



YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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Description

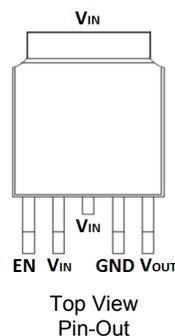
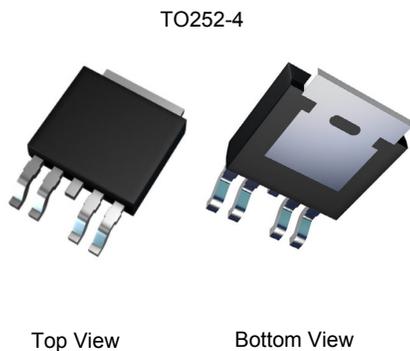
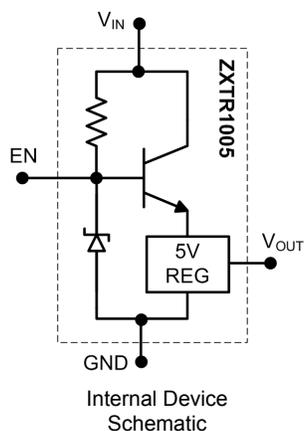
The NK-ZXTR1005K4 is a high voltage regulator with fixed output voltage of $5V \pm 2\%$ and a 50mA drive capability. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a TO252 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

The device also features an enable pin which disables the regulator when pulled low.

Applications

Supply voltage regulation in:

- Networking
- Telecom
- Power Over Ethernet (PoE)



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

Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 10 to 100V
- Output Voltage = $5V \pm 2\%$
- $\pm 4\%$ tolerance over -55 to $+125^\circ\text{C}$
- Output Current up to 50mA
- Toggle Output On/Off with Enable pin
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Mechanical Data

- Case: TO252-4
- 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 
- Weight: 0.34 grams (approximate)

Absolute Maximum Ratings

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

Characteristic	Symbol	Value	Unit
Input Voltage	V _{IN}	-0.3 to 100	V
Enable Current	I _{EN}	±1	mA
Continuous Input & Output Current	I _{IN} , I _{OUT}	100	mA
Peak Pulsed Input & Output Current	I _{IM} , I _{OM}	100	mA
Maximum Voltage applied to V _{OUT}	V _{OUT(max)}	10	V

Maximum Current

(@ V_{IN} = 48V, T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current	I _{OUT}	50	mA
Pulsed Output Current	I _{OM}	100	mA
		100	

Thermal Characteristics

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

Characteristic	Symbol	Value	Unit
Power Dissipation	P _D	2.3	W
		1.1	
Thermal Resistance, Junction to Ambient	R _{θJA}	44	°C/W
		90	
Thermal Resistance, Junction to Lead	R _{θJL}	8.39	
Thermal Resistance, Junction to Case	R _{θJC}	8.15	
Maximum Operating Junction Temperature Range	T _J	-55 to +125	
Storage Temperature Range	T _{STG}	-65 to +150	°C

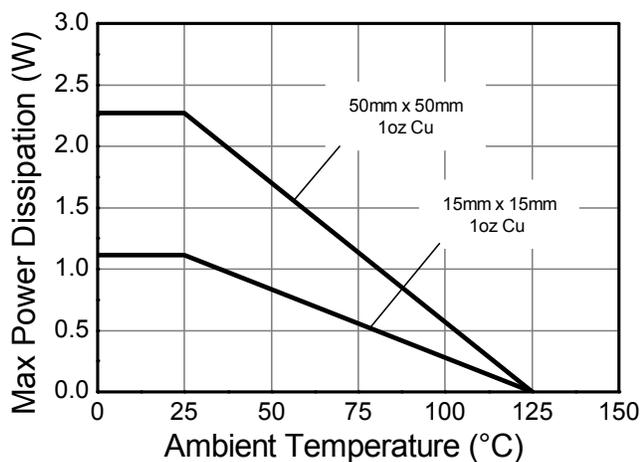
ESD Ratings

(Note 11)

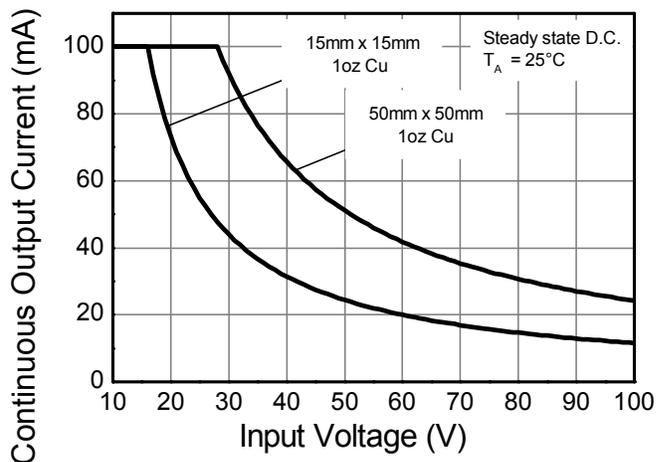
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted with the exposed V_{IN} pad on 50mm x 50mm 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}=48V this is thermally limited. Refer to Safe Operating Area for other Input Voltages.
 - Same as note 5, except measured with a single pulse width = 100µs and V_{IN}=48V. This is limited by the absolute maximum I_{OM} rating.
 - Same as note 5, except measured with a single pulse width = 10ms and V_{IN}=48V. This is limited by the absolute maximum I_{OM} rating.
 - R_{θJL} = Thermal resistance from junction to solder-point (on the exposed V_{IN} pad).
 - R_{θJC} = Thermal resistance from junction to the top of case.
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

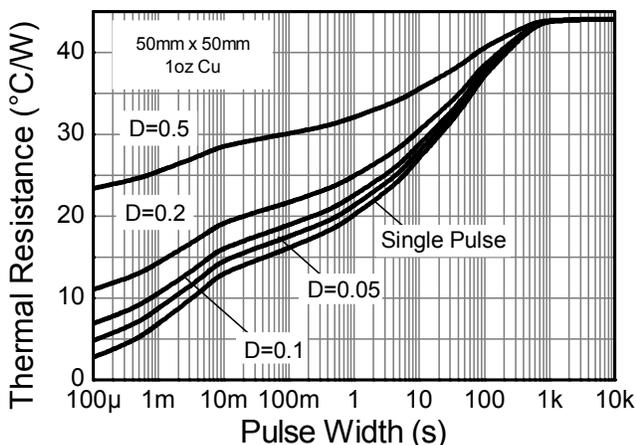
Thermal Characteristics and Derating Information



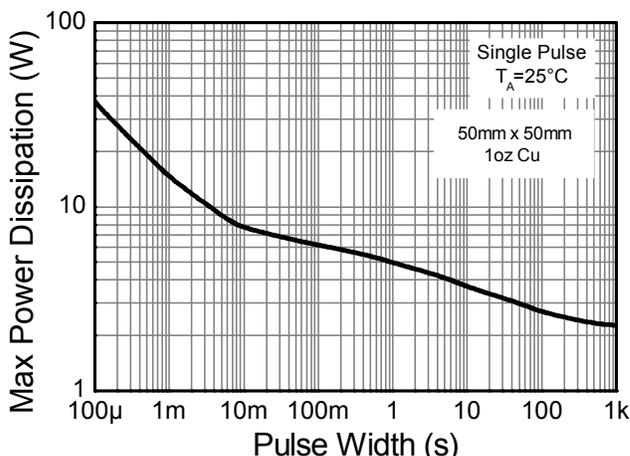
Derating Curve



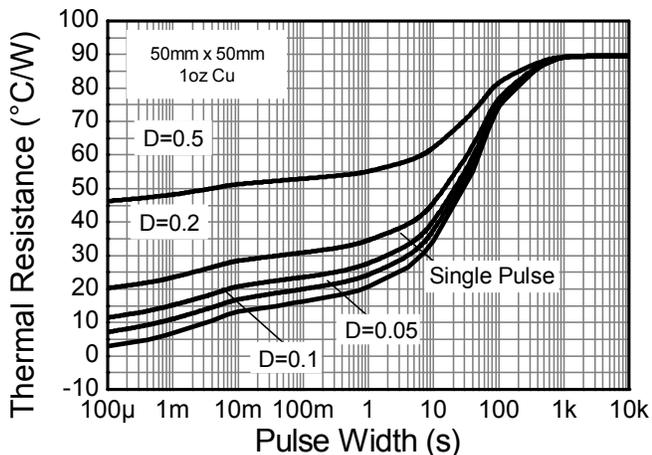
Safe Operating Area



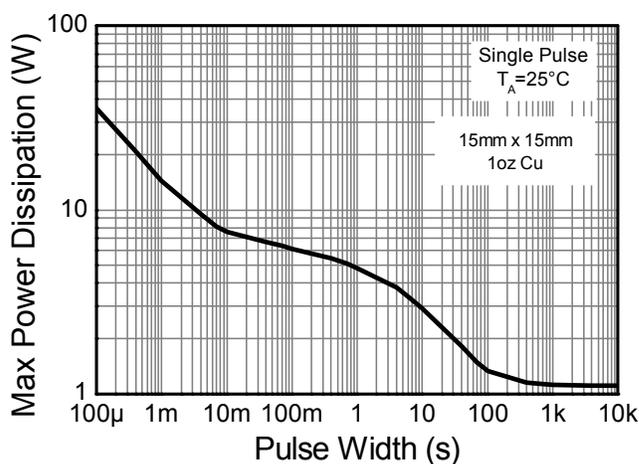
Transient Thermal Impedance



Pulse Power Dissipation



Transient Thermal Impedance



Pulse Power Dissipation

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

Enable Output with EN =OPEN (i.e. -100nA < I_{EN} <100nA)

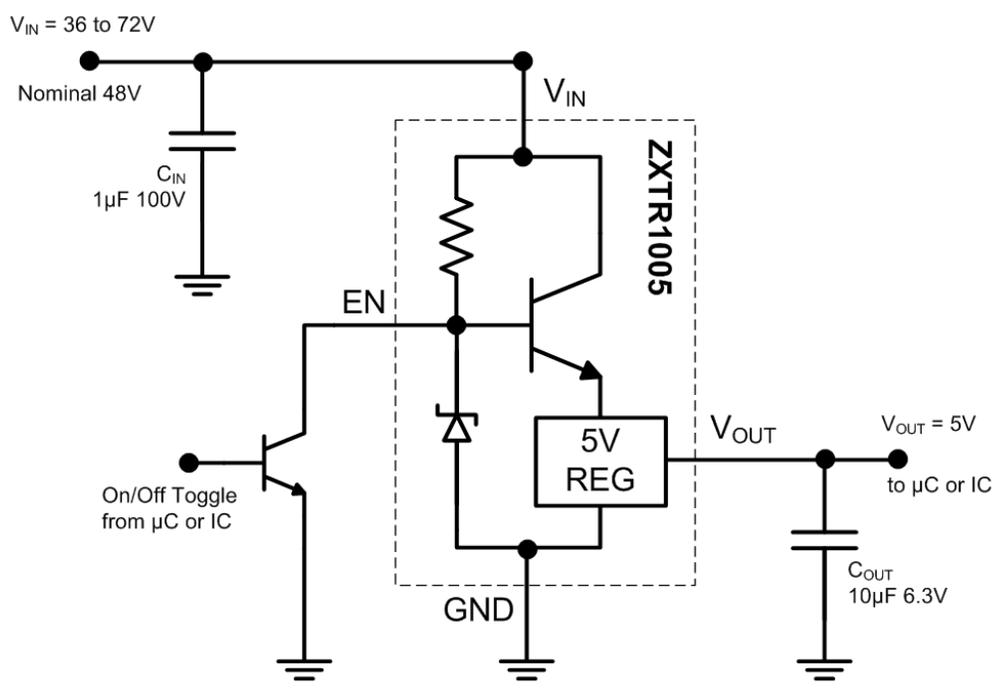
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V _{OUT}	4.9	5.0	5.1	V	V _{IN} = 48V, I _{OUT} = 15mA
Line Regulation (Note 12 & 13)	ΔV _{OUT}	-10	2	10	mV	V _{IN} = 10 to 100V, I _{OUT} = 15mA
Average Temperature Coefficient	ΔV _{OUT} /ΔT	—	0.44	0.7	mV/°C	T _J = -55°C to +125°C V _{IN} = 48V, I _{OUT} = 15mA
Load Regulation (Note 12 & 14)	ΔV _{OUT}	—	20	50	mV	I _{OUT} = 0.1 to 50mA, V _{IN} = 48V
Minimum Value of Input Voltage Required to Maintain Line Regulation	V _{IN(MIN)}	10	—	—	V	—
Power Supply Rejection Ratio	ΔV _{IN} /ΔV _{OUT}	—	57	—	dB	C _{OUT} = 100nF, I _{OUT} = 15mA, V _{OUT} = 5V, V _{IN} = 10 to 100V, f = 100Hz
Toggle Output On/Off						
Enable Output	V _{OUT}	4.9	5.0	5.1	V	EN = OPEN, -100nA < I _{EN} <100nA, V _{IN} = 48V, I _{OUT} = 15mA
Disable Output	V _{OUT}	—	0	1	V	EN = GND, -0.3V < V _{EN} < 1V, V _{IN} = 48V, I _{OUT} = 100nA
Quiescent Current (Note 12) with Enable Output	I _Q	—	300 650	500 900	μA	EN = OPEN, V _{IN} = 48V EN = OPEN, V _{IN} = 100V
Quiescent Current (Note 12) with Disable Output	I _Q	—	300 650	500 900	μA	EN = GND, V _{IN} = 48V EN = GND, V _{IN} = 100V

- Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.
 13. Line regulation ΔV_{OUT} = V_{OUT}(@ V_{IN} = 100V) – V_{OUT}(@ V_{IN} = 10V)
 14. Load regulation ΔV_{OUT} = V_{OUT}(@ I_{OUT} = 50mA) – V_{OUT}(@ I_{OUT} = 0mA)

Pin Functions

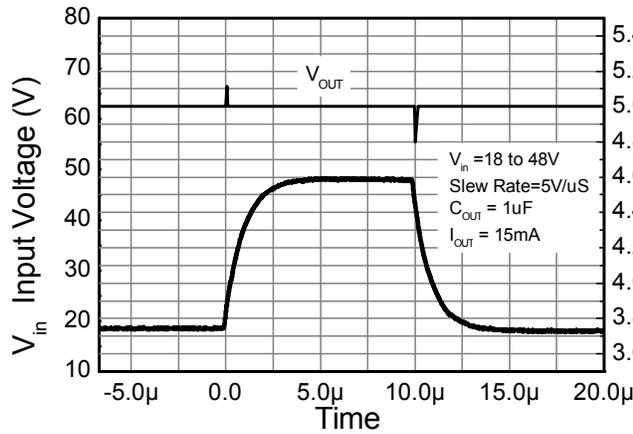
Pin Name	Pin Function	Notes
V _{IN}	Input Supply	To maintain output regulation the input voltage can vary from 10 to 100V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V _{OUT}	Voltage Output	Outputs a regulated 5V when drawing between 0.1 to 50mA current. It is recommended to connect a ≥100nF capacitor to GND to minimize the noise on the regulated output. The pin can be pulled high to a maximum of 10V with respect to ground.
EN	Enable Output	<p>Output Always On</p> <p>When the output state is required to be permanently on, then the EN pin should be left floating in an OPEN state.</p> <p>Toggle Output On/Off</p> <p>Toggle the regulator's output state between on (5V) and off (0V).</p> <p>Enable Output</p> <p>Leave the EN pin floating in an OPEN state.</p> <p>Disable Output</p> <p>Pull the EN pin to GND in a SHORT state.</p> <p>For example, see the Typical Application Circuit showing a transistor toggling the EN pin.</p>
		<p>EN pin = Do not connect</p> <p>Enable Output</p> <p>EN pin = -100nA < I_{EN} <100nA</p> <p>Disable Output</p> <p>EN pin = -0.3V < V_{EN} < 1V</p>

Typical Application Circuit

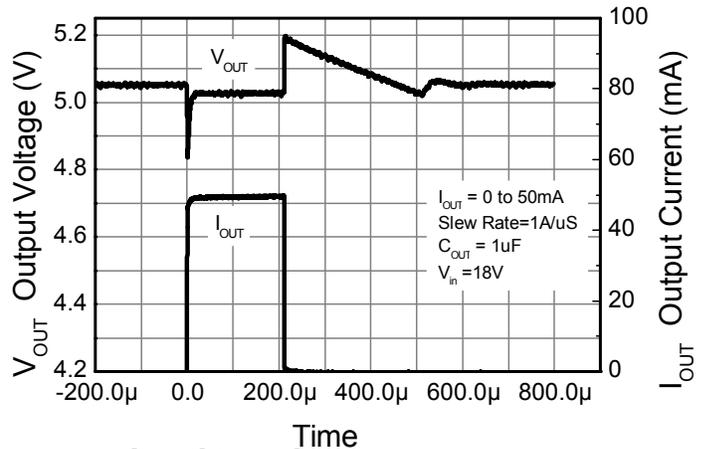


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

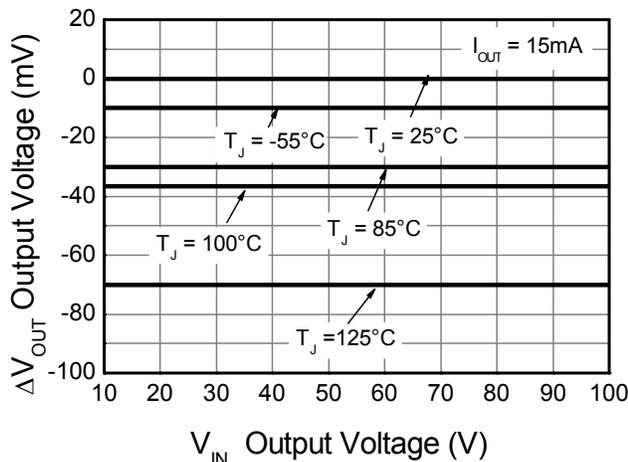
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



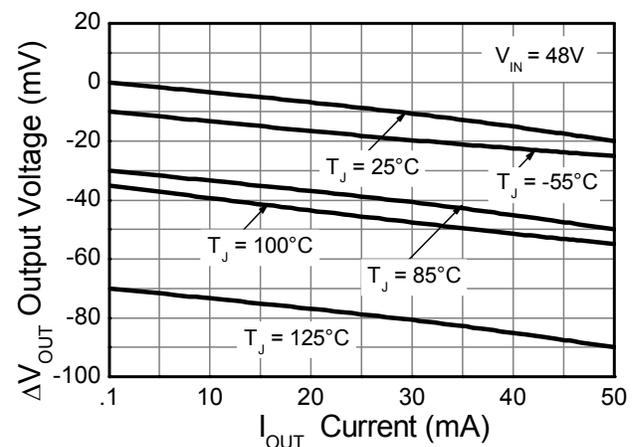
Line transient response



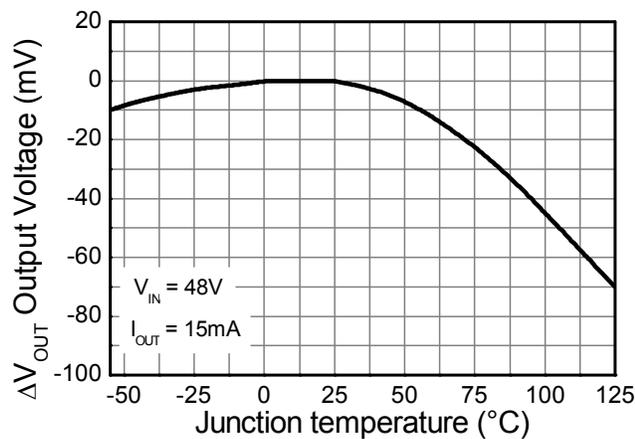
Load transient response



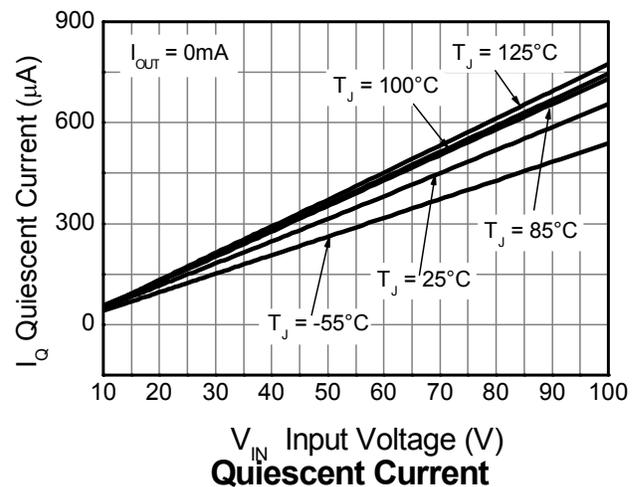
Line Regulation (Note 15)



Load Regulation (Note 16)



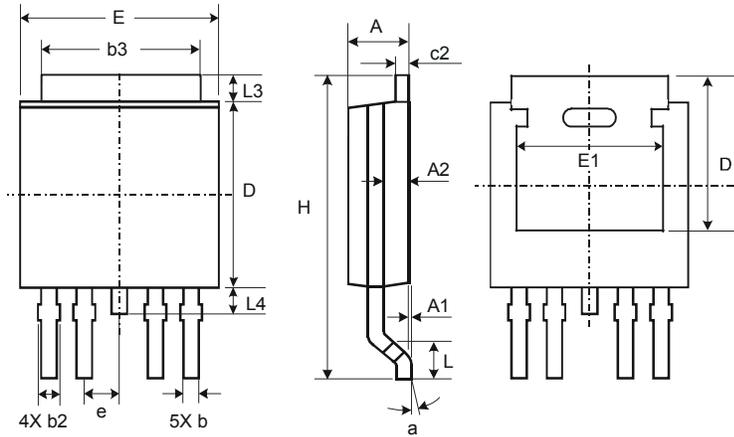
Temperature Coefficient (Note 17)



Quiescent Current

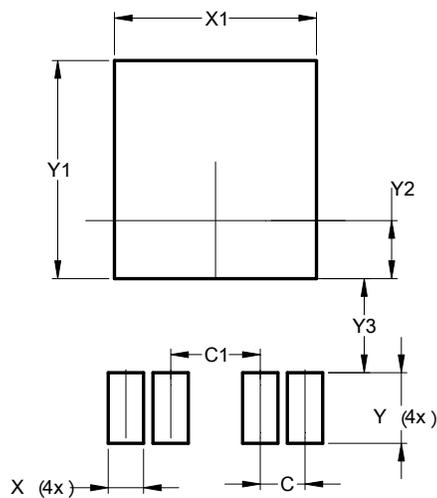
- Notes:
- 15. Line regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 10V, I_{OUT} = 15mA, T_J = +25^\circ\text{C})$
 - 16. Load regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48V, I_{OUT} = 0A, T_J = +25^\circ\text{C})$
 - 17. Temperature Coefficient $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48V, I_{OUT} = 30mA, T_J = +25^\circ\text{C})$

Package Outline Dimensions



TO252-4			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.51	0.71	0.583
b2	0.61	0.79	0.70
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	1.27
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
c	1.27
c1	2.54
X	1.00
X1	5.73
Y	2.00
Y1	6.17
Y2	1.64
Y3	2.66