

## Description

The ZXTR2012FF monolithically integrates a transistor, Zener diode and resistor to function as a high-voltage linear regulator. The device regulates with a 12V 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 an SOT23F package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

## Applications

Supply voltage regulation in:

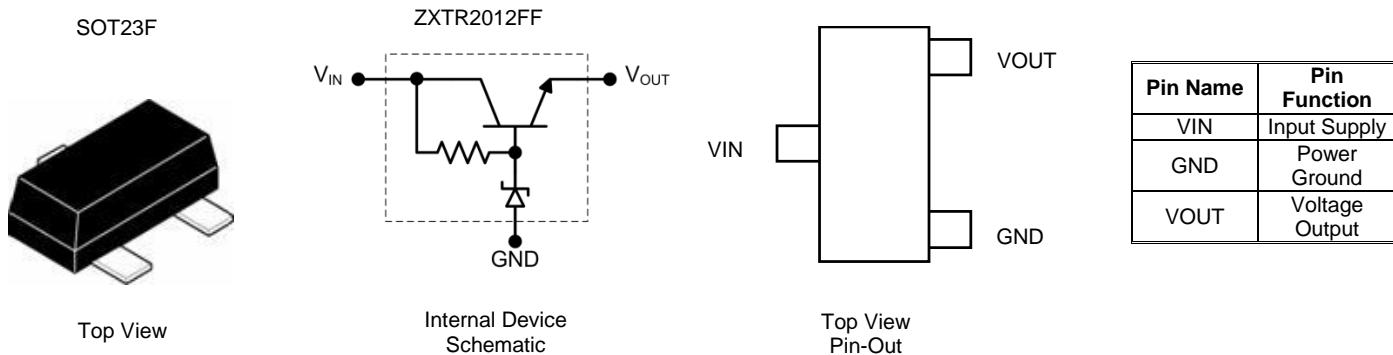
- Networking
- Telecommunications
- Power over Ethernet (PoE)

## Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 15V to 100V
- Output Voltage = 12V  $\pm$  10%
- Fully Integrated into a SOT23F Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

- Case: SOT23F
- 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: 0.012 grams (Approximate)



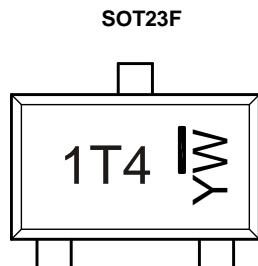
## Ordering Information (Note 4)

Product	Package	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXTR2012FF-7	SOT23F	1T4	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](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



1T4 = Product Type Marking Code  
 YW = Date Code Marking  
 Y = Year : 0~9  
 W = Week : A~Z : 1~26  
 a~z : 27~52  
 z represents 52 & 53 week

**Absolute Maximum Ratings** (Voltage relative to GND, @ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Input Supply Voltage	$V_{IN}$	-0.3 to 100	V
Continuous Input & Output Current	$I_{IN}, I_{OUT}$	550	mA
Peak Pulsed Input & Output Current	$I_{IM}, I_{OM}$	2	A
Maximum Voltage Applied to $V_{OUT}$	$V_{OUT(MAX)}$	18	V

**Maximum Current at  $V_{IN} = 48\text{V}$**  (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit	
Continuous Output Current	$I_{OUT}$	36	mA	
Pulsed Output Current		880		
		180		

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Power Dissipation	$P_D$	1.3	W
		1	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	95	°C/W
		126	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	59	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	38	
Maximum Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-65 to +150	°C

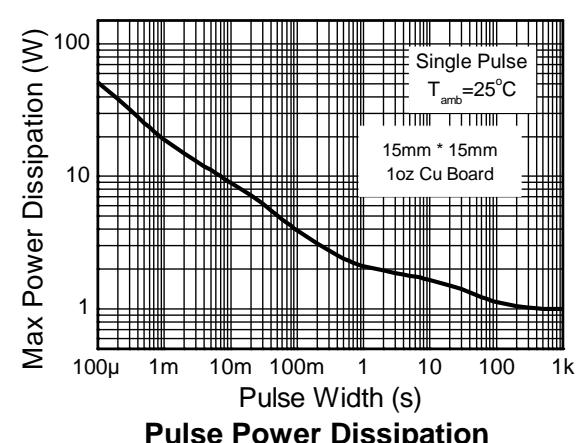
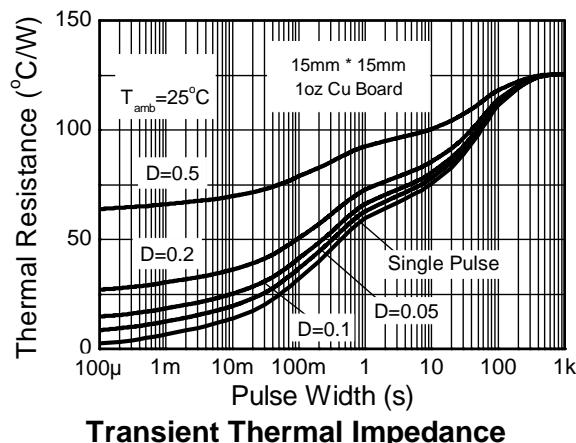
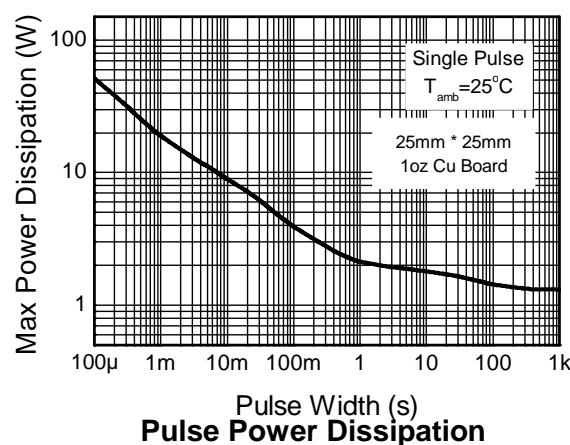
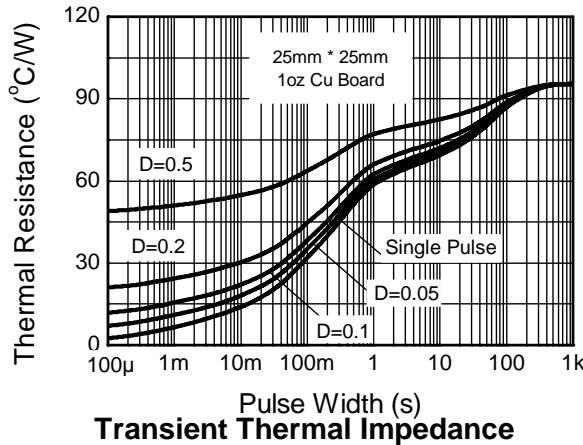
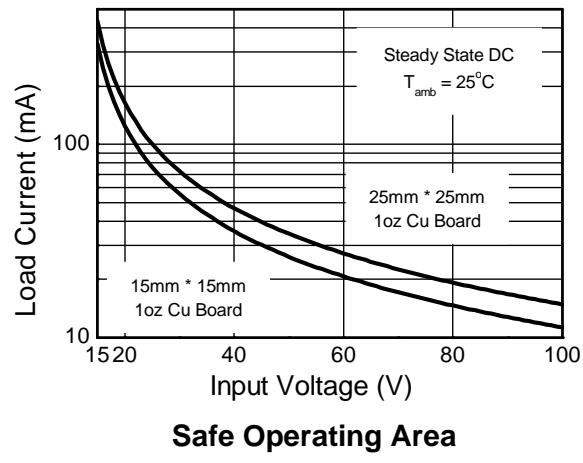
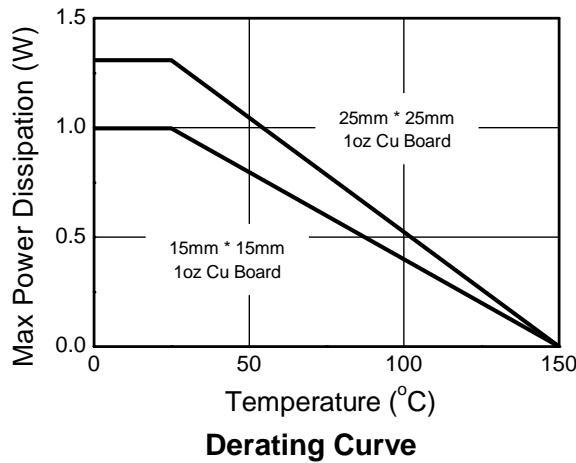
**ESD Ratings** (Note 11)

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:

5. For a device mounted with the exposed  $V_{IN}$  pad on 25mm x 25mm 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in steady-state.
6. Same as note 5, except mounted on 15mm x 15mm 1oz copper.
7. Same as note 5, whilst operating at  $V_{IN} = 48\text{V}$ . Refer to Safe Operating Area for other Input Voltages.
8. Same as note 5, except measured with a single pulse width = 100 $\mu\text{s}$  and  $V_{IN} = 48\text{V}$ .
9. Same as note 5, except measured with a single pulse width = 10ms and  $V_{IN} = 48\text{V}$ .
10.  $R_{\theta JL}$  = Thermal resistance from junction to solder-point (on the exposed  $V_{IN}$  pad).
11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics and Derating Information



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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	$V_{\text{OUT}}$	10.8	12	13.2	V	$V_{\text{IN}} = 48\text{V}$ , $I_{\text{OUT}} = 15\text{mA}$
Line Regulation (Notes 12 & 13)	$\Delta V_{\text{OUT}}$	—	240	750	mV	$V_{\text{IN}} = 15\text{V}$ to $72\text{V}$ , $I_{\text{OUT}} = 15\text{mA}$
Temperature Coefficient	$\Delta V_{\text{OUT}}/\Delta T$	—	8.0	—	mV/ $^\circ\text{C}$	$T_J = -40^\circ\text{C}$ to $+125^\circ\text{C}$ $V_{\text{IN}} = 48\text{V}$ , $I_{\text{OUT}} = 15\text{mA}$
Load Regulation (Notes 12 & 14)	$\Delta V_{\text{OUT}}$	—	-450 -600	-600 -750	mV	$I_{\text{OUT}} = 0.1\text{mA}$ to $30\text{mA}$ , $V_{\text{IN}} = 48\text{V}$ $I_{\text{OUT}} = 0.1\text{mA}$ to $100\text{mA}$ , $V_{\text{IN}} = 48\text{V}$
Minimum Value of Input Voltage Required to Maintain Line Regulation	$V_{\text{IN(MIN)}}$	15	—	—	V	—
Quiescent Current	$I_Q$	—	240 590	400 900	$\mu\text{A}$	$V_{\text{IN}} = 48\text{V}$ , $I_{\text{OUT}} = 10\mu\text{A}$ $V_{\text{IN}} = 100\text{V}$ , $I_{\text{OUT}} = 10\mu\text{A}$
Power Supply Rejection Ratio	$\Delta V_{\text{IN}}/\Delta V_{\text{OUT}}$	—	45	—	dB	$C_{\text{OUT}} = 100\text{nF}$ , $I_{\text{OUT}} = 15\text{mA}$ , $V_{\text{OUT}} = 12\text{V}$ , $V_{\text{IN}} = 15\text{V}$ to $100\text{V}$ , $f = 100\text{Hz}$

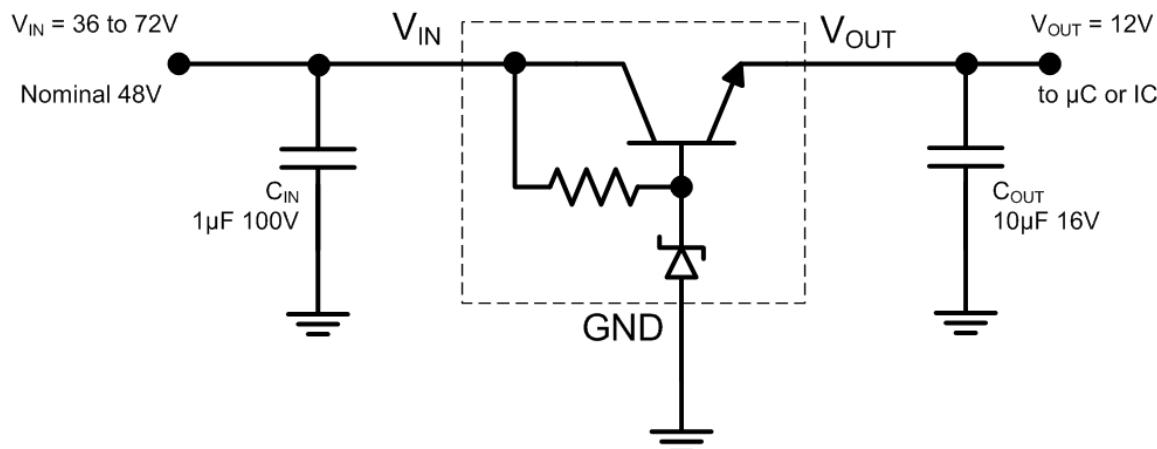
Notes:

12. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

13. Line regulation  $\Delta V_{\text{OUT}} = V_{\text{OUT}}(@ V_{\text{IN}} = 72\text{V}) - V_{\text{OUT}}(@ V_{\text{IN}} = 15\text{V})$ .

14. Load regulation  $\Delta V_{\text{OUT}} = V_{\text{OUT}}(@ I_{\text{OUT}} = 30\text{mA}) - V_{\text{OUT}}(@ I_{\text{OUT}} = 0.1\text{mA})$ .

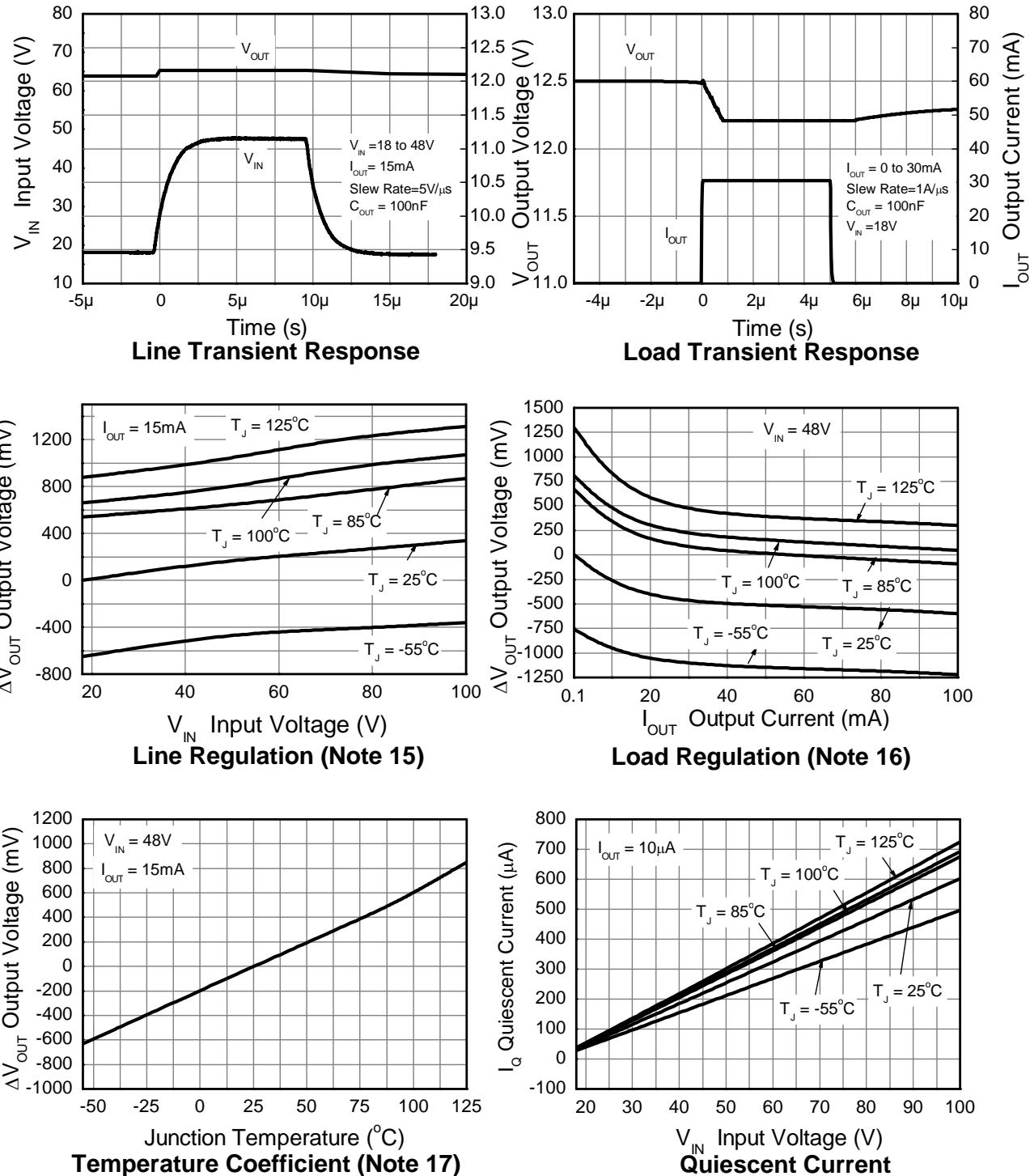
$\Delta V_{\text{OUT}} = V_{\text{OUT}}(@ I_{\text{OUT}} = 100\text{mA}) - V_{\text{OUT}}(@ I_{\text{OUT}} = 0.1\text{mA})$ .

**Typical Application Circuit**
**ZXTR2012FF**


Example of an 12V regulated supply from a nominal 48V for powering a Controller IC.

**Pin Functions**

Pin Name	Pin Function	Notes
$V_{\text{IN}}$	Input Supply	To maintain output regulation the input voltage can vary from 15V to 100V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.
<b>GND</b>	Power Ground	This pin should be tied to the system ground.
$V_{\text{OUT}}$	Voltage Output	Outputs a regulated 12V. It is recommended to connect a 10μF capacitor to GND. Minimum of 10μA must be drawn from $V_{\text{OUT}}$ to maintain regulation. The pin can be pulled high to a maximum of 18V with respect to ground.

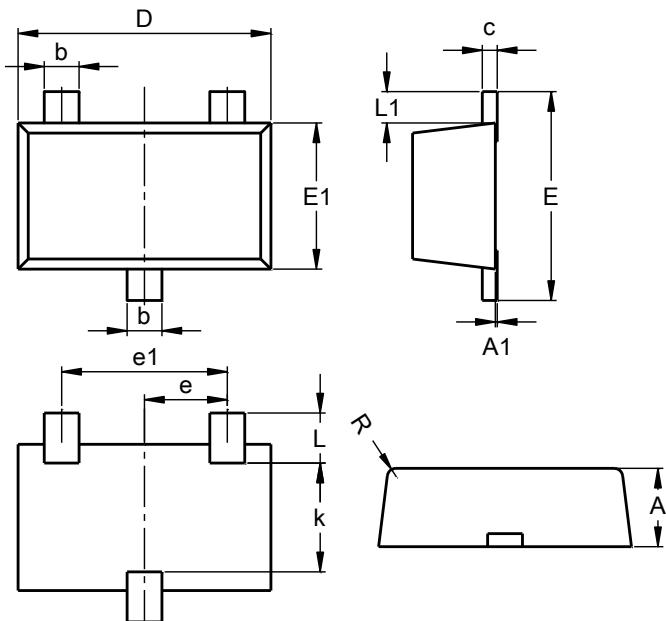
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

**Notes:**

15. Line regulation  $\Delta V_{OUT} = V_{OUT} - V_{IN}$  (@  $V_{IN} = 15\text{V}$ ,  $I_{OUT} = 15\text{mA}$ ,  $T_J = +25^\circ\text{C}$ ).
16. Load regulation  $\Delta V_{OUT} = V_{OUT} - V_{IN}$  (@  $V_{IN} = 48\text{V}$ ,  $I_{OUT} = 0.1\text{mA}$ ,  $T_J = +25^\circ\text{C}$ ).
17. Temperature Coefficient  $\Delta V_{OUT} = V_{OUT} - V_{IN}$  (@  $V_{IN} = 48\text{V}$ ,  $I_{OUT} = 15\text{mA}$ ,  $T_J = +25^\circ\text{C}$ ).

## Package Outline Dimensions

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

**SOT23F**



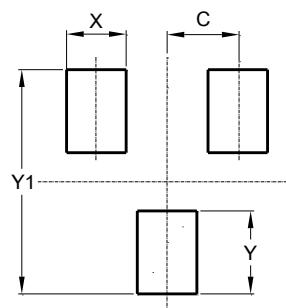
SOT23F			
Dim	Min	Max	Typ
<b>A</b>	0.80	1.00	0.90
<b>A1</b>	0.00	0.10	0.01
<b>b</b>	0.35	0.50	0.44
<b>c</b>	0.10	0.20	0.16
<b>D</b>	2.80	3.00	2.90
<b>e</b>	0.95 REF		
<b>e1</b>	1.90 REF		
<b>E</b>	2.30	2.50	2.40
<b>E1</b>	1.50	1.70	1.65
<b>k</b>	1.20	-	-
<b>L</b>	0.30	0.65	0.50
<b>L1</b>	0.30	0.50	0.40
<b>R</b>	0.05	0.15	-

All Dimensions in mm

## Suggested Pad Layout

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

**SOT23F**



Dimensions	Value (in mm)
<b>C</b>	0.95
<b>X</b>	0.80
<b>Y</b>	1.110
<b>Y1</b>	3.000

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