## Features

- Wide 3.3V to 16V Operating input Range
- 2A Continuous Output Current
- No Schottky Diode Required
- 600KHz Frequency Operation
- Built-in Over Current Limit
- Built-in Over Voltage Protection
- Internal Soft start
- Output Adjustable from 0.6V
- Integrated internal compensation
- Short Protection with Hiccup-Mode
- Thermal Shutdown
- Available in SOT23-6 ,Package
- -40℃ to +85℃ Temperature Range

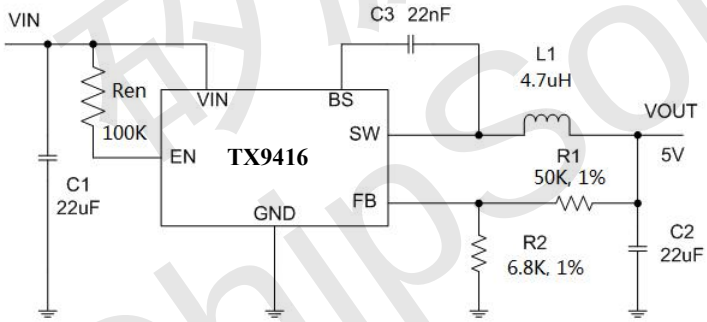
## Applications

- Digital Set-top Box (STB)
- Tablet Personal Computer (Pad)
- Flat-Panel Television and Monitor
- Digital Video Recorder (DVR)
- Portable Media Player (PMP)
- General Purposes

## General Description

The TX9416 is a high frequency, synchronous, rectified, step-down, switch-mode converter with internal power MOSFETs. It offers a very compact solution to achieve a 2A continuous output current over a wide input supply range, with excellent load and line regulation.The TX9416 requires a minimal number of readily available, external components and is available in a space saving SOT23-6 package.

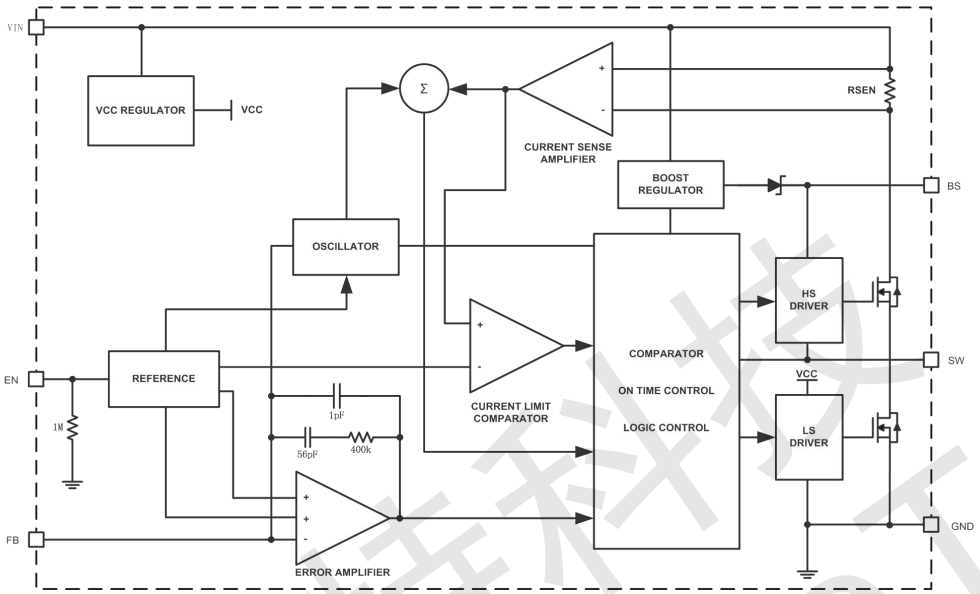
## Typical Application




| VOUT | R1 | R2 |
|---|---|---|
| 5.0V | 50K | 6.8K |
| 3.3V | 50K | 11K |
| 1.8V | 50K | 25K |
| 1.5V | 50K | 33.3K |
| 1.2V | 50K | 50K |
| 1.0V | 50K | 75K |

Figure 1. Basic Application Circuit For VOUT=5V

## System Block Diagram




## Functional Description

**Internal Regulator**

The TX9416 is a current mode step down DC/DC converter that provides excellent transient response with no extra external compensation components. This device contains an internal, low resistance, high voltage power MOSFET, and operates at a high 600K operating frequency to ensure a compact, high efficiency design with excellent AC and DC performance.

**Error Amplifier**

The error amplifier compares the FB pin voltage with the internal FB reference (VFB) and outputs a current proportional to the difference between the two. This output current is then used to charge or discharge the internal compensation network to form the COMP voltage, which is used to control the power MOSFET current. The optimized internal compensation network minimizes the external component counts and simplifies the control loop design.

**Internal Soft-Start**

The soft-start is implemented to prevent the converter output voltage from overshooting during startup. When the chip starts, the internal circuitry generates a soft-start voltage (SS) ramping up from 0V to 0.6V. When it is lower than the internal reference (REF), SS overrides REF so the error amplifier uses SS as the reference. When SS is higher than REF, REF regains control. The SS time is internally fixed to 1.5ms.

**Over Current Protection & Hiccup**

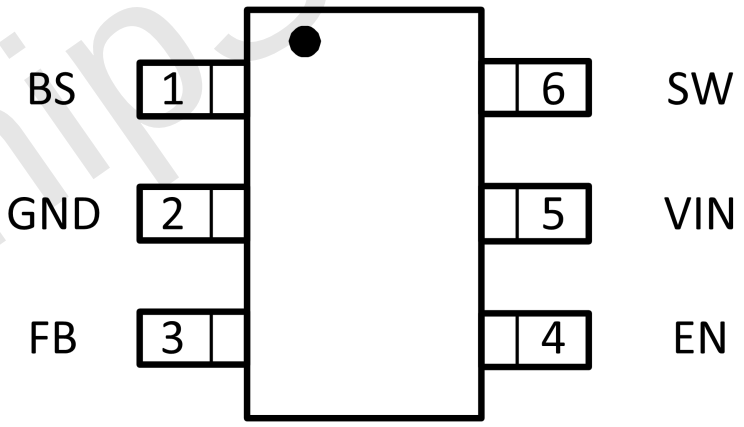
The TX9416 has cycle-by-cycle over current limit when the inductor current peak value exceeds the set current limit threshold. Meanwhile, output voltage starts to drop until FB is below the Under-Voltage (UV) threshold, typically 25% below the reference. Once a UV is triggered, the TX9416 enters hiccup mode to periodically restart the part. This protection mode is especially useful when the output is dead-short to ground. The average short circuit current is greatly reduced to alleviate the thermal issue and to protect the regulator. The TX9416 exits the hiccup mode once the over current condition is removed.

**Startup and Shutdown**

## Pin Description

| PIN | NAME | FUNCTION |
|---|---|---|
| 1 | BS | Bootstrap. A capacitor connected between SW and BST pins is required to form a floating supply across the high-side switch driver. |
| 2 | GND | GROUND Pin |
| 3 | FB | Adjustable Version Feedback input. Connect FB to the center point of the external resistor divider |
| 4 | EN | Drive this pin to a logic-high to enable the IC. Drive to a logic-low to disable the IC and enter micro-power shutdown mode. |
| 5 | IN | Power Supply Pin |
| 6 | SW | Switching Pin |

## Pin Configuration




(SOT23-6)

## Absolute Maximum Ratings

Vin, EN, Voltage ····· -0.3V to 17V
Operating Temperature Range ····· -40℃to +85℃
FB Voltages ····· -0.3 to 6V
Lead Temperature (Soldering, 10s) ····· +300℃
SW Voltage ····· -0.3Vto VIN+0.5V)
Storage Temperature Range ····· -65℃to 150℃
BS Voltage ····· (Vsw-0.3) to (Vsw+5V)

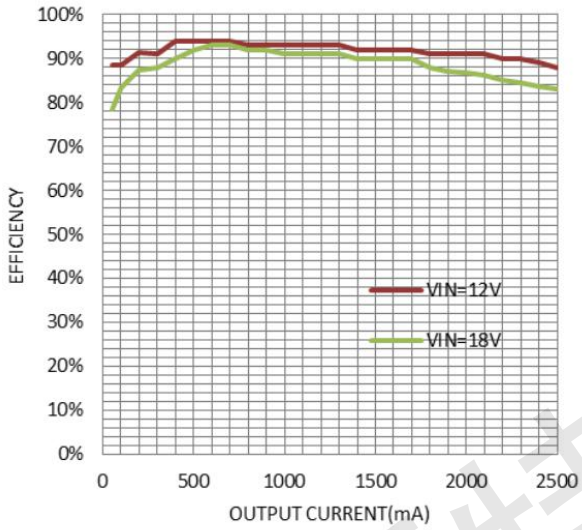
## Electrical Characteristics

(VIN=12V, Vout=5V,TA = 25℃, unless otherwise noted.)

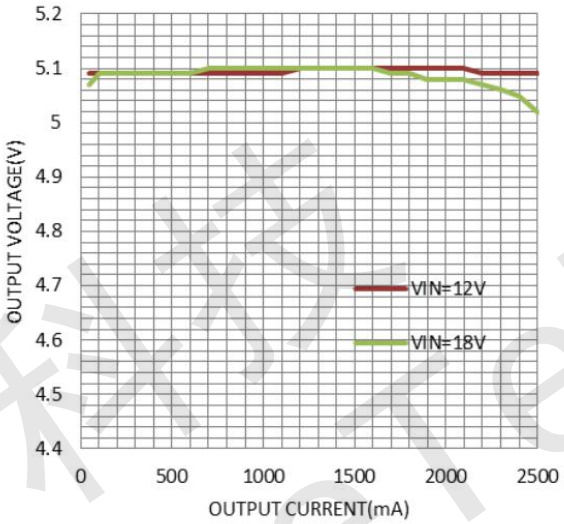
| Parameter | Conditions | MIN | TYP | MAX | unit |
|---|---|---|---|---|---|
| Input Voltage Range | | 3.3 | | 16 | V |
| Supply Current in Operation | VEN=3.0V, VFB=1.1V | | 0.4 | 0.6 | mA |
| Supply Current in Shutdown | VEN =0 or EN = GND | | 4 | | uA |
| Regulated Feedback Voltage | TA = 25℃, 4V≤VIN ≤18V | 0.588 | 0.6 | 0.612 | V |
| High-Side Switch On-Resistance | | | 100 | | mΩ |
| Low-Side Switch On-Resistance | | | 70 | | mΩ |
| High-Side Switch Leakage Current | VEN=0V, VSW=0V | | 0 | 10 | uA |
| Upper Switch Current Limit | Minimum Duty Cycle | | 3 | | A |
| Oscillation Frequency | | | 0.6 | | MHz |
| Maximum Duty Cycle | VFB=0.6V | | 92 | | % |
| Minimum On-Time | | | 60 | | nS |
| Minimum Off-Time | | | 90 | | nS |
| Thermal Shutdown | | | 160 | | ℃ |
| Thermal Hysteresis | | | 20 | | ℃ |

## Typical Performance Characteristics

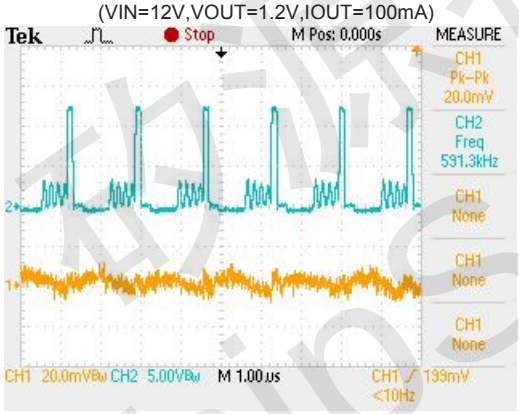
EFFICIENCY VS OUTPUT CURRENT (VOUT=5V)



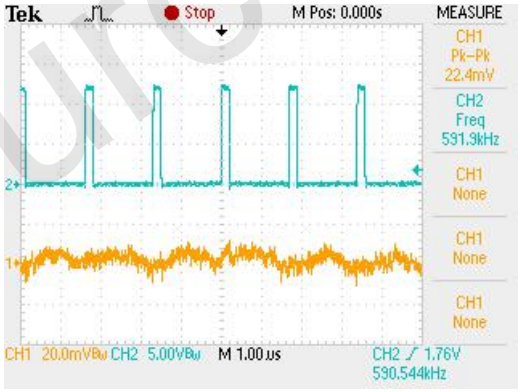

OUTPUT VOLTAGE VS OUTPUT CURRENT (VOUT=5V)



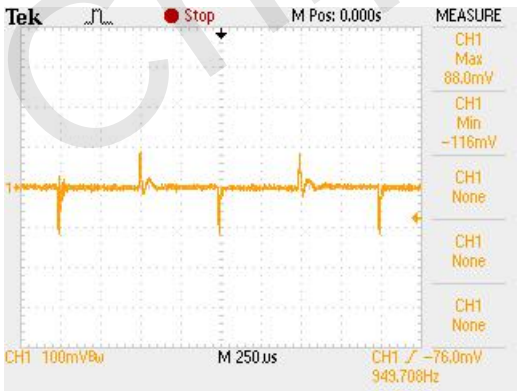

STEADY STATE OPERATION
(VIN=12V,VOUT=1.2V,IOUT=100mA)




STEADY STATE OPERATION
(VIN=12V,VOUT=1.2V,IOUT=1000mA)




LOAD TRANSIENT RESPONSE
(VIN=12V,VOUT=1.2V,IOUT=100-1000mA,1A/uS)




STRAT UP
(VIN=12V,VOUT=1.2V)

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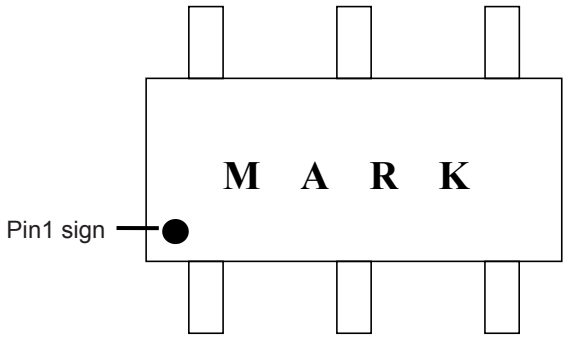
## Marking Information




SOT23-6
(TOP VIEW)

The major marks：**KA5M/A66MG/KM661.**

**Remark** If there are other requirements,please contact our sales office.

## Applications Information

**Setting the Output Voltage**

**Selecting the Output Capacitor**

**PCB Layout Guide**

PCB layout is very important to achieve stable operation. It

Place the feedback resistors and compensation

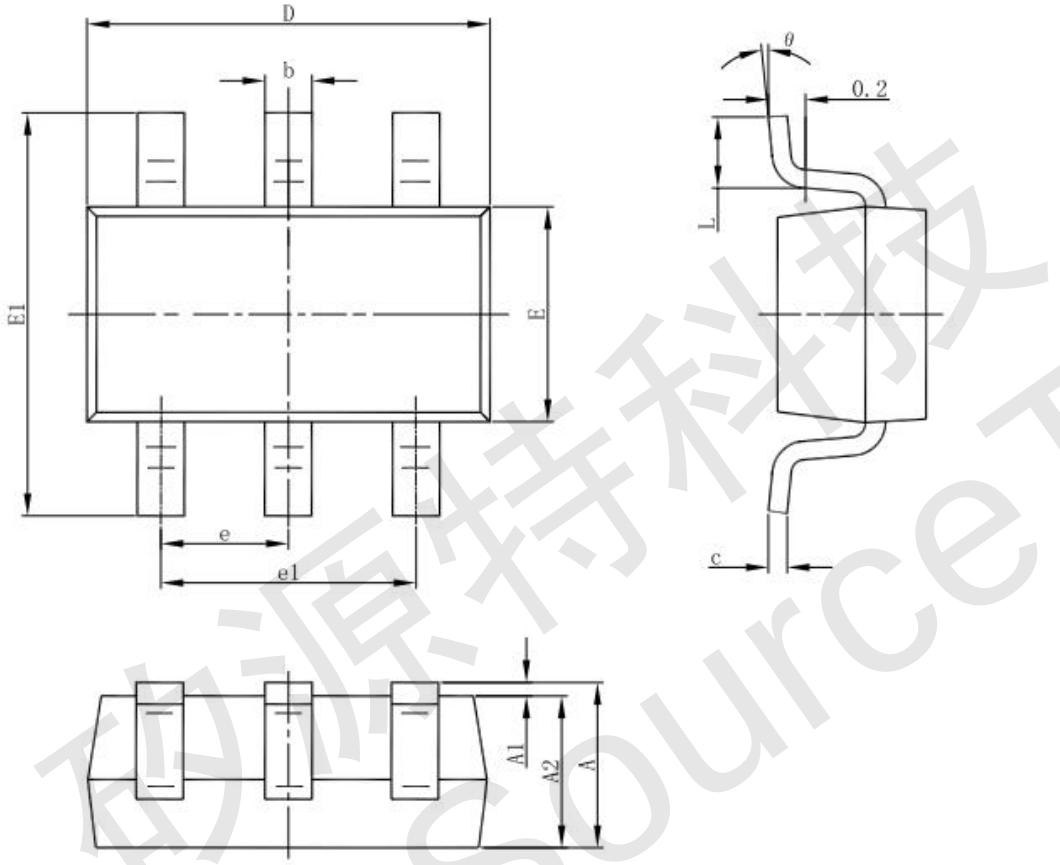
FB.

large copper area to cool the chip to improve thermal performance and long-term reliability.

for reference.

## Package Description

### 6-pin SOT23-6 Outline Dimensions




| Symbol | Dimensions In Millimeters | | Dimensions 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 | 0.500 | 0.012 | 0.020 |
| 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 | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |



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