



# CS-8125

## 5V, 750mA Low Dropout Linear Regulator with Delayed RESET

### Description

The CS-8125 is a low dropout, high current regulator. Included on-chip is a **RESET** function with an externally set delay time. During power up, or after detection of an error in the regulated output, the **RESET** pin will remain in the low state for the duration of the delay. Types of errors detected include short circuit, low input voltage, input transients and thermal shutdown, that cause the output to become unregulated. The current charging the delay capacitor ( $C_{DELAY}$ ) is very low, thus allowing long delay times.

In automotive applications, the CS-8125 and all regulated circuits are protected from reverse battery installations, as well as two-battery jumps. During line transients, such as a 60V load dump, the 0.75A regulator will automatically shut down to protect both internal circuits and the load.

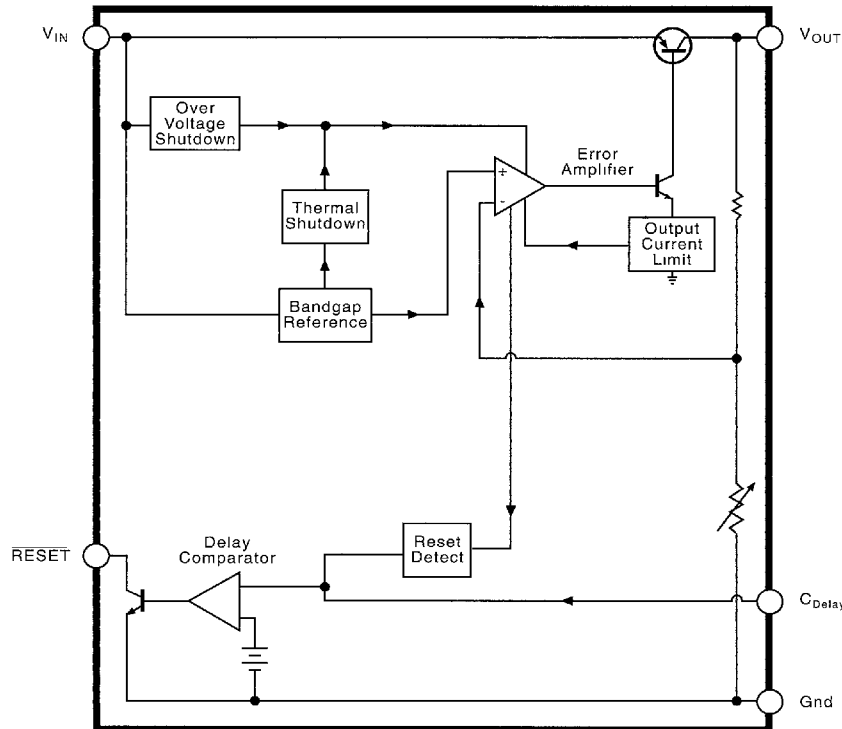
The CS-8125 is packaged in a 5-lead TO-220, with copper tab for connection to a heat sink, if necessary.

NOTE: The CS-8125 is pin compatible with the CS-925A, CS-925 LM2925, LM2926, TLE4260, ST4947.

### Features

- 5V  $\pm 4\%$  Output Voltage
- Low Dropout Voltage (0.6V at 500mA)
- 500mA Output Current
- Externally Set RESET Delay
- Reverse Battery Protection
- 60V Load Dump Protection
- -50V Reverse Transient Protection
- Short Circuit Protection
- Internal Thermal Overload Protection
- Long Delay Times Available

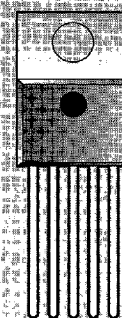
### Block Diagram



### Package Options

TO-220 5 Lead

Tab (Gnd)



**CSC**™ **CHERRY**  **SEMICONDUCTOR**

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## Absolute Maximum Ratings

Input Voltage	
Operating Range	.....-0.5 to 26V
Overvoltage Protection	.....60V
Internal Power Dissipation	.....Internally Limited
Operating Temperature Range	.....-40°C to +125°C
Junction Temperature Range	.....-40°C to +150°C
Storage Temperature Range	.....-65°C to +150°C
Lead Temperature: TO-220 (10 sec)	.....260°C

Electrical Characteristics for  $V_{OUT}$ :  $V_{IN} = 14V$ ,  $C_2 = 10\mu F$ ,  $I_{OUT} = 500mA$ ,  $-40^\circ C \leq T_A \leq 125^\circ C$ ,  $-40^\circ C \leq T_J \leq 150^\circ C$   
unless otherwise specified

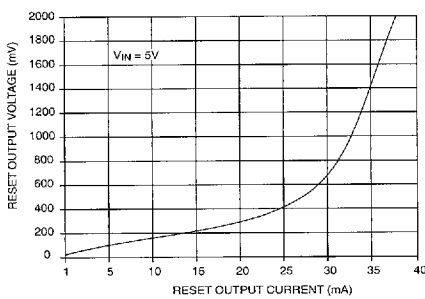
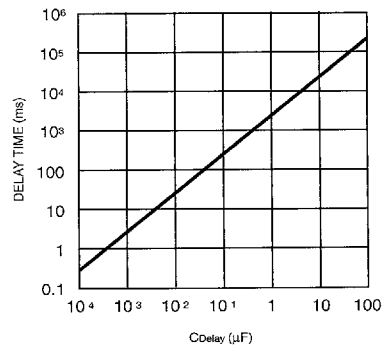
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>■ Output Stage (<math>V_{OUT}</math>)</b>					
Output Voltage, $V_{OUT}$	$6V \leq V_{IN} \leq 26V$ , $I_{OUT} \leq 500mA$ ,	4.75	5.00	5.25	V
Dropout Voltage ( $V_{IN} - V_{OUT}$ )	$I_{OUT} = 500mA$		0.35	0.60	V
	$I_{OUT} = 750mA$		0.6		V
Line Regulation	$6V \leq V_{IN} \leq 26V$ , $I_{OUT} = 5mA$		10	50	mV
Load Regulation	$5mA \leq I_{OUT} \leq 500mA$		10	50	mV
Output Impedance, $R_{OUT}$	$500mA_{DC}$ and $10mA_{rms}$ , 100Hz-10kHz		200		m $\Omega$
Quiescent Current, $I_Q$	$I_{OUT} \leq 10mA$		3		mA
	$I_{OUT} = 500mA$		55	100	mA
	$I_{OUT} = 750mA$		100		mA
Ripple Rejection	$f = 120Hz$		66		dB
Current Limit		0.75	1.40		A
Output Noise Voltage	10Hz-100kHz		100		$\mu V_{rms}$
Long Term Stability			20		mV/kyr
Maximum Line Transient	$V_O \leq 5.5V$	60	90		V
Reverse Polarity Input Voltage, DC	$V_O \geq -0.6V$ , 10 $\Omega$ Load	-15	-50		V
Reverse Polarity Input Voltage, Transient	1% Duty Cycle, $T_A \leq 100ms$ , 10 $\Omega$ Load	-50	-80		V
<b>■ RESET Function (RESET)</b>					
RESET Voltage					
Output Low	$I_{SINK} = 1.6mA$		0.30	0.25	V
Output High	$I_{SOURCE} = 0$	4.4	5.0	6.0	V
RESET Output Current Limit	$V_{RESET} = 1.2V$		20		mA
$V_{OUT}$ Threshold		4.5	4.8		V
Delay Time	$C_{DELAY} = 0.005\mu F$		12		ms
	$C_{DELAY} = 0.1\mu F$	85	250	500	ms
	$C_{DELAY} = 4.7\mu F$ (tantalum)		12		sec
Delay Current		0.8	1.6	2.5	$\mu A$

## Package Pin Description

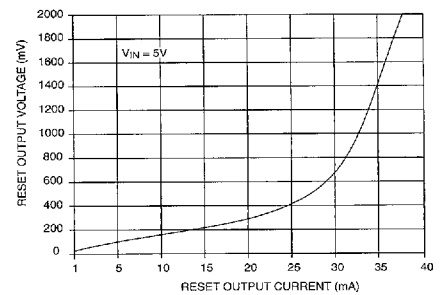
PACKAGE PIN #	PIN SYMBOL	FUNCTION
<b>TO-220</b>		
1	$V_{IN}$	Supply voltage to IC, usually direct from the battery
2	$V_{OUT}$	Regulated output voltage, 5V(typ)
3	Gnd	Ground connection
4	$C_{Delay}$	Timing capacitor for RESET function
5	RESET	CMOS compatible output pin. RESET goes low whenever $V_{OUT}$ is out of regulation.

## Typical Performance Characteristics

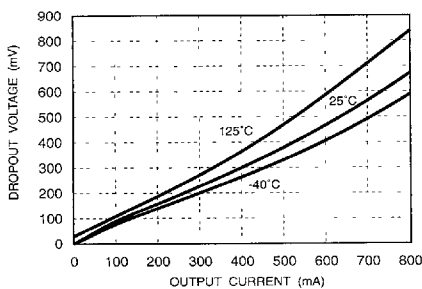
Reset Voltage vs. Current

Delay Time vs.  $C_{DELAY}$ 

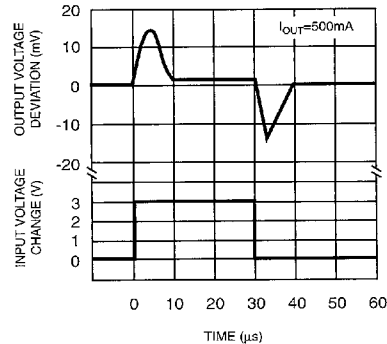
Reset Voltage on Power-up



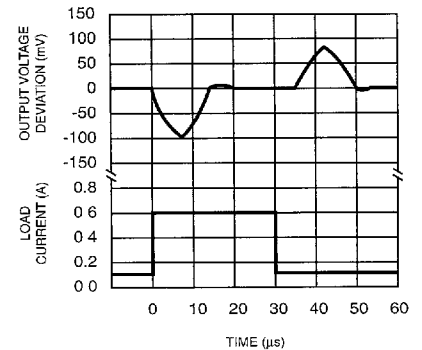
Dropout Voltage vs. Output Current



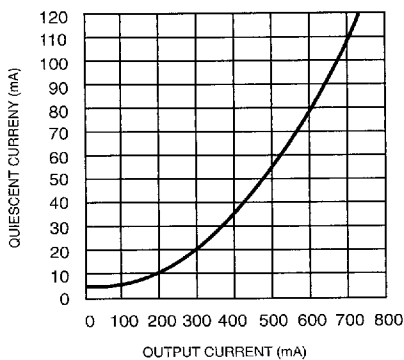
Line Transient Response



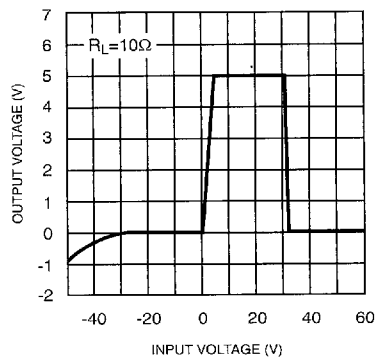
Load Transient Response



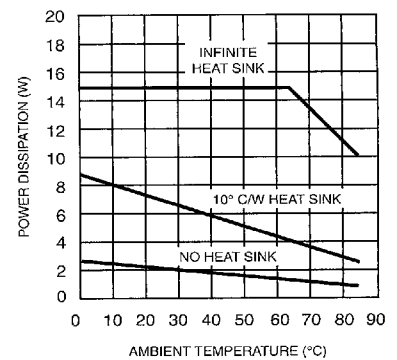
Quiescent Current vs. Output Current



Output Voltage vs. Input Voltage



Maximum Power Dissipation (TO-220)



## Definition of Terms

**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  $V_{OUT}$ :** The percentage change in output voltage for a thermal variation from room temperature to either temperature extreme.

**Current Limit:** Peak current that can be delivered to the output.

## Application Notes

## External Capacitors

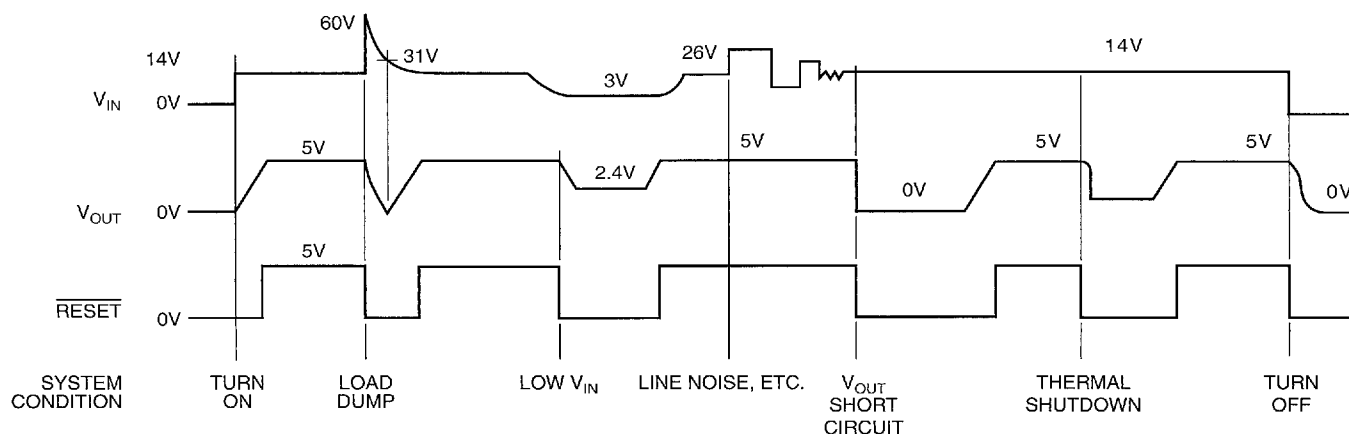
The CS-8125 output capacitor connected to the  $V_{OUT}$  pin is required for stability. Without it, the regulator output will oscillate. The 10 $\mu$ F shown is the minimum recommended value. Actual size and type may vary depending upon the application load and temperature range. Capacitor effective series resistance (ESR) is also factor in the IC stability. Worst-case is usually determined at the minimum junction and ambient temperature and a load of 50 - 200mA.

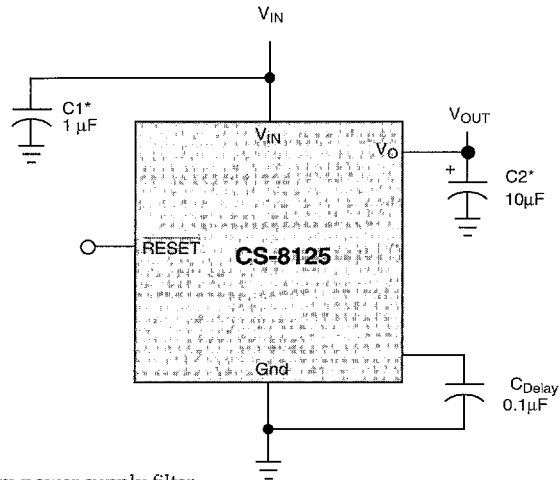
Output capacitors can be increased in size to any desired value above the minimum. One possible purpose of this would be to maintain the output voltage during brief conditions of negative input transients that might be characteristic of a particular system.

Capacitors must also be rated at all ambient temperatures expected in the system. To maintain regulator stability

down to  $-40^{\circ}\text{C}$ , capacitors rated at that temperature (such as tantalums) must be used.

The range of values for  $C_{Delay}$  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  $\mu\text{A}$ , allows the use of small inexpensive disc capacitors for the nominal range of 100 to 500 ms. This is the time required in many microprocessor systems for the clock oscillator to stabilize when initially powered up. The  $\overline{\text{RESET}}$  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.

Timing Diagram for  $\overline{\text{RESET}}$  function



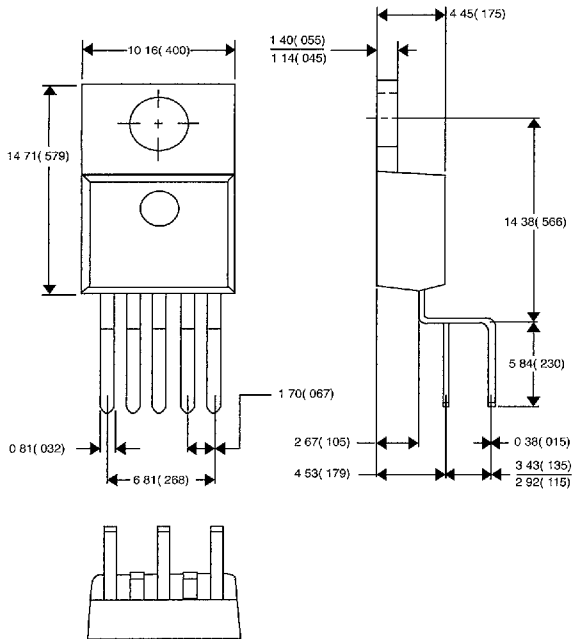
\* C1 required if regulator is located far from power supply filter.

C2 required for stability value may be increased. Capacitor must be capable of operating at minimum temperature expected.

### Package Specification

#### Package Dimensions in MM (Inches)

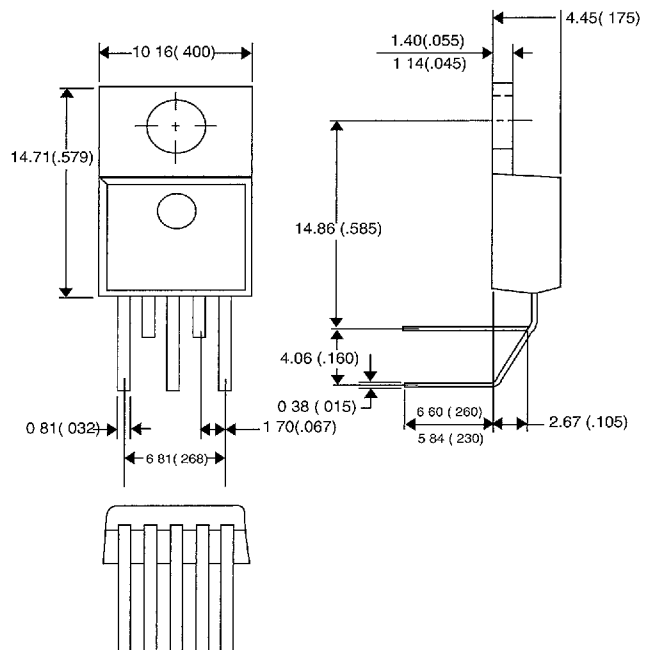
##### TO-220 Vertical



#### PACKAGE THERMAL DATA

Thermal Data		TO-220	
$R_{\theta JC}$	typ	3.5	$^{\circ}C/W$
$R_{\theta JA}$	typ	50	$^{\circ}C/W$

##### TO-220 Horizontal



#### Ordering Information

Part Number	Description
CS-8125T	TO-220 Straight
CS-8125TV	TO-220 Vertical
CS-8125TH	TO-220 Horizontal

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