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

FEATURES

- 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
- Automatically adjusts for battery aging, battery self discharge and temperature inefficiencies
- Supports the Smart Battery Specification SBS V1.1
- Works With the TI bq29330 Analog Front-End (AFE) Protection IC to Provide Complete Pack Electronics Solution
- Full Array of Programmable Voltage, Current, and Temperature Protection Features
- Integrated Time Base Removes Need for External Crystal with Optional Crystal Input
- Electronics for 7.2-V, 10.8-V or 14.4-V Battery Packs With 50% Fewer External Components
- Based on a Powerful Low-Power RISC CPU Core With High-Performance Peripherals
- Integrated Field Programmable FLASH Memory Eliminates the Need for External Configuration Memory
- Measures Charge Flow Using a High-Resolution, 16-Bit Integrating Delta-Sigma Converter
 - Better Than 0.65 nVh of Resolution
 - Self-Calibrating
- Uses 16-Bit Delta-Sigma Converter for Accurate Voltage and Temperature Measurements
- Extensive Data Reporting Options For

Improved System Interaction

- Optional Pulse Charging Feature for Improved Charge Times
- Drives 3-, 4- or 5-Segment LED Display for Remaining Capacity Indication
- Supports SHA-1 Authentication
- Lifetime Data Logging
- 30-Pin TSSOP (DBT)

APPLICATIONS

- Notebook PCs
- Medical and Test Equipment
- Portable Instrumentation

DESCRIPTION

The bq20z90-V110 SBS-compliant gas gauge IC, incorporating patented Impedance Track™ technology, is designed for battery-pack or in-system installation. The bq20z90-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 bq20z90-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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

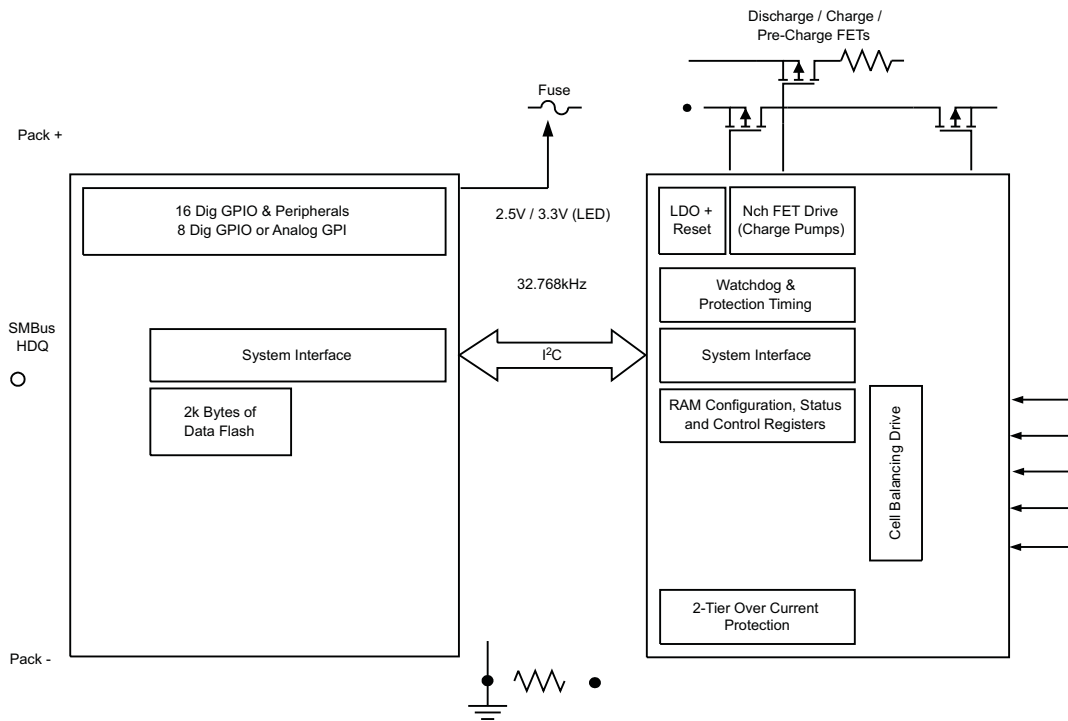
IMPEDANCE TRACK is a trademark of Texas Instruments.

AVAILABLE OPTIONS

T _A	PACKAGE	
	30-PIN TSSOP (DBT) Tube	30-PIN TSSOP (DBT) Tape & Reel
-40°C to 85°C	bq20z90DBT ⁽¹⁾	bq20z90DBTR ⁽²⁾

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

SYSTEM PARTITIONING DIAGRAM



**TSSOP (DBT)
(TOP VIEW)**

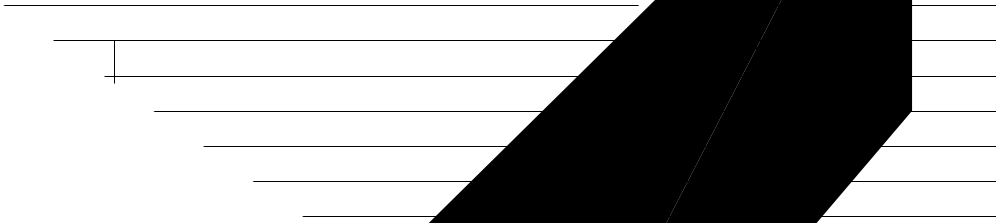
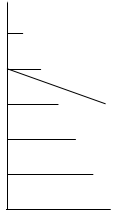
NC	1	30	VCELL-
XALERT	2	29	VCELL+
SDATA	3	28	NC
SCLK	4	27	RBI
CLKOUT	5	26	VCC
TS1	6	25	VSS
TS2	7	24	MRST
PRES	8	23	SRN
PFIN	9	22	SRP
SAFE	10	21	*VSS
SMBD	11	20	LED5
NC	12	19	LED4
SMBC	13	18	LED3
DISP	14	17	LED2
NC	15	16	LED1

NC - No internal connection

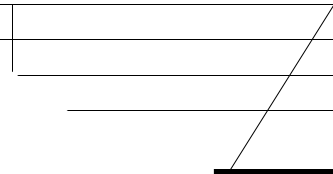
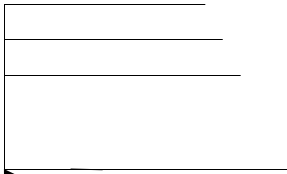
TERMINAL FUNCTIONS

TERMINAL		I/O ⁽¹⁾	DESCRIPTION
NO.	NAME		
1	NC	–	Not used— leave floating
2	XALERT	I	Input from bq29330 XALERT output.
3	SDATA	I/O	Data transfer to and from bq29330
4	SCLK	I/O	Communication clock to the bq29330
5	CLKOUT	O	32.768-kHz output for the bq29330. This pin should be directly connected to the AFE.
6	TS1	I	1 st Thermistor voltage input connection to monitor temperature
7	TS2	I	2 nd Thermistor voltage input connection to monitor temperature
8	PRES	I	Active low input to sense system insertion and typically requires additional ESD protection
9	PFIN	I	Active low input to detect secondary protector output status and allows the bq20z90-V110 to report the status of the 2 nd level protection output
10	SAFE	O	Active high output to enforce additional level of safety protection; e.g., fuse blow.
11	SMBD	I/OD	SMBus data open-drain bidirectional pin used to transfer address and data to and from the bq20z90
12	NC	–	Not used— leave floating
13	SMBC	I/OD	SMBus clock open-drain bidirectional pin used to clock the data transfer to and from the bq20z90
14	$\overline{\text{DISP}}$	I	Display control for the LEDs. This pin is typically connected to bq29330 REG via a 100-k Ω resistor and a push-button switch to VSS.
15	NC	–	Not used— leave floating
16	LED1	O	LED1 display segment that drives an external LED depending on the firmware configuration
17	LED2	O	LED2 display segment that drives an external LED depending on the firmware configuration
18	LED3	O	LED3 display segment that drives an external LED depending on the firmware configuration
19	LED4	O	LED4 display segment that drives an external LED depending on the firmware configuration
20	LED5	O	LED5 display segment that drives an external LED depending on the firmware configuration
21	VSS	–	Connected I/O pin to VSS
22	SRP	IA	Connections to the top of a small-value sense resistor to monitor the battery charge- and discharge-current flow
23	SRN	IA	Connections to the bottom of a small-value sense resistor to monitor the battery charge- and discharge-current flow
24	$\overline{\text{MRST}}$	I	Master reset input that forces the device into reset when held low. Must be held high for normal operation
25	VSS	P	Negative Supply Voltage
26	VCC	P	Positive Supply Voltage
27	RBI	P	Backup power to the bq20z90-V110 data registers during periods of low operating voltage. RBI accepts a storage capacitor or aastorage

MAXIMUM RATINGS



ELECTRICAL



DATA FLAT CHARACTERISTICS

LED Display

LifeTime Data Logging Features

Authentication

Power Modes

CONFIGURATION

Oscillator Function

System Present Operation

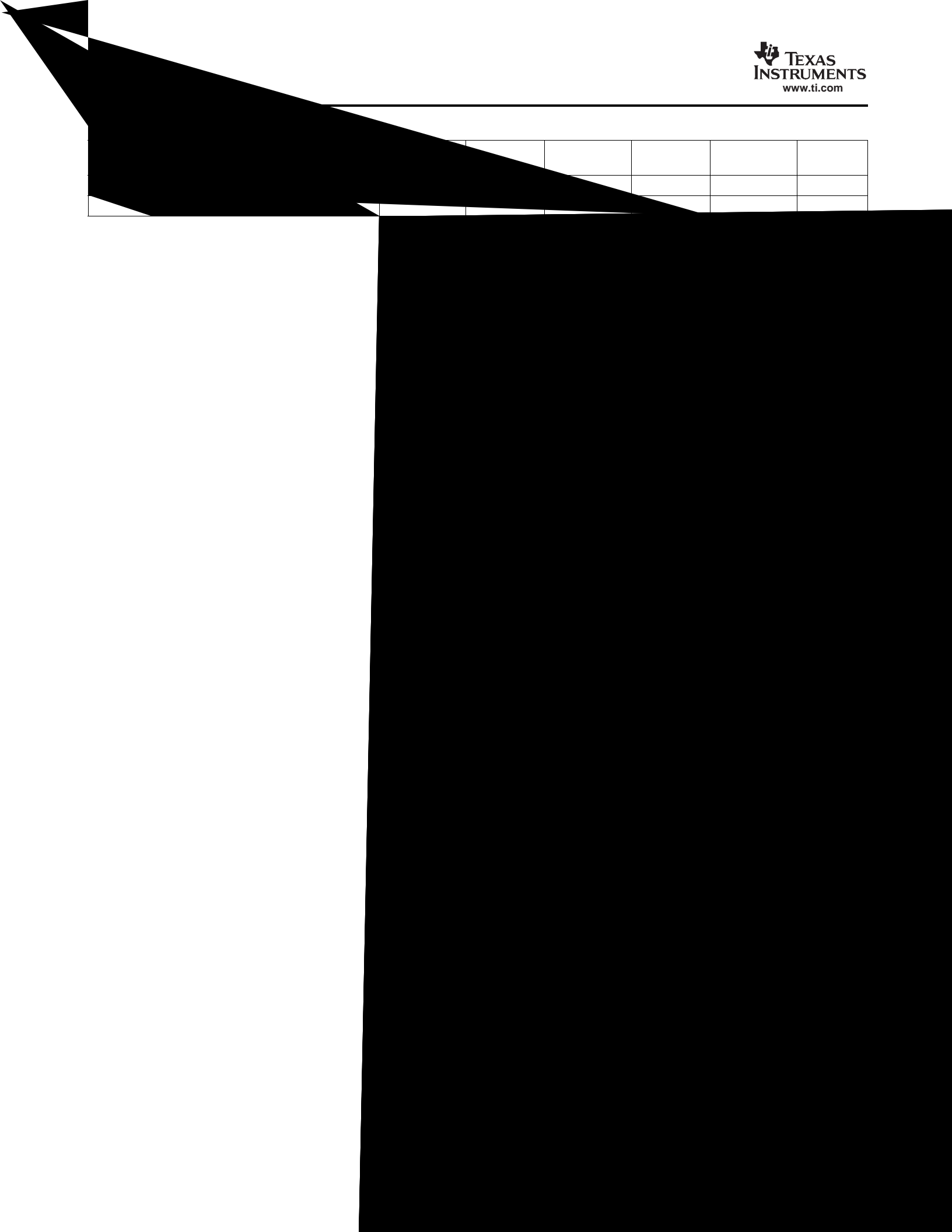
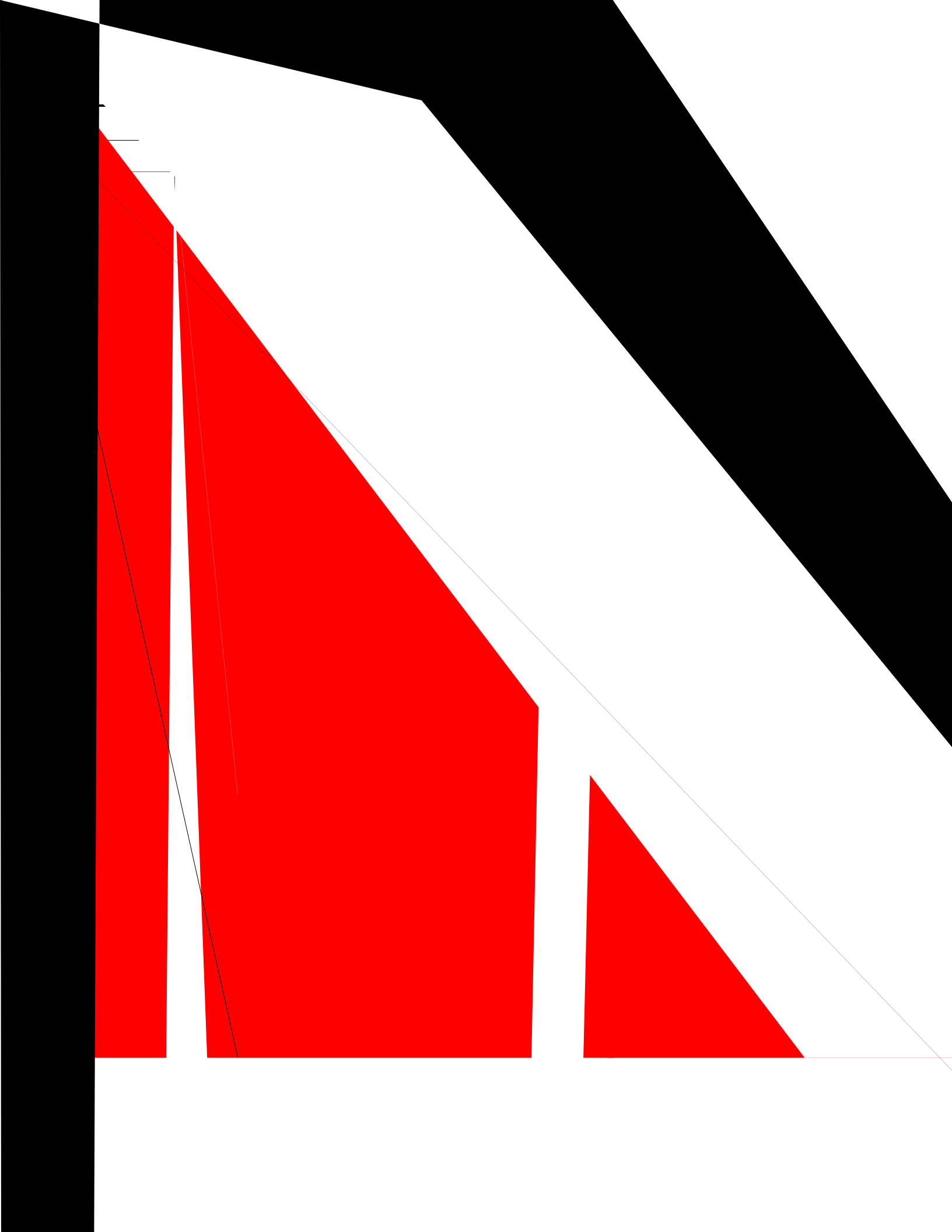
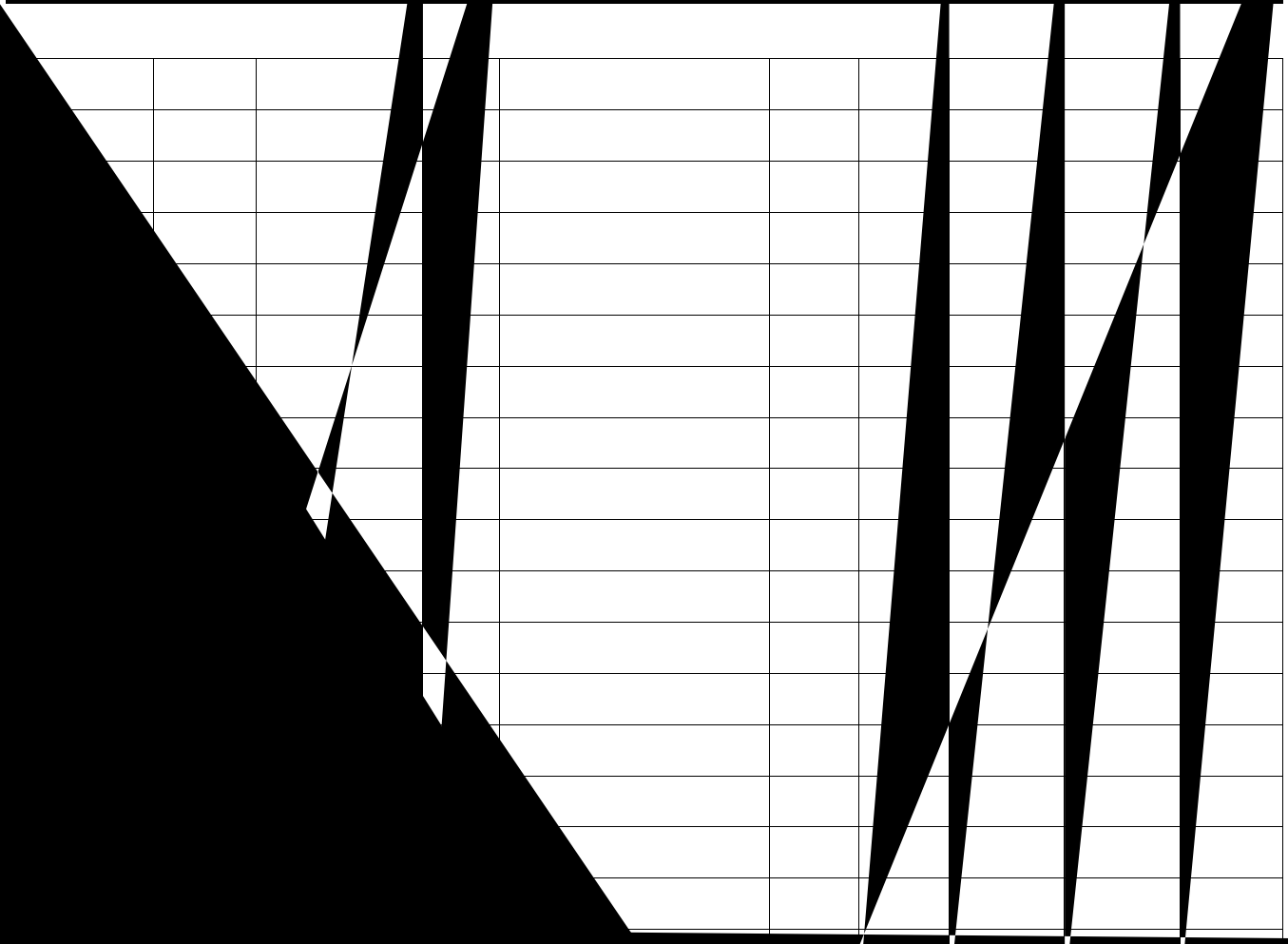
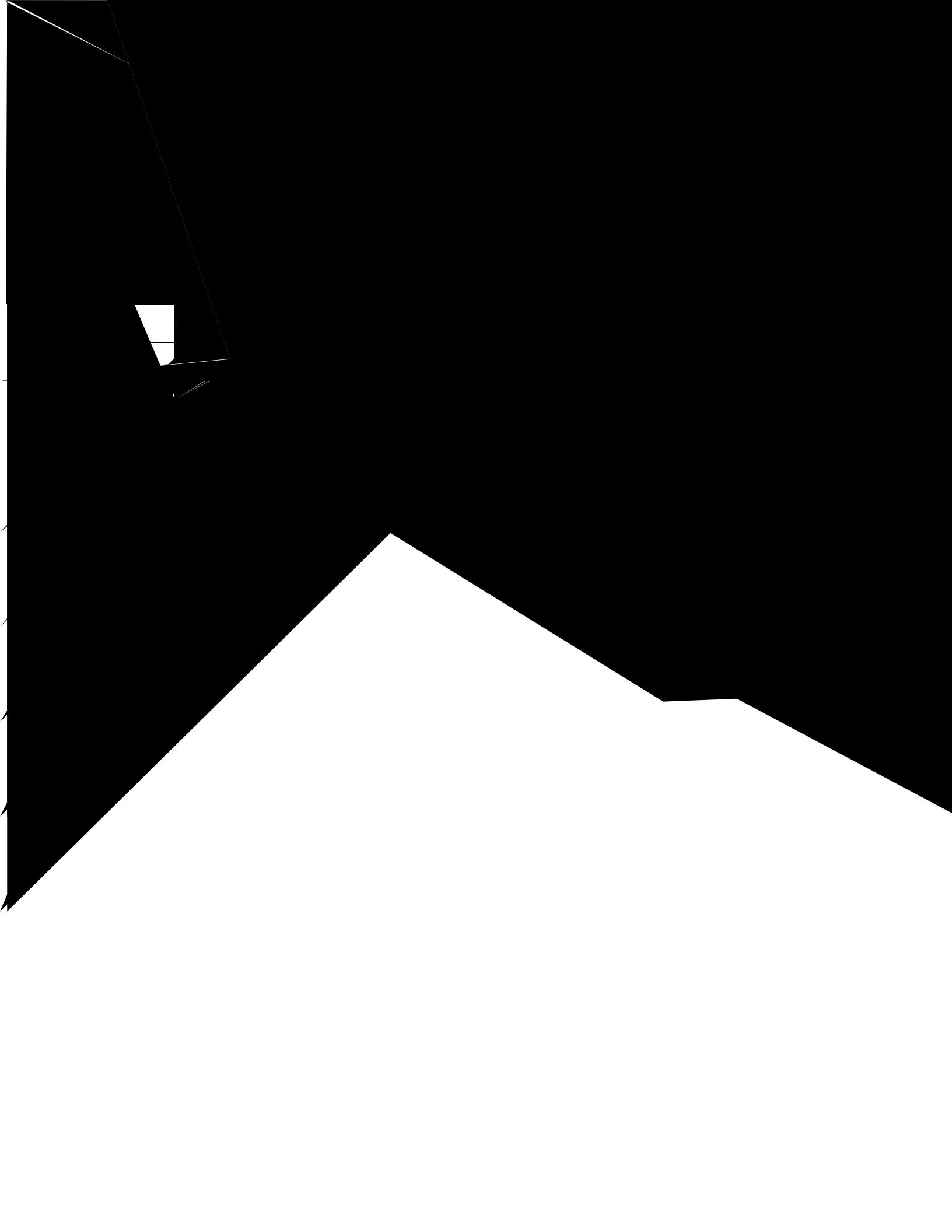



Table 3. DATA FLASH VALUES (continued)

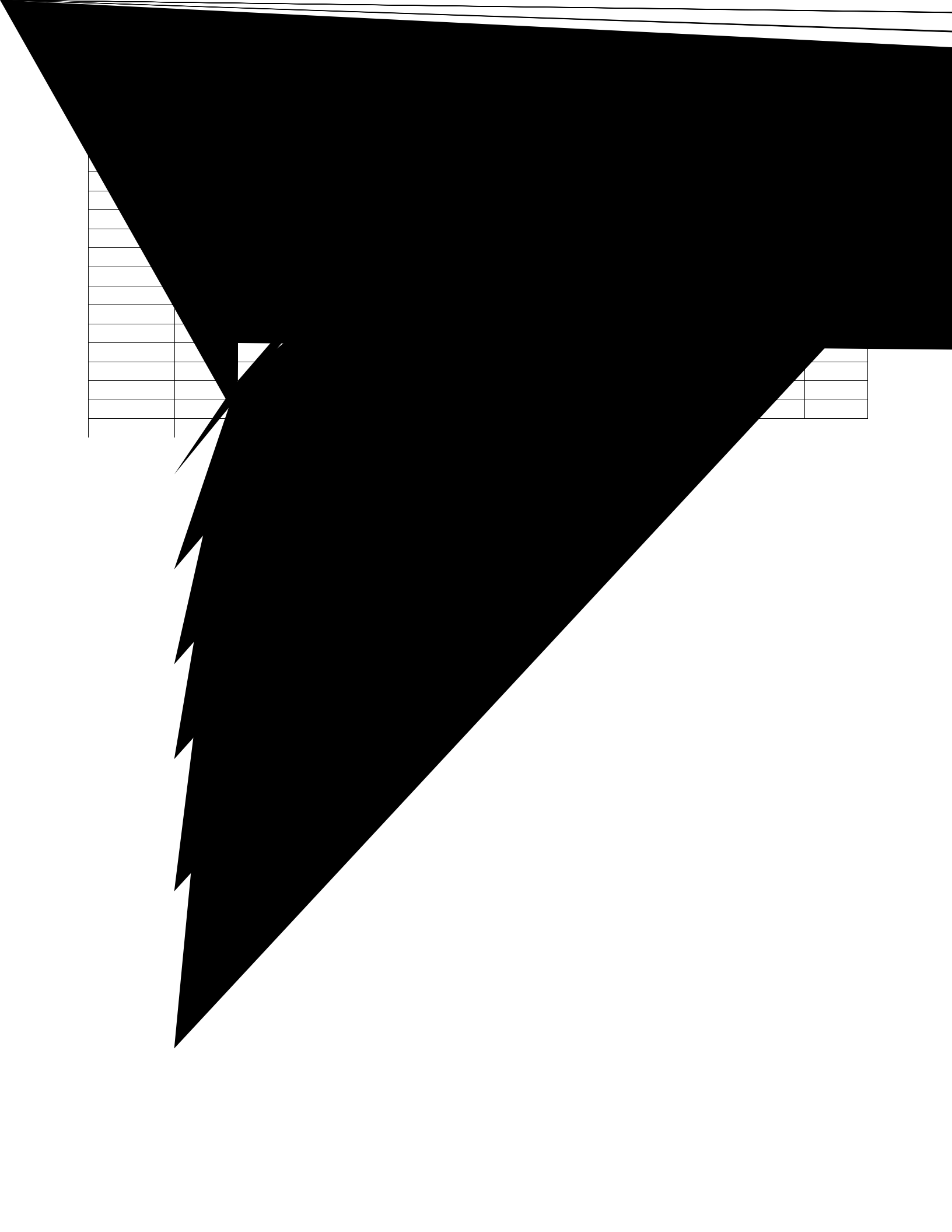
Class	Subclass ID	Subclass	Offset	Name	Data Type	Min Value	Max Value	Default Value	Units
2nd Level Safety	16	Voltage	2	SOV Time	U1	0	240	0	s
2nd Level Safety	16	Voltage	3	Cell Imbalance Current	I1	0	200	5	mA
2nd Level Safety	16	Voltage	4	Cell Imbalance Fail Voltage	I2	0	5000	1000	mV
2nd Level Safety	16	Voltage	6	Cell Imbalance Time	U1	0	240	0	s
2nd Level Safety	16	Voltage	7	Battery Rest Time	U2	0	65535	1800	s
2nd Level Safety	16	Voltage	9	PFIN Detect Time	U1	0	240	0	s
2nd Level Safety	17	Current	0	SOC Chg	I2	0	30000	10000	mA
2nd Level Safety	17	Current	2	SOC Chg Time	U1	0	240	0	s
2nd Level Safety	17	Current	3	SOC Dsg	I2	0	30000	10000	mA
2nd Level Safety	17	Current	5	SOC Dsg Time	U1	0	240	0	s
2nd Level Safety	18	Temperature	0	SOT Chg	I2	0	1200	650	0.1°C
2nd Level Safety	18	Temperature	2	SOT Chg Time	U1	0	240	0	s
2nd Level Safety	18	Temperature	3	SOT Dsg	I2	0	1200	750	0.1°C
2nd Level Safety	18	Temperature	5	SOT Dsg Time	U1	0	240	0	s
2nd Level Safety	18	Temperature	6	Open Thermistor	I2	-1000	1200	-333	0.1°C
2nd Level Safety	18	Temperature	8	Open Time	I1	0	240	0	s
2nd Level Safety	19	FET Verification	0	FET Fail Limit	I2	0	500	20	mA
2nd Level Safety	19	FET Verification	2	FET Fail Time	U1	0	240	0	s
2nd Level Safety	20	AFE Verification	0	AFE Check Time	U1	0	255	0	s
2nd Level Safety	20	AFE Verification	1	AFE Fail Limit	U1	0	255	10	
2nd Level Safety	20	AFE Verification	2	AFE Fail Recovery Time	U1	0	255	20	s
2nd Level Safety	20	AFE Verification	3	AFE Init Retry Limit	U1	0	255	6	
2nd Level Safety	20	AFE Verification	4	AFE Init Limit	U1	0	255	20	
2nd Level Safety	21	Fuse Verification	0	Fuse Fail Limit	I2	0	20	2	mA
2nd Level Safety	21	Fuse Verification	2	Fuse Fail Time	U1	0	240	0	s
Charge Control	32	Charge Inhibit Cfg	0	Chg Inhibit Temp Low	I2	-400	1200	0	0.1°C
Charge Control	32	Charge Inhibit Cfg	2	Chg Inhibit Temp High	I2	-400	1200	450	0.1°C
Charge Control	32	Charge Inhibit Cfg	4	Temp Hys	I2	0	100	10	0.1°C
Charge Control	33	Pre-Charge Cfg	0	Pre-chg Current	I2	0	2000	250	mA
Charge Control	33	Pre-Charge Cfg	2	Pre-chg Temp	I2	-400	1200	120	0.1°C
Charge Control	33	Pre-Charge Cfg	4	Pre-chg Voltage	I2	0	20000	3000	mV
Charge Control	33	Pre-Charge Cfg	6	Recovery Voltage	I2	0	20000	3100	mV
Charge Control	34	Fast Charge Cfg	0	Fast Charge Current	I2	0	10000	4000	mA
Charge Control	34	Fast Charge Cfg	2	Charging Voltage	I2	0	20000	16800	mV

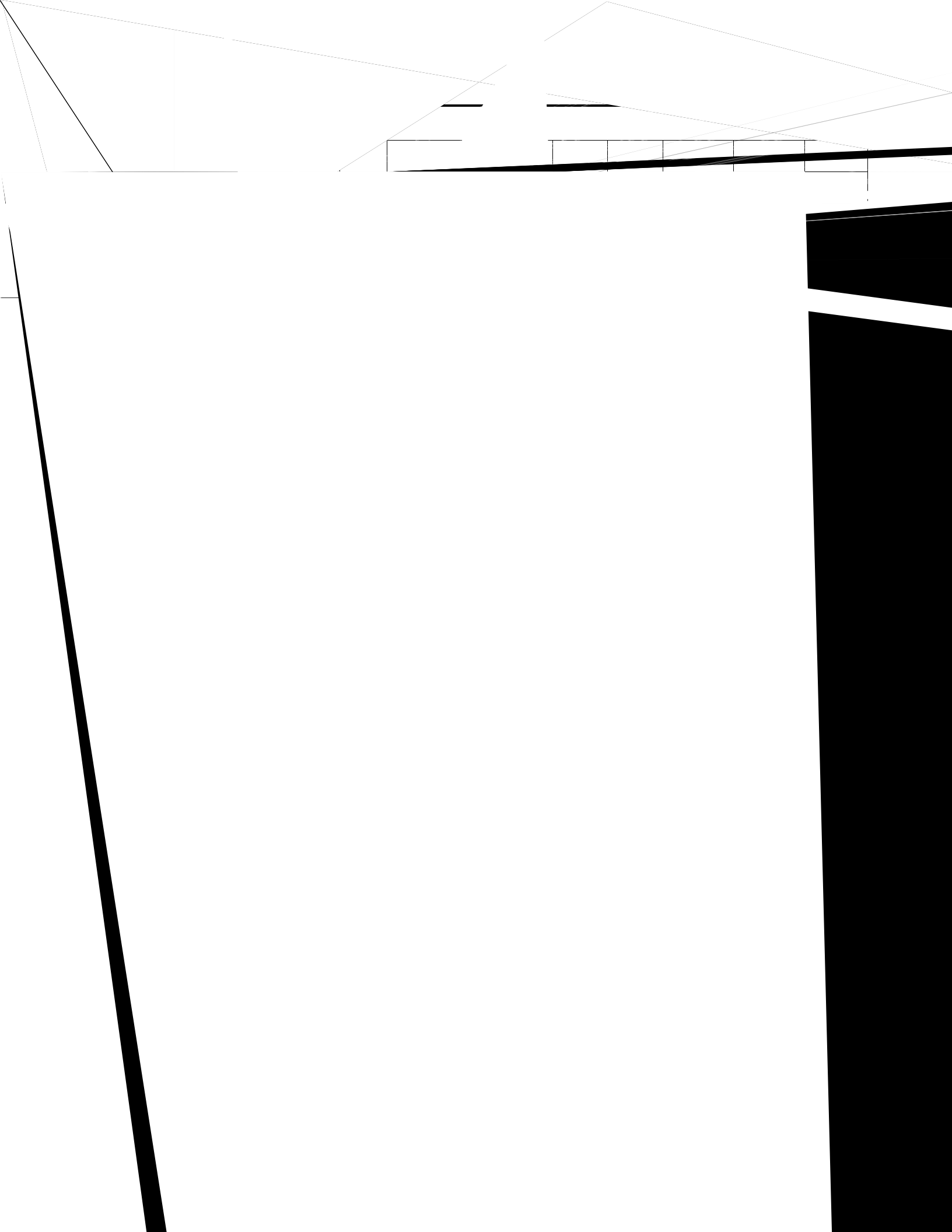












PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
BQ20Z90DBT-V110	NRND	TSSOP	DBT	30	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
BQ20Z90DBT-V110G4	NRND	TSSOP	DBT	30	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
BQ20Z90DBTR-V110	NRND	TSSOP	DBT	30	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
BQ20Z90DBTR-V110G4	NRND	TSSOP	DBT	30	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR

⁽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.

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