

## Protection IC for 1-Cell Battery Pack

### Features

- High Detection Accuracy
  - Over-charge Detection:  $\pm 25\text{mV}$
  - Over-discharge Detection:  $\pm 35\text{mV}/\pm 45\text{mV}$
  - Discharge Over-current Detection:  $\pm 10\text{mV}/\pm 15\text{mV}$
  - Charge Over-current Detection:  $\pm 20\text{mV}$
- High Withstand Voltage
  - Absolute maximum ratings: 28V (V- pin and CO pin)
- Ultra Small Package
  - SOT-23-6

### Description

The NT1713 series are the 1-cell protection IC for lithium-ion/lithium-polymer rechargeable battery pack. The high accuracy voltage detector and delay time circuits are built in NT1713 series with state-of-the-art design and process.

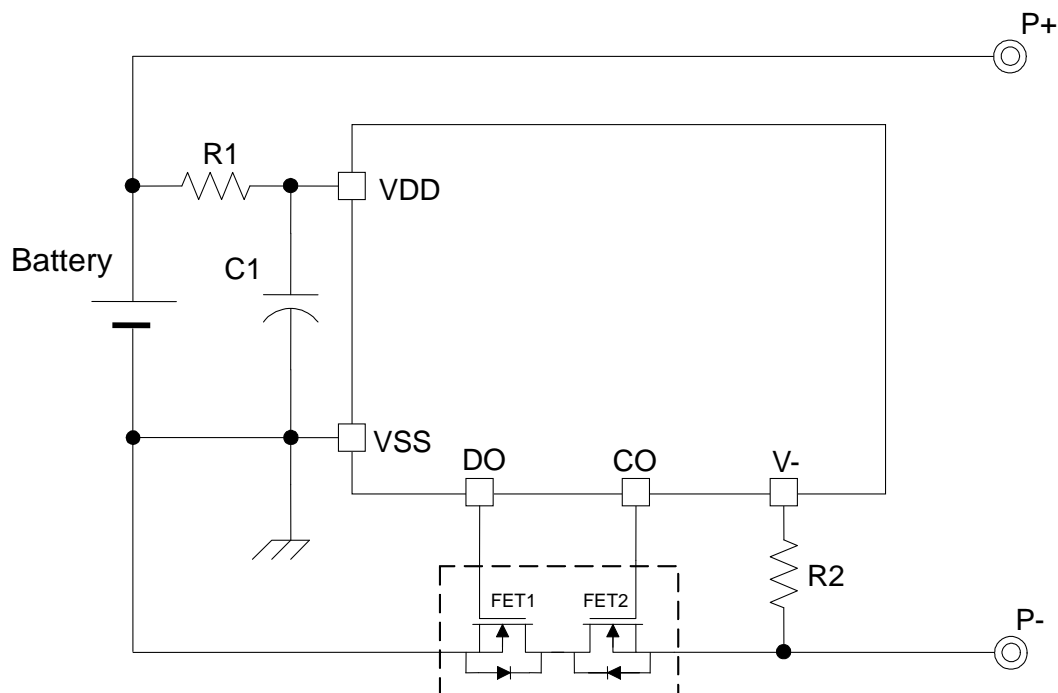
To minimize power consumption, NT1713 series activate power down mode when an over-discharge event is detected for power-down mode enabled version. Besides, NT1713 series perform protection functions with four external components for miniaturized PCB.

The tiny package is especially suitable for compact portable device, i.e. slim mobile phone and Bluetooth earphone.

### Application

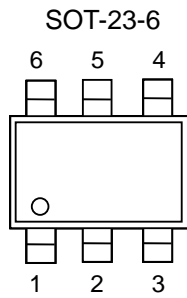
- Mobile phone battery packs
- Digital camera battery packs
- Bluetooth earphone Li-ion battery module

### Typical Application Circuit



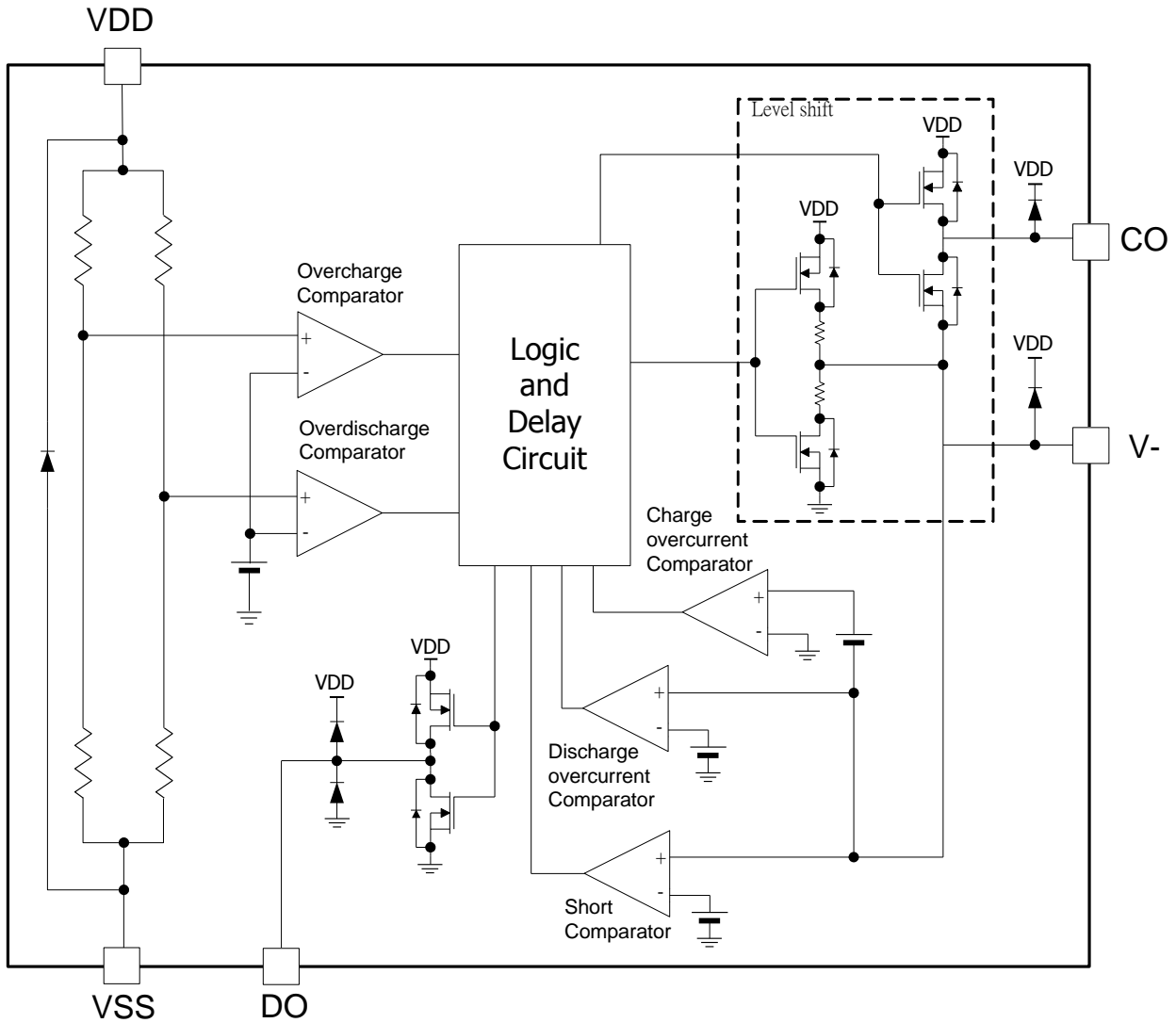
These devices have limited built-in ESD protection. The leads must be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

## Package and Pin Description



Pin No.	Symbol	Pin description
1	DO	Connection of discharge control FET gate
2	V-	Voltage detection between V- pin and VSS pin (Over-current / charger detection pin)
3	CO	Connection of charge control FET gate
4	NC	No connection
5	VDD	Connection for positive power supply input
6	VSS	Connection for negative power supply input

**Block Diagram**



## Ordering Information

NT1713C -XXX XX

 Package Type  
 A6: SOT-23-6

Version code

## Product version code:

Table1: Detection threshold level table

Product Name	Version Code	Package Type	Over-charge Detection Voltage $V_{DET1}$ (V)	Over-charge Release Voltage $V_{REL1}$ (V)	Over-discharge detection voltage $V_{DET2}$ (V)	Over-discharge release voltage $V_{REL2}$ (V)	Discharge over-current detection voltage $V_{DET3}$ (V)	Charge over-current detection voltage $V_{DET4}$ (V)	Load short-circuiting detection voltage $V_{SHORT}$ (V)
NT1713C	GKA	A6	4.275	4.075	2.5	2.9	0.15	-0.10	0.5
NT1713C	HFA	A6	4.280	4.280	2.3	2.3	0.10	-0.10	0.5
NT1713C	HFB	A6	4.280	4.280	2.3	2.3	0.13	-0.10	0.5
NT1713C	HQA	A6	4.280	4.130	2.8	3.1	0.15	-0.10	0.5
NT1713C	HQB	A6	4.280	4.130	2.8	3.1	0.10	-0.10	0.5
NT1713C	HSA	A6	4.280	4.080	3.0	3.0	0.15	-0.15	0.5
NT1713C	KKA	A6	4.325	4.125	2.5	2.9	0.15	-0.10	0.5
NT1713C	MQA	A6	4.405	4.305	2.8	3.0	0.15	-0.15	0.5
NT1713C	MVA	A6	4.405	4.205	3.3	3.3	0.20	-0.15	0.5
NT1713C	NHA	A6	4.425	4.225	2.4	2.4	0.10	-0.10	0.5
NT1713C	NHB	A6	4.425	4.225	2.4	2.4	0.15	-0.10	0.5
NT1713C	NHC	A6	4.425	4.225	2.4	2.4	0.20	-0.10	0.5
NT1713C	QKA	A6	4.475	4.275	2.5	2.5	0.15	-0.15	0.5
NT1713C	QKB	A6	4.475	4.275	2.5	2.5	0.20	-0.15	0.5
NT1713C	QKC	A6	4.475	4.275	2.5	2.8	0.20	-0.20	0.5
NT1713C	QKD	A6	4.475	4.275	2.5	2.8	0.15	-0.15	0.5
NT1713C	QKE	A6	4.475	4.275	2.5	2.8	0.13	-0.13	0.5

Table2: Function

Product Name	Version Code	0V Battery Charge Function	Power Down Mode	Auto Over-discharge Recovery Function	Delay Time (Table3)
NT1713C	GKA	Unavailable	Yes	No	(2)
NT1713C	HFA	Unavailable	Yes	No	(1)
NT1713C	HFB	Unavailable	Yes	No	(1)
NT1713C	HQA	Unavailable	Yes	No	(2)
NT1713C	HQB	Unavailable	Yes	No	(2)
NT1713C	HSA	Available	Yes	No	(3)
NT1713C	KKA	Unavailable	Yes	No	(2)
NT1713C	MQA	Available	Yes	No	(3)
NT1713C	MVA	Unavailable	Yes	No	(3)
NT1713C	NHA	Unavailable	Yes	No	(1)
NT1713C	NHB	Unavailable	Yes	No	(1)
NT1713C	NHC	Unavailable	Yes	No	(1)
NT1713C	QKA	Available	Yes	No	(3)
NT1713C	QKB	Available	Yes	No	(3)
NT1713C	QKC	Available	No	Yes	(3)
NT1713C	QKD	Available	No	Yes	(3)
NT1713C	QKE	Available	No	Yes	(3)

Table3: Delay Time table

Delay time	Over-charge delay time $t_{VDET1}$ (S)	Over-discharge delay time $t_{VDET2}$ (mS)	Discharge over-current delay time $t_{VDET3}$ (mS)	Charge over-current delay time $t_{VDET4}$ (mS)	Load short-circuiting delay time $t_{SHORT}$ (uS)
(1)	1.0 +/- 20%	125 +/- 20%	8.0 +/- 20%	8.0 +/- 20%	400 +/- 20%
(2)	1.2 +/- 20%	150 +/- 20%	9.0 +/- 20%	9.0 +/- 20%	300 +/- 20%
(3)	1.0 +/- 30%	20 +/- 30%	12.0 +/- 33.3%	16.0 +/- 31.2%	250 +60/-33.3%

**Remark** Please contact our sales office for the products with detection voltage value other than those specified above.

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