High Input Voltage
Adjustable 3-Terminal Linear Regulator

Features

- 13.2V to 100V Input Voltage Range
- Stable with 100nF output capacitor
- Adjustable 1.20V to 88V output regulation
- 5% reference voltage tolerance
- Output current limiting, 50mA min.
- 10µA typical ADJ current
- Over temperature protection
- Available in 3 different packages

Applications

- DC/DC SMPS startup circuits
- Adjustable high voltage constant current sources
- Industrial Controls
- Motor Controls
- Battery Powered Systems
- Power Supplies
- Telecom Applications
- LED Drivers
- Automotive Applications

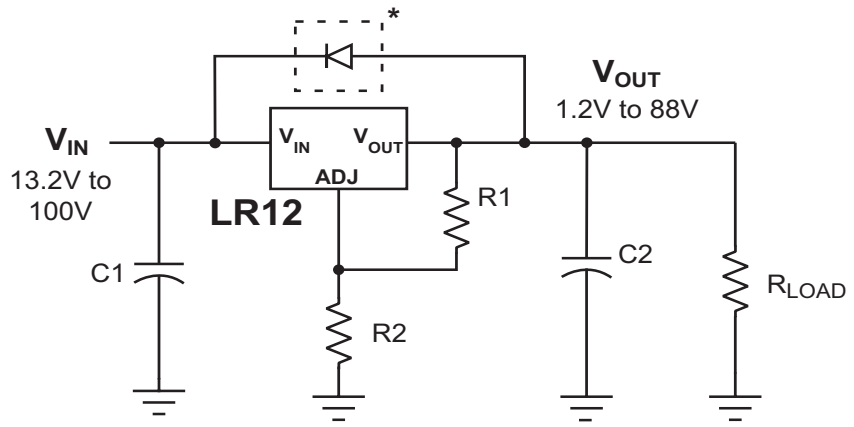
General Description

The Supertex LR12 is a high voltage, low output current, adjustable linear regulator. It has a wide operating input voltage range of 13.2V to 100V. The output voltage can be adjusted from 1.20V to 88V provided that the input voltage is at least 12V greater than the output voltage. The output voltage can be adjusted by means of two external resistors R_1 and R_2 as shown in the typical application circuits. The LR12 regulates the voltage difference between V_{OUT} and ADJ pins to a nominal value of 1.20V. The 1.20V is amplified by the external resistor ratio R_1 and R_2. An internal constant bias current of typically 10µA is connected to the ADJ pin. This increases V_{OUT} by a constant voltage of 10µA times R_2.

The LR12 has current limiting and temperature limiting. The output current limit is 100mA maximum and the minimum temperature limit is 125°C. An output short circuit current will therefore be limited to 100mA maximum. When the junction temperature reaches its temperature limit, the output current and/or output voltage will decrease to keep the junction temperature from exceeding its temperature limit. For SMPS start-up circuit applications, the LR12 turns off when an external voltage greater than the output voltage of the LR12 is applied to V_{OUT} of the LR12. To maintain stability, a bypass capacitor of 100nF or larger and a minimum DC output current of 500µA are required.

The device is available in TO-92, SO-8, and TO-252 (D-PAK) packages.

LR12 Typical Application



*Required for conditions where V_{IN} is less than V_{OUT}.

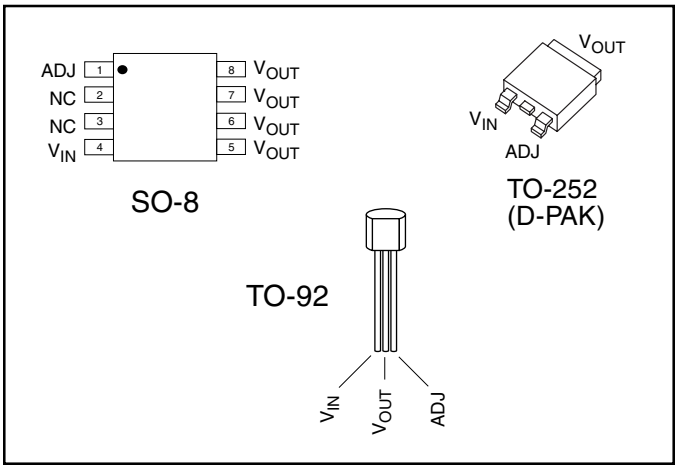
A081605

Ordering Information

Package Options		
SO-8	**TO-252[1]**	**TO-92**
LR12LG	LR12K4	LR12N3
LR12LG-G	LR12K4-G	LR12N3-G

Notes:
1. TO-252 supplied on 2000 piece carrier tape reels only
-G indicates package is RoHS compliant "Green"

Pin Configurations



Absolute Maximum Ratings

V_{IN-ADJ}	-0.5V to +120V
$V_{OUT-ADJ}$	-10V to +10V
$V_{IN} - V_{OUT}$	-0.5V to +120V
Operating Ambient Temperature Range	-40°C to +85°C
Operating Junction Temperature Range	-40°C to +125°C
Storage Temperature Range	-65°C to +150°C

Electrical Characteristics

Test conditions unless otherwise specified: -40°C < T_A < 85°C.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
$V_{IN} - V_{OUT}$	Input to Output Voltage Difference	12		98.8	V	
V_{OUT}	Overall Output Voltage Regulation	1.14	1.20	1.26	V	13.2V<V_{IN}<100V, R_1 = 2.4KΩ, R_2 = 0
ΔV_{OUT}	Line Regulation		0.003	0.03	%/V	15V<V_{IN}<100V, V_{OUT} = 5V, I_{OUT} = 0.5mA
ΔV_{OUT}	Load Regulation		1.4	3.0	%	V_{IN} = 15V, V_{OUT} = 5V, 0.5mA<I_{OUT}<50mA
ΔV_{OUT}	Temperature Regulation	-1		+1	%	V_{IN} = 15V, V_{OUT} = 5V, I_{OUT} = 10mA, -40°C<T_A<85°C
I_{OUT}	Output Current Limit	50		100	mA	T_J < 85°C, V_{IN} - V_{OUT} = 12V
I_{OUT}	Output Current Limit			0.5	mA	T_J > 125°C, V_{IN} - V_{OUT} = 100V
I_{OUT}	Minimum Output Current	0.5			mA	Includes R_1 and load current
I_{ADJ}	Adjust Output Current	5	10	15	µA	
C2	Minimum Output Load Capacitance	100			nF	
DV_{OUT}/DV_{IN}	Ripple Rejection Ratio	50	60		dB	120Hz, V_{OUT} = 5V
T_{LIMIT}	Junction Temperature Limit	125			°C	

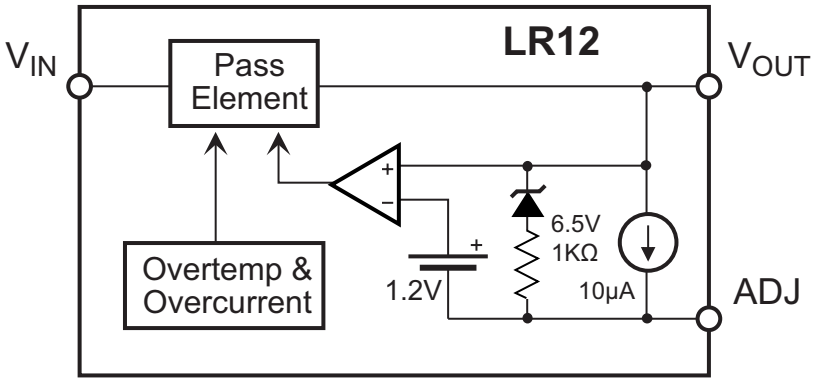
A081605

Thermal Characteristics

Package	Power Dissipation @ T_A=25°C	θ_{JC} °C/W	θ_{JA} °C/W
TO-92	0.6W	125	170
SO-8	1.8W	—	55†
TO-252	2.0W	6.25	50†

† Mounted on FR4 board, 25mm x 25mm x 1.57mm.
Significant P_D increase possible on ceramic substrate.

Functional Block Diagram



A081605

Typical Application Circuits

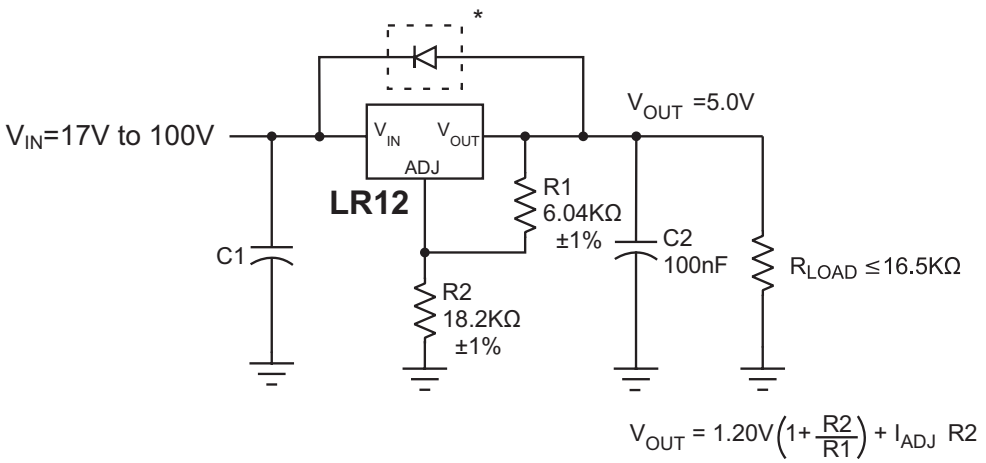


Figure 1: High Input Voltage, 5.0V Output Linear Regulator

*** Required for conditions where V_{IN} is less than V_{OUT}.**

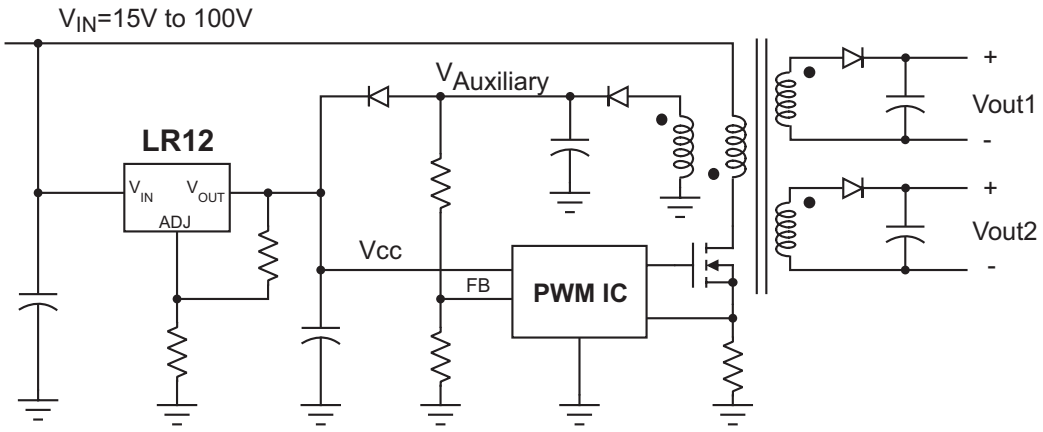


Figure 2: SMPS Start-Up Circuit

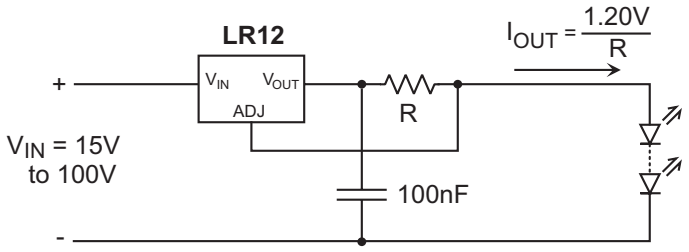
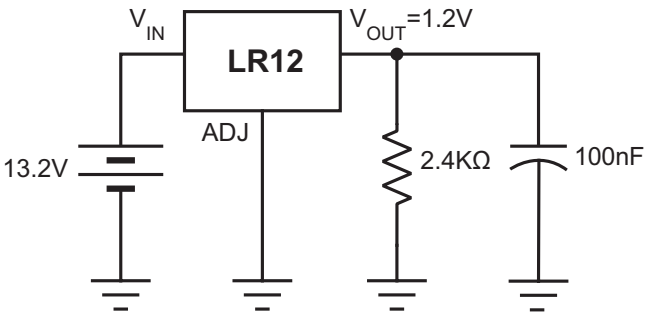
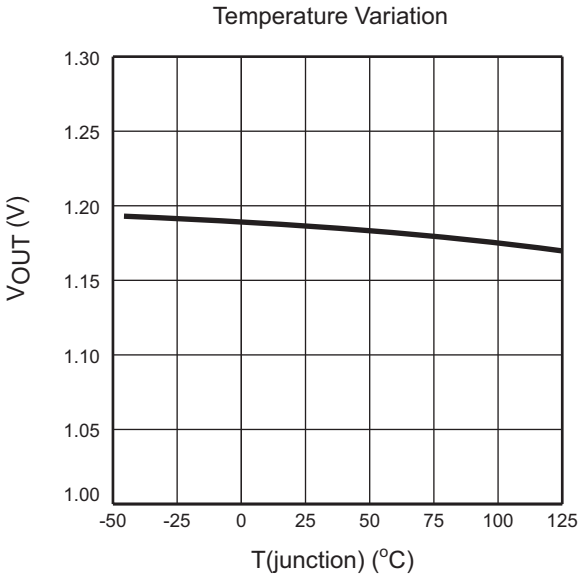


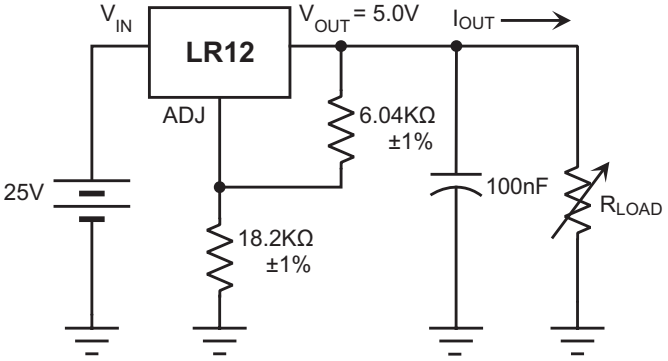
Figure 3: High Voltage Adjustable Constant Current Source

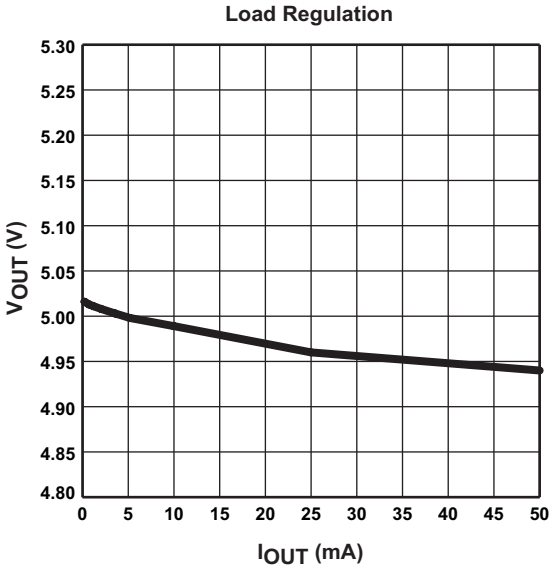
A081605

Typical Performance Curves

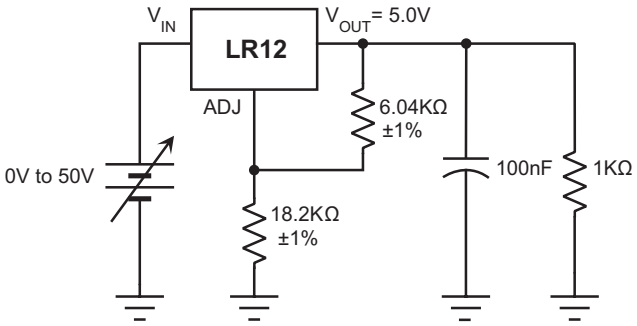


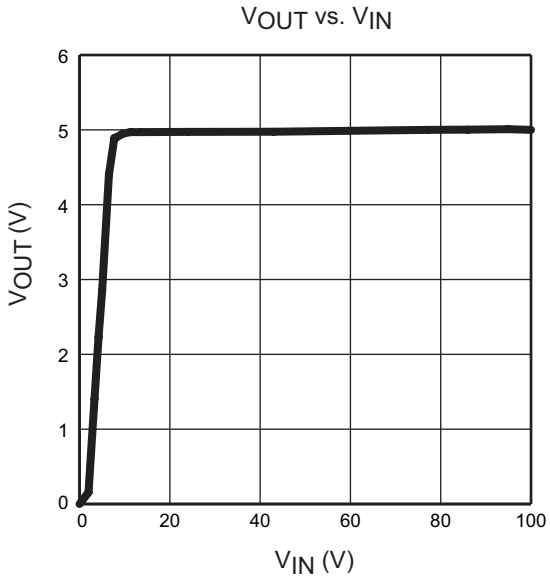


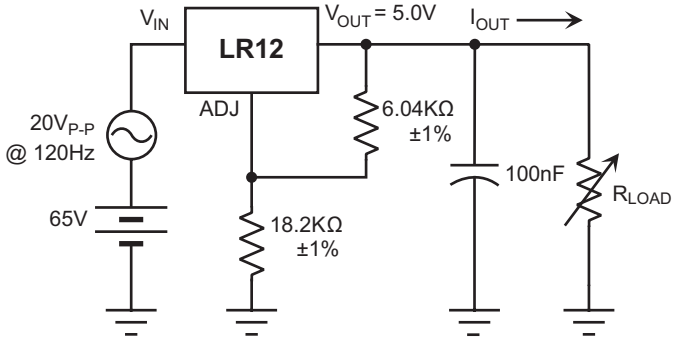


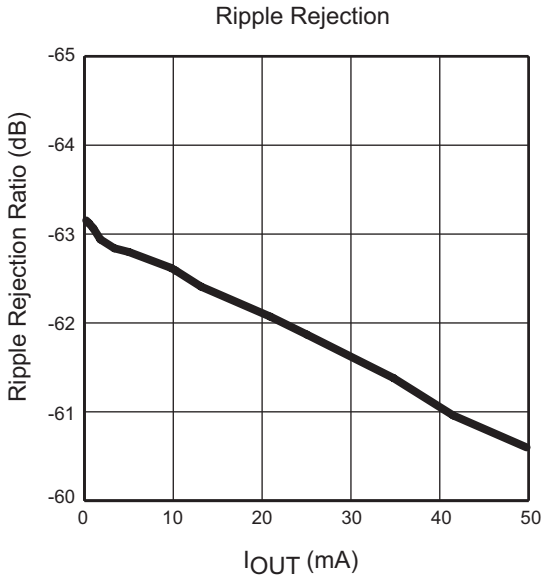


Typical Performance Curves

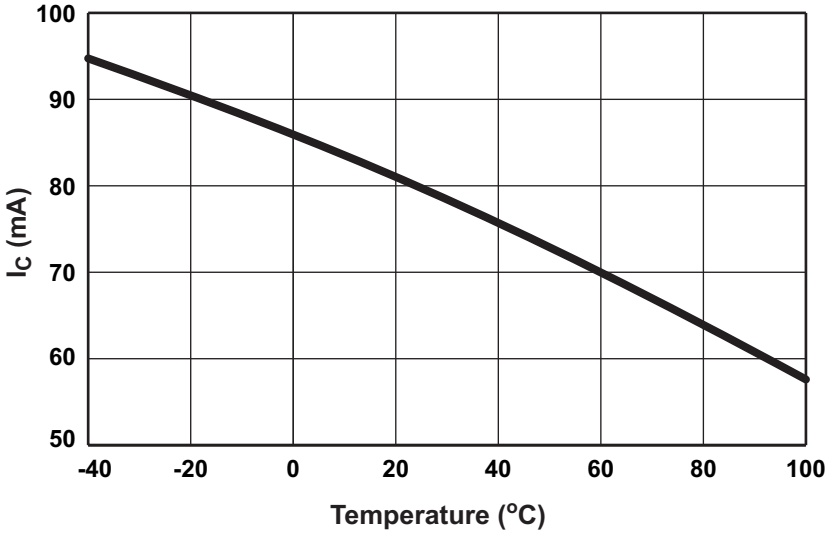








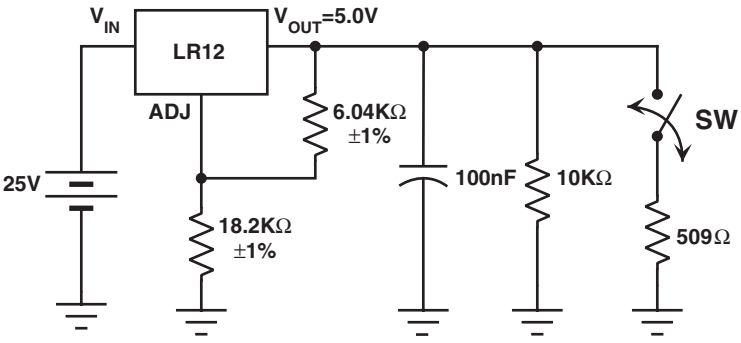
Current Limit

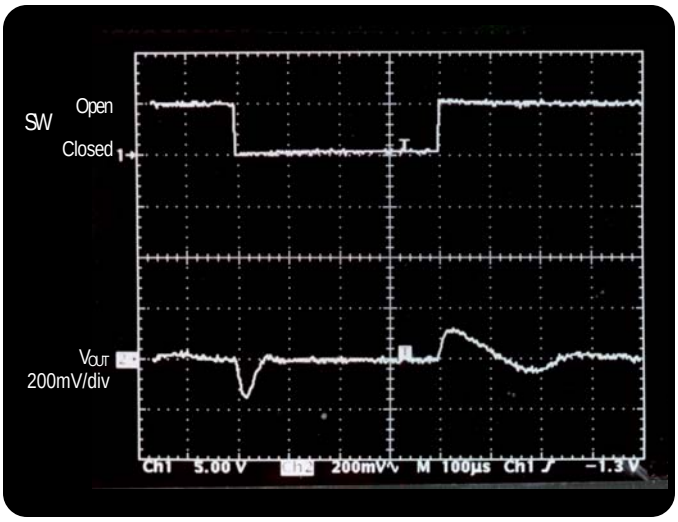


A081605

Typical Performance Curves

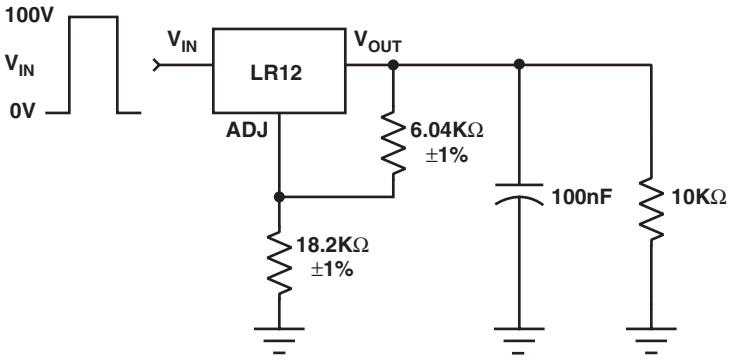
Load Transient Response

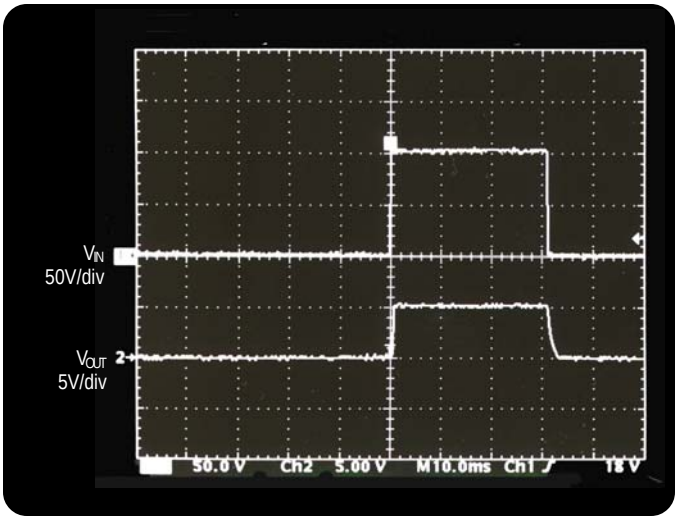




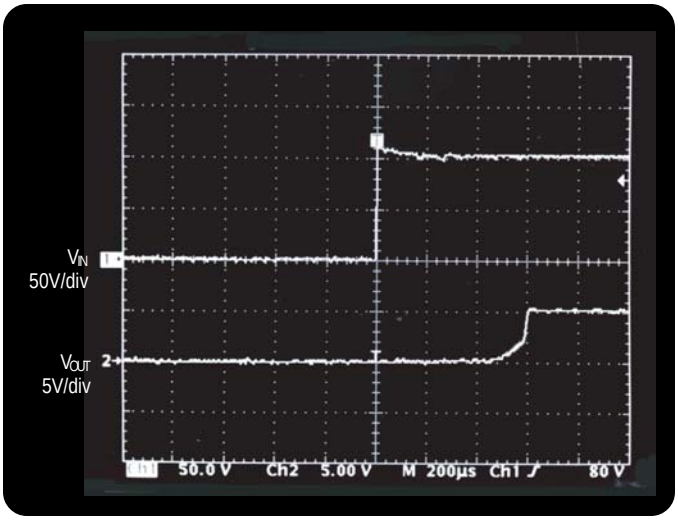
Load Transient Response, Load = 509Ω

Line Transient Response

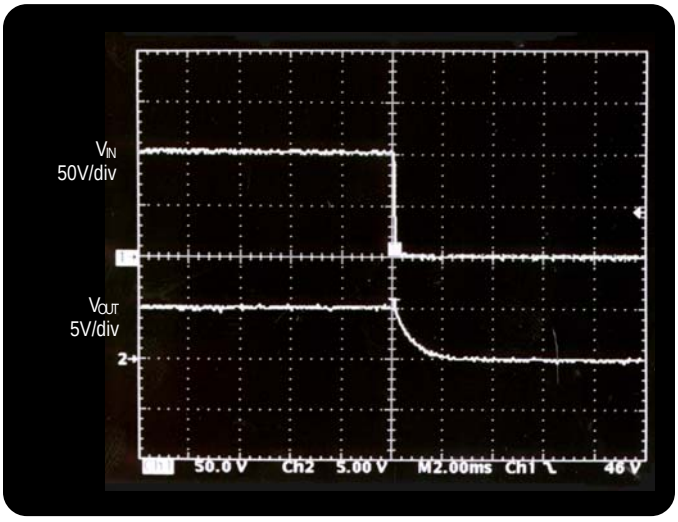




Line Turn On/Off Response



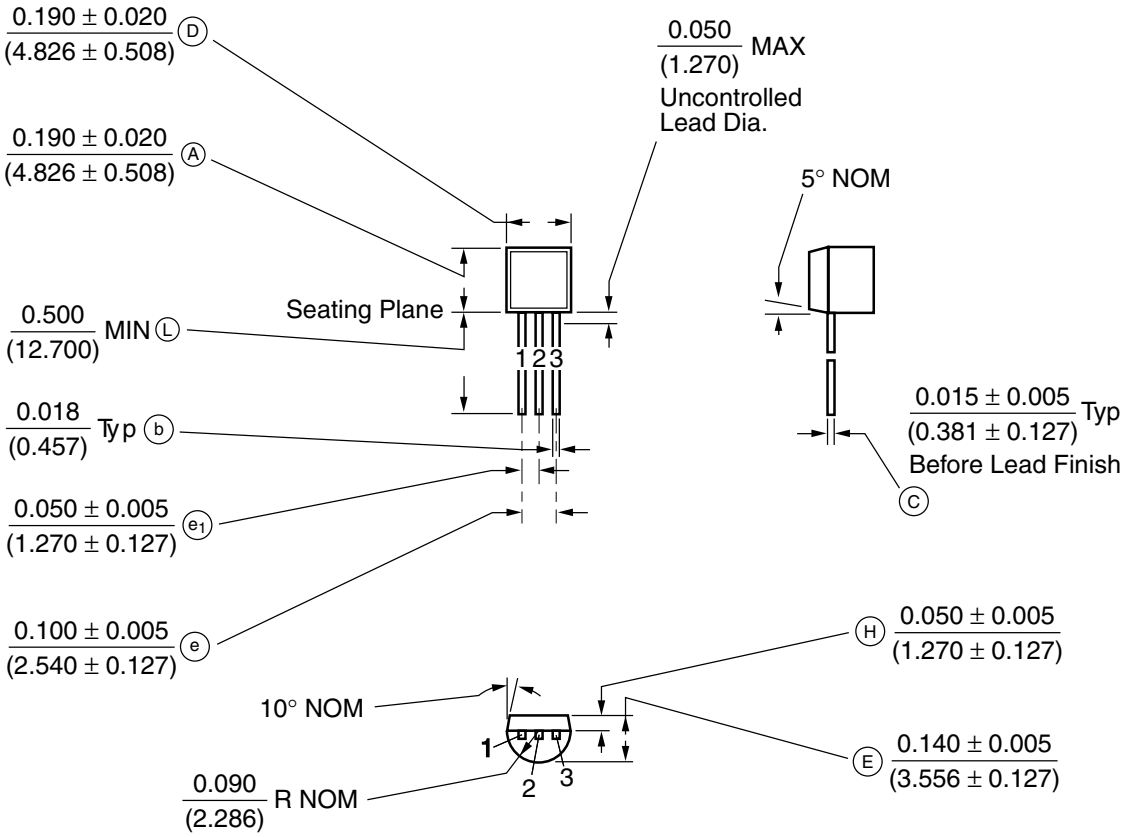
Line Power Up Transient



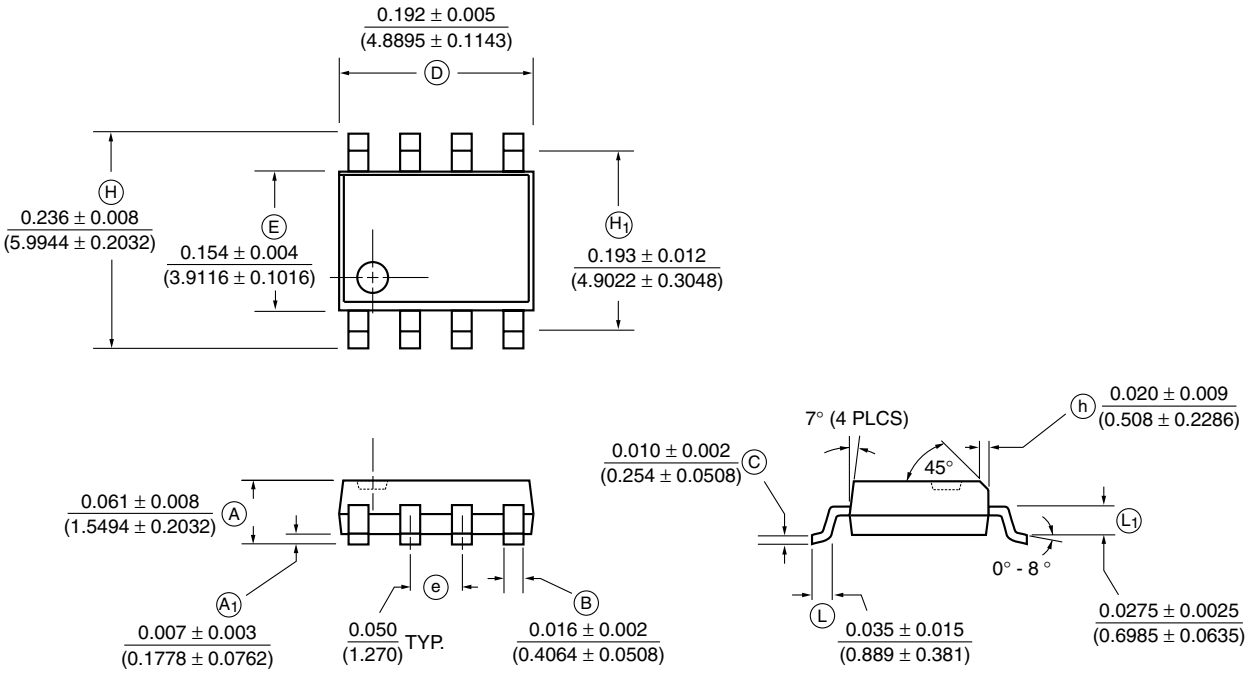
Line Power Down Transient

A081605

3 Lead TO-92 Plastic Package (N3)



8-Lead Small Outline Package (LG, TG)

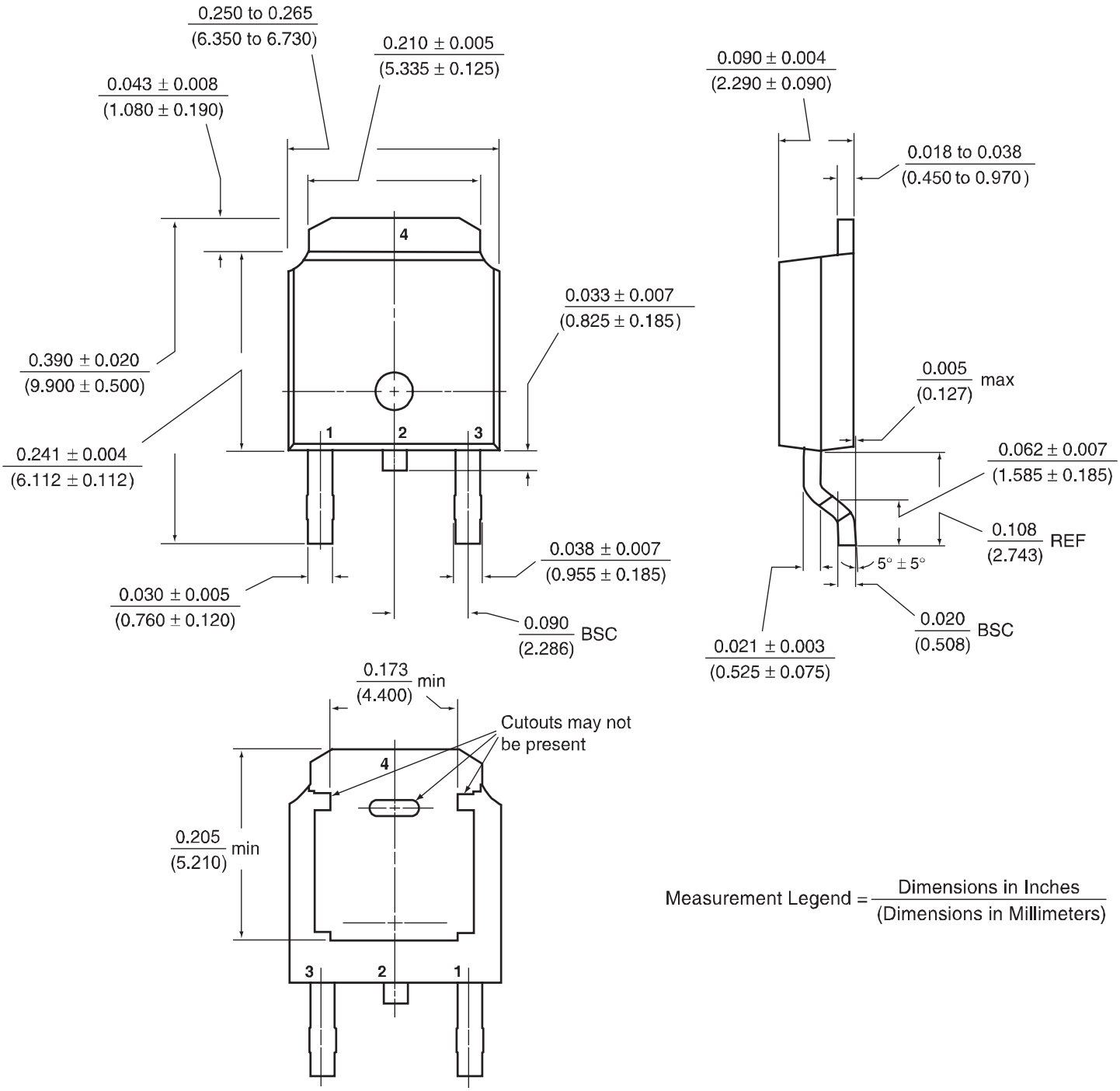


Note: Circle (e.g. (B)) indicates JEDEC Reference.

Measurement Legend = Dimensions in Inches / (Dimensions in Millimeters)

A081605

3-Lead TO-252 (D-PAK) Package (K4)



Measurement Legend = Dimensions in Inches / (Dimensions in Millimeters)

Supertex inc.
1235 Bordeaux Drive, Sunnyvale, CA 94089
TEL: (408) 222-8888 / FAX: (408) 222-4895
www.supertex.com