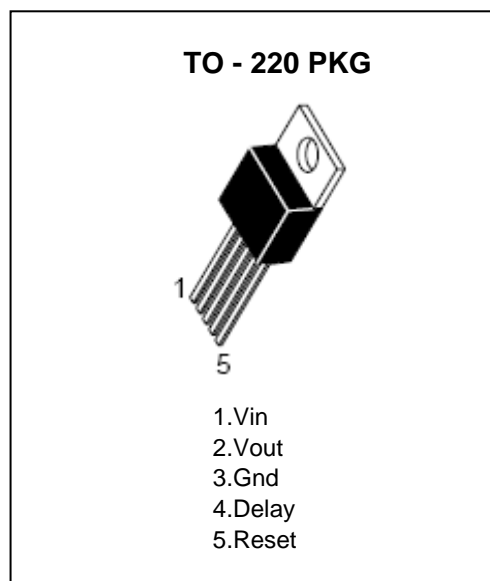


FEATURES

- Externally set delay for reset
- 5V/750mA output
- Very low dropout voltage 0.6V at 0.5A
- Reverse battery protection
- 60V load dump protection
- -50V reverse transient protection
- Internal thermal over load protection
- Short circuit protection
- Available in plastic TO-220
- Long delay times available
- P+ Product Enhancement tested
- Moisture Sensitivity Level 3



ORDERING INFORMATION

Device	Marking	Package
LM2925T	LM2925	TO-220

DESCRIPTION

The LM2925 features a low dropout, high current regulator.

Also included on-chip is a reset function with an externally set delay time. Upon power up, or after the detection of any error in the regulated output, the reset pin remains in the active low state for the duration of the delay.

Types of errors detected include any that cause the output to become unregulated: low input voltage, thermal shutdown, short circuit, input transients, etc. No external pull-up resistor is necessary. The current charging the delay capacitor is very low, allowing long delay times.

Designed primarily for automotive applications, the LM2925 and all regulated circuitry are protected from reverse battery installations or two-battery jumps.

During line transients, such as a load dump (60V) when the input voltage to the regulator can momentarily exceed the specified maximum operating voltage, the 0.75A regulator will automatically shut down to protect both internal circuits and the load.

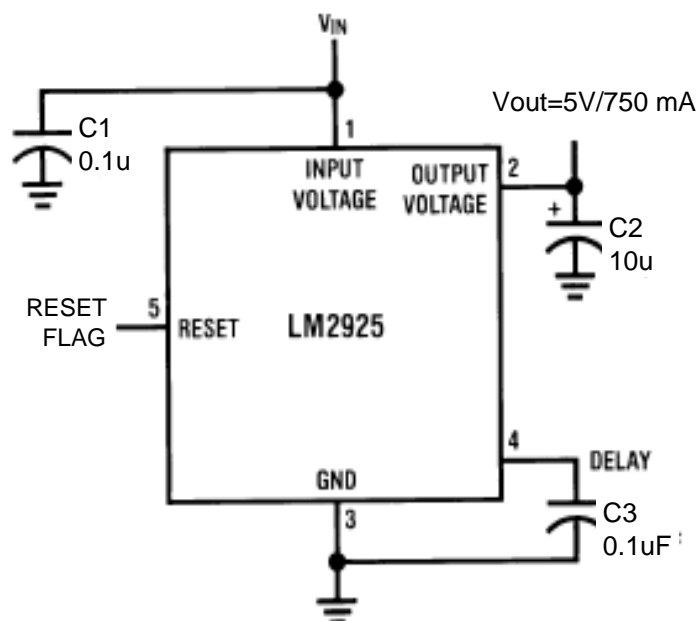
The LM2925 cannot be harmed by temporary mirror-image insertion.

Familiar regulator features such as short circuit and thermal overload protection are also provided.

ABSOLUTE MAXIMUM RATING

Internal Power Dissipation(Note 2*)	Internally Limited
Supply Voltage (V_{in})	
Operating Range	26 [V]
Over voltage Protection	37 [V]
Impulse Voltage(fall=100mS, rise=10mS)	60 [V]
Reverse Input Voltage	-18 [V]
Impulse Voltage(fall=100mS)	- 40 [V]
Operation Temperature Range	-40 ~ +125 °C
Maximum Junction Temperature	150 °C
Storage Temperature Range	-65 ~ +150 °C
Lead Temperature (Soldering, max 10 sec)	260 °C

TYPICAL APPLICATION CIRCUIT



C1/C2 Required if regulator is located far from power supply filter. C2 must be at least 10 μ F to maintain stability. May be increased without bound to maintain regulation during transients. Locate as close as possible to the regulator. This capacitor must be rated over the same operating temperature range as the regulator. The equivalent series resistance (ESR) of this capacitor is critical; see curve.

ELECTRICAL CHARACTERISTICS for V_{OUT}

V_{in}=14V, C₁=0.1uF, C₂=10 uF, I_o=500mA, T_j=25°C, Unless otherwise specified)

Parameter	Condition	Min	Typ	Max	Units
Output Voltage	6V ≤ V _{IN} ≤ 26V, 5 ≤ I _O ≤ 500mA, -40°C ≤ T _J ≤ +125°C	4.75	5	5.25	mV
Line Regulation	6V ≤ V _{IN} ≤ 26V, I _O = 5mA		10	50	mV
Load Regulation	5mA ≤ I _o ≤ 500mA		10	50	mV
Quiescent Current	I _o ≤ 0 mA		3	10	mA
	I _o = 500mA		40	100	mA
	I _o = 750mA		90		mA
Ripple Rejection	f _o = 120 KHz		66		dB
Dropout Voltage	I _o = 500mA		0.45		V
	I _o = 750mA		0.85		V
Current Limit		0.75	1.2		A
Reverse Polarity Input Voltage, DC	V _o ≥ -0.6V, 10Ω Load	-50	-30		V
Reverse Polarity Input Voltage, Transient	1% duty Cycle, t ≤ 1000 ms 10Ω Load	-50	-80		V

ELECTRICAL CHARACTERISTICS for RESET OUTPUT

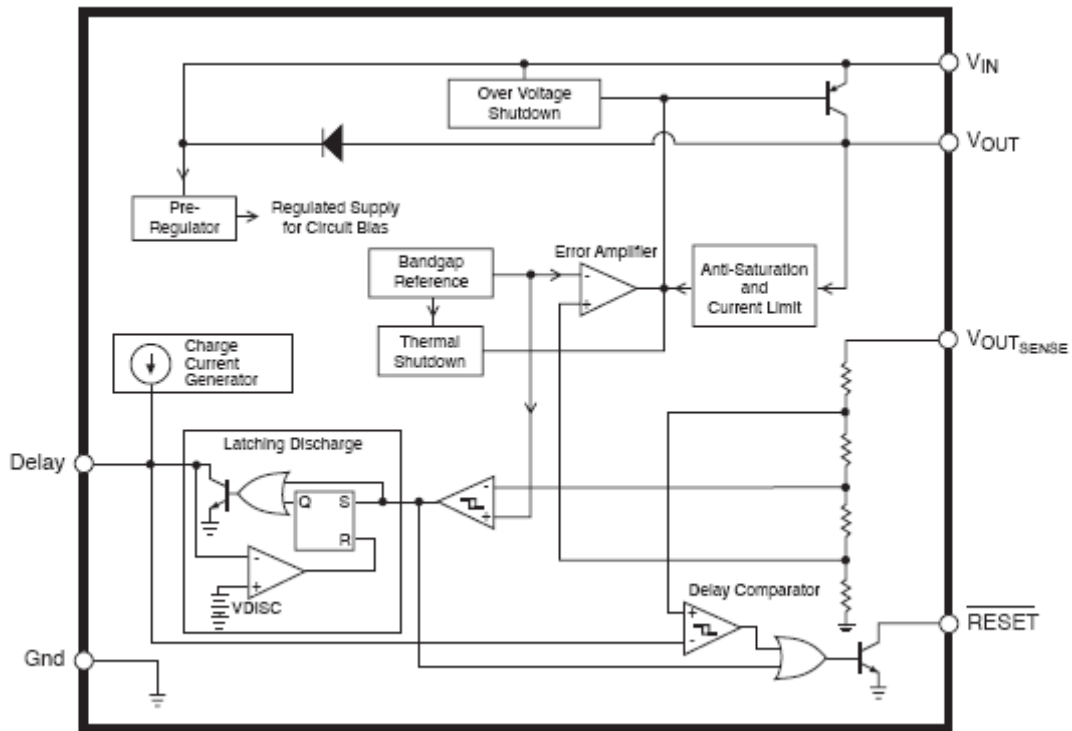
V_{in}=14V, C₁=0.1uF, C₂=10uF, C₃=0.1 uF, T_a=25°C, Unless otherwise specified)

Parameter	Condition	Min	Typ	Max	Units
Reset Voltage Output Low	I _{SINK} =1.6mA, V _{in} =35V		0.3	0.6	V
Reset Voltage Output Hi	I _{SOURCE} =0	4.5	5	5.5	V
Reset internal Pull-up Resistor			30		KΩ
Reset Output Current Limit	V _{RESET} = 1.2V		5		mA
V _{OUT} Threshold			4.5		V
Delay Time	C ₃ = 0.005 uF		12		mS
	C ₃ = 0.1 uF	150	250	300	mS
	C ₃ = 4.7 uF (Tantalum)		12		S
Delay Current	Pin 4	1.2	1.95	2.5	uA

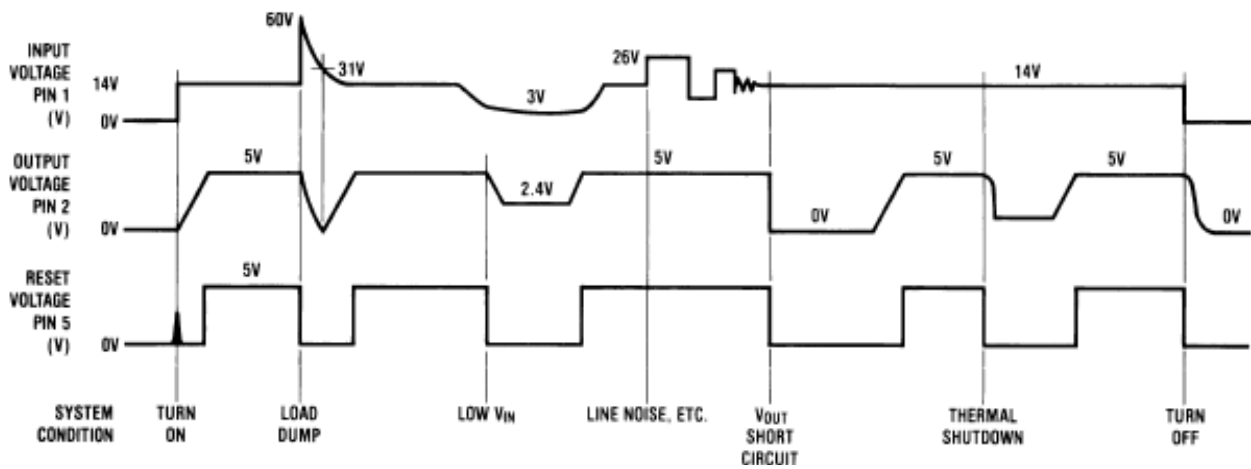
Note1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Electrical specifications do not apply when operating the device beyond its rated operating Conditions.

Note2: Thermal resistance without a heat sink for junction to case temperature is 3°C/W(TO-220). Thermal resistance for TO-220 case to ambient temperature is 50°C/W.

FUNCTIONAL BLOCK DIAGRAM

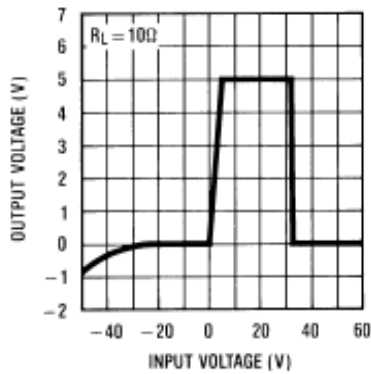


TYPICAL CRICUIT WAVEFORMS

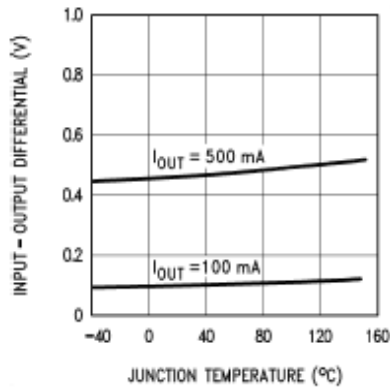


TYPICAL PERFORMANCE CHARACTERISTICS

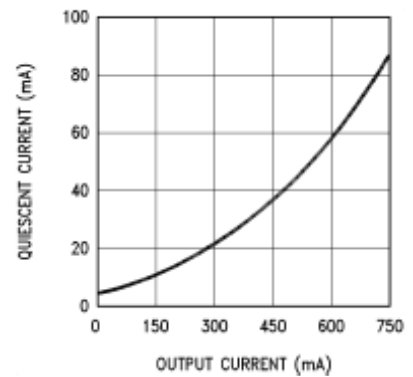
Output Voltage



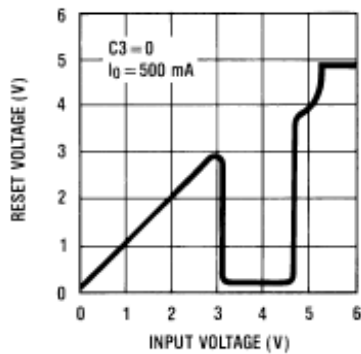
Dropout Voltage



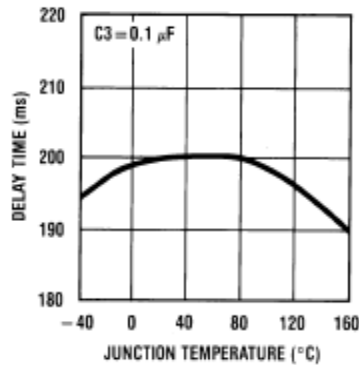
Quiescent Current



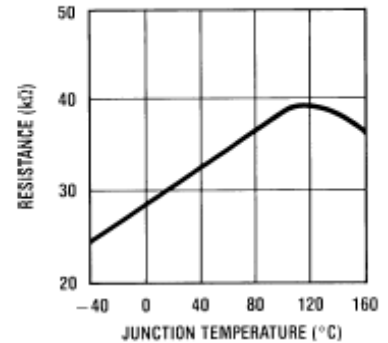
Reset Voltage on Power-up



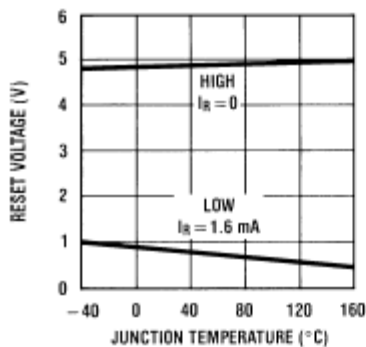
Delay Time



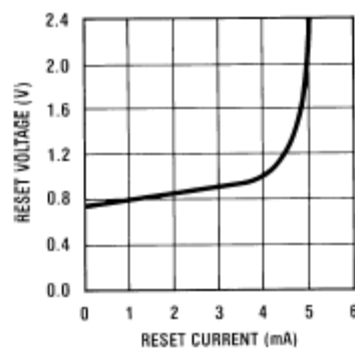
Reset Pull-up Resistor R10



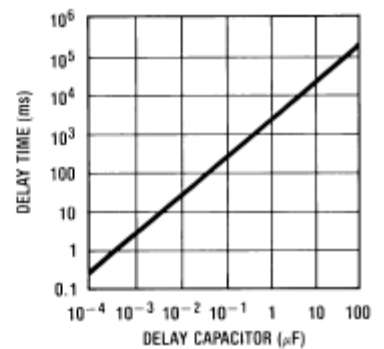
Reset Voltage



Reset Voltage

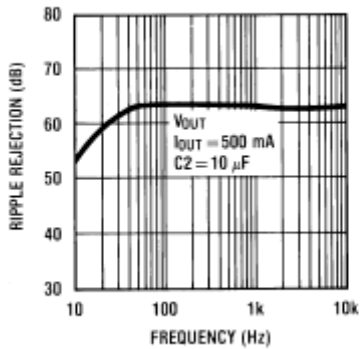


Delay Time

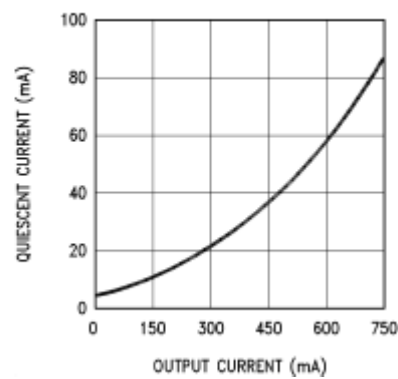


TYPICAL PERFORMANCE CHARACTERISTICS

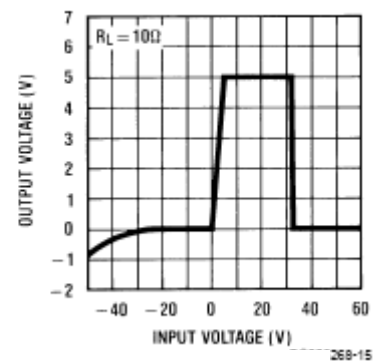
Ripple Rejection



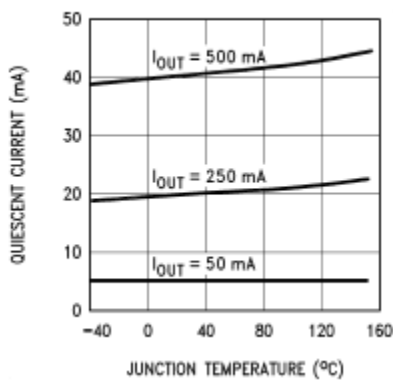
Quiescent Current



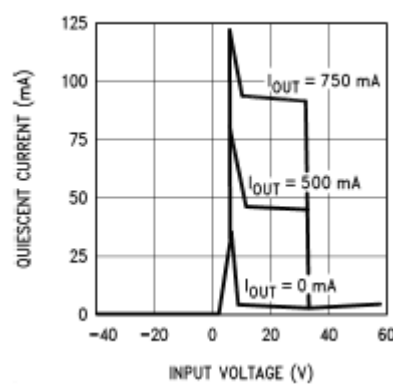
Output Voltage



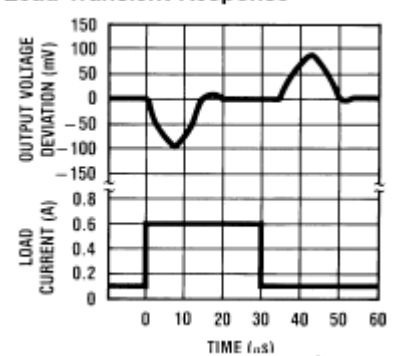
Quiescent Current



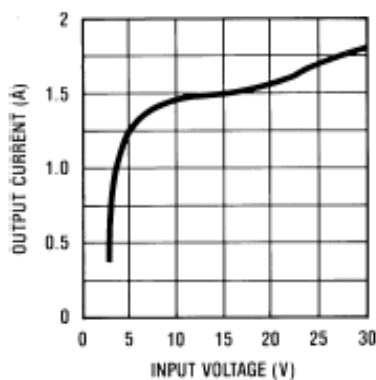
Quiescent Current



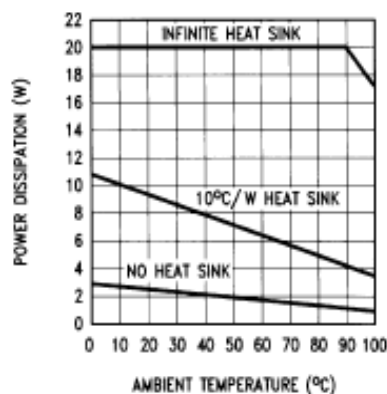
Load Transient Response



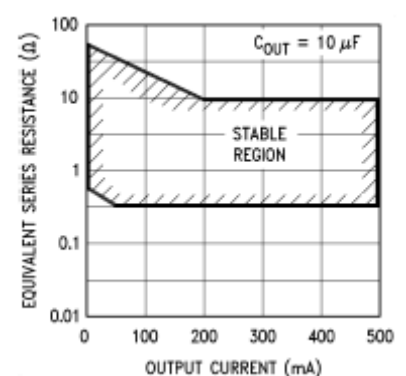
Peak Output Current



Maximum Power Dissipation (TO-220)



Output Capacitor ESR



DETAILED DESCRIPTION

Dropout Voltage:

The input-output voltage differential at which the circuit ceases to regulate against further reduction in input voltage. Measured when the output voltage has dropped 100mV from the nominal value obtained at 14V input, dropout voltage is dependent upon load current and junction temperature.

Input Voltage

The DC voltage applied to the input terminals with respect to ground. Input-Output Differential: The voltage difference between the unregulated input voltage and the regulated output voltage for which the regulator will operate.

Line Regulation

The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

Load Regulation

The change in output voltage for a change in load current at constant chip temperature.

Long Term Stability

Output voltage stability under accelerated life-test conditions after 1000 hours with maximum rated voltage and junction temperature.

Output Noise Voltage

The rms AC voltage at the output, with constant load and no input ripple, measured over a specified frequency range.

Quiescent Current

The part of the positive input current that does not contribute to the positive load current. The regulator ground lead current.

Ripple Rejection

The ratio of the peak-to-peak input ripple voltage to the peak-to-peak output ripple voltage.

Temperature Stability of V_o

The percentage change in output voltage for a thermal variation from room temperature to either temperature extreme.

APPLICATION HINT

EXTERNAL CAPACITORS

The LM2925 output capacitor is required for stability. Without it, the regulator output will oscillate, sometimes by many volts. Though the 10 μ F shown is the minimum recommended value, actual size and type may vary depending upon the application load and temperature range. Capacitor effective series resistance (ESR) also affects the IC stability.

Since ESR varies from one brand to the next, some bench work may be required to determine the minimum capacitor value to use in production. Worst-case is usually determined at the minimum junction and ambient temperature and maximum load expected.

Output capacitors can be increased in size to any desired value above the minimum. One possible purpose of this would be to maintain the output voltages during brief conditions of negative input transients that might be characteristic of a particular system.

Capacitors must also be rated at all ambient temperatures expected in the system. Many aluminum type electrolytics will freeze at temperatures less than -30°C , reducing their effective capacitance to zero. To maintain regulator stability down to -40°C , capacitors rated at that temperature (such as tantalums) must be used.

RESET OUTPUT

The range of values for the delay capacitor is limited only by stray capacitances on the lower extreme and capacitance leakage on the other. Thus, delay times from microseconds to seconds are possible. The low charging current, typically 2.0 microamps, allows the use of small, inexpensive disc capacitors for the nominal range of 100 to 500 milliseconds. This is the time required in many microprocessor systems for the clock oscillator to stabilize when initially powered up.

The RESET output of the regulator will thus prevent erroneous data and/or timing functions to occur during this part of operation. The same delay is incorporated after any other fault condition in the regulator output is corrected.