



## ■ 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

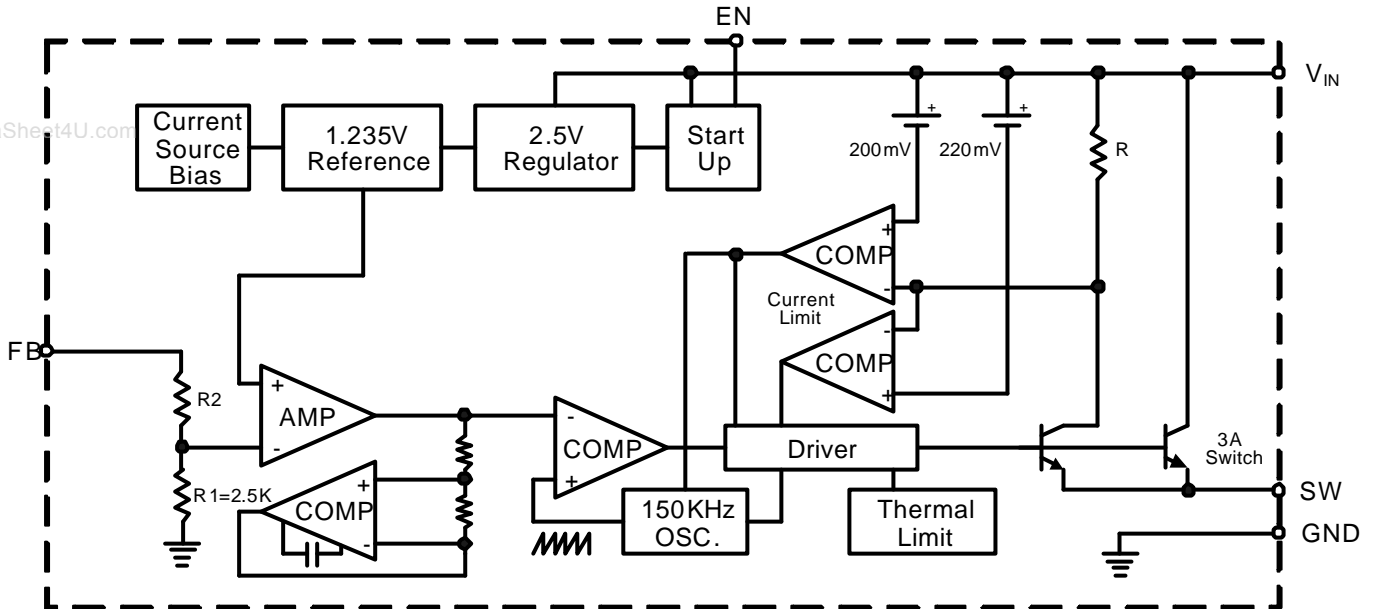
- 3.3V, 5V, 12V and adjustable
- Adjustable version output voltage range:  
1.4-36V
- $\pm 4\%$  max over line and load conditions
- 150KHz  $\pm 15\%$  fixed switching frequency
- TTL shutdown capability
- Operating voltage can be up to 36V
- Output load current: 3A
- TO-263-5L package
- Low power standby 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

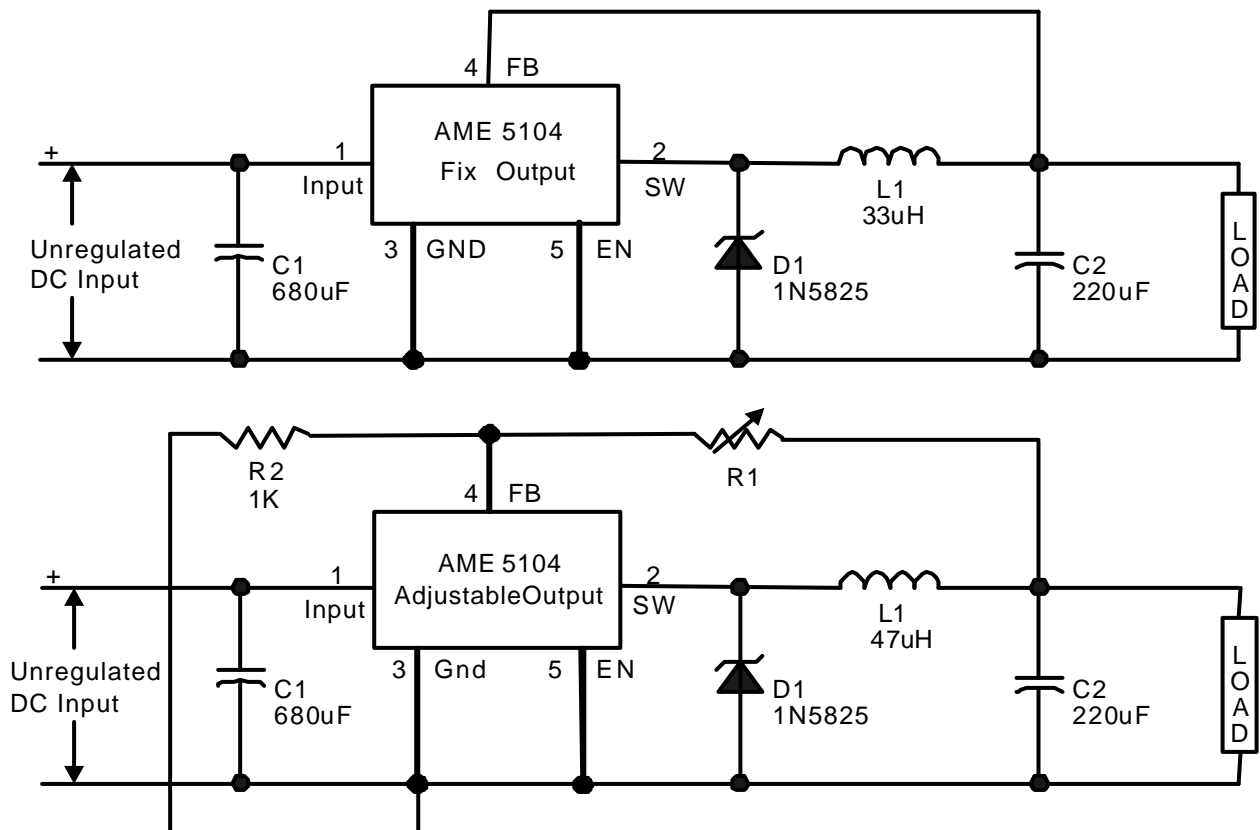
- Simple High-efficiency step-down regulator
- Positive to negative converter
- On-card switching regulators

## AME5104

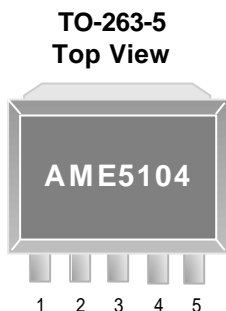
### ■ Function Block Diagram



### ■ Typical Application



## ■ Pin Configuration



### AME5104ACDV

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

## ■ Pin Description

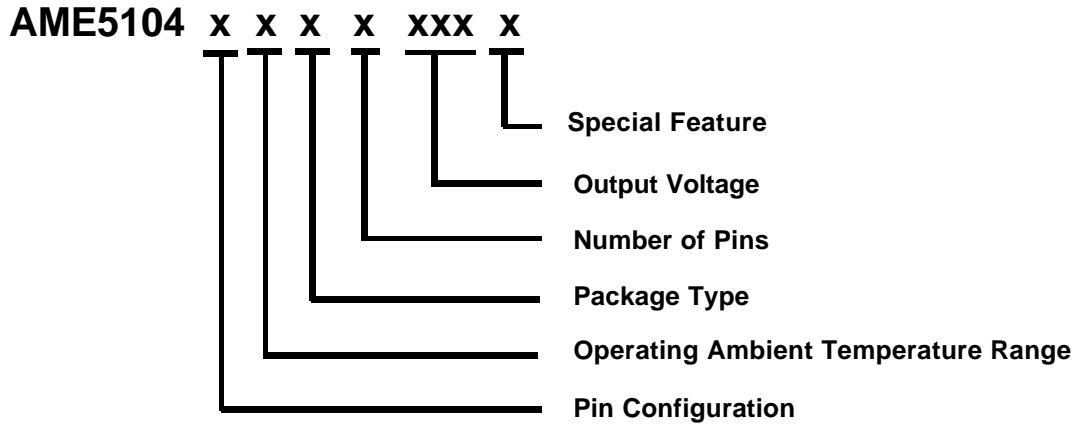
### AME5104AJDVxxx

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.



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■ Ordering Information



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Pin Configuration	Operating Ambient Temperature Range	Package Type	Number of Pins	Output Voltage	Special Feature
A 1. IN 2. SW 3. GND 4. FB 5. EN <small>(TO-263)</small>	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.



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■ 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					
Feedback Bias Current	$I_{FB}$	Adjustable Version Only, $V_{FB}=1.3V$	$T_J=25^{\circ}C$	10	50	nA	
			$T_A=0^{\circ}C$ to $70^{\circ}C$				100
Oscillator Frequency	$F_{OSC}$	(Note 1)	$T_J=25^{\circ}C$	150	173	KHz	
			$T_A=0^{\circ}C$ to $70^{\circ}C$				110
Saturation Voltage	$V_{SAT}$	$I_{OUT}=2A$ (Note 2,3)	$T_J=25^{\circ}C$	1.3	1.4	V	
			$T_A=0^{\circ}C$ 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	



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■ 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	250	μA
					T <sub>J</sub> =25°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.

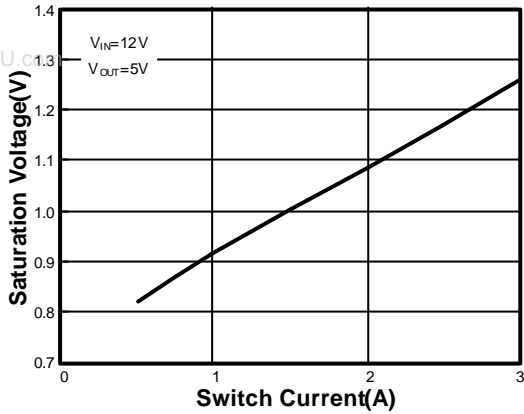
Note 4: Feedback pin removed from output and connected to 12V for the 3.3V, 5V, ADJ. version, and 15V for the 12V version, to force the output transistor switch OFF.



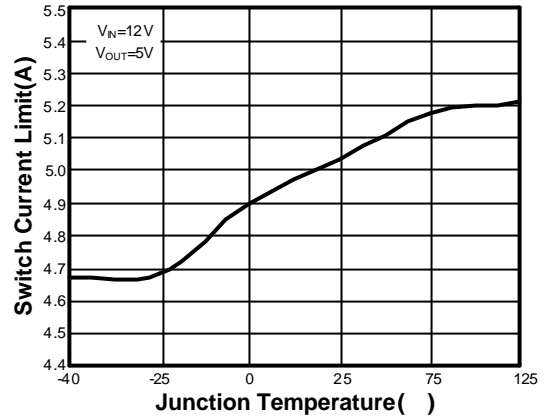


Characterization Curve

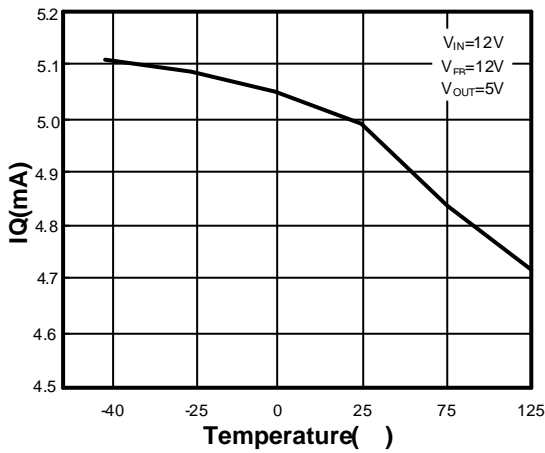
Switch vs Saturation Voltage



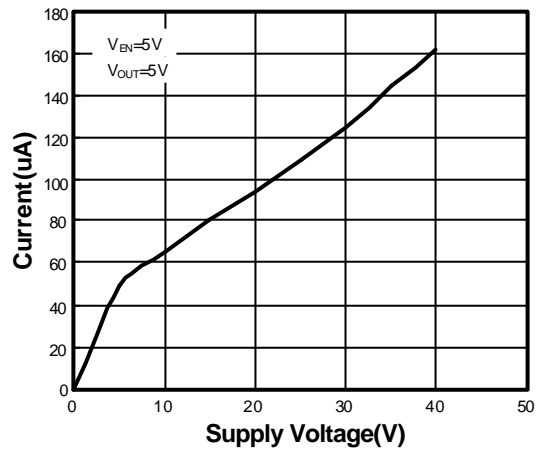
Switch Current Limit



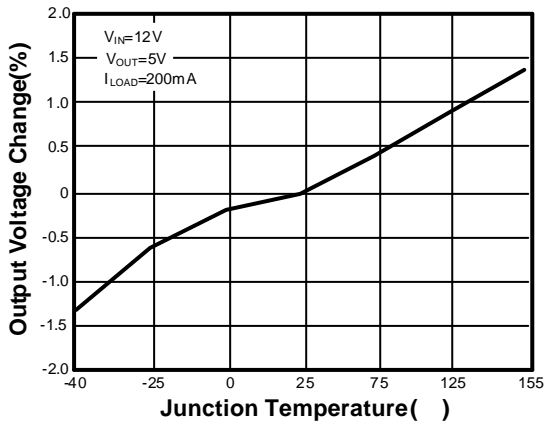
IQ vs. Temperature



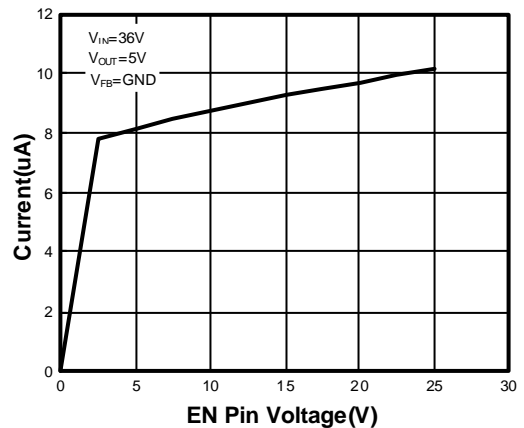
Shutdown Quiescent Current



Normalized Output Voltage



EN Pin Current(Sinking)

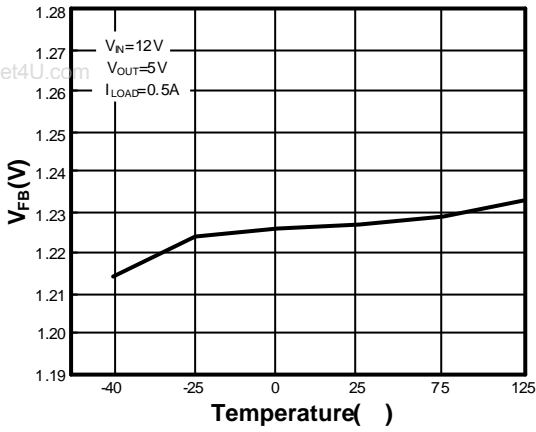




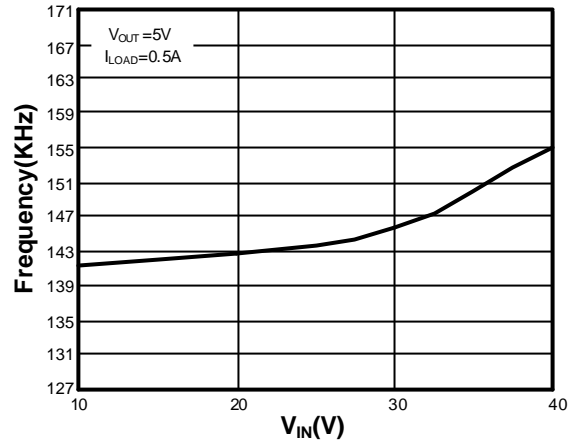
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■ Characterization Curve

V<sub>FB</sub> vs. Temperature

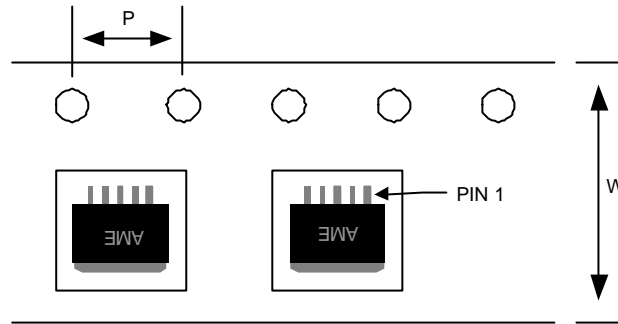


Frequency vs V<sub>IN</sub>

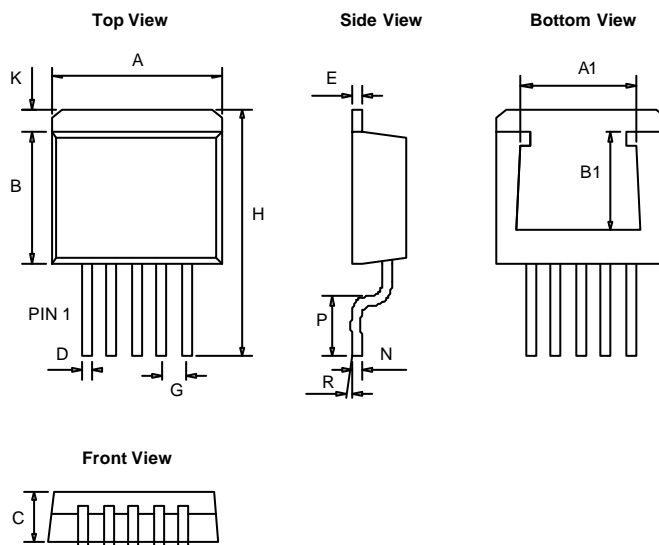


**■ Tape and Reel Dimension**
**TO-263-5**

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



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