

## BQ2515x Setup Guide

## ABSTRACT

This guide was created to walk you through the use of the BQ2515x Setup Guide Excel tool. Using this guide and the Excel tool together allows you to configure your system and battery charger very quickly and easily. Although the guide provides a great starting point for new users to get set up, it is not intended to be an exhaustive tutorial into using the device to its full potential. For more details, refer to the BQ2515x datasheet.

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## Trademarks

#### 1 Overview

Upon opening the BQ2515x Setup Guide Excel tool, the home page is displayed as shown in Figure 1. The home page serves a few different purposes. First, it serves as an index for the rest of the tool, allowing you to easily access any other page within the tool through the hyperlinks on the screen. Under each hyperlink is a brief description of the settings contained within every sheet. The home page also has several buttons to export or import the calculated register values. Since the tool automatically loads the power-on system defaults of the BQ2515x device upon being opened, these buttons can be useful for saving and loading workbook states. The buttons can also be used to quickly transfer the register values to BQ Studio or into a .C file for firmware code. In order to use BQ Studio with your EVM, you need to purchase an EV2400 module.

# TEXAS INSTRUMENTS

BQ25150 Setup Guide Tool



Figure 1. Home Page

Table 1	. BQ2515x	Register	<b>Settings</b>	Quick	Access	Guide
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PAGE	REGISTER	SETTING
	VBAT_CTRL	Battery Regulation Voltage
	ICHG_CTRL	Fast Charge Current
	ренрострі	Pre-Charge Current
Primary Charge Parameters		Charge Current Step
	TERMCTRL	Termination Current
	ILIMCTRL	Input Current Limit
	Rimax	Hardware Fast Charge Current Limit
		Pre Charge to Fast Charge Threshold
	BUVLO	Battery Over-Current Protection
		Battery Under Voltage Lock Out
Secondary Charge Deremeters		TS Control Mode
Secondary Charge Farameters	CHARGERCTRL0	Recharge Voltage Threshold
		Watchdog Timer Enable
		Charger Safety Timer
		2X Safety Timer Enable
	MPCTRI	MR Reset Functionality
	MRGTRE	Wake Timers
Input Parametere		MR Long Press Action
		ADCIN Mode of Operation
		PG Mode of Operation
		PMID Control



TSFASTCHGCTRL         Target Battery Voltage During Warm Part Charge Current During Cool           TS_COLD         TS Cold Threshold           TS_COL         TS Cold Threshold           TS_COL         TS Cold Threshold           TS_HOT         TS Kart Threshold           TS_HOT         TS Hot Threshold           TS_HOT         TS Hot Threshold           TS_HOT         TS Hot Threshold           TS_HOT         TS Hot Threshold           Ro         Ro           Ro         Ro           Ro         Ro           ADC CRut1         Comparator 1 Channel           ADC_ALARM_COMP1         Comparator 3 Channel           ADC_ALARM_COMP2         Comparator 1 Threshold           ADC_ALARM_COMP3         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_CREAD_EN         ADC Channel Enable Select           VINDPM Enable         VINDPM Enable           VINDPM Enable         Threshold           Comparator 3 Polarity         Comparator 3 Polarity           ADC_CREAD_EN         ADC Channel Enable Select           VINDPM Enable	PAGE	REGISTER	SETTING
ISASURGE         Fast Charge Current During Cool           TS_COLD         TS Coid Tireshold           TS_COL         TS Coid Tireshold           TS_WARM         TS Warm Threshold           TS_HOT         TS Hot Threshold           TS_HOT         TS Hot Threshold           Reparatel         Ro           Reparatel         Ro           Reparatel         Ro           Reparatel         Ro           Reparatel         Ro           Reparatel         Ro           Ro         Ro           ADC CTRL0         Comparator Shanel           ADC_ALARM_COMP1         Comparator 1 Polarity           Comparator 2 Polarity         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           Comparator 3 Polarity         Comparator 3 Polarity           DOC FIL         DOUPM Unable			Target Battery Voltage During Warm
Thermal Parameters         TS_COLD         TS Cold Treshold           TS_COL         TS Col Threshold           TS_UMRM         TS Warm Threshold           TS_HOT         TS Hot Threshold           TB_HOT         TS Hot Threshold           TB_HOT         TS Hot Threshold           Thermal Schematic         Beta           Ro         Ramatel           Ro         Ramatel           Ro         Ramatel           ADC CRUD         ADC Conversion Speed           ADCTRL1         Comparator 2 Channel           ADC_ALARM_COMP1         Comparator 2 Channel           ADC_ALARM_COMP2         Comparator 2 Channel           ADC_ALARM_COMP3         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 2 Polarity           ADC_READ_EN         ADC Consersion 3 Threshold           ADC_READ_EN         ADC Consersion 3 Threshold           ADC_READ_EN         ADC Consersion 3 Threshold           ADC_MARM_COMP3         Comparator 3 Threshold           ADC         ADC         Comparator 3 Threshold           ADC         ADC         Comparator 3 Threshold           ADC         ADC         Comparator 3 Threshold           ADC_READ_EN         ADC Channel Enable		ISFASICHGUIRL	Fast Charge Current During Cool
Thermal Parameters         TS_COOL         TS Cool Threshold           TS_WARM         TS Warm Threshold         TS Warm Threshold           TS_HOT         TS HOT TS Hot Threshold         Beta           Ro         Ra         Ra           Thermal Schematic         Rarrilel         Racries           ADC CTRL0         ADC Read Rate         ADC Conversion Speed           ADC_CALARM_COMP1         Comparator 1 Channel         Comparator 1 Channel           ADC_ALARM_COMP1         Comparator 1 Threshold         Comparator 1 Polarity           ADC_ALARM_COMP1         Comparator 2 Polarity         Comparator 2 Polarity           ADC_ALARM_COMP2         Comparator 2 Polarity         Comparator 2 Polarity           ADC_READ_EN         ADC Cannel Enable Select         MINDPM Enable           VINDPM Enable         Threshold         Comparator 2 Polarity           ADC_READ_EN         ADC Connel Enable Select         WINDPM Enable           Thermal Charge Current Foldback         Threshold         Comparator 2 Polarity           ADC_READ_EN         ADC Connel Enable         Enable           Thermal Charge Current Foldback         Threshold         Comparator 3 Threshold           Connel Enable         Thermal Charge Current Foldback         Threshold           Thermal C		TS_COLD	TS Cold Threshold
Thermal Parameters         TS_WARM         TS Warm Threshold           TS_HOT         TS Hot Threshold         Ro           Thermal Schematic         Ro         Ro           Ro         Ro         Ro           ADC Read Rate         ADC Conversion Speed         Comparator 1 Channel           ADC CTRL0         Comparator 1 Channel         Comparator 1 Channel           ADC ALARM_COMP1         Comparator 1 Channel         Comparator 2 Channel           ADC_ALARM_COMP2         Comparator 1 Threshold         Comparator 1 Threshold           ADC_ALARM_COMP2         Comparator 3 Polarity         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Threshold         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select         VINDPM Level Select           VINDPM Level Select         CHARGERCTRL1         DPM Enable           VINDPM Level Select         Threshold         Comparator 3 Polarity           ADC_TRL0         ELOCTRL         ELOCTRL         ELOUTIN Voltage           ADC_ALARM_COMP3         Comparator 3 Polarity         C           ADC_READ_EN         ADC Channel Enable Select         Treshold           ADC_READ_EN         ADC Channel Enable         E           ADC_TRL1         ELOCTRL		TS_COOL	TS Cool Threshold
TS_HOT     TS_HOT     TS Hot Threshold       Ro     Ro       Rparallel     Regrise       ADC Read Rate     ADC Read Rate       ADC Conversion Speed     Comparator 1 Channel       ADC CTRL0     Comparator 2 Channel       ADC CALARM_COMP1     Comparator 2 Channel       ADC_ALARM_COMP1     Comparator 1 Threshold       ADC_ALARM_COMP1     Comparator 2 Threshold       ADC_ALARM_COMP2     Comparator 2 Threshold       ADC_ALARM_COMP3     Comparator 2 Threshold       ADC_ALARM_COMP4     Comparator 2 Threshold       ADC_ALARM_COMP3     Comparator 2 Threshold       ADC_ALARM_COMP3     Comparator 2 Threshold       ADC_ALARM_COMP3     Comparator 2 Threshold       ADC_ALARM_COMP3     Comparator 3 Threshold       ADC_READ_EN     ADC Channel Enable Select       VINDPM Enable     VINDPM Enable       VINDPM Enable     VINDPM Enable       IDOCTRL     DOLS Configuration       LDOCTRL     LDO Enable       LDOCLS Configuration     Ship Mode Enable       Additional Features     Kip Guest Control       ICCTRL0     Interrupt Mask       MASK2     Interrupt Mask       MASK2     Interrupt Mask	Fi I D I	TS_WARM	TS Warm Threshold
Additional Features         Beta         Ro           Revies         Revies         Revies           ADC TRL0         ADC Read Rate         ADC Comparator 1 Channel           ADC CTRL0         Comparator 2 Channel         Comparator 3 Channel           ADC CALARM_COMP1         Comparator 3 Channel         Comparator 1 Polarity           ADC_ALARM_COMP2         Comparator 2 Threshold         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 2 Polarity         Comparator 3 Threshold           ADC_ALARM_COMP3         Comparator 2 Polarity         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity         Comparator 3 Polarity           ADC_ALARM_COMP3         DECTRL         DECTRL0         DECTRL0           IDOCTRL         LDOCTRL         DECTRL0         DECTRL0           IDOCTRL         LDOCTRL         DEO Lable         DECTRL0           ILOCTRL         LDO Cuput Voltage         DOLAS Configuration           IDOLIS Configuration         Software Reset Operation	Inermal Parameters	TS_HOT	TS Hot Threshold
Ro           Rate         Rearies           Rearies         Rearies           ADC Read Rate         ADC Read Rate           ADC Cruce         ADC Conversion Speed           Comparator 1 Channel         Comparator 2 Channel           Comparator 3 Channel         Comparator 3 Channel           ADC_ALARM_COMP1         Comparator 1 Threshold           ADC_ALARM_COMP2         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Diarity           ADC_READ_EN         ADC Channel Enable Select           VINDPM Enable         VINDPM Enable           VINDPM Enable         VINDPM Enable           International Charge Current Foldback         Threshold           IDO CITCL         IDO Chable           IDO/LS Configuration         Ship Mode Enable           Additional Features         Freshold           ICCTRL0         Software Reset Operation           Software Reset Operation         Software Reset Operation           Additional Features         Interrupt Masks			Beta
Inermal Schematic         Rparallel Resries           Reparation         Reparation           ADC Cread Rate         ADC Conversion Speed           Comparator 1 Channel         Comparator 2 Channel           ADC TRL1         Comparator 2 Channel           ADC_ALARM_COMP1         Comparator 1 Threshold           ADC_ALARM_COMP2         Comparator 2 Threshold           ADC_ALARM_COMP3         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select           VINDPM Enable         VINDPM Enable           CHARGERCTRL1         DPPM Enable           Thermal Charge Current Foldback         Threshold           Threshold         Threshold           Comparator 3 Polarity         DPPM Enable           VINDPM Enable         Thermal Charge Current Foldback           Threshold         Threshold           LDOCTRL         LDO Chable           LDO Output Voltage         LDO/LS Configuration           Additional Features         Frequency           ICCTRL0         Global Interrupt Mask           Matowakeup Timer         Global Interrupt Mask           Hardware Reset Operation         Software Reset Operation           Software Reset Operatio		The second Oak a second	Ro
Resries           ADC Read Rate           ADC CRL0           ADC Conversion Speed           Comparator 1 Channel           ADCCTRL1           Comparator 2 Channel           Comparator 1 Channel           ADC_ALARM_COMP1           Comparator 1 Threshold           Comparator 1 Threshold           Comparator 2 Polarity           ADC_ALARM_COMP2           Comparator 3 Threshold           Comparator 3 Threshold           Comparator 3 Threshold           Comparator 3 Polarity           ADC_ALARM_COMP2           Comparator 3 Polarity           ADC_READ_EN           ADC_READ_EN           ADC Channel Enable Select           VINDPM Enable           VINDPM Enable           POPM Enable           LDO CTRL           LDO Chapt           LDO Chapt           LDO Chapt           LDO Chapt           LDO Chapt           Additional Features           AGRECTRL1           COTR           LDOCTRL           LDO Chapt           LDO Chapt           LDO Chapt           LDO Chapt           LDO Chapt		I nermai Schematic	Rparallel
ADC Read Rate         ADC Conversion Speed           Comparator 1 Channel         Comparator 2 Channel           ADC Parameters         ADC_ALARM_COMP1         Comparator 3 Channel           ADC_ALARM_COMP2         Comparator 1 Polarity           ADC_ALARM_COMP2         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Threshold           ADC_ALARM_COMP3         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         VINDPM Enable           VINDPM Enable         VINDPM Enable           VINDPM Level Select         DPPM Enable           Threshold         Comparator 1 Foldback           Threshold         Comparator 3 Polarity           ADC_CREAD_EN         ADC Channel Enable Select           VINDPM Level Select         DPPM Enable           Threshold         Comparator 3 Foldback           Threshold         Comparator 3 Channel           LDOCTRL         LDO Chanle           LDO Upput Voltage         LDO Upput Voltage           LDOCTRL         Ship Mode Enable           Auto-wakeup Timer         Global Interrupt Mask           Hardware Reset Operation         Software Reset Operation           Software Reset Operation         Software Reset Opera			Rseries
ADC CRL0         ADC Conversion Speed           Comparator 1 Channel         Comparator 2 Channel           ADCCTRL1         Comparator 3 Channel           ADC_ALARM_COMP1         Comparator 1 Threshold           ADC_ALARM_COMP2         Comparator 2 Threshold           ADC_ALARM_COMP2         Comparator 2 Threshold           ADC_ALARM_COMP3         Comparator 3 Threshold           ADC_ALARM_COMP3         Comparator 3 Threshold           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         VINDPM Level Select           UNDPM Level Select         DPPM Enable           LDO CITRL         LDO Control           LDO Control         LDO Control <td></td> <td></td> <td>ADC Read Rate</td>			ADC Read Rate
ADC Parameters         Comparator 1 Channel           ADC CTRL1         Comparator 2 Channel           ADC_ALARM_COMP1         Comparator 3 Channel           ADC_ALARM_COMP1         Comparator 1 Polarity           ADC_ALARM_COMP2         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select           VINDPM Enable         Comparator 3 Polarity           LOCCTRL         DO Enable           LOCOTRL         LOO Cander Comparator 3 Polarity           LOCTRL         LOO Comput Voltage           LOCLS Configuration         Comparator 3 Polarity           Korter         Foresoft Comparator 3 Polarity           LOCTRL         LOO Canter Comparator 3 Polarity		ADCCTRL0	ADC Conversion Speed
ADC Parameters         ADCCTRL1         Comparator 2 Channel           ADC_ALARM_COMP1         Comparator 1 Threshold         Comparator 1 Polarity           ADC_ALARM_COMP2         Comparator 2 Threshold         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 2 Polarity         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Threshold         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Polarity         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select         VINDPM Enable           VINDPM Enable         VINDPM Enable         Comparator 3 Polarity           VINDPM Level Select         DPPM Enable         Decessor           VINDPM Level Select         DPPM Enable         Decessor           LDOCTRL         LDO Chanble         LDO Chanble         LDO Chanble           LDOCTRL         LDO Chanble         LDO Chanble         LDO Chanble           LDOCTRL         LDO Chanble         LDO Chanble         LDO Chanble           LDO CTRL         LDO Chanble         LDO Chanble         LDO Chanble           LDO CTRL         LDO Chanble         Addware Reset Operation         Software Reset Operation           Corage Disable         Corage Disable         Charage Disable         Charage Disa			Comparator 1 Channel
ADC Parameters         ADC_ALARM_COMP1         Comparator 3 Channel           ADC_ALARM_COMP2         Comparator 1 Threshold         Comparator 2 Polarity           ADC_ALARM_COMP2         Comparator 2 Polarity         Comparator 3 Threshold           ADC_ALARM_COMP3         Comparator 3 Polarity         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select         VINDPM Enable           VINDPM Enable         VINDPM Enable         VINDPM Enable           CHARGERCTRL1         DPPM Enable         VINDPM Enable           LDOCTRL         LDO Cupent Voltage         LDO Log Voltage           LDOCTRL         LDO Cuput Voltage         LDO/LS Configuration           Additional Features         Filter Reset Operation         Software Reset Operation           Additional Features         ICCTRL2         /PG GPO State Control           MASK2         Interrupt Masks         MASK2			Comparator 2 Channel
ADC Parameters         ADC_ALARM_COMP1         Comparator 1 Threshold           ADC_ALARM_COMP2         Comparator 2 Threshold         Comparator 2 Threshold           ADC_ALARM_COMP3         Comparator 2 Threshold         Comparator 2 Threshold           ADC_ALARM_COMP3         Comparator 3 Threshold         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select         VINDPM Enable           VINDPM Level Select         DPPM Enable         DPPM Enable           VINDPM Level Select         DPPM Enable         DPPM Enable           LDOCTRL         LDO Channel Enable Select         DPPM Enable           Additional Features         LDOCTRL         LDO Enable           ILDOCTRL         LDO Chanel Enable Select         DPPM Enable           ILDOCTRL         LDO Chanel Enable         LDO Chanel Enable           ILDOCTRL         LDO Enable         LDO/LS Configuration           Adu-wakeup Timer         Ship Mode Enable         Adu-wakeup Timer           ILDOCTRL         Global Interrupt Mask         Hardware Reset Operation           Software Reset Operation         Software Reset Operation         Software Reset Operation           MASK0         Interrupt Masks         Masks1         Interrupt Masks           MASK1         Interrupt Masks         Interru		ADCCTRL1	Comparator 3 Channel
ADC_Parameters         ADC_ALARM_COMP1         Comparator 1 Polarity           ADC_ALARM_COMP2         Comparator 2 Threshold         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Threshold         Comparator 3 Threshold           ADC_ALARM_COMP3         ADC Channel Enable Select         VINDPM Enable           ADC_READ_EN         ADC Channel Enable Select         VINDPM Level Select           NUNDPM Level Select         DPPM Enable         Threshold           UNDPM Level Select         DPPM Enable         Threshold           LDOCTRL         LDO Channel Enable Select         Threshold           LDOCTRL         LDO Channel Enable         Threshold           LDOCTRL         LDO Channel Enable         Threshold           LDOCTRL         LDO Chable         LDO Chable           LDO/LS Configuration         Ship Mode Enable         Auto-wakeup Timer           Global Interrupt Mask         Hardware Reset Operation         Software Reset Operation           Kottra         Interrupt Mask         Hardware Reset Operation         Software Reset Operation           MASK0         Interrupt Masks         Hardware Reset Operation         Software Interrupt Masks           MASK1         Interrupt Masks         MASK3         Interrupt Masks			Comparator 1 Threshold
ADC_ALARM_COMP2         Comparator 2 Threshold           ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_ALARM_COMP3         Comparator 3 Threshold           ADC_READ_EN         ADC Channel Enable Select           ADC_READ_EN         ADC Channel Enable Select           VINDPM Enable         VINDPM Enable           VINDPM Level Select         DPPM Enable           International Contract Control         Threshold           LDOCTRL         DD Enable           LDOCTRL         LDO Enable           LDO/LS Configuration         LDO Channel Enable Select           Koto         Threshold           Internut Natsk         Nato-scale           Additional Features         ECCTRLO           Additional Features         Congration           Internut Natsk         Nato-scale           Additional Features         ADC CRLO	ADC Parameters	ADC_ALARM_COMP1	Comparator 1 Polarity
ADC_ALARM_COMP2         Comparator 2 Polarity           ADC_ALARM_COMP3         Comparator 3 Threshold           ADC_READ_EN         ADC Channel Enable Select           VINDPM Enable         VINDPM Enable           VINDPM Level Select         DPPM Enable           Thermal Charge Current Foldback         Threshold           Threshold         LDO Cutput Voltage           LDOCTRL         LDO Output Voltage           LDO/LS Configuration         Ship Mode Enable           Auto-wakeup Timer         Global Interrupt Mask           IcCTRL0         Ship Mode Enable           IcCTRL2         Interrupt Masks           MASK0         Interrupt Masks           MASK1         Interrupt Masks			Comparator 2 Threshold
ADC_ALARM_COMP3         Comparator 3 Threshold           ADC_READ_EN         ADC Channel Enable Select           VINDPM Enable         VINDPM Enable           VINDPM Enable         VINDPM Enable           VINDPM Enable         DPPM Enable           VINDPM Enable         DPPM Enable           VINDPM Enable         DPPM Enable           VINDPM Enable         DPPM Enable           Internal Charge Current Foldback         Threshold           Threshold         LDO Cable           LDOCTRL         LDO Uput Voltage           LDO/LS Configuration         LDO/LS Configuration           Katowakeup Timer         Global Interrupt Mask           Hardware Reset Operation         Software Reset Operation           Software Reset Operation         Software Reset Operation           Interrupt Mask         Hardware Reset Operation           MASK0         Interrupt Masks           MASK1         Interrupt Masks           MASK2         Interrupt Masks		ADC_ALARM_COMP2	Comparator 2 Polarity
ADC_ALARM_COMP3         Comparator 3 Polarity           ADC_READ_EN         ADC Channel Enable Select           VINDPM Level Select         VINDPM Level Select           DPPM Enable         Thermal Charge Current Foldback           Threshold         Thermal Charge Current Foldback           Threshold         LDO Enable           LDOCTRL         LDO Cuput Voltage           LDO/LS Configuration         LDO/LS Configuration           Kato-wakeup Timer         Global Interrupt Mask           Hardware Reset Operation         Software Reset Operation           Software Reset Operation         Software Reset Operation           ICCTRL2         Interrupt Masks           MASK1         Interrupt Masks           MASK2         Interrupt Masks			Comparator 3 Threshold
ADC_READ_EN     ADC Channel Enable Select       VINDPM Enable     VINDPM Level Select       DPPM Enable     DPPM Enable       Internal Charge Current Foldback     Threshold       LDOCTRL     LDO Enable       LDO Output Voltage     LDO Configuration       ILDOLS Configuration     Mate-wakeup Timer       Global Interrupt Mask     Auto-wakeup Timer       ICCTRL0     Global Interrupt Mask       Interrupt Mask     Hardware Reset Operation       Software Reset Operation     Software Reset Operation       ICCTRL2     Interrupt Masks       MASK0     Interrupt Masks       MASK1     Interrupt Masks       MASK3     Interrupt Masks		ADC_ALARM_COMP3	Comparator 3 Polarity
Additional Features         CHARGERCTRL1         VINDPM Enable           ILDOCTRL         Thermal Charge Current Foldback Threshold           ILDOCTRL         LDO Enable           ILDOCTRL         LDO Output Voltage           ILDOLS Configuration         LDO/LS Configuration           ILDOCTRL         Ship Mode Enable           Additional Features         ILCCTRL0           ICCTRL0         Global Interrupt Mask           Hardware Reset Operation         Software Reset Operation           Software Reset Operation         Software Reset Operation           ICCTRL2         Interrupt Mask           MASK0         Interrupt Masks           MASK1         Interrupt Masks           MASK2         Interrupt Masks		ADC_READ_EN	ADC Channel Enable Select
Additional Features         CHARGERCTRL1         VINDPM Level Select           Internal Charge Current Foldback Threshold         Thermal Charge Current Foldback Threshold           IDO Enable         IDO Output Voltage           IDO/LS Configuration         IDO/LS Configuration           IDO/LS Configuration         Auto-wakeup Timer           ICCTRL0         Global Interrupt Mask           Hardware Reset Operation         Software Reset Operation           Software Reset Operation         Software Reset Operation           ICCTRL2         14-second Watchdog Timer Enable           ICCTRL2         14-second Watchdog Timer Enable           MASK0         Interrupt Masks           MASK1         Interrupt Masks           MASK2         Interrupt Masks			VINDPM Enable
CHARGERCTRL1         DPPM Enable           Thermal Charge Current Foldback         Thermal Charge Current Foldback           Threshold         Thermal Charge Current Foldback           Notestand         LDO Enable           LDOCTRL         LDO Output Voltage           LDO/LS Configuration         DPPM Enable           Notestand         Auto-wakeup Timer           Global Interrupt Mask         Hardware Reset Operation           Software Reset Operation         Software Reset Operation           ICCTRL2         Interrupt Masks           MASK0         Interrupt Masks           MASK1         Interrupt Masks           MASK3         Interrupt Masks		CHARGERCTRL1	VINDPM Level Select
Additional FeaturesInternationThermal Charge Current Foldback ThresholdLDOCTRLLDO EnableLDO Output VoltageLDO/LS ConfigurationLDO/LS ConfigurationMade EnableAuto-wakeup TimerGlobal Interrupt MaskHardware Reset OperationSoftware Reset OperationSoftware Reset OperationICCTRL2ICCTRL2MASK0Interrupt MasksMASK1Interrupt MasksMASK3Interrupt Masks			DPPM Enable
Additional Features         LDO CTRL         LDO Enable           ILDO Output Voltage         IDO/LS Configuration           ILDO/LS Configuration         Ship Mode Enable           Auto-wakeup Timer         Auto-wakeup Timer           Global Interrupt Mask         Hardware Reset Operation           ICCTRL0         Software Reset Operation           ICCTRL2         /PG GPO State Control           Id-second Watchdog Timer Enable         Id-second Watchdog Timer Enable           ICCTRL2         Interrupt Masks           MASK0         Interrupt Masks           MASK2         Interrupt Masks           MASK3         Interrupt Masks			Thermal Charge Current Foldback Threshold
Additional FeaturesLDOCTRLLDO Output Voltage LDO/LS ConfigurationAdditional FeaturesShip Mode Enable Auto-wakeup TimerICCTRL0Global Interrupt Mask Hardware Reset OperationSoftware Reset OperationSoftware Reset OperationICCTRL2/PG GPO State ControlICCTRL214-second Watchdog Timer Enable Charge DisableMASK0Interrupt MasksMASK1Interrupt MasksMASK2Interrupt MasksMASK3Interrupt Masks			LDO Enable
Additional FeaturesICCTRL0IDO/LS ConfigurationAdditional FeaturesShip Mode Enable Auto-wakeup TimerICCTRL0Global Interrupt Mask Hardware Reset Operation Software Reset OperationICCTRL2/PG GPO State ControlICCTRL214-second Watchdog Timer Enable 		LDOCTRL	LDO Output Voltage
Additional FeaturesShip Mode Enable Auto-wakeup TimerICCTRL0Global Interrupt Mask Hardware Reset OperationFeaturesFeaturesICCTRL2/PG GPO State Control 14-second Watchdog Timer Enable Charge DisableMASK0Interrupt MasksMASK1Interrupt MasksMASK2Interrupt MasksMASK3Interrupt Masks			LDO/LS Configuration
Additional Features       Auto-wakeup Timer         Global Interrupt Mask       Global Interrupt Mask         Hardware Reset Operation       Software Reset Operation         Software Reset Operation       Software Reset Operation         ICCTRL2       /PG GPO State Control         ICCTRL2       14-second Watchdog Timer Enable         Charge Disable       Charge Disable         MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK2       Interrupt Masks         MASK3       Interrupt Masks			Ship Mode Enable
Additional Features       ICCTRL0       Global Interrupt Mask         Hardware Reset Operation       Software Reset Operation         Software Reset Operation       VPG GPO State Control         ICCTRL2       14-second Watchdog Timer Enable         Charge Disable       Charge Disable         MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK3       Interrupt Masks			Auto-wakeup Timer
Hardware Reset OperationSoftware Reset OperationSoftware Reset Operation/PG GPO State Control14-second Watchdog Timer Enable14-second Watchdog Timer EnableCharge DisableMASK0Interrupt MasksMASK1Interrupt MasksMASK2Interrupt MasksMASK3Interrupt Masks	Additional Features	ICCTRL0	Global Interrupt Mask
Software Reset Operation         /PG GPO State Control         ICCTRL2       14-second Watchdog Timer Enable         Charge Disable         MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK2       Interrupt Masks         MASK3       Interrupt Masks			Hardware Reset Operation
ICCTRL2       /PG GPO State Control         14-second Watchdog Timer Enable         Charge Disable         MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK2       Interrupt Masks         MASK3       Interrupt Masks			Software Reset Operation
ICCTRL2       14-second Watchdog Timer Enable         Charge Disable         MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK2       Interrupt Masks         MASK3       Interrupt Masks			/PG GPO State Control
Charge Disable         MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK2       Interrupt Masks         MASK3       Interrupt Masks		ICCTRL2	14-second Watchdog Timer Enable
MASK0       Interrupt Masks         MASK1       Interrupt Masks         MASK2       Interrupt Masks         MASK3       Interrupt Masks			Charge Disable
MASK1     Interrupt Masks       MASK2     Interrupt Masks       MASK3     Interrupt Masks		MASKO	Interrupt Masks
MASK2     Interrupt Masks       MASK3     Interrupt Masks		MASK1	Interrupt Masks
MASK3 Interrupt Masks		MASK2	Interrupt Masks
		MASK3	Interrupt Masks



## 2 Primary Charge Parameters

The "Primary Charge Parameters" page contains parameters which are most likely to change based on the battery being used and the system requirements. There are several drop-down boxes on the page as shown in Figure 2, as well as on all other pages throughout the tool, which allow you to select from the available settings for parameters such as battery regulation voltage, charge current, and termination current. Other parameters, such as the hardware fast charge current limit, have open-ended boxes (as shown in Figure 3) which allow you to enter any number within the range supported by the device. All of these selections are used by the tool to calculate the register values and schematic requirements shown at the bottom of the page. At any point throughout using the tool, the "Reset to Page Defaults" button located on each page can be clicked to recover the system defaults for all registers on the current page.



This is the maximum allowable fast charge current, overriding the fast charge and pre-charge current selections above. This selection will determine your Rimax, calculated at the bottom of this page.

## Figure 3. Free Response Box

After completing the first page, you can navigate to any other page within the workbook to use features such as battery temperature-dependent charging (that is the JEITA standard) and the on-chip ADC and LDO. Some of the functionality, such as using the ADC to measure temperature, requires that other parts of the workbook be completed. Not only is this noted when it occurs, but the ordering of the pages is also set up to avoid such conflicts. Therefore, if you are new to the device, it is important to follow the ordering in which the pages are placed to ensure that all required parameters are correctly entered.

#### 3 Secondary Parameters

The "Secondary Charge Parameters" page mainly contains charge parameters which are less likely for you to need to change from their defaults. These parameters contain some protection settings for both the IC and the battery, including overcurrent protection and undervoltage lock-out. By default, these settings are enabled and set to the recommended values, but you have the ability to disable or change their values based on your application. Additionally, the page contains the "TS Enable" and "TS Control Mode" settings. With TS enabled, the chip charges the battery differently based on how hot or cold it is. With the "TS Control Mode" setting, you can choose between JEITA and hot/cold only. In the JEITA control mode, the charger cuts off charging when the battery is considered "hot" or "cold," decreases the battery regulation voltage when the battery is considered "warm," and decreases fast charge current when the battery is considered "cool". The thresholds for each of these temperatures and the voltage/current reductions all have default settings, but they can be changed in the "Thermal Parameters" page. On the other hand, selecting the hot/cold only control mode simply shuts off charging whenever the battery is determined to be either hot or cold.



## 4 Input Parameters

The settings under "Input Parameters" are used to control the ADCIN setting, the settings for the user input button, /MR, and the operation of PMID and PG. You have the ability to configure the ADCIN pin to output an 80  $\mu$ A bias current for measuring temperature with a 10 k $\Omega$  NTC or configure the pin as a general purpose analog measurement. Also configured on this page are parameters which configure the push-button controller for the /MR pin. The wake timers are used to dictate how long the MR Button must be held before sending an interrupt. The first interrupt is sent when the Wake 1 Timer condition is met and the second interrupt, which wakes the device from ship mode, is sent when the Wake 2 Timer condition is met. Finally, both the PMID and PG pins can be configured to perform different functionality based on the application.

## 5 Thermal Parameters

As noted in the Secondary Charge Parameters section, you can change the way the battery is charge based on its temperature by using the settings contained in the "Thermal Parameters" page. Not only can you change the thresholds at which the battery is considered "hot," "warm," "cool," and "cold," but you can also change the target battery voltage and fast charge current in the "warm" and "cool" conditions, respectively. An important part of this sheet is the schematic parameters as shown in Figure 4. If the recommended layout and NTC is used, then these parameters can be left as their default values. However, if a different parallel resistor, series resistor, or NTC is used, then these values should be modified so that the correct voltages are calculated for the different temperature thresholds.



 $R_{PARALLEL} = R_{NTC@25C}$ 

## Figure 4. Temperature Sense Bias Functional Diagram

The temperature thresholds which you enter are not necessarily be the exact temperature thresholds which the ADC detects. If the exact temperature that the ADC sees after the corresponding binary value is calculated is needed, you can use the buttons on the home page. First, save the registers to a .txt file. Then, load the same .txt file into the tool and return to the Thermal Parameters page. The temperature thresholds can now be reverse-calculated to show the exact value in degrees Celsius measured by the ADC.

Although all of the calculations needed to utilize battery temperature-dependent charging are done in the background by the tool, you may also want to refer to the NTC calculator on the BQ2515x page. The calculator may be especially useful for calculating the ADC values used to measure temperature through the ADCIN pin, which is not mentioned in the User Guide tool.



#### 6 ADC Parameters

Within the "ADC Parameters" page, you have the ability to easily set all ADC comparator values without having to do any calculations or binary conversions as shown in Figure 5. All you have to do is select the channel you wish to measure with each comparator and set its threshold value and polarity. When setting a comparator to measure "TS", the NTC values must be entered in the "Thermal Parameters" page in order for the calculation to be correct. The checkbox of the desired channel must also be checked under the "Enable ADC Read" section of the same sheet as shown in Figure 6. Note that in order to avoid a false interrupt from the comparator, you must first make sure that a valid ADC measurement has been made on the channel the comparator is monitoring before configuring the comparator.

Comparator 1 Channel:

Comparator 1 Threshold:	65	Comparator 1 Polarity:	Less than
Enter temperature value in C. Ensure you		This determines when the comparator flag	
have entered your TS schematic parameters		will be set. For example, if the polarity is	
on the previous page.		set to "Greater than," the flag will be set as	
		soon as the ADC value is larger than that	
		of the comparator channel.	

TS

Figure 5. Comparator Settings

Enable ADC Read:

IIN
PMID
ICHG
VIN
VBAT
TS
ADCIN

#### Figure 6. ADC Enable Checkboxes

## 7 Additional Features

The "Additional Features" sheet contains various miscellaneous settings which are most likely to be configured in the final stage of development, such as when developing firmware. A series of checkboxes also appear on this page to control the masking of every possible interrupt as shown in Figure 7. By default, most of the interrupts are unmasked, corresponding to an unchecked box. However, when writing firmware to communicate with the device, it is likely that only a handful of these interrupts are needed, and the rest can be masked to avoid undesired program interruption. In addition, several control settings appear on this sheet that you can set to define extra functionality for the chip. For example, the LDO/LS pin can be configured, the LDO output voltage can be selected, and the PG pin (when configured as a general purpose output) can be changed between high impedance and pulldown states.

Select Interrupt Masks:	CHRG_CV	CHARGE_DONE	□ IINLIM_ACTIVE	VDPPM_ACTIVE
	□ VINDPM_ACTIVE	□ THERMREG_ACTIVE	□ VIN_PGOOD	VIN_OVP_FAULT
	BAT_OCP_FAULT	BAT_UVLO_FAULT	TS_COLD	TS_COOL
	□ TS_WARM	□ TS_HOT	ADC_READY	COMP1_ALARM
	COMP2_ALARM	COMP3_ALARM	TS_OPEN	UWD_FAULT
	SAFETY_TMR_FAULT	LDO_OCP_FAULT	IMAX_FAULT	MRWAKE1_TIMEOUT
	□ MRWAKE2_TIMEOUT	MRRESET_WARN		

#### Figure 7. Interrupt Masks



## 8 File I/O

When all necessary parameters are set based on the your application, the file can be exported using the buttons on the home page. Specifically, the register initializations can be exported to a format which is readable by BQ Studio. To import the registers into BQ Studio, you must first make sure "Auto Read" is set to "OFF". Then click "Load Registers" and choose the file which was output by the Excel tool. Using the BQ Studio .txt file format also allows you to save the workbook state and load it at a later time, using the "Load .txt File" button," to continue making changes.

The other generate button on the home page exports the initializations to a .txt file with the contents in C code format. This code contains an I2C write command implemented as a C function, which requires the StdI2C library to also be included. It then uses the write command to initialize all registers contained within the Excel tool. The code, either in its entirety or some portion thereof depending on your needs, can either be copied and pasted into the your own main file, or it can be directly called by the main file by changing the file extension to ".c" and using the function "BQ2515x\_init\_all();".

## 9 Application Example

This section provides several examples containing common application requirements and how to leverage the setup guide tool to take advantage of the BQ2515x functionality to fulfill these requirements.

Example 1: The battery you are charging is a 4.2-V battery rated at 50 mAh, and you would like to charge it at 1C (50 mA fast charge current). You also want to limit the maximum programmable fast charge current to 2C (100 mA fast charge current).

- 1. Change the battery voltage to 4.2 V using the drop-down menu on the Primary Charge Parameters page.
- 2. Select a charge current step of 1.25 mA and a fast charge current of 50 mA.
- 3. Enter 100 mA in the Hardware Fast Charge Current Limit box.
- 4. Find the required Rimax resistor at the bottom of the Primary Charge Parameters page and connect a resistor of the same value between the Imax pin and ground.
- 5. Set the BQ2515x registers as the tool has calculated by using the file I/O described above.

Example 2: You would like to use the JEITA standard battery temperature-dependent charging, but you would like to change the "cold" threshold to -10°C, disable any changes during "warm" operation, and change the fast charge current in the "cool" region to 75% of the normal fast charge current.

- 1. Navigate to the Secondary Charge Parameters page and choose "Yes" for "TS Enable" and "JEITA" for "TS Control Mode".
- In the Thermal Parameters page, first make sure that the Schematic parameters match your setup. If the NTC recommended in the BQ2515x datasheet is being used, then no changes to this section are necessary.
- 3. Change the input box for  $T_{cold}$  to -10°C.
- 4. Change "Battery Voltage During Warm" to "No Reduction".
- 5. Choose "0.750 \* ICHG" in the "Charge Current During Cool" setting.
- 6. Set the BQ2515x registers as the tool has calculated by using the file I/O described above.

Example 3: You would like to continuously measure your battery voltage and board temperature and send an interrupt to your host device when the battery voltage reaches below 3.4 V and when the circuit board temperature is greater than 40°C.

- 1. Navigate to the Input Parameters page and select "10K NTC" under the "ADCIN Mode" setting. This provides an 80 μA bias current with which the pin measures the voltage over the NTC.
- 2. Navigate to the ADC Parameters page.
- 3. Choose "Continuous" for the ADC Read Rate. Depending on the application and the required power consumption, you may also want to change the ADC Conversion Speed.
- 4. Choose any of the three comparators to measure battery voltage by selecting "VBAT" under the channel selection for any comparator.
- 5. Enter the threshold for the comparator that should send the interrupt, which is 3.4 in this case.
- 6. Select the polarity "Less than". This indicates that the interrupt is sent as the battery voltage crosses

from greater than 3.4 V to less than 3.4 V.

- 7. Choose any of the remaining two comparators to measure the board temperature by selecting the "ADCIN" channel.
- 8. Calculate the voltage over your NTC which will correspond to 40°C. You need the value of R<sub>0</sub> and β for your NTC, as well as any parallel or series resistance connected to the ADCIN pin. Use 80 µA as the bias current. Enter the calculated voltage as the comparator threshold.
- 9. Choose the polarity "Greater than," which triggers an interrupt when the temperature of the board crosses from less than 40°C to greater than 40°C.
- 10. Set the BQ2515x registers as the tool has calculated by using the file I/O described above.

As an example, the .txt file has been generated using all constraints provided in each of the three examples and is displayed below:

BQ25150_Register	_Init_User_Guid	le_Ex - Notepad		-	×
<u>File Edit Format</u>	<u>V</u> iew <u>H</u> elp				
STATO 00					^
STAT1 00					
STAT2 00					
FLAG0 00					
FLAG1 00					
FLAG2 00					
FLAG3 00					
MASKØ ØØ					
MASK1 00					
MASK2 71					
MASK3 00					
VBAT_CTRL	3C				
ICHG_CTRL	28				
PCHRGCTRL	02				
TERMCTRL	14				
ROATO 00					
CHARGERCTRLØ	82				
CHARGERCIRL1	42				
ILIMCIRL	01				
LDOCTRL BØ					
MKCTKL ZA					
ICCIRLØ 10					
ICCIRLI 20					
ADCCTRL2 00	42				
ADCCTRL0	43				
ADCONTA VRAT	20				
ADCDATA_VDAT	0000				
ADCDATA_TS	0000				
ADCDATA_ICHG	0000				
ADCDATA VIN	0000				
ADCDATA PMTD	0000				
ADCDATA TIN	0000				
ADCALARM COMP1	9110				
ADCALARM COMP2	3858				
ADCALARM COMP3	M Ø	0000			
ADC READ EN	00				
TSFASTCHGCTRI	02				
TS COLD 8C					
TS COOL 6F					
TS WARM 39					
TS HOT 29					
DEVICE_ID	20				
Beta 3380					
Ro 10000					
Rparallel	10000				
Rseries 0					
					~
<					>
		Windows (CRLF	) Ln 56, Col 1	100%	

Figure 8. Text File Output Example

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