



■ 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.

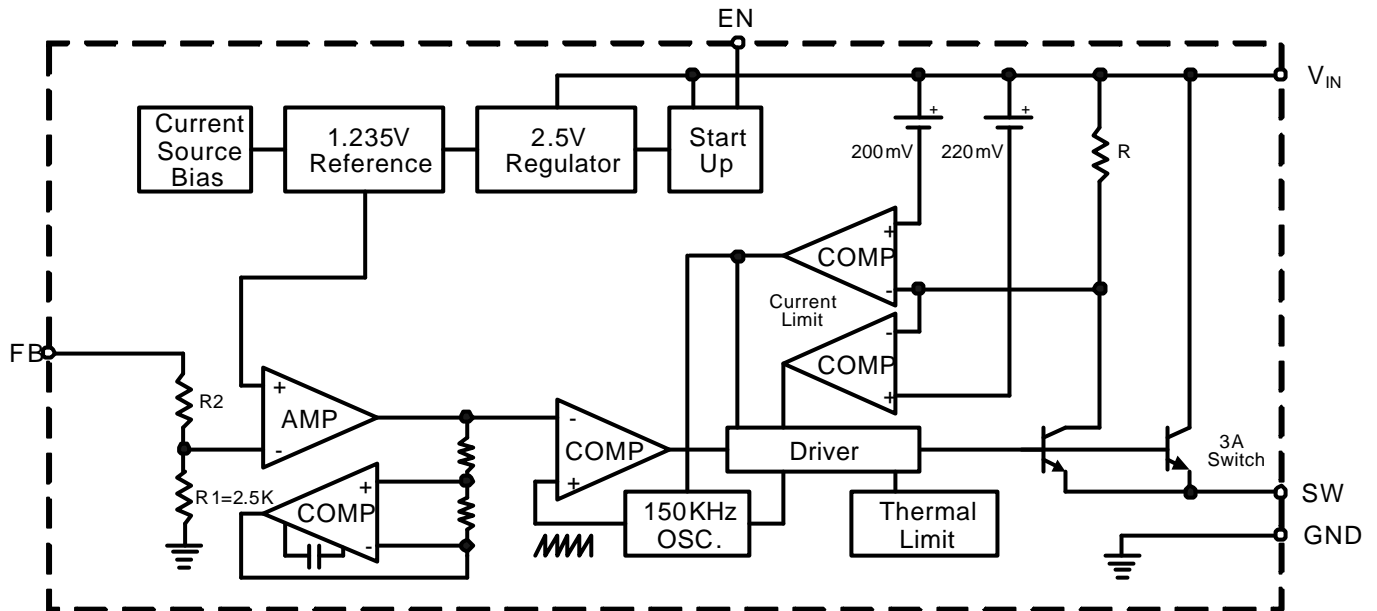
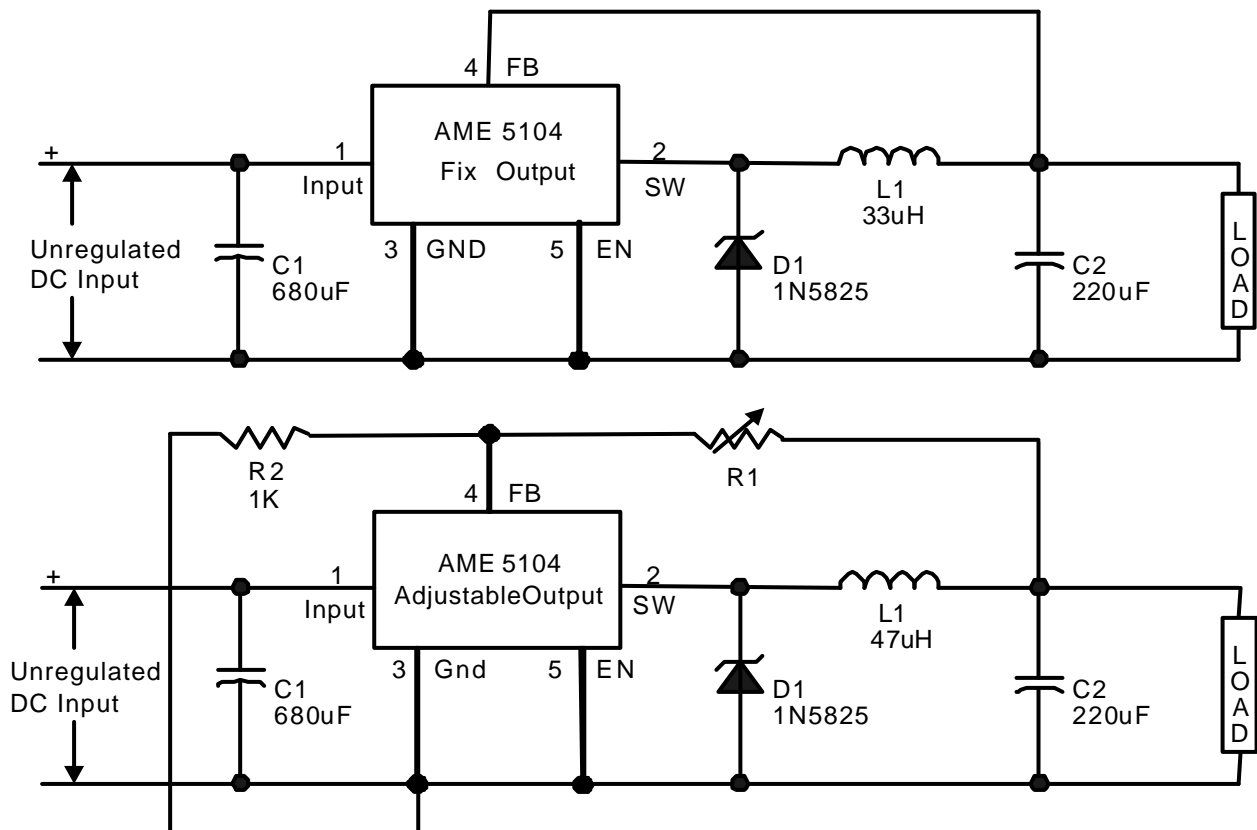
Other features include a guaranteed $\pm 4\%$ tolerance on output voltage under specified input voltage and output load conditions, and $\pm 15\%$ on the oscillator frequency. Regarding protected function, current limit is to protect over current operating of the output switch.

■ Features

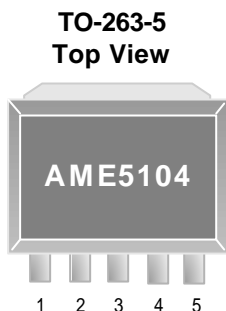
- 3.3V, 5V, 12V and adjustable
- Adjustable version output voltage range:
1.4-36V
- $\pm 4\%$ max over line and load conditions
- 150KHz $\pm 15\%$ fixed switching frequency
- TTL shutdown capability
- Operating voltage can be up to 36V
- Output load current: 3A
- TO-263-5L package
- Low power standby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

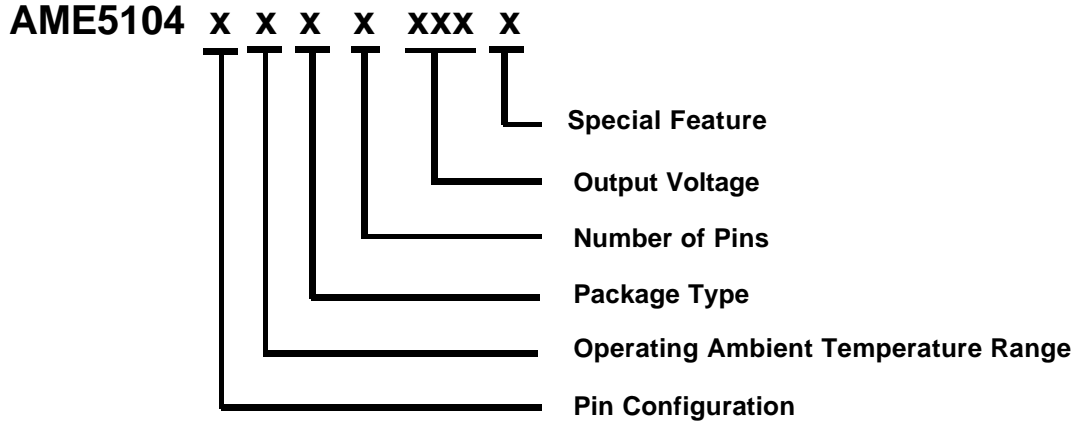
AME5104AJDVxxx

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



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	θ_{JC}	3.5	°C / W
Thermal Resistance (Junction to Ambient)	TO-263-5		θ_{JA}	23	
Internal Power Dissipation	TO-263-5		P_D	Internally Limited	W
Solder Iron (10 Sec)**				350	°C

* Measure θ_{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	η	$V_{OUT}=3.3V$ $V_{IN}=12V, I_{LOAD}=3A$		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	μA	
Quiescent Current	I_Q	(Note 4)		5	10	mA	



AME5104

■ Electrical Specifications

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Shutdown current	I _{SD}	EN pin=5V V _{IN} =36V		150	250	μA
					T _J =25°C	
					300	
EN Input Threshold (High)	V _{EH}	Low (Regulator ON)		1.3	0.6	V
EN Input Threshold (Low)	V _{EL}	High (Regulator OFF)	2.0			
EN Input Current(High)	I _{EH}	V _{EN} =2.5V (Regulator OFF)		5	15	μA
EN Input Current(Low)	I _{EL}	V _{EN} =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.

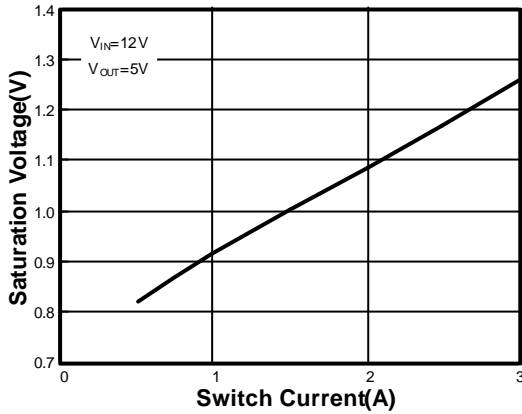
Note 3: Feedback pin removed from output and connected to 0V to force the output transistor switch ON.

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.

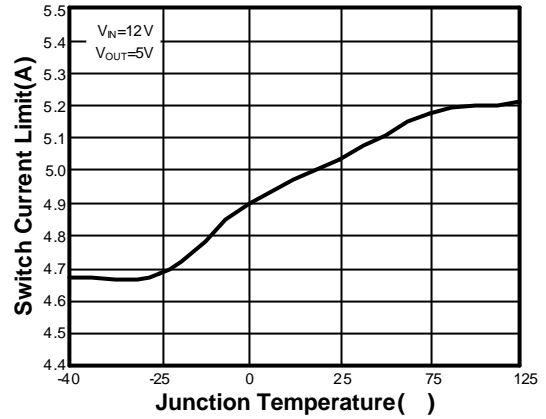


■ Characterization Curve

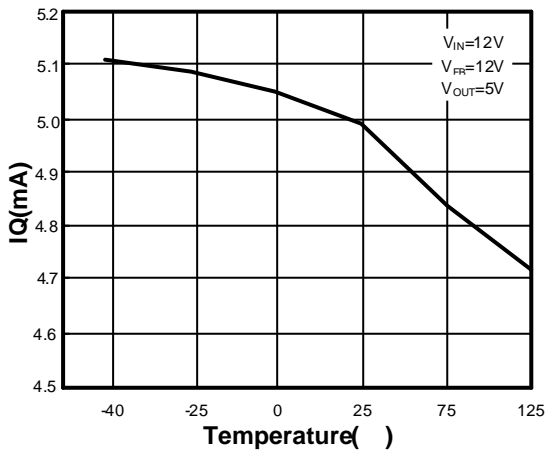
Switch vs Saturation Voltage



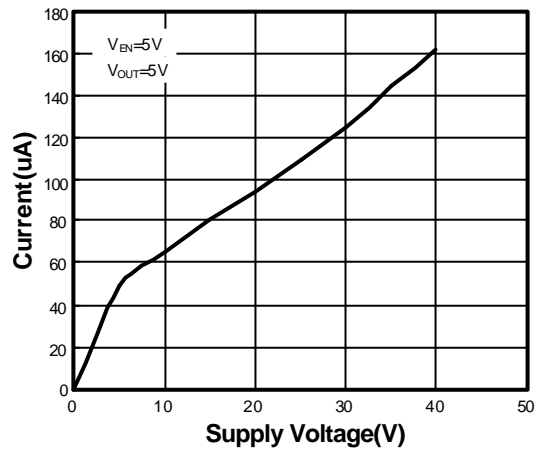
Switch Current Limit



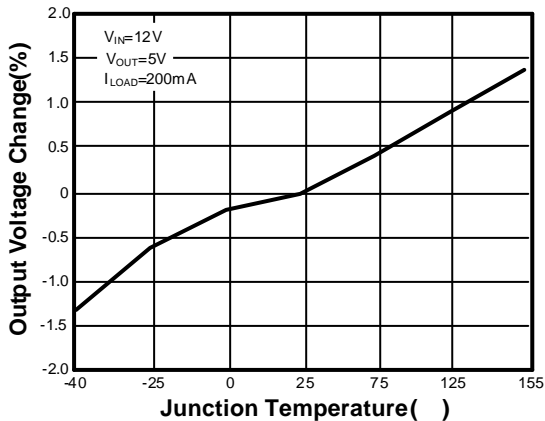
IQ vs. Temperature



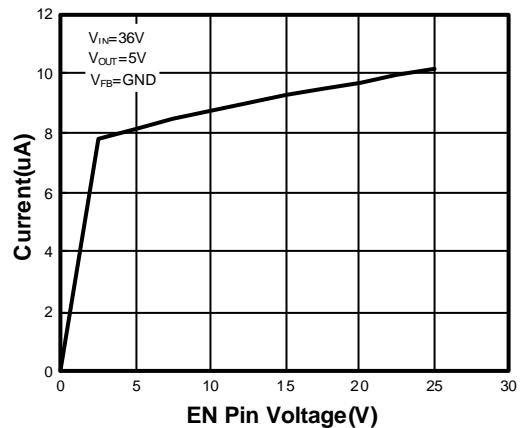
Shutdown Quiescent Current



Normalized Output Voltage



EN Pin Current(Sinking)

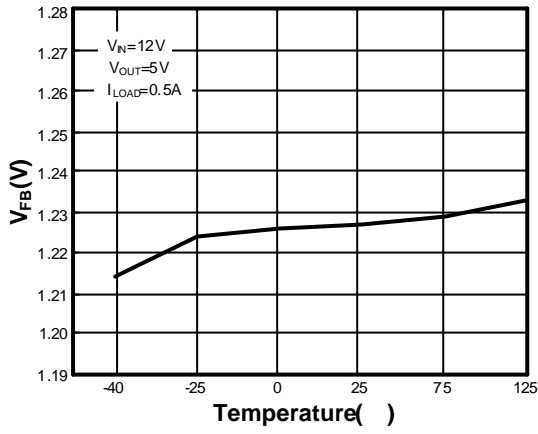




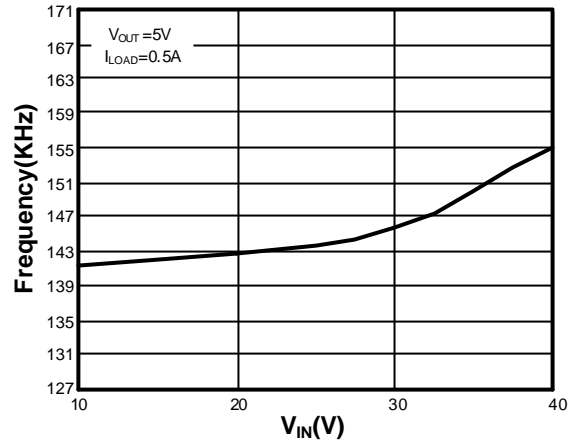
AME5104

■ Characterization Curve

V_{FB} vs. Temperature



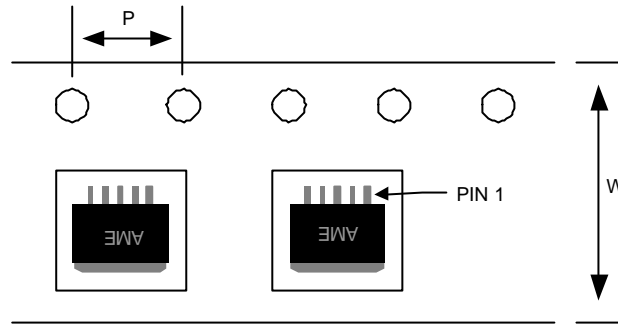
Frequency vs V_{IN}





■ Tape and Reel Dimension

TO-263-5

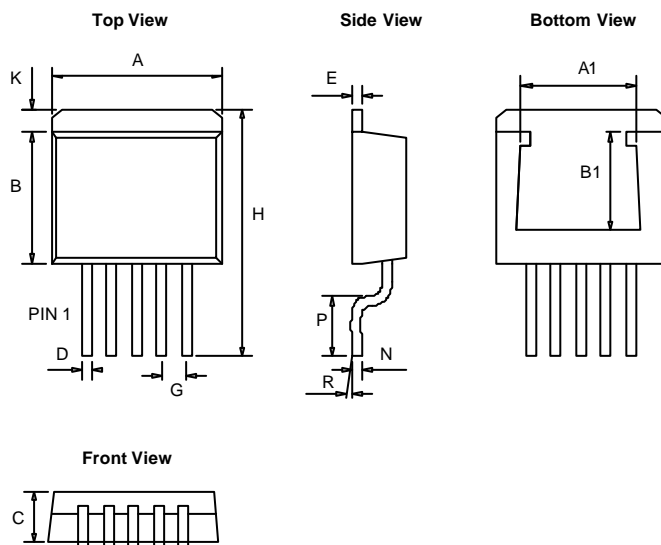


Carrier Tape, Number of Components Per Reel and Reel Size

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
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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