OUTLINE

The OMS252 series is a lithium-ion/lithium polymer rechargeable battery protection IC for 2-serial-cell, using high voltage CMOS process and including high-accuracy voltage detectors and delay circuit.

The OMS252 series is suitable for detection and protection of two-series-cell Lithium-polymer or Lithium-ion battery packs from overcharge, over-discharge, overcurrent, and short circuit status.

FEATURES

(1) Internal high accuracy voltage detection circuit

Overcharge detection voltage	3.5V to 4.7V	Accuracy±20mV (Ta=+25°C)
		Accuracy±25mV (Ta=-10~+60°C)
Overcharge release voltage	3.1V to 4.6V	Accuracy±30mV
Overdischarge detection voltage	2.0 to 3.2V	Accuracy±50mV
Overdischarge release voltage	2.0 to 3.4V	Accuracy±100mV
Discharging overcurrent detection voltage	50mV to 500mV	Accuracy±10mV
Charging overcurrent detection voltage	-40mV to -500mV	Accuracy±20mV
Short detection voltage	0.50-1.00V	Accuracy ±100mV

(2) Detection delay times are generated by an internal circuit.

(3) High-withstanding-voltage device is used for charger connection pins.

(4) 0V battery charge function: “available” or “Inhibited” is selectable

(5) Power down function. “Yes” or “no” is selectable

(6) Wide operating temperature range Ta=-40°C~+85°C

(7) Low current consumption (Ta=+25°C)

Operation mode	8μA Max.
Power-down mode	0.1μA(Max).

(8) Ultra small package SOT-23-6

(9) Lead-free, Halogen-Free, Green packaging.

APPLICATIONS

Lithium-ion/ Lithium polymer rechargeable battery pack.

High precision protectors for cell-phones and any other gadgets using on board Lithium-ion/ Lithium polymer battery pack.

BLOCK DIAGRAM

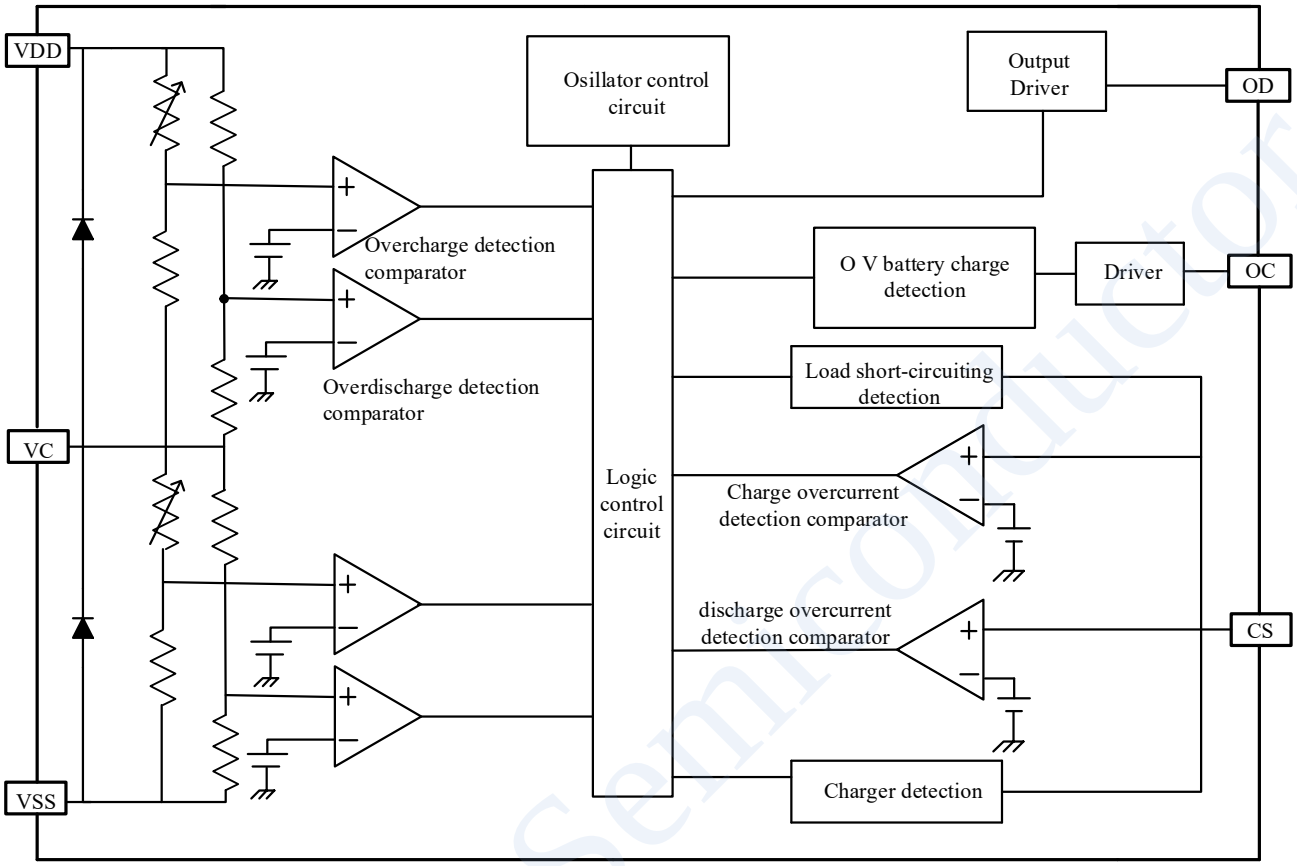


Figure 1

PRODUCT NAME & PARAMETER

Table 1(1/1)

Product Name	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	0 V battery charges function	Power down function
	V_{CU} (V)	V_{CR} (V)	V_{DL} (V)	V_{DR} (V)	V_{DIP} (mV)	V_{CIP} (mV)	V_{SIP}(V)		
OMS252-AH	4.25	4.10	3.00	3.00	200	-200	0.5	Available	YES
OMS252-AG	4.30	4.15	2.80	3.00	150	-150	0.5	Available	YES
OMS252-AD	4.28	4.13	2.40	2.90	150	-150	0.5	Inhibited	YES
OMS252-AC	4.300	4.100	2.40	3.00	200	−200	0.5	Inhibited	YES
OMS252-AF	4.350	4.100	2.40	3.00	150	-150	0.5	Available	YES
OMS252-AK	4.350	4.150	2.30	3.00	200	−200	0.5	Available	YES
OMS252-AL	4.200	4.050	2.50	3.00	200	−200	0.5	Inhibited	YES
OMS252-AO	4.250	4.100	2.50	3.00	200	−100	0.5	Inhibited	YES
OMS252-AS	4.250	4.050	2.50	3.00	200	−200	0.5	Available	NO
OMS252-FK	4.250	4.050	2.50	3.00	200	−200	0.5	Available	YES
OMS252-AV	4.400	4.250	2.50	2.90	150	−100	0.5	Available	YES
OMS252-AX	4.230	4.030	2.75	3.05	150	−100	0.5	Inhibited	YES
OMS252-AY	4.250	4.050	3.00	3.20	150	−50	0.5	Inhibited	YES
OMS252-BI	4.425	4.225	2.500	2.800	150	−100	0.5	Inhibited	NO
OMS252-AAI	3.650	3.450	2.000	2.700	200	-200	0.5	Available	NO
0MS252-PB	4.250	4.050	2.40	3.00	200	-100	0.5	Available	YES
OMS252-BF	4.250	4.050	2.500	3.000	200	-200	0.5	Available	YES
OMS252-BW	4.230	4.050	2.800	3.000	150	-100	0.5	Inhibited	YES
OMS252-BN	4.425	4.250	2.500	2.900	120	-100	0.5	Available	YES
OMS252-AJ	3.900	3.550	2.000	2.500	200	-200	0.5	Available	NO
OMS252-HH	4.280	4.130	2.400	2.900	100	-100	0.5	Inhibited	YES
OMS252-BU	4.500	4.300	2.000	2.400	250	-200	0.5	Inhibited	YES
OMS252-MA	4.225	4.050	2.600	3.000	150	-150	0.5	Inhibited	YES
OMS252-QA	4.475	4.270	2.800	3.000	200	-200	0.5	Inhibited	YES
OMS252-BI	4.425	4.225	2.5	2.8	150	-100	0.5	Inhibited	NO

Delay Time

Table 1(2/1)

Product Name	Overcharge Delay Time	Over-discharge Delay Time	Discharge Overcurrent Delay Time	Charge Overcurrent Delay Time	Short Circuit Delay Time
	T_{OC}	T_{OD}	T_{DIP}	T_{CIP}	T_{SIP}
OMS252-AH	1000ms	128ms	8ms	8ms	300μs
OMS252-AG	1000ms	128ms	8ms	8ms	300μs
OMS252-AD	1000ms	128ms	8ms	8ms	300μs
OMS252-AD	1000ms	128ms	8ms	8ms	300μs
OMS252-AC	1000ms	128ms	8ms	8ms	300μs
OMS252-AF	1000ms	128ms	8ms	8ms	300μs
OMS252-AK	1000ms	128ms	8ms	8ms	300μs
OMS252-AL	1000ms	128ms	8ms	8ms	300μs
OMS252-AO	1000ms	128ms	8ms	8ms	300μs
OMS252-AS	1000ms	128ms	8ms	8ms	300μs
OMS252-FK	1000ms	128ms	8ms	8ms	300μs
OMS252-AV	1000ms	128ms	8ms	8ms	300μs
OMS252-AX	1000ms	128ms	8ms	8ms	300μs
OMS252-AY	1000ms	500ms	8ms	8ms	300μs
OMS252-BI	1000ms	128ms	8ms	8ms	300μs
OMS252-AAI	1000ms	128ms	8ms	8ms	300μs
0MS252-PB	1000ms	110ms	10ms	7ms	300μs
OMS252-BF	1000ms	128ms	8ms	8ms	300μs
OMS252-BW	1000ms	128ms	8ms	8ms	300μs
OMS252-BN	1000ms	128ms	8ms	8ms	300μs
OMS252-AJ	1000ms	128ms	8ms	8ms	300μs
OMS252-HH	1000ms	128ms	8ms	8ms	300μs
OMS252-BU	1000ms	128ms	8ms	8ms	300μs
OMS252-MA	1000ms	128ms	8ms	8ms	300μs
OMS252-QA	1000ms	128ms	8ms	8ms	300μs
OMS252-BI	1000ms	128ms	8ms	8ms	300μs

Remark:

About accuracy of electrical parameter, Please refer to Table 4 & Table 5.

PIN CONFIGURATIONS

SOT23-6
Top View

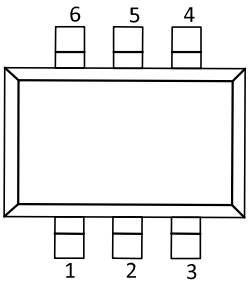


Figure 2

Table 2 Pin description

Pin No.	Symbol	Description
1	OD	FET gate control pin for discharge (CMOS output)
2	OC	FET gate control pin for charge (CMOS output)
3	CS	Overcurrent / charger detection
4	V_C	Connection pin for negative voltage of battery 1 and connection pin for positive voltage of battery 2
5	V_{DD}	Connection pin for positive power supply input and connection pin for positive voltage of battery 1
6	V_{SS}	Connection pin for negative power supply input and connection pin for negative voltage of battery 2

Package and Ordering information

Part No.	Package	Qty of Reel
OMS252 series	SOT-23-6	3000PCS

ABSOLUTE MAXIMUM RATINGS

Table 3 (Ta=+25°C unless otherwise specified)

Item	Symbol	Applied pin	Absolute Maximum Rating	Unit
Input voltage between V_{DD} and V_{SS}	V_{DS}	V_{DD}	V_{SS}-0.3~V_{SS}+12	V
Input pin voltage for CS	V_{CS}	CS	V_{DD}-30~V_{DD}+0.3	V
Input pin voltage for V_C	V_{vc}	Vc	V_{SS}-0.3~V_{DD}+0.3	V
Output pin voltage for OD	V_{OD}	OD	V_{SS}-0.3~V_{DD}+0.3	V
Output pin voltage for OC	V_{OC}	OC	V_{CS}-0.3~V_{DD}+0.3	V
Operation temperature range	T_{opt}	-	-40~+85	°C
Storage temperature range	T_{stg}	-	-40~+125	°C
Power dissipation	P_D	-	650 (When mounted on board)	mW

Caution:

The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

ELECTRICAL CHARACTERISTICS

Table 4 (Ta=+25°C unless otherwise Specified)

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
INPUT VOLTAGE, OPERATION VOLTAGE RANGE						
Operating voltage between V_{DD} and V_{SS}	V_{DSOP1}	-	1.5	-	12	V
Operating voltage between V_{DD} and CS	V_{DSOP2}	-	1.5	-	30	V
CURRENT CONSUMPTION						
Operation current consumption	I_{OPE}	V_{CELL1}=V_{CELL2}=3.5V, V_{CS}=0V	-	4	8.0	μA
Power-Down Current consumption （Power down function）	I_{PD}	V_{CELL1}=V_{CELL2}=2.05V, V_{CS}=0V	-	-	0.1	μA
Over Discharge Current consumption （without Power down function）	I_{PD}	V_{CELL1}=V_{CELL2}=2.05V, V_{CS}=0V	-	-	5.0	μA
DETECTION VOLTAGE						
Overcharge Detection Voltage	V_{CU}	3.5~4.6V	V_{CU}-0.020	V_{CU}	V_{CU}+0.020	V
		3.5~4.6V, -10°C to 60°C	V_{CU}-0.025	V_{CU}	V_{CU}+0.025	V
Overcharge Release Voltage	V_{CR}	V_{CU}=V_{CR}/3.5~4.6V	V_{CR}-0.030	V_{CR}	V_{CR}+0.030	V
		V_{CU}≠V_{CR}/3.5~4.6V	V_{CR}-0.030	V_{CR}	V_{CR}+0.020	V
Overdischarge Detection Voltage	V_{DL}	2.0~3.1V	V_{DL}-0.050	V_{DL}	V_{DL}+0.050	V
Overdischarge Release Voltage	V_{DR}	V_{DL}=V_{DR}/2.0~3.4V	V_{DR}-0.100	V_{DR}	V_{DR}+0.050	V
		V_{DL}≠V_{DR}/2.0~3.4V	V_{DR}-0.100	V_{DR}	V_{DR}+0.100	V
Discharge Overcurrent Detection Voltage	V_{DIP}	V_{DD}=7V,V_C=3.5V	V_{DIP}-10.0	V_{DIP}	V_{DIP}+10.0	mV
Load short-Circuit Detection Voltage	V_{SIP}	V_{DD}=7V,V_C=3.5V	V_{SIP}-0.10	V_{SIP}	V_{SIP}+0.10	V
Charge overcurrent detection voltage	V_{CIP}	V_{DD}=7V,V_C=3.5V	V_{CIP}-20.0	V_{CIP}	V_{CIP}+20.0	mV
CONTROL PIN OUTPUT VOLTAGE LEVEL						
OD Pin Output “H” Voltage	V_{DH}	-	V_{DD}-0.1	V_{DD}-0.02	-	V
OD Pin Output “L” Voltage	V_{ODL}	-	-	0.1	0.5	V
OC Pin Output “H” Voltage	V_{CH}	-	V_{DD}-0.1	V_{DD}-0.02	-	V
OC Pin Output “L” Voltage	V_{CL}	-	-	0.1	0.5	V
0V BATTERY CHARGE FUNCTION						
0V battery charge starting voltage(Inhibited)	V_{0CH}	Battery Voltage	0.5	-	1.2	V
0V battery charger starting voltage(available)	V_{0CH}	Charger Voltage	1.2	-	-	V
OUTPUT IMPEDANCE OF CONTROL TERMINALS						
OD Pin Output impedance “H”	R_{DH}	V_{CELL}=3.5V, V_{OD}=3.0V, V_{CS}=0V	2.5	-	30	KΩ
OD Pin Output impedance “L”	R_{DL}	V_{CELL}=2.0V, V_{OD}=0.5V, V_{CS}=0V	1.5	-	10	KΩ
OC Pin Output impedance “H”	R_{CH}	V_{CELL}=3.5V, V_{OC}=3.0V, V_{CS}=0V	3	-	30	KΩ
OC Pin Output impedance “L”	R_{CL}	V_{CELL}=4.5V, V_{OC}=0.5V, V_{CS}=0V	10	-	50	KΩ
INTERNAL RESISTANCE						
Resistance between CS and V_{SS}	R_{CSS}	V_{CELL}=3.5V, V_{CS}=1.0V	20	40	80	KΩ
Resistance between CS and V_{DD}	R_{CSD}	V_{CELL}=1.8V, V_{CS}=0V	100	300	900	KΩ

Delay Time Combination (Ta=+25°C, unless otherwise specified)

Table 5

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Overcharge Delay Time	T_{OC}	V_{CELL}=3.8~4.6V	TOC *0.7	TOC	TOC *1.3	ms
Overdischarge Delay Time	T_{OD}	V_{CELL} =3.6~2.0V -	TOD *0.7	TOD	TOD *1.3	ms
Discharge Overcurrent Delay Time	T_{DIP}	V_{CELL} =3.5V, V_{CS}=0.35V	TDIP *0.7	TDIP	TDIP *1.3	ms
Charge Overcurrent Delay Time	T_{CIP}	V_{CELL} =3.5V, V_{CS}=-0.3V	TCIP *0.7	TCIP	TCIP *1.3	ms
Short Circuit Delay Time	T_{SIP}	V_{CELL} =3.5V, V_{CS}=1.6V	TSIP *0.7	TSIP	TSIP *1.3	μs

Caution:

Since products are not screened at high and low temperatures, the specification for this temperature range is guaranteed by design, not tested in production.

TYPICAL APPLICATION

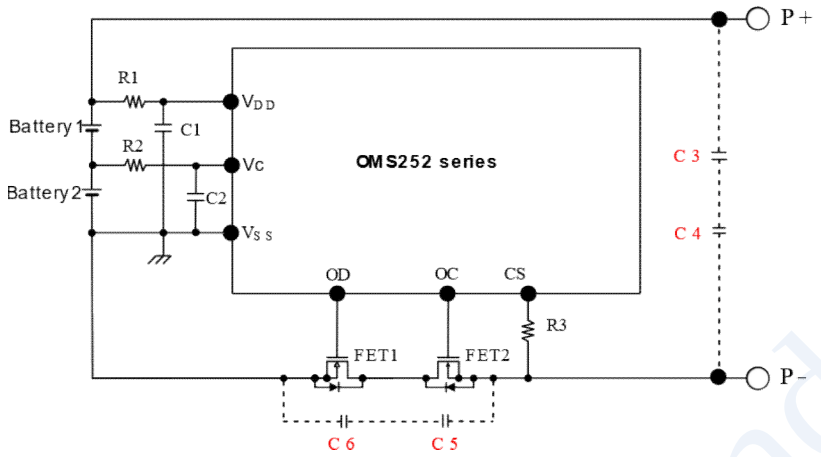


Figure 8

Table 6 Constants for External Components

Symbol	Device Name	Purpose	Min.	Typ.	Max	Remark
FET1	N-MOSFET	Discharge control				*1
FET2	N-MOSFET	Charge control				*2
R1,R2	Resistor	Current limit, stabilize V_{DD} and strengthen ESD protection	330Ω	470Ω	1KΩ	*3
R3	Resistor	Current limit,	300Ω	2kΩ	4kΩ	*4
C1,C2	Capacitor	Stabilize V_{DD}	-	1μF	2.2uF	*5
C3,C4	Capacitor	Enhanced ESD and EMI	-	0.1μF	-	*6
C5,C6	Capacitor	Enhanced anti surge capability	-	0.1μF	-	*7

APPLICATION HINTS:

*1. If the FET with a threshold voltage which is equal to or higher than the over-discharge detection voltage is applied, discharging function may be stopped before over-discharge is detected.

*2. If the FET's voltage tolerance between the gate and source is lower than the charger voltage, the FET may be destroyed.

*3. R1,R2 should be as small as possible to avoid lowering the overcharge detection accuracy due to current consumption. When a charger is connected in reverse; the current flows from the charger to the IC. At this time, if R1 has a high resistance, the voltage between V_{DD} pin and V_{SS} pin may exceed the absolute maximum rating.

*4. If R3 has a resistance higher than 4kΩ, the charging current may not be cut when a high-voltage charger is connected. Please select as large a resistance as possible to prevent current when a charger is connected in reverse.

*5. C1,C2 will stabilize the supply voltage of V_{DD}; the value of C1 should be equal to or more than 1μF.
Please set up a filter constant to be R1×C1 = R2×C2>330Ω*uF

*6. C3 C4 can be enhanced ESD and EMI, It's not necessary. It can be chosen according to the actual application scenarios

*7. C5 C6 can be enhance the ability of surge current, It's not necessary. It can be chosen according to the actual application scenarios

Caution:

1. **The above constants may be changed without notice.**
2. **It has not been confirmed whether the operation is normal or not in circuits other than the above example of connection. In addition, the example of connection shown above and the constant do not guarantee proper operation. Perform thorough evaluation using the actual application to set the constant.**

OPERATION

Reference the "Typical Application".

1. Normal Status

1. 1 With charge overcurrent detection function

The OMS252 Series monitors the voltage of the battery connected between the V_{DD} pin and V_{SS} pin and the voltage difference between the CS pin and V_{SS} pin to control charging and discharging. When the battery voltage is in the range from overdischarge detection voltage (V_{DL}) to overcharge detection voltage (V_{CU}), and the CS pin voltage is in the range from the charge overcurrent detection voltage (V_{CIP}) to discharge overcurrent detection voltage (V_{DIP}), The OMS252 Series turns both the charging and discharging control FETs on. This condition is called the normal status, and in this condition charging and discharging can be carried out freely. The resistance (R_{CSD}) between the CS pin and V_{DD} pin, and the resistance (R_{CSS}) between the CS pin and V_{SS} pin are not connected in the normal status.

Caution

When the battery is connected for the first time, discharging may not be enabled. In this case, short the CS pin and V_{SS} pin, or set the CS pin voltage at the level of V_{CIP} or more and V_{DIP} or less by connecting the charger. The OMS252 Series then returns to the normal status.

2. Overcharge status

When the battery voltage becomes higher than V_{CU} during charging in the normal status and detection continues for the overcharge detection delay time (t_{CU}) or longer, the OMS252 Series turns the charging control FET off to stop charging. This condition is called the overcharge status. R_{CSD} and R_{CSS} are not connected in the overcharge status.

The overcharge status is released in the following two cases ((1) and (2)).

(1) In the case that the CS pin voltage is lower than V_{DIP}, the OMS252 Series releases the overcharge status when the battery voltage falls below V_{CL}.

(2) In the case that the CS pin voltage is higher than or equal to V_{DIP}, the OMS252 Series releases the overcharge status when the battery voltage falls below V_{CU}.When the discharge is started by connecting a load after the overcharge detection, the CS pin voltage rises more than the voltage at V_{SS} pin due to the V_f voltage of the parasitic diode, because the discharge current flows through the parasitic diode in the charging control FET. If this CS pin voltage is higher than or equal to V_{DIP}, the OMS252 Series releases the overcharge status when the battery voltage is lower than or equal to V_{CU};

Caution

1. If the battery is charged to a voltage higher than V_{CU} and the battery voltage does not fall below V_{CU} even when a heavy load is connected, discharge overcurrent detection and load short-circuiting detection do not function until the battery voltage falls below V_{CU}. Since an actual battery has an internal impedance of tens of mΩ, the battery voltage drops immediately after a heavy load that causes overcurrent is connected, and discharge overcurrent detection and load short-circuiting detection function.

2. If a charger is connected after the overcharge detection, the overcharge status is not released even when the battery voltage falls below V_{CL}. The OMS252 Series releases the overcharge status when the CS pin voltage returns to V_{CIP} (or V_{CHA} when without charge overcurrent detection function) or higher by removing the charger.

3. Overdischarge status

When the battery voltage falls below overdischarge detection voltage (V_{DL}) during discharging in the normal status and the condition continues for the overdischarge detection delay time (t_{DL}) or longer, the OMS252 Series turns the discharging control FET off to stop discharging. This

condition is called the overdischarge status. Under the overdischarge status, the CS pin and V_{DD} pin are shorted by R_{CSD} in the OMS252 Series. The CS pin is pulled up by R_{CSD} . R_{CSS} is not connected in the overdischarge status.

3. 1 With power-down function

Under the overdischarge status, when voltage difference between the CS pin and V_{DD} pin is 0.8 V typ. or lower, the power-down function works and the current consumption is reduced to the current consumption during power-down (I_{PD}). By connecting a battery charger, the power-down function is released when the CS pin voltage is 0.7 V typ. or lower.

• When a battery is not connected to a charger and the CS pin voltage ≥ 0.7V typ., the OMS252 Series maintains the overdischarge status even when the battery voltage reaches V_{DU} or higher. When a battery is connected to a charger and 0.7 V typ.> the CS pin voltage>−0.7V typ., the battery voltage reaches V_{DU} or higher and the OMS252 Series releases the overdischarge status.

• When a battery is connected to a charger and −0.7V typ.≥the CS pin voltage, the battery voltage reaches V_{DL} or higher and the OMS252 Series releases the overdischarge status.

3. 2 Without power-down function

The power-down function does not work even when voltage difference between the CS pin and V_{DD} pin is 0.8 V typ. or lower.

• When a battery is not connected to a charger and the CS pin voltage ≥ 0.7V typ., the battery voltage reaches V_{DU} or higher and the OMS252 Series releases the overdischarge status.

• When a battery is connected to a charger and 0.7 V typ. > the CS pin voltage >−0.7 V typ., the battery voltage reaches V_{DU} or higher and the OMS252 Series releases the overdischarge status.

• When a battery is connected to a charger and −0.7 V typ.≥ the CS pin voltage, the battery voltage reaches V_{DL} or higher and the OMS252 Series releases the overdischarge status.

4. Discharge overcurrent status (Discharge overcurrent, load short-circuiting)

When a battery in the normal status is in the status where the voltage of the CS pin is equal to or higher than V_{DIP} because the discharge current is equal to or higher than the specified value and the status lasts for the discharge overcurrent detection delay time (t_{DIP}) or longer, the discharge control FET is turned off and discharging is stopped.

This status is called the discharge overcurrent status.

In the discharge overcurrent status, the CS pin and V_{SS} pin are shorted by the R_{CSS} in the OMS252 Series. However, the voltage of the CS pin is at the V_{DD} potential due to the load as long as the load is connected. When the load is disconnected, the CS pin returns to the V_{SS} potential. If the voltage at the CS pin returns to V_{DIP} or lower, the OMS252 Series releases the discharge overcurrent status. R_{CSD} is not connected in the discharge overcurrent detection status.

5. Charge overcurrent status

When a battery in the normal status is in the status where the voltage of the CS pin is equal to or lower than V_{CIP} because the charge current is equal to or higher than the specified value and the status lasts for the charge overcurrent detection delay time (t_{CIP}) or longer, the charge control FET is turned off and charging is stopped. This status is called the charge overcurrent status.

The OMS252 Series releases the charge overcurrent status when the voltage at the CS pin returns to V_{CIP} or higher by removing the charger. The charge overcurrent detection function does not work in the overdischarge status. R_{CSD} and R_{CSS} are not connected in the charge overcurrent detection status.

6. 0 V battery charge function "available"

This function is used to recharge a connected battery whose voltage is 0 V due to self-discharge. When the 0 V battery charge starting charger voltage (V_{0CHA}) or a higher voltage is applied between the P+ and P- pins by connecting a charger, the charging control FET gate is fixed to the V_{DD} potential.

When the voltage between the gate and source of the charging control FET becomes equal to or higher than the threshold voltage due to the charger voltage, the charging control FET is turned on to start charging. At this time, the discharging control FET is off and the charging current flows through the internal parasitic diode in the discharging control FET. When the battery voltage becomes equal to or higher than V_{DU} , the OMS252 Series enters the normal status.

Caution

1. Some battery providers do not recommend recharging for a completely self-discharged battery. Please ask the battery provider to determine whether to enable or inhibit the 0 V battery charge function.

2. The 0 V battery charge function has higher priority than the charge overcurrent detection function. Consequently, a product in which use of the 0 V battery charge function is enabled charges a battery forcibly and the charge overcurrent cannot be detected when the battery voltage is lower than V_{DL} .

7. 0 V battery charge function "unavailable"

This function inhibits charging when a battery that is internally short-circuited (0 V battery) is connected. When the battery voltage is the 0 V battery charge inhibition battery voltage (V_{0INH}) or lower, the charging control FET gate is fixed to the P- pin voltage to inhibit charging. When the battery voltage is V_{0INH} or higher, charging can be performed.

Caution

Some battery providers do not recommend recharging for a completely self-discharged battery. Please ask the battery provider to determine whether to enable or inhibit the 0 V battery charge function.

TIMING CHART

(1) Overcharge detection, overdischarge detection (The charger is assumed to charge with a constant current)

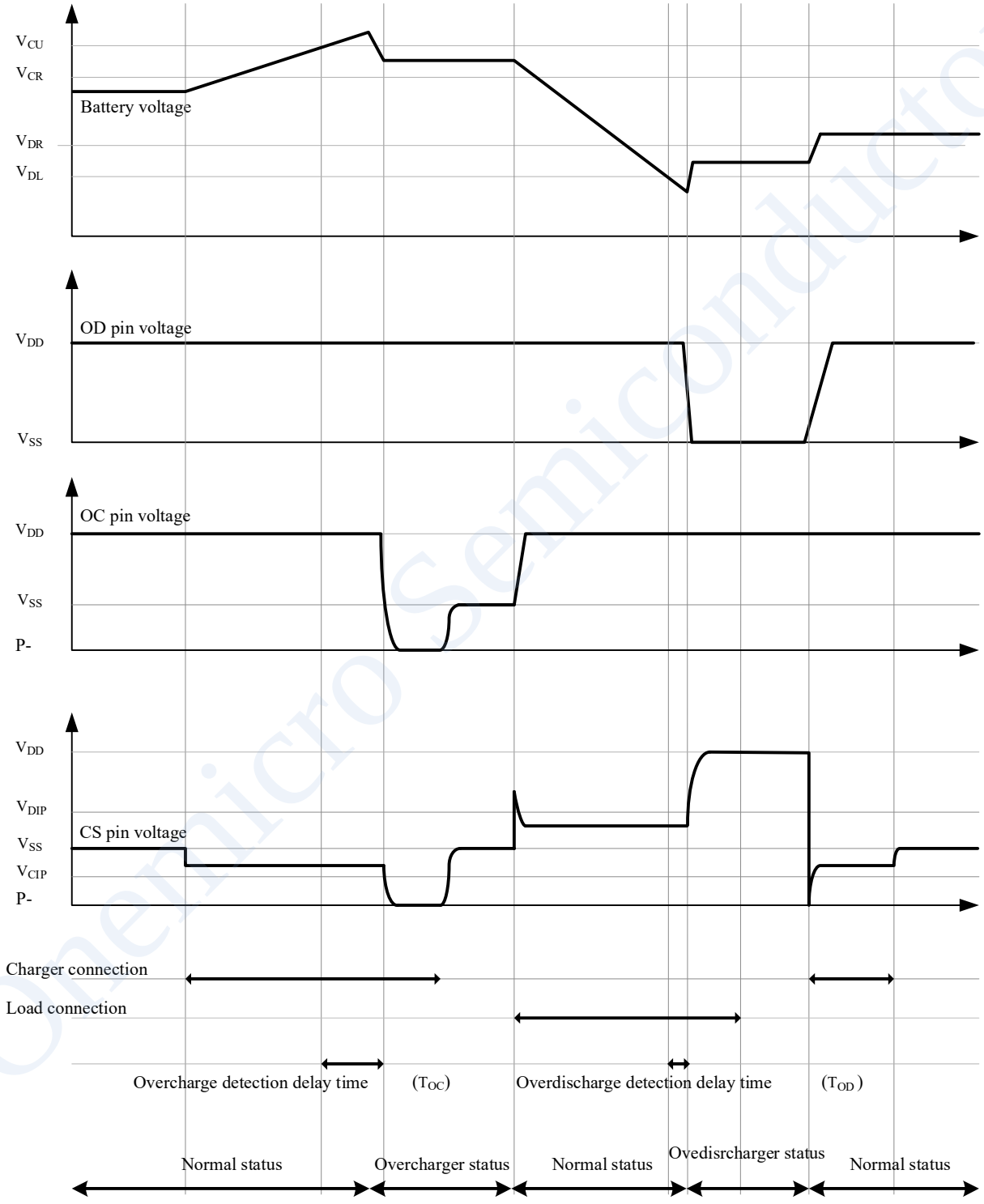


Figure 9

(2) Discharge overcurrent detection

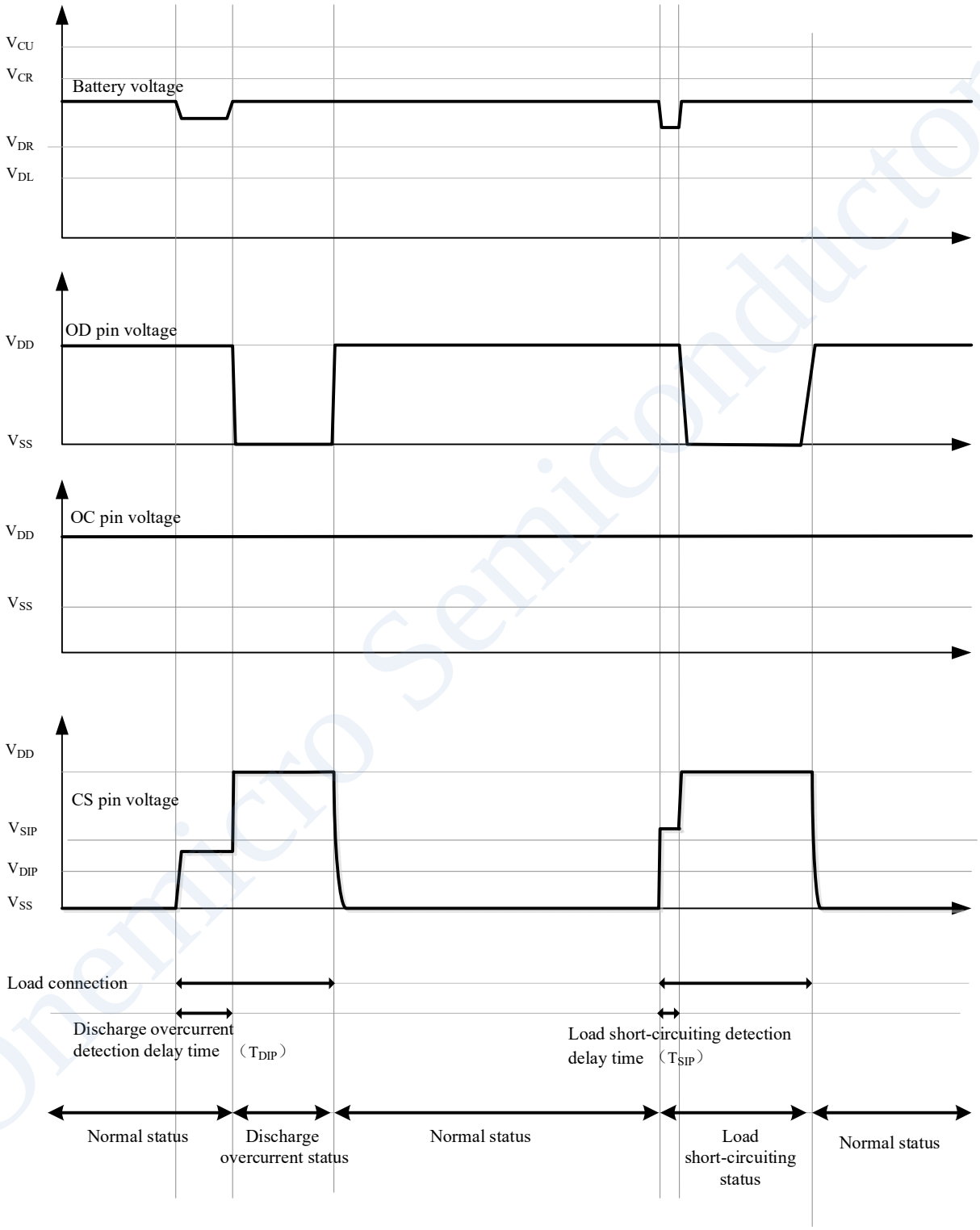


Figure 10

(3) Charger detection (The charger is assumed to charge with a constant current)

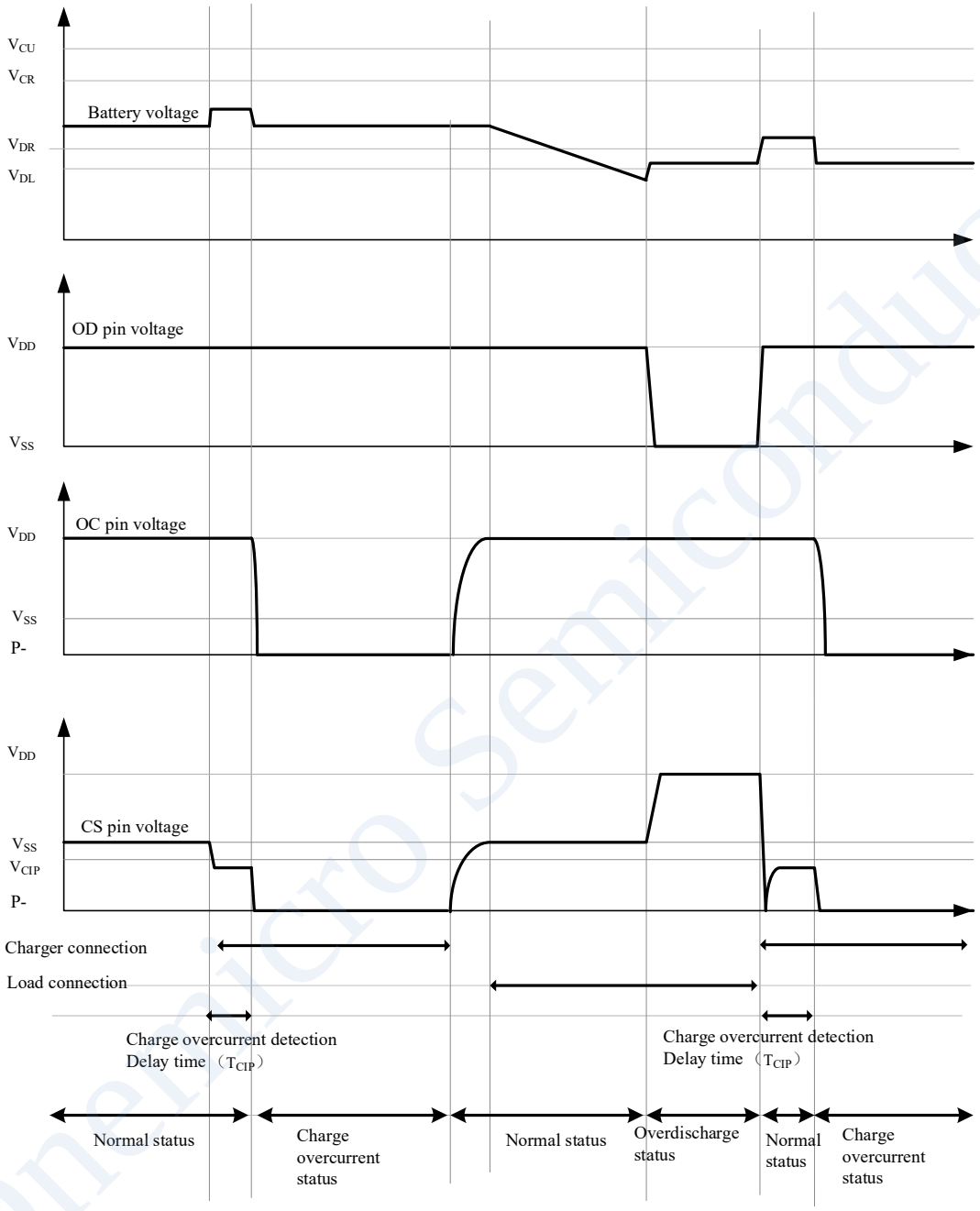


Figure 11

CHARACTERISTICS (TYPICAL DATA)

(1) Current consumption

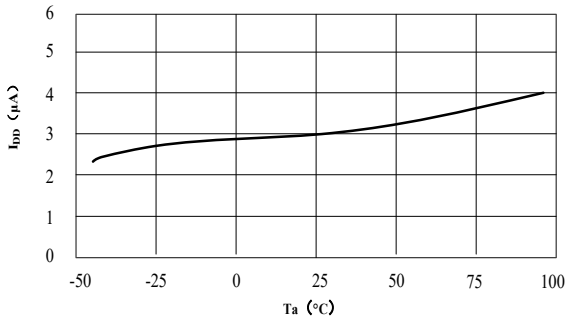


Figure 12 **<I_{DD}-Ta>**

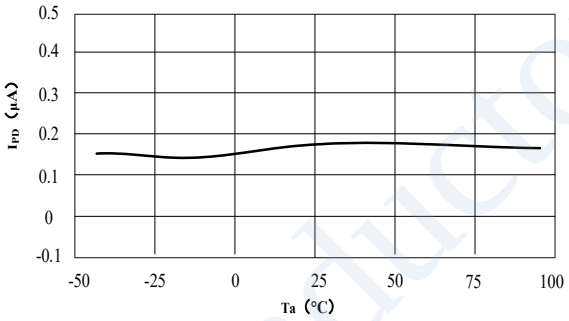
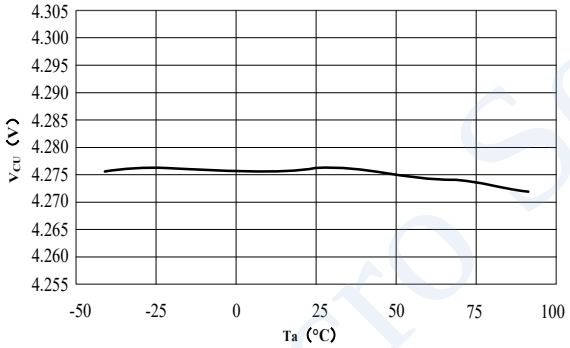


Figure 13 **<I_{PD}-Ta>**

(2) Overcharge detection / release voltage, overdischarge detection / release voltage, overcurrent detection voltage, and corresponding delay time



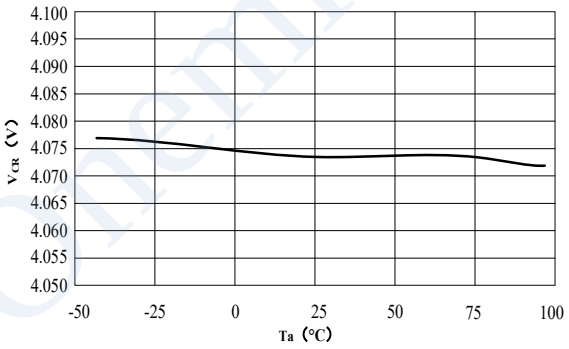


Figure 14 **<V_{CU}-Ta>**

Figure 15 **<V_{CR}-Ta>**

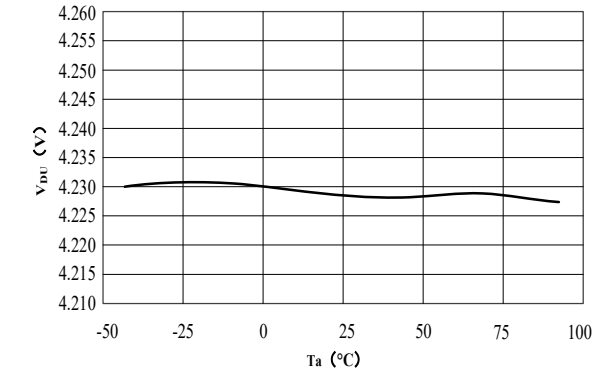


Figure 16 **<V_{DL}-Ta>**

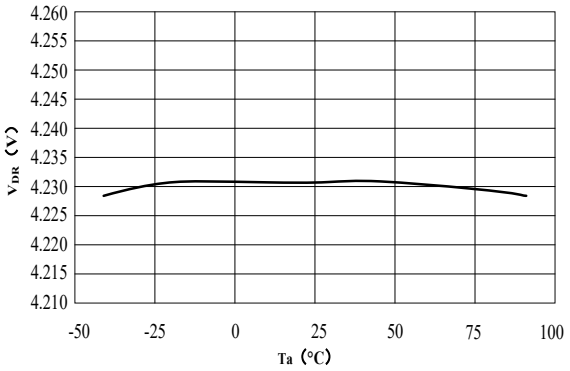


Figure 17 **<V_{DR}-Ta>**

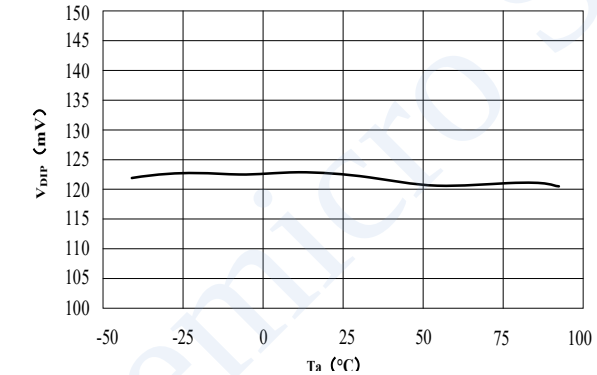


Figure 18 **<V_{DIP}-Ta>**

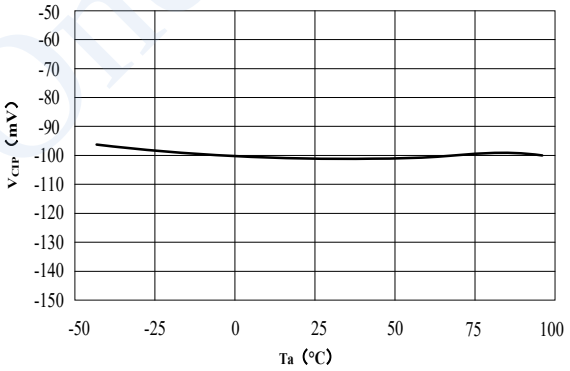


Figure 19 **<V_{CIP}-Ta>**

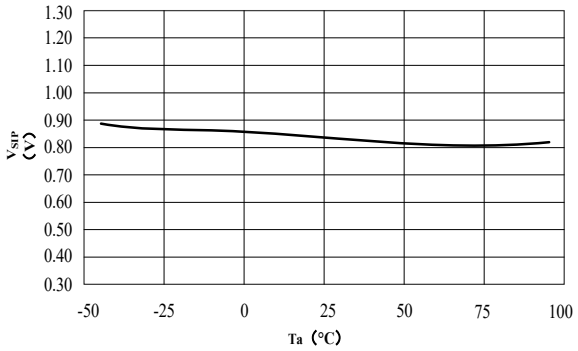


Figure 20 **<V_{SIP}-Ta>**

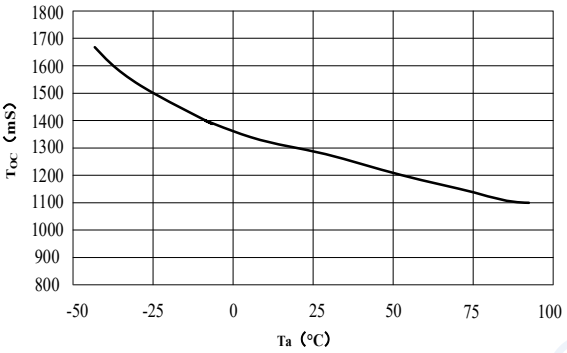


Figure 21 **<T_{OC}-Ta>**

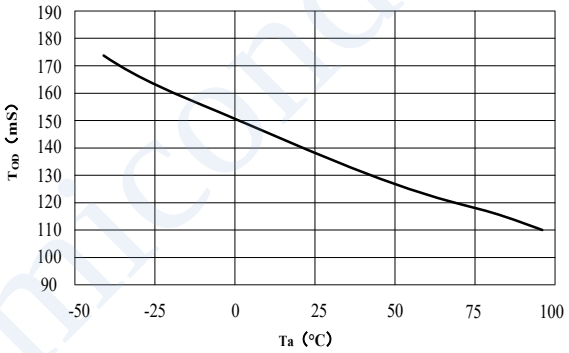


Figure 22 **<T_{OD}-Ta>**

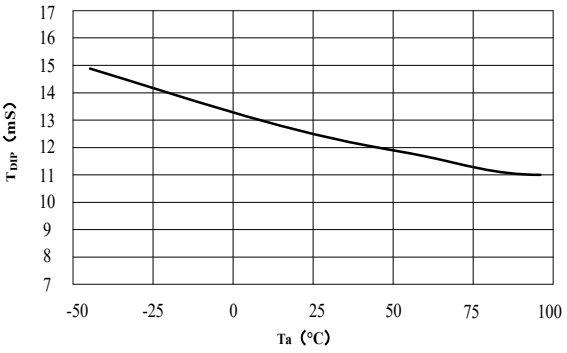


Figure 23 **<T_{DIP}-Ta>**

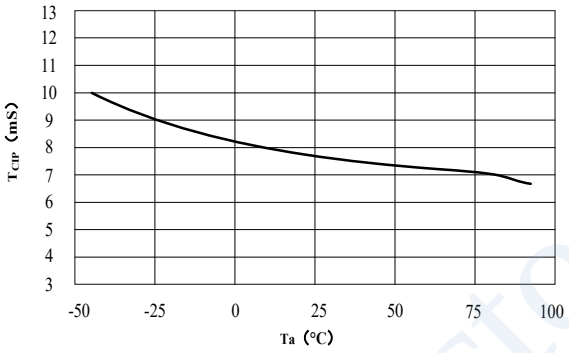


Figure 24 **<T_{CIP}-Ta>**

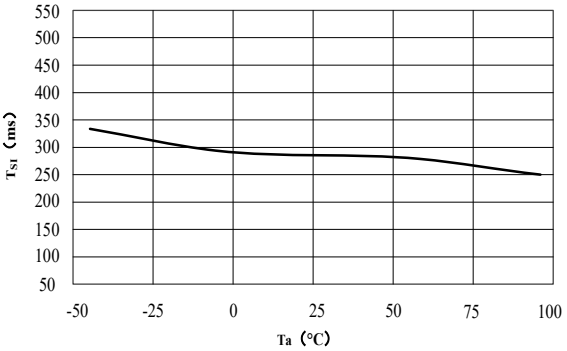
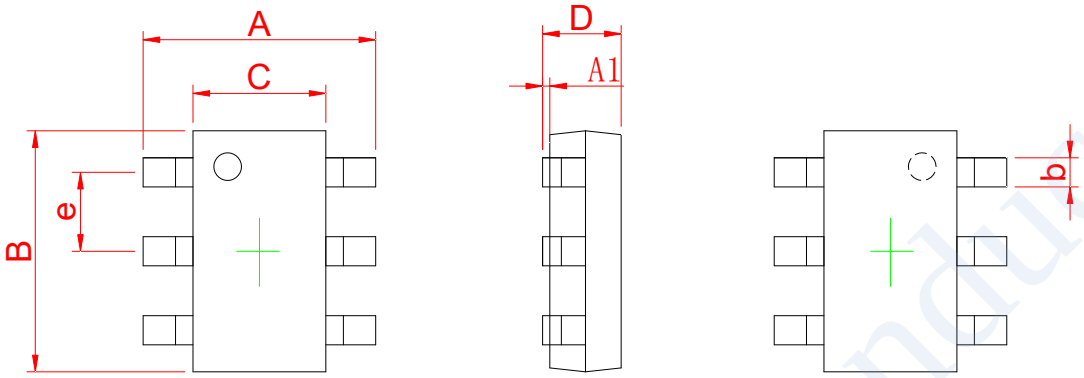


Figure 23 <T_{SIP}-Ta>

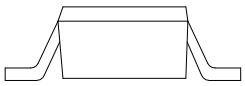
PACKAGE SPECIFICATIONS

SOT23-6 PKG Dimensions (Unit: mm)



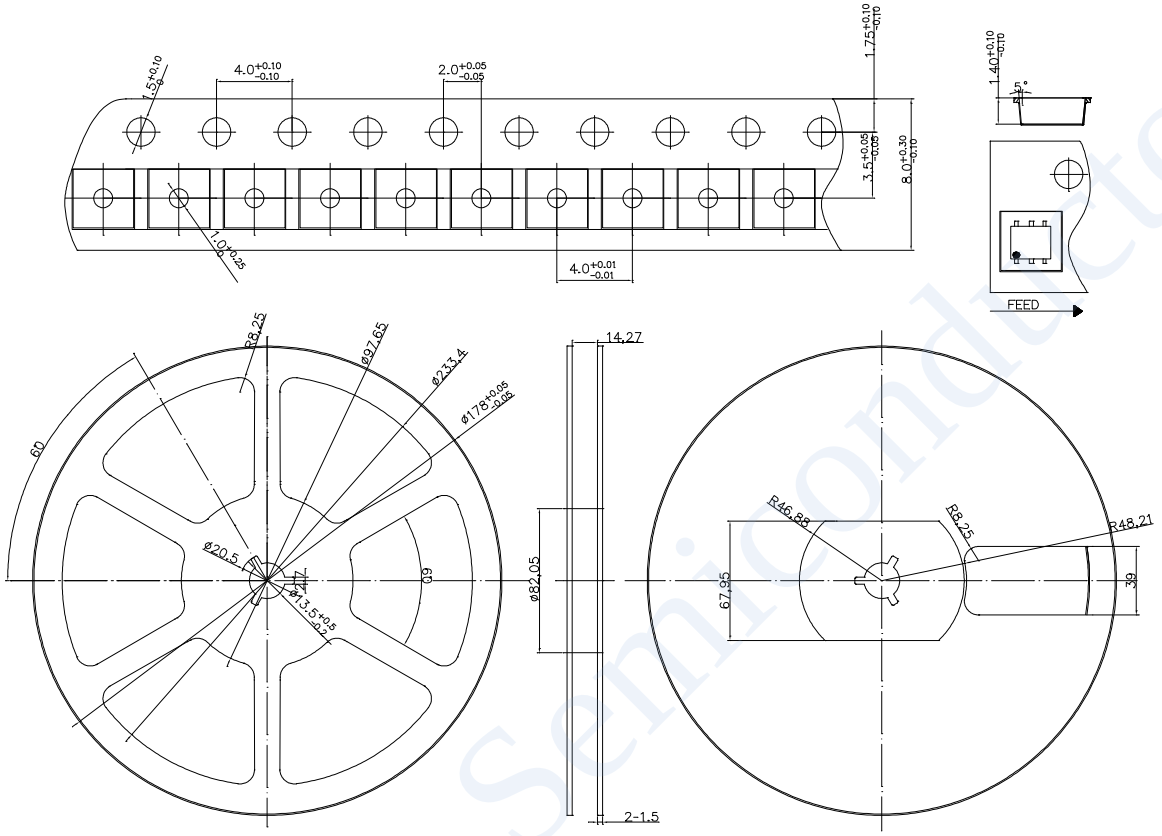
TOP VIEW

BOTTOM VIEW



Symbol	Dimension in Millimeters		Dimension in Inches	
	Min	Max	Min	Max
A	2.600	3.000	0.102	0.118
B	2.700	3.100	0.106	0.122
C	1.500	1.700	0.059	0.067
D	0.800	1.300	0.031	0.051
A1	0.020	0.150	0.001	0.006
b	0.200	0.500	0.007	0.020
e	0.950REF		0.037REF	

Figure 24 Package Specification



Note

a) All dimensions are in millimeters;

b) The pad color is silver.

PRECAUTIONS:

1. The application conditions for the input voltage, output voltage, and load current should not exceed the package power dissipation.
2. Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.
3. One-Micro Semiconductor claims no responsibility for any and all disputes arising out of or in connection with any infringement by products including this IC of patents owned by a third party.
4. The products are strictly prohibited from using, providing or exporting for the purposes of the development of weapons of mass destruction or military use. One-Micro Semiconductor is not liable for any losses, damages, claims or demands caused by any provision or export to the person or entity who intends to develop, manufacture, use or store nuclear, biological or chemical weapons or missiles, or use any other military purposes.
5. The products are not designed to be used as part of any device or equipment that may affect the human body, human life, or assets (such as medical equipment, disaster prevention systems, security systems, combustion control systems, infrastructure control systems, vehicle equipment, traffic systems, in-vehicle equipment, aviation equipment, aerospace equipment, and nuclear-related equipment), excluding when specified for in-vehicle use or other uses by One-Micro Semiconductor. Do not apply the products to the above listed devices and equipment. One-Micro Semiconductor is not liable for any losses, damages, claims or demands caused by unauthorized or unspecified use of the products.