



AME5131

Low Power DC/DC Boost Converter

■ General Description

The AME5131 is a high-frequency boost converter dedicated for LCD bias supply and white LED applications for cellular phone backlighting, PDAs, and other hand-held devices. The part can also be used to generate standard 3.3 V/5 V to 12 V power conversions.

The AME5131 has an internal 400mA switch current limit, offering lower output voltage ripple. The 32 μ A low quiescent current together with an optimized control scheme, allows device operation at high efficiencies and maintains long battery lifetime. AME5131 uses SOT-25 package and gives a small size solution.

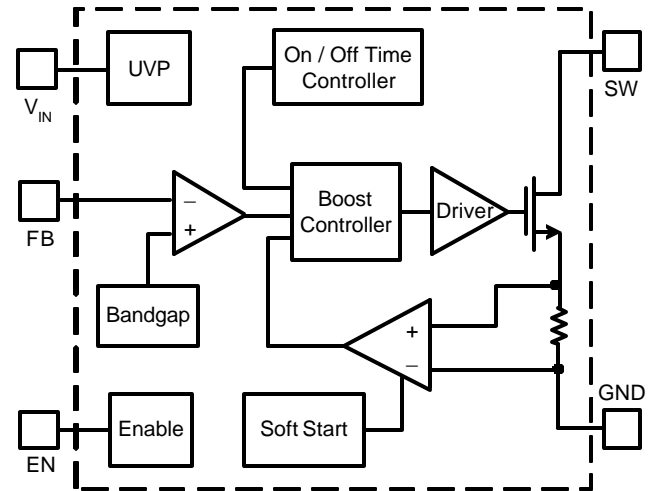
■ Features

- 0.6 Ω Internal Switch
- 1.8V to 5.5V Input Range
- Adjustable Output Voltage Up to 28V
- Input Under Voltage Protection
- 32 μ A Typical No Load Quiescent Current
- 1 μ A Shutdown Current
- SOT-25 Package
- All AME's Lead Free Products Meet RoHS Standards

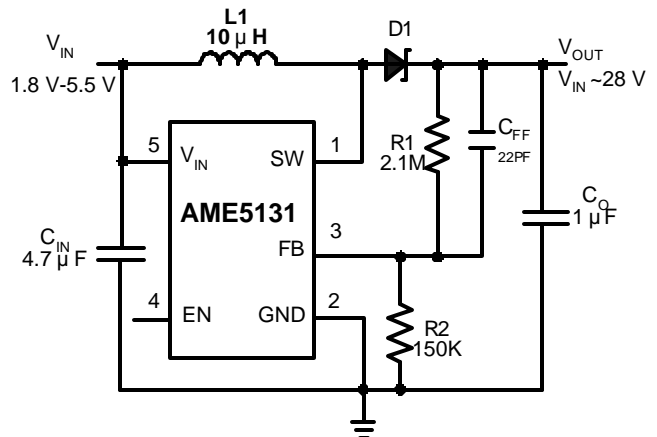
■ Applications

- White LED Back-Lighting
- Hand-held Devices
- Digital Cameras
- Portable Applications
- Internet Audio Player
- LCD Bias Power
- Standard 3.3 V/5 V to 12 V Conversions

■ Function Block Diagram

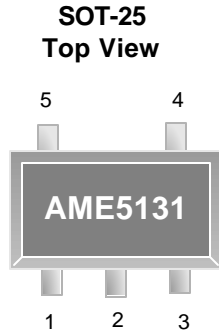


■ Typical Application





■ Pin Configuration



AME5131AEEV

- 1. SW
- 2. GND
- 3. FB
- 4. EN
- 5. V_{IN}

* Die Attach:
Conductive Epoxy

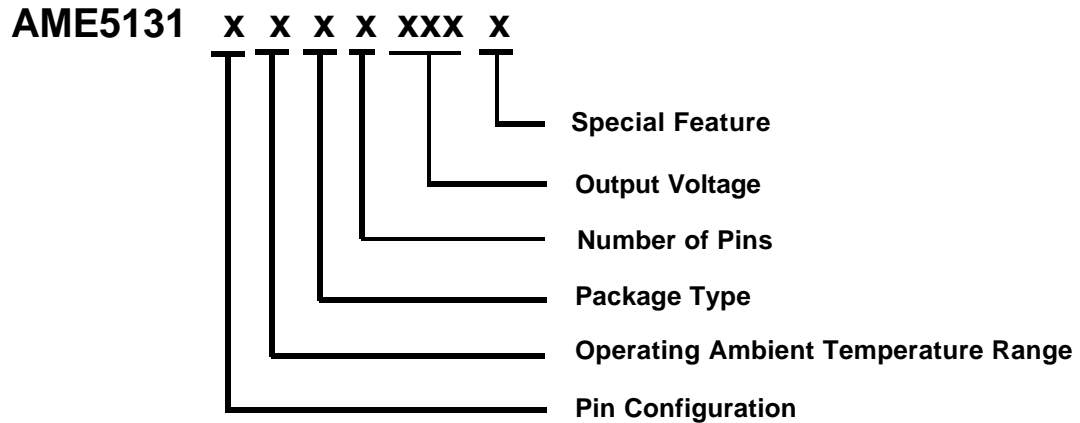
■ Pin Description

Pin Number	Pin Name	Pin Description
1	SW	This is the switch pin and is connected to the drain of the internal NMOS power switch. Minimize the metal trace area connected to this pin to minimize EMI.
2	GND	Ground Pin.
3	FB	Feedback Input Pin. Connect this pin to the external voltage divider to program the desired output voltage.
4	EN	Enable Control Input Pin. (Active High)
5	V_{IN}	Input Supply Pin. Place bypass capacitor as close to V_{IN} as possible.



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Ordering Information



Pin Configuration	Operating Ambient Temperature Range	Package Type	Number of Pins	Output Voltage	Special Feature
A (SOT-25) 1. SW 2. GND 3. FB 4. EN 5. V _{IN}	E: -40°C to +85°C	E: SOT-2X	V: 5	ADJ: Adjustable	Z: Lead free

Ordering Information

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME5131AEEVADJZ	BEFww	ADJ	SOT-25	-40°C to +85°C

Note: ww represents the date code and pls refer to Date Code Rule page on Package Dimension.

* A line on top of the first letter represents lead free plating such as BEFww.

Please consult AME sales office or authorized Rep./Distributor for the availability of package type.



■ Absolute Maximum Ratings

Parameter	Symbol	Maximum	Unit
Input Supply Voltage	V_{IN}	6	V
EN, FB Voltages	V_{EN}, V_{FB}	V_{IN}	
SW Voltage	V_{SW}	30	
ESD Classification	C*		

Caution: Stree above the listed absolute maximum rating may cause permanent damage to the device.
HBM C: 4000V+

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Ambient Temperature Range	T_A	-40 to +85	°C
Junction Temperature Range	T_J	-40 to +125	

■ Thermal Information

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	SOT-25	Conductive Epoxy	θ_{JC}	81	°C / W
Thermal Resistance (Junction to Ambient)			θ_{JA}	260	°C / W
Internal Power Dissipation			P_D	400	mW
Maximum Junction Temperature				150	°C
Solder Iron (10 Sec)**				350	°C

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

** MIL-STD-202G210F



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■ Electrical Specifications

$V_{IN} = 2.4V$, $EN = V_{IN}$, $T_A = -40^{\circ}C$ to $85^{\circ}C$, typical values are at $T_A = 25^{\circ}C$

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Input Voltage	V_{IN}		1.8		5.5	V
Quiescent Current	I_Q	$I_{OUT} = 0mA$, not switching, $V_{FB} = 1.3V$		32	50	μA
Shutdown Current	I_{SD}	EN = GND		0.1	1	
FB Pin Bias Current	I_{FB}	$V_{FB} = 1.3V$			1	
Feedback Trip Point	V_{FB}	1.8V V_{IN} 5.5V	1.187	1.212	1.237	V
UVP Voltage	UVP			1.5	1.7	V
Switch Current Limit	I_{CL}	$V_{OUT} = 18V$, $I_{OUT} = 10mA$, $T_A = 25^{\circ}C$	350	400	450	mA
Switch R_{DSON}	R_{DSON}	$V_{IN} = 2.4V$; $I_{SW} = 200mA$		0.6	1	Ω
SW leakage current	I_{SW}	$V_{SW} = 28V$		1	10	μA
Switch Off Time	t_{OFF}			400		ns
Switch On Time	t_{ON}			6		μs
EN Input Current	I_{EN}	EN = GND or V_{IN}		0.1	1	μA
EN Input Threshold (High)	V_{EH}	Device Active	1.3			V
EN Input Threshold (Low)	V_{EL}	Device Shutdown			0.4	V
Line Regulation	REG_{LINE}	1.8 V_{IN} 5.5V; $V_{OUT} = 18V$; $I_{LOAD} = 10mA$; Cff = not connected		0.3		%/V
Load Regulation	REG_{LOAD}	$V_{IN} = 2.4V$; $V_{OUT} = 18V$; 0mA I_{OUT} 30mA		0.15		%/mA



■ Detailed Description

Operation

The AME5131 is a boost converter with a smart control scheme that operates in a pulse frequency modulation (PFM) with constant peak current control.

The smart control schemes utilize a reference voltage, minimum off-time, maximum on-time and current-limited control scheme. The switch turns off as the inductor current reaches the internally set peak current of 400mA (typical). The second criteria that turns off the switch is the maximum on-time of 6 μ s (typical). As the switch is turned off the external Schottky diode is forward biased delivering the current to the output. The switch remains off for a minimum of 400 ns (typical), or until the feedback voltage drops below the reference voltage.

Using this PFM peak current control scheme the converter operates in discontinuous conduction mode (DCM) where the switching frequency depends on the output current, which results in high efficiency over the entire load current range. This regulation scheme is inherently stable, allowing a wider selection range for the inductor and output capacitor.

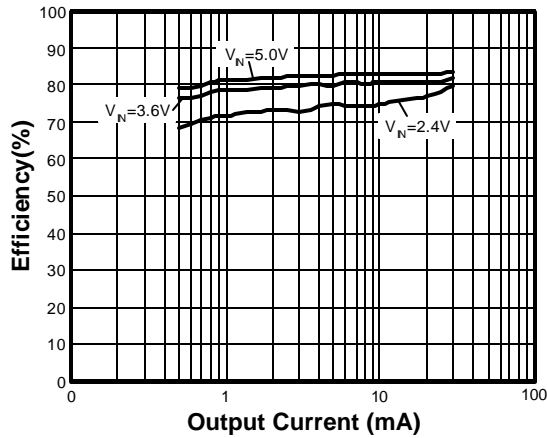
Soft-start

Soft-start is provided on the AME5131 to minimize inrush current. All inductive boost converters exhibit high inrush current during start-up if no special precaution is made. This can cause voltage drops at the input rail during start up and may result in an unwanted or early system shut down.

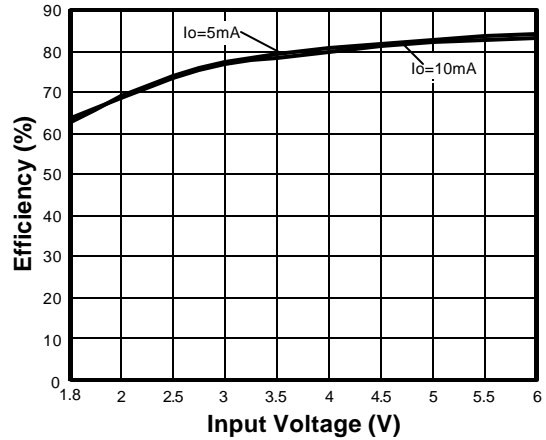
The soft-start time is set by increasing the current limit in two steps starting from 100mA for 256 cycles to 200mA for the next 256 cycles, and then full current limit.



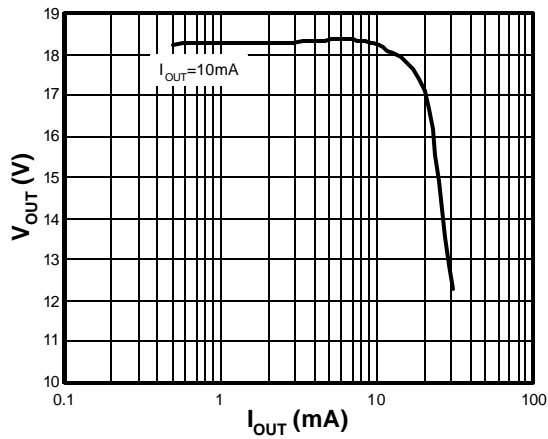
Efficiency vs Output Current



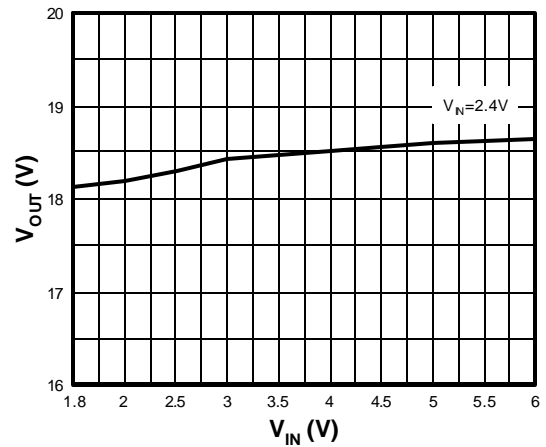
Efficiency vs Input Voltage



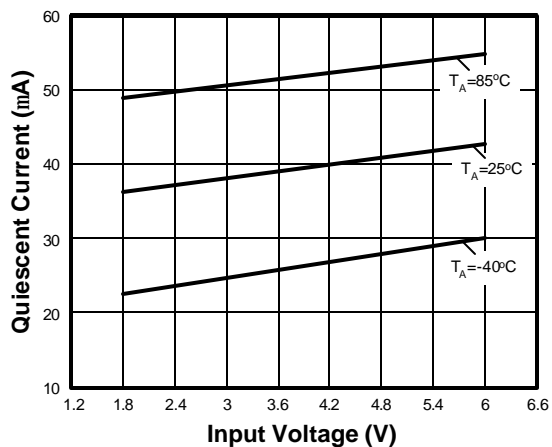
V_{OUT} vs I_{OUT}



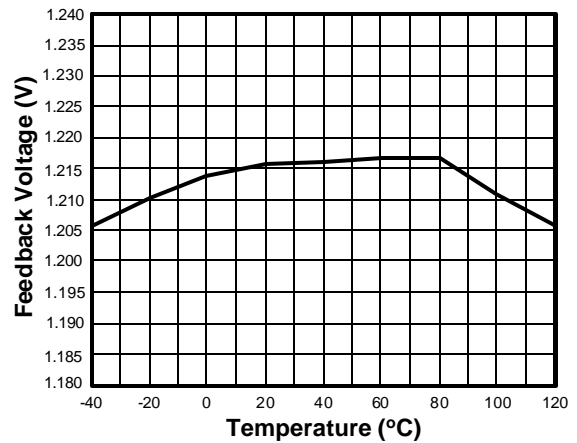
V_{OUT} vs V_{IN}



Quiescent Current vs Input Voltage

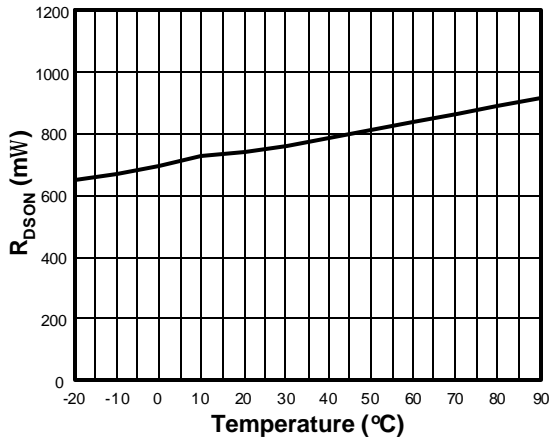


Feedback Voltage vs Temperature

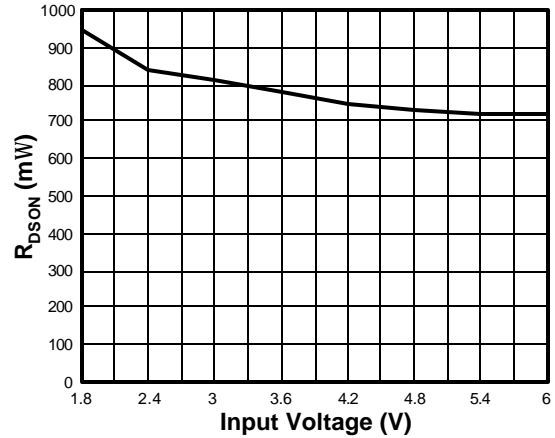




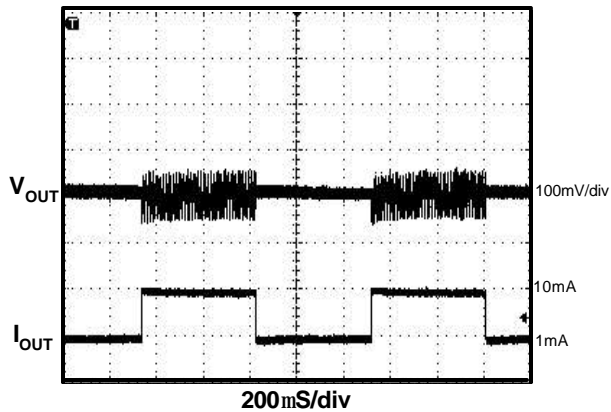
$R_{\text{DS(on)}}$ vs Temperature



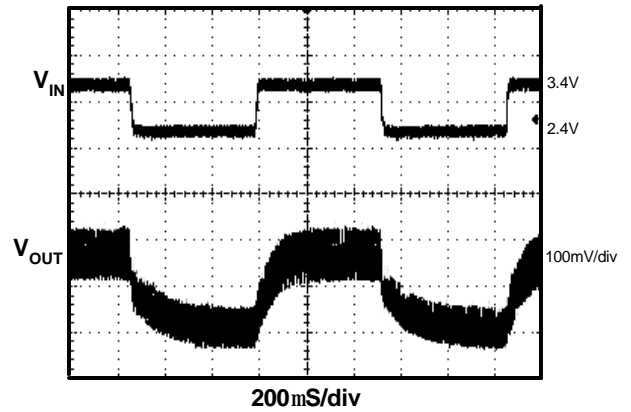
$R_{\text{DS(on)}}$ vs Input Voltage



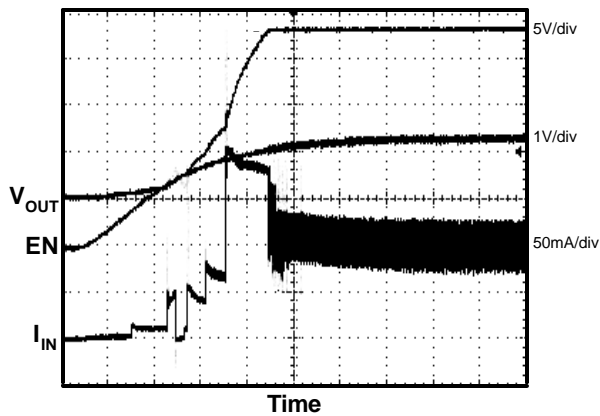
Load Transient Response



Line Transient Response



Start Up Behavior





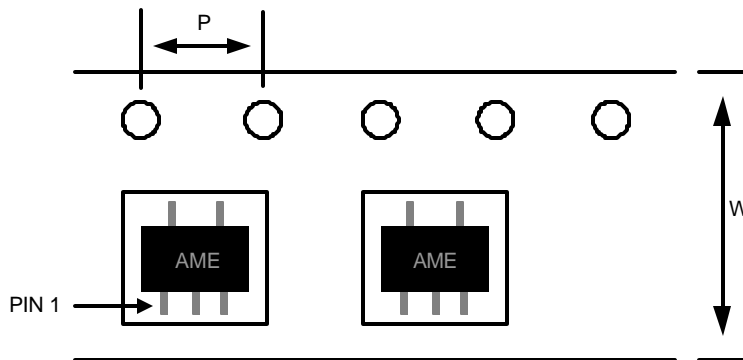
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■ Date Code Rule

Marking			Date Code		Year
A	A	A	W	W	xxx0
A	A	A	W	<u>W</u>	xxx1
A	A	A	<u>W</u>	W	xxx2
A	A	A	<u>W</u>	<u>W</u>	xxx3
A	A	<u>A</u>	W	W	xxx4
A	A	<u>A</u>	W	<u>W</u>	xxx5
A	A	<u>A</u>	<u>W</u>	W	xxx6
A	A	<u>A</u>	<u>W</u>	<u>W</u>	xxx7
A	<u>A</u>	A	W	W	xxx8
A	<u>A</u>	A	W	<u>W</u>	xxx9

■ Tape and Reel Dimension

SOT-25



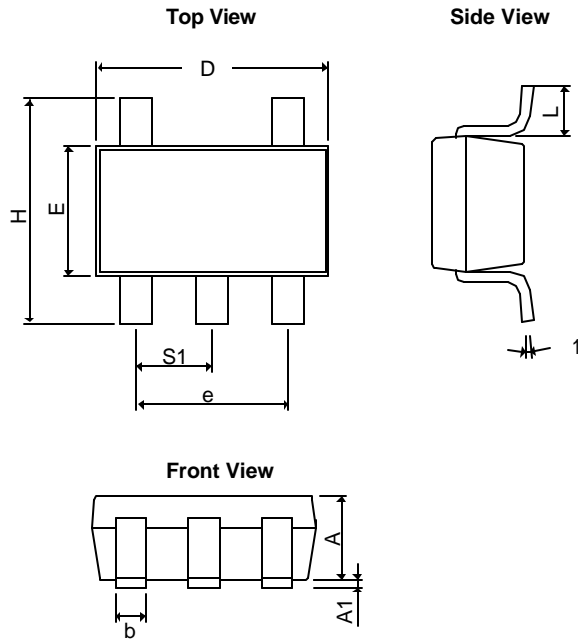
Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOT-25	8.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm



■ Package Dimension

SOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.20REF		0.0472REF	
A₁	0.00	0.15	0.0000	0.0059
b	0.30	0.55	0.0118	0.0217
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.07480 BSC	
H	2.60	3.00	0.10236	0.11811
L	0.37BSC		0.0146BSC	
q1	0°	10°	0°	10°
S₁	0.95BSC		0.0374BSC	



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