GENERAL DESCRIPTION

The HM2940 series of adjustable and fixed voltage regulators are designed to provide 1A output current and to operate down to 2.3V input-to-output differential. The input volage can up to +35V maximum. It has very good output short protect function than normal others LDO. And HM2940 can output larger current than normal LDO when same application condition.

On-chip trimming adjusts the reference voltage to within 2% accuray. Current limit is also trimmed, minimizing the stress under overload conditions on both the regulator and power source circuitry.

The HM2940 devices are pin compatible with other three-terminal SCSI regulators and are offered in the low profile surface mount SOT-223 package

FEATURES

- Three Terminal Adjustable or Fixed Voltages* 3.3V or 5.0V
- Output Current of 1A
- Operates Down to 2.3V Dropout
- Line Regulation: 0.2% Max.
- Load Regulation: 0.4% Max.
- SOT-223

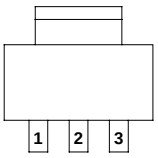
APPLICATIONS

- High Efficiency Linear Regulators
- VGA Notebook
- Battery Chargers
- Battery Powered Instrumentation

PIN DESCRIPTIONS

FIXED VERSION
1- Vin
2- Ground
3- V_{out}

SOT-223 Top View



ABSOLUT MAXIMUM RATINGS(Note 1)

Power Dissipation	Internally limited	Soldering information	
Input Voltage	37V	Lead Temperature (10 sec)	300°C
Operating Junction Temperature		Thermal Resistance	
Control Section	-15°C to 125°C	SOT-223 package	φ JA= 90°C/W*
Power Transistor	0°C to 150°C	* With package soldering to copper area over backside ground plane or internal power plane φJA can vary from 46°C/W to >90°C/W depending on mounting technique and the size of the copper area.	
Storage temperature	- 65°C to +150°C		

ELECTRICAL CHARACTERISTICS

Electrical Characteristics at I_{OUT} = 0 mA, and T_J = +25°C unless otherwise specified.

Parameter	Device	Conditions	Min	Typ	Max	Units
Output Voltage	HM2940-5.0	0 ≤I_{OUT} ≤1A , 6.5V ≤V_{IN} ≤12V	**4.800**	**5.000**	**5.200**	V V
Line Regulation	HM2940-5.0	6.5V≤V_{IN} ≤12V		10	50	% %
Parameter	**Device**	**Conditions**	**Min**	**Typ**	**Max**	**Units**
Load Regulation (Notes 2, 3)	HM2940-5.0	V_{IN}=8V, 0≤I_{OUT} ≤1A		10	100	%
Dropout Voltage (V_{IN} - V_{OUT})	HM2940 -5.0	ΔV_{OUT} , ΔV_{REF} = 1%, I_{OUT} = 1A (Note 4)			**2.5**	V
Current Limit	HM2940 -5.0	(V_{IN} - V_{OUT}) = 5V	900	1,000	1,500	mA
Minimum Load Current	HM2940	(V_{IN} - V_{OUT}) = 12V (Note 5)		**5**	**10**	mA
Quiescent Current	HM2940 -5.0	V_{IN} ≤12V		**10**	**15**	**mA**
Ripple Rejection	HM2940	f =120Hz , C_{OUT} = 22µF Tantalum, I_{OUT} = 1A, (V_{IN}-V_{OUT}) = 3V, C_{ADJ} =10µF	**60**	**75**		dB
	HM2940-5.0	f =120Hz , C_{OUT} = 22µF Tantalum, I_{OUT} = 1A, V_{IN} = 6V	**60**	**68**		dB
Thermal Regulation	HM2940	T_A = 25°C, 30ms pulse		0.008	0.04	%W
Temperature Stability				**1**		%
Parameter	**Device**	**Conditions**	**Min**	**Typ**	**Max**	**Units**
Long Term Stability		T_A =125°C, 1000Hrs		0.3	1	%
RMS Output Noise (% of V_{OUT})		T_A=25°C, 10Hz ≤f ≤10kHz		0.003		%
Thermal Resistance Junction-to-Case					15	°C/W

Parameters identified with **boldface type** apply over the full operating temperature range.

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed.

Note 2: Line and Load regulation are guaranteed up to the maximum power dissipation of 1.2 W. Power dissipation is determined by the input/output differential and the output current. Guaranteed maximum power dissipation will not be available over the full input/output range.

Note 3: See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output lead ~1/8" from the package.

Note 4: Dropout voltage is specified over the full output current range of the device.

Note 5: Minimum load current is defined as the minimum output current required to maintain regulation. When 2.5V≤ (V_{IN} - V_{OUT}) ≤20V the device is guaranteed to regulate if the output current is greater than 10mA.

APPLICATION HINTS

The HM2940 series of adjustable and fixed regulators are easy to use and are protected against short circuit and thermal overloads. Thermal protection circuitry will shut-down the regulator should the junction temperature exceed 165°C at the sense point.

Pin compatible with older three terminal adjustable regulators, these devices offer the advantage of a lower dropout voltage, more precise reference tolerance and improved reference stability with temperature.

Stability

The circuit design used in the HM2940 series requires the use of an output capacitor as frequency compensation. The addition of 10μF tantalum or 22-220uF aluminum on the output will ensure stability for all operating conditions.

When adjustment terminal is bypassed with a capacitor to improve ripple rejection, the requirement for output capacitor increase. The value of 22μF tantalum or 100uF aluminum covers all cases of bypassing the adjustment terminal. Without bypassing the adjustment terminal smaller capacitors can be used with equally good results.

.current paths on the HM2940 adjustment pin, therefore even with capacitors on the adjustment pin no protection diode is needed to ensure device safety under short-circuit conditions.

Diodes between the input and output are not usually needed. Microsecond surge currents of 50A to 100A can be handled by the internal diode between the input and output pins of the device. In normal operations it is difficult to get those values of surge currents even with the use of large output capacitances. If high value output capacitors are used, such as 1000mF to 5000mF and the input pin is instantaneously shorted to ground,

To ensure good transient response with heavy load current changes capacitor values on the order of 100mF are used in the output of many regulators. To further improve stability and transient response of these devices larger values of output capacitor can be used.

Protection Diodes

Unlike older regulators, the HM2940 family does not need any protection diodes between the adjustment pin and the output and from the output to the input to prevent over-stressing the die. Internal resistors are limiting the internal

Table 1.

COPPER AREA		BOARD AREA	THERMAL RESISTANCE (JUNCTION-TO-AMBIENT)
TOP SIDE*	BACK SIDE		
2500 Sq. mm	2500 Sq. mm	2500 Sq. mm	45°C/W
1000 Sq. mm	2500 Sq. mm	2500 Sq. mm	45°C/W
225 Sq. mm	2500 Sq. mm	2500 Sq. mm	53°C/W
100 Sq. mm	2500 Sq. mm	2500 Sq. mm	59°C/W
1000 Sq. mm	1000 Sq. mm	1000 Sq. mm	52°C/W
1000 Sq. mm	0	1000 Sq. mm	55°C/W

Ripple Rejection

The ripple rejection values are measured with the adjustment pin bypassed. The impedance of the adjust pin capacitor at the ripple frequency should be less than the value of R1 (normally 100Ωto 200Ω) for a proper bypassing and ripple rejection approaching the values shown. The size of the required adjust pin capacitor is a function of the input ripple frequency. If R1=100Ω at 120Hz the adjust pin capacitor should be >13mF. At 10kHz only 0.16mF is needed.

The ripple rejection will be a function of output voltage, in circuits without an adjust pin bypass capacitor. The output ripple will increase directly as a ratio of the output voltage to the reference voltage (V_{OUT} / V_{REF}).

PACKAGE DIMENSIONS

Inches (millimeters) unless otherwise noted.

3 LEAD SOT-223 PLASTIC PACKAGE **Marking: A = SOT223 ; ***** = datacode**