HIGH CURRENT, LOW DROPOUT VOLTAGE REGULATORS

FEATURES

- Extremely Compact 10 Pin Flatpack With Metal Base
  Extremely Low Dropout Voltage: 350mV @ 1.5 Amps
- Available in +1.5V, +1.7V, +1.9V, +2.5V, +3.3V, +5.0V and +12.0V
- TTL Level Enable Pin: Zero Current Shutdown Mode
- Reverse Battery and Load Dump Protection
- Low Ground Current: 32mA Typical at Full
- Load 1% Guaranteed Accuracy
- Output Current to 1.5 Amps.
- TID Hardened to 300 Krads
- Neutron Tested to $1.0\text{x}10^{12}$ n/cm²
- Comparable to MSK5820RH, OMR9601
  IRUH33PXXXB/IRUH50PXXXB

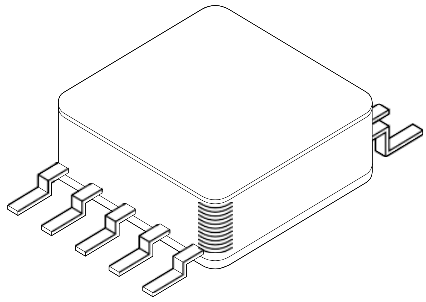


Table 1. Pin description.

Pin Number	Name	Function
1, 5, 9, 10	NC	NC
2	Enable	Enable
3	Vin A	Vin A
4	Vin B	Vin B
6	Vout A	Vout A
7	Vout B	Vout B
8	Vout C	Vout C
BASE	BASE	The base of the package is electrically connected to ground.

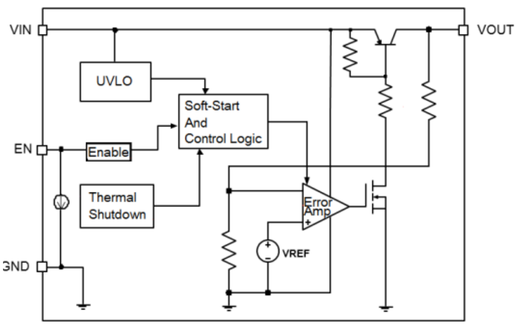
DESCRIPTION

The JTR5102 series voltage regulators are available in the following voltages: +1.5V, +1.7V, +1.9V, +2.5V, +3.3V, +5.0V, and +12.0V. With the use of a super PNP Bipolar transistor with monolithic technology, ultralow dropout requirements are achieved. In this arrangement, dropout voltages of 350mV at 1.5 amps are normal, resulting in increased efficiency and lower power dissipation. With a 1% output voltage tolerance, accuracy is assured. A TTL/CMOS compatible on/off enable feature is also included in the series. The JTR5102 series is housed in a 10 pin ceramic flatpack with a built-in aluminum base that is space saving.

TYPICAL APPLICATIONS

High Efficiency, High Current Linear Regulators. Constant Voltage/Current Regulators. System Power Supplies. Switching Power. Supply Post Regulators. Battery Powered Equipment

EQUIVALENT SCHEMATIC

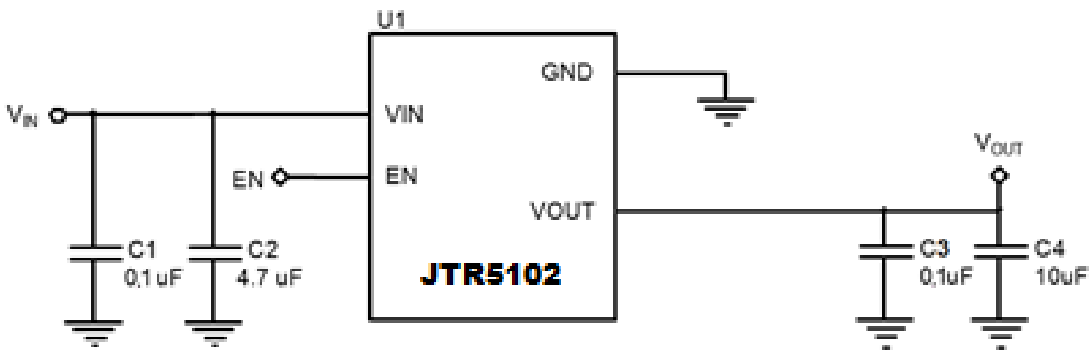


ELECTRICAL SPECIFICATIONS

Table 2. Electrical specifications

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
V_{IN}	V_{IN}		-	-	14	V
Output Voltage Tolerance	S_T	I_{OUT}=10mA; V_{IN}=V_{OUT}+1V	-	±0.5	±1.0	%
Output Noise	V_N	C_L=10μF; 10Hz ≤ f ≤ 100KHz	-	400	-	uV
On Resistance	$R_{DS(ON)}$	I_{OUT}=100mA, V_{EN}=5.0 V, V_{OUT}=1.2 V	-	230	470	mΩ
Dropout Voltage	V_{DROP}	I_{OUT} = 1.5A, V_{OUT} = 1.2V	-	0.35	0.7	V
Soft Start Time	T_{SS}		-	0.3	-	ms
EN Pin Logic High Threshold Voltage	V_{ENH}	Disable	2.4	-	-	V
	V_{ENL}	Enable	-	-	0.8	
EN Pin Pull-Up Current	I_{EN}	EN=5V	-	100	600	uA
		EN=GND	-	15	30	
Thermal Shutdown Threshold	T_{SD}		-	135	-	°C
Quiescent Current	I_Q	No Load	-	-	20	mA
		Full Load	-	-	100	

TYPICAL APPLICATION



APPLICATION NOTES

REGULATOR PROTECTION

Reversed input polarity, overcurrent faults, overtemperature situations (Pd), and transient voltage spikes of up to 60V are all protected in the JTR5102 series. The output voltage must be diode clamped to ground if the regulator is used in dual supply systems where the load is returned to a negative supply.

OUTPUT CAPACITOR

A filter capacitor placed between the output and ground helps reducing the output voltage ripple of the JTR5102 series voltage regulators. The best value for this capacitor varies depending on the application, however for best results, a minimum of 10F is suggested. By putting a capacitor directly across the load, transient load responsiveness can be enhanced as well.

LOAD CONNECTIONS

The load connection is critical in voltage regulator situations when extremely high load currents are involved. To prevent influencing the load regulation parameters, the route connecting the regulator's output to the load must have extremely low impedance. With the load, any impedance in this route forms a voltage divider.

ENABLE PIN

The ENABLE pin on the JTR5102 family of voltage regulators is TTL compatible. The internal bias circuit is activated and the gadget is powered up when this pin is set to a TTL high level. The controller enters shutdown mode when this pin is set to a TTL low level, and the device consumes roughly 10A of quiescent current. If you don't want to use the enable function, just connect the enable pin to the input.

DEVICE SOLDERING/CASE CONNECTION:

The JTR5102 family of devices are extremely thermally conductive, with a very short thermal path from the package base to the internal connections. When connecting the device to a circuit board, standard surface mount procedures should be utilized. Because the base of the JTR5102 02 is likewise electrically linked to ground, the external heat sink/pad must be connected to ground. When designing the printed circuit board for the JTR5102, the user is advised to bear this in mind. Except for ground, no printed circuit traces should make contact with the device's base. Heat may be drawn away from the gadget using the ground plane.

HEAT SINK SELECTION

The following formula for convective heat flow can be used to choose a heat sink for the JTR5102.

Governing Equation:

$$T_j = P_d \times (R_{\theta jc} + R_{\theta cs} + R_{\theta sa}) + T_a$$

WHERE:

T_j = Junction Temperature
P_d= Total Power Dissipation
$R_{\theta jc}$= Junction to Case Thermal Resistance
$R_{\theta cs}$= Case to Heat Sink Thermal Resistance
$R_{\theta sa}$= Heat
Sink to Ambient Thermal ResistanceT_a = Ambient Temperature

First, the power dissipation must be calculated as follows:

$$\text{Power Dissipation} = (V_{in} - V_{out}) \times I_{out}$$

The next step is for the user to choose a maximum junction temperature. The greatest junction temperature that may be tolerated is 125°C. To solve for the necessary heat sink to ambient thermal resistance ($R_{\theta sa}$), rearrange the equation..

EXAMPLE:

Vin=+5V and Vout=+3.3V are set on an JTR5102-3.3. Iout is a constant 1A DC current. The temperature outside is +25°C. The greatest junction temperature that may be achieved is 125°C.

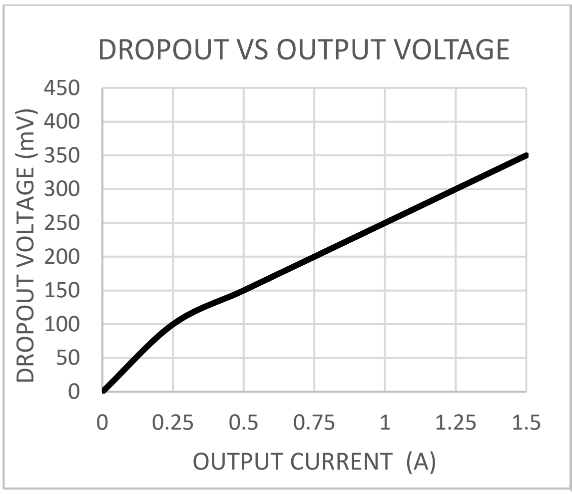
$R_{\theta jc}$= 6°C/W and $R_{\theta cs}$ =0.5°C/W typically.
Power Dissipation = (5V - 3.3V) x (1A)= 1.7Watts
Solve for $R_{\theta sa}$:

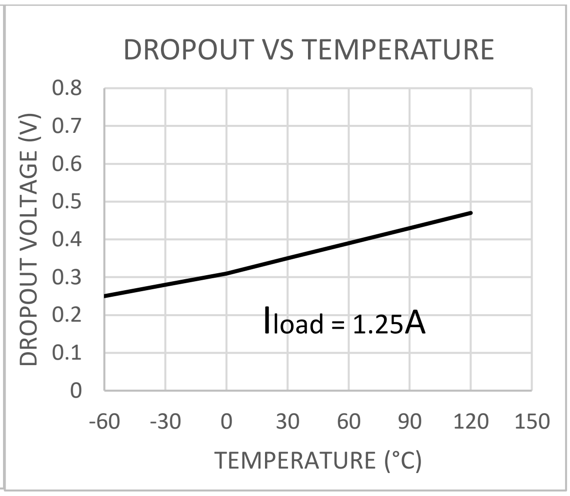
$$R_{\theta sa} = \left[\frac{125℃ - 25℃}{1.7W}\right] - 6℃/W \; - 0.5℃/W \; =$$

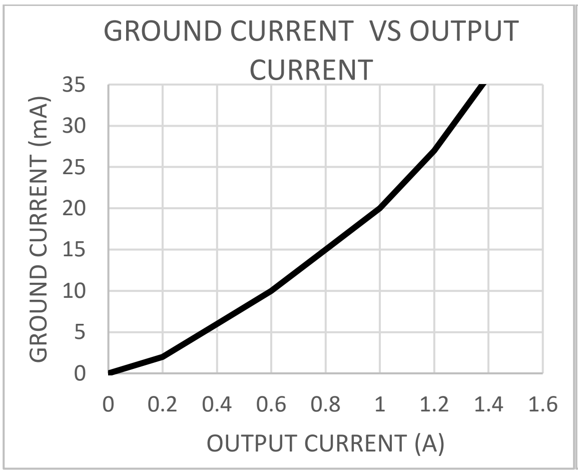
$$= 52.3℃/W$$

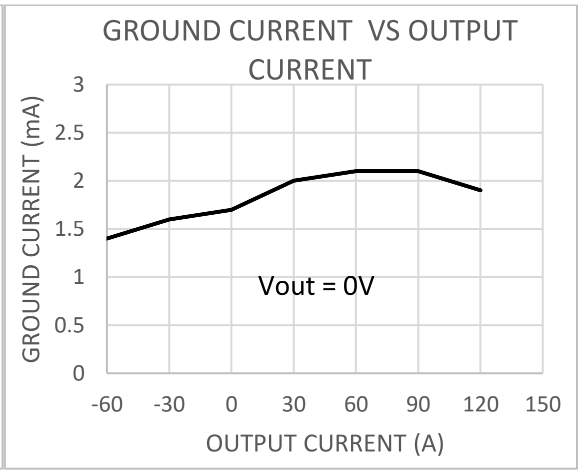
To maintain a junction temperature of no more than 125°C, a heat sink with a thermal resistance of no more than 52°C/W must be employed.

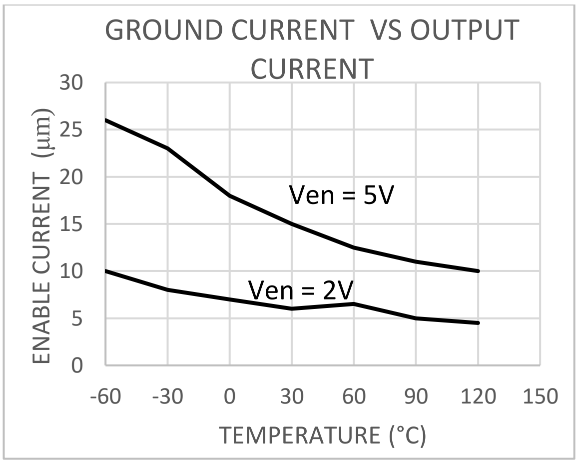
TYPICAL PERFORMANCE CURVES



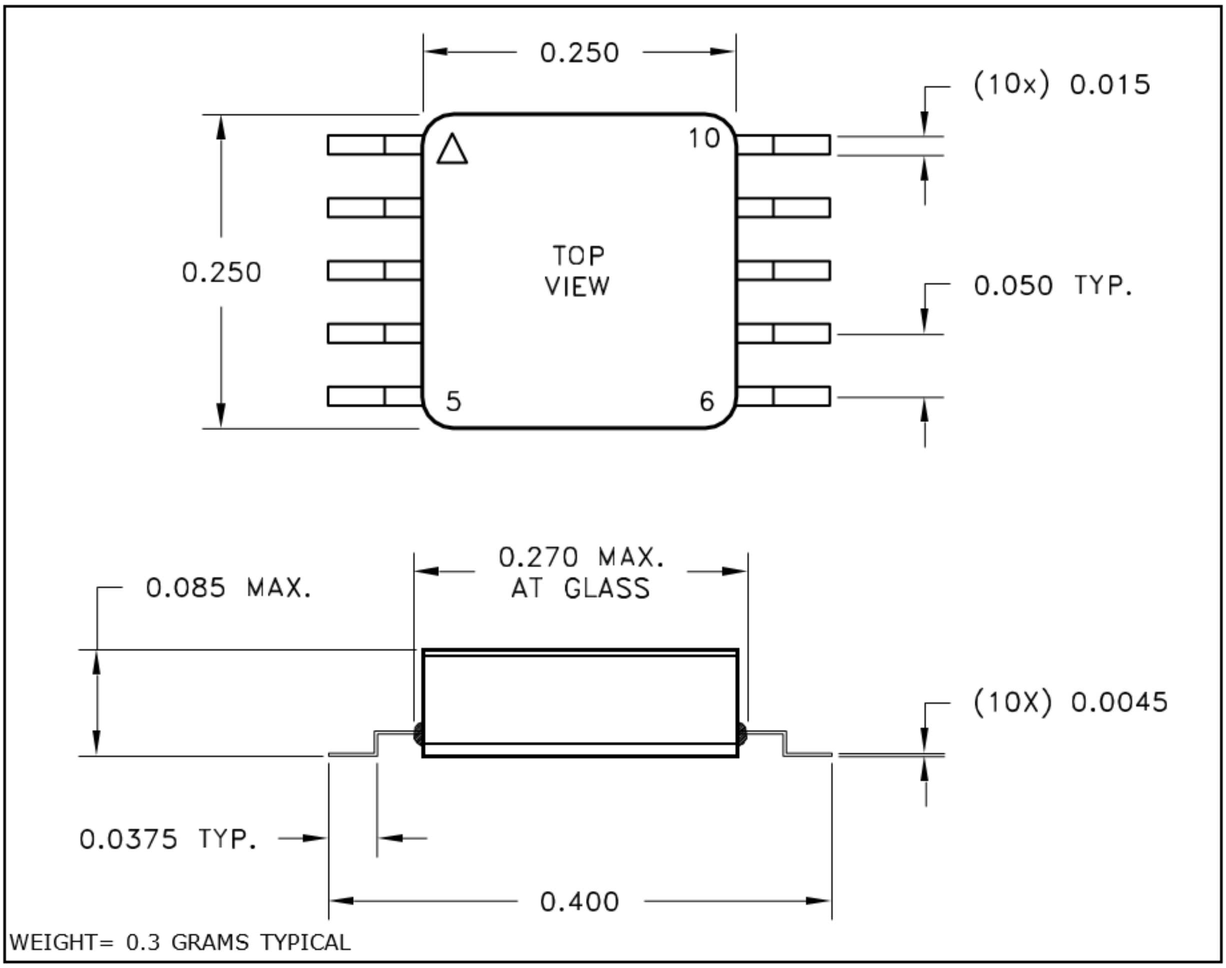








MECHANICAL SPECIFICATION



NOTE: ALL DIMENSIONS ARE ±0.010 INCHES UNLESS OTHERWISE LABELED.
ESD Triangle indicates Pin 1.

ORDERING INFORMATION