



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($\pm 4\%$ Tolerance) and Adjustable ($\pm 3\%$ 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 80 μ A
- 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		V_{IN}	40	V
$\overline{ON/OFF}$ Pin Voltage		$V_{\overline{ON/OFF}}$	40	V
Feedback Pin Voltage		V_{FB}	40	V
Operating Junction Temperature		T_J	150	$^{\circ}C$
Thermal Resistance (Junction to Ambient, No Heatsink)	TO-263-5	$R_{\theta JA}$	60	$^{\circ}C/W$
Lead Temperature (Soldering, 10sec)		T_{LEAD}	260	$^{\circ}C$
Storage Temperature Range		T_{STG}	-65 to 150	$^{\circ}C$

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 at 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.

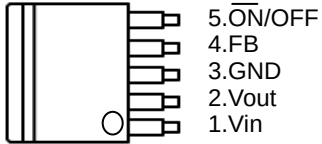


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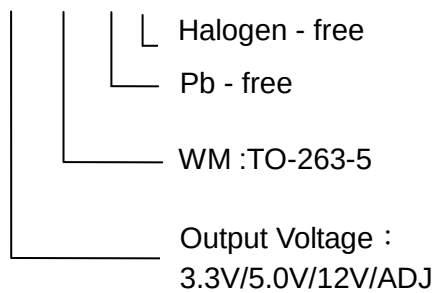
Packaging Type

TO-263-5 (WM)

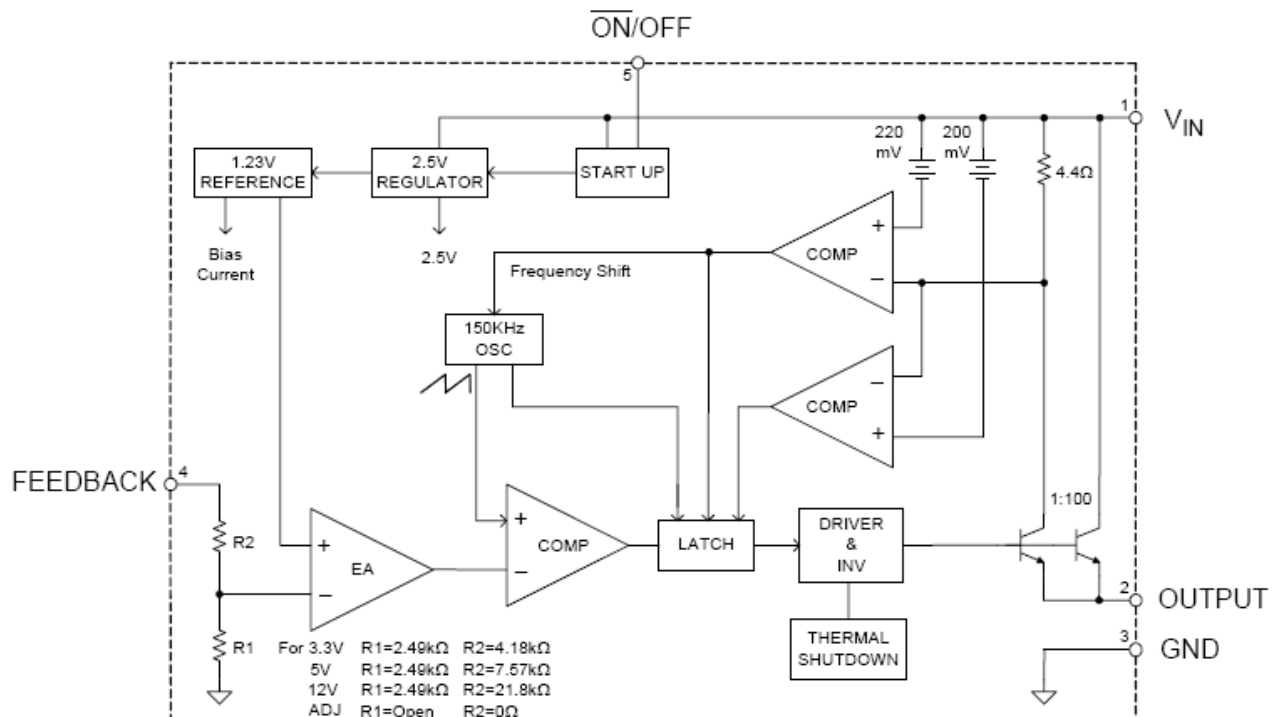


Ordering information

ACE2596 XX XXX + H



Functional Block Diagram





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Recommended Operating Conditions

Parameter		Symbol	Value	Unit
Maximum Input Voltage (Note 2)	3.3V	V_{IN}	32	V
	5.0V		32	
	12V		32	
	ADJ ($V_{OUT}=3.2V$)		32	
	ADJ ($V_{OUT}=2.5V$)		25	
Operating Junction Temperature		T_J	-40 to 125	$^{\circ}C$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output	V_{OUT}	$5.5V \leq V_{IN} \leq 32V$, $0.2A \leq I_{LOAD} \leq 3A$	3.168 3.135	3.3	3.432 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	Typ	Max	Unit
Output	V_{OUT}	$7V \leq V_{IN} \leq 32V$, $0.2A \leq I_{LOAD} \leq 3A$	4.800 4.750	5	5.200 5.250	V
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	Typ	Max	Unit
Output	V_{OUT}	$15V \leq V_{IN} \leq 32V$, $0.2A \leq I_{LOAD} \leq 3A$	11.52 11.40	12.0	12.48 12.60	V
Efficiency	η	$V_{IN}=24V$, $I_{LOAD}=3A$		88		%



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For ADJ Output Voltage Version

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output	V _{OUT}	$4.5\text{V} \leq V_{\text{IN}} \leq 32\text{V}$, $0.2\text{A} \leq I_{\text{LOAD}} \leq 3\text{A}$ V _{OUT} 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 All Output Voltage Versions

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

Parameter	Symbol	Conditions	Min	Typ	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	A
Output Leakage Current	I _{SWL}	Output=0V, No output devices, V _{FB} =1.3V, V _{IN} =32V		50		μA
		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
ON/OFF Pin Logic Input Threshold Voltage	V _{IL}	Regulator ON			0.6	V
	V _{IH}	Regulator OFF	2.0			V
ON/OFF Pin Input Current	I _H	V _{PIN5} =2.5V (Regulator OFF)		5	15	μA
	I _L	V _{PIN5} =2.5V (Regulator ON)		0.02	5	μA

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

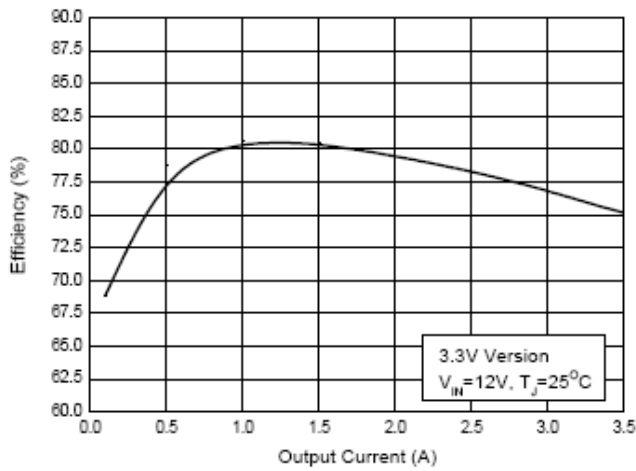


Figure 1. Efficiency vs. Output Current

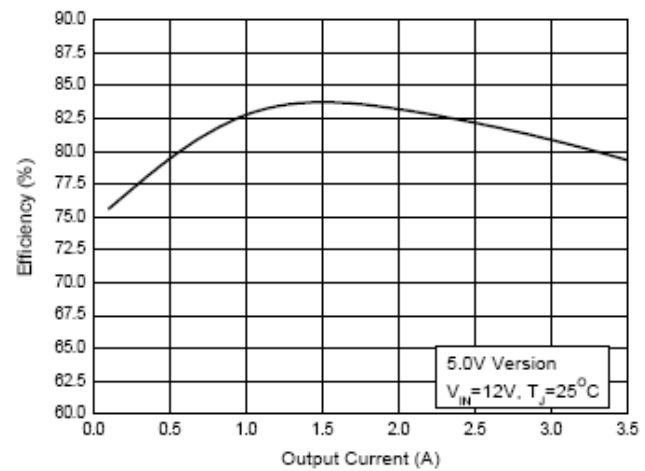


Figure 2. Efficiency vs. Output Current

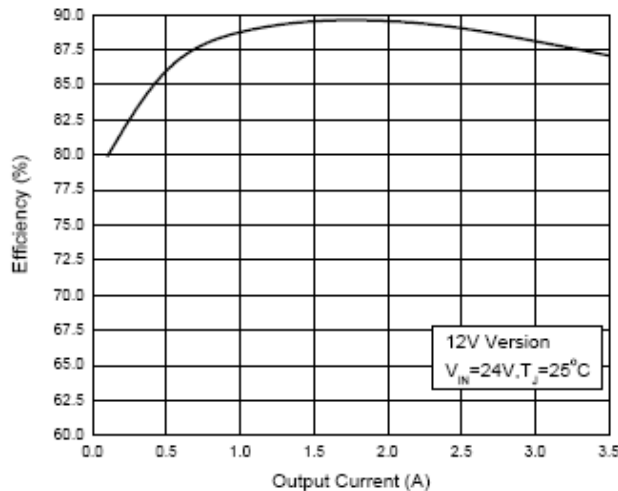


Figure 3. Efficiency vs. Output Current

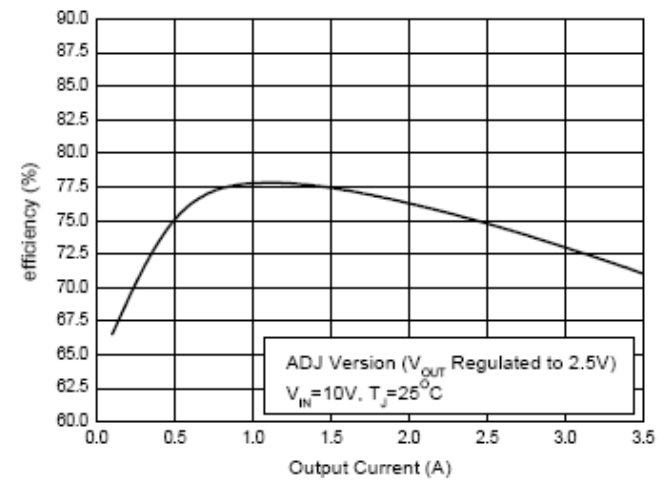


Figure 4. Efficiency vs. Output Current

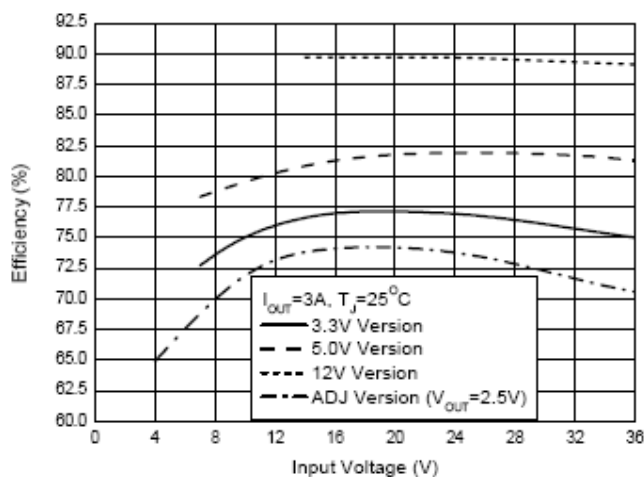


Figure 5. Efficiency vs. Input Current

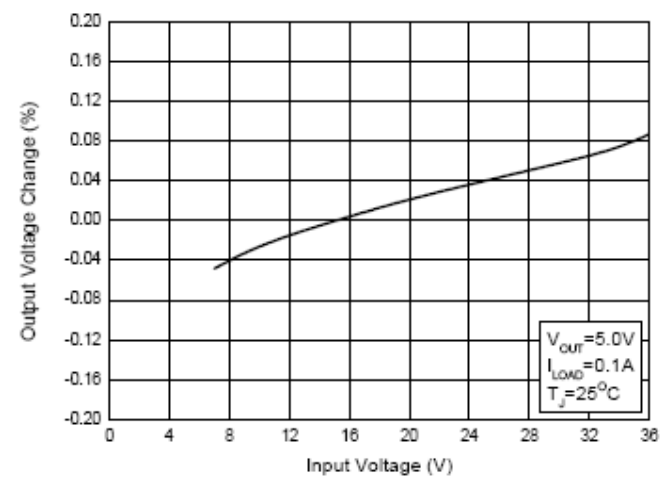


Figure 6. Line Regulation



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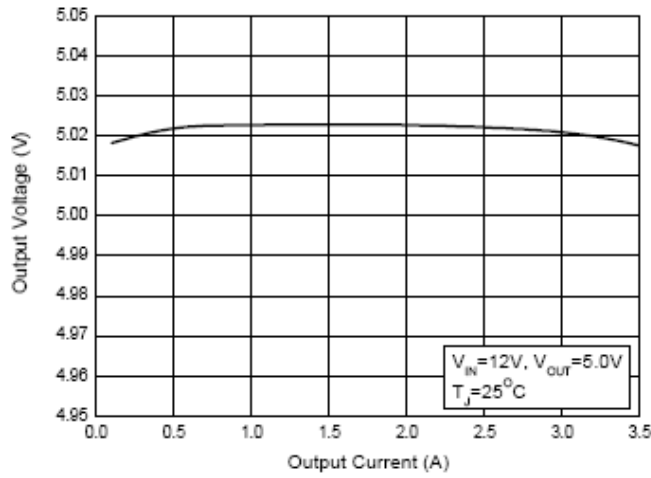


Figure 7. Load Regulation

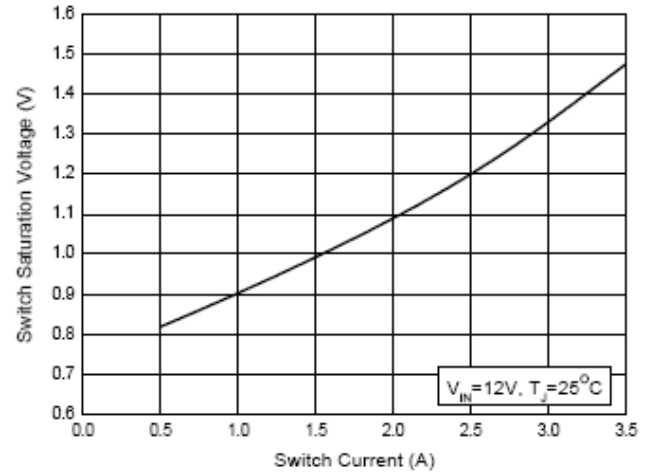


Figure 8. Switch Saturation Voltage vs. Switch Current

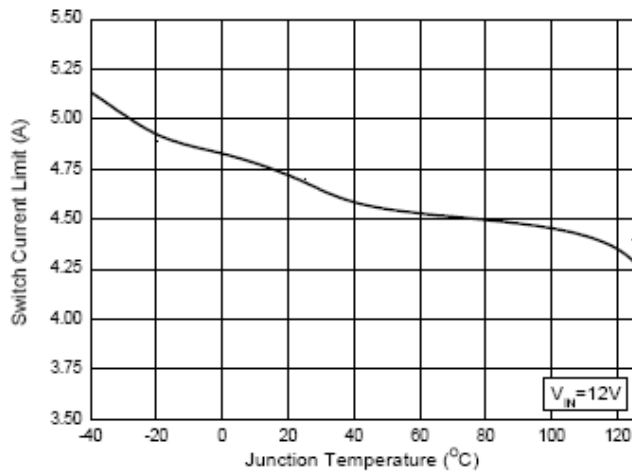


Figure 9. Switch Current Limit vs. Junction Temperature

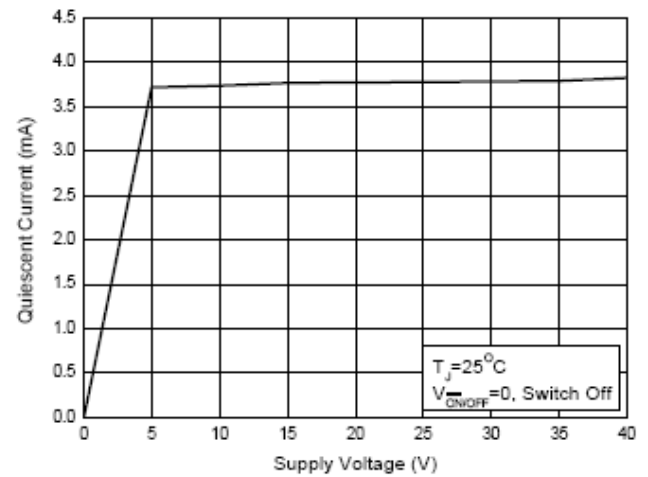


Figure 10. Quiescent Current vs. Supply Voltage

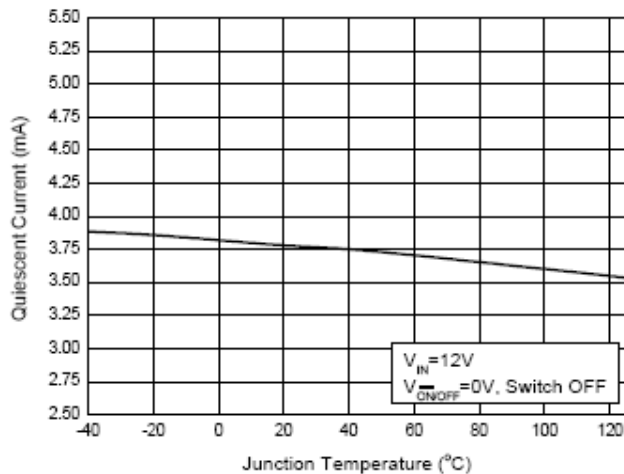


Figure 11. Quiescent Current Limit vs. Junction Temperature

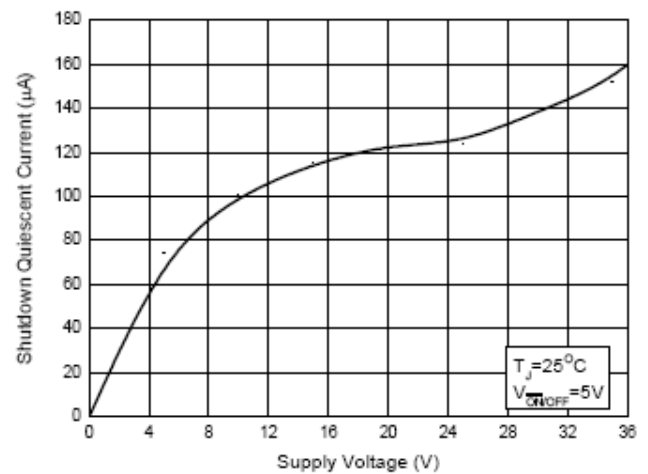


Figure 12. Shutdown Quiescent Current vs. Input Voltage



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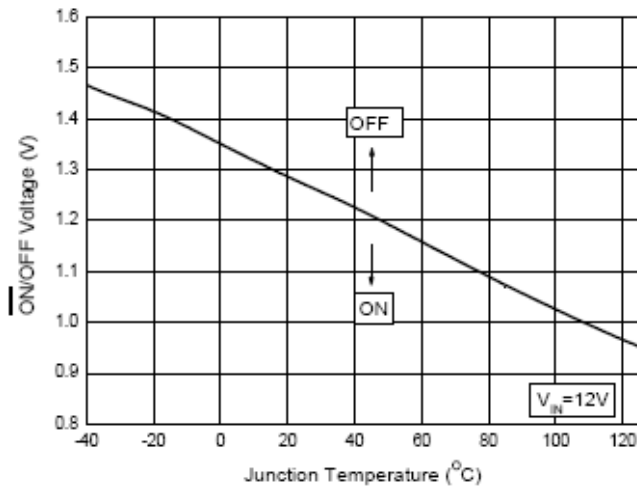


Figure 13. On/Off Threshold Voltage vs. Junction Temperature

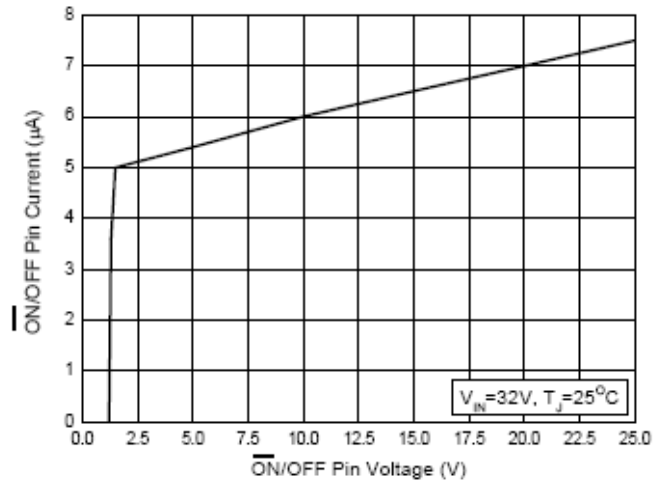


Figure 14. On/Off Pin Current vs. On/Off Pin Voltage

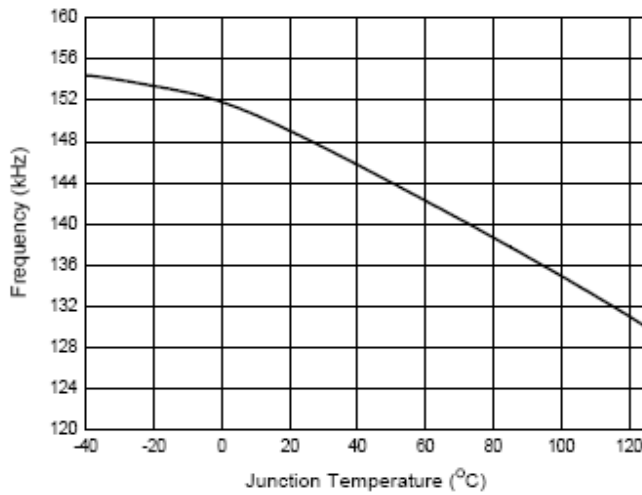


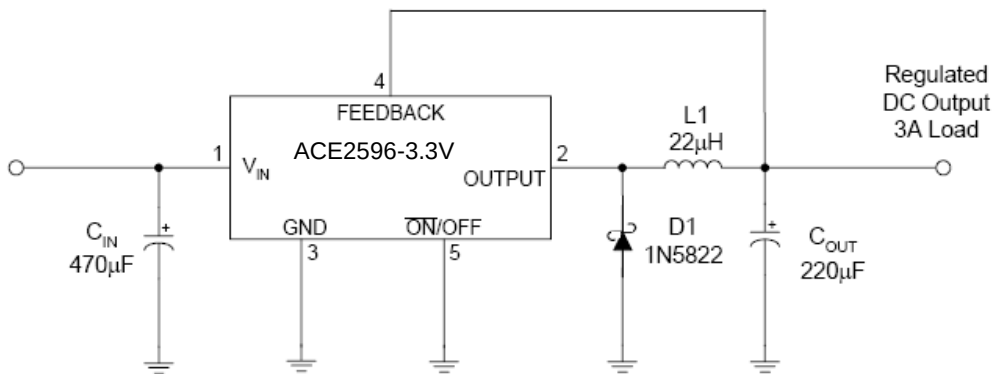
Figure 15. Switching Frequency vs. Junction Temperature



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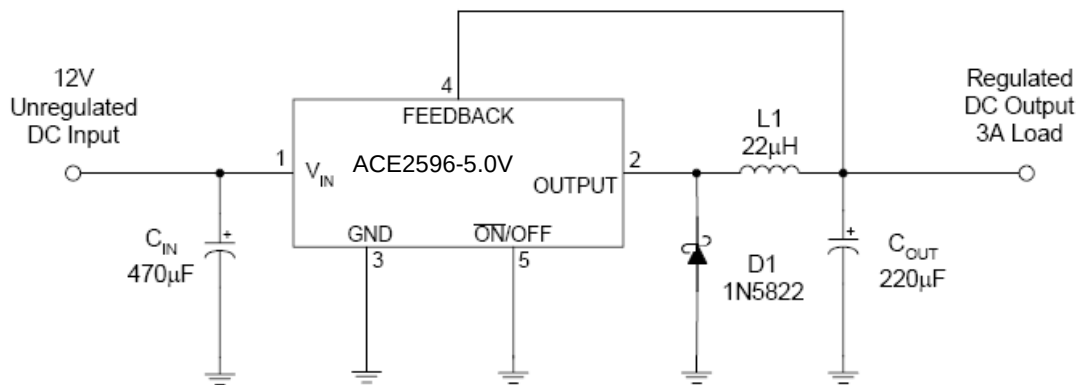
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Typical Application



L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 16. Typical Application of ACE2596-3.3V



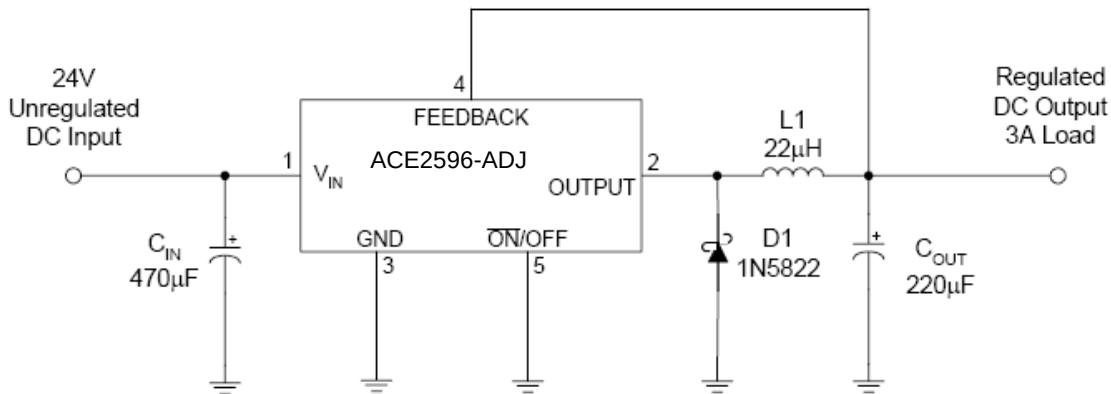
L1: Sumida CDRH127/LDNP-220MC or Equivalent

Figure 17. Typical Application of ACE2596-5.0V



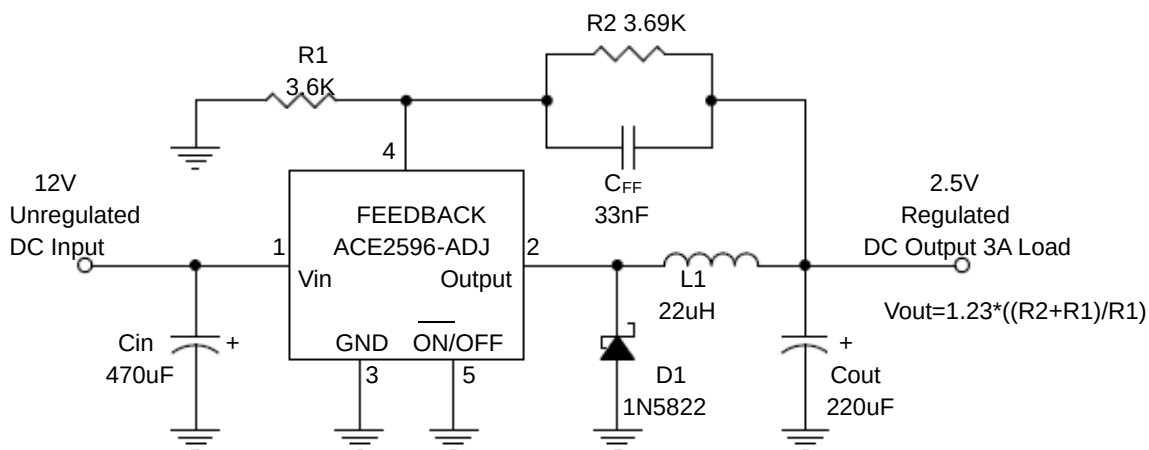
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L1: Sumida CDRH127/LDNP-220MC or Equivalent

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

	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.395	-	0.420	10.03	-	10.67
B	0.325	-	0.361	8.25	-	9.17
C	0.171	-	0.181	4.34	-	4.59
D	0.045	-	0.055	1.14	-	1.40
E	0.013	-	0.017	0.330	-	0.432
F	0.029	-	0.035	0.737	-	0.889
G	0.062	-	0.072	1.57	-	1.83
I	-	-	0.065	-	-	1.65
K	0.575		0.635	14.60		16.13
L	0.090		0.110	2.29		2.79
M	7°			7°		
N	3°			3°		



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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 stated 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 whose 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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