



## UCL2300

Preliminary

LINEAR INTEGRATED CIRCUIT

### PSR SINGLE-STAGE APFC OFFLINE LED DRIVER

#### DESCRIPTION

The UTC **UCL2300** is a high precision primary-side regulation controller with single stage Active PFC, specially designed for universal input offline flyback or buck-boost constant current LED lighting. The controller with on-chip PFC circuit achieves high power factor and low THD. Operating in critical conduction mode, the power MOSFET switching loss is reduced and the inductor is fully utilized.

The UTC **UCL2300** adopts proprietary primary side current sensing scheme. It can precisely control the LED current without secondary side sense and feedback circuits. The system size and cost are optimized, as well as the system reliability.

The UTC **UCL2300** utilizes patented line and load voltage compensation method to achieve excellent line and load regulation. And the line compensation factor can also be tuned externally for flexibility.

The UTC **UCL2300** offers rich protection functions to improve the system reliability, including LED open circuit protection, LED short circuit protection,  $V_{CC}$  over voltage protection,  $V_{CC}$  under voltage protection, CS resistor open protection and cycle by cycle current limit. All the protection functions are auto-recovery.

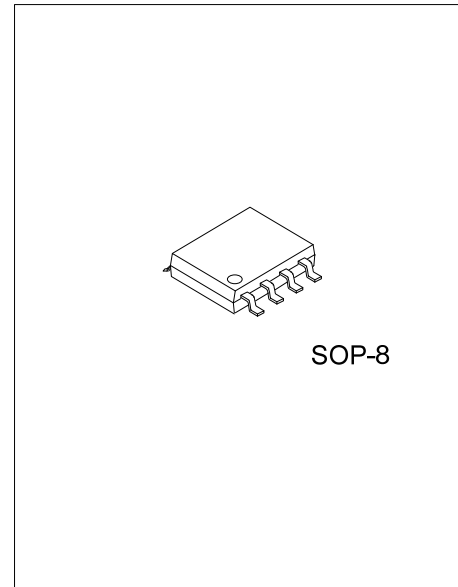
#### FEATURES

- \* Single-stage active PFC for high power factor and low THD
- \* Primary side control constant current operation, No opto-coupler required
- \* Ultrafast LED start (<200ms @85V)
- \*  $\pm 3\%$  LED current accuracy
- \* Excellent line and load regulation
- \* Critical conduction mode operation
- \* Source driving method
- \* Ultra-low (20 $\mu$ A) startup current
- \* Ultra-low (300 $\mu$ A) Operating current
- \* High resistance feedback resistor for improved efficiency
- \* LED open and short circuit protection
- \* CS resistor open and short circuit protection
- \* Transformer saturation protection
- \* Cycle-by-cycle current limit
- \*  $V_{CC}$  over-voltage and under-voltage protection
- \* Auto fault recovery

#### ORDERING INFORMATION

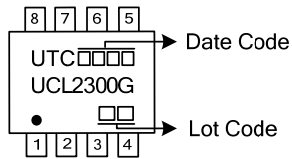
Ordering Number	Package	Packing
UCL2300G-S08-R	SOP-8	Tape Reel

<p>UCL2300G-S08-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free</p>
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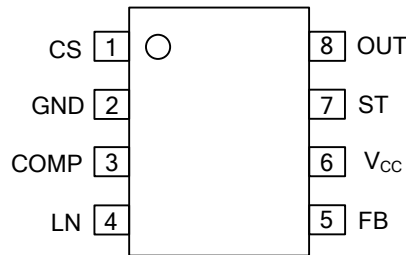


SOP-8

MARKING



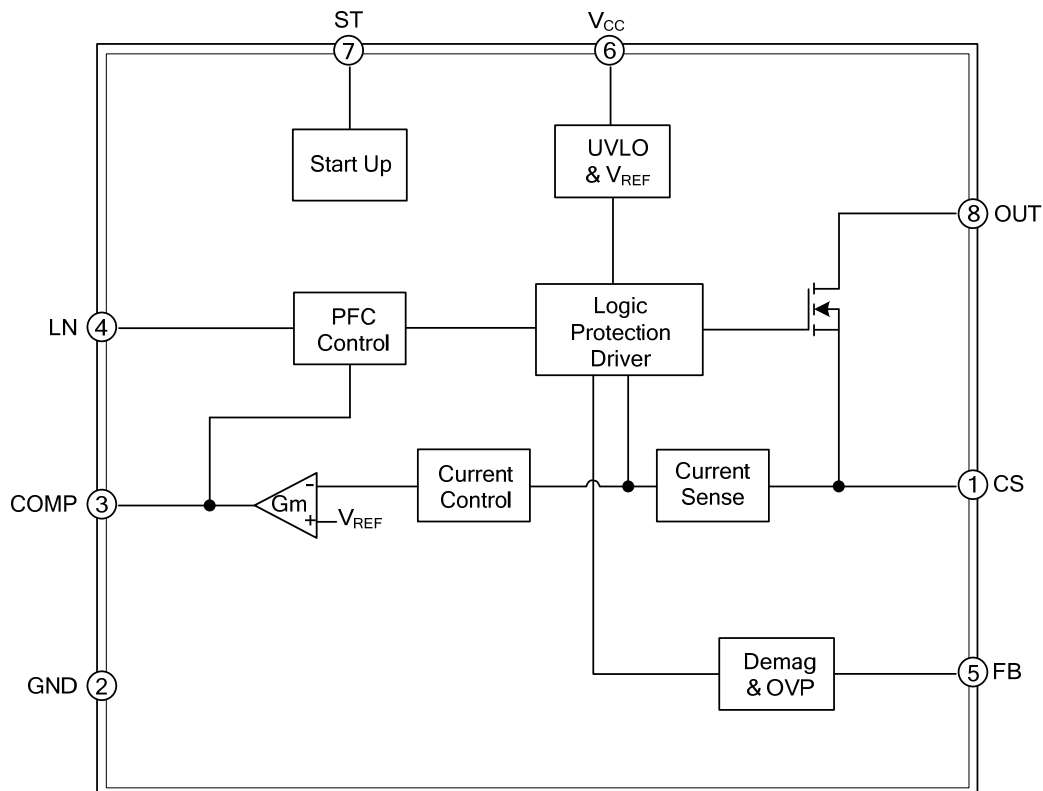
PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	CS	Current sense pin. Connect a resistor to GND to sense the power MOSFET current.
2	GND	Ground.
3	COMP	Loop compensation node.
4	LN	Line voltage sample input.
5	FB	Feedback voltage input Pin.
6	V <sub>CC</sub>	Power supply pin.
7	ST	Chip enable pin.
8	OUT	Pulse out pin. Connected to the 'Source' of external power MOSFET.

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
V <sub>CC</sub> Pin Input Voltage	V <sub>CC</sub>	-0.3~22	V
Current Sense Pin Input Voltage	CS	-0.3~6	V
Compensation Pin Voltage	COMP	-0.3~6	V
Line Voltage Sample Input	LN	-0.3~6	V
Feedback Pin Input Voltage	FB	-0.3~6	V
ST Pin Maximum Supply Current	I <sub>ST MAX</sub>	5	mA
External Power MOSFET Drive Voltage	OUT	-0.3~18	V
Maximum Work Current of Internal Power MOSFET	I <sub>OUT</sub>	3	A
Power Dissipation (Note 1)	P <sub>D MAX</sub>	0.45	W
Junction to Ambient	θ <sub>JA</sub>	145	°C/W
Junction Temperature	T <sub>J</sub>	-40~+150	°C
Storage Temperature	T <sub>STG</sub>	-55~+150	°C

Notes: 1. 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.

2. The maximum power dissipation decrease if temperature rise, it is decided by T<sub>J MAX</sub>, θ<sub>JA</sub>, and environment temperature (T<sub>A</sub>). The maximum power dissipation is the lower one between P<sub>D MAX</sub>=(T<sub>J MAX</sub>-T<sub>A</sub>)/ θ<sub>JA</sub> and the number listed in the maximum table.

■ RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Power Supply Voltage	V <sub>CC</sub>	11.5~17.5	V

■ ELECTRICAL CHARACTERISTICS (Notes 1, 2) (Unless otherwise specified,  $V_{CC}=14V$  and  $T_A=25^{\circ}C$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Startup Voltage</b>						
$V_{ST}$ Startup Voltage	$V_{ST\_ON}$	1mA, $V_{CC}=10V$	16	17	18	V
$V_{ST}$ Hysteresis Voltage	$V_{ST\_HYS}$	$V_{CC}=14V$		2		V
ST Startup Current	$I_{ST\_ON}$	$V_{CC}=10V$		20	35	$\mu A$
ST Operating Current	$I_{ST\_OP}$	$V_{CC}=14V$		35	60	$\mu A$
<b>Supply Voltage Section</b>						
$V_{CC}$ Startup Voltage	$V_{CC\_ON}$	$V_{CC}$ Rising	10	11	12	V
$V_{CC}$ Undervoltage Protection Threshold	$V_{CC\_UVLO}$	$V_{CC}$ Falling	5.2	5.8	6.5	V
$V_{CC}$ Hold Voltage	$V_{CC\_HOLD}$	$V_{CC}$ Falling	7	7.5	8	V
$V_{CC}$ Turn Off Current	$I_{CC\_UVLO}$	$V_{CC}$ Rising, $V_{CC}=10V$		40	70	$\mu A$
$V_{CC}$ Quiescent Current	$I_Q$	No Switch, $V_{CC}=14V$		320	600	$\mu A$
$V_{CC}$ Operating Current	$I_{CC}$	$F_{OP}=60kHz$		300		$\mu A$
$V_{CC}$ Over Voltage Protection Threshold	$V_{CC\_OVP}$			21		V
<b>FB Feedback</b>						
FB Falling Edge Threshold Voltage	$V_{FB\_FALL}$	FB Falling		0.4		V
FB Hysteresis Voltage	$V_{FB\_HYS}$	FB Rising		0.6		V
FB Over Voltage Protection Threshold	$V_{FB\_OVP}$			5.5		V
Minimum Off Time	$T_{OFF\_MIN}$			4.0		$\mu s$
Maximum Off Time	$T_{OFF\_MAX}$			90		$\mu s$
<b>Current Sense Section</b>						
Leading Edge Blanking Time for Current Sense	$T_{LEB\_CS}$			350		ns
Switch off Delay Time	$T_{DELAY}$			180		ns
<b>Loop Compensation</b>						
Internal Reference Voltage	$V_{REF}$		0.294	0.300	0.306	V
COMP Low Clamp Voltage	$V_{COMP\_LO}$			1.5		V
COMP Linear Operating Voltage Range	$V_{COMP}$		1.5		3.5	V
COMP Protection Threshold	$V_{COMP\_OVP}$			4.5		V
<b>Linear Voltage Sampling</b>						
LN Linear Working Range	$V_{LN}$		0		2.5	V
<b>Driver Stage</b>						
Internal Tube Driven MOS Resistance	$R_{DS\_ON}$	$V_{CC}=14V$		1200		m $\Omega$

Notes: 1. Production testing of the chip is performed at  $25^{\circ}C$ .

2. The maximum and minimum parameters specified are guaranteed by test, the typical value are guaranteed by design, characterization and statistical analysis

