SIGNAL PROCESSING TECHNOLOGIES

SPT114

VOLTAGE REGULATOR WITH ON/OFF SWITCH

FEATURES

- Low Dropout Voltage
- Electronic ON/OFF Switch
- Very Low Standby Current (ON, No Load)
- Internal Thermal Shutdown
- Short Circuit Protection
- Very Low (<100 nA) Current in OFF Mode
- Available on Tape and Reel
- Customized Versions Are Available

APPLICATIONS

- Battery Powered Systems
- Cellular Telephones
- Pagers
- Personal Communications Equipment
- Portable Instrumentation
- Portable Consumer Equipment
- Radio Control Systems
- Low Voltage Systems

GENERAL DESCRIPTION

The SPT114 series of devices are low power, linear regulators. Each regulator can be turned ON and OFF by an internal electronic switch which is controlled by an external control signal.

The Internal PNP pass-transistor is used in order to achieve low dropout voltage (typically 200 mV at 50 mA load current). The device has very low quiescent current (500 µA) in the ON mode with no load and 2 mA with 30 mA load. The quiescent current is typically 4 mA at 60 mA load. An internal thermal shutdown circuit limits the junction temperature to below 150 °C. The load current is internally monitored and the device will shut down (no load current) in the presence of a short circuit at the output. The regulated output voltage may be specified in 0.5 V increments between 2.0 to 6.0 V. Additionally, 3.25 V and 8.0 V versions are also available.

The device is available in a plastic SOT-23L package. Tape and reel mounted devices are also available.

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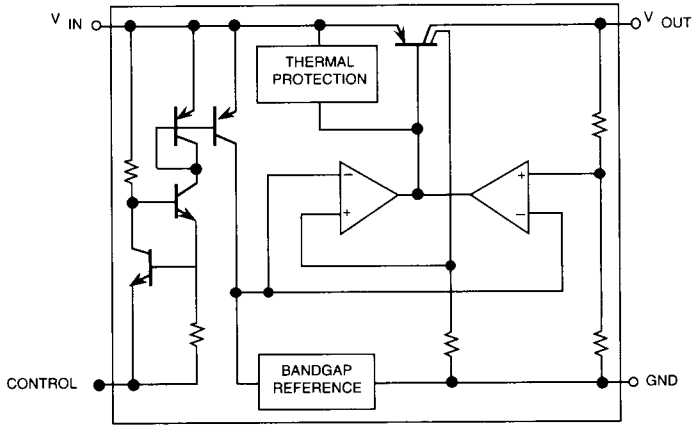
BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (BEYOND WHICH DAMAGE MAY OCCUR) 25[1] °C

Supply Voltage ..... 14 V
Output Voltage ..... V_{OUT} x1.15 V
Load Current ..... 180 mA
Power Dissipation (Note 2) ..... 200 mW

Storage Temperature Range ..... -55 to +150 °C
Operating Temperature Range ..... -40 to +85 °C
Lead Soldering Temp (10 sec) ..... +240 °C
Junction Temperature ..... +150 °C

ELECTRICAL SPECIFICATIONS

$T_A=T_{MIN}$ - T_{MAX} unless otherwise specified.

PARAMETERS	TEST CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
Supply Voltage Range		V_{IN}	2.5		14	V
Supply Current 1	$V_{IN}=V_{OUT}$ + 1 V, I_O=0 mA	I_{IN1}		500	900	µA
Supply Current 2	$V_{IN}=V_{OUT}$ -(1 V to 0.1 V), I_O = 0 mA	I_{IN2}		1.0	2.5	mA
Supply Current 3	V_{IN}=10 V, V_{OUT} = OFF Mode	I_{IN3}				
	T_A=-20 °C to +70 °C			0.1	2.0	mA
	T_A=-40 °C to +85 °C			0.1	3.0	mA
Regulated Output Voltage	$V_{IN}=V_{OUT}$ + 1 V, I_{OUT}=30 mA	V_O				
	T_A=25 °C		-3.5		+3.5	%
			-100		+100	mV
	T_A=-20 °C to +70 °C		-4.5		+4.5	%
			-130		+130	mV
	T_A=-40 °C to +85 °C		-5.0		+5.0	%
			-140		+140	mV
Dropout Voltage 1	V_O=30 mV	V_{DROP}		0.12	0.3	V
Output Current	T_A=-20 °C to +70 °C	I_O		110		mA
	T_A=-40 °C to +85 °C			100		mA
Recommended Output Current		I_{OR}			70	mA
Line Regulation	V_{OUT} +1 V ≤ V_{IN} ≤ V_{OUT}+6.0 V	Line Reg		2	20	mV
Load Regulation	V_{IN} = V_O +1 V, I_O = 0-60 mA	Load Reg		35	110	mV
Control Pin Current		I_{CONT}		35	120	µA
Control Pin Voltage	Off Mode	V_{COFF}	V_{IN}-0.2 V		V_{IN}	V
Control Pin Voltage	On Mode	V_{CON}	0		V_{IN}-1.0 V	V
Ripple Rejection	100 mVRMS, f=400 Hz	RR		55		dB
	$V_{IN}=V_O$ + 1.5 V, I_O=10 mA					
V_O Temperature Coefficient	$V_{IN}=V_O$ + 1.5 V, I_{OUT}=10 mA	ΔV/ΔT		0.6		mV/°C
Output Noise Voltage	$V_{IN}=V_O$ + 1.5 V, I_O=10 mA	V_N				
	CL = 10 µF			180		mV_{RMS}

Note 1: Operation at any Absolute Maximum Rating is not implied. See Operating Conditions for proper nominal applied conditions in typical applications.
Note 2: Derates above T_A=25 °C at 1.6 mW/°C.

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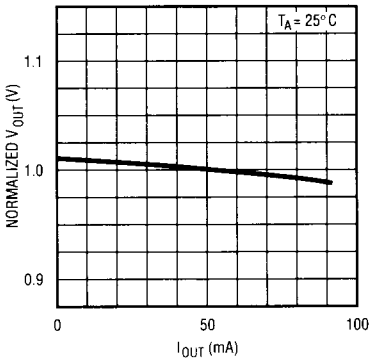
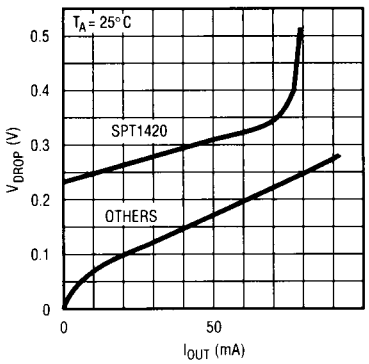
TYPICAL PERFORMANCE CHARACTERISTICS

PART NUMBER	OUTPUT VOLTAGE(V)
SPT11420	2.0
SPT11425	2.5
SPT11430	3.0
SPT11432	3.2
SPT11435	3.5
SPT11440	4.0
SPT11445	4.5
SPT11450	5.0
SPT11455	5.5
SPT11460	6.0
SPT11480	8.0

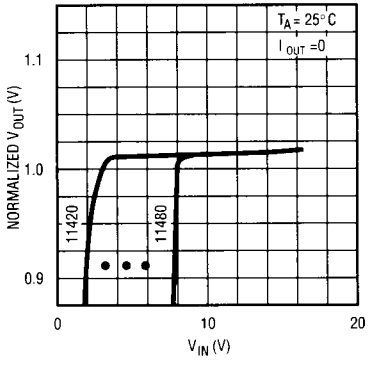
OUTPUT VOLTAGE vs OUTPUT CURRENT



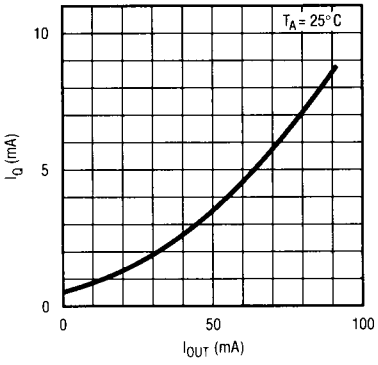
DROPOUT VOLTAGE vs LOAD CURRENT



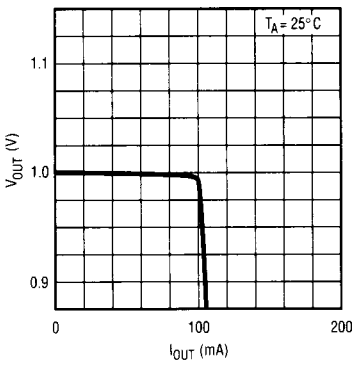
OUTPUT VOLTAGE vs INPUT VOLTAGE



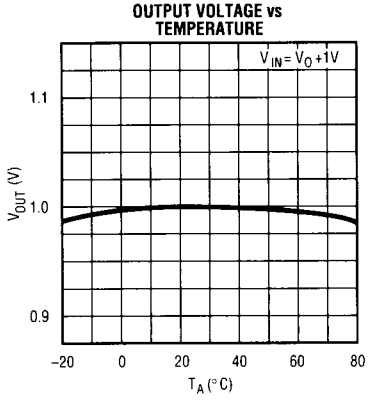
QUIESCENT CURRENT vs LOAD CURRENT



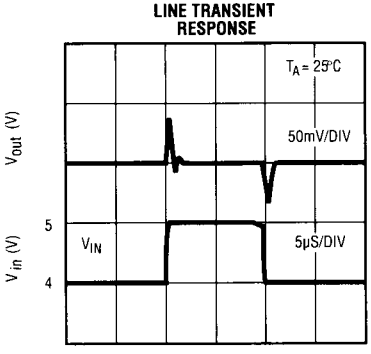
SHORT CIRCUIT PROTECTION



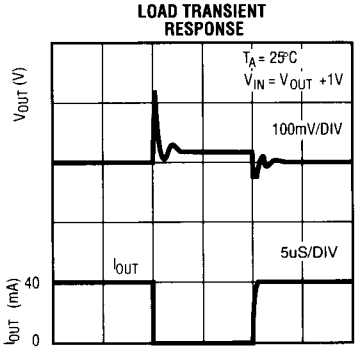
OUTPUT VOLTAGE vs TEMPERATURE



LINE TRANSIENT RESPONSE

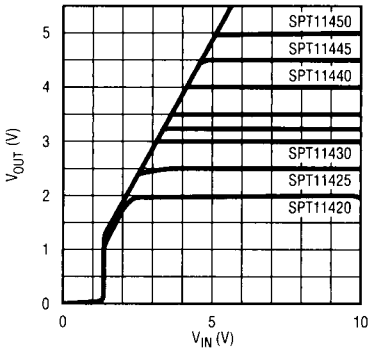


LOAD TRANSIENT RESPONSE

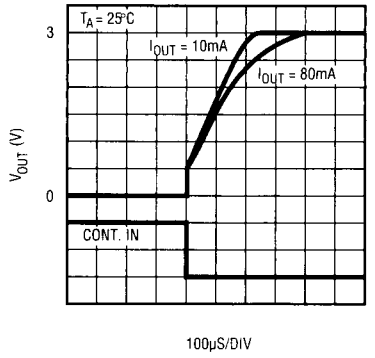


TYPICAL PERFORMANCE CHARACTERISTICS

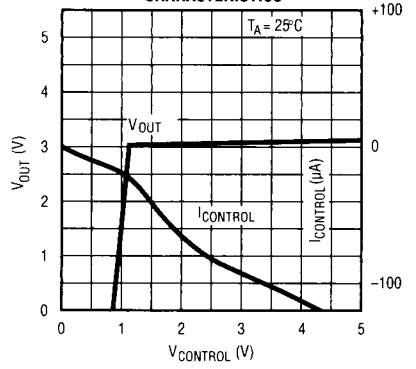
INPUT OUTPUT CHARACTERISTICS (SWITCH ON)



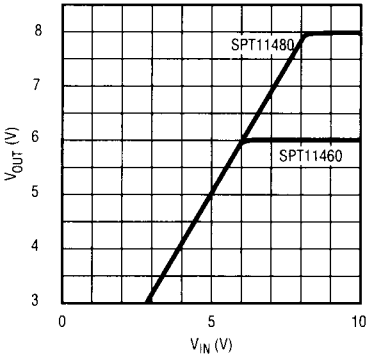
TURN ON TRANSIENT RESPONSE



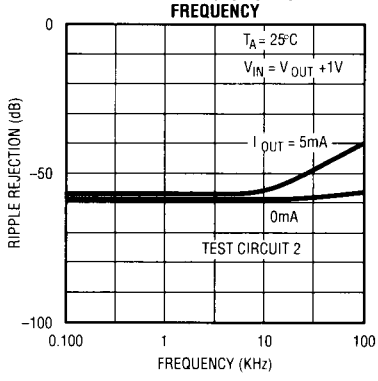
CONTROL PIN CHARACTERISTICS



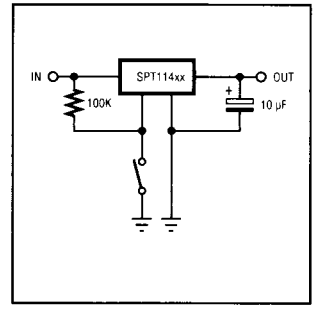
INPUT OUTPUT CHARACTERISTICS (SWITCH ON)



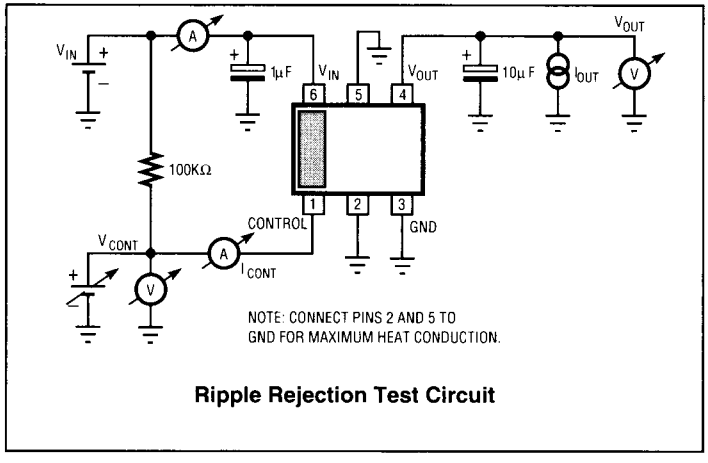
RIPPLE REJECTION vs FREQUENCY



Test Circuit 1



Test Circuit 2



Ripple Rejection Test Circuit

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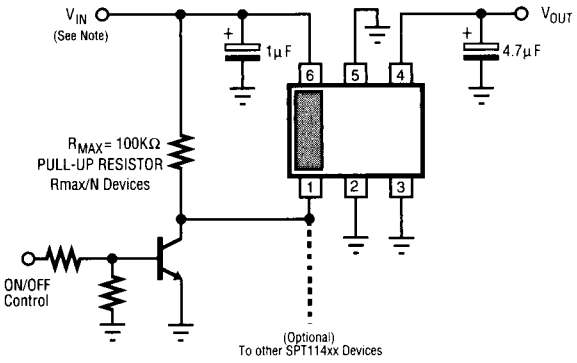
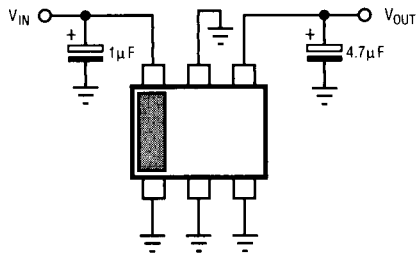
TYPICAL APPLICATIONS

CONTROL FUNCTION UTILIZED

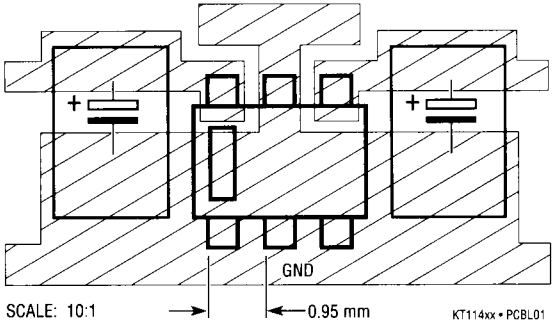


CONTROL FUNCTION NOT UTILIZED



Note: Parallel connection of control pins is allowed if all devices use identical input voltage.

PRINTED CIRCUIT BOARD LAYOUT



APPLICATION HINTS

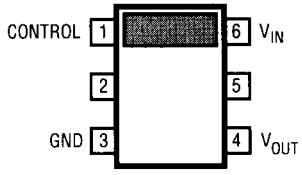
Maximize copper foil area connecting to all IC pins for optimum performance. Place input and output bypass capacitors close to the GND pin. For best transient behavior and lowest output impedance, use as large of a capacitor value as possible. The temperature coefficient of the capacitance and Equivalent Series Resistance (ESR) should be taken into account. These parameters can influence power supply noise and ripple rejection. In extreme cases, oscillation may occur. In order to maintain stability, the output bypass capacitor value should be minimum 2.2 µF in case of Tantalum electrolytic or 4.7 µF in case of Aluminium electrolytic.

HANDLING MOLDED RESIN PACKAGES

All plastic molded packages absorb some moisture from the air. If moisture absorption occurs prior to soldering the device into the printed circuit board, increased separation of the lead from the plastic molding may occur, degrading the moisture barrier characteristics of the device. Do not overlook this property of plastic molding compounds, paticularly with small packages in which the plastic is very thin.

In order to preserve the original moisture barrier properties of the package, devices are stored and shipped in moisture proof bags, filled with dry air. The bags should not be opened or damaged prior to the actual use of the devices. If this is unavoidable, the devices should be stored in a low relative humidity environment (40 to 65%) or in an enclosed environment with desicant.

PIN ASSIGNMENT



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