



Working Together for a Greener Society

Future of Power Electronics and the Earth



Fully Digital-controlled Power Supply Control IC  
with Bridgeless PFC and LLC Current-resonant Circuits

MD6751



## ■ Description

The MD6751 is a fully digital-controlled power supply IC, which incorporates a bridgeless PFC control circuit and an LLC current-resonant circuit. These digitally controlled strategies allow application-specific optimal settings. Compared to conventional analog control circuits, the IC can achieve more cost-effective, high-efficient, yet low-noise power systems with fewer external components.

**Package**  
SOP28



## ■ Applications

For devices requiring high power supplies such as:

- Audiovisual Equipment (e.g., LCD TV)
- Office Automation Equipment (e.g., Server, Multifunction Printer)
- Industrial Equipment
- Communication Equipment

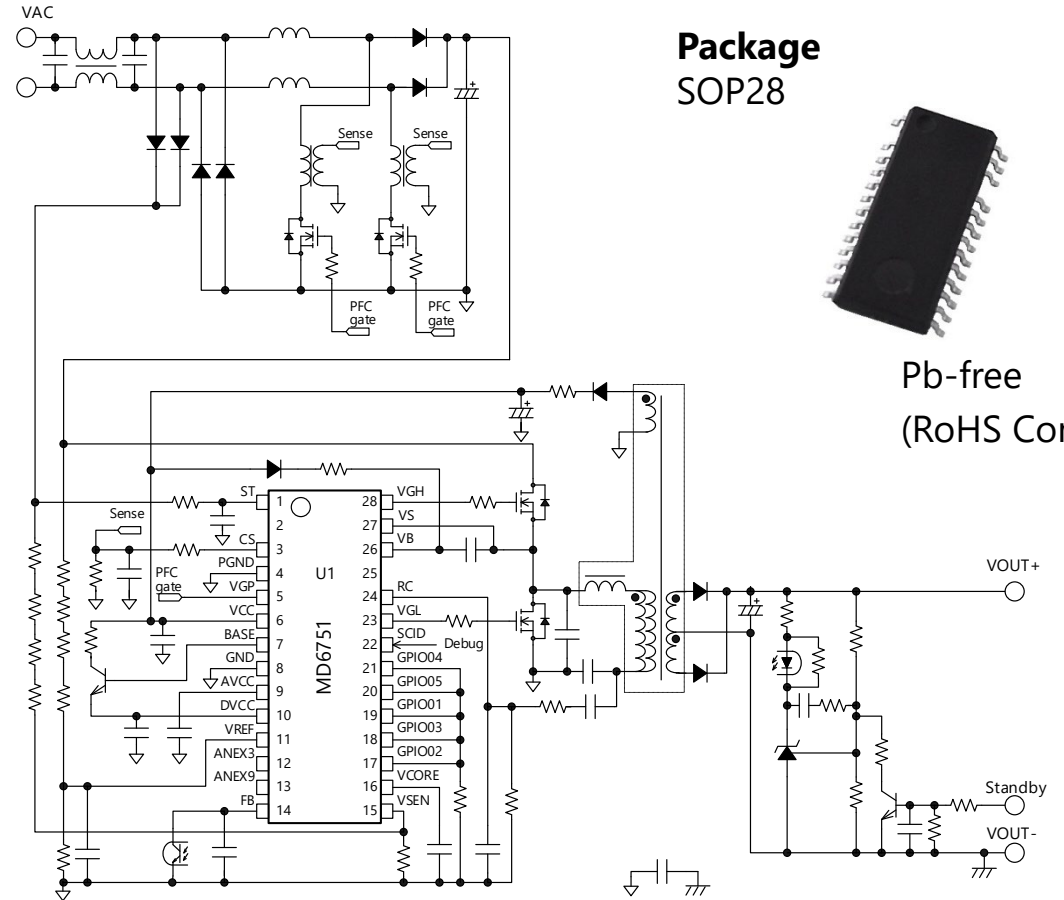


The MD6721 digitally controls its bridgeless PFC and LLC current-resonant circuits.

## Features

- Soft Start Function
- X-capacitor Discharge Function (No discharge resistor required)
- Bridgeless PFC Circuit
- Continuous Conduction Mode (CCM) PFC Control
- LLC Capacitive Mode Detection Function
- LLC Automatic Standby Mode Function
- Protection Functions
  - AC Power Supply Input Undervoltage Lockout
  - PFC Undervoltage Protection (PFC\_UVP)
  - PFC Output Overvoltage Protection (PFC\_OVP)
  - PFC Overcurrent Protection (PFC\_OCP)
  - LLC High-side Driver Undervoltage Lockout (VB\_UVLO)
  - LLC Overcurrent Protection (LLC\_OCP)
  - LLC Overload Protection (LLC\_OLP)
  - VCC Pin Overvoltage Protection (VCC\_OVP)
  - Thermal Shutdown (TSD)

## Typical Application

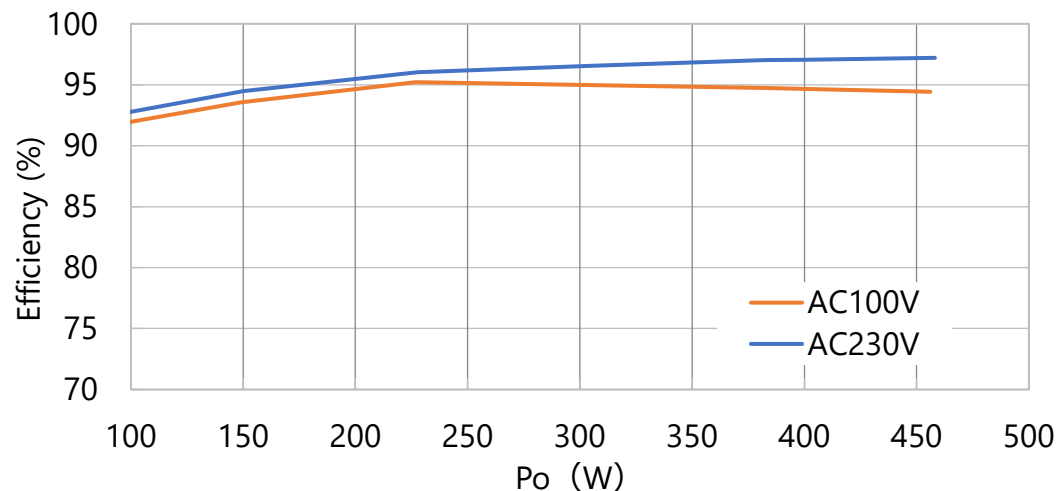


**Package**  
SOP28

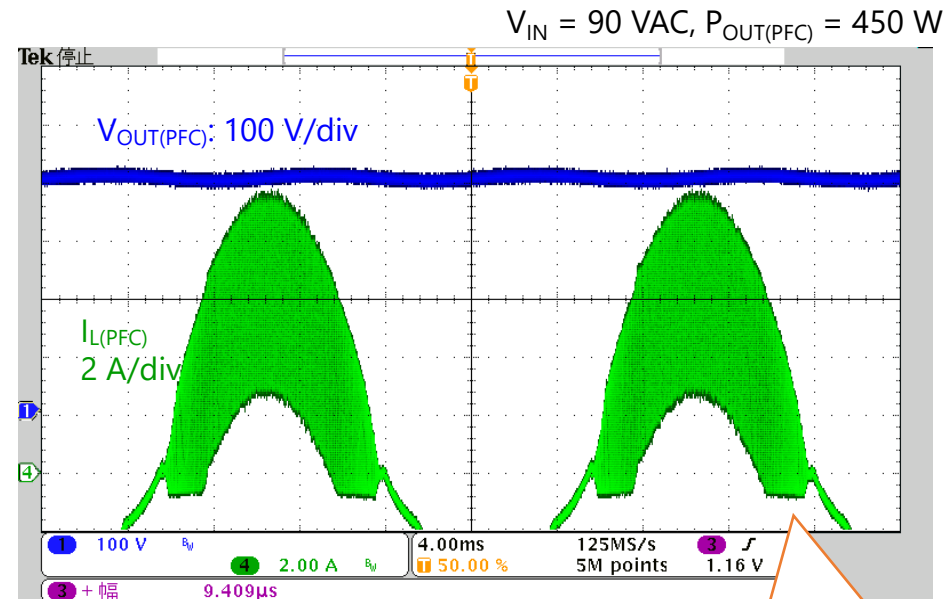


Pb-free  
(RoHS Compliant)

## ■ PFC Efficiency (Standard Demo Board)

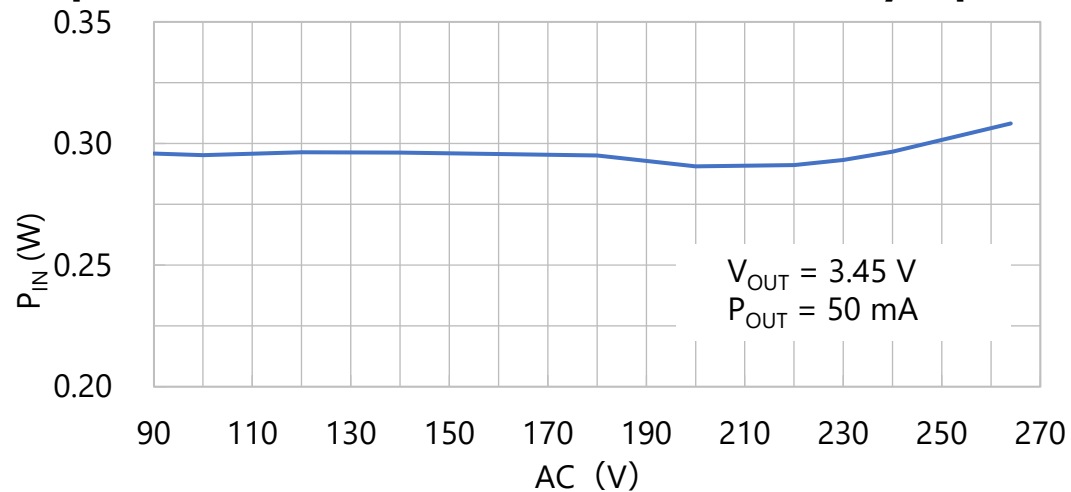


## ■ PFC Waveforms in Actual Normal Operation



PFC is controlled in continuous conduction mode (CCM)

## ■ Input Power Characteristics in Standby Operation (PFC+LLC\*)



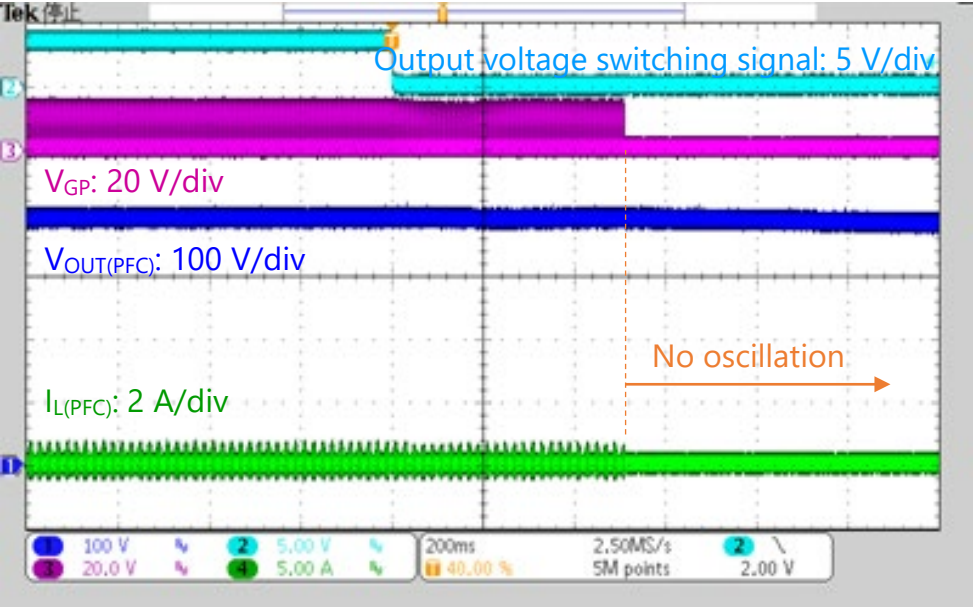
\*LLC includes DC/DC converter circuits with NR264S.

# Automatic Standby Function

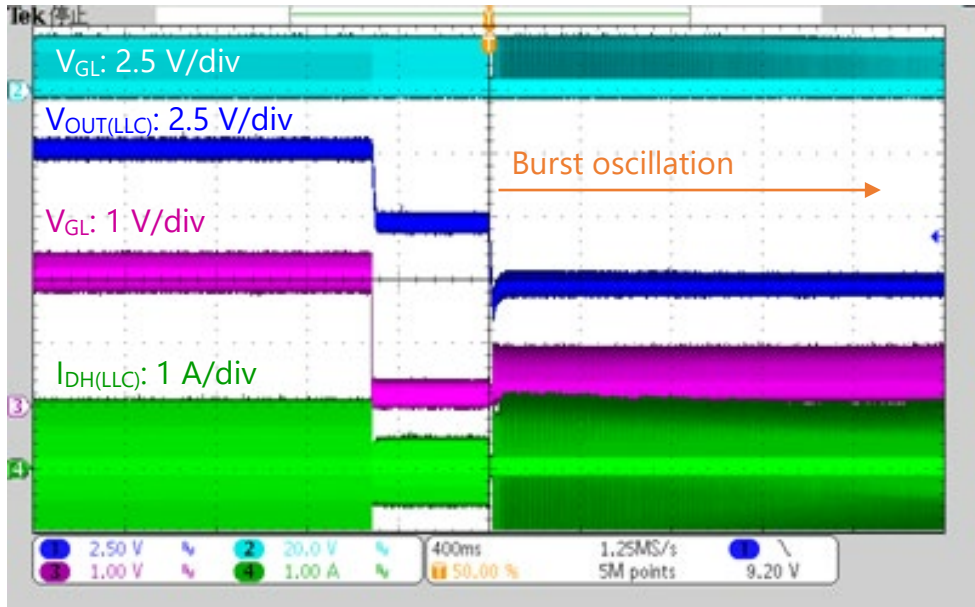
The IC is equipped with the automatic standby mode function which increases efficiency in standby operation. When the secondary output voltage decreases, the IC automatically transits to standby mode. In standby mode, the VGP pin stops oscillating. The VGH and VGL pins increase their oscillation frequencies to lower switching currents gradually, and then enters the burst oscillation operation.

### Operational Waveforms in Standby Operation

PFC Standby Transition



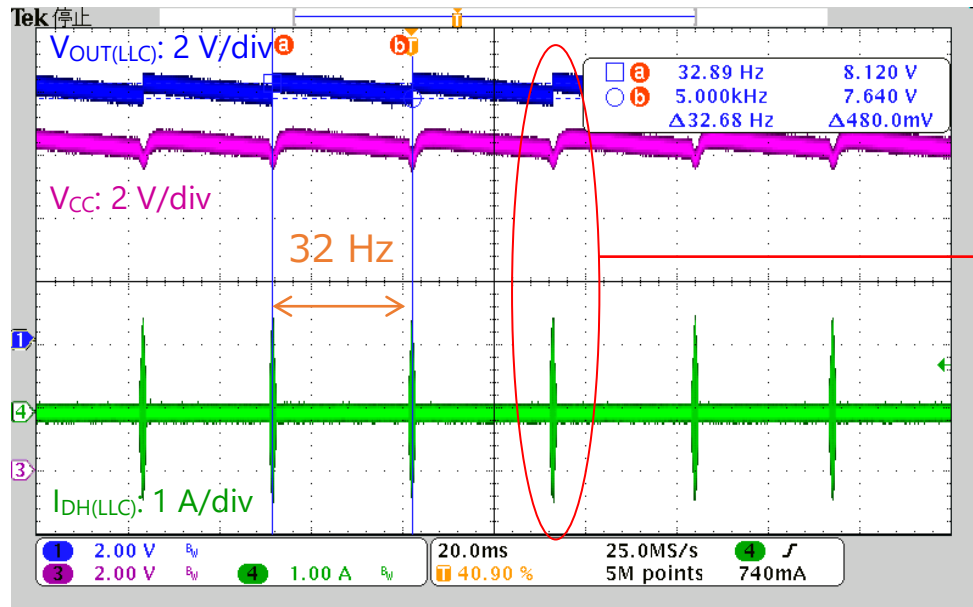
LLC Standby Transition



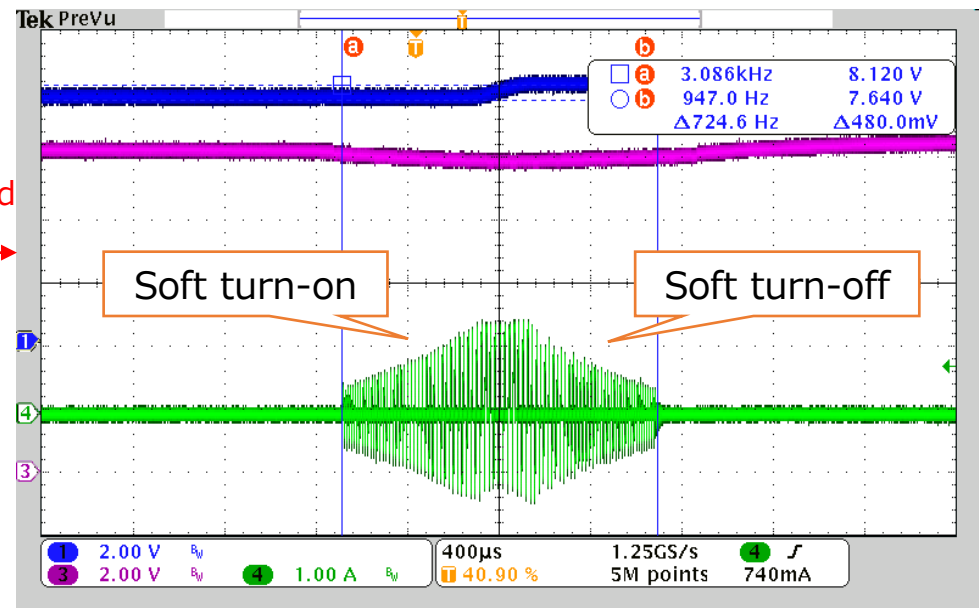
# Burst Oscillation

The burst oscillation, which repeats oscillating and non-oscillating periods, reduces switching losses. Generally, a burst oscillation frequency is set at several hertz to improve efficiency in standby operation. The IC has the soft turn-on/off function to prevent drain currents from varying steeply in LLC burst oscillation, thus suppressing audible noise in the transformer.

LLC Burst Oscillation ( $V_{IN} = 230 \text{ VAC}$ )



Enlarged View



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