

UNISONIC TECHNOLOGIES CO., LTD

### **UC3883**

Preliminary

CMOS IC

## **HIGH PERFORMANCE CURRENT MODE PWM** CONTROLLER WITH PEAK LOAD

### DESCRIPTION

UTC UC3883 is a highly integrated current mode PWM control IC optimized for high performance, low standby power and cost effective offline flyback converter applications.

PWM switching frequency at normal operation is internally fixed and is trimmed to tight range. At no load or light load condition, the IC operates in extended 'burst mode' to minimize switching loss. Lower standby power and higher conversion efficiency is thus achieved.

V<sub>CC</sub> low startup current and low operating current contribute to a reliable power on startup and low standby design with UTC UC3883.

UTC UC3883 offers complete protection coverage with auto-recovery including Cycle-by-Cycle current limiting (OCP), over load protection (OLP), over temperature protection (OTP) and V<sub>CC</sub> under voltage lockout (UVLO). It also provides the over voltage protection (OVP) protections with latched shut down. Excellent EMI performance is achieved with UTC proprietary frequency shuffling technique.

The tone energy at below 20KHZ is minimized in the design and audio noise is eliminated during operation.

#### **FEATURES**

- \* Power on Soft Start Reducing MOSFET V<sub>DS</sub> Stress
- \* Frequency shuffling for EMI
- \* Extended Burst Mode Control For Improved Efficiency and Minimum Standby Power Design
- \* Ultra Low Operating Current at Light Load (typical 0.6mA)
- \* Audio Noise Free Operation
- \* Normal 65KHz Switching Frequency
- \* Frequency Triple for peak load (180KHz)
- \* Adjustable Overload Protection (OLP) delay time
- \* Comprehensive Protection Coverage V<sub>CC</sub> Under Voltage Lockout with Hysteresis (UVLO) Cycle-by-cycle over current threshold setting for constant output power limiting over universal input voltage range Overload Protection (OLP) with autorecovery External (if NTC resistor is connected at CT/RT pin) or internal (if capacitor is connected at CT/RT pin) Over Temperature Protection (OTP) with autorecovery. V<sub>CC</sub> Over Voltage Protection (OVP) with latch shut down





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### ORDERING INFORMATION

Ordering Number		Deekere	Dealing	
Lead Free	Halogen Free	Раскаде	Packing	
UC3883L-AG6-A-R	UC3883G-AG6-A-R	SOT-26	Tape Reel	
UC3883L-AG6-B-R	UC3883G-AG6-B-R	SOT-26	Tape Reel	



#### MARKING





## UC3883

### PIN CONFIGURATION



#### PIN DESCRIPTION

PIN NO.			DESCRIPTION	
UC3883A	UC3883B		DESCRIPTION	
1	5	Vcc	Power Supply	
2	4	CS	Current sense input	
3	6	Gate	Totem-pole gate driver output for power MOSFET	
4	1	GND	Ground	
5	3	CT/RT	Dual functions pin. Connecting a NTC resistor to ground for over temperature control. Connecting a capacitor to ground sets OLP delay time	
6	2	FB	Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and the current-sense signal at Pin 4.	

#### BLOCK DIAGRAM





#### ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sub>cc</sub>	-0.3 ~ 36	V
Input Voltage to OUT Pin	V <sub>OUT</sub>	-0.3 ~ V <sub>CC</sub> +0.3	V
FB, CS, DEM		-0.3 ~ 6	V
Power Dissipation @ T <sub>A</sub> =+25°C	PD	400	mW
Junction Temperature	TJ	+150	°C
Operating Ambient Temperature	T <sub>OPR</sub>	-40 ~ +125	°C
Storage Temperature Range	T <sub>STG</sub>	-65 ~ +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.

#### RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	Vcc	9 ~ 28	V
Start up Resistor		0.86 ~ 4.4	MΩ
V <sub>CC</sub> Capacitor		2.2 ~ 4.7	μF

#### THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	250	°C/W

#### ■ ELECTRICAL CHARACTERISTICS (V<sub>CC</sub>=15V, T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT		
SUPPLY VOLTAGE								
	V <sub>CC(ON)</sub>	For UC3883A	18	20	22	V		
V <sub>CC</sub> (ON)		For UC3883B	13.8	15.3	16.8	V		
V <sub>CC</sub> (OFF)	V <sub>CC(MIN)</sub>		7.2	8.2	9.2	V		
Startup Current	I <sub>STR</sub>	V <sub>CC</sub> <v<sub>CC(ON)-0.5V</v<sub>		1.5	5	μA		
Operating Current		V <sub>FB</sub> =3V		0.85		mA		
Operating Current	I <sub>OP</sub>	V <sub>FB</sub> =Burst Level		0.5		mA		
V <sub>CC</sub> OVP Threshold	V <sub>CC(OVP)</sub>		28	30	32	V		
<b>OSCILLATOR &amp; SWITCHING FREQU</b>	OSCILLATOR & SWITCHING FREQUENCY							
Switching Frequency	F <sub>(SW)</sub>		60	65	70	KHz		
Temperature Stability	F <sub>DT</sub>	Guaranteed by Design			10	%		
Voltage Stability	F <sub>DV</sub>				10	%		
Green Mode Frequency	$F_{(SW_GR)}$		20			KHz		
Frequency Spreading Range	$\Delta$ OSC		+9		-9	%		
Max.Duty Cycle	DCMAX	V <sub>FB</sub> =3.9V	70	77	85	%		
VOLTAGE FEEDBACK								
Open Loop Voltage	V <sub>FB_Open</sub>		5.00	5.40	5.80	V		
OLP Level	$V_{FB_OLP}$			4.60		V		
OLP De-Bounce Time	$T_{D_OLP}$	V <sub>FB</sub> >5V	60	100	160	mS		
Burst-Mode Enter FB Voltage	V <sub>FB-IN</sub>			1.05		V		
Burst-Mode Quit FB Voltage	V <sub>FB-OUT</sub>			1.15		V		
FB Pin Short Current	I <sub>FB_SHORT</sub>			130		μA		



### ■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT		
Current Sensing								
Current Limiting Threshold Voltage	V <sub>CS_MAX</sub>	Read cs pin in testmode		0.88		V		
Current Limiting Threshold Voltage with 0% Duty	V <sub>CS_L</sub>	Read cs pin in testmode		0.43		V		
Lead Edge Blanking Time	T <sub>LEB</sub>	Guaranteed by Design		350		ns		
SDSP(Secondary Diode Short Protection) CS pin Level	V <sub>SCP</sub>	Guaranteed by Design		1.32		V		
CS DCOVP Level	V <sub>CS_DCOVP</sub>	Guaranteed by Design		0.44		V		
Soft Start Time		Guaranteed by Design		10		mS		
GATE DRIVE OUTPUT	GATE DRIVE OUTPUT							
Output Low Level	V <sub>OL</sub>	V <sub>CC</sub> =15V, I <sub>OUT</sub> =-20mA			1	V		
Output High Level	V <sub>OH</sub>	V <sub>CC</sub> =15V, I <sub>OUT</sub> =20mA	9			V		
Rising Time	t <sub>R</sub>	10% to 90% of $V_{OUT}$ , $C_L=1nF$		200		nS		
Falling Time	t <sub>F</sub>	90% to 10% of $V_{OUT}$ , $C_L=1nF$		60		nS		
Out Clamping	V <sub>clamp</sub>	V <sub>CC</sub> =20V		15		V		
CT/RT Detection		-						
	$T_{d\_OLP}$	C <sub>T</sub> =100nF		1				
OLP De-bounce time	$T_{d\_OLP\_inner}$	No capacitor connected to CT/RT		12		S		
OTP Threshold Level	V <sub>OTP</sub>		0.92	0.98	1.04	V		
Output current of CT/RT pin	I <sub>RT</sub>		94	100	106	μA		
OTP De-Bounce Time	T <sub>OTP</sub>	Guaranteed by Design			7	Times		
THERMAL SHUT DOWN								
OTP Threshold				150		°C		



#### VACin -||<sub>C4</sub> ₩ R7 EMI FILTER L1 D1 •} Rst 1.5M C5 Cbi С3 🗸 C1 🔁 Rst 1.5M D27 D4 D3 Ŧ C10 10uF C7 1uF ≶r3 **≶**R1 $\mathbf{F}_{R4}$ ≴¥ UTC UC3883 C2 łŀ CT/RT $V_{CC}$ W~ R5 D5 🖌 М1 R<sub>G</sub> Gate TL431 R8 cs FB \$<sup>R2</sup> ≥<sub>Rcs</sub> C6 K R101≶

#### **TYPICAL APPLICATION CIRCUIT**









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