

# FSDH0165

## Fairchild Power Switch(SPS)

### Features

- Single Chip 650V 1A SenseFET PowerSwitch
- Precision Fixed Operating Frequency (100kHz)
- Internal Start-up Switch
- UVLO with Hysteresis (6.7V/8.7V)
- Over Load Protection (typ. 4.5V)
- Over Current Protection (typ. 0.6A)
- Internal Thermal Shutdown Function
- Secondary Side Regulation
- Auto-restart mode

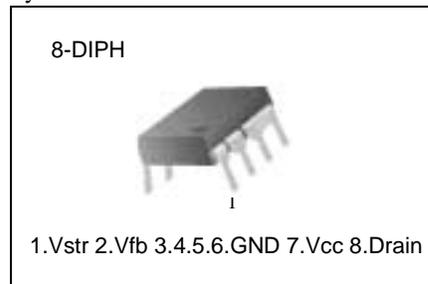
### Applications

- Charger & Adaptor for Mobile Phone, PDA & MP3
- Auxiliary Power for PC

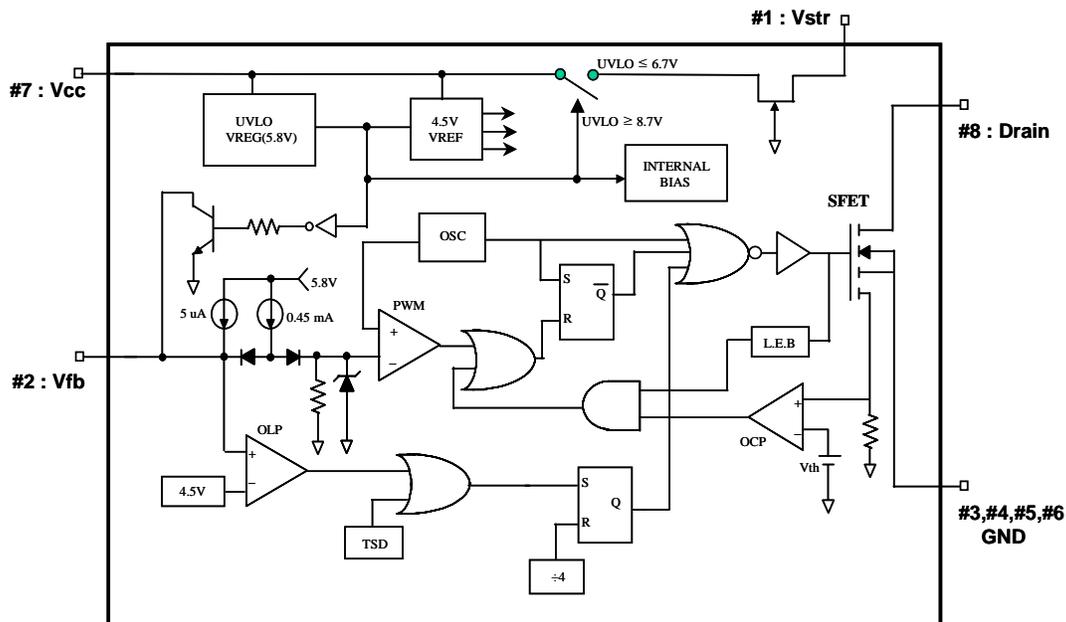
### Description

The FSDH0165 is specially designed for an off-line SMPS with minimal external components. The FSDH0165 is a monolithic high voltage power switching regulator that combine the SenseFET(LDMOS) with voltage mode PWM control block. Included PWM controller features integrated fixed oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection and temperature compensated precision current sources for loop compensation and fault protection circuitry. Compared to discrete MOSFET and controller or RCC switching converter solution, a FSDH0165 can reduce total component count, design size, weight and at the same time increase efficiency, productivity, and system reliability.

It has a basic platform well suited for cost-effective design in a flyback converter.



### Internal Block Diagram



## Absolute Maximum Ratings

(Ta=25°C unless otherwise specified)

| Parameter                                       | Symbol              | Value                   | Unit |
|---|---------------------|-------------------------|------|
| Maximum Drain Voltage                           | V <sub>D,MAX</sub>  | 650                     | V    |
| Continuous Drain Current (T <sub>C</sub> =25°C) | I <sub>D</sub>      | 0.6                     | ADC  |
| Maximum Supply Voltage                          | V <sub>CC,MAX</sub> | 21                      | V    |
| Input Voltage Range                             | V <sub>FB</sub>     | -0.3 to V <sub>SD</sub> | V    |
| Operating Ambient Temperature                   | T <sub>A</sub>      | -25 to +85              | °C   |
| Storage Temperature Range                       | T <sub>STG</sub>    | -55 to +150             | °C   |

## PIN Definitions

| Pin Number | Pin Name | Pin Function Description  |
|------------|----------|---|
| 1          | Vstr     | This pin connects directly to the rectified AC line voltage source. At start up the internal switch supplies internal bias and charges an external capacitor that connects from the Vcc pin to ground. Once this reaches 8.7V, Vstr is isolated internally.   |
| 2          | Vfb      | This pin is the inverting input of the PWM comparator, and it operates normally between 0.5V and 2.5V. It has a 0.45mA current source connected internally and a capacitor and opto coupler connected externally. A feedback voltage of 3.5V to 4.5V triggers overload protection (OLP). There is a time delay due to the 5uA current source, which prevents false triggering under transient conditions but still allows the protection mechanism to operate under true overload conditions. |
| 3,4,5,6    | GND      | These pins are the control ground and the SenseFET Source.  |
| 7          | Vcc      | This is the positive supply voltage input. During start up, power is supplied to this input from Pin 1. When Vcc reaches the UVLO upper threshold (8.7V), the start up Internal Switch (Vstr) turns off and power is supplied from auxiliary transformer winding.   |
| 8          | Drain    | This pin is designed to directly drive the converter transformer and is capable of switching a maximum of 650V and 1A.  |

## Electrical Characteristics

(Ta=25°C unless otherwise specified)

| Parameter  | Symbol            | Condition             | Min. | Typ. | Max. | Unit |
|--|-------------------|-----------------------|------|------|------|------|
| <b>SENSEFET SECTION</b>                          |                   |                       |      |      |      |      |
| Drain-Source Breakdown Voltage                   | BVDSS             | VGS=0V, ID=100μA      | 650  | -    | -    | V    |
| Zero gate voltage drain current                  | IDSS              | VDS=520V              | -    | -    | 100  | μA   |
| Static drain-source on Resistance                | RDS(ON)           | ID=50mA Tj=25°C       | -    | 15.6 | 18   | Ω    |
|  |                   | ID=50mA Tj=100°C      | -    | 25.7 | 30   | Ω    |
| Rise Time  | TR                | VDS=325V, ID=300mA    | -    | 100  | -    | nS   |
| Fall Time  | TF                | VDS=325V, ID=50mA     | -    | 50   | -    | nS   |
| <b>START UP SECTION</b>                          |                   |                       |      |      |      |      |
| VSTR Supply Voltage                              | VST               | -                     | 17   | -    | -    | V    |
| <b>UVLO SECTION</b>                              |                   |                       |      |      |      |      |
| Start Threshold Voltage                          | Vstart            | -                     | 8.0  | 8.7  | 9.4  | V    |
| Stop Threshold Voltage                           | Vstop             | After turn on         | 6.0  | 6.7  | 7.4  | V    |
| <b>OSCILLATOR SECTION</b>                        |                   |                       |      |      |      |      |
| Initial accuracy                                 | FOSC              | Tj=25°C               | 90   | 100  | 110  | kHz  |
| Maximum Duty Cycle                               | Dmax              | Vfb=3V                | 64   | 67   | 70   | %    |
| Minimum Duty Cycle                               | Dmin              | Vfb=0V                | -    | 0    | 0    | %    |
| <b>FEEDBACK SECTION</b>                          |                   |                       |      |      |      |      |
| Feedback Source Current                          | IFB               | Vfb=0V                | 0.40 | 0.45 | 0.50 | mA   |
| Shutdown feedback Voltage                        | VSD               | -                     | 4.0  | 4.5  | 5.0  | V    |
| <b>CURRENT LIMIT(SELF-PROTECTION)SECTION</b>     |                   |                       |      |      |      |      |
| Peak Current Limit                               | I <sub>OVER</sub> | peak inductor current | 0.5  | 0.6  | 0.7  | A    |
| <b>PROTECTION SECTION</b>                        |                   |                       |      |      |      |      |
| Thermal Shutdown Temperature (Tj) <sup>(1)</sup> | TSD               | -                     | 125  | 145  | -    | °C   |
| <b>TOTAL DEVICE SECTION</b>                      |                   |                       |      |      |      |      |
| Operating Supply Current                         | IOPR              | VCC=21V (Max)         | -    | -    | 4    | mA   |

### Notes:

1. These parameters, although guaranteed, are not 100% tested in production

## Typical Performance Characteristics

(These characteristic graphs are normalized at  $T_a=25^\circ\text{C}$ )

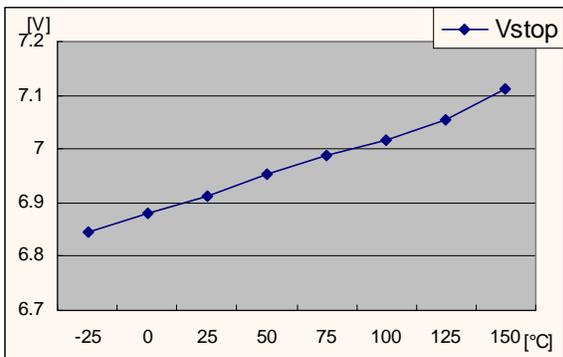


Fig 1. Stop Threshold Voltage

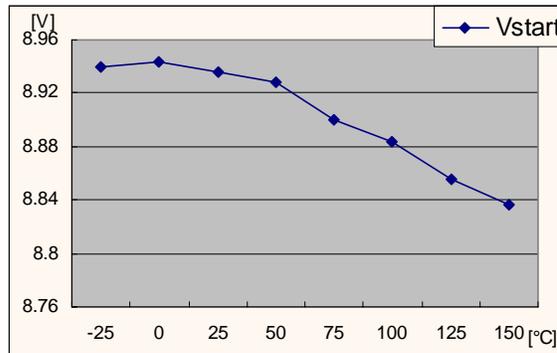


Fig 2. Start Threshold Voltage

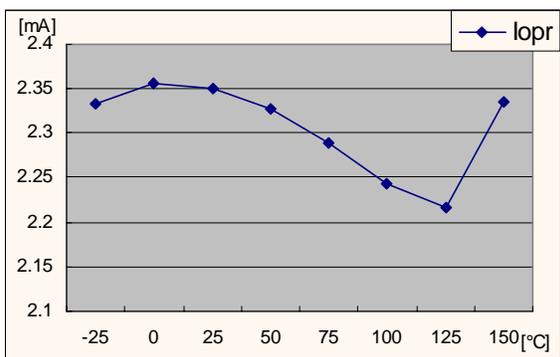


Fig 3. Operating Supply Current

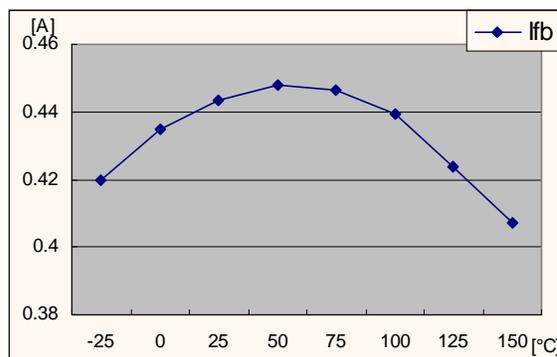


Fig 4. Feedback Source Current

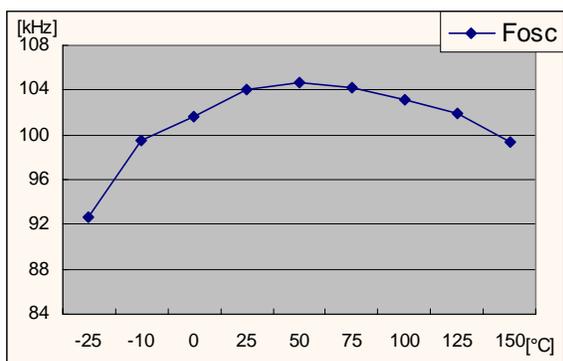


Fig 5. Initial Accuracy

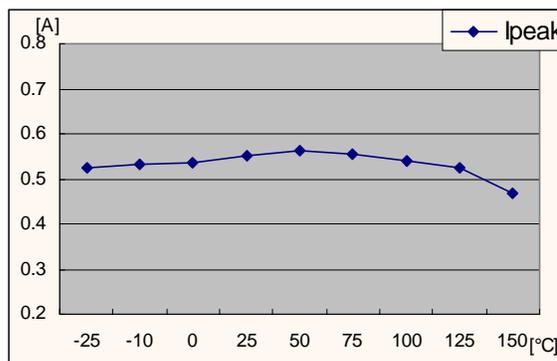


Fig 6. Peak Current Limit

## Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at  $T_a=25^\circ\text{C}$ )

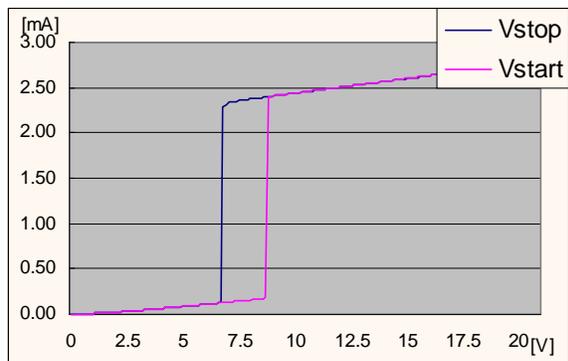


Fig 7. Stop/Start Threshold Voltage

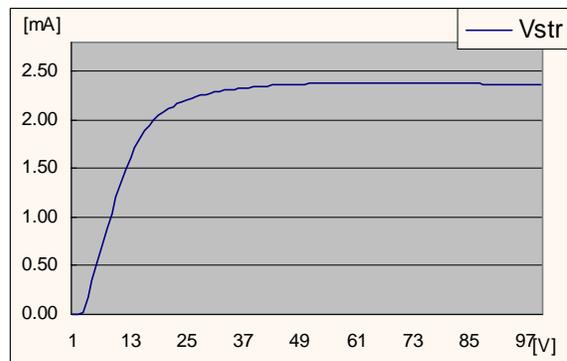


Fig 8. VSTR Supply Voltage

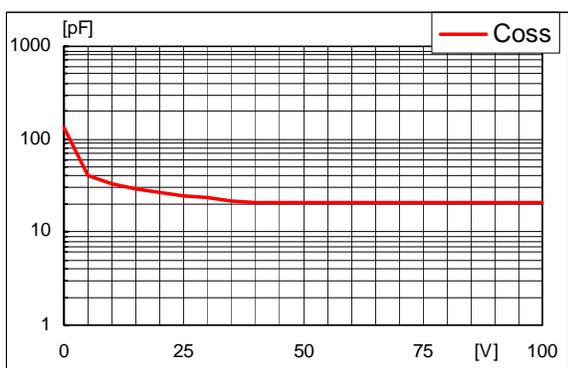


Fig 9. Coss vs. Drain Voltage

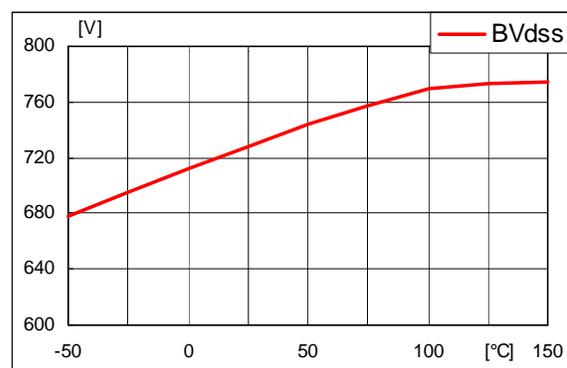
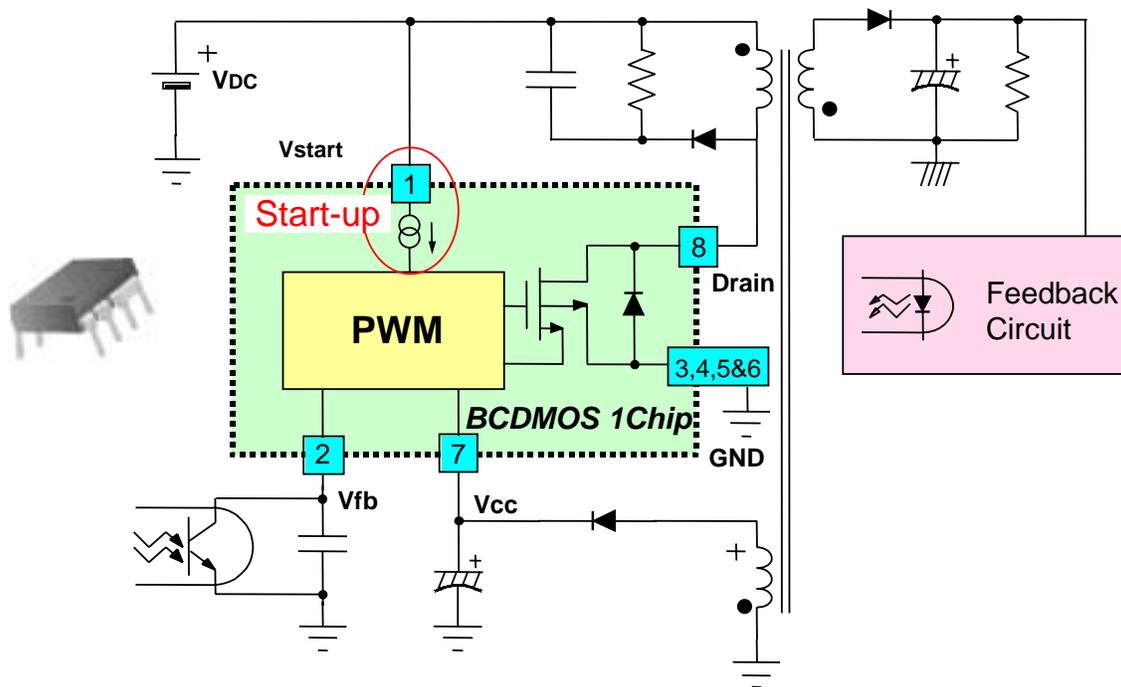


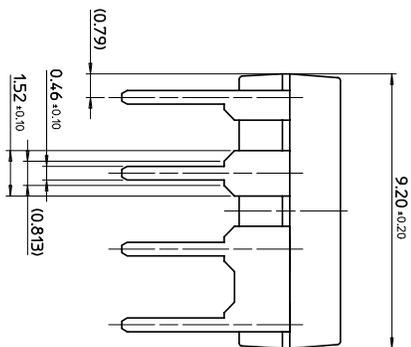
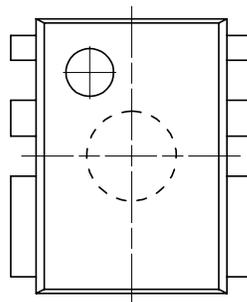
Fig 10. Breakdown vs. Temperature

# Application Circuit



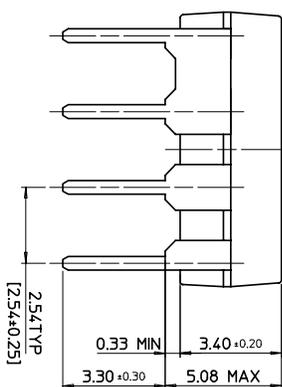
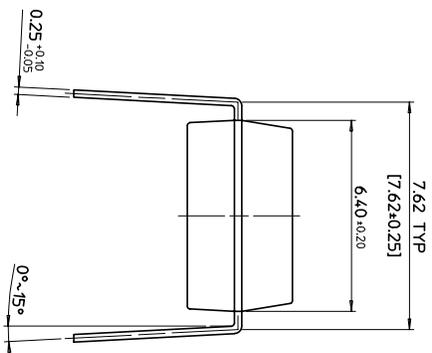
# Package Dimensions

## 8-DIPH



(NOTE)

1. THESE DIMENSIONS DO NOT INCLUDE MOLD PROTRUSION.
2. ( ) IS REFERENCE
3. [ ] IS ASSY OUT QUALITY



**Ordering Information**

| <b>Product Number</b> | <b>Package</b> | <b>Rating</b> | <b>Topr (°C)</b> |
|-----------------------|----------------|---------------|------------------|
| FSDH0165              | 8-DIPH         | 650V, 1A      | -25°C to +85°C   |



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