SBS 1.1-COMPLIANT GAS GAUGE ENABLED WITH IMPEDANCE TRACK™ TECHNOLOGY FOR USE WITH THE bq29330

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**
- **Powerful 8-Bit RISC CPU With Ultra-Low Power Modes**
- **Works With the TI bq29330 Analog Front-End (AFE) Protection IC to Provide Complete Pack Electronics Solution**
- **Full Array of Programmable Protection Features**
  - **Voltage, Current and Temperature**
- **Fully Integrated High Accurate Clock**
- **Flexible Configuration for 2 to 4 Series Li-Ion and Li-Polymer Cells**
- **Integrated Field Programmable FLASH Memory Eliminates the Need for External Configuration Memory**
- **Smart Battery Charger Control Feature**
- **Two 16-Bit Delta-Sigma Converter**
  - **Accurate Voltage and Temperature Measurements**
  - **Integrating Coloumb Counter for Charge Flow**
    - **Better Than 0.65 nVh of Resolution**
    - **Self-Calibrating**
- **Supports SHA-1 Authentication**
- **20-Pin TSSOP (PW)**

APPLICATIONS

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

DESCRIPTION

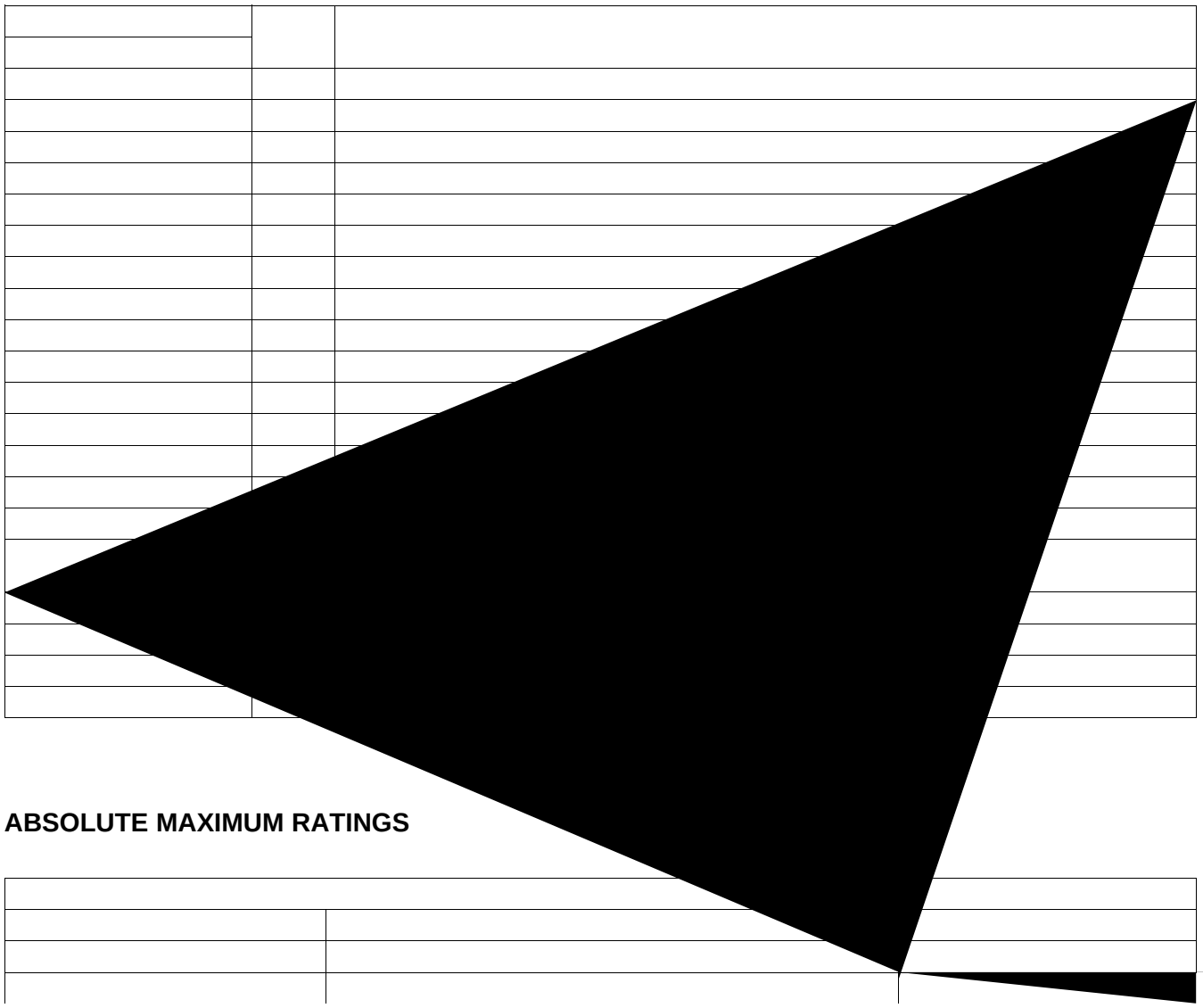
The bq20z70-V110 SBS-compliant gas gauge IC, incorporating patented Impedance Track™ technology, is designed for battery-pack or in-system installation. The bq20z70-V110 measures and maintains an accurate record of available charge in Li-ion or Li-polymer batteries using its integrated high-performance analog peripherals. The bq20z70-V110 monitors capacity change, battery impedance, open-circuit voltage, and other critical parameters of the battery pack, and reports the information to the system host controller over a serial-communication bus. It is designed to work with the bq29330 analog front-end (AFE) protection IC to maximize functionality and safety, and minimize component count and cost in smart battery circuits.

The Impedance Track 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.

AVAILABLE OPTIONS

T_A	PACKAGE	
	20-PIN TSSOP (PW) Tube	20-PIN TSSOP (PW) Tape & Reel
–40°C to 85°C	bq20z70-V110PW(1)	bq20z70-V110PWR(2)

(1) A single tube quantity is 50 units.
(2) A single reel quantity is 2000 units



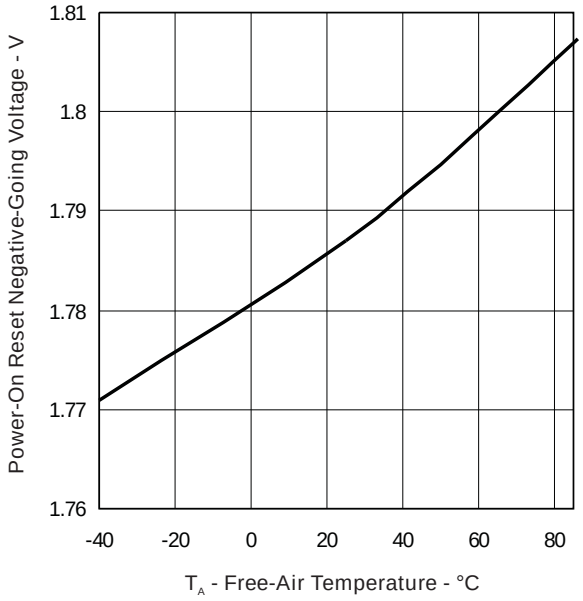
ABSOLUTE MAXIMUM RATINGS

ELECTRICAL CHARACTERISTICS (continued)

V_{CC} = 2.4 V to 2.6 V, T_A = -40°C - 85°C (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
	Shutdown Mode		0.1		

POWER-ON RESET



INTEGRATING ADC (Coulomb Counter) CHARACTERISTICS

DATA FLASH MEMORY CHARACTERISTICS

V_{CC} = 2.4 V to 2.6 V, T_A = –40°C to 85°C (unless otherwise noted)

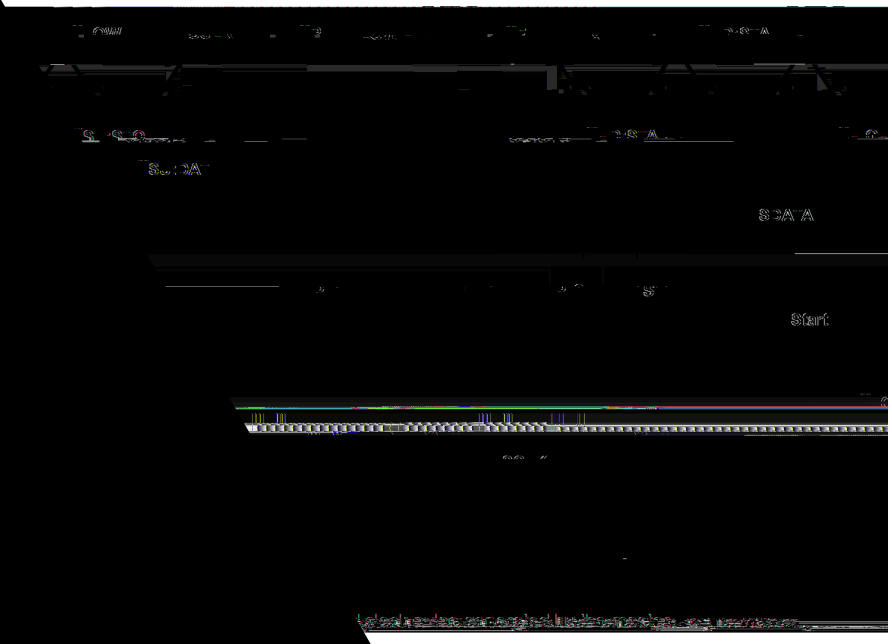
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{DR}	Data retention	See (1)	10			Years
	Flash programming write-cycles	See (1)	20,000			Cycles
$t_{(WORDPROG)}$	Word programming time	See (1)			2	ms
$I_{(DDPROG)}$	Flash-write and erase supply current	See (1)		5	10	mA

(1) Assured by design. Not production tested

SMBus TIMING SPECIFICATIONS

V_{CC} = 2.4 V to 2.6 V, T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{SMB}	SMBus operating frequency	Slave mode, SMBC 50% duty cycle				



FEATURE SET

Primary (1st Level) Safety Features

The bq20z70-V110 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 Circut
- Charge and Discharge Over temperature
- AFE Watchdog

Secondary (2nd Level) Safety Features

The bq20z70-V110 has additional safety features that can be used to indicate more serious failures and

Charge Control Features

Gas Gauging

Authentication

Power Modes

FEATURE SET (continued)

- In Sleep Mode, the bq20z70-V110 performs measurements, calculations, protection decisions and data update in adjustable time intervals. Between these intervals, the bq20z70-V110 is in a reduced power stage. The bq20z70-V110 has a wake function that enables exit from Sleep

CONFIGURATION

Oscillator Function

System Present Operation

BATTERY PARAMETER MEASUREMENTS

Charge and Discharge Counting

Voltage

Current

Auto Calibration

Temperature

FEATURE SET (continued)

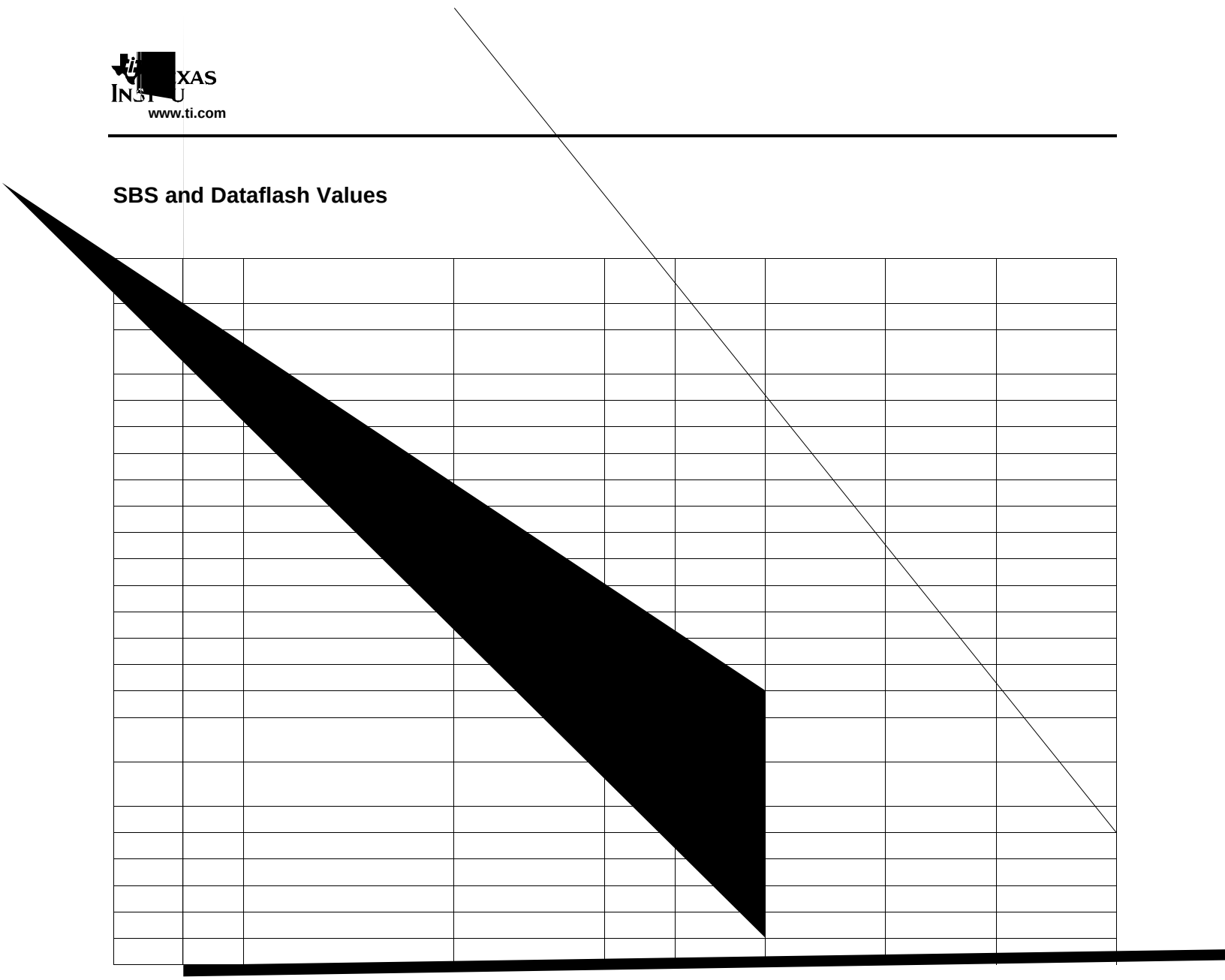
COMMUNICATIONS

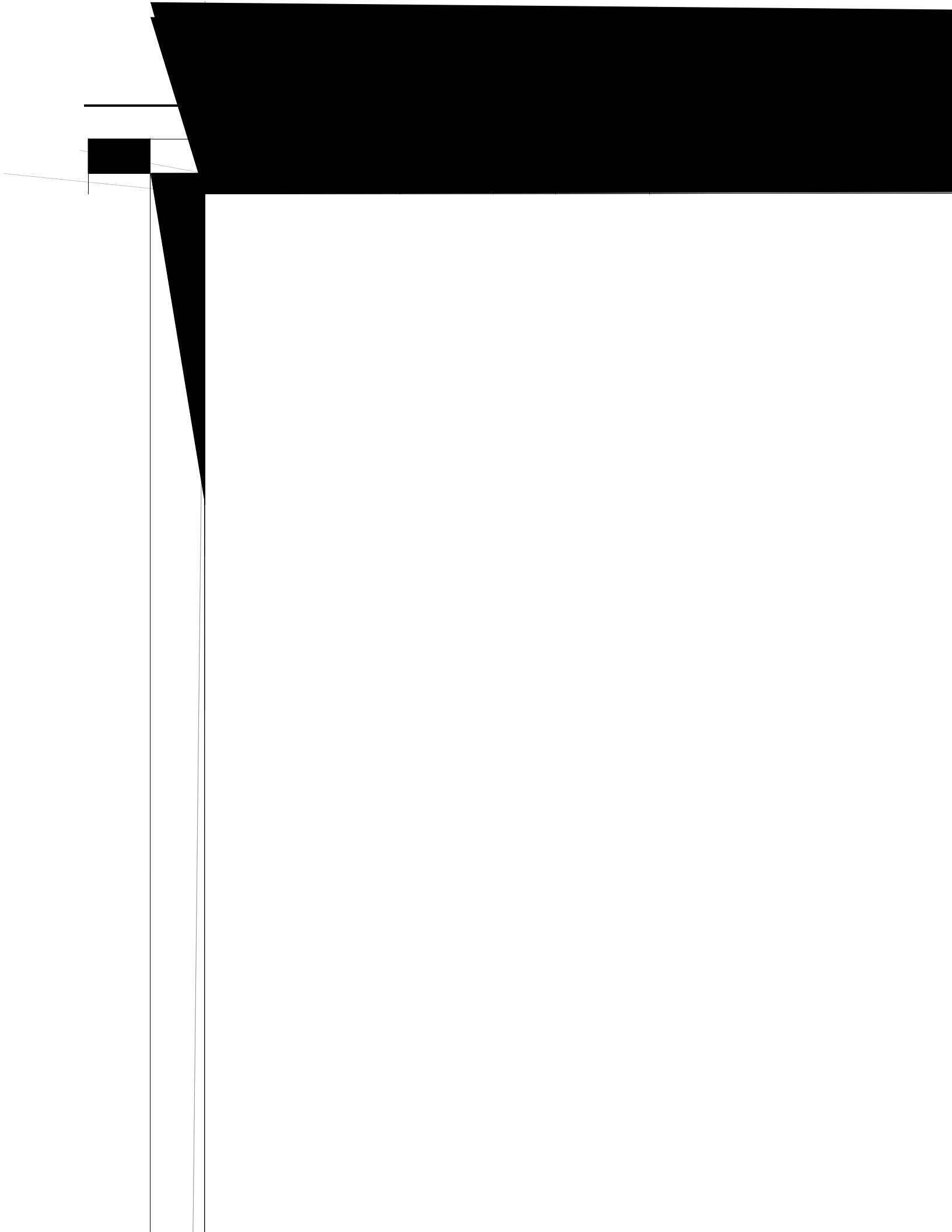
The bq20z70-V110 uses SMBus v1.1 with Master Mode and package error checking (PEC) options per the SBS specification.

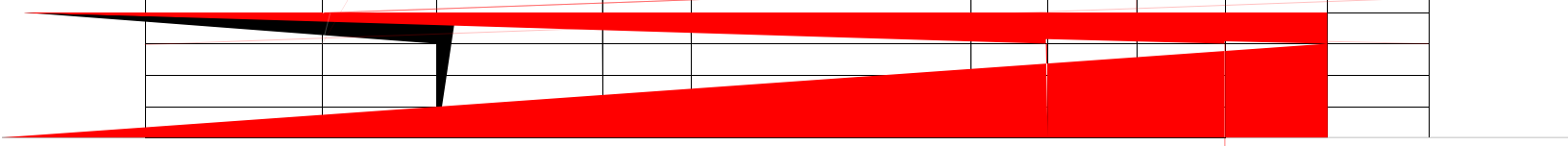
SMBus On and Off State

The bq20z70-V110 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.

SBS and Dataflash Values







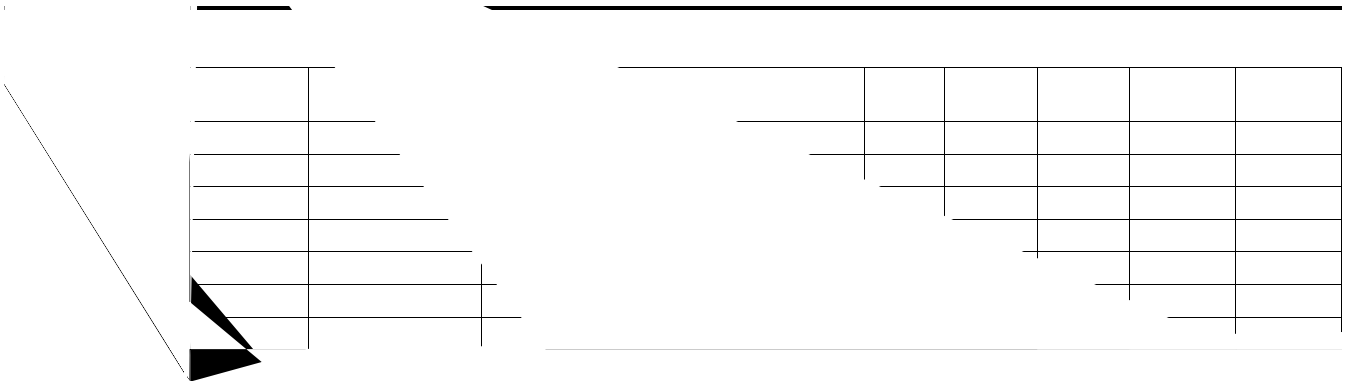


Table 3. DATAFLASH VALUES (continued)

Class	Subclass ID	Subclass	Offset	Name	Data Type	Min Value	Max Value	Default Value	Units
Calibration	106	Temp Model	18	Int Coef 4	I2	-32768	32767	5754	Sec
Calibration	106	Temp Model	20	Int Min AD	I2	-32768	32767	0	Sec
Calibration	106	Temp Model	22	Int Max Temp	I2	-32768	32767	5754	Sec
Calibration	107	Current	0	Filter	U1	0	255	239	
Calibration	107	Current	1	Deadband	U1	0	255	3	mA
Calibration	107	Current	2	CC Deadband	U1	0	255	34	294 nV

Application Schematic

The application schematic is on the following page.

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
BQ20Z70PW-V110	NRND	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
BQ20Z70PW-V110G4	NRND	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
BQ20Z70PWR-V110	NRND	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
BQ20Z70PWR-V110G4	NRND	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

(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.

PW (R-PDSO-G20)

B. This drawing is su

0

D. Body width does not include interlead flash. Inte ash

E. Falls within JEDEC MO-15

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