





70m Ω , 5V USB High Side Current Limited Load Switch

Description

ME1502 is a USB output protection chip with adjustable current limit threshold for 5V applications. The device integrates over current protection, short protection, over temperature protection, under voltage lock-out protection functions, etc. It can limit output current when short event happens or heavy capacitive load is applied to the USB output, so as to protect the supply voltage source from collapsing.

Typical Application

- USB hub
- USB periphery
- Notebook and tablet
- Charger and adapter

Features

- Low on resistance: 70mΩ
- Current-limit threshold adjustable by external resistor
- Current limit accuracy over full operating conditions: ±15%
- Output short fast response and protection
- No parasitic substrate diode, and reverse current blocking when switch is off.

Package

5-pin SOT23-5



Typical Application Circuit



Selection Guide



Part Number	Description		
	Current limit threshold is adjustable, EN high enable;		
ME 1502AM5G	Package:SOT23-5		
	Current limit threshold is adjustable, EN low enable;		
ME 1502CIVI5G	Package:SOT23-5		

Pin Configuration



Pin Assignment

Pin# (SOT23-5)	Symbol	Pin Description
1	VOUT	Output, connected to USB port VBUS.
2	GND	Chip ground.
3	RSET	Current limit threshold setting pin, external resistance to ground to set the current limit threshold. loc=60K/Rset
4	EN	Chip enable pin. Logic low effective.
5	VIN	Power supply pin.



Block Diagram



Figure.2 Internal block diagram

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Power supply	VIN	6	V
Output voltage	VOUT	-0.3 to VIN	V
Dissipation power SOT23-5	P _D	600	mW
Thermal resistance(Junction to air) SOT23-5	θ_{JA}	210	°C /W
Junction temperature	TJ	-40~+150	°C
Storage temperature	T _{STG}	-55~+150	°C
Soldering temperature (5 seconds)	T _{LEAD}	260	°C

Caution: Exceeding these ratings may damage the device.

Recommended Operating Conditions

Parameter	Symbol	Min.	Тур.	Max.	Unit
Power supply	VIN	2.7	5.0	5.5	V
Operating ambient temperature	Та	-40	25	85	°C



Electrical Characteristics

Unless otherwise noticed, Ta=25°C, VIN=5V, Rset=30K

Parameter	Conditions Min.		Тур.	Max.	Unit
Supply voltage range		2.7		5.5	V
Quiescent current	EN =0	30	50	80	uA
Shutdown current	EN =5V	0	0.01	1.0	uA
On resistance	lout=500mA		70		mΩ
Current limit threshold	Current ramping (<0.1A/mS) VIN: 2.7~ 5V Ta: -40°C~ 85°C Rset=30K	1.7	2.0	2.3	A
Short current	Rset=30K, VOUT short to GND		1.2		А
UVLO	VIN increasing	1.8	2.2	2.6	V
UVLO hysterisis	VIN decreasing		0.2		V
EN high level		1.6			V
EN low level				0.4	V
Over temperature protection threshold			155		°C
Over temperature protection hysterisis			20		°C





Typical Operating Characteristics

(Unless otherwise noticed: Ta=25°C, VIN=5V, RSET=22K)





Operation Theory

• Startup / Shutdown / On resistance

When the EN pin is connected to the enable level, and VIN voltage is higher than UVLO threshold. When device is enabled, the power NMOS between VIN and VOUT is turned on, and exhibits low resistance. The typical on resistance is 70 m Ω .

When the EN pin is connected to the shutdown level, or VIN voltage decreases to lower than UVLO hysteresis voltage, the device is shut down, and the power NMOS is turned off, which exhibits high resistance. When device is shutdown, the output discharge function accelerates VOUT voltage decreasing.

The current limit circuit takes effect during startup, which will limit the inrush current caused by attaching to a large capacitive load.

Current limiting

When output current is larger than current limit threshold, the internal power NMOS resistance increases, which makes VOUT to decrease, and the output current is limited. The internal current limit circuit will set the output current value according to VOUT voltage. If VOUT keep decreasing, the output current will decrease as well, and reaches to short current if VOUT is shorted to GND. The current-limit threshold can be set through the RSET pin external resistor to ground. The relationship between the current-limit threshold loc and the Rset resistor value is:

• Over temperature protection

In current limiting status, the internal power dissipation of the device increases due to VOUT decreasing, which makes junction temperature increase. When the junction temperature exceeds over temperature threshold, the device is shut down, which will cool down the device. When junction temperature decreases to lower than OT hysteresis threshold, the device is auto restarted.

Under voltage lock out protection

When power on, the device is turned on when VIN voltage ramps to higher than UVLO threshold. When power off, the device is shut down when VIN voltage decreases to lower than UVLO hysteresis threshold.

Application Information

- Cin and Cout capacitor should be placed as near as device pin.
- VIN and VOUT routings should be as wide as possible on PCB.
- The Rset resistor should be placed as close as possible to the RSET pin to reduce parasitic resistance and capacitance.
- Makes copper area as large as possible.



Package Information

• Packaging Type:SOT23-5



DIM	Millimeters		Inches		
	Min	Мах	Min	Max	
А	1.05	1.45	0.0413	0.0571	
A1	0	0.15	0.0000	0.0059	
A2	0.9	1.3	0.0354	0.0512	
A3	0.6	0.7	0.0236	0.0276	
b	0.25	0.5	0.0098	0.0197	
С	0.1	0.23	0.0039	0.0091	
D	2.82	3.05	0.1110	0.1201	
e1	1.9(TYP)		0.0748(TYP)		
E	2.6	3.05	0.1024	0.1201	
E1	1.5	1.75	0.0512	0.0689	
е	0.95(TYP)		0.0374	4(TYP)	
L	0.25	0.6	0.0098	0.0236	
L1	0.59(TYP)		0.0232	2(TYP)	
θ	0	8°	0.0000	8°	
c1	0.2(TYP)		0.007	9(TYP)	



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