

## 70mΩ, 3A Smart Universal Power Switch with Flag

### General Description

The HM9703 is a low voltage, high performance single N-MOSFET power switch, designed for power rail on/off control with low  $R_{DS(ON)} \approx 70m\Omega$  and full protection functions. The HM9703 equipped with a charge pump circuitry to drive the internal MOSFET switch and a flag output is available to indicate fault conditions against large di/dt which may cause the supply to fall out of regulation. In order to fit different application, an ISET pin is offered for current limit point setting, a resistor from ISET to ground sets the current limit for the switch.

Additional features include soft-start to limit inrush current during plug-in, thermal shutdown to prevent catastrophic switch failure from high-current loads, Output anti back irrigation Protection whether EN pin is connected GND or VIN, under-voltage lockout (UVLO) to ensure that the device remains off unless there is a valid input voltage present, a precision resistor-programmable output current limit up to 3.5A. Besides, the lower quiescent current as 40μA making this device ideal for portable battery-operated equipment.

The HM9703 is available in SOT23-5 or SOP-8 package requiring minimum board space and smallest components.

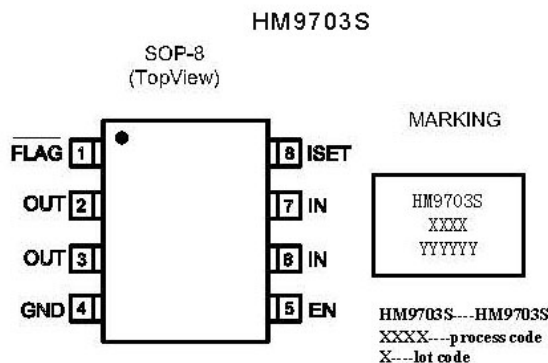
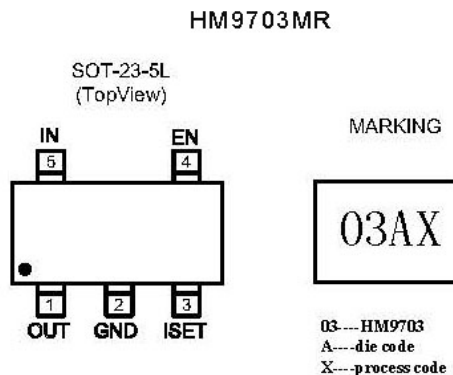
### Applications

- USB 3G Datacard
- USB Dongle
- MiniPCI Accessories
- LCD Monitor, LCD-TV
- USB Power Module for ADSL
- Information Appliance and Set-Top Box
- Battery-Powered Equipment
- Hot-Plug Power Supplies
- ACPI Power Distribution
- PCI Bus Power Switching
- Motherboard & Notebook PCs
- PC Card Hot Swap Application

### Features

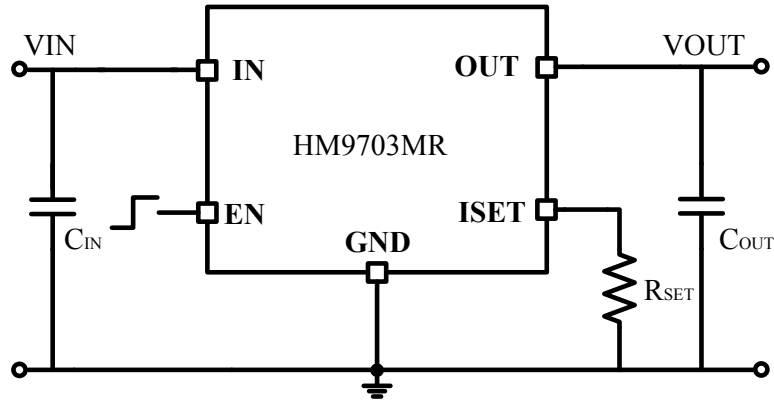
- Adjustable Current Limiting up to 3.5A
- Built-In (Typically 70mΩ) N-MOSFET
- Reverse Current Flow Blocking (no body diode)
- Output Can Be Forced Higher than Input (Off or On State)
- Low Supply Current :  
-----40μA Typical at Switch on State  
-----Less than 1μA Typical at Switch Off State
- Guaranteed Continuous Load Current  
-----HM9703MR (SOT23-5) : 2.1A  
-----HM9703S (SOP-8) : 3A
- Wide Input Voltage Ranges : 2V to 5.5V
- Open-Drain Fault Flag Output
- Hot Plug-In Application (Soft-Start)
- 1.7V Typical Under-Voltage Lockout (UVLO)
- Thermal Shutdown Protection
- Smallest SOT23-5 and SOP-8 Package
- RoHS Compliant and 100% Lead (Pb)-Free

### Pin and Marking

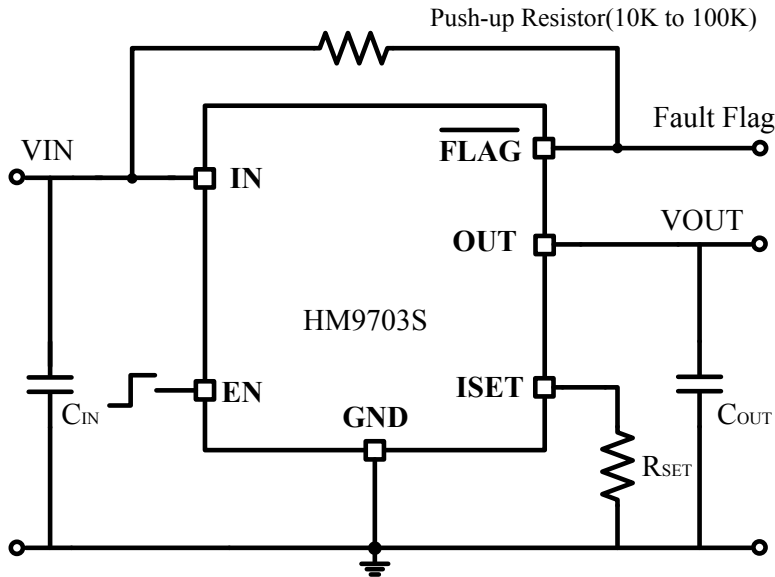


## ■ Typical Application Circuit

Circuit 1:



Circuit 2:



Note: Current limit:  $I_{LIMIT} = 270K/R_{SET}$ .

## ■ Functional Pin Description

| Pin Name                 | Pin Function                     |
|--------------------------|----------------------------------|
| IN                       | Power Input Voltage.             |
| OUT                      | Output Voltage.                  |
| GND                      | Ground.                          |
| EN                       | Chip Enable (Active High).       |
| ISET                     | Current Limit Programming Input. |
| $\overline{\text{FLAG}}$ | Open-Drain Fault Flag Output.    |

## ■ Absolute Maximum Ratings

- Supply Voltage ----- 6.5V
- Chip Enable Input Voltage ----- -0.3V to 6.5V
- Flag Voltage----- 6.5V
- Power Dissipation, PD @ TA = 25°C  
SOT23-5----- 0.6W  
SOP-8 ----- 0.95W
- Package Thermal Resistance  
SOT23-5-----200°C/W  
SOP-8,  $\theta_{JA}$  -----104°C/W
- Junction Temperature -----125°C
- Lead Temperature (Soldering, 10 sec.) -----260°C
- Storage Temperature Range ----- -65°C to 150°C
- ESD Susceptibility (Note 2)  
HBM (Human Body Mode) -----8kV  
MM (Machine Mode) ----- 800V

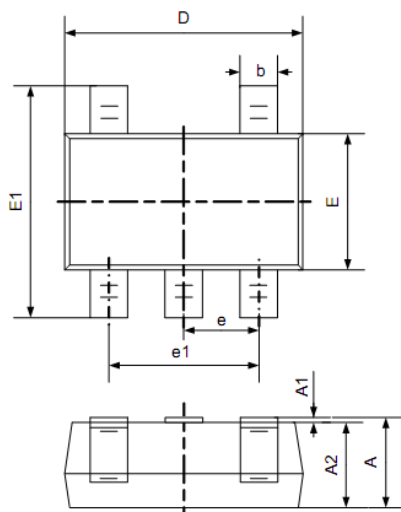
## ■ Electrical Characteristics

(VS = +5V, VCM = +2.5V, VO = +2.5V, TA = +25°C, unless otherwise noted.)

| Symbol               | Parameter                       | Conditions                                                             | Min. | Typ. | Max. | Unit |
|----------------------|---------------------------------|------------------------------------------------------------------------|------|------|------|------|
| R <sub>DS(ON)</sub>  | Switch On Resistance            | I <sub>OUT</sub> = 1A                                                  |      | 70   | 80   | mΩ   |
| I <sub>SW_ON</sub>   | Supply Current                  | Switch On, V <sub>OUT</sub> = Open                                     |      | 40   | 50   | μA   |
| I <sub>SW_OFF</sub>  | Shutdown Current                | Switch Off, V <sub>OUT</sub> = Open                                    |      | 0.1  | 1    | μA   |
| V <sub>IL</sub>      | CE Threshold Logic-Low Voltage  | Switch Off                                                             |      |      | 0.8  | V    |
| V <sub>IH</sub>      | CE Threshold Logic-High Voltage | Switch On                                                              | 2.0  |      |      | V    |
| I <sub>CE</sub>      | CE Input Current                | V <sub>CE</sub> = 0V to 5.5V                                           |      | 10   |      | pA   |
| I <sub>LEAKAGE</sub> | Output Leakage Current          | V <sub>CE</sub> = 0V, R <sub>LOAD</sub> = 0Ω                           |      | 0.5  |      | μA   |
| T <sub>ON_RISE</sub> | Output Turn-On Rise Time        | 10% to 90% of V <sub>OUT</sub> rising                                  |      | 1.5  |      | ms   |
|                      | Current Limit Factor            | I <sub>LIM</sub> × R <sub>SET</sub>                                    |      | 270k |      | A·Ω  |
| I <sub>LIMSET</sub>  | Max. Current Limit Setting      | V <sub>IN</sub> =3.3V to 5.5V, R <sub>SET</sub> =75kΩ                  |      |      | 3.5  | A    |
| ΔI <sub>LIMSET</sub> | Current Limit Setting Accuracy  | I <sub>LIMSET</sub> = 0.5A to 3A<br>(R <sub>SET</sub> = 540kΩ to 90kΩ) | -20  |      | +20  | %    |
| R <sub>FLG</sub>     | FLAG Output Resistance          | I <sub>SINK</sub> = 1mA                                                |      | 15   | 400  | Ω    |
| I <sub>FLG_OFF</sub> | FLAG Off Current                | V <sub>FLG</sub> = 5V                                                  |      | 10   |      | nA   |
| t <sub>D</sub>       | FLAG Delay Time                 | Form fault condition to FLAG assertion                                 | 2    | 4.6  | 8    | ms   |
| V <sub>UVLO</sub>    | Under-Voltage Lockout           | V <sub>IN</sub> increasing                                             | 1.3  | 1.7  |      | V    |
| ΔV <sub>UVLO</sub>   | Under-Voltage Hysteresis        | V <sub>IN</sub> decreasing                                             |      | 0.1  |      | V    |
| T <sub>SD</sub>      | Thermal Shutdown Protection     |                                                                        |      | 120  |      | °C   |
| ΔT <sub>SD</sub>     | Thermal Shutdown Hysteresis     |                                                                        |      | 30   |      | °C   |

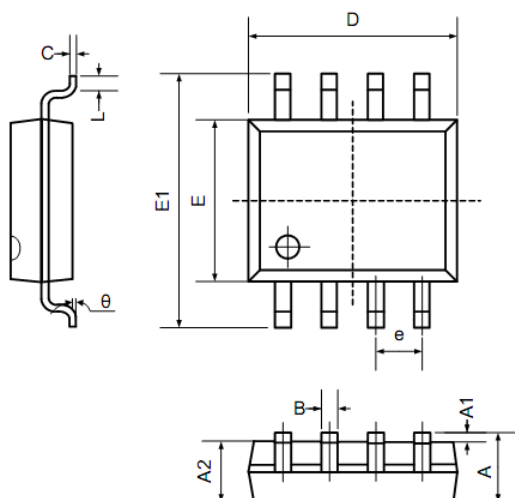
■ Package Information

SOT-23-5L



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | Min                          | Max   | Min                     | Max   |
| A      | 1.050                        | 1.250 | 0.041                   | 0.049 |
| A1     | 0.000                        | 0.100 | 0.000                   | 0.004 |
| A2     | 1.050                        | 1.150 | 0.041                   | 0.045 |
| b      | 0.300                        | 0.400 | 0.012                   | 0.016 |
| C      | 0.100                        | 0.200 | 0.004                   | 0.008 |
| D      | 2.820                        | 3.020 | 0.111                   | 0.119 |
| E      | 1.500                        | 1.700 | 0.059                   | 0.067 |
| E1     | 2.650                        | 2.950 | 0.104                   | 0.116 |
| e      | 0.950TYP                     |       | 0.037TYP                |       |
| e1     | 1.800                        | 2.000 | 0.071                   | 0.079 |
| L      | 0.700REF                     |       | 0.028REF                |       |
| L1     | 0.300                        | 0.600 | 0.012                   | 0.024 |
| θ      | 0°                           | 8°    | 0°                      | 8°    |

SOP8



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | Min                          | Max   | Min                     | Max   |
| A      | 1.350                        | 1.750 | 0.053                   | 0.069 |
| A1     | 0.100                        | 0.250 | 0.004                   | 0.010 |
| A2     | 1.350                        | 1.550 | 0.053                   | 0.061 |
| B      | 0.330                        | 0.510 | 0.013                   | 0.020 |
| C      | 0.190                        | 0.250 | 0.007                   | 0.010 |
| D      | 4.780                        | 5.000 | 0.188                   | 0.197 |
| E      | 3.800                        | 4.000 | 0.150                   | 0.157 |
| E1     | 5.800                        | 6.300 | 0.228                   | 0.248 |
| e      | 1.270TYP                     |       | 0.050TYP                |       |
| L      | 0.400                        | 1.270 | 0.016                   | 0.050 |
| θ      | 0°                           | 8°    | 0°                      | 8°    |