

LM5165

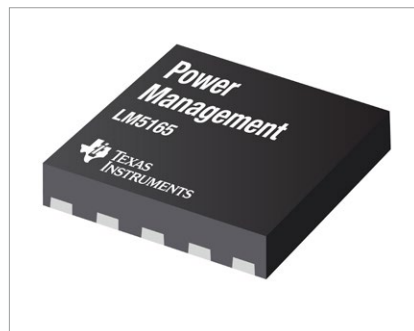
3 V-65 V, 150 mA Synchronous Buck Converter With Ultra-Low IQ



LM5165 mainly targets industrial 4-20mA field transmitter application which has extremely tight input power budget. It offers more than 90% efficiency for 1mA load which leaves out enough power to add additional functionality. The LM5165 is a compact, easy-to-use, 3 V to 65 V, ultra-low IQ synchronous buck converter with high efficiency over wide input voltage and load current ranges. With integrated high-side and low-side power MOSFETs, up to 150mA of output current can be delivered at fixed output voltages of 3.3V or 5V, or an adjustable output. The converter is designed to simplify implementation while providing options to optimize the performance the target application. Pulse Frequency Modulation (PFM) mode is selected for optimal light-load efficiency or Constant On-Time (COT) control for nearly constant operating frequency. Both control schemes do not require loop compensation while providing excellent line and load transient response and short PWM on-time for large step-down conversion ratios.

The high-side p-channel MOSFET can operate at 100% duty cycle for lowest dropout voltage and does not require a bootstrap capacitor for gate drive. Also, the current limit setpoint is adjustable to optimize inductor selection for a particular output current requirement. Selectable/adjustable startup timing options include minimum delay (no

soft start), internally fixed (900µs), and externally programmable soft start via an external capacitor. An open-drain PGOOD indicator can be used for sequencing and output voltage monitoring. The LM5165 is qualified to automotive AEC-Q100 grade 1 and is available in a VSON-10 package with 0.5 mm pin pitch.



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KEY FEATURES

- Wide input voltage range of 3 V to 65 V
- Fixed (3.3 V, 5 V) or adjustable output voltages
- Maximum output current as high as 150 mA
- 10.5µA no load quiescent current
- -40°C to 150°C junction temperature range
- Selectable PFM or COT mode operation
- Switching frequency as high as 600 kHz

- Diode emulation mode and pulse skipping for ultra-high light-load efficiency performance
- Integrated 2 Ω PMOS buck switch
 - Supports 100% duty cycle for low dropout Integrated 1 Ω NMOS synchronous rectifier
 - Eliminates external rectifier diode
- Programmable current limit setpoint (4 Levels)
- 1.223V internal voltage reference
- 900µs internal or programmable soft start
- Monotonic startup into pre-biased output
- No loop compensation or bootstrap components
- Precision enable/input UVLO with hysteresis
- Open-drain power good indicator
- Active slew rate control for low EMI
- Thermal shutdown protection with hysteresis
- 10-Lead, 3 mm × 3 mm VSON package

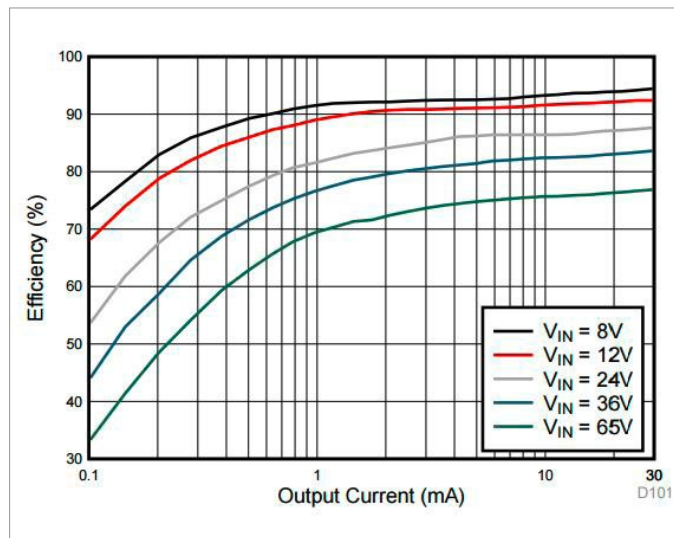
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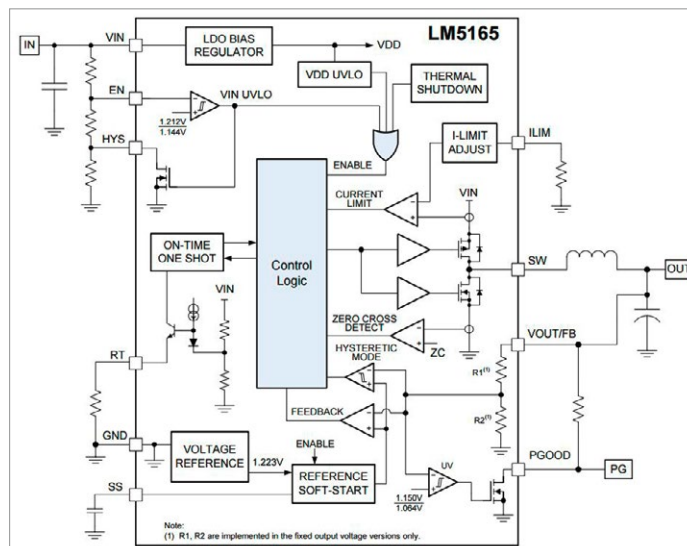


APPLICATION EXAMPLES

- 4–20 mA loop-powered sensors
- Automotive and battery-powered equipment
- High-voltage LDO replacement
- Industrial control systems
- General purpose bias supplies



LM5165 Typical Efficiency; V_{out} = 5V



LM5165 Functional Block Diagram