iW3605

AC/DC Digital Power Controller for Bleederless Single-Stage High Power Factor Dimmable LED Drivers

1.0 Features

- Isolated/non-isolated offline120V$_{AC}$/230V$_{AC}$ LED driver up to 25W output power
- Wide line frequency range (from 45Hz to 66Hz)
- Meets IEC61000-3-2 Current Harmonic requirement
- Total harmonic distortion < 20% with PF > 0.92
- Wide dimmer compatibility
  - Leading-edge dimmer
  - Trailing-edge dimmer
- No bleeder needed with output power down to 5W for 120V$_{AC}$/230V$_{AC}$
- Resonant control to achieve high efficiency (typical > 82% without dimmer)
- Over-temperature LED current foldback
- Small solution size
  - Single-stage topology reduces part counts
  - 90kHz maximum switching frequency enables the use of a small transformer
- Primary-side sensing eliminates the need for opto-isolator feedback
- Tight LED current regulation (± 5%)
- Fast start-up (< 0.5s without dimmer)
- Compatible with NEMA SSL6 dimming curve standard
- Multiple protection features that include:
  - LED open-circuit and short-circuit protection
  - Over-current protection
  - Over-temperature protection
  - Current sensing resistor short-circuit protection
  - AC line over-voltage protection

2.0 Description

The iW3605 is a single-stage, high-performance AC/DC offline power supply controller for dimmable LED luminaires. It applies advanced digital control technology to detect the dimmer type, which provides dynamic impedance to interface with the dimmer and control the LED brightness at the same time.

With advanced dimmer detection technology, the iW3605 can operate with most wall dimmers including leading-edge dimmers (R-type or R-L type) and trailing-edge dimmers (R-C type). In addition, the iW3605's cycle-by-cycle waveform analysis technology allows for fast dimmer setting response. When no dimmer is on the line, the iW3605 optimizes the power factor and minimizes the current harmonic distortion to the AC line. Furthermore, in no dimmer condition, output current is regulated at nominal output current value over a wide input voltage range.

The iW3605 operates the main power converter that delivers current to the LED load in quasi-resonant mode to provide high power efficiency and minimize electro-magnetic interference (EMI). The commonly utilized converter topologies for iW3605 are buck-boost and flyback. It uses Dialog's patented PrimAccurate^{TM} primary-side sensing technology to achieve excellent LED current regulation under different AC line and LED load voltages, without using a secondary-side feedback circuit and thus eliminating the need for an opto-coupler.

The iW3605 minimizes the external components count by eliminating the secondary feedback circuit and bleeder circuit. Additionally, the digital control loop of the iW3605 maintains stable overall operating conditions without the need for loop compensation components.

3.0 Applications

- Dimmable LED retrofit lamps up to 25W
- Dimmable LED luminaires up to 25W

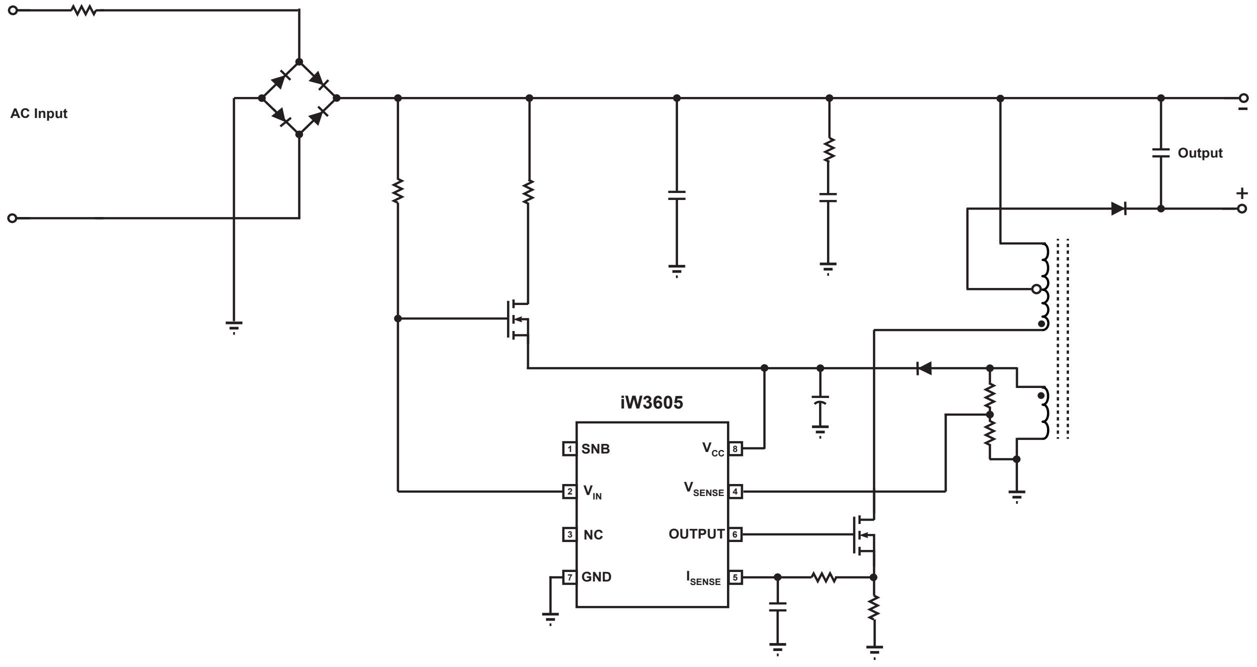
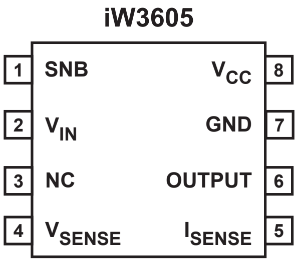


Figure 3.1 : iW3605 Simplified Application Circuit

4.0 Pinout Description



Pin #	Name	Type	Pin Description
1	SNB	Output	Gate drive for active snubber switch
2	V_{IN}	Analog Input	Rectified AC line voltage sense
3	NC	–	No connection
4	V_{SENSE}	Analog Input	Auxiliary winding voltage sense
5	I_{SENSE}	Analog Input	Primary side current sense
6	OUTPUT	Output	Gate drive for main MOSFET switch
7	GND	Ground	Ground
8	V_{CC}	Power	Power supply for control logic

5.0 Absolute Maximum Ratings

Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Section 6.0 Electrical Characteristics.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 8)	V_{CC}	-0.3 to 18	V
OUTPUT (pin 6)		-0.3 to V_{CC}	V
SNB output (pin 1)		-0.3 to V_{CC}	V
V_{SENSE} input (pin 4, $I \leq 10mA$)		-0.7 to 4.0	V
V_{IN} input (pin 2)		-0.3 to 18	V
I_{SENSE} input (pin 5)		-0.3 to 4.0	V
Power dissipation at $T_A \leq 25°C$		TBD	mW
Maximum junction temperature	$T_{J\ MAX}$	150	°C
Storage temperature	T_{STG}	-65 to 150	°C
Thermal Resistance Junction-to-Ambient [Still Air]	θ_{JA} (Note 1)	160	°C/W
ESD rating per JEDEC JESD22-A114		2,000	V
Latch-up test per JEDEC 78		±100	mA

Notes:

Note 1. θ_{JA} (Junction-to-Ambient [Still Air]) is measured in a one-cubic-foot natural convection chamber.

AC/DC Digital Power Controller for Bleederless Single-Stage High Power Factor Dimmable LED Drivers

6.0 Electrical Characteristics

V_{CC} = 12V, -40°C ≤ T_A ≤ 85°C, unless otherwise specified (Note 1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
V_{IN} SECTION						
Over-voltage shutdown threshold (Note 5)	$V_{IN(OVP)}$ (Note 2)	T_A = 25°C	1.582	1.758	1.933	V
Input impedance	Z_{VIN} (Note 3)	After start-up	2.438	2.5	2.563	kΩ
V_{IN} range (Note 5)	V_{IN} (Note 2)	After start-up	0		1.8	V
Line fequency range (Note 5)	f_{IN}		45		66	Hz
V_{SENSE} SECTION						
Input leakage current	$I_{BVS(VSENSE)}$	V_{SENSE} = 2V			1	µA
Nominal voltage threshold	$V_{SENSE(NOM)}$	T_A= 25°C, negative edge	1.521	1.536	1.551	V
Output OVP threshold	$V_{SENSE(MAX)}$	T_A= 25°C, negative edge	1.65	1.7	1.75	V
Configuration current source	$I_{CFG(VSENSE)}$		475	500	525	µA
OUTPUT SECTION						
Output low level ON-resistance	$R_{DS\_ON\_LO(OUTPUT)}$	I_{SINK} = 5mA		11		Ω
Output high level ON-resistance	$R_{DS\_ON\_HI(OUTPUT)}$	I_{SOURCE} = 5mA		16		Ω
Maximum switching frequency (Note 5)	$f_{SW(OUTPUT)}$			90		kHz
SNB SECTION						
Output low level ON-resistance	$R_{DS\_ON\_LO(SNB)}$	I_{SINK} = 5mA		22		Ω
Output high level ON-resistance	$R_{DS\_ON\_HI(SNB)}$	I_{SOURCE} = 5mA		45		Ω
Switching frequency (Note 5)	$f_{SW(SNB)}$			160		kHz
V_{CC} SECTION						
Operating voltage	V_{CC}				16	V
Start-up threshold	$V_{CC(ST)}$		12	13.5	14.5	V
Under-voltage lockout threshold	$V_{CC(UVL)}$		5.5	6	6.5	V
Operating current	I_{CCQ}			4.5	5	mA

6.0 Electrical Characteristics (cont.)

V_{CC} = 12V, -40°C ≤ T_A ≤ 85°C, unless otherwise specified (Note 1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
I_{SENSE} SECTION						
I_{SENSE} short protection reference	V_{RSENSE}			0.16		V
Over-current limit threshold	V_{OCP}			1.3		V
Configuration current source	$I_{CFG(ISENSE)}$		475	500	525	µA

Notes:

Note 1. Adjust V_{CC} above the start-up threshold before setting at 12V.

Note 2. Refer to the voltage level at the V_{IN_a} point in Figure 8.1. The typical impedance between the V_{IN} pin and V_{IN_a} point is 750Ω.

Note 3. Refer to Z_{VIN} in Figure 8.1.

Note 4. Operating frequency varies based on the line and load conditions. See the Theory of Operation section for more details.

Note 5. These parameters are not 100% tested. They are guaranteed by design and characterization.

7.0 Typical Performance Characteristics

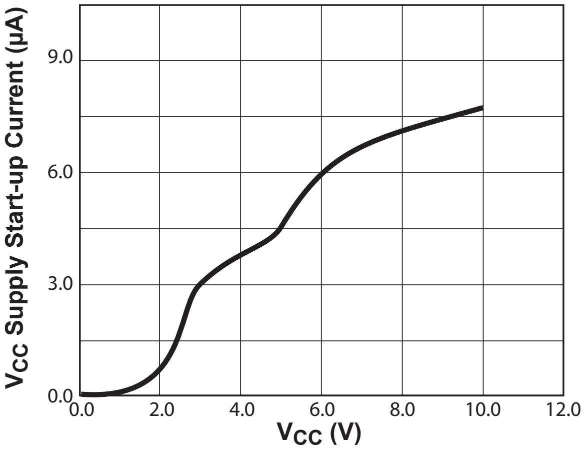


Figure 7.1 : V_{CC} vs. V_{CC} Supply Start-up Current

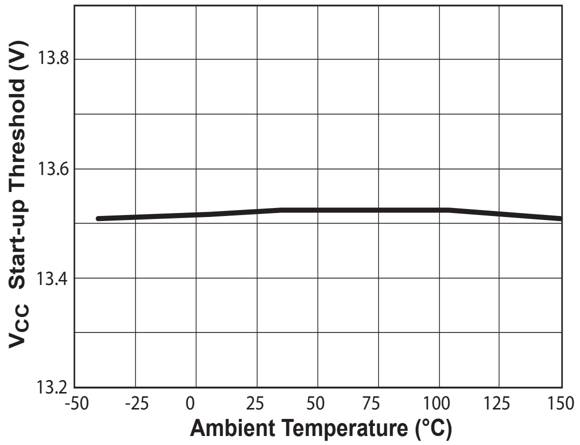


Figure 7.2 : Start-up Threshold vs. Temperature

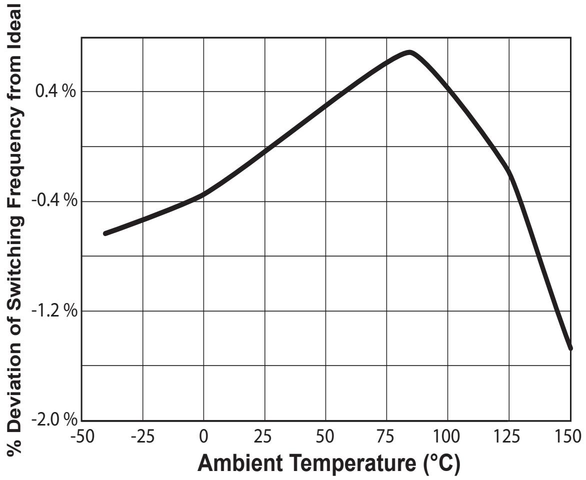


Figure 7.3 : % Deviation of Switching Frequency to Ideal Switching Frequency vs. Temperature

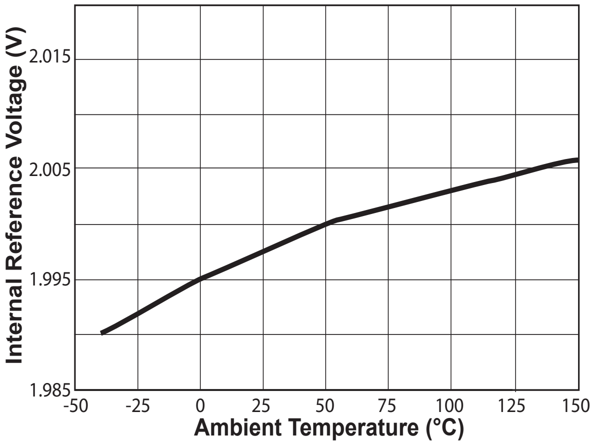


Figure 7.4 : Internal Reference vs. Temperature

8.0 Functional Block Diagram

The iW3605 consists of two function blocks:

- Dimmer interface and dimmer mode control
- LED current regulation and dimming control

The dimmer interface and dimmer mode control block (shown in Figure 8.1) analyzes the rectified AC waveform and determines whether a dimmer is connected on the line.

The LED current regulation and dimming control block control the buck-boost or flyback converter. It switches the main MOSFET to supply the current to LED load. The current regulation is determined by the transformer primary-side peak current (I_{SENSE} pin), the magnetic flux status of transformer (V_{SENSE} pin) and the input voltage waveform (V_{IN} pin) (Refer to section 9.4 for details). If no dimmer is detected, the iW3605 operates in no dimmer mode operation, which regulates the averaged output current to the nominal value despite of input voltage variation. If leading edge or trailing edge dimmer is detected, the iW3605 switches to dimmer mode operation. The iW3605 adjusts the average output current based on the averaged input voltage value.

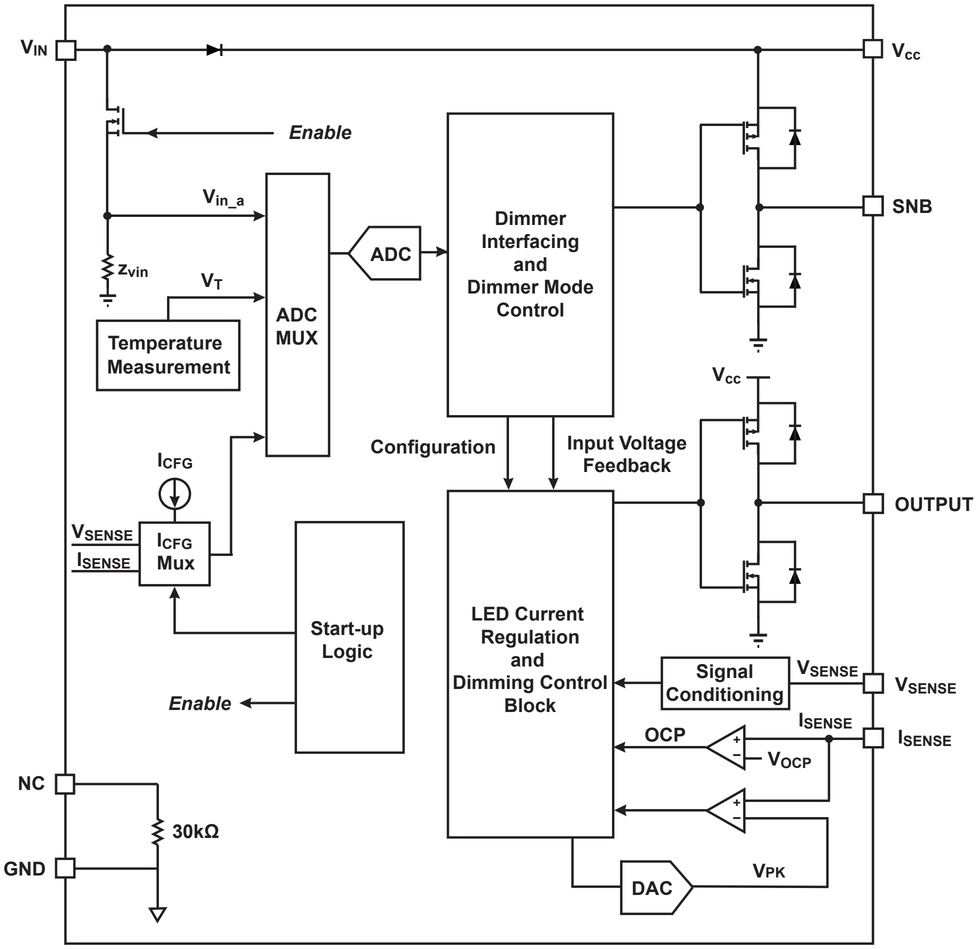


Figure 8.1 : iW3605 Functional Block Diagram

9.0 Theory of Operation

9.1 System Startup

This section provides information about iW3605 system start up, which includes the IC startup, wall dimmer detection, and the LED current soft start.

9.1.1 IC Startup

When AC voltage is applied, V_{IN} pin is open by default so that active startup switch (Q3 in Figure 11.1) is turned on and the V_{CC} capacitors (C4 and C5 in Figure 11.1) are charged through resistor R3 and Q3. When the V_{CC} voltage reaches start-up threshold $V_{CC(ST)}$, the iW3605's control logic is activated and the IC starts up. The V_{IN} pin is connected to Z_{VIN} resistor.

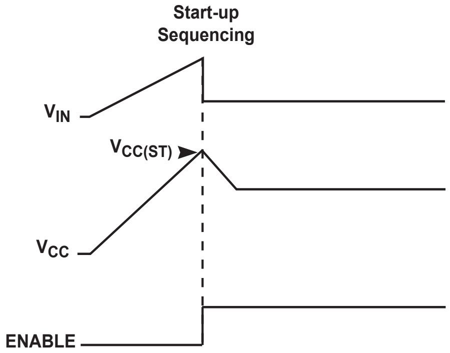


Figure 9.1 : Start-up Sequencing Diagram

9.1.2 Wall Dimmer Detection

There are two basic categories of phase-cut wall dimmers: leading-edge dimmers and trailing-edge dimmers. If the AC voltage rises at the phase-cut edge, the dimmer is called leading-edge dimmer (shown in Figure 9.2). Otherwise it is called trailing-edge dimmer (shown in Figure 9.3). Normally speaking, leading-edge dimmer is TRIAC based (R-type, RL-type); trailing-edge dimmer is MOSFET or IGBT based (RC-type).

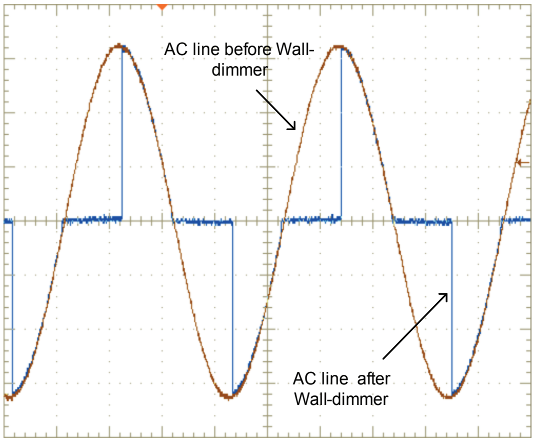


Figure 9.2 : Leading-Edge Wall Dimmer Waveforms

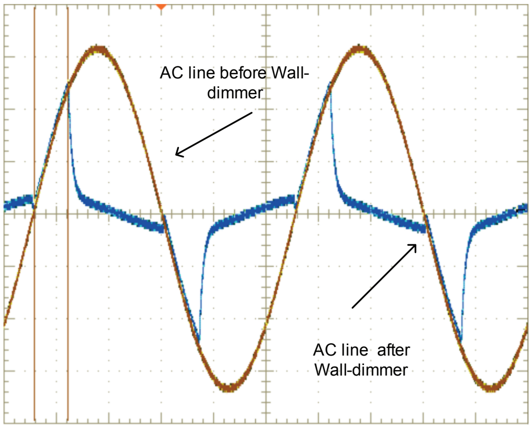


Figure 9.3 : Trailing-Edge Wall Dimmer Waveforms

The dimmer detection stage occurs in the iW3605 immediately after IC starts up. Meanwhile the iW3605 starts the flyback converter. The flyback converter provides a load current to the dimmer so the dimmer can work normally.

The dimmer type can be determined by looking at the slope of the input AC voltage and the dimming phase angle. A fast rising edge of the input voltage indicates a leading-edge dimmer. Otherwise, trailing-edge dimmer or no dimmer is detected.

9.1.3 LED Current Soft-Start

If a dimmer is connected, the driver starts immediately into leading-edge or trailing-edge mode operation (refer to section 9.3.1 and 9.3.2 for details) to interface with the dimmer. If no dimmer is connected, the driver starts no-dimmer mode operation (refer to section 9.3.3 for details).

A soft-start algorithm is applied to the buck-boost or flyback converter to gradually ramp up the LED current.

9.2 Dimming Curve

The iW3605 adjusts the output current to a certain ratio of the nominal output current when the leading-edge or trailing-edge dimmer is detected. This ratio is called dimming percentage. A typical mapping between the dimmer phase angle and the dimming percentage is shown in Figure 10.6. Four different dimming curves can be selected by the I_{SENSE} pin configuration (refer to section 9.5 for details). All dimming curves fall within the limits of the NEMA SSL6 standard (shown in Figure 10.6). The iW3605 updates the dimming percentage based on the averaged input voltage to ensure fast dimmer response.

9.3 Dimmer Interface and Dimmer Mode Control Block Operation

This section provides information about iW3605 dimmer interface and dimmer mode control block's operation, which includes leading-edge dimmer mode, trailing-edge dimmer mode, and no-dimmer mode.

A typical application circuit is shown in Figure 11.1. An optional active snubber circuit is added in Figure 11.2. Active snubber circuit is used to hold leading edge dimmer for high line and high power designs. Due to the big snubber resistor R4, a low current MOSFET can be used for Q3 in Fig11.2.

9.3.1 Leading-Edge Dimmer Mode

The iW3605 monitors the input voltage continuously. When V_{in_a} falls below 0.3V, the SNB is high. In Figure 11.2, Q2 turns on and R4,C9 are connected across bus. R4 and C9 help to damp the input current ringing when Leading-edge dimmer turns on.

When V_{in_a} exceeds 0.3V, SNB is low. Q3 turns off so power loss on R4 is reduced.

In order to prevent the disturbance caused by the sudden change of the active snubber switch on/off, the iW3605 makes the smooth transition during active snubber switch fully on and fully off.

The peak value of primary winding current I_{pk} is determined by the voltage generated on the current-sense resistor: $I_{pk} = V_{pk}/R10$.

9.3.2 Trailing-Edge Dimmer Mode

When the phase-cut edge of the input voltage is detected, the SNB is high, the active snubber switch (Q2 in Figure 11.2) turns on to help discharge the input capacitor. Otherwise, when V_{in_a} exceeds 0.3V, SNB is low and Q2 is off. It reduces the power loss on R4.

In order to prevent the disturbance caused by sudden on/off of the active snubber switch, the iW3605 makes a smooth transition during the active snubber switch on/ff.

9.3.3 No Dimmer Mode

If there is no dimmer on the line, the iW3605 operates in no-dimmer mode for optimal power factor and minimum harmonic distortion. The SNB is always low. In Figure 11.2, Q2 is off and there is no power loss on active snubber circuit. V_{pk} is designed to be proportional to the input voltage shape with a lower limit of 0.1V.

9.4 Output Current Regulation and Dimming Control Block Operation

This section provides information about iW3605 output current regulation, which incorporates the Dialog-patented PrimAccurate™ technology.

In iW3605, peak current regulation is achieved by forcing the peak value of the primary-side current to follow the reference curve in every switching cycle. Figure 9.4 shows the basic principle of this peak current regulation.

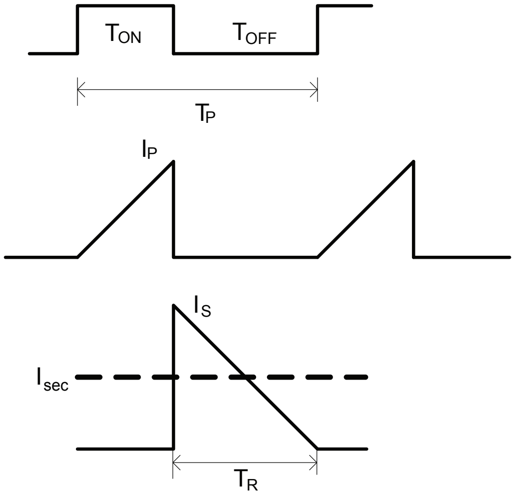


Figure 9.4 : Cycle-to-Cycle Peak Current Regulation

The buck-boost or flyback converter operates in critical discontinuous conduction mode (CDCM) if the switching frequency of main switch does not exceed the frequency limit. Otherwise, if the switching frequency reaches the frequency limit, the power converter operates in discontinuous conduction mode (DCM). When the main switch MOSFET (Q1 in Figure 11.1) turns on, the transformer primary winding current ramps up linearly and energy builds up in the transformer. The iW3605 turns off the MOSFET when the primary winding current reaches the peak current regulation level. At this moment, the transformer maintains the magnetic flux so that the energy in the transformer generates the secondary winding current that equals to the peak primary winding current multiplied by primary-secondary turns-ratio. Then the secondary winding current ramps down linearly until all the energy in transformer is discharged. After the energy in the transformer is discharged, the iW3605 starts the next switching cycle.

As shown in Figure 9.4, the averaged secondary current of the transformer in one switching cycle can be expressed by an equation as shown below.

$$I_{sec} = 0.5 \times N_{TR} \times I_{pk} \times T_R / T_P \qquad (9.1)$$

where I_{pk} is the peak value of primary winding current. N_{TR} is the primary-secondary turns ratio. T_R is the secondary winding current ramp-down time, or the transformer reset time. T_P is the entire period.

The I_{pk} is determined by the voltage generated on the current-sense resistor: $I_{pk} = V_{pk} / R10$. Therefore, the equation can be written as:

$$I_{sec} = 0.5 \times N_{TR} \times V_{pk} / R10 \times T_R / T_P \qquad (9.2)$$

In the steady state, the average output current is equal to the average transformer secondary current over one half AC cycle. Therefore, the average output current can be obtained by averaging equation 9.2 over one half-AC-cycle.

In iW3605, the nominal output current $I_{out\_avg(NOM)}$ can be determined by the equation 9.3.

$$I_{out(avg)(NOM)} = 0.5 \times N_{TR} / R10 \times 0.35V \times \eta \qquad (9.3)$$

η is the current regulation efficiency.

Therefore, the nominal output current $I_{out\_avg(NOM)}$ can be determined by the turns-ratio and current sensing resistor value.

9.5 V_{SENSE} and I_{SENSE} Configuration Function

At start-up, a current source in the controller drives the configuration current I_{CFG} (500µA) into V_{SENSE} and I_{SENSE} pin alternatively after V_{CC} reaches $V_{CC(ST)}$. The iW3605 reads their pin voltages respectively to determine the configuration options. V_{SENSE} pin configuration selects the temperature derating start points. I_{SENSE} pin configuration selects the dimming curves. By connecting resistors R8, R9, and R13 with different values to V_{SENSE} and I_{SENSE} pins respectively, different dimming curves and temperature starting points are selected. Table 9.1 and 9.2 show the temperature starting points and the dimming curves respectively vs. the resistor values.

V_{SENSE} CFG Option Number	V_{SENSE} Pin Resistors (R8//R9 in Fig. 11.1)				Temperature Derating Starting Point $T_{DERATE(ST)}$ (°C) (Fig. 9.5)
	Typical Value (kΩ)	Tole-rance	Min Value (kΩ)	Max Value (kΩ)	
0	0.72	≤ 1%	0.68	0.81	100
1	1.38	≤ 1%	1.21	1.53	110
2	2.30	≤ 1%	2.01	2.56	120
3	3.60	≤ 1%	3.15		130
4	0.25	≤ 1%		0.34	disable temperature derating

Table 9.1 V_{SENSE} Pin Configuration Resistor Values

I_{SENSE} CFG Option Number	I_{SENSE} Pin Resistors (R10 in Fig.11.1)				Dimming Curve Number (Fig. 10.6)
	Typical Value (kΩ)	Tole-rance	Min Value (kΩ)	Max Value (kΩ)	
0	0.5	≤ 1%		0.58	option 1*
1	1.2	≤ 1%	1.04	1.34	option 2*
2	2.20	≤ 1%	1.88	2.48	option 3*
3	3.60	≤ 1%	3.15		option 4*

Table 9.2 I_{SENSE} Pin Configuration Resistor Values

Notes (*):

Option 1: I_{SENSE} clamp to nominal

Option 2: I_{SENSE} clamp to nominal plus 0.1V

Option 3: I_{SENSE} clamp to nominal, deep dimming

Option 4: I_{SENSE} clamp to nominal plus 0.1V, deep dimming

9.6 Protection Features

This section provides information about iW3605 protection features.

9.6.1 Output Over-Voltage/LED Open Protection

The iW3605 includes a function that protects against an output over-voltage.

The output voltage is monitored by the V_{SENSE} pin. The ratio between the V_{SENSE} pin voltage and output voltage is equal to the auxiliary to secondary winding turns-ratio multiplied by the V_{SENSE} resistor divider ratio (R8 and R9 in Figure 11.1). If the voltage at the V_{SENSE} pin exceeds $V_{SENSE(MAX)}$, the iW3605 shuts down its output pins (SNB pin and OUTPUT pin) immediately. As a result, both the active snunnber and the power converter circuits are turned off. After the shutdown of output pins, the iW3605 remains powered while V_{CC} continues to discharge. In order to avoid over-charging the output voltage, the iW3605 employs an extended discharge time as described below if V_{CC} does not drop below V_{CC_UVL}. Otherwise, when V_{CC} drops below V_{CC_UVL}, the iW3605 resets itself and then initiates a new soft-start cycle.

Under the fault condition, the iW3605 tries to start up for three consecutive times. If all three start-up attempts fail, the iW3605 enters an inactive mode, during which the iW3605 does not respond to the V_{CC} power-on requests. The iW3605 is activated again after three to five seconds.

9.6.2 Output Short Protection

The iW3605 includes a function that protects against an output short-circuit fault.

When output is shorted, V_{SENSE} stays low. As a result, output short fault is detected, and the iW3605 shuts down its output pins (SNB pin and OUTPUT pin) immediately. After the output pins' shutdown, the iW3605 remains powered while V_{CC} continues to discharge. In order to avoid excessive power stress due to auto-restart, the iW3605 employs an extended discharge time as described in section 9.6.1 if V_{CC} does not drop below V_{CC_UVL}. Otherwise, when V_{CC} drops below V_{CC_UVL}, the iW3605 resets itself and then initiates a new soft-start cycle.

To support applications with high output capacitance, output short protection is not activated in the initial LED current soft start period. This allows the voltage to build up in the output capacitor without mis-triggering the protection.

9.6.3 Temperature De-Rating and Over-Temperature Protection

The iW3605 can detect and protect against over-temperature event. The iW3605 utilizes an internal sensor for temperature measurement.

When the monitored temperature reaches $T_{DERATE(ST)}$, the maximum output current limit begins to reduce linearly from 100% to 70% of the nominal value until the temperature reaches $T_{DERATE(FINISH)}$ threshold as shown in Figure 9.5, where $T_{DERATE(FINISH)} = T_{DERATE(ST)} + 20°C$. At $T_{DERATE(FINISH)}$, the maximum output current limit is clamped to 70%. If the temperature further increases to $T_{OTP(START)}$, the iW3605 shuts down.

The iW3605 remains in shutdown mode as long as the monitored IC temperature is above $T_{OTP(START)}$. If the detected temperature falls below $T_{OTP(START)}$ at anytime, the device starts up. From $T_{DERATE(FINISH)}$ to $T_{DERATE(ST)}$, the maximum output current limit increases linearly from 70% to 100% as shown in Figure 9.5. The device goes back to normal operation if the sensed IC temperature falls below $T_{DERATE(ST)}$. This bi-directional operation enables the LED current thermal fold-back instead of an abrupt shut-down of the LED current.

The values of $T_{DERATE(ST)}$ and $T_{DERATE(FINISH)}$ can be adjusted through V_{SENSE} pin resistors (R8 and R9 in Figure 11.1).

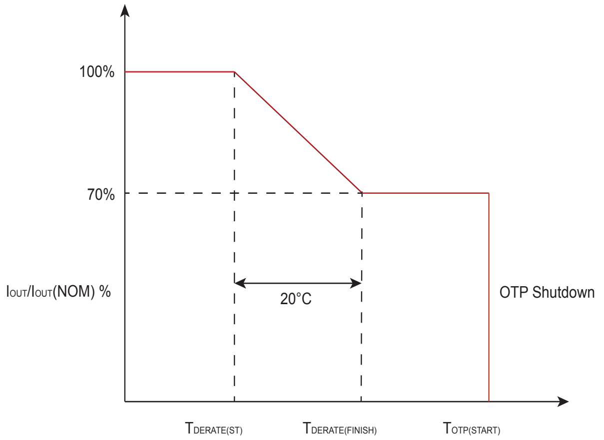


Figure 9.5 : Temperature DeRating and OTP

9.6.4 Over-Current Protection

Over-current protection (OCP) is a feature that is built into the iW3605.

With the I_{SENSE} pin, the iW3605 is able to monitor the primary peak current of the buck-boost or flyback converter. This allows for cycle-by-cycle peak current control and limit. When the primary peak current multiplied by the I_{SENSE} pin sensing resistor (R10 in Figure 11.1) is greater than V_{OCP}, over-current is detected and the iW3605 immediately shuts down the OUTPUT pin until the next cycle. The OUTPUT pin sends out switching pulse in the next cycle, and the switching pulse continues if V_{OCP} is not reached; or, if V_{OCP} is reached, the switching pulse turns off again.

9.6.5 Current Sensing Resistor Short Protection

The iW3605 uses a MOSFET as its main switch for the buck-boost or flyback converter. If the current sensing resistor is shorted, there is a potential danger of the over-current condition not being detected. Thus the iW3605 is designed to detect this sensing-resistor short fault. When the sensing-resistor short fault is detected, iW3605 shuts down its output pins (SNB pin and OUTPUT pin) immediately. After the output pins' shutdown, the iW3605 remains powered while V_{CC} continues to discharge. In order to prevent over stress of power circuit components, the iW3605 employs an extended discharge time as described in section 9.6.1 if V_{CC} does not drop below $V_{CC(UVL)}$. Otherwise, when V_{CC} drops below $V_{CC(UVL)}$, the iW3605 resets itself and then initiates a new soft-start cycle.

9.6.6 AC Input Over-Voltage Protection

The iW3605 supports the over-voltage protection of AC input.

If the V_{in_a} is higher than V_{IN_OVP} for continuous 2ms within every 16ms period, and this condition lasts for 500ms, the iW3605 shuts down its output pins. As a result, both active snubber and power converter circuits are turned off. After the shutdown the external circuits, V_{CC} is discharged since the iW3605 remains powered. When V_{CC} drops below $V_{CC(UVL)}$, the iW3605 resets itself and then initiates a new soft-start cycle.

10.0 Performance Characteristics

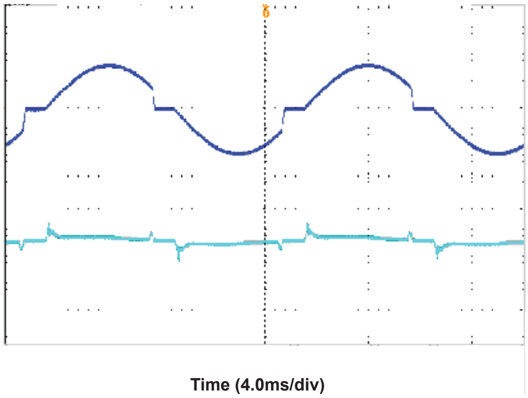


Figure 10.1 : Trailing-Edge Dimmer

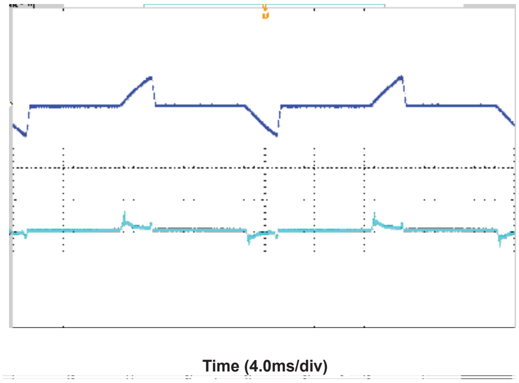


Figure 10.2 : Trailing-Edge Dimmer 2

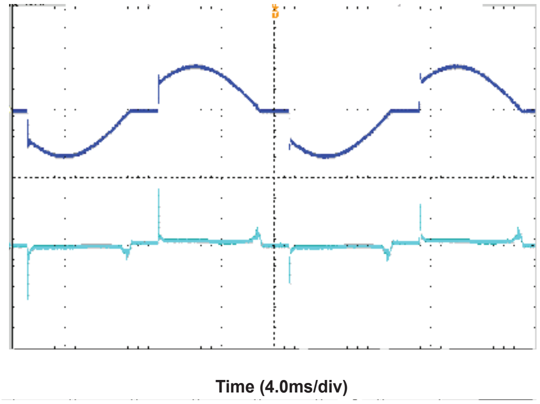


Figure 10.3 : Leading-Edge Dimmer

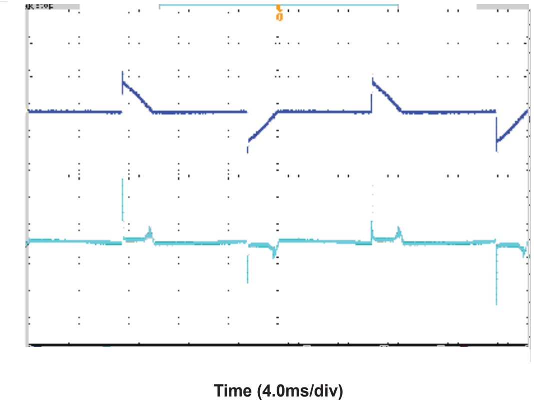


Figure 10.4 : Leading-Edge Dimmer 2

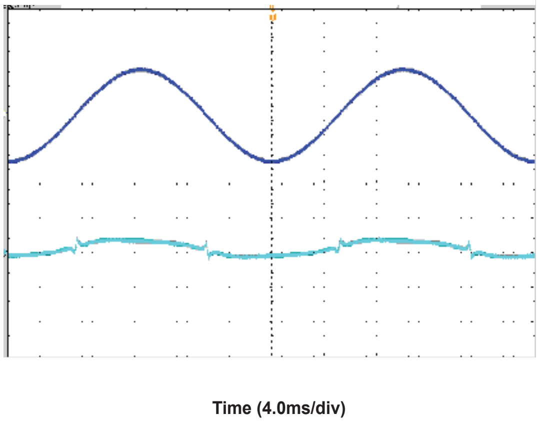


Figure 10.5 : No Dimmer

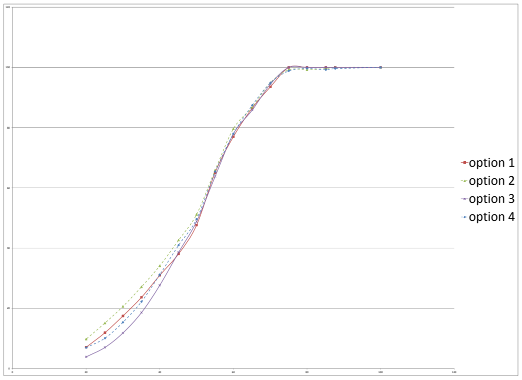


Figure 10.6 : Dimming Curve

11.0 Typical Application Schematic

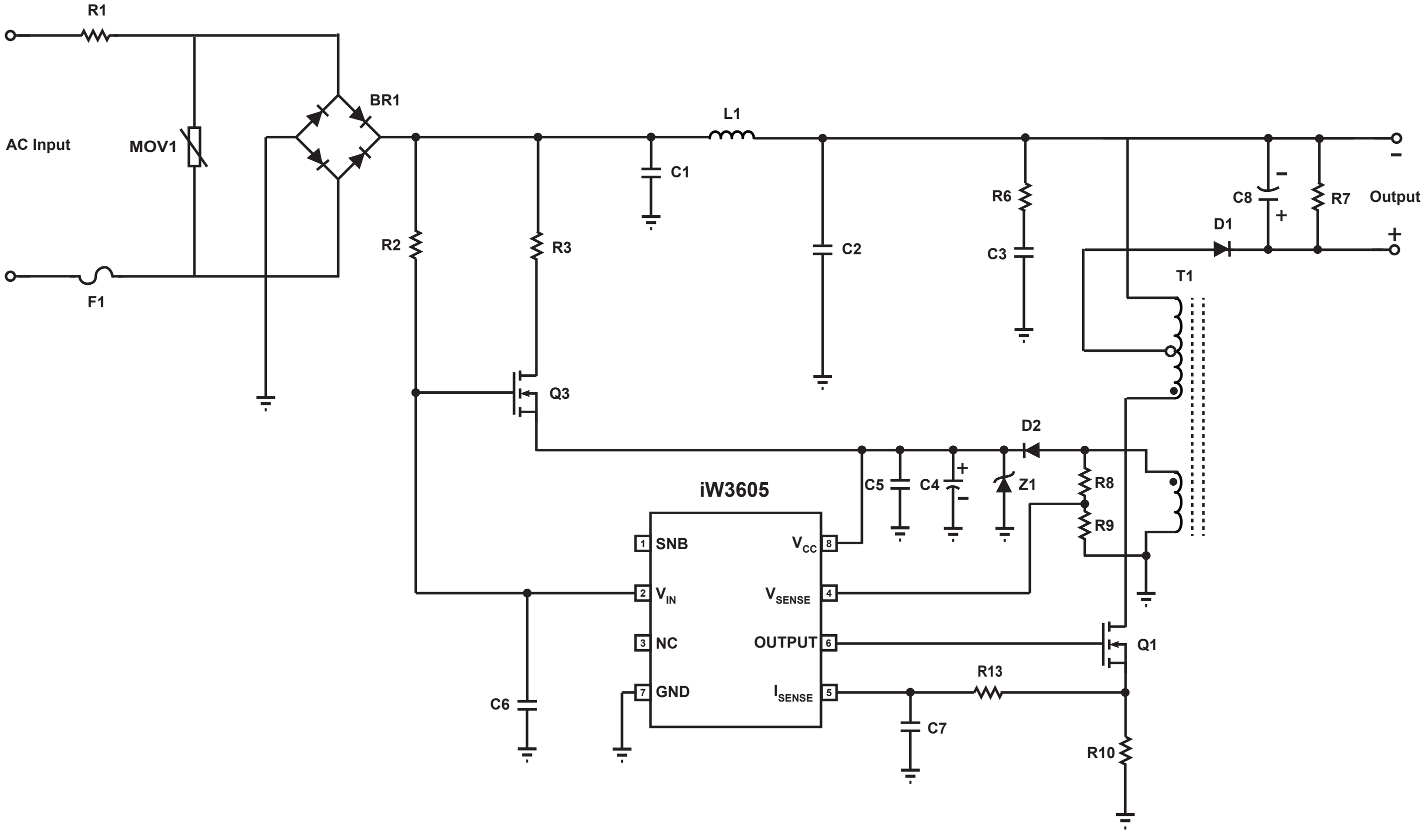


Figure 11.1 : Typical Application Circuit without Active Snubber

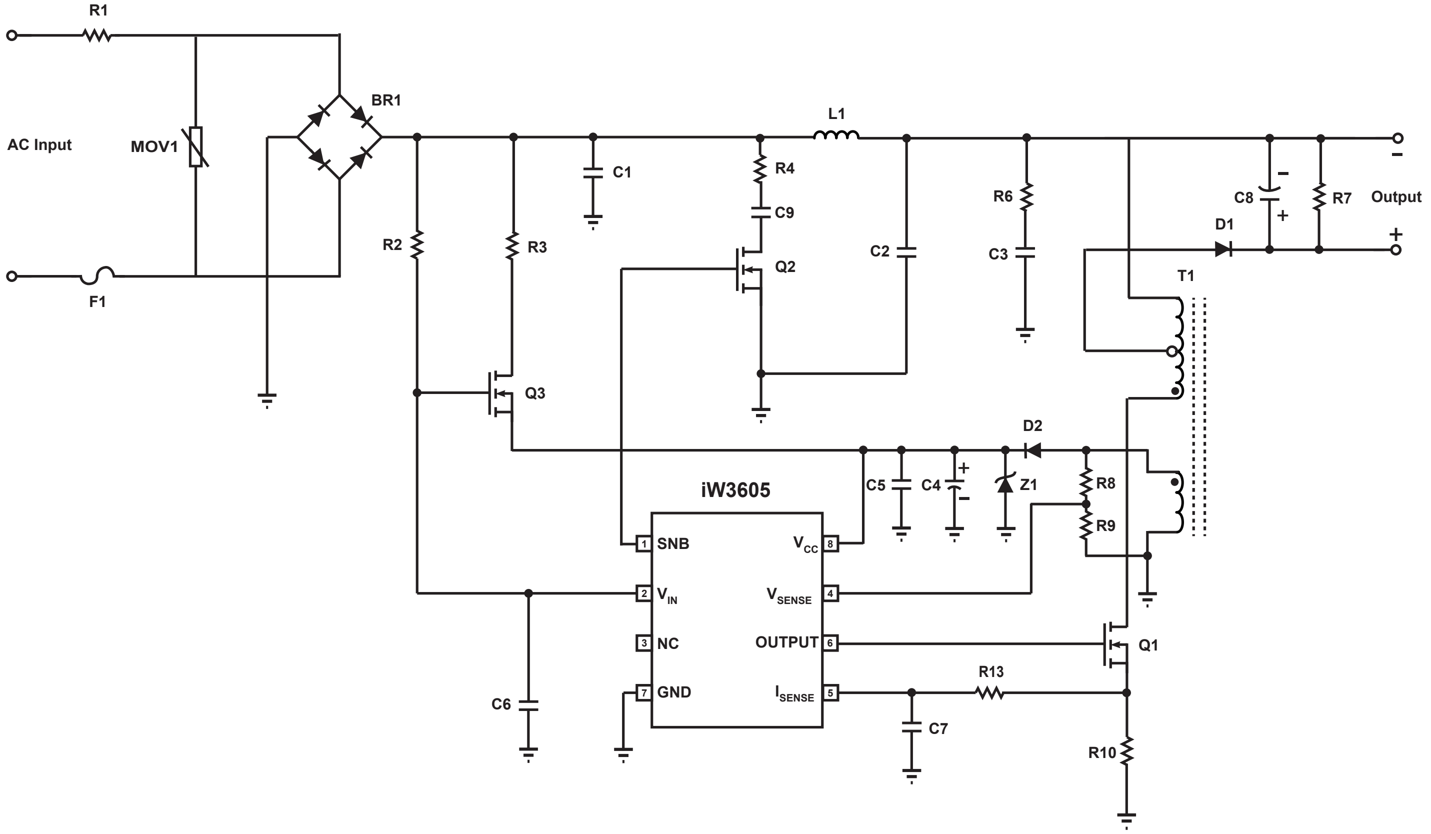
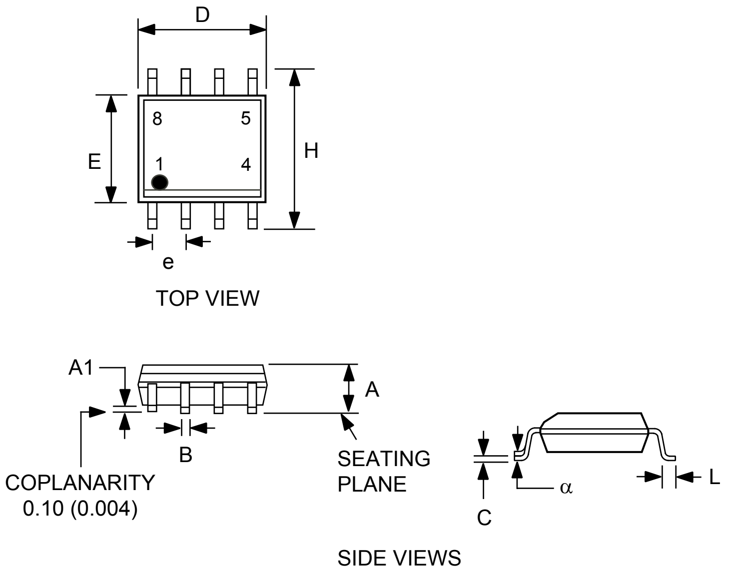


Figure 11.2 : Typical Application Circuit with Active Snubber for High Line and High Power Design

12.0 Physical Dimensions

8-Lead Small Outline (SOIC) Package



Symbol	Inches		Millimeters	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.0040	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
D	0.189	0.197	4.80	5.00
E	0.150	0.157	3.80	4.00
e	0.050 BSC		1.27 BSC	
H	0.228	0.244	5.80	6.20
L	0.016	0.049	0.40	1.25
α	0°	8°		

Compliant to JEDEC Standard MS12F

Controlling dimensions are in inches; millimeter dimensions are for reference only

This product is RoHS compliant and Halide free.

Soldering Temperature Resistance:
[a] Package is IPC/JEDEC Std 020D moisture sensitivity level 1
[b] Package exceeds JEDEC Std No. 22-A111 for solder immersion resistance; package can withstand 10 s immersion < 260˚C

Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15 mm per end. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25 mm per side.

The package top may be smaller than the package bottom. Dimensions D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.

13.0 Ordering Information

Part Number	Options	Package	Description
iW3605-02	I_{SENSE} clamp to 0.3V nominal	SOIC-8	Tape & Reel[1]
iW3605-05	I_{SENSE} clamp to 0.5V nominal	SOIC-8	Tape & Reel[1]

Note 1: Tape & Reel packing quantity is 2,500/reel.

AC/DC Digital Power Controller for Bleederless Single-Stage High Power Factor Dimmable LED Drivers

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