# WS4603E

**80mΩ, Adjustable Current Limit,**
**Power Distribution Switch**

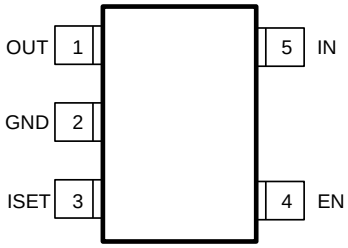
## Descriptions

The WS4603E is high-side switch with ultra-low ON resistance P-MOSFET. Integrated current-limit function can limit inrush current for heave capacitive load, over load current, and short-circuit current to protect power source.

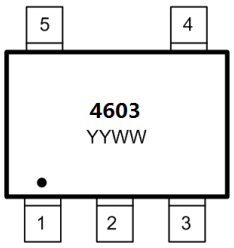
The WS4603E is also integrated reverse protection function to eliminate any reverse current flow across the switch when the device is off. Output auto-discharge while the device shutdown made output voltage off quickly. Thermal shutdown function can protect the device and load.

The WS4603E is available in SOT-23-5L package. Standard product is Pb-free and Halogen-free.

**SOT-23-5L**




**Pin configuration (Top view)**




**4603 = Device code**
**YY = Year code**
**WW = Week code**
**Marking**

## Features

- Input voltage range : 2.5~5.5V
- Main switch $R_{ON}$ : 80mΩ @ $V_{IN}$=5V
- Adj. current limit range : 0.4~2A (Typ.)
- Current limit accurate : +/-20%
- Auto discharge
- Reverse block (No “body diode”)
- Over temperature protection

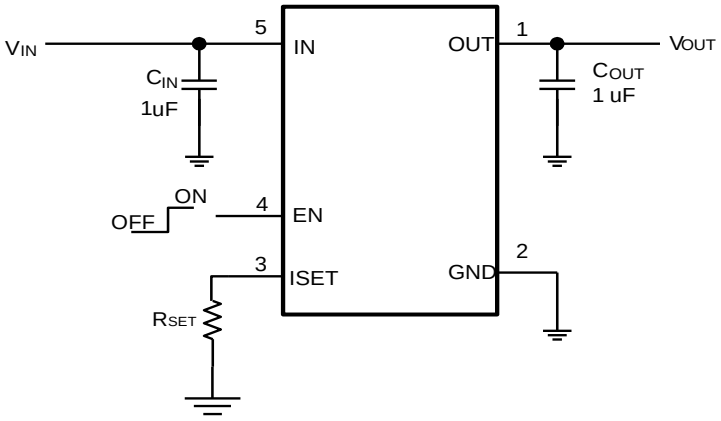
## Applications

- USB peripherals
- USB Dongle
- USB 3G data card
- 3.3V or 5V Power Switch
- 3.3V or 5V Power Distribution

## Order information

| Device | Package | Shipping |
|---|---|---|
| WS4603E-5/TR | SOT-23-5L | 3000/Reel&Tape |

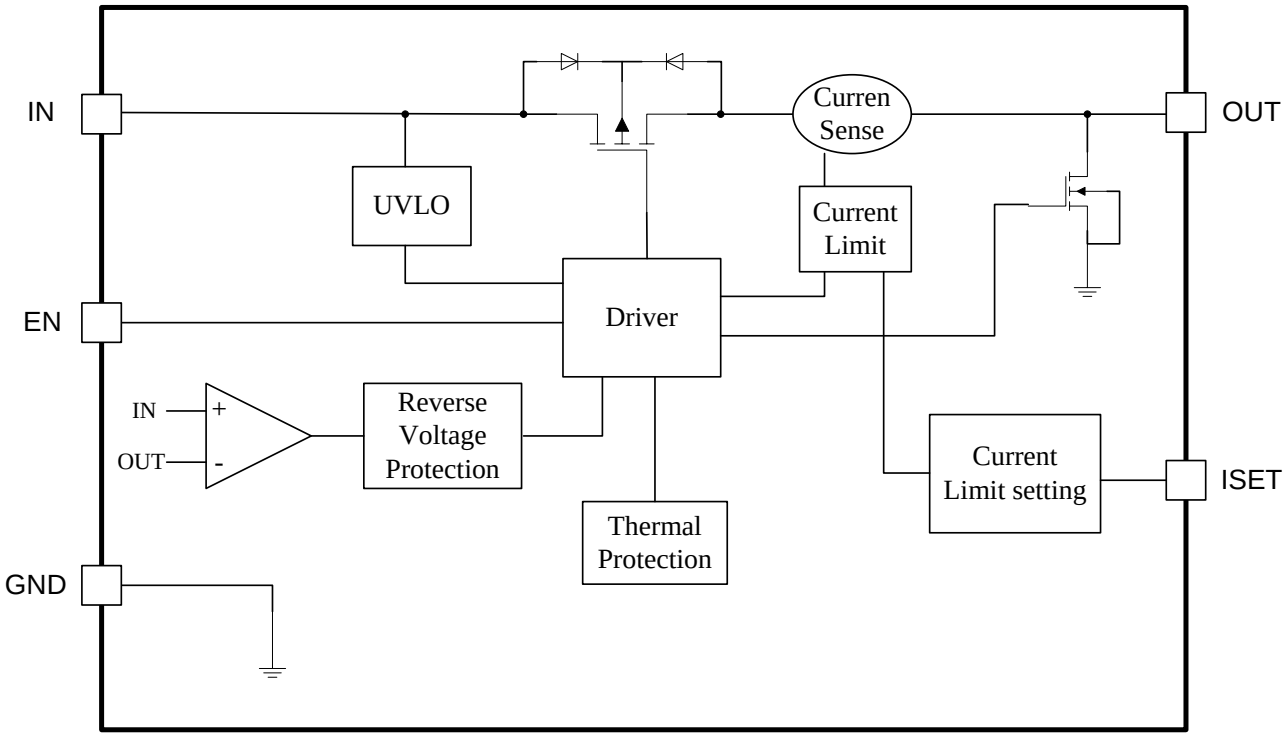
## Typical Applications




## Pin Descriptions

| Pin Number | Symbol | Descriptions |
|---|---|---|
| 1 | OUT | Output Pin |
| 2 | GND | Ground Pin |
| 3 | ISET | Current limit programming pin. Connect a resistor Rset from this pin to GND to program the current limit: $I_{LIM}$ (A)=6800/Rset (ohm) |
| 4 | EN | Enable Pin, Active High |
| 5 | IN | Input Pin |

## Block Diagram



## Absolute maximum ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| IN pin voltage range | $V_{IN}$ | -0.3～6.5 | V |
| OUT pin voltage range | $V_{OUT}$ | -0.3~6.5 | V |
| ISET pin voltage range | $V_{FLG}$ | -0.3~6.5 | V |
| EN pin voltage range | $V_{EN}$ | -0.3~6.5 | V |
| Junction temperature | $T_J$ | -40~150 | °C |
| Lead temperature(Soldering, 10s) | $T_L$ | 260 | °C |
| Storage temperature | Tstg | -55 ~ 150 | °C |
| IN, OUT Pin ESD Ratings | HBM | 8000 | V |
| | MM | 400 | V |
| ISET, EN Pin ESD Ratings | HBM | 4000 | V |
| | MM | 400 | V |

These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

## Recommend Operating Conditions

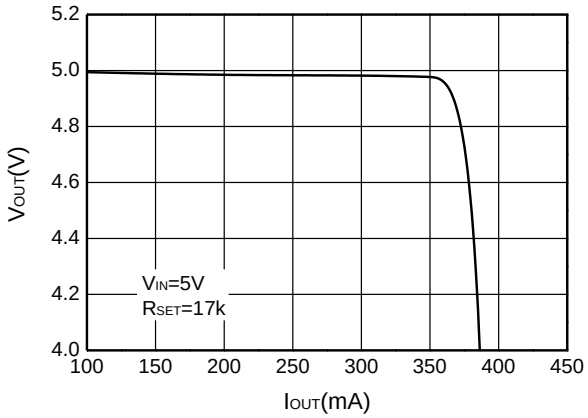
| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Supply input voltage range | $V_{IN}$ | 2.5～5.5 | V |
| Operating ambient temperature | $T_A$ | -40～85 | °C |
| Thermal Resistance | $R_{\theta JA}$ | 250 | °C/W |

## Electronics Characteristics (Ta=25°C, $V_{IN}$=5V, $C_{IN}$=$C_{OUT}$=1uF, unless otherwise noted)

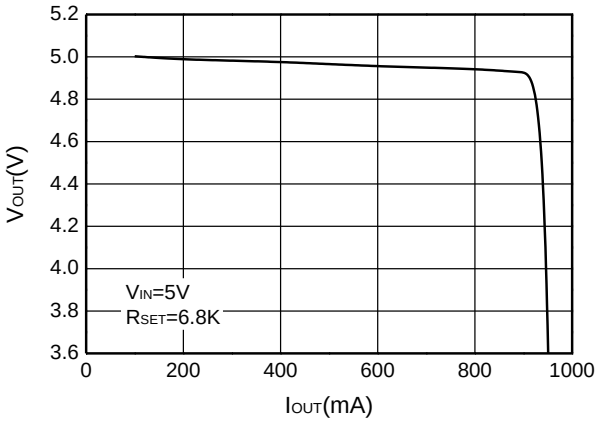
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Quiescent supply current | $I_Q$ | $I_{OUT}$=0, $V_{IN}$=$V_{EN}$=5V | | 48 | 60 | uA |
| Shutdown current | $I_{SD}$ | $V_{EN}$=0V | | | 1 | uA |
| Reverse current | $I_{REV}$ | $V_{IN}$=$V_{EN}$=0V, $V_{OUT}$=5V, Current flow to $V_{IN}$ | | | 1 | uA |
| Main-FET ON resistance(1) | $R_{ON}$ | $V_{IN}$=$V_{EN}$=5V, $I_{OUT}$=500mA | | 80 | | mΩ |
| Auto-discharge FET ON resistance | $R_{DCHG}$ | $V_{EN}$=0V, $V_{IN}$ =$V_{OUT}$=5V | | 65 | | Ω |
| Over-current trip threshold | $I_{OC}$ | Rset=6.8K | 0.8 | 1 | 1.2 | A |
| Short-circuit output current | $I_{OS}$ | $V_{OUT}$ shorted to GND, Rset = 6.8K | | 0.45 | | A |
| Over-current threshold range | Ioc(min) | | | 0.4 | | A |
| | Ioc(max) | | | 2 | | A |
| Short circuit current limiting response time | $t_{SHORT}$ | $V_{OUT}$ shorted to GND, $C_L$=1uF | | 3 | | us |
| EN input low voltage | $V_{IL}$ | $V_{IN}$=5V | | | 0.4 | V |
| EN input high voltage | $V_{IH}$ | $V_{IN}$=5V | 2.0 | | | V |
| OUT pin turn-on time after EN ON | $t_{ON}$ | $C_L$=1uF, $R_L$=5ohm | | 20 | | us |
| Over-temperature shutdown threshold | $T_{SD}$ | | | 160 | | °C |
| Over-temperature threshold hysteresis | $T_{HYS}$ | | | 35 | | °C |
| Under voltage lock out threshold | $V_{UVLO}$ | | | 2.2 | | V |
| Under voltage lock out hysteresis | $V_{UVLO-HYS}$ | | | 200 | | mV |

(1) Pulse test, $T_P$=380us

## Typical Characteristics (Ta=25°C, unless otherwise noted)




**Output Voltage vs. Output Current**

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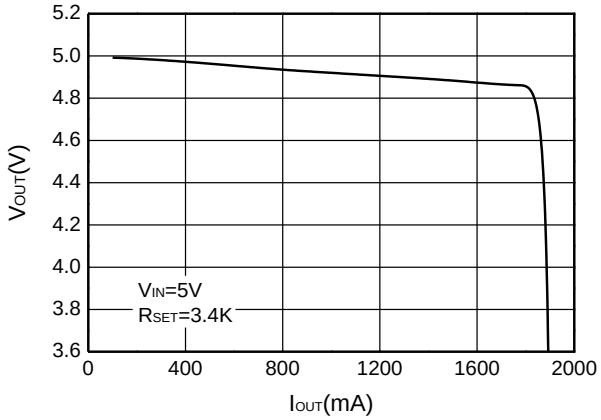


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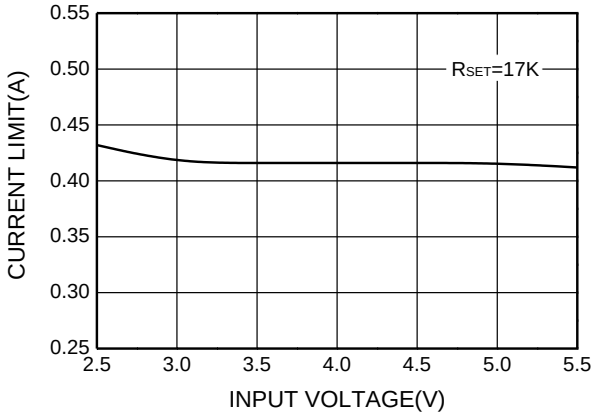
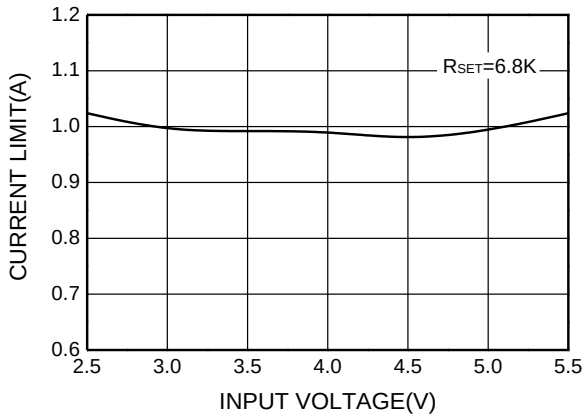



**Current Limit vs. Input voltage**

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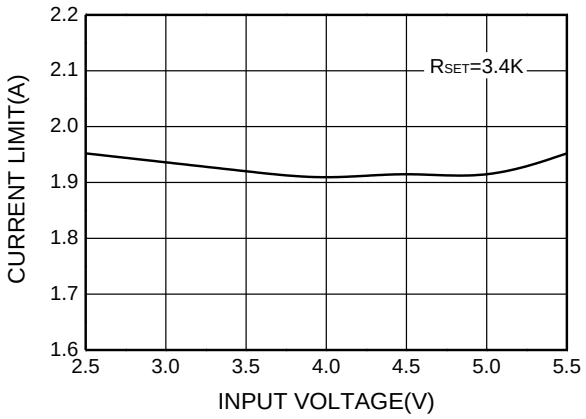


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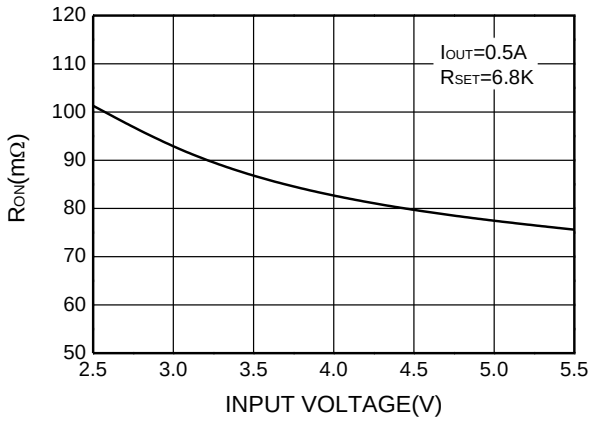
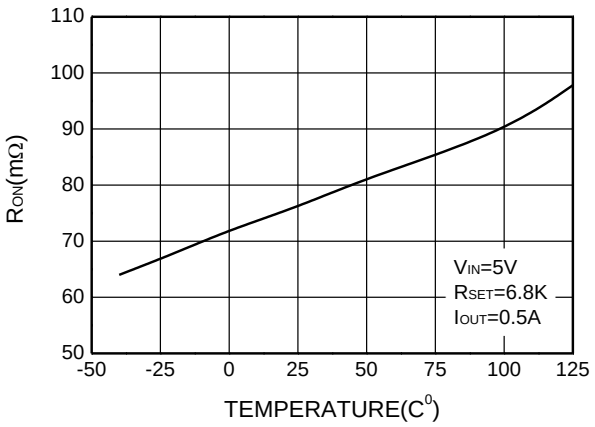
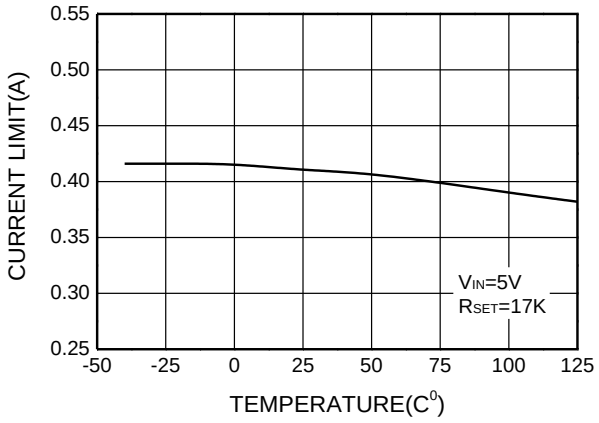


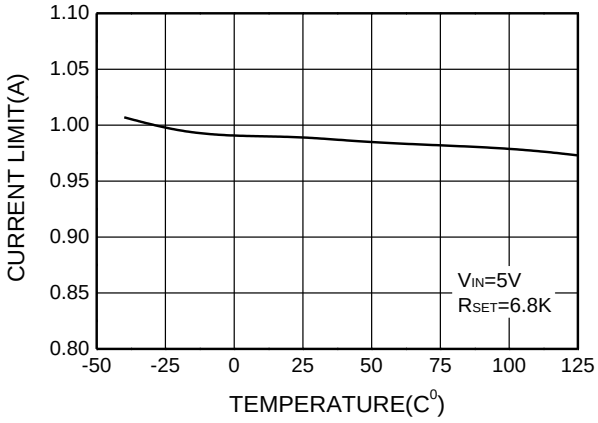

**ON Resistance vs. Input Voltage**




**ON Resistance vs. Temperature**




**Current Limit vs. Temperature**

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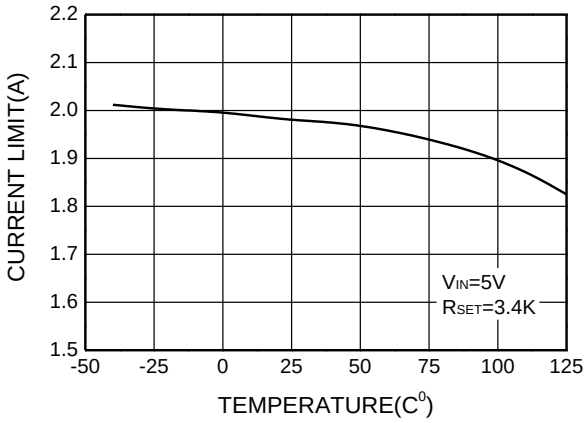
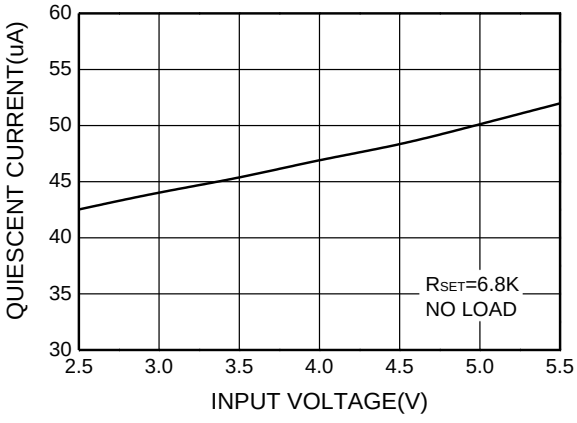


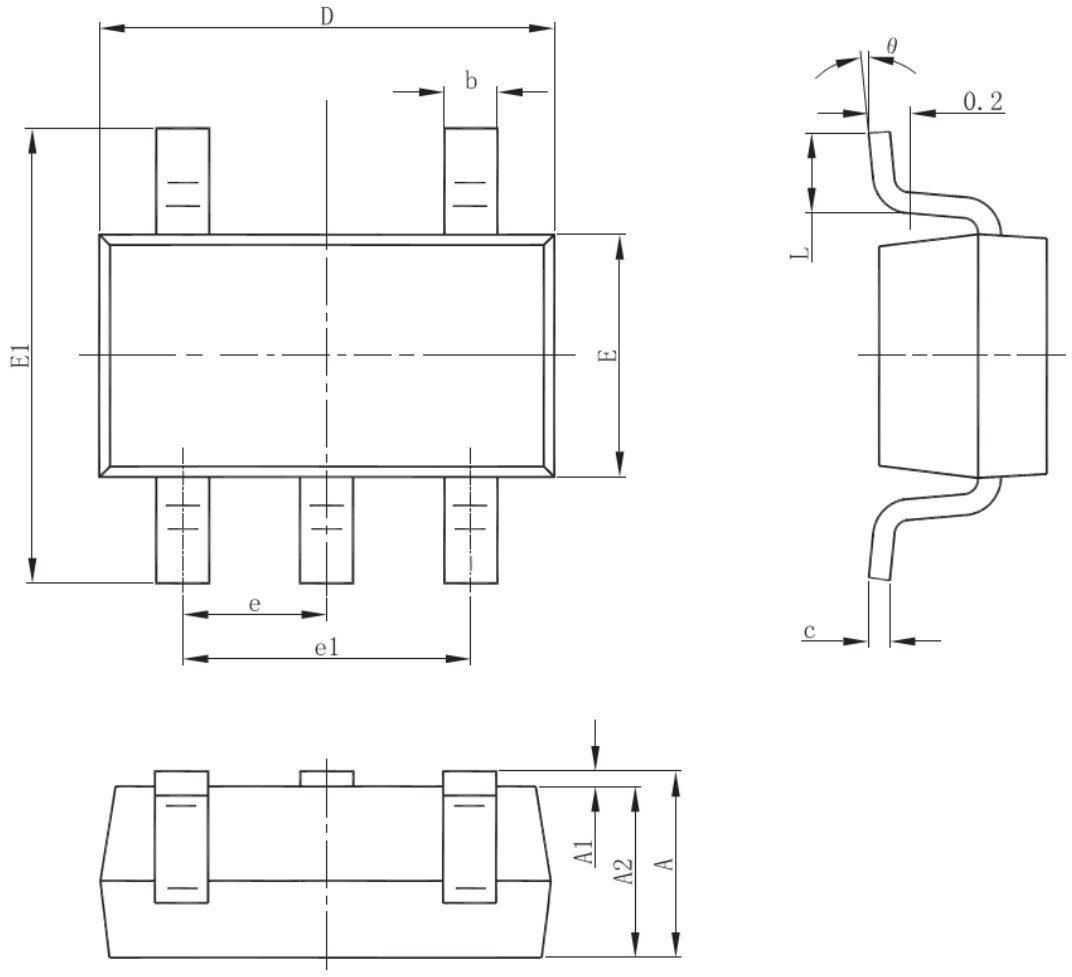

**Current Limit vs. Temperature**




**Quiescent Current vs. Input Voltage**

## Package outline dimensions

### SOT-23-5L




| Symbol | Dimensions in millimeter | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 1.050 | - | 1.250 |
| A1 | 0.000 | - | 0.100 |
| A2 | 1.050 | - | 1.150 |
| b | 0.300 | - | 0.500 |
| c | 0.100 | - | 0.200 |
| D | 2.820 | 2.900 | 3.020 |
| E | 1.500 | 1.600 | 1.700 |
| E1 | 2.650 | 2.800 | 2.950 |
| e | 0.950(BSC) | | |
| e1 | 1.800 | - | 2.000 |
| L | 0.300 | - | 0.600 |
| θ | 0° | - | 8° |