

### INTRODUCTION

The [LTC<sup>®</sup>3886-1](#) is a pin-compatible upgrade to the LTC3886. The key features of the LTC3886-1 vs LTC3886 is that the LTC3886-1 includes a sequencing off feature to fully discharge very large output capacitors as fast as safely possible.

This guide describes the differences and explains the configuration file changes needed when migrating a design from the LTC3886 to the LTC3886-1.

### FEATURE COMPARISON

	LTC3886	LTC3886-1
MFR_VOFF_THRESHOLD for Sequencing Off		√

The LTC3886 output voltage will ramp as shown in Figure 1 so long as the part is in forced continuous mode and the TOFF\_FALL time is slow enough that the power stage can achieve the desired slope. The TOFF\_FALL time can only be met if the power stage and controller can sink sufficient current to assure the output is at zero volts by the end of the fall time interval. If the TOFF\_FALL time is set shorter than the time required to discharge the load capacitance, the output will not reach the desired zero volt state. At the end of TOFF\_FALL, the controller will cease to sink current and V<sub>OUT</sub> will decay at the natural rate determined by the load impedance.

The LTC3886-1 sequence off feature is enabled by bit[5] of the MFR\_CHAN\_CONFIG command. When enabled, the sequence off feature keeps the power stage on until the output voltage has ramped below the MFR\_VOFF\_THRESHOLD value. This allows the LTC3886-1, in continuous mode, to fully discharge very large output capacitors regardless if the controller power stage can sink enough current to meet the TOFF\_FALL time. If the controller is in discontinuous mode, the controller will not pull negative current and the output will be pulled low by the load, not the power stage. The maximum TOFF\_FALL value is limited to 1.3 seconds.

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## FEATURE COMPARISON

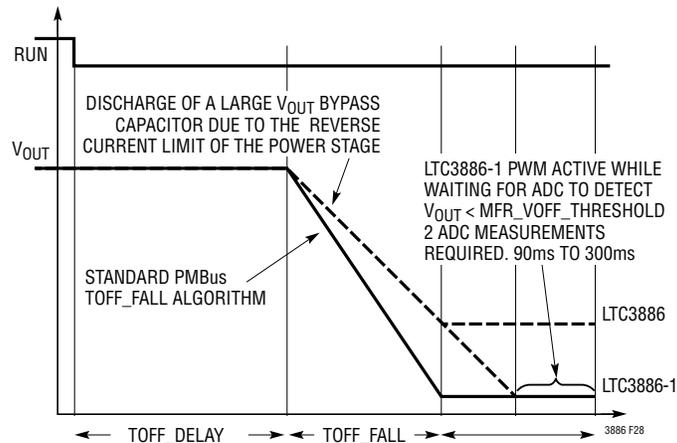


Figure 1. Sequence Off

## ELECTRICAL CHARACTERISTICS

The electrical characteristics of the LTC3886-1 are the same as the LTC3886 with the following exceptions:

## CONFIGURATION

The following PMBus commands are new or have changed in the LTC3886-1. An automatic conversion utility is provided in LTpowerPlay to simplify the transition from an LTC3886 configuration file to a functionally equivalent LTC3886-1 configuration file.

### Read-Only Commands

The following read-only commands were added to the LTC3886-1. No configuration file changes are required, but if your software or firmware reads these registers and expects certain values, note that they do not exist on the LTC3886.

	LTC3886	LTC3886-1
IC_DEVICE_ID (0xAD)		LTC3886-1
IC_DEVICE_REV (0xAE)		ACA0

## CONFIGURATION

### Writeable Commands

The following writeable commands are new or different between the LTC3886-1 and LTC3886.

	LTC3886	LTC3886-1
MFR_VOFF_THRESHOLD (0xDA)		0x019A
MFR_CHAN_CONFIG (0xD0)	0x1D	0x3D

### MFR\_VOFF\_THRESHOLD

The LTC3886-1 PWM channel remains active until the ADC measures  $V_{OUT}$  below this value during sequencing OFF. The MFR\_VOFF\_THRESHOLD is used to determine the presence of residual voltage on the channel's PWM output. The presence of residual voltage is determined by the ADC and is defined by  $V_{OUT} > \text{MFR\_VOFF\_THRESHOLD}$ . The function of the MFR\_VOFF\_THRESHOLD is dependent upon the value of the EnableMfrVoffThreshold bit (MFR\_CHAN\_CONFIG\_LTC3886 bit #5).

This command is not used during fault events. If a fault occurs, the PWM channel will immediately shutoff without attempting to discharge any energy storage remaining on the corresponding rail.

### MFR\_CHAN\_CONFIG\_LTC3886

The MFR\_CHAN\_CONFIG\_LTC3886 command contains channel specific configuration bits. The function of bit[5] and bit[0] are different between the LTC3886-1 and the LTC3886.

MFR\_CHAN\_CONFIG\_LTC3886 bit[5] - EnableMfrVoffThreshold

#### LTC3886:

Reserved

#### LTC3886-1:

MFR\_CHAN\_CONFIG\_LTC3886 bit[5] - EnableMfrVoffThreshold=0

Residual Voltage on the channel's output will not prevent the PWM from shutting down. When the IgnoreResidualVoltage bit (i.e. MFR\_CHAN\_CONFIG\_LTC3886 bit #0) is set to 0, residual Voltage is used to determine when a TOFF\_MAX Warning conditions exist. Once residual voltage is no longer determined to be present, a TOFF\_MAX Warning event is prevented from being generated. If the IgnoreResidualVoltage bit is set to 0, the channel will not attempt to turn-on until the channel output residual voltage is no longer present.

It is recommended that the value of the MFR\_VOFF\_THRESHOLD command is set to 12.5% of the programmed VOUT\_COMMAND. It is also recommended that most users set the IgnoreResidualVoltage bit to a value of 1.

## CONFIGURATION

MFR\_CHAN\_CONFIG\_LTC3886 bit[5]- EnableMfrVoffThreshold=1

Residual Voltage on the channel's output will prevent the PWM from shutting down. The ADC must measure at least 2 samples of  $V_{OUT} < MFR\_VOFF\_THRESHOLD$  before the PWM will stop switching. The ADC will not begin to look for the  $V_{OUT} < MFR\_VOFF\_THRESHOLD$  until the PWM sequence off operation has reached the end of the TOFF\_FALL sequencing. When the IgnoreResidualVoltage bit is set to 0, the MFR\_VOFF\_THRESHOLD is used to determine when TOFF\_MAX Warning conditions exist. Only one  $V_{OUT} < MFR\_VOFF\_THRESHOLD$  is required to consider residual voltage on the channel output to not be present and prevent a TOFF\_MAX Warning event from being generated. The channel will not attempt to turn-on until the channel output residual voltage is not present when the IgnoreResidualVoltage bit is set to 0.

MFR\_CHAN\_CONFIG\_LTC3886 bit[0] - IgnoreResidualVoltage

### LTC3886:

Disables the  $V_{OUT}$  decay value requirement for MFR\_RETRY\_TIME processing. When this bit is set to a 0, the output must decay to less than 12.5% of the programmed value before the PWM will restart. This applies to any action that turns off the PWM including a fault, an OFF/ON command, or a RUN pin transition from high to low. A TOFF\_MAX warning status will not be generated when this bit is set to a 1.

### LTC3886-1:

Disables the  $V_{OUT}$  decay value requirement for MFR\_RETRY\_TIME processing. When this bit is set to a 0, the output must decay below the MFR\_VOFF\_THRESHOLD value before the PWM will restart. This applies to any action that turns off the PWM including a fault, an OFF/ON command, or a RUN pin transition from high to low. A TOFF\_MAX warning status will not be generated when this bit is set to a 1.