

#### Features

- Step-down Switching Regulator with very high Efficiency
- Adjustable Output 1.8 – 3.3 VDC or 3.0 – 5.0 VDC
- Remote ON/OFF
- Overload Protection
- Low Output Noise
- Standby Current only 100  $\mu$ A
- Small SIL- or DIL-Package
- 3 Year Product Warranty



This new generation of step-down converters provides designers with a cost-effective solution for converting a 5, 12 or 24 VDC voltage. To achieve highest efficiency, these dc/dc converters are using newest technologies, as amorphous ferrite, solid aluminum capacitors and a synchronous commutation IC. A very high efficiency allows operation without additional heatsink. This product finds many applications in distributed powersystems where a voltage conversion at the point of load is an required.

Models					
Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.	Package
TSI 10N-0510	4.75 – 13.6 VDC	* + 3.3 VDC	2000 mA	92.0 %	SIP
TSI 10N-0510D	4.75 – 13.6 VDC	* + 3.3 VDC	2000 mA	92.0 %	DIP
TSI 10N-1211	6.0 – 16.5 VDC	** + 5 VDC	2000 mA	93.0 %	SIP
TSI 10N-1211D	6.0 – 16.5 VDC	** + 5 VDC	2000 mA	93.0 %	DIP
TSI 10N-2410	16.0 – 28.0 VDC	* + 3.3 VDC	2000 mA	83.0 %	SIP
TSI 10N-2410D		* + 3.3 VDC	2000 mA	83.0 %	DIP
TSI 10N-2411		** + 5 VDC	2000 mA	85.0 %	SIP
TSI 10N-2411D		** + 5 VDC	2000 mA	85.0 %	DIP

\* Output adjustable 1.8 to 3.3 VDC  
 \*\* Output adjustable 3.0 to 5.0 VDC

### Input Specifications

Input current	TSI 10N-0510	21mA / 1435 mA typ.
(no load / full load)	TSI 10N-1211	27 mA / 895 mA typ.
	TSI 10-N2410	45 mA / 330 mA typ.
	TSI 10N-2411	45 mA / 485 mA typ.

Surge voltage (1 sec max.)	5 Vin models	16 V max.
	12 Vin models	25 V max.
	24 Vin models	30 V max.

Stand-by current		100 $\mu$ A typ.
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### Output Specifications

Voltage adjustment	TSI 10N-0510 & TSI 10N-2410	+1.8 VDC to +3.3 VDC
	TSI 10N-1211 & TSI 10N-2411	+3.0 VDC to +5.0 VDC

Regulation	- Input variation	0.5 %
	- Load variation 10 – 100 %	< 1.5 %

Ripple and noise (20 MHz Bandwidth)		50 mVpk-pk max. (with 2.2 $\mu$ F capacitor on output)
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Transient response time (50% Load change)		100 $\mu$ sec typ.
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Temperature coefficient		$\pm$ 0.02 % / $^{\circ}$ C
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Short circuit protection		indefinite foldback
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Remote ON/OFF control	ON=Pin 1 (ON/OFF Pin) to pin 3 (GND) open (3 – 5 VDC)	
	OFF=Pin 1 (ON/OFF Pin) to pin 3 (GND) short (– 0.3 – 1.2 VDC)	

### General Specifications

Temperature ranges	- Operating	- 25 $^{\circ}$ C ... + 70 $^{\circ}$ C
	- Storage	- 25 $^{\circ}$ C ... +125 $^{\circ}$ C

Humidity (non condensing)		95 % rel H max.
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Reliability, calculated MTBF (MIL-HDBK-217 E)		> 1'500'000 h @ 25 $^{\circ}$ C
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Isolation Input/Output		none
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Switching frequency		300 kHz typ. (PWM modulation)
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### Physical Specifications

Vibration (IEC 60068-3-6)		5 to 10 Hz amplitude 10 mm pk-pk 10 to 55 Hz acceleration 2 G
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Shock (IEC 6068-2-27)		acceleration 20 G max. time 11 ms
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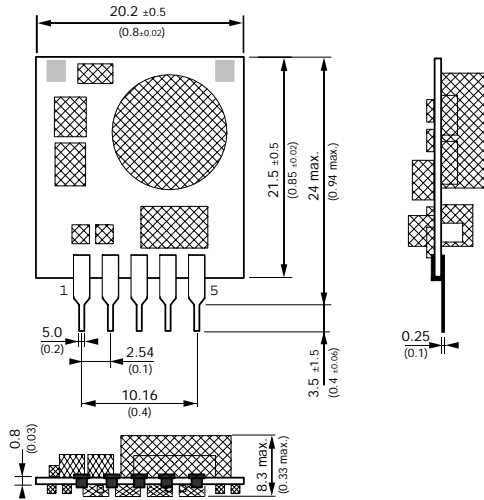
Package weight		4 g (0.14 oz)
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Soldering temperature		235 $^{\circ}$ C max. / 10 sec.
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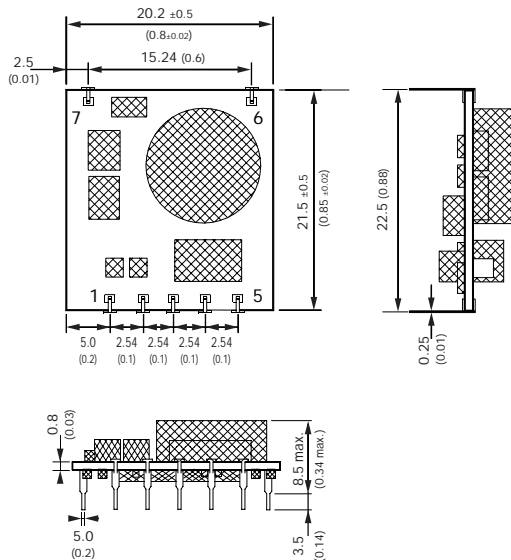
All specifications valid at nominal input voltage, full load and +25 $^{\circ}$ C after warm-up time unless otherwise stated.

Outline Dimensions mm (inches)

**SIP Package**



**DIP Package**



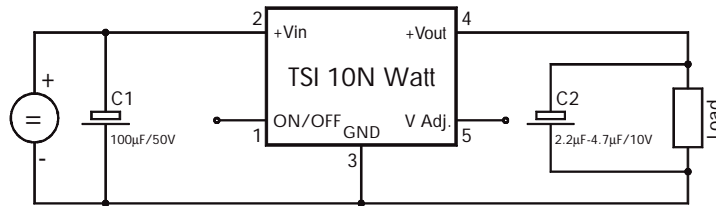
**Pin-Out**

Pin	SIP	DIP
1	Remote on/off	Remote on/off
2	+V Input (Vcc)	+V Input (Vcc)
3	-V Input (GND) -V Output	-V Input (GND) -V Output
4	+V Output	+V Output
5	V Output adj.	V Output adj.
6		No Con.
7		No Con.

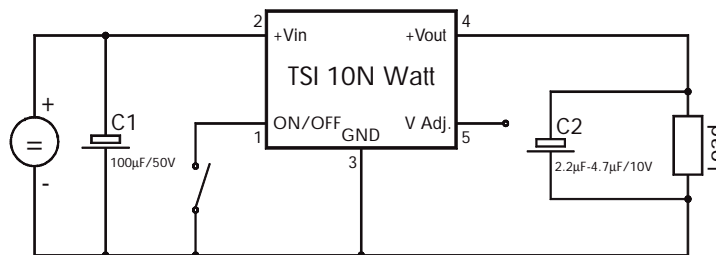
Specifications can be changed without notice

**Connections**

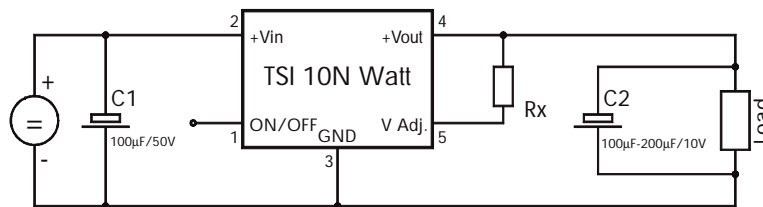
Normal Connection (Standard)



Remote ON/OFF Connection



Output Voltage Adjustment Connection



$$R_x = \frac{R_1 \cdot 1200 \cdot (V_{out} - 1.195)}{R_1 \cdot 1.195 - 1200 \cdot (V_{out} - 1.195)}$$

TSI 10N-xx10 ==> R1 = 2130 Ohm  
Output Voltage (Vout) = 1.8 - 3.3VDC

TSI 10N-xx11 ==> R1 = 3840 Ohm  
Output Voltage (Vout) = 3.0 - 5.0VDC

Vout = adjusted output voltage

Specifications can be changed without notice