29T50K-XX/29T51K-XX 100mA Low Dropout Voltage Regulators

September 2014 – revised December 2014

FEATURES

- High accuracy output voltage
- Guaranteed 100mA output
- Very low quiescent current
- Low dropout voltage
- Extremely tight load and line regulation
- Very low temperature coefficient
- Needs only 1μF for stability
- Error flag warns of output dropout
- Logic-controlled electronic shutdown
- Output programmable from 1.24V to 29V

APPLICATIONS

- Battery-powered systems
- Cordless telephones
- Radio-control systems
- Portable/palm-top/notebook computers
- Portable consumer equipment
- Portable instrumentation
- Avionics
- Automotive electronics
- SMPS post-regulator
- Voltage reference

PRODUCT DESCRIPTION

The 29T50K-XX/29T51K-XX is a low power voltage regulator. This device is an excellent choice for use in battery-powered applications such as cordless telephones, radio-control systems, and portable computers.
The 29T50K-XX/29T51K-XX features a very low quiescent current (75μA typ.) and a very low drop output voltage (typ. 40mV at a light load and 380mV at 100mA). Furthermore, a tight initial output voltage tolerance of 0.5% typ., an extremely good load and line regulation of 0.05% typ. and a very low output temperature coefficient – all that makes the 29T50K-XX/29T51K-XX very useful as a low-power voltage reference.
The error flag output feature is used as a power-on reset for warning of a low output voltage, which is due to falling batteries on the input. Another feature is the logic-compatible shutdown input, which enables the regulator to be switched on and off.
The 29T51K-XX is available in 8-pin plastic package. The regulator output voltage may be pin-strapped for a –XX volts or programmed for 1.24V to 29V with an external pair of resistors.
The 29T50K-XX is offered in 3-pin TO-92 package compatible with other regulators.

ABSOLUTE MAXIMUM RATINGS

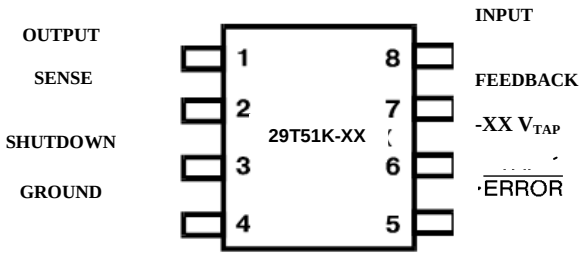
Power dissipation	P_D	Internally-limited
Lead temperature (soldering, 5 seconds)		260ºC
Storage temperature range	T_{STG}	-65ºC to +150ºC
Operating junction temperature range	T_J	-40ºC to +125ºC
Input supply voltage	V_{IN}	-0.3V to +30V
FEEDBACK input voltage		-1.5V to +30V
SHUTDOWN input voltage		-0.3V to +30V
ERROR COMPARATOR output		-0.3V to +30V

DEVICE SELECTION GUIDE

V_{OUT}, V	Device
2.85*	29T50K-2.85, 29T51K-2.85
3.0	29T50K-3.0, 29T51K-3.0
3.3	29T50K-3.3, 29T51K-3.3
5.0	29T50K-5.0, 29T51K-5.0

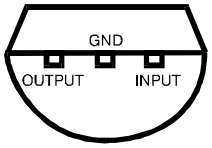
*other versions (V_{OUT} =2.0V to 5.0V) are also available.
Please, consult the factory for more information

29T51K-XX
Pin Connection



Top view

TO-92 Plastic Package
(29T50K-XX only)



Bottom view

ELECTRICAL CHARACTERISTICS

(At T_J = 25°C, V_{IN}= V_0 +1V, I_L =100µA and C_L=1µF, unless otherwise noted)

Parameter	Conditions (Note 1)	Min.	Typ.	Max.	Units
Output voltage	T_J=25°C -25°C ≤ T_J ≤ 85°C Full operating temperature	0.99 IV_0I 0.985 IV_0I 0.98 IV_0I	V_0	1.01 IV_0I 1.015 IV_0I 1.02 IV_0I	V
Output voltage	100µA ≤ I_L ≤ 100mA, T_J≤ T_{Jmax}	0.976 IV_0I	V_0	1.024 IV_0I	
Output voltage temperature coefficient	(**Note 2**)		50	150	ppm/ºC
Line regulation	V_0 + 1V ≤ V_{IN} ≤ 30V		0.04	0.2	%
Load regulation (**Note 3**)	100µA ≤ I_L ≤ 100mA		0.1	0.3	%
Dropout voltage (**Note 4**)	I_L = 100µA I_L = 100mA		50 380	80 450	mV
Ground current	I_L = 100µA I_L = 100mA		75 3	120 12	µA mA
Dropout ground current	V_{IN} = V_0 - 0.5V, I_L =100µA		110	170	µA
Current limit	V_{OUT} = 0		160	200	mA
Thermal regulation			0.05	0.2	%/W
Output noise, 10Hz to 100kHz	C_L = 1µF		430		μV_{rms}
	C_L = 200µF		160		μV_{rms}
	C_L = 3.3µF (Bypass = 0.01µF, pins 7 to 1 (29T51K-XX))		100		μV_{rms}
Turn-on time				70	µsec
8-pin versions only					
Reference voltage		1.21	1.235	1.26	V
Reference voltage	Over temperature (**Note 5**)	1.185		1.285	
FEEDBACK pin bias current			20	40	nA
Reference voltage temperature coefficient	(**Note 2**)		50		ppm/°C
FEEDBACK pin bias current temperature Coefficient			0.1		nA/°C
ERROR COMPARATOR					
Output leakage current	V_{OH} = 30V		0.01	1.0	µA
Output low voltage	V_{IN} = 4.5V, I_{OL} = 400µA		150	250	mV
Upper threshold voltage	(**Note 6**)	40	60		
Lower threshold voltage	(**Note 6**)		75	95	
Hysteresis	(**Note 6**)		15		
SHUTDOWN input					
Input logic voltage	Low (Regulator ON) High (Regulator OFF)	 2	1.3	0.7	V
SHUTDOWN pin input current	$V_{shutdown}$ = 2.4V $V_{shutdown}$ = 30V		30 450	50 600	µA
Regulator output current in Shutdown	(**Note 7**)				
	V_{OUT}= 5.0V		3	10	
	3.3V ≤ V_{OUT} < 5.0V			20	
	2.0V ≤ V_{OUT} < 3.3V			30	

Note 1: Additional conditions for 8-pin versions are the FEEDBACK tied to –XX V_{TAP} and the OUTPUT tied to the SENSE output (V_{OUT} =XX V) and $V_{shutdown}$ ≤ 0.8V.

Note 2: Output or reference voltage temperature coefficients are defined as the worst case voltage change divided by the total temperature range.

Note 3: The **Regulation** is measured at a constant junction temperature using pulse testing with a low duty cycle. Changes in the output voltage due to heating effects are covered under the specification for thermal regulation.

Note 4: The **Dropout voltage** is defined as the input-to-output differential, at which the output voltage drops 100mV below its nominal value measured at 1V differential. At very low values of a programmed output voltage, the minimum input supply voltage 2V (2.3V over temperature) must be taken into account.

Note 5: V_{REF} ≤ V_{OUT} ≤ (V_{IN}-1V), 2.3V ≤ V_{IN} ≤ 30V, 100µA ≤ I_L ≤ 100mA, T_J ≤ T_{Jmax}

Note 6: Comparator thresholds are expressed in terms of a voltage differential at the FEEDBACK terminal below the nominal reference voltage measured at V_o+1V input. To express these thresholds in terms of an output voltage change, multiply by the error amplifier gain=V_{OUT}/V_{ref} =(R1+R2)/R2.For example, at a programmed output voltage of 5V, the Error output is guaranteed to go low when the output drops by 95mV x 5V/1.235V=384mV. Thresholds remain constant as a percent of V_{OUT} as V_{OUT} is varied, with the dropout warning occurring at typically 5% below nominal, 7.5% guaranteed.

Note 7: $V_{shutdown}$ ≥ 2 V, V_{IN} ≤ 30V, V_{OUT} = 0, the FEEDBACK pin is tied to –XX V_{TAP}.

BLOCK DIAGRAM AND TYPICAL APPLICATIONS

29T50K-XX **29T51K-XX**

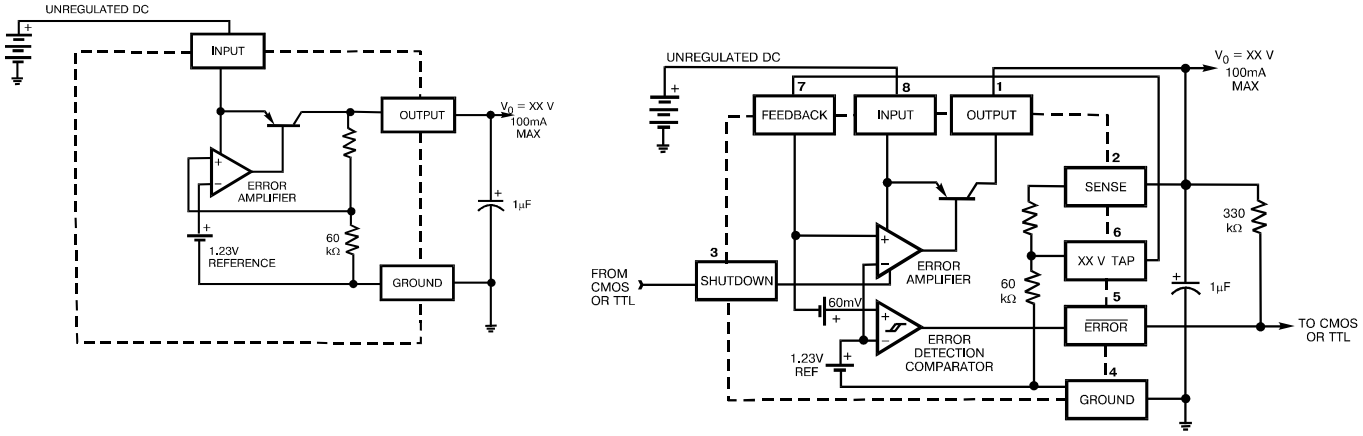


Fig.1. Block diagrams

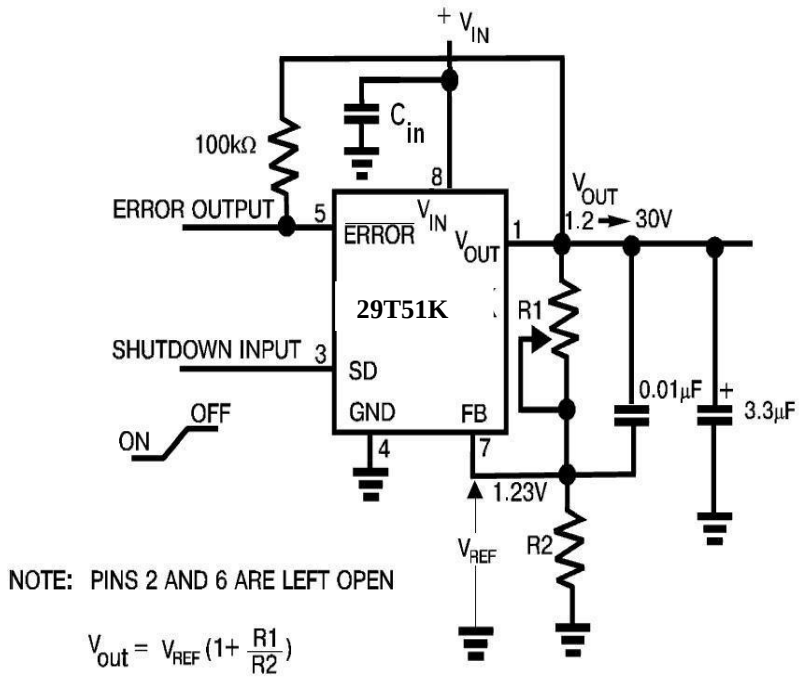
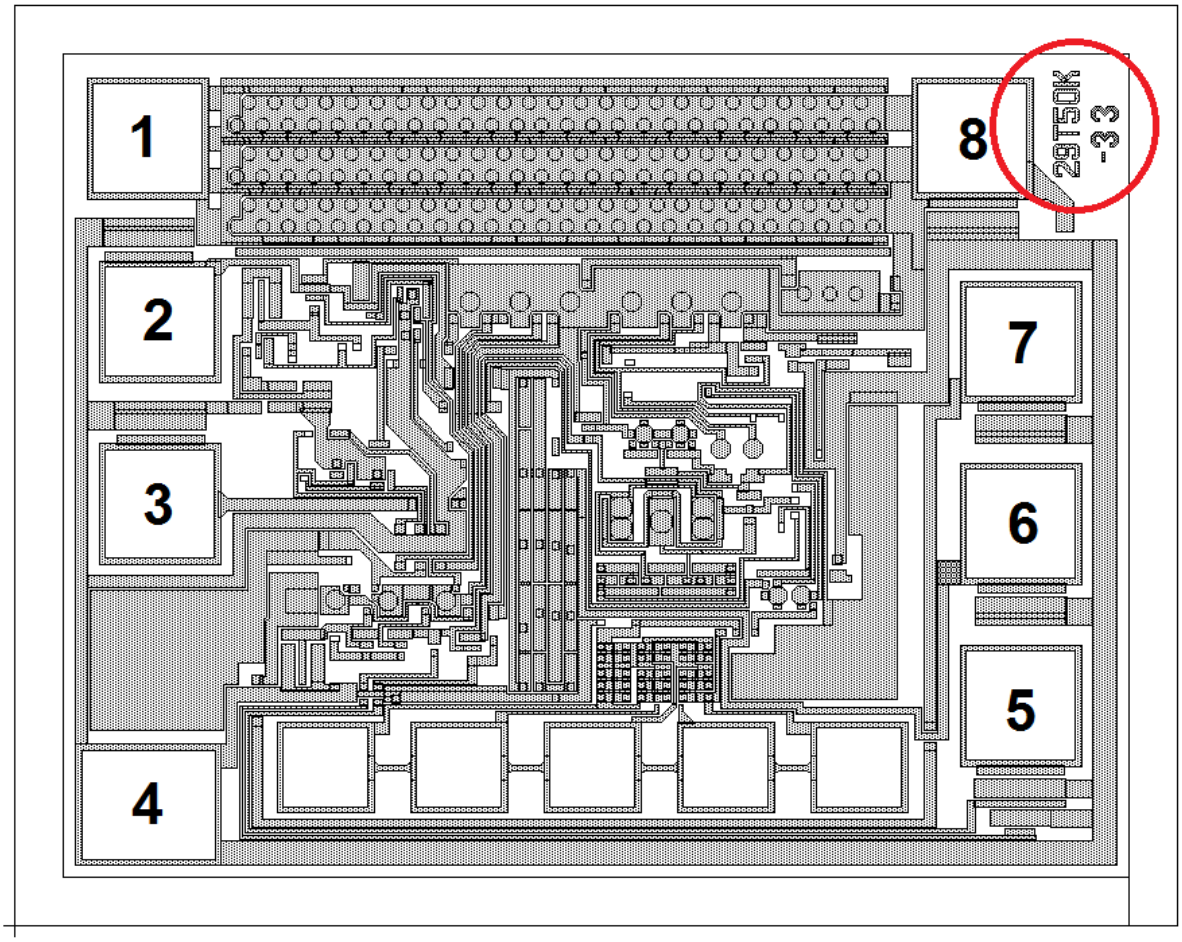


Fig.2. Voltage regulator

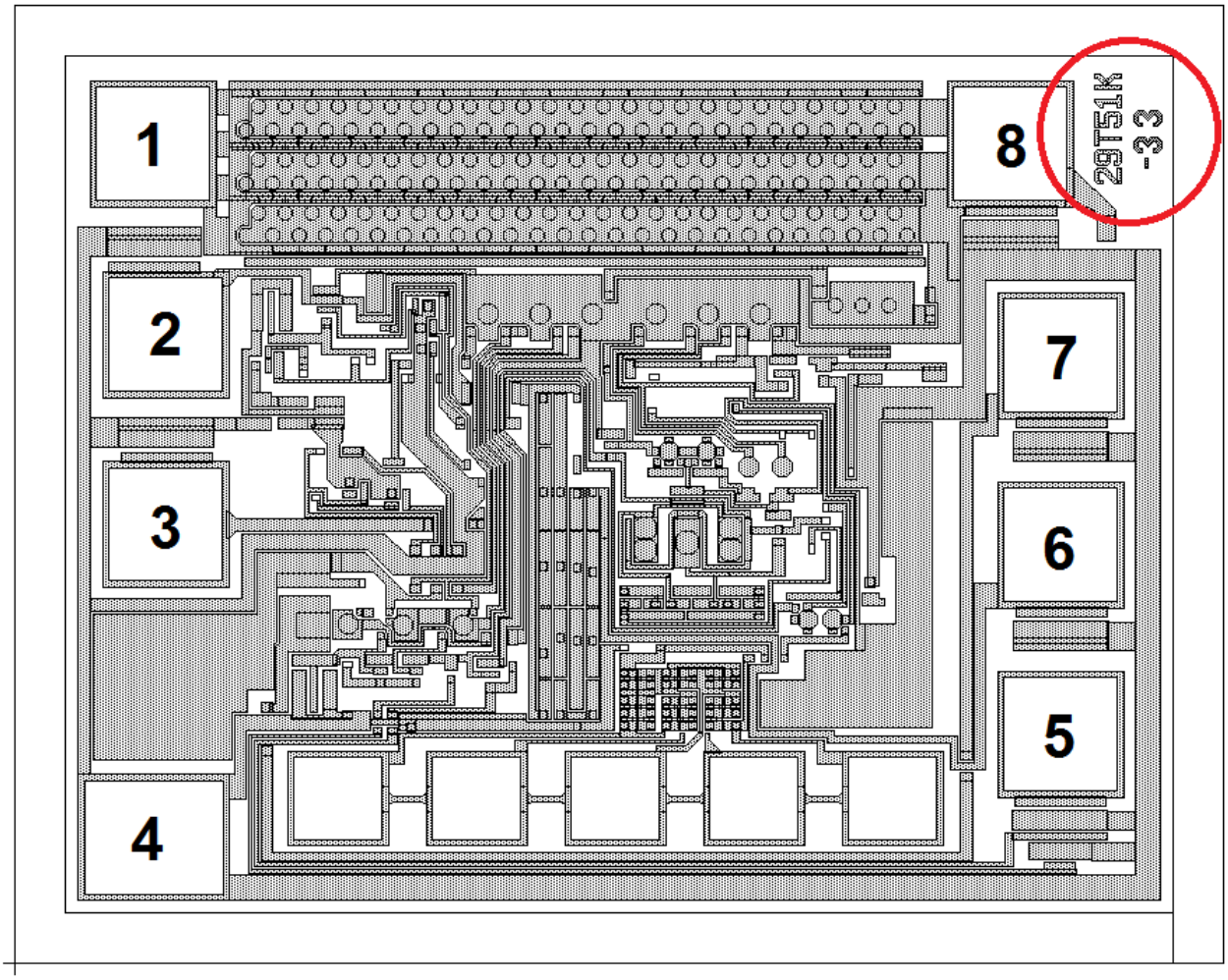
29T50K-XX
PAD LOCATION AND COORDINATES
(METAL LAYERS DRAWING)



Die Mark: 29T50K-XX

Pad	Name	Pad opening size (μm^2)	Pad centers coordinates (μm)	
			X	Y
1	OUTPUT	90 x 90	110	650
2	OUTPUT sense	90 x 90	120	500
3	Non Connect	90 x 90	120	350
4	GND	110 x 90	110	100
5	Non Connect	90 x 90	830	180
6	Non Connect	90 x 90	830	330
7	Non Connect	90 x 90	830	480
8	INPUT	90 x 90	790	650

29T51K-XX
PAD LOCATION AND COORDINATES
(METAL LAYERS DRAWING)

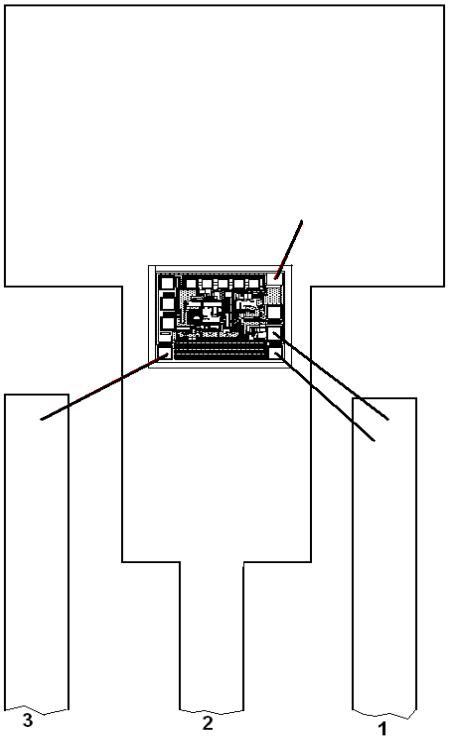


Die Mark: 29T51K-XX

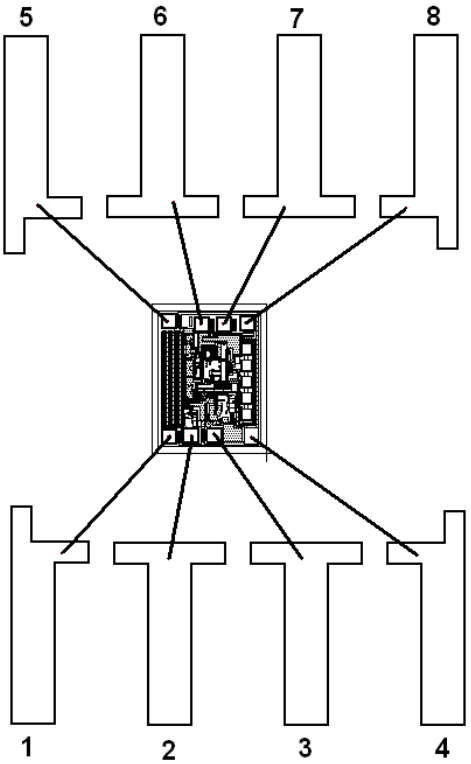
Pad	Name	Pad opening size (μm^2)	Pad center coordinates (μm)	
			X	Y
1	OUTPUT	90 x 90	110	650
2	SENSE	90 x 90	120	500
3	SHUTDOWN	90 x 90	120	350
4	GND	110 x 90	110	100
5	ERROR	90 x 90	830	180
6	XX V_{TAP}	90 x 90	830	330
7	FEEDBACK	90 x 90	830	480
8	INPUT	90 x 90	790	650

ASSEMBLY DRAWING

29T50K-XX (TO-92)



29T51K-XX
(Surface-mount package)



Assembly Characteristics

No.	Assembly Characteristics	Value
1	Wafer Size	6 Inch
2	Wafer Thickness before Grinding	675 +/-25 µm
3	Scribe Street Width	80 µm
4	Chip Size (including Scribe Line)	0.96 × 0.76 mm^2
5	Die Attach Material	Substrate is connected to GND
6	Quantity of Bond Pad Metal Layers	1
7	Pad Thickness	1.6 µm
8	Composition of Metal Layers	Al+Si(1.0%)+Ti(0.5%)
9	Min. Bond Pad Opening Size	90×90 µm
10	Min. Bond Pad Pitch	150 µm
11	Min. Wire Diameters	0.9 mil (22.9 µm)
12	Circuit Under Pad Design (CUP)	No

For your information

Pb-free products:
- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.

Green products:
- Lead-free (RoHS compliant)
- Halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

The appearance complies with the requirements of the company standards.