FICE

ACE2596

150KHz 3A Buck DC-DC Converter

Description

The ACE2596 series of regulators are fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A load with excellent line and load regulation. These regulators include internal frequency compensation and a fixed frequency oscillator so that they are easy to use. A system adopting ACE2596 requires a minimum number of external components to work.

A standard series of inductors, optimized for use with the ACE2596 series, are available from several manufacturers. This feature greatly simplifies the design of switch-mode power supplies.

These ICs are available in TO-263-5 packages.

Features

- 3.3V, 5V, 12V Fixed(±4% Tolerance) and Adjustable (±3% Tolerance) Output Versions
- Guaranteed 3A Output Load Current
- 150kHz Fixed Frequency Internal Oscillator
- Input Voltage Range up to 32V
- Requires only 4 external components
- High Efficiency up to 90%
- Excellent Line and Load Regulation
- TTL Shutdown Capability
- Low Power Standby Mode, I_Q Typically 80μA
- Built-in Current Limit Protection and Thermal Shutdown Circuit

Application

- LCD Monitor and LCD TV
- On-Card DC-DC Converter
- DVD Recorder
- PDP

Absolute Maximum Ratings

Parameter	Symbol	Max	Unit	
Input voltage	Vin	40	V	
 ON/OFF Pin Voltage	V_N/OFF	40	V	
Feedback Pin Voltage	V_{FB}	40	V	
Operating Junction Temperature	T_J	150	°C	
Thermal Resistance (Junction to Ambient, No Heatsink) TO-263-5		$R_{\theta JA}$	60	°C/W
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C	
Storage Temperature Range	T _{STG}	-65 to150	°C	

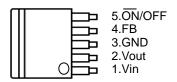
Note: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device ate these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.



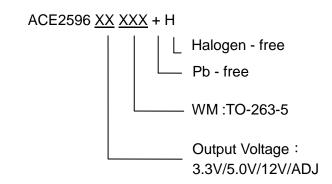


Packaging Type

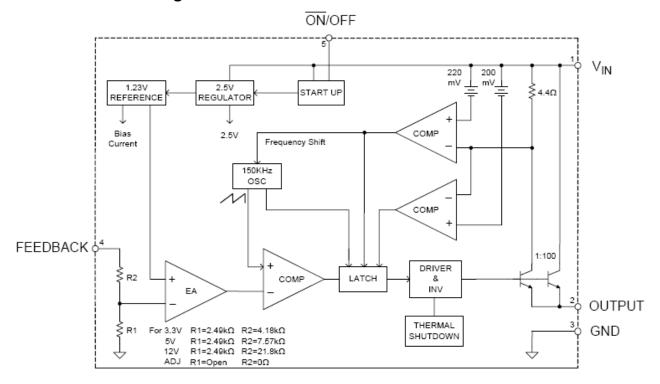
TO-263-5 (WM)



Ordering information



Functional Block Diagram





150KHz 3A Buck DC-DC Converter

Recommended Operating Conditions

Parameter	Symbol	Value	Unit		
	3.3V		32		
	5.0V		32		
Maximum Input Voltage (Note 2)	12V	V_{IN}	32	V	
	ADJ (V _{OUT} =3.2V)		32		
	ADJ (V _{OUT} =2.5V)		25		
Operating Junction Tem	TJ	-40 to 125	°C		

Note: For ADJ version, the recommended supply voltage depends on the needed output voltage.

Electrical Characteristics

For 3.3V Output Voltage Version

Unless otherwise specified, $T_J=25^{\circ}\mathbb{C}$, The specifications with boldface type apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Output	VOUT	$5.5V \leq V_{IN} \leq 32V$,	3.168	3.3 3.432 3.465	V	
	VO01	$0.2A \leq I_{LOAD} \leq 3A$	3.135		3.465	V
Efficiency	η	V_{IN} =12V, I_{LOAD} =3A		75	_	%

For 5V Output Voltage Version

Unless otherwise specified, $T_J=25^{\circ}C$, The specifications with boldface type apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Output	VOUT	7V≦V _{IN} ≦32V,	4.800	5	5.200	V
	VO01	$0.2A \leq I_{LOAD} \leq 3A$	4.750	4.750	5.250	
Efficiency	η	$V_{IN}=12V$, $I_{LOAD}=3A$		80		%

For 12V Output Voltage Version

Unless otherwise specified, $T_J=25^{\circ}C$, The specifications with boldface type apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Output	VOUT	15V≦V _{IN} ≦32V,	11.52	12.0	12.48	V
	VO01	$0.2A \le I_{LOAD} \le 3A$	11.40	12.0	12.60	
Efficiency	η	V_{IN} =24V, I_{LOAD} =3A		88		%



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For ADJ Output Voltage Version

Unless otherwise specified, $T_J=25^{\circ}C$, The specifications with boldface type apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Output	VOUT	$4.5V \leqq V_{\text{IN}} \leqq 32V, \\ 0.2A \leqq I_{\text{LOAD}} \leqq 3A \\ V_{\text{OUT}} \text{ programmed for 2.5V}$	1.193 1.180	1.23	1.267 1.280	V
Efficiency	η	V_{IN} =12V, I_{LOAD} =3A, V_{OUT} =2.5V		73		%

Electrical Characteristics

For AallOutput Voltage Versions

Unless otherwise specified, V_{IN} =12V for 3.3V, 5V and adjustable version, V_{IN} =24V for 12V version, I_{LOAD} =500mA, T_J =25 $^{\circ}$ C. Specifications with boldface type apply over Full Operating Junction Temperature Range.

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Feedback Bias Current	I _{FB}	Adjustable Version Only, V _{FB} =1.3V		10	50 100	nA
Oscillator Frequency	f	(Note 3)	127 110	150	173 173	kHz
Saturation Voltage	V _{SAT}	I _{LOAD} =3A (No output devices, V _{FB} =0V)		1.2	1.5 1.6	V
Maximum Duty Cycle	D _{MAX}	V _{FB} =0V		100		%
Minimum Duty Cycle	D _{MIN}	V _{FB} =1.3V		0		%
Current Limit	I _{CL}	Peak Current, No output devices, V _{FB} =0V	3.6 3.4	4.5	6.9 7.5	Α
Outrot Lookers Comment		Output=0V, No output devices, $V_{FB} = 1.3V$, $V_{IN} = 32V$		50		μΑ
Output Leakage Current	I _{SWL}	Output=-1V, No output devices, $V_{FB} = 1.3V$, $V_{IN} = 32V$		2	30	mA
Quiescent Current	I_Q	V _{FB} =1.3V		5	10	mA
Standby Quiescent Current	I _{STBY}	 ON/OFF Pin=5V, V _{IN} =18V		80	200 250	μA
_	V_{IL}	Regulator ON			0.6	V
ON/OFF Pin Logic Input Threshold Voltage	V _{IH}	Regulator OFF	2.0			V
_	I _H	V _{PIN5} =2.5V (Regulator OFF)		5	15	μΑ
ON/OFF Pin Input Current	Ι _L	V _{PIN5} =2.5V (Regulator ON)		0.02	5	μΑ

Note:

- 1. The switching frequency is reduced when the second stage current limit is activated.
- 2. The specifications with boldface are GBD (Guaranteed By Design).



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Typical Performance Characteristics

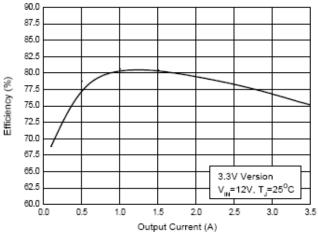


Figure 1. Efficiency vs. Output Current

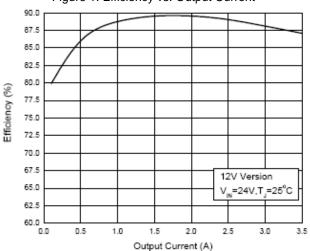


Figure 3. Efficiency vs. Output Current

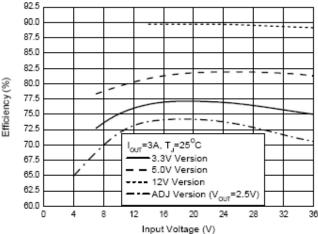


Figure 5. Efficiency vs. Input Current

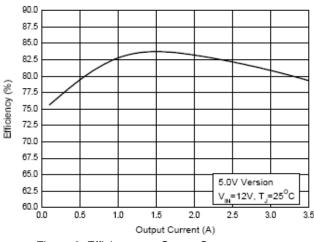


Figure 2. Efficiency vs. Output Current

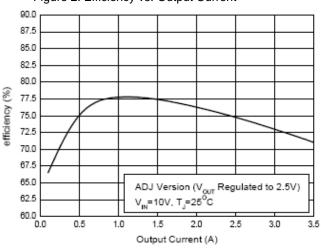


Figure 4. Efficiency vs. Output Current

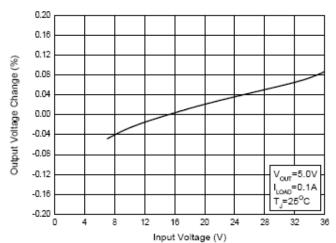


Figure 6. Line Regulation



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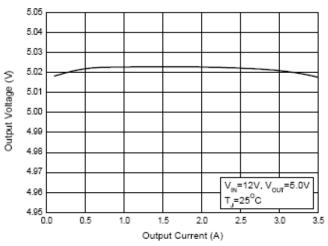


Figure 7. Load Regulation

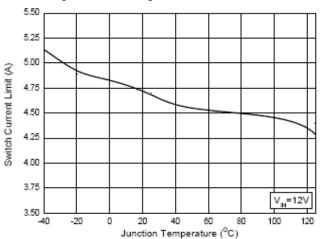


Figure 9. Switch Current Limit vs. Junction Temperature

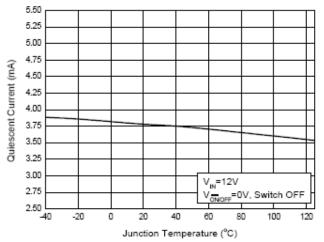


Figure 11. Quiescent Current Limit vs. Junction Temperature

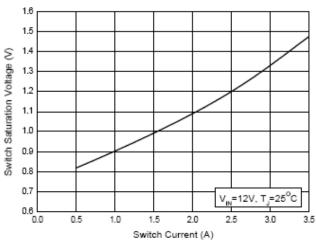


Figure 8. Switch Saturation Voltage vs. Switch Current

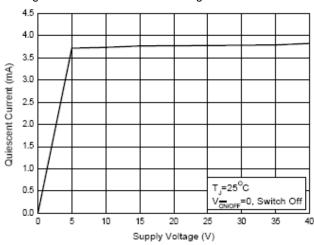


Figure 10. Quiescent Current vs. Supply Voltage

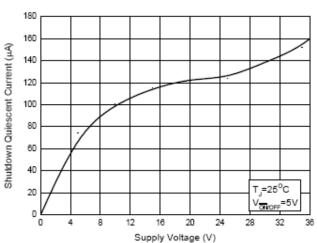


Figure 12. Shutdown Quiescent Current vs. Input Voltage



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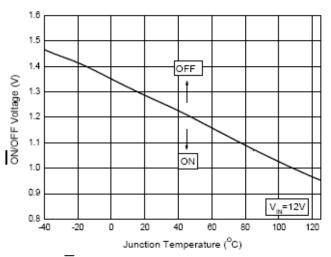


Figure 13. $\overline{\text{O}}\text{n/Off}$ Threshold Voltage vs. Junction Temperature

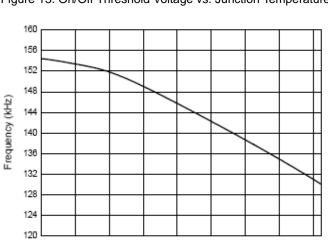


Figure 15. Switching Frequency vs. Junction Temperature

Junction Temperature (^OC)

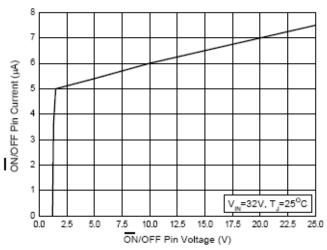
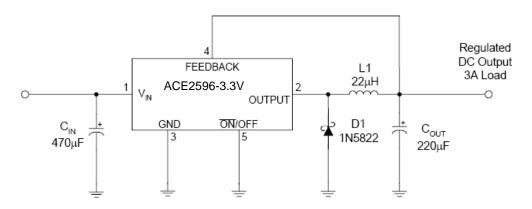


Figure 14. On/Off Pin Current vs. On/Off Pin Voltage



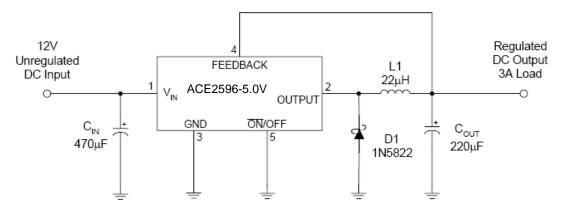


Typical Application



L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 16. Typical Application of ACE2596-3.3V

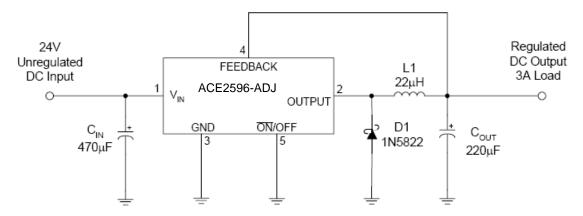


L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 17. Typical Application of ACE2596-5.0V

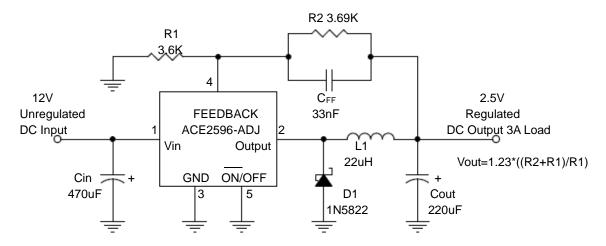


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L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 18. Typical Application of ACE2596-12V



L1: Sumida CDRH127/LDNP-220MC or Equivalent

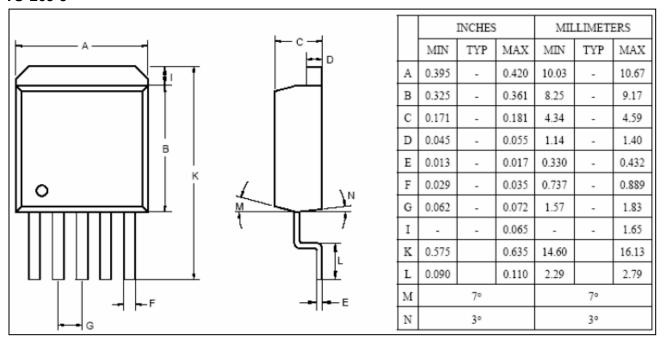
Figure 19. Typical Application of ACE2596-ADJ



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Packing Information

TO-263-5





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Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As sued herein:

- 1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and shoes failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- 2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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