



# L8561

## LINEAR INTEGRATED CIRCUIT

### POWER FACTOR CORRECTOR

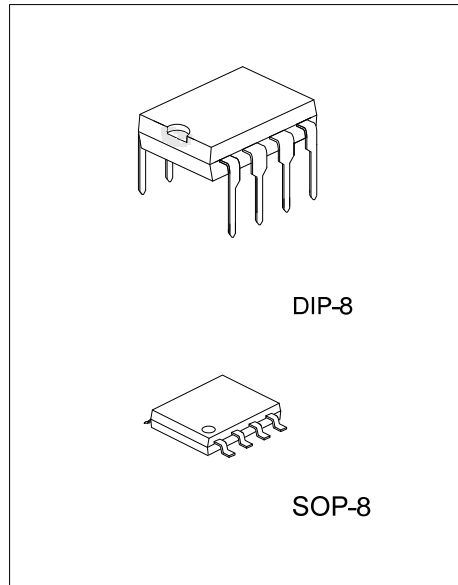
#### DESCRIPTION

The UTC **L8561** is a Power Factor Corrector, which can work in wide input voltage range applications (from 85V ~ 265V) with an excellent THD. It has very low start up current (about 20  $\mu$ A) and a disable function on the ZCD pin, which is designed to keep lower current consumption in stand by mode.

The device is operating in transition mode, and is able to drive a Power MOS or IGBT with a  $\pm$  400mA current for sourcing and sinking.

#### FEATURES

- \* 1% Precision (@  $T_J = 25^\circ\text{C}$ ) Internal Reference Voltage
- \* Output Overvoltage Protection
- \* Very Low Power Start-Up Current
- \* Current Sense Filter On Chip
- \* Disable Function (with ZCD pin)
- \* Transition Mode Operation
- \* Gate Driving Current:  $\pm$  400mA
- \* 15V Gate clamped



#### ORDERING INFORMATION

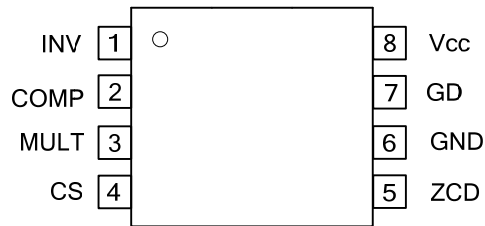
Ordering Number		Package	Packing
Lead Free	Halogen Free		
L8561L-D08-T	L8561G-D08-T	DIP-8	Tube
-	L8561G-S08-R	SOP-8	Tape Reel

<p>L8561L-D08-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) D08: DIP-8, S08: SOP-8 (3) G: Halogen Free and Lead Free</p>
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#### MARKING

DIP-8	SOP-8
<p>8 7 6 5 → Date Code UTC □□□□ L8561 □ □ □ → L: Lead Free □ □ → G: Halogen Free □ □ → Lot Code 1 2 3 4</p>	<p>8 7 6 5 → Date Code UTC □□□□ L8561G ● □ □ → Lot Code 1 2 3 4</p>

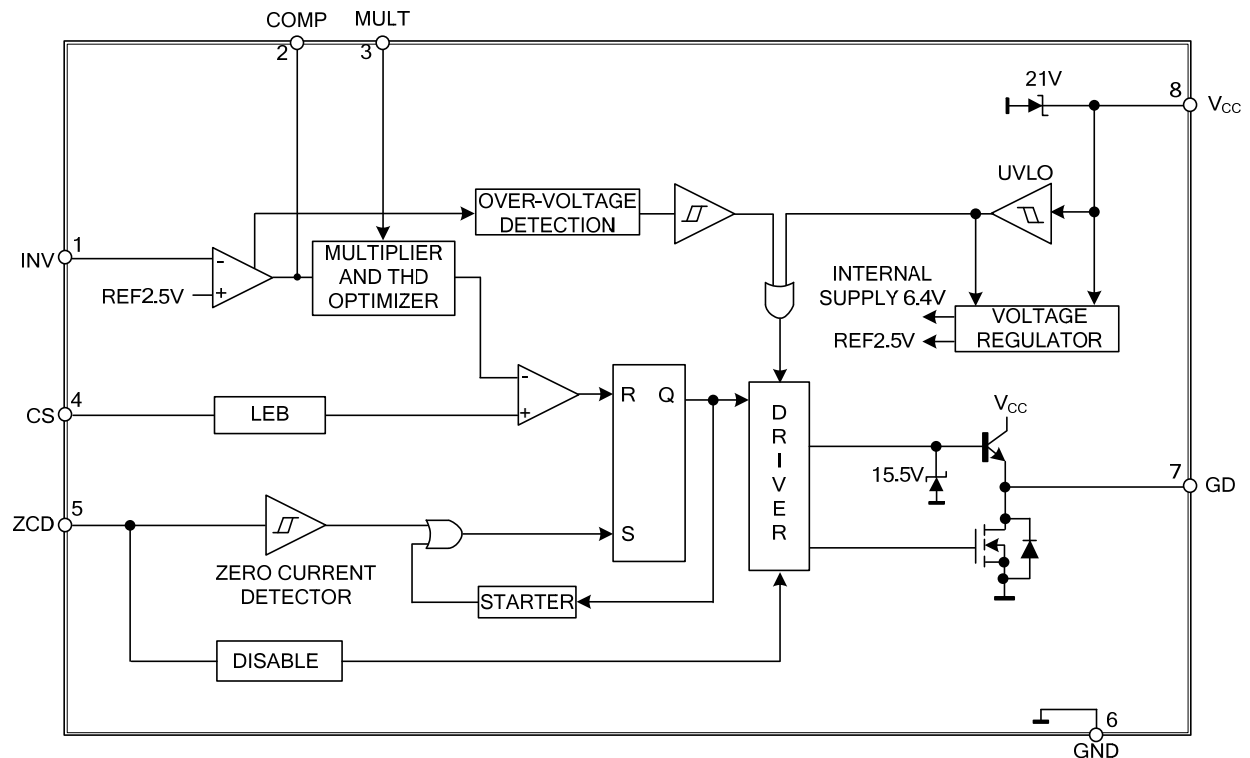
### ■ PIN CONFIGURATION



### ■ PIN DESCRIPTION

PIN NO	PIN NAME	DESCRIPTION
1	INV	Inverting input of the error amplifier.
2	COMP	Output of the error amplifier.
3	MULT	Input of the multiplier stage.
4	CS	Input of the current sense stage.
5	ZCD	Input of the zero current detection .
6	GND	Ground.
7	GD	Gate driver output.
8	V <sub>cc</sub>	Voltage supply.

### ■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Analog Inputs & Outputs	INV, COMP MULT	-0.3 ~ 7	V
Current Sense Input	CS	-0.3 ~ 7	V
I <sub>q</sub> +I <sub>z</sub> (I <sub>GD</sub> = 0)	I <sub>VCC</sub>	30	mA
Output Totem Pole Peak Current (2ms)	I <sub>GD</sub>	±700	mA
Zero Current Detector	ZCD	50 (source)	mA
		-10 (sink)	
Power Dissipation @ T <sub>A</sub> =50°C	SOP-8	1	W
	DIP-8	0.65	W
Junction Temperature	T <sub>J</sub>	125	°C
Operating Temperature	T <sub>OPR</sub>	-20 ~ +85	°C
Storage Temperature	T <sub>STG</sub>	-40 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=-25°C ~ 125°C, V<sub>CC</sub>=14.5V, unless otherwise specified)

PARAMETER	PIN	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>SUPPLY VOLTAGE SECTION</b>							
Operating Range	8	V <sub>CC</sub>	after turn-on	11		18	V
Turn-on Threshold	8	V <sub>CC ON</sub>		14	15.3	16.5	V
Turn-off Threshold	8	V <sub>CC OFF</sub>		7.2	7.9	8.7	V
Hysteresis	8	Hys		6.5		8.3	V
<b>SUPPLY CURRENT SECTION</b>							
Start-up Current	8	I <sub>START-U</sub>	V <sub>CC ON</sub> -1V		30	50	μA
Quiescent Current	8	I <sub>q</sub>			6	9	mA
Operating Supply Current	8	I <sub>CC</sub>	C <sub>L</sub> =1nF @ 70KHz		10	15	mA
			In OVP condition V <sub>pin1</sub> =2.7V			6.8	mA
Quiescent Current	8	I <sub>q</sub>	V <sub>PIN5</sub> ≤150mV, V <sub>CC</sub> >V <sub>CC off</sub>			6	mA
	8		V <sub>PIN5</sub> ≤150mV, V <sub>CC</sub> <V <sub>CC off</sub>	4	7	10	μA
Zener Voltage	8	V <sub>Z</sub>	I <sub>CC</sub> =20mA	18	21	24	V
<b>ERROR AMPLIFIER SECTION</b>							
Voltage Feedback Input Threshold	1	V <sub>INV</sub>	T <sub>A</sub> =25°C	2.465	2.5	2.535	V
			10.3V<V <sub>CC</sub> <18V	2.44		2.56	V
Line Regulation			V <sub>CC</sub> =10.3 ~ 18V		3	5	mV
Input Bias Current	1	I <sub>INV</sub>			-100	-1000	uA
Voltage Gain		G <sub>V</sub>	Open loop	60	80		dB
Gain Bandwidth		G <sub>B</sub>			0.8		MHz
Source Current	2	I <sub>COMP</sub>	V <sub>COMP</sub> =4V, V <sub>INV</sub> =2.4V	-2	-4	-8	mA
Sink Current			V <sub>COMP</sub> =4V, V <sub>INV</sub> =2.6V	2.5	4.5		mA
Upper Clamp Voltage	2	V <sub>COMP</sub>	I <sub>SOURCE</sub> =0.5mA	4.5	5	5.5	V
Lower Clamp Voltage			I <sub>SINK</sub> =0.5mA	2.25	2.4	2.55	V
<b>MULTIPLIER SECTION</b>							
Linear Operating Voltage	3	V <sub>MULT</sub>		0~ 2.5	0 ~ 3.5		V
Output Max. Slope		$\frac{\Delta V_{CS}}{\Delta V_{MULT}}$	V <sub>MULT</sub> =from 0V ~ 0.5V V <sub>COMP</sub> =Upper ClamVoltage	1.65	1.9		
Gain		K	V <sub>MULT</sub> =1V, V <sub>COMP</sub> =4V	0.5	0.7	0.9	1/V

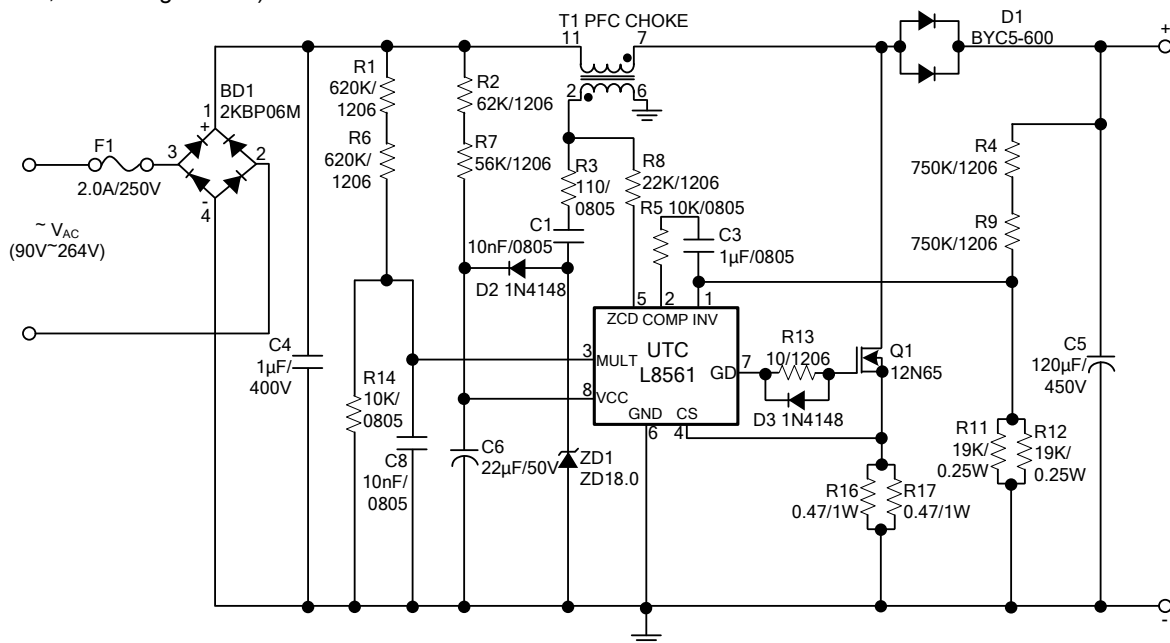
■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	PIN	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>CURRENT SENSE COMPARATOR</b>							
Current Sense Reference Clamp	4	$V_{CS}$	$V_{MULT}=2.5V$ $V_{COMP}=\text{Upper Voltage}$ Clamp	1.6	1.7	1.8	V
Input Bias Current	4	$I_{CS}$	$V_{OS}=0$		-0.05	-1	$\mu A$
Delay to Output	4	$T_{D(H-L)}$			200	450	ns
<b>ZERO CURRENT DETECTOR</b>							
Input Threshold Voltage Rising Edge	5	$V_{ZCD}$	(Note)		2.1		V
Hysteresis			(Note)	0.4	0.6	0.8	V
Upper Clamp Voltage	5	$V_{ZCD}$	$I_{ZCD}=20\mu A$	5.9	6.5	7.3	V
Upper Clamp Voltage	5	$V_{ZCD}$	$I_{ZCD}=3mA$	6.1	6.6	7.5	V
Lower Clamp Voltage	5	$V_{ZCD}$	$I_{ZCD}=3mA$	0.3	0.7	1	V
Sink Bias Current	5	$I_{ZCD}$	$1V \leq V_{ZCD} \leq 4.5V$		2		$\mu A$
Source Current Capability	5	$I_{ZCD}$		-3		-10	mA
Sink Current Capability	5	$I_{ZCD}$		3		10	mA
Disable threshold	5	$V_{DIS}$		100	200	300	mV
Restart Current After Disable	5	$I_{ZCD}$	$V_{ZCD} < V_{DIS}, V_{CC} > V_{COFF}$	-20	-50		$\mu A$
<b>OUTPUT SECTION</b>							
Dropout Voltage	7	$V_{GD}$	$I_{GD(SOURCR)}=200mA$		1.2	2	V
			$I_{GD(SOURCR)}=20mA$		0.8	1.2	V
			$I_{GD(SINK)}=200mA$		1.2	1.9	V
			$I_{GD(SINK)}=20mA$			1.2	V
Output Voltage Rise Time	7	$t_R$	$C_L=1nF$		40	100	ns
Output Voltage Fall Time	7	$t_F$	$C_L=1nF$		40	100	ns
IGD Sink Current	7	$I_{GD(OFF)}$	$V_{CC}=3.5V, V_{GD}=1V$	10	40		mA
<b>OUTPUT OVERVOLTAGE SECTION</b>							
OVP Triggering Current	2	$I_{OVP}$		30	40	50	$\mu A$
Static OVP Threshold				2.25	2.4	2.55	V
<b>RESTART TIMER</b>							
Start Timer		$t_{START}$		70	130	300	$\mu s$

Note: Parameter guaranteed by design, not tested in production.

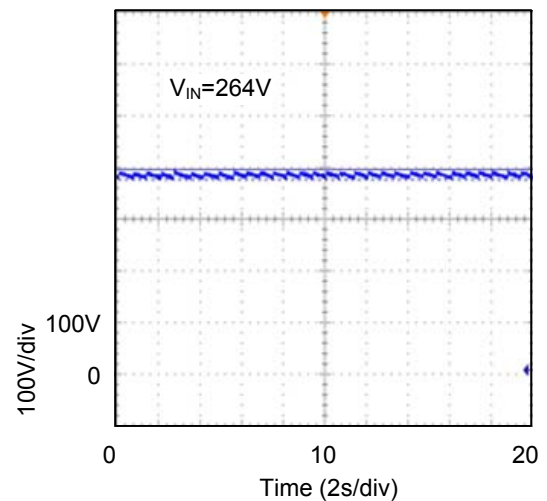
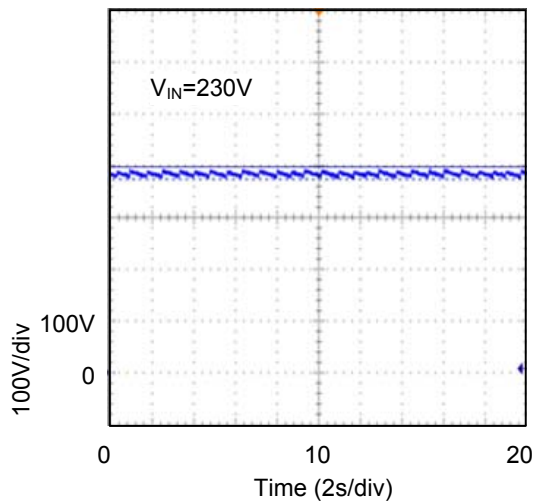
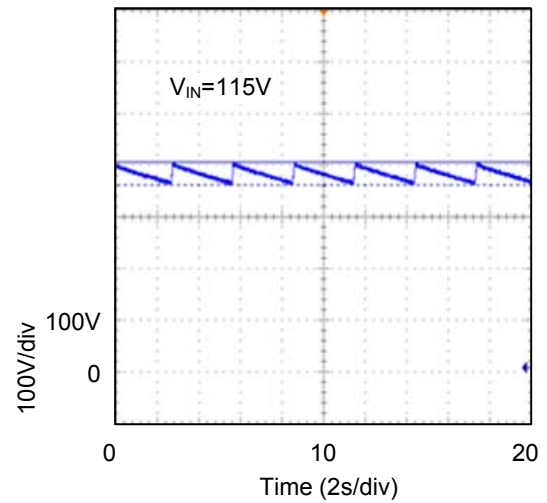
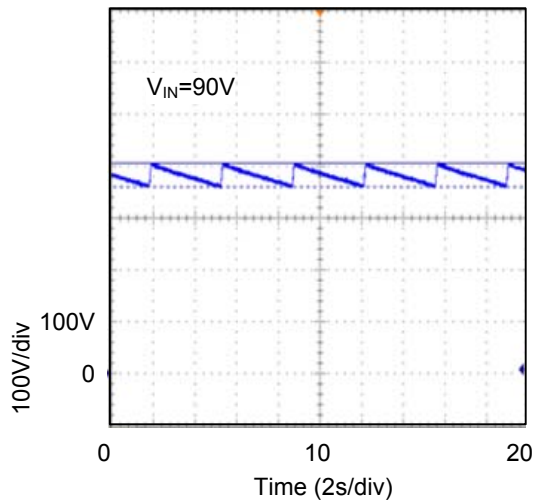
## ■ TYPICAL APPLICATION CIRCUIT

(150W, Wide-range Mains)



## ■ TYPICAL CHARACTERISTICS

### Output ripple at 0.5W



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