

**LEVEL VI**  
**EFFICIENCY EMI & EMC**



### Features

- Meets DoE Efficiency Level VI and EU CoC Tier 2 Requirements
  - No load input power
  - Average Efficiency
- Up to 60W of AC-DC Power
- Universal Input 90-264Vac Input Range
- Meets “Heavy Industrial” Levels of EN61000 EMC Requirements
- Meets EN55011/CISPR11, FCC Part 15.109 Class B Conducted & Radiated Emissions, with 6db margin
- EN/IEC/UL60950-1, 2<sup>nd</sup> Edition, Am. 2
- E-cap life of >8 years
- >900,000 hours MTBF
- 3 Year Warranty
- IP22 Rated Enclosure

### Description

A high performance AC to DC external power supply family designed for test & measurement and industrial applications. Fully compliant with Efficiency Level VI requirements per U.S. Dept. of Energy, and also compliant to the Heavy Industrial levels of various EN61000-4-x standards for EMC. The TE60A series models also meet Class B conducted and radiated EMI per FCC Part 15, EN55032, EN55022, CISPR22. Designed to allow easy integration with test and measurement equipment and other industrial applications.

### Model Selection

Model Number	Volts	Output Current	Output Power	Ripple & Noise <sup>1</sup>	Line Regulation	Load Regulation	Output Connector	Output Cable	Input Configuration
TE60A0551F01	5.0V	7.00A	35W	75mV pk-pk	±1%	±5%	6 pin Molex Type <sup>2</sup>		
TE60A0903F01	9.0V	6.00A	54W	90mV pk-pk	±1%	±5%	2.5 x 5.5 x 9.5mm Straight Barrel Type, center positive	#18AWG, See mechanical drawings for cable length.	Class I Desktop, IEC60320 C14 Receptacle
TE60A1203F01	12.0V	5.00A	60W	120mV pk-pk	±1%	±5%			
TE60A1503F01	15.0V	4.00A	60W	150mV pk-pk	±1%	±5%			
TE60A1803F01	18.0V	3.40A	60W	180mV pk-pk	±1%	±5%			
TE60A2403F01	24.0V	2.70A	60W	240mV pk-pk	±1%	±5%			
TE60A4803F01	48.0V	1.35A	60W	480mV pk-pk	±1%	±5%			
TE60A0551N01	5.0V	7.00A	35W	75mV pk-pk	±1%	±5%	6 pin Molex Type <sup>2</sup>		
TE60A0903N01	9.0V	6.00A	54W	90mV pk-pk	±1%	±5%	2.5 x 5.5 x 9.5mm Straight Barrel Type, center positive	#18AWG, See mechanical drawings for cable length.	Class II Desktop, IEC60320 C8 Receptacle
TE60A1203N01	12.0V	5.00A	60W	120mV pk-pk	±1%	±5%			
TE60A1503N01	15.0V	4.00A	60W	150mV pk-pk	±1%	±5%			
TE60A1803N01	18.0V	3.40A	60W	180mV pk-pk	±1%	±5%			
TE60A2403N01	24.0V	2.70A	60W	240mV pk-pk	±1%	±5%			
TE60A4803N01	48.0V	1.35A	60W	480mV pk-pk	±1%	±5%			
TE60A0551Q01	5.0V	7.00A	60W	75mV pk-pk	±1%	±5%	6 pin Molex Type <sup>2</sup>		
TE60A0903Q01	9.0V	6.00A	54W	90mV pk-pk	±1%	±5%	2.5 x 5.5 x 9.5mm Straight Barrel Type, center positive	#18AWG, See mechanical drawings for cable length.	Class II Desktop, IEC60320 C18 Receptacle
TE60A1203Q01	12.0V	5.00A	60W	120mV pk-pk	±1%	±5%			
TE60A1503Q01	15.0V	4.00A	60W	150mV pk-pk	±1%	±5%			
TE60A1803Q01	18.0V	3.40A	60W	180mV pk-pk	±1%	±5%			
TE60A2403Q01	24.0V	2.70A	60W	240mV pk-pk	±1%	±5%			
TE60A4803Q01	48.0V	1.35A	60W	480mV pk-pk	±1%	±5%			

Notes:

1. Measured at the output connector, with noise probe directly across output and load, terminated with 0.1µF ceramic and 47µF low ESR capacitors. For 5V and 6V models, values listed are typical, 100mV pk-pk maximum.
2. Molex p/n 39-01-2060 or equivalent. See outline drawing for pinout information.
3. For Input Class I models: For AC GND connected to output common (-), insert a “B” in the part number where the “A” is located (TE60B1203F01).
4. All specifications are typical at nominal input, full load, at 25°C ambient unless noted.

## General Specifications

<b>AC Input</b>	100-240Vac, ±10%, 47-63Hz, 1Ø	<b>Turn On Time</b>	Less than 1 sec @115Vac, full load
<b>Input Current</b>	115Vac: 1.5A, 230Vac: 0.75A	<b>Hold-up Time</b>	20mS min., at full Load, 100Vac input
<b>Inrush Current</b>	264Vac, cold start: will not exceed 40A	<b>Overtemperature Protection</b>	Will shutdown upon an over-temperature condition, auto-recovery.
<b>Input Fuses</b>	F1, F2: 2A, 250Vac fuses (line & neutral lines) provided on all models	<b>Overload Protection</b>	130 to 180% of rating, Hiccup Mode
<b>Earth Leakage Current</b>	Input-GND: <500µA@264Vac, 60Hz, NC Output-GND: <4mA@264Vac, 60Hz, NC	<b>Short Circuit Protection</b>	Hiccup Mode, auto recovery.
<b>Efficiency</b>	Meets US DoE Efficiency Level VI and EU CoC Tier 2 average efficiency levels	<b>Overvoltage Protection</b>	130 to 150% of output voltage (max. 60V on 48V model), hiccup mode
<b>Output Power</b>	60W continuous – See models chart for specific voltage model ratings.	<b>Isolation</b>	Input-Output: 4000Vac Input-Ground: 1500Vac Output-Ground: 1500Vac
<b>No Load Input Power</b>	<0.150W. Meets DoE Efficiency Level VI and EU CoC Tier 2 Requirements	<b>Safety Standards</b>	EN/CSA/UL/IEC 60950-1, 2nd Edition, Am 2
<b>Ripple and Noise</b>	See models chart on pg 1.	<b>Operating Temperature</b>	-20°C to +70°C. Derate above 40°C. Start Up at -40°C, full load, (warmup period before all parameters are within published specifications).
<b>Output Voltage</b>	See models chart on pg 1.	<b>Case Temperature</b>	Case Temperatures are within regulatory guidelines. Care should be taken to avoid prolonged contact with skin or other heat sensitive surfaces.
<b>Transient Response</b>	500µs response time for return to within 0.5% of final value for any 50% load step over the range of 5% to 100% of rated load, $\Delta i/\Delta t < 0.2A/\mu s$ . Max. voltage deviation is +/-3.5%.	<b>Temperature Derating</b>	See derating curve below.
<b>E-Cap Life</b>	>8 year life based on calculations at 115Vac/60Hz & 230Vac/50Hz, ambient 25°C at 24 hrs per day, 365 days/year, 6 power up cycles per day. (80% load on 12V model)	<b>MTBF</b>	>250,000 hours, full load, 110 & 220Vac input, 25°C amb., per Telcordia 332 Issue 6.
<b>Weight</b>	400g	<b>Storage Temperature</b>	-40°C to +85°C
<b>Safety Drop Test</b>	1.4m from table top to wooden platform, 6 faces.	<b>Altitude</b>	Operating: to 5000m Non-operating: -500 to 40,000 ft.
<b>Dimensions</b>	See mechanical drawings below.	<b>Relative Humidity</b>	5% to 95%, non-condensing
<b>Vibration</b>	Operating: 0.003g/Hz, 1.5grms overall, 3 axes, 10 min/axis, 1-500Hz. Non-Oper.: random waveform, 3 minutes per axis, 3 axes and Sine waveform, Vib. frequency/acceleration: 10-500Hz/1g, sweep rate of 1 octave / minutes, Vibration time of 10 sweeps / axes, 3 axes	<b>Shock</b>	Operating: Half-sine, 20gpk, 10mS, 3 axes, 6 shocks total Non-Operating: Half-sine waveform, impact acceleration of 100G, Pulse duration of 6 mS, Number of shocks: 3 for each of the three axis

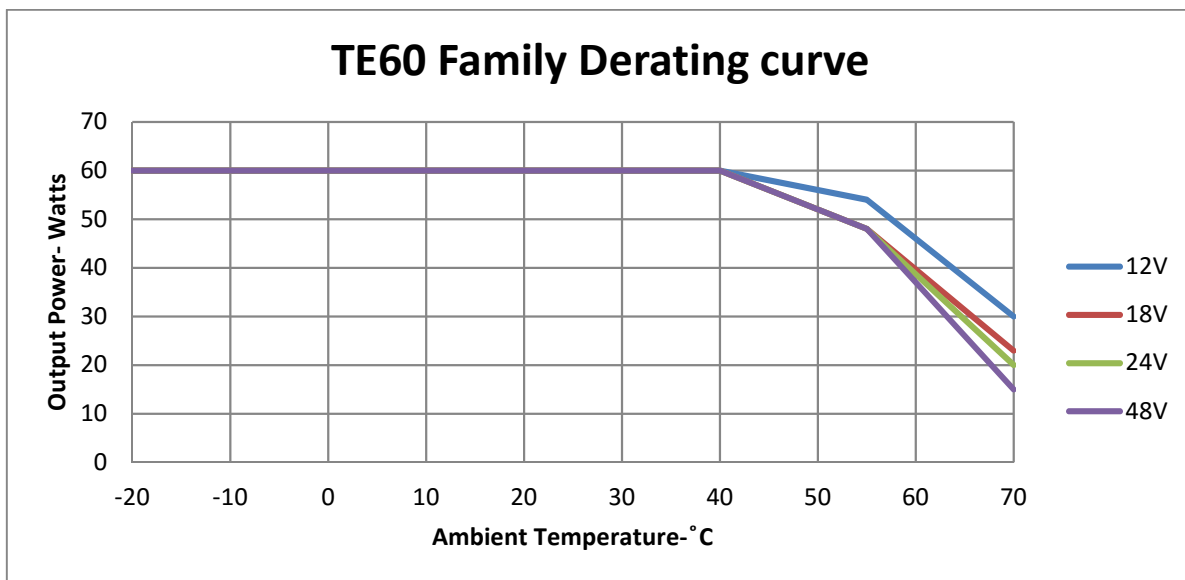
All specifications are typical at nominal input, full load, at 25°C ambient unless noted.

### EMI/EMC Compliance

<b>Conducted Emissions:</b>	EN55032//EN55022/CISPR22 Class B, FCC Part 15.107, Class B: 6db margin typ, 115/230Vac
<b>Radiated Emissions:</b>	EN55032/EN55022/CISPR22 Class B, FCC Part 15.109, Class B: 3db margin typ, 115/230Vac
<b>Common Mode Noise:</b>	High Frequency (100kHz-20MHz): <40mA pk-pk
<b>Electro-Static Discharge (ESD) Immunity on Power ports:</b>	EN55024/IEC61000-4-2, Level 4: +/- 8kV contact, +/- 15kV air, Criteria A
<b>Radiated RF EM Fields Susceptibility</b>	EN55022/EN61000-4-3, 10V/m, 80MHz-2.7GHz, 80% AM at 1kHz
<b>Electrical Fast Transients (EFT) /Bursts:</b>	EN55024/IEC61000-4-4, Level 4, +/- 4kV, 100Khz rep rate, 40A, Criteria A
<b>Surges, Line to Line (Diff Mode) and Line to GND (CMN Mode)</b>	EN55024/IEC61000-4-5, Level 4, +/-2kV DM, +/-4kV CM, Criteria A
<b>Conducted Disturbances induced by RF Fields</b>	EN55022/IEC61000-4-6, 10Vrms – Level 4, in ISM and amateur radio bands between 0.15Mhz and 80Mhz, 80% AM at 1KHz
<b>Rated Power frequency magnetic fields</b>	EN55024/IEC1000-4-8, Level 4: 30 A/m, 50/60 Hz
<b>Voltage Interruptions, Dips, Sags &amp; Surges</b>	EN55024/IECEN61000-4-11: --100% dip for 20mS, Criteria A --100% dip for 5000mS (250/300 cycles), Criteria B --60% dip for 100mS, Criteria B --30% dip for 500mS, Criteria A
<b>Harmonic Current Emissions</b>	EN55011/EN61000-3-2, Class A
<b>Flicker Test</b>	EN61000-3-3

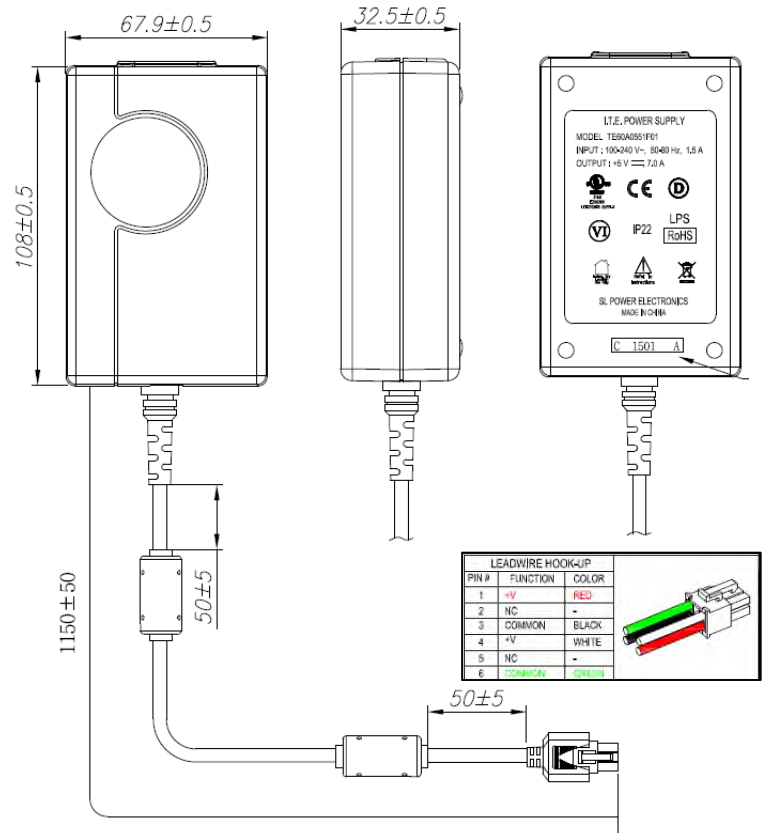
All specifications are typical at nominal input, full load, at 25°C ambient unless noted.

### TE60 Series Output Power Derating Curve:

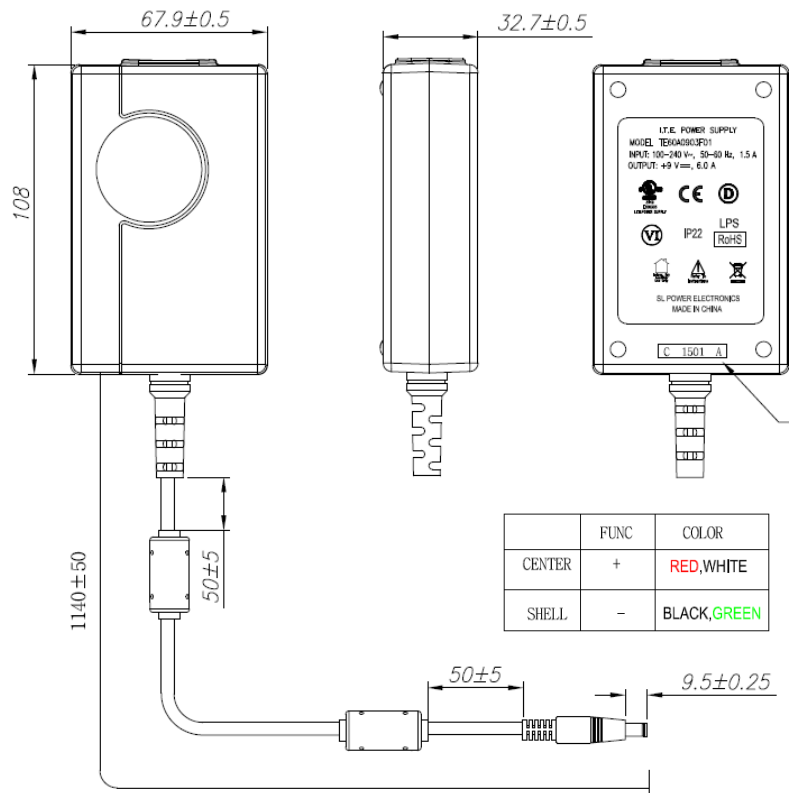


## Mechanical Drawings:

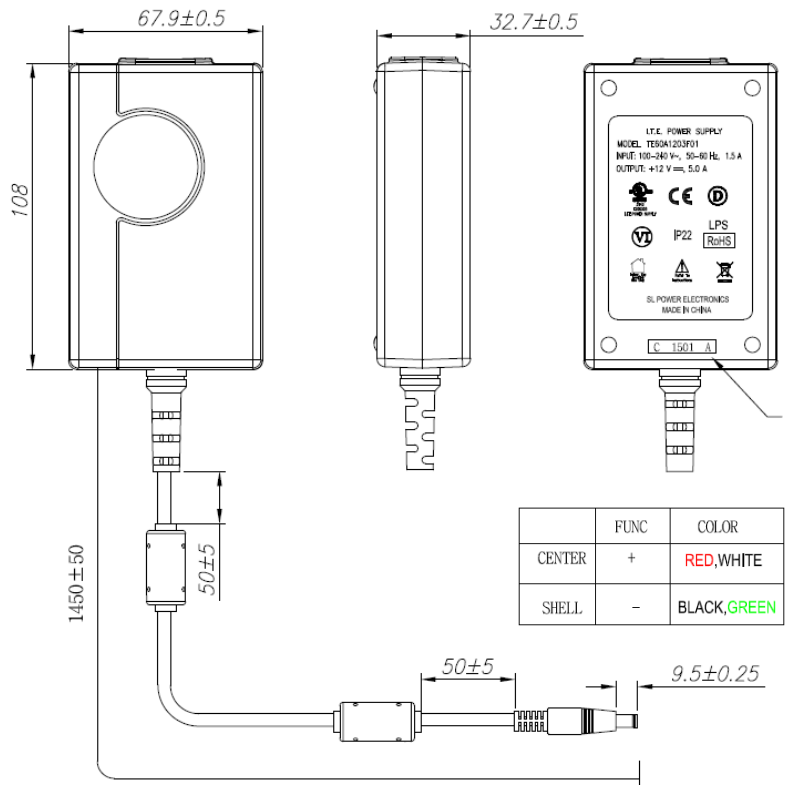
5V model:



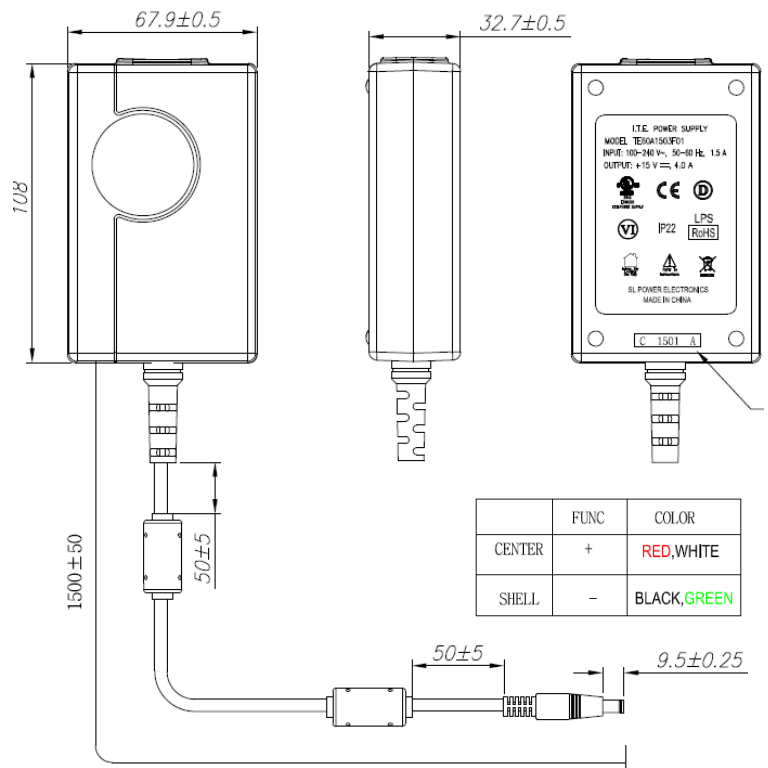
9V model:



12V model:



15V thru 48V models:



- Notes:**
- 1) All dimensions in (mm).
  - 2) The unit should not be covered or enclosed to protect against excessive case temperature rise.

## Connector Information

Standard models include a 2.5 x 5.5 x 9.5mm straight barrel type connector (Ault #3), center positive (6-pin Molex type - #51 – on 5V models). Other standard options are listed below. The “03” in the standard model number is replaced by the applicable digits below:

Connector No.	Description	Connector No.	Description
02	2.1 x 5.5 x 9.5mm straight barrel plug - Center Positive	44	2.1 x 5.5 x 9.5mm straight barrel plug, locking - Center Positive
03	2.5 x 5.5 x 9.5mm straight barrel plug - Center Positive (Standard Models)	45	2.5 x 5.5 x 9.5mm straight barrel plug, locking - Center Positive
12	5 pin DIN-180 male connector (Pins 3, 5 = (+), pins 1, 2, 4 = (-))	48	3 pin Snap n Lock, Kycon Kpp-3P or equivalent (Pin 1 = (+), pin 2 = (-))
22	6 pin DIN male connector (Pins 1, 2 = (+), pins 4, 5 = (-))	49	4 pin Snap n Lock, Kycon Kpp-4P or equivalent (Pins 1, 3 = (+), pins 2, 4 = (-))
23	8 pin DIN male connector (Pins 3, 7 = (+), pins 1, 4, 6, 8 = (-), shell = FG)	51	6 pin Minifit - Molex 39-01-2060 or equivalent (Pins 1, 4 = (+), pins 3, 6 = (-))
32	9 pin "D" type, female (Pin 8 = (+), pin 5 = (-), all others = NC)	65	Stripped and Tinned Leads
33	2.5 x 5.5 x 12.5mm straight barrel plug - Center Positive	70	2.1 x 5.5 x 11mm right angle barrel plug (high retention) - Center Positive
40	2.1 x 5.5 x 9.5mm right angle barrel plug (high retention) - Center Positive	71	2.5 x 5.5 x 11mm right angle barrel plug (high retention) - Center Positive
41	2.5 x 5.5 x 9.5mm right angle barrel plug (high retention) - Center Positive	72	2.1 x 5.5 x 9.5mm straight barrel plug (high retention, no spark) - Center Positive
42	2.1 x 5.5 x 11mm straight barrel plug (high retention) - Center Positive	73	2.5 x 5.5 x 9.5mm straight barrel plug (high retention, no spark) - Center Positive
43	2.5 x 5.5 x 11mm straight barrel plug (high retention) - Center Positive	74	EIAJ#5 style connector - Center Positive

## Efficiency Level VI Information:

Single-Voltage External AC-DC Power Supply, Basic-Voltage		
Nameplate Output Power (P <sub>out</sub> )	Minimum Average Efficiency in Active Mode (expressed as a decimal)	Maximum Power in No-Load Mode [W]
P <sub>out</sub> ≤ 1 W	≥ 0.5 × P <sub>out</sub> + 0.16	≤ 0.100
1 W < P <sub>out</sub> ≤ 49 W	≥ 0.071 × ln(P <sub>out</sub> ) - 0.0014 × P <sub>out</sub> + 0.67	≤ 0.100
49 W < P <sub>out</sub> ≤ 250 W	≥ 0.880	≤ 0.210
P <sub>out</sub> > 250 W	≥ 0.875	≤ 0.500
Single-Voltage External AC-DC Power Supply, Low-Voltage		
Nameplate Output Power (P <sub>out</sub> )	Minimum Average Efficiency in Active Mode (expressed as a decimal)	Maximum Power in No-Load Mode [W]
P <sub>out</sub> ≤ 1 W	≥ 0.517 × P <sub>out</sub> + 0.087	≤ 0.100
1 W < P <sub>out</sub> ≤ 49 W	≥ 0.0834 × ln(P <sub>out</sub> ) - 0.0014 × P <sub>out</sub> + 0.609	≤ 0.100
49 W < P <sub>out</sub> ≤ 250 W	≥ 0.870	≤ 0.210
P <sub>out</sub> > 250 W	≥ 0.875	≤ 0.500

TE60A 12V-48V

TE60A 5V

Note: No load power requirement for CoC Tier 2 is 0.150W