

Parameters Subject to Change Without Notice

FEATURES

- DiSEqC 1.x Compatibility
- Up to 550mA Continuous Output Current
- 8V to 14V Input Voltage
- Tracking Switch-Mode Power Converter for Lowest Power Dissipation, High Efficiency
- Boost Converter with Internal Switch
- Low Noise Linear Regulator Output
- 1V Line Drop Compensation
- External Input 22KHz Tone
- Output Short Circuit Robust
- Input Voltage UVLO Protection
- Over Temperature Protection

APPLICATIONS

- LNB Power Supply and Control for Satellite Set-Top Boxes

DESCRIPTION

JW4002 is a monolithic linear and switching voltage regulator, specially designed to provide efficient, low noise power to Satellite receiver's RF LNB (Low Noise Block) converter via coaxial cable.

The JW4002 integrates a current mode boost converter followed by a tracking linear regulator. A high switching frequency is chosen to minimize the size of passive filtering components, further assisting in cost reduction. The tracking linear regulator protects the output against overload or short circuit.

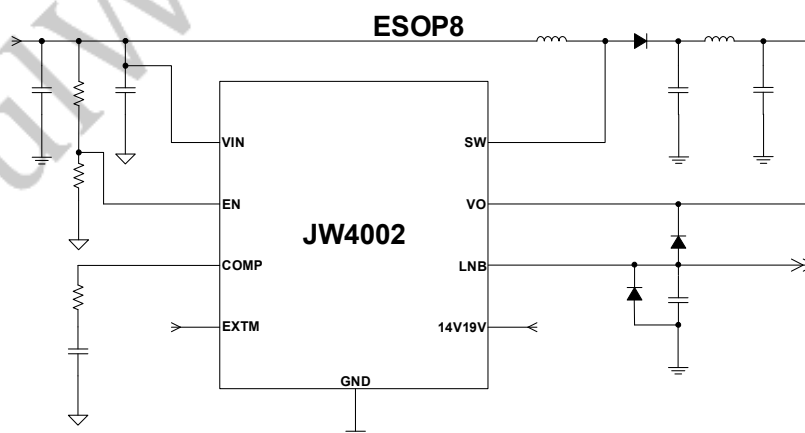
The JW4002 provides a number of features described in DiSEqC. For DiSEqC communications, the 22 KHz tone signal can be generated from external clock, all the way down to no-load.

JW4002 is available in ESOP8 packages.

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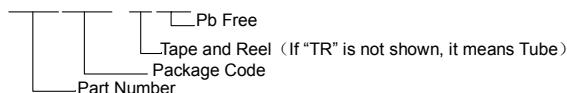
TYPICAL APPLICATION



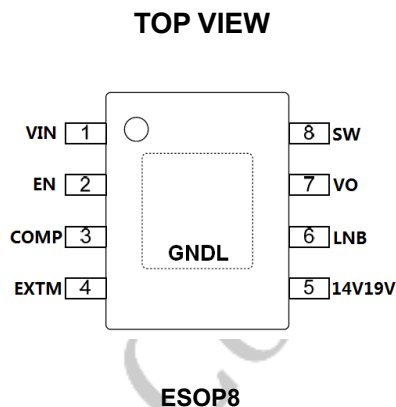
ORDERING INFORMATION

LEAD FREE FINISH	TAPE AND REEL	PACKAGE	TOP MARKING	JUNCTION TEMPERATURE RANGE
JW4002ESOP#PBF	JW4002ESOP#TRPBF	eSOP8	JW4002	- 40 °C to 125 °C

JWXXXXPPPP#TRPBF



PIN CONFIGURATION

ABSOLUTE MAXIMUM RATING¹⁾

VIN, EN, LNB, VO, SW	-0.3V to 24V
All Other Pins	-0.3V to 7V
Junction Temperature	150°C
Lead Temperature	260°C
Storage Temperature	-65°C to +150°C

RECOMMEND OPERATING RANGE

Supply Voltage V_{IN}	8V to 14V
Output Voltage V_{LNB}	13V/14V/18V/19V
Ambient Temperature	-25°C to +85°C
Maximum Junction Temperature (T_J)	125°C

THERMAL RESISTANCE⁴⁾ θ_{JA} θ_{JC}

ESOP8	50	10 °C /W
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Note:

- Exceeding these ratings may damage the device.
- The JW4002 guarantees robust performance from -40°C to 150°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.
- The JW4002 includes thermal protection that is intended to protect the device in overload conditions. Thermal protection is active when junction temperature exceeds the maximum operating junction temperature. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.
- Measured on JESD51-7, 4-layer PCB.

ELECTRICAL CHARACTERISTICS*V_{IN}=12V, T_A=25 °C, unless otherwise stated.*

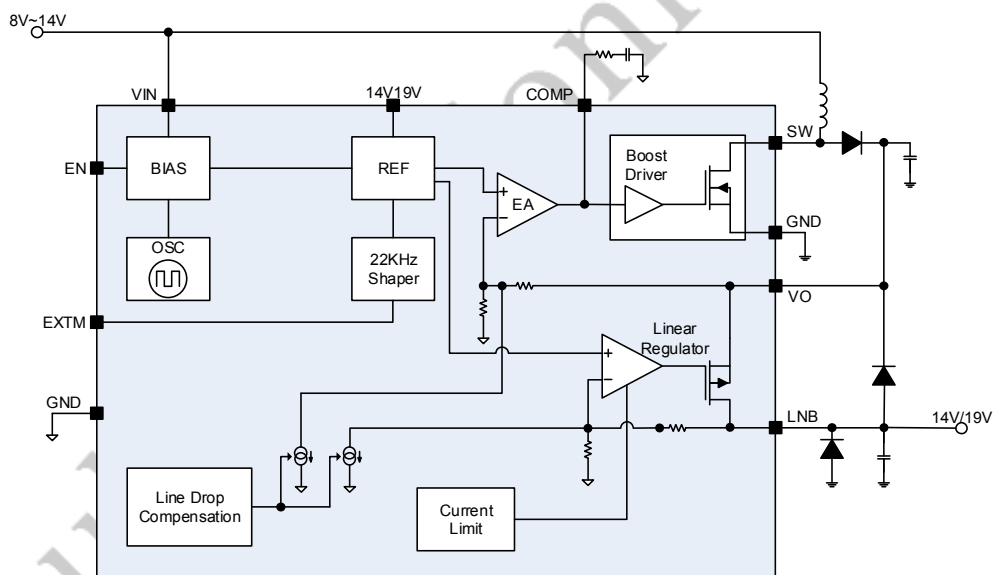
Item	Symbol	Condition	Min.	Typ.	Max.	Units
General						
Input Voltage Range	V _{IN}		8	12	14	V
Input Supply Current	I _{IN}	EN=High, no load		2		mA
Under Voltage Lockout	V _{UVLO}	V _{IN} rising	7.4	7.7	8	V
UVLO Hysteresis	V _{UVLO_HYS}	V _{IN} falling		350		mV
EN Input Logic Threshold	V _{EN_HIGH}	V _{EN} rising	2			V
	V _{EN_LOW}	V _{EN} falling			0.8	V
14V19V Input Logic Threshold	V _{14V19V_HIGH}	V _{14V19V} rising	2			V
	V _{14V19V_LOW}	V _{14V19V} falling			0.8	V
COMP Pin Current	I _{COMP_DISCHG}	COMP sinking	19.8	22	24.2	μA
	I _{COMP_CHG}	COMP sourcing	19.8	22	24.2	μA
Boost Converter						
Boost Switch ON Resistance	R _{DS(on)}	I _{SW} =1A		200		mΩ
Boost Switching Frequency	F _{SW}		634	704	774	KHz
Boost Switch Peak Current Limit	I _{SW_LIMIT}		2.8	3.1	3.4	A
Minimum On Time	T _{ON_MIN}			100		nS
Maximum On Time	T _{ON_MAX}			1.3		μS
Linear Regulator						
Output Voltage	V _{LNB}	14V19V=Low, I _{LNB} =0mA-100mA	13.9	14.2	14.5	V
		14V19V=High, I _{LNB} =0mA-100mA	18.9	19.3	19.7	V
Output Line Regulation		8V≤V _{IN} ≤14V		4	40	mV
Output Load Regulation		10mA≤I _{LNB} ≤500mA, 14V19V=Low		60		mV
		10mA≤I _{LNB} ≤500mA, 14V19V=High		80		mV
Dropout Voltage	V _{DROP}	V _O -V _{LNB} , I _{LNB} =500mA, T _{MOD} =High		1		V
		V _O -V _{LNB} , I _{LNB} =500mA, T _{MOD} =Low, EXT _M =Low		0.6		V
Tone Signal						
Tone Signal Frequency	F _{TONE}	T _A =25℃		22		KHz

Peak-to-Peak Amplitude		ILNB=0mA-100mA	0.4	0.65	0.9	V
Rising and Falling Time	T _{TRAN}	ILNB=100mA, C _{LNB} =0.1μF		7		μS
EXTM Input Logic Threshold	V _{EXTM_HIGH}	V _{EXTM} rising	2			V
	V _{EXTM_LOW}	V _{EXTM} falling			0.8	V
Over Current Protection						
Output Current Limit	I _{LNB_LIMIT}		0.5	0.6	0.7	A
Dynamic Overload Protection On Time	T _{ON}	Time to onset of shutdown		3		mS
Dynamic Overload Protection OFF Time	T _{OFF}	Time to attempt to restart		2		S
Over Temperature Protection						
Over Temperature Shutdown Threshold	T _{SHDN}			150		°C
OTP Hysteresis	T _{SHDN_HYS}			10		°C

PIN DESCRIPTION

Pin No	Name	Description
1	VIN	Power Supply for the Chip
2	EN	Chip ON/OFF Control Input
3	COMP	Compensation for Boost Converter
4	EXTM	External Modulation 22KHz Tone signal Input.
5	14V19V	Select 14V or 19V for Output Voltage, Low for 14V and High for 19V
6	LNB	Output Voltage to LNB
7	VO	Tracking Supply Voltage to Linear Regulator
8	SW	Drain of the Internal Boost MOSFET
EP	GND	Ground

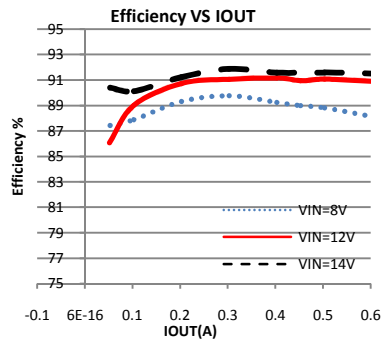
BLOCK DIAGRAM



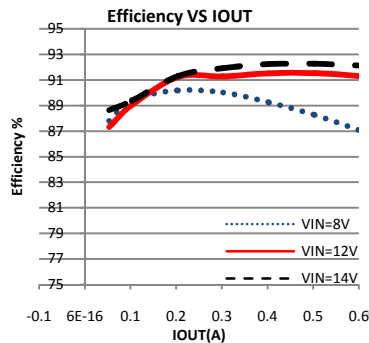
TYPICAL PERFORMANCE CHARACTERISTICS

Note: $V_{IN}=12V$, $V_{EN}=2V$, $V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$, $T_A=+25^{\circ}C$, unless otherwise stated.

Efficiency Curve @ $V_{14V19V}=0V$

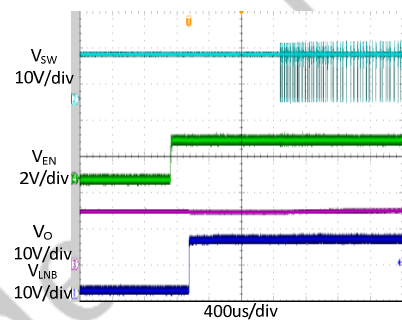


Efficiency Curve @ $V_{14V19V}=2V$



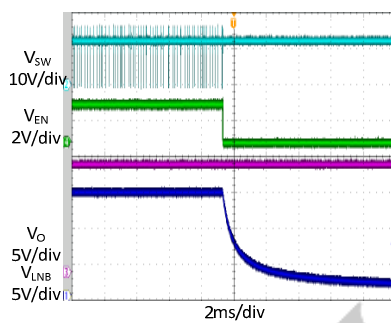
EN Startup w/o 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$



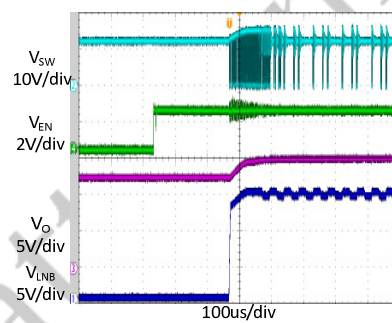
EN Shutdown w/o 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$



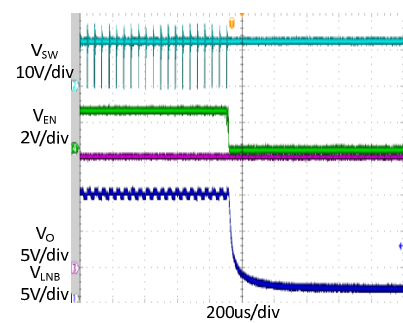
EN Startup w/ 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=22KHz$, $I_{LNB}=0mA$



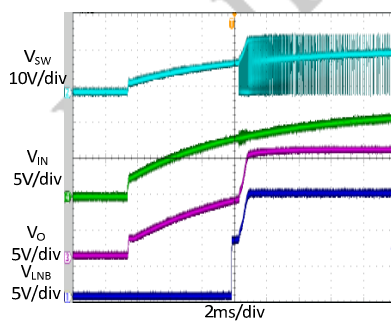
EN Shutdown w/ 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=22KHz$, $I_{LNB}=0mA$



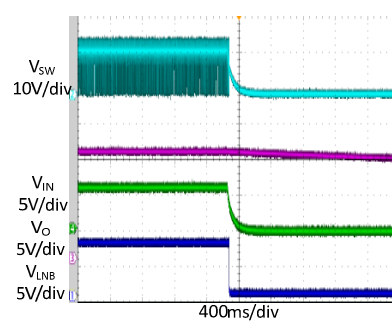
VIN Startup w/o 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$



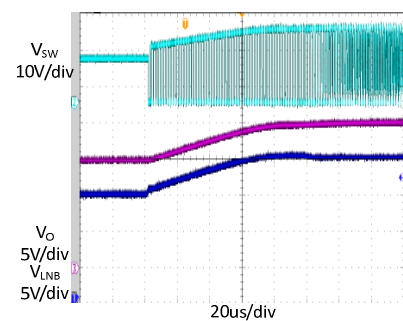
VIN Shutdown w/o 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$



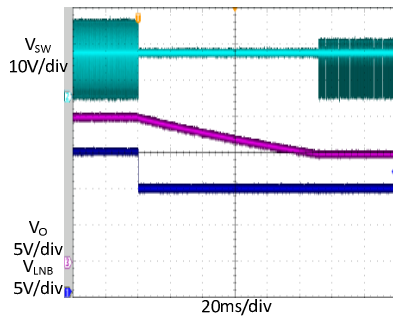
14V→19V Switching w/o 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$



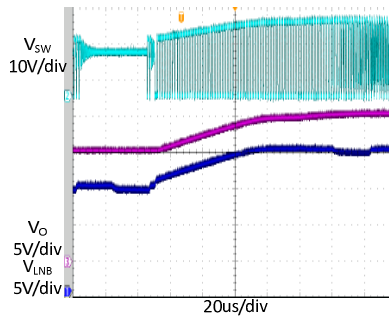
19V→14V Switching w/o 22KHz Tone

$V_{14V19V}=0V$, $V_{EXTM}=0V$, $I_{LNB}=0mA$



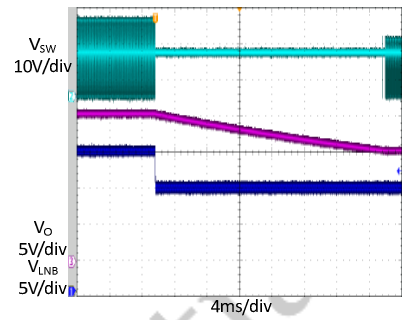
14V→19V Switching w/ 22KHz Tone

$V_{TMOD}=0V$, $V_{EXTM}=2V$, $I_{LNB}=0mA$



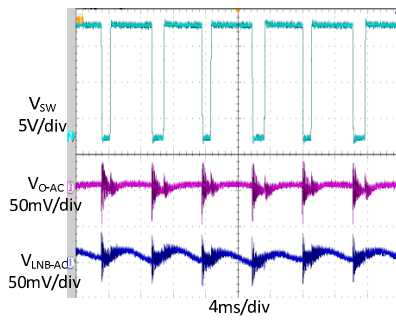
19V→14V Switching w/ 22KHz Tone

$V_{TMOD}=0V$, $V_{EXTM}=2V$, $I_{LNB}=0mA$



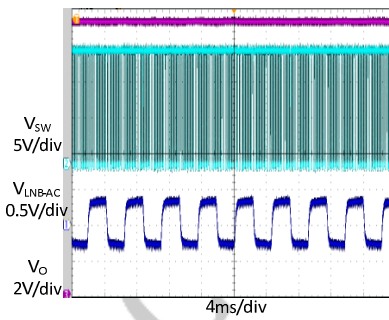
Output Voltage Ripple

$I_{LNB}=100mA$



22KHz Tone Signal

$V_{TMOD}=0V$, $V_{EXTM}=2V$, $I_{LNB}=120mA$



FUNCTIONAL DESCRIPTION

The JW4002 is a single output voltage regulator for providing both supply voltage and control signal from satellite set-top box modules to LNB of the antenna port.

JW4002 has an integrated boost converter which generates the voltage to enable the linear post-regulator to work at a minimum dissipated power from a single supply source between 8V and 14V.

Boost Converter and Linear Regulator

JW4002 integrates a fixed frequency, asynchronous boost converter with peak current control. The switching frequency is 704KHz typically.

The boost converter will automatically switch from PWM to PFM mode to reduce power dissipation at light load.

The output voltage of boost converter tracks the requested output voltage of linear regulator to allow the linear regulator to work with minimum drop-out voltage, typically 0.6V with 22KHz tone signal or 1V without 22KHz tone signal. The drop-out voltage will be automatically selected by detecting whether 22 KHz tone signal is activated or not internally.

14V/19V Switching & Soft-Start

The output voltage of linear regulator can be set to 14V or 19V to select different polarization directions of LNB. A logic level low on 14V19V pin will set LNB to 14V while a high level set it to 19V.

Current Limit

The maximum output current of linear regulator is 0.6A. When overload condition is detected, the output current will be regulated at ILIMIT level for 3mS. After this time period, if overload condition still exists, both boost converter and linear regulator will be shut down for 2S before they're resumed.

The boost converter integrates a cycle-by-cycle over current limit function which can guarantee JW4002 works with full load.

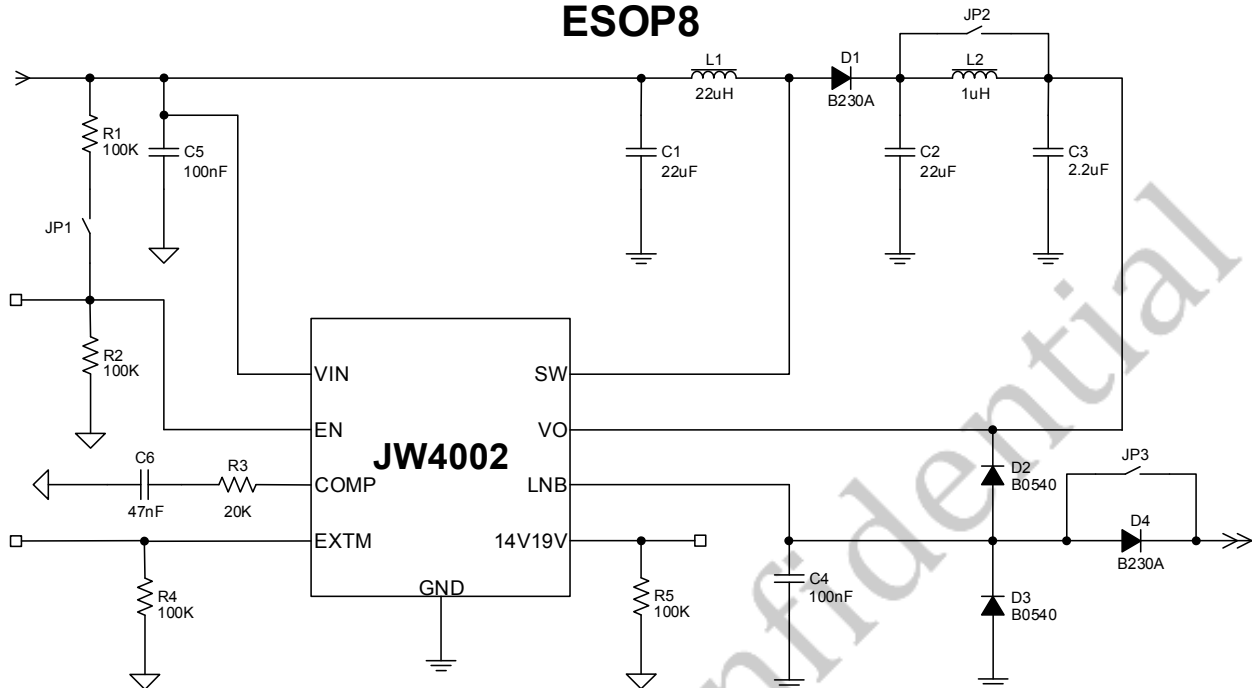
Tone Signal Generation

In accordance with DiSEqC standards, a 22KHz tone signal can be generated from EXTM input externally and modulated onto LNB output to provide the LNB control information. If EXTM remains constant low or high which indicates no external 22 KHz tone signal input, the 22 KHz tone signal will be deactivated. In operation, when EXTM switches to constant low or high, the 22 KHz tone signal will be deactivated if EXTM remains constant logic low or high at the 7th falling edge of internal 22 KHz clock and reactivated upon 1st rising edge of signal on EXTM pin.

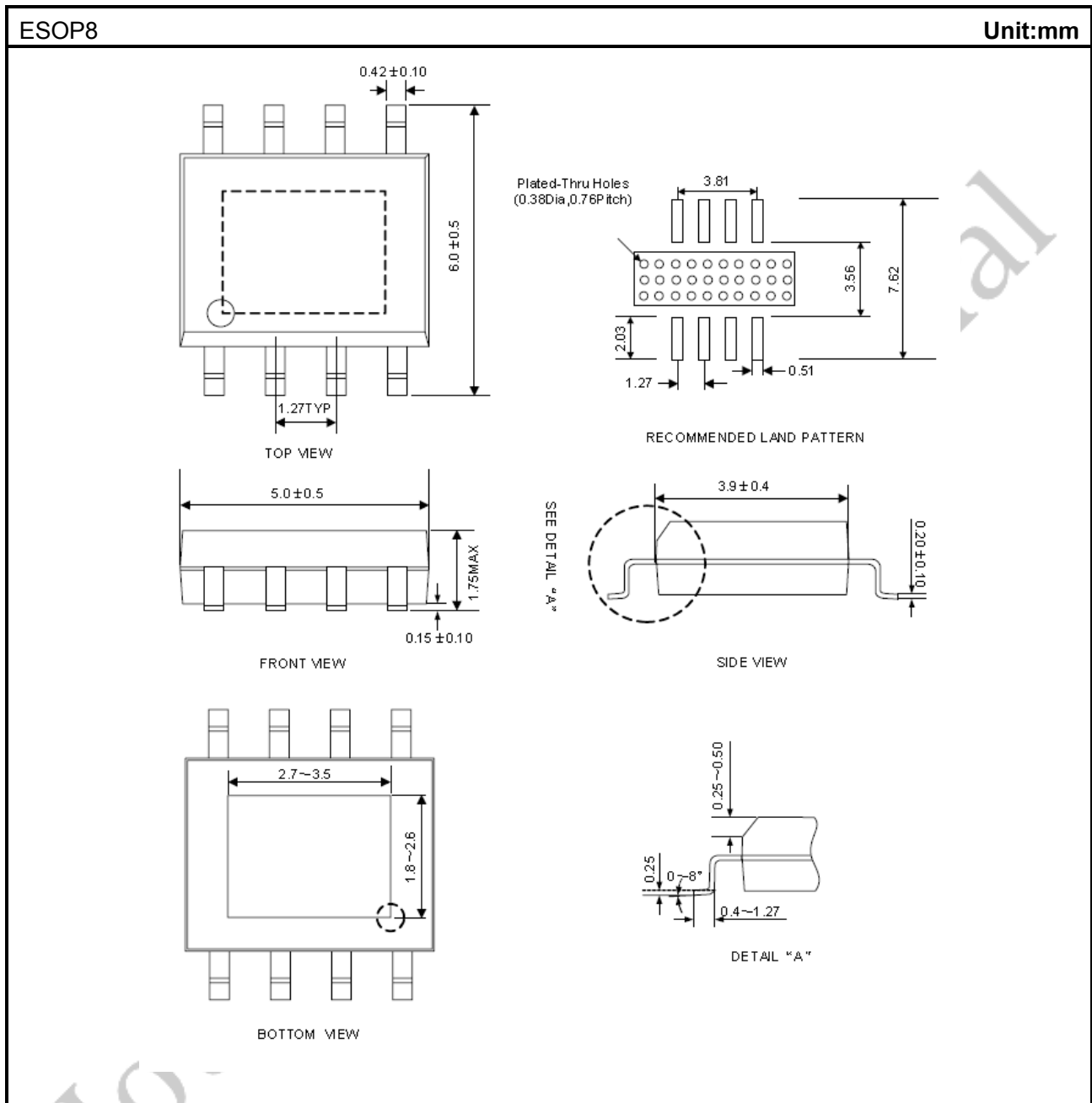
Thermal Protection

When the junction temperature exceeds +150°C, the chip will be shut down. Once the junction temperature drops below 140°C typically, the chip will restart automatically.

APPLICATION REFERENCE

PCB Schematic
ESOP8

PACKAGE OUTLINE



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