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# FSDM1265RB

## Green Mode Fairchild Power Switch (FPS™)

### Features

- Internal Avalanche Rugged Sense FET
- Advanced Burst-Mode operation that consumes less than 1 W at 240VAC and 0.5W load
- Precision Fixed Operating Frequency (66kHz)
- Internal Start-up Circuit
- Improved Pulse by Pulse Current Limiting
- Over-Voltage Protection (OVP)
- Over-Load Protection (OLP)
- Internal Thermal Shutdown Function (TSD)
- Auto-Restart Mode
- Under Voltage Lock Out (UVLO) with Hysteresis
- Low Operating Current (2.5mA)
- Built-in Soft Start

### Application

- SMPS (Switch Mode Power Supplies) for LCD monitor and STB
- Adapter

### Description

The FSDM1265RB is an integrated Pulse-Width Modulator (PWM) and a SenseFET which is specifically designed for high performance offline SMPS with minimal external components. This device is an integrated high-voltage power switching regulator which combines a rugged avalanche Sense FET with a current mode PWM control block. The PWM controller includes integrated fixed frequency oscillator, under-voltage lockout, leading edge blanking (LEB), optimized gate driver, internal soft-start, and precise current sources that are temperature compensated for loop compensation and self protection circuitry. Compared with discrete MOSFET and PWM controller solution, it can reduce total cost, component count, size, and weight, while simultaneously increasing efficiency, productivity, and system reliability. This device is a basic platform which is well suited for cost effective designs of flyback converters.

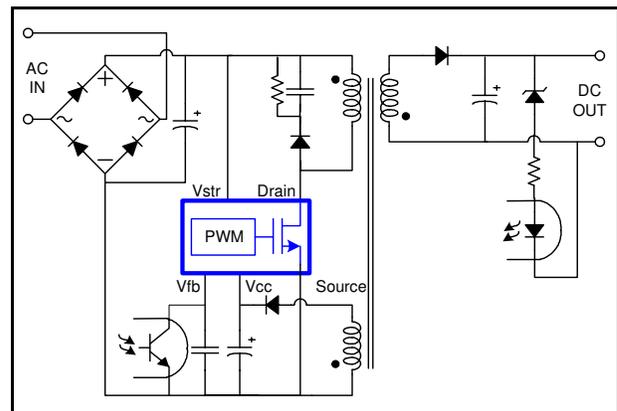
| OUTPUT POWER TABLE <sup>(4)</sup> |                            |                           |                         |                           |
|-----------------------------------|----------------------------|---------------------------|-------------------------|---------------------------|
| PRODUCT                           | 230VAC ±15% <sup>(3)</sup> |                           | 85-265VAC               |                           |
|                                   | Adapt-er <sup>(1)</sup>    | Open Frame <sup>(2)</sup> | Adapt-er <sup>(1)</sup> | Open Frame <sup>(2)</sup> |
| FSDM0565RB                        | 60W                        | 70W                       | 50W                     | 60W                       |
| FSDM0565RBI                       | 60W                        | 70W                       | 50W                     | 60W                       |
| FSDM07652RB                       | 70W                        | 80W                       | 60W                     | 70W                       |
| FSDM1265RB                        | 90W                        | 110W                      | 80W                     | 90W                       |

**Table 1. Maximum Output Power**

#### Notes:

1. Typical continuous power in a non-ventilated enclosed adapter measured at 50°C ambient.
2. Maximum practical continuous power in an open-frame design at 50°C ambient.
3. 230 VAC or 100/115 VAC with doubler.
4. The junction Temperature can limit the Maximum output power.

### Typical Circuit



**Figure 1. Typical Flyback Application**

# Internal Block Diagram

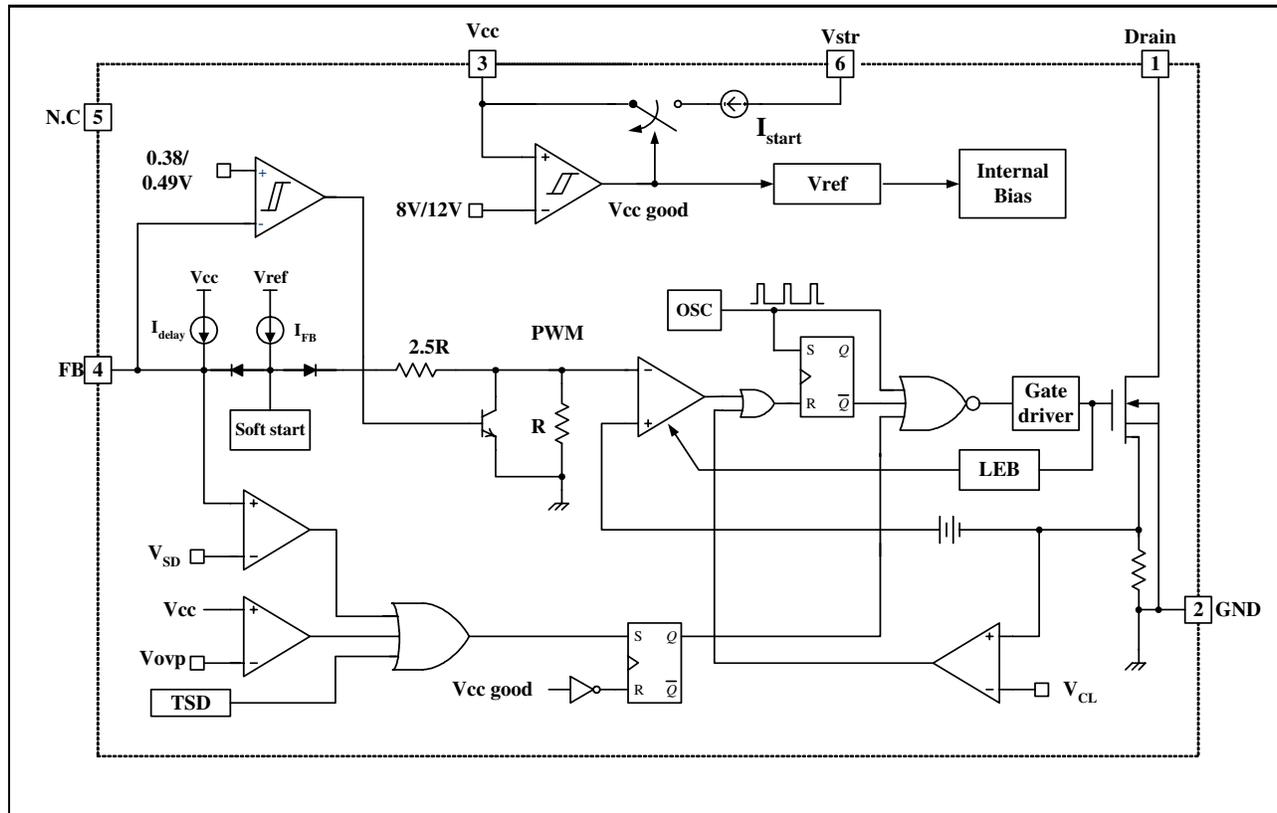


Figure 2. Functional Block Diagram of FSDM1265RB

## Pin Definitions

| Pin Number | Pin Name | Pin Function Description                                                                                                                                                                                                                                                                                                           |
|------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | Drain    | This pin is the high voltage power Sense FET drain. It is designed to drive the transformer directly.                                                                                                                                                                                                                              |
| 2          | GND      | This pin is the control ground and the Sense FET source.                                                                                                                                                                                                                                                                           |
| 3          | Vcc      | This pin is the positive supply voltage input. During startup, the power is supplied by an internal high voltage current source that is connected to the Vstr pin. When Vcc reaches 12V, the internal high voltage current source is disabled and the power is supplied from the auxiliary transformer winding.                    |
| 4          | Vfb      | This pin is internally connected to the inverting input of the PWM comparator. The collector of an opto-coupler is typically tied to this pin. For stable operation, a capacitor should be placed between this pin and GND. Once the pin reaches 6.0V, the overload protection is activated resulting in the shutdown of the FPS™. |
| 5          | N.C      |                                                                                                                                                                                                                                                                                                                                    |
| 6          | Vstr     | This pin is connected directly to the high voltage DC link. At startup, the internal high voltage current source supplies internal bias and charges the external capacitor that is connected to the Vcc pin. Once Vcc reaches 12V, the internal current source is disabled.                                                        |

## Pin Configuration

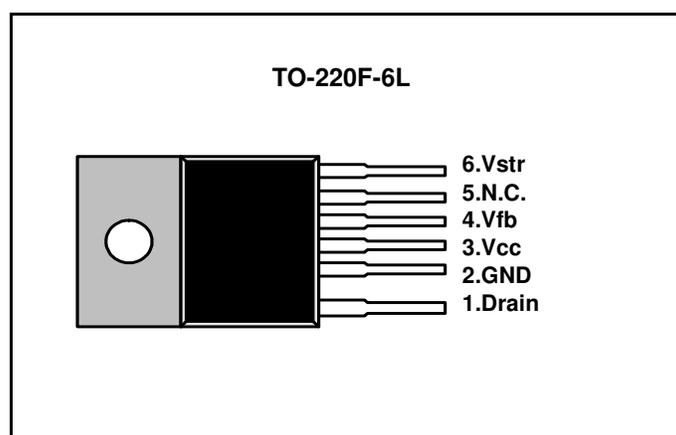


Figure 3. Pin Configuration (Top View)

## Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

| Parameter                                                           | Symbol | Value                       | Unit |
|---------------------------------------------------------------------|--------|-----------------------------|------|
| Drain-source Voltage                                                | VDSS   | 650                         | V    |
| Vstr Max. Voltage                                                   | VSTR   | 650                         | V    |
| Pulsed Drain Current (Tc=25°C) <sup>(1)</sup>                       | IDM    | 15.9                        | ADC  |
| Continuous Drain Current(Tc=25°C)                                   | ID     | 5.3                         | A    |
| Continuous Drain Current(Tc=100°C)                                  |        | 3.4                         | A    |
| Supply Voltage                                                      | VCC    | 20                          | V    |
| Input Voltage Range                                                 | VFB    | -0.3 to VCC                 | V    |
| Total Power Dissipation<br>(Tc=25°C with Infinite Heat Sink)        | PD     | 50                          | W    |
| Operating Junction Temperature                                      | Tj     | Internally limited          | °C   |
| Operating Ambient Temperature                                       | TA     | -25 to +85                  | °C   |
| Storage Temperature Range                                           | TSTG   | -55 to +150                 | °C   |
| ESD Capability, HBM Model (All Pins<br>except for Vstr and Vfb)     | -      | 2.0<br>(GND-Vstr/Vfb=1.5kV) | kV   |
| ESD Capability, Machine Model (All Pins<br>except for Vstr and Vfb) | -      | 300<br>(GND-Vstr/Vfb=225V)  | V    |

### Notes:

1. Repetitive rating: Pulse width limited by maximum junction temperature

## Thermal Impedance

| Parameter                | Symbol              | Package    | Value | Unit |
|--------------------------|---------------------|------------|-------|------|
| Junction-to-Case Thermal | $\theta_{JC}^{(1)}$ | TO-220F-6L | 2.5   | °C/W |

### Notes:

1. Infinite cooling condition - Refer to the SEMI G30-88.

## Electrical Characteristics

(Ta = 25°C unless otherwise specified)

| Parameter                            | Symbol              | Condition                                                              | Min. | Typ. | Max. | Unit |
|--------------------------------------|---------------------|------------------------------------------------------------------------|------|------|------|------|
| <b>Sense FET SECTION</b>             |                     |                                                                        |      |      |      |      |
| Drain-source breakdown voltage       | BVDSS               | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                           | 650  | -    | -    | V    |
| Zero gate voltage drain current      | I <sub>DSS</sub>    | V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V                           | -    | -    | 500  | μA   |
|                                      |                     | V <sub>DS</sub> = 520V<br>V <sub>GS</sub> = 0V, T <sub>C</sub> = 125°C | -    | -    | 500  | μA   |
| Static drain source on resistance    | R <sub>DS(ON)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.5A                           | -    | 0.75 | 0.9  | Ω    |
| Output capacitance                   | C <sub>OSS</sub>    | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V,<br>f = 1MHz               | -    | 78   | -    | pF   |
| Turn-on delay time                   | T <sub>D(ON)</sub>  | V <sub>DD</sub> = 325V, I <sub>D</sub> = 5A                            | -    | 42   | -    | ns   |
| Rise time                            | T <sub>R</sub>      |                                                                        | -    | 106  | -    |      |
| Turn-off delay time                  | T <sub>D(OFF)</sub> |                                                                        | -    | 330  | -    |      |
| Fall time                            | T <sub>F</sub>      |                                                                        | -    | 110  | -    |      |
| <b>CONTROL SECTION</b>               |                     |                                                                        |      |      |      |      |
| Initial frequency                    | F <sub>OSC</sub>    | V <sub>FB</sub> = 3V                                                   | 60   | 66   | 72   | kHz  |
| Voltage stability                    | F <sub>STABLE</sub> | 13V ≤ V <sub>CC</sub> ≤ 18V                                            | 0    | 1    | 3    | %    |
| Temperature stability <sup>(1)</sup> | ΔF <sub>OSC</sub>   | -25°C ≤ Ta ≤ 85°C                                                      | 0    | ±5   | ±10  | %    |
| Maximum duty cycle                   | D <sub>MAX</sub>    | -                                                                      | 77   | 82   | 87   | %    |
| Minimum duty cycle                   | D <sub>MIN</sub>    | -                                                                      | -    | -    | 0    | %    |
| Start threshold voltage              | V <sub>START</sub>  | V <sub>FB</sub> = GND                                                  | 11   | 12   | 13   | V    |
| Stop threshold voltage               | V <sub>STOP</sub>   | V <sub>FB</sub> = GND                                                  | 7    | 8    | 9    | V    |
| Feedback source current              | I <sub>FB</sub>     | V <sub>FB</sub> = GND                                                  | 0.7  | 0.9  | 1.1  | mA   |
| Soft-start time                      | T <sub>S</sub>      | V <sub>fb</sub> = 3                                                    | -    | 10   | 15   | ms   |
| Leading edge blanking time           | T <sub>LEB</sub>    | -                                                                      | -    | 250  | -    | ns   |
| <b>BURST MODE SECTION</b>            |                     |                                                                        |      |      |      |      |
| Burst mode voltages <sup>(1)</sup>   | V <sub>BURH</sub>   | V <sub>CC</sub> = 14V                                                  | 0.3  | 0.38 | 0.46 | V    |
|                                      | V <sub>BURL</sub>   | V <sub>CC</sub> = 14V                                                  | 0.39 | 0.49 | 0.59 | V    |

**Electrical Characteristics** (Continued)

(Ta = 25°C unless otherwise specified)

| Parameter                                   | Symbol               | Condition                                  | Min. | Typ. | Max. | Unit |
|---------------------------------------------|----------------------|--------------------------------------------|------|------|------|------|
| <b>PROTECTION SECTION</b>                   |                      |                                            |      |      |      |      |
| Peak current limit <sup>(2)</sup>           | I <sub>OVER</sub>    | V <sub>FB</sub> =5V, V <sub>CC</sub> =14V  | 3.0  | 3.4  | 3.8  | A    |
| Over voltage protection (OVP)               | V <sub>OVP</sub>     | -                                          | 18   | 19   | 20   | V    |
| Thermal shutdown temperature <sup>(1)</sup> | T <sub>SD</sub>      |                                            | 130  | 145  | 160  | °C   |
| Shutdown feedback voltage                   | V <sub>SD</sub>      | V <sub>FB</sub> ≥ 5.5V                     | 5.5  | 6.0  | 6.5  | V    |
| Shutdown delay current                      | I <sub>DELAY</sub>   | V <sub>FB</sub> =5V                        | 2.8  | 3.5  | 4.2  | μA   |
| <b>TOTAL DEVICE SECTION</b>                 |                      |                                            |      |      |      |      |
| Operating supply current <sup>(3)</sup>     | I <sub>OP</sub>      | V <sub>FB</sub> =GND, V <sub>CC</sub> =14V | -    | 2.5  | 5    | mA   |
|                                             | I <sub>OP(MIN)</sub> | V <sub>FB</sub> =GND, V <sub>CC</sub> =10V |      |      |      |      |
|                                             | I <sub>OP(MAX)</sub> | V <sub>FB</sub> =GND, V <sub>CC</sub> =18V |      |      |      |      |

**Notes:**

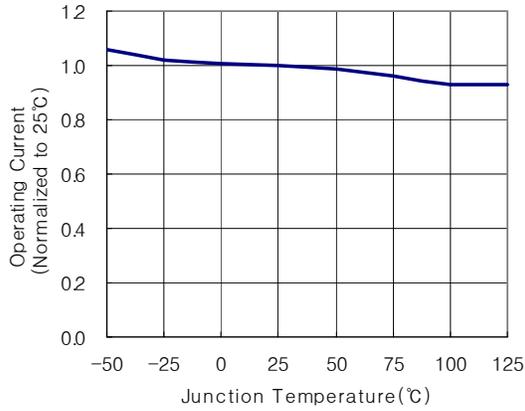
1. These parameters, although guaranteed at the design level, are not tested in mass production.
2. These parameters indicate the inductor current.
3. This parameter is the current flowing into the control IC.

## Comparison of FS6M12653RTC and FSDM1265RB

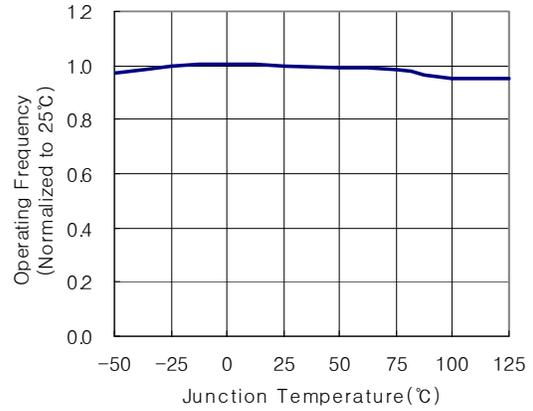
| Function             | FS6M12653RTC                                                                                                            | FSDM1265RB                                                                                                | FSDM1265RB Advantages                                                                                                                                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Soft-Start           | Adjustable soft-start time using an external capacitor                                                                  | Typical Internal soft-start of 10ms (fixed)                                                               | <ul style="list-style-type: none"> <li>• Gradually increasing current limit during soft-start reduces peak current and voltage component stresses</li> <li>• Eliminates external components used for soft-start in most applications</li> <li>• Reduces or eliminates output overshoot</li> </ul> |
| Burst Mode Operation | <ul style="list-style-type: none"> <li>• Built into controller</li> <li>• Output voltage drops to about half</li> </ul> | <ul style="list-style-type: none"> <li>• Built into controller</li> <li>• Output voltage fixed</li> </ul> | <ul style="list-style-type: none"> <li>• Improves light-load efficiency</li> <li>• Reduces no-load consumption</li> </ul>                                                                                                                                                                         |

# Typical Performance Characteristics

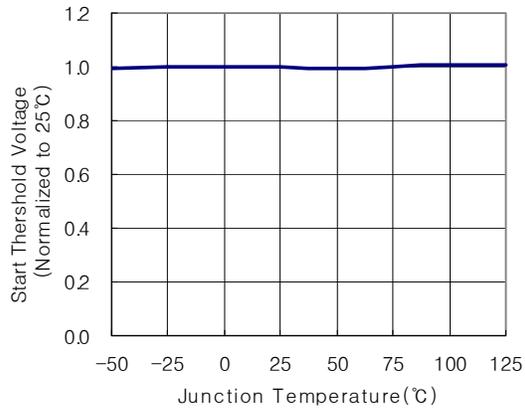
(These Characteristic Graphs are Normalized at Ta= 25°C)



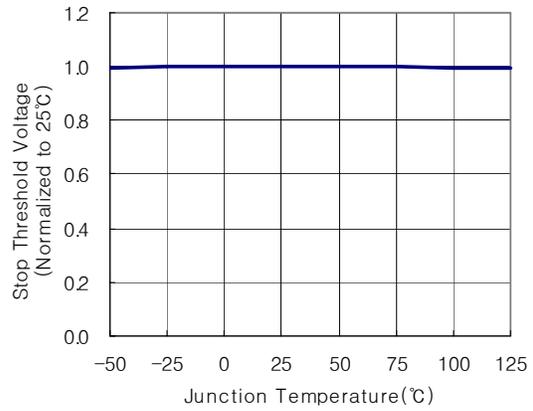
**Operating Current vs. Temperature**



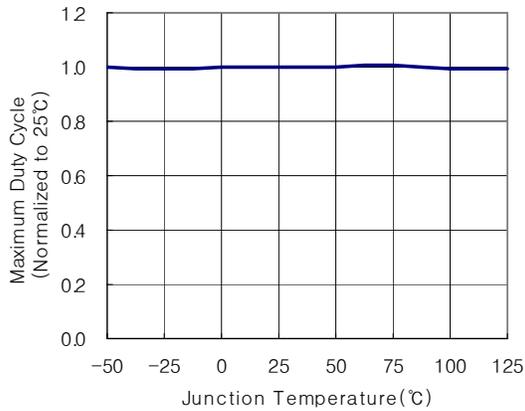
**Operating Frequency vs. Temperature**



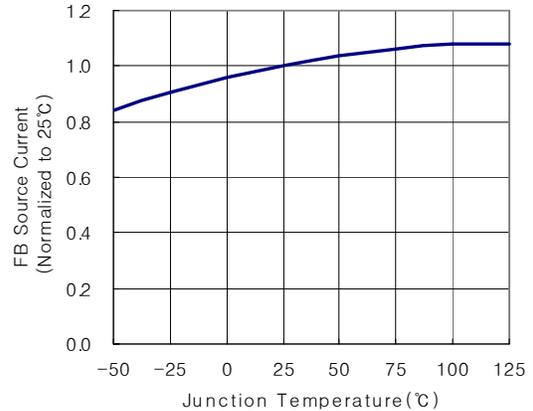
**Start Threshold Voltage vs. Temperature**



**Stop Threshold Voltage vs. Temperature**



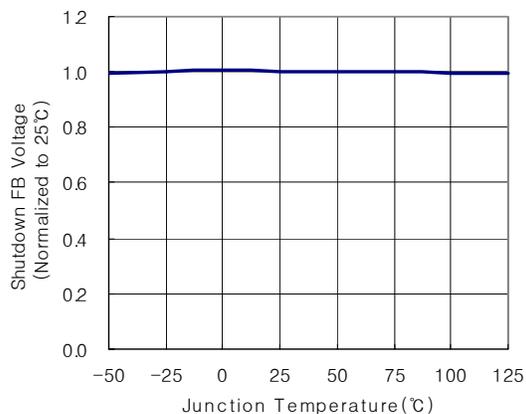
**Maximum Duty vs. Temperature**



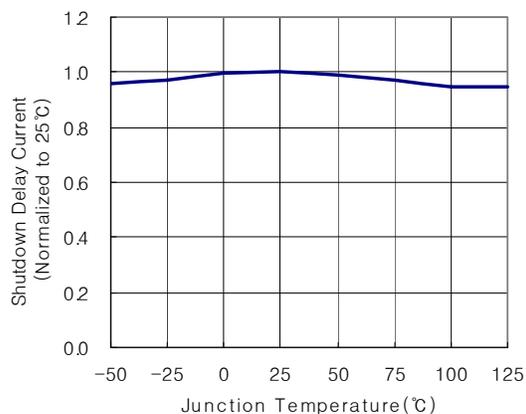
**Feedback Source Current vs. Temperature**

## Typical Performance Characteristics (Continued)

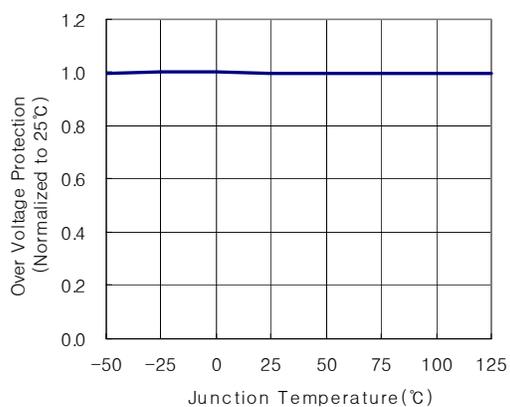
(These Characteristic Graphs are Normalized at Ta= 25°C)



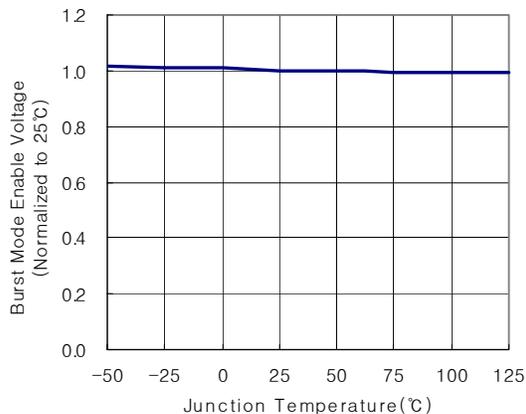
ShutDown Feedback Voltage vs. Temperature



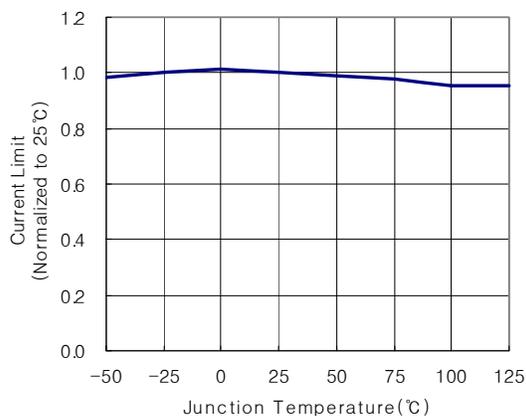
ShutDown Delay Current vs. Temperature



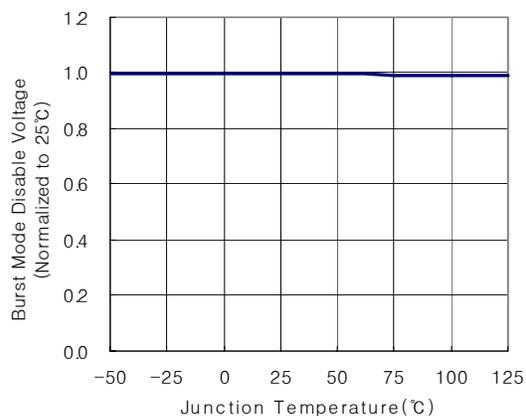
Over Voltage Protection vs. Temperature



Current Limit VS. Temperature



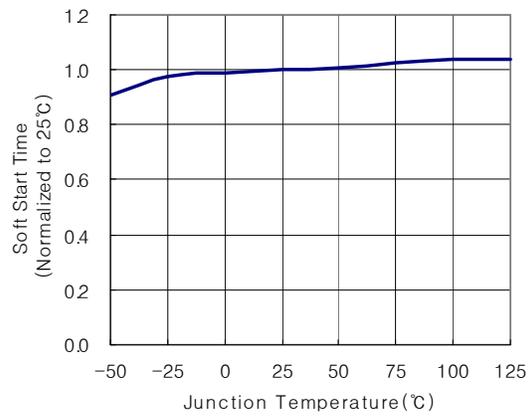
Burst Mode Enable Voltage vs. Temperature



Burst Mode Disable Voltage vs. Temperature

## Typical Performance Characteristics (Continued)

(These Characteristic Graphs are Normalized at Ta= 25°C)



**Soft-start Time vs. Temperature**

## Functional Description

**1. Star-up:** In previous generations of Fairchild Power Switches (FPS™), the Vcc pin had an external start-up to the DC input voltage line. In the newer switches, the startup resistor is replaced by an internal high voltage current source. At startup, an internal high voltage current source supplies the internal bias and charges the external capacitor (C<sub>VCC</sub>) that is connected to the Vcc pin as illustrated in Figure 4. When the Vcc pin reaches 12V, the FSDM1265RB begins switching and the internal high voltage current source is disabled. Then, the FSDM1265RB continues its normal switching operation and the power is supplied from the auxiliary transformer winding unless Vcc goes below the stop voltage of 8V.

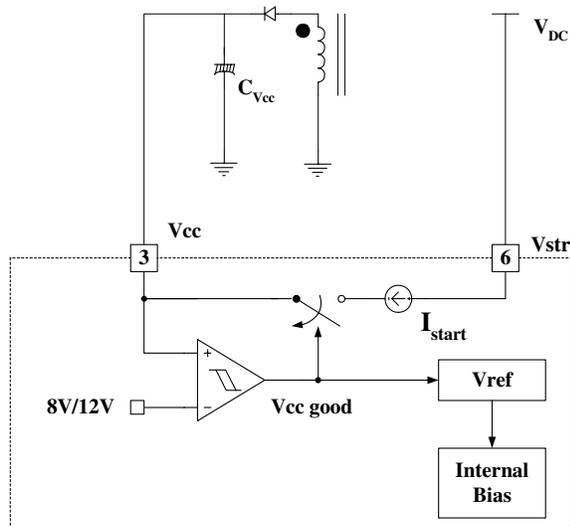


Figure 4. Internal startup circuit

**2. Feedback Control:** FSDM1265RB employs current mode control, as shown in Figure 5. An opto-coupler (such as the H11A817A) and shunt regulator (such as the KA431) are typically used to implement the feedback network. Comparing the feedback voltage with the voltage across the R<sub>sense</sub> resistor in addition to the offset voltage makes it possible to control the switching duty cycle. When the reference pin voltage of the KA431 exceeds the internal reference voltage of 2.5V, the H11A817A LED current increases, thereby pulling down the feedback voltage and reducing the duty cycle. Typically this happens when the input voltage is increased or the output load is decreased.

**2.1 Pulse-by-pulse current limit:** Because current mode control is employed, the peak current through the Sense-FET is limited by the inverting input of PWM comparator (Vfb\*) as shown in Figure 5. Assuming that the 0.9mA current source flows only through the internal resistor (2.5R + R = 2.8 kΩ), the cathode voltage of diode D2 is about 2.5V. Since D1 is blocked when the feedback voltage (Vfb) exceeds 2.5V, the maximum voltage of the cathode of D2 is clamped at this voltage, thus clamping Vfb\*. Therefore, the peak value of the current through the Sense FET is limited.

**2.2 Leading edge blanking (LEB):** When the internal Sense FET is turned on, usually the reverse recovery of the primary-side capacitance and the secondary-side rectifier causes a high current spike through the SenseFET. Excessive voltage across the R<sub>sense</sub> resistor can lead to incorrect feedback operation in the current mode PWM control. To counter this effect, the FSDM1265RB employs a leading edge blanking (LEB) circuit. This circuit inhibits the PWM comparator for a short time (T<sub>LEB</sub>) after the SenseFET is turned on.

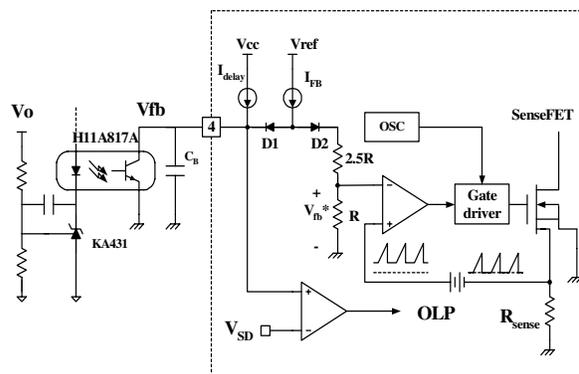


Figure 5. Pulse width modulation (PWM) circuit

**3. Protection Circuit:** The FSDM1265RB has several self protective functions such as overload protection (OLP), over voltage protection (OVP) and thermal shutdown (TSD). Because these protection circuits are fully integrated into the IC without external components, the reliability can be improved without increasing cost. Once the fault condition occurs, switching is terminated and the SenseFET remains off. This causes Vcc to fall. When Vcc reaches the UVLO stop voltage (8V), the protection is reset and the internal high voltage current source charges the Vcc capacitor via the Vstr pin. When the Vcc reaches the UVLO start voltage (12 V), the FSDM1265RB resumes its normal operation. Thus, the auto-restart alternately enables and disables the switching of the power SenseFET until the fault condition is eliminated (see Figure 6).

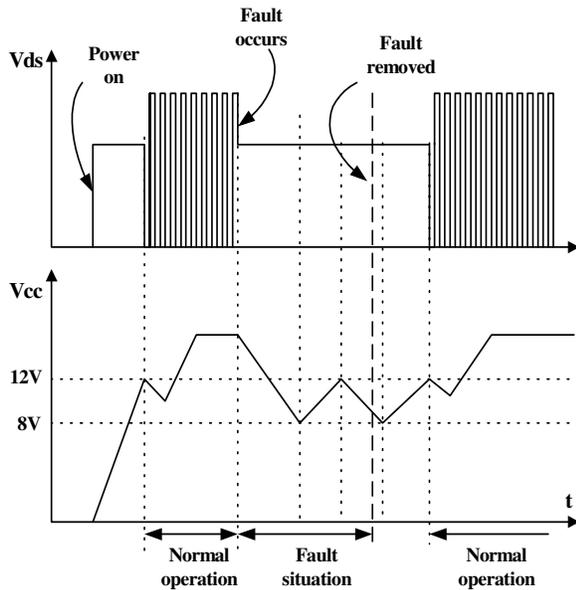


Figure 6. Auto Restart Operation

**3.1 Over Load Protection (OLP):** Overload occurs when the load current exceeds a pre-set level due to an unexpected event. The protection circuit (OLP) is activated to protect the SMPS. However, even when the SMPS is operating normally, the OLP circuit can become activate during the load transition. To avoid this undesired operation, the OLP circuit is designed to become activate after a specified time to determine whether it is in a transient or an overload mode. Because of the pulse-by-pulse current limit capability, the maximum peak current through the SenseFET is limited, and therefore the maximum input power is restricted with a given input voltage. If the output consumes beyond this maximum power, the output voltage ( $V_o$ ) decreases below the set voltage. This reduces the current through the opto-coupler LED, which also reduces the opto-coupler transistor current, thus increasing the feedback voltage

( $V_{fb}$ ). If  $V_{fb}$  exceeds 2.5V, D1 is blocked and the 3.5uA current source slowly starts to charge  $C_B$  up to  $V_{cc}$ . In this condition,  $V_{fb}$  continues increasing until it reaches 6V. Then the switching operation terminates as shown in Figure 7. The delay time for shutdown is the time required to charge  $C_B$  from 2.5V to 6.0V with 3.5uA. In general, a 10 ~ 50 ms delay is typical for most applications.

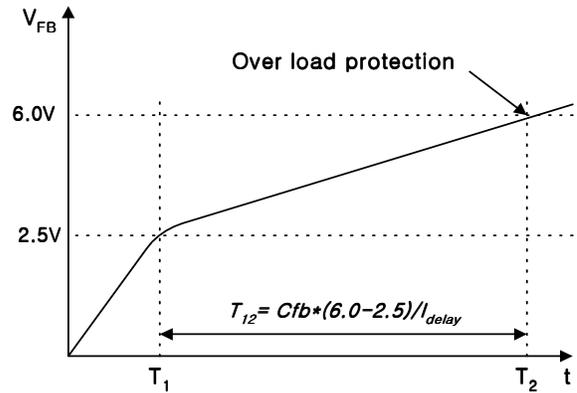


Figure 7. Over Load Protection

**3.2 Over voltage Protection (OVP):** If the secondary side feedback circuit malfunctions or a solder defect causes an open in the feedback path, the current through the opto-coupler transistor becomes almost zero. Then,  $V_{fb}$  climbs up in a similar manner to the over load situation forcing the pre-set maximum current to be supplied to the SMPS until the OLP is activated. Because more energy than required is provided to the output, the output voltage may exceed the rated voltage before the OLP is activated, resulting in the breakdown of the devices in the secondary side. In order to prevent this situation, an OVP circuit is used. Generally,  $V_{cc}$  is proportional to the output voltage and the FSDM1265RB uses  $V_{cc}$  instead of directly monitoring the output voltage. If  $V_{CC}$  exceeds 19V, an OVP circuit is activated resulting in the termination of the switching operation. In order to avoid undesired activation of OVP during normal operation,  $V_{cc}$  should be designed to be below 19V.

**3.3 Thermal Shutdown (TSD):** The SenseFET and the control IC are built in one package making it easy for the control IC to detect the heat generated by the SenseFET. When the temperature exceeds approximately 150°C, the thermal shutdown is activated.

**4. Soft Start:** The FSDM1265RB has an internal soft-start circuit, which increases the PWM comparator and slowly inverts the input voltage together with the SenseFET current, after it starts up. The typical soft-start time is 10ms, The pulse width to the power switching device is progressively increased to establish the correct working conditions for transformers, inductors, and capacitors. The voltage on the output capacitors is progressively increased to smoothly establish the required output voltage. This also helps prevent transformer saturation and reduce the stress on the secondary diode during startup.

**5. Burst operation:** To minimize power dissipation in the standby mode, the FSDM1265RB enters burst mode operation. As the load decreases, the feedback voltage decreases. As shown

in Figure 8, the device automatically enters burst mode when the feedback voltage drops below  $V_{BURL}(380mV)$ . At this point switching stops and the output voltages start to drop at a rate dependent on the standby current load. This causes the feedback voltage to rise. Once it passes  $V_{BURH}(490mV)$ , switching resumes. The feedback voltage then falls and the process repeats. Burst mode operation alternately enables and disables switching of the power SenseFET, thereby reducing switching loss in the Standby mode.

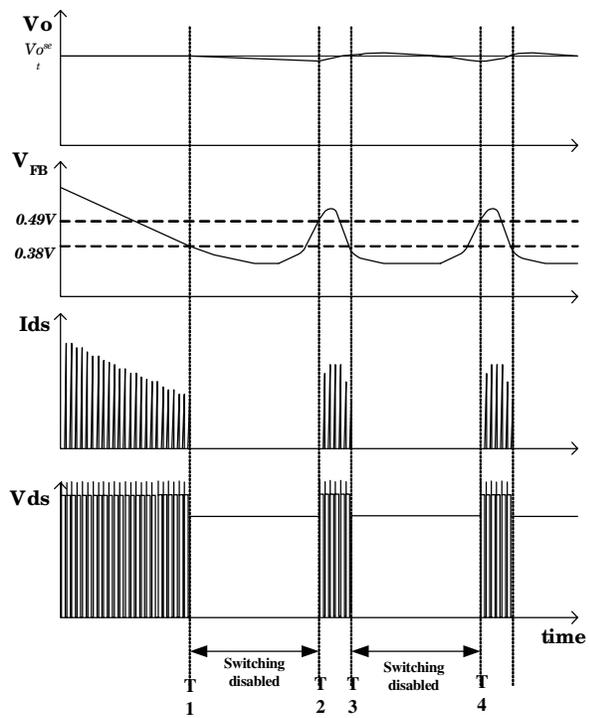


Figure 8. Waveforms of Burst Operation

## Typical Application Circuit

| Application | Output Power | Input Voltage                  | Output Voltage (Max. Current) |
|-------------|--------------|--------------------------------|-------------------------------|
| LCD Monitor | 62W          | Universal input<br>(85-265Vac) | 5V (4.0A)                     |
|             |              |                                | 12V (3.5A)                    |

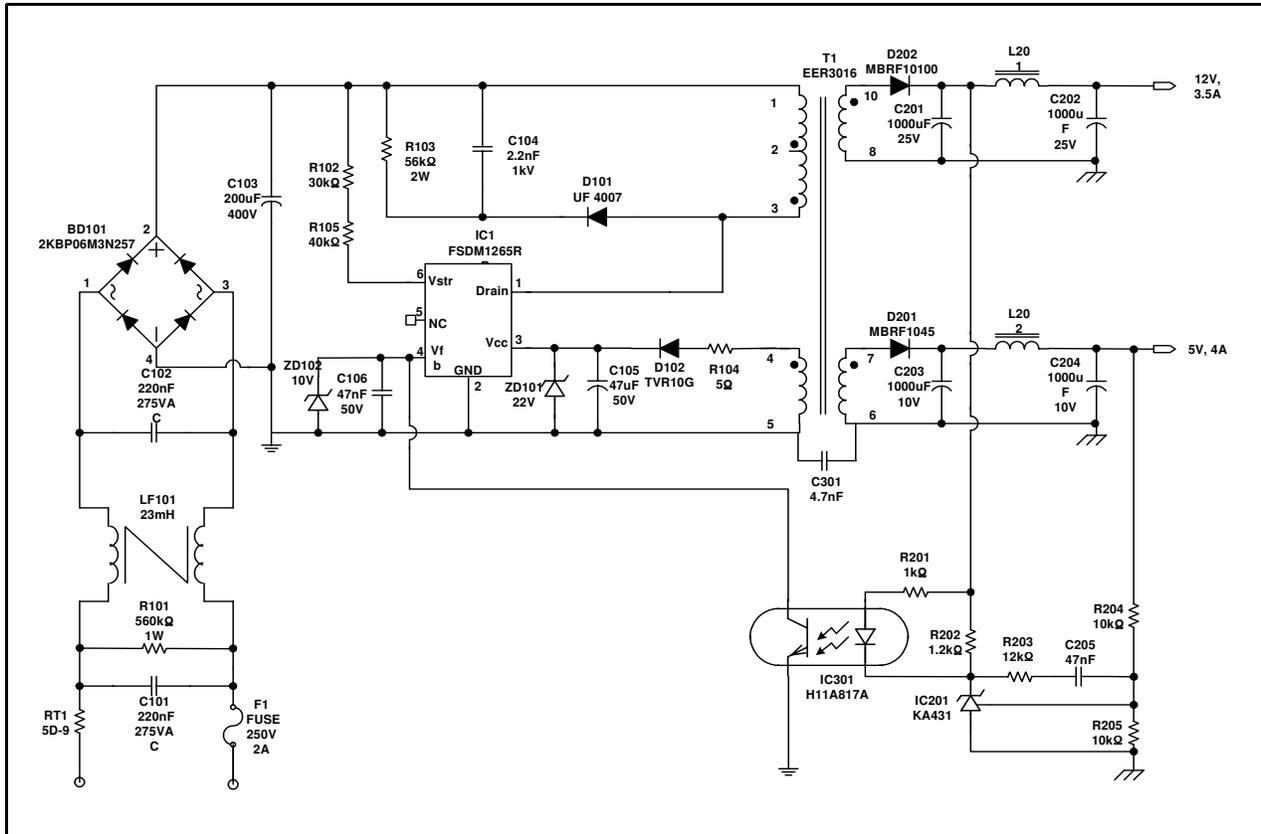
### Features

- High efficiency (>81% at 85Vac input)
- Low zero-load power consumption (<300mW at 240Vac input)
- Low standby-mode power consumption (<800mW at 240Vac input and 0.3W load)
- Low component count
- Enhanced system reliability through several protection functions
- Internal soft-start (10ms)

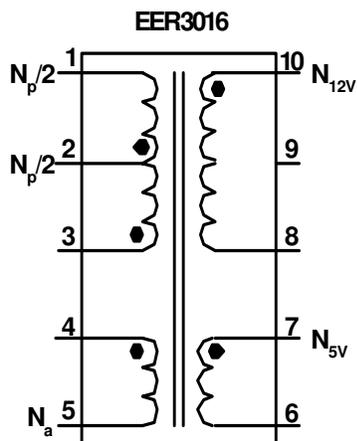
### Key Design Notes

- Resistors R102 and R105 are employed to prevent start-up at low input voltage. After start-up, there is no power loss in these resistors since the start-up pin is internally disconnected after start-up.
- The delay time for OLP is designed to be about 50ms with C106 of 47nF. If you require a faster triggering of OLP, reduce the C106 to 10nF.
- Zener diode ZD102 is used for a safety test such as UL. When the drain pin and feedback pin are shorted, the zener diode fails and remains short, which causes the fuse (F1) to blow and prevents explosion of the opto-coupler (IC301). The zener diode also increases immunity against a line surge.

### 1. Schematic



## 2. Transformer Schematic Diagram



## 3. Winding Specification

| No                                                    | Pin (s→f) | Wire                 | Turns | Winding Method   |
|-------------------------------------------------------|-----------|----------------------|-------|------------------|
| Na                                                    | 4 → 5     | 0.2 <sup>φ</sup> × 1 | 8     | Center Winding   |
| Insulation: Polyester Tape t = 0.050mm, 2Layers       |           |                      |       |                  |
| Np/2                                                  | 2 → 1     | 0.4 <sup>φ</sup> × 1 | 18    | Solenoid Winding |
| Insulation: Polyester Tape t = 0.050mm, 2Layers       |           |                      |       |                  |
| N12V                                                  | 10 → 8    | 0.3 <sup>φ</sup> × 3 | 7     | Center Winding   |
| Insulation: Polyester Tape t = 0.050mm, 2Layers       |           |                      |       |                  |
| N5V                                                   | 7 → 6     | 0.3 <sup>φ</sup> × 3 | 3     | Center Winding   |
| Insulation: Polyester Tape t = 0.050mm, 2Layers       |           |                      |       |                  |
| Np/2                                                  | 3 → 2     | 0.4 <sup>φ</sup> × 1 | 18    | Solenoid Winding |
| Outer Insulation: Polyester Tape t = 0.050mm, 2Layers |           |                      |       |                  |

## 4. Electrical Characteristics

|                    | Pin   | Specifications | Remarks                   |
|--------------------|-------|----------------|---------------------------|
| Inductance         | 1 - 3 | 420uH ± 10%    | 100kHz, 1V                |
| Leakage Inductance | 1 - 3 | 10uH Max.      | 2 <sup>nd</sup> all short |

## 5. Core & Bobbin

Core: EER 3016

Bobbin: EER3016

Ae(mm<sup>2</sup>): 96

## 6.Demo Circuit Part List

| Part             | Value        | Note                   | Part                | Value         | Note                |
|------------------|--------------|------------------------|---------------------|---------------|---------------------|
| <b>Fuse</b>      |              |                        | C301                | 4.7nF         | Polyester Film Cap. |
| F101             | 2A/250V      |                        |                     |               |                     |
| <b>NTC</b>       |              |                        | <b>Inductor</b>     |               |                     |
| RT101            | 5D-9         |                        | L201                | 5uH           | Wire 1.2mm          |
| <b>Resistor</b>  |              |                        | L202                | 5uH           | Wire 1.2mm          |
| R101             | 560K         | 1W                     |                     |               |                     |
| R102             | 30K          | 1/4W                   |                     |               |                     |
| R103             | 56K          | 2W                     |                     |               |                     |
| R104             | 5            | 1/4W                   | <b>Diode</b>        |               |                     |
| R105             | 40K          | 1/4W                   | D101                | UF4007        |                     |
| R201             | 1K           | 1/4W                   | D102                | TVR10G        |                     |
| R202             | 1.2K         | 1/4W                   | D201                | MBRF1045      |                     |
| R203             | 12K          | 1/4W                   | D202                | MBRF10100     |                     |
| R204             | 10K          | 1/4W                   | ZD101               | Zener Diode   | 22V                 |
| R205             | 10K          | 1/4W                   | ZD102               | Zener Diode   | 10V                 |
|                  |              |                        | <b>Bridge Diode</b> |               |                     |
|                  |              |                        | BD101               | 2KBP06M 3N257 | Bridge Diode        |
| <b>Capacitor</b> |              |                        | <b>Line Filter</b>  |               |                     |
| C101             | 220nF/275VAC | Box Capacitor          |                     |               |                     |
| C102             | 220nF/275VAC | Box Capacitor          | LF101               | 23mH          | Wire 0.4mm          |
| C103             | 200uF/400V   | Electrolytic Capacitor | <b>IC</b>           |               |                     |
| C104             | 2.2nF/1kV    | Ceramic Capacitor      | IC101               | FSDM1265RB    | FPS™(12A,650V)      |
| C105             | 47uF/50V     | Electrolytic Capacitor | IC201               | KA431(TL431)  | Voltage reference   |
| C106             | 47nF/50V     | Ceramic Capacitor      | IC301               | H11A817A      | Opto-coupler        |
| C201             | 1000uF/25V   | Electrolytic Capacitor |                     |               |                     |
| C202             | 1000uF/25V   | Electrolytic Capacitor |                     |               |                     |
| C203             | 1000uF/10V   | Electrolytic Capacitor |                     |               |                     |
| C204             | 1000uF/10V   | Electrolytic Capacitor |                     |               |                     |
| C205             | 47nF/50V     | Ceramic Capacitor      |                     |               |                     |

7. Layout

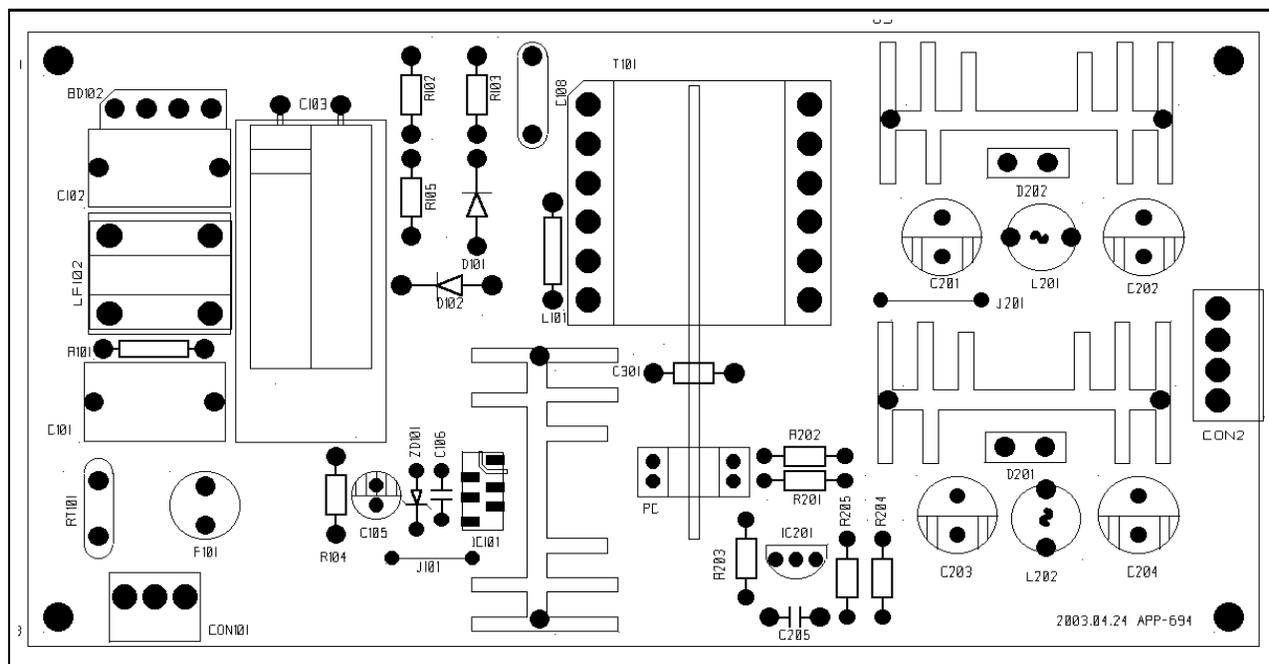


Figure 9. Layout Considerations for FSDM1265RB

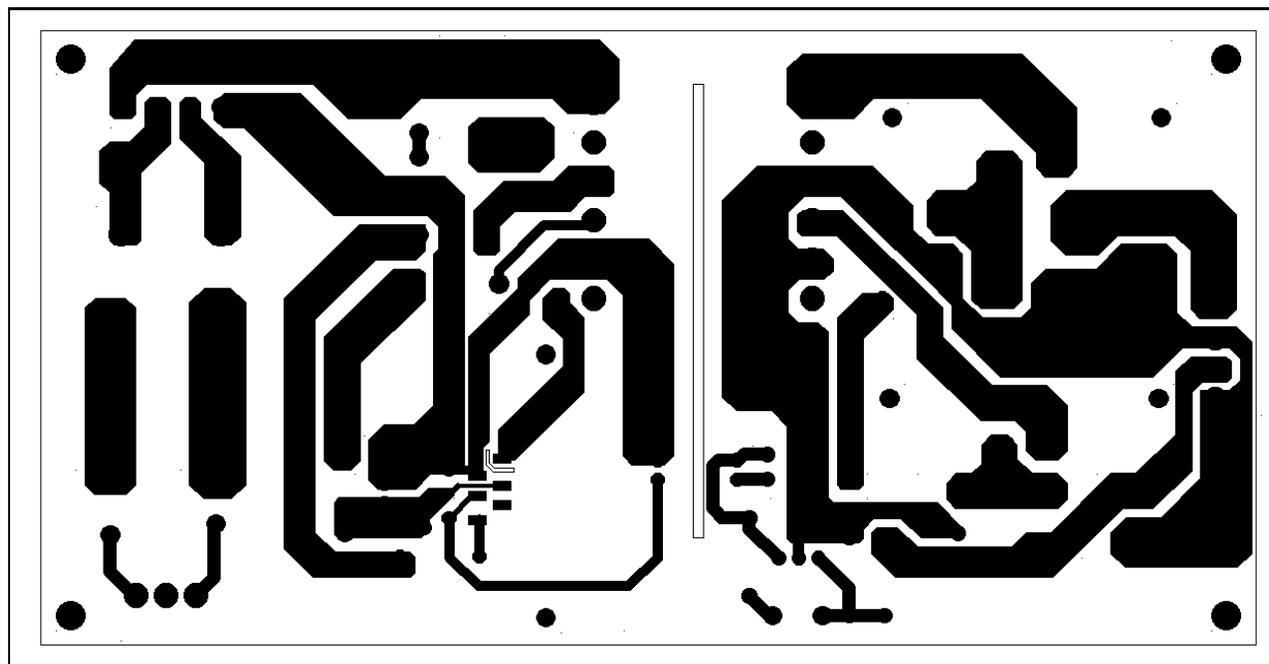
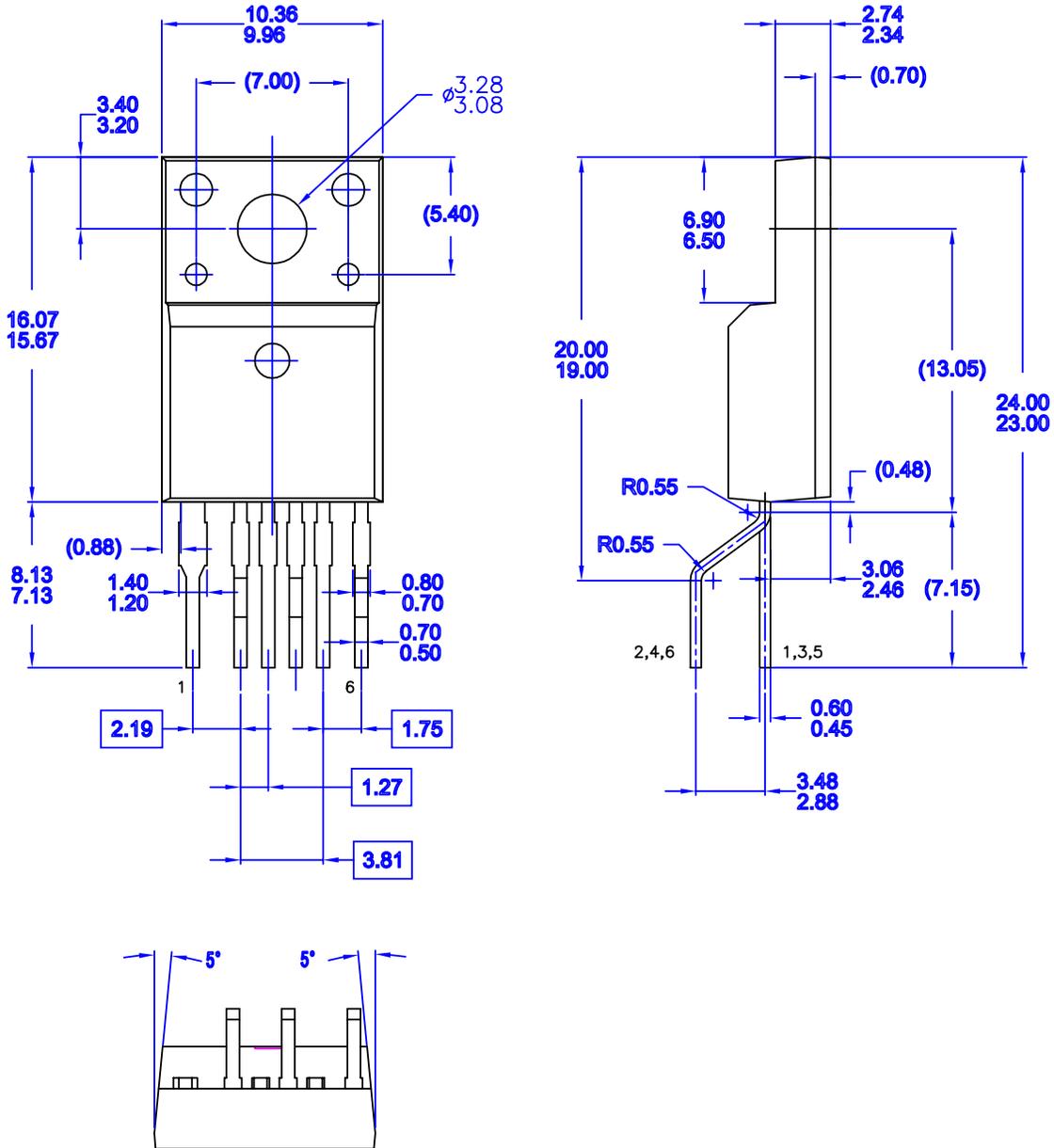


Figure 10. Layout Considerations for FSDM1265RB

# Package Dimensions

## TO-220F-6L(Forming)



NOTES: UNLESS OTHERWISE SPECIFIED  
 A) THIS PACKAGE DOES NOT COMPLY TO ANY CURRENT PACKAGING STANDARD.  
 B) ALL DIMENSIONS ARE IN MILLIMETERS.  
 C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.  
 D) LEADFORM OPTION A

MKT-TO220A06revB

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## Ordering Information

| Product Number | Package             | Marking Code | BVdss | Rds(on)Max   |
|----------------|---------------------|--------------|-------|--------------|
| FSDM1265RBWDTU | TO-220F-6L(Forming) | DM1265RB     | 650V  | 0.9 $\Omega$ |

WDTu: Forming Type

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