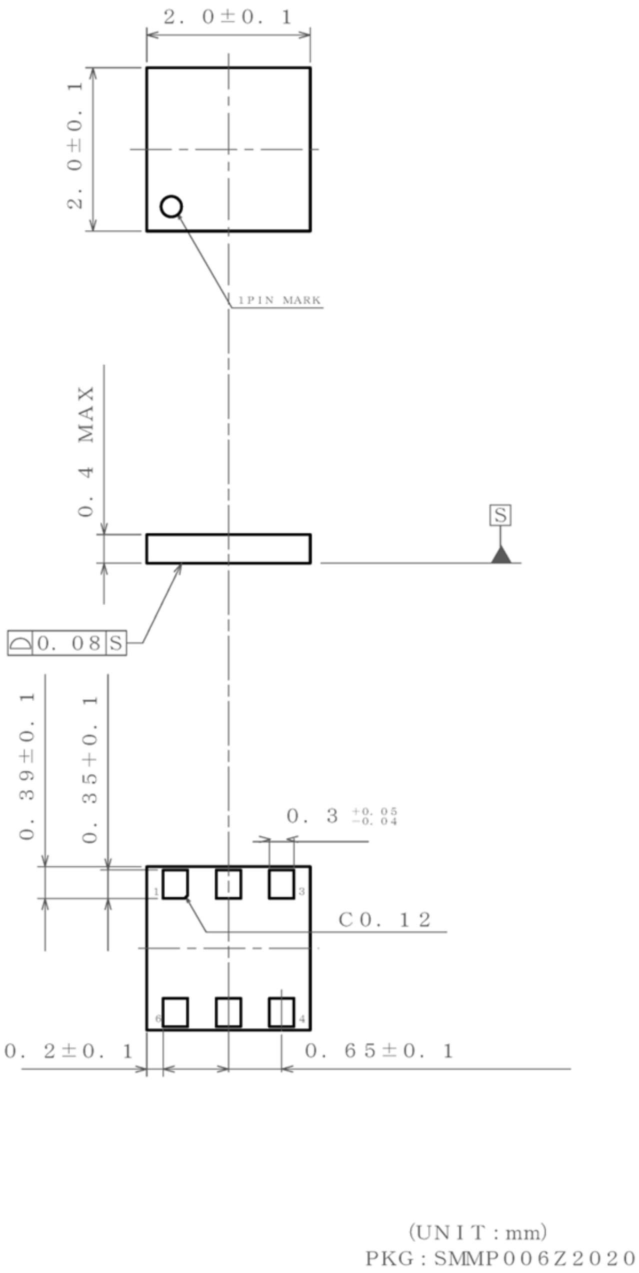
SMMP006Z2020(TOP VIEW)



Over-Current Threshold(Typ)	Control Input Logic	Part Number Marking	Orderable Part Number
1.15A	Active-High	D82048	BD82048QVZ-E2
	Active-Low	D82049	BD82049QVZ-E2
1.65A	Active-High	D82050	BD82050QVZ-E2
	Active-Low	D82051	BD82051QVZ-E2
2.20A	Active-High	D82052	BD82052QVZ-E2
	Active-Low	D82053	BD82053QVZ-E2
2.80A	Active-High	D82054	BD82054QVZ-E2
	Active-Low	D82055	BD82055QVZ-E2

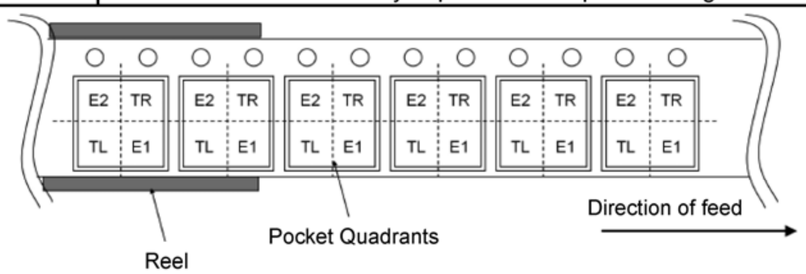
Physical Dimension and Packing Information

Package Name	SMMP006Z2020



< Tape and Reel Information >

Tape	Embossed carrier tape
Quantity	4000pcs
Direction of feed	E2 The direction is the pin 1 of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand



Revision History

Date	Revision	Changes
22.Sep.2017	001	New Release
25.Dec.2017	002	Addition of the series model information

Notice

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1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
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   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

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   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

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This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   [b] the temperature or humidity exceeds those recommended by ROHM
   [c] the Products are exposed to direct sunshine or condensation
   [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

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