



DW8528B

Power Factor Correction IC for LED Lighting

Preliminary

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Ver. 0.5

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Preliminary

1. General Description

The DW8528B is an active boundary-mode power factor correction controller for AC-DC SMPS applications. The DW8528B provides the optimization method of Isolation LED Lighting. The DW8528B is available in a thermally enhanced 8 pin SOIC package.

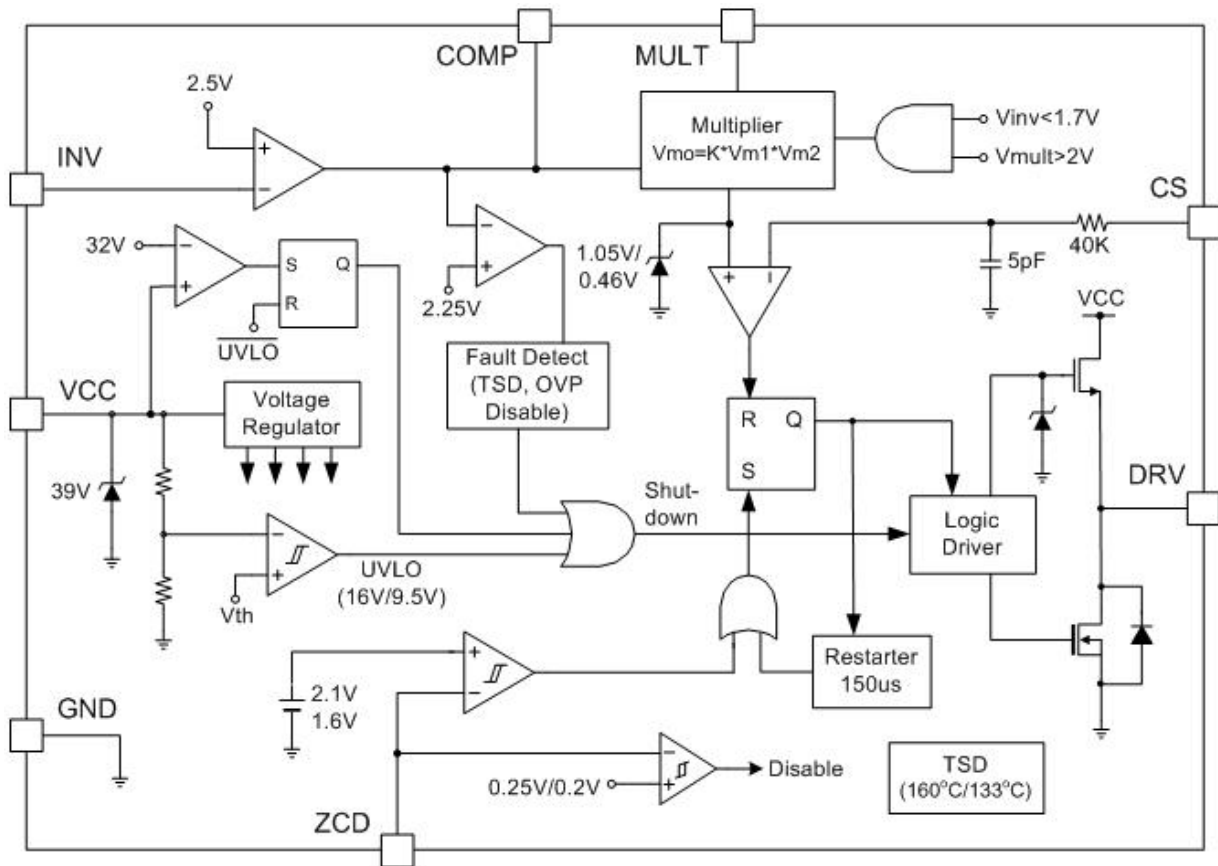
■ Features

- Boundary Mode Power Factor Correction Control
- Improved Power Factor and THD
- Wide Range Supply Voltage
- Under Voltage Lock Out
- Extremely Low Startup Current
- Low Quiescent Current
- Precise Internal Reference Voltage
- Leading Edge Blanking Circuit
- On Chip R/C Filter on CS pin
- Zero Current Switching
- System Power Limit at Feedback Open
- Supply Voltage Over Voltage Protection
- Thermal Shutdown Protection
- Disable Function on ZCD pin
- +800/-600mA Totem Pole Gate Driver
- 8 SOIC Package

■ Applications

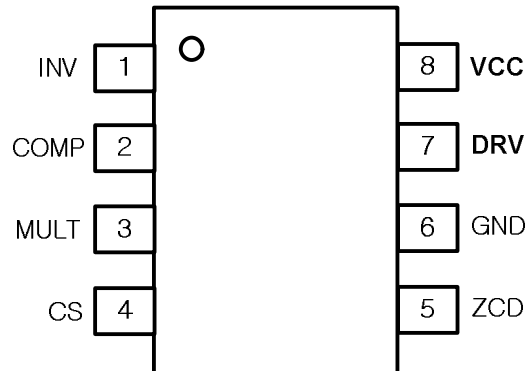
- Single Stage High PF flyback AC/DC SMPS
- LED Lighting Power

2. Block Diagram



3. Pin Information

■ Pin placement and IC dimension



■ Pin Description

No.	Pin Name	Description	Note
1	INV	Inverting input of the error amplifier.	
2	COMP	Output of the error amplifier.	
3	MULT	Input of the multiplier stage. A resistive divider connects to this pin the rectified mains. A voltage signal, proportional to the rectified mains, appears on this pin.	
4	CS	Input to the comparator of the control loop. The current is sensed by a resistor and the resulting voltage is applied to this pin.	
5	ZCD	Zero current detection input. If it is connected to GND, the device is disabled.	
6	GND	Current return for driver and control circuits.	
7	DRV	Gate driver output. A push pull output stage is able to drive the Power NMOS with peak current of +800mA/-600mA.	
8	VCC	Supply voltage of driver and control circuits.	

4. Absolute Maximum Ratings

Symbol	Parameter	Ratings
V_{CC}	Maximum Supply Voltage	40 V
I_{CC}	Maximum Supply Current	30 mA
I_{OMAX}	Output Maximum Current (2us)	+800/-600 mA
V_{IN}	Input Voltage (SS, MULT, CS)	-0.3 ~ 7 V
V_{COMP}	Erramp Output Voltage (COMP)	-0.3 ~ 7 V
I_{ZCD}	ZCD Pin Current	-10/20 mA
θ_{JA}	Package Thermal Resistance	150 °C/W
T_{OPR}	Operating Junction Temperature	-40 ~ 150 °C
T_{STG}	Storage Temperature	-55 ~ 150 °C

■ Absolute Maximum Ratings

Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range (T_J) may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. The implementation of a physical safety measure such as a fuse should be considered when use of the IC in a special mode when the absolute maximum ratings may be exceeded is anticipated.

5. Recommended Operating Condition

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	10.3	-	26	V

6. Electrical Specification

(V_{CC} = 14V, T_a = 25°C ; unless otherwise specified)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
SUPPLY VOLTAGE SECTION						
Operating Voltage Range	V _{OP}	After Turn On	10.3	-	26	V
VCC Turn-on Threshold	V _{CCON}	V _{CC} =8~18V	15	16	17	V
VCC Turn-off Threshold	V _{CCOFF}	V _{CC} =18~8V	8.7	9.5	10.3	V
UVLO Hysteresis	V _{CHYS}	V _{CCON} -V _{CCOFF}	6	6.5	7	V
VCC OVP Threshold Voltage	V _{OVP}	Positive-going	-	32	-	V
VCC Zener Clamp Voltage	V _Z	I _{CC} =25mA	-	39	-	V
SUPPLY CURRENT SECTION						
Start-up Current	I _{ST}	V _{CC} =14V	10	30	50	uA
Quiescent Current	I _Q	V _{CC} =14V	1.2	2.5	4.0	mA
	I _{QMAX}	V _{CC} =20V	1.3	2.6	4.2	mA
Quiescent Current at Disable	I _{QDH}	V _{CC} =14V	0.5	1.2	2	mA
	I _{QDL}	V _{CC} =8V	5	15	30	uA
Quiescent Current at OVP	I _{QOVP}	V _{INV} =2.7V	0.5	1.2	2	mA
Operation Supply Current	I _{CC}	F _{SW} =70KHz	2	3	5	mA
MULTIPLIER SECTION ^(Note1)						
MULT Input Bias Current	I _{MULT}	V _{MULT} =1V	-1	-0.1	1	uA
Multiplier Input Voltage Range	V _{MULT}	^(Note2)	0	-	3	V
Multiplier Output Max. Slope	V _{CS} /dV _{MULT}	V _{MULT} =0.5V/0.7V V _{COMP} =6V	0.8	0.95	1.1	-
Multiplier Gain	K	V _{MULT} =1V V _{COMP} =4V	0.31	0.37	0.43	1/V
ERROR AMPLIFIER SECTION						
Erramp Inverting Voltage	V _{INV}	V _{CC} = 12~26V	2.45	2.5	2.55	V
INV Input Bias Current	I _{INV}	V _{INV} =2.5V	-0.5	-0.1	0.5	uA
COMP Source Current	I _{COMP}	V _{COMP} =4V	-6.8	-4.5	-2.2	mA
COMP Sink Current	I _{SINK}	V _{COMP} =4V	4.2	8.5	-	mA
COMP Upper Clamp Voltage	V _{COMP} H	I _{COMP} =-0.5mA	4.5	5.5	6.5	V
COMP Lower Clamp Voltage	V _{COMP} L	I _{COMP} =0.5mA	2	2.2	2.4	V
Static OVP Threshold Voltage	V _{SOVP}		2	2.2	2.4	V
Voltage Gain	G _v	Open loop ^(Note3)	60	80	-	dB
Gain Bandwidth Product	GB	^(Note4)	-	1	-	MHz

(V_{CC} = 14V, T_a = 25°C ; unless otherwise specified)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
CURRENT SENSE SECTION (Note5)						
CS Input Bias Current	I _{CS}	V _{CS} =0V	-1	-0.1	1	uA
Leading Edge Blanking Time	T _{LEB}	(Note6)	-	240	-	ns
CS Propagation Delay	T _D	(Note7)	-	180	-	ns
CS Reference Clamp Voltage	V _{CS}	V _{MULT} =1.5V, V _{COMP} =5V	0.95	1.05	1.15	V
CS Offset Voltage	V _{OS}	V _{MULT} =0V	-	10	30	mV
CS Power Limitation Voltage	V _{CSLIM}	V _{INV} =1.4V, V _{MULT} =1.5V	0.68	0.78	0.88	V
		V _{INV} =1.4V, V _{MULT} =2.5V	0.36	0.46	0.56	V
ZERO CURRENT DETECTOR SECTION						
ZCD Upper Clamp Voltage	V _{UPPER}	I _{ZCD} =2.5mA	6	6.7	7.4	V
ZCD Lower Clamp Voltage	V _{LOWER}	I _{ZCD} =-2.5mA	0.4	0.7	1	V
ZCD Input Threshold Voltage	V _{ZCD}	Positive-going	1.8	2.1	2.4	V
		Negative-going	1.3	1.6	1.9	V
ZCD Input Bias Current	I _{ZCD}	V _{ZCD} =4V	-4	0.2	4	uA
ZCD Source Current Capability	I _{ZCDSC}	(Note8)	-3	-	-	mA
ZCD Sink Current Capability	I _{ZCDSI}	(Note9)	3	-	-	mA
Disable Triggering Current	I _{DIS}	V _{ZCD} =0.3V	-10	-6	-3	mA
Disable Threshold Voltage	V _{DIS}	Negative-going	120	200	280	mV
		Positive-going	150	250	350	mV
Holding Current after Disable	I _{HOLD}	V _{ZCD} =0.1V	-120	-75	-30	uA
RESTART TIMER SECTION						
Restart Time Delay	T _{RST}	V _{ZCD} =5KHz	70	150	300	us
GATE DRIVER SECTION						
DRV Output Low Voltage	V _{OL}	I _{DRV} =100mA	-	0.3	0.6	V
DRV Dropout Voltage	V _{DROP}	V _{CC} =12V, I _{DRV} =-100mA	1	2	3	V
DRV Peak Source Current	V _{DRVSC}	(Note10)	-0.6	-	-	A
DRV Peak Sink Current	V _{DRVSI}	(Note11)	0.8	-	-	A

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(V_{CC} = 14V, T_a = 25°C ; unless otherwise specified)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
GATE DRIVER SECTION (Continued)						
DRV Rising Time	T _R	C _O =1nF ^(Note12)	-	60	110	ns
DRV Falling Time	T _F	C _O =1nF ^(Note13)	-	30	70	ns
DRV Maximum Clamp Voltage	V _{OMAX}	V _{CC} =20V, I _O =-5mA	11	12.5	14	V
DRV Sink Current at UV	I _{DRV_OFF}	V _{CC} =5V, V _{DRV} =1V	5	10	30	mA
THERMAL SHUTDOWN SECTION						
Thermal Shutdown Temp.	TSD	Positive-going ^(Note14)	-	160	-	°C
		Negative-going ^(Note15)	-	133	-	°C
TSD Hysteresis Temp.	HY _{TSD}	^(Note16)	-	27	-	°C

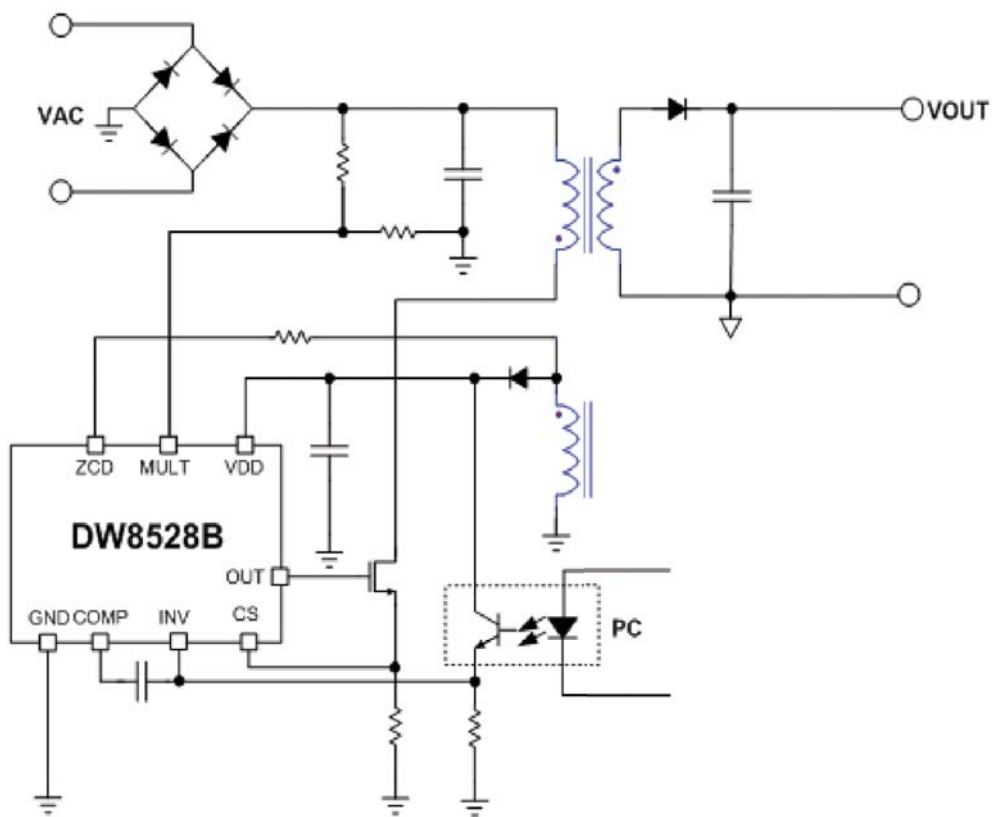
1. Note 1,5 : V_{CS}=K*V_{MULT}*(V_{COMP}-2.5)

2. Note 2,3,4,6,7,8,9,10,11,12,13,14,15,16 : Parameters are guaranteed by design, but not tested in production.

7. Typical Operating Characteristics

(VDD = 24V, T_A = -35°C~+85°C, unless otherwise specified. Typical values are at T_A=+25°C)

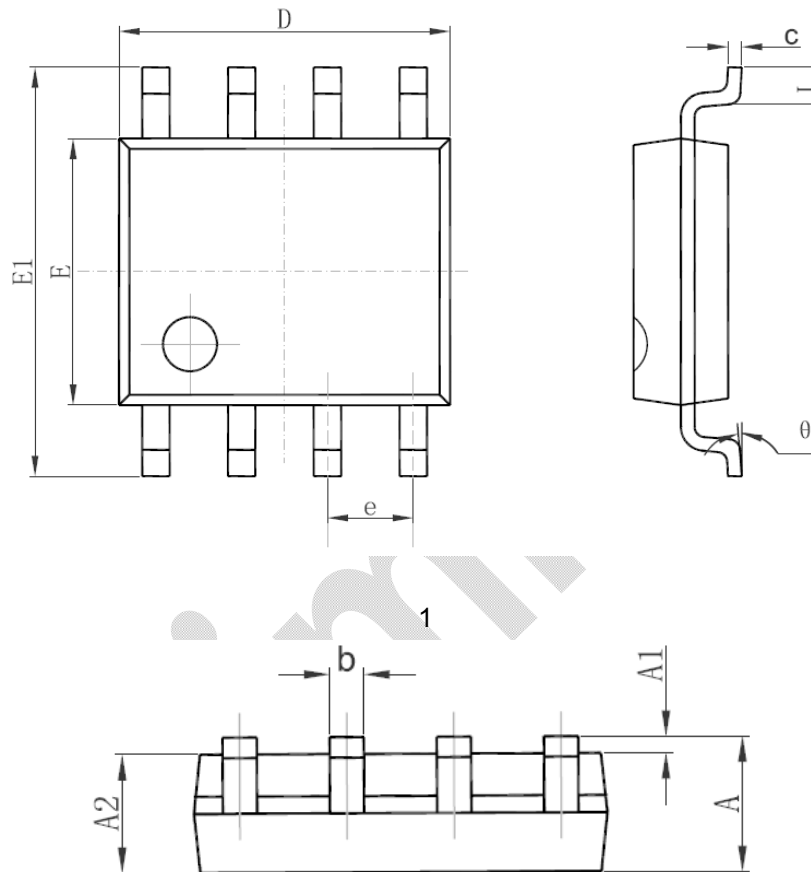
8. Typical Applications



9. Package Dimension

Package Dimension (4.9mm X 6.0mm X 1.4mm)

- Package Name : SOIC8
- Package Size : 4.9mm * 6.0mm, Thickness : 1.4mm
- Pin Pitch : 1.27mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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