

Current Sensor : F01P***S05L



Features:

- Backward compatible to F01PS05 series
- Anti-Surge current (4kAT, 8/20uS, single)
- Mounting area reduced ; pin compatible. Longitudinal dimension reduced
- Super precision & High Stability (low temperature, drift)
- Unipolar power voltage ; +5V
- Multi-range models
- F01P***S05L series are designed by the pin compatibility as high-end models of S22P***X05M2 series.

Comparison of the main features of F*****S05L series

| Series | Features |
|-------------|---|
| F01P***S05L | No reference access |
| F02P***S05L | No reference access. Ref In/Out |
| F03P***S05L | No reference access. Ref In/Out. Higher creep age and clearance distance. |

*** = Rated Current Symbol

Specification

| | F01P***S05L |
|--|---|
| Maximum Peak Current | 4kAT (2kAx2. Number of primary turns is two turns) |
| Rated Current If (***= rated current symbol) | 6A(006) / 15A(015) / 25A(025) 50A(050) |
| Maximum Current | ±20A(If=6A) / ±51A(If=15A) / ±85A(If=25A) / ±150A(If=50A) |
| Existence of reference access | 0 |
| Number of primary busbar | 3 pcs |
| Clearance distance ; Primary ↔ Secondary | 7.7 mm |
| Standards | UL508 (file#E243511) , EN501758, EN61010-1 , EN60950-1 |
| Ambient Operating Temperature | -40°C ~ +105°C |

Mounting Area



The mounting area has been reduced more than the F01P series. However, F01P***S05L series are 100% compatible with original footprint mounting.

The F02P/F03PxxxS05L series also similarly reduces the mounting area.

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Absolute Maximum Rating

| | Symbol | Unit | Value | Notes |
|-------------------------------|--------|------|-------|---|
| Supply Voltage | Vcc | V | 7 | |
| Primary Conductor Temperature | - | °C | 110 | |
| ESD (HBM: Human Body Model) | - | kV | 4 | C=100pF , R=1.5kΩ |
| Maximum Peak Current | - | kAT | 4 | Current Waveform : <ul style="list-style-type: none"> • Front time 8μs • Time to half value 20μs • Single |

Isolation Characteristics

| | Symbol | Unit | Value | Notes |
|----------------------------------|--------|------|---|---|
| Insulation Voltage | Vd | - | AC4200V for 1 min. (Sensing Current 0.5mA) | Primary↔Secondary |
| Insulation Resistance | Ris | - | ≥500mΩ (@DC500V) | Primary↔Secondary |
| Clearance distance | dCi | - | 7.7mm (TYP) | Primary↔Secondary |
| Creep age distance | dCp | - | 7.7mm (TYP) | Primary↔Secondary |
| Case material | - | - | UL94 V-0 | |
| Comparative Tracking Index (CTI) | CTI | V | 600 | |
| Application Example | - | - | 300V , CAT III , PD2 | Reinforced Isolation Non uniform field according to EN50178 , EN61010 |
| | - | - | 600V , CAT III , PD2 | Simple isolation Non uniform field according to EN50178 , EN61010 |

Environmental and Mechanical Characteristics

| | Symbol | Unit | Value | | |
|-------------------------------|--------|------|-------|-----|-------|
| | | | min | typ | max |
| Ambient Operating Temperature | Ta | °C | - 40 | | + 105 |
| Ambient Storage Temperature | Ts | °C | - 40 | | +105 |
| Mass | - | g | | 12 | |

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Specification

(*1) = Offset voltage value is after removal of core hysteresis

| | | Symbol | Unit | Value | | | Notes |
|--|-------------|--------|------|---------|------|-------|--------------------|
| | | | | min | typ | max | |
| Rated Current | F01P006S05L | If | A | | 6 | | |
| | F01P015S05L | | | | 15 | | |
| | F01P025S05L | | | | 25 | | |
| | F01P050S05L | | | | 50 | | |
| Maximum Current (@ Vcc : +5V , Ta : +105°C) | F01P006S05L | Ipmax | A | - 20 | | 20 | |
| | F01P015S05L | | | - 51 | | 51 | |
| | F01P025S05L | | | - 85 | | 85 | |
| | F01P050S05L | | | - 150 | | 150 | |
| Supply Voltage | | Vcc | V | 4.75 | 5.00 | 5.25 | |
| Number of primary turns | | Np | T | 1,2,3 | | | |
| Number of secondary turns | F01P006S05L | Ns | T | | 1816 | | |
| | F01P015S05L | | | | 1737 | | |
| | F01P025S05L | | | | 1764 | | |
| | F01P050S05L | | | | 1600 | | |
| Consumption current (at If) | F01P006S05L | Icc | mA | | 25 | | Icc=15+Ip(mA) / Ns |
| | F01P015S05L | | | | 30 | | |
| | F01P025S05L | | | | 35 | | |
| | F01P050S05L | | | | 55 | | |
| Output Voltage | | Vo | V | 0.375 | | 4.625 | |
| Output Voltage (Ip=0A) | | Vo | V | | 2.5 | | |
| Electrical Offset Voltage (*1) | F01P006S05L | Voe | mV | - 10.40 | | 10.40 | |
| | F01P015S05L | | | - 7.10 | | 7.10 | |
| | F01P025S05L | | | - 6.25 | | 6.25 | |
| | F01P050S05L | | | - 5.80 | | 5.80 | |
| Electrical Offset Current referred to primary | F01P006S05L | loe | A | - 0.10 | | 0.10 | |
| | F01P015S05L | | | - 0.17 | | 0.17 | |
| | F01P025S05L | | | - 0.25 | | 0.25 | |
| | F01P050S05L | | | - 0.46 | | 0.46 | |

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Specification

| | | Symbol | Unit | Value | | | Notes |
|---|-------------|-----------------|------------------------|-------|-------|-------|------------------------------|
| | | | | min | typ | max | |
| Temperature coefficient of Output voltage (@ Ip=0A) | F01P006S05L | TCVo | ppm/K | | ±10.0 | ±80.0 | ppm/K of 2.5V (-40°C~+105°C) |
| | F01P015S05L | | | | ±7.5 | ±70.0 | |
| | F01P025S05L | | | | ±6.5 | ±60.0 | |
| | F01P050S05L | | | | ±6.0 | ±60.0 | |
| Sensitivity (Theoretical value) | F01P006S05L | Gth | mV/A | | 104.2 | | 625mV/If |
| | F01P015S05L | | | | 41.67 | | |
| | F01P025S05L | | | | 25 | | |
| | F01P050S05L | | | | 12.5 | | |
| Sensitivity Error | | ε _G | % | - 0.7 | | 0.7 | |
| Temperature coefficient of Sensitivity (@Ta=-40°C~+105°C) | | TCG | ppm/K | | | ±40 | |
| Output Linearity | | ε _L | % | - 0.1 | | 0.1 | |
| Magnetic offset current referred to primary (@ 10xf) | | I _{om} | A | - 0.1 | | 0.1 | |
| Output current noise referred to primary (@ 100Hz~100kHz) | F01P006S05L | I _{no} | μA/(Hz) ^{1/2} | | 36 | | RL=1kΩ |
| | F01P015S05L | | | | 90 | | |
| | F01P025S05L | | | | 150 | | |
| | F01P050S05L | | | | 300 | | |
| Peak to peak output ripple at oscillator frequency (f typ=450kHz) | F01P006S05L | - | mV | | 40 | 160 | RL=1kΩ |
| | F01P015S05L | | | | 15 | 60 | |
| | F01P025S05L | | | | 10 | 40 | |
| | F01P050S05L | | | | 5 | 20 | |
| Reaction time (@ 10% of If) | F01P006S05L | tra | μs | | | 0.3 | RL=1kΩ, di/dt=18A/μs |
| | F01P015S05L | | | | | 0.3 | RL=1kΩ, di/dt=44A/μs |
| | F01P025S05L | | | | | 0.3 | RL=1kΩ, di/dt=68A/μs |
| | F01P050S05L | | | | | 0.3 | RL=1kΩ, di/dt=100/μs |
| Response time (@90% of If) | F01P006S05L | tr | μs | | | 0.3 | RL=1kΩ, di/dt=18A/μs |
| | F01P015S05L | | | | | 0.3 | RL=1kΩ, di/dt=44A/μs |
| | F01P025S05L | | | | | 0.3 | RL=1kΩ, di/dt=68A/μs |
| | F01P050S05L | | | | | 0.3 | RL=1kΩ, di/dt=100/μs |

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Specification

| | | Symbol | Unit | Value | | | Comment |
|--|-------------|--------|---------|-------|-----|-----|---|
| | | | | min | typ | max | |
| Response time 2 (@ 10% of I_f to 90% of V_o) | | t_r | μs | | | 0.6 | $R_L=1k\Omega$ |
| Frequency bandwidth ($\pm 1dB$) | | BW | kHz | 200 | | | $R_L=1k\Omega$ |
| Frequency bandwidth ($\pm 3dB$) | | BW | kHz | 300 | | | $R_L=1k\Omega$ |
| Output Voltage Accuracy (Overall) | F01P006S05L | X_G | % | | | 2.5 | $X_G=(100 \times V_{oe}/625)+\epsilon_G+\epsilon_L$ |
| | F01P015S05L | | | | | 1.9 | |
| | F01P025S05L | | | | | 1.8 | |
| | F01P050S05L | | | | | 1.7 | |

Standards

EN 50178; EN 61010-1 ; EN 60950-1 ; UL 508 (file no. E243511)

Characteristic Curve (TYP)



Figure 1: Linearity curve



Figure 2: Frequency response curve

ex) F01P025S05L

Measurement condition $T_a=+25^\circ C$, $R_L=1k\Omega$, $I_p=3A$, $V_{cc}=+5V$

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Maximum Continuous DC primary current

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

1. $I_p < I_{pmax}$
2. Junction temperature $T_j < 125^\circ\text{C}$
3. Primary conductor temperature $< 110^\circ\text{C}$
4. Resistor power dissipation $< 0.5 \times \text{rated power}$

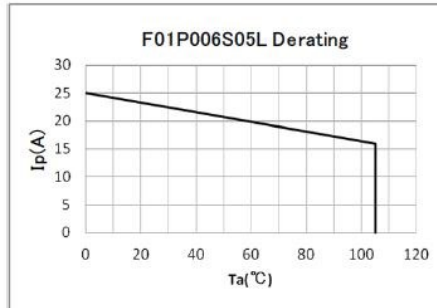


Figure 3: Ip vs Ta for F01P006S05L

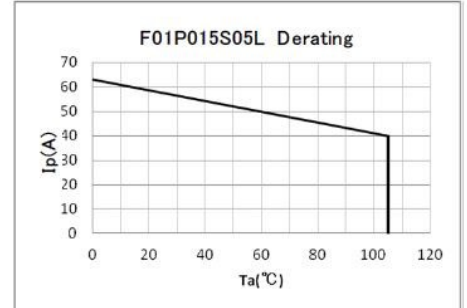


Figure 4: Ip vs Ta for F01P015S05L



Figure 5: Ip vs Ta for F01P025S05L

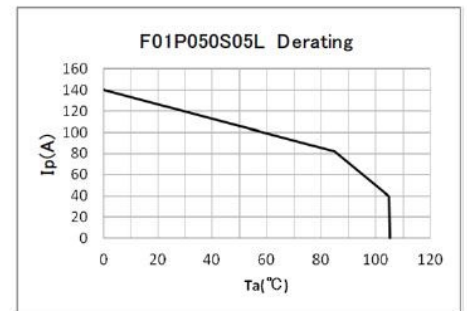


Figure 6: Ip vs Ta for F01P050S05L

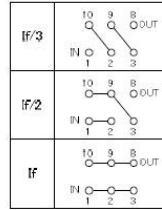
Frequency Derating



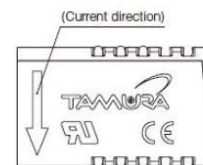
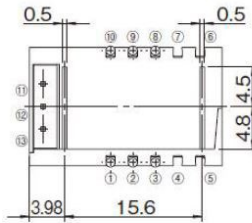
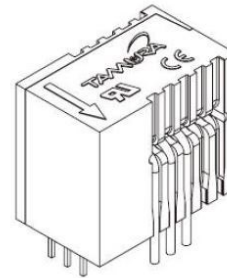
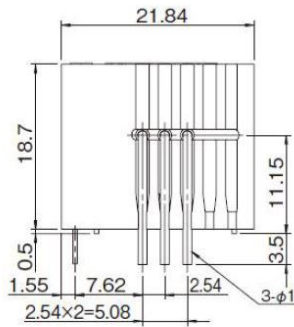
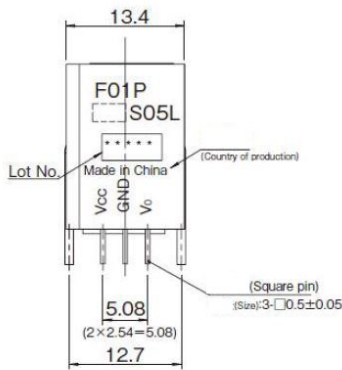
Figure 7 : Maximum RMS AC primary current / maximum DC primary current vs frequency

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Connection



Dimension (mm)



| Terminal number | |
|-----------------|-------------------|
| ① Input | ⑧ Output |
| ② Input | ⑨ Output |
| ③ Input | ⑩ Output |
| ④ - | ⑪ V _o |
| ⑤ - | ⑫ GND |
| ⑥ - | ⑬ V _{cc} |
| ⑦ - | |

Note

1. Unless otherwise specified, tolerances shall be $\pm 0.25\text{mm}$
2. Unit is [mm]

Recommended Hole Diameter (mm)

