Magnetic Direct Current Sensor MDCS

Outline

Magnetic direct current sensors (MDCS) use a magnetic substance and hole device for magnetic detection of direct current. They detect all currents (DC, AC and pulse), and the output voltage varies in proportion to the strength of the current measured.

Features

- Detection of both direct currents and alternating currents (including pulse currents)
- Fluctuations in output from changes in the power supply voltage and the ambient temperature are small.
- Excellent linearity of measured current and the converted power output
- The measured current and the secondary output side are insulated.

Applications

- Inverter-based home appliances (air-conditioners, refrigerators, washing machines, etc.)
- General-purpose inverters • Servo motors
- Industrial machines • Automobiles
- FAX and other multifunction telephone series (THS Series)

● **MA12, SB15, KB15, MB15**

Item		Marking	Rated value and conditions (Ta=25˚C)				
			Amplifier built-in type				
			Single power supply operating type		Double power supply operating type		
Model			KA15D	MA12	SBI5	KBI5	MBI5
Rated current	(AT)	If	-160 to +160	-40 to +40	-100 to +100	-50 to +50	-40 to +40
Output voltage	(V)	Vh	+4.500±0.050 (If = +160AT) +0.500±0.050 (If = -160AT)	+4.500±0.080 (If = +40AT) +0.500±0.080 (If = -40AT)	+4.000±0.080 (If = +100AT) -4.000±0.080 (If = -100AT)	+5.000±0.100 (If = +50AT) -5.000±0.100 (If = -50AT)	+4.000±0.120 (If = +40AT) -4.000±0.120 (If = -40AT)
Offset voltage (remaining voltage)	(V)	Vo	+2.500±0.050 (If = 0AT)	+2.500±0.060 (If = 0AT)	±0.060 (If = 0AT)	±0.100 (If = 0AT)	±0.120 (If = 0AT)
Vh linearity	(%)		Within ±1%	±3%	Within±1%		±3%
Power supply voltage	(V)	Vcc	+15±10%	+12±5%	±15± 5%	±15±10%	±15±5%
Power supply input current	(mA) max.		40				
Pulse response	(μs) max.		15 (di/dt = 200AT/μs)	15 (di/dt = 200AT/μs)	15 (di/dt = 200AT/μs)	15 (di/dt = 100AT/μs)	
Vh temperature characteristics	(mV / ˚C) max.		±2.0 (at +160AT)	±4.0 (at ±40AT)	±8.0 (at ±100AT)	±8.0 (at ±50AT)	±5.0 (at ±40AT)
Vo temperature characteristics	(mV / ˚C) max.		±2.0	±4.0	±5.0	±8.0	±4.0
Insulation withstand voltage	(V)		AC2000V for 1 minute at 50/60 Hz Leakage current within 5 mA (Between pass-through side and connectors)				
Insulation resistance	(MΩ) min.		500 (500VDC) (Between pass-through side and connectors)				
Operating temperature range	(˚C)	Ta	-10 to +80				
Storage temperature range	(˚C)	Ts	-15 to +85				
Primary side windings*			φ1.0 mm /8 turns	φ1.0 mm /4 turns	–	φ1.0 mm /5 turns	φ1.0 mm /4 turns
Comments			Positive/negative output				

*Besides the standard windings (8 turns), any other windings within the rated current are possible. *The rated current unit AT is designated as the primary side current (A) × number of turns (Turn).

● **THS56,56F,65,63F**

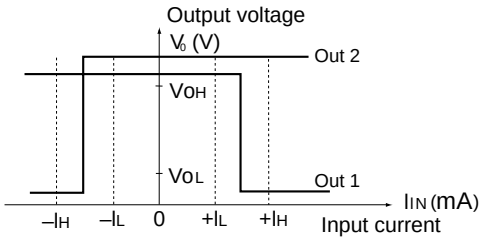
Electrical Characteristics (Ta=25°C, Vcc=+5V)

Item		Marking	Conditions	Rating			Comments
				min.	typ.	max.	
Sensitivity current (mA)	56,65	I_L	Ta=+5°C~+45°C	2			
		I_H				15	
	56F,63F	I_L		5			
		I_H				10	
Primary side input current (mA)	56,56F,63F,65	Iin		-120		120	
Input direct current resistance (Ω)	56	Rin	Ta=–10°C~+70°C	2.5	3.5	4.5	
	56F,63F,65			2.5	3.9	5.0	
Input inductance (mH)	56	Lin	Ta=–10°C~+70°C	0.8	1.0	1.2	-10°C ~ +70°C
	56F,63F,65			0.8	1.1	1.4	
Output voltage (V)		V_{OH}	RL=10kΩ	3.5			
		V_{OL}			0.1	0.8	
Response (μS)		ton-off	RL=∞		60		
Power supply voltage (V)		Vcc		+4.5		+5.5	
Consumption current (mA)	56,56F,65	Icc			10		
	63F				12		
Effect of external magnetic field (mA)	56,56F,63F,65	Iin offset	Iin=0 B=1×10^{-3}T		3		
"Analog" out put — Loss (dB)	56,65		Iin=0~120mA 1kHz,60Ω	30	34	38	
	56F			30	33	36	
	63F			-2	0	2	
"Analog" out put — S/N (dB)	56,56F,65		Input level(Vin) –45~+20dBm	15			
	63F		Input level(Vin) –45~0dBm				

Maximum Rating

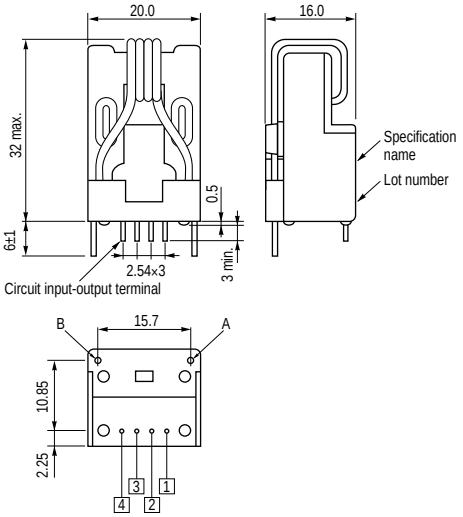
Item		Marking	Rating	Comments
Power supply voltage (V)		V_{CC}	7.0	
Primary side input current (A)	56,56F,63F,65	Iin	0.5	10sec. max.
Withstand voltage between primary and secondary (kVAC) min.			2.2	60sec. 50Hz RH=65±5%
Operating temperature range (°C)		Topt.	–10 ~ +70	
Storage temperature range (°C)		Tstg.	–20 ~ +80	

Input Current - Output Voltage Characteristics

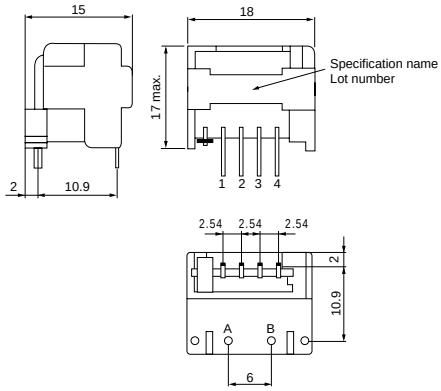


Shape and Dimensions

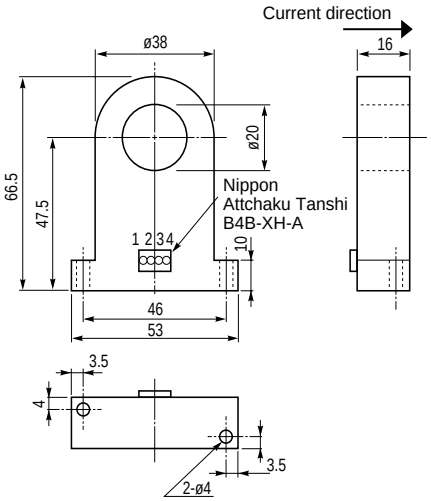
● **KA15D,KB15**



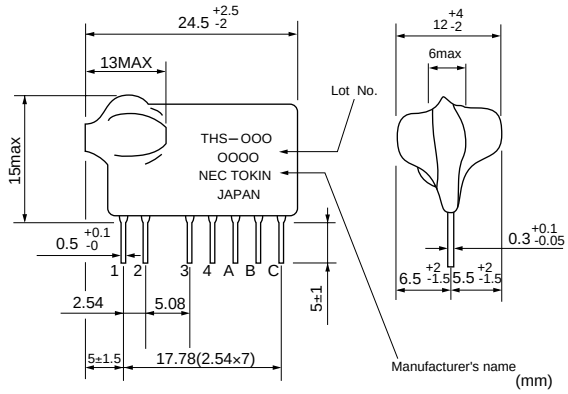
● **MA12, MB15**



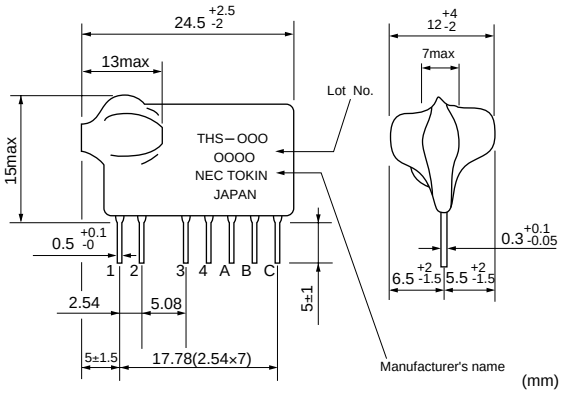
● **SB15**



● **THS-56,56F,65**



● **THS-63F**



Pin number	KA15D	MA12	SB15	KB15	MB15	THS56,56F,65,63F
1	Vcc (+15V)	GND (Ground pin)	Vcc (+15V)	Vee (-15V)	Vee (-15V)	(Coil input)
2	GND (Ground pin)	Vcc (+12V)	Vee (-15V)	GND (Ground pin)	GND (Ground pin)	(Coil input)
3	Vout (Output voltage pin)	Vout (Output voltage pin)	Vout (Output voltage pin)	Vcc (+15V)	Vcc (+15V)	GND (Ground pin)
4	NC (Cannot be connected)	NC (Cannot be connected)	GND (Ground pin)	Vout (Output voltage pin)	Vout (Output voltage pin)	"Analog" output
A	(Measured current ⊕pin)	(Measured current ⊕pin)	—	(Measured current ⊕pin)	(Measured current ⊕pin)	OUT2
B	(Measured current ⊖ pin)	(Measured current ⊖ pin)	—	(Measured current ⊖ pin)	(Measured current ⊖pin)	OUT1
C	—		—	—	—	Vcc (+5V)

Before Using Magnetic Direct Current Sensor MDCS

- Strong physical shocks could damage cores. Be careful not to drop or apply other strong impact.
- These products are heat resistant up to 260°C for 10 seconds. Be careful not to exceed this amount when soldering. Use a low-corrosion type flux when soldering.
- Because the circuit uses ICs, application of strong static electricity could cause damage. Take static electricity precautions when handling.
- Because these products are magnetic current detectors, application of strong external magnetic fields could cause their characteristics to change. Limit ambient magnetic fields to 50e or less.