

## LM2937

# 500 mA Low Dropout Regulator

### General Description

The LM2937 is a positive voltage regulator capable of supplying up to 500 mA of load current. The use of a PNP power transistor provides a low dropout voltage characteristic. With a load current of 500 mA the minimum input to output voltage differential required for the output to remain in regulation is typically 0.5V (1V guaranteed maximum over the full operating temperature range). Special circuitry has been incorporated to minimize the quiescent current to typically only 10 mA with a full 500 mA load current when the input to output voltage differential is greater than 3V.

The LM2937 requires an output bypass capacitor for stability. As with most low dropout regulators, the ESR of this capacitor remains a critical design parameter, but the LM2937 includes special compensation circuitry that relaxes ESR requirements. The LM2937 is stable for all ESR below 3Ω. This allows the use of low ESR chip capacitors.

Ideally suited for automotive applications, the LM2937 will protect itself and any load circuitry from reverse battery

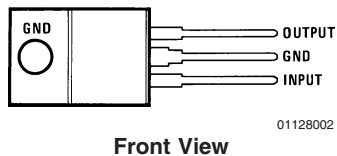
connections, two-battery jumps and up to +60V/-50V load dump transients. Familiar regulator features such as short circuit and thermal shutdown protection are also built in.

### Features

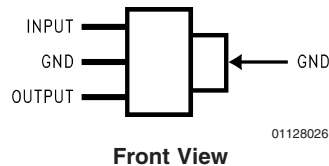
- Fully specified for operation over -40°C to +125°C
- Output current in excess of 500 mA
- Output trimmed for 5% tolerance under all operating conditions
- Typical dropout voltage of 0.5V at full rated load current
- Wide output capacitor ESR range, up to 3Ω
- Internal short circuit and thermal overload protection
- Reverse battery protection
- 60V input transient protection
- Mirror image insertion protection

### Connection Diagrams

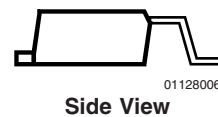
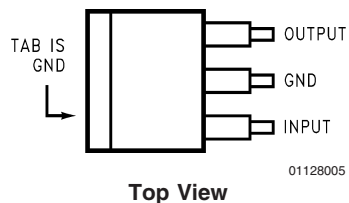
**TO-220 Plastic Package**



**SOT-223 Plastic Package**



**TO-263 Surface-Mount Package**



## Ordering Information

Package	Temperature Range	Part Number	Packaging Marking	Transport Media	NSC Drawing
TO-263	$-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$	LM2937ES-5.0	LM2937ES-5.0	Rail	TS3B
		LM2937ESX-5.0		500 Units Tape and Reel	
		LM2937ES-8.0	LM2937ES-8.0	Rail	
		LM2937ESX-8.0		500 Units Tape and Reel	
		LM2937ES-10	LM2937ES-10	Rail	
		LM2937ESX-10		500 Units Tape and Reel	
		LM2937ES-12	LM2937ES-12	Rail	
		LM2937ESX-12		500 Units Tape and Reel	
		LM2937ES-15	LM2937ES-15	Rail	
LM2937ESX-15	500 Units Tape and Reel				
TO-220	$-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$	LM2937ET-5.0	LM2937ET-5.0	Rail	TO3B
		LM2937ET-8.0	LM2937ET-8.0	Rail	
		LM2937ET-10	LM2937ET-10	Rail	
		LM2937ET-12	LM2937ET-12	Rail	
		LM2937ET-15	LM2937ET-15	Rail	
SOT-223	$-40^{\circ}\text{C} \leq T_J \leq 85^{\circ}\text{C}$	LM2937IMP-5.0	L71B	1k Units Tape and Reel	MP04A
		LM2937IMPX-5.0		2k Units Tape and Reel	
		LM2937IMP-8.0	L72B	1k Units Tape and Reel	
		LM2937IMPX-8.0		2k Units Tape and Reel	
		LM2937IMP-10	L73B	1k Units Tape and Reel	
		LM2937IMPX-10		2k Units Tape and Reel	
		LM2937IMP-12	L74B	1k Units Tape and Reel	
		LM2937IMPX-12		2k Units Tape and Reel	
LM2937IMP-15	L75B	1k Units Tape and Reel			
LM2937IMPX-15		2k Units Tape and Reel			

**Absolute Maximum Ratings** (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Input Voltage	
Continuous	26V
Transient ( $t \leq 100$ ms)	60V
Internal Power Dissipation (Note 2)	Internally Limited
Maximum Junction Temperature	150°C
Storage Temperature Range	-65°C to +150°C
TO-220 (10 seconds)	260°C

TO-263 (10 seconds)	230°C
SOT-223 (Vapor Phase, 60 seconds)	215°C
SOT-223 (Infrared, 15 seconds)	220°C
ESD Susceptibility (Note 3)	2 kV

**Operating Conditions** (Note 1)

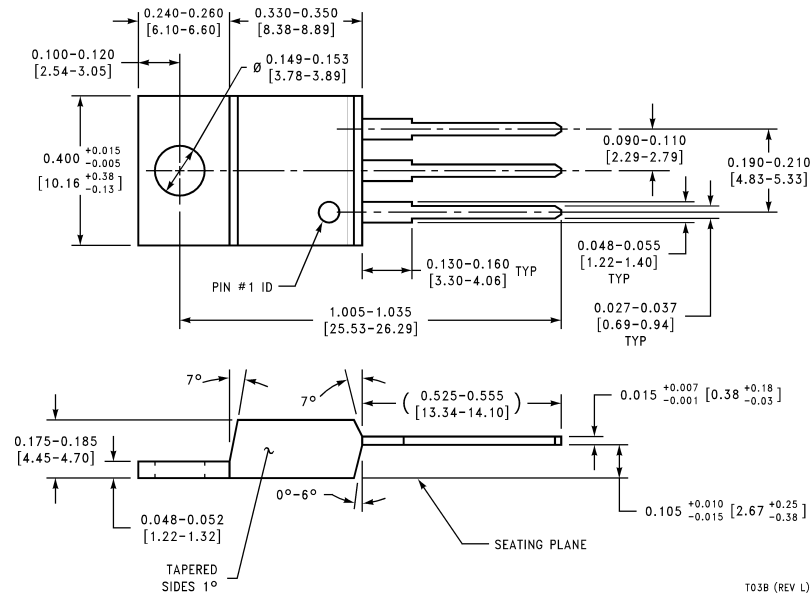
Temperature Range (Note 2)	
LM2937ET, LM2937ES	-40°C $\leq$ T <sub>J</sub> $\leq$ 125°C
LM2937IMP	-40°C $\leq$ T <sub>J</sub> $\leq$ 85°C
Maximum Input Voltage	26V

**Electrical Characteristics**

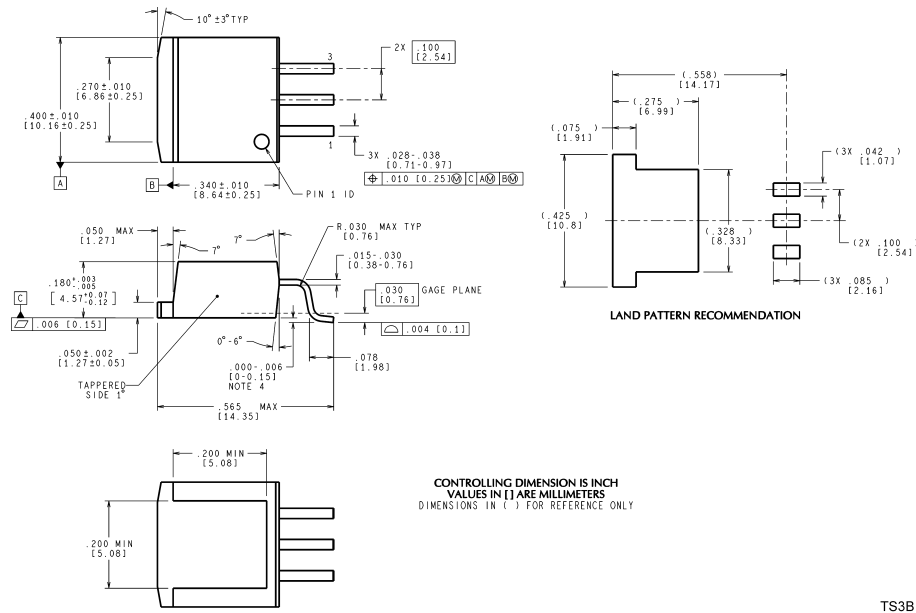
$V_{IN} = V_{NOM} + 5V$ , (Note 4)  $I_{OUTmax} = 500$  mA for the TO-220 and TO-263 packages,  $I_{OUTmax} = 400$  mA for the SOT-223 package,  $C_{OUT} = 10$   $\mu$ F unless otherwise indicated. **Boldface limits apply over the entire operating temperature range of the indicated device.**, all other specifications are for T<sub>A</sub> = T<sub>J</sub> = 25°C.

Output Voltage (V <sub>OUT</sub> )		5V		8V		10V		Units
Parameter	Conditions	Typ	Limit	Typ	Limit	Typ	Limit	
Output Voltage	$5 \text{ mA} \leq I_{OUT} \leq I_{OUTmax}$		4.85		7.76		9.70	V(Min)
		5.00	<b>4.75</b>	8.00	<b>7.60</b>	10.00	<b>9.50</b>	V(Min)
			5.15		8.24		10.30	V(Max)
			<b>5.25</b>		<b>8.40</b>		<b>10.50</b>	V(Max)
Line Regulation	$(V_{OUT} + 2V) \leq V_{IN} \leq 26V$ , $I_{OUT} = 5 \text{ mA}$	15	<b>50</b>	24	<b>80</b>	30	<b>100</b>	mV(Max)
Load Regulation	$5 \text{ mA} \leq I_{OUT} \leq I_{OUTmax}$	5	<b>50</b>	8	<b>80</b>	10	<b>100</b>	mV(Max)
Quiescent Current	$(V_{OUT} + 2V) \leq V_{IN} \leq 26V$ , $I_{OUT} = 5 \text{ mA}$	2	<b>10</b>	2	<b>10</b>	2	<b>10</b>	mA(Max)
	$V_{IN} = (V_{OUT} + 5V)$ , $I_{OUT} = I_{OUTmax}$	10	<b>20</b>	10	<b>20</b>	10	<b>20</b>	mA(Max)
Output Noise Voltage	10 Hz–100 kHz $I_{OUT} = 5 \text{ mA}$	150		240		300		$\mu$ Vrms
Long Term Stability	1000 Hrs.	20		32		40		mV
Dropout Voltage	$I_{OUT} = I_{OUTmax}$	0.5	<b>1.0</b>	0.5	<b>1.0</b>	0.5	<b>1.0</b>	V(Max)
	$I_{OUT} = 50 \text{ mA}$	110	<b>250</b>	110	<b>250</b>	110	<b>250</b>	mV(Max)
Short-Circuit Current		1.0	<b>0.6</b>	1.0	<b>0.6</b>	1.0	<b>0.6</b>	A(Min)
Peak Line Transient Voltage	$t_f < 100 \text{ ms}$ , $R_L = 100\Omega$	75	<b>60</b>	75	<b>60</b>	75	<b>60</b>	V(Min)
Maximum Operational Input Voltage			<b>26</b>		<b>26</b>		<b>26</b>	V(Min)
Reverse DC Input Voltage	$V_{OUT} \geq -0.6V$ , $R_L = 100\Omega$	-30	<b>-15</b>	-30	<b>-15</b>	-30	<b>-15</b>	V(Min)
Reverse Transient Input Voltage	$t_f < 1 \text{ ms}$ , $R_L = 100\Omega$	-75	<b>-50</b>	-75	<b>-50</b>	-75	<b>-50</b>	V(Min)

**Physical Dimensions** inches (millimeters) unless otherwise noted

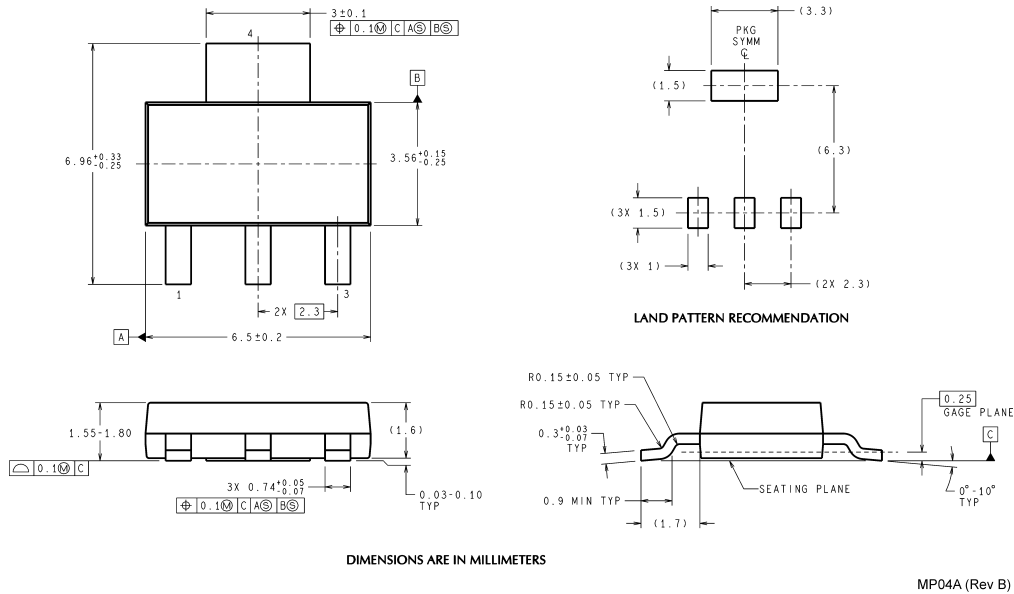


**Plastic Package**  
**Order Number LM2937ET-5.0,**  
**LM2937ET-8.0, LM2937ET-10, LM2937ET-12,**  
**or LM2937ET-15**  
**NS Package Number T03B**



**TO-263 3-Lead Plastic Surface Mount Package**  
**Order Number LM2937ES-5.0, LM2937ES-8.0, LM2937ES-10, LM2937ES-12 or LM2937ES-15**  
**NS Package Number TS3B**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**SOT-223 3-Lead Plastic Surface Mount Package**  
**Order Number LM2937IMP-5.0, LM2937IMP-8.0, LM2937IMP-10, LM2937IMP-12 or LM2937IMP-15**  
**NS Package Number MP04A**

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