

## ■ General Description

The AME5104 is a monolithic IC that was designed as a step-down DC/DC Converter and owns the ability of driving a 3A load without additional transistor component. The output versions included 3.3V, 5V, 12V and an adjustable type. It operates at a switching frequency of 150KHz thus allowing smaller sized filter components otherwise it would need lower frequency switching regulators.

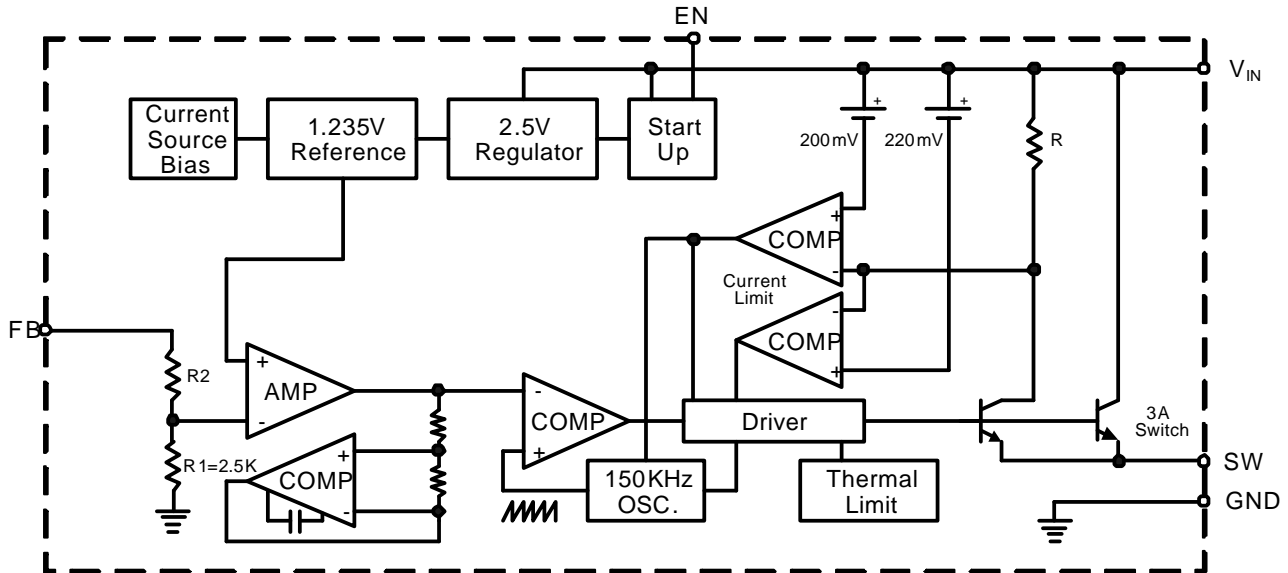
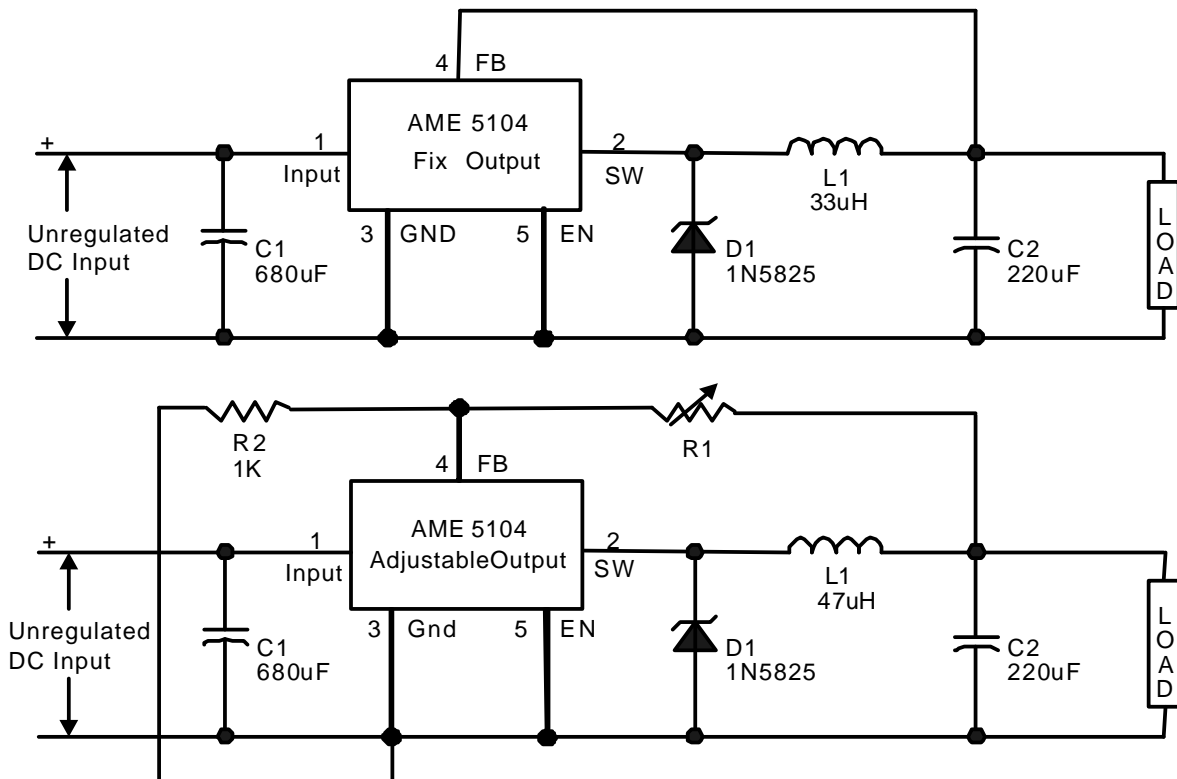
Other features include a guaranteed  $\pm 4\%$  tolerance on output voltage under specified input voltage and output load conditions, and  $\pm 15\%$  on the oscillator frequency. Regarding protected function, current limit is to protect over current operating of the output switch.

## ■ Features

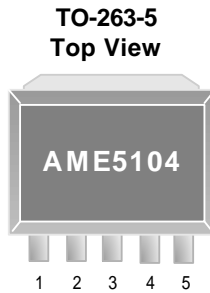
- 3.3V, 5V, 12V and adjustable
- Adjustable version output voltage range:  
1.4-36V
- $\pm 4\%$  max over line and load conditions
- 150KHz  $\pm 15\%$  fixed switching frequency
- TTL shutdown capability
- Operating voltage can be up to 36V
- Output load current: 3A
- TO-263-5L package
- Low power standby mode
- Current-limit protection
- High efficiency
- Built-in a switching transistor on chip,  
requires only 4 external components
- All AME's Lead Free Products Meet  
Standards RoHS

## ■ Applications

- Simple High-efficiency step-down regulator
- Positive to negative converter
- On-card switching regulators

**■ Function Block Diagram**

**■ Typical Application**


### ■ Pin Configuration



#### AME5104ACDV

1. IN
2. SW
3. GND(TAB)
4. FB
5. EN

### ■ Pin Description

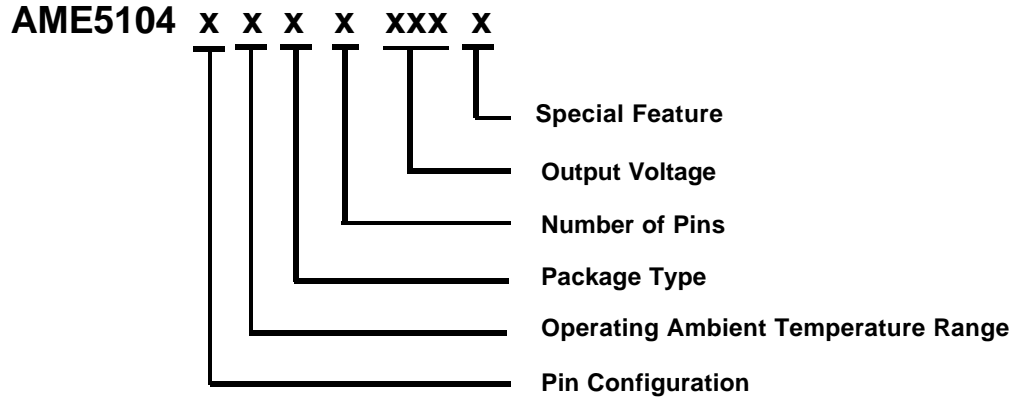
#### AME5104AJDVxxx

Pin Number	Pin Name	Pin Description
1	IN	Analog and Power input. Input Supply Pin. Place bypass capacitor as close to $V_{IN}$ as possible.
2	SW	Power Switch input. This is the drain of the internal NMOS power switch. Minimize the metal trace area connected to this pin to minimize EMI.
3	GND	Ground. Tie directly to ground plane.
3	FB	Output voltage feedback input. Set the output voltage by selecting values for R1 and R2 using: $R1 = R2 \left( \frac{V_{out}}{1.23V} - 1 \right)$ Connect the ground of the feedback network to a GND plane.
5	EN	Enable, active low. The enable pin is an active low control. Tie this pin above 2V to turn off the device. Tie this pin below 0.6V to enable the device.



AME5104

■ Ordering Information



Pin Configuration	Operating Ambient Temperature Range	Package Type	Number of Pins	Output Voltage	Special Feature
A (TO-263) 1. IN 2. SW 3. GND 4. FB 5. EN	C: 0°C to 70°C	D: TO-263	V: 5	330: 3.3V 500: 5V 12A: 12V ADJ: Adjustable	Z: Lead free

**■ Ordering Information**

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME5104ACDV330Z	AME5104 ACDV330 yyww	3.3V	TO-263-5	0°C to 70°C
AME5104ACDV500Z	AME5104 ACDV500 yyww	5V	TO-263-5	0°C to 70°C
AME5104ACDV12AZ	AME5104 ACDV12A yyww	12V	TO-263-5	0°C to 70°C
AME5104ACDVADJZ	AME5104 ACDVADJ yyww	ADJ	TO-263-5	0°C to 70°C

Note: ww represents the date code.

\* A line on top of the first letter represents lead free plating such as  $\bar{A}$ 5104 ACDV330 yyww.  
Please consult AME sales office or authorized Rep./Distributor for the availability of package type.

### ■ Absolute Maximum Ratings

Parameter	Symbol	Maximum	Unit
Supply Voltage	$V_{IN}$	40	V
EN Pin Input Voltage	$V_{EN}$	-0.3~+25	V
Feedback Pin Voltage	$V_{FB}$	-0.3~+25	V
Output Voltage to Ground	$V_{out}$	-1	V
Operating Voltage	$V_{OP}$	+4.5~+40	V
ESD Classification	TBD*		

Caution: Stree above the listed absolute maximum rating may cause permanent damage to the device.

\*HBM B: 2000~3999V

### ■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Ambient Temperature Range	$T_A$	0 to 70	°C
Junction Temperature Range	$T_J$	0 to 125	
Storage Temperature Range	$T_{STG}$	-65 to 150	

### ■ Thermal Information

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	TO-263-5	Conductive Epoxy	$\theta_{JC}$	3.5	°C / W
Thermal Resistance (Junction to Ambient)	TO-263-5		$\theta_{JA}$	23	
Internal Power Dissipation	TO-263-5		$P_D$	Internally Limited	W
Solder Iron (10 Sec)**				350	°C

\* Measure  $\theta_{JC}$  on center of molding compound if IC has no tab.

\*\* MIL-STD-202G-210F

**■ Electrical Specifications**

Unless otherwise specified,  $V_{IN}=12V$  for the 3.3V, 5V, and adjustable version and  $V_{IN}=24V$  for the 12V version,  
 $I_{LOAD}=500mA$

Parameter	Symbol	Test Condition	Min	Typ	Max	Units	
Output Voltage	$V_{OUT}$	$V_{OUT}=3.3V$ $4.75V \leq V_{IN} \leq 36V, 0.2A \leq I_{LOAD} \leq 3A$	$T_J=25^{\circ}C$	3.168	3.3	3.342	V
			$T_A=0^{\circ}C$ to $70^{\circ}C$	3.135		3.465	
		$V_{OUT}=5V$ $7V \leq V_{IN} \leq 36V, 0.2A \leq I_{LOAD} \leq 3A$	$T_J=25^{\circ}C$	4.800	5.0	5.200	
			$T_A=0^{\circ}C$ to $70^{\circ}C$	4.750		5.250	
		$V_{OUT}=12V$ $15V \leq V_{IN} \leq 36V, 0.2A \leq I_{LOAD} \leq 3A$	$T_J=25^{\circ}C$	11.52	12.0	12.48	
			$T_A=0^{\circ}C$ to $70^{\circ}C$	11.40		12.60	
Feedback Trip Point	$V_{FB}$	$V_{OUT}$ programmed for 5V $8V \leq V_{IN} \leq 36V, 0.2A \leq I_{LOAD} \leq 3A$	$T_J=25^{\circ}C$	1.193	1.23	1.290	
			$T_A=0^{\circ}C$ to $70^{\circ}C$			1.310	
Efficiency	$\eta$	$V_{OUT}=3.3V$ $V_{IN}=12V, I_{LOAD}=3A$		73		%	
			$V_{OUT}=5V$ $V_{IN}=12V, I_{LOAD}=3A$		80		
		$V_{OUT}=12V$ $V_{IN}=25V, I_{LOAD}=3A$		90			
		$V_{OUT}=5V$ $V_{IN}=12V, I_{LOAD}=3A$		77			
Feedback Bias Current	$I_{FB}$	Adjustable Version Only, $V_{FB}=1.3V$	$T_J=25^{\circ}C$		10	50	
			$T_A=0^{\circ}C$ to $70^{\circ}C$			100	
Oscillator Frequency	$F_{OSC}$	(Note 1)	$T_J=25^{\circ}C$		150	173	
			$T_A=0^{\circ}C$ to $70^{\circ}C$			110	173
Saturation Voltage	$V_{SAT}$	$I_{OUT}=2A$ (Note 2,3)	$T_J=25^{\circ}C$		1.3	1.4	
			$T_A=0^{\circ}C$ to $70^{\circ}C$			1.5	
Max. Duty Cycle (ON)	$D_{max}$	(Note 3)		100		%	
Min. Duty Cycle (OFF)	$D_{min}$	(Note 4)		0			
Current Limit	$I_{CL}$	Peak Current (Note 2,3)	$T_J=25^{\circ}C$	3.6	4.5	5.5	
			$T_A=0^{\circ}C$ to $70^{\circ}C$			6.5	
Output Leakage Current	$I_L$	Output=0V (Note 2,4)			50	$\mu A$	
Quiescent Current	$I_Q$	(Note 4)		5	10	mA	



■ Electrical Specifications

Parameter	Symbol	Test Condition	Min	Typ	Max	Units	
Shutdown current	I <sub>SD</sub>	EN pin=5V V <sub>IN</sub> =36V		150	T <sub>J</sub> =25°C	250	μA
					T <sub>A</sub> =0°C to 70°C	300	
EN Input Threshold (High)	V <sub>EH</sub>	Low (Regulator ON)		1.3	0.6	V	
EN Input Threshold (Low)	V <sub>EL</sub>	High (Regulator OFF)	2.0				
EN Input Current(High)	I <sub>EH</sub>	V <sub>EN</sub> =2.5V (Regulator OFF)		5	15	μA	
EN Input Current(Low)	I <sub>EL</sub>	V <sub>EN</sub> =0.5V (Regulator ON)		0.02	5		

Note 1: The switching frequency is reduced when the second stage current limit is activated.

Note 2: No diode, inductor or capacitor connected to output pin.

Note 3: Feedback pin removed from output and connected to 0V to force the output transistor switch ON.

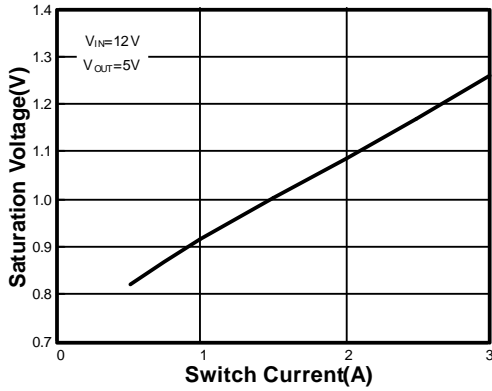
Note 4: Feedback pin removed from output and connected to 12V for the 3.3V, 5V, ADJ. version, and 15V for the 12V version, to force the output transistor switch OFF.



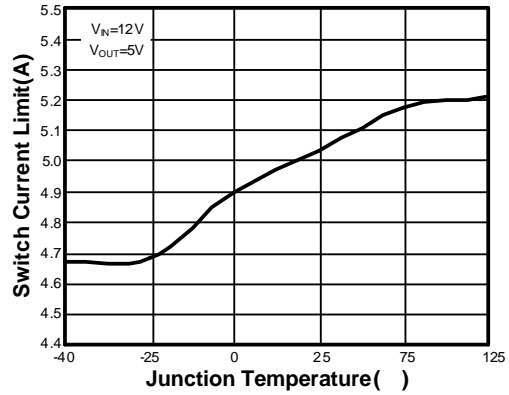


■ Characterization Curve

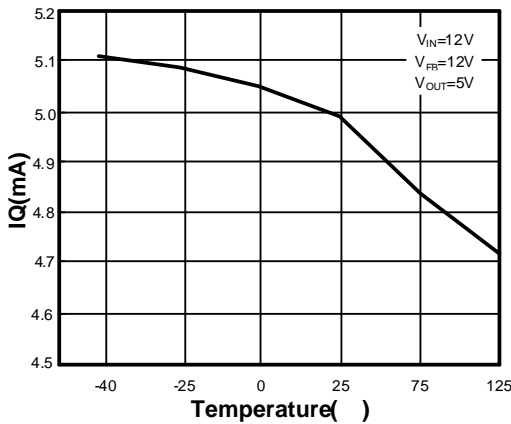
Switch vs Saturation Voltage



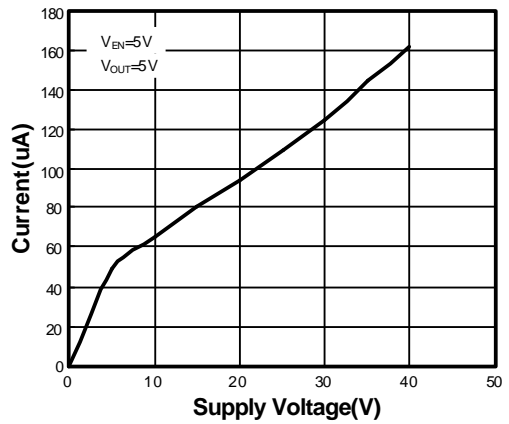
Switch Current Limit



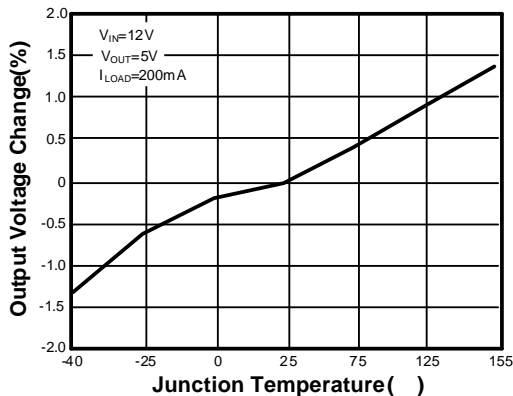
IQ vs. Temperature



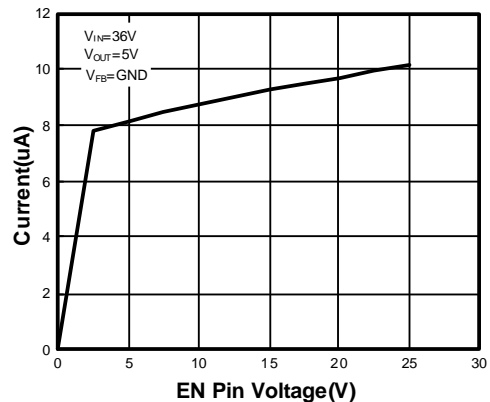
Shutdown Quiescent Current



Normalized Output Voltage



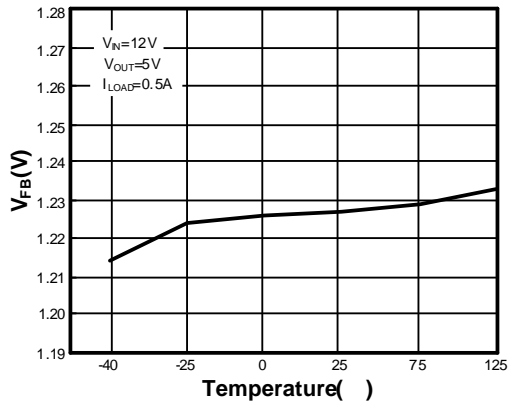
EN Pin Current(Sinking)



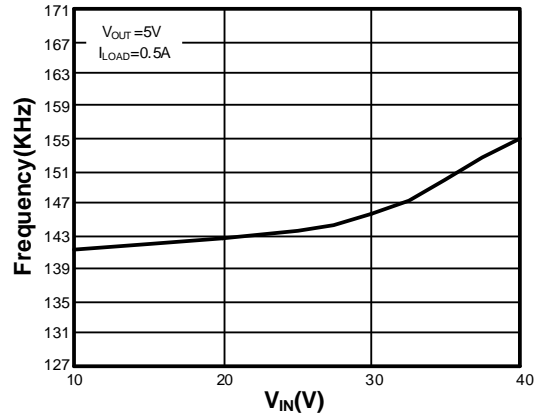


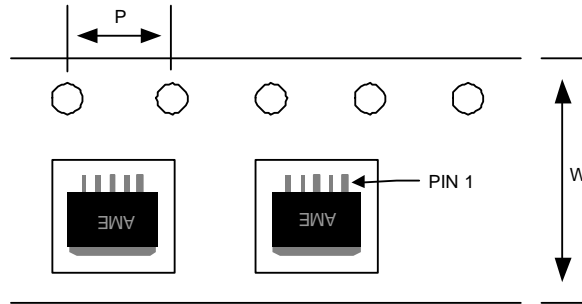
■ Characterization Curve

$V_{FB}$  vs. Temperature

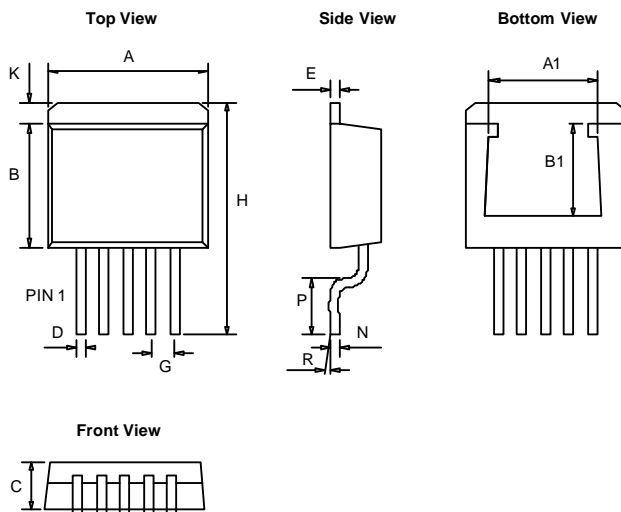


Frequency vs  $V_{IN}$



**■ Tape and Reel Dimension**
**TO-263-5**

**Carrier Tape, Number of Components Per Reel and Reel Size**

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
TO-263-5	24.0±0.1 mm	4.0±0.1 mm	800pcs	330±1 mm

**■ Package Dimension**
**TO-263-5**


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A</b>	10.050	10.668	0.396	0.420
<b>B</b>	8.280	9.169	0.326	0.361
<b>C</b>	4.310	4.670	0.170	0.184
<b>D</b>	0.660	0.910	0.026	0.036
<b>E</b>	1.140	1.400	0.045	0.055
<b>G</b>	1.70REF		0.067 REF	
<b>H</b>	14.600	15.875	0.575	0.625
<b>K</b>	1.143	1.680	0.045	0.066
<b>N</b>	0.330	0.580	0.013	0.023
<b>P</b>	2.280	2.800	0.090	0.110
<b>R</b>	0°	8°	0°	8°
<b>A1</b>	7.50	7.70	0.295	0.303
<b>B1</b>	5.80	6.45	0.228	0.254



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