1.General Description

The WP250152T3-B is a current limited P-channel MOSFET power switch designed for high-side load switching applications. This switch operates with inputs ranging from 2.5V to 5.2V, making it ideal for both 3.3V and 5V systems. An integrated current-limiting circuit protects the input supply against large currents which may cause the supply to fall out of regulation. The WP250152T3-B includes thermal shutdown protection that prevents damage to the device when a continuous over-current condition causes excessive heating by turning off the switch. The load of the switch can be up to 0.15A. The quiescent current is only 100μA.

The WP250152T3-B is available in Pb-free packages and is characterized for operation over the free-air temperature range of - 40°C to 85°C.

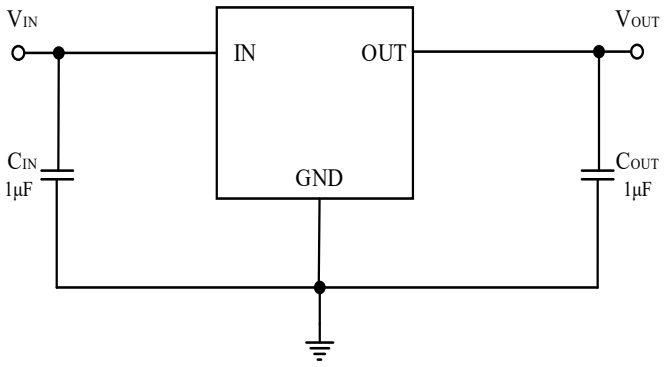
2. Features

- Input Voltage Range: 2.5V to 5.2V
- 200mA Current Limit
- Reverse Current Limit
- Very Low Quiescent Current: 100μA (Typ.)
- Output Over-voltage Protection
- Under-Voltage Lockout
- Thermal Shutdown
- 8kV ESD Rating
- Package: SOT23-3

3. Applications

- Laptop/Desktop Computers and Netbooks
- Smart Phones and PDAs
- LCD TVs and Monitors
- Set-Top-Boxes, Residential Gateways
- Printers, Docking Stations, HUBs
- USB Memory Drives
- USB Hubs

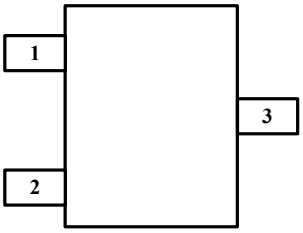
4. Typical Application



Note: Tantalum or Aluminum Electrolytic capacitors (C_{IN} and C_{OUT}) may be required for USB applications

5. Pin Configuration

(Top View)



SOT23-3

6.Pin Description

PIN NUMBER	PIN NAME	I/O	PIN FUNCTION
1	GND		Common ground.
2	OUT	O	Switch output.
3	IN	I	Switch input.

7. Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)(1)

PARAMETER	RATING	UNIT
IN Voltage	-0.3 to 6	V
OUT Voltage	-0.3 to V_{IN} + 0.3	V
OUT Current	Internal Limited	A
Power Dissipation	300	mW
Package Thermal Resistance(θ_{JA})	250	°C/W
Operating Junction Temperature	-40 to 125	°C
Storage Temperature	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)	260	°C
ESD(HBM)	8000	V

NOTE: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

8. Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Input Voltage	2.5	5.2	V
I_{OUT}	Output Current		150	mA
T_A	Operating Ambient Temperature	-40	85	°C

9. Electrical Characteristics

(V_{IN} = 5 V, C_{IN}=1μF, C_{OUT}=1μF, T_A=25°C, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
I_Q	Quiescent Current	Enabled, OUT floating		100	140	μA
$R_{DS(ON)}$	Switch on-resistance	V_{IN}=5V, I_{OUT}=0.6A	100	250	350	mΩ
I_{LIM}	Current Limit	V_{IN}=5V, V_{OUT}=4.5V	160	200	240	mA
V_{UVLO}	Input UVLO Threshold	Enabled, V_{IN} rising	1.4	1.8	2.2	V
V_{UVLO_HYS}	Input UVLO Hysteresis			0.01		V
I_{REV}	Reverse Leakage Current	V_{IN} = 0V, V_{OUT} = 5V, I_{REV} at V_{IN}		0.1	1	μA
I_{ROCP}	Reverse-Current Trigger Point	V_{IN} = 5.0V, V_{OUT} = 5.2V		0.1		A
t_{TRIG}	Deglitch time from reverse current trigger to MOSFET turn off	Note 2	0.5	0.7	1.0	ms
V_{OVP}	Output over-voltage trip point	Note 3	5.3		5.6	V
t_R	Output Turn-on Rise Time	R_{LOAD}=100Ω	0.2	0.4	0.8	ms
T_{SHDN}	Thermal Shutdown Threshold	Note 1		150		°C
T_{HYS}	Thermal shutdown hysteresis	Note 1		20		°C

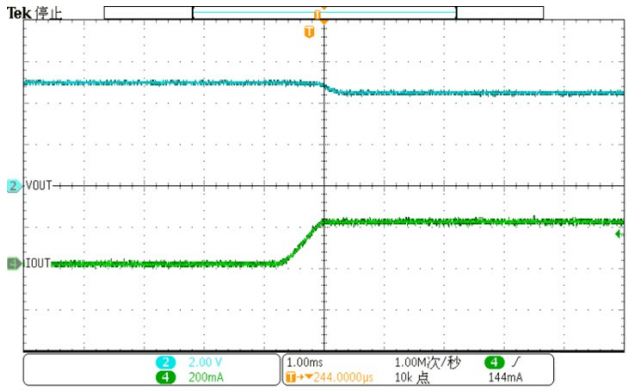
Note 1: Guaranteed by design.

Note 2: When reverse current triggers at I_{ROCP} = 0.10A, the reverse current is continuously clamped at I_{ROCP} for 0.7ms deglitch time until MOSFET is turned off.

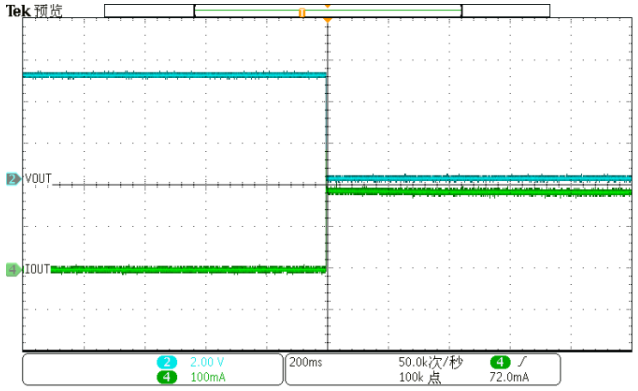
Note 3: During output over-voltage protection, the output draws approximately 60μA current.

10. Typical Performance Characteristics

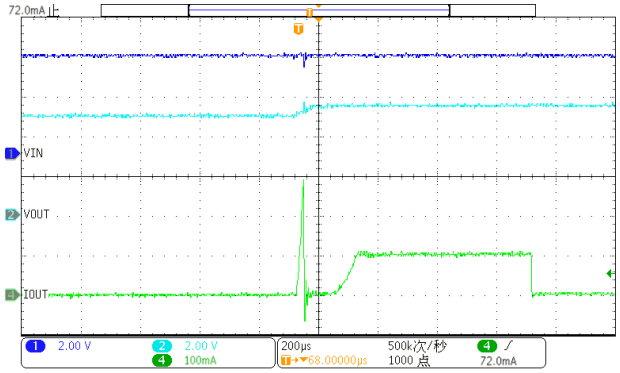
(V_{IN} = 5V, V_{EN} = 5V, C_{IN}=1μF, C_{OUT}=1μF, T_A=25°C, unless otherwise noted)



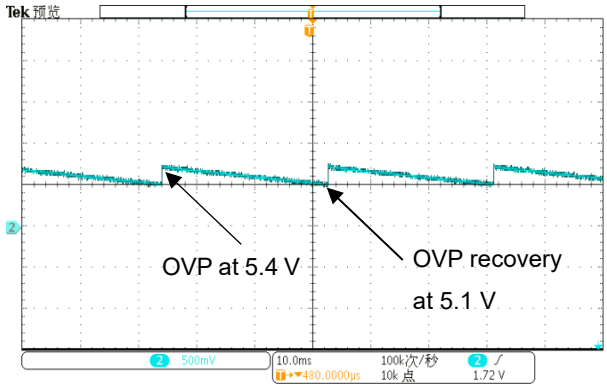
Overload Current-Limit



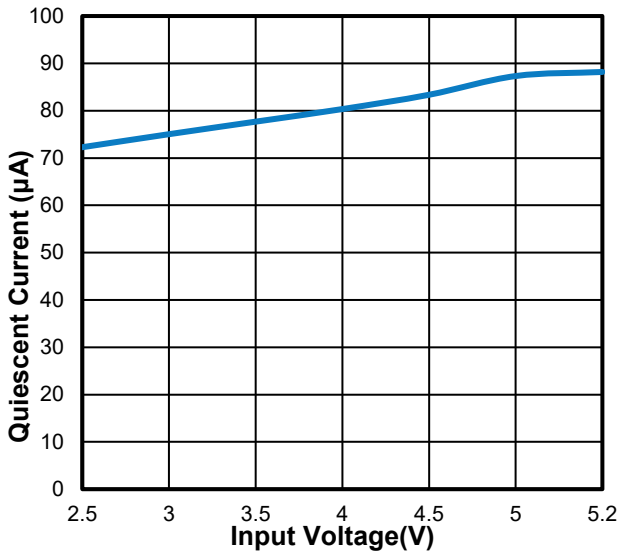
Short Current Response



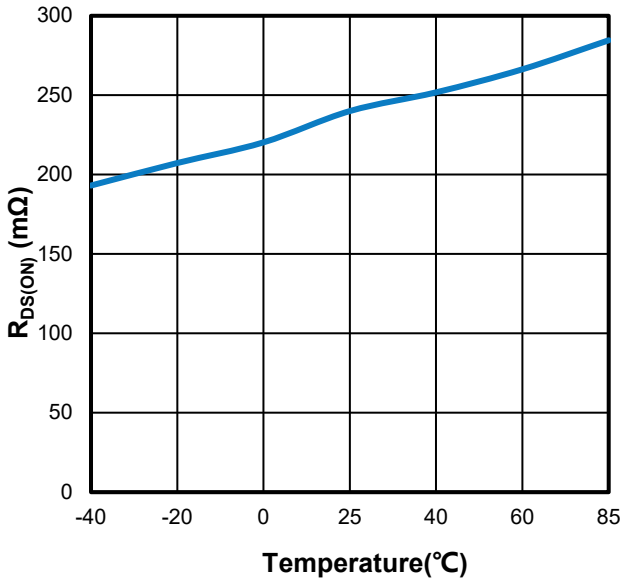
Reverse-Current Limit



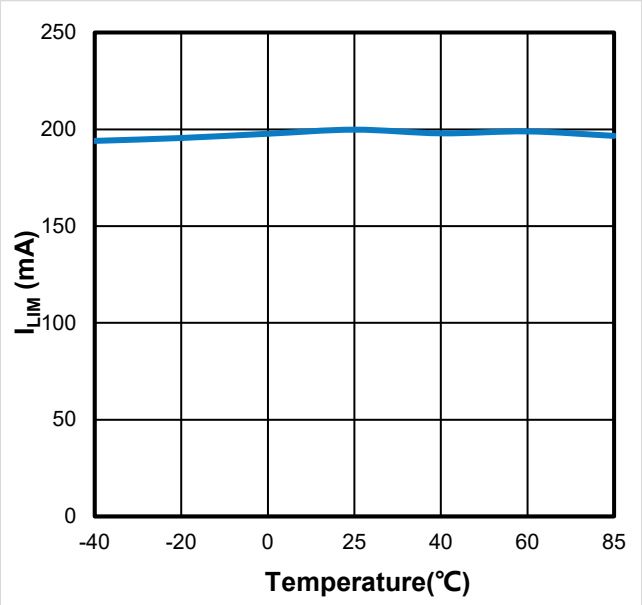
Output Over-Voltage Trip Point



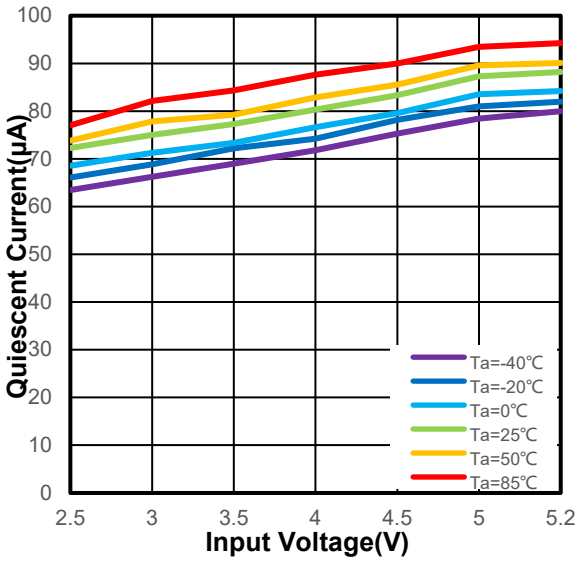
Quiescent Current vs. Input Voltage



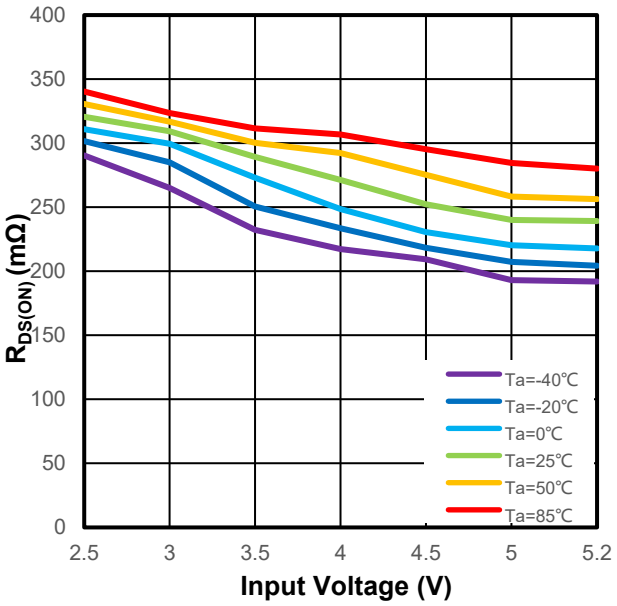
Switch On-Resistance vs. Ambient Temperature



Current Limit vs. Ambient Temperature



Quiescent Current vs. Input Voltage vs. Ambient Temperature



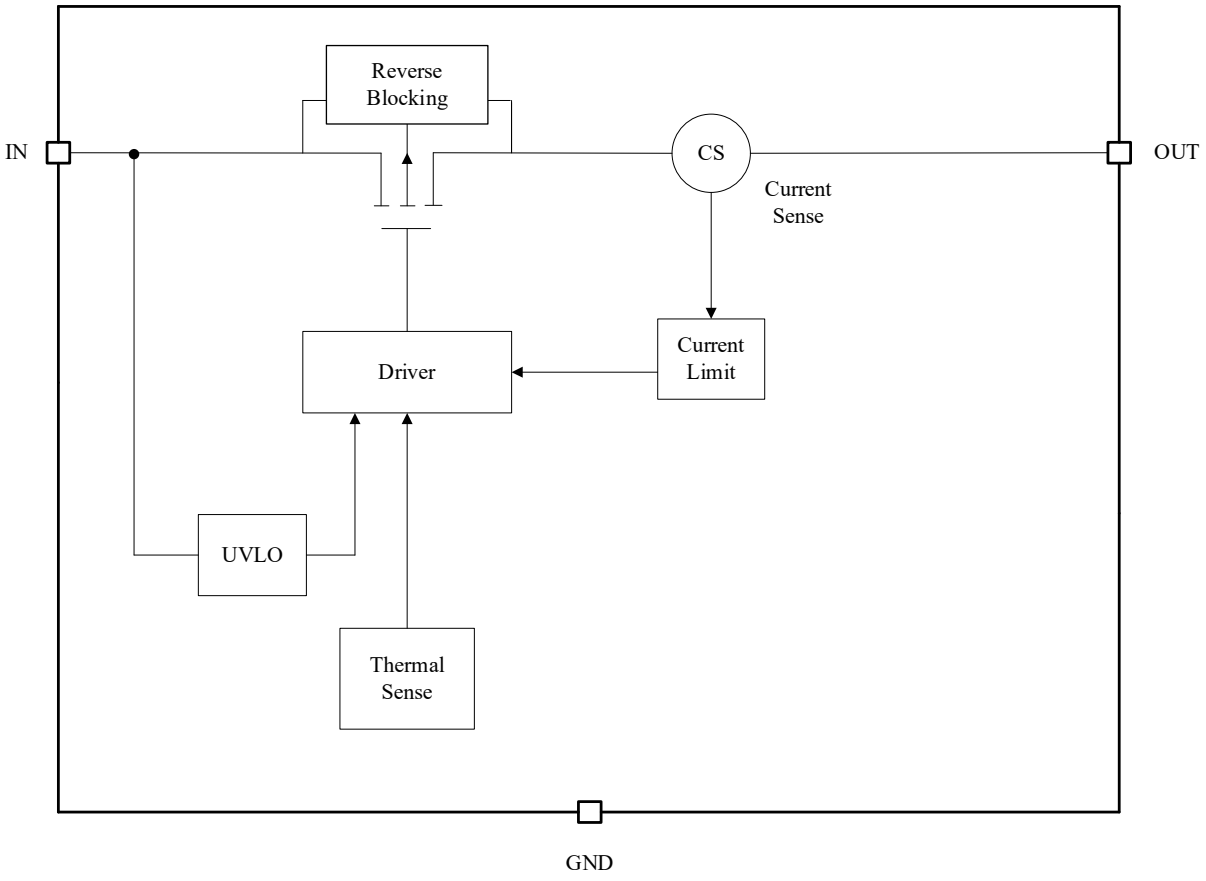
Switch On-Resistance vs. Input Voltage vs. Ambient Temperature

11. Function Description

11.1 Overview

The WP250152T3-B load switches are 5.2V, current limited load switches in a SOT23-3 package. The devices contain a 250 mΩ current-limited P-channel MOSFET that can operate over an input voltage range of 2.5 V to 5.2V. When the switch current reaches the maximum limit, the WP250152T3-B operates in a constant-current mode to prohibit excessive currents from causing damage. WP250152T3-B has a current limit of 200 mA.

11.2 Block Diagram



11.3 Feature Description

11.3.1 Current Limiting

When the switch current reaches the maximum limit, the WP250152T3-B operates in a constant-current mode to prohibit excessive currents from causing damage.

11.3.2 Thermal Shutdown

Thermal shutdown protects the device from internally or externally generated excessive temperatures. During an overtemperature condition the switch is turned off. The switch automatically turns on again if the temperature of the die drops below the threshold temperature.

11.4 Device Functional Modes

When the EN pin is actively pulled high and no fault conditions are present, the switch will be turned on, connecting V_{IN} to V_{OUT}. When the EN pin is actively pulled low regardless of the fault condition, the switch will be turned off. In the event that the current limit is exceeded, the device will operate in a constant-current mode until the fault condition is removed. During thermal shutdown conditions, the switch will automatically turn off and will turn back on again if the temperature of the die drops below the threshold temperature.

12 Application and Implementation

12.1 Application Information

12.1.1 Input Capacitor

To limit the voltage drop on the input supply caused by transient inrush current, a capacitor 1μF or larger must be placed between the IN and GND pins.

12.1.2 Output Capacitor

A 1μF or larger capacitor should be placed between the OUT and GND pins. This capacitor will prevent parasitic board inductances from forcing OUT below GND when the switch turns off.

12.1.3 Undervoltage Lockout

The undervoltage lockout turns off the switch if the input voltage drops below the undervoltage lockout threshold. Under-voltage detection functions only when the switch is enabled.

12.1.4 Power Dissipation and Junction Temperature

The junction temperature of the switch depend on several factors such as the load, PCB layout, ambient temperature and package type. Power dissipation can be calculated based on the output current and the $R_{DS(ON)}$ of the switch as below.

$$P_D = R_{DS(ON)} \times I^2$$

The junction temperature can be estimated by the following thermal equation:

$$T_J = P_D \times \theta_{JA} + T_A$$

Where:

T_A = Ambient temperature

θ_{JA} = Thermal resistance

P_D = Total power dissipation

With all possible conditions, the junction temperature must be within the range specified under operating conditions. The maximum output current must be derated at higher ambient temperature to ensure the junction temperature does not exceed the maximum junction temperature which is 125°C.

12.1.5 Over-Voltage Protection

The device has an output over-voltage protection that triggers when the output voltage reaches output over-voltage trip point. When this fault condition stays on for longer than 15μs, (This is called the “Debounce time from output over voltage to MOSFET turn off”) output device is disabled and shut down. Recovery from ROVP occurs when the output voltage falls to 101% of input voltage.

12.1.6 Reverse-Current Protection

The USB specification does not allow an output device to source current back into the USB port. In a normal MOSFET switch, current will flow in reverse direction (from the output side to the input side) When the output voltage exceeds than input voltage. A reverse current limit feature is implemented in the WP250152T3-B to limit such back currents. Reverse current limit is always active. Reverse current is limited to half of the I_{LIM} level and when the fault exists for more than 700μs, output device is disabled and shut down. This is called the "Deglitch time from reverse current trigger to MOSFET turn off.” The MOSFET will turn on again when the output voltage returns to t 101% of input voltage.

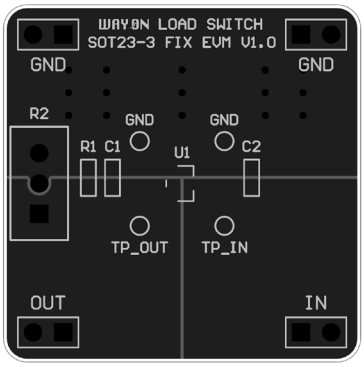
13. Power Supply Recommendations

The device is designed to operate from a V_{IN} range of 2.5 V to 5.2 V. This supply must be well regulated and placed as close to the device terminal as possible with the recommended 1μF bypass capacitor. If the supply is located more than a few inches from the device terminals, additional bulk capacitance may be required in addition to the ceramic bypass capacitors. If additional bulk capacitance is required, an electrolytic, tantalum, or ceramic capacitor of 10 μF may be sufficient

14. Layout

For best performance, all traces should be as short as possible, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. The V_{IN} terminal should be bypassed to ground with low ESR ceramic bypass capacitors. The typical recommended bypass capacitance is 1μF ceramic with X5R or X7R dielectric. This capacitor should be placed as close to the device terminals as possible. Using wide traces for V_{IN}, V_{OUT}, and GND will help minimize parasitic electrical effects along with minimizing the case to ambient thermal impedance.

14.1 Layout Example



15 Evaluation Modules

Evaluation Modules (EVMs) are available to help evaluate the device performance. We have evaluation modules for different packages, you can contact us by phone or address at the end to get the evaluation module or schematic.

The module names are listed in the table below.

NAME	PACKAGE	EVALUATION MODULE
WP250152T3-B	SOT23-3	WAYON LOAD SWITCH SOT23-3 FIX EVM V1.0

16 Naming Conventions

WP AB CCC D EE - F

WP: WAYON Protection IC;

A: Product Category –2: Load Switch;

B: Maximum Output Voltage – 5: ＜6V;

CCC: Maximum Output Current – 015:150mA；

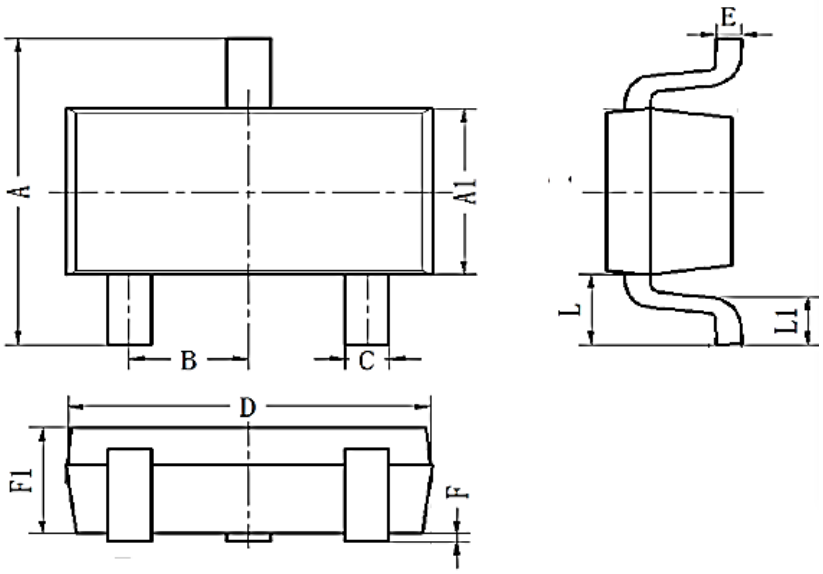
D: Serial number;

EE: Package – T3: SOT23-3;

F: Current Limit Accuracy – B: 20%

17 Package Information

SOT 23-3



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	2.60	2.80	3.00
A1	1.50	1.60	1.70
B		0.95(BSC)	
C	0.25	0.40	0.50
D	2.82	2.92	3.02
E	0.10	0.15	0.20
L		0.59REF	
L1	0.30	0.45	0.60
F1	0.90	1.10	1.30
F	0.00	0.08	0.15

18 Ordering Information

PART NUMBER	CURRENT LIMIT	PACKAGE	PACKING QUANTITY	MARKING*
WP250152T3-B	200mA	SOT23-3	3k/Reel	250152 B XXXX

Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201202
Tel: 86-21-68960674 Fax: 86-21-50757680 Email: market@way-on.com
WAYON website: http://www.way-on.com
For additional information, please contact your local Sales Representative.

Specifications are subject to change without notice.
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.
Users should verify actual device performance in their specific applications.

单击下面可查看定价，库存，交付和生命周期等信息

>>WAY-ON(维安)