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1. Description

With Smartphone and Tab become the mainstream portable mobile devices, the demand for a "universal charging (fast charging)" to various mobile devices increase dramatically.

MA5885 is an USB fast-charging controller which, if putting it in wall-adaptors, travel chargers, and car-chargers, allows to identify these adaptor/charger as an original USB-dedicated charger to Smartphone.

Normally, a USB wall-charger provides unified charging mechanism by traditional USB current supply (0.5A) when charging devices through USB ports. With an USB enabled wall-charger which complies with USB Battery Charging Specification (BC), it provides unified charging mechanism by more USB current supply (up to 1.5A) when charging the devices through USB ports, so called "fast-charging" mechanism. In another word, MA5885 is a high performance solution for "fast-charging" mechanism and speed up charging time much.

MA5885 embedded automatic charger detection circuit which complies with USB Battery Charging Specification (BC) version 1.2, and Apple/Samsung Tab resistor mode. This feature implies MA5885 supports wide range of Smartphone/Tabs for fast charging.

The MA5885 is designed for all charger products with USB interface. With the package of SOT23-5, the MA5885 provides best performance and cost solution.

2. Feature

- Fast Charging :
  - ✓ USB Battery Charging Specification1.2 (BC1.2)
  - ✓ Apple (1A/2.1A) resistor mode
  - ✓ Samsung Tab 2A charging mode
- Automatic charger detection circuit
- Selectable between Apple 1A/2.1A mode
- Build in Power Switch
- SOT23-5 package

3. Target Application

- USB Wall Charger Adaptor

- Travel Adaptor

- USB Car Charger / Cigarette Lighter Adaptor

- Power bank

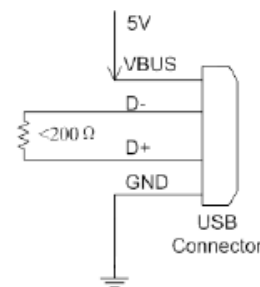## 4. MA5885 Charging Modes

Charging Mode	Max charging current	Support Device Type
BC1.2 (DCP only)	1.5A	BC 1.2 device
Apple Resistor	1A	iPhone
Apple Resistor	2.1A	iPad
Samsung Divider	1.5A	Galaxy Tab

5. Detail Function Description

- Smartphone/Tab will monitor Timing/voltage/Current of D+/D- signal to determine which kind of charging port it connected to.

- The impedances presented on D+ and D- of "dedicated chargers" are different depending on the "specific standard" the dedicated charger is designed to. Standards such as BS1.2, Divider mode and Quick Charge 2.0.

  ✓ BC1.2 and the Chinese Telecommunications Industry Standard YD/T 1591-2009 define that the D+ and D- data lines should be shorted together with a maximum series impedance of 200 Ω.

 ✓ Apple divider mode, 2 V and 2.7 V are presented on D+ and on D-.
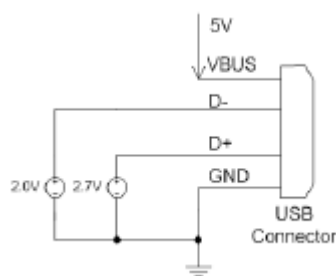
Apple 2.1A divider mode   BC1.2 DCP mode

- Apple divider mode, Samsung Galaxy mode and BC1.2 define the protocol necessary to allow "portable devices "to recognize what kind of port it is connected to, so that it can start its maximum allowable current draw.

- Current dedicated charger limitation :
  ✓ Apple iPad USB charger can not charge Galaxy Tab
  ✓ Samsung Galaxy Tab USB charger can not charge iPhone/iPad
  ✓ Traditional USB wall adaptor (BC1.2, DCP, with DP/DM short) can not charge iPhone/iPad/Galaxy tab

- If using MA5885 in an USB charger. After protocol handshaking between MA5885 and the charging device (Smartphone/Tab) through DP/DM signals, MA5885 will auto-configure the dedicated DP/DM voltage bios for the connecting charging devices.
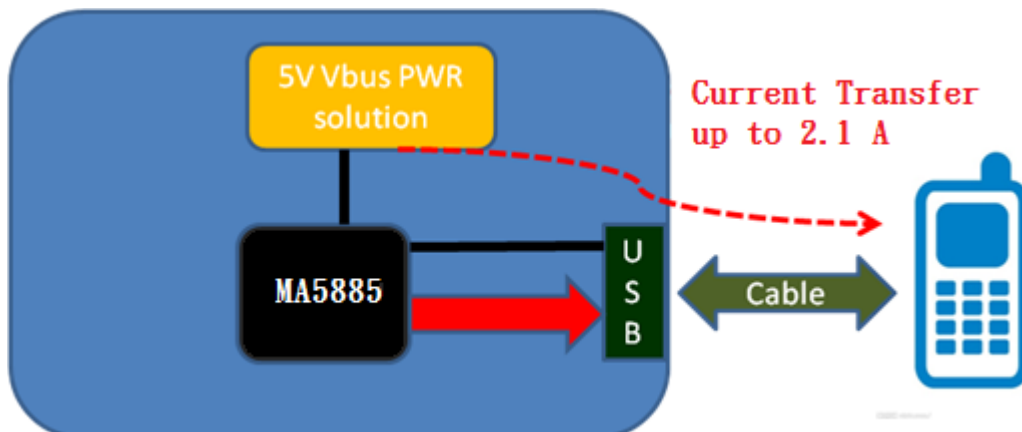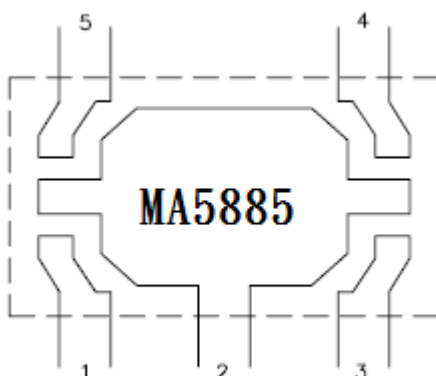
Smart (Universal) USB Charger

- MA5885 starts with Apple Divider Mode. Thus if a BC1.2 compliant device is attached, MA5885 responds by discharging, turn on the internal power switch and operating in BC1.2 DCP mode. It then stays in that mode until the device is unattached, in which case MA5885 then goes back to Apple Divider Mode.
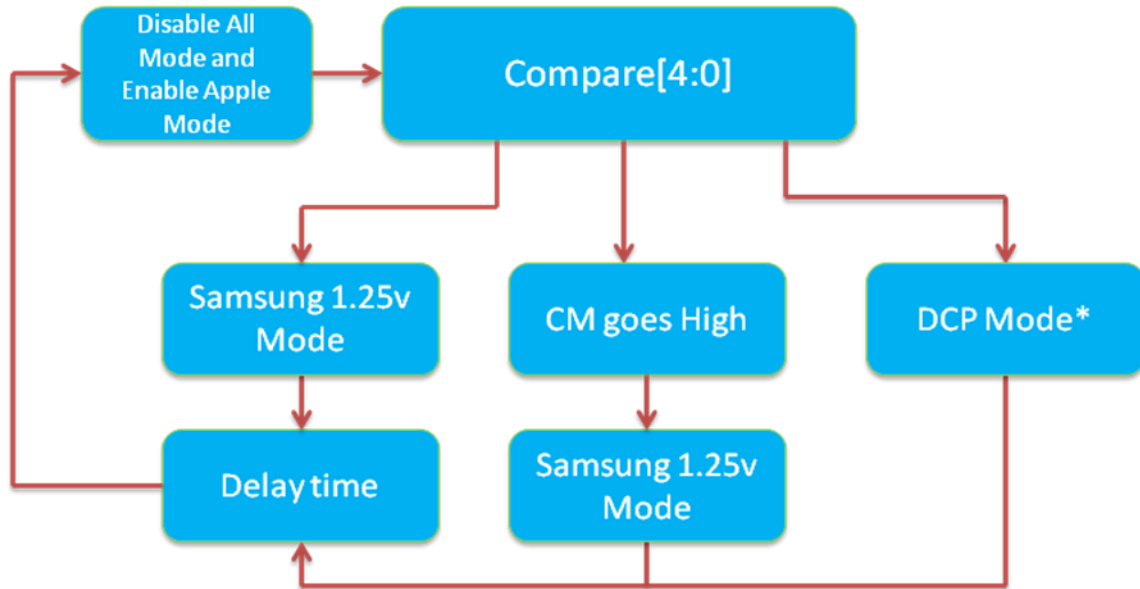
6. Pin Assignment

7. Pin Description

Pin #	Pin Name	I/O	Description
1	SEL	I	Mode selection
2	GND	P	Ground
3	VDD5	P	Power
4	DP	B	D+ to USB connector
5	DM	B	D- to USB connector

8. Electrical Characteristics

8.1 Regulator

Parameter	Value
VBUS (5 volts input)	Min.=4.5 volts , Max.=5.5 volts
VDDR33 (3.3 volts output)	3.3 volts ± 10 %
VDDR18 (1.8 volts output)	1.8 volts ± 10 %
Maximum current	300 mA

8.2 Analog and Digital power

Parameter	Value
AVDD33 (analog supply voltage)	3.3 volts ± 10 %
VDD33 (Digital supply voltage)	3.3 volts ± 10 %
VDD33F (Card power supply)	3.3 volts ± 10 % ; Max. current=200mA
VDD18 (Digital supply voltage)	1.8 volts ± 10 %

8.3 Power consumption

| Parameter	Value	Note
Normal operation	Max. =110mA	With SanDisk 8G C10 SD card
Suspend current	Max.= 350 uA	With SanDisk 8G C10 SD card

8.4 DP/DM characteristics

Parameter	Description
Eye diagram test	Pass the USB eye-diagram test, so the DP,DM electrical characteristics such as eye-diagram, signal rate, rise time, fall time are met the specification.

8.5 DC Characteristics and Operating Conditions

Symbol.	Parameter	Rating			Unit
		Min.	Typ.	Max.	
Vbus	5V Power Supply Voltage	4.5		5.5	V
VDDR33	3.3V Power Supply Voltage	3.0		3.6	V
VDDR18	1.8V Power Supply Voltage	1.62		1.98	V
V_{IH}	High level input voltage	0.7VDDR33			V
V_{IL}	Low level input voltage			0.3VDDR33	V
V_{OH}	High level output voltage	0.8VDDR33			V
V_{OL}	Low level output voltage			0.2VDDR33	V
I_{OH}	High level output current	6			mA
I_{OL}	Low level output current (V_{OL} =0.4V)	6			mA

9. Package (SOT23-5)
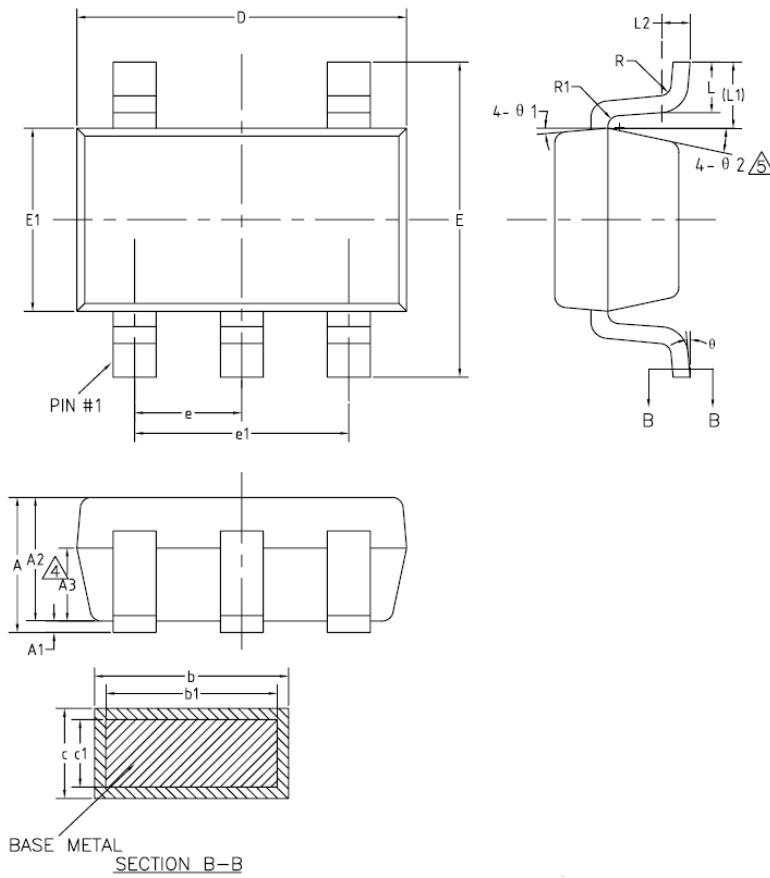
COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
SYMBOL	MIN	NOM	MAX
A	–	–	1.25
A1	0	–	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	–	0.50
b1	0.36	0.38	0.45
c	0.14	–	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59REF		
L2	0.25BSC		
R	0.10	–	–
R1	0.10	–	0.25
θ	0°	–	8°
θ1	3°	5°	7°
θ2	6°	–	14°

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