1.5V/3.5A or 3V/2A Buck Synchronous Converter and 5V Linear Charger in-One Solution for Lithium Battery

DESCRIPTION

ETA6200 includes a 5V single cell Li+ battery linear charger and a 1.5V/3.5A or 3V/2A buck synchronous converter.

The linear charger is fully integrated with constant current (CC) / constant voltage (CV) control module and a charge FET.

It also can drive a LED via output pin to indicate the charge status.

The integrated 1.5V output buck converter is capable of delivering 3.5A current at output.

The integrated 3V output buck converter is capable of delivering 2A current at output.

ETA6200 is available in a DFN3x3-10 package.

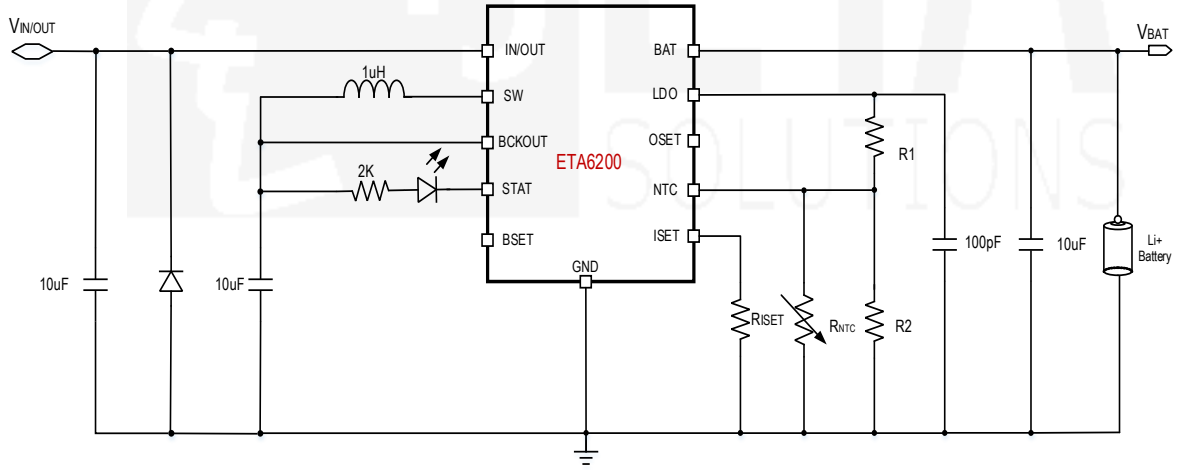
FEATURES

- 5uA Standby Current
- 28V Charge IN/OUT Standoff Voltage
- 1.5V/3.5A or 3V/2A Output Power
- Up to 94% Efficiency for Buck
- 4.16V/4.31V Charge Termination Voltage
- Programmable Charge Current
- NTC for Charging and Discharging
- Thermal Shutdown
- DFN3x3-10 Package
- RoHS Compliant

APPLICATIONS

- Lithium Battery

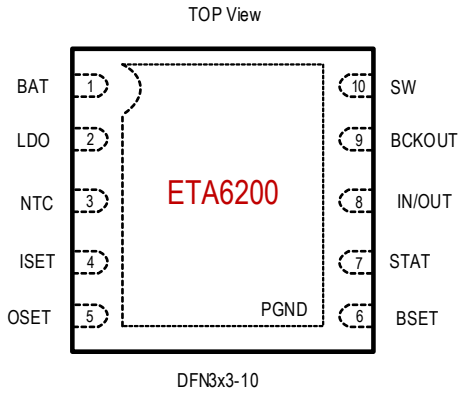
TYPICAL APPLICATION



ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA6200D3K	DFN3x3-10	ETA6200 YWW2L	5000

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.)

IN/OUT pin Voltage.....-0.3V to 28V
All Other PIN Voltage.....-0.3V to 6V
SW to ground current .....Internally limited
Operating Temperature Range .....–40°C to 85°C
Storage Temperature Range .....–55°C to 150°C

Thermal Resistance	θ_{JA}	θ_{JC}	
DFN3x3-10	50	12	°C/W

Lead Temperature (Soldering 10sec).....260°C

ELECTRICAL CHARACTERISTICS

(V_{BAT}=3.8V, $V_{IN/OUT}$ = 5V, unless otherwise specified. Typical values are at TA = 25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Linear Charger					
Input standoff voltage	$V_{IN/OUT}$ Voltage			28	V
Input voltage Range	$V_{IN/OUT}$ Voltage	3.2		6	V
V_{IN} OVP	$V_{IN/OUT}$ Voltage, Hys=450mV	5.75	6	6.25	V
V_{IN} UVLO	Rising ,Hys=800mV	3.9	4.05	4.2	V
Input current when charging completed			5		mA
Battery CV voltage	I_{BAT} =0mA, BSET PIN floating	4.12	4.16	4.2	V
	I_{BAT} =0mA, V_{BSET}=0V	4.27	4.31	4.35	V
Charger Restart Threshold	From DONE to CC mode		-150		mV
Battery Pre-condition Voltage	V_{BAT} Rising Hys = 200mV	2.9	3	3.1	V
Pre-Condition Charge Current		7.8	10	12.2	%I_{CC}
CC Charge Current	R_{ISET} =2KΩ， I_{CC}=1000/R_{ISET}	450	500	550	mA
Termination Current		7.6	10	12.4	%I_{CC}
Pre-ChargeTimer			120		min
Fast-Charge Timer			600		min
Buck Converter					
V_{BAT} Range		3	3.7	5	V
V_{BAT} Low Bat detection threshold （V_L）	Falling， HYS = 200mV	3.2	3.3	3.4	V
V_{BAT} discharging disable threshold （V_D）	Falling， HYS = 300mV	2.9	3.0	3.1	V
Output voltage （$V_{IN/OUT}$） When OSET PIN floating	$V_{BAT} > V_L$	1.48	1.51	1.54	V
	$V_D < V_{BAT} \leq V_L$	1.15	1.2	1.25	
	$V_{BAT} \leq V_D$		0		
Output voltage （$V_{IN/OUT}$） When V_{OSET}=0V	$V_{BAT} > V_L$	2.96	3.02	3.08	V
	$V_D < V_{BAT} \leq V_L$	2.3	2.4	2.5	
	$V_{BAT} \leq V_D$		0		

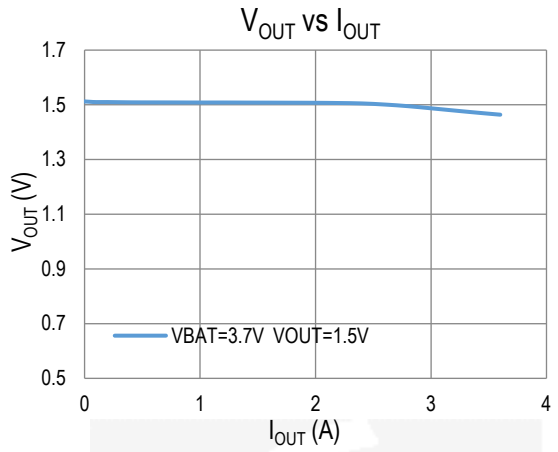
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
IN/OUT Discharging Threshold	IN/OUT begin Discharging when OSET PIN floating		1.64		V
	IN/OUT begin Discharging when V_{OSET} = 0V		3.28		
IN/OUT Discharging current			3		mA
V_{BAT} Operating Current	$V_D < V_{BAT}$		5		μA
	$V_{BAT} \leq V_D$		3		
Switching Frequency			2.7		MHz
Highside Current limit			4.5		A
NTC					
NTC Threshold, Hot When Charging	Charger Suspended, HYS =1%		35		$\%V_{LDO}$
NTC Threshold, Cold When Charging	Charger Suspended, HYS =1%		84		$\%V_{LDO}$
NTC Threshold, Hot When Discharging	Output Suspended, HYS = 1%		22		$\%V_{LDO}$
NTC Disable Threshold			100		mV
NTC Input Leakage			0		μA
OSET,BSET PIN					
V_{OSET}	High	1.2			V
	Low			0.4	V
V_{BSET}	High	1.2			V
	Low			0.4	V

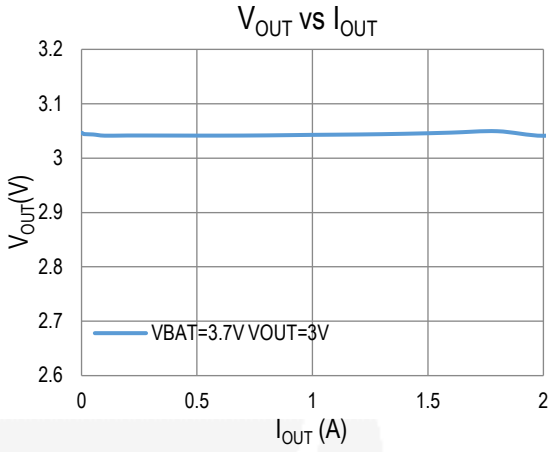
PIN DESCRIPTION

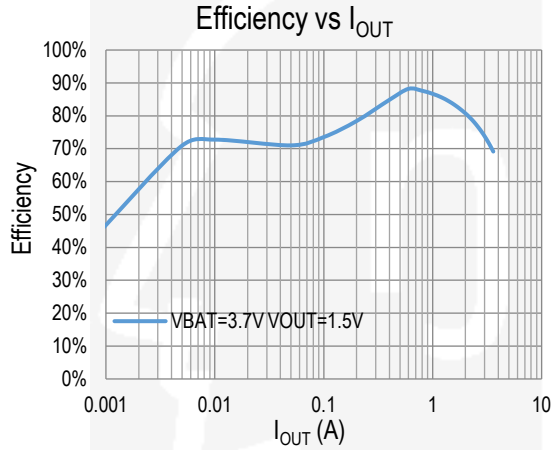
PIN #	NAME	DESCRIPTION
1	BAT	Connected to the battery positive terminal. Bypass with a 10uF ceramic capacitor to GND
2	LDO	A LDO Output for NTC. Connect a 100pF Between LDO and GND
3	NTC	Battery Temperature Monitoring input pin. It sets the valid temperature operating range for battery charging and discharging
4	ISET	Charge current program pin. The charge current is programmed by connecting a 1% resistor (R_{ISET}), between ISET and GND pin. The charge current can be calculated using the following formula: $I_{BAT}(mA)=\frac{1}{R_{ISET}(K)}\times 1000$
5	OSET	A V_{OUT} select pin, when OSET PIN floating, then V_{OUT}=1.5V, default. when V_{OSET}=0, then V_{OUT}=3V
6	BSET	A V_{CV} select pin, when BSET PIN floating, then V_{CV}=4.16V, default. when V_{BSET}=0, then V_{CV}=4.31V
7	STAT	Drive a LED to indicate the charge status. Charge in progress: LOW Charge complete: HIGH Safety timers expire or No bat: Flashing at 1Hz
8	IN/OUT	Input or Output pin, when in charge mode, it is V_{IN}. when in discharge mode, it is V_{OUT}. Bypass with a 10μF ceramic capacitor to GND
9	BCKOUT	It is a buck output pin, Bypass with a 10μF ceramic capacitor to GND
10	SW	Inductor Connection. Connect an inductor Between SW and BCKOUT pin
11	PGND	Power GND, Expose pad

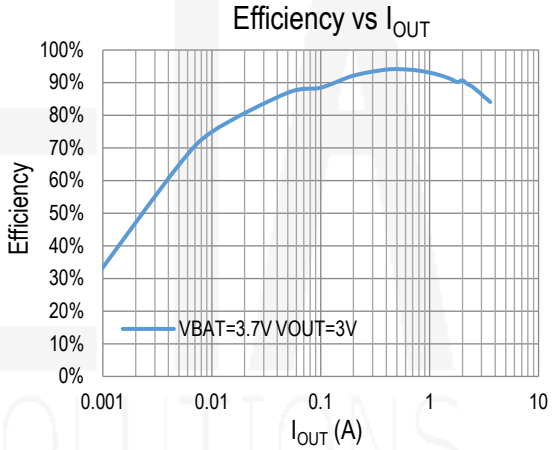
TYPICAL CHARACTERISTICS

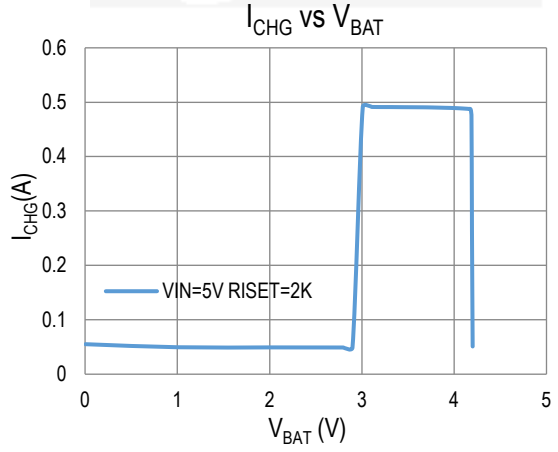
(Typical values are at T_A = 25°C unless otherwise specified.)











FUNCTION DESCRIPTION

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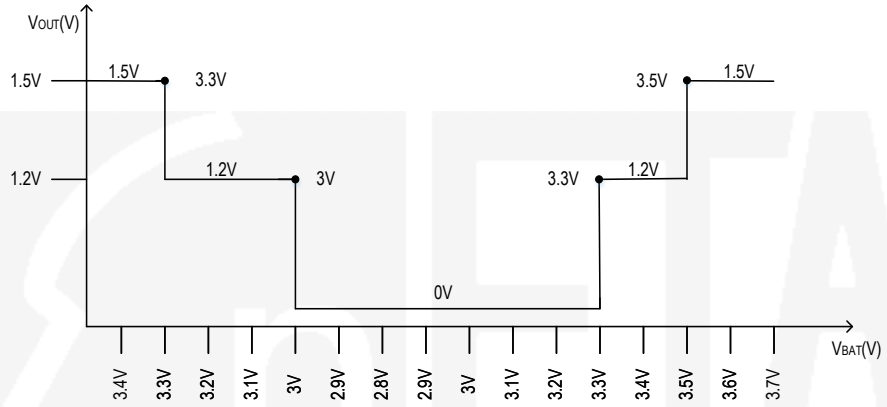
BUCK OPERATION

In the buck mode, IN/OUT Voltage converted by V_{BAT} has low voltage alarm function, which truly simulates the actual working voltage of the dry cell. the curve is as follows:



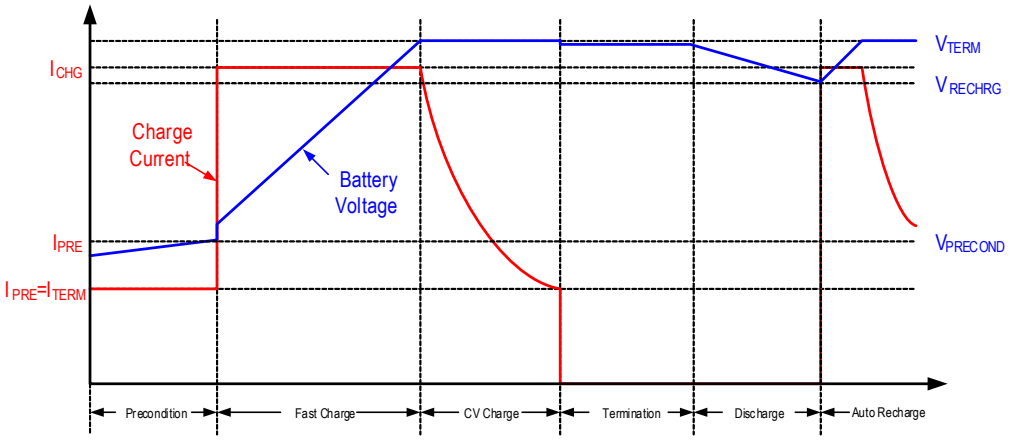
Status Indicators

STAT pin is a status pin for charging status indications. Please refer to Table 1.

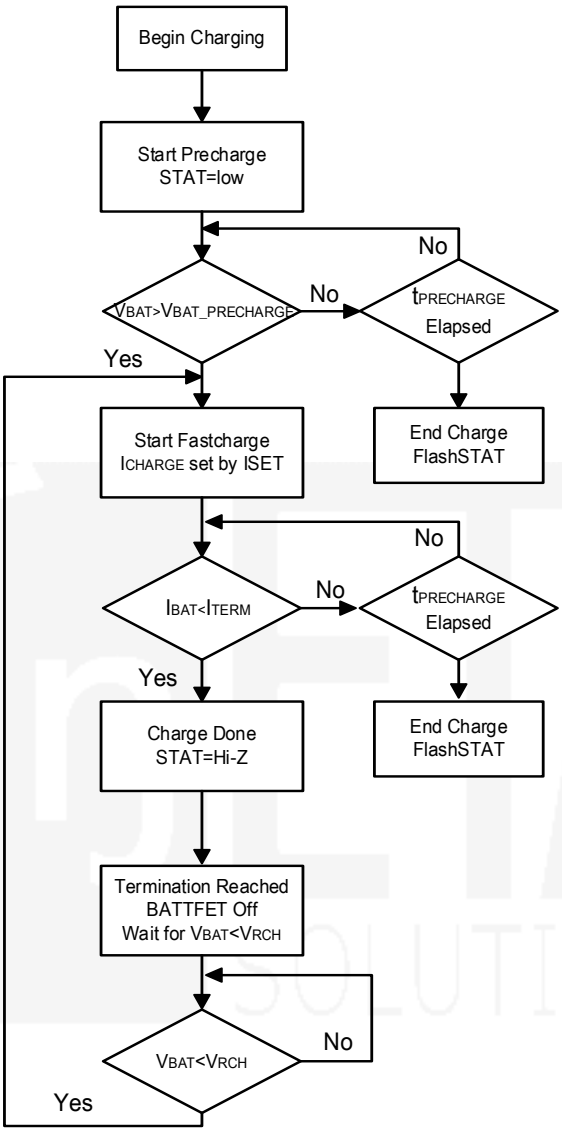
Table 1 STAT indicator

Charge STATE	STAT OUTPUT
Charging	Low
Charging done	High impedance
Safety timers expired	Flashing at 1Hz
No battery	

Battery Charge Profile

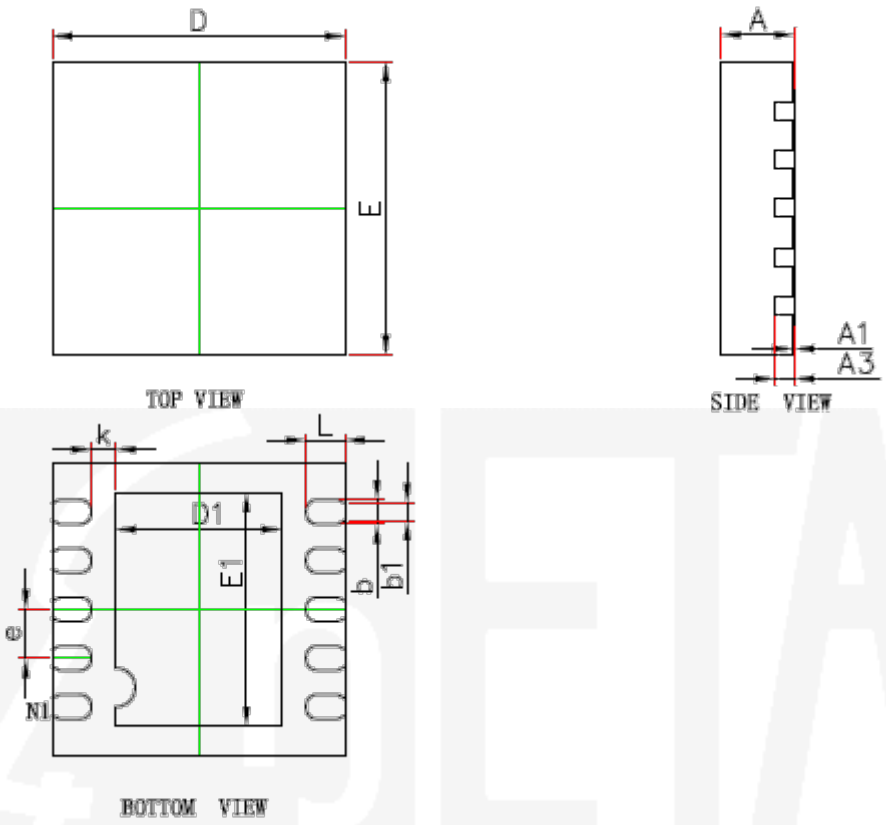


Charge Current Translator



PACKAGE OUTLINE

Package: DFN3x3-10

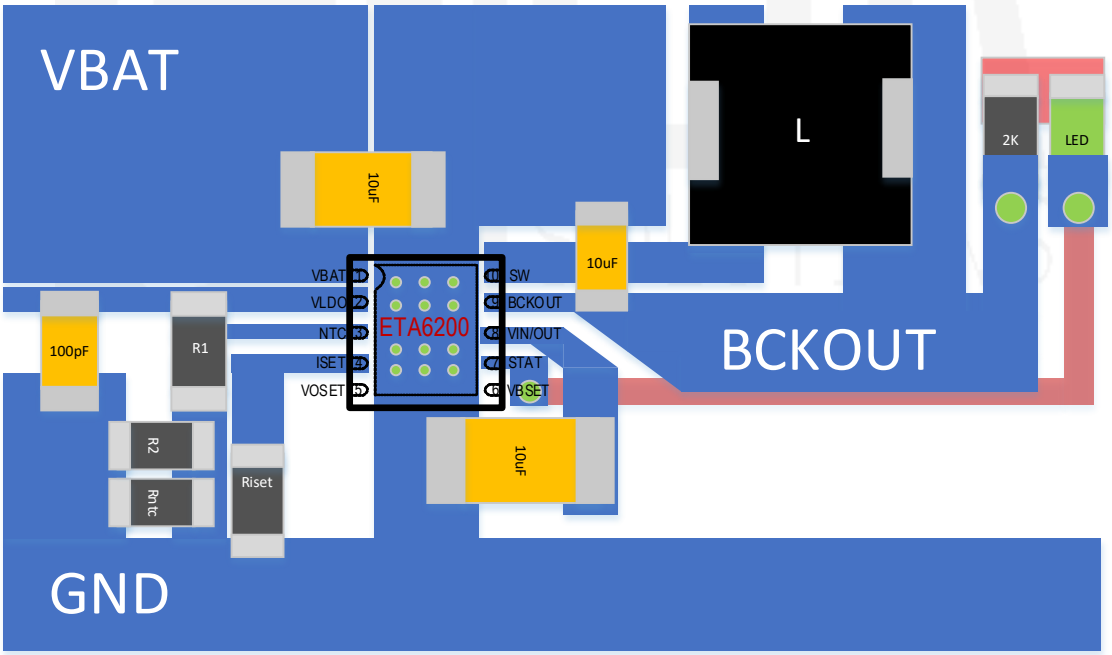


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN.	MAX.	MIN.	MAX.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.924	3.076	0.115	0.121
E	2.924	3.076	0.115	0.121
D1	1.600	1.800	0.063	0.071
E1	2.300	2.500	0.091	0.098
b	0.200	0.300	0.008	0.012
b1	0.180REF		0.007REF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

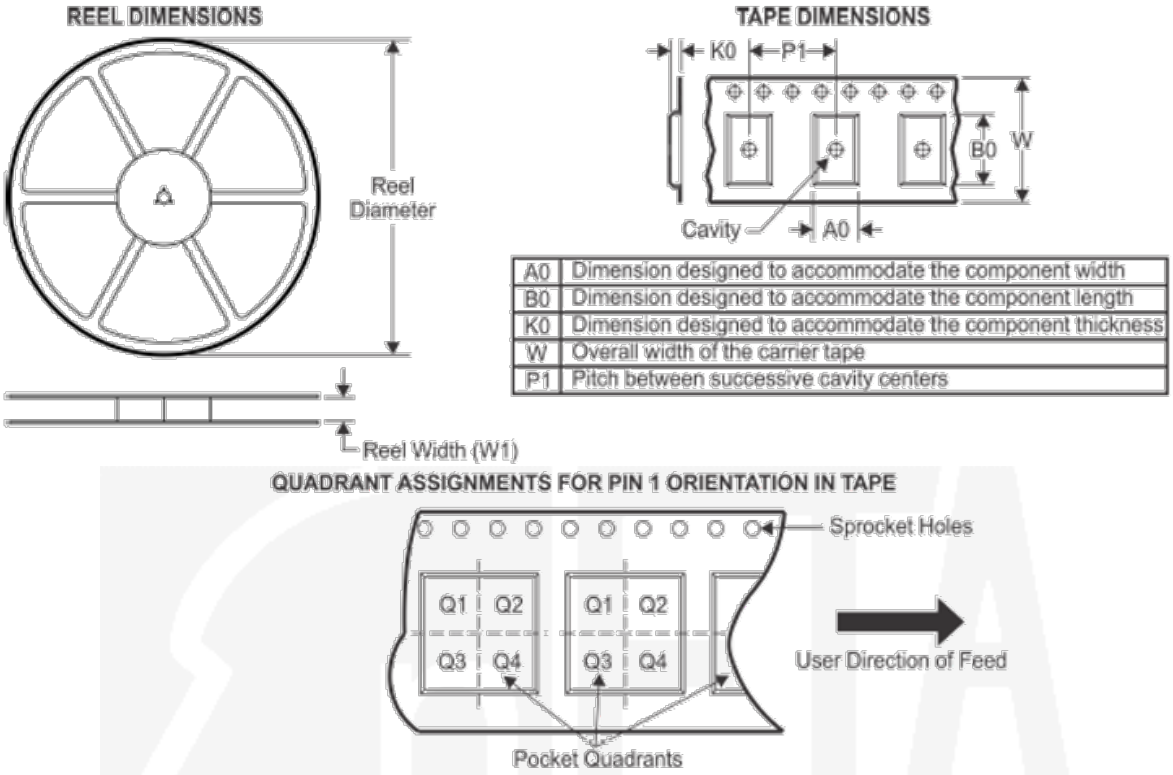
PCB GUIDELINES

In order to have as clean as possible supply for converter, please follow following suggestion:

1. Place the BAT, IN/OUT, BCKOUT, LDO capacitor as close as possible to the pins and wide bottom layer for PGND connections.
2. Place inductor input pin to SW pin as close as possible. Minimize the copper area of this trace to lower electrical and magnetic field radiation but make the trace wide enough to carry the charging current. Do not use multiple layers in parallel for this connection. Minimize parasitic capacitance from this area to any other trace or plane.
3. Put output capacitor near to the inductor and the device. Ground connections need to be tied to the IC ground with a short copper trace connection or GND plane.
4. Use thermal pad as the single ground connection point.
5. Use single ground connection to tie charger power ground to charger analog ground. Just beneath the device. Use ground copper pour but avoid power pins to reduce inductive and capacitive noise coupling.
6. Place decoupling capacitors next to the IC pins and make trace connection as short as possible.
7. It is critical that the exposed thermal pad on the backside of the device package be soldered to the PCB ground. Ensure that there are sufficient thermal vias directly under the IC, connecting to the ground plane on the other layers.
8. Ensure that the number and sizes of vias allow enough copper for a given current path.
9. Ensure almost the bottom layer be ground unless bridge connection.



TAPE AND REEL INFORMATION



Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ETA6200D3K	DFN3*3-10	10	5000	330	12.4	3.35	3.35	1.13	8	12	Q1