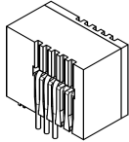


電流センサ CURRENT SENSOR

フラックスゲート型 / 電圧出力型 Fluxgate type / Voltage-output type

F02P SERIES

F02P006S05, F02P015S05, F02P025S05, F02P050S05

RoHS指令
適合品

■絶対最大定格 ABSOLUTE MAXIMUM RATINGS

仕様項目 Parameters	記号 Symbol	単位 Unit	規格値 Value	備考 Comment
電源電圧 Supply voltage	V _{cc}	V	7	
一次側導体温度 Primary conductor temperature	—	°C	110	
非繰り返し一次電流 (20 μs) Non repetitive primary current pulse (20 μs), in powered or unpowered state.	I _p	A	20 × I _f	
静電耐圧 (HBM:人体モデル) ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω

■絶縁性能 ISOLATION CHARACTERISTICS

仕様項目 Parameters	記号 Symbol	単位 Unit	規格値 Value	備考 Comment
絶縁耐圧 Insulation voltage	V _d	—	AC4100V, 1分間 (感応電流0.5mA) AC4100V, for 1minute (Sensing current 0.5mA)	一次 ⇔ 二次間 Primary ⇔ Secondary
絶縁抵抗 Insulation Resistance	R _{is}	—	≥ 500M Ω (at DC500V)	一次 ⇔ 二次間 Primary ⇔ Secondary
絶縁距離 Clearance distance	d _{Cl}	—	7.5mm	一次 ⇔ 二次間 Primary ⇔ Secondary
沿面距離 Creepage distance	d _{Cp}	—	7.5mm	一次 ⇔ 二次間 Primary ⇔ Secondary
ケース材料 Case material	—	—	UL94 V-0	
比較トラッキング指数 (CTI) Comparative Tracking Index: (CTI)	CTI	V	600	
適用例 Application example	—	—	300V, CAT III, PD2	強化絶縁, 不均一電界 EN50178, EN61010による Reinforced isolation, non uniform field according to EN50178, EN61010
	—	—	600V, CAT III, PD2	基礎絶縁, 不均一電界 EN50178, EN61010による Simple isolation, non uniform field according to EN50178, EN61010

■環境及び機械的性能 ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

仕様項目 Parameters	記号 Symbol	単位 Unit	規格値 Value			備考 Comment
			MIN	TYP	MAX	
動作温度範囲 Ambient operating temperature	T _a	°C	-40		+105	
保存温度範囲 Ambient storage temperature	T _s	°C	-40		+105	
製品重量 Mass	m	g		12		

仕様 SPECIFICATIONS

Ta=+25°C, RL=10kΩ, Vcc=+5V

仕様項目 Parameters		記号 Symbol	単位 Unit	規格値 Value			備考 Comment
				MIN	TYP	MAX	
定格電流 Rated Current	F02P006S05	If	A		6		
	F02P015S05				15		
	F02P025S05				25		
	F02P050S05				50		
最大電流 (at Vcc=+5V, Ta=+105°C) Maximum current (at Vcc=+5V, Ta=+105°C)	F02P006S05	I _{pmax}	A	-20		20	
	F02P015S05			-51		51	
	F02P025S05			-85		85	
	F02P050S05			-150		150	
供給電圧 Supply Voltage		V _{cc}	V	4.75	5.00	5.25	
一次側ターン数 Number of primary turns		N _p	T	1, 2, 3			
二次側ターン数 Number of secondary turns	F02P006S05	N _s	T		1816		
	F02P015S05				1737		
	F02P025S05				1764		
	F02P050S05				1600		
定格消費電流 Consumption current	F02P006S05	I _{cc}	mA		25		
	F02P015S05				30		
	F02P025S05				35		
	F02P050S05				55		
内部基準電圧 (at I _p =0A) Internal reference voltage (at I _p =0A)		V _{ref1}	V	2.495	2.500	2.505	Ref OUT mode
外部基準電圧 External reference voltage		V _{ref2}	V	0		4	Ref IN mode
出力電圧 Output voltage		V _o	V	0.375		4.625	
出力電圧 (at I _p =0A) Output voltage (at I _p =0A)		V _o	V		V _{ref1} , V _{ref2}		
電氣的オフセット電圧 *1 Electrical offset voltage	F02P006S05	V _{oe}	mV	-5.300		5.300	
	F02P015S05			-2.210		2.210	
	F02P025S05			-1.350		1.350	
	F02P050S05			-0.725		0.725	
一次側電氣的オフセット電流 Electrical offset current referred to primary	F02P006S05	I _{oe}	mA	-51		51	
	F02P015S05			-53		53	
	F02P025S05			-54		54	
	F02P050S05			-58		58	
内部基準電圧温度係数 Temperature coefficient of Internal reference voltage		TCV _{ref1}	ppm/K		±5.0	±50	
出力電圧温度係数 (at I _p =0A) Temperature coefficient of Output voltage (at I _p =0A)	F02P006S05	TCV _o	ppm/K		±6.0	±14	ppm/K of 2.5V (-40°C ~ +105°C)
	F02P015S05				±2.3	±6	
	F02P025S05				±1.4	±4	
	F02P050S05				±0.7	±3	
感度 (理論値) Sensitivity (Theoretical value)	F02P006S05	G _{th}	mV/A		104.2		625mV/If
	F02P015S05				41.67		
	F02P025S05				25		
	F02P050S05				12.5		
感度誤差 Sensitivity error		ε _G	%	-0.7		0.7	
感度温度係数 (at Ta=-40°C ~ +105°C) Temperature coefficient of Sensitivity (at Ta=-40°C ~ +105°C)		TCG	ppm/K			±40	
出力直線性 Output Linearity		ε _L	%	-0.1		0.1	
一次側磁氣的オフセット電流 (at 10×If) Magnetic offset current referred to primary (at 10×If)		I _{OM}	A	-0.1		0.1	
一次側入力換算ノイズ電流 (at 100Hz ~ 100kHz) Output current noise referred to primary (at 100Hz ~ 100kHz)		I _{no}	μA/(Hz) ^{1/2}		20		RL=1kΩ

*1 オフセット電圧はコアヒステリシス除去後の値とする。Offset voltage value is after removal of core hysteresis.

■仕様 SPECIFICATIONS

Ta=+25°C, RL=10kΩ, Vcc=+5V

仕様項目 Parameters	記号 Symbol	単位 Unit	規格値 Value			備考 Comment	
			MIN	TYP	MAX		
発振周波数における最大出力リップル (f typ=450kHz) Peak to peak output ripple at oscillator frequency (f typ=450kHz)	F02P006S05	—	mV		40	160	RL=1kΩ
	F02P015S05				15	60	
	F02P025S05				10	40	
	F02P050S05				5	20	
遅延時間 (at 10% of If) Reaction time (at 10% of If)	F02P006S05	tra	μs			0.3	RL=1kΩ, di/dt=18A/μs
	F02P015S05					0.3	RL=1kΩ, di/dt=44A/μs
	F02P025S05					0.3	RL=1kΩ, di/dt=68A/μs
	F02P050S05					0.3	RL=1kΩ, di/dt=100A/μs
応答時間 1 (at 90% of If) Response time 1 (at 90% of If)	F02P006S05	tr	μs			0.3	RL=1kΩ, di/dt=18A/μs
	F02P015S05					0.3	RL=1kΩ, di/dt=44A/μs
	F02P025S05					0.3	RL=1kΩ, di/dt=68A/μs
	F02P050S05					0.3	RL=1kΩ, di/dt=100A/μs
応答時間 2 (at 10% of If to 90% of Vo) Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL=1kΩ, di/dt=If/μs
周波数帯域幅 (±1dB) Frequency bandwidth (±1dB)		BW	kHz	200			RL=1kΩ
周波数帯域幅 (±3dB) Frequency bandwidth (±3dB)		BW	kHz	300			RL=1kΩ
出力電圧精度 (総合) Output Voltage Accuracy (Overall)	F02P006S05	X _G	%			1.7	
	F02P015S05					1.2	
	F02P025S05					1.0	
	F02P050S05					0.9	

■適用規格 STANDARDS

- EN50178 認定 Recognized
- EN61010-1 認定 Recognized
- EN60950-1 認定 Recognized
- UL508 認定 Recognized (file No.E243511)
- ・UL508適合について According to UL508

Ratings - Electrical :

Model	Primary (Feed-through)	Secondary(Sensing)	
		Input	Output
F02P006S05	6 A, 600 Vrms	5 Vdc, 25 mA	2.5 ± 2.2 Vdc, ±0.5 mA
F02P015S05	15 A, 600 Vrms	5 Vdc, 30 mA	
F02P025S05	25 A, 600 Vrms	5 Vdc, 35 mA	
F02P050S05	50 A, 600 Vrms	5 Vdc, 55 mA	

Ratings - Environmental :

Model	Maximum Surrounding Air Temperature Rating	Pollution Degree
F02P006S05	105°C	2
F02P015S05		
F02P025S05		
F02P050S05		

Caution : The maximum temperature at top of Case shall not be higher than 110°C and primary conductor shall not be higher than 108°C in the end-use product.

■特性曲線 (TYP) Characteristic curve (TYP)

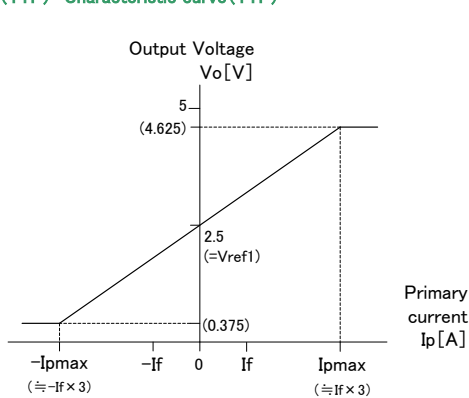


Figure 1: Linearity curve (Internal reference voltage)

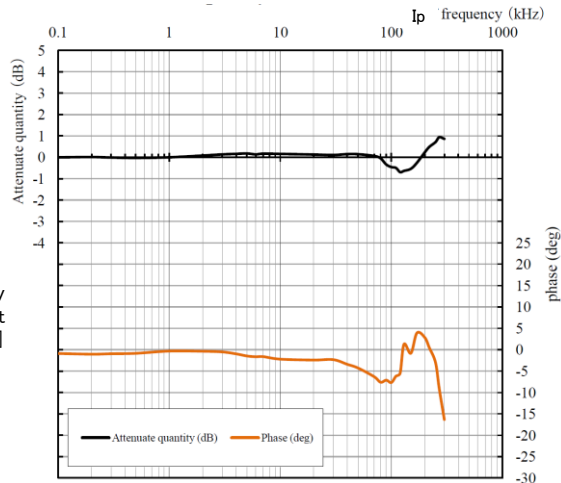


Figure 2: Frequency response curve

ex) F02P025S05

Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A, Vcc=+5V

■補足資料 SUPPORT DOCUMENTATION

最大繰り返し一次電流 Maximum continuous DC primary current

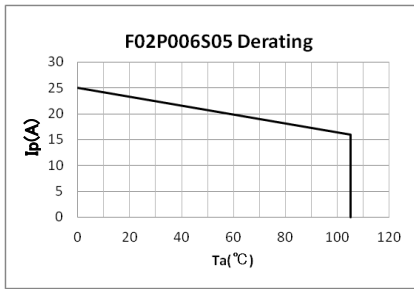


Figure 3: Ip vs Ta for F02P006S05

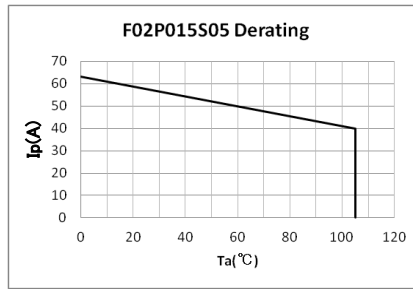


Figure 4: Ip vs Ta for F02P015S05

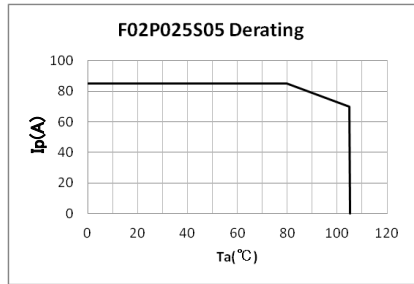


Figure 5: Ip vs Ta for F02P025S05

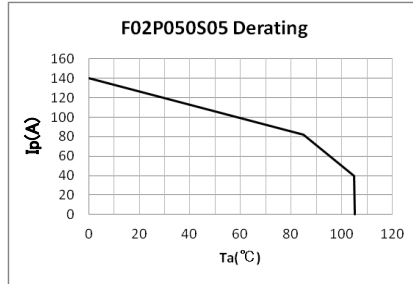


Figure 6: Ip vs Ta for F02P050S05

最大繰り返し一次電流は、次のすべての条件を満たします。

条件は以下となります。

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

- ① $I_p < I_{pmax}$
- ② ジャンクション温度 Junction temperature $T_j < 125^\circ\text{C}$
- ③ 一次側導体温度 Primary conductor temperature $< 110^\circ\text{C}$
- ④ 内部抵抗消費電力 Resistor power dissipation $< 0.5 \times \text{rated power}$

周波数によるディレーティング Frequency derating

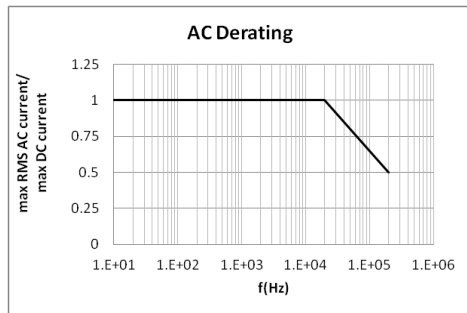


Figure 7: Maximum RMS AC primary current/maximum DC primary current vs frequency

外部基準電圧 External reference voltage

Refピンを使用しない場合、未接続として下さい。

If you do not want to use the Ref pin, please unconnected.

Refピンは、Ref IN と Ref OUT の二種類のモードがあります。

The Ref pin has two modes Ref IN and Ref OUT:

・Ref OUT モードは、高精度の2.5V内部リファレンスを両極性の電流検出の基準として使用します。

この内部基準電圧は、680Ω抵抗を経由してRefピンに接続されています。

シンク及びソース電流は最大±5mAに制限されていますが、680Ω抵抗により許容範囲に抑えられます。

・In the Ref OUT mode the 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements; this internal reference is connected to the Ref pin of the transducer through the 680 ohms resistor. it tolerates sink and source current up to ±5mA, but the 680 ohms resistor prevent this current to exceed these limits.

・Ref IN モードは、外部基準電圧をRefピンに接続します。外部基準電圧は0~4Vまで供給可能です。

供給した電圧は、測定時の基準電圧となります。

・In the Ref IN mode, an external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V, its voltage is used as the reference voltage at the time of measurement.

ソース電流 $(V_{ref2} - 2.5) / 680$ 最大値は、 $V_{ref2} = 4V$ の際に 2.2mA となります。

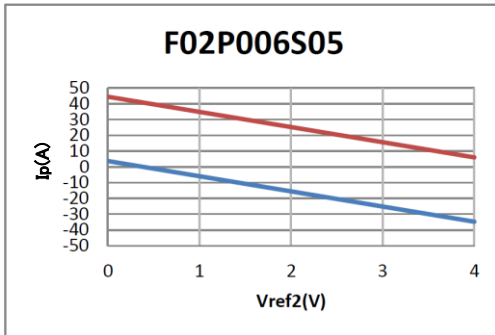
- either to source a typical current of $(V_{ref2} - 2.5) / 680$, the maximum value will be 2.2mA typ. when $V_{ref2} = 4V$.

シンク電流 $(2.5 - V_{ref2}) / 680$ 最大値は、 $V_{ref2} = 0V$ の際に 3.68mA となります。

- or to sink a typical current of $(2.5 - V_{ref2}) / 680$, the maximum value will be 3.68mA typ. when $V_{ref2} = 0V$.

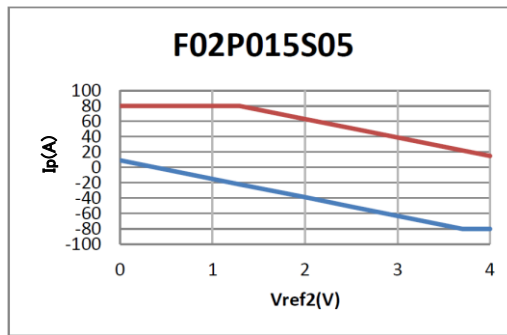
以下のグラフは、外部基準電圧値 V_{ref2} 変化による測定範囲を示します。

The following graphs show how the measuring range of each transducer version depends on external reference voltage value V_{ref2} .



測定範囲上限 Upper limit: $I_p = -9.6 \times V_{ref2} + 44.4$ ($V_{ref2} = 0 \dots 4V$)

測定範囲下限 Lower limit: $I_p = -9.6 \times V_{ref2} + 3.6$ ($V_{ref2} = 0 \dots 4V$)

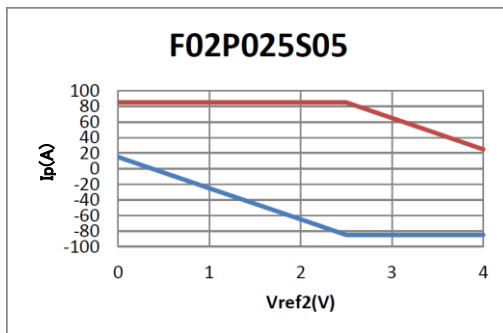


測定範囲上限 Upper limit: $I_p = 80$ ($V_{ref2} = 0 \dots 1.29V$)

$I_p = -24 \times V_{ref2} + 111$ ($V_{ref2} = 1.29 \dots 4V$)

測定範囲下限 Lower limit: $I_p = -24 \times V_{ref2} + 9$ ($V_{ref2} = 0 \dots 3.7V$)

$I_p = -80$ ($V_{ref2} = 3.7 \dots 4V$)

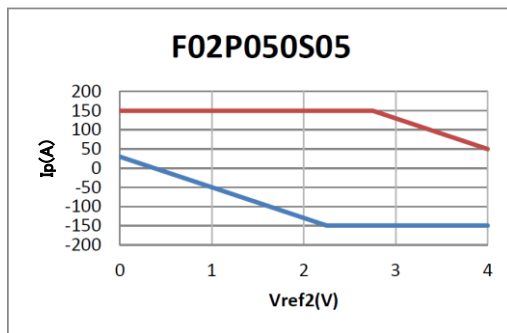


測定範囲上限 Upper limit: $I_p = 85$ ($V_{ref2} = 0 \dots 2.5V$)

$I_p = -40 \times V_{ref2} + 185$ ($V_{ref2} = 2.5 \dots 4V$)

測定範囲下限 Lower limit: $I_p = -40 \times V_{ref2} + 15$ ($V_{ref2} = 0 \dots 2.5V$)

$I_p = -85$ ($V_{ref2} = 2.5 \dots 4V$)



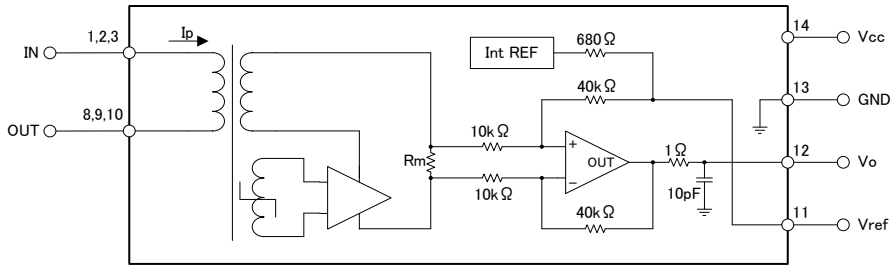
測定範囲上限 Upper limit: $I_p = 150$ ($V_{ref2} = 0 \dots 2.75V$)

$I_p = -80 \times V_{ref2} + 370$ ($V_{ref2} = 2.75 \dots 4V$)

測定範囲下限 Lower limit: $I_p = -80 \times V_{ref2} + 30$ ($V_{ref2} = 0 \dots 2.25V$)

$I_p = -150$ ($V_{ref2} = 2.25 \dots 4V$)

■接続図 CONNECTION



If/3	
If/2	
If	

■外形図 DIMENSIONS(mm)

