USB Type-C Current Advertisement Controller

REV. 01

General Description

The LD8200S provides an uncomplicated solution for USB type-C DFP host Current advertisement. It is advertised VBUS current mode as default, medium or high depending on the ISEL pin resistor setting and used the USB type-C ports with the configuration channel (CC1 and CC2) to notice Type-C UFP device. Then the device control external blocking MOSFET to determine a successful attach of UFP device.

The LD8200S operates over a wide supply range and has low power consumption. It is available in the SOT-26 package to minimize the PCB size as well as component count and cost.

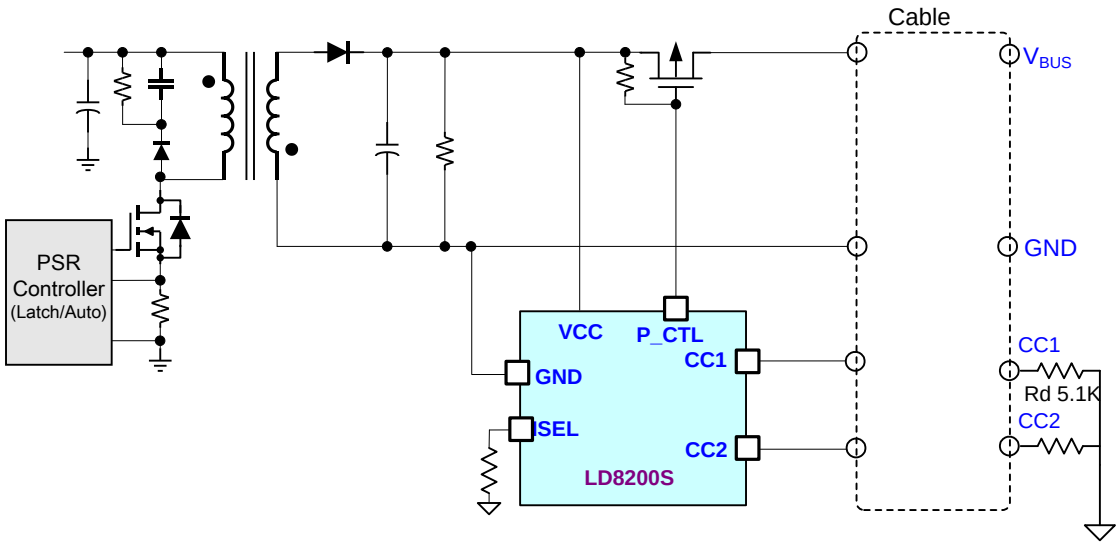
Features

- USB type-C Downstream facing port(DFP)
- Support up to 3A/1.5A of current Advertisement
- Low Quiescent Current
- VCC Operation Range : 3.5V~20V
- External Blocking MOSFET Control
- SOT-26 Package

Applications

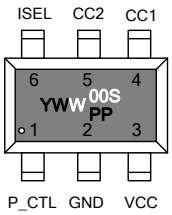
- Mobile Phone Type-C Adaptor
- USB Type-C Charger

Typical Application



Pin Configuration

SOT-26 (TOP VIEW)



YY, Y : Year code (D: 2004, E: 2005.....)
WW, W : Week code
PP : Production code
W00S : LD8200S

Ordering Information

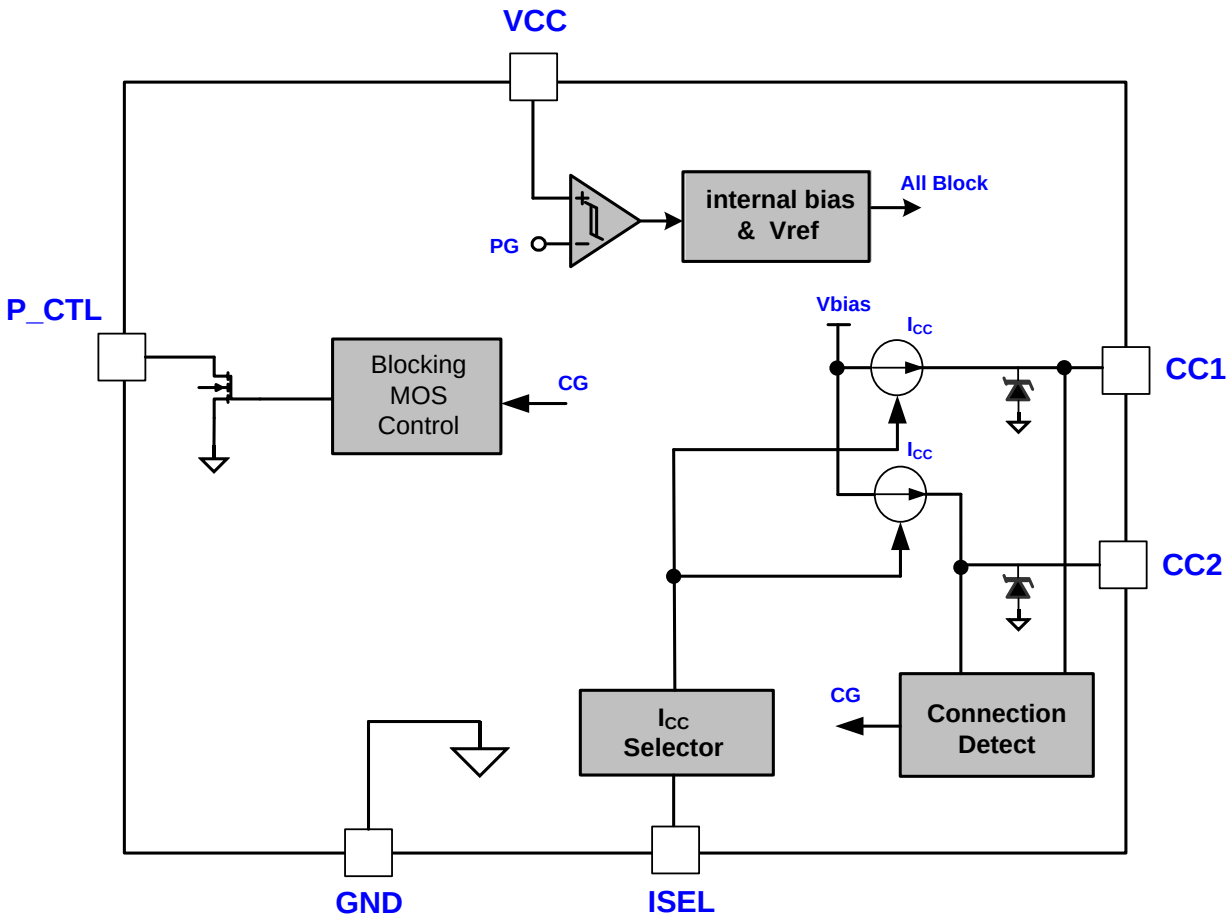
Part number	Package	Top Mark	Shipping
LD8200S GL	SOT-26	YWW/00S	3000 /tape & reel

The LD8200S 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	ISEL	VBUS Current mode selector L - Default Current. Pull-down to GND. M - Medium (1.5A) current. Pull-down to GND with 150-kΩ resistor. H - High (3.0A) current. leave unconnected.

Block Diagram



Absolute Maximum Ratings

VCC	-0.3V ~ 23V
CC1,CC2,P_CTL	-0.3V ~ VCC-0.3V
ISEL	-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
CC1 and CC2 Pins						
Configuration Channel Current	ISEL=GND VCC=5V	I_{CC_L}	64	80	96	μA
	ISEL connect 150kΩ to GND VCC=5V	I_{CC_M}	166	180	194	μA
	ISEL Floating ;VCC=5V	I_{CC_H}	304	330	356	μA
Configuration Channel attached debounce time		T_{CCDB}		150		mS
Configuration Channel attached Low level Threshold	ISEL=GND VCC=5V	V_{CC_TLL}	0.15	0.2	0.25	V
	ISEL connect 150kΩ to GND VCC=5V	V_{CC_TLM}	0.35	0.4	0.45	V
	ISEL Floating ;VCC=5V	V_{CC_TLH}	0.75	0.8	0.85	V
Configuration Channel attached High level Threshold	ISEL=GND VCC=5V	V_{CC_THL}	1.51	1.6	1.64	V
	ISEL connect 150kΩ to GND VCC=5V	V_{CC_THM}	1.51	1.6	1.64	V
	ISEL Floating ;VCC=5V	V_{CC_THH}	2.46	2.6	2.74	V

PARAMETER	CONDITIONS	Symbol	MIN	TYP	MAX	UNITS
Current mode Selector (ISEL Pin)						
ISEL Charger Current		I_{SEL}		10		μA
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
Supply Voltage (VCC Pin)						
Operation Current	CC1/CC2 unattached	I_{CC}		200		μA
	ISEL connect 100kΩ ; 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

Note: (*) Guaranteed by Design.

Typical Performance Characteristics

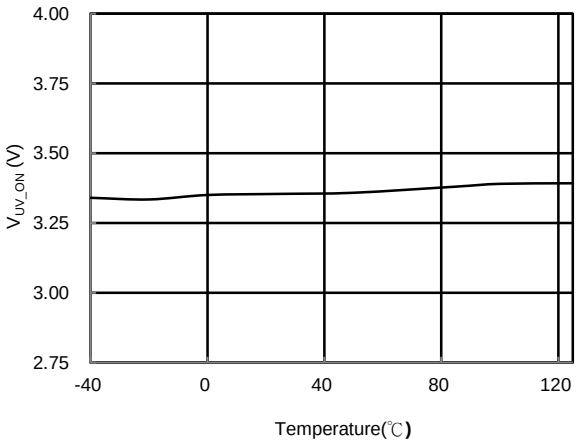


Fig. 1 V_{UV_ON} vs. Temperature

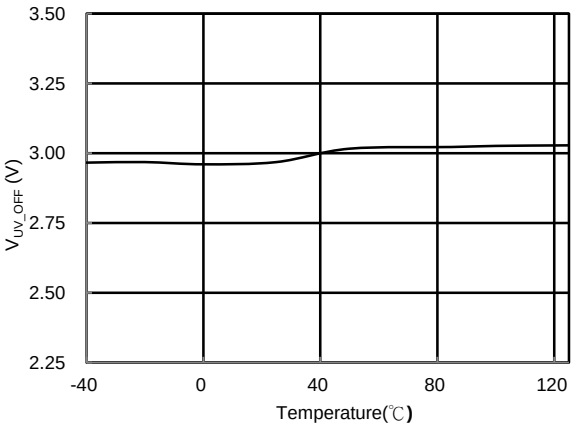


Fig. 2 V_{UV_OFF} vs. Temperature

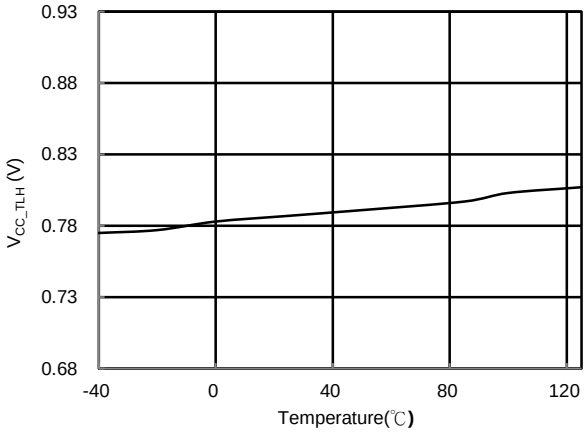


Fig. 3 V_{CC_TLH} vs. Temperature

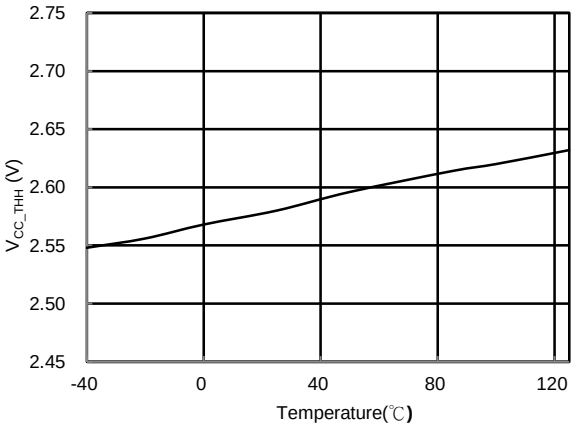


Fig. 4 V_{CC_THH} vs. Temperature

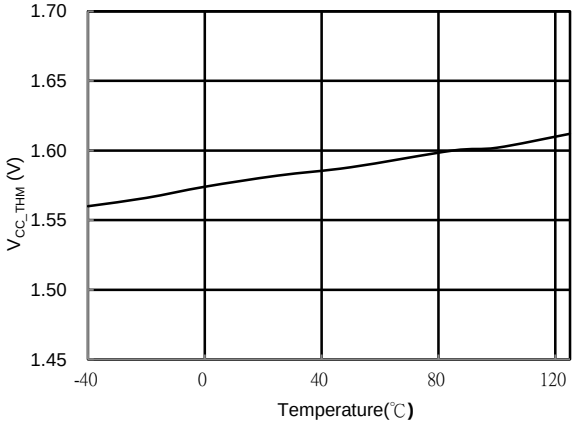


Fig. 5 V_{CC_THM} vs. Temperature

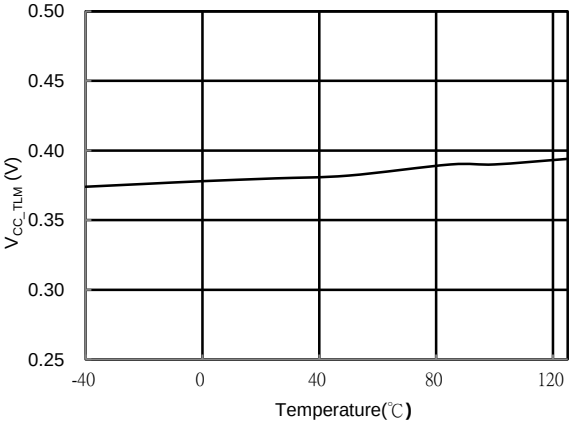


Fig. 6 V_{CC_TLM} vs. Temperature

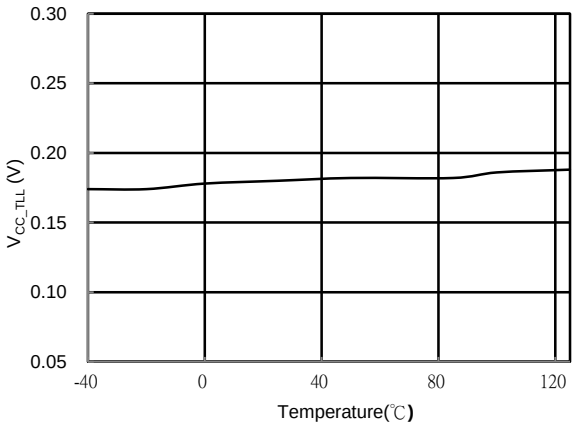


Fig. 7 V_{CC_TLL} vs. Temperature

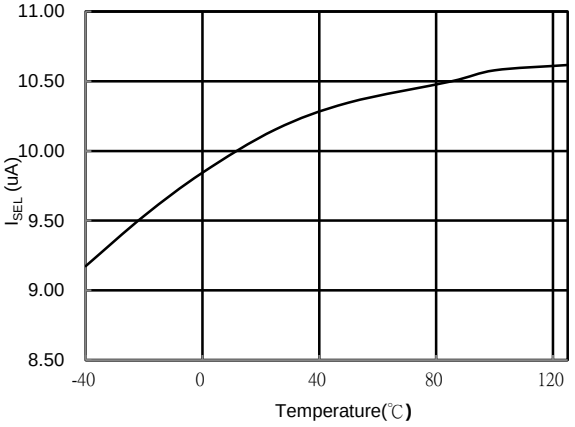


Fig. 8 I_{SEL} vs. Temperature

Application Information

Basic Description

The LD8200S is a current advertisement and blocking MOSFET controller for USB Type-C adapter or Charger. The Function includes Type-C cable detector, the current level advertisement and over voltage protection.

The device operates under a wide input voltage range from 3.5V to 20V. The SOT-26 package minimizes the PCB size as well as component counts and cost

Current advertisement Selection

When the VCC pin voltage rises over UVLO(ON). The device will detect the resistor of ISEL pin and the IC selects output current of configuration channel to advertise the USB type-C adaptor or charger current level to UFP (Upstream Facing Port). The following table is the Current level advertisement lookup table:

R_{ISEL} (Ω)	Advertisement Current Level	CC Curent (uA)
GND	Default ; 500 mA or 900mA	80
150K	Medium - 1.5 A	180
Floating	High - 3 A	330

If the ISEL pin is short to the GND, it means the USB adapter or charger current level is used as USB 2.0 or USB 3.1 default power. Its maximum current is 500mA or 900mA and the CC pin will output 80uA current to detect the UFP connection. When the ISEL pin is floating, the power source can provide the 3A current capability and the CC pin output current is 330uA. If the power source maximum current is 1.5A, the ISEL pin must connect a 150KΩ resistor to the GND. The CC pin will output 180uA.

Blocking P-MOSFET Controller

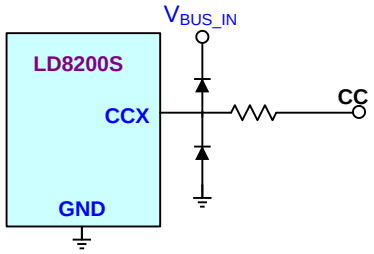
When a type-C cable connection has been completed, the P_CTL will pull low after 150mS. Then the blocking P-MOSFET will turn on. When the cable is unattached, the P_CTL will pull high straightway. The blocking P-MOSFET will turn off shortly as well.

Internal Thermal protection

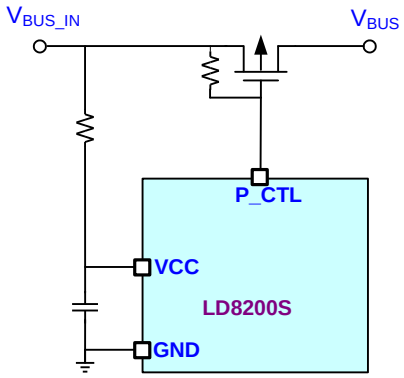
When the junction temperature reaches 140°C approximately, the thermal sensor signals will turn off External Blocking P-MOSFET. The VBUS output voltage and current are cut off to UFP under the IC's junction temperature cools by 20°C.

ESD Stress Level and Interference Improve

The USB adapter or charger for ESD high levels test is recommended to connect diodes or TVS and RC filter to the CC pin. It strengthens ESD stress level and avoids noise interference as below figure:

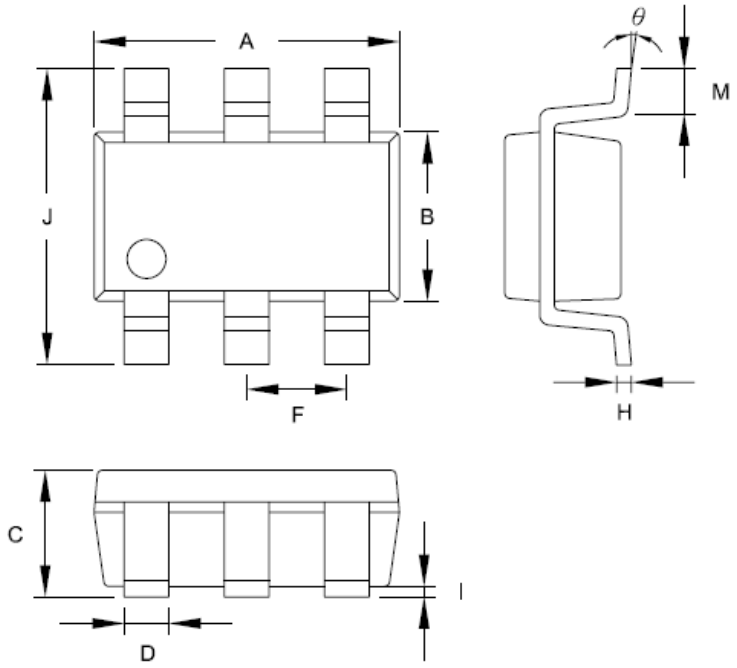


It is suggested to connect the RC filter to filter out the ESD pulse interference at VCC pin for stable operation.



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	06/27/2016	Original Specification.
01	09/29/2016	1. Update ICC Current