

LDO Regulator - 400 mA, Best-in-Class Dropout, with Bias Rail

Product Preview

T30LMPSR132, T30LAPSR132

The T30LxPSR132 is an ultra-fast, 400 mA bias rail LDO with market-leading dropout voltage (**20 mV @ full load**). Due to its advanced CMOS process, the T30LxPSR132 offers ultra-fast dynamic response and provides very stable output voltage with 1% accuracy over full temperature range. The device also features high PSRR across frequency range and ultra-low noise optimized for noise sensitive applications. The T30LxPSR132 very low bias current makes the device suitable for battery powered applications. The minimum recommended output capacitance (1 x 2.2 μ F) and the low profile, WLCSP6 0.99 mm x 0.65 mm, 0.35P Chip Scale package is ideal for space-constrained applications.

Features

- Best-in-Class Dropout: 20 mV (typ.) at 400 mA
- $\pm 1\%$ Accuracy over -40°C to 125°C Temp. Range
- High PSRR across Frequency Range
 - ◆ 75 dB at 1 kHz
 - ◆ 38 dB at 100 kHz
- Very Low Bias Input Current of Typ. 85 μ A
- Ultra Low Noise, 7.5 μ V_{RMS} Typ.
- Excellent Load Transient Performance
- Input Voltage Range: up to 2.2 V
- Bias Voltage Range: up to 3.3 V
- Output Voltage Range: 0.5 V to 1.8 V (Fixed), Resolution 25 mV
- 1.2 V Logic Level Enable Input Compatibility

Typical Applications

- Battery-powered Equipment
- Smartphones, Tablets
- Cameras, DVRs, STB and Camcorders

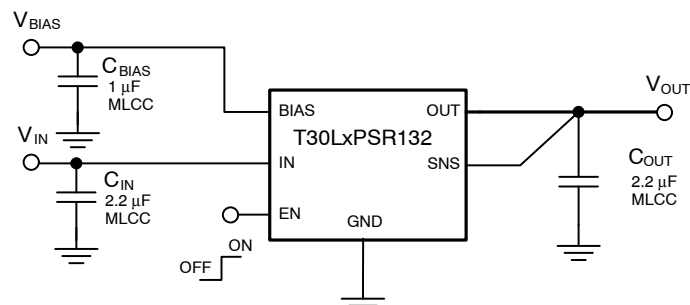


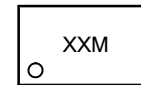
Figure 1. Typical Application Schematics

This document contains information on a product under development. onsemi reserves the right to change or discontinue this product without notice.



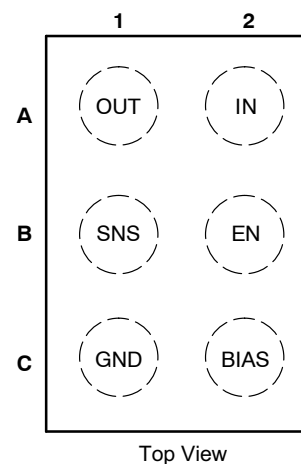
WLCSP6 0.99x0.65x0.29
CASE 567ZT

MARKING DIAGRAM



XX = Specific Device Code
M = Month Code

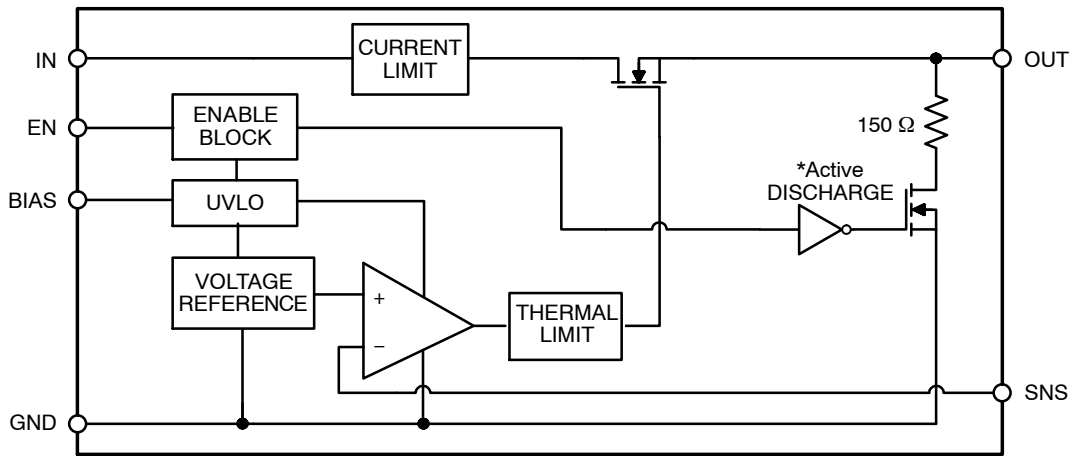
PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

T30LMPSR132, T30LAPSR132



*Active output discharge function is present only in "A" and "C" option devices.

Figure 2. Simplified Schematic Block Diagram – Fixed Version

PIN FUNCTION DESCRIPTION

Pin No. WLCSP6	Pin Name	Description
A1	OUT	Regulated Output Voltage pin
A2	IN	Input Voltage Supply pin
B1	SNS	Output voltage Sensing Input. Connect to Output on the PCB to output the voltage corresponding to the part version.
B2	EN	Enable pin. Driving this pin high enables the regulator. Driving this pin low puts the regulator into shutdown mode.
C1	GND	Ground pin
C2	BIAS	Bias voltage supply for internal control circuits.

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage (Note 1)	V_{IN}	-0.3 to 2.5	V
Output Voltage	V_{OUT}	-0.3 to $(V_{IN}+0.3) \leq 2.5$	V
Chip Enable, Bias and SNS Input	$V_{EN}, V_{BIAS}, V_{SNS}$	-0.3 to 3.6	V
Output Short Circuit Duration	t_{SC}	unlimited	s
Maximum Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 to 150	°C
ESD Capability, Human Body Model (Note 2)	ESD_{HBM}	2000	V
ESD Capability, Charged Device Model (Note 2)	ESD_{CDM}	750	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Refer to ELECTRICAL CHARACTERISTICS and APPLICATION INFORMATION for Safe Operating Area.
2. This device series incorporates ESD protection (except OUT pin) and is tested by the following methods:
ESD Human Body Model tested per EIA/JESD22-A114.
ESD Charged Device Model tested per JS-002-2018.
Latchup Current Maximum Rating tested per JEDEC standard: JESD78.

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Characteristics, WLCSP6 1.145 mm x 0.75 mm Thermal Resistance, Junction-to-Air (Note 3)	$R_{\theta JA}$	69	°C/W

3. This junction-to-ambient thermal resistance under natural convection was derived by thermal simulations based on the JEDEC JESD51 series standards methodology. Only a single device mounted at the center of a high_K (2s2p) 80 mm x 80 mm multilayer board with 1-ounce internal planes and 2-ounce copper on top and bottom. Top copper layer has a dedicated 1.6 mm² copper area.

T30LMPSR132, T30LAPSR132

ELECTRICAL CHARACTERISTICS $-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$; $V_{\text{BIAS}} = 2.7\text{ V}$ or $(V_{\text{OUT}} + 1.6\text{ V})$, whichever is greater, $V_{\text{IN}} = V_{\text{OUT(NOM)}} + 0.1\text{ V}$, $I_{\text{OUT}} = 1\text{ mA}$, $V_{\text{EN}} = 1\text{ V}$, $C_{\text{IN}} = 2.2\text{ }\mu\text{F}$, $C_{\text{OUT}} = 2.2\text{ }\mu\text{F}$, $C_{\text{BIAS}} = 1\text{ }\mu\text{F}$, unless otherwise noted. Typical values are at $T_J = +25^{\circ}\text{C}$. Min/Max values are for $-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$ unless otherwise noted. (Note 4)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Operating Input Voltage Range		V_{IN}	$V_{\text{OUT}} + V_{\text{DO}}$		2.2	V
Operating Bias Voltage Range		V_{BIAS}	$(V_{\text{OUT}} + 1.50) \geq 2.5$		3.3	V
Undervoltage Lock-out	V_{BIAS} Rising Hysteresis	$UVLO_{(\text{BIAS})}$		2.1 0.1		V
	V_{IN} Rising Hysteresis	$UVLO_{(\text{IN})}$		$0.8 \times V_{\text{OUT}} \times 0.1$		
Output Voltage Accuracy	$-40^{\circ}\text{C} \leq T_J \leq 85^{\circ}\text{C}$, $V_{\text{OUT(NOM)}} + 0.1\text{ V} \leq V_{\text{IN}} \leq V_{\text{OUT(NOM)}} + 1.0\text{ V}$, 2.7 V or $(V_{\text{OUT(NOM)}} + 1.6\text{ V})$, whichever is greater < $V_{\text{BIAS}} < 3.3\text{ V}$, $1\text{ mA} < I_{\text{OUT}} < 400\text{ mA}$	V_{OUT}	-0.8		+0.8	%
Output Voltage Accuracy	$-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$, $V_{\text{OUT(NOM)}} + 0.1\text{ V} \leq V_{\text{IN}} \leq V_{\text{OUT(NOM)}} + 1.0\text{ V}$, 2.7 V or $(V_{\text{OUT(NOM)}} + 1.6\text{ V})$, whichever is greater < $V_{\text{BIAS}} < 3.3\text{ V}$, $1\text{ mA} < I_{\text{OUT}} < 400\text{ mA}$	V_{OUT}	-1		+1	%
V_{IN} Line Regulation	$V_{\text{OUT(NOM)}} + 0.1\text{ V} \leq V_{\text{IN}} \leq 2.2\text{ V}$	LineReg		0.01		%/V
V_{BIAS} Line Regulation	2.7 V or $(V_{\text{OUT(NOM)}} + 1.6\text{ V})$, whichever is greater < $V_{\text{BIAS}} < 3.3\text{ V}$	LineReg		0.01		%/V
Load Regulation	$I_{\text{OUT}} = 1\text{ mA}$ to 400 mA	LoadReg		1		mV
V_{IN} Dropout Voltage	$I_{\text{OUT}} = 400\text{ mA}$ (Note 5)	V_{DO}		20	50	mV
V_{BIAS} Dropout Voltage	$I_{\text{OUT}} = 400\text{ mA}$, $V_{\text{IN}} = V_{\text{BIAS}}$ (Notes 5, 6)	V_{DO}		1.1	1.5	V
Output Current Limit	$V_{\text{OUT}} = 90\% V_{\text{OUT(NOM)}}$	I_{CL}	530	660	800	mA
SNS Pin Operating Current		I_{SNS}		0.1	0.5	μA
Bias Pin Quiescent Current	$V_{\text{BIAS}} = 3.3\text{ V}$, $I_{\text{OUT}} = 0\text{ mA}$	I_{BIASQ}		85	130	μA
Bias Pin Disable Current	$V_{\text{EN}} \leq 0.325\text{ V}$	$I_{\text{BIAS(DIS)}}$		0.5	TBD	μA
Input Pin Disable Current		$I_{\text{VIN(DIS)}}$		0.5	TBD	μA
EN Pin Threshold Voltage	EN Input Voltage "H"	$V_{\text{EN(H)}}$	0.825			V
	EN Input Voltage "L"	$V_{\text{EN(L)}}$			0.325	
EN Pull Down Current	$V_{\text{EN}} = 3.3\text{ V}$	I_{EN}		0.3	TBD	μA
Power Supply Rejection Ratio	V_{IN} to V_{OUT} , $V_{\text{IN}} = V_{\text{OUT}} + 0.1\text{ V}$, $I_{\text{OUT}} = 150\text{ mA}$, $C_{\text{OUT}} = 2.2\text{ }\mu\text{F}$, 0201	$f = 100\text{ Hz}$	$\text{PSRR}(V_{\text{IN}})$		75	dB
				$f = 1\text{ kHz}$	80	
				$f = 10\text{ kHz}$	60	
				$f = 100\text{ kHz}$	40	
	V_{BIAS} to V_{OUT} , $V_{\text{IN}} = V_{\text{OUT}} + 0.1\text{ V}$	$f = 1\text{ kHz}$	$\text{PSRR}(V_{\text{BIAS}})$		80	dB
Output Noise Voltage	$V_{\text{IN}} = V_{\text{OUT}} + 0.1\text{ V}$, $f = 10\text{ Hz}$ to 100 kHz	$I_{\text{OUT}} = 10\text{ mA}$	V_{N}		9	μVRMS
		$I_{\text{OUT}} = 400\text{ mA}$			7.5	
Thermal Shutdown Threshold	Temperature increasing			160		$^{\circ}\text{C}$
	Temperature decreasing			140		
Output Discharge Pull-Down	$V_{\text{EN}} \leq 0.325\text{ V}$, $V_{\text{OUT}} = 0.5\text{ V}$, Active Discharge Version Only	R_{DISCH}		150		Ω

4. Performance guaranteed over the indicated operating temperature range by design and/or characterization. Production tested at $T_A = 25^{\circ}\text{C}$. Low duty cycle pulse techniques are used during the testing to maintain the junction temperature as close to ambient as possible.
5. Dropout voltage is characterized when V_{OUT} falls 3% below $V_{\text{OUT(NOM)}}$.
6. For fixed output voltages below 1.5 V , V_{BIAS} dropout does not apply due to a minimum Bias operating voltage of 2.5 V .

T30LMPSR132, T30LAPSR132

ELECTRICAL CHARACTERISTICS $-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$; $V_{\text{BIAS}} = 2.7\text{ V}$ or $(V_{\text{OUT}} + 1.6\text{ V})$, whichever is greater, $V_{\text{IN}} = V_{\text{OUT(NOM)}} + 0.1\text{ V}$, $I_{\text{OUT}} = 1\text{ mA}$, $V_{\text{EN}} = 1\text{ V}$, $C_{\text{IN}} = 2.2\text{ }\mu\text{F}$, $C_{\text{OUT}} = 2.2\text{ }\mu\text{F}$, $C_{\text{BIAS}} = 1\text{ }\mu\text{F}$, unless otherwise noted. Typical values are at $T_J = +25^{\circ}\text{C}$. Min/Max values are for $-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$ unless otherwise noted. (Note 4)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Delay time	From assertion of V_{EN} to output voltage increase	'A' option		120		μs
		'C' option		120		
Rise time	V_{OUT} rise from 10% to 90% $V_{\text{OUT(NOM)}}$	'A' option		21		
		'C' option		100		
Turn-On Time	From assertion of V_{EN} to $V_{\text{OUT}} = 98\% V_{\text{OUT(NOM)}}$	'A' option		140		
		'C' option		220		

4. Performance guaranteed over the indicated operating temperature range by design and/or characterization. Production tested at $T_A = 25^{\circ}\text{C}$. Low duty cycle pulse techniques are used during the testing to maintain the junction temperature as close to ambient as possible.
5. Dropout voltage is characterized when V_{OUT} falls 3% below $V_{\text{OUT(NOM)}}$.
6. For fixed output voltages below 1.5 V, V_{BIAS} dropout does not apply due to a minimum Bias operating voltage of 2.5 V.

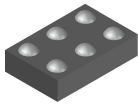
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

ORDERING INFORMATION

Device	Output Voltage	Marking	Option	Package	Shipping [†]
T30LMPSR132	TBD V	TBD	TBD	WLCSP6 Case 567ZT (Pb-Free) UBM: 210 μm Bump Type: (98.2% Sn/1.8% Ag) Plate	10,000 / Tape & Reel
T30LAPSR132	TBD V	TBD			

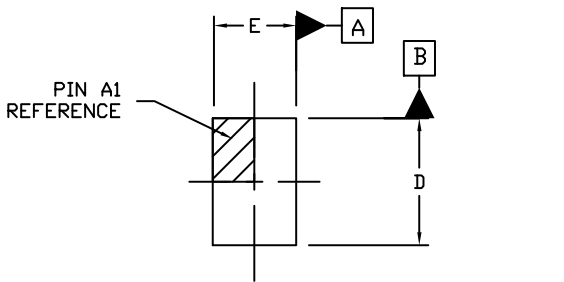
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

7. To order other package and voltage variants, please contact your **onsemi** sales representative.

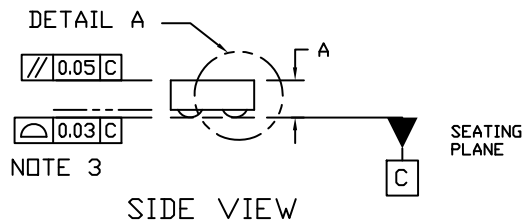


WLCSP6 0.99x0.65x0.29
CASE 567ZT
ISSUE B

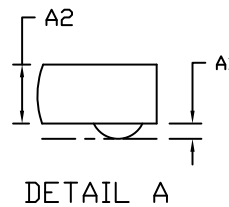
DATE 21 JAN 2022



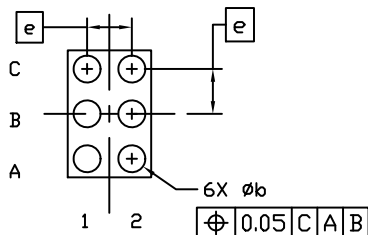
TOP VIEW



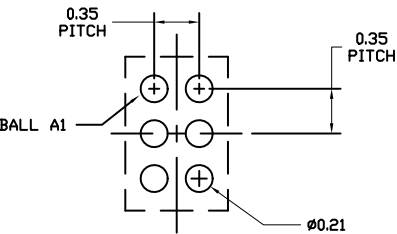
SIDE VIEW



DETAIL A



BOTTOM VIEW



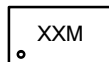
RECOMMENDED
MOUNTING FOOTPRINT*

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
4. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS.
5. DIMENSION b IS MEASURED AT THE MAXIMUM BALL DIAMETER, PARALLEL TO DATUM C.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.250	0.290	0.330
A1	0.040	0.060	0.080
A2	0.23 REF		
b	0.180	0.210	0.240
D	0.940	0.990	1.040
E	0.600	0.650	0.700
e	0.35 BSC		

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

DOCUMENT NUMBER:	98AON27334H	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WLCSP6 0.99x0.65x0.29	PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales