



Linear Voltage Regulator – 7809

Positive Fixed 9V Voltage Regulator in bare die form

Rev 1.1
19/02/24

Description

The 7809 9V fixed 3-terminal positive voltage regulator delivers up to 1.5A of output current with adequate heat-sinking. The device is equipped with internal limiting, safe-area compensation + thermal shutdown features for overload immunity. The 7809 can be used with external components to obtain adjustable voltages or currents & can also be used as the power-pass element in precision high-current voltage regulators. No external components are needed other than to enhance performance or increase design flexibility.

Features:

- $\pm 5\%$ V_{OUT} tolerance over entire temperature range
- Greater than 1A output current capability
- Internal thermal overload protection
- Internal short-circuit current limit
- Output capacitor not essential for stability
- Full Military temperature range
- Negative voltage complement is 7909

Ordering Information

The following part suffixes apply:

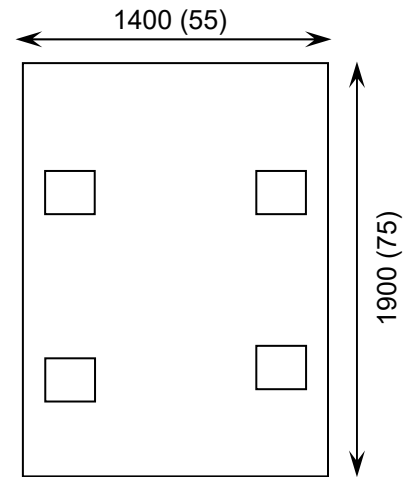
- No suffix - MIL-STD-883 /2010B Visual Inspection
- "H" - MIL-STD-883 /2010B Visual Inspection + MIL-PRF-38534 Class H LAT
- "K" - MIL-STD-883 /2010A Visual Inspection (Space) + MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

www.siliconsupplies.com/quality/bare-die-lot-qualification

Die Dimensions in μm (mils)



Supply Formats:

- Default – Die in Waffle Pack (100 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- Tape & Reel – On request
- In Metal or Ceramic package – On request

Mechanical Specification

Die Size (Unsawn)	1400 x1900 55 x 75	μm mils
Minimum Bond Pad Size	230 x 230 9.05 x 9.05	μm mils
Die Thickness	280 (± 20) 11.02 (± 0.79)	μm mils
Top Metal Composition	Al 1%Si 1.1 μm	
Back Metal Composition	Ti/Ni/Ag 1.2 μm	

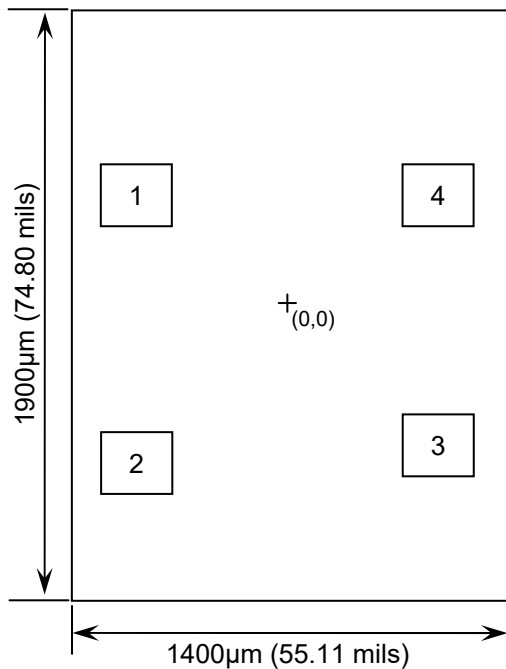




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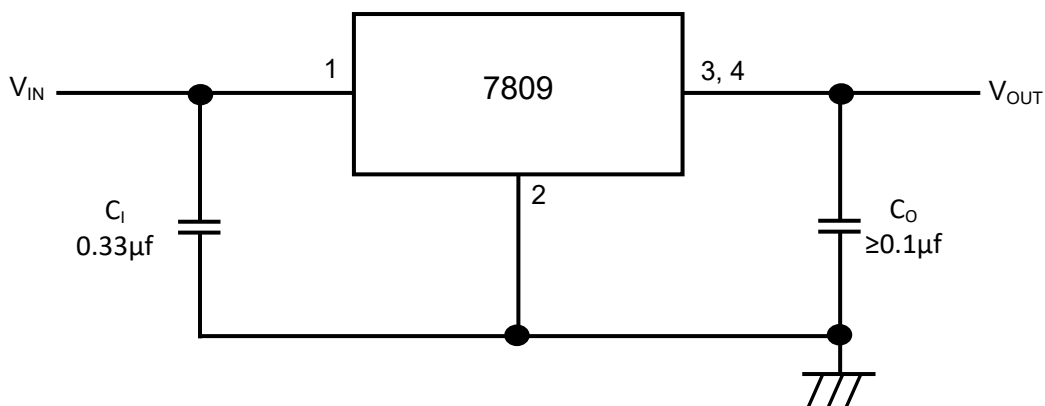
Rev 1.1
19/02/24

Pad Layout and Functions



PAD	FUNCTION	COORDINATES (µm)	
		X	Y
1	V _{IN}	-610	247
2	GND	-610	-626
3	V _{OUT}	372	-560
4	V _{OUT}	372	247
CONNECT CHIP BACK TO GND			

Typical Application



C_I is required if the regulator is located an appreciable distance from power supply filter. C_O is not required for stability; however it does improve transient response. For optimum stability and transient response locate C_I C_O as close as possible to the regulator. A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.





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Rev 1.1
19/02/24

Absolute Maximum Ratings¹

PARAMETER	SYMBOL	VALUE	UNIT
Input Voltage	V_{IN}	36	V
Power Dissipation ²	P_D	Internally Limited	W
Operating Temperature Range	-	-55 to 150	°C
Maximum Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65 to 150	°C

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNIT
Input Voltage	V_{IN}	7	25	V
Output Current	I_{OUT}	-	1.5	A
Operating Temperature Range	T_J	-55	125	°C

DC Electrical Characteristics, $V_I=15V$, $I_{OUT}=500mA$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, $T_{MIN} \leq T_J \leq T_{MAX}$ (unless noted otherwise)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	$T_J = 25^\circ C$	8.65	9.0	9.35	V
		$5mA \leq I_{OUT} \leq 1A$, $11.5V \leq V_{IN} \leq 24V$, $P_D \leq 15$ Watts	8.55	9.0	9.45	
Line Regulation	ΔV_{OUT}	$11V \leq V_{IN} \leq 26V$, $T_J = 25^\circ C$	-	-	180	mV
		$11.5V \leq V_{IN} \leq 17V$, $T_J = 25^\circ C$	-	-	90	
Load Regulation	ΔV_{OUT}	$5mA \leq I_{OUT} \leq 1.5A$, $T_J = 25^\circ C$	-	-	180	mV
Input Bias Current	I_B		-	3.4	8	mA
Input Bias Current Change	ΔI_B	$11.5V \leq V_{IN} \leq 26V$	-	-	1	mA
		$5mA \leq I_{OUT} \leq 1A$, $T_J = 25^\circ C$	-	-	0.5	
Output Noise Voltage	V_n	$10Hz \leq f \leq 100KHz$, $T_J = 25^\circ C$	-	10	-	$\mu V/V_{OUT}$
Ripple Rejection	RR	$11.5V \leq V_{IN} \leq 21.5V$, $f = 120Hz$,	-	71	-	dB
Dropout Voltage	$V_{IN} - V_{OUT}$	$I_{OUT} = 1A$, $T_J = 25^\circ C$	-	2	-	V
Output Resistance	r_{OUT}	$f = 1$ kHz	-	1	-	m Ω
Short-Circuit Current Limit	I_{SC}	$V_{IN} = 35V$, $T_A = 25^\circ C$	-	0.2	-	A
Peak Output Current	I_{MAX}	$T_J = 25^\circ C$	-	2.2	-	A
Avg. Output Voltage Temp. Coefficient	TCV_{OUT}		-	-0.5	-	mV/°C

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability. 2. Results in die form are dependent on die attach and assembly method. Max power dissipation is internally limited by the die.





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19/02/24

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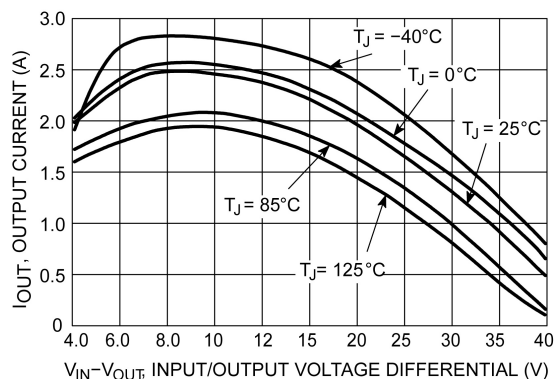


Figure 1 – Peak output current as a function of input/output differential voltage

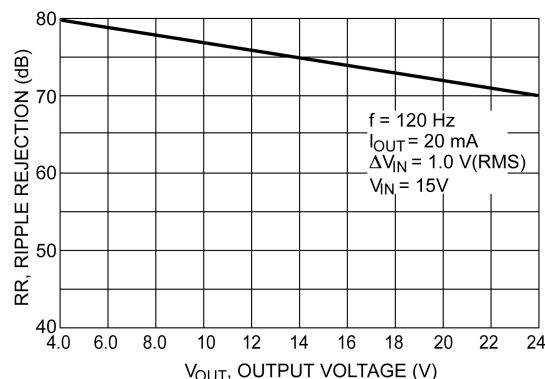


Figure 2 – Ripple rejection as a function of output voltage

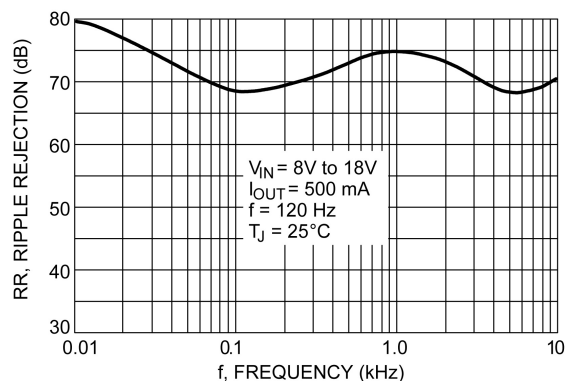


Figure 3 – Ripple rejection as a function of frequency

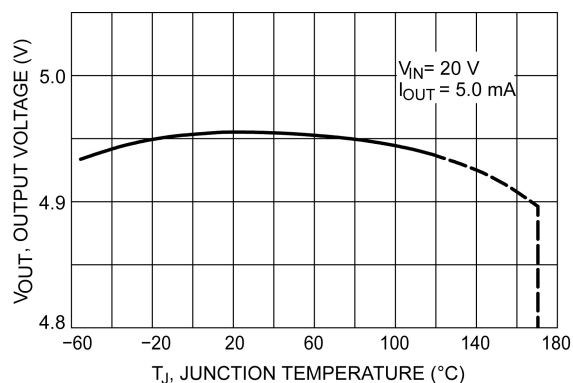


Figure 4 – Output voltage as a function of junction temperature

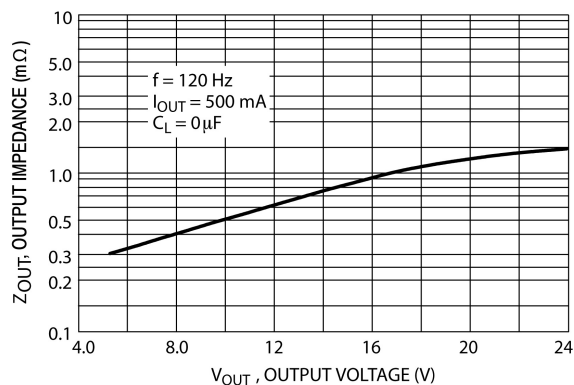


Figure 5 – Output impedance as a function of output Voltage

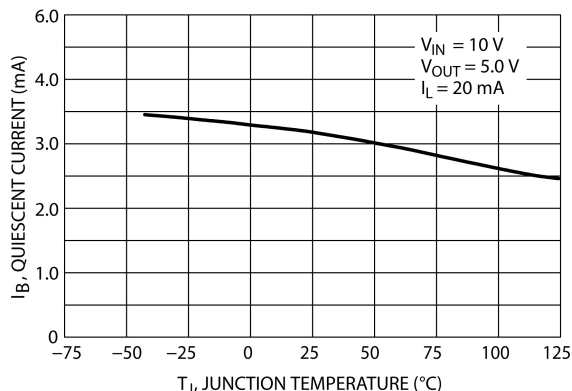


Figure 6 – Quiescent current as a function of temperature





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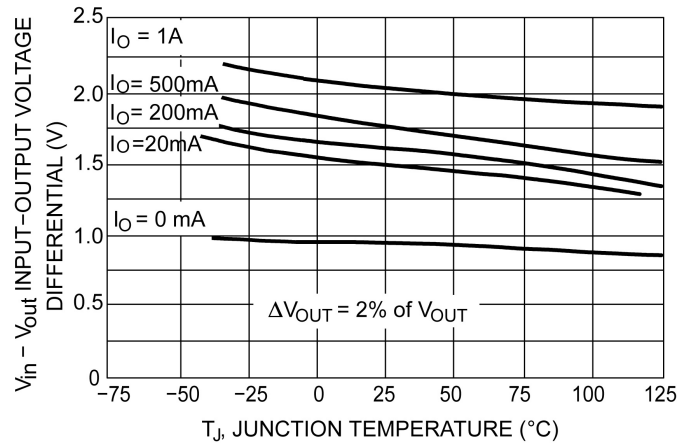


Figure 7 – Input/Output differential voltage as a function of junction temperature

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