

SBS 1.1-COMPLIANT GAS GAUGE AND PROTECTION-ENABLED IC WITH IMPEDANCE TRACK™

Check for Samples: [bq20z75-V180](#)

FEATURES

- **Next Generation Patented Impedance Track™ Technology accurately Measures Available Charge in Li-Ion and Li-Polymer Batteries**
 - Better than 1% Error Over Lifetime of the Battery
 - Instant Accuracy – No Learning Cycle Required
- **Supports the Smart Battery Specification SBS V1.1**
- **Flexible Configuration for 2 to 4 Series Li-Ion and Li-Polymer Cells**
- **Powerful 8-Bit RISC CPU With Ultra-Low Power Modes**
- **Full Array of Programmable Protection Features**
 - Voltage, Current and Temperature
- **Supports SHA-1 Authentication**
- **small 38-Pin TSSOP (DBT) Package**

APPLICATIONS

- **Notebook PCs**
- **Medical and Test Equipment**
- **Portable Instrumentation**

DESCRIPTION

The bq20z75-V180 SBS-compliant gas gauge and protection IC is a single IC solution designed for battery-pack or in-system installation. The bq20z75-V180 measures and maintains an accurate record of available charge in Li-ion or Li-polymer batteries using its integrated high-performance analog peripherals, monitors capacity change, battery impedance, open-circuit voltage, and other critical parameters of the battery pack as well and reports the information to the system host controller over a serial-communication bus. Together with the integrated analog front-end (AFE) short-circuit and overload protection the bq20z75-V180 maximizes functionality, safety and minimize external component count, cost and size in smart battery circuits.

The implemented Impedance Track™ gas gauging technology continuously analyzes the battery impedance, resulting in superior gas-gauging accuracy. This enables remaining capacity to be calculated with discharge rate, temperature, and cell aging all accounted for during each stage of every cycle with high accuracy.

Table 1. AVAILABLE OPTIONS

T _A	PACKAGE	
	38-PIN TSSOP (DBT) Tube ⁽¹⁾	38-PIN TSSOP (DBT) Tape and Reel ⁽²⁾
–40°C to 85°C	bq20z75DBT	bq20z75DBTR
	bq20z75DBT-V160	bq20z75DBTR-v160
	bq20z75DBT-v180	bq20z75DBTR-v180

(1) A single tube quantity is 50 units.

(2) A single reel quantity is 2000 units

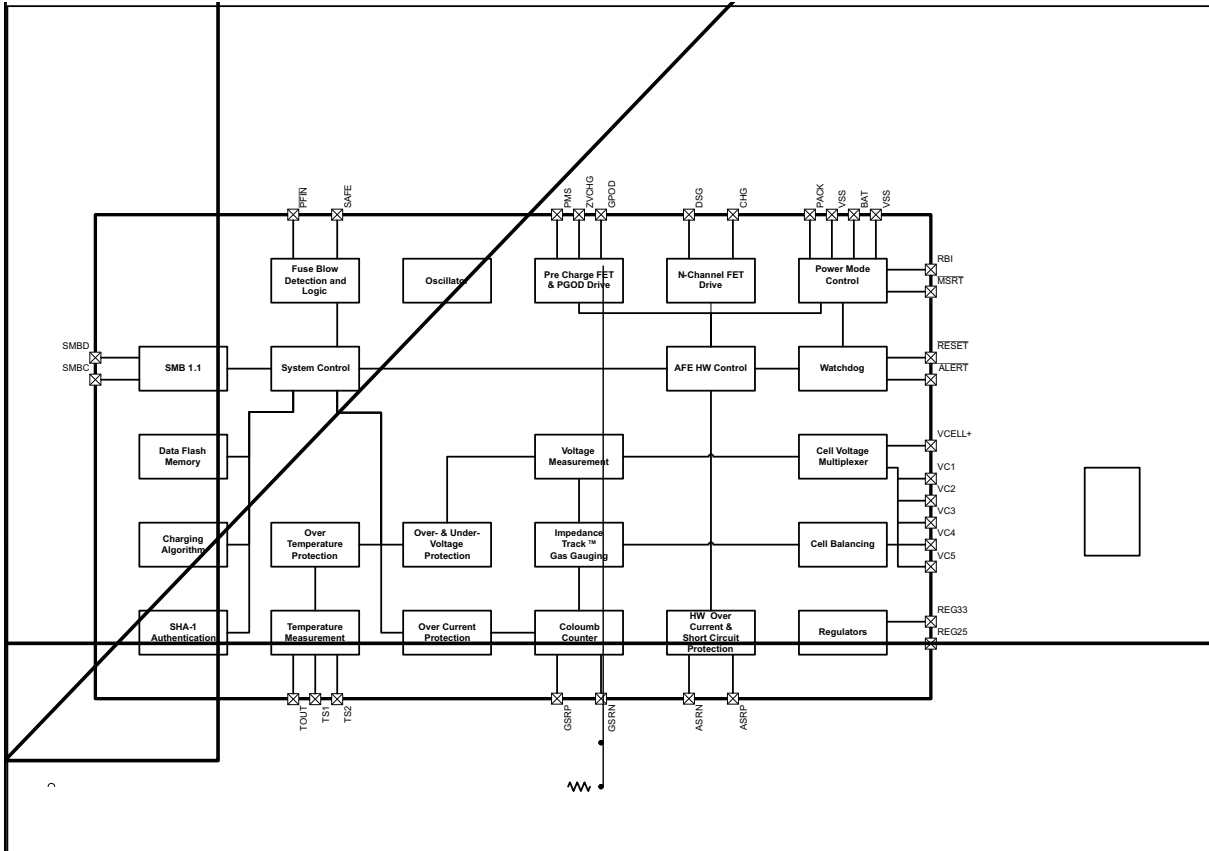


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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

SYSTEM PARTITIONING DIAGRAM



TSSOP (PW)
(TOP VIEW)

DSG	1	38	CHG
PACK	2	37	BAT
VCC	3	36	VC1
ZVCHG	4	35	VC2
GPOD	5	34	VC3
PMS	6	33	VC4
VSS	7	32	VC5
REG33	8	31	ASRP
TOUT	9	30	ASRN
VCELL+	10	29	RESET
ALERT	11	28	VSS
PRES	12	27	RBI
TS1	13	26	REG25
TS2	14	25	VSS
PFIN	15	24	MRST
SAFE	16	23	GSRN
SMBD	17	22	GSRP
SMBC	18	21	VSS
NC	19	20	VSS

Recommended Operating Conditions

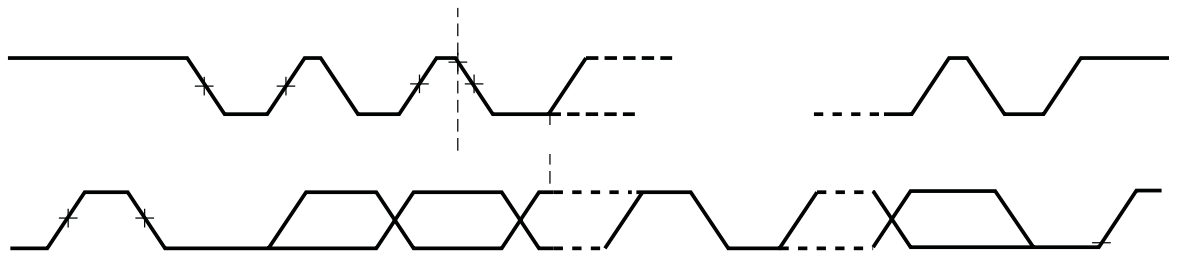
over operating free-air temperature range (unless otherwise noted)

PARAMETER	PIN	MIN	NOM	MAX	UNIT
V _{SUP}	Supply	0	2.8	2.8	V
V _{BATT}	BATT	0	1.2	1.2	V
T _J	Junction	-40	25	100	°C
T _z	Zero-current	0	0	0	°C
I _{REG}	REG	0	0.5	0.5	A
I _{BT}	BT	0	0.1	0.1	A
I _{FB}	FB	0	0.1	0.1	A
I _{CP}	CP	0	0.1	0.1	A
I _{CP2}	CP2	0	0.1	0.1	A
I _{CP3}	CP3	0	0.1	0.1	A
I _{CP4}	CP4	0	0.1	0.1	A
I _{CP5}	CP5	0	0.1	0.1	A
I _{CP6}	CP6	0	0.1	0.1	A
I _{CP7}	CP7	0	0.1	0.1	A
I _{CP8}	CP8	0	0.1	0.1	A
I _{CP9}	CP9	0	0.1	0.1	A
I _{CP10}	CP10	0	0.1	0.1	A
I _{CP11}	CP11	0	0.1	0.1	A
I _{CP12}	CP12	0	0.1	0.1	A

PARAMETER	PIN	MIN	NOM	MAX	UNIT
V _{BATT}	BATT	0	1.2	1.2	V
T _z	Zero-current	0	0	0	°C
I _{REG}	REG	0	0.5	0.5	A
I _{BT}	BT	0	0.1	0.1	A
I _{FB}	FB	0	0.1	0.1	A
I _{CP}	CP	0	0.1	0.1	A
I _{CP2}	CP2	0	0.1	0.1	A
I _{CP3}	CP3	0	0.1	0.1	A
I _{CP4}	CP4	0	0.1	0.1	A
I _{CP5}	CP5	0	0.1	0.1	A
I _{CP6}	CP6	0	0.1	0.1	A
I _{CP7}	CP7	0	0.1	0.1	A
I _{CP8}	CP8	0	0.1	0.1	A
I _{CP9}	CP9	0	0.1	0.1	A
I _{CP10}	CP10	0	0.1	0.1	A
I _{CP11}	CP11	0	0.1	0.1	A
I _{CP12}	CP12	0	0.1	0.1	A

Supply V_{BATT} T_z 0 0 0 rg 248.5 60

Supply V_{BATT} T_z 0 0 0 rg 248.5 60



FEATURE SET

Primary (1st Level) Safety Features

The bq20z75-V180 supports a wide range of battery and system protection features that can easily be configured. The primary safety features include:

- Cell over/under voltage protection
- Charge and Discharge over current
- Short Circuit
- Charge and Discharge Over temperature
- AFE Watchdog

Secondary (2nd Level) Safety Features

The secondary safety features of the bq20z75-V180 can be used to indicate more serious

Power Modes

The bq20z75-V180 supports 3 different power modes to reduce power consumption:

- In Normal Mode, the bq20z75-V180 performs measurements, calculations, protection decisions and data updates in 1 second intervals. Between these intervals, the bq20z75-V180 is in a reduced power stage.
- In Sleep Mode, the bq20z75-V180 performs measurements, calculations, protection decisions and data update in adjustable time intervals. Between these intervals, the bq20z75-V180 is in a reduced power stage. The bq20z75-V180 has a wake function that enables exit from Sleep mode, when current flow or failure is detected.
- In Shutdown Mode the bq20z75-V180 is completely disabled.

CONFIGURATION

Oscillator Function

The bq20z75-V180 fully integrates the system oscillators. Therefore the bq20z75-V180 requires no external components for this feature.

System Present Operation

The bq20z75-V180 checks the $\overline{\text{PRES}}$ pin periodically (1 s). Connect the $\overline{\text{PRES}}$ pin to TOUT with a 100k Ω resistor. If $\overline{\text{PRES}}$ input is pulled to ground by external system host, the bq20z75-V180 detects this as system present.

BATTERY PARAMETER MEASUREMENTS

The bq20z75-V180 uses an integrating delta-sigma analog-to-digital converter (ADC) for current measurement, and a second delta-sigma ADC for individual cell and battery voltage, and temperature measurement.

Charge and Discharge Counting

The integrating delta-sigma ADC measures the charge/discharge flow of the battery by measuring the voltage drop across a small-value sense resistor between the SRP and SRN pins. The integrating ADC measures bipolar signals from -0.25 V to 0.25 V. The bq20z75-V180 detects charge activity when $V_{\text{SR}} = V_{(\text{SRP})} - V_{(\text{SRN})}$ is positive and discharge activity when $V_{\text{SR}} = V_{(\text{SRP})} - V_{(\text{SRN})}$ is negative. The bq20z75-V180 continuously integrates the signal over time, using an internal counter. The fundamental rate of the counter is 0.65 nVh.

Voltage

The bq20z75-V180 updates the individual series cell voltages at one second intervals. The internal ADC of the bq20z75-V180 measures the voltage, scales and calibrates it appropriately. This data is also used to calculate the impedance of the cell for the Impedance Track™ gas-gauging.

Current

The bq20z75-V180 uses the GSRP and GSRN inputs to measure and calculate the battery charge and discharge current using a 5 m Ω to 20 m Ω typ. sense resistor.

Auto Calibration

The bq20z75-V180 provides an auto-calibration feature to cancel the voltage offset error across GSRN and GSRP for maximum charge measurement accuracy. The bq20z75-V180 performs auto-calibration when the SMBus lines stay low continuously for a minimum of 5 s.

Temperature

The bq20z75-V180 has an internal temperature sensor and 2 external temperature sensor inputs TS1 and TS2 used in conjunction with two identical NTC thermistors (default are Semitec 103AT) to sense the battery environmental temperature. The bq20z75-V180 can be configured to use internal or external temperature sensors.

COMMUNICATIONS

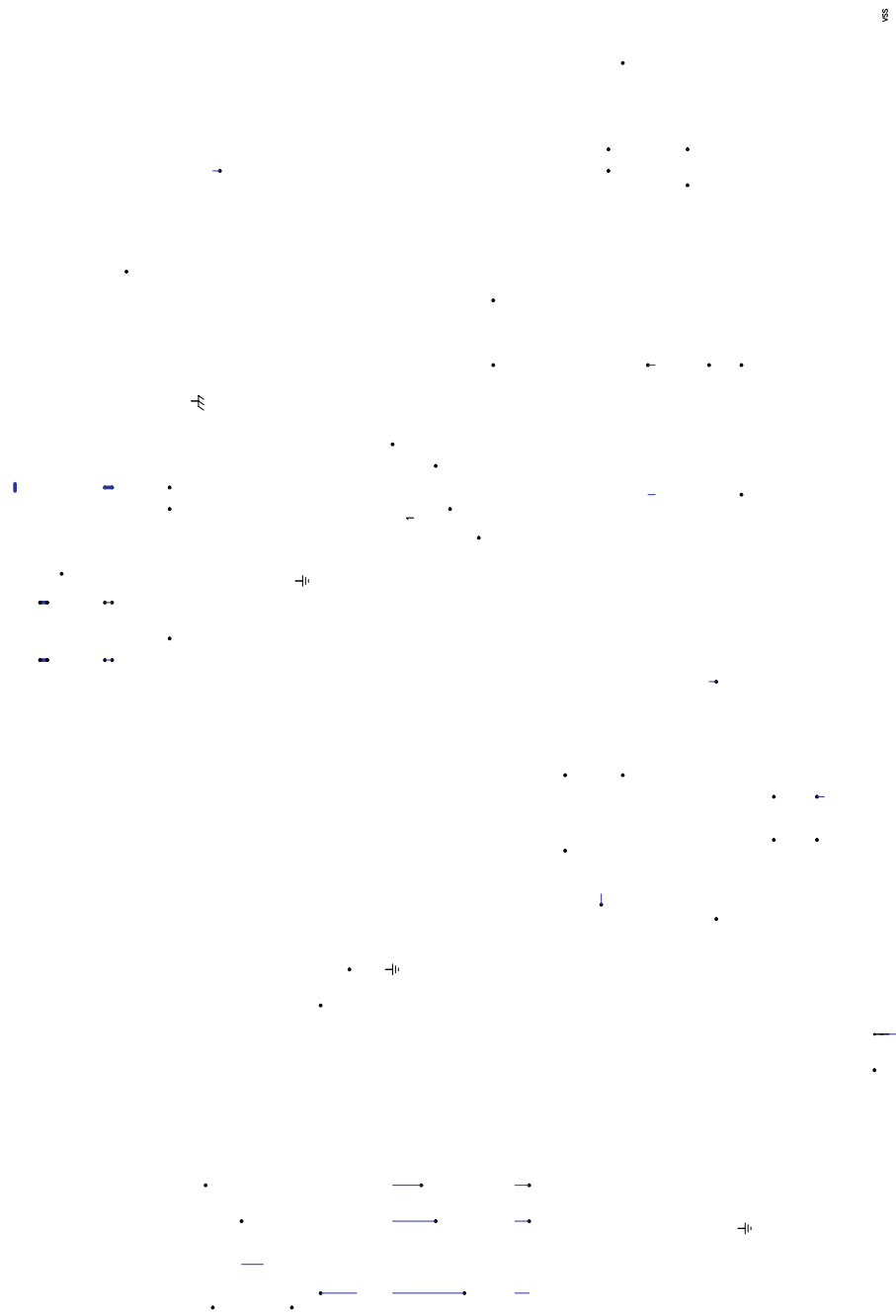
The bq20z75-V180 uses SMBus v1.1 with Master Mode and package error checking (PEC) options per the SBS specification.

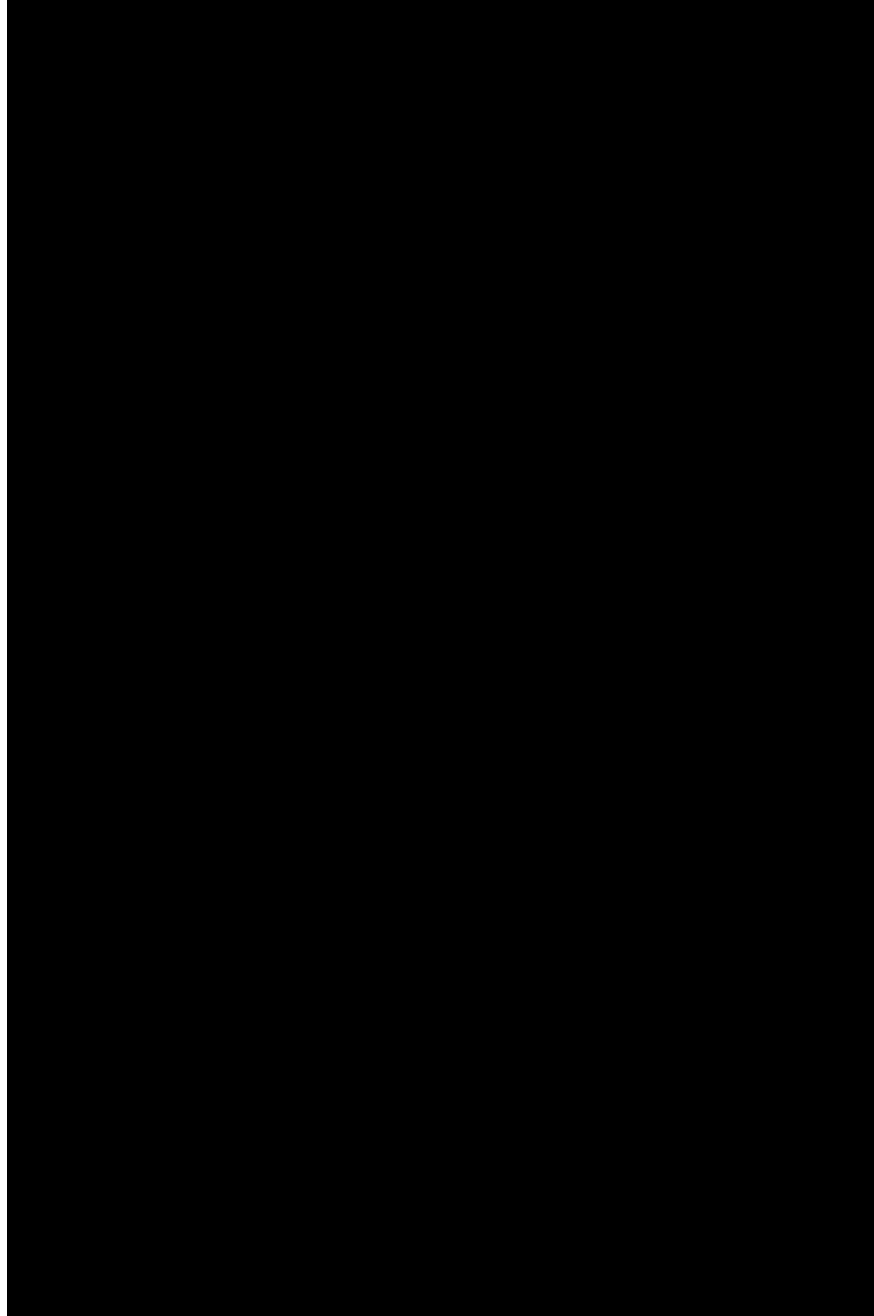
SMBus On and Off State

The bq20z75-V180 detects an SMBus off state when SMBC and SMBD are logic-low for ≥ 2 seconds. Clearing this state requires either SMBC or SMBD to transition high. Within 1 ms, the communication bus is available.



Application Schematics





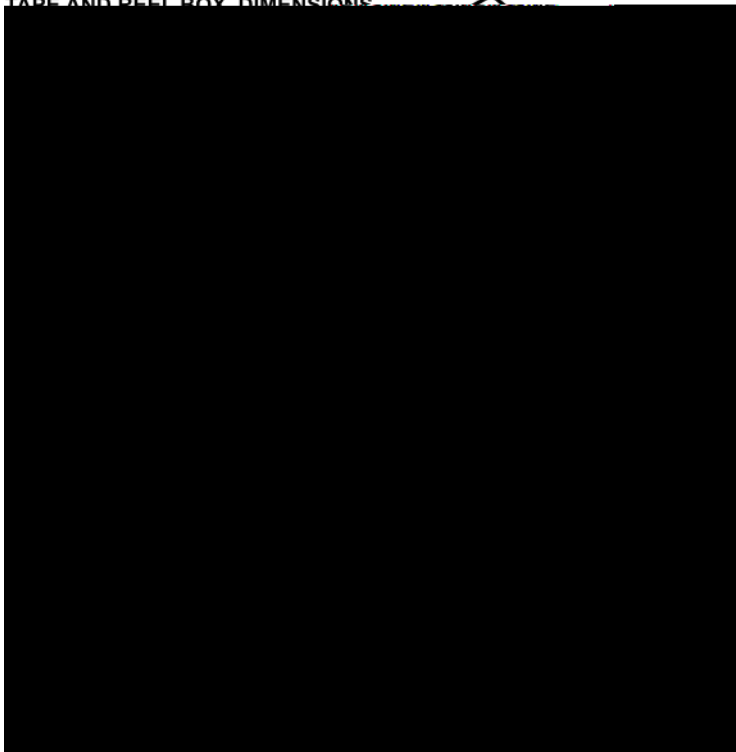


PACKAGING INFORMATION

Green (RoHS
& no Sb/Br)

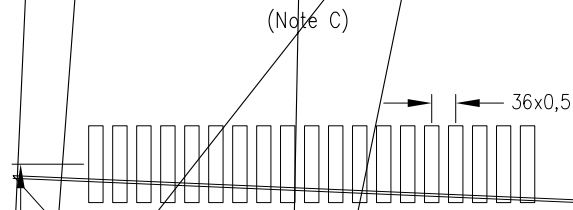
Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
BQ20Z75DBT-V180	ACTIVE	TSSOP	DBT	38	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR			

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
BQ20Z75DBTR-V180	TSSOP	DBT	38	2000	367.0	367.0	38.0

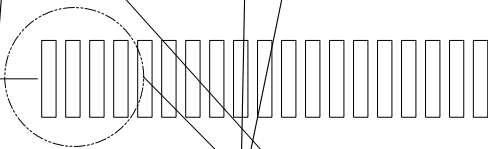


(Note C)

(Note D)

38x0,5 x0,5

5,6



Example
Non Soldermask Defined Pad

ry

(Note E)

NOTES:

dimensions are in millimeters.

B. This drawing is subject to change without notice.

D. Pads with trapezoidal walls and also rounding corners will offer better paste

E.

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