

2.4A Charge/Discharge Power Bank SOC Integrated With TYPE_C Protocol

1. Features

- **Synchronous switch charge and discharge**
 - ✧ 2.4A Synchronous switching charger and 2.4A boost converter
 - ✧ Boost converter efficiency up to 96%
 - ✧ Switching charger efficiency up to 92%
 - ✧ Integrated power-path management, charging batteries and charging cellphones at the same time
- **Charger**
 - ✧ Adaptive charging current control, adaptive adapter output capability
 - ✧ Support 4.20V/4.30V/4.35V/4.40V batteries
- **State of charge (SOC) indicator**
 - ✧ Integrated LED controller supports 4、2、1 LEDs as the SOC indicator
- **Fully featured**
 - ✧ Built-in light drive
 - ✧ Integrated cellphone plug-in and plug-out detector
 - ✧ Integrated Type-C DRP protocol, support single port input and output
 - ✧ Integrated mobile phone charging current intelligent identification DCP protocol
- **Low power consumption**
 - ✧ Smart load detector, switching to standby mode automatically
 - ✧ Standby power consumption is less than 100 μ A
- **Low BOM cost**
 - ✧ Integrated power MOSFET, charging/boosting with a single inductor
- **Multiple protections, high reliability**
 - ✧ Input over-voltage, over-current, over-charge protection
 - ✧ Output over-voltage, over-current, short-circuit protection
 - ✧ Battery overcharge, over discharge and overcurrent protection
 - ✧ Over temperature protection
 - ✧ Input / Output battery temperature protection
 - ✧ Input voltage up to 12V
 - ✧ 4kV ESD
- **Package size: ESSOP 10**

- **In-depth customization**

- ✧ I2C interface for flexible and low cost customized solution
- Custom Version :IP5316_I2C

2. Applications

- Power bank
- Mobile Phones, Smart Phones, Handheld Devices, Portable Media Player, Tablet

3. Description

IP5316 is a fully-integrated multi-function power management SoC. It integrates a boost converter, a Li battery charger management system and a battery state of charge indicate controller. It provides a complete power supply solution for mobile power banks.

IP5316 high integration and rich features make the minimized component number in application. It can effectively downsize the application and lower the BOM cost.

IP5316 only needs a single inductor to realize step-down and step-up which provides 2.4A output current. Conversion efficiency to 92%. It can switch to standby mode at light load automatically. standby current drops to 100uA.

IP5316 synchronous switching charger provides 2.4A charging current. Its efficiency is up to 92%. It regulates the charging current by IC temperature and input voltage.

Content

1. Features.....	1
2. Applications	1
3. Description.....	1
4. Reversion History.....	3
5. Simplified application	4
6. IP Series Products List.....	5
7. Pin Configuration and Functions	6
7.1 IP5316 Pin Functions	6
8. Block diagram	7
9. Absolute maximum ratings.....	8
10. Recommended operation conditions.....	8
11. Electrical Characteristics.....	8
12. Function description.....	11
12.1. Low power lock out and activation	11
12.2. Boost.....	11
12.3. Charge.....	12
12.4. TYPE_C.....	12
12.5. DCP Function	15
12.6. The phone is plugged in with auto-detection and light-load auto-standby.....	15
12.7 Battery level display for LED mode.....	16
12.8. KEY and lights	18
12.9. NTC function.....	18
12.10. I2C function.....	19
13. PCB Layout.....	20
13.1. Location of VOUT capacitor.....	20
13.2. Location of BAT capacitor.....	20
14. Typical Application Schematic.....	21
14.1. Application schematic	21
14.2. BOM list	22
15. IC Silk Screen Description	23
16. Package information.....	24
17. IMPORTANT NOTICE.....	26

4. Reversion History

Reversion V1.00 (August 2023)	Page
• Preliminary release.....	1
Reversion V1.10~V1.30 (January 2024)	Page
• Added feature descriptions.....	1
• Modify the schematic.....	1
Reversion V1.31 (March 2024)	Page
• Modify the electrical property parameters.....	1
Reversion V1.31 (May 2024)	Page
• Modify the electrical property parameters.....	1

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5. Simplified application

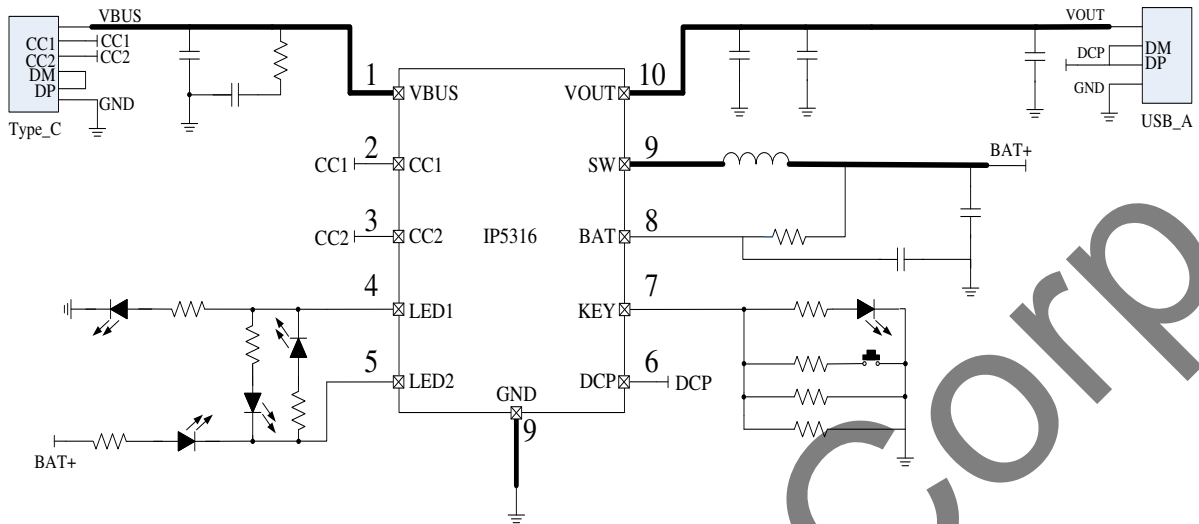


Figure 1 Simplified application (4 LEDs indicate battery level)

6. IP Series Products List

IC Part No.	Charge/Boost Power		Main feature								Package	
	Boost Power	Charge Power	LED number	I2C	DCP	USB C	QC	PD3.0 /PPS	Super charge	UF CS	Package	Compatibility
IP5303T	5V/1A	5V/1A	1,2	-	-	-	-	-	-	-	ESOP8	PIN2PIN
IP5305T	5V/1A	5V/1A	1,2,3,4	√	-	-	-	-	-	-	ESOP8	
IP5306	5V/2.4A	5V/2A	1,2,3,4	√	-	-	-	-	-	-	ESOP8	
IP5306H	5V/2.4A	5V/2A	1,2,3,4	√	-	-	-	-	-	-	ESOP8	
IP5306P	5V/2.1A	5V/2A	1,2,4	√	-	-	-	-	-	-	ESOP8	
IP5316	5V/2.4A	5V2.4A	1,2,4	√	√	√	-	-	-	-	ESSOP10	
IP5326	5V/2.4A	5V2.4A	1,2,4	√	√	√	-	-	-	-	QFN16	
IP5407	5V/2.4A	5V/2A	1,2,4	-	√	-	-	-	-	-	ESOP8	
IP5407H	5V/2.4A	5V/2.1A	1,2,4	-	√	-	-	-	-	-	ESOP8	
IP5209	5V/2.4A	5V/2.1A	3,4,5	√	√	-	-	-	-	-	QFN24	
IP5189T	5V/2.1A	5V/2A	1,2,3,4	√	√	-	-	-	-	-	QFN24	
IP5218	5V/1A	5V/1A	1,2,3,4	-	-	√	-	-	-	-	QFN16	
IP5219	5V/2.4A	5V/2A	1,2,3,4	√	-	√	-	-	-	-	QFN24	
IP5310	5V/3.1A	5V/2.6A	1,2,3,4	√	√	√	-	-	-	-	QFN32	
IP5506	5V/2.4A	5V/2A	Nixie Tube	-	-	-	-	-	-	-	ESOP16	
IP5508	5V/2.4A	5V/2A	Nixie Tube	-	√	-	-	-	-	-	QFN32	
IP5509	5V/2.4A	5V/2.4A	Nixie Tube	-	√	√	-	-	-	-	QFN28	
IP5320	5V/3.1A	5V/2.6A	Nixie Tube	√	√	√	-	-	-	-	QFN28	
IP5330	5V/3.1A	5V/2.6A	Nixie Tube	-	√	√	-	-	-	-	QFN32	
IP5328P	20W	18W	1,2,3,4	√	√	√	√	√	-	-	QFN40	
IP5353	22.5W	18W	4	√	√	√	√	√	√	-	QFN32	
IP5355	22.5W	18W	4	√	√	Double Lines	√	√	√	-	QFN32	
IP5356	22.5W	18W	Nixie Tube	√	√	Double Lines	√	√	√	-	QFN40	PIN2PIN
IP5356H	22.5W	18W	Nixie Tube	√	√	Double Lines	√	√	√	-	QFN40	
IP5356M	22.5W	18W	Nixie Tube	√	√	Double Lines	√	√	√	-	QFN40	
IP5358	22.5W	18W	Nixie Tube	-	√	√	√	√	√	-	QFN48	
IP5365	22.5W	18W	Nixie Tube	√	√	Triple Lines	√	√	√	√	QFN48	
IP5568	22.5W	18W	Nixie Tube	-	√	√	√	√	√	-	QFN64	
IP5568U	22.5W	18W	Nixie Tube	-	√	√	√	√	√	-	QFN64	
IP5385	65W	65W	Nixie Tube	√	√	Double Lines	√	√	√	√	QFN48	
IP5386	45W	45W	Nixie Tube	√	√	Double Lines	√	√	√	-	QFN48	
IP5389	100W	100W	Nixie Tube	√	√	Double Lines	√	√	√	-	QFN64	
IP5389H	100W	100W	Nixie Tube	√	√	Double Lines	√	√	√	-	QFN64	

Order the model

Order the model	Description
IP5316_BZ	Standards, Support 4 LEDs
IP5316_2D1D	Support 2 LEDs and 1 LED
IP5316_I2C	Support IIC communication

7. Pin Configuration and Functions

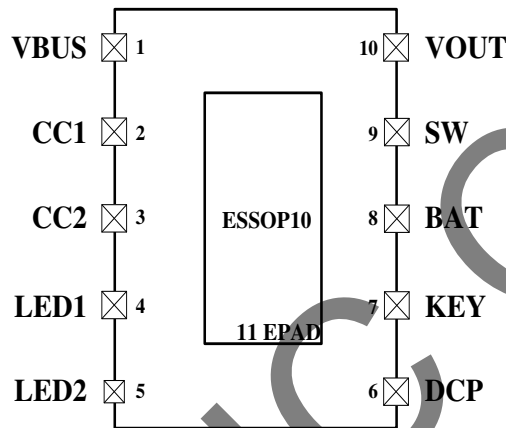


Figure 2 IP5316 Top View

7.1 IP5316 Pin Functions

名称	序号	描述
VBUS	1	Type_C port input/output PIN
CC1	2	USB_C CC1
CC2	3	USB_C CC2
LED1	4	Battery level display drive pin LED1/I2C SCL PIN
LED2	5	Battery level display drive pin LED2; I2C SDA PIN
DCP	6	USB_A DP PIN ,Connect the DPDM of the USB_A/INT PIN
KEY	7	Key detection pin, reusable as WLED flashlight and NTC PIN
BAT	8	Connect the battery positive, battery-powered node PIN
SW	9	DCDC switch node, connect inductor
VOUT	10	DCDC 5V output PIN
PowerPAD	11(EPAD)	GROUND

8. Block diagram

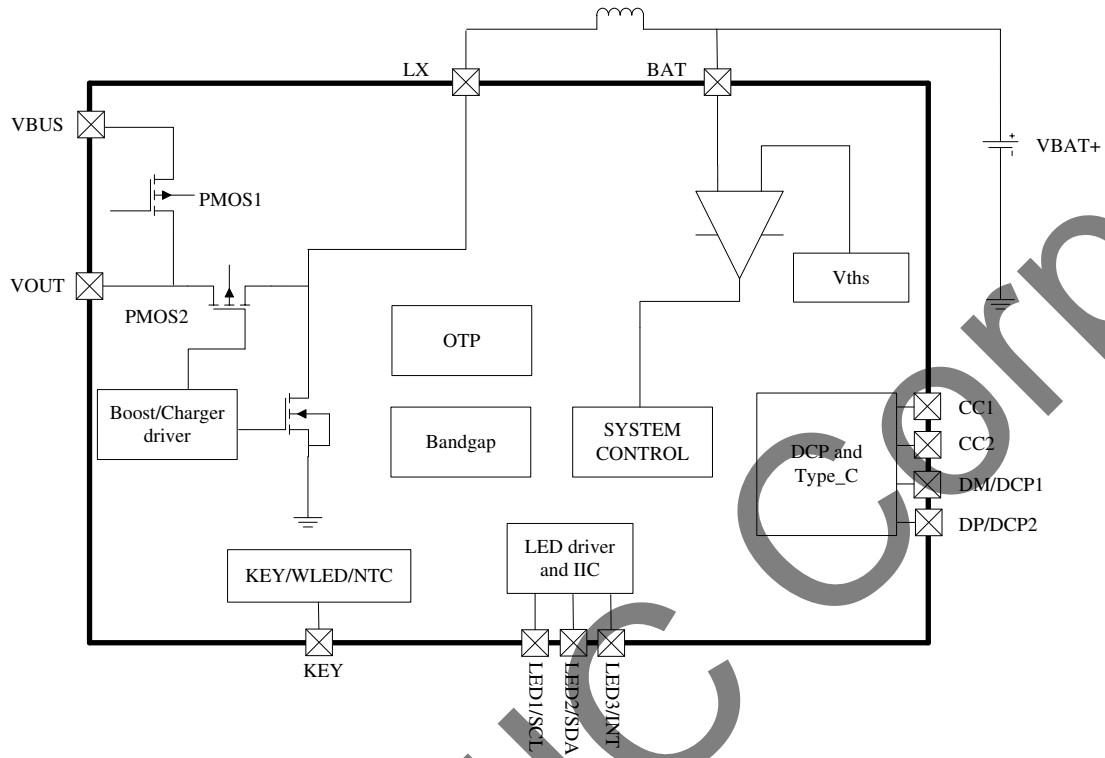


Figure 3 IP5316 block diagram

9. Absolute maximum ratings

Parameter	symbol	value	Unit
Port input voltage range	V_{IN}	-0.3 ~ 7	V
Junction temperature	T_J	-40 ~ 150	°C
Storage temperature	T_{stg}	-60 ~ 150	°C
Thermal resistance (from junction to ambient air)	θ_{JA}	50	°C/W
Human-body model (HBM)	ESD	4	kV

*Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.

Exposure to Absolute Maximum Rated conditions for extended periods may affect device reliability.

*Voltages are referenced to GND unless otherwise noted.

10. Recommended operation conditions

Parameter	symbol	MIN	Typical	MAX	Unit
Input voltage	V_{BUS_IN}	4.65	5	5.50	V
Load current	I	0	2.40		A
Operating ambient temperature	T_A	0	--	70	°C

* Devices' performance cannot be guaranteed when working beyond those Recommended Operating Conditions.

11. Electrical Characteristics

Unless otherwise specified, $T_A=25^\circ\text{C}$, $L=2.2\mu\text{H}$

Parameter	symbol	Test condition	MIN	TYP	MAX	Unit
Charger system						
Input voltage	V_{BUS_IN}	$V_{BAT}=3.7V$	4.65	5.00	5.50	V
Input voltage OVP	V_{BUS_INOV}		5.51	5.60	5.80	V
Input voltage UVP	V_{BUS_INUV}		4.40	4.50	4.60	V
CV charge voltage	$CV_{4.2V}$	$V_{SET}=4.20V$	4.19	4.22	4.25	V
	$CV_{4.3V}$	$V_{SET}=4.30V$	4.29	4.32	4.35	V
	$CV_{4.35V}$	$V_{SET}=4.35V$	4.34	4.37	4.39	V
	$CV_{4.4V}$	$V_{SET}=4.40V$	4.39	4.42	4.45	V
stop charge current	I_{stop}	$V_{BUS_IN}=5V$		150		mA

Charge current	I_{VBUS}	Current at the VIN path	2.10	2.40	2.70	A
Trickle charge current	I_{TRKL}	$V_{BUS}=5v, BAT=2.7v$	150	250	350	mA
		$V_{BUS}=5v, BAT=1.0v$	30	70	90	mA
Trickle charge stop voltage	V_{TRKL}		2.95	3	3.15	V
Recharge threshold	V_{RCH}		4.10	4.15	4.18	V
Charger safety timer	T_{END}			36		Hour
Boost system						
Battery operation voltage	V_{BAT}		2.95	3.70	4.40	V
Battery low protection voltage	V_{BATLOW}	$I_{OUT}=1A$		3.0		V
Battery operation current	I_{BAT}	$V_{BAT}=3.0V, V_{OUT}=5.0V, fs=500kHz$	2	5	20	mA
DC-DC output voltage	V_{OUT}	$V_{BAT}=3.7V @0A$	5.00	5.12	5.25	V
		$V_{BAT}=3.7V @2.4A$	4.75	5	5.15	V
Output voltage ripple	ΔV_{OUT}	$V_{BAT}=3.7V, V_{OUT}=5.0V, fs=500kHz$	50	100		mV
Boost output current	I_{out}			2.40		A
Boost output shutdown current	I_{OVP}	$V_{BAT}=3.7V$		2.80		A
Load over-current detect timer	T_{UVD}	Output voltage continuously lower than 4.2V		32		ms
Load short-circuit detect timer	T_{OCD}	Output current continuously larger than 5A		12		μs
Control system						
Switching frequency	fs	Boost switching frequency	400	500	600	kHz
		Charger switching frequency	600	750	850	kHz
PMOS on resistance	$r_{DS(on)}$	$V_{BAT}=3.7V$	30	35	45	m Ω
NMOS on resistance		$V_{BAT}=3.7V$	20	25	35	m Ω
VBUS and VOUT PMOS	$r_{DS(on)}$	$V_{IN}=5V$		40		m Ω
Input voltage OCP	I_{IDOC}	$V_{IN}=5V$		4.30		A
Battery standby current	I_{STB}	$V_{IN}=0V, V_{BAT}=3.7V$		60		μA
LED lighting current	I_{light}		20	30	40	mA
LED indicator current	I_{L1}		2	10	20	mA
	I_{L2}					

	I_{L3}					
Load removal detect timer	T_{loadD}	Load current continuously lower than 40mA	25	32	44	s
Light load shutdown current	I_{plout}	VABT=3.7V	20	50	80	mA
Push-button wake-up timer	$T_{OnDebounce}$		70	100	500	ms
Push-button light-on timer	$T_{Keylight}$		2	2.50	3.50	s
Thermal shutdown	T_{OTP}	Rising temperature	110	120	135	°C
Thermal shutdown hysteresis	ΔT_{OTP}		30	40	50	°C

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12. Function description

12.1 Low power lock out and activation

When IP5316 is connected to the battery for the first time, the chip is locked, and the lowest position of the power lamp will flash for 4s. In the non-charging state, if the battery voltage is too low and triggers a low-power shutdown, the IP5316 will also enter the locked state.

In order to reduce static power consumption, the IP5316 does not support the mobile phone insertion detection function when the chip is locked, and it cannot be powered on by pressing the button. At this time, the button action cannot turn on the boost output, but the lowest position of the power light will flash for 4s to prompt.

When the chip is locked, there must be a charging action to activate the chip function.

12.2 Boost

IP5316 integrates a 5V output step-up DCDC converter with 2.4A output capacity. It works at 500 kHz. When input battery voltage is 4.2V, its efficiency is 92% with the output of 5V@2.4A. Internal soft-start circuit prevents malfunction caused by starting inrush current. It integrate short-circuit, over- current, over-voltage protection, making the system stable and reliable.

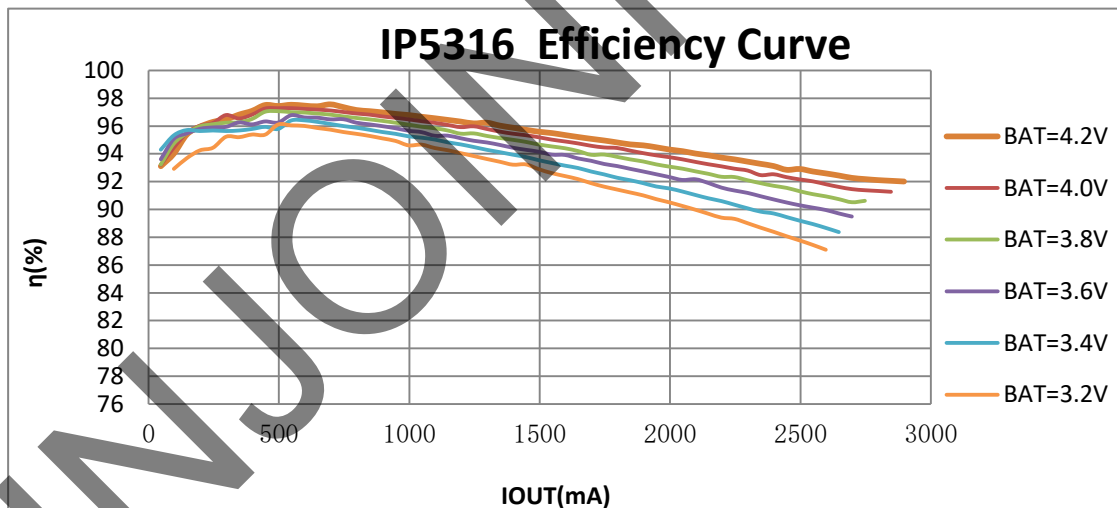


Figure 4 IP5316 Efficiency Curve

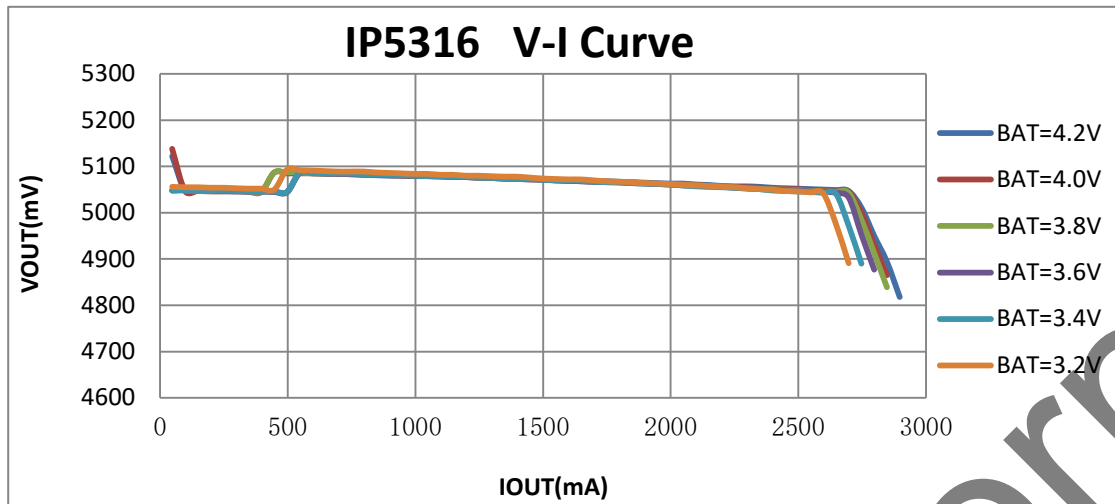


Figure 5 IP5316 V-I Curve

12.3. Charge

IP5316 integrates trickle, constant current, and constant voltage charge management. When the battery voltage is less than 2.20V, 70mA trickle charging is used, when the battery voltage is less than 3.0V, 250mA trickle charging is used, when the battery voltage is greater than 3.0V, it enters constant current charging, and then the VIN input current limiting loop works, and when the battery voltage is greater than 4.2V, it enters constant voltage charging. After charging is complete, if the battery voltage decreases by 50mV, restart battery charging.

IP5316 adopts switching charging technology, charging switching frequency of 750kHz, maximum charging current of 2.4A, charging efficiency up to 92%, can shorten the charging time by 3/4. IP5316 supports adaptive power path management and supports charging and discharging.

12.4. TYPE_C

IP5316 integrates Type_C input and output identification interfaces, and can automatically identify the charging and discharging properties of plugged devices by automatically switching the built-in pull-up resistor. And with the Try.SRC function, when connected to the other party is a DRP device, it can give priority to the other party's charging.

When operating as a DFP, the CC pin is configured to output 1.5A current capability information externally, and when operating as a UFP, the output current capability of the other party can be identified.

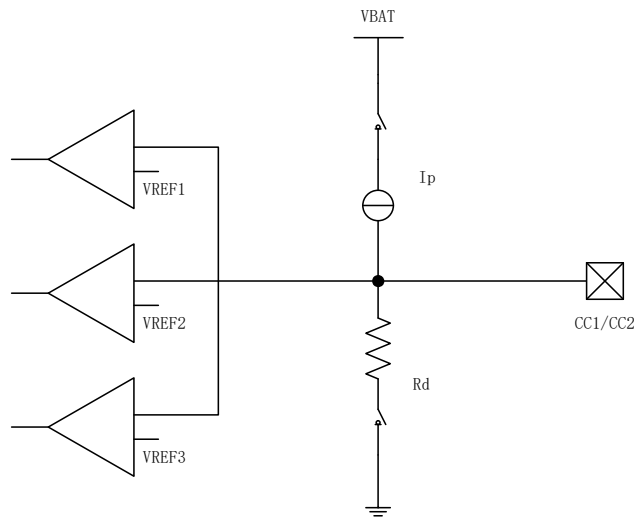


Figure 6 CC internal circuit

Chart 1 Pull-up and pull-down ability

Name	Value
Ip	180 μ A
Rd	5.1k Ω

Chart 2 Comparator Threshold of pull-up Ip

	Minimum Voltage	Maximum Voltage	Threshold
Powered cable/adaptor (vRa)	0.00V	0.75V	0.80V
Sink (vRd)	0.85V	2.45V	2.60V
No connect(vOPEN)	2.75V		

Chart 3 Comparator Threshold of Pull-down Resistor Rd

Detection	Min voltage	Max voltage	Threshold
vRa	-0.25V	0.15V	0.20V
vRd-Connect	0.25V	2.04V	
vRd-USB	0.25V	0.61V	0.66V
vRd-1.5	0.70V	1.16V	1.23V
vRd-3.0	1.31V	2.04V	

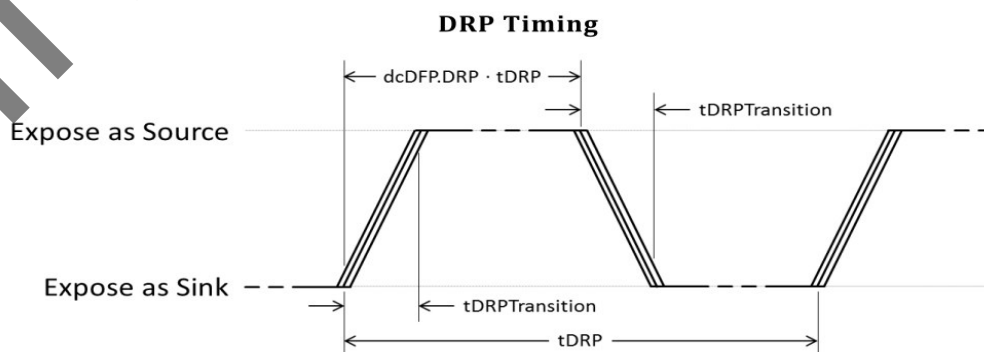


Figure 7 Type_C detects cycle

Chart 4 Type_C detects cycle

	Minimum	Maximum	Description
tDRP	50ms	100ms	The period a DRP shall complete a Source to Sink and back advertisement
dcSRC.DRP	30%	70%	The percent of time that a DRP shall advertise Source during tDRP
tDRPTransition	0ms	1ms	The time a DRP shall complete transitions between Source and Sink roles during role resolution
tDRPTry	75ms	150ms	Wait time associated with the Try.SRC state
tDRPTryWait	400ms	800ms	Wait time associated with the Try.SNK state

Connection State Diagram: DRP with Accessory and Try.SRC Support

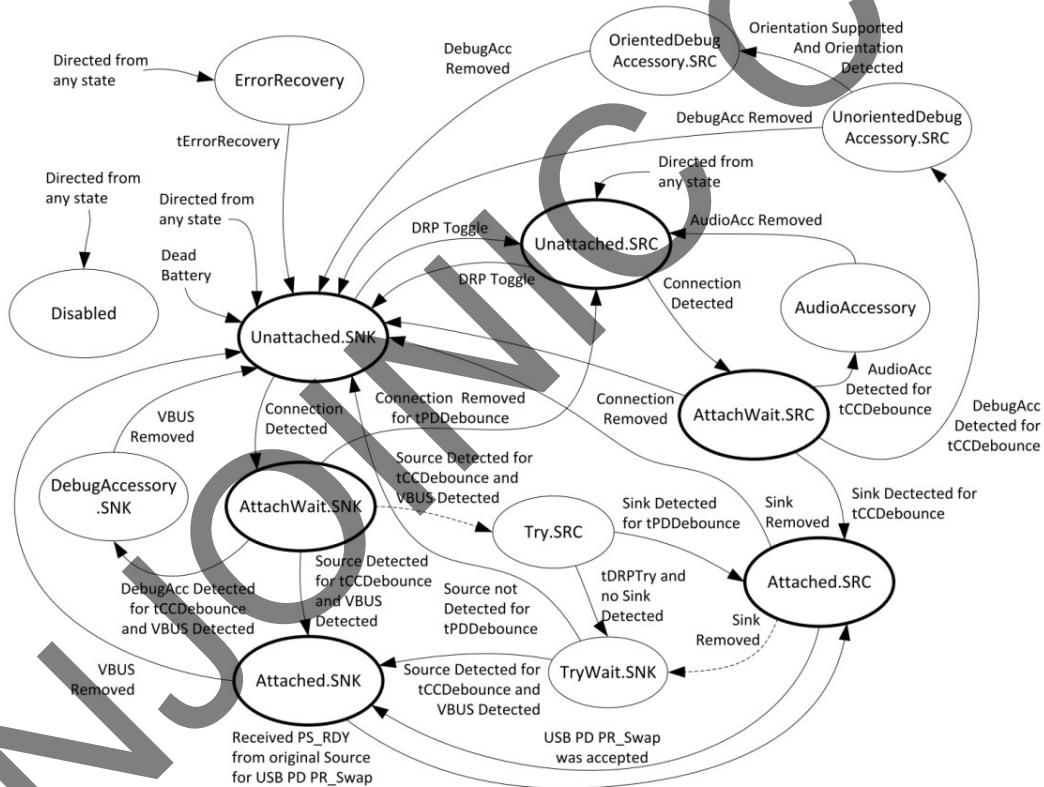


Figure 8 Type_C detects state transition

12.5. DCP Function

IP5316 integrates the intelligent identification function of mobile phone charging current, which automatically switches DP and DM line connections for connected mobile phone devices, so that the mobile phone charging current can be adapted to the maximum value and speed up the charging speed of mobile phones.

IP5316 supports Apple, Samsung and BC1.2 interface specifications DP, DM switching, default DP=2.7V, DM=2.7V.

Dedicated USB charging port with DP,DMshort connect.

Support DM application 2.7V voltage, DP application 2.7V voltage Apple 2.4A charging port.

12.6. The phone is plugged in with auto-detection and light-load auto-standby

IP5316 support auto detection on sink device/phone attachment/plug in, once the attachment is detected, the boost will be turned on charging the sink device / phone, so non-key solution are supported.

IP5316 supports light-load automatic standby, when the load current of the VOUT terminal is less than 50mA and lasts for 32s, it will automatically enter the standby state.

IP5316 supports Type_C port CC5.1K pull-down and output port normally open. When the output current is less than 50mA and lasts for 32s, the output port will continue to be normally open and automatically enter the low-power mode, and the power indicator will be turned off.

12.7 Battery level display for LED mode

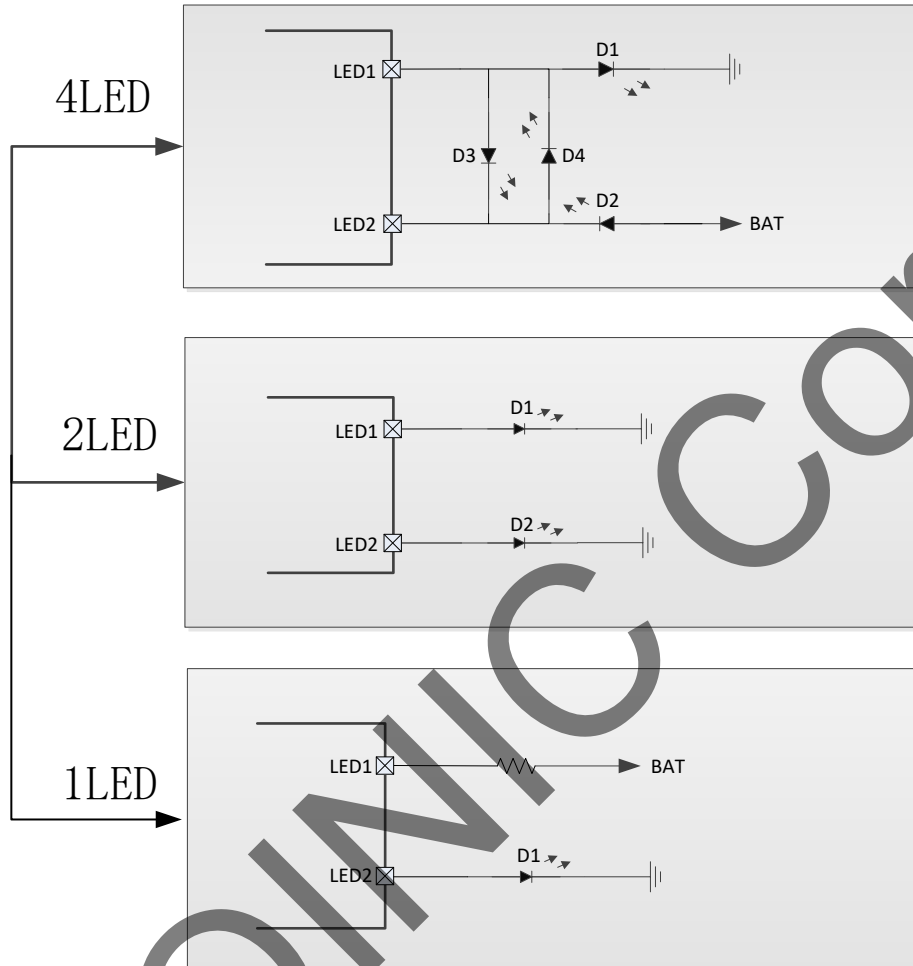


Figure 9 4/2/1 LED PIN configuration

■ 4 LED mode

Chart 5 Discharging mode, 4 LEDs as the indicator

SOC (%)	D1	D2	D3	D4
SOC≥75%	ON	ON	ON	ON
50%≤SOC<75%	ON	ON	ON	OFF
25%≤SOC<50%	ON	ON	OFF	OFF
3%≤SOC<25%	ON	OFF	OFF	OFF
0%<SOC<3%	1.0Hz Flash	OFF	OFF	OFF
SOC=0%	OFF	OFF	OFF	OFF

Chart 6 Charging mode 4 LEDs as the indicator

SOC (%)	L1	L2	L3	L4
Full	ON	ON	ON	ON
75%≤SOC	ON	ON	ON	0.5Hz Flash
50%≤SOC<75%	ON	ON	0.5Hz Flash	OFF
25%≤SOC<50%	ON	0.5Hz Flash	OFF	OFF
SOC<25%	0.5Hz Flash	OFF	OFF	OFF

■ 2 LED Mode

Chart 7 Charging/ Discharging mode 2 LEDs as the indicator

	state	D1	D2
Charging	In charging	ON	OFF
	End of Charge	OFF	OFF
Boost	In discharging	OFF	ON
	Low Battery	OFF	1.0Hz Flash

■ 1 LED Mode

Chart 8 Charging/ Discharging mode 1 LED as the indicator

	state	LED1
Charging	In charging	0.5Hz Flash
	End of Charge	ON
Boost	In discharging	ON
	Low Battery	1.0Hz Flash

12.8. KEY and lights

IP5316 can recognize short press or long press operation.

- If the duration of the button is longer than 100ms, but less than 2s, it is a short press action, and the short press will turn on the power indicator and boost output.
- If the light is on, press and hold into standby, the light will remain on, and the light will be turned off when double-clicked.
- Buttons less than 30ms will not have any response.
- Pressing the button twice in a row within 1s will turn the light on or off.
- Long press for 10s to reset the whole system.

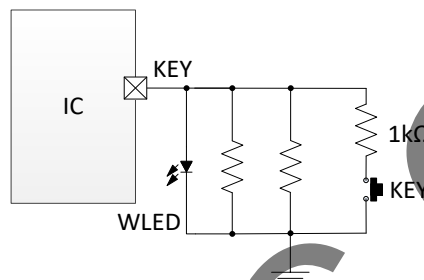


Figure 10 Key and lighting circuits

12.9. NTC function

IP5316 integrated NTC function, which can detect battery temperature; When IP5316 is working, the NTC pin and the KEY pin, and the WLED pin are time-sharing multiplexed on the KEY pin, and the KEY/WLED/NTC function is realized by time-sharing multiplexing. The KEY PIN outputs 20 μ A of current, and an external NTC resistor generates a voltage, and the voltage of the NTC pin is detected inside the chip to determine the temperature of the current battery. The output current is 20uA with 82k Ω resistor and 100k Ω thermistor.

If the NTC function is not required, the RNTC resistor and the 82k Ω resistor can be omitted, and the RNTC resistor can be replaced with a 51k Ω resistor ground.

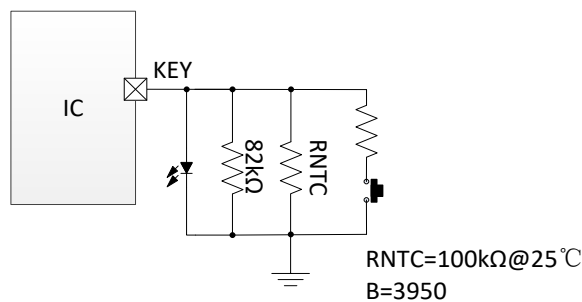


Figure 11 Battery temperature detection

In the state of charge:

When the NTC voltage is lower than 0.56V, it means the battery temperature is higher than 45°C, the charging is stopped.

When the NTC voltage is higher than 1.32V, it means the battery temperature is lower than 0°C, the charging is stopped.

In the state of discharge:

When the NTC voltage is lower than 0.49V, it means the battery temperature is higher than 55°C, the discharging is stopped.

When the NTC voltage is higher than 1.52V, it means the battery temperature is lower than -20°C, the discharging is stopped.

Tip:

The above temperature range refers to the NTC resistor ZL104FBXV050 (B=3950), which is different from other models and needs to be adjusted.

12.10. I2C function

I2C Connection:

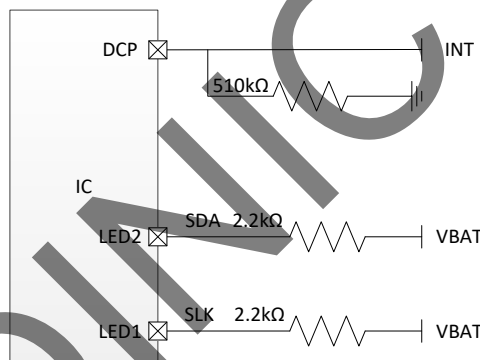


Figure 12 I2C application circuit diagram

The IP5316_I2C series supports I2C connection, and the connection will automatically enter I2C mode according to the corresponding method.

When connected to I2C mode, the INT signal is in a high-impedance state during standby and a high-level state during operation, which can be used to wake up the MCU.

13. PCB Layout

Here below lists essential precautions that may affect the function and performance on PCB layout, more details will be attached in another document if any.

13.1. Location of VOUT capacitor

IP5316, the position of the capacitor on the VOUT network will affect the stability of DCDC operation. The capacitor on the VOUT network needs to be as close as possible to the VOUT pin and EPAD of the IC, and the copper is laid in a large area, and more vias are added to reduce the area of current circulation between the capacitor and the IC, and reduce the parasitic parameters.

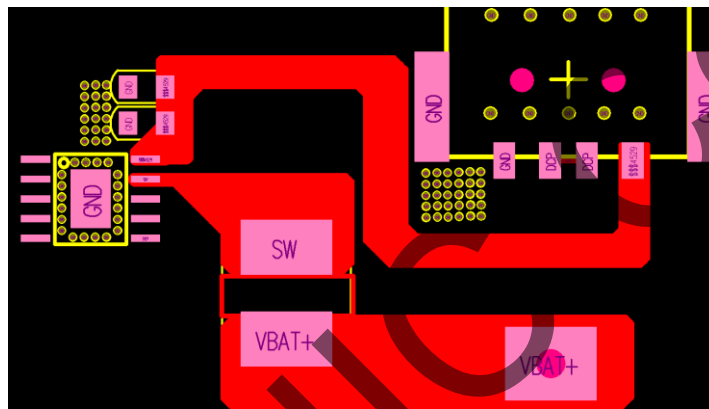


Figure 13 Location of VOUT capacitor

13.2. Location of BAT capacitor

IP5316, the position of the capacitor on the BAT pin will affect the stability of DCDC operation. The capacitor on the BAT pin should be placed in the path where the BAT current flows. The RC of the BAT pin is routed separately to the VBAT capacitor, not directly sampled to the inductor terminal, as shown in the blue line in Figure 14

The resistor of the RC circuit on the BAT pin, R12 in Figure 14, is recommended in the 0805 package.

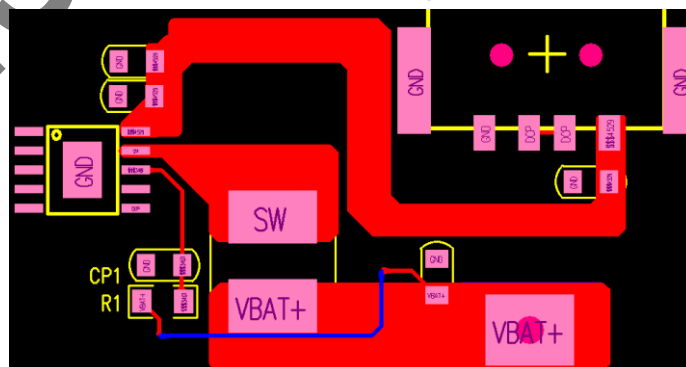


Figure 14 Location of BAT capacitor

14. Typical Application Schematic

14.1. Application schematic

IP5316 only needs capacitors, resistors, and inductors to realize a full featured power bank solution.

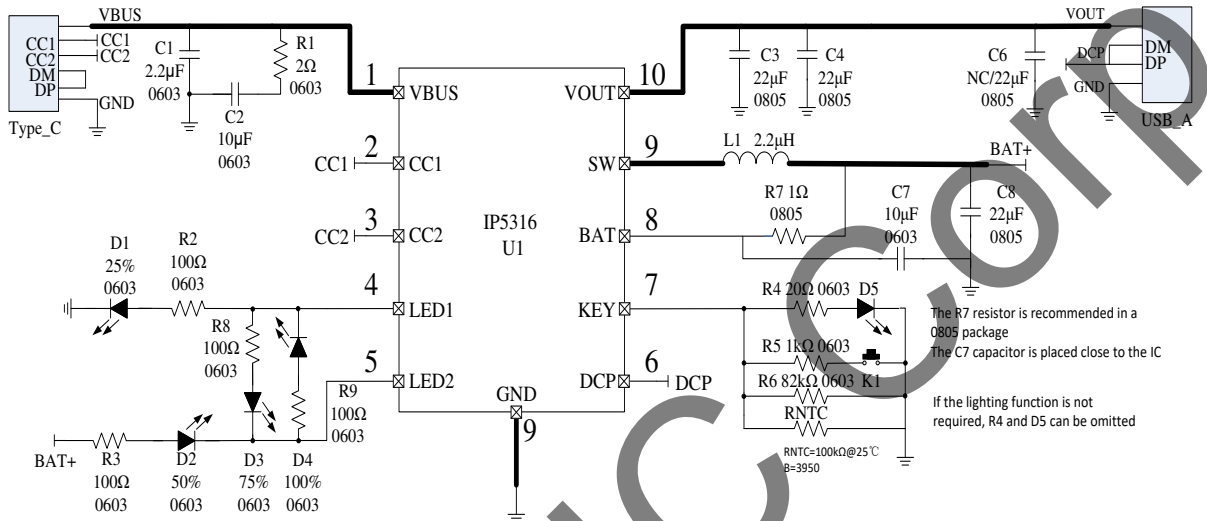


Figure 15 4 LEDs SOC indicator typical application schematic

14.2. BOM list

Recommended inductance model:

FXL0630-2R2-M

DARFON PIN	Inductance (μ H)	Tolerance	DC Resistance (m Ω)		Heat Rating Current DC Amp.	Saturation Current DC Amps.	Measuring Condition
			Typ.	Max.	Idc(A)Max.	Isat(A)Max.	
FXL0630-2R2-M	2.2	$\pm 20\%$	13.5	15.0	9.50	10	

No.	Part Name	Type	Location	Num	Note
1	SMT IC	ESSOP10 IP5316	U1	1	
2	SMT capacitor	0603 2.2 μ F 10% 16V	C1	1	
3	SMT capacitor	0603 10 μ F 10% 16V	C2	1	
4	SMT capacitor	0805 22 μ F 10% 16V	C3 C4	2	
5	SMT capacitor	NC/0805 22 μ F 10% 16V	C6	1	
6	SMT capacitor	0603 10 μ F 10% 16V	C7	1	
7	SMT capacitor	0805 22 μ F 10% 16V	C8	1	
8	SMT resistor	0603 2 Ω 1%	R1	1	
9	SMT resistor	0603 100 Ω 1%	R2 R3 R8 R9	4	
11	SMT resistor	0603 20 Ω 1%	R4	1	
12	SMT resistor	0603 1k Ω 1%	R5	1	
13	SMT resistor	0603 82k Ω 1%	R6	2	
14	SMT resistor	0805 1 Ω 1%	R7	1	
15	NTC THERMAL resistor	100k Ω @25 $^{\circ}$ C (B=3950)	RNTC	1	
16	SMT Inductance	2.2 μ H	L1	1	
17	SMT LED	0603	D1 D2 D3 D4	4	
18	USB_C	USB C 座子	USB-C	1	
19	USB_A	SMT USB	USB_A	1	
20	LED	5MM LED	D5	1	
21	KEY	SMT 3*6 KEY	K1	1	

15. IC Silk Screen Description

TOP Marking



Description:



- 1、  --Injoinic Logo
- 2、 IP5316 --Part Number
- 3、 LLLLLLLL --Manufacture lot number
- 4、  --Pin1 location

Figure 16 IP5316 Marking described

16. Package information

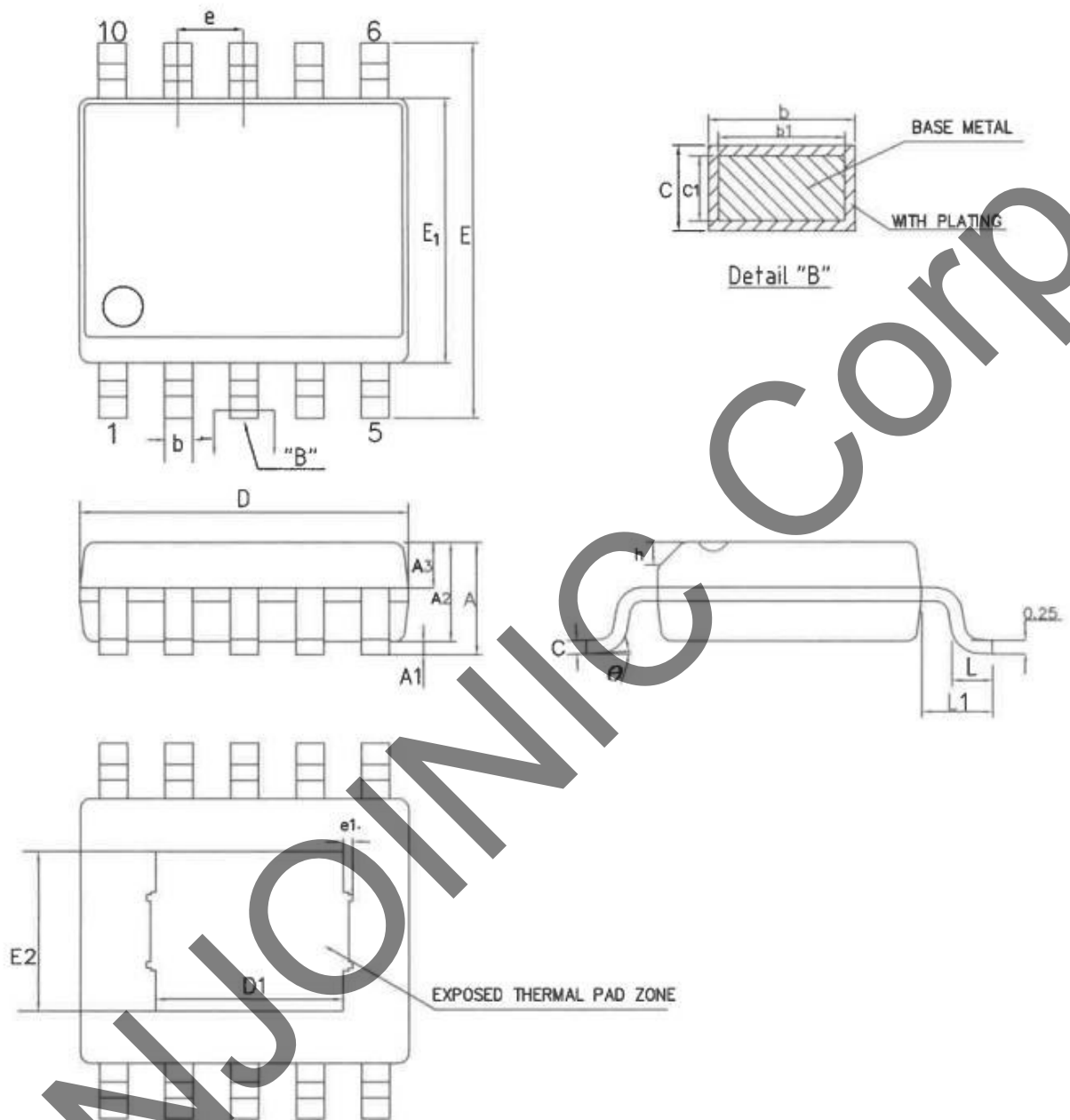


Figure 17 Package size

Chart 11 Packaging information size table

SYMBOL	MIN	NOM	MAX	
A	---	---	1.65	
A1	0.05	---	0.15	
A2	1.30	1.40	1.50	
A3	0.60	0.65	0.70	
b	0.23	---	0.30	
b1	0.22	0.25	0.28	
c	0.20	---	0.24	
c1	0.19	0.20	0.21	
D	4.80	4.90	5.00	
E	5.80	6.00	6.20	
E1	3.80	3.90	4.00	
e	1.0750BSC			
h	0.25	---	0.50	
L	0.50	0.60	0.80	
L1	1.05REF			
θ	0°	---	8°	
Size(mm)	D1	E2	e1	
L/F Size(mil)	130*95(mil)	3.10REF	2.21REF	0.10REF

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