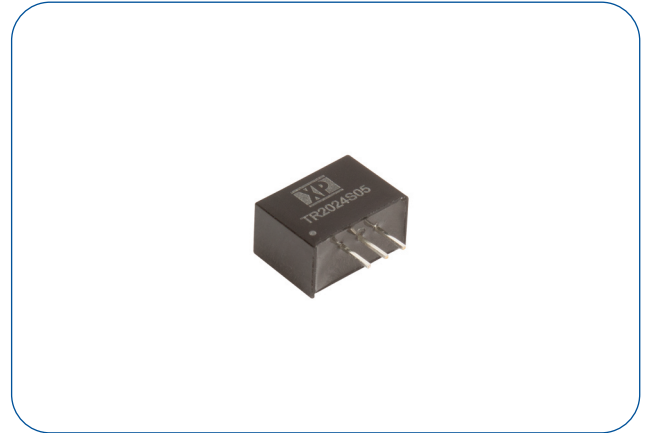


### 2.0 Amp

- 2A Switching Regulator
- Regulated Single Outputs from 1.2 to 15VDC
- Wide Input Range to 36V
- SIP3 Package
- Non Isolated
- High Efficiency to 96%
- Class B Conducted & Radiated Emissions
- Short Circuit Protection
- Low 1mA Standby Input Current
- -40°C to +100°C Operation
- MTBF >2.6Mhrs
- 3 Year Warranty



#### Dimensions:

**TR20:**  
0.55 x 0.30 x 0.40" (14.0 x 7.5 x 10.1 mm)

The TR20 provides a compact efficient switching regulator solution operating from a wide range DC input. Output voltages start from 1.2V and the TR20 consumes just 1mA when idle.

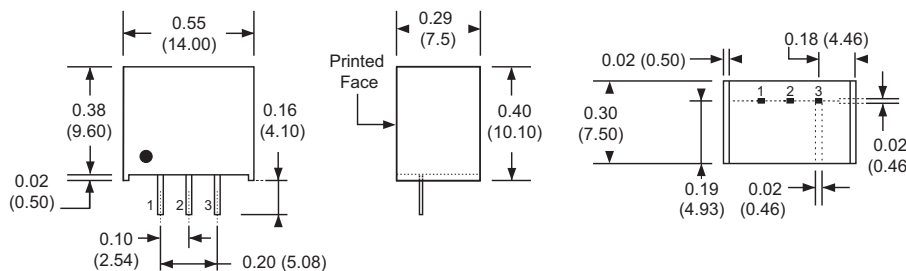
### Models & Ratings

Input Voltage	Output Voltage	Output Current	Input Current <sup>(1,2)</sup>	Max. Capacitive Load	Efficiency <sup>(3)</sup>	Model Number
3.0-5.5V	1.2V	2.0A	889mA	2500µF	90%	TR2005S1V2
3.0-5.5V	1.5V		1099mA	2000µF	91%	TR2005S1V5
3.0-5.5V	1.8V		1304mA	1600µF	92%	TR2005S1V8
3.8-5.5V	2.5V		1385mA	1200µF	95%	TR2005S2V5
4.6-36V	1.2V		621mA	2500µF	84%	TR2024S1V2
4.6-36V	1.5V		758mA	2000µF	86%	TR2024S1V5
4.6-36V	1.8V		899mA	1600µF	87%	TR2024S1V8
4.6-36V	2.5V		1221mA	1200µF	89%	TR2024S2V5
4.75-36V	3.3V		1527mA	900µF	91%	TR2024S3V3
6.5-36V	5.0V		1637mA	600µF	94%	TR2024S05
9-36V	6.5V		1537mA	470µF	94%	TR2024S6V5
12-36V	9.0V		1579mA	330µF	95%	TR2024S09
15-36V	12.0V		1684mA	270µF	95%	TR2024S12
18-36V	15.0V		1736mA	200µF	96%	TR2024S15

#### Notes

1. No load input current 1mA.
2. Input current measured at full load and minimum input voltage.
3. Efficiency measured at full load and minimum input voltage.
4. Standard tube quantity 30 pcs

### Mechanical Details



Pin Connections	
Pin	Single
1	+Vin
2	Ground
3	+Vout

#### Notes

1. All dimensions are in inches (mm)
2. Weight: 0.005lbs (2.4g) approx.
3. Pin diameter: 0.03±0.006 (0.65±0.15)
4. Pin pitch tolerance: ±0.014 (±0.35)
5. Case & pin tolerance: ±0.02 (±0.5)

### Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage Range	3		36	VDC	See Models and Ratings table.
Input Filter	Capacitor				
Input Reflected Ripple			35	mA pk-pk	Measured with 12µH inductor and 10µF capacitor source values.
Input Surge			6/40	VDC for 100 ms	TR2005/TR2024 series.

### Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage	1.2		15	VDC	See Models and Ratings table.
Initial Set Accuracy			±2.0	%	At full load.
Minimum Load	0			mA	No minimum load required.
Line Regulation			±0.5	%	
Load Regulation		±1.0	±1.5	%	From 0% to full load. Maximum variation applies to ≤3V3 output voltage.
Transient Response			±5	%	For 50% load change. Recovery in 250µs.
Ripple & Noise		50/75		mV pk-pk	20 MHz bandwidth. ≤6.5Vout / ≥9.0Vout.
Short Circuit Protection	Continuous, with auto recovery				
Maximum Capacitive Load	See Models and Ratings table				
Temperature Coefficient			0.02	%/°C	
Overload Protection		8.5/3.5		A	TR2005/TR2024 series.
Startup Time		5		ms	Nominal Vin with resistive load.

### General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency			96	%	See models and ratings table.
Isolation: Input to Output	0			VDC	Non isolated.
Switching Frequency		1200/410		kHz	TR2005/TR2024 series.
Mean Time Between Failure	2.6			MHrs	TR2005/TR2024 series. MIL-HDBK-217F.
Weight		0.005 (2.4)		lb (g)	
Case Material	Non-conductive black plastic UL94V-0				
Pin Material	Copper matte tin coated				
Potting Material	Silicon, UL94V-0 rated				
Soldering Temperature			260	°C	Wave solder peak, 1.5mm from case 10s max. Not suitable for vapour phase soldering. For further details contact XP Power applications team.

### Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-40		+100	°C	See derating curves.
Storage Temperature	-55		+125	°C	
Case Temperature			+105	°C	
Humidity			95	%RH	Non-condensing.
Cooling	Natural convection				

### Safety Approvals

Agency	Standard	Test Level	Notes & Conditions
CE	Meets all applicable directives		
UKCA	Meets all applicable legislation		

### EMC: Emissions

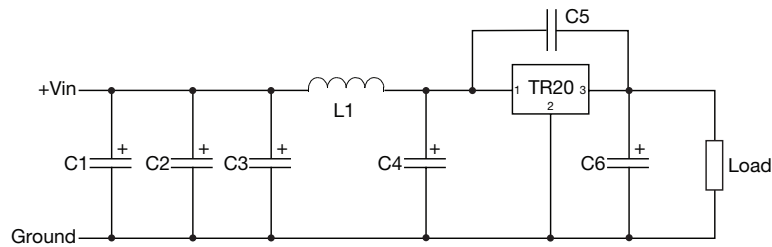
Phenomenon	Standard	Test Level	Notes & Conditions
Conducted	EN55032	Class B	See Application Notes
Radiated	EN55032	Class B	

### EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
ESD Immunity	EN61000-4-2	$\pm 6\text{kV}/\pm 8\text{kV}$	A	Contact discharge/Air discharge
Radiated Immunity	EN61000-4-3	20Vrms	A	See Application Notes
EFT/Burst	EN61000-4-4	$\pm 2.0\text{kV}$	A	
Surges	EN61000-4-5	$\pm 0.5\text{kV}$	A	
Conducted Immunity	EN61000-4-6	10Vrms	A	
Magnetic Fields	EN61000-4-8	100A/m	A	

### Application Note

#### EMI Filter

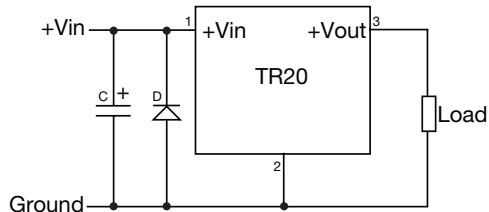


Components should be placed as close to the TR20 as possible

Part Number	C1	C2	C3	C4	C5	L1
TR2005	10 $\mu\text{F}$ , 50V	Not fitted	Not fitted	10 $\mu\text{F}$ , 50V	1nF, 50V	22 $\mu\text{H}$
TR2024	10 $\mu\text{F}$ , 50V	10 $\mu\text{F}$ , 50V	10 $\mu\text{F}$ , 50V	Not fitted	Not fitted	22 $\mu\text{H}$

C6: 47 $\mu\text{F}$  (optional) to improve transient response

#### EFT Filter



Part Number	C	D
TR2005	3300 $\mu\text{F}/10\text{V}$	SMDJ6.0A
TR2024	220 $\mu\text{F}/100\text{V}$	SMDJ26A

#### Derating Curves

