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TAMURA CURRENT SENSORS

Fluxgate system ／ Voltage-output type

F02P***S05 SERIES

rev A / May 2013

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
Non repetitive primary current pulse(20μS), in powered or unpowered state.	Îp	A	20 × If	
ESD(HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5kΩ

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4100V, for 1minute(Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500MΩ(at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	7.5mm(TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	7.5mm(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

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	−40		+105	
Ambient storage temperature	T_S	℃	−40		+105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃, RL=10kΩ, Vcc=+5V

Parameters		Symbol	Unit	Value MIN	Value TYP	Value MAX	Comment
Rated Current	F02P006S05	If	A		6		
	F02P015S05				15		
	F02P025S05				25		
	F02P050S05				50		
Maximum current(at Vcc=+5V, Ta=+105℃)	F02P006S05	Ipmax	A	−20		20	
	F02P015S05			−51		51	
	F02P025S05			−85		85	
	F02P050S05			−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	F02P006S05	Ns	T		1816		
	F02P015S05				1737		
	F02P025S05				1764		
	F02P050S05				1600		
Consumption current (at If)	F02P006S05	Icc	mA		25		Icc=15+Ip(mA)／Ns
	F02P015S05				30		
	F02P025S05				35		
	F02P050S05				55		
Internal reference voltage(at Ip=0A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
External reference voltage		Vref2	V	0		4	Ref IN mode
Output voltage		Vo	V	0.375		4.625	
Output voltage(at Ip=0A)		Vo	V		Vref1,Vref2		
Electrical offset voltage	F02P006S05	Voe	mV	−5.300		5.300	
	F02P015S05			−2.210		2.210	
	F02P025S05			−1.350		1.350	
	F02P050S05			−0.725		0.725	
Electrical offset current reffered to primary	F02P006S05	Ioe	mA	−51		51	
	F02P015S05			−53		53	
	F02P025S05			−54		54	
	F02P050S05			−58		58	
Temperature coefficient of Internal reference voltage		TCVref1	ppm/K		±5.0	±50	
Temperature coefficient of Output voltage(at Ip=0A)	F02P006S05	TCVo	ppm/K		±6.0	±14	ppm/K of 2.5V
	F02P015S05				±2.3	±6	(−40℃～+105℃)
	F02P025S05				±1.4	±4	
	F02P050S05				±0.7	±3	
Sensitivity(Theoretical value)	F02P006S05	Gth	mV/A		104.2		625mV/If
	F02P015S05				41.67		
	F02P025S05				25		
	F02P050S05				12.5		
Sensitivity error		ε_G	%	−0.7		0.7	
Temperature coefficient of Sensitivity(at Ta=−40℃～+105℃)		TCG	ppm/K			±40	
Output Linearity		ε_L	%	−0.1		0.1	
Magnetic offset current reffered to primary(at 10×If)		I_{OM}	A	−0.1		0.1	
Output current noise reffered to primary(at 100Hz～100kHz)		Ino	$\mu A/(Hz)^{1/2}$		20		RL=1kΩ

Offset voltage value is after removal of core hysteresis.

SPECIFICATIONS

Ta=+25℃, RL=10kΩ, Vcc=+5V

Parameters		Symbol	Unit	Value MIN	Value TYP	Value MAX	Comment
Peak to peak output ripple at oscillator freqency(f typ=450kHz)	F02P006S05	—	mV		40	160	RL=1kΩ
	F02P015S05				15	60	
	F02P025S05				10	40	
	F02P050S05				5	20	
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
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
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL=1kΩ, di/dt=If/μs
Frequency bandwidth(±1dB)		BW	kHz	200			RL=1kΩ
Frequency bandwidth(±3dB)		BW	kHz	300			RL=1kΩ
Output Voltage Accuracy(Overall)	F02P006S05	X_G	%			1.7	$X_G=(100\times Voe/625)+\varepsilon_G+\varepsilon_L$
	F02P015S05					1.2	
	F02P025S05					1.0	
	F02P050S05					0.9	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508(file №E243511)

※Please refer to the another sheet about conditions of UL Recognition.

Characteristic curve(TYP)

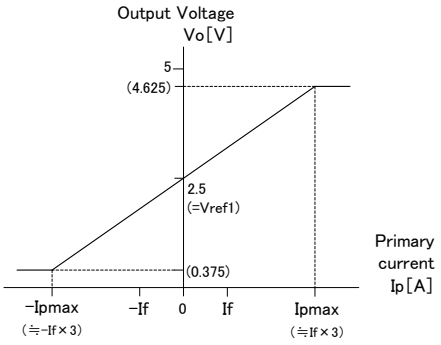


Figure 1:Linearity curve(Internal reference voltage)

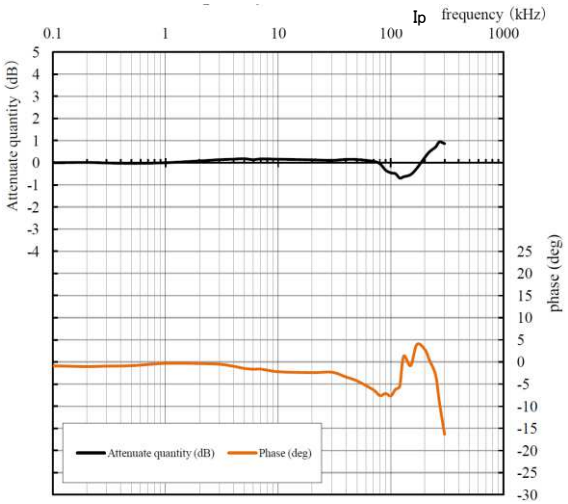


Figure 2:Frequency response curve
ex)F02P025S05
Measurement condition Ta=+25℃, RL=1kΩ, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

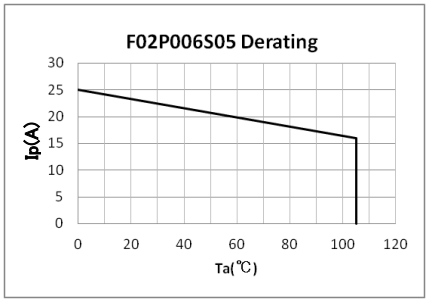


Figure 3 : Ip vs Ta for F02P006S05

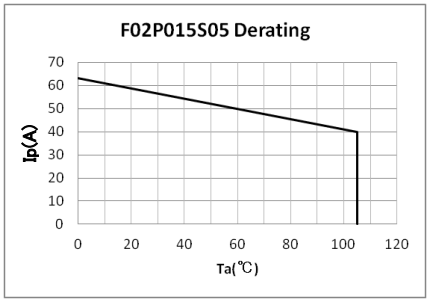


Figure 4 : Ip vs Ta for F02P015S05

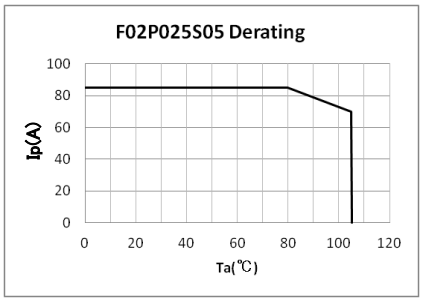


Figure 5 : Ip vs Ta for F02P025S05

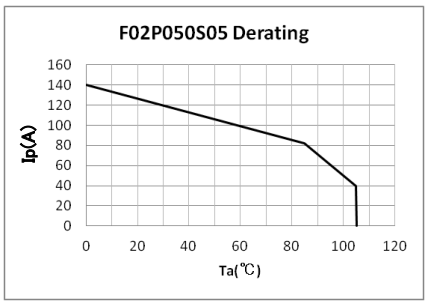


Figure 6 : Ip vs Ta for F02P050S05

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

①Ip ＜ Ipmax
②Junction temperature Tj ＜ 125℃
③Primary conductor temperature ＜ 110℃
④ Resistor power dissipation ＜ 0.5 x rated power

Frequency derating

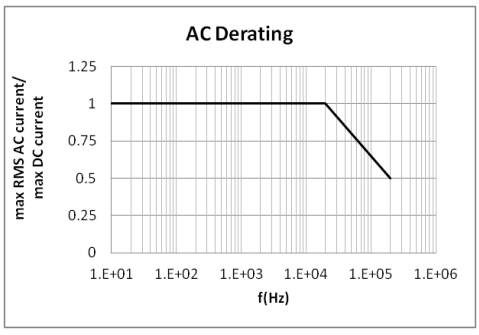


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

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

＜Ref OUT mode＞

The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

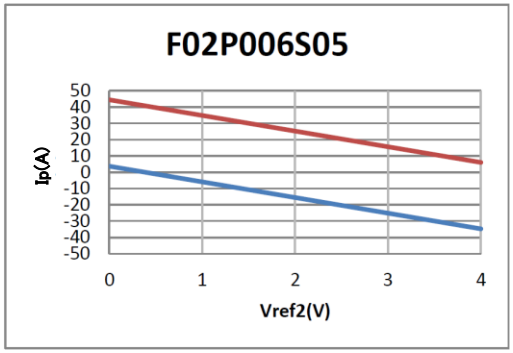
＜Ref IN mode＞

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.

-either to source a typical current of (Vref－2.5)/680,the maximum value will be 2.2mA typ.when Vref2＝4V.

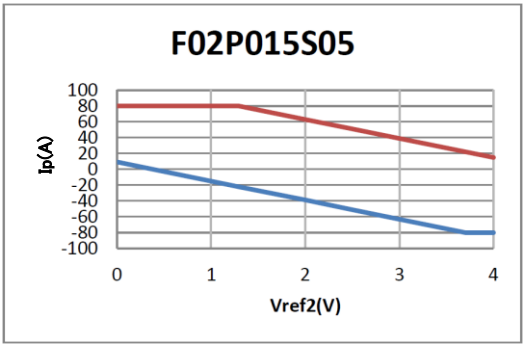
-or to sink a typical current of (2.5－Vref2)/680,the maximum value will be 3.68mA typ.when Vref2＝0V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.



Upper limit: Ip＝－9.6×Vref2＋44.4 (Vref2＝0...4V)

Lower limit: Ip＝－9.6×Vref2＋3.6 (Vref2＝0...4V)

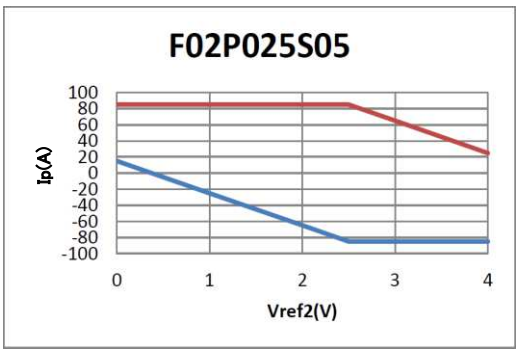


Upper limit: Ip＝80 (Vref2＝0...1.29V)

Ip＝－24×Vref2＋111(Vref2＝1.29...4V)

Lower limit: Ip＝－24×Vref2＋9 (Vref2＝0...3.7V)

Ip＝-80 (Vref2＝3.7...4V)

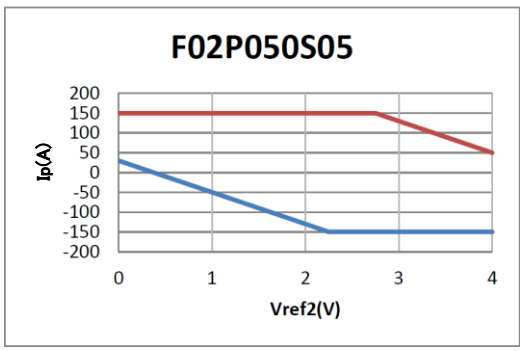


Upper limit: Ip＝85 (Vref2＝0...2.5V)

Ip＝－40×Vref2＋185 (Vref2＝2.5...4V)

Lower limit: Ip＝－40×Vref2＋15 (Vref2＝0...2.5V)

Ip＝－85 (Vref2＝2.5...4V)



Upper limit: Ip＝150 (Vref2＝0...2.75V)

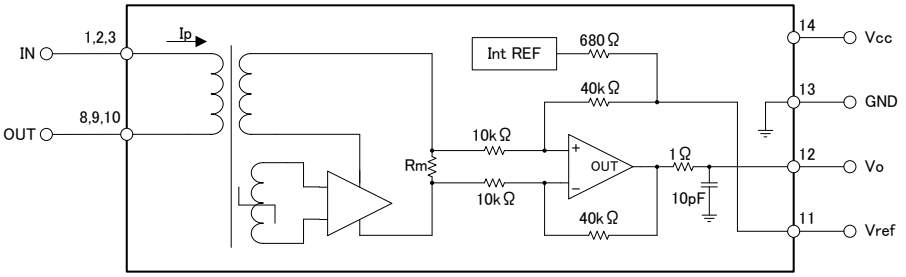
Ip＝－80×Vref2＋370 (Vref2＝2.75...4V)

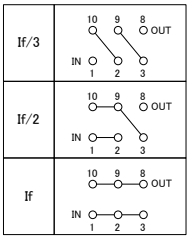
Lower limit: Ip＝－80×Vref2＋30 (Vref2＝0...2.25V)

Ip＝－150 (Vref2＝2.25...4V)

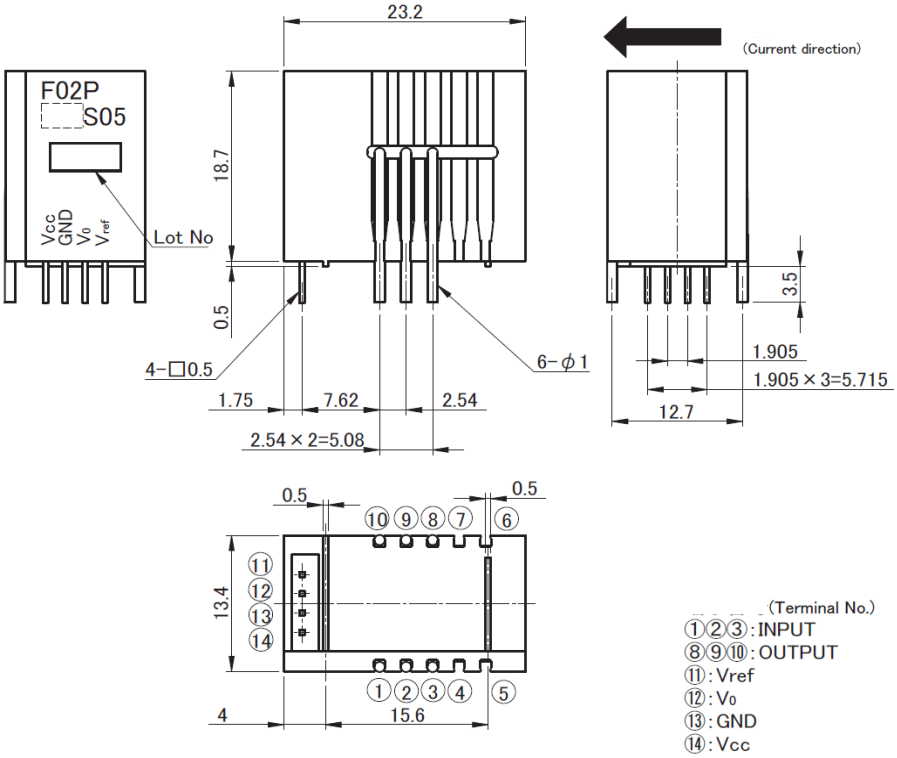
If you do not want to use the Ref pin, please unconnected.

CONNECTION





DIMENSIONS(mm)



(Terminal No.)
①②③:INPUT
⑧⑨⑩:OUTPUT
⑪:Vref
⑫:Vo
⑬:GND
⑭:Vcc

※
(Unless otherwise specified tolerances shall be ±0.5)

RECOMMENDED HOLE DIAMETER(mm)