JIANGSU CHANGJING ELECTRONICS TECHNOLOGY CO., LTD.

Ultra Fast Response High PSRR and Inrush Current Protection LDO

CJ6214 Series Low-dropout Regulators

1 Introduction

The CJ6214 series is a High speed LDO regulator that features high accuracy, low noise, high ripple rejection, low dropout and low power consumption. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit. The inrush current protection limits the inrush current from input pin (V_{IN}) to output pin (V_{OUT}) to charge C_{OUT} capacitor.

The output can be turned off by controlling the EN pin on the chip, and the power consumption after turning off is only below 0.1 μA.

The CJ6214 series provides a fixed voltage version with multiple output voltage points for selection. The fixed voltage version does not require external resistors, and the CJ6214 series can use ceramic capacitors.

2 Available Packages

PARTNUMBER	PACKAGE
CJ6214 Series	SOT-23
	SOT-23-3L
	SOT-23-5L
	DFNWB1×1-4L

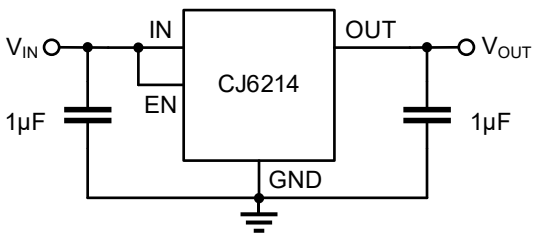
Note: For all available packages, please refer to the part *Orderable Information*.

3 Features

- Power Supply Rejection Ratio:
  90dB@1kHz
  75dB@10kHz
- Output Noise Voltage:
  30 × V_{OUT} μV_{RMS} (10Hz ~ 100kHz)
- Inrush Current Protection
- Input Voltage Range: 1.8V ~ 5.5V
- Fixed Output Voltage:
  Available from 1.0V to 5.0V
- Output Tolerance: ±1%
- Output Current: up to 300mA
- Dropout Voltage: 135mV@300mA
- Output active discharge
- Enable Control
- Complete protection:
  Current limiting protection
  Thermal Shutdown

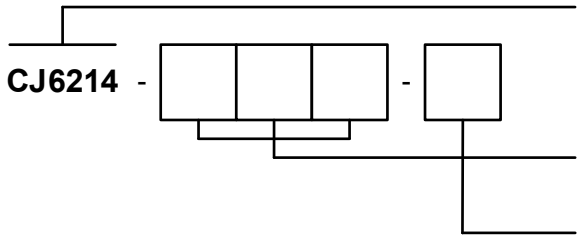
4 Applications

- Battery-powered Equipment
- Cellular and Smart Phones
- Digital Still and Video Cameras
- Laptop, Palmtops and PDA
- Portable Audio Video Equipment
- Radio Control System



Typical Application Circuit

5 Orderable Information



Device serial number.

Package type.
N3N: SOT-23
M3N: SOT-23-3L
M5N: SOT-23-5L
DAN: DFNWB1×1-4L

Output voltage.
1.2: Fixed output 1.2V
1.8: Fixed output 1.8V
2.5: Fixed output 2.5V
2.8: Fixed output 2.8V
3.0: Fixed output 3.0V
3.3: Fixed output 3.3V

Figure 5-1. Naming Conventions

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
3 Pins Packaged Products							
CJ6214-1.2	CJ6214-M3N-1.2	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-1.8	CJ6214-M3N-1.8	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-2.5	CJ6214-M3N-2.5	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-2.8	CJ6214-M3N-2.8	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-3.0	CJ6214-M3N-3.0	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-3.3	CJ6214-M3N-3.3	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
4 Pins Packaged Products							
CJ6214-1.2	CJ6214-DAN-1.2	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Active
CJ6214-1.8	CJ6214-DAN-1.8	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Active
CJ6214-2.5	CJ6214-DAN-2.5	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Active
CJ6214-2.8	CJ6214-DAN-2.8	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Active
CJ6214-3.0	CJ6214-DAN-3.0	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Active
CJ6214-3.3	CJ6214-DAN-3.3	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Active

5 Orderable Information (continued)

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
5 Pins Packaged Products							
CJ6214-1.2	CJ6214-M5N-1.2	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-1.8	CJ6214-M5N-1.8	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-2.5	CJ6214-M5N-2.5	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-2.8	CJ6214-M5N-2.8	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-3.0	CJ6214-M5N-3.0	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJ6214-3.3	CJ6214-M5N-3.3	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
Customized Products							
Output available from 1.0V to 5.0V	CJ6214-N3N-x.x	SOT-23	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Customized
	CJ6214-M3N-x.x	SOT-23-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Customized
	CJ6214-DAN-x.x	DFNWB1×1-4L	-40 ~ 125°C	RoHS & Green	Level 1 Infinite	Tape and Reel 10000 Units / Reel	Customized
	CJ6214-M5N-x.x	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Customized
Others	-	-	-	-	-	-	Customized

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:

Active: Recommended for new products;

Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

Obsolete: The device has been discontinued.

6 Pin Configuration and Marking Information

6.1 Pin Configuration

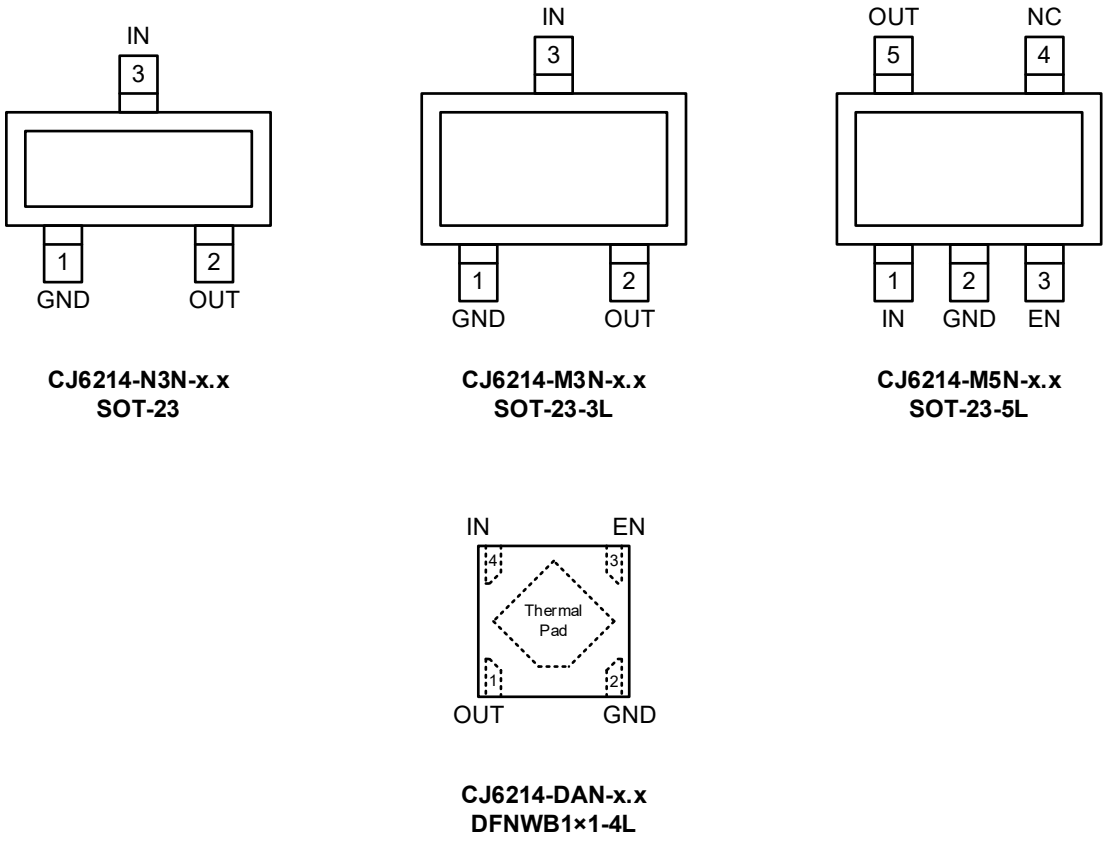


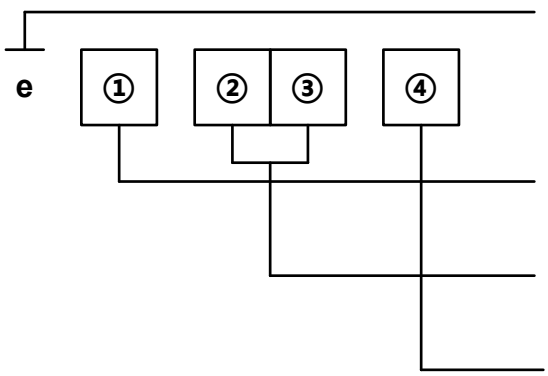
Figure 6-1. Package Top View (Not to Scale)

6.2 Pin Function

PIN NAME	I/O	CJ6214 Series Pin Function
		DESCRIPTION
OUT	O	Output of the regulator. An output capacitor is required for stability and help device obtain the best transient response. Use the capacitor with the recommended value and place it as close as possible to the output.
GND	-	Ground.
EN	I	Enable pin. Driving this pin to logic high enables the device; driving this Pin to logic low disables the device. Float this pin，disables the device.
IN	IN	Input to the device. Use the recommended value of the input capacitor and place it as close to the input of the device as possible to reduce the impedance.
NC	-	No internal connection. This pin can float, but when this pin is connected to GND, the device has better thermal performance.
Thermal Pad	-	Connect the thermal pad to a large-area ground plane. The thermal pad is internally connected to GND.

6 Pin Configuration and Marking Information

6.3 Marking Information



Serial code for CJ6214 series.

Representative output voltage.
B: Fixed output 1.2V F: Fixed output 2.8V
D: Fixed output 1.8V G: Fixed output 3.0V
E: Fixed output 2.5V H: Fixed output 3.3V

(Other products are customized)

Code, indicates weekly record information of production.

Code, special pin arrangement sequence.
(blank): Normal

Figure 6-2. Marking Rule

Output Voltage	Marking Information for CJ6214 Series			
	3-Pins Packages		4-Pins Packages	5-Pins Packages
	SOT-23	SOT-23-3L	DFNWB1×1-4L	SOT-23-5L
1.2V	-	CJ6214-M3N-1.2: **eB**XX	CJ6214-DAN-1.2: **eB**XX	CJ6214-M5N-1.2: **eB**XX
1.8V	-	CJ6214-M3N-1.8: **eD**XX	CJ6214-DAN-1.8: **eD**XX	CJ6214-M5N-1.8: **eD**XX
2.5V	-	CJ6214-M3N-2.5: **eE**XX	CJ6214-DAN-2.5: **eE**XX	CJ6214-M5N-2.5: **eE**XX
2.8V	-	CJ6214-M3N-2.8: **eF**XX	CJ6214-DAN-2.8: **eF**XX	CJ6214-M5N-2.8: **eF**XX
3.0V	-	CJ6214-M3N-3.0: **eG**XX	CJ6214-DAN-3.0: **eG**XX	CJ6214-M5N-3.0: **eG**XX
3.3V	-	CJ6214-M3N-3.3: **eH**XX	CJ6214-DAN-3.3: **eH**XX	CJ6214-M5N-3.3: **eH**XX

7 Specifications

7.1 Absolute Maximum Ratings

(T_A = 25°C, unless otherwise specified)(1)

CHARACTERISTIC			SYMBOL	VALUE	UNIT
Input voltage range(2)			V_{IN}	-0.3 ~ 6.0	V
Output voltage range(2)			V_{OUT}	Vss-0.3 ~ V_{IN} + 0.3 ≤ 6	V
Enable、BIAS input voltage range(2)			V_{EN},V_{BIAS}	Vss-0.3 ~ V_{IN} +0.3	V
Maximum power dissipation	CJ6214 Series	SOT-23	$P_{D\ Max}$	Internally Limited(3)	W
		SOT23-3L			
		DFNWB1×1-4L			
		SOT-23-5L			
Maximum junction temperature			T_J	150	℃
Storage temperature			T_{STG}	-40 ~ +150	℃
Soldering temperature & time			T_{solder}	260℃, 10s	-

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

(2) All voltages are with respect to network ground terminal.

(3) Refer to *Thermal Information* for details.

7.2 Recommended Operating Conditions

PARAMETER	SYMBOL	MIN.	NOM.	MAX.	UNIT
Input voltage	V_{IN}	1.8		5.5	V
Operating junction temperature	T_J	-40		125	°C

7.3 ESD Ratings

ESD RATINGS		SYMBOL	VALUE	UNIT
Electrostatic discharge(4)	Human body model	$V_{ESD-HBM}$	2000	V

(4) ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body model (HBM) electrostatic discharge test is based on the JS-001-2017 test standard, using a 100pF capacitor and discharging to each pin of the device through a resistance of 1.5kΩ.

7 Specifications

7.4 Thermal Information

THERMAL METRIC(5)	SYMBOL	CJ6214 Series		UNIT
Junction-to-ambient thermal resistance	$R_{\Theta JA}$	**DFNWB1×1-4L**	**SOT-23-5L**	°C/W
		220.0	249.5	
		SOT-23	**SOT23-3L**	
		-	260	
Junction-to-case thermal resistance	$R_{\Theta JC}$	**DFNWB1×1-4L**	**SOT-23-5L**	°C/W
		115.8	64.8	
		SOT-23	**SOT23-3L**	
		-	67.2	
Reference maximum power dissipation for continuous operation	$P_{D\ Ref}$	**DFNWB1×1-4L**	**SOT-23-5L**	W
		0.45	0.4	
		SOT-23	**SOT23-3L**	
		-	0.38	

(5) Thermal metric is measured in still air with T_A = 25°C and mounted on a 1 in^2 FR-4 substrate PCB covered with 2 ounces of copper.

7 Specifications

7.5 Electrical Characteristics

CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS		MIN.	TYP.(6)	MAX.	UNIT
Input voltage	V_{IN}	T_A = 25°C		1.8	-	5.5	V
DC output tolerance	-	T_J = 25°C, I_{OUT} = 1mA		-1	-	+1	%
Output current	I_{OUT}(7)	-		-	300	-	mA
Output current limit	I_{CL}	V_{OUT} = $V_{OUT\ (NOM)}$ (8)* 90%		-	600		mA
Line regulation	LNR(9)	V_{IN} = V_{OUT} + 1V to 6.0V, I_{OUT} =10mA		-	0.01	0.3	%/V
Load regulation	LDR	1mA ≤ I_{OUT} ≤ 300mA		-	25	50	mV
Dropout voltage	V_{DO}(10)	I_{OUT} = 300mA	1.2V ≤ V_{OUT} < 1.8V	-	400	800	mV
			1.8V ≤ V_{OUT} < 2.5V	-	220	330	mV
			2.5V ≤ V_{OUT} < 3.3V	-	140	210	mV
			V_{OUT} ≥ 3.3V	-	120	180	mV
Quiescent current	I_Q	I_{OUT} = 0mA		15	45	90	μA
Shutdown current	I_{SHDN}	V_{EN} ≤ 0.4V		-	0.01	1	μA
EN high	$V_{EN(H)}$	Turn on, stable output voltage		1	-	-	V
EN low	$V_{EN(L)}$	Turn off, output voltage is 0		-	-	0.4	
EN Pull down current	I_{EN}	V_{EN} = 5.5V		-	0.05	1	μA
Output noise voltage	Noise	f = 10Hz-100kHz, I_{OUT} = 300mA		-	30 × V_{OUT}	-	μVrms
Power supply rejection ratio	PSRR	I_{OUT} = 10mA, V_{IN} = 3.8V, V_{OUT} = 2.8V	f = 1k	-	90	-	dB
			f = 10k	-	75	-	
			f = 100k	-	60	-	
			f = 1M	-	62	-	
Thermal shutdown	T_{SD}	-		-	150	-	℃
Thermal shutdown hysteresis	ΔT_{SD}	-		-	20	-	℃
C_{OUT} auto-discharge resistance	R_{DIS}	V_{EN} < 0.4		-	500	-	Ω
Inrush Current	I_{RUSH}	V_{IN} = 5.5V, V_{EN} = 0 → 5.5V		-	200	-	mA
Load Transient	-	I_{OUT} = 1 mA to 300 mA in 1 us V_{OUT} = 2.8V		-	-30	-	mV
	-	I_{OUT} = 300mA to 1mA in 1 us V_{OUT} = 2.8V		-	+29	-	

7 Specifications

7.5 Electrical Characteristics (continued)

Note:

(6) Typical numbers are at 25°C and represent the most likely norm.

(7) Maximum output current is affected by the PCB layout, metal trace width, number of layers, ambient temperature and other environmental factors. Thermal limitations of the system must be carefully considered.

(8)$V_{OUT\ (NOM)}$: nominal voltage;

(9) The line regulation is calculated by the following formula:

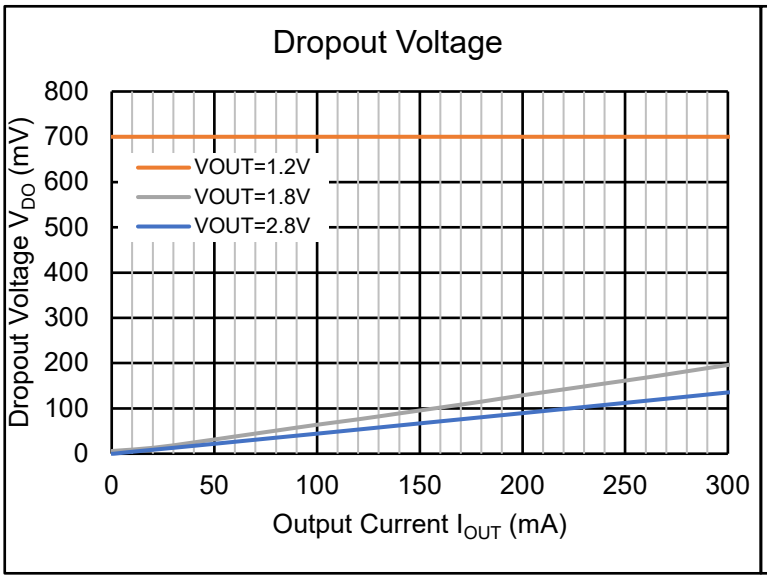
$$LNR = \frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$$

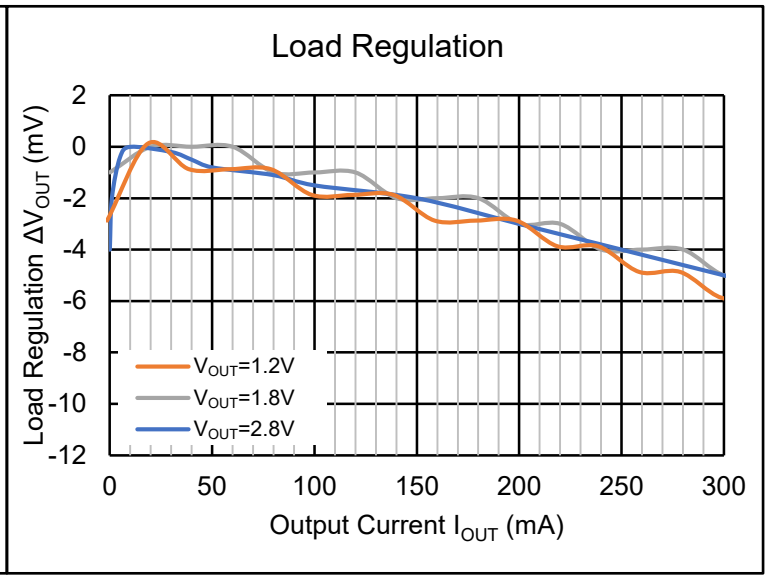
Where, ΔV_{OUT} is the variation of the output voltage, ΔV_{IN} is the variation of the input voltage.

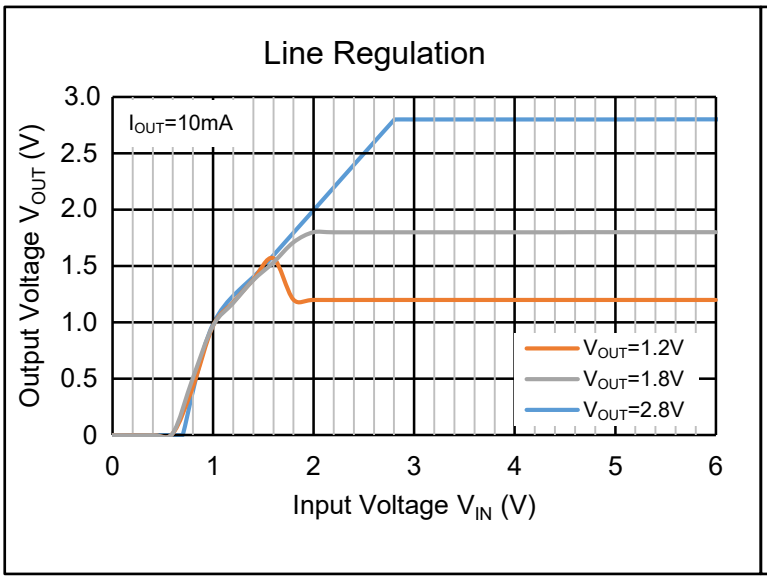
(10) Test the difference of output voltage and input voltage when input voltage is decreased gradually till output voltage equals to 98% of V_{OUT} Normal.

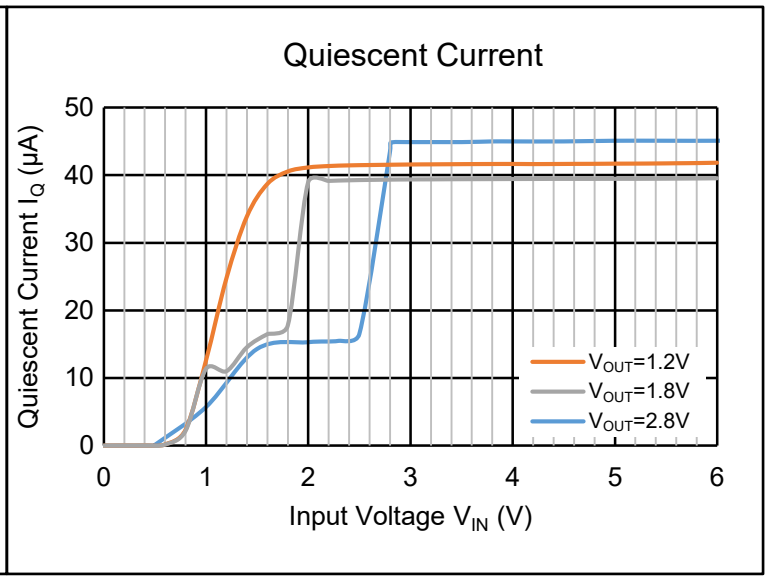
7.6 Typical Characteristics

CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)







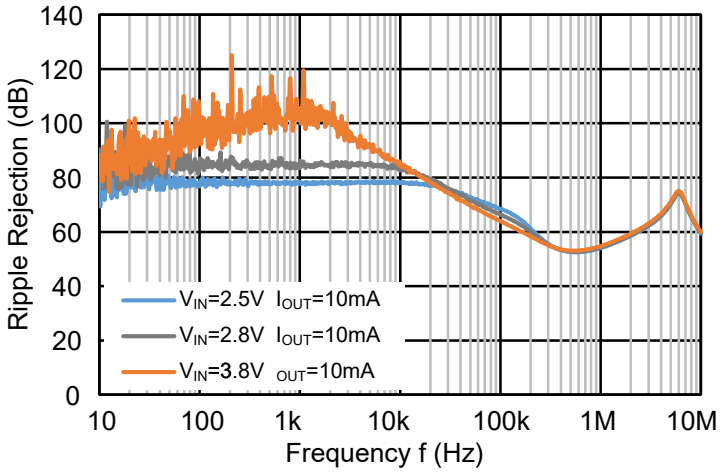


7 Specifications

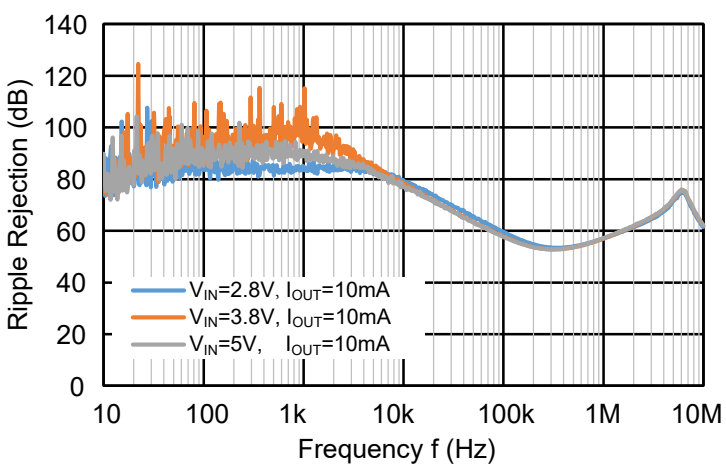
7.6 Typical Characteristics (continued)

CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)

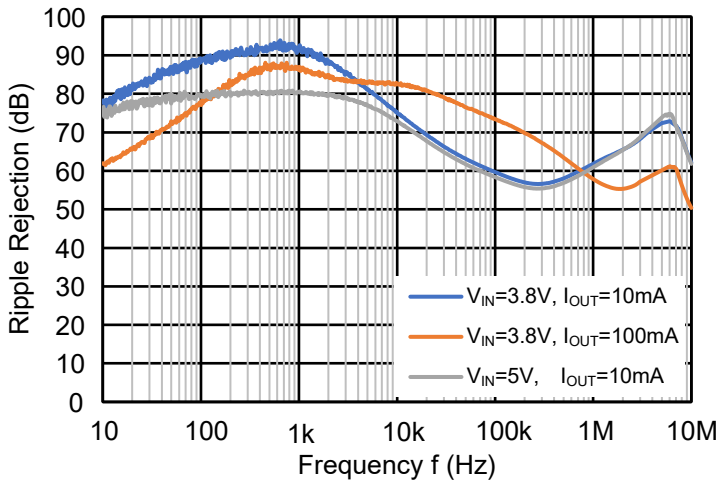
1.2V Output Ripple Rejection vs. Frequence



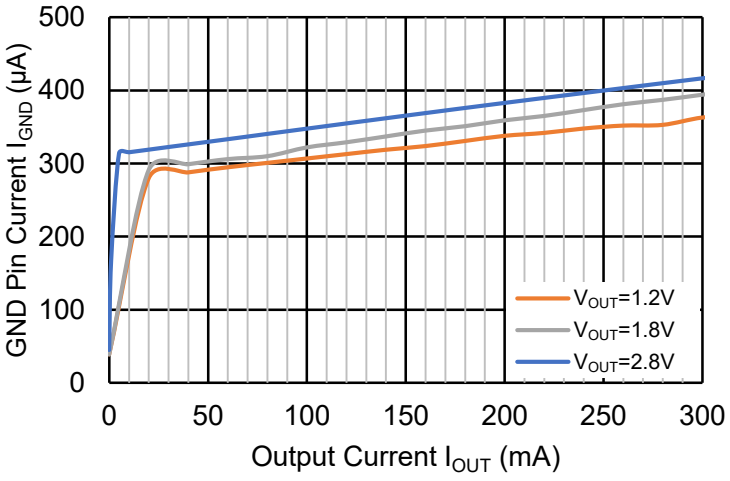
1.8V Output Ripple Rejection vs. Frequence



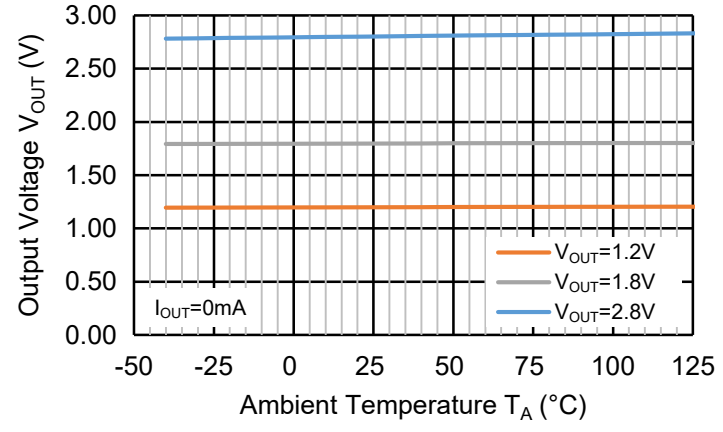
2.8V Output Ripple Rejection vs. Frequence



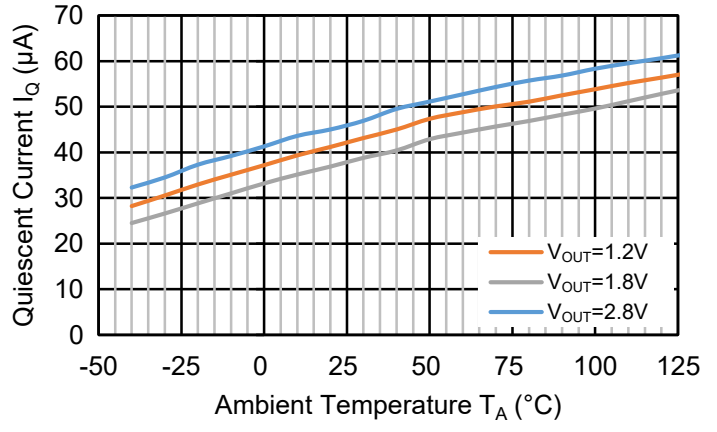
GND Pin Current



Output Voltage vs.Temperature



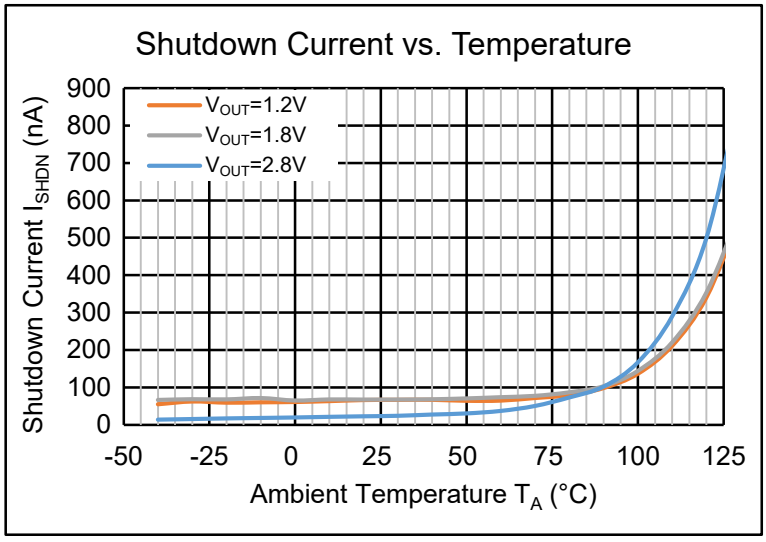
Quiescent Current vs. Temperature



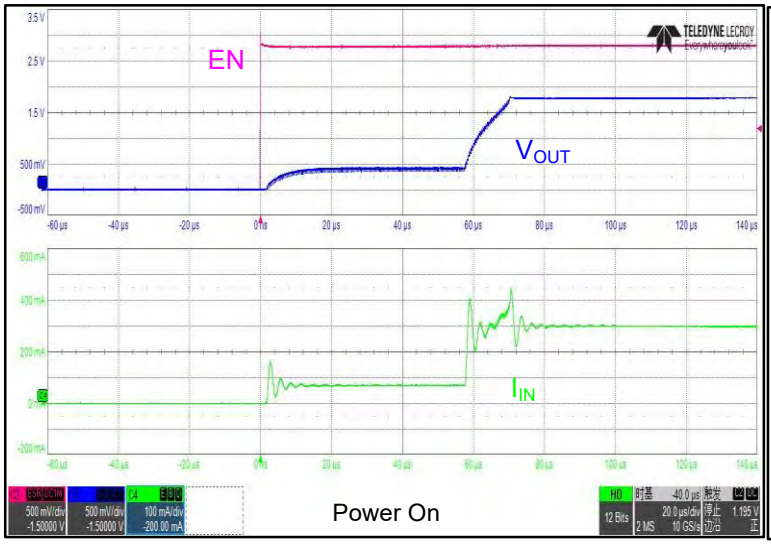
7 Specifications

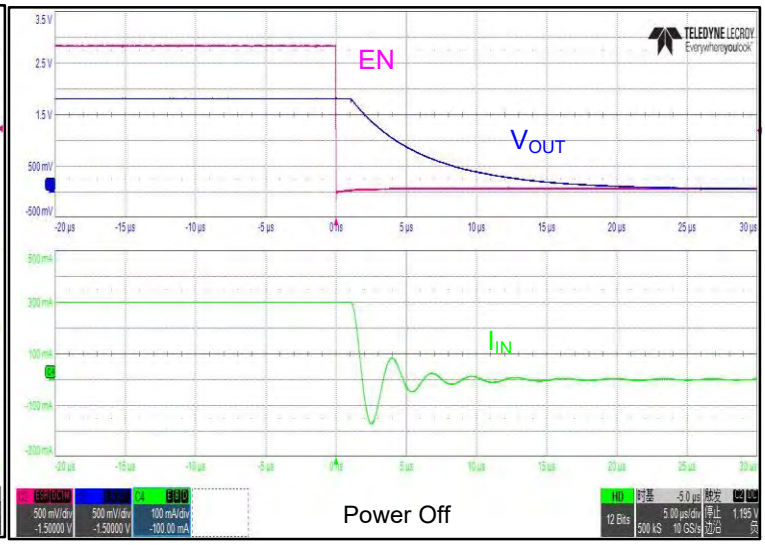
7.6 Typical Characteristics (continued)

CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)

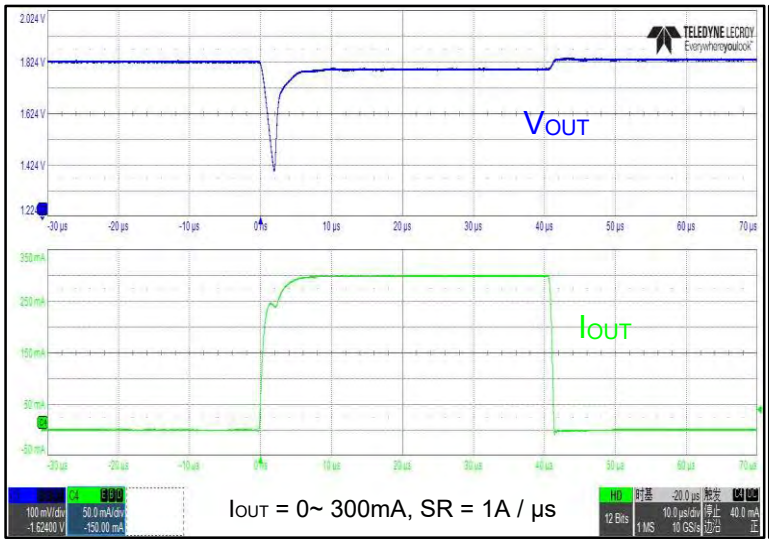


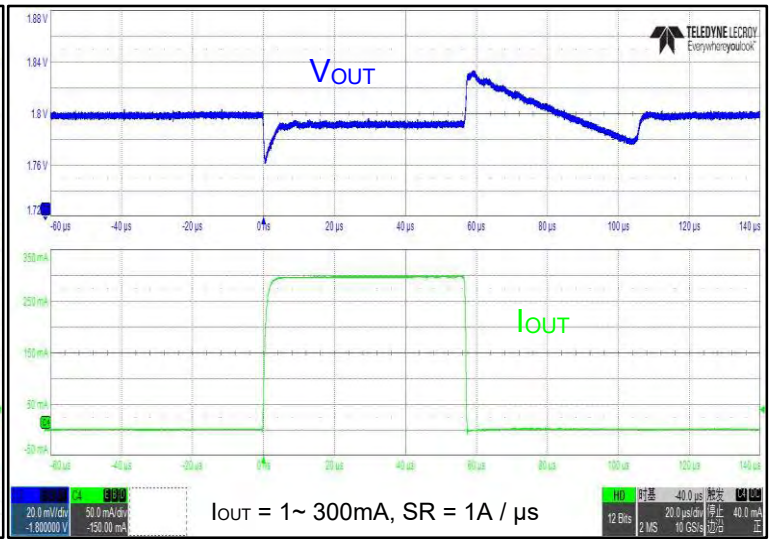
Inrush Current Response Time (V_{OUT}=1.8V,V_{IN} = V_{EN} = 2.8V, I_{OUT}=300mA)





Load Transient (V_{OUT}=1.8V,V_{IN} = V_{EN} = 2.8V)



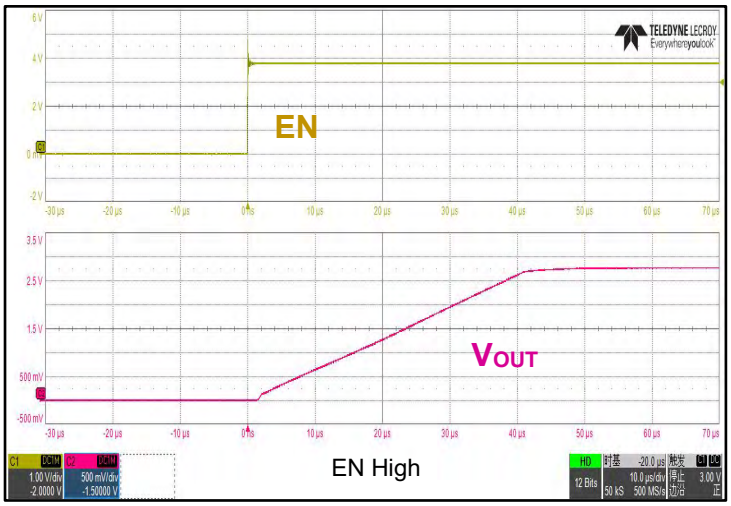


7 Specifications

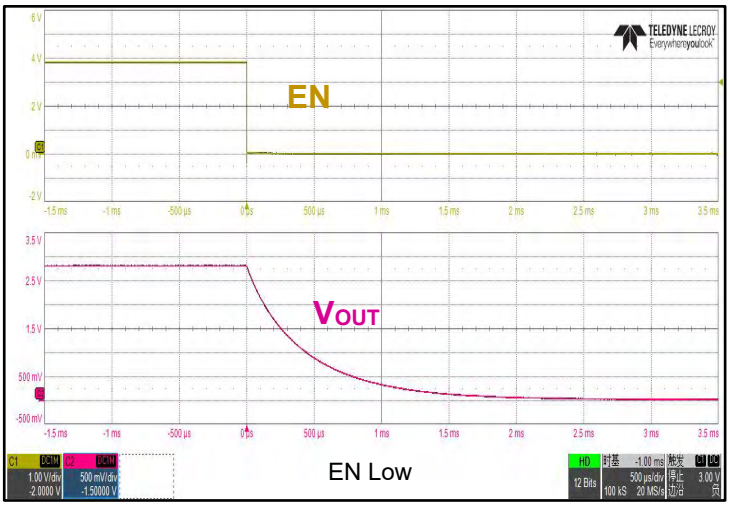
7.6 Typical Characteristics (continued)

CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)

EN Response (V_{OUT} = 2.8V, V_{IN} = 3.8V, V_{EN} = 0 ~ 3.8V, I_{OUT} = 0mA)

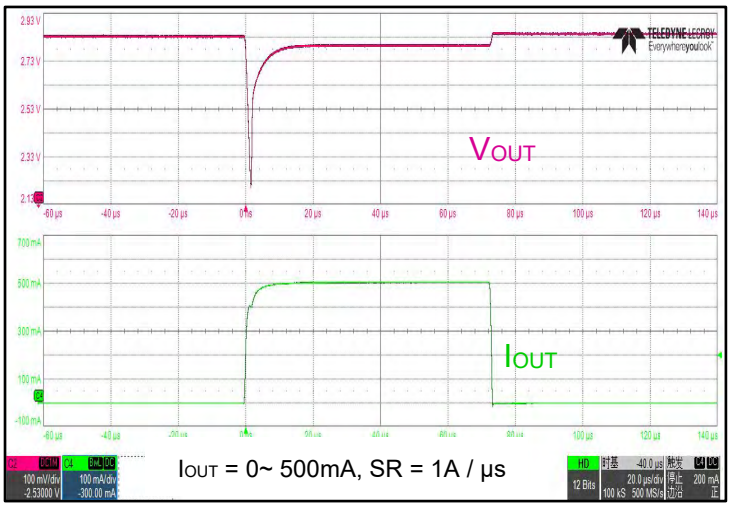


EN High

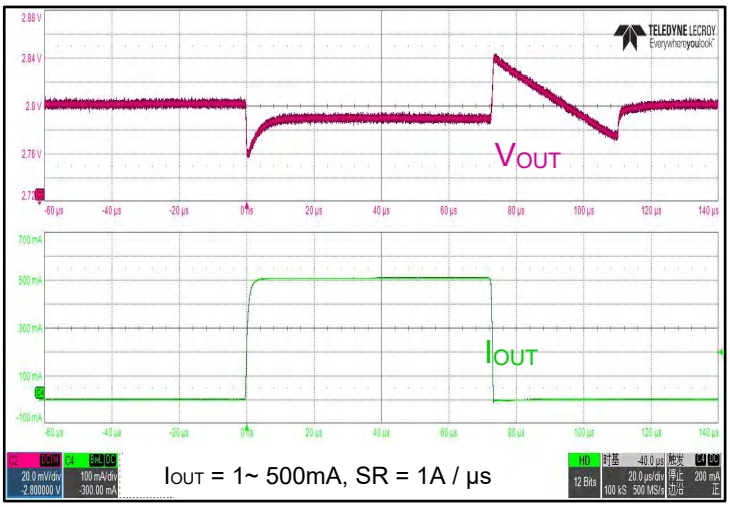


EN Low

Load Transient (V_{OUT}=2.8V, V_{IN} = V_{EN} = 3.8V)

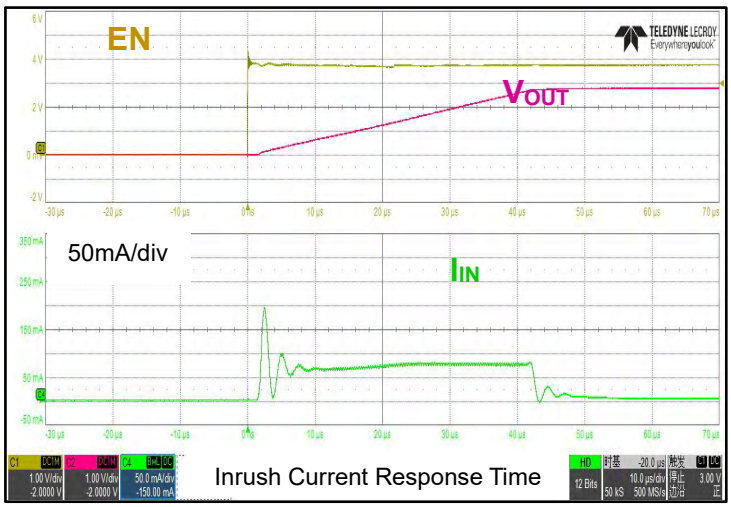


I_{OUT} = 0~ 500mA, SR = 1A / μs



I_{OUT} = 1~ 500mA, SR = 1A / μs

Inrush Current Response Time (V_{OUT}=2.8V, V_{IN} = V_{EN} = 3.8V, I_{OUT} = 0mA)



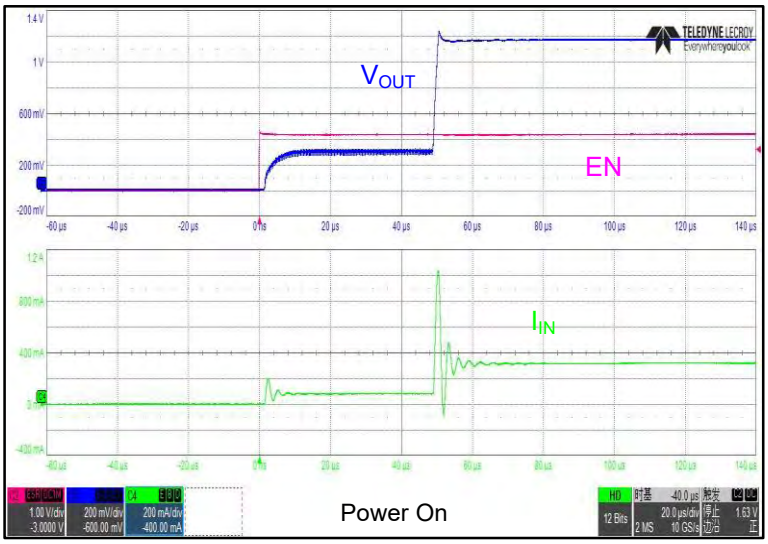
Inrush Current Response Time

7 Specifications

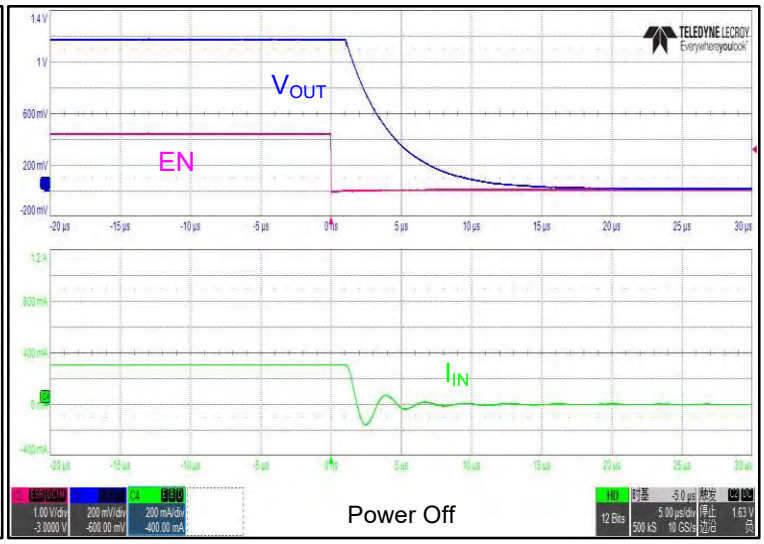
7.6 Typical Characteristics (continued)

CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)

Inrush Current Response Time (V_{OUT}=1.2V,V_{IN} = V_{EN} = 2.2V, I_{OUT}=300mA)

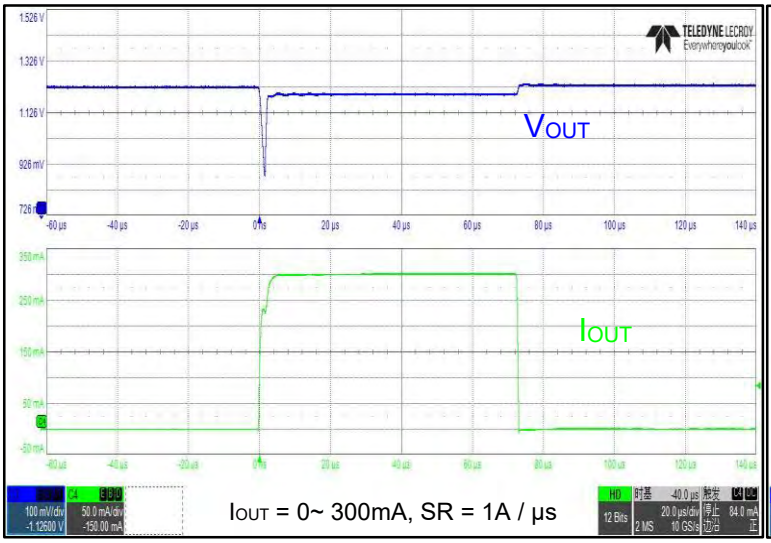


Power On

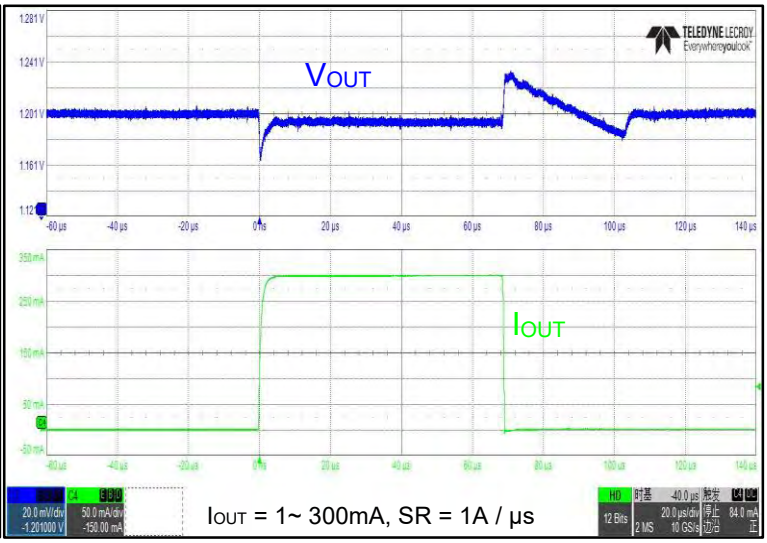


Power Off

Load Transient (V_{OUT}=1.2V,V_{IN} = V_{EN} = 2.2V)

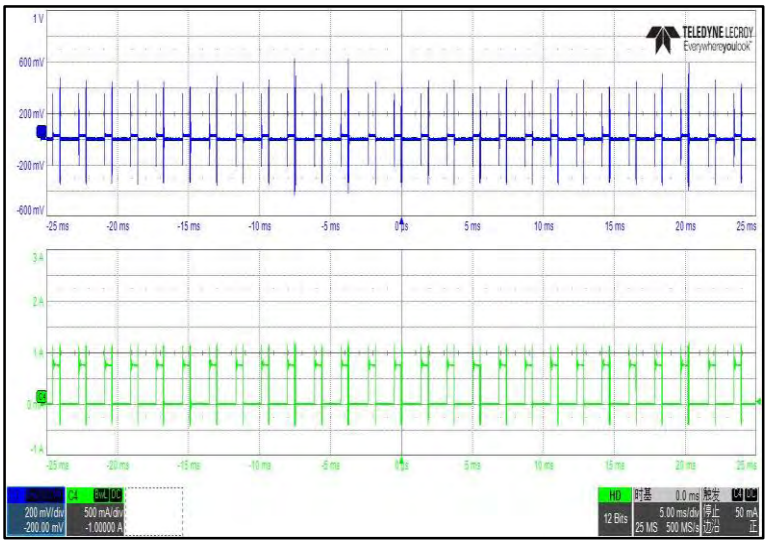


I_{OUT} = 0~ 300mA, SR = 1A / μs

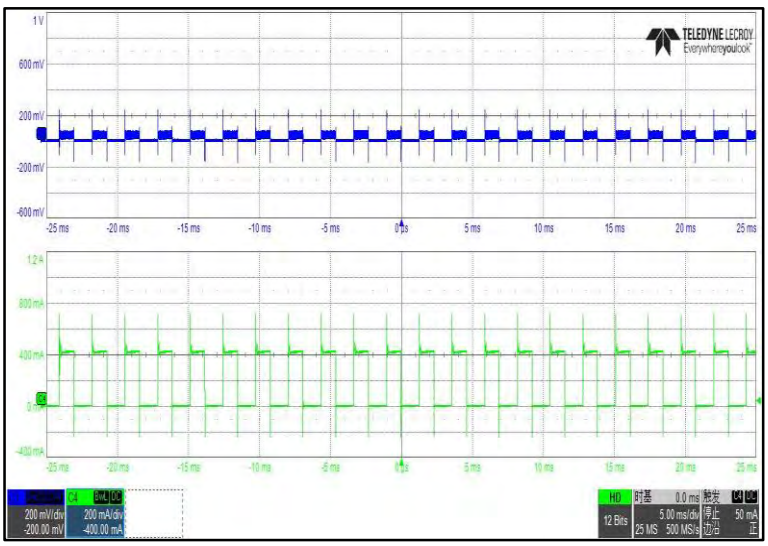


I_{OUT} = 1~ 300mA, SR = 1A / μs

Short-Circuit Response (V_{OUT} = 1.2V, V_{EN} = V_{IN})



Short-Circuit Response (V_{OUT} = 1.8V, V_{EN} = V_{IN})

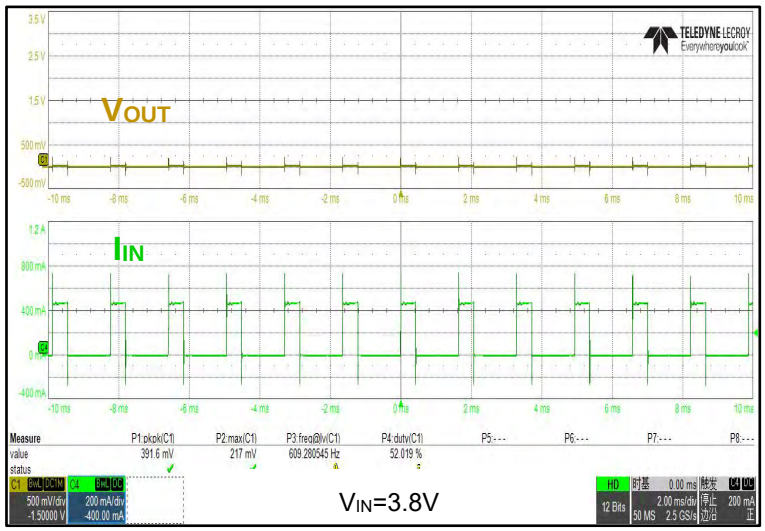


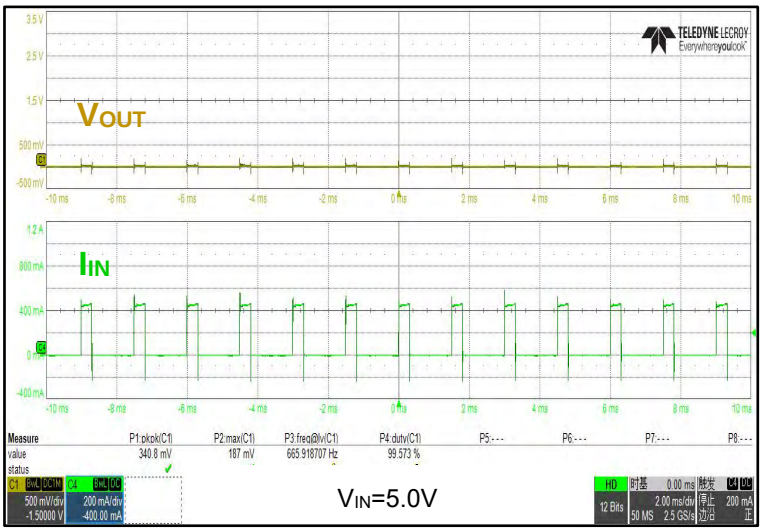
7 Specifications

7.6 Typical Characteristics (continued)

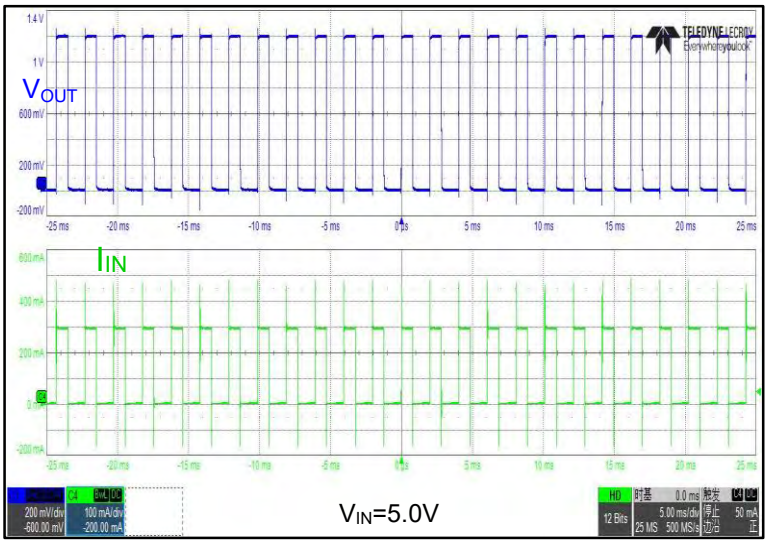
CJ6214 Series (V_{IN}= $V_{OUT\ (NOM)}$ + 1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified)

Short-Circuit Response (V_{OUT} = 2.8V, V_{EN} = V_{IN})

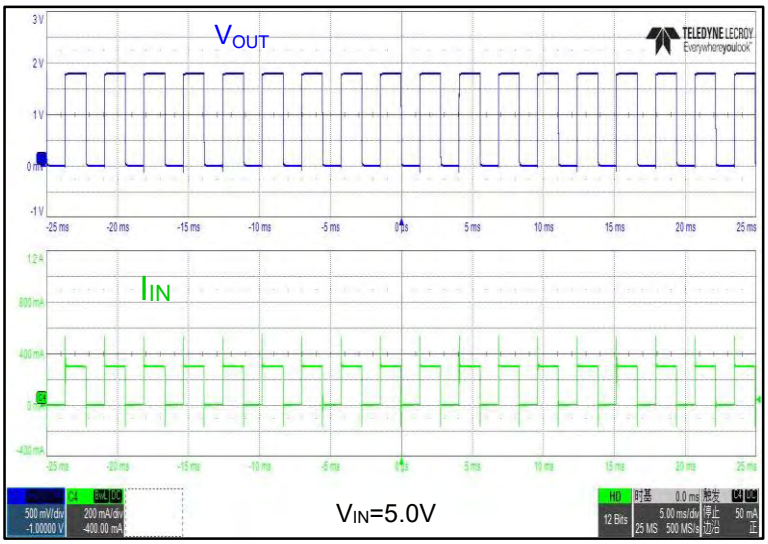




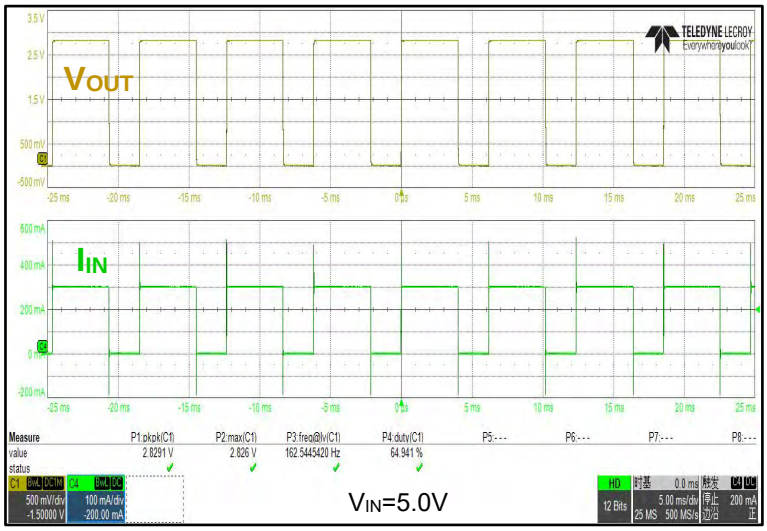
Thermal Shutdown (V_{OUT} = 1.2V, I_{OUT} = 300mA)



Thermal Shutdown (V_{OUT} = 1.8V, I_{OUT} = 300mA)



Thermal Shutdown (V_{OUT} = 2.8V, I_{OUT} = 300mA)



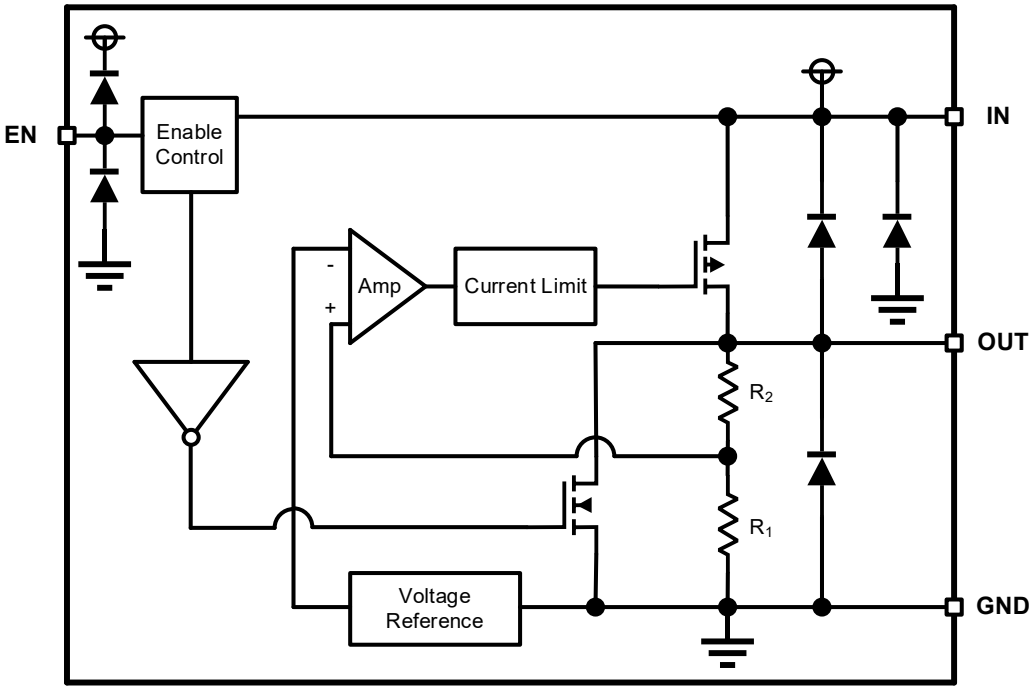
8 Detailed Description

8.1 Description

The CJ6214 series is a High speed LDO regulator that features high accuracy, low noise, high ripple rejection, low dropout and low power consumption. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit. The inrush current protection limits the inrush current from input pin (V_{IN}) to output pin (V_{OUT}) to charge C_{OUT} capacitor.

The output can be turned off by controlling the EN pin on the chip, and the power consumption after turning off is only below 0.1 μA.

8.2 Function Block Diagram



8 Detailed Description

8.3 Description

Dropout Voltage

Dropout voltage (V_{DO}) refers to the minimum voltage difference between input and output (V_{IN} - V_{OUT}) to make the device output voltage reach the rated range at rated current. When the dropout voltage condition required by the device is reached, the internal MOSFET will be fully turned on, at this time, the MOSFET is equivalent to a switch for regulation.

The V_{DO} increases with the increase of load current. Since V_{IN} - V_{OUT} must be no less than the V_{DO}, the V_{DO} indirectly specifies the minimum input voltage of devices under different load current conditions. If the V_{IN} - V_{OUT} is less than the V_{DO}, the performance of the device may deteriorate (see *Operation in Dropout Mode* for details).

Enable Operation

The enable pin will turn the regulator on or off. The threshold limits are covered in the Electrical characteristics table in this data sheet. If the enable function is not to be used then the pin should be connected to V_{IN}.

Current Limitation

The internal Current Limitation circuitry allows the device to supply the full nominal current and surges but protects the device against Current Overload or Short.

Thermal Protection

Internal thermal shutdown (TSD) circuitry is provided to protect the integrated circuit in the event that the maximum junction temperature is exceeded. When TSD activated, the regulator output turns off. When cooling down under the low temperature threshold, device output is activated again. This TSD feature is provided to prevent failures from accidental overheating. Activation of the thermal protection circuit indicates excessive power dissipation or inadequate heatsinking. For reliable operation, junction temperature should be limited to +150°C maximum.

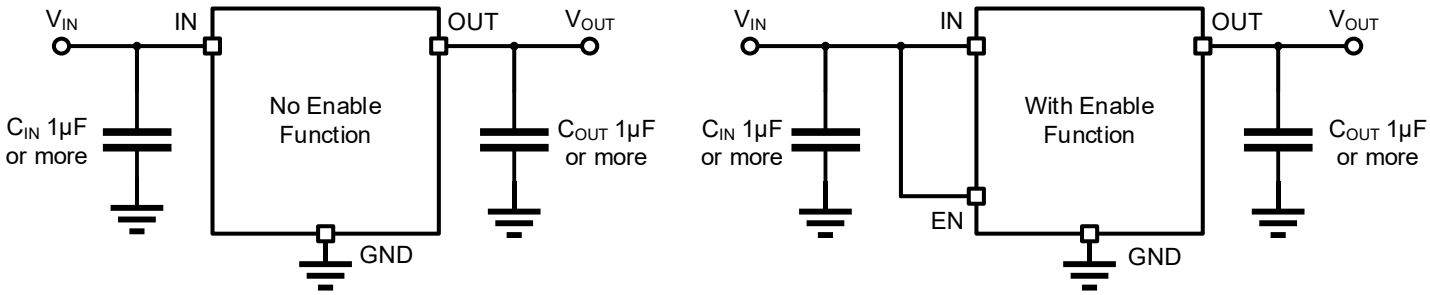
Inrush Current Protection

The inrush current protection circuit is built in the CJ6214.

When the IC starts to operate, the protection circuit limits the inrush current from input pin (V_{IN}) to output pin (V_{OUT}) to charge C_{OUT} capacitor.

9 Application and Implementation

9.1 Typical Application Circuits



9.2 Application Information

Selection of Bypass Capacitances

For the CJ6214 series, it is recommended to use 1μF input C_{IN} and output C_{OUT} ceramic capacitors.

Type of Capacitors:

Since any leakage of the capacitor will increase the quiescent power consumption of the whole circuit, attention should be paid to selecting capacitors with low leakage. When designing the circuit of portable equipment including CJ6214 series, due to the shortage of tantalum capacitors, it is a good choice to use small size, low equivalent series resistance (ESR) and high RMS current capacity multilayer ceramic capacitors (MLCC) in the DC to DC voltage conversion. The designer must choose the appropriate capacitor type for circuit design: X7R- Ceramic capacitors of X5R- and COG- rated dielectric materials can provide relatively good capacitance stability within the temperature range, Y5V- type capacitors are not recommended because of large changes in capacitance values. However, no matter which type of ceramic capacitor is selected, the effective capacitance may vary with the operating voltage and temperature. The designer must consider the influence of the change of the effective value of capacitance according to the circuit design and application conditions.

Input Capacitors C_{IN}:

It is recommended to use a 1μF capacitor at the input pin of the device, and the position of the input capacitor should be as close to the device input pin as possible.

For the CJ6214 series, the input capacitor is not necessary to maintain the output stability, but it can offset the reactive input source and improve the transient response, input ripple and PSRR performance of the device. It should be noted that although many types of capacitors can be used for input bypass, using ceramic capacitors for input filtering may cause problems. Due to the self-resonance and high Q characteristics of some types of ceramic capacitors, under certain starting conditions, applying voltage steps to ceramic capacitors may lead to large current surges (such as directly connecting the input pin of LDO to the power supply), which may cause some energy stored in the parasitic inductance of the power lead. When the stored energy is transferred from these inductors to ceramic capacitors, large voltage spikes may occur in the circuit. These voltage spikes are easily twice the step amplitude of the input voltage, and are likely to bring potential risks to the normal operation and reliability of the device. Therefore, the selection of ceramic capacitors as input capacitors must be careful. Adding 3Ω resistors and X5R- type ceramic capacitors will minimize voltage transients during startup. A higher value capacitor may be necessary if large, fast rise time load or line transients are anticipated or if the device is located several inches from the input power source.

9 Application and Implementation

9.2 Application Information (continued)

Selection of Bypass Capacitances (continued)

Output Capacitors C_{OUT}:

Recommended 1μF output ceramic capacitor to keep the device output stable, and the capacitor position should be as close to the device pin as possible.

For CJ6214 series, the device needs an output capacitor to achieve loop stability. As with any regulator, a larger output capacitance reduces the peaks during a load transient but slows down the response time of the device. The proper capacitor can help to obtain better dynamic performance.

Transient Response

Transient response refers to the change of system output from initial state to stable state under the action of typical signal input. For LDO, the designer should pay attention to the possible impact of linear transient response and load transient response on the system: linear transient response refers to the transient response of output to change when the input voltage changes, while load transient response refers to the transient response of output to change when the output current changes. The specific phenomenon is that the output voltage of the device will have a short spike, especially when the input voltage or output current changes greatly in a short time. This change is not only related to the performance of the chip itself, but also related to the change of output current, change rate and output capacitance:

1. When the output current increases, the output voltage of the device will decrease to a certain extent, and the larger output current will provide a higher current discharge path for the output capacitor, which will affect the peak value generated by the transient spike and reduce the peak value;
2. The output current or input voltage changes relatively slowly, and the output change of the device is relatively small, affecting the spike caused by the change;
3. The use of large input and output capacitors can reduce the spike caused by transient response to a certain extent to improve the transient performance, but large output capacitors can also affect the response time of devices.

Operation in Dropout Mode

The CJ6214 series is internally integrated with a P-MOSFET to achieve low dropout voltage. The voltage difference between the input and the output V_{IN} - V_{OUT} of the device must not be lower than the corresponding dropout voltage VDO to ensure that the output voltage tolerance is within the rated range of the data sheet. The dropout voltage will increase with the increase of load current. When the V_{IN} - V_{OUT} is less than the V_{DO}, the P-MOSFET inside the device is in a linear state, the resistance from the input pin to the output pin is equal to the resistance from the drain to the source of the P-MOSFET, and the device functions like a resistor. When operating in this state, the response time of the error amplifier inside the device will be limited, which will seriously degrade the transient performance of the device, when the external circuit has a transient change, the deviation of the output voltage will become larger than the normal operating state. In addition, the PSRR and noise performance of the device will be worse than that under normal operating conditions.

9 Application and Implementation

9.2 Application Information (continued)

Recommended Continuous Operating Areas

As an LDO, the working area of CJ6214 series is limited by dropout voltage, output current, junction temperature and input voltage under continuous working condition. The recommended areas for continuous operation are shown in Figure 9-1:

A. The LDO input and output voltage difference V_{IN} - V_{OUT} must meet the dropout voltage V_{DO} conditions. See *Dropout Voltage* for more details.
B. Rated output current range I_{Rated}.
C. The actual junction temperature T_J of LDO shall not exceed the rated junction temperature. The product of voltage difference and current at both ends of LDO is power consumption, which determines the actual working junction temperature of LDO, so the curve is not linear.

In addition, the working area of CJ6214 series is limited by the rated $V_{IN\ MIN}$ and $V_{IN\ MAX}$.

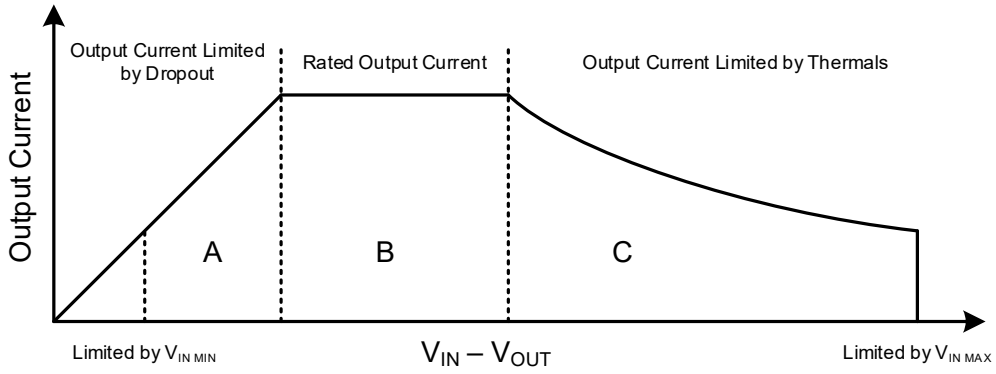


Figure 9-1. Region Description for Continuous Operation

9.3 Power Supply Recommendation

The CJ6214 series is designed to operate within the input power supply voltage range of 1.8V to 5.5V. The input power supply should be well adjusted and have low noise. If the input power supply has high noise, it is recommended to use an additional bypass capacitor at the input to improve the output noise performance of the device. It is recommended to use an input capacitor of 1μF or higher to reduce the impedance of the input power supply, especially during transients.

9.4 Layout Guidelines

When designing the circuit including CJ6214 series, the following matters should be noted:

- Place the input and output capacitors as close to the pins of the device as possible;
- The device is connected by copper plane and the heat sink (or back pad) of the device is fully welded with PCB to obtain better heat dissipation performance and lower on resistance;
- Heat sink holes are placed around the device to help the circuit dissipate more heat energy. However, attention should be paid to the position of the heat sink holes to prevent the solder (or solder paste) on the IC pad from being absorbed by the heat sink holes and being damaged during welding.

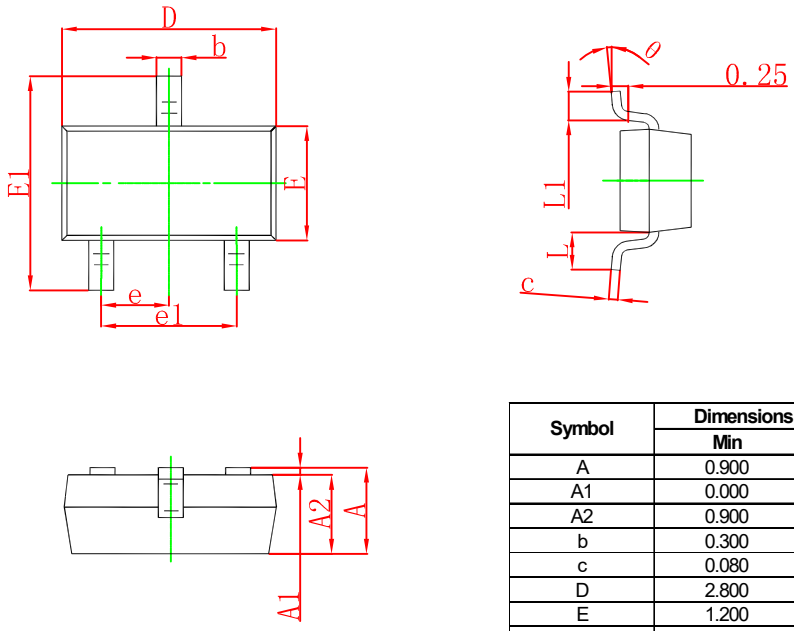
NOTE

The application information in this section is not part of the data sheet component specification, and JSCJ makes no commitment or statement to guarantee its accuracy or completeness. Customers are responsible for determining the rationality of corresponding components in their circuit design and making tests and verifications to ensure the normal realization of their circuit design.

10 Mechanical Information

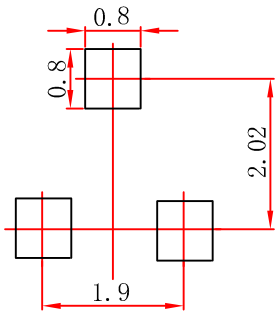
10.1 SOT-23 Mechanical Information

SOT-23 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT-23 Suggested Pad Layout



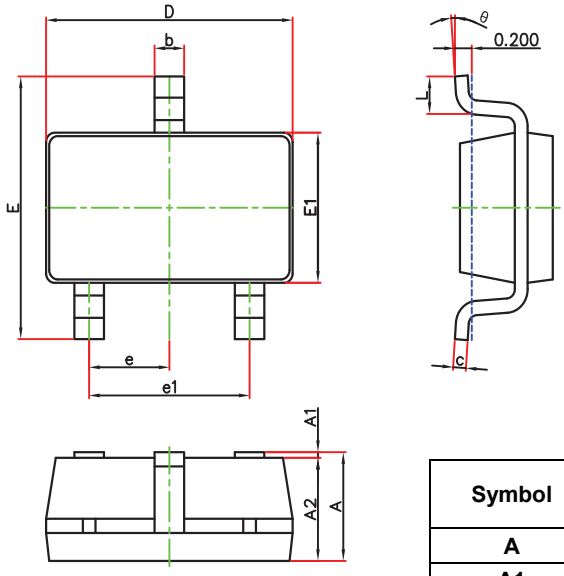
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

10 Mechanical Information

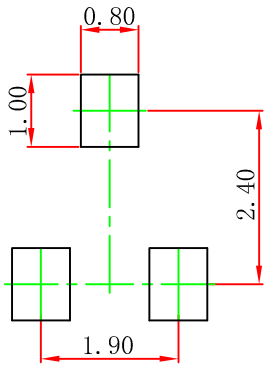
10.2 SOT-23-3L Mechanical Information

SOT-23-3L Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.059	0.067
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT-23-3L Suggested Pad Layout



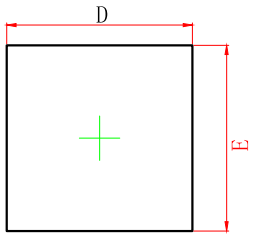
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

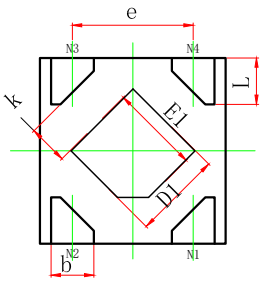
10 Mechanical Information

10.3 DFNWB1×1-4L Mechanical Information

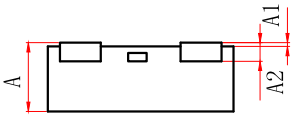
DFNWB1×1-4L Outline Dimensions



TOP VIEW



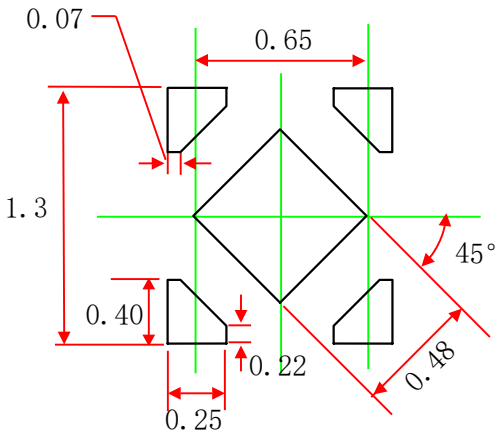
BOTTOM VIEW



SIDE VIEW

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.320	0.400	0.013	0.016
A1	0.000	0.050	0.000	0.002
A2	0.100 REF.		0.004 REF.	
D	0.950	1.050	0.037	0.041
E	0.950	1.050	0.037	0.041
D1	0.430	0.530	0.017	0.021
E1	0.430	0.530	0.017	0.021
k	0.150MIN.		0.006MIN.	
b	0.180	0.280	0.007	0.011
e	0.650TYP.		0.026TYP.	
L	0.200	0.300	0.008	0.012
L1	0.200	0.300	0.008	0.012

DFNWB1×1-4L Suggested Pad Layout



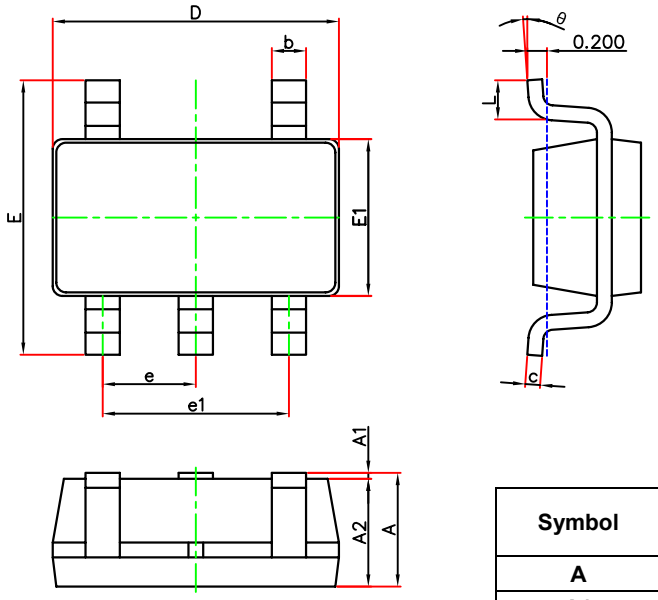
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

10 Mechanical Information

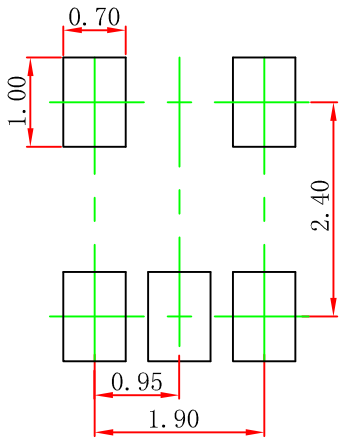
10.4 SOT-23-5L Mechanical Information

SOT-23-5L Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.059	0.067
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT-23-5L Suggested Pad Layout



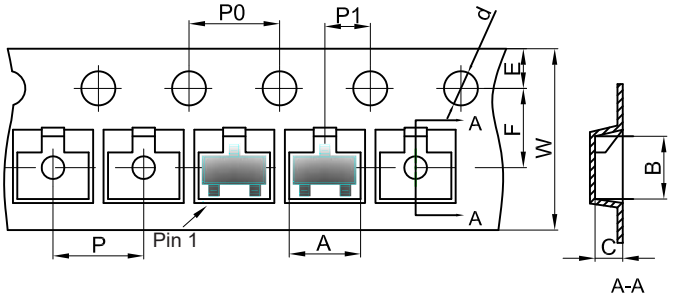
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

11 Packaging Information

11.1 SOT-23 Tape and Reel Information

SOT-23 Embossed Carrier Tape

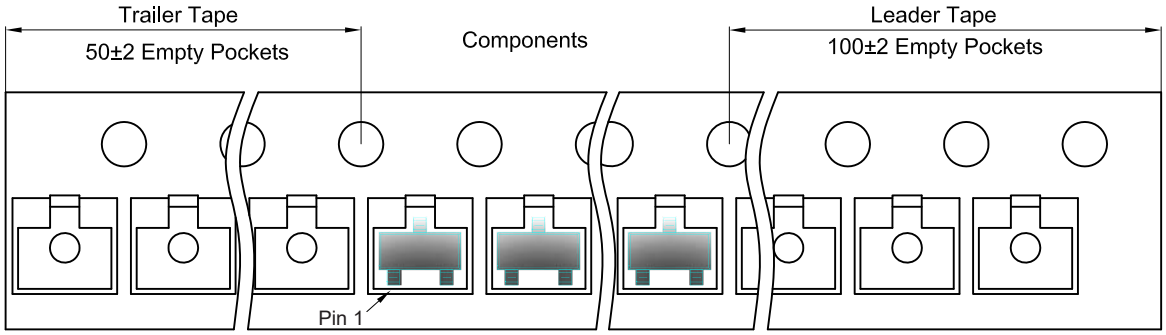


Packaging Description:

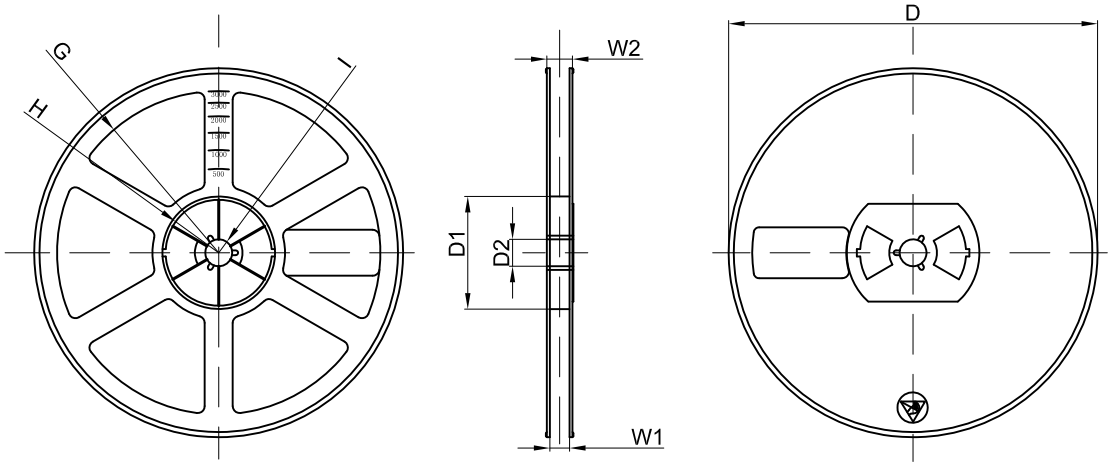
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23 Tape Leader and Trailer



SOT-23 Reel



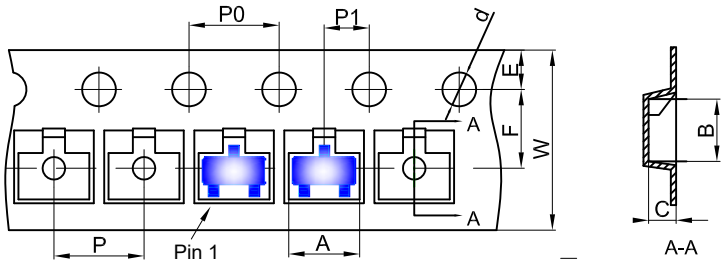
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	45,000 pcs	203×203×195	180,000 pcs	438×438×220	

11 Packaging Information

11.2 SOT-23-3L Tape and Reel Information

SOT-23-3L Embossed Carrier Tape

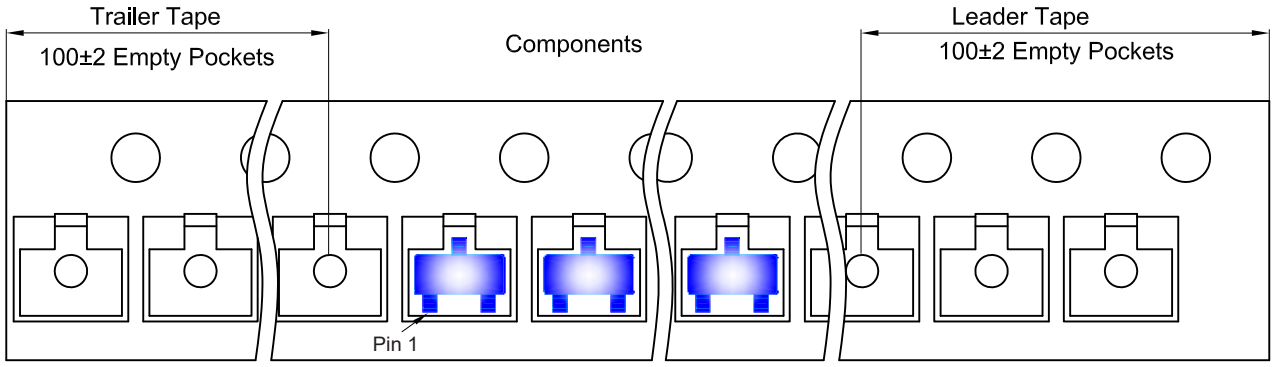


Packaging Description:

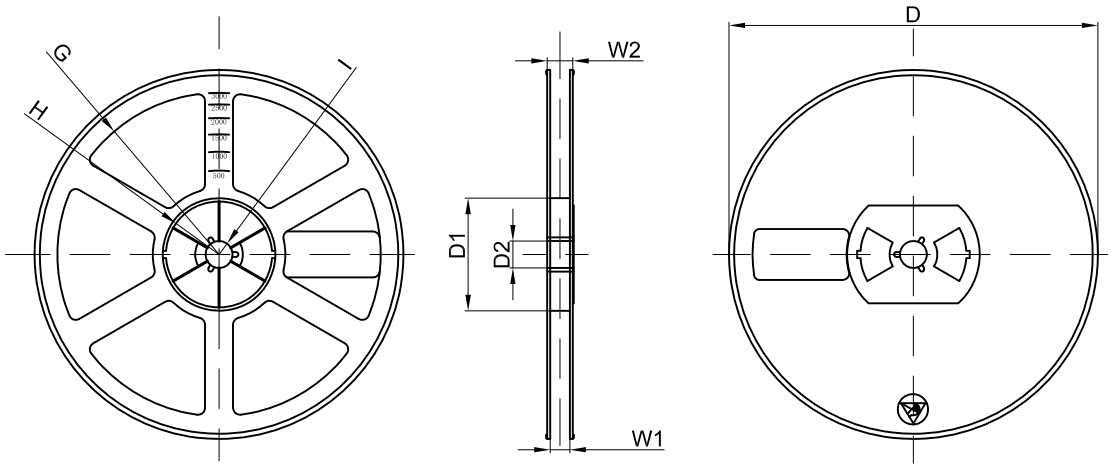
SOT-23-3L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 18.0cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23-3L	3.18	3.28	1.32	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23-3L Tape Leader and Trailer



SOT-23-3L Reel



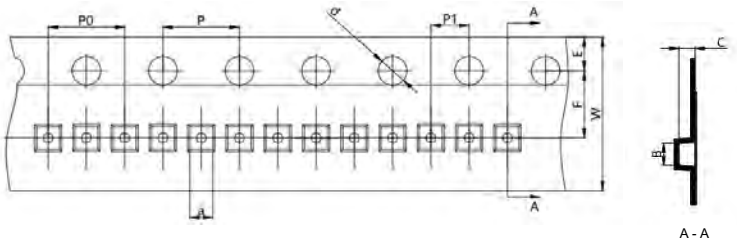
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø180.00	60.00	13.00	R78.00	R25.60	R6.50	9.50	13.10

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	30,000 pcs	203×203×195	120,000 pcs	438×438×220	

11 Packaging Information

11.3 DFNWB1×1-4L Tape and Reel Information

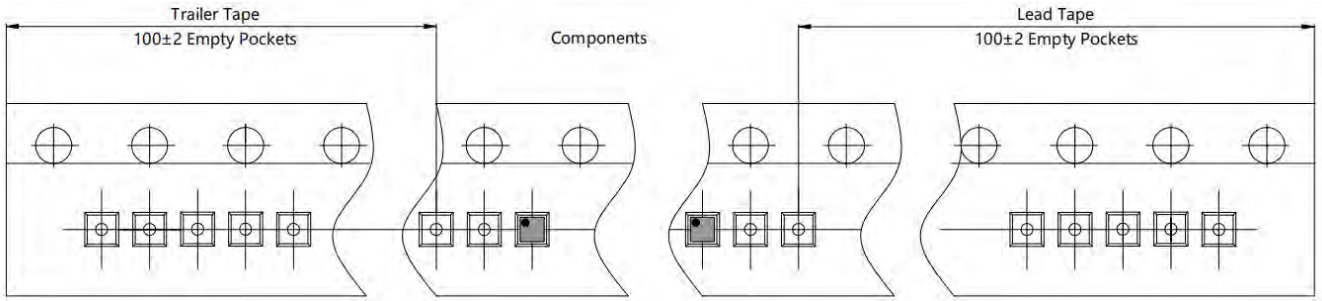
DFNWB1×1-4L Embossed Carrier Tape



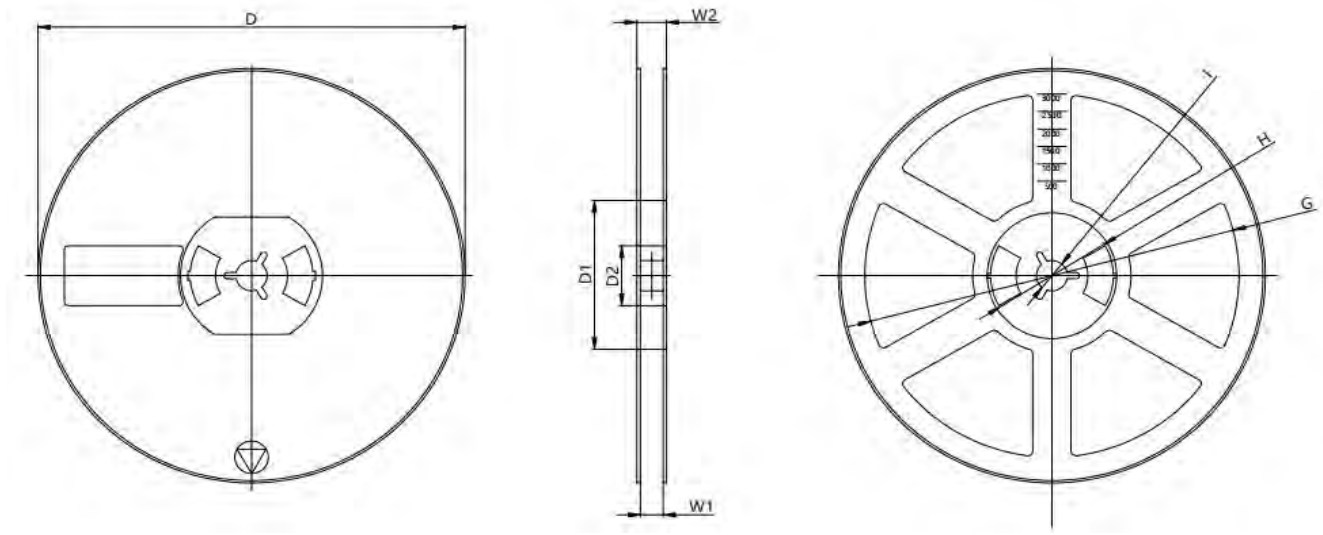
Packaging Description:
DFNWB1×1-4L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled)polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7"or 18.0cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
DFNWB1×1-4L	1.12	1.13	0.50	1.55	1.75	3.5	4.00	4.00	2.00	8.00

DFNWB1×1-4L Tape Leader and Trailer



DFNWB1×1-4L Reel



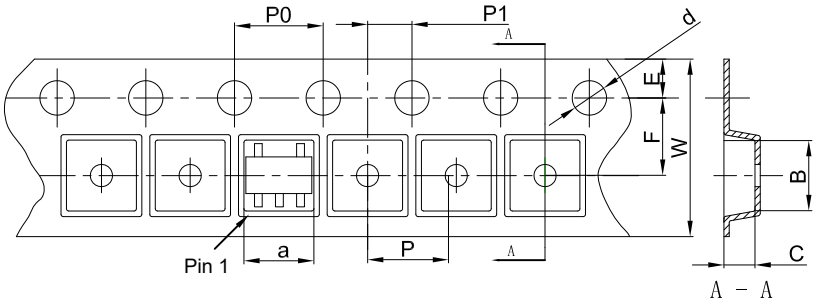
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7''Dia	Ø 178.00	54.5	13.5	R78.0	R25.6	R6.75	9.6	12.3

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
10,000 pcs	7 inch	100,000pcs	210×208×205	400,000 pcs	440×440×230	

11 Packaging Information

11.4 SOT-23-5L Tape and Reel Information

SOT-23-5L Tape and Reel Information

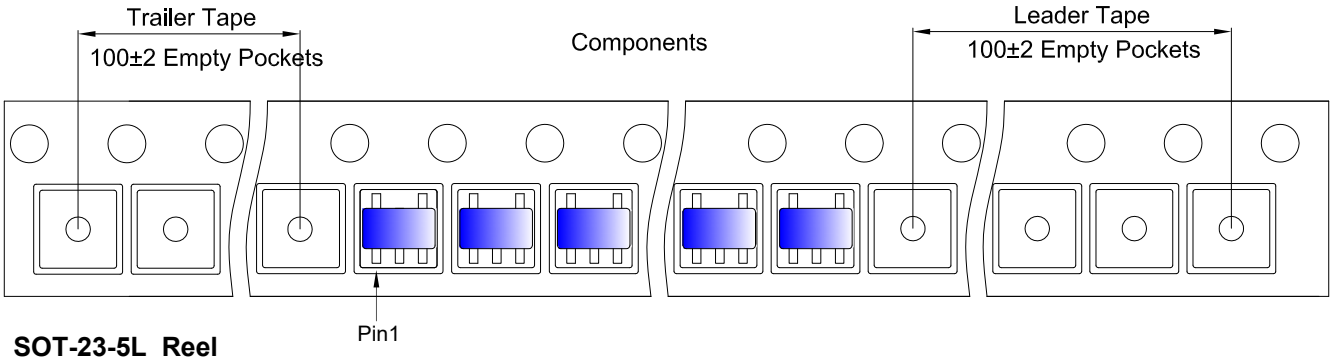


Packaging Description:

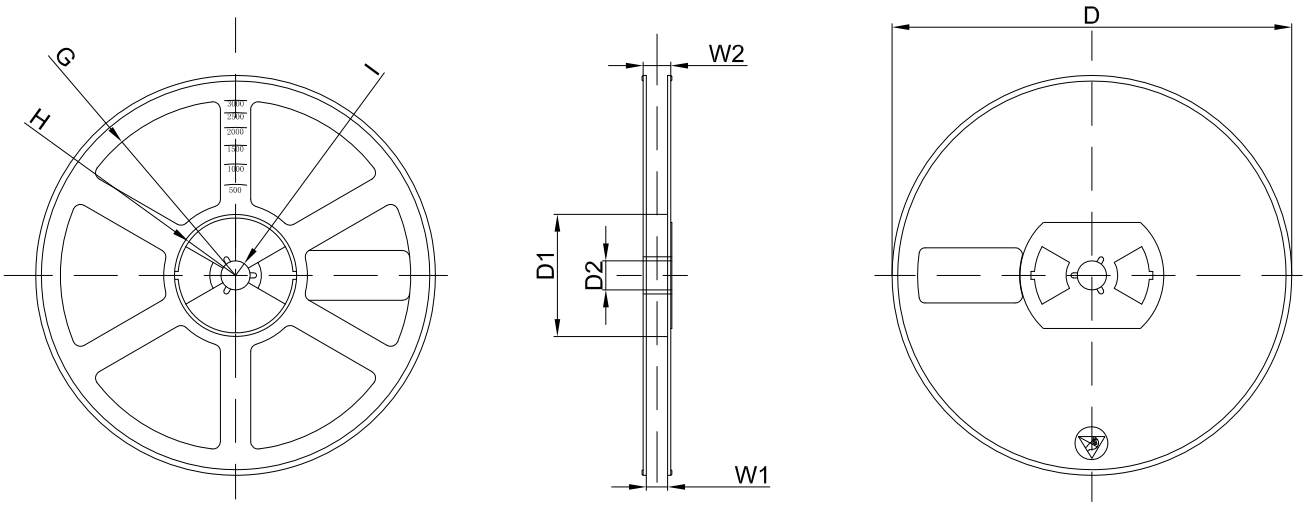
SOT-23-5L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 18.0cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOT-23-5L	3.17	3.23	1.37	Ø1.55	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23-5L Tape Leader and Trailer



SOT-23-5L Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø180.00	60.00	13.00	R78.00	R25.60	R6.50	9.50	13.10

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	30,000 pcs	203×203×195	120,000 pcs	438×438×220	

12 Notes and Revision History

12.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- https: ***www.jscj-elec.com*** for more details.

12.2 Notes

Electrostatic Discharge Caution

This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

12.3 Revision History

May, 2025: changed from rev - 1.2 to rev - 1.3:

- Page 2~3, Orderable Information, changed OP TEMP from -40 ~ 85°C to -40 ~ 125°C.
- Page 6, Recommended Operating Conditions, removed Operated ambient temperature T_A.

February, 2025: changed from rev - 1.1 to rev - 1.2:

- Page 1, Features,
- Page 8, Electrical Characteristics, change the output current limit from 500mA to 300mA.
- Page 9 ~ 10, Typical Characteristics, change the output current limit of the chart "Dropout Voltage", "Load Regulation" and "GND Pin Current" from 500mA to 300mA.

November, 2024: changed from rev - 1.0 to rev - 1.1:

- Page 9 ~ 14, Typical Characteristics, added the CJ6214-1.2V and CJ6214-1.8V device.

September, 2024: released CJ6214 series rev - 1.0.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. JSCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses JSCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. JSCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

Without the written consent of JSCJ, this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, military facilities and aerospace. JSCJ shall not be responsible for casualties or property losses caused by abnormal use or application of this product.

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