

ZXTR2105F

60V INPUT, 5V 15mA REGULATOR TRANSISTOR

Description

The ZXTR2105F monolithically integrates a transistor, Zener diode and resistor to function as a linear regulator. The device regulates with a 5V nominal output at 15mA. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a SOT23 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

Applications

Supply voltage regulation for:

- 12V to 5V Rails
- 24V to 5V Rails
- Other Customized Input Rails

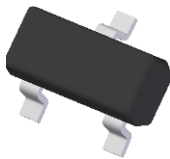
Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 7 to 60V
- Output Voltage = 5V ± 5%
- Fully integrated into a SOT23 Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

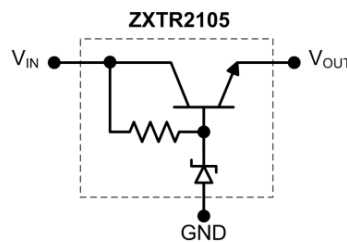
Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic "Green" Molding Compound; UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.008 grams (Approximate)

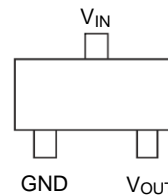
SOT23



Top View



Internal Device Schematic



Top View Pin-Out

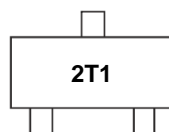
Pin Name	Pin Function
V _{IN}	Input Supply
GND	Power Ground
V _{OUT}	Voltage Output

Ordering Information (Note 4)

Product	Package	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXTR2105F-7	SOT23	2T1	7	8	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html 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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



2T1 = Product Type Marking Code

Absolute Maximum Ratings (Voltage relative to GND, @T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Input Voltage	V _{IN}	60	V
Continuous Input & Output Current	I _{IN} , I _{OUT}	320	mA
Peak Pulsed Input & Output Current	I _{IM} , I _{OM}	2	A
Maximum Voltage Applied to V _{OUT}	V _{OUT(max)}	7	V

Maximum Current at V_{IN} = 12V (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current	I _{OUT}	89	mA
Pulsed Output Current	I _{OM}	2,000	mA
		890	

Thermal Characteristics

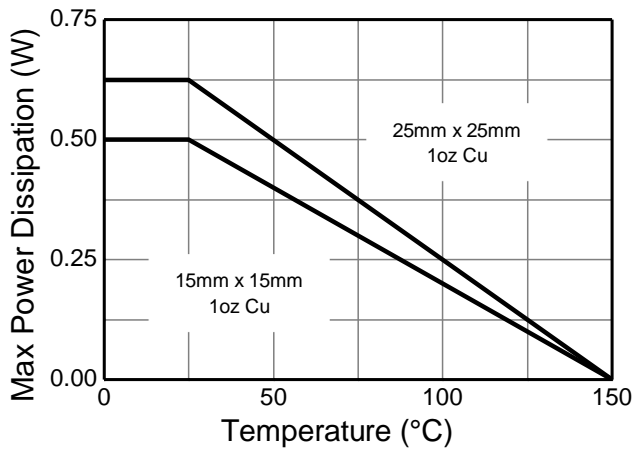
Characteristic	Symbol	Value	Unit
Power Dissipation	P _D	625	mW
		500	
Thermal Resistance, Junction to Ambient	R _{θJA}	200	°C/W
		250	
Thermal Resistance, Junction to Lead	R _{θJL}	197	
Thermal Resistance, Junction to Case	R _{θJC}	17	
Maximum Operating Junction and Storage Temperature Range	T _J , T _{STG}	-65 to +150	°C

ESD Ratings (Note 11)

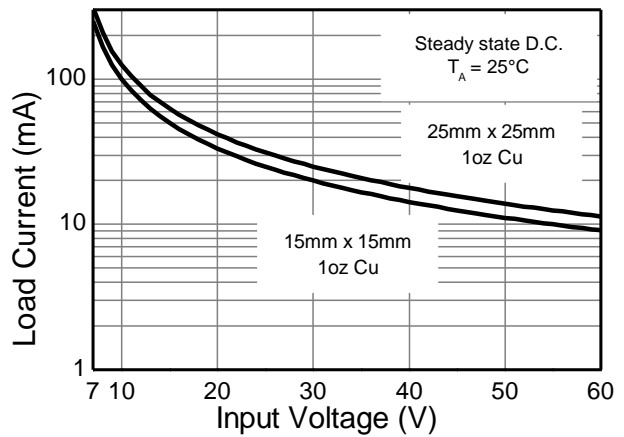
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted with the V_{IN} lead on 25mm x 25mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
 - Same as Note 5, except mounted on 15mm x 15mm 1oz copper.
 - Same as Note 5, whilst operating at V_{IN}=12V. Refer to Safe Operating Area for other Input Voltages.
 - Same as Note 5, except measured with a single pulse width = 100µs and V_{IN}=12V.
 - Same as Note 5, except measured with a single pulse width = 10ms and V_{IN}=12V.
 - R_{θJL} = Thermal resistance from junction to solder-point (at the end of the V_{IN} lead).
 - R_{θJC} = Thermal resistance from junction to the top of case.
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

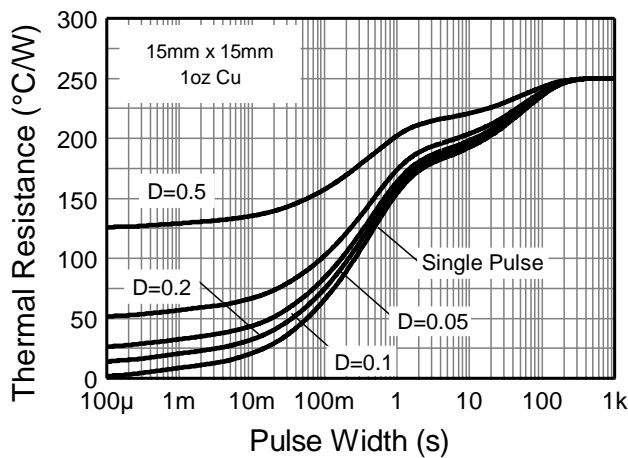
Thermal Characteristics and Derating Information



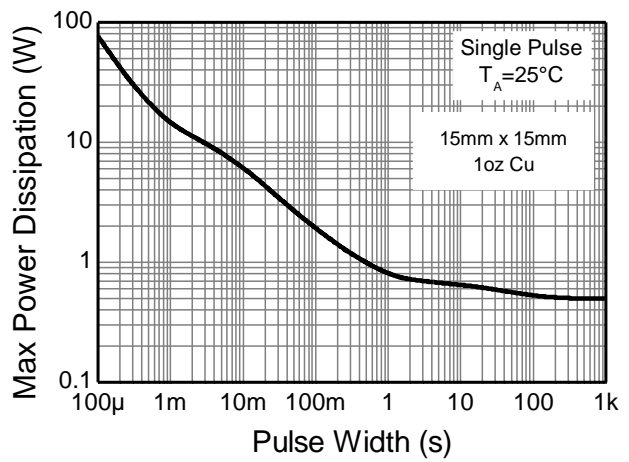
Derating Curve



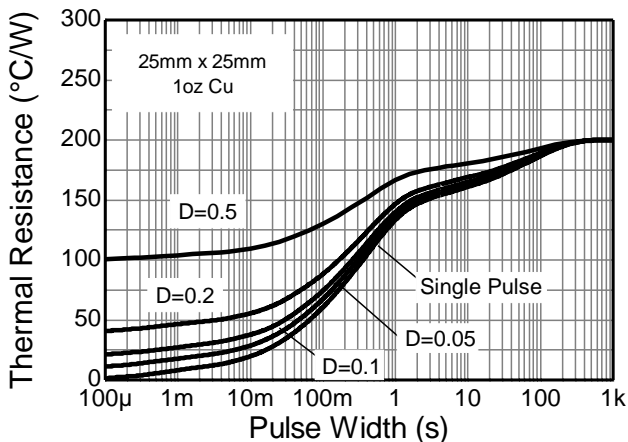
Safe Operating Area



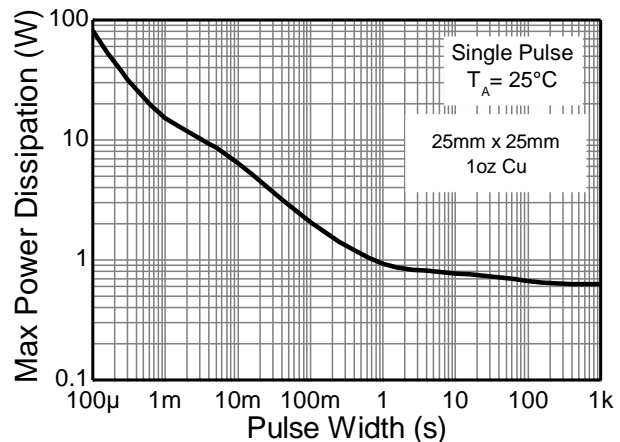
Transient Thermal Impedance



Pulse Power Dissipation



Transient Thermal Impedance



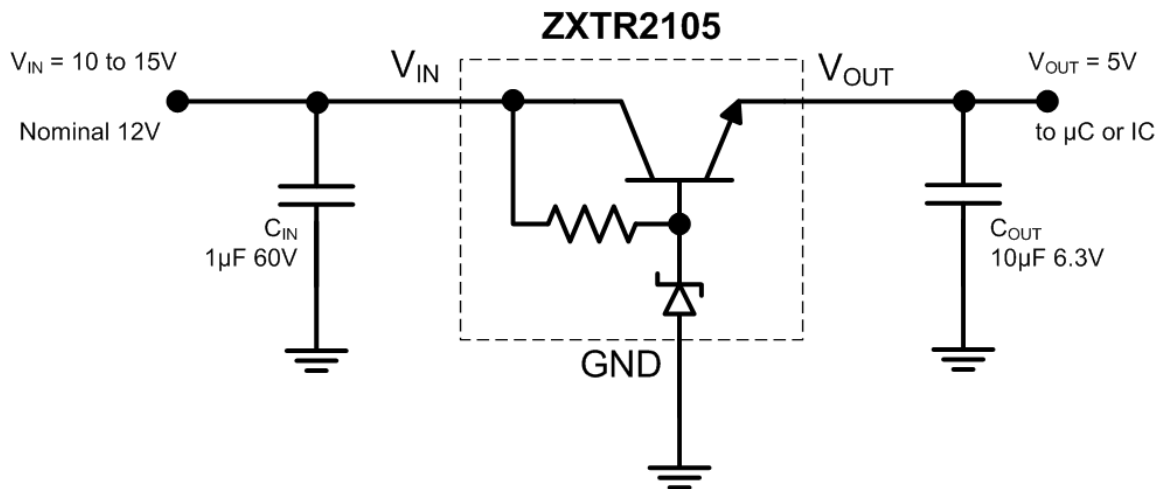
Pulse Power Dissipation

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V _{OUT}	4.75	5.0	5.25	V	V _{IN} = 12V, I _{OUT} = 15mA
Line Regulation (Notes 12 & 13)	ΔV _{OUT}	—	33	220	mV	V _{IN} = 10 to 15V, I _{OUT} = 15mA
		—	400	700		V _{IN} = 7 to 60V, I _{OUT} = 15mA
		—	145	400		V _{IN} = 10 to 60V, I _{OUT} = 15mA
Temperature Coefficient	ΔV _{OUT} /ΔT	—	3.52	—	mV/°C	T _J = -40°C to +150°C V _{IN} = 12V, I _{OUT} = 15mA
Load Regulation (Notes 12 & 14)	ΔV _{OUT}	—	-20 -166	-130 -300	mV	I _{OUT} = 10 to 20mA, V _{IN} = 12V I _{OUT} = 0.1 to 50mA, V _{IN} = 12V
Minimum Value of Input Voltage Required to Maintain Line Regulation	V _{IN(MIN)}	7	—	—	V	—
Quiescent Current	I _Q	—	450	800	μA	V _{IN} = 12V, I _{OUT} = 10μA
		—	4000	6700		V _{IN} = 60V, I _{OUT} = 10μA
Power Supply Rejection Ratio	ΔV _{IN} /ΔV _{OUT}	—	46	—	dB	C _{OUT} = 100nF, I _{OUT} = 15mA, V _{OUT} = 5V, V _{IN} = 10 to 100V, f = 100Hz

- Notes:
- 12. Measured Under Pulsed Conditions; Pulse Width ≤ 300μs. Duty cycle ≤ 2%.
 - 13. Line Regulation
 $\Delta V_{OUT} = V_{OUT}(@V_{IN} = 15V) - V_{OUT}(@V_{IN} = 10V)$
 $\Delta V_{OUT} = V_{OUT}(@V_{IN} = 60V) - V_{OUT}(@V_{IN} = 7V)$
 $\Delta V_{OUT} = V_{OUT}(@V_{IN} = 60V) - V_{OUT}(@V_{IN} = 10V)$
 - 14. Load Regulation
 $\Delta V_{OUT} = V_{OUT}(@I_{OUT} = 20mA) - V_{OUT}(@I_{OUT} = 10mA)$
 $\Delta V_{OUT} = V_{OUT}(@I_{OUT} = 50mA) - V_{OUT}(@I_{OUT} = 0.1mA)$

Typical Application Circuit

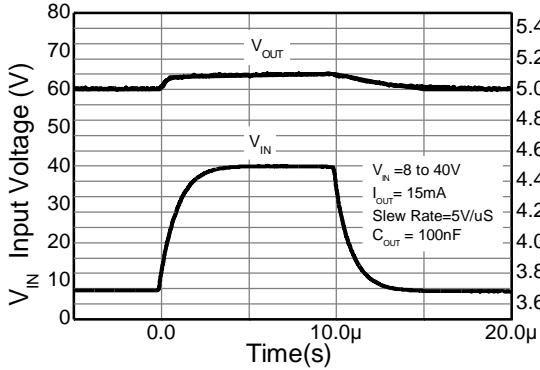


Example of a 5V regulated supply from a nominal 12V for powering a Controller IC.

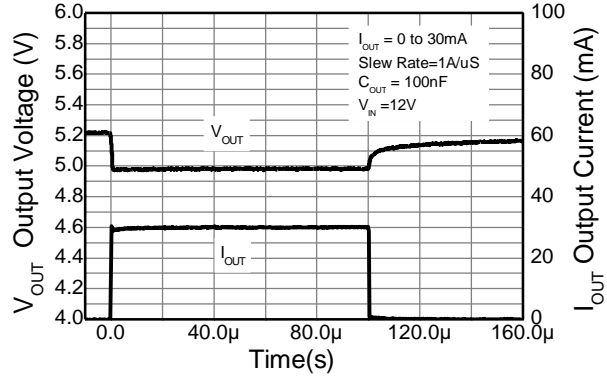
Pin Functions

Pin Name	Pin Function	Notes
V _{IN}	Input Supply	To maintain output regulation the input voltage can vary from 7V to 60V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V _{OUT}	Voltage Output	Outputs a regulated 5V. It is recommended to connect a 10μF capacitor to GND and a minimum of 10μA to be drawn from V _{OUT} to maintain regulation. The pin can be pulled high to a maximum of 7V with respect to ground.

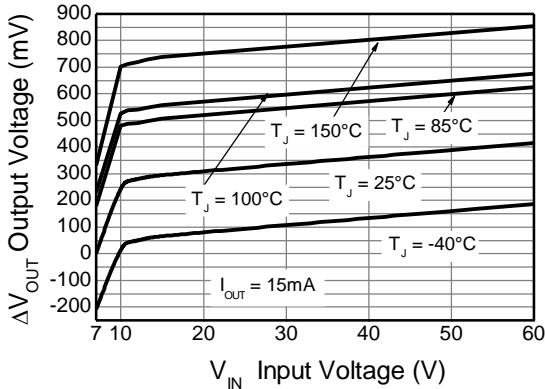
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



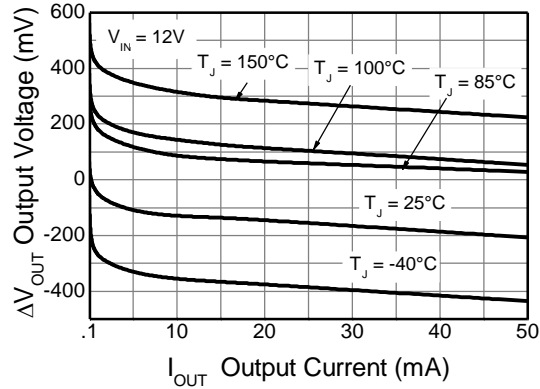
Line transient response



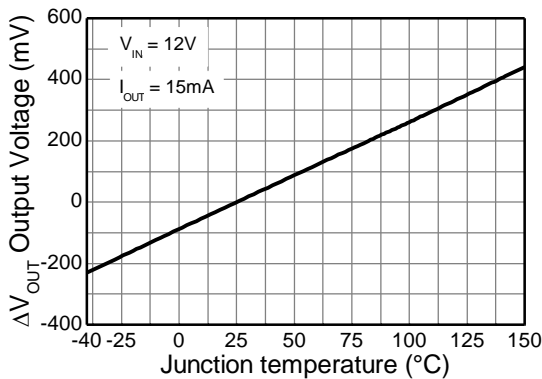
Load transient response



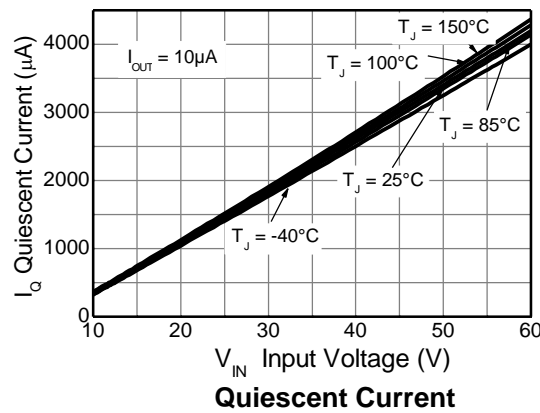
Line Regulation (Note 15)



Load Regulation (Note 16)



Temperature Coefficient (Note 17)

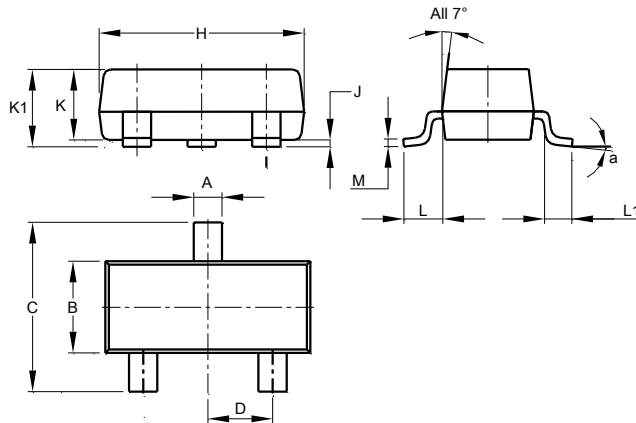


Quiescent Current

- Notes:
- 15. Line Regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 7\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$
 - 16. Load Regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 12\text{V}, I_{OUT} = 0.1\text{mA}, T_J = +25^\circ\text{C})$
 - 17. Temperature Coefficient $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 12\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$

Package Outline Dimensions

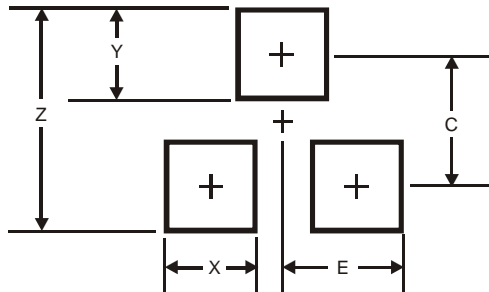
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	8°		
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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