

ACOT™ (Advanced Constant-On Time) Synchronous Step-Down Converters

Introducing our new cost-effective, high performance ACOT Buck converters for Set Top Boxes, Industrial and commercial low power systems, computer peripherals and LCD Monitors and TVs.

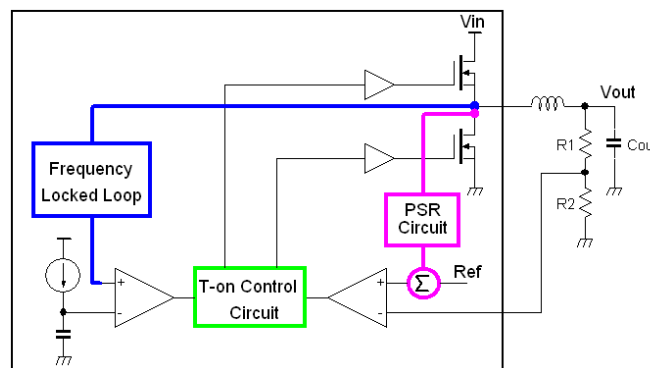
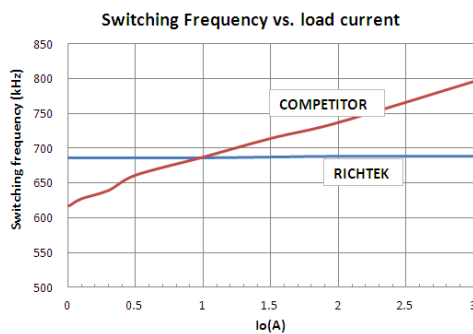
ACOT Key Features

The proprietary ACOT control scheme not only features ultra-fast transient response but also improves upon legacy constant on-time architectures, achieving constant average frequency over line, load and output ranges to minimize interference and noise problems. The ACOT Buck converters are stable with and optimized for ceramic output capacitors without external ripple injection scheme. The ACOT family includes latch-off, hiccup and constant current protection modes.

Richtek ACOT™ (Advanced Constant On Time) Synchronous Step-Down Converter

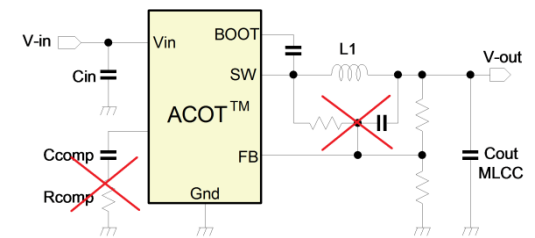
Constant Frequency

Frequency Locked Loop (FLL) provides constant average frequency over line & load.



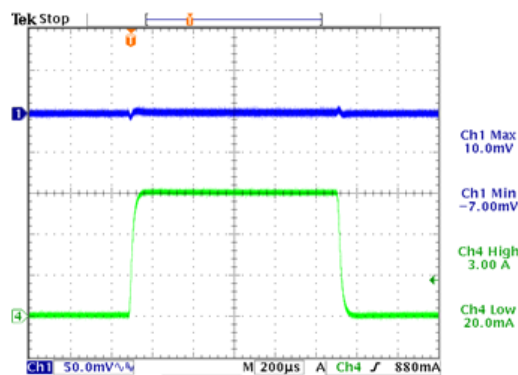
MLCC Suitable

Pulse Shaping Regulators (PSR™) supports MLCC-only operation with lowest component count.



Ultrafast Transient Response

T-on control with "instant on" response provides ultrafast transient response.



Comparison Table of Richtek Buck Topologies

Topology	Current Mode	CMCOT Current Mode Constant-On-Time	ACOT Advanced Constant-On-Time
Response to Load Steps	moderate	fast	extremely fast
Current Sense	current sense limits min. ON time	low side current sense	not required
Min. ON Time	larger, limits the min. achievable duty-cycle	small min. On time allows small duty-cycles	small min. On time allows small duty-cycles
Frequency	stable fixed f_{SW}	constant average f_{SW}	constant average f_{SW}
Stable with MLCC	√	√	√
Slope Compensation	√	not required	not required
Synchronized to ext. Clock	√	x	x
Applications	used for applications with steady load conditions. (some CM buck converters can be synchronized to an external clock)	used in applications with moderate load transients, or applications that require small minimum ON times (i.e. high switching frequency in combination with larger step-down ratios)	applications with severe fast load transients , such as DDR, Core SoC, FPGA and ASIC supplies

Which Buck topology is most suitable for your application?

Input voltage, output voltage and nature of the load will in most cases determine which topology is most suitable. Systems with **steady load conditions** can use **CM** buck converter. To avoid sensitive frequency bands, some CM buck converters can be **synchronized to an external clock**. Applications with **severe fast load transients** (such as seen in **Core and DDR rails**), should be driven by **ACOT** buck converters. Note that switching frequency can deviate considerably during dynamic loads. **CMCOT** buck converter performance lies in between CM and ACOT buck converters, so it can be used in applications with moderate load transients, or applications that require **small minimum ON times** (i.e. high switching frequency in combination with larger step-down ratios). The dynamic frequency deviation during load transients is less than ACOT.

For more information, please read the application notes "Comparing Buck converter topologies" and "Choosing the optimal Buck converter for your application".

Example of ACOT™ Product Overview: RT7275 & RT7276

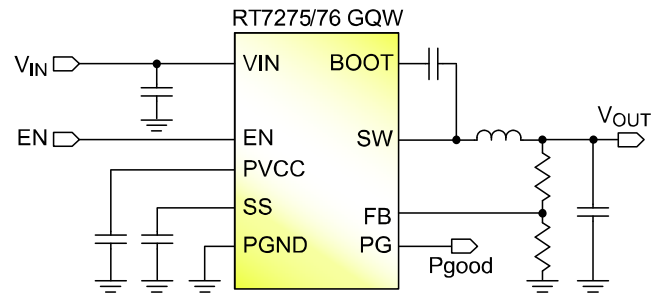
3A, 4.5V to 18V V_{IN} , 700kHz ACOT™ Synchronous Step-Down Converter

Datasheet RT7275/76 datasheet download (PDF, 356KB) [Get Free Samples](#)

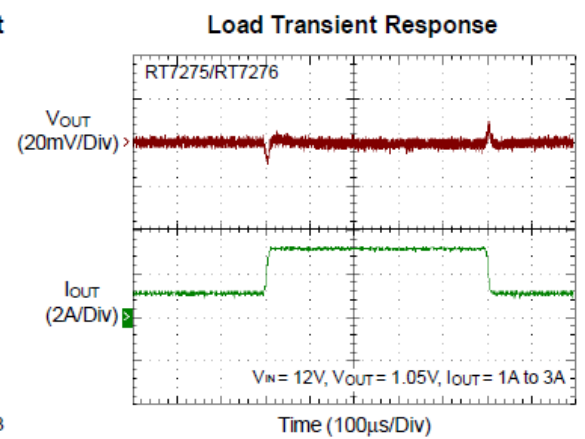
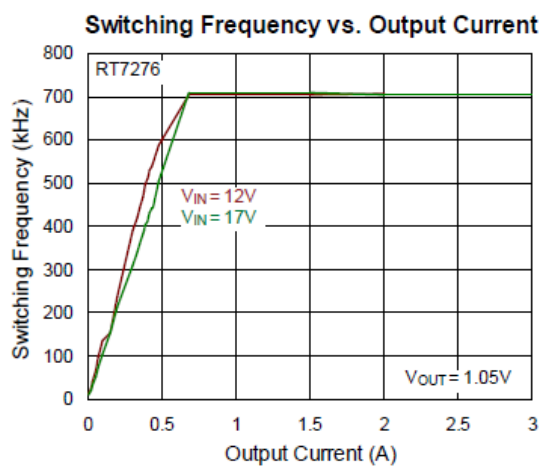
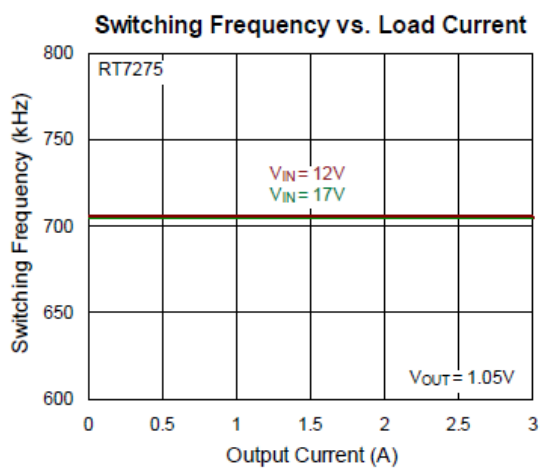
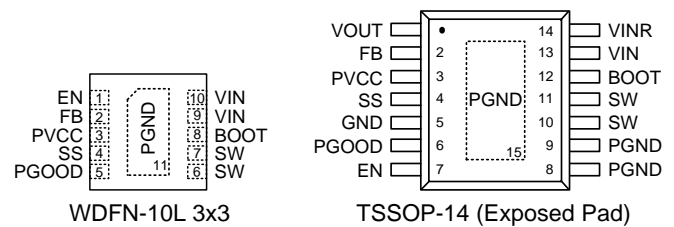
Features

- Ultra Fast Transient Response
- RT7275: Steady 700kHz Switching Frequency at all loads
- RT7276: Steady 700kHz Switching Frequency in continuous conduction mode
- Internal 90mΩ Switch and 60mΩ Synchronous Rectifier
- 0.765V to 8V Adjustable Output Voltage
- Optional Output Discharge Function(TSSOP-14 only)
- Power Good Indication
- Externally-adjustable, Pre-biased compatible Soft-Start
- Cycle-by-cycle current limit
- Current Limit with Latch-off Mode Under-Voltage Protection(TSSOP-14); Current Limit with Hiccup Mode Under-Voltage Protection (DFN-10L 3x3)
- Output Over-Voltage Protection

Simplified Application Circuit



Pin Configurations



ACOT™ Product Family and Sample Ordering Information

- V_{IN} range up to 6.0V, I_{OUT} up to 2A
- Key features: Power Good, low quiescent current, and $\pm 2\%$ V_{REF}

V_{IN}	Current rating	Package	f_{SW}	Over current behaviour	I_Q	P/N	
						PSM/PWM For enhanced light load efficiency	Force-PWM
2.5V-6.0V	2A	 WDFN-8JL 2x1.5 (FC)	1.5MHz	Cycle-by-cycle Current limit	22 μ A	RT5784A ^{*Coming soon}	RT5784B ^{*Coming soon}
		 TSOT-23-8 (FC)				RT5785A ^{*Coming soon}	RT5785B ^{*Coming soon}
2.5V-5.5V		 WDFN-8SL 2x2	2.7MHz		30 μ A	RT5795A	-

- V_{IN} range up to 18.0V, I_{OUT} up to 3A in SOT-23 and WDFN 2x3 small packages
- Key features: simple and easy low BOM cost design with excellent FCOL thermal performance, 500kHz f_{SW} and $\pm 1.5\%$ V_{REF}

V_{IN}	Current rating	Package	Over current behaviour		P/N	
			Hiccup	Constant current	PSM/PWM For enhanced light load efficiency	Force-PWM
4.3V-18V	1.5A	 SOT-23-8	✓		RT7255A	
				✓	RT7255B	
			✓			RT7255C
				✓		RT7255D
4.5V-18V	2A	 WDFN-8L 2x3	✓		RT6232A	RT6232B
	2.5A (3A peak)		✓		RT6233A	RT6233B
	3A		✓		RT6234A ^{*Coming soon}	RT6234B ^{*Coming soon}
4.3V-18V	1.5A	 T/SOT-23-6	✓		RT7285A	
				✓	RT7285B	
			✓			RT7285C
				✓		RT7285D
4.5V-18V	1.5A	 SOT-23-6	✓		RT6211A	
			✓			RT6211B
4.3V-18V	2.5A (3A peak)	 TSOT-23-6 (FC)	✓		RT7294A	
				✓	RT7294B	
			✓			RT7294C
4.5V-18V	2A	 TSOT-23-6 (FC)	✓		RT6212A	
			✓			RT6212B
	2.5A (3A peak)		✓		RT6213A	
			✓			RT6213B
4.3V-18V	3A (3.5A peak)	 TSOT-23-6 (FC)	✓		RT7295A	
				✓	RT7295B	
			✓			RT7295C
				✓		RT7295D
4.5V-18V	3A	 TSOT-23-6 (FC)	✓		RT6214A	
			✓			RT6214B

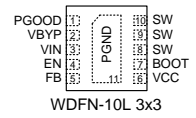
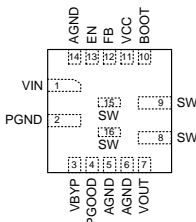
- V_{IN} range up to 18.0V, I_{OUT} up to 5.5A in TSSOP-14, WDFN and SOP-8 packages
- Key features: high performance, programmable Soft-Start, Power Good in TSSOP-14 & WDFN-10L 3x3, 650kHz f_{SW} and $\pm 1\%$ V_{REF}

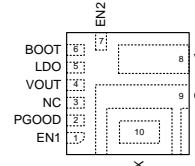
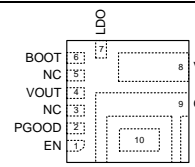
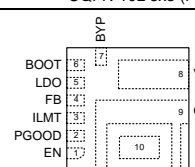
V_{IN}	Current rating	Package	Features		Over current behaviour			P/N	
			Power Good	V_{OUT} Discharge function	Latch-off	Hiccup	Constant current	PSM/PWM For enhanced light load efficiency	Force-PWM
4.5V-18V	2A	<p>TSSOP-14 (Exposed Pad)</p>	✓	✓	✓			RT7280GCP	RT7279GCP
	3A		✓	✓	✓			RT7276GCP	RT7275GCP
	4A		✓	✓	✓			RT7232GCP	RT7231GCP
	5A		✓	✓	✓			RT7236GCP	RT7235GCP
	2A	<p>WDFN-10L 3x3</p>	✓			✓		RT7280GQW	RT7279GQW
	3A		✓			✓		RT7276GQW	RT7275GQW
	4A		✓			✓		RT7232GQW	RT7231GQW
	5A		✓			✓		RT7236GQW	RT7235GQW
	5.5A		✓			✓		RT6206BHGQW	RT6206AHGQW
	2A	<p>SOP-8 (Exposed Pad)</p>					✓	RT7274GSP	RT7281GSP
	3A						✓	RT7278GSP	RT7277GSP
	4A						✓	RT7234GSP	RT7233GSP
	4A					✓		RT6201AHGSP	RT6201BHGSP
	5A						✓	RT7240GSP	RT7239GSP
	5A					✓		RT6202AHGSP	RT6202BHGSP
5.5A					✓		RT6206BHGSP	RT6206AHGSP	

- V_{IN} range up to 18.0V, I_{OUT} up to 12A in UQFN packages
- Key features: high current ACOT parts, programmable Soft-Start, Power Good, FCOL technology for low parasitic and good thermal performance and $\pm 1.0\%$ V_{REF}

V_{IN}	Current rating	Package	f_{SW}	Over current behaviour	R_{ON}	P/N	
						PSM/PWM For enhanced light load efficiency	Force-PWM
4.5V-18V	5A	<p>UQFN-13JL 2x3 (FC)</p>	650kHz	Cycle-by-cycle Current limit	60m/22m	RT6207A	RT6207B
	6A					51m/18m	RT6236A
	7A	<p>UQFN-14L 2x3 (FC)</p>			40m/16m	RT6237A	RT6237B
	8A				35m/14m	RT6238A	RT6238B
	9A				30m/12m	RT6239A	RT6239B
	12A	<p>UQFN-16JL 3x3 (FC)</p>			Adj. f_{SW} from 300kHz to 700kHz	Adj. current limit from 10A to 15A	12m/5.4m

- V_{IN} range up to 23.0V, I_{OUT} up to 8A in WDFN, UQFN packages
- Key features: 500kHz, Power Good and $\pm 1\%$ V_{REF} accuracy.

Vin	Current rating	Package	Over current behaviour		RDSON	P/N	
			Latch-off	Hiccup		PSM/PWM For enhanced light load efficiency	Force-PWM
5V-23V	4A	 WDFN-10L 3x3	✓		67mΩ/41mΩ	RT6219A	RT6219BL
				✓	67mΩ/41mΩ	RT6219AH	RT6219BH
	6A	 UQFN-16L 3x3 (FC)	✓		31mΩ/20mΩ	RT6220A	RT6220BL
				✓	31mΩ/20mΩ	RT6220AH	RT6220BH

VIN	Current rating	Package	Over current behaviour	With LDO	Buck VOUT	RDSON	P/N
							PSM/PWM For enhanced light load efficiency
5V-23V	8A	 RT7238B UQFN-10L 3x3 (FC)	Cycle-by-cycle Current limit	70mA, 3.35VLDO	Fixed 3.3V	27mΩ/10mΩ	RT7238B
		 RT7238C/E UQFN-10L 3x3 (FC)		70mA, 5.1VLDO	Fixed 5.0V		RT7238C
		 RT7238D UQFN-10L 3x3 (FC)		70mA, Adj. VLDO,	Adj. VOUT 0.6V– 5.0V		RT7238D

Technical Support

ACOT™ Video
ACOT™ video Youtube



ACOT™ video Tudou: ENGLISH,CHINESE
ACOT™ video YouKu: ENGLISH,CHINESE

Richtek Designer

- ACOT Stability Design Tool



Application Note

- SOT-23 FCOL Thermal considerations
- ACOT™ Stability Testing
- Comparing Buck converter topologies
- Choosing the optimal Buck converter for your application