DESCRIPTION

The PT16750 is a Headlight LED controller for automotive. The controller can support multiple DC-DC topologies, such as Buck, Boost, SEPIC driver topologies. The controller implements a fixed-frequency peak current mode control technique, integrated programmable switching frequency, slope compensation, and soft-start timing. It incorporates a high voltage (65 V) rail-to-rail current sense amplifier, which can directly measure LED current using a high-side series sense resistor. The amplifier is designed to achieve better current accuracy than ±3%, in the junction temperature range of 25°C to 140°C and output common-mode voltage range of 3 to 60 V.

LED current can be modulated using either analog dimming or PWM dimming techniques. Adjust IADJ input voltage from 140 mV to 2.25 V to realize linear analog dimming. PWM dimming of LED current is achieved by modulating the PWM input pin with the desired duty cycle and frequency. DDRV gate driver output can be used to enable series FET dimming functionality to get over 1000:1 contrast ratio.

The PT16750 provides current monitor function, check the LED status continuous through the IMON pin. This allows for LED short circuit or open circuit detection and protection. Additional fault protection features include VCC UVLO, output OVP, switch cycle-by-cycle current limit, and thermal protection.

FEATURES

- Input Voltage: 4.5V-65V
- Output Voltage: 3V to 65V
- LED Current Accuracy: ±3%
- High-Side Current Sense Implementations
- Analog LED Current Adjust (IADJ) With over 15:1 Contrast Ratio
- Integrated Series N-Channel dimming driver Interface, supports over 1000:1 Series FET PWM Dimming Ratio
- Programmable Switching Frequency With External Clock Synchronization Capability
- Programmable Soft-Start and Slope Compensation
- Continuous LED Current Monitor Output for System Fault Detection and Diagnoses
- Comprehensive Fault Protection Circuitry Including VCC Undervoltage Lockout (UVLO), Output Overvoltage Protection (OVP), Cycle-by-Cycle Switch Current Limit, and Thermal Protection

APPLICATIONS

- Automotive Headlight LED Drive
- High-Brightness LED Applications
- Exit Signs and Emergency Lighting

TYPICAL APPLICATION
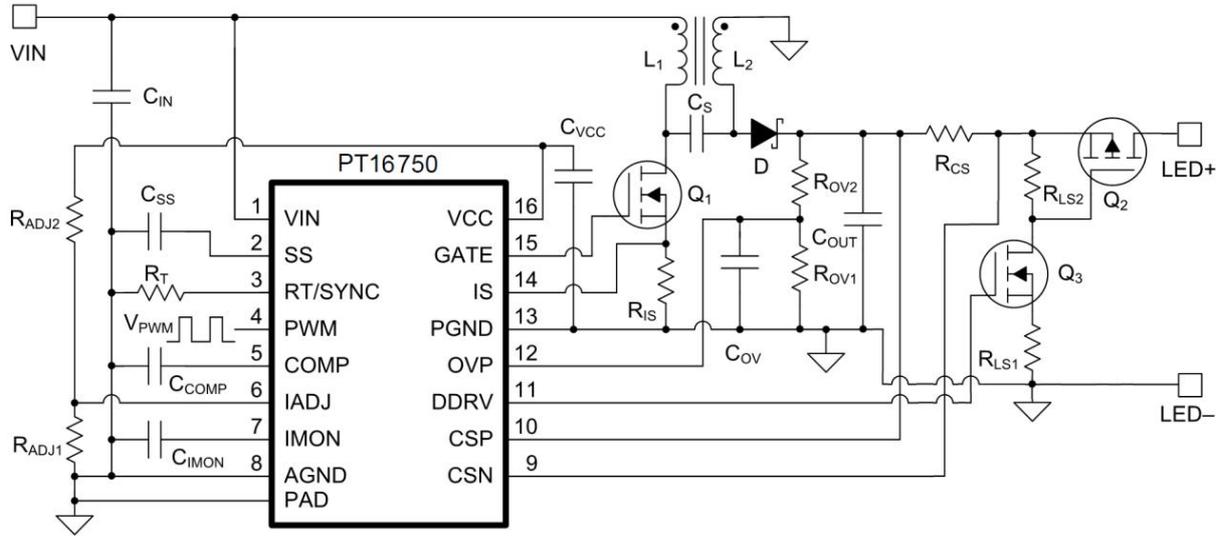
ORDER INFORMATION

Valid Part Number	Package Type	Top Code
PT16750-HT	HTSSOP 16pins	PT16750-HT

PIN CONFIGURATION

VIN	1	Thermal Pad	16	VCC
SS	2		15	GATE
RT/SYNC	3		14	IS
PWM	4		13	PGND
COMP	5		12	OVP
IADJ	6		11	DDRV
IMON	7		10	CSP
AGND	8		9	CSN

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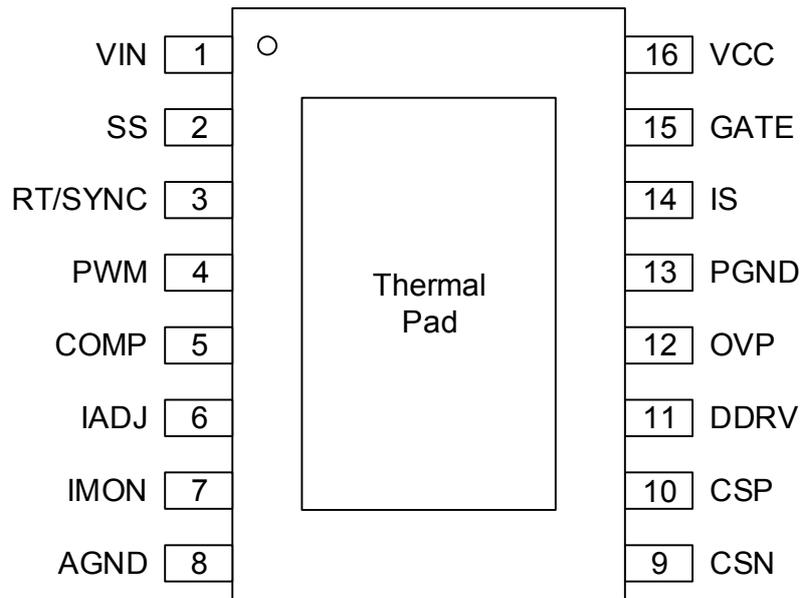
PIN DESCRIPTION

PIN Name	I/O	Description	Pin No.
VIN	--	Supply voltage input. Place a 100nF capacitor close to the controller.	1
SS	I/O	Programmable soft-start pin. Connect a capacitor to AGND to set the start-up time. Short this pin to AGND to disable the Gate pin work.	2
RT/SYNC	I/O	Programmable oscillator frequency pin. Connect a resistor to AGND to set the switching frequency. Connect a 100nF capacitor series to this pin to synchronize the internal oscillator from an external clock pulse.	3
PWM	I	PWM dimming input. In the PWM dimming mode, the input signal duty cycle controls the LED average current. Connect PWM pin to VCC when not used for PWM dimming. Pull this pin below 2.3 V to turn off switching, and set DDRV output to ground.	4
COMP	I/O	Error amplifier compensation. Connect compensation network to achieve desired closed loop response.	5
IADJ	I	Reference voltage input for LED current. To implement analog dimming, source a external voltage from 0V to 2.25V to this pin, and the current sense voltage: $V_{(CSP-CSN)} = V_{IADJ}/14$. Connecting IADJ to VCC with 100kΩ series resistor, the reference voltage would be clamped to 2.42 V and the current sense threshold, $V_{(CSP-CSN)} = 172$ mV.	6
IMON	O	LED current status report pin. The pin reports LED current as $V_{IMON} = 14 \times I_{LED} \times R_{CS}$. Bypass with a 1nF ceramic capacitor to AGND.	7
AGND	--	Analog ground. Return for the internal voltage reference and analog circuit.	8
CSN	I	Current sense amplifier negative input (−). Connect directly to the negative node of LED current sense resistor R_{CS}.	9
CSP	I	Current sense amplifier positive input (+). Connect directly to the positive node of LED current sense resistor R_{CS}.	10
DDRV	O	Gate driver output for series dimming MOSFET. Connect to a level-shift circuit with P-channel MOSFET to implement series FET PWM dimming.	11
OVP	I	Overvoltage protection pin. Connect resistor divider from output to set overvoltage protection threshold and hysteresis.	12
PGND	--	Power ground. Return for GATE and DDRV drivers. Connect to circuit ground, GND, to complete return path.	13
IS	I	Switching current sense pin. Connected to switching current sense resistor, R_{IS}, to monitor the peak current of the main MOSFET.	14
GATE	O	Gate driver output for switching MOSFET. Connect to gate of the main MOSFET.	15
VCC	--	VCC bias supply pin. Using a 2.2µF to 4.7µF ceramic capacitor located close to the controller.	16
Thermal PAD	--	Thermal pad. This PAD must be connected to PCB ground plane using multiple vias for good thermal performance.	Thermal PAD

IMPORTANT NOTICE

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