

General Description (产品描述)

PT F1 €F is an USB Type-C controller (USB Type-C™ Specification 1.1) with/without internal PMOS FET. It is specially designed for power adapter and charger applications (*up to 3A @5V). It can provide the information about the power source current rating to a load device. It also prevents the VBUS from being asserted unless a valid connection has been detected. PT F1 €F 是一款带智能识别功能的USB Type-C DFP CC控制器芯片。芯片支持USB Type-C V1.1端口协议的连接检测、正反插识别、广播DFP设备电流能力配置等，只有在适配器（DFP）检测到有UFP插入之后才开启VBUS供电，当UFP拔出后，会自动关闭VBUS。

广泛应用于车充、旅充、墙充、移动电源等。

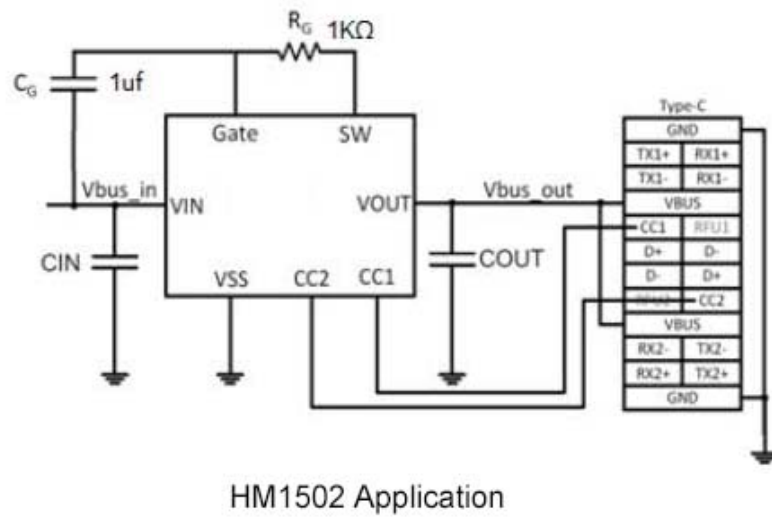
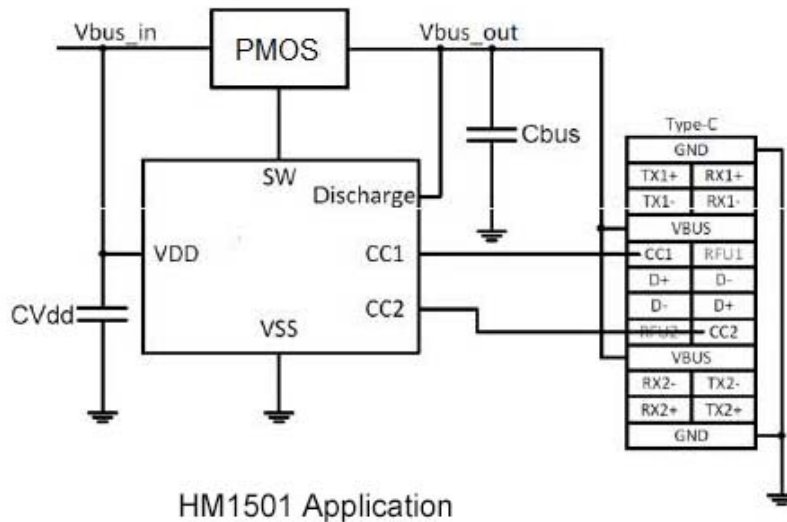
Features(产品特性)

- 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 (PT F1 €F)
- Build in internal P-MOS (HM1502)
- VDD Operating Range 3.0V-5.5V
- 2KV HBM ESD Protection

Applications(产品应用)

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

Typical Application (典型应用电路)



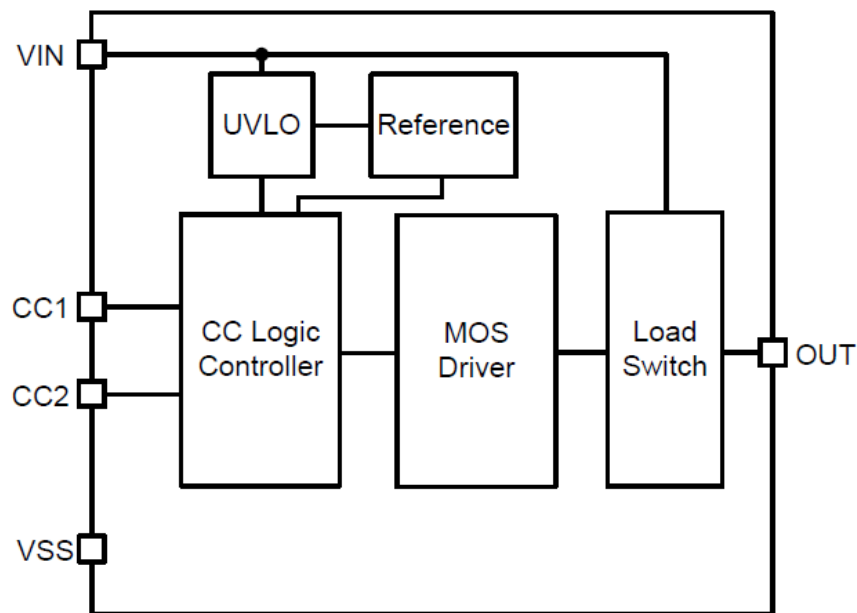
Pin Configuration (管脚排列)

<p>SOT23-6L TOP VIEW</p> <p>DISCHARGE VDD CC2 6 5 4 1 2 3 SW VSS CC1</p>	<p>SOP-8L Top View</p> <p>OUT 1 VIN 2 CC2 3 CC1 4 5 6 7 8 Gate SW VSS VSS</p>
HM1501	HM1502

Pin Description (管脚功能描述)

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 P in
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

Functional Block Diagram (功能框图)



Absolute Maximum Ratings(最大额定参数)

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(推荐工作条件)

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

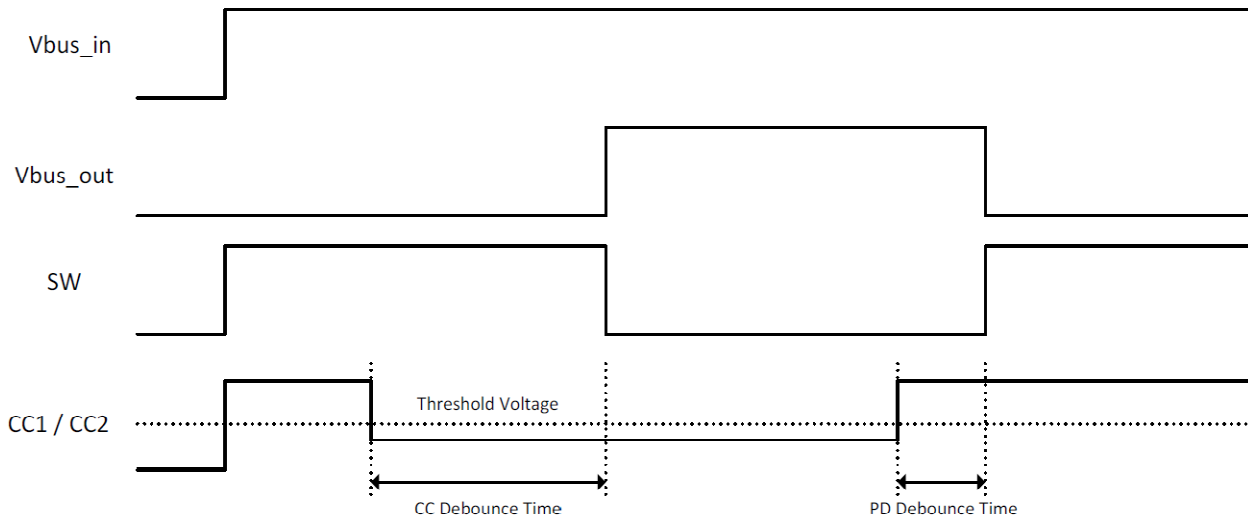
Electrical Characteristics(电气参数)

(V_{CC}=5V ; T_a=25°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	uA
CC1 / CC2 Source Current	I _{SOURCE}	Source Current = 80 uA	-5	-	+5	%
		Source Current = 180 uA	-5	-	+5	
		Source Current = 330 uA	-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	
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	μA
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	V_{OHSW}	Source Current = 4mA	$V_{DD}-0.4$	$V_{DD}-0.2$	-	V
SW Output Low Voltage	V_{OLSW}	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	$m\Omega$
Drain-Source Breakdown Voltage	$BVDSS$	$V_{IN}=0V$, $I_D=-250\mu A$	-30	-	-	V

Typical Performance Characteristics(典型性能特性)



Timing Chart

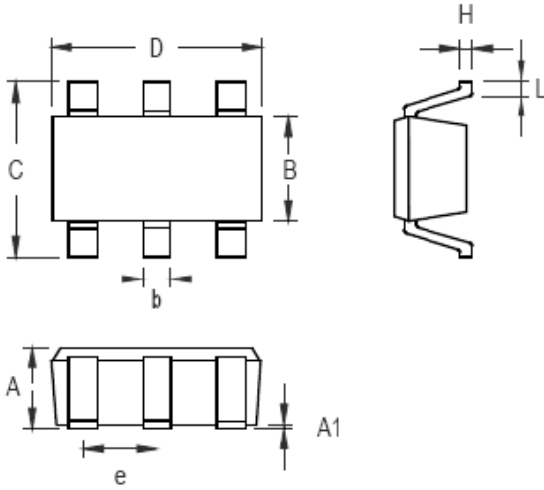
DFP Advertisement	Current Source to 1.7 - 5.5 V	Resistor pull-up to 4.75 - 5.5 V	Resistor pull-up to 3.3 V ± 5%
Default USB Power	80 μA ± 20%	56 kΩ ± 20% (Note 1)	36 kΩ ± 20%
1.5 A @ 5 V	180 μA ± 8%	22 kΩ ± 5%	12 kΩ ± 5%
3.0 A @ 5 V	330 μA ± 8%	10 kΩ ± 5%	4.7 kΩ ± 5%

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.

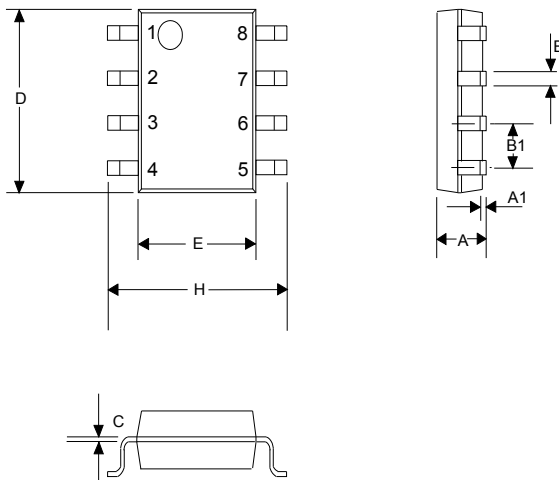
CC Timing

Outline Drawing For SOT23-6 (封装尺寸 SOT23-6)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.031	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.250	0.560	0.010	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

Outline Drawing For PSOP8 (封装尺寸 PSOP8)



DIMENSIONS				
DIM ^N	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.0532	0.0688	1.35	1.75
A1	0.0040	0.0098	0.10	0.25
B	0.0130	0.0200	0.33	0.51
B1	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