CW1071

3~7 Channel Secondary Protection IC

Features

- 3~7Cells Application
- Overcharge Protection
  - Threshold from 3.600V to 4.6500V
  - 25mV Steps, ±15mV Accuracy
- Internal Overcharge Protection Delay Time
- Overcharge Delay Counter Reset Time
- Open Wire Protection
- Low Power Dissipation
  - Normal Working 1.5μA (25°C)
- Package Type: MSOP10L

Applications

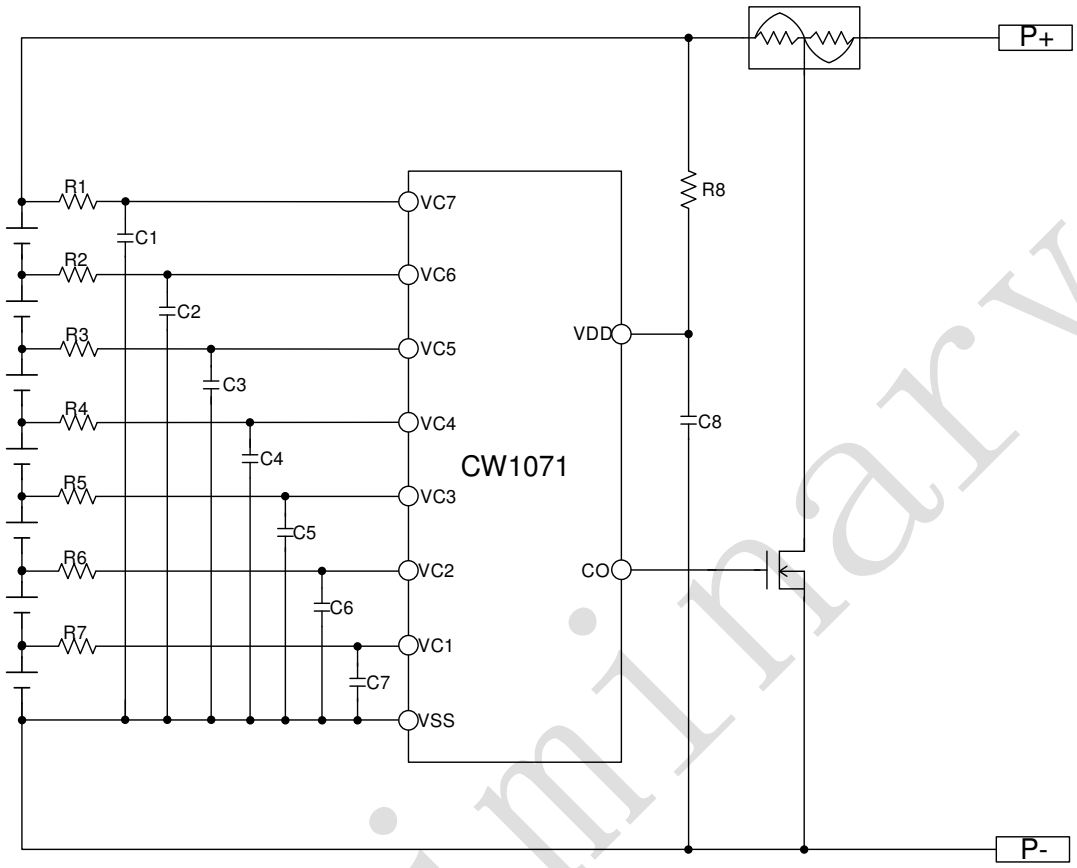
- Vacuum cleaner
- E-Tools
- E-Bike
- Backup Power Supply
- Other Lithium-ion or Lithium Polymer Battery Packs

General Description

The CW1071 series products are highly integrated secondary protection ICs for 3 to 7 lithium-ion and lithium polymer battery cells connected in series. CW1071 provides overcharge protection for battery pack by measuring each cell's voltage.

Application Circuits

For 7 cell connect in series（CMOS, Active H）



Recommended parameter

Symbol	Typical	Range	Unit
R1, R2, R3, R4, R5, R6, R7	1000	200~2000	Ω
R8	200	200~1000	Ω
C1, C2, C3, C4, C5, C6, C7, C8	0.1	0.1~1	μF

Product Name

CW1071 X X X X

- Package type, M: MSOP10L
- Parameter option, from A to Z
- Battery type, L: Lithium F: Lithium iron phosphate
- Function and revision option, from A to Z

Ordering Information

Part Number	Temperature Range	Package And Pin	Top Mark*1	Shipping
CW1071BLAM	-40°C to 85°C	MSOP10L	1071BL AMXXXX	Tape&Reel 3000
CW1071BLBM	-40°C to 85°C	MSOP10L	1071BL BMXXXX	Tape&Reel 3000
CW1071BLCM	-40°C to 85°C	MSOP10L	1071BL CMXXXX	Tape&Reel 3000
CW1071BLDM	-40°C to 85°C	MSOP10L	1071BL DMXXXX	Tape&Reel 3000
CW1071BLEM	-40°C to 85°C	MSOP10L	1071BL EMXXXX	Tape&Reel 3000
CW1071BLFM	-40°C to 85°C	MSOP10L	1071BL FMXXXX	Tape&Reel 3000
CW1071BLGM	-40°C to 85°C	MSOP10L	1071BL GMXXXX	Tape&Reel 3000
CW1071BLIM	-40°C to 85°C	MSOP10L	1071BL IMXXXX	Tape&Reel 3000
CW1071BFCM	-40°C to 85°C	MSOP10L	1071BF CMXXXX	Tape&Reel 3000

*1:The mark “XXXX” is the production information

Product List

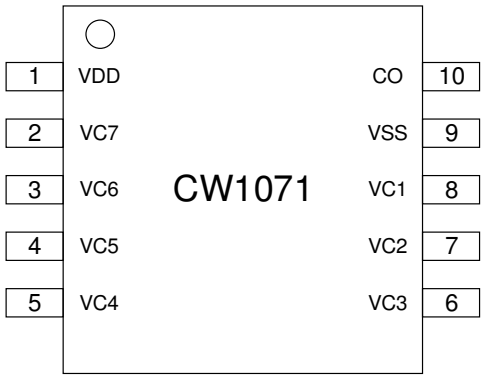
Part Number	Over Charge Threshold [V_{oc}] (V)	Hysteresis Voltage*1 [V_{hys}] (V)	Delay Time*2 [t_{oc}] (s)	Output Type*3
CW1071BLAM	4.275	0.100	1	CMOS, Active H
CW1071BLBM	4.275	0.100	1	NMOS open drain Active Hiz
CW1071BLCM	4.300	0.100	2	CMOS, Active H
CW1071BLDM	4.250	0.100	1	NMOS open drain Active Hiz
CW1071BLEM	4.350	0.300	4	CMOS, Active H
CW1071BLFM	4.225	0.100	1	CMOS, Active H
CW1071BLGM	4.200	0.100	1	CMOS, Active L
CW1071BLIM	4.250	0.100	1	CMOS Active H
CW1071BFCM	3.800V	0.100	2	CMOS Active H

*1 Optional hysteresis voltage: 0V~0.350V

*2 Optional delay time: 1s, 2s, 4s, 6s

*3 Optional output type: CMOS active H, CMOS Active L, NMOS open drain Active L, NMOS open drain Active Hiz

Pin Configuration



MSOP10L Package

Pin Descriptions

Pin	Name	Description
1	VDD	Power supply
2	VC7	Positive input of cell7
3	VC5	Positive input of cell6
4	VC5	Positive input of cell5
5	VC4	Positive input of cell4
6	VC3	Positive input of cell3
7	VC2	Positive input of cell2
8	VC1	Positive input of cell1
9	VSS	Ground
10	CO	Overcharge output driver

Absolute Maximum Ratings

		Value		Units
		Min	Max	
PIN voltage range respect to VSS	VDD, VCx	-0.3	40	V
PIN voltage range respect	CO	-0.3	42	V
Operation Temperature	T_A	-40	85	°C
Storage Temperature	T_{STG}	-40	125	°C

Caution:

Stresses beyond "Absolute Maximum Ratings" condition may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD Ratings

			Max	Units
$V_{(ESD)}$Rating	Electrostatic discharge	Human body model (HBM) ESD stress voltage	±4000	V
		Charged device model (CDM) ESD stress voltage	±1000	V

Recommended DC Operating Conditions

Parameter	Symbol	Conditions	Min	Typ	Max	Units
VDD Input Voltage Range	V_{DD}		3.5		35	V
VDD Input Voltage Range	V_{DD}	From -40°C to 85°C	4.0		35	V
VCx Input Voltage Range	V_{Cx}		0		5	V

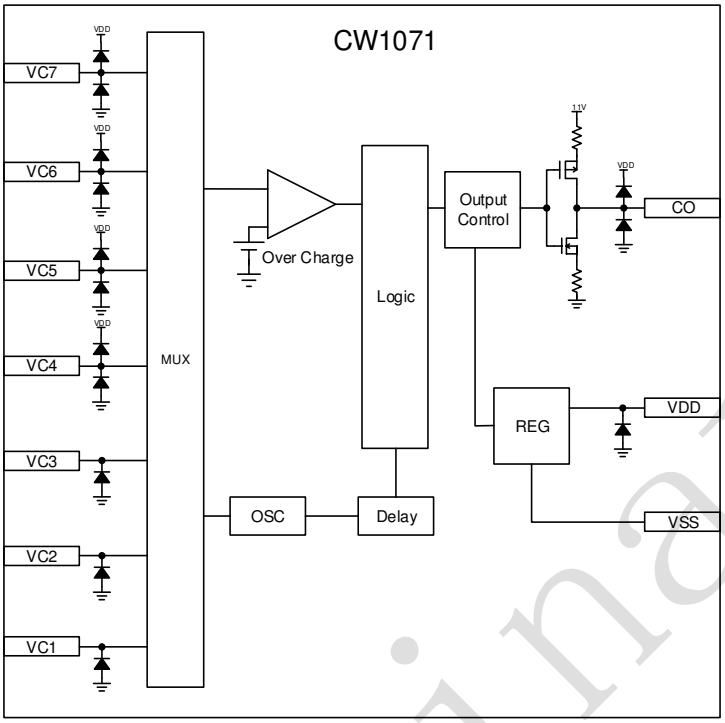
Electrical Characteristics

Operation under 25°C unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Current						
Operation Current	I_{OPR}	VC1=VC2=……=VC7=3.7V		1.5	2.5	μA
Channel Current	I_{CX}	VC1=VC2=……=VC7=3.7V	-0.3		0.3	μA
Voltage/Temperature Detect And Protection Threshold						
Overcharge Threshold	V_{OC}	VC1=VC2=……=VC6=3.7V Sweep VC7 from 3.7V to 4.7V	V_{OC} - 0.015	V_{OC}	V_{OC} + 0.015	V
Overcharge Threshold in whole Temperature Range		From -10°C to 60°C	V_{OC} - 0.025	V_{OC}	V_{OC} + 0.025	V
		From -40°C to 85°C	V_{OC} - 0.035	V_{OC}	V_{OC} + 0.035	V
OC Release Threshold $V_{OCR}=V_{OC}-V_{HYS}$	V_{OCR}	VC1=VC2=……=VC6=3.7V Sweep VC7 from 4.7V to 3.7V	V_{OCR} - 0.025	V_{OCR}	V_{OCR} + 0.025	V
Open-wire Threshold	V_{OW}	VC_n ~ VC_{n-1}		-200		mV
Action Delay						
Overcharge Delay	t_{OC}	VC1=VC2=……=VC6=3.7V Sweep VC7 from 3.7V to 4.7V	0.70 * t_{OC}	t_{OC}	1.30 * t_{OC}	s
Overcharge Release Delay	t_{OCR}	VC1=VC2=……=VC6=3.7V Sweep VC7 from 4.7V to 3.7V	2	4	6	ms
Overcharge Reset Delay	t_{RESET}		8	12	16	ms
Open-wire Detection Delay	t_{OW}			1.5		s
Open-wire Release Delay	t_{OWR}			5		ms
Pin Output Voltage						
CO Logic High Output	V_{OC}	VDD＞11.7V		11		V
		VDD＜11.7V		VDD - 0.7		V
CO Logic Low Output*1					0.3	V
Pin Drive Ability						
CO High Output Drive Ability		Source resistance	3	5	7	kΩ
CO Low Output Drive Ability		Sink resistance	1	2	3	kΩ

*1There is several output types, detail please refer to the product selection table. Take CMOS Active H for example here.

Functional Block Diagram



Notes: Some buffer blocks omitted

Detailed Description

Normal State

CW1071 works under a normal state when each cell voltage is less than Voc.

Overcharge State

When any cell voltage becomes higher than overcharge threshold voltage (V_{OC}) and stays longer than overcharge protection delay time (t_{OC}), CO will output a Overcharge signal, and CW1071 enters over charge state. CO signal can be used to inform the external device or control the MOSFET. If within overcharge protection delay time (t_{OC}), cell voltage drops lower than V_{OC} but stays shorter than overcharge reset delay time (t_{RESET}) before rising up over V_{OC} again, this spike will be ignored. Otherwise, accumulated delay time of overcharge will be reset.
Overcharge protection state will release when all the cell voltages are less than the overcharge release threshold (V_{OCR}) and stay longer than the release delay time (t_{OCR}).

Open-wire Detection

Any wire connected between the battery cell and IC will be monitored.
When the wire disconnects and maintains (t_{OW}) time, IC will enter to the open-wire protection state. CO will output a Overcharge signal to cut off the charge loop.
Open-wire protection will release when all wires reconnect and stay longer than the release delay time (t_{OWR}).

Test Mode

Test mode is used to reduce the protection delay time for test of mass production.
CW1071 will enter the test mode when add a VDD+6V voltage on VDD pin and maintains 20ms. Test mode lasts 7s then recovers to the normal status.
Detailed test mode timing is illustrated as bellow:

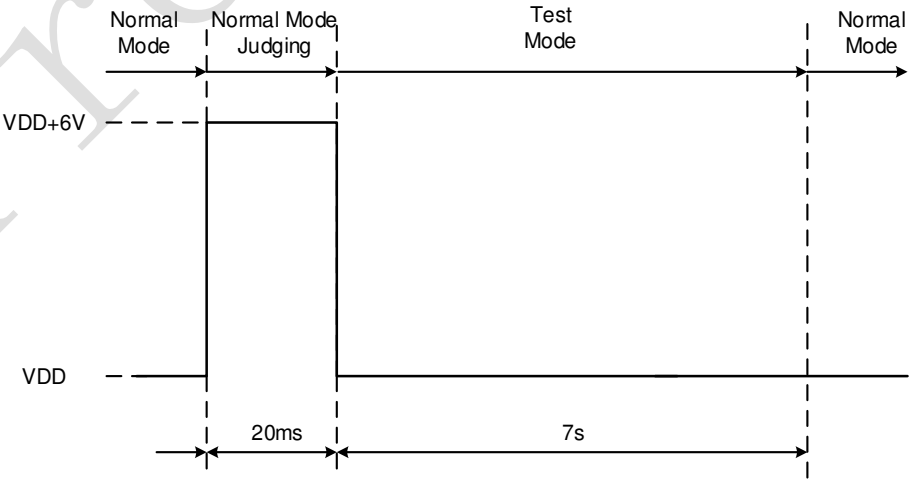
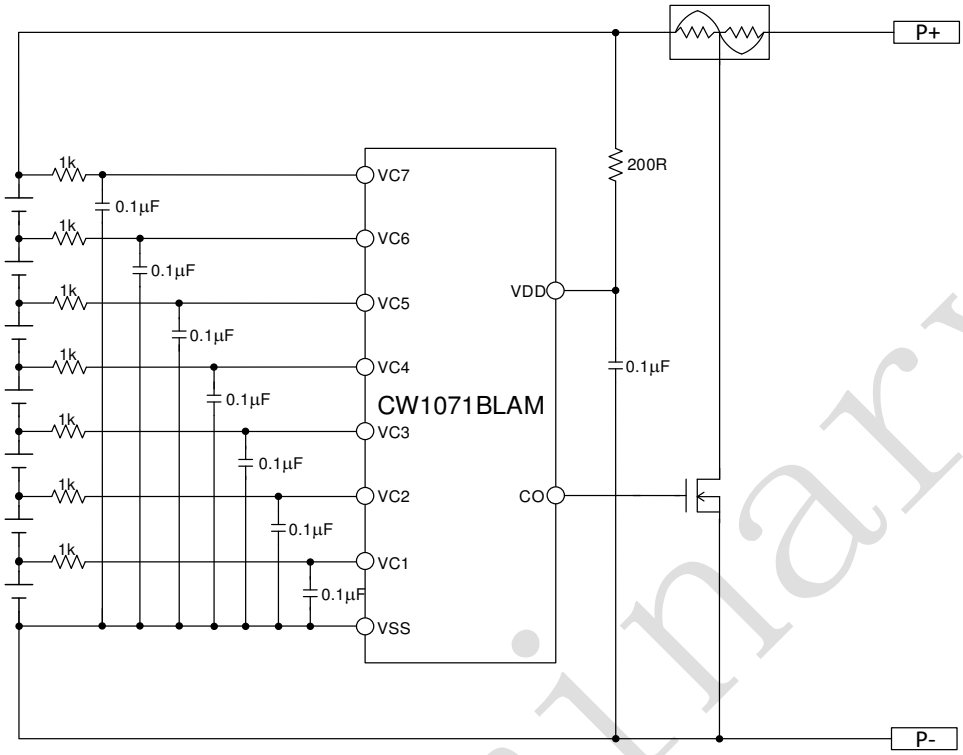
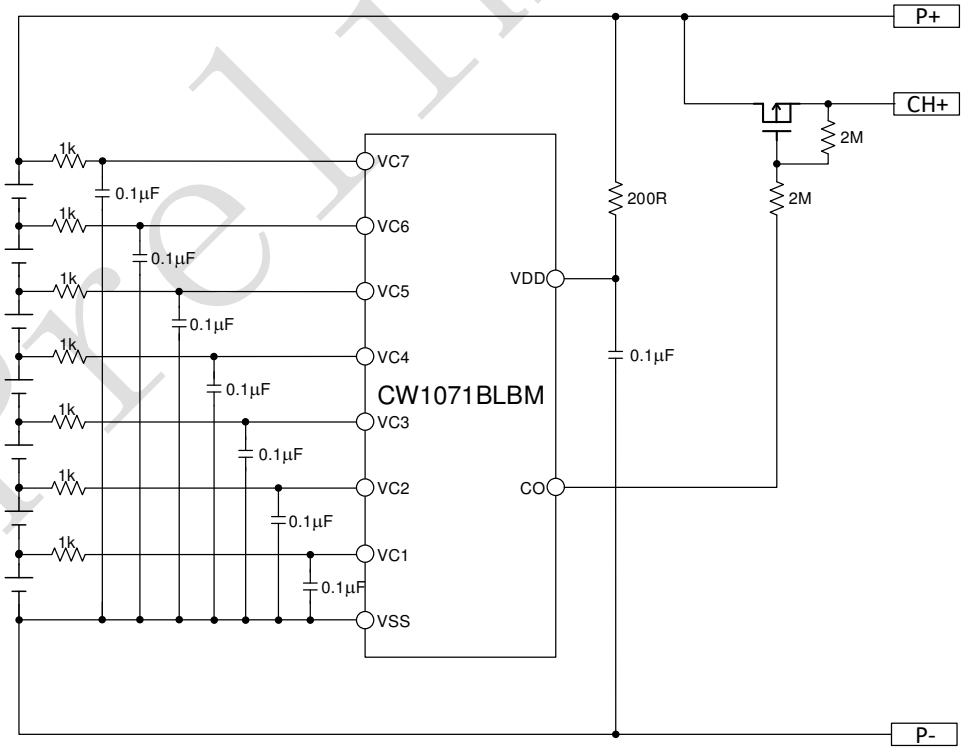


Figure 1. Test Mode Timing

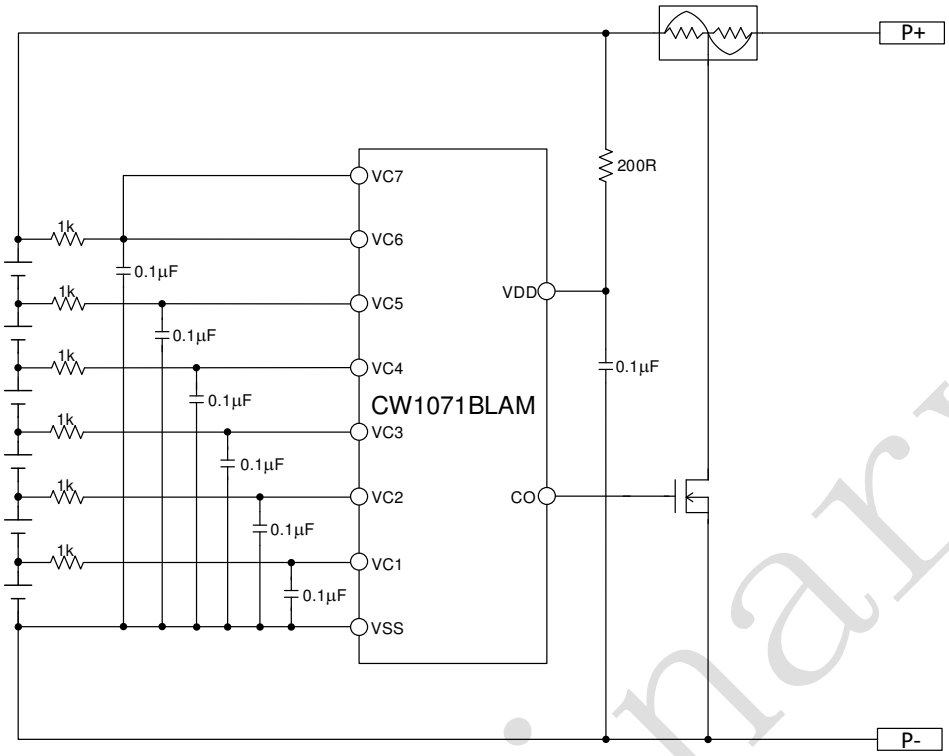
Reference Schematic



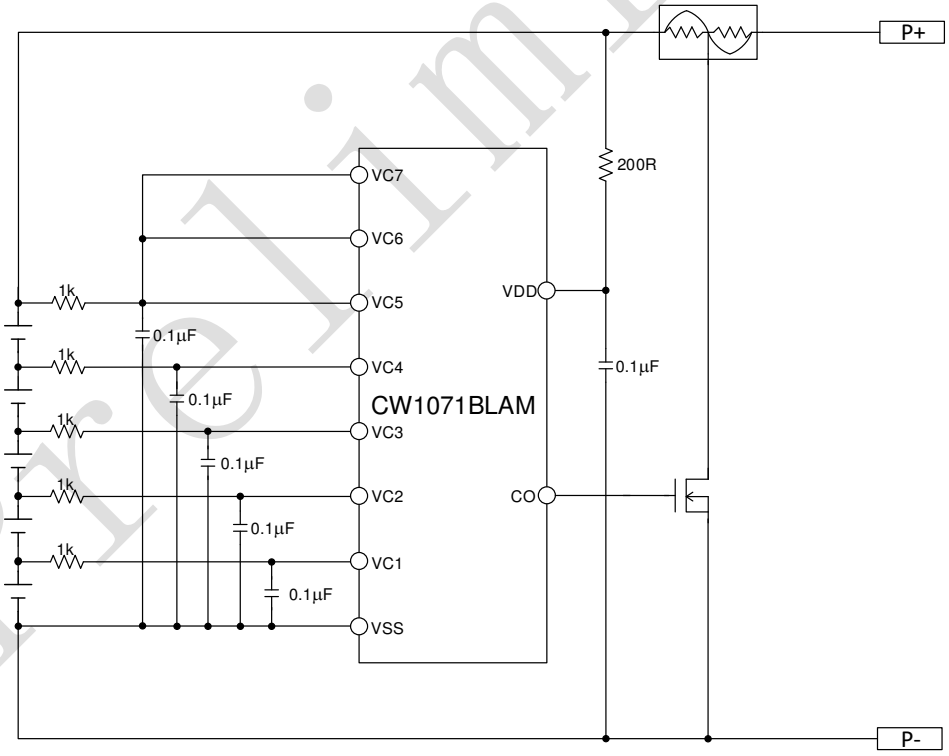
Reference Schematic for 7 cells(FUSE)



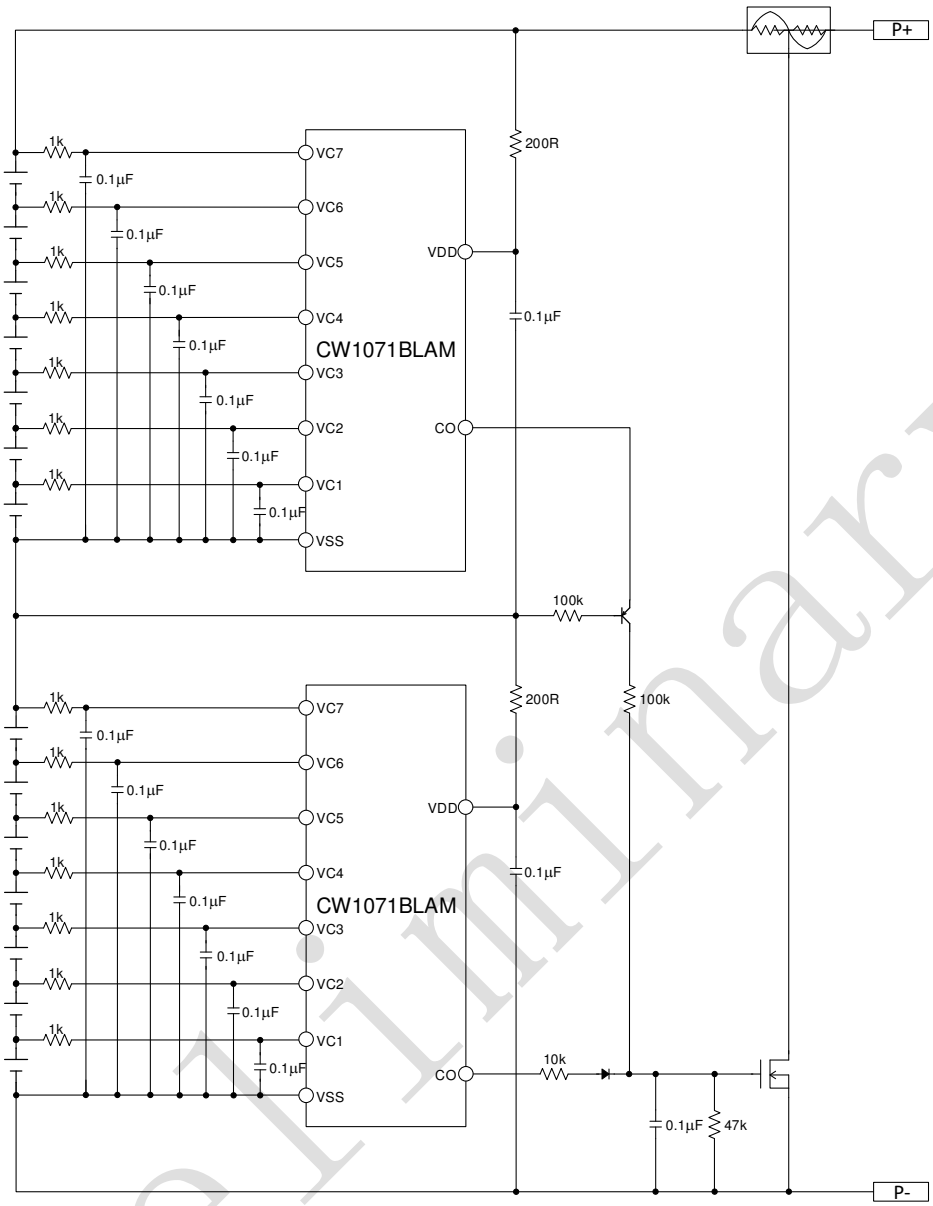
Reference Schematic for 7 cells(PMOS)



Reference Schematic for 6 cells (FUSE)



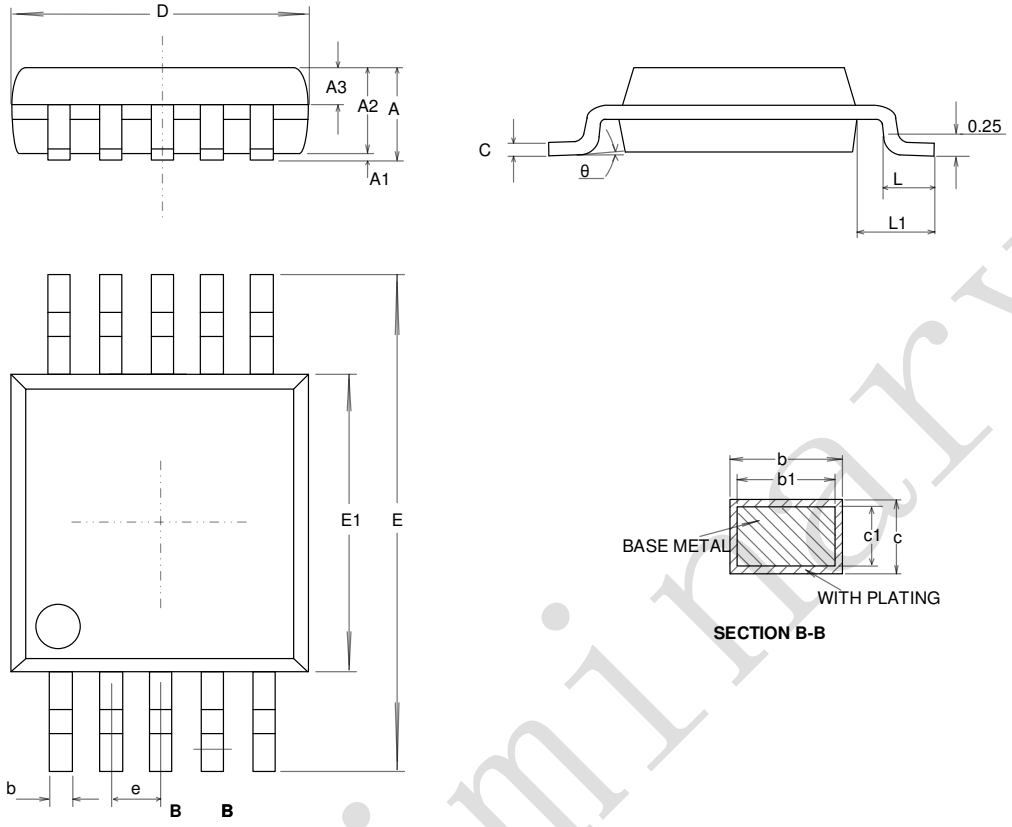
Reference Schematic for 5 cells (FUSE)



Reference Schematic for 14 cells

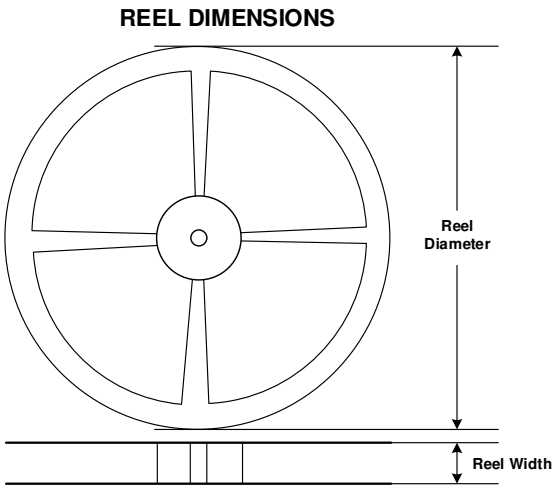
Package Information

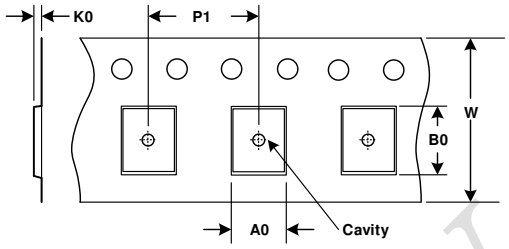
MSOP10L Package



Symbol	Millimeter		
	Min	Nom	Max
A	---	---	1.10
A1	0.05	---	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.18	---	0.26
b1	0.17	0.20	0.23
c	0.15	---	0.19
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.50BSC		
L	0.40	---	0.70
L1	0.95REF		
θ	0	---	8°

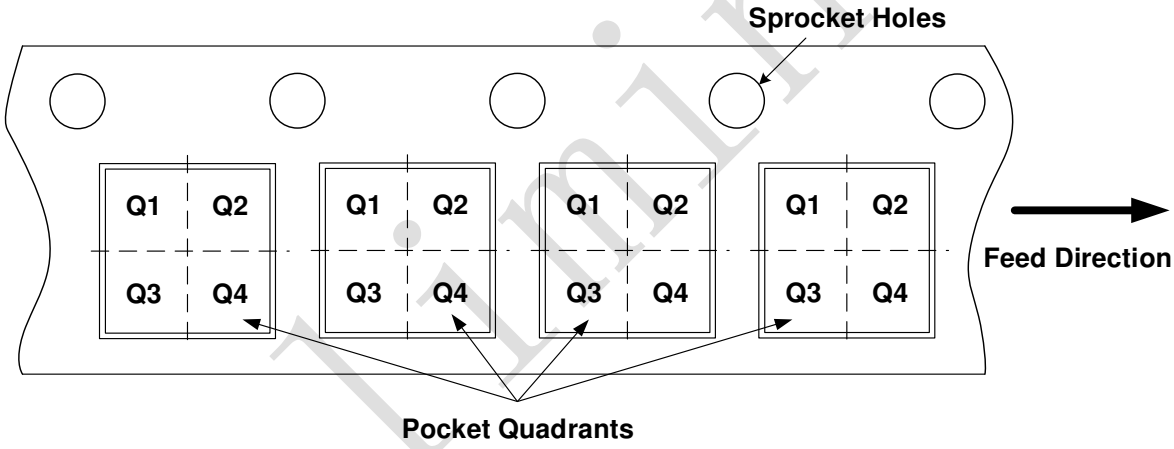
Tape and Reel Information





A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	W (mm)	P1 (mm)	Pin 1 Quadrant
CW1071	MSOP10L	330	12.40	5.40	3.40	1.40	12.00	8.00	Q1

Note：All dimensions are nominal.

Revision History

Release No.	Date	Revision Description
1.0	2022-11-29	Initial Release
1.1	2023-03-13	Modify part number
1.2	2023-04-15	Add CW1071BLCM/BLDM
1.3	2023-11-24	Add CW1071BLEM/BLFM/BLGM
1.31	2024-03-04	Add CW1071BLIM/BFCM

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