2 ~ 3 cells rechargeable lithium battery secondary protection IC

The CM1225 series is a secondary protection chip for 2-3 rechargeable batteries, with built-in high-precision voltage detection and delay circuits. By detecting the voltage of each cell in the battery pack, it provides overcharging protection for the battery pack.

■ Features

1) High accuracy voltage detection for each cell
   - Overcharge detection voltage — 4.150 V ~ 4.700 V (50 mV step) — accuracy ±20 mV
   - Overcharge hysteresis voltage — 0.100 V ~ 0.300 V (50 mV step) — accuracy ±50 mV
   - Overcharge protection delay time — 1.0 s, 2.0 s, 4.0 s, 6.0 s — accuracy ±30%
2) Output logic Optional: Active “H”、Active “L”
3) Output high level potential optional: 4.3 V or VDD
4) High breakdown voltage: Absolute Maximum breakdown voltage 35 V
5) Wide operating temperature range: -40°C ~ +85°C
6) Low current consumption
   - Normal mode — 1.0 μA (Typ.) (Ta = +25°C)
7) RoHS、PB-Free、HF

■ Applications

- laptop battery
- Power Tools
- Sweeping robot
- UPS

■ Packages

- DFN1.9*1.6-6L

■ Block Diagram

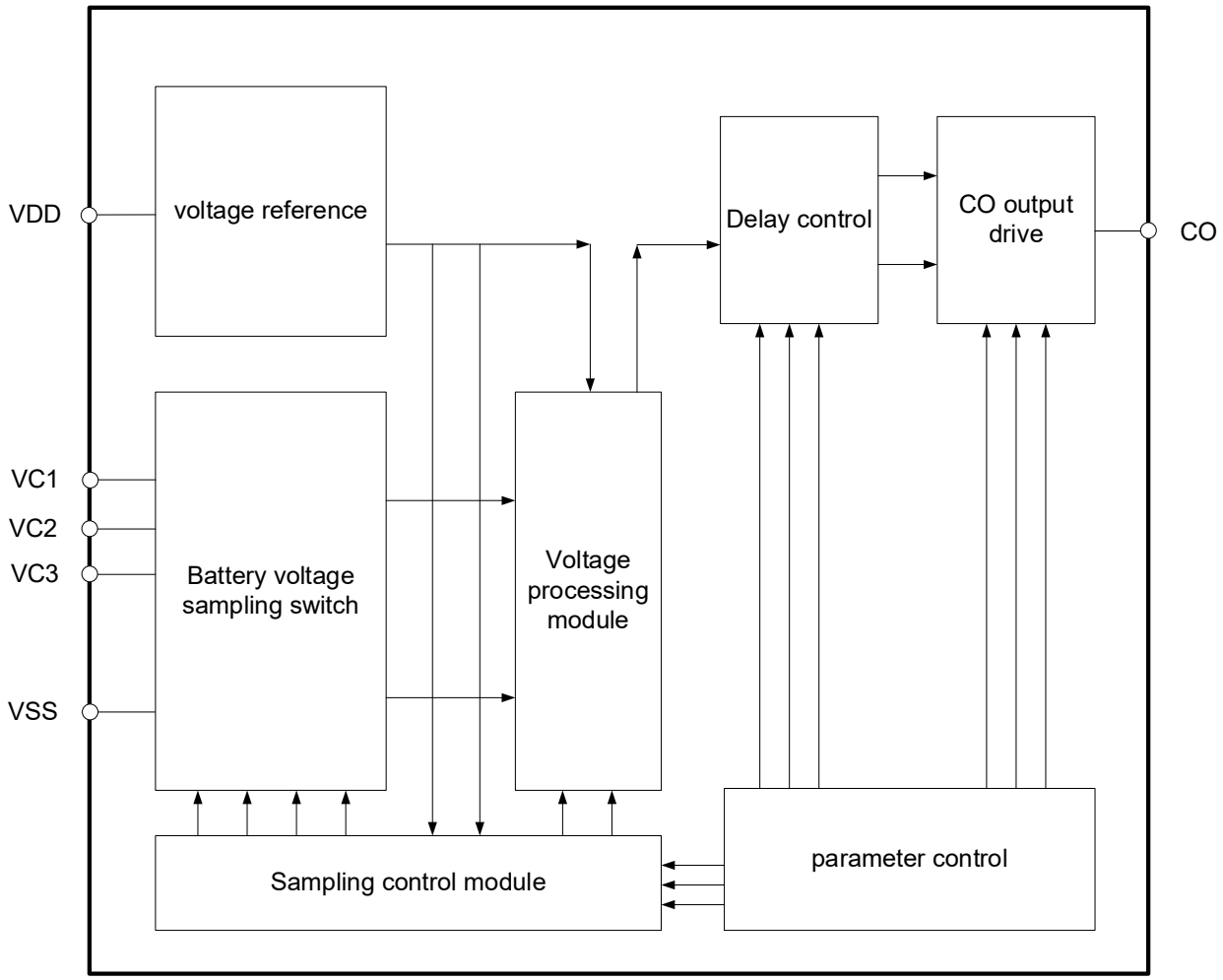


Figure 1

■ Pin Configurations

DFN1.9×1.6-6L

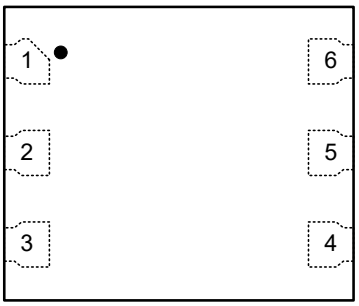


Figure 2 Top View

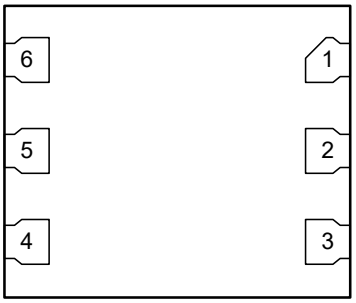


Figure 3 Bottom View

PIN No.	Symbol	Description
1	CO	Charge power mosfet control terminal
2	VDD	Power supply
3	VC1	Cell1 positive input
4	VC2	Cell2 positive input, Cell1 negative input
5	VC3	Cell3 positive input, Cell2 negative input
6	VSS	Cell3 negative input, GROUND terminal

Table 1

■ Marking

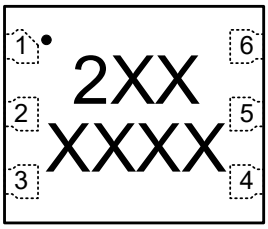
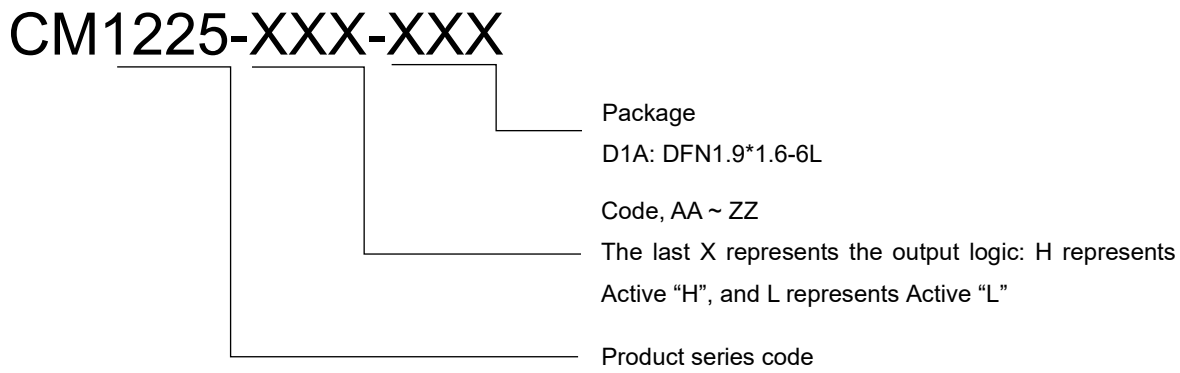


Figure 4

The first line：Product series code

The second line：Lot number

■ Naming rule



■ Products Catalogue

Part No.	Overcharge protection voltage V_{OC}	Overcharge hysteresis voltage V_{HC}	Overcharge protection delay time T_{OC}	High level output potential	Output logic
CM1225-AAH-D1A	4.500 V	0.200 V	6 s	4.3 V	Active “H”
CM1225-ABH-D1A	4.500 V	0.300 V	2 s	4.3 V	Active “H”
CM1225-BAH-D1A	4.300 V	0.100 V	2 s	4.3 V	Active “H”
CM1225-BBH-D1A	4.350 V	0.200 V	2 s	4.3 V	Active “H”

Table 2

Remark: For more product info, please contact iCM marketing department.

■ Absolute Maximum Ratings

(Unless otherwise specified: Ta = +25°C)

Item	Symbol	Description	Ratings	Unit
Power supply voltage	VDD	VDD	VSS-0.3 ~ VSS+35	V
Single cell input voltage	V_{CELL}	VC1-VC2, VC2-VC3, VC3-VSS	0 ~ 35	V
CO output voltage	V_{CO}	CO	VSS-0.3 ~ VDD+0.3	V
Operating temperature	T_{OPR}	–	–40 ~ +85	°C
Storage temperature	T_{STG}	–	–55 ~ +125	°C

Table 3

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

■ Electrical Characteristics

(Unless otherwise specified: Ta = +25°C)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage		V_{OP}	VDD-VSS	4.0	-	25	V
Operating consumption		I_{DD_OP}	VC1=VC2=VC3=3.5V	-	1.0	1.8	μA
Overcharge	Protection voltage	V_{OC}	VC1=VC2=3.5V, VC3=3.5 → 4.4V （@Ta=25°C）	V_{OC}-0.020	V_{OC}	V_{OC} +0.020	V
			VC1=VC2=3.5V, VC3=3.5 → 4.4V （@Ta=-20°C ~ +60°C）	V_{OC}-0.025	V_{OC}	V_{OC} +0.025	V
	Hysteresis	V_{HC}	V_{HC}＜0.100V VC1=VC2=3.5V VC3=4.4 → 3.5V	V_{HC} -0.025	V_{HC}	V_{HC} +0.025	V
		V_{HC}	V_{HC} ≥0.100V VC1=VC2=3.5V VC3=4.4 → 3.5V	V_{HC} -0.050	V_{HC}	V_{HC} +0.050	V
	Protection delay time	T_{OC}	VC1=VC2=3.5V, VC3=3.5 → 4.6V	Toc*0.7	Toc	Toc*1.3	s
	Release delay time	T_{OCR}	VC1=VC2=3.5V, VC3=4.6 → 3.5V	6	16	80	ms
	Reset delay time	T_{TR}	-	3	6	9	ms
CO output potential	CO high output level	V_{COH}	-	VDD-0.7	VDD	VDD+0.7	V
			-	3.7	4.3	4.9	V
CO driving current	CO absorption current	I_{COL}	-	0.4	-	-	mA
	CO output current	I_{COH}	-	50	-	-	μA

Table 4

■ Electrical Characteristics

(Unless otherwise specified: Ta = -40°C ~ +85°C*1)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage		V_{OP}	VDD-VSS	4.0	-	25	V
Operating consumption		I_{DD_OP}	VC1=VC2=VC3=3.5V	-	1.0	2.5	μA
Overcharge	Protection voltage	V_{OC}	VC1=VC2=3.5V, VC3=3.5 → 4.4V	V_{OC}-0.045	V_{OC}	V_{OC} +0.035	V
	Hysteresis	V_{HC}	V_{HC}＜0.100V VC1=VC2=3.5V VC3=4.4 → 3.5V	V_{HC} -0.050	V_{HC}	V_{HC} +0.040	V
		V_{HC}	V_{HC} ≥0.100V VC1=VC2=3.5V VC3=4.4 → 3.5V	V_{HC} -0.080	V_{HC}	V_{HC} +0.080	V
	Protection delay time	T_{OC}	VC1=VC2=3.5V, VC3=3.5 → 4.6V	Toc*0.5	Toc	Toc*1.5	s
	Release delay time	T_{OCR}	VC1=VC2=3.5V, VC3=4.6 → 3.5V	3	16	120	ms
	Reset delay time	T_{TR}	-	1	6	12	ms
CO output potential	CO high output level	V_{COH}	-	VDD-0.7	VDD	VDD+0.7	V
			-	3.5	4.3	5.1	V
CO driving current	CO absorption current	I_{COL}	-	0.4	-	-	mA
	CO output current	I_{COH}	-	50	-	-	μA

Table 5

■ Description

1. **Normal state**

When the voltage of all battery is below the overcharge protection release voltage (V_{OCR}), the output of the CO terminal is "L" (active "H") or "H" (active "L"), this state is called the normal state.

2. **Overcharge**

During charging, If the voltage of any battery exceeds the overcharge protection voltage (V_{OC}) and this state remains above the T_{OC}. The output voltage of CO will reverse. This state is called the overcharged state. By connecting the MOSFET at the CO terminal, charge control and secondary protection are available. When the battery voltage after overcharge protection is all lower than the V_{OCR} and this state lasts for more than overcharge release delay time (T_{OCR}), the normal state is returned.

3. **Overcharging reset time**

During charging, any battery voltage, waiting for overcharge protection delay in the process, If there is a pulse lower than the overcharge protection voltage and the pulse width is less than the overcharge reset delay time (T_{TR}), T_{OC} will not be re-timed; If there is a pulse lower than the overcharge protection voltage and the pulse width is greater than the overcharge reset delay time (T_{TR}), T_{OC} will time again.

4. **Quick test mode**

When VDD>VC1+5.5V and lasts for more than 32ms, the chip can enter fast testing mode, and the overcharge protection delay can be reduced from a normal second level to 16ms, helping customers conduct fast testing. When VDD<VC1+5.5V, the chip exits the fast test mode and the overcharge protection delay becomes a positive second level.

■ Application Circuits

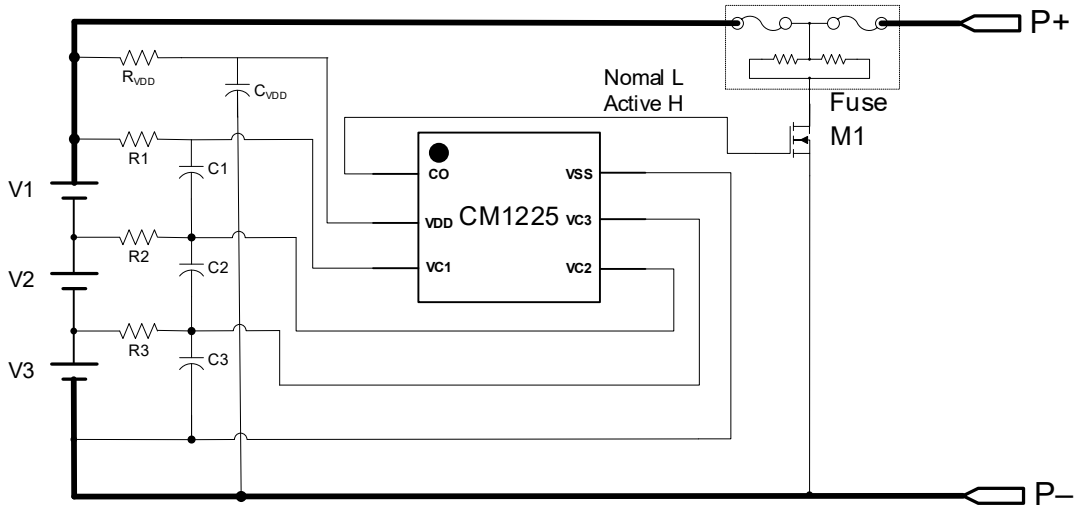


Figure 5 3 cells application

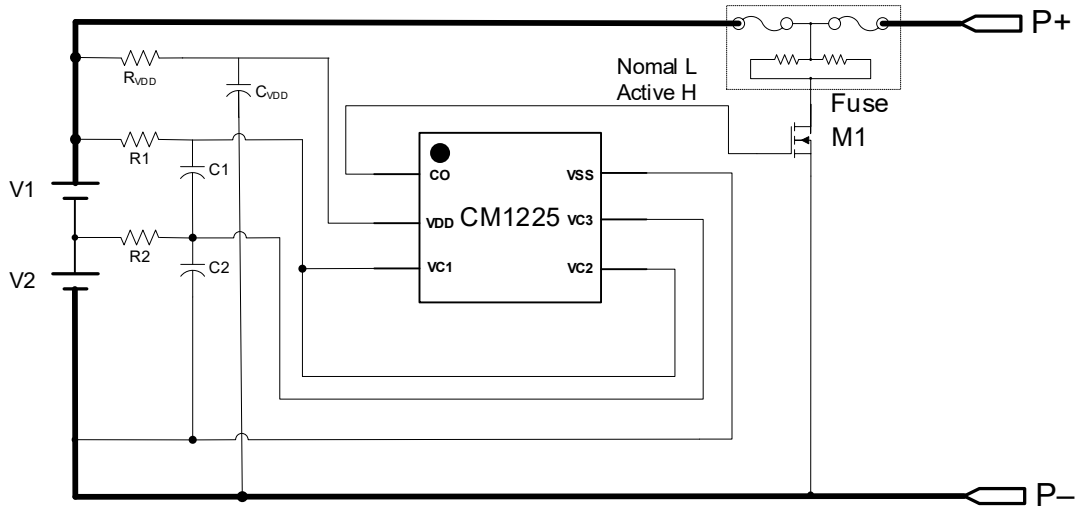


Figure 6 2 cells application

■ BOM list

Component Symbol	Type	Range	Unit
R_{VDD}	1	0.33 ~ 2.0	kΩ
R1、R2、R3	1	0.3 ~ 2.0	kΩ
C_{VDD}	1.0	0.1 ~ 2.2 μF, BV≥10V	μF
C1、C2、C3	0.1	0.1 ~ 1.0 μF, BV≥10V	μF

Table 6

Caution:

1. **The above constants may be changed without notice.**
2. **The above circuit and parameters do not guarantee the normal operation under all application conditions. Please set the parameters of the actual application circuit according to the actual application.**
3. **R1 to R3 must be set to the same values, and C1 to C3 and CVDD should be adjusted according to the actual application.**

■ Operation Timing Chart

1. **Overcharge protection and recovery in normal mode**

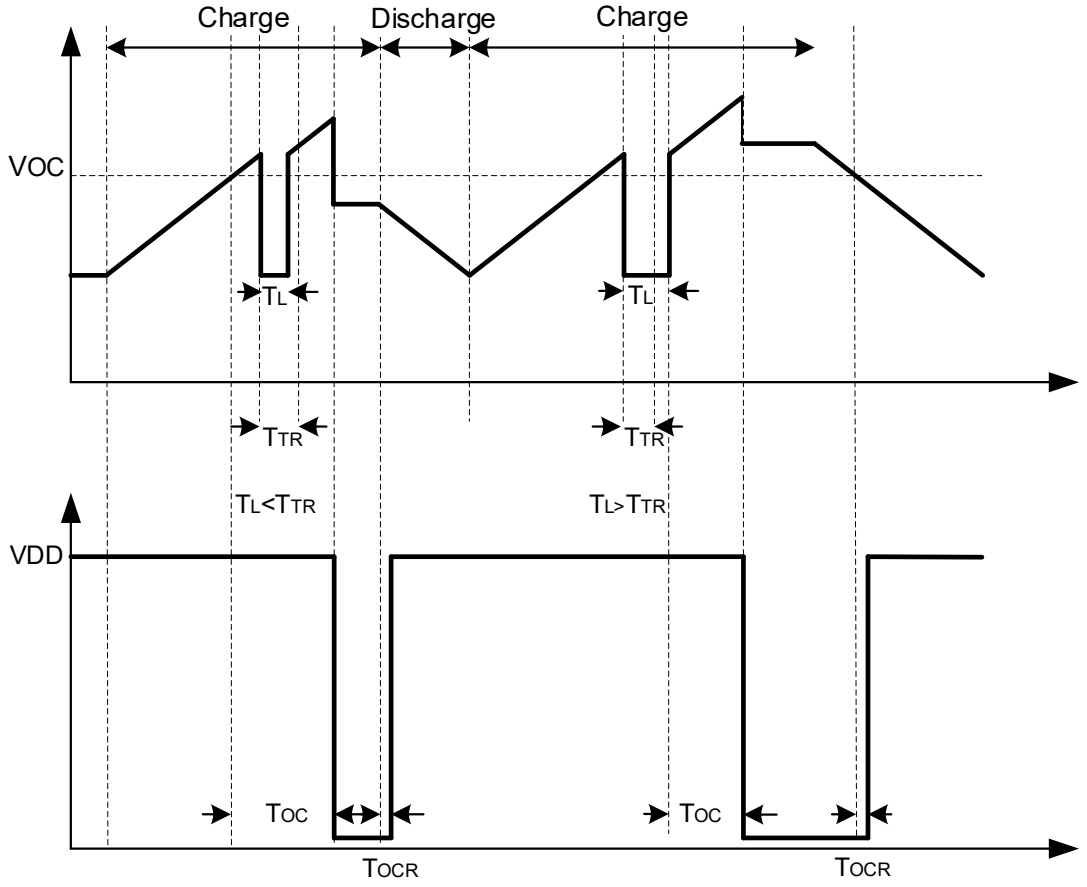


Figure 7

2. **Overcharge protection delay time in quick test mode**

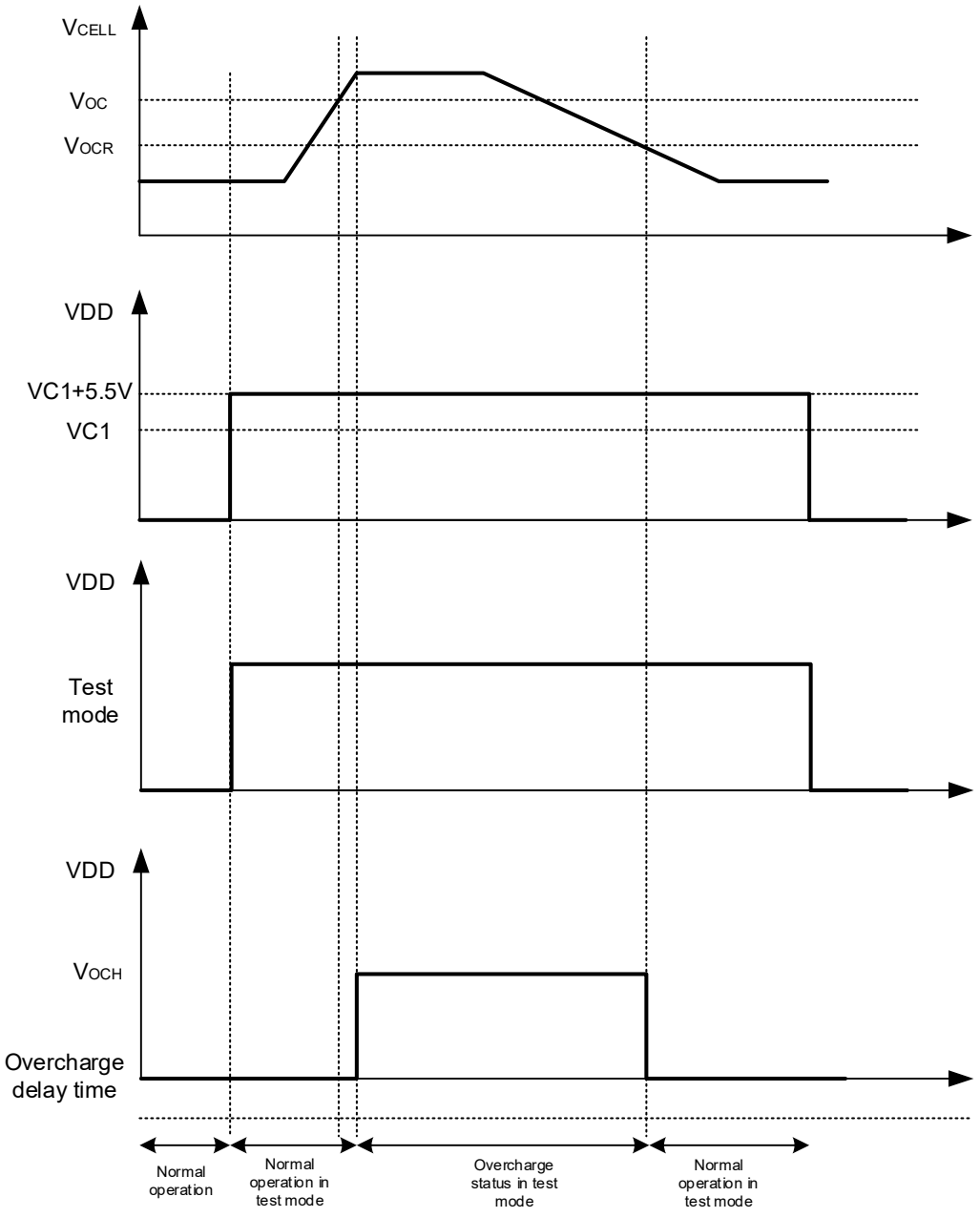


Figure 8

■ Package

DFN1.9×1.6-6L

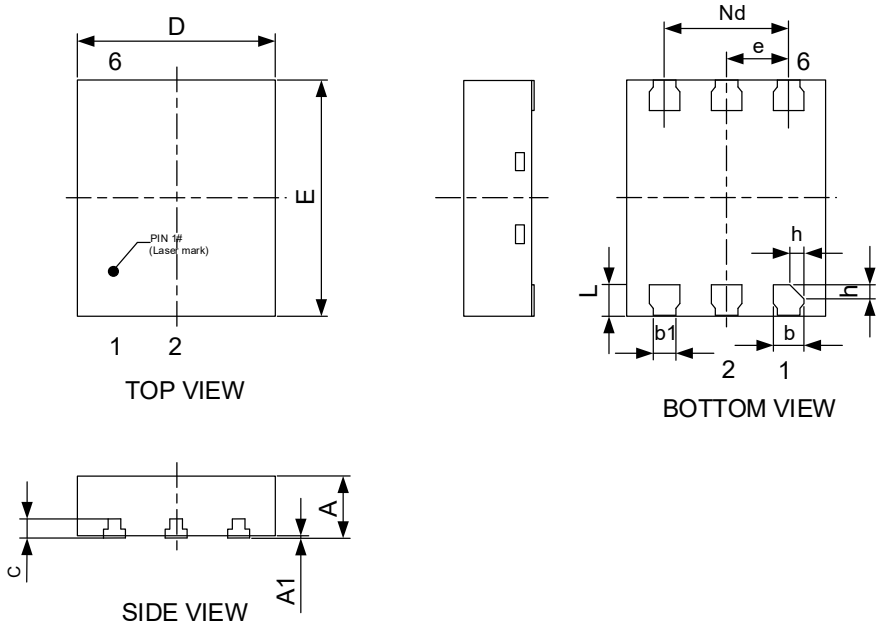


Figure 9

NOTE:ALL DIMENSIONS IN MM

SYMBOL	MIN	NOM	MAX
D	1.500	1.600	1.700
E	1.850	1.900	1.950
L	0.200	0.250	0.300
b	0.200	0.250	0.300
Z	0.125	0.175	0.225
e	0.500BSC		
A	0.400	0.500	0.600
A1	0.15REF		
A2	0.000	-	0.050

Table 7

■ PCB Layout

DFN1.9×1.6-6L

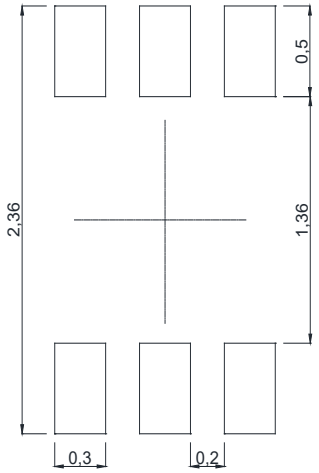


Figure 10

Note:

1. **Do not print screen or solder under the package to avoid the product being jacked up.**
2. **The opening size and position of the steel mesh should be aligned with the solder pad.**
3. **Please extend pad mode towards the front end of the pins.**
4. **Do not expand pad mode into the middle range of the package.**

■ Carrier Tape information

DFN1.9×1.6-6L

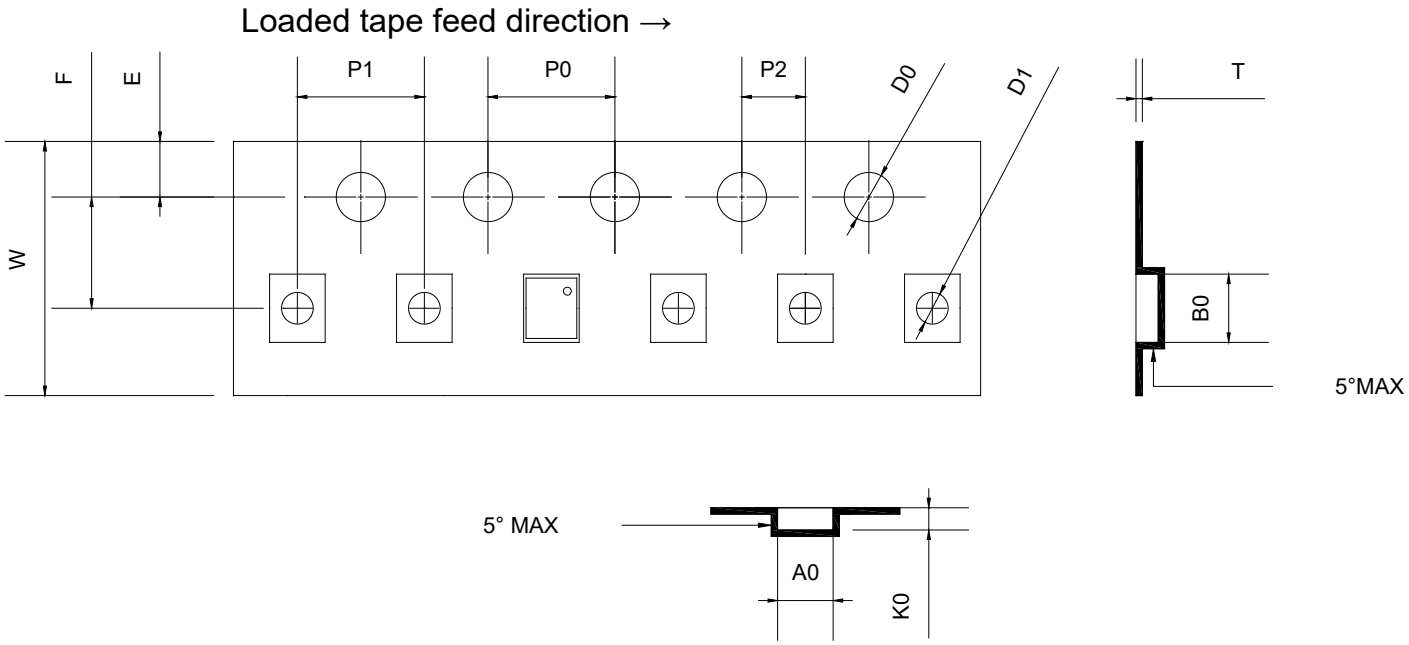
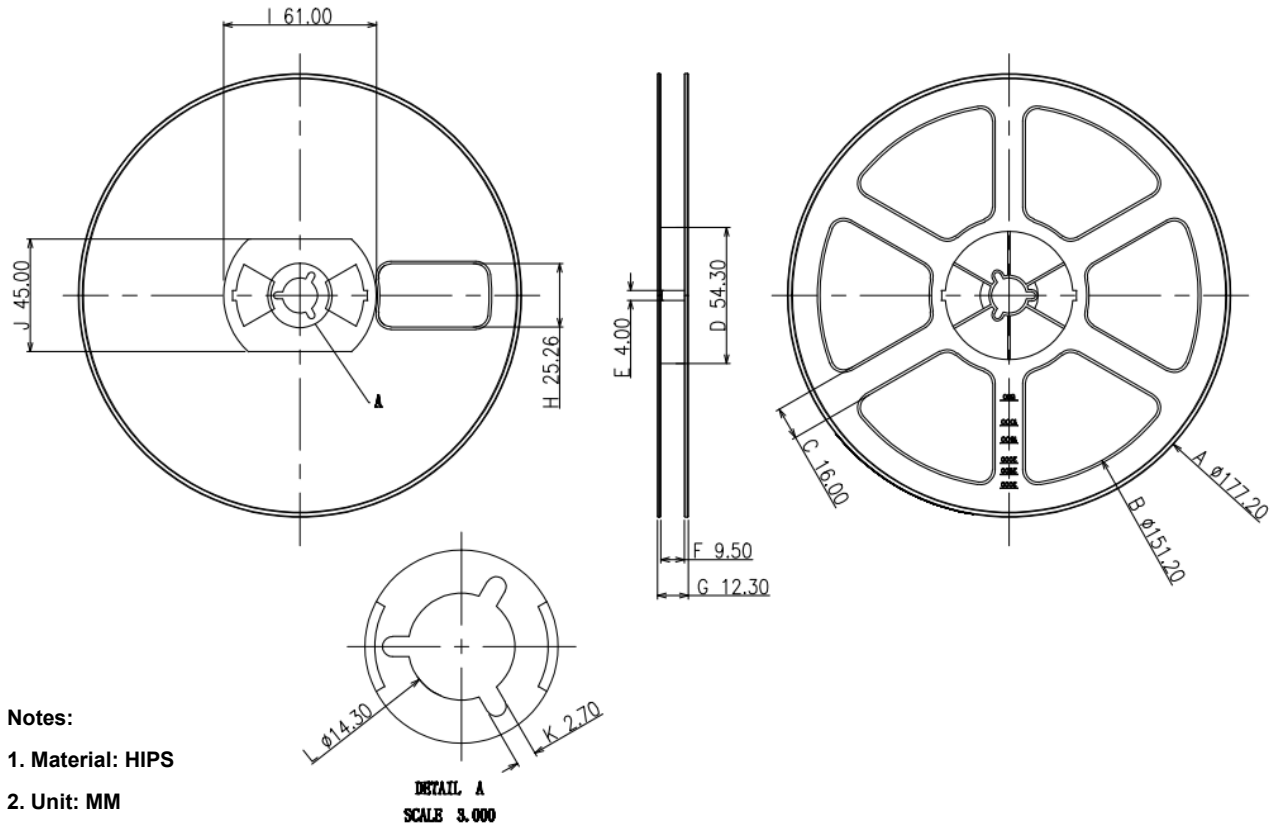


Figure 11

Type	W*P1	Unit
DFN1.9*1.6	8.0*4.0	mm
Item	**Specification**	**Tol（+/-）**
W	8.00	±0.20
F	3.50	±0.05
E	1.75	±0.10
P2	2.00	±0.05
P1	4.00	±0.10
P0	4.00	±0.10
P0*10	40.00	±0.20
D0	1.50	+0.10/-0
D1	1.00	±0.10
T	0.20	±0.02
B0	2.15	±0.10
A0	1.75	±0.10
K0	0.75	±0.10

Table 8

■ Reel information



Notes:

1. Material: HIPS

2. Unit: MM

Figure 12

■ Package information

Reel	PCS/Reel	Reel /Inner Box	Inner Box/Carton
7”	3000 PCS	10	4

Precautions for use

1. The content in this manual may be changed without notice as the product improves. For more detailed content, please contact our company's marketing department.
2. The circuit examples, usage methods, etc. in this specification are for reference only, and are not designed to guarantee mass production. The company does not assume any responsibility for problems caused by third-party ownership.
3. When this specification is used alone, our company guarantees that its performance, typical applications and functions meet the conditions in the specification. When using the customer's products or equipment, we do not guarantee the above conditions, we recommend that customers do adequate evaluation and testing.
4. Please pay attention to the use of the product within the conditions stated in the specification. Please pay special attention to the use conditions of input voltage, output voltage, and load current so that the power dissipation in the IC does not exceed the power dissipation of the package. The company will not be liable for any losses caused by customers using the product beyond the rated value specified in the specification, even if it is used instantaneously.
5. When using this product, please confirm the laws and regulations of the country, region and purpose of use, and test the ability and safety performance of the product.
6. The products in this specification, without written permission, cannot be used in high-reliability circuits of equipment or devices that may cause damage to the human body, life and property, such as: medical equipment, disaster prevention equipment, vehicle equipment, and vehicle Equipment, aviation equipment, space equipment, nuclear energy equipment, etc., shall not be used as their parts.
7. The company does not assume any responsibility for damages caused by using the products described in this specification for purposes other than those specified by the company.
8. The company has been committed to improving the quality and reliability of products, but all semiconductor products have a certain probability of failure.
9. In order to prevent personal accidents, fire accidents, social damages, etc. caused by the probabilistic failure of this product, customers are requested to fully evaluate the entire system and be responsible for redundant design, measures to prevent fire spread, and safety design to prevent mishandling, you can avoid accidents.
10. This product will not affect human health under normal conditions of use, but because it contains chemical substances and heavy metals, please do not put it in your mouth. In addition, the cracked surface of the package and chip may be sharp, so please protect it when touching it with bare hands to avoid injury.
11. When disposing of this product, please abide by the laws and regulations of the country and region of use and dispose of it reasonably.
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