28V Standoff, Li+ Battery PMU with 1.5A Charger and 1A Boost OTG

Description

ETA6915 is a PMU, which integrates a 28V single cell Li+ battery Switching charger, and a 5V/1A Boost synchronous converter with true-shutoff function.

ETA6915 has two versions: non-I2C and I2C serial interface versions. For the Switching Charger Module, the pre-charge current, constant current (CC) and the terminal Charge Current can be programmed through the I2C serial interface and the charging status can be read from the register.

For the Boost synchronous converter module, the output voltage can be programmed through the I2C serial interface.

ETA6915 also has NTC Protection for battery safety, which is effective during charge and discharge mode.
ETA6915 is available in a QFN3x3-16L package (I2C version) and DFN3x3-10 package (non-I2C version).

Features

- 28V input standoff voltage
- Bi-Directional Power conversion with Single Inductor
- 1.5A Switching Charger and 1A Boost
- Iq<3.5uA when ENBST=0
- 4.2V/4.35V/4.4V/4.45V Charge Termination Voltage
- Programmable Charge Current
- Programmable Pre-Charge Current (I2C Version)
- Programmable End of Charge Current (I2C Version)
- Boost VOUT programable (I2C Version)
- Up to 90% Efficiency Boost
- NTC thermistor input
- Charge Status indictor
- Operation over JEITA Range via Battery NTC
- Pb Free, RoHS and REACH Compliant
- Halogen Free and “Green” Device
- Package: DFN3x3-10/ QFN3x3-16L package

Applications

- TWS charge cradle
- Bluetooth application
- Battery powered IOT module
- Power Bank
- Li+ Battery Powered System

Ordering information

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA6915Q3Q	QFN3x3-16L	ETA6915 YWWXL	5000
ETA6915D3K	DFN3x3-10L	ETA6915 YWWXL	5000
ETA6915V435D3K	DFN3x3-10L	ETA6915 V435 YWWXL	5000
ETA6915V440D3K	DFN3x3-10L	ETA6915 V440 YWWXL	5000
ETA6915V445D3K	DFN3x3-10L	ETA6915 V445 YWWXL	5000

Typical application

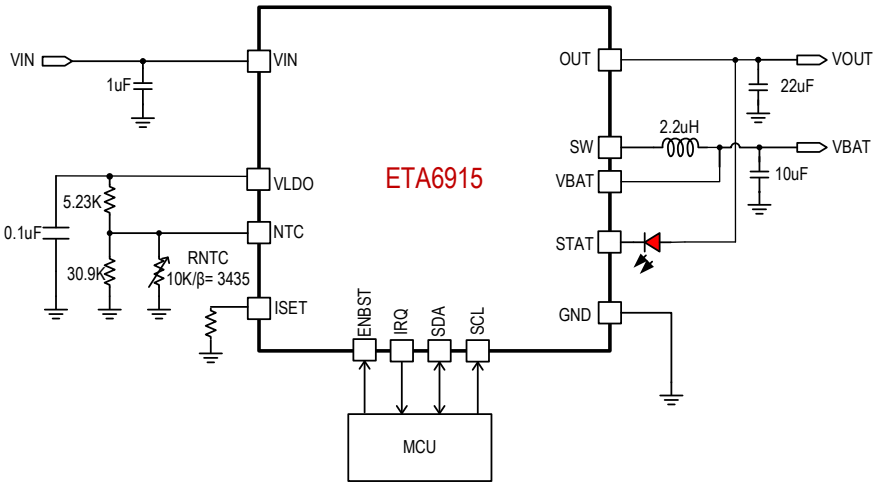


*Figure1.1 ETA6915 Typical Application with I2C Serial Interface (package: QFN3*3-16L)*

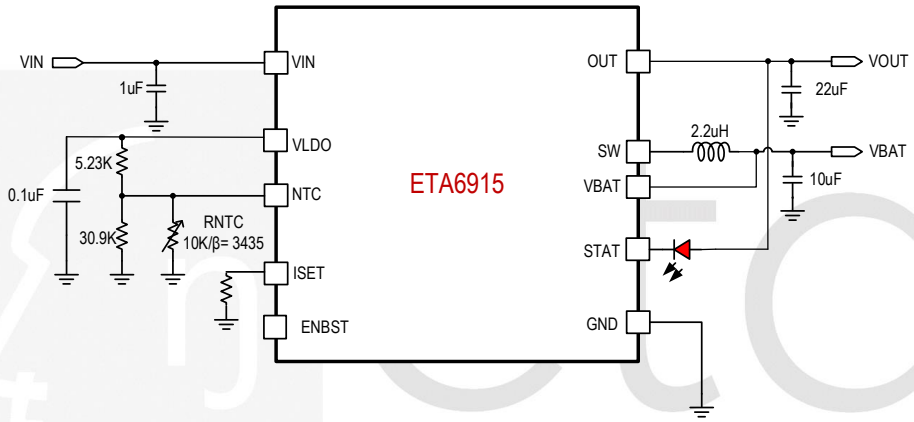
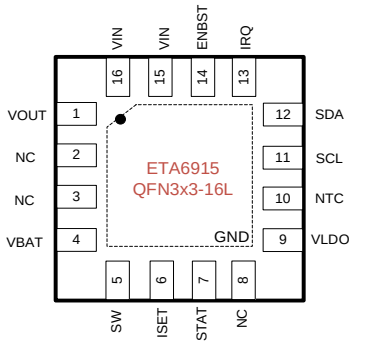
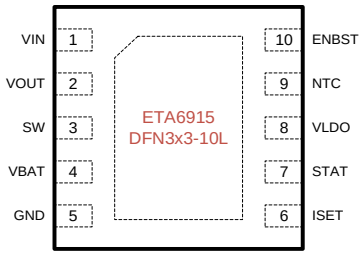


*Figure1.2 ETA6915 Typical Application without I2C Serial Interface (package: DFN3*3-10L)*

Pin Configuration





Absolute Maximum Ratings

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

VIN Voltage .....–0.3V to 28V
All Other Pin Voltage .....–0.3V to 6V
Junction Temperature .....150°C
Storage Temperature Range .....–55°C to 150°C

Thermal Resistance	θJA	θJC
QFN3X3-16L	30	10 °C /W
DFN3X3-10L	40	10 °C /W

Lead Temperature (Soldering, 10ssec) .....260°C

Recommended Operating Conditions

(Note: The device is not guaranteed to function outside its operating conditions.)

Ambient Temperature Range .....–40°C to 85°C
Junction Temperature Range .....–40°C to 125°C

Pin Description

DFN3x3-10L PIN #	QFN3x3-16L PIN #	NAME	DESCRIPTION
2	1	VOUT	Output pin. Bypass with a 22μF or larger ceramic capacitor between this pin and GND as close as possible.
4	4	VBAT	Battery Voltage sense pin. Connect to the battery positive terminal with a separate sensing wire to avoid voltage drop to achieve accurate battery CV charging. Bypass with a 10μF or larger ceramic capacitor between this pin and GND as close as possible.
3	5	SW	Switching node. Connect with a 2.2uH inductor between this pin and VBAT pin.
6	6	ISET	External constant charge (CC) current program pin. The charge current is programmed by connecting a 1% resistor (RISET) between ISET Pin and GND. The charge current can be calculated by using the following formula: $I_{BAT}(mA)=\frac{1}{R_{set}(kOhm)}\times 40000$ When REG13<3> is set to 1, the charge current is depended on REG13<7:4>. The pre-charge current (REG13<1:0>) and the terminal charge current (REG16<0>) are proportional to this current ICC. Float This pin or pull this pin high will disable charger.
7	7	STAT	Open-drain output, drive a LED to indicate the charge status with about 5mA current limit internally, so there is no external resistor needed.
8	9	VLDO	LDO Output Voltage. Bypass the pin with 0.1μF capacitor from VLDO to GND. The capacitor should be closed to the pin.
9	10	NTC	Battery Temperature Monitoring input pin. It sets the valid temperature operating range for battery charging and discharging. It is designed for use with a **10k NTC β= 3435**. Disable NTC function by shorting this pin to GND.
	11	SCL	I2C interface clock. Connect a 10kΩ pull up resistor to the logic rail
	12	SDA	I2C interface data. Connect a 10kΩ pull up resistor to the logic rail
	13	IRQ	Open-drain interrupt Output. Connect this pin to a logic rail through 10kΩ resistor. This pin sends an active low to host to report device status and fault
10	14	ENBST	Enable pin for the Boost converter. Pulling high to enable, low to disable. Default is low. ENBST Pin or REG15<1> is high will enable boost converter.
1	15,16	VIN	Input Supply Voltage. Bypass with a 1μF ceramic capacitor to GND
	2,3,7,8	NC	No connection
5	Thermal Pad	GND	GND

Electrical Characteristics

(V_{in}= 5V, unless otherwise specified. Typical values are at TA = 25°C.)

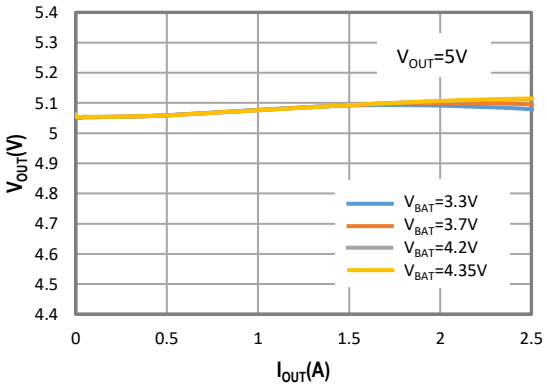
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{BUS}	VIN Operating Range	4.5	5.0	5.75	V
V_{UVLO}	VIN UVLO Voltage Rising, Hys=500mV	4.35	4.5	4.65	V
V_{OVP}	VIN OVP Voltage Rising, Hys=0.4V	5.8	6	6.2	V
$I_{VINLIMIT}$	VIN to VOUT Current Limit	1.8	2	2.2	A
$V_{OUTSHORT}$	When VIN is plugin, VOUT short protection voltage		2.6		V
$I_{VINLIMITSHT}$	$I_{VINLIMIT}$ in VOUT Short		1		A
$V_{Q1HICCUP}$	VIN to VOUT Hiccup threshold Voltage, Falling. Vin-Vout>800mVRising, Hys=100mV		800		mV
$T_{ONQ1HICCUP}$	VIN to VOUT Hiccup on time		7		mS
$T_{OFFQ1HICCUP}$	VIN to VOUT Hiccup off time		350		mS
R_{DSONQ1}	VIN to VOUT RDSON		200		mΩ
R_{DSONH}	Highside Pmos Rdson		200		mΩ
R_{DSONL}	Lowside Nmos Rdson		180		mΩ
V_{DPPM}	VDPPM for VINS, set by I2C	4.5	4.6	4.7	V
T_{SHUT}	Thermal Shutdown Rising, Hys=40°C		160		°C
BATTERY CHARGER					
V_{CV}	Battery CV Voltage: ETA6915D3K ETA6915Q3Q: REG0x18[5:3]=000	4.16	4.2	4.24	V
	Battery CV Voltage: ETA6915V435D3K ETA6915Q3Q:REG0x18[5:3]=011	4.31	4.35	4.39	V
	Battery CV Voltage: ETA6915V440D3K ETA6915Q3Q:REG0x18[5:3]=101	4.36	4.4	4.44	V
	Battery CV Voltage: ETA6915V445D3K ETA6915Q3Q:REG0x18[5:3]=110	4.41	4.45	4.49	V
ΔV_{RECHRG}	From Charge DONE to Fast Charge		-170		mV
V_{SHORT}	Battery Pre-Condition Voltage Rising, Hys=200mV	2.9	3	3.1	V
I_{SHORT}	Pre-Condition Charge Current, 10%*ICC: REG0x16[0]=0, ICC=400mA	30	40	50	mA
I_{CC}	Fast Charge Current, ICC=40000/RISET or set by I2C, RISET=100K	360	400	440	mA
I_{EOC}	Charge Termination Current, 10%*ICC or set by I2C	25	40	55	mA
f_{SW}	Charging frequency	0.7	0.9	1.1	MHz
T_{SST}	Charging current soft start time		200		mS
I_{LIMITP}	Highside Pmos Peak Current Limit		2.2		A
I_{LINEAR}	When Icharging<100mA, then force in linear charge mode, Hys=50mA		150		mA
I_Q	Quiescent current into VIN When charge done, Tie NTC to GND		200	500	uA
BOOST MODE					

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$V_{BATUVLO}$	VBAT UVLO Voltage, Rising, Hys=400mV	3.1	3.2	3.3	V
I_{SHUT}	ENBST=0, Quiescent current into VBAT		3.5		uA
I_Q	ENBST=1, Quiescent current into VBAT Tie NTC to GND		120		uA
f_{SW}	Boost frequency	0.7	0.9	1.1	MHz
D_{MAX}	Maximum Duty Cycle		95		%
I_{LIMITN}	Lowside Nmos Peak Current Limit		2.2		A
V_{OUT}	VOUT=5.1V or set by I2C	5.05	5.1	5.15	V
$V_{OUTSHORT}$	80%*VOUT, VOUT short circuit protect voltage		80		%
$I_{OUTSHORT}$	VOUT Short Circuit Hiccup Current		0.5		A
$T_{ONOUTSHORT}$	VOUT Short Hiccup ON time		24		mS
$T_{OFFOUTSHORT}$	VOUT Short Hiccup OFF time		750		mS
NTC THERMISTOR MONITOR					
$T_{COLDCHRG}$	NTC Threshold, Cold for charging 0℃, stop charging		73.3		%
$T_{COOLCHRG}$	NTC Threshold, Cool for charging 10℃ (REG18<7>=0)		68.84		%
	NTC Threshold, Cool for charging 15℃ (REG18<7>=1)		66		%
$T_{HOTCHRG}$	NTC Threshold, Hot for charging 45℃ (REG18<6>=0), stop charging		44.7		%
	NTC Threshold, Hot for charging 55℃ (REG18<6>=1), stop charging		33.7		%
$T_{COOLBST}$	NTC Threshold, Cold for boost -15℃, stop boost		79		%
T_{HOTBST}	NTC Threshold, Hot for boost 55℃, stop boost		37.3		%
V_{HYS}	NTC Threshold Hysteresis		1		%
V_{NTCDIS}	NTC Disable Threshold, VNTC<0.1V		0.1		V
I_{NTC}	NTC Input Leakage			1	μA
LOGIC INPUT: ENBST, COMMR, COMML, SDA, SCL					
V_{IH}	2.5V<VBAT<4.5V	1.2			V
V_{IL}	2.5V<VBAT<4.5V			0.4	V
LOGIC OUTPUT: COMMR, COMML, SDA, SCL, IRQ					
V_{OL}	Low level output voltage Isink=5mA			0.4	V
Watchdog					
$T_{WATCHDOG}$	Watchdog Time, when no I2C communication more than 160S, then reload the register to default value		160		S

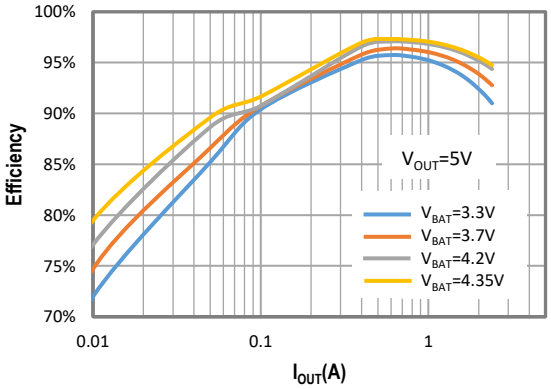
Typical Characteristics

(Typical values are at T_A = 25°C unless otherwise specified.)

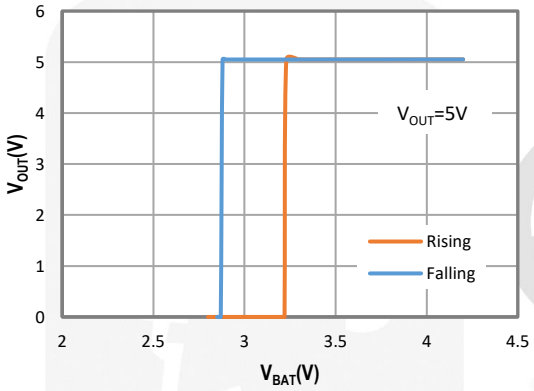
Boost V_{OUT} Vs. I_{OUT}



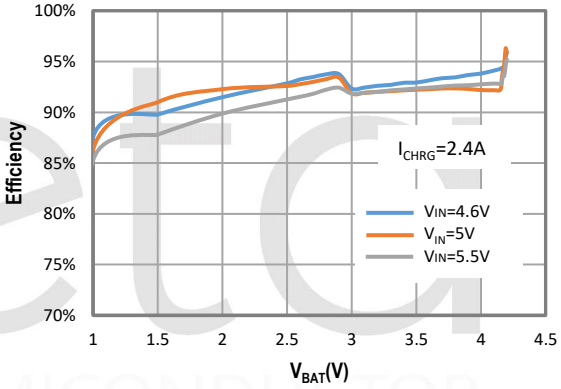
Boost Eff Vs. I_{OUT}



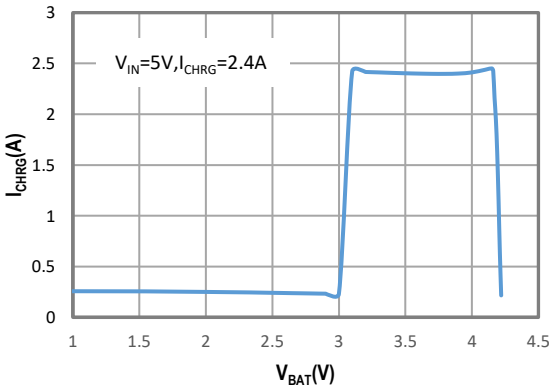
Boost UVLO



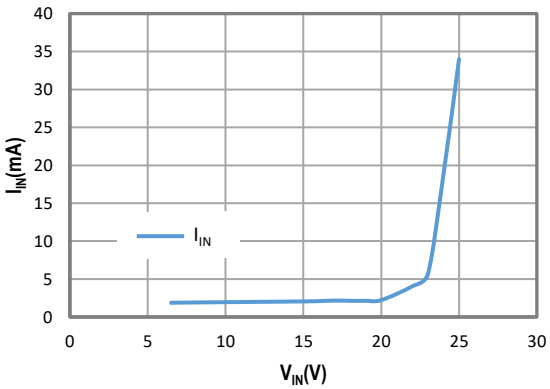
Charger Eff. Vs. V_{BAT}



I_{CHRG} Vs. V_{BAT}



V_{IN} Standoff Voltage



Function Block Diagram

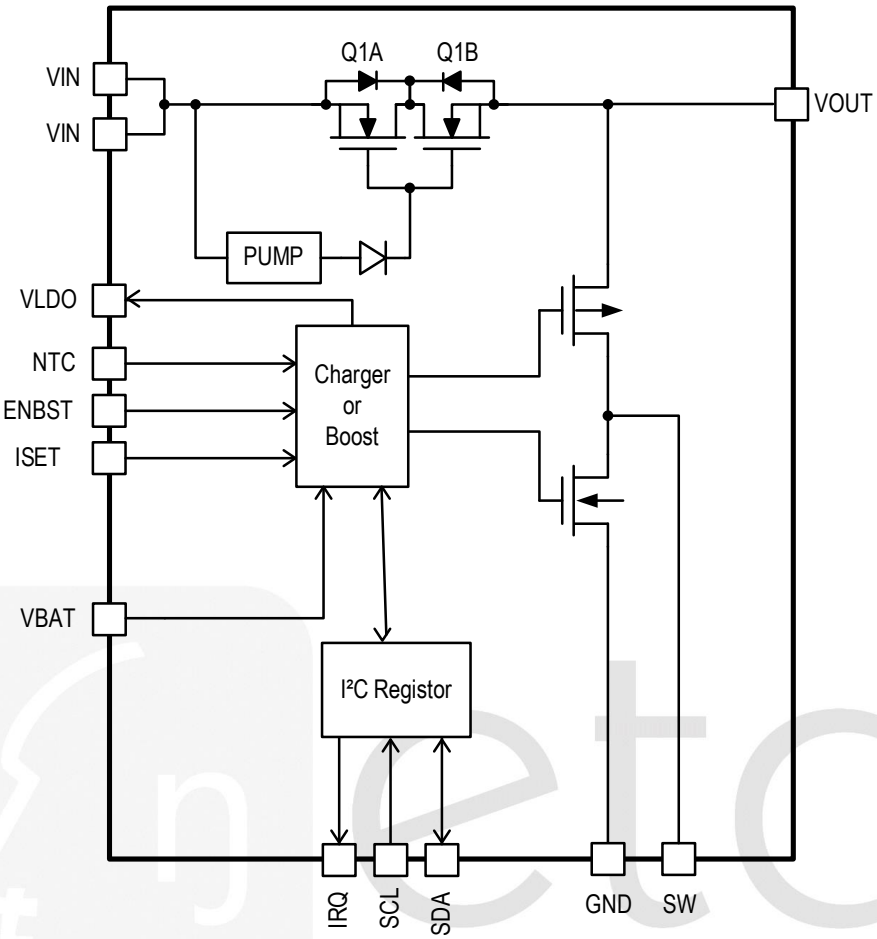


Figure 2: Function Block Diagram

Application Information

ETA6915 is an PMU, which integrates a 28V single cell Li+ battery Switching charger, and a 5V/1A Boost synchronous converter with true-shutoff function.

Normal Charge Cycle

ETA6915 initiates a charge cycle once the voltage at the VIN pin rises above the UVLO threshold level. If the voltage at the BAT pin is less than 3.0V, the charger enters trickle charge mode. In this mode, ETA6915 is working in linear charging mode and the current is reduced to $I_{Trickle}$ (set by REG16<0>), until the battery voltage is raised to a safe level for full current charging.

The charger switches to constant-current mode as the BAT pin voltage rises above 3.0V, ETA6915 is working in switching charging mode and the current the charge current is thus resumed to full programmed value. When the final VBAT voltage (4.2V) is reached, ETA6915 enters constant-voltage mode and the charge current begins to decrease until it drops to I_{EOC} (set by REG13<1:0>), and then ends the charge cycle. In constant-voltage mode phase, if the charging current is less than 100mA, then ETA6915 transfer to linear charging mode, After the termination of the charge cycle, ETA6915 constantly monitors the BAT pin voltage

and starts a new charge cycle when the battery voltage falls below Recharge Voltage, keeping the battery at fully charged condition.

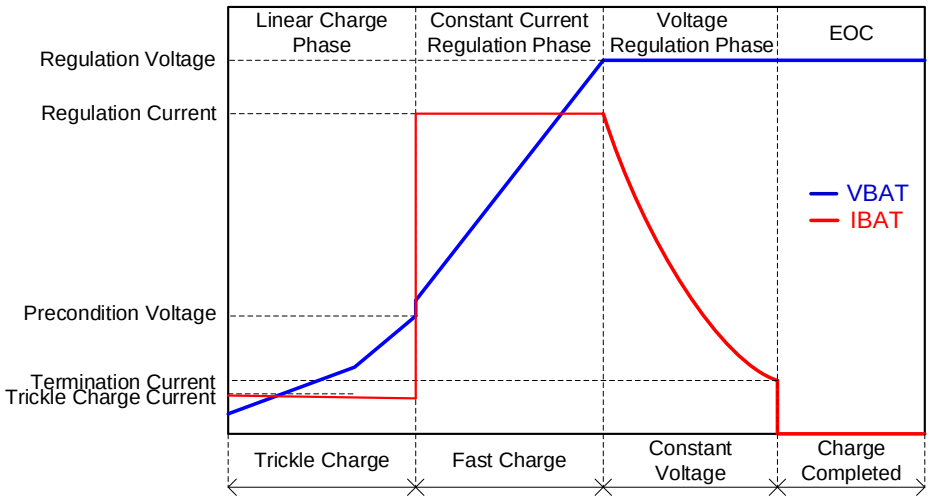


Figure 2: Battery Charger Profile

Programming Charge Current

There are two methods to set the constant charge (CC) current, which depends on REG13<3>:

REG13<3>=0: The charge current is programmed by connecting a 1% resistor (RISET), between ISET Pin and GND. The charge current can be calculated by using the following formula:

$$I_{BAT}(mA)=\frac{1}{R_{set}(kOhm)}\times 40000$$

Otherwise, if REG13<3> is set to 1 (default value), the charge current is depended on REG13<7:4>.

High Temperature Fold-back

Build-in feedback circuitry mechanism can reduce the value of the programmed charge current once the die temperature tends to rise above 100°C, hence prevents the temperature from further increase and ensure device safe operation.

VIN Dynamic Power Path Management

When VIN voltage is OK, then VOUT is connected to VIN through Q1, VOUT can charging the battery and provide power to the OUTX at the same time. The Q1 have current limit 2A and short circuit protection. When the Q1 current is up to VIN source current limit or VIN voltage close to VDPPM, the charging current is reduced to ensure the VOUT.

Under-voltage Lock-out (UVLO) and Over-voltage Protect (OVP)

Build-in under-voltage lockout circuit monitors the input voltage and keeps the charger in shutdown mode until VIN rises above the under-voltage lockout threshold. The UVLO circuit has a built-in hysteresis of 500mV. When the input voltage rising high than Over-voltage Protect threshold, then turn off the charger and keep monitor the VIN, The OVP circuit has a built-in hysteresis of 400mV.

Battery Temperature Monitoring

ETA6915 continuously monitors temperature by measuring the voltage of NTC pin, during Charge Mode and Boost Mode. A negative temperature coefficient thermistor (designed for use with a 10k NTC β= 3435) and an external voltage divider (Rt1=5.23K，Rt2=30.9K) typically develop this voltage.

In Charge Mode:

- 0°C <T<T_{cool}, the charge current can be set by REG16<1> to reduce to half of the charge current or not, which is the requirement of JEITA.
- T_{cool} <T<T_{hot}, normal operation;
- T<0°C or T> T_{hot}, suspends charging and waits until the battery temperature is within the normal range (0°C <T<T_{cool}).

Note:

- T_{cool}: REG18<7>=0(default), T_{cool}=10°C; REG18<7>=1, T_{cool}=15°C;
- T_{hot}: REG18<6>=0(default), T_{hot}=45°C; REG18<6>=1, T_{hot}=55°C.

In Discharge Mode (Boost Mode):

- T<-15°C or T>55°C, disable Boost;
- -15°C <T<55°C, normal operation;

Disable NTC function by shorting this pin to GND.

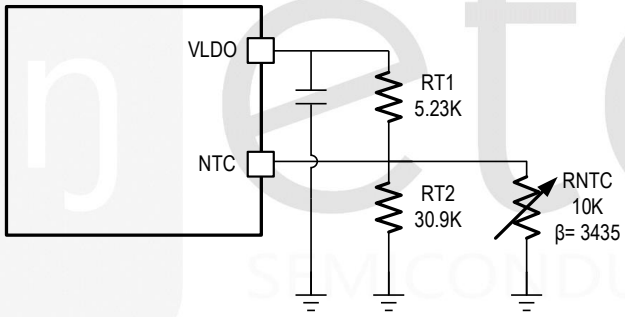


Figure 3: Battery NTC Connection

Boost Operation

ETA6915 integrates boost converter up to 0.5A output current, which is required that the load should be connected on VOUT pin. The boost is enabled when the below conditions are valid:

- VBAT voltage above VBATUVLO=3.2V
- ENBST Pin=High, or REG15<1>=1
- NTC pin is within acceptable range (-15°C <T<55°C)

During boost mode, the status can be read from register REG10<7>. The battery Fuel Gauge is read from REG12<1:0>.

To extend the battery life time and increase discharge efficiency, the output voltage is programmed by REG16<7:4>.

Output Short-Circuit Protection

Unlike most step-up converters, ETA6915 allows for short circuits on the output. In the event of a short circuit,

the device first turns off the NMOS when the sensed current reaches the current limit. When OUT drops below VBAT, the device then enters a linear charge period with the current limited same as with the start-up period. In addition, the thermal shutdown circuits disable switching if the die temperature rises above 160°C.

I2C COMMUNICATION

The device uses I²C compatible interface for flexible charging parameter programming and instantaneous device status reporting. I²C™ is a bi-directional 2 wire serial interface developed by Philips Semiconductor (now NXP Semiconductors). Only two bus lines are required: a serial data line (SDA) and a serial clock line (SCL). Devices can be considered as masters or slaves when performing data transfers. A master is the device which initiates a data transfer on the bus and generates the clock signals to permit that transfer. At that time, any device addressed is considered a slave.

The device operates as a slave device, receiving control inputs from the master device like micro controller or a digital signal processor through REG10-REG19. The I2C interface supports both standard mode (up to 100kbits), and fast mode (up to 400kbits), connecting to the positive supply voltage via a current source or pull-up resistor. When the bus is free, both lines are HIGH. The SDA and SCL pins are open drain.

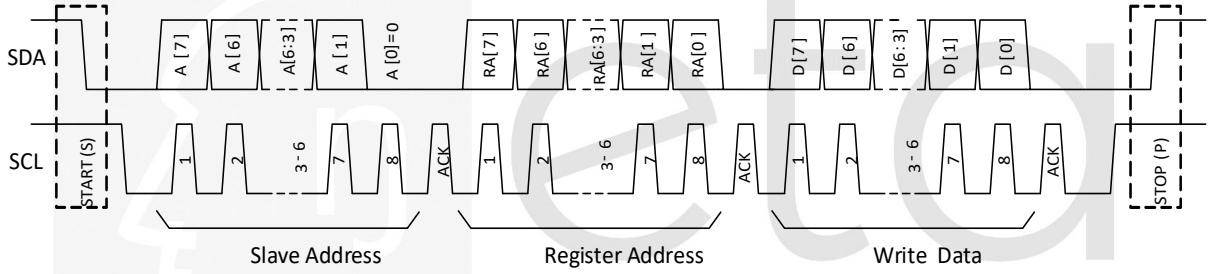


Figure 4: Single Write

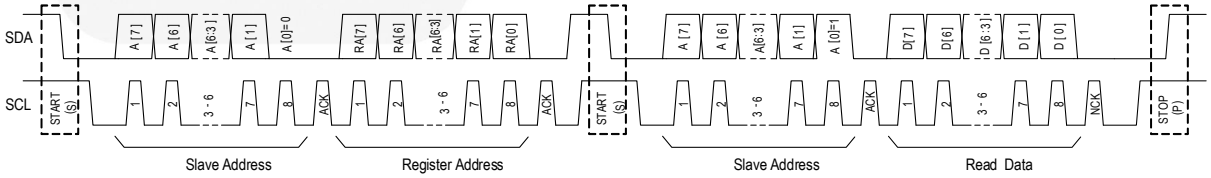


Figure 5: Single Read

Device address is understood value of A[7:0] while A[0] is “0”. This is also the address to write the data to the device registers. To read data from register, sending the command to address with A[0] is “1”. Register address are in RA[7:0]. Data to or from register are D[7:0].

Registers Map

- **DEVICE ADDRESS:** 0000 001x (x=1: Read; x=0: Write)

REG0x10: STAT0 Register

Address	Mode	BIT	Symbol	Description
0x10	Read	B<0>	**ST_LOWBAT**	Battery Low Power Alarm in Discharge Mode 0：Normal （VBAT>3.3V） 1：Battery Low Power （2.8V<VBAT<3.3V）
		B<1:2>	**Reserved**	
		B<3>	**ST_BAT_UVLO**	BAT_UVLO Status: when VBAT is lower than 2.8V in discharge mode, this bit is set to 1 and the boost convertor will be turned off. 0：UVLO Protection（VBAT<2.8V） 1：Normal（VBAT>2.8V）
		B<4>	**ST_VIN_UVLO_OVP**	VIN UVLO or OVP Status: 0：VIN is abnormal (UVLO or OVP); 1：VIN is normal
		B<5>	**ST_CHARGING**	Charger status: 0：not charging 1：charging
		B<6>	**ST_CHARGING_END**	End of charge Status 0：in Charging 1：Charge full
		B<7>	**ST_BOOST**	Boost Status 0：Boost mode off 1：Boost mode on

REG0x11: STAT1 Register

Address	Mode	BIT	Symbol	Description
0x11	Read	B<0:5>	**Reserved**	
		B<6>	**ST_NTC_OK**	NTC Status: When the NTC pin voltage is outside of the cold or hot thresholds, this bit is set to 0. 1：No fault. 0：NTC_FAULT is triggered，Cold or Hot
		B<7>	**ST_NTC_cool**	Jeita NTC Cool Status: When the NTC pin voltage is at Cool threshold, this bit is set to 1. 0: not cool 1: cool

REG0x12: STAT2 (Battery Fuel Gauge) Register

Address	Mode	BIT	Symbol	Description
0x12	Read	B<0>	**VBAT Fuel Gauge：33%**	0: in Charge Mode, VBAT<3.78V; in Discharge Mode, VBAT<3.575V 1: in Charge Mode, VBAT >3.78V; in Discharge Mode,VBAT>3.575V
		B<1>	**VBAT Fuel Gauge：66%**	0: in Charge Mode, VBAT<4V; in Discharge Mode, VBAT<3.774V 1: in Charge Mode, VBAT >4V; in Discharge Mode, VBAT>3.774V
		B<2:7>	**Reserved**	

REG0x13: Charge Current Setting Register

Address	Mode	BIT	Symbol	Description
0x13	Read/ Write	B<1:0>	**IEOC<1:0>**	Set Charge Termination Current **00：10% ICC (Default)** 01：12% ICC 10：14% ICC 11： 6% ICC
		B<2>	**VHOLD_enable**	**0: when VIN is in VHOLD statue, the charger termination is enabled and the charge current is not reduced; (Default)** 1: When VIN is in VHOLD status, the charger termination is disabled and the charge current is reduced.
		B<3>	**SEL_I2C_ICC**	Charge current setting selected **0: the charge current is set by the external resistor on the ISET Pin (Default)** 1：the Charge current is set by the register ICC<2:0>
		B<7:4>	**ICC<3：0>**	CC charge current setting： **0000: 200mA (Default)** 0001: 500mA 0010: 600mA 0011: 700mA 0100: 800mA 0101: 900mA 0110: 1000mA 0111: 1100mA 1000: 1200mA 1001: 1300mA 1010: 1400mA 1011: 1500mA 1100: 1600mA 1101: 300mA 1110: 400mA 1111: 100mA

REG0x14: Reserved

REG0x15: Enable Control Register

Address	Mode	BIT	Symbol	Description
0x15	Read/Write	B<0>	**DISABLE_CHRG**	**0：Enable Charger；(Default)** 1：Disable Charger (Q1 still on)
		B<1>	**EN_BOOST**	**0：Boost Off；(Default)** 1：Boost on
		B<2:7>	**Reserved**	

REG0x16: Charge and Discharge Setting Register

Address	Mode	BIT	Symbol	Description
0x16	Read/Write	B<0>	**IPRE_SEL**	Pre-Charge Current Set（VBAT<3V） **0：10%* ICC (Default)** 1：20%* ICC
		B<1>	**Half_ICC**	Half Charge Current Set **0：100%*ICC (Default)** 1：50%*ICC
		B<3:2>	**VHOLD<1:0>**	Vhold Threshold Set: when VIN voltage drops to this threshold, the chip will reduce the charge current gradually until the VIN voltage stop dropping, and keep the VIN voltage at this threshold. **00: 4.5V (Default)** 01: 4.7V 10: 4.4V 11: 4.6V
		B<7:4>	**VOUT_set<3:0>**	Boost Output Voltage Set **0000: 5.1V (Default)** 0001: 5.0V 0010: 4.9V 0011: 4.8V 0100: 4.7V 0101: 4.6V 0110: 4.5V 0111: 4.4V 1000: 4.3V 1001: 4.2V 1010: 4.1V 1011: 4.0V 1100: 3.9V 1101: 3.8V 1110: 3.7V 1111: 3.6V

REG0x17: Reserved

REG0x18: Charge Termination Voltage and NTC Set Register

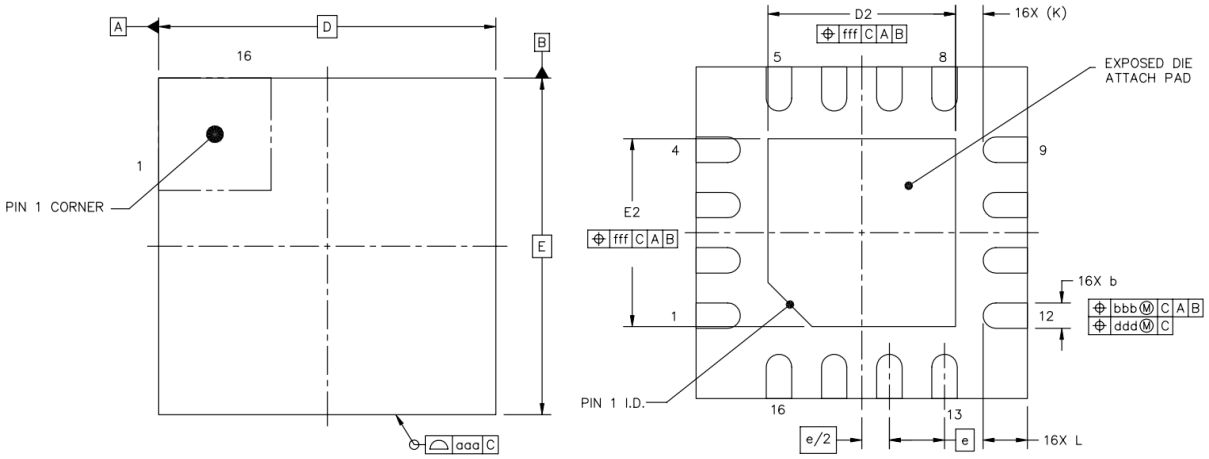
Address	Mode	BIT	Symbol	Description
0x18	Read/Write	B<2:0>	**Reserved**	
		B<5:3>	**VCV<2:0>**	Charge Termination Voltage Set: **000:4.2V (Default)** 001:4.25V 010:4.4V 011:4.45V 100:4.1V 101:4.15V 110:4.3V 111:4.35V
		B<6>	**NTC_charge_hot**	NTC HOT threshold control in Charge Mode **0：44.7%（45°C）(Default)** 1：33.7%（55°C）
		B<7>	**NTC_charge_cool**	JEITA NTC Cool threshold control in Charge Mode **0：68.84%（10°C）(Default)** 1：66%（15°C）

REG0x19: I2C and Watchdog Set Register

Address	Mode	BIT	Symbol	Description
0x19	Read/Write	B<0>	**Continue mode for I2C enable**	**0: disable; (Default)** 1: enable
		B<1>	**Watchdog Enable**	0: disable watchdog **1: enable watchdog, and the timer is 160S. (Default)**
		B<2>	**VCV<3>**	**0: VTERM= VCV<2:0>** 1: VTERM= VCV<2:0>+200mV
		B<7:3>		Reserved

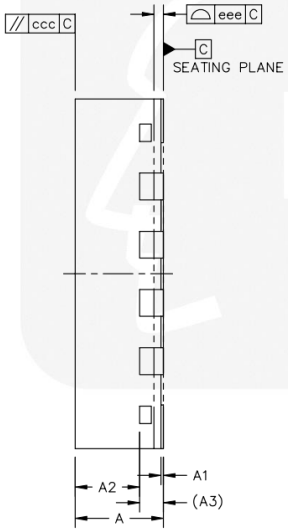
PACKAGE OUTLINE

Package: QFN3x3-16L



TOP VIEW

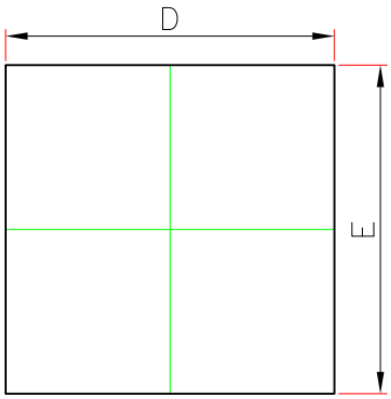
BOTTOM VIEW



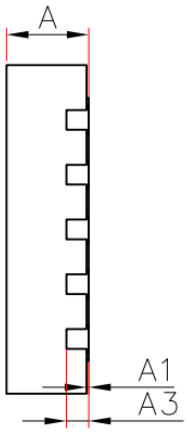
SIDE VIEW

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.55	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.18	0.23	0.28
BODY SIZE	X	D		3 BSC	
	Y	E		3 BSC	
LEAD PITCH		e		0.5 BSC	
EP SIZE	X	D2	1.6	1.7	1.8
	Y	E2	1.6	1.7	1.8
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		0.25 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.1	
		bbb		0.05	
EXPOSED PAD OFFSET		fff		0.1	

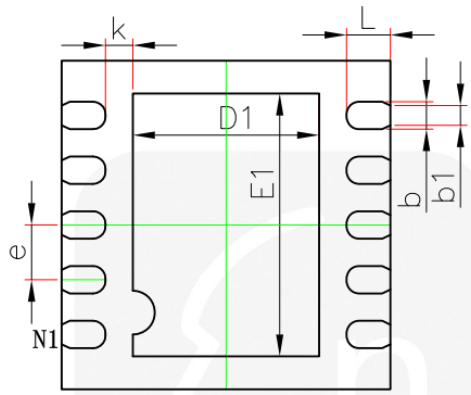
Package: DFN3x3-10L



TOP VIEW



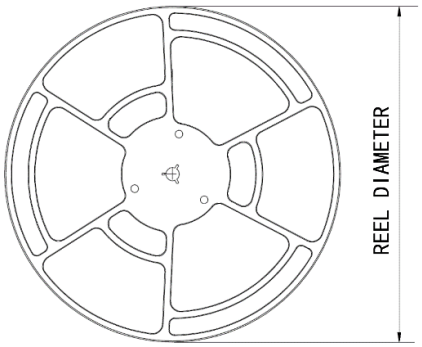
SIDE VIEW

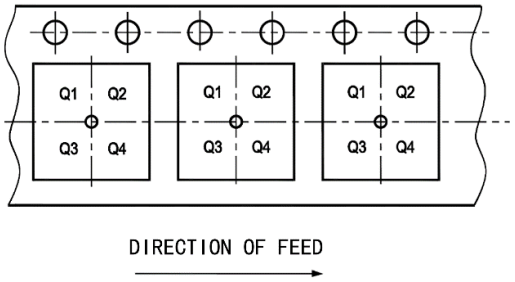


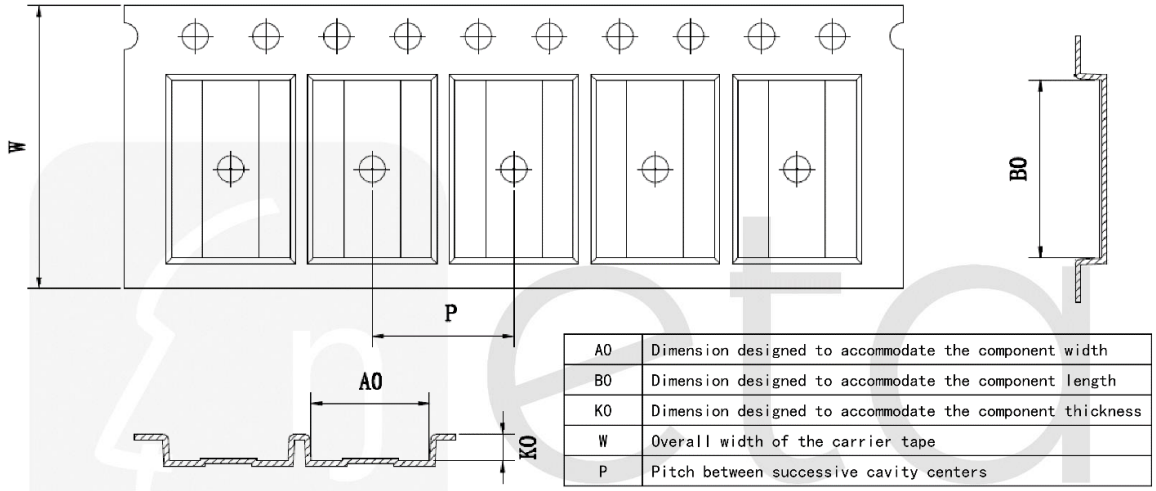
BOTTOM VIEW

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN.	MAX.	MIN.	MAX.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.924	3.076	0.115	0.121
E	2.924	3.076	0.115	0.121
D1	1.600	1.800	0.063	0.071
E1	2.300	2.500	0.091	0.098
b	0.200	0.300	0.008	0.012
b1	0.180REF		0.007REF	
e	0.500BSC.		0.020BSC.	
k	0.250REF		0.010REF	
L	0.324	0.476	0.013	0.019

Tape and Reel Information







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
P	Pitch between successive cavity centers

Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P (mm)	W (mm)	Pin1 Quadrant
ETA6915Q3Q	QFN3x3X0.75-16	16	5000	330	12.4	3.35	3.35	1.13	8	12	Q1
ETA6915D3K	DFN3x3X0.75-10	10	5000	329	12.8	3.3	3.3	1.1	8	12	Q1