



フラックスゲート式 / 電圧出力型  
Fluxgate system / Voltage-output type  
F03P SERIES



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	Vcc	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 <sub>p</sub>	A	20 × I <sub>f</sub>	
静電耐圧 (HBM:人体モデル) ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5kΩ

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 <sub>d</sub>	—	AC4300V, 1分間(感応電流0.5mA) AC4300V, for 1minute(Sensing current 0.5mA)	一次 ⇄ 二次間 Primary ⇄ Secondary
絶縁抵抗 Insulation Resistance	R <sub>is</sub>	—	≥ 500MΩ (at DC500V)	一次 ⇄ 二次間 Primary ⇄ Secondary
絶縁距離 Clearance distance	d <sub>ci</sub>	—	8.2mm (TYP)	一次 ⇄ 二次間 Primary ⇄ Secondary
沿面距離 Creepage distance	d <sub>cp</sub>	—	8.2mm (TYP)	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 EN61010による Reinforced isolation,non uniform field according to EN61010
	—	—	600V, CAT III, PD2	強化絶縁,不均一電界 EN50178による Reinforced isolation,non uniform field according to EN50178
	—	—	1000V, CAT III, PD2	基礎絶縁,不均一電界 EN50178による Simple isolation,non uniform field according to EN50178

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 <sub>a</sub>	°C	-40		+105	
保存温度範囲 Ambient storage temperature	T <sub>s</sub>	°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	F03P006S05	If	A		6		
	F03P015S05				15		
	F03P025S05				25		
	F03P050S05				50		
最大電流 Maximum current	F03P006S05	I <sub>pmax</sub>	A	-20		20	
	F03P015S05			-51		51	
	F03P025S05			-85		85	
	F03P050S05			-150		150	
供給電圧 Supply Voltage		V <sub>cc</sub>	V	4.75	5.00	5.25	
一次側ターン数 Number of primary turns		N <sub>p</sub>	T	1, 2, 3, 4			
二次側ターン数 Number of secondary turns	F03P006S05	N <sub>s</sub>	T		1816		
	F03P015S05				1737		
	F03P025S05				1764		
	F03P050S05				1600		
定格消費電流(at If) Consumption current (at If)	F03P006S05	I <sub>cc</sub>	mA		25		I <sub>cc</sub> =15+I <sub>p</sub> (mA)/N <sub>s</sub>
	F03P015S05				30		
	F03P025S05				35		
	F03P050S05				55		
内部基準電圧(at I <sub>p</sub> =0A) Internal reference voltage(at I <sub>p</sub> =0A)		V <sub>ref1</sub>	V	2.495	2.500	2.505	Ref OUT mode
外部基準電圧 External reference voltage		V <sub>ref2</sub>	V	0		4	Ref IN mode
出力電圧 Output voltage		V <sub>o</sub>	V	0.375		4.625	
出力電圧(at I <sub>p</sub> =0A) Output voltage(at I <sub>p</sub> =0A)		V <sub>o</sub>	V		V <sub>ref1</sub> , V <sub>ref2</sub>		
電気のオフセット電圧 *1 Electrical offset voltage	F03P006S05	V <sub>oe</sub>	mV	-5.300		5.300	
	F03P015S05			-2.210		2.210	
	F03P025S05			-1.350		1.350	
	F03P050S05			-0.725		0.725	
一次側電気のオフセット電流 Electrical offset current referred to primary	F03P006S05	I <sub>oe</sub>	mA	-51		51	
	F03P015S05			-53		53	
	F03P025S05			-54		54	
	F03P050S05			-58		58	
内部基準電圧温度係数 Temperature coefficient of Internal reference voltage		TCV <sub>ref1</sub>	ppm/K		±5.0	±50	
出力電圧温度係数(at I <sub>p</sub> =0A) Temperature coefficient of Output voltage(at I <sub>p</sub> =0A)	F03P006S05	TCV <sub>o</sub>	ppm/K		±6.0	±14	ppm/K of 2.5V (-40°C~+105°C)
	F03P015S05				±2.3	±6	
	F03P025S05				±1.4	±4	
	F03P050S05				±0.7	±3	
感度(理論値) Sensitivity(Theoretical value)	F03P006S05	G <sub>th</sub>	mV/A		104.2		625mV/If
	F03P015S05				41.67		
	F03P025S05				25		
	F03P050S05				12.5		
感度誤差 Sensitivity error		ε <sub>G</sub>	%	-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(at If) Output Linearity(at If)		ε <sub>L</sub>	%	-0.1		0.1	
一次側磁気的オフセット電流(at 10×If) Magnetic offset current referred to primary(at 10×If)		I <sub>oM</sub>	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 <sub>no</sub>	μA/(Hz) <sup>1/2</sup>		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)	F03P006S05	—		40	160	RL=1kΩ
	F03P015S05			15	60	
	F03P025S05			10	40	
	F03P050S05			5	20	
遅延時間 (at 10% of If) Reaction time (at 10% of If)	F03P006S05	tra			0.3	RL=1kΩ, di/dt=18A/μs
	F03P015S05				0.3	RL=1kΩ, di/dt=44A/μs
	F03P025S05				0.3	RL=1kΩ, di/dt=68A/μs
	F03P050S05				0.3	RL=1kΩ, di/dt=100A/μs
応答時間 1 (at 90% of If) Response time 1 (at 90% of If)	F03P006S05	tr			0.3	RL=1kΩ, di/dt=18A/μs
	F03P015S05				0.3	RL=1kΩ, di/dt=44A/μs
	F03P025S05				0.3	RL=1kΩ, di/dt=68A/μs
	F03P050S05				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			0.6	RL=1kΩ, di/dt=If/μs
周波数帯域幅 (±1dB) Frequency bandwidth (±1dB)		BW		200		RL=1kΩ
周波数帯域幅 (±3dB) Frequency bandwidth (±3dB)		BW		300		RL=1kΩ
出力電圧精度 (総合) Output Voltage Accuracy (Overall)	F03P006S05	X <sub>G</sub>			1.7	$X_G = (100 \times V_{oe} / 625) + \epsilon_G + \epsilon_L$
	F03P015S05				1.2	
	F03P025S05				1.0	
	F03P050S05				0.9	

適用規格 STANDARDS

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

※UL承認条件につきましては、別紙を参照願います。  
※Please refer to the another sheet about conditions of UL Recognition.

特性曲線 (TYP) Characteristic curve (TYP)

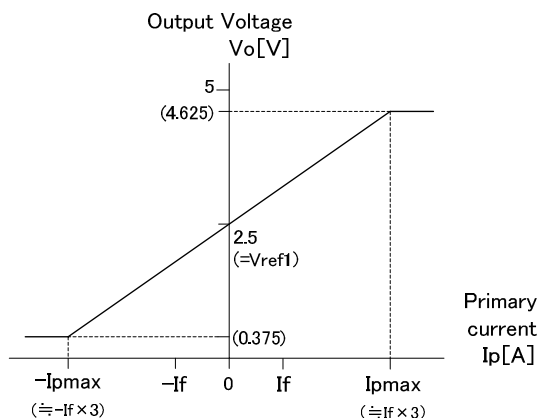


Figure 1: Linearity curve (Internal reference voltage)

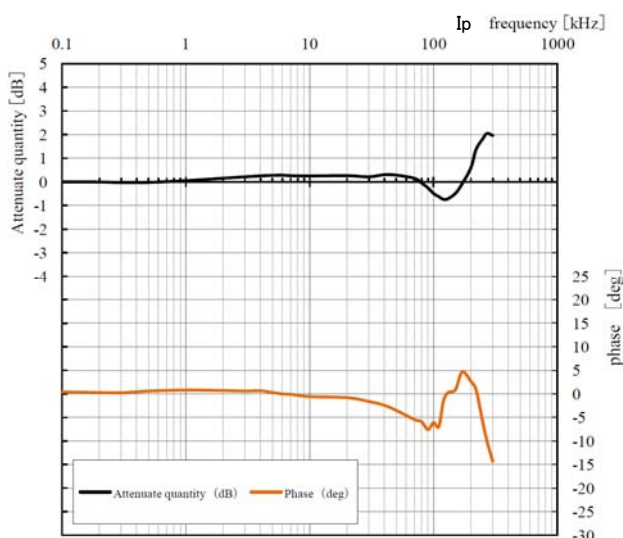


Figure 2: Frequency response curve

ex) F03P025S05  
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

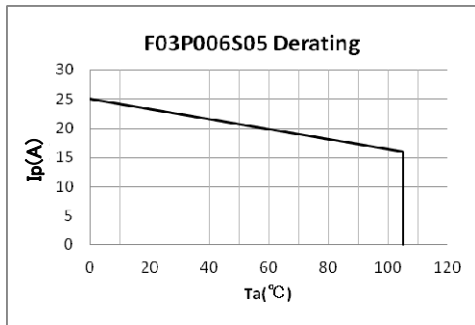


Figure 3: Ip vs Ta for F03P006S05

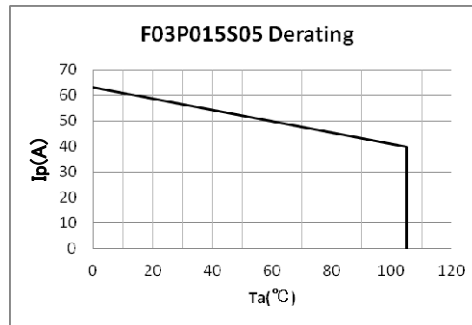


Figure 4: Ip vs Ta for F03P015S05

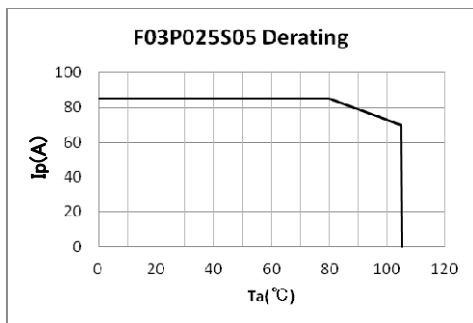


Figure 5: Ip vs Ta for F03P025S05

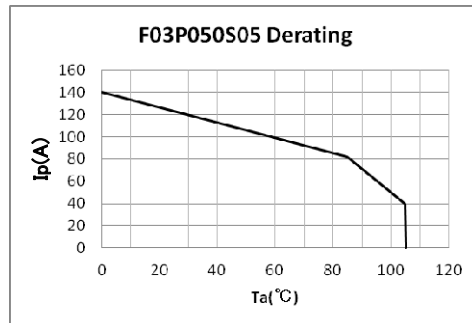


Figure 6: Ip vs Ta for F03P050S05

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。

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 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

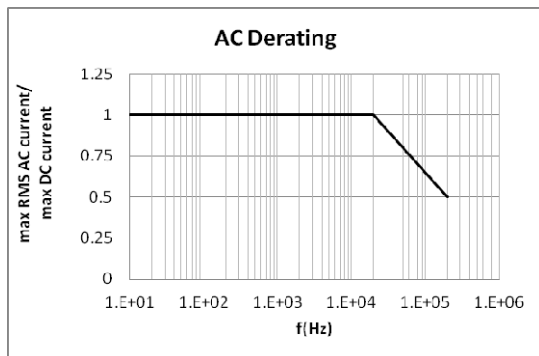


Figure 7: Maximum RMS AC primary current/maximum DC primary current vs frequency

**基準電圧 Reference voltage**

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 mode>

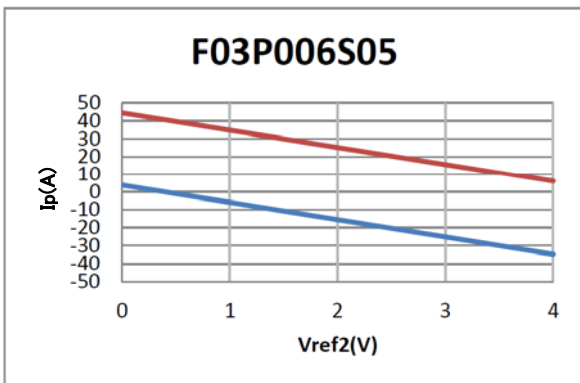
高精度の2.5V内部リファレンスを両極性の電流検出の基準として使用します。  
 The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

<Ref IN mode>

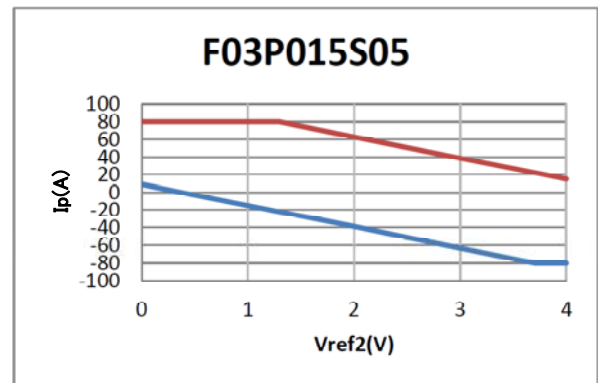
外部基準電圧をRefピンに接続します。外部基準電圧は0~4Vまで供給可能です。  
 供給した電圧は、測定時の基準電圧となります。  
 An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V ,  
 its voltage is used as the reference voltage at the time of measurement.

- 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  $V_{ref2}=0V$ .

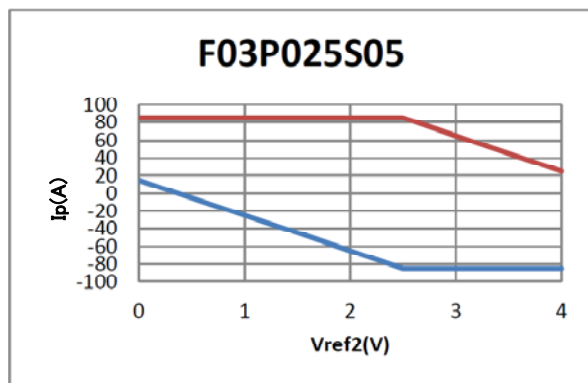
以下のグラフは、外部基準電圧値 $V_{ref2}$ 変化による測定範囲を示します。  
 The following graphs show how the measuring range of each transducer version depends on external reference voltage value  $V_{ref2}$ .



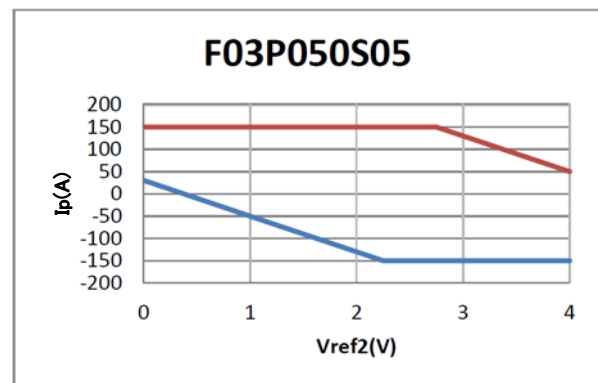
測定範囲上限 Upper limit:  $I_p = -9.6 \times V_{ref2} + 44.4$  ( $V_{ref2}=0...4V$ )  
 測定範囲下限 Lower limit:  $I_p = -9.6 \times V_{ref2} + 3.6$  ( $V_{ref2}=0...4V$ )



測定範囲上限 Upper limit:  $I_p = 80$  ( $V_{ref2}=0...1.29V$ )  
 $I_p = -24 \times V_{ref2} + 111$  ( $V_{ref2}=1.29...4V$ )  
 測定範囲下限 Lower limit:  $I_p = -24 \times V_{ref2} + 9$  ( $V_{ref2}=0...3.7V$ )  
 $I_p = -80$  ( $V_{ref2}=3.7...4V$ )



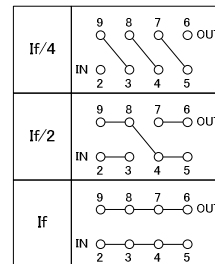
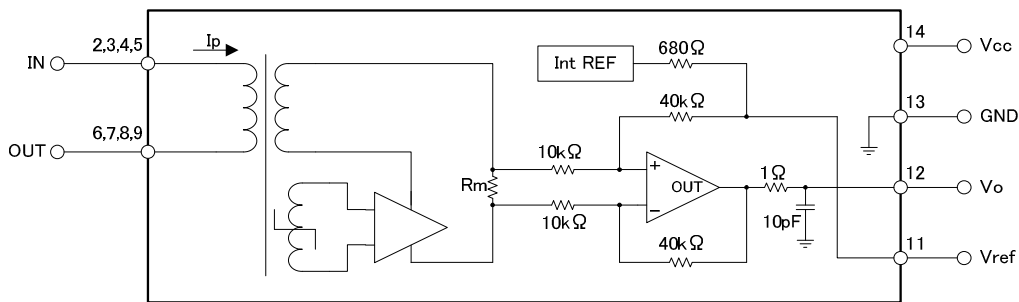
測定範囲上限 Upper limit:  $I_p = 85$  ( $V_{ref2}=0...2.5V$ )  
 $I_p = -40 \times V_{ref2} + 185$  ( $V_{ref2}=2.5...4V$ )  
 測定範囲下限 Lower limit:  $I_p = -40 \times V_{ref2} + 15$  ( $V_{ref2}=0...2.5V$ )  
 $I_p = -85$  ( $V_{ref2}=2.5...4V$ )



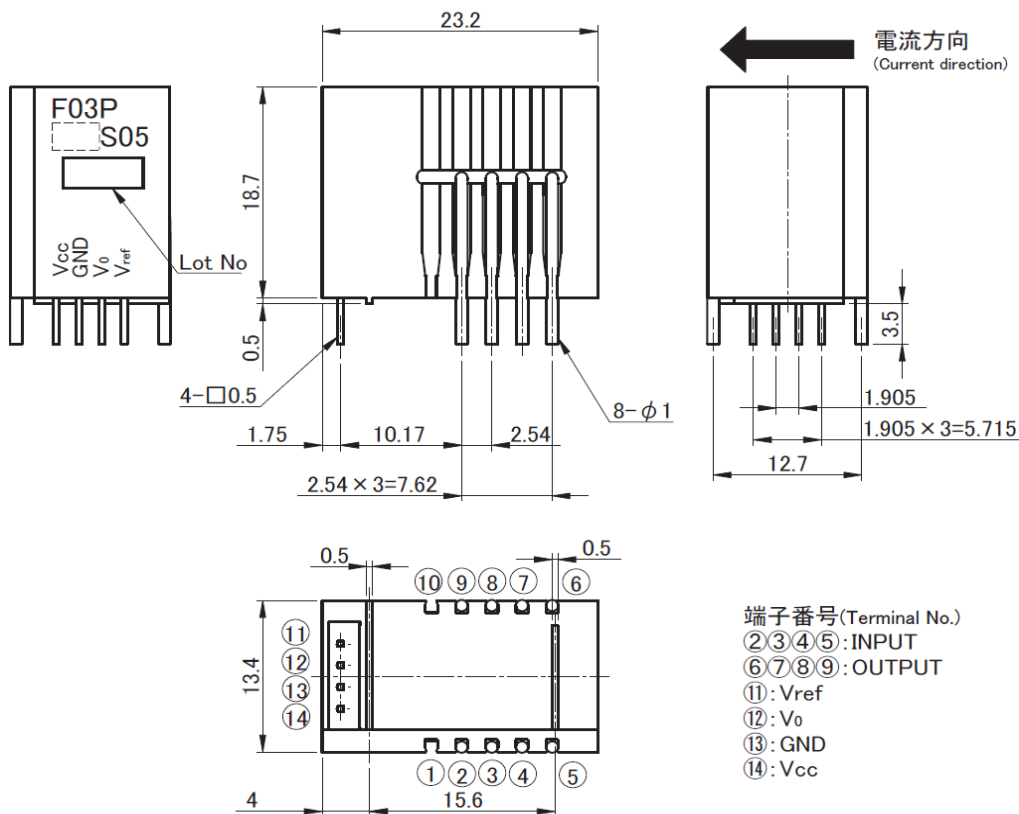
測定範囲上限 Upper limit:  $I_p = 150$  ( $V_{ref2}=0...2.75V$ )  
 $I_p = -80 \times V_{ref2} + 370$  ( $V_{ref2}=2.75...4V$ )  
 測定範囲下限 Lower limit:  $I_p = -80 \times V_{ref2} + 30$  ( $V_{ref2}=0...2.25V$ )  
 $I_p = -150$  ( $V_{ref2}=2.25...4V$ )

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.

接続図 CONNECTION



外形図 DIMENSIONS(mm)



- 端子番号(Terminal No.)
- ②③④⑤: INPUT
  - ⑥⑦⑧⑨: OUTPUT
  - ⑪: Vref
  - ⑫: Vo
  - ⑬: GND
  - ⑭: Vcc

※指示無き寸法公差は±0.5とする。  
(Unless otherwise specified tolerances shall be ±0.5)

推奨穴径 RECOMMENDED HOLE DIAMETER(mm)

