bq771800, bq771801, bq771802
bq771803, bq771807, bq771808
bq771809, bq771815

SLUSAX1D – DECEMBER 2012 – REVISED NOVEMBER 2014

bq7718xy Overvoltage Protection for 2-Series to 5-Series Cell Li-Ion Batteries with Internal Delay Timer

1 Features

- 2-, 3-, 4-, and 5-Series Cell Overvoltage Protection
- Internal Delay Timer
- Fixed OVP Threshold
- High-Accuracy Overvoltage Protection: ± 10 mV
- Low Power Consumption I_{CC} ≈ 1 µA ($V_{CELL(ALL)}$ < $V_{PROTECT}$)
- Low Leakage Current Per Cell Input < 100 nA
- Small Package Footprint
  - 8-pin QFN (3.00 mm × 4.00 mm)

2 Applications

- Protection in Li-Ion Battery Packs in:
  - Power Tools
  - UPS Battery Backup
  - Light Electric Vehicles (eBike, eScooter, Pedal Assist Bicycles)

3 Description

The bq7718xy family of products provides an overvoltage monitor and protector for Li-Ion battery pack systems. Each cell is monitored independently for an overvoltage condition. For quicker production-line testing, the bq7718xy device provides a Customer Test Mode (CTM) with greatly reduced delay time.

In the bq7718xy device, an internal delay timer is initiated upon detection of an overvoltage condition on any cell. Upon expiration of the delay timer, the output is triggered into its active state (either high or low depending on the configuration).

Device Information Table(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
bq771800	QFN (8)	3.00 mm × 4.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet and the Device Comparison Table.

Table of Contents

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision C (August 2014) to Revision D — **Page**

- Added the bq771815 device to Production Data ... 3
- Changed the *Handling Ratings* table ... 6
- Added note to the *Application and Implementation* section ... 11

Changes from Revision B (October 2013) to Revision C — **Page**

- Changed the data sheet format ... 1
- Added the bq771807 device to Production Data ... 3

Changes from Revision A (September 2013) to Revision B — **Page**

- Added the bq771809 device to Production Data ... 3

Changes from Original (December 2012) to Revision A — **Page**

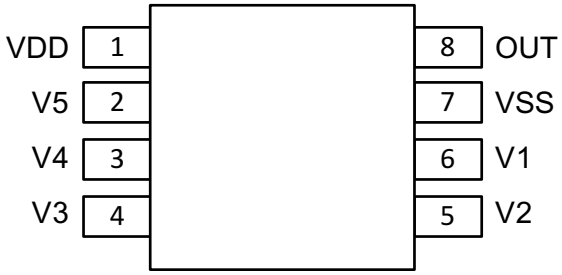
- Added the bq771808 device to Production Data ... 3

5 Device Comparison Table

T_A	Part Number	Package	Package Designator	OVP (V)	OV Hysteresis (V)	Output Delay	Output Drive	Tape and Reel (Large)	Tape and Reel (Small)
–40°C to 110°C	bq771800	8-Pin QFN	DPJ	4.300	0.300	4 s	CMOS Active High	bq771800DPJR	bq771800DPJT
	bq771801			4.275	0.050	3 s	NCH Active Low, Open Drain	bq771801DPJR	bq771801DPJT
	bq771802			4.225	0.300	1 s	NCH Active Low, Open Drain	bq771802DPJR	bq771802DPJT
	bq771803			4.275	0.050	1 s	NCH Active Low, Open Drain	bq771803DPJR	bq771803DPJT
	bq771804(1)			4.225	0.300	3 s	CMOS Active High	bq771804DPJR	bq771804DPJT
	bq771805(1)			4.325	0.300	3 s	CMOS Active High	bq771805DPJR	bq771805DPJT
	bq771806(1)			4.350	0.300	3 s	CMOS Active High	bq771806DPJR	bq771806DPJT
	bq771807			4.450	0.300	3 s	CMOS Active High	bq771807DPJR	bq771807DPJT
	bq771808			4.200	0.050	1 s	NCH Active Low	bq771808DPJR	bq771808DPJT
	bq771809			4.200	0.050	1 s	CMOS Active High	bq771809DPJR	bq771809DPJT
	bq771810(1)			4.200	0.250	1 s	CMOS Active High	bq771810DPJR	bq771810DPJT
	bq771811(1)			4.225	0.050	1 s	CMOS Active High	bq771811DPJR	bq771811DPJT
	bq771812(1)			4.250	0.050	1 s	CMOS Active High	bq771812DPJR	bq771812DPJT
	bq771813(1)			4.250	0.050	1 s	CMOS Active High	bq771813DPJR	bq771813DPJT
	bq771814(1)			3.900	0.300	3 s	CMOS Active High	bq771814DPJR	bq771814DPJT
	bq771815			4.225	0.050	1 s	NCH Active Low	bq771815DPJR	bq771815DPJT
	bq771816(1)			4.250	0.050	1 s	NCH Active Low	bq771816DPJR	bq771816DPJT
	bq7718xy(2)			3.850–4.650	0–0.300	1 s	NCH, Active Low, Open Drain	bq7718xyDPJR	bq7718xyDPJT

(1) Product Preview only.
(2) Future option, contact TI.

6 Pin Configuration and Functions



Pin Functions

bq7718xy	Pin Name	Type I/O	Description
1	VDD	P	Power supply
2	V5	I	Sense input for positive voltage of the fifth cell from the bottom of the stack
3	V4	I	Sense input for positive voltage of the fourth cell from the bottom of the stack
4	V3	I	Sense input for positive voltage of the third cell from the bottom of the stack
5	V2	I	Sense input for positive voltage of the second cell from the bottom of the stack
6	V1	I	Sense input for positive voltage of the lowest cell in the stack
7	VSS	P	Electrically connected to IC ground and negative terminal of the lowest cell in the stack
8	OUT	O	Output drive for overvoltage fault signal

6.1 Pin Details

In the bq7718xy device, each cell is monitored independently. Overvoltage is detected by comparing the actual cell voltage to a protection voltage reference, V_{OV}. If any cell voltage exceeds the programmed OV value, a timer circuit is activated. When the timer expires, the OUT pin goes from inactive to active state.

For NCH Open Drain Active Low configurations, the OUT pin pulls down to VSS when active (OV present) and is high impedance when inactive (no OV).

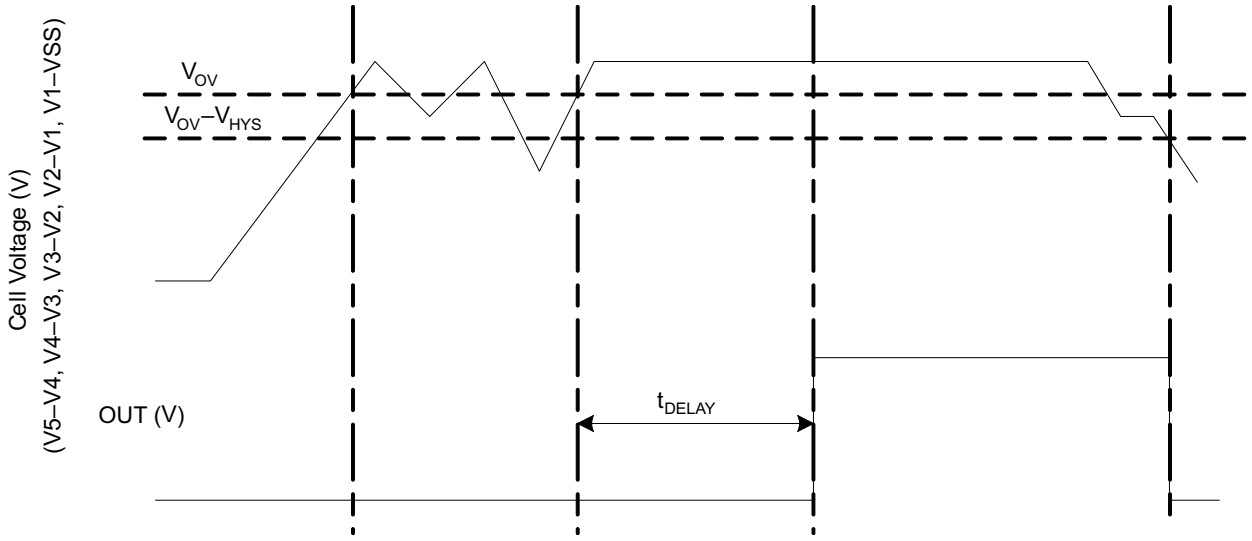


Figure 1. Timing for Overvoltage Sensing

6.1.1 Sense Positive Input for Vx

This is an input to sense each single battery cell voltage. A series resistor and a capacitor across the cell for each input is required for noise filtering and stable voltage monitoring.

Pin Details (continued)

6.1.2 Output Drive, OUT

This pin serves as the fault signal output, and may be ordered in either active HIGH or LOW options.

6.1.3 Supply Input, VDD

This pin is the unregulated input power source for the IC. A series resistor is connected to limit the current, and a capacitor is connected to ground for noise filtering.

7 Specifications

7.1 Absolute Maximum Ratings

Over-operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Supply voltage range	VDD–VSS	–0.3	30	V
Input voltage range	V5–VSS or V4–VSS or V3–VSS or V2–VSS or V1–VSS	–0.3	30	V
Output voltage range	OUT–VSS	–0.3	30	V
Continuous total power dissipation, P_{TOT}		See package dissipation rating.		
Functional temperature		–40	110	°C
Storage temperature range, T_{STG}		–65	150	°C
Lead temperature (soldering, 10 s), T_{SOLDER}		300		°C

(1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum–rated conditions for extended periods may affect device reliability.

7.2 Handling Ratings

			MIN	MAX	UNIT
T_{STG}	Storage temperature range		–65	150	°C
$V_{(ESD)}$ Rating	Electrostatic discharge	Human body model (HBM) ESD stress voltage(1)	–2	2	kV
		Charged device model (CDM) ESD stress voltage(2)	–500	500	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

Over-operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
Supply voltage, V_{DD}(1)		3	25	V
Input voltage range	V5–V4 or V4–V3 or V3–V2 or V2–V1 or V1–VSS	0	5	V
Operating ambient temperature range, T_A		–40	110	°C

(1) See Typical Applications.

7.4 Thermal Information

THERMAL METRIC(1)		bq7718xy	UNITS
		8 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	56.6	°C/W
$R_{\theta JCtop}$	Junction-to-case(top) thermal resistance	56.4	
$R_{\theta JB}$	Junction-to-board thermal resistance	30.6	
ψ_{JT}	Junction-to-top characterization parameter	1.0	
ψ_{JB}	Junction-to-board characterization parameter	37.8	
$R_{\theta JCbot}$	Junction-to-case(bottom) thermal resistance	11.3	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, SPRA953.

7.5 DC Characteristics

Typical values stated where T_A = 25°C and VDD = 18 V, MIN/MAX values stated where T_A = –40°C to 110°C and V_{DD} = 3 V to 25 V (unless otherwise noted).

SYMBOL	PARAMETER	CONDITION	MIN	TYP	MAX	UNIT
Voltage Protection Threshold VCx						
V_{OV}	$V_{(PROTECT)}$ Overvoltage Detection	bq771800		4.300		V
		bq771801		4.275		V
		bq771803		4.275		V
		bq771802		4.225		V
		bq771804 (1)		4.225		V
		bq771805 (1)		4.325		V
		bq771806 (1)		4.350		V
		bq771807		4.450		V
		bq771808		4.200		V
		bq771809		4.200		V
		bq771810 (1)		4.200		V
		bq771811 (1)		4.225		V
		bq771812 (1)		4.250		V
		bq771813 (1)		4.250		V
		bq771814 (1)		3.900		V
		bq771815		4.225		V
		bq771816 (1)		4.250		V
V_{HYS}	OV Detection Hysteresis	bq771800	250	300	400	mV
		bq771801	0	50	100	V
		bq771802	250	300	400	mV
		bq771803	0	50	100	V
		bq771804 (1)	250	300	400	mV
		bq771805 (1)	250	300	400	mV
		bq771806 (1)	250	300	400	mV
		bq771807	250	300	400	mV
		bq771808	0	50	100	V
		bq771809	0	50	100	V
		bq771810 (1)	200	250	250	mV
		bq771811 (1)	0	50	100	V
		bq771812 (1)	0	50	100	V
		bq771813 (1)	0	50	100	V
		bq771814 (1)	250	300	400	mV
		bq771815	0	50	100	V
		bq771816 (1)	0	50	100	V
V_{OA}	OV Detection Accuracy	T_A = 25°C	–10		10	mV
$V_{OADRIFT}$	OV Detection Accuracy Across Temperature	T_A = –40°C	–40		44	mV
		T_A = 0°C	–20		20	mV
		T_A = 60°C	–24		24	mV
		T_A = 110°C	–54		54	mV
Supply and Leakage Current						
I_{CC}	Supply Current	(V5–V4) = (V4–V3) = (V3–V2) = (V2–V1) = (V1–VSS) = 4.0 V (See Figure 12.)		1	2	µA
I_{IN}	Input Current at Vx Pins	(V5–V4) = (V4–V3) = (V3–V2) = (V2–V1) = (V1–VSS) = 4.0 V (See Figure 12.)	–0.1		0.1	µA

(1) Product Preview only.

DC Characteristics (continued)

Typical values stated where T_A = 25°C and VDD = 18 V, MIN/MAX values stated where T_A = –40°C to 110°C and V_{DD} = 3 V to 25 V (unless otherwise noted).

SYMBOL	PARAMETER	CONDITION	MIN	TYP	MAX	UNIT
Output Drive OUT, CMOS Active HIGH Versions Only						
V_{OUT1}	Output Drive Voltage, Active High	(V5–V4), (V4–V3), (V3–V2), (V2–V1), or (V1–VSS) > V_{OV}, VDD = 18 V, I_{OH} = 100 µA	6			V
		If three of four cells are short circuited and only one cell remains powered and > V_{OV}, VDD = Vx (cell voltage), I_{OH} = 100 µA		VDD – 0.3		V
		(V5–V4), (V4–V3), (V3–V2), (V2–V1), and (V1–VSS) < V_{OV}, VDD = 18 V, I_{OL} = 100 µA measured into pin		250	400	mV
I_{OUTH1}	OUT Source Current (during OV)	(V5–V4), (V4–V3), (V3–V2), (V2–V1), or (V1–VSS) > V_{OV}, VDD = 18 V. OUT = 0 V. Measured out of OUT pin			4.5	mA
I_{OUTL1}	OUT Sink Current (no OV)	(V5–V4), (V4–V3), (V3–V2), (V2–V1), and (V1–VSS) < V_{OV}, VDD = 18 V, OUT = VDD. Measured into OUT pin	0.5		14	mA
Output Drive OUT, NCH Open Drain Active LOW Versions Only						
V_{OUT2}	Output Drive Voltage, Active Low	(V5–V4), (V4–V3), (V3–V2), (V2–V1), or (V1–VSS) > V_{OV}, VDD = 18 V, I_{OL} = 100 µA measured into OUT pin		250	400	mV
I_{OUTH2}	OUT Sink Current (during OV)	(V5–V4), (V4–V3), (V3–V2), (V2–V1), or (V1–VSS) > V_{OV}, VDD = 18 V. OUT = VDD. Measured into OUT pin	0.5		14	mA
I_{OUTL2}	OUT Source Current (no OV)	(V5–V4), (V4–V3), (V3–V2), (V2–V1), and (V1–VSS) < V_{OV}, VDD = 18 V. OUT = VDD. Measured out of OUT pin			100	nA
Delay Timer						
t_{DELAY}	OV Delay Time	bq771800	3.2	4	4.8	s
		bq771801, bq771807	2.4	3	3.6	s
		bq771802, bq771803, bq771815	0.8	1	1.2	s
		Preview option only. Contact TI.	4.4	5.5	6.6	s
$X_{CTMDELAY}$	Fault Detection Delay Time during Customer Test Mode	See Customer Test Mode.		15		ms

8 Typical Characteristics

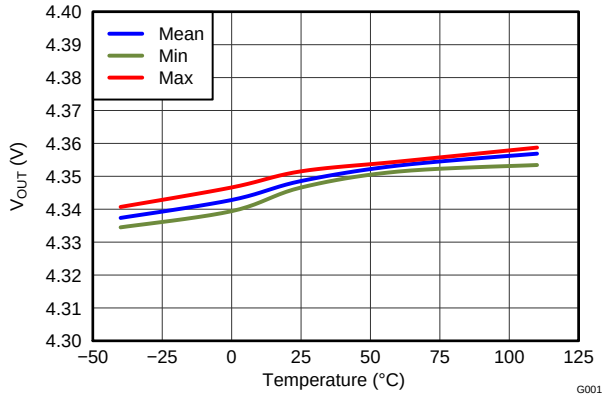


Figure 2. Overvoltage Threshold (OVT) vs. Temperature

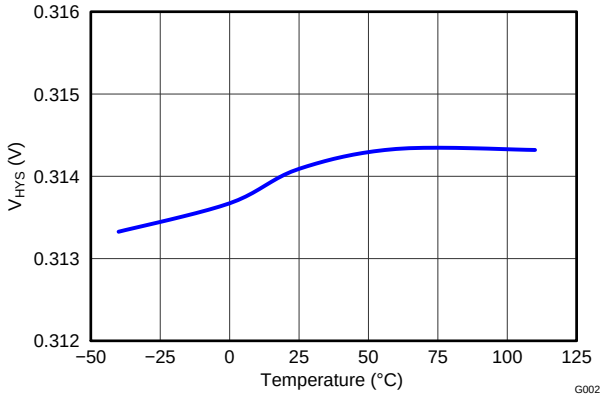


Figure 3. Hysteresis V_{HYS} vs. Temperature

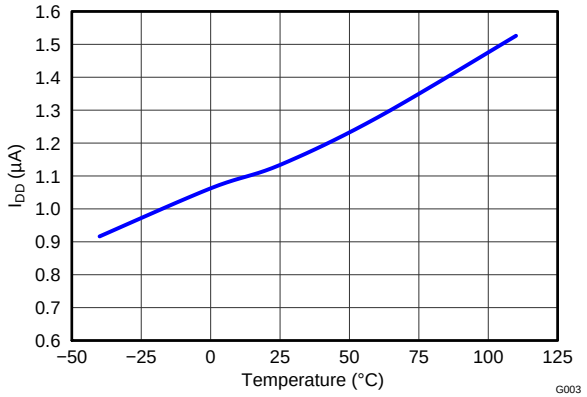


Figure 4. I_{DD} Current Consumption vs. Temperature at VDD = 16 V

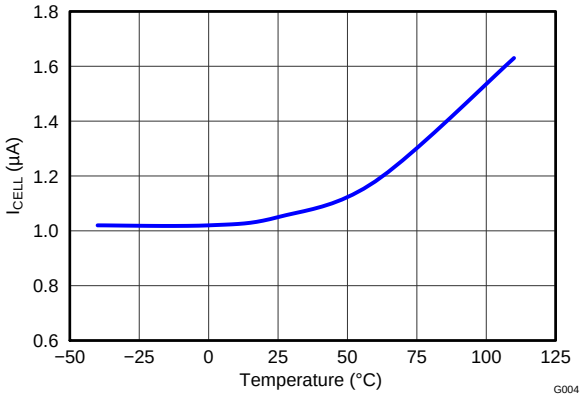


Figure 5. I_{CELL} vs. Temperature at V_{CELL}= 9.2 V

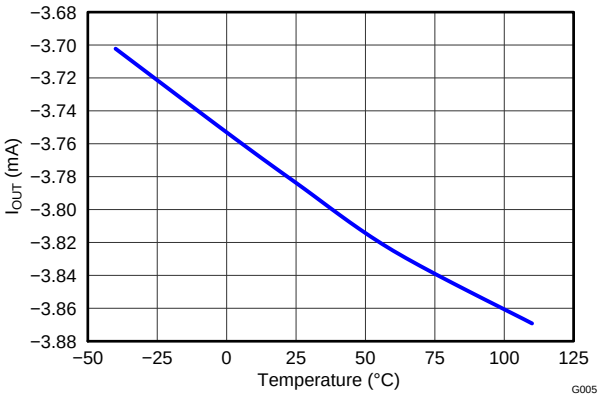


Figure 6. Output Current I_{OUT} vs. Temperature

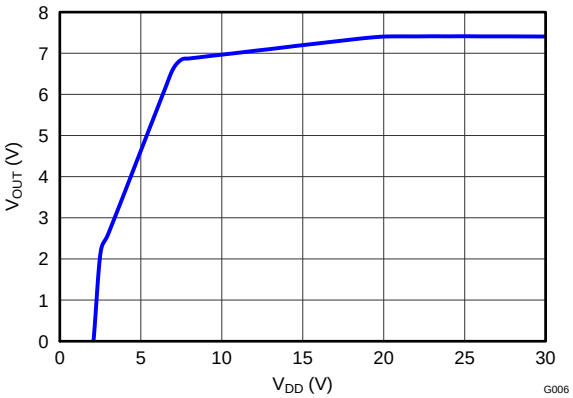


Figure 7. V_{OUT} vs. V_{DD}

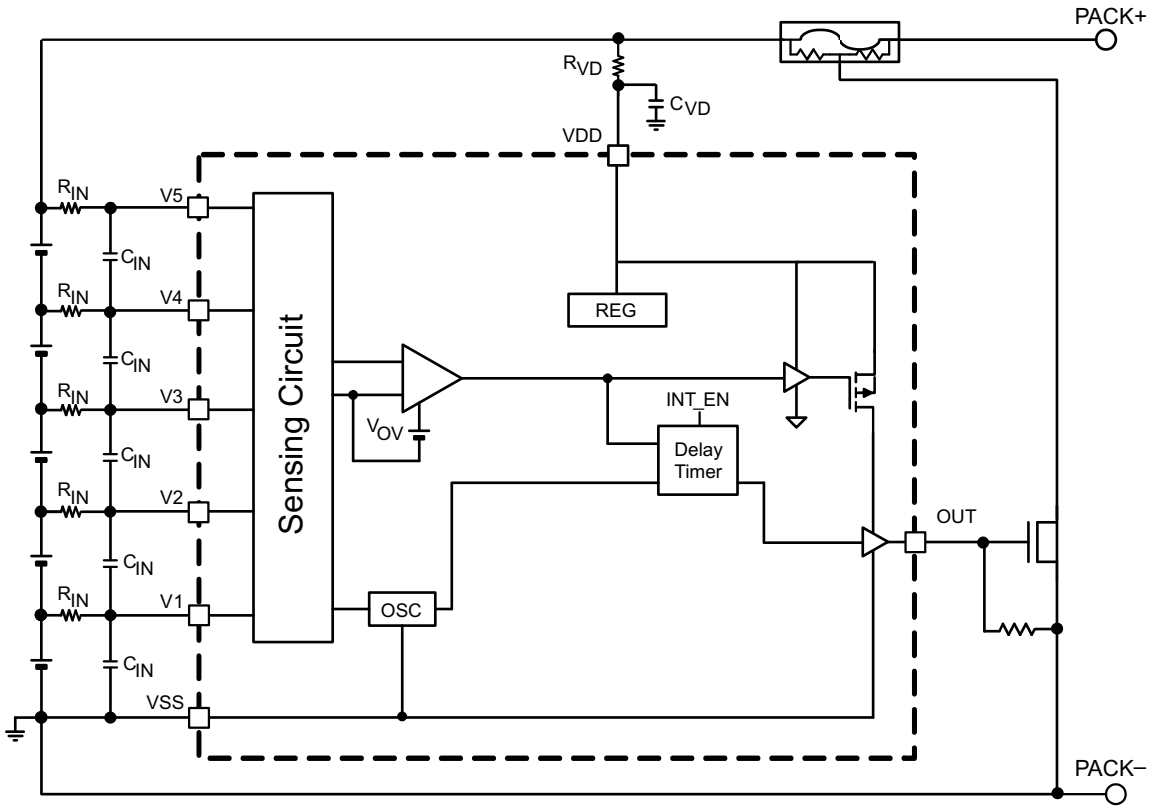
9 Detailed Description

9.1 Overview

In the bq7718xy family of devices, each cell is monitored independently and an external delay timer is initiated if an overvoltage condition is detected on any cell.

For quicker production-line testing, the device provides a Customer Test Mode with greatly reduced delay time.

9.2 Functional Block Diagram



10 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

10.1 Application Information

In the case of an Open Drain Active Low configuration, an external pull-up resistor is required on the OUT pin. Changes to the ranges stated in Table 1 will impact the accuracy of the cell measurements.

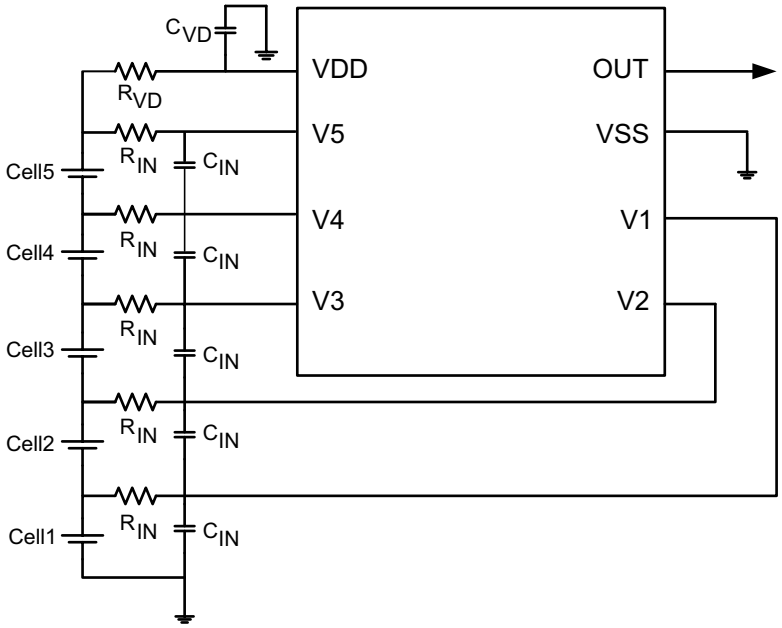


Figure 8. Application Configuration

Changes to the ranges stated in Table 1 will impact the accuracy of the cell measurements. Figure 8 shows each external component.

Table 1. Parameters

PARAMETER	EXTERNAL COMPONENT	MIN	NOM	MAX	UNIT
Voltage monitor filter resistance	R_{IN}	900	1000	1100	Ω
Voltage monitor filter capacitance	C_{IN}	0.01		0.1	µF
Supply voltage filter resistance	R_{VD}	100		1K	Ω
Supply voltage filter capacitance	C_{VD}		0.1		µF
CD external delay capacitance			0.1	1	µF
OUT Open drain version pull-up resistance to PACK+			100		kΩ

NOTE

The device is calibrated using an R_{IN} value = 1 kΩ. Using a value other than this recommended value changes the accuracy of the cell voltage measurements and V_{OV} trigger level.

10.2 Typical Applications

In these application examples, an external pull-up resistor is required on the OUT pin to configure for an Open Drain Active Low operation.

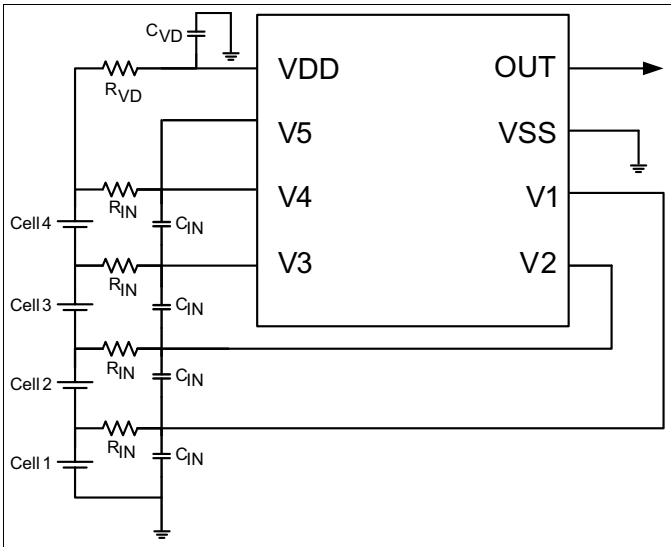


Figure 9. 4-Series Cell Configuration

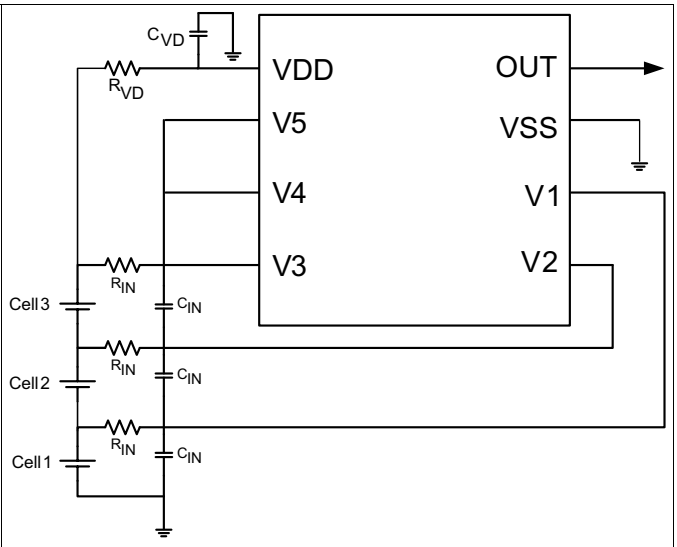


Figure 10. 3-Series Cell Configuration with Fixed Delay

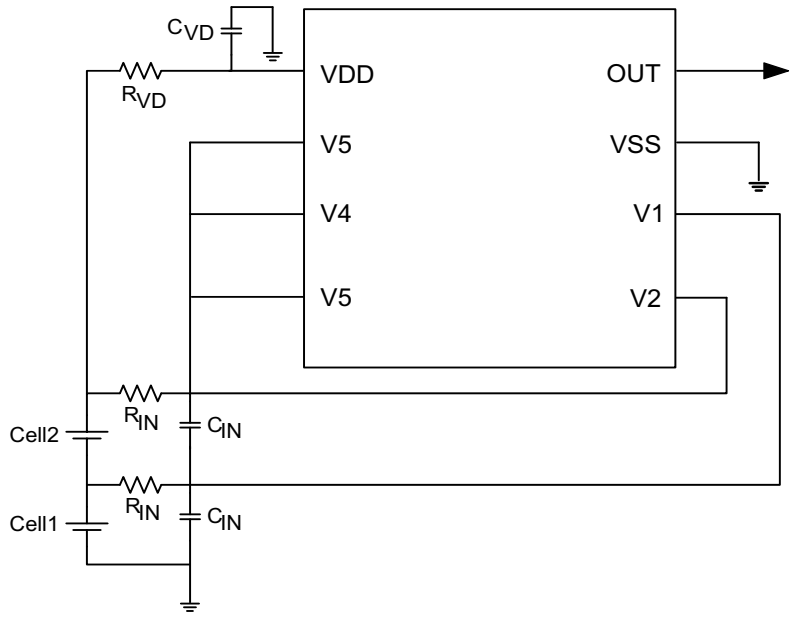


Figure 11. 2-Series Cell Configuration with Internal Fixed Delay

10.3 Customer Test Mode

Customer Test Mode (CTM) helps to reduce test time for checking the overvoltage delay timer parameter once the circuit is implemented in the battery pack. To enter CTM, VDD should be set to at least 10 V higher than V5 (see Figure 12). The delay timer is greater than 10 ms, but considerably shorter than the timer delay in normal operation. To exit Customer Test Mode, remove the VDD to a V5 voltage differential of 10 V so that the decrease in this value automatically causes an exit.

Customer Test Mode (continued)

CAUTION

Avoid exceeding any Absolute Maximum Voltages on any pins when placing the part into Customer Test Mode. Also avoid exceeding Absolute Maximum Voltages for the individual cell voltages (V5–V4), (V4–V3), (V4–V3), (V3–V2), (V2–V1), and (V1–VSS). Stressing the pins beyond the rated limits may cause permanent damage to the device.

Figure 12 shows the timing for the Customer Test Mode.

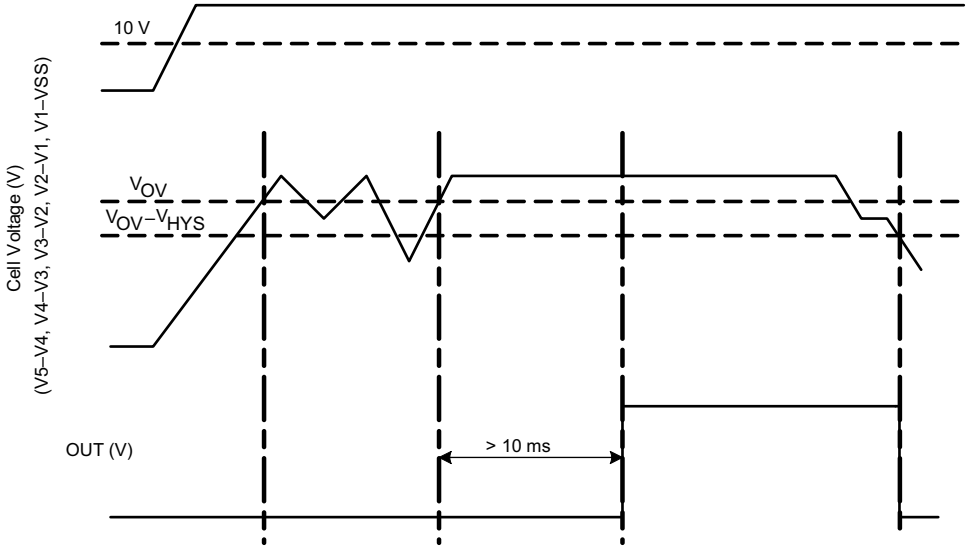


Figure 12. Timing for Customer Test Mode

Customer Test Mode (continued)

Figure 13 shows the measurement for current consumption for the product for both VDD and Vx.

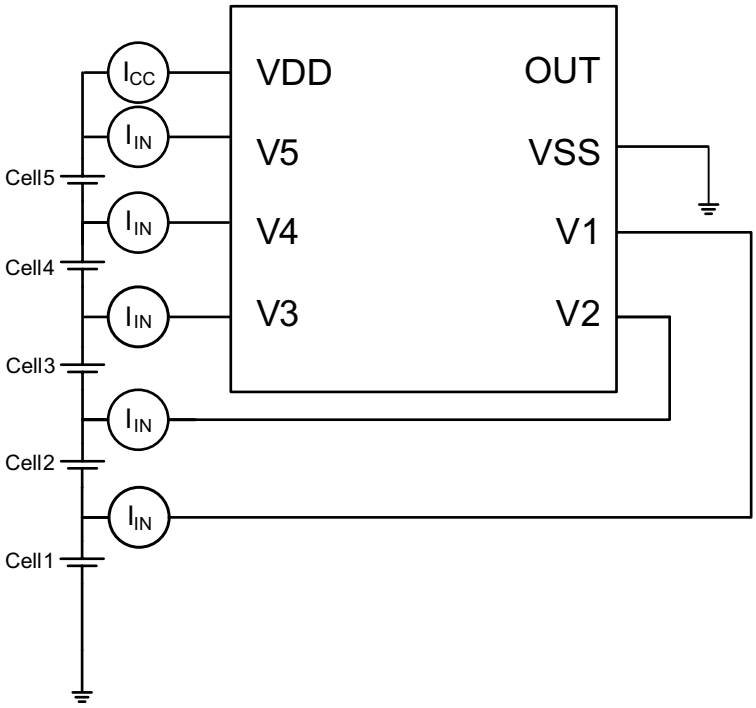


Figure 13. Configuration for IC Current Consumption Test

Customer Test Mode (continued)

10.3.1 Application Curves

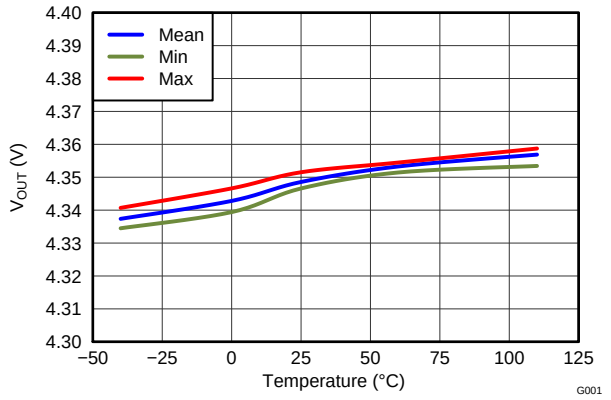


Figure 14. Overvoltage Threshold (OVT) vs. Temperature

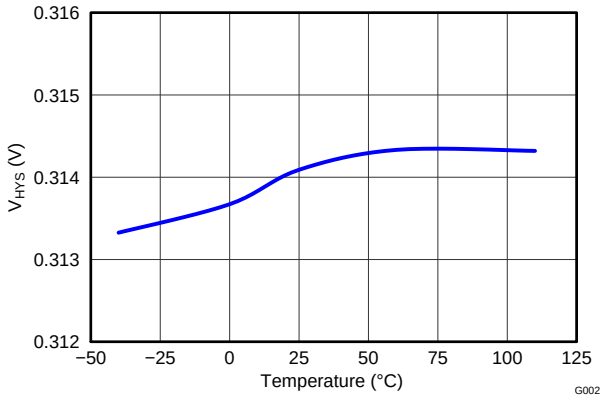


Figure 15. Hysteresis V_{HYS} vs. Temperature

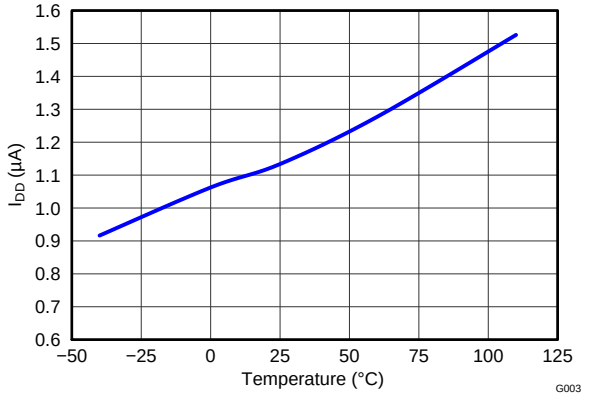


Figure 16. I_{DD} Current Consumption vs. Temperature at VDD = 16 V

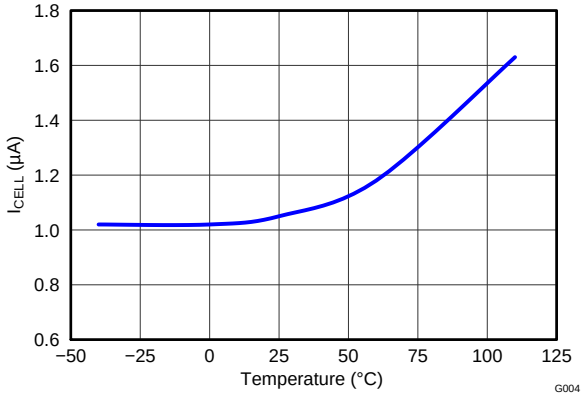


Figure 17. I_{CELL} vs. Temperature at V_{CELL}= 9.2 V

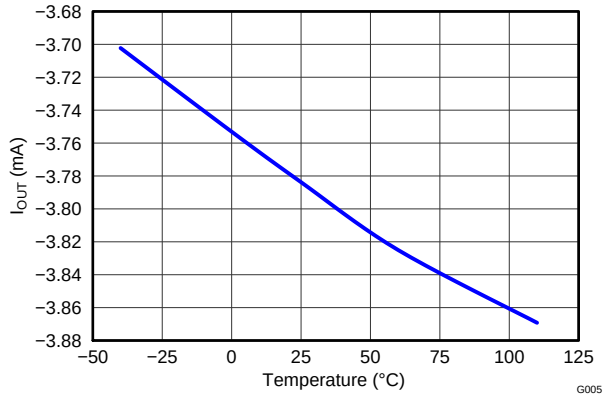


Figure 18. Output Current I_{OUT} vs. Temperature

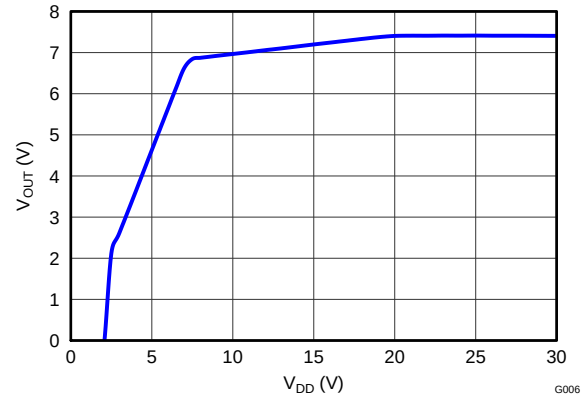


Figure 19. V_{OUT} vs. V_{DD}

11 Device and Documentation Support

11.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

Table 2. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
bq771800	Click here	Click here	Click here	Click here	Click here
bq771801	Click here	Click here	Click here	Click here	Click here
bq771802	Click here	Click here	Click here	Click here	Click here
bq771803	Click here	Click here	Click here	Click here	Click here
bq771807	Click here	Click here	Click here	Click here	Click here
bq771808	Click here	Click here	Click here	Click here	Click here
bq771809	Click here	Click here	Click here	Click here	Click here
bq771815	Click here	Click here	Click here	Click here	Click here

11.2 Trademarks

All trademarks are the property of their respective owners.

11.3 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

11.4 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

12 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
BQ771800DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771800	Samples
BQ771800DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771800	Samples
BQ771801DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771801	Samples
BQ771801DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771801	Samples
BQ771802DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771802	Samples
BQ771802DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771802	Samples
BQ771803DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771803	Samples
BQ771803DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771803	Samples
BQ771807DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771807	Samples
BQ771807DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771807	Samples
BQ771808DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771808	Samples
BQ771808DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771808	Samples
BQ771809DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771809	Samples
BQ771809DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771809	Samples
BQ771815DPJR	ACTIVE	WSON	DPJ	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771815	Samples
BQ771815DPJT	ACTIVE	WSON	DPJ	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	771815	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

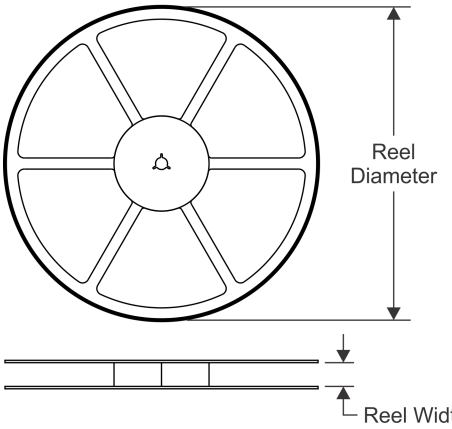
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

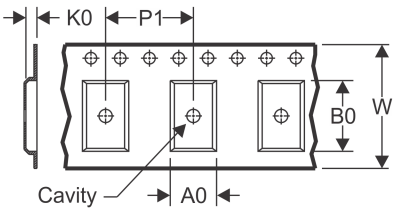
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

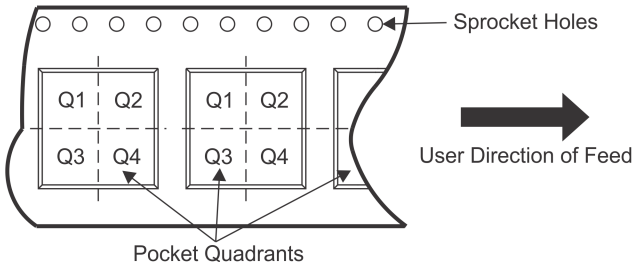


TAPE DIMENSIONS



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

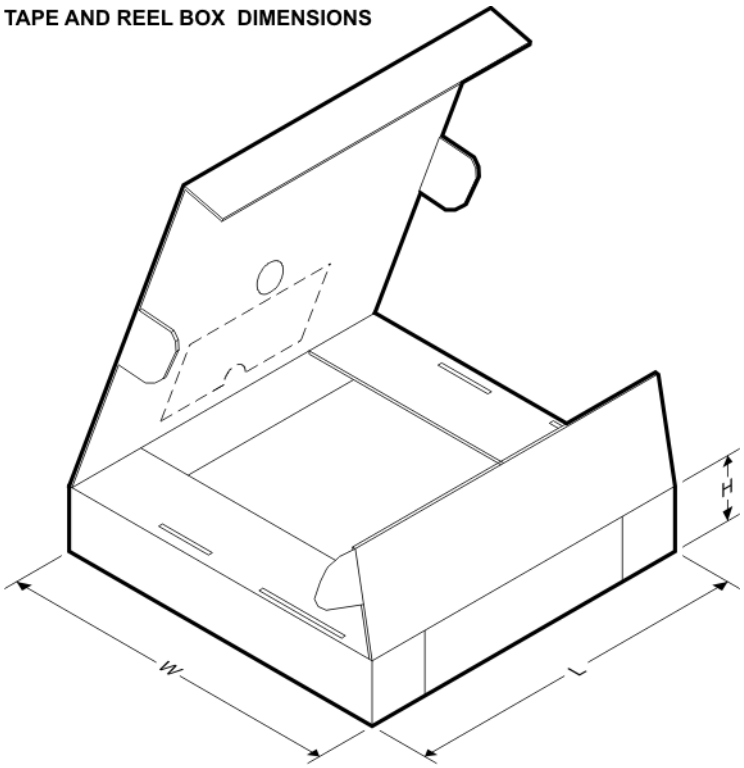
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
BQ771800DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771800DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771801DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771801DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771802DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771802DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771803DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771803DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771807DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771807DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771808DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771808DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771809DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771809DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771815DPJR	WSON	DPJ	8	3000	330.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2
BQ771815DPJT	WSON	DPJ	8	250	180.0	12.4	3.3	4.3	1.1	8.0	12.0	Q2

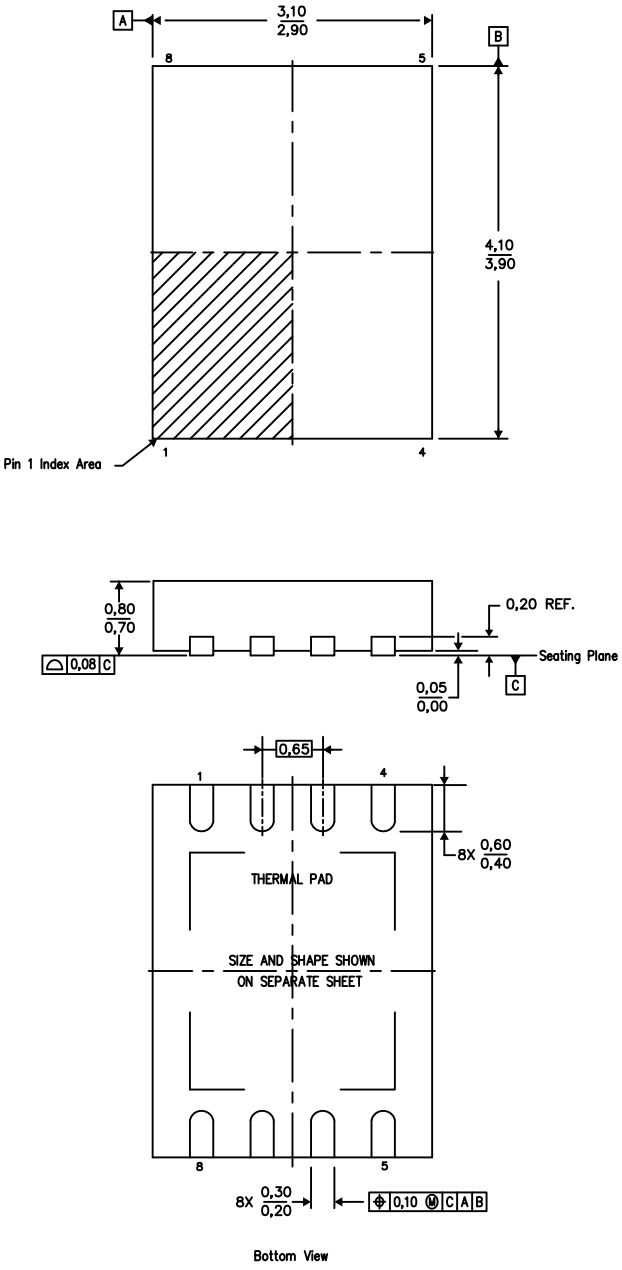
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
BQ771800DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771800DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771801DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771801DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771802DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771802DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771803DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771803DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771807DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771807DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771808DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771808DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771809DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771809DPJT	WSON	DPJ	8	250	210.0	185.0	35.0
BQ771815DPJR	WSON	DPJ	8	3000	367.0	367.0	35.0
BQ771815DPJT	WSON	DPJ	8	250	210.0	185.0	35.0

DPJ (R–PWSON–N8) PLASTIC SMALL OUTLINE NO–LEAD



4212590/B 04/12

NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Small Outline No–Lead (SON) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.

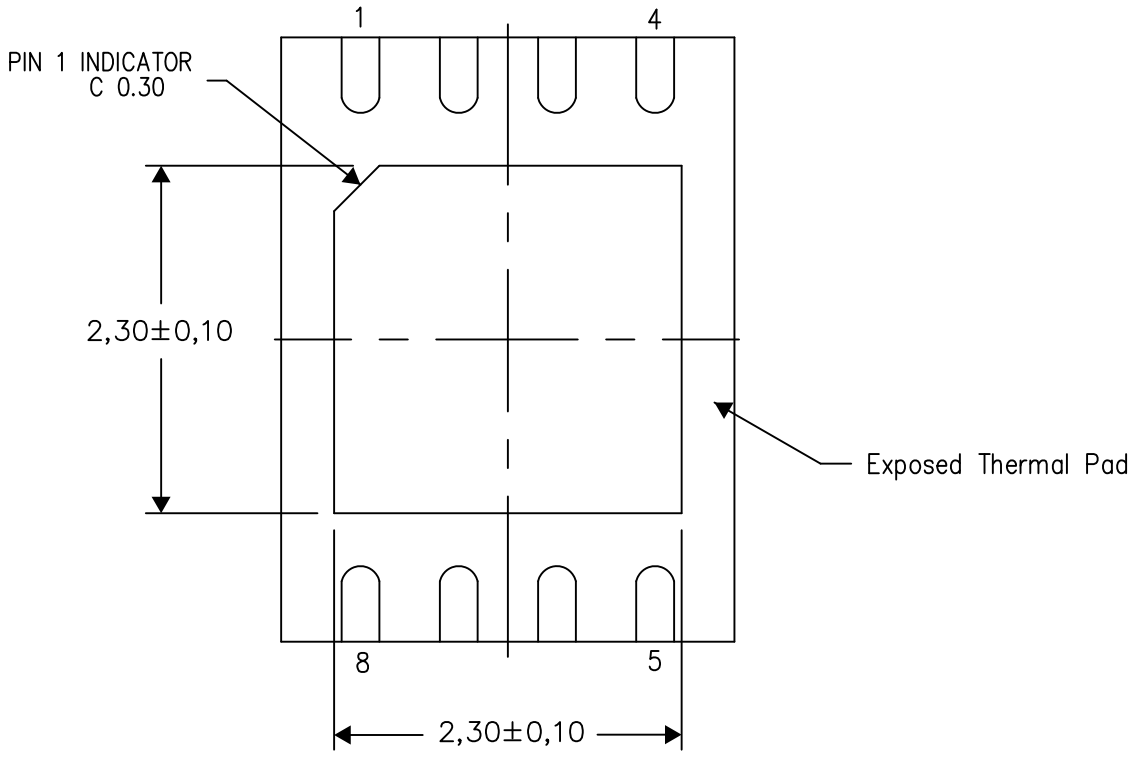
DPJ (R–PWSON–N8) PLASTIC SMALL OUTLINE NO–LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

4212605/A 04/12

NOTE: All linear dimensions are in millimeters

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