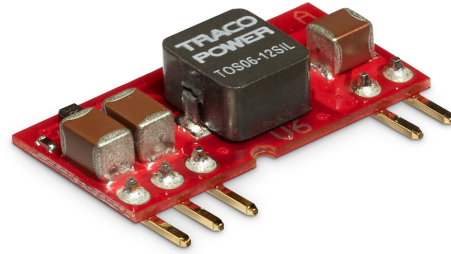


- Small size, low profile
- SIP version
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.75 VDC to 5.0 VDC
- Delivers up to 6 A with minimal derating
- Ultra high efficiency to 94 %
- Fast transient response
- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



UL 62368-1

The TOS 06SIL series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 6 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.75 VDC to 5.0 VDC. These converters work over a wide input voltage range of 2.4 to 5.5 VDC or 8.3 to 14.0 VDC. Further features include remote On/Off, under voltage lockout and over current protection. These products have an open-frame construction with very small footprint and are available in an industry standard SIP package. The TOS 06SIL series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 06-05SIL	6'000 mA	2.4 - 5.5 VDC (5 VDC nom.)	0.75 VDC (0.75 - 3.3 VDC)	94 %
TOS 06-12SIL		8.3 - 14 VDC (12 VDC nom.)	0.75 VDC (0.75 - 5.0 VDC)	89 %

## Input Specifications

Input Current	- At no load	5 Vin models: <b>45 mA typ.</b> 12 Vin models: <b>100 mA typ.</b> (at Vout max.)
Start-up Voltage		5 Vin models: <b>2.2 VDC typ. / 2.4 VDC max.</b> 12 Vin models: <b>7.9 VDC typ. / 8.3 VDC max.</b>
Under Voltage Lockout		5 Vin models: <b>1.6 VDC min. / 2 VDC typ. / 2.2 VDC max.</b> 12 Vin models: <b>6.5 VDC min. / 7.5 VDC typ. / 8 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>35 mAp-p typ.</b> 12 Vin models: <b>30 mAp-p typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>8'000 mA</b> (fast acting) 12 Vin models: <b>6'300 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos06sil">www.tracopower.com/overview/tos06sil</a>

## Output Specifications

Output Voltage Adjustment		0.75 Vout models: <b>0.75 - 3.3 VDC</b> <b>0.75 - 5.0 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos06sil">www.tracopower.com/overview/tos06sil</a> (Vin must be at least 0.5 V higher than Vout)
Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.3% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>50 mVp-p max.</b>
Capacitive Load		<b>3'000 µF max.</b> (ESR >10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.4 %/K max.</b>
Start-up Time		<b>8 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>210% typ. of Iout max.</b>
Transient Response	- Peak Variation  - Response Time	<b>130 mV typ.</b> (50% Load Step) (5 Vin model) <b>200 mV typ.</b> (50 % Load Step) (12 Vin model) <b>25 µs typ.</b> (50% Load Step) (with 1 µF MLCC    10 µF TC)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>UL 60950-1</b> <b>UL 62368-1</b>
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## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+125°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos06sil">www.tracopower.com/overview/tos06sil</a>
Cooling System		<b>Natural convection</b> (20 LFM)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: open circuit or Vin max. Off: 0 to 0.3 VDC Refers to 'Remote' and 'GND' Pin 1 mA typ. (12 Vin model: Open circuit or (Vin – 4 V) to Vin max. for on state)
Switching Frequency		270 - 330 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	9'300'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP9
Soldering Profile		Wave Soldering 265°C / 10 s max.
Weight		2.8 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

## Supporting Documents

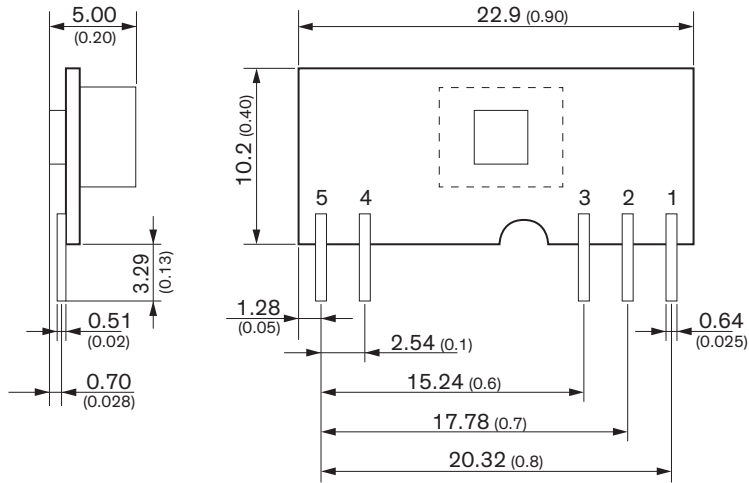
Overview Link (for additional Documents)

[www.tracopower.com/overview/tos06sil](http://www.tracopower.com/overview/tos06sil)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

## Outline Dimensions

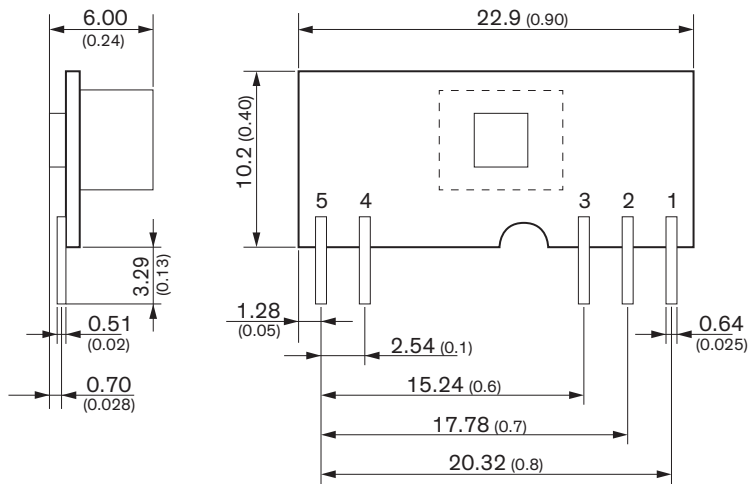
TOS 06-05SIL



### Pinout

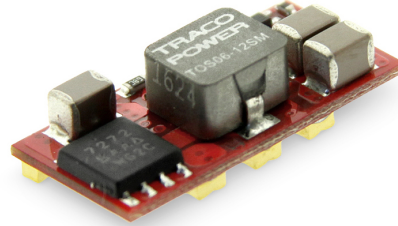
Pin	Function
1	+Vout
2	Trim
3	GND
4	+Vin
5	Remote On/Off

TOS 06-12SIL



Dimensions in mm (inch)  
 Tolerances x.x ±0.5 (x.xx ±0.02)  
 Tolerances x.xx ±0.25 (x.xxx ±0.01)  
 Pin dimension tolerance ±0.1 (±0.004)

- Small size, low profile
- SMT package
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.75 VDC to 5.0 VDC
- Delivers up to 6 A with minimal derating
- Ultra high efficiency to 94 %
- Fast transient response
- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



UL 62368-1

The TOS 06SM series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 6 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.75 VDC to 5.0 VDC. These converters work over a wide input voltage range of 2.4 to 5.5 VDC or 8.3 to 14.0 VDC. Further features include remote On/Off, under voltage lockout and over current protection. These products have an open-frame construction with very small footprint and are available in a SMT package. The TOS 06SM series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 06-05SM	6'000 mA	2.4 - 5.5 VDC (5 VDC nom.)	0.75 VDC (0.75 - 3.3 VDC)	94 %
TOS 06-12SM		8.3 - 14 VDC (12 VDC nom.)	0.75 VDC (0.75 - 5.0 VDC)	89 %

## Input Specifications

Input Current	- At no load	5 Vin models: <b>45 mA typ.</b> 12 Vin models: <b>100 mA typ.</b> (at Vout max.)
Start-up Voltage		5 Vin models: <b>2.2 VDC typ. / 2.4 VDC max.</b> 12 Vin models: <b>7.9 VDC typ. / 8.3 VDC max.</b>
Under Voltage Lockout		5 Vin models: <b>1.6 VDC min. / 2 VDC typ. / 2.2 VDC max.</b> 12 Vin models: <b>6.5 VDC min. / 7.5 VDC typ. / 8 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>35 mAp-p typ.</b> 12 Vin models: <b>30 mAp-p typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>8'000 mA</b> (fast acting) 12 Vin models: <b>6'300 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos06sm">www.tracopower.com/overview/tos06sm</a>

## Output Specifications

Output Voltage Adjustment		0.75 Vout models: <b>0.75 - 3.3 VDC</b> <b>0.75 - 5.0 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos06sm">www.tracopower.com/overview/tos06sm</a> (Vin must be at least 0.5 V higher than Vout)
Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.3% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>50 mVp-p max.</b>
Capacitive Load		<b>3'000 µF max.</b> (ESR >10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.4 %/K max.</b>
Start-up Time		<b>8 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>210% typ. of Iout max.</b>
Transient Response	- Peak Variation  - Response Time	<b>130 mV typ.</b> (50% Load Step) (5 Vin model) <b>200 mV typ.</b> (50 % Load Step) (12 Vin model) <b>25 µs typ.</b> (50% Load Step) (with 1 µF MLCC    10 µF TC)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>UL 60950-1</b> <b>UL 62368-1</b>
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## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+125°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos06sm">www.tracopower.com/overview/tos06sm</a>
Cooling System		<b>Natural convection</b> (20 LFM)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Capacitive Load	5 VDC model:	16'000 $\mu$ F max.
	7.5 VDC model:	8'900 $\mu$ F max.
	9 VDC model:	6'200 $\mu$ F max.
	12 VDC model:	3'500 $\mu$ F max.
	15 VDC model:	2'300 $\mu$ F max.
	18 VDC model:	1'600 $\mu$ F max.
	24 VDC model:	870 $\mu$ F max.
	36 VDC model:	390 $\mu$ F max.
	48 VDC model:	220 $\mu$ F max.
53 VDC model:	180 $\mu$ F max.	
Minimum Load		Not required
Temperature Coefficient		$\pm 0.02$ %/K max.
Hold-up Time	- At 230 VAC	50 ms min.
	- At 115 VAC	12 ms min.
Start-up Time	- At 230 VAC	600 ms max.
	- At 115 VAC	800 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		165% typ. of Iout max.
Overvoltage Protection		115 - 135% of Vout nom.
Transient Response	- Response Deviation	3% max. (50% to 75% Load Step at 2.5 A/ $\mu$ s)
	- Response Time	300 $\mu$ s typ. (50% to 75% Load Step at 2.5 A/ $\mu$ s)

### Safety Specifications

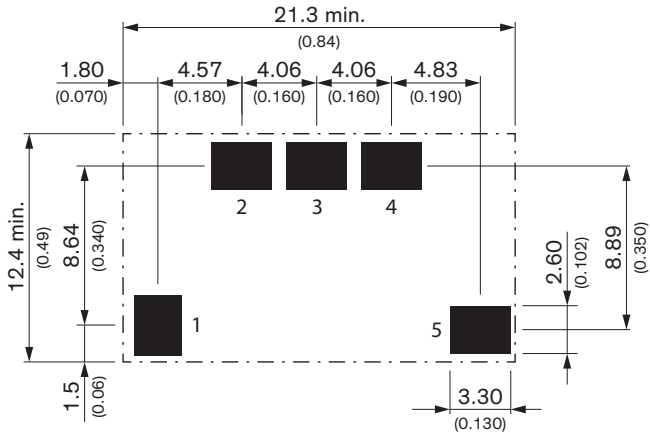
Safety Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/tpi50a-j">www.tracopower.com/overview/tpi50a-j</a>
Protection Class		Class I & II (Prepared): Reinforced Insulation
Pollution Degree		PD 2
Over Voltage Category		OVC III

### EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class B (internal filter) FCC Part 15 class B (internal filter)	
	- Radiated Emissions	EN 55032 class B (internal filter) FCC Part 15 class B (internal filter)	
	- Harmonic Current Emissions	EN 61000-3-2, class A	
	- Voltage Fluctuations & Flicker	EN 61000-3-3	
EMS Immunity	- Electrostatic Discharge	EN 55024 (IT Equipment) EN 55035 (Multimedia) Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A	
	- RF Electromagnetic Field	EN 61000-4-3, 20 V/m, perf. criteria A	
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A L to L: EN 61000-4-5, $\pm 1$ kV, perf. criteria A L to PE: EN 61000-4-5, $\pm 2$ kV, perf. criteria A	
	- Conducted RF Disturbances	EN 61000-4-6, 20 Vrms, perf. criteria A	
	- PF Magnetic Field	Continuous: EN 61000-4-8, 10 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A	
	- Voltage Dips & Interruptions	230 VAC / 50 Hz:	EN 61000-4-11
		115 VAC / 60 Hz:	EN 61000-4-11
			30%, 25 periods, perf. criteria A >95%, 0.5 periods, perf. criteria A >95%, 250 periods, perf. criteria B

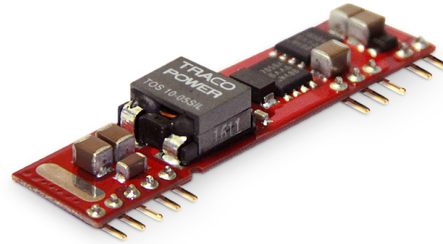
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

### Recommended Solder Pad Layout





- Small size, low profile
- SIP version
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.75 VDC to 5.0 VDC
- Delivers up to 10 A with minimal derating
- Ultra high efficiency to 95 %
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- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



UL 62368-1

The TOS 10SIL series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 10 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.75 VDC to 5.0 VDC. These converters work over a wide input voltage range of 2.4 to 5.5 VDC or 8.3 to 14.0 VDC. Further features include remote On/Off, under voltage lockout and over current protection. These products have an open-frame construction with very small footprint and are available in an industry standard SIP package. The TOS 10SIL series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 10-05SIL	10'000 mA	2.4 - 5.5 VDC (5 VDC nom.)	0.75 VDC (0.75 - 3.3 VDC)	95 %
TOS 10-12SIL		8.3 - 14 VDC (12 VDC nom.)	0.75 VDC (0.75 - 5.0 VDC)	93 %

## Input Specifications

Input Current	- At no load	5 Vin models: <b>130 mA typ.</b> 12 Vin models: <b>100 mA typ.</b> (at Vout max.)
Start-up Voltage		5 Vin models: <b>2.2 VDC typ. / 2.4 VDC max.</b> 12 Vin models: <b>7.9 VDC typ. / 8.3 VDC max.</b>
Under Voltage Lockout		5 Vin models: <b>1.6 VDC min. / 2 VDC typ. / 2.2 VDC max.</b> 12 Vin models: <b>6.5 VDC min. / 7.5 VDC typ. / 8 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>100 mAp-p typ.</b> 12 Vin models: <b>20 mAp-p typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>15'000 mA (fast acting)</b> 12 Vin models: <b>10'000 mA (fast acting)</b> (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos10sil">www.tracopower.com/overview/tos10sil</a>

## Output Specifications

Output Voltage Adjustment		0.75 Vout models: <b>0.75 - 3.3 VDC</b> <b>0.75 - 5.0 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos10sil">www.tracopower.com/overview/tos10sil</a> (Vin must be at least 0.5 V higher than Vout)
Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.3% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>50 mVp-p max.</b>
Capacitive Load		<b>5'000 µF max.</b> (ESR >10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.4 %/K max.</b>
Start-up Time		<b>8 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>200% typ. of Iout max.</b>
Transient Response	- Peak Variation - Response Time	<b>200 mV typ.</b> (50% Load Step) (5 Vin model) <b>200 mV typ.</b> (50 % Load Step) (12 Vin model) <b>25 µs typ.</b> (50% Load Step) (with 1 µF MLCC    10 µF TC)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>UL 60950-1</b> <b>UL 62368-1</b>
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## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+115°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos10sil">www.tracopower.com/overview/tos10sil</a>
Cooling System		<b>Natural convection (20 LFM)</b>

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: open circuit or Vin max. Off: 0 to 0.3 VDC Refers to 'Remote' and 'GND' Pin 2 mA typ. (12 Vin model: Open circuit or (Vin – 4 V) to Vin max. for on state)
Switching Frequency		270 - 330 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	3'300'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP20
Soldering Profile		Wave Soldering 265°C / 10 s max.
Weight		6 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

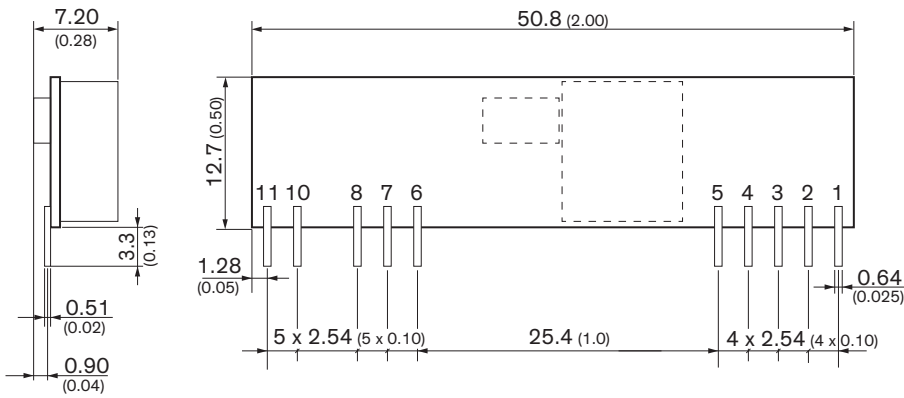
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tos10sil](http://www.tracopower.com/overview/tos10sil)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

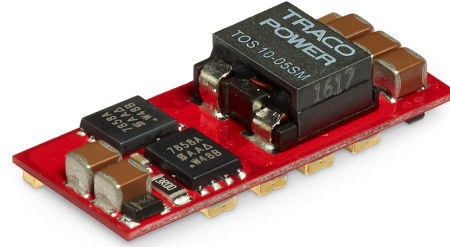
## Outline Dimensions



Dimensions in mm (inch)  
 Tolerances x.x ±0.5 (x.xx ±0.02)  
 Tolerances x.xx ±0.25 (x.xxx ±0.01)  
 Pin dimension tolerance ±0.1 (±0.004)

Pinout	
Pin	Function
1	+Vout
2	+Vout
3	+Sense
4	+Vout
5	GND
6	GND
7	+Vin
8	+Vin
10	Trim
11	Remote On/Off

- Small size, low profile
- SMT package
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.75 VDC to 5.0 VDC
- Delivers up to 10 A with minimal derating
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UL 62368-1

The TOS 10SM series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 10 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.75 VDC to 5.0 VDC. These converters work over a wide input voltage range of 2.4 to 5.5 VDC or 8.3 to 14.0 VDC. Further features include remote On/Off, under voltage lockout and over current protection. These products have an open-frame construction with very small footprint and are available in a SMT package. The TOS 10SM series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 10-05SM	10'000 mA	2.4 - 5.5 VDC (5 VDC nom.)	0.75 VDC (0.75 - 3.3 VDC)	95 %
TOS 10-12SM		8.3 - 14 VDC (12 VDC nom.)	0.75 VDC (0.75 - 5.0 VDC)	93 %

## Input Specifications

Input Current	- At no load	5 Vin models: <b>130 mA typ.</b> 12 Vin models: <b>100 mA typ.</b> (at Vout max.)
Start-up Voltage		5 Vin models: <b>2.2 VDC typ. / 2.4 VDC max.</b> 12 Vin models: <b>7.9 VDC typ. / 8.3 VDC max.</b>
Under Voltage Lockout		5 Vin models: <b>1.6 VDC min. / 2 VDC typ. / 2.2 VDC max.</b> 12 Vin models: <b>6.5 VDC min. / 7.5 VDC typ. / 8 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>100 mAp-p typ.</b> 12 Vin models: <b>20 mAp-p typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>15'000 mA (fast acting)</b> 12 Vin models: <b>10'000 mA (fast acting)</b> (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos10sm">www.tracopower.com/overview/tos10sm</a>

## Output Specifications

Output Voltage Adjustment		0.75 Vout models: <b>0.75 - 3.3 VDC</b> <b>0.75 - 5.0 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos10sm">www.tracopower.com/overview/tos10sm</a> (Vin must be at least 0.5 V higher than Vout)
Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.3% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>50 mVp-p max.</b>
Capacitive Load		<b>5'000 µF max.</b> (ESR >10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.4 %/K max.</b>
Start-up Time		<b>8 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>200% typ. of Iout max.</b>
Transient Response	- Peak Variation  - Response Time	<b>200 mV typ.</b> (50% Load Step) (5 Vin model) <b>200 mV typ.</b> (50 % Load Step) (12 Vin model) <b>25 µs typ.</b> (50% Load Step) (with 1 µF MLCC    10 µF TC)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>UL 60950-1</b> <b>UL 62368-1</b>
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## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+115°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos10sm">www.tracopower.com/overview/tos10sm</a>
Cooling System		<b>Natural convection (20 LFM)</b>

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

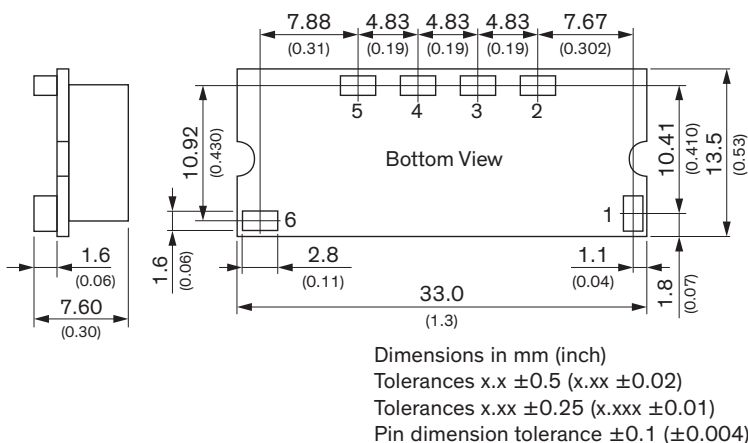
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: open circuit or Vin max. Off: 0 to 0.3 VDC Refers to 'Remote' and 'GND' Pin 2 mA typ. (12 Vin model: Open circuit or (Vin – 4 V) to Vin max. for on state)
Switching Frequency		270 - 330 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	3'300'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2a (J-STD-033C)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Soldering Profile		Reflow Soldering (J-STD-020E) 245°C / 10 s max.
Weight		6 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

## Supporting Documents

Overview Link (for additional Documents)

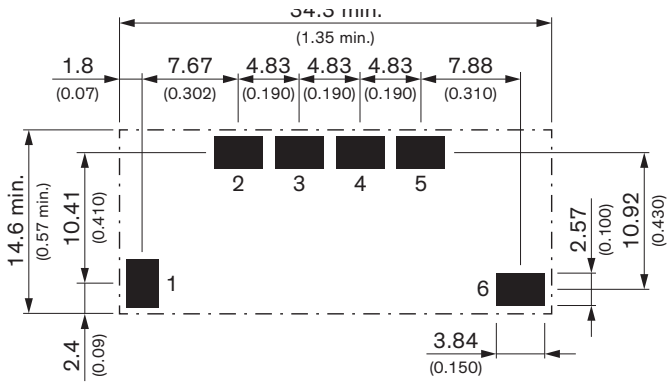
[www.tracopower.com/overview/tos10sm](http://www.tracopower.com/overview/tos10sm)

## Outline Dimensions



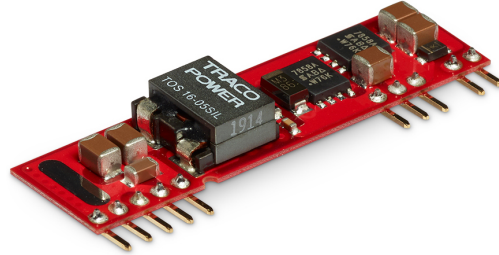
Pinout	
Pin	Function
1	Remote On/Off
2	+Sense
3	Trim
4	+Vout
5	GND
6	+Vin

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.





- Small size, low profile
- SIP version
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.75 VDC to 5.0 VDC
- Delivers up to 16 A with minimal derating
- Ultra high efficiency to 95 %
- Fast transient response
- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



UL 62368-1

The TOS 16SIL series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 16 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.75 VDC to 5.0 VDC. These converters work over a wide input voltage range of 2.4 to 5.5 VDC or 8.3 to 14.0 VDC. Further features include remote On/Off, under voltage lockout and over current protection. These products have an open-frame construction with very small footprint and are available in an industry standard SIP package. The TOS 16SIL series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 16-05SIL	16'000 mA	2.4 - 5.5 VDC (5 VDC nom.)	0.75 VDC (0.75 - 3.3 VDC)	95 %
TOS 16-12SIL		8.3 - 14 VDC (12 VDC nom.)	0.75 VDC (0.75 - 5.0 VDC)	92 %

## Input Specifications

Input Current	- At no load	5 Vin models: <b>130 mA typ.</b> 12 Vin models: <b>100 mA typ.</b> (at Vout max.)
Start-up Voltage		5 Vin models: <b>2.2 VDC typ. / 2.4 VDC max.</b> 12 Vin models: <b>7.9 VDC typ. / 8.3 VDC max.</b>
Under Voltage Lockout		5 Vin models: <b>1.6 VDC min. / 2 VDC typ. / 2.2 VDC max.</b> 12 Vin models: <b>6.5 VDC min. / 7.5 VDC typ. / 8 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>100 mAp-p typ.</b> 12 Vin models: <b>30 mAp-p typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>25'000 mA (fast acting)</b> 12 Vin models: <b>15'000 mA (fast acting)</b> (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos16sil">www.tracopower.com/overview/tos16sil</a>

## Output Specifications

Output Voltage Adjustment		0.75 Vout models: <b>0.75 - 3.3 VDC</b> <b>0.75 - 5.0 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos16sil">www.tracopower.com/overview/tos16sil</a> (Vin must be at least 0.5 V higher than Vout)
Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.3% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>50 mVp-p max.</b>
Capacitive Load		<b>5'000 µF max.</b> (ESR >10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.4 %/K max.</b>
Start-up Time		<b>8 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>180% typ. of Iout max.</b>
Transient Response	- Peak Variation  - Response Time	<b>300 mV typ.</b> (50% Load Step) (5 Vin model) <b>200 mV typ.</b> (50 % Load Step) (12 Vin model) <b>100 µs typ.</b> (50% Load Step) (with 1 µF MLCC    10 µF TC)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>UL 60950-1</b> <b>UL 62368-1</b>
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## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+115°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos16sil">www.tracopower.com/overview/tos16sil</a>
Cooling System		<b>Natural convection (20 LFM)</b>

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

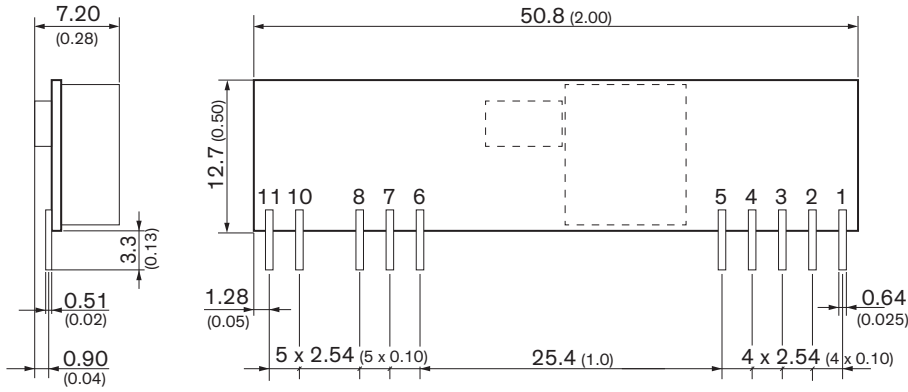
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: open circuit or Vin max. Off: 0 to 0.3 VDC Refers to 'Remote' and 'GND' Pin 2 mA typ. (12 Vin model: Open circuit or (Vin – 4 V) to Vin max. for on state)
Switching Frequency		270 - 330 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	3'200'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP20
Soldering Profile		Wave Soldering 265°C / 10 s max.
Weight		6 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-l (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

## Supporting Documents

Overview Link (for additional Documents) [www.tracopower.com/overview/tos16sil](http://www.tracopower.com/overview/tos16sil)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

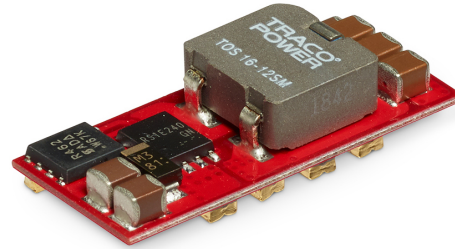
## Outline Dimensions



Dimensions in mm (inch)  
 Tolerances x.x ±0.5 (x.xx ±0.02)  
 Tolerances x.xx ±0.25 (x.xxx ±0.01)  
 Pin dimension tolerance ±0.1 (±0.004)

Pinout	
Pin	Function
1	+Vout
2	+Vout
3	+Sense
4	+Vout
5	GND
6	GND
7	+Vin
8	+Vin
10	Trim
11	Remote On/Off

- Small size, low profile
- SMT package
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.75 VDC to 5.0 VDC
- Delivers up to 16 A with minimal derating
- Ultra high efficiency to 95 %
- Fast transient response
- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



UL 62368-1

The TOS 16SM series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 16 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.75 VDC to 5.0 VDC. These converters work over a wide input voltage range of 2.4 to 5.5 VDC or 8.3 to 14.0 VDC. Further features include remote On/Off, under voltage lockout and over current protection. These products have an open-frame construction with very small footprint and are available in a SMD package. The TOS 16SM series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 16-05SM	16'000 mA	2.4 - 5.5 VDC (5 VDC nom.)	0.75 VDC (0.75 - 3.3 VDC)	95 %
TOS 16-12SM		8.3 - 14 VDC (12 VDC nom.)	0.75 VDC (0.75 - 5.0 VDC)	92 %

## Input Specifications

Input Current	- At no load	5 Vin models: 130 mA typ. 12 Vin models: 100 mA typ. (at Vout max.)
Start-up Voltage		5 Vin models: 2.2 VDC typ. / 2.4 VDC max. 12 Vin models: 7.9 VDC typ. / 8.3 VDC max.
Under Voltage Lockout		5 Vin models: 1.6 VDC min. / 2 VDC typ. / 2.2 VDC max. 12 Vin models: 6.5 VDC min. / 7.5 VDC typ. / 8 VDC max.
Reflected Ripple Current		5 Vin models: 100 mA <sub>p-p</sub> typ. 12 Vin models: 30 mA <sub>p-p</sub> typ. (with input filter, see application note)
Recommended Input Fuse		5 Vin models: 25'000 mA (fast acting) 12 Vin models: 15'000 mA (fast acting) (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos16sm">www.tracopower.com/overview/tos16sm</a>

## Output Specifications

Output Voltage Adjustment		0.75 Vout models: 0.75 - 3.3 VDC 0.75 - 5.0 VDC (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos16sm">www.tracopower.com/overview/tos16sm</a> (Vin must be at least 0.5 V higher than Vout)
Voltage Set Accuracy		±2% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.3% max. 0.4% max.
Ripple and Noise	- 20 MHz Bandwidth	50 mV <sub>p-p</sub> max.
Capacitive Load		5'000 µF max. (ESR >10 mOhm)
Minimum Load		Not required
Temperature Coefficient		±0.4 %/K max.
Start-up Time		8 ms typ.
Start-up Overshoot Voltage		3% max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		180% typ. of Iout max.
Transient Response	- Peak Variation - Response Time	300 mV typ. (50% Load Step) (5 Vin model) 200 mV typ. (50 % Load Step) (12 Vin model) 100 µs typ. (50% Load Step) (with 1 µF MLCC    10 µF TC)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	UL 60950-1 UL 62368-1
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## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +115°C max. -55°C to +125°C
Power Derating	- High Temperature	Depending on model See application note: <a href="http://www.tracopower.com/overview/tos16sm">www.tracopower.com/overview/tos16sm</a>
Cooling System		Natural convection (20 LFM)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

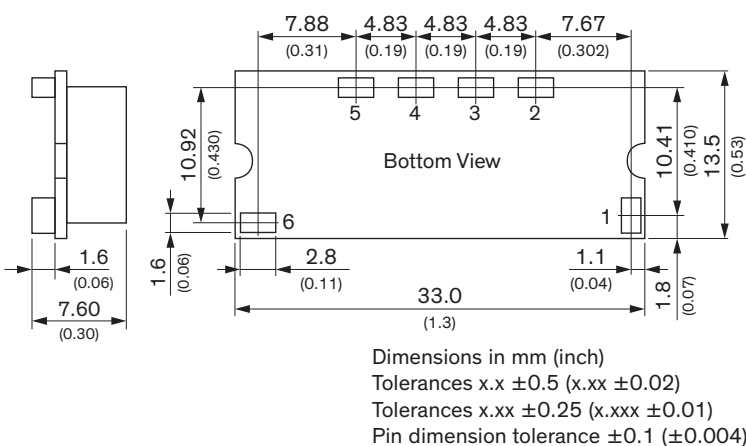
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: open circuit or $V_{in}$ max. Off: 0 to 0.3 VDC Refers to 'Remote' and 'GND' Pin 2 mA typ. (12 $V_{in}$ model: Open circuit or $(V_{in} - 4 V)$ to $V_{in}$ max. for on state)
Switching Frequency		270 - 330 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	3'200'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2a (J-STD-033C)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 $\mu$ m)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Soldering Profile		Reflow Soldering (J-STD-020E) 245°C / 10 s max.
Weight		6 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tos16sm](http://www.tracopower.com/overview/tos16sm)

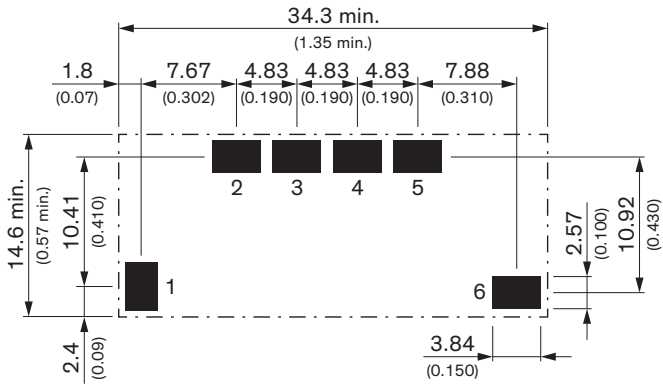
## Outline Dimensions



Pinout	
Pin	Function
1	Remote On/Off
2	+Sense
3	Trim
4	+Vout
5	GND
6	+Vin

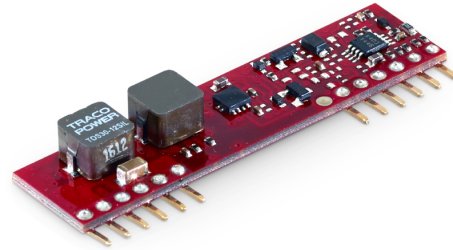
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

### Recommended Solder Pad Layout





- Small size, low profile
- SIP version
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.8 VDC to 5.5 VDC
- Delivers up to 30 A with minimal derating
- Ultra high efficiency to 93 %
- Fast transient response
- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



The TOS 30SIL series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 30 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.8 VDC to 5.5 VDC. These converters work over a wide input voltage range of 4.5 to 5.5 VDC or 6.0 to 14.0 VDC. Further features include remote On/Off, under voltage lockout, over temperature and over current protection. These products have an open-frame construction with very small footprint and are available in an industry standard SIP package. The TOS 30SIL series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

### Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 30-05SIL	30'000 mA	4.5 - 5.5 VDC (5 VDC nom.)	0.8 VDC (0.8 - 3.63 VDC)	93 %
TOS 30-12SIL		6 - 14 VDC (12 VDC nom.)	0.8 VDC (0.8 - 5.5 VDC)	92 %

### Options

<b>on demand</b> (backorder with MOQ non stocking item)	- Optional models with Load Share function
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Note - 12 Vin model: 25 A output voltage higher than 2.75 VDC

## Input Specifications

Input Current	- At no load	5 Vin models: <b>180 mA typ.</b> 12 Vin models: <b>200 mA typ.</b> (at Vout max.)
Under Voltage Lockout		5 Vin models: <b>3 VDC min. / 4 VDC typ. / 4.4 VDC max.</b> 12 Vin models: <b>4 VDC min. / 4.5 VDC typ. / 5.5 VDC max.</b>
Reflected Ripple Current		<b>100 mAp-p typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>35'000 mA</b> (fast acting) 12 Vin models: <b>30'000 mA</b> (fast acting) (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos30sil">www.tracopower.com/overview/tos30sil</a>

## Output Specifications

Output Voltage Adjustment		0.8 Vout models: <b>0.8 - 3.63 VDC</b> <b>0.8 - 5.5 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos30sil">www.tracopower.com/overview/tos30sil</a> (Vout < Vin - 0.5 VDC)
Voltage Set Accuracy		<b>±1.5% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.1% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>75 mVp-p typ.</b> (w/ 1 µF MLCC    10 µF T/C)
Capacitive Load		<b>10'000 µF max.</b> (ESR ≥ 10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.5 %/K max.</b>
Start-up Time		<b>2.5 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>150% typ. of Iout max.</b>
Transient Response	- Peak Variation - Response Time	<b>350 mV typ.</b> (50% to 100% Load Step) <b>25 µs typ.</b> (50% to 100% Load Step) (1 µF MLCC    10 µF T/C)
Load Share Function	- Refer to application note	<a href="http://www.tracopower.com/overview/tos30sil">www.tracopower.com/overview/tos30sil</a>
Load Share Accuracy		<b>10%</b>

## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+115°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos30sil">www.tracopower.com/overview/tos30sil</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	<b>125°C typ.</b> (Automatic recovery) See application note: <a href="http://www.tracopower.com/overview/tos30sil">www.tracopower.com/overview/tos30sil</a>
Cooling System		<b>Natural convection</b> (20 LFM)
Sense Function		<b>62.5% max. of Vout nom.</b> (equals 0.5 VDC max.) (If sense function is not used, sense pins should be connected to output pins.)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Remote Control	- Voltage Controlled Remote	On: 3.0 VDC to Vin max. or open circuit Off: -0.3 to 1.2 VDC Refers to 'Remote' and 'GND' Pin
	- Off Idle Input Current	3.3 mA max.
Switching Frequency		261 - 339 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	1'260'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP20
Soldering Profile		Wave Soldering 260°C / 6 s max.
Weight		7 g
Environmental Compliance	- REACH Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	74aba7b9-7723-4fee-805d-adba83300523

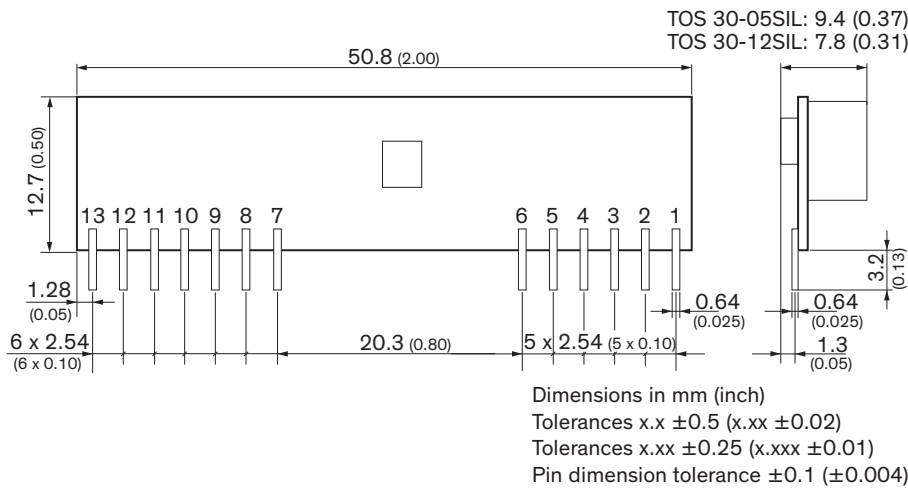
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tos30sil](http://www.tracopower.com/overview/tos30sil)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

## Outline Dimensions

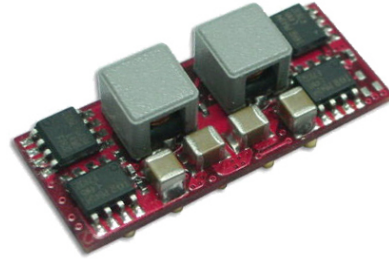


## Pinout

Pin	Function
1	+Vout
2	+Vout
3	+Sense
4	+Vout
5	GND
6	GND
7	Share (option)
8	GND
9	+Vin
10	+Vin
11	SEQ
12	Trim
13	Remote On/Off

For SEQ description see Application-Note

- Small size, low profile
- SMT package
- Cost-efficient open frame design
- Wide input voltage ranges
- Output voltages trim from 0.8 VDC to 3.6 VDC
- Delivers up to 30 A with minimal derating
- Ultra high efficiency to 93 %
- Fast transient response
- Remote On/Off control
- Wide temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



The TOS 30SM series is a range of high performance non-isolated DC/DC converters with very high efficiency that can supply up to 30 A of output current. These modules provide precisely regulated output voltages which can be set via an external resistor to a value from 0.8 VDC to 3.6 VDC. These converters work over a wide input voltage range of 4.5 to 5.5 VDC or 6.0 to 14.0 VDC. Further features include remote On/Off, under voltage lockout, over temperature and over current protection. These products have an open-frame construction with very small footprint and are available in an SMT package. The TOS 30SM series is fully RoHS compliant and can withstand industry standard handling, cleaning and the high temperatures of lead-free reflow solder processes.

## Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TOS 30-05SM	30'000 mA	4.5 - 5.5 VDC (5 VDC nom.)	0.8 VDC (0.8 - 3.63 VDC)	93 %
TOS 30-12SM		6 - 14 VDC (12 VDC nom.)	0.8 VDC (0.8 - 3.63 VDC)	92 %

## Options

<b>on demand</b> (backorder with MOQ non stocking item)	- Optional models with Load Share function
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Note - 12 Vin model: 20 A output voltage higher than 2.75 VDC

## Input Specifications

Input Current	- At no load	5 Vin models: <b>180 mA typ.</b> 12 Vin models: <b>200 mA typ.</b> (at Vout max.)
Under Voltage Lockout		5 Vin models: <b>3 VDC min. / 4 VDC typ. / 4.4 VDC max.</b> 12 Vin models: <b>4 VDC min. / 4.5 VDC typ. / 5.5 VDC max.</b>
Reflected Ripple Current		<b>100 mA<sub>p-p</sub> typ.</b> (with input filter, see application note)
Recommended Input Fuse		5 Vin models: <b>35'000 mA</b> (fast acting) 12 Vin models: <b>30'000 mA</b> (fast acting) (The need of an external fuse has to be assessed in the final application.)
Input Filter		See application note: <a href="http://www.tracopower.com/overview/tos30sm">www.tracopower.com/overview/tos30sm</a>

## Output Specifications

Output Voltage Adjustment		0.8 Vout models: <b>0.8 - 3.63 VDC</b> <b>0.8 - 3.63 VDC</b> (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tos30sm">www.tracopower.com/overview/tos30sm</a> (Vout < Vin - 0.5 VDC)
Voltage Set Accuracy		<b>±1.5% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	<b>0.1% max.</b> <b>0.4% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>75 mV<sub>p-p</sub> typ.</b> (w/ 1 µF MLCC    10 µF T/C)
Capacitive Load		<b>10'000 µF max.</b> (ESR ≥10 mOhm)
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.5 %/K max.</b>
Start-up Time		<b>2.5 ms typ.</b>
Start-up Overshoot Voltage		<b>3% max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>150% typ. of Iout max.</b>
Transient Response	- Peak Variation - Response Time	<b>350 mV typ.</b> (50% to 100% Load Step) <b>25 µs typ.</b> (50% to 100% Load Step) (1 µF MLCC    10 µF T/C)
Load Share Function	- Refer to application note	<a href="http://www.tracopower.com/overview/tos30sm">www.tracopower.com/overview/tos30sm</a>
Load Share Accuracy		<b>10%</b>

## General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	<b>-40°C to +85°C</b> <b>+115°C max.</b> <b>-55°C to +125°C</b>
Power Derating	- High Temperature	<b>Depending on model</b> See application note: <a href="http://www.tracopower.com/overview/tos30sm">www.tracopower.com/overview/tos30sm</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	<b>125°C typ.</b> (Automatic recovery) See application note: <a href="http://www.tracopower.com/overview/tos30sm">www.tracopower.com/overview/tos30sm</a>
Cooling System		<b>Natural convection</b> (20 LFM)
Sense Function		<b>62.5% max. of Vout nom.</b> (equals 0.5 VDC max.) (If sense function is not used, sense pins should be connected to output pins.)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

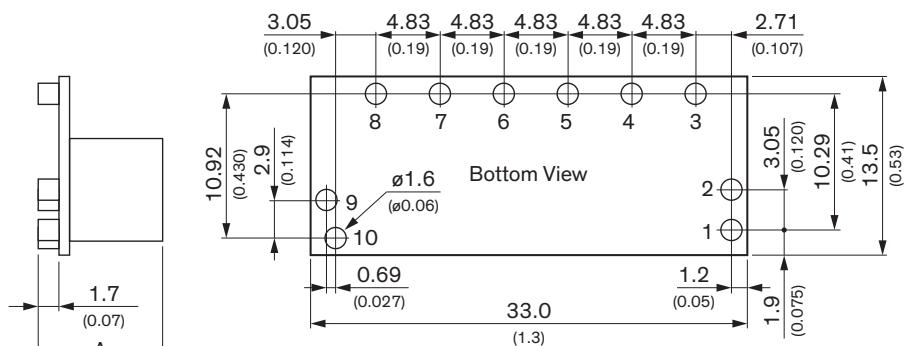
Remote Control	- Voltage Controlled Remote	On: 3.0 VDC to Vin max. or open circuit Off: -0.3 to 1.2 VDC
	- Off Idle Input Current	Refers to 'Remote' and 'GND' Pin 3.3 mA max.
Switching Frequency		261 - 339 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	1'260'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2a (J-STD-033C)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Soldering Profile		Reflow Soldering (J-STD-020E)
Weight		6 g
Environmental Compliance	- REACH Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	e7a6fd65-90ea-4967-a6fb-57a98cb52e59

## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tos30sm](http://www.tracopower.com/overview/tos30sm)

## Outline Dimensions



TOS 30-05SM: A = 9.40 (0.37)  
TOS 30-12SM: A = 7.80 (0.31)

Dimensions in mm (inch)  
Tolerances x.x ±0.5 (x.xx ±0.02)  
Tolerances x.xx ±0.25 (x.xxx ±0.01)  
Pin dimension tolerance ±0.1 (±0.004)

## Pinout

Pin	Function
1	Remote On/Off
2	GND (option)
3	Share (option)
4	+Sense
5	Trim
6	+Vout
7	GND
8	SEQ
9	GND (option)
10	+Vin

For SEQ description see Application-Note

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

**Recommended Solder Pad Layout**

