



USB Type-C DFP Controller IC Without/with Internal PMOS

EC301/EC302

Description

EC301 is an USB Type-C controller (USB Type-C™ Specification 1.1) with and without internal PMOS FET. It is specially designed for power adapter and charger applications (*up to 3A @5V). It negotiates with the UFP devices according to USB Type-C specifications. Once EC301/EC302 identifies the UFP devices as USB Type-C compliant, it will provide the current rating information accordingly. It also prevents the VBUS from being asserted unless a valid connection has been detected. EC301 is a USB Type-C DFP CC controller chip with intelligent identification function. USB Type-C chip supports V1.1 port protocol connection detection, identification, DFP radio equipment and inserted current configuration, only in the adapter (DFP) to open the power supply to the VBUS detection after UFP insertion, when UFP pulled out, will automatically shut down VBUS. Widely used in car charger, charger, charging, mobile power etc..

Features

- ◆ CC1/CC2 Pin to Advertise Power Source Current rating to UFP Device
- ◆ Three DFP CC Termination Current Source Levels Available
 - 80uA for Default USB Power Application
 - 180uA for 1.5A@5V Application-
 - 300uA for 3A@5V Application
- ◆ P-MOS VBUS Switch Control Pin (EC301)
- ◆ Build in internal P-MOS (EC302)
- ◆ VDD Operating Range 3.0V-5.5V
- ◆ 2KV HBM ESD Protection

Applications

- ◆ USB Type-C DFP for Mobile Chargers
- ◆ AC-DC Adapters
- ◆ Power Adapters
- ◆ Car Charger

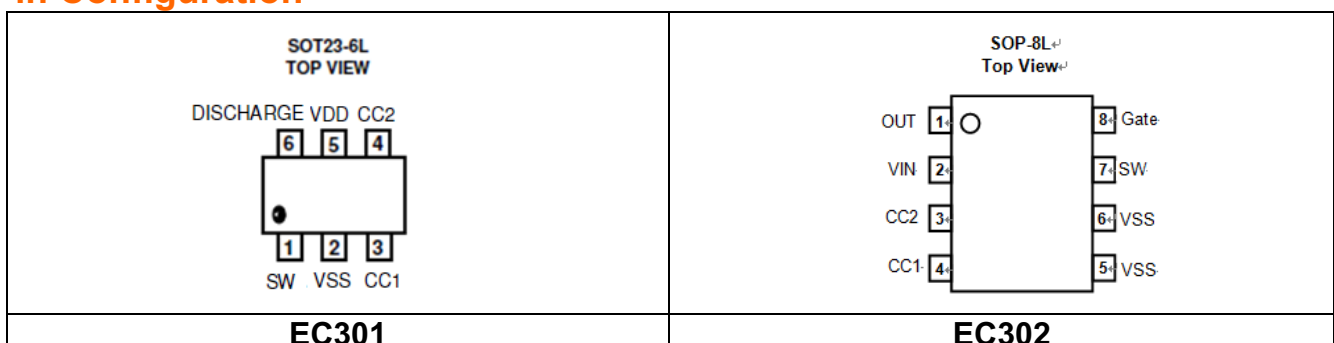
Ordering Information

EC301NN
EC302NN XX X

R : Tape & Reel

Package Type :
B3 : SOT23-6
M1 : SOP8

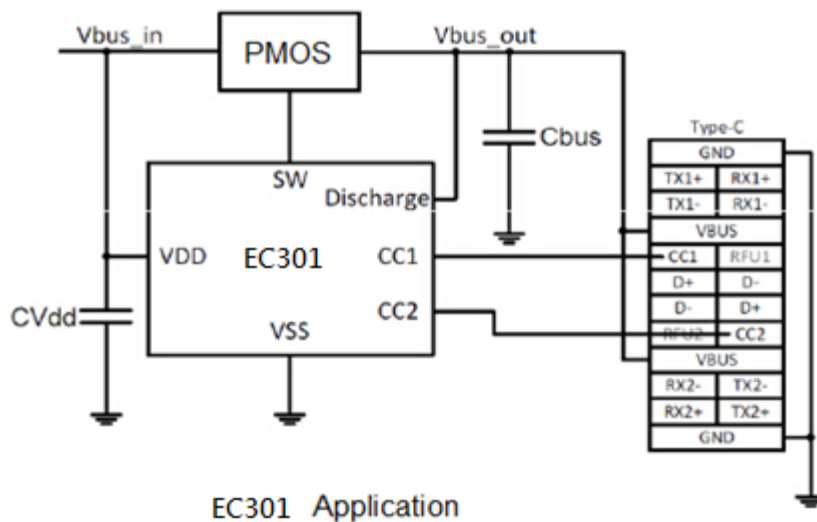
Pin Configuration



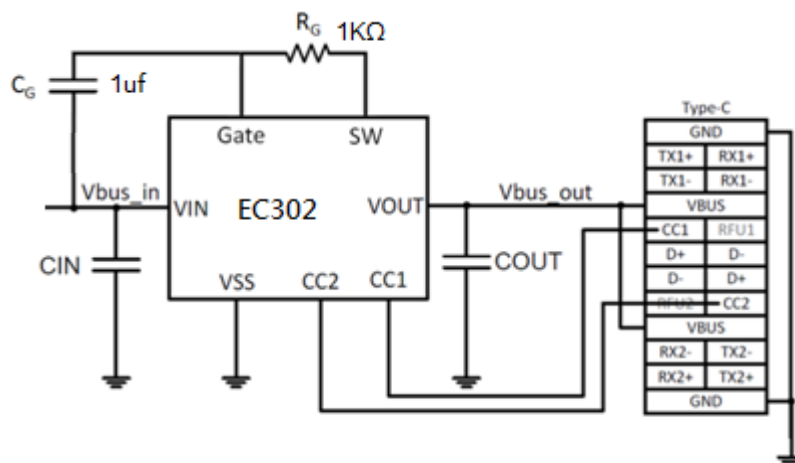
Pin Description

NO.	Pin Name	Pin Function Description
1	VDD	Power supply pin
2	CC1	Output to Type-C CC or VCONN pin.
3	CC2	Output to Type-C CC or VCONN pin.
4	VSS	Ground Pin
5	SW	External P-MOS VBUS Switch Control Pin
6	Gate	Gate Side Of Internal P-MOS
7	OUT	USB Power Output Pin
8	Discharge	Discharging VBUS line during voltage change

Typical Application



EC301 Application



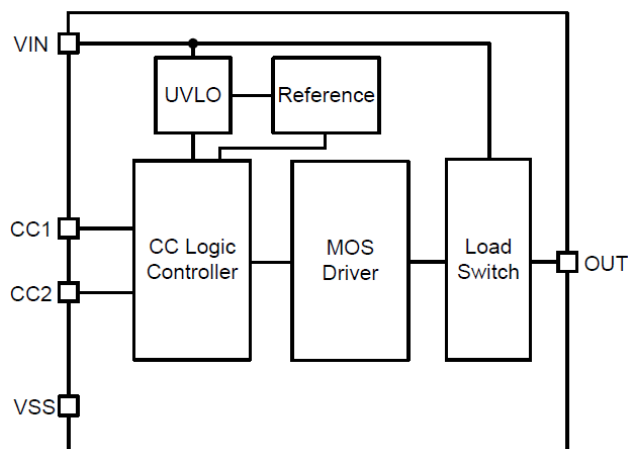
EC302 Application



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Functional Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Maximum	Units
V_{DD}	Supply Voltage	-0.3 to 7.0	V
CC1, CC2	Control Pins	-0.3 to $V_{DD}+0.3$	V
OUT	USB Power Output Pin	-0.3 to 7.0	V
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	-60~150	°C
T_{Lead}	Lead Temperature (Soldering, 10 sec.)	260	°C

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units
V_{DD}	Supply Input Voltage	3.0	6.0	V
T_J	Operating Junction Temperature Range	-40	125	°C
T_A	Operating Ambient Temperature Range	-40	85	°C

Electrical Characteristics $V_{CC}=5V$; $T_a=25^{\circ}C$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}		3.0	-	6.0	V
V_{DD} Turn-on Threshold Voltage	V_{ON}		-	4.1	-	V
V_{DD} Turn-off Threshold Voltage	V_{OFF}		-	2.85	-	V
Quiescent Current	I_Q	CC1 Pin and CC2 Pin Open	-	85	150	μA
CC1 / CC2 Source Current	I_{SOURCE}	Source Current = 80 μA	-5	-	+5	%
		Source Current = 180 μA	-5	-	+5	
		Source Current = 330 μA	-5	-	+5	
CC Rd Detection Threshold Voltage	V_{RD_TH}	For Default USB Power	1.51	1.60	1.64	V
		For 1.5A Current	1.51	1.60	1.64	
		For 3A Current	2.46	2.60	2.74	



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CC Ra Detection Threshold Voltage	V _{RA_TH}	For Default USB Power	0.16	0.20	0.24	V
		For 1.5A Current	0.36	0.40	0.44	
		For 3A Current	0.76	0.80	0.84	
CC Leakage Current	I _{CC_LEAK}	CC = 5V, V _{DD} = 0V	-	-	1	uA
tCCDebounce	T _{CC}	Time from CC Voltage Detection until SW goes Low	100	150	200	ms
tPDDebounce	T _{PD}	Time from CC Voltage Not Detection until SW goes High	10	15	20	ms
Discharge Sink Capability	V _{DIS}	Sink Current = 10mA	-	0.2	0.4	V
SW Output High Voltage	VOHSW	Source Current = 4mA	V _{DD} -0.4	V _{DD} -0.2	-	V
SW Output Low Voltage	VOLSW	Sink Current = 4mA	-	0.2	0.4	V
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{IN} =-4.5V , I _D =-4A	-	20	25	mΩ
Drain-Source Breakdown Voltage	B _{VDSS}	V _{IN} =0V , I _D =-250uA	-30	-	-	V

Typical Performance Characteristics

Timing Chart

DFP Advertisement	Current Source to 1.7 – 5.5 V	Resistor pull-up to 4.75 – 5.5 V	Resistor pull-up to 3.3 V ± 5%
Default USB Power	80 μA ± 20%	56 kΩ ± 20% (Note 1)	36 kΩ ± 20%
1.5 A @ 5 V	180 μA ± 8%	22 kΩ ± 5%	12 kΩ ± 5%
3.0 A @ 5 V	330 μA ± 8%	10 kΩ ± 5%	4.7 kΩ ± 5%

DFP CC Termination (Rp) Requirements



	Minimum	Maximum	Description
tCCDebounce	100 ms	200 ms	Time a port shall wait before it can determine it is attached
tPDDebounce	10 ms	20 ms	Time a port shall wait before it can determine it is either detached or a change in USB Type-C current due to the potential for USB PD BMC signaling on CC
tErrorRecovery	25 ms		Time a self-powered port shall remain in the ErrorRecovery state.

CC Timing

Package Outline Dimensions

SOT23-6

SOP8

DIMENSIONS				
DIM ^N	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.0532	0.0688	1.35	1.75
A 1	0.0040	0.0098	0.10	0.25
B	0.0130	0.0200	0.33	0.51
B 1	0.050 BSC		1.27 BSC	
C	0.0075	0.0098	0.19	0.25
D	0.1890	0.1968	4.80	5.00
H	0.2284	0.2440	5.80	6.20
E	0.1497	0.1574	3.80	4.00