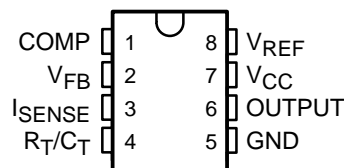


UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

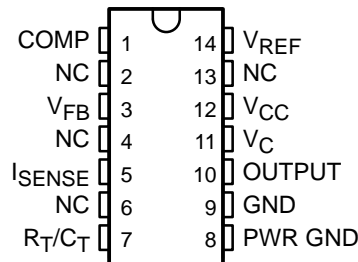
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- Extended Temperature Performance of -40°C to 125°C
- Optimized for Off-line and DC to DC Converters
- Low Start Up Current ($<0.5\text{ mA}$)
- Trimmed Oscillator Discharge Current
- Automatic Feed Forward Compensation
- Pulse-by-Pulse Current Limiting
- Enhanced Load Response Characteristics
- Under-Voltage Lockout With Hysteresis
- Double Pulse Suppression
- High Current Totem Pole Output
- Internally Trimmed Bandgap Reference
- 500 kHz Operation
- Low R_O Error Amp

D 8-PIN PACKAGE
(TOP VIEW)



D 14-PIN PACKAGE
(TOP VIEW)



description

The UC2842A/3A/4A/5A family of control ICs is a pin for pin compatible improved version of the UC2842/3/4/5 family. Providing the necessary features to control current mode switched mode power supplies, this family has the following improved features. Start up current is guaranteed to be less than 0.5 mA. Oscillator discharge is trimmed to 8.3 mA. During under voltage lockout, the output stage can sink at least 10 mA at less than 1.2 V for V_{CC} over 5 V.

The difference between members of this family are shown in the table below.

PART NUMBER	UVLO ON	UVLO OFF	MAXIMUM DUTY CYCLE
UC2842A	16 V	10 V	<100%
UC2843A	8.5 V	7.9 V	<100%
UC2844A	16 V	10 V	<50%
UC2845A	8.5 V	7.9 V	<50%



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

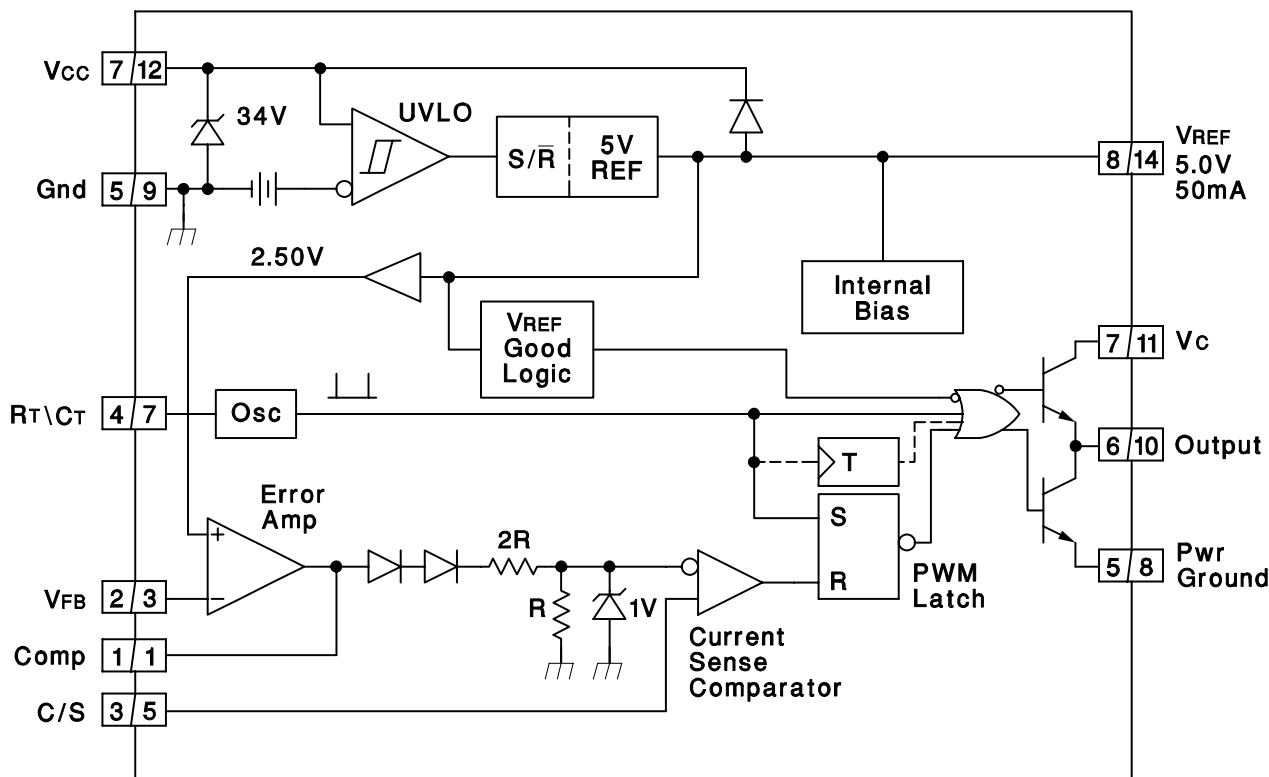
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ORDERING INFORMATION†

TA	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	SOIC-8 – D8	Tape and reel	UC2842AQD8R	2842AQ
	SOIC-8 – D8	Tube	UC2842AQD8	2842AQ
	SOIC-14 – D	Tape and reel	UC2842AQDR	2842AQ
	SOIC-14 – D	Tube	UC2842AQD	2842AQ
	SOIC-8 – D8	Tape and reel	UC2843AQD8R	2843AQ
	SOIC-8 – D8	Tube	UC2843AQD8	2843AQ
	SOIC-14 – D	Tape and reel	UC2843AQDR	2843AQ
	SOIC-14 – D	Tube	UC2843AQD	2843AQ
	SOIC-8 – D8	Tape and reel	UC2844AQD8R	2844AQ
	SOIC-8 – D8	Tube	UC2844AQD8	2844AQ
	SOIC-14 – D	Tape and reel	UC2844AQDR	2844AQ
	SOIC-14 – D	Tube	UC2844AQD	2844AQ
	SOIC-8 – D8	Tape and reel	UC2845AQD8R	2845AQ
	SOIC-8 – D8	Tube	UC2845AQD8	2845AQ
	SOIC-14 – D	Tape and reel	UC2845AQDR	2845AQ
	SOIC-14 – D	Tube	UC2845AQD	2845AQ

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

block diagram



- NOTES: 1. A = DIL-8 Pin Number. B = SO-14 Pin Number.
2. Toggle flip flop used only in 2844A and 2845A.

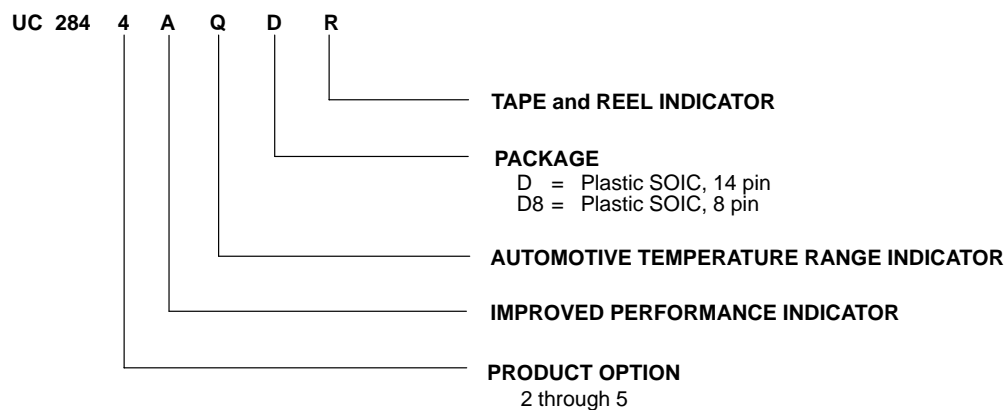


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UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

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Ordering Information



UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†‡

V_{CC} voltage (low impedance source)	30 V
V_{CC} voltage (I_{CC} mA)	self limiting
Output current, I_O	± 1 A
Output energy (capacitive load)	5 μ J
Analog Inputs (pins 3, 5)	-0.3 V to 6.3 V
Error Amp Output Sink current	10 mA
Power Dissipation at $T_A < +25^\circ\text{C}$ (D package)	1 W
Package thermal impedance, θ_{JA} (see Note 1): D (8-pin) package	97°C/W
Storage temperature range, T_{stg}	-65°C to 150°C
Lead temperature soldering 1,6 mm (1/16 inch) from case for 10 seconds	260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

‡ Unless otherwise indicated, voltages are reference to ground and currents are positive into and negative out of the specified terminals.

NOTE 1: Long term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See http://www.ti.com/ep_quality for additional information on enhanced plastic packaging.

electrical characteristics, $T_A = -40^\circ\text{C}$ to 125°C , $V_{CC} = 15$ V (see Note 1), $R_T = 10$ k Ω , $C_T = 3.3$ nF, and $T_A = T_J$ (unless otherwise stated)

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNITS	
Reference Section							
Output voltage	$T_J = 25^\circ\text{C}$, $I_O = 1$ mA		4.95	5.0	5.05	V	
Line regulation voltage	$V_{IN} = 12$ V to 25 V			6	20	mV	
Load regulation voltage	$I_O = 1$ mA to 20 mA			6	25	mV	
Temperature stability	See Notes 2 and 3			0.2	0.4	mV/ $^\circ\text{C}$	
Total output variation voltage	Line, Load, Temp.		4.9		5.1	V	
Output noise voltage	$f = 10$ Hz to 10 kHz, See Note 2	$T_J = 25^\circ\text{C}$		50		μ V	
Long term stability	1000 hours,	See Note 2		5	25	mV	
Output short-circuit current			-30	-100	-180	mA	
Oscillator Section							
Initial accuracy	See Note 4	$T_J = 25^\circ\text{C}$	47	52	57	kHz	
Voltage stability	$V_{CC} = 12$ V to 25 V			0.2	1	%	
Temperature stability	$T_A = \text{MIN to MAX}$, See Note 2			5		%	
Amplitude peak-to-peak	V pin 7,	See Note 2		1.7		V	
Discharge current	V pin 7 = 2 V,	See Note 5	$T_J = 25^\circ\text{C}$	7.8	8.3	8.8	mA
			$T_J = \text{Full range}$	7.5		8.8	



UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

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electrical characteristics, $T_A = -40^\circ\text{C}$ to 125°C , $V_{CC} = 15\text{ V}$ (see Note 1), $R_T = 10\text{ k}\Omega$, $C_T = 3.3\text{ nF}$, and $T_A = T_J$ (unless otherwise stated)

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNITS	
Error Amplifier Section							
Input voltage	COMP = 2.5 V		2.45	2.5	2.55	V	
Input bias current				-0.3	-1	μA	
Open loop voltage gain (A_{VOL})	$V_O = 2\text{ V}$ to 4 V		65	90		dB	
Unity gain bandwidth	See Note 2	$T_J = 25^\circ\text{C}$	0.7	1		MHz	
PSRR	$V_{CC} = 12\text{ V}$ to 25 V		60	70		dB	
Output sink current	FB = 2.7 V,	COMP = 1.1 V	2	6		mA	
Output source current	FB = 2.3 V,	COMP = 5 V	-0.5	-0.8		mA	
V_{OUT} high	FB = 2.3 V,	$R_L = 15\text{ k}\Omega$ to GND	5	6		V	
V_{OUT} low	FB = 2.7 V,	$R_L = 15\text{ k}\Omega$ to V_{REF}		0.7	1.1	V	
Current Sense Section							
Gain	See Notes 6 and 7		2.85	3	3.15	V/V	
Maximum input signal	COMP = 5 V,	See Note 6	0.9	1	1.1	V	
PSRR	$V_{CC} = 12\text{ V}$ to 25 V , See Note 6			70		dB	
Input bias current				-2	-10	μA	
Delay to output	$I_{SENSE} = 0\text{ V}$ to 2 V ,	See Note 2		150	300	ns	
Output Section (OUT)							
Low-level output voltage	$I_{OUT} = 20\text{ mA}$			0.1	0.4	V	
	$I_{OUT} = 200\text{ mA}$			15	2.2		
High-level output voltage	$I_{OUT} = -20\text{ mA}$		13	13.5		V	
	$I_{OUT} = -200\text{ mA}$		12	13.5			
Rise time	$C_L = 1\text{ nF}$,	See Note 2	$T_J = 25^\circ\text{C}$	50	150	ns	
Fall time	$C_L = 1\text{ nF}$,	See Note 2	$T_J = 25^\circ\text{C}$	50	150	ns	
UVLO saturation	$V_{CC} = 5\text{ V}$,	$I_{OUT} = 10\text{ mA}$		0.7	1.2	V	
Undervoltage Lockout Section							
Start threshold			UC2842A, UC2844A	15	16	17	V
			UC2843A, UC2845A	7.8	8.4	9	
Minimum operation voltage after turn on			UC2842A, UC2844A	9	10	11	V
			UC2843A, UC2845A	7	7.6	8.2	



UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

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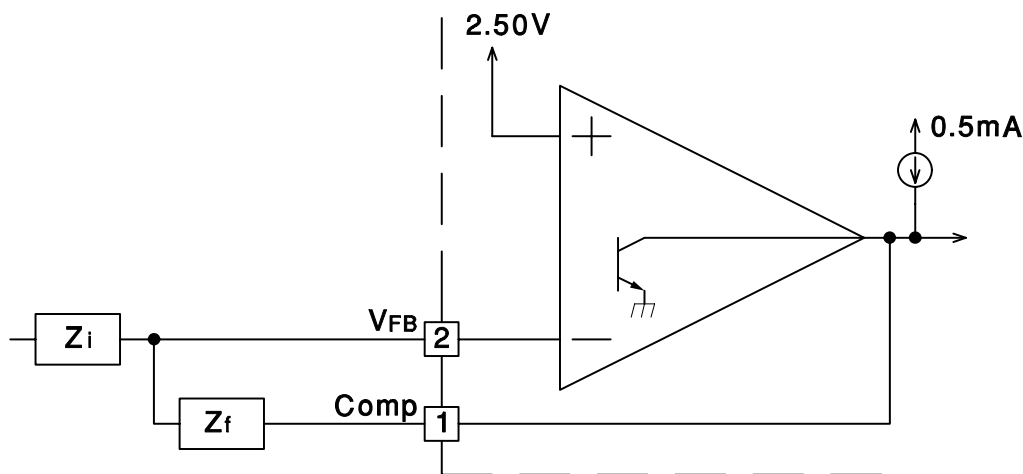
electrical characteristics, $T_A = -40^\circ\text{C}$ to 125°C , $V_{CC} = 15\text{ V}$ (see Note 1), $R_T = 10\text{ k}\Omega$, $C_T = 3.3\text{ nF}$, and $T_A = T_J$ (unless otherwise stated)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
PWM Section					
Maximum duty cycle	UC2842A, UC2843A	94	96	100	%
	UC2844A, UC2845A	47	48	50	
Minimum duty cycle				0	%
Total Standby Current					
Start-up current			0.3	0.5	mA
Operating supply current	FB = 0 V, SENSE = 0 V		11	17	mA
V_{CC} internal zener voltage	$I_{CC} = 25\text{ mA}$	30	34		V

- NOTES:
- Adjust V_{CC} above the start threshold before setting at 15 V.
 - Not production tested.
 - Temperature stability, sometimes referred to as average temperature coefficient, is described by the equation:

$$\text{Temp Stability} = \frac{V_{REF}(\text{max}) - V_{REF}(\text{min})}{T_J(\text{max}) - T_J(\text{min})}$$
 $V_{REF}(\text{max})$ and $V_{REF}(\text{min})$ are the maximum and minimum reference voltage measured over the appropriate temperature range. Note that the extremes in voltage do not necessarily occur at the extremes in temperature.
 - Output frequency equals oscillator frequency for the UC2842A and UC2843A. Output frequency is one half oscillator frequency for the UC2844A and UC2845A.
 - This parameter is measured with $R_T = 10\text{ k}\Omega$ to V_{REF} . This contributes approximately $300\text{ }\mu\text{A}$ of current to the measurement. The total current flowing into the R_T/C pin will be approximately $300\text{ }\mu\text{A}$ higher than the measured value.
 - Parameter measured at trip point of latch with V_{FB} at 0 V.
 - Gain is defined by: $A = \frac{\Delta V_{COMP}}{\Delta V_{SENSE}}$; $0 \leq V_{SENSE} \leq 0.8\text{ V}$.

PARAMETER MEASUREMENT INFORMATION



Error Amp can source and sink up to 0.5 mA, and sink up to 2 mA.

Figure 1. Error Amp Configuration

PARAMETER MEASUREMENT INFORMATION

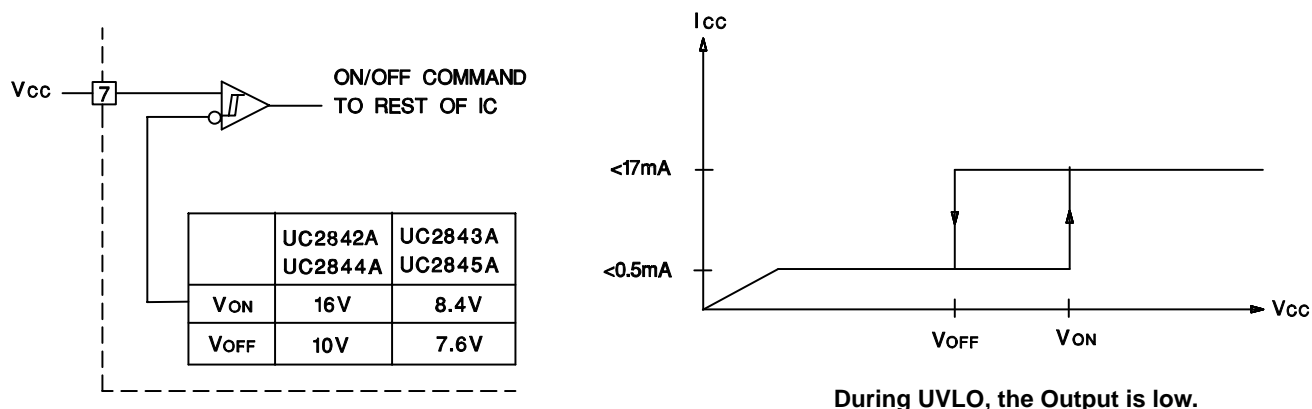
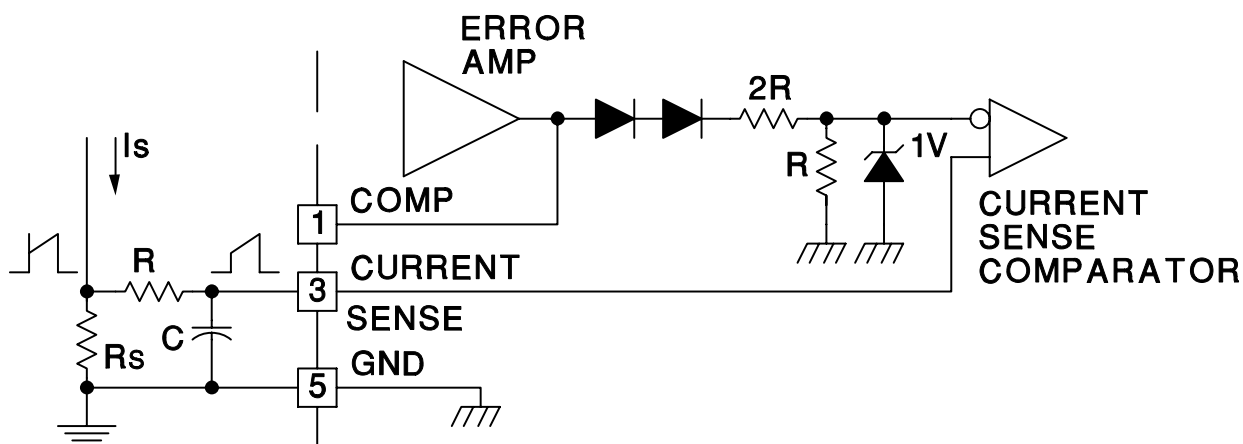


Figure 2. Under Voltage Lockout



Peak Current (Is) is Determined By The Formula:

$$I_{smax} = \frac{1.0V}{R_S}$$

A small RC filter may be required to suppress switch transients.

Figure 3. Current Sense Circuit

UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

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PARAMETER MEASUREMENT INFORMATION

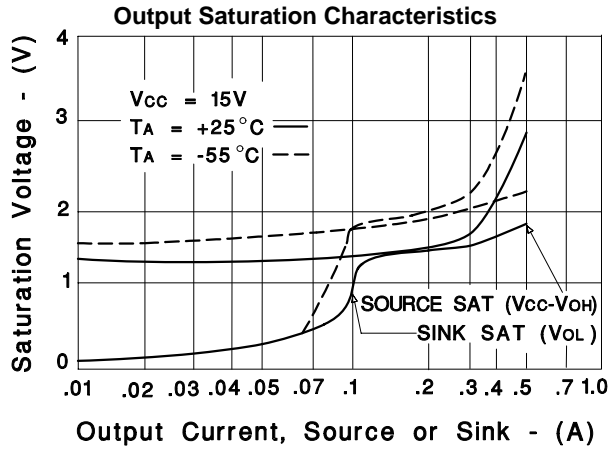


Figure 4

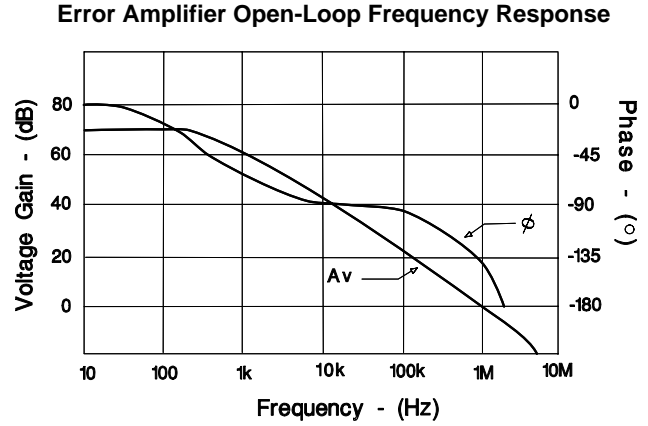


Figure 5

APPLICATION INFORMATION

AP

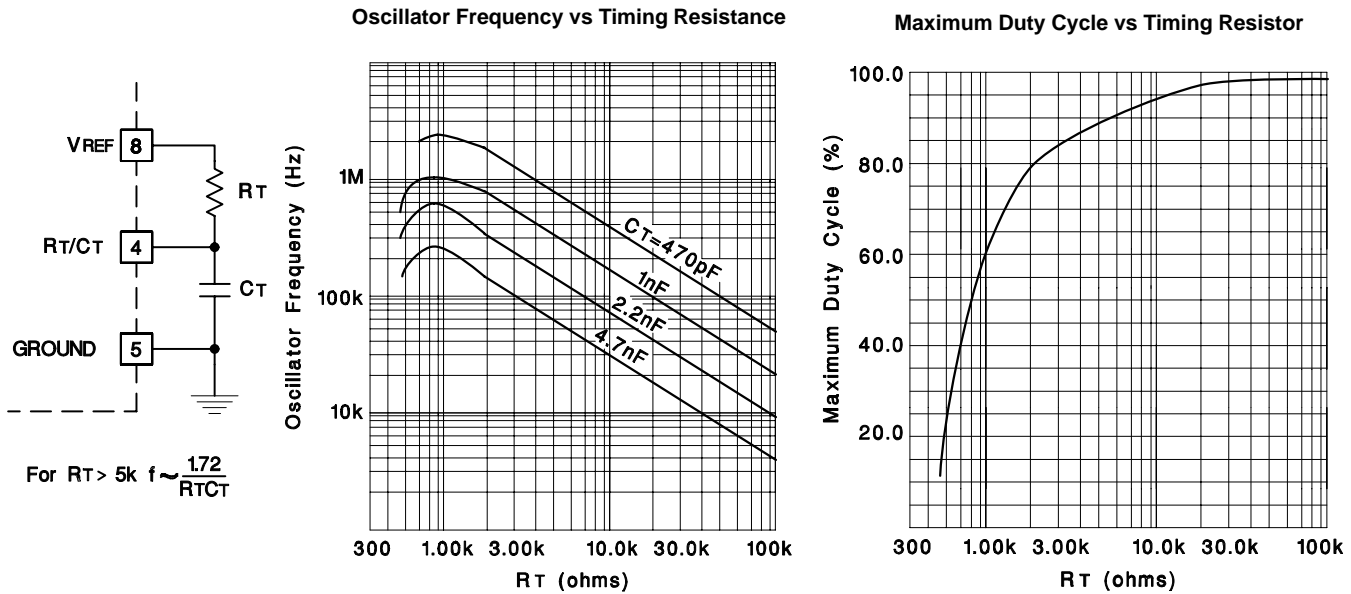
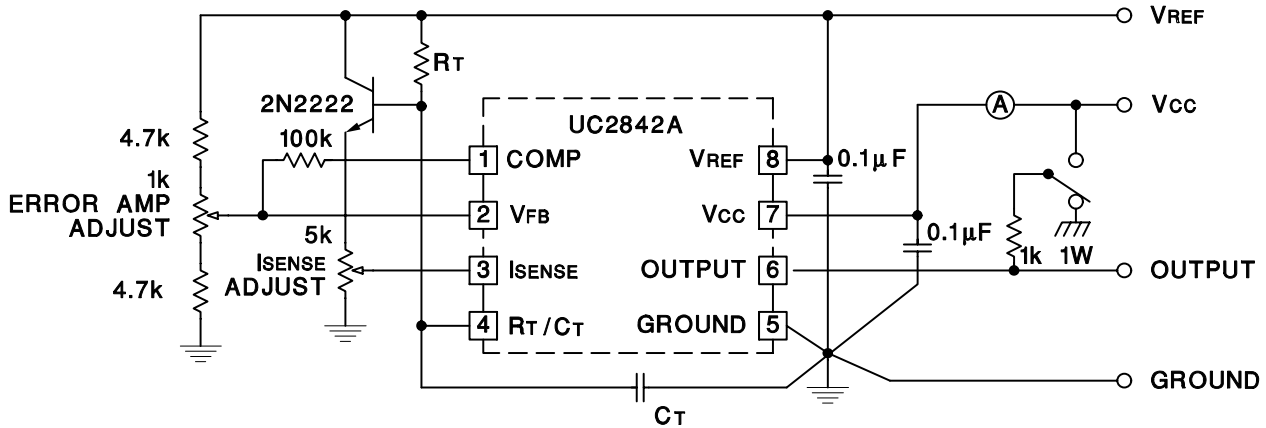


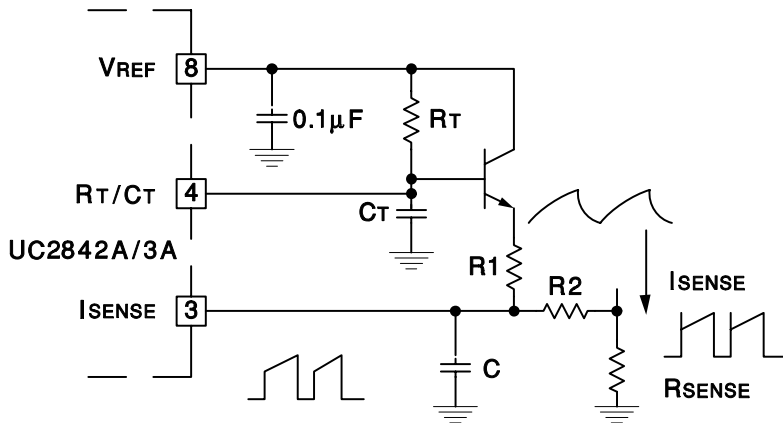
Figure 6. Oscillator

APPLICATION INFORMATION



High peak currents associated with capacitive loads necessitate careful grounding techniques. Timing and bypass capacitors should be connected close to pin 5 in a single point ground. The transistor and 5k potentiometer are used to sample the oscillator waveform and apply an adjustable ramp to pin 3.

Figure 7. Open-Loop Laboratory Text Fixture



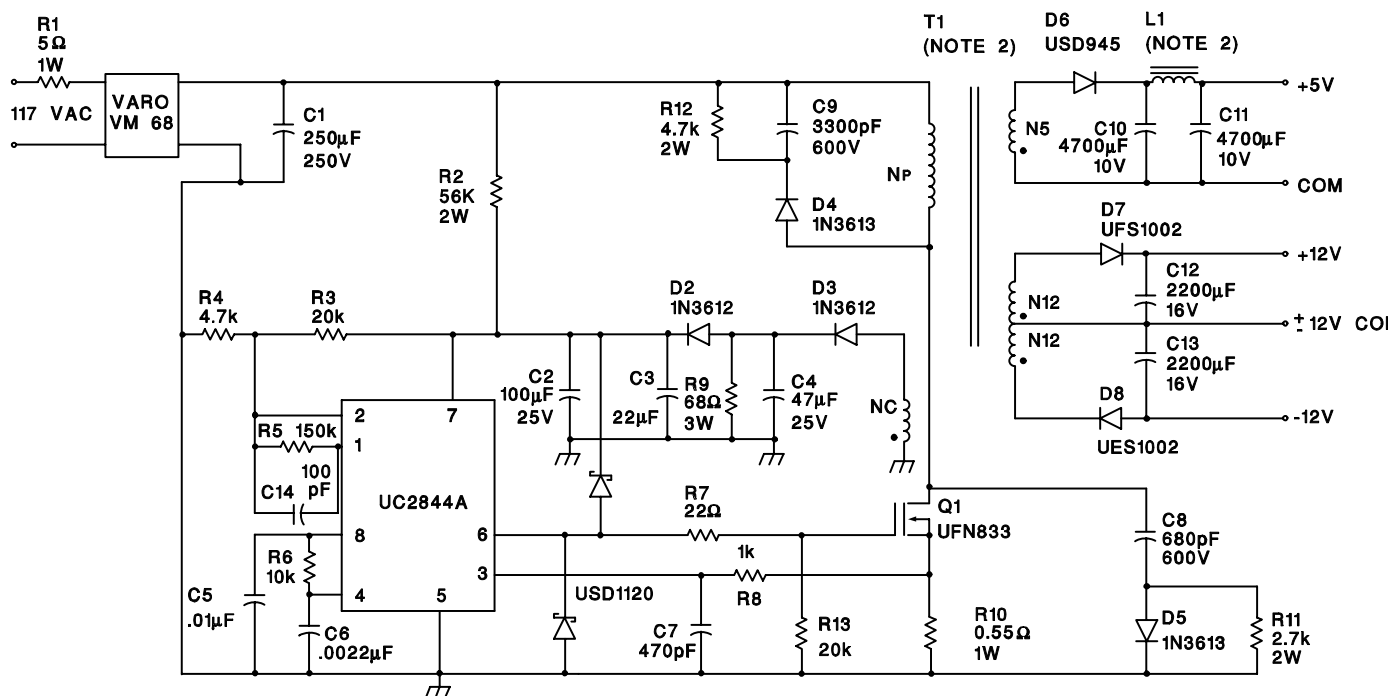
A fraction of the oscillator ramp can be resistively summed with the current sense signal to provide slope compensation for converters requiring duty cycles over 50%. Note that capacitor, C, forms a filter with R2 to suppress the leading edge switch spikes.

Figure 8. Slope Compression

UC2842AQ, UC2843AQ, UC2844AQ, UC2845AQ CURRENT-MODE PWM CONTROLLER

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APPLICATION INFORMATION



Power Supply Specifications

1. Input Voltage 95VAC to 130VAC (50Hz/60Hz)
2. Line Isolation 3750V
3. Switching Frequency 40 kHz
4. Efficiency, Full Load 70%
5. Output Voltage:
 - A. +5V, $\pm 5\%$; 1A to 4A Load
 - B. +12V, $\pm 3\%$; 0.1A to 0.3A Load Ripple voltage: 100 mV P-P Max
 - C. -12V, $\pm 3\%$; 0.1A to 0.3A Load Ripple voltage: 100 mV P-P Max

Figure 9. Off-Line Flyback Regulator

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
UC2842AQD8	LIFEBUY	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2842AQ, UC2842AQ)	
UC2842AQD8R	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2842AQ, UC2842AQ)	Samples
UC2842AQDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2842AQ, UC2842AQ)	Samples
UC2843AQD8	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2843AQ, UC2843AQ)	Samples
UC2843AQD8R	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2843AQ, UC2843AQ)	Samples
UC2843AQDR	LIFEBUY	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2843AQ, UC2843AQ)	
UC2845AQD8R	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2845AQ, UC2845AQ)	Samples
UC2845AQDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(2845AQ, UC2845AQ)	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
UC2842AQD8R	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
UC2842AQDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
UC2843AQD8R	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
UC2843AQDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
UC2845AQD8R	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
UC2845AQDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UC2842AQD8R	SOIC	D	8	2500	356.0	356.0	35.0
UC2842AQDR	SOIC	D	14	2500	356.0	356.0	35.0
UC2843AQD8R	SOIC	D	8	2500	356.0	356.0	35.0
UC2843AQDR	SOIC	D	14	2500	356.0	356.0	35.0
UC2845AQD8R	SOIC	D	8	2500	356.0	356.0	35.0
UC2845AQDR	SOIC	D	14	2500	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
UC2842AQD8	D	SOIC	8	75	506.6	8	3940	4.32
UC2843AQD8	D	SOIC	8	75	506.6	8	3940	4.32

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211283-3/E 08/12

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



D0008A

PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed $.006$ [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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