USB Type-C Current Advertisement Controller

REV. 00

General Description

The LD8200A provides an uncomplicated solution for USB type-C DFP host 3A Current advertisement. It used the USB type-C ports with the configuration channel (CC1 and CC2) to notice Type-C UFP device. Than the device control external blocking MOSFET to determine a successful attach of UFP device.

The LD8200A provide complete protections include VCC over Voltage and external over temperature protection. And LD8200A operates over a wide supply range and has low power consumption. It available in the SOT-26 package to minimize the PCB size well as component counts.

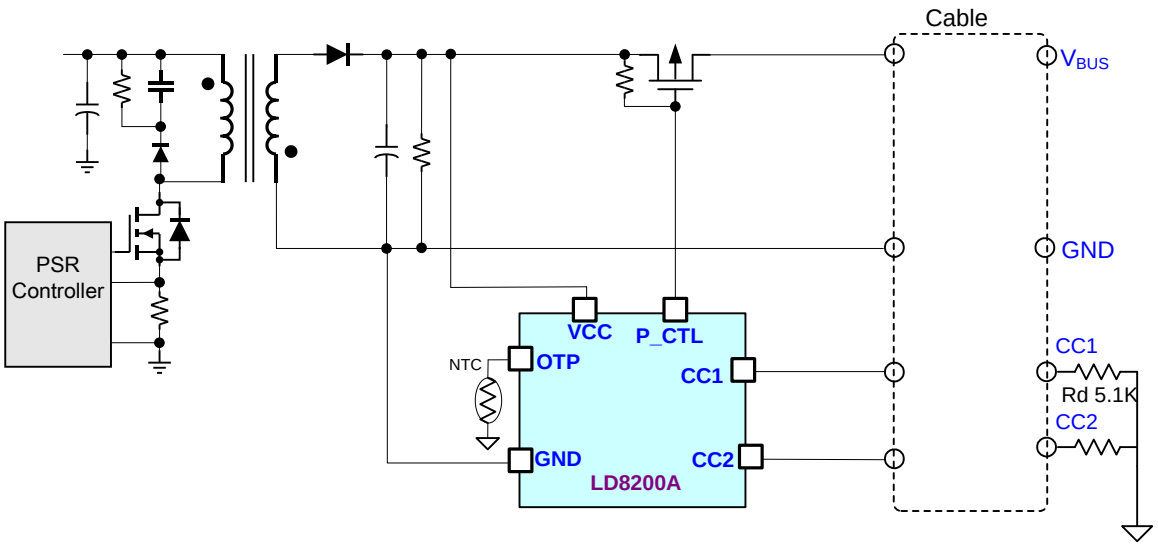
Features

- USB type-C 3A current Advertisement
- Low Quiescent Current
- VCC Operation Range : 3.5V~20V
- External Blocking MOSFET Control
- VCC Over-Voltage Protection
- External Over Temperature Protection
- SOT-26 Package

Applications

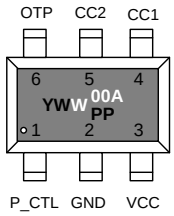
- Mobile Phone Type-C Adaptor
- USB Type-C Charger

Typical Application



Pin Configuration

SOT-26 (TOP VIEW)



YY, Y : Year code (D: 2004, E: 2005…..)
WW, W : Week code
PP : Production code
W00A : LD8200A

Ordering Information

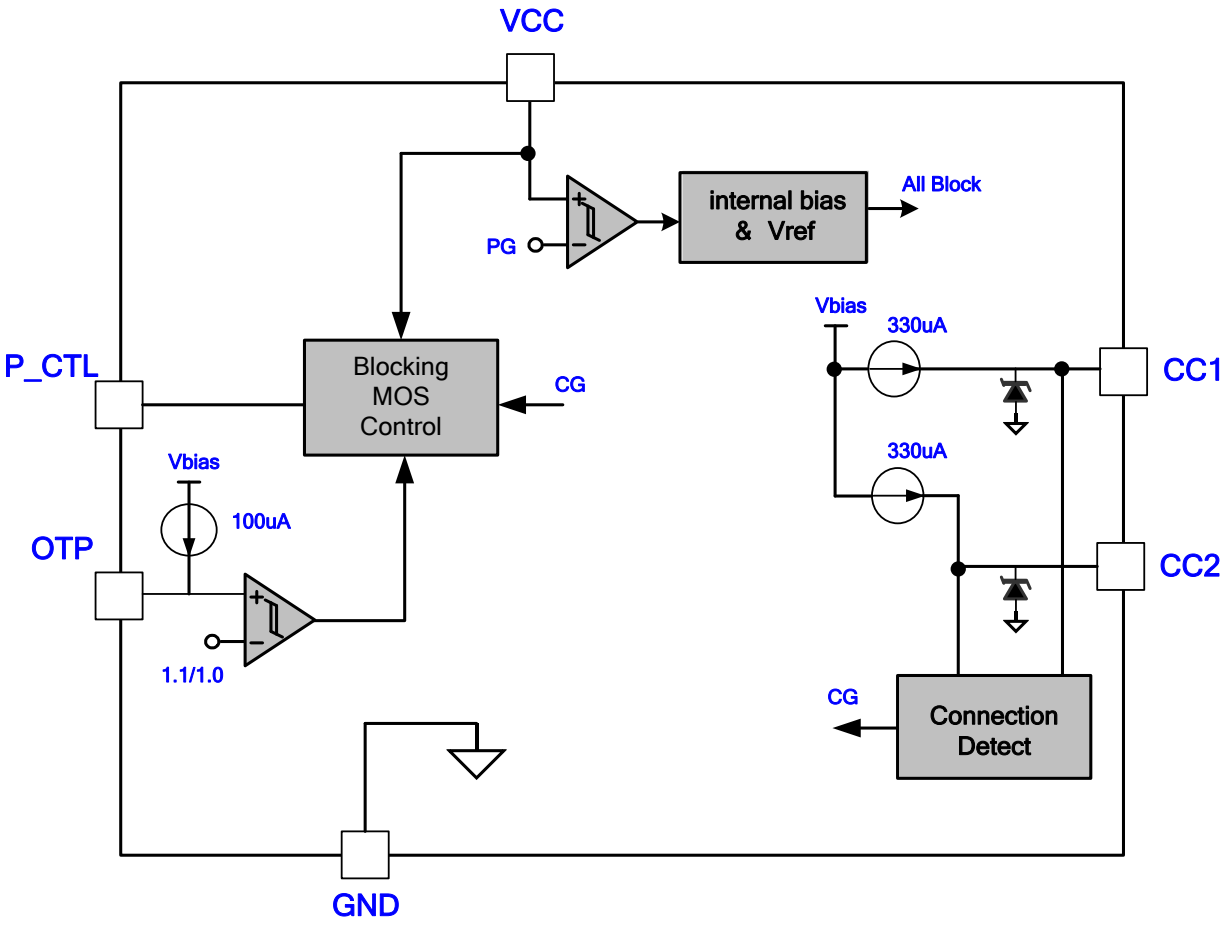
Part number	Package	Top Mark	Shipping
LD8200A GL	SOT-26	YWW/00A	3000 /tape & reel

The LD8200A is ROHS compliant/Green packaged.

Pin Descriptions

Pin	NAME	FUNCTION
1	P_CTL	Blocking MOS Control
2	GND	Ground
3	VCC	Positive power supply
4	CC1	Type-C configuration channel signal 1
5	CC2	Type-C configuration channel signal 2
6	OTP	Connecting this pin to ground with NTC will achieve OTP protection

Block Diagram



Absolute Maximum Ratings

VCC	-0.3V ~ 23V
CC1,CC2,P_CTL	-0.3V ~ VCC-0.3V
OTP	-0.3V ~ 6V
Maximum Junction Temperature	150°C
Storage Temperature Range	-65°C ~ 150°C
Package Thermal Resistance (SOT-26, θ_{JA})	200°C/W
Power Dissipation (SOT-26, Tj=125°C, Ta=85°C)	200mW
Lead temperature (Soldering, 10sec)	260°C
ESD Voltage Protection, Human Body Model (CC1,CC2)	4.0KV
ESD Voltage Protection, Machine Model (CC1,CC2)	400V
ESD Voltage Protection, Human Body Model (Others)	2.5KV
ESD Voltage Protection, Machine Model (Others)	250V

Caution:

Stress exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stress above Recommended Operating Conditions may affect device reliability.

Recommended Operating Conditions

Item	Min.	Max.	Unit
VCC Operation Range	3.5	20	V
Operating Junction Temperature	-40	125	°C
CC pin Capacitor	--	470	pF

Note:

1. It's suggest to connect VCC pin with a SMD ceramic capacitor (0.47μF~4.7μF) to filter out the undesired switching noise for stable operation. This capacitor should be placed close to IC pin as possible
2. It's essential to connect VCC pin with a SMD ceramic capacitor and TVS to prevent the ESD destroy.
3. The small signal components should be placed close to IC pin as possible.

Electrical Characteristics

(VCC=5 V, T_A = 25°C unless otherwise specified.)

PARAMETER	CONDITIONS	Symbol	MIN	TYP	MAX	UNITS
Supply Voltage (VCC Pin)						
Operation Current	CC1/CC2 unattached	I_{CC}		50		μA
	Device CC1 attached 5.1kΩ	I_{CC_H}		500		μA
UVLO(OFF)		V_{UV_OFF}	2.7			V
UVLO(ON)		V_{UV_ON}			3.5	V
CC1 and CC2 Pins						
Configuration Channel Current		I_{CC_H}	304	330	356	μA
Configuration Channel attached debounce time		T_{CCDB}		150		mS
Configuration Channel attached Low level Threshold		V_{CC_TLH}	0.75	0.8	0.85	V
Configuration Channel attached High level Threshold		V_{CC_THH}	2.46	2.6	2.74	V
External OTP(OTP)						
OTP Pin Source Current		I_{OTP}		100		μA
Over Temperature Threshold		V_{OTP}		1.00		V
Over Temperature Release Threshold		V_{OTP_R}		1.10		V
Over Temperature Threshold Debounce time		T_{OTP}		128		μs
Block MOS Control (P_CTL Pin)						
P_CTL Pull Low Resistor		R_{CTL_L}		5	10	KΩ
P_CTL High Voltage	I_{OH}=10mA	V_{CTL_OH}	VCC-0.3V			V
P_CTL leakage current		I_{CTL_LK}			10	μA
Over Voltage Protection		V_{CC_OVP}		6.5		V

Typical Performance Characteristics

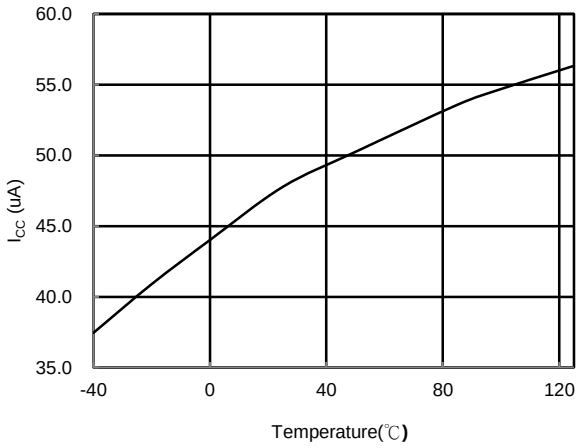


Fig. 1 I_{CC} vs. Temperature

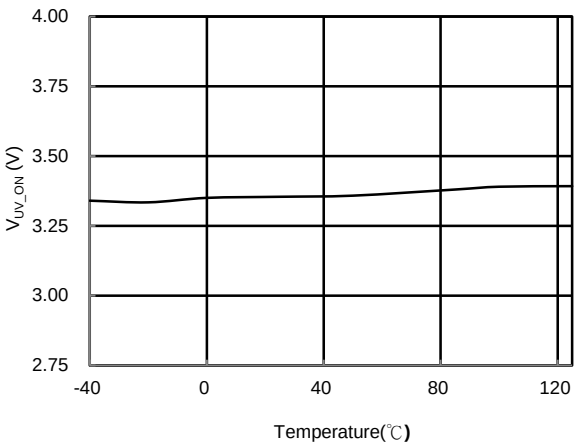


Fig. 2 V_{UV_ON} vs. Temperature

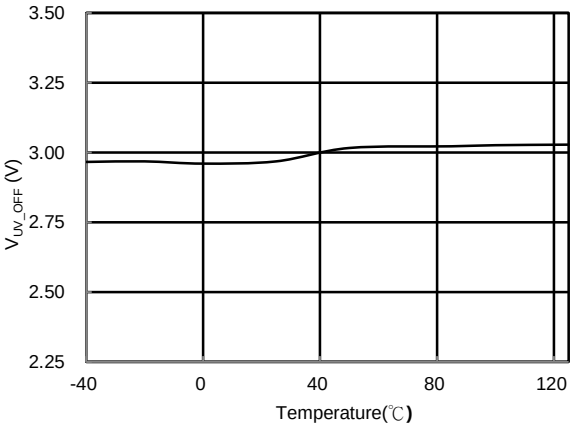


Fig. 3 V_{UV_OFF} vs. Temperature

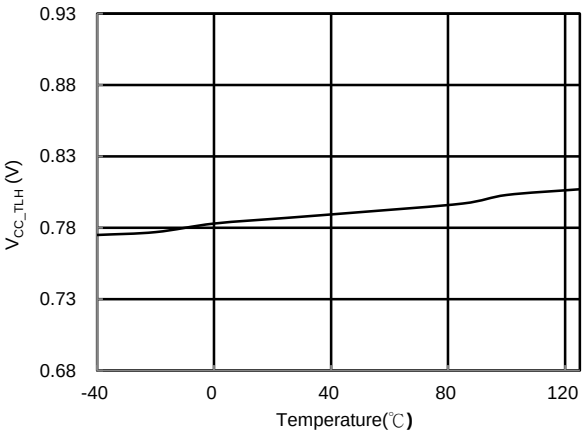


Fig. 4 V_{CC_TLH} vs. Temperature

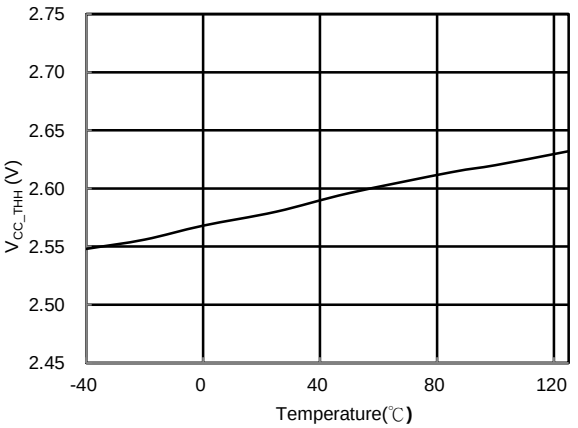


Fig. 5 V_{CC_THH} vs. Temperature

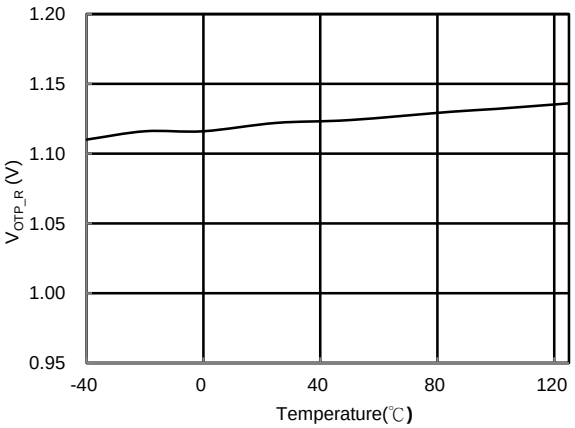


Fig. 6 V_{OTP_R} vs. Temperature

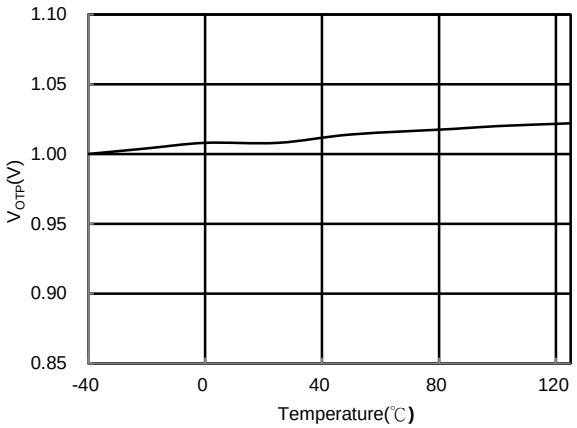


Fig. 7 V_{OTP} vs. Temperature

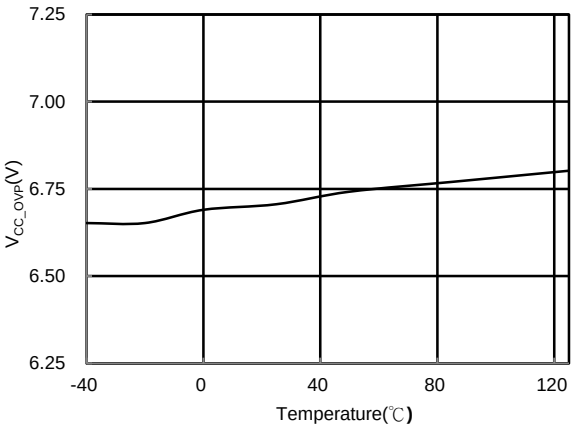


Fig. 8 V_{CC_OVP} vs. Temperature

Application Information

Basic Description

The LD8200A is a current advertisement and blocking MOSFET controller for USB Type-C adapter or Charger. The Function are includes Type-C cable detector, external over thermal protection and over voltage protection.

The device operation in wide range input voltage 3.5V~20V, low quiescent current under 100uA. And the SOT-26 package to minimize the PCB size well as component counts and cost

Current advertisement

When the VCC pin voltage rises over UVLO(ON). The IC has output current of configuration channel to advertisement the USB type-C Adaptor or charger current level to UFP (Upstream Facing Port).

Blocking P-MOSFET Controller

When a type-C cable attaches have been completed. The P_CTL would pull low after 120mS than the blocking P-MOSFET will turn on. When the cable unattached, the P_CTL would pull high straightway the blocking P-MOSFET will turn off shortly.

External Thermal protection

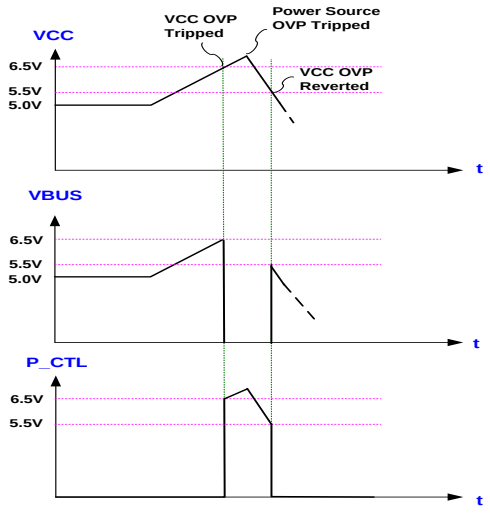
The OTP circuit is implemented to sense whether there is any hot-spot of power circuit like power MOSFET or output rectifier. Once an over-temperature condition is detected, the OTP is enabled to shut down the controller to protect the controller. Typically, a NTC is recommended to connect with OTP pin. The NTC resistance will decrease as the device or ambient in high temperature. The relationship is as below.

$$V_{OTP} = 100uA \times R_{NTC}$$

When the V_{OTP} is below the defined voltage threshold (typ. 0.1V), LD8200A will disable the P_CTL output and blocking off the VBUS. There are 2 conditions required to restart it successfully. First, cool down the circuit so that NTC resistance will increase and raise V_{OTP} up above 1.1V. Then, remove the VCC power to UVLO(OFF).

Over Voltage Protection

If VCC pin voltage is larger than 6.5V, the LD8200A would be turn off blocking P-MOSFET until the VCC Pin voltage decline to 5.6V then the LD8200A would turn on blocking P-MOSFET again.

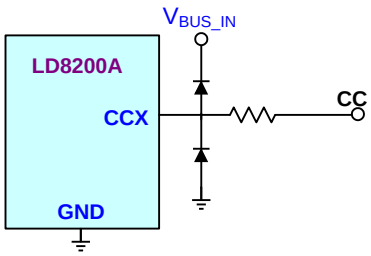


Internal Thermal protection

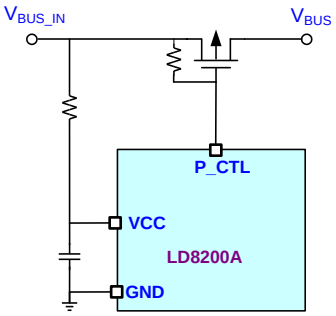
When the junction temperature reaches 140°C approximately, the thermal sensor signals would turn off External Blocking P-MOSFET. The VBUS output voltage and current is cut off to UFP under the IC's junction temperature cools by 20°.

ESD Stress Level and Interference Improve

The USB adapter or charger for ESD high levels test, it is recommended to connected diodes or TVS to CC pin to strengthen ESD stress level and avoid noise interference as below figure:

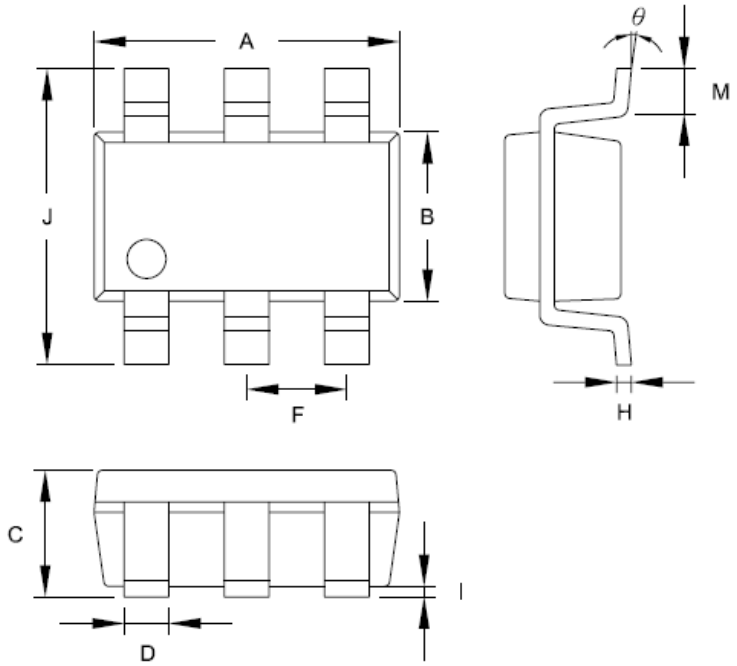


And the suggest connect VCC pin with a the RC filter to filter out the ESD pulse interference for stable operation.



Package Information

SOT-26



Symbol	Dimension in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	2.692	3.099	0.106	0.122
B	1.397	1.803	0.055	0.071
C	-------	1.450	-------	0.057
D	0.300	0.500	0.012	0.020
F	0.95 TYP		0.037 TYP	
H	0.080	0.254	0.003	0.010
I	0.050	0.150	0.002	0.006
J	2.600	3.000	0.102	0.118
M	0.300	0.600	0.012	0.024
Θ	0°	10°	0°	10°

Important Notice

Leadtrend Technology Corp. reserves the right to make changes or corrections to its products at any time without notice. Customers should verify the datasheets are current and complete before placing order

Revision History

REV.	Date	Change Notice
00	01/22/2016	Original Specification.