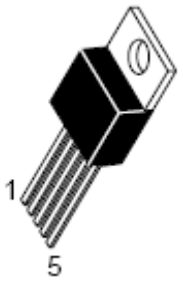
Low Dropout Regulator with Delayed Reset LM2925

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 plasticTO-220
- Long delay times available
- P+ Product Enhancementtested
- Moisture Sensitivity Level 3

TO - 220 PKG



1.Vin
2.Vout
3.Gnd
4.Delay
5.Reset

ORDERING INFORMATION

Device	Marking	Package
LM2925T	LM2925	TO-220

DESCRIPTION

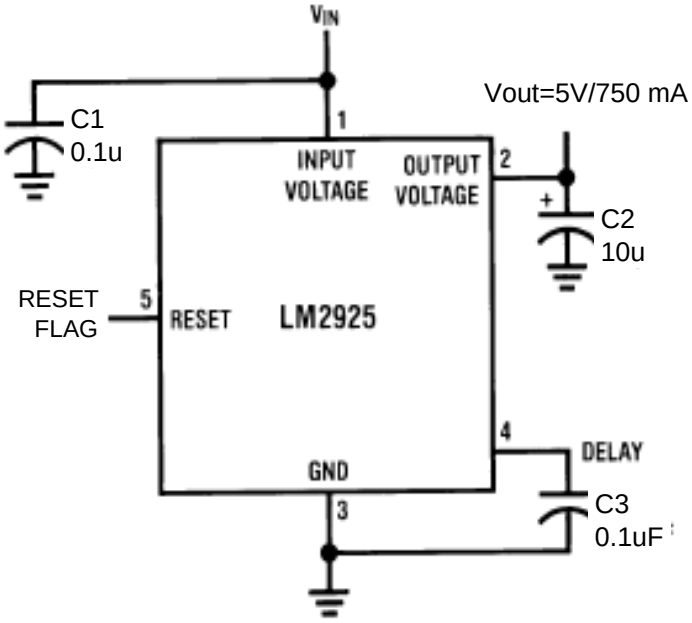
The LM2925 features a low dropout, high current regulator.
Also included on-chip is a reset function with an externally set delay time. Upon power up, or after the detection of anyerror in the regulated output, the reset pin remains in the ac-tive low state for the duration of the delay.
Types of errors de-tected include any that cause the output to become unregu- lated: low input voltage, thermal shutdown, short circuit,input transients, etc. No external pull-up resistor is neces-sary.
The current charging the delay capacitor is very low, al-lowing 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 theload.
The LM2925 cannot be harmed by temporary mirror-image inser-tion.
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 (Vin)	
Operating Range	26 [V]
Over voltage Protaction	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 10µF 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 VOUT

Vin=14V, C1=0.1uF, C2=10 uF, Io=500mA, Tj=25°C, Unless otherwise specified)

Parameter	Condition	Min	Typ	Max	Units
Output Voltage	6V≤VIN≤26V, 5≤ IO≤ 500mA, −40°C ≤ TJ ≤ +125°C	4.75	5	5.25	mV
Line Regulation	6V ≤ VIN ≤ 26V, IO = 5mA		10	50	mV
Load Regulation	5mA ≤ Io ≤ 500mA		10	50	mV
Quiescent Current	Io ≤ 0 mA		3	10	mA
	Io = 500mA		40	100	mA
	Io = 750mA		90		mA
Ripple Rejection	fo = 120 KHz		66		dB
Dropout Voltge	Io = 500mA		0.45		V
	Io = 750mA		0.85		V
Current Limit		0.75	1.2		A
Reverse Polarity Input Voltage, DC	Vo ≥ -0.6V, 10Ω Load	-50	-30		V
Reverse Polarity Input Voltage, Transient	1% duty Cycle, t ≤ 1000 ms 10Ω Load	-50	-80		V

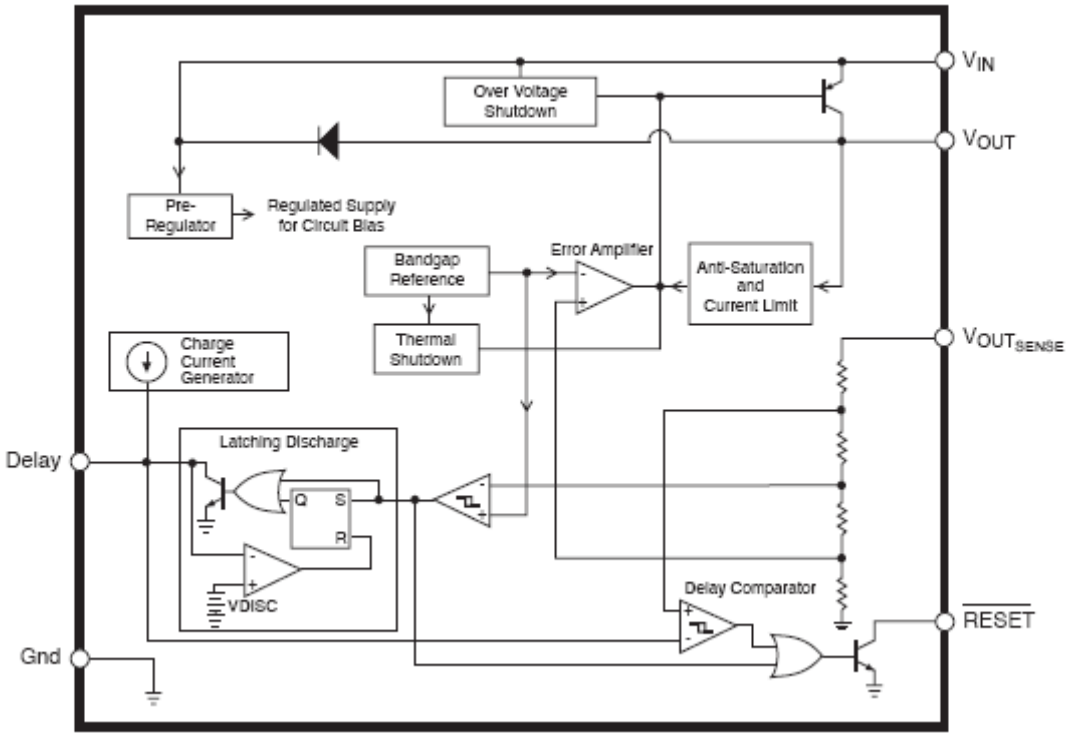
ELECTRICAL CHARACTERISTICS for RESET OUTPUT

Vin=14V, C1=0.1uF, C2=10uF, C3=0.1 uF, Ta=25°C, Unless otherwise specified)

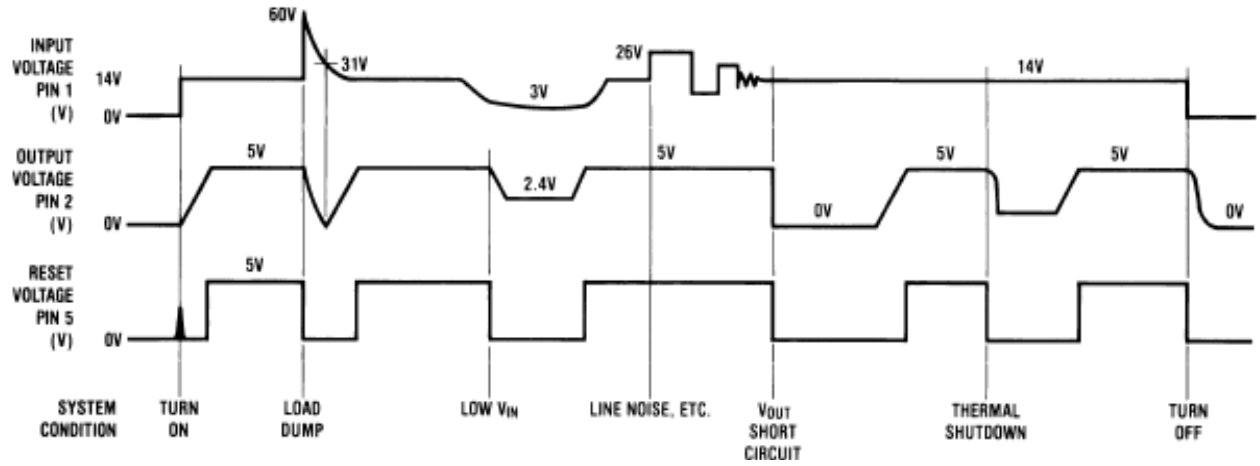
Parameter	Condition	Min	Typ	Max	Units
Reset Voltage Output Low	I_{SINK}=1.6mA, Vin=35V		0.3	0.6	V
Reset Voltage Output Hi	I_{SOURCE}=0	4.5	5	5.5	V
Reset internal Pull-up Resistor			30		KΩ
Reset Output Current Limit	V_{RESET} =1.2V		5		mA
V_{OUT} Threshold			4.5		V
Delay Time	C3 = 0.005 uF		12		mS
	C3 = 0.1 uF	150	250	300	mS
	C3 = 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

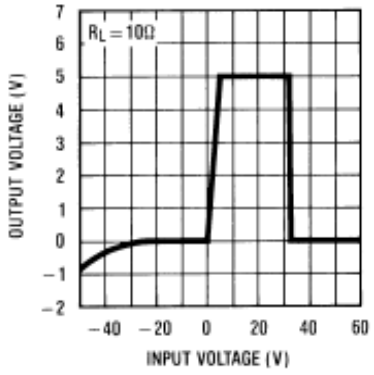


TIPICAL CRICUIT WAVEFORMS

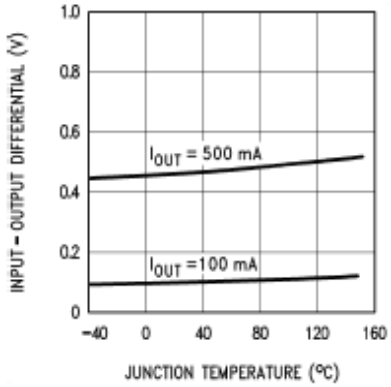


TYPICAL PERFORMANCE CHARACTERISTICS

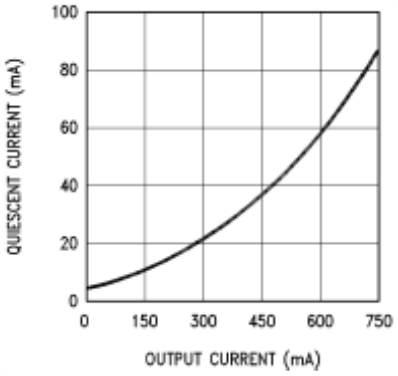
Output Voltage



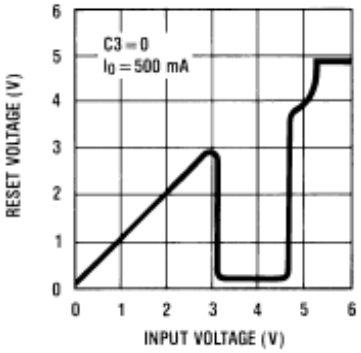
Dropout Voltage



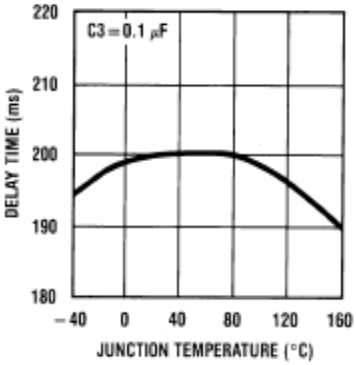
Quiescent Current



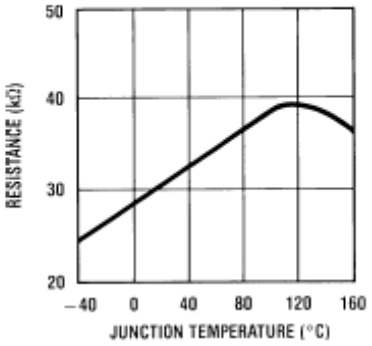
Reset Voltage on Power-up



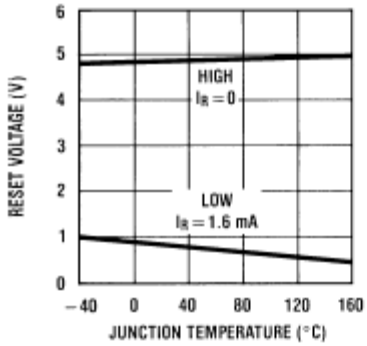
Delay Time



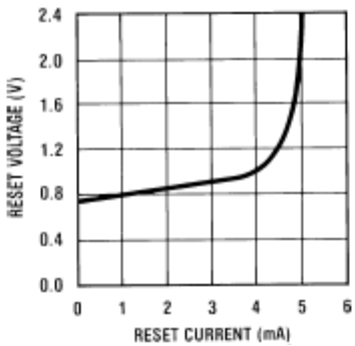
Reset Pull-up Resistor R10



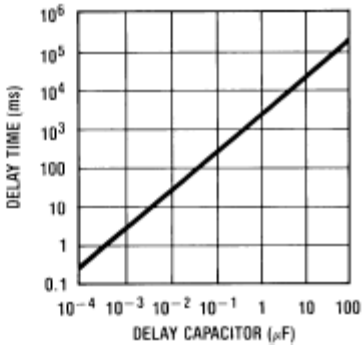
Reset Voltage



Reset Voltage

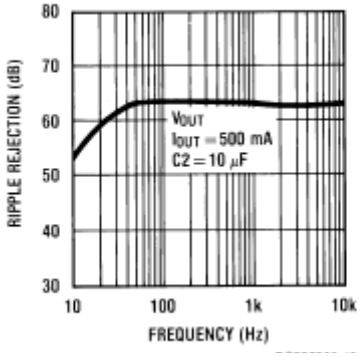


Delay Time

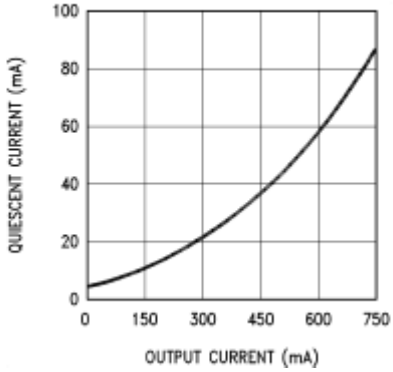


TYPICAL PERFORMANCE CHARACTERISTICS

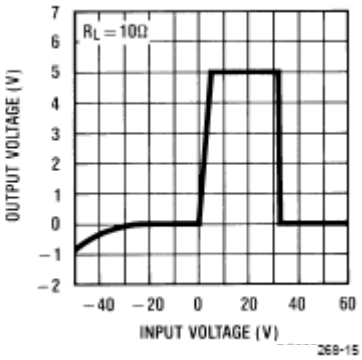
Ripple Rejection



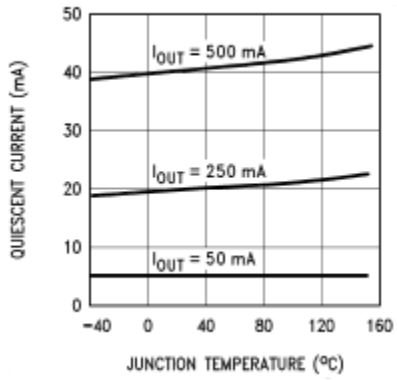
Quiescent Current



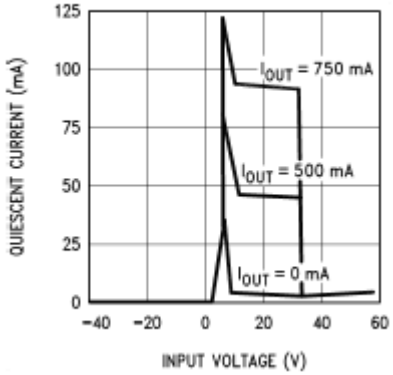
Output Voltage



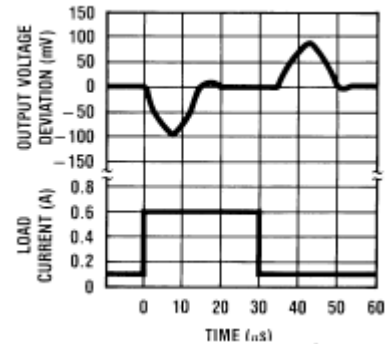
Quiescent Current



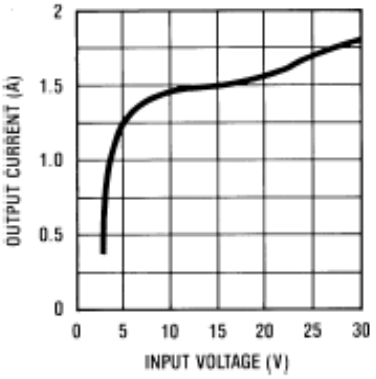
Quiescent Current



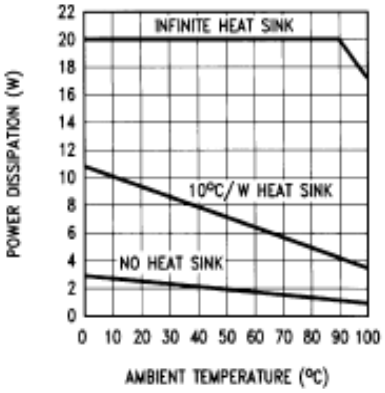
Load Transient Response



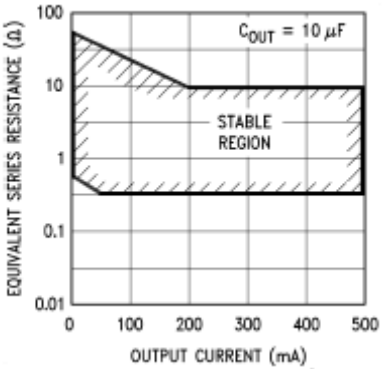
Peak Output Current



Maximum Power Dissipation (TO-220)



Output Capacitor ESR



DETAILED DESCRIPTION

Dropout Voltage:
Th input-output voltage differential at which the circuit ceases to regulate against further reduction in input voltage. Measured when the outpu voltage has dropped 100mV from the nominal value obtained at 14V in-put, 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 volt-age 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 condi-tions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly af-fected.

Load Regulation
The change inoutput voltage for a change in load current at constant chip temperature.

Long Term Stability
Output voltage stability under acceler-ated 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 inpu ripple, measured over aspecified 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 ou-put voltage for a thermal variation from room temperature to either temperature extreme.

APPLICATION HINT

EXTERNAL CAPACITORS

The LM2925 output capacitoris required for stability. Without it, the regulator output will oscillate, sometimes by many volts. Though the 10μF shown is the minimum recom-mended value,actual size and type may vary depending upon the application load and temperature range. Capacitor effective series resistance (ESR) also effects 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 maxi- mum 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 condi-tions 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 ca-pacitors 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 op-eration The same delay is incorporated after any other fault condition in the regulator output is corrected.