

Description

The AP3012 is a high power, constant frequency, current mode PWM, inductor based, step-up (boost) converter. The converter operates at high frequency (1.5MHz) so that a small, low profile inductor can be used.

The AP3012 has built-in overvoltage protection (OVP) to allow the device goes into shutdown mode when the output voltage exceeds the OVP threshold of 29V.

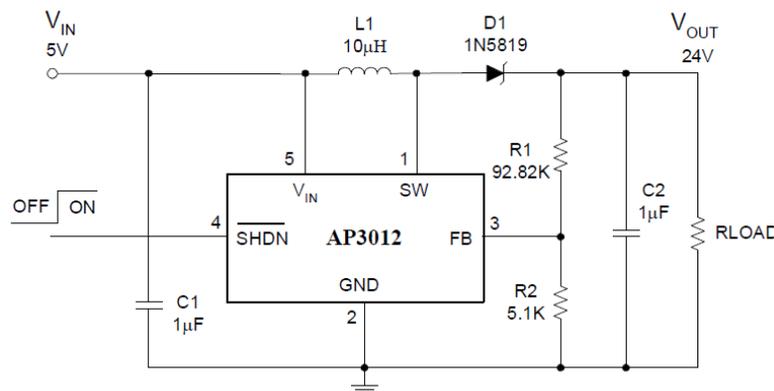
The AP3012 is available in standard SOT-23-5 package.

Features

- High Efficiency up to 81%
- Adjustable Output Voltage up to 29V
- Shutdown Current 1µA Typical
- 1.5MHz Switching Frequency
- 36V 500mA Rugged Integrated Bipolar Switch
- Built-in Soft-start to Reduce Inrush Current During Startup
- On-chip Overvoltage Protection
- Uses Low ESR Ceramic Output Capacitor
- Uses Small Inductor
- Available in "Green" Package: SOT-23-5
 - **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
 - **Halogen and Antimony Free. "Green" Device (Note 3)**
- Lead-Free Package, Available in "Green" Molding Compound: SOT-23-5
 - **Totally Lead-Free & Fully RoHS Compliant (Notes 4 & 2)**
 - **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.

Typical Applications Circuit (Note 5)

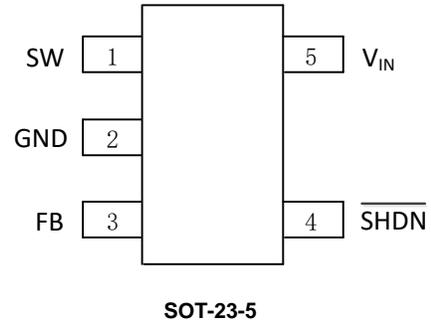


- Note 5: $V_{OUT} = 1.25 \cdot (1 + R1/R2) = 1.25 \cdot 19.2 = 24V$
 C: X5R or X7R Dielectric
 L: SUMIDA CDTH3D14/HPNP-100NC or Equivalent

LCD/OLED Display Bias Driver Typical Circuit

Pin Assignments

(Top View)



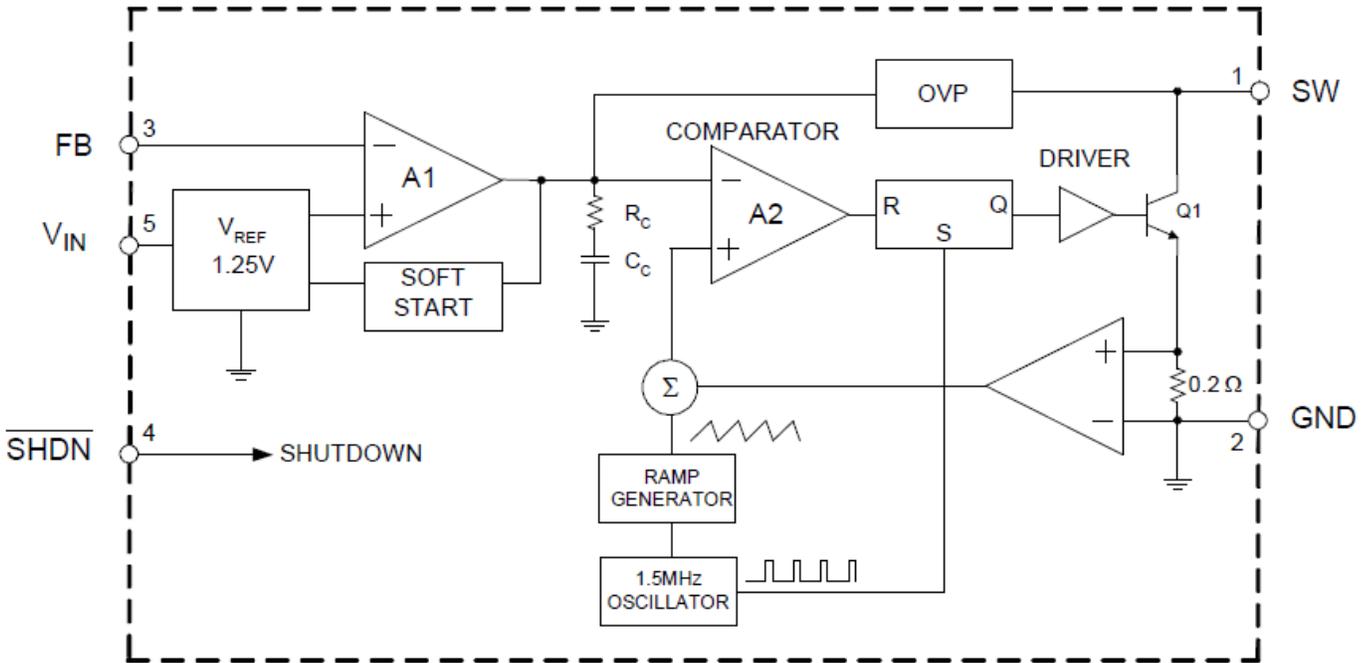
Applications

- LCD/OLED display bias supplies
- White LED drivers for LCD display backlights
- Cellular phones

Pin Descriptions

Pin Number	Pin Name	Function
1	SW	Switch Pin. Connect inductor/diode here. The output voltage can go up to 29V but should not exceed this limit. If the voltage on this pin is higher than the overvoltage protection (OVP) threshold, the device can go into shutdown mode. It can be restarted by a low to high pulse on the SHDN pin, or by a power on reset on the V _{IN} supply
2	GND	Ground Pin. Connect directly to local ground plane
3	FB	Feedback Pin. Internally compares to 1.25V. Connect R1 and R2 resistor divider here. Calculate the Output Voltage according to the formula: $V_{OUT} = 1.25V * (1+R1/R2)$
4	SHDN	Shutdown Pin. Connect to 1.5V or higher to enable device (ON), 0.4V or lower to disable device (OFF)
5	V _{IN}	Input Supply Pin. Must be locally bypassed

Functional Block Diagram



Absolute Maximum Ratings (Note 6)

Symbol	Parameter	Rating	Unit
V_{IN}	Input Voltage	20	V
—	SW Voltage	38	V
—	FB Voltage	5	V
—	$\overline{\text{SHDN}}$ Voltage	16	V
θ_{JA}	Thermal Resistance (Junction to Ambient, no Heat Sink)	265	°C/W
—	Operating Junction Temperature	+150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering, 10sec)	+260	°C
—	ESD (Machine Model)	250	V
—	ESD (Human Body Model)	2000	V

Note: 6. Stresses greater than those listed under *Absolute Maximum Ratings* can 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 can affect device reliability.

Recommended Operating Conditions

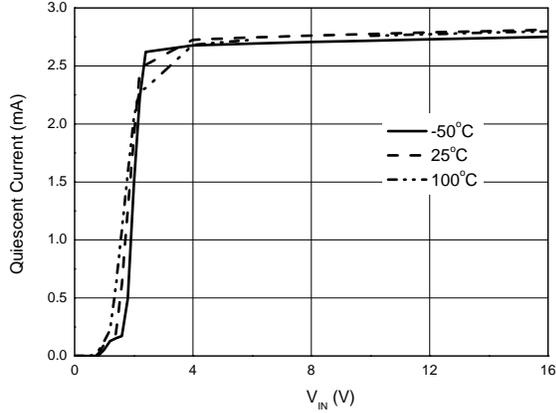
Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	2.6	16	V
T_{OP}	Operating Temperature	-40	+85	°C

Electrical Characteristics (@ $V_{IN} = 3V$, $\overline{V_{SHDN}} = 3V$, $T_A = +25^\circ C$, unless otherwise specified.)

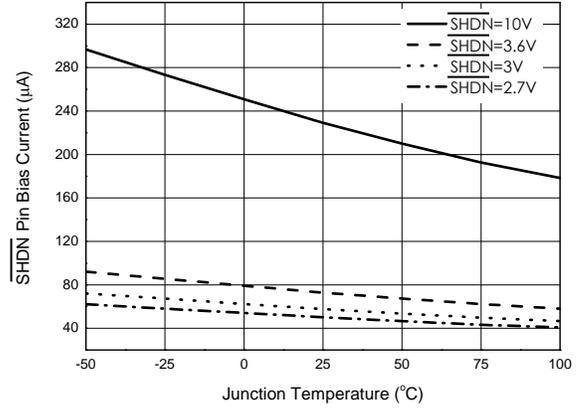
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
—	Minimum Operating Voltage	—	2.6	—	—	V
—	Maximum Operating Voltage	—	—	—	16	V
V_{FB}	Feedback Voltage	$V_{IN} = 5V$, $V_{OUT} = 24V$, $I_{OUT} = 30mA$	1.17	1.25	1.33	V
—	FB Pin Bias Current	$V_{FB} = 1.25V$	10	45	100	nA
I_{CC}	Supply Current	$\overline{V_{SHDN}} = V_{FB} = V_{IN}$, No switching	—	2.5	3.5	mA
I_Q	Supply Current	$\overline{V_{SHDN}} = 0V$, $V_{FB} = 0V$	—	0.1	1.0	μA
f	Switching Frequency	—	1.1	1.5	1.9	MHz
D_{MAX}	Maximum Duty Cycle	—	85	90	—	%
—	Switching Current Limit	Duty Cycle = 80%	—	500	—	mA
V_{CESAT}	Switch VCESAT	$I_{SW} = 250mA$	—	300	—	mV
—	Switch Leakage Current	$V_{SW} = 5V$	—	0.01	5	μA
V_{TH}	\overline{SHDN} Voltage High (ON)	—	1.5	—	—	V
V_{TL}	\overline{SHDN} Voltage Low (OFF)	—	—	—	0.4	
—	\overline{SHDN} Pin Bias Current	—	—	55	—	μA
V_{OVP}	OVP Voltage Threshold	—	—	29	—	V
—	Soft-Start Time	—	—	550	—	μs
θ_{JC}	Thermal Resistance (Junction to Case)	—	—	69.57	—	$^\circ C/W$

Performance Characteristics

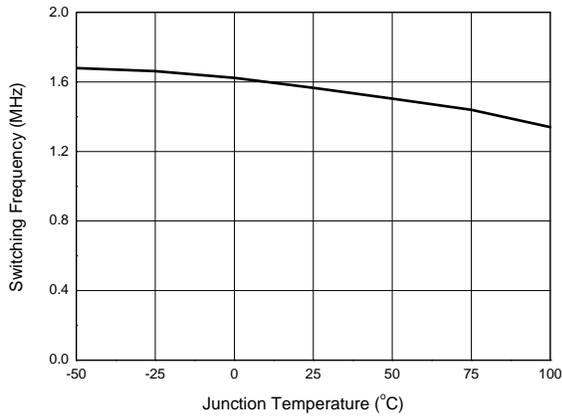
Quiescent Current vs. Input Voltage



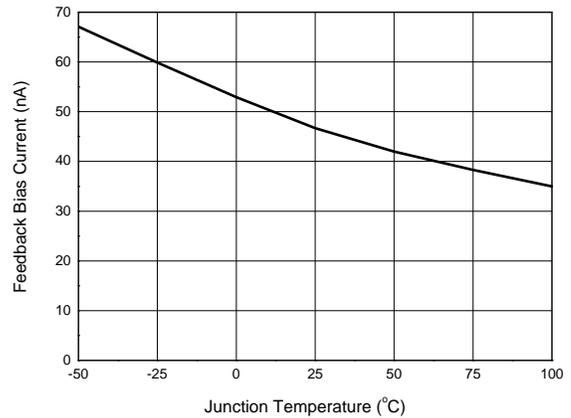
SHDN Pin Bias Current vs. Junction Temperature



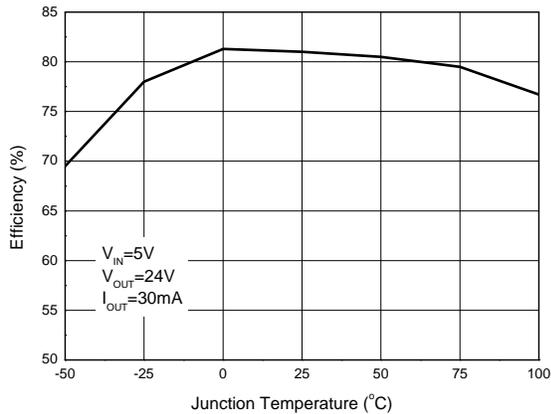
Switching Frequency vs. Junction Temperature



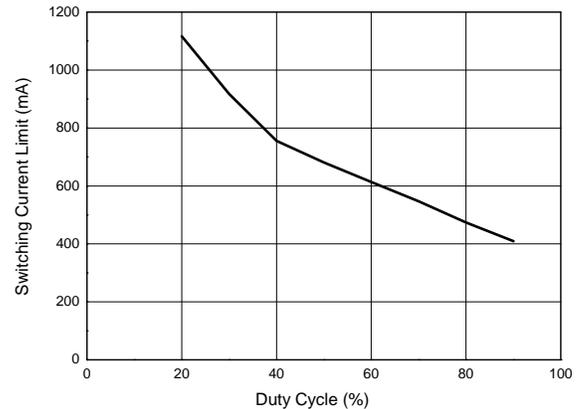
Feedback Bias Current vs. Junction Temperature



Efficiency vs. Junction Temperature

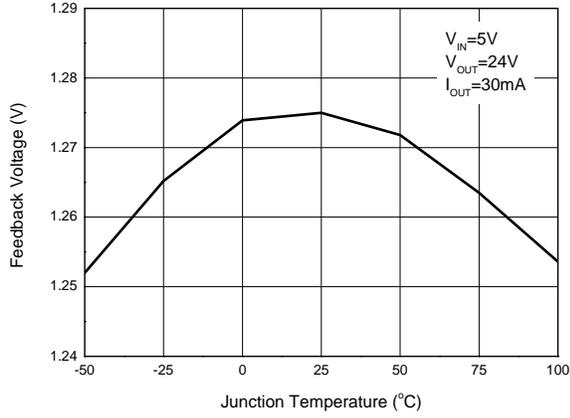


Switching Current Limit vs. Duty Cycle

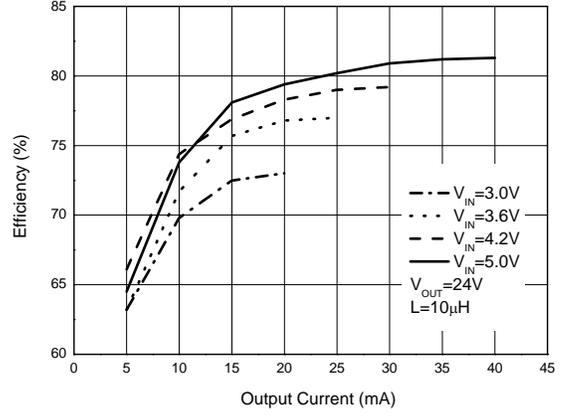


Performance Characteristics (continued)

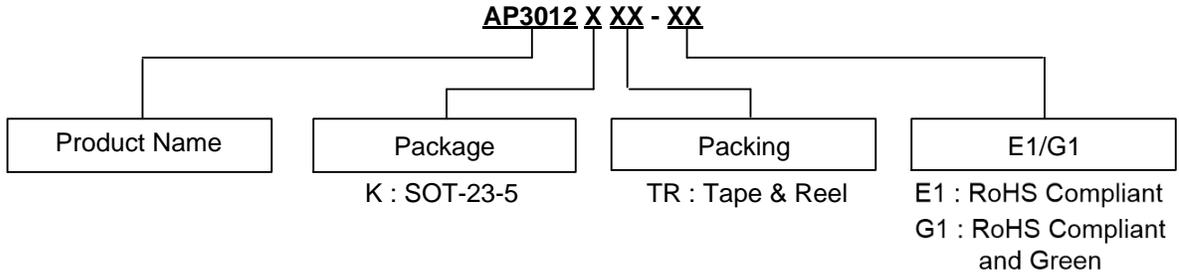
Feedback Voltage vs. Junction Temperature



Efficiency vs. Output Current



Ordering Information



Part Number		Marking ID		Package	Temperature Range	Packing	
RoHS Compliant	RoHS Compliant and Green	RoHS Compliant	RoHS Compliant and Green			Qty.	Carrier
AP3012KTR-E1	AP3012KTR-G1	E6B	G6B	SOT-23-5	-40 to +85°C	3000pcs	Tape & Reel

Marking Information



: Logo
 E6B: Marking ID

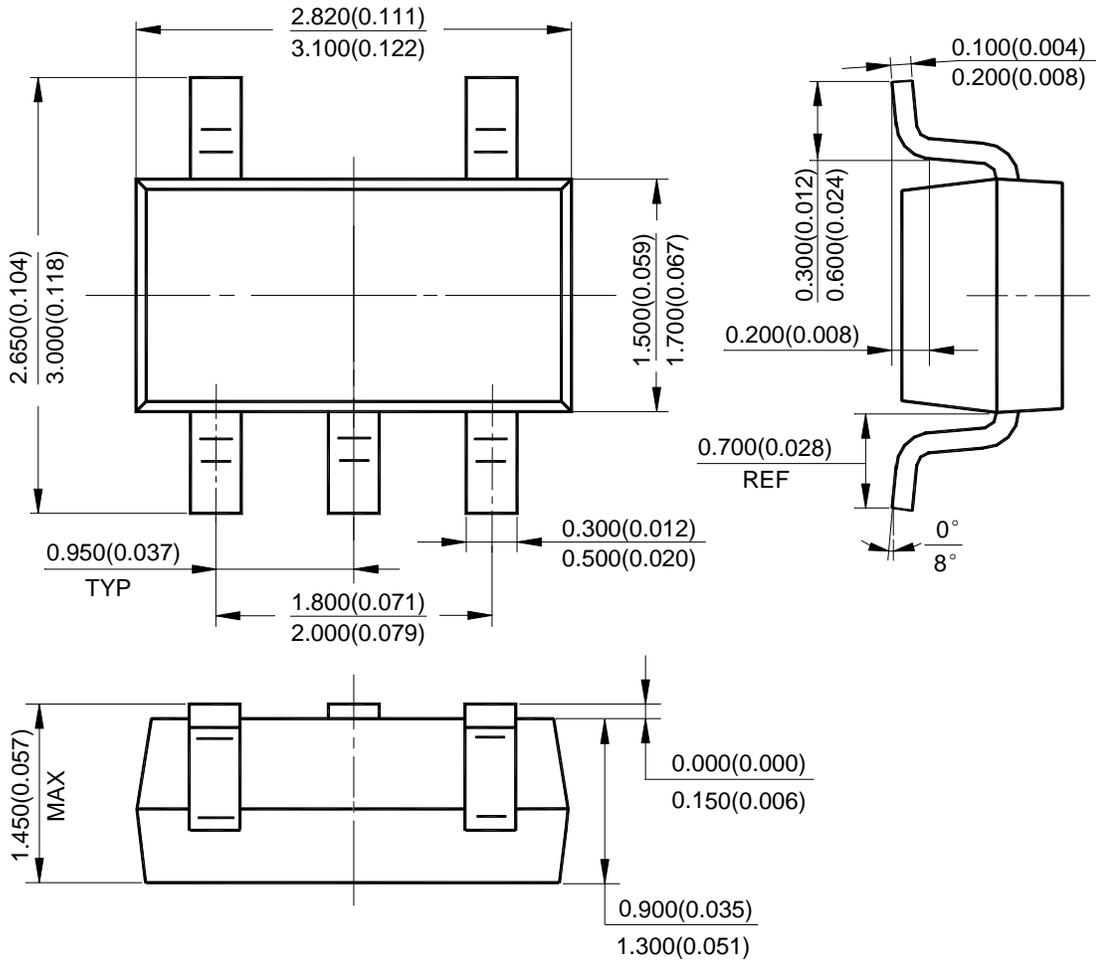


: Logo
 G6B: Marking ID

Package Outline Dimensions (All dimensions in mm(inch).)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

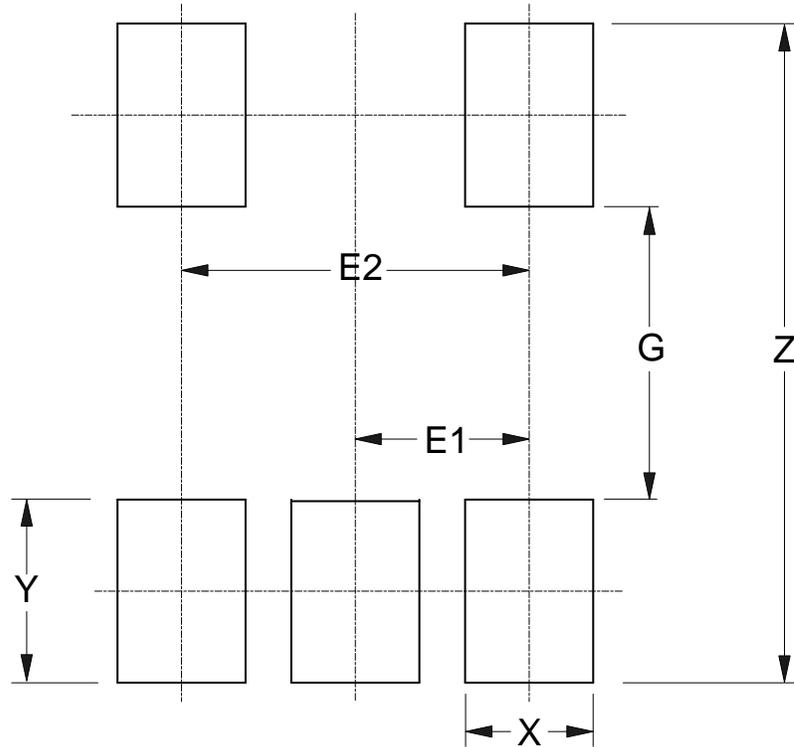
(1) Package Type: SOT-23-5



Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SOT-23-5



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

Mechanical Data

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.016 grams (Approximate)

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