ET61HA1XX - High Input Very-Low IQ 100mA LDO

General Description

ET61HA1XX is a high input very low I_Q 100mA LDO. The ET61HA1XX operates from 4V~100V. The quiescent current is 4.5uA (V_{IN} = 12V) with no load. The devices feature integrated short-circuit, over-current and over-temperature protection. They are quite suitable for standby microprocessor control-unit systems.

ET61HA1XX have a fast response to line transients and load transients, and ensure that no overshoot voltage during start-up and short-circuit recovery of the ET61HA1XX.

The families of ET61HA1XX are available in standard fixed output voltages of 3.3V (ET61HA133), 5.0V (ET61HA150).

Features

- Wide Input Voltage Range: 4V to 100V
- Up to 100mA Load Current
- Standard Fixed Output Voltage Options are 3.3V and 5.0V
- Very Low I_Q: 4.5μA@V_{IN} = 12V
- Over-Temperature Protection
- Current-Limit Protection
- Short-Circuit Protection
- Part No. and Package Information

Part No.	Package	MSL
ET61HA1XXF	SOT89-3	3

Pin Configuration

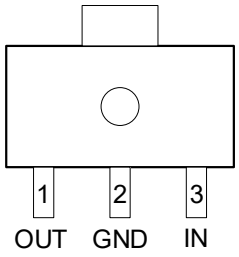

Figure1. Pin Configuration

Pin Function

Pin No.	Pin Name	Description
1	OUT	Output Pin
2	GND	Ground Pin
3	IN	Input Pin

Functional Description

Input Capacitor

It is recommended to connect a 1μF capacitor between the VIN and GND pins to eliminate input power fluctuations and reduce output ripple. This input capacitor must be as close to the chip as possible to ensure stable input and output. For PCB layout, note that both VIN and GND require wide copper wires. For high-voltage input (V_{IN} ≥ 48V) applications, you are advised to use an electrolytic capacitor at the input end or connect a resistor of at least 1 ohm in series at the front end of the input capacitor (the resistor must be adjusted according to the actual application) to prevent chip failure caused by input overshoot.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is from 1μF to 10μF, Equivalent Series Resistance (ESR) is from 5mΩ to 100mΩ, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

Thermal Shutdown

Thermal shutdown protection disables the output when the junction temperature rises to approximately 145°C.Disabling the device eliminates the power dissipated by the device, allowing the device to cool. When the junction temperature cools to approximately 120°C, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits regulator dissipation, protecting the LDO from damage as a result of overheating. Activating the thermal shutdown feature usually indicates excessive power dissipation as a result of the product of the (V_{IN} - V_{OUT}) voltage and the load current. For reliable operation, limit junction temperature to 120°C maximum.

Thermal Considerations

For continuous operation, do not exceed absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated by the following formula:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

where $T_{J(MAX)}$ is the maximum junction temperature, T_A is the ambient temperature, and θ_{JA} is the junction to ambient thermal resistance. The maximum power dissipation depends on the operating ambient temperature for fixed $T_{J(MAX)}$ and thermal resistance, θ_{JA}.

Current-Limit Protection

The ET61HA1XX provides current limit function to prevent the device from damages during over-load or shorted-circuit condition. This current is detected by an internal sensing transistor.

Absolute Maximum Ratings

Symbol	Rating	Value	Unit
V_{IN}[(1)]	Input Voltage	-0.3~115	V
V_{OUT}	Output Voltage	-0.3~7	V
$T_{J(MAX)}$	Maximum Junction Temperature	150	°C
T_{STG}	Storage Temperature	-40~150	°C
V_{ESD}[(2)]	HBM Capability	±4000	V
	CDM Capability	±200	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Note1: Refer to Electrical Characteristics and Application Information for Safe Operating Area and IN port needs to be powered on before the EN port.

Note2: This device series incorporates ESD protection and is tested by the following methods:
HBM tested per JEDEC JS-001;
CDM tested per JEDEC JS-002.

Thermal Characteristics

Symbol	Parameters	Value	Unit
$R_{\theta JA}$	Thermal Characteristics, Thermal Resistance, Junction-to-Air	130	°C/W
P_D	Max Power Dissipation @25°C	0.9	W

Recommended Operating Conditions

Symbol	Parameters	Rating	Unit
V_{IN}	LDO Input Voltage	4 to 100	V
I_{OUT}	LDO Output Current	0 to 100	mA
T_J	Operating Junction Temperature	-40 to 125	°C
C_{IN}	Effective LDO Input Ceramic Capacitor Value	1~10	μF
C_{OUT}	Effective LDO Output Ceramic Capacitor Value	1~10	μF
ESR	Input and Output Capacitor Equivalent Series Resistance	5 to 100	mΩ

Electrical Characteristics

(V_{IN} = V_{OUT} + 1V; I_{OUT} = 10mA, C_{IN} = 1.0μF, C_{OUT} = 10μF, unless otherwise noted. Typical values are at T_A = 25°C.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Operating Input Voltage		4		100	V
V_{OUT}	Output Voltage	V_{IN} = 12V, I_{OUT} = 10mA	-2%		2%	V
I_{Q_ON}	Quiescent Current	V_{IN} = 12V, I_{OUT} = 0mA		4.5		μA
Reg_{Line}	Line Regulation	V_{IN} = 6V to 100V, I_{OUT} = 1mA		0.1		mV/V
Reg_{LOAD}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA, V_{IN} = 7V		10		mV
V_{DROP}[3]	Dropout Voltage	I_{OUT} = 10mA, V_{OUT} = V_{OUTNOM} - 0.1V		120		mV
		I_{OUT} = 100mA, V_{OUT} = V_{OUTNOM} - 0.1V		830		
I_{OUT}	Output Current			100		mA
I_{LMT}	Current Limit			240		mA
I_{SHORT}	LDO Short Current Limit	V_{IN} = 12V, V_{OUT} = 0V		80		mA
T_{TSD} [4]	Thermal Shutdown Temperature	Temperature Increasing from T_A = 25°C		145		°C
T_{HYS} [4]	Thermal Shutdown Hysteresis	Temperature Falling from T_{TSD}		25		°C

Note3: V_{DROP} FT test method: test the V_{OUT} voltage at V_{OUT} + $V_{DROPMAX}$ with 100mA output current.

Note4: Guaranteed by design and characterization. not a FT item.

Application Circuits

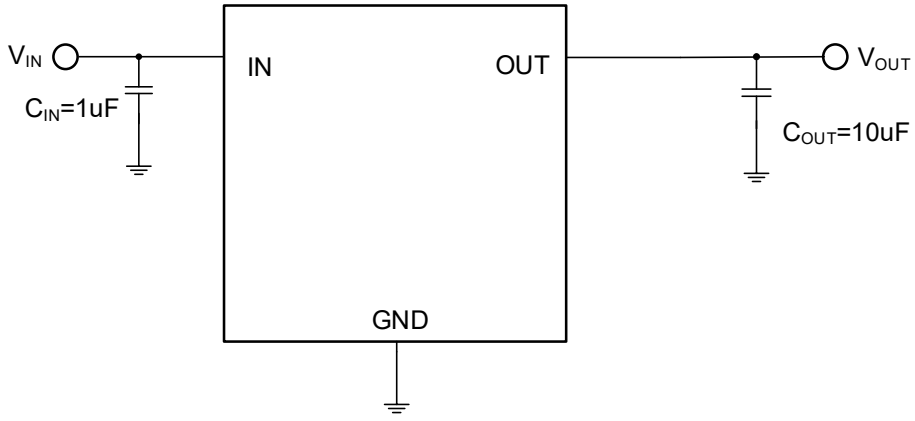

Figure3. Application Circuits

Package Dimension

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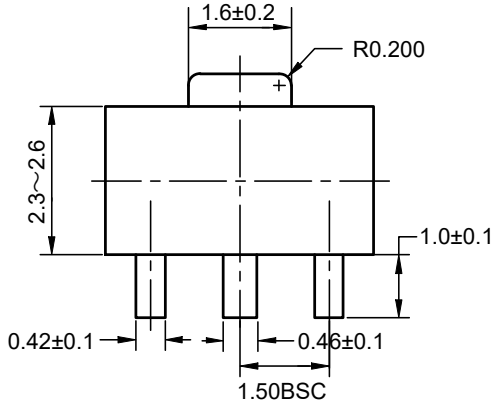
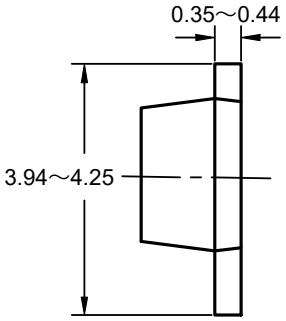
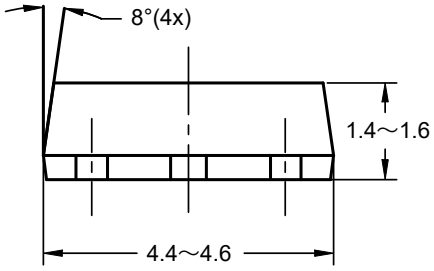


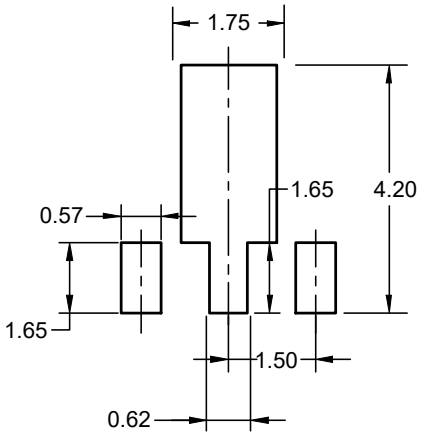
Top View



Side View



Side View



Recommended Land Pattern

Unit: mm

Tape Information

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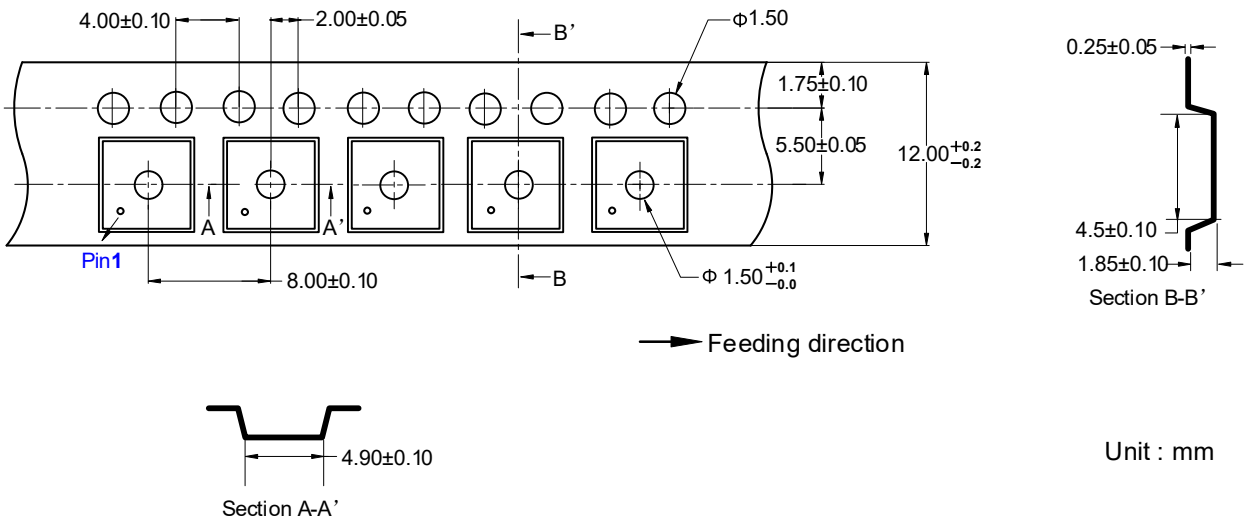

Marking Information

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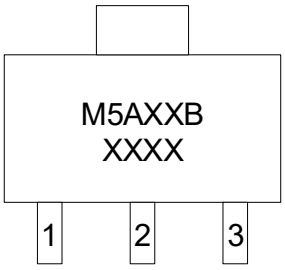

M5A & B = Part Number

XX = V_{OUT} Version

XXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-12-20	Preliminary Version	Xu tao	Tu guozhu	Liu jiaying
1.0	2026-04-27	Official Version	Xu tao	Yang xiaoxu	Liu jiaying